

APPENDIX A

Telephone System



NBX Installation Guide

NBX V3000

Release 4.4

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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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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

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Date: 5 November 1990

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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

Your Comments on the Technical Documentation

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:

Voice_TechComm_Comments@3com.com

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

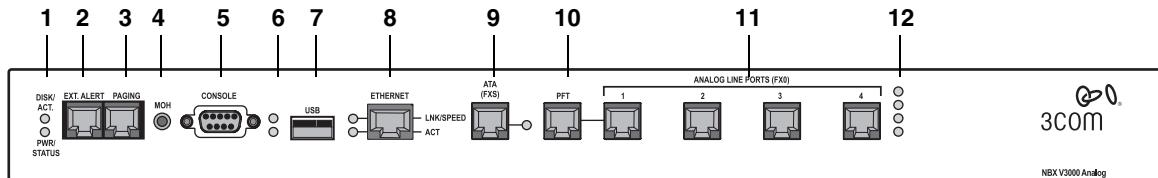
The NBX V3000 ([Figure 1](#)) houses these components:

- 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:

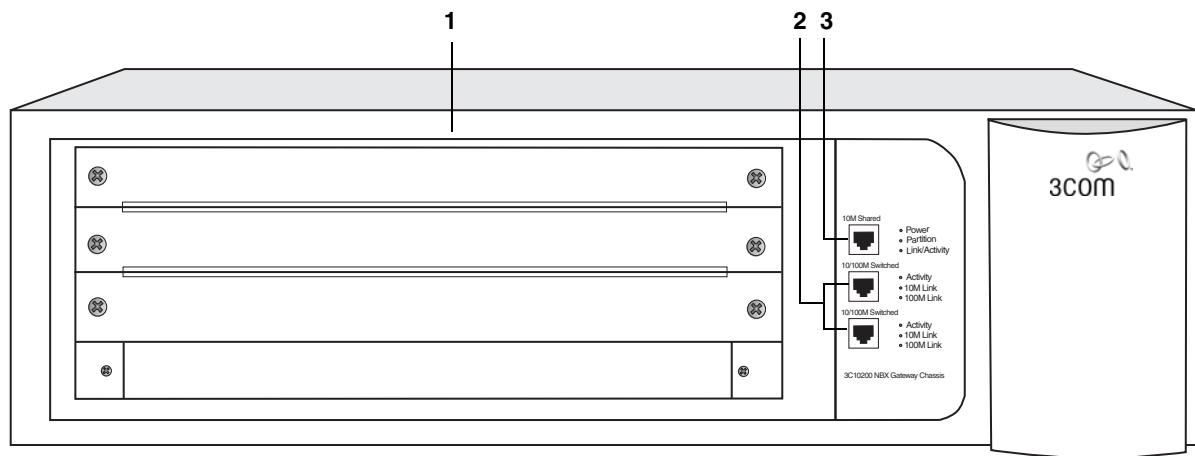
- S2 flashing green — System boot sequence has started.
- S2 green — Disk drive initialization is complete.
- S1 and S2 flash alternately — A file system check (FSCK) is running due to previous improper system shutdown. (Do not turn off the system until you have run the system shutdown operation through 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 <ul style="list-style-type: none">■ Yellow — 10Mbit link■ Green — 100Mbit link■ Off — No link ACT <ul style="list-style-type: none">■ 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: <ul style="list-style-type: none">■ 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: <ul style="list-style-type: none">■ 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 (FXO)	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: <ul style="list-style-type: none">■ 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: <ul style="list-style-type: none">■ 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)

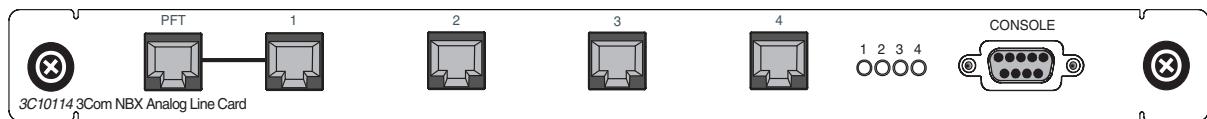
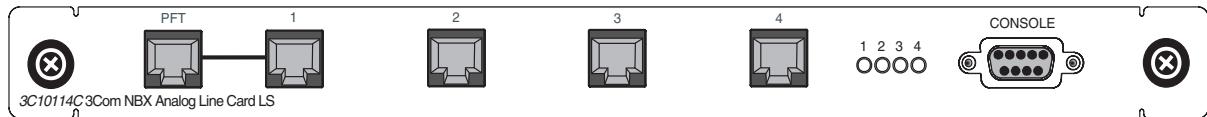


Figure 4 NBX Analog Line Card (3C10114C)



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)

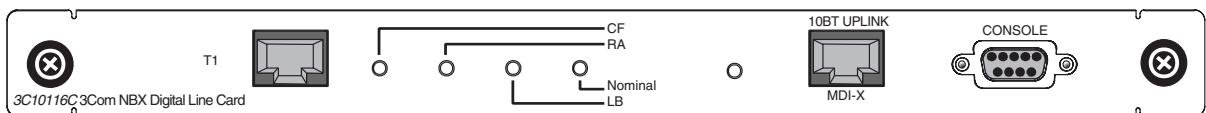
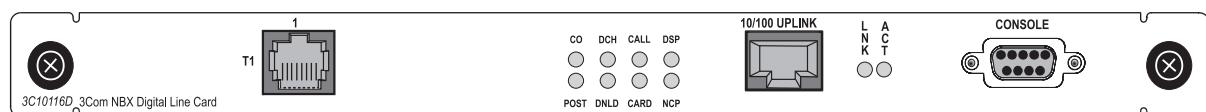


Figure 6 T1 Digital Line Card (3C10116D)



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)

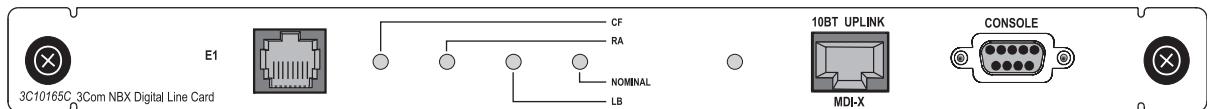
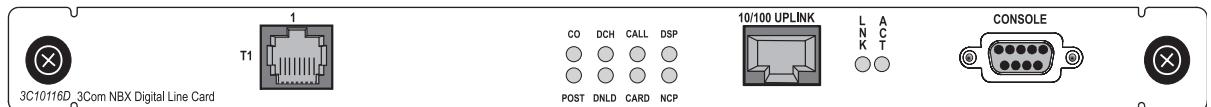


Figure 8 E1 Digital Line Card (3C10165D)



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.

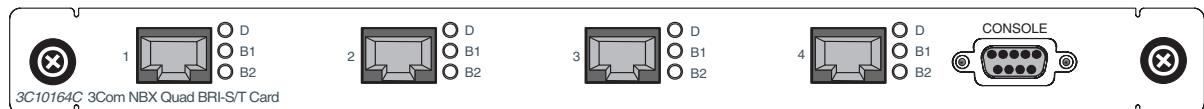


CAUTION: *This equipment does not operate when the main power fails.*

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:

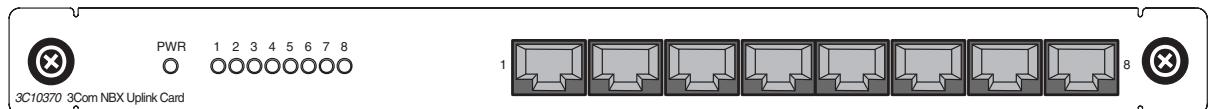
- The D light turns green if the span is operating properly, and turns amber if there is a problem. For a span that is operating properly, when the NBX system initiates or receives a call on a B channel, the corresponding light initially turns amber. When the call is answered, the light turns green.
- **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)

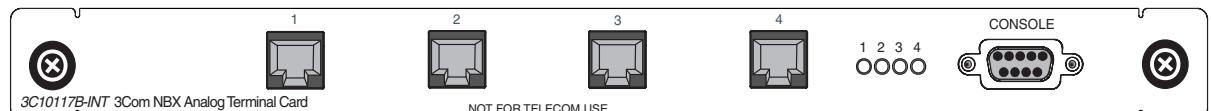
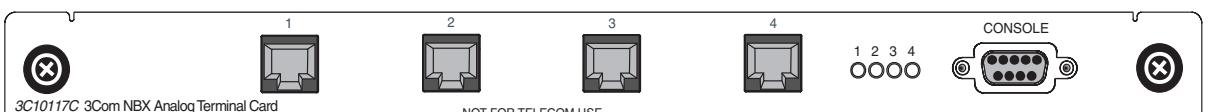


Figure 12 NBX Analog Terminal Card (3C10117C)



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

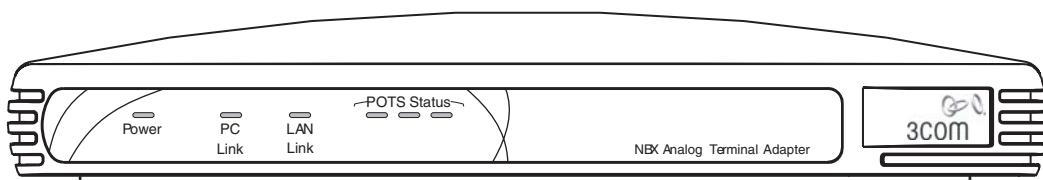
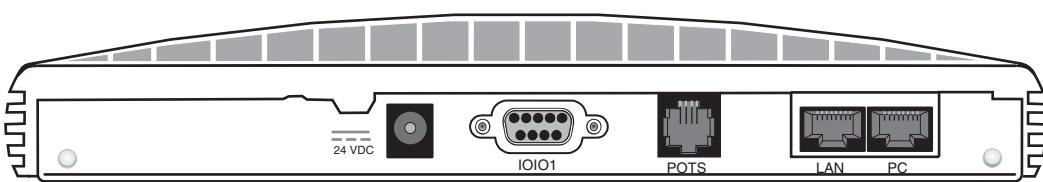


Figure 14 Analog Terminal Adapter (3C10400) — Rear View



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

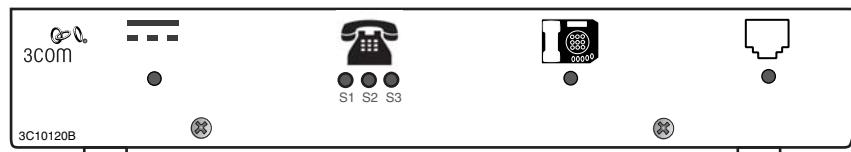
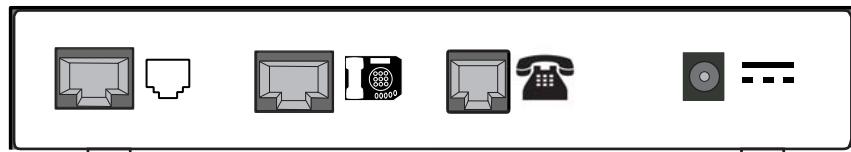


Figure 16 Analog Terminal Adapter (3C10120B) — Rear View



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:

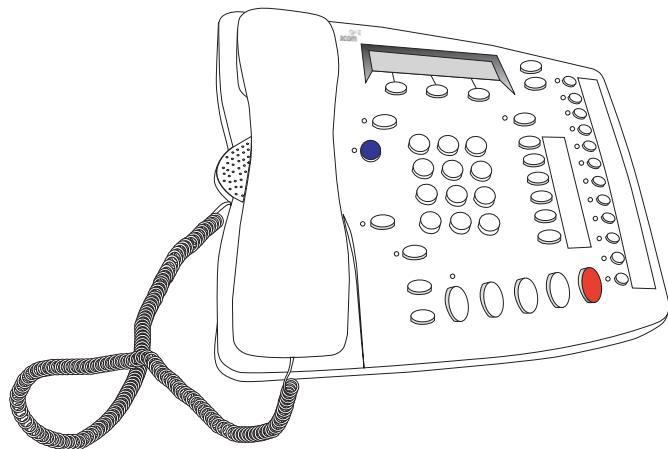
- 3102 Business Telephone
- 3101 or 3101SP Basic Telephones
- 3105 Attendant Console

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

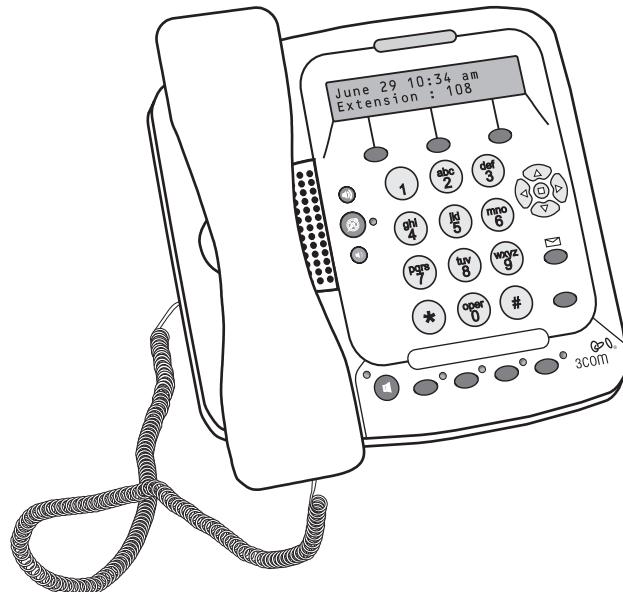


Figure 18 3Com Business Telephone Model 1102, 2102, or 2101-IR



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



3C10248B
3C10248PE

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 $(6 \times 4) + (12 \times 4) = 72$.
- 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
CITELink 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](#)
- [International Feature Support](#)
- [Installation Requirements](#)
- [Installation Questions](#)
- [Before You Begin Installation](#)
- [Important Safety Information](#)
- [Unpacking and Examining the Components](#)
- [Installing the NBX V3000 System Hardware](#)
- [Configuring NBX System Networking](#)
- [Connecting Cards and Devices](#)
- [Selecting Regional Software and Components](#)
- [Using Auto Discover for Initial System Configuration](#)
- [Connecting Telephone Lines](#)
- [Adding External Hardware](#)
- [Configuring Routing Devices](#)

Introduction

This guide uses the following definitions for administrators, users, and callers 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 with 10BASE-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 Mbps 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	<ul style="list-style-type: none"> ■ 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	<ul style="list-style-type: none"> ■ 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	<ul style="list-style-type: none"> ■ 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	<ul style="list-style-type: none"> ■ The supply plug must comply with section 107-2-D1, standard DK2-1a or DK2-5a.
Switzerland	<ul style="list-style-type: none"> ■ 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 système est paramétré sur le réglage de tension conforme aux exigences du pays d'utilisation.*



AVERTISSEMENT: Le système 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 être 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 Région	Détails du Cordon Électrique
Europe	<ul style="list-style-type: none"> ■ 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	<ul style="list-style-type: none"> ■ La prise secteur doit être conforme aux normes BS1363 (tripolaire, 13 amp) et équipée d'un fusible 5A à conformité BS1363. ■ Le cordon secteur doit porter la mention <HAR> ou <BASEC> et doit être de type HO3VVF3GO.75 (minimum).
Italie	<ul style="list-style-type: none"> ■ 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	<ul style="list-style-type: none"> ■ La prise mâle d'alimentation doit respecter la section 107-2 D1 de la norme DK2 1a ou DK2 5a.
Suisse	<ul style="list-style-type: none"> ■ 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	<ul style="list-style-type: none"> ■ 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	<ul style="list-style-type: none"> ■ 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	<ul style="list-style-type: none"> ■ 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	<ul style="list-style-type: none"> ■ Der Netzstecker muß die Vorschriften laut Abschnitt 107-2-D1 der Norm DK2-1a oder DK2-5a erfüllen.
Schweiz	<ul style="list-style-type: none"> ■ 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.



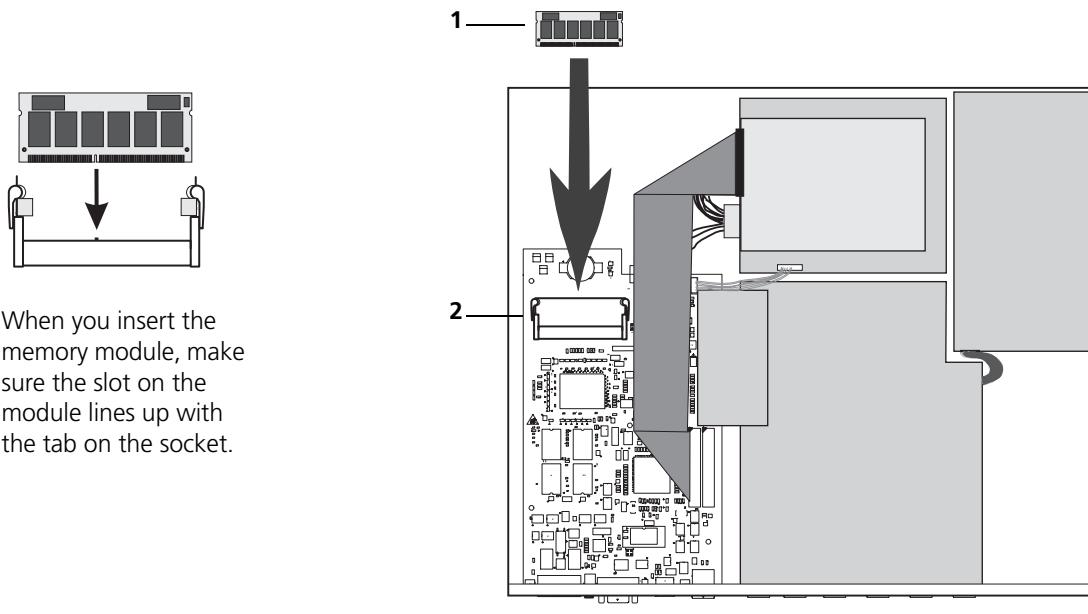
CAUTION: Always wear a properly grounded anti-static strap when you remove the cover from the NBX V3000 system and when you handle a memory module. Leave the memory module in its anti-static container until you are ready to install it.

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



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 subnet (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 192.168.1.192 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	<p>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.</p> <p>Set the computer's IP parameters to these settings:</p> <ul style="list-style-type: none">■ IP address: 192.168.1.191■ Default gateway: 192.168.1.1■ Subnet mask: 255.255.255.224 <p>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.</p>
Private IP network, no subnets	<p>You probably need to change the NBX system IP address to conform with the existing IP addressing scheme.</p> <p>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.</p>

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

Table 9 IP Addressing and the NBX System (continued)

Local IP Environment	NBX System Configuration
Private IP network, with subnets	<p>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.</p>
	<p>You must change the NBX System subnet mask (255:255:255:0) if it does not conform to the network subnet scheme.</p>
	<p>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.</p>
Internet connectivity; addresses provided by the Internet Service Provider.	<p>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.</p>
Internet connectivity; addresses provided from address block controlled by the client's organization.	<p>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.</p>

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

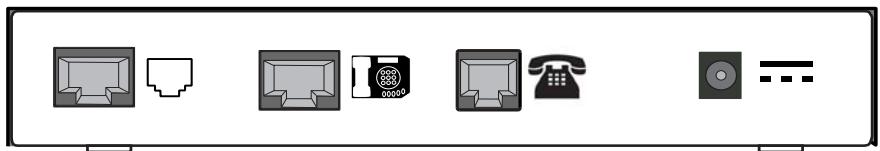
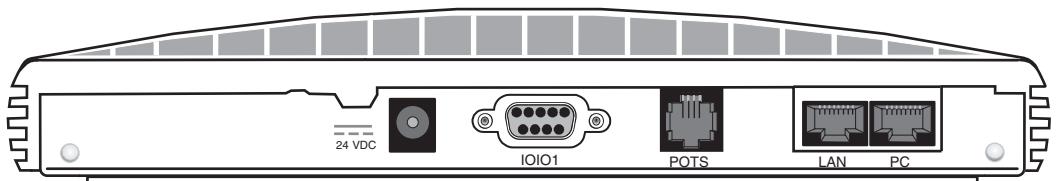


Figure 23 3C10400 ATA Connectors



- 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

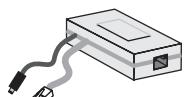
The 3C10120B requires the use of a splitter device to accept Power over Ethernet (PoE).

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.

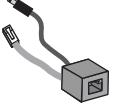
Table 10 Connecting Power to an NBX Analog Terminal Adapter

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 3C10120B	Connect the powered Ethernet cable directly to the telephone's Ethernet connector. No separate power connection is required.
		Devices that predate the 802.3af standard can be powered by an 802.3af-compliant power supply with the use of the <i>3Com Network Jack to NBX Phone Power Module</i> (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:	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 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 and power connection.
■ 3C10220 (12-port) ■ 3C10222 (24-port)		
		 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)

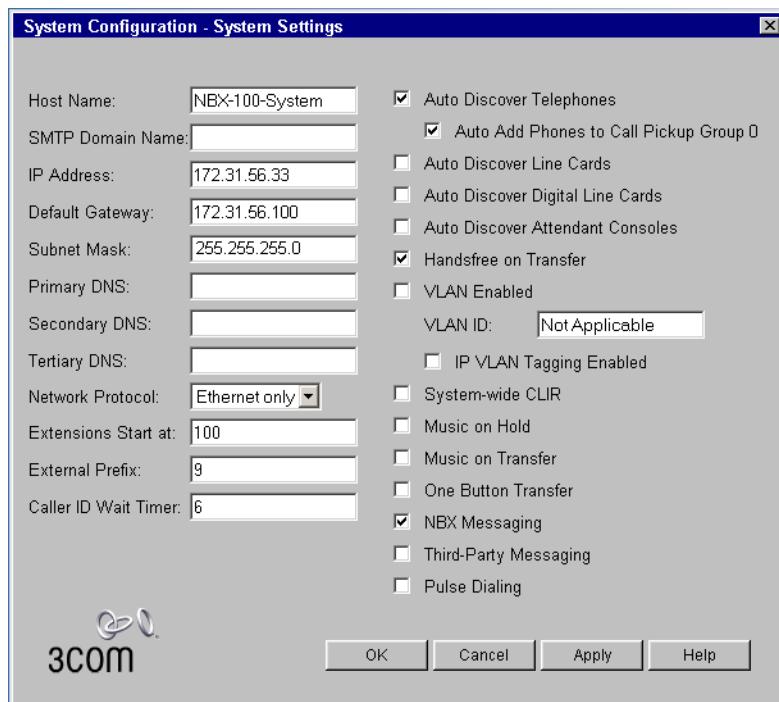
Component	Auto Discover Action
3Com Attendant Console	Finds and configures any installed 3Com Attendant Consoles. The first 100 existing telephones, except for the extension that is associated with the Attendant Console, are mapped to Attendant Console buttons. The lowest extension is automatically associated 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: <ul style="list-style-type: none"> ■ 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: <ul style="list-style-type: none"> ■ 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. <i>Auto Add Phones to Call Pickup Group 0</i> 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 <i>NBX Administrator's Guide</i> 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.
Trunk to Trunk	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.
Disable Caller ID	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.
Pulse Dialing	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.
AutoExt	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 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: <ul style="list-style-type: none">■ 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

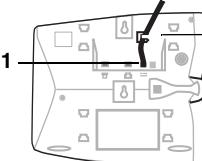
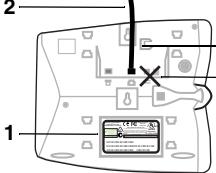
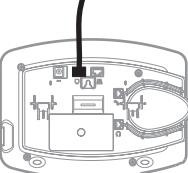
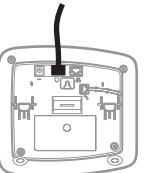
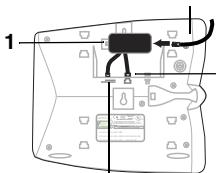
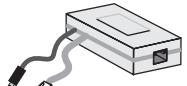
Power Source	3Com Telephone	Connection Details
AC power adapter (commonly known as a 'power brick')	All 3Com Telephones On all NBX devices, the power connector is marked by the DC power symbol: 	<p>Connect the AC adapter's power jack 1 to the power connector on the bottom of the phone. Run the cable through the strain-relief tab 2 to prevent power from becoming disconnected.</p> 
Any 3Com Telephone can accept power from a power adapter.		<p>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.</p>
		<p>3102 Business Telephone.</p> <p>A power adapter is an optional component on the 3102 Business Telephone.</p>
		<p>3101 and 3101SP Basic Telephone.</p> <p>A power adapter is an optional component on the 3101 and 3101SP Basic Telephones</p>
		<p>2101 Basic Telephone.</p>

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)	 <p>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.</p> <p>All 3Com telephones identify the Ethernet connection with this icon: </p>
		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 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 connection 3 and a power jack 4 .
3Com Basic Telephone: 3C10248B (2101)		



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:	3Com Business Telephones: ■ 3C10220 (12-port) ■ 3C10222 (24-port)	<p>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.</p>
	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)	<p>3102 Business Telephone</p>
		<p>3101 and 3101SP Basic Telephones</p>
		<p>2101 Basic Telephone</p>



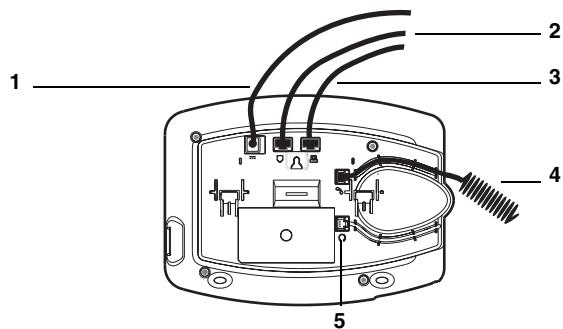
CAUTION: You can damage an NBX device by using an NBX power splitter (3C10223) with the 3Com Network Jack Power over Ethernet Multiport Midspan Solution (3CNJPSE24). Use the NBX power splitter (3C10223) only with the 3Com Ethernet Power Source (3C10220, 12-port, or 3C10222, 24-port).

Connecting the Telephone to the LAN

To connect the telephone:

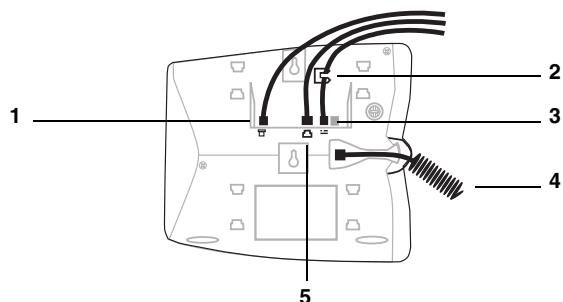
- 1 Connect a Category 5 Ethernet cable to an available hub port or wall jack that is connected to the same subnet as the NCP.
- 2 Connect the other end of the Ethernet cable to the LAN connector on the underside of the telephone.

Figure 25 Connections for 3Com 3102 Business Telephones

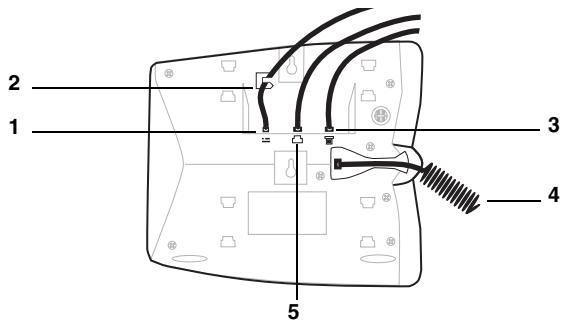


- 1** Power cable. Ask your Administrator how you should power your phone. Then see [Table 18](#) for instructions on how to connect your telephone to power. ([Figure 27](#) shows a connection using an optional AC adapter.)
- 2** Ethernet cable (to data jack)
- 3** Ethernet cable (optional; to connect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

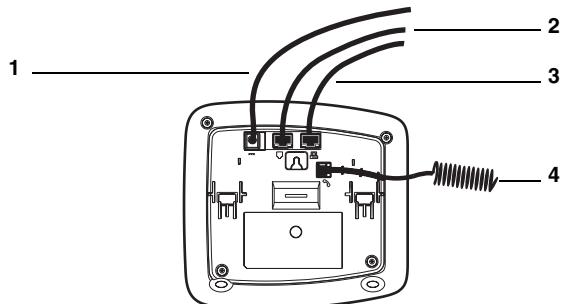
Figure 26 Connections for 3Com 1102 Business Telephones



- 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)

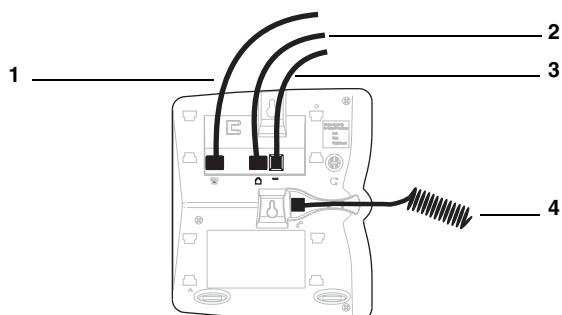
Figure 27 Connections for 3Com 2102 Business Telephones

- 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.

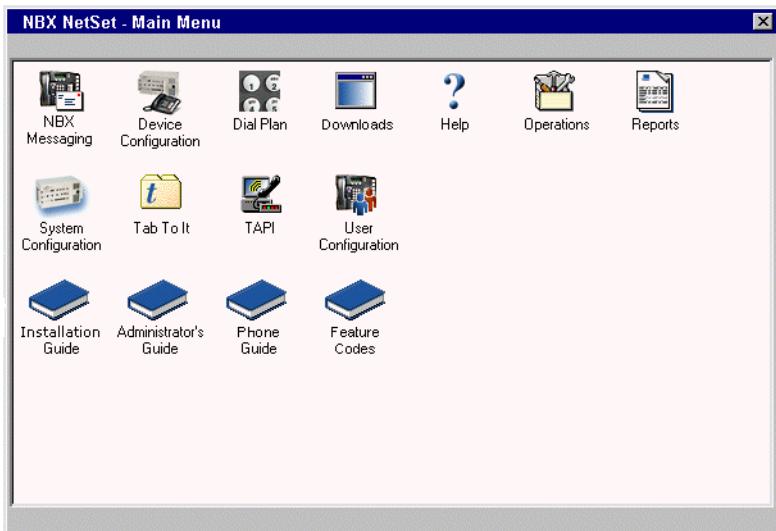


If you are adding licensed devices, such as the 3102, 3101, 3101SP, or 3105, you must first add the license key into the NBX NetSet utility. The Auto Discover process will not discover a licensed device if the license has not been added to the system.

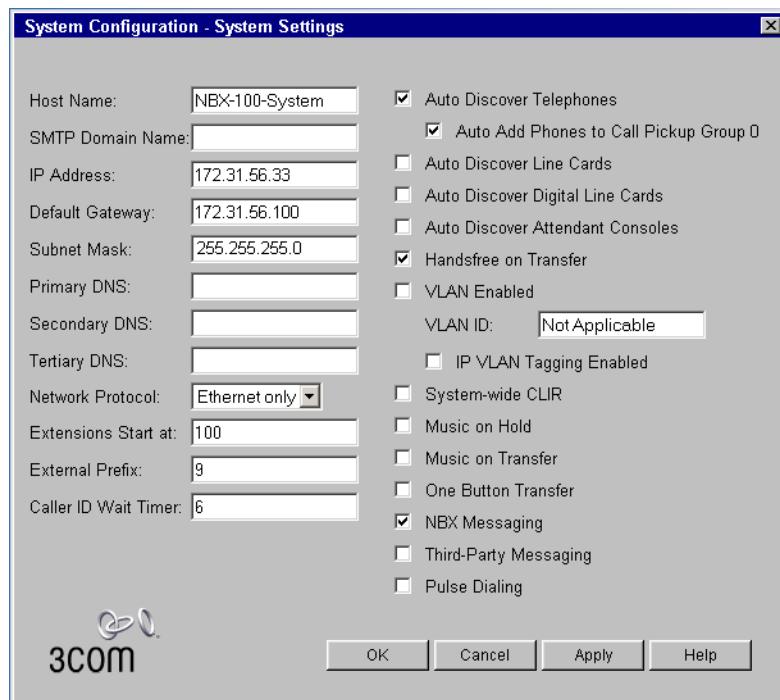
To Auto Discover a telephone:

- 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

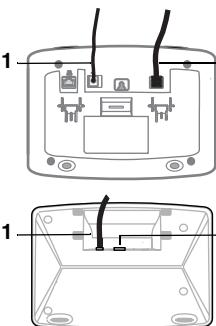
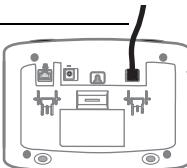
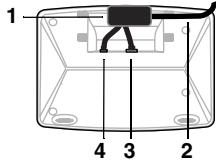
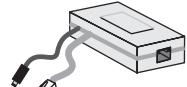
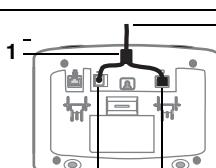
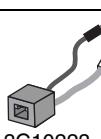
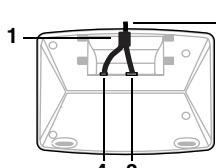
Power Source	Connection Details
AC power adapter The Attendant Console can accept power from a power adapter. Use the adapter that comes with your Attendant Console.	<p>Connect the AC adapter's power jack to the power connector 1 on the bottom of the Attendant Console. Connect an Ethernet cable 2 from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

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

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

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.

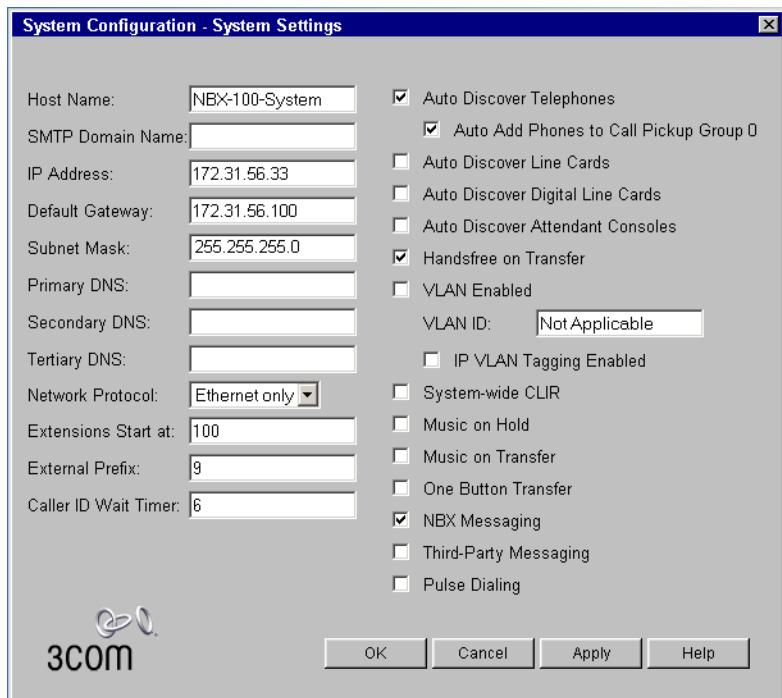


Do not Auto Discover the Attendant Console before you have configured all telephones and Analog Line Cards.

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.

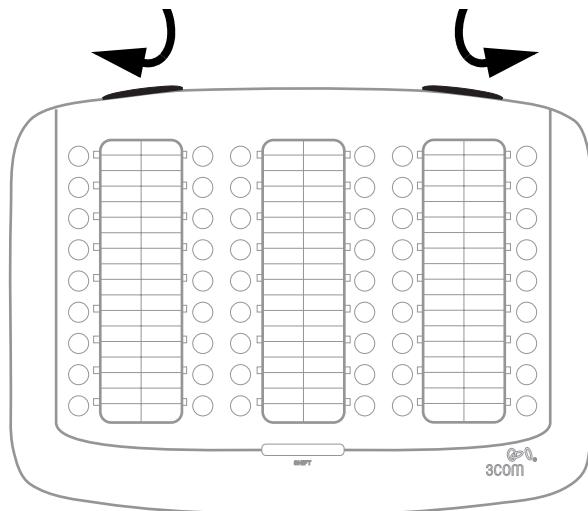
For more about button mappings on an Attendant Console, see Chapter 3, "Device Configuration," in the *NBX Administrator's Guide*.

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

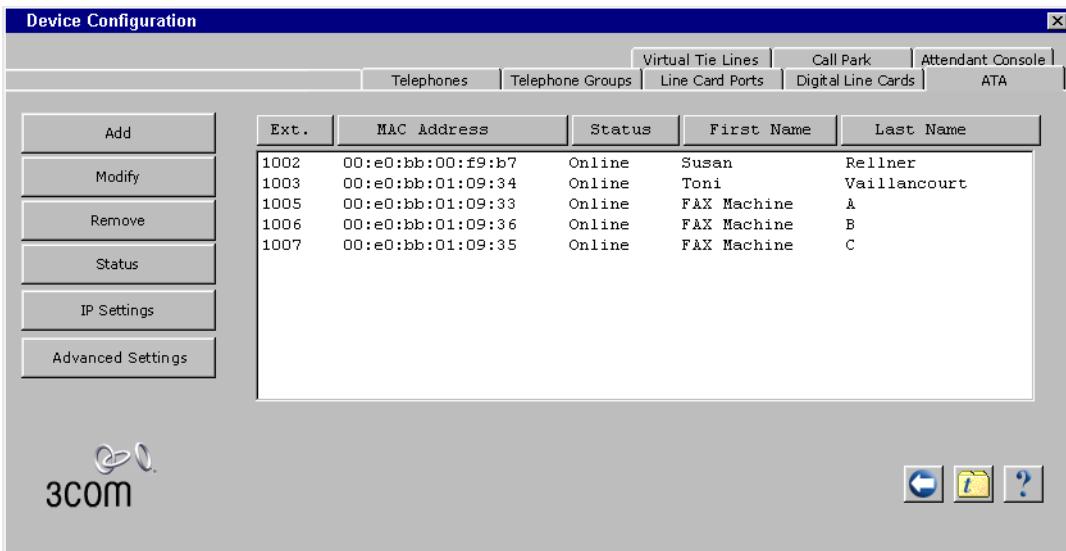
After you have used the Auto Discover feature to add an Analog Terminal Card, you can verify that the card is properly installed by using the NBX NetSet utility, described next, and by examining the status lights on the front of the card, which are described on [page 35](#).

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: <ul style="list-style-type: none"> ■ 3C10220 (12-port) ■ 3C10222 (24-port) 	<p>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 <i>LAN</i>) and power connection (labeled <i>—</i>).</p> 



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).

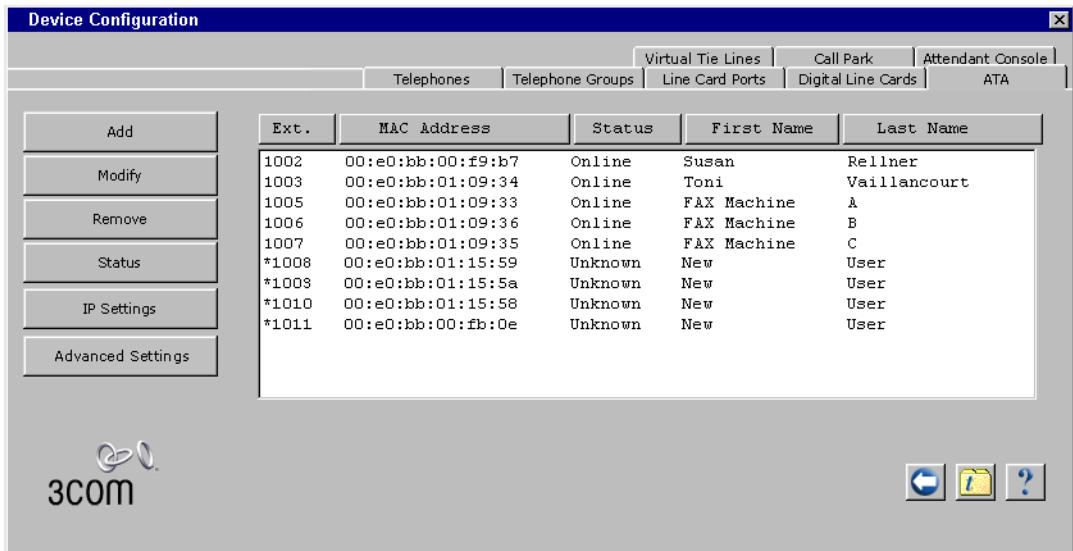
Verifying an Analog Terminal Adapter or the ATA Port

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:

- [Adding a BRI-ST Digital Line Card](#)
- [Verifying a BRI-ST Digital Line Card](#)



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:

- [Adding an E1 Digital Line Card](#)
- [Verifying an E1 Digital Line Card](#)

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 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:

- [Adding a T1 Digital Line Card](#)
- [Verifying the T1 Digital Line Card](#)

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](#)
 - [Implementing IP](#)
 - [Standard IP Configuration](#)
 - [IP On-the-Fly Configuration](#)
 - [Providing the NCP IP Address to Devices](#)
- [Configuring IP Telephony](#)
 - [Selecting the Operating Mode](#)
 - [Selecting the Operating Mode](#)
 - [Configuring IP On-the-Fly](#)
 - [Configuring the DHCP Server](#)
 - [Manually Configuring Telephone IP Settings](#)
 - [Entering Data Using the Telephone Key Pad](#)
 - [Automatically Configuring Telephone IP Settings](#)
 - [Configuring Analog Line Card Ports](#)
 - [Configuring T1, E1, and BRI Channels](#)
 - [Low-bandwidth Telephony](#)
 - [Broadband Telephony](#)

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 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 <i>NBX Administrator's Guide</i> .
 <i>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.</i>	<i>3C10165D E1 Digital Line Cards and 3C10116D T1 Digital Line Cards do not support DHCP lease times of less than 20 minutes.</i>
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
A small icon of a telephone key pad with a central circle and four arrows pointing up, down, left, and right.
- For the 3101 and 3101SP Basic Telephones, press the center select button:
A small icon of a telephone key pad with a central circle and four arrows pointing up, down, left, and right.
- For the 1102, 2102, and 2102-IR Business Telephones, press
A small icon of a telephone key pad with a central circle labeled 'PROGRAM' and four arrows pointing up, down, left, and right.

- 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.
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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:

- [System-level Troubleshooting](#)
- [Connecting a Computer to an NCP](#)
- [Servicing the Network Call Processor Battery](#)
- [Getting Service and Support](#)

The SuperStack 3 NBX hardware needs no routine maintenance. However, you should perform periodic backups of the configuration database, 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 are 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:

- [NBX V3000 Call Processor](#)
- [SuperStack 3 NBX Call Processor](#)
- [SuperStack 3 NBX Gateway Chassis](#)
- [NBX 100 Call Processor](#)
- [NBX 100 6-Slot Chassis](#)
- [NBX Analog Line Cards](#)
- [NBX Analog Terminal Cards](#)
- [NBX Analog Terminal Adapter \(ATA\)](#)
- [NBX BRI-ST Digital Line Card](#)
- [NBX E1 and T1 Digital Line Cards](#)
- [NBX Hub Card](#)
- [NBX Uplink Card](#)
- [3Com 3102 Business Telephone](#)
- [3Com 2102 and 2102-IR Business Telephones](#)
- [3Com 1102 Business Telephone](#)
- [3Com 3101 Basic Telephone](#)
- [3Com 2101 Basic Telephone](#)
- [3Com 3105 Attendant Console](#)
- [3Com 1105 Attendant Console](#)

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:



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

An 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: 3C10121-CN China: 3C10121-ME Europe: 3C10121-SA South Africa: 3C10121-UK United Kingdom: 3C10121-US North America:	240VAC, 50Hz, 13W 220VAC, 50Hz, 13W 230VAC, 50Hz, 13W 230VAC, 50Hz, 13W 230VAC, 50Hz, 13W 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: 3C10223-CN China: 3C10223-ME Mainland Europe: 3C10223-SA South Africa: 3C10223-UK United Kingdom: 3C10223-US North America:	240VAC, 50Hz, 13W 220VAC, 50Hz, 13W 230VAC, 50Hz, 13W 230VAC, 50Hz, 13W 230VAC, 50Hz, 13W 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](#)
- [T1 Prerequisites](#)
- [T1 Recommendations](#)
- [ISDN PRI Prerequisites](#)
- [ISDN PRI Recommendations](#)
- [ISDN BRI Prerequisites](#)
- [ISDN BRI Recommendations](#)

Caller ID Choices for Analog Lines

When you order analog telephone lines from your telephone service provider, you can also order caller ID service. Your telephone service provider can tell you the format in which they provide caller ID information.

You can configure your NBX system to work with any of these formats:

- Bellcore GR-30-CORE
- ETSI FSK
- ETSI DTMF
- British Telecom SIN 242
- NTT Telephone Interface Services

See the *NBX Administrator's Guide* for information on how to configure Analog Line Card ports for the caller ID format you want to use.

T1 Prerequisites

All contact information *must* be available at time of installation, including telephone numbers and appropriate account representative contact information from the client's carrier.

T1 Recommendations

If the client is using standard (DS1) T1 lines, 3Com recommends that the circuits from the T1 provider meet the following criteria:

- **Framing Type** — Use either ESF with B8ZS.
- **Zero Code Suppression** — Use D4 with AMI.
- **Signaling** — E&M/Wink is required.
- **Start Type** — Wink Start is required.



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 \(MTU\)](#)
- [Communication Latency Requirements](#)
- [Bandwidth Requirements](#)
- [Installing Fax Machines with ATAs](#)

Maximum Transfer Unit (MTU)

The system requires that the interconnection mechanism provide an apparent MTU of a full size IEEE 802.1 packet (1514 bytes of information plus 4 byte CRC). The interconnection can fragment packets into smaller frames but *must* reassemble the packets prior to delivery to any NBX device. The NBX devices do not presently support IP (or other) packet fragmentation and reassembly.

**Communication
Latency
Requirements**

The interconnect latency requirements can be broken into two main categories: large packet latency and small packet latency. Depending on the configuration of the interconnection mechanism, these latencies can be quite different, often due to the interconnection device applying compression to the packets. The compression function can increase exponentially with packet size, resulting in very long delays for large packets.

Large Packet Latency

The round-trip latency on large packets, 300 bytes to full MTU, must be less than 450 ms. The system will support an occasional packet delay of 450 to 900 ms, but each such delay will cause retries and thus affect bandwidth and performance. If delays in excess of 450 ms occur at a "high rate" (more than one such delay every three seconds) then system degradation can occur, resulting in problems initializing (downloading devices) as well as sluggish performance of system features.

Small Packet Latency

The round-trip latency on small packets, from 64 bytes up to the large packet size, should be less than 150 ms, to maintain a high performance level (this is especially significant in the quality of user conversations). Longer latency will not cause system failure but can result in "talk-over" situations within a conversation. Additionally, the longer latency can cause the system to appear sluggish during user interaction (dialing, answering, etc.).

Bandwidth Requirements	The interconnect bandwidth requirements depend on the selected audio compression and system configuration [Layer 2 or Layer 3 (IP)] topology.
 Layer 2 Mulaw (G.711) Audio (Normal Setting)	<i>NBX default audio settings deliver optimum audio quality. Any change to default audio settings affects audio quality.</i>
Layer 3 Mulaw (G.711) Audio	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 2 ADPCM Audio (Reduced Bandwidth Setting)	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 3 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.
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
India	+61 2 9424 5179 or 000800 650 1111	1800 1 888 9469	
Indonesia	001 803 61009	P.R. of China	800 810 3033
Japan	00531 616 439 or 03 3507 5984	Singapore	800 6161 463
Malaysia	1800 801 777	S. Korea	080 333 3308
New Zealand	0800 446 398	Taiwan	00801 611 261
		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
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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	1 800 998 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	1 800 998 2112
Curacao	1 800 998 2112	Tobago	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.

3Com and you, the purchaser, agree that the following terms and conditions (sometimes referred to herein as this "Agreement") shall govern your purchase of the Product from an authorized 3Com dealer. The term "Product" includes (i) the equipment accompanying these terms and conditions and (ii) the software included in such equipment or otherwise furnished to you in connection with your purchase and/or use of such equipment (the "Software"). This Agreement covers Products for use only in the United States and Canada.

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FCC CLASS A VERIFICATION STATEMENT

FCC CLASS B STATEMENT

FCC DECLARATION OF CONFORMITY

ABOUT THIS GUIDE

This guide describes how to configure and manage NBX® Networked Telephony Systems. For information about installing an NBX system for the first time, see the *NBX Installation Guide*.



If the information in the release notes differs from the information in this guide, follow the instructions in the release notes. Release notes are available on the NBX Resource Pack CD and the 3Com Partner Access Web Site.

How to Use This Guide

Table 1 can help you find information in this guide.

Table 1 Overview of This Guide

If you are looking for	Turn to
An overview of the NBX systems	Chapter 1
How to prepare and configure the dial plan	Chapter 2
How to configure devices	Chapter 3
How to configure user settings	Chapter 4
How to configure system settings	Chapter 5
How to configure NBX Voice Messaging (voice mail), the Auto Attendant, and Voice Profile for Internet Mail (VPIM)	Chapter 6
Basic operations information	Chapter 7
How to create reports	Chapter 8
How to download software and label makers	Chapter 9
Troubleshooting information	Chapter 10
Using a third-party messaging system	Appendix A
Information about ISDN Completion Cause Codes	Appendix B
How to configure Option 184 on a Windows 2000 DHCP server	Appendix C
How to configure 3Com ConneXtions software	Appendix D

Table 1 Overview of This Guide

If you are looking for	Turn to
Caller ID behavior	Appendix E
Definitions of telephony and networking terms	Glossary
References to all topics in this book	Index
FCC and Industry Canada information, Software End-User License Agreement, and Limited Warranty for Software and Hardware	End of the 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 that are 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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Send comments about this guide or any of the 3Com NBX documentation and Help systems to:

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Please include the following information with your comments:

- Document title
- Document part number (found on the front page)
- Page number

Example:

NBX Administrator's Guide

Part Number 900-0156-01 Rev AA

Page 25



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

1

INTRODUCTION

The *NBX Administrator's Guide* explains how to configure your NBX® system. This chapter covers these topics:

- Network-based Telephony
- Overview of the System Software
- NBX NetSet Administration Utility
- NBX NetSet Features



For information about installing hardware components, see the NBX Installation Guide.

Network-based Telephony

3Com Networked Telephony Solutions merge telephony with networking by delivering business telephone service over a data network.

To a telephone user, an NBX Telephone is an office telephone. You can use it to make and receive calls, transfer calls, park calls, use voice mail, and so on. Inside, the NBX Telephone is a network device that can communicate over the LAN using Ethernet frames or IP packets. The telephone also includes a LAN port. You can connect your computer to your network through the telephone and avoid the need for a second LAN connection at the desktop.

The core of 3Com Networked Telephony Solutions is the *Network Call Processor* (NCP). The NCP manages the processes of making and receiving calls, providing voice mail and auto attendant services, and responding to requests for special services, such as access to the NBX NetSet administration utility, Computer Telephony Integration (CTI) services, or the system's IMAP (Internet Message Access Protocol) server.

The NBX system provides the reliability required in a business environment because NBX system voice traffic is independent of computer traffic on the same network. In fact, after the NCP completes the processing

required to connect two telephones, the telephones communicate directly with each other. Therefore, existing conversations are not affected if power to the NCP fails.

Overview of the System Software

Auto Attendant

With the Auto Attendant, a full-featured call answering service, you set up automated call answering, including multiple Auto Attendants, each with separate menu structures, to manage incoming calls.

Auto Discovery and Auto Relocation

The Network Call Processor and the NBX Telephones communicate with each other to streamline configuration. When you connect a new telephone, the system discovers it and adds it to the configuration database. The communication between devices means that if telephone users move their telephones to a new location, the telephones retain their extension number and personal settings. You do not have to change telephone addresses and data for them.

Virtual Tie Lines

You can connect two or more NBX systems that are connected to your Wide Area Network. Calls made over Virtual Tie Lines incur no toll charges. G.729 compression allows you to make the most of your bandwidth.

Integrated Voice Mail and Messaging Features

NBX Voice Messaging is a standard feature of the 3Com Networked Telephony Solution. Voice Messaging supports Off-Site Notification, which alerts you if you receive new voice messages when you are out of the office. Voice Messaging also includes an IMAP (Internet Message Access Protocol) mail server that allows you to retrieve voice mail messages through any IMAP4-compatible e-mail client.

Standard NBX Telephone Features

NBX systems support the standard features, such as call park, conference, speed dial, and paging, that you expect in a business telephone system.

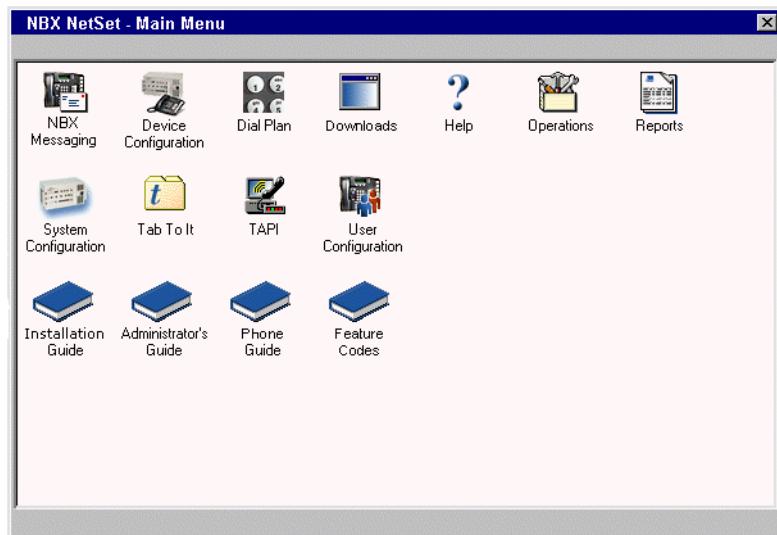
Redialing From Call Logs

In an NBX Telephone display panel, you can view logs of recent Missed Calls, Answered Calls, and Dialed Calls. You can select and redial a call from any of these lists, as well as from the directory of internal users, your personal speed dial list, or the system-wide speed dial list.

Calling Line Identity Restriction (CLIR)	When an NBX Telephone user makes a call on an ISDN channel, the receiving party can see the identity of the caller (normal ISDN behavior). When the NBX option Calling Line Identity Restriction (CLIR) is enabled, the receiving party cannot see your identity when you call.
Computer Telephony Integration (CTI) Connectivity	3Com Networked Telephony Solutions provide a software-based CTI solution through the Microsoft Telephony Applications Programming Interface (TAPI). Your telephone and your computer connect to the same LAN so that your computer does not need any special hardware, such as proprietary cards. The NBX system works with TAPI 2.X-compliant CTI applications.
Call Recording	You can integrate a third-party call recording system into your NBX system so that selected calls can be recorded. (Optional license required.)
NBX Call Reports	NBX Call Reports, a Windows client program, is a standard feature of 3Com Networked Telephony Solutions. Call Reports allows you to save calling data about inbound and outbound calls, present it in a report, or export it to spreadsheets, word processors, or reporting programs.
NBX Resource Pack CD	3Com Networked Telephony Solutions include the <i>NBX Resource Pack CD</i> with the most recent system software for backup and upgrade purposes, optional software, and electronic versions of system documentation.
Support for Multiple Languages	The NBX system's Administrator Help is in English, by default, but the User side of the NetSet administration utility's Help system can be configured for other languages. In addition, the three telephone Quick Reference Cards, the <i>NBX Telephone Guide</i> , and the Auto Attendant and system prompts are available in multiple languages on the <i>NBX Resource Pack CD</i> .
NBX NetSet Administration Utility	The NBX NetSet utility is a web interface in which you configure and manage the NBX system. You need Microsoft Internet Explorer (version 5.5 or later is optimal) to administer the system. You do not need Internet access to use the NBX NetSet utility.

Figure 1 shows the NBX NetSet - Main Menu window, which appears when you log on to the NBX NetSet utility.

Figure 1 NBX NetSet - Main Menu Window



NBX systems present the NBX NetSet utility through an embedded web server that is integrated in system software. NBX NetSet passwords grant system administrators and users different levels of access privileges.

Individual telephone users can view or change their personal settings such as personal speed dial lists, off-site notification settings, and ringing tones.

System administrators can manage user profiles and devices, change system parameters, such as speed dial lists and dial plan settings, and upgrade the system software.

NBX NetSet Features

Table 4 describes the features that administrators can access through the NBX NetSet - Main Menu window.

Table 4 NBX NetSet Features for the NBX Administrator

Icon	Description
 NBX Messaging	Configure and manage system-wide NBX Voice Messaging, Auto Attendants, and VPIM settings. If you install a license for a third-party messaging application and disable NBX Messaging, this icon is not available.
 Device Configuration	Configure and manage NBX devices, such as: <ul style="list-style-type: none">■ Telephones and telephone groups■ Analog Line Cards■ Digital Line Cards (T1, E1, and BRI-ST cards)■ Analog Terminal Adapters (ATAs)■ Call Park■ Attendant Consoles■ Virtual Tie Lines
 Dial Plan	Configure and manage your system Dial Plan.
 Downloads	Download, install, configure, and manage additional system features, such as: <ul style="list-style-type: none">■ Optional NBX software, such as NBX Call Reports and TAPI software■ LabelMaker utility for telephones and NBX Attendant Consoles■ <i>Quick Reference Guides</i> for the NBX Business and Basic Telephones, and analog telephones on the NBX system■ NBX manuals including the <i>NBX Installation Guide</i>, <i>NBX Administrator's Guide</i>, <i>NBX Telephone Guide</i>, and <i>NBX Feature Codes Guide</i>

Table 4 NBX NetSet Features for the NBX Administrator (continued)

Icon	Description
 Operations	<p>Configure and manage these system-level operations:</p> <ul style="list-style-type: none"> ■ Upgrading software ■ Rebooting and shutting down the NBX system ■ Managing data (backup and restore) ■ Viewing and managing event log files ■ Viewing and adding licenses for optional features ■ Setting regionally different information (voice-prompt language, dial tones and cadences, and documentation language) ■ Installing third-party drivers (for example, for telephones other than NBX Telephones)
 Reports	<p>View and manage system reports:</p> <ul style="list-style-type: none"> ■ Directory lists of users ■ Device List ■ System Data ■ Call Reporting
 System Configuration	<p>Configure and manage the system-level settings for:</p> <ul style="list-style-type: none"> ■ System Settings ■ Audio Settings including compression and silence suppression ■ System-wide Speed Dials ■ Business Identity ■ Security ■ TAPI Settings
 TAPI	<p>Configure settings for TAPI (Telephony Applications Programming Interface). (Can also be configured from the System Configuration icon.)</p>
 User Configuration	<p>Configure and manage:</p> <ul style="list-style-type: none"> ■ Users ■ Call Pickup Groups ■ TAPI Route Points ■ Hunt Groups ■ Class of Service (CoS) Settings for users

Table 5 describes the additional icons that appear on or below the NBX NetSet - Main Menu window. They are shortcuts to specific areas within the NBX NetSet utility and to some of the online documentation.

Table 5 NBX NetSet Shortcuts

Icon	Description
 Help	The Help icon in the <i>NBX NetSet - Main Menu</i> window provides access to the Contents, Index, and search features of the online Help system. The Help icon on individual dialog boxes takes you directly to content-specific Help in addition to accessing the global Help features.
 Tab To It	Displays Tab To It, a window that shows all the tabs for the entire system. Click on a tab in the Tab to It window to go directly to that tab's interface. The Tab To It icon also appears on most dialog boxes throughout the NBX NetSet utility.
	If you install a license for a third-party messaging application, the tab for NBX Messaging is disabled in the Tab To It window
 Installation Guide	Opens the online (PDF) version of the <i>NBX Installation Guide</i> . This icon is available in the <i>NBX NetSet - Main Menu</i> window only.
 Administrator's Guide	Opens the online (PDF) version of the <i>NBX Administrator's Guide</i> (this book). This icon is available in the <i>NBX NetSet - Main Menu</i> window only.
 Phone Guide	Opens the online (PDF) version of the <i>NBX Telephone Guide</i> . This icon is available in the <i>NBX NetSet - Main Menu</i> window, and below the User Settings window when users log on to the NBX system.
 Feature Codes	Opens the online (PDF) version of the <i>NBX Feature Codes Guide</i> . This icon is available in the <i>NBX NetSet - Main Menu</i> window, and in the User Settings window when users log on to the NBX system.
	Returns you to the <i>NBX NetSet - Main Menu</i> window.

2 DIAL PLAN

The NBX system's *dial plan* determines how the system handles calls. It defines the set of destinations that the system can reach, how to get to these destinations, and which telephone numbers to dial to reach these destinations. This chapter provides information about understanding, developing, and managing the dial plan. It covers these topics:

- Dial Plan Concepts and Overview
- Dial Plan Tables
- Dial Plan Pretranslators
- Managing the Dial Plan Configuration File
- Outdialing Prefix Settings
- Managing Extensions
- Managing Extension Lists
- Managing Dial Plan Tables
- Managing Dial Plan Pretranslators
- Configuring the Dial Plan for the 4ESS Protocol (T1)
- Overview of Voice Profile for Internet Mail
- Configuring the Dial Plan for VPIM
- Configuring VPIM Parameters
- Overview of Virtual Tie Lines
- How to Configure a Virtual Tie Line
- Call Rerouting for Virtual Tie Lines
- Managing Existing Virtual Tie Lines
- Using a VTL Password
- Dial Plan Configuration File Commands
- Sample Solutions Using Dial Plan Configuration File Commands

Dial Plan Concepts and Overview

The dial plan configuration file is an ASCII text file that implements the dial plan and specifies pretranslation (digit manipulation). The system is shipped with several default dial plan configuration files, typically, a 3-digit and a 4-digit file for each supported country.

The dial plan configuration file includes several tables:

- **Internal** — Must be table ID 1
- **Incoming** — Must be table ID 2
- **Least Cost Routing** — Must be table ID 3
- **Routes**
- **Pretranslators**

You can create additional tables if necessary.

Each dial plan table consists of a series of entries, each of which includes a sequence of digits and the action to be performed by the NBX system in response to sending or receiving those digits. For more information on the Internal, Incoming, and Least Cost Routing dial plan tables, see “Dial Plan Tables” on page 33.



Usually, you access the dial plan configuration file and manage dial plan operations, tables, pretranslators, and extension lists through the NBX NetSet administration utility. If your dial plan is larger than 32,000 characters, however, you cannot edit the dial plan using the NBX NetSet utility. You must export the dial plan, edit it, and then import it.

Before you configure the dial plan, please be sure that you understand these concepts:

- Call Process Flow (page 29)
- Inbound and Outbound Call Processing (page 29)
- NBX System Database (page 30)
- NBX System Dial Plan (page 30)
- Pretranslation (page 31)
- Routing (page 31)

In addition, be sure to understand how the dial plan configuration file can affect other parts of the NBX system. See “System Features Affected by the Dial Plan Configuration” on page 32.

Call Process Flow The dial plan configuration file is a key component of inbound and outbound call processing. The dial plan tables in the configuration file process *incoming* calls in this order:

- 1 Incoming Dial Plan Table
- 2 Pretranslator Table

The dial plan tables process *outgoing* calls in this order:

- 1 Internal Dial Plan Table
- 2 Least Cost Routing Table

After pretranslation (if performed), the final translation process routes the call to the destination.

Inbound and Outbound Call Processing The system routes all inbound and outbound calls through the dial plan.

Inbound Call Processing

The system processes inbound calls using the *Incoming* table. The system can also use *pretranslators* to perform digit manipulations on incoming calls before it uses the *Incoming* table.

Each pretranslator operation performs a digit manipulation operation on the dialed digits. For incoming calls, if the DID/DDI range matches the internal extensions, the dial plan requires no pretranslator. However, you can use pretranslators to map nonmatching dialed numbers on an incoming DID/DDI channel to desired internal extensions. See the example in Customer Requirement 1 in “Sample Solutions Using Dial Plan Configuration File Commands” on page 118.

Outbound Call Processing

The system processes outbound calls using the *Internal* dial plan table or the *Least Cost Routing* table. You can add entries to the *Internal* dial plan table to match the system to your service. See Customer Requirement 2 in “Sample Solutions Using Dial Plan Configuration File Commands” on page 118.



If you have entries in both the Least Cost table and the Internal table for the same purpose, the behavior of the dial plan can be confusing. 3Com recommends that you accomplish least cost routing using Internal Table entries. For more information, see TimedRoute Create, TimedRouteEntry Create, and TimedRouteOperation Create later in this chapter.

NBX System Database

The NBX system database contains a default dial plan that is initially loaded at the factory and is reloaded if you purge the database.

- NBX V3000 system — default 4-digit plan

Changes that you make to any system settings, including changes made by importing a modified dial plan configuration file, are stored in the database. When you reboot the system, it loads the database with any changes that you have made. The NBX system database includes all of the settings necessary for system operation.

NBX System Dial Plan

You can import a dial plan configuration file to provide the system with a set of operating instructions for managing the telephone system.

Alternatively, if you have made changes to the currently loaded instructions through the NBX NetSet utility, you can export the dial plan configuration file to save it. You can also make changes by editing the configuration file off-system, using any ASCII editor, and then importing the modified file. You can easily reuse a given configuration file on many systems. For more information, see “Importing and Exporting Dial Plan Configuration Files” on page 45.

The system is shipped with several default dial plan configuration files, typically, a 3-digit and a 4-digit file for each country that is supported.

In addition, the file `samples.txt` contains several examples that illustrate how you can configure the dial plan configuration file to control how the system manages incoming and outgoing calls.

Normally, you completely configure a dial plan before you start to use the system to control the telephones. Although you can make changes later, major changes in the dial plan can disrupt the system.

Decide whether you want to use a 3-digit or 4-digit dial plan before you create the dial plan, autodiscover, or manually add telephones or other devices to the NBX system.

When you import a dial plan, some parameters of the system change immediately. Others change only when you reboot the NBX system. 3Com recommends that you reboot the NBX system each time that you change the dial plan.



Rebooting the system disrupts service to the telephones. Plan to reboot at a time that does not inconvenience telephone users.

Pretranslation *Pretranslation* is the process of translating (or manipulating) dialed digits before they are passed to the appropriate dial plan table for subsequent routing. You can set the dial plan to perform pretranslation on incoming or outgoing calls. For more information, see “Dial Plan Pretranslators” on page 40.

Routing *Routing* specifies how a call reaches a destination. You define the routes for the system to use in the Routes section of the dial plan configuration file.



When you define call routing, you can also instruct the system to perform pretranslations (digit manipulations). Both destination routes and timed routes have digit manipulation operations (append, prepend, replace, stripLead, or stripTrail).

The system passes dialed digits first through the device’s Least Cost Routing table (if there is one). If the system finds no entry there, it then uses the Normal dial plan table. If it does find an entry in the Least Cost Routing table, it attempts to use that entry and, even if the attempt is unsuccessful, it does *not* use the Normal table.

You can route incoming calls to the Auto Attendant port, and you can instruct the Auto Attendant to route these calls to any internal or external number.



CAUTION: *If you configure the Auto Attendant so that it can access any external number, you risk the possibility of toll fraud. You can reduce the possibility of toll fraud by explicitly putting specific external numbers into the outgoing dial plan table. This precaution prevents outside callers from dialing any external number except the ones that you define.*

There are two types of routes:

- **Destination routes** — Specify the extension of a destination device. They can also perform digit manipulation operations on the dialed digits that resulted in the selection of this route before those digits are dialed on the destination device.
- **Timed routes** — Specify time of day and day of week criteria which, when met, result in a particular destination route being selected.



CAUTION: *If you operate the NBX system in Keyset Mode, routes are not applicable.*

For more information, see “DestinationRoute Create” on page 106, “TimedRoute Create” page 114, and related entries under “Dial Plan Configuration File Commands” on page 103.

System Features Affected by the Dial Plan Configuration

The dial plan configuration affects several system features:

- Keyset Mode Operation Using the Dial Plan
- Hybrid Mode Operation Using the Dial Plan
- Off-Site Notification

Keyset Mode Operation Using the Dial Plan

If you map any telephone buttons that have LEDs to specific Analog Line Card ports, you enable Keyset mode in the NBX system. Instead of dialing a single digit (typically 8, 9, or 0) before placing an outside call, the user presses a button to select an available Analog Line Card port. The user defines the routing (that is, the selection of a destination device) by pressing the button to select the Analog Line Card port; however the NBX system controls the call using the dial plan.



You cannot map a digital line extension in Keyset mode.

The NBX system applies any Class of Service restrictions that are associated with the user's telephone to determine whether to make a call. The system also uses any pretranslator that a device uses and performs any required digit manipulation operations before it actually transmits the digits on the Analog Line Card or Digital Line Card port.

Hybrid Mode Operation Using the Dial Plan

If you map telephone buttons for some telephones but not others, you enable Hybrid mode (a mixture of standard and Keyset behaviors). The system provides a system-wide External Prefix setting, which allows the administrator to establish a prefix.

Off-Site Notification

The NBX system uses off-site notification to notify users when new voice mail messages arrive. You can define notification devices and assign them in the Internal dial plan as well as through the NBX NetSet utility.

Example: When voice mail arrives, the NBX system dials the telephone number of the user's pager. Typically, you use a system-wide prefix to designate the device or devices you want to use for outdialing purposes, including off-site notification calls.

Example: If the user's pager number is 800-555-3751, and the system-wide prefix digit is 9, the system dials 98005553751 to send a call to the user's pager.

To tell the system to dial a single Line Card port or a restricted number of Line Card ports, create a suitable pool of Line Card ports for that purpose, and then use an existing set of dial plan table entries (such as the entries that begin with 8) or create a new set of entries to allow the dial plan devices to route calls via the selected line card ports.

Example: You set up one 4-port card to handle all off-site notification calls. You create a set of entries in the Internal dial plan table that each start with the digit 8. You define a route to the 4-port card for all of these dial plan entries so that whenever the system acts on one of these entries, it uses one of the 4 ports on that card to dial out and notify the user.

To apply different off-site CoS restrictions to different users, you need multiple dial plan entries. If you are not trying to apply the CoS restrictions, then a single dial plan entry is sufficient.

Dial Plan Tables

Dial plan tables contain information that controls how the system routes calls. Each dial plan configuration file consists of at least three dial plan tables. This section discusses these topics:

- Dial Plan Command Format
- Internal Dial Plan Table — Must be table ID 1
- Incoming Dial Plan Table — Must be table ID 2
- Least Cost Routing Dial Plan Table — Must be table ID 3
- Adding New Dial Plan Tables



CAUTION: Tables 1, 2, and 3 must exist. Do **not** delete them. You may create additional dial plan tables if necessary, but they must be numbered 4 or higher.

If the Least Cost Routing table exists, it takes precedence over the Internal table. If the system cannot find a Least Cost Routing table, it attempts to find a corresponding entry in the Internal table. If you have entries for the same purpose in both the Least Cost and Internal tables, the behavior of the dial plan can be confusing.

See “Dial Plan Command Format” next for a description of dial plan command syntax and structure. For a complete list and description of dial plan commands, including command arguments and examples, see “Dial Plan Configuration File Commands” on page 103.

Dial Plan Command Format

Each dial plan table contains a sequence of commands. These commands collectively determine how calls are handled.

Most of the dial plan commands have a very similar format, as shown in Figure 2.

Figure 2 Dial Plan Command Format

Leading Digits to Collect	Call Classification — Used with Class of Service	Number of the route (dial tone facility) from Routing Tables
Table Entry ID Number	Maximum and Minimum Characters to Collect	Priority (Not Used)
Table Name		
Table ID Number		
Command		
Table Create 1 Internal		
/	Id Entry Digits	Min Max Class
/		
TableEntry Create 1 1 0	1 1	Internal 0 4
TableEntry Create 1 2 1	3 3	Internal 0 0
TableEntry Create 1 3 2	3 3	Internal 0 0
Table Create 2 Incoming		
/	Id Entry Digits	Min Max Class
/		
TableEntry Create 2 1 0	1 1	Internal 0 4
TableEntry Create 2 2 1	3 3	Internal 0 0
Table Create 3 Least Cost Routing		
/	Id Entry Digits	Min Max Class
		Prio Route

Table 6 describes each field of a dial plan command.

Table 6 Dial Plan Command Fields

Field	Description
Command	Command name. For example, TableEntry Create is the command that makes Class of Service and call routing decisions based on the correspondence of dialed digits and table entry digits. See “Dial Plan Configuration File Commands” later in this chapter for a description of each command.
Table ID Number	Table ID number. This is always 1 for the Internal dial plan table, 2 for the Incoming dial plan table, and 3 for the Least Cost Routing Table.

Table 6 Dial Plan Command Fields (continued)

Field	Description
Table Entry ID Number	Table entry number (a unique number for each entry in the table). These numbers are usually in ascending order in the table, but you can change the order. For example, you might want to place a new item near other items of the same type (that begin with the same digit) in order to help you when you troubleshoot the configuration file.
Digits	<p>One or more digits that begin the dial sequence. Either single or multiple entries can start with the same digit. The system uses this field in conjunction with Min and Max to determine when to make the call routing decision.</p> <p>Most sample tables have a single entry for digit 0 (zero) to specify how the system handles a telephone number which has zero as the first digit.</p> <p>If you want the system to handle calls differently, depending on whether they start with 90 or 91, you must have one entry in the table for each of these 2-digit sequences.</p>
Min	Minimum number of digits that the system collects before routing the call.
Max	Maximum number of digits the system collects before routing a call.
Class	<p>Class of Service (CoS). The system uses this information to decide whether a caller is allowed to make this specific type of call. The possible classifications are:</p> <p>Internal, Local, LongDistance, International, WAN, Toll-Free, Emergency, COCode, Wireless, Toll, Operator, AlternateLong, TrunkToTrunk, Diagnostics, NotAllowed, Other</p> <p>Each of these values corresponds to a selection in the NBX NetSet utility.</p>
Priority	Priority number. This field is not used at this time, but must be present and should always be 0 (zero).
Route	Route number. This identifies an entry in the Routes section of the dial plan. Zero is a typical value for internal calls, and indicates that this call uses no route, in which case, digits are transmitted as soon as they are dialed.



If a new entry in the Internal table appears not to work, it is possible that the system is using an entry from the Least Cost table instead. To avoid such conflicts, you can accomplish least cost routing using only the Internal table. 3Com strongly recommends that, to keep the dial plan as simple as possible, you use only the Internal table for least cost routing.

For more information on how to use the dial plan configuration file, see “Managing the Dial Plan Configuration File” on page 44.

Basic Dial Plan Table Examples

These examples describe the basic operation of a dial plan table.

Example: If you are using a 4-digit dial plan and the telephone extensions start with 2, then the table entry with 2 in the *Digits* column typically has 4 in the *Min* column. Before making a decision, the system

would collect all 4 digits of the extension. If the caller dials fewer than the Min number of digits, the system times out in 20 seconds.

Example: If Digits = 2, Min = 4, and Max = 4, the system knows that if the first digit is 2, it must collect no less than 4 and no more than 4 digits before making the call routing decision.

If the caller dials at least the minimum number of digits and not more than the maximum number of digits, the system waits 5 seconds and then routes the call based on the digits dialed. If the caller dials more than the maximum number of digits, the system attempts to place the call.

Often, Max value and the Min value are identical, because you want the system to collect a specific number of digits, no more and no less.

Example: For internal extensions, you want the system to collect exactly 3 digits (4 in a 4-digit dial plan) before making a decision, so you would set both Min and Max to 3 (4 in a 4-digit dial plan).

The two columns may be different if the table entry applies to more than one situation.

Example: In the United States, the Min value for the 90 entry is 2, because 90 allows an internal caller to reach a telephone company operator (9 to get an outside line, and then 0 to get the operator). The Max value is 64, because the caller can continue to dial after the zero, entering a number to call, plus a telephone credit card number, and possibly an identification code number.

If the caller dials only 90 (which satisfies the minimum of two digits) and stops dialing, the system waits for 5 seconds. If no other digits are entered, the system connects the caller to the operator.

If other digits are dialed, the system accepts them up to the limit of 64. If the caller stops after dialing fewer than 64 digits, the system again waits 5 seconds before acting on the dialed sequence of digits.

Example: You can assign a new employee to the *Default User Group*. You can then set the permissions for that group so that group members have permission to make *LongDistance* calls when the system mode is Open or Lunch, but not when the system mode is Closed or Other.

Example: You can assign the company's Vice President of Finance to a group that you name the *All Privileges Group*. You can set the permissions for that group so that group members have permission to make *LongDistance* calls during all system modes.

Internal Dial Plan Table

The Internal dial plan table (table ID 1) defines how to handle calls placed from internal devices, such as NBX Business or Basic Telephones, to a destination. A destination can be another internal device, such as a local telephone, or an external telephone line (Analog Line Card or Digital Line Card) that connects the NBX system to other facilities.

The Internal dial plan table consists of a series of commands. For an example of the command format, see "Dial Plan Command Format" earlier in this chapter. Table 6 on page 35 describes each element of the command. Table 7 describes the predefined routes.

Table 7 Predefined Routes

Route Number	Description
1	Local CO (strip)
2	Local CO (no strip)
3	Voice Application (Auto Attendant on extension 500)
4	Attendant (person)
5	H.323 Gateway
6	Least Cost Route example
Other	User-defined routes



You cannot delete or modify predefined routes, only create new routes.

Each device must have a Normal table. The Least Cost Routing table is optional. Telephones use the Internal dial plan table (table ID 1) as their normal outbound table and the Least Cost Routing table (table ID 3) as their long distance routing table.

Incoming Dial Plan Table

The Incoming dial plan table (table ID 2) defines how calls arriving from outside the NBX system are routed to extensions. Incoming calls can arrive on analog telephone lines or through Digital Line Card ports.

The incoming dial plan table consists of a series of commands. For an example and basic understanding of the command format, see "Dial Plan Command Format" on page 34. For a description of the each element of a dial plan command, see Table 6 on page 35.

By default, Line Card ports, Digital Line Card ports, and H.323 gateways use the Incoming dial plan table as their normal dial plan table. An Incoming dial plan table typically has a more restricted list of dialable digits than the Internal dial plan table. You usually cannot dial extensions associated with internal paging or Analog or Digital Line Card ports.

Least Cost Routing Dial Plan Table

The Least Cost Routing table (table ID 3) defines how to route calls in order to minimize the cost of those calls.

Example: You might use two different long distance carriers, one for a specific geographic region, and one for all other areas of the country. In the Least Cost Routing table, you can create entries that route calls differently for those two geographic areas. Each country uses a different method to accomplish this. In the United States, you can specify the area codes that apply to a geographic region. In France, you can specify a carrier by adding prefix digits to the telephone number.

By default, internal telephones specify the Least Cost Routing table as their least cost table. Typically, devices associated with the Incoming dial plan table (Line Card ports, Digital Line Card ports, and H.323 gateways) do not use the Least Cost Routing table.



The Least Cost Routing table is optional. If it does not exist, the system uses the Internal table routing destinations. If you have entries in both the Least Cost and Internal tables for the same purpose, the behavior of the dial plan can be confusing. Therefore, 3Com recommends that you accomplish least cost routing using Internal Table entries. See TimedRoute Create, TimedRouteEntry Create, and TimedRouteOperation Create.

Example: If a new entry in the Internal table appears not to work, it is possible that the system is using an entry from the Least Cost table instead. To avoid such conflicts, accomplish least cost routing using only the Internal table. 3Com strongly recommends that you keep the dial plan as simple as possible by using only the Internal table.

Adding New Dial Plan Tables

If you are sharing the system with another company or group and want to control calls differently at the two sites, you can add a fourth table.

Example: You assign one extension range to Company A and a different range to Company B. The fourth table controls the extension range for Company B, so that outbound calls from Company B's extensions use only their external telephone lines.

You might also need a fourth table if a single company had two sites but only one NBX system. In order to properly route emergency (911) calls, you use the fourth table to define which extensions use each dedicated 911 telephone line.

Example: Users at site A dial 911 and the system uses the Internal table (table ID 1) to make the emergency call on one external telephone line. Users at site B dial 911 and the system uses table ID 4 to make the emergency call on a different external telephone line. The emergency staff know, based on the dialing number, which site has the emergency.

Enhanced 911, E911, is available in some areas. This service enables emergency staff to identify the specific location of the emergency. For example, in a campus of buildings, the emergency staff can identify the specific building, floor, and location from which the emergency call originated. The NBX system supports E911 over ISDN. The administrator must define an outbound call pretranslator to provide the specific extension number from which the 911 call originated.

Dial Plan Pretranslators

The system uses pretranslators to modify digit sequences of incoming or outgoing calls. On incoming calls, pretranslators can map the entire dialed number (including area code) to an internal extension number. For example, an external party dials 978-555-0101 to reach the person on extension 101. Pretranslators ensure that the proper digits are mapped to the correct extension number.

For more information, see:

- Pretranslators for Incoming Calls on page 41
- Pretranslators for Certain Outgoing Calls on page 42

A typical pretranslator function involves mapping incoming DDI/DID telephone calls to internal extension numbers.

Example: Say that the DDI/DID (Direct Inward Dial/Direct Dial Inward) telephone numbers range from 508-555-4200 through 508-555-4299. The telephone company sends you the last 4 digits of the total telephone number. Internally, you want to use extensions 2000 through 2099. You can define a pretranslator to:

- Remove (*stripLead*) the first two digits of the incoming 4-digit sequence.
- Add (*prepend*) the digits 20 in front of the remaining 2 digits.

See “Managing Dial Plan Pretranslators” on page 64 for detailed information and examples on creating and managing dial plan pretranslators.

Pretranslators for Incoming Calls

For incoming calls, pretranslation reformats the dialed number *before* it is passed to the Incoming dial plan table (Table ID 2). See “Incoming Dial Plan Table” on page 38. For information on how to properly handle caller ID information over incoming VTL calls, see “Creating a Pretranslator for VTL Calls” on page 65.

Incoming Pretranslator Example 1

If, for an incoming telephone call, the telephone company passes you 4-digit numbers from 6100 through 6199, the system can use a pretranslator to remove the first digit; the remaining 3 digits can then be used as internal extension numbers in a 3-digit dial plan. Tell the system which pretranslations that you want to perform by defining digit manipulation operations (*append*, *prepend*, *replace*, *stripLead*, or *stripTrail*) within the *PreTranslator* section of the dial plan configuration file.

Incoming Pretranslator Example 2

Assume the telephone company passes 10-digit numbers to the system for each incoming telephone call (for example, numbers in the range 4567-89-3000 to 4567-89-3500). If the system uses 4-digit extensions in the range 2000 to 2500, you could pass an incoming 10-digit number such as 4567-89-3210 to extension 2210.

This strategy requires two pretranslation operations: The first operation performs a *stripLead* operation to remove the initial 7 digits, leaving 210. The second operation *prepends* the number 2 in front of the remaining 3 digits. The result is 2210, which matches an extension within the extension range. “Sample Solutions Using Dial Plan Configuration File

Commands” on page 118 shows how to accomplish this pretranslation using the dial plan configuration file.



Each device can specify only one DDI/DID pretranslator and one CLIP pretranslator. To create or modify a pretranslator, you either edit a dial plan configuration file and import it, or use the NBX NetSet utility and modify an existing dial plan configuration file.



The system performs operations in ascending order of operation ID. Operations are both sequential and cumulative.

You can also use pretranslators with virtual tie lines to link multiple NBX systems. Incoming calls within a defined numeric range arrive at the first system, are modified through digit manipulation operations, and are then routed to a tie line connected to a second system.

Each sample dial plan that is shipped with the system includes a default pretranslator.

Pretranslator Example 3

Assume that the telephone company passes 4-digit numbers to the system for each incoming telephone call (for example, numbers in the range 5200 through 5300). If the system uses 3-digit extensions in the range 200 through 300, you could define a single pretranslation operation to *stripLead* (remove) the first digit, for instance, the number 5 from an incoming number such as 5278, and pass the call to extension 278. “Sample Solutions Using Dial Plan Configuration File Commands” on page 118 shows how to accomplish this pretranslation using the dial plan configuration file.

Pretranslators for Certain Outgoing Calls

On outgoing calls using an ISDN PRI card, pretranslators allow the external called party to identify the full number of the internal calling party, including the area code. For example, if the person on extension 101 within a company calls an external number, the caller’s entire number is displayed to the called party when Calling Line ID Presentation (CLIP) pretranslators are used. Pretranslation reformats the outgoing dialed number *before* it is passed to the Internal dial plan table (Table ID 1) or possibly the Least Cost Routing table (Table ID 3). For more information, see “Internal Dial Plan Table” on page 38 and “Least Cost Routing Dial Plan Table” on page 39.

Example: If the DDI/DID telephone numbers range from 508-555-4200 through 508-555-4299, internally, you dial extensions from 2000 through 2099 to reach another internal telephone.

When you place a call to an external telephone number, the system can use these pretranslator steps to create the full 10-digit number:

- 1 Remove (*stripLead*) the first two digits (20) from the internal extension number of the telephone making the call.
- 2 Add (*prepend*) the digit sequence 50855542 to the two remaining digits, creating the full DDI/DID telephone number.
- 3 Pass the full number to the telephone company.

Example: To transmit Calling Line ID Presentation (CLIP) information on outgoing calls, you can define a pretranslator that transforms internal extensions into full telephone numbers (the numbers that someone external to the company uses to dial in). Assume that you are using telephone extension numbers from 1000 to 1099 and that only the last two digits match the DDI/DID numbers that are assigned to the company. You can define a pretranslator to remove (*stripLead*) the first two digits from the internal extension number and add (*prepend*) the appropriate digit string. This pretranslator constructs the full telephone number.

Example: If you use two different long-distance carriers at different times of the day to save costs, you can prepend different digit sequences to the outgoing dialed number to select which carrier that you want. If you prepend 1010321 between the time the business opens and 3:00 p.m., you select one long-distance carrier. If you prepend 1010220 from 3:00 p.m. until the next time the business opens (including weekends), you select the other carrier and obtain a lower rate.

To tell the system which outgoing pretranslations that you want to perform, you define digit manipulation operations (*append*, *prepend*, *replace*, *stripLead*, or *stripTrail*) in the Routes section of the dial plan configuration file. You can define these commands for both destination routes and timed routes. For more information on configuring pretranslators, see “Managing Dial Plan Pretranslators” on page 64.

**Managing
the Dial Plan
Configuration File**

This section describes the dial plan configuration file and how to manage it. From the *Operations* tab of the Dial Plan window, you can perform these tasks:

- Accessing the Dial Plan
- Creating Dial Plan Configuration Files
- Importing and Exporting Dial Plan Configuration Files
- Importing a User-Defined Dial Plan
- Exporting (Saving) a Dial Plan Configuration File
- Testing a Dial Plan
- Generating a Dial Plan Report
- Modifying a Dial Plan Configuration File

**Accessing the
Dial Plan**

To import a dial plan configuration file and modify it, select **NBX NetSet > Dial Plan > Operations**. From this tab, you can access customer-defined and default dial plans.

**Creating Dial Plan
Configuration Files**

The simplest way to create a new dial plan is to model it after an existing one.

- 1 Go to the *Operations* tab.
- 2 Browse for a dial plan, or select one from the pull-down list.
- 3 Click *Open* to open the file in your browser.
- 4 Click *Save As* and save the dial plan as a new file.

You can now edit the file with an ASCII editor. After you customize the new dial plan, Import it to the NBX system. see “Importing and Exporting Dial Plan Configuration Files” on page 45.

3Com recommends that you enter these commands at the top of every dial plan configuration file:

```
Table Delete *
DestinationRoute Delete *
TimedRoute Delete *
PreTranslator Delete *
```

When you subsequently import this dial plan, these commands purge any traces of the old dial plan and prevent any conflicts that can result from importing one dial plan on top of an existing one.

You create new entries in the dial plan configuration file by typing in new commands (see “Dial Plan Configuration File Commands” on page 103) or by cutting, pasting, and editing existing lines in the file.



When you cut and paste new lines into dial plan tables, be sure to change the Entry number in the pasted line. If two or more lines have the same Entry number, only the last one takes effect.

Importing and Exporting Dial Plan Configuration Files

You import a dial plan configuration file either to implement changes you have made by editing the file, or to reload a previously saved configuration.

From the *Operations* tab of the Dial Plan window, you can:

- Import a North American Dial Plan
- Import an International Dial Plan

This section concludes with a discussion of International Dial Plan Issues.

When you export the working dial plan, the NBX system constructs a *new* configuration file from the values in the database and displays it. The new file shows the current date and time. You name the file when you save it.



The sample default files include examples of such things as timed routes and pretranslators. To preserve the default (sample) dial plan configuration included with the system, 3Com advises you to choose a unique file name different than any of the default (sample) dial plan configuration files so that you do not overwrite the sample default files.

Import a North American Dial Plan

The default dial plan scheme is as follows:

- NBX V3000 system — `NorthAmerica-4-digit.txt`

Some customized dial plans are provided for use in other countries.



Always read the system Release Notes (called `readme.txt`) for the most up-to-date information on dial plans.

To import a default dial plan configuration file:

- 1 In the *NBX NetSet – Main Menu* window, click *Dial Plan*. The Dial Plan window appears, displaying the *Operations* tab.
- 2 Click the *Default File* radio button. From the Default File pull-down list, select the default file that you want to use.
- 3 Click *Import*.
- 4 Reboot the system.



CAUTION: When you import a dial plan configuration file, the NBX system immediately implements the dial plan. You are always warned that the system may become inoperative. The system becomes inoperative **only** if you have manually modified a dial plan and have made syntax or content errors. Carefully check any changes that you make to the configuration file before you import.

Import an International Dial Plan

To change the default North American dial plan to a country-specific dial plan:

- 1 In the *NBX NetSet – Main Menu* window, click *Dial Plan*. The Dial Plan window appears, displaying the *Operations* tab.
- 2 Click the *Default File* radio button.
- 3 In the list next to the Default File button, select the default file that you want to use.
- 4 Click *Import*.



CAUTION: When you import a dial plan configuration file, a message warns you that the dial plan may become inoperative. The system becomes inoperative **only** if you have manually modified a dial plan and have made syntax or content errors. Carefully check any changes that you make to the configuration file before you import.

- 5 Click Yes. The system imports the new dial plan and produces a report of any errors.
- 6 Reboot the system.



You may see a warning that "destination extension list is empty." This means that a particular type of device is not installed. You may safely ignore this type of warning.

International Dial Plan Issues

Several international dial plan issues warrant attention. See these topics:

Customizing an International Dial Plan. If there is no customized dial plan for your country, you may need to modify the default dial plan. See “Modifying a Dial Plan Configuration File” on page 51. If you edit the default dial plan, you can test the changes by making a simulated call. See “Testing a Dial Plan” on page 49.

Autodiscovering Internal Telephones. If you autodiscover your company’s internal telephones, Auto Discovery usually begins at number 100 or 1000. However, for some countries, internal telephones begin at a higher number to allow you to directly dial numbers of “national importance.” Auto Discovery allocates telephone extensions numbers within this range.

- The default dial plan for the NBX V3000 system allows you to allocate internal telephones to extension numbers 1000 through 3999.

For more information on Auto Discovery, see “Using Auto Discovery for Initial System Configuration” in the *NBX Installation Guide*.

Dialing Outside Lines. To obtain an outside line, dial 9 or 0 as appropriate for your country.



WARNING: You must first obtain an outside line before you can dial emergency numbers.

Importing a User-Defined Dial Plan

1 In the *NBX NetSet – Main Menu* window, click *Dial Plan*. The *Dial Plan* window appears, displaying the *Operations* tab.

2 In the *User-Defined File* box, enter the path and name of the user-defined configuration file, or click *Browse* to find the file that you want.



The NBX system has no predefined location for dial plan configuration files. You can specify any directory or path that you want.

3 Click *Import* and reboot the system.



CAUTION: When you import a dial plan configuration file, the NBX system immediately implements the dial plan. You are always warned that the system may become inoperative. The system becomes inoperative **only** if you have manually modified a dial plan and have

made syntax or content errors. Carefully check any changes that you make to the configuration file before you import them.

Exporting (Saving) a Dial Plan Configuration File

When you export (save) the current configuration, the system creates a new dial plan configuration file from the current database. You save the new text file using a name that you choose.



This example refers to Internet Explorer. If you use another browser, you may need to use slightly different procedures.

To export a dial plan configuration file:

- 1 In the *NBX NetSet – Main Menu* window, click *Dial Plan*. The Dial Plan window appears, displaying the *Operations* tab.
- 2 Click *Export*. The system constructs a new configuration file from the current values in the database and displays it. Figure 3 shows a partial display. Scroll your browser window to see your complete dial plan.

Figure 3 Dial Plan Configuration File (partial)

A screenshot of Microsoft Internet Explorer version 5.0. The title bar says "Microsoft Internet Explorer". The menu bar includes File, Edit, View, Favorites, Tools, and Help. The toolbar includes Back, Forward, Stop, Refresh, Home, Search, Favorites, History, Mail, and Print. The main content area displays a text-based configuration file:

```
//////////  
/ First, delete all existing dialplan information  
  
Table Delete *  
DestinationRoute Delete *  
TimedRoute Delete *  
PreTranslator Delete *  
  
/ Now, create all dialplan information  
  
//////////  
/     Settings  
//////////  
  
ExtensionLength 4  
ExtensionRange Telephone      1000 1999  
ExtensionRange Park          6000 6099
```

The status bar at the bottom shows "Done" and "Internet".

- 3 Click the *File* menu and select *Save As*.
- 4 From the list box at the top of the *Save As* window, select the destination folder.
- 5 In the *File Name* text box, replace the default file name with a new name.



The sample default files include examples of such things as timed routes and pretranslators. Verify that you rename the new configuration file with a unique file name so that you do not overwrite the sample default file.

- 6 Click Save.

Testing a Dial Plan

This section describes how to test the currently loaded dial plan by placing a simulated call.



Even if the NBX system is completely installed and operational, a test places a simulated, not an actual call.

Example: If you have an entry in the dial plan for digit sequences starting with 91, with MIN and MAX set to 5, and you test the sequence 9123, the dial plan test reports an insufficient number of digits. However, in actual operation, the NBX system would time out waiting for the fifth digit, and then attempt to place the call. Assuming that the outside line prefix is 9 (such as in the United States), this situation would obtain an outside line (9) and then dial the numbers 123.

You can specify a day of the week and a time by selecting entries from the *Day/Time* list boxes. This choice instructs the system to act as if the day and time you select are the current day and time.

If you have timed routes defined in the dial plan, you use different day and time settings to determine whether the timed route works properly.

Example: Assume that you want a timed route to select route 35 during open business hours Monday through Friday, but route 36 when business is closed on those days and on weekends. After you define the timed route commands and import the modified file, you then test using days and times within business hours (to verify that the system selects route 35) and during closed hours and weekends (to verify that it selects route 36).

You can also use day and time settings to test whether the Class of Service settings operate as expected.

Example: You can configure the dial plan to allow toll calls from an extension during open business hours, but to disallow such calls when the business is closed and on weekends. Test using days and times within business hours (to confirm that you can make toll calls from that extension) and during closed hours and weekends (to confirm that the system prevents such calls).

To create and run a test using the currently loaded dial plan:

- 1 In the *NBX NetSet – Main Menu* window, click *Dial Plan*. The Dial Plan window appears, displaying the *Operations* tab.
- 2 Click *Test*. The *Test Dial Plan* dialog box appears.
- 3 To set up the simulated call, from the *Device to dial from* list box, select the number from which you want to dial.
- 4 In *Number to dial*, enter the number that you want the system to dial.
- 5 Select the desired date and time in the *Day/Time* pull-down lists.



For some tests, the day and time settings are irrelevant. You can leave the settings at their default values (Sunday, 00, and 00).

- 6 Click *Test*. The test runs and the results appear in the dialog box.

Generating a Dial Plan Report

This section describes how to create a report containing all dial plan settings, tables, routes, and pretranslators. The report also performs a consistency check to ensure that all dial plan table entries point to valid routes which, in turn, point to valid extensions. The report also identifies how many devices are using each dial plan table and each pretranslator.

Consider these common dial plan problems:

- Dial plan table entries that point to nonexistent routes
- Timed route entries that point to nonexistent destination routes
- Destination route entries that point to nonexistent extensions or empty extension lists
- Timed route entries that overlap
- Devices that do not specify a normal table
- Devices that point to nonexistent Normal tables, Least Cost Routing tables, or pretranslators
- Pretranslator entries that have no operations

If a telephone has no table assigned, that telephone does not have permission to dial. This error is flagged in Reports. If a device has only a Normal table, no error is reported.

If a device has only a Least Cost table, an error is reported. The telephone is still usable and has permissions defined in whatever table has been chosen as Least Cost. If a device has both a Normal and Least Cost table, no error is reported (the usual condition).



When the NBX system detects an error in any line of an imported dial plan configuration file, it ignores that line and continues to process all remaining lines in the file. This precaution minimizes the impact of errors on the dial plan.

To generate a dial plan report:

- 1** In the *NBX NetSet – Main Menu* window, click *Dial Plan*. The Dial Plan window appears, displaying the *Operations* tab.
- 2** Click *Report*. The dial plan report appears. Scroll up and down the browser window to see the full display.
- 3** Click *Close*.

The person validating the dial plan test is responsible for verifying that the test call used the correct dial plan table and dial plan table entry.



To record test results and send them to someone, select the text in the results pane and use the browser's copy function (typically found in the Edit menu) to copy the test results to another application window, such as an editor or e-mail.

Errors can prevent calls from being successfully routed. Warnings are conditions that you can easily correct to successfully route the call.

- 4** When you are finished, click *Close* at the bottom of the screen.

Modifying a Dial Plan Configuration File

This section describes how to modify the currently loaded dial plan configuration file.



CAUTION: *Modifications must be syntactically correct. Each time that the system imports a dial plan configuration file, it verifies the file for errors and displays the results. To avoid typing mistakes, 3Com suggests that you start with an existing dial plan (for example, one of the default plans that are shipped with the NBX system or a plan from another NBX system), modify it, and save it as a renamed file.*

To modify a dial plan configuration file:

- 1** In the *NBX NetSet – Main Menu* window, click *Dial Plan*. The Dial Plan window appears, displaying the *Operations* tab.
- 2** Click *Modify*. The Modify Dial Plan dialog box shows a partial display. Scroll up and down the browser window to see the complete dial plan.

- 3 Edit the dial plan configuration file. A single line of space is *required* between each dial plan entry. You can type a complete dial plan entry anywhere in the file.
- 4 Click *OK*. The *Import Confirmation* dialog box prompts you to confirm the changes.
- 5 Click *Yes*. The system imports the modified dial plan. The *Dial Plan Consistency* dialog box appears, displaying the results of the error and consistency checks.
- 6 Make a note of any errors, and correct them by editing the file. You may be required to make changes based on warning messages.
- 7 Click *Close*.

Outdialing Prefix Settings

A telephone user can look up a call in the call logs (Missed Calls, Answered Calls, and Dialed Calls) using the telephone display panel, select a telephone number from any of the logs, and redial it.

To redial a number from the Missed Calls or Answered Calls list, the NBX system needs to know the appropriate dial prefix to prepend to the digits in the telephone number.

For information and examples about how to configure outdialing prefixes, see the Help at **NBX NetSet > Dial Plans > Operations > Outdialing Prefixes**.

Managing Extensions

This section describes how to add, change, and manage extensions:

- Extension Settings Overview
- Changing Extension Length and Ranges
- How Auto Discovery Assigns Extensions
- Modifying Extensions

Extension Settings Overview

The NBX system establishes connections between extension numbers. The concept of an extension applies to more than just telephones. Extensions are also assigned to NBX applications such as Call Park zones, Auto Attendants, hunt groups, Line Card ports, voice mail ports, and virtual devices such as the pcXset™ PC soft telephone Client and the ConneXtions H.323 Gateway.

The NBX V3000 has a default extension length of four digits. You may implement a three-digit plan on the NBX V3000 if you wish; read this entire chapter in order to understand all of the system changes required.

Table 8 lists typical extension ranges by type. Table 9 describes these ranges in more detail.

Table 9 provides a more detailed explanation of extension types.

Table 8 Typical Extension Ranges by Type

Extension Type	4-digit
Telephones	NBX V3000: 1000–3999
Auto Attendant	NBX V3000: 500, 501, plus 5500–5599
Hunt Group	NBX V3000: 4000–4099
External Extensions (includes line card ports and Call Park)	NBX V3000: 6000–7999 (external Auto Discovery starts at 7250)
Call Park (must fall within External Extension range)	NBX V3000: 6000–6099

Note 1: The NBX V3000 is shipped with a 4-digit dial plan. If you import any 3-digit plan, you must manually specify any 3-digit extension ranges that are not set by the imported plan. You must also manually change any device extensions so that they fall within the appropriate range.

Note 2: TAPI Route Point extensions occur in the same range as telephones. TAPI Route Point extensions do not appear in telephone lists within the NBX NetSet utility. For more information about TAPI Route Points, see TAPI Route Points on page 221.

Table 9 Dial Plan Extension Settings

Field	Purpose
Telephone Extensions Range	The range of extensions for telephones. ■ NBX V3000: 1000–3999 TAPI route point extensions are included in the telephone extensions range. <i>Length</i> — This pull-down field specifies the number of digits for telephone extensions.

Table 9 Dial Plan Extension Settings (continued)

Field	Purpose
Auto Attendant Extensions Range	<p>The range of extensions for Auto Attendants.</p> <p>Default:</p> <ul style="list-style-type: none"> ■ NBX V3000: 5500–5599 <p>For both 3-digit and 4-digit dial plans:</p> <ul style="list-style-type: none"> ■ Extension 500 is reserved as the default Auto Attendant. ■ Extension 501 is reserved as the voice mail Auto Attendant.
Default Auto Attendant Extensions	<p>Default extension that the NBX system assigns to the default Auto Attendant. The Auto Discovery process assigns this extension.</p> <p>The system must direct each call coming in on an external line to an extension. During the Auto Discovery of external lines (analog lines and Digital Line Card channels), the NBX system assigns the default extension (500) as the Auto Attendant extension. After you import the dial plan configuration file and complete the Auto Discovery process, you can manually configure the extension for each analog line and each Digital Line Card channel.</p> <p>For both 3-digit and 4-digit dial plans:</p> <ul style="list-style-type: none"> ■ Extension 500 is reserved as the default Auto Attendant. ■ Extension 501 is reserved as the voice mail Auto Attendant.
Hunt Group Extensions Range	<p>The range of extensions for hunt groups.</p> <ul style="list-style-type: none"> ■ NBX V3000: 4000–4099
External Extensions Range	<p>The range of extensions that are connected to external devices, such as Analog Line Card ports, Digital Line Card ports (BRI-S/T, T1, E1, ISDN PRI), Call Park, and Paging extensions.</p> <p>Default:</p> <ul style="list-style-type: none"> ■ NBX V3000: 6000–7999
Call Park Extensions Range	<p>The range of extensions for Call Park. This feature allows the user to temporarily park a telephone call and then pick it up at a different telephone. Call Park extensions must be a subset of <i>external</i> extensions.</p> <ul style="list-style-type: none"> ■ NBX V3000: 6000-7999

Table 9 Dial Plan Extension Settings (continued)

Field	Purpose
Start External Discovery At	The extension to use when autodiscovering external devices. The system assigns extensions starting with this number and incrementing upward as they are discovered. If the highest extension is reached, the system starts looking from the beginning of the external range and selects the first unused one. Typically, systems do not use all of the available external extensions from 600–799 in a 3-digit dial plan or from 6000–7999 in a 4-digit dial plan. Default: <ul style="list-style-type: none">■ NBX V3000: 7250
External Keyset Prefix	In Keyset mode, when a button on an NBX Business Telephone directly accesses an outside line, the NBX system must check Class of Service. The system prepends the <i>External Keyset Prefix</i> value (typically 8, 9, or 0) when it makes a call in Keyset mode.
Note 1: The NBX V3000 is shipped with a factory default 4-digit dial plan. If you import any 3-digit plan, you must manually specify any 3-digit extension ranges that are not set by the imported plan. You must also manually change any device extensions so that they fall within the appropriate range.	

Some countries reserve numbers beginning with 11 for numbers of national importance. To accommodate this requirement, you can begin the telephone extension range at 120.

Changing Extension Length and Ranges



You can view and change extension settings, such as extension length and extension ranges.

If you are changing from a 3-digit to a 4-digit plan, import the 4-digit dial plan configuration file before you configure or autodiscover any devices.

To view and change extension settings:

- 1 On the *Operations* tab, click *Settings*. The *Settings* dialog box appears.
- 2 Make the desired changes to the extension settings. Table 9 describes each field.
- 3 Click *OK* to enable your changes and exit the dialog box.

Planning Extension Ranges

Plan extension ranges in order to accommodate your present and future needs.

Example: If you initially have 60 telephones and expect to add no more than 100 additional telephones in the future, choose 100–299 as the telephone extension range (1000–1199 in a 4-digit system). This arrangement provides 200 extension numbers to handle the planned 160 telephones plus 40 extra extensions to handle unexpected additions.



Once you set the telephone extension range, you can extend it later, provided that the new range does not overlap any other number range.

Example: For a 4-digit dial plan, you can set the initial telephone extension range to 1000–1099. This arrangement allows for up to 100 telephone extensions. Later, you can extend the range up to 3999 to allow for 400 telephone extensions.

How Auto Discovery Assigns Extensions

The Auto Discovery process assigns new extensions to telephones and other devices. For example, if you install a T1 or E1 card, you can use Auto Discovery to assign extension numbers to each port on the card. The Auto Discovery process initially assigns a default name (*new user*) to each new telephone, and assigns the next available extension number. Later, you can replace (*new user*) with the appropriate user's name.



It is possible to bypass the Auto Discovery process and to manually add a new telephone and assign an extension. However, 3Com strongly recommends that you take advantage of the Auto Discovery process. For instructions on using Auto Discovery, see the section on "Adding a New Telephone" on page 127.

You can define a user in the system database without assigning a telephone to that user. By defining a user with no device, but with a telephone extension only, you create a *phantom mailbox*. The NBX system associates an extension with this phantom mailbox so that the user can have voice mail capability. To access voice mail from any telephone, the user calls either extension 500 (the default Auto Attendant extension), or 501 (the default Auto Attendant voice mail extension.)

Telephones and Line Card ports reserve most of the extensions within the system. However, there are other extensions within the system. Table 8 shows the default extension ranges for 3-digit and 4-digit dial plans.

Modifying Extensions

You can modify the extension number of any device in the system. Normally, you make changes *only* after you have changed the extension ranges for the NBX system, in order to align the extensions with the new ranges.



CAUTION: Be very careful when you change extensions. The system does not validate changes that you make here, and there is no Undo or Cancel function. A mistake can compromise the operation of the system.

To modify extensions:

- 1 From the NBX NetSet main menu, click *Dial Plan > Operations > Modify Extensions* to open the *Modify Extensions* dialog box.
- 2 In the extensions list, select the extensions that you want to modify. Use Shift-click to select a block of extensions or Ctrl-click to select several extensions at different locations in the list.
- 3 Select an operation from the *Operation* drop-down list. Table 10 lists and describes the operations.
- 4 Make the appropriate entry in the text box to the right of the *Operation* list. The system uses this number in conjunction with the operation that you selected in step 3. For examples, see "Changing Extensions" below.
- 5 Click *Apply*. If the requested change creates a duplicate extension or an extension of zero length, the change is discarded.
- 6 Click *OK* to enable your changes and exit the dialog box.

Table 10 Modify Extension Operations

Operation	Purpose
Change Extension	Modifies the first selected extension. Change Extension applies to only one extension at a time. If you select multiple extensions, the NBX system changes only the first extension that you selected.
Prepend	Prepends the digits in front of all selected extensions.
Append	Appends the digits to the end of all selected extensions.
Strip Leading Digits	Strips (removes) the specified number of digits from the beginning of all selected extensions.
Strip Trailing Digits	Strips (removes) the specified number of digits from the end of all selected extensions.

Changing Extensions

You can perform several operations through the Modify Extensions dialog box (Table 10). This section describes several examples.

Example: If you select *Change Extension* from the *Operation* list, the system replaces the selected extension with the number you type in the text box.

Example: If you select *Strip Leading Digits* from the *Operation* list, and type the number 2 in the text box, the system strips (removes) two digits from the beginning of the extension.

Example: If you select extensions 1000 through 1009 and select *Strip Trailing Digits* from the *Operation* list, the system does not make any change, because the result is a series of identical numbers (all 100).

Managing Extension Lists

An extension list contains extension numbers that are assigned and dedicated to specific dial tone facilities or to specific NBX applications (voice mail, Auto Attendant, and so on), or both. You can add an extension list to define a subset of devices such as fax machines.

The system default extension lists are numbered starting at *0001 in either a 3-digit or 4-digit plan. By convention, a default extension list number is preceded by an asterisk. See Table 11 for a description of the standard extension lists.



CAUTION: Extension lists must not overlap.

Table 11 Extension Lists

Extension List ID	Description
*0001	Contains extension numbers assigned to Analog Line Card ports. Routes 1 and 2 use this list.
*0002	Contains extension numbers assigned to Digital Line Card ports. Routes 1 and 2 use this list.
*0003	Contains extension numbers assigned to voice mail. ■ NBX V3000: 6400–6499 (See Note 1) Route 3 uses this list.

Table 11 Extension Lists (continued)

Extension List ID	Description
*0004	Contains the extension for the attendant (that is, the person who monitors incoming calls). The system automatically assigns to this list the lowest extension found during Auto Discovery. Route 4 uses this list.
*0005	Contains extension numbers assigned to H.323 ports.
*0006	Contains extension numbers assigned to Virtual Tie Lines.
*0008	Contains extension numbers assigned to the 8-pool.

Note 1: The NBX V3000 is shipped with a 4-digit dial plan. If you import any 3-digit plan, you must manually specify any 3-digit extension ranges that are not set by the imported plan. You must also manually change any device extensions so that they fall within the appropriate range.

Within an extension list, you can assign a priority to each extension. When the system accesses an extension list, it tries to use the highest priority extension first. The highest priority is 1 and the lowest is 99.

For example, If the extension list contains extensions that are assigned to T1 channels, you can assign unique priorities to each of the extensions. If you instruct the system to place an outgoing call using the T1 line, it attempts to use the highest priority extension/channel first. If the first is unavailable, it tries the next highest priority extension/channel, and so on.

From the *Extensions List* tab of the Dial Plan window, you can perform these tasks:

- Adding an Extension List
- Modifying an Extension List
- Removing an Extension List



The system restricts access to any specific Analog Line Card port or Digital Line Card port. To directly dial the extension number that is associated with one of these devices, you must have diagnostic privileges. In addition, you cannot dial a prefix to obtain a Digital Line Card port.

Adding an Extension List

To add a new extension list:

- 1 From the Dial Plan window, click the *Extension Lists* tab.
- 2 Click *Add*. The Add Extension List dialog box appears.
- 3 In the *List Extension* text box, type the number that you want to assign to the new extension list. Do not select a number that is currently in use by the system as either an extension or as the number of an extension list.

You may use the default extension number.
- 4 Type an asterisk preceding the extension number. By convention, the asterisk indicates that the number represents an extension list.
- 5 In the *Name* text box, type the name that you want to assign to the new extension list. Names can include uppercase and lowercase alphanumeric characters, spaces, underscores, and hyphens.
- 6 If you want calls to cycle through the extensions in the list, check the *Cycle Extensions* checkbox. Each time the system accesses the extension list, it uses the next extension in the list. Calls effectively progress through the list to balance the load of calls. If *Cycle Extensions* is not checked, the extension selection always starts from the top of the list.

If an extension in the list has a higher priority, the highest priority extension is used regardless of the *Cycle Extension* setting.
- 7 To move an extension from *Extensions not in List* to *Extensions in List*, select the extension and click <<.Use Shift-click to select a block of extensions, and Ctrl-click to select several extensions in different locations in the list.
- 8 To change the priority of extensions:
 - a Select the extension from the *Extensions in List* scroll list.
 - b Enter a priority number in the text box below the list (from a high of 1 through a low of 99).
 - c Click the *Change Priority in List* button.

The new priority appears as the number to the left of the item within square brackets. The default value is 50. When the system accesses an extension list, it first attempts to use the highest priority extension.
- 9 Click *OK* to enable your changes and leave the dialog box.

Example: If the extension list contains extensions that are assigned to T1 channels, you can assign unique priorities to each extension. If you

instruct the system to place an outgoing call using the T1 line, it attempts to use the highest priority extension/channel first, and, if the first is unavailable, tries the next highest priority extension/channel, and so on. Priorities range from 1 (highest) through 99 (lowest).



CAUTION: If you add an extension list, you must change the dial plan configuration file to create a destination route to the new list. This arrangement enables the system to route calls to the new list.

Modifying an Extension List

To modify an extension list:

- 1 On the *Extension Lists* tab, select an extension list.
- 2 Click *Modify*. The *Modify Extension List* dialog box appears.
- 3 To modify the name of the Extension List, edit the contents of the *Name* text box.

 If you change the name of an extension list, you invalidate any aspect of the dial plan that refers to the name. You must change all references to the extension list name in the dial plan configuration file. If you made your changes using an editor (as opposed to modifying the dial plan from within the NBX NetSet utility), you must reimport the dial plan.
- 4 If you want calls to cycle through the extensions in the list, check the *Cycle Extensions* checkbox. Each time that the system accesses the extension list, it uses the next extension in the list. This arrangement effectively progresses through the list to balance the load of calls. If *Cycle Extensions* is not checked, the extension selection always starts from the top of the list.
- 5 To add an extension to the *Extensions in List* scroll list, select it in the *Extensions not in List* scroll list and click the << button. Use Shift+click to select a block of extensions, or Ctrl+click to select several extensions at different locations in the list.
- 6 To remove an extension from the extension list, select it in the *Extensions in List* scroll list and click the >> button. The extension moves to the *Extensions not in List* scroll list.
- 7 To change the priority of extensions:
 - a Select the extension from the *Extensions in List* scroll list.
 - b Enter a priority number in the text box below the list (from a high of 1 through a low of 99).

- c Click the *Change Priority in List* button.

The new priority appears as the number to the left of the item within square brackets. The default value is 50. When the system accesses an extension list, it attempts to use the highest priority extension first.

- 8 Click *OK* to enable your changes and exit the dialog box.

Removing an Extension List

The system does not let you remove an extension list that the dial plan is using even if that extension list is empty. You must remove the extension list from the dial plan before you can delete the extension list.

To remove an extension list:

- 1 On the *Extension Lists* tab, select the extension list you want to remove.
- 2 Click *Remove*. A dialog box prompts you to confirm the removal.
- 3 Click *Yes*.



CAUTION: Do not remove any of the predefined lists (lists 1 through 8).

Managing Dial Plan Tables

The NBX system associates a normal dial plan table and a Least Cost Routing table with each device. Devices include, for example, telephones, Analog Line Card ports, or Digital Line Card ports. A telephone that has no table assigned does not have permission to dial. A telephone without an assigned table is flagged in Reports. For details, see “Generating a Dial Plan Report” on page 50. For more information, see these topics:

- Determining Which Devices Use Dial Plan Tables
- Removing a Dial Plan Table

Determining Which Devices Use Dial Plan Tables

You can view or change the devices associated with a particular dial plan:

- 1 In the *NBX NetSet – Main Menu* window, click *Dial Plan*. The Dial Plan window appears, displaying the *Operations* tab.
- 2 Click the *Tables* tab.
- 3 From the list, select a dial plan table for which you want to list associated devices. To list devices not assigned to any table, select *(none)*.

- 4 Click *Devices Using* to open the *Devices Using Dial Plan* dialog box. For descriptions of the field, see Table 12. If you select *(none)*, the *Devices That Have No Dial Plan* dialog box appears.
- 5 Select *Normal* to see which devices use table ID 1 (in this example) as the *Normal* table.
- 6 Click *Least Cost* to see which devices use table ID 1 as the *Least Cost* table. Each device can use only one normal and one least cost table.
- 7 To move a device to the *Devices Using Table* list, select it in the *Devices Not Using Table* list and click <<. To move a device to the *Devices Not Using Table* list, select it in the *Devices Using Table* list and click >>.
- 8 Click *Close*.

Table 12 Devices Using Dial Plan Table Fields

Field	Purpose
Dial Plan Table ID	The identification number of the dial plan table as specified in the dial plan configuration file.
Dial Plan Table Name	The name of the dial plan table.
Table Usage	The type of table (either <i>Normal</i> or <i>Least Cost</i>). To select a type, click either <i>Normal</i> or <i>Least Cost</i> .
Devices Using Table	A list of devices using this Normal or Least Cost Routing table.
Devices Not Using Table	A list of devices <i>not</i> using this Normal or Least Cost Routing table.

Removing a Dial Plan Table Note that you must *not* remove any of the predefined tables (Internal, Incoming, or Least Cost).



CAUTION: You cannot remove a dial plan table if a device is using it. To remove the table, you must first remove all devices from the Devices Using Table list.

To remove a dial plan table:

- 1 In the *NBX NetSet – Main Menu* window, click *Dial Plan*. The Dial Plan window appears, displaying the *Operations* tab.
- 2 Click the *Tables* tab.
- 3 Select the table you want to remove.
- 4 Click *Remove*. A dialog box prompts you to confirm the removal.
- 5 Click *Yes*.

**Managing Dial Plan
Pretranslators**

Pretranslators are tables in the dial plan configuration file. Each entry in a pretranslator table contains a string of one or more digits that are compared to incoming or outgoing digits. When the digits match an entry in the table, the NBX system performs the associated pretranslator operations.

For more information, see:

- Identifying Devices Using Pretranslators
- Creating a Pretranslator for VTL Calls
- Identifying Devices Using Pretranslators for CLI
- Removing a Pretranslator from the Dial Plan

**Identifying Devices
Using Pretranslators**

To view a list of devices and their associated pretranslators, or to associate a pretranslator with a specific device:

- 1 In the *NBX NetSet – Main Menu* window, click *Dial Plan*.
- 2 Click the *Pretranslators* tab.
- 3 Select a pretranslator, or (none) for devices that have no pretranslator.
- 4 Click *Devices Using*. The *Devices Using Pretranslator* dialog box appears. If you selected (none) in step 3, you see a list of devices that do not use a pretranslator. Table 13 describes each field. The fields are the same for the *Devices Using Pretranlator for CLI* dialog box.
- 5 To move a device to the *Devices Using Pretranslator* list, select it in the *Devices Not Using Pretranslator* list and click <<. To move a device to the *Devices Not Using Pretranslator* list, select it in the *Devices Using Pretranslator* list and click >>. Then
- 6 Click *Close*.

Table 13 Pretranslator Fields

Field	Purpose
Pretranslator ID	The identification number of the pretranslator as specified in the dial plan.
Pretranslator Name	The name of the pretranslator as specified in the dial plan.
Devices Using Pretranslator	Devices currently using the pretranslator.
Devices Not Using Pretranslator	Devices not using the pretranslator.

To enable a specific pretranslator, update the dial plan. See “Importing and Exporting Dial Plan Configuration Files” on page 45.

Creating a Pretranslator for VTL Calls

Calls from one NBX system to another NBX system over a VTL connection include caller ID information that includes the IP address of the caller’s system and the caller’s extension. Each field of numbers in this caller ID string is separated by the “*” character. For example, if extension 1002 on System A calls someone on system B over a VTL connection, the display panel on the System B telephone shows 10*234*208*2*1002, which indicates an incoming call from extension 1002 on the NBX system with the IP address 10.234.208.2.

If the System B dial plan has a pretranslator that removes the IP address when the call arrives at System B, (see Figure 4 on page 66), the display panel on the System B telephone shows the calling extension and no IP address or “*” characters. This solution works well when the extensions on System A and System B do not overlap, for example, System A user extensions are 1000-1999 and System B extensions are 2000-2999.

Site Codes

If the dial plan on System B uses a site code, such as 69, for VTL calls to System A, you could create a pretranslator that prepends the site code after it removes the IP address. (See Figure 5 on page 67.) This pretranslator would provide caller ID information that the System B extension can use to return a call to the System A extension. For example, a call from System A (10.234.208.2) extension 1002 would appear on a System B telephone’s display panel as 691002 instead of 10*126*14*200*1002. The pretranslator removes the IP address and prepends the calling extension with the System A site code, 69.



You might choose to not implement this pretranslator if calls from System A can hop off at System B onto a PRI line because the site code would be included as caller ID information on the PRI line, and that caller ID information would be meaningless to someone outside the NBX system. For hop-off calls, you could create a separate pretranslator.

VTL Calls, Caller ID and Hop Off

If a VTL call from System A to System B hops off System B and onto an ISDN PRI trunk, the “*” characters in the caller ID string can present problems for the PRI service. The PRI service cannot interpret the “*” symbols so it ignores the caller ID string it has received and instead uses

the PRI line phone number. For example, if you must dial 1-508-555-1234 to get into the PRI from the outside world, that number is used for the outgoing caller ID. If System A or System B has CLIR (Calling Line Identity Restriction) enabled, the PRI service ignores the CLIR setting and it sends the PRI line phone number as the caller ID.

If you have a pretranslator on System B that removes the IP address from the caller ID string of incoming VTL calls, then the caller ID will be the extension of the phone making the call. If system A and/or System B has CLIR enabled, then CLIR will be in effect. The only exception is for emergency calls (as defined in System B's dial plan), which never have caller ID blocked.

Figure 4 shows an example of a pretranslator that removes the "*" character from VTL calls that originated on an NBX system with the IP address 10.234.208.2. The Value column of the PreTranslatorOperation Create line of Figure 4 specifies how many digits to strip from the beginning of the string. That value depends on the length of the received IP address. In the example, the IP address, 10*234*208*2, is 12 digits, and then you must also count the trailing "*" in the string. That trailing "*" is the character that separates the IP address from the caller extension and you must count it when you specify the number of digits to remove.

Figure 4 Pretranslator to Remove IP Address

PreTranslator Create 2 VTL	PreTransId	Entry	Digits
/	-----	-----	-----
/	-----	-----	-----
PreTranslatorEntry Create	2	1	10*234*208*2*
/	-----	-----	-----
/	-----	-----	-----
PreTranslatorOperation Create	2	1	1 stripLead 13

Figure 5 shows an example of a pretranslator that removes the "*" character from VTL calls that originated on an NBX system with the IP address 10.234.208.2 and prepends the site code, 69, of NBX system 10.234.208.2.

Figure 5 Pretranslator to Remove IP Address and Prepend Site Code

```

PreTranslator Create 2 VTL
/
PreTranslatorEntry Create          PreTransId Entry Digits
/                                     -----
/                                     2   1   10*234*208*2*
/
PreTranslatorOperation Create      PreTransId Entry OperId Operation Value
PreTranslatorOperation Create      2   1       1 stripLead 13
                                         2   1       2 prepend   69

```

To add a pretranslator for VTL caller ID issues:

- 1** Open your dial plan for editing as described in “Accessing the Dial Plan” on page 44.
- 2** Search for the section titled Pretranslators.
- 3** Add a new pretranslator for each system from which you will be receiving calls over a VTL.
- 4** Save the edited dial plan and import it into the system. For more information, see “Importing and Exporting Dial Plan Configuration Files” on page 45.
- 5** Specify the devices that should use the pretranslator. See “Adding VTL Devices to the Pretranslators (Optional)” on page 89.

Identifying Devices Using Pretranslators for CLI To view a list of devices that use a particular pretranslator to present Calling Line ID (CLI) information on outgoing calls:

- 1** In the *NBX NetSet – Main Menu* window, click *Dial Plan*.
- 2** Click the *Pretranslators* tab and select a pretranslator from the scroll list. For a list of devices that have no pretranslator, select (none).
- 3** Click *Devices Using Pretranslator for CLI*. The *Devices Using Pretranslator for CLI* dialog box appears. If you selected (none) in step 3, you see a list of devices that do not use a pretranslator for Calling Line ID.
- 4** To move a device to the *Devices Using Pretranslator* list, select it and click <<. To move a device to the *Devices Not Using Pretranslator* list, select it and click >>. Then click *Close*. See Table 13 for field descriptions.

Removing a Pretranslator from the Dial Plan

- To remove a pretranslator:
- 1 In the *NBX NetSet – Main Menu* window, click *Dial Plan*.
 - 2 Click the *Pretranslators* tab.
 - 3 Select a pretranslator from the scroll list.
 - 4 Click *Remove*.



CAUTION: You cannot remove a pretranslator if any device is currently using it. If you want to remove the pretranslator, you must first remove all devices from the Devices Using Pretranslator list.

Configuring the Dial Plan for the 4ESS Protocol (T1)

The 4ESS protocol, used on T1 Digital Line Cards that are configured for PRI operation, requires specific configuration entries in the NBX system dial plan. If you purchase the 4ESS protocol and SDN (Software Defined Network) service from your long-distance carrier, you must make dial plan changes similar to those outlined in “Configuring the Dial Plan for Software-Defined Network Calls” on page 68. If you want to make long distance calls or international long distance calls using the 4ESS protocol, you must make dial plan changes similar to those outlined in “Configuring the Dial Plan for North American Long Distance” on page 69 and “Configuring the Dial Plan for International Long Distance” on page 69.

Configuring the Dial Plan for Software-Defined Network Calls

In the NBX system dial plan, if you are using the 4ESS protocol and you want to make SDN calls, you must configure a unique route to use for SDN calls and include the letters SDN at the beginning of the dial string.

Example: The dial plan entry shown adds the characters SDN (must be capital letters) before the long-distance dialed digits. This example assumes that route 4 is used for SDN calls.

Figure 6 Dial Plan Entries for SDN

		Route	Entry	OperID	Operation	Value
/	/					
Destination	Route	Operation	Create	4	1	1 prepend SDN

Configuring the Dial Plan for North American Long Distance

In the NBX system dial plan, if you are using the 4ESS protocol and you want to make long-distance calls, you must remove from the dial string any digits that are dialed by users to access the long-distance service. For example, if users normally dial 9 and then 1 to obtain a long-distance dial tone, and then dial a 10-digit number, the dial plan must remove the 9 and the 1 and present only the 10-digit number to the long-distance carrier. Otherwise, the 4ESS protocol rejects the call.

Example: If you use route 1 in the dial plan for Long Distance, and users must dial 91 to make a long-distance call, the dial plan entries shown in Figure 7 remove the first two digits (91) and submit the remaining 10 digits to the long-distance carrier.

Figure 7 Dial Plan Entries for North American Long Distance

```
Table Create 1 Internal 4 Digit Extensions
/           ID Entry Digits Min Max Class      Prio Route
/           -- ----- -- -- -- -- -- -- -- --
TableEntry Create 1     2 91       12  12 LongDistance 0    1
/
/           Route Entry OperID Operation Value
/           -- ----- -- -- -- -- --
DestinationRouteOperation Create 1     1       1   stripLead 2
```

Configuring the Dial Plan for International Long Distance

In the NBX system dial plan, if you are using the 4ESS protocol and you want to make international long-distance calls, you must remove from the dial string the digits 9011 that are dialed by users to access the international long-distance service. For example, if the user dials the string 9-011-44-1234-567890, the dial plan must remove the 9011 before passing the dialed digits to the long-distance carrier or the 4ESS protocol rejects the call. See Figure 8.

Figure 8 Dial Plan Entries for International Long Distance

```
Table Create 1 Internal 4 Digit Extensions
/           ID Entry Digits Min Max Class      Prio Route
/           -- ----- -- -- -- -- -- -- -- --
TableEntry Create 1     3 9011       12  64 International 0    1
/
/           Route Entry OperID Operation Value
/           -- ----- -- -- -- -- --
DestinationRouteOperation Create 3     2       1   stripLead 4
```

Overview of Voice Profile for Internet Mail

With Voice Profile for Internet Mail (VPIM), users on one NBX system can send voice mail to a user on another NBX or VPIM-compliant system. VPIM is an optional component that requires a license, which appears in the NBX NetSet Licenses dialog as *Internet Voice Messaging License*.



VPIM uses an SMTP server that is embedded in the NBX operating system. To avoid abuse by spammers, an SMTP server should always be protected by a firewall. Configure the firewall to allow access to port 25 on the NBX system only from valid VPIM systems that need to deliver VPIM messages to the phone system. The NBX SMTP server is started only when the system has a valid license for VPIM.

To send a voice mail message to a user on another VPIM-compliant system, an NBX user first composes the voice mail message, using the commands in the user's voice mailbox. Depending on how the system's dial plan is configured, the user can specify the destination in two ways:

- If the dial plan is configured for site codes, the user specifies the destination site code followed by the extension of the person for whom the voice mail message is intended.
- If the dial plan is configured without site codes, the user specifies the extension of the person for whom the message is intended. This is easier, but requires that each site use a unique extension range for telephones.
- A user who knows the IP address of a VPIM-compliant voice mail system and the extension of a person who uses that system can compose a voice mail message and then send it using these steps:
 - Dial the IP address, pressing the * key after each field in the address, including the last field.
 - Dial the extension of the person followed by #.

The system administrator configures the dial plan and decides whether to use site codes or unique extension ranges.

Configuring the Dial Plan for VPIM

To fully define a VPIM connection between two NBX systems, you must create entries in the dial plan for the following items:

- The digit sequence that a telephone user must dial to access the VPIM connection
- The route number that is used to access the other NBX system
- The extension list to which the VPIM route belongs
- The operations that must be performed on the dialed digits in order to create the appropriate outgoing digit sequence

Figure 9 contains sample lines which, when added to an existing dial plan, implement VPIM connections to two other NBX systems, one in Atlanta and one in Dallas. Table 14 explains each entry.

Figure 9 Dial Plan with VPIM Implementation Commands

Table Create 1 Internal Extensions

/		Id	Entry	Digits	Min	Max	Class	Prio	Route
/		--	--	--	--	--	--	--	--
TableEntry	Create	1	45	V82	5	5	WAN	0	532
TableEntry	Create	1	46	V83	6	6	WAN	0	533

/	Route Description		
/	--		
DestinationRoute	Create	532	Atlanta VPIM Connection
DestinationRoute	Create	533	Dallas VPIM Connection

/	Route	Entry	DestinationExtension
/	--	--	--
DestinationRouteEntry	Create	532	1 *0003
DestinationRouteEntry	Create	533	1 *0003

/	Route	Entry	OperId	Operation	Value
/	--	--	--	--	--
DestinationRouteOperation	Create	532	1	1 stripLead	3
DestinationRouteOperation	Create	532	1	2 prepend	10*234*101*222*

Table 14 Explanation of Entries in Figure 9

Field	Purpose
Table Create 1 Internal Extensions	
	This command is already present in all default dial plans, and is included here as a reference point for subsequent commands.
TableEntry Create 1 45 V82 5 5 WAN 0 532	
TableEntry Create 1 45	This portion of the command creates entry 45 in dial plan table 1 (the <i>Internal Extensions</i> table). The choice of 45 as the entry number depends on how many entries exist in table 1. This example assumes that the highest number assigned to a previously existing entry was 44.
V82 (Digits column)	The letter V (required, and must be a capital letter) indicates that this is a VPIM connection, and the 82 indicates that the user must dial 82 to access the VPIM connection and then dial the extension the user wants to reach.
	You can select any number of digits for a site code. The selected number must not conflict with other dial plan entries. This example assumes that 82 is not used in any other way in the dial plan.
	Long digit sequences can annoy telephone users and create the opportunity for dialing errors.
Min (5) Max (5)	Indicates that the total digit sequence dialed by the user is 5 digits. The first two digits are the site code (82 in this example) and the remaining 3 digits are the destination extension.
Class (WAN)	Indicates that this call is classified as WAN. All VPIM calls have this classification.
Priority (0)	This field is unused by the dial plan; the default value is zero (0).
Route (532)	In this example, the VPIM connection to the other NBX system uses route 532. The route number must be unique in the dial plan and in the range of 1–32768.
DestinationRoute Create 532 Atlanta VPIM Connection	
	This command creates route number 532 and gives it the name <i>Atlanta VPIM Connection</i> .
DestinationRouteEntry Create 532 1 *0003	
	This command (mandatory for all VPIM routes) assigns route 532 to the extension list *0003.
DestinationRouteOperation Create 532 1 1 stripLead 3	

Table 14 Explanation of Entries in Figure 9 (continued)

Field	Purpose
	For DestinationRoute 532, entry 1, this command creates operation 1, which removes the first three digits, including the letter V, from the digit string, leaving only the extension that the user dialed.
DestinationRouteOperation Create 532 1 2 prepend 10*234*101*222*	

Configuring VPIM Parameters	Using the NBX NetSet utility, you can configure several VPIM control parameters, check the status of the VPIM queues, and obtain statistics on recent VPIM activity.
VPIM Control Parameters	<p>To set the VPIM control parameters:</p> <ol style="list-style-type: none"> 1 In the <i>NBX NetSet - Main Menu</i> window, click <i>NBX Messaging</i>. 2 Click the <i>VPIM</i> tab. Table 15 describes the fields.

Table 15 VPIM Tab Fields

Field	Purpose
Max message size	Controls the size of incoming messages from other sites. If a message is larger than the specified value, the NBX system rejects it. The default value represents a voice mail message approximately 4 to 5 minutes in length. Default: 3000 Kilobytes
<i>Time between send attempts (minutes)</i>	For outgoing messages, the NBX system may not be able to contact the target system on the first attempt. If so, the NBX system attempts to contact the target system later. To change the time between attempts, change this number. Default: 15 minutes Minimum: 1 minute Maximum: 60 minutes

Table 15 VPIM Tab Fields (continued)

Field	Purpose
Max number of send attempts	Specifies the number of times (Default: 4) that the NBX system tries to connect to the target system. After the specified number of send attempts, the message is returned to the sender's voice mailbox with a notice that the message could not be sent.

Operations Management

To manage outgoing voice mail messages, click Queue Management. The Operations Management dialog box appears. See Table 16.

Table 16 Operations Management Dialog Box Fields

Field	Purpose
Operations status	The status of the queue of outgoing voice mail messages. Possible values: Starting, Ready, Processing, Stopped.
Number of outgoing messages	The number of messages in the outgoing queue when this dialog box was last accessed or refreshed.
Outgoing Messages	
Time Waiting	The number of minutes that the voice mail message has been waiting in the queue.
# Attempts	The number of times the NBX system has attempted to send the voice mail message.
Sender	The e-mail address of the user who sent the voice mail message.
Destination	The IP address and extension to which the voice mail message is to be sent.
Remove	NOTE: You must stop the message queue before you can remove any message. Select a voice mail message in the scroll list and click this button to remove the message from the queue. The NBX system prompts you to confirm that you want to delete the selected message. Use Shift+Click to select a block of messages, or Ctrl+Click to select several messages that are not in a single block.
Apply Buttons	
Send all messages now	The NBX system attempts to send all messages immediately and then waits for the required number of minutes before making another send attempt.

Table 16 Operations Management Dialog Box Fields (continued)

Field	Purpose
Send all messages now and then delete them	The NBX system makes a single attempt to send each message on the queue. Any undeliverable messages are returned to sender with delivery failure notices, and then deleted from the outgoing mail queue.
Delete all messages now	The NBX system deletes all messages from the outgoing mail queue. These messages are not returned to sender with delivery failure notices.
Stop operations	Stops the queue if it is currently active.
Start operations	Starts the queue if it is stopped.

Statistics To view the most recent statics for voice mail messages, click the *Statistics* button. The Statistics window appears. Table 17 lists the fields in this window and explains their purpose.

Table 17 Statistics Window Fields

Field	Purpose
Incoming Messages	
Total messages received by system	The number of messages received by this NBX system from voice mailboxes on other systems
Total messages delivered to user mailboxes	The number of voice mail messages delivered to user voice mailboxes on this NBX system. If this number is smaller than the total number of messages received, some messages have not yet been delivered.
Outgoing Messages	
Total messages submitted for external delivery	The number of messages submitted by users of this NBX system for delivery to voice mailboxes on other systems
Total messages delivered to external recipients	The number of messages for which a confirmation of delivery has been received.
Total messages returned to sender on failed delivery	The number of messages that have been returned because they could not be delivered.
Failed Outgoing Messages	

If a message appears in this list, the NBX system has tried to deliver the message and has failed. The NBX system attempts to resend the message up to the retry limit. Default: 4. Minimum: 1. Maximum: 10.

Table 17 Statistics Window Fields (continued)

Field	Purpose
Date/Time	The date and time that the message was originally submitted for delivery
Attempts	The number of attempts that the NBX system has made to send each message
Sender	The person on the local NBX system who created and sent the voice mail message
Destination	The defined target for the voice mail message
Reason	The reason for the most recent failure to deliver the message
Reset and Reboot Times	
Last reset command	<p>The date and time of the last reset command. Sets all VPIM statistics to 0 (zero) and deletes all messages from the Failed Outgoing Messages queue.</p> <p>If this field's date and time are more recent than <i>Last system reboot</i>, then the NBX system began to collect the currently displayed statistics at this date and time.</p>
Last system reboot	<p>The date and time of the most recent reboot of the NBX system. An NBX system reboot resets all VPIM statistics to 0 (zero).</p> <p>If this field's date and time are more recent than <i>Last reset command</i>, then the NBX system began to collect the currently displayed statistics at this date and time.</p>

Advanced Settings

The NBX system transmits VPIM voice mail messages by attaching them to e-mail messages that are sent using SMTP (Simple Mail Transfer Protocol) or ESMTP (Extended Simple Mail Transfer Protocol).

Click the Advanced Settings button to access the Advanced Settings dialog box. Set the parameters to control the behavior of SMTP. Table 18 describes the fields.

Table 18 VPIM Advanced Settings Dialog Box

Field	Purpose
SMTP OK response	<p>Definition: The amount of time that the local system waits for a response from the remote system.</p> <p>Detail: After the local system attempts to open a connection to the remote system, it waits for a response giving the status of the connection.</p> <p>Minimum: 5 minutes</p> <p>Default: 5 minutes</p>
SMTP HELO response	<p>Definition: The amount of time that the local system waits for an acknowledgement of a HELO message.</p> <p>Detail: After the greeting, the local system sends either a HELO (or EHLO to get ESMTP) message to identify itself. The other site then responds with an acknowledgement of that message.</p> <p>Minimum: None defined.</p> <p>Default: 5 minutes</p>
SMTP EHLO response	<p>Definition: The amount of time that the local system waits for acknowledgement of a EHLO message.</p> <p>Detail: After the greeting, the local system sends either a HELO (or EHLO to get ESMTP) message to identify itself. The other site then responds with an acknowledgement of that message.</p> <p>Minimum: None defined.</p> <p>Default: 5 minutes</p>
SMTP MAIL response	<p>Definition: The amount of time that the local system waits for an acknowledgement of a MAIL command.</p> <p>Detail: After the local system sends out a MAIL command along with the From information, it waits for a response from the other site to indicate that the MAIL command was received.</p> <p>Minimum: 5 minutes</p> <p>Default: 5 minutes</p>

Table 18 VPIM Advanced Settings Dialog Box (continued)

Field	Purpose
SMTP RCPT response	<p>Definition: The time that the local system waits for an acknowledgement of a RCPT command.</p> <p>Detail: After the system sends out a RCPT command (one per recipient), it waits for a response from the other site indicating acceptance or rejection of the recipient.</p> <p>Minimum: 5 minutes</p> <p>Default: 5 minutes</p>
SMTP DATA response	<p>Definition: The time that the local system waits for an acknowledgement of a DATA command.</p> <p>Detail: After the local system has specified all of the recipient information, it sends a DATA command to indicate that it is ready to send the mail message itself. It then waits for the other site to acknowledge the DATA command.</p> <p>Minimum: 2 minutes</p> <p>Default: 2 minutes</p>
SMTP DATA END response	<p>Definition: The time that the local system waits, after sending the entire message, for an acknowledgement from the other site that the message was received.</p> <p>Detail: After the local system sends the entire message, it waits for a response from the other site indicating acceptance of the message.</p> <p>Minimum: 10 minutes</p> <p>Default: 10 minutes</p>
SMTP RSET response	<p>Definition: The time that the local system waits for an acknowledgement of a RSET command.</p> <p>Detail: Since the RSET command resets the SMTP connection, the local system must wait for the other site to reset itself and acknowledge.</p> <p>Minimum: None defined</p> <p>Default: 10 minutes</p>

Table 18 VPIM Advanced Settings Dialog Box (continued)

Field	Purpose
SMTP QUIT response	<p>Definition: The time that the local system waits for an acknowledgement of the QUIT command.</p> <p>Detail: When the local system is finished transmitting a message and wants to break the connection, it sends a QUIT command. It then waits for the other site to acknowledge the QUIT command. When the acknowledgement arrives, or when the time-out value is reached, whichever comes first, the local system breaks the connection.</p> <p>Minimum: None defined</p> <p>Default: 5 minutes</p>

Configuring Domain Name Server Information	<p>When the SMTP utility attempts to send e-mail, it must be able to resolve a host name within an e-mail address and determine the proper IP address from that name. Domain Name Servers on the Internet perform this function. You can configure up to three DNS entries with the NBX NetSet utility. The NBX system uses the second and third entries if the first or second cannot be reached. To configure DNS information in the NBX NetSet utility:</p> <ol style="list-style-type: none"> 1 In the <i>NBX NetSet - Main Menu</i> window, click <i>System Configuration</i>. 2 Click the System Settings tab and the System-wide button. The System Settings dialog box appears. 3 In the <i>Primary DNS</i>, <i>Secondary DNS</i>, and <i>Tertiary DNS</i> text boxes, type the IP addresses of three Domain Name Servers. If you have the IP address of only one server, type it in the <i>Primary DNS</i> text box. If you have the IP address of only two servers, type them in the <i>Primary and Secondary DNS</i> text boxes. Click <i>OK</i>.
---	---

Overview of Virtual Tie Lines	<p>A Virtual Tie Line (VTL) provides a way to make calls between NBX system sites that are separated geographically but tied together by a Wide Area Network (WAN). VTLs are a licensed feature of the NBX systems.</p> <ul style="list-style-type: none"> ■ NBX V3000 — support for 48 simultaneous VTL connections <p>On any NBX system, a VTL connection can be used either for an incoming VTL call from any site or for an outgoing VTL call to any site. A VTL connection is not dedicated in the same way as a physical tie line, which always connects the same pair of sites. In the example in Figure 10, the</p>
--------------------------------------	--

VTLs on the Chicago NBX system can be used for any combination of incoming and outgoing VTL calls to either Atlanta or Dallas.

The NBX system can reroute VTL calls that fail to reach their destination on the first attempt. For details, see "Call Rerouting for Virtual Tie Lines" on page 93.



- *You must configure the system for either IP On-the-Fly or Standard IP in order to use VTL connections to other NBX systems.*
- *VTL connections cannot be configured to run through firewalls or NAT routers.*
- *When you calculate the number of devices on an NBX system, do not include the number of VTLs.*

There are two implementation techniques you can use: unique extension ranges, as described next, or site codes, which begins on page 81.

VTL Connections Using Unique Extension Ranges

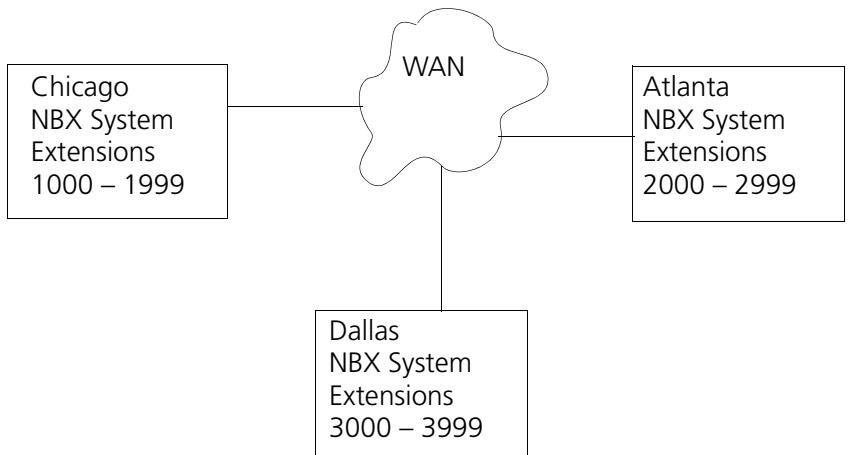
If you can restrict the extension ranges on each of the NBX systems so that they do not overlap, you can configure the dial plans to route calls based only on the extension that is being dialed. The caller does not have to dial any digits to specify the site.



Assess your growth plans for each site to verify that as you add telephones you do not exceed your defined extension ranges.

Figure 10 depicts a configuration that uses unique extension ranges

Figure 10 Multi-site Network using Virtual Tie Lines



In the sample network shown in Figure 10, each site is set up to use a unique range of telephone extensions. The dial plan on each of the systems is configured so that whenever a call is made to an extension not located at the local site, the NBX system sets up a VTL connection to the appropriate site.

To make a call to a user in Dallas, a user in Chicago dials a Dallas extension (3000 through 3999). The dial plan on the Chicago NBX system is configured to set up the necessary VTL connection to the Dallas NBX system, and then to the extension at that site.

See “Dial Plan Configuration” on page 85 for further information on how to set up VTLs in the dial plan.

VTL Connections Using Site Codes

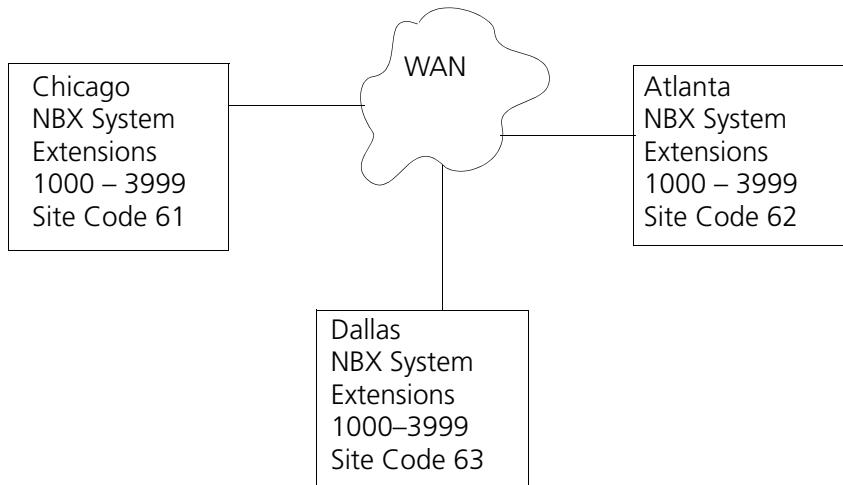
The simpler way to implement VTL connections uses a site code, consisting of one or more digits that a user must dial to specify the site that is being called. This approach requires no restriction on the telephone extension ranges, but does require the caller to dial the site code digits as well as the extension.

A site code can be any number of digits, but typically, one- or two-digit numbers make the most sense. The dial plan at each site must include appropriate routing instructions for each of the possible site code.

Figure 11 shows three sites connected by VTLs. All sites use the same range of extension numbers (1000 through 3999). To reach someone on

another NBX system, a user must dial a site code (61, 62, or 63 in this example) followed by an extension.

Figure 11 Virtual Tie Lines Using Site Codes



To call someone in Atlanta, a user in Chicago must dial the site code 62 and then the appropriate extension (1000 through 3999). To reach a user in Dallas, a user in Chicago must dial 63 and then the appropriate extension (1000 through 3999). Because the extension is preceded by the site code, there is no conflict between the extension dialed and an identical extension number at the local site (Chicago). The choice of site codes is made by the person who configures the dial plans for the sites.

See “Dial Plan Configuration” on page 85 for more information on how to set up VTLs in the dial plan.

Conference Calls Using VTL Connections

Users can set up conference calls over VTLs in much the same way that they set up conference calls with other users at their local site, or at a site reachable by an external telephone line.

- On a SuperStack 3 NBX system, you can have up to twelve 4-person conference calls simultaneously.



To be able to make conference calls between sites, you must have IGMP (Internet Group Management Protocol) implemented on your network.

Conference Calls Using Site-Unique Extensions

In Figure 10, a user in Chicago establishes a conference call with two users in Atlanta and one user in Dallas as follows:

- 1 Dial the first extension in Atlanta.
- 2 After the user answers, press **Conference** and dial the second extension in Atlanta.
- 3 When the second user answers, press **Conference** again to connect all three users.
- 4 Press **Conference** again and dial the extension of the user in Dallas.
- 5 When the fourth party answers, press **Conference** to connect all four users.

Conference Calls Using Site Codes

In Figure 11, if you work in the Chicago office, to establish a conference call with two people in Atlanta and one person in Dallas:

- 1 Dial the site code (62) and the first extension.
- 2 After the first user answers, press **Conference**, dial the same site code (62) and the second extension in Atlanta.
- 3 When the second Atlanta user answers, press **Conference** again to connect all three users.
- 4 Press **Conference** again and dial the Dallas site code (63) and then the extension of the user in Dallas.
- 5 When the Dallas user answers, press **Conference** again to connect all four users.

Conference Calls Involving Site Codes and Off-Site Telephones

In Figure 11, you work in the Chicago office and want to establish a conference call with someone in Atlanta, someone in Dallas, and someone at an external telephone number, you:

- 1 Dial the Atlanta site code (62) and then the extension.
- 2 After the Atlanta user answers, press Conference and dial the Dallas site code (63) and then the extension.
- 3 When the Dallas user answers, press Conference again to connect all three users.
- 4 Press Conference again and dial the external telephone number.

If the site requires that you dial 9 to reach an outside telephone line, and if the call is a long-distance call, the user might dial a number in area code 367 using the digit sequence 913675551212.

- 5 When the person answers, press Conference again to connect all four users.

How to Configure a Virtual Tie Line

Configuring a working VTL connection between two systems involves:

- License Installation
- Dial Plan Configuration
- Updating the Extension List
- Adding VTL Devices to the Pretranslators (Optional)
- Verification of the Virtual Tie Line

You can enable silence suppression and different levels of audio compression for your VTL calls. For more information on how silence suppression and compression affect bandwidth, see “Audio Settings” on page 238. To change the system-wide settings for silence suppression and compression on VTL calls, use the NBX NetSet utility to edit the audio settings: *System Configuration > System Settings > Audio Settings*.

License Installation

- You must obtain and install a license to enable VTLs.
- Each VTL license applies only to the NBX system on which it is installed. To connect three sites by VTLs and to have each site support up to 8 simultaneous active VTL connections, you must install a separate license key for 8 VTLs on each of the three NBX systems.
- To increase the number of VTLs above one of the levels on a system, you must add one or more incremental licenses of 2 VTLs each.

To install a VTL license:

- 1 In the *NBX NetSet - Main Menu* window, click *Operations*. Click the *Licenses* tab and the *Add License* button. In the text boxes, type the license key code.
- 2 Click *OK* and then restart the NBX system.

Dial Plan Configuration You configure the dial plan after you install the VTL license. See “License Installation” on page 84 for information about VTL licenses.

To configure the dial plan for VTLs, you must define:

- Routes within the dial plan
- Digit sequences to be used to select those routes
- Operations to be performed for each route

Example: Dial Plan with Site-Unique Extensions

In Figure 10, each of the three sites uses a unique extension range. In the Internal table in the Chicago system dial plan, the entries shown in Figure 12 control the routing of calls if a user dials an extension in the 2000 through 2999 range (Atlanta extensions) or the 3000 through 3999 range (Dallas extensions) respectively. The dial plans for the Atlanta and Dallas NBX systems would contain similar, but not identical entries.

An explanation of each line in the dial plan follows Figure 12.

Figure 12 Sample Dial Plan Entries for Chicago Using Site-Unique Extensions

Table Create 1 Internal 4 Digit Extensions						
/						Prio Route
/	--	-----	-----	-----	-----	-----
TableEntry Create	1	3	2	4	4 WAN	0 522
TableEntry Create	1	4	3	4	4 WAN	0 523
/	Route Description					
/	-----					
DestinationRoute Create	522 Atlanta VTL Connection					
DestinationRoute Create	523 Dallas VTL Connection					
/					Route Entry DestinationExtension	
/					-----	-----
DestinationRouteEntry Create	522		1	*	0006	
DestinationRouteEntry Create	523		1	*	0006	
/				Route Entry OperId Operation Value		
,						

The first *TableEntry Create* command modifies entry 3 in Table 1. Entry 3 watches for 4-digit sequences (Min = 4, Max = 4) beginning with 2 (extensions 2000 through 2999) and specifies route 522 whenever a 4-digit sequence falls within this range. Entry 4 watches for 4-digit sequences (Min = 4, Max = 4) beginning with 3 (extension 3000 through 3999) and specifies route 523 whenever a 4-digit sequence falls within this range. Route numbers 522 and 523 are examples only. The choice of route numbers is made by the person who configures the dial plans for the sites.

Two *DestinationRoute Create* commands create routes 522 and 523. The Description field contains any text you want to use to describe each route.

Two *DestinationRouteEntry Create* commands specify the extension list for routes 522 and 523. Extension list *0006 is reserved for VTLs.

Two *DestinationRouteOperation Create* commands prepend the IP Address of the destination NBX system to the extension that the user dialed. In this example, the IP address for Atlanta is 192.169.25.100 and for Dallas, the IP address is 192.168.35.100. You must use the asterisk (*) character to separate fields within the IP address and to separate the IP address from the destination extension.

Example: Dial Plan with Site Codes

In Figure 11, each of the three sites uses the same extension range. In the Internal table in the Chicago system dial plan, the entries shown in Figure 13 select route 522 and 523 if a user dials the site codes 62 and 63 respectively, and then dials an extension. The dial plans for the Atlanta and Dallas NBX systems would contain similar, but not identical entries.

An explanation of each line in the dial plan follows Figure 13.

Figure 13 Sample Dial Plan Entries for Chicago Using Site Codes

```

Table Create 1 Internal 4 Digit Extensions
/
      Id Entry   Digits     Min Max Class          Prio Route
/
      -- ----- - - - - - - - - - - - - - - - - - - - - - - - - - -
TableEntry Create  1    100   62           6   6   WAN          0    522
TableEntry Create  1    101   63           6   6   WAN          0    523

/
      Route Description
/
      ----- -----
DestinationRoute Create  522 Atlanta VTL Connection
DestinationRoute Create  523 Dallas VTL Connection

/
      Route Entry DestinationExtension
/
      ----- -----
DestinationRouteEntry Create  522      1 *0006
DestinationRouteEntry Create  523      1 *0006

/
      Route Entry OperId Operation  Value
/
      ----- -----
DestinationRouteOperation Create  522      1      1 stripLead  2
DestinationRouteOperation Create  522      1      2 prepend    192*168*25*100*

```

The first *TableEntry Create* command creates entry 100 in Table 1. This assumes that the highest previous entry in Table 1 was 99 or lower. Entry 100 watches for the 2-digit sequence 62 followed by a 4-digit extension and specifies route 522 whenever a user dials such a 6-digit (Min = 6 and Max = 6) sequence. Entry 101 watches for the 2-digit sequence 63 followed by a 4-digit extension and specifies route 523 whenever a user dials such a 6-digit sequence. The choice of route numbers is made by the person configuring the dial plans for the sites.

Two *DestinationRoute Create* commands create routes 522 and 523. The Description field contains any text you want to use to describe each route.

Two *DestinationRouteEntry Create* commands specify the extension list for routes 522 and 523. Extension list *0006 is the default extension list for VTLs.

For each DestinationRoute, two *DestinationRouteOperation Create* commands perform two functions:

- The *stripLead* command removes the two digits (62 or 63) leaving the 4-digit extension the user dialed.
- The *prepend* command adds the IP Address of the destination NBX system to the extension that the user dialed. In this example, the IP address for Atlanta is 192.169.25.100 and for Dallas, the IP address is 192.168.35.100. In the dial plan, you must use an asterisk (*) instead of a period (.) to separate the fields within the IP address, and to separate the IP address from the destination extension.

Updating the Extension List The final step in activating the virtual tie lines is to add the VTL extensions to the appropriate extension list (*0006).

To update the extension list:

- 1 In the *NBX NetSet - Main Menu* window, click *Dial Plan*.
- 2 Click the *Extension Lists* tab.
- 3 Select the *Virtual Tie Lines* extension list (*0006).
- 4 Click *Modify*.
- 5 In *Extensions not in List*, scroll down until you see the first VTL item.
The number of VTL items depends on the VTL license you have.
Each VTL item has (*VTL*) at the beginning of the line, followed by the name of the virtual tie line.
Table 19 describes the VTL extension ranges.
- 6 Select the first VTL, and click << to move the VTL to *Extensions in List*.
- 7 Repeat until all VTLs are moved to *Extensions in List*.

Table 19 Virtual Tie Line Extension Ranges

Platform	Extension Range
V3000 4-digit dial plan	6500–6523
V3000 3-digit dial plan	The default dial plan for a NBX V3000 system is 4-digit. If you convert to a 3-digit dial plan, you must manually change each 4-digit extension to a 3-digit extension. For VTLs, you can select any unused 3-digit extension from the external extension range (600–799).

Adding VTL Devices to the Pretranslators (Optional)

If you optionally added a pretranslator to the dial plan to reformat the information on incoming calls, you *must* add the VTL devices to that pretranslator. You might need to add a pretranslator to the dial plan to handle caller ID issues. See “Creating a Pretranslator for VTL Calls” on page 65.

To add the VTL devices to the pretranslator:

- 1** In the *NBX NetSet - Main Menu* window, click *Dial Plan*.
- 2** Click the *PreTranslators* tab.
- 3** In the scroll list, select *VTL*.
- 4** Click the *Devices Using* button.
- 5** In the *Devices Using Pretranslator* window, scroll down in the *Devices Not Using Pretranslator* list until you see the devices associated with VTLs. For a 4-digit dial plan, the VTL device extensions range from 6500 through 6523. For a 3-digit dial plan, VTL device extensions range from 623 through 630.
- 6** Select the first VTL device extension.
- 7** Scroll until you can see all of the VTL device extensions.
- 8** Simultaneously press the Shift key and click the last VTL device extension to select the entire block of VTL device extensions.
- 9** To move all VTL device extensions to the *Devices Using Pretranslator* list, click <<.

Verification of the Virtual Tie Line

After you have configured the VTLs on each of two NBX systems, you must verify that the VTL connection works properly.

To verify that a working VTL connection exists between two systems, you must verify that:

- Local System Verification — Verify that the configured VTLs appear on each system.
- Remote Access Verification — Verify that each of the systems can access each other.
- Placing Telephone Calls — Verify that telephone calls can be made between all pairs of connected systems in both directions.

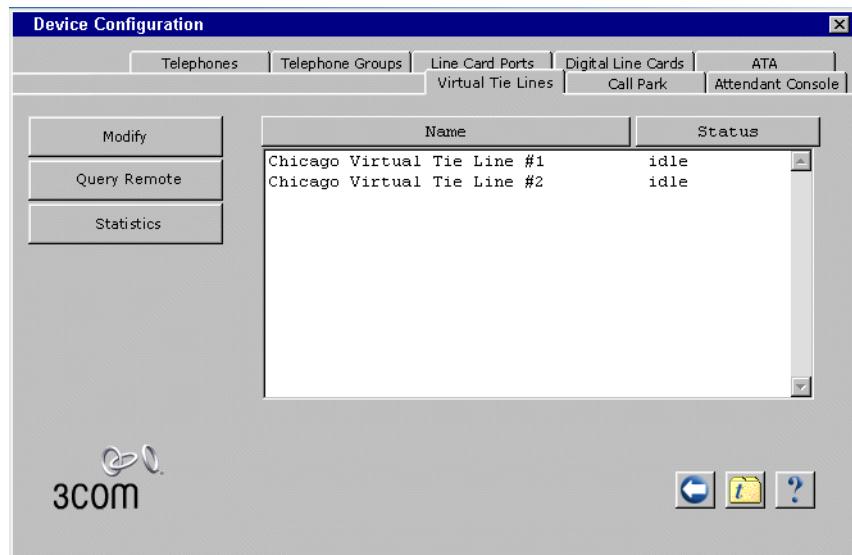
Local System Verification

On each system you must verify that you can view the VTLs using the NBX NetSet utility. To verify that you can view the local VTLs:

- 1 In the *NBX NetSet - Main Menu* window, click *Device Configuration*.
- 2 Click the *Virtual Tie Lines* tab.
- 3 Verify that all of VTLs you have configured appear in the list.

In our example, if you perform this verification test on the Chicago NBX system, the results appear as shown in Figure 14.

Figure 14 Example: Virtual Tie Lines Tab



Remote Access Verification

To verify that each system can access the other, on each system:

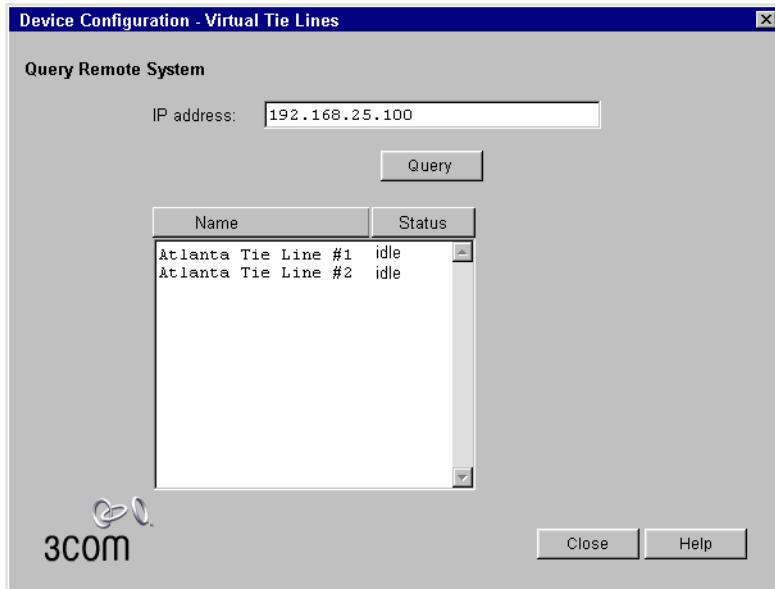
- 1 On the *Virtual Tie Lines* tab, select the VTL and then click the *Query Remote* button.
- 2 In the *Query Remote System* window, type the IP address of the remote system in the *IP address* text box. Click the *Query* button. If the verification is successful, the window displays the VTLs configured at the remote site.

Example: Suppose you have installed an NBX system in Chicago, Atlanta, and Dallas, and you have configured two VTL connections on each of the Chicago and Atlanta systems. Also, the IP addresses of the three systems are:

- Chicago — 192.168.15.100
- Atlanta — 192.168.25.100
- Dallas — 192.168.35.100

If you perform the Query Remote operation from the Chicago system to the Atlanta system, the results might look like Figure 15.

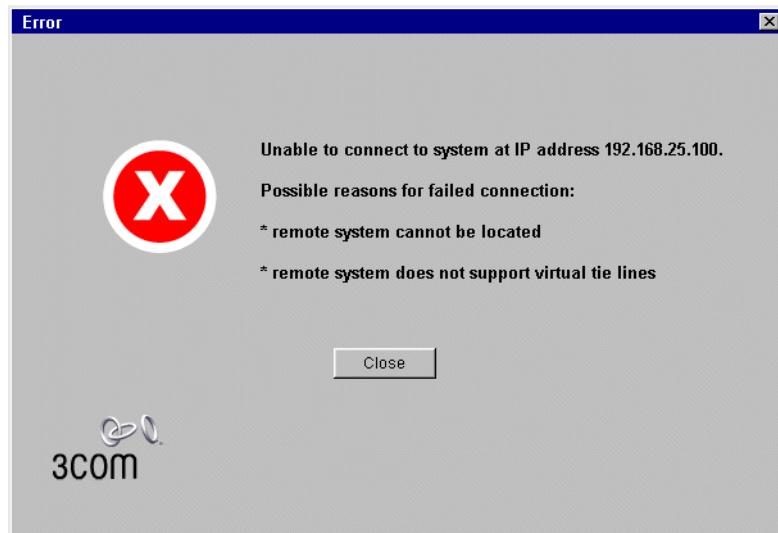
Figure 15 Query Remote Window (Example)



The Atlanta system (IP address 192.168.25.100) shows two installed but idle VTL connections. If you performed the Query Remote test from the Atlanta office and specified the IP address of the Chicago system, it should show two installed but idle VTL connections.

If the local NBX system fails to access the remote system, an error message appears similar to the one shown in Figure 16.

Figure 16 Query Remote Error Message



If you have not yet configured the remote system to support VTLs, this message indicates that you must do so before the Query Remote operation can succeed.

If you have configured the remote system to support VTLs, the error message indicates that the local NBX system cannot access the remote system using the IP address you specified. To remedy the problem:

- 1 Verify that you specified the correct IP address for the remote system.
- 2 Verify that the remote NBX system is running properly.
- 3 Verify that the remote NBX system is using the dial plan which you modified to configure VTLs on that system.
- 4 Work with your network administrator to verify that WAN connection between the two sites is properly configured and is working.
- 5 Verify that the VTL extensions are included in the *Devices Using Pretranslator* table.

Placing Telephone Calls

The final step when verifying a virtual tie line connection is to place telephone calls in both directions between each pair of connected sites.

Call Rerouting for Virtual Tie Lines

To enable the NBX system to better deal with network problems, you can configure the system dial plan so that some virtual tie line (VTL) calls can be rerouted if a VTL connection cannot be made.

VTL calls can be rerouted if:

- The dial plan contains an invalid IP address
- The remote NBX system is not responding
- All VTL channels on the remote NBX system are currently busy
- All IP addresses in the IP On-the-Fly address pool are in use

Some VTL calls are not rerouted. Example situations in which a call is not rerouted include:

- Placing a VTL call to another system with the intention of hopping off (dialing a telephone number local to the other system) when all trunks are busy on the other system
- Dialing an invalid telephone number

If you normally connect calls from site A to site B using VTL connections, you can define an alternate route to site B using Analog Line Card ports, Digital Line Card channels, etc. If a network problem such as a router failure occurs, or if all VTL ports on the site A NBX system are busy, VTL calls that fail to reach site B are then dialed using the alternate route.

If your VTL call is rerouted, you see additional routing information in the display panel on your NBX telephone.

The NBX system log file contains records of failed VTL calls that were rerouted.

Example Dial Plan Entries

If you normally dial a site code such as 72 to reach site B, and if the telephones at the other site use four-digit extensions, the dial plan entries to handle the initial call and the rerouting of the call might look like the example shown in Figure 17.

Figure 17 Sample Dial Plan Entries for Rerouting VTL Calls

```

Table Create 1 Internal 4 Digit Extensions
/
      Id Entry   Digits      Min Max Class          Prio Route
/
      ----- ----- ----- ----- -----
TableEntry Create  1     8 72           6   6 WAN            0     6

/
      Routes
/
      Route Description
/
      ----- -----
DestinationRoute Create    6 Site B

/
      Route Entry DestinationExtension
/
      ----- -----
DestinationRouteEntry Create  6     1 *0006
DestinationRouteEntry Create  6     2 *0001

/
      Route Entry OperId Operation  Value
/
      ----- ----- ----- -----
DestinationRouteOperation Create  6     1 stripLead  2
DestinationRouteOperation Create  6     1 prepend    192*168*155*100*
DestinationRouteOperation Create  6     2 stripLead  2
DestinationRouteOperation Create  6     2 prepend    1978247

```

Explanation:

The TableEntry Create command specifies that when a user on the local NBX system dials a six-digit number beginning with the digits 72, the call is routed via route 6, which is the route that normally contains only the VTL extension list (*0006).

To allow VTL calls to be rerouted, route 6 is configured to use both the VTL extension list and the Line Cards extension list (*0001). Calls that use route 6 can be completed using devices in either of these extension lists.

There are four DestinationRouteOperation lines. The first two lines specify the primary way to handle the call, using VTL methods. The last two lines specify the backup way to handle the call if the first method fails.

Successful VTL Call

If there are no network problems:

- 1** The first line (Entry 1, OperId 1) removes the digits 72.
- 2** The second line (Entry 1, OperId 2) prepends the IP address of the NBX system at site B in front of the dialed extension number.

Unsuccessful VTL Call

If a network problem or a lack of VTL ports prevents the VTL call from reaching its destination:

- 1** The third line (Entry 2, OperId 1) removes the digits 72.
- 2** The fourth line (Entry 2, OperId 2) prepends an appropriate dial string and dials out over an analog telephone line.

Managing Existing Virtual Tie Lines

After VTLs are installed and you have verified that they are working properly, you can manage them using the NBX NetSet utility. There are NBX NetSet utility functions for:

- Modifying a Virtual Tie Line Name
- Viewing and Resetting Virtual Tie Line Statistics
- Enabling Audio Compression for VTL Calls
- Enabling Silence Suppression on VTL Calls

Modifying a Virtual Tie Line Name

You can change the name of a VTL. The name appears in NBX NetSet lists, and helps you identify each VTL.

To modify the name of a VTL:

- 1** In the *NBX NetSet - Main Menu* window, click Device Configuration.
- 2** Click the *Virtual Tie Lines* tab. The window that appears contains the list of existing VTLs, and the status of each one.
- 3** Select a VTL from the list.
- 4** Click *Modify*. The Modify dialog box appears.
- 5** In the *New VTL name* text box, type the name you want to assign to this VTL. Click *OK*. Verify that the name change is on the Virtual Tie Lines tab.

**Viewing and
Resetting Virtual Tie
Line Statistics**

You can view the statistics for a VTL at any time.

To view statistics for a VTL:

- 1 In the *NBX NetSet - Main Menu* window, click *Device Configuration*.
- 2 Click the *Virtual Tie Lines* tab.
- 3 From the list, select the VTL.
- 4 Click the *Statistics* button. The Statistics dialog box appears. The fields are described in Table 20.
- 5 To reset all VTL statistics, click *Reset*.



Another way to reset all VTL statistics is to restart the NBX system.

- 6 When you are finished, click *Close*.

Table 20 Virtual Tie Line Statistics Fields

Field	Description
NOTE: All statistics apply to the time period since the most recent Reset command or since the most recent system reboot, whichever was more recent. To determine the starting time for the displayed statistics, compare the <i>Last reset command</i> with the time of the <i>Last system reboot</i> . Both are displayed at the bottom of the VTL Statistics window.	
Number of outgoing VTL calls made	The number of outgoing calls made over all virtual tie lines (VTLs) since the most recent reset command or since the time the NBX system was last restarted. Each time you restart the NBX system, you reset the statistics for all VTLs.
Number of incoming VTL calls received	The number of incoming calls received over all VTLs since the most recent reset command or since the time the NBX system was last restarted.
Number of active VTL calls	The number of calls currently active on all VTLs.
Maximum number of concurrently active VTL calls	The maximum number of VTL calls that have been active at the same time on this NBX system since the most recent reset command or since the time the NBX system was last restarted.
Incoming VTL calls rejected due to all VTLs busy	The number of telephone calls that would have arrived from other NBX systems over VTL channels, but could not be accepted because all local VTL ports were busy when the calls arrived.
Outgoing VTL calls rejected due to all VTLs busy	The number of telephone calls that would have been sent from the local NBX system over VTL channels, but could not be sent because all local VTL ports were busy when the calls were made.

Table 20 Virtual Tie Line Statistics Fields (continued)

Field	Description
Rerouted VTL calls	The number of calls that did not reach their destination when attempted over VTL channels, and were rerouted using another device.
Last reset command	The date and time of the most recent <i>Reset</i> for this VTL.
Last system reboot	The date and time of the most recent reboot of the NBX system.

Enabling Audio Compression for VTL Calls

You can set audio compression for VTL calls. The default condition is no audio compression because compression can compromise audio quality. For more information on how compression affects bandwidth, see “Audio Settings” on page 238.

During VTL call setup, the VTL software at each end of the call negotiates a compression level that is supported by both systems. For example, System A is configured for G729, high compression, and System B is configured for G711, no compression. A VTL call between System A and System B will use G711, no compression. It does not matter which system initiates the call.

To enable VTL audio compression:

- 1 In the *NBX NetSet - Main Menu* window, click *System Configuration*.
- 2 On the *System Settings* tab click *Audio Settings*.
- 3 Click the *Audio Compression on VTL Calls* check box and then click *OK*.

Enabling Silence Suppression on VTL Calls

You can enable silence suppression for VTL calls. The default condition is disabled because silence suppression can compromise audio quality. For more information on how compression affects bandwidth, see “Audio Settings” on page 238.

When you enable VTL silence suppression, the VTL software attempts to use silence suppression on all VTL calls. If the other NBX system is not configured to support silence suppression, the local VTL software attempts to find a compatible communications mode.



Do not enable silence suppression unless you have network congestion problems you cannot solve otherwise. Enabling silence suppression can reduce network traffic, but the result is a compromise to audio quality.

To enable silence suppression on VTLs:

- 1 In the *NBX NetSet - Main Menu* window, click *System Configuration*.
- 2 On the *System Settings* tab click *Audio Settings*.
- 3 Click the *System-wide Silence Suppression on VTL Calls* check box, and then click *OK*.

Using a VTL Password

To allow users on one NBX system to place VTL calls to another NBX system and then place long-distance (toll) calls from that location (a practice called 'hop off'), you can configure a VTL password.

When an NBX system receives a VTL call from a user on another NBX system, it can allow that user to make long-distance calls if the incoming VTL call contains the password. Otherwise, such calls are not allowed. If you set up two classes of VTL calls (with and without passwords), you can permit or disallow hop off.

To enable an NBX system to handle incoming hop off calls, create or modify a VTL password, as described in the next topic, Configuring a VTL Password.

To enable an NBX system to send hop off VTL calls, configure the dial plan to include the VTL password, as described in Configuring VTL Passwords in the Dial Plan on page 99.

Configuring a VTL Password

For each NBX system that can receive VTL calls, you use the NBX NetSet utility to configure a local system VTL password.

To configure the password:

- 1 In the *NBX NetSet - Main Menu* window, click *System Configuration*.
- 2 Click the *Security* tab.
- 3 Click the *Virtual Tie Lines Password* button. The *Change Virtual Tie Lines Password* dialog box appears.
- 4 Type the administrator password in the *Current Admin Password* text box.
- 5 Type the new VTL password in the *New Virtual Tie Line Password* text box.



Passwords are from 8 to 15 characters in length and must contain only letters and numbers. Upper and lower case letters are permitted.

- 6 Retype the new VTL password in the *Re-enter New Password* text box.
- 7 Click *OK*.

Configuring VTL Passwords in the Dial Plan

For each remote NBX system that controls hop-off by means of a VTL password, you must configure that password into the VTL commands in the local dial plan.

If you use site codes to access other NBX systems through VTL connections, you can configure one set of VTL connections that permit hop-off and are accessed by one set of site codes. You can configure another set of VTL connections that do not permit hop-off and are accessed using a different set of site codes.

If you use unique extension ranges at each site, and therefore do not dial a site code when placing VTL calls to users at those sites, you can still use codes to access VTL connections that permit hop-off at the far end.

Figure 18 shows how to configure VTL passwords in a dial plan, using site codes that permit hop-off and other site codes that do not.

Figure 18 Dial Plan Entries for VTL Passwords

```

Table Create 1 Internal 4 Digit Extensions
/
  Id Entry  Digits      Min Max Class          Prio Route
/
  -----  -----
TableEntry Create  1   100  62           6   6   WAN          0   522
TableEntry Create  1   101  63           6   6   WAN          0   523
TableEntry Create  1   102  72           6   32  WAN          0   524
TableEntry Create  1   103  73           6   32  WAN          0   525

/
  Route Description
/
  -----
DestinationRoute Create  522 Atlanta VTL Connection
DestinationRoute Create  523 Dallas VTL Connection
DestinationRoute Create  524 Atlanta VTL Connection with password
DestinationRoute Create  525 Dallas VTL Connection with password

/
  Route Entry DestinationExtension
/
  -----
DestinationRouteEntry Create  522     1 *0006
DestinationRouteEntry Create  523     1 *0006
DestinationRouteEntry Create  524     1 *0006
DestinationRouteEntry Create  525     1 *0006

/
  Route Entry OperId Operation  Value
/
  -----
DestinationRouteOperation Create  522     1     1 stripLead 2
DestinationRouteOperation Create  522     1     2 prepend   192*168*25*100*
DestinationRouteOperation Create  523     1     1 stripLead 2
DestinationRouteOperation Create  523     1     2 prepend   192*168*35*100*

```

The first *TableEntry Create* command creates entry 100 in Table 1. This assumes that the highest previous entry in Table 1 was 99 or lower. Entry 100 watches for the 2-digit sequence 62 followed by a 4-digit extension and specifies route 522 whenever a user dials such a 6-digit (Min = 6 and Max = 6) sequence. Entry 101 watches for the 2-digit sequence 63 followed by a 4-digit extension and specifies route 523 whenever a user dials such a 6-digit sequence. The choice of route numbers is made by the person configuring the dial plans for the sites.

The next two *TableEntry Create* commands are set up in a similar manner to handle VTL connections with passwords. If a user dials 72 followed by a 4-digit extension, the VTL call uses route 524. If a user dials 73 followed by a 4-digit extension, the VTL call uses route 525. These two commands specify a minimum of 6 digits (for example, if the caller is calling an internal extension preceded by the site code) and a maximum of 32 digits (for example if the caller is calling a long-distance or international number preceded by the site code).

The first two *DestinationRoute Create* commands create routes 522 and 523. The Description field contains text that describes each route.

The second two *DestinationRoute Create* commands create routes 524 and 525, the routes that are used with a VTL password.

The four *DestinationRouteEntry Create* commands specify the extension list for routes 522, 523, 524, and 525. Extension list *0006 is the default extension list for VTLs.

For the first two DestinationRoutes, two *DestinationRouteOperation Create* commands perform two functions:

- The *stripLead* command removes the two digits (62 or 63) leaving the 4-digit extension the user dialed.
- The *prepend* command adds the IP Address of the destination NBX system to the extension that the user dialed. In Figure 18, the IP address for Atlanta is 192.169.25.100; for Dallas, 192.168.35.100. In the dial plan, you must use an asterisk (*) instead of a period (.) to separate the fields within the IP address, and to separate the IP address from the destination extension.

For the second two DestinationRoutes, two *DestinationRouteOperation Create* commands perform two similar functions.

- The *stripLead* command removes the two digits (72 or 73) leaving the 4-digit extension the user dialed.
- The *prepend* command adds the IP address and system password of the destination NBX system to the extension dialed by a user. In Figure 18, the IP address for Atlanta is 192.169.25.100 and the password is ATLPassW. For Dallas, the IP address is 192.168.35.100 and the password is DALPWord. In the dial plan, you use an asterisk (*) instead of a period (.) to separate fields within the IP address and to separate the IP address from the destination extension.

To place a hop-off call to 555-1212 in area code 903 through the Atlanta system, a user on a remote system would dial 72919035551212. The 72 code sets up a VTL connection to Atlanta that includes the Atlanta system's VTL password, and the remaining digits are used to dial the number (9 accesses an outside line to obtain dial tone from the local carrier, 1 accesses the long-distance carrier, and the remaining digits specify the long-distance number).

If the same user used site code 62 to place a call to the Atlanta office, only toll-free, emergency, and internal call would be allowed.

Toll Calls Without a VTL Password	If a local user has configured his telephone to forward calls to a long-distance number, then an incoming VTL call to that telephone does not need to supply the local system's VTL password in order for the call to be forwarded.
Music On Hold	If two users are talking on a VTL connection, and the first user places the call on hold, the second user hears Music On Hold only if his local system is configured to play it.
Troubleshooting VTL Calls	Table 21 contains a list of error situations, the possible causes and the action to take in each case.

Table 21 VTL Errors and Corrections

Error Condition	Possible Causes	Actions
Long pause after dialing. Telephone display contains "VTL" during the pause. Busy signal is then heard.	Remote server does not respond	Test the connection to the remote system using the Query Remote function.
After you finish dialing a VTL call, you get a busy signal and the message "All ports busy" appears in the telephone display panel.	1. No VTL license installed. 2. VTL device extensions not added to Extension List *0006. 3. All local VTL connections are currently in use. 4. All VTL connections at the remote site are currently in use.	1. Verify that the licenses appear when you access the tab. 2. Verify that the *0006 extension contains the VTL device extensions. 3. On the Virtual Tie Line tab, verify that there is at least one idle VTL connection. 4. Use the Query Remote function to verify that there is at least one idle VTL connection.

Table 21 VTL Errors and Corrections (continued)

Error Condition	Possible Causes	Actions
After you finish dialing a VTL call, you get a busy signal and the message "Invalid Number" appears in the telephone display panel.	1. Local dial plan is not properly configured. 2. Dial plan on the remote (target) system is not properly configured. 3. You are trying to use hop-off without the necessary password.	1. Examine the local dial plan for errors. 2. Examine the dial plan on the remote system for errors. 3. Verify that the password for the remote system is used in both dial plans.
No audio	1. Telephones are not configured to use either IP On-the-Fly or Standard IP. 2. VTL Audio compression is supported on only one of the two NBX systems. 3. 3C10165D E1 and 3C10116D T1 Digital Line Cards do not have static IP addresses.	1. Verify that the IP setting in the System Settings, System-wide dialog box is "IP On-the-Fly" or "Standard IP." Change the setting, if necessary. 2. Verify that audio compression is enabled on both systems. 3. If your NBX system is set up for IP-On-the-Fly, verify that 3C10165D E1 and 3C10116D T1 Digital Line Cards have a static P address. These cards cannot receive an IP On-the-Fly address.
Caller ID information does not appear correctly in the telephone display panel.	1. Invalid local pretranslator. 2. VTL extensions are not in the VTL pretranslator "Devices Using" table.	1. Examine the local dial plan for pretranslator errors. 2. Verify that VTL extensions appear in the left-hand table for the pretranslator.

Dial Plan Configuration File Commands

This section provides the syntax and description of each command used to create the information in the dial plan configuration file. In addition, Table 22 categorizes and summarizes all the dial plan commands. See also "Dial Plan Command Format" on page 34.

The Alphabetical List of Dial Plan Commands provides a detailed description and syntax of each command. See "Dial Plan Command Summary", next, for a description of each component of dial plan commands.

To see how these commands are implemented in a dial plan, see “Sample Solutions Using Dial Plan Configuration File Commands” on page 118. You can also open and examine any of the dial plans shipped with your NBX system.

Dial Plan Command Summary

Table 22 provides a brief summary the dial plan commands. These commands are listed and categorized in the order that they might logically appear in a working dial plan.

See “List of Dial Plan Commands” on page 105 for a complete list and description of each dial plan command, including syntax and arguments.

Command syntax is case insensitive. In the sample dial plans (supplied with the system), and in this section, commands use upper and lower case to make them easier to read.

An entry that begins with “*n*” for example, *nDialPlanID*, indicates an integer field. Integer IDs are used in many places, and must be within the range 1 through 32768. The system reserves dial plan table ID numbers 1, 2, and 3 for Internal, Incoming, and Least Cost Routing, respectively.

An entry that begins with “*sz*” (for example, *szDescription*) indicates a field composed of alphanumeric characters. Acceptable characters are a through z, A through Z, and 0 through 9.

Each line in the configuration file must contain a complete command. The NBX system reads all lines in the configuration file, and ignores only those lines containing one or more syntax errors. The system treats any line beginning with / (forward slash) as a comment and ignores it.



CAUTION: Do not place comments at the end of a command line.

Table 22 Dial Plan Command Summary

Command Name	Description
Table Create	Creates a dial plan table.
TableEntry Create	Creates an entry in a dial plan table.
DestinationRoute Create	Creates a route that specifies the primary and alternative destination device of a call.
DestinationRouteEntry Create	Creates a destination route entry that identifies a single destination device or device list.

Table 22 Dial Plan Command Summary (continued)

Command Name	Description
DestinationRouteOperation Create	Creates a digit manipulation operation for a destination route entry.
TimedRoute Create	Creates a timed route (a route that the system uses based on defined criteria for time of day and day of week).
TimedRouteEntry Create	Creates a timed route entry specifying either a time of day or system mode, day of the week criteria, and the destination route to use if that criteria are met.
TimedRouteOperation Create	Creates a digit manipulation operation for a timed route entry.
PreTranslator Create	Creates a pretranslator entry and specifies a string of digits that are compared to the incoming digits.
PreTranslatorEntry Create	Creates a pretranslator entry and specifies a string of digits that are compared to the incoming digits.
PreTranslatorEntry Delete	Deletes a pretranslator entry or deletes all entries for a particular pretranslator.
PreTranslatorOperation Create	Creates a digit manipulation operation for a pretranslator entry.
ExtensionLength	Specifies the length of extension numbers for system devices.
ExtensionRange	Specifies a range of extensions for each type of device.
ExternalSettings	Specifies settings for several aspects of external devices.

List of Dial Plan Commands

The dial plan commands are described in this section. They are listed in alphabetical order:

- DestinationRoute Create
- DestinationRouteEntry Create
- DestinationRouteOperation Create
- ExtensionLength
- ExtensionRange
- ExternalSettings
- PreTranslator Create

- PreTranslatorEntry Create
- PreTranslatorEntry Delete
- PreTranslatorOperation Create
- Table Create
- TableEntry Create
- TimedRoute Create
- TimedRouteEntry Create
- TimedRouteOperation Create

*DestinationRoute Create***Syntax**

```
DestinationRoute Create nRouteId szDescription
```

Description Creates a route that specifies the primary and alternative destination device of a call (for example, which CO Line or Digital Line Card port over which to route the call). If the destination route already exists, this command removes all of its entries and operations, and overwrites its description with the new information.

Arguments

nRouteId — An integer in the range 1 – 32768, uniquely identifying this destination route.

szDescription — The description or name of the destination route.

Example: This example creates destination route 3 and names it "Voice Application": `DestinationRoute Create 3 Voice Application`

*DestinationRouteEntry**Create***Syntax**

```
DestinationRouteEntry Create nRouteId nEntryId szExtension
```

Description creates a destination route entry that identifies a single destination device or device list.

If the specified destination route entry already exists, this command overwrites it with the new information. During routing, the system checks the list of destinations in ascending *nEntryId* order (*nEntryId* 1 first).

Arguments

nRouteId — An integer in the range 1 through 32768.

nEntryId — An integer in the range 1 through 32768. The system checks the list of destinations in ascending *nEntryId* order, and uses the first available one.

szExtension — The extension of the destination device or device list. Note that the system does not dial this extension (that is, it neither checks the extension against a dial plan nor subjects it to Class of Service restrictions, digit manipulation, or routing) but instead uses the extension only to look up the device in the internal device directory.

Example: This example command creates, in route table 3, entry 1 and defines extension list *0003 as the destination for this route entry. Extension list *0003 contains the voice mail extensions/ports.

```
DestinationRouteEntry Create 3 1 *0003
```

DestinationRouteOperation on Create

Syntax

```
DestinationRouteOperation Create nRouteId nEntryId nOperId  
szOperation szValue
```

Description Creates a digit manipulation operation for a destination route entry. If the specified digit manipulation operation already exists, this command overwrites it with the new information. During routing the system processes the entire list of operations in ascending *nOperId* order (*nOperId* 1 first).

Arguments

RouteId — An integer in the range 1 through 32768.

nEntryId — An integer in the range 1 through 32768 specifying the destination route entry to which this operation applies.

nOperId — An integer in the range 1 through 32768. The system processes the list of operations in ascending *nOperId* order.

szOperation — The name of the digit manipulation operation to perform: stripLead, stripTrail, replace, prepend, append.

szValue — A value used by the operation, either the string of digits to prepend, append, replace with, or the number of digits to strip.

Example: This example command creates, for destination route 3, entry 1, an operation numbered 1, with the associated function

`stripLead`, and an argument of 1, indicating that the command removes (strips) one leading digit from the dialed number before dialing.

```
DestinationRouteOperation Create 3 1 1 stripLead 1
```

ExtensionLength

Syntax

```
ExtensionLength nExtensionLength
```

Description The length of extension numbers for system devices. The default is 4 for NBX V3000 systems.

Arguments

nExtensionLength — specifies either 3 to designate a 3-digit dial plan, or 4 to designate a 4-digit dial plan.

ExtensionRange

Syntax

```
ExtensionRange szExtensionType szLowestExtension szHighestExtension
```

Description A range of extensions for each type of device. When the system automatically generates extensions it assigns them from within this range. When you manually generate an extension number, verify that it is within the valid range. During a dial plan import operation, the system does not validate that existing extensions are within the specified range. 3Com strongly recommends that you configure the dial plan before you define any devices in the system.

Arguments

szExtensionType — One of these: Telephone, Park, Auto Attendant, Hunt Group, External.

szLowestExtension — The lowest desired extension for this device type.

szHighestExtension — The highest desired extension for this device type.

Example: These commands define the extension range for telephones as 100 through 449, for call park as 601 through 609, for Auto Attendants as 500 through 599, for hunt groups as 450 through 499, and for external lines as 600 through 799.

```
ExtensionRange Telephone 100 449
ExtensionRange Park 601 609
ExtensionRange Autoattendant 500 599
ExtensionRange HuntGroup 450 499
```

```
ExtensionRange External 600 799
```



CAUTION: Do not define extension ranges that overlap. The only exception is Park, which must be within the External range.

ExternalSettings

Syntax

```
ExternalSettings szExternalKeysetPrefix  
szFirstAutoDiscoverExtension szDefaultAutoExtension
```

Description Specifies settings for several aspects of external devices.

Arguments

szExternalKeysetPrefix — The digits that are prepended to external calls made in Keyset mode. This is used to determine the Class of Service (CoS) for external calls made in Keyset mode. Typical values for this digit are 8, 9, or 0 (zero). This prefix is set to the appropriate number in each country's dial plan.

Example: In the default internal dial plan table, the digit 9 instructs the system to connect the call to an external line. When a telephone has a button mapped to an external device, and the user places a call using that external device, the system prepends the *szExternalKeysetPrefix* digit to the digits dialed by a user; then the system applies the dial plan tables to determine call Class of Service.

szFirstAutoDiscoverExtension — The first extension used when autodiscovering external devices. This must be in the specified range of lowest/highest external extensions.

The system assigns extensions starting with this number and incrementing upward. For information on the Auto Discovery topic, see “Using Auto Discovery for Initial System Configuration” in the *NBX Installation Guide*.

The default value for a 3-digit system is 750, and for a 4-digit system is 7250. Typically, systems do not use all of the extensions from 600 through 799 (or 6000 through 7999). If, however, the system uses all of these extensions and needs another one, it starts looking from the beginning of the range and selects the first unused one.

szDefaultAutoExtension — The default extension the system uses for forwarding incoming calls. This is always 500.

The system must direct each incoming call (on an external line) to an extension. After you import the dial plan configuration file, and complete the Auto Discovery process, you can manually configure the extension for each analog line and each Digital Line Card channel, if you want.

PreTranslator Create

Syntax

```
PreTranslator Create nPreTranslatorId szDescription
```

Description Creates a pretranslator. If the pretranslator already exists, this command removes all of its entries and operations, and overwrites its description with the new information.

Arguments

nPreTranslatorId — An integer in the range 1 through 32768.

szDescription — The description or name of the pretranslator.

Example: This command creates a pretranslator, designates it as the first one (number 1) and give it the title "4-to-3-digit DID/DDI pretranslator."

```
PreTranslator Create 1 4-to-3-digit DID/DDI pretranslator
```

PreTranslatorEntry Create

Syntax

```
PreTranslatorEntry Create nPreTranslatorId nEntryId szDigits
```

Description Creates a pretranslator entry and specifies a string of digits that are compared to the incoming digits. If the pretranslator entry already exists, this command overwrites it with the new information.

Arguments

nPreTranslatorId — An integer in the range 1 through 32768.

nEntryId — An integer in the range 1 through 32768.

szDigits — The digits to compare to the incoming digits.

Example: These example commands create, in pretranslator 1, entries 1 through 10, each of which looks for a different single digit (0 through 9) in the incoming digits.

```
PreTranslatorEntry Create 1 1 0
PreTranslatorEntry Create 1 2 1
PreTranslatorEntry Create 1 3 2
PreTranslatorEntry Create 1 4 3
```

```
PreTranslatorEntry Create 1 5 4
PreTranslatorEntry Create 1 6 5
PreTranslatorEntry Create 1 7 6
PreTranslatorEntry Create 1 8 7
PreTranslatorEntry Create 1 9 8
PreTranslatorEntry Create 1 10 9
```

PreTranslatorEntry Delete

Syntax

```
PreTranslatorEntry Delete nPreTranslatorId nEntryId
```

Description Deletes a pretranslator entry or deletes all entries for a particular pretranslator.



Use caution when using this command to delete Pretranslator entries in an existing Dial Plan. In general, it is best to delete all tables, routes, and pretranslators at the beginning of each dial plan configuration file. This precaution avoids the potential conflicts or unpredictable actions caused by importing new dial plan entries on top of an existing dial plan.

For instructions on how to edit the dial plan configuration file to delete existing tables, routes, and pretranslators, see “Creating Dial Plan Configuration Files” on page 44.

Arguments

nPreTranslatorId — An integer in the range 1–32768.

nEntryId — An integer in the range 1–32768 or * for all entries.

Example: This command deletes pretranslator entry 3 from pretranslator 2.

```
PreTranslatorEntry Delete 2 3
```

This command deletes all pretranslator entries from pretranslator 2.

```
PreTranslatorEntry Delete 2 *
```



Normally this command is not necessary. It is better to delete an entire dial plan rather than import a new dial plan over it. To accomplish this, 3Com recommends using specific commands at the top of every dial plan configuration file. For an example of this technique, see “Creating Dial Plan Configuration Files” on page 44.

*PreTranslatorOperation**Create***Syntax**

```
PreTranslatorOperation Create nPreTranslatorId nEntryId
nOperId szOperation szValue
```

Description Creates a digit manipulation operation for a pretranslator entry. If the specified digit manipulation operation already exists, this command overwrites it with the new information. During pretranslation, the system processes the list of operations in ascending *nOperId* order (*nOperId* 1 first).

Arguments

nPreTranslatorId — An integer in the range 1 through 32768.

nEntryId — An integer in the range 1 through 32768 specifying the pretranslator entry to which this operation applies.

nOperId — An integer in the range 1 through 32768. The system processes the list of operations in ascending *nOperId* order (*nOperId* 1 first).

szOperation — The name of the digit manipulation operation to perform. Values are: stripLead, stripTrail, replace, prepend, append.

szValue — The value to use in the operation, either the string of digits to prepend, append, replace with, or the number of digits to strip.

*Table Create***Syntax**

```
Table Create nDialPlanTableId szDescription
```

Description Creates a dial plan table to control the routing of calls placed by devices. Dial plan tables apply to internal devices such as telephones, incoming calls from outside the NBX system, and Least Cost Routes. If the dial plan table already exists, this command removes all entries from the table, and fills the table with the new information.

Arguments

nDialPlanTableId — An integer in the range 1 through 32768. The default dial plan tables use ID numbers 1 through 3:

1 — Internal dial plan table

2 — Incoming dial plan table

3 — Least Cost Routing table

szDescription — The description or name of the dial plan table. the NBX NetSet utility uses this name to refer to the table.

Example: This example command creates dial plan table 1 and names it “Internal 4 Digit Extensions.”

```
Table Create 1 Internal 4 Digit Extensions
```

TableEntry Create

Syntax

```
TableEntry Create nDialPlanTableId nEntryId szDigits  
nMinDigits nMaxDigits szCallClass nPriority nRouteId
```

Description Creates an entry in a dial plan table that specifies a string of digits that are compared to the dialed digits. If the dial plan table entry already exists, this command overwrites it with the new information.

Dial plan table entries make Class of Service and call routing decisions based on the correspondence of dialed digits and table entry digits.

Arguments

nDialPlanTableId — An integer in the range 1 through 32768. The system reserves three ID numbers:

- 1** — Internal dial plan table
- 2** — Incoming dial plan table
- 3** — Least Cost Routing table

nEntryId — An integer in the range 1 through 32768. Each entry must have a unique ID. If two entries have the same ID, the system uses the entry closer to the bottom of the configuration file (the one processed last).

szDigits — A string of dialed digits in a dial plan entry.

nMinDigits — An integer specifying the minimum number of digits to collect.

nMaxDigits — An integer specifying the maximum number of digits to collect.

szCallClass — The call class for this dial plan entry. The call class corresponds to permissions granted to users in their Class of Service. Values are Internal, Local, LongDistance, International, WAN, TollFree,

Emergency, COCode, Wireless, Other, Toll, AlternateLong, Operator, TrunkToTrunk, Diagnostics, and NotAllowed.

nPriority — Not presently used. Always set to zero (0).

nRouteId — An integer specifying the ID of the route to use when this dial plan entry is matched. A route ID of zero (0) indicates that this entry has no defined route; digits are transmitted ed as soon as they are dialed.

Example: This example command creates (in table ID 1) table entry 1, which looks for 3 as the first digit in a 4-digit string (minimum and maximum number of characters are both specified as 4), classifies the call type as “Internal”, assigns the call a priority of zero (the only acceptable priority in this product release). Because the destination is an internal extension, there is no need for a defined route so the route number is zero.

```
TableEntry Create 1 1 3 4 4 Internal 0 0
```

TimedRoute Create

Syntax

```
TimedRoute Create nRouteId nDefaultDestinationRouteId
szDescription
```

Description Creates a timed route (a route that the system uses based on defined criteria for time of day and day of week). If the timed route already exists, this command removes all of its entries and overwrites its description and *defaultDestinationRoute* with the new information.

Arguments

nRouteId — An integer in the range 1 through 32768 which uniquely identifies this timed route.

nDefaultDestinationRouteId — An integer in the range 1 through 32768 identifying the destination route the system must use if none of the entries in this timed route match the current time of day.

szDescription — A description or name of the timed route.

Example: This example command creates timed route 7 which uses destination route 1, defined in the “Routes” section of the system configuration file. The description of route 7 is “Business Hours Long Distance.”

```
TimedRoute Create 7 1 Business Hours Long Distance
```

TimedRouteEntry Create

Syntax

```
TimedRouteEntry Create nRouteId nEntryId szStartTime  
szEndTime szDaysOfWeek nDestinationRouteId
```

Description Creates a timed route entry specifying either a time of day or system mode, day of the week criteria, and the destination route to use if that criteria are met. If the specified timed route entry already exists, this command overwrites it with the new information. During routing, the system checks the list of timed route entries in ascending nEntryId order (*nEntryId* 1 first). The system performs any digit manipulation operations that apply to the specified destination.

Arguments

nRouteId — An integer in the range 1 through 32768.

nEntryId — An integer in the range 1 through 32768. The system checks the list of timed routes in ascending order based on *nEntryId*.

szStartTime — Start time in 24-hour format, for example, 13:30 for 1:30 p.m. You can use either 24:00 or 00:00 to specify midnight. Instead of specifying times, you can enter a system mode name (*open*, *closed*, *lunch*, or *other*). For each system mode, the system knows the start and stop times. If you use one of the system modes, both *szStartTime* and *szEndTime* parameter must be the same.



You define start and end times for system modes through the NBX NetSet utility. Click System Configuration, then the Business Identity tab, and the Business Hours button. Enter the times that you want and click OK.

Example: If you define business hours from 8:00 to 17:00 on Mondays, Wednesdays and Fridays, and from 9:00 to 18:00 Tuesdays and Thursdays, then a timed route entry both *szStartTime* and *szEndTime* set to "open" applies differently on Monday, Wednesday, and Friday than on Tuesday and Thursday.



You set the beginning and ending times for open, lunch, and other using the NBX NetSet utility. Click System Configuration, then the Business Identity tab, and the Business Hours button. The NBX system treats all times not included these three categories as closed.

szEndTime — End time in 24-hour format, for example, "18:30" for 6:30 p.m. You can use either 00:000 or 24:00 to indicate midnight. If you

use a system mode (open, lunch, or other) for *szStartTime*, you must use the same system mode for *szEndTime*.

szDaysOfWeek — A seven character mask in which each character position represents one day of the week, beginning with Sunday as the first character and ending with Saturday as the last character. The NBX system excludes any day if a dot “.” character appears in that day's position. (As a convention, you place the first letter of each day in the appropriate character position to indicate that the day is included, but you can use any letter you want; the presence of a dot “.” in a given position excludes the day of the week and the presence of any other character in that position selects that day.)

You use the *szDaysOfWeek* parameter to specify when this timed route is active. You can specify that the timed route entry apply to all days of the week. If you specify the start and end times for open mode differently on some days of the week than for other days, one timed route entry can operate differently depending on the day.

Example: The system interprets “SMT.T.S” (or “XXX.X.X”) as “all days except Wednesday and Friday.” The “dot” characters in positions four and six exclude the fourth and sixth days of the week (Wednesday and Friday).

nDestinationRouteId — The Id of the destination route to use if this entry's time of day and day of week criteria are met.

Example: This example command creates two entries, one to define the route to use during business hours (open) and the other to define the route when the business is closed.

The first entry is timed route 7, timed route entry 1. The two occurrences of the word “Open” instruct the system to use the start time and end time defined by the “open for business” hours, and the letters “SMTWTFS” indicate that this entry applies to all seven days of the week (Sunday through Saturday).

The number 6 designates destination route 6, defined in the system routes table. Because this entry applies to the “open for business” hours, route 6 could define a least cost route for outgoing long distance calls.

The second entry is timed route 7, timed route entry 2. The two occurrences of the word “Closed” instruct the NBX system to use the

start time and end time defined by the “business closed” hours, and the letters “SMTWTFS” indicate that this entry applies to all seven days of the week (Sunday through Saturday). The number 3 designates destination route 3, defined in the system routes table. Because this route applies to the “business closed” hours, route 3 could connect the incoming call to an Auto Attendant menu that tells the caller that the company is closed and gives instructions on how to leave a message and how to reach someone in an emergency.

```
TimedRouteEntry Create 7 1 Open Open SMTWTFS 6  
TimedRouteEntry Create 7 2 Closed Closed SMTWTFS 3
```

TimedRouteOperation

Create

```
TimedRouteOperation Create nRouteId nEntryId nOperId  
szOperation szValue
```

Description Creates a digit manipulation operation for a timed route entry. If the specified digit manipulation operation already exists, this command overwrites it with the new information. During routing, the system processes the list of operations in ascending *nOperId* order (*nOperId* 1 first).



CAUTION: Timed route operations are performed before Destination Route operations. So if you strip a leading 9 using a TimedRouteOperation Create command verify that you don't mistakenly perform the same action in a DestinationRouteOperation Create command. If you made that error, you would lose the first dialed digit.

Arguments

nRouteId — An integer in the range 1 through 32768.

nEntryId — An integer in the range 1 through 32768 specifying the timed route entry to which this operation applies.

nOperId — An integer in the range 1 through 32768. The system processes the list of operations in ascending *nOperId* order (*nOperId* 1 first).

szOperation — The name of the digit manipulation operation to perform: stripLead, stripTrail, replace, prepend, append.

szValue — The value used by the operation, either the string of digits to prepend, append, replace with, or the number of digits to strip.

Sample Solutions Using Dial Plan Configuration File Commands

This section describes several requirements that a customer might have, and for each one, provides a sample solution. An explanation follows each step in the solution.

For a detailed explanation of each command, see “Dial Plan Configuration File Commands” on page 103.

Customer Requirement 1. Assume that the telephone company passes 4-digit numbers to the NBX system for each incoming telephone call (for example, numbers in the range 5200 through 5300). If the system uses 3-digit extensions in the range 200 through 300, you could define a single pretranslation operation that performed a *stripLead* to remove the first digit. For example, the system could remove the number five from an incoming number such as 5278, and pass the call to extension 278.

To accomplish the pretranslation:

```
PreTranslator Create 1 4-to-3-digit T1 DID/DDI Pretranslator
```

Explanation: Create pretranslator table 1, called “4-to-3-digit T1 DID/DDI Pretranslator.”

```
PreTranslatorEntry Create 1 1 5
```

Explanation: Create, in pretranslator table 1, entry number 1, which applies when the first digit in the sequence is 5.

```
PreTranslatorOperation Create 1 1 1 stripLead 1
```

Explanation: For pretranslator table 1, PreTranslatorEntry 1, create the first PreTranslatorOperation. This performs a *stripLead* operation, removing a single leading digit from the incoming number.

Customer Requirement 2. Assume that the telephone company passes 10-digit numbers to the NBX system for each incoming telephone call (for example, numbers in the range 4567-89-3000 through 4567-89-3500). If the system uses 4-digit extensions in the range 2000 through 2500, you can pass an incoming 10-digit number such as 4567-89-3210 to extension 2210 by using two pretranslation operations. The first operation performs a *stripLead* operation to remove the first 7 digits, leaving 210. The second would perform a *prepend* to add the digit 2 to the front of the number, creating 2210, which matches an extension within the extension range.

These entries in a dial plan configuration file would accomplish the pretranslation:

```
PreTranslator Create 1 10-to-3-digit T1 DID/DDI Pretranslator
```

Explanation: Create pretranslator table 1, called “10-to-3-digit T1 DID/DDI Pretranslator.”

```
PreTranslatorEntry Create 1 1 4567893
```

Explanation: Creates the first entry in pretranslator table 1. This entry looks for sequence of digits 4567893.



This example assumes that all numbers begin with the same 7 digits (4567-89-3) and differ only in the last 3 digits. If this assumption is incorrect, you can add PreTranslatorEntry Create lines to describe all of the possible variations.

```
PreTranslatorOperation Create 1 1 1 stripLead 7
```

```
PreTranslatorOperation Create 1 1 2 prepend 2
```

Explanation: For PreTranslator table 1, PreTranslatorEntry 1, create the first PreTranslatorOperation. This performs a stripLead operation, removing the first seven leading digits from the incoming number.

Then create operation 2, which prepends the digit 2 to the remaining 3-digit number. The resulting 4-digit number matches one of the internal extensions in the system.

Customer Requirement 3. Assume that the telephone company assigns a group of 4-digit DID/DDI numbers from 6000 through 6199; however, you want to use internal telephone extensions from 3000 through 3199. Also, you want the number 6111 to connect the caller to an Auto Attendant line for the customer service group.

Add these lines to the dial plan configuration file:

```
PreTranslator Create 1 6XXX to 3XXX Translator
```

Explanation: Creates PreTranslator 1, and names it “6XXX to 3XXX Translator”

```
PreTranslatorEntry Create 1 1 6111
```

Explanation: Creates the first entry in Pretranslator 1. This entry looks for the specific sequence of digits 6111.

```
PreTranslatorOperation Create 1 1 1 replace 5502
```

Explanation: Creates the first operation associated with PreTranslator 1, PreTranslatorEntry 1. Defines a replace operation that replaces all digits in the incoming sequence (6111) with 5502. In this example, 5502 connects you to the Auto Attendant menu for customer service.

```
PreTranslatorEntry Create 1 2 6
```

Explanation: Creates, the second entry in Pretranslator 1; this entry looks for any incoming digit string beginning with the number 6.

```
PreTranslatorOperation Create 1 2 1 stripLead 1
```

Explanation: Creates the first operation associated with PreTranslator 1, PreTranslatorEntry 2. Defines a stripLead operation that removes (strips) the first (leading) digit from the incoming 4-digit sequence. This removes the 6 from the incoming numbers (6000 through 6199) leaving 3-digit numbers from 000 through 199.

```
PreTranslatorOperation Create 1 1 2 prepend 3
```

Explanation: Creates the second operation associated with PreTranslator 1, PreTranslatorEntry 2. Defines a prepend operation that adds the digit 3 at the beginning of the 3-digit string (created by the previous operation). The incoming numbers from 000 through 199 become numbers from 3000 through 3199.

The Incoming dial plan table may already contain this line. If necessary, modify the line to match.

```
TableEntry Create 2 4 3 4 4 Internal 0 0
```

Explanation: In table ID 2 (Incoming dial plan table) entry 4 instructs the system to look for 3 as the first in a sequence of 4 digits (both Min and Max are 4). If the system finds such a sequence, it assigns *Internal* as the call class. The system does not use the number in the priority column, so it remains 0 (zero). The system directs the call to route 0 (zero), the default route for internal extensions.

Customer Requirement 4. Assume that the company is located in New York, and has two long distance telephone carriers: ABC, which provides a low-cost service to four Boston area codes (508, 617, 781, and 978), and DEF, which provides service to the rest of the United States. You want to use one 4-port Analog Line Card, connected to analog trunk lines owned by ABC, for all calls to the Boston area. You want to use the T1 line, which you lease from DEF, for all other long distance calls within the United States.

The system users dial 9 to get an outside line, 1 to obtain a long distance carrier, 3 digits to specify the area code, and 7 digits to specify the telephone number. To ensure that long distance calls are handled in the least-cost way that you want, you place these entries in the Internal dial plan table. The numbering of the entries assumes that the table has 46 entries before you make any additions. Columns in each table entry are titled: Command, Table Number, Entry Number, Digits, Min, Max, Class, Priority, and Route Number.

Add these lines to the dial plan configuration file:

```
TableEntry Create 1 47 91 12 12 LongDistance 0 2
```

Explanation: Creates, in table ID 1 (the Internal table), entry 47, which directs the system to look for the digits 91 at the beginning of any 12-digit sequence (Min and Max are both 12). If the system detects such a sequence, it assigns LongDistance as the class of service.

Because the system software does not use the priority value, the system leaves 0 (zero) as the value, and assigns the call to route 2 (the T1 route).



Dial plan entries are searched in sequential order. As soon as dialed digits match a dial plan entry, the dial plan acts on that match without further analysis. So if a previous dial plan entry (entries 1 through 46 in this example) was matched, entry 47 would not be found or used.

```
TableEntry Create 1 48 91508 12 12 LongDistance 0 1
```

Explanation: In table ID 1 (the Internal table), creates entry 48, which directs the system to look for the digits 91508 at the beginning of any 12-digit sequence (Min and Max are both 12). If the system detects such a sequence, it assigns LongDistance as the class of service. Because the system software does not use the priority value, the system leaves 0 (zero) as the value, and assigns the call to route 1 (the route that uses the 4-port card).

```
TableEntry Create 1 49 91617 12 12 LongDistance 0 1
```

Explanation: In table ID 1 (the Internal table), creates entry 49, which directs the system to look for the digits 91617 at the beginning of any 12-digit sequence (Min and Max are both 12). If the system detects such a sequence, it assigns LongDistance as the class of service. Because the system software does not use the priority value, the system leaves 0 (zero) as the value, and assigns the call to route 1 (the route that uses the 4-port card).

```
TableEntry Create 1 50 91781 12 12 LongDistance 0 1
```

Explanation: In table ID 1 (the Internal table), creates entry 50, which directs the system to look for the digits 91781 at the beginning of any 12-digit sequence (Min and Max are both 12). If the system detects such a sequence, it assigns LongDistance as the class of service. Because the system software does not use the priority value, the system leaves 0 (zero) as the value, and assigns the call to route 1 (the route that uses the 4-port card).

```
TableEntry Create 1 51 91978 7 7 LongDistance 0 1
```

Explanation: In table ID 1 (the Internal table), creates entry 51, which directs the system to look for the digits 91978 at the beginning of any 12-digit sequence (Min and Max are both 12). If the system detects such a sequence, it assigns LongDistance as the class of service. Because the system software does not use the priority value, the system leaves 0 (zero) as the value, and assigns the call to route 1 (the route that uses the 4-port card).

In combination, the five lines in the internal table work with these two lines in the Routes section of the dial plan.

```
DestinationRoute Create 1 Boston Low-cost Carrier  
DestinationRoute Create 2 T1 Line to DEF Telephone Company
```

Explanation: Creates two routes, numbered 1 and 2, with the names "Boston Low-cost Carrier" and "T1 Line to DEF Telephone Company."

```
DestinationRouteEntry Create 1 1 *0001  
DestinationRouteEntry Create 2 1 *0001
```

Explanation: In route 1, creates entry number 1, which defines extension list *0001 (TLIM extensions) as the destination. Then creates, in route 2, an entry that defines extension list *0002 (Digital Line Card extensions) as the destination.

```
DestinationRouteOperation Create 1 1 1 stripLead 1  
DestinationRouteOperation Create 2 1 1 stripLead 1
```

Explanation: Creates, in route 1, entry 1, operation number 1. This is a stripLead operation, which removes the first digit from the dialed string, then and passes the remaining digits to the carrier.

Customer Requirement 5. Assume that you want to transmit Calling Line ID Presentation (CLIP) information on outgoing calls. You use internal telephone extension numbers from 3000 to 3099. There is no DDI/DID, so the T1 or E1 line has only a single number (555-555-1212). All incoming calls are routed by default to the Auto Attendant.

Add these lines to the dial plan configuration file:

```
PreTranslator Create 1 CLIP Internal Ext to Single Number
```

Explanation: Create pretranslator table 1 called “CLIP Internal Ext to Single Number.”

```
PreTranslatorEntry Create 1 1 3
```

Explanation: For pretranslator 1, create entry 1, which applies when the first digit in the sequence is 3. (All internal telephone extensions begin with the number 3.)

```
PreTranslatorOperation Create 1 1 1 replace 555 555 1212
```

Explanation: For pretranslator 1, entry 1, create operation 1, which replaces the extension number with the string 555 555 1212.

Customer Requirement 6. Assume that you want to use two different long distance carriers at different times of the day, to obtain a cost saving. To select one long distance carrier from 7:30 a.m.) to 3:00 p.m., prepend 1010321 to each call. To select another carrier and obtain a lower rate from 3:00 p.m. until opening business hours the next day, prepend 1010220. This assumes the business is not open on weekends.

Add these lines to the dial plan configuration file:

```
TableEntry Create 1 99 91 12 12 LongDistance 0 27
```

Explanation: In Table 1 (Internal table) entry 99, creates an entry which looks for the digits 91 at the beginning of any 12-digit sequence (since both Min and Max are set to 12). If the system detects such a sequence, it assigns LongDistance as the class of service.

Because system software does not use the priority value, the system leaves 0 (zero) as the value, and assigns the call to route 27.



If Table 1 already contains an entry with 91 in the digits column, delete it and substitute the above TableEntry Create line.

```
TimedRoute Create 27 28 3PM Switchover
```

Explanation: Create TimedRoute 27, with a default DestinationRoute of 28. Assign the title “3PM Switchover” to TimedRoute 27.

```
TimedRouteEntry Create 27 1 7:30 15:00 .MTWTF. 29
```

Explanation: For TimedRoute 27, create entry 1, which applies from 7:30 a.m. through 3:00 p.m. Monday through Friday. The route to use is 29.

```
DestinationRouteCreate 29 Open Hours Carrier
```

Explanation: Create DestinationRoute 29, and call it “Open Hours Carrier.”

```
DestinationRouteEntry Create 29 1 *0002
```

Explanation: For DestinationRoute 29, create entry 1, which uses extension list *0002, the extension list that contains all extensions associated with Digital Line Cards.

```
DestinationRouteOperation Create 29 1 1 stripLead 2
```

Explanation: For DestinationRoute 29, entry 1, create operation 1, which strips 2 digits (9 and 1) from the beginning of the dialed string.

```
DestinationRouteOperation Create 29 1 2 prepend 1010321
```

Explanation: For DestinationRoute 29, entry 1, create operation 2, which prepends 1010321 to select the long distance carrier to use from 7:30 a.m. Monday through Friday.

```
DestinationRoute Create 28 Carrier After 3pm and Closed
```

Explanation: Create DestinationRoute 28 and call it “Carrier After 3 p.m. and Closed.”

```
DestinationRouteEntry Create 28 1 *0002
```

Explanation: For DestinationRoute 28, create entry 1, which uses extension list *0002, the extension list that contains all extensions associated with Digital Line Cards.

```
DestinationRouteOperation Create 28 1 1 stripLead 2
```

Explanation: For DestinationRoute 28, entry 1, create operation 1, which strips 2 digits (9 and 1) from the beginning of the dialed string.

```
DestinationRouteOperation Create 28 1 2 prepend 1010220
```

Explanation: For DestinationRoute 28, entry 1, create operation 2, which prepends 1010220 to select the other long distance carrier. Route 28 is the default route, so it is used at all other times than those defined for route 29.

Example 1 If you make a long distance call at 2:00 p.m. on any Tuesday, the system uses these timed route definitions, and:

- Determines that the date is a valid business date.
- Determines that the time is prior to 3:00 p.m.
- Selects timed route 29.
- Prepends 1010321 to the outgoing call to select the first long distance carrier.

Example 2 If you make a long distance call at any time on any Saturday, the system uses these timed route definitions, and:

- Determines that the date is not a valid business date.
- Selects timed route 28.
- Prepends 1010220 to the outgoing call to select the second long distance carrier.

3

DEVICE CONFIGURATION

This chapter describes how to configure and manage devices on the NBX system. It covers these topics:

- Adding, Removing, and Modifying Telephones
- Adding a Remote Telephone
- Creating and Managing Bridged Extensions
- Creating and Managing Telephone Groups
- Recording and Monitoring Telephone Calls
- Creating and Managing Button Mappings
- Changing Device IP Settings
- Configuring Call Park
- Configuring the NBX Attendant Console
- Configuring and Managing Analog Line Card Ports
- Connecting and Managing Analog Devices
- Configuring and Managing BRI-ST Digital Line Cards
- Configuring and Managing E1 Digital Line Cards
- Configuring and Managing T1 Digital Line Cards
- Setting Up a Digital Line Card at a Remote Location
- Setting Up T1/E1 Logging
- Viewing CSU State Information and Statistics
- Using Loopback Tests



For information about installing the system hardware components, see the NBX Installation Guide.

Adding, Removing, and Modifying Telephones

This section describes how to add, remove, and modify telephones in the NBX NetSet utility. You can also review the status of each device and configure button mappings for NBX telephones.

Adding a New Telephone

You can configure a new telephone in two ways: using Auto Discovery or manually.

- **Auto Discovery method** — Auto Discovery is the simplest and most common method of adding a new telephone. When you enable Auto Discovery and then connect a new NBX Telephone to the LAN, the new telephone receives the next lowest available extension number, which appears on the telephone's display panel, and a default set of properties.
- **Manual method** — You can disable Auto Discovery and configure telephones manually using the NBX NetSet utility. However, if you have many telephones to configure, manual configuration can be a tedious and error-prone process.

For either method of adding a telephone, you must connect the telephone to the network. If you use Auto Discovery, 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 the Telephone

Instructions for connecting the phone to power and the network depend on your power source and the type of telephone. See Chapter 3 in the *NBX Installation Guide* or the telephone packing sheet for telephone connection information.

Adding a New Telephone Using Auto Discovery



Before you enable Auto Discovery, verify that a 3-digit or 4-digit dial plan is installed on the Network Call Processor and that you have specified a starting extension. See the NBX Installation Guide.

To add a new telephone using Auto Discovery:

- 1 Select *System Configuration > System Settings* tab.
- 2 Click *System-wide*. The System Settings dialog box appears.
- 3 Optionally, clear all check boxes associated with autodiscovering devices.

- 4 Enable *Auto Discover Telephones*, and then click *Apply*.
- 5 Optionally, enable the *Auto Add Phones to Call Pickup Group 0* check box.



Regardless of whether you select this check box, you can change the call pickup group for any telephone later. See "Call Pickup" on page 222 for information about Call Pickup Groups.

- 6 Click *OK*.
- 7 For each telephone that you want to autodiscover:
 - a Remove the telephone from the packing box.
 - b Connect the phone to power and the network according to the instructions in the telephone packing sheet or the *NBX Installation Guide*.
 - c Wait until an extension number appears in the telephone's display panel.



NBX devices that require a license, such as the 3102 Business Telephone, the 3101 and 3101SP Basic Telephones, and the 3105 Attendant Console, will not display an extension number until you add the license to the system. If you have not entered a license for a telephone, its display panel will show the device's MAC address and a rotating hyphen.

You can now disconnect the telephone and move it to its destination. The telephone retains its extension and button mappings.

Adding a Telephone Manually

To add a new telephone manually:

- 1 From the NBX NetSet main menu, click *Device Configuration > Telephones*.
- 2 Click *Add*. The Add Telephones dialog box appears.
- 3 Fill in the fields with the appropriate values. Click the *Help* button to see more information about the dialog box fields.
- 4 Click *Apply* to configure this telephone. You can then configure additional telephones using the same menu.
- 5 Click *OK*.

Modifying a Telephone To modify a telephone:

- 1 Select *NBX NetSet > Device Configuration > Telephones*.
- 2 Select the telephone that you want to modify from the list.
- 3 Click *Modify*. The Modify Telephones dialog box appears.
- 4 *Change the desired fields. Click the Help button to see more information about the dialog box fields.*
- 5 Click *Apply* to make your changes.
- 6 Click *OK*.

Checking a Telephone's Status To check the status of a telephone:

- 1 Select *Device Configuration > Telephones*.
- 2 Select the telephone for which you want a status report from the list box.
- 3 Click *Status*. The Device Status dialog box appears.
- 4 View the device status and make any desired changes.*Click the Help button to see more information about the dialog box fields.*
- 5 When you finish, click *Apply*, and then click *OK*.

Removing a Telephone To remove a telephone from the system:

- 1 Select *Device Configuration > Telephones tab*.
- 2 Select the telephone that you want to remove from the list box.
- 3 Click *Remove*. A dialog box prompts you to confirm removal.
- 4 Click *Yes*. The system removes the selected telephone.
- 5 On the *Users* tab, delete the extension. If you do not perform this step, the extension of the removed telephone becomes a phantom mailbox.

Rebooting a Telephone To reboot a telephone:

- 1 Select *Device Configuration > Telephones*.
- 2 Choose a telephone from the list, and then click the *Status* button to open the *Telephones Status* dialog box.



CAUTION: If the telephone has an active call, resetting the telephone disconnects the call.

- 3 Click Reset Device and then click OK.

You can also reboot a telephone by unplugging the power connector from the telephone and then plugging it in again.

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 an NBX Telephone behind a device that applies network address translation at a remote location, such as a home office, and connect to the NBX call processor 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.

Remote NAPT Device Configuration

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 call processor 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 use the LUI utility, see “Using the Telephone Local User Interface Utility” on page 307.

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.

Creating and Managing Bridged Extensions

Bridged extensions allow you to have the extension of a primary telephone appear on one or more secondary telephones. Most activities associated with the extension can be performed on both the primary telephone and any of the secondary telephones. However, you cannot use a bridged extension on a secondary telephone to place a call.



On any NBX system, you can configure a maximum number of primary telephones and a maximum number of bridged extension on primary telephones. See Table 23.

Table 23 Maximum Bridged Extensions

System	Device Limit	Maximum Number of Primary Telephones	Maximum Number of Bridged Extensions on Primary Phones
NBX V3000	250	250	1200
NBX V3000	More than 250	400	1200



There are no restrictions on the number of secondary telephones or the number of bridged extensions on secondary telephones.

Provided that you do not exceed the limits shown in Table 23, you can configure the maximum number of bridged extensions using any combination of primary telephones and bridged extensions.

You can configure a different number of bridged extension buttons on a primary and an associated secondary telephone. For example, if a primary telephone has 5 bridged extensions, one of the secondary telephones can be configured to have fewer (1 through 4) bridged extensions. However, if all of the primary bridged extensions are in use, the person at the secondary telephone will not be able to see all of the calls.

You can define any one telephone as either a primary telephone or a secondary telephone, but not both. If the telephone has an Attendant Console associated with it, the bridged extension functions for the telephone extend to the Attendant Console. For example, an NBX 2101 Basic Telephone with an associated Attendant Console, can be configured as a primary telephone with up to 11 bridged extensions on Attendant Console buttons.

You can configure bridged extensions on the same buttons that are used for the telephone's extension or on non-extension buttons. Before you can create a bridged extension on a telephone, you must unlock the button settings in the telephone group button mappings dialog box for the telephone group to which the telephone belongs.

You can view a report that lists the primary and secondary telephones on which bridged extensions have been defined. See "Viewing Bridged Extension Information" on page 139.

When you define bridged extension appearances on a primary telephone:

- Incoming calls appear on the bridged extension buttons first, followed by the buttons (if any) associated with the primary telephone's extension. For example, by default, buttons 1, 2, and 3 are extension appearances of the primary telephone. If you define buttons 4, 5, 6, and 7 as bridged extensions on the primary telephone, incoming calls appear on primary telephone buttons in the order 4, 5, 6, 7, 1, 2, 3.
- Any bridged extension appearance that overlaps one of the defined extension appearances for the primary telephone take precedence over those extension appearances. For example, if you define buttons 3, 4, 5, 6, and 7 as bridged extension appearances on the primary telephone, incoming calls appear on primary telephone buttons in the order 3, 4, 5, 6, 7, 1, 2.

Example Bridged Extensions Configurations

Example 1: An NBX Business Telephone, extension 1044, is defined as a primary telephone and buttons 2, 3, and 4 are defined as bridged extension buttons. Two other NBX Business Telephones, extensions 1055 and 1066, are defined as secondary telephones on which extension 1044 appears. On the 1055 telephone, buttons 10, 11, and 12 are configured as the three bridged extension buttons for the 1044 telephone. On the 1066 telephone, buttons 4, 5, and 6 are configured as bridged extension appearances.

If a call is made to extension 1044, it can be answered using any of the following buttons:

- Extension 1044 (primary telephone) — button 2
- Extension 1055 (secondary telephone) — button 10
- Extension 1066 (secondary telephone) — button 4

In this example, both secondary telephones use buttons 1, 2, and 3 as extensions appearances for their own extensions.

Example 2: An NBX Business Telephone with extension 1077 is defined as a primary telephone and buttons 4, 5, 6, 7, and 8 are defined as bridged extension buttons. Two other NBX Business Telephones (extensions 1088 and 1099) are defined as secondary telephones on which extension 1077 is to appear. On the 1088 telephone, buttons 10, 11, and 12 are configured as bridged extension buttons. On the 1099 telephone, buttons 3, 4, 5, 6, and 7 are configured as bridged extension appearances for extension 1077.

If a call is made to extension 1077, it can be answered using any of the following buttons:

- Extension 1077 (primary telephone) — button 4
- Extension 1088 (secondary telephone) — button 10
- Extension 1099 (secondary telephone) — button 3

Secondary telephone 1099 has only two extension appearances for the 1099 extension because button 3, by default an extension appearance for the local telephone, has been used as a bridged appearance of extension 1077.

The primary telephone has buttons 1, 2, and 3 as local appearances of its own extension (1077). If multiple calls arrive at this telephone, they appear on buttons 4, 5, 6, 7, and 8, followed by 1, 2, 3.

Buttons 1, 2, and 3 on the 1077 telephone are not defined as bridged extension appearances. Therefore, they do not appear on either of the secondary telephones. If the owner of the 1077 telephone makes a call using any of these buttons, there is no indication (status light) of the call on either secondary telephone. If there are five active calls on the 1077 telephone, and a sixth call is made to that extension, it rings only on the 1077 telephone, on the first unused button in the 1, 2, 3 group).

Defining Bridged Extensions

The process of defining bridged extensions involves:

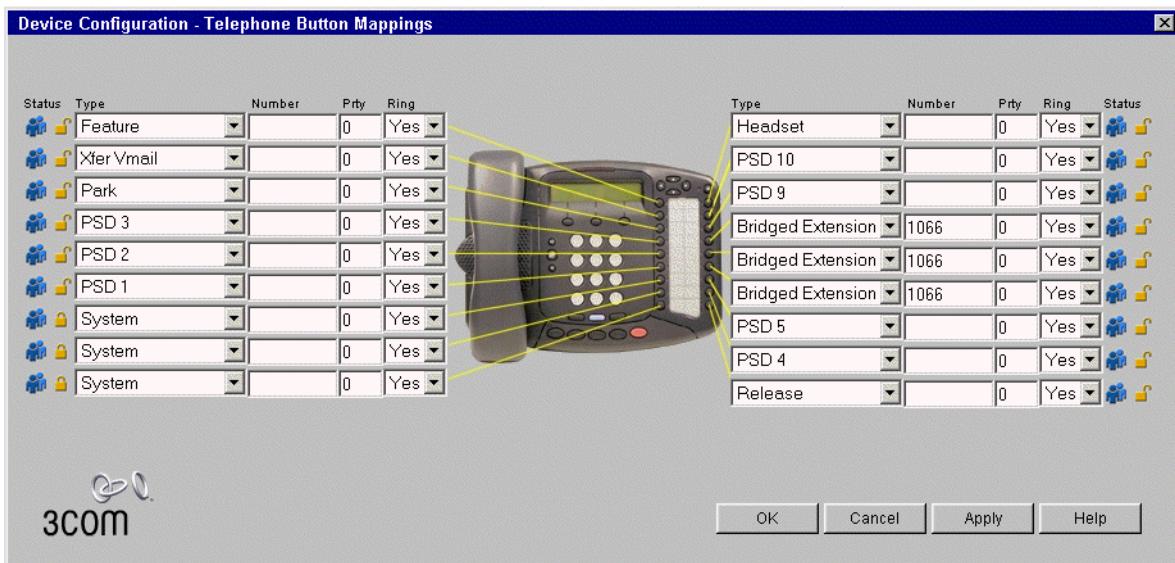
- Defining Bridged Extensions on a Primary Telephone
- Defining Bridged Extensions on a Secondary Telephone

Defining Bridged Extensions on a Primary Telephone

On a primary telephone, you can define from 1 to 11 buttons as bridged extensions. The buttons do not have to be next to each other.

To define the bridged extensions for the primary telephone:

- 1** Select *NBX NetSet > Device Configuration > Telephones*.
- 2** Select the primary telephone from the scroll list.
- 3** Click *Button Mappings*. The Telephone Button Mappings dialog box (Figure 19) appears.

Figure 19 Telephone Button Mappings Dialog Box

- 4 For each button that you want to include in the group of bridged extension buttons:
 - a Select *Bridged Extension* from the drop-down list in the *Type* column.
 - b Type the extension number of the primary telephone in the *Number* column.
- 5 Click *OK*.

Defining Bridged Extensions on a Secondary Telephone

After you have defined the bridged extension buttons on the primary telephone, you can define the corresponding bridged extension buttons on a secondary telephone. You can do this for as many secondary telephones as you want.

To define the bridged extensions for a secondary telephone:

- 1 Select *NBX NetSet > Device Configuration > Telephones*.
- 2 Select the secondary telephone from the scroll list.
- 3 Click *Button Mappings*. The Telephone Button Mappings dialog box appears.

- 4 For each button that you want to include in the group of bridged extension buttons:
- Select *Bridged Extension* from the drop-down list in the *Type* column.
 - Type the extension number of the primary telephone in the *Number* column. See Figure 20.

Figure 20 Button Mapping Dialog Box After Mapping

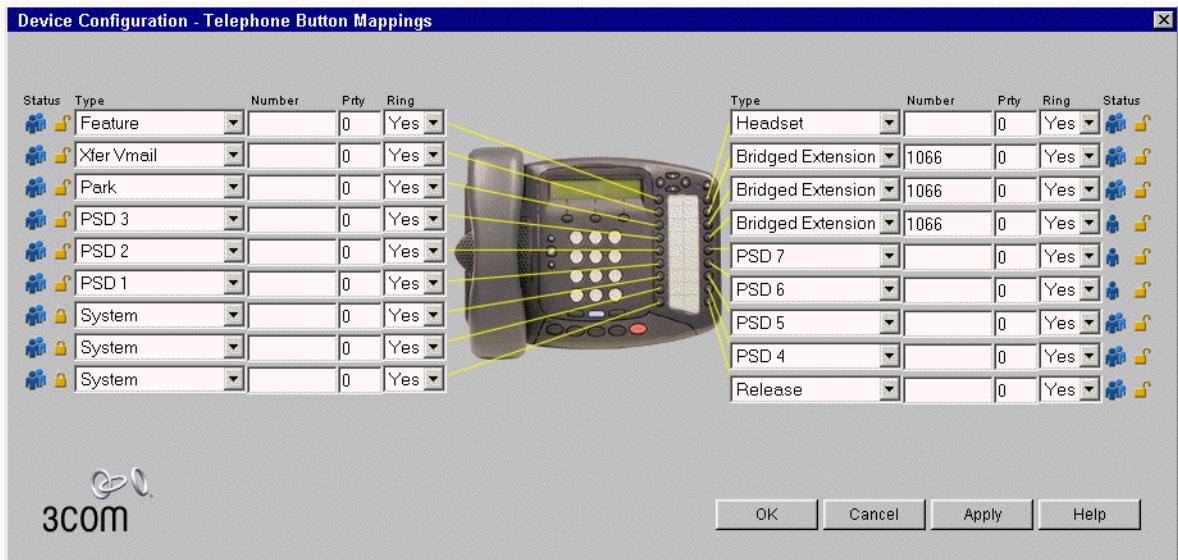


Figure 20 shows a group of three buttons that have been configured as bridged extension appearances for the extension (1066) associated with the primary telephone.

- 5 Click *OK*.

Modifying Bridged Extensions

You can modify bridged extensions on a primary telephone at any time. Bridged extensions do not need to be on adjacent buttons on a primary or a secondary telephone. You can have a different number of bridged extensions on a primary and a secondary telephone.

Sample Calling Situations Using Bridged Extensions

This section describes typical telephone call situations involving bridged extensions on primary and secondary telephones. For all of the examples:

- The primary telephone is an NBX Business telephone (extension 1027) used by a manager (Alicia). This telephone has buttons 2, 3, and 4

defined as bridged extension buttons. Button 1 is the manager's private line.

- One secondary telephone, an NBX Business Telephone (extension 1051), is used by the manager's assistant (Bradley). On this telephone, buttons 1, 2, and 3 are extension appearances for extension 1051 and buttons 4, 5, and 6 are configured as bridged extension appearances of the manager's telephone (1027).
- The other secondary telephone is also an NBX Business Telephone (extension 1018). The telephone is used by the person (Connie) who answers the manager's telephone whenever the manager's assistant is not available. Buttons 10, 11, and 12 are configured as bridged extension appearances of the manager's telephone (1027).

Example 1: If there are no active calls on Alicia's telephone, a call made to her telephone from either an internal or outside telephone rings on button 2 on her telephone, button 4 on Bradley's telephone and button 10 on Connie's telephone.

Bradley answers the call by pressing button 4. After identifying the person who is calling, Bradley places the call on hold and informs Alicia of the call. Alicia presses button 2 on her telephone to take the call.



During the time that Bradley is talking to the caller, neither Alicia nor Connie can access the call. Alicia can pick up the call only after it is placed on hold by Bradley. Similarly, after Alicia picks up the call, neither Bradley nor Connie can access the call. If Alicia wants to include either Bradley or Connie in the call, she can set up a conference call.

Example 2: Alicia wants to place a call but wants to keep all three bridged extensions available for incoming calls. Alicia can place the call using button 1.

Neither Bradley's telephone nor Connie's telephone shows any indication that there is a call on Alicia's telephone, because button 1 on Alicia's telephone is not configured as a bridged extension.

Example 3: Three incoming calls have arrived on Alicia's telephone (on buttons 2, 3, and 4). Alicia is talking on button 2, Bradley has placed the second call on hold, and is talking to the third caller.

A fourth call arrives at Alicia's extension and rings on button 1. Neither Bradley nor Connie can answer this call because that button on Alicia's telephone is not a bridged extension appearance.

If a fifth call arrives at Alicia's extension before the fourth call stops ringing, it is sent directly to Alicia's voice mailbox, because all buttons are being used.

Example 4: A call arrives at Alicia's telephone and the building has been evacuated because of a fire. Neither Alicia, nor Bradley, nor Connie is available to answer the call. After the number of rings that are configured for Alicia's telephone, the call is sent to Alicia's voice mailbox.

Example 5: A call arrives at Alicia's telephone and Bradley answers the call, then places it on hold, and Alicia picks up the call. Bradley leaves the area, asking Connie to answer his telephone and Alicia's until he returns.

Alicia places the call on hold in order to pass the call back to Bradley but finds that he is not available. Connie is not close enough to Alicia's office to permit Alicia to talk directly to her, so Alicia presses another button on her telephone, calls Connie's extension, and asks her to pick up the call.

**Viewing
Bridged Extension
Information** You can view a list of all telephones on the NBX system and determine which are primary telephones and which are secondary telephones.

To view the bridged extensions information, select *NBX NetSet > Device Configuration > Telephones > Bridged Extensions*. The NBX Bridged Extensions Report appears.

If a telephone is a primary telephone, the Bridged Exts column contains the extension of the telephone and the extension of each associated secondary telephone. The Mapped Buttons column displays the telephone's extension once for each button that is mapped as a bridged extension.

Example: If extension 1002 is a primary telephone and extensions 1005, 1008, and 1019 are secondary telephones with 1002 mapped to them, the Bridged Exts column contains four extension numbers (1002, 1005, 1008, and 1019). If 3 buttons on the 1002 telephone are mapped as bridged extensions, the Mapped Buttons column contains extensions 1002, listed 3 times.

Creating and Managing Telephone Groups

Telephone groups let you create common Button Mappings. Button mappings let you assign specific actions to the buttons on an NBX Business Telephone. When you associate a Group with a specific telephone, the telephone inherits all the mappings of the Group.

For example, you can create a Group called Sales that includes Access buttons mapped to a set of CO lines. When you add a new salesperson to the group, you simply specify the Sales group for the telephone assigned to that person. All of the Sales group's Button Mappings are then available on that person's telephone.

This section covers these topics:

- Creating a New Telephone Group
- Modifying a Telephone Group
- Removing a Telephone Group
- Viewing Telephone Group Membership

Creating a New Telephone Group

- To create a new telephone group,
- 1 Select *NBX NetSet > Device Configuration*.
 - 2 Click the *Telephone Groups* tab.
 - 3 Click *Add*. The Add Telephone Group dialog box appears.
 - 4 Enter the name of the new group in the *Group Name* field.
 - 5 Select an entry from the *Telephone Type* drop-down list.
 - 6 To enable call recording and monitoring as the default setting for all telephones in this group, enable the *Call Record & Monitor* check box.
 - 7 Click *OK*.

The group now appears in the Telephone Group group list box.

Modifying a Telephone Group

You may want to change the name of a telephone group to reflect a change in your organization, or you may want to change whether the group is configured for call recording and monitoring.

To change the name of a telephone group:

- 1** Select *NBX NetSet > Device Configuration > Telephone Groups*.
- 2** Select the group whose name you want to change.
- 3** Click *Modify*. The Modify Telephone Group dialog box appears.
- 4** Change the name of the telephone group in the *Group Name* field.
- 5** To set call recording and monitoring as the default condition for all telephones in this telephone group, enable the *Call Record & Monitor* check box. To disable call recording and monitoring, clear the check box.
 *You must have installed a call recording license before you can enable the Call Record & Monitor check box.*
- 6** Click *OK*.

Removing a Telephone Group You can remove a telephone group if it is no longer needed.

To remove a telephone group:

- 1** Select *NBX NetSet > Device Configuration > Telephone Groups*.
- 2** Select the group you want to remove.
- 3** Click *Remove*. A confirmation window appears.
- 4** Click *Yes*.

The system removes the group.

Viewing Telephone Group Membership You can view a report that describes which telephones belong to each telephone group. The report also includes membership information about Class of Service groups.

To view the membership report, click *Membership*.



You do not need to select a telephone group first. The report includes information about all telephone groups.

In the report window, click any of the column headings to arrange the information in ascending or descending order.

Recording and Monitoring Telephone Calls

If you have call recording application software that runs on a PC that is external to the NBX system, you can record and monitor telephone calls to and from telephones on the NBX system.

To enable call recording and monitoring on the NBX system, you must purchase a system-wide license. After you install the license, you can enable call recording and monitoring for these devices:

- Analog telephones connected to ports on an Analog Terminal Card or to a single-port Analog Terminal Adapter. For instructions on enabling these features, see:
 - “Adding an Analog Terminal Card” on page 160
 - “Adding an Analog Terminal Adapter (ATA)” on page 162
 - “Modifying an Analog Terminal Port” on page 163
- NBX Telephones. For instructions on enabling these features, see:
 - “Adding a New Telephone” on page 128
 - “Modifying a Telephone” on page 130
- Telephone Groups. For instructions on enabling these features, see:
 - “Creating a New Telephone Group” on page 140
 - “Modifying a Telephone Group” on page 140

Recording Calls Between Telephones with Different Recording Settings

For a call that involves NBX telephones or analog telephones that are connected to either ATC ports or to ATAs, the NBX system verifies the current recording setting for each NBX device involved in order to determine which recording setting to use for the call.

Two-party Calls

In a two-party call involving only NBX devices, if either NBX device has recording enabled, the NBX system enables recording for both devices for the duration of the call. When the call has been completed, the NBX system restores the recording settings that were in effect prior to the call.

Conference Calls

If any NBX device in a conference call has recording enabled, the NBX system enables recording for all NBX devices for the duration of the conference call. When the call has been completed, the NBX system restores the recording settings that were in effect prior to the call.

Example:

A three-party conference call involves these telephones:

- An NBX Business Telephone on the local NBX system
- An analog telephone connected to an ATC port on the local NBX system
- An NBX Basic Telephone on a different NBX system, connected to the local NBX system by a virtual tie line (VTL)

Only the NBX Basic Telephone has recording enabled. For the duration of the conference call, the NBX system enables recording for the analog telephone and the NBX Business Telephone. After the call ends, the NBX system disables the recording for the analog telephone and the NBX Business Telephone.

Remote Telephones

If an NBX telephone or an analog telephone connected to an ATA is connected to a subnetwork different than the NBX Call Processor's, you can enable recording for that remote device.

Music On Hold

On an NBX system, music on hold is always recordable. During a call with two NBX devices (NBX telephones, or analog telephones attached to ATC ports or to ATAs) that both normally have recording disabled, if either person puts the call on hold, the NBX system enables recording while music on hold is playing. When the call is taken off hold, the NBX system restores the recording settings that were in effect prior to the call.



If music on hold is disabled for the NBX system, recording is not enabled while the call is on hold.

Non-NBX Telephones

If your NBX system has telephones other than NBX Telephones attached, you can include these telephones in NBX telephone groups, provided that the other telephones are configured to emulate an NBX telephone.



CAUTION: *If a telephone other than an NBX Telephone is configured to emulate an NBX telephone, then you can add the telephone to the associated telephone group (for example, the Default Business Phone Group). However, the other telephone may only partially emulate an NBX Business Telephone and may not respond to the commands to enable or disable call recording. If you disable recording for the Default Business Phone Group, it may still be possible to record calls involving the telephones that are not NBX Telephones in that group.*

Creating and Managing Button Mappings

Button Mappings allow you to place features, such as speed dial numbers and shortcuts, on telephone buttons for individual telephones or for telephone groups. In addition, you can use Button Mappings to map CO telephone lines to buttons and set up your system in one of these modes:

- **Key Mode system** — In Key Mode, all outside lines map to individual buttons on users' telephones. You can share lines by assigning one line to multiple telephones. Incoming calls ring on all telephones that have that line assigned. Any of those telephones can answer the call.
- **PBX (Private Branch eXchange) system** — In a PBX system, outside lines are pooled and arbitrated by the Call Processor. To call an outside number, a user must dial the line pool access number, typically 9, and the Call Processor assigns the next available line.
- **Hybrid Mode system** — In hybrid mode, some lines are assigned as keyed lines, while the rest are pooled.



You must use NBX Business Telephones to operate the system in key mode or hybrid mode. NBX Basic Telephones operate in PBX mode only.

This section covers these topics:

- Mapping Access Buttons
- Mappings for Users and Groups
- Creating a Busy Lamp/Speed Dial Button Mapping
- Creating a Delayed Ringing Pattern
- Creating Groups and Button Mappings

Mapping Access Buttons

NBX Telephone Access buttons have these characteristics:

- NBX 3101 and 3101SP Basic Telephones each have four Access buttons. Only two buttons can serve as line appearances, primary or secondary bridged station appearances or any other feature. The other two buttons cannot be mapped as line appearances or primary bridged station appearances, but the NBX administrator can map any other feature to these buttons. These two buttons are mapped by default as Transfer and Feature, and changing these default mappings can limit the features you can access.
- On NBX 1102, 2102, and 1102-IR Business Telephones, you can assign CO telephone lines or line pool access only to buttons that have lights.

You can assign one-touch actions such as Speed Dial or system features such as Do Not Disturb to any Access button.

- NBX 2101 Basic Telephones include three Access buttons. NBX 2101 Basic Telephones operate in PBX mode only, that is, you cannot map CO lines directly to telephone buttons.
- Not all Button Type functions are available on all models of telephones. For a description of each function you can assign to a button, click the Help button in the NBX NetSet Button Mapping Screen.
- The use of the *Prtty* (priority) and *Number* fields depend on the selected Button Type function.
- The *Ring* field is used to enable and disable ringing for a lone appearance button and to set delayed ringing patterns. See “Creating a Delayed Ringing Pattern” on page 146 for details.
- A *Lock* check box at the Group Mappings level lets you control button inheritance behavior. If you lock a button at the Group Mappings level, a change made to the Group always passes to every telephone in the Group. If you clear the *Lock* box at the Group Mappings level, you can override the mapping at the device level. An icon at the device level indicates whether the button can be remapped.
- Telephone Button Mappings are part of a device. You assign a set of mappings to an individual by associating a particular device or group to the user.
- Users can see the Button Mappings in effect for their telephones by accessing the NBX NetSet interface with a personal password.
- Users can use the NBX NetSet interface to create and print labels for the Access buttons on their telephones.

Mappings for Users and Groups

When you create a new user and assign the user to a group, the button mappings for that group become active for the user’s telephone. You can override group mappings and create mappings for individual telephones. For example, you can create a Group called Sales and assign three shared direct lines to the group. Then you can assign one unshared direct line to each of the telephones currently in use by people in the Sales group.



The Lock feature (see “Creating Groups and Button Mappings” on page 147) allows you to control button behavior. If you enable Lock, a change that you make at the group level passes to every telephone in the group and it cannot be overridden for individual telephones. If you

disable Lock, you can override group button mappings at the device level. (This Lock feature is not the same as the Telephone Locking feature that a user can apply to an individual telephone. See the NBX Telephone Guide.)

Creating a Busy Lamp/Speed Dial Button Mapping

A Busy Lamp/Speed Dial button is an Access button, with a light, that is mapped so that it can function as a speed dial to another extension and also indicate when that extension is in use. When you press the Access button mapped to the Busy Lamp/Speed Dial button, you dial the mapped extension. When the other extension is in use, the lamp lights on your telephone.

For the NBX Attendant Console, the default configuration created by the Auto Discovery process creates Busy Lamp/Speed Dial mappings for up to the first 100 extensions on the system.

A CO line mapped directly to telephones (Key mode) does not get transferred to any user's voice mail. For more on key mode, see Creating and Managing Button Mappings on page 144.

To create a Busy Lamp/Speed Dial button mapping:

- 1 Select *NBX NetSet > Device Configuration > Telephones*.
- 2 Select a telephone in the list and click the *Button Mappings* button.
- 3 On the *Telephone Configuration* dialog box, select an available Access button that has a light. In the *Type* box, select *Line/Extension*. In the *Number* box, specify the extension of the telephone that you want as the Busy Lamp/Speed Dial target.

Creating a Delayed Ringing Pattern

You can define a ringing progression for a line that is mapped to multiple telephones. For example, you can configure a call to ring immediately at telephone 1, begin ringing at telephone 2 after 4 rings, and then begin ringing at telephone 3 after 8 rings. Any of the telephones can pick up the call at any time, even if it has not yet started audibly ringing at a particular telephone. (The light flashes during all rings.)



Delayed ringing works with Key mode only, that is, with line card ports mapped to buttons on two or more telephones.

Delayed ringing is useful for backup coverage on shared lines, such as for secretaries who must cover each other's lines.

Additional considerations:

- The first telephone and each succeeding telephone in a delayed ringing pattern continue to ring until the call is answered or transferred to the Auto Attendant.
- Telephones belonging to a delayed ringing pattern do not need to belong to the same group. As long as all the telephones have the same line mapped, you can create the delayed ringing pattern.

To create a delayed ringing pattern:

- 1 Use the *Group Button Mappings* feature of the NBX NetSet utility to map a CO line. See Creating and Managing Button Mappings on page 144.
- 2 Set *Ring* to Yes.
- 3 Clear the *Lock* check box.
- 4 In the *NBX NetSet - Main Menu* window, click *Device Configuration*.
- 5 On the *Telephones* tab, choose the second telephone in the progression of telephones where you want to create the Delayed Ringing pattern, and then click the *Button Mappings* button.
- 6 For the shared line appearance button, set the *Ring* box to the behavior that you want.

To have the telephone begin ringing after one ring, select 1; after two rings, select 2. Select No to disable ringing entirely. (The indicator light still functions to indicate ringing/call status.) Do not change the settings in the *Type*, *Number*, and *Prty* boxes.

- 7 Repeat the procedure for each telephone in the Delayed Ringing pattern, taking care to set the Ring delay to create the appropriate delay for each extension.

Creating Groups and Button Mappings

Telephone Button Mappings are part of a device. You assign a set of mappings to an individual by associating a particular device or group to that user.

A user can see the Button Mappings in effect for an assigned telephone by logging on to the NBX NetSet utility with a personal password. The user can also use the NBX NetSet utility to create and print labels for the Access Buttons on the telephone and set up One Touch Speed Dials.

An administrator can define the button mappings for telephone groups and also define exceptions to the group mappings for individual telephones.

To create groups and button mappings:

- 1 Select *NBX NetSet > Device Configuration > Telephone Groups*.
- 2 Click *Add*, type a *Group Name*, and click *OK*.
- 3 Click the *Group* that you want to apply mappings to.
- 4 Click *Button Mappings*. Click the *Help* button to see more information about the dialog box fields.

To define button mappings for an individual telephone:

- 1 Select *NBX NetSet > Device Configuration > Telephones*.
- 2 Click the telephone that you want to apply mappings to.
- 3 Click *Button Mappings*. Click the *Help* button to see more information about the dialog box fields.

Changing Device IP Settings

If you are using Standard IP network protocol, you can manually change the IP address of telephones, Line Card ports, Attendant Consoles, and Analog Terminal Cards. You modify the IP settings of a device if you plan to move the device to a different subnetwork than the one on which the Call Processor resides. If the new subnetwork is served by a DHCP server, the IP address you assign to the device must be outside the address range that the DHCP server uses.



3C10116D T1 and 3C10165D E1 Digital Line Cards can be installed in a remote location and communicate with their NCP over a routed network. For a detailed description of how to configure remote Digital Line Cards, see "Setting Up a Digital Line Card at a Remote Location" on page 214.

See the Help for *NBX NetSet System Configuration > System Settings > System-Wide* for more information on IP network protocols.

To change the IP settings of a telephone:

- 1 Select *NBX NetSet > Device Configuration > Telephones*.



If you are updating the IP Settings of a different type of device (such as an Attendant Console or a Digital Line Card), click the appropriate tab to see a list of devices.

- 2** Select the telephone or other device that you want to update and click *IP Settings*.
- 3** Type the new values for IP Address, Subnet Mask, and Default Gateway address in the text boxes. *Click the Help button to see more information about the dialog box fields.*
- 4** Click *OK*.
- 5** Disconnect the device from the Call Processor subnetwork.
- 6** Connect the device to the new subnetwork as follows:
 - Connect a telephone or a single-port Analog Terminal Adapter to a port on either a switch or hub that is connected to the new subnetwork.
 - Plug a card into an NBX chassis that is connected to the new subnetwork.
- 7** Reboot the device:
 - Remove power from a telephone or a single-port Analog Terminal Adapter, and then reconnect it.
If the device is a card, it reboots automatically when you insert it into the new chassis. You do not need to remove power to the chassis when adding or removing cards.



When you change IP Settings, all current calls through this device are terminated.

- 8** In the NBX NetSet utility, return to the IP Settings dialog box for the device.
- 9** Verify that the IP settings that you entered are now reported by the device.



CAUTION: *If you have configured an NBX telephone for operation on a subnetwork other than the Call Processor's subnetwork, and if you access the Modify IP Settings dialog box to verify that the device settings are correct, you must exit the dialog box by clicking the Cancel button. If you click OK, the NBX system applies the IP settings in the Manually Assigned IP Settings text boxes. By default, all of these fields contain 0.0.0.0, and if you click OK, all of the IP settings for the telephone are set to 0.0.0.0, and the telephone no longer works on the "remote" subnetwork.*

Configuring Call Park

When you park a call, anyone can retrieve it from any other telephone in the system by entering the Call Park extension that is associated with that call. **Example:** You need to transfer an incoming caller, but the person that you need to reach is not available. You can park the call on any unused Call Park extension and then page the person, announcing the Call Park extension where the call is parked. The person can then retrieve the parked call from any internal telephone by dialing the Call Park extension on which you parked the call.

These are the default system configuration extensions for Call Park:

- **NBX V3000:** 6000 through 6099



The NBX V3000 is shipped with a 4-digit dial plan. If you import any 3-digit plan, you must manually specify any 3-digit extension ranges that are not set by the imported plan.

Adding a Call Park Extension

To add a Call Park extension or change the name of a default Call Park extension:

- 1 Select *NBX NetSet > Device Configuration > Call Park* tab.
- 2 Click *Add*. The Add Call Park dialog box appears. *Click the Help button to see more information about the dialog box fields.*
- 3 Enter the number of an extension you have previously removed in the *Extension* field.
- 4 Enter a name for the extension in the *Name* field.
- 5 Click *OK*.

Changing the Name of a Call Park Extension

You can change the name of any Call Park extension.

To change the name of an extension:

- 1 Select *NBX NetSet > Device Configuration > Call Park*.
- 2 Select the extension name that you want to change. Click *Modify*. The Modify Call Park dialog box appears. *Click the Help button to see more information about the dialog box fields.*
- 3 Enter the new name for the Call Park extension in the *Name* field.
- 4 Click *OK*.

Removing a Call Park Extension You can remove a Call Park extension at any time.

To remove a Call Park extension:

- 1** Select *NBX NetSet > Device Configuration > Call Park*.
- 2** Select the extension that you want to remove.
- 3** Click *Remove*. You are prompted to confirm that you want to remove this extension.
- 4** Click *Yes*.

To replace any extension that you remove, see “Adding a Call Park Extension” on page 150.

Configuring the NBX Attendant Console

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

This section describes how to configure the Attendant Console manually. Alternatively, you can use Auto Discovery to add and configure the device automatically, and then use the manual configuration procedures in this section to fine-tune your mappings.



If you auto discover the Attendant Console, do so after you have auto discovered all telephones, Analog Terminal Adapters, and Analog Terminal Cards. The Auto Discovery process maps all existing telephones to the Attendant Console.

This section covers these topics:

- Adding an Attendant Console
- Modifying an Attendant Console
- Viewing Attendant Console Status
- Removing an Attendant Console
- Configuring Attendant Console Buttons
- Changing Attendant Console IP Settings

Adding an Attendant Console

Before you add Attendant Consoles, keep the following requirements in mind:

- On a NBX V3000 system, you can configure up to 100 Attendant Consoles.

You can associate at most 3 Attendant Consoles with any one telephone.



The NBX Model 3105 Attendant Console requires a license. You must enter a valid device license key into the NBX NetSet utility before you can add a 3105 Attendant Console to the system.

To add a new NBX Attendant Console:

- 1 Select *NBX NetSet > Device Configuration > Attendant Console*.
- 2 The Add Attendant Console dialog box appears.
- 3 Fill in the fields for the new Attendant Console. *Click the Help button to see more information about the dialog box fields.*
- 4 Click *OK*. The system adds the new NBX Attendant Console.

Modifying an Attendant Console

This section describes how to modify an existing Attendant Console. You can change an Attendant Console's device number or associated telephone. Every Console must be associated with a telephone. To modify an existing NBX Attendant Console:

- 1 Select *NBX NetSet > Device Configuration > Attendant Console*.
- 2 Select the Attendant Console that you want to modify and click *Modify*. The Modify dialog box appears.
- 3 Change the desired fields. *Click the Help button to see more information about the dialog box fields.*
- 4 Click *Apply* to make the changes and then click *OK*.

Viewing Attendant Console Status

Use the *Status* button on the *Attendant Console* tab to check the status of an Attendant Console. You can also reboot it from this tab with the *Reset Device* option.

To view the status of an Attendant Console:

- 1 Select *NBX NetSet > Device Configuration > Attendant Console*.
- 2 Select the Attendant Console for which you want to view the status and click *Status*. The Device Status dialog box appears.

- 3 View the settings and optionally change the Dialog Refresh, Device Refresh, and Reset Device settings. *Click the Help button to see more information about the dialog box fields.*
- 4 Click *Apply* to apply the settings and then click *OK*.

Removing an Attendant Console To remove an NBX Attendant Console from the system:

- 1 Select *NBX NetSet > Device Configuration > Attendant Console*.
- 2 Select the Attendant Console that you want to remove.
- 3 Click *Remove*. A dialog box prompts you to confirm the removal.
- 4 Click *Yes*. The system removes the Attendant Console.

Configuring Attendant Console Buttons This section describes how to configure the buttons on the NBX Attendant Console. The Attendant Console buttons include:

- 50 Access buttons. You can assign each button two settings.
- A Shift button. This button switches between the two settings allowed for each Access button.
- Four Feature buttons.

Configuring Feature Buttons

To map the Attendant Console Feature Buttons:

- 1 Select *NBX NetSet > Device Configuration > Attendant Console*.
- 2 Select the Attendant Console for which you want to map Feature Buttons.
- 3 Click *Feature Buttons*. The Feature Button Mappings dialog box appears.
- 4 Use the drop down list next to each button to select the feature you want to assign to the button.

To see a description of each function you can assign to a button, click the Help button on the NBX NetSet Button Mappings screen.

- 5 Click *Apply* to implement the new mappings.

Mapping the Attendant Console Access Buttons

To map the NBX Attendant Console Access buttons:

- 1 Select *NBX NetSet > Device Configuration > Attendant Console*.
- 2 Select the Attendant Console you want.

3 Click *Button Mappings*.

4 To map the buttons that you want, follow these steps:

- a** Select the appropriate column of buttons. Click *1-50* to select columns A through E, or *51* through *100* to select columns F through J. (This choice emulates the function of the *Shift* button on the physical Attendant Console.)
- b** Click the letter (A through J) that corresponds to the column of buttons that you want to map.
- c** Map the buttons for the column that you selected using the drop-down list boxes.

To see a description of each function you can assign to a button, click the Help button on the NBX NetSet Attendant Console Button Mappings screen.

5 Click *Apply* for the changes to take effect.

Changing Attendant Console IP Settings

Although most configurations use IP On-the-Fly or DHCP to assign IP addresses (and thus cannot manually change the addresses), if you use Standard IP network protocol, you can manually change the IP address of Attendant Consoles and other devices.

To set Attendant Console Feature IP settings:

- 1** Select *NBX NetSet > Device Configuration > Attendant Console*.
- 2** Select the Attendant Console you want, and click *IP Settings*.



When you change IP Settings, all current calls through this device are terminated.

Configuring and Managing Analog Line Card Ports

Each NBX Analog Line Card provides access for up to four local telephone lines into your NBX system. The Call Processor treats a line card port as an extension, so each line card port needs its own extension number.

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



You typically configure Line Cards during installation. See the NBX Installation Guide for more information.

If you remove a line card from the system, the port information remains in the database. The extension numbers assigned to the four ports do not become available for reuse unless you use the NBX NetSet utility to remove the line card from the configuration database.

This section covers these topics:

- Configuring a Line Card Port
- Modifying a Line Card Port
- Removing a Line Card Port
- Verifying Line Card Port Status
- Rebooting a Line Card Port
- Advanced Settings

Configuring a Line Card Port

When you configure a line card port, you can assign it as a member of a line pool.

You can configure a line card port automatically (recommended) or manually.



Verify that you have chosen a 3-digit or 4-digit dial plan before you begin to configure line card ports. See Chapter 2.

Configuring a Line Card Port Automatically

To configure a line card port automatically:

- 1 Select NBX NetSet > System Configuration.
- 2 Click System-wide. The System Settings dialog box appears.
- 3 Enable the Auto Discover Line Cards check box.
- 4 Click OK.

Configuring a Line Card Port Manually

Most organizations use Auto Discovery to automatically configure line card ports. However, you can configure a line card port manually and select all settings.

To configure a line card port manually:

- 1** Select *NBX NetSet > Device Configuration > Line Card Ports*.
- 2** Click *Add*.
- 3** In the *Add Line Card Port* dialog box, specify the port information, and then click *OK*. *Click the Help button to see more information about the dialog box fields.*

Auto Extension Behavior

The extensions you specify in the AutoExt. fields control where a call is directed. Table 24 describes typical the behaviors for AutoExt.

Table 24 Auto Extension Configuration

Button Mapping Setting for This Line	Auto Extension Setting	Incoming Call Behavior
Not mapped to any telephone	Extension of the Receptionist	<p>Receptionist's telephone rings. If no one answers, the call transfers to the call coverage point defined for the Receptionist's telephone.</p> <p><i>User Configuration > Users > User Settings > Call Forward</i></p> <p>The transfer occurs after the number of rings specified for the Receptionist's telephone.</p> <p><i>User Configuration > Users > User Settings > Call Forward</i></p> <p>Because the analog line is not mapped to any telephone, the Time-out values (Open, Closed, Lunch, and Other) for the Analog Line Card port are not used.</p> <p><i>Device Configuration > Line Card Ports > Modify</i></p>
Not mapped to any telephone 500		Calls go directly to the Automated Attendant without ringing any telephone.

Table 24 Auto Extension Configuration (continued)

Button Mapping Setting for This Line	Auto Extension Setting	Incoming Call Behavior
Mapped to a button on the Receptionist's Telephone (or to a button on an Attendant Console associated with the Receptionist's telephone)	Extension of the Receptionist	<p>Receptionist's telephone rings. If no one answers, the call transfers to call coverage point defined for the Receptionist's telephone.</p> <p><i>User Configuration > Users > User Settings > Call Forward</i></p> <p>The transfer occurs after:</p> <ul style="list-style-type: none"> ■ The number of seconds specified on the <i>Time Out</i> line in the Modify Line Card Port dialog box for the appropriate time of day (Open, Closed, Lunch, Other): <p><i>Device Configuration > Line Card Ports > Modify</i></p> <p>PLUS</p> <ul style="list-style-type: none"> ■ The number of rings specified in the user settings for the Receptionist's telephone. <p><i>User Configuration > Users > User Settings > Call Forward</i></p> <p>Example: If the Time Out value for the Analog Line Card port is 12 seconds, the equivalent number of rings is 2. If the Call Forward settings for the receptionist's telephone is 4 rings, then the call transfers after 6 rings.</p>
Mapped to a button on the Receptionist's Telephone (or to a button on an Attendant Console associated with the Receptionist's telephone)	500	<p>Receptionist's telephone rings. If no one answers, the call transfers to the Automated Attendant.</p> <p>NOTE: The call coverage point defined for the receptionist's telephone has no affect.</p> <p>The transfer occurs after the number of seconds specified on the <i>Time Out</i> line in the Modify Line Card Port dialog box for the appropriate time of day (Open, Closed, Lunch, Other).</p> <p><i>Device Configuration > Line Card Ports > Modify</i></p>
Mapped to a button on a user telephone (or to a button on an Attendant Console associated with the user's telephone)	Extension of the Receptionist	<p>User telephone rings. If no one answers, the call transfers to the Receptionist's telephone.</p> <p>The transfer occurs after the number of seconds specified on the <i>Time Out</i> line in the Modify Line Card Port dialog box for the appropriate time of day (Open, Closed, Lunch, Other).</p> <p><i>Device Configuration > Line Card Ports > Modify</i></p> <p>If the receptionist's telephone is not answered, the call transfers to the call coverage point defined for the receptionist's telephone.</p> <p><i>User Configuration > Users > User Settings > Call Forward</i></p>

Table 24 Auto Extension Configuration (continued)

Button Mapping Setting for This Line	Auto Extension Setting	Incoming Call Behavior
Mapped to a button on a user telephone (or to a button on an Attendant Console associated with the user's telephone)	500	<p>User telephone rings. If no one answers, the call transfers to the Automated Attendant.</p> <p>The transfer occurs after the number of seconds specified on the <i>Time Out</i> line in the Modify Line Card Port dialog box for the appropriate time of day (Open, Closed, Lunch, Other).</p> <p><i>Device Configuration > Line Card Ports > Modify</i></p>

4 Click *OK*.

5 Connect your CO line to the configured port.

Modifying a Line Card Port You can modify a line card port that is already configured.

To modify a line card port:

- 1** Select *NBX NetSet > Device Configuration > Line Card Ports*.
- 2** Select the port you want to modify from the list.
- 3** Click *Modify*.
- 4** Specify the port information. The fields are the same as those described in “Configuring a Line Card Port Manually” on page 155.
- 5** Click *OK*.

Removing a Line Card Port When you remove a line card port that is already configured, you remove the port information from the database.

To remove a line card port:

- 1** Select *NBX NetSet > Device Configuration > Line Card Ports*.
- 2** Select the port that you want to remove from the list.
- 3** Click *Remove*. A prompt asks you to confirm that you want to remove the port.
- 4** Click *Yes* to remove the port.

Verifying Line Card Port Status You can verify the status of a configured line port at any time.

To view the status of a line card port:

- 1 Select *NBX NetSet > Device Configuration > Line Card Ports*.
- 2 Select the port that you want and click *Status*.

Click the Help button to see more information about the dialog box fields.

Rebooting a Line Card Port To reboot a line card port:

- 1 Select *NBX NetSet > Device Configuration > Line Card Ports*.
- 2 From the list, select the port that you want to reboot.
- 3 Click *Status*. The Device Status dialog box appears.
- 4 Click *Reset Device*.
- 5 Click *OK*.



CAUTION: On the 3C10117 Analog Line Card, you can reboot individual ports without affecting the other ports. However, if you reboot a port on the 3C10114C Analog Line Card, all four ports on the card are rebooted. Active telephone calls on any of these ports are disrupted.

Advanced Settings The Advanced Settings button enables you to set the audio gain and timing controls on each port of an Analog Line Card.

To set these parameters:

- 1 Select *NBX NetSet > Device Configuration > Line Card Ports*.
- 2 Select one of the items from the list and click *Advanced Settings*. The Advanced Settings dialog box appears. *Click the Help button to see more information about the dialog box fields.*



If you change any of the values in the Advanced Settings dialog box, the settings that you change persist if you later upgrade the NBX system software or change the regional software.

Default Values

To reset all parameters to the default values, click the *Reset* button.

Connecting and Managing Analog Devices

An Analog Terminal Card (ATC) or an Analog Terminal Adapter (ATA) allows ordinary analog (2500-series compliant) telephones, including cordless telephones and Group-3 facsimile (fax) devices, to operate with NBX systems.

These limitations apply because of the differences between an analog device and an NBX Telephone:

- A user dials 500, then ** on a telephone connected to an ATA to gain access to voice mail.
- An analog telephone can make or receive only one call. A second incoming call goes to voice mail.

This section discusses these topics:

- Adding an Analog Terminal Card
- Adding an Analog Terminal Adapter (ATA)
- Modifying an Analog Terminal Port
- Removing an Analog Terminal Adapter
- Viewing The Status of an Analog Terminal Adapter

Adding an Analog Terminal Card

To add an Analog Terminal Card to the NBX system using Auto Discovery:

- 1 Select *NBX NetSet > System Configuration > System-wide*.
- 2 Click the *Auto Discover Telephones* check box to select it.
- 3 Click *OK*.
- 4 Insert the Analog Terminal Card into the chassis.
- 5 Wait 1 minute for the system to discover the card.
- 6 In the *NBX NetSet - Main Menu* window, click *Device Configuration*.
- 7 In the *Device Configuration* dialog box, click the *ATA* tab.
- 8 The four ports of the Analog Terminal Card appear in the list of ATAs, along with the ports of any previously discovered Analog Terminal Cards, and any previously discovered Single-Port Analog Terminal Adapters (ATAs).

Extension Assignments (3C10117 ATC)

3C10117 has been replaced with model 3C10117C.

Each of the four ports on a 3C10117 Analog Terminal Card has a MAC address. The first port has the same MAC address as the card, and the remaining three ports have sequential MAC addresses incremented by one hexadecimal digit. See Table 25:

Table 25 MAC Addresses of Analog Terminal Card Ports (3C10117)

Card or Port	MAC Address
Analog Terminal Card	00:e0:bb:00:f8:c8
Port 1	00:e0:bb:00:f8:c8
Port 2	00:e0:bb:00:f8:c9
Port 3	00:e0:bb:00:f8:ca
Port 4	00:e0:bb:00:f8:cb

The extensions assigned to these ports by the NBX system may not be in order. For example, if the NBX system assigns extensions 7258, 7259, 7260, and 7261 to the ATC ports, it might assign 7258 to port 3.

To determine which extension is associated with a given port, you must access the ATA tab in the NBX NetSet utility and examine the list of ATAs and ATC ports. For example, to determine the extension assigned to the third port, look for the ATC port with a MAC address that is two hexadecimal digits higher than the MAC address of the board. The extension of the port is in the first column (Ext.).



After you have added the Analog Terminal Card, you can configure the parameters for each of the four ports. See "Modifying an Analog Terminal Port" on page 163.

Extension Assignments (3C10117C ATC)

On a 3C10117C Analog Terminal Card, there is only one MAC address. Each of the four ports is assigned a unique virtual device number (1 through 4) so that the NBX software can address each port separately.

When you select the ATA tab, and view the information, the port number appears after the MAC address, enclosed within square brackets. See Table 26.

Table 26 MAC Addresses of Analog Terminal Card Ports (3C10117C)

Card or Port	MAC Address
Analog Terminal Card	00:e0:bb:00:f8:c8
Port 1	00:e0:bb:00:f8:c8[1]
Port 2	00:e0:bb:00:f8:c8[2]
Port 3	00:e0:bb:00:f8:c8[3]
Port 4	00:e0:bb:00:f8:c8[4]

The extensions that are assigned to these ports by the NBX system may not be in order. For example, if the NBX system assigns extensions 7258, 7259, 7260, and 7261 to the ATC ports, it might assign 7258 to port 3.

To determine the extension assigned to any port on a 3C10117C ATC:

- 1 Click the ATA tab.
- 2 Look for the combination of MAC address and port number that you want. The extension associated with the port is in the first column (Ext.).



After you have added the Analog Terminal Card, you can configure the parameters for each of the four ports. See "Modifying an Analog Terminal Port" on page 163.

Adding an Analog Terminal Adapter (ATA)

To add an Analog Terminal Adapter (ATA) to the NBX system:

- 1 Select *NBX NetSet > Device Configuration > ATA*.
- 2 Click *Add*. The Add ATA dialog box appears.
- 3 Fill in the fields in the Add ATA dialog box. *Click the Help button to see more information about the dialog box fields.*
- 4 Click *Apply* to add the new ATA to the system.
- 5 Repeat as necessary to add more ATAs.
- 6 When you are finished adding ATAs, click *OK*.

Modifying an Analog Terminal Port You can modify the configuration of an Analog Terminal Card port or a single-port ATA at any time.

To modify an analog device configuration:

- 1** Select *NBX NetSet > Device Configuration > ATA*.
- 2** Select the port that you want to modify and click *Modify*.
- 3** Modify the desired fields. *Click the Help button to see more information about the dialog box fields.*
- 4** Click *Apply* to effect the changes.
- 5** Click *OK*.

Removing an Analog Terminal Adapter You can remove either an Analog Terminal Adapter (ATA) or one of the ports on an Analog Terminal Card (ATC) from the system at any time. Any device connected to the ATA is also removed from the system.

To remove an Analog Terminal Adapter:

- 1** Select *NBX NetSet > Device Configuration > ATA*.
- 

Use the MAC addresses to determine whether an item in the list is an Analog Terminal Adapter (ATA) or one of the ports on an Analog Terminal Card. Ports on a 3C10117 Analog Terminal Card have MAC addresses that differ by two hexadecimal digits. Ports on a 3C10117C Analog Terminal Card all have the same MAC address and use a Virtual Device Number to identify each port. The port number appears after the MAC address, enclosed in square brackets. An ATA has a unique MAC address with no port number.
- 2** Select the ATA or the port on an ATC you want to remove.
 - 3** Click *Remove*. A dialog box prompts you to confirm the removal.
 - 4** Click *Yes*. The system removes the item you selected.

Viewing The Status of an Analog Terminal Adapter You can view the status of either an Analog Terminal Adapter or one of the ports on an Analog Terminal Card at any time.

To view the status of an Analog Terminal Adapter or a port on an Analog Terminal Card:

- 1 Select *NBX NetSet > Device Configuration > ATA* tab.



Use the MAC addresses to determine whether an item in the list is an ATA or one of the ports on an ATC. Ports on a 3C10114 Analog Terminal Card have sequential MAC addresses. Ports on a 3C10114C Analog Terminal Card all have the same MAC address followed by a Virtual Device Number (VDN), enclosed in square brackets. An Analog Terminal Adapter has a unique MAC address with no port number.

- 2 Select an ATA or port from the list.
- 3 Click *Status*. The Device Status dialog box appears. Click the *Help* button to see more information about the dialog box fields.
- 4 View the device status and make any necessary changes.
- 5 To optionally send a status message to the Call Processor about the ATA or ATC port, select *Device Refresh* and click *Apply*.
- 6 To optionally reset the ATA or ATC port, select *Reset Device* and click *Apply*. A dialog box prompts you to confirm the reset.
- 7 Click *Yes*. The ATA or ATC port resets itself.



CAUTION: On the 3C10114 Analog Terminal Card, you can reboot individual ports without affecting the other ports. However, if you reboot a port on the 3C10114C Analog Terminal Card, all four ports on the card are rebooted. Active calls on any of these ports are disrupted.

- 8 Click *OK*.

Advanced Settings

You can set the audio gain and timing controls on each port of an Analog Terminal Card, or on an Analog Terminal Adapter. To set these parameters:

- 1 Select *NBX NetSet > Device Configuration > ATA*.
- 2 Select one of the ports in the list and click *Advanced Settings*. Click the *Help* button to see more information about the dialog box fields.



If you change any of the values in the Advanced Settings dialog box, the settings you change persist if you later upgrade the NBX system software or you change the regional software.

Configuring and Managing BRI-ST Digital Line Cards

These sections describe how to add and configure a BRI-ST Digital Line Card to handle a BRI line with four BRI spans using the ST interface.

This section covers these topics:

- Adding an ISDN BRI-ST Digital Line Card
- Configuring the BRI-ST Digital Line Card
- BRI-ST Card Status Lights
- Modifying a BRI-ST Card
- Adding or Modifying a BRI Group
- Modifying BRI Card Channels
- Modifying IP Settings for a BRI Card
- Removing a BRI Digital Line Card

Each BRI-ST Digital Line Card (3C10164C) supports the Basic Rate Interface protocol (ST interface only).

Adding an ISDN BRI-ST Digital Line Card

To add a 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 the chassis, order an ISDN BRI-ST line from your telephone carrier, and have them install the line.

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. 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. Create entries in your Dial Plan configuration file to translate the incoming numbers into the corresponding extension numbers.

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

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

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

Enabling Auto Discovery for Digital Line Cards

To enable Auto Discovery for Digital Line Cards:

1 Select *NBX NetSet > System Configuration > System Settings*.

2 Click the *Auto Discover Digital Line Cards* check box.

 Other check boxes may be selected based upon previous Auto Discoveries. You do not need to clear these check boxes to install the BRI-ST card.

3 Click *OK*.

Inserting the BRI-ST Digital Line Card

You do not need to remove the power cable from the chassis before you insert the BRI-ST card.

To insert the BRI-ST card into the chassis:

- 1** Write down the MAC address of the BRI-ST card.
- 2** Select a slot for the BRI-ST card in the chassis, and use a Phillips screwdriver to remove the blank faceplate from the slot.
- 3** Insert the BRI-ST card into the slot.
- 4** Slide the BRI-ST card into the chassis until you feel it touch the connectors.
- 5** To seat the BRI-ST card into the connectors, press the front of the card firmly.
- 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.



CAUTION: When you insert the BRI-ST Digital Line Card, it begins an initialization sequence. Also, because you enabled the Auto Discover Digital Line Cards check box, the system recognizes the addition of the BRI-ST card and begins to update its database. Allow 3 minutes for both of these processes to be completed.

You are now ready to configure the BRI-ST Digital Line Card.

Configuring the BRI-ST Digital Line Card

These sections tell you how to use the NBX NetSet utility to set up your BRI-ST Digital Line Card parameters:

- Configuring for ISDN BRI Signaling
- Configuring BRI Groups
- Verifying BRI Group Membership
- Completing the BRI-ST Configuration

Before you configure the BRI-ST card, you must configure the Dial Plan as described in Chapter 2.

Configuring for ISDN BRI Signaling



CAUTION: Before you begin to configure the BRI-ST card, be sure to wait 3 minutes after you insert the BRI-ST card into the chassis.

To configure for ISDN BRI signaling:

- 1 Select *NBX NetSet > Device Configuration > Digital Line Cards*.
- 2 In the *T1/ISDN Board List*, find the MAC address of the BRI-ST board that you recorded before you inserted the card into the chassis.
- 3 Select the BRI-ST card from the list and click *Modify*.
- 4 Scroll through the *Channel List* to verify that the system lists all eight channels. The channel numbers appear after the MAC address, separated by a hyphen.

Example:

2...00:01:03:48:e0:4e-4...New Trunk.

The 4 after the hyphen indicates channel number 4.

- 5 To change the name of the BRI-ST card, edit the contents of the *Board Name* field to help you to identify the BRI-ST card in device lists.
- 6 Enable the *On Line* check box.
- 7 Click *OK*.

To connect the BRI line and activate the span:

- 1 Plug the BRI line into the BRI interface box.
- 2 Using a category 5 Ethernet cable, connect the BRI interface box to one of the four ports on the front panel of the BRI-ST card.
- 3 The *Card Type* field should contain ISDN BRI. If it does not, the system has not properly auto discovered the card. Restart the installation process.

To verify that the span status changes from *Offline* to *Ready*:

- 1 On the *Digital Line Cards* tab, select *ISDN BRI Span List* from the *Select Device Type* list and then click *Apply*.
- 2 Enable the *On Line* check box.
- 3 Click *Apply*.
- 4 Verify that the word *Ready* appears in the *ISDN BRI Span List* line item that corresponds to this span.



The Digital Line Cards dialog box includes buttons named *Config & Status Report* and *Export Report*. Both of these buttons generate configuration and status information for the selected Digital Line Card. Because this information is used for troubleshooting purposes, these buttons and the generated reports are described in "Digital Line Card Troubleshooting" on page 307.

Configuring BRI Groups

To configure the BRI groups:

- 1 On the *Digital Line Cards* tab, from the *Select Device Type* list, select *ISDN BRI Group List* and then click *Apply*.
- 2 From the *ISDN BRI Group List*, select *BRI Group 1*.
- 3 Click *Modify*. The Modify Group dialog box appears.
- 4 Select *Restricted* from the *Trunk to Trunk* drop-down list.



CAUTION: If you select *Unrestricted*, users can transfer incoming calls to outgoing trunks. 3Com does not recommend this setting because it enables the possibility of toll fraud.

- 5 Click the *On Line* check box.
- 6 Enter 500 in each of the four *AutoExt* text boxes.
- 7 Click *OK*.

Verifying BRI Group Membership

To verify that all channels are in the member list:

- 1 On the *Digital Line Cards* tab, from the *Select Device Type* list, select *BRI Group List* and then click *Apply*.
- 2 Select the group you want, and click *Membership*.
- 3 Scroll through the *Member List* to verify that all eight channels are present.
- 4 To transfer a channel from the non-member list to the member list, select the channel and click <<.



You cannot transfer a channel from the Member List to the Non-Member list.

Completing the BRI-ST Configuration

To complete the BRI-ST installation:

- 1** Return to the *Digital Line Cards* tab.
- 2** From the *Select Device Type* list, select *ISDN BRI Channel List*.
- 3** Click *Apply*.
- 4** Wait approximately 30 seconds for the status of each channel to change from *Ready* to *Idle*.



*If the channel status does not change to *Idle*, verify that you have enabled the *On Line* check box for the card, the span, and the group.*



*While you are waiting, click *Apply* to refresh the list of channels and to see the updated status.*

BRI-ST Card Status Lights Each of the four spans on a BRI-ST card has status lights that indicate the status of the span (Table 27).

Table 27 BRI-ST Card Status Lights

Status	D	B1	B2
Off	No Layer 1 connection is established with the Central Office (CO).	The channel is not carrying a call.	The channel is not carrying a call.
Yellow	A Layer 1 connection is established but the channel is not yet ready to make or receive calls.	A call build-up is occurring.	A call build-up is occurring.
Green	The channel is ready to make and receive calls.	A call is connected.	A call is connected.

Modifying a BRI-ST Card

These sections tell you how to modify a BRI card that is already installed in the system:

- Modifying a BRI Span
- Modifying Audio Controls

For the BRI-ST card, you can modify only a BRI span. You cannot modify the board type for a BRI-ST card.

Modifying a BRI Span

To modify a span:

- 1 On the *Digital Line Cards* tab, from the *Select Device Type* drop-down list, select *ISDN BRI Span List* and then click *Apply*.
- 2 Select the span you want to modify from the *Span List*. Click *Modify*. The *Modify Span* dialog box appears.
- 3 Make the changes that you want. *Click the Help button to see more information about the dialog box fields*. The ISDN BRI-ST Digital Line Card supports two channels per span.
- 4 Click *Apply*.
- 5 Enable the *On Line* check box to bring the span online. Note that the span does not come online unless the card is online first.
- 6 Click *Apply* to make the changes and then click *OK*.

Modifying Audio Controls

In a normal environment, you should not need to change the Audio Controls from their default settings. If you have an issue with sound quality and you cannot resolve it using the volume controls on the NBX Telephones, contact your technical support representative.



CAUTION: *Do not change your Audio Controls settings unless you are instructed to do so by a qualified support representative.*

Adding or Modifying a BRI Group

A BRI-ST Digital Line Card group is one or more BRI channels that are assigned the same characteristics. These sections tell you how to perform these tasks:

- Adding a BRI Group
- Modifying a BRI Group
- Changing BRI Group Membership
- Removing a BRI Group

Adding a BRI Group

You add a new group when you need to assign common characteristics to several BRI channels.

To add a BRI Digital Line Card group:

- 1 On the *Digital Line Cards* tab, select *ISDN BRI Group List* from the *Select Device Type* drop-down list and click *Apply*.
- 2 In the dialog box that appears, click *Add*. The Add Group dialog box appears.

Modifying a BRI Group

You may want to modify a Digital Line Card group to change its name, Auto Extension assignments, or other parameters. When you modify a group, the changes affect all of the Digital Line Cards assigned to that group.



CAUTION: *Modifying a BRI group disconnects any active calls on any channels that are associated with the group.*

To modify a BRI group:

- 1 On the *Digital Line Cards* tab, from the *Select Device Type* drop-down list, select *ISDN BRI Group List*.
- 2 Click *Apply*.
- 3 Select the group that you want to modify.
- 4 Click *Modify*. The *Modify Group* dialog box appears. *Click the Help button to see more information about the dialog box fields*.
- 5 Make the changes that you want to the group parameters.
- 6 Enable the *On Line* check box to bring the group on line. Click *Apply* for the changes to go into effect and then click *OK*.

Changing BRI Group Membership

You may want to change the channel membership in a group to accommodate changing needs.

To change group membership:

- 1 On the *Digital Line Cards* tab, from the *Select Device Type* drop-down list, select *ISDN BRI Group List* and then click *Apply*.
- 2 Select the group for which you want to change membership.
- 3 Click *Membership*. The *Manage Group Membership* dialog box appears. *Click the Help button to see more information about the dialog box fields*.

- 4 To add a channel to the Member List, select the channel in the *Non Member List* and click <<.

If you select the *Copy Group Settings to Channels* check box, the system copies the settings of the group to each channel you add or remove. If you do not select this check box, the channel settings are not changed.

- 5 Optionally enable the *Refresh Channels on Add/Remove* check box. This refreshes each channel as you add or remove it.



- You cannot move a channel from the Member List to the Non-Member List.*

Each channel must belong to a group. A channel can belong to only one group. You cannot move a channel from the members list to the non-members list of a group unless the system can assign the channel to another group. If a channel has never been a member of a group, the system cannot determine a group to which it can move the channel. Therefore, it cannot remove the channel from the member list. If a channel has been a member of a group in the past, the system moves the channel to the group of which the channel was most recently a member.

Example: By default, the system creates two groups, Group 1 and Group 2, and places all channels in Group 1. If you try to move a channel to the non-member list of Group 1, the operation fails. If you select Group 2, click *Membership*, move a channel from the non-member list to the member list, and then move the same channel back to the non-member list, the operation succeeds because the channel was previously a member of Group 1. If you then view the Group 1 membership list, it contains the channel you just removed from Group 2.

- 6 Click *Close*.

Removing a BRI Group

You may want to remove any group that you no longer need.

To remove a group:

- 1 Return to the *Digital Line Cards* tab.
- 2 From the *Select Device Type* drop-down list, select */ISDN BRI Group List*.
- 3 Click *Apply*.
- 4 Select the group you want to remove.
- 5 Click *Remove*. A prompt appears asking if you want to remove the group.
- 6 Click *Yes* to remove the group.

Modifying BRI Card Channels

A channel is an ISDN logical B channel. A channel can take a single call. This section describes how to modify channels for an installed BRI card and how to view the status of an existing channel.



CAUTION: *Do not modify channels unless a 3Com Technical Support representative advises you to do so. Modifying an ISDN channel disconnects any existing calls on that channel.*

To modify a channel on an installed BRI-ST card:

- 1 On the *Digital Line Cards* tab, from the *Select Device Type* drop-down list, select *ISDN BRI Channel List*.
- 2 Click *Apply*. The system updates the window to show the BRI channels.
- 3 Select the channel that you want and click *Modify*. The Modify Channel dialog box appears.
- 4 Fill in or change the fields in the appropriate Modify Channel dialog box. *Click the Help button to see more information about the dialog box fields.*
- 5 Enable the *On Line* check box to bring the channel on line. Note that the channel does not come online unless, previously, the card and the span have come online. Click *OK*.

Viewing the Status of a BRI Channel

To view the status of a channel on an installed BRI-ST card:

- 1 On the *Digital Line Cards* tab, select *ISDN BRI Channel List*.
- 2 Click *Apply*.
- 3 Select the channel for which you want status information.
- 4 Click *Status*. The BRI Channel Status dialog box appears.
- 5 View the status of the channel.
- 6 Refresh the Channel Status dialog box.

To manually refresh the *Channel Status* dialog box, select *Manual* from the *Dialog Refresh* list, and click *Apply*.

To automatically refresh the *Channel Status* dialog box, select *Auto* from the *Dialog Refresh* list, and click *Apply*.

- 7 To reboot the card, select the *Device Refresh* check box.

Viewing Digital Signal Processor Status

To view DSP (Digital Signal Processor) details:

- 1 Return to the *Digital Line Cards* tab.
- 2 From the *Select Device Type* list, select *T1/ISDN Board List* and click *Apply*.
- 3 Select the BRI card you want and click *Status*.
- 4 In the Board Status dialog box, select a DSP from the *DSP List* and click *Details*. The DSP Status window appears.
- 5 Click *Close* to close the *DSP Status* window.
- 6 Click *OK*.

Modifying IP Settings for a BRI Card You can modify the IP settings for a Digital Line Card to meet changing requirements.



The card must be on the same subnetwork as the Call Processor to modify IP settings using the NBX NetSet utility.

To modify the IP settings of a BRI Digital Line Card:

- 1 On the *Digital Line Cards* tab, from the *Select Device Type* drop-down list, select *T1/ISDN Board List*.
- 2 Click *Apply*.
- 3 Select the BRI card for which you want to change the IP settings.
- 4 Click *IP Settings*.
- 5 To assign IP addresses, enter the first address in the *First IP Address* field. The system sequentially adds the remaining addresses.

To assign IP addresses one at a time per channel:

- 1 In the *Digital Line Card IP Settings* dialog box, click *Assign Addresses Individually*.
- 2 Enter the desired IP addresses for the channels.
- 3 Enter the mask number appropriate for your site in the *Common Subnet Mask* field.
- 4 Enter IP address for the *Common Default Gateway*.
- 5 Click *Apply*.
- 6 Click *OK*.
- 7 In the *Digital Line Card IP Settings* dialog box dialog box, click *OK*.

Removing a BRI Digital Line Card



You can remove a Digital Line Card at any time.

CAUTION: *Removing a Digital Line Card may affect your Dial Plan.*

To remove a Digital Line Card:

- 1 On the *Digital Line Cards* tab, from the *Select Device Type* drop-down list, select *T1/ISDN Board List* and click *Apply*. A list of installed T1, ISDN PRI, or ISDN BRI boards appears in the *T1/ISDN Board List*.
- 2 Select the board (Digital Line Card) you want to remove from the list.
- 3 Click *Remove*. A dialog box prompts you to confirm the removal.
- 4 Click *Yes*.

Configuring and Managing E1 Digital Line Cards

This section describes how to add and configure an E1 Digital Line Card to connect to an E1 service provided by the local telephone company. You can configure an E1 Digital Line Card for ISDN PRI signaling only. In the NBX NetSet utility, Digital Line Cards are referred to as either cards or boards.

These topics explain NBX E1 card configuration:

- Adding an E1 Digital Line Card
- Configuring an E1 Digital Line Card
- E1 Card Status Lights
- Modifying an E1 Card
- Adding or Modifying an E1 Group
- Modifying E1 Card Channels
- Modifying IP Settings for an E1 Card
- Removing an E1 Digital Line Card

3C10165D E1 Digital Line Cards have expanded capabilities that are described in these topics:

- Setting Up a Digital Line Card at a Remote Location
- Setting Up T1/E1 Logging
- Viewing CSU State Information and Statistics
- Using Loopback Tests

Adding an E1 Digital Line Card

These sections tell you how to add an E1 Digital Line Card to an NBX system:

- Preparing the NBX System for E1 Cards
- Ordering DID, CLIP, and MSN Services for E1
- Inserting the E1 Digital Line Card

Preparing the NBX System for E1 Cards

Before you insert the E1 Digital Line Card into the chassis, order an E1 line, with the specifications you want, from your telephone carrier, and have them install the line.

Ordering DID, CLIP, and MSN Services for E1

When you order E1 with DID, CLIP, or MSN services, the local telephone carrier assigns a block of telephone numbers to you. Usually, you can request a specific range of numbers, but sometimes the carrier assigns numbers other than the ones you request.

You may be able to request that the local telephone carrier pass you a specific number of digits for each incoming telephone call. Sometimes the carrier does not offer any choice. In either situation, you need to know how many digits the carrier passes.

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

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

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

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

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

Enabling Auto Discovery for Digital Line Cards

To enable Auto Discovery for Digital Line Cards:

1 Select *NBX NetSet > System Configuration > System Settings > System-wide*.

2 Enable the *Auto Discover Digital Line Cards* check box.

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.

3 Click *OK*.

Inserting the E1 Digital Line Card

You do not need to remove the power cable from the chassis before you insert the E1 card.

To insert the E1 Digital Line Card into the chassis:

1 Write down the MAC address of the E1 card.

2 Select a slot for the E1 card in the chassis, and use a Phillips screwdriver to remove the blank faceplate from the slot.

3 Insert the E1 card into the slot.

4 Slide the E1 card into the chassis until you feel it touch the connectors.

5 To seat the E1 card into the connectors, press the front of the card firmly.

6 Tighten the left and right screws on the front of the E1 card.

7 Wait 3 minutes.



CAUTION: When you insert the E1 Digital Line Card, it begins an initialization sequence. Also, because you enabled the *Auto Discover Digital Line Cards* check box, the system recognizes the addition of the

E1 card and begins to update its database. Allow 3 minutes for both of these processes to be completed.

You are now ready to configure the E1 Digital Line Card.

Configuring an E1 Digital Line Card These sections tell you how to use the NBX NetSet utility to set up your E1 Digital Line Card parameters.

- Configuring for ISDN PRI Signaling
- Configuring E1 Groups
- Verifying E1 Group Membership
- Completing the E1 Configuration
- Verifying E1 Span Status

Before you configure an E1 card, you must configure the Dial Plan as described in Chapter 2.

Configuring for ISDN PRI Signaling

Before you configure the E1 card, read the cautionary note. This section describes how to configure an E1 Digital Line Card for ISDN PRI (Primary Rate Interface) signaling.



CAUTION: Before you configure the E1 card, you must wait 3 minutes after you insert the E1 card into the chassis.

- 1 Select NBX NetSet > Device Configuration > Digital Line Cards.
- 2 Use the MAC address of the E1 card to identify the board in the *T1/ISDN Board List*. You recorded this address before inserting the board into the chassis.
- 3 Select the E1 board from the *T1/ISDN Board List* and click *Modify*.
- 4 Scroll through the *Channel List* to verify that the system lists all 30 channels. The channel numbers appear after the MAC address, separated by a hyphen.

Example:

1...00:e0:bb:04:4e:a5-4 Trunk

The 4 after the hyphen indicates channel number 4.

- 5 To change the name of the E1 board, edit the contents of the *Board Name* field. This name helps you identify the E1 board in a list.

6 Enable the *On Line* check box.

7 Click *Apply* and then click *OK*.

To connect the E1 line and activate the span:

1 Plug the E1 line into the E1 board.

2 Select *ISDN PRI Span List* from the *Card Type* drop-down list.

3 Select the E1 span from the list and click *Modify*.

4 Click the *On Line* check box.

5 Click *Apply*.

To verify that the span status changes from *Offline* to *Ready*:

1 On the *Digital Line Cards* tab, select *ISDN PRI Span List* from the *Select Device Type* list.

2 Click *Apply*.

Configuring E1 Groups

To configure the E1 Groups:

1 On the *Digital Line Cards* tab, select *ISDN PRI Group List* from the *Select Device Type* list.

2 Click *Apply*.

3 From the *ISDN PRI Group List*, select *PRI Group 1*.

4 Click *Modify*. The Modify Group dialog box appears.

5 Select *Restricted* from the *Trunk to Trunk* drop-down list.



If you select *Unrestricted*, users can transfer incoming calls to outgoing trunks. 3Com does not recommend this setting because it enables the possibility of toll fraud.

6 Click the *On Line* check box.

7 Enter 500 in each of the four *AutoExt* text boxes and click *OK*.

Verifying E1 Group Membership

To verify that all channels are in the member list:

1 On the *Digital Line Cards* tab, select *ISDN PRI Group List* from the *Select Device Type* list and click *Apply*.

2 Select the group that you want, and click *Membership*.

- 3 Scroll through the *Member List* to verify that all 30 channels are present.

Completing the E1 Configuration

To complete the E1 configuration, perform these steps:

- 1 On the *Digital Line Cards* tab, select *ISDN PRI Channel List* from the *Select Device Type* list and click *Apply*.
- 2 Wait approximately 30 seconds for the status of each channel to change from *Ready* to *Idle*. You can also watch the *Nominal* (3C10165C) or the *CO* (3C10165D) status light on the E1 card front panel. When it stops flashing and stays on, the board is active.



*If the channel status does not change to *Idle*, verify that you have enabled the *On Line* check box for the card and the span.*



*While you are waiting, you can click *Apply* to refresh the list of channels and to see the updated status.*

Verifying E1 Span Status

To verify the E1 span status:

- 1 On the *Digital Line Cards* tab, select *ISDN PRI Span List* from the *Select Device Type* list and click *Apply*.
- 2 Select the span and click *Status*.

E1 Card Status Lights

The 3C10165, 3C10165B, and 3C10165C E1 cards contain these status lights:

- **CF** — Carrier Fail (when lit, indicates either a red alarm or blue alarm)
- **RA** — Remote Alarm (yellow alarm)
- **LB** — Loopback
- **Nominal** — E1 card is framed

The 3C10165D E1 card contains these status lights:

- **CO** — Central Office:
 - Amber — Alarm condition at the remote end or the CO is not connected or available.
 - Green — No alarm condition; the card has a valid connection to the Central Office.
- **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 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 has been completed.

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 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.

Modifying an E1 Card

These sections tell you how to modify a E1 card that is already installed in the system:

- Modifying the E1 Card Name
- Modifying an E1 Span
- Configuring Partial E1 Lines
- Modifying E1 Span Audio Controls

Modifying the E1 Card Name

You can change the name of an E1 Digital Line Card at any time. The name you pick helps you identify the E1 card in device lists.

To modify an E1 card name:

- 1 Select *NBX NetSet > Device Configuration > Digital Line Cards*.
- 2 Select the board in the *T1/ISDN Board List*, and click *Modify*.
- 3 In the *Board Name* field, you can enter a name for the board, if you want, or you can accept *Trunk*, the default name that the NBX system assigns. The name that you enter helps you to identify the board in device lists.

Modifying an E1 Span

To modify an E1 span:

- 1 On the *Digital Line Cards* tab, select *ISDN PRI Span List* from the *Select Device Type* drop-down list.
- 2 Click *Apply*.

- 3 Select the span you want to modify from the *Span List*. The number of channels supported per span depends on the configuration of the Digital Line Card. E1 cards support 30 channels per span.
- 4 Click *Modify*.
- 5 Make the desired changes. Click the Help button for more information about dialog box fields.
- 6 Click *Apply*.
- 7 Enable the *On Line* check box to bring the span online.
 *Before the span can come online, the board must be online.*
- 8 Click *Apply* or *OK* for the changes to take effect.

Configuring Partial E1 Lines

Some telephone companies offer an E1 line that has less than the maximum number of channels implemented. This is called a *Fractional, Partial, or Subequipped E1*. Example: To reduce near-term costs, you may decide to purchase 15 channels now and implement more later.

Some telephone companies offer Partial E1 lines as their standard offering and provide fully implemented E1 lines only if you make a specific request. If you are unaware of this, outbound calls using the E1 line may fail because the system places outbound calls using high numbered channels first, and a Fractional E1 typically has the lower numbered channels implemented.

In the *Span Status* dialog box, under *Details of last five calls*, if you see the error message *REQ_CHANNEL_UNAVAIL*, determine if the error is caused by a Partial E1 by following these steps:

- 1 Remove the highest numbered channel from service (set it to offline in the Modify Channel dialog box) and retry the outbound call.
- 2 Continue to remove channels until an outbound call succeeds.
- 3 When the first outbound call succeeds, the highest numbered channel still in service represents the number of active (provisioned) channels in the Partial E1.
- 4 Create two groups. Put all of the active channels in one group, and all of the inactive channels in the other. Mark the active group “online” and the inactive group “offline.”

Modifying E1 Span Audio Controls

Audio Controls settings affect individual spans. You can edit these properties:

- Silence Suppression (3C10165D only) — Enables you to override the system-wide setting. For a detailed description of how silence suppression affects audio quality and bandwidth, see “Audio Settings” on page 238.
- Audio Compression (3C10165D only) — Enables you to override the system-wide setting. For a detailed description of how audio compression affects audio quality and bandwidth, see “Audio Settings” on page 238.
- Audio Source Gain — Enables you to adjust the audio gain to resolve volume issues.



CAUTION: *Do not change your Audio Source Gain settings unless you are instructed to do so by a support representative.*

To modify E1 span audio controls:

- 1 On the *Digital Line Cards* tab, select *ISDN PRI Span List* from the *Select Device Type* drop-down list.
- 2 Click *Apply*.
- 3 Select the span you want to modify from the *Span List*. The number of channels supported per span depends on the configuration of the Digital Line Card. E1 cards support 30 channels per span.
- 4 Click *Audio Controls*. Click the Help button for more information about dialog box fields.

Adding or Modifying an E1 Group

A digital line card group is one or more E1 channels that are assigned the same characteristics, such as Channel Protocol. This section describes how to perform these actions:

- Adding an E1 Group
- Modifying an E1 Group
- Changing E1 Group Membership
- Removing an E1 Group



CAUTION: *Modifying an E1 group disconnects any calls in process on any channels associated with the group.*

Adding an E1 Group

You add a new group when you need to assign common characteristics to several E1channels.

To add a digital line card group:

- 1 On the *Digital Line Cards* tab, select *ISDN PRI Group List* from the *Select Device Type* drop-down list and click *Apply*.
- 2 In the dialog box that appears, click *Add*.

To modify ISDN PRI group parameters:

- 1 Type a name for the new group in the *Group Name* field.
- 2 To enable the transfer of incoming calls to another line card port, select *Unrestricted* from the *Trunk to Trunk* list. To disable this feature, select *Restricted*.
- 3 Use the *AutoExt* fields to select the extension to which calls are routed when they are not answered. You can select different extensions for different times of the day. The default settings route all calls to the Auto Attendant (extension 500). Click *Apply* to add the group.
- 4 Repeat these steps to add additional groups, if desired, and then click *OK*.

Modifying an E1 Group

You may want to modify a digital line card group to change its name, Auto Extension assignments, or other parameters. When you modify a group, the changes affect all the Digital Line Cards assigned to that group. To modify a digital line card group:

- 1 On the *Digital Line Cards* tab, select *ISDN PRI Group List* from the *Select Device Type* drop-down list and click *Apply*.
- 2 Select the group that you want to modify.
- 3 Click *Modify*.
- 4 Make the changes that you want to the group parameters. Click the Help button for more information about dialog box fields.
- 5 Enable the *On Line* check box to bring the group on line.
 *The group does not come online unless the card and the span are online.*
- 6 Click *Apply* to effect the changes.
- 7 Click *OK*.

Changing E1 Group Membership

You may want to change the channel membership in an E1 group to accommodate changing needs.

To change group membership:

- 1** On the *Digital Line Cards* tab, select *ISDN PRI Group List* from the *Select Device Type* drop-down list and click *Apply*.
- 2** Select the group for which you want to change membership.
- 3** Click *Membership*.
- 4** To add a channel to the Member List, select the channel in the *Non Member List* and click <<. If you select the *Copy Group Settings to Channels* check box, the system copies the settings of the selected group to each channel that you add or remove. If you do not select this check box, the channel settings are not changed.
- 5** Optionally, enable the *Refresh Channels on Add/Remove* check box. This refreshes each channel as you add or remove it.
- 6** To remove a channel from the *Member List*, select the channel in the *Member List* and click >>.

Each channel must belong to a group. A channel can belong to only one group at a time. You cannot move a channel from the members list to the non-members list of a group unless the system can assign the channel to another group. If a channel has never been a member of another group, the system cannot determine a group to which it can move the channel, so it cannot remove the channel from the member list. If a channel has been a member of another group in the past, the system moves the channel to the group of which the channel was most recently a member.

Example: By default, the system creates two groups, Group 1 and Group 2, and places all channels in Group 1. If you try to move a channel to the non-member list of Group 1, the operation fails. If you select Group 2, click *Membership*, move a channel from the non-member list to the member list, and then move the same channel back to the non-member list, the operation succeeds because the channel was previously a member of Group 1. If you then view the Group 1 membership list, it contains the channel you just removed from Group 2.

- 7** Click *Close*.

Removing an E1 Group

You may want to remove groups if you no longer need them.

To remove a group:

- 1 On the *Digital Line Cards* tab, select *ISDN PRI Group List* from the *Select Device Type* drop-down list and click *Apply*.
- 2 Select the group you want to remove.
- 3 Click *Remove*. A prompt appears asking if you want to remove the group.
- 4 Click *Yes* to remove the group.

Modifying E1 Card Channels A channel can take a single call. This section describes how to modify channels for an installed E1 card and how to view the status of an existing channel.



CAUTION: *Do not modify channels unless a 3Com Technical Support representative advises you to do so. Modifying an ISDN channel disconnects any existing calls on that channel.*



If you use Auto Discovery to add channels on an E1 PRI line, note that the 30 channels discovered are numbered 1 through 15, and 17 through 31. This reflects the physical channel mapping on the E1 interface, where channel 16 is the ISDN D-channel, used for signaling.

To modify a channel on an installed E1 card:

- 1 On the *Digital Line Cards* tab select *ISDN PRI Channel List* from the *Select Device Type* drop-down list and click *Apply*.
- 2 Select the channel that you want to modify.
- 3 Click *Modify*.
- 4 Fill in or change the fields in the appropriate Modify Channel dialog box. Click the Help button for more information about dialog box fields,
- 5 To bring the card online, enable the *On Line* check box. Click *Apply* and then click *OK*.

Viewing the Status of an E1 Card Channel

To view the status of a channel on an installed E1 card:

- 1 On the *Digital Line Cards* tab, select *ISDN PRI Channel List* from the *Select Device Type* drop-down list and click *Apply*.
- 2 Select the channel for which you want status information.
- 3 Click *Status*.
- 4 View the status of the channel and then refresh the *Channel Status* dialog box.
 - a From the *Dialog Refresh* drop-down list, select:
 - **Manual** — To manually refresh the *Channel Status* dialog box each time that you click the *Apply* button.
 - A time interval (**5, 10, 15, 30, or 60** seconds) — To refresh the *Channel Status* dialog box at the specified intervals.
 - b Enable the *Device Refresh* check box.
- 5 Click *Apply* and then click *OK*.

Viewing DSP (Digital Signal Processor) Details

To view DSP (Digital Signal Processor) details:

- 1 Return to the *Digital Line Cards* tab.
- 2 From the *Select Device Type* list, select *T1/ISDN Board List* and click *Apply*.
- 3 Select the board you want and click *Status*.
- 4 In the *Board Status* dialog box, select a DSP from the *DSP List* and click *Details*.
- 5 Click *Close* to close the *DSP Status* window.

Modifying IP Settings for an E1 Card

You can modify the IP settings for an E1 card to meet changing requirements.

3C10165D E1 Card Configuration Notes

- 3C10165D E1 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 do not support DHCP option 184. Before you install a 3C10165D card at a site that is remote from the

system's NCP, you must first discover the card by connecting it to the same subnet as the NCP. That procedure is described in "Setting Up a Digital Line Card at a Remote Location" on page 214.

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

To modify the IP settings of a Digital Line Card:

- 1 Select *NBX NetSet > Device Configuration > Digital Line Cards*.
- 2 From the *Select Device Type* drop-down list, select *T1/ISDN Board List*.
- 3 Click *Apply*.
- 4 Select the board (ISDN PRI) for which you want to change the IP settings.
- 5 Click *IP Settings*.
- 6 To assign IP addresses automatically, enter the first address in the *First IP Address* field. The system sequentially adds the remaining addresses. 3C10165D E1 Digital Line Cards work need only one IP address.

To assign IP addresses one at a time:

- 1 In the *Digital Line Card IP Settings* dialog box, click *Assign Addresses Individually*.
3C10165D E1 Digital Line Cards work need only one IP address, so the *Assign Addresses Individually* button is not present for these cards.
- 2 Enter the desired IP addresses for the channels.
- 3 Enter the mask number for your site in the *Common Subnet Mask* field.
- 4 Enter IP address for the *Common Default Gateway*.
- 5 Click *Apply*.
- 6 Click *OK*.
- 7 In the *Digital Line Card IP Settings* dialog box, click *Apply*.
- 8 Click *OK*.

Removing an E1 Digital Line Card



You can remove a Digital Line Card at any time.

CAUTION: Removing a Digital Line Card may affect your Dial Plan.

To remove a Digital Line Card:

- 1** Select *NBX NetSet > Device Configuration > Digital Line Cards*.
- 2** From the *Select Device Type* drop-down list, select *T1/ISDN Board List* and click *Apply*. A list of installed T1, ISDN PRI, and ISDN BRI boards appears in the *T1/ISDN Board List*.
- 3** Select the board (Digital Line Card) you want to remove from the list.
- 4** Click *Remove*. A dialog box prompts you to confirm the removal.
- 5** Click *Yes*.

Configuring and Managing T1 Digital Line Cards

These sections describe how to add and configure a T1 Digital Line Card to connect to a T1 service provided by the local telephone company:

- Adding a T1 Digital Line Card
- Configuring a T1 Digital Line Card for the DS1 Protocol
- Configuring a T1 Digital Line Card for ISDN PRI Signaling
- T1 Card Status Lights
- Modifying a T1 Card
- Modifying a T1 Group
- Modifying T1 Card Channels
- Modifying IP Settings for a T1 Card
- Removing a T1 Digital Line Card

The NBX NetSet utility refers to Digital Line Cards as cards or boards.

3C10116D T1 Digital Line Cards have expanded capabilities that are described in these topics:

- Setting Up a Digital Line Card at a Remote Location
- Setting Up T1/E1 Logging
- Viewing CSU State Information and Statistics
- Using Loopback Tests

You can configure the T1 Digital Line Card to use one of two types of signaling:

- DS1 protocol (sometimes referred to as "Standard T1")

- ISDN PRI (Primary Rate Interface) signaling



By default, the Auto Discovery process selects DS1 as the signaling type for a T1 Digital Line Card.

The 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 these procedures:

- Preparing the NBX System for T1 Cards
- Ordering DID (Direct Inward Dialing) Services for T1
- Enabling Auto Discovery for Digital Line Cards
- Inserting the T1 Digital Line Card

Preparing the NBX System for T1 Cards

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 that the carrier assigns to you do not match the telephone extension numbers that 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 requires several translator entries to handle subsets of the total range. A unique set of entries handles incoming digit sequences from 3500 through 3599, from 3600 through 3699, and each of the other sequences in which the first two digits are unique in the range from 37XX through 44XX.

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

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

Enabling Auto Discovery for Digital Line Cards

To enable Auto Discovery for Digital Line Cards:

- 1** Select *NBX NetSet > System Configuration > System Settings > System-wide*.
- 2** Click the *Auto Discover Digital Line Cards* check box (may already be selected).



Other check boxes may be selected based on previous Auto Discoveries. You do not need to clear these check boxes to install the T1 Digital Line Card. However, it is good practice to clear all check boxes other than the one that you want to select so that the Call Processor does not continue to search for added devices.

- 3** Click *OK*.

Inserting the T1 Digital Line Card

To insert the T1 card:

- 1 Find the MAC address of the T1 card on the label on the card.
- 2 Record the MAC address for the configuration process.
- 3 Select a slot for the T1 card in the chassis and use a Phillips screwdriver to remove the blank faceplate from the slot.
- 4 Insert the T1 card into the slot.
- 5 Slide the T1 card into the chassis until you feel it touch the connectors.
- 6 To seat the T1 card into the connectors, apply firm pressure to both the left and right sides of the front of the card.
- 7 Tighten the left and right screws on the front of the T1 card to secure it to the chassis.



CAUTION: *Wait 3 minutes for the T1 card to initialize and for the system to update its database. The T1 card reboots twice during the initialization process. If you attach a console cable to the COM1 port on the T1 card and use Hyperterm software to view the text output from the card, you see status messages associated with the two reboot processes. See "Connecting a Computer to a Serial Port" on page 330.*



Another way that you can be sure that it is safe to proceed is to examine the status lights on the front panel of the T1 card. After the Auto Discovery process has completed, and before you connect the T1 Digital Line Card to the telephone company's T1 line, the CF (Carrier Fail) light should appear solid green on a 3C10116C card. On a 3C10116D card, the POST, DNLD, CARD and NCP lights should appear solid green. For more information on T1 card status lights, see "T1 Card Status Lights" on page 202.

You are now ready to configure the T1 Digital Line Card for either DS1 signaling or ISDN PRI signaling. Before you configure a T1 card, be sure you have configured the system Dial Plan for your needs as described in Chapter 2.

Configuring a T1 Digital Line Card for the DS1 Protocol

These sections tell you how to use the NBX NetSet utility to set up your T1 Digital Line Card for DS1 protocol:

- T1 DS1 Configuration
- Configuring T1 Groups (DS1)

- Verifying T1 Group Membership (DS1)
- Completing the T1 Configuration (DS1)

Before you configure a T1 Digital Line Card for DS1 protocol, read the cautionary note.



CAUTION: *Wait 3 minutes for the T1 card to initialize and for the system to update its database. The T1 card reboots twice during the initialization process. If you attach a console cable to the COM1 port on the T1 card and use Hyperterm software to view the text output from the card, you see status messages associated with the two reboot processes. See "Connecting a Computer to a Serial Port" on page 330.*



Another way that you can be sure that it is safe to proceed is to examine the status lights on the front panel of the T1 card. After the Auto Discovery process has completed, and before you connect the T1 Digital Line Card to the telephone company's T1 line, the CF (Carrier Fail) light should appear solid green on a 3C10116C card. On a 3C10116D card, the POST, DNLD, CARD and NCP lights should appear solid green. For more information on T1 card status lights, see "T1 Card Status Lights" on page 202.

T1 DS1 Configuration

To set up the T1 card for the DS1 protocol:

- 1 On the *Digital Line Cards* tab, select *T1/ISDN Board List* from the *Select Device Type* list, and click *Apply*. All Digital Line Cards (T1, E1, or BRI-ST) that the system has discovered appear in the list. By default, the NBX system autodiscovers a T1 Digital Line Card as a T1 DS1 card and displays it in the list as T1 (not PRI).
- 2 From the list, select the new T1 Digital Line Card. Use the MAC address of the T1 Digital Line Card to identify the card in the list. You recorded the MAC address before inserting the card.
- 3 Click *Modify*.
- 4 Scroll through the *Channel List* to verify that the system lists all 24 channels. The channel numbers appear after the MAC address, separated by a hyphen.

Example:

00:e0:bb:00:bd:f0-4...New Trunk

The 4 after the hyphen indicates channel number 4.

- 5 To change the name of the T1 Digital Line Card, enter a new name in the *Board Name* field. The name you choose helps identify this card in lists that contain similar cards. You can use alphanumeric characters, hyphens, and underscores. The maximum name length is 30 characters, but some dialog boxes truncate the name field to 15 characters.
- 6 Click *Apply* to verify your changes.
- 7 Click *OK* to exit.

Connecting the T1 Line and Activating the Span

To connect the T1 line and activate the span:

- 1 Plug the T1 line into the T1 Digital Line Card.
- 2 On the *Digital Line Cards* tab, select *T1/ISDN Board List* from the *Select Device Type* list and click *Apply*.
- 3 From the list, select the new T1 Digital Line Card. Use the MAC address of the T1 Digital Line Card to identify the card in the list.
- 4 Click *Modify*. The *Modify Board* dialog box appears.
- 5 Click the *On Line* check box.
- 6 Click *Apply*.
- 7 Click *OK*.
- 8 In the *T1/ISDN Board List*, verify that the entry for this card in the *Status* column changes from *Offline* to *Online*. You may need to wait a minute or two, and then refresh your browser window to see this change.

Verifying the T1 Span Status

To verify the T1 span status:

- 1 On the *Digital Line Cards* tab, select *T1 Span List* from the *Select Device Type* list and click *Apply*.
- 2 Select the span and click *Modify*.
- 3 Enable the *On Line* check box.
- 4 Click *OK*.

- 5 Verify that the word *Ready* appears next to the T1 span list line item that corresponds to this span.

Configuring T1 Groups (DS1)

To configure a T1 DS1 Group:

- 1 On the *Digital Line Cards* tab, select *T1 Group List* from the *Select Device Type* list and click *Apply*.
- 2 From the *T1 Group List*, select *Group 1*.
- 3 Click *Modify*. The *Modify Group* dialog box appears.
 *The fields in the Modify Group dialog box contain default values. No default values are assumed for Called Party Digits or Calling Party Digits.*
- 4 Modify the Wink Wait value:
 - a Select Wink Wait from the Timer Values list.
 - b Type 3000 in the New Value text box.
 - c Click *Apply*.
 - d Ask your telephone service provider to set their Wink Wait value to 3000 msec.
- 5 Modify the Guard value:
 - a Select Guard from the Timer Values list.
 - b Type 2200 in the New Value text box.
 - c Click *Apply*.
 - d Ask your telephone service provider to set their Guard value to 2200 msec.
- 6 Click the *On Line* check box.
- 7 Enter 500 in each of the four *AutoExt* text boxes.
- 8 Click *OK*.

Verifying T1 Group Membership (DS1)

To verify that all channels are in the *Member List* of a T1 Digital Line Card:

- 1 On the *Digital Line Cards* tab, select *T1 Group List* from the *Select Device Type* list and click *Apply*.
- 2 From the list, select the group that you want.
- 3 Click *Membership*. The *Manage Group Membership* dialog box appears.

- 4 Scroll through the *Member List* to verify that all 23 channels are present for each T1 Digital Line Card in the system.

Completing the T1 Configuration (DS1)

To complete the T1 installation:

- 1 On the *Digital Line Cards* tab, select *T1 Channel List* from the *Select Device Type* list and click *Apply*.
- 2 Wait approximately 30 seconds for the status of each channel to change from Ready to Idle.



Click Apply to refresh the list of channels and to see the updated status. If you have connected the Telephone company's T1 line to the T1 Digital Line Card, the Nominal (3C10116C) or the CO (3C10116D) status light on the front panel of the T1 board should now turn on (solid green). If the status light does not turn on and you have the telephone company's T1 line connected, disconnect the T1 line and connect a loopback connector. If the light now turns on, contact the telephone company for assistance with the T1 line. If the light does not turn on, contact 3Com Technical Support.

Enabling and Disabling Echo Cancellation

There are two situations in which it may be desirable to disable echo cancellation on a T1 Digital Line Card.

- An NBX system is connected to a telephone carrier (Central Office) by a T1 Digital Line Card, and the telephone carrier guarantees to provide echo cancellation on all channels, all of the time.
- Two NBX systems are connected together directly using T1 Digital Line Cards and the network between the two is completely composed of digital circuitry, thus eliminating sources of echo.

You can enable or disable echo cancellation for each T1 Digital Line Card.

You cannot enable or disable echo cancellation on individual channels.

Before you enable echo cancellation for a T1 Digital Line Card you must verify that the card is configured for DS1 operation and not ISDN PRI.

To enable or disable echo cancellation:

- 1 On the *Digital Line Cards* tab, select *T1 Span List* from the *Select Device Type* drop-down list and click *Apply*.
- 2 Select the span for which you want to set echo cancellation.
- 3 Click the *Audio Controls* button.
- 4 Enable the *Echo Canceller Enabled* check box to turn on echo cancellation. Remove the check from the *Echo Canceller Enabled* check box to turn off echo cancellation
- 5 Click *OK*.

Configuring a T1 Digital Line Card for ISDN PRI Signaling

These sections tell you how to use the NBX NetSet utility to set up your T1 Digital Line Card for ISDN PRI signaling:

- T1 ISDN PRI Configuration
- Configuring T1 Groups (ISDN PRI)
- Verifying T1 Group Membership (ISDN PRI)
- Completing the T1 Configuration (ISDN PRI)

Before you configure a T1 Digital Line Card for ISDN PRI (Primary Rate Interface) signaling, read the cautionary note.



CAUTION: Wait at least 3 minutes for the T1 card to initialize and for the system to update its database. The T1 card reboots twice during the initialization process. If you attach a console cable to the COM1 port on the T1 card and use Hyperterm software to view the text output from the card, you see status messages associated with the two reboot processes. See "Connecting a Computer to a Serial Port" on page 330.



Another way that you can be sure that it is safe to proceed is to examine the status lights on the front panel of the T1 card. After the Auto Discovery process has completed, and before you connect the T1 Digital Line Card to the telephone company's T1 line, the CF (Carrier Fail) light should appear solid green on a 3C10116C card. On a 3C10116D card, the POST, DNLD, CARD and NCP lights should appear solid green. For more information on T1 card status lights, see "T1 Card Status Lights" on page 202.

T1 ISDN PRI Configuration



When you configure a T1 Digital Line Card for ISDN PRI operation, verify that the Auto Discover Digital Line Cards check box is enabled (System Configuration > System Settings > System-wide).

To configure the T1 card for ISDN PRI signaling:

- 1 On the *Digital Line Cards* tab select *T1/ISDN Board List* from the *Select Device Type* drop-down list and click *Apply*.
- 2 From the list, select the new T1 Digital Line Card. Use the MAC address of the T1 Digital Line Card to identify the card in the list. You recorded the MAC address before inserting the card.
- 3 Click *Modify*. The *Modify Board* dialog box appears.
- 4 To change the name of the T1 Digital Line Card, enter a new name in the *Board Name* field. You can use alphanumeric characters, hyphens, and underscores. The maximum name length is 30 characters.
- 5 From the *Card Type* drop-down list, select *ISDN PRI*.
- 6 Click *OK*. The *Digital Line Cards* tab reappears.
- 7 Wait until the entry for this Digital Line Card in the *Type* column changes to *PRI*. To see the change, you may need to wait a minute or two, and refresh your browser window.
- 8 After the board type changes, from the *Select Device Type* drop-down list, select *ISDN PRI Channel List*.
- 9 Click *Apply*. The dialog box is updated to show the ISDN PRI Channel List.
- 10 Verify that the highest channel in the *Chan* column is 23.

When you configure a T1 Digital Line Card for ISDN PRI signaling, one of the 24 channels is allocated for signaling, leaving 23 for data (voice).

Connecting the T1 Line and Activating the Span

To connect the T1 line and activate the span:

- 1 Plug the T1 line into the T1 Digital Line Card.
- 2 On the *Digital Line Cards* tab, select *T1/ISDN Board List* from the *Select Device Type* list and click *Apply*.
- 3 From the list, select the new T1 Digital Line Card.



To identify the card, look for those cards that have *PRI* in the *Type* column and use the MAC address to identify the specific card. You recorded the MAC address before inserting the card.

- 4 Click *Modify*. The *Modify Board* dialog box appears.
- 5 Click the *On Line* check box.
- 6 Click *OK*.
- 7 In the *T1/ISDN Board List*, verify that the entry for this card in the *Status* column changes from *Offline* to *Online*. You may need to wait a minute or two, and then refresh your browser window to see this change.

Verifying the Change in Span Status

To verify that the Span status changes from *Offline* to *Ready*:

- 1 On the *Digital Line Cards* tab, select *ISDN PRI Span List* from the *Select Device Type* list and click *Apply*.
- 2 Select the span from the list and click *Modify*.
- 3 Enable the *On Line* check box and click *OK*.
- 4 Verify that the word *Ready* appears in the *ISDN PRI Span List* line item that corresponds to this span.

Configuring T1 Groups (ISDN PRI)

To configure a T1 ISDN PRI Group:

- 1 On the *Digital Line Cards* tab, select *ISDN PRI Group List* from the *Select Device Type* list and click *Apply*.
- 2 From the *ISDN PRI Group List*, select *PRI Group 1*.
- 3 Click *Modify*. The *Modify Group — T1 ISDN PRI* dialog box appears.
- 4 To modify the name of the group, enter a new name in the *Group Name* field. You can use alphanumeric characters, hyphens, and underscores. The maximum name length is 30 characters.
- 5 To prohibit call transfers between trunk lines, select *Restricted* (the default value) from the *Trunk to Trunk* drop-down list. Otherwise, select *Unrestricted*.
- 6 Click the *On Line* check box.
- 7 Verify that 500 (the default) is in each of the four *AutoExt* text boxes.
- 8 Click *OK*.

Verifying T1 Group Membership (ISDN PRI)

To verify that all channels are in the Member List:

- 1 On the *Digital Line Cards* tab, select *ISDN PRI Group List* from the *Select Device Type* list and click *Apply*.
- 2 Select the group you want.
- 3 Click *Membership*. The Manage Group Membership dialog box appears.
- 4 Scroll through the *Member List* to verify that all 23 channels are present.
- 5 To change the membership of a group, you must move channels from the *Non-Member List* to the *Member List*. You cannot move a channel from the *Member List* to the *Non-Member* list of a group.

For each channel that you move to the Member List, you have two options:

- a To copy the current group settings, and apply them to the channel in the new group, enable the *Copy Group Settings to Channels on Add/Remove* check box.
- b To update the status of a channel, enable the *Refresh Channels on Add/Remove* check box.

Completing the T1 Configuration (ISDN PRI)

To complete the T1 ISDN PRI installation:

- 1 On the *Digital Line Cards* tab, select *ISDN PRI Channel List* from the *Select Device Type* list and click *Apply*.
- 2 Wait approximately 30 seconds for the status of each channel to change from Ready to Idle.



Click Apply to refresh the list of channels and to see the updated status. If you have connected the Telephone company's T1 line to the T1 Digital Line Card, the Nominal (3C10116C) or the CO (3C10116D) status light on the front panel of the T1 card should now turn on (solid green). If the light does not turn on and you have a T1 line connected, disconnect the T1 line and connect a loopback connector. If the light now turns on, contact the telephone company for assistance with the T1 line. If the light does not turn on, contact 3Com Technical Support.

T1 Card Status Lights

The 3C10116C T1 card contains these status lights:

- **CF** — Carrier Fail (when lit, indicates red alarm or blue alarm)
- **RA** — Remote Alarm (yellow alarm)

- **LB** — Loopback (when lit, indicates that the card is in loop-back testing mode; does not indicate any of the red, blue, or yellow alarms)
- **Nominal** — T1 card is framed

The 3C10116D T1 card contains these status lights:

- **CO** — Central Office:
 - Amber — Alarm condition at the remote end or the CO is not connected or available.
 - Green — No alarm condition; the card is connected to the Central office.
- **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.
 - 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 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.

Modifying a T1 Card

These sections describes how to modify a T1 card that is already installed in the system.

- Modifying the T1 Card Name or Type
- Modifying a T1 Span
- Configuring Partial T1 Lines
- Modifying T1 Audio Controls

Modifying the T1 Card Name or Type

You can change the name of a Digital Line Card at any time. You can also set the type to T1 or ISDN PRI.

To modify a T1 card name or type:

- 1** On the *Digital Line Cards* tab, select the board in the *T1/ISDN Board List*.
- 2** Click *Modify*.
- 3** To modify the name of the board, enter a new name in the *Board Name* field. You can use alphanumeric characters, hyphens, and underscores. The maximum name length is 30 characters.
- 4** To change the type of card, in the *Card Type* field, select either *T1* (for T1 DS1 protocol) or *ISDN PRI* (for T1 ISDN PRI).
- 5** Click *OK*.

Modifying a T1 Span

To modify a span:

- 1** On the *Digital Line Cards* tab, select either *T1 Span List* (for T1 DS1) or *ISDN PRI Span List* (for T1 ISDN PRI) from the *Select Device Type* drop-down list and click *Apply*.
- 2** Select the span you want to modify from the *Span List*.
- 3** Click *Modify*.

The dialog box that appears depends on which span list you select, either the T1 DS1 Modify Span dialog box or the ISDN PRI Modify Span dialog box.

- 4** Make the desired changes. Click the *Help* button in the dialog box for detailed information about span parameters.

The number of channels supported per span depends on the configuration of the Digital Line Card. If you configure the T1 Digital Line Card for DS1, it supports 24 channels. If you configure the card for ISDN PRI, it supports 23 channels.

- 5** Click *Apply*.
- 6** Enable the *On Line* check box to bring the span online.
 *The span does not come online unless the card is online.*
- 7** Click *OK* to effect the changes.

Support of AT&T's 4ESS Switch Protocol	4ESS is the AT&T proprietary version of ISDN. You can select the 4ESS protocol when you configure a T1 Digital Line Card for PRI (Primary Rate Interface) operation. If you select the 4ESS protocol, you can optionally use Call By Call Service Configuration which enables you to select one of three access services:
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- Long Distance — The default service if the customer selects the 4ESS protocol, but purchases no other services. Long Distance can be used with SDN but not with MEGACOM.
- MEGACOM — A high-volume outward calling service. MEGACOM can be the default setting.
- SDN (Software Defined Network) — A premises-to-premises service with voice and voice-grade data transport, plus a number of customer-controllable call management and call monitoring features (for example, Virtual Private Networking). You cannot configure SDN as the default setting but you can configure the NBX system dial plan to use SDN.

Selecting the 4ESS Protocol

To select the 4ESS protocol:

- 1 On the *Digital Line Cards* tab, select *ISDN PRI Span List* from the *Select Device Type* drop-down list and click *Apply*.
- 2 From the *CO Switch Protocol* drop-down list, select *AT&T Custom - 4ESS*.
- 3 Click *OK* to enable the 4ESS protocol and exit from the dialog box. Otherwise click *Apply* to enable 4ESS, stay in the *Modify Span* dialog box, and configure Call-By-Call Service. See “Configuring Call-By-Call Service” in the next section.

Configuring Call-By-Call Service

You order the optional Call-By-Call Service from your long-distance carrier only if you order the 4ESS protocol. 3Com does not support Call-By-Call Service with any other protocol.

To configure Call-By-Call Service:

- 1 In the *Modify Span* dialog box, click the *Enable Call-By-Call Service* check box.
- 2 In the *Carrier Identification Code* text box, type the identification code for your long-distance carrier.



Your long-distance carrier can supply this code when you order PRI services, or you can ask the carrier for their code number. Another way to obtain the code is to access the web site for the North American Number Plan Administration (<http://www.nanpa.com>). In the menu in the left frame, expand Number Assignments, and click Carrier Identification Codes. Follow the instructions to download and unzip the two files (Current Feature Group B (950-XXXX) CIC Assignments and Current

Feature Group D (101-XXXX) CIC Assignments). Search the documents to determine the identification code for your long-distance carrier. For example, AT&T is listed next to code 288 in the Group D document.

- 3 From the *Default Outbound Service* drop-down list, select either *MEGACOM* or *Standard (LDS)* as the service to use as the default. You can configure the NBX system dial plan to use a particular service.



Select *MEGACOM* as the default service only if you purchased *MEGACOM* from your long-distance carrier. You cannot select *Standard (LDS)* as the default service if you purchased *MEGACOM*, because these two services do not work together.

- 4 Click *OK*.

Configuring Partial T1 Lines

Sometimes the telephone company supplies a T1 line which has less than the maximum number of channels implemented. This is called a *Fractional, Partial, or Subequipped T1*. For example, you may decide to purchase 15 channels now and implement more later in order to reduce your near-term costs.

Some telephone companies offer Partial T1 lines as their standard offering, and provide fully implemented T1 lines only if you make a specific request. If you are unaware of this policy, outbound calls using the T1 line may fail because, by default, the system places outbound calls using high numbered channels first, and a Fractional T1 typically has the lower numbered channels implemented.

In the *Span Status* dialog box, under *Details of last five calls*, if you see the error message *REQ_CHANNEL_UNAVAIL*, determine if the error is caused by a Partial T1:

- 1 Remove the highest numbered channel from service (set it to offline in the *Modify Channel* dialog box) and retry the outbound call.
- 2 Continue to remove channels until an outbound call succeeds.
- 3 When the first outbound call succeeds, the highest numbered channel still in service represents the number of active (provisioned) channels in the Partial T1.
- 4 Create two groups. Put all of the active channels in one group, and all of the inactive channels in the other. Mark the active group online and the inactive group offline.

Modifying T1 Audio Controls

Audio Controls settings affect individual spans. You can edit these properties:

- Silence Suppression (3C10126D only) — Enables you to override the system-wide setting. For a detailed description of how silence suppression affects audio quality and bandwidth, see “Audio Settings” on page 238.
- Audio Compression (3C10116D only) — Enables you to override the system-wide setting. For a detailed description of how audio compression affects audio quality and bandwidth, see “Audio Settings” on page 238.
- Audio Source Gain — Enables you to adjust the audio gain to resolve volume issues.



CAUTION: *Do not change your Audio Source Gain settings unless you are instructed to do so by a support representative.*

To modify T1 Audio Controls:

- 1 On the *Digital Line Cards* tab, select *T1 Span List* or *ISDN PRI Span List* from the *Select Device Type* list.
- 2 Click *Apply*.
- 3 Select the span you want to modify from the *Span List*. The number of channels supported per span depends on the configuration of the Digital Line Card.
- 4 Click *Audio Controls*. Click the Help button for more information about dialog box fields.

In a normal environment, you should not need to change the Audio Controls from their default settings. If you have an issue with sound quality and you cannot resolve it using the volume controls on the NBX Telephones, contact your technical support representative.

Modifying a T1 Group

A Digital Line Card group is one or more T1 channels that are assigned the same characteristics, such as Channel Protocol and DS1 direction. This section describes how to perform these actions:

- Modifying a T1 Group
- Changing T1 Group Membership
- Removing a T1 Group



CAUTION: Modifying a T1 group disconnects any calls in process on any channels associated with the group.

Modifying a T1 Group

You may want to modify a Digital Line Card group to change its name, Auto Extension assignments, or other parameters. When you modify a group, the changes affect all the Digital Line Cards assigned to that group. To modify a Digital Line Card group:

- 1** On the *Digital Line Cards* tab, from the *Select Device Type* drop-down list, select one:
 - *T1 Group List* (for T1 DS1)
 - *ISDN PRI Group List* (for T1 ISDN PRI)
- 2** Click *Apply*.
- 3** Select the group that you want to modify.
- 4** Click *Modify*. The dialog box that appears depends on the Group List that you selected either the T1 DS1 Modify Group dialog box or the T1 ISDN PRI Modify Group dialog box.
- 5** Make the desired changes to the group parameters. See the Help for details on each parameter.
- 6** Enable the *On Line* check box to bring the group on line.
- 7** Click *Apply* to effect the changes.

Changing T1 Group Membership

You can change the channel membership in a group to accommodate changing needs.

To change group membership:

- 1** On the *Digital Line Cards* tab, select either *T1 Group List* (for DS1), or *ISDN PRI Group List* (for ISDN PRI) from the *Select Device Type* drop-down list and click *Apply*.
- 2** Select the group for which you want to change membership.
- 3** Click *Membership*. The dialog box that appears depends on the group list you select.
- 4** To add a channel to the Member List, select the channel in the *Non Member List* and click <<.

If you select the *Copy Group Settings to Channels* check box, the system copies the settings of the selected group to each channel you add or remove. If you do not select this option, the channel settings do not change.

- 5 Optionally enable the *Refresh Channels on Add/Remove* check box. This refreshes each channel as you add or remove it.
- 6 To remove a channel from the *Member List*, select the channel in the *Member List* and click **>>**.

Each channel must belong to a group. A channel can belong to only one group at a time. You cannot move a channel from the members list to the non-members list unless the system can assign the channel to another group. If a channel has never been a member of another group, the system cannot determine a group to which it can move the channel. Therefore, it cannot remove the channel from the member list. If a channel has been a member of another group the system moves the channel to the group of which the channel was most recently a member.

Example: By default, the system creates two groups, Group 1 and Group 2, and places all channels in Group 1. If you try to move a channel to the non-member list of Group 1, the operation fails. If you select Group 2, click *Membership*, move a channel from the non-member list to the member list, then move the same channel back to the non-member list, the operation succeeds because the channel was previously a member of Group 1. If you then view the Group 1 membership list, it contains the channel you just removed from Group 2.

- 7 Click *Close*.

Removing a T1 Group

To remove a group:

- 1 On the *Digital Line Cards* tab, select either *T1 Group List* (for T1 DS1), or *ISDN PRI Group List* (for T1 ISDN PRI) from the *Select Device Type* drop-down list and click *Apply*.
- 2 Select the group you want to remove.
- 3 Click *Remove*. A prompt appears asking if you want to remove the group.
- 4 Click *Yes* to remove the group.

Modifying T1 Card Channels A channel is either a T1 DS1 or T1 ISDN PRI time slot. Each channel can accommodate a single telephone call. This section describes how to modify channels for an installed T1 Digital Line Card and how to view the status of an existing channel.



CAUTION: *Do not modify channels unless a 3Com Technical Support representative advises you to do so. Modifying an ISDN channel disconnects any existing calls on that channel.*

To modify a channel on an installed T1 card:

- 1 On the *Digital Line Cards* tab, select either *T1 Channel List* (for T1 channels), or *ISDN PRI Channel List* (for T1 PRI channels) from the *Select Device Type* drop-down list and click *Apply*.
The window that appears depends on the channel list you select.
- 2 Select the channel that you want to modify.
- 3 Click *Modify*. The dialog box that appears depends on the channel list that you selected either the *T1 DS1 Modify Channel* dialog box or the *T1 ISDN PRI Modify Channel* dialog box.
- 4 Fill in or change the fields in the appropriate Modify Channel dialog box. See the Help for a description of each parameter. Enable the *On Line* check box to bring the channel on line. Click *Apply* and then *OK*.



The channel does not come online unless the card and the span are online.

Viewing the Status of a T1 Card Channel

To view the status of a channel on an installed T1 Digital Line Card:

- 1 On the *Digital Line Cards* tab, select either *T1 Channel List* (for T1 DS1 channels) or *ISDN PRI Channel List* (for T1 ISDN PRI channels) from the *Select Device Type* drop-down list.
- 2 Click *Apply*.
- 3 Select the channel for which you want status information.
- 4 Click *Status*. A Channel Status dialog box appears.
- 5 The dialog box that appears depends on the channel list that you select.
- 6 View the status of the channel.
- 7 Refresh the Channel Status dialog box.
 - a From the Dialog Refresh drop-down list, select:

- Manual — To manually refresh the *Channel Status* dialog box each time you click the *Apply* button.
 - A time interval (5, 10, 15, 30, or 60 seconds) to automatically refresh the *Channel Status* dialog box at the specified intervals.
- b** Enable the *Device Refresh* check box.
- 8** Click *Apply*, and then click *OK*.

Viewing DSP (Digital Signal Processor) Details

To view DSP (Digital Signal Processor) details:

- 1** On the *Digital Line Cards* tab, select *T1/ISDN Board List* from the *Select Device Type* list and click *Apply*.
- 2** Select the board you want and click *Status*.
- 3** In the Board Status dialog box, select a DSP from the *DSP List* and click *Details*.
- 4** Click *Close* to close the *DSP Status* window.
- 5** Click *Apply* to make the changes.
- 6** Click *OK*.

Modifying IP Settings for a T1 Card

You can modify the IP settings for a T1 Digital Line Card to meet changing requirements.

3C10116D T1 Card Configuration Notes

- 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.
- 3C10116D T1 Digital Line Cards do not support DHCP option 184. Before you install a 3C10116D T1 card at a site that is remote from the system's NCP, you must first discover the card by connecting it to the same subnet as the NCP. That procedure is described in "Setting Up a Digital Line Card at a Remote Location" on page 214.
- 3C10116D T1 Digital Line Cards do not support DHCP lease times of less than 20 minutes.

To modify the IP settings of a T1 Digital Line Card:

- 1** On the *Digital Line Cards* tab, select *T1/ISDN Board List* from the *Select Device Type* drop-down list and click *Apply*.
- 2** Select the board for which you want to change the IP settings and click *IP Settings*.
- 3** To assign IP addresses automatically, enter the first address in the *First IP Address* field. The system sequentially adds the remaining addresses. 3C10116D T1 Digital Line Cards work need only one IP address.

Assigning IP Addresses One at a Time

To assign IP addresses one at a time:

- 1** In the *Digital Line Card IP Settings* dialog box, click *Assign Addresses Individually*.
3C10116D T1 Digital Line Cards work need only one IP address, so the *Assign Addresses Individually* button is not present for these cards.
- 2** Enter the IP addresses that you want for the channels.
- 3** Enter the mask number appropriate for your site in the *Common Subnet Mask* field.
- 4** Enter IP address for the *Common Default Gateway*, and then click *Apply* and *OK*.
- 5** In the *Digital Line Card IP Settings* dialog box dialog box, click *Apply* to effect the changes.

Removing a T1 Digital Line Card



You can remove a T1 Digital Line Card at any time.

CAUTION: Removing a Digital Line Card may affect your Dial Plan.

To remove a Digital Line Card:

- 1** On the *Digital Line Cards* tab, select *T1/ISDN Board List* from the *Select Device Type* drop-down list and click *Apply*.
- 2** From the list, select the Digital Line Card you want to remove.
- 3** Click *Remove*. A dialog box prompts you to confirm the removal.
- 4** Click *Yes*.

Setting Up a Digital Line Card at a Remote Location

Each 3C10116D T1 Digital Line Card and 3C10165D E1 Digital Line Card can function as a standalone unit and communicate with the NBX Network Call Processor over a routed network.

To function as a remote card, the card must have the normal IP settings (IP address, default gateway, and subnet mask), and one extra setting, the IP address of the NBX Network Call Processor.

The 3C10116D and 3C10165D Digital Line Cards can use static IP configuration or they can get their IP configuration from a DHCP server. However, they do not support DHCP option 184 to get the Network Call Processor IP address, so you must perform some manual configuration of the card before you install it in its remote location.

To install a card on a remote network, you must install the card on the same subnet as its Network Call Processor and use the NBX NetSet utility to enable Auto Discovery and to perform some manual configuration. Then you can move the card to its remote location. Auto Discovery downloads the Network Call Processor IP address to the card. The card stores that information in its non-volatile memory.

Configuration Notes

- 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, 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 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 as described in this section.
- 3C10165D E1 Digital Line Cards and 3C10116D T1 Digital Line Cards do not support DHCP lease times of less than 20 minutes.

To configure a 3C10116D T1 Digital Line Card or 3C10165D E1 Digital Line Card for remote operation:

- 1** Be sure your NBX system is set for IP operation, either Standard IP or IP On-the-Fly. (*System Configuration > System Settings > System-wide*.)
- 2** Install the digital line card in an NBX chassis that is on the same subnet as the NBX Network Call Processor. You do not need to power down the chassis when inserting or removing NBX cards.

To help you identify the card in the NBX NetSet utility, make a note of the card's MAC address printed on the component side of the card.

- 3** Enable Auto Discovery:
 - a** Login to the NBX NetSet utility as administrator.
 - b** Click *System Configuration > System Settings > System-wide*.
 - c** Enable the check box labeled Auto Discover Digital Line Cards, and then click *Apply*.

When you insert the card, it begins an initialization sequence. Once the power up tests complete, the card communicates with the NCP, which begins to update its database. Allow at least 3 minutes for both of these processes to be completed. When the card finishes its startup tests and establishes contact with its NCP, the NCP status light on the card's front panel turns green. You can then disable Auto Discover Digital Line Cards.

- 4** From the NBX NetSet main menu, click *Device Configuration > Digital Line Cards* to display a list of available T1/ISDN boards.
- 5** Select the card you just installed and click the IP Settings button.



Unlike earlier NBX Digital Line Cards, the 3C10165D E1 Digital Line Cards and 3C10116D T1 Digital Line Cards use one IP address for all channels on the card.

- 6** In the section titled Manually Assigned IP Settings, look at the boxes labeled First IP Address, Common Subnet Mask, and Common Default Gateway.

If you are using a static IP address for the card:

- a** Enter the card's IP address in the box labeled First IP Address. The address must be appropriate for the remote network where the card will eventually reside.

- b** Enter the subnet mask and default gateway values that are appropriate for the remote network where the card will eventually reside.
- c** Click OK. The card will restart and go through its startup process. After the card finishes its reboot process, proceed to step 7.

If the remote network where the card will eventually reside uses DHCP to assign addresses:

- a** If the First IP Address, Common Subnet Mask, and/or Common Default Gateway boxes have an IP address, change each box to 0.0.0.0, and then click Apply. After the card finishes its reboot process, proceed to step 7.

If the First IP Address, Common Subnet Mask, and Common Default Gateway all show 0.0.0.0, assign some arbitrary IP address to any one box, and then click Apply. The card will restart and go through its startup process again.

- b** When the card finishes its startup process, refresh the card's IP Settings page. You will see the arbitrary IP address you assigned.
 - c** Change each box to 0.0.0.0, and then click Apply. The card will restart and go through its startup process again.
- 7** When the card finishes its startup process, the card is set with the IP address of its Network Call Processor. You can now move the card to its remote location where it will use its saved Network Call Processor IP address to communicate with the NBX system.

Setting Up T1/E1 Logging

The 3C10116D T1 Digital Line Card and the 3C10165D E1 Digital Line Card can generate logging information. The TEP (**T1**, **E1**, Primary Rate Interface) logs are stored on the system disk drive and you can use the NBX NetSet utility to view, download, and delete log files. Each card has a separate log, up to a maximum of five log files. When a log reaches its maximum size, 5 MB, it begins to overwrite the oldest data.

Because TEP logging has a performance cost, it is disabled by default. To enable TEP logging and to receive help interpreting the log results, contact your 3Com NBX Voice-Authorized Partner.

Viewing CSU State Information and Statistics

3C10165D E1 cards and 3C10116D T1 cards have an onboard channel service unit (CSU). You can use the NBX NetSet utility to view near end (local CSU) and far end (central office) state information and statistics about each connected span.

To view CSU statistics:

- 1** Login to the NBX NetSet utility as Administrator and click *Device Configuration > Digital Line Cards*.
- 2** In the Select Device Type list, select *T1 Span List* or *ISDN PRI Span List* and then click *Apply*.
- 3** In the Span List dialog box, select a span and then click the near end and far end statistics button you want.

Click the Help button in the statistics screen for descriptions of the statistics categories.

T1 state information and statistics are reported in two formats - T1.231 format and AT&T TR54016 format. Both formats report the same information but they use different terminology. E1 state information and statistics are reported in a single format - ITU G.826.

Performance statistics are sampled every 15 minutes. The system saves up to 24-hours of data in 15-minute intervals. By default, the statistics screens display data from the most recent 15-minute interval. To see other intervals or data from the entire 24-hour period, use the *Select Interval* controls on the screen. You can display the currently selected data interval in a bar chart by clicking the *Graph* button on the screen.

T1.231 Near End To view T1 Span near end statistics in T1.231 format:

- 1** Log in to the NBX NetSet utility using the administrator username and password.
- 2** In the Select Device Type box, select *T1 Span List* and then click *Apply*.
- 3** When the Span List appears, click a span and then click *T.231 Near End* to open the T.231 Near End Performance screen.
- 4** Click the Help button for details about each dialog box field.

T1.231 Far End To view T1 Span far end statistics in T1.231 format:

- 1 Log in to the NBX NetSet utility using the administrator username and password.
- 2 In the *Select Device Type* box, select *T1 Span List* and then click *Apply*.
- 3 When the Span List appears, click a span and then click *T.231 Far End* to open the T.231 Far End Performance screen.
- 4 Click the Help button for details about each dialog box field.

TR54016 Near End To view T1 Span near end statistics in TR54016 format:

- 1 Log in to the NBX NetSet utility using the administrator username and password.
- 2 In the *Select Device Type* box, select *T1 Span List* and then click *Apply*.
- 3 When the Span List appears, click a span and then click *TR54016 Near End* to open the TR54016 Near End Performance screen.
- 4 Click the Help button for details about each dialog box field.

TR54016 Far-End To view T1 Span far end statistics in TR54016 format:

- 1 Log in to the NBX NetSet utility using the administrator username and password.
- 2 In the *Select Device Type* box, select *T1 Span List* and then click *Apply*.
- 3 When the Span List appears, click a span and then click *TR54016 Far End* to open the TR54016 Far End Performance screen.
- 4 Click the Help button for details about each dialog box field.

G.826 Near End To view E1 Span near end statistics:

- 1 Log in to the NBX NetSet utility using the administrator username and password.
- 2 In the *Select Device Type* box, select *ISDN PRI Span List* and then click *Apply*.
- 3 When the Span List appears, click a span and then click *G.826 Near End* to open the G.826 Near End Performance screen.
- 4 Click the Help button for details about each dialog box field.

G.826 Far End To view E1 Span far end statistics:

- 1 Log in to the NBX NetSet utility using the administrator username and password.
- 2 In the *Select Device Type* box, select *ISDN PRI Span List* and then click *Apply*.
- 3 When the Span List appears, click a span and then click *G.826 Far End* to open the G.826 Far End Performance screen.
- 4 Click the Help button for details about each dialog box field.

Using Loopback Tests

The 3C10116D T1 and 3C10165D E1 cards can respond to commands from the Central Office to loop back data at different points for diagnostic purposes.

You *enable* each loopback test using the NBX NetSet utility. You *initiate* the Local and Framer loopback tests using the NBX NetSet utility. The Line and Payload loopback tests must be initiated by the Central Office or by test equipment emulating Central Office equipment.

For detailed logging information, you can enable TEP logging before you enable loopback testing. However, setting up logging and interpreting the logs are advanced tasks that require help from a support technician. You can see a simple pass/fail result by viewing the span status, as described in “Enabling or Disabling Loopback Tests” on page 220. To see the loopback test status of all spans, use the *Config & Status Report* button on the *Device Configuration > Digital Line Cards* tab of the NBX NetSet utility.

The cards loop back data at the following points and with the following characteristics:

- **Line Loopback** — A loopback in which the signal returned toward the source of the loopback command comprises the full 1.544 Mbits/s signal with bit sequence integrity maintained, no change in framing, and no removal of bipolar violations.
- **Local Loopback:** An internal (within the framer) diagnostic loopback in which the signal returned towards the source is framed.
- **Framer Loopback** — An internal (within the framer) loopback that tests the path up to where framing is introduced.

- **Payload Loopback** — A loopback in which the signal returned toward the source of the loopback command comprises the payload of the received signal (with bit sequence integrity retained) and newly generated ESF framing (not necessarily maintaining the integrity of the channel timeslots, frames, or superframes of the received signal). The newly generated ESF data link contains a valid performance report message with a value of one in every LB-labeled bit position for the duration of the loopback indicating the signal is the result of a payload loopback.

Enabling or Disabling Loopback Tests

You can use the NBX NetSet utility to enable or disable loopback test support in the 3C10116D T1 and 3C10165D E1 cards. By default, loopback test support is disabled. Once enabled, you can initiate the Local and Framer tests. The Line and Payload tests must be initiated by the Central Office or by test equipment emulating Central Office equipment.



CAUTION: *Enabling one or more loopback tests will terminate any active calls on all channels of the selected span and make that span unavailable for calls until loopback testing is disabled.*

To enable or disable loopback support:

- 1 Login to the NBX NetSet utility as administrator.
- 2 Click *Device Configuration > Digital Line Cards > T1 Span List* or *Device Configuration > Digital Line Cards > ISDN PRI Span List*
- 3 Choose a span from the list and click *Modify*.
- 4 Enable or clear the Enable Loopbacks check boxes are required and then click *Apply*.

You can view the results of Local and Framer loopback testing in the Span Status dialog box. To view Span status:

- 1 On the *Digital Line Cards* tab, select *T1 Span List* or *ISDN PRI SPAN List* from the *Select Device Type* list, and then click *Apply*.
- 2 Select the span and click *Status*.

A red alarm indicates that the test failed. No alarm indicates that the test passed.

4

USER CONFIGURATION

This chapter describes these elements of the NBX system:

- Users (including phantom mailboxes)
- Call Pickup
- TAPI Route Points
- Hunt Groups
- Class of Service (CoS)
- Page Zones

Users

You use the User Configuration tab in the NBX NetSet utility to add users and phantom mailboxes to the NBX system and remove them. You can also modify and maintain user profiles and parameters.

To perform these tasks, in the NBX NetSet utility, select *User Configuration > Users* and then see the Help for these buttons: *Add*, *Modify*, *Remove*, and *User Settings*. For information about User Settings that individual users can configure, see Chapter 1 in the *NBX Telephone Guide*.

Phantom Mailboxes

A phantom mailbox is an extension that has no associated physical telephone. A caller can dial directly into a phantom mailbox and leave a message. The person assigned to a phantom mailbox can create and send a message from within the voice mail system and the Auto Attendant can route callers to a phantom mailbox.

Example: A user who is never in the office can use a phantom mailbox to receive and manage messages, even though no telephone is associated with the mailbox extension. The user can call into voice mail to retrieve and send messages, log onto the NBX NetSet utility to manage messages, including having the system forward voice messages using the Off-Site

Notification feature, or use an e-mail client to manage the messages. See "IMAP for Integrated Voice Mail" in Chapter 6.

To create a phantom mailbox:

- 1 Log on to the NBX NetSet utility using the administrator login ID and password.
- 2 In the *NBX NetSet - Main Menu* window, click *User Configuration*.
- 3 On the *Users* tab, click *Add* to open the *User Configuration* dialog box.
- 4 For Extension Number, use any unused extension in your dial plan. Once that extension is assigned to this phantom mailbox, the auto discovery process will not use it when you add new telephones.
- 5 In the Associated Telephone list, click *(none)*. Click the Help button for information about dialog box fields.

To access a phantom mailbox from any telephone, the user calls the extension, presses * during the greeting, and then logs in. The first time the user accesses the phantom mailbox, the system prompts for mailbox initiation information. Once the user sets up a password, the user can use the NBX NetSet utility to set up phone options such as Call Forwarding.

Call Pickup

Call Pickup allows any user who hears a telephone ringing to answer the call on her or his own telephone. To enable this feature, you add telephone extensions to Call Pickup Groups.

Group Numbers

Account for the following when configuring group numbers:

NBX V3000 systems:

- 50 Call Pickup groups:
 - Group 0 through group 31 (extension 500 through 531)
 - Group 32 through group 49 (extension 482 through 499)
- 50 Directed Call Pickup groups (extension 540 through 589)



See the NBX Telephone Guide for user instruction on how to use Call Pickup.

If you select *Auto Add Phones to Call Pickup Group 0* (System Settings > System-wide), every telephone that is added to the system is a member of Call Pickup group 0. Administrators can add and remove users to and

from any of the groups. Users can remove themselves from Call Pickup group 0, but not from any other Call Pickup groups.

Calls to a user who is a member of default Call Pickup Group 0 (extension 500) can be picked up from any telephone. Users can add or remove their own telephone extensions from the group to allow or prevent others from picking up their calls. See the *NBX Telephone Guide* and the User Help.

You can map Call Pickup Groups to user telephone buttons to provide one-touch access to the Call Pickup groups. See “Creating and Managing Button Mappings” in Chapter 3.

To modify call pickup groups and group membership:

- 1 Log on to the NBX NetSet utility using the administrator login ID and password.
- 2 In the *NBX NetSet - Main Menu* window, click *User Configuration > Call Pickup*. Click the Help button for information on dialog box fields.

TAPI Route Points

A TAPI Route Point is a virtual device within the NBX system where calls are held pending action by an external TAPI application. Route points are typically used by call center applications to redirect calls. A redirected call is one that is sent from its original destination (the route point) without being answered, to a new location specified in the external application.

A TAPI Route Point in the NBX system is an extension with a voice mailbox in the normal extension range:

■ **NBX V3000:** 1000 – 3999

You create the TAPI Route Point, configure the NBX system to route calls to it, and then configure the external application to monitor it. For example, you can configure a line card port to send all incoming calls on that line to a specific TAPI Route Point. When a call arrives at the route point extension, it is queued until the external application examines it and then instructs the NCP to redirect the call to a destination specified in the external application. Typically, the redirect action is based on the caller ID information of the incoming call.

Redirect Behaviors Table 28 describes the behavior of TAPI Route Points and redirected calls within the NBX system.

Table 28 TAPI Route Points and NBX System Features

Call Redirected to	Description
Internal extension	If the internal extension has activated Do Not Disturb, a call redirected to that extension goes immediately to the extension's Call Forwarding setting. If the TAPI Line Redirect Timeout is set to a value greater than the extension's Call Forwarding setting and the call is not answered, the redirected call will be handled by the extension's Call Forwarding setting. The system will log a successful redirect. If the TAPI Line Redirect Timeout is set to a value less than the extension's Call Forwarding setting and the call is not answered, the call will return to the route point. For more information, see "Specifying TAPI Line Redirect Timeout" on page 227.
External number	Subject to the route point extension's Class of Service setting. The call connects as soon as the external line resource (line card port, a PRI line, or a T1 channel) is acquired. The caller hears the call progress tones directly from the CO. At this point, the NBX system logs a successful connection. Calls redirected to an external number cannot timeout, even if the call was redirected to a busy or an invalid number.
Call Park extension	If a call has been previously parked at the specified Call Park extension, the redirected call is connected to the parked call. If no call is waiting at the specified Call Park extension, the call returns to its original destination when the TAPI Line Redirect Timeout expires and the external application can redirect it again. After two failures, the call goes to the Call Coverage specified for the Route Point.
Hunt Group extension	Calls redirected to a Hunt Group extension do not timeout. Once the call is passed to the Hunt Group, the system reports that the call has been successfully redirected. Calls can be redirected from a Hunt Group extension. You cannot add a TAPI Route Point extension to a Hunt Group.
Hunt Group member	A Hunt Group takes precedence over a Route Point. If a call arrives on a Hunt Group member phone because it is a member of a Hunt Group, a redirect is not permitted. If a call arrives on the phone's extension (not as a result of a Hunt Group action), the call can be redirected.
Phantom Mailbox	A call can be redirected to a phantom mailbox.

Table 28 TAPI Route Points and NBX System Features (continued)

Call Redirected to	Description
Mapped Line	Calls that arrive through an incoming line that is mapped to a line appearance button on a phone cannot be redirected. If you redirect a call to a mapped line, the call does not timeout. It fails and is routed back to the route group until the caller disconnects.
Bridged Station Appearance	Calls can be redirected to or from a phone that has a bridged station appearance. Once a call to a primary bridged station appearance reaches the secondary bridge station appearance, the call cannot be redirected.
Configurable Operator	Calls can be redirected to a System Operator or a Personal Operator.

TAPI Route Point Capacities When the maximum number of calls on a route point is reached (see Table 29), subsequent calls routed into the route point from an internal extension or through a Virtual Tie Line ring for 10 seconds and are then disconnected. If the call arrives through a line card port, the call continues ringing.

Table 29 TAPI Route Point Capacities

System	Maximum Number of Route Points	Maximum Number of Calls per Route Point
NBX V3000	100	400

Creating a TAPI Route Point To create a new TAPI Route Point, the NBX system administrator performs these steps:

- 1 Log on to the NBX NetSet utility using the administrator login ID and password.
- 2 In the *NBX NetSet - Main Menu* window, click *User Configuration > TAPI Route Points* tab.
- 3 Click *Add* to open the *Add TAPI Route Point* dialog box.
- 4 Enter the appropriate information in the fields. Click the Help button for information on dialog box fields.

Modifying a TAPI Route Point

- 1 Log on to the NBX NetSet utility using the administrator login ID and password.
- 2 In the *NBX NetSet - Main Menu* window, click *User Configuration > TAPI Route Points* tab.
- 3 From the list of TAPI Route Points, select the one you want to modify.
- 4 Click *Modify* to open the *Modify TAPI Route Point* dialog box. Click the Help button for information on dialog box fields.



To modify the password for the TAPI Route Point, you must enter the administrator password for the NBX system in the Current Admin Password field.

Viewing TAPI Route Point Statistics

You can view the statistics for all of the TAPI Route Points on your NBX system. The NBX system starts to accumulate new statistics each time you reboot the system or each time you click the *Reset* button in the TAPI Route Point Statistics dialog box.

To view TAPI Route Point statistics:

- 1 Log on to the NBX NetSet utility using the administrator login ID and password.
- 2 In the *NBX NetSet - Main Menu* window, click *User Configuration > TAPI Route Points* tab.
- 3 Click the *Statistics* button. The Statistics dialog box appears.
- 4 Click the heading of any column to sort the data in ascending or descending order.
- 5 Click *Reset* to erase all data. The NBX system begins collecting new statistical data.

The *Last reset command* field displays the date and time of the most recent Reset. A row of hyphens (-----) indicates no Reset since the most recent system reboot.

The *Last system reboot* field contains the date and time when the NBX system was most recently rebooted.

Click the Help button for information on dialog box fields.

Specifying TAPI Line Redirect Timeout

The TAPI Line Redirect Timeout is a system-wide timer that specifies the amount of time before a redirected call goes back to its original destination, which allows the TAPI application to redirect the call again. When a redirected call times out, the system also sends a failure code back to the TAPI application. After two failures, the call goes to the route point's call coverage option.

To set the TAPI Line Redirect Timeout:

- 1** Log on to the NBX NetSet utility using the administrator login ID and password.
- 2** In the *NBX NetSet - Main Menu* window, click *System Configuration*. *System Settings > Timers*. See the Help for the procedure on setting timers.

Hunt Groups

A hunt group is a set of users that can be accessed by dialing a single extension. A call routed to the hunt group extension can reach any member of the group who is currently logged into the group. A static hunt group is one in which all members are permanently logged in (locked). A dynamic hunt group is one where users can be logged in and out of the group by you, the administrator, or you can allow them to log into or out of the group themselves, using the hunt group password you create.

You can associate one or more of the hunt group login/logout feature codes with a particular group and then map that feature code to a telephone access button to allow users to easily login and logout of the hunt group. The access button light remains lit while the user is logged into the hunt group.

Hunt groups are specified by extension, in these ranges:

- **NBX V3000:** 4000–4099 (All 100 can be assigned.)

To configure hunt groups:

- 1** Log on to the NBX NetSet utility using the administrator login ID and password.
- 2** Click *User Configuration > Hunt Groups* and then see the Help topics associated with these buttons: *Add*, *Modify*, *Remove*, *Status*, and *Feature Mappings*.

Hunt Group Considerations

- For a telephone to participate in a hunt group, the user must be logged into the hunt group. See the *NBX Telephone Guide*.
- When you create a hunt group, you specify one of three types: **linear hunt group**, **circular hunt group**, or **calling group**. Your choice is based largely on the ringing pattern that you want.
- For each group that you define, you also specify:
 - The **Total Timeout** — The length of time in seconds that the call will ring on the group's telephones before the call goes to the group's call coverage point.
 - The **Per-Device Timeout** — The length of time in seconds that each phone rings in the cycle. (Ignored for Calling Groups.)
 - Whether you want the system to **log a phone out of the hunt group if it does not answer**. (Ignored for Calling Groups.)
- For linear and circular hunt groups, the *order* in which a group telephone rings (the telephone's "priority") is the same as the order in which you added it to the group. For calling groups, all phones ring simultaneously.

Linear and Circular Hunt Groups

In linear and circular hunt groups, calls ring sequentially on telephones in the group, but the behavior differs when the time specified in the Total Timeout field elapses:

- If the Total Timeout value is less than the sum of all of the Per-Device Timeout values, a call that is routed to either a linear and circular hunt group rings on some, but not all of the telephones in the group and then is routed to the group's call coverage point.
- If the Total Timeout value is greater than the sum of the Per-Device Timeouts:
 - For a Linear Hunt Group, the call rings in order on each group telephone and then goes to the group's call coverage point. Any time remaining in the Total Timeout is ignored, and the call does not ring again on any telephone in the group.
 - For a Circular Hunt Group, the call rings in order on each group telephone and then, for the remainder of the Total Timeout, begins ringing again through the telephones, in order. Depending on the Total Timeout value, an unanswered call may ring through all telephones in the group multiple times.



If the Total Timeout value exactly matches the sum of the Per-Device Timeouts, the behavior of a single incoming call is the same for both linear and circular hunt groups.

When a **second call** is routed to a linear or circular hunt group, the telephone on which the second call first rings is different:

- For Linear Hunt Group, the new call rings on the first telephone in the group.
- For a Circular Hunt Group, the new call rings on the telephone that is next in the ringing sequence.

Calling Groups

In this special type of hunt group, an incoming call rings on all telephones in the group simultaneously. After the Total Timeout value is reached, a call that is still unanswered is routed to the group's call coverage point.



The value in the Per Device Timeout field has no effect on the behavior of telephones in a calling group.

Call Coverage

For each hunt group, you can define where the NBX system routes an unanswered call (the call coverage point):

- **Voice Mail** — An unanswered call goes to the hunt group extension's voice mailbox, or to a configured operator.
- **Auto Attendant** — An unanswered call goes to the Automated Attendant that you specify.
- **Phone Number** — An unanswered call goes to the extension that you specify, such as the receptionist, or another hunt group.

Class of Service (CoS)

Class of Service (CoS) is a set of calling permissions that you assign to users. Most permissions are subject to the Business Hours parameters: Open, Lunch, and Other. For example, you can create a class that allows toll calls during normal business hours, but denies them at other times.

Additional considerations:

- Emergency calls (such as calls to 911) are not subject to CoS restrictions.
- System-wide Speed Dial numbers are not subject to Class of Service restrictions. For example, if you want to enable calling to a specific toll

number to all users without regard to their CoS settings, create a System Speed Dial for that number.

- When you create a new profile, the system assigns the default CoS unless you specify a different one. If you edit the properties of the default CoS, verify that it contains a minimum set of permissions.
- You can enable or disable Offsite Notification at the system level. The system-wide setting takes precedence over the CoS setting.

Service classes control these types of calls:

- Intercom
- External (local, long distance, international, long distance toll-free, and long distance toll)
- CO Code (optional telephone company services, such as Call Waiting)
- Trunk to trunk transfers
- Off-site Notification
- Configurable operators (destinations pre-selected by the user to which callers are sent if those callers reach the user's voice mail)

To configure Class of Service:

- 1 Log on to the NBX NetSet utility using the administrator login ID and password.
- 2 Click *User Configuration > CoS* and then see the Help screens for these buttons: *Add*, *Modify*, *Remove*, and *View*.

Page Zones

The Page Zone feature allows you to provision a subset of devices within the system as members of a zone. Users then have the ability to page members of that group only, rather than having to page all devices on the system. NBX System Software supports up to nine page zones per system.

The NBX System allows multiple simultaneous zone pages. However, a device that is currently paging or being paged will not respond to another page request.

Page Zone Feature Support

Zone Page supports the following NBX features and desktop applications:

- Caller ID — The LCD on the device originating the zone page displays the zone page's name and extension; the recipients' LCDs do not display the broadcaster's extension.

- Hands Free — A zone page reaches a device that has Hands Free enabled.
- Hold — A zone page reaches a device that has Hold enabled.
- Speed Dial (Personal) — A device is able to store personal speed dial extensions as zone page extensions.
- Speed Dial (System) — A device is able to store system speed dial extensions as zone page extensions.

All other features and desktop applications are not supported. A zone page does not reach a device that has Do Not Disturb enabled.



When zone paging, you cannot include devices from a different NBX Call Processor (NCP) in a local page zone. However, you can call a zone on a different NCP over a Virtual Tie Line (VTL) if your dial plan is configured properly.

To configure Page Zones:

- 1 Log on to the NBX NetSet utility using the administrator login ID and password.
- 2 Click *User Configuration > Page Zones* and then see the Help screens for these buttons: *Add*, *Modify*, and *Remove*.

5

SYSTEM CONFIGURATION

This chapter provides information about using the *System Configuration* function of the NBX NetSet utility to configure system level settings. It covers these topics:

- System Settings
- Speed Dials
- Business Identity
- Security
- TAPI Settings

System Settings

You can use the System Settings tab to configure these system-level items:

- System-wide Settings
- Audio Settings
- Regional Settings
- Date and Time
- Timers
- Ringing Patterns
- Multicast Addresses
- IP Addresses

On the System Settings tab, you can also view the current system settings, such as the software version, the IP address of the system, and the amount of free memory. Table 30 describes the fields.

To view system settings:

- 1 Log on to the NBX NetSet utility using the administrator login ID and password.
- 2 Click *System Configuration > System Settings*. Table 30 describes the System Settings fields.

Table 30 System Settings

Field	Purpose
Software Version	The call control software for the NBX system.
System Serial #	The serial number on the Call Processor circuit board.
Host Name	This is an IP setting. It is a name you can give to the NBX system so you do not have to specify the IP address when accessing NBX NetSet through a browser.
IP Address	The IP address of the NBX system.
Default Gateway	The IP address of the destination host for any IP packet not addressed to a host on the local subnetwork.
Subnet Mask	An IP setting that identifies the network and host portions of an IP address on the network.
Network Protocol	<p>The transport mechanism for voice packets.</p> <p><i>Ethernet only:</i> All communications are at the Ethernet frame layer.</p> <p><i>Standard IP:</i> IP communications are used for traffic between NBX system addresses. Every device needs an IP address.</p> <p><i>IP On-the-Fly:</i> An implementation of IP communications in which Layer 2 (Ethernet) devices are temporarily assigned a Layer 3 (IP) address only when they need to communicate with a Layer 3 device on a different subnetwork. The IP address is assigned from an address pool defined by the NBX system administrator. After the Layer 2 device returns to the idle state the IP address is returned to the pool of available addresses for future use.</p>
MOH MAC Address	The hardware address of the Music-on-Hold device.
Free Memory	Available memory on the NBX system.
Date and Time	The current system date and time. To modify, click the Date and Time button.
System Start Time	The last time the system was initialized (boot time).

System-wide Settings You use the System-wide dialog box to make changes to System-wide settings. Table 31 describes each setting.

To configure system-wide settings:

- 1 Log on to the NBX NetSet utility using the administrator login ID and password.
- 2 Click *System Configuration > System Settings > System-wide*. See the Help for procedures on modifying system-wide settings.

Table 31 System Settings System-wide Dialog Box Fields

Field	Purpose
Host Name	An IP setting for the NBX system. A Host name functions only if you add the name to the name resolution system. If you do not do this, then you must enter the IP address in the browser when you want to access NBX NetSet.
SMTP Domain Name	The name of your SMTP domain. Required for Off-Site Notification by e-mail.
IP Address	The IP address of the NBX system.
Default Gateway	The IP address of the destination host for any IP packet not addressed to a host on the local subnetwork.
Subnet Mask	An IP setting that identifies the network and host portions of an IP address on the network.
Primary DNS	The IP address of the primary DNS server. You must specify at least a primary address to use e-mail Off-Site Notification.
Secondary DNS	The IP address of the secondary DNS server. If you specify two DNS IP addresses, they must be the primary and secondary addresses.
Tertiary DNS	The IP address of the tertiary DNS server.

Table 31 System Settings System-wide Dialog Box Fields (continued)

Field	Purpose
Network Protocol	<p>The transport mechanism for voice packets.</p> <p><i>Ethernet only:</i> All communications are at the Ethernet frame layer.</p> <p><i>Standard IP:</i> IP communications are used for traffic between NBX system addresses.</p> <p><i>IP On-the-Fly:</i> An implementation of IP communications in which Layer 2 (Ethernet) devices are temporarily assigned a Layer 3 (IP) address only when they need to communicate with a Layer 3 device on a different subnet. The IP address is assigned from an address pool defined by the NBX system administrator. After the Layer 2 device returns to the idle state the IP address is returned to the pool of available addresses for future use.</p> <p>If you select IP On-the-Fly in the Network Protocol list, you must return to the Current System Settings window, select IP Addresses and add the IP addresses associated with IP On-the-Fly. There may be unpredictable results in other system functions if you have Network Protocol set to IP On-the-Fly but do not have any IP addresses.</p>
Extensions Start at	<p>The starting extension number used by Auto Discover Telephones.</p> <p>You may select any unused telephone number extension from these ranges:</p> <p>NBX V3000:</p> <p>3-digit dial plan — 100–399</p> <p>4-digit dial plan — 1000–3999</p>
External Prefix	The prefix required for an outside line.
Caller ID Wait Timer	Amount of time to wait for receiving Caller ID information.
Auto Add Phones to Call Pickup Group 0	When selected, this adds telephones to the default Call Pickup Group 0 (zero) when telephones are added to the system. Turn this ON before Auto Discovering telephones if you want the telephones to appear in Call Pickup Group 0.

Table 31 System Settings System-wide Dialog Box Fields (continued)

Field	Purpose
Handsfree on Transfer	<p>This setting defines the way an NBX Business Telephone responds to a <i>transferred</i> call when a user enables the HANS FREE button on the telephone or uses the HANS FREE feature code (100).</p> <p>Transferred calls include:</p> <ul style="list-style-type: none"> ■ Internal calls from other NBX users, both direct and transferred ■ External calls transferred via an automated attendant <p>NOTE: Calls that directly arrive at an NBX Business Telephone via an analog telephone line or Digital Line Card channel ring on the telephone in the normal way. To answer the call, the user must pick up the handset or press the Speaker button.</p> <p>Handsfree on Transfer Enabled</p> <p>When the <i>HANDS FREE</i> button on an NBX Business Telephone is activated and the <i>Handsfree on Transfer</i> function is enabled on the NBX system, a call that is <i>transferred</i> to the telephone causes the telephone to issue a two-second hands-free warning tone.</p> <p>The telephone user does not need to take action to answer the call because, immediately after the warning tone, the call is connected using the speaker phone.</p> <p>Handsfree on Transfer Disabled</p> <p>When the <i>HANDS FREE</i> button is activated but the <i>Handsfree on Transfer</i> function is disabled on the NBX system, a call that is <i>transferred</i> to the telephone rings in the normal manner, whether or not the HANS FREE button is activated.</p> <p>Internal calls cause the telephone to issue a two-second hands-free warning tone. The user does not need to take action to answer the internal call because, immediately after the warning tone, the system connects the call using the speaker phone.</p> <p>If an external call is blind transferred manually to the NBX Business Telephone, the call rings on the telephone in the normal manner and the HANS FREE button is ignored.</p>
Virtual LAN Enabled	Adds a Priority 6 Virtual LAN identifier to each Ethernet frame.
Virtual LAN ID	If the VLAN Enabled box is checked, you must specify the Virtual LAN identifier in this field.
IP VLAN Tagging Enabled	If you enable the IP VLAN Tagging Enabled check box, the NBX system adds VLAN tags to outgoing voice and control packets intended for devices on the VLAN you specified in the Virtual LAN ID text box.

Table 31 System Settings System-wide Dialog Box Fields (continued)

Field	Purpose
System-wide CLIR	Suppresses the transmission of caller ID for outgoing calls. NOTE: For calls over VTL connections, you might need to add a pretranslator to the dial plan. See “Creating a Pretranslator for VTL Calls” on page 65.
Music On Hold	Enables Ethernet multicasts for Music On Hold (MOH). MOH is automatically enabled if Music on Transfer is enabled. MOH Audio should be enabled only if you have a MOH device connected to the system.
Music on Transfer	Enables MOH audio for Call Transfer; requires MOH to be installed and enabled. Music on Transfer is automatically disabled if MOH is disabled.
One Button Transfer	Enables system users to transfer a call by pressing the Transfer button only once. If this box is not checked, call transfers require users to press the Transfer button once to start the call transfer and another time to complete the transfer of the call.
NBX Messaging	Allows you to enable or disable NBX Messaging after you install a third-party messaging license. By default, this check box is selected but not accessible until you install a third-party messaging license. If you disable NBX Messaging by clearing this check box, all NBX Messaging icons and headings become inactive throughout NBX NetSet. (NBX Messaging must be enabled for Configurable Operators to function.)
Third-Party Messaging	This check box is active only if you have installed a third-party messaging license. You can enable the third-party messaging application by selecting this check box or by clearing the <i>NBX Messaging</i> check box.
Pulse Dialing	Enables pulse dialing for all telephones in the system.

Audio Settings

Audio Settings enable you to affect the network impact of your audio packets by enabling or disabling compression, silence suppression, and echo suppression. You can enable and disable these settings for the entire system and then override the system-wide setting for individual devices.

Compression Overview

Before voice traffic can be transmitted over a digital network, the audio waveform, an analog signal, must be encoded into a digital format. The digitized audio is packetized and delivered over the network to a destination, and then decoded back into a voice waveform. Software called a codec (coder/decoder) converts the audio information between digital and analog formats.

Digitized audio formats have different properties. Each format represents a compromise between bandwidth and audio quality, that is, high quality audio typically requires more network bandwidth. Compressing the digitized audio data can conserve bandwidth with little compromise in audio quality, but compression requires increased processing overhead when encoding and decoding the audio information. Too much processing overhead can introduce delay.

Table 32 lists the codecs supported by the NBX system and describes the characteristics of each one.

Table 32 Supported Codecs

Codec	Description
G.711 No Compression	An International Telecommunications Union (ITU) standard for audio encoding. Encoding and decoding is fast and support is widespread. Also called MULAW or μ LAW. There is a slight variation called A-law used in European telephone systems. G.711 provides high quality audio at 64 kbit/sec. G.711 encoding is used by telephone companies worldwide to provide "toll-quality audio."
ADPCM Medium Compression	Adaptive Differential Pulse Code Modulation (ADPCM) provides good quality audio at a lower bitrate (32kbit/sec.) than G.711. The NBX system uses the International Multimedia Association (IMA) version of ADPCM.
G.729 High Compression	G.729, an ITU standard, employs a more sophisticated compression technique than ADPCM and it is supported worldwide. The G.729A codec compresses the audio information to 8kbit/sec., although processing overhead results in actual bandwidths greater than 8kbit/sec.

Codecs and NBX Devices

Codecs reside on the NBX devices — telephones, analog terminal adapters, and so forth. Some older NBX devices do not support the latest codecs so during call setup NBX devices negotiate an encoding scheme that is supported by both devices (or all devices on a conference call).

Table 33 lists each NBX device that must encode or decode audio and shows how each device supports the available codecs.

Table 33 Audio Encoding Supported by NBX Devices

NBX Device	Part Number	G.729	ADPCM	G.711
NBX 1102, 2102, and 2102-IR Business Telephones	3C10121 3C10226A 3C10228IRA	No	Yes	Yes
	3C10226PE 3C10226B 3C10228IRPE 3C10228IRB 3C10281PE 3C10281B	Yes	Yes	Yes
NBX 3102 Business Telephone	3C10402A	Yes	Yes	Yes
NBX 2101 Basic Telephones	3C10248PE 3C10248B	Yes	Yes	Yes
NBX 3101, and 3101SP Basic Telephones	3C10401A 3C10401SPKRA	Yes	Yes	Yes
NBX Analog Terminal Adapter	3C10120 3C10120B	No	Yes	Yes
	3C10400	Yes	Yes	Yes
NBX Analog Terminal Card	3C10117 3C10117B-INT	No	Yes	Yes
	3C10117C	Yes	Yes	Yes
NBX Analog Line Card	3C10114 3C10114-ANZ	No	Yes	Yes
	3C10114C	Yes	Yes	Yes
NBX Digital Line Card	3C10116, 3C10116B 3C10116C 3C10164-ST (BRI) 3C10164C-ST (BRI) 3C10165 3C10165C	No	Yes	Yes
	3C10116D 3C10165D	Yes	Yes	Yes

Silence Suppression Overview

Silence suppression is a method of reducing the number of packets transmitted during a conversation. Silence suppression can help you avoid dropped packets on a congested network. During a conversation there are periods of silence. A packet of silence takes up as much bandwidth as

a packet with audio data. If you enable Silence Suppression, the phone sends a 'silence indicator' when it senses the start of a silent period and it suppresses all subsequent voiceless frames. When another NBX device receives this indicator, it generates and inserts white noise until it receives the next frame that contains audio data. If you enable Silence Suppression, a careful listener might notice a difference in audio quality. The background white noise generated by the receiving phone is subtly different from the silence in an audio stream.



Silence suppression and echo suppression (described next) both result in compromises to audio quality. Do not enable suppression settings unless you are trying to solve network bandwidth congestion issues that you cannot solve through other means such as increasing network capacity.

Echo Suppression Overview

Echo suppression is a method of reducing or eliminating audio feedback (echo). The NBX system has internal mechanisms to deal with echo, however, external conditions can induce echo that is beyond the scope of the internal mechanisms. Echo on external calls is usually due to older equipment at the phone company's central office. Echo can also be caused by user behavior. If a caller has the phone volume turned up and then that caller does not hold the phone flush to their ear, the handset's mouthpiece can pick up audio from the ear piece, which can cause echo.

To enable audio settings, select *System Configuration > System Settings > Audio Settings*.

Table 34 System Settings Audio Settings Dialog Box Fields

Field	Purpose
Bandwidth Controls	reduce the number or the size of packets transmitted during a conversation. You can enable bandwidth controls to help reduce network congestion, however, enabling bandwidth controls can compromise audio quality.
System-wide Silence Suppression	Reduces the number of packets transmitted during a conversation by not transmitting packets during times of silence during a conversation. Enabling this check box enables silence suppression on <i>all</i> conversations.
System-wide Silence Suppression on VTL Calls	Implements silence suppression on calls carried over Virtual Tie Lines.

Table 34 System Settings Audio Settings Dialog Box Fields (continued)

Field	Purpose
System-wide Audio Compression	Select one of these compressions settings as the default setting for all calls: None - G711 — No compression, G.711 (MULAW) audio encoding Med - ADPCM — Medium compression, ADPCM audio encoding High - G729 — High compression, G.729 audio encoding. You can override the system wide setting for individual telephones, line card ports or T1/E1 spans (3C10116D and 3C10165D only).
Audio Compression on VTL Calls	Select one of these compressions settings as the default setting for calls over virtual tie lines: None - G711 — No compression, G.711 (MULAW) audio encoding Med - ADPCM — Medium compression, ADPCM audio encoding High - G729 — High compression, G.729 audio encoding.
Echo Troubleshooting controls can reduce or eliminate audio feedback (echo) during conversations. The NBX system has default mechanisms to deal with echo, however, extreme conditions can induce echo that is beyond the scope of the default mechanisms.	
NOTE: When additional echo suppression is enabled for analog and digital line cards, echo should be reduced or eliminated. However, in rare conditions, the additional echo suppression may cause incoming audio to occasionally fade in and out.	
NBX Handset Acoustic Echo Suppression	Enables additional echo suppression on calls between internal extensions. Acoustic echo typically occurs when the phone volume is set to maximum and audio feeds back from the ear piece to the mouthpiece.
Analog Line Cards Echo Suppression	Enables echo suppression on calls between internal extensions and outside callers.
Digital Line Cards Echo Suppression	Enables echo suppression on calls that use digital line connections.

Regional Settings After you install regional software and components from the regional packs, you can enable regional settings. To enable these regional settings in NBX NetSet, you select the appropriate country and language for the system voice prompts, the technical tones and cadences, and the online user documentation.

To enable regional settings, select *System Configuration > System Settings > Regional Settings*. See the Help for the procedure on enabling regional settings.



See “*Regional Software*” on page 295 for information on installing regional language packs.

Advanced Regional Settings

The NBX system also allows you to choose different regional settings for the system voice prompts, the technical tones and cadences, and the online user (not administrator) documentation. For example, you may require local tones and cadences but may want the documentation to be in English and the voice prompts in Australian English.

You can select separate regional settings for:

- Voice prompts — The Auto Attendant voice prompts.
- Documentation — The *NBX Telephone Guide*, the NBX NetSet user Help, the LabelMaker utility, and the quick reference cards.
- Tones and Cadences — The tones and the patterns of rings (cadence) versus silence. Tones and cadences vary from country to country.
Examples:
 - United States ringing cadence (pattern) is 2 seconds of ring followed by 4 seconds of silence.
 - United Kingdom ringing cadence is 2 rings within approximately 2 seconds followed by 2 seconds of silence.
 - United States busy tone is 0.75 seconds of tone followed by 0.75 seconds of silence.

To enable different regional settings:

- 1 Log on to the NBX NetSet utility using the administrator login ID and password.
- 2 Click *System Configuration > System Settings > Regional Settings > Advanced*. See the Help for procedures on selecting regional settings.

Date and Time If necessary, you can set the NBX system date and time. It is important that the date and time are accurate because the system date and time affect these NBX features:

- The NBX telephone display panel
- Business hours behavior
- Time-dependent prompts in the Auto Attendant
- Time and date stamp on voicemail

To set the system date and time:

- 1 Log on to the NBX NetSet utility using the administrator login ID and password.
- 2 Click *System Configuration > System Settings > Date and Time*. See the Help for the procedure on setting the system date and time.

Timers System timers enable you to set time-out periods for the NBX system features that are described in Table 35.

To set timers:

- 1 Log on to the NBX NetSet utility using the administrator login ID and password.
- 2 Click *System Configuration > System Settings > Timers*. See the Help for the procedure on setting timers.

Table 35 System Timers Fields

Field	Purpose
Forward Voice Mail On Timeout	When a telephone's FWD VMAIL button is <i>enabled</i> , this field specifies the duration of ringing before a call is forwarded to voice mail. If you set this time to under 6 seconds, caller ID information is not captured in voicemail.
Forward Voice Mail Off Timeout	When a telephone's FWD VMAIL button is <i>disabled</i> , this field specifies the duration of ringing before a call is forwarded to voice mail.
Line Port Hold Timeout	For a call originating on an outside line (Analog Line Card port), the length of time that the call remains on hold before it rings at the extension that placed the call on hold.
Call Park Timeout	The length of time that a call can be parked before it rings at the extension that parked the call.

Table 35 System Timers Fields (continued)

Field	Purpose
Conference Timeout	The length of time before a conference attempt is abandoned. Applies to a blind (unannounced) conference only. The timeout takes effect under these conditions: <ul style="list-style-type: none"> ■ Two people, A and B, are involved in a call and one of them attempts to blind conference another person, C. ■ C does not answer and C's voice mail does not pick up the call. After the Conference Timeout period, the system stops ringing C's telephone, stops attempting to conference with C, and reverts to the call between A and B.
Transfer Timeout	The length of time that a transferred call attempts the transfer before it rings back to the caller's extension.
TAPI Line Redirect Timeout	The length of time before a call redirected from a TAPI route point by an external application goes back to its original destination. After two failures, the call goes to the TAPI route point's call coverage option. For more information, see "TAPI Route Points" on page 223.

Ringing Patterns

You can set system-wide ringing patterns to distinguish between internal and external calls. You can choose one, two, or three rings to distinguish between internal and external calls.



Do not confuse ringing patterns with ringer tones, which NBX system users can set for their telephones using NBX NetSet. For information on setting a user's ringing tones, see the NBX Telephone Guide or the User Help.

To set ringing patterns

- 1 Log on to the NBX NetSet utility using the administrator login ID and password.
- 2 Click *System Configuration > System Settings > Ringing Patterns*. See the Help for instructions.

Multicast Addresses

The NBX system uses IP multicast addressing to distribute information for these system features:

- Mapped line appearances
- Music on hold
- Internal page

- External page
- Conference calls

These features are available on Layer 2 and Layer 3 IP devices. The IP implementation uses Internet Group Management Protocol (IGMP) to transmit and distribute the necessary data and audio.



If you configure your NBX system to use IP On-the-Fly or Standard IP and your switches use IGMP Snooping, you must have an IGMP Host on the network. Typically, an IGMP Host is an IP Multicast Router or a switch that has IGMP Query capability.

The NBX system IGMP is an implementation of administratively scoped IP multicast that uses three scopes of administration:

- **Local scope** — Limited by local routers with IP addresses 239.255.0.0 through 239.255.0.16
- **Organizational local scope** — Limited by boundary routers with IP addresses 239.192.0.0 through 239.192.0.14
- **Global scope** — IP addresses 224.2.0.0 through 224.2.127.253

IGMP may not be available in all systems or network topologies. All of the routers between the various components must support IGMP and the necessary router protocols to establish a path for the IP multicast packets.

Each event that occurs in an IGMP setup, such as taking a telephone off the hook, causes a packet of 200 Kb to 300 Kb to be sent.

The default settings for the IP multicast addresses should work in most network environments. Certain addresses are reserved.



The MAC address and the IP address displayed on any one line of the Multicast Address List window are not related.

There are two methods for selecting multicast addresses:

- **Change IP** — Lets you select a starting address for all entries. Changing IP multicast addresses is a quick way to change the range of NBX system multicast addresses, to avoid conflicts with other equipment on your network.
- **Change bins** — Lets you change a single entry by selecting from a list of available bins. Changing IP bins is useful for changing a single address that may conflict with another system device. Consult your

network administrator to determine which address is in conflict and the new address to choose.

To change multicast addresses:

- 1** Log on to the NBX NetSet utility using the administrator login ID and password.
- 2** Click *System Configuration > System Settings > Multicast Addresses*. See the Help for instructions.

IP Addresses The IP Addresses window allows you to add or delete a range of IP On-the-Fly addresses.



The IP Addresses button appears only if you have IP On-the-Fly enabled in System Configuration > System Settings > System-wide.

To add IP addresses:

- 1** Log on to the NBX NetSet utility using the administrator login ID and password.
- 2** Click *System Configuration > System Settings > IP Addresses*. See the Help for the procedure on adding or deleting IP addresses.

Speed Dials

You can create up to 100 System Speed Dial numbers. You can also create system speed dial and personal speed dial button definitions and assign them to groups. Do not confuse speed dial codes with extension numbers.

Any telephone in a Telephone Group has access to the same button definitions. Users can create personal speed dial definitions for buttons that do not already have a button mapping. Users can also change definitions for any buttons mapped as personal speed dial buttons, even if those buttons are defined in the Group Button Mappings.

System speed dial numbers are not subject to Class of Service (CoS) restrictions, so a speed dial number mapped to a number that is a toll call is available to users even if their CoS does not allow toll calls. Personal speed dial numbers are subject to CoS.

To set up system speed dials:

- 1 Log on to the NBX NetSet utility using the administrator login ID and password.
- 2 Click *System Configuration > Speed Dials*. See the Help for these speed dial procedures:
 - Adding or modifying a system speed dial
 - Removing a system speed dial
 - Printing system speed dials

Business Identity

You can configure information about your business, such as business address and hours, including time of day service modes. You can also view the current mode and force the system into a different mode.

To enter business information:

- 1 Log on to the NBX NetSet utility using the administrator login ID and password.
- 2 Click *System Configuration > Business Identity*. See the Help for procedures to modify these types of information:
 - Business information
 - Business hours
 - System mode

Business Information

You can enter basic information about your business on this dialog box, including name, address, and telephone and Fax numbers.

Business Hours

The business hours dialog box allows you to define business hours for three separate times of day, or service, modes: *Open*, *Lunch*, and *Other*. Any time period that does not fall within these specified hours is considered *Closed*. Business hours are directly linked to time-of-day service modes and can affect other settings in the system, such as the Auto Attendant.

You can manually specify that the system operate in a given mode, or set it to operate automatically. See “System Mode” next. If the system is left in an automatic state, it constantly compares the current time of day and day of week with the business hour tables. The system knows the current

day of the week and proceeds across the tables in a sequential manner, looking for business hours that match the current time of day. The system examines the three tables sequentially: first the Other mode, then the Lunch mode, and then the Open mode. The system moves across the tables until it finds a match. It skips a blank table.

- System Mode** You can specify that the system operate in a given mode, or set it to operate automatically. If necessary, you can force the system into a specific Time of Day Service mode without changing other system settings, such as Business Hours. If the system is left in an automatic state, it constantly compares the current time of day and day of week with the business hour tables.

Security	The Security tab enables an administrator to manage NBX passwords. The most common use is to reset a user's forgotten password. To set system passwords: <ol style="list-style-type: none">1 Log on to the NBX NetSet utility using the administrator login ID and password.2 Click <i>System Configuration > Security</i>. See the Help for procedures on changing these types of passwords:<ul style="list-style-type: none">■ Change Administrator Password — Resets the password for administrator access to NBX NetSet. After you change an administrator password, write it down and store it appropriately. There is no "back door" password to use if this password is lost. If you change the default 4-digit password to an 8-digit or longer password, you cannot revert to a 4-digit password.■ Reset User Password — Resets the password to a user's telephone extension. After you reset the password, instruct the user to change to a new password as soon as possible to ensure system security.■ Auto Attendant Password — Limits access to Auto Attendant settings and functions.■ System Backup Password — Enables automated backups from an external system.■ Reporting Password — Limits access to Call Detail Reports, an optional component of the NBX system. See "Call Reporting" on page 300 for more information.
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- **Virtual Tie Lines Password** — Enables calls over virtual tie lines to “hop off” after they reach the destination NBX system. The call then appears to originate at the destination NBX system. See Chapter 2 for more information on setting up VTLs.
- **Reset Password for a Hunt Group** — The password for the Hunt Group is reset to the extension number of the Hunt Group.
- **Reset Password for a TAPI Route Point** — The password for the TAPI Route Point is reset to the extension number of the Route Point.

TAPI Settings

You must configure system-wide Telephony Application Programming Interface (TAPI) settings before users can download the NBX TAPI Service Provider (NBXTSP). NBXTSP enables a TAPI application on a user’s PC to interact with the user’s NBX telephone. You can set a maximum number of TAPI clients in the system. You can also require users to enter passwords for TAPI devices.

Before you configure system-wide TAPI settings, install the appropriate TAPI software. After you have the software installed, select *System Configuration > TAPI Settings* to configure TAPI settings. See the System Configuration Help for procedures on configuring TAPI settings. See the Downloads Help for procedures on downloading NBX TSP software.



The System Configuration TAPI settings do not apply to TAPI Route Points. For security reasons, the NBX system always requires that an external application supply a password to access a TAPI Route Point.

6

NBX MESSAGING

This chapter describes how to configure these features of NBX Messaging:

- NBX Voice Mail
- Auto Attendant
- Voice Profile for Internet Mail



If you have installed a third-party messaging system, the NBX Messaging screen is not available in the NBX NetSet utility. Follow the documentation for your voice messaging system.

NBX Voice Mail

You use the NBX Voice Mail tab on the NBX Messaging screen to configure system-wide settings for users' voice mailboxes. When you add new users to the system, the system creates a mailbox for each user. Users must record a name announcement, a personal greeting, and create a password before they can retrieve their messages.

The system also creates mailboxes for extensions that are not associated with a particular telephone, such as hunt group extension or a TAPI route point extension.

To configure system-wide voice mail settings, select *NBX Messaging > NBX Voice Mail*. See the Help for instructions.

Table 36 describes the fields on the NBX Voice Mail tab.

Table 36 Voice Mail Settings

Field	Purpose
Max Number of Messages	<p>The number of messages, regardless of length, that an individual mailbox can have. A typical voice message lasts about 20 to 30 seconds.</p> <p>Default: 30 messages</p> <p>Maximum: 512 messages</p> <p>Minimum: 1 message</p>
New Msg Retention (days)	<p>The maximum number of days that a new (unheard) message remains in a voice mailbox before the NBX system marks it for deletion. However, the message is not deleted until the end of this sequence of events:</p> <ul style="list-style-type: none"> ■ The user logs in. ■ The NBX system informs the user that the message will be deleted. ■ The user takes no action to prevent the deletion of the message. ■ The user logs out. <p>Default: 30 days</p> <p>Maximum: 1826 days (5 years)</p> <p>Minimum: 1 day</p> <p>NOTE: When a user listens to a new message or saves it, the system resets the time stamp for that message. The <i>Msg Retention</i> value (described next) controls when the system marks the message for deletion.</p>
Msg Retention (days)	<p>The maximum number of days that a message remains in the mailbox after a user has listened to it or saved it. The NBX system then marks the message for deletion. However, the message is not deleted until the end of this sequence of events:</p> <ul style="list-style-type: none"> ■ The user logs in. ■ The NBX system informs the user that the message will be deleted. ■ The user takes no action to prevent the deletion of the message. ■ The user logs out. <p>Default: 30 days</p> <p>Maximum: 1826 days (5 years)</p> <p>Minimum: 1 day</p>

Table 36 Voice Mail Settings (continued)

Field	Purpose
Max Incoming Msg Length (minutes)	The maximum length, in minutes, for any one message. Default: 5 minutes Maximum: 10 minutes Minimum: 1 minute
Voice Mail Compression Format	The system uses ADPCM as the voice mail compression format for voice prompts and messages.
On Disk Voice Mail Format	The system uses ADPCM as the compression format for voice prompts and mail on your disk.
Disable AA Transfer Prompt	Enables or disables the transfer prompt ("Please hold while your call is transferred") when a call is transferred from the Auto Attendant. Default: disabled (unchecked)

Additional Considerations

- The maximum length of a voice mail message is 10 minutes. If accumulated messages use up the system's message storage space before individual users reach their capacity limits, you should either lower the mailbox settings or upgrade your message storage option. Decreasing mailbox settings does not affect data already in storage. You can also encourage users to delete old messages.
- To view your system's current message storage capacity, select *Operations > Licenses*. The system displays the number of NBX Voice Mail/Auto Attendant ports and storage space (in hours on an NBX 100 system). The number of ports determines how many voice mail sessions and Auto Attendants can be in use simultaneously.
- Each voice mail extension (port) enables one voice message session. If all voice mail extensions are in use, call behavior differs depending on the operation. If the Attendant Console is forwarding calls to the Auto Attendant, and all voice mail extensions are in use, a caller from outside the system hears ringing but no answer until an extension is free. If an internal user transfers a caller to voice mail, but no voice mail extensions are available, the call rings back to the caller's extension.
- As the administrator, you can configure voice mail extensions, settings, passwords, and off-site notification. The NBX NetSet utility also offers reports on the status and usage of voice mail ports and voice mail storage usage by user. For details, see these sections:

- Voice Mail Extensions
- Voice Mail Passwords
- IMAP for Integrated Voice Mail
- Off-Site Notification
- Status
- Port Usage
- User Usage

Voice Mail Extensions

The number of voice mail ports on your system determines the number of voice mail sessions that can take place at one time. The default NBX system includes 4 voice mail ports. You can purchase a license for additional capacity. Each voice mail port has an extension number. See “Extension Settings Overview” on page 52 for more information.

Voice Mail Passwords

To retrieve voice messages, a user must log on using the extension number and password. The password, a 4-digit to 10-digit number, allows access to Personal Settings in the NBX NetSet utility and to voice mail from the telephone.

- The user can change the password from the telephone or by logging in to the NBX NetSet utility
- The administrator can reset a user password to the user’s extension number. See “Security” on page 249 for information on Security features.
- For more information about the menus and features available to users, see the *NBX Telephone Guide* and the Help available on User screens in the NBX NetSet utility.

IMAP for Integrated Voice Mail

NBX Voice Mail uses an Internet Message Access Protocol (IMAP) server, which enables users to access and manage their voice messages through any IMAP-compliant e-mail client. As the administrator, you may need to help users to configure e-mail clients.

Voice mail messages can be sent as mail messages with .WAV file attachments. Double-clicking an attachment activates the computer’s media player, and the voice message plays through the speakers or earphones on the user’s computer. After the user listens to a message, it loses its “new” status, but it remains on the server until the user deletes it using the IMAP e-mail client, the telephone, or the Personal Settings

screen in the NBX NetSet utility, or until the system deletes it when it is older than the system limit (after a warning message to the user). The computer used to receive messages must support multimedia.

Users cannot compose new voice mail messages through their IMAP e-mail client. They must use their NBX Telephones.

To process both e-mail and voice mail on one computer, the user needs:

- An e-mail client that can connect to two servers
OR
- Two instances of the e-mail client

Each e-mail client has a unique configuration interface, so the following procedure is presented in general terms only. See your e-mail client's documentation to determine how to accomplish a specific task.

Setting Up an e-mail Client to Access Messages

- 1 Determine if the e-mail client can communicate with an IMAP 4 server.
Some versions of Microsoft Outlook and Outlook Express, Netscape, and Eudora support IMAP. Check the documentation that came with your e-mail program to determine if it supports IMAP.
- 2 Set the *Incoming Mail Server* to the IP address or to the host name of your NBX system.
Set the *Outgoing Mail Server* to the mail server in use for regular e-mail.
 *The NBX IMAP server cannot perform address translation, so you cannot use the NBX system as your company e-mail server.*
- 3 If necessary, identify the server type as *IMAP*.
- 4 For the username, specify the user's telephone extension number. For the password, specify the user's NBX voice mail password.

Configurable Operators You can allow callers to the system, upon accessing a user's voice mailbox, to instead forward their calls to one of two operators that you or the user has pre-configured. The configurable operators are:

- **System Operator** — This is the standard System Operator for your site.
- **Personal Operator** — This is a destination other than the default System Operator that would be appropriate for a call placed to you.

For example, a Personal Operator might be your executive assistant, or your cell phone, or a hunt group.



If you do not wish to employ configurable operators, the default System Operator (extension 501) remains in place.

The caller reaches either operator by pressing a number (the **access digit**) on the key pad. The access digit for the System Operator is either **0** or **9**; the access digit for the Personal Operator is the digit you did not use for the System Operator. (Access digits cannot be the same for both operators.)

The two operators are functionally identical: either can be referenced as the Personal Operator or the System Operator, depending on your site's requirements. For example, you could designate the extension for the System Operator as your Personal Operator.

What Can You Assign As An Operator?

As System Administrator, you can assign any of the following as an operator destination:

- System extension
A system extension can be, for example, Auto Attendant or another extension within your facility.
- Hunt group
- External phone number
- Virtual Tie Line (VTL) extension

Feature Support For Configurable Operators

The following NBX features and desktop applications support Configurable Operators:

- Call Groups — Call Group mailboxes support the Configurable Operators feature; otherwise, Call Groups defaults apply.
- Hunt Groups — Hunt Group mailboxes support the Configurable Operators feature; otherwise, Hunt Group defaults apply.
- TAPI — TAPI Route Points support the Configurable Operators feature; otherwise, TAPI Route Points defaults apply.
- Virtual Tie Lines (VTLs) — Personal operators can accept a VTL extension.

- Phantom Mailboxes — Phantom mailboxes support the Configurable Operators feature. The destination can be one of the following: internal extensions, Auto Attendant, or voice mail.
- Greeting-only Mailboxes — Greeting-only Mailboxes support the Configurable Operators feature.

How the Configurable Operator Feature Works

Following is a brief description of how the system directs a caller from your voice mail to an operator designated by you:

- 1 If you do not answer a call, the system invokes your voice mail.
 - 2 The caller listens to your pre-recorded voice mail message, which includes the instruction to press an access digit (**0** or **9**) in order to reach the appropriate operator.
-  *Employing a configurable operator means that you must re-record your personal voice mail greeting in order to explain to callers that an operator is available to them if they press the appropriate access digit during the voice mail greeting.*
- 3 The caller presses **0** or **9**.
 - 4 The call is redirected to the operator you designated.

If desired, the caller is able to leave a message, then press **0** or **9** in order to transfer to a configured operator.

Provisioning Operator Destinations

To provision system default operator destinations:

- 1 Log on to NetSet as Administrator.

- 2 Select the *NBX Messaging* window.

The *NBX Voice Mail* window is displayed.

- 3 Click the *Operators* button.

The current system default values for System Operator and Personal Operator are displayed in editable text boxes.



You cannot leave the system default values for the operators as null. Also, the text string for an operator destination cannot exceed 16 characters.

- 4 Edit the operator numbers and the access digits as appropriate.

- 5 Click the *Apply* button to make the changes and keep this screen open, or click the *OK* button to make the changes and close the screen.

Off-Site Notification Off-site Notification can notify users by pager, e-mail, or telephone when they receive a new voice mail message. Users can specify the methods by which they receive notification.

You can configure these system-wide Off-site Notification settings:

- Enable or disable Off-site Notification for the entire system
- Set the maximum number of out-calling ports
- Assign an out-dialing prefix for Off-site Notification

To configure Off-site Notification, select *NBX Messaging > NBX Voice Mail > Off Site Notification*. See the Help for the procedure on setting up Off-site Notification.

Notes About Off-Site Notification

- To allow users to take advantage of Off-Site Notification, verify that Off-Site Notification is enabled in System-wide Settings, the group Class of Service settings, and by the individual user. For Off-Site Notification to work correctly, it must be enabled in all these locations. To change group Class of Service settings, select *User Configuration > CoS > CoS Group Name > Modify*.
- Before Off-Site Notification can send e-mail, you must define an SMTP Domain Name and one or more valid Domain Name Servers. These settings are configured in *System Settings > System-wide*.
- If users choose *Pager* or *Voice Mail* as the *first* notification method, they are notified only of the *first* new message they receive after the time they have most recently logged in to their voice mailbox. They are not notified each time they receive a new message. The next time they log on to their voice mailbox, Off-Site Notification is re-enabled.
- If users choose *EMail* as the *first* notification method, they receive a notice for each message. The message is attached to the e-mail as a .WAV file. If users configure *any* method in any of the remaining four attempt lines, each specified method is also attempted for each new voice mail message.
- If you configure more than one notification attempts, you must configure them in order. For example, if you configure three attempts, you must configure them on lines 1 through 3, with no unconfigured lines in between.

- If you disable NBX Messaging in favor of another messaging application, the *Off-Site Notification* button on the *Voice Mail* tab is disabled.

Table 37 provides details on Off-site Notification fields.

Table 37 Systemwide Settings Fields

Field	Purpose
Enabled	<p>Check the box to enable Off-site Notification throughout the system. By default, Off-site Notification is disabled.</p> <p>If you select Enabled, you must also enable Off-site Notification in these locations:</p> <ul style="list-style-type: none"> ■ Class of Service Settings. See “Configuring Class of Service” in Chapter 4. ■ User’s personal settings. See “Off-Site Notification” in the <i>NBX Telephone Guide</i>.
Max Out-calling Ports	The number of voice mail ports available for simultaneous use by Off-site Notification. This parameter can be configured up to the number of voice mail ports licensed for the NBX system. The system ships with 4 ports; you must purchase an upgrade license to enable additional ports.
Out-dialing Prefix	A prefix used by every call made by Off-Site Notification. If this setting is empty, the call uses only the information specified by the user.

Status To view the status of all voice mail ports on your NBX system, click the *Status* button.

In the status window, to reset a voice mail port, select it and click Reset.

Table 38 explains the information in the Status window.

Table 38 Fields in the Status Window

Column	Purpose
Ext.	The extension associated with the voice mail port.
Name	The name associated with the voice mail port.

Table 38 Fields in the Status Window (continued)

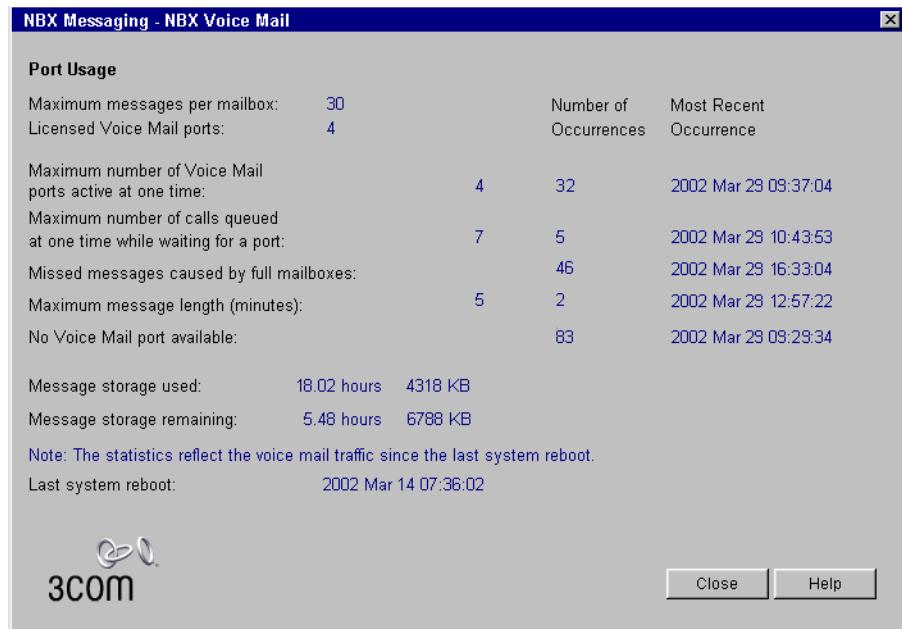
Column	Purpose
Used By	<p>The person or device that is using the voice mail port.</p> <p>Values:</p> <ul style="list-style-type: none"> ■ Extension number, name — An internal user is using the voice mail port. The user's extension number and name appear in this column. ■ Auto Attendant — The automated attendant is using the port. ■ Blank — The port is not being used. The word <i>Idle</i> appears in the <i>In Use</i> column.
In Use (Secs)	<p>The length of time, in seconds, that the voice mail port has been in use.</p> <p>If the port is not in use, the word <i>Idle</i> appears in this column.</p>
On Hold	<p>Indicates whether the voice mail port is on hold. Voice mail ports can be placed on hold in the same way that a call can be placed on hold.</p> <p>Values: Yes, No</p>

Port Usage

To help you determine how busy the NBX system's voice mail ports are, and whether additional ports may be necessary, click the *Port Usage* button. Click the Help button in the Port Usage screen for details about the fields in the report.



If a parameter in the Port Usage window turns red, the NBX system is alerting the system administrator that a problem exists. For example, if "Missed messages caused by full mailboxes" turns red, it may be time to increase the maximum number of messages allowed per mailbox.

Figure 21 Port Usage Report

User Usage To help you determine the impact that users are having on the NBX voice mail voice mail system, you can click the *User Usage* button.

The User Usage report provides the current number of new and saved voice mail messages for each user and calculates the amount of storage each user's messages consume. This report lists any type of mailbox, including telephone, phantom, TAPI route point, and hunt group mailboxes.

Deleting User Voice Mail

From the User Usage report dialog box, you can also delete the voice mail messages for a selected user. Click the Help button in the User Usage screen for details about the fields in the report.



Keep in mind that the time required to delete a user's voice mail depends on the number of voice mail messages in the user's mailbox.

Auto Attendant

The NBX Messaging system includes an Auto Attendant that answers incoming calls. The Auto Attendant includes a series of recorded messages (prompts) describing actions that a caller can take to access individual services. You can customize the menu structure and record or import your own prompts to fit the system to your business needs. This section provides information on these topics:

- Overview of Auto Attendant Features
- Adding an Auto Attendant
- Voice Application Setup Utility
- Testing the Auto Attendant

Overview of Auto Attendant Features

The Auto Attendant is the centerpiece of the voice mail system. The administrator can create and configure Auto Attendants, and can record or import messages and prompts to direct the actions of callers.

Use the NBX NetSet utility to administer and configure these Auto Attendant features:

- **Multiple Auto Attendants** — The system supports multiple, independent Auto Attendants. Different Auto Attendants can be assigned to different extensions, inbound lines or DID numbers. See “Adding an Auto Attendant” on page 263 for more information.
- **Multiple-Level Menus** — Each Auto Attendant can support a main menu and up to 19 levels of submenus. This enables you to configure an automated system in which inbound callers can select specific departments or groups, and then further select subgroups or individuals. See “Prompt Menus” on page 266 for more information.
- **Voice Prompts** — To the caller, the time-dependent greeting, main menu prompt, and submenu prompt are integrated into the Auto Attendant system. The administrator can customize the system by recording or importing voice prompts in a time-dependent greeting main menu, or submenu. Depending on the time of day and selections that the caller makes, the caller hears the appropriate prompts and receives appropriate directions.
- **Default Time-out** — If a caller does not respond to the Auto Attendant prompts (for example, a caller using a rotary telephone), the system routes the call to a designated time-out destination. See “Prompt Menus” on page 266 for more information. (Note: if you do not specify a valid time-out destination for an Auto Attendant, the

system drops a call when it reaches the time-out value.) To set the default timeout, click *NBX Messaging > Auto Attendant > Menu Tree*.

- **Shortcuts** — Callers can move to a function without listening to an entire greeting or prompt. For example, if you call to leave a message for a person, you can bypass the greeting by pressing the appropriate shortcut button.
- **Dialing by Extension or Name** — A caller can reach a party either by dialing the person's extension or by using the telephone key pad to spell the person's name. The system plays the announcement of each person identified as a possible match and asks the caller to pick one.
- **Manual and Automatic Activation** — You can activate the Auto Attendant manually, by pressing the FWD MAIL button on the Attendant Console. The system also activates automatically, according to the Business Hours settings (see "Business Hours" on page 248), or after an incoming call exceeds a set number of rings. To set the number of rings, select *User Configuration > Users > User Settings > Call Forward*.
- **Routing Calls to Specific Auto Attendants** — You can use the dial plan to map Auto Attendants to specific extensions of analog telephones. This enables incoming calls to go directly to a specific Auto Attendant.
- **Voice Application Setup Utility** — From the NBX Business Telephone, you can use the Auto Attendant Voice Application Setup utility to set up these Auto Attendant features:
 - Button actions
 - Time-dependent greetings and schedule
 - Main menu greeting
 - Administrator's Auto Attendant password

For more information, see "Voice Application Setup Utility" on page 276.

Adding an Auto Attendant

The NBX system includes two Auto Attendants: the Default Menu (extension 500), which handles incoming calls, and the VoiceMail Menu (extension 501), for employee access to voice mail. These two Attendants cannot be deleted. The default Auto Attendant processes calls as soon as you install the system. When you add a new Auto Attendant, you are adding a "blank" Auto Attendant, which you can configure.

To add a new Auto Attendant, select *NBX Messaging > Auto Attendant > Add*, and then click *Add*.

Table 39 describes the entries and checkbox that appear on the *Add Auto Attendant Menu* dialog box.

Table 39 Add Auto Attendant Menu Fields

Field	Purpose
Name	In the <i>Name</i> field, enter the name of the new Auto Attendant.
Extension	The next available extension is automatically assigned when you add a new Auto Attendant. You can change the extension number to an unused number that falls within the Auto Attendant extension range of your dial plan. Default range: 3-digit dial plan: 500–599 4-digit dial plan: 5500–5599 For both 3-digit and 4-digit dial plans, the default Auto Attendant is extension 500 and the voice mail Attendant is extension 501.
Maximum number of prompt repeats	Select the number of times the Auto Attendant prompt repeats. You can select a number from 1 through 3. The default is 3. CAUTION: If Maximum number of prompt repeats is set to 1 and the time-out action for the Auto Attendant menu tree is set to Disabled, the system disconnects a call forwarded to the Auto Attendant because the forwarding party always hears a portion of the Auto Attendant prompt. Likewise, if the time-out action for the Auto Attendant Menu Tree is set to Disabled, and Maximum number of prompt repeats is set to 2 or 3, the system disconnects the forwarded call if the forwarding party stays on the line long enough to hear at least a portion of the final repeated prompt. To ensure that forwarded calls eventually reach a valid destination, you must configure a time-out action for each Auto Attendant menu tree.
Use System-wide Greetings checkbox	If you select the <i>Use System-wide Greetings</i> check box, all three system-wide greetings (Morning, Afternoon and Evening) are used by default. To enable or disable individual system-wide greetings for a particular Auto Attendant, select the required Auto Attendant in the main Auto Attendant screen, click <i>Menu Tree</i> and then click <i>TD Greetings</i> .

After you add or modify an Auto Attendant, you can configure the following features:

- Play/Record Extension
- Time-dependent Greetings
- Prompt Menus
- Auto Attendant Buttons

Play/Record Extension

The *Play/Record Extension* identifies the telephone where you can work interactively with the NBX NetSet utility to record and listen to Auto Attendant prompts. Typically, this is the extension of the person who is configuring and administering the Auto Attendant. An Auto Attendant prompt is simply an audio file (.WAV) that is associated with a specific Auto Attendant. It describes the actions a caller can take.

When you click the button in the NBX NetSet utility to record or play a prompt, the extension rings. When you answer it, you either hear the prompt you selected to play or you are prompted to record a prompt.



You cannot customize any greetings or prompts until you have specified this extension.

You can specify a play/record extension in any of these locations:

- *NBX Messaging > Auto Attendant*
- *NBX Messaging > Auto Attendant > Menu Tree > Prompt*
- *NBX Messaging > Auto Attendant > Menu Tree > TD Greetings*
- *NBX Messaging > Auto Attendant > System Wide Greetings*

See the Help for the procedure on specifying a play/record extension.

Time-dependent Greetings

The system clock and the greeting schedule control when the system changes from one time-dependent greeting to the next. For example, the morning greeting might start at 12 midnight, the afternoon greeting would begin at noon, and the evening greeting might begin at 6 p.m. If time-dependent greetings are enabled, the caller hears the current active one before the main menu prompt.

You can create time-dependent greetings that are enabled on all Auto Attendants in your system. An example of this system-wide greeting would be "Good morning." To record or to import system-wide time-dependent greetings and define the times during which they play, select *NBX Messaging > Auto Attendant > System-wide Greetings*.

See the Help for the procedures on setting up system-wide greetings.

You can also create and schedule time-dependent greetings for individual Auto Attendants. These greetings can be up to five minutes long. To record, import, or schedule customized time-dependent greetings, select *NBX Messaging > Auto Attendant > Menu Tree > TD Greetings*.

See the Help for the procedures on setting up time-dependent greetings.

Prompt Menus

You can use a main menu and submenus of prompts to direct callers to individuals and services in your organization. You configure prompt menus for each Auto Attendant by using the *Menu Tree* dialog box. The *Menu Tree* dialog box consists of 13 button rows that you use to assign actions to the key pad buttons (see "Auto Attendant Buttons" on page 270). Be sure to define the menu time-out behavior so that if a caller does not respond to the Auto Attendant prompts (for example, a caller using a rotary telephone) the system automatically routes the call to a time-out destination.



CAUTION: *To ensure that forwarded calls eventually reach a valid destination, you must configure a time-out action for each Auto Attendant menu tree. For example, if the time-out action for the Auto Attendant menu tree is set to Disabled, and Maximum number of prompt repeats is set to 1, the system disconnects a call forwarded to the Auto Attendant because the forwarding party always hears a portion of the Auto Attendant prompt. Likewise, if the time-out action for the Auto Attendant Menu Tree is set to Disabled, and Maximum number of prompt repeats is set to 2 or 3, the system disconnects the forwarded call if the forwarding party stays on the line long enough to hear at least a portion of the final repeated prompt.*

Main Menus The main menu prompt follows the time-dependent greeting if you have one enabled. The main menu prompt should describe all Auto Attendant options and can be up to five minutes long. The default Auto Attendant main menu prompt says:

"If you know the extension of the party you want to reach, you may enter it at any time. To reach the name directory, press 9. To reach the Auto Attendant, press 0 or remain on the line. Thank you for calling."

By default, the Auto Attendant main menu provides callers with the functions that are described in Table 40.

Table 40 Auto Attendant Default Configuration

Button	Action
1–4	Identifies internal extension range and allows callers to dial user extensions. User extensions are: NBX V3000: 1000–3999
9	Goes to the Name Directory.
0	Performs a single-digit transfer to the extension specified in the menu tree for the auto attendant, usually the extension of the receptionist's telephone. The default extension is the lowest extension specified in the factory default dial plan: NBX V3000: 1000
*	Transfers to voice mail box.
#	Exits from the system.
T/O	Defines what happens when a call times out, typically, a transfer to the extension specified in the menu tree for the auto attendant, usually the extension of the receptionist's telephone. You should always define a time-out action. If a call times and there is no time-out action defined, the system disconnects the call.

To create a main menu, select *NBX Messaging > Auto Attendant > Menu Tree*. To create or import voice prompts, select *NBX Messaging > Auto Attendant > Menu Tree > Prompt*. See the Help for these procedures.

Submenus An Auto Attendant main menu can branch to submenus to keep the main menu brief, and to give the caller a variety of choices. Each submenu should have a prompt that informs the caller of the option that each key pad button provides.

If you have a large organization, the caller may have to enter several digits and listen to several submenus before reaching the person or department. For example, the caller may hear:

"To reach our Sales Department, press 1. For Technical Support, press 2..."

The caller selects option 1 for sales and hears:

"For European Sales, press 1. For North American sales, press 2."

The caller requires North American sales, presses 2, and is connected to a sales hunt group.

To configure submenus, select *NBX Messaging > Auto Attendant > Menu Tree*. See the Help for procedures on setting up submenus.

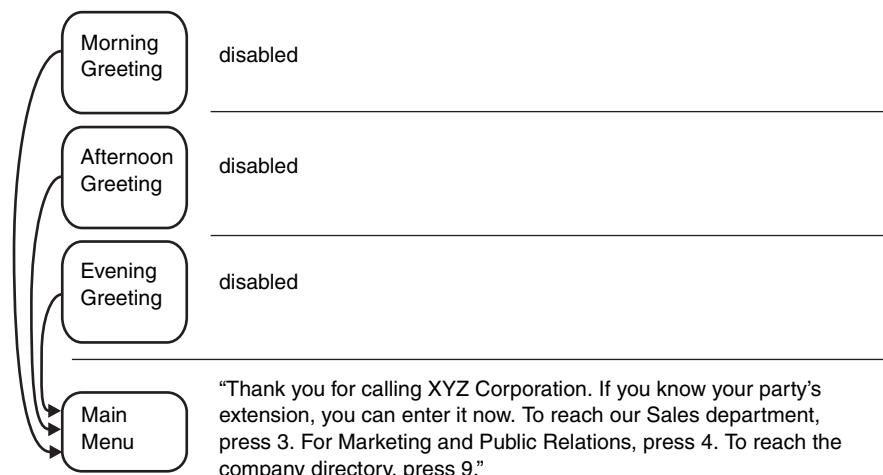
For an example that uses submenus, see "Three Greetings, a Main Menu, and a Submenu" in the next section.

Examples

These examples illustrate some typical Auto Attendant systems. They illustrate the kind of information that you might include in your time-dependent greetings, main menu prompts, and submenu prompts.

No Greetings Figure 22 shows the simplest configuration. The time-dependent greetings are disabled; the Main Menu contains all of the prompts. In Example 1, callers hear the same message no matter what time they call.

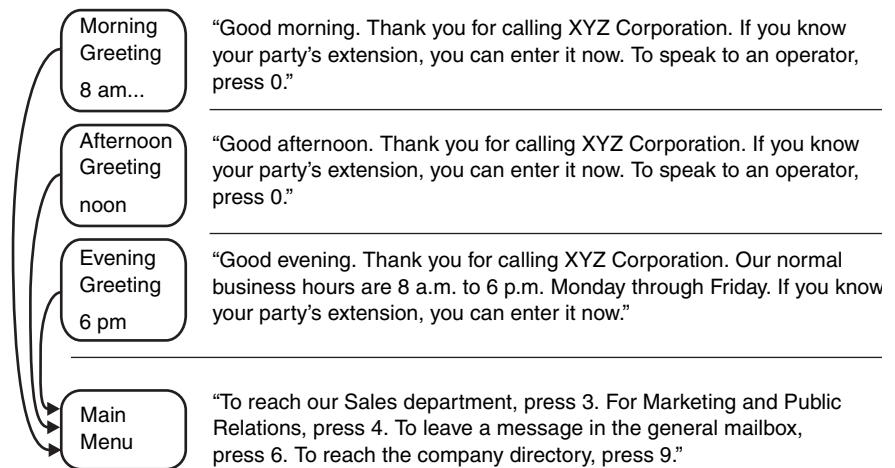
Figure 22 No Time-dependent Greetings, All Prompts in Main Menu



In this example, the main menu is configured to have button 3 mapped to a Sales submenu and button 4 to a Marketing and Public Relations submenu. Button 9 is mapped to the Name Directory.

Three Greetings and a Main Menu Figure 23 shows a simple Auto Attendant that uses time-dependent greetings to provide different messages for different times of the day.

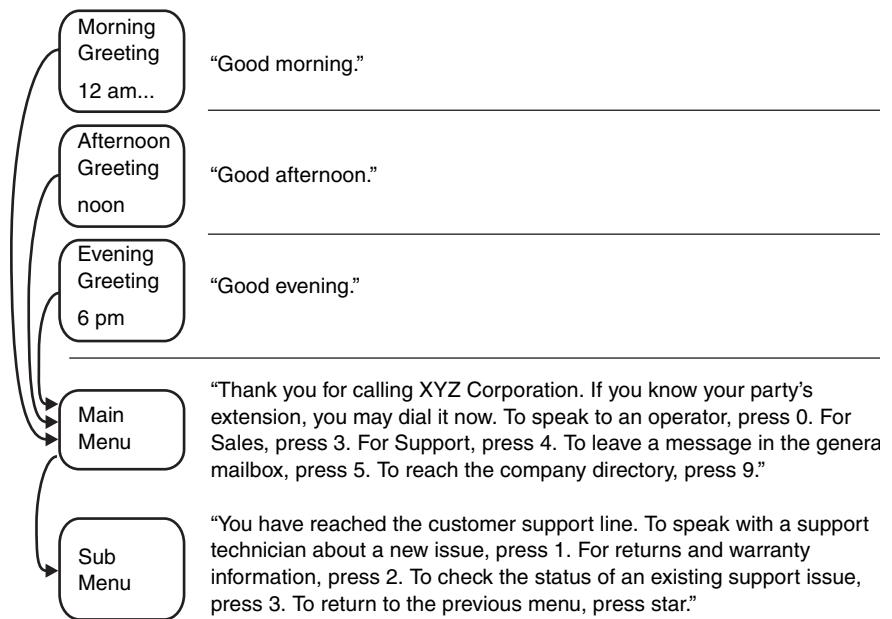
Figure 23 Three Time-dependent Greetings and Main Menu



In Figure 24, the morning greeting starts at 8 a.m. and is active until the afternoon greeting begins at noon. The evening greeting begins at 6 p.m.

The function that you allocate to a button on the keypad remains the same throughout the day.

Three Greetings, a Main Menu, and a Submenu Figure 24 shows an example that uses time-dependent greetings, a Main Menu, and a Submenu.

Figure 24 Three Time-dependent Greetings, a Main Menu and a Submenu

This example uses time-dependent greetings to greet callers according to the time of day. The main menu prompt presents callers with options for reaching the operator, specific departments, or the company directory of names. It also uses a submenu to direct callers to subgroups within the Support department.

Auto Attendant Buttons

From the *Menu Tree* dialog box, you can configure the key pad button actions presented to a caller by the Auto Attendant. For examples of how you can use prompts and greetings in an Auto Attendant, see “Examples” on page 268. Table 41 describes the fields of the *Menu Tree* dialog box.

Table 41 Menu Tree

Field	Purpose
Button	Lists the buttons on the telephone key pad.
Task Description	Describes the key pad button operation. If you assign the <i>Enter Submenu</i> action to the button, this description is used as the Submenu name.

Table 41 Menu Tree (continued)

Field	Purpose
Action	Contains a drop-down list box that lists the actions you can assign to a key pad button. The Auto Attendant prompts callers to press buttons to perform specific actions. You must configure the Menu Tree so that each button performs the proper action. For a complete list of button actions, see Table 42.
Value	Describes the value associated with each key pad button action. For a complete list of key pad button actions, see Table 42.

You can assign keypad actions to each button on a typical telephone key pad, 0 through 9, #, and *. Table 42 describes the actions you can assign to buttons. Most systems use no more than five action choices to avoid confusing callers. If you need to present more than five choices, use submenus to configure these additional options. See "Submenus" on page 267.



You can create an unannounced option by mapping a button without creating a corresponding prompt. Callers do not hear a message that the choice is available.

Table 42 Button Actions

Action	Description
Disabled	<p>The system takes no action when the user presses that button. A prompt announces "invalid key."</p> <p>If assigned as a menu time-out action (T/O), Disabled either leaves the system or goes to a parent menu, depending on where the attendant is in the menu hierarchy.</p> <p>CAUTION: If the time-out action for the Auto Attendant menu tree is set to <i>Disabled</i>, and <i>Maximum number of prompt repeats</i> is set to 1, the system disconnects a call manually forwarded to the Auto Attendant because the forwarding party always hears a portion of the Auto Attendant prompt and the system then performs the time-out action. Likewise, if the time-out action for the Auto Attendant Menu Tree is set to <i>Disabled</i>, and <i>Maximum number of prompt repeats</i> is set to 2 or 3, the system disconnects the forwarded call if the forwarding party stays on the line long enough to hear at least a portion of the final repeated prompt. To ensure that forwarded calls eventually reach a valid destination, make sure you have configured a time-out action for the top-level Auto Attendant menu tree.</p> <p><i>Value</i> — Not used.</p>
Name Directory	<p>Transfers the user to the name directory, which allows a caller to reach a person by spelling the person's name on the dialpad. The system matches the letters entered by the caller to a Last Name in the list of User Profiles. If the system finds more than three matches, it prompts the caller to enter more letters. When the system narrows the choice to three or fewer, it offers the caller a choice by playing the recorded name greeting of each choice. During a search, the system ignores any User Profile that does not have a recorded greeting.</p> <p><i>Value</i> — Not used.</p>
System Disconnect	<p>Allows the caller to have the system close the connection. This feature can save time for callers who call into the system using a calling card. By having the system disconnect them instead of breaking the connection themselves, callers can make other calls without re-entering all of their calling card information. To activate System Disconnect, the user must press the key defined in the menu and then, when prompted, the key defined in the Value box. Typically, you do not include these instructions in the Auto Attendant prompt, which is heard by all callers. Instead, you make your system users aware of this sequence.</p> <p><i>Value</i> — Any of 0-9, #, *</p>

Table 42 Button Actions (continued)

Action	Description
Transfer to Voice Mail	Allows callers to leave a voice message for a person without ringing that person's phone, or allows users to call in and listen to their voice mail from a remote location. <i>Value</i> — Not used.
Exit Menu	Available in submenus only. Allows the caller to return to the next menu up in the menu tree. <i>Value</i> — Not used
Prompted Transfer	Instructs callers to press a button before dialing a known extension. The prompt should include a message something like this: "If you know your party's extension, press 5, and then dial the extension." <i>Value</i> — Not used.
Reserved in Dial Plan	Interprets a specified button as the first number of an extension. For example, in the default 4-digit dial plan, extensions begin at 1000, so you could not use 1 as an option for an Auto Attendant menu. <i>Value</i> — Not used
Single Digit Transfer	Allows a caller to reach a specific destination by pressing a specific button. For example, you could assign button 6 to a hunt group extension in the Sales Department. In the menu prompt, you would record: "To reach our Sales Department, press 6." You could also use Single Digit Transfer to specify a destination, typically the Attendant Console extension, for the time-out option (T/O). By default, Single Digit Transfer can forward only to internal extension numbers. To transfer calls to an external number, you must first alter Table 2 of the dial plan (Incoming Table) to specify the external number. <i>Value</i> — Any valid extension



CAUTION: Use care when allowing access to PSTN ports using Dial Plan Table 2, as this can create the possibility of toll fraud.

Table 42 Button Actions (continued)

Action	Description
Enter Submenu	<p>Puts the caller into a submenu of options. When you assign the <i>Enter Submenu</i> action to a button and then click <i>Apply</i>, a down-arrow button appears to the right of the row. Click this down-arrow button to configure the submenu that you want to associate with the main menu. The entry in the <i>Task Description</i> field for this button becomes the submenu name.</p> <p>Submenu button actions include “Exit menu” to allow callers to return to the next highest menu. Otherwise, submenu button actions are identical with main menu button actions.</p> <p>Each menu can have up to 20 levels of submenus.</p> <p>For an example that uses submenus, see “Three Greetings, a Main Menu, and a Submenu” on page 269.</p> <p><i>Value</i> — Not used</p>

To configure telephone buttons, select *NBX Messaging > Auto Attendant > Menu Tree*. See the Help for procedure on configuring telephone buttons for Auto Attendant actions.

Activating Changes

After you modify a greeting or prompt (or any Auto Attendant setting), you must activate these changes in the Auto Attendant before they become effective. The characters “!>” next to an Auto Attendant in the list on the Auto Attendant tab indicate that an Auto Attendant must be activated.



*This procedure is very important. If you change an Auto Attendant, clicking *Apply* does not implement the changes.*

To activate changes, select *NBX Messaging > Auto Attendant > Activate*. See the Help for more information on activating changes to Auto Attendants.

Managing Auto Attendants

This section describes additional ways in which you can manage Auto Attendants.

- Modifying an Auto Attendant
- Removing an Auto Attendant
- Restoring Auto Attendant Greetings

Modifying an Auto Attendant

To modify an Auto Attendant, select *NBX Messaging > Auto Attendant > Modify*. See the Help for procedures on modifying Auto Attendants.

Table 39 describes the entries and checkbox that appear on the Modify Auto Attendant Menu dialog box.

Table 43 Modify Auto Attendant Menu Dialog Box

Field	Purpose
Name	Edit the name of the Auto Attendant.
Extension	<p>Edit the extension number by changing it to an unused number that falls within the Auto Attendant extension range of your dial plan.</p> <p>Default range: 3-digit dial plan: 500–599 4-digit dial plan: 5500–5599</p> <p>For both 3-digit and 4-digit dial plans, the default Auto Attendant is extension 500 and the voice mail Attendant is extension 501.</p>
Maximum number of prompt repeats	Edit the number of times the Auto Attendant prompt repeats. You can select a number from 1 through 3. The default is 3.
 <p>CAUTION: If the time-out action for the Auto Attendant menu tree is set to Disabled, and Maximum number of prompt repeats is set to 1, the system disconnects a call forwarded to the Auto Attendant because the forwarding party always hears a portion of the Auto Attendant prompt and the system then performs the time-out action. Likewise, if the time-out action for the Auto Attendant Menu Tree is set to Disabled, and Maximum number of prompt repeats is set to 2 or 3, the system disconnects the forwarded call if the forwarding party stays on the line long enough to hear at least a portion of the final repeated prompt. To ensure that forwarded calls eventually reach a valid destination, make sure you have configured a time-out action for the Auto Attendant menu tree.</p>	
Use System-wide Greetings	If you select the <i>Use System-wide Greetings</i> check box, all three system-wide greetings (Morning, Afternoon and Evening) are used by default. To enable or disable individual system-wide greetings for a particular Auto Attendant, select the required Auto Attendant in the main Auto Attendant screen, click <i>Menu Tree</i> and then click <i>TD Greetings</i> .

Removing an Auto Attendant

To remove an Auto Attendant, select *NBX Messaging > Auto Attendant > Remove*. See the Help for procedures on removing an Auto Attendant.



You cannot remove the Default Menu Auto Attendant or the Voice Mail Auto Attendant.

Restoring Auto Attendant Greetings

You can restore the greetings to their default values:

- *aamenu.wav* and *aamenu2.wav* prompts
- System-wide Morning, Afternoon and Evening greetings

This feature restores *all* of these prompts and greetings at the same time.



No other user-defined prompt is affected.

To restore greetings, select *NBX Messaging > Auto Attendant > Restore AA Greetings*. See the Help for procedures on restoring greetings.

Voice Application Setup Utility

The Auto Attendant Voice Application Setup utility provides a series of voice prompts to guide you in configuring your Auto Attendant. You can access the setup utility through any NBX Business Telephone.

The Voice Application Setup utility is useful for making short-term changes to your Auto Attendant. For example, if you must close your office because of bad weather, you can edit the main menu and direct callers to a message telling them that your office is closed. However, you cannot use the Voice Application Setup to configure submenus. That must be done using the NBX NetSet utility. See "Submenus" on page 267.

Although the setup utility lets you perform tasks in any sequence, 3Com recommends this sequence when setting up the system for first time:

- 1** Plan the system.
- 2** Create profiles (phantom mailboxes and destination extensions).
- 3** Start the Auto Attendant Setup utility.
- 4** Change the Auto Attendant Setup utility password.
- 5** Assign actions to key pad buttons.
- 6** Record greetings and main menu prompts.
- 7** Set the greeting schedule.
- 8** Review and test the system.

Using the Voice Application Setup Utility

From an NBX telephone, you can use the Auto Attendant Setup Utility. Follow these steps:

- 1 Lift the NBX telephone handset, and then press the *MSG* button to access the Voice Mail system.
- 2 At the voice mail password prompt, press *****.
- 3 At the voice mail extension prompt, dial **999** if you are using a 3-digit dial plan or **9999** if you are using a 4-digit dial plan.
- 4 Enter the Auto Attendant password. The default password is **0000**. 3Com recommends that you change this password.

0000 press 1 to assign actions to dial pad key, 9 to record greetings, schedules, change password

- 5 Follow prompts to assign key pad button actions, record and play back greetings, change the schedule (morning, afternoon, and evening) and change the Auto Attendant password.

Testing the Auto Attendant

Before using your system, 3Com strongly recommends that you review and test it to verify that all features work as you intend. Use this checklist to verify that your system is ready:

- Do your recorded prompts match your key pad button actions?
You can define key pad button actions through the NBX NetSet utility (see “Auto Attendant Buttons” on page 270) or through the Voice Application Setup utility.
- Do your time-dependent greetings become active at the times you want?
If not, you can use the NBX NetSet utility (see “Time-dependent Greetings” on page 265) or the Voice Application Setup utility to change the start times of your morning, afternoon, and evening greetings.
- Do your single-digit transfers and transfer to the general mailbox take a caller to a valid destination?
- When callers reach a mailbox of a single-digit transfer and transfer to the general mailbox, do they hear an appropriate greeting?
- Is someone responsible for checking messages sent to single-digit transfers and transfer to the general mailbox?

- Do you get an “invalid key” message when you press a button that should not have an action assigned?
- Does the Auto Attendant time-out action perform the correct action? You should always have a time-out action for a top-level Auto Attendant menu tree. Leaving the time-out action set to *Disabled*, the default, can result in calls being disconnected.
- Do all of your submenu prompts match the submenu key pad button actions?

Voice Profile for Internet Mail

Voice Profile for Internet Mail (VPIM) is an optional feature of the NBX system. You must enter a license key through the NBX NetSet utility before you can configure and use VPIM.

The NBX system transmits VPIM voice mail messages by attaching them to e-mail messages. The system then uses SMTP (Simple Mail Transfer Protocol) or ESMTP (Extended Simple Mail Transfer Protocol) to send the e-mail message and its VPIM attachment.

Using VPIM, users on an NBX system can send voice mail to a user on any voice mail system that is VPIM-compliant.

Using the NBX NetSet utility, you can configure several VPIM parameters and check VPIM status. See these sections for more information:

- Control Parameters
- Operations Management
- Statistics
- Advanced Settings



VPIM uses an SMTP server that is embedded in the NBX operating system. To avoid abuse by spammers, an SMTP server should always be protected by a firewall. Configure the firewall to allow access to port 25 on the NBX system only from valid VPIM systems that need to deliver VPIM messages to the phone system. The NBX SMTP server is started only when the system has a valid license for VPIM.

Control Parameters To configure VPIM control parameters, select *NBX Messaging > VPIM*. See the Help for the procedure on configuring control parameters.

Table 44 explains the VPIM control parameter fields and their purpose.

Table 44 VPIM Tab Fields

Field	Purpose
Max message size	Controls the size of incoming messages from other sites. If a message is larger than the specified value, the NBX system rejects it. The default value represents a voice mail message approximately 4 to 5 minutes in length. Default: 3000 Kbytes Minimum: 500 Kbytes Maximum: 5000 Kbytes
Time between send attempts (minutes)	For outgoing messages, the NBX system may not be able to contact the target system on the first attempt. If so, the NBX system attempts to contact the target system later. To change the time between attempts to send a voice mail message, change this number. Default: 15 minutes Minimum: 1 minute Maximum: 60 minutes
Max number of send attempts	To change the number of times the NBX system attempts to connect to the target system, modify the number (default is 4 attempts) in this text box. If the NBX system is unsuccessful in contacting the target system after the specified number of send attempts, the voice mail message is returned to the sender's voice mail box along with an indication that the message could not be sent. Default: 4 attempts Minimum: 1 attempt Maximum: 10 attempts

Operations Management The *Operations Management* dialog box allows you to manage the queue of outgoing voice mail messages.

To select queue management parameters, select *NBX Messaging > VPIM > Operations Management*. See the Help for procedures on configuring queue management parameters.

Table 45 contains a list of the fields within this dialog box along with a description of their purpose.



Some commands require that operations be stopped or started. For example, to remove a message from the queue, you must first stop operations. Similarly, unless you start operations or they are currently running, you cannot use the “Send all messages now” command.

Table 45 Operations Management Dialog Box Fields

Field	Purpose
Operations status	The status of the queue of outgoing voice mail messages. Possible values: Ready, Starting, Processing, Stopped
Number of outgoing messages	The number of messages in the outgoing queue when this dialog box was last accessed or refreshed.
Time Waiting	The time that the voice mail message has been waiting in the queue.
# Attempts	The remaining number of attempts to send the message.
Sender	The IP address and extension of the user who sent the voice mail message.
Destination	The IP address and extension to which the voice mail message is to be sent. If a message has multiple destinations, the first destination is listed, and three dots are displayed immediately after the extension number.
Example: 1057@192.168.15.135...	
Remove	Select a voice mail message in the scroll list and click this button to remove the message from the queue. The NBX system prompts you to confirm that you want to delete the selected message. To remove a block of messages, use Ctrl/Shift. Hold down the Ctrl key to select several non-contiguous messages for removal.
Send all messages now	The NBX system attempts to send all messages immediately, and changes the status of each successfully sent message to <i>Sent</i> .
Send all messages now and then delete them	The NBX system attempts to send all messages in the queue and deletes each message that is sent successfully. If a message cannot be sent, it is also deleted.
Delete all messages now	The NBX system empties the queue of all messages
Stop operations	Stops the queue if it is currently active.
Start operations	Starts the queue if it is stopped.

Statistics The *Statistics* window allows you to view the most recent statistics for voice mail messages.

To view statistics, select *NBX Messaging > VPIM > Statistics*. See the Help for information on viewing VPIM statistics.

Table 46 lists the fields in this window and explains their purpose.

Table 46 Statistics Window Fields

Field	Purpose
Total messages received	Contains the number of messages received from voice mailboxes on other systems.
Total messages submitted for delivery	The number of voice mail messages in the queue.
Total messages queued for external delivery	The number of messages in the queue for delivery outside the system.
Total messages delivered to external recipients	The number of messages for which a confirmation of delivery has been received.
Total messages returned to sender on failed delivery	The number of messages that have been returned because they could not be delivered.
Failed messages	The number of messages that never left the queue either because every attempt to deliver them failed and the retry limit was reached, or because the type of failure caused the retry limit to be ignored (example: a non-existent address would be tried only once). If a message has multiple destinations, the first destination is listed, and three dots are displayed immediately after the extension number.
Example:	1057@192.168.15.135...
Reset	This button allows you to reset the message totals to zero and clear the listing of failed messages.
Last reset command	The date and time of the last reset command. If this field contains a more recent date and time than <i>Last system reboot</i> , then this is the date and time that the NBX system began collecting the currently displayed statistics.
Last system reboot	The date and time of the most recent reboot of the NBX system. An NBX system reboot resets all VPIM statistics to zero. If this field contains a more recent date and time than <i>Last reset command</i> , then this is the date and time that the NBX system began collecting the currently displayed statistics.

Advanced Settings The *Advanced Settings* dialog box allows you to control the behavior of SMTP and how it sends the e-mail messages with VPIM attachments.

To make SMTP settings, select *NBX Messaging > VPIM > Advanced Settings*. See the Help for information on SMTP settings.

Table 47 lists the fields in this dialog box and describes their purpose.

Table 47 VPIM Advanced Settings Dialog Box

Field	Purpose
SMTP OK response	<p>Definition: The amount of time that the local system waits for an acknowledgement of a <i>From</i> message.</p> <p>Detail: After the local system sends a <i>MAIL</i> command specifying the sender of the message, it waits for acknowledgement from the other site. The acknowledgement is an <i>OK</i> message.</p> <p>Minimum: 5 minutes</p> <p>Default: 5 minutes</p>
SMTP HELO response	<p>Definition: The amount of time that the local system waits for an acknowledgement of a <i>HELO</i> message.</p> <p>Detail: After the greeting, the local system sends either a <i>HELO</i> (or <i>EHLO</i> to get <i>ESMTP</i>) message to identify itself. The other site then responds with an acknowledgement of that message.</p> <p>Minimum: None defined.</p> <p>Default: 5 minutes</p>
SMTP EHLO response	<p>Definition: The amount of time that the local system waits for an acknowledgement of a <i>EHLO</i> message.</p> <p>Detail: After the greeting, the local system sends either a <i>HELO</i> (or <i>EHLO</i> to get <i>ESMTP</i>) message to identify itself. The other site then responds with an acknowledgement of that message.</p> <p>Minimum: 0 minutes</p> <p>Default: 5 minutes</p>

Table 47 VPIM Advanced Settings Dialog Box (continued)

Field	Purpose
SMTP MAIL response	<p>Definition: The amount of time that the local system waits for an acknowledgement of a MAIL command.</p> <p>Detail: After the local system sends out a MAIL command along with the From information, it waits for a response from the other site to indicate that the MAIL command was received.</p> <p>Minimum: 5 minutes</p> <p>Default: 5 minutes</p>
SMTP RCPT response	<p>Definition: The time that the local system waits for an acknowledgement of a RCPT command.</p> <p>Detail: When the local system receives and SMTP or ESMTP message, it returns a RCPT command to the sending system for each recipient listed in the <i>To:</i> field.</p> <p>Minimum: 5 minutes</p> <p>Default: 5 minutes</p>
SMTP DATA response	<p>Definition: The time that the local system waits for an acknowledgement of a DATA command.</p> <p>Detail: After the local system has specified all of the recipient information, it sends a DATA command to indicate that it is ready to send the mail message itself. It then waits for the other site to acknowledge the DATA command.</p> <p>Minimum: 2 minutes</p> <p>Default: 2 minutes</p>
SMTP DATA END response	<p>Definition: The time that the local system waits, after sending the entire message, for an acknowledgement from the other site that the message was received.</p> <p>Detail: After the local system sends the entire message, it sends a single dot (ascii code 056) to the other site. It then waits for an acknowledgement from the other site that the dot has been received.</p> <p>Minimum: 10 minutes</p> <p>Default: 10 minutes</p>

Table 47 VPIM Advanced Settings Dialog Box (continued)

Field	Purpose
SMTP RSET response	<p>Definition: The time that the local system waits for an acknowledgement of a RSET command.</p> <p>Detail: Maintaining a cached connection between the local system and any other site requires additional system resources compared to a non-cached connection. If connection caching is enabled, the local system waits for the defined time-out period and if no message is received, it sends a RSET command to the other site.</p> <p>Minimum: None defined.</p> <p>Default: 10 minutes</p>
SMTP QUIT response	<p>Definition: The time that the local system waits for an acknowledgement of the QUIT command.</p> <p>Detail: When the local system is finished transmitting a message and wants to break the connection, it sends a QUIT command. It then waits for the other site to acknowledge the QUIT command. When the acknowledgement arrives, or when the time-out value is reached, whichever comes first, the local system breaks the connection.</p> <p>Minimum: None defined.</p> <p>Default: 5 minutes</p>

7

OPERATIONS

This chapter describes how to manage system-level operations for your NBX system.

You can perform these operations from NBX NetSet:

- Software Upgrade
- Reboot/Shutdown
- Manage Data
- Event Log
- Licenses
- Regional Software
- Third-Party Drivers

See the Help for the procedures for each function.

Software Upgrade

As part of the upgrade and reboot process, you can choose to use your existing configuration data with the new version of the software or use a new (empty) database. NBX NetSet allows you to choose which software version to use when you reboot the system. The ability to select which version to boot allows you to restore an earlier operating environment (both software and configuration data) if you need to.



Release 4.4 is applicable to an NBX V3000 system only. You cannot load a release prior to Release 4.4 onto an NBX V3000, and you cannot upgrade a 4.4 system unless you are upgrading from a release that has 4.4 as its base (such as 4.4, 4.4.1, etc.). All 4.X versions are chargeable.

Important Upgrade Notes

- To run NBX system software release R4.4 and higher, you must install a license key.

- When you upgrade the system software, do not enter any "cd..." commands using the terminal emulation software on a PC attached to the NBX Network Call Processor.
- When the software upgrade is complete, a new window, containing a confirmation message, appears in NBX NetSet.
- At certain times during an upgrade, the system reboots itself. Do not interrupt the reboot; wait until the upgrade is complete.
- Before you upgrade your system software, 3Com recommends that you back up your system data. (See "Backup" on page 288.)
- If you are using NBX PC applications, such as pcXset, you must also upgrade these applications after upgrading the NBX software.
- If you are connected to the NCP COM1 port, you see the upgrade activity messages during the upgrade process, but you cannot issue any commands.
- After you upgrade your system software, you must reboot the system.

To upgrade or remove software:

- 1 Log on to the NBX NetSet utility using the administrator login ID and password.
- 2 Click *Operations > Software Upgrade*. See the Help for procedures on upgrading or removing software.

System Software Licensing

To run release R4.4 and all later releases of the NBX V3000 system software on your NBX system, you must have and install a license. All NBX systems that ship from the factory with software release R4.4 or any later release, include a license for the software version that is shipped with the system.

Restricted Operation

If you reboot the NBX system without installing the required license, the NBX system remains operational with these restrictions:

- NBX NetSet is not available.
- Each NBX telephone display panel periodically displays a NO LICENSE message.
- Auto discovery is turned off for all device types.
- Voice mail messages are not allowed.
- The Automated Attendant software is not operational.

- The ability to configure user groups and Automated Attendants from a telephone is not operational.
- If you connect a PC to the NBX system COM1 port using a terminal emulation software application such as Hyperterm, the NBX system sends a message to the Hyperterm application indicating that a required software license has not been installed.



If you log on using the administrator ID and password, a screen appears giving you two options:

- *You can click the Reboot button to go to a reboot screen and reboot to a previous NBX software release.*
- *You can click the License button to go to a license screen and enter a license key for R4.4.*



The installation of a valid upgrade license removes all restrictions without the need for an NBX system reboot operation.

Considerations	Some situations require specific actions because of the system software licensing mechanism.
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Chassis or Disk Tray Replacement

If you have an NBX V3000 system and you need to replace the main system chassis for any reason, you must provide a valid license backup file to your 3Com NBX Voice-Authorized Partner. This file enables them to provide you with license keys equivalent to those that were associated with the replaced chassis.

Downgrading to Previous Releases

If you are running R4.4.X with a valid system software license and you want to downgrade to a previous software version, you can downgrade to a previous version of R4.4.X only. No other action is required.

Reboot/Shutdown

You must reboot the system after you upgrade software. You must shut down the system software before you turn off power to your NBX system.

To reboot or shutdown the system:

- 1 Log on to the NBX NetSet utility using the administrator login ID and password.
- 2 Click *Operations > Reboot/Shutdown*. See the Help for procedures on rebooting and shutting down the system.



CAUTION: If you remove power from the NBX system without first shutting down the system software using the NBX NetSet Shutdown button, the operating system must perform a file system check during the next startup cycle to ensure file integrity. The file system check significantly increases the time it takes for the system to come to a ready state. During a file system check operation, the NCP status lights S1 and S2 flash in an alternating pattern.

Manage Data

This section describes these system data management operations:

- Backup
- Restore
- Convert Database
- Purge Database
- Purge Database and CDR
- Purge All Voice Mail

To perform data management operations, select *Operations > Manage Data*. See the Help for procedures on managing your system data.

Backup

You can back up a database at any time. To ensure a successful restoration of your database, be sure that the version number of the backup file matches the version number of the system software. Many times, if you try to restore a database that was saved on an older release, you will succeed. However, if a database schema change has occurred between the old and new releases, the restore will fail.



CAUTION: 3Com does not support the restoration of a database from an older version of the 3Com NBX system software.

3Com recommends this backup policy:

- Back up your database before you upgrade the NBX system software.
- When you upgrade NBX system software, answer Yes when the software asks if you want to include the database in the upgrade process.
- After an upgrade, backup the database again.
- After you make any administrator-level configuration changes, backup the database.
- To ensure that you capture changes that users make to their personal settings, perform frequent, possibly daily backups.



Voice mail messages are included in a backup of your system data only if you specify that you want them included. If voice mail was not included when the system data was backed up, you cannot specify that you want to restore voice mail during a restore operation.



License backup operations are part of a separate backup operation.

During a backup operation, a series of progress screens track the steps. Some steps may happen quickly enough that the status screen may not appear. For example, you may see the status screen appear to go from step 1 to step 4 if steps 2 and 3 are completed quickly.

The six steps in the backup process are:

- **Backing up NBX Database** — The databases are locked during this step. The status bar shows step 1 of 6.
- **Backing up Voice Mail** — If you enabled the Include NBX Voice Mail check box, voice mail messages for all users are backed up. Auto Discovery and voice mail access are locked during this step. The status bar shows step 2 of 6.
- **Backing up Voicemail Data** — Greetings and name announcements of all users are backed up. The status bar shows step 3 of 6.
- **Creating Backup file** — All files created during the backup process are added to a single backup file. The status bar shows step 4 of 6.
- **Backup Finishing** — Temporary files created during the backup operation are now deleted. The status bar shows step 5 of 6.

- **Backup Finished** — A new screen appears containing the name of the backup file and prompting you to save the backup file in a location of your choice. This screen indicates that the backup process has been completed and represents the last of the six steps.



Backing up your database is done by a system task that is independent of all other system tasks. This means that you can safely perform any of these actions before the backup operation has been completed without interfering with the backup:

- *Click your browser's Back button*
- *Click your browser's Stop button*
- *Exit your browser*
- *Shut off your computer*

If another administrator tries to back up the system database before the current backup task has been completed, a message appears warning that a backup is currently in progress.

The message includes:

- The IP address of the computer from which the backup was started
- The time that the backup was started
- The step of the upgrade process that is currently being performed

Cancelling a Backup Operation

You can cancel the currently active backup operation if you want. When you click *Cancel*, the NBX system immediately asks you to confirm that you want to cancel the backup operation. If you click *Yes*, the NBX system first completes the step of the backup operation that it is performing and then cancels the backup operation.



Depending on the size of your NBX database, some of the steps in the backup operation can take several minutes to be completed. Please allow time for the NBX system to complete the current step and respond to your cancel command.

After the backup operation has been completed, the final screen displays the name of the backup file and gives you the opportunity to save the file in a location you choose, typically on the disk drive of your PC or on the disk of another computer in your network.



If you choose not to save the database backup file, the file remains on the NBX system disk until the next time you perform a backup operation.

Accessing the Most Recent Backup File

During the backup procedure, the NBX system prompts you to save the backup file in a location you choose. 3Com recommends that you save the backup file when prompted to do so.

The NBX system keeps a copy of the most recent backup file on your NBX system. Each time you perform a backup operation on the NBX database, the NBX system overwrites this file.

If you choose to not save the backup file during the backup procedure or if you forget to save it, you can save it later. However, if you perform another backup, the prior backup file is no longer available.

To save the most recent backup file to a location you choose:



- 1** Click the Save As button.

If you do not see a date and time next to Last Backup or if the words Download last backup file are gray, the NBX system does not have a backup file for you to download.

- 2** In the window that appears, click the Save button.
- 3** In the Save As window that appears, browse to the location in which you want to save the most recent backup file and click Save.

Restore

Restore a database using a backup file that is from the same version as the running system software. Many times, if you try to restore a database that was saved on an older release, you will succeed. However, if a schema change has occurred between the old and new releases, the restore fails.



CAUTION: 3Com does not support the restoration of a database from an older version of the 3Com NBX system software.



Voice mail is included in a backup of your system data only if you specify that you want it included. If voice mail was not included when the system data was backed up, you cannot specify that you want to restore voice mail during a restore operation.



Backing up and restoring your licenses are procedures that are separate from the database backup and restore procedures. You should backup your licenses before and after you add or remove any licenses.

To restore your NBX database from a saved backup file:

- 1 On the *NBX NetSet Manage Data* tab, click the *Browse* button.
- 2 In the window that appears, locate the backup file that you want to restore and click *Open*.
- 3 Click *Restore*.
- 4 In the window that appears, the NBX system provides cautionary information about the effect of a restoration on system operation and prompts you to confirm that you want to restore the database. Click *Yes* to restore the database, or *No* to cancel the operation.

If you choose to restore the database, the NBX system automatically reboots after the database file is loaded.

Convert Database

You can migrate configuration data stored with an older software version to a newer software version. You may need to do this if you have installed a new version of the software but you want to use older configuration data. During normal operation, you should not need to use the Convert Database function. No backup from a pre-R4.4 database can be converted for use on a R4.4-based system.

Purge Database

Purging the database removes existing user and device data you have added to the system, restores factory defaults, and causes an automatic reboot.



The Purge Database feature does not affect your IP connectivity to NBX NetSet. After a database purge, the system continues to use the IP address, subnet mask, default gateway, and host name that you have assigned.

Purge Database and CDR

If you want to purge Call Detail Reports (CDR) data as well as user and device data, you can perform these functions at the same time.

Purge All Voice Mail When you perform this operation, the NBX system deletes all voice mail messages for all users. Mailbox greetings are not affected. After the database is purged, the system reboots automatically.

Event Log

You can view these event logs that are maintained by the system:

- **Adminlog** — Tracks activities performed in NBX NetSet under the administrator login. The Adminlog is never renamed or deleted. It continues to grow over time, but it is unlikely that the size of the Adminlog file will ever grow to be a problem.
- **Upglog** — Tracks the history of upgrades and processes that occur during upgrades.
- **TEP Logs** — The 3C10116D T1 Digital Line Card and the 3C10165D E1 Digital Line Card can generate logging information. TEP (**T1**, **E1**, Primary Rate Interface) logs are stored on the system disk drive, even for cards that are in remote locations, and you can use the NBX NetSet utility to view, download, and delete log files. Each card has a separate log, up to a maximum of five log files. When a log reaches its maximum size, it begins to overwrite the oldest data.



Because TEP logging has a performance cost, it is disabled by default. To enable TEP logging, contact your 3Com NBX Voice-Authorized Partner.

To view event logs, select *Operations > Event Log*.

See the Help for the procedure on viewing event logs.

Licenses

You can install licenses for these components:

- NBX system software
- H.323 Gateway
- pcXset™ (Soft Telephone)
- Voicemail (Additional voice mail and Auto Attendant ports and voice mail storage)
- Devices (specifies the total number of devices allowed on the system)
- Windows Audio Volume (WAV) devices
- Virtual Tie Lines
- Internet Voice Messaging (VPIM)

- Third-Party Messaging
- Complement Attendant Software
- Call Recording & Monitoring
- Polycom Telephones
- Citel Nortel Telephones
- Citel Analog Telephones
- 3102 Business Telephones
- 3101 and 3101SP Basic Telephones
- 3105 Attendant Consoles

To manage your software licenses, select *Operations > Licenses*.

See the Help for procedures on managing licenses.

Add a License	Each NBX system includes a factory default license, tied to the system serial number. <ul style="list-style-type: none">■ On the NBX V3000, the serial number is located on the back of the chassis.
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To configure the system to support new licenses, contact your 3Com dealer and provide the serial number. The dealer obtains a new license key from 3Com Customer Support that enables the upgrade.

See the Help for procedures for adding a license to an NBX system.

Usage Report	The Usage Report displays, for each license installed on the NBX system, the current number of devices in use for the license type and the maximum number of devices allowed by that license.
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Backing Up Licenses	3Com recommends that you make a backup of all licenses on your NBX system.
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- 1 In the *Operations > Licenses* dialog box, click *Backup Licenses*.
- 2 Click *Save*, choose a location to save the backup file, and click *Save*.

You can also run license backup from the *Operations > Manage Data* tab.

Restoring Backed-Up Licenses You can restore all licenses from a previously created backup file.

- 1** In the *Operations > Licenses* or the *Operations > Manage Data* tab dialog box, click *Restore Licenses*, and browse to the location in which you saved the licenses backup file. Alternatively, type full path to the license backup file in the *Enter path to restore license(s) on this system:* text box.
- 2** Click *Restore*.
- 3** Respond to the confirmation prompt message that appears.

Obtaining Details of License History You can view a detailed history, including the date and time on which each license was added to the NBX system.

To view the license detail report:

- 1** In the *Operations > Licenses* dialog box, click *Details*.

Regional Software Regional software includes voice prompts, tones and cadences, and user documentation. A region is a country and language pair, for example, "China - Mandarin" or "France - French."

To add or remove regional software:

- 1** Click *Operations > Regional Software*. See the Help for procedures on managing your regional software.
- 2** See the notes in the next sections for important information about managing regional software.

Install You can install regional software including local language voice prompts, regional tones and cadences, and local language versions of certain user documentation for your region.

After you install regional software, you must designate it to be the current system regional software by selecting *System Configuration > Regional Settings*.

Remove You can remove regional software at any time. All versions of the regional software that you select are removed. For example, if you choose to remove the "Mexico - Spanish" regional pack, *all* versions of the selected regional software are removed from the system.

U.S. English cannot be removed.



When you remove a version of system software, the system verifies whether the removal might leave any regional software unassigned to a system software version.



Specific regional languages, tones and cadences, or voice prompts that were associated with earlier releases may no longer be usable by recent system software versions. 3Com recommends that you purge unused regional software to conserve disk space.



You can only remove unused regional software immediately after you delete a version of system software. If you choose not to remove this software when prompted, you must either:

- *Wait until you remove a subsequent version of system software before you can delete any unused regional software.*
- *Remove all versions of the selected regional software on the system. You can then install the required version.*

Details The Regional Software Diagnostic Details window displays the status of each region in the current system software. Table 48 defines the displayed values.

Table 48 Diagnostic Details

Values	Description
In Use	The regional software is currently being used by the system.
Available	The regional software is fully loaded on the system, but it is not currently in use.
Not Fully Installed	The system can access some parts of the regional software, but not all. You probably have not loaded the correct regional software version for the system software you are running.
Error While Loading	An error occurred while loading the regional software. Re-install the software.
Nothing Installed	The system is aware that this regional software exists, but no version is installed.

Third-Party Drivers	You can add and configure third-party telephones for use on an NBX system. The third-party vendor supplies the interface hardware and a software package to support the telephones. <p>The process of adding third-party telephones has these steps:</p> <ul style="list-style-type: none">■ Install the device type license — Each third-party device type (typically a telephone) must be licensed for use on the NBX system. The license governs the type of device and the number of devices of that type that can be added to the NBX system.■ Installing the software driver — This step places the third-party driver software on the NBX system disk.■ Importing — This step activates the third-party driver software. <p>See the Help for instructions on these procedures.</p>
NBX Software Upgrades	When you upgrade the NBX system software, you do not need to reinstall and import the third-party drivers, provided that you continue to use the same NBX database after the upgrade. <p>If you upgrade the NBX system software and choose to start with a new database, or if you revert to a database that did not include the third-party driver, you must import the third-party driver again.</p>
Third-Party Telephone Groups	When you install and import a third-party driver, a new telephone group is created for the third-party telephone type. When you add third-party telephones to the NBX system, by default they are added to this group. <p>You cannot delete the default third-party telephone group.</p> <p>A third-party telephone can belong to the default third-party telephone group, or to a telephone group that you create for that third-party telephone.</p>

8 REPORTS

This chapter describes how to access details of NBX system data traffic. It covers these topics:

- Directory
- Device List
- System Data
- Call Reporting

See the Help for procedures on accessing this data.

Directory

The NBX system provides a directory listing of all the telephone extensions in the system (except for special use extensions such as TAPI Route Point extensions).

If a call is picked up by the Auto Attendant, the caller can search this same directory for the person by using the phone's key pad to type the first letters of the person's last name. The Last Name parameter of each user profile forms the dial-by-name directory.



Only mailboxes that have been initialized and have a recorded greeting are included in the directory. Special purpose mailboxes, such as a mailbox associated with a TAPI Route Point are not included in the directory. You can exclude a user from the directory when you add or modify a user.

To view, print, or search the system directory, select *Reports > Directory*.

See the Help for the procedures on viewing, printing, and searching the directory.

Device List	<p>The NBX system provides a list of the devices and functions such as telephones, line card ports, voice mail ports, Call Park extensions, and Groups that are currently being used.</p> <p>To view or print a report of system devices, select <i>Reports > Device List</i>.</p> <p>See the Help for procedures on viewing and printing the system device list.</p>
System Data	<p>NBX NetSet provides basic data about the NBX system.</p> <p> Before you contact your 3Com Voice - Authorized Partner or 3Com Technical Support, access this report and record the information.</p> <p>To view system data, select <i>Reports > System Data</i>.</p> <p>See the Help for procedures on viewing system data.</p>
Disk Status	<p>In addition to viewing basic system data, you can also view data specifically about disk drives. If you are using disk mirroring, you can confirm the status of both disks.</p> <p>To view disk status, select <i>Reports > System Data > Disk Status</i>.</p> <p>See the Help for procedures on viewing disk status.</p>
Call Reporting	<p>The NBX Call Processor captures information about all outgoing and incoming calls made through the system. To view this call information in detail, you must install Call Reports (Downloads > Software > NBX Call Detail Reports) on a networked computer as specified later in this section. Then, you must download the call report information, which is referred to as call detail reports, from the system to a local hard drive.</p> <p>After you install NBX Call Detail Reports, you can:</p> <ul style="list-style-type: none">■ Retrieve calling data from the system.■ Generate formatted reports.■ Export reports in formats suitable for use with third-party reporting software, spreadsheets, databases, and word processing applications.

- Export your call data in HTML format for publication on a web server.
- Export reports to a disk file or directly to a Microsoft mail message or a Microsoft Exchange folder.

Call reports do not include information on the locked or unlocked status of telephones.

See the Help in the NBX Call Detail Reports application software for procedures.

Windows Environment Specifications

Your computer must have these minimum requirements to run Call Reports:

- **Processor** — Pentium 166MHz or higher
- **Operating System** — Windows NT 4.0 (Service Pack 6a), Windows 98, Windows 2000 (Service Pack 2), or Windows XP
- **RAM** — 32 MB on Windows 98; 64 MB on Windows NT or Windows 2000; 128 MB on Windows XP
- **Network** — Network connectivity to the NBX Call Processor
- **Disk Space** — At least 40 MB of free disk space

Installing Call Reports

To install NBX Call Reports, select *Downloads > Software > NBX Call Reports*.

See the Help topic for *Downloads > Software* in the NBX Call Reports installation procedures.

Configuring Call Reporting

You can configure your system to save call information, and then use the Call Reports function to view the information in a variety of formats. You can create a password-protected logon for users so that the users can access call report information. This logon does not provide administrator privileges to users.



The NBX software supplied by or on behalf of 3Com has the ability to mask or scramble the last four digits on call records. If you do not select this function, call numbers are recorded without any digits masked or scrambled.

The collection, storage, or manipulation of personal data such as these call numbers may incur obligations under local laws, such as those relating to data protection or privacy. These legal requirements differ

from country to country and it is your responsibility to comply with all such obligations.

3Com accepts no liability for your failure to comply with local laws regarding the collection, storage, or manipulation of such information and data.

To configure call reporting, select *Reports > Call Reporting*.

See the Help for procedures on configuring call reporting.

Purge CDR You can purge old Call Detail Report (CDR) data from the system.

To purge CDR data, select *Reports > Call Reporting > Purge CDR*.

See the Help for the procedure on purging call report data.

9 DOWNLOADS

This chapter provides information about downloading:

- Software
- LabelMaker
- NBX Documentation and Quick Reference Guides

Software

You can download these applications:

- **NBX Call Reports** — You can install NBX® Call Reports on a Microsoft Windows NT 4.0, Windows 98, or Windows 2000 computer. The application enables you to retrieve call logging information from the NBX system for reporting purposes. See Chapter 8 for prerequisites and details on running these reports.
- **NBX TAPI Service Provider (NBX TSP)** — You can install NBX TSP on a Microsoft Windows NT 4.0, Windows 98, or Windows 2000 computer. The application enables you to use TAPI-enabled programs with the NBX system. For more information, see Chapter 5.

To download software applications, select *Downloads > Software*.

See the Help for procedures on downloading the software.

LabelMaker

Each NBX Telephone and Attendant Console comes with a set of blank labels on which users and administrators can write Speed Dials and other unique settings that have been applied to the buttons. When you are setting up many telephones with similar features, you can use the LabelMaker utility to create and print your labels.

Users and administrators launch the same LabelMaker. The LabelMaker utility can create labels for these devices:

- 3102 Business Telephone

- 1102, 2102, 2102-IR Business Telephones
- 3101 and 3101SP Basic Telephones
- 2101 Basic Telephone
- 3105 and 1105 Attendant Consoles



The LabelMaker is a Windows program file. If you use an operating system that cannot run Windows programs, you can get a PDF version of the LabelMaker through your 3Com NBX Voice-Authorized Partner.

To Launch the LabelMaker and select a label:

- 1 Login as administrator and then click *Downloads > LabelMakers > Universal LabelMaker*.

OR

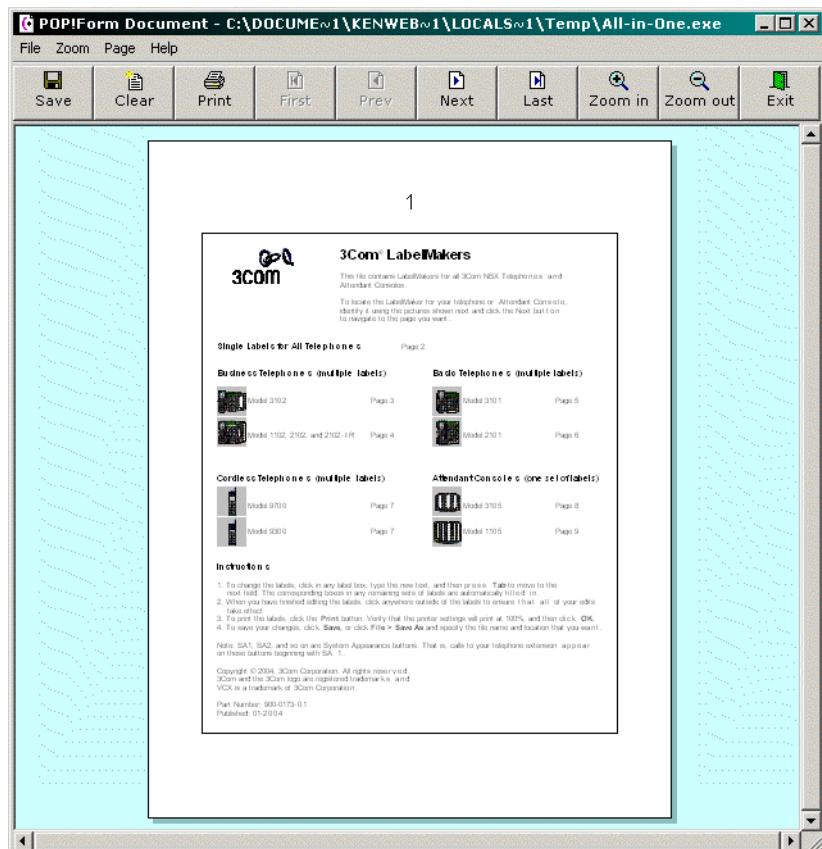
Login as a User and then click *Speed Dials > Telephone Labels* or *Attendant Console Labels*. Both buttons launch the same LabelMaker.

- 2 If the Windows **File Download** dialog appears, click **Save**, and then specify a location in the **Save As** dialog to save the LabelMaker file. If you click **Open** from the File Download dialog, Windows puts the LabelMaker file in a default location on your hard disk.
- 3 Locate and launch the LabelMaker by double-clicking the file named `labels.exe` using one of these methods:
 - Open **Windows Explorer** and navigate to the file.
 - Double-click **My Computer** and navigate to the file.
 - Depending on your operating system, click **Start > Find > Files or Folders** or **Start > Search > For Files or Folders**, and then type the name of the file in the appropriate text box.
- 4 Find the page in the LabelMaker that has labels for your telephone. Figure 25 shows the LabelMaker contents page.
- 5 Edit the label template by clicking any of the label text boxes to highlight the existing text, and then typing new text.
- 6 Press **Tab** to move to the next text field in the label.
- 7 Click the **Print** button at the top of the LabelMaker screen to open the Print dialog. Be sure to specify which page you want to print. Typically, the default is to print all pages.
- 8 Click **Print**.

- 9 Cut out the labels and put them in the label holders of your NBX Telephone or your Attendant Console.
- 10 To save the edited LabelMaker, click the **Save** button at the top of the LabelMaker screen. Or you can click **File > Save As** to save the LabelMaker to a new location.

 *To reuse your saved LabelMaker, you must run the file that you saved to your computer. If you launch the LabelMaker from NetSet, you always get the default version. If you save the default version to the same place you saved an earlier edited version, you overwrite the earlier version.*

Figure 25 LabelMaker Utility Page 1



**NBX
Documentation and
Quick Reference
Guides**

You can download and print NBX documentation from the *Downloads > Documentation* tab.

Quick Reference Guides and the Telephone User Guide are available to individual users by selecting *Personal Settings > User Information*.

You can get or upgrade your existing version of Adobe Acrobat Reader from the Adobe website, www.adobe.com.

10

TROUBLESHOOTING

Overview

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

- Using the Telephone Local User Interface Utility
- Using H3PingIP
- System-level Troubleshooting
- Connecting a Computer to a Serial Port
- Getting Service and Support

NBX hardware needs no routine maintenance. However, you should perform periodic backups of the configuration and license databases, especially after you make changes to system or user configurations.

Using the Telephone Local User Interface Utility

Each NBX Telephone supports a telephone diagnostic and configuration utility called the Local User Interface (LUI). The LUI utility enables you to perform these tasks:

- View telephone settings, both the active settings and the settings stored in the telephone's memory
- Set telephone IP address, subnet mask, and default gateway
- Specify IP address of the Network Call Processor (NCP)
- Specify settings specific to a 3Com VCX Telephone System (not used in an NBX environment)
- Test the telephone buttons, display panel, and LEDs
- Clear all device settings
- Specify the MAC address of the NCP (test environment option)
- View firmware information (technician option)

- Test connectivity
- Restart the telephone



Early model NBX Telephones support an earlier version of the LUI utility that has a slightly different menu structure. For information on this older version of the LUI utility, see your NBX Voice-Authorized Partner or a version of the NBX Administrator's Guide from a release prior to NBX R4.3.

To start the LUI utility:

- 1 Cycle power to the telephone by disconnecting and then reconnecting its power connector, and then start the LUI utility (as described in step 2, next) before the telephone finishes its download of code from the call processor.

For telephones that use a powered Ethernet cable instead of a power adapter, disconnect and then reconnect the Ethernet cable.

- 2 To start (or exit from) the LUI utility:

- On the NBX 3102 Business Telephone, press the *Program* button:



- On NBX 1102, 2102, or 2101-IR Business Telephones, press the *Program* button:



- On NBX 3101 or 3101SP Basic Telephones, press the *Select* button (the center button in the cursor control button group):



- On the NBX 2101 Basic Telephone, press the *MSG* button:

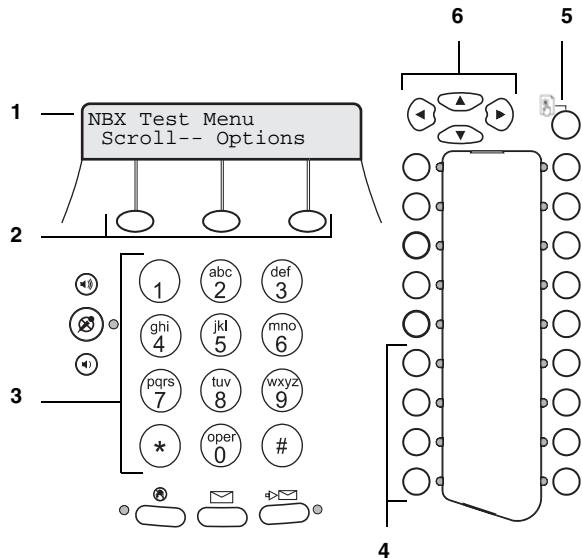


The buttons you use to enter information vary with each type of supported telephone:

- NBX 3102 Business Telephone, see Figure 26 on page 309.
- NBX 3101 or 3101SP Basic Telephones, see Figure 27 on page 310.
- NBX 1102, 2102, or 2101-IR Business Telephones, see Figure 28 on page 311.
- NBX 2101Basic Telephone, see Figure 29 on page 312.

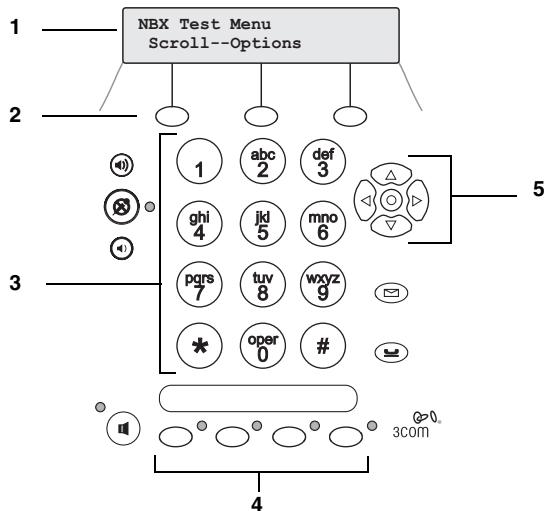
Table 49 on page 313 describes each LUI utility menu item.

Figure 26 Local User Interface Controls on the NBX 3102 Business Telephone



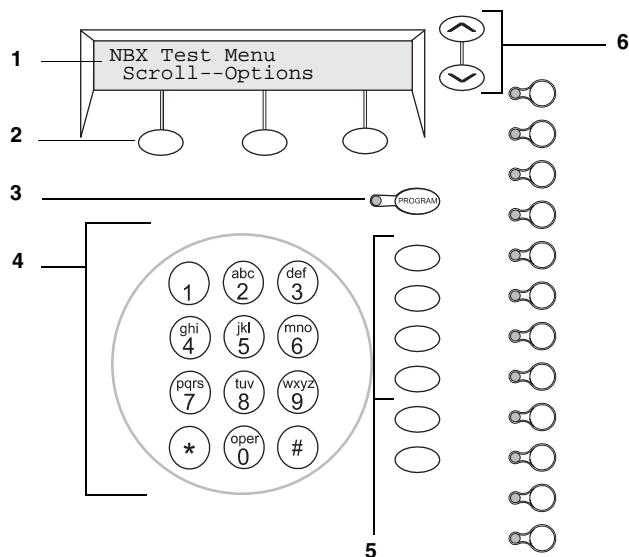
- 1** Display panel.
- 2** Soft buttons move the cursor left or right. The middle button is not used.
- 3** Key pad numeric keys select menu items or enter numeric characters in a menu item. Use the # key to save changes after you edit an item.
- 4** Access buttons AB1-AB4 (from bottom to top) select menu items.
- 5** Program button:
 - Start and exit from the LUI utility.
 - Exit from a menu item and move to the next higher menu. If you press the Program button before you save a change to a setting, you exit the menu item without saving the change.
- 6** Scroll buttons:
 - Up and down buttons move up or down through the LUI menu and select hex digits when editing a MAC address.
 - Left and right buttons position the cursor in the display panel when editing a setting, such as an IP address.

Figure 27 Local User Interface Controls on NBX 3101 and 3101SP Basic Telephones



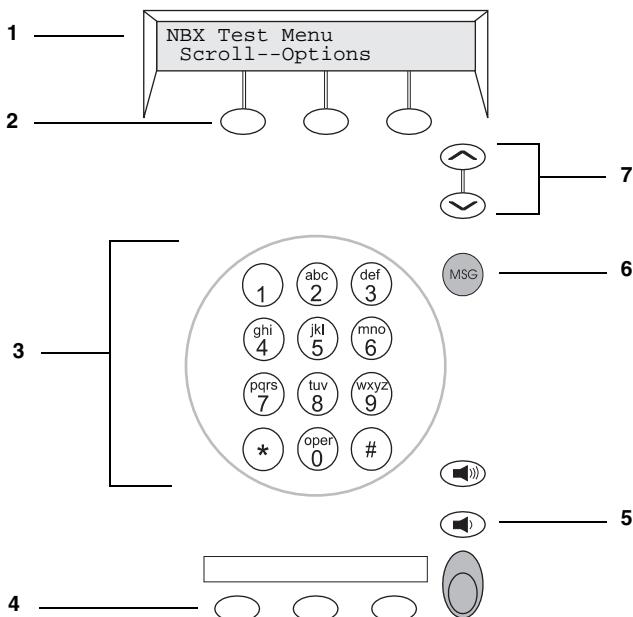
- 1 Display panel.
- 2 Soft buttons move the cursor left or right. The middle button is not used.
- 3 Key pad numeric keys select menu items or enter numeric characters in a menu item. Use the # key to save changes after you edit an item.
- 4 Access buttons AB1-AB4 (from left to right) select LUI menu items.
- 5 Scroll buttons:
 - Center select button starts and exits from the LUI utility or exits from a menu item and moves to the next higher menu. If you press the center select button before you save a change to a setting, you exit the menu item without saving the change.
 - Up and down buttons move up or down through the LUI menu and select hex digits when editing a MAC address.
 - Left and right buttons position the cursor in the display panel when editing a setting, such as an IP address.

Figure 28 Local User Interface Controls on the NBX 1102, 2102, and 2102-IR Business Telephones



- 1 Display panel.
- 2 Soft buttons move the cursor left or right. The middle button is not used.
- 3 Program button starts and exits from the LUI utility or exits from a menu item and moves to the next higher menu. If you press the Program button before you save a change to a setting, you exit the menu item without saving the change.
- 4 Key pad numeric keys select menu items or enter numeric characters in a menu item. Use the # key to save changes after you edit an item.
- 5 Access buttons AB1-AB4 (from top to bottom) select LUI menu items.
- 6 Scroll buttons move up or down through the LUI menu and select hex digits when editing a MAC address.

Figure 29 Local User Interface Controls on the NBX 2101 Basic Telephone



- 1 Display panel.
- 2 Soft buttons move the cursor left or right. The middle button is not used.
- 3 Key pad numeric keys select menu items or enter numeric characters in a menu item. Use the # key to save changes after you edit an item.
- 4 Access buttons AB1-AB3 select LUI menu items.
- 5 Volume Down button selects LUI menu item AB4.
- 6 MSG (voice mail message) button starts and exits from the LUI utility or exits from a menu item and moves to the next higher menu. If you press the MSG button before you save a change to a setting, you exit the menu item without saving the change.
- 7 Scroll buttons move up or down through the LUI menu and select hex digits when editing a MAC address.

Table 49 LUI Menu Items

Menu Option	Description
1 View Settings	<p>Press 1 on the number pad and scroll to view these options:</p> <p>MAC Address – MAC address of this telephone.</p> <p>NCP MAC Address – MAC address of call processor. All Fs, the normal value for this setting, indicates that the telephone responds to any NCP.</p> <p>SW Build Ident. – Software version running on this telephone.</p> <p>Serial # Rev – Telephone serial number and hardware version.</p> <p>Phone Port Speed – Speed and duplex setting of the LAN connection.</p> <p>PC Port Speed – The speed and duplex setting of the PC port to the device, if any, connected to the port.</p> <p>Note: The next four settings are all valid only if the device downloads via IP (layer 3). These four settings are acquired from either DHCP or a setting in the telephone's memory</p> <p>My IP Address – Active IP address of this telephone.</p> <p>Subnet Mask – Active IP mask.</p> <p>Gatwy IP Address – Active default gateway IP address.</p> <p>NCP IP Address – Active IP address of the call processor with which this telephone communicates.</p> <p>ALT SrvrlP – Active IP address of a secondary download server with which this telephone communicates, acquired from either DHCP option 184 or a setting in the telephone's memory. (Valid for 3Com VCX Telephone systems only.)</p> <p>VLAN Config – Active VLAN for this telephone, acquired from either DHCP option 184 or a setting in the telephone's memory. Valid for 3Com VCX Telephone systems only.</p> <p>Mem- My IP Addr – The IP address configured in the telephone's memory through the LUI utility.</p> <p>Mem- Subnet Mask – The IP mask configured in the telephone's memory through the LUI utility.</p> <p>Mem- Gatwy IP – The default gateway IP address configured in the telephone's memory through the LUI utility.</p> <p>Mem- NCP IP Addr – The NCP IP address configured in the telephone's memory through the LUI utility.</p> <p>Mem- ALT SrvrlP – Secondary download server address configured in the telephone's memory. (Valid for 3Com VCX Telephone systems only.)</p> <p>Mem- VLAN Config – VLAN values configured in telephone's memory. Valid for 3Com VCX Telephone systems only.</p>

Table 49 LUI Menu Items (continued)

Menu Option	Description
2 Set my IP	Lets you specify the IP information for this telephone.
3 Set SubNMsks	When entering an IP address:
4 Set Gatwy IP	<ul style="list-style-type: none"> ■ Use the key pad to enter digits 0–9. ■ Use the left and right soft keys or scroll keys to move the cursor left or right. ■ If any of the fields within the IP address contain only one or two digits, add leading zeros. Example: Enter 10.234.1.125 as 010.234.001.125 ■ To change a telephone back to its default setting, enter 255 for each octet of the IP address. To clear all configured settings and return to factory defaults, select menu item AB4. ■ Press the # key to commit your address change.
5 Set NCP IP	<p>Lets you specify the IP address of the Network Call Processor. If the telephone is on the same subnet as the NCP you never need to specify the NCP IP address. If the telephone is on a different subnet, then you must enter this information or provide it by using DHCP option 184.</p> <p>When entering an IP address:</p>
	<ul style="list-style-type: none"> ■ Use the key pad to enter digits 0–9. ■ Use the left and right soft keys or scroll keys to move the cursor left or right. ■ If any of the fields within the IP address contain only one or two digits, add leading zeros. Example: Enter 10.234.1.125 as 010.234.001.125 ■ To change a telephone back to its default setting, enter 255 for each octet of the IP address. To clear all configured settings and return to factory defaults, select menu item AB4. ■ Press the # key to commit your address change.
6 VCX Config Menu	Not used in an NBX environment. NBX telephones can operate as SIP clients for the 3Com VCX Telephone System. This option opens a submenu that allows you to set telephone operating settings for a VCX environment.
7 Spare	Reserved for future use.

Table 49 LUI Menu Items (continued)

Menu Option	Description
8 Test LED & LCD	<p>On all NBX Business Telephones and NBX 3101 and 3101SP Basic Telephones, turns on all LEDs for 5 seconds, then fills every pixel on the display panel for 5 seconds.</p> <p>On all NBX Basic Telephones, turns on the icons and words on the right side of the display panel for 5 seconds.</p> <p>Icons: Telephone icon plus the number 1 (top line) and telephone icon plus the number 2 (bottom line) Words: FWD (top line) and IN (bottom line)</p>
9 Test – Buttons	<p>Puts the telephone in the button test state. Press any telephone button to see a description of the button's function. To return to the main menu, you must press the menu button twice:</p> <ul style="list-style-type: none"> ■ On the NBX 3102 Business Telephone:  ■ On an NBX 1102, 2102, or 2102-IR Business Telephone:  ■ On an NBX 3101 or 3101SP Basic Telephone:  ■ On an NBX 2101 Basic Telephone: 
0 EEPROM-Default	<p>Restores the phone to default settings by clearing these configured settings:</p> <p>IP Information — My IP, Subnet Mask, Gateway IP, NCP-IP, and the Alt Download Server IP return to 255.255.255.255.</p> <p>NCP MAC address — The NCP MAC address returns to ff:ff:ff:ff:ff:ff.</p> <p>SIP Parameters — All SIP specific parameters will be set to default 0xffff (data parameters) or 255.255.255.255 for IP addresses.</p> <p>NOTE: If you select this option you are prompted to verify your action before the system clears the EEPROM.</p>
AB1 Set NCP MAC NOTE: This setting is for test networks only.	<p>Lets you specify the MAC address of the Network Call Processor. In all but special circumstances, the system messages communicate this information and you do not need to manually configure the MAC address.</p> <p>To change a telephone back to its default setting, enter all Fs for the NCP MAC address.</p>

Table 49 LUI Menu Items (continued)

Menu Option	Description
AB2 Show EEPROM	Lets you scroll through the locations in the memory of the telephone. The information is presented in hexadecimal format and can be properly interpreted only by a 3Com service person.
AB3 Ping H3/IP	Run an H3 IP ping test. See the next topic, Using H3PingIP, for more information.
AB4 Reset Phone	Reset the device. You can perform the same task by removing power from the telephone. However, Option AB4 can be useful for cordless phones, which cannot easily be disconnected from power.

Using H3PingIP

You can use the H3PingIP menu item to ping another device on the network to test the telephone's connectivity and to check the packet delay.

When using H3PingIP to test for connectivity, you must use the IP address of a device that is connected to the NBX system NCP. You should not use the NCP IP address. The NBX Business Telephone uses the IP Gateway and subnet mask information programmed into it using the AB16 and AB17 buttons.

H3PingIP shows the following information:

- **Port** — The UDP Destination Port
- **Tx** — The number of packets transmitted
- **Rx** — The number of packets received
- **mS** — The delay time, in milliseconds



If you ping a device on a subnetwork different than the one on which the telephone is located, the delay time is greater.

System-level Troubleshooting

For each symptom listed in Table 50, perform the suggested actions in the order listed.



WARNING: Before you remove any component, **shut down the system software** and then turn off the power to the chassis by removing the chassis power cord. If the system has two power supplies, remove both power cords.

Table 50 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 Call Processor. 2 Wait 60 seconds. 3 Reconnect power to the system. 4 Use NBX NetSet to enter the correct date and time.
Problem with Network Call Processor battery.		Contact your 3Com NBX Voice - Authorized Partner.
Your browser cannot find NBX NetSet.	No IP connectivity	Verify that the computer you are using to run the browser has network connectivity. See "Establishing IP Connectivity" in the <i>NBX Installation Guide</i> .
	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.
	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 NBX NetSet using the new IP address. See "Establishing IP Connectivity" in the <i>NBX Installation Guide</i> .

Table 50 Troubleshooting Actions (continued)

Symptom	Possible Cause	Suggested Action
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" in the <i>NBX Installation Guide</i> for more information.
	MOH audio is disabled.	Enable MOH audio in NBX NetSet > System Configuration > System Settings > System-wide. See "Connecting a Music-on-Hold (MOH) Input Device" in the <i>NBX Installation Guide</i> .
	MOH volume is set too low.	See "Adjusting Music-on-Hold (MOH) Volume" in the <i>NBX Installation Guide</i> .
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.

Table 50 Troubleshooting Actions (continued)

Symptom	Possible Cause	Suggested Action
	You are answering the telephone before the Caller ID information is fully received.	Caller ID information does not appear immediately. It usually appears between the first and second rings. If you answer the call too quickly, the information is never received. If you transfer the call, the person you transfer the call to sees your ID instead of the ID of the original caller.

Digital Line Card Troubleshooting

In order to correctly troubleshoot a Digital Line Card, you must determine whether the origin of the problem is:

- The hardware
- The software configuration
- The CSU (Channel Service Unit)
- The telephone company's line

To eliminate the Digital Line Card (T1 or E1) attach a loop back connector in place of the telephone company's line. Configure the card as described in the appropriate section of Chapter 3.



The 3C10116D T1 card and 3C101156D E1 card can respond to commands from the Central Office to loop back data at different points for diagnostic purposes. You enable each loopback test using the NBX NetSet utility. You initiate the Local and Framer loopback tests using the NBX NetSet utility. The Line and Payload loopback tests must be initiated by the Central Office or by test equipment emulating Central Office equipment. For more information on enabling loopback tests, see "Using Loopback Tests" on page 219.

After you complete the configuration, and with the loopback connector in place, verify that the Nominal status light (3C10165C E1 card or 3C10116C T1 card) on the front panel of the Digital Line Card is turned on (appears steady and green). For the 3C10165D E1 card and 3C10116D T1 card, make sure the CO status light is green.

- If the Nominal or CO status light does not turn on, the problem is most likely in the Digital Line Card, and you should contact your 3Com Voice-Authorized Partner to report the problem.

- If the Nominal or CO light turns on, the problem is either in the CSU (Channel Service Unit) or in the telephone company's line. Contact the telephone company for assistance.



The 3C10165D E1 Card and the 3C10116D T1 card each have an onboard CSU. You can view CSU statistics for the card through the NBX NetSet utility. For more information see "Viewing CSU State Information and Statistics" on page 217.

Alarm Conditions (Overview)

T1 and E1 Digital Line Cards may experience these alarm conditions:

- Red Alarm — Indicates one of these conditions:
 - Loss of Signal (LOS)
 - Loss of Framing (LOF) also known as Out of Frame (OOF)
- Blue Alarm — Indicates an Alarm Indication Signal (AIS)
- Yellow Alarm — Indicates a Remote Alarm Indication (RAI)

An alarm condition may be one of these:

- Signal — Information transmitted either in the upstream or downstream direction, warning of a detected failure:
- State — A condition, activated at a terminal device, indicating that a problem exists and remedial action is required.



T1 and E1 Digital Line Cards are considered "downstream" equipment.

Alarm Descriptions

Red Alarm

- **Carrier Fail Alarm** (Red CFA) — A state that exists at a downstream terminal device, based upon the terminal device detecting an incoming LOS or LOF.

Blue Alarms

- **AIS, Keep-alive/Blue** — A signal that is transmitted instead of the normal signal to maintain transmission continuity and to indicate to the receiving equipment that there is a transmission interruption either at the equipment that is generating the AIS signal or upstream of that equipment. The all ones signal is generated:
 - To maintain transmission continuity
 - To notify downstream equipment of a transmission fault

- To indicate to downstream equipment that a DS1 framed signal is not being generated

The transmission fault may be located at the equipment that is generating the alarm signal, or it may be located upstream of that equipment.

- **AIS CFA** (also known as Blue CFA) — A state that exists at the downstream equipment and indicates that it has detected an AIS signal from the upstream equipment.

Yellow Alarms

- **RAI** (also known as Yellow Alarm Signal) — A signal transmitted in the outgoing direction when a terminal determines that it has lost the incoming signal. The terminal equipment generates the Yellow Alarm Signal for a minimum of 1 second using one of these methods:
 - If you are using Super Frame (SF), the terminal equipment generates the Yellow Alarm Signal by setting the second bit in all channels of the Super Frame to 0 (zero).
 - If you are using Extended Super Frame (ESF), the terminal equipment generates the Yellow Alarm Signal by sending an alternating pattern of 8 ones followed by 8 zeros on the Facilities Data Link (FDL).
- **Yellow CFA** — A state that is activated at the terminal equipment when the terminal equipment detects a Yellow Alarm Signal. The Yellow Alarm Signal comes from the equipment at the other end when the far end equipment enters a Red CFA state. See Red Alarm, earlier in this section.

Alarms on NBX Digital Line Cards	NBX T1 and E1 Digital Line Cards support all of the alarm states and signals described in “Alarm Descriptions” on page 320. Table 51, next, and Table 52 on page 323 describe how the status lights indicate alarm conditions on digital line cards.
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Table 51 3C10165, 3C10165B, 3C10165C, 3C10116, and 3C10116C Status Lights and Error Conditions

Status Light	Purpose
Nominal	On: There are no error or alarm conditions. Flashing: A call is active on at least one channel.

Table 51 3C10165, 3C10165B, 3C10165C, 3C10116, and 3C10116C Status Lights and Error Conditions (continued)

Status Light	Purpose
CF (Carrier Fail)	<p>On: A Red Alarm state or Blue Alarm state exists on the card. To determine which alarm state exists:</p> <ol style="list-style-type: none"> <li>1 Log on to the NBX NetSet utility using the administrator ID and password. <li>2 Click <i>Device Configuration > Digital Line Cards</i>. <li>3 In the <i>Select Device Type</i> list, select <i>T1 Span List</i> or <i>ISDN PRI Span List</i>, and then click <i>Apply</i>. <li>4 Select the span you want and click <i>Status</i>. The words <i>Red Alarm</i> or <i>Blue Alarm</i> appear in the <i>Status</i> field.
RA (Remote Alarm)	<p>On: A Yellow Alarm state on the card. To confirm that the Yellow Alarm state exists:</p> <ol style="list-style-type: none"> <li>1 Log on to the NBX NetSet utility using the administrator ID and password. <li>2 Click <i>Device Configuration > Digital Line Cards</i>. <li>3 In the <i>Select Device Type</i> list, select <i>T1 Span List</i> or <i>ISDN PRI Span List</i>, and then click <i>Apply</i>. <li>4 Select the span you want and click <i>Status</i>. The words <i>Yellow Alarm</i> appear in the <i>Status</i> field. <p>NOTE: This light is used only on the T1 Digital Line Card.</p>
LB (Loop Back)	<p>On: The card is in loop-back testing mode.</p> <p>NOTE: This light is not used to indicate any of the Red, Blue, or Yellow alarms.</p>

Table 52 3C10165D and 3C10116D Status Lights and Error Conditions

Status Light	Purpose
CO	<p>Green: There are no error or alarm conditions.</p> <p>Amber: An alarm condition at the remote end or the CO is not connected or available. To determine which alarm state exists:</p> <ol style="list-style-type: none"> 1 Log on to the NBX NetSet utility using the administrator ID and password. 2 Click <i>Device Configuration > Digital Line Cards</i>. 3 In the <i>Select Device Type</i> list, select <i>T1 Span List</i> or <i>ISDN PRI Span List</i>, and then click <i>Apply</i>. 4 Select the span you want and click <i>Status</i>. The words <i>Red Alarm</i> or <i>Blue Alarm</i> appear in the <i>Status</i> field.

Configuration and Status Reports

You can obtain the status of all Digital Line Cards in the NBX system with either of these two methods:

Select *NBX NetSet > Device Configuration > Digital Line Cards* and:

- Click *Config & Status Report*. The formatted report appears on the screen with headings shown in a larger font.
- Click *Export Report*. The unformatted report appears on the screen. To save the report as an ASCII text file, select *Save as* from the *File* menu of your browser.

Table 53 describes in alphabetical order (not the order of appearance) the headings in the Configuration and Status Report.

Table 53 Configuration and Status Report Headings

Heading	Description
#Chs	Number of channels.
#Dsp	Number of digital signal processors.
#OffChs	Number of channels in the offline state.
#OnChs	Number of channels in the online state.
AEClosed	Autoattendant extension when business is closed.
AELunch	Autoattendant extension when business is at lunch.
AEOpen	Autoattendant extension when business is open.
AOOther	Autoattendant extension for Other hours.

Table 53 Configuration and Status Report Headings (continued)

Heading	Description
ais	TEP performance data. Alarm Indication Signal. The number of seconds in which an ais was transmitted. An ais signal is transmitted in lieu of the normal signal to maintain transmission continuity and indicate to the receiving terminal that there is a transmission fault located either at the transmitting terminal or upstream of the transmitting terminal. Also referred to as a Blue Alarm.
aissp	TEP performance data. T1.231 Near End. Number of seconds when loss of frame encountered.
ANI	Automatic Number Identification. The telephone number from which the call originated.
Audio Input	Numeric value of audio input control setting.
Audio Output	Numeric value of audio output control setting.
Audio Compr	The type of audio compression selected for this span. Default means that the device is using the system-wide setting.
bbec	TEP performance data. G.826 Near End, Far End. Number of E1 background block errors.
bber	TEP performance data. G.826 Near End, Far End. Background block ratio.
bes	TEP performance data. Bursty Errored Seconds, TR54016 Far End and Far End. Number of seconds during which there were 2 to 319 CRC errors, but no Severely Errored Frame or AIS conditions.
BdId	Board (card) ID number.
BdId Name	Board (card) name.
Brd	The number of the board (card) in a multiple board system.
CO Switch Protocol	Protocol (ETS1, QSIG Slave) used by the CO switch (not applicable to T1).
Card Type	Type of card (T1, ISDN PRI, E1, BRI).
Ch MAC Address	Channel MAC address.
Ch List	Channels supported by a DSP.
Ch Name	Name of a channel.
Chld	Unique identifying number of a channel in a list of channels, possibly including channels from more than one board.
ChNo	Channel number. For example: 1–24 for a T1 board.
css	TEP performance data. Controlled Slip Seconds, TR54016 Near End and Far End. Number of seconds of controlled (benign) slips.

Table 53 Configuration and Status Report Headings (continued)

Heading	Description
cssp	TEP performance data. Controlled Slip Seconds Path, T1.231 Near End and Far End. Number of seconds of controlled (benign) slips.
CurState	Current state of a channel (in use, idle, available).
cv	TEP performance data. Code Violations, G.826 Near End. Number of bipolar violations and excessive zeroes.
cvl	TEP performance data. Code Violations Line, T1.231 Near End. Number of bipolar violations and excessive zeroes.
cvp	TEP performance data. Code Violations Path, T1.231 Near End and Far End. Number of bipolar violations and excessive zeroes.
datasecs	TEP performance data. The number of seconds with valid data.
DNIS/DID	Number of digits passed that identify the called party.
DSP Name	Name of a digital signal processor.
DSP Status	Status of a digital signal processor.
DSP Version	Version of code running on a digital signal processor.
Digit Collection	Specifies the data the CO sends and the format in which it is sent over the span of an incoming call. Can include both DNIS/DID and ANI, and can specify the order in which they arrive, and the number of digits involved.
EchoCanceller	The state of the echo cancellation function. Values: Enabled, Disabled.
E&M Direction	For a T1 line, the direction of the E&M signaling. Values: Two Way, One Way. Default: Two Way.
ErrorCnt	Reserved for future use.
ErrorCode	Reserved for future use.
es	TEP performance data. Errored Seconds, TR54016 Near End and Far End. Number of one-second intervals with exactly one CRC-6 error and no SEF or AIS defects.
esap	TEP performance data. Errored Seconds Type A, T1.231 Near End and Far End. Number of one-second intervals with exactly one CRC-6 error and no SEF or AIS defects.
esbp	TEP performance data. Errored Seconds Type B, T1.231 Far End. Number of one-second intervals with between 2 and 319 CRC errors.
esc	TEP performance data. Errored Seconds, G.826 Near End and Far End. Number of one-second intervals with exactly one CRC-6 error and no SEF or AIS defects.
esl	TEP performance data. Number of one-second interval with between 2 and 319 CRC errors. (line)

Table 53 Configuration and Status Report Headings (continued)

Heading	Description
esp	TEP performance data. Errored Seconds, T1.231 Near End and Far End. The number of one-second intervals with between 2 and 319 CRC errors.
esr	TEP performance data. Errored seconds ratio, G.826 Near End and Far End.
Ext.	The extension number for a channel.
fc	TEP performance data. Failure Count, T1.231 Near End and Far End. Total failure count for the sample.
FlashHookTransfer	Status of flash hook transfer function. If enabled, allows user receiving a call to do a flash hook transfer to another trunk line Values: Enabled, Disabled. Default: Enabled
Framing Type	Type of framing used on this board (ES4, D4). For a T1 board, ESF is always associated with a B8ZS line coding, and D4 is always associated with AMI line coding.
Framer Loopback	The state of the setting for the Framer Loopback test, either enabled or disabled.
Gpld	Group ID number.
Group Name	Group name.
Guard	A time out value that controls the waiting period after a call completes, before the channel can be used for another outbound call from NBX system.
InterfaceType	Type of interface. Values: E1, T1, ISDN, no config. Default: T1. Does not apply to T1 E&M.
Interval	TEP performance statistics are sampled every 15 minutes. The system saves up to 24-hours of data in 15-minute intervals.
Intl. Prefix	An advanced configuration setting. An identifier, up to five-digits, that can be manually configured for outgoing calls on this span. Manual configuration of the international prefix is for situations where the telephone company equipment requires special configuration on the NBX system.
Line Code	Type of line coding used (HDB3, AMI). For a T1 board, AMI line coding is always associated with D4 framing, and B8ZS line coding is always associated with ESF framing.
Line Length	Length of the line between the termination and the board.
Line Loopback	The state of the setting for the Line Loopback test, either enabled or disabled.
lofc	TEP performance data. Loss Of Frame Count, T1.231 Near End and Far End. Number of Out-Of-Frame events.

Table 53 Configuration and Status Report Headings (continued)

Heading	Description
los	TEP performance data. Loss Of Signal Seconds, G.826 Near End. Number of seconds during which the signaling channel was lost.
lossl	TEP performance data. Loss of Signal Seconds, T1.231 Near End. Number of seconds during which no pulses (loss of signal) have arrived within 100 to 250 bit times.
Local Loopback	The state of the setting for the Local Loopback test, either enabled or disabled.
MAC Address	A 48-bit address unique to each network device.
Model Number	The model number of the board.
Values:	
	0x0700 — T1 board 3C10116B
	0x0b00 — T1 board 3C10116C
	0x0e00 — T1 board 3C10116D
	0x0c00 — E1 board 3C10165C
	0x0f00 — E1 board 3C10165D
	0x0a00 — BRI board 3C10164C
National Prefix	An advanced configuration setting. An identifier, up to five-digits, that can be manually configured for outgoing calls on this span. Manual configuration of the national prefix is for situations where the telephone company equipment requires special configuration on the NBX system.
NCP Conne	The amount of time that the digital line card waits for the NCP to connect the call. "USER_ALERTING_NO_ANSWER" errors mean that this value may be too small.
NCP Gener	A time-out value that controls how long the digital line card waits for a response from the call processor. Do not modify this value.
Network Digit	A time-out value that controls how long the digital line card waits between digits sent on an incoming call.
OffHk Min	The minimum time an analog telephone, connected to an Analog Terminal Card, must be off hook for the NBX system to recognize that the telephone has been picked up.
On Line	One possible status of a channel.
oof	TEP performance data. Out of Frame Seconds, G.826 Near End. Number of seconds during which there were excessive frame bit errors.
Payload Loopback	The state of the setting for the Payload Loopback test, either enabled or disabled.

Table 53 Configuration and Status Report Headings (continued)

Heading	Description
Prepend Prefix	Full text: Prepend prefix to Calling Party Number in Setup Indication. Either enabled or disabled. National and international prefixes can be added for outgoing calls. The prefix is for situations where the telephone company equipment requires special configuration on the NBX system.
Protocol	A signaling method used to make calls.
rai	TEP performance data. Remote Alarm Indicator, G.826 Near End and Far End. Number of seconds during which a remote alarm indication was declared.
Recv. Timer	Full Text: Overlap Receiving timer (T302). PRI span only. An advanced configuration setting for situations where the telephone company equipment requires special configuration on the NBX system.
Release Complete	Full Text: Send "Release Complete" if incoming call is from incompatible equipment. Either enabled or disabled. An advanced configuration setting for situations where the telephone company equipment requires special configuration on the NBX system.
RxWnkMax	The maximum duration of a received Wink signal.
RxWnkMin	The minimum duration of a received Wink signal.
sasp	TEP performance data. SEF/AIS Seconds, T1.231 Near End. Number of seconds when at least 2 frame bit errors or loss of frame encountered.
sefsp	TEP performance data. Severely Errored Frame Seconds, T1.231 Far End. Number of one-second intervals with either out-of-frame signals, AIS defects, 390 or more CRC errors, or four or more frame bit errors.
Sending Complete	Full Text: Send "Sending Complete IE" in Setup Request IE (Information Element) refers to the data fields within an ISDN layer 3 message. An advanced configuration setting for situations where the telephone company equipment requires special configuration on the NBX system.
ses	TEP performance data. Severely errored seconds, TR54016 Near and Far End. Number of one-second intervals with either out-of-frame signals, AIS defects, 390 or more CRC errors, or four or more frame bit errors.
sesc	TEP performance data. Number of one-second intervals with either out-of-frame signals, AIS defects, 390 or more CRC errors, or four or more frame bit errors.

Table 53 Configuration and Status Report Headings (continued)

Heading	Description
sesl	TEP performance data. Severely Errored Seconds Line, T1.231 Near End. Number of one-second intervals with either out-of-frame signals, AIS defects, 390 or more CRC errors, or four or more frame bit errors.
sesp	TEP performance data. TEP performance data. Severely Errored Seconds Path, T1.231 Near End. Number of one-second intervals with either out-of-frame signals, AIS defects, 390 or more CRC errors, or four or more frame bit errors.
sesr	TEP performance data. Severely Errored Seconds Ratio, G.826 Near End and Far End.
Silence Suppr	The state of the silence suppression setting for this span. "Default" indicates that the span is set to use the system-wide setting.
SpId	Span ID.
SpNo	Span number.
Span MAC Address	MAC address assigned to this span.
Span Name	Name of span.
SpanNo	Identifying number for a span.
Start Type	Mechanism used to indicate start of a call.
Status	Status of a channel, span, card. Values: Online, Idle, Unknown. Default: Online
Strip #	Full Text: Strip trailing # from Called Party Number in Setup Request. Either enabled or disabled. An advanced configuration setting for situations where the telephone company equipment requires special configuration on the NBX system.
TEI	Terminal Equipment Identification number (of BRI board). The telephone company may provide this number or the system may assign it, depending on how you purchased the BRI lines.
TEP Version	The version of software running on the board.
Time Last Seen	Last time activity was recorded for this board.
Timing Mode	Internal: Timing is generated from within the digital line card. Loop: Timing is taken from the central office.
Trunk to Trunk	Whether call transfers are allowed from one trunk to another. Values: Enabled (default), Disabled, Restricted, Unrestricted.
TxGudMin	The minimum duration of a transmitted Guard signal.
TxWnkDura	The duration of a transmitted Wink signal.

Table 53 Configuration and Status Report Headings (continued)

Heading	Description
uas	TEP performance data. Unavailable Seconds, TR54016 Near End and Far End. Number of seconds during which the frame was unavailable for 10-seconds.
uasc	TEP performance data. Unavailable Seconds, G.826 Near End and Far End. Number of seconds during which the frame was unavailable for 10-seconds.
uasp	TEP performance data. Unavailable Seconds, T1.231 Near End and Far End. Number of seconds during which the frame was unavailable for 10-seconds.
vsecs	TEP performance data. Valid seconds for the selected interval.
Wink Wait	This time out value controls how long the digital line card waits to respond with a wink signal on an outgoing call. If you see "no_wink_received" errors, this value may be too small.

Connecting a Computer to a Serial Port

On some devices, you can connect a computer to a serial port and, by running a terminal emulation program on the computer, you can obtain information about the status of the card or the NBX system.

You can connect a computer directly to the serial port on these devices:

Table 54 Serial Port Connections

Card	Port
NBX V3000 Call Processor	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

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 54.

To connect the computer to the COM1 or CONSOLE port on a board:

- 1** Using a standard computer serial cable (9-pin male to 9-pin female), connect the male end of the cable to the female connector (COM1 or CONSOLE) on the front panel of the board.
- 2** Connect the female end of the cable to an available serial port on the computer.
- 3** Start the terminal emulation software and create a new connection.
- 4** Configure the connection to use the serial port to which you connected the cable and to use the settings in Table 55.

Table 55 Terminal Emulation Program Properties

Property	Value
Emulation	VT100
Baud Rate	9600
Data bits	8
Parity	None
Stop bits	1
Flow control	None

All messages associated with the board (for example, the initialization process) appear in the terminal emulation window.

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

INTEGRATING THIRD-PARTY MESSAGING

The NBX system can operate with a third-party messaging system. This appendix describes the steps that you must perform to use a third-party messaging system with the NBX system:

- Installing Software on the Third-Party Messaging Server
- Configuring the NBX System
- Configuring NBXTSP on the Server

Installing Software on the Third-Party Messaging Server

You must install the NBX Media Driver and the NBX TAPI Service Provider (NBXTSP) on the third-party messaging server to enable it to interact with the NBX system. See your messaging application's documentation for server requirements.

- 1 Install the NBX Media Driver application from the *NBX Resource Pack CD* or the NBX Partner Access website.
- 2 Install the NBXTSP from the *NBX Resource Pack CD* or the NBX Partner Access website.

You can also download the NBXTSP from your NBX system by connecting to the NBX NetSet utility from a browser located on the third-party messaging server.

Configuring the NBX System

To activate third-party messaging on the NBX system use the NBX NetSet utility to perform the tasks described in this section.

- Add the NBX Third-party Messaging and Media Driver licenses
- Make sure Auto Discover Telephones is enabled
- Disable NBX messaging
- Create a Hunt Group for the third-party messaging system
- Modify the Voice Mail Extensions List

All NBX NetSet procedures require an administrator login.

Add the NBX Third-Party Messaging and Media Driver licenses to your NBX system:

- 1 Select *NBX NetSet > Operations > Licenses > Add License*.
- 2 In the *License Key* field, enter the license key provided by your 3Com Voice-Authorized Partner.
- 3 Click *Apply*.
- 4 Add any additional licenses. When you are finished adding licenses, click *OK*.
- 5 Reboot the system.



3Com strongly recommends that you back up your licenses each time you make a license change.

Verify that Auto Discover Telephones is enabled and NBX Messaging is disabled:

- 1 Select *NBX NetSet > System Configuration > System-wide*.
- 2 Verify that *Auto Discover Telephones* is enabled.
- 3 Clear the check box for *NBX Messaging*.
- 4 Click *OK*.

Create an NBX Hunt Group for third-party messaging:

- 1 Select *NBX NetSet > User Configuration > Hunt Groups > Add*.
- 2 Set the following parameters:

- **Name** — UM Hunt Group (or some similar name)
- **Type** — HuntGroup - Circular.



3Com recommends that you use a circular hunt group rather than a linear hunt group.

- **Extension** — Enter the appropriate extension for your hunt group.
- **Password** — Set the password for this hunt group.
- **Logout if no answer** — Verify that this check box is empty.
- **Users** — Select the WAV phones and the ATA ports that are connected to the third-party messaging system.
- **Call Coverage** — Set to Voicemail.

- 3** Click *OK*.

Edit the Voice Mail Extensions list:

- 1** Select *NBX NetSet > Dial Plan > Extension Lists*.
- 2** Click **0003 VoiceMail*, and then click *Modify*.
- 3** In *Extensions in List*, select all of the Voicemail extensions and then click the **>>** button.
- 4** In *Extensions not in List*, select the Hunt group extension that you created for third-party messaging and click the **<<** button.
- 5** Click *OK*.

Configuring NBXTSP on the Server

On the third-party messaging server, you must add the WAV extensions to the NBX TAPI Control Panel. If your third-party messaging system needs TAPI messages from NBX Analog Terminal Adapter devices or NBX Telephones, you must also add these devices to the NBX TAPI Control Panel.

Update the devices in the NBX TAPI Control Panel:

- 1** **WinNT** — On the server, select *Control Panel > Telephony > Telephony Drivers > NBX TAPI Service Provider*.
Win2K — On the server, select *Control Panel > Phone and Modem Options > Advanced > NBX TAPI Service Provider*.
- 2** Click *Configure* and add the extension numbers.
- 3** Click *OK*.

You are now ready to install your third-party messaging software. See your application's documentation for installation and configuration instructions.

B

ISDN COMPLETION CAUSE CODES

This appendix lists the Completion Cause Codes displayed in the digital line card *Span Status* dialog boxes:

- *Digital Line Cards > T1 Span List > Status*
- *Digital Line Cards > ISDN PRI Span List > Status*
- *Digital Line Cards > ISDN BRI Span List > Status*

The codes, listed in Table 56, detail the reasons for the termination of a call. See “Configuring and Managing E1 Digital Line Cards” on page 176.



These completion cause code descriptions are only guidelines. The detailed cause may vary according to the Public Switched Telephone Network (PSTN) to which your NBX system is connected.

Table 56 Completion Cause Codes

Class Grouping	Hex Code	Decimal Code	Description	Details
Normal events	0x00	0	No diagnostic	
	0x01	1	Unassigned number	The requested destination, although valid, cannot be reached.
	0x02	2	No route	The sending equipment (sending the cause) is requested to route the call through an unrecognized transit network.
	0x03	3	No route to destination	The called user cannot be reached because the network does not serve the destination.
	0x06	6	Channel unacceptable	The last identified channel is not acceptable to the sending entity.
	0x07	7	Call awarded	The incoming call is connected to a channel already established for similar calls (e.g. packet-mode X.25 virtual calls).
	0x10	16	Normal clearing	This call is being cleared by one of the users involved.

Table 56 Completion Cause Codes (continued)

Class Grouping	Hex Code	Decimal Code	Description	Details
	0x11	17	User busy	The called user cannot accept another call although compatibility is established.
	0x12	18	No user responding	The user does not respond to call establishment messages with either an alerting or connect indication within the allowed time.
	0x13	19	User alerting no answer	The user has provided an alerting indication but no connect indication within the allowed time.
	0x15	21	Call rejected	Equipment sending the cause does not wish to accept this call although it is not busy or incompatible.
	0x16	22	Number changed	The called party number is not assigned.
	0x1A	26	Non-selected user clearing	The user has not been awarded the incoming call.
	0x1B	27	Destination out of order	The destination interface is not operating correctly.
	0x1C	28	Invalid number format	The called party number is invalid, or incomplete.
	0x1D	29	Facility rejected	The network cannot provide the facility requested.
	0x1E	30	Response to status enquiry	The reason for the STATUS message was the prior receipt of a STATUS ENQUIRY message.
	0x1F	31	Unspecified cause	Used to report normal events only when no other cause in the normal class applies.
Resource unavailable	0x22	34	No circuit available	An appropriate circuit or channel is not currently available to handle the call.
	0x23	35	Call queued (AT&T)	The network is not functioning. Immediate redial is unlikely to be successful.
	0x26	38	Network out of order	The network is not functioning. Immediate redial is unlikely to be successful.
	0x29	41	Temporary failure	The network is not functioning. Immediate redial is unlikely to be successful.
	0x2A	42	Network congestion	The switching equipment generating this cause is experiencing a period of high traffic.
	0x2B	43	Access info discarded	The network could not deliver access information to the remote user as requested. May include the type of discarded information (user-to-user information, low layer or high layer compatibility, or sub-address).
	0x2C	44	Requested channel not available	Returned when the circuit (or channel) indicated by the requesting entity cannot be provided by the other side of the interface.

Table 56 Completion Cause Codes (continued)

Class Grouping	Hex Code	Decimal Code	Description	Details
	0x2D	45	Pre-empted	
	0x2F	47	Resources unavailable – unspecified	Reports a resource unavailable event only when no other cause in the resource unavailable class applies.
Service or option not available	0x31	49	Quality of service unavailable	Throughput or transit delay cannot be supported and that the Quality of Service (as defined in Recommendation X.213) cannot be provided.
	0x32	50	Facility not subscribed	The requested supplementary service could not be provided by the network because the user has not completed the necessary administrative arrangements with its supporting networks.
	0x34	52	Outgoing call barred	
	0x36	54	Incoming call barred	
	0x39	57	Bearer capability not authorized	The user is trying to make unauthorized use of equipment providing a bearer capability.
	0x3A	58	Bearer capability not available	The user has requested a bearer capability, which is implemented by the equipment generating the cause, but is not available at this time.
	0x3F	63	Service not available	Reports a service (or option) not available event only when no other cause in the service (or option) not available class applies.
Service or option not implemented	0x41	65	Capability not implemented	The equipment sending this cause does not support the requested bearer capability.
	0x42	66	Chan not implemented	The equipment sending this cause does not support the requested channel type.
	0x45	69	Facility not implemented	The equipment sending this cause does not support the requested supplementary service.
	0x46	70	Only restricted digital available	One equipment has requested an unrestricted bearer service but the equipment sending this cause only supports the restricted version.
	0x4F	79	Service not implemented, unspecified	Reports the service (or option) not implemented event only when no other cause in the service (or option) not implemented class applies.
Invalid message	0x51	81	Invalid call reference	The equipment sending this cause has received a message with a call reference that is not currently in use on the user network interface.

Table 56 Completion Cause Codes (continued)

Class Grouping	Hex Code	Decimal Code	Description	Details
	0x52	82	Chan does not exist	The equipment sending this cause has received a request to use a channel that is not activated on the interface for a call.
	0x53	83	Suspended call exists, call identity does not	A call resume has been attempted with a call identity that differs from that in use for any currently suspended calls.
	0x54	84	Call identity in use	The network has received a call suspended request that contained a call identity (including the null call identity) that is already in use for a suspended call within the domain of interfaces over which this call may be resumed.
	0x55	85	Incompatible destination	
	0x58	88	Incompatible destination	The equipment sending this cause has received a request to establish a call that has low layer compatibility, high layer compatibility, or other compatibility attributes (for example, data rate) that cannot be handled.
	0x5B	91	Transit network does not exist.	
	0x5F	95	Invalid message (unspecified)	Reports an invalid message event only when no other cause in the invalid message call applies.
Protocol error	0x60	96	Mandatory IE missing	The equipment sending this cause has received a message that is missing an information element that must be present in the message before that message can be processed.
	0x61	97	Nonexistent message	The equipment sending this cause has received a message with a message type that it does not recognize, either because it is an undefined message, or it is defined but not implemented by the equipment sending the cause.
	0x62	98	Wrong message	The equipment sending this cause has received a message that it considers as not permitted while in the call state; or a STATUS message was received indicating an incompatible call state.
	0x63	99	Bad info element	The equipment sending this cause has received a message that includes information elements not recognized because the information element identifier is not defined, or it is defined but not implemented by the equipment sending the cause. However, the information element is not required to be present in the message to enable the equipment sending the cause to process the message.

Table 56 Completion Cause Codes (continued)

Class Grouping	Hex Code	Decimal Code	Description	Details
	0x64	100	Invalid element contents	The equipment sending this cause has received an information element that it has implemented. However, the sending equipment was not able to implement the code because one or more of the fields were incorrectly coded.
	0x65	101	Wrong message for state	The received message is incompatible with the call state.
	0x66	102	Timer expiry	A timer has expired and an associated Q.931 error handling procedure has been initiated.
	0x67	103	Mandatory IE length error	
	0x6F	111	Protocol error	reports an error event only when no cause in the protocol error class applies.
Interworking	0x7F	127	Interworking unspecified	There has been interworking with a network that does not provide cause codes for its actions. Therefore, the precise cause for a message being sent is not known.

C

CONFIGURING OPTION 184 ON A WINDOWS 2000 DHCP SERVER

Overview

RFC 2132 (DHCP Options and BOOTP Vendor Extensions) allows for vendor-specific extensions to the DHCP protocol. It defines that option codes in the range 128 through 254 are set aside for site-specific extensions.

3Com telephones can receive their IP configuration from a DHCP server. However, 3Com telephones need configuration information that is not part of a standard DHCP response. You can use DHCP option 184 to specify this extended information:

- NCP IP Address — Each telephone must receive a download of operating settings from the Network Call Processor.
- Alternate Server IP Address — Specifies a second location from which a telephone can receive its download. (Not used in an NBX system.)
- Voice VLAN Configuration — Reserved for future use.
- Fail-Over Call Route Point — Reserved for future use.

To help you configure option 184, this appendix includes an example of how to configure option 184 on a Windows 2000 server that has been configured to run DHCP server software. It covers these topics:

- Creating Option 184
- Editing Option 184 Values
- Activating Option 184



This appendix describes how to configure the NCP IP address only. The extended options are not used in an NBX environment. The information in this appendix pertains only to a Windows 2000 server. The configuration instructions differ for other DHCP servers. This appendix describes only the configuration of option 184, not how to install or perform basic configuration of the Windows 2000 server.

Creating Option 184

If you are configuring more than one subfield for Option 184, the first subfield must be the NCP IP Address for backward compatibility.

- 1 Start the DHCP Microsoft Management Console:
Start > Programs > Administrative Tools > DHCP
The *DHCP* dialog box appears. In the left pane, look for the name of your Windows 2000 DHCP server.
- 2 Right click the name of your DHCP server. From the menu that appears, select *Set Predefined Options* to open the *Predefined Options and Values* dialog box.
- 3 Click *Add* to open the *Option Type* dialog box.
- 4 In the *Name* field, type a name of your choice.
- 5 From the *Data Type* drop-down list, select *Byte*.
- 6 Enable the *Array* check box.
- 7 In the *Code* text box, type *184*.
- 8 In the *Description* text box, enter a description of your choice. Example: *NBX NCP IP Address*.
- 9 Click *OK*.

In the *Predefined Options and Values* dialog box, the DHCP Microsoft Management Console creates a new option name by combining the option number with the name that you chose and adds this name to the *Option name* drop-down list. Example: If you used *NBX* as the option name, the system adds *184 NBX* to the drop-down list.

Editing Option 184 Values

- 1 Select the new option name from the *Option name* drop-down list, and click *Edit Array*. The *Numeric Value Array Editor* dialog box appears.
- 2 In the *Data entry* area of the dialog box, click the *Decimal* radio button at the right of the word *Format*.
- 3 In the *Current Values* text box, highlight the 0 (zero), and click *Remove*.
- 4 To create the new value, enter each element of the new value:
 - a Click in the *New value* text box.
 - b Type the individual element value.

- c Click *Add*.
- 5 Repeat steps 4 a, b, and c for each element in the following table. As you add each element, it appears in the *Current values* list, above previously added values.

Add these elements in this order:

Table 57

What You Type	Description
1	Enter 1 as the only suboption code for option 184. (Some options can have more than one suboption.)
4	The length of the argument that applies to this suboption. For option 184, suboption 1, the argument is an IP address, which is composed of four numerical fields (octets).
NOTE: The next four fields use 10.234.1.254 as the sample IP address of the NBX Call Processor. Enter the IP address of your NBX Call Processor.	
10	The first octet in the IP address of the NBX Call Processor.
234	The second octet in the IP address of the NBX Call Processor.
1	The third octet in the IP address of the NBX Call Processor.
254	The fourth octet in the IP address of the NBX Call Processor.

- 6 After you have entered all elements in the new value, click *OK*. You return to the *Predefined Options and Values* dialog box. The values that you entered appear in the *Value* area of the dialog box under *Byte*.



The values appear in hexadecimal format although you entered them in decimal format.

- 7 To accept the values, click *OK*. You return to the *DHCP Microsoft Management Console* dialog box.

Activating Option 184

To activate option 184, decide whether you want to apply the option to a specific scope or globally, that is, to all scopes that are served by the DHCP server software.

To activate option 184 for a specific scope:

- 1 In the left pane of the *DHCP Microsoft Management Console* dialog box, find the scope that you want. Then highlight *Scope Options*.
- 2 Right click *Scope Options*, and, from the menu that appears, select *Configure Options*. The *Scope Options* dialog box appears.

- 3 Scroll down in the *Available Options* list until you find the option that you just added (184 NBX in this example).
- 4 Enable the check box to the left of the option.
- 5 Click *OK*.

In the right pane, the option name now appears in the *Option Name* column. The *Vendor* column contains the word *Standard*. The values of the individual elements that you entered appear in the *Value* column.



The values appear in hexadecimal format although you entered them in decimal format.

To activate option 184 globally:

- 1 In the left pane of the *DHCP Microsoft Management Console* dialog box, highlight *Server Options*.
- 2 Right click *Server Options*, and from the menu that appears, select *Configure Options*. The *Server Options* dialog box appears.
- 3 Scroll down in the *Available Options* list until you find the option that you just added (184 NBX in this example).
- 4 Enable the check box to the left of the option.
- 5 Click *OK*.

In the right pane, the option name now appears in the *Option Name* column. The *Vendor* column contains the word *Standard*. The values of the individual elements that you entered appear in the *Value* column.



The values appear in hexadecimal format although you entered them in decimal format.

D

CONNEXTIONS H.323 GATEWAY

This appendix provides information on how to install and configure the 3Com ConneXtions H.323 Gateway.

It covers these topics:

- Overview of ConneXtions
- Installation Requirements
- Preparing for Installation
- Installing ConneXtions
- Overview of H.323
- The H.323 Connection
- Connection Considerations
- Special Issues
- Checking Connections
- Placing Calls
- Receiving Calls
- Handling Conference Calls
- Related H.323 Documentation

Overview of ConneXtions

ConneXtions is a 3Com software product that allows you to use an appropriately configured Windows system as an H.323 gateway for use with NBX systems.

H.323 gateways implement an ITU standard that allows telephone-like call connections to occur through an IP network. Although this standard addresses the means for transferring data, voice, and images, the NBX ConneXtions H.323 Gateway focuses on delivering low-cost, high-quality, voice connections through IP networks.

The ConneXtions software adapts internal NBX system protocols to equivalent H.323 protocols that are carried across a WAN in IP packets. The H.323 protocol addresses:

- Negotiated connections.
- Negotiated voice compression.
- Standard extensions.
- Remote Internet device connections.

For more information, see “Overview of H.323” on page 357.

Installation Requirements

The ConneXtions H.323 Gateway software requires an NBX system and at least four additional components:

- A router with access to a wide area network (WAN)
- A Windows-based server connected to the NBX LAN
- ConneXtions software (on the *NBX Resource Pack CD*)
- A ConneXtions license



Systems that receive H.323 calls through the public Internet may also need a firewall. See “Firewall Security” page 367.

WAN Router

WAN Routers typically connect to ISDN, T1, E1, Frame Relay, or Asynchronous Transfer Mode facilities, depending on the load they carry.

A dedicated router can often reduce problems encountered with firewalls. Firewalls often interfere with connections because they are designed to admit only authorized addresses, and because they discriminate against specific types of packets. The unusual complexity of the H.323 protocol presents special problems for firewalls because it requires additional processing. To minimize packet delay through a firewall, verify that the firewall is configured to give H.323 packets a high processing priority.



During installation, you can select a range of TCP or UDP ports to use with H.323 connections to provide more flexibility when using firewalls.

A ConneXtions gateway can use a separate network interface card to bypass the firewall delay. However, you should implement this solution

only if it is consistent with your company's network security policy. For more information, see "Firewall Security" on page 367.

Windows-based System	The ConneXtions software requires a dedicated computer system that is running Windows NT version 4.0 with service pack 4 (or higher), or Windows 2000. The system hardware must be certified by Microsoft. The installation software checks for the presence of Windows 2000 or Windows NT and then loads the correct NBX packet driver from the <i>NBX Resource Pack CD</i> .
-----------------------------	--

Although the ConneXtions software requires little disk storage, processing and memory requirements are crucial, and you may need multiple gateways. Microsoft server licenses do not apply because no additional operating system logons are involved.

The main considerations are "Windows Compatibility" and "Processor, Memory, and Bandwidth Requirements", discussed next, and "Firewall Security", on page 367.

Windows Compatibility

To check the compatibility of your system:

- 1 On a computer that has Internet access, enter www.microsoft.com/hwdq/hwtest
- 2 Locate the link to the Hardware Compatibility List.
- 3 Verify that your intended Windows 2000 or Windows NT system is on the Hardware Compatibility List.

Processor, Memory, and Bandwidth Requirements

Each G.711 call needs about 50 MHz on a Pentium II or 20 Mhz on a Pentium III. Each G.723 call needs about 128 MHz on a Pentium II or 75 Mhz on a Pentium III. These speed requirements increase directly with the number of ports. The IP router bandwidth requirements also increase directly with the number of ports.



The bandwidth requirements for a Pentium II and a Pentium III are identical.

Table 58 shows the speed and bandwidth requirements for different numbers of ports. It assumes that each packet carries a 50-byte overhead.

Table 58 Pentium Processor Capabilities

Ports	Pentium II Speed (MHz)		Pentium III Speed (MHz)		Bandwidth (Kbps) on the LAN	
	G.711	G.723	G.711	G.723	G.711	G.723
2	100	256	40	150	153.6	38.4
4	200	512	80	300	307.2	76.8
8	400	1000	160	600	614.4	153.6
16	800	2000	320	1200	1228.8	307.2
32	1600	4000	640	2400	2457.6	614.4
64	3200	10000	1280	4800	4915.2	1228.8
100	5000	12800	2000	7500	7680	1920

The memory requirements to support port processing also increase with each new port. A fully configured system, with the maximum number of ports (100), needs 600 MB of main memory. Hard disk requirements are less than 40 MB.

Table 59 lists the theoretical maximum number of ports that typical Pentium processors can handle.

Table 59 Pentium II and III Processor Capabilities

Pentium II (MHz)	Ports G.711	Ports G.723	Pentium III (MHz)	Ports G.711	Ports G.723
300	6	2	450	22	6
400	8	3	500	25	6
500	10	4	533	26	7
600	12	4	550	27	7
650	13	5	600	30	8
Dual 500	20	8	650	32	8
			667	33	8
			700	35	9
			733	36	9
			750	37	10
			800	40	10
			1500	74	20



The maximum number of ports can be limited by the number of licenses.

If your port processing requirements exceed the capacity of a single processor, ConneXtions software supports either multiprocessor (dual and quad Pentium processors) or multiple gateway solutions. A Windows 2000 or Windows NT system that uses a dual 800 MHz Pentium processor achieves the same result.

Other System Requirements

Each H.323 port requires 6 MB of memory. 3Com recommends a PC with at least 128 MB of memory. Disk storage requirements are minimal. In addition to memory and disk storage, the operating system needs:

- A compact disk drive for loading ConneXtions software from the *NBX Resource Pack CD*.
- A 3Com Network Interface Card for connecting to the NBX LAN (10BASE-T or 100BASE-T).
- A 3Com Network Interface Card for connecting to a separate firewall or router (optional).

The Call Processor coordinates its activities with the gateway through a Network Interface Card (NIC) in that gateway system. The same NIC can also be used to communicate with the IP router. This single NIC configuration is appropriate if the firewall, which separates Internet and intranet, is either unnecessary or is required by company policy.

ConneXtions Software

You use the *NBX Resource Pack CD* to install ConneXtions software. The ConneXtions software performs the protocol conversions between an NBX system and the international H.323 standards. To a system administrator, H.323 ports look like PSTN line ports. Both have extensions and are configured the same way but have different license requirements.



The NBX Resource Pack CD is also required to change H.323 gateway parameters after installation. A dealer who wants to explore possible hardware incompatibilities by running ConneXtions from a substitute laptop must reinstall ConneXtions on the laptop at each site.

Preparing for Installation

Before you install a ConneXtions H.323 Gateway:

- Assemble system information.
- Check for the G.723 convertor (optional).
- Verify and install the NT Service Pack (Service Pack 4) (if required).

- Assemble permissions, licenses, and notifications.



Do not uninstall the current version. You would remove the current settings.

Assembling System Information

ConneXtions is installed through an InstallShield wizard. It presents a series of dialog boxes that request specific permissions and configuration information. Assemble this information before you begin an installation:

- NBX administrator login name: <administrator>
- NBX administrator password: <xxxxxxxx>
- NBX H.323 software and associated port licenses.
- Caller ID label for outgoing calls. The default is the caller's extension. Use the main office telephone number (10 digits in the United States).
- NBX system name. Supply the name that H.323 callers see when they connect to the Auto Attendant.
- The TCP or UDP port ranges for use with a firewall, if any.

Verifying the G.723 Converter

Installations that need G.723.1 audio compression require access to a converter in Microsoft NetMeeting 2.1 or 3.01. NetMeeting must be installed on the same PC that holds the ConneXtions software, but the two cannot run simultaneously.



G.723.1 does not appear as a selectable option in ConneXtions unless the converter is accessible.

To confirm that the converter is present, search for the `msg723.acm` file on your hard drive or download it from the Microsoft web site.

Checking Service Pack (Windows NT Only)

If you are using Windows NT 4.0 to run the ConneXtions software, you require Service Pack 4 (or higher).

To verify that you are running Service Pack 4 or higher:

- 1 On the Start menu, select *Programs > Administrative Tools (Common)*.
- 2 Select *Windows NT Diagnostics*, and click the *Version* tab.
- 3 Verify that the NT version is 4.0 with Service Pack 4 or higher. If it is not, download the latest version from the Microsoft web site.

Configuring Licenses To configure licenses, you must enter system information, such as the number of H.323 ports that you want to install. You can find this information through NBX NetSet.

You can purchase licensed keycodes to unlock additional ports. A license provides a software key that unlocks ports that are already loaded. You can purchase licenses to enable or upgrade a system to:

- 1, 2, 4, 8, 16, 32, 64 or 100 ports on an NBX V3000 system

Software keys are tied to the system serial number.

To configure licenses:

- 1 Log on to NBX NetSet:
 - a Open your browser and connect to the Call Processor by using its IP address (example: 192.168.1.190) or host name (example: Home).
 - b Click *Administrator*.
 - c Enter your username and password.
 - d Click *OK*.
- 2 **Access and record the Call Processor MAC address:**
 - a In the *NBX NetSet - Main Menu* window, click *Reports*.
 - b Click the *System Data* tab.
 - c Record the MAC address.
- 3  **Determine the number of port licenses:**
 - a Return to the *NBX NetSet - Main Menu* window.
 - b Click *Operations*.
 - c Click the *Licenses* tab.
 - d Record the number of licenses for the H.323 Gateway.
 - e Click *Add License*.
 - f Enter the License Key (must be purchased) to unlock the license. To obtain a license key, contact 3Com order management or your supplier.

g Click OK.



Do NOT click Apply. If you click Apply and then OK, the system warns you that you have an invalid license.

4 Specify Auto Discovery:

- a** Return to the *NBX NetSet - Main Menu* window.
- b** Click *System Configuration*.
- c** On the *System Settings* tab, click *System Wide*.
- d** Check *Auto Discover Line Cards*.
- e** Click OK.

Installing ConneXtions

To install the NBX ConneXtions H.323 Gateway:

- 1** Insert the *NBX Resource Pack CD* into the PC. Click *NBX Applications*, and then click *NBX ConneXtions*, and then click OK.



If the program does not start automatically, click the Windows Start menu, and then Run. Type D:autorun, substituting the letter of your CD-ROM drive for D, and click OK.

- 2** Respond to these initial InstallShield dialog boxes:

- a** In the *Welcome* dialog, click *Next*.
- b** In the *License Agreement* dialog, click *Yes*.
- c** In the *Default Destination Location* dialog, click *Next* or browse for an alternative destination location.
- d** In the NBX license request dialog, click *Yes*. This confirms that the NBX system is legal.

- 3** Specify the Audio Channel Format:

- a** Select first option (G.711 only) for uncompressed connections
- b** Select one of the other two options to configure G.723.1 connections.

These options require the file `msg723.acm`. See “Verifying the G.723 Converter” on page 352.

- 4** Information Block - click OK.

- 5** Specify the number of configured H.323 ports for this ConneXtions gateway. 3Com recommends that licenses are allocated equally when using multiple gateways.

- 6** Optionally, specify a Caller ID Label by entering an outgoing caller ID notification label of up to 33 digits. Enter numbers only, no other characters or spaces.

Example: **9787490000**

(The Caller ID shows the caller's extension number followed by the [User Name] if the entry is left blank.)

- 7** Specify the Call Processor name. Enter the name H.323 callers see when they reach the Auto Attendant.
- 8** Only one Gateway? - Click Yes if the NBX system has only one H.323 gateway system.



CAUTION: *Multiple gateways must have unique configurations. Multiple gateways need a distinguishing "Gateway Number". Assign the first installed gateway to number 0; the second to number 1; and so on. 3Com recommends that licenses be allocated equally when using multiple gateways.*

- 9** Enter the Call Processor MAC Address. To find it, log on as an administrator in NBX NetSet, and click Reports, followed by the System Data tab.



Be sure to record the Call Processor (NCP) MAC Address, not the Music-On-Hold MAC address, which also appears in the System Data tab.

- 10** Select the country in which you are using ConneXtions. This defines the tones and cadences that ConneXtions uses.
- 11** Specify the UDP and TCP port ranges for use with a firewall. If these ranges are not important in your system, use the default settings. You can coordinate these settings with the firewall administrator.
- 12** Do you want to interface with a Gatekeeper? Click Yes if you want to use a gatekeeper. Gatekeepers act as the central point for all calls within their zones and provide call control services to registered endpoints.
- 13** If you have chosen to use a gatekeeper, enter the IP address of the preferred gatekeeper. This forces ConneXtions to try to use this gatekeeper first and provides a more secure option. If you want ConneXtions to autodiscover a gatekeeper, leave the field empty. You might choose to do this if you only have one gatekeeper on your network.
- 14** Choose what you want ConneXtions to do if it cannot register with the preferred gatekeeper:

Autodiscover a new Gatekeeper — ConneXtions allows you to make direct H.323 (unregistered calls) while attempting to contact an alternative gatekeeper on the network.

Continue unregistered — ConneXtions continues to function without using a gatekeeper.

Block Calls — ConneXtions blocks calls if it cannot register with a gatekeeper. (You must either have a gatekeeper on the network, or select one of the other options which enables ConneXtions to work without a gatekeeper present.) If a gatekeeper becomes available, you must stop the ConneXtions service and then restart it.

- 15** Do you want to use alternate Gatekeepers? If you select Yes, the chosen gatekeeper maintains a list of alternate gatekeepers to be used if the preferred gatekeeper does not respond.



If you choose to use alternate gatekeepers and have also selected to autodiscover new gatekeepers if ConneXtions cannot contact the preferred gatekeeper, ConneXtions first tries to use alternate gatekeepers from the list (in priority order); if this fails, it then tries to autodiscover a new gatekeeper.

- 16** Do you want to route calls through the Gatekeeper? You can route H.323 calls through the gatekeeper for these reasons:

- To control calls more effectively. For example, service providers need to be able to control call flow to allow them to bill for calls placed through the network.
- To reroute a call to another endpoint if a called endpoint is unavailable.
- To maintain interoperability with multi-vendor equipment which routes all calls directly using the gatekeeper.
- To use address resolution in large multi-zone configurations which have one or more gatekeepers in each zone.

- 17** You are prompted to set the size of the log files. The default value is 1 Mb. ConneXtions maintains two log files, named `ConneXtions01.log` and `ConneXtions02.log`. Data is logged to only one of these at a time. Once the active log file reaches a specified size, data logging switches to the second log file. Any data previously stored in that log file is overwritten.

- 18** Setup Complete: Click *Finish*.

Finishing the Installation

Verify the installation:

- 1 Select the *Line Card Ports* tab under the Device Configuration heading in NBX NetSet.
- 2 Note the MAC Address, extension, status, and group for each port.
- 3 Record the extension numbers for each H.323 port.
- 4 Enter user-friendly port names that appear when a user dials an H.323 port.
- 5 Close the browser to exit NBX NetSet and end the installation.

Overview of H.323

The H.323 standard provides a foundation for audio, video, and data communications across IP-based networks, including the Internet. By complying with H.323, multimedia products and applications from different vendors can interoperate, allowing users to communicate without concern for compatibility.

An NBX ConneXtions H.323 Gateway provides connections similar to tie lines between existing NBX systems across an IP network. However, it can also support voice connections between a 3Com NBX Telephone and other H.323-compliant devices.

ConneXtions H.323 Gateways support communication with:

- Extensions on other NBX systems that have a ConneXtions gateway.
- Extensions on PBX systems that have an attached H.323 gateway.
- H.323 gatekeepers.
- Miscellaneous H.323-compliant end-point devices such as:
 - H.323 telephones.
 - Suitably equipped personal computers.
 - An emerging class of wireless handsets.



The quality of H.323 calls over the Internet is determined by the quality of the connection provided by your ISP.

The H.323 protocol addresses these main areas:

- Negotiated Connections
- Negotiated Voice Compression

- Standard Extensions
- Remote Internet Device Connections

Negotiated Connections

The H.323 protocol adds negotiated call setup and tear-down capabilities to Internet Protocol (IP) connections. It exists because Internet protocols were designed to deliver text messages and computer files in data packets. IP networks were not originally concerned about involving a person in a real-time conversation as a telephone does.

H.323 provides call setup capability to negotiate the readiness of two parties to exchange information and how they do it. It then keeps the connection alive until one of the parties ends the connection. A call tear-down signal indicates to the network, and to the other party, when a call ends. On standard telephone networks, the telephone company uses this signal to determine when to start and stop charging for long distance calls, but long distance charges do not normally apply to H.323 calls. Other reasons for call setup and tear-down signals are to indicate when an IP network can release bandwidth to support other calls, and to inform other devices, such as voice mail systems, when to stop their conversation-related activities.

Negotiated Voice Compression

IP networks can carry a lot of traffic, creating competition for the available bandwidth. Devices have the best access, and the least delay, when they communicate messages by using fewer and smaller packets. This also means lower cost.

Voice compression offers a way to reduce the number and size of the data packets needed to carry each second of a voice conversation. However, voice compression needs high-speed processors to remove the redundancies that are inherent in the way standard voice is represented.

The international standard for representing voice (G.711) requires 64 Kb for each second of conversation. NBX Business and Basic Telephones contain a digital signal processor (DSP) that transforms spoken voice into this form. An Ethernet interface, also within each telephone, breaks up the 64 Kbps stream into frames, adds addressing and error checking, and dumps the voice-data frames (now 83 Kbps) onto a 10 Mbps LAN. Elsewhere on the LAN (local or remote), the destination telephone detects its address, recovers the frames, extracts the bit stream, and reproduces the voice.

While LANs have enough bandwidth to support uncompressed digitized voice transfers, WAN bandwidth is less generous. For this reason, compression is often used to squeeze the digitized voice into a smaller bandwidth that can be carried across an Internet in smaller packets.

When an NBX call passes through an H.323 gateway, the ConneXtions software performs an intermediate step that extracts the essential voice information, encapsulates it in packets, and sends it across an IP network.

G.723 is a compression standard that represents each second of voice conversation with 6.3 Kbps. ConneXtions software supports the use of this compression standard. With more than one way to represent voice (G.711 and G.723), H.323 gateways negotiate the type of compression they use during each call setup. Negotiation ensures that the compression on the transmit side matches the decompression processing on the receiving side. With the frame and packet overhead, each G.723 channel needs about 19.2 Kbps of the available bandwidth.

Standard Extensions ConneXtions routes incoming H.323 calls to one designated extension, usually the Auto Attendant. Callers can dial additional digits to redirect calls to internal extensions, but cannot access outside lines by dialing 9.

Remote Internet Device Connections A NBX system with a ConneXtions gateway can communicate with remote H.323 devices other than NBX Business and Basic Telephones, such as:

- Wireless handsets
- Personal computers
- Ordinary telephones (POTS) with adapters
- H.323 gatekeepers

Wireless Handsets

An emerging class of H.323 wireless handsets is being used by some large outlet stores as portable PBX telephones. A ConneXtions H.323 server is well suited for use with these H.323 handsets.

Personal Computers

Microsoft NetMeeting software supports H.323 voice connections over the Internet. The personal computer must be equipped with Internet access, a sound system, and a microphone.

The current version of Microsoft NetMeeting (3.01) cannot conveniently place calls through the Auto Attendant because it has no way of entering extension digits after it reaches an IP address (the Auto Attendant). This is a temporary limitation that usually disappears when those programs upgrade to H.323 version 2. Version 2 requires that compliant devices support out-of-band DTMF (touch-tone) signaling.



If you choose ConneXtions as the gateway under the Advanced Calling options, and if you configure NetMeeting to "speed-dial" the IP address and extension, Microsoft NetMeeting can place calls to an extension.

POTS Adapters

You can purchase circuit boards that plug into a personal computer and adapt an analog telephone (POTS) for use with an H.323 connection.

H.323 Gatekeepers

The gatekeeper is an H.323 entity on the network that provides address translation and controls access to the network for H.323 terminals, Gateways, and MCUs. The gatekeeper also provides services to the terminals, Gateways, and MCUs, such as managing bandwidth and locating Gateways.

The H.323 Connection

H.323 calls between local and remote NBX Business and Basic Telephones are transparent to users, except for the IP dial plan. The Call Processor sets up the local end of the H.323 call as though it were setting up a call through a line card. However, this connection actually goes to a network interface card (NIC) in a dedicated Windows 2000 or Windows NT system that is running the ConneXtions software.

The Call Processor requests an H.323 port in the ConneXtions software by sending a frame, with a simulated Ethernet address, that contains a requested IP address. The ConneXtions gateway uses this address to request a level three connection between the local router and the remote router associated with another PBX or NBX system.

After an IP connection has been established, the ConneXtions software begins a series of H.323 exchanges by using TCP packets on the IP connection.

These H.323 exchanges set up the call and negotiate the type of voice compression that is used. They also cause the remote NBX (or PBX) system to begin setting up the remote end of the connection.

Connection Considerations

As soon as an end-to-end connection has been set up, all three networks (local LAN, WAN, and remote LAN) are ready to pass voice packets. The NBX Business and Basic Telephones use their DSP to convert spoken words into digital voice packets. The voice packets are transferred across the Ethernet to the local H.323 gateway. The gateway strips off the Ethernet frames, compresses the voice, and encapsulates it within UDP packets which are delivered to the router, again via the Ethernet. The UDP packets are placed on the WAN for IP delivery to a remote H.323 gateway. The remote gateway undoes the process and sends the decompressed voice to an extension.

Connection considerations apply to two areas:

- Overall Connectivity
- Quality of Service

Overall Connectivity

An end-to-end NBX H.323 connection consists of a succession of Physical Connections and Logical Connections, both local and external.

Physical Connections

An NBX H.323 gateway has few *physical* connections. An installer can add an H.323 gateway to an existing NBX system by creating one physical connection on the LAN that links a network interface card in an operating system to a hub or to a switch. The same connection also gives the H.323 gateway a direct connection to every other device on the near-end LAN. Those devices include any NBX Business or Basic Telephone, the Call Processor, and the firewall or router.

Alternatively, you can use a second NIC in the gateway system to provide a separate connection between the H.323 gateway and the IP router.

Logical Connections

Locally, every device on an NBX LAN has the same physical access to the local network traffic as any other device. Consequently, addresses control connections because devices can only read information that is addressed to them. This makes addressing, and managing addresses, a key concern for logical continuity.

Logical continuity concerns extend throughout a network connection because the identity of a frame (or packet) and its destination determine where it goes, how it is handled, and what happens to it.

Because so many devices share the same physical media on the Internet and on the local network, there is always the possibility of incomplete or degraded connections that arise from network congestion, device configuration, or addressing problems.

Bridges, switches, routers, and firewalls can help to manage network congestion, conversions, and security. Configuration problems with any of these devices can cause connection difficulties.

Bridges and switches are used to segregate areas of congestion within a local network (switches are multiport bridges). Routers perform a similar function but at the Layer-3 level where they perform conversions between LAN and WAN protocols. Firewalls, which are often built into routers, protect intranets from unauthorized internet users.

All of these devices can filter packets based on source address, destination address or packet type. Depending on how the devices are configured, they can let packets pass or they can block them.

Quality of Service

Unlike switched network connections, Internet voice connections consist of a sequence of numbered data packets. Packet transfers across the Internet are subject to delays or loss or both. If these delays are great (larger than 200 ms), or if the packet loss is excessive, voice quality deteriorates noticeably. The round-trip delay is typically no greater than 400 ms. You can test this by using several “ping” commands.

Voice conversations occur in “real-time,” so these packets need to be delivered in a consistent manner and with the shortest delay. The goal is to deliver 32 regularly spaced packets to the recipient every second.

The frequency response, dynamic range, and noise of a voice conversation depend on the voice representation. If all data packets reach their destination, the system provides voice of a specified quality.

The H.323 standard accommodates alternative voice compression standards that allow users to trade some voice quality for bandwidth by selecting a different compression standard (G.711 or G.723). Consequently, packet loss and delay are crucial to the Quality of Service.

Packet Loss

Packet loss can occur for reasons discussed in Bandwidth, Congestion, and Connections, next.

Bandwidth

Bandwidth is the capacity to carry information. By using H.323, the same bandwidth that supports one uncompressed G.711 voice connection can, instead, support several compressed G.723 conversations with little noticeable difference in quality.

Networks differ in the age of their equipment and in the quality of their service. Traffic can form a bottleneck if network loads force a wide area service provider to route traffic through old equipment.

Congestion

Users notice congestion when audio “breaks up” during a call. Congestion can occur anywhere on the network, for example, at an overloaded LAN (local or remote), at an overloaded router or firewall, or within an overloaded internet. Because voice packets are only significant during a conversation, IP networks respond to congestion by discarding data packets they cannot accommodate. Resending or delaying packets is not an effective solution.

At the local level, congestion symptoms can be subtle. For example, routers from different vendors can respond differently to congestion because of the way they prioritize their response to packet congestion.

When considering communications problems, it is important to maintain reserve capacity and to use a systematic approach that considers the entire, end-to-end, connection.

You can reduce NBX system’s bandwidth requirements by enabling “silence suppression,” but doing so compromises audio quality. NBX Telephones generate voice frames at regular intervals for the duration of a connection. These frames normally continue when no one is speaking. When silence suppression is enabled, the NBX system sends a “silence indicator” when the NBX Telephone senses the start of a silent period. When another NBX device receives this indicator, it inserts “white noise” until it receives the next frame that contains real voice. All subsequent “voiceless” frames are suppressed during the silent period. However, most telephone users will notice the difference between genuine silence and generated silence.

This type of silence suppression applies to Layer 2 Ethernet transfers. At Layer 3, the ConneXtions software achieves a similar result by not sending empty packets during a silent period. The receiving ConneXtions gateway generates a silence indicator or sends frames filled with silence, depending on the silence suppression mode.

Connections

Sometimes packet loss is caused by a poor physical connection. This type of packet loss is more likely to occur in a LAN than in a WAN. Typical causes are faulty wiring, connectors, and termination. High-bandwidth LANs (100BASE-T) are more likely to have termination problems than 10BASE-T LANs.

Packet Delay

Latency and jitter delays affect the Quality of Service.

Latency

Latency is the sum of all the fixed delays in an end-to-end connection. Latency prevents a caller from responding immediately to another caller's remarks.

Most people notice latency when the end-to-end delay is above 200 ms. (The round-trip delay is typically no greater than 400 ms.) Conversations sound most natural when latency is below this range. Network latency can be measured by "pinging" the network connection, but the network connection is only part of the delay. The entire end-to-end delay also includes the H.323 gateway, firewall or router, and the LAN itself. System administrators can control some local device delays by controlling the system load and by upgrading system components as needed.

Jitter

Momentary transmission delays can affect the pace of a conversation and, if severe, cause the voice to "break up." This is known as "jitter."

All voice-over-internet devices have a "jitter buffer" at the receiving end whose purpose is to absorb jitter. It does this by delaying the first packets that arrive by some significant amount (from 50 to 200 ms). This delay creates a window of time for receiving the next group of related samples which are then forwarded to a callee at a regular rate. However, if some packets are too late, and exceed the jitter buffer capacity, those packets are lost and there are gaps in the audio.

Quality of Service Control NBX systems address Quality of Service (QoS) issues using methods that are discussed in this section.

Adaptive Jitter Buffering

All IP network devices use buffers to retime the packets that they receive from a network. Retiming allows these devices to compensate for the variable delays that occur as the packets pass through an IP network. H.323 calls take different paths through a network so the ConneXtions gateway uses an adaptive “jitter buffer” to minimize delay variability. Initially, the jitter buffer delays the entire packet stream by 50 ms, an amount that is too small to be noticed in conversation, but large enough to account for the variability.

If the packet delays are too variable, packets may not arrive in time to be useful. This can result in lost packets and gaps in the conversation. When ConneXtions detects the gaps caused by late-arriving packets, it automatically extends the jitter buffer delay to match the delay so similar packets are not lost. ConneXtions can extend the jitter buffer delay up to its 200 ms limit.

Reconstruction

NBX Business and Basic Telephones expect to receive voice packets at regular intervals, but unanticipated network delays can cause lost packets and gaps in the conversation. Reconstruction makes these gaps less noticeable with “best guess” substitutes based on the preceding and following samples.



If your network is not optimized for voice, the quality of voice can be affected.

Priority Schemes

Packet-based voice systems depend on the speedy and consistent delivery of voice packets for good voice quality. This dependency presents an obstacle to H.323 communication on the Internet because it was designed to treat all packets alike with respect to time. By treating packets that carry e-mail with the same priority as packets that carry real-time voice, the Internet ignores the important differences between these applications.

NBX systems use the latest developments to address voice packet priority concerns at the Layer 2 Ethernet level and at the Layer 3 IP network level.

Layer 2 NBX systems address Layer 2 priority concerns through the 802.1(p and q) standards. These standards have two parts. The first part addresses the way Ethernet frames get onto the local “wire.” The NBX system uses a special “back-off” algorithm that gives voice frames a higher priority when both voice frames and data frames try to access the Ethernet wire at the same time.

The second part of the 802.1(p and q) standards addresses the way LAN switches prioritize different packets that are competing to enter a different LAN segment. This scheme is based on a 3-bit priority field within the Ethernet header.



NBX ConneXtions does not support the Layer 2 (Ethernet) 802.1 (p and q) priority field. However, it is usually possible for IP routers to use these priority schemes if they are configured to prioritize H.323 packets.

Layer 3 NBX systems address Layer 3 priority concerns through a packet priority scheme called “IP/DS” (for differentiated services). Many routers support this scheme, which replaces an earlier scheme (TOS), which uses a 6-bit priority field within the IP header of every packet. Most routers examine this field and base their pass-through priorities on it.

NBX systems are designed to use the default values that come with 3Com switches. If you use other routers, you may need to reprogram their diff-serv settings. The 3Com default is 101110xx. This setting must be consistent at both ends of the connection. Note that some routers overwrite the TOS field (diff-serv priority field) and eliminate the priority distinctions between packets.



NBX ConneXtions does not support the Layer 3 (IP) 6-bit TOS/DS priority field. However, it is usually possible for IP routers to use these priority schemes if they are configured to prioritize H.323 packets.

Special Issues

This section describes issues related to H.323 telephony in general and to ConneXtions gateways in particular. These include:

- Firewall Security
- Gateway Load
- Remote Access
- PBX Connections
- Class of Service

- IP Type of Service and Differentiated Services
- Alternate Gatekeepers

Firewall Security

Firewalls determine which packets can cross the boundary between a protected network (intranet) and the public internet. The network administrator specifies crossing privileges according to network needs and policies. Control criteria consists of direction of transfer, source and destination address, packet type, and access ports.

Firewalls affect, and are affected by, H.323 gateways. For example, firewall processing increases packet delay while the complexity of the H.323 protocol complicates the firewall programming.

The only way to safely avoid firewall delays is to exclude outside internet access. This means calls can only be made within the secure intranet.

In some business applications, it is possible to eliminate the firewall delay by setting up a dedicated physical connection between the H.323 gateway and the router. This approach, which requires a second NIC in the ConneXtions PC system, bypasses the firewall and puts the burden of discriminating against non-H.323 packets on the gateway. The PC system that runs the ConneXtions software must be secure.

Systems that must conform to very conservative firewall policies can use a Virtual Private Network (VPN) if they need to filter incoming H.323 calls from the public Internet. An alternative is to use a firewall with H.323 proxy support.

While the operating system that runs the H.323 gateway can be programmed to serve both as an H.323 gateway and as an IP router, such arrangements are usually impractical because the gateway needs so much processing power just to handle audio conversions.



3Com recommends that a high-performance PC be dedicated to the ConneXtions software.

The question of whether an operating system is adequately "secure" is a subject of debate. The concern is that Windows has many IP ports of its own. One way to deal with these ports is to set up a firewall that limits the range of externally accessible ports. However, some organizations connect the ConneXtions gateway directly to the Internet through a

second NIC that bypasses the firewall protecting the rest of the local network. ConneXtions supports either configuration.

Organizations that want to completely bypass firewall delays can research the large volume of security information on the subject.

These descriptions focus on the firewall-protected approach, and offer guidelines for programming a firewall that can be used to support H.323 connections that are accessible to the public internet.

Outbound Calls

Most firewalls do not restrict outbound packets or IP packets that respond to outbound initiatives. They are configured for unrestricted outbound packets with unrestricted reply packets. They do not have to be changed to support outbound H.323 calls from an NBX system.

Inbound Calls

Firewalls usually discriminate against incoming packets. The network administrator configures a list of acceptable sources for each destination address within a protected network. The configuration list includes a list of entries that the firewall compares to the IP address of the local H.323 gateway and the IP address of an external caller. The configuration list also discriminates for or against specific types of packets. IP addresses and packet types must match for packets to pass.

The H.323 protocol uses TCP packets for call setup, and UDP packets to carry the voice payload. Each type of packet includes an array of port addresses that are used during the connection. Ports 1720 negotiates which of the other available ports is used to carry the connection.

The ConneXtions gateway uses these default port assignments:

- For UDP traffic, ConneXtions uses ports 8000-8099 by default. Calls require four UDP ports each.
- ConneXtions uses ports 1025-5000 for TCP traffic. You can configure TCP ports during installation.

During ConneXtions installation, you can configure the TCP ports that are used for incoming calls. For outgoing calls, no control is possible. Port 1720 must be preserved.



You must configure a firewall to accommodate both TCP and UDP ports on the same system.

Gateway Load If the gateway system NIC is attached to a LAN with heavy packet traffic (more than 700 non-H.323 packets per second), the extra address processing burden, which requires processing power, can slow down the gateway. This occurs because the ConneXtions software makes H.323 ports look like hardware line cards to a Call Processor.

To emulate a group of simulated line cards, the gateway system must read the destination address of every frame that is presented to its Network Interface Card, instead of responding to only one hard-coded Ethernet address. The gateway system is able to examine every Ethernet frame because its NIC does not discriminate between frames. The NIC passes every frame that it sees to the software for address evaluation.

To reduce the load on an H.323 gateway, you can connect it to an existing multi-port switch. For optimum performance, use switches that support 802.1(p and q). The 802.1(p and q) standard offers priority enhancement which NBX systems exploit. Most 3Com switches support this feature.

Remote Access Business people who travel can make routine calls without long distance line charges by using an internet-ready laptop with Microsoft NetMeeting to make H.323 calls, and a Virtual Private Network (VPN) connection to the NBX system LAN. Microsoft NetMeeting software works with Windows 9x, Windows 2000 and Windows NT, and it can be downloaded for free from www.microsoft.com.

You can use Microsoft's VPN Dial Up Networking (version 1.3) to establish a virtual private network connection between a roaming laptop and the NBX system LAN. One end of the VPN connection is in the laptop while the other end must be located in a VPN server between the router and firewall.

The VPN server provides caller authentication and a secure (encrypted) channel across the internet. After a caller has been authenticated, the connection is passed to the firewall, which sees the VPN connection as coming from a recognizable (and therefore firewall-configurable) IP address. VPN allows a business person to establish an IP connection into the NBX LAN from a hotel room with internet service.

After an Internet connection has been established, you must change your automatic call forwarding number:

- 1 Log on to NBX NetSet as a user.
- 2 On the *User Information* tab, click *Call Forward*.
- 3 Click the telephone number radio button.
- 4 Enter the number to which you want to forward the call and click *OK*.

The caller is now ready to use NetMeeting to place an H.323 to the NBX system at the office. Configure NetMeeting with the IP address of the ConneXtions gateway as the gateway in Advanced Calling options. Dial the NBX extension to place the call.

The call passes through the Auto Attendant to your extension and forwards the call to your previously specified number.

After the call, return to NBX NetSet and remove the forwarded number so that work-related calls to your extension are not forwarded to your home, or to wherever you placed your last H.323 call.

PBX Connections

H.323 gateways allow NBX systems to establish IP connections to other H.323-equipped PBXs as well as to similarly equipped NBX systems. Although H.323 standards describe a universally accepted interface for interconnecting similar systems, each of the 20 or 30 PBX manufacturers brings its own PBX solution to the marketplace. This complexity is further increased by the diversity of products and release levels that are associated with each manufacturer. Because any implementation differences can affect connectivity, this manual can only offer guidelines for connecting NBX and PBX systems.

Tie-line connections between NBX and PBX systems require technical people from both ends of the connection to collaborate in these major areas, discussed next:

- H.323 Interoperability
- IP Addressing
- Voice Ports
- Extension Dial Plans
- Extension Delay

H.323 Interoperability

H.323 protocol stacks provide the foundation for H.323 compatibility. Each consists of a collection of engineered software products that implements the H.323 standard. Although PBX manufacturers can develop their own H.323 software stacks, it is more efficient to purchase software licenses from a company that specializes in developing H.323 protocol stacks.

The ConneXtions gateway has been tested for compatibility with PBX H.323 gateways that are licensed to use Lucent Elemedia and RADVision H.323 protocol stacks. It has also been tested with these H.323 telephones:

- Siemens HiNet LP 5100 (phone application version 1.1.3)
- ACT Sagitta PH200
- Microsoft NetMeeting (version 3.0)

IP Addressing

The main goal of an H.323 gateway is to provide telephone-like service through IP connections. This means each end-to-end connection involves two types of addresses: a normal telephone number (E.164 address) and an intermediate IP address. Some H.323 implementations use a "gatekeeper" to convert the E.164 number into the appropriate IP address at the calling side, and then to reconvert the IP address to the E.164 number at the receiving side (for caller ID purposes). ConneXtions allows you to choose if you want to use a gatekeeper on your network.

Outgoing IP addresses can be entered:

- As pre-programmed speed dial numbers that forward callers to the Auto Attendant at a remote NBX system.
- By modifying the dial plan.

You can configure the speed dial numbers to include an appended extension if a person in one NBX system needs to make frequent calls to someone in another NBX system. Alternatively, you can configure the dial plan to route these calls seamlessly to the caller.

NBX system calls to outside numbers must use IP addresses or host names. The ConneXtions software automatically converts host names to their corresponding IP address.

Voice Ports

Multiple voice ports allow the Auto Attendant to respond to multiple incoming calls at the same time. However, since these ports are also used by the voice mail system, voice mail inquiries can slow down incoming H.323 calls. You may have to increase the number of voice port licenses.

Extension Dial Plans

PBX systems can use different dial plans. You must consider dial plan differences when setting up calls between systems. Dial plans differ in their use of leading digits, number of digits, and excluded numbers. For more information, see Chapter 2.

Extension Delay

Call setup times for digital connections, compared to analog connections, are instantaneous so there is no need to include a delay between the IP address and an appended extension.

Incoming H.323 calls to an NBX system usually go directly to the Automated Attendant. Although the Auto Attendant can respond with voice instructions, the call does not have to wait until the end of the voice instruction to respond. The Auto Attendant accepts extensions whether they are entered manually or as part of a speed dial number.

Class of Service

The use of an H.323 gateway affects the Class of Service assignments that are applied to extensions because:

- H.323 calls use IP addresses instead of the familiar numbers that are used for public switched network calls (different dial plan).
- The cost of an H.323 call is distance-independent, so you do not need to limit long distance calling for cost reasons.

External Call Control

Users of ConneXtions-equipped NBX systems can place H.323 calls to other H.323 systems anywhere in the world without having to pay long distance charges. Since there are no long distance charges for H.323 calls, there is no need to restrict them for cost reasons.

IP Type of Service and Differentiated Services

The header of each IP packet contains an 8-bit Type of Service (TOS) field that indicates the precedence (relative importance) of the packet. Routers then examine the TOS field and give precedence to packets with a higher TOS setting.

Although your telephone system supports prioritization using the TOS field, this facility is not supported for H.323 calls. However, for H.323 calls over the WAN, routers can prioritize voice traffic using alternative means. For example, during installation, you can select a range of UDP or TCP port addresses to help with router setup.

Alternate Gatekeepers	A zone can contain only one gatekeeper at a time, although multiple distinct devices can provide the gatekeeper function in a zone. Multiple devices that provide the RAS signaling function for the gatekeeper are called alternate gatekeepers. Each alternate gatekeeper appears to each endpoint as a distinct Gatekeeper.
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To ensure system availability, redundancy, and scalability, the gatekeeper can provide RAS signaling function by using multiple physical or logical devices, referred to as alternate gatekeepers.

Checking Connections

You can use connection checks to pre-qualify an installation and to help localize connection problems. H.323 gateway installers can conduct connection checks for:

- Gateway Checks
- Network Checks

Gateway Checks Gateway checks can verify that the NBX systems at each end of an H.323 connection are working properly.

Gateway Self-Check

A gateway self-check is simply an H.323 call that returns to the local IP address (loopback test).

To perform a gateway loopback test:

- 1 Access a ConneXtions H.323 port from an NBX Business or Basic Telephone by dialing an H.323 port line number or by using a dial plan configured with a ConneXtions pool number.



You must have Super User Group CoS allowed to dial in to a line port number directly.

- 2 Enter the IP address of the gateway.

- 3 Verify the connection. If you are using default settings, you are connected to the Auto Attendant. If you are not using default settings, you may be connected to a different extension number.

Local Considerations

All voice packets that move between an NBX Business or Basic Telephone, Call Processor, ConneXtions gateway, and router on the LAN have a high priority and high quality of service.

However, at the router and beyond, network administrators can influence H.323 call quality through the priority that they give to H.323 packets at both the internet router and at the firewall. If H.323 connections consistently experience significant delays, you should review the local router and firewall configurations at each side of the H.323 connection.

Network Checks

A network check uses:

- Network Ping
- NetMeeting Connections

Network Ping

A network *ping* is a packet transfer that checks the logical continuity between a personal computer and a specified IP (router) address. For example, you can ping your own address, or the default gateway. The next ping checks the connection to the IP router at the remote end of the intended H.323 connection.

The easiest way to initiate a ping is with a DOS ping command. This command sends four pings to the specified IP address. The router at that address immediately returns the ping, and the command notes the round trip delay for each ping packet. Some firewalls do not return pings for security reasons. If the ping test fails, you can use a "trace route" command ("tracert") to find out where the logical connection failed.

To check a connection:

- 1 Access the DOS command prompt from the DOS shell in Windows.
- 2 Enter `ping` on the command line:
`ping <192.168.1.190>` (sample IP address)
- 3 Interpret ping results:
 - a Request timed out (all four times)

- Ping reached the network but couldn't connect to the host
- (No such address; or the device is down.)
- Initial request timed-out
- (It is normal for a first ping to fail and subsequent pings to succeed.)
- Subsequent requests timed-out
- (Indicates some packet loss. Rerun using the “-n 100” option. The “request timed out” number represents the percentage of lost packets. These packets could have been lost in either direction.)

b Destination host not reachable

- Ping couldn't negotiate a path to the specified address
(PC is not plugged into LAN, incorrect gateway address in route, or a firewall blocked the ping.)

c Approximate round-trip times in milliseconds

- Ping time greater than 10 ms but preferably less than 300 ms.
(Ping times can differ because the network often routes individual packets along different internal routes depending on congestion.)

4 Use `tracert` on the command line:

`tracert <192.168.1.190>` (example IP address)

5 Interpret trace results:

The `tracert` command lists every IP gateway it encounters as it tries to reach the specified destination. It also includes the number of times (3) required to reach each intermediate gateway. If a network connection failure occurred in route, this command indicates where it occurred.

Because the `tracert` command reveals the chain of logical connections across a network, it can be useful for comparing the performance of alternative internet service providers.

NetMeeting Connections

You can also check H.323 voice packets that are sent between systems that are running Microsoft NetMeeting. ConneXtions software requires it to run G.711 (CCITT mu-law) or G.723.1 compression. NetMeeting is available on the Resource Pack CD, or it is available as a free download from www.microsoft.com.

You can conduct the NetMeeting connect test from the operating system that runs the ConneXtions software, or from another PC on the LAN.



You must run NetMeeting and ConneXtions on different PCs.

In addition to the NetMeeting software, participating computers need an audio card with a headset (or speakers) and a microphone. The audio card must support full-duplex 64 Kbps transfers.

Note that it is possible for a NetMeeting connection to be unsuccessful and still have a successful ConneXtions installation. This can occur because ConneXtions restricts the range of TCP and UDP ports used but NetMeeting allocates its ports from a wider pool. For more information, see "Firewall Security" on page 367. If ConneXtions is installed with a limited range of allowable ports, and the firewall is configured to pass only those ports, it is possible that NetMeeting cannot pass a call through the firewall while the more restricted ConneXtions calls can pass through.

The following procedure uses NetMeeting to test the connection between the operating system that runs the NBX ConneXtions H.323 Gateway and a remote IP address. This end-to-end NetMeeting check can help to recognize firewall problems without the complexity of the NBX system and ConneXtions H.323 server.

To make a NetMeeting check:

- 1 From the *Start* menu, select *Settings*, and then *Control Panel*.
- 2 If you are using Windows NT, double-click *Services*. If you are using Windows 2000, select *Applications*, and then *Services*.
- 3 Select *3ComConnexions* from the list, and click *Stop*.
- 4 Access www.microsoft.com using a web browser.
 - a Click *Downloads* in the navigation bar.
 - b In the *Product Name* field, select *NetMeeting*.
 - c In the *Operating System* field, select *Windows 95*, *Windows 98*, *Windows 2000* or *Windows NT*.
 - d Click *Find It!* The latest versions of NetMeeting are displayed. Click the version you require.
- 5 Download NetMeeting files and respond to the prompts.
 - a Click the program name (`NM30.exe`) next to *Download Now*.

- b** Click *OK*.
 - c** In the Save As dialog box, select a folder for the downloaded files.
 - d** Click *Save*.
- 6** Install the NetMeeting files and respond to the prompts:
 - a** Select *Open* when the download is complete.
 - b** Click *Yes* to confirm installation.
 - c** Click *Yes* to acknowledge the legal agreement.
 - d** Click *OK* to accept the default installation directory.
 - e** Click *OK* to acknowledge successful installation.
- 7** Open NetMeeting:
 - a** Click *Next* on next two screens.
 - b** Enter your details as required.
 - c** Click *Next* on next two screens.
 - d** Click *Put a Shortcut to NetMeeting on My Desktop*.
 - e** Click *Next* on next two screens.
 - f** Click *Test*.
 - g** Adjust the speaker volume.
 - h** Click *Next*.
 - i** Click *Test*.
 - j** Adjust the microphone Record Volume.
 - k** Click *Next*.
 - l** Click *Finish*.
- 8** To attempt a NetMeeting call:
 - a** Click the NetMeeting icon, followed by the telephone icon.
 - b** Enter the IP address of similar system at remote end, after *To*.
 - c** Select *Network* or *Direct Call*, after *using*.
 - d** Click *Call*.
 - e** Confirm the connection using a speaker or headset and microphone.
- 9** To end the call, click the “hang-up” icon.

Interpreting the Results

The NetMeeting check has three possible outcomes:

- No communication with remote NetMeeting.
 - Wrong IP address.
 - Firewall is blocking call setup (TCP) packets.
- Call rings remote end and it answers, but there is no audio.
 - Faulty connection to a microphone, speaker or both.
 - Firewall is blocking audio (UDP) packets.
- Calls work in one direction, but not in the reverse direction. Place a call to determine which firewall is blocking TCP traffic. Once you determine this, it is the *remote* firewall that is blocking the traffic.

Placing Calls

You can place an outgoing H.323 call from an NBX system in one of several ways, as discussed in this section.



See Chapter 2 for information on how to use the dial plan to set up the NBX system to use H.323 ports.

IP Address Entry

Depending on how you set up the dial plan, the most convenient way to place a call to a new number is to dial a ConneXtions extension list (configured within the dial plan), which provides a connection to an available H.323 port. If a port is available (not busy), enter the extension and IP address from the telephone key pad. Use the * key to separate the four "octets" in the IP address, and then press the # key to "dial now."

You must configure the dial plan to use ConneXtions. You must have Super User Group CoS privileges to perform this test.

These examples show key pad sequences that request an extension list connection and a specific port connection:

8192*168*1*15#

where extension list access is used

OR

754 192*168*1*15#

if there is no extension list access, or if you want to test specific ports.

The first example begins with an 8 to request any available H.323 port. The second example begins with the 3-digit extension (754) of a specific H.323 port. The remaining digits in both examples represent the IP address of the remote H.323 gateway (192.168.1.15). Note that IP addresses are always four octets long. In this case, 15 is the last octet.

Extension Lists

You can configure H.323 ports for single-digit access (usually 8) instead of a specific 3-digit line extension. The single-digit access allows the NBX system to select an available line port when you place an external call.

Internet IP line ports and CO (central office) line ports must never be assigned to the same extension list because they use very different dial plans. Conventional practice is to use 9 for external switched network (PSTN) connections and 8 for external IP network connections.

Calls to other NBX systems (or PBX systems) can include a destination extension. This example represents a call to an extension (273) on a remote NBX system that has an H.323 ConneXtions gateway:

8192*168*1*15*273#

The # sign tells ConneXtions to “dial now.” The last asterisk, *, terminates the IP address, but ConneXtions cannot dial the number until it sees the “# sign,” or until 4 seconds pass after the last digit. In the preceding example, the IP address (192.168.1.15) and the extension are presented to the device as the “called party.”

The # sign also precedes the extension as shown below. This allows the ConneXtions gateway to complete the IP connection before it presents the remaining digits to the remote terminal:

8192*168*1*15#273

Both configurations produce the same result when dialing into another NBX system; however, other PBXs can be position-sensitive. If you are not sure, use the first format with the # sign after the extension.

Speed Dials

Your telephone system has a speed dial capability that offers a quick way to dial frequently called numbers. Each telephone is capable of accessing 199 previously stored dial sequences with up to 30 characters in each sequence. These sequences can represent switched network numbers or

Internet addresses. Special 3-digit speed dial numbers specify each dial sequence.

Speed dial numbers must be preceded by the “Feature” button when entered from a telephone. This button distinguishes NBX speed dial numbers from ordinary extensions that use the same three digits.

Speed dial numbers can be system-wide or personal. System speed dial numbers (700-799) apply system-wide and are programmed by the system administrator. Personal speed dial numbers (601 through 699) apply only to an individual telephone; they are programmed by its owner.

You can assign any of the first ten speed dial numbers in each type group, system or personal, to any Access button on a telephone. For more information, see Chapter 6 of the *NBX Telephone Guide*.

Setting Up Speed Dials

The following procedure assumes that you are logged on to NBX NetSet as an administrator, and that you know the H.323 port extensions that were established during installation.

To set up speed dials:

- 1 In the *NBX NetSet - Main Menu* window, click *Device Configuration*.
- 2 Click the *Line Card Ports* tab.
- 3 Note the extension number of each listed NBX H.323 port.
- 4 Return to the *NBX NetSet - Main Menu* window, and click *System Configuration*.
- 5 Click the *Speed Dials* tab.
- 6 To complete the fields:
 - a Note a speed dial number. (One-button dialing requires system speed dial numbers 700 through 709.)
 - b In the *New Number* field, type an H.323 extension, or an 8 (for extension list), followed by an IP address, or a system name. Examples are:
 - 8192 * 168 * 1 * 15 * 273# (IP address plus extension)
 - 8192.168.1.15 * 273# (IP address plus extension)
 - 8273@h323.nbx.com# (extension plus host name)
 - 8h323.nbx.com# (host name, defaults to AA)



Use those characters shown here, that is, no spaces, hyphens or & signs.

- c** In the *Comment* field, enter a description with up to 30 characters, such as *Tie-line to NYC*, and then click *Apply*.
- 7** Verify the speed dial entry by pressing the *Feature* button followed by the new speed dial number.

One Button Access

You can configure an Access button on a NBX system to dial a complete H.323 (or switched) dial sequence.

This procedure assumes that all buttons available for one-button access are configured in the first ten system (or personal) speed dial locations.

To set up one-button dials:

- 1** In the *NBX NetSet - Main Menu* window, click *Device Configuration*.
- 2** Click the *Telephones* tab or the *Group Telephones* tab. Select a telephone extension or a telephone group.
- 3** Click *Button Mappings*.
- 4** Associate one of the first ten speed dial numbers with a telephone Access button:
 - a** Locate the *Type* field associated with an available button.
 - b** Select the speed dial selection (SSD 0 through 9) that is associated with a previously programmed speed dial code (700 through 709).
 - c** Click *Apply* and then click *OK* (to return).
- 5** Verify the one-button dial feature operation by pressing the new button and confirming that it dials the specified number.

Entering Digits During Calls

When ConneXtions dials a call, it stores the dialed digits until it connects the call. Then it sends those digits, and any subsequent digits, to the remote H.323 device if the device supports version 2, or later, of the H.323 standard.



The behavior of ConneXtions depends on when the # sign is entered during this process.

ConneXtions sends digits as messages, which are more reliable than audio tones. ConneXtions also expects to receive digits from H.323 devices in the same way, and therefore does not have a tone detector. This means older (H.323 version 1) devices cannot send or receive digits

to or from ConneXtions. For example, the current version of Microsoft NetMeeting, which sends DTMF tones in the audio stream (in-band signaling), cannot use DTMF signaling to pass the Auto Attendant.

In instances where other devices might listen for in-band DTMF signaling, the quality of the tone recognition depends on the selected voice compression. Tones transmitted by G.711 can be reproduced, but tones transmitted by G.723.1 are degraded.

Receiving Calls

ConneXtions gateways route incoming calls to any available H.323 port. The NBX system then connects this port to the extension specified during port configuration. H.323 ports are configured through the NBX software just like line card ports. Selectable extensions are:

- Auto Attendant (500)
- Receptionist's telephone (usually the lowest numbered extension on the system. Default:
 - NBX V3000 system: 1000
- Other extensions (each ConneXtions H.323 port can go to a single extension)

Auto Attendant

H.323 calls are usually routed to the Auto Attendant. From there, NBX callers can reach internal extensions without operator assistance by supplying a 3-digit extension when setting up the call (as the called party), or by dialing an extension after the Auto Attendant answers. Callers cannot get an outside line through the Auto Attendant because dialing 9 normally diverts incoming calls to the name directory.

You can configure H.323 calls to appear to go directly to an internal extension by adding a 3-digit extension immediately after the last octet in an H.323 IP address. Do not use commas, spaces, or hyphens between the IP address and an extension when programming an H.323 speed dial number. IP network connections do not incur delays like those that occur with analog PSTN connections.

8192*168*1*15*273#

The # sign in this example indicates when the last digit was entered so that the Call Processor does not have to wait 4 seconds to determine that a caller has no other digits to dial.

Caller ID Response

The Auto Attendant receives caller ID information from an outside caller and passes it to a caller-selected extension. On a telephone, the caller ID name and extension (if applicable) appear in brackets to indicate that the network has not authenticated the enclosed information.

Attendant Console	By convention, NBX systems reserve extension 100 or 1000 for the Attendant Console (receptionist), although the Attendant Console can be assigned any internal extension number. Outside callers cannot reach internal extensions without operator involvement when incoming calls are directed to the Attendant Console. See "Adding an Auto Attendant" in Chapter 6.
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Other Extensions	Incoming H.323 calls can be routed directly to some other extension or to a phantom mailbox. Sales people often have phantom mailboxes because they are never in the office. Calls to their extension go directly to their voice mailbox. Note that phantom mailbox extensions cannot be used to forward calls.
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Setting Up an H.323 Port Route

After you install an H.323 line port, you need to configure it.

To configure a H.323 line port:

- 1 In the *NBX NetSet - Main Menu* window, click *Device Configuration*.
- 2 Click the *Line Card Ports* tab.
- 3 Select an H.323 port. This port has the default setting from the Auto Discovery installation process.
- 4 Click *Modify*.
- 5 In the *AutoExt* field, enter the required extension number.



CAUTION: Do not route an H.323 port directly to another line port. Routing an H.323 call to a PSTN line, from the Internet, is dangerous because it would allow anyone to make long distance toll calls through the Call Processor — with no accountability.

- 6 Click *OK*.

conferences at the H.323 level, so, if two or more of the conferring parties are at a remote NBX system, each requires a separate port connection. This characteristic determines who can initiate the conference call.

A four-way conference call with three people at one NBX site and one person at the other site uses one H.323 port if it is set up from the side with three people. Otherwise, it needs three ports.

Related H.323 Documentation

Here are some useful sources of information on the H.323 standard:

Web Sites

- <http://www.packetizer.com/iptel/h323/>
- <http://www.itu.int/itudoc/itu-t/rec/h/>

Book

IP Telephony: Packet-Based Multimedia Communications Systems — Olivier Hersent, David Gurle, Jean-Pierre Petit (1999).

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CALLER ID

Caller ID behavior varies depending on the type of device and the conditions under which the call is received. This appendix describes these caller ID conditions:

- Forwarded Calls and Caller ID
- Long Caller ID Character Strings
- Specific Caller ID Situations

Forwarded Calls and Caller ID

While a *forwarded* call is ringing on a telephone:

- On the top line in the telephone's display panel, the Caller ID of the original caller appears and a greater than (>) character on the left side of the display helps you to visually identify the Caller ID of the original caller.
- On the bottom display panel line, the Caller ID of the telephone that is performing the transfer appears.

After the call is answered, only the Caller ID of the original caller remains in the display and the greater than (>) character is removed.

Long Caller ID Character Strings

Some models of the NBX Business Telephone can display two lines of 16 characters while other models of the NBX Business Telephone can display two lines of 24 characters. The displays of different brands and models of analog telephones with built-in Caller ID can show either 16 or 24 characters per line. The same is true of Caller ID boxes that are connected in-line with analog telephones.

If the length of the Caller ID information on either the top or bottom line exceeds the width of the NBX telephone display panel, the information is truncated for the first five seconds. After five seconds, the Caller ID information on the bottom line is cleared, and any truncated information

from the top line appears on the bottom line. After an additional five seconds, if the Caller ID information from the top line exceeds the capacity of both display lines, the numeric portion is removed and only the name portion appears in the display.

Specific Caller ID Situations	The Caller ID information that appears in the telephone display panel can be different in some specific call situations.
Analog Telephones	Analog telephones can be connected to the NBX system using these interfaces: <ul style="list-style-type: none">■ NBX single port Analog Terminal Adapter■ A port on an NBX Analog Terminal Card■ Citel Analog Interface Card
Analog Terminal Adapter and Analog Terminal Card Ports	
	If you have an analog telephone connected to the NBX system using a single port Analog Terminal Adapter or to a port on an Analog Terminal Card, the behavior of Caller ID on the analog telephone (or on Caller ID boxes connected in-line with the analog telephone) depends on whether the Caller ID device/telephone supports 2-line Caller ID display. <ul style="list-style-type: none">■ Most analog telephones with built-in Caller ID and most Caller ID boxes do not support 2-line display of Caller ID information. For this type of device, only the Caller ID of the original caller appears.■ If the analog telephone or Caller ID box supports 2-line display of Caller ID information, the information appears in the same way as it does on an NBX telephone.
If the Caller ID information exceeds the capacity of the Caller ID display (some can display 16 characters and others can display 24 characters) the Caller ID information is typically truncated at the width of the display.	
Citel Analog Interface Card	
	If you have analog telephones connected to the NBX system using the Citel analog interface card, the behavior of Caller ID on the analog telephones is the same as the behavior of analog telephones connected to a single port Analog Terminal Adapter or a port on an Analog Terminal Card. See "Analog Terminal Adapter and Analog Terminal Card Ports" on page 386.

Bridged Extension Telephones	Caller ID information appears in exactly the same way on a bridged extension telephone as it does on a non-bridged extension telephone. See “Caller ID” on page 385 and “Long Caller ID Character Strings” on page 385.
Calls That Are Forwarded Multiple Times	If a call is forwarded several times, the Caller ID information of the original caller appears on the top line of the display panel of the ringing telephone and the Caller ID of the telephone that most recently forwarded the call appears on the bottom line. A greater than (>) character appears to the left of the original Caller ID on the top line in the telephone display panel.
	Example: A places a call to B, who answers the call and forwards it to C, whose telephone is forwarded to D. While telephone D is ringing, the top line in the display panel contains the Caller ID for A and the bottom line contains the Caller ID for C. After 5 seconds, only the Caller ID information for A appears.
External Calls	The display of Caller ID information for external calls depends on how the call arrives at the NBX system.
	External Analog Line Card Calls
	An external call arrives at an NBX system on an Analog Line Card port and is routed to A's telephone.
	When A transfers the call to B, the Caller ID (if any is provided by the telephone company) appears in the top line of B's telephone display panel. If no Caller ID information is available, the extension associated with the Analog Line Card port appears on the top line. A's Caller ID information appears in the bottom line.
	Exception: An Analog Line Card port is mapped to an internal extension. The call is not answered and goes to the call coverage point for the extension. If the coverage point is the receptionist's telephone, for example, the receptionist sees the Caller ID information only for the external call, and not for any telephone on which the mapped Analog Line Card Port appears.

External ISDN BRI Calls

An external call arrives at an NBX system on an ISDN BRI channel and is routed to A's telephone.

When A transfers the call to B, the Caller ID (if any is provided by the telephone company) appears for five seconds in the top line of B's telephone display panel. If no caller ID information is available, the Trunk name and channel number from the Digital Line Card appear on the top line of B's telephone display panel. A's ID appears on the bottom line.

External ISDN PRI Calls

An external call arrives at an NBX system on an ISDN PRI channel and is routed to A's telephone.

When A transfers the call to B, the Caller ID (if any is provided by the telephone company) appears for five seconds in the top line of B's telephone display panel. If no caller ID information is available, the Trunk name and channel number from the Digital Line Card appear on the top line of B's telephone display panel. A's ID appears on the bottom line.

External T1 Calls

An external call arrives at an NBX system on a T1 channel and is routed to telephone A. If the call is transferred to B, the display of caller ID information on B's telephone depends on which *Incoming Call Digit Format* is configured on the T1 board.

- **DNIS/DID** — The T1 board is configured to expect either Dialed Number Identification System digits or Direct Inward Dialing digits.
If DNIS digits arrive, there is no Caller ID information. Instead, the NBX system displays the name of the T1 trunk and the extension associated with the T1 channel.

- **DNISANI** — The T1 board is configured to expect Dialed Number Identification System digits followed by Automatic Number Identification digits.

The NBX system displays the ANI portion of the incoming digit sequence followed by the name of the T1 trunk and the extension associate with the T1 channel. The ANI field can be configured to capture either 7 or 10 digits of ANI information.

- Internal Calls** On a single NBX system, user A calls B who transfers the call to user C. In C's telephone display panel, the top line contains Caller ID information for A and the bottom line contains Caller ID information for B.
- Nortel Phones** If you have Nortel telephones connected to your NBX system using the Nortel interface card, the behavior of Caller ID on these telephones is identical to the behavior on NBX telephones.
- Parked Calls** When you retrieve a parked call, the Caller ID associated with the call appears for approximately five seconds in your telephone display panel. You do not see the Caller ID of the person who parked the call.
- Second Incoming Call** If you are currently involved in a call on your telephone and another call arrives, for approximately five seconds you see "Incoming Call" on the top line of the telephone display panel and the Caller ID of the incoming call appears on the bottom line.
- TAPI Calls** If a call is forwarded to a telephone that is controlled by TAPI software, both the original Caller ID and the Caller ID of the person forwarding the call are sent to the TAPI software.
- TAPI Redirected Calls** If telephone A is being monitored by an external TAPI application and a forwarded call to A is redirected to telephone B, the TAPI software passes the Caller ID of the original caller and the Caller ID of the forwarding telephone to telephone B.
- VTL Calls** If A1 calls A2 who then forwards the call to B1 over a Virtual Tie Line connection, the Caller ID information for A2 appears in the display panel on B1's telephone. The Caller ID information includes the IP address of NBX system A and the extension number of A2.
- Calls Transferred to Hunt Groups** When someone performs a blind transfer to a hunt group, telephones in the hunt group display the called ID information of the original caller on line 1 and the hunt group name and number on line 2. After a hunt group member answers the call, only the caller ID information of the original caller appears.

GLOSSARY

A B C D E F G H I J K
L M N O P Q R S T U
V W X Y Z

Symbols

- 10BASE-T** A form of [Ethernet](#) and IEEE 802.3 network cabling using [twisted pair](#). It provides 10Mbits/s with a maximum segment length of 100 m (382 ft).
- 10BASE2** An implementation of [IEEE 802.3](#) Ethernet standard, often called thinnet or cheapernet, because it uses thin coaxial cable. 10BASE2 runs at a data transfer rate of 10 Mbits/s with a maximum segment length of 185 m (607 ft) per segment.
- 911** The emergency service that provides a single point of contact for police and fire departments. See also [E911](#).
- account codes** Codes that allow you to keep track of calls associated with a client or account for bookkeeping or billing purposes.
- ADSL** Asymmetrical Digital Subscriber Line. A telephone line that delivers high-speed data services, such as Internet access, videoconferencing, interactive TV, and video on demand. The line is split asymmetrically so that more bandwidth can be used from the telephone company to the customer (downstream) than from the customer to the telco (upstream).
- ATM** Asynchronous Transfer Mode. A cell-based data transfer technique in which channel demand determines packet allocation. ATM offers fast packet technology, real-time, demand-led switching for efficient use of network resources.
- Attendant Console** A standard telephony device that shows the status of each extension in a telephone system. The Attendant Console is usually used by a receptionist to connect incoming calls to the correct extension. All

incoming calls ring at the telephone associated with the Attendant Console.

AUI Attachment Unit Interface. The IEEE 802.3-specified cable and connector used to attach single-channel and multiple-channel equipment to an Ethernet transceiver. Defined in Section 7 of the 802.3 standard.

auto dial A feature that opens a line and dials a preprogrammed telephone number.

Auto Attendant A system feature that provides incoming callers with menu options to help them reach the appropriate person or information.

Auto Discovery A feature that “discovers” a new telephone or other device on the network. A new telephone receives a default telephone number that appears on the telephone display panel. A new device is assigned one or more extension numbers or device numbers.

auto redial A modem, fax, or telephone feature that redials a busy number a fixed number of times before giving up.

autorelocation A feature that allows a telephone to keep its extension number and personal and systems settings when you connect it to a different Ethernet jack on the same LAN.

B

backbone A high-capacity network that links together other networks of lower capacity. A typical example is a Frame Relay or [ATM](#) backbone that serves a number of Ethernet LAN segments.

bandwidth The capacity of a connection method to carry data.

BRI Basic Rate Interface. An [ISDN](#) standard that allows two circuit-switched B (bearer) channels of 64 Kbit/s each plus one D (data) channel at 16 Kbit/s for a total of 144 Kbit/s to be carried over a single twisted pair cable.

bridge A networking device that connects two separate local area networks and makes the LANs look like a single LAN, passing data between the networks and filtering local traffic.

bridged extension An extension of a primary telephone that appears on one or more secondary telephones. Incoming calls and indeed any activity associated with the primary telephone can be handled on any of the secondary telephones.

broadcast	A simultaneous transmission method that sends each packet from one node to all other nodes.
buffer	A temporary storage area for data that compensates for a difference in transmission speeds.
bus topology	A type of network in which all devices are connected to a single cable. All devices that are attached to a bus network have equal access to it, and they can all detect all of the messages that are put on to the network.
byte	A unit of 8 bits that forms a unit of data. Usually each byte stores one character.
call coverage point	The user-specified destination for the call forward feature, that is, how the system is to handle incoming calls when the user is unable to answer the telephone.

C

caller ID	A telephone company service that displays the name and number associated with an incoming call. Also called calling line ID or CLI. See also CLIR .
call forward	A feature that allows calls to be transferred to a call coverage point (voice mail, the Auto Attendant, or a prespecified telephone number) when the user is unable to answer the telephone.
calling groups	A feature that transfers incoming calls to a specified group of telephones. All telephones ring at the same time. See also hunt groups .
call park	A feature that places a call in a “holding pattern” and makes it available for others to pick up from any telephone on the system.
call permissions	Restrictions that an administrator establishes to control the types of calls that users can place from their telephones. Can be based on time of day.
call pickup	A feature that allows users to retrieve calls that ring on other telephones.
call reports	A feature that downloads data about calls and creates simple reports or exports the data for use in spreadsheets, word processors, or reporting programs.
category 3	The cable standard for UTP (unshielded twisted pair) voice-grade cabling that is specified by EIA/TIA 568 for use at speeds of up to 10Mbit/s, including 10BASE-T Ethernet .

category 4	The cabling standard specified by EIA/TIA 568 for use at speeds of up to 20Mbit/s.
category 5	The cabling standard specified by EIA/TIA 568 for use at speeds of up to 100 Mbit/s including FDDI (TP PMD), 100BASE-T and 100BASE-VG-AnyLan, and potentially ATM at 155Mbit/s.
Channel Service Unit (CSU)	Equipment installed on customer premises to terminate a DDS or T1 circuit. CSUs provide network protection and diagnostic capabilities and regenerate the signal received from the network. The CSU also controls pulse shape and amplitude for the transmission of the signal into the network.
client/server computing	The division of an application into two parts that are linked by a network. A typical example is a database application in which the database and application software reside on a server, and the interface for entering or retrieving information resides on individual workstations (clients).
CLI	See caller ID .
CLIR	Calling Line Identity Restriction. A telephone company option that allows the caller to withhold caller identity from the person being called.
coaxial cable	High-capacity networking cable that is formed by an outer braided wire or metal foil shield surrounding a single inner conductor, with plastic insulation between the two conducting layers. "Coax" cable is used for broadband and baseband communications networks. Ethernet employs <i>thin</i> coaxial cable in 10BASE2 and <i>thick</i> cable in 10BASE5.
CODEC	C ompressor/ D ECompressor. A hardware circuit or software routine that compresses and decompresses digitized audio, video, or image data. Most codecs include the functions of A/D and D/A conversion as well as compression and decompression.
	C Oder/ D ECoder. A hardware circuit that converts analog audio or video signals into digital code, and vice versa, using techniques such as pulse code modulation and delta modulation. A CODEC is an A/D and D/A converter.
collapsed backbone	Network architecture in which the backplane of a device, such as a hub, performs the function of a network backbone . Example: The backplane routes traffic between desktop nodes and between other hubs serving multiple LANs.

collision	The result of two devices on a shared transmission medium, like Ethernet, transmitting simultaneously. Both devices must retry their transmissions. A delay mechanism used by both senders drastically reduces the chances of another collision.
collision detection	Ethernet devices detect collisions instantly and attempt to resend. This is the principle on which CSMA/CD (Carrier Sense Multiple Access with Collision Detection) is based and the access control method for Ethernet.
concentrator	A central chassis into which various modules, such as bridging, supervisory, and 10BASE-T cards are plugged.
congestion	The result of increased network use on a LAN segment. Standard network partitioning practices must be invoked to reduce bottlenecks and maximize throughput speeds on the segment.
contention	The method used to resolve which users gain access to crowded bandwidth.
CO	Central Office. A telephony term for the telephone company site that houses the PSTN switching equipment.
CoS	Class of Service. A collection of calling permissions that are assigned to individual users and govern the times and types of calls these users can make.
CPE	Customer Premises Equipment. Telecommunications equipment, including PBXs and wiring, that is located in a user's premises.
CSU	Channel Service Unit. Data transmission equipment to repeat the signal from the carrier and link to CPE. Vendors add value to CSUs by adding performance monitoring and management features.
CTI	Computer Telephony Integration. A generic name for the technology that connects computers and telephone systems through software applications.
D	
data compression	A method of reducing the amount of data to be transmitted by reducing the number of bits needed to represent the information.
delayed ringing	Prevents a telephone on a shared line from ringing until the incoming call has rung on other telephones a set number of times.

delayed ringing pattern	The definition for the order in which telephones ring and how many times each telephone rings.
demand priority access	A method for supporting time-sensitive applications such as video and multimedia as part of the proposed 100BASE-VG standard offering 100Mbit/s over voice-grade UTP cable.
DHCP	Dynamic Host Configuration Protocol. A method by which devices are assigned temporary, renewable IP addresses by a server when the devices become active on the network.
DID/DDI	Direct Inward Dial/Direct Dialing Inward. A feature that allows outside calls to reach an internal extension without going to an operator or Automated Attendant.
direct mail transfer	Transfers a caller directly to another user's voice mail without requiring them to wait through ringing and without interrupting the recipient.
domain	A group of nodes on a network that form an administrative entity. A domain can also be a number of servers that are grouped and named to simplify network administration and security.
DSP	Digital Signal Processor. A special-purpose CPU tailored to handle complex mathematical functions. A DSP takes an analog signal and reduces it to numbers so its components can be isolated, sampled, and rearranged more easily than in analog form.
DSU/CSU	Digital (or Data) Service Unit/Channel Service Unit. A pair of communications devices that connect an in-house line to an external digital circuit (such as T1 and DDS). It is similar to a modem, but connects a digital circuit rather than an analog circuit.
DTMF	Dual Tone Multi-Frequency. A term for push button dialing. The pushed button generates a pair of tones which uniquely identify the button that was pressed.
E911	Enhanced 911. The addition of two features to the standard 911 service: one is ANI (Automatic Number Identification) to identify the person associated with the calling telephone, and the other is ALI (Automatic Location Identification) to identify the physical location of the calling telephone.

E

encapsulation The process of sending data encoded in one protocol format across a network operating a different protocol, where it is not possible or desirable to convert between the two protocols. Also known as protocol tunneling.

error correction A technique to restore data integrity in received data that has been corrupted during transmission. Error correction techniques involve sending extra data. The correct form of the data can be reconstructed from the extra information.

error detection A set of techniques that can be used to detect errors in received data. Parity checking techniques include the use of parity bits, checksums or a Cyclic Redundancy Check (CRC).

Ethernet The most widely used LAN transmission protocol. Based on a network [bus topology](#), it runs at a maximum 10Mbit/s and can use a wide variety of cable types. The IEEE Ethernet standard is [IEEE 802.3](#).

Ethernet switching A technique that brings the advantages of a parallel networking architecture to contention-based Ethernet LANs. Each LAN can be segmented with its own path. When users on different segments exchange data, an Ethernet switch dynamically connects the two separate Ethernet channels without interfering with other network segments.

F

fast Ethernet An evolution of Ethernet that raises the bandwidth to 100 Mbit/s.

fast packet switching A [WAN](#) technology for transmitting data, digitized voice, and digitized image information. It uses short, fixed length packets.

FDDI Fiber Distributed Data Interface. An optical fiber-based token-passing ring LAN technology that carries data at a rate of 100 Mbit/s.

FRAD Frame Relay Access Device. A wide-area networking device that forwards traffic to and from the endpoint of a the network.

frame A structured group of bits sent over a link. A frame can contain control, addressing, error detection, and error correction information. The term is often used synonymously with the term [packet](#).

frame relay A packet-switching wide-area technology for interconnecting LANs at high speeds.

G

gateway A network device that provides a means for network traffic to pass from one topology, protocol, or architecture into a different topology, protocol, or architecture.

gigabit Ethernet An Ethernet technology that raises transmission speed to 1 Gbit/s, targeted primarily for use in backbones.

glare A condition in telephony where both ends of an available connection are seized at the same time.

group mailboxes Mailboxes that are not associated with a single telephone but allow a group of users to have joint access to a single mailbox.

H

H.323 An [ITU](#) standard for the transmission of real-time audio, video, and data communications over packet-switched networks, such as local area networks (LANs) and the Internet. H.323 is the basis for Internet telephony.

header The control information added to the beginning of a transmitted message. This may consist of packet or block address, destination, message number and routing instructions.

hierarchical network A network with one host at its hub, which is the major processing center, and one or more satellite processing units.

hot swap The ability of a device to have parts removed and replaced without turning off the device and without interrupting the service the device provides.

hub The center of a star topology network or cabling system. A multi-node network topology that has a central multiplexer with many nodes feeding into and through the multiplexer or hub. The nodes do not directly interconnect.

hunt groups Informal “call centers” in which a call rings to one member of the group. If there is not answer, the call rings at the next member’s telephone and so on until a member answers.

hybrid mode A PBX operating mode in which some outside lines are grouped together in pools while other lines are assigned directly to buttons on telephones. Users access outside lines by dialing a pool access code. See also [key mode](#).

I

IEEE Institute of Electrical and Electronic Engineers. A U.S. publishing and standards organization responsible for many LAN standards, such as the 802 series.

IEEE 802.2 The Data Link standard for use with IEEE 802.3, 802.4 and 802.5 standards. It specifies how a basic data connection should be set up over the cable.

IEEE 802.3 The Ethernet standard. A physical layer definition that includes specification for cabling plus the method of transmitting data and controlling access to the cable.

IETF Internet Engineering Task Force. The standards-setting body for the Internet. Protocols adopted by the IETF define the structure and the operation of the Internet.

IMAP Internet Message Access Protocol. A method of accessing electronic messages that are kept on a server. IMAP defines how an e-mail program can access messages that are stored on a remote server.

intelligent hub See [managed hub](#).

IP Internet Protocol. The TCP/IP standard protocol that defines the IP datagram as the unit of information passed across an Internet. IP provides the basis for connectionless packet delivery service.

IP address The address used by devices on the network to establish their unique identity. IP addresses are composed of four fields separated by dots. Each field is an 8-bit number (0 through 255). IP addresses can be permanently assigned, or they can be temporarily assigned by [DHCP](#).

IP telephony Technology that allows voice, data, and video to be transmitted over IP-based networks.

ISDN Integrated Services Digital Network. An international telecommunications standard for transmitting voice, video and data over digital lines running at 64 Kbit/s. ISDN uses B channels, or “bearer” channels, to carry voice

and data. It uses a separate D channel, or “delta,” channel for control signals to the telephone company computer.

ITU International Telecommunication Union. An international standards organization for telecommunications.

J

jitter The variation in latency (waiting time) for different packets on the network. For real time data such as voice transmission, jitter must be kept to a minimum.

K

key mode A telephone system operating model in which each telephone in the system has buttons for each available outside line. Also known as a square plan or a direct system inward access (DISA) system. See also [hybrid mode](#).

L

LAN local area network. A communications system that links computers, printers, and other devices. LANs allow users to communicate and share resources like hard disk storage and printers. Devices linked by a LAN may be on the same floor or within a building or campus.

LAN segment A section of a local area network that is used by a particular workgroup or department and separated from the rest of the LAN by a bridge, router or switch.

LAN switch A network device that connects stations or LAN segments, also known as a frame switch.

latency The sum of all the delays in an end-to-end connection.

layering The process of dividing complex software up into several layers, each of which performs a specific task. Layering allows faster and easier software development and is often used in public, open software.

LCD Liquid Crystal Display. A low cost display technology.

line pool In a PBX system, outside lines are pooled and arbitrated by the Call Processor. To call an outside number, a user must dial the line pool access number, typically 9, and the Call Processor assigns the next available line.

LLC	Logical Link Control. A data link protocol for LANs that is part of the IEEE 802.2 standard and common to all LAN standards for OSI model data link, level two transmissions.
loop start	The most common signaling method in the public telephone network, typically used for residence and business CO lines.
M	
MAC	Media Access Control. A sub-layer of the Data Link layer (Layer 2) of the ISO OSI model responsible for media control. Also known as the "MAC layer."
MAC address	A unique 48-bit number that is encoded in the circuitry of a device to identify it on a LAN. Also known as a "hardware address" or an Ethernet address."
managed hub	A network device in which each port on the hub can be configured, monitored, and enabled or disabled by a network administrator from a hub management console or utility tied into an SNMP (Signaling Network Management Protocol) platform. Hub management can also include gathering information on network parameters.
MAU	Medium Attachment Unit. A transceiver that provides the correct electrical or optical connection between the computer and IEEE 802.3 LAN media.
MIB	Management Information Base. A database that can be accessed by a gateway running CMIP (Common Management Information Protocol), CMOT (CMIP Over TCP/IP), or SNMP (Signaling Network Management Protocol) network management protocols. The MIB defines variables needed by the protocol to monitor and control components in a network. Managers can fetch or store these variables.
modem	MO dulator/ DE Modulator. A modem converts a binary bit stream to an analog signal and vice versa.
multiplexer	A device that can send several signals over a single line. A similar device at the other end of the link then separates the signals.
multi-tasking	The concurrent execution of two or more tasks or the concurrent use of a single program that can carry out many functions.

NCP Network Call Processor. The device that manages call traffic, voice mail, the Auto Attendant, and related applications in an NBX system.

N

NetBEUI NetBios Extended User Interface. A network device driver or transport protocol that is the transport driver supplied with LAN Manager.

NetBIOS Network Basic Input/Output System. Software developed by IBM that provides the interface between the PC operating system, the I/O bus, and the network. Since its design, NetBIOS has become a de facto standard.

NetWare LAN Network Operating System and related products developed by Novell. NetWare is based on the SPX/IPX networking protocols.

network collisions Result of two stations simultaneously attempting to use a shared transmission medium. See [collision](#).

network congestion Result of increased network utilization. Creates traffic bottlenecks on a LAN segment. See [congestion](#).

network layer Layer 3 in the [OSI model](#) responsible for the routing and relaying through one or more networks in multiple link or wide area environments.

network management The process and technique of remotely or locally monitoring and configuring networks.

network ping A packet transfer that checks logical continuity between a PC and a specified IP address.

NIC Network Interface Card. Controller circuitry that connects a node to a network, usually in the form of a card in a PC expansion slot. In conjunction with the NOS (Network Operating System) and PC operating system, it helps transmit and receive messages on the network.

node Device on a network that demands or supplies services. Also, a location where transmission paths are connected.

NOS Network Operating System. Software that connects all the devices on a network so that resources can be shared efficiently and managed from a central location. Novell NetWare is one example of a network operating system.

O

OEM Original Equipment Manufacturer. The maker of a product or component that is marketed by another vendor, integrator, VAR (Value Added Reseller), or reseller.

off-hook The state of a telephone line that allows dialing and transmission but prohibits incoming calls from being answered. The term stems from the days when a telephone handset was lifted off of a hook. Contrast with on-hook.

off-site notification A feature that sends a message to a pager, outside telephone number, or email account that informs a user of a voice mail message. The user can retrieve the messages remotely.

on-hook The state of a telephone line that can receive an incoming call.

OSI model A conceptual model of hardware and software layers that define when, how, and in what order data can be transmitted on a network. The OSI Model defines seven layers:

Layer 7	Application layer
Layer 6	Presentation layer
Layer 5	Session layer
Layer 4	Transport layer
Layer 3	Network layer
Layer 2	Data Link layer
Layer 1	Physical layer

out-of-band signaling An extra signal transmitted with the information signal to monitor and control a transmission. It provides an additional layer of resilience by using a separate channel.

P

packet A collection of bits, including address, data, and control information, that are transmitted together. The terms frame and packet are often used synonymously.

packet buffer Memory space reserved for storing a packet awaiting transmission or for storing a received packet.

packet switching	A method of switching data in a network. Individual packets of a set size and format are accepted by the network and delivered to their destination. The sequence of packets is maintained, and destination established, by the exchange of control information (also contained in the packets) between the sending terminal and the network before the transmission starts.
paging	1) A communications service that includes a one-way beeper service, one-way text service, and two-way text and voice service. 2) A public address announcement system. Many PBX telephone systems can do paging through the speakers in the telephone sets.
PBX	Private Branch eXchange. An in-house telephone switching system that interconnects telephone extensions to each other, as well as to the outside telephone network. It can include functions such as least cost routing for outside calls, call forwarding, conference calling, and call accounting.
PCS	Personal Communications Services. Refers to a variety of wireless services emerging after the U.S. Government auctioned commercial licenses in late 1994 and early 1995.
phantom mailbox	A user profile that uses a telephone number with no associated telephone. Messages can be sent to the phantom mailbox from within the voice mail system. The Auto Attendant can route messages to the phantom mailbox, and you can dial the phantom mailbox directly.
port	A computer interface capable of attachment to another device, such as a modem for communicating with a remote terminal or, if the port is within a hub, to a workstation.
POTS	Plain Old Telephone Service.
PPP	Point-to-Point Protocol. An addition to the Internet protocol suite to help connect devices where dissimilar transport protocols exist. Typically used for serial connections to the Internet.
predictive dialing	Automated dialing feature in which CTI software predicts when you will end your current call, and dials the next call in advance.
pretranslator	A device that interprets and modifies a sequence of incoming digits or transmits outgoing digits.

preview dialing	Automated dialing feature in which CTI software queues the next call to be made but allows you to check and activate the call.
PRI	Primary Rate Interface. An ISDN service for users with large bandwidth requirements, such as large PBXs or high performance video desktop conferencing systems; the ISDN equivalent of a T1 circuit.
protocol	A set of rules governing the information flow within a communications infrastructure. A protocol typically specifies the structure of parameters like format, timing, and error correction.
protocol converter	A device that translates between two protocols to facilitate communications between different computers or different systems.
PSTN	Public-Switched Telephone Network. The term describes the national telephone network.
punch-down block	Telephony term describing the connector arrangements for distributing and connecting unshielded and shielded twisted pair wiring inside a building. Typically found in telephone wiring closets.

Q

Q.921/931	ITU-TS "Q Series" Recommendations describing Lap-D, the Layer 2 protocol for an ISDN D-channel. See OSI model .
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R

reconfiguration	The process of physically altering the location or functionality of network or system elements. Automatic configuration describes the way sophisticated networks can readjust themselves in the event of a link or device failing, enabling the network to continue operation.
redundancy	In data transmission, this refers to characters and bits that can be removed from a transmission without affecting the message. In data processing and data communications, it means providing backup for components so that if one of them fails, the system continues to run without interruption.
REN	Ringer Equivalency Number. A number that indicates how much power is required by a telephone to make it ring. When connecting telephones to a telephone line, the sum of the RENs of the telephones must be less than the rated REN capacity of the telephone line.

- repeater** A device that extends the maximum length of cable that can be used in a single network.
- RMON** Remote Monitoring. A facet of SNMP-based network management, the RMON MIB (Management Information Base) defines the standard network monitoring functions for communication between SNMP-based management consoles and remote monitors. A typical MIB captures information about a device, but RMON captures information about traffic between devices.
- RJ-11** A four-wire modular connector used by the telephone system.
- RJ-45** An eight-wire modular connector used by telephone systems. The eight-pin modular connectors used for 10BASE-T [UTP](#) cable resemble RJ-45 connectors, but they have substantially different electrical properties.
- router** A network device that links LANs together locally or remotely as part of a WAN. A network built using routers is often termed an internetwork.
- routing** The process of delivering a packet across one or more networks via the most appropriate path.
- SA** System Appearance
- S**
- screen POP** A [CTI](#) term for a window that automatically opens on a user's computer when a predefined telephone event occurs. For example, an incoming call could generate a screen pop that lists [caller ID](#) information.
- segment** A LAN term meaning an electrically continuous piece of the bus. Segments can be joined together using repeaters or [bridges](#).
- serial interface** Hardware for sending and receiving data one bit at a time.
- SMDR** Station Message Detail Recording. A stream of call data from the telephone system. Typically, the data is not stored on the telephone system itself. Rather, it is captured by an external device that connects to the telephone system through an RS232 port.
- SMTP** Simple Mail Transfer Protocol. The [TCP/IP](#) standard protocol for transferring electronic mail messages from one machine to another. SMTP specifies how two mail systems interact and the format of control messages they exchange to transfer mail.

SNA	Systems Network Architecture. IBM's layered communications protocol for sending data between IBM hardware and software.
STP	Shielded Twisted Pair. A twisted pair of wires surrounded by a shield that is typically made of braided wire or metal foil.
switched Ethernet	An Ethernet network that allows each user the full Ethernet bandwidth of 10 Mbit/s to another node.
system-wide greetings	A special type of time-dependent greeting that is used throughout the system.
T	
T1/E1	A high-speed data channel that can handle 24 voice or data channels (T1) or 30 voice or data channels (E1) at 64Kbit/s. Refers to the U.S. T1 line or European E1 equivalent.
T3	A U.S. standard for high-speed data transmission at 44.736 Mbit/s, providing the equivalent bandwidth of 28 T-1 circuits. The carrier channel can handle 672 voice or data channels.
TAPI	Telephony Applications Programming Interface A Microsoft Windows standard interface for integration between telephone systems and Windows-based software. A typical example is integrating Caller ID with a database on your computer that contains detailed information about potential callers. When your telephone rings, a window pops up on your computer with information about the caller.
TCP/IP	Transmission Control Protocol/Internet Protocol. The suite of protocols that define how to move information over the Internet.
thin Ethernet	An 802.3 LAN that uses smaller than normal diameter coaxial cable ; often used to link PCs together. Also known as 10BASE2 .
time-dependent greeting	Greetings that usually indicate the time of day that the caller is calling (morning, afternoon, evening) and are an optional feature of the Automated Attendant.
toll-free	The U.S. term for "free phone."
toll restrictions	The U.S. term for "call barring."

- translation** The process of interpreting or modifying dialed digits for incoming or outgoing calls and allows the call to progress through the network.
- trunk** A communications channel between two points. It often refers to large-bandwidth telephone channels between major switching centers, capable of transmitting many simultaneous voice and data signals.
- twisted pair** Two insulated wires twisted together with the twists varied in length to reduce potential signal interference between the pairs. Twisted pair is the most common medium for connecting telephones, computers and terminals.

U

- UPS** Uninterruptible Power Supply. A secondary power source attached to a piece of hardware, for example a server, which provides backup power for conducting an orderly shutdown if the server's normal power supply fails.
- UTP** Unshielded Twisted Pair. Two insulated wires twisted together with the twists varied in length to reduce potential signal interference between the pairs. The standard cabling used for telephone lines and Ethernet 10BASE-T.

V

- virtual LAN** A logical, rather than a physical, LAN that includes workgroups drawn together for business reasons or for a particular project regardless of the location of the members.
- VPIM** Voice Profile for Internet Mail. A set of Internet protocols that merges voice messaging and e-mail. VPIM lets voice mail and e-mail servers exchange messages across TCP/IP-based intranets and the Internet.
- VTL** Virtual Tie Line. Allows several NBX domains to create tie lines on demand and to place calls over a [WAN](#). Uses peer-to-peer connections for the audio.

W

- WAN** Wide Area Network. A network that covers a larger geographical area than a LAN. In a WAN, telecommunications links are normally leased from the appropriate Public Telephone Operator (PTO).

- wiring closet** The location, usually a physical box, in which the cabling on one floor of a building is terminated.
- workstation** Another name for a computer, typically running UNIX or the Windows NT operating system.

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3Com Corporation LIMITED WARRANTY

NBX V3000

HARDWARE

3Com warrants this hardware product to be free from defects in workmanship and materials, under normal use and service, for the following length of time from the date of purchase from 3Com or its authorized reseller:

3Com's sole obligation under this express warranty shall be, at 3Com's option and expense, to repair the defective product or part, deliver to Customer an equivalent product or part to replace the defective item, or if neither of the two foregoing options is reasonably available, 3Com may, in its sole discretion, refund to Customer the purchase price paid for the defective product. All products that are replaced will become the property of 3Com. Replacement products may be new or reconditioned. 3Com warrants any replaced or repaired product or part for ninety (90) days from shipment, or the remainder of the initial warranty period, whichever is longer.

SOFTWARE

3Com warrants that each software program licensed from it will perform in substantial conformance to its program specifications, for a period of ninety (90) days from the date of purchase from 3Com or its authorized reseller. 3Com warrants the media containing software against failure during the warranty period. No updates are provided. 3Com's sole obligation under this express warranty shall be, at 3Com's option and expense, to refund the purchase price paid by Customer for any defective software product, or to replace any defective media with software which substantially conforms to applicable 3Com published specifications. Customer assumes responsibility for the selection of the appropriate applications program and associated reference materials. 3Com makes no warranty or representation that its software products will meet Customer's requirements or work in combination with any hardware or applications software products provided by third parties, that the operation of the software products will be uninterrupted or error free, or that all defects in the software products will be corrected. For any third party products listed in the 3Com software product documentation or specifications as being compatible, 3Com will make reasonable efforts to provide compatibility, except where the non-compatibility is caused by a "bug" or defect in the third party's product or from use of the software product not in accordance with 3Com's published specifications or user manual.

YEAR 2000 WARRANTY

In addition to the Hardware Warranty and Software Warranty stated above, 3Com warrants that each product sold or licensed to Customer on and after January 1, 1998 that is date sensitive will continue performing properly with regard to such date data on and after January 1, 2000, provided that all other products used by Customer in connection or combination with the 3Com product, including hardware, software, and firmware, accurately exchange date data with the 3Com product, with the exception of those products identified at 3Com's Web site, <http://www.3com.com/products/yr2000.html>, as not meeting this standard. If it appears that any product that is stated to meet this standard does not perform properly with regard to such date data on and after January 1, 2000, and Customer notifies 3Com before the later of April 1, 2000, or ninety (90) days after purchase of the product from 3Com or its authorized reseller, 3Com shall, at its option and expense, provide a software update which would effect the proper performance of such product, repair such product, deliver to Customer an equivalent product to replace such product, or if none of the foregoing is feasible, refund to Customer the purchase price paid for such product.

Any software update or replaced or repaired product will carry a Year 2000 Warranty for ninety (90) days after purchase or until April 1, 2000, whichever is later.

OBTAINING WARRANTY SERVICE

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FCC CLASS A VERIFICATION STATEMENT

WARNING: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules, and the Canadian Department of Communications Equipment Standards entitled, "Digital Apparatus," ICES-003. These limits are designed to provide reasonable protection against harmful interference in a commercial installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, 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 be required to correct the interference at the user's own expense.

Changes or modifications not expressly approved by 3Com could void the user's authority to operate this equipment.

FCC CLASS B STATEMENT

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

- 1 This device may not cause harmful interference, and
- 2 This device must accept any interference received, including interference that may cause undesired operation.

WARNING: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules, and the Canadian Department of Communications Equipment Standards entitled, "Digital Apparatus," ICES-003. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from the one which the receiver is connected to.
- Consult the dealer or an experienced radio/TV technician for help.

The user may find the following booklet prepared by the Federal Communications Commission helpful:

The Interference Handbook

This booklet is available from the U.S. Government Printing Office, Washington, D.C. 20402. Stock No. 004-000-00345-4.

NOTE: In order to maintain compliance with the limits of a Class B digital device, 3Com requires that you use quality interface cables when connecting to this device. Changes or modifications not expressly approved by 3Com could void the user's authority to operate this equipment. Refer to the manual for specifications on cabling types.

FCC DECLARATION OF CONFORMITY

We declare under our sole responsibility that the

Model:	Description:
3CXXX	Product Name

to which this declaration relates, is in conformity with the following standards or other normative documents:

- ANSI C63.4-1992 Methods of Measurement
- Federal Communications Commission 47 CFR Part 15, subpart B
15.107 (a) Class B Conducted Limits
15.109 (a) Class B Radiated Emissions Limits
- 15.107 (e) Class B Conducted Limits
15.109 (g) Class B Radiated Emissions Limits

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System Release 4.4

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ABOUT THIS GUIDE

This guide is intended for anyone using NBX® Telephones, NBX Attendant Consoles, or the NBX Complement Attendant Software. It includes information about using the NBX Voice Mail system and the NBX NetSet™ administration utility for personal telephone settings.

Devices documented in this guide include:

Telephones

- NBX 3102 Business Telephone
- NBX 2102 Business Telephone
- NBX 2102-IR Business Telephone
- NBX 1102 Business Telephone
- NBX 3101 Basic Telephone
- NBX 3101SP Basic Telephone
- NBX 2101 Basic Telephone

Attendant Consoles

- NBX 3105 Attendant Console
- NBX 1105 Attendant Console
- NBX Complement Attendant Software



If the information in the release notes (readme.pdf) on the NBX Resource Pack CD differs from the information in this guide, follow the instructions in the release notes.



Analog telephones connected through the Analog Terminal Card or the Analog Terminal Adapter can use most of the features described in this book. See the NBX Feature Codes Guide in the NBX NetSet utility.

How to Use This Guide

[Table 1](#) shows where to look for specific information in this guide.

Table 1 Where to Find Information

If you are looking for information about	Turn to
How to get started with your new telephone	Chapter 1
The NBX 3102 Business Telephone	Chapter 2
The NBX 1102, 2102, and 2102-IR Business Telephones	Chapter 3
The NBX 3101 and 3101SP Basic Telephones	Chapter 4
The NBX 2101 Basic Telephone	Chapter 5
NBX Voice Messaging features	Chapter 6
Using standard telephone features	Chapter 8
Personalizing your telephone	Chapter 7
Enhanced system features	Chapter 9
The Attendant Console and Complement Attendant Software	Chapter 10
Telephone maintenance and troubleshooting information	Appendix A
References to all topics in this book	Index

Conventions

[Table 2](#) defines some commonly used words and phrases in this guide.

Table 2 Common Terms

Term	Definition
Auto Attendant	The set of voice prompts that answers incoming calls and describes actions that a caller or user can take to access individual services.
Administrator	The person who is responsible for maintaining your 3Com Networked Telephony Solution.
Receptionist	The person who answers the majority of incoming telephone calls. In some business environments, this person may be a switchboard operator.
User	A person who has a single NBX Business Telephone, an NBX Basic Telephone, or an analog telephone connected to the NBX system through an ATC card or the single-port ATA device.

[Table 3](#) lists conventions that are used throughout this guide.

Table 3 Icons

Icon	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, system, device, or network.
	Warning	Information that alerts you to potential personal injury.

Documentation

The documentation set for 3Com NBX Networked Telephony Solutions is designed to help NBX telephone users, installers, and administrators maximize the full potential of the system.

The *NBX Resource Pack CD* contains many guides to the NBX products and their related 3Com applications.

When you log in to the NBX NetSet utility as a user, you can view the PDF versions of the *NBX Telephone Guide* and *NBX Feature Codes Guide* by clicking the icons at the bottom of the screen.

An administrator who logs in can also see the *NBX Installation Guide* and the *NBX Administrator's Guide*. The NBX NetSet utility also includes a searchable Help system with Help buttons on each screen.

Comments on the Documentation

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

Please send your e-mail comments about this guide or any of the 3Com NBX documentation and Help systems to:

Voice_TechComm_Comments@3com.com

Include the following information with your comments:

- Document title
- Document part number (found on the front or back page)
- Page number

Example:

NBX Telephone Guide

Part Number PhG-EN

Page 25



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

1

GETTING STARTED

As soon as you are given a telephone and extension number, you need to set up a password and record your name announcement and personal greeting.

This chapter covers these topics:

- [Setting Up Your Password and Voice Mail for the First Time](#)
- [NBX NetSet Utility](#)
- [Quick Reference Guides](#)



For how to access NBX features from an analog telephone, set your password as described next and then see the NBX Feature Codes Guide in the NBX NetSet utility.

Setting Up Your Password and Voice Mail for the First Time

The procedure by which you set up your password and voice mailbox for the first time depends on:

- The kind of telephone that you have
- The kind of voice messaging system on your NBX system. Ask your administrator what kind of voice messaging is active on your system.

[Table 4](#) describes how to set up your first password.



For details on tones and codes on analog telephones, see the NBX Feature Codes Guide in the NBX NetSet utility.

Table 4 Setting Your NBX NetSet and NBX Messaging Password

Feature	NBX Business Phones	NBX Basic Phones	Analog Telephones
Password — Set Initially			
If your system uses NBX Messaging, follow the NBX voice prompts to set your NBX password (which is the same for NBX NetSet and voice messaging) OR use the NBX NetSet utility, described next.	Msg button (1102, 2102, 2102-IR) or button (3102) and follow the voice prompts	Msg button (2101) or button (3101 and 3101SP) and follow the voice prompts	500 ** and follow the voice prompts
If your system uses a voice messaging application other than NBX Messaging, use this code sequence to set your password for the NBX NetSet utility. 3Com recommends that you use the same password for the NBX NetSet utility and your messaging application.	OR, for systems that do not use NBX Messaging: Feature + 434 + new password + # + repeat your new password + #	OR, for systems that do not use NBX Messaging: Feature + 434 + new password + # + repeat your new password + #	OR, for systems that do not use NBX Messaging: # (Feature Entry Tone) + 434 # (Feature Entry Tone) + new password + # # (Feature Entry Tone) + repeat your new password + # # (Confirmation Tone)
For all voice messaging systems:			
■ Use only 4- to 10-digit numbers			
■ Do not use letters, *, or # as part of your password.			
Password — Change			
If your system uses NBX Messaging, follow the NBX voice prompts to change your NBX password (which changes your NBX NetSet password, because they are the same) OR use the NBX NetSet utility, described next.	Msg button (1102, 2102, 2102-IR) or button (3102) + current password + # + 9 + 2 + follow the prompts	Msg button (2101) or button (3101 and 3101SP) + current password + # + 9 + 2 + follow the prompts	500 ** + extension number + current password + # + 9 + 2 + follow the prompts
If your system uses a voice messaging application other than NBX Messaging, use this code sequence to change your password for the NBX NetSet utility. 3Com recommends that you use the same password for the NBX NetSet utility and your voice messaging application.	OR, for systems that do not use NBX Messaging: Feature + 434 + current password + # + new password + # + repeat your new password	OR, for systems that do not use NBX Messaging: Feature + 434 + current password + # + new password + # + repeat your new password	OR, for systems that do not use NBX Messaging: # (Feature Entry Tone) + 434 # (Feature Entry Tone) + current password + # # (Feature Entry Tone) + new password + # # (Feature Entry Tone) + repeat your new password + # # (Confirmation Tone)
For all voice messaging systems:			
■ If you forget your password, the administrator can reset it to your extension. Then use this code (for applications other than NBX Messaging) or the NBX voice prompts to change it.			

NBX NetSet Utility

The NBX NetSet administration utility has two interfaces:

- **Administrator** — Your administrator logs in with a special password and uses the NBX NetSet utility to manage and configure system-wide telephone settings and many of the settings for your telephone.
- **User** — As a telephone user, you log in to the NBX NetSet utility with your own system ID (your extension) and password to:
 - View and change your telephone's personal settings, such as speed dials, ringer tone, and specify where you want your calls to go when you cannot answer them (your *call coverage point*).
 - Listen to and delete your voice messages from your computer as an alternative to managing calls on your telephone.
 - View your call permissions, certain current feature settings, and the internal user directory to call other users on your system.
 - Log in to and out of one or all hunt groups and calling groups of which your telephone is a member.

See [Chapter 8](#), [Chapter 7](#), and [Chapter 9](#) for discussions about the standard and enhanced features that you can monitor and change in the NBX NetSet utility. See [Chapter 6](#) for voice messaging features.



If your NBX system uses a messaging application other than NBX Messaging, off-site notification and other voice messaging features are available through your messaging application. See the application's documentation rather than using this Guide.

Starting the NBX NetSet Utility

To use the NBX NetSet utility, you need a computer that is connected to your local area network (LAN) and that has a web browser. (You do not need Internet access.) To start the NBX NetSet utility:

- 1 Ask your administrator for the IP address (or DNS host name) for your NBX system. In the web browser on your computer (Microsoft Internet Explorer version 5.5 or later is optimal), enter the IP address (or DNS host name) in the **Address** field, and then press Enter on your keyboard. The NBX NetSet login screen appears.



You cannot log in to the NBX NetSet utility until you establish your password through your telephone using NBX voice prompts or the Feature Code sequence. See [Table 4](#).

- 2 Click **User** to log in as a user. The password dialog box appears.

- 3 Type your NBX NetSet user identification (always your 3-digit or 4-digit telephone extension) and your NBX NetSet password, and then click **OK**.

Navigation and Shortcut Icons in the NBX NetSet Utility

The icons at the lower right of any **Personal Settings** window allow you or your administrator to navigate to the following features:

Table 5 Navigation Icons

Icon	Action	Where You Go
	Back	<ul style="list-style-type: none">■ For the User goes to the main NBX NetSet login dialog box■ For the Administrator goes to the NBX NetSet main menu window
	Help	Help for the fields and procedures related to the screen

Click the icons below the window to go directly to these features:

One-Touch Speed Dials



Off-Site Notification



Telephone Guide (this guide)



NBX Feature Codes Guide



Quick Reference Guides

To open and print a copy of the *Quick Reference Guides* for the most frequently used features on your telephone:

- 1 Log in to the NBX NetSet utility. See "[Starting the NBX NetSet Utility](#)" earlier in this chapter.
- 2 Click **Telephone Quick Reference**. The quick reference that pertains to your telephone (Business, Basic, or analog) appears. Adobe Acrobat Reader 4.0 or higher is required to view the file. Adobe Acrobat Reader is available free from the Adobe Web site: www.adobe.com

2

NBX 3102 BUSINESS TELEPHONE

This chapter describes the buttons, controls, and features on the NBX 3102 Business Telephone. It covers these topics:

- [Telephone Buttons and Controls](#)
- [Programmable Access Buttons](#)
- [Status Lights for System Appearance Buttons](#)



For a description of the features on the NBX 1102, 2102, and 2102-IR Business Telephones, see [Chapter 3](#).

For a description of the features on the NBX 3101 and 3101SP Basic Telephones, see [Chapter 4](#).

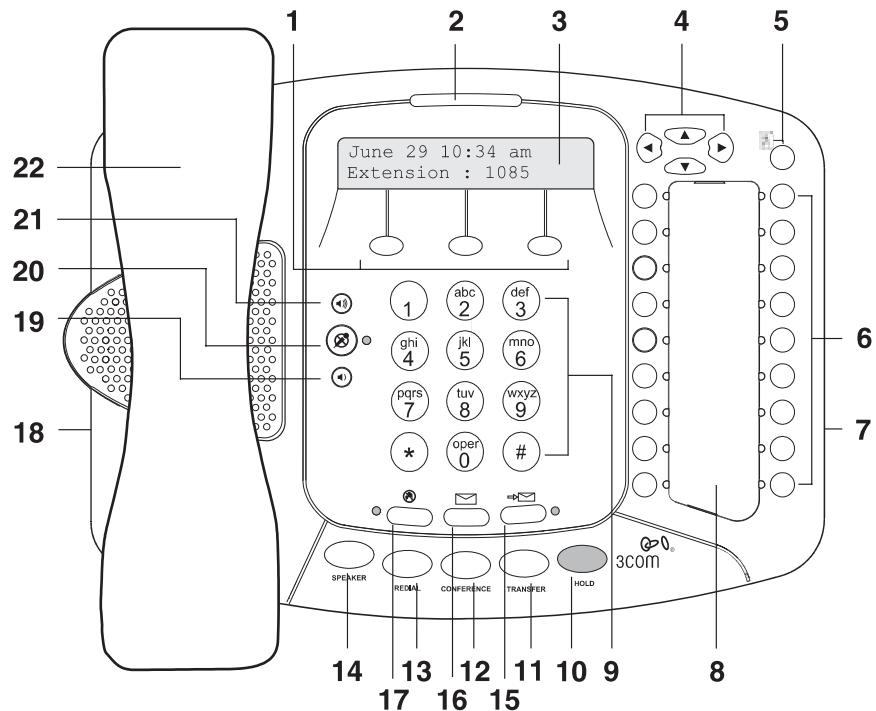
For a description of the features on the NBX 2101 Basic Telephone, see [Chapter 5](#).

For how these features work on an analog telephone that is connected to the NBX system, click the NBX Feature Codes Guide icon below any screen in the NBX NetSet utility.

Telephone Buttons and Controls

[Figure 1](#) shows the buttons and controls on the NBX 3102 Business Telephone. The features are discussed after the picture.

Figure 1 NBX 3102 Business Telephone



- 1 Soft buttons** — Allow you to select items that are displayed in the telephone display panel. See ["Using the NBX Telephone Display Panel"](#) in [Chapter 8](#). The buttons, from left to right, are:
 - **Slct** (Select)
 - **Back** (*returns you to the next higher level in the menu*)
 - **Exit** (leaves the display panel menus)
- 2 Message Waiting Indicator (MWI)** — When lit, indicates that you have one or more new voice mail messages in your voice mailbox. Also, this indicator flashes when your telephone rings.
- 3 Display panel** — Displays telephone status messages, Caller ID information (if enabled), and the number of messages that you have in your voice mail mailbox. You can also use it to view these items:
 - Logs of your recent missed, answered, and dialed calls
 - A directory of people's names in your organization
 - Personal speed dial numbers

- System-wide speed dial numbers
- 4 Scroll buttons (Up, Down, Left, Right)** — Allow you to scroll through the items in the telephone display panel. See ["Using the NBX Telephone Display Panel"](#) in [Chapter 8](#). The left and right buttons are reserved for future use.
- 5 Program button** — Reserved for future use.
- 6 Programmable Access buttons** — Allow you and your administrator to assign features to specific buttons. See ["Programmable Access Buttons"](#) and ["Status Lights for System Appearance Buttons"](#) later in this chapter.
- 7 Microphone (located on the side of the telephone)** — Activated when the telephone is in speaker phone mode, that is, after you press the **Speaker** button or the  (Hands Free) button. For best results, keep the area around the microphone free of obstructions.
- 8 Label area for Access buttons**
- 9 Telephone key pad**
- 10 Hold button** — Places a caller on hold. See ["Putting a Call on Hold"](#) in [Chapter 8](#).
- 11 Transfer button** — Sends the currently active call to another telephone. See ["Transferring a Call"](#) in [Chapter 8](#).
- 12 Conference button** — Establishes a single call with up to three additional internal parties, external parties, or both. See ["Establishing a Conference Call"](#) in [Chapter 8](#).
- 13 Redial button** — Redials the last telephone number or extension that you called. See ["Redialing a Call"](#) in [Chapter 8](#).
- 14 Speaker button** — Enables you to use the speaker phone feature. Press the **Speaker** button before you dial the call, when your telephone is ringing, or while a call is in progress. To turn the speaker phone off and resume the conversation, pick up the handset.
- 15 Forward to Voice Mail button** — Directs all incoming calls, after one ring, to your voice mail or to wherever you have specified in **NBX NetSet > User Information > Call Forward**. See ["Forwarding Incoming Calls to Your Call Coverage Point"](#) in [Chapter 6](#).
- 16 Message button** — Accesses your voice mail messages through the NBX Messaging system. See ["Listening to NBX Messages"](#) in [Chapter 6](#).
- 17 Hands Free button** — Allows you to answer *internal* (intercom) calls without picking up the handset. To activate this feature, press the  button *before* calls come in to your telephone. When the feature is

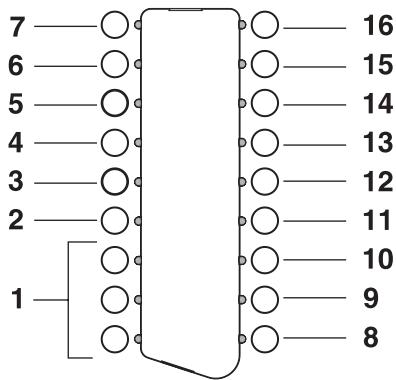
enabled, the indicator is lit. When you receive an internal call, your telephone sounds a tone and activates the speaker phone.

An external call (a call from outside your NBX system) rings to your telephone as usual.

- 18 **Headset connector** — Located on the underside of the telephone, this RJ-11 connector enables you to plug in a headset so that you can listen to calls and have your hands free. See ["Using a Headset"](#) in [Chapter 7](#).
- 19 To enable the use of a connected headset, press the **Headset** button (by default, button 16 at the top of the right column of buttons).
- 20 **Volume down** — Lowers the volume of the ringer, the speaker, the handset, or the headset. See ["Setting the Volume"](#) in [Chapter 8](#).
- 21 **Mute button** — Enables you to prevent callers from hearing what you are saying during a telephone call, although you can still hear them. Press the  button to turn off the telephone's microphone when you are using the handset or headset, or when your telephone is in speaker phone mode. To turn off the Mute feature, press the  button again.
- 22 **Volume up** — Raises the volume of the ringer, the speaker, the handset, or the headset. See ["Setting the Volume"](#) in [Chapter 8](#).
- 22 **Handset**

Programmable Access Buttons

[Figure 2](#) shows the 18 programmable Access buttons on the NBX 3102 Business Telephone. To view or change the current features on your telephone's buttons (button mappings), click the **Shortcut to One-Touch Speed Dials** icon below any NBX NetSet utility screen. Click the Help button for instructions.

Figure 2 3102 Access Buttons

Access buttons have these default settings, which your administrator can change:

- 1 In most circumstances, your administrator designates these three system appearance buttons as lines for incoming and outgoing calls.
- 2 **Personal Speed Dial 1.** See "[Speed Dials](#)" in [Chapter 7](#).
- 3 **Personal Speed Dial 2**
- 4 **Personal Speed Dial 3**
- 5 **Call Park button** — Allows you to place a call in a "holding pattern" so that it can be retrieved from any other telephone on the system. See "[Call Park](#)" in [Chapter 9](#).
- 6 **Transfer to Voice Mail button** — Sends a call directly to another user's voice mailbox. See "[Direct Mail Transfer](#)" in [Chapter 9](#).
- 7 **Feature button** — Allows you to access features that are not directly assigned to an Access button on your telephone. See the *NBX Feature Codes Guide* in the NBX NetSet utility for a list of features and codes and how to use them.
- 8 **Release button** — Disconnects calls. Useful when you use a telephone headset. See "[Using a Headset](#)" in [Chapter 7](#).
- 9 **Personal Speed Dial 4.** See "[Speed Dials](#)" in [Chapter 7](#).
- 10 **Personal Speed Dial 5**
- 11 **Personal Speed Dial 6**
- 12 **Personal Speed Dial 7**
- 13 **Personal Speed Dial 8**

14 Personal Speed Dial 9**15 Personal Speed Dial 10**

16 Headset — Press this button to enable the use of a headset that is connected to the telephone.

Status Lights for System Appearance Buttons

An Access button that is set up for incoming and outgoing calls is called a System Appearance button. The light beside each System Appearance button indicates the status. See [Table 6](#).

Table 6 Status Indicator Lights for System Appearance Buttons

If the light is	The line is
Off	Available for use
Steady	In use
Blinking quickly	Ringing
Blinking slowly	On hold

3

NBX 1102, 2102, AND 2102-IR BUSINESS TELEPHONES

This chapter describes the buttons, controls, and features on the following NBX telephones:

- NBX 1102 Business Telephone
- NBX 2102 Business Telephone
- NBX 2102-IR Business Telephone

The chapter covers these topics:

- [Telephone Buttons and Controls](#)
- [Programmable Access Buttons](#)
- [Status Lights for System Appearance Buttons](#)



For a description of the features on the NBX 3102 Business Telephone, see [Chapter 2](#).

For a description of the features on the NBX 3101 and 3101SP Basic Telephones, see [Chapter 4](#).

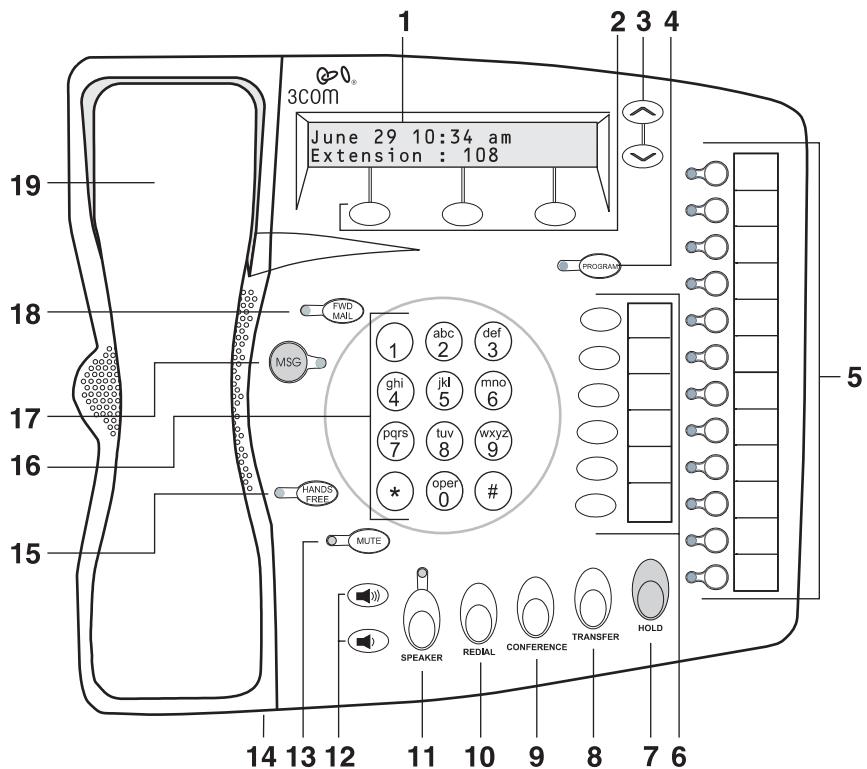
For a description of the features on the NBX 2101 Basic Telephone, see [Chapter 5](#).

For how these features work on an analog telephone that is connected to the NBX system, click the NBX Feature Codes Guide icon below any screen in the NBX NetSet utility.

Telephone Buttons and Controls

[Figure 3](#) shows the buttons and controls on the NBX 1102, 2102 and 2102-IR Business Telephones.

Figure 3 NBX Business Telephone (2102-IR Shown)



1 Display panel — Displays telephone status messages, Caller ID information (if enabled), and the number of messages that you have in your voice mail mailbox. You can also use it to view these items:

- Logs of your recent missed, answered, and dialed calls
- A directory of people's names in your organization
- Personal speed dial numbers
- System-wide speed dial numbers

2 Soft buttons — Allow you to select items that are displayed in the telephone display panel. See ["Using the NBX Telephone Display Panel"](#) in [Chapter 8](#).

The soft buttons, from left to right, are:

- **Slct** (Select)
- **Back** (*returns you to the next higher level in the menu*)

- **Exit** (leaves the display panel menus)
- 3 Scroll buttons (Up, Down)** — Allow you to scroll through the items in the telephone display panel. See "[Using the NBX Telephone Display Panel](#)" in [Chapter 8](#).
- 4 Program button** — Reserved for future use.
- 5 Programmable Access buttons and label area** — Allow you and your administrator to assign features to specific buttons. See "[Programmable Access Buttons](#)" and "[Status Lights for System Appearance Buttons](#)" later in this chapter.
- 6 Programmable Access and label area** — Allow you and your administrator to assign features to specific buttons. See "[Programmable Access Buttons](#)" later in this chapter.
- 7 Hold button** — Places a caller on hold. See "[Putting a Call on Hold](#)" in [Chapter 8](#).
- 8 Transfer button** — Sends the currently active call to another telephone. See "[Transferring a Call](#)" in [Chapter 8](#).
- 9 Conference button** — Establishes a single call with up to three additional internal parties, external parties, or both. See "[Establishing a Conference Call](#)" in [Chapter 8](#).
- 10 Redial button** — Redials the last telephone number or extension that you called. See "[Redialing a Call](#)" in [Chapter 8](#).
- 11 Speaker button** — Enables you to use the speaker phone feature. Press the **Speaker** button before you dial the call, when your telephone is ringing, or while a call is in progress. To turn the speaker phone off and resume the conversation, pick up the handset.
- 12 Volume up and down buttons** — Raises and lowers the volume of the ringer, the speaker, the handset, or the headset. See "[Setting the Volume](#)" in [Chapter 8](#).
- 13 Mute button** — Enables you to prevent callers from hearing what you are saying during a telephone call. Press the **Mute** button to turn off the telephone's microphone when you are using the handset or when your telephone is in speaker phone mode. To turn off the Mute feature, press the **Mute** button again.
- 14 Infrared Port (2102-IR only)** — Receives infrared signals from a hand-held device running the Palm Operating System. See "[Palm Integration](#)" in [Chapter 7](#).

15 Hands Free button — Allows you to answer *internal* (intercom) calls without picking up the handset. To activate this feature, press the **Hands Free** button *before* calls come in to your telephone. When this feature is enabled, the indicator is lit. When you receive an internal call, your telephone sounds a tone and activates the speaker phone.

An external call (a call from outside your NBX system) rings to your telephone as usual.

16 Telephone key pad

17 MSG (Message) button — Accesses your voice mail messages through the NBX Messaging system. See [“Listening to NBX Messages”](#) in [Chapter 6](#). The status light beside this button acts as a message waiting indicator (you have one or more messages in your voice mailbox).

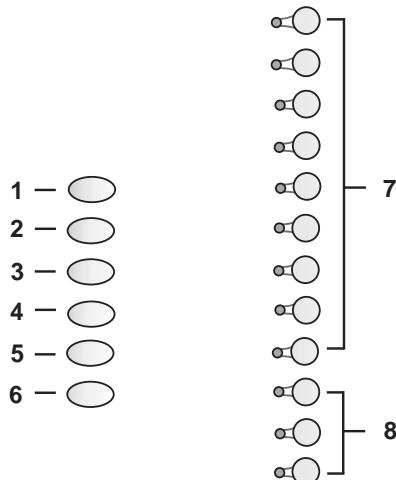
18 FWD MAIL (Forward to Voice Mail) button — Directs all incoming calls to your voice mail (or to wherever you have specified in **NetSet > User Information > Call Forward**) after one ring. See [“Forwarding Incoming Calls to Your Call Coverage Point”](#) in [Chapter 6](#).

19 Handset

Programmable Access Buttons

[Figure 4](#) displays the 18 programmable Access buttons. The **One-Touch Speed Dials** screen in the NBX NetSet utility shows your telephone's current button mappings.

Figure 4 Access Buttons on NBX 1102, 2102, and 2102-IR Telephones



Access buttons have these default settings, which your administrator can change:

- 1 Feature button** — Allows you to access features that are not directly assigned to an Access button on your telephone. See the *NBX Feature Codes Guide* in the NBX NetSet utility for a list of features and codes.
- 2 Direct Mail Transfer button** — Sends a call directly to another user's voice mailbox. See "[Direct Mail Transfer](#)" in [Chapter 9](#).
- 3 Call Park button** — Allows you to place a call in a "holding pattern" so that it can be retrieved from any other telephone on the system. See "[Call Park](#)" in [Chapter 9](#).
- 4 Flash button (analog line only)** — Toggles the current call to another call if the line has the Call Waiting service from your local telephone company, or enables call transfer if the line has the Call Transfer service.
- 5 Unassigned** — This button has no default assigned function.
- 6 Release button** — Disconnects calls. Useful when you use a telephone headset. See "[Using a Headset](#)" in [Chapter 7](#).
- 7** Typically, you can use these nine buttons for personal speed dial settings, although the administrator can map them to other features. See "[Speed Dials](#)" in [Chapter 7](#).
- 8** In most circumstances, your administrator designates these three system appearance buttons as lines for incoming and outgoing calls.

Status Lights for System Appearance Buttons

An Access button that is set up for incoming and outgoing calls is called a System Appearance button. The light beside each System Appearance button indicates the status. See [Table 7](#).

Table 7 Status Indicator Lights for System Appearance Buttons

If the light is	The line is
Off	Available for use
Steady	In use
Blinking quickly	Ringing
Blinking slowly	On hold

4

NBX 3101 AND 3101SP BASIC TELEPHONES

This chapter describes the buttons, controls, and features on the NBX 3101 and 3101SP Basic Telephones.

The chapter covers these topics:

- [Telephone Buttons and Controls](#)
- [Programmable Access Buttons](#)
- [Status Lights for System Appearance Buttons](#)



For a description of the features on the NBX 3102 Business Telephone, see [Chapter 2](#).

For a description of the features on the NBX 1102, 2102, and 2102-IR Business Telephones, see [Chapter 3](#).

For a description of the features on the NBX 2101 Basic Telephone, see [Chapter 5](#).

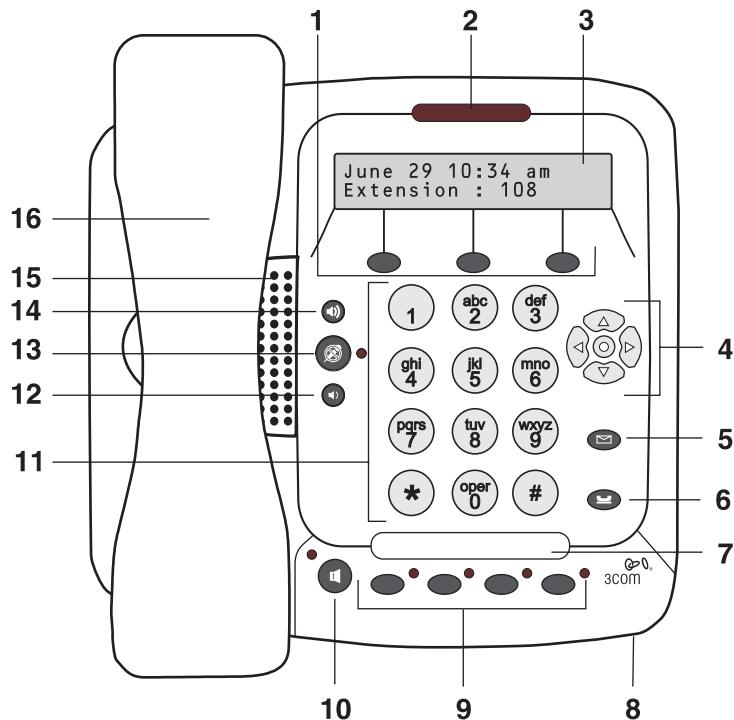
For how these features work on an analog telephone that is connected to the NBX system, click the NBX Feature Codes Guide icon below any screen in the NBX NetSet utility.

The NBX 3101 Basic Telephone (3C10401A) does not include a microphone, which means it does not support speaker phone operation. The NBX 3101SP Basic Telephone (3C10410SPKRA) has a microphone and supports speaker phone operation. All other features operate the same on the two telephones.

Telephone Buttons and Controls

[Figure 5](#) shows the buttons and controls on the NBX 3101SP Basic Telephone. The NBX 3101 Basic Telephone does not include a microphone, **8**, or a speaker button and its indicator light, **10**. All other controls are identical on the two telephones.

Figure 5 NBX 3101SP Basic Telephone



- 1 **Soft buttons** — Allow you to select items that are displayed in the telephone display panel. See "[Using the NBX Telephone Display Panel](#)" in [Chapter 8](#). The buttons, from left to right, are:
 - **Slct** (Select)
 - **Back** (returns you to the next higher level in the menu)
 - **Exit** (leaves the display panel menus)
- 2 **Message Waiting Indicator (MWI)** — When lit, indicates that you have one or more new voice mail messages in your voice mailbox. Also, this indicator flashes when your telephone rings.
- 3 **Display panel** — Displays telephone status messages, Caller ID information (if enabled), and the number of messages that you have in your voice mail mailbox. You can also use it to view these items:
 - Logs of your recent missed, answered, and dialed calls
 - A directory of people's names in your organization
 - Personal speed dial numbers

- System-wide speed dial numbers
- 4 Scroll buttons (Up, Down, Left, Right, Center)** — Allow you to scroll through the items in the telephone display panel. See ["Using the NBX Telephone Display Panel"](#) in [Chapter 8](#). The left, right, and center buttons are reserved for future use.
- 5 Message button** — Accesses your voice mail messages through the NBX Messaging system.
- 6 Hold button** — Places a caller on hold. See ["Putting a Call on Hold"](#) in [Chapter 8](#).
- 7 Label area for Access buttons** — You can use the NBX NetSet utility to create a new label if you change any button mappings.
- 8 Microphone (3101SP only)** — Activated when the telephone is in speaker phone mode, that is, after you press the  (speaker) button. For best results, keep the area around the microphone free of obstructions. To minimize the effects of background noise, the microphone is directional; it performs best when you are directly in front of the telephone.
- 9 Programmable Access buttons** — Allow you and your administrator to assign features to specific buttons. See ["Programmable Access Buttons"](#) and ["Status Lights for System Appearance Buttons"](#) later in this chapter.
- 10 Speaker button (3101SP only)** — Enables you to use the speaker phone feature. Press the  button before you dial the call, when your telephone is ringing, or while a call is in progress. To turn the speaker off and resume the conversation, pick up the handset.



The NBX 3101SP Basic Telephone includes a microphone and supports speaker phone operation. The NBX 3101 Basic Telephone does not support speaker phone operation and it does not have a  button.

- 11 Telephone key pad**
- 12 Volume down** — Lowers the volume of the ringer, the speaker, or the handset. See ["Setting the Volume"](#) in [Chapter 8](#)
- 13 Mute button** — Enables you to prevent callers from hearing what you are saying during a telephone call, although you can still hear them. Press the  button to turn off the telephone's mouthpiece when you are using the handset or the microphone (3101SP only) when your telephone is in speaker phone mode. To turn off the Mute feature, press the  button again. The indicator lamp is lit when the Mute feature is enabled.

14 Volume up — Raises the volume of the ringer, the speaker, or the handset. See [“Setting the Volume”](#) in [Chapter 8](#)

15 Speaker

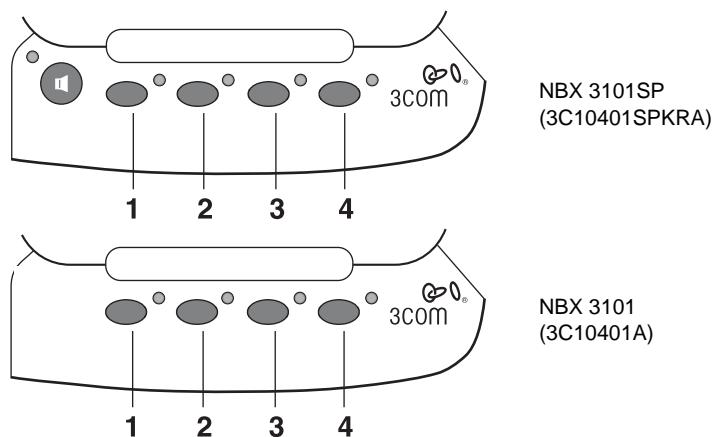
16 Handset — Supports wide band audio.

Programmable Access Buttons

[Figure 6](#) displays the Access buttons on the NBX 3101 and 3101SP Basic Telephones. By default, the functions assigned to these buttons are set by your administrator and you cannot change their functions unless your administrator defines one or more buttons as User Speed Dials.

To view or change the current features on your telephone's buttons, click the **Shortcut to One-Touch Speed Dials** icon below any NBX NetSet utility screen. Buttons that you can change are marked with an asterisk and the description “User SPD” on the One-Touch Speed Dials screen. Click the Help button on the screen for detailed instructions.

Figure 6 Access Buttons



Access buttons have these default settings:

- 1 System Appearance button 1.**
- 2 System Appearance button 2.**
- 3 Feature button** — Allows you to access features that are not directly assigned to an Access button on your telephone. See the *NBX Feature Codes Guide* in the NBX NetSet utility for a list of features and codes and how to use them.
- 4 Transfer button** — Sends the currently active call to another telephone.



The telephone LabelMaker, which is available through the NBX NetSet utility, enables you to define and print a new label for your Access buttons.

Status Lights for System Appearance Buttons

An Access button that is set up for incoming and outgoing calls is called a System Appearance button. The light beside each System Appearance button indicates the status. See [Table 8](#).

Table 8 Status Indicator Lights for System Appearance Buttons

If the light is	The line is
Off	Available for use
Steady	In use
Blinking quickly	Ringing
Blinking slowly	On hold

5

NBX 2101 BASIC TELEPHONE

This chapter describes the buttons, controls, and features that are specific to the NBX 2101 Basic Telephone. It covers these topics:

- [Telephone Buttons and Controls](#)
- [Programmable Access Buttons](#)
- [Status Icons](#)



For a description of the features on the NBX 3102 Business Telephone, see [Chapter 2](#).

For a description of the features on the NBX 1102, 2102, and 2102-IR Business Telephones, see [Chapter 3](#).

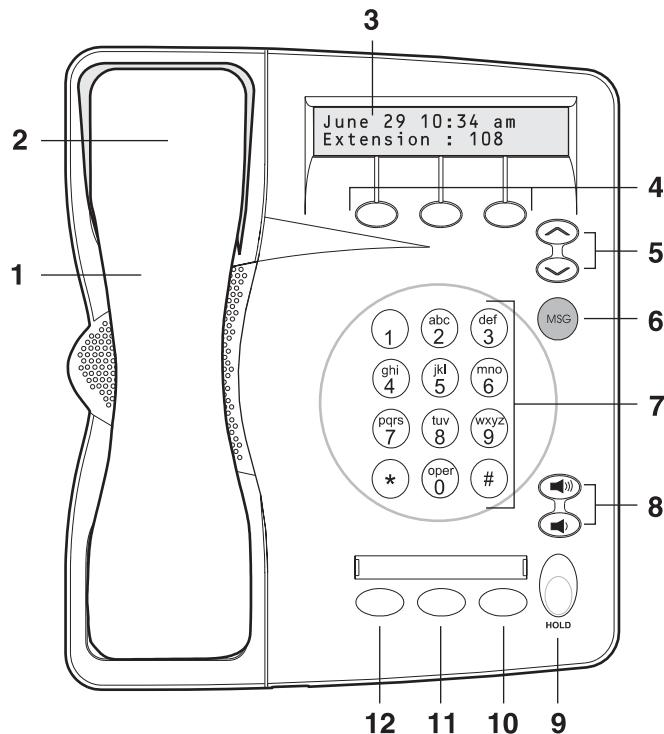
For a description of the features on the NBX 3101 and 3101SP Basic Telephones, see [Chapter 4](#).

For how these features work on an analog telephone that is connected to the NBX system, click the NBX Feature Codes Guide icon below any screen in the NBX NetSet utility.

Telephone Buttons and Controls

[Figure 7](#) shows the buttons and controls on the NBX 2101 Basic Telephone.

Figure 7 NBX 2101 Basic Telephone



The NBX 2101 Basic Telephone has these features:

- 1 Handset**
- 2 Hook switch (under the handset)** — Pressing and releasing the hook switch gives you a dial tone. This feature is used with Call Park. See "[Call Park](#)" in [Chapter 9](#).
- 3 Display panel** — Displays telephone status messages (see [Table 9](#)), Caller ID, Locked Telephone, and other feature information (if enabled), and the number of messages in your voice mail mailbox. You can also use it to view these items:
 - Logs of your recent missed, answered, and dialed calls
 - A directory of people's names in your organization
 - Personal speed dial numbers
 - System-wide speed dial numbers

- 4 Soft buttons** — Allow you to select items that are displayed in the telephone display panel. See [“More Ways to Dial a Call”](#) in [Chapter 8](#). The buttons, from left to right, are:
- **Slct** (Select)
 - **Back** (returns you to the next higher level in the menu)
 - **Exit** (leaves the display panel menus)
- 5 Scroll buttons** — Allow you to scroll through the items in the telephone display panel. See [“Using the NBX Telephone Display Panel”](#) in [Chapter 8](#).
- 6 MSG (Message) button** — Accesses your voice mail messages through the NBX Messaging system. See [“Listening to NBX Messages”](#) in [Chapter 6](#).
- 7 Telephone key pad**
- 8 Volume control buttons** — Raise or lower the volume of the ringer, the handset, or the headset. See [“Setting the Volume”](#) in [Chapter 8](#).
- 9 Hold button** — Places a caller on hold. See [“Putting a Call on Hold”](#) in [Chapter 8](#).
- 10 Transfer button** — (factory default setting) Sends the currently active call to another telephone. See [“Programmable Access Buttons”](#) later in this chapter.
- 11 Call Toggle button** — (factory default setting) Similar to a Hold button, enables you to switch between two calls. See [“Programmable Access Buttons”](#) later in this chapter.
- 12 Feature button** — (factory default setting) See [“Programmable Access Buttons”](#) later in this chapter.

Programmable Access Buttons

The NBX 2101 Basic Telephone has three programmable Access buttons. The factory-default settings for these buttons are (from left to right):

- **Feature** — Allows you to access features that are not directly assigned to an Access button on your telephone. See the *NBX Feature Codes Guide* in the NBX NetSet utility for a list of features and codes and how to use them.
- **Call Toggle** — Available only on the NBX 2101 Basic Telephone. Use this button to manage two telephone calls at the same time. See [“Answering a Call”](#) in [Chapter 8](#).

- **Transfer** — Sends the currently active call to another telephone. See “[Transferring a Call](#)” in [Chapter 8](#).



Your administrator can program these buttons for other commonly used functions. However, changing the settings for the Feature or Call Toggle buttons greatly reduces your ability to use some of the NBX system features.

Status Icons

Your NBX 2101 Basic Telephone allows you to use two telephone lines at the same time.

On the display panel, the behavior of the telephone icon next to the number **1** (for Line 1) on the first row, or **2** (for Line 2) on the second row, indicates the status of the lines. See [Table 9](#).

Table 9 Status Indicator Behavior for the Telephone Icons in the Display Panel

If the telephone icon is	The line is
Not displayed	Available for use
Steady	In use
Blinking quickly	Ringing
Blinking slowly	On hold

6

NBX MESSAGING

This chapter describes the NBX® Networked Telephony Solutions voice messaging features. It covers these topics:

- [NBX Messaging Components](#)
- [Changing Your Password](#)
- [Changing Your Name Announcement and Personal Greeting](#)
- [Listening to NBX Messages](#)
- [Replies to a Message](#)
- [Forwarding a Message](#)
- [Creating and Sending a Message](#)
- [Creating Personal Voice Mail Group Lists](#)
- [Marking a Message as Private or Urgent](#)
- [Forwarding Incoming Calls to Your Call Coverage Point](#)
- [Other Ways to Manage Your Voice Mail Messages](#)
- [Other Kinds of Mailboxes](#)

NBX Messaging Components

A key component of the NBX Networked Telephony Solutions is the NBX Messaging system, which includes voice mail, off-site notification, and several administrative features. Voice mail allows callers to leave voice messages in your voice mailbox when you are not able to answer your telephone. You can listen to, save, and forward those messages from any touch-tone telephone.



*If your system uses a messaging application other than NBX Messaging, use the documentation for your messaging application instead of the instructions in this chapter. **Exception:** Use the procedures in [“Changing Your Password”](#) regardless of your messaging application.*

Important Considerations

- The steps are the same for initially setting up the name announcement, personal greetings, and passwords for personal, greeting-only, and phantom voice mailboxes. See "[Setting Up Your Password and Voice Mail for the First Time](#)" in [Chapter 1](#) for details. (Your administrator creates group mailboxes and their passwords.)
- For changes to passwords and greetings, see "[Changing Your Password](#)" and "[Changing Your Name Announcement and Personal Greeting](#)" later in this chapter.
- The default setting for the maximum length of each voice mail message on the system is 5 minutes. Your administrator can configure your organization's NBX Messaging system to receive and store voice mail messages that are up to 10 minutes long.
- Use the *Off-Site Notification* feature if you want the NBX system to notify you when callers leave voice mail messages in your voice mailbox. See "[Off-Site Notification](#)" in [Chapter 7](#).
- With a touch-tone telephone, you are able to bypass system messages using option buttons if you are configuring passwords and greetings. However, you cannot bypass voice mail messages in this manner.



For information on accessing NBX features from an analog telephone, see the NBX Feature Codes Guide in the NBX NetSet™ utility.

Changing Your Password

You use the same 4-digit to 10-digit password to log in to the NBX NetSet utility and to access your NBX voice mail. You can change this password with your telephone (using the NBX voice prompts or a feature code) or through the NBX NetSet utility.

To set up your password for the first time, see [Table 4](#) and "[NBX NetSet Utility](#)" in [Chapter 1](#). [Table 4](#) also describes how to change your password.

If you forget your password, the administrator can set it to be your extension number. Then follow the instructions in [Table 4](#) in [Chapter 1](#) to change it to a more secure password. Also see "[Security Tips](#)" next.



If your NBX system uses a messaging system other than NBX Messaging:

- Use the feature code method described in [Table 4](#) in [Chapter 1](#) to set and change the NBX NetSet password.

- 3Com recommends that you use the same password for your voice messaging system and for the NBX NetSet utility.

Security Tips

- Change your password often.
- Do not use passwords that can easily identify you, such as your phone extension or birth date.
- Avoid simple passwords such as 1234 or 0000.
- Use numbers only; do not use * or # as part of your password.
- Longer passwords are more secure. You can use up to 10-digits for your password.
- Never tell your password to anyone.

Changing Your Name Announcement and Personal Greeting

Your name announcement tells callers that they have reached your voice mailbox. Your personal greeting lets callers know important information about you, for instance, that you are on vacation, available at another number, or unavailable for a specified amount of time. Change your personal greeting often, to ensure that callers hear up-to-date information.

If appropriate, you may also want to change the greeting for an extension that is a "greeting-only mailbox," so that callers do not attempt to leave messages. See ["Greeting-Only Mailbox"](#) later in this chapter.

To change your name announcement or personal greeting:

- 1 Log in to your mailbox at your telephone or remotely.
- 2 Press **9** for **Mailbox Options** and then press **1**.
- 3 To review or change your name announcement, press **1** and follow the prompts.
- 4 To review or change your personal greeting, press **2** and follow the prompts.



If you forget your password, the administrator can set it to be your extension number. Then follow the instructions in [Table 4](#) in [Chapter 1](#) to change it to a more secure password. Also see ["Security Tips"](#) earlier in this chapter.

Listening to NBX Messages

You can listen to your NBX voice mail messages from your NBX Telephone, from any touch-tone telephone, or by logging in to the NBX NetSet utility. After you listen to messages, you can save or delete them to clear them from the New Messages queue. For how to set up your NBX NetSet password the first time, see [Table 4](#) and [“NBX NetSet Utility”](#) in [Chapter 1](#).



If your system uses a messaging application other than NBX Messaging, use the documentation for your messaging application instead of these instructions.

Message Indicators

Here is how you can tell if you have messages in your mailbox:

- **On an NBX 3102 Business Telephone** — The indicator bar above the display panel is lit, and the display panel shows the number of messages. Example: **3 Msgs 2 New**.
- **On an NBX 1102, 2102, or 2102-IR Business Telephone** — The indicator next to the **MSG** button is lit, and the display panel shows the number of messages. Example: **3 Msgs 2 New**.
- **On an NBX 3101 or 3101SP Basic Telephone** — The indicator bar above the display panel is lit, and the display panel shows the number of messages. Example: **3 Msgs 2 New**.
- **On an NBX 2101 Basic Telephone** — The display panel shows the number of messages. Example: **3 Msgs 2 New**.
- **On an analog telephone** — Pick up the handset. If you hear the New Messages Tone (rapid stutter tone), you have new messages or messages that you have listened to but have not yet saved or deleted. For information on accessing NBX features from an analog telephone, see the *NBX Feature Codes Guide* in the NBX NetSet utility.
- **In the NBX NetSet utility** — Log in as a user. The list of your messages appears in the Voice Mail Messages area on the **NBX NetSet > User Information** screen. A new message has a * next to it. A forwarded messages has -->**Fw:** next to it.

Listening from Your Computer To listen to your messages from your computer, you must have a way of playing audio files:

- A USB audio device such as a USB headset and an operating system that supports USB
- OR
- A sound card, a third-party application such as Windows Media Player, and either headphones or speakers

- 1 Log in to the NBX NetSet utility with your extension and password.
- 2 Select a message in **User Information > Voice Mail Messages**.
- 3 Click **Listen**.
- 4 The third-party application downloads the voice message and plays it.
- 5 To delete the message, select the message and then click **Delete**.

Listening from Your NBX Telephone To listen to your messages from your own NBX Business or Basic Telephone:

- 1 Pick up the handset and press the **MSG** button (1102, 2102, 2102-IR, and 2101) or the  button (3102, 3101, and 3101SP) to access the mailbox.
- 2 At the prompt, type your password and press #.
- 3 See [Table 10](#) for the buttons that you use to manage your messages.

Listening from Any Internal NBX Telephone To listen to your messages from any NBX Telephone other than your own within your NBX system:

- 1 Pick up the handset and press the **MSG** button (1102, 2102, 2102-IR, and 2101) or the  button (3102, 3101, and 3101SP).
- 2 Press * and dial your extension. You hear your name announcement.
- 3 Dial your password and press #.
- 4 See [Table 10](#) for the buttons that you use to manage your messages.

Listening from an External Location To listen to your messages from an external telephone:

- **If you can dial your telephone extension directly** — Press * during your personal greeting. At the prompts, enter your extension and password, and press #.

- If you call the main telephone number of your organization and:
 - The Automated Attendant answers — Press * * during your personal greeting. At the prompts, enter your extension and password, and press #.
 - The receptionist answers — Ask to be transferred to your voice mail. Press * during your personal greeting. At the prompts, enter your extension and password, and press #.

Managing Your Messages

See [Table 10](#) for the buttons that you use to manage your messages.

Table 10

- | | |
|--|---|
| | Play or repeat a message. |
| | Save the message. |
| | Delete the message from your mailbox. <i>You cannot retrieve a message after you delete it.</i> |
| | Reply to the message. See "Replies to a Message" later in this chapter. |
| | Forward the message. See "Forwarding a Message" later in this chapter. |
| | Listen to date, time, and sender information about the message. See "Information About Your Messages" next. |
| | Back up 5 seconds in the current message. |
| | Pause the current message for up to 20 seconds. |
| | Move ahead 5 seconds in the current message. |
| | Move to the next message. |
| | Return to the main menu. |
-

Information About Your Messages To listen to date, time, and sender information about a message in your mailbox, press **6** during or after the message, and then press one of these buttons:

Table 11

 1	Date and time information.
 2	Sender information.
 4	Listen to the previous message.

Replies to a Message

You can send a reply to the originator of a voice mail message, provided that the NBX system has received the necessary caller ID information.



If you receive a message that is marked Private, you can reply to the originator, but you cannot forward the message to others.

To reply to a message after you listen to it:

- 1 Press **4**.
- 2 After the tone, record your reply.
- 3 Hang up, or press **#** for more options.
- 4 If you press **#**, press one of these buttons:

Table 12:

 1	Send your reply.
 2	Re-record your reply.
 3	Listen to your reply.
 9	Mark the message Private or Urgent . See " Marking a Message as Private or Urgent " later in this chapter.
 *	Cancel your message.

Forwarding a Message



You can forward most messages, with or without comments.

If you receive a message that is marked Private, you cannot forward it.

To forward a message:

- 1 Log in to your voice mailbox at your telephone or remotely.
- 2 Listen to a message that you want to forward, and press **5**.
- 3 After the tone, record an introductory message and then press # OR if you choose not to record a comment, press # when you hear the tone.
- 4 Optionally, press one of these buttons, OR proceed to step 5.

Table 13:



Re-record your introductory comment.



Listen to your introductory comment.



Mark the message **Private** or **Urgent**. See "[Marking a Message as Private or Urgent](#)" later in this chapter.



Cancel your message.

- 5 When you are ready to forward the message, press **1**.
- 6 Dial one of these destination numbers plus #:
 - The internal extension or mailbox number of the recipient
 - A One-Touch (not available on NBX Basic Telephones), personal, or system-wide speed dial number. See "[Speed Dials](#)" in [Chapter 7](#).
 - A personal voice mail group list number. (See "[Creating Personal Voice Mail Group Lists](#)" later in this chapter.)
 - A site code plus extension (to send to a user on another NBX system in your organization). Example: neee or neeee (where n = one or more site code digits and e = the extension digits on the other system)
- 7 To forward the message to several recipients, dial each destination number followed by #.
- 8 After the last destination number and its #, press #. Your message is sent.
- 9 Follow the prompts to delete or save the message you just forwarded.

Creating and Sending a Message

To create and send a message directly without actually making a call, follow these steps:

- 1 Log in to your mailbox at your telephone or remotely.
- 2 Dial **2** to select **Create and Send a Message**.
- 3 At the tone, record a message that is at least 2 seconds long, and press # to end the recording.
- 4 Optionally, press one of these buttons, OR proceed to step **5**.

Table 14:



Re-record the message.



Review the message.



Mark the message **Private** or **Urgent**. See "[Marking a Message as Private or Urgent](#)" later in this chapter.



Cancel the message.

- 5 When you are ready to send the message, press **1**.
- 6 Dial one of these destination numbers plus #:
 - The internal extension or mailbox number of the recipient
 - A One-Touch (not available on NBX Basic Telephones), personal, or system-wide speed dial number. See "[Speed Dials](#)" in [Chapter 7](#).
 - A personal voice mail group list number. (See "[Creating Personal Voice Mail Group Lists](#)" later in this chapter.)
 - A site code plus extension (to send to a user on another NBX system in your organization). Example: *neee* or *neeee* (where *n* = one or more site code digits and *e* = the extension digits on the other system)
-  *For valid site codes in your organization, see your administrator.*
- 7 To send the message to several recipients, dial each destination number followed by #.
- 8 After the last destination number and its #, press #. Your message is sent.

Creating Personal Voice Mail Group Lists

A Personal Voice Mail List, also called a mail group, is a collection of extensions to which you assign a special “group number.” Use it to send a message to everyone on the list at the same time.



A Personal Voice Mail List is not the same as a Hunt Group or Calling Group. See "[Hunt Groups and Calling Groups](#)" in [Chapter 9](#).

To create a personal voice mail list (mail group):

- 1 Log in to your mailbox at your telephone or remotely.
- 2 Dial **9** for **Mailbox Options**.
- 3 Dial **3** for **Group Lists**, and then **2** for **Create Group**.
- 4 Dial any 2-digit number, which becomes the Group Number.
- 5 After the tone, speak a name for the group, and press **#**. Write down the group number and name.
- 6 Dial one of these numbers:
 - **1** to save the group name and proceed to step **7**
 - **2** to change the group name and return to step **5**
 - ***** to exit without saving
- 7 Dial one of these destination numbers plus **#**:
 - The internal extension or mailbox number of the recipient
 - A One-Touch (not available on NBX Basic Telephones), personal, or system-wide speed dial number. See "[Speed Dials](#)" in [Chapter 7](#).
 - A site code plus extension (to send to a user on another NBX system in your organization). Example: *neee* or *neeee* (where *n* = one or more site code digits and *e* = the extension digits on the other system)
- 8 When you have added all of the destination numbers, press:
 - **1** to save the group list
 - **2** to cancel creating the group
 - ****** to return to the previous menu

OR hang up.

Modifying or Deleting Groups You can review your voice mail groups, add members, or delete a group.
To review or modify a voice mail group:

- 1 Log in to your mailbox at your telephone or remotely.
- 2 Dial **9** for **Mailbox Options**.
- 3 Dial **3** for **Group Lists**.
- 4 Press **1**, **3**, or **4**:

Table 15:

	Review your list of groups.
	Create a group.
	Delete a group.
	Add or delete group members. See step 5.
	Return to the main menu.

- 5 To add members to a group or delete members from one, press **4**.
 - a To add one or more members to the group, dial one of these destination numbers plus #:
 - The internal extension or mailbox number of the recipient
 - A One-Touch (not available on NBX Basic Telephones), personal, or system-wide speed dial number. See "[Speed Dials](#)" in [Chapter 7](#).
 - A site code plus extension (to send to a user on another NBX system). Example: *neee* or *neeee* (where *n* = one or more site code digits and *e* = the extension digits on the other system). For valid site codes for your organization, see your administrator.
 - b To delete one or more members from the group, dial the destination number that you want to delete and then press **1**.
- 6 When you have added or deleted all of the destination numbers, press:
 - **1** to save the modified group list
 - **2** to cancel this modification to the group
 - ****** to return to the previous menu

OR hang up.

Marking a Message as Private or Urgent

When you compose a voice message, you can select *Private* or *Urgent* from the delivery options. If you do not select a delivery option, your message is sent as a Normal message.

- **Private Messages** — The recipient cannot forward the message to others.
- **Urgent Messages** — Places the message at the beginning of the recipient's message queue. Urgent messages are heard first.

- 1 Follow the steps in ["Replying to a Message"](#), ["Forwarding a Message"](#), or ["Creating and Sending a Message"](#) earlier in this chapter.
- 2 In step 4 of those instructions, press **9**.
- 3 To mark the message **Urgent**, press **1**. To mark the message **Private**, press **2**.
- 4 To send the marked message, press **1**, or listen to the prompts for other choices.

Forwarding Incoming Calls to Your Call Coverage Point

You can configure your NBX Telephone so that all incoming calls go directly to your call coverage point, which may be your voice mailbox, the Auto Attendant or receptionist, or a different telephone number. When a call comes in, the telephone rings once, which gives you the chance to answer the call, and then sends the call to your call coverage point.

On an NBX 3102 Business Telephone:

- 1 Press the  (**Forward to Mail**) button. The indicator light turns on.
- 2 To turn off Forward to Mail, press the button again. The light turns off.

On an NBX 1102, 2102, or 2102-IR Business Telephone:

- 1 Press the **FWD MAIL (Forward to Mail)** button. The indicator light turns on.
- 2 To turn off Forward to Mail, press the button again. The light turns off.

On an NBX 2101, 3101, or 3101SP Basic Telephone:

- 1 Pick up the handset.
- 2 Press the **Feature** button and **440**. **FWD** appears in the display panel.
- 3 To turn off Forward to Mail, pick up the handset and press the **Feature** button and **440** again. **FWD** disappears from the display panel.

To prevent the telephone from ringing even once, use the Do Not Disturb feature. See "[Do Not Disturb](#)" in [Chapter 7](#).

To view your current Forward Calls to Mail setting, log in to **NBX NetSet > User Information > Feature Settings**.

Other Ways to Manage Your Voice Mail Messages

You can listen to and, in some configurations, delete your voice messages from within an e-mail application or a messaging application using your Internet browser. For details, see "[Listening to Your Messages in Your E-mail or Browser](#)" in [Chapter 9](#).

Other Kinds of Mailboxes

The NBX system allows *you* (for the greeting-only mailbox) or the *administrator* (for phantom or group mailboxes) to set up mailboxes for special situations, as described in this section.

Greeting-Only Mailbox

When you designate your mailbox as a *greeting-only mailbox*, callers hear your personal greeting but they cannot leave a voice mail message.

To change your voice mailbox to a greeting-only mailbox, select **NBX NetSet > NBX Messaging > Greeting Only Mailbox**.

Examples:

- When you take an extended leave of absence, you can create a personal greeting with your scheduled date of return and whom to call during your absence. Callers can be transferred but are unable to leave voice messages for you. When you return, clear the Greeting Only Mailbox check box so that callers can leave messages again.
- If you are a teacher, you can create a new personal greeting on the school's NBX system every day to explain homework assignments. Students call in to the greeting-only mailbox to get the homework information but cannot leave a message for you on this mailbox.
- If you are the administrator, you can create a greeting-only mailbox and use the personal greeting to post information for employees, such as a notice that the offices are closed because of bad weather.



When you create the personal greeting, remember to tell callers that they cannot leave messages in this voice mailbox. For instructions on changing the personal greeting, see "[Changing Your Name Announcement and Personal Greeting](#)" earlier in this chapter.

In addition to preventing a caller from leaving a message, a greeting-only mailbox does not allow anyone to forward or create and send a message to it or reply to a message that was sent from its extension



Avoid adding a greeting-only mailbox to a personal voice mail group list.

Phantom Mailbox

A *phantom mailbox* does not have an actual telephone associated with it. The administrator sets up a phantom mailbox.

Examples:

- If you are a sales representative who travels constantly for your organization and never comes into the office, you still need a way to receive telephone messages. Using your phantom mailbox, you can retrieve, forward, and save messages in the same way that any other employee can but without a physical telephone connected to your NBX system.
- If you are an employee who lives a long distance from your office and works from home, customers and others can leave messages in the your phantom mailbox and you can call in to the NBX system to retrieve them, or you can listen to them from the NBX NetSet utility.

You retrieve messages from a phantom mailbox in the same way that you retrieve messages from a personal mailbox. See "[Listening to NBX Messages](#)" earlier in this chapter.

Group Mailbox

A *group mailbox* is a voice mailbox from which a group of users can retrieve messages. Your administrator creates group mailboxes and can explain how to retrieve messages that are left in the group mailbox.

Example:

- During nonbusiness hours, the system can send incoming telephone calls for your sales department to a group mailbox. Your administrator assigns to the appropriate sales people the ability to listen to, forward, or otherwise handle all messages that are directed to the group mailbox.



Your administrator can assign (map) a Message Waiting Indicator for the group mailbox to an Access button on the NBX Business Telephone of each group member. The light next to the mapped button indicates when the group mailbox has messages in it. Any group member can press the button to retrieve messages from the group mailbox.

7

PERSONALIZING YOUR TELEPHONE

Your NBX® Networked Telephony System has many features that can make your telephone easier to use. This chapter describes:

- [Guidelines About Features on NBX Telephones](#)
- [Ringer Tones](#)
- [Speed Dials](#)
- [Off-Site Notification](#)
- [Do Not Disturb](#)
- [Preventing Unauthorized Use of Your Telephone](#)
- [Class of Service Override](#)
- [Palm Integration](#)
- [Using a Headset](#)



For help on accessing NBX features from an analog telephone, see the NBX Feature Codes Guide below any screen in the NBX NetSet™ utility. For how to set up your NBX NetSet password for the first time, see [Chapter 1](#).



If your system uses a messaging application other than NBX Messaging, use the documentation for your messaging application instead of these instructions.

Guidelines About Features on NBX Telephones

- If your telephone does not have a button programmed for Feature, ask your administrator to program one.
- Because your administrator determines whether some of the features that are described in this chapter are available for your telephone or for the entire system, some of these features may not be available to you.

- The settings on your telephone, including your extension, personal settings, and system settings, remain the same even when you move your telephone from one Ethernet jack to another, as long as both Ethernet connections are part of the same LAN.
- Because your extension and personal settings are associated with your telephone, you cannot switch your telephone with another user's telephone without first having your administrator reassociate your profile with the other telephone.

Ringer Tones

To help you to distinguish the ring tone of your NBX Business Telephone or NBX Basic Telephone from the sound of other phones, use the NBX NetSet utility to select one of nine ringing tones. You can also choose Silent Ring to disable audible ringing.

To change the ringer tone:

- 1 Verify that your computer has a sound device (a USB headset or a sound card with either headphones or speakers).
- 2 Log in to **NBX NetSet > Ringer Tones**.
- 3 Click each of the nine **Sample Ringer Tone** buttons to hear the choices.
- 4 From the **Ringer Tone Setting** pull-down list, select the number of the tone that you want.
- 5 Click **Apply**.

Speed Dials

This section describes the types of speed dials — personal speed dials and system-wide speed dials, plus the special case for NBX Business Telephones, called One-Touch speed dials. It also describes how you can print a list of speed dials and a set of labels for your telephone, showing which of your buttons are mapped to features and speed dial numbers.



Although 3101 and 3101SP Basic Telephones each have two Access buttons that can be made available by your administrator for One-Touch speed dial numbers, these buttons are mapped by default as a Feature button and a Transfer button.

Personal Speed Dials

You can create a list of up to 99 personal speed dials (using ID numbers 601 through 699) for any telephone on the NBX system. These speed dials are available only from the telephone for which they were created.

You create, view, and print your personal speed dial list using the NBX NetSet utility. You can view and dial a personal speed dial number using the telephone display panel of any NBX Telephone.



Your first personal speed dial numbers appear on whichever of the Access buttons at the right of your NBX Business Telephone are not used for other purposes.

The bottom 3 buttons on an NBX Business Telephone are normally reserved for your extension. On an NBX 3102 Business Telephone, by default, your extension appears on the bottom 3 buttons of the left column of 9 buttons. On the 1102, 2102, and 2102-IR Business Telephones, your extension appears by default on the bottom 3 buttons of the column of 12 buttons.

Your administrator may have mapped some of the buttons to features. See ["Special Case: One-Touch Speed Dials"](#) later in this chapter.

To assign or change a personal speed dial number:

- 1 Select **NBX NetSet > Speed Dials > Personal**.
- 2 In the **Personal Speed Dials** box, select an unassigned speed dial ID number, or select the speed dial ID number for which you want to change the speed dial number.
- 3 In the **Destination Number** text box, type the telephone number that you want the system to dial when you use that ID number.

Include all of the prefix numbers that you would normally dial, such as a **9** or **8** or **1** to access an outside line, and, if necessary, the country code or area code. Do not use spaces, hyphens, commas, or other nonnumeric characters.

- 4 In the **Description** text box, type a brief description, usually a name, that corresponds to the number.
- 5 After you have made all of your changes to the personal speed dials, click **Apply**, and then click **OK**.

To use a personal speed dial:

- 1 Pick up the handset or, if you are using an NBX Business Telephone, you can press the **Speaker** button.
- 2 Press the **Feature** button plus the 3-digit personal speed dial code for the number that you want to call, or scroll to Personal Speed Dials on the

display panel, press **Slct**, scroll to the number that you want to dial, and press **Slct** again.

If you dial a speed dial code that has no number assigned to it, the display panel shows the message "No number stored."

System-wide Speed Dials

The administrator can set up to 100 system-wide speed dials (using ID numbers 700 through 799) for numbers that are dialed frequently by many internal users. You can view the system-wide speed dial list through the NBX NetSet utility, or you can view and dial from it using the telephone display panel.

You can ask the administrator to map a system-wide speed dial ID number to one of the Access buttons on your telephone. See "[Special Case: One-Touch Speed Dials](#)" next.

To use a system-wide speed dial:

- 1 Pick up the handset or, if you are using an NBX Business Telephone, you can press the **Speaker** button.
- 2 Press the **Feature** button plus the 3-digit system-wide speed dial ID code for the number that you want to call, or scroll to System Speed Dials on the display panel, press **Slct**, scroll to the number that you want to dial, and press **Slct** again.



If you dial a speed dial code that has no number assigned to it, the display panel on your telephone shows the message "No number stored."

Special Case: One-Touch Speed Dials

(NBX Business Telephones only) In most circumstances, your administrator designates 3 Access buttons as extension lines to manage incoming and outgoing telephone calls.

- **NBX 3102 Business Telephone** — See item 1 in [Figure 2](#) in [Chapter 2](#).
- **NBX 1102, 2102, and 2102-IR Business Telephones** — See item 8 in [Figure 4](#) in [Chapter 3](#).



Although 3101 and 3101SP Basic Telephones each have two Access buttons that can be made available by your administrator for One-Touch speed dial numbers, these buttons are mapped by default as a Feature button and a Transfer button.

Any of the remaining buttons that the administrator has not mapped to a feature or system-wide speed dial is available for a One-Touch speed dial.

Use either the One-Touch or the Personal speed dial screen to assign or change the One-Touch speed dial numbers on your telephone. If you make a change in one screen, it appears in the other screen. See ["Personal Speed Dials"](#) or follow these steps for the One-Touch screen.

To add or change a One-Touch speed dial on an available Access button:

- 1 Log in to **NBX NetSet > Speed Dials > One Touch**.
- 2 Any box that has an asterisk in the right margin is available for a personal or system-wide speed dial. In any of the asterisked text boxes under **Number**, type the telephone number to which you want to assign a speed dial button. Or change the telephone number in a box that already has a speed dial number.

Include all of the prefix numbers that you would normally dial, such as a **9** or **8** or **1** to access an outside line, and, if necessary, the country code or area code. Do not use spaces, hyphens, commas, or other nonnumeric characters.

- 3 In the **Description** text box, type a brief description, usually a name that corresponds to the number.
- 4 After you have made all of your changes to the One-Touch speed dials, click **Apply**, and then click **OK**.

If you make a change in this screen, the change also appears in the Personal Speed Dials screen. See ["Personal Speed Dials"](#) earlier in this chapter.

Printing Speed Dial Lists and Labels

You may find it useful to have a paper list of personal or system speed dials. You can also create paper labels for your telephone.

To print a list of speed dials:

- 1 Log in to **NBX NetSet > Speed Dials > Personal or System-wide**.
- 2 Click 
- 3 A list appears with all of the personal or system-wide speed dial numbers that are allocated to your telephone.
- 4 Click  to print the list.

You can print labels that identify the numbers and features that are assigned to Access buttons on your telephone using the LabelMaker in the NBX NetSet utility or on the *NBX Resource Pack CD*.

To print labels for your telephone:

- 1 Log in to **NBX NetSet > Speed Dials > Telephone Labels**. Save the file to your choice of location on your PC, and then open the file:
 - a Locate the file, labels.exe, using one of these methods:
 - Open Windows Explorer and navigate to the file.
 - Double-click My Computer and navigate to the file.
 - Depending on your operating system, click **Start > Find > Files or Folders** or **Start > Search > For Files or Folders**, and type the name of the file, labels.exe, in the appropriate text box.
 - b Double-click the file icon to start the LabelMaker program.
- 2 Find the page in the LabelMaker that has labels for your telephone.
- 3 Edit the label template by clicking any of the label text boxes to highlight the existing text, and then typing new text.
- 4 Press **Tab** to move to the next text field in the label.
- 5 Click the **Print** button at the top of the LabelMaker screen to open the Print dialog. Be sure to specify which page you want to print. Typically, the default is to print all pages.
- 6 Click **Print**.
- 7 Cut out the labels and put them in the label holders of your NBX Telephone or your Attendant Console.
- 8 To save the edited LabelMaker, click the **Save** button at the top of the LabelMaker screen. Or you can click **File > Save As** to save the LabelMaker to a new location.



*To reuse your saved LabelMaker, you must run the file that you saved to your computer. If you download the LabelMaker from the NBX NetSet utility again, you get the default version, and the download might overwrite your saved LabelMaker. To create a Windows Desktop shortcut to your saved LabelMaker, right-click the saved file and then click **Send To > Desktop (create shortcut)**.*

Off-Site Notification

When you enable off-site notification, the NBX Messaging system notifies you that you have received voice mail. You can then retrieve your messages. Off-site notification consists of one cycle of up to five attempts to reach you, one attempt for each Attempt row that you configure in the Off-Site Notification screen.



If your system uses a messaging application other than NBX Messaging, use the documentation for your messaging application instead of these instructions.

To configure off-site notification for your NBX voice mailbox:

- 1 In **NBX NetSet > NBX Messaging > Off-Site Notification**, look for the System and Group columns in the upper right corner. If the columns show "Yes," your system administrator has enabled off-site notification for the NBX system and for the Class of Service group to which your telephone belongs. If "No," ask to have these features enabled.
- 2 Check **Enabled**.
- 3 If you want to be notified only about urgent voice mail messages, also check **Urgent Messages Only**.
- 4 In the first **Attempt** row, in the **Method** drop-down list, select **Pager**, **VoiceMail**, or **EMail**



The cycle of notice behaviors differs depending on the method that you specify for the **first** attempt. See ["Notice Behaviors"](#) later in this chapter.

- 5 In the **Number/Address** field:
 - If you selected **Pager** for **Method** in step 4:
 - Enter a pager number. Do not use parentheses, hyphens, or spaces. Ask your administrator if you need to include the area code and any other digits that your system needs to dial an outside number, such as 9, 8, 1, or 0. After you receive the pager message, you call in to your voice mailbox to listen to your messages.
 - In the **Numeric Page** field, indicate what you want the pager to display. Enter a series of digits, such as your telephone extension number.
 - If you selected **VoiceMail** for **Method** in step 4:
 - Enter the telephone number at which you want to be notified. Do not use parentheses, hyphens, or spaces. Ask your administrator if you need to include the area code and all other digits that your system needs to dial an outside number, such as 9, 8, 1, or 0.

When you choose to be notified by voice mail, the NBX system calls the number that you enter in this field. When you answer the call, the system announces the new voice message and allows you to follow the prompts to access your voice mailbox and listen to and delete any of your messages.
 - If you selected **EMail** for **Method** in step 4:

- Enter the e-mail address at which you want to be notified. You can use different e-mail addresses for different Attempts.

When you choose to be notified by e-mail message, the NBX system sends you an e-mail message for each voice mail message that you receive. The voice message may be attached to the e-mail message as a WAV file. See the tables in "[Notice Behaviors](#)" later in this section.

You can listen to the messages using your PC sound device (a USB headset or a sound card with either speakers or headphones).



If you delete the e-mail notice with its attached WAV file after you listen to the message, you delete only the copy. The original voice mail message remains in your NBX voice mailbox. You must log in to the NBX voice mail system by telephone or through the NBX NetSet utility to delete your messages.

- 6 From the **Interval** drop-down list box, select the number of minutes that you want the system to wait after each attempt before it moves to the next attempt.



The "best" time interval depends on the Attempt method that you choose. For instance, allow sufficient time after a Pager notification for the usual delay at your pager supplier.

- 7 Click **Apply**.
- 8 Repeat steps 4 through 7 to set up additional attempts if you want.



*The cycle of notice behaviors differs depending on the method that you select for the **first** attempt. See "[Notice Behaviors](#)" at the end of this section.*

- 9 You do not need to configure every Attempt row. When you have configured all of the Attempt rows that you want, click **OK**. The NBX Messaging tab appears.
- 10 Test your off-site notification settings by leaving yourself a voice mail message.

Additional Notes

- You can use the same notification method for all five attempts, or any combination of methods.
- If your voice mailbox is full and someone tries to leave you a voice mail message, the NBX system does not send you an e-mail notification.
- When you activate the **Telephone Locking** feature on your telephone, the NBX system sends you off-site notification messages

only if the notification number (for example, your pager number) is a toll-free telephone number. See ["Telephone Locking"](#) later in this chapter.

Notice Behaviors

These tables explain how the cycle of notice behaviors depends on the method that you select for the **first** attempt. See the definitions as well as ["Resetting the Off-Site Notification Cycle"](#) on the next page.

- **If you specify EMail for the first attempt:**

Table 16

Attempt	Method	Notice Behavior
1	E-mail	<ul style="list-style-type: none"> ■ You receive an e-mail notice for each voice message. ■ Each e-mail notice contains information about the voice message (like time of receipt and the number that called), and the voice message is attached as a WAV file.
and then you configure attempt:		
2 through 5 as	E-mail	<ul style="list-style-type: none"> ■ You receive an additional e-mail notice for each voice message. ■ The second e-mail notice contains no information about the voice message (like time of receipt and the number that called) and no WAV file attachment.
2 through 5 as	Pager	<ul style="list-style-type: none"> ■ You receive a pager call for each voice message.
2 through 5 as	VoiceMail	<ul style="list-style-type: none"> ■ You receive a telephone call for each voice message. Follow the prompts to log in and listen to messages, or log in to the NBX NetSet utility.

- **If you specify Pager or VoiceMail for the first attempt:**

Table 17

Attempt	Method	Effect
1	Pager or Voice Mail	<ul style="list-style-type: none"> ■ You receive a telephone call or pager call for only the first new voice message.*

and then you configure attempt:

Table 17

Attempt	Method	Effect
2 through 5 as	E-mail	■ You receive an e-mail notice for only the first new voice mail message.* The e-mail notice contains no information about the voice message (like time of receipt and number that called) and no WAV file attachment.
2 through 5 as	Pager	■ You receive a pager call for only the first new voice message.*
2 through 5 as	Voice Mail	■ You receive a telephone call for only the first new voice message.*

***First new message** means the first voice mail message that arrived at your mailbox since the last time that you logged in to your voice mailbox through a telephone OR through the NBX NetSet utility. Logging in restarts the cycle.

Resetting the Off-Site Notification Cycle

When you log in to your voice mailbox and hang up or log out (regardless of whether you listen to or delete messages), you start the off-site notification cycle again. You will be notified about the next message that comes into your voice mailbox.

Do Not Disturb

When the Do Not Disturb feature is enabled, calls coming in to your telephone immediately go to the call coverage point that you set in the NBX NetSet utility. See [“Setting Your Call Coverage Point”](#) in [Chapter 8](#).

You can ask your administrator to map the Do Not Disturb feature to an available Access button on your NBX Telephone, or you can use the Feature Code to enable and disable the feature.

When your telephone is in Do Not Disturb mode:

- Your telephone does not ring when it receives an incoming call.



If you use an NBX Business Telephone or an NBX Attendant Console, the associated status light does flash when a call arrives.

- You can use the telephone to dial outgoing calls.
- You can use the telephone to dial internal and external pages.
- An NBX Business Telephone does not broadcast incoming paging messages over the speaker.
- If your telephone is part of a call pickup group, no other telephone in the pickup group can retrieve a call that comes directly in to your

telephone. The incoming call goes immediately to the call coverage point (voice mail, auto attendant, or other extension).

- If your telephone is part of a hunt group, incoming calls to the hunt group ring on your telephone. Calls coming in directly to your telephone (not directed to the hunt group) do not ring on your telephone. To prevent every call from ringing, you must enable Do Not Disturb and *also* log out of the hunt group.

To enable and disable Do Not Disturb using the feature code:

- 1 Pick up the handset and press **Feature + 446**.
- 2 Hang up. Your telephone is now in Do Not Disturb mode. The display panel on an NBX Telephone shows **DO NOT DISTURB**.
- 3 To disable Do Not Disturb mode, repeat steps **1** and **2**. The **DO NOT DISTURB** message disappears from the display panel.



*To view your current Do Not Disturb setting even if you do not have an NBX Telephone or if you are away from your desk, log in to **NBX NetSet > User Information > Feature Settings**.*

Preventing Unauthorized Use of Your Telephone

To prevent others from dialing long-distance or other unauthorized calls from your telephone permanently, ask your administrator to adjust the call permissions schedule for your extension, or you can adjust it temporarily with the **Telephone Locking** feature.

Telephone Locking

To enable and disable the Locking feature using the feature code:

- 1 Pick up the handset and press the **Feature** button + **432**. The display panel on an NBX telephone prompts you to enter your password.
- 2 Enter your password + # and hang up. Your telephone is now locked. The display panel shows the **Lock** icon and displays only the directory and system-wide speed dials.
- 3 To turn off this feature, repeat steps **1** and **2**. The **Lock** icon disappears, and your call logs and personal speed dials are again available.

Additional Notes

- When Telephone Locking is activated, a person using your telephone can dial only toll-free calls, calls to emergency services (such as 911 in the United States), or calls to telephone numbers that have been programmed in your system as “*internal*” calls.

- Even when Telephone Locking is active on your telephone, your off-site notification choices remain in effect. That is, notification of voice mail messages is sent to the outside telephone numbers or paging numbers that you have specified in **NBX NetSet > NBX Messaging > Off-Site Notification**, even if these numbers are not toll-free.



If your system uses a messaging application other than NBX Messaging, you will not be able to specify your Off-site Notification in the NBX NetSet utility. Use the documentation for your messaging application instead of these instructions.

- To view your current Telephone Lock setting if you do not have an NBX Telephone or if you are away from your desk, log in to **NBX NetSet > User Information > Feature Settings**.

Call Permissions

Your administrator establishes Call Permissions to control the types of calls that can be dialed from your telephone. The administrator can configure these permissions to change depending on the time of day. For example, your administrator can prevent long-distance calls from being dialed from your telephone outside of business hours.

To view your current call permissions, log in to **NBX NetSet > User Information > Call Permissions**.

Class of Service Override

The **Class of Service Override** feature allows you to apply the features of your own NBX telephone temporarily to another NBX telephone on the same local network.

Example:

- The telephones in your organization's conference rooms are configured so that long-distance telephone calls cannot be dialed from it. You may, however, need to place a long-distance call during a meeting. Using the Class of Service Override feature, you can apply the features of your own telephone to the conference room telephone **for one call only** and dial the call, assuming that your Call Permissions allow you to make long-distance calls from your own telephone.



If your system uses a messaging application other than NBX Messaging, use the documentation for your messaging application instead of these instructions.

To activate the one-call-only Class of Service Override from any NBX telephone:

- 1 Pick up the handset.
- 2 Press the **Feature** button and **433**.
- 3 Dial your telephone extension.
- 4 Dial your voice mailbox password and press **#**.
- 5 When you hear the dial tone, you can dial the call in the same way that you do from your own NBX telephone.



When you use Class of Service (CoS) Override, any reports that are generated on the NBX system indicate that the CoS features of your own NBX telephone were applied temporarily to the telephone on which you made the call.

Using a Headset

You can use a headset that has a microphone with any telephone on an NBX system.

- For how to use a typical headset and amplifier with telephones other than the 3102 Business Telephone, see "[General Headset Instructions](#)" later in this section.
- For how to connect and use a headset with the 3102 Business Telephone, read the next section.

With the NBX 3102 Business Telephone

The NBX 3102 Business Telephone has a headset jack located on the underside of the telephone on the left side.

To prepare the headset for all calls on the 3102 Business Telephone:

- 1 Plug the headset connector into the headset jack on the underside of the telephone. See [Figure 1](#) in [Chapter 2](#) for the location of the jack.
- 2 Press the **Headset** button. By default, this button is the Access button just below the (Program) button at the top right corner of the telephone.
- 3 Verify that the indicator light beside the **Headset** button turns on.

To answer a call when you are using the headset:

- 1 Put the headset on. When a call comes in, press the System Appearance button beside the flashing light. You are connected to the call.
 *The handset can be either on hook or off hook.*
- 2 To end a call when you are using the headset, press the **Release** button on the telephone. By default, the **Release** button is located at the bottom of the right column of Access buttons.

General Headset Instructions For all telephones other than the NBX 3102 Business Telephone, follow these instructions.



You may need to modify some of these instructions for some headsets or amplifiers. See the instructions that come with your equipment.

To prepare a headset for all calls:

- 1 Insert the cord for the headset amplifier into the handset cord receptacle on the underside of the telephone.
- 2 Insert the cord for the telephone handset into the headset amplifier.
- 3 Put on the headset.
- 4 Pick up the telephone handset and set it on your desk.

To prepare a headset so that you can choose either the handset or the headset for each call:

- 1 Insert the cord for the headset amplifier into the handset cord receptacle on the underside of the telephone.
- 2 Insert both the headset cord *and* the handset cord into the headset amplifier.
- 3 **For headset calls:** Lift the handset off the telephone and leave it off. Use the headset microphone and earphones.

Even when the headset is plugged into the amplifier, you must remove the handset from the cradle to use the headset.

- 4 **For handset calls:** Press the button on the headset amplifier that turns the headset off, pick up the handset, and speak into it.

To manage calls when you are using the headset:

- 1** Put the headset on. When a call comes in:
 - If the handset is on hook, pick it up, set it on your desk, and begin to speak.
 - If the handset is off hook, press the System Appearance button beside the flashing light.
- 2** To end a call when you are using a headset:
 - On an NBX Business Telephone, press the **Release** button, depress the hook switch, or hang up the handset.
 - On an NBX Basic Telephone or an analog telephone, hang up the handset or press the **Feature** button and **111**.

Returning to the Headset After a Long Delay

Certain brands of headsets enter a power-saving mode that prevents the telephone from ringing for one or more calls when *both* of these circumstances are true:

- The headset amplifier buttons for **Mute** and **On** are both set to **On**.
- The handset is off the phone for a long time (for instance, overnight).

It may take a few minutes for your headset to return from the power-saving mode to the active mode when calls first come in, so your telephone may not ring until the headset has returned to active mode, and you may miss a call.

If you plan to not use the headset for a long time (for instance, overnight), 3Com recommends that you set the mute and headset buttons on the amplifier to **Off** and hang up the handset on your telephone. When you are ready to receive calls again, set up the headset for receiving calls:

- 1** Pick up the handset on your telephone and set it on your desk.
- 2** Put on the headset. On the amplifier, set the headset button to **On**.

Palm Integration

(NBX 2102-IR Business Telephone only) — The infrared port on the front edge of the NBX 2102-IR Business Telephone receives infrared signals from a hand-held device that runs the Palm operating system. You can use your hand-held device to call numbers in its directory and to perform standard telephone operations, such as Forward, Redial, and Transfer.



Install the Palm Dialer software (available on the NBX Resource Pack CD) on your hand-held device. See your administrator for details.

8

STANDARD FEATURES

This chapter describes standard features of the NBX Business and Basic Telephones. It covers these topics:

- [Answering a Call](#)
- [Using the NBX Telephone Display Panel](#)
- [More Ways to Dial a Call](#)
- [Setting Your Call Coverage Point](#)
- [Putting a Call on Hold](#)
- [Transferring a Call](#)
- [Direct Mail Transfer](#)
- [Establishing a Conference Call](#)
- [Setting the Volume](#)



For help on accessing NBX features from an analog telephone, see the NBX Feature Codes Guide in the NBX NetSet utility.



If your system uses a messaging application other than NBX Messaging, use the documentation for your messaging application instead of the instructions in this chapter.

Answering a Call

To answer an incoming call, pick up the handset. Or if you are using an NBX Business Telephone you can press the **Speaker** button. If you are using an NBX 3101SP Basic Telephone, you can press (Speaker).

Caller ID

The display panel on your NBX Telephone shows the name and extension of an internal caller. For an external caller, if your organization purchases Caller ID service from your telephone company and if the external caller allows Caller ID information to be broadcast, the display panel shows the external caller's name and telephone number.

An unanswered call on any telephone on the NBX system is forwarded to the call coverage point that you specify in **NBX NetSet > User Information > Call Forward**. To specify the number of times that your telephone rings before the call is forwarded or to specify where you want the call to go, see ["Setting Your Call Coverage Point"](#) later in this chapter.

Answering a Second Call On NBX Business Telephones or 3101 and 3101SP Basic Telephones, when a new call arrives while you are on a call:

- 1 Press **Hold** (3102, 1102, 2102, 2102-IR) or  (3101, 3101SP) to put the current call on hold.
- 2 Press the Access button for the line on which the new call is arriving.
- 3 To return to the earlier call, hang up the new call, or put it on hold, or transfer it, and then press the Access button for the original call.

On the NBX 2101 Basic Telephone, use [Table 18](#) to manage the two lines.

Table 18 Managing Multiple Calls on the NBX 2101 Basic Telephone

Line A	Line B	How to Manage New Calls
Active call	Ringing	To answer the incoming call, press Call Toggle. (If you do not answer, the system sends the second call to your call coverage point.)
Active call	On hold	To toggle to the call that is on hold, press Call Toggle. To return to the first call, press Call Toggle.
On hold	Ringing	If you have placed one call on hold: <ul style="list-style-type: none"> ■ And you <i>do not</i> hang up the handset, and the other line rings, press Call Toggle to return to the call on hold. Then press Call Toggle to answer the incoming call. ■ And you <i>do</i> hang up the handset and the other line rings, pick up the handset to connect to the incoming call. Press Call Toggle to switch calls.
On hold	On hold	If you have placed two calls on hold: <ul style="list-style-type: none"> ■ And you <i>do not</i> hang up the handset, press Call Toggle to return to the call you most recently placed on hold. Then press Call Toggle again to return to the line you first placed on hold. ■ And you <i>do</i> hang up the handset, pick up the handset to return to the call you most recently placed on hold. Then press Call Toggle to be connected to the line you first placed on hold.

Table 18 Managing Multiple Calls on the NBX 2101 Basic Telephone (continued)

Line A	Line B	How to Manage New Calls
Active or on hold	On hold	If a third call comes in while you have one active call and one on hold, or two calls on hold, the system forwards the third caller directly to your call coverage point. See "Setting Your Call Coverage Point" in Chapter 8 for call forwarding details.

See also ["Status Icons"](#) in [Chapter 5](#) for the indicators in the NBX 2101 Basic Telephone's display panel during these calls.

Using the NBX Telephone Display Panel

Use the telephone display panel of your NBX Telephone to dial a number:

- **Call Logs** — Logs of the most recent calls to and from your telephone (Missed Calls, Answered Calls, Dialed Calls).
- **Directory** — A list of the users on your system and their extensions
- **Personal Speed Dials** — A list of personal speed dial numbers that you have set in **NBX NetSet > Speed Dials**
- **System-wide Speed Dials** — A list of the system-wide speed dial numbers set by your administrator. You can print and view these numbers in **NBX NetSet > System Speed Dials**.

To access the display panel lists:

- 1 Pick up the handset. Press the up or down scroll key to the right of the display.

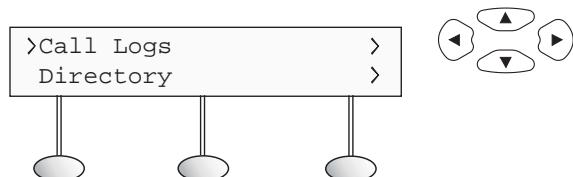


On NBX Business Telephones or 3101 and 3101SP Basic Telephones, you can press a scroll key and select a number to dial without picking up the handset. Note, however, that the 3101 Basic Telephone does not support speaker phone operation. With the 3101, you must use the handset to speak to the person on the call.

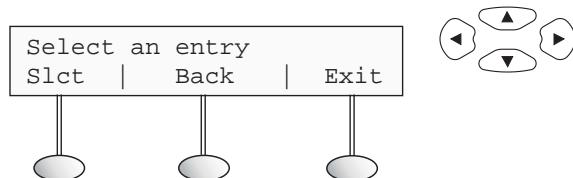
- 2 Use the scroll keys to move through the lists. When you see the list that you want to use, press the button under **Slct** (Select).
- 3 Use the scroll keys to move to the name or number that you want to call. Verify that the cursor is at the entry you want, and press the button under **Slct**.
- 4 To move back to the previous menu, press the button under **Back**.
- 5 To leave the lists entirely, press the button under **Exit**, or press an Access button that is programmed for **Release**, or hang up.

Tips on Using the Lists

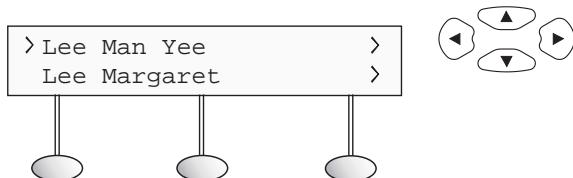
After you press the up or down scroll key (3102 Business Telephone scroll keys shown), if you do not select an item immediately, the display alternates between the list:



and the menu choices:



In the user directory, names appear in alphabetical order, by last name. The system updates the directory when the administrator adds or removes users.



In the user directory, to move quickly to the first name that begins with a particular letter, you can use the key pad. For example: press **3** to show the first name that begins with D; press **3** twice to move to the first name that begins with E; press **3** three times to move to the first name that begins with F. Then scroll up or down to the name that you want.

More Ways to Dial a Call

This section describes other standard dialing features. For information on dialing from an analog telephone, see the *NBX Feature Codes Guide* in the NBX NetSet utility.

An Internal Call To dial an internal call:

- 1 Pick up the handset or, on NBX Business Telephones, press the **Speaker** button. On a 3101SP Basic Telephones, you can press the  button. You hear the dial tone. For an internal call, if your telephone line appearances are mapped to external lines or if you inadvertently chose an external line, select an internal line.
- 2 Use the display panel to find and dial the last name of the person whom you want to call in the user directory, find and dial one of the numbers in a speed dial directory, or dial the person's 3-digit or 4-digit extension.
- 3 When you are finished, hang up the handset, or if you are using the Speaker, press the **Speaker** or the  button again to end the call.

For details about placing calls to remote or branch offices, see ["Dialing a Call to a Remote Office"](#) in [Chapter 9](#).

An External Call To dial an external call:

- 1 Pick up the handset or, on NBX Business Telephones, press the **Speaker** button. On a 3101SP Basic Telephones, you can press the  button. You hear the Dial Tone. If your line appearance is mapped to an internal line, dial **9**, **8** or whatever you need to access an external line. If you are using an NBX Business Telephone or the 3101SP Basic Telephone and one of the Access buttons is configured to access an external line directly, press that button.
- 2 Dial the number, or use the display panel on an NBX Telephone to scroll to a missed, answered, or dialed number, or a personal or system-wide speed dial number. If you have programmed one of the One-Touch buttons on the NBX Business Telephone, press that button.
- 3 When you finish speaking, hang up the handset, or if you are using the Speaker, press the **Speaker** or the  button again to end the call.

Redialing a Call On an NBX Business Telephone:

- Pick up the handset and press **Redial** to dial the most recent number that you called.
OR
■ Use the Call Logs to redial a recently missed, answered, or dialed call.

On an NBX Basic Telephone:

- Pick up the handset and then press the **Feature** button + **401** to dial the most recent number that you dialed.
- OR
- Use the Call Logs on the display panel to redial a recently missed, answered, or dialed call.

Setting Your Call Coverage Point

Calls that come in directly to your extension go to the call coverage point that you specify in the NBX NetSet utility.

Calls that come to your telephone through hunt groups and calling groups follow the call coverage path that your administrator sets up for the group. See "[Hunt Groups and Calling Groups](#)" in [Chapter 9](#).

Use this feature to specify:

- How many times you want your telephone to ring before the system forwards unanswered calls
- Your call coverage point, which is where you want your calls to go when you do not answer

To change the number of rings or the call coverage point:

- 1 Log in to **NBX NetSet > User Information > Call Forward**.
- 2 Select your choice for the **Number of rings before forwarding a call**.
- 3 Select a call coverage point:

- If you select **Forward Call to Phone Number**, type that number in the Phone Number field. Do not use parentheses, hyphens, or spaces. For external calls, start by entering a **9** or **8** or whatever required to access an outside line. Example: **912815551212** dials (281) 555-1212.



*The number that you choose may be limited by your call permissions. To view your permissions, see **NBX NetSet > User Information > Call Permissions**.*

- If you select **Disconnect (no coverage)**, the system disconnects an incoming call if it is not answered after the specified number of rings.
- 4 Click **Apply**, and then click **OK**.

Putting a Call on Hold

To put a call on hold for any reason:

On NBX Business Telephones or 3101 and 3101SP Basic Telephones:

- 1 Press the **Hold** button (3102, 1102, 2102, 2102-IR) or  button (3101, 3101SP).
- 2 To return to the call, press the appropriate Access button.

On an NBX 2101Basic Telephone:

- 1 Press the **Hold** button.
- 2 To return to the call, press the **Call Toggle** button.

Dialing Another Call

To place a call on hold to dial a new call:

On NBX Business Telephones or 3101and 3101SP Basic Telephones:

- 1 Press the **Hold** button (1102, 2102, 2102-IR) or  button (3101, 3101SP).
- 2 Press one of the Access buttons that is currently not being used.



Typically, the bottom three Access buttons in the column on the left of the 3102 Business Telephone, the bottom three Access buttons in the column on the right of the 1102, 2102, or 2102-IR Business Telephones are reserved for your extension. The first two Access buttons on the left of a 3101 or 3101SP Basic Telephone are used for your extension. Your system administrator can verify the number and location of Access buttons on your telephone.

- 3 When you hear dial tone, dial the second call.

On an NBX 2101 Basic Telephone:

- 1 Press the **Hold** button.
- 2 To obtain dial tone to make the second call:
 - If you *did not* hang up the handset, press and release the hook switch.
 - If you *did* hang up the handset, pick it up again.
- 3 When you hear dial tone, dial the second call.

More Than One Call

The number of simultaneous calls that you can have on your NBX Telephone is limited by the number of Access buttons that are defined for

your extension. The default is the bottom three buttons in the column of Access buttons on the left of the 3102 Business Telephone, the bottom three Access buttons in the column on the right on the 1102, 2102, or 2102-IR Business Telephones, and the first two Access buttons on the left of 3101 and 3101SP Basic Telephones. Your administrator can verify the number and location on your telephone.

To place more than one call on hold on an NBX Business Telephone or a 3101 or 3101SP Basic Telephone:

- 1 To place the current call on hold, press the **Hold** button (3102, 1102, 2102, 2102-IR) or  button (3101, 3101SP).
 - To make a call, press one of the Access buttons that is currently not being used. When you hear dial tone, dial the call.
 - To receive a call, locate the flashing status light that indicates the incoming call and press the associated Access button.
- 2 To place the new call on hold, press **Hold** or .
- 3 To return to either call, press the appropriate Access button.
- 4 To place or receive another new call, repeat the previous steps.

To place more than one call on hold on an NBX 2101 Basic Telephone

- 1 Press the **Hold** button.
- 2 Make or receive a new call:
 - To obtain dial tone and make a second call:
 - If you *did not* hang up the handset, press and release the hook switch.
 - If you *did* hang up the handset, pick it up again.When you hear dial tone, dial the second call.
 - To answer a call:
 - If you *did not* hang up the handset, press the **Call Toggle** button.
 - If you *did* hang up the handset, pick it up again.
- 3 To place the second call on hold, press the **Hold** button.



On an NBX 2101 Basic Telephone, you can place at most two calls on hold.

On the NBX 2101 Basic Telephone, if you have placed two calls on hold:

- And you *did not* hang up the handset, press **Call Toggle** to return to the call that you most recently put on hold. Then press **Call Toggle** again to put that call on hold and return to the second call.
- And you *did* hang up the handset, pick up the handset to return to the call that you most recently put on hold. Then press **Call Toggle** to put the call on hold and return to the second call.

Transferring a Call

When you answer an incoming telephone call, the Transfer feature allows you to send that call from your telephone to any other internal line or, if your call permissions allow, to an outside line. To view your permissions, log in to **NBX NetSet > User Information > Call Permissions**. Your administrator can change your call permissions.

- | | |
|--|--|
| Announced
(Screened) Transfer | <p>Before you complete a transfer, you can announce to the recipient that you are transferring a call. The recipient can then decide whether to take the call. To announce a transfer:</p> <ol style="list-style-type: none">1 While on a call, press the Transfer button. The system places the caller on hold and selects a new line.2 Dial the extension number to which you want to transfer the call.3 When the recipient answers, announce the call.<ul style="list-style-type: none">■ If the recipient wants to take the call, press Transfer again to complete the transfer, and hang up the handset.■ If you are on an NBX Business Telephone or a 3101 or 3101SP Basic Telephone and the recipient does <i>not</i> want to take the call, retrieve it by pressing the Access button on which the call originated.■ If you are on an NBX 2101 Basic Telephone, and the recipient does not want to take the call, press and release the hook switch to disconnect the attempted transfer, and then retrieve the original call by pressing Call Toggle. |
|--|--|



Your administrator can disable Announced Transfers (by enabling the One Button Transfer feature) for the entire NBX system. When that setting is enabled, every time that you press the Transfer button, the current call is transferred as soon as you dial the extension — without waiting for you to announce the call.

Blind Transfer In a blind transfer, you transfer the call without notifying the recipient:

- 1 While on a call, press the **Transfer** button. The system places the caller on hold and selects a new line.
 - 2 Dial the number to which you want to transfer the call.
 - 3 As soon as you hear a full ring, press the **Transfer** button and hang up. (If you press the Transfer button too soon after you dial the number, the transfer may not occur.)
-

Direct Mail Transfer

You can transfer a call directly into another user's voice mailbox. The call does not ring on that user's telephone.



Calls transferred to a user's mailbox by means of Direct Mail Transfer are always directed into that user's voice mailbox, even if the recipient has specified a different call coverage point.

On an NBX Business Telephone:

- 1 While you are on a call, press the Access button assigned to **Direct Mail Transfer**.
- 2 Dial the extension of the person to whose voice mailbox you want to transfer the call.
- 3 Hang up the handset.

On an NBX Basic Telephone:

- 1 While you are on a call, press the **Feature** button and **441**.
 - 2 Dial the voice mail extension of the person to whose voice mailbox you want to transfer the call.
 - 3 Hang up the handset.
-

Establishing a Conference Call

You can establish a Conference Call with up to four parties, including yourself. You must be using a telephone on the NBX system to establish the call. The other three parties can be any combination of internal and external parties.



On NBX Basic Telephones, you must use the Feature Code instructions shown in parentheses. For NBX Business Telephones, use either the Conference button or the Feature Code instructions.

From an NBX Telephone, follow these steps:

- 1 Dial a call, or receive a call from someone else. Two parties are now on the call.
- 2 While on the call, press the **Conference** button (or press **Feature + 430**). The system selects a new line and places the first party on hold.
- 3 Dial a call to an internal or external third party.
 - For an **announced** conference, wait for the third party to answer the call, and then press the **Conference** button (or **Feature + 430**) again.
 - Until you press the **Conference** button (or **Feature + 430**) the second time, the second party remains on hold, and you may converse with the third party privately.
 - For a **blind** conference, press the **Conference** button (or **Feature + 430**) immediately after you dial the number. You return to the conference, and you and the second party hear the called party's telephone ringing.

If the third party answers, three parties are now in the conference call.



If the third party is internal and does not answer, the attempt to conference that party is cancelled. You cannot establish a conference call with an NBX user's voice mailbox.

- 4 Repeat steps 2 and 3 to conference in a fourth party.
 - On NBX Business Telephones, you can activate speaker phone operation during the conference call by pressing the **Speaker** button. On a 3101SP Basic Telephone, you can press the button to activate speaker phone operation.
 - You can turn off the microphone or the mouthpiece on the handset by pressing the **Mute** button (1102, 2102, 2102-IR) or button (3102, 3101, 3101SP). The other parties cannot hear you, but you can hear them.
 - For details about the Speaker and Mute features, see ["Telephone Buttons and Controls"](#) in [Chapter 2](#) for the 3102 Business Telephone, ["Telephone Buttons and Controls"](#) in [Chapter 3](#) for the 1102, 2102, and 2102-IR Business Telephones, or ["Telephone Buttons and Controls"](#) in [Chapter 4](#) for the 3101 and 3101SP Basic Telephones.

Disconnecting the Last Person That You Called

Use the Conference Drop feature to disconnect the last person that you add to a conference call. This feature is helpful if, when you add a party, your call is answered by someone else.



- Only the person who added the last caller to the conference call can drop that caller.
- Your administrator can configure any Access button on an NBX Business Telephone or the Attendant Console to be a **Conference Drop** button.

On an NBX 2101 Basic Telephone, or a telephone that does not have a button programmed for Conference Drop:

- 1 Press the **Feature** button and **431**.
- 2 The system returns you to the others who are in the conference call.

More About Conference Calls

- To place your part of a conference call on hold, press the **Hold** button (3102, 1102, 2102, 2102-IR, 2101) or  button (3101, 3101SP). The other parties can talk among themselves, but they cannot hear you. Music on hold does not play when a conference call is on hold.
- To transfer a conference call to another telephone, press the **Transfer** button. Dial the number to which you want to transfer the call, announce to the recipient (optionally) that you are transferring a conference call, and then press the **Transfer** button again. All of the conferenced parties are transferred except yourself.
- Your ability to drop the last person that you added to the conference is transferred to the person who accepts the transfer.

Setting the Volume

On any NBX Telephone, use the **Volume Control** buttons to raise or lower one of these volumes:

- **Ring Volume** — To raise or lower the volume of the ring, press the up or down **Volume Control** button repeatedly while your telephone is ringing, until the volume is at the level that you prefer. To read how ringer volume is different from ringer tone, see ["Ringer Tones"](#) in [Chapter 7](#).
- **Handset Volume** — To raise or lower the volume of the dial tone or the sound that you hear when you are using the handset, pick up the handset and then press the up or down **Volume Control** button repeatedly until the volume is at the level that you prefer. You can change the handset volume during a conversation or by listening to the dial tone.
- **Speaker Volume (NBX Business Telephones or 3101 and 3101SP Basic Telephones)** — To raise or lower the volume of the sound that

you hear when you are using the speaker phone for a conversation or just listening to the dial tone, press the **Speaker** button and then press the up or down **Volume Control** button repeatedly until the volume is at the level that you prefer.

- **Headset Volume** — To raise or lower the volume of the dial tone or the sound that you hear on the headset, put on the headset and activate it as specified for your headset. When you hear the dial tone or during a conversation, press the up or down **Volume Control** button repeatedly until the volume is at the level that you prefer. See ["Using a Headset"](#) in [Chapter 7](#).

9

GETTING MORE FROM YOUR TELEPHONE SYSTEM

This chapter covers these topics:

- [Listening to Your Messages in Your E-mail or Browser](#)
- [Account \(Billing\) Codes](#)
- [Caller ID](#)
- [Call Pickup](#)
- [Hunt Groups and Calling Groups](#)
- [Call Park](#)
- [Paging](#)
- [Configurable Operators](#)
- [Dialing a Call to a Remote Office](#)
- [Bridged Extensions](#)
- [Delayed Ringing](#)
- [Using Pulse Dialing](#)
- [Additional Applications](#)



Security Note: Several of the features described in this chapter include configuring a telephone line to appear on more than one NBX Business Telephone. For any of these features, if one person is using a telephone line, no one else can listen in on that same line from a different telephone.



If your system uses a messaging application other than NBX Messaging, use the documentation for your messaging application instead of the instructions in this chapter.



For help on accessing NBX features from an analog telephone, see the NBX Feature Codes Guide in the NBX NetSet utility. For how to set up your NBX NetSet password the first time, see [Chapter 1](#).

Listening to Your Messages in Your E-mail or Browser

You can listen to your voice mail from any computer that allows you to access your e-mail. Your e-mail software application must be IMAP-4 compliant, such as Microsoft Outlook. See your administrator for assistance with this feature.

If you configure your first off-site notification method to send you an e-mail message when you have voice messages, the NBX system sends each voice mail message as a sound-file attachment to an e-mail message. To listen to your messages using your computer, it must have a sound device such as a USB headset or a sound card with either speakers or headphones.

When you delete the e-mail message that contains the attached voice message, you are not deleting the voice message on the NBX system. To delete voice messages from the NBX system, you must access your voice mailbox through the telephone or the NBX NetSet utility.

See [“Off-Site Notification”](#) in [Chapter 7](#) for a discussion of off-site notification behavior.

Account (Billing) Codes

The Account Codes feature allows your administrator to track calls that are associated with an individual client or account. When you answer your telephone or when you dial a call, you dial a numeric account code that allows the NBX system to track time spent on the telephone with a client, perhaps to be associated with a billable account.

To activate the Account Codes feature at any time before or during a call:

- 1 Press the **Feature** button and **888**.
- 2 Dial the account code that has been assigned by your administrator, and then press the **#** key.

The NBX system records the account code and applies it to:

- The next call, if you activate the Account Codes feature before a call arrives at your telephone
- The current call, if you activate the Account Codes feature during a call

Caller ID	Your administrator can set up your NBX system to allow for Internal and External Caller ID or can configure the system so that you can block your identity (telephone number) from anyone you call.
Internal and External Caller ID	<p>By default, the NBX system shows the extension and name of any <i>internal</i> caller on the display panel of your NBX telephone.</p> <p>External Caller ID provides the same information for <i>external</i> incoming calls if your organization subscribes to the service from your local telephone company and if the caller has not blocked the information from being sent to the NBX system.</p> <p>Availability and service charges for External Caller ID vary by location.</p>
Calling Line Identity Restriction (CLIR)	<p>On NBX systems that include T1 lines that are configured as DS1, you can choose to prevent the NBX system from transmitting your Caller ID information to outside parties when you dial a call. Your administrator must enable this feature, called Calling Line Identity Restriction (CLIR), on the NBX system. If this feature is enabled system-wide, you can choose to restrict calls:</p> <ul style="list-style-type: none">■ For <i>all</i> external (outbound) calls that you dial<li style="text-align: center;">OR■ For only the <i>next</i> single external (outbound) call that you dial <p> <i>Your administrator can configure your system so that CLIR is always active, in which case you cannot change the CLIR settings on your telephone to override this option.</i></p>
	<p>CLIR for All External Calls</p> <p>To enable CLIR-All for all calls from your telephone:</p> <ol style="list-style-type: none">1 Pick up the handset, and press the Feature button and 889. The display panel on your NBX Telephone shows CLIR-ALL on.2 Dial the number that you want to call. <p>The NBX system does not send caller ID information on this call or any future calls until you disable this feature.</p>

To disable CLIR-All:

- 1 Pick up the handset.
- 2 Press the **Feature** button and **889** again. **CLIR-ALL off** appears briefly in the display panel and then disappears when you hang up the handset.

To view your current CLIR-All setting, log in to **NBX NetSet > User Information > Feature Settings**.

CLIR for Next External Call Only

To enable CLIR for only the next call from your telephone:

- 1 Pick up the handset.
- 2 Press the **Feature** button and **890**. The telephone display panel shows **CLIR-NEXT on**.
- 3 Dial the number that you want to call.
- 4 When you disconnect the call, the CLIR feature is no longer in effect. **CLIR-NEXT on** disappears from the display panel.

If you hang up the handset without making a call, the CLIR-NEXT feature remains active and will apply to the next external call that you make. If you are unsure about whether CLIR-NEXT is active, pick up the handset, press **Feature** and **890**, and read the status message in the display panel of your telephone.

Call Pickup

Use the Call Pickup feature to answer a call that is ringing on another telephone. This feature is best arranged in advance when you and another user know that it would be convenient or necessary to answer calls ringing on that user's telephone.

You can answer a call that is ringing on another telephone only if you and that user both are members of the same Call Pickup group or if that user is a member of a Call Pickup group that allows "nonmember pickup." Your administrator configures call pickup groups and can tell you which group you belong to.

To view the list of Call Pickup groups of which you are a member:

- 1 Log in to **NBX NetSet > User Information > Call Pickup**.
- 2 Select the group number that you want to view from the **Group List**, and click **Details** to list the members of that group.

Directed Call Pickup on a Specific Telephone You can answer a call that is ringing on a specific user's telephone.

Using the feature code:

- 1 Pick up the handset.
- 2 Press the **Feature** button followed by **455** and the user's extension. The call is directed to your telephone.

Using One-Touch Pickup (NBX Business Telephones only):

- 1 Pick up the handset.
- 2 Press the Access button that your administrator has assigned to **Directed Pickup**.
- 3 Dial the extension number of the telephone that is ringing.

Group Call Pickup You can answer a call that is ringing on a group member's telephone.

Using the feature code:

- 1 Pick up the handset.
- 2 Press the **Feature** button followed by **456** and the group number. The call is directed to your telephone.

Using One-Touch Pickup (NBX Business Telephones only):

- 1 Pick up the handset.
- 2 Press the Access button that your administrator has assigned to **Call Pickup**.
- 3 Dial the group number.

Hunt Groups and Calling Groups

Your administrator can establish informal "call centers" so that incoming calls can be directed to several telephones that have been associated into hunt groups or calling groups.

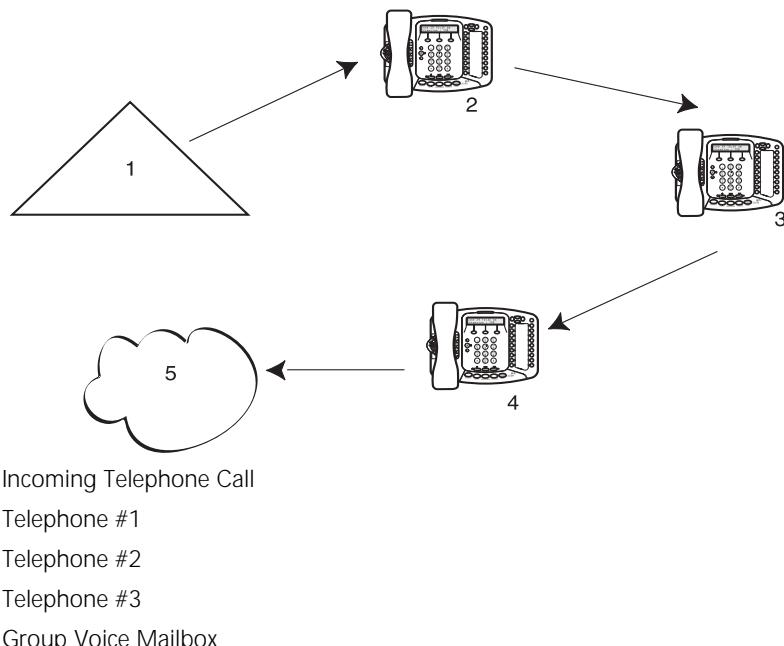
Calls that come in to your telephone:

- Through your extension go to the call coverage point that you have set up.
- Through hunt groups and calling groups follow the call coverage path set up by the administrator for that group.

Hunt Groups Incoming calls ring to one member of the hunt group. If that member's telephone is in use, or if that member does not answer the call, the system "hunts" for another member of the group until the call is answered or is forwarded to the group call coverage point. For example, if there are no available members of the hunt group, the call might be forwarded to a group mailbox or to the receptionist.

[Figure 8](#) shows the path of a call coming into a hunt group.

Figure 8 Sample Hunt Group Configuration



Hunt groups can be static or dynamic:

- If you are in a *static* hunt group, you are always part of that group along with the other group members.
- If you are in a *dynamic* hunt group, you must log in to the group to be part of it.

To log in to a dynamic hunt group using your NBX Telephone:

- 1 Pick up the handset.
- 2 Press the **Feature** button followed by the feature code for the hunt group. Your administrator can tell you which feature code to use.

- 3 Dial the hunt group password. Your administrator can tell you which password to use.
- 4 Press #.

To log out of a dynamic hunt group using your NBX Telephone:

- 1 Pick up the handset.
- 2 Press the **Feature** button followed by the feature code for the hunt group. Your administrator can tell you which feature code to use.
- 3 Dial the hunt group password. Your administrator can tell you which password to use.
- 4 Hang up the telephone.



Your administrator can configure a hunt group to an Access button on an NBX Business Telephone. To log in to or to log out of the hunt group, press the specified Access button. The indicator next to the button lights to show that you are logged in. On the NBX Basic Telephone, the display panel shows the message IN.

To log in to a dynamic hunt group using the NBX NetSet utility:

- 1 Log in to the **NBX NetSet** utility and click the **Hunt Groups** button.
- 2 Select the hunt group to which you want to log in.
- 3 Click **Log In**, and then click **Close**.



If you log in to a dynamic hunt group and do not answer a call when it rings on your telephone, the system may log you out of the group depending on how the administrator has configured the group.

To log out of a dynamic hunt group using the NBX NetSet utility:

- 1 Log in to the **NBX NetSet** utility and click the **Hunt Groups** button.
- 2 Select the hunt group from which you want to log out.
- 3 Click **Log Out**, and then click **Close**.

To log in to all hunt groups of which you are a member:

- 1 Log in to the **NBX NetSet** utility and click the **Hunt Groups** button.
- 2 Click the **Login all** button.

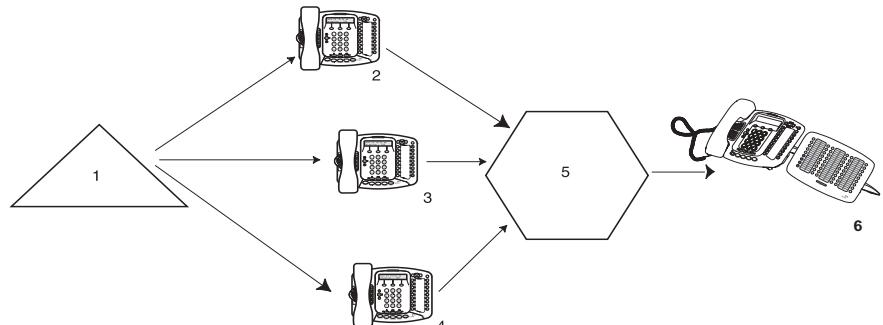
To log out of all hunt groups of which you are a member:

- 1 Log in to the **NBX NetSet** utility and click the **Hunt Groups** button.
- 2 Click the **Logout all** button.

Calling Groups One type of hunt group is the **Calling Group**. Calling groups allow an incoming call to ring simultaneously on all telephones in a group, for example, a customer service group. To log in to or out of a calling group follow the steps in ["Hunt Groups and Calling Groups"](#) earlier in this chapter.

[Figure 9](#) shows the path of a call coming in to a calling group.

Figure 9 Sample Calling Group Configuration



- 1 Incoming Telephone Call
- 2 Telephone #1
- 3 Telephone #2
- 4 Telephone #3
- 5 After a specified number of rings with no answer
- 6 Receptionist

Group Membership To view the list of users that belong to a group:

- 1 In **NBX NetSet > User Information > Hunt Group**, select a group.
- 2 Click **Details**.

Call Park

Use Call Park to place a call in a “holding pattern” and make it available for another person to pick up from any telephone on the system. Use the internal paging feature, the external paging feature, or both, to announce the call. The recipient can retrieve the call from any NBX Telephone or analog telephone by dialing the Call Park extension that you give during your announcement.

This feature is useful in any of these circumstances:

- The recipient is elsewhere in the building.
- You want to continue a call on another telephone, for instance, in a conference room for privacy, and transferring the call does not give you enough time to retrieve it.

When you park a call, you assign it a Call Park extension, which anyone can use to retrieve it. [Table 19](#) lists the default Call Park extension numbers. Ask your administrator to verify the Call Park extensions for your location.

Table 19 Default Call Park Extension Numbers

System	Default Extension Numbers
4-digit dial plan	6000 – 6099
3-digit dial plan	601 – 609

If the call is not answered within 5 minutes (default) after it is parked, it rings again at the original telephone. Your administrator can modify the length of this waiting period.

To park a call:

- 1 While you are on a call, press the **Feature** button and **444**, or press the Access button assigned to **Call Park**.
- 2 Dial a Call Park extension from the list shown in [Table 19](#) or the list of extensions at your location.

If you select a Call Park extension that is already in use, **Park Cancelled** appears on the display panel on your NBX Telephone, and the call rings back to your telephone. Try another Call Park extension.

- 3 To notify another user about the parked call:
 - a From NBX Business Telephones or 3101 and 3101SP Basic Telephones, select an Access button that is assigned for placing telephone calls,

and dial the user's extension, or use the paging feature. See "[Paging](#)" next for details.

- b** From an NBX 2101 Basic Telephone, press the hook switch. When you hear the dial tone, dial the user's extension, or use the paging feature. See "[Paging](#)" next for details.

To retrieve a parked call:

- 1** Pick up the handset of any telephone on the system.
- 2** Dial the Call Park extension that was assigned to the call.

Paging

Paging is the general term used to describe the act of broadcasting a voice message through audio speakers.

There are two different ways to page on the NBX system:

- Page all extensions on the system
This method uses default codes.
- Page a subset of all extensions on the system (this subset is called a *zone*).
This method uses extensions that the System Administrator configures for this purpose.

Each method allows you to broadcast a message to different destinations, depending on your location and equipment.



Do **not** press the **Feature** button before you dial the Paging code.

Paging the System When you page the system, you broadcast a message to *all* internal extensions, to a Public Address (P.A.) system, or to both simultaneously. Paging codes, as described in [Table 20](#), have default values for each destination.

Table 20 Paging Codes

Feature	3-digit dial plan (default codes)	4-digit dial plan (default codes)
External Paging Broadcast an announcement over a public address system that has a paging amplifier and speaker system that is connected to your NBX system	620	6200
Internal Paging Broadcast an announcement through the speakers on all NBX® Business Telephones on your system except those that have been set to Do Not Disturb.	621	6201
Simultaneous Paging Broadcast an announcement externally and internally at the same time.	622	6202

To page, perform the following steps using your NBX Telephone:

- 1 Pick up the handset.
- 2 Dial the appropriate paging code on your system.
- 3 Speak the broadcast message into your handset.
- 4 Hang up.

Paging Zones A page zone is a subset of internal extensions to which you can direct a broadcast using a configured extension. You are able to page a zone, or a P.A. system, or both the zone and the P.A. system simultaneously. Zone extensions are configured by the System Administrator.

To discover the page zone extensions on your system:

- 1 Log in to **NBX NetSet**.
- 2 Go to **Personal Information > User Information > Page Zones**. NetSet lists the existing page zones and their extension numbers.
- 3 Click **Details** to list the members of each zone.



You can view zone memberships only if the administrator authorizes you to do so.

To page a zone, a P.A. system, or both, perform the following steps using your NBX Telephone:

- 1 Pick up the handset.
- 2 Dial the appropriate extension in order to page the zone.
- 3 Speak the broadcast message into your handset.
- 4 Hang up.



Cordless telephones and analog telephones can initiate a zone page, but cannot receive a zone page. For a complete list of devices supported by this feature, see the NBX Administrator's Guide.

Configurable Operators

The Configurable Operators feature gives a caller who is directed to voice mail the option of going to another destination, if desired.

You can configure your own operators for those who call your extension (if the System Administrator allows it), and you can also use this feature as a caller to another device.

How the Configurable Operator Feature Works

Following is a brief description of how the system directs a caller from your voice mail to operators designated by you:

- 1 If you do not answer a call, the system invokes your voice mail.
- 2 The caller listens to your pre-recorded voice mail message, which includes the instruction to press an access digit (**0** or **9**) in order to reach the appropriate operator.



Employing a configurable operator means that you must re-record your personal voice mail greeting in order to explain to callers that an operator is available to them if they press the appropriate access digit during the voice mail greeting.

- 3 The caller presses **0** or **9**.
- 4 The call is redirected to the operator you designated.

If desired, the caller is able to leave a message, then press **0** or **9** in order to transfer to a configured operator.

Configuring the Operators

As an NBX user, you can view the operators' settings, and modify those settings if your System Administrator allows it.

You should be aware that the operator's call-handling rules (such as call coverage) may apply to the voice mail caller. Also, you must have external-to-external permissions in order for transfers to external phone numbers to complete successfully.



NBX System Software by default designates both operators as the System Operator (extension 501), so if you or the administrator do not configure operator destinations, the system directs an operator-bound caller there.

Viewing Your Operator Permissions

To find out if you have permission to configure operators:

- 1 Log on to NetSet as User.

The **Personal Settings** window appears.

- 2 Select **User Information**.

- 3 Click the **Call Permissions** button.

Your current permissions to configure the System Operator and the Personal Operator appear in the **User Information** window.

Configuring the Operator Destinations

To configure your own destinations for System and Personal Operator:

- 1 Log onto NetSet as User.

The **Personal Settings** window appears.

- 2 Select **NBX Messaging**.

- 3 Click the **Personal Operators** button.

The current System Operator and Personal Operator extensions and access digits appear. If the System Administrator has given you the appropriate configuration permissions, the extensions appear in editable text boxes.

- 4 Edit the destinations to include the appropriate extensions.

The operator destination text string cannot exceed 16 characters.

- 5 Click the **Apply** button to make the changes and keep this screen open, or click the **OK** button to make the changes and close the screen.



If you clear an operator destination (using the **Clear** check box), calls directed to that operator are directed instead to the default system operator (extension 501).

Dialing a Call to a Remote Office

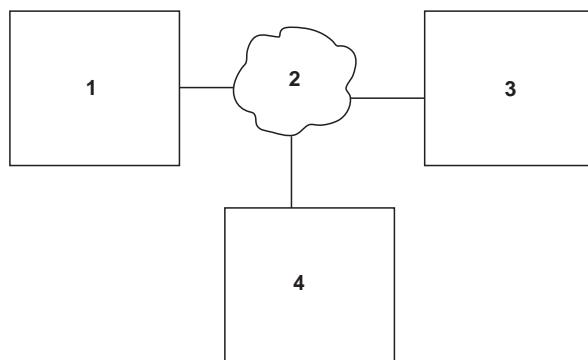
You can dial calls between sites in your organization that are separated geographically but that are linked by a Wide Area Network (WAN) connection. Each site must have an NBX system. Typical configurations are described in the next sections.

Using Unique Extensions

In the sample network shown in [Figure 10](#), everyone in the entire organization has a *unique* telephone extension. Whenever you make a call to an extension that is not located at your own site, your NBX system sets up a connection to the NBX system at the other extension's site.

In this example, to call a user in Dallas, a user in Chicago dials a Dallas extension (3000 through 3999). The dial plan on the Chicago NBX system sets up the necessary connection to the Dallas NBX system and then to the extension at that site.

Figure 10 Using Unique Extensions to Dial Remote Offices



1 NBX System in Chicago

Extensions: 1000–1999

2 Wide Area Network (WAN)

3 NBX System in Atlanta

Extensions: 2000–2999

4 NBX System in Dallas

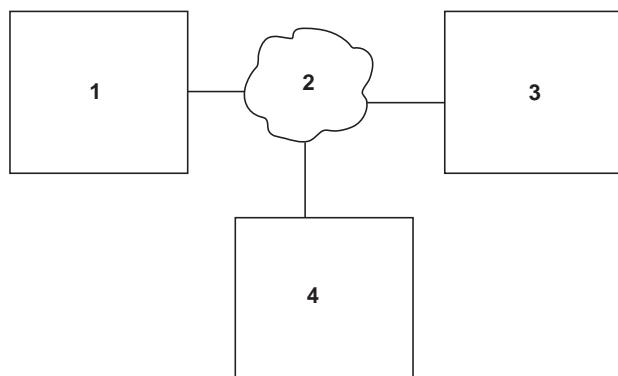
Extensions: 3000–3999

Using Site Codes

If some users have *overlapping* telephone extensions, your administrator can configure your telephone system to use *site codes* for you to dial people at remote offices. Your administrator chooses the site codes for your system. In this example, you dial a site code first, followed by the extension at the site.

For example, as shown in [Figure 11](#), to call someone in Atlanta, a user in Chicago dials the site code 62 and then the appropriate extension (1000 through 3999). To reach a user in Dallas, a user in Chicago dials 63 and then the appropriate extension (1000 through 3999). The site code prevents conflicts between the remote extension number and a duplicated extension number at the local site (Chicago).

Figure 11 Using Site Codes to Dial Remote Offices



1 NBX System in Chicago

Extensions: 1000–3999

Site Code: 61

2 Wide Area Network (WAN)

3 NBX System in Atlanta

Extensions: 1000–3999

Site Code: 62

4 NBX System in Dallas

Extensions: 1000–3999

Site Code: 63

Bridged Extensions

With a bridged extension, buttons and status lights on one telephone are associated with buttons and status lights on another telephone. On the primary telephone, you can perform all operations (such as dialing telephone calls, placing calls on hold, forwarding calls, and so on). On the secondary telephone, you can answer calls that are made to the primary telephone's extension but you cannot make calls using the buttons that are associated with the primary telephone.

The administrator can create bridged extensions on:

- Any NBX Business Telephone or NBX 3101 or 3101SP Basic Telephone
- An NBX 2101 Basic Telephone if an NBX Attendant Console is associated with it. The administrator creates the bridged extension on the Attendant Console.

Example:

If an assistant's job is to answer a manager's telephone calls, the administrator can map the manager's extension on the assistant's telephone. The manager's telephone is the primary telephone, and the assistant's telephone is the secondary telephone.



Your administrator can map a primary telephone's extension to one or more secondary telephones.

Delayed Ringing

(NBX Business Telephone and Attendant Console only)

The Delayed Ringing feature prevents a call on a shared line from ringing on a specific telephone until the incoming call rings on another telephone for a specified number of times.



A shared line can be a bridged extension or an incoming analog telephone line that is mapped to more than one telephone.

Example:

The administrator programs (maps) a telephone extension to appear on both a manager's telephone and the assistant's telephone; that is, it is a bridged extension. The administrator has also enabled the Delayed Ringing feature on the manager's telephone and has specified 4 rings (a typical setting).

When a call comes in to the manager on that extension, the assistant's telephone rings 4 times before the call audibly rings on the manager's telephone. Even during the first silent rings, the line's status light on the manager's telephone flashes, allowing the manager to answer the call if required.

Using Pulse Dialing

In some locations, analog telephone users must dial telephone calls using *pulse* dialing instead of *tone* dialing (also called *Dual Tone Multi Frequency*, or *DTMF*, dialing).



Your administrator must configure the Analog Line Card ports for pulse dialing.

Examples:

- Some of your telephone lines are provided by a telephone company that supports only pulse dialing while other lines are provided by a different telephone company that supports DTMF dialing.
- Your organization's telephone service provider offers low-cost, pulse-dialing-only service.
- In some situations, you must switch to DTMF dialing during a call. For example, if your call is answered by an automated attendant that requires that you enter information from your telephone keypad, you must typically enter the information using DTMF dialing.

Using a Feature Code

To change from pulse dialing to DTMF during a call:

- 1 Press the **Feature** button and **891**.
- 2 Your connection is switched from pulse to tone (DTMF) for the remainder of the call. When you hang up, the port you were using on the Analog Line Card reverts to pulse dialing mode.

Using a Mapped Button

Your administrator can map a button on your telephone so that you can press the button to change from pulse dialing to DTMF during a call. When you hang up, the port that you were using on the Analog Line Card reverts to pulse dialing mode.

Using a Personal Speed Dial

You can configure a personal speed dial in the NBX NetSet utility to dial a number in pulse dial mode and then to switch to DTMF. Use the left angle-bracket character (<) in the NBX NetSet utility as the command to

switch to DTMF mode. You can also include the digits that you want the system to dial after it switches to DTMF. The system dials any digits after the < using DTMF tones. When you hang up, the port that you were using on the Analog Line Card reverts to pulse dialing mode.

For additional information about programming speed dials, see ["Personal Speed Dials"](#) in [Chapter 7](#).

Additional Applications

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

- NBX Call Reports *
- NBX TAPI Service Provider (NBXTSP)
- NBX Desktop Call Assistant (formerly NBX TAPI Dialer) *
- Complement Attendant Software *
- Palm Dialer
- pcXset Soft Telephone *
- NBX Media Driver



* *This application has been tested with Window XP Home Edition and Windows XP Professional Edition.*

10

NBX 3105 AND 1105 ATTENDANT CONSOLES

NBX Attendant Consoles and the NBX Complement Attendant Software (CAS) application enable a receptionist to handle high call volumes efficiently. Although receptionists are the primary users of the Attendant Console and CAS, the two can also be used by busy sales representatives and others who receive a high volume of telephone calls or who make frequent calls to the same telephone numbers.

This chapter covers these features:

- [NBX Attendant Console](#) — A device that works along with NBX Telephones to increase call handling capability. In many offices, the Attendant Console is used by a receptionist or switchboard operator, who is referred to in this guide as "the receptionist."
- [Complement Attendant Software \(CAS\) — A software application](#) that allows a receptionist to answer and route calls using a personal computer. Your administrator installs the Complement Attendant Software on your computer from the *NBX Resource Pack CD*.

The Attendant Console and Complement Attendant Software can be used at the same time. However:

- When incoming calls appear on the Attendant Console, you must handle them using the buttons of the console.
- When calls appear on the CAS computer screen, you must handle them using the mouse and the CAS software features.

NBX Attendant Console

The NBX 3105 and 1105 Attendant Consoles each have 50 Access buttons and 4 preprogrammed Feature buttons. Although the design of the two Attendant Consoles is different, the buttons work the same way. In effect, the Attendant Console is an extension of the NBX Business Telephone or NBX Basic Telephone to which it is associated.

See [Figure 12](#) for [NBX 3105 Attendant Console](#) buttons and controls and [Figure 13](#) for [NBX 1105 Attendant Console](#) buttons and controls.

Access Buttons

The 50 Access buttons on an NBX Attendant Console can each have two sets of assignments: 1 through 50, and 51 through 100. To toggle between the two sets of assignments, you press the **Shift** button.

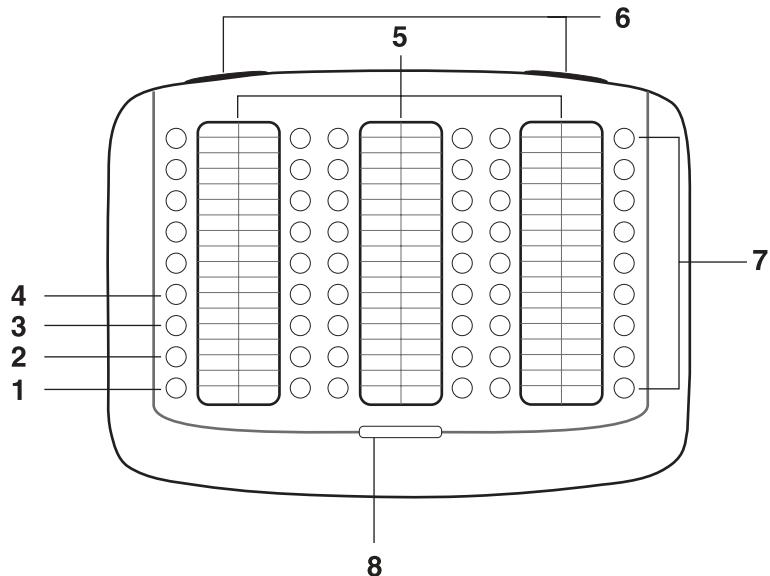
Your administrator can assign features to each Access button. Possible features include:

- Status of internal telephone extensions (busy, available)
- Status of external telephone lines
- Speed dials for:
 - User extensions
 - Pager numbers
 - Cellular telephone numbers
- Message Waiting Indicators (MWI) for:
 - Group mailboxes
 - Phantom or personal mailboxes
- Time of Day Service Modes (See your administrator for details.)
- Status of Hunt Group and Calling Group lines

Feature Buttons

The four Feature buttons are preprogrammed for the most common features needed by a receptionist: Transfer, Transfer to Voicemail, Park, and Hold. The **Shift** button does not affect the operation of the Feature buttons. Your administrator can change the features assigned to each button using the NBX NetSet utility.

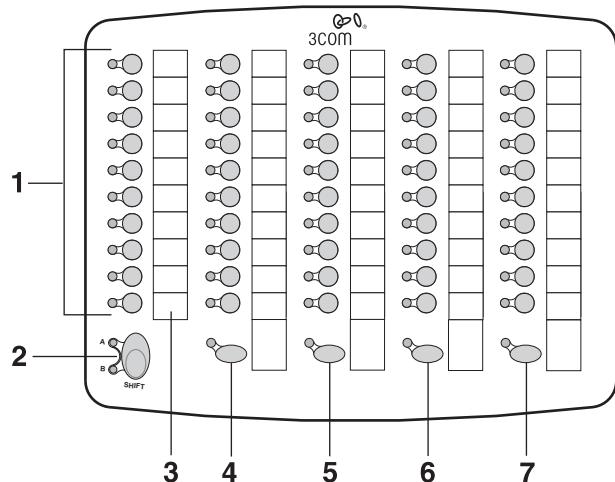
[Figure 12](#) and the text that follows it describe the features on the NBX 3105 Attendant Console. [Figure 13](#) and the text that follows it describe the NBX 1105 Attendant Console.

Figure 12 NBX 3105 Attendant Console

- 1 Hold button** — Places a caller on hold.
- 2 Transfer button** — Enables you to send a call to another telephone.
- 3 Direct Mail Transfer button** — Allows you to send a caller directly to another user's voice mailbox or phantom mailbox.
- 4 Call Park button** — Places a call in a "holding pattern" so that it can be retrieved from any other telephone on the system.
- 5 Labels** — You can print labels for your Attendant Console using the LabelMaker utility in the NBX NetSet utility or on the *NBX Resource Pack CD*.
- 6 Label cover tabs** — Allow you to unsnap the plastic cover to insert labels.
- 7 Access buttons** — A light next to each button indicates whether the line is available or in use, or whether assigned features are enabled.
- 8 Shift button** — Enables you to toggle between the two sets of Access button assignments on the Console. Press the **Shift** button to switch between assignments 1 through 50 and assignments 51 through 100. The **Shift** button LED is lighted when you have buttons 51 through 100 selected.

[Figure 13](#) and the text that follows it describe the features on the NBX 3105 Attendant Console.

Figure 13 NBX 1105 Attendant Console



- 1 **Access buttons** — A light next to each button indicates whether the line is available or in use, or whether assigned features are enabled. For details of button status, see [Table 7](#) in [Chapter 3](#).
- 2 **Shift button** — Enables you to toggle between the two sets of button assignments on the Console. Press the **Shift** button for assignments 1 through 50. Press **Shift** again for assignments 51 through 100. The **Shift** button LED is lighted when you have buttons 51 through 100 selected.
- 3 **Labels** — You can print labels for your Attendant Console using the LabelMaker forms in the NBX NetSet utility or on the *NBX Resource Pack CD*. See ["Attendant Console Labels"](#) next.
- 4 **Transfer button** — Enables you to send a call to another telephone. See ["Transferring a Call"](#) in [Chapter 8](#).
- 5 **Direct Mail Transfer button** — Allows you to send a caller directly to another user's voice mailbox or phantom mailbox. See ["Direct Mail Transfer"](#) in [Chapter 8](#).
- 6 **Call Park button** — Places a call in a "holding pattern" so that it can be retrieved from any other telephone on the system. See ["Call Park"](#) in [Chapter 9](#).

- 7 **Hold button** — Places a caller on hold. See [“Putting a Call on Hold”](#) in [Chapter 8](#).

Attendant Console Labels To create, print, and save labels for your Attendant Console:

- 1 Log in to **NBX NetSet > Speed Dials > Attendant Console Labels**. Save the file to a location on your PC, and then open the file:
 - a Locate the file, labels.exe, using one of these methods:
 - Open Windows Explorer and navigate to the file.
 - Double-click My Computer and navigate to the file.
 - Depending on your operating system, click **Start > Find > Files or Folders** or **Start > Search > For Files or Folders**, and type the name of the file, labels.exe, in the appropriate text box.
 - b Double-click the file icon to start the LabelMaker program.
- 2 Find the page in the LabelMaker that has labels for your attendant console.
- 3 Edit the label template by clicking any of the label text boxes to highlight the existing text, and then typing new text.
- 4 Press **Tab** to move to the next text field in the label.
- 5 Click the **Print** button at the top of the LabelMaker screen to open the Print dialog. Specify which page you want to print. Typically, the default is to print all pages.
- 6 Click **Print**.
- 7 Cut out the labels and put them in the label holders of your attendant console.
- 8 To save the edited LabelMaker, click the **Save** button at the top of the LabelMaker screen. Or you can click **File > Save As** to save the LabelMaker to a new location.



To reuse your saved LabelMaker, you must run the file that you saved to your computer. If you launch the LabelMaker from the NBX NetSet utility, you always get the default version. If you save the default version to the same place you saved an earlier edited version, you overwrite the earlier version.

Complement Attendant Software

The Complement Attendant Software is an optional component, which requires a license. On your personal computer, the Complement Attendant Software displays your telephone directory in a series of tabs. Each tab sorts the directory by a different type of information, for example, by last name, by department, or by extension.

When you answer a call using the Complement Attendant Software, you can select a user from the directory and transfer the call to that user.

[Table 21](#) describes the main elements of the Complement Attendant Software screens.

Table 21 Elements of the Complement Attendant Screens

Field	Purpose
Display Panel	Displays Caller ID information (name and extension number), the status of a call, and the duration of the call. The number of calls displayed depends on the number of access lines that you have specified in your general settings.
Find/Phone# Display	Provides the extension number and name of the person selected in the directory.
Clear Button	Cancels previous criteria.
Extension Tab	Sorts the data in the directory by listing the extension numbers in ascending order.
First Tab	Sorts the list of users in alphabetical order by first name.
Last Tab	Sorts the list of users in alphabetical order by last name.
Department Tab	Sorts the directory by the user department.
Hidden Tab	Hides entries in the NBX directory that you do not want to appear on other tabs, such as conference room phones.
Quick Tab	Provides access to frequently used entries in the directory.

[Table 22](#) describes Complement Attendant Software buttons and the keyboard shortcuts to functions on the Action menu.

Table 22 Attendant Software Buttons and Keyboard Shortcuts

Button	Purpose	Keyboard Shortcut
Answer	Answers an incoming call.	Alt+A
Dial	Dials a selected number to place an outgoing call.	Alt+D

Table 22 Attendant Software Buttons and Keyboard Shortcuts

Button	Purpose	Keyboard Shortcut
Park	Places a call in a "holding pattern" so that it can be retrieved from another telephone on the system.	Alt+K
UnPark	Releases a caller from a "holding pattern."	Alt+U
Release	Terminates a call.	Alt+R
Hold	Places a caller on hold.	Alt+H
UnHold	Removes a caller from being on hold and returns to the call.	Alt+N
Transfer	Forwards a call to another telephone.	Alt+T
Complete Transfer	Completes the transfer of a call.	Alt+M
Cancel Transfer	Cancels a transfer.	Alt+S
Conference	Establishes a single call with up to three additional internal or external parties.	Alt+C
Complete Conference	Completes the conference call.	Alt+P
Cancel Conference	Cancels the addition of a party to a conference call.	Alt+E

Managing Calls To manage incoming calls using the Complement Attendant Software, click the buttons at the bottom of the screen, as described here:

- 1 Select a sort method by clicking the appropriate tab. For example, to select a user by last name, click the **Last** tab.
- 2 Click the user's name. The user's extension number and name appear in the **Find/Phone #** field.
- 3 Click the button for the way that you want to handle the call. For example, to transfer a call, click **Transfer**. To park a call, click **Park**.

For additional information on using the Complement Attendant Software, see the Help system in the software.

A

TELEPHONE INSTALLATION AND MAINTENANCE

This chapter covers these topics:

- [Connecting the Telephone](#)
- [Installing the 3102 Telephone Label Plate](#)
- [Attaching and Adjusting the 3101/3102/3105 Support Bracket](#)
- [Attaching and Adjusting the 1102/2101/2102 Support Bracket](#)
- [Moving Your Telephone](#)
- [Swapping Telephones](#)
- [Cleaning Your Telephone](#)
- [Troubleshooting Problems](#)

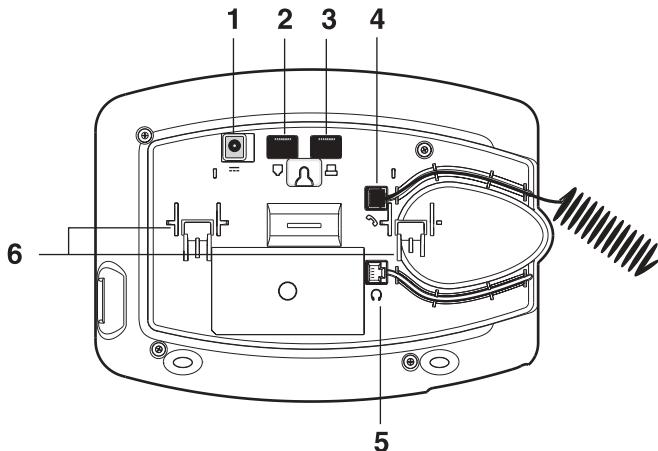
Connecting the Telephone

Although the connector layout varies between telephones, all NBX telephones and attendant consoles use these symbols to identify the connectors:

- Power connection for an AC power adapter. The adapter is an optional component on NBX 3101 and 3102 Telephones and the 3105 Attendant Console.
-  Network connection. Connects the device to the network. NBX 3101 and 3102 Telephones and the 3105 Attendant Console, as well as older NBX telephones that include "PE" in the part number, can accept a powered Ethernet cable that conforms to the Power over Ethernet (IEEE 802.3af) standard.
-  Switch port for connecting a computer or other network device, such as an NBX Attendant Console, to the network.
-  Handset connector.
-  Headset connector. NBX 3102 only.

[Figure 14](#) shows underside of the NBX 3102 Business Telephone. Connection details for each type of NBX device are listed on the packing sheet that is shipped with the device.

Figure 14 Underside of the NBX 3102 Business Telephone



CAUTION: The NBX system operates over the LAN, not through traditional telephone wiring. Your telephone connects to the NBX system through an RJ-45 LAN connector instead of an RJ-11 telephone connector. Your telephone will not work unless it is connected properly. Ask your administrator if you have questions about your telephone connection.

The underside of an NBX telephone or attendant console includes:

- 1 AC power adapter connection (optional on the 3101, 3102, and 3105)
- 2 Ethernet connector for connection to the LAN
- 3 Ethernet connector for an optional connection to your desktop computer
- 4 Handset connector
- 5 Headset connector (3102 only)
- 6 Tabs for the support bracket



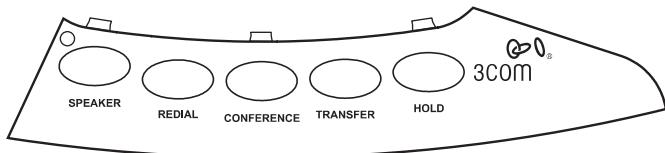
- For information about the underside of each NBX Telephone, and for information about how to connect any NBX Telephone or Attendant Console to a Power over Ethernet source, see the packing sheet that comes with the device.
- Strain relief clamps are built into the 3101/3102/3105 support bracket.

Installing the 3102 Telephone Label Plate

The NBX 3102 Business Telephone has a label plate with localized button labels that you must install. Once you snap the plate onto the telephone, you cannot remove it.

To install the plate, slip the tabs along the top edge of the plate into the slots on the telephone, and then press firmly along the bottom edge of the plate until you feel it snap into place.

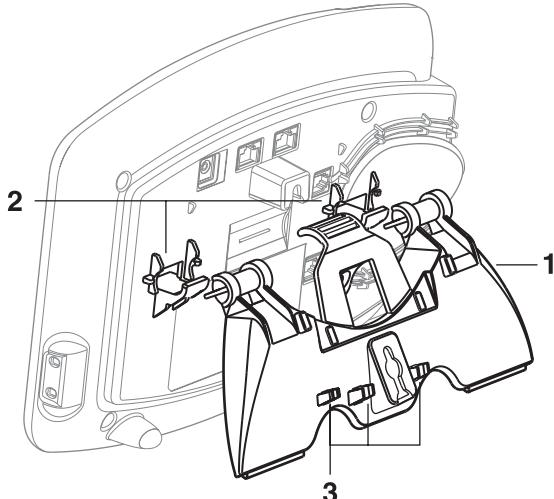
Figure 15 NBX 3102 Label Plate



Attaching and Adjusting the 3101/3102/3105 Support Bracket

The articulating support bracket is common to the NBX 3105 Attendant Console, the 3101 and 3101SP Basic Telephones, and the 3102 Business Telephone. [Figure 16](#) shows a 3102 Telephone.

Figure 16 Attaching the Support Bracket



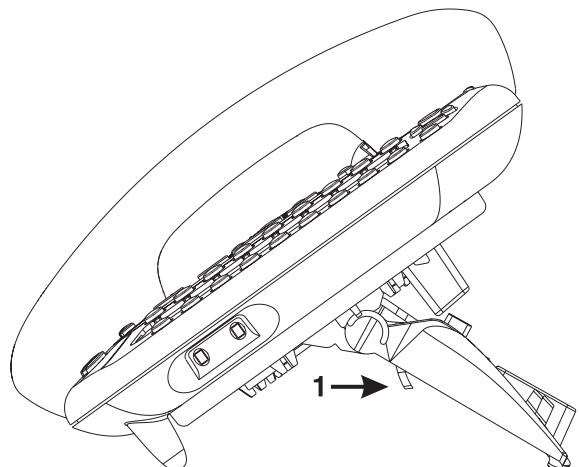
To attach the support bracket, **1**, snap the bracket into the mounting supports **2**, on the bottom of the telephone.

After you connect the cables to the phone, press the cables into the cable management clamps **3**, on the stand.



[Figure 17](#) and [Figure 18](#) show the NBX 3102 Telephone. The instructions also apply to the 3105 Attendant Console and the 3101 and 3101SP Basic Telephones.

Figure 17 Adjusting the Support Bracket

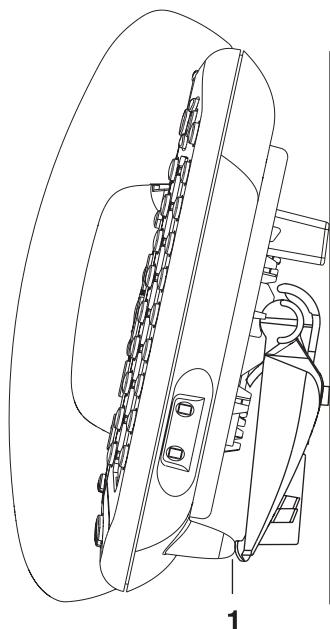


To adjust the support bracket, press to release the lock tab **1**, rotate the bracket to the position that you want, and then release the lock tab.

Figure 18 Wall Mounting a 3102 Telephone

When you mount a 3101, 3101SP, or 3102 telephone on a wall, attach the support bracket and adjust it so that the bottom of the support bracket rests against the bottom supports on the telephone, **1**.

Safe wall mounting requires 3/4-inch drywall and 1.5-inch drywall screws.



**Attaching and
Adjusting the
1102/2101/2102
Support Bracket**

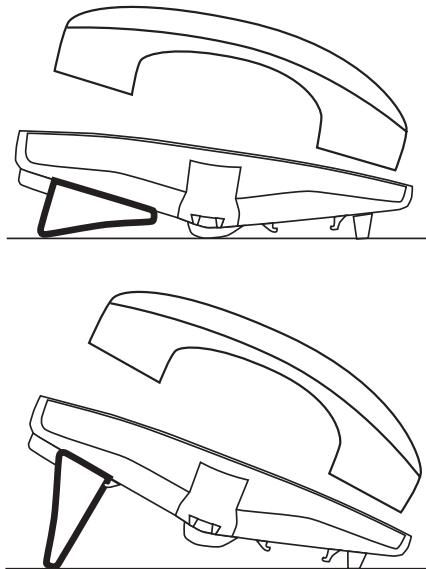
Each NBX Telephone and Attendant Console is shipped with a support bracket that you attach to the telephone. The 1105 Attendant Console and 2101, 1102, 2102, and 2102-IR Telephone support bracket can be attached in low profile, high profile, or wall mount positions.

Tabs on the underside of the telephone slip into slots on the bracket, and the opposite mounting points snap into place.

**Low-Profile and
High-Profile Positions**

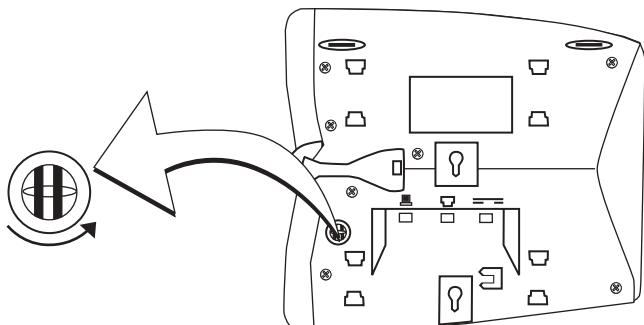
In [Figure 19](#), the support bracket is outlined to show you how to install the NBX Telephone in the low-profile and high-profile desktop positions.

Figure 19 Low-Profile and High-Profile Desktop Positions

**Wall-Mount Position**

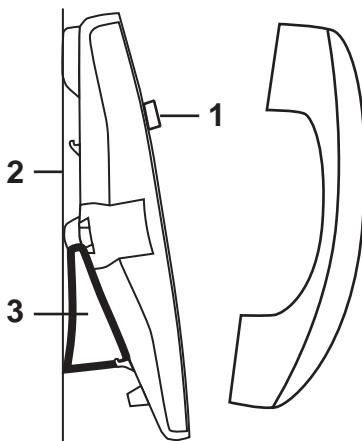
To mount an NBX 1102, 2102, or 2102-IR Telephone on a wall, put the bracket on the opposite end of the telephone in the low-profile position. Pull and twist the knob on the underside of the phone 90 degrees ([Figure 20](#)) so that the spring-loaded peg projects out on the top of the phone (Item 1 in [Figure 21](#)).

Figure 20 Knob for the Handset Support Peg



[Figure 21](#) shows an NBX 2102 Telephone in the wall-mount position. Safe wall mounting requires 3/4-inch drywall and 1.5-inch drywall screws.

Figure 21 Wall-Mount Position



- 1 Handset support peg
- 2 Wall with a solid backing
- 3 Support bracket in the low-profile position on opposite end of telephone

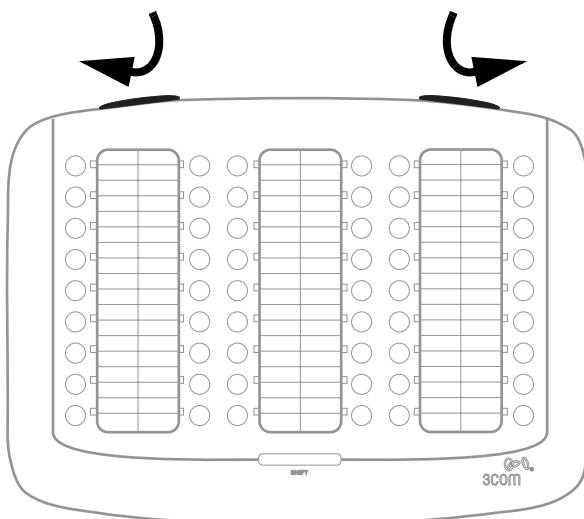
Security Wall-Mount Bracket

Every NBX 1102, 2101, 2102 and 2102-IR Telephone can be fitted with an optional security wall-mount bracket that ensures that the device cannot be removed by unauthorized persons. For how to order this bracket, consult your 3Com NBX Voice-Authorized Partner. Read and follow the instructions that come with the bracket.

Opening the 3105 Attendant Console Label Cover

For instructions on how to create and print labels, see ["Attendant Console Labels"](#) on [page 105](#).

Figure 22 3105 Attendant Console Label Cover Tabs



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

Moving Your Telephone

All NBX Telephones have the Automatic Telephone Relocation feature. Each telephone has a unique "address." You can move your telephone to another location, connect it to any Ethernet jack on the LAN, and still maintain all of your personalized features, speed dials, and extension number.

Swapping Telephones

Because your extension number and personal settings are associated with your physical telephone, only your administrator can move phone extension settings from one telephone to another.

Cleaning Your Telephone

Always unplug your telephone from the power source and from the network before you clean it. Use a soft cloth dampened with mild detergent.



WARNING: Failure to unplug the telephone before you clean it could result in electrical shock.

Troubleshooting Problems

[Table 23](#) lists possible problems that you may encounter and the most likely solutions. Where possible, each solution refers to the section in this guide where you can find detailed information.

Table 23 Possible Problems

Possible Problem	Suggested Solutions
My telephone has no dial tone and the display panel is blank.	<ul style="list-style-type: none"> ■ Verify that the power cord is fully inserted in the correct connector on the underside of the telephone. Use the strain relief tab to prevent the cord from becoming unplugged. ■ Verify that the Ethernet cables are connected and that each cable is in the proper connection. ■ Remove and add power to the telephone by unplugging the power cord at the electric outlet and plugging it back in. ■ If the telephone is powered through a powered Ethernet cable, make sure that power is applied to the cable at its source.
My telephone has "locked up."	<ul style="list-style-type: none"> ■ Your telephone has lost the connection to the system. Remove the Ethernet cord from the jack, and then re-insert it into the jack. ■ Wait a few seconds. If the telephone display panel still appears to be locked, disconnect the electrical power for your telephone, and then plug it back in.
Callers cannot leave messages on my voice mail.	<ul style="list-style-type: none"> ■ Your mailbox may be full. Log in to your voice mailbox and delete some messages. ■ Your telephone may be set up for Greeting Only Mailbox. Log in to NBX NetSet > NBX Messaging and clear the Greeting Only Mailbox checkbox.
When I park a call, the display panel shows "Park xtn in use," and the call returns to my telephone.	You have selected a Call Park extension that is already in use. Try another Call Park extension. Your administrator can add additional Call Park Extensions. For details, see " Call Park " in Chapter 9 .
When I dial 9 or 8 to access an outside line, the display panel shows "All Ports Busy."	No outside lines are available. Try again in a few minutes.
After I call another user in my organization, I hear a tone but no ringing.	The other user may have the Hands Free Active on Intercom feature enabled. Begin speaking after you hear the tone. For details, see " Telephone Buttons and Controls " in Chapter 2 or Chapter 3 .

Table 23 Possible Problems (continued)

Possible Problem	Suggested Solutions
On my NBX Business Telephone, all incoming internal calls come over my speaker phone.	You have the Hands Free Active on Intercom feature enabled. For details, see " Telephone Buttons and Controls " in Chapter 2 or Chapter 3 .
When I try to access the NBX NetSet utility, I do not get a response after I type the NBX system's IP address and press Enter .	Ask your administrator to verify the IP address that you typed into your web browser.
I am unable to log in to the NBX NetSet utility.	You must set up your voice mail before you can use the NBX NetSet utility. Press the MSG button. The prompts guide you through the setup. Then use your voice mail password to access the NBX NetSet utility. If you are on an analog telephone, see " Setting Up Your Password and Voice Mail for the First Time " in Chapter 1 .
My telephone is not forwarding my incoming calls to my voice mailbox.	In NBX NetSet > User Information > Call Forward , verify that you have selected Forward to Voice Mail as your call coverage point. For details, see " Setting Your Call Coverage Point " in Chapter 8 .
On my NBX Business Telephone, I added a One-Touch speed dial, but the telephone does not dial that number.	Use only numeric characters in your Speed Dial setup. For details, see " Special Case: One-Touch Speed Dials " in Chapter 7 .
I try to pick up a call ringing on another telephone using Directed Call Pickup, but it fails.	The telephone that you are using to pick up the call may not be in the same group as the telephone that is ringing and the telephone group to which the ringing telephone belongs does not allow nonmember pickup. See " Call Pickup " in Chapter 9 .
My telephone keeps ringing after I pick up the handset.	<ul style="list-style-type: none"> ■ Your telephone may have lost connection to the system immediately after a call came in. Remove the Ethernet cord from the jack, then re-insert it into the wall jack. ■ Wait a few seconds. If the telephone continues to ring, disconnect the electrical power for your telephone, and then plug it back in.
The display panel shows "Wait for NCP."	Your telephone may be disconnected from the system. Hang up your telephone and wait a few seconds. Then pick up the handset. If the message still appears on your telephone display panel, contact your administrator.

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```
//////////  
/  
/ NBX Dial Plan Configuration File  
/ Generated from machine V3000 192.168.1.190 owned by California Polytechnic State  
/ Generated on TUE NOV 08 13:12:43 2005  
/  
//////////  
  
/ First, delete all existing dialplan information  
  
Table Delete *  
DestinationRoute Delete *  
TimedRoute Delete *  
PreTranslator Delete *  
  
/ Now, create all dialplan information  
  
//////////  
/  
    Settings  
//////////  
  
ExtensionLength 3  
ExtensionRange Telephone      100 399  
ExtensionRange Park          600 619  
ExtensionRange AutoAttendant 500 599  
ExtensionRange HuntGroup     400 499  
ExtensionRange External       600 799  
//////////  
/ The ExtensionRange External Setting MUST include the Park range.  
/ If the Call Park range is outside of the ExtensionRange External,  
/ the Call Park feature will not work.  
//////////  
ExternalSettings 9 750 500  
  
//////////  
/  
    Dial Plan Tables  
//////////  
  
Table Create 1 Internal 3 Digit Extensions  
/           Id Entry   Digits      Min Max Class        Prio Route  
/  
-----  
TableEntry Create 1 1 0           1 1 Internal 0 4  
TableEntry Create 1 2 1           3 3 Internal 0 0  
TableEntry Create 1 3 2           3 3 Internal 0 0  
TableEntry Create 1 4 3           3 3 Internal 0 0  
TableEntry Create 1 5 4           3 3 Internal 0 0  
TableEntry Create 1 6 5           3 3 Internal 0 3  
TableEntry Create 1 8 6           3 3 Internal 0 0  
TableEntry Create 1 9 7           3 3 Diagnostics 0 0  
TableEntry Create 1 10 9          8 8 Local 0 1  
TableEntry Create 1 11 90         2 64 Operator 0 1  
TableEntry Create 1 12 901        4 64 International 0 1  
TableEntry Create 1 13 91         9 12 LongDistance 0 1  
TableEntry Create 1 20 9101       9 64 AlternateLong 0 1  
TableEntry Create 1 21 911        3 3 Emergency 0 2  
TableEntry Create 1 22 91888      12 12 TollFree 0 1  
TableEntry Create 1 23 91877      12 12 TollFree 0 1  
TableEntry Create 1 24 91866      12 12 TollFree 0 1  
TableEntry Create 1 25 91855      12 12 TollFree 0 1  
TableEntry Create 1 26 91900      12 12 Toll 0 1  
TableEntry Create 1 27 91976      12 12 Toll 0 1  
TableEntry Create 1 28 9911        4 4 Emergency 0 1  
TableEntry Create 1 29 9411        4 4 Operator 0 1  
TableEntry Create 1 30 9*          4 4 COCode 0 1  
TableEntry Create 1 31 8           8 8 Local 0 8  
TableEntry Create 1 32 8*          4 4 COCode 0 8
```

TableEntry	Create	1	33	919492313522	12	12	Other	0	9
TableEntry	Create	1	34	919492313554	12	12	Other	0	10
TableEntry	Create	1	35	919492313422	12	12	Other	0	11
TableEntry	Create	1	36	919492313426	12	12	Other	0	12
TableEntry	Create	1	37	919492313702	12	12	Other	0	13
TableEntry	Create	1	38	919492313704	12	12	Other	0	14
TableEntry	Create	1	39	919492313705	12	12	Other	0	15
TableEntry	Create	1	40	917147648090	12	12	Other	0	16
TableEntry	Create	1	41	918008625800	12	12	Other	0	17
TableEntry	Create	1	42	912138973656	12	12	Other	0	18
TableEntry	Create	1	43	919093834561	12	12	Other	0	19
TableEntry	Create	1	44	916196886785	12	12	Other	0	20
TableEntry	Create	1	45	918584673085	12	12	Other	0	21
TableEntry	Create	1	46	919499363400	12	12	Other	0	22
TableEntry	Create	1	47	919494542300	12	12	Other	0	23
TableEntry	Create	1	48	919499363555	12	12	Other	0	24
TableEntry	Create	1	49	919163242265	12	12	Other	0	25
TableEntry	Create	1	50	919496322648	12	12	Other	0	26
TableEntry	Create	1	51	917142457490	12	12	Other	0	27
TableEntry	Create	1	52	919494373732	12	12	Other	0	28
TableEntry	Create	1	53	919494502600	12	12	Other	0	29
TableEntry	Create	1	54	919494502564	12	12	Other	0	30
TableEntry	Create	1	55	919494502077	12	12	Other	0	31
TableEntry	Create	1	56	919494502659	12	12	Other	0	32
TableEntry	Create	1	57	919497244326	12	12	Other	0	33
TableEntry	Create	1	58	919494502365	12	12	Other	0	34
TableEntry	Create	1	59	919494502395	12	12	Other	0	35
TableEntry	Create	1	60	919494502380	12	12	Other	0	36
TableEntry	Create	1	61	919494502386	12	12	Other	0	37
TableEntry	Create	1	62	919494502387	12	12	Other	0	38
TableEntry	Create	1	63	919494502388	12	12	Other	0	39
TableEntry	Create	1	64	912134252800	12	12	Other	0	40
TableEntry	Create	1	65	917604307700	12	12	Other	0	41
TableEntry	Create	1	66	917604307777	12	12	Other	0	42
TableEntry	Create	1	67	917146287000	12	12	Other	0	43
TableEntry	Create	1	68	919497543400	12	12	Other	0	44
TableEntry	Create	1	69	917147651900	12	12	Other	0	45
TableEntry	Create	1	70	917149356848	12	12	Other	0	46
TableEntry	Create	1	71	917149907673	12	12	Other	0	47
TableEntry	Create	1	72	917145623901	12	12	Other	0	48
TableEntry	Create	1	73	919494501000	12	12	Other	0	49
TableEntry	Create	1	74	917147545252	12	12	Other	0	50
TableEntry	Create	1	75	915624312255	12	12	Other	0	51
TableEntry	Create	1	76	917145934485	12	12	Other	0	52
TableEntry	Create	1	77	917147386317	12	12	Other	0	53
TableEntry	Create	1	78	917147415704	12	12	Other	0	54
TableEntry	Create	1	79	919497231002	12	12	Other	0	55
TableEntry	Create	1	80	917149608811	12	12	Other	0	56
TableEntry	Create	1	81	919497247000	12	12	Other	0	57
TableEntry	Create	1	82	919494970701	12	12	Other	0	58
TableEntry	Create	1	83	915629059750	12	12	Other	0	59
TableEntry	Create	1	84	917145234552	12	12	Other	0	60
TableEntry	Create	1	85	919494356718	12	12	Other	0	61
TableEntry	Create	1	86	919496443681	12	12	Other	0	62
TableEntry	Create	1	87	917147447444	12	12	Other	0	63
TableEntry	Create	1	88	919495597888	12	12	Other	0	64
TableEntry	Create	1	89	917146477400	12	12	Other	0	65
TableEntry	Create	1	90	917147440400	12	12	Other	0	66
TableEntry	Create	1	91	917146474666	12	12	Other	0	67
TableEntry	Create	1	92	917149938164	12	12	Other	0	68
TableEntry	Create	1	93	917142458049	12	12	Other	0	69
TableEntry	Create	1	94	917145733200	12	12	Other	0	70
TableEntry	Create	1	95	917148983315	12	12	Other	0	71
TableEntry	Create	1	96	919494502400	12	12	Other	0	72
TableEntry	Create	1	97	919494503743	12	12	Other	0	73
TableEntry	Create	1	98	919494503722	12	12	Other	0	74

TableEntry Create	1	99	919494503744	12	12	Other	0	75
TableEntry Create	1	100	917142703324	12	12	Other	0	76
TableEntry Create	1	101	912136322353	12	12	Other	0	77
TableEntry Create	1	102	917143236830	12	12	Other	0	78
TableEntry Create	1	103	919494622205	12	12	Other	0	79
TableEntry Create	1	104	915623252352	12	12	Other	0	80
TableEntry Create	1	105	915627832346	12	12	Other	0	81
TableEntry Create	1	106	919492772964	12	12	Other	0	82
TableEntry Create	1	107	917144743793	12	12	Other	0	83
TableEntry Create	1	108	912138974600	12	12	Other	0	84
TableEntry Create	1	109	912132982902	12	12	Other	0	85
TableEntry Create	1	110	913108633368	12	12	Other	0	86
TableEntry Create	1	111	919498432398	12	12	Other	0	87
TableEntry Create	1	112	913236424400	12	12	Other	0	88
TableEntry Create	1	113	915624403925	12	12	Other	0	89
TableEntry Create	1	114	917142709870	12	12	Other	0	90
TableEntry Create	1	115	915623242962	12	12	Other	0	91
TableEntry Create	1	116	913105603400	12	12	Other	0	92
TableEntry Create	1	117	919492333453	12	12	Other	0	93
TableEntry Create	1	118	919492333466	12	12	Other	0	94
TableEntry Create	1	119	919492333457	12	12	Other	0	95
TableEntry Create	1	120	919492745355	12	12	Other	0	96
TableEntry Create	1	121	919498522832	12	12	Other	0	97
TableEntry Create	1	122	919492745303	12	12	Other	0	98
TableEntry Create	1	123	919492745323	12	12	Other	0	99

Table Create 2 Incoming DID and Auto Attendant

/	Id	Entry	Digits	Min	Max	Class	Prio	Route
/	--	--	--	--	--	--	--	--
TableEntry Create	2	1	0		1	1 Internal	0	4
TableEntry Create	2	2	1		3	3 Internal	0	0
TableEntry Create	2	3	2		3	3 Internal	0	0
TableEntry Create	2	4	3		3	3 Internal	0	0
TableEntry Create	2	5	4		3	3 Internal	0	0
TableEntry Create	2	6	5		3	3 Internal	0	3

Table Create 3 Least Cost Routing

/	Routes
/	/

/	Route	Description
/	--	--
DestinationRoute Create	1	LocalCO
DestinationRoute Create	2	LocalCONoStrip
DestinationRoute Create	3	Voice Application
DestinationRoute Create	4	Attendant
DestinationRoute Create	5	H323 ConneXtions Ports
DestinationRoute Create	8	8 Pool
DestinationRoute Create	9	District Director
DestinationRoute Create	10	DD Chief
DestinationRoute Create	11	Chief TM DTM
DestinationRoute Create	12	Chief CTM
DestinationRoute Create	13	HOV Toll Roads
DestinationRoute Create	14	Public Info
DestinationRoute Create	15	Truck Services
DestinationRoute Create	16	Anaheim TMC
DestinationRoute Create	17	CGM Fastrack
DestinationRoute Create	18	District 7 TMC
DestinationRoute Create	19	District 8 TMC CHP
DestinationRoute Create	20	District 11 TMC
DestinationRoute Create	21	District 11 CHP
DestinationRoute Create	22	District 12 TMC

DestinationRoute Create	23 District 12 CHP
DestinationRoute Create	24 District 12 COMM
DestinationRoute Create	25 HQ Communications
DestinationRoute Create	26 John Wayne Airport
DestinationRoute Create	27 Santa Ana CHP Dispatch
DestinationRoute Create	28 Sheriffs SubStation
DestinationRoute Create	29 Local Caltrans Dispatch Maintena
DestinationRoute Create	30 Local Front Desk Bldg Security
DestinationRoute Create	31 Construction Help Line
DestinationRoute Create	32 [Blank]
DestinationRoute Create	33 [Blank]
DestinationRoute Create	34 Local CHP LT Commander
DestinationRoute Create	35 Local CHP CO Supervisor
DestinationRoute Create	36 Local CHP Dispatch
DestinationRoute Create	37 Local CHP Green Radio
DestinationRoute Create	38 Local CHP Gray Radio
DestinationRoute Create	39 Local CHP FSP Radio
DestinationRoute Create	40 Media Page Toll Roads
DestinationRoute Create	41 San Onofre NB
DestinationRoute Create	42 San Onofre SB
DestinationRoute Create	43 County Wide Control
DestinationRoute Create	44 Transportation Corridor Agency
DestinationRoute Create	45 Anaheim Police Department
DestinationRoute Create	46 Animal Control
DestinationRoute Create	47 Brea Yorba Linda Police
DestinationRoute Create	48 Buena Park Police Department
DestinationRoute Create	49 Technical Support
DestinationRoute Create	50 Costa Mesa Police
DestinationRoute Create	51 [Blank]
DestinationRoute Create	52 Fountain Valley Police
DestinationRoute Create	53 Fullerton PD
DestinationRoute Create	54 [Blank]
DestinationRoute Create	55 [Blank]
DestinationRoute Create	56 Huntington Beach PD
DestinationRoute Create	57 Irvine PD
DestinationRoute Create	58 Laguna Beach PD
DestinationRoute Create	59 Callback Phone 01
DestinationRoute Create	60 Callback Phone 02
DestinationRoute Create	61 Callback Phone 03
DestinationRoute Create	62 Newport Beach PD
DestinationRoute Create	63 Orange PD
DestinationRoute Create	64 Orange County CHP
DestinationRoute Create	65 Orange County Coroner
DestinationRoute Create	66 Orange County Fire Authority
DestinationRoute Create	67 Orange County Sheriff Dept
DestinationRoute Create	68 Placentia PD
DestinationRoute Create	69 Santa Ana PD
DestinationRoute Create	70 Tustin PD
DestinationRoute Create	71 Westminster PD
DestinationRoute Create	72 Caltrans TMC
DestinationRoute Create	73 Sam Davies TMT Leader
DestinationRoute Create	74 Leslie Adams TMT Leader
DestinationRoute Create	75 Chris Stevenson TMT Leader
DestinationRoute Create	76 Dakota Crew KCOW Radio
DestinationRoute Create	77 Monica Stevens KCLY Radio
DestinationRoute Create	78 Bill Bradley KCTR Radio
DestinationRoute Create	79 Alex Harmon KJOK Radio
DestinationRoute Create	80 Lee Rogers KLNW Radio
DestinationRoute Create	81 John Sinclair KNIN Radio
DestinationRoute Create	82 Kim Williamson KRST Radio
DestinationRoute Create	83 Tom Webb KSON Radio
DestinationRoute Create	84 Jordan Bradley KTCR Radio
DestinationRoute Create	85 Jim Sanso KTAK Radio
DestinationRoute Create	86 Bill Rasmussen KTRC Radio
DestinationRoute Create	87 Fred Masterson KTRC Radio
DestinationRoute Create	88 Chris Rasmussen KWIT Radio

DestinationRoute Create	89	Cameron Stevens KCLY Channel 2
DestinationRoute Create	90	Fred Roppel KNOW TV 3
DestinationRoute Create	91	Terry Webb KTSV Channel 11
DestinationRoute Create	92	Andy Philco KTTQ TV
DestinationRoute Create	93	HAR I5 at Harbor
DestinationRoute Create	94	HAR I5 at Junipero Serra
DestinationRoute Create	95	HAR 55 at Edinger
DestinationRoute Create	96	Jamie Carter TMT Truck
DestinationRoute Create	97	Chris Hart TMT Truck
DestinationRoute Create	98	Mike Mueller TMT Truck
DestinationRoute Create	99	David Rogers TMT Truck

/	Route	Entry	DestinationExtension
/	-----	-----	-----
DestinationRouteEntry Create	1	1	*0001
DestinationRouteEntry Create	1	2	*0002
DestinationRouteEntry Create	2	1	*0001
DestinationRouteEntry Create	2	2	*0002
DestinationRouteEntry Create	3	1	*0003
DestinationRouteEntry Create	4	1	*0004
DestinationRouteEntry Create	5	1	*0005
DestinationRouteEntry Create	8	1	*0008
DestinationRouteEntry Create	9	1	400
DestinationRouteEntry Create	10	1	401
DestinationRouteEntry Create	11	1	402
DestinationRouteEntry Create	12	1	403
DestinationRouteEntry Create	13	1	404
DestinationRouteEntry Create	14	1	405
DestinationRouteEntry Create	15	1	406
DestinationRouteEntry Create	16	1	407
DestinationRouteEntry Create	17	1	408
DestinationRouteEntry Create	18	1	409
DestinationRouteEntry Create	19	1	410
DestinationRouteEntry Create	20	1	411
DestinationRouteEntry Create	21	1	412
DestinationRouteEntry Create	22	1	413
DestinationRouteEntry Create	23	1	414
DestinationRouteEntry Create	24	1	415
DestinationRouteEntry Create	25	1	416
DestinationRouteEntry Create	26	1	417
DestinationRouteEntry Create	27	1	418
DestinationRouteEntry Create	28	1	419
DestinationRouteEntry Create	29	1	420
DestinationRouteEntry Create	30	1	421
DestinationRouteEntry Create	31	1	422
DestinationRouteEntry Create	32	1	423
DestinationRouteEntry Create	33	1	424
DestinationRouteEntry Create	34	1	425
DestinationRouteEntry Create	35	1	426
DestinationRouteEntry Create	36	1	427
DestinationRouteEntry Create	37	1	428
DestinationRouteEntry Create	38	1	429
DestinationRouteEntry Create	39	1	430
DestinationRouteEntry Create	40	1	431
DestinationRouteEntry Create	41	1	432
DestinationRouteEntry Create	42	1	433
DestinationRouteEntry Create	43	1	434
DestinationRouteEntry Create	44	1	435
DestinationRouteEntry Create	45	1	436
DestinationRouteEntry Create	46	1	437
DestinationRouteEntry Create	47	1	438
DestinationRouteEntry Create	48	1	439
DestinationRouteEntry Create	49	1	440
DestinationRouteEntry Create	50	1	441

DestinationRouteEntry Create	51	1	442
DestinationRouteEntry Create	52	1	443
DestinationRouteEntry Create	53	1	444
DestinationRouteEntry Create	54	1	445
DestinationRouteEntry Create	55	1	446
DestinationRouteEntry Create	56	1	447
DestinationRouteEntry Create	57	1	448
DestinationRouteEntry Create	58	1	449
DestinationRouteEntry Create	59	1	450
DestinationRouteEntry Create	60	1	451
DestinationRouteEntry Create	61	1	452
DestinationRouteEntry Create	62	1	453
DestinationRouteEntry Create	63	1	454
DestinationRouteEntry Create	64	1	455
DestinationRouteEntry Create	65	1	456
DestinationRouteEntry Create	66	1	457
DestinationRouteEntry Create	67	1	458
DestinationRouteEntry Create	68	1	459
DestinationRouteEntry Create	69	1	460
DestinationRouteEntry Create	70	1	461
DestinationRouteEntry Create	71	1	462
DestinationRouteEntry Create	72	1	463
DestinationRouteEntry Create	73	1	464
DestinationRouteEntry Create	74	1	465
DestinationRouteEntry Create	75	1	466
DestinationRouteEntry Create	76	1	467
DestinationRouteEntry Create	77	1	468
DestinationRouteEntry Create	78	1	469
DestinationRouteEntry Create	79	1	470
DestinationRouteEntry Create	80	1	471
DestinationRouteEntry Create	81	1	472
DestinationRouteEntry Create	82	1	473
DestinationRouteEntry Create	83	1	474
DestinationRouteEntry Create	84	1	475
DestinationRouteEntry Create	85	1	476
DestinationRouteEntry Create	86	1	477
DestinationRouteEntry Create	87	1	478
DestinationRouteEntry Create	88	1	479
DestinationRouteEntry Create	89	1	480
DestinationRouteEntry Create	90	1	481
DestinationRouteEntry Create	91	1	482
DestinationRouteEntry Create	92	1	483
DestinationRouteEntry Create	93	1	484
DestinationRouteEntry Create	94	1	484
DestinationRouteEntry Create	95	1	484
DestinationRouteEntry Create	96	1	485
DestinationRouteEntry Create	97	1	486
DestinationRouteEntry Create	98	1	487
DestinationRouteEntry Create	99	1	488

/	Route	Entry	OperId	Operation	Value
/	-----	-----	-----	-----	-----
DestinationRouteOperation Create	1	1	1	stripLead	1
DestinationRouteOperation Create	1	2	1	stripLead	1
DestinationRouteOperation Create	8	1	1	stripLead	1

//////////
 / Pretranslators
 //

PreTranslator Create	1	4Digit DDI	3Digit Internal	
/		PreTransId	Entry	Digits
/		-----	-----	-----
PreTranslatorEntry Create	1	1	1	1

```

PreTranslatorEntry Create      1      2 2
PreTranslatorEntry Create      1      3 3
PreTranslatorEntry Create      1      4 4
PreTranslatorEntry Create      1      5 5
PreTranslatorEntry Create      1      6 6
PreTranslatorEntry Create      1      7 7
PreTranslatorEntry Create      1      8 8
PreTranslatorEntry Create      1      9 9
PreTranslatorEntry Create      1     10 0

```

```

/
/          PreTransId Entry OperId Operation  Value
/----- -----
PreTranslatorOperation Create   1      1      1 stripLead 1
PreTranslatorOperation Create   1      2      1 stripLead 1
PreTranslatorOperation Create   1      3      1 stripLead 1
PreTranslatorOperation Create   1      4      1 stripLead 1
PreTranslatorOperation Create   1      5      1 stripLead 1
PreTranslatorOperation Create   1      6      1 stripLead 1
PreTranslatorOperation Create   1      7      1 stripLead 1
PreTranslatorOperation Create   1      8      1 stripLead 1
PreTranslatorOperation Create   1      9      1 stripLead 1
PreTranslatorOperation Create   1     10      1 stripLead 1

```

```
/ End of configuration
```

```

///////////////////////////////
/ Configuration file command syntax guide:
/   Table Create {nTableId} {szDescription}
/   Table Delete {nTableId}
/   TableEntry Create {nTableId} {nEntryId} {szDigits}
/           {nMinDigits} {nMaxDigits} {szCallClass}
/           {nPriorty} {nRouteId}
/   TableEntry Delete {nTableId} {nEntryId}
/   DestinationRoute Create {nRouteId} {szDescription}
/   DestinationRoute Delete {nRouteId}
/   DestinationRouteEntry Create {nRouteId} {nEntryId} {szExtension}
/   DestinationRouteEntry Delete {nRouteId} {nEntryId}
/   DestinationRouteOperation Create {nRouteId} {nEntryId} {nOperId}
/           {szOperation} {szValue}
/   DestinationRouteOperation Delete {nRouteId} {nEntryId} {nOperId}
/   TimedRoute Create {nRouteId} {nDefaultDestinationRouteId} {szDescription}
/   TimedRoute Delete {nRouteId}
/   TimedRouteEntry Create {nRouteId} {nEntryId} {szStartTime} {szEndTime}
/           {szDaysOfWeek} {nDestinationRouteId}
/   TimedRouteEntry Delete {nRouteId} {nEntryId}
/   TimedRouteOperation Create {nRouteId} {nEntryId} {nOperId}
/           {szOperation} {szValue}
/   TimedRouteOperation Delete {nRouteId} {nEntryId} {nOperId}
/   PreTranslator Create {nPreTranslatorId} {szDescription}
/   PreTranslator Delete {nPreTranslatorId}
/   PreTranslatorEntry Create {nPreTranslatorId} {nEntryId} {szDigits}
/   PreTranslatorEntry Delete {nPreTranslatorId} {nEntryId}
/   PreTranslatorOperation Create {nPreTranslatorId} {nEntryId} {nOperId}
/           {szOperation} {szValue}
/   PreTranslatorOperation Delete {nPreTranslatorId} {nEntryId} {nOperId}
/   PreTranslatorISDNNumberType {nPreTranslatorId} {nISDNNumberType}
/   ExtensionLength {nExtensionLength}
/   ExtensionRange {szExtensionType} {szLowestExtension} {szHighestExtension}
/   ExternalSettings {szExternalKeysetPrefix} {szFirstAutoDiscoverExtension}
/           {szDefaultAutoExtension}
/ Notes: 1. Each command must be entered on one line.
/        2. Commands are case insensitive.
/        3. Tabs and spaces are ignored except in szDescription arguments.
/        4. The {} shown enclosing command argument names should not

```

```
/      be included in commands.  
/  
/      5. Command arguments beginning with n must be numbers.  
/  
/      6. Command arguments beginning with sz are strings.  
/  
/      7. nTableId 1 is the default Internal 3 digit dial plan table.  
/  
/      8. nTableId 2 is the default Incoming 3 digit dial plan table.  
/  
/      9. nTableId 3 is the default LCR dial plan table. (If used the  
/  
/          LCR table is checked first, if no entry exists, string is then  
/  
/          run through the associated internal dial plan.  
/  
/      10. szExtension *0001 is the default Line Card Port extension list  
/  
/      11. szExtension *0002 is the default T1 extension list  
/  
/      12. szExtension *0003 is the default Voicemail extension list  
/  
/      13. szExtension *0004 is the default Attendant extension list  
/  
/          (The lowest telephone extension that is Auto-discovered will  
/  
/              populate)  
/  
/      14. szExtension *0005 is the default H323 extension list  
/  
/      15. szExtension *0008 is the default 8 Pool extension list  
/  
/          (for backward compatibility, 8 Pool from R1.x upgrades)  
/  
/      16. szOperation can be: stripLead stripTrail replace prepend append  
/  
/      17. szCallClass can be: Internal Local LongDistance International WAN  
/  
/                      TollFree Emergency COCode Other Wireless Toll  
/  
/                      AlternateLong Operator TrunkToTrunk Diagnostics  
/  
/                      NotAllowed  
/  
/      18. route 0 always means look up internal device by extension  
/  
/      19. szStartTime and szEndTime are military time 00:00 through 23:59  
/  
/      20. szStartTime and szEndTime can be: open closed lunch other  
/  
/          (if specifying a system mode, both must be the same mode)  
/  
/      21. szExtensionType can be: telephone, park, autoAttendant, huntGroup,  
/  
/                      external, page  
/  
/      22. nISDNNumberType types for ETSI are as follows: (0, default) unknown;  
/  
/          (1) international; (2) national; (3) network; (4) subscriber  
//////////
```

TMC SIMULATOR PHONE LIST

Technical Support (949) 450-1000

TMC Extensions

ATMS #1	Ext. #201
ATMS #2	Ext. #203
MIO	Ext. #202
Radio Dispatch	Ext. #204

Management

District Director	(949) 231-3522
DD Chief	(949) 231-3554
Chief TM / DTM	(949) 231-3422
Chief CTM	(949) 231-3426
HOV / Toll Roads	(949) 231-3702
Public Info	(949) 231-3704
Truck Services	(949) 231-3705

District Offices

Anaheim TMC	(714) 764-8090
CGM (Fastrack)	(800) 862-5800
District 7 TMC	(213) 897-3656
District 8 TMC / CHP	(909) 383-4561
District 11 TMC	(619) 688-6785
District 11 CHP	(858) 467-3085
District 12 TMC	(949) 936-3400
District 12 CHP	(949) 454-2300
District 12 COMM	(949) 936-3555
HQ Communications	(916) 324-2265
John Wayne Airport	(949) 632-2648

Santa Ana CHP Dispatch	(714) 245-7490
Sheriff's Sub-Station	(949) 437-3732

Local Caltrans

Dispatch Maintenance	(949) 450-2600
Caltrans TMC	(949) 450-2400
Front Desk (Bldg. Security)	(949) 450-2564
Construction Help Line	(949) 450-2077
DOT Chief	(949) 450-2659
District Director	(949) 724-4326

Local CHP

LT Commander	(949) 450-2365
CO Supervisor	(949) 450-2395
CAD	(949) 450-2380
Green Radio	(949) 450-2386
Gray Radio	(949) 450-2387
FSP Radio	(949) 450-2388

TMT Operators

Sam Davies	(949) 450-3743
Leslie Adams	(949) 450-3722
Chris Stevenson	(949) 450-3744

Miscellaneous Numbers

Toll Roads (Media Page)	(213) 425-2800
San Onofre N/B	(760) 430-7700
Sam Onofre S/B	(760) 430-7777
County-Wide Control	(714) 628-7000
Transportation Corridor Agency	(949) 754-3400

Allied Agencies

Anaheim PD	(714) 765-1900
Animal Control	(714) 935-6848
Brea / Yorba Linda PD	(714) 990-7673
Buena Park PD	(714) 562-3901
Cal State Fullerton PD	(714) 278-2515
Costa Mesa PD	(714) 754-5252
Cypress PD	(562) 431-2255
Fountain Valley PD	(714) 593-4485
Fullerton PD	(714) 738-6317
Garden Grove PD	(714) 741-5704
Harbor Patrol NPTB	(949) 723-1002
Huntington Beach PD	(714) 960-8811
Irvine PD	(949) 724-7000
Laguna Beach PD	(949) 497-0701
La Habra PD	(562) 905-9750
La Palma PD	(714) 523-4552
Long Beach PD	(562) 435-6718
Newport Beach PD	(949) 644-3681
Orange PD	(714) 744-7444
Orange County CHP	(949) 559-7888
Orange County Coroner	(714) 647-7400
Orange County Fire Authority	(714) 744-0400
Orange County Sheriff Dept.	(714) 647-4666
Placentia PD	(714) 993-8164
Santa Ana PD	(714) 245-8049
Tustin PD	(714) 573-3200
Westminster PD	(714) 898-3315

Radio Stations

KCOW Radio (Dakota Crew)	(714) 270-3324
--------------------------	----------------

KCLY Radio (Monica Stevens)	(213) 632-2353
KCTR Radio (Bill Bradley)	(714) 323-6830
KJOK Radio (Alex Harmon)	(949) 462-2205
KLNW Radio (Tim Rogers)	(562) 325-2352
KNIN Radio (John Sinclair)	(562) 783-2346
KRST Radio (Kim Williamson)	(949) 277-2964
KSON Radio (Tom Webb)	(714) 474-3793
KTCR Radio (Jordan Bradley)	(213) 897-4600
KTAK Radio (Jim Sanso)	(213) 298-2902
KTRC Radio (Bill Rasmussen)	(310) 863-3368
KTRC Radio (Fred Masterson)	(949) 843-2398
KWIT Radio (Chris Rasmuessian)	(323) 642-4400

Television Stations

KCLY Channel 2 (Cameron Stevens)	(562) 440-3925
KNOW TV 3 (Fred Roppel)	(714) 270-9870
KTSV Channel 11 (Terry Webb)	(562) 324-2962
KTQ TV (Art Philco)	(310) 560-3400

Highway Advisory Radios

I5 @ Harbor	(949) 233-3453
I5 @ Junipero Serra	(949) 233-3466
55 @ Edinger	(949) 233-3457

APPENDIX B

Video System



ETS Installation Guide

**For ETS4P, ETS8P, ETS16P, ETS16PR, ETS32PR,
and ETS422PR Multiport Device Servers**

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The revision date for this manual is **August 2003**

Part Number: 900-194
Rev. C

WARNING

This product has been designed 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 such interference when operating in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy, and if not installed and used in accordance with this guide, may cause harmful interference to radio communications.

Operation of this equipment in a residential area is likely to cause interference in which case the user, at his or her own expense, will be required to take whatever measures may be required to correct the interference.

Changes or modifications to this device not explicitly approved by Lantronix will void the user's authority to operate this device.

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1: Introduction

The Lantronix ETSs (ETS4P, ETS8P, ETS16P, ETS16PR, ETS32PR, and ETS422PR) are multi-port device servers that provide shared network access to terminals, devices, console ports, and printers for a variety of network protocols and operating systems. The ETS supports the TCP/IP, IPX (NetWare), Local Area Transport (LAT), AppleTalk (EtherTalk), and Microsoft LAN Manager protocols.

Note: *In this manual, all ETS servers will be referred to as “the ETS” unless a distinction needs to be made between models.*

The ETS stores its executable software in Flash (rewritable) ROM, meaning that it does not have to download software from a host each time it boots. Software must only be downloaded when a new software version becomes available. See *Appendix D* for more information.

1.1 Supported Serial Protocols

The ETS models support the RS-423/232 serial protocol, and the ETS422PR supports the RS-422 serial protocol.

1.1.1 RS-232

The RS-232 line interface standard is a single-ended peer-to-peer interface. Today's personal computers typically have at least one RS-232 serial port. It is the most common serial protocol used today.

RS-232 is used for connecting devices across short distances, at speeds up to 230.4 kb/s. Faster speeds require shorter cabling to ensure error-free communications. The maximum cable length at a given speed is determined by many factors, including the immediate electrical environment and the quality of cable used, but is usually less than 15 meters at high speeds.

1.1.2 RS-423

All of the ETS models support the RS-423 line interface standard. RS-423 devices are interoperable with RS-232 devices. That is, RS-232 ports can receive data reliably from RS-423 ports and vice-versa.

The main difference between RS-423 and RS-232 is that RS-423 employs lower voltage signaling and differential receivers. RS-423 still uses single-ended transmitters for compatibility with RS-232 receivers.

RS-423 is generally rated at higher speeds over longer cabling runs than RS-232. Maximum data rates of 230.4 kb/s are possible on ETS-PR models, and 115.2 kb/s is the maximum on ETS-P models.

1.1.3 RS-422

The ETS422PR supports RS-422 on all of its ports. RS-422 is different from RS-232 or RS-423 in that it is a differential or balanced line interface standard. It is designed for longer cabling distances (approaching 4,000 feet) in noisier electrical environments, and it can be used in multi-drop networks with one driver and up to ten receivers.

The maximum speed of ETS422PR RS-422 ports is 230.4 kb/s, but this rate can be sustained over longer cable runs than possible on RS-232 or RS-423 connections.

1.2 How to Use This Manual

This guide is structured as follows:

- ◆ Chapter 2, *Installation* explains how to physically install the ETS.
- ◆ Chapter 3, *Getting Started* explains the minimum configuration needed.
- ◆ Chapter 4, *Using the MPS* explains some of the ways that you can use your ETS.
- ◆ Chapters 5 through 9 cover protocol-specific setup needed to install print queues and otherwise use the ETS.
 - Chapter 5, *TCP/IP Configuration*
 - Chapter 6, *NetWare Configuration*
 - Chapter 7, *LAT Configuration*
 - Chapter 8, *AppleTalk Configuration*
 - Chapter 9, *DLC Configuration for LAN Manager*
- ◆ Appendices A through F provide supplementary information.
 - Appendix A, *Contact Information*
 - Appendix B, *Troubleshooting*
 - Appendix C, *Pinouts*
 - Appendix D, *Updating Software*
 - Appendix E, *Specifications*
 - Appendix F, *Frequently-used Commands*

Read chapters 2 through 4 in order, then proceed to the protocol-specific chapter that relates to your network. Refer to Appendix F often. The *Device Server Reference Manual*, located on the CD-ROM and web site, provides additional information about configuring and using your ETS.

2: Installation

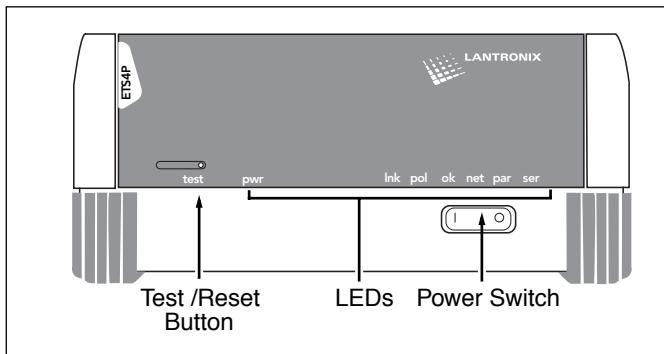
This chapter describes the various ETS models and shows how to install them into a basic network situation. The ETS-P models will be explained first. For ETS-PR descriptions and installation instructions, skip to Section 2.3.

2.1 ETSP Product Descriptions

2.1.1 ETSP Front Panels

The front panel of all ETSP models has a Test/Reset button (called Test/Reset on the ETS4P and simply Reset on the ETS8P and ETS16P), seven LEDs, and a power switch. Pressing the Reset button for 5 seconds while the unit powers up will flush NVR. Pressing the ETS4P Test button during operation will generate a status page on any parallel port that appears to be connected to a printer.

Figure 2-1: ETSP Front Panels



Note: The ETS8P is slightly shorter than the ETS4P (pictured above) and ETS16P.

2.1.2 ETS4P LEDs

The seven LEDs are explained in the following table.

Table 2-1: ETS4P LED Functionality

LED	Function
PWR	Lights to indicate the ETS has power
LNK	Lights to indicate a functional 10BASE-T network link
POL	Lights to indicate a swapped 10BASE-T cable
OK	Blinks to indicate that the ETS is functioning properly.
NET	Blinks to indicate Ethernet activity.
PAR	Blinks periodically to indicate parallel characters entering and exiting the ETS.
SER	Blinks periodically to indicate serial characters entering and exiting the ETS.

2.1.3 ETS8P/ETS16P LEDs

The seven LEDs are explained in the following table.

Table 2-2: ETS8P/ETS16P LED Functionality

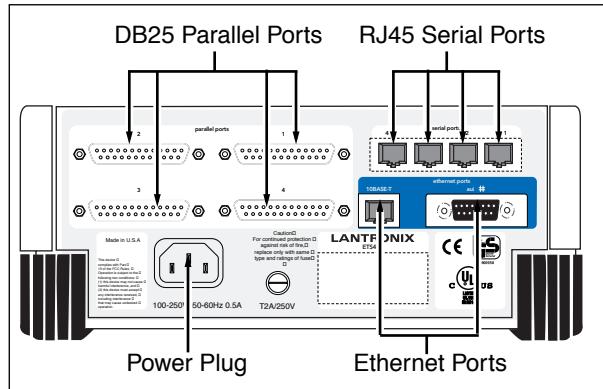
LED	Function
PWR	Lights to indicate the ETS has power
LNK	Lights to indicate a functional 10BASE-T network link
POL	Lights to indicate a swapped 10BASE-T cable
OK	Blinks to indicate that the ETS is functioning properly.
NET	Blinks to indicate Ethernet activity.
RCV	Blinks periodically to indicate serial characters entering the ETS.
XMT	Blinks periodically to indicate serial characters exiting the ETS.

2.1.4 ETS4P Back Panel

The back panel of the ETS4P has a power plug, an AUI Ethernet port, an RJ45 10BASE-T Ethernet port, four DB25 parallel ports, and four RJ45 serial ports.

Note: *The Centronics parallel ports on the back of the ETS4P are compatible with the Hewlett Packard Bitronics interface, which allows bi-directional communication on a parallel port.*

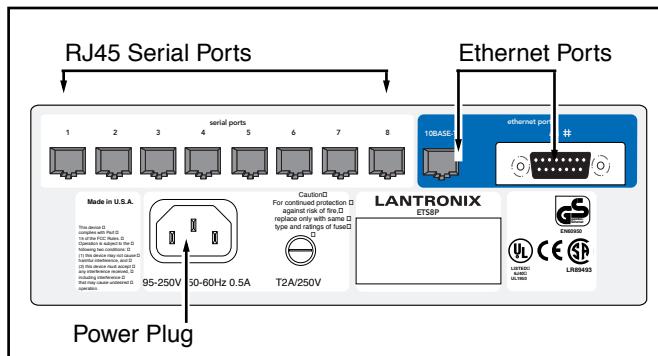
Figure 2-2: ETS4P Back Panel



2.1.5 ETS8P Back Panel

The back panel of the ETS8P has a power plug, an AUI Ethernet port, an RJ45 10BASE-T Ethernet port, and 8 RJ45 serial ports.

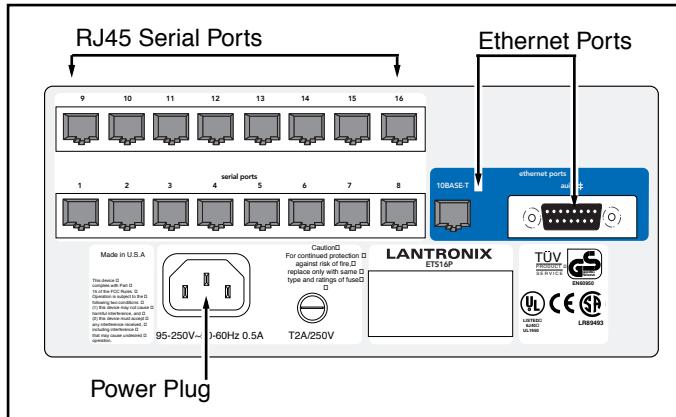
Figure 2-3: ETS8P and ETS16P Back Panels



2.1.6 ETS16P Back Panel

The back panel of the ETS16P has a power plug, an AUI Ethernet port, an RJ45 10BASE-T Ethernet port, and 16 RJ45 serial ports.

Figure 2-4: ETS16P Back Panel



2.2 Installing the ETSP

The following two diagrams shows properly-installed ETSP servers.

Figure 2-5: Sample ETS4P Network Layout

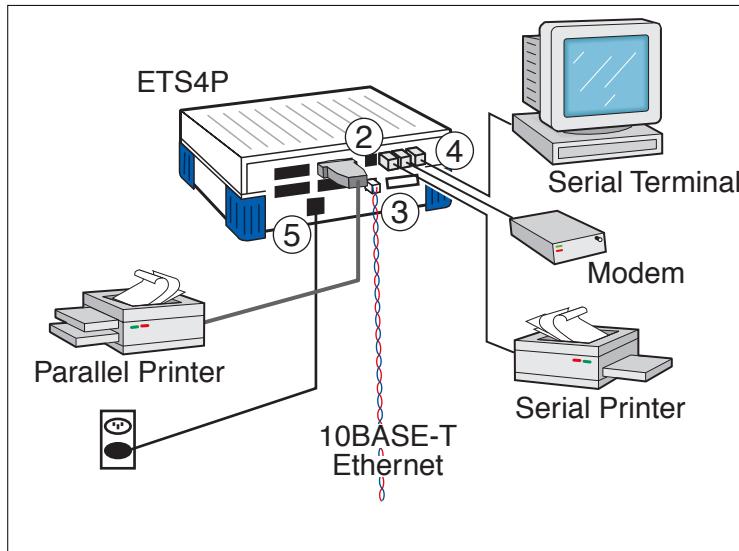
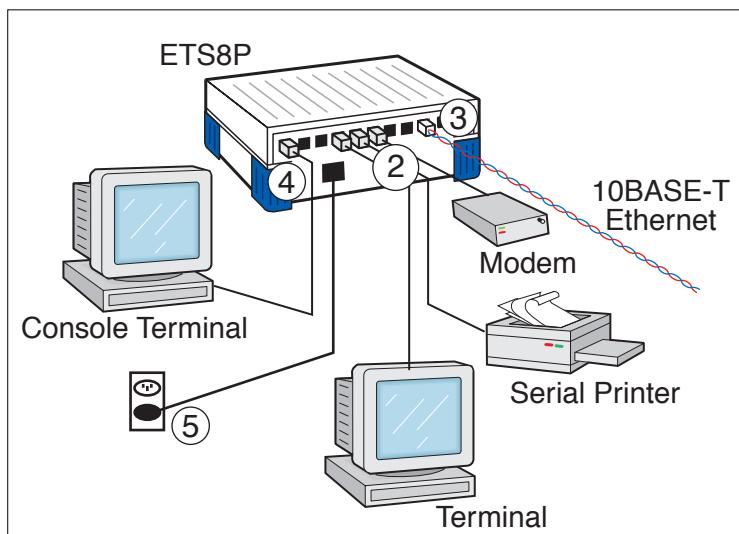


Figure 2-6: Sample ETS8P/ETS16P Network Layout (ETS8P pictured)



To install the ETS, complete the following steps in order. Refer to the numbers in the previous figure.

1 Select a location for the ETS.

When choosing a location, keep in mind the environmental restrictions discussed in Appendix E, *Specifications*.

- 2** Connect one or more serial and/or parallel devices to the ETS, as appropriate. See Appendix C, *Pinouts*, for information on what kinds of device attachments the ETS supports.
- 3** Connect an Ethernet cable to **either** the 10BASE-T port (shown) **or** a transciever connected to the AUI port.

The ETS will boot without a valid Ethernet connection, but it will pause to print a message asking if you want to stop at the Boot> prompt. If you do not respond to this message, it will wait for 10 seconds and then finish booting.

- 4** If desired, connect a terminal to the ETS console port (port 1). This will enable you to receive diagnostic and initial configuration messages.

Note: *The default serial port settings are 9600 baud, 8 bit characters, and no parity. Refer to Appendix C for more information.*

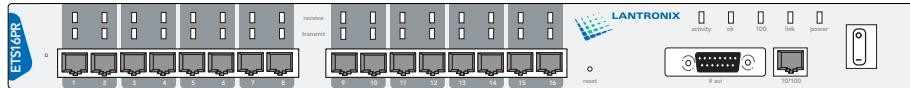
- 5** Attach one end of the power cable to the ETS and plug the other end into an electrical outlet.
- 6** Flip the power switch to turn the unit ON. The ETS will go through two steps to begin normal operation:
- A** It runs through a set of power-up diagnostics for approximately 12 seconds. The LEDs show varying patterns corresponding to the tests being run.
 - B** It tries to obtain TCP/IP configuration information via DHCP, BOOTP, and RARP. This may take as long as 15 seconds if no hosts answer the requests. During this step, the OK LED blinks approximately 3 times per second and the NET LED blinks occasionally.
- 7** Install EZWebCon on your 32-bit Windows PC, Apple Macintosh, or Solaris computer. The EZWebCon software is located on the distribution CD-ROM.

2.3 ETSPR Product Descriptions

2.3.1 ETS16PR Front Panel

The ETS16PR has 16 RJ45 serial ports, a Reset button, an AUI Ethernet port, an RJ45 Ethernet port for 10/100BASE-T, several LEDs, and a power switch.

Figure 2-7: ETS16PR Front Panel

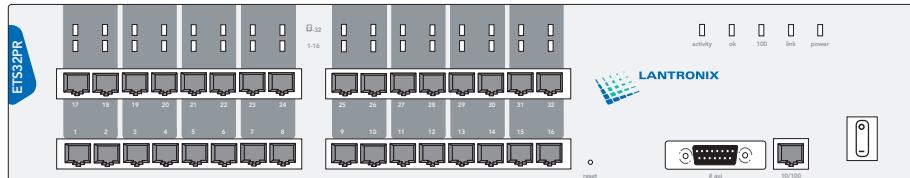


Note: *The first RJ45 port is also the serial console port; however, in most situations connecting a terminal to this port will not be necessary.*

2.3.2 ETS32PR Front Panel

The ETS32PR has 32 RJ45 serial ports, a Reset button, an AUI Ethernet port, an RJ45 Ethernet port for 10/100BASE-T, several LEDs, and a power switch.

Figure 2-8: ETS32PR Front Panel

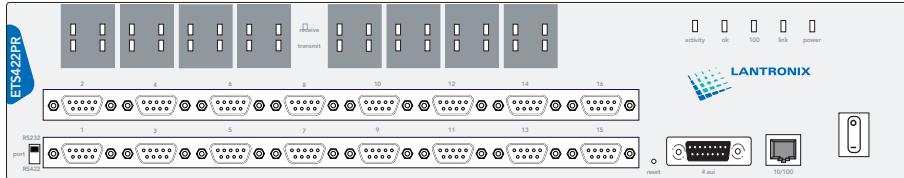


Note: *The first RJ45 port is also the serial console port; however, in most situations connecting a terminal to this port will not be necessary.*

2.3.3 ETS422PR Front Panel

The ETS422PR has 16 DB9 serial ports, a Reset button, an AUI Ethernet port, an RJ45 10/100BASE-T Ethernet port, several LEDs, and a power switch. In addition, port 1 includes a switch to set the port for RS-422 or RS-232 mode.

Figure 2-9: ETS422PR Front Panel



Note: *The first DB9 port is also the serial console port.*

2.3.4 ETSPR LEDs

Each ETSPR has 37 LEDs. Each serial port has one (ETS32PR) or two (ETS16PR and ETS422PR) corresponding LEDs that indicate receive and transmit activity. There are also five LEDs on the right side of the case. Their functionality is shown in Table 2-3.

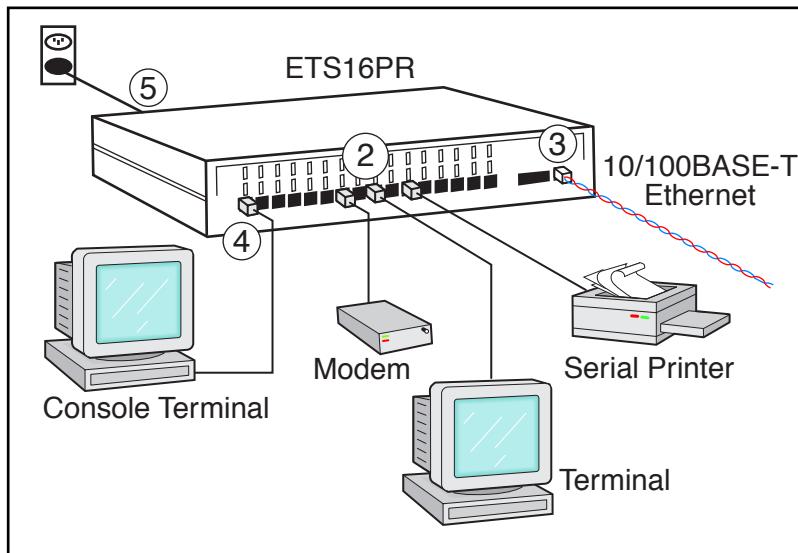
Table 2-3: ETSPR Port LED Functionality

LED	Function
activity	Blinks to indicate Ethernet activity.
ok	Blinks to indicate that the ETS is functioning properly.
100	Lights to indicate a 100BASE-T rather than 10BASE-T Ethernet link
link	Lights to indicate a functional Ethernet network link
power	Lights to indicate the ETS has power

2.4 Installing the ETSPR

The following diagram shows a properly-installed ETS16PR. Installation will generally be the same for all ETSPR models, the only difference being the type of serial ports available. See *ETSPR Product Descriptions* on page 2-7 for more information.

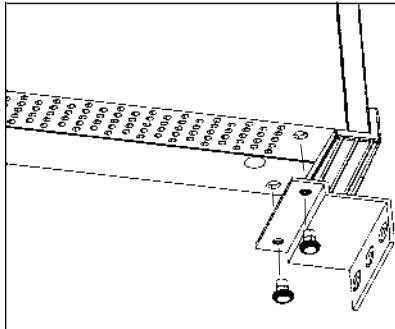
Figure 2-10: Sample ETSPR Network Layout (ETS16PR shown)



To install the ETS, complete the following steps in order.

- 1 Attach the two rack mount brackets to your ETS and attach your bracketed ETS to your rack. The brackets should go on both front corners **or** both rear corners. (This is only necessary if you would like to mount the unit on a rack.)

Figure 2-11: Rack Mount Bracket Installation



2.5 Was the Installation Successful?

If the ETS appears to be working and the unit is connected to the network, there are a couple of ways to confirm that the unit is visible to network hosts:

- ◆ If the ETS has an IP address, ping it from a TCP/IP host.
- ◆ If the ETS has an IP address, use EZWebCon to log into the ETS.
- ◆ If the ETS does not have an IP address, assign one by following the instructions in Section 5.1 on page 5-1.

When you are satisfied that the ETS is working properly, proceed to Chapter 3, *Getting Started*. If the ETS does not boot properly, see Appendix B, *Troubleshooting*.

3: Getting Started

It is important to consider the following points before logging into and configuring the ETS:

- ◆ You must configure the ETS IP address before any TCP/IP functionality is available. (See *Setting the IP Address* on page 5-1) You cannot use the ThinWeb Manager until you have configured an IP address.
- ◆ Changing any server, service, or port setting requires privileged user status. The default privileged password is **system**.
- ◆ The login password is required for remote console logins. The default login password is **access**.

Note: *If you would like to change either the privileged or login password, either use EZWebCon or refer to the Device Server Reference Manual located on the CD-ROM.*

3.1 Configuration Methods

3.1.1 EZWebCon

The EZWebCon configuration software is the recommended way to configure the ETS. EZWebCon's graphical user interface guides first time users through the initial configuration process and allows experienced users to update any configurable parameters.

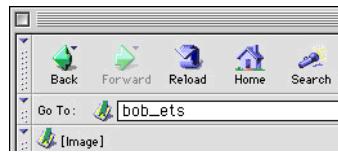
EZWebCon requires a Java Virtual Machine (JVM) on the client. Lantronix provides JVM installers for Solaris and 32-bit Windows users, as well as source code and instructions for compiling it for use on other systems.

The EZWebCon software is located on the distribution CD-ROM. All instructions for installing EZWebCon are provided in the README file. For assistance once EZWebCon is running, refer to the EZWebCon on-line help.

Note: *EZWebCon is also available from the Lantronix website and FTP server. See Appendix D for more information.*

3.1.2 Using a Web Browser (ETSPR models)

The ThinWeb Manager web browser interface allows you to log into and configure your ETS using a standard web browser with JavaScript enabled. Simply type the ETS IP address or resolvable text name into the browser's URL/Location field.

Figure 3-1: Sample Web Browser Login

Once you have connected to the ETS, you will see the Lantronix ThinWeb Manager interface. Use the left-hand menu to navigate to subpages where you can configure important settings as well as view statistics and other server information.

Figure 3-2: ThinWeb Manager Interface

3.1.3 Incoming Logins

Incoming logins made via EZWebCon can be used to configure the ETS. Incoming LAT and TCP/IP logins can also be used.

Incoming Telnet is only possible if your ETS has an IP address configured. Incoming Telnet is enabled by default to allow TCP/IP connections. To change this setting, use the **Define Server Incoming** command described in the *Command Reference* chapter of the *Device Server Reference Manual* located on the CD-ROM.

Incoming logins do not prompt for a login password, so you may wish to disable them for security reasons. If it is undesirable to disable incoming logins, the ETS can be configured to prompt for a password with the **Define Server Incoming Password Enabled** command.

3.1.4 Console Terminal

To configure the ETS via a console terminal, attach a terminal to the serial console port (port 1) and press the **Return** key. You will see a Local> prompt at which configuration commands can be entered.

3.2 Services

With few exceptions, a service must be created before print queues can be configured on the ETS. A service is a resource accessible to network hosts. A Lantronix service is also known as a **remote printer** name or **remote queue** name on many operating systems.

4: Using the ETS

The sections in this chapter show how to use the ETS in a variety of applications.

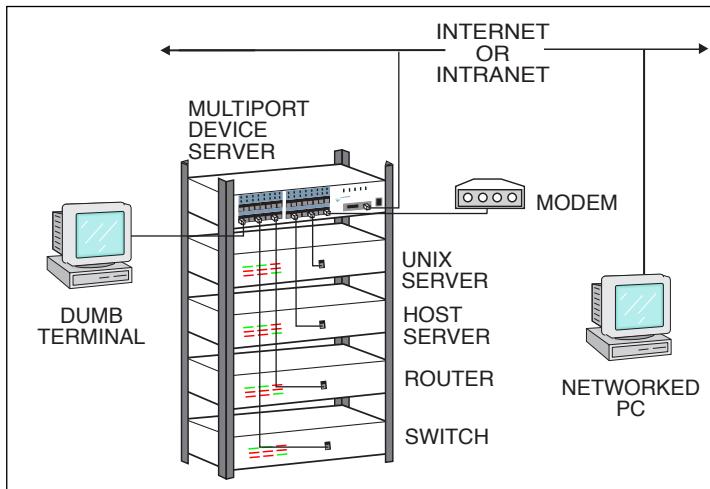
- ◆ For detailed instructions on how to set up the ETS as a console server, see Console Server Example on page 4-1.
- ◆ For instructions on how to use the ETS in serial tunnel mode, see Serial Tunnel Example on page 4-6.
- ◆ For information about using the ETS with the Lantronix Comm Port Redirector, see Comm Port Redirector on page 4-7.

Keep in mind that you must reboot the ETS after issuing a Define command. The command will take effect when the ETS reboots. The one exception is that Define Port commands take effect once the ports are logged out.

4.1 Console Server Example

When you use the ETS as a console server, you can remotely manage devices and equipment from anywhere on the network.

Figure 4-1: Console Server

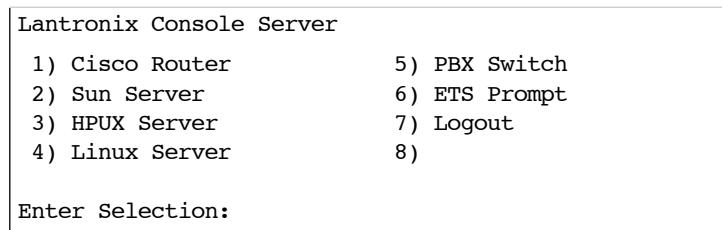


To use the ETS as a console server, you must connect the ETS serial ports to the serial console/management ports of other equipment such as a UNIX servers, PBX switches, routers, network switches, or other similar devices.

Once you have completed the connections, you can establish a Telnet connection to the ETS IP address and socket number of the desired port. The ETS serial ports allow two types of socket connections: Telnet IAC interpretation at socket 200x, and raw TCP connections at socket 300x, where x is the port number. For example, to open a Telnet connection to port 4 of an ETS at IP address 192.0.1.168, you would issue the command “Telnet 192.0.1.168:2004” from your system prompt.

In addition to direct Telnet connections, you can use the ETS’ built-in menu feature. The ETS menu allows you to connect to the IP address of the ETS and be greeted with a menu with which to connect to each attached serial device. Menu choices are an easy way to let users access often-used hosts and services without needing to know any ETS command syntax, the IP addresses of the non-local devices, or the socket numbers involved.

Figure 4-2: Sample Menu



4.1.1 Define the Menus

You create menus with the **Set/Define Menu** command. Each menu entry is numbered. Each command includes a name for the menu item and a command that is executed on the ETS when that menu item is chosen. Users type the number of the command they wish to execute and press Return.

To give your menu a name, use a Define Menu Title command.

Figure 4-3: Menu Title

```
Local>> DEFINE MENU TITLE "Lantronix Console Server:"
```

There are three types of menu entries: those that connect users to devices on the network, those that connect users to devices attached to the ETS, and those that function locally on the ETS. The basic syntax of the **Define Menu** command includes a menu item number, a menu item name, and a command that is executed when the user chooses that menu item.

Figure 4-4: Generic Menu Command

```
Local>> DEFINE MENU n "Name" "command"
```

Note: You must enclose both the menu item and the command in their own sets of quotation marks.

To allow users to connect **to** a device on the network **from** a terminal connected to the ETS, use a Telnet command.

Figure 4-5: Menu Entries for Network Connections

```
Local>> DEFINE MENU 1 "Cisco Router" "telnet 192.0.1.250;kill"  
Local>> DEFINE MENU 2 "Sun Server" "telnet 192.0.1.251;kill"
```

To allow users to connect **from** the network **to** a device connected to the ETS (or from one ETS port to another) add a **Connect Local** command.

Figure 4-6: Menu Entries for Local Connections

```
Local>> DEFINE MENU 3 "HPUX Server" "connect local port_3"  
Local>> DEFINE MENU 4 "Linux Server" "connect local port_4"  
Local>> DEFINE MENU 5 "PBX Switch" "connect local port_5"
```

To allow users to access a local service on the ETS, add a general ETS command.

Figure 4-7: Menu Entries for manipulating the ETS

```
Local>> DEFINE MENU 6 "ETS Prompt" "exit"  
Local>> DEFINE MENU 7 "Logout" "logout"
```

Note: *The Exit command only works in menu mode. It allows users to return to the Local> prompt on the ETS on which the menu was configured. It is helpful to include this command in your menus until you have fully tested them - otherwise there is no way for users on menu mode ports to return to the Local> prompt.*

To review the menu you've just created, type **Show Menu** at the Local> prompt. The menu created by the previous commands would look like this:

Figure 4-8: New Menu

```
Local_1>> show menu  
Title for the menu is "Lantronix Console Server"  
1: Cisco Router --> "telnet 192.0.1.250;kill"  
2: Sun Server --> "telnet 192.0.1.251;kill"  
3: HPUX Server --> "connect local port_3"  
4: Linux Server --> "connect local port_4"  
5: PBX Switch --> "connect local port_5"  
6: ETS Prompt --> "exit"  
7: Logout --> "logout"
```

4.1.2 Enable Menu Mode

You must enable menu mode for all ports on which you wish the menu system to work. Ports 2-4 will be used for the examples in this section.

Figure 4-9: Enabling Menu Mode

```
Local>> DEFINE PORT 2-4 MENU ENABLED  
Local>> LOGOUT PORT 2-4
```

If you want incoming logins from the network to be able to use the menu, you must enable menu mode on **port 0**. Users who Telnet into the ETS would see the menu rather than the Local> prompt.

Note: *Administrators can bypass the menu and get to the ETS command line by forming a Telnet connection to port 7000.*

4.1.3 Configure Switches

Switches allow users to move around within open sessions and return to the ETS Local> prompt if needed. It is important to set switches if you intend to allow serial port users to hold multiple sessions to remote servers. You must set switches for all of the ports for which menu mode was enabled in Section 4.1.2.

Any key may be used for a switch, provided that the chosen keys do not interfere with the sessions. To use a control key, type a carat (^).

Figure 4-10: Configuring Switches

```
Local>> DEFINE PORT 2-4 LOCAL SWITCH ^X  
Local>> DEFINE PORT 2-4 FORWARD SWITCH ^F  
Local>> DEFINE PORT 2-4 BACKWARD SWITCH ^B  
Local>> DEFINE PORT 2-4 BREAK LOCAL
```

Note: *Define Port Break Local allows the ETS to recognize the switches you just configured.*

To check switch configurations, enter the **Show/List Port** command and specify the ports that are used for menu mode.

Figure 4-11: Show Port Screen

```
Local_1>> show po 2

Port 2 : Username:                               Physical Port 2 (Idle)

Char Size/Stop Bits:   8/1      Input Speed:        9600
Flow Ctrl:           Xon/Xoff  Output Speed:       9600
Parity:             None      Modem Control:     None

Access:              Dynamic   Local Switch:       ^X
Backward:            ^B        Port Name:         Port_2
Break Ctrl:          Local    Session Limit:     4
Forward:             ^F        Terminal Type:    Soft( )

Characteristics: Menu
```

4.1.4 Using Menus

When you log into a port with menu mode enabled, you will be presented with an initial login screen.

Figure 4-12: Login Screen

```
Lantronix ETSxx Version B3.6/3 (000410)

Type HELP at the 'Local_10>' prompt for assistance.

Username>
```

- 1 Enter your user name (in this case, Bob) and press Return.

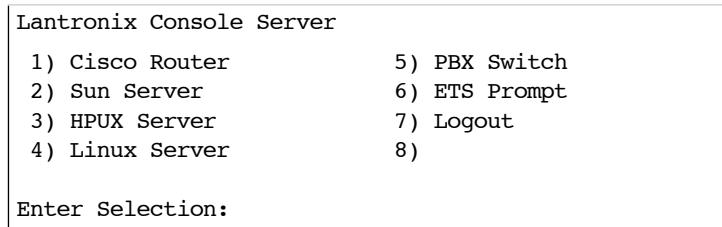
Figure 4-13: Login Screen, part 2

```
Username> Bob

Press <CR> to continue...
```

- 2** As instructed, press the Return key once more to see the actual menu.

Figure 4-14: Login Menu



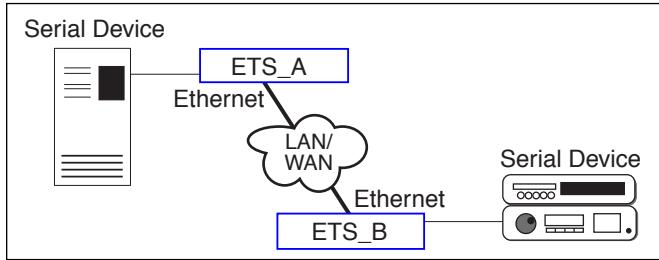
- 3** Choose a menu option. Type the number of the desired option and press Return. For example, to connect to the Linux server, you would press 2 and then press Return.
- 4** To return to the menu from your Linux session, press the configured Local Switch key. In this case, the Local Switch is Ctrl-X (see Figure 4-9).

Note: *Switch keys only work within sessions. They do not work from the menu screen - you must enter a menu number to go to a session from the menu screen.*

4.2 Serial Tunnel Example

Two ETS's can be connected to emulate a direct serial connection across a LAN or WAN. Servers connected in this way can pass data only—they will not be able to pass status signals (DSR/DTR, CTS/RTS, etc.) or preserve timing between characters. The basic network configuration for this virtual serial line is shown in Figure 4-14.

Figure 4-15: Back-to-Back ETS Connections



4.2.1 TCP Configuration

Assuming the ETS serial port parameters have been configured properly, the ETS's would be configured as follows.

ETS_A

```
Local>> DEFINE PORT 2 DEDICATED TELNET 192.168.5.10:3001T  
Local>> DEFINE PORT 2 AUTOSTART ENABLED
```

ETS_B

```
Local>> DEFINE PORT 3 ACCESS REMOTE  
Local>> DEFINE PORT 3 DEDICATED NONE  
Local>> DEFINE PORT 3 AUTOSTART DISABLED
```

Note: *If the ETSs are on different IP subnets, configure the default gateway on each unit with the Change Gateway command.*

The above commands create a raw (8-bit clean) TCP connection between **ETS_A** port 2 and **ETS_B** port 3 once the units have been power-cycled. The commands for **ETS_A** ensure that it will automatically connect to **ETS_B** each time it is booted. The commands for **ETS_B** ensure that it is always available to accept connections from **ETS_A**.

Note: *You must log out the ETS ports after configuring them so that the commands can take effect.*

4.2.2 UDP Configuration

When the UDP protocol is used, there is no connection; each ETS must be told explicitly which hosts it is allowed to accept packets from. Each ETS would have to be configured to both send packets to and accept packets from the other ETS.

```
ETS_A    Local>> DEFINE PORT 2 DEDICATED TELNET 192.168.5.10:4096U  
          Local>> DEFINE PORT 2 AUTOSTART ENABLED  
          Local>> DEFINE PORT 2 ACCESS DYNAMIC  
  
ETS_B    Local>> DEFINE PORT 3 DEDICATED TELNET 192.168.5.2:4096U  
          Local>> DEFINE PORT 3 AUTOSTART ENABLED  
          Local>> DEFINE PORT 3 ACCESS DYNAMIC
```

Setting up Dedicated hosts ensures that the units will always talk to each other. Enabling Autostart for both units enables one ETS to send data to the other ETS without having to wait for a serial carriage return to start the session. **ETS_B** knows exactly which other ETS to accept connections from. Finally, when Autostart is enabled, the access mode must be either Local or Dynamic (Dynamic is more flexible).

4.2.3 Multi-port Serial Tunnel Configuration

You can create serial tunnels for any available ports on the ETS. Each serial tunnel must point from one ETS port to one different serial device port (such as a serial port on an ETS or MSS server).

4.3 Comm Port Redirector

The Lantronix Comm Port Redirector application allows PCs to share modems and other serial devices connected to an ETS using Microsoft Windows or DOS communication applications. The Redirector intercepts communications to specified Comm ports and sends them over an IP network connection to the ETS serial port. This enables the PC to use the ETS serial port as if it were one of the PC Comm ports. Using their existing communications software, PC users dial out to a remote host through a modem connected to the ETS.

The Comm Port Redirector software and installation instructions are included on the distribution CD-ROM and web site.

5: TCP/IP Configuration

The EZWebCon configuration software is the easiest way to configure the ETS. The following sections cover IP address configuration and print configuration methods for TCP/IP hosts.

5.1 Setting the IP Address

The ETS IP address must be configured before any TCP/IP functionality is available. Use one of the following methods to set the IP address: EZWebCon; a directed Ping packet; a BOOTP, DHCP, or RARP reply; or commands entered via the command line interface.

5.1.1 Using EZWebCon

Use the following steps to assign an IP address using the EZWebCon Expert Shell.

- 1 From the **Action** menu, select **Assign IP Address**.
- 2 Enter or change the IP-related settings:
 - A For **Ethernet Address**, enter the number that appears on the bottom label of your ETS.
 - B For **IP Address**, enter the desired IP address to use for this ETS.
 - C For **Subnet Mask**, change the values provided only if you wish to use a mask other than the default. The default value should be correct in most cases.
 - D For **Loadhost**, enter the IP address of the loadhost where you intend to store your operating code and SDK files (if used).
- 3 Click **OK**.
- 4 Reboot the ETS. EZWebCon will let you know whether the configuration was successful.

Note: *If you have an older version of EZWebCon, refer to the Readme that was included with it.*

5.1.2 Using a Directed Ping Packet

The ARP/ping method is available under UNIX and Windows-based systems. If the ETS has no IP address, it will set its address from the first directed IP packet it receives.

On a **UNIX** host, create an entry in the host's ARP table and substitute the intended IP address and the hardware address of the ETS, then ping the ETS. This process typically requires superuser privileges.

Figure 5-1: ARP and Ping on UNIX

```
# arp -s 192.0.1.228 00:80:a3:xx:xx:xx  
% ping 192.0.1.228
```

In order for the ARP command to work on **Windows**, the ARP table on the PC must have at least one IP address defined other than its own. If the ARP table is empty, the command will return an error message. Type ARP -A at the DOS command prompt to verify that there is at least one entry in the ARP table.

Figure 5-2: ARP and Ping on Windows

```
C:\ ARP -S 192.0.1.228 00-80-A3-XX-XX-XX  
C:\ PING 192.0.1.228
```

Note: *There should be replies from the IP address if the ARP command worked.*

When the ETS receives the ping packet, it will notice that its IP address is not set and will send out broadcasts to see if another node is using the specified address. If no duplicate is found, the ETS will use the IP address and will respond to the ping packet.

The ETS will not save the learned IP address permanently; this procedure is intended as a temporary measure to enable EZWebCon to communicate with the ETS, or allow an administrator to Telnet into the ETS. Once logged in, the administrator can enter the **Change IPaddress** command to make the address permanent.

Figure 5-3: Configuring Permanent IP Address

```
% telnet 192.0.1.228  
  
Trying 192.0.1.228  
  
Lantronix ETSx Version n.n/n (yymmdd)  
Type Help at the 'Local_>' prompt for assistance.  
  
Enter Username> gopher  
Local> SET PRIVILEGED  
Password> system (not echoed)  
Local>> DEFINE IPADDRESS 192.0.1.228
```

Any host wishing to access the ETS will have to be told the ETS's IP address. This is typically configured in the unix file **/etc/hosts** or via a nameserver. Refer to the host's documentation for additional information.

5.1.3 Using a BOOTP, DHCP, or RARP Reply

At boot time a host-based DHCP, BOOTP, or RARP server can respond to an ETS request for an available IP address. For information about configuring the DHCP, BOOTP, or RARP server, see your host documentation.

5.1.4 Using the Command Line Interface

- 1 Connect to the serial port (Port_1) using a console terminal or a terminal emulation program, and press **Return**. The serial port settings are 9600 baud, 8 bits, 1 stop bit, no parity.
- 2 Become the privileged user.

Figure 5-4: Becoming the Privileged User

```
Local> SET PRIVILEGED  
Password> system (not echoed)  
Local>>
```

- 3 Enter the new IP address.

Figure 5-5: Configuring the IP Address

```
Local>> define server ipaddress 192.0.1.201
```

5.2 LPR Printing

The ETS provides two major methods of printing via TCP/IP: Berkeley remote LPR and RTEL host software.

Two parameters **must** be configured for LPR printing:

- 1 The IP address or host name of the ETS.
- 2 The remote output queue (the name of the service on the ETS).

In addition, there are a few important things to note about LPR printing:

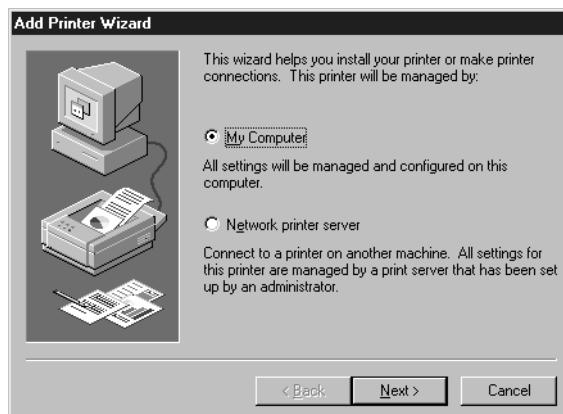
- ◆ Windows for Workgroups, Windows 95, and Windows 98 do not support LPR directly; however, Lantronix has provided a peer-to-peer printing solution on the distribution CD-ROM.
- ◆ Because of the way the LPR protocol is typically implemented on the host, the processing options and banner page are sent after the job data itself. The ETS will print a banner page at the end of a job, and cannot support most of the LPR options. If it is necessary to have the banner page at the beginning of the printout, install and use the RTEL software. If banners are not needed, they can be disabled.

- ◆ The ETS cannot print multiple copies of the print job when using the “-#n” lpr option.
- ◆ If two print queues on the host refer to two services on the same ETS, they must use separate spooling directories.
- ◆ No special purpose input or output filters can be used when printing via LPR. If this functionality is necessary, use the named pipe interface program in the RTELT print queue configuration software.

5.2.1 LPR on Windows NT 3.5.1 (and later)

This section assumes that TCP/IP, Simple TCP/IP, and Microsoft TCP/IP printing have been installed on the Windows NT host.

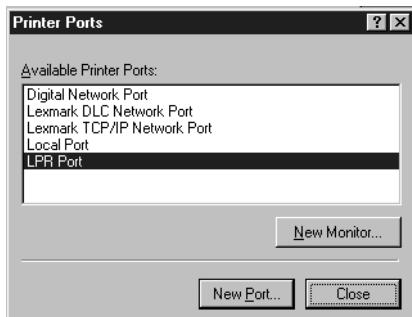
- 1 In the Control Panel, double-click the **Printers** icon.
- 2 Double-click the **Add Printer** icon.
- 3 In the window that appears, choose **My computer** and click **Next**.



- 4 Select the **Add Port** button and click **Next**.



- 5 Select **LPR Port**.



Note: If LPR Port is not an option, open the Network Control Panel and add "Microsoft TCP/IP Printing" to the List of services.

- 6 Enter the name or IP address of your ETS on the first line, and enter the name of your ETS print service on the second line.

7 Select the manufacturer and printer type.



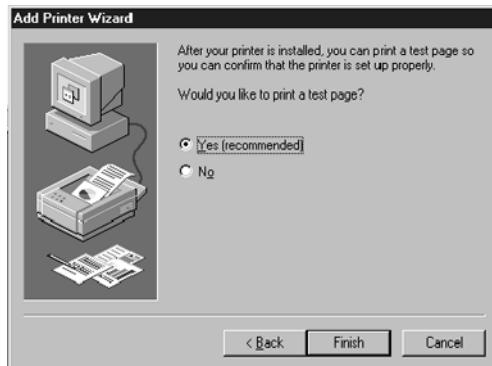
8 Enter the queue name.



9 If applicable, choose **Shared** and select the type of operating system that the printer will be working with. (First confirm that the print queue is working.)



- 10 Test the printer by choosing **Yes** and clicking **Finish**.



5.2.2 LPR on Windows 95/98

To enable LPR printing on Windows 95/98, you must download and install the LPR for Windows 95/98 application from the Lantronix FTP site (<ftp://ftp.lantronix.com>).

- 1 Go to the FTP home page and click on **pub**.
- 2 Click on **lpr_win32**.
- 3 Download the file **ltxlpr.exe**.
- 4 Install the file **ltxlpr.exe**. Once installation is complete, a readme file will open automatically.
- 5 Follow the directions in the readme file to configure LPR on your PC.

5.2.3 LPR on UNIX Hosts

The Berkeley remote printing system is supported on many machines, and is simple to configure. This section describes how to configure LPR print queues on generic UNIX hosts such as SUN hosts. There are slight variations in LPR configuration for AIX, HP, and SCO hosts, as will be explained in the following sections.

- 1 Install a print queue on your host by adding the ETS name and IP address to the **/etc/hosts** file:

Figure 5-6: Adding /etc/hosts Entry

xxx.xxx.xxx.xxx	ETS_XXXXXX
-----------------	------------

- 2 Add the host print queue to the /etc/printcap file. The punctuation shown in Figure 5-7 is required, and no extra spaces should be added.

Figure 5-7: Adding /etc/printcap Entry

```
ets_prt|Printer on LAB ETS:\n:rm=ETS_xxxxxx:\n:rp=ETS_xxxxxx_TEXT:\n:sd=/usr/spool/lpd/ets_prt:
```

This will create a host queue named ets_prt. The rm parameter is the name of the ETS in the host's address file, the rp parameter is the name of the service as it exists on the ETS, and the sd parameter specifies the name of a directory used to hold temporary spooling files.

- 3 Create a world-writable spooling directory using the **mkdir** command.

Figure 5-8: Creating Spooling Directory

```
# mkdir /usr/spool/lpd/ets_prt\n# chmod 777 /usr/spool/lpd/ets_prt
```

- 4 If desired, use the **mx** option to allow unlimited size files to be printed and the **sh** option to prevent header pages from being generated. See the host's documentation or man pages for more information on the format of the printcap file and how to create the spool directory.
- 5 Print to the queue using normal lpr commands:

Figure 5-9: Printing to Queue

```
% lpr -Pets_prt /etc/hosts
```

5.2.4 LPR on AIX Hosts

The System Management Interface Tool (SMIT) allows you to enable LPD printing and create print queues. LPR has only been tested on AIX versions 3.2 and higher.

To create a print queue:

- 1 At the host prompt, type **smit**.
- 2 Choose **Print Spooling**.
- 3 Choose **Manage Print Server** and **Start the Print Server Subsystem (lpd daemon)**.
- 4 In the **Start the Print Server Subsystem** dialog box, type **both** in the first field.
- 5 The message “The lpd subsystem has been started” will appear. Click **Done**.

To add a print queue:

- 1 From the main window, choose **Print Spooling**.
- 2 Choose **Manage Print Server** and **Manage Print Queues**.
- 3 Choose **Add a print queue**.
- 4 From the dialog box that appears, choose **remote**.
- 5 From the next dialog box, choose **Remote Printing**.
- 6 The **Add a Standard Remote Print Queue** dialog box will appear. Enter the following information.
 - The name of the print queue,
 - The name of the ETS unit,
 - The name of the ETS service,
 - The type of print spooler on the remote server, and
 - A description of the printer on the remote server.
- 7 A dialog box will appear: “Added print queue **ets_prt**”. Click **Done**.

Note: *If you are unable to use SMIT, see the Device Server Reference Manual on the CD-ROM for UNIX commands used to set up print queues.*

- 8 Print to the queue using normal lp syntax.

Figure 5-10: Printing to Queue

```
% lp -dets_prt filename
```

5.2.5 LPR on HP Hosts

The System Administration Manager (SAM) allows you to create print queues.

Note: *If you are unable to use SAM, the Device Server Reference Manual located on the CD-ROM describes UNIX commands that can be used to set up print queues.*

To create a print queue:

- 1 At the HP prompt, type **sam**.
- 2 From the main application window, choose **Printers and Plotters**.
- 3 In the **Printers and Plotters** window, choose **Printers/Plotters**.
- 4 In the pull-down menu, select **Remote Printer/Plotter** from the **Actions** menu.

5 The **Add Remote Printer** window will appear. SAM will prompt you for:

- The printer name (the name of the print queue),
- The remote system name (the ETS name),
- The remote printer name (the ETS service),
- The remote cancel model, and
- The remote status model.

5.2.6 LPR on SCO UNIX Hosts

LPR is supported in SCO V3.2 release 4 with TCP/IP Version 1.2 and greater.

To configure a print queue using LPR, issue the **mkdev rlp** command. This will install the Berkeley remote printing files and executable programs.

Note: *The mkdev rlp command should only be issued once, or serious problems will occur. If this happens, contact SCO technical support.*

You can print to this queue using normal lp syntax once the remote printer is set up. To create a remote printer:

- 1 Issue the **rlpconf** command.

- 2 Answer the questions that follow.

Figure 5-11: Configuring Remote Printer

```
Remote Printing Configuration
Enter information for remote printers or local printers accepting remote
printing requests
Please enter the printer name (q to quit): backupprinter
Is printer backupprinter a remote printer or a local printer? (r/l) r
Please enter the name of the remote host that backupprinter is attached
to: ETS_xxxxxx
The backupprinter is connected to host ETS_xxxxxx.
Is this correct? (y/n) y
Would you like this to be the sys.default printer? (y/n) y
Make sure your hostname appears in ETS_PRT's /etc/hosts.equiv or /etc/
hosts:lpd file.
Make sure backupprinter appears in /etc/printcap (in BSD format).
Make sure backupprinter has a spool directory on ETS_PRT.
Putting the printer in printer description file and creating spool direc-
tory... done
Updating LP information... done
```

In the example, the printer name is your ETS service name, and the remote host name is the name of your ETS as it is listed in your hosts file.

During initial configuration, the queue name must be the same as the remote printer name. However, you may change the queue name later by manually editing the printcap file.

5.2.7 RTEL Functionality

If the LPR method of printing is not adequate for an application (for example, if you need banners before jobs, or more flexibility), configure the Lantronix-supplied RTEL software on the host. After installing the software configuring the connections to the ETS, you can use normal UNIX print commands and queue utilities such as **lpc** and **lpstat**.

Note: *RTEL binaries are provided for many systems. Source code is also provided for use on non-supported systems.*

To print to the ETS using special formatting or using third-party software packages, you may have to create **print pipes** on the host. The RTEL software provides this functionality by providing a UNIX named-pipe interface.

To recreate the RTEL source files:

- 1 Copy the file **RTEL_SRC.TAR** in binary mode from the distribution CD-ROM to the UNIX host.
- 2 Untar the archive.
- 3 See the README files in the created directories that describe the contents of the RTEL distribution and man pages that describe the actual software functionality.

5.3 Unix Host Troubleshooting

Table 5-1: TCP Troubleshooting

Area to Check	Explanation
The ETS IP address and name are entered in the host file	Telnet to the ETS using the name in the host file and verify that the ETS name is resolvable and that the ETS is reachable via the network.
Jobs that appear in the host queue reach the ETS	From within the LPC administrative utility, enter these commands to clear and reset the host queue: <i>abort queue</i> <i>clear queue</i> <i>enable queue</i> <i>start queue</i>

6: NetWare Configuration

The EZWebCon configuration software is the easiest way to configure the ETS. The following sections cover print configuration methods for NetWare hosts.

Note: *The ETS needs an IP address before you can use EZWebCon. See Setting the IP Address on page 5-1 for instructions.*

This chapter explains creating NDS print queues with NetWare Administrator and with the PCONSOLE Quick Setup option. To create NDS print queues, you must be running NetWare version 4.x with NDS capabilities.

If you are running NetWare versions 2.x, 3.x, or version 4.x with bindery emulation, you may configure bindery print queues using QINST (bindery only) or PCONSOLE. For more information, see the *NetWare* chapter of the *Device Server Reference Manual* located on the CD-ROM.

6.1 NDPS Printing

Lantronix Terminal and Print Servers support Novell's NDPS for printing using the Novell NDPS Gateway. For instruction on setting up NDPS, refer to your Novell documentation. Lantronix also provides information on setting up NDPS in our FAQs on our support web site (<http://www.lantronix.com/support/>).

6.2 NDS Print Queues

6.2.1 Obtain an NDS License

If you wish to create NDS print queues, you must read and complete an NDS registration form via one of the following methods:

- ◆ Using a forms-capable Internet browser, navigate to the Lantronix World Wide Web site (www.lantronix.com), go to the Technical Support section, and find the **Novell NDS Registration** link.
- ◆ Send email to **support@lantronix.com**. You will receive a blank registration form that can be completed and returned to Lantronix.
- ◆ If you don't have Internet access, contact a Lantronix technical support representative for assistance. Contact information is provided in *Appendix A*.

6.2.2 Configure your ETS

- 1 License NDS on your ETS using the string obtained from Lantronix.

Figure 6-1: Licensing NDS

```
Local>> DEFINE PROTOCOL NETWARE DSLICENSE licensestring
```

- 2 Define the directory service tree in which the ETS is located.

Figure 6-2: Defining Directory Service Tree

```
Local>> DEFINE PROTOCOL NETWARE DSTREE foodco
```

Note: For an explanation of the structure of the NetWare Directory Service tree, see your host documentation.

- 3 Define the directory service context in which the ETS is located.

Figure 6-3: Defining Directory Service Context

```
Local>> DEFINE PROTOCOL NETWARE DSCONTEXT ou=kiwi.ou=exotic.o=fruit
```

- 4 Enter the **List Protocol NetWare Access** command to ensure that at least one of the file servers in the directory service tree is in the access list.
- 5 If desired file server is not in the access list, add it.

Figure 6-4: Defining Access List

```
Local>> DEFINE PROTOCOL NETWARE ACCESS fileserver
```

- 6 Reboot the ETS.

Figure 6-5: Rebooting

```
Local>> INITIALIZE DELAY 0
```

6.3 NetWare Administrator Quick Setup Print Queues

The NetWare Administrator management utility allows you to manage network resources, such as queue-based print services, in a tree structure. You can either use the Quick Setup option or individually create printing-related objects.

Note: NetWare Administrator can be used for both NDS and bindery print queues.

To create a print queue with the Quick Setup option:

- 1 Start the NetWare Administrator.
- 2 In the **Directory Tree** windows, select the context in which to install the printer.
- 3 From the Menu Bar, select **Tools: Print Services Quick Setup**.
- 4 In the **Print Server Name** field, enter the name of your ETS (viewable by entering the **Show Server** command at the Local> prompt).
- 5 In the **Printer Name** field, enter the name of the desired print **service** configured on your ETS. For example, ETS_xxxxxx_.
- 6 In the **Print Queue Name** field, enter the name of the print queue to create. The name should be meaningful to you; it will not affect ETS configuration.
- 7 Click **Create**.
- 8 Reboot the ETS.

6.4 P_CONSOLE Print Queues

- 1 Log in as Admin on the file server you will be changing.
- 2 At the prompt, type **P_CONSOLE** to start the utility.

For example, if your file server is mapped to the F: drive, you would use the **F:** prompt.

- 3 From the main menu, choose **Quick Set-Up**.
- 4 When prompted by P_CONSOLE, enter the information with which to configure the print queue.
 - The print server name (ETS_xxxxxx),
 - The new printer name (service name, such as ETS_xxxxxx_),
 - The new print queue name, and
 - The print queue volume (the name of the file server from which the printer receives print requests).

The remaining fields can be left in their default settings.

- 5 Press the **F10** key to save the print queue information.
- 6 Reboot the ETS.

6.5 NetWare Host Troubleshooting

Table 6-1: NetWare Host Troubleshooting (Bindery Mode)

Area to Check	Explanation
The print server names in PCONSOLE match the ETS name and its service name	Use PCONSOLE to check.
The ETS NetWare access table	Use the Show Protocols NetWare Access command. Scanning too many file servers can cause a delay between jobs. Configure the access list to only scan for jobs on the file servers of interest.

Table 6-2: NetWare Host Troubleshooting (NDS)

Area to Check	Explanation
The ETS NetWare access table	Use the Show Protocols NetWare Access command. By default, only local file servers are scanned for queues.
The ETS login password and the queue password on the file server	The passwords must match or the ETS will not be able to log into the file servers to scan for jobs.
The ETS has successfully attached to the queue	Type NETSTAT at the Local> prompt. This will display information about fileservers, printers, and queues that the ETS has found. If a queue is in JobPoll, the ETS has successfully attached to the queue.
The DSTree, DSContext, and DSLicense	Type Show Protocol NetWare NDS . This command shows the tree and the context that you have configured, a failure code, and an NDS error code for each server. DSTree is the directory service tree on which the ETS is located. DSContext is the context where the ETS is located; it must match the context on the file server (The DSContext must be of the following form: ou=fruit,o=exotic). DSLicensed should be yes.
Printer and queue changes have propagated through the NDS tree	It may take a few minutes for the changes to propagate. If the ETS doesn't attach, reboot the ETS.

Table 6-3: NDS Errors from the File Server

Code	Meaning	Remedy
0xfffffd47	Object could not be found in the given context	Check the ETS server name, DScontext, and DSTree to ensure the printer server is set up correctly with PCONSOLE.
0xfffffd45	Requested attribute could not be found	Use PCONSOLE to ensure that the ETS has associated printers and the printers have associated queues.
0xfffffd69	DS Database is locked	An administrator is probably updating the database. Wait a few minutes and issue the Set Protocol NetWare Reset command.
0xfffffd63	Invalid password	The password for the print server object under PCONSOLE must match the ETS login password. If the login password on the ETS is left as the default (access), there should be no password for the print server object.
0xfffffd54	Secure NCP violation	Turn down the NCP packet signature level so that it is not required.

Table 6-4: NDS Printing Errors

Bit	Meaning	Remedy
1	Server out of memory	Turn the ETS off, wait a few seconds, and turn it back on. Disable unused protocols and/or remove fileservers without print queues from the NetWare access list.
2, 3	Unexpected response from file server	Report the problem to Lantronix Technical Support.
4	No printers found for the ETS	Ensure that there are printers for the ETS, and the printer names match the service names on the ETS.
5	No printer queue found	Ensure that the printers have associated queues.
6	Login failed	Ensure there is a print server object configured with the same name as the ETS.
7	Authentication failed	Ensure the ETS login password is the same as the print server object password. If the ETS is using the default password (access), there should be no print server object password.
8	Server cannot attach to queue	Check the NDS partitions, replicas, and volumes to ensure the file server where the queue lives has the correct information.



7: LAT Configuration

The EZWebCon configuration software is the easiest way to configure the ETS. The following sections cover print configuration methods for LAT hosts.

Note: *The ETS needs an IP address before you can use EZWebCon. See Setting the IP Address on page 5-1 for instructions.*

To use LAT you must obtain a LAT license from your dealer or Lantronix and use the Set/Define Protocol LAT License command on your ETS. LAT print queues can be created by printing to a port or printing to a service. Printing directly to a port requires no ETS configuration.

Note: *Printing directly to a port is the easiest method for printing to the ETS. If you would like instructions for printing to a service, see the Device Server Reference Manual located on the CD-ROM.*

7.1 Printing Directly to a Port

- 1 Create a LAT application port that references the ETS port.

Figure 7-1: Creating LAT Application Port

```
$ RUN SYS$SYSTEM:LATCP  
LATCP> CREATE PORT LTAnnn/APPLICATION  
LATCP> SET PORT LTAnnn/NODE=ETS_xxxxxxx/PORT=Port_n  
LATCP> EXIT
```

- 2 Create and start a print queue that uses the LAT application port.

Figure 7-2: Creating and Starting Print Queue

```
$ INITIALIZE/QUEUE/START/ON=LTA/ /PROCESSOR=LATSYM  
/RETAIN=ERROR queue_name
```

- 3 Add the commands to the SYS\$MANAGER:LAT\$STARTUP.COM file so the required LAT devices will be recreated after each host reboot.

Note: *LAT terminal device characteristics may have to be changed to correctly print certain files. See your VMS documentation for more information.*

- 4 Print to the queue.

Figure 7-3: Printing to Queue

```
$ PRINT/QUEUE=queue_name filename.txt
```

7.2 LAT Host Troubleshooting

By default, the LAT error message codes on the host are not translated into text error messages. If a LAT job fails and appears in the queue with an eight-digit hex result code, the code can be translated by issuing the following commands:

Figure 7-4: Translating LAT Error Codes

```
$ SHOW QUEUE/FULL/ALL queue_name  
(note the error code nnnnnnnn)  
$ SET MESSAGE SYS$MESSAGE:NETWRKMSG.EXE  
$ EXIT %Xnnnnnnnn
```

Table 7-1: Troubleshooting LAT Configurations Using a Port

Area to check	Explanation
The specified node name matches the ETS node name	Use the Show Server command to verify.
The specified port name matches the port's name	Use the List Port 1 command to verify.

8: AppleTalk Configuration

The EZWebCon configuration software is the easiest way to configure the ETS. The following sections cover print configuration methods for AppleTalk hosts.

Note: *The ETS needs an IP address before you can use EZWebCon. See Setting the IP Address on page 5-1 for instructions.*

Note: *Macintoshes that do not support EtherTalk will need either an Ethernet card or a LocalTalk-to-EtherTalk router to use the ETS.*

8.1 Bitronics

Printing from a Macintosh is only possible with a PostScript printer and bi-directional communication between the ETS and that printer. The ETS supports the Bitronics interface, an extension to the standard Centronics interface. Printers that support Bitronics allow bi-directional communication. To enable Bitronics on an ETS port, use the **Define Port 2 Bitronics Enabled** command.

Note: *MacOS 8.1 can also print via LPD. See the Device Server Reference Manual located on the CD-ROM and web site for configuration instructions.*

8.2 Macintosh Services

Before attempting to print from a Macintosh, ensure that AppleTalk and PostScript are both enabled on at least one service. Once a PostScript AppleTalk service is configured, the service will appear in the Chooser as a LaserWriter in the same zone as the ETS. Select the service in the Chooser and complete the appropriate setup options. Then close the Chooser window and print a test page of text to the Macintosh service.

8.3 AppleTalk Zones

If there is a router on the network, the ETS will appear in the default zone specified by the router. To change the default zone use the **Define Protocol AppleTalk Zone** command.

If the ETS is attached to a network without an AppleTalk router, all AppleTalk devices (including the ETS) will appear in the default zone in the Chooser.

Note: *If no router is present on the network, the ETS will not accept AppleTalk print jobs for 60 seconds after booting.*

8.4 AppleTalk Host Troubleshooting

Table 8-1: AppleTalk Host Troubleshooting

Area to Check	Explanation
The printer is available to be selected in the Chooser	Make sure the printer is in the right zone.
Bidirectional communication	Lock the printer in PostScript mode and issue the Test Service PostScript Count n command. This sends a job to the printer and waits for the response.

9: DLC Configuration for LAN Manager

The EZWebCon configuration software is the easiest way to configure the ETS. This chapter explains DLC/Digital Network Port configuration for Windows NT 4.x hosts.

Note: *The Server needs an IP address before you can use EZWebCon. See Setting the IP Address on page 5-1 for instructions.*

Printing using an LPD client is the preferred method for sending print jobs to the ETS. Windows 95 does not support DLC printing (see *Chapter 5* for more information).

9.1 DLC Configuration

9.1.1 ETS Configuration

To use the DLC protocol, you must have one service with the DLC characteristic enabled. The DLC characteristic may be associated with only one service on a given ETS.

Figure 9-1: Enabling DLC

```
Local>> DEFINE SERVICE ETS_xxxxxx_ DLC ENABLED
```

9.1.2 Host Configuration

To send print jobs from a Windows NT host to the ETS, add the ETS as a Windows NT printer.

- 1 Double-click the **Printers** icon in the Control Panel.
- 2 Double-click the **Add Printer** icon.
- 3 In the window that appears, select **My Computer** and click **Next**.
- 4 Select the **Add Port** button.
- 5 Select **Hewlett-Packard Network Port** and click **New Port**.

If Hewlett-Packard port is not one of the available options, you must install DLC printing from your Windows NT system disks. DLC is not installed by default.

- 6 Enter the ETS hardware address. It is printed on the ETS bottom label.

- 7** Select **Job-based**.
- 8** Select the manufacturer and printer type.
- 9** Enter the queue name.
- 10** If applicable, choose **Shared** and select the operating system the printer will be working with. (First confirm that the print queue is working.)
- 11** Test the printer.

A: Contact Information

If you are experiencing an error that is not listed in Appendix B; or if you are unable to fix the error, contact your dealer or Lantronix Technical Support at 800-422-7044 (US) or 949-453-3990. Technical Support is also available via Internet email at support@lantronix.com.

A.1 Problem Report Procedure

When you report a problem, please provide the following information:

- ◆ Your name, and your company name, address, and phone number
- ◆ Lantronix ETS model number
- ◆ Lantronix ETS serial number
- ◆ Software version (use the **Show Server** command to display)
- ◆ Network configuration, including the information from a **Netstat** command
- ◆ Description of the problem
- ◆ Debug report (stack dump), if applicable
- ◆ Status of the unit when the problem occurred (please try to include information on user and network activity at the time of the problem)

A.2 Full Contact Information

Address: 15353 Barranca Parkway, Irvine, CA 92618 USA

Phone: 949/453-3990

Fax: 949/453-3995

World Wide Web: <http://www.lantronix.com>

North American Direct Sales: 800/422-7055

North American Reseller Sales: 800/422-7015

North American Sales Fax: 949/450-7232

Internet: sales@lantronix.com

International Sales: 949/450-7227

International Sales Fax: 949/450-7231

Internet: intsales@lantronix.com

Technical Support: 800/422-7044 or 949/453-3990

Technical Support Fax: 949/450-7226

Internet: support@lantronix.com



B: Troubleshooting

This Appendix discusses how to diagnose and fix errors quickly yourself without having to contact a dealer or Lantronix. It will help to connect a terminal to the serial port while diagnosing an error to view any summary messages that are displayed.

When troubleshooting, always ensure that the physical connections (power cable, network cable, and serial cable) are secure. If you have trouble with wireless networking, it may help to connect the ETS to a wired Ethernet network to verify that it is working properly and to check the wireless settings.

Note: *Some unexplained errors may be caused by duplicate IP addresses on the network. Make sure that your ETS IP address is unique.*

B.1 Power-up Troubleshooting

Problem situations and error messages are listed in Table B-1. If you cannot find an explanation for your problem, try to match it to one of the other errors. If you cannot remedy the problem, contact your dealer or Lantronix Technical Support.

Table B-1: Power-up Problems and Error Messages

Problem/Message	Error	Remedy
The ETS is connected to a power source, but there is no LED activity.	The unit or its power supply is damaged.	Contact your dealer or Lantronix Technical Support for a replacement.
The ETS is unable to complete power-up diagnostics.	This generally indicates a hardware fault. One of the LEDs will be solid red for three seconds, followed by one second of another color.	Note the blinking LED and its color, then contact your dealer or Lantronix Technical Support. The ETS will not be operational until the fault is fixed.
The ETS completes its power-up and boot procedures, but there's no noticeable serial activity.	There is a problem with the serial connection or the set-up of the serial device.	Check the terminal setup and the physical connections, including the cable pinouts (see Appendix C). Try another serial device or cable, or cycle power on the ETS.
	A rapidly-blinking OK LED may signal boot failure.	Reboot the unit. When the ETS is running normally, the OK LED blinks every two seconds.

Table B-1: Power-up Problems and Error Messages, cont.

Problem/Message	Error	Remedy
The terminal shows a Boot> prompt rather than a Local> prompt.	The ETS is not connected properly to the Ethernet. The ETS Ethernet address is invalid.	Ensure that the ETS is firmly connected to a functional and properly-terminated network node. The ETS Ethernet address is located on the bottom of the unit. Use the Change Hardware command to set the correct address, then reboot.
The ETS passes power-up diagnostics, but attempts to download new Flash ROM code from a network host.	Init Noboot command was entered. If the OK LED blinks rapidly, the Flash ROM code may be corrupt. If you did not request a TFTP boot, the flash ROM code is corrupt. The unit will remain in boot mode.	See <i>Entering Commands at the Boot Prompt</i> on page B-4. Reboot the unit. If you get the same message, you will need to reload Flash ROM. See <i>Reloading Software</i> on page D-3.

B.2 DHCP Troubleshooting

Table B-2: DHCP Troubleshooting

Area to Check	Explanation
DHCP is enabled on the ETS	Use the Set Server DHCP Enabled command. If you manually enter an IP address, DHCP is automatically disabled.
Make sure the DHCP server is operational.	Check to see that the DHCP server is on and is functioning correctly.
The ETS gets its IP address from the DHCP server	Refer to the DHCP Manager on your DHCP server for information about addresses in use. If the DHCP server doesn't list your ETS IP address, there may be a problem.

B.3 BOOTP Troubleshooting

If the BOOTP request is failing and you have configured your host to respond to the request, check these areas:

Table B-3: BOOTP Troubleshooting

Area to Check	Explanation
BOOTP is in your system's <code>/etc/services</code> file	BOOTP must be an uncommented line in <code>/etc/services</code> .
The ETS is in the <code>loadhost</code> 's <code>/etc/hosts</code> file	The ETS must be in this file for the host to answer a BOOTP or TFTP request.
The download file is in the correct directory and is world-readable	The download file must be in the correct directory and world-readable. Specify the complete pathname for the download file in the BOOTP configuration file, or add a default pathname to the download filename.
The ETS and host are in the same IP network	Some hosts will not allow BOOTP replies across IP networks. Either use a host running a different operating system or put the ETS in the same IP network as the host.

B.4 RARP Troubleshooting

Table B-4: RARP Troubleshooting

Area to Check	Explanation
The ETS name and hardware address in the host's <code>/etc/ethers</code> file	The ETS name and hardware address must be in this file for the host to answer a RARP request.
The ETS name and IP address in the <code>/etc/hosts</code> file	The ETS name and IP address must be in this file for the host to answer a RARP request.
The operating system	Many operating systems do not start a RARP server at boot time. Check the host's RARPD documentation for details, or use the <code>ps</code> command to see if there is a RARPD process running.

B.5 Modem Configuration Checklist

Most modem problems are caused by cabling mistakes or incorrect modem configuration. However, the following items should be verified after any modem configuration, and re-checked when there is modem trouble.

- ◆ The modem must disconnect immediately when DTR is de-asserted.
- ◆ The modem must assert CD (or DSR, if connected) when connected to another modem. It must not assert CD when disconnected. The modem may optionally assert CD during outbound dialing.
- ◆ The modem and ETS must agree on the flow control method and baud rate scheme.
- ◆ The modem must not send result codes or messages to the ETS except optionally during outgoing calls.
- ◆ The modem should be set to restore its configuration from non-volatile memory when DTR is dropped.
- ◆ The modem should be configured to answer the phone if incoming connections are to be supported. Generally this is done with the **ats0=1** command.
- ◆ The modem should not be configured to answer the phone unless the ETS asserts DTR.
- ◆ ETS Modem control must be enabled. Using modems on ports without modem control enabled will lead to security problems.
- ◆ The ETS Autobaud feature should be enabled only when required.

B.6 Entering Commands at the Boot Prompt

If the Boot> prompt appears on the serial console instead of the Local> prompt, one of two things may be wrong. Either the ETS does not have enough information to boot, or the network or flash boot has failed. If pressing the **Return** key does not display a prompt, press any other key. The Boot> prompt should appear.

If the ETS does not have enough information to boot, or the network or flash boot has failed, it will print a message to the console and wait ten seconds for serial port activity. If it detects serial port activity, it will continue booting provided the flash is good. However, if the user presses a key during that time period, the ETS will display the Boot> prompt.

Note: *If you see the message “Will attempt another download in x minutes,” press any key for the Boot> prompt.*

A series of commands called Boot Configuration Program (BCP) commands can be entered at the Boot> prompt to configure the ETS. These commands are a subset of the entire ETS command set. For example, a typical TCP/IP configuration might use the following commands:

Figure B-1: BCP Command Examples

```
Boot> Set IPADDRESS 192.0.1.229
Boot> Set SOFTWARE /tftpboot/ETS*.SYS
Boot> Set LOADHOST 192.0.1.188
Boot> Set SECONDARY 192.0.1.22
Boot> FLASH
% Initialization begins in 5 seconds.....
```

These commands set the Server's address, the software loadfile, and the loadhost's IP address (as well as that of a backup loadhost). The server then reboots using the **Flash** command and will attempt to load the file ETS*.SYS from the host at 192.0.1.188.

Flush NVR

This command is used to restore the ETS's non-volatile RAM to its factory default settings. It will reset everything that is configurable on the server, including the unit's IP address.

Flash

This command will force the ETS to download new operational code and reload it into Flash ROM. This is necessary when a new version of software is released and you wish to upgrade your unit. If the server cannot download the file, the code in Flash ROM will still be usable.

Help

Displays a one-page summary of available commands and what they do.

Init 451

Reboots the ETS after it has been configured. If the ETS can find and load the specified software loadfile, it will restart itself with full functionality. If the loadfile is not found, the server will attempt to reload continuously. If there is an error, or if the console's **Return** key is pressed, the ETS will re-enter the Boot Configuration Program.

Set BOOTP {Enabled, Disabled}

Enables or disables the sending of BOOTP queries during the boot sequence. It is enabled by default.

Set DHCP {Enabled, Disabled}

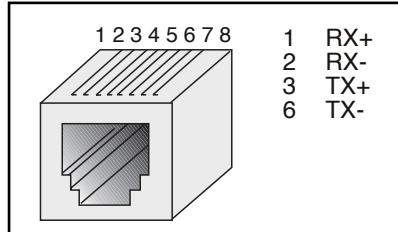
Enables or disables the sending of DHCP queries during the boot sequence. It is enabled by default.

Set Hardware xx-xx-xx	Specifies the last three numbers of the server's Ethernet address. The first three numbers will be supplied automatically.
	The Ethernet address should have been set at the factory. Setting an incorrect address could cause serious network problems.
Set IPAddress ip_address	Specifies this server's IP address. Uses the standard numeric format.
Set Loadhost ip_address	Specifies the host to attempt to load the file from. The IP address should be in standard numeric format (no text names are allowed).
Set RARP {Enabled, Disabled}	Enables or disables the sending of RARP queries during the boot sequence. It is enabled by default.
Set Secondary ip_address	Specifies a backup loadhost. The IP address should be in standard numeric format (no text names are allowed). The backup loadhost will be queried if the primary host cannot load the server.
Set Software filename	Specifies the name of the file to load. The ETS will automatically add .SYS to the filename you specify. Note that all protocols must have a filename specified (either the default or set by the user). For more information, see <i>Appendix D</i> . TCP/IP users must use the Software option to specify the loadhost, the loadfile, and their own network address.
	TFTP users can specify a complete path name (up to 31 characters) if the file is located in a directory other than the default. The case of the filename must match that of the filename loaded onto the host computer.
Show Server	Use this command when issuing other commands to view the current ETS setup.

C: Pinouts

C.1 Ethernet Connector

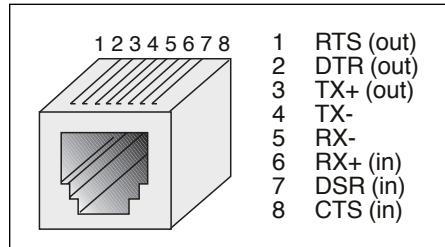
Figure C-1: RJ45 Ethernet Connector



C.2 RJ45 Serial Connectors

ETS servers are RS-423 compliant, and are thus limited by the equipment at the remote end of the serial line. If the is connected to an RS-232 device, it is subject to RS-232 limits: 15m (50 ft.) in length at 9600 baud, and to 2m (6 ft.) at 115.2K baud, although longer lengths will generally work.

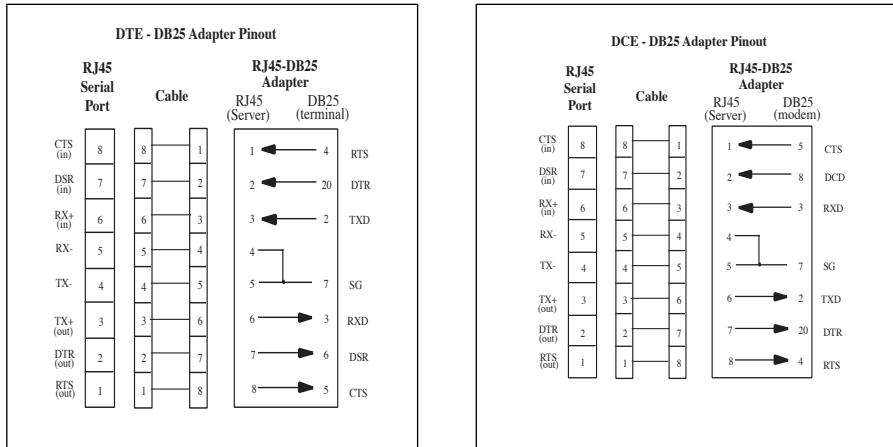
Figure C-2: RJ45 Serial Connector



C.2.1 RJ45 to DB25

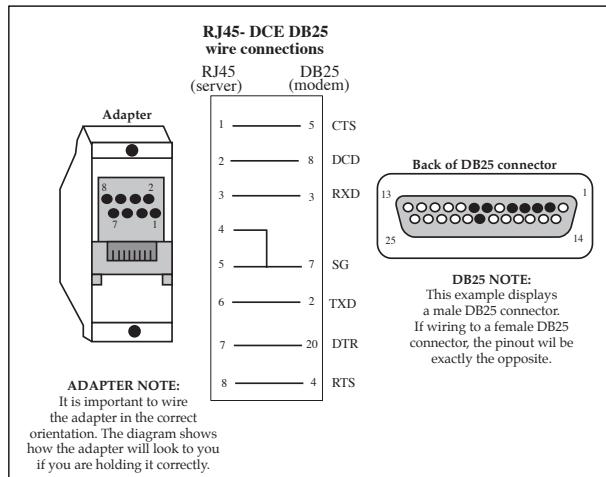
If you are connecting an RJ45 port to a DTE device (such as a terminal) that has a DB25 connector, you will need to use an RJ45-DTE DB25 adapter. To connect an RJ45 port to a DB25 connector on a DCE device, you will need an RJ45-DCE DB25 adapter. The pinout information for both connections is shown in Figure C-3.

Figure C-3: Pinouts of RJ45-DB25 Connections



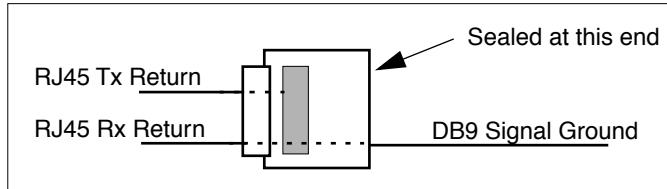
The arrows in Figure C-3 represent the direction of the signal. The pinouts assume that the 8-conductor cable connecting the ETS and the adapter block is a swapped cable. Both the transmit and receive ground signals on the ETS connector are wired to the signal ground on a DB25 adapter.

Figure C-4: RJ45 to DCE DB25 Adapter



You can use a crimper block to connect both transmit and receive grounds from the RJ45 cable to the single signal ground on the DB25. The connector internally “splices” the two wires together and provides one wire into the DB25 connector as shown below.

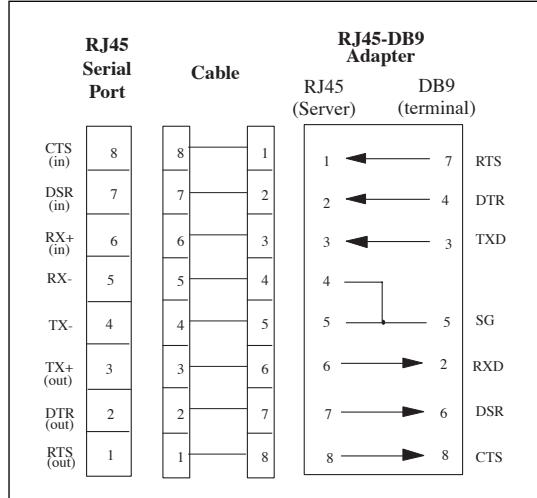
Figure C-5: Wire Splicer



To splice the wires, cut off the end of the wire that **does not** extend through the connector and insert both wires into the connector. Make sure that the wire that **does not** extend through the connector is in as far as possible to ensure a solid connection. Make sure that the wire that **does** extend through the connector extends far enough on the other side to be inserted in to the DB25 connector. Carefully squeeze the connector using a pair of pliers to make sure it is fully latched.

C.2.2 RJ45 to DB9

Figure C-6: RJ45-DTE DB9 Adapter



The arrows in Figure C-6 represent the direction of the signal. The pinouts assume that the 8-conductor cable connecting the ETS and the adapter block is a swapped cable. Both the transmit and receive ground signals on the ETS connector are wired to the signal ground on a DB9 adapter.

The information about crimping the RJ45 ground wires in Section C.2.1, *RJ45 to DB25* applies to the DB9 connector as well.

C.3 ETS422PR Serial Connectors

The ETS422PR has 16 DB9 serial ports. Port 1 is switchable between RS-422 and RS-232 serial modes. Ports 2-16 are RS-422 only.

Figure C-7: DB9 RS-232/RS422 Serial Connector

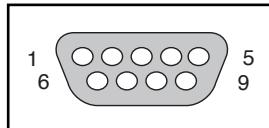


Table C-1: ETS422PR DB9 Serial Connector Signals

Pin	RS-422 mode	RS-232 mode
1	GND	
2	RTS+	RX
3	RTS-	TX
4	CTS+	
5	CTS-	GND
6	RX-	
7	RX+	RTS
8	TX-	CTS
9	TX+	

Note: In the idle state, TX- should have a lower voltage than TX+, and RTS- should have a lower voltage than RTS+.

C.4 Parallel Connectors

Lantronix uses standard Centronics parallel connectors.

For optimum performance of your ETS, Lantronix recommends the use of high quality parallel cables. Choose one of the following:

- ◆ A Lantronix parallel port cable, part number #500-011 (6 feet).
- ◆ Any other brand of **IEEE Std. 1284-1994** compliant cable. Compliant cables can easily be identified by the permanent label “IEEE Std. 1284-1994 compliant” printed on the cable.

Note: Non-compliant cables have the same type of connectors but different electrical characteristics.

D: Updating Software

D.1 Choosing the Right Software File

Lantronix intends to provide multiple software files for the ETS models. Each software file will contain the core ETS operating code for that particular model.

Table D-1: Available ETS Software

Software File Name	Models Supported
ETS.SYS	Old, do not use this file
ETSP.SYS	ETS8P, ETS16P, ETS4P
ETS16PR.SYS	ETS16PR
ETS32PR.SYS	ETS32PR
ETS422PR.SYS	ETS422PR

D.2 Obtaining Software

Current software files (ETS*.SYS) are available on the distribution CD. You can obtain software updates and release notes for the ETS from the Lantronix World Wide Web site (www.lantronix.com), or by using anonymous FTP through the Internet (ftp.lantronix.com).

D.2.1 Via the Web

The latest version of ETS*.SYS can be downloaded from the Lantronix Web site. At the time of this writing, the exact location of the files on the re-designed site was unknown.

Note: *As a result of Netscape Navigator's configuration, it may try to open the file as an ASCII text file. To avoid this, hold down the shift key when choosing the software file.*

D.2.2 Via FTP

The ETS software resides on the Lantronix FTP server (ftp.lantronix.com). Most of these files are binary data, so the binary option must be used to transfer the files. All released files are in the **pub** directory. Always download the README file in the pub directory before downloading anything else; it contains a list of available software files.

To log into the FTP server, enter a username of **anonymous** and enter your full email address as the password. The following text will be displayed:

Figure D-1: Sample FTP Login

```
230-Welcome to the Lantronix FTP Server.  
230-  
230-IMPORTANT: Please get the README file before proceeding.  
230-IMPORTANT: Set BINARY mode before transferring executables.  
220-  
230-Direct questions to support@lantronix.com or 800-422-7044 (US) or  
949-453-3990  
230-  
230 Guest login ok, access restrictions apply.  
Remote system type is [your type will be displayed here].  
ftp>
```

D.3 Reloading Software

The ETS stores software in Flash ROM to control the initialization process, operation, and command processing. The contents of Flash ROM can be updated by downloading a new version of the operational software via NetWare, TCP/IP, or MOP. Regardless of which protocol is used to update Flash ROM, the following points are important:

- ◆ The Flash ROM software file name, **ETS*.SYS**, should not be changed.
- ◆ The download file should be world-readable on the host.
- ◆ There is a sixteen character length limit for the path name.
- ◆ There is a twelve character limit for the filename.
- ◆ Define commands must be used because Set configurations are cleared when the ETS boots. Use the **List Server Boot** command to check settings before rebooting.

Note: *It is important to check ETS settings before using the Initialize Reload command to ensure that you are reloading the correct software file.*

D.3.1 Reloading Sequence

If DHCP, BOOTP, or RARP is enabled on the ETS, the ETS will request assistance from a DHCP, BOOTP, or RARP server before starting the download attempts. The ETS will then try TFTP, NetWare, and MOP booting (in that order) provided that it has enough information to try each download method.

Downloading and rewriting the Flash ROM will take approximately two minutes from the time the **Initialize** command is issued. If the download file cannot be found or accessed, the ETS can be rebooted with the code still in Flash ROM. The OK/ACT LED will blink quickly while the ETS is booting (and reloading code) and then slowly when it returns to normal operation.

Note: *If you experience problems reloading Flash ROM, refer to Troubleshooting Flash ROM Updates on page D-5.*

D.3.1.1 TCP/IP

Before the ETS downloads the new software, it will send DHCP, BOOTP, and/or RARP queries (all are enabled by default). Next, the ETS will attempt to download the ETS*.SYS file using TFTP (Trivial File Transfer Protocol).

Note: *EZWebCon can also be used to reload software.*

If a host provides DHCP, BOOTP, or RARP support, it can be used to set the ETS IP address (all methods) and loadhost information (BOOTP and RARP only).

Some BOOTP and TFTP implementations require a specific directory for the ETS*.SYS file. See your host's documentation for instructions.

To manually configure the ETS IP parameters for software reload, use the following commands.

Figure D-2: Configuring TCP/IP Reload

```
Local> SET PRIVILEGED
Password> SYSTEM (not echoed)
Local>> DEFINE SERVER IPADDRESS nnn.nnn.nnn.nnn
Local>> DEFINE SERVER SOFTWARE "/tftpboot/ETS*.SYS"
Local>> DEFINE SERVER LOADHOST nnn.nnn.nnn.nnn
Local>> LIST SERVER BOOT
Local>> INITIALIZE RELOAD
```

Note: *For instructions on how to log into the ETS to enter these commands, see the Getting Started chapter.*

The path and filename are case-sensitive and must be enclosed in quotation marks. When attempting to boot across an IP router, you must configure the router to proxy-ARP for the ETS, or use the bootgateway feature. For more information, see **Set/Define Bootgateway** in the *Commands* chapter of the *Device Server Reference Manual* located on the CD-ROM.

D.3.1.2 NetWare

The ETS*.SYS file should be placed in the login directory on the NetWare file server. The ETS cannot actually log into the file server (since it knows no username/password); it can only access files in the login directory itself. On the ETS, specify the file server name, filename, and path.

Figure D-3: Configuring NetWare Reload

```
Local> SET PRIVILEGED
Password> SYSTEM (not echoed)
Local>> DEFINE SERVER NETWARE LOADHOST fileserver
Local>> DEFINE SERVER SOFTWARE SYS:\LOGIN\ETS*.SYS
Local>> INITIALIZE RELOAD
```

D.3.1.3 MOP

The ETS*.SYS filename is the only parameter that the ETS needs to reload via MOP. Make sure the service characteristic is enabled on the host's Ethernet circuit, copy the ETS*.SYS file to the MOM\$LOAD directory, and reload the ETS using the **Initialize Reload** command. Be sure to use binary mode for the file transfer.

D.4 Troubleshooting Flash ROM Updates

Many of the problems that occur when updating the Flash ROM can be solved by completing the following steps:

Table D-2: Flash ROM Troubleshooting

Protocol	Area to Check
NetWare	Ensure the file is in the login directory. Since the ETS cannot actually log into the file server, it has very limited access to the server directories.
TFTP	<p>Check the file and directory permissions.</p> <p>Ensure the loadhost name and address are specified correctly and that their case matches that of the filenames on the host system.</p> <p>Ensure the file and pathnames are enclosed in quotes to preserve case.</p> <p>Ensure that TFTP is enabled on the host; several major UNIX vendors ship their systems with TFTP disabled by default.</p>
MOP	<p>The Ethernet circuit must have the service characteristic enabled.</p> <p>Ensure that the MOM\$LOAD search path includes the directory containing the ETS*.SYS file.</p>

E: Specifications

E.1 Power Information

E.1.1 Power Requirements

Voltage:	95 - 250 Volts AC, 3-wire single phase, auto-ranging
Frequency:	47-63 Hz
Operating Current:	300 mA @ 120 V
Power Consumption:	40 Watts (maximum)
Fuse Rating	1.6A, 250 Volts

E.1.2 Power Supply Cord

Cord type:	3 conductors, 1.0 mm ² minimum conductor size (approximately 18 AWG)
Rated for:	250 Volts AC, 10 Amps
Length:	3.0 meters

E.2 Environmental Limitations

E.2.1 Temperature

Operating range:	5° to 50° C (41° to 122° F)
Storage range:	-40° to 66° C (-40° to 151° F)
Max temp. change/hr:	20° C (36° F)

Rapid temperature changes may affect operation. Therefore, do not operate the ETS near heating or cooling devices, large windows, or doors that open to the outdoors.

E.2.2 Altitude

Operating maximum: 2.4 km (8,000 ft)

Storage maximum: 9.1 km (30,000 ft)

If operating the ETS above 2.4 km (8000 ft.), decrease the operating temperature rating by 1° F for each 1000 ft.

E.2.3 Relative Humidity

Operating range: 10% to 90% noncondensing, 40% to 60% recommended

Storage range: 10% to 90% noncondensing

F: Frequently-used Commands

This appendix lists some of the most frequently-used commands of the Multiport Device Server command set. More information about the command set, including additional options, can be found in the *Device Server Reference Manual* located on the CD-ROM.

F.1 Conventions

Please note the following before continuing:

- ◆ Commands are divided into Server (general), Port, and Protocol sections. Within each section, commands are listed alphabetically.
- ◆ Commands may require privileged user status. Enter **Set Privileged**, then enter the privileged password when prompted.
- ◆ When you enter a Define (or Purge) command, you must reboot the ETS for the command to take effect. Alternately, you can issue several Set commands and then a Save command to make the Set commands take effect without rebooting.
- ◆ When the abbreviated syntax “{EN/DIS}” is shown, you must choose either **Enabled** or **Disabled** to complete the command.
- ◆ When nn is shown, enter a single port number, a list of port numbers separated by commas, a range of port numbers separated by dashes, or the word all.

F.2 Server Commands

Table F-1: Frequently-used Server Commands

Command	Option(s)	Description
CONNECT option	servicename	Makes a connection to a LAT service.
	LOCAL num	Makes a connection to the specified local port.
	RLOGIN host	Makes an Rlogin connection to the specified host (text name or numeric IP address).
	TCP host	Makes a raw TCP connection to the specified host (text name or numeric IP address).
	TELNET host	Makes a Telnet connection to the specified host (text name or numeric IP address).
DEFINE SERVER BOOTP {EN/DIS}		Enables or disables querying for a BOOTP host at system boot time.
DEFINE SERVER DHCP {EN/DIS}		Enables or disables querying for a DHCP host at system boot time.
DEFINE SERVER GATEWAY ipaddr		Specifies the host to be used as a TCP/IP gateway to forward packets between networks. Enter an IP address.
DEFINE SERVER INCOMING option	BOTH	Enables incoming LAT and Telnet connections.
	LAT	Enables only incoming LAT connections.
	NONE	Disables incoming connections.
	TELNET	Enables only incoming Telnet connections.
	PASSWORD	Causes the ETS to prompt for a password for all incoming connections.
	NOPASSWORD	Allows connections to be established without prompting for a password.
DEFINE SERVER IPADDRESS ipaddr		Sets the ETS's network IP address.
DEFINE SERVER LOADHOST ipaddr		Specifies the TCP/IP host from which the ETS requests its run-time code.
DEFINE SERVER LOGIN PASSWORD		Sets a new password that will be required before incoming logins are accepted. You will be prompted for the new password (up to 6 alphanumeric characters, case-insensitive).
DEFINE SERVER NAME "newname"		Specifies a new name for the ETS. Names are restricted in length; generally a name of 11 or fewer characters is permissible.

Table F-1: Frequently-used Server Commands, cont.

Command	Option(s)	Description
DEFINE SERVER NETWARE LOADHOST server		Specifies the NetWare host from which the ETS requests its run-time code. Enter a file server name of up to 11 characters.
DEFINE SERVER PRIVILEGED PASSWORD		Sets a new password that will be required for privileged user status. You will be prompted for the new password (up to 6 alphanumeric characters, case-insensitive).
DEFINE SERVER RARP {EN/DIS}		Enables or disables querying for a RARP host at system boot time.
DEFINE SERVER SOFTWARE “filename”		Specifies the name or path (TCP) of the software download file. The filename can be up to 11 characters, and the pathname can be up to 26. The ETS will add a “.SYS” extension.
DEFINE SERVER SUBNET MASK ipmask		Specifies the subnet mask to be used for the ETS. The ipmask must be in n.n.n.n format.
HELP option	<nothing>	Displays a list of top-level (general) Help topics.
	<keyword>	Displays information about the keyword(s) entered. Multiple keywords must be specified in the order they occur in a command.
DEFINE SERVICE “name” PORT num		Creates a new service and associates it with the specified port.
DEFINE SERVICE “name” option	APPLETALK {EN/DIS}	Toggles whether the named service can be used to service networks running the specified protocol. RTEL applies to TCP/IP networks.
	LANMAN {EN/DIS}	
	LAT {EN/DIS}	
	NETWARE {EN/DIS}	
	RTEL {EN/DIS}	

Table F-1: Frequently-used Server Commands, cont.

Command	Option(s)	Description
DEFINE SERVICE “name” option	DLC {EN/DIS}	Specifies which service will handle print requests from DLC hosts. DLC can be enabled on one service per ETS.
	BANNER {EN/DIS}	When Enabled, causes the ETS to print a banner page before jobs.
	BINARY {EN/DIS}	When Enabled, the ETS will not process data passed through the service. This characteristic should be enabled when printing PCL data.
	EOJ string	Causes the ETS to send an end-of-job string to the attached device after every job. Enter an end string or the word none .
	FORMFEED {EN/DIS}	When Enabled, causes the ETS to append a formfeed to the end of LPR print jobs.
	POSTSCRIPT {EN/DIS}	When Enabled, causes the ETS to assume the attached device is a PostScript device and act accordingly.
	PSCONVERT {EN/DIS}	When Enabled, causes the ETS to place a PostScript wrapper around each job.
	SOJ string	Causes the ETS to send a start-of-job string to the attached device before every job. Enter a start string or the word none .
DEFINE SERVICE “name” option	TCPPORT string	Specifies a raw TCP listener socket for the service. Enter a socket number (4000 to 4999) or the word none .
	TELNETPORT string	Specifies a TCP listener socket for the service. Unlike TCPport, this option performs Telnet IAC interpretation on the data stream. Enter a socket number (4000 to 4999) or the word none .
INITIALIZE option	DELAY num	Schedules a reboot after num minutes. Enter a value from 0 to 120.
	CANCEL	Cancels an impending initialization.
	FACTORY	Reboots the ETS to its factory default settings.
	NOBOOT	Forces the ETS to stop in Boot Configuration Mode rather than fully rebooting.
	RELOAD	Forces the ETS to download new operational code and reprogram its flash-ROM.

Table F-1: Frequently-used Server Commands, cont.

Command	Option(s)	Description
LOGOUT option	<nothing>	Logs out the current port (the port that issued the command).
	PORT num	Logs out the specified port.
PURGE SERVICE option	LOCAL	Removes the definitions of all local services.
	“service”	Removes the definition of the specified service.
SET PRIVILEGED		Enters privileged mode, provided the user enters the proper privileged password when prompted.
{SHOW/MONITOR} QUEUE		Displays the status of ETS queues once (Show) or continually every three seconds (Monitor).
{SHOW/MONITOR} SERVER	<nothing>	Displays ETS information once (Show) or continually every three seconds (Monitor).
	COUNTERS	Displays characteristics related to the various counters kept by the ETS.
{SHOW/MONITOR} SERVICE option	<nothing>	Displays characteristics about all configured services once (Show) or continually every three seconds (Monitor).
	“service”	Displays only characteristics related to the named service.
ZERO COUNTERS option	ALL	Zeroes all port, node, and server counters.
	PORT num	Zeroes port counters for the specified port.

F.3 Port Commands

In the following commands, “1” can be a single port number, a list of port numbers separated by commas, a range of port numbers separated by dashes, or the word all.

Table F-2: Port Commands

Command	Option(s)	Description
DEFINE PORT 2 ACCESS option	DYNAMIC	The port can initiate and receive connection requests.
	LOCAL	The port can initiate connection requests, and local logins are permitted.
	NONE	The port is unusable.
	REMOTE	The port can receive host-initiated connection requests.

Table F-2: Port Commands, cont.

Command	Option(s)	Description
DEFINE PORT 2 BITRONICS {EN/DIS}		When Enabled, ensures bidirectional functioning of the parallel port. The attached printer must also support Bitronics mode.
DEFINE PORT 2 CHARACTER size		Toggles the port between 7-bit and 8-bit characters (the default). Enter either 7 or 8 .
DEFINE PORT 2 DSRLOGOUT {EN/DIS}		When Enabled, the port will be logged out automatically whenever DSR is deasserted.
DEFINE PORT 2 DTRWAIT {EN/DIS}		When Enabled, the ETS will not assert DTR on the port when it is idle (no user logins or connections).
DEFINE PORT 2 FLOW option	CTS {EN/DIS} NONE XON	Specifies CTS/RTS (hardware) flow control. Activates or deactivates the currently-configured flow-control method. Removes the current flow control settings. Specifies XON/XOFF (software) flow control.
DEFINE PORT 2 NAME “newname”		Enter a name of up to 16 alphanumeric characters for the specified port.
DEFINE PORT 2 PARITY option	parity NONE	Enter even , odd , mark , or space . Specifying mark or space will change the character size to 7 bits. Specifies that no parity will be used (the default).
DEFINE PORT 2 SPEED baudnum		Sets the port’s baud rate. Acceptable baudnum values range from 300 to 230000 baud.
{SHOW/MONITOR} PORT 2		Displays the port’s configuration characteristics once (Show) or continually every three seconds (Monitor). Counters and Status keywords can be added.
TEST PORT 2 option	COUNT rows WIDTH cols POSTSCRIPT	Sends an ASCII data stream to the port for the specified number of rows and/or columns. Sends a PostScript test page to the port.

F.4 Protocol Commands

In the following table, **PROTO** is an abbreviation for the optional keyword **PROTOCOL**.

Table F-3: Protocol Commands

Command	Option(s)	Description
DEFINE PROTO APPLETALK option	{EN/DIS}	Enables or Disables the AppleTalk protocol for the ETS.
	ZONE newzone	Places the ETS in a zone other than the default.
DEFINE PROTO IP option	{EN/DIS}	Enables or Disables the TCP/IP protocol for the ETS.
	GATEWAY ipaddr	See DEFINE SERVER GATEWAY ipaddr.
	IPADDRESS ipaddr	See DEFINE SERVER IPADDRESS ipaddr.
	LOADHOST ipaddr	See DEFINE SERVER LOADHOST ipaddr.
	NAMESERVER ipaddr	Specifies the IP address of the host that will resolve text host names into their numeric equivalents for TCP/IP connection attempts.
DEFINE PROTO LANMAN option	{EN/DIS}	Enables or Disables the LAN Manager protocol for the ETS.
DEFINE PROTO LAT option	{EN/DIS}	Enables or Disables the LAT protocol for the ETS.
	LICENSE string	Enables LAT on multi-port ETS's. Enter the license string obtained from Lantronix.
DEFINE PROTO NETWARE option	{EN/DIS}	Enables or Disables the NetWare (IPX) protocol for the ETS.
	DSCONTEXT string	Configures the NetWare Directory Services context in which the ETS is located. For more information about NDS contexts, see your NDS documentation.
	DSLICENSE string	Configures the NetWare Directory Services license needed to enable NDS on your ETS. Enter the license string obtained from Lantronix.
	DSTREE string	Configures the NetWare Directory Services tree in which the ETS is located. For more information about NDS trees, see your NDS documentation.

Table F-3: Protocol Commands, cont.

Command	Option(s)	Description
DEFINE PROTO NETWARE ENCAPSULATION option {EN/DIS}	NATIVE ETHER_II 802_2 SNAP	Configures the ETS to use the “native mode” frame format. Configures the ETS to use Ethernet v2 frame format. Configures the ETS to use 802.2 frame format with NetWare SAPs. Configures the ETS to use 802.2 frame format with SNAP SAPs.
DEFINE PROTO NETWARE LOADHOST server		See DEFINE SERVER NETWARE LOADHOST server.
PURGE IPSECURITY option	ALL ipaddress	Removes the entire IP security table. Removes entries from the IP security table that are related to the specified IP address.
PURGE PROTO NET- WARE ACCESS option	ALL server	Removes all entries from the NetWare access list. Removes entries from the NetWare access list that are related to the specified file server.
{SHOW/MONITOR} PROTO protocolname		Displays operating characteristics of the specified protocol.

Warranty Statement

Lantronix warrants for a period of ONE year from the date of shipment that each ETS4P, ETS8P, ETS16P, ETS16PR, ETS32PR, and ETS422PR Multiport Device Server supplied shall be free from defects in material and workmanship. During this period, if the customer experiences difficulties with a product and is unable to resolve the problem by phone with Lantronix Technical Support, a Return Material Authorization (RMA) will be issued. Following receipt of a RMA number, the customer is responsible for returning the product to Lantronix, freight prepaid. Lantronix, upon verification of warranty will, at its option, repair or replace the product in question, and return it to the customer freight prepaid. No services are handled at the customer's site under this warranty.

Lantronix warrants software for a period of sixty (60) days from the date of shipment that each software package supplied shall be free from defects and shall operate according to Lantronix specifications. Any software revisions required hereunder cover supply of distribution media only and do not cover, or include, any installation. The customer is responsible for return of media to Lantronix and Lantronix for freight associated with replacement media being returned to the customer.

Lantronix shall have no obligation to make repairs or to cause replacement required through normal wear and tear or necessitated in whole or in part by catastrophe, fault or negligence of the user, improper or unauthorized use of the Product, or use of the Product in such a manner for which it was not designed, or by causes external to the Product, such as, but not limited to, power or failure of air conditioning.

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Warranty claims must be received by Lantronix within the applicable warranty period. A replaced product, or part thereof, shall become the property of Lantronix and shall be returned to Lantronix at the Purchaser's expense. **All return material must be accompanied by a return material authorization number assigned by Lantronix.**

Declaration of Conformity

(according to ISO/IEC Guide 22 and EN 45014)

Manufacturer's Name & Address:

Lantronix 15353 Barranca Parkway, Irvine, CA 92618 USA

Declares that the following product:

Product Name & Model:

Terminal Server ETS4P, ETS8P, ETS16P, ETS16PR, ETS32PR, ETS422PR

Conforms to the following standards or other normative documents:

Safety:

EN60950: 1988+A1, A2, A3, A4, A11

Electromagnetic Emissions:

EN55022: 1998 (CISPR 22, Class A: 1993, A1: 1995, A2: 1996)

IEC 1000-3-2/A14: 2000

IEC 1000-3-3: 1994

Electromagnetic Immunity:

EN55024: 1998 Information Technology Equipment-Immunity Characteristics

IEC 6100-4-2: 1995 Electro-Static Discharge Test

IEC 6100-4-3: 1996 Radiated Immunity Field Test

IEC 6100-4-4: 1995 Electrical Fast Transient Test

IEC 6100-4-5: 1995 Power Supply Surge Test

IEC 6100-4-6: 1996 Conducted Immunity Test

IEC 6100-4-8: 1993 Magnetic Field Test

IEC 6100-4-11: 1994 Voltage Dips & Interrupts Test

(L.V.D. Directive 73/23/EEC)

Supplementary Information:

This Class A digital apparatus complies with Canadian ICES-003 (CSA) and has been verified as being compliant within the Class A limits of the FCC Radio Frequency Device Rules (FCC Title 47, Part 15, Subpart B CLASS A), measured to CISPR 22: 1993 limits and methods of measurement of Radio Disturbance Characteristics of Information Technology Equipment. This product also complies with the requirements of the Low Voltage Directive 72/23/EEC and the EMC Directive 89/336/EEC.

Manufacturer's Contact:

Director of Quality Assurance, Lantronix
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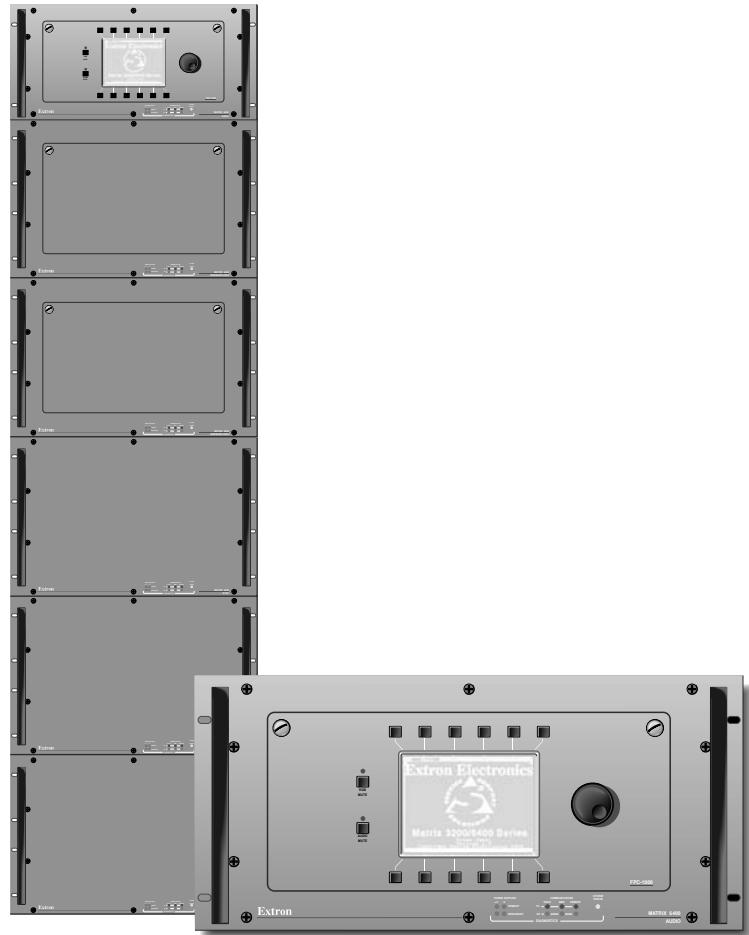
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Extron® Electronics
INTERFACING, SWITCHING AND DISTRIBUTION

User's Manual



Matrix 3200 and 6400 Series

Video Switcher

Precautions

Safety Instructions • English



This symbol is intended to alert the user of important operating and maintenance (servicing) instructions in the literature provided with the equipment.



This symbol is intended to alert the user of the presence of uninsulated dangerous voltage within the product's enclosure that may present a risk of electric shock.

Caution

Read Instructions • Read and understand all safety and operating instructions before using the equipment.

Retain Instructions • The safety instructions should be kept for future reference.

Follow Warnings • Follow all warnings and instructions marked on the equipment or in the user information.

Avoid Attachments • Do not use tools or attachments that are not recommended by the equipment manufacturer because they may be hazardous.

Consignes de Sécurité • Français



Ce symbole sert à avertir l'utilisateur que la documentation fournie avec le matériel contient des instructions importantes concernant l'exploitation et la maintenance (réparation).



Ce symbole sert à avertir l'utilisateur de la présence dans le boîtier de l'appareil de tensions dangereuses non isolées posant des risques d'électrocution.

Attention

Lire les instructions • Prendre connaissance de toutes les consignes de sécurité et d'exploitation avant d'utiliser le matériel.

Conserver les instructions • Ranger les consignes de sécurité afin de pouvoir les consulter à l'avenir.

Respecter les avertissements • Observer tous les avertissements et consignes marqués sur le matériel ou présentés dans la documentation utilisateur.

Eviter les pièces de fixation • Ne pas utiliser de pièces de fixation ni d'outils non recommandés par le fabricant du matériel car cela risquerait de poser certains dangers.

Sicherheitsanleitungen • Deutsch



Dieses Symbol soll dem Benutzer in der im Lieferumfang enthaltenen Dokumentation besonders wichtige Hinweise zur Bedienung und Wartung (Instandhaltung) geben.



Dieses Symbol soll den Benutzer darauf aufmerksam machen, daß in Inneren des Gehäuses dieses Produktes gefährliche Spannungen, die nicht isoliert sind und die einen elektrischen Schock verursachen können, herrschen.

Achtung

Lesen der Anleitungen • Bevor Sie das Gerät zum ersten Mal verwenden, sollten Sie alle Sicherheits- und Bedienungsanleitungen genau durchlesen und verstehen.

Aufbewahren der Anleitungen • Die Hinweise zur elektrischen Sicherheit des Produktes sollten Sie aufzubewahren, damit Sie im Bedarfsfall darauf zurückgreifen können.

Befolgen der Warnhinweise • Befolgen Sie alle Warnhinweise und Anleitungen auf dem Gerät oder in der Benutzerdokumentation.

Keine Zusatzergeräte • Verwenden Sie keine Werkzeuge oder Zusatzergeräte, die nicht ausdrücklich vom Hersteller empfohlen wurden, da diese eine Gefahrenquelle darstellen können.

Instrucciones de seguridad • Español



Este símbolo se utiliza para advertir al usuario sobre instrucciones importantes de operación y mantenimiento (o cambio de partes) que se desean destacar en el contenido de la documentación suministrada con los equipos.



Este símbolo se utiliza para advertir al usuario sobre la presencia de elementos con voltaje peligroso sin protección aislante, que puedan encontrarse dentro de la caja o alojamiento del producto, y que puedan representar riesgo de electrocución.

Precaucion

Leer las instrucciones • Leer y analizar todas las instrucciones de operación y seguridad, antes de usar el equipo.

Conservar las instrucciones • Conservar las instrucciones de seguridad para futura consulta.

Obedecer las advertencias • Todas las advertencias e instrucciones marcadas en el equipo o en la documentación del usuario, deben ser obedecidas.

Evitar el uso de accesorios • No usar herramientas o accesorios que no sean específicamente recomendados por el fabricante, ya que podrían implicar riesgos.

Warning

Power sources • This equipment should be operated only from the power source indicated on the product. This equipment is intended to be used with a main power system with a grounded (neutral) conductor. The third (grounding) pin is a safety feature, do not attempt to bypass or disable it.

Power disconnection • To remove power from the equipment safely, remove all power cords from the rear of the equipment, or the desktop power module (if detachable), or from the power source receptacle (wall plug).

Power cord protection • Power cords should be routed so that they are not likely to be stepped on or pinched by items placed upon or against them.

Serviceing • Refer all servicing to qualified service personnel. There are no user-serviceable parts inside. To prevent the risk of shock, do not attempt to service this equipment yourself because opening or removing covers may expose you to dangerous voltage or other hazards.

Slots and openings • If the equipment has slots or holes in the enclosure, these are provided to prevent overheating of sensitive components inside. These openings must never be blocked by other objects.

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

Avertissement

Alimentations • Ne faire fonctionner ce matériel qu'avec la source d'alimentation indiquée sur l'appareil. Ce matériel doit être utilisé avec une alimentation principale comportant un fil de terre (neutre). Le troisième contact (de mise à la terre) constitue un dispositif de sécurité : n'essayez pas de la contourner ni de la désactiver.

Déconnexion de l'alimentation • Pour mettre le matériel hors tension sans danger, déconnectez tous les cordon d'alimentation de l'arrière de l'appareil ou du module d'alimentation de bureau (s'il est amovible) ou encore de la prise secteur.

Protection du cordon d'alimentation • Acheminer les cordons d'alimentation de manière à ce que personne ne risque de marcher dessus et à ce qu'ils ne soient pas écrasés ou pincés par des objets.

Réparation-maintenance • Faire exécuter toutes les interventions de réparation-maintenance par un technicien qualifié. Aucun des éléments internes ne peut être réparé par l'utilisateur. Afin d'éviter tout danger d'électrocution, l'utilisateur ne doit pas essayer de procéder lui-même à ces opérations car l'ouverture ou le retrait des couvercles risquent de l'exposer à de hautes tensions et autres dangers.

Fentes et orifices • Si le boîtier de l'appareil comporte des fentes ou des orifices, ceux-ci servent à empêcher les composants internes sensibles de surchauffer. Ces ouvertures ne doivent jamais être bloquées par des objets.

Lithium Batterie • Il a danger d'explosion s'il y a remplacement incorrect de la batterie. Remplacer uniquement avec une batterie du même type ou d'un type équivalent recommandé par le constructeur. Mettre au rebut les batteries usagées conformément aux instructions du fabricant.

Vorsicht

Stromquellen • Dieses Gerät sollte nur über die auf dem Produkt angegebene Stromquelle betrieben werden. Dieses Gerät würde für eine Verwendung mit einer Hauptstromleitung mit einem geerdeten (neutralen) Leiter konzipiert. Der dritte Kontakt ist für einen Erdanschluß, und stellt eine Sicherheitsfunktion dar. Diese sollte nicht umgangen oder außer Betrieb gesetzt werden.

Stromunterbrechung • Um das Gerät auf sichere Weise vom Netz zu trennen, sollten Sie alle Netzkabel aus der Rückseite des Gerätes, aus der externen Stromversorgung (falls dies möglich ist) oder aus der Wandsteckdose ziehen.

Schutz des Netzkabels • Netzkabel sollten stets so verlegt werden, daß sie nicht im Weg liegen und niemand darauf treten kann oder Objekte darauf- oder unmittelbar dagegengestellt werden können.

Wartung • Alle Wartungsmaßnahmen sollten nur von qualifiziertem Servicepersonal durchgeführt werden. Die internen Komponenten des Gerätes sind wartungsfrei. Zur Vermeidung eines elektrischen Schocks versuchen Sie in keinem Fall, dieses Gerät selbst öffnen, da beim Entfernen der Abdeckungen die Gefahr eines elektrischen Schlags und/oder andere Gefahren bestehen.

Schlitzes und Öffnungen • Wenn das Gerät Schlitzes oder Löcher im Gehäuse aufweist, dienen diese zur Vermeidung einer Überhitzung der empfindlichen Teile im Inneren. Diese Öffnungen dürfen niemals von anderen Objekten blockiert werden.

Lithium-Batterie • Explosionsgefahr, falls die Batterie nicht richtig ersetzt wird. Ersetzen Sie verbrauchte Batterien nur durch den gleichen oder einen vergleichbaren Batterietyp, der auch vom Hersteller empfohlen wird. Entsorgen Sie verbrauchte Batterien bitte gemäß den Herstelleranweisungen.

Advertencia

Alimentación eléctrica • Este equipo debe conectarse únicamente a la fuente/tipo de alimentación eléctrica indicada en el mismo. La alimentación eléctrica de este equipo debe provenir de un sistema de distribución general con conductor neutro a tierra. La tercera pata (puesta a tierra) es una medida de seguridad, no la quite ni elimine.

Desconexión de alimentación eléctrica • Para desconectar con seguridad la acometida de alimentación eléctrica al equipo, desenchufar todos los cables de alimentación en el panel trasero del equipo, o desenchufar el módulo de alimentación (si fuera independiente), o desenchufar el cable del receptáculo de la pared.

Protección del cables de alimentación • Los cables de alimentación eléctrica se deben instalar en lugares donde no sean pisados ni apretados por objetos que se puedan apoyar sobre ellos.

Reparaciones/mantenimiento • Solicitar siempre los servicios técnicos de personal calificado. En el interior no hay partes a las que el usuario deba acceder. Para evitar riesgo de electrocución, no intentar personalmente la reparación/mantenimiento de este equipo, ya que al abrir o extraer las tapas puede quedar expuesto a voltajes peligrosos u otros riesgos.

Ranuras y aberturas • Si el equipo posee ranuras o orificios en su caja/alojamiento, es para evitar el sobrecalentamiento de componentes internos sensibles. Estas aberturas nunca se deben obstruir con otros objetos.

Batería de litio • Existe riesgo de explosión si esta batería se coloca en la posición incorrecta. Cambiar esta batería únicamente con el mismo tipo (o su equivalente) recomendado por el fabricante. Descharar las baterías usadas siguiendo las instrucciones del fabricante.

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The following icons may be used in this manual:

 _____ *Important information – for example, an action or a step that must be done before proceeding.*

 _____ *A Warning – possible dangerous voltage present.*

 _____ *A Warning – possible damage could occur.*

 _____ *A Note, a Hint, or a Tip that may be helpful.*

 _____ *Possible Electrostatic Discharge (ESD) damage could result from touching electronic components.*

 _____ *Indicates word definitions. Additional information may be referenced in another section, or in another document.*

Matrix 3200/6400 Video Switcher



Chapter One

Introduction to the Matrix 3200/6400 Video Switcher

What is a Matrix 3200/6400 Video Switcher?

Features

Specifications

What is a Matrix 3200/6400 Video Switcher?

The Matrix 3200/6400 Video Switchers may be used with composite video, S-Video and component video. The Switchers are housed in 5U high rack-mountable metal enclosures with internal universal switching power supplies. They may be used as stand-alone video switchers or as part of a Matrix 3200/6400 system switcher.

In most installations an RS-232 program will be used to control the Matrix 3200/6400 Video Switcher as a stand-alone or as part of a system switcher. Control can be from any user-supplied controlling device capable of generating the proper commands such as a PC using Extron's Windows® control software or AMX, Crestron, etc. An optional Front Panel Controller enables the user to perform most configuration operations at the switcher.

See "Matrix 3200 & 6400 Video Switcher System Overview" on Page 1-5.

Features

- Supports Composite video, S-Video and Component video
- Virtual input and output assignments
- Microprocessor Control
- Independent matrix switching outputs
- 32 Global Preset configurations stored in nonvolatile memory
- 10 Room configurations with 10 Presets per room
- RS-232/RS-422 (serial port) control
- Rack mountable metal enclosure with internal Universal Power Supplies
- Redundant power supplies (Optional)
- FPC 1000 Front Panel Controller (Optional)
- MKP 1000 and MCP 1000 remote keypads control switching in remote rooms (Optional)

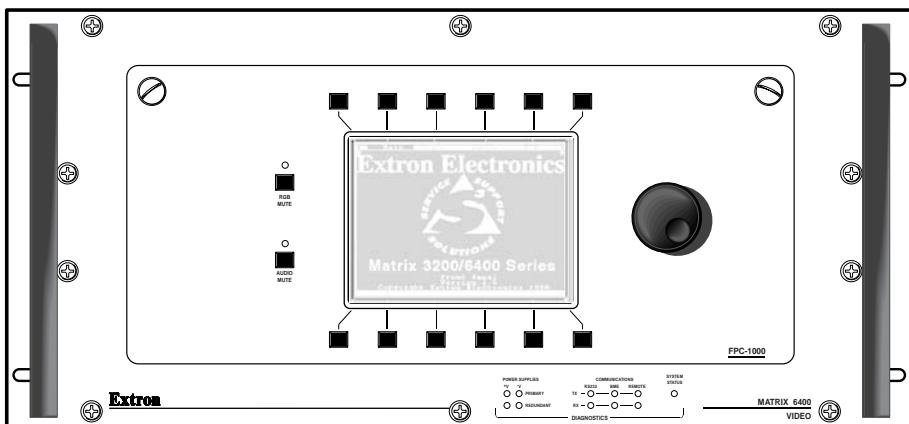


Figure 1-1.A Matrix 6400 Video Switcher w/optional FPC 1000

Feature Descriptions

Virtual Control – Logical assignment of physical Input/Output connector.

Microprocessor Control – A Microprocessor enables the Matrix 3200/6400 Video switcher to be programmed from a host system, or from the optional Front Panel Controller (FPC 1000).

Global Preset configurations (32 +1) – Thirty-two Global Preset configurations plus the current I/O configuration are stored in nonvolatile memory. As new configurations are developed, they may be stored as Global Presets (up to a total of thirty-two) in the Preset memory. Any preset may later be recalled – instantly setting the switcher to the desired configuration.

Room configurations – 10 Room configurations with 10 Presets for each Room enables 10 different remote locations to control switching for that particular location using an **optional MKP 1000 or MCP 1000 Remote Keypad**. Room Configurations may be significantly different from room to room and would probably only include a select number of inputs and outputs per room.

Memory – Nonvolatile memory contents remain valid after power is removed normally or due to a power failure.

RS-232/RS-422 – The Matrix 3200/6400 Video Switcher can be controlled by any remote Host system with serial communications capability.

Rack Mountable metal enclosures – Matrix Video Switchers are housed in 5U high, rack mountable-metal enclosures. An internal switch mode power supply is standard for all models.

Modular Design – The modular design of the Matrix 3200/6400 Video Switcher provides flexibility and expandability by allowing users to purchase only the modules required for their systems. BMEs may also be upgraded by adding output video cards (8 outputs/card).

Redundant Power Supply (Optional) – If the main power supply fails, the Redundant Power Supply will take over automatically.

FPC 1000 Front Panel Controller (Optional) – The FPC 1000 mounts in place of the blank access panel in the master module (BME #0) and enables the user to perform most configuration operations at the switcher. See FPC 1000 User's Manual (Extron Part #68-355-02).

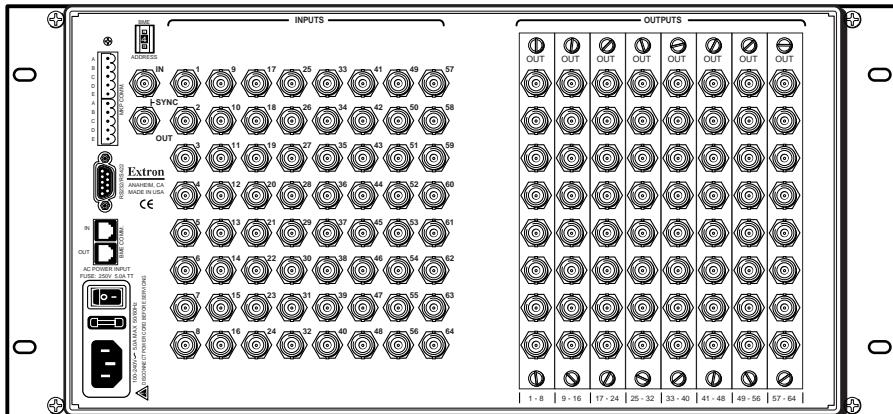
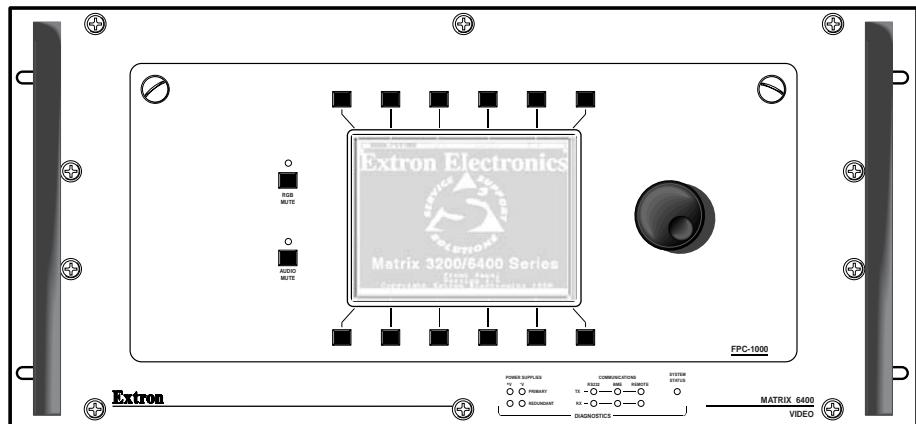
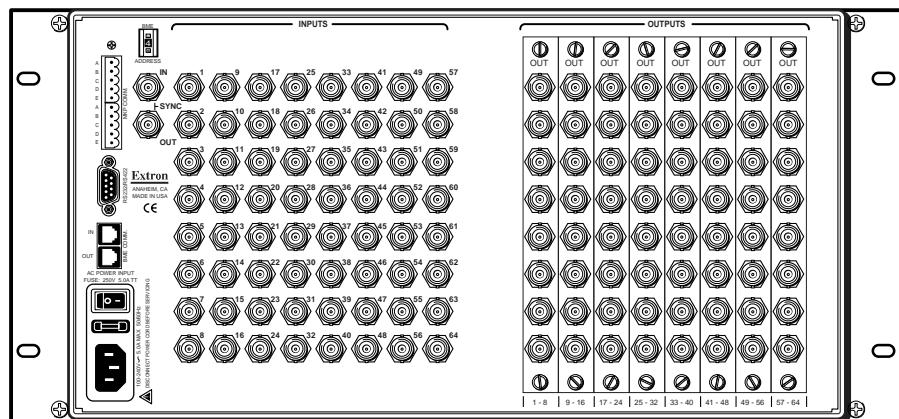


Figure 1-2.A Matrix 6400 Video Switcher (Rear Panel View)

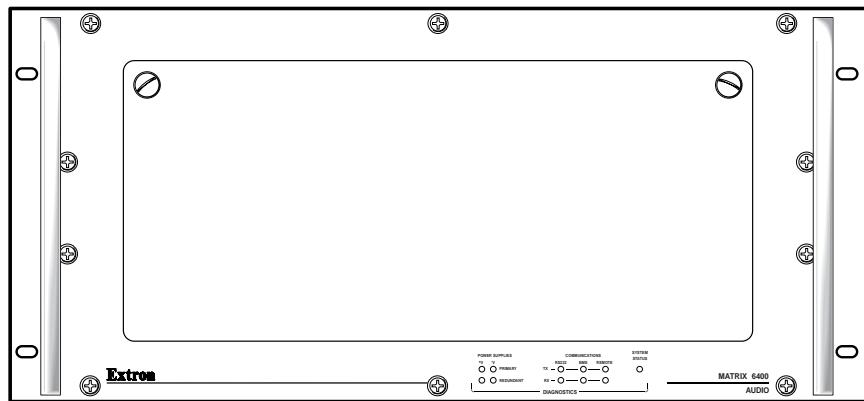
Matrix 6400 Video Switcher
(Front View) - shown with
optional Front Panel Controller
(FPC 1000)



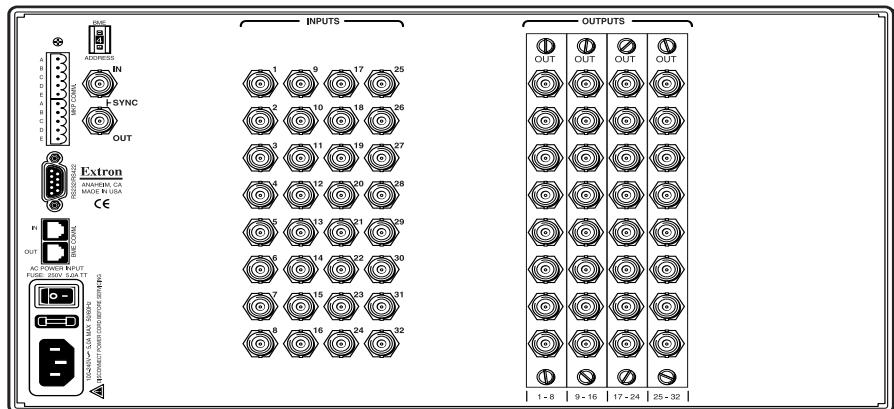
Matrix 6400 Video Switcher
(Rear View) - shown with 8
Video Output cards installed.



Matrix 3200 Video Switcher
(Front View) - shown with a
blank access panel.



Matrix 3200 Switcher
(Rear View) - shown with 4
Video Output cards installed.



Matrix 3200/6400 System Manuals

This manual (68-355-03) covers the Matrix 6400 Audio Switcher. Following is a list of related manuals:

- 68-355-01 = MKP 1000 User's Manual
- 68-355-02 = FPC 1000 User's Manual
- 68-456-01 = MCP 1000 User's Manual
- 68-355-04 = Matrix 3200 and 6400 Video User's Manual
- 68-355-05 = Matrix 3200 and 6400 Wideband Video/Sync User's Manual

Matrix 3200 & 6400 Video Switcher System Overview

A Matrix 3200/6400 Video Switcher System may consist of 1 to 3 Matrix 3200 and/or Matrix 6400 Video BMEs (Basic Module Enclosures). Three video formats are supported, composite video, S-Video and component video. The switcher system may be dedicated to any one video format or a combination of all three formats in almost any configuration. What makes this possible is the switcher's unique ability to accept virtual connector assignments of its physical connectors. Virtual assignments are done through the RS-232 serial port of the switcher from a Host computer using Extron supplied software. If a system consists of more than one switcher, the Host computer communicates with the switcher designated as BME #0 which communicates with the other switcher(s). When Virtual assignments have been completed, the system is considered to be Virtualized.

One or more physical input connectors may be assigned as any Virtual input number, the same is true of the output connectors. Virtual input and output assignments are done through BME #0's RS-232/RS-422 communications port with a PC computer using Extron's Matrix 3200/6400 System Virtualization/Control software. This will probably need to be done during initial system installation (before installing input and output cables) and would not normally need to be repeated unless the system configuration changed. After the Virtual inputs and outputs have been assigned (the system has been Virtualized), the input and output cables are installed. Input/output selection (Ties and/or Presets) may be done through the RS-232/RS-422 port with a PC Host or from a touch screen or any other user-supplied controlling device, such as AMX, Crestron, etc., that is capable of generating the proper commands, or, with an optional FPC 1000 Front Panel Controller.

Figure 1-5.A is an example of a Virtualized Matrix 3200 Video Switcher with 16 S-Video inputs and 4 S-Video outputs. The circles represent BNC connectors, the physical connector number is shown just outside each circle (one o'clock position). The Virtual assignment for each connector is shown inside the circle; for example, physical input connectors 1 and 2 are Virtual input #1 (Y1 and C1). If Virtual input #1 is tied (switched) to Virtual output #4, the YC video on physical input connectors 1 and 2 will be output to physical output connectors 7 and 8.

Blank Virtual Matrix work-sheets which may be copied and used to assist in Virtualizing a system are provided in Appendix A. The Matrix 3200/6400 System Virtualization/Control software may also be used to print maps which show the physical connectors to Virtual assignments and make it easy to cable a system.

A Matrix 3200/6400 System Virtualization/Control Software Tutorial with instructions for Virtualizing a system is provided in Chapter 3 of this manual.

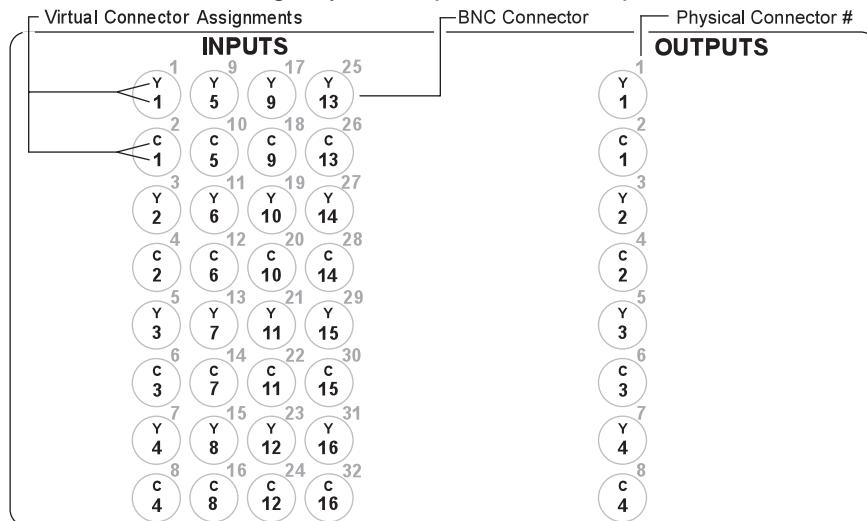


Figure 1-5.A 32x8 Video Switcher BME virtualized for 16x4 S-Video matrix.

Matrix 3200 Video and Matrix 6400 Audio Switcher System

A Matrix 6400 Video Switcher System may include a Matrix 6400 Audio Switcher which would enable the system to switch both video and audio. Figure 1-6.A below is an example of a virtualized 16x8 S-Video configured Matrix 3200 Video Switcher (top chassis) combined with a 32x8 Matrix 6400 Audio Switcher (bottom chassis). Audio-follow/breakaway are among the supported features of mixed video and audio configurations.

Virtualization (mapping) of the system in Figure 1-6.A below shows virtual audio inputs 1 - 16 mapped to follow virtual video inputs 1 - 16. Audio inputs 17 - 32 are shown mapped as unassigned to specific video inputs but available to all video inputs. Input to output connections (ties) including audio breakaway may be made via a Host computer/control device or from an FPC 1000 Front Panel Controller.

Example 1: Video/Audio Follow

Virtual video input 1 tied to virtual video output 8 and virtual audio input 1 tied to virtual audio output 8 enables the video and audio (a football game?) from a Satellite Receiver to be seen and heard with a monitor.

Example 2: Video/Audio Breakaway

Virtual video input 1 tied to virtual video output 8 and virtual audio input 4 tied to virtual audio output 8 enables the video (a football game?) to be seen while listening to a CD. This is a typical breakaway audio example.

Example 3: Video/Audio Breakaway

Virtual video input 1 tied to virtual video output 8 and virtual audio input 32 tied to virtual output 8 enables the video (a football game?) to be seen while listening to a stereo radio. This example demonstrates breakaway audio using an unassigned audio input.

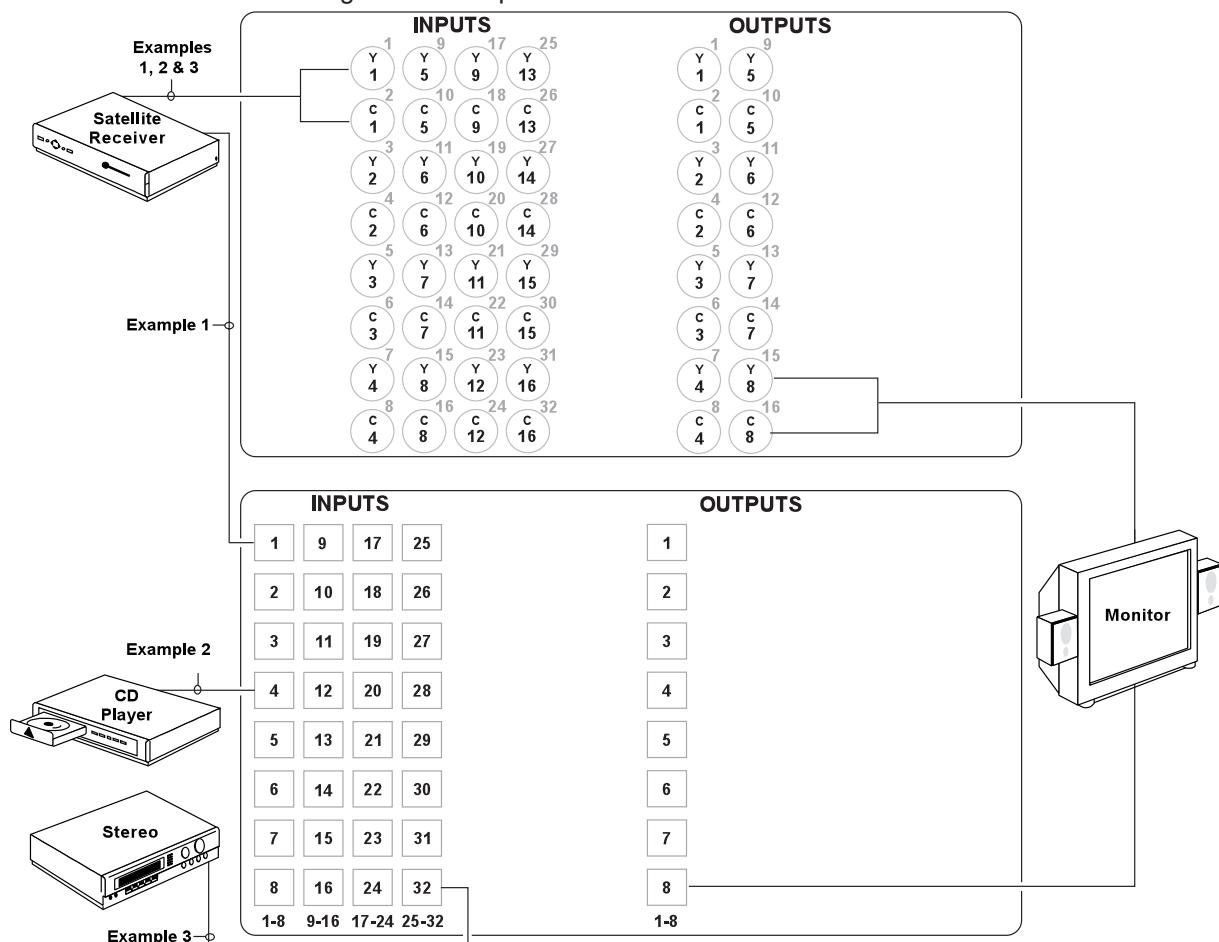


Figure 1-6.A Matrix 3200 Video system with Matrix 6400 Audio Switcher.

Matrix 3200/6400 Video Switcher Specifications

Video input

Number/signal type	Up to 32 or 64 (varies with configuration) RGsB, RsGsBs, component video, S-video, composite video, HDTV
Connectors	BNC female (quantity varies with model)
Nominal level	Analog 1V p-p
Minimum/maximum level(s) ...	Analog 0.5V to 1.5V p-p
Impedance	75 ohms
Return loss	-30dB @ 5 MHz
External sync (genlock)	0.3V to 12V p-p, 75 ohms

Video throughput

Routing	16 x 8 or larger matrix up to 32 x 32 or 64 x 64, depending on model and configuration
Gain	Unity
Bandwidth — Matrix 6400	Minimum 80 MHz (-3dB), fully loaded Maximum 150 MHz (-3dB), fully loaded 0–10 MHz..... No more than +0.1dB to -0.1dB 0–30 MHz..... No more than +0.5dB to -0.5dB
Crosstalk	> 65dB @ 20 MHz > 80dB @ 60 MHz
Switching speed	200 nS (max.)

Video output

Number/signal type	Up to 32 or 64 (varies with configuration) RGsB, RsGsBs, component video, S-video, composite video, HDTV
Connectors	BNC female (quantity varies with model)
Nominal level	1V p-p
Impedance	75 ohms
Return loss	-40dB to input section 3.58 MHz/4.43 MHz
DC offset	±10mV maximum
Switching type	Vertical interval
Slew rate	>200V/mS

Control/Remote — switcher

Serial control port	RS-232 or RS-422, 9-pin female D connector
Baud rate and protocol	9600 , 8-bit, 1 stop bit, no parity
Pin configurations	2 = TX, 3 = RX, 5 = GND
System intercommunications	2 RJ-11 connectors
Remote keypad control	2 5 mm, 5-pin captive screw connectors
Program control	Extron's control program for Windows® Extron's Simple Instruction Set™ — SIS™

General

Power	100VAC to 240VAC, 50/60 Hz; internal, auto-switchable
Matrix 6400 video	90 watts at 115VAC, 60 Hz
Matrix 3200 video	40 watts at 115VAC, 60 Hz
Temperature/humidity	Storage -40° to +158° F (-40° to +70° C) / 10% to 90%, non-condensing Operating +32° to +122° F (0° to 50° C) / 10% to 90%, non-condensing
Rack mount	Yes
Enclosure type	Metal

5U dimensions	8.75" H x 19.0" W* x 14.0" D 22.2 cm H x 48.3 cm W* x 35.6 cm D *17.0" (43.18 cm) W excluding rack ears
7U dimensions	12.25" H x 19.0" W* x 14.0" D 31.1 cm H x 48.3 cm W* x 35.6 cm D *17.0" (43.18 cm) W excluding rack ears

Shipping weight

Matrix 6400	34 lbs. (15.3 kg)
Matrix 3200	31 lbs. (14.0 kg)

Vibration NSTA 1A in carton (National Safe Transit Association)

Listings UL, CUL

Approvals CE, FCC Class A

MTBF 30,000 hours

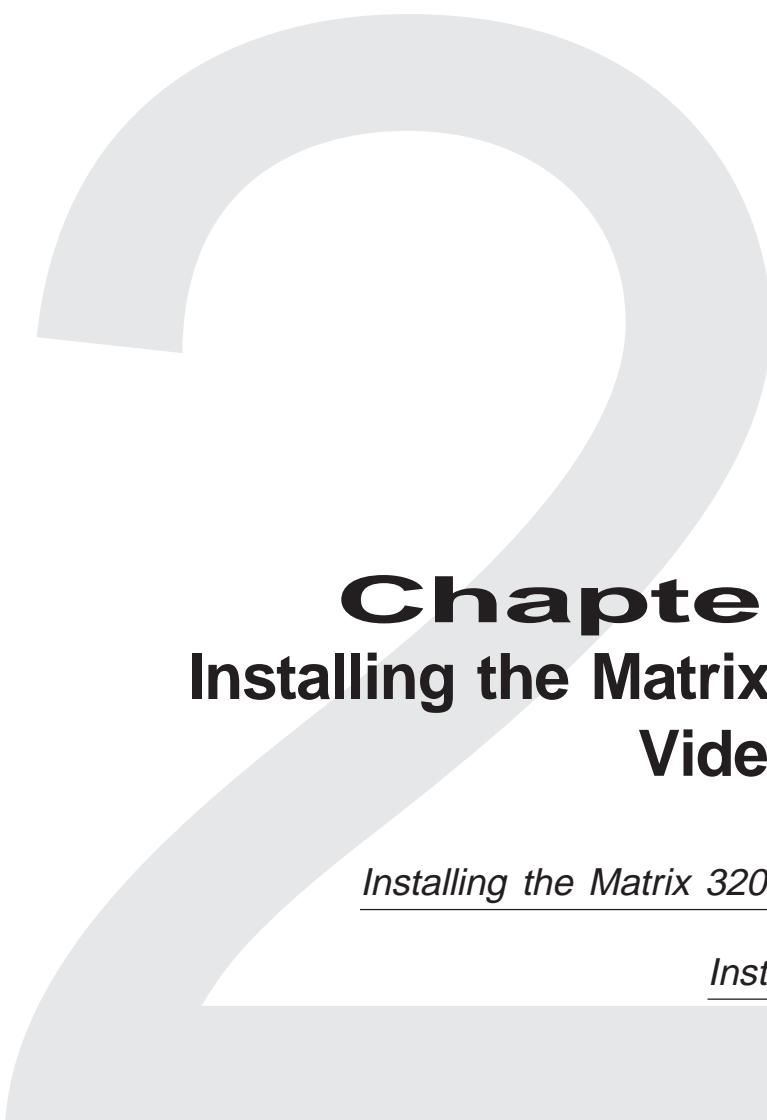
Warranty 3 years parts and labor



Specifications are subject to change without notice.

Notes

Matrix 3200/6400 Video Switcher



Chapter Two

Installing the Matrix 3200/6400 Video Switcher

Installing the Matrix 3200/6400 Video BME

Installing the Software

BME Cabling

Matrix 3200/6400 Video Switcher Installation

Extron recommends that the following steps be done in the order listed to install a Matrix 3200/6400 Video BME.

1. Installing the Matrix 3200/6400 Video BME. (Page 2-1)
2. Set the BME address numbers (0 - 5). (Page 2-2)
3. Connect the BME COMM interconnecting cable(s). (Page 2-2)
4. Connect the RS-232/RS-422 cable to BME #0's serial port. (Page 2-2)
5. Connect the external vertical interval sync cables (Page 2-2)
6. Connect the AC Power cable(s) to the BME(s). (Page 2-2)
7. Apply AC power to the BMEs and Verify Normal Power-Up. (Page 2-2)
8. Load the Matrix 1000 System Virtualization/Control Software. (Page 2-3)
9. Virtualize the Matrix 3200/6400 switcher/system if required. (Page 3-1)

The numbered procedures that follow match the steps above.

1. Installing the Matrix 3200/6400 Video BME

The Matrix 3200/6400 Video BME may be a stand-alone video switcher or it may be part of a Matrix 6400/3200 System. In either case it may be installed in a rack. If it is part of a Matrix 6400/3200 System, BMEs may be separated by up to 12 feet and rack mounting is NOT required. If the BMEs are to be rack mounted, they may be mounted in any order within a rack or cabinet. The limiting factor is the BME COMM interconnecting cable length which is 12 feet maximum. There are no restrictions to the order in which BMEs may be mounted relative to each other. Logically, the BME addresses in a system such as the one shown in Figure 2-1.A (3 Matrix 3200/6400 Video BMEs above a Matrix 6400 Audio BME) would be set to 0 - 3 sequentially from top to bottom, however, a different order is acceptable and will not impact system operation in any way (see restrictions below).

The location of the equipment within a room should be given careful consideration. Poor planning, with the number of cables involved, could result in a cluttered appearance. Power requirements and the amount of heat exhaust from the system should be taken into consideration.

The following restrictions apply to installing BMEs.

- One BME must be assigned as BME #0.
- BME #0 cannot be a Sync module.
- A BME with an FPC 1000 Front Panel Controller must be BME #0.
- Address assignments must not skip numbers.
- Address assignments of 0 - 5 are accepted, BMEs w/address 6-9 are ignored.
- A system is limited to one audio module.
- A system may NOT include both Wideband video and Low Resolution video modules.

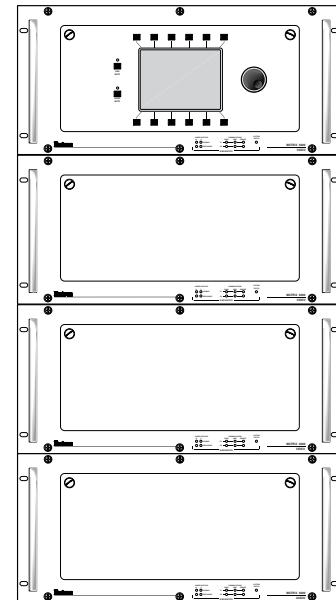


Figure 2-1.A

2. Setting BME Addresses

Each BME must be set to a unique address of 0 - 5 using a push-button switch located on the rear panel (see Figure 2-2.B, Item 1). BME #0 will be the Main Controller and may be any module except the Sync module.

3. Connecting the BME COMM interconnecting cable(s)

If there is more than one BME, the BME COMM connectors must all be connected together in daisy chain fashion using Extron supplied RJ-11 telephone cable (Figure 2-2.A). The chain begins at the BME COMM OUT connector of BME #0 (See Item 2 in Figure 2-3.A) and connects to the BME COMM IN connector of the closest BME, that BME's BME COMM OUT connector is then connected to the next closest BME if necessary. Repeat this process until all BMEs are connected (No BME will have two empty BME COMM connectors).



Figure 2-2.A
RJ-11 Cable

4. Connecting the RS-232/RS-422 Cable to BME #0

Connect the cable from the Host PC computer serial port to the RS-232/RS-422 connector on the rear panel of BME #0 as shown in Figure 2-3.A on the next page (Item3). After the BME(s) have been virtualized, they can be controlled through this connection using a PC Host or from a touch screen or any other user-supplied controlling device, such as AMX, Crestron, etc., that is capable of generating the proper commands.

5. Connecting the External Vertical Interval Sync Cables

Matrix 3200/6400 video switchers can use an external sync signal during the vertical interval. The required external sync signal is essentially a composite sync signal from a black burst generator or a time base corrector. The illustration to the right shows the sync connections. The IN connector receives the external sync timing signal. The OUT connector allows the signal to be passed on to another video device if required.

If there is no external sync, the switcher will switch inputs at any time during the vertical scan.

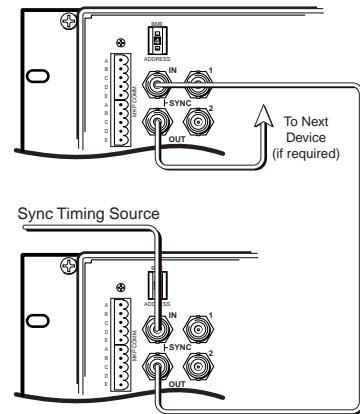


Figure 2-2.B

6. Connecting the AC Power Cable(s) to the BME(s)

Each BME has its own internal power supply. Connect an AC Power cord to the AC power receptacle on each BME (Item 4 in Figure 2-3.A). Connect the power cord plug to an AC power source.

7. Applying AC Power to the BME(s)

Each BME has a power ON/OFF toggle switch on the rear panel just above the AC power cord receptacle. BME #0 must be powered ON at the same time or after all other BMEs are ON. Press each power switch to the ON (1) position, Go to 7A on Page 2-3.

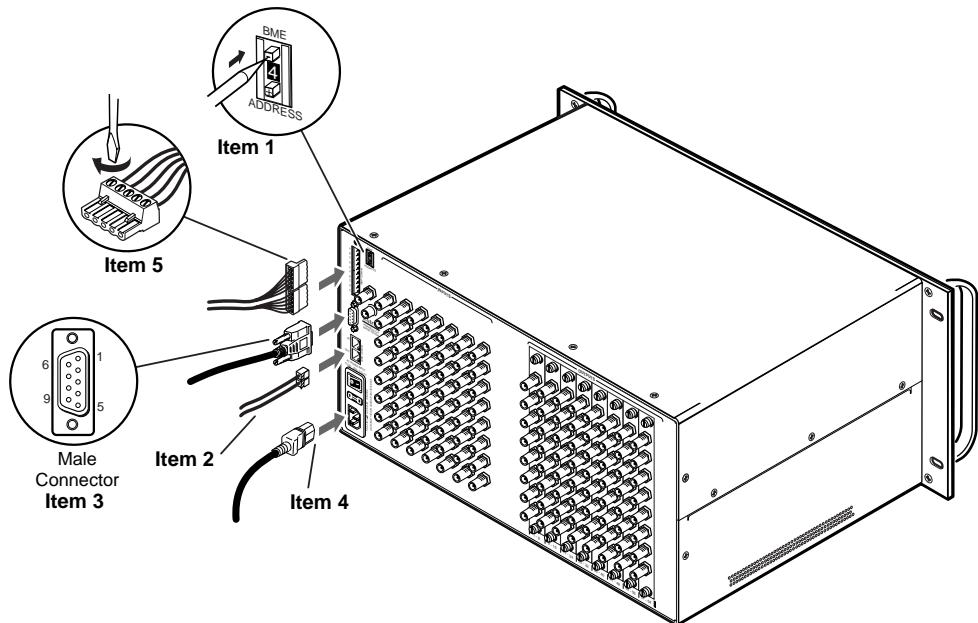


Figure 2-3.A Matrix 3200/6400 Video Switcher Connections (BME#0 only)

7A. BME Power-Up Verification

The Diagnostics LEDs shown in Figure 2-3.B are located on the front panel of the Matrix 3200/6400 Video BME. The normal state of the LEDs after power-up is Primary +V and -V LEDs ON. If the BME includes a Redundant power supply, the Redundant +V and -V LEDs will also be ON. If the Primary power supply fails, its LEDs will be OFF and the Redundant LEDs will blink.

The System Status LED will initially blink indicating that internal housekeeping is occurring, when it goes solid ON, the system is ready.

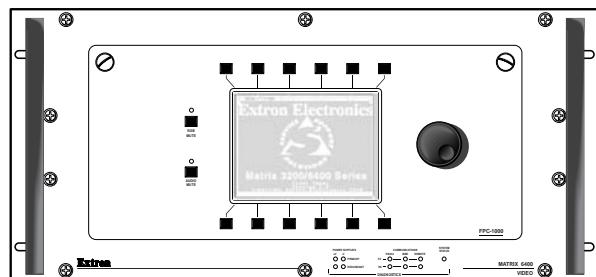
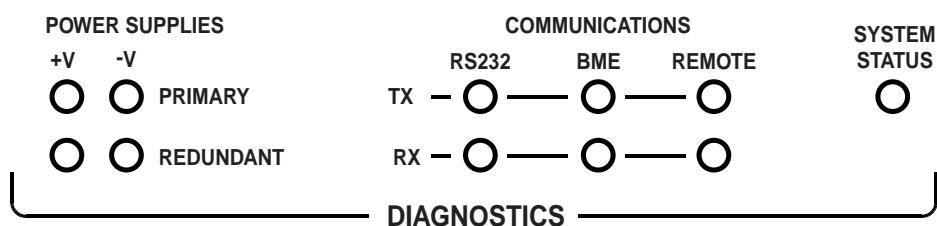


Figure 2-3.B



8. Installing the Matrix 6400/3200 Virtualization/ Control Program Software

The Matrix 6400/3200 Virtualization/Control Program (Extron part number 29-036-01), which is used by the Matrix 6400, is compatible with Windows 95/98/2000, and NT. It provides tools for initial setup of the system and remote control of various functions including input to output ties, audio gain, muting, recalling and saving presets, etc.

NOTE If your Matrix 3200/6400 switcher was previously set up for RS-232, and your PC comm port uses RS-422, the switcher must be changed to match the PC interface. The procedure for making the change begins on Page 5-1.

The program is contained on a set of 3.5-inch diskettes. To install the program from the floppy disk to the hard drive, run SETUP.EXE from the floppy disk and follow the instructions that appear on the screen. The program occupies approximately 3 MB (megabyte) of hard-drive space.



Matrix 6400
Control Pgm

By default, the Windows installation creates a C:\MTRX6400 directory, and it will place two icons (MTRX 6400 Control Pgm and MTRX 6400 Help) into a folder named "Extron Electronics".

Purpose of installing the software

The Matrix 3200/6400 Video Switcher must first be virtualized before starting any operations. Installing the Matrix 6400/3200 Virtualization/Control Program is the first step towards system virtualization. See Step 9 below for virtualization instructions.

Optionally, using normal Windows controls, you can perform many of the same adjustments as from the front panel.

For information about program features, you can access the help program in any of the following ways:



Matrix 6400
Help

- From the Extron Electronics program folder, double-click on the Matrix 6400 Help icon (shown at the left).
- From within the Matrix 6400 Control Program, click on the Help menu on the main screen.
- From within the Matrix 6400 Control Program, press the F1 key.

9. Virtualizing the Matrix 3200/6400 Switcher/System

Detailed virtualization instructions begin on Page 3-1.

10. Matrix 3200/6400 Video Input/Output Cabling

Using work-sheets and/or printouts from the Matrix 6400 Control Program, install video input/output cables as required.

Adapters

An RCA male to BNC female adapter (see Figure 2-4.B) enables input and/or output devices with RCA style connectors to use high resolution cables with BNC connectors to connect to the Matrix 3200/6400 Video Switcher. Extron does not currently offer an adapter of this type but it can be purchased at many electronics parts suppliers.



Figure 2-4.A

An S-Video male to dual BNC female adapter (see Figure 2-4.C below) enables input or output devices with S-Video connectors to use high resolution cables with BNC connectors to connect to the Matrix 3200/6400 Video Switcher. The Extron part number for this adapter is 26-353-01.

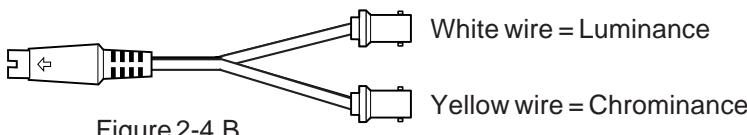
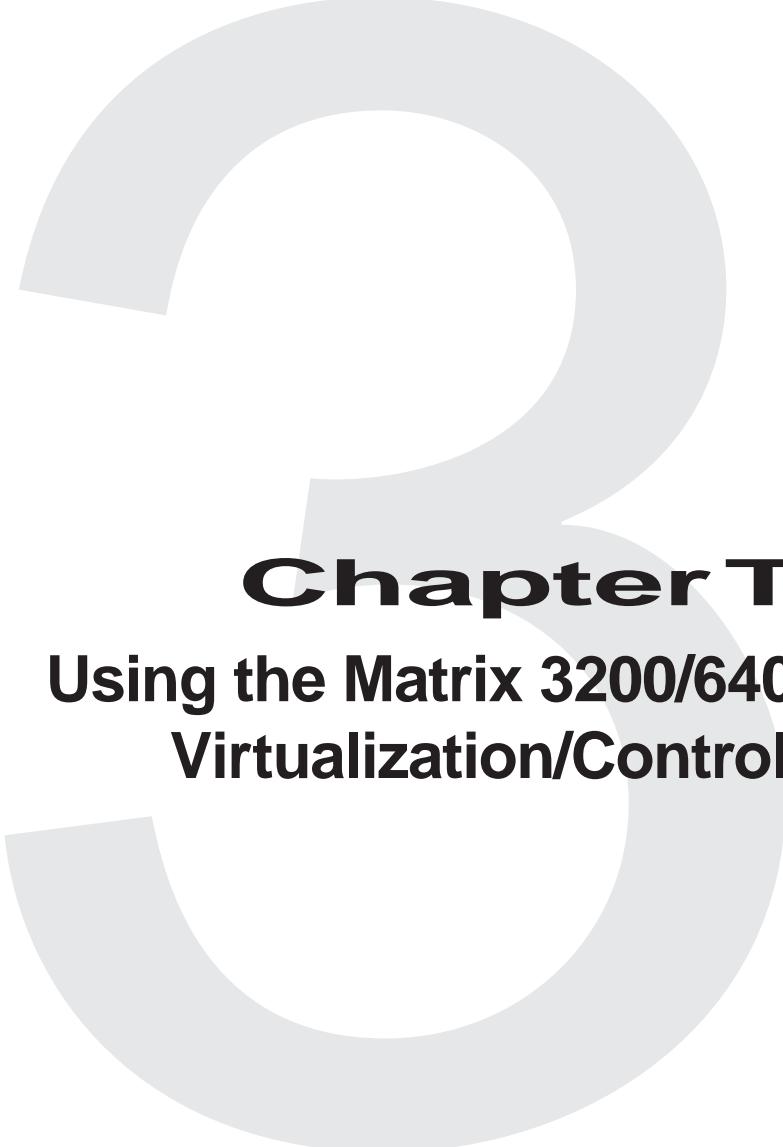


Figure 2-4.B

Notes

Matrix 3200/6400 Video Switchers



Chapter Three

Using the Matrix 3200/6400 System Virtualization/Control Software

Extron's Matrix 3200/6400 System Virtualization/Control Program

The Matrix 3200/6400 System Virtualization/Control program communicates with the Extron Matrix 3200/6400 System through the RS-232/422 port on BME #0 (defaults to 9600 baud, 8 bit, 1 stop, no parity). The program is required to initially set the Virtualization and optional Room configurations for the system. See the following two sections for details:

- System Virtualization - creating a virtual I/O switching System - (see Page 3-2)
- Rooming - how to create Rooms - (see Page 3-4)

The program also presents all the functions found on the optional Front-Panel Controller (FPC 1000), but in an interactive graphical interface, so it may be used for full control or initial programming of the system. Because settings to the Matrix (Ties, Presets, Audio config) are stored in the unit's memory, several modes of 'programming' are possible. It provides 4 major methods:

- Remote control and programming of the system in real time through the RS-232 port.
- Saving system's settings for later restoration to the same system (backup) or copying to (programming) another system. Multiple configurations (programs) can be saved to disk and any one quickly reloaded later, providing an unlimited number of possible setups.
- Creating Program byte-strings for application to the Matrix system through a third-party control system.
- Emulation (off-line) programming of the system's settings for copying to system at a later time or another place. Emulation mode also allows creation of programs for any possible Matrix hardware configuration without being connected to such a system.

To load a demonstration set of Ties, Presets and Rooms to your Matrix (or Emulate one) Restore from the DEMO6400.MTX file which was installed with the Windows Software. Use NEW.INI to clear all settings in a unit.

Note that pressing F1 from within the program will provide context-sensitive Help.

An Explanation of VIRTUAL I/O SWITCHING in the Matrix 3200/6400 System

A Matrix 3200/6400 System consists of from 1 to 6 Switcher boxes (BMEs), each of which may have as many as 64 inputs and 64 outputs. It is usually desirable to have certain inputs (or outputs) switch together as a set: to *Follow* each other. For example, if the system hardware consisted of a 64 x 64 Video BME and a 64 x 64 Audio BME, you'd want your Video monitor's image and its Audio speakers to be coming from the same source (maybe a VCR) and to follow each other when switched to another source (perhaps a Laser Disc player). This type of switching requires the two BMEs to communicate with each other so that they both switch to the correct inputs to create the *follow* condition. In the traditional and simplest configurations, hardware is usually designed to cause both BMEs to switch to the same input (or output) number.

An example where Follow mode is *always* required is with S-Video where the 'Y' signal and the 'C' signal must be switched as a pair of input signals and a pair of output signals. Again, traditional hardware does this by causing the paired signals to follow each other, either in a single box that is made only for S-Video or by using two boxes designed for Composite Video and forcing them to follow each other by switching to the same input (or output) number. Wouldn't it be nice to have a single Video switcher box that can be field-programmed to be either an S-Video or Composite Video switcher? This is what Extron's Virtual I/O

Switching does; it groups physical input connectors and physical output connectors together into *Virtual Inputs* and *Virtual Outputs*, each of which switches from 1 to 6 *Virtual Planes*.

Let's carry the S-Video example a step further using the 64 x 64 Video BME and a 64 x 64 Audio BME. If we can *map* (logically split) the first box into a 'Y' plane and a 'C' plane and the second box into an 'Audio' plane, we will have created a system with 32 Virtual Inputs and 32 Virtual Outputs in 3 Virtual Planes. [The 32 comes from splitting the 64 x 64 Video box into two halves]. In this example, half of the Audio box would not be included in the Virtual map since we only need 32 of the 64 ports and we'd be better off using a 32 x 32 Audio BME for this configuration. Or, using the same hardware, we could map the first box as 'Composite Video' and the second into an 'Audio' plane again to create a system of 64 Virtual Inputs and 64 Virtual Outputs in 2 Virtual Planes. Or, we could map the first box into 'Component Video' with a 'R-Y' plane, a 'B-Y' plane, and a 'Y' plane and the second into an 'Audio' plane again to create a system of 21 Virtual Inputs and 21 Virtual Outputs in 4 Virtual Planes. [The 21 comes from splitting the 64 x 64 Video box into three parts]. All three of these configurations are made with the same two BMEs merely by loading the appropriate Virtual Map into the Matrix 3200/6400 system's memory.

Note that the number of Virtual Planes tells you how many physical input (or output) connectors will be switched together for each Virtual Input (or Output) switched. In the 21 x 21 x 4 Component Video with Audio virtual system example, the first BME might have physical inputs 1, 2, and 3 as Virtual Input 1 and 4, 5, and 6 as Virtual Input 2, etc. The Audio BME would have physical input 1 as Virtual Input 1, 2 as 2, etc.

The Windows Virtualization/Control Program is used to create and load the Virtual Map to the Matrix 3200/6400 system as described in the [Creating a Virtual I/O Switching System \(Map\) for the Matrix 3200/6400 System](#) section.

Creating a VIRTUAL I/O SWITCHING SYSTEM (MAP) for the Matrix 3200/6400 System

The following steps use the Windows Virtualization/Control Program to create a *Virtual I/O Switching System* ([click here for definitions](#)) within the physical hardware by generating and loading a *map* to the Matrix 3200/6400 hardware. A physical Matrix 3200/6400 System consists of from 1 to 6 Switcher boxes (BMEs), each of which may have as many as 64 inputs and 64 outputs. After determining what type and sizes of switcher hardware exists in the matrix, the program will generate a 'virtual system' consisting of from 1 to 64 *Virtual Inputs*, and 1 to 64 *Virtual Outputs*, in 1 to 6 *Virtual Planes*.

- Ensure that all BME's that will be part of the system have been connected to each other and their BME numbers have been set correctly. Establish an RS-232 connection between the PC and BME #0 of the Matrix 3200/6400 System. Start the MTRX6400 program (under Windows) and click on the corresponding **Comm Port** number when asked (Figure 3-2.A). Click **OK**, or.....

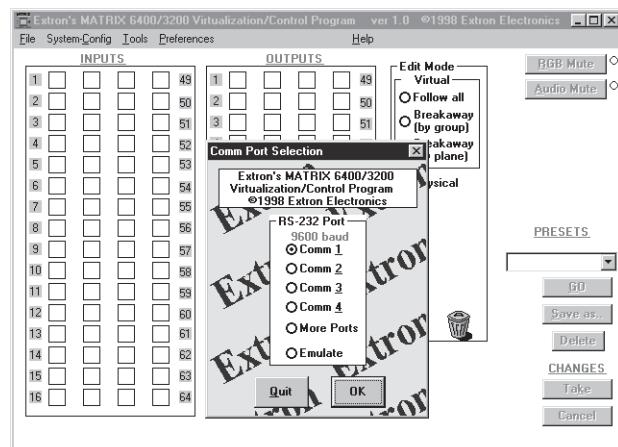


FIGURE 3-2.A

If you wish to program a system without being connected to it at this time, click on **EMULATE**. Follow steps in [How to Off-Line \(Emulate\) Program the Matrix](#).

- The program will communicate with the Matrix 3200/6400 System to determine its hardware configuration (type and size of each connected BME). It then reads the system's settings (Ties, Presets, Virtual Map, etc.) and draws a graphical representation of the unit's configuration and settings (Ties) on the Main screen (Figure 3-5.A & B). It also reads the MTRX6400.INI file (saved from last session) to draw Icons for each I/O (if any had been applied in previous programming sessions) to make the graphical representation even more friendly.

NOTE: If this is a new system that has not been virtualized yet or one that has had its map cleared, the graphical representation and all information shown on the Virtual Map screen may be invalid at this time.

- From the menu on the Main screen, click SYSTEM-CONFIG to show the Virtual Map screen (see Figure 3-4.A). From the Virtual Map screen menu, click **CONFIGURE|PHYSICAL SWITCHERS** to show the Physical Configuration screen (Figure 3-3.A). Examine

this screen to ensure that all BMEs were seen and their type and size is being reported as expected. Click on the '**Close**' button to return to the Virtual Map screen.

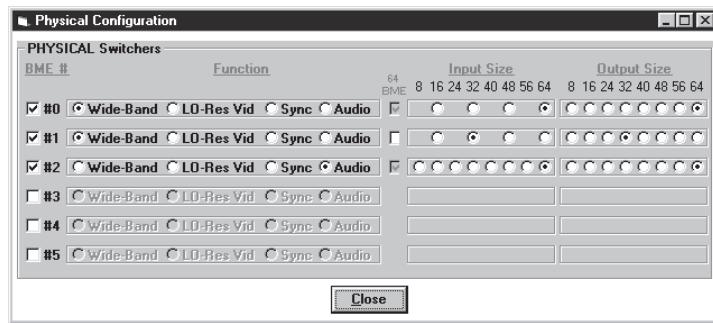


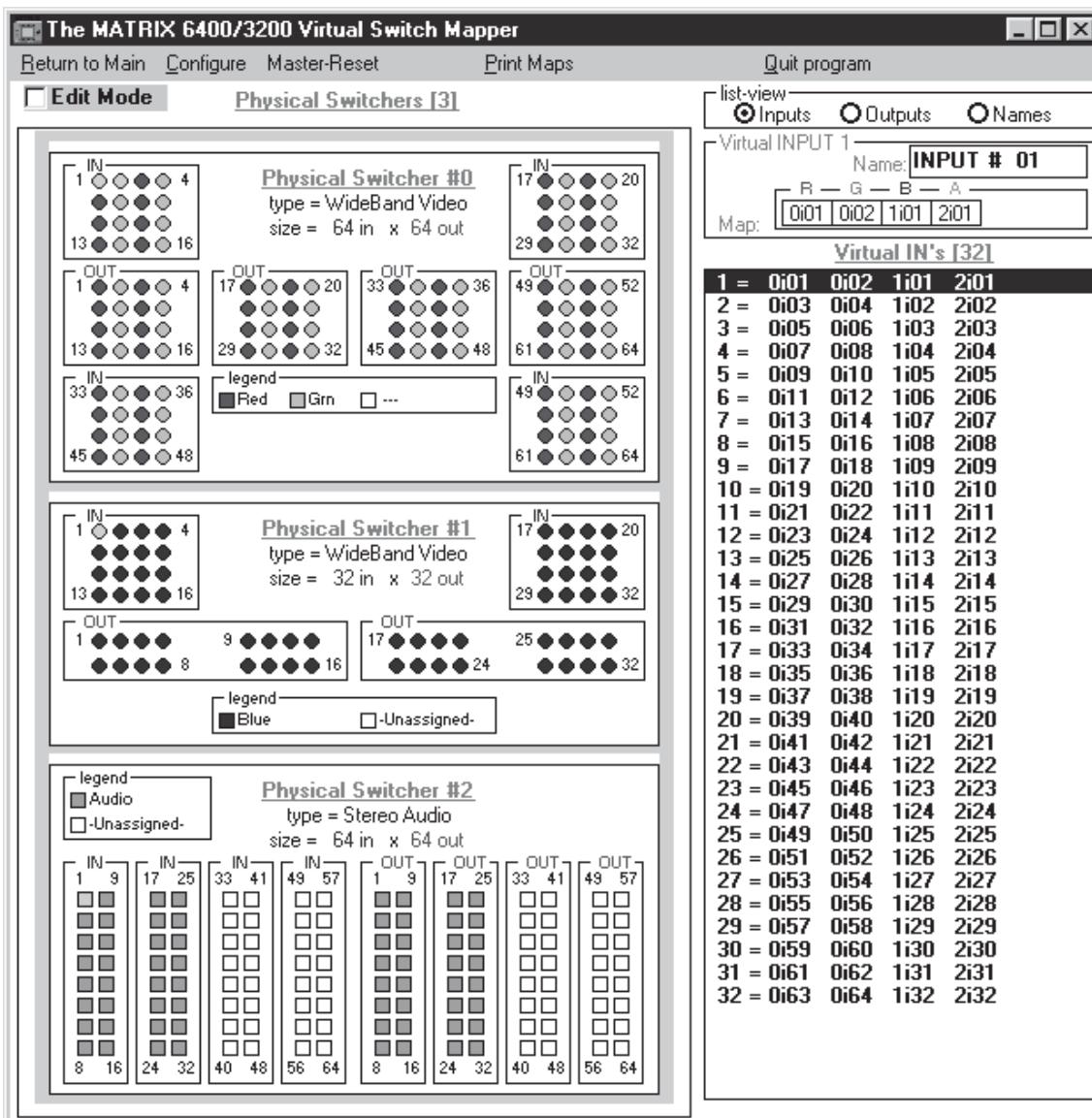
FIGURE 3-3.A

- From the Virtual Map screen menu, click **CONFIGURE|VIRTUAL SWITCHER** to show the Virtual Configuration screen. This screen shows how the physical system will be *mapped* into a virtual system switcher by the Windows program (see Figure 3-4.B). You may need to make some choices at this time that affect how many virtual planes will be created and how many virtual inputs and outputs will exist. For example, if a Sync BME was found, the program needs you to decide whether to use composite sync (1 plane) or separate H and V sync (2 planes).

You need to decide how you want the initial map assignments organized, whether as 'Repeat-Pattern' (e.g. RGBRGB..B) or 'Group-by-Plane' (e.g. RRRRGGG..BBB). You may also change the ordering of the planes with this screen and affect which physical connectors get which signals. For example, in a Wideband system, instead of being in RGB order, you can change it to BGR order by using the radio buttons in each plane's choices.

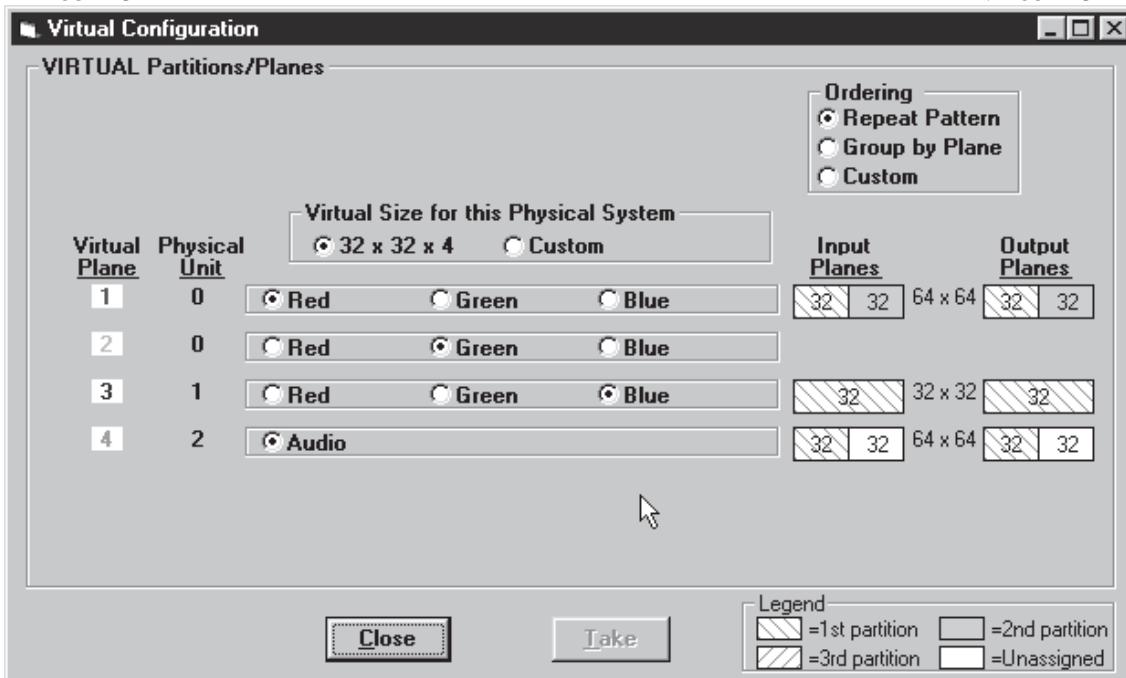
Note that you may play with the settings in this screen without causing any changes to the system's map until you press the '**OK**' button. Even after committing the changes and viewing them in the Virtual Map screen, you can still return to this Virtual Configuration screen later and virtualize the system differently. Changes can be made freely UNTIL you begin to make ties, save presets, create rooms, or name your virtual inputs and outputs because the number of virtual inputs and outputs may be changed by re-virtualizing. Click on the '**OK**' button to return to the Virtual Map screen.

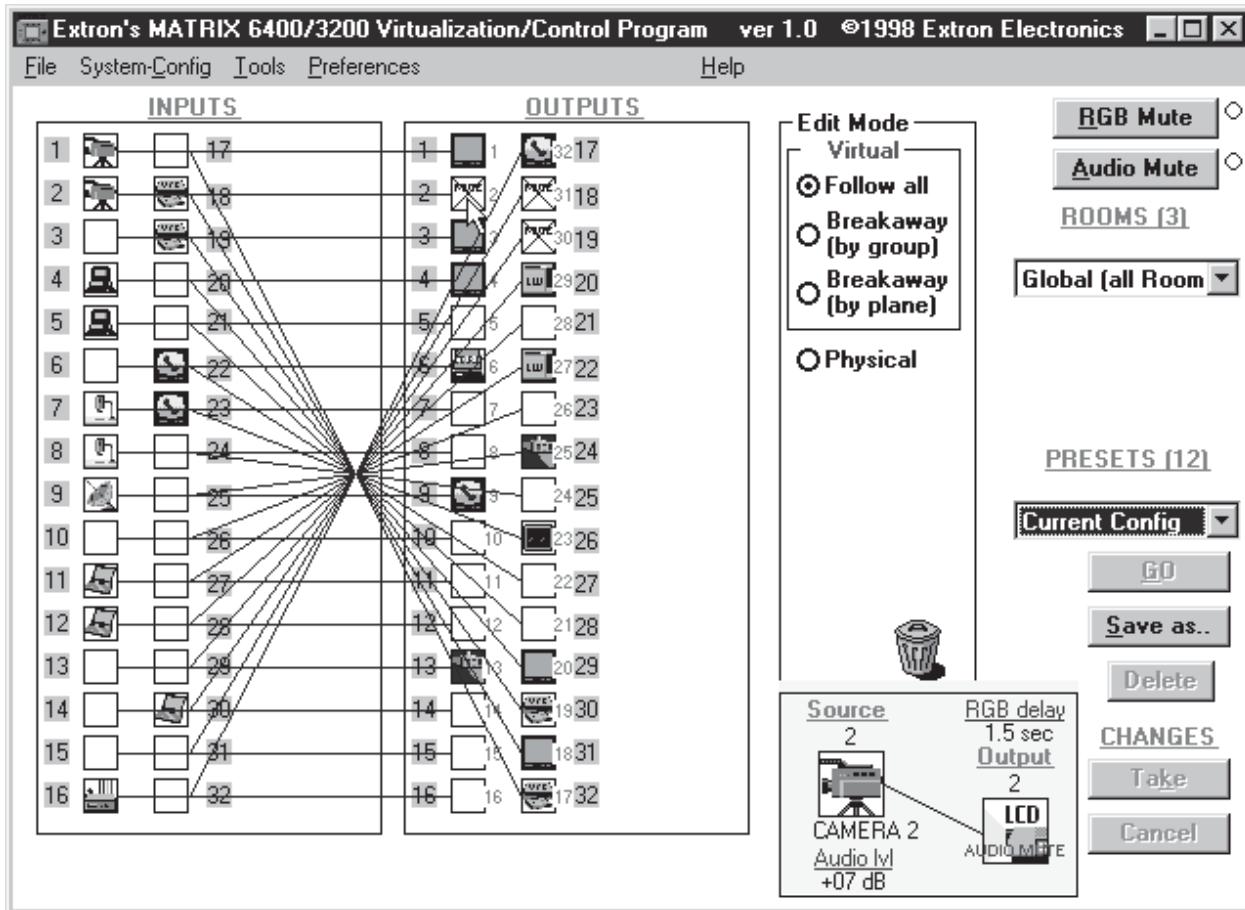
- In the Virtual Map screen, examine the physical layout of the BMEs and how the virtualization process assigned the input and output connectors to various planes. You can return to the Virtual Configuration screen if you wish to change the mapping at this time by clicking **CONFIGURE|VIRTUAL SWITCHER** again. If the map looks correct, you may optionally assign names (up to 12 characters long) to any of the virtual inputs or outputs from the Virtual Map screen at any time. Names can also be read and edited from the system's front panel controller, if present.



↑FIGURE 3-4.A

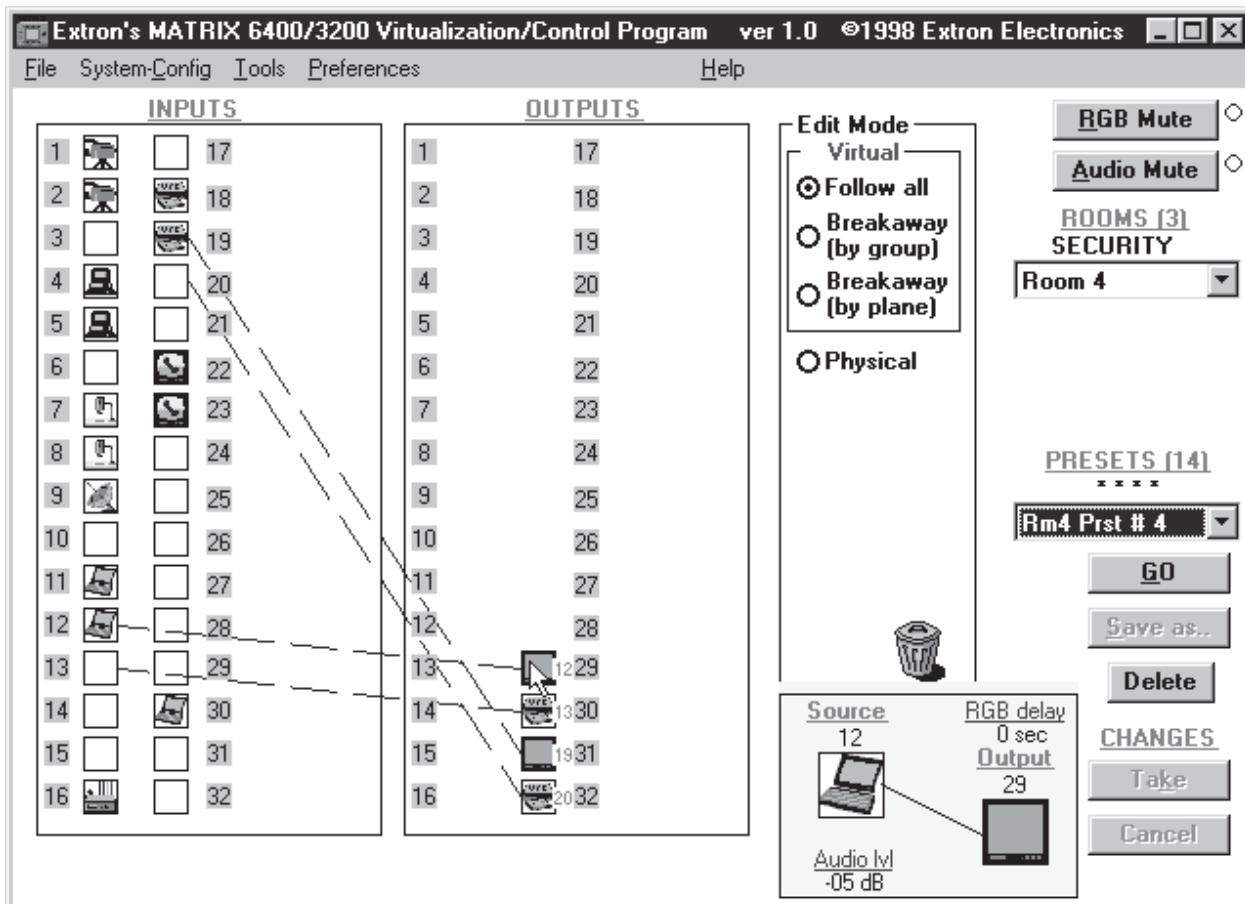
↓FIGURE 3-4.B





↑FIGURE 3-5.A Main Screen - Ties

↓FIGURE 3-5.B Main Screen - Presets



- If you wish to group certain virtual outputs together so that you may later create Room Presets, now would be a good time to Create ROOMS by clicking **CONFIGURE|ROOM CONFIGURATION**.
- You can create a hard-copy document that shows all the details from the Virtual Map screen at any time by clicking the **PRINT MAPS** menu. The printed maps make a very handy wiring guide and will appear in color if using a color printer. You can specify which printer to use from the **FILE|SELECT PRINTER** menu in the Main screen.
- From the Virtual Map screen menu, click **RETURN To MAIN** and note that the number of input and output boxes shown on the Main screen matches the number of virtual input and virtual outputs created by the virtualization. The virtualization of the system is now complete and the map has been stored in BME #0. Unless the map gets destroyed or needs to be regenerated because of a system hardware reconfiguration (size, type, or number of BMEs changes) or you wish to change the virtual configuration, there is no requirement to use the Windows Virtualization/Control software. You can, however, continue to use it to control and program (set Ties, Presets, etc.) the system at any time.

How to Create ROOMS within the Matrix 3200/6400 System

The following steps use the Windows Virtualization/Control Program to optionally define *Rooms* in the Matrix 3200/6400 system. A Room is a group of virtual outputs that are logically associated with each other, probably by location (such as 3 video monitors and a VCR all located at a building's security desk). A Room consists of from 1 to 16 virtual outputs and the Matrix 3200/6400 supports up to 10 Rooms. Each Room can have a name (for user friendliness, up to 12 characters long) and up to 10 Presets assigned to it (for a total of 100 Room Presets). Unlike the 32 Global Presets, Room Presets only affect those virtual outputs associated with that Room and do not change any other connections in the Matrix, making the use of Presets much more simple and flexible. Room Presets are particularly useful in conjunction with the MKP-1000 keypads. Note: Rooms exist only to support Room Presets.

- Ensure that the System has been Virtualized before creating any Rooms. Establish an RS-232 connection between the PC and BME #0 of the Matrix 3200/6400 System. Start the MTRX6400 program (under Windows) and click on the corresponding **Comm Port** number when asked (Figure 3-6.A). Click **OK**, or.....

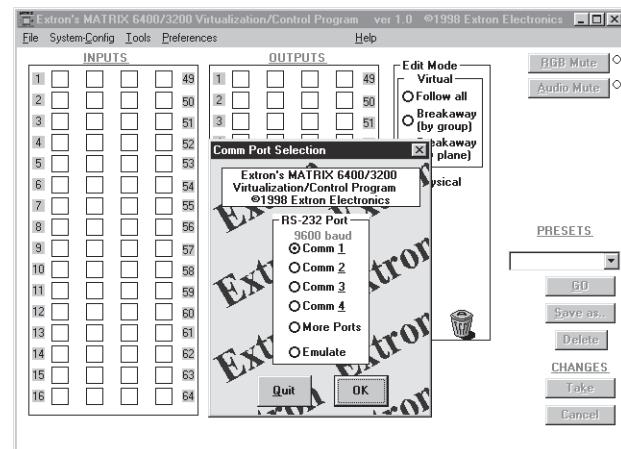


FIGURE 3-6.A

If you wish to program a system without being connected to it at this time, click on **EMULATE**. Follow steps in How to Off-Line (Emulate) Program the Matrix.

- The program will communicate with the Matrix 3200/6400 System to determine its hardware configuration (type and size of each connected BME). It then reads the system's settings (Ties, Presets, Virtual Map, etc.) and draws a graphical representation of the unit's configuration and settings (Ties) on the Main screen. It also reads the MTRX6400.INI file (saved from last session) to draw Icons for each I/O (if any had been applied in previous programming sessions) to make the graphical representation even more friendly.

- From the menu on the Main screen, click **SYSTEM-CONFIG** to show the Virtual Switch Virtual Map screen (Figure 3-4.A). From the Virtual Map screen menu, click **CONFIGURE|Room CONFIGURE** to show the Room Mapper screen (Figure 3-7.A).

Associate a Virtual Output with a room number by using the mouse to drag the output circle to the list on the right side. You can remove a Virtual Output from a room by dragging the circle to

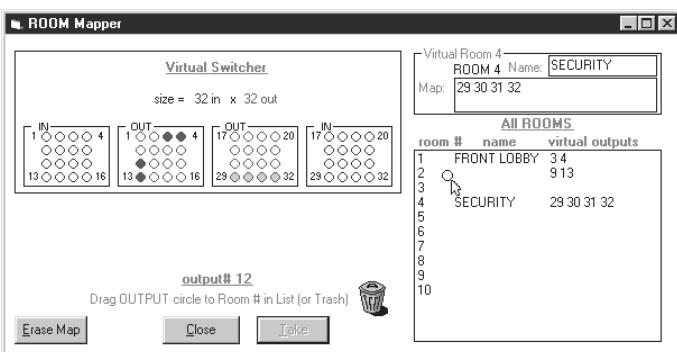


FIGURE 3-7.A

the trash-can. You can add a name to the Room or edit it by typing in the text-box. Click on the '**OK**' button to save your changes or '**Cancel**' to abandon your changes. Press '**Close**' to return to the Virtual Map screen.

- From the Virtual Map screen menu, click **RETURN To MAIN** and note that a list-box for the defined rooms should appear below the 'Audio Mute' button. The Room mapping of the system is now complete and the map is stored in BME #0. Unless the map gets destroyed or needs to be regenerated because of a system hardware reconfiguration (size, type, or number of BMEs changes) or you wish to change the room configuration, there is no requirement to use the Windows Virtualization/Control software. You can, however, continue to use it to control and program (set Ties, Presets, etc.) the system at any time.

How to REMOTE CONTROL PROGRAM the Matrix 3200/6400 System

Because the Matrix 3200/6400 Switchers store their settings in a nonvolatile memory, programming applied to the unit from the Virtualization/Control Program (or the FPC) is remembered in the unit. The Program only needs to talk to the Matrix system long enough to create (program) the settings. You can, however, leave a computer connected (dedicated) to the Matrix for real-time interactive control and monitoring if you wish.

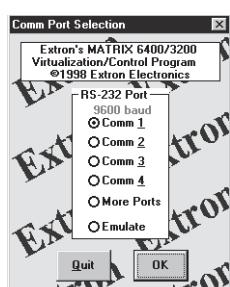
- To control or program the switcher system in real-time, establish an RS-232 connection between the PC and BME #0 of the Matrix 3200/6400 System. Start the MTRX6400 program (under Windows) and click on the corresponding COMM PORT number when asked. Click **OK**, or.....

If you wish to program a system without being connected to it at this time, click on **EMULATE**. Follow steps in [How to Off-Line \(Emulate\) Program the Matrix](#).

- The program will communicate with the Matrix 3200/6400 System to determine its hardware configuration (type and size of each connected BME). It then reads the system's settings (Ties, Presets, Virtual Map, etc.) and draws a graphical representation of the unit's configuration and settings (Ties) on the Main screen. It also reads the MTRX6400.INI file (saved from last session) to draw Icons for each I/O (if any had been applied in previous programming sessions) to make the graphical representation even more friendly.

NOTE: If this is a new system that has not been virtualized yet or one that has had its map cleared by a System Reset, the graphical representation and all information shown on the Virtual Map screen may be invalid at this time.

- Initially, the "Current configuration" from the Matrix is shown. Notice [How the Ties Appear](#) as solid lines in various colors here and [How the I/O Ports are Grouped and Titled](#). Selecting a Preset (if any exist) from the Presets List at the



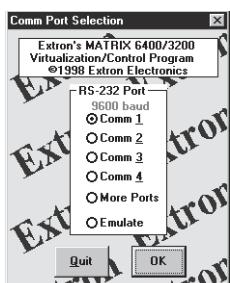
right side of the screen will cause that configuration to be read from the Matrix and drawn on the screen. The displayed preset becomes the “Current configuration” by clicking the **Go Button**.

- You can Add and Erase Ties (edit) when in the “Current configuration”. These edits are made using the mouse in a drag and drop operation. To add a Tie, drag the input box and drop it on the desired output box (left to right). To erase a Tie, drag the output box and drop it on the desired input box (right to left). Note that an output can be rerouted to a different input by merely adding the new connection (without erasing the old Tie). You can also erase all Ties that appear on a box by dragging that box to the trash-can. Other settings will affect how the Tie changes are applied: the Hold/Verify versus Immediate settings in the Preferences menu. Hold/Verify (the default) shows Adds and Erases as dotted lines until committed (Take Button) or cancelled (Cancel Button).
- After you have edited the “Current settings”, you can also store the configuration as a Preset using the Save As.. Button.
- You can assign a Device icon and a Caption to any of the I/O port boxes for your convenience in operating the Control Program using the Devices Palette. To access the Devices screen, use the mouse to click on the desired I/O port box or click the **Tools|ASSIGN-DEVICE-ICONS** menu. Your setting of the Icons are remembered by the program (NOT by the Matrix) for your convenience in your next editing session.
- If you have edited any of the configurations or assigned Icons or Captions, when you exit the program you will be prompted to save the changes. These will be written to the MTRX6400.INI file for use in your next editing session (if you agree). The information in the file also allows you to fully restore a Matrix 3200/6400 System to all the settings (Ties, Presets, etc.) from the current session. We strongly recommend you allow the program to save your changes! You may also wish to Save the unit's settings in a uniquely named file, instead.

How to OFF-LINE (Emulate) PROGRAM the Matrix 3200/6400 System

The Matrix Control Program provides an “Emulate” mode to allow you to build and save a configuration file, off-line, without being connected to a Matrix System. This file can later be downloaded (programmed) into a Matrix via the RS-232 port using the Matrix 3200/6400 Virtualization/Control Program. The Emulate mode also allows you to generate the RS-232 strings needed to interface a third party control system to a Matrix System instead of downloading it with the Virtualization/Control Program. Finally, the Emulate mode allows “programming” for a hardware configuration that differs from your present system.

- To program a switcher without being connected to it at this time, start the MTRX6400 program (under Windows) and click on **EMULATE** (instead of a COMM PORT number) when asked. Click **OK**.
- The program will ask for 2 file names. The first is for restoring the settings to an existing configuration (as though a Matrix with that configuration and presets were connected). Typical choices for this would be MTRX6400.INI (to edit the last real-time configuration) or DEMO6400.MTX (to view some possibilities) or NEW.INI (to start from an empty configuration). This first file is read by the program (and will not be altered) and is optional: you can choose **CANCEL** instead of specifying a name if you wish. The second file is required and will be created to save the results of editing in the Emulation mode. It is this file that you would later use for downloading to the Matrix. You should give this file a meaningful name (i.e. JOB1107.MTX). If the second file already exists, you'll be warned that you are about to overwrite it.



- A typical Emulation operation might consist of multiple editing sessions:
- Session A (connected to a Matrix 3200/6400 System)
- Session B (Emulation) use MTRX6400.INI as the first file (source) to edit the last save from the Matrix
 use JOB1107.MTX as the second file (destination)
- Session C (Emulation) use JOB1107.MTX as the first file (source) to further edit the last Emulation save
 use JOB1107.MTX as the second file (destination)
- Session D (connected to a Matrix 3200/6400 System)
 Restore from JOB1107.MTX to program the System from the saved Emulation
- The program will show the Physical Configuration screen using the parameters read from the source file (if you specified one). Change the settings as needed and then click **TAKE**.
- The program reads the emulated settings (Ties, Presets, Virtual Map, etc.) and draws a graphical representation of the system's configuration and settings (Ties) on the Main screen. It also reads the source file to draw Icons for each I/O (if any had been applied in previous programming sessions) to make the graphical representation even more friendly.
- Initially, the “Current configuration” from the emulated Matrix is shown. Notice How the Ties Appear as solid lines in various colors here and How the I/O Ports are Grouped and Titled. Selecting a Preset (if any exist) from the Presets List at the right side of the screen will cause that configuration to be read from the emulated Matrix and drawn on the screen. The displayed preset becomes the “Current configuration” by clicking the **GO** Button.
- You can Add and Erase ties (edit) when in the “Current configuration”. These edits are made using the mouse in a drag and drop operation. To add a Tie, drag the input box and drop it on the desired output box (left to right). To erase a Tie, drag the output box and drop it on the desired input box (right to left). Note that an output can be rerouted to a different input by merely adding the new connection (without erasing the old Tie). Another setting will affect how the Tie changes are applied: the Hold/Verify versus Immediate settings in the Preferences menu. Hold/Verify (the default) shows Adds and Erases as dotted lines until committed (**Take** Button) or cancelled (**Cancel** Button)
- After you have edited the “Current settings”, you can also store the configuration as a Preset using the Save As.. Button.
- You can assign a Device icon and a Caption to any of the I/O port boxes for your convenience in operating the Control Program using the Devices Palette. To access the Devices screen, use the mouse to click on the desired **I/O PORT** box or click the **Tools|ASSIGN-DEVICE-ICONS** menu. Your setting of the Icons are remembered by the program (NOT by the Matrix) for your convenience in your next editing session.
- If you have edited any of the configurations or assigned Icons or Captions, when you exit the program you will be prompted to save the changes. These will be written to the Emulation file for use in your next editing session (if you agree). The information in the file also allows you to fully restore a Matrix 3200/6400 System to all the settings (Ties, Presets, etc.) from the current session We strongly recommend you allow the program to save your changes! You may also wish to Save the unit's settings in a uniquely named file, instead.

How to SAVE and RESTORE the Matrix 3200/6400 Settings

The FILE menu provides the following functions:

- Save MATRIX settings as... (uploads *.MTX file from system)
- Restore MATRIX settings from... (downloads *.MTX file to system)
- Save This Session's settings (uploads MTRX6400.INI file from unit)
- Restore Last Session's settings (downloads MTRX6400.INI file to unit)

In normal operation (non-emulation mode), the Virtualization/Control Program reads the MTRX6400.INI file at start-up to display Icons since these items do not cause any changes in the Matrix System's configuration (programming) and provide convenience to the user. The file actually contains all the information needed to fully Restore (program) the Matrix 3200/6400 System's settings. Both of the Restore functions in the menu cause a FULL Restore of the attached Matrix System, providing an easy method to switch between (reprogram) configurations.

Both of the Save functions in the menu create a complete .INI type file for future restoration to an attached Matrix. By default, the SAVE AS choice uses file extension .MTX, but any name and extension can be used when saving or restoring a file. The SAVE THIS function is not usually needed since the program prompts you to create one upon exiting if any edits were performed. The RESTORE LAST function allows you to set your Matrix configuration back to its settings when you first started the Virtualization/Control Program (effectively cancelling any edits and changes without leaving the program).

How to Create PROGRAM BYTE STRINGS for the Matrix 3200/6400 System

The Matrix 3200/6400 System can be controlled and programmed through the RS-232 port via third party control systems. These systems need to be "told" what bytes to send to the Matrix to perform this control. The Matrix 3200/6400 User's Manual provides details of how to build these byte strings (using paper and pencil), but the Matrix Virtualization/Control Program can make this job much easier by building the strings for you. To generate the strings:

- Create all the Matrix System settings (program) from either Emulate mode or being connected to a Matrix System. The Program Strings that can be viewed produce the Current-Ties, Presets, Audio-Config, and RGB Delay settings.
- To see the strings, click on the **TOOLS|SHOW RS-232-STRINGS** menu to show the Program Strings screen (Figure 3-10.A).

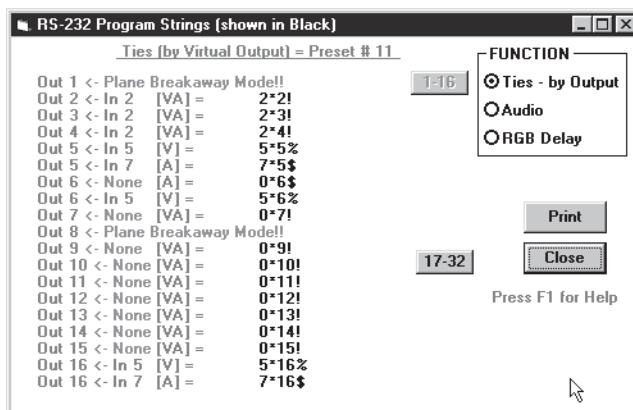


FIGURE 3-10.A

Notes

Matrix 3200/6400 Video Switchers

Chapter Four

RS-232/RS-422 Programmer's Guide

Serial Communications Port

Host to Switcher Series Instructions

Commands and Responses

Error Codes

Switcher Initiated Messages

Serial Communications Port

If the Matrix Video Switcher is the Master BME (BME #0), its RS-232/RS-422 connector may be connected to the serial port output of a Host device such as a computer or control panel. Software control of the switcher is made possible by this connection. A Host serial port connection to the RS-232/RS-422 connector of a Matrix Video Switcher is shown in Figure 4-1.A.



The Matrix Video Switcher is normally configured for RS-232 control. If it is to be used with an RS-422 device, an internal cable must be moved. The procedure for moving the cable begins on Page 5-1.

The RS-232/422 connector on the Matrix Video Switcher is a 9-pin D female with the following pin assignments:

Pin	RS-232	Description	RS-422	Description
1	—	not used	Tx(-)	Transmit Data (-)
2	Tx	Transmit Data	Tx(+)	Transmit Data (+)
3	Rx	Receive Data	Rx(+)	Receive Data (+)
4	—	not used	Rx(-)	Receive Data (-)
5	Gnd	Signal Ground	Gnd	Ground
6	—	not used	—	not used
7	—	not used	—	not used
8	—	not used	—	not used
9	—	not used	—	not used

The protocol is 9600 baud, 8-bit, 1 stop bit, no parity and no Flow control.

Details for programming the Matrix Video Switcher from a Host system connected to the RS-232/RS-422 port are covered in this chapter.

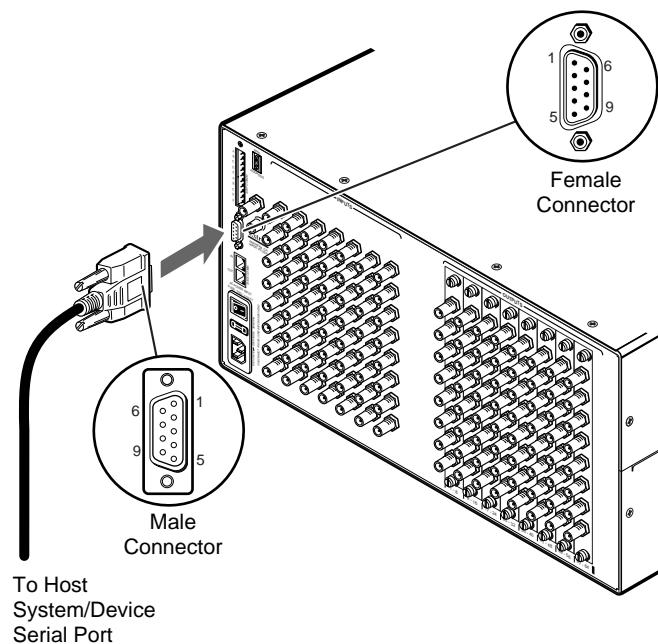


Figure 4-1.A Matrix Video Switcher RS-232/RS-422 to Host connection.

Host to Switcher Communications

The Matrix Video Switcher accepts both Simple Instruction Set and Advanced Instruction Set Commands through the RS-232/RS-422 port. Simple Instruction Set (SIS) commands may consist of one or more characters per command field and do not require any special characters to begin or end the command character sequence. Switcher responses to SIS commands all end with a carriage return and a line feed (CR/LF). An Advanced Instruction Set (AIS) command field begins with an Escape character and ends with a carriage return, line feed is optional (the Switcher Response to an AIS command always ends with a CR/LF).

When the Matrix Video Switcher receives a command (SIS or AIS) and determines that it is valid, it will execute the command and send a response back to the controlling (Host) device. If the switcher is unable to execute the command because it is invalid or contains invalid parameters, it will return an error response to the Host. The error response is coded to help identify the cause of the error. Error code responses are defined on Page 4-8.

When a Matrix Video Switcher local event takes place, such as a Front Panel operation, the switcher responds by sending a message to the Host. These switcher initiated messages are listed on Page 4-8. The switcher does not expect a response from the host, but, for example, the host program may want to request new status.

Command/Response Table

The Command/Response Table begins on the following page. Lower case characters are acceptable in the command field only where indicated. Symbols are used throughout the table to represent variables in the Command/Response fields. Symbol definitions are shown at the beginning of the table as is an ASCII to Hexadecimal (HEX) conversion table. Error Response codes and switcher generated Unsolicited Responses are shown at the end of the table. Command and/or Response examples are shown throughout the table. Name fields are 12 alphanumeric characters 0 - 9, A - Z (upper and lower case) including "+/-:=" and space.

Commands are split into two groups which are identified by page headers. The two groups are "Simple Instruction Set Commands" and "Advanced Instruction Set and Simple Instruction Set Commands".

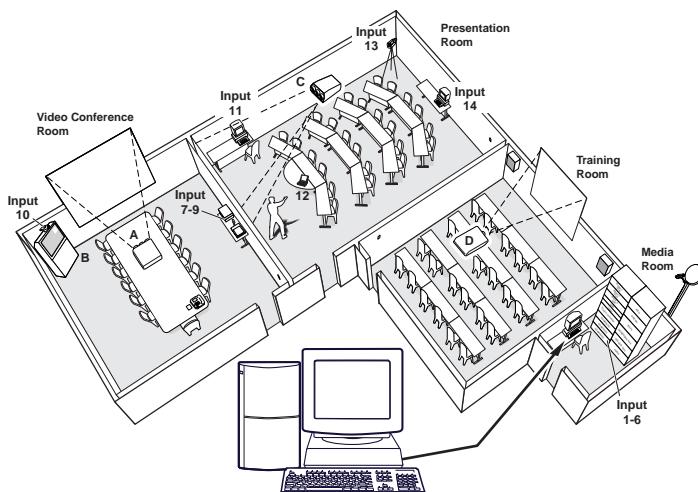


Figure 4-2.A Host computer controls Matrix 3200/6400 System

COMMAND/RESPONSE TABLESymbol Definitions: Esc = Escape \leftarrow = CR \leftarrow = CR/LF • = space

XA = 1 thru maximum number of inputs
XB = 0 thru maximum number of inputs (Input 0 = muted output)
XC = 1 thru maximum number of outputs
XD = BME number (0 thru 5)
XE = 0 dB thru 9 dB (audio gain)
XF = 1 dB thru 15 dB (audio attenuation)
XG = Numerical Value -15 thru +9
XH = 1 thru maximum number of rooms [10 max.]
XI = 0 or 1 (0 meaning off and 1 meaning on)
XJ = Global preset # (0 = current ties for system in view) [32 max.]
XK = Room preset # (0 = current ties for room in view mode) [10 max.]
XL = Group Mode (follow). A = All (Follow), B = Aud / Vid / RGB breakaway, C = total breakaway
XM = Delay in 1/2 second increments [10 max. = 5.0 seconds]
XN = One digit status of Main and Redundant Power Supplies 0 = Off or Dead Power supply 1 = No Redundant, using Main Power 2 = Using Redundant Power supply 3 = Has Redundant, using Main Power
XP = 1 through maximum number of virtual planes
XQ = 00 through 99 (two digits)
XR = (Y)es or (N)o, Y = Mute and N = UnMute for RGB or Audio
XS = Controller software version to the second decimal place
XT = 0 = No mute, 1 = Video mute, 2 = Audio mute, 3 = Vid. & Aud. mute, - = Not used
VO = Two digit Virtual output number [16 per room max]
VI = Two digit Virtual input number
IO = Four character physical i/o port (BME# + i or o + port#) example 3i07
NAME , ROOM NAME , VI NAME (Virtual Input Name), VO NAME (Virtual Output Name) = Maximum of 12 alphanumeric characters (upper and lower case) " " + - : / and space.

ASCII to HEX Conversion Table					
Esc	1B	CR	0D	LF	0A
!	21	"	22	#	23
%	25	&	26	'	27
)	29	*	2A	+	2B
-	2D	.	2E	/	2F
1	31	2	32	3	33
5	35	6	36	7	37
9	39	:	3A	;	3B
=	3D	>	3E	?	3F
A	41	B	42	C	43
E	45	F	46	G	47
I	49	J	4A	K	4B
M	4D	N	4E	O	4F
Q	51	R	52	S	53
U	55	V	56	W	57
Y	59	Z	5A	[5B
J	5D	^	5E	_	5F
a	61	b	62	c	63
e	65	f	66	g	67
i	69	j	6A	k	6B
m	6D	n	6E	o	6F
q	71	r	72	s	73
u	75	v	76	w	77
y	79	z	7A	{	7B
}	7D	~	7E	DEL	7F

SIMPLE INSTRUCTION SET COMMANDS (PAGE 1 OF 3)

OUTPUT SWITCHING COMMANDS	ASCII (HOST-SWITCHER)	RESPONSE (SWITCHER-HOST)
All	$\text{XB}^* \text{XC}!$	Out $\text{XC}^*\text{In} \text{XB}^*\text{All} \leftarrow$
Example →	3*21!	Out21>In03 ←
		Example explanation: Connect Virtual Output 21 to Virtual Input 3 in all Planes (i.e. Audio Follows Video).
RGB	$\text{XB}^* \text{XC} \&$	Out $\text{XC}^*\text{In} \text{XB}^*\text{Vid} \leftarrow$
Video	$\text{XB}^* \text{XC} \%$	Out $\text{XC}^*\text{In} \text{XB}^*\text{Vid} \leftarrow$
Audio	$\text{XB}^* \text{XC} \$$	Out $\text{XC}^*\text{In} \text{XB}^*\text{Aud} \leftarrow$
Specific BME	$\text{XB}^* \text{XC}^* \text{XD}!$	Out $\text{XC}^*\text{In} \text{XB}^*\text{Bme} \text{XD} \leftarrow$
Example →	11*2*2!	Out02>In11*BME02 ←
		Example explanation: Connect physical Output 2 in BME 2 to physical Input 11 in BME 2.
PRESET COMMANDS	ASCII (HOST-SWITCHER)	RESPONSE (SWITCHER-HOST)
Save Current	$\text{XJ},$	Spr $\text{XJ} \leftarrow$
Recall	$\text{XJ}.$	Rpr $\text{XJ} \leftarrow$
Save for a room	$\text{XH}^* \text{XK},$	Rmm $\text{XH}^*\text{Spr} \text{XK} \leftarrow$
Example →	3*9	Rmm03*Spr09 ←
		Example explanation: Save Current Ties as Preset #9 for Room #3.
Recall for a room	$\text{XH}^* \text{XK}.$	Rmm $\text{XH}^*\text{Rpr} \text{XK} \leftarrow$
RGB MUTE COMMANDS	ASCII (HOST-SWITCHER)	RESPONSE (SWITCHER-HOST)
RGB Mute	XC^*B	Vmt $\text{XI} \leftarrow$
RGB Un-mute	XC^*b	Vmt $\text{XI} \leftarrow$

Note: Where XC is not included, global RGB mute is activated.

SIMPLE INSTRUCTION SET COMMANDS (PAGE 2 OF 3)				
SETTING AUDIO GAIN COMMANDS	ASCII (HOST-SWITCHER)	RESPONSE (SWITCHER-HOST)		
Positive	$\text{XA}^* \text{XE}G$	In $\text{XA}^*\text{Aud} \text{XG} \leftarrow$		
	Example → 4*3G	In 04*Aud+03 ↳		
	Example explanation: Set Audio Gain on Virtual Input 4 to 3 dB.			
Attenuation	$\text{XA}^* \text{XF}g$	In $\text{XA}^*\text{Aud} \text{XG} \leftarrow$		
<hr/>				
Increment Audio Level (up)	$\text{XA}\{G$	In $\text{XA}^*\text{Aud} \text{XG} \leftarrow$		
Decrement Audio Level (down)	$\text{XA}\}G$	In $\text{XA}^*\text{Aud} \text{XG} \leftarrow$		
	Example → 4}G	In 04*Aud+02 ↳		
	Example explanation: (Decrement Audio Level on Virtual Input 4 - down 1 dB).			
AUDIO MUTE COMMANDS	ASCII (HOST-SWITCHER)	RESPONSE (SWITCHER-HOST)		
Audio Mute	$\text{Xc}Z$	Amt $\text{XI} \leftarrow$		
Audio Un-mute	$\text{Xc}z$	Amt $\text{XI} \leftarrow$		
Note: Where Xc is not included, global Audio mute is activated.				
List Commands	ASCII (HOST-SWITCHER)	RESPONSE (SWITCHER-HOST)		
List Room Configuration	LR	ROOM# NAME VIRTUAL OUTPUTS ↳		
		01 ROOM NAME_1 , $\text{VO}_1, \text{VO}_2, \text{VO}_3, \rightarrow \text{VO}_n \leftarrow$		
		02 ROOM NAME_2 , $\text{VO}_1, \text{VO}_2, \text{VO}_3, \rightarrow \text{VO}_n \leftarrow$		
		03 ROOM NAME_3 , $\text{VO}_1, \text{VO}_2, \text{VO}_3, \rightarrow \text{VO}_n \leftarrow$		
		↓ ↓ ↓ ↓ ↓		
		10 ROOM NAME_{10} , $\text{VO}_1, \text{VO}_2, \text{VO}_3, \rightarrow \text{VO}_n \leftarrow \leftarrow$		
<hr/>				
	Example → LR	ROOM# Name VIRTUAL OUTPUTS ↳		
		01 Security , 04,11,12,13 ↳		
		02 Demo Rm , 27 ↳		
		03 , 15,16,17,18 ↳		
		↓ ↓ ↓		
		09 [unassigned] ↳		
		10 Conf. Rm , 31,32 ↳ ↳		
<hr/>				
List Virtual inputs	LI	VIRT-IN# NAME LVL1 LVL2 → LVL6 ↳		
		01 VIT NAME_1 , $\text{VI}_1, \text{VI}_2, \rightarrow \text{VI}_6 \leftarrow$		
		02 VIT NAME_2 , $\text{VI}_1, \text{VI}_2, \rightarrow \text{VI}_6 \leftarrow$		
		↓ ↓ ↓ ↓ ↓		
		N VIT NAME_n , $\text{VI}_1, \text{VI}_2, \rightarrow \text{VI}_6 \leftarrow \leftarrow$		
<hr/>				
List Virtual outputs	LO	VIRT-OUT# NAME LVL1 LVL2 → LVL6 VMUT AMUT ↳		
		01 $\text{VO NAME}_1, \text{VO}_1, \text{VO}_2, \rightarrow \text{VO}_6, \text{XS}, \text{XS} \leftarrow$		
		02 $\text{VO NAME}_2, \text{VO}_1, \text{VO}_2, \rightarrow \text{VO}_6, \text{XS}, \text{XS} \leftarrow$		
		↓ ↓ ↓ ↓ ↓		
		N $\text{VO NAME}_n, \text{VO}_1, \text{VO}_2, \rightarrow \text{VO}_6, \text{XS}, \text{XS} \leftarrow \leftarrow$		
<hr/>				
	Example → LO	VIRT-OUT# NAME LVL1 LVL2 → LVL6 VMUT AMUT ↳		
		01 Barco7 ,1o16 ,1o17 ,1o18 ,2o05 ,y ,n ↳		
		02 Preview ,1o01 ,1o02 ,1o03 ,2o01 ,y ,y ↳		
		↓ ↓ ↓ ↓ ↓		
		20 ,1o04 ,1o05 ,1o06 ,2o02 ,y ,n ↳		
		21 VCR ,1o07 ,1o62 ,1o63 ,2o21 ,n ,y ↳ ↳		

SIMPLE INSTRUCTION SET COMMANDS (PAGE 3 OF 3)													
LIST COMMANDS	ASCII (HOST-SWITCHER)	RESPONSE (SWITCHER-HOST)											
List Remote Keypad	LK	ADDR#	MODE	ID#	NAME	USER INPUT ↳							
	Example response for LK command →	ADDR#	MODE	ID#	NAME	USER INPUT ↳							
		1	LBL	,00	,	,01 ↳							
		2	OUTP	,14	,ConfRm1	,05 ↳							
		5	OUTP	,15	,Security2	,05 ↳							
		↓	↓	↓	↓	↓							
		64	ROOM	,10	,ConfRm2	,01 ↳ ↳							
List Presets	LP	ROOM#	PRESET#	NAME	FOLLOW MODE ↳								
	Example response for LP command →	ROOM#	PRESET#	NAME	FOLLOW MODE ↳								
		GL	01	,DailyConfig	,ALL ↳								
		↓	↓	↓	↓								
		GL	32	,LunchConfig	,ALL ↳								
		01	01	,WkEndConfig	,NO ↳								
		01	02	,NightConfig	,ALL ↳								
		↓	↓	↓	↓								
		10	10	,TestConfig	,NO ↳ ↳								
INFORMATION COMMANDS	ASCII (HOST-SWITCHER)	RESPONSE (SWITCHER-HOST)											
Query Software Version	Q/q	Ver [Xs] ↳											
Specific BME	[Xo] Q/q	Ver [Xs] ↳											
	Example → 4Q	Ver 1.00 ↳											
	Example explanation: Query Firmware version of BME #4.												
	4Q or 4q is acceptable as ASCII command format.												
Request Part Number	N/n	N60-25x-io fr ↳			(Response = BME #0 Part Number)								
Specific BME	[Xo] N/n	N60-25x-iofr ↳											
	Note: x = 0 = Matrix 6400 Wideband, x = 1 = Matrix 3200 Wideband, x = 2 = Matrix 6400 Lo Res,												
	x = 3 = Matrix 3200 Lo Res, x = 4 = Matrix 6400 Sync, x = 5 = Matrix 3200 Sync, x = 6 = Audio.												
	io = Two character Input/Output Matrix configuration code (see Page B-1)												
	f = FPC-1000 installed?, 0 = No, 1 = Yes. r = Redundant Power Supplies installed?, 0 = No, 1 = Yes.												
Request Information	I/i	I [IN SIZE] X [OUT SIZE] • T [TECHNOLOGY] • U [# OF UNITS] • M [IN MAP SIZE]											
		X [OUT MAP SIZE] • Vmt [X] • Amt [X] • Sys [X] • Dgn [X] ↳											
	Example → I	I64X64•T1•U2•M21X21•Vmt0•Amt1•Sys1•Dgn00 ↳											
	Example explanation: I64X64 indicates that this BME has 64 physical inputs and 64 physical outputs.												
	T1= Wideband Switcher, U2 indicates system has 2 BMEs and is set to M21X21 (21 Virtual Inputs and 21 Virtual Outputs). Vmt0 = Video is not Muted, Amt1 = Audio is Muted. Sys1 indicates that this BME has no redundant power supply and the main power supply is on. Dgn00 indicates no error (BME's self-test diagnostics passed. Dgn20 if reported = System physical size has changed since last virtualized.												
Specific BME	[Xo] I/i	Same as Request Information Response above.											
	Notes:												
	1. Command "0I " is equivalent to "I" or "i" command.												
	2. [TECHNOLOGY] 1 = Wideband, 2 = Lo-Res, 3 = Sync, 4 = Audio (for this BME), 0 = BME not present.												
	3. [IN SIZE] + [OUT SIZE] is physical size of this BME.												
	4. [IN SIZE], [OUT SIZE], [# OF UNITS], [IN MAP SIZE], [OUT MAP SIZE] are each two digit fields.												

Global PRESET w/Total Breakaway	$\text{XJ} * \text{XC} * \text{XP} \text{ VC}$	$\text{VI}_{\text{XC}} * \text{VI}_{\text{XC}+1} * \text{VI}_{\text{XC}+2} \rightarrow \text{VI}_{\text{XC}+15} \text{ Plane } \text{XP} \leftarrow$
Command description →	preset*start-output*plane	
Global PRESET by Specific BME	$\text{XJ} * \text{XC} * \text{XD} \text{ VD}$	$\text{XB}_{\text{XC}} * \text{XB}_{\text{XC}+1} * \text{XB}_{\text{XC}+2} \rightarrow \text{XB}_{\text{XC}+15} \text{ Bme } \text{XD} \leftarrow$
Command description →	preset*start-output*BME#	
Room PRESET information	$\text{XH} * \text{XK} \text{ VI}$	$\text{P}_{\text{RESET NAME}}, \text{Grp } \text{XL} \leftarrow$
Room PRESET Ties	$\text{XH} * \text{XK} * 01 * 00 \text{ VA}$	$\text{VI}_1 \rightarrow \text{VI}_{\text{Rvo...}} \bullet \text{All} \leftarrow$
Room PRESET w/Total Breakaway	$\text{XH} * \text{XK} * 01 * \text{XP} \text{ VC}$	$\text{VI}_1 \rightarrow \text{VI}_{\text{Rvo...}} \bullet \text{Plane } \text{XP} \leftarrow$
Command description →	room*preset*start-output*plan	

Command	Response	Description
1V1 .lims Lecture GrpB	1	Read Preset 1 breakaway information (follow versus breakaway mode)

In the 4 examples below, all Ties are read from a 32 x 32 virtual RGBA (red, green, Blue, Audio) system with Audio/Video breakaway (Grp B). In Examples 1 and 2 below (Video breakaway), only virtual plane 1 (Red) needs to be read, since virtual planes 2 and 3 (Green and Blue) are the same as virtual plane 1. Examples 3 and 4 below refer to virtual Audio breakaway with virtual plane 4 representing Audio.

Explanation: Read Preset 1 Red (plane 1). Ties of Virtual Video Inputs to Virtual Video Outputs 01 through 16.

Example 2 → 1*17*01VC 04*64*00*00*00*00*00*03*01*00*00*00*64*00*01*00*00*Plane 1→

Explanation: Read Preset 1 Red (plane 1) Ties of Virtual Video Inputs to Virtual Video Outputs 17 through 32.

Explanation: Read Preset 1 Audio (plane 4) Ties of Virtual Audio Inputs to Virtual Audio Outputs 01 through 16.

Explanation: Read Preset 1 Audio (plane 4) Ties of Virtual Audio Inputs to Virtual Audio Outputs 17 through 32.

ADVANCED INSTRUCTION SET AND SIMPLE INSTRUCTION SET COMMANDS (PAGE 2 OF 3)		
VIEW COMMANDS	ASCII(HOST-SWITCHER)	RESPONSE(SWITCHER-HOST)

Virtual Output MUTES VM $\text{[XT}_1 \bullet \text{XT}_2 \bullet \bullet \bullet \bullet \text{XT}_{64}\text{]Mut} \leftarrow$

Notes:

1. Start output is always 01 for Room PRESET, because room has max. of 16 outputs assigned.
2. All "VI" values in responses are 2 numeric characters (i.e. 12 or 03) or "na" indicating nonexistent virtual outputs.
3. In "VA" View, any outputs that do not follow show as " - " in response.
4. Rvo = Virtual Output assigned to specified "room" (up to 16 total).

RGB DELAY COMMANDS	ASCII(HOST-SWITCHER)	RESPONSE(SWITCHER-HOST)
Read RGB Delay (for 1 ch.)	$\text{[Esc]D} \text{[Xc} \leftarrow$	Out $\text{[Xc} \bullet \text{Dly} \text{[XM} \leftarrow$
Set RGB Delay (for 1 ch.)	$\text{[Esc}d \text{[XM}^* \text{[Xc} \leftarrow$	Out $\text{[Xc} \bullet \text{Dly} \text{[XM} \leftarrow$

Note: Where [XM = delay in 1/2 second increments (i.e. 0 = 0 sec, 10 = 5.0 sec)

DIRECT WRITE OF GLOBAL PRESETS COMMAND	ASCII(HOST-SWITCHER)	RESPONSE(SWITCHER-HOST)
Start Write Mode	$\text{[Esc}P \text{[Xj} \leftarrow$	Write Preset [Xj Ready \leftarrow
End Write Mode	$\text{[Esc}p \leftarrow$	End Write Preset $\text{[Xj} \leftarrow$
Example →	$\text{[Esc}P32 \leftarrow$ 1*1! 1*2& 1*3% : : 1*64\$ $\text{[Esc}p \leftarrow$	Write Preset 32 Ready \leftarrow End Write Preset 32 \leftarrow

Notes:

1. Any non-output switching or invalid command between the Start and End commands will be ignored.
2. If there is no activity for 5 seconds while in write mode, then error E17 occurs.
3. No front panel switching (Actual Switching) is allowed during the Start and End commands.
4. If an End ($\text{[Esc}p$) command is issued with no Start command, then error E10 occurs.

QUICK RECALL OF GLOBAL PRESET COMMANDS	ASCII(HOST-SWITCHER)	RESPONSE(SWITCHER-HOST)
Quick Recall Preset	$\text{[Esc}. \leftarrow$	RPR $\text{[Xj} \leftarrow$

Notes:

1. If the Quick Recall Preset ($\text{[Esc}.$) command is issued without an active write, then error E10 occurs.
2. Complete backplane switch within 60mS (apprx.) after receipt of the command.
3. Recall must take place 100mS after End Write Mode command ($\text{[Esc}p$).
4. Quick recall command only recalls last entered direct write preset.

SET NAMES COMMANDS	ASCII(HOST-SWITCHER)	RESPONSE(SWITCHER-HOST)
Read Global preset name	$\text{[Esc}NG \text{[Xj} \leftarrow$	$\text{[NAME} \leftarrow$
Write Global preset name	$\text{[Esc}nG \text{[Xj}, \text{[NAME} \leftarrow$	NamP \leftarrow
Read Room preset name	$\text{[Esc}NP \text{[XH}^* \text{[Xk} \leftarrow$	$\text{[NAME} \leftarrow$
Write Room preset name	$\text{[Esc}nP \text{[XH}^* \text{[Xk}, \text{[NAME} \leftarrow$	NamP \leftarrow
Read Room Name	$\text{[Esc}NR \text{[XH} \leftarrow$	$\text{[NAME} \leftarrow$
Write Room Name	$\text{[Esc}nR \text{[XH}, \text{[NAME} \leftarrow$	NamR \leftarrow
Read Virtual Input Name	$\text{[Esc}NI \text{[XB} \leftarrow$	$\text{[NAME} \leftarrow$
Write Virtual Input Name	$\text{[Esc}nl \text{[XB}, \text{[NAME} \leftarrow$	NamI \leftarrow
Read Virtual Output Name	$\text{[Esc}NO \text{[XC} \leftarrow$	$\text{[NAME} \leftarrow$
Write Virtual Output Name	$\text{[Esc}nO \text{[XC}, \text{[NAME} \leftarrow$	NamO \leftarrow
ZAP CONFIGURATION COMMANDS	ASCII(HOST-SWITCHER)	RESPONSE(SWITCHER-HOST)
Zap All Global presets & names	$\text{[Esc}zG \leftarrow$	ZapG \leftarrow

ADVANCED INSTRUCTION SET AND SIMPLE INSTRUCTION SET COMMANDS (PAGE 3 OF 3)		
ZAP CONFIGURATION COMMANDS	ASCII (HOST-SWITCHER)	RESPONSE (SWITCHER-HOST)
Zap individual Global	<code>EsczT[XJ]</code> ↵	ZapT ↵
Zap All Room presets & names	<code>EsczP</code> ↵	ZapP ↵
Zap individual Room Preset	<code>EsczT[XH]*[XK]</code> ↵	ZapT ↵
Zap All RGB Delay to Ø sec.	<code>EsczD</code> ↵	ZapD ↵
Zap all Audio Gains to Ø dB.	<code>EsczA</code> ↵	ZapA ↵
UnMute RGB/Audio (All Mutes)	<code>Esczz</code> ↵	ZapZ ↵
Master Reset	<code>EsczXXX</code> ↵	ZapXXX ↵

ERROR CODES

If the switcher receives a command that is invalid or contains invalid parameters, it will return an Error Code response. The error code response has the format "Exx". Following is a list of possible error code responses.

Description of Error code

- E01 ↵ Invalid input channel number (too large)
- E05 ↵ Device is off
- E10 ↵ Invalid command
- E11 ↵ Invalid preset number (too large)
- E12 ↵ Invalid output number (too large)
- E13 ↵ Value too large (Gain)
- E14 ↵ Command not available for matrix configuration
- E17 ↵ Timeout
- E20 ↵ Invalid BME number
- E21 ↵ Invalid Room number
- E22 ↵ Busy
- E23 ↵ Checksum error

SWITCHER GENERATED UNSOLICITED RESPONSES

When a local event takes place, such as a Front Panel operation, the switcher responds by sending an unsolicited response (RECONFIGxx) to the Host. Use the 2 digit code xx to locate a description of the event below.

RECONFIG00 = Audio level change

RECONFIG02 = Room#1 or room#1's preset name change
 RECONFIG03 = Room#2 or room#2's preset name change
 RECONFIG04 = Room#3 or room#3's preset name change
 RECONFIG05 = Room#4 or room#4's preset name change
 RECONFIG06 = Room#5 or room#5's preset name change
 RECONFIG07 = Room#6 or room#6's preset name change
 RECONFIG08 = Room#7 or room#7's preset name change
 RECONFIG09 = Room#8 or room#8's preset name change
 RECONFIG10 = Room#9 or room#9's preset name change
 RECONFIG11 = Room#10 or room#10's preset name change

RECONFIG12 = Name change for global preset #1-16
 RECONFIG13 = Name change for global preset #17-32

RECONFIG14 = Current connection change

RECONFIG17 = Name change for virtual input #1-16
 RECONFIG18 = Name change for virtual input #17-32
 RECONFIG19 = Name change for virtual input #33-48
 RECONFIG20 = Name change for virtual input #49-64

RECONFIG21 = Name change for virtual output #1-16
 RECONFIG22 = Name change for virtual output #17-32
 RECONFIG23 = Name change for virtual output #33-48
 RECONFIG24 = Name change for virtual output #49-64

RECONFIG25 = Individual mute change

RECONFIG26 = RGB->SYNC delay change

RECONFIG34 = A global preset has been saved

RECONFIG35 = A room preset has been saved

RECONFIG36 = All RGB Sync Delays initialized (Zapped to Ø sec)

RECONFIG37 = All Audio Levels initialized (Zapped to Ø dB)

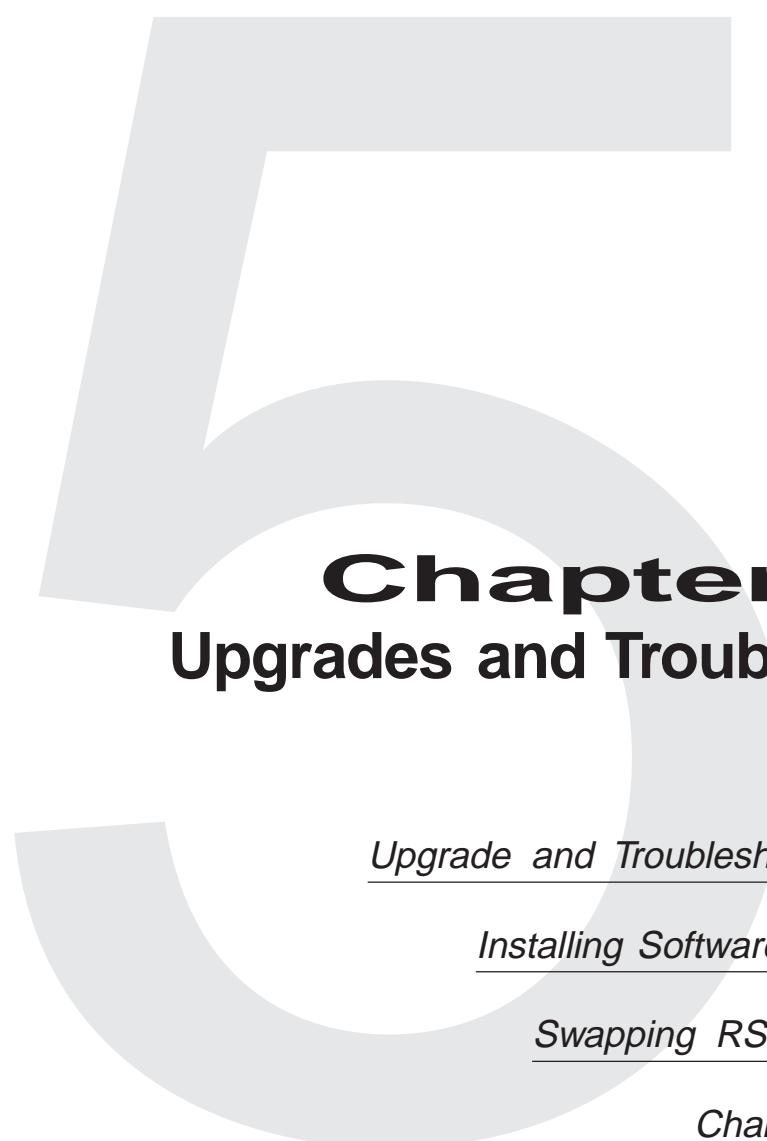
RECONFIG38 = All Mutes initialized (Zapped to UnMuted)

RECONFIG40 = Global mute change

RECONFIG41 = Power supply status changed

RECONFIG99 = Entire System initialized (Master Reset)

Matrix 3200/6400 Video Switcher



Chapter Five

Upgrades and Troubleshooting

Upgrade and Troubleshooting Procedures

Installing Software Update (IC Chip)

Swapping RS-232/RS-422 Ports

Changing the AC Fuse

Upgrades

Upgrade and Troubleshooting Procedures

The following procedures may be done in the field.

- Add Front Panel Controller (FPC 1000) - see below.
- Installing a Software Upgrade - see Page 5-3.
- Swapping RS-232 / RS-422 Ports - see Page 5-4.
- Troubleshooting a system problem - see Page 5-5.
- Adding Video cards to a Matrix 3200/6400 Video Switcher- see Page 5-7.
- Adding BMEs to a Matrix 6400/3200 System - see Page 5-9.

Adding a Front Panel Controller to an existing system

Adding a Front Panel Controller to an existing system involves replacing the blank Access Panel on any BME (except Sync) with the FPC 1000 panel. A system can only have one Front Panel Controller and it must be installed on BME #0. The details for installing the FPC 1000 are included in the User's Manual provided with the unit.

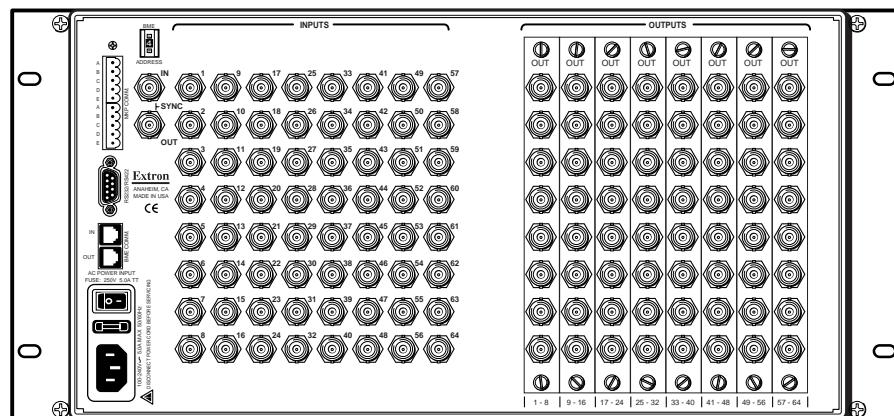
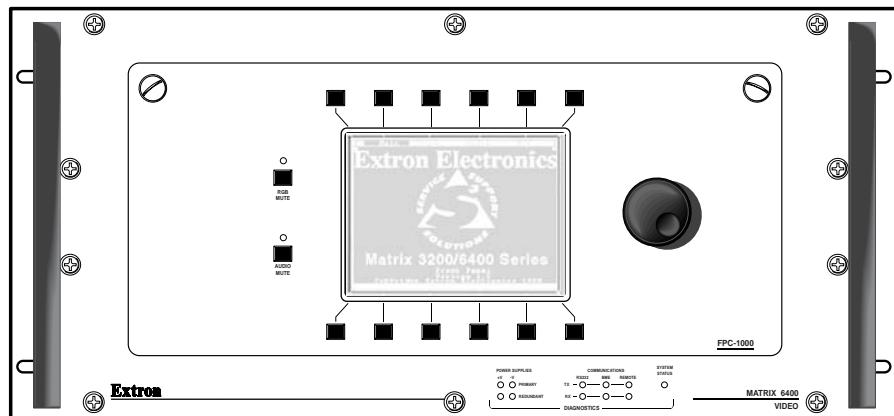


Figure 5-1.A Matrix 6400 Video BME Front and Rear Panels

Matrix 3200/6400 Video BME Internal Access

⚠ Before opening the BME, turn power OFF and unplug the AC power cord. High voltages are present inside the BME and the FPC 1000 Front Panel Controller.

Upgrades or repairs may require access to internal areas of the Matrix 3200/6400 Video BME. This involves removing the access panel (blank or FPC 1000) using a coin or a flat blade screwdriver to rotate the two captive screws (Figure 5-2.A) as shown in Figure 5-2.B. Pull the top of the access panel out slightly then lift up and remove it from the front panel. The FPC 1000 will have a cable connecting it to the Main Controller, unplug the connector.

When done, reverse the procedure to reinstall the access panel

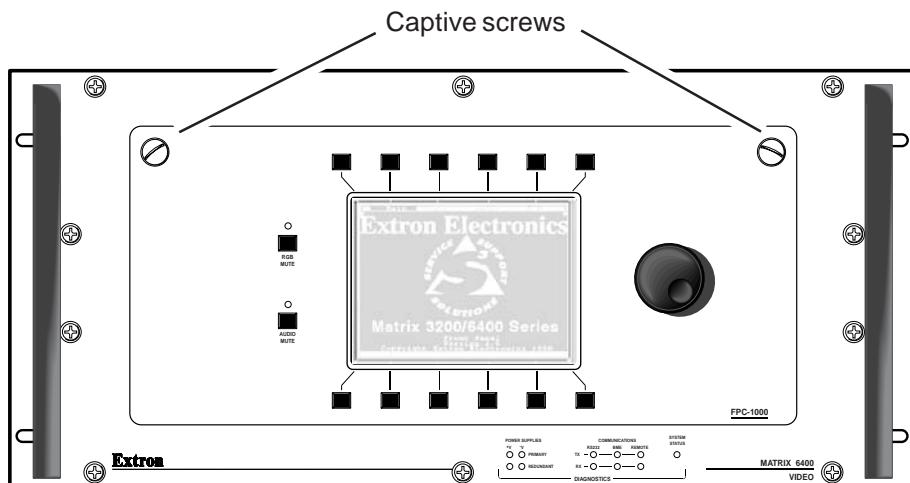


Figure 5-2.A Use a coin or screwdriver to rotate two captive screws.

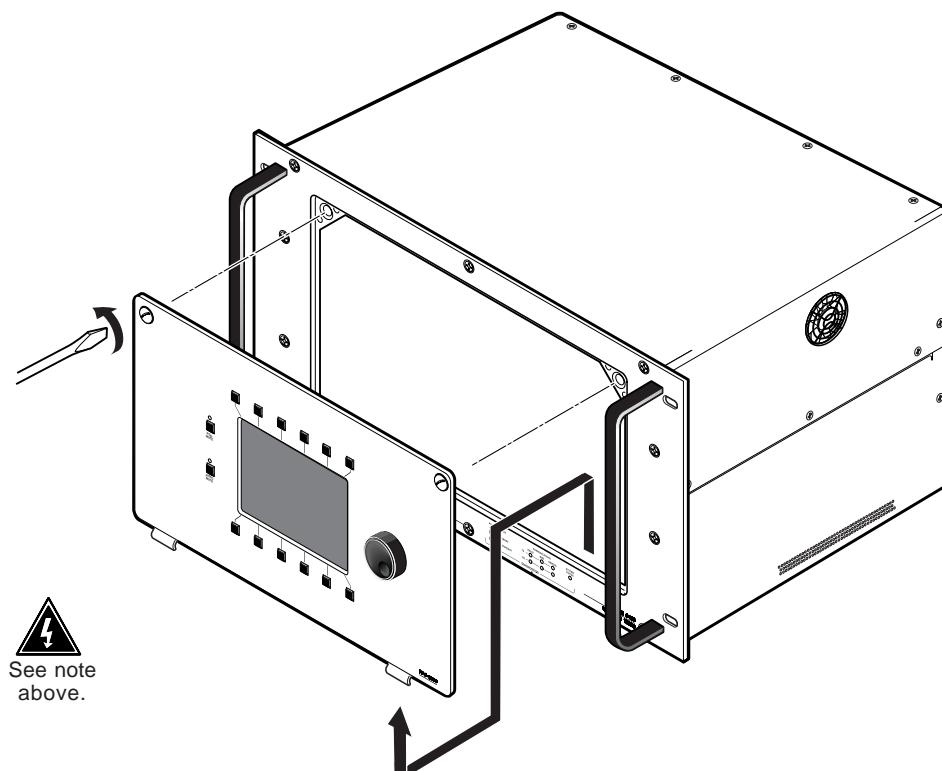


Figure 5-2.B Removing the access panel (blank or FPC 1000)

Installing A Software Update

To install a software update, IC U9 or U6 (or both) on the Main Control printed circuit card is replaced. If the system consists of multiple BMEs, the software IC(s) in each BME's Main Control PCB may need to be updated. Use the following procedure to replace the Matrix 3200/6400 Video Main Control PCB IC(s).

1. Power the system OFF and unplug the AC power cord.
2. Remove the Access Panel. See Page 5-2.
3. Use the PLCC IC puller (Figure 5-3.A) to remove the existing Software IC. Squeeze the tool to align the hooks with the slots provided in opposite corners of IC socket U9 or U6. Insert the hooks, squeeze gently and pull the IC straight out of the socket. Set the IC aside.
4. Note the key (angled corner) of the new Software IC. Orient this to match the key of the socket and carefully press it in place.
5. Reinstall the Access Panel.
6. Plug in the AC power cord, power the system ON.
7. Verify that the switcher is working properly.

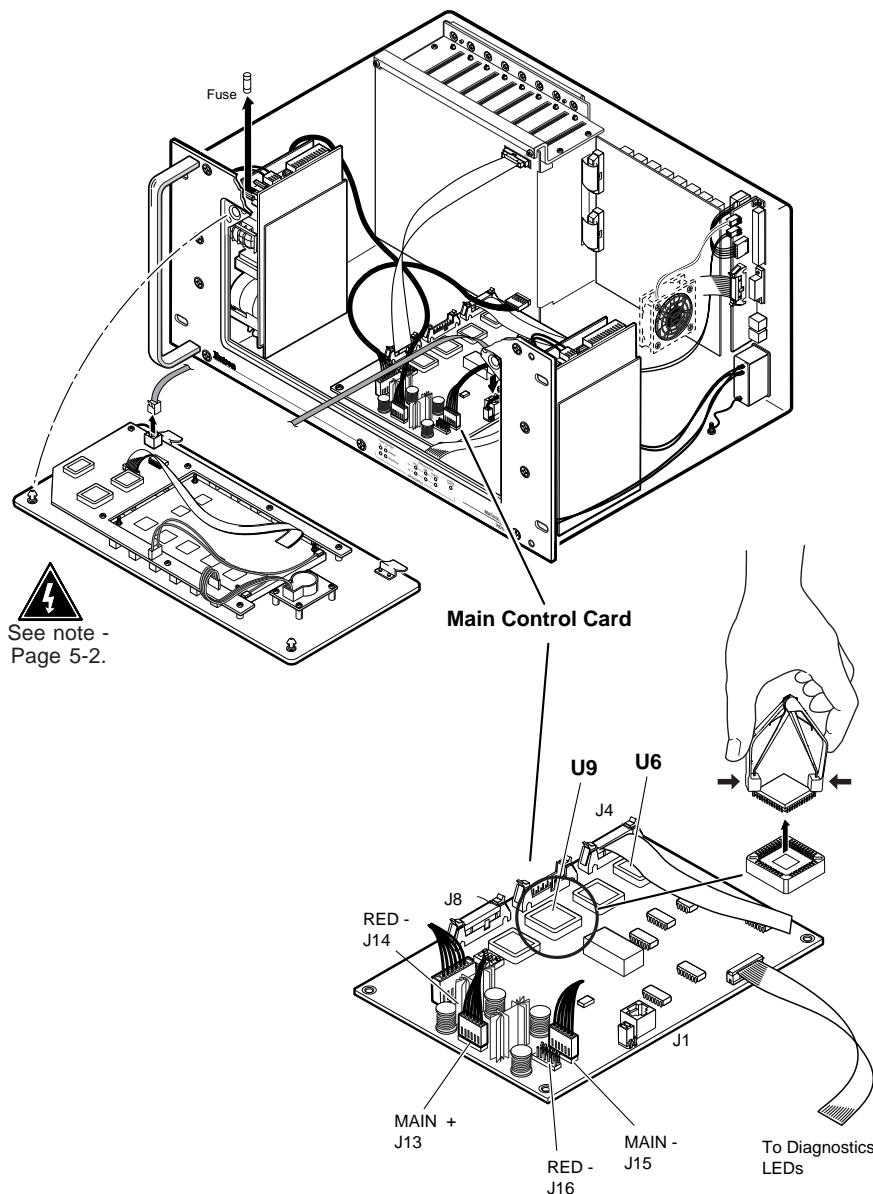


Figure 5-3.A Updating the Software IC on the Main Control Card

Swapping BME #0 RS-232/RS-422 Ports

Swapping BME #0 RS-232/RS-422 ports (not required on BME #1 - BME #5) involves moving a ribbon cable from one Main Control card connector to another.

Ribbon Cable Connectors

The ribbon cables used in the Matrix 3200/6400 Video Switcher use a self-latching style receptacle. Figure 5-4.A shows how it operates.

1. Press each of the two tabs outward, this unlocks the receptacle and ejects the ribbon cable connector part way. Pull evenly on the ribbon cable connector to remove it.
2. When reconnecting the cable, first align the pins in the receptacle with the holes in the connector and press evenly into the receptacle until the receptacle tabs lock the connector in place.

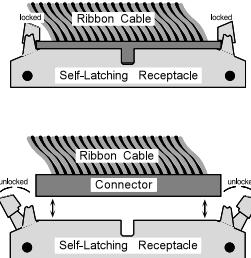


Figure 5-4.A

Swapping Serial Ports (RS-232/RS-422)

⚠ Before working inside, unplug the power cord.

The Matrix 3200/6400 Video Switcher is normally connected for RS-232 use. If your application requires RS-422, follow this procedure (and Figure 5-4.B) to change the configuration. The procedure for removing and installing the ribbon cables is described above in "Ribbon Cable Connectors" above.

1. Power OFF BME #0, unplug the power cord.
2. Remove the Access Panel on BME #0 (Page 5-2), locate the Main Control card (see Figure 5-3.A).
3. Locate two ribbon cable receptacles (Figure 5-4.B) One is empty and the other has a ribbon cable which goes to the rear panel. J4 is the RS-232 receptacle and J5 is the RS-422 receptacle. If the connection is not correct for your application, disconnect the cable and move it to the other receptacle.
4. Reinstall the Access Panel.
5. Plug in the AC power cord, power ON the BME.

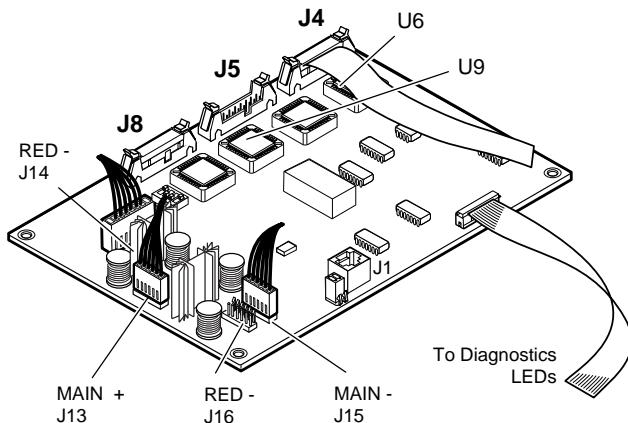


Figure 5-4.B Main Control Card - for card location, see Figure 5-3.A.

Troubleshooting a Matrix 3200/6400 System Problem

All Matrix 3200/6400 BME front panels include LEDs at the bottom of the panel which are bracketed and labeled DIAGNOSTICS. These LEDs (Figure 5-6.A) indicate the current status of the BME power supplies, the RS232/BME/MKP¹ Communications RX and TX lines, and the System Status. The following descriptions include normal/failure/status conditions for each LED.

Power Supplies

Primary +V	Green LED	ON = Normal OFF = Failure
Primary -V	Green LED	ON = Normal OFF = Failure
Redundant +V	Green LED	ON = Normal OFF = Failure (or Redundant not present) Blinking = Redundant +V supplying full +V load (indicates Primary +V power supply failure)
Redundant -V	Green LED	ON = Normal OFF = Failure (or Redundant not present) Blinking = Redundant -V supplying full +V load (indicates Primary -V power supply failure)

 If a BME fails to power ON, check the BME external AC fuse (see Page 5-6). If the Diagnostic LEDs indicate that a power supply has failed, check the power supply fuse (see Page 5-6).

BME #0 must be powered ON at the same time or after other BMEs. Any BME powered on after BME #0 will not be seen by the internal system software.

Communications

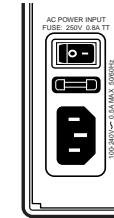
RS232 TX - Red LED ON/Blinking = BME is transmitting data to Host
 RS232 RX - Green LED ON/Blinking = BME is receiving data from Host
 BME TX - Red LED ON/Blinking = BME is transmitting data
 BME RX - Green LED ON/Blinking = BME is receiving data
 MKP TX - Red LED ON/Blinking = BME is transmitting to Remote keypad
 MKP RX - Green LED ON/Blinking = BME is receiving from Remote keypad

 1. MKP TX/RX LEDs are not present on SYNC BMEs.
 2. MKP LED conditions above apply only to BME #0.
 3. RS-232 LED conditions above apply only to BME #0.
 4. A communications failure between BME #0 and other BMEs could be caused by one BME loading down the BME TX or RX line. To determine if that is the case, run the RJ-11 BME COMM interconnecting cable to bypass each BME one at a time.

System Status	Amber LED	ON = Normal OFF = System failure - Call Extron Tech Support Blinking = Busy
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Checking/Replacing the BME External AC Input Fuse

The AC power input cord plugs into the Power-Switch/Fuse assembly which is located on the rear panel in the lower left corner of the BME. To check/replace the external fuse, remove the power-cord and insert the tip of a small screwdriver blade into the fuse-holder slot (the fuse-holder is located just below the power switch). Pry the fuse-holder out, it contains the AC input fuse plus a spare. If may be obvious that the fuse is blown, if not, check it with an ohmmeter or any other continuity device if available. If the fuse is blown, replace it with the provided spare. Plug the AC power cord in and Power the BME ON. Verify that the unit powered ON correctly (check Front Panel LEDs). If the LEDs are in the proper state, the problem has been corrected. If not, contact Extron Technical Support.



Checking/Replacing the BME Internal Power Supply AC Input Fuses

Each internal power supply has an AC input fuse. If a power supply fuse blows, the Front Panel LED for that power supply will go OFF (it is normally solid ON). If the BME has redundant power supplies, the redundant supply for the failed power supply will assume the full load and its front panel diagnostic LED will blink indicating that the Main (Primary) power supply is inoperative. To check/replace a power supply fuse, unplug the AC power cord from the BME rear panel, remove the Access Panel (see Page 5-2). The power supply fuse location is shown in Figure 5-6.A (circled). Remove the fuse from the problem power supply. If may be obvious that the fuse is blown, if not, check it with an ohmmeter or any other continuity device if available. If the fuse is blown, replace it, plug the AC power cord in, power up the BME and check Diagnostic LEDs. If the problem persists, call Extron Technical Support.

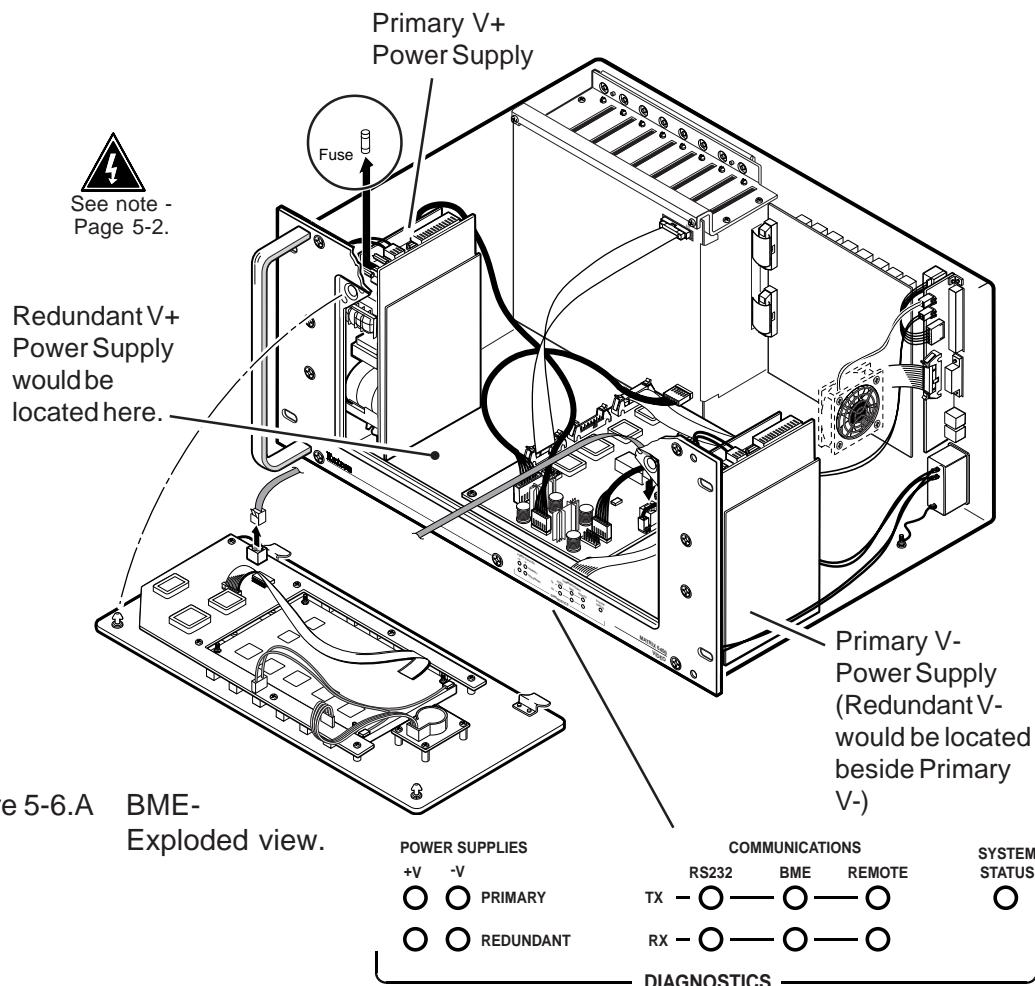


Figure 5-6.A BME-
Exploded view.

Matrix 3200/6400 Video Switcher Upgrade - Changing the Matrix Size

Changing the matrix size of a Matrix 6400 Video Switcher may require adding or removing output Video circuit cards. Page 5-8 describes the procedure for determining the required number of output cards for the desired matrix size and which connectors the cards should be plugged into. The following procedure describes how to change the matrix size.

1. See Page 5-11 "Software Procedure - Before and After a Hardware Upgrade". Do steps under "Before Hardware Changes" prior to making any hardware changes.

⚠ *To ignore step 1 and proceed with the hardware upgrade will require considerable system reconfiguration time. It is highly recommended that you not skip any step.*

2. Turn OFF the AC power switch and unplug the AC power cord.
3. Plug the Video cards in as required (see page 5-8).
4. Plug the AC power cord in and turn ON the AC power switch.
5. Do the steps under "After Hardware Changes" on Page 5-12.
6. Verify that the new matrix size is correctly identified by the software.

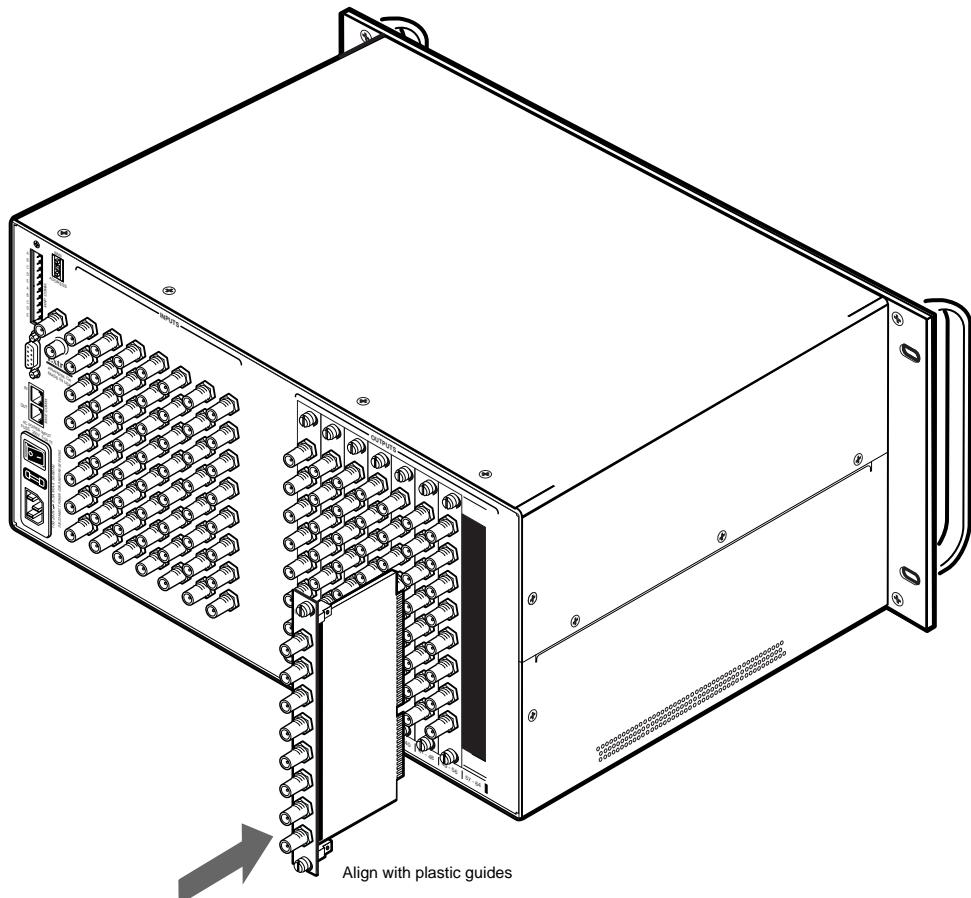
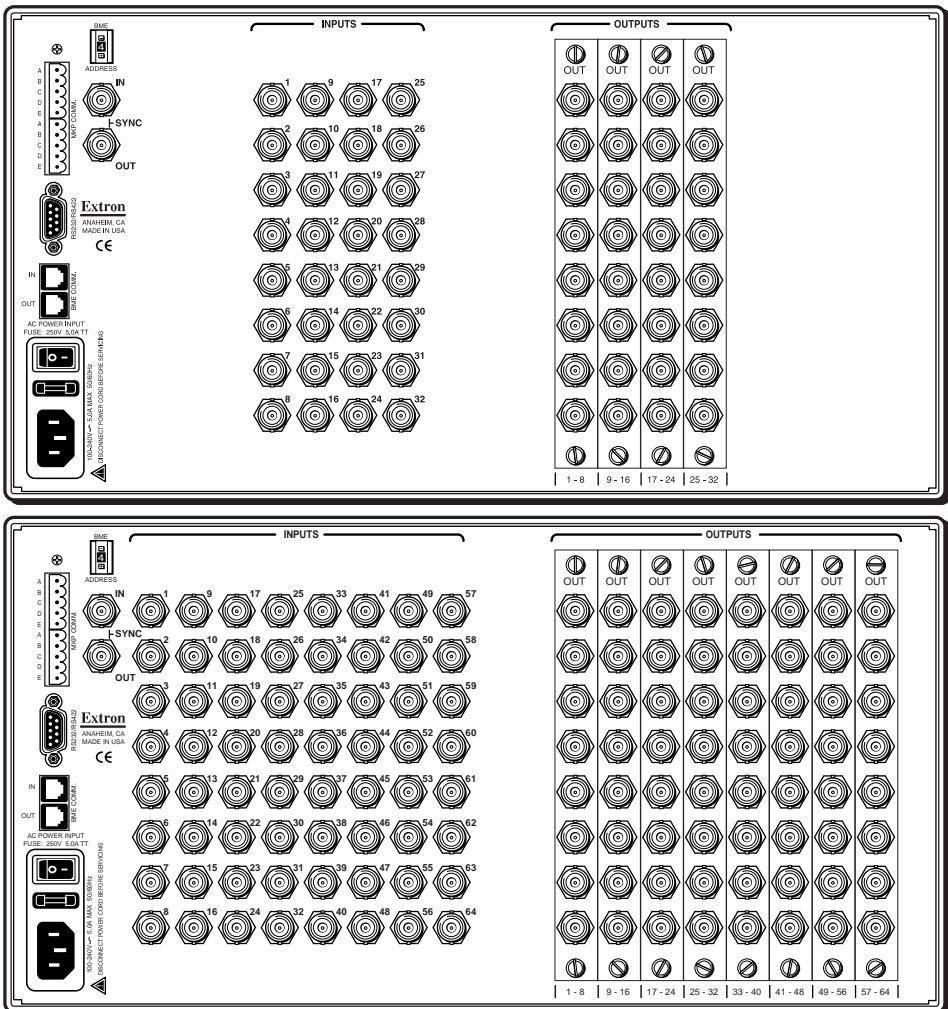


Figure 5-7.A Inserting an output video card into the BME.



Determining Video Output Card Population

The drawings above show the rear panel layout for the Matrix 3200 and Matrix 6400 Video Switchers. The number of input connectors is fixed at 32 or 64; the number of output connectors depends on the number of Video Output cards and is variable from 8 to 32 or 64 in multiples of 8. Each card supports 8 video outputs and each card slot is labeled to identify the physical connector range supported by the card in that slot (low number = top connector, high number = bottom connector on card).

The chart to the right shows the only supported Video card population for the following configurations.

32 inputs x 8, 16, 24, 32 outputs

64 inputs x 8, 16, 24, 32, 40, 48, 56, 64 outputs

An example matrix configuration of 64x40 would require five Video Output cards in slots 1-8, 9-16, 17-24, 25-32 and 33-40.

If the cards are not installed as shown for each matrix size, the Extron Matrix 6400 System Virtualization/Control Software will be unable to accurately virtualize the system. The Video Output circuit cards (PN# 70-068-01) plug into connectors OUTPUTS 1-8 through 25-32 or 57-64. It is not possible to plug the circuit cards in upside down.

Matrix 3200 32 Inputs Maximum	Matrix 6400 64 Inputs Maximum
	OUTPUTS

Adding BME(s) to a Matrix 3200/6400 System

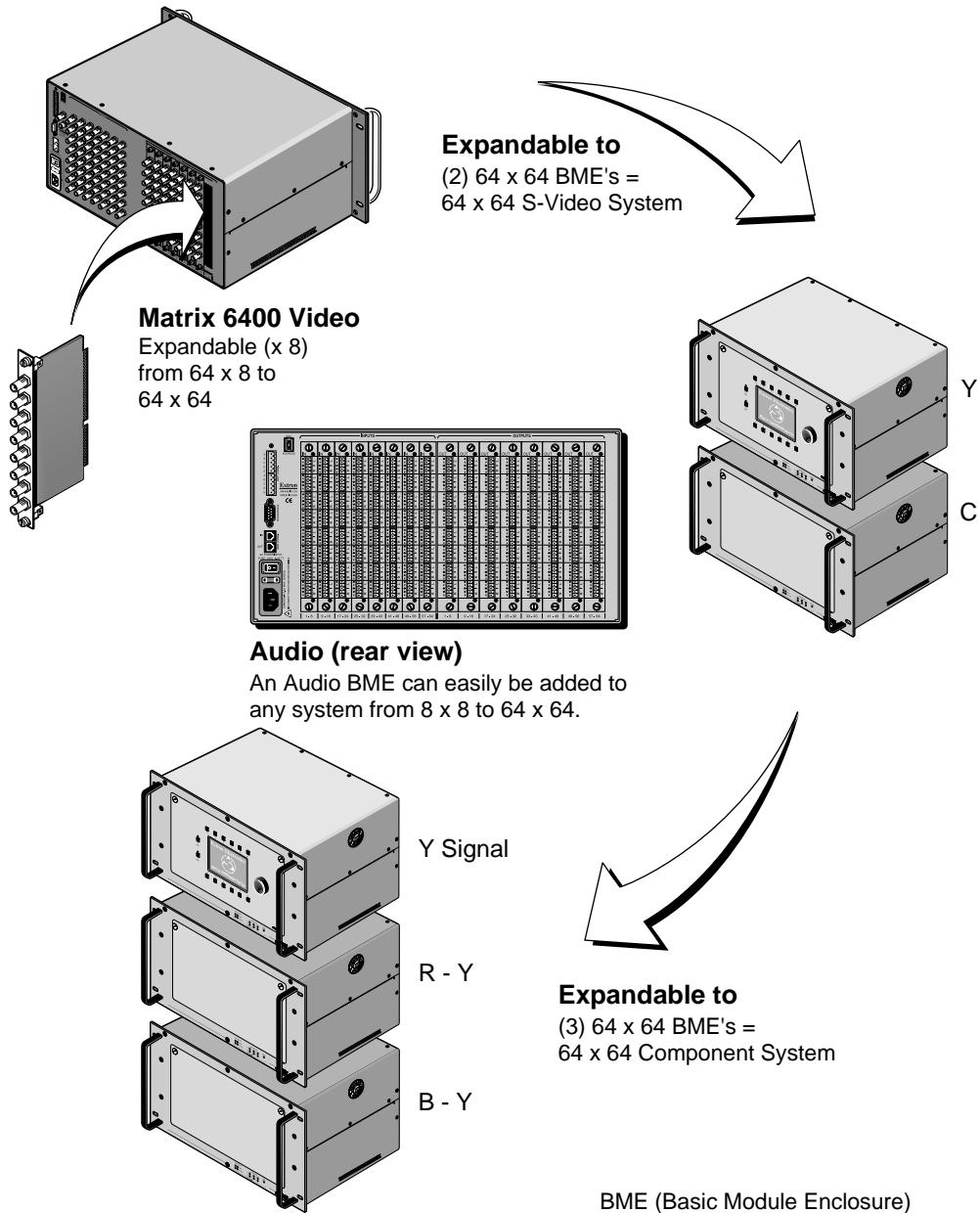


Figure 5-9.A Adding BMEs to a Matrix 3200/6400 system

Adding BME(s) to an existing Matrix 3200/6400 System involves doing most of the same steps as an initial installation. Extron recommends that the following steps be done in the order listed to add a Video BME (maximum Video BMEs per system = 3) and/or an Audio BME (maximum Audio BMEs per system = 1) to an existing system.

1. See Page 5-11 "Software Procedure - Before and After a Hardware Upgrade". Do steps under "Before Hardware Changes" before making any hardware changes.
- ⚠** *To ignore step 1 and proceed with the hardware upgrade will require considerable system reconfiguration time. It is highly recommended that you not skip any step.*
2. Remove power before proceeding. Go to "Adding a Video and/or an Audio BME" (below). If this is not a Video or Audio BME add-on, go to Chapter 2.
 3. Set the BME address numbers (0 - 5). (Page 2-2)
 4. Connect the BME COMM interconnecting cable(s). (Page 2-2)

5. Connect the RS-232/RS-422 cable to the serial port of BME #0. (Page 2-2)
6. Connect the AC Power cable(s) to the BME(s). (Page 2-2)
7. Apply AC power to the BMEs and Verify Normal Power-Up. (Page 2-2)
8. Do the steps under “After Hardware Changes” on Page 5-12.
9. Connect cables to BMEs (video, sync and/or audio cables). (Page 2-4)

The procedure for adding a Video and/or an Audio BME follows.

Adding a Video and/or an Audio BME

Matrix 3200/6400 Video BME(s) and/or a Matrix 6400 Audio BME may be installed in a rack with an existing Matrix 3200/6400 Video system, or in a different location. BMEs may be separated by up to 12 feet and rack mounting is NOT required. If the Video and/or Audio BME(s) are going to be rack mounted with other BMEs, they may be mounted in any order within a rack or cabinet. There are no restrictions to the order in which BMEs may be mounted relative to each other. Logically, the BME addresses in a system such as the one shown in Figure 5-10.A would be set to 0 - 5 sequentially from top to bottom, however, a different order is acceptable and will not impact system operation in any way.

Equipment location within a room should be given careful consideration. Poor planning, with the number of cables involved, could result in a cluttered appearance. Power requirements and the amount of heat exhaust from the system should be taken into consideration.

The following restrictions apply to installing BMEs.

- One BME must be assigned as BME#0.
- A BME with an FPC 1000 must be BME#0.
- Address assignments must not skip numbers.
- Address assignments of 0 - 5 are accepted, BMEs w/address 6-9 are ignored.
- A Matrix 3200/6400 Video system is limited to a maximum of 3 Video and one Audio BME(s).

See Page 2-1 for other BME restrictions.

Return to step 3 above.

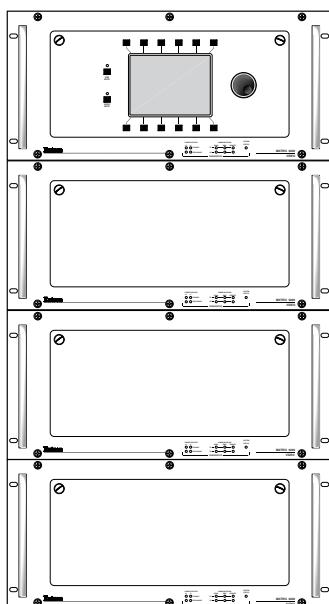


Figure 5-10.A Example of a Matrix 3200/6400 Video rack-mounted system

Software Procedure – Before and After a Hardware Upgrade

Prior to upgrading a Matrix 3200/6400 Video Switcher System, read the “Upgrade System – Software Procedure” below. The suggested procedure can save you a lot of time reconfiguring a system that is going to have a hardware upgrade installed. The procedure includes steps to be performed before and after the hardware upgrade.

Upgrade System – Software Procedure

The UPGRADE WIZARD is started by clicking the TOOLS | UPGRADE menu on the main screen. It guides you through restoration of all your system settings (programming of Presets, Virtual Names, Rooms, etc.) when you add more physical IO ports or more BMEs to your existing 3200/6400 system.

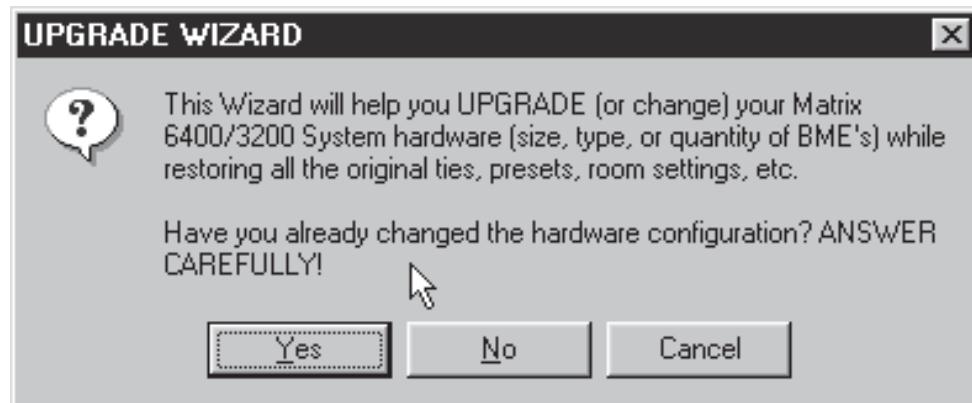
The following procedures must be done in the sequence listed to save the original system settings and use them to create a new configuration.

Before Hardware Changes

Do the following steps BEFORE starting the hardware upgrade:

1. From Windows open the “Extron Electronics” program group or folder.
2. Double click the “Matrix 6400 Control Pgm” icon to start the program. You will be asked to select the COMM port, or choose “Emulate” mode. After the COMM port is selected, the software looks for the matrix system, “reads” its configuration, and then displays it in a window called “Extron’s Matrix 6400 Control Program.”
3. Click on TOOLS, the TOOLS menu is displayed. Click on Upgrade.
4. The “Upgrade Wizard” dialog box shown below will be displayed. The options are Yes, NO and Cancel. Click on “No” (since the hardware changes have NOT been installed at this point).
 - The current MATRIX settings will be saved in the MTRX6400.INI file.
 - The Matrix 6400 Control Pgm will shut down to allow you to power down the system to make the hardware changes.
5. Return to step 2 of the applicable procedure (Page 5-7 or 5-9).

Note: The “After Hardware Changes” procedure begins on Page 5-12.

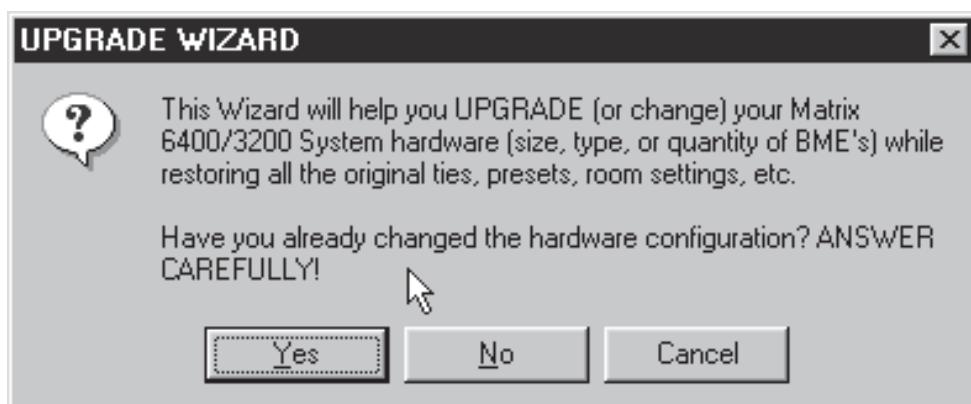


After Hardware Changes

Do the following steps AFTER the hardware upgrade has been installed:

1. From Windows open the Program Group or Folder called "Extron Electronics".
2. Double click the "Matrix 6400 Control Pgm" icon to start the program. You will be asked to select the COMM port, or choose "Emulate" mode. After the COMM port is selected, the software looks for the matrix system, "reads" its configuration, and then displays it in a window called "Extron's Matrix 6400 Control Program".
3. Click on TOOLS, the TOOLS menu is displayed. Click on Upgrade.
4. The "Upgrade Wizard" dialog box shown below will be displayed. The options are Yes, NO and Cancel. Click on "Yes" (since the hardware changes have been installed at this point). The "Upgrade Wizard" does the following:
 - Presents the Virtual Configuration screen so you may re-virtualize the system to match your new hardware configuration.
 - Restores MATRIX settings from the MTRX6400.INI file saved before the hardware configuration was changed. All settings are restored from before, except the Map.
 - You may want to assign new icons and names to any Virtual IO ports that were newly created by your upgrade after the wizard has finished. This would also be the time to update your Room Configurations if needed.
5. Verify that the system (including the new hardware) is functioning correctly. If the system is not functioning as expected, call Extron Technical Support.

NOTE: The upgrade wizard also allows you to downgrade your system (remove hardware), but various Room and Preset settings may not fully restore since some of the Virtual input and output ports may no longer



Notes

Matrix 3200/6400 Video Switcher

Appendix A

Reference Information

Switcher Part Numbers

Related Part Numbers

BNC Cables

Glossary of Terms

Matrix 3200/6400 Series Part Numbers

Part Numbers for Matrix 3200/6400 switchers use the following format:
60-25x-iofr

where: x = 0 = Matrix 6400 Wideband
 x = 1 = Matrix 3200 Wideband
 x = 2 = Matrix 6400 Video
 x = 3 = Matrix 3200 Video
 x = 4 = Matrix 6400 Sync
 x = 5 = Matrix 3200 Sync
 x = 6 = Matrix 6400 Audio

io = Inputs/Outputs (Matrix size). The i and the o are replaced by two characters which identify the exact size of the Matrix.

f = Front Panel Controller (FPC-1000)
 f = 0 = No, f = 1 = Yes

r = Redundant Power Supply
 r = 0 = No, r = 1 = Yes

An example of a typical Matrix 3200/6400 part number follows:

60-250-HD11

For this example: x = 0 = Matrix 6400 Wideband

io = HD = 64x32 which was obtained from the Matrix 6400 Wideband Part Number Table on Page A-2.

f = 1 = yes = Front Panel Controller
 r = 1 = yes = Redundant Power Supply

For the example above, the io characters would be HD for matrix size 64x32, DD for matrix size 32x32 and PH for matrix size 64x64.

The Matrix 3200 Wideband and Matrix 6400 Audio io characters are selected using the same procedure as is used with the Matrix 6400 Wideband, but with different tables as shown on Pages A-2 and A-3.

The io characters for the Matrix 3200 Sync part number are DD as it is only available in one matrix size, 32x32. The io characters for the Matrix 6400 Sync part numbers are PH as it is also available in only one matrix size, 64x64. Either of the two Sync part numbers may include r = 0 or 1 but f must be 0 as a Sync module cannot have a Front Panel Controller.

Matrix 3200/6400 Part Numbers (with matrix tables) are shown on Pages A-2 and A-3.

Matrix 3200/6400 Series Part Numbers (continued from previous page)

Extron Part	Part #
Matrix 6400 Wideband Switcher	60-250-iofr

Two io (Inputs/Outputs) characters = table matrix size coordinate points.

f = Front Panel Controller (FPC), 0 = No, 1 = Yes

r = Redundant Power Supply (RPS), 0 = No, 1 = Yes

Examples:

60-250-IE11 = 48 Inputs/40 Outputs 1-FPC & 1- RPS

60-250-HD10 = 64 Inputs/32 Outputs 1-FPC & 0-RPS

60-250-PH00 = 64 Inputs/64 Outputs 0-FPC & 0-RPS

Physical Outputs	Matrix 6400 Wideband (7U)			
	Physical Inputs			
16	16x	32x	48x	64x
8	60-250-AA	60-250-BA	60-250-CA	60-250-DA
16	60-250-AB	60-250-BB	60-250-CB	60-250-DB
24	60-250-BC	60-250-DC	60-250-FC	60-250-HC
32	60-250-BD	60-250-DD	60-250-FD	60-250-HD
40	60-250-CE	60-250-FE	60-250-IE	60-250-LE
48	60-250-CF	60-250-FF	60-250-IF	60-250-LF
56	60-250-DG	60-250-HG	60-250-LG	60-250-PG
64	60-250-DH	60-250-HH	60-250-LH	60-250-PH

Matrix 3200 Wideband Switcher	60-251-iofr
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Two io (Inputs/Outputs) characters = table matrix size coordinate points.

f = Front Panel Controller (FPC), 0 = No, 1 = Yes

r = Redundant Power Supply (RPS), 0 = No, 1 = Yes

Examples:

60-251-BB01 = 32 Inputs/16 Outputs 0-FPC & 1- RPS

60-251-DC10 = 32 Inputs/24 Outputs 1-FPC & 0-RPS

60-251-DD11 = 32 Inputs/32 Outputs 1-FPC & 1-RPS

Physical Outputs	Matrix 3200 Wideband (5U)	
	Physical Inputs	
16	16x	32x
8	60-251-AA	60-251-BA
16	60-251-AB	60-251-BB
24	60-251-BC	60-251-DC
32	60-251-BD	60-251-DD

Matrix 6400 Video Switcher	60-252-iofr
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Two io (Inputs/Outputs) characters = table matrix size coordinate points.

f = Front Panel Controller (FPC), 0 = No, 1 = Yes

r = Redundant Power Supply (RPS), 0 = No, 1 = Yes

Examples:

60-252-HD10 = 64 Inputs/32 Outputs 1-FPC & 0-RPS

60-252-HE11 = 64 Inputs/40 Outputs 1-FPC & 1-RPS

60-252-HH00 = 64 Inputs/64 Outputs 0-FPC & 0-RPS

Physical Outputs	Matrix 6400 Video (5U)	
	Physical Inputs	
	64x	
8	60-252-HA	
16	60-252-HB	
24	60-252-HC	
32	60-252-HD	
40	60-252-HE	
48	60-252-HF	
56	60-252-HG	
64	60-252-HH	

Matrix 3200 Video Switcher**60-253-iofr**

Two io (Inputs/Outputs) characters = table matrix size coordinate points.

f = Front Panel Controller (FPC), 0 = No, 1 = Yes

r = Redundant Power Supply (RPS), 0 = No, 1 = Yes

Examples:

60-253-DB01 = 32 Inputs/16 Outputs 0-FPC & 1-RPS

60-253-DC10 = 32 Inputs/24 Outputs 1-FPC & 0-RPS

60-253-DD11 = 32 Inputs/32 Outputs 1-FPC & 1-RPS

Physical Matrix 3200 Video (5U)

Outputs Physical Inputs

32x

8 60-253-DA

16 60-253-DB

24 60-253-DC

32 60-253-DD

Matrix 6400 Sync Switcher**60-254-PH0r**

r = Redundant Power Supply (RPS), 0 = No, 1 = Yes

Examples:

60-254-PH01 = 64 Inputs/64 Outputs with RPS

60-254-PH00 = 64 Inputs/64 Outputs without RPS

Physical Matrix 6400 Sync (7U)

Outputs Physical Inputs

64x

64 60-254-PH

Matrix 3200 Sync Switcher**60-255-DD0r**

r = Redundant Power Supply (RPS), 0 = No, 1 = Yes

Examples:

60-255-DD01 = 32 Inputs/32 Outputs with RPS

60-255-DD00 = 32 Inputs/32 Outputs without RPS

Physical Matrix 3200 Sync (5U)

Outputs Physical Inputs

32x

32 60-255-DD

Matrix 6400 Audio Switcher**60-256-iofr**

Two io (Inputs/Outputs) characters = table matrix size coordinate points.

f = Front Panel Controller (FPC), 0 = No, 1 = Yes

r = Redundant Power Supply (RPS), 0 = No, 1 = Yes

Examples:

60-256-HD01 = 64 Inputs/32 Outputs with RPS (no FPC)

60-256-HH10 = 64 Inputs/64 Outputs with FPC (no RPS)

60-256-DB11 = 32 Inputs/16 Outputs with FPC & RPS

60-256-BA00 = 16 Inputs/8 Outputs (no FPC, no RPS)

Physical Matrix 6400 Audio (5U)

Outputs Physical Inputs

8x 16x 24x 32x 40x 48x 56x 64x

8 60-256-AA 60-256-BA 60-256-CA 60-256-DA 60-256-EA 60-256-FA 60-256-GA 60-256-HA

16 60-256-AB 60-256-BB 60-256-CB 60-256-DC 60-256-EB 60-256-FB 60-256-GB 60-256-HB

24 60-256-AC 60-256-BC 60-256-CC 60-256-DC 60-256-EC 60-256-FC 60-256-GC 60-256-HC

32 60-256-AD 60-256-BD 60-256-CD 60-256-DD 60-256-ED 60-256-FD 60-256-GD 60-256-HD

40 60-256-AE 60-256-BE 60-256-CE 60-256-DE 60-256-EE 60-256-FE 60-256-GE 60-256-HE

48 60-256-AF 60-256-BF 60-256-CF 60-256-DF 60-256-EF 60-256-FF 60-256-GF 60-256-HF

56 60-256-AG 60-256-BG 60-256-CG 60-256-DG 60-256-EG 60-256-FG 60-256-GG 60-256-HG

64 60-256-AH 60-256-BH 60-256-CH 60-256-DH 60-256-EH 60-256-FH 60-256-GH 60-256-HH

Matrix 3200/6400 Series Part Numbers (continued from previous page)

Extron Part	Part #
FPC 1000 (Matrix 6400 Series)	60-276-01
FPC 1000 (Matrix 3200 Series)	60-276-02
MKP 1000 (Gray)	60-239-01
MKP 1000 (Black)	60-239-02
MKP 1000 (White)	60-239-03
MCP 1000M (Master)	60-298-01
MCP 1000S (Slave)	60-298-02
Stereo Audio Input Card (8 Inputs)	70-069-01
Stereo Audio Output Card (8 Outputs)	70-070-01
Wideband Input Card (16 Inputs)	70-066-01
Wideband Output Card (8 Outputs)	70-067-01
Video Output Card	70-068-01

Related Part Numbers

Extron Part	Part #
Captive Screw Audio Connector	10-319-10
RCA (female) BNC (male) Adapter	10-264-01
SVHS - BNC Adapter	26-353-01
GLI 250 (Ground Loop Isolator, 250 MHz RGBHV)	60-123-01
MKP 1000 User's Manual	68-355-01
FPC 1000 User's Manual	68-355-02
Matrix 6400 Audio User's Manual	68-355-03
Matrix 3200/6400 System Virtualization/Control Software (2-Diskettes)	29-036-01

BNC Cables (Super High Resolution (SHR) BNC Cables)

Extron SHR BNC cables are Super High Resolution BNC cables. Extron recommends that when using signals with a scanning frequency of 15-125 kHz and running distances of 100 feet or more, high resolution BNC cables should be used to achieve maximum performance.

Extron Part	Part #
Bulk Cable	
SHR Bulk Cable	
Bulk SHR-1, 500'	
Bulk SHR-1, 500'	22-098-02
Bulk SHR-1, 1000'	22-098-03
Bulk SHR-4, 500'	22-099-02
Bulk SHR-5, 500'	22-100-02
BNC SHR crimp connectors, qty. 50	100-075-51
BNC-4 MINI-HR Bulk Cable	
Bulk BNC 4-500' HR	22-032-02
Bulk BNC 4-1000' HR	22-032-03
BNC 5 MINI-HR Bulk Cable	
Bulk BNC 5-500' HR	22-020-02
Bulk BNC 5-1000' HR	22-020-03
BNC 5 Plenum MINI-HR Bulk Cable	
Bulk BNC 5-500' HRP	22-103-02
Bulk BNC 5-1000' HRP	22-103-03
Six Conductor HR Cable	
Bulk Six Conductor High Res., 500'	22-124-02
Install Plenum Bulk Cable	
Bulk Install Plenum, 500'	22-111-03
Bulk Install Plenum, 1000'	22-111-04
Assorted Connectors	
BNC Connectors	
BNC MINI-HR crimp connectors, qty. 50	100-074-51
BNC SHR crimp connectors, qty. 50	100-075-51
BNC Bulkhead connectors, qty. 50 (for custom wall plates)	100-076-51

Pre-cut Cables

The BNC-4 HR is used for RGBS cable runs and the BNC-5 is used for RGBHV cable runs, but either type can also be used for composite video, S-Video or RGB with sync on green. All Extron BNC cables have male gender connectors on both ends. Also available is a plenum version of the BNC-5 HR cabling.

BNC-4 HR Cable

BNC-4-25'HR (25 feet/7.5 meters)	26-210-04
BNC-4-50'HR (50 feet/15.0 meters)	26-210-05
BNC-4-75'HR (75 feet/23.0 meters)	26-210-06
BNC-4-100'HR (100 feet/30.0 meters)	26-210-07
BNC-4-150'HR (150 feet/45.0 meters)	26-210-08
BNC-4-200'HR (200 feet/60.0 meters)	26-210-09
BNC-4-250'HR (250 feet/75.0 meters)	26-210-54
BNC-4-300'HR (300 feet/90.0 meters)	26-210-53

BNC-5 HR Cable

BNC-5-25'HR (25 feet/7.5 meters)	26-260-03
BNC-5-50'HR (50 feet/15.0 meters)	26-260-04
BNC-5-75'HR (75 feet/23.0 meters)	26-260-16
BNC-5-100'HR (100 feet/30.0 meters)	26-260-05
BNC-5-150'HR (150 feet/45.0 meters)	26-260-12
BNC-5-200'HR (200 feet/60.0 meters)	26-260-06
BNC-5-250'HR (250 feet/75.0 meters)	26-260-18
BNC-5-300'HR (300 feet/90.0 meters)	26-260-14



Bulk cable in lengths up to 5000' rolls is available with or without connectors.

Binary/Hex/Decimal Conversion Table

Decimal value	n/a	64	32	16	8	4	2	1
Dec. Hex Add the decimal values above for equivalents.								
0	80/00h	n/a	0	0	0	0	0	0
1	81/01h	n/a	0	0	0	0	0	1
2	82/02h	n/a	0	0	0	0	1	0
3	83/03h	n/a	0	0	0	0	1	1
4	84/04h	n/a	0	0	0	1	0	0
5	85/05h	n/a	0	0	0	1	0	1
6	86/06h	n/a	0	0	0	1	1	0
7	87/07h	n/a	0	0	0	1	1	1
8	88/08h	n/a	0	0	1	0	0	0
9	89/09h	n/a	0	0	1	0	0	1
10	8A/0Ah	n/a	0	0	1	0	1	0
11	8B/0Bh	n/a	0	0	1	0	1	1
12	8C/0Ch	n/a	0	0	1	1	0	0
13	8D/0Dh	n/a	0	0	1	1	0	1
14	8E/0Eh	n/a	0	0	1	1	1	0
15	8F/0Fh	n/a	0	0	1	1	1	1
16	90/10h	n/a	0	0	1	0	0	0
etc.								
32	A0/20h	n/a	0	1	0	0	0	0
etc.								
64	C0/40h	n/a	1	0	0	0	0	0
etc.								
99	E3/63h	n/a	1	1	0	0	1	1
100	E4/64h	n/a	1	1	0	0	1	0
etc.								
127	FF/7F	n/a	1	1	1	1	1	1

Glossary of terms

Following is a list of terms taken from Extron's Glossary.

AC – Alternating Current – Flow of electrons that changes direction alternately.

ADA – Extron's product designation for Analog Distribution Amplifier.

AMPS – Amperes – A unit of measurement for current.

Analog – Analogue – A continuous signal that takes time to make a transition from one level to another. Standard audio and video signals are analog. This signal has an infinite number of levels between its highest and lowest value. (Not represented by bits, such as with digital.)

ANSI – American National Standards Institute

ASCII – American Standard Code for Information Interchange – The standard code consisting of 7-bit coded characters (8 bits including parity check), utilized to exchange information between data processing systems, data communication systems, and associated equipment. The ASCII set contains control characters and graphic characters.

Attenuation – The decrease in magnitude of a signal.

Audio Follow – A term used when audio is tied to other signals, such as video, and they are switched together. (The opposite of Break-away)

Balanced Audio – A method that uses three conductors for one audio signal. They are plus (+), minus (-) and ground. The ground conductor is strictly for shielding, and does not carry any signal. Also Differential Audio.

Bandwidth – A frequency range, or "band" of frequencies, within which a device operates. In audio and video, it is the band of frequencies that can pass through a device without significant loss or distortion. The higher the bandwidth, the sharper the picture; low bandwidth can cause a "fuzzy" picture.

Barrel – Outward curved edges on a display image. Also see "pincushion".

Blanking – The turning off of the electron beam that scans the image onto the screen. When the beam completes a scan line it must return (retrace) back to the left. During this time, the beam must be turned off (horizontal blanking). Similarly, when the last line has been scanned at the bottom of the screen, the beam must return to the upper left. This requires vertical blanking.

Blooming – Most noticeable at the edges of images on a CRT, "blooming" is when the light (color) is so intense that it seems to exceed the boundary of the object. Thin lines and sharp edges could look thick and fuzzy. This may be caused by the brightness being set to high, or by a high voltage problem.

BNC – It is a cylindrical Bayonet Connector which operates with a twist-locking motion. Two curved grooves in the collar of the male connector are aligned with two projections on the outside of the female collar. This allows the connector to be locked in place without the need of tools.

Break-away – The ability to separate signals for the purpose of switching them independently. For example: an audio and video signal from the same source may be "broken away" and switched to different destinations. This is the opposite of the term "follow".

Buffer – Generally referred to as a unity gain amplifier used to isolate the signal source from the load. This is for both digital and analog signals.

Cable Equalization – The method of altering the frequency response of a video amplifier to compensate for high frequency losses in cables that it feeds. (See Peaking.)

Capacitance – The storing of an electrical charge. At high frequencies, capacitance that exists in cables also represents a form of impedance.

Cathode Ray Tube – See CRT.

Chroma – The characteristics of color information, independent of luminance intensity. Hue and saturation are qualities of chroma. Black, gray, and white objects do not have chroma characteristics.

Chrominance Signal – Part of a television signal containing the color information. Abbreviated by "C".

Coaxial Cable – A two-conductor wire in which one conductor completely wraps the cable.

Component Video – Our color television system starts with three channels of information; Red, Green, & Blue (RGB). In the process of translating these channels to a single composite video signal they are often first converted to Y, R-Y, and B-Y. Both 3-channel systems, RGB and Y, R -Y, B -Y are component video signals. They are the components that eventually make up the composite video signal. Much higher program production quality is possible if the elements are assembled in the component domain.

Composite Sync – A signal consisting of horizontal sync pulses, vertical sync pulses, and equalizing pulses only, with no signal reference level.

Composite Video – A mixed signal comprised of the luminance (black and white), chrominance (color), blanking pulses, sync pulses and color burst.

Contrast – The range of light and dark values in a picture or the ratio between the maximum and the minimum brightness values. Low contrast is shown mainly as shades of gray, while high contrast is shown as blacks and whites with very little gray. It is also a TV monitor adjustment which increases or decreases the level of contrast of a televised picture.

Crosstalk – Interference from an adjacent channel which adds an undesirable signal to the desired signal.

Crosstalk Isolation – Attenuation of an undesired signal introduced by crosstalk from an adjacent channel.

CRT – Cathode Ray Tube – A vacuum tube that produces light when energized by the electron beam generated inside the tube. A CRT has a heater element, cathode, and grids in the neck of the tube, making up the “gun”. An electron beam is produced by the gun and is accelerated toward the front display, or screen surface of the tube. The display surface contains phosphors that light up when hit by the electron beam. The CRT is more commonly known as picture tube.

dB – Decibel – The standard unit used to express gain or loss of power. It indicates the logarithmic ratio of output power divided by input power. A power loss of 3 dB is an attenuation of half of the original value. The term “3dB down” is used to describe the “half power point”.

DC – Direct Current – The flow of electrons in one direction.

D Connector – A connector with rounded corners and angled ends, taking on the shape of the letter “D”. Commonly used in computers and video.

Decibel – See dB.

Decoder – A device used to separate the RGBS (Red, Green, Blue and Sync) signals from a composite video signal.

Differential Audio – See Balanced Audio.

Distribution Amplifier (DA) – A device that allows connection of one input source to multiple output sources such as monitors or projectors.

FCC – Federal Communications Commission – A unit of the U.S. Government that monitors and regulates communications.

Field – In interlaced video, it takes two scans on a screen to make a complete picture, or a “Frame”. Each scan is called a “Field”. Sometimes these are referred to as “field 1 and field 2”.

Flicker – Flicker occurs when the electron gun paints the screen too slowly, giving the phosphors on the screen time to fade.

Frame – In interlaced video, a Frame is one complete picture. A Frame is made up of two fields, or two sets of interlaced lines.

Frequency Range – Refers to the low-to-high limits of a device, such as a computer, projector or monitor. Also “bandwidth”.

Gain – A general term used to denote an increase in signal power or voltage produced by an amplifier in transmitting a signal from one point to another. The amount of gain is usually expressed in decibels above a reference level. Opposite of Attenuation.

Genlock – A method of synchronizing video equipment by using a common, external “Genlock” signal.

Hertz – Hz – A measure of frequency in cycles per second.

High Impedance – Hi Z or High Z – In video, when the signal is not terminated locally and is going to another destination, where it will be terminated. In video, Hi Z is typically 10k ohms or greater.

Horizontal Rate – Horizontal Frequency – The number of complete horizontal lines, including trace and retrace, scanned per second. Typically shown as a measure of kHz.

Horizontal Resolution – Smallest increment of a television picture that can be discerned in the horizontal plane. This increment is dependent upon the video bandwidth and is measured in frequency. Determines the number of lines it takes to scan an image on the screen.

Hue – Tint Control – Red, yellow, blue, etc. are hues of color or types of color. Hue is the parameter of color that allows us to distinguish between colors.

Hz – Hertz – Frequency in cycles per second.

Impedance – Z – The opposition or “load” to a signal. Circuits that generate audio or video signals, are designed to work with a certain “load”, or impedance. Typical video impedances: 75 ohm or High Z. Also see High Impedance and Low Impedance.

Interlaced – The process of scanning whereby the alternate lines of both scanned fields fall evenly between each other.

IRE Scale – An oscilloscope scale that applies to composite video levels. Typically there are 140 IRE units in one volt (1 IRE = 7.14 mV).

K – An abbreviation for kilobyte. A kilobyte is 1,000 bytes. In computer memory sizes, the numbers are rounded down. e.g. 1k byte = 1024 bytes.

Kilohertz – kHz – Thousands of Hertz, or a frequency rate in units of thousands of cycles per second. For example, CGA’s horizontal scan rate is 15.75 kHz or 15,750 hertz (Hz).

LED – Light-Emitting Diode

Level Control – The Level Control on selected Extron interface products is similar to the Contrast Control on a data monitor. It can either increase or decrease the output voltage level of the interface to the connected data monitor or projector. This results in greater or less contrast in the picture.

Low Impedance – The condition where the source or load is at a lower impedance than the characteristic impedance of the cable. Low source impedances are common; low load impedances are usually fault conditions.

Luminance – This is the signal that represents brightness in a video picture. Luminance is any value between black and white. In mathematical equations, luminance is abbreviated as “Y”.

M – Mega – An abbreviation for megabyte. A megabyte is 1024K, or roughly a million bytes (1,048,076 to be exact [1024 x 1024]).

Matrix – In A/V, an electronic device used to collect and distribute video (and sometimes audio) signals. See matrix switcher.

Matrix switcher – In audio/video, a means of selecting an input source and connecting it to one or more outputs. A Matrix switcher would normally have multiple inputs and multiple outputs.

MHz (as in 8 MHz) – An abbreviation for megahertz. This is a unit of measurement and refers to a million cycles per second. Bandwidth is measured in megahertz.

Milli – m – Abbreviation for one thousandth. Example: 1 ms = 1/1000 second.

Monitor – (A) A TV that may receive its signal directly from a VCR, camera or separate TV tuner for high quality picture reproduction. It may not contain a channel selector. (B) A video display designed for use with closed circuit TV equipment. (C) Device used to display computer text and graphics.

Non-Interlaced – Also called progressive scan – a method by which all the video scan lines are presented on the screen in one sweep instead of two (also see interlaced).

Nonvolatile memory – Memory that retains data when power is turned off.

NTSC – National Television Standards Committee – Television standard for North America and certain countries in South America. 525 lines/60 Hz (60 Hz Refresh).

Output – The product of an operation by a device going to some external destination, such as another device, a video screen, image or hard copy.

PAL – Phase Alternate Line – The phase of the color carrier is alternated from line to line. It takes four full pictures for the color horizontal phase relationship to return to the reference point. This alternation helps cancel out phase errors, the reason the hue control is not needed on PAL TV sets. PAL, in its many forms is used extensively in Western Europe.

PCB – Printed Circuit Board

Peak-to-Peak – abbreviated **p-p** – The amplitude (voltage) difference (as displayed on an oscilloscope) between the most positive and the most negative excursions (peaks) of an electrical signal.

Peaking – A means of compensating for mid and high frequency RGB Video Bandwidth response in data monitors and projectors and for signal losses due to cable capacitance. When using the Peak enhancements, use the following guidelines for proper output settings: Use 50% with all computer frequencies between 15-125 kHz at any cable length. Use 100% with high frequency computers of 36 kHz or higher with cable lengths 75 feet or greater.

Pincushion – The inward or outward (curved) appearance of the edges of a display.

Pin-out – An illustration or table that names signals, voltages, etc. that are on each pin of a connector or cable.

Plenum Cable – Cable having a covering that meets the UL specifications for resistance to fire.

PLUGE – Picture Line Up Generation Equipment – This is a name of a test pattern that assists in properly setting picture black level. PLUGE can be part of many test patterns. The phrase and origination of the test signal are both credited to the BBC.

Power – Electrical – The dissipation of heat by passing a current through a resistance. Measured in Watts (W), it is expressed by Ohm's law from the two variables: Voltage (E) and Current (I). i.e. $P = I^2 \times R$, or, $P = E^2/R$ or $P = E \times I$

Resolution – The density of lines or dots that make up an image. Resolution determines the detail and quality in the image.

- A) A measure of the ability of a camera or television system to reproduce detail.
- B) In video, generally called horizontal resolution. It can be evaluated by establishing the limit to which lines can be distinguished on a test pattern. A larger resolution value means a broader frequency band of the video signal.
- C) A measure of the greatest amount of detail that can be seen in an image. Often incorrectly expressed as a number of pixels in a given line; more correctly it is the bandwidth.

RGB – Red, Green, Blue – The basic components of the color television system. They are also the primary colors of light, not to be confused with Cyan, Magenta, and Yellow, the primary pigments. Also called the "Additive Color Process".

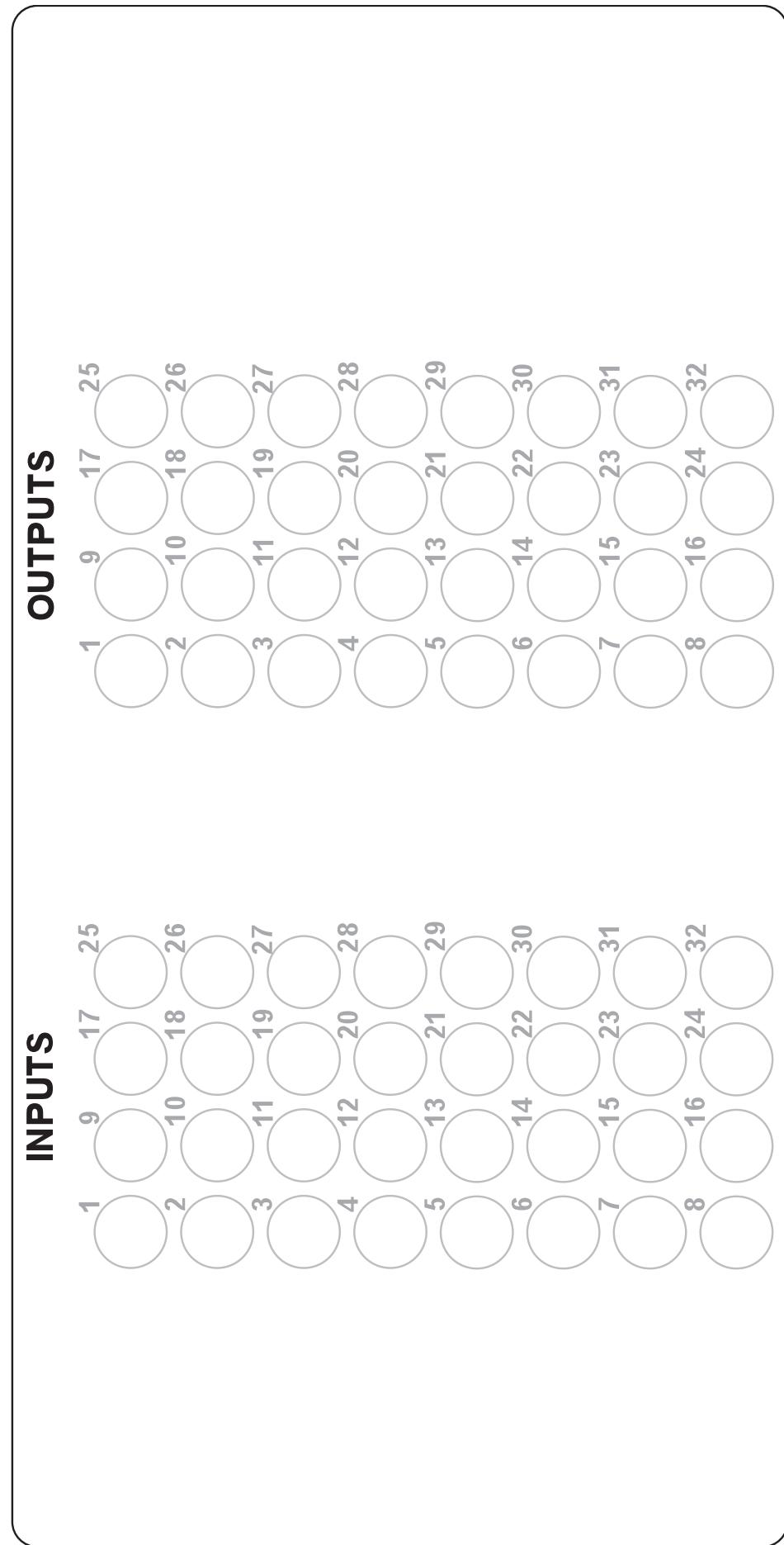
RGB Video – A form of color video signal (red, green, blue) distinctly different from the composite color video used in standard television sets. RGB can be displayed only on a color monitor that has a separate electron gun for each of these primary colors. Some color television sets use only one gun. RGB monitors are noted for their crisp, bright colors and high resolution.

RS-170A – EIA technical standard NTSC color TV.

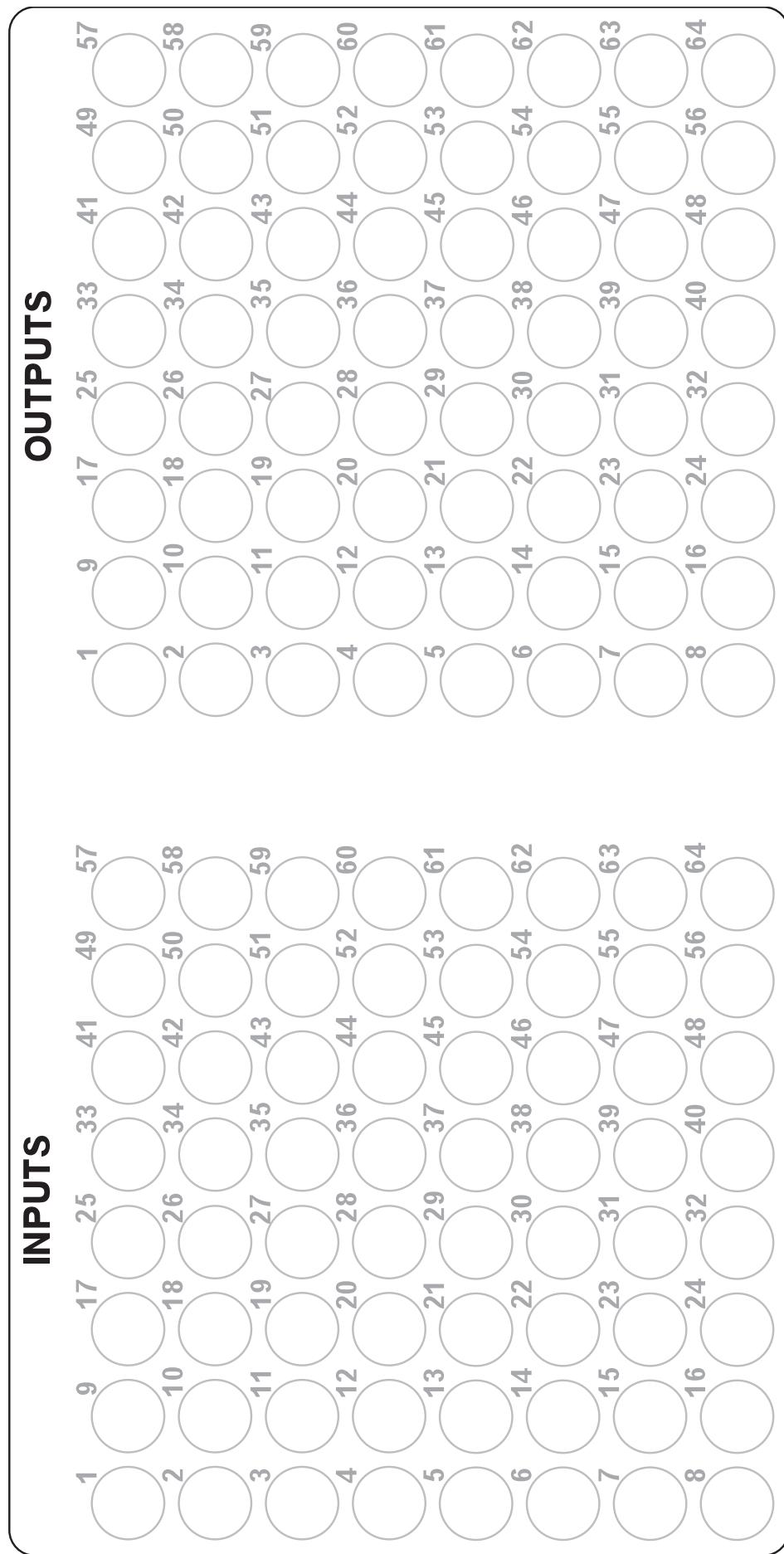
RS-232 – An Electronic Industries Association (EIA) serial digital interface standard specifying the electrical and mechanical characteristics of the communication path between two devices using D-type connectors. This standard is used for relatively short range communications and does not specify balanced control lines.

RS-422 – An EIA serial digital interface standard which specifies the electrical characteristics of balanced voltage digital interface circuits. This standard is usable over longer distances than RS-232. Although originally designed for use with 9-pin and 37-pin, D-type connectors, it is often used with others, including 25-pin D-types. It is also used as the serial port standard for Macintosh computers. This signal governs the asynchronous transmission of computer data at speeds of up to 920,000 bits per second.

- SECAM – Sequential Couleur Avec Mémoire** – Translated as “Sequential Color with Memory”. A composite color transmission system that potentially eliminates the need for both a color and hue control on the monitor. One of the color difference signals is transmitted on one line and the second is transmitted on the second line. Memory is required to obtain both color difference signals for color decoding. This system is used in France, Africa, Asia and many Eastern European countries.
- Serial Port** – An output on the computer that allows it to communicate with other devices in a serial fashion – data bits flowing on a single pair of wires. The serial port is most often used with RS-232 protocol.
- SMPTE – Society of Motion Picture and Television Engineers** – A global organization, based in the United States, that sets standards for base-band visual communications. This includes film as well as video standards.
- SMPTE Pattern** – The video test pattern made up of color, black, and white bands used by television stations.
- Software** – The programs used to instruct a processor and its peripheral equipment.
- Switcher** – Term often used to describe a special effects generator; a unit which allows the operator to switch between video camera signals. Switchers are often used in industrial applications to switch between video camera monitoring certain areas for display on a monitor, or system of display devices. These kinds of switchers do not have sync generators.
- Sync** – In video, a means of synchronizing signals with timing pulses to insure that each step in a process occurs at exactly the right time. For example: Horizontal Sync determines exactly when to begin each horizontal line (sweep) of the electron beam. Vertical Sync determines when to bring the electron beam to the top-left of the screen to start a new field. There are many other types of sync in a video system. (Also called Sync Signal or Sync Pulse.)
- SVHS** – A high band video recording process for VHS that increases the picture quality and resolution capability. See S-Video.
- S-Video** – The composite video signal is separated into the Luminance (Y) and the Chrominance (C).
- Terminal** – A device typically having a keyboard and display that is capable of sending text to and receiving text from another device, a network, etc.
- Termination** – A load, or impedance at the end of a cable or signal line used to match the impedance of the equipment that generated the signal. The impedance absorbs signal energy to prevent signal reflections from going back toward the source. In the video industry, termination impedance is typically 75 ohms.
- Vertical Interval** – The synchronizing information which is presented between fields, and then signals the picture monitor to return to the top of the screen to start another vertical scan.
- Videoconferencing** — Conducting a conference between two or more locations using video cameras, microphones and video monitors. The participants can be seen, as well as heard. Referred to as a “virtual conference room”.
- Virtual conference room** — See videoconferencing.
- Virtual map** — Used with Extron’s virtual matrix switchers (Matrix 3200/6400), a virtual map is made up of tables stored in memory that relate physical connectors (as on the back panel) to logical connections (as seen by the user). In printed form, this can show physical input/output connector numbers as they relate to virtual input/output numbers.
- Virtual memory** — The process of increasing the apparent size of a computer’s random-access memory (RAM) by using a section of the hard disk storage as an extension of RAM.
- Virtual switching** — A means of making real, physical input or output ports appear to have different numbers. For example, Extron’s Matrix 3200/6400 switchers can be programmed to switch a set (group) of connectors as one. Also see virtual map.
- Wideband** – A relative term indicating a high bandwidth.
- Y** – In video, “Y” is an abbreviation for Luminance.
- Z** – A symbol for impedance.



Matrix 3200 Video Switcher Virtualization Work-sheet



Matrix 6400 Video Switcher Virtualization Work-sheet

Notes

FCC Class A Notice

Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the 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 manual, 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 be required to correct the interference at his own expense.

Note: This unit was tested with shielded cables on the peripheral devices. Shielded cables must be used with the unit to ensure compliance.

Extron's Warranty

Extron Electronics warrants this product against defects in materials and workmanship for a period of three years from the date of purchase. In the event of malfunction during the warranty period attributable directly to faulty workmanship and/or materials, Extron Electronics will, at its option, repair or replace said products or components, to whatever extent it shall deem necessary to restore said product to proper operating condition, provided that it is returned within the warranty period, with proof of purchase and description of malfunction to:

**USA, Canada, South America,
and Central America:**

Extron Electronics
1230 South Lewis Street
Anaheim, CA 92805, USA

Europe, Africa, and the Middle East:

Extron Electronics, Europe
Beeldschermweg 6C
3821 AH Amersfoort
The Netherlands

Asia:

Extron Electronics, Asia
135 Joo Seng Road, #04-01
PM Industrial Bldg.
Singapore 368363

Japan:

Extron Electronics, Japan
Daisan DMJ Bldg. 6F,
3-9-1 Kudan Minami
Chiyoda-ku, Tokyo 102-0074
Japan

This Limited Warranty does not apply if the fault has been caused by misuse, improper handling care, electrical or mechanical abuse, abnormal operating conditions or non-Extron authorized modification to the product.

If it has been determined that the product is defective, please call Extron and ask for an Applications Engineer at (714) 491-1500 (USA), 31.33.453.4040 (Europe), 65.6383.4400 (Asia), or 81.3.3511.7655 (Japan) to receive an RA# (Return Authorization number). This will begin the repair process as quickly as possible.

Units must be returned insured, with shipping charges prepaid. If not insured, you assume the risk of loss or damage during shipment. Returned units must include the serial number and a description of the problem, as well as the name of the person to contact in case there are any questions.

Extron Electronics makes no further warranties either expressed or implied with respect to the product and its quality, performance, merchantability, or fitness for any particular use. In no event will Extron Electronics be liable for direct, indirect, or consequential damages resulting from any defect in this product even if Extron Electronics has been advised of such damage.

Please note that laws vary from state to state and country to country, and that some provisions of this warranty may not apply to you.



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Pioneer sound.vision.soul

DVD Player

DVD-V5000



Operating Instructions



CAUTION

RISK OF ELECTRIC SHOCK
DO NOT OPEN



The lightning flash with arrowhead symbol, within an equilateral triangle, is intended to alert the user to the presence of uninsulated "dangerous voltage" within the product's enclosure that may be of sufficient magnitude to constitute a risk of electric shock to persons.

CAUTION:

TO PREVENT THE RISK OF ELECTRIC SHOCK, DO NOT REMOVE COVER (OR BACK). NO USER-SERVICEABLE PARTS INSIDE. REFER SERVICING TO QUALIFIED SERVICE PERSONNEL.

The exclamation point within an equilateral triangle is intended to alert the user to the presence of important operating and maintenance (servicing) instructions in the literature accompanying the appliance.

D1-4-2-3-A_En

IMPORTANT SAFETY INSTRUCTIONS

READ INSTRUCTIONS — All the safety and operating instructions should be read before the product is operated.

RETAIN INSTRUCTIONS — The safety and operating instructions should be retained for future reference.

HEED WARNINGS — All warnings on the product and in the operating instructions should be adhered to.

FOLLOW INSTRUCTIONS — All operating and use instructions should be followed.

CLEANING — The product should be cleaned only with a polishing cloth or a soft dry cloth. Never clean with furniture wax, benzine, insecticides or other volatile liquids since they may corrode the cabinet.

ATTACHMENTS — Do not use attachments not recommended by the product manufacturer as they may cause hazards.

WATER AND MOISTURE — Do not use this product near water — for example, near a bathtub, wash bowl, kitchen sink, or laundry tub; in a wet basement; or near a swimming pool; and the like.

ACCESSORIES — Do not place this product on an unstable cart, stand, tripod, bracket, or table. The product may fall, causing serious injury to a child or adult; and serious damage to the product. Use only with a cart, stand, tripod, bracket, or table recommended by the manufacturer, or sold with the product. Any mounting of the product should follow the manufacturer's instructions, and should use a mounting accessory recommended by the manufacturer.

CART — A product and cart combination should be moved with care. Quick stops, excessive force, and uneven surfaces may cause the product and cart combination to overturn.



VENTILATION — Slots and openings in the cabinet are provided for ventilation and to ensure reliable operation of the product and to protect it from overheating, and these openings must not be blocked or covered. The openings should never be blocked by placing the product on a bed, sofa, rug, or other similar surface. This product should not be placed in a built-in installation such as a bookcase or rack unless proper ventilation is provided or the manufacturer's instructions have been adhered to.

POWER SOURCES — This product should be operated only from the type of power source indicated on the marking label. If you are not sure of the type of power supply to your home, consult your product dealer or local power company.

LOCATION — The appliance should be installed in a stable location.

NONUSE PERIODS — The power cord of the appliance should be unplugged from the outlet when left un-used for a long period of time.

GROUNDING OR POLARIZATION

- If this product is equipped with a polarized alternating current line plug (a plug having one blade wider than the other), it will fit into the outlet only one way. This is a safety feature. If you are unable to insert the plug fully into the outlet, try reversing the plug. If the plug should still fail to fit, contact your electrician to replace your obsolete outlet. Do not defeat the safety purpose of the polarized plug.
- If this product is equipped with a three-wire grounding type plug, a plug having a third (grounding) pin, it will only fit into a grounding type power outlet. This is a safety feature. If you are unable to insert the plug into the outlet, contact your electrician to replace your obsolete outlet. Do not defeat the safety purpose of the grounding type plug.

POWER-CORD PROTECTION — Power-supply cords should be routed so that they are not likely to be walked on or pinched by items placed upon or against them, paying particular attention to cords at plugs, convenience receptacles, and the point where they exit from the product.

OUTDOOR ANTENNA GROUNDING — If an outside antenna or cable system is connected to the product, be sure the antenna or cable system is grounded so as to provide some protection against voltage surges and built-up static charges. Article 810 of the National Electrical Code, ANSI/NFPA 70, provides information with regard to proper grounding of the mast and supporting structure, grounding of the lead-in wire to an antenna discharge unit, size of grounding conductors, location of antenna-discharge unit, connection to grounding electrodes, and requirements for the grounding electrode. See Figure A.

LIGHTNING — For added protection for this product during a lightning storm, or when it is left unattended and unused for long periods of time, unplug it from the wall outlet and disconnect the antenna or cable system. This will prevent damage to the product due to lightning and power-line surges.

POWER LINES — An outside antenna system should not be located in the vicinity of overhead power lines or other electric light or power circuits, or where it can fall into such power lines or circuits. When installing an outside antenna system, extreme care should be taken to keep from touching such power lines or circuits as contact with them might be fatal.

OVERLOADING — Do not overload wall outlets, extension cords, or integral convenience receptacles as this can result in a risk of fire or electric shock.

OBJECT AND LIQUID ENTRY

— Never push objects of any kind into this product through openings as they may touch dangerous voltage points or short-out parts that could result in a fire or electric shock. Never spill liquid of any kind on the product.

SERVICING — Do not attempt to service this product yourself as opening or removing covers may expose you to dangerous voltage or other hazards. Refer all servicing to qualified service personnel.

DAMAGE REQUIRING SERVICE — Unplug this product from the wall outlet and refer servicing to qualified service personnel under the following conditions:

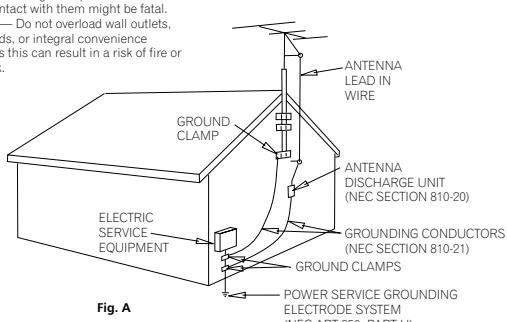
- When the power-supply cord or plug is damaged.
- If liquid has been spilled, or objects have fallen into the product.
- If the product has been exposed to rain or water.
- If the product does not operate normally by following the operating instructions. Adjust only those controls that are covered by the operating instructions as an improper adjustment of other controls may result in damage and will often require extensive work by a qualified technician to restore the product to its normal operation.
- If the product has been dropped or damaged in any way.
- When the product exhibits a distinct change in performance — this indicates a need for service.

REPLACEMENT PARTS — When replacement parts are required, be sure the service technician has used replacement parts specified by the manufacturer or have the same characteristics as the original part. Unauthorized substitutions may result in fire, electric shock, or other hazards.

SAFETY CHECK — Upon completion of any service or repairs to this product, ask the service technician to perform safety checks to determine that the product is in proper operating condition.

WALL OR CEILING MOUNTING — The product should not be mounted to a wall or ceiling.

HEAT — The product should be situated away from heat sources such as radiators, heat registers, stoves, or other products (including amplifiers) that produce heat.



NEC — NATIONAL ELECTRICAL CODE

D1-4-2-2_En

WARNING: The apparatus is not waterproofs, to prevent fire or shocks hazard, do not expose this apparatus to rain or moisture and do not put any water source near this apparatus, such as vase, flower pot, cosmetics container and medicine bottle etc.

D3-4-2-1-3_En

WARNING: Handling the cord on this product or cords associated with accessories sold with the product will expose you to lead, a chemical known to the State of California and other governmental entities to cause cancer and birth defects or other reproductive harm.

Wash hands after handling

D36-P4_En

CAUTION – PREVENT ELECTRIC SHOCK DO NOT USE THIS (POLARIZED) PLUG WITH AN EXTENSION CORD. RECEPTACLE OR OTHER OUTLET UNLESS THE BLADES CAN BE FULLY INSERTED TO PREVENT BLADE EXPOSURE.

ATTENTION – POUR PREVENIR LES CHOCS ELECTRIQUES NE PAS UTILISER CETTE FICHE POLARISEE AVEC UN PROLONGATEUR UNE PRISE DE COURANT OU UNE AUTRE SORTIE DE COURANT, SAUF SI LES LAMES PEUVENT ETRE INSERERES A FOND SANS EN LAISSER AUCUNE PARTIE A DECOUVERT.

D2-4-4-1_EF

CAUTION : USE OF CONTROLS OR ADJUSTMENTS OR PERFORMANCE OF PROCEDURES OTHER THAN THOSE SPECIFIED HEREIN MAY RESULT IN HAZARDOUS RADIATION EXPOSURE.

CAUTION : THE USE OF OPTICAL INSTRUMENTS WITH THIS PRODUCT WILL INCREASE EYE HAZARD. D6-8-2-1_En

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

D8-10-1-2_En

Information to User

Alteration or modifications carried out without appropriate authorization may invalidate the user's right to operate the equipment.

D8-10-2_En

CAUTION: This product satisfies FCC regulations when shielded cables and connectors are used to connect the unit to other equipment. To prevent electromagnetic interference with electric appliances such as radios and televisions, use shielded cables and connectors for connections.

D8-10-3a_En

This Class B digital apparatus complies with Canadian ICES-003.

Cet appareil numérique de la Classe B est conforme à la norme NMB-003 du Canada.

D8-10-1-3_EF

IMPORTANT NOTICE – THE SERIAL NUMBER FOR THIS EQUIPMENT IS LOCATED IN THE REAR. PLEASE WRITE THIS SERIAL NUMBER ON YOUR ENCLOSED WARRANTY CARD AND KEEP IN A SECURE AREA. THIS IS FOR YOUR SECURITY.

D1-4-2-6-1_En

This product incorporates copyright protection technology that is protected by method claims of certain U.S. patents and other intellectual property rights owned by Macrovision Corporation and other rights owners. Use of this copyright protection technology must be authorized by Macrovision Corporation, and is intended for home and other limited viewing uses only unless otherwise authorized by Macrovision Corporation. Reverse engineering or disassembly is prohibited.

This product includes FontAvenue® fonts licenced by NEC corporation. FontAvenue is a registered trademark of NEC Corporation.

Thank you for buying this Pioneer product.
Please read through these operating instructions so you will know how to operate your model properly.

- This component may not stand up to continuous long use in severe environments.
- Pioneer disclaims all responsibility for any losses or other incidental damages arising from accidents or other use of this component.



Dear Customer:

Selecting fine audio equipment such as the unit you've just purchased is only the start of your musical enjoyment. Now it's time to consider how you can maximize the fun and excitement your equipment offers. This manufacturer and the Electronic Industries Association's Consumer Electronics Group want you to get the most out of your equipment by playing it at a safe level. One that lets the sound come through loud and clear without annoying blaring or distortion-and, most importantly, without affecting your sensitive hearing.

Sound can be deceiving. Over time your hearing "comfort level" adapts to higher volumes of sound. So what sounds "normal" can actually be loud and harmful to your hearing. Guard against this by setting your equipment at a safe level BEFORE your hearing adapts.

To establish a safe level:

- Start your volume control at a low setting.
- Slowly increase the sound until you can hear it comfortably and clearly, and without distortion.

Once you have established a comfortable sound level:

- Set the dial and leave it there.

Taking a minute to do this now will help to prevent hearing damage or loss in the future. After all, we want you listening for a lifetime.



We Want You Listening For A Lifetime

Used wisely, your new sound equipment will provide a lifetime of fun and enjoyment. Since hearing damage from loud noise is often undetectable until it is too late, this manufacturer and the Electronic Industries Association's Consumer Electronics Group recommend you avoid prolonged exposure to excessive noise. This list of sound levels is included for your protection.

Decibel Level Example

30	Quiet library, soft whispers
40	Living room, refrigerator, bedroom away from traffic
50	Light traffic, normal conversation, quiet office
60	Air conditioner at 20 feet, sewing machine
70	Vacuum cleaner, hair dryer, noisy restaurant
80	Average city traffic, garbage disposals, alarm clock at two feet.

THE FOLLOWING NOISES CAN BE DANGEROUS UNDER CONSTANT EXPOSURE

90	Subway, motorcycle, truck traffic, lawn mower
100	Garbage truck, chain saw, pneumatic drill
120	Rock band concert in front of speakers, thunderclap
140	Gunshot blast, jet plane
180	Rocket launching pad

Information courtesy of the Deafness Research Foundation.



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Chapter 1

Before you start

Features

NTSC/PAL dual playback

DVD discs in either the NTSC format or the PAL format can be played back.

Interface with external signals (RS-232C, extend terminal)

The device is fitted with an RS-232C connection so that commands can be given to support DVD, Video CD and CD.

Other than the RS-232C interface connector, an extend terminal is provided. By simply connecting a switch to this terminal, operation is possible for DVD-VIDEO menu selection calls as well as operation of the remote control unit.

24-bit/192kHz compatible DAC

This player is fully compatible with high sampling-rate discs, capable of delivering better-than-CD sound quality in terms of dynamic range, low-level resolution and high-frequency detail.

Excellent audio performance with Dolby^{*1} Digital and DTS^{*2} software



Logos:

When connected to a suitable AV amplifier or receiver, this player gives great surround sound with Dolby Digital and DTS discs.

Virtual Dolby Digital using SRS TruSurround^{*3}



Logo: SRS TruSurround creates a realistic surround-sound effect from any Dolby Digital source using just two speakers. SRS TruSurround is a process

approved by Dolby Laboratories for Virtual Dolby Digital sound. See *Virtual Surround* on page 37.

PureCinema progressive scan

When connected to a progressive scan-compatible TV or monitor using the component video outputs, you can enjoy extremely stable, flicker free images, with the same frame refresh rate as the original movie.

Frame search function

When the frame search function is used, searching is possible in units smaller than when searching by chapter and time, and any point can be found.

When frame segment playback is used, it is possible to play back from any point to any point in a video with still playback at the end.

- The frame search function cannot be used with a multi PGC disc (time is not displayed on the TV screen), with a VR format DVD-RW or with a Video CD, etc. Frame segment playback is possible with the DVD barcode, RS-232C control and a Barcode/Command stack.

Picture zoom

While a DVD or Video CD is playing, you can zoom in on any part of the picture at up to 4x magnification for a closer look. See *Zooming the screen* on page 36.

*1 Manufactured under license from Dolby Laboratories. "Dolby" and the double-D symbol are trademarks of Dolby Laboratories.

*2 "DTS" and "DTS Digital Out" are registered trademarks of Digital Theater Systems, Inc.

*3 TruSurround, SRS and (●) symbol are trademarks of SRS Labs, Inc. TruSurround technology is incorporated under license from SRS Labs, Inc.

What's in the box

Please confirm that the following accessories are in the box when you open it.

- Remote control
- AA/R6P dry cell batteries x2
- Audio/video cable (red/white/yellow plugs)
- Power cable
- Operating instructions
- Warranty card

Putting the batteries in the remote control

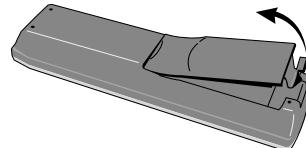


Important

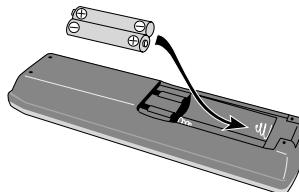
Incorrect use of batteries can result in hazards such as leakage and bursting. Please observe the following:

- Don't mix new and old batteries together.
- Don't use different kinds of battery together—although they may look similar, different batteries may have different voltages.
- Make sure that the plus and minus ends of each battery match the indications in the battery compartment.
- Remove batteries from equipment that isn't going to be used for a month or more.
- When disposing of used batteries, please comply with governmental regulations or environmental public instruction's rules that apply in your country or area.

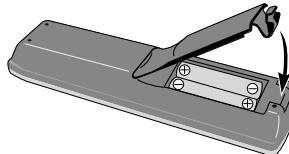
- 1 Open the battery compartment cover on the back of the remote control.



- 2 Insert two AA/R6P batteries into the battery compartment following the indications (+, -) inside the compartment.



- 3 Close the cover.



Using the remote control

Keep in mind the following when using the remote control:

- Make sure that there are no obstacles between the remote and the remote sensor on the unit.
- The remote has a range of about 7m (23ft.).
- Remote operation may become unreliable if strong sunlight or fluorescent light is shining on the unit's remote sensor.
- Remote controllers for different devices can interfere with each other. Avoid using remotes for other equipment located close to this unit.
- Replace the batteries when you notice a fall off in the operating range of the remote.

Disc / content format playback compatibility

General disc compatibility

This player was designed and engineered to be compatible with software bearing one or more of the following logos:



DVD-Video



DVD-R



DVD-RW



Audio CD



Video CD



CD-R



CD-RW

This player can play discs recorded in either PAL or NTSC format. Use those discs which indicates "NTSC" or "PAL" on the jacket.

Other formats, including but not limited to the following, are not playable in this player:

DVD-Audio / SACD / DVD-RAM

DVD-ROM / CD-ROM

DVD-R/RW and CD-R/RW discs (Audio CDs and Video CDs) recorded using a DVD recorder, CD recorder or personal computer may not be playable on this unit. This may be caused by a number of possibilities, including but not limited to: the type of disc used; the type of recording; damage, dirt or condensation on either the disc or the player's pick-up lens. See below for notes about particular software and formats.



DVD-Video regions

All DVD-Video discs carry a region mark on the case somewhere that indicates which region(s) of the world the disc is compatible with. Your DVD player also has a region mark, which you can find on the rear panel. Discs from incompatible regions will not play in this player. Discs marked ALL will play in any player.

CD-R/RW compatibility

- This unit will play CD-R and CD-RW discs recorded in CD Audio or Video CD format. However, any other content may cause the disc not to play, or create noise/distortion in the output.
- This unit cannot record CD-R or CD-RW discs.
- Unfinalized CD-R/RW discs recorded as CD Audio can be played, but the full Table of Contents (playing time, etc.) will not be displayed.

DVD-R/RW compatibility

- This unit will play DVD-R/RW discs recorded using the DVD-Video format that have been finalized using a DVD-recorder.
- This unit will play DVD-RW discs recorded using the Video Recording (VR) format.
- When playing a VR format DVD-RW discs that was edited on a DVD recorder, the screen may go momentarily black at edited points and/or you may see scenes from immediately before the edited point.
- This unit cannot record DVD-R/RW discs.
- Unfinalized DVD-R/RW discs cannot be played in this player.

PC-created disc compatibility

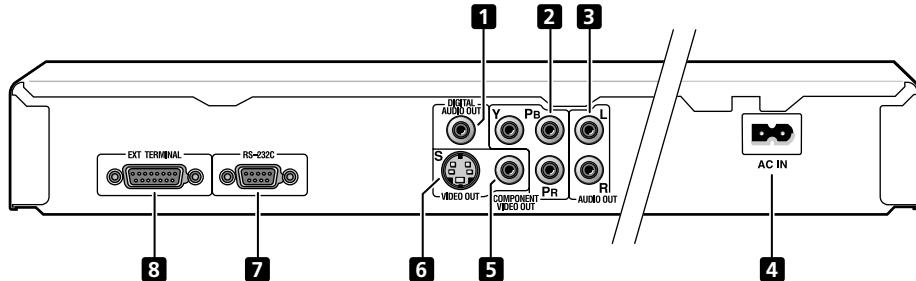
- If you record a disc using a personal computer, even if it is recorded in a "compatible format" as listed above, there will be cases in which the disc may not be playable in this machine due to the setting of the application software used to create the disc. In these particular instances, check with the software publisher for more detailed information.
- Check the DVD-R/RW or CD-R/RW software disc boxes for additional compatibility information.

Due to the unique construction of DVD-R/RW and CD-R/RW discs, leaving them for extended periods of time in the pause mode at a single place on the disc may result in the discs' becoming difficult to play at that location on the disc. When playing discs containing important data, users are recommended to construct backup archive discs.

Chapter 2

Connecting up

Rear panel connections



Important

- When connecting this player up to your TV, AV receiver or other components, make sure that all components are switched off and unplugged.

1 DIGITAL AUDIO OUT

This is a digital audio output for connection to a PCM, Dolby Digital and/or DTS-compatible AV receiver that has a coaxial digital input. Connect using a commercially available coaxial digital cable.

2 COMPONENT VIDEO OUT

This is a high quality video output for connection to a TV, monitor or AV receiver that has component video inputs.

Connect using a commercially available three-way component video cable. Be careful to match the colors of the jacks and cables for correct connection.

3 AUDIO OUT L / R

This pair of analog audio outputs connects to your TV, AV receiver or stereo system. Even if you are connecting up one of the digital outputs, we still recommend you connect these jacks. Use the supplied audio/video cable when connecting these jacks. Match the colors of the jacks and cables for correct stereo sound.

1

2

3

DIGITAL
AUDIO OUT

Y Pb Pr

S VIDEO OUT

COMPONENT
VIDEO OUT

L R

AUDIO OUT

4

AC IN

4 AC IN

Connect the supplied power cable here, then plug into a power outlet.

5 VIDEO OUT

This is a standard video output that you can connect to your TV or AV receiver using the supplied audio/video cable.

6 S (S-video output)

This is an S-video output that you can use instead of the video output described in **5** above.

7 RS-232C

This is a RS-232C terminal (D-sub 9-pin, male).

8 EXT TERMINAL

This is a RS-232C and Extend terminal (D-sub 15-pin, female).

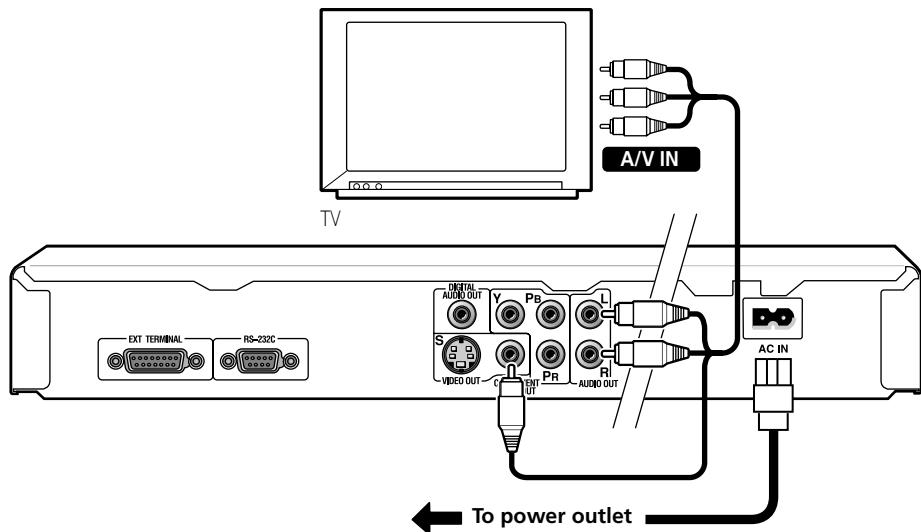


Tip

- You may find it useful to have the manuals supplied with your other components handy when connecting this player.

Easy connections

The setup described here is a basic setup that allows you to play discs using just the cables supplied with the player. In this setup, stereo audio is played through the speakers in your TV.



Important

- This player is equipped with copy protection technology. Do not connect this player to your TV via a VCR using AV cables, as the picture from this player will not appear properly on your TV. (This player may also not be compatible with some combination TV/VCRs for the same reason; refer to the manufacturer for more information.)
- When connecting to your TV as shown above, do not set the **COMPONENT VIDEO OUT** setting to **Progressive** (page 15).

1 Connect the VIDEO OUT and AUDIO OUT L/R jacks to a set of A/V inputs on your TV.

Use the supplied Audio/video cable, connecting the red and white plugs to the audio outputs and the yellow plug to the video output.

See next page if you want to use a component or S-video cable for the video connection.

2 Connect the supplied AC power cable to the AC IN inlet, then plug into a power outlet.



Note

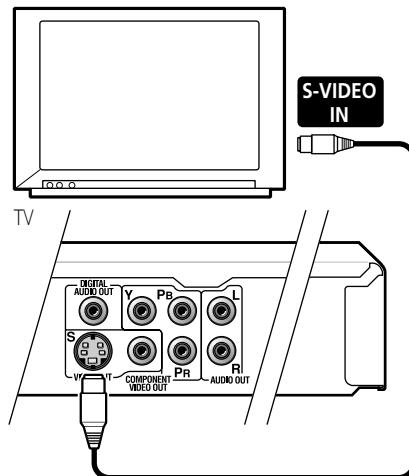
- When **COMPONENT VIDEO OUT** is set to **Progressive**, there is no video output from the **VIDEO OUT** (composite) and **S** (S-video) jacks. If you want to display video on more than one monitor simultaneously, make sure that it is set to **Interlace**. Press **PROGRESSIVE** on the front panel to switch the player back to **Interlace**.

Connecting using the S-video output

If your TV (or other equipment) has an S-video input, you can use this instead of the standard (composite) output for a better quality picture.

- Use an S-video cable (not supplied) to connect the S-VIDEO OUT to an S-video input on your TV (or monitor or AV receiver).**

Line up the small triangle above the jack with the same mark on the plug before plugging in.



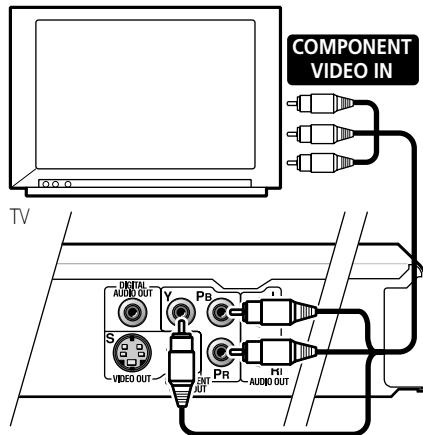
Note

- When **COMPONENT VIDEO OUT** is set to **Progressive**, there is no video output from the **S** (S-video) jack. If you want to display video on the monitor, make sure that it is set to **Interlace**. Press **PROGRESSIVE** on the front panel to switch the player back to **Interlace**.

Connecting using the component video output

You can use the component video output instead of the standard video out jack to connect this player to your TV (or other equipment). This should give you the best quality picture from the three types of video output available.

- Use a component video cable (not supplied) to connect the COMPONENT VIDEO OUT jacks to a component video input on your TV, monitor or AV receiver.**



Note

- Only NTSC video is output when set to progressive scan.
- To set up the player for use with a progressive scan TV, see *About progressive scan video* on page 15.

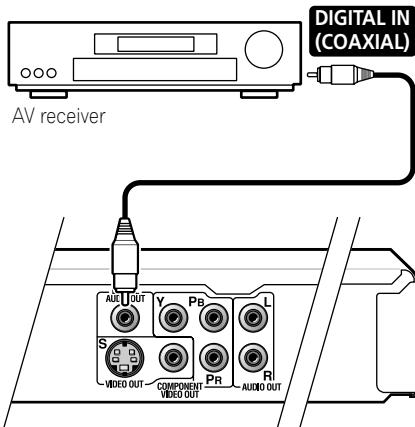
Connecting to an AV receiver

To enjoy multichannel surround sound you need to connect this player to an AV receiver using a digital output. This player has coaxial digital jack; use whichever is convenient.

In addition to a digital connection, we recommend also connecting using the stereo analog connection.

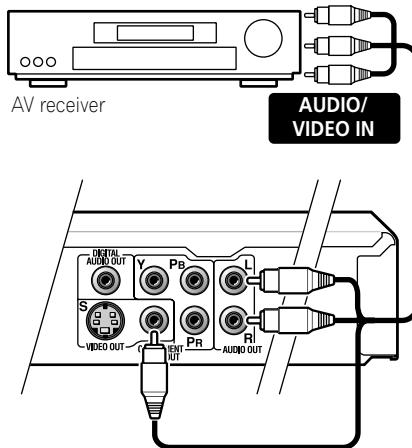
You'll probably also want to connect a video output to your AV receiver. You can use any of the video outputs available on this player (the illustration shows a standard (composite) connection).

1 Connect one of DIGITAL AUDIO OUT jack on this player to a digital input on your AV receiver.



This enables you to listen to multichannel surround sound.
For a coaxial connection, use a coaxial cable (similar to the supplied video cable) to connect the **DIGITAL AUDIO OUT** jack to a coaxial input on your AV receiver.

2 Connect the analog AUDIO OUT L/R and VIDEO OUT jacks on this player to a set of analog audio and video inputs on your AV receiver.



The diagram shows standard video connections, but you can alternatively use the S-video or component video connections if they're available.

3 Connect the AV receiver's video output to a video input on your TV.

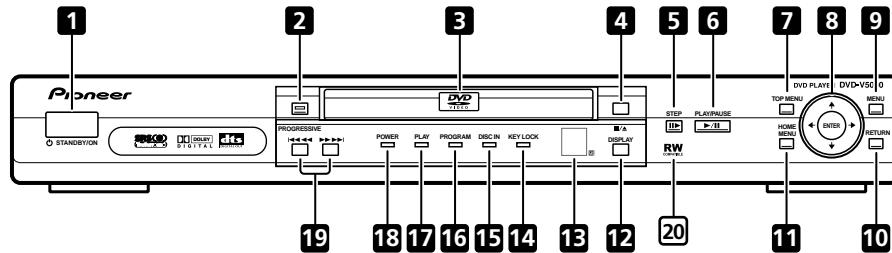
Tip

- You usually have to connect the same kind of video cable between your DVD player and AV receiver, and between your AV receiver and TV.
- If you don't mind mono sound, you can buy a stereo RCA-to-mono RCA cable from an electronics store. Connect the stereo end to this player and the mono end to your TV.

Chapter 3

Controls and displays

Front panel



1 ⌂ STANDBY/ON

Press to switch the player on or into standby.

2 PROGRESSIVE button/indicator

Press to switch the progressive video output mode between **Progressive** and **Interlace**. The indicator lights in progressive scan mode. See page 15 for more information.

3 Disc tray

4 □/▲

Press to stop the disc.

In the stop mode, press to open or close the disc tray.

5 ▶▶

Use for frame advance.

6 PLAY/PAUSE ▶/⏸

Press to start or resume playback.

In the play mode, press to pause playback. Press again to restart.

7 TOP MENU

Press to display the top menu of a DVD disc.

8 ENTER & cursor buttons

Use to navigate on-screen displays and menus. Press **ENTER** to select an option or execute a command.

9 MENU

Press to display a DVD disc menu, or the Disc Navigator if a VR format DVD-RW, CD or Video CD disc is loaded.

10 RETURN

Press to return to a previous menu screen.

11 HOME MENU

Press to display (or exit) the on-screen display.

12 DISPLAY

Press to display information about the disc playing (see *Displaying disc information* on page 17).

13 Remote control sensor

The remote control has a range of up to about 7m (23ft).

14 KEY LOCK

When this indicator is lighted, the player cannot be operated using the front panel controls or the remote control unit.

Settings can be changed by ADV. SETUP.
(See **Key Lock** on page 44.)

15 DISC IN

Flashes during disc discriminating, and lights when a disc is loaded.

16 PROGRAM

Lights when repeat play, program play or command stack function is operated.

17 PLAY

Lights during playback, and flashes when starting up.

18 POWER

Lights green when the player is on.
Lights orange when the player is in the standby mode.

19 << << and >> >>

Press and hold for fast reverse/forward scanning.
Press to jump to the previous/next chapter or track.

20 RW COMPATIBLE

This mark indicates compatibility with DVD-RW discs recorded on a DVD recorder in Video Recording mode.

About progressive scan video

Compared to interlace video, progressive scan video effectively doubles the scanning rate of the picture, resulting in a very stable, flicker-free image.

Progressive scan video is available only from the **COMPONENT VIDEO OUT**. Use the **PROGRESSIVE** button on the front panel to switch the **COMPONENT VIDEO OUT** between **Interlace** and **Progressive**. With a DVD-Video disc you can do this during playback, or when the disc is stopped. For other types of disc, the player must be stopped.



Important

- If you connect a TV that is not compatible with a progressive scan signal and switch the player to **Progressive**, you will not be able to see any picture at all. In this case, press the **PROGRESSIVE** button on the front panel to switch back to **Interlace** (the **PROGRESSIVE** indicator should be unlit).



Note

- When **COMPONENT VIDEO OUT** is set to **Progressive**, there is no video output from the **VIDEO OUT** (composite) and **S** (S-video) jacks. If you want to display video on more than one monitor simultaneously, make sure that it is set to **Interlace**. Press **PROGRESSIVE** on the front panel to switch the player back to **Interlace**.

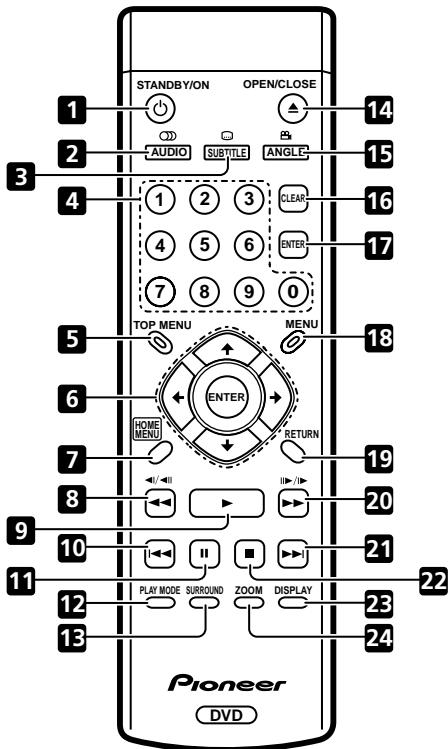
- You can't switch the video output when an OSD is on-screen.
- The picture on some TVs may momentarily break up when you switch the video output of this player.

Compatibility of this unit with progressive-scan TVs.

This player is compatible with progressive video Macro Vision System Copy Guard.

CONSUMERS SHOULD NOTE THAT NOT ALL HIGH DEFINITION TELEVISION SETS ARE FULLY COMPATIBLE WITH THIS PRODUCT AND MAY CAUSE ARTIFACTS TO BE DISPLAYED IN THE PICTURE. IN CASE OF 525 PROGRESSIVE SCAN PICTURE PROBLEMS, IT IS RECOMMENDED THAT THE USER SWITCH THE CONNECTION TO THE "STANDARD DEFINITION" OUTPUT. IF THERE ARE QUESTIONS REGARDING OUR TV SET COMPATIBILITY WITH THIS MODEL 525p DVD PLAYER, PLEASE CONTACT OUR CUSTOMER SERVICE CENTER.

Remote control



1 ⏹ STANDBY/ON

Press to switch the player on or into standby.

2 AUDIO

Press to select the audio channel or language (see *Switching DVD audio language* on page 31).

3 SUBTITLE

Press to select a subtitle display (see *Switching subtitles* on page 31).

4 Number buttons

5 TOP MENU

Press to display the top menu of a DVD disc.

6 ENTER & cursor buttons

Use to navigate on-screen displays and menus. Press **ENTER** to select an option or execute a command.

7 HOME MENU

Press to display (or exit) the on-screen display.

8 ⏪ and ⏪/⏪

Use for reverse slow motion playback, frame reverse and reverse scanning.

9 ►

Press to start or resume playback.

10 ⏪

Press to jump to the beginning of the current chapter or track, then to previous chapters/tracks.

11 II

Press to pause playback (still); press again to restart.

12 PLAY MODE

Press to display the Play Mode menu. (You can also get to the Play Mode menu by pressing **HOME MENU** and selecting Play Mode).

13 SURROUND

Press to activate/switch off DVI/SRS TruSurround.

14 ▲ OPEN/CLOSE

Press to open or close the disc tray.

15 ANGLE

Press to change the camera angle during DVD multi-angle scene playback (see *Switching camera angles* on page 31).

16 CLEAR

Press to clear a numeric entry.

17 ENTER

Use to select menu options, etc. (works exactly the same as the **ENTER** button in 6 above).

18 MENU

Press to display a DVD disc menu, or the Disc Navigator if a VR format DVD-RW, CD or Video CD disc is loaded.

19 RETURN

Press to return to a previous menu screen.

20 ►► and ►►/II►

Use for forward slow motion playback, frame advance and forward scanning.

21 ►►I

Press to jump to the next chapter or track.

22 ■

Press to stop the disc (you can resume playback by pressing ► (play)).

23 DISPLAY

Press to display information about the disc playing (see *Displaying disc information*).

Displaying disc information

Various track, chapter and title information, as well as the video transmission rate for DVD discs, can be displayed on-screen while a disc is playing.

To show/switch the information displayed, press DISPLAY.

When a disc is playing, the information appears at the top of the screen. Keep pressing **DISPLAY** to change the displayed information.

- DVD displays

Play ► DVD				
	Current / Total	Elapsed	Remain	Total
Title	1/3	2.23	138.36	138.59
Frame		4295		250470
Audio	1 English		Subtitle	Angle
Dolby Digital	3/2.1CH			

Play ► DVD				
	Current / Total	Elapsed	Remain	Total
Chapter	2/36	0.06	1.40	1.46
Frame		196		3180
# Tr. Rate :	■■■■■■■■■■			6.0Mbps

The # mark displayed with some DVD-Video discs means that the video is playing at 24 frames/second, progressive.

DVD				
	Current / Total	Elapsed	Remain	Total
Chapter	2/36	0.06	15	1.46
Frame		196		3180
Tr. Rate :	■■■■■■■■■■			6.0Mbps

When the disc is paused, the display also shows the frame number.

Still ► DVD				
	Current / Total	Elapsed	Remain	Total
Title	1/1	0.05 00	19.55	20.00
Frame		151		36000
Audio	1 English		Subtitle	Angle
		--		1

24 ZOOM

Press to change the zoom level (see *Zooming the screen* on page 36).

- VR format DVD-RW displays

Play ► DVD-RW Original				
	Current / Total	Elapsed	Remain	Total
Title	1/32	0.08	30.22	30.30
Frame				--
Audio	1	Subtitle		
Dolby Digital	2/0CH			

Play ► DVD-RW Original				
	Current / Total			
Chapter	1/1			
Frame				
Tr. Rate	■■■■■			4.3Mbps

- Video CD displays

Play ► VCD				
	Current / Total	Elapsed	Remain	Total
Track	2/16	0.23	4.20	4.43
Frame				

Play ► VCD				
	Elapsed	Remain	Total	
Disc	0.23	58.51	57.14	
Frame				

- CD displays

Play ► CD				
	Current / Total	Elapsed	Remain	Total
Track	2/16	1.07	4.40	5.47
Frame				

Play ► CD				
	Elapsed	Remain	Total	
Track	28.00	30.20	58.20	
Frame				



Note

- You can see disc information (number of titles/chapters, tracks and so on) from the Disc Navigator screen. See *Using the Disc Navigator to browse the contents of a disc* on page 30.

Chapter 3

Getting started

Switching on

After making sure that everything is connected properly and that the player is plugged in, press **Ø STANDBY/ON** on the front panel, or on the remote control to switch the player on.

Also, switch on your TV and make sure that it is set to the input you connected the DVD player to. Make sure that the TV is set to the correct video input (not a TV channel). For example, if you connected this player to the **VIDEO 1** inputs on your TV, switch your TV to **VIDEO 1**.

Using the on-screen displays

For ease of use, this player makes extensive use of graphical on-screen displays (OSDs). You should get used to the way these work as you'll need to use them when setting up the player, using some of the playback features, such as program play, and when making more advanced settings for audio and video.

All the screens are navigated in basically the same way, using the cursor buttons (**↑/↓/←/→**) to change the highlighted item and pressing **ENTER** to select it.



Important

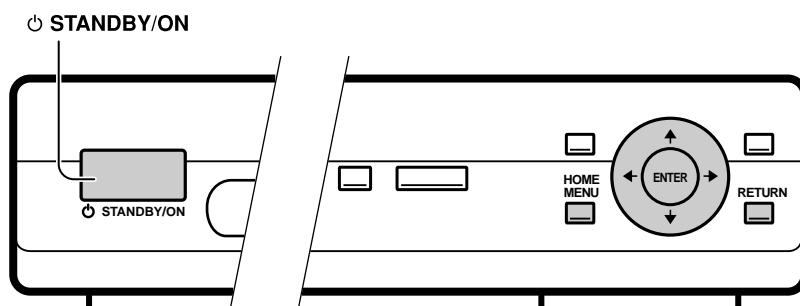
- Throughout this manual, 'Select' means use the cursor buttons to highlight an item on-screen, then press **ENTER**.

Button	What it does
HOME MENU	Display/exit the on-screen display.
↑/↓/←/→	Changes the highlighted menu item.
ENTER	Selects the highlighted menu item.
RETURN	Returns to the main menu without saving changes.



Tip

- The buttons to navigate the on-screen displays are available on the remote control as well as the front panel.
- The button guide at the bottom of every OSD screen shows you which buttons you'll need to use for that screen.



Chapter 4

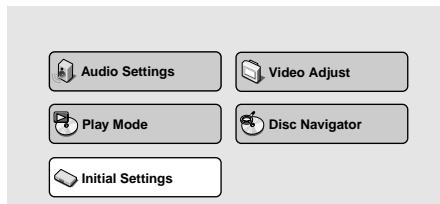
Initial Settings menu

Using the Initial Settings menu

The Initial Settings menu is where you can set preferences for language, audio and video output, and so on.

If a menu option is grayed out it means that it cannot be changed at the current time. This is usually because a disc is playing. Stop the disc, then change the setting.

- 1 Press HOME MENU and select 'Initial Settings' from the on-screen display.



- 2 Select the setup category from the list on the left, then select an item from the menu list to the right.

- 3 Make the setting you want.

Note

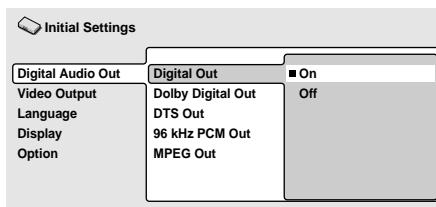
- The language options shown in the on-screen display illustrations on the following pages may not correspond to those available in your country or region.

Digital Audio Out settings

Digital Out

You only need to make this setting if you connected this system to an AV receiver (or other component) using the digital output.

- Default setting: **On**

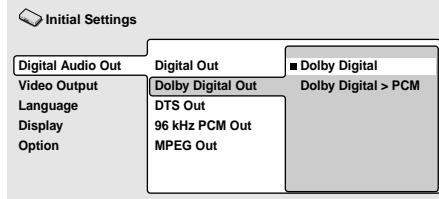


If at any time you need to switch off the digital audio output, set this to **Off**, otherwise leave it **On**.

Dolby Digital Out

You only need to make this setting if you connected this system to an AV receiver (or other component) using the digital output.

- Default setting: **Dolby Digital**

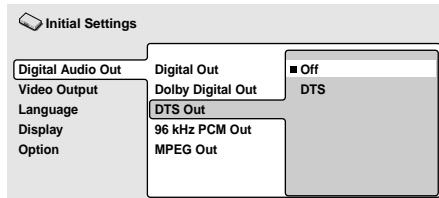


If your AV receiver (or other connected component) is Dolby Digital compatible, set to **Dolby Digital**, otherwise set to **Dolby Digital > PCM**.

DTS Out

You only need to make this setting if you connected this player to an AV receiver (or other component) using the digital output.

- Default setting: **Off**



If your AV receiver (or other connected component) has a built-in DTS decoder, set this to **DTS**, otherwise set to **Off**. Check the manual that came with the other component if you're unsure whether it is DTS compatible.



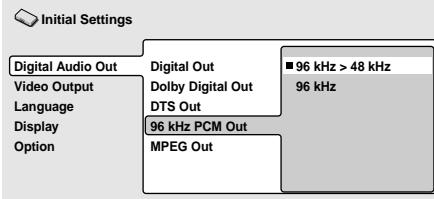
Note

- If you set to DTS with a non-DTS compatible amplifier, noise will be output when you play a DTS disc.

96kHz PCM Out

You only need to make this setting if you connected this player to an AV receiver (or other component) using the digital output.

- Default setting: **96kHz > 48kHz**

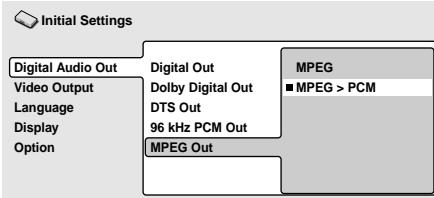


If your AV receiver (or other connected component) is compatible with high sampling rates (96 kHz), set this to **96kHz**, otherwise set it to **96kHz > 48kHz** (96 kHz audio is converted to a more compatible 48 kHz). Check the manual that came with the other component if you're unsure whether it is 96 kHz compatible.

MPEG Out

You only need to make this setting if you connected this player to an AV receiver (or other component) using the digital output.

- Default setting: **MPEG > PCM**

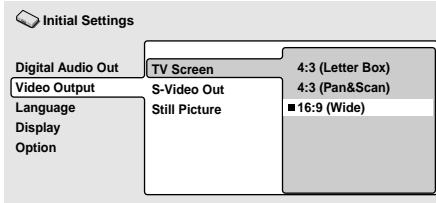


If your AV receiver (or other connected component) is compatible with MPEG audio, set this to **MPEG**, otherwise set it to **MPEG > PCM** (MPEG audio is converted to more compatible PCM audio). Check the manual that came with the other component if you're unsure whether it is MPEG audio compatible.

Video Output settings

TV Screen

- Default setting: **16:9 (Wide)**



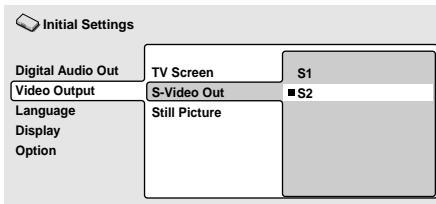
If you have a widescreen TV, select the **16:9 (Wide)** setting—widescreen DVD software is then shown using the full screen area. When playing software recorded in conventional (4:3) format, the settings on your TV will determine how the material is presented—see the manual that came with your TV for details on what options are available.

If you have a conventional TV, select either **4:3 (Letter Box)** or **4:3 (Pan & Scan)**. In Letter Box mode, widescreen software is shown with black bars at the top and bottom of the screen. Pan & Scan chops the sides off widescreen material to make it fit the 4:3 screen (so even though the image looks larger on the screen, you're actually seeing less of the picture). See also *Screen sizes and disc formats* on page 65.

S-Video Out

You only need to make this setting if you connected this player to your TV using an S-video cable.

- Default setting: **S2**

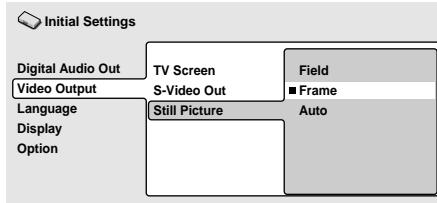


If you find that the picture is stretched or distorted on the default **S2** setting, try changing it to **S1**.

Still Picture

This player uses one of two processes when displaying a still frame from a DVD disc.

- Default setting: **Frame**



The default **Frame** setting produces a sharper image, but more prone to shake than field stills.

- Field** – produces a stable, generally shake-free image
- Auto** – automatically chooses the best setting each time



Note

- Depending on the disc, there are times when the picture quality may not become clear, even if **Field** is selected.

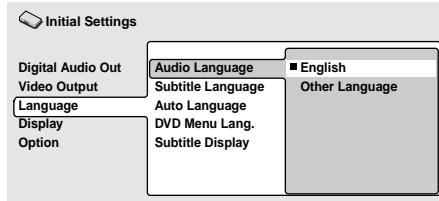
Component Out

You only need to make this setting if you connected this player to a progressive scan compatible TV using the component video outputs. See *About progressive scan video* on page 15.

Language settings

Audio Language

- Default setting: **English**



This setting is your preferred audio language for DVD discs. If the language you specify here is recorded on a disc, the player automatically plays the disc in that language.

The DVD format recognizes 136 different languages. Select **Other Language** if you want to specify a language other than English. See also *Selecting languages using the language code list*.



Tip

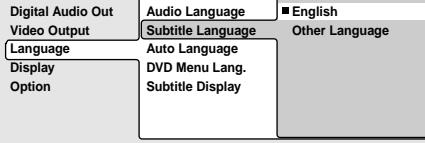
- You can switch between the languages recorded on a DVD disc during playback using the **AUDIO** button. (This does not affect this setting.) See *Switching DVD audio language* on page 31.
- Some DVD discs set the audio language automatically when loaded, overriding the **Audio Language** setting.
- Discs with two or more audio languages usually allow you to select the audio language from the disc menu. Press **MENU** to access the disc menu.

Subtitle Language

- Default setting: **English**



Initial Settings



This setting is your preferred subtitle language for DVD discs. If the language you specify here is recorded on a disc, the player automatically plays the disc with those subtitles.

The DVD format recognizes 136 different languages. Select **Other Language** if you want to specify a language other than English. See also *Selecting languages using the language code list*.



Tip

- You can change or switch off the subtitles on a DVD disc during playback using the **SUBTITLE** button. (This does not affect this setting.) See *Switching subtitles* on page 31.
- Some DVD discs set the subtitle language automatically when loaded, overriding the **Subtitle Language** setting.
- Discs with two or more subtitle languages usually allow you to select the subtitle language from the disc menu. Press **MENU** to access the disc menu.

Selecting languages using the language code list

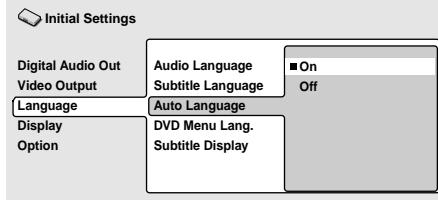
Some of the language options (such as 'Audio Language' in the Language setting) allow you to set your preferred language from any of the 136 languages listed in the *Language code list* on page 67.

- 1 Select 'Other Language'.
- 2 Use the **↔/→** (cursor left/right) buttons to select either a code letter or a code number.
- 3 Use the **↑/↓** (cursor up/down) buttons to select a code letter or a code number.

See *Language code list* on page 67 for a complete list of languages and codes.

Auto Language

- Default setting: **On**



When set to **On**, the player always selects the default audio language on a DVD-Video disc (French dialog for a French movie, for example), and displays subtitles in your preferred subtitle language only if that is set to something different. In other words, movies in your native language won't have any subtitles, while foreign language movies will be shown with subtitles. Set to **Off** to have the player play discs strictly according to your **Audio Language** and **Subtitle Language** settings.

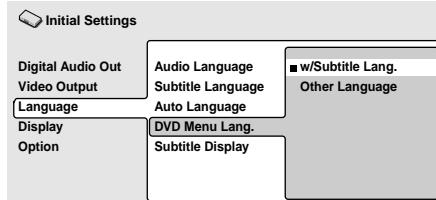
For **Auto Language** to work, the **Audio Language** and **Subtitle Language** settings must be the same (see also page 22).

Tip

- You can still switch audio and subtitle language on playback using the **AUDIO** and **SUBTITLE** buttons.

DVD Menu Language

- Default setting: **w/Subtitle Lang.**

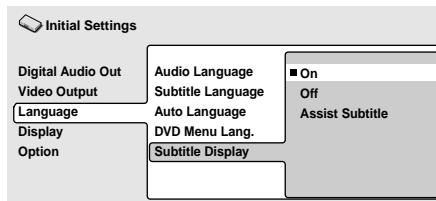


Some multilingual discs have disc menus in several languages. This setting specifies in which language the disc menus should appear. Leave on the default setting for menus to appear in the same language as your **Subtitle Language**—see page 22.

The DVD format recognizes 136 different languages. Select **Other Language** if you want to specify a language other than those listed. See also *Selecting languages using the language code list* on page 22.

Subtitle Display

- Default setting: **On**

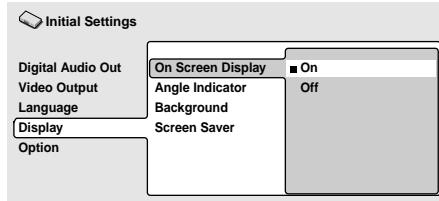


When set to **On**, the player displays subtitles according to the Subtitle Language and Auto Language settings. Set to **Assist Subtitle** to have the player display the extra assistive subtitles recorded on to some DVD discs. Set to **Off** to switch subtitles off altogether.

Display settings

On Screen Display

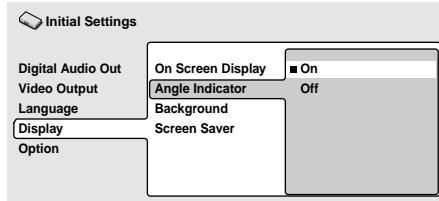
- Default setting: **On**



This sets whether operation displays are shown on-screen (**Play**, **Scan** and so on.)

Angle Indicator

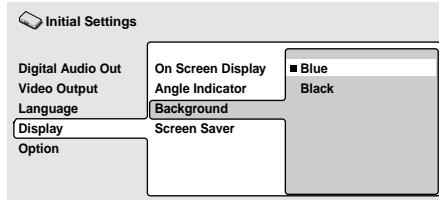
- Default setting: **On**



If you prefer not to see the camera icon on-screen during multi-angle scenes on DVD discs, change this setting to **Off**.

Background

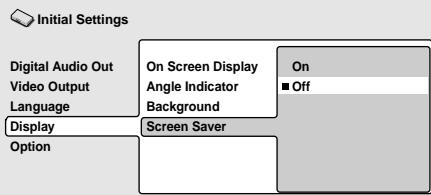
- Default setting: **Blue**



This specifies the color of the screen when the player is stopped.

Screen Saver

- Default setting: **Off**



If a constant image is displayed on a conventional CRT-type TV, it can 'burn in' leaving a ghost image on the screen. Switch to **On** to make sure that a constant image is not displayed for a dangerously long time.

Option

Parental Lock

- Default level: **Off**
- Default password: none
- Default Country code: **us (2119)**

Some DVD-Video discs feature a Parental Lock level. If your player is set to a lower level than the disc, the disc won't play. This gives you some control about what your children watch on your DVD player.

Some discs also support the Country code feature. The player does not play certain scenes on these discs, depending on the Country code you set.

Before you can set the Parental Lock level or the Country code you must register a password. As the password owner, you can change the Parental Lock level or Country code whenever you like. You can also change the password.



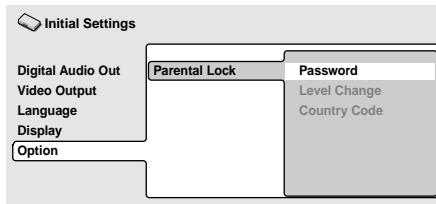
Note

- Not all discs that you may consider inappropriate for your children use the Parental Lock feature. These discs will always play without requiring the password first.
- If you forget your password, you'll need to reset the player to its factory settings (see *Resetting the player* on page 66), then register a new password.

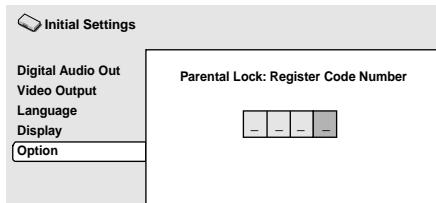
Registering a new password

You must register a password before you can change the Parental Lock level or enter a Country code.

1 Select 'Password'.



2 Use the number buttons on the Remote control to enter a 4-digit password.



The numbers you enter show up as asterisks (*) on-screen.

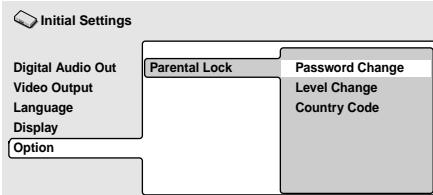
3 Press ENTER to register the password and return to the Option menu screen.

If you forget your password, you can reset the player then register a new one. See *Resetting the player* on page 66 for how to reset the player.

Changing your password

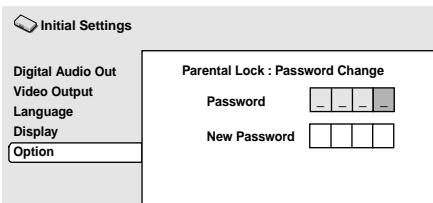
To change your password, confirm your existing password then enter a new one.

1 Select 'Password Change'.

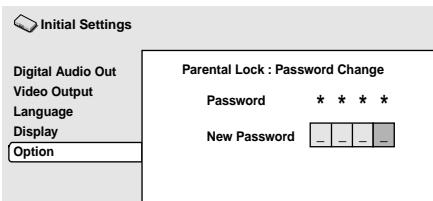


2 Use the number buttons on the Remote control to enter your existing password, then press ENTER.

The numbers appear as asterisks as you enter them.



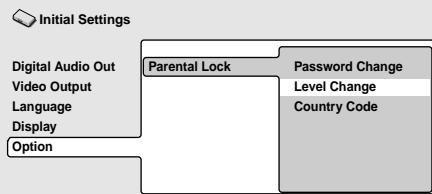
3 Enter a new password.



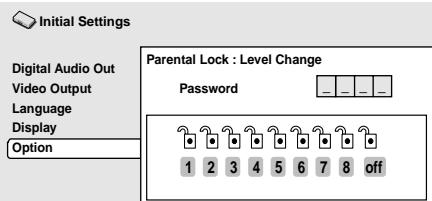
4 Press ENTER to register the new password and return to the Option menu screen.

Setting/changing the Parental Lock level

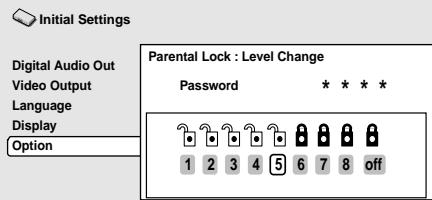
1 Select 'Level Change'.



2 Use number buttons on the Remote control to enter your password, then press ENTER.



3 Select a new level.



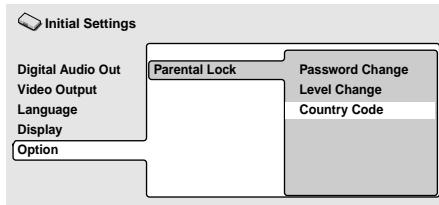
Press **←** (cursor left) repeatedly to lock more levels (more discs will require the password); press **→** (cursor right) to unlock levels. You can't lock level 1.

4 Press ENTER to set the new level and return to the Option menu screen.

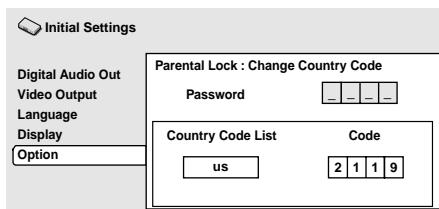
Setting/changing the Country code

You may also want to refer to the *Country code list* on page 67.

1 Select 'Country Code'.



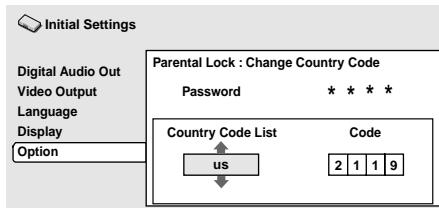
2 Use number buttons on the Remote control to enter your password, then press ENTER.



3 Select a Country code.

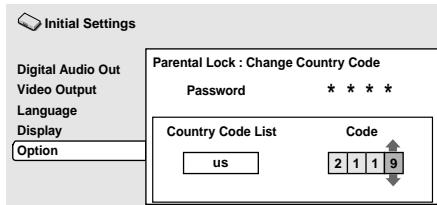
There are two ways you can do this.

- Select by code letter: Use \uparrow/\downarrow (cursor up/down) to change the Country code.



- Select by code number: Press \rightarrow (cursor right) to select the 4-digit Country code input.

Then use \uparrow/\downarrow (cursor up/down) to select the number for each digit and use \leftarrow/\rightarrow (cursor left/right) to move the digit, or use the number buttons on the Remote control to enter the 4-digit Country code (you can find the *Country code list* on page 67).



4 Press ENTER to set the new Country code and return to the Option menu screen.



Note

- Changing the Country code does not take effect until the next disc is loaded (or the current disc is reloaded).

Chapter 6

Playing discs

Throughout this manual, the term 'DVD' means DVD-Video and DVD-R/RW. If a function is specific to a particular kind of DVD disc, it is specified.

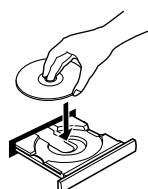
1 If the player isn't already on, press \odot STANDBY/ON to switch it on.

If you're playing a DVD or Video CD, also turn on your TV and make sure that it is set to the correct video input.

2 Press \blacksquare/\triangle (stop, open/close) to open the disc tray.

3 Load a disc.

- Load a disc with the label side facing up, using the disc tray guide to align the disc.
- Never load more than one disc at a time.



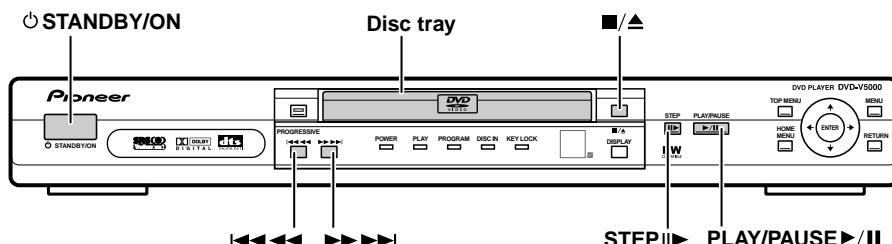
4 Press PLAY/PAUSE $\blacktriangleright/\text{II}$ to start playback.

If you're playing a DVD or Video CD, a menu may appear. See *DVD-Video disc menus* on page 29 and *Video CD PBC menus* on page 29 for more on how to navigate these.

Basic playback controls

The table below shows the basic controls on the remote for playing discs. The following chapter covers more playback features in more detail.

Button	What it does
$\blacktriangleright/\text{II}$	Starts playback. Pauses a disc that's playing, or restarts a paused disc.
\blacksquare/\triangle	Stops playback. Open/close the disc tray.
$\blacktriangleleft\blacktriangleleft\blacktriangleleft$	Press and hold for fast reverse scanning; press for previous track/chapter skip.
$\blacktriangleright\blacktriangleright\blacktriangleright$	Press and hold for fast forward scanning; press for next track/chapter skip.
Numbers (remote buttons)	Use to enter a title/track number. Press ENTER to select (or wait a few seconds). <ul style="list-style-type: none"> If the disc is stopped, playback starts from the selected title (for DVD) or track number (for CD/Video CD). If the disc is playing, playback jumps to the start of the selected chapter or track.

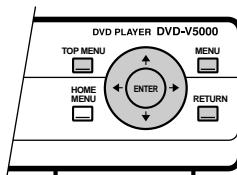


Button	What it does
▶▶	Press to advance a frame at a time.

DVD-Video disc menus

Many DVD-Video discs contain menus from which you can select what you want to watch. They may give access to additional features, such as subtitle and audio language selection, or special features such as slideshows. See the disc packaging for details. Sometimes DVD-Video menus are displayed automatically when you start playback; others only appear when you press **MENU** or **TOP MENU**.

Button	What it does
TOP MENU	Displays the 'top menu' of a DVD disc-this varies with the disc.
MENU	Displays a DVD disc menu-this varies with the disc and may be the same as the 'top menu'.
↑/↓/←/→	Moves the cursor around the screen.
ENTER	Selects the current menu option.
RETURN	Returns to the previously displayed menu screen.
Numbers (remote buttons)	Highlights a numbered menu option (some discs only). Press ENTER to select.

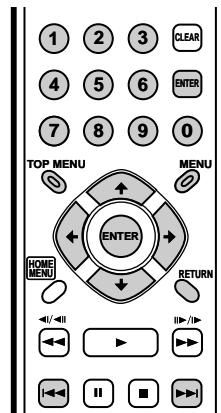


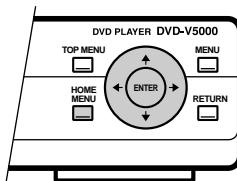
Video CD PBC menus

Some Video CDs have menus from which you can choose what you want to watch. These are called PBC (Playback control) menus. You can play a PBC Video CD without having to navigate the PBC menu by starting playback using a number button to select a track, rather than the ▶ (play) button.

Button	What it does
RETURN	Displays the PBC menu.
Numbers (remote buttons)	Use to enter a numbered menu option. Press ENTER to select.
◀◀ (remote button)	Displays the previous menu page (if there is one).
▶▶ (remote button)	Displays the next menu page (if there is one).

Remote control



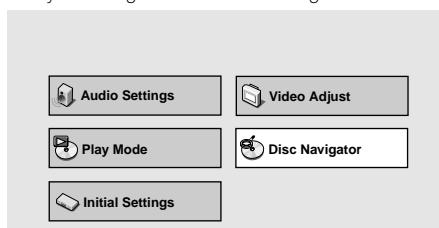


Using the Disc Navigator to browse the contents of a disc

Use the Disc Navigator to browse through the contents of a disc to find the part you want to play. You can use the Disc Navigator when a disc is playing or stopped.

1 Press HOME MENU and select 'Disc Navigator' from the on-screen display.

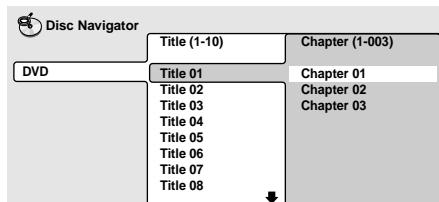
Alternatively, if a VR format DVD-RW, CD or Video CD disc is loaded, you can press **MENU**, which takes you straight to the Disc Navigator screen.



2 Select what you want to play.

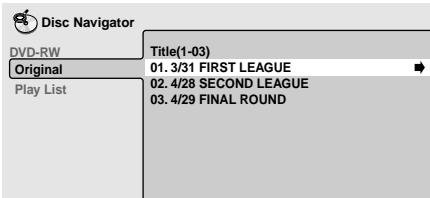
Depending on the type of disc you have loaded, the Disc Navigator looks slightly different.

The screen for DVD discs shows the titles on the left and the chapters on the right. Select a title, or a chapter within a title.

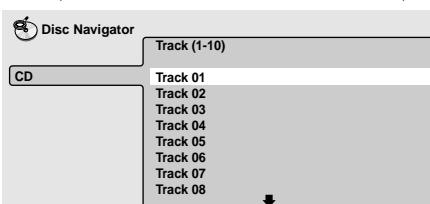


For a VR (Video Recording) mode DVD-RW disc select between the **Playlist** and **Original** areas of the disc, or a title. Press → (cursor right) to preview the title.

- It's not possible to switch between Original and Playlist during playback.
- Not all VR format DVD-RW discs have a Playlist.



The screen for CDs and Video CDs shows a list of tracks. (The screen below show a CD loaded.)



3 Playback starts after you press ENTER.



- Tip**
- The Disc Navigator is not available unless there is a disc loaded.
 - It's not possible to use the Disc Navigator when playing a Video CD in PBC mode, or an unfinalized CD-R/RW disc.
 - Another way to find a particular place on a disc is to use one of the search modes. See *Searching a disc* on page 36.



Switching subtitles

Some DVD discs have subtitles in one or more languages; the disc box will usually tell you which subtitle languages are available. You can switch subtitle language during playback.

Press SUBTITLE repeatedly to select a subtitle option.



Note

- Some discs only allow you to change subtitle language from the disc menu. Press **TOP MENU** to access.
- To set subtitle preferences, see *Subtitle Language* on page 22.

Switching DVD audio language

When playing a DVD disc recorded with dialog in two or more languages, you can switch audio language during playback.

Press AUDIO repeatedly to select an audio language option.



Note

- Some discs only allow you to change audio language from the disc menu. Press **TOP MENU** to access.
- To set audio language preferences, see *Audio Language* on page 23.

Switching VR format DVD-RW audio channel

When playing a VR format DVD-RW disc recorded with dual-mono audio, you can switch between the main, sub, and mixed channels during playback.

Press AUDIO repeatedly to select an audio channel option.



Switching Video CD audio channel

When playing a Video CD, you can switch between stereo, just the left channel or just the right channel.

Press AUDIO repeatedly to select an audio channel option.

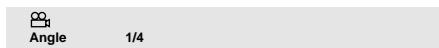


Switching camera angles

Some DVD discs feature scenes shot from two or more angles—check the disc box for details.

When a multi-angle scene is playing, a icon appears on screen to let you know that other angles are available (this can be switched off if you prefer—see *Angle Indicator* on page 24).

During playback (or when paused), press ANGLE to switch angle.





Scanning discs

You can fast-scan discs forward or backward at various different speeds.

During playback, press and hold ▲◀◀◀ or ▶▶▶▶ on the front panel to scan.

[When using remote control]

1 During playback, press ▲◀ or ▶▶ to start scanning.

2 Press repeatedly to increase the scanning speed.

- The scanning speed is shown on-screen.

3 To resume normal playback, press ▶▶ (play).



Note

- Sound can be heard while scanning audio CDs.
- When scanning a Video CD track, playback automatically resumes at the end or beginning of the track.
- There is no sound while scanning DVDs and Video CDs, and no subtitles while scanning DVDs.
- Depending on the disc, normal playback may automatically resume when a new chapter is reached on a DVD disc.

Playing in slow motion

You can play DVDs and Video CDs at four different forward slow motion speeds. DVD discs can also be played at two reverse speeds. (With Video CDs and VR format DVD-RWs, you can only use forward slow motion playback.)

1 During playback, press □ (pause) (PLAY/PAUSE ▶/□ or □▶ on the front panel).

2 Press and hold ▲◀/▲◀ or □▶/▶ until slow motion playback starts.

- The slow motion speed is shown on-screen.
- There is no sound during slow motion playback.

3 Press repeatedly to change the slow motion speed.

- The slow motion speed is displayed on-screen.

4 To resume normal playback, press ▶▶ (play) (PLAY/PAUSE ▶/□ on the front panel).



Note

- The picture quality during slow motion playback is not as good as during normal playback.
- Depending on the disc, normal playback may automatically resume when a new chapter is reached.

Frame advance/frame reverse

You can advance or back up a DVD disc frame-by-frame. With Video CDs and VR format DVD-RWs, you can only use frame advance.

1 During playback, press □ (pause) (PLAY/PAUSE ▶/□ or □▶ on the front panel).

2 Press ▲◀/▲◀ or □▶/▶ to reverse or advance a frame at a time.

3 To resume normal playback, press ▶▶ (play) (PLAY/PAUSE ▶/□ on the front panel).



Note

- The picture quality when using frame reverse is not as good as frame advance.
- Depending on the disc, normal playback may automatically resume when a new chapter is reached.
- When changing direction with a DVD disc, the picture may 'move' in an unexpected way. This is not a malfunction.

Looping a section of a disc

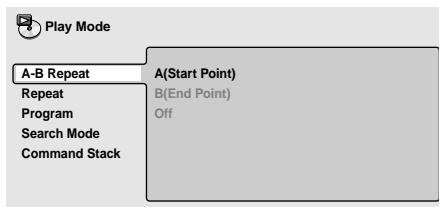
The A-B Repeat function allows you to specify two points (A and B) within a track (CD and Video CD) or title (DVD) that form a loop which is played over and over.



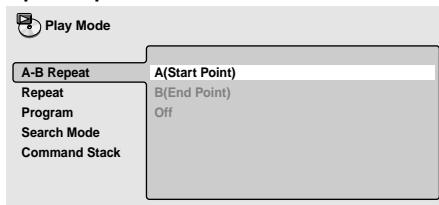
Important

- You can't use A-B Repeat with Video CDs in PBC mode, or unfinalized CD-R/RW discs.

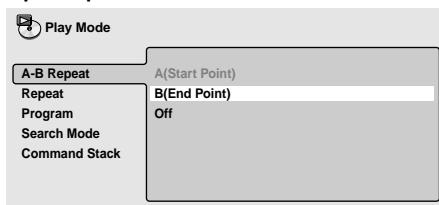
1 During playback, press PLAY MODE and select 'A-B Repeat' from the list of functions on the left.



2 Press ENTER on 'A(Start Point)' to set the loop start point.



3 Press ENTER on 'B(End Point)' to set the loop end point.



After pressing **ENTER**, playback jumps back to the start point and plays the loop.

- The minimum loop time is 2 seconds.

4 To resume normal playback, select 'Off' from the menu.

Using repeat play

There are various repeat play options, depending on the kind of disc loaded. It's also possible to use repeat play together with program play to repeat the tracks/chapters in the program list (see *Creating a program list* on page 34).

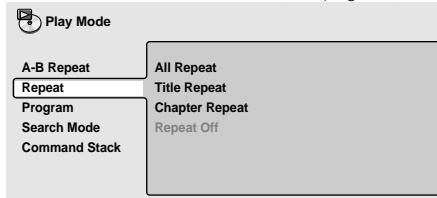


Important

- You can't use Repeat play with Video CDs in PBC mode, or unfinalized CD-R/RW discs.

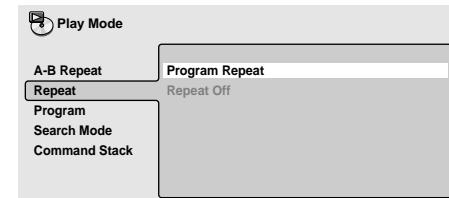
1 During playback, press PLAY MODE and select 'Repeat' from the list of functions on the left.

"All Repeat" will be displayed as an option when the **TITLE PLAY MODE** is set to "All" on the ADV. SETUP menu (see page 41).

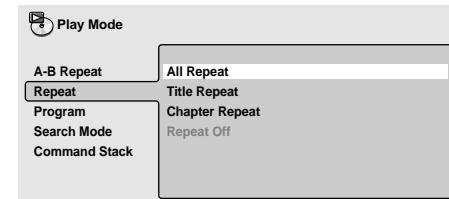


2 Select a repeat play option.

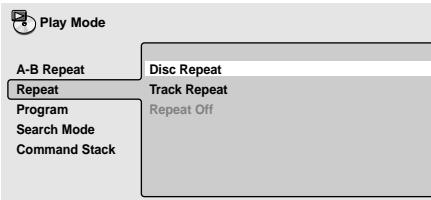
If program play is active, select **Program Repeat** to repeat the program list, or **Repeat Off** to cancel.



For DVD discs, select **All Repeat**, **Title Repeat** or **Chapter Repeat** (or **Repeat Off**).



For CDs and Video CDs, select **Disc Repeat** or **Track Repeat** (or **Repeat Off**).



Note

- If you switch camera angle during repeat play, repeat play is canceled.

Creating a program list

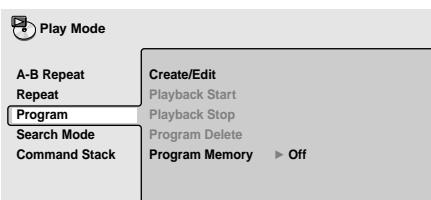
This feature lets you program the play order of titles/chapters/tracks on a disc.



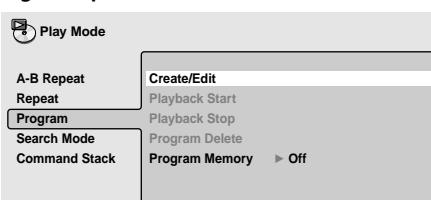
Important

- You can't use Program play with VR format DVD-RW discs, Video CDs playing in PBC mode, or while a DVD disc menu is being displayed.

1 Press PLAY MODE and select 'Program' from the list of functions on the left.



2 Select 'Create/Edit' from the list of program options.



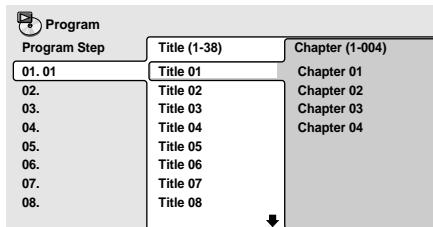
The Program edit screen that appears depends on the kind of disc loaded.

On the left side is the program list, then to the right is a list of titles (if a DVD disc is loaded) or tracks (for CDs and Video CDs). On the far right is a list of chapters (for DVD).

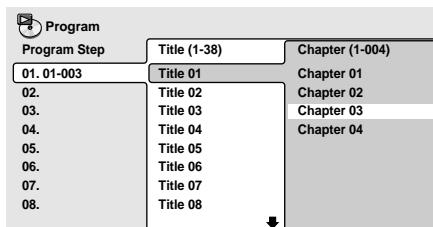
3 Select a title, chapter or track for the current step in the program list.

For a DVD disc, you can add a whole title, or a chapter within a title to the program list.

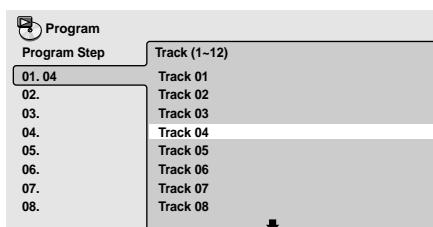
- To add a title, select the title.



- To add a chapter, first highlight the title, then press → (cursor right) and select a chapter from the list.



For a CD or Video CD, select a track to add to the program list.



After pressing **ENTER** to select the title/chapter/track, the step number automatically moves down one.

4 Repeat step 3 to build up a program list.

A program list can contain up to 24 titles/chapters/tracks.

5 To play the program list, press ► (play).

Program play remains active until you turn off program play (see below), erase the program list (see below), eject the disc or switch off the player.

When an item on the step is currently being played, its title characters change color.

 **Tip**

- To save your program list and exit the program edit screen without starting playback, press **PLAY MODE** or **HOME MENU**. (Don't press **RETURN** – your program list won't be saved.)
- During program play, press **▶▶I** to skip to the next program step.
- Press **CLEAR** during playback to switch off program play. Press while stopped to erase the program list.

Editing a program list

After creating a program list, you can add, delete and change steps.

1 Press PLAY MODE and select 'Program' from the list of functions on the left.**2 Select 'Create/Edit' from the list of program options.****3 To clear a step, highlight the step number and press CLEAR.****4 To insert a step in the middle of the program list, highlight the step where you want the new step to appear, then select a title/chapter/track to add.**

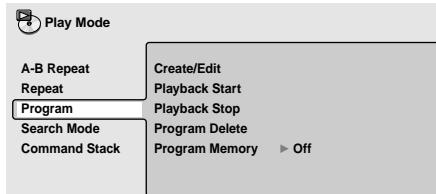
After pressing **ENTER**, the new step is inserted into the list.

5 To add a step to the end of the program list, highlight the next free step then select a title/chapter/track to add.
 **Tip**

- To save your program list and exit the program edit screen without starting playback, press **PLAY MODE** or **HOME MENU**.
- If you want to exit the program edit screen without saving the changes you made, press **RETURN**.

Other functions available from the program menu

As well as creating and editing a program list, you can start program play, cancel program play, erase the program list, and memorize a program list from the Play Mode menu.

1 Press PLAY MODE and select 'Program' from the list of functions on the left.**2 Select a program play function.**

- Create/Edit** – See above
- Playback Start** – Starts playback of a saved program list
- Playback Stop** – Turns off program play, but does not erase the program list
- Program Delete** – Erases the program list and turns off program play
- Program Memory** (DVD only) – Select On to save the program list for the disc loaded. (Select Off to cancel the program memory for the disc loaded)

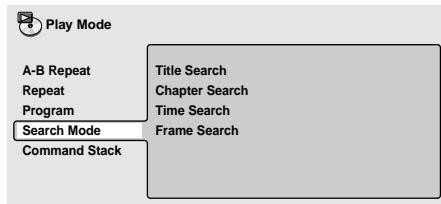
 **Tip**

- Program lists are saved for the DVD disc loaded. When you load a disc with a saved program list, program play is automatically turned on.
- You can save program lists for up to 24 discs. After that, the oldest one is replaced with the new one saved.

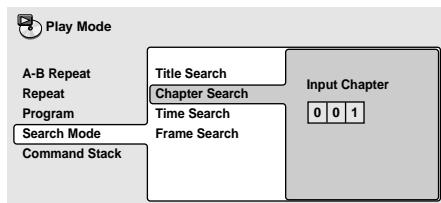
Searching a disc

You can search DVD discs by title or chapter number, by time or frame. CDs can be searched by track number, and Video CDs by track number or time.

- 1 Press **PLAY MODE** and select 'Search Mode' from the list of functions on the left. The search options that appear depend on the kind of disc loaded. The screen below shows the DVD search options.



- 2 Select a search mode.
- 3 Use the number buttons to enter a title, chapter, track number, a time or a frame.



- For a time search, enter the number of minutes and seconds into the currently playing title (DVD) or track (Video CD) you want playback to resume from. For example, press **4, 5, 0, 0** to have playback start from 45 minutes into the disc. For 1 hour, 20 minutes and 30 seconds, press **8, 0, 3, 0**.

- 4 Press **ENTER** to start playback.



Note

- The disc must be playing in order to use time search or frame search.
- Search functions are not available with Video CDs in PBC mode, or unfinalized CD-R/RW discs.
- The frame search function cannot be used with a VR format DVD-RW.

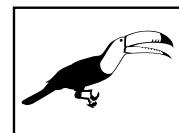
Zooming the screen

Using the zoom feature you can magnify a part of the screen by a factor of 2 or 4, while watching a DVD or Video CD.

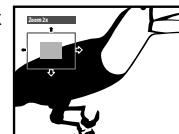
- 1 During playback, use the **ZOOM** button to select the zoom factor.

- Normal
- 2x
- 4x

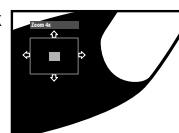
Normal



Zoom 2x



Zoom 4x



• Since DVD and Video CD have a fixed resolution, picture quality will deteriorate, especially at 4x zoom. This is not a malfunction.

- 2 Use the cursor buttons to change the zoomed area.

You can change the zoom factor and the zoomed area freely during playback.

- If the navigation square at the top of the screen disappears, press **ZOOM** again to display it.



Note

- We do not recommend using DVD disc menus when the screen is zoomed as menu options will not be highlighted.
- If you are displaying subtitles, these will disappear when the screen is zoomed. They will reappear when you return the screen to normal.

Chapter 7

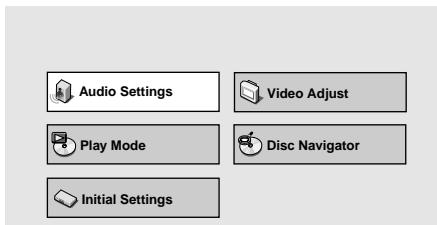
Audio Setting menu

Audio DRC

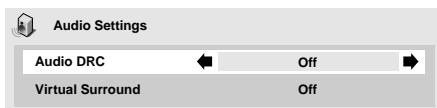
- Default setting: **Off**

When watching Dolby Digital DVDs at low volume, it's easy to lose the quieter sounds completely-including some of the dialog. Switching Audio DRC (Dynamic Range Control) to On can help by bringing up the quieter sounds, while controlling loud peaks. How much of a difference you hear depends on the material you're listening to. If the material doesn't have wide variations in volume, you may not notice much change.

1 Press HOME MENU and select 'Audio Settings' from the on-screen display.



2 Highlight Audio DRC, then use the ←/→ (cursor left/right) buttons to change to 'On' or 'Off', as required.



3 Press ENTER to make the setting and exit the Audio Settings screen.



Note

- Audio DRC is only effective with Dolby Digital audio sources.
- Audio DRC is only effective through the digital output when **Digital Out** (see page 19) is set to **On**, and **Dolby Digital Out** (see page 20) is set to **Dolby Digital > PCM**.
- The effect of Audio DRC depends on your speakers and AV receiver settings.

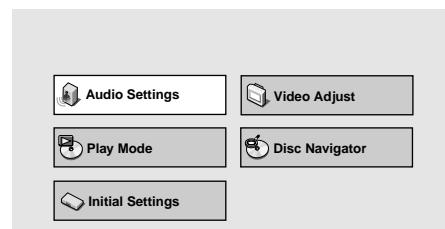
Virtual Surround

- Default setting: **Off**

Switch on Virtual Surround to enjoy surround sound effects from just two speakers.

When you play a Dolby Digital soundtrack, TruSurround technology from SRS produces a deep, realistic 3D soundspace from a pair of stereo speakers. SRS TruSurround is a process approved by Dolby Laboratories for Virtual Dolby Digital sound.

1 Press HOME MENU and select 'Audio Settings' from the on-screen display.



- 2 Highlight Virtual Surround, then use the \leftarrow/\rightarrow (cursor left/right) buttons to change to 'DVi/SRS TruSurround' or 'Off', as required.



- 3 Press ENTER to make the setting and exit the Audio Settings screen.



Tip

- You can also use the **SURROUND** button on the remote control to switch Virtual Surround on (**DVi/SRS TruSurround**)/Off.



Note

- Virtual Surround doesn't work with DTS or 96kHz linear PCM audio through either the analog or digital outputs.
- If the player is outputting Dolby Digital or MPEG bitstream audio (in other words, no conversion to PCM), Virtual Surround has no effect on the audio from the digital output. See *Digital Audio Out settings* on page 19 for how to set up the digital output formats.
- How good the surround effect is varies with the disc.

Chapter 8

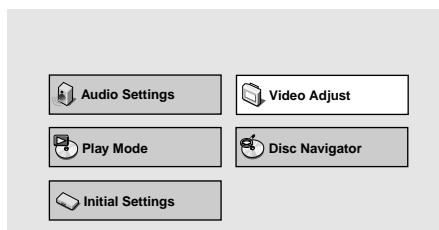
Video Adjust menu

Video Adjust

- Default setting: Standard

From the Video Adjust screen you can select the standard video presentation or define presets of your own.

1 Press HOME MENU and select 'Video Adjust' from the on-screen display.



2 Use the ←/→ buttons (cursor left/right) to select a preset.



- **Standard** – Normal
- **I. Memory1–2 / P. Memory1–2** – Use for making your own interlaced / progressive presets (see below)

3 Press ENTER to make the setting and exit the Video Adjust screen.

Note

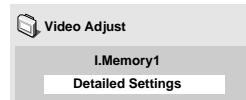
- Depending on the disc and the TV/monitor, you may not see the effect clearly.

Creating your own interlace output presets

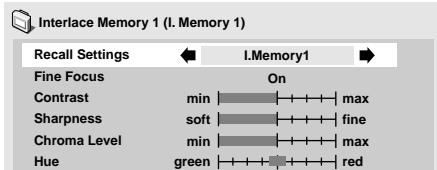
These presets are available when the video output is set to interlace. (Use the front panel **PROGRESSIVE** button to switch between interlace and progressive video output. See also page 15)

1 Select one of the Memory presets (see above).

2 Press ↓ (cursor down) to select 'Detailed Settings' then press ENTER.



3 Adjust the picture quality settings.



- Use the ↑/↓ buttons (cursor up/down) to select a setting.
- Use the ←/→ buttons (cursor left/right) to adjust the current setting.
- Press **DISPLAY** to switch between full and single view.
- You can change the preset number from the **Recall Settings** menu item.

You can adjust any or all of the following picture quality settings:

- **Fine Focus** – Switch **On** to reveal greater detail (high resolution) in the picture.
- **Contrast** – Adjusts the contrast between light and dark elements in the picture.

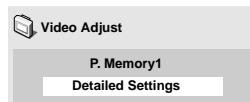
- **Sharpness** – Adjusts the sharpness of the mid-frequency (less detailed) elements in the picture. (This setting is only effective when **Fine Focus** is **On**.)
- **Chroma Level** – Adjusts how saturated colors appear.
- **Hue** – Adjusts the overall color balance between red and green. (This is only effective when the player is connected using the **VIDEO OUT** or **S-VIDEO OUT** jacks.)

4 Press ENTER to save the preset and exit the Video Adjust screen.

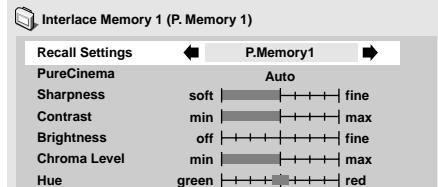
Creating your own progressive output presets

These presets are available when the video output is set to progressive. (Use the front panel **PROGRESSIVE** button to switch between interlace and progressive video output. See also page 15)

- 1 Select one of the Memory presets (see above).
- 2 Press ↓ (cursor down) to select 'Detailed Settings' then press ENTER.



3 Adjust the picture quality settings.



- Use the ↑/↓ buttons (cursor up/down) to select a setting.
- Use the ←/→ buttons (cursor left/right) to adjust the current setting.
- Press **DISPLAY** to switch between full and single view.
- You can change the preset number from the **Recall Settings** menu item.

You can adjust any or all of the following picture quality settings:

- **PureCinema** – When watching DVD movies, PureCinema optimizes the picture quality. The default setting is **Auto**, but if the picture appears unnatural, then set to **On** or **Off**, as appropriate.
- **Sharpness** – Adjusts the sharpness of the mid-frequency (less detailed) elements in the picture. (This setting is only effective when **Fine Focus** is **On**.)
- **Contrast** – Adjusts the contrast between light and dark elements in the picture.
- **Brightness** – Adjusts the overall brightness of the picture.
- **Chroma Level** – Adjusts how saturated colors appear.
- **Hue** – Adjusts the overall color balance between red and green.

4 Press ENTER to save the preset and exit the Video Adjust screen.



Note

• Video on a DVD discs may be either video material (originally shot on video) or film material (originally shot on film). Video material has a frame rate of 30 frames/sec.(NTSC), compared with 24 frames/sec. for film. This player converts film material to 60 frames/sec. (in progressive scan mode). PureCinema adjusts the picture so that it matches more closely the picture quality of a cinema screen.

You can see whether video on a DVD disc is film or video material by displaying the video transmission rate (see page 17). If a hash mark (#) appears next to the transmission rate display, it is film material.

Chapter 9

Advanced Setup Menu

In addition to the normal setup menu, this player includes an advanced setup menu for selecting special functions.

To access the ADV. SETUP menu

Press and hold the HOME MENU button for one second.

- The screen displays the Advanced Setup (ADV. SETUP) menu.

ADV. SETUP	
▶COMMAND STACK	OFF
POWER ON START	Single
TITLE PLAY MODE	OFF
KEY LOCK	OFF
REPEAT MODE	OFF
SERIAL PORT	15 Pin
BAUD RATE	19200 bps
EXTEND TERMINAL	Standard
SYNC OUT(DURING SQ)	OFF

- COMMAND STACK**

Press **ENTER** to begin inputting Command Stacks (see page 49).

- POWER ON START**

Automatic playback has no effect on the POWER ON START function.

Use **↔/→** (cursor left/right) buttons to alternate between **ON** and **OFF** (Default setting is **OFF**).

OFF: POWER ON START function is disabled.

ON: POWER ON START function is enabled. Press **ENTER** to set this function (see page 42).

- TITLE PLAY MODE**

Use **↔/→** (cursor left/right) buttons to alternate between **Single** and **All** (Default setting is **Single**).

Single: When a NAVI command ("Return to Menu", "Search for Specific Title", "Playback from Beginning of Title", etc.) follows a title, the specified operation is performed after the title finishes playing.

All: When playback of a single DVD disc title is complete, the next title plays and so on until all titles have played.

- KEY LOCK**

The Key Lock allows commands to be sent through the remote control and main panel buttons. However, **EXTEND TERMINAL** commands are always supported, regardless of this setting.

Use **↔/→** (cursor left/right) buttons to alternate between **ON** and **OFF** (Default setting is **OFF**).

OFF: Commands from remote control and main control panel buttons are allowed.

ON: Commands from remote control and main control panel buttons are limited. Press **ENTER** to set the KEY LOCK (see page 44).

- REPEAT MODE**

The Repeat command provides a way to loop playback for all or part of a DVD-Video disc. Use **↔/→** (cursor left/right) buttons to select **OFF/CHAPTER/TITLE/DISC** (Default setting is **OFF**).

(When **TITLE PLAY MODE** is set to **All**, "**DISC**" appears as an additional option).

OFF: No repeat play is performed.

CHAPTER: With DVD discs, repeat play is performed for a single chapter. With CD and video CD discs, repeat play is performed on a single track.

TITLE: A single title is repeated.

DISC: All content on the disc plays back again (repeats).

- **SERIAL PORT**

Set the RS-232C interface to use with a 15-pin connector or a 9-pin connector. Only a single type of connector may be used at a time. Use **↔** (cursor left/right) buttons to alternate between **15 Pin** and **9 pin** (Default setting is **15 Pin**).

15 Pin: When connecting to a PC using a Pioneer or other brand 15-pin to 9-pin cable.

9 Pin: When connecting to a PC using a commercial 9-pin cross-cable.

- **BAUD RATE**

Set the Baud rate for the RS-232C interface.

Use **↔** (cursor left/right) buttons to alternate between **19200 bps** and **9600 bps** (Default setting is **19200 bps**).

- **EXTEND TERMINAL**

Use the Extend Terminal to select a switch-key setting.

Use **↔** (cursor left/right) buttons to alternate between **Standard** and **User** (Default setting is **Standard**).

Standard: The unit responds according to established jama commands.

User: The user selects how the external option key responds. Press **ENTER** to activate this option (see page 46).

- **SYNC OUT (During SQ)**

Use SYNC OUT to determine if a video signal is sent when the player is not playing video.

Use **↔** (cursor left/right) buttons to alternate between **ON** and **OFF** (Default setting is **OFF**).

OFF: Video is output constantly; the sync signal is ON.

ON: Video is not output except during playback and when displaying menu screens (sync signal is OFF).

Power On Start

Sets playback mode when power is turned on.

- 1 **Press and hold HOME MENU for one second.**

The screen displays the ADV. SETUP menu.

- 2 **Use the ↓ (cursor down) button to select POWER ON START.**

ADV. SETUP	
COMMAND STACK	
► POWER ON START	OFF
TITLE PLAY MODE	Single
KEY LOCK	OFF
REPEAT MODE	OFF
SERIAL PORT	15 Pin
BAUD RATE	19200 bps
EXTEND TERMINAL	Standard
SYNC OUT(DURING SQ)	OFF

- 3 **Use the ←/→ (cursor left/right) buttons to select a mode other than OFF, then press ENTER.**

- When OFF is selected, the Power On Start function is disabled.

POWER ON START

- 1. TOP MENU

- 2. TITLE

- 3. BARCODE/COMMAND STACK

- 4 **Use the ↑/↓ (cursor up/down) buttons to select 1, 2, or 3, then press ENTER.**

If "TOP MENU" is selected in step 4

Press **ENTER** again to set the Power On Start mode. This option displays the top menu when the power is turned ON.

- POWER ON START
 - 1.TOP MENU => SET ENTER
 - 2.TITLE
 - 3.BARCODE/COMMAND STACK

- If the loaded disc does not have a top menu, the disc enters the Stop mode.
- If the **◀** (cursor left) button is pressed before **ENTER** is pressed, the selection is canceled.
- When **RETURN** is pressed, the option is set and the display returns to the POWER ON START screen in the ADV. SETUP menu.

If "TITLE" is selected in step 4

When "TITLE" flashes, use the **↑/↓** (cursor up/down) buttons or number buttons to input the desired title number.

When either **ENTER** or **▶▶** is pressed, the "CHAPTER" flashes. Use the **↑/↓** (cursor up/down) buttons or number buttons to input the chapter number.

Press **ENTER** again to confirm playback of a title or chapter when power is turned on.

- If the **◀** (cursor left) button is pressed before **ENTER** is pressed, the menu returns to the TITLE option screen.
- When **RETURN** is pressed, the option is set and the display returns to the POWER ON START screen in the ADV. SETUP menu.

If "BARCODE/COMMAND STACK" is selected in step 4

When "GROUP" flashes, use the **↑/↓** (cursor up/down) buttons or number buttons to input the group number.

Press **ENTER** to perform the series of commands in the barcode when the power is turned on.

- POWER ON START
 - 1.TOP MENU
 - 2.TITLE
 - 3.BARCODE/COMMAND STACK
GROUP 001

- If the **◀** (cursor left) button is pressed before **ENTER** is pressed, the menu returns to the BARCODE/COMMAND setting screen.
- When **RETURN** is pressed, the option is set and the display returns to the POWER ON START screen in the ADV. SETUP menu.

- POWER ON START
 - 1.TOP MENU
 - 2.TITLE
TITLE 01 CHAPTER 01
 - 3.BARCODE/COMMAND STACK

Key Lock

The Key Lock sets whether remote control or main panel buttons are enabled or disabled.

- 1 Press and hold HOME MENU for one second.
The screen displays the ADV. SETUP menu.
- 2 Use the ↓ (cursor down) button to select KEY LOCK.

ADV. SETUP	
COMMAND STACK	OFF
POWER ON START	Single
TITLE PLAY MODE	OFF
► KEY LOCK	OFF
REPEAT MODE	OFF
SERIAL PORT	15 Pin
BAUD RATE	19200 bps
EXTEND TERMINAL	Standard
SYNC OUT(DURING SQ)	OFF

- 3 Use the ←/→ (cursor left/right) buttons to toggle the setting ON then press ENTER.

Select OFF to disable the Key Lock function.

KEY LOCK	
► 1. TRAY LOCK	Off
2. IR	Enable
3. FRONT	Enable

- 4 Use the ↑/↓ (cursor up/down) buttons to select an item then the ←/→ (cursor left/right) buttons to set the item.

- 1. TRAY LOCK (Off/On)

With the Tray Lock **ON**, the disc tray cannot be opened by using the remote control's OPEN/CLOSE ▲ button, the front panel's ■/▲ button, or the RS-232C Tray Open command.

- 2. IR (Enable/Disable)

With the IR **Disabled**, the unit ignores commands sent from the remote control or through barcodes.

3. FRONT (Enable/Disable)

With Front **Disabled**, the unit ignores commands issued from the front panel.

- 5 Press RETURN to cause the display to return from the KEY LOCK setting screen to the ADV. SETUP menu.

To Temporarily Suspend KEY LOCK

The Key Lock setting is preserved even when the player's power is turned OFF. However, the Key Lock function can be temporarily suspended if necessary to change discs or modify other settings.

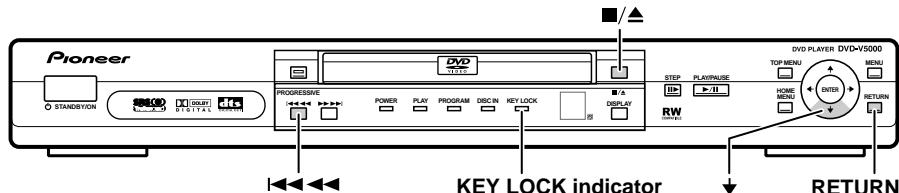
To temporarily suspend the Key Lock, hold down the RETURN button, the down arrow ↓ (cursor down), and ←→ buttons simultaneously for approximately 2 seconds.

- This release operation can be performed during playback if necessary.
- All KEY LOCK, TRAY LOCK functions are released and ordinary operations can be performed. This condition does not change any settings preserved in the player. If the power is turned off then back on, the unit reverts to the previous locked condition.
- With the KEY LOCK function temporarily suspended, hold down the RETURN button, the down arrow ↓ (cursor down), and the ←→ button simultaneously for approximately 2 seconds. The suspended condition ends and the unit returns to a locked status.



Note

- While the KEY LOCK function is temporarily suspended, even if the ADV. SETUP menu is opened and the KEY LOCK setting is changed, the temporarily suspended state continues when the ADV. SETUP menus is closed. The newly selected KEY LOCK setting only takes effect when the temporary suspension is ended.



Remote control



KEY LOCK indicator display specifications

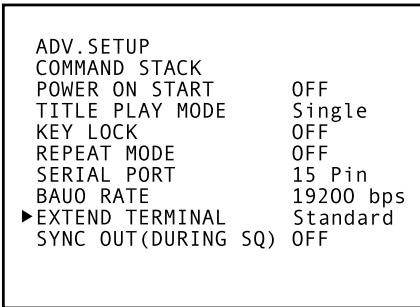
The status of the KEY LOCK indicator on the main unit's front panel is as follows:

KEY LOCK Setting			KEY LOCK indicator display
TRAY LOCK	IR	FRONT	
Off	Enable	Enable	[Not lighted]
On	Enable	Enable	[Not lighted] Flashes for 2 seconds when remote control's OPEN/CLOSE ▲ button is pressed or when the front panel's □/▲ button is pressed while the unit is in the stop mode.
Off	Disable	Enable	[Lighted] Flashes for 2 seconds when remote control button is pressed.
On	Disable	Enable	[Lighted] Flashes for 2 seconds when a remote control button is pressed or when the front panel's □/▲ button is pressed while the unit is in the stop mode.
Off	Enable	Disable	[Lighted] Flashes for 2 seconds when main unit control button is pressed.
On	Enable	Disable	[Lighted] Flashes for 2 seconds when the front panel's control button or the remote control's OPEN/CLOSE ▲ button is pressed.
Off	Disable	Disable	[Lighted] Flashes for 2 seconds when the front panel's control button or the remote control's OPEN/CLOSE button is pressed.
			[Lighted] Flashes for 2 seconds when main unit control button or remote control button is pressed.

Extend Terminal

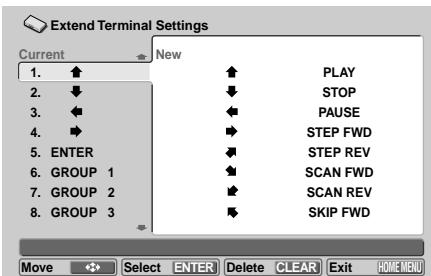
Sets the function of the switch connected to the EXT TERMINAL (see page 68).

- Press and hold the HOME MENU button for one second.**
The screen displays the ADV. SETUP menu.
- Use the ↓ (cursor down) button to select EXTEND TERMINAL.**



- Use the ←/→ (cursor left/right) buttons to select "User" then press ENTER.**

- Selecting "Standard" sets the unit to respond according to established jama commands.
- When "User" is selected, the function of the terminal switch can be set by the user.



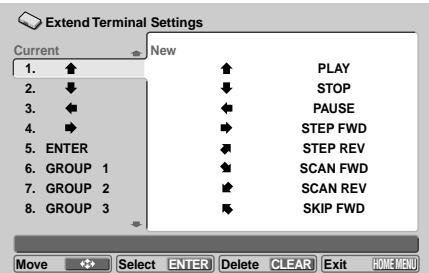
- Press RETURN to move from the Extend Terminal Setting menu to the ADV. SETUP menu.**

Press **HOME MENU** to return from the Extend Terminal Setting menu to the idle condition.

Recording Settings

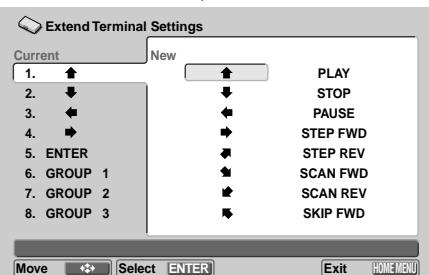
● Select "Current" Settings

- Up to 30 "Current" settings can be recorded
- Use the ↑/↓ (cursor up/down) buttons to select the desired item.



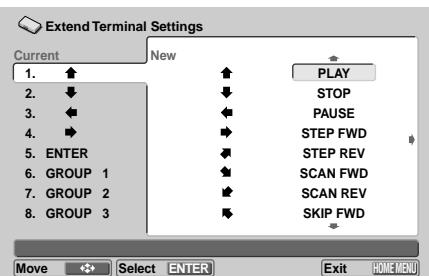
● Select Cursor Functions

- Eight cursor functions can be selected
- Use the ←/→/↑/↓ (cursor left/right/up/down) buttons to select, then press **ENTER**. Cancelation is not possible.



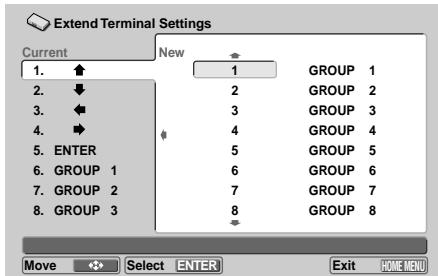
Operation Functions

- Up to 24 operation functions are available
- Use the ←/→/↑/↓ (cursor left/right/up/down) buttons to select then press **ENTER**. Cancelation is not possible.



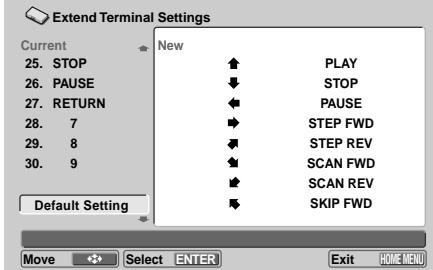
● Number Functions

- Up to 21 number functions are available
- Use the **←/→/↑/↓** (cursor left/right/up/down) buttons to select then press **ENTER**.
Cancellation is not possible.



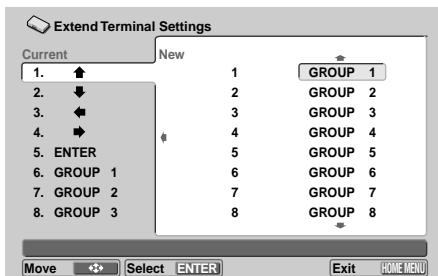
● Return To Factory Default Setting

- With "Default Setting" selected, press **ENTER** to reset the unit to its factory default settings.



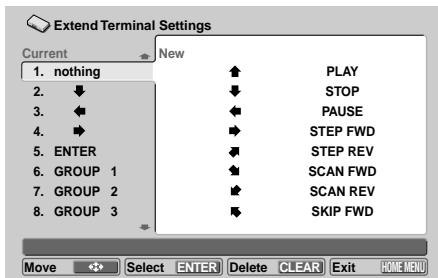
● Command Stack Functions

- Up to 27 command stack functions are available
- Use the **←/→/↑/↓** (cursor left/right/up/down) buttons to select then press **ENTER**.
Cancellation is not possible.



● Not-Set Function

- In the Current mode, press **CLEAR** to force the non-set condition (a button does not respond even if pressed).



Changing the setting

The function of the diode assignment can be changed within a range of 1 to 30 (Current).

Example:

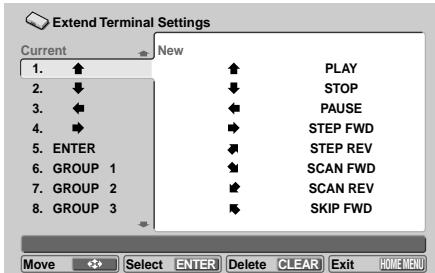
Changing "GROUP 3" (Default) to "MENU"

- 1 Press and hold HOME MENU for one second.

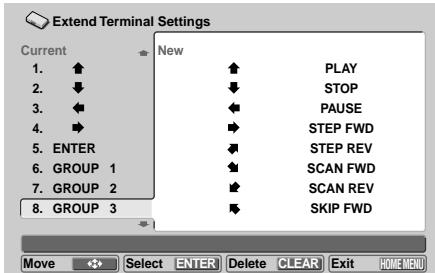
The screen displays the ADV. SETUP menu.

- 2 Use ↓ button (cursor down) to select EXTEND TERMINAL.

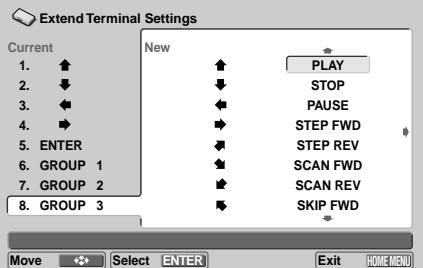
- 3 Use ←/→ button (cursor left/right) to select "User" then press ENTER.



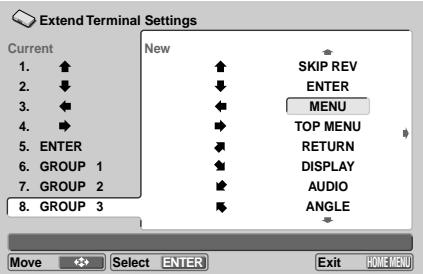
- 4 Use ↓ button (cursor down) to select "GROUP 3".



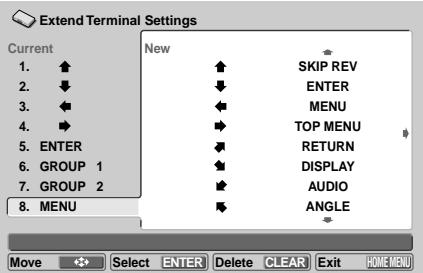
- 5 Press → button (cursor right).



- 6 Use ↓ button (cursor down) to select MENU.



- 7 Press ENTER.



- 8 Press RETURN to move from the Extend Terminal Setting menu to the ADV. SETUP menu.

- Press HOME MENU to return from Extend Terminal Setting menu to the idle condition.
- Changed settings are saved within the player even if the power is disconnected.

Chapter 10

Barcode Stack / Command Stack

Barcode / Command Stack Function

The following operations can be performed within a Barcode Stack / Command Stack function:

- Pre-recording of barcode commands in player (barcode stack function)
- Remote control used to set commands when barcodes are not available or when desired commands are not available in barcodes (command stack function).
- Remote control can be used to call up recorded contents for continuous or step-by-step performance.



Important

- Barcode stack and command stack functions cannot be used with video CDs or music CDs.



Note

- The player allows a maximum of 300 step.
- The recorded data is preserved even if the power is disconnected.

Basic operation

Basic use of barcode stack/command stack functions are as follows:

For detailed explanations of each item, refer to the page indicated after the arrow (→):

- 1 **Use the remote control to select the barcode stack/command stack setting menu**
→ Page 50
- 2 **Use a barcode reader to read barcodes and transfer the data to the player**
→ Page 51
Use the remote control to read/transfer barcodes
→ Pages 50 – 56
- 3 **Perform repetitive input as from step 2
(Use a barcode reader to read barcodes and transfer data to the player)**
- 4 **Retain data in player memory after input**
→ Page 57
- 5 **Command execution**
→ Page 62

Advanced Functions

The barcode stack/command stack functions can be memorized in separate groups so as not to affect previously input commands. For example, recording the contents of multiple discs separately or allow multiple people to use a single player.

Record commands in a separate group from previously input contents

1 Create new group

→ Page 59

At the left side of the barcode stack/command stack input screen is the current memory group number (**Group002**). This group number is necessary for performing commands. The user should make note of these numbers for later reference.

2 Use a barcode reader to read barcodes and transmit to player

→ Page 51

The remote control unit can also be used to input the numbers.

→ Pages 50 – 56

3 Repeat step 2 in the desired playback order

4 After inputting the commands, retain the data in player memory

→ Page 57

5. Execute

→ Page 62

Select the group number as noted in step 1.



Tip

Commands already recorded in the player's memory can be reordered in one or more groups.

→ Pages 60 – 61

However, the order of commands cannot be changed.

Barcode Stack/Command Stack Settings

DVD barcode commands are recorded by the player. These commands can be called up to perform continuous or step-by-step playback. The recorded data is retained even if the power is disconnected.

Access Barcode Stack / Command Stack Menu

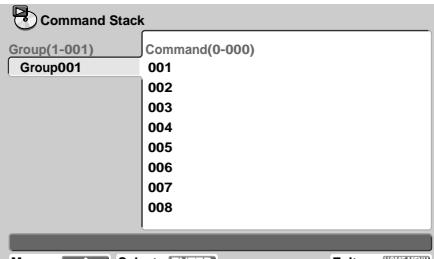
1 Press and hold HOME MENU for one second.

The screen displays the ADV. SETUP menu.

2 Use the ↓ (cursor down) button to select "COMMAND STACK."

ADV. SETUP	
▶ COMMAND STACK	
POWER ON START	OFF
TITLE PLAY MODE	Single
KEY LOCK	OFF
REPEAT MODE	OFF
SERIAL PORT	15 Pin
BAUD RATE	19200 bps
EXTEND TERMINAL	Standard
SYNC OUT(DURING SQ)	OFF

3 Press ENTER.



- Instructions for using this menu screen are available in the following sections.
- To set a barcode stack/command stack, use either a barcode reader (sold separately) or the remote control.

Direct setting using a barcode reader

1 Use the barcode reader to input the barcodes.

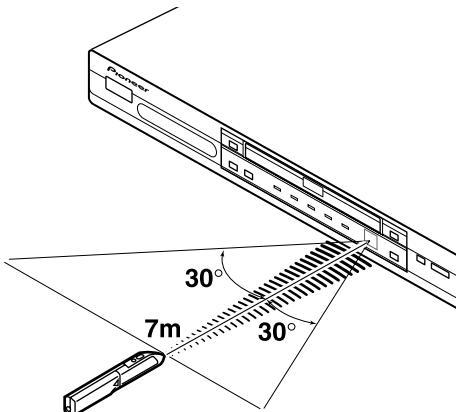
2 Transmit to player.

[Example 1]

Read in and transmit to player: "PLAY."

[example 2]

Read in and transmit to player: "Playback chapters 5 – 12 of title 8 as subtitle 3, audio 2, angle 1."



Note

- Attempting to use the remote control or player control buttons while performing barcode operations can cause the player to malfunction.
- When barcodes are used to operate the player, On Screen Displays (OSD: operation indicators such as [Play] and [Stop]) do not appear.
- Commands other than DVD barcodes are ignored.

Using the remote control unit to make settings

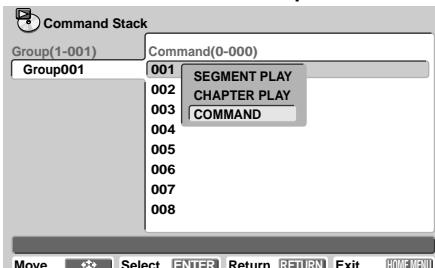
The remote control unit can be used to set the five operating commands **PLAY**, **PAUSE**, **STEP FWD/REV**, and **STOP**, as well as **WAIT** and **GO TO GROUP**.

Other related commands available through the remote control include Chapter Search, Chapter Play, Frame Search, and Frame Segment Play.*

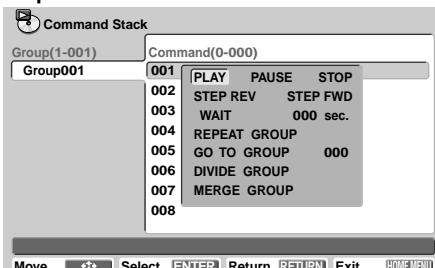
* Frame Segment Play plays back a desired frame interval.

Example 1: "PLAY"

- Press **ENTER** in the command input area.
- Use the **↑/↓** (cursor up/down) buttons to select "COMMAND" then press **ENTER**.

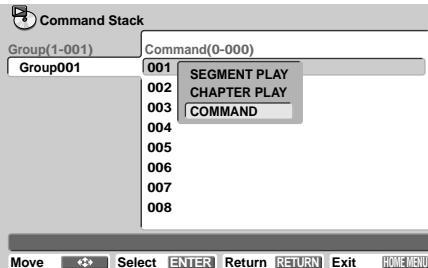


- Use the **↑/↓/←/→** (cursor up/down/left/right) buttons to select **PLAY** then press **ENTER**.

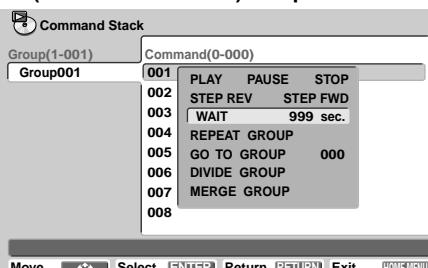


Example 2: Input wait time

- 1 Press ENTER in the command input area.
- 2 Use the **↑/↓** (cursor up/down) buttons to select "COMMAND" then press ENTER.



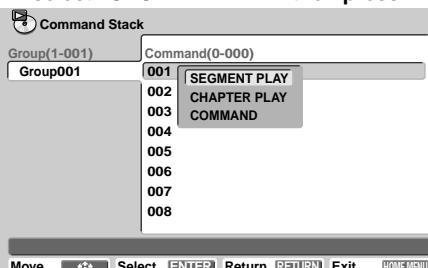
- 3 Use the **↑/↓/←/→** (cursor up/down/left/right) buttons to select WAIT then use the number buttons to select the desired time (wait for 'x' seconds) and press ENTER.



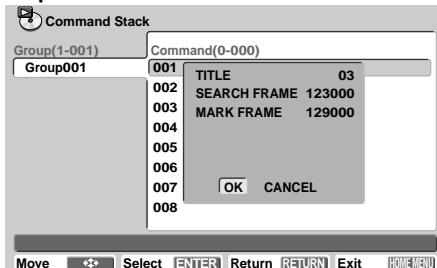
The wait length can be set up to 999 seconds.

Example 3: "Play title 3, frames 123000 to 129000"

- 1 Press ENTER in the command input area.
- 2 Use the **↑/↓** (cursor up/down) buttons to select "SEGMENT PLAY" then press ENTER.



- 3 Press number button 3 then ENTER. Title 3 is designated and frame input mode is set.
- 4 Press **1 → 2 → 3 → 0 → 0 → 0 → ENTER**
 - The starting frame number is designated.
 - To enter this sequence during playback, use the search function to find the desired starting frame.
- 5 Press **1 → 2 → 9 → 0 → 0 → 0 → 0 → ENTER**
 - The ending frame number is marked.
 - During playback, press the **ENTER** key instead of using the number buttons from steps 3 – 4. This action causes the currently playing frame to be input as the ending frame number.
- 6 Use the **↑/↓/←/→** (cursor up/down/left/right) buttons to select "OK" then press ENTER.

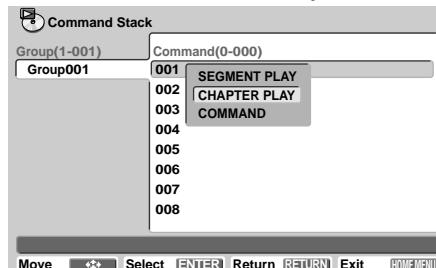


Note

- There must be a difference of at least 25 frames between the "search frame" (starting frame) and the "mark frame" (ending frame). This method is unavailable for fewer than 24 frames.
- Frame search and frame segment playback cannot be used with VR formatted DVD-RW discs.

Example 4: "Play title 5, chapter 3 to 7, subtitle 3, audio 2, angle 1"

- 1 Press ENTER on the command input area.
- 2 Use the **↑/↓** (cursor up/down) buttons to select "CHAPTER PLAY" then press ENTER.



- 3 Press number button 5 then press ENTER.

- Title 5 is selected and the chapter input mode is set.

- 4 Press number button 3 then press ENTER.

- The starting chapter number is assigned.

- 5 Press number button 8 then press ENTER.

- To play to the end of chapter 7, the "**MARK CHAPTER**" command is given a value of 1 increment higher (8).

- The ending chapter number is assigned.

- 6 Press number button 3 then press ENTER.

- Subtitle 3 is selected.

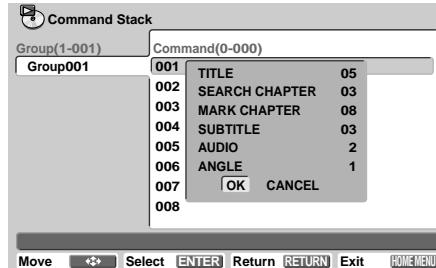
- 7 Press number button 2 then press ENTER.

- Audio 2 is selected.

- 8 Press number button 1 then press ENTER.

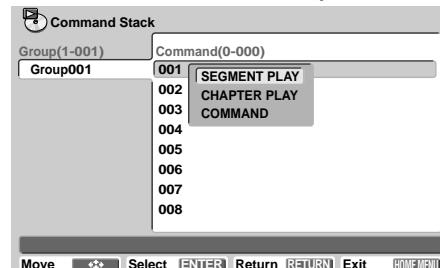
- Angle 1 is selected.

- 9 Use the **↑/↓/←/→** (cursor up/down/left/right) buttons to select "OK" then press ENTER.



Example 5: Select subtitle 1, audio 2, angle 3

- 1 Press ENTER on the command input area.
- 2 Use the **↑/↓** (cursor up/down) buttons to select "SEGMENT PLAY" then press ENTER.



- 3 Use the **↑/↓** (cursor up/down) buttons to select "SUBTITLE" then press number button 1 followed by ENTER.

- Subtitle 1 is selected and the audio input mode is set.

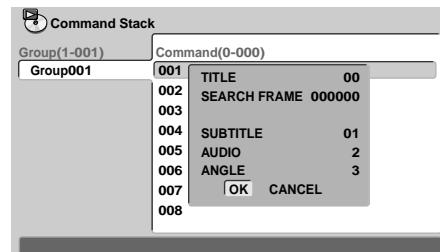
- 4 Press number button 2 then press ENTER.

- Audio 2 is selected and the angle input mode is set.

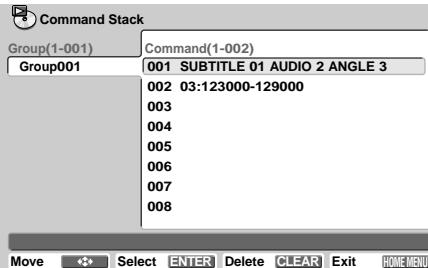
- 5 Press number button 3 then press ENTER.

- Angle 3 is assigned.

- 6 Use the **↑/↓/←/→** (cursor up/down/left/right) buttons to select "OK" then press ENTER.



- When using the play command with a starting frame and ending frame, the subtitle, audio, and angle commands cannot be set simultaneously. By inputting the subtitle, audio, and angle setting commands before the frame interval play command, the selected settings are applied to the selected playback interval.



In this example, if commands are input in the order shown above then Title 3 Frames 123000 - 129000 are played back as subtitle 1, audio 2, angle 3.

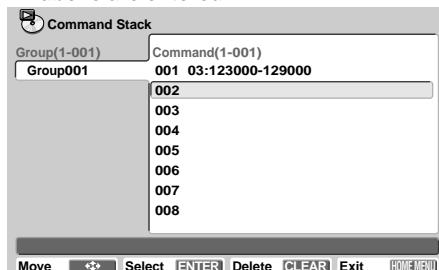


Tip

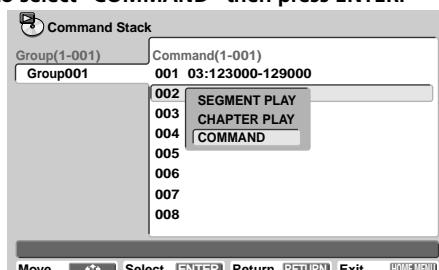
- With the exception of the frame interval play command, when the frame search, chapter search, or chapter interval play commands are used, the various settings designated within the commands are supported.

Example 6: To loop commands in example 3 -- Play title 3, frames 123000 to 129000 -- (repeat play)

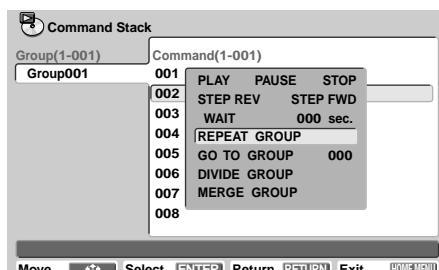
- Perform steps 1 through 6 in example 3.
- Press ENTER after all commands noted above are entered.



- Use the ↑/↓ (cursor up/down) buttons to select "COMMAND" then press ENTER.

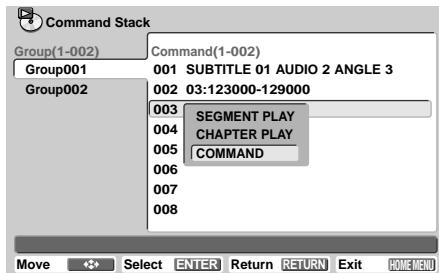


- Use the ↑/↓/←/→ (cursor up/down/left/right) buttons to select "REPEAT" then press ENTER.

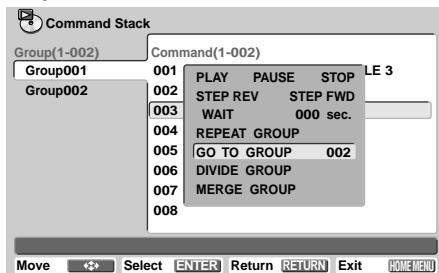


Example 7: Input command to jump to another group

- 1 Press ENTER on the command input area.
- 2 Use the **↑/↓** (cursor up/down) buttons to select "COMMAND" then press ENTER.



- 3 Use the **↑/↓/←/→** (cursor up/down/left/right) buttons to select "GO TO GROUP." Press a number button corresponding to the number of the group you wish to jump to then press ENTER.



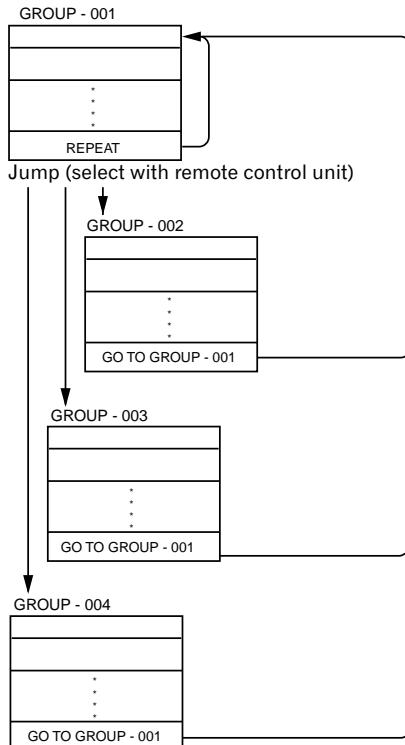
- To modify (correct) the number of a previously input **GO TO GROUP** command, the number must be input again.

→ Page 57 (Correcting Settings)

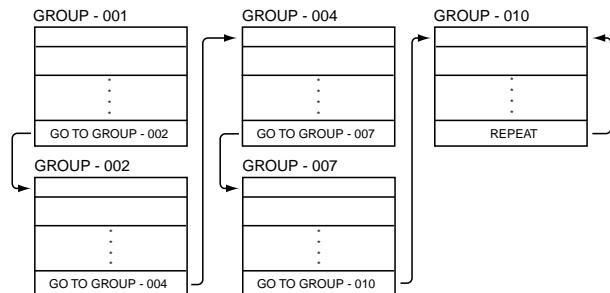
By using this command, multiple groups of commands can be executed in sequence.

By creating a wait-screen group to run after each group of commands is executed, the display can return to the wait screen rather than continuing.

<Conceptual Diagram>



<Conceptual Diagram>



How to set SUBTITLE, AUDIO, ANGLE

SUBTITLE:

- Input 00 to cause the background to change to the GUI menu's background color and the Playback Menu to disappear.
- Input 01 – 32 to display the corresponding subtitle.
- Input 33 to hide any subtitles when playback starts.
- Input 34 to restore the Playback Menu previously hidden with the 00 command.
- Input 99 to retain the previous status. Use this command to preserve the SUBTITLE setting while changing other settings.
- Numbers 35 – 98 are not supported.

AUDIO

- Input 0 to playback video without audio.
- Input 1 – 8 to select the corresponding audio for playback.
- Input 9 to preserve the previous status.

ANGLE

- Input 1 – 8 to select the corresponding angle for playback.
- Input 9 to preserve the previous status.
- Input 0 to select angle 9 for playback.



Note

- When a command is used to "preserve the previous status," an asterisk (*) appears on the input screen.
- If an input number does not correspond to a number actually recorded on the disc, the command stack is ignored.

Performing chapter search or frame search only

At a MARK CHAPTER or MARK FRAME item, do not enter a setting but press ENTER at the 'OK' message.

- After performing a search, the player displays a still image.



Note

- The frame search function cannot be used with DVD-VR discs.

To change numbers during input:

Use the number buttons to input the correct number (including "0") again.

- To return to the above setting location, press the ↑ (cursor up) button.

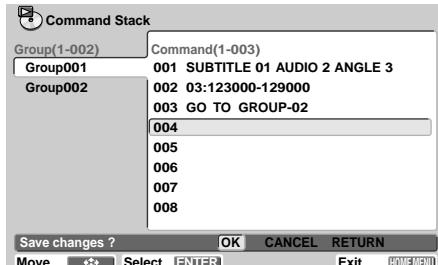
To cancel an operation during input:

Press RETURN.

Retain (Prserve) Barcode Stack/Command Stack settings

1 Press HOME MENU or RETURN with the group or command selected.

2 Use the **←/→** (cursor left/right) buttons to select "OK" then press ENTER.

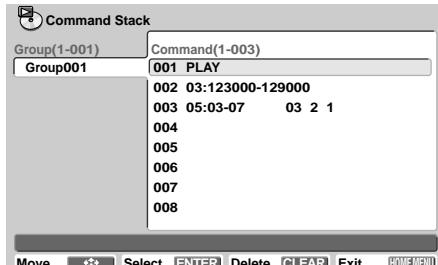


Note

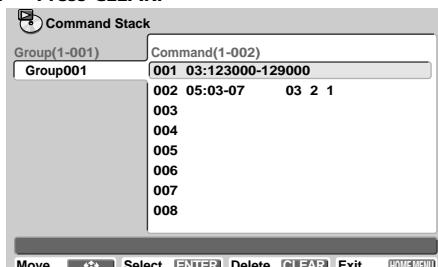
- Settings are not saved if **ENTER** is pressed when "CANCEL" is highlighted.

Erase Barcode Stack/Command Stack Settings

1 Use the **↑/↓** (cursor up/down) buttons to select the step to be erased.



2 Press **CLEAR**.



- The selected step is erased and the following steps increment up.

3 Save the change.

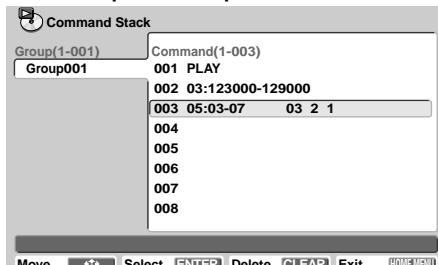
Important

- During the save step after an erase operation, the step will not be erased if **ENTER** is pressed on "CANCEL." The erasure is confirmed and recorded only when **ENTER** is pressed on "OK."

Modify Barcode Stack/Command Stack Settings

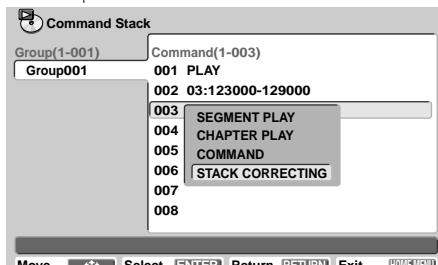
Example: To change audio setting from 2 to 1 on step 003

1 Use the **↑/↓** (cursor up/down) buttons to select step 003 then press **ENTER**.

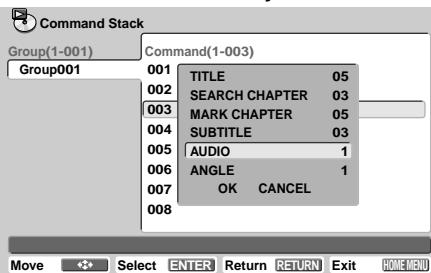


2 Use the **↑/↓** (cursor up/down) buttons to select "STACK CORRECTING" then press **ENTER**.

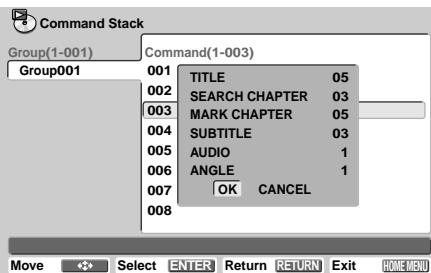
- "**STACK CORRECTING**" appears only after a step has been entered.



- 3 Press ENTER or the ↓ (cursor down) button 4 times to select "AUDIO." Press the number button 1 followed by ENTER.



- 4 Use the ↑/↓/←/→ (cursor up/down/left/right) buttons to select "OK" then press ENTER.



- 5 Save the change.

Add Barcode Stack/Command Stack Settings

- 1 Use the ↑/↓ (cursor up/down) buttons to select where the new command will be inserted.
- 2 Press ENTER.
- 3 Build a Barcode Stack/Command Stack according to the previous instructions. (Pages 50 - 56).
- 4 Save the addition.



Important

- Changes are only saved when OK is highlighted and ENTER is pressed. If "CANCEL" is highlighted when the ENTER button is pressed, all corrections are lost.



Important

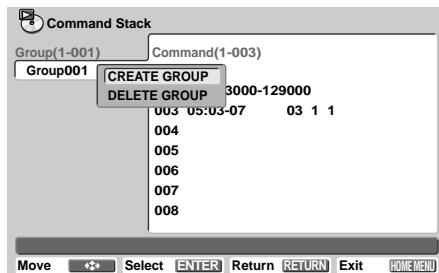
- Changes are only saved when OK is highlighted and ENTER is pressed. If "CANCEL" is highlighted when the ENTER button is pressed, all corrections are lost.

Grouping Barcode Stacks and Command Stacks

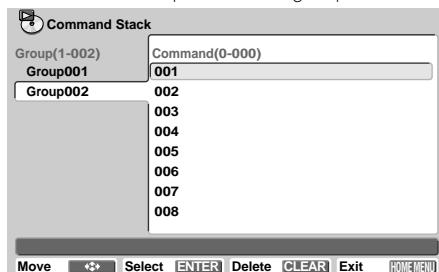
Barcode stacks and command stacks can be assembled into groups. By creating multiple groups, their commands can be saved together. When executed, stacks can be performed as a single series of commands, or a single step can be selected from a group for independent execution. Grouped stack can also be divided and/or steps erased if desired.

Create a Group

- 1 Highlight GROUP and press ENTER.
- 2 Use the **↑/↓** (cursor up/down) buttons to select "CREATE GROUP."



- 3 Press ENTER.
- The display changes to the input screen for the first step of the next group.

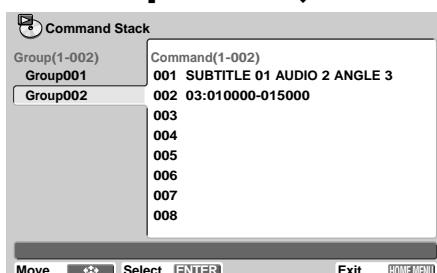
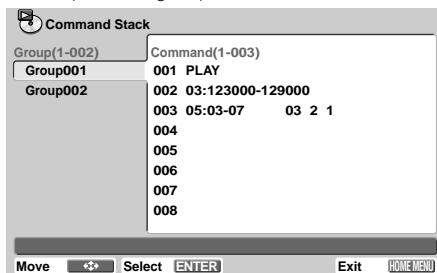


- From this point, you can select the next barcode stack/command stack step for the group.

Switch Between Groups

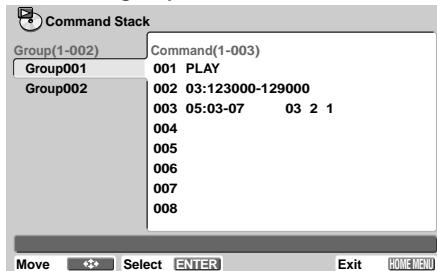
Use the **↑/↓** (cursor up/down) buttons to highlight the desired group.

- Press the **↓** (cursor down) button to move to the next group.
- Press the **↑** (cursor up) button to move to the previous group.



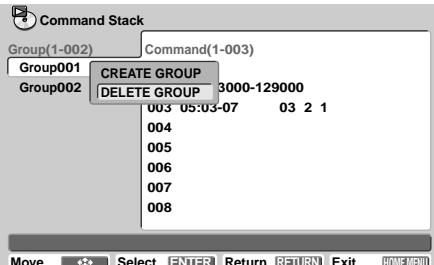
Delete Groups

- 1 Use the **↑/↓** (cursor up/down) buttons to select the group to be deleted.

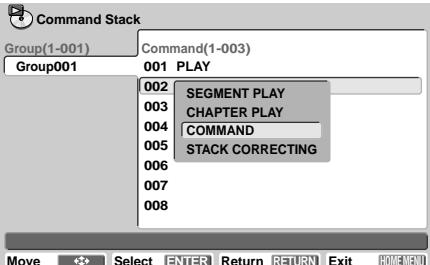


- 2 Press ENTER then use the **↑/↓** (cursor up/down) buttons to select "DELETE GROUP."

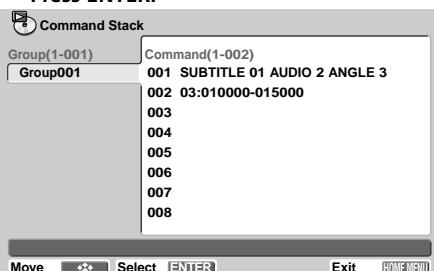
Barcode Stack / Command Stack



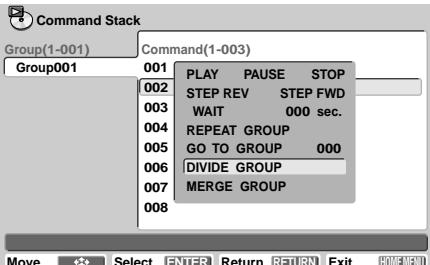
3 Use the ↑/↓ (cursor up/down) buttons to select "COMMAND" then press ENTER.



3 Press ENTER.



4 Use the ↑/↓/←/→ (cursor up/down/left/right) buttons to select "DIVIDE GROUP."



4 Save the change.



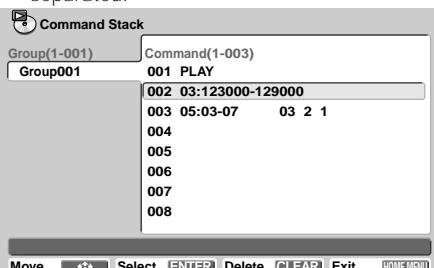
Important

- Deletions are only saved when OK is highlighted and ENTER is pressed. If "CANCEL" is highlighted when the ENTER button is pressed, all deletions are ignored.

Dividing a joined group

1 Use the ↑/↓ (cursor up/down) buttons to select the group to be divided.

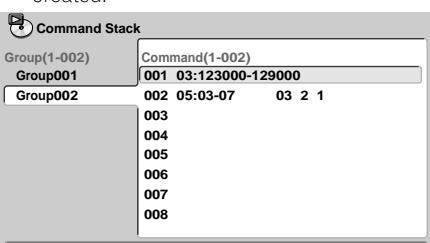
- Highlight the first step of the group to be separated.



2 Press ENTER.

5 Press ENTER.

- The group is divided and a new group is created.



- The display changes to the barcode stack/command stack input menu at the first step of the newly created group.

6 Save the change.



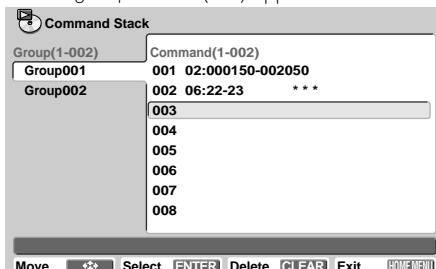
Important

- Group splits are only saved when OK is highlighted and ENTER is pressed. If "CANCEL" is highlighted when the ENTER button is pressed, all divisions are removed.

Merge Groups

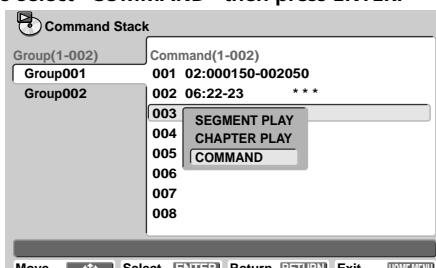
1 Use the **↑/↓** (cursor up/down) buttons to select the next available step.

- The group divider (*** appears here.

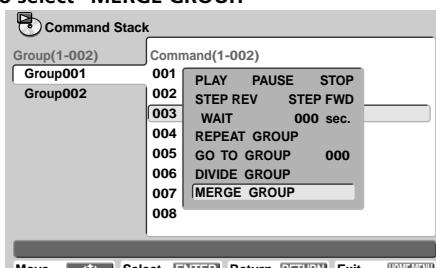


2 Press ENTER.

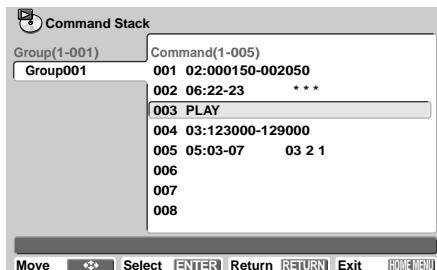
3 Use the **↑/↓** (cursor up/down) buttons to select "COMMAND" then press ENTER.



4 Use the **↑/↓** (cursor up/down) buttons to select "MERGE GROUP."



5 Press ENTER.



- The group divider is erased and the previous group is joined with the following group.
- The group number is adjusted for each subsequent group.

6 Save the change.



Important

- Merges are only saved when OK is highlighted and ENTER is pressed. If "CANCEL" is highlighted when the ENTER button is pressed, all merges are reversed.



Note

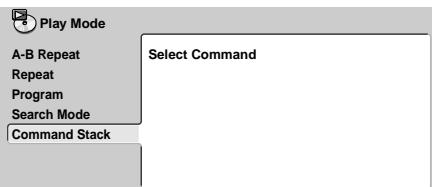
- If the power is interrupted while saving a barcode stack/command stack during video playback and the disc is still spinning, the settings are not recorded.

When disconnecting the power cord, always turn off the main power switch first (the power indicator is not lit) or use the remote control to set the unit to Standby mode (the power indicator changes to red).

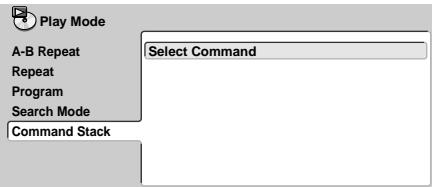
Execute a Barcode Stack / Command stack

Execute a group

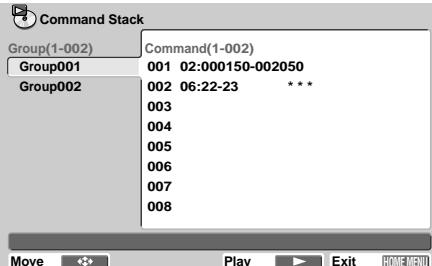
- 1 Load the disc.
- 2 Press PLAY MODE and select "Command Stack."



- 3 Select "Select Command" and press ENTER.

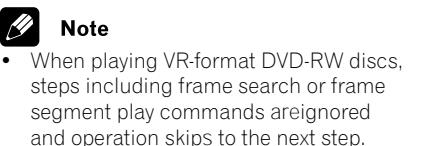


- 4 Use the **↑/↓** (cursor up/down) buttons to select the number of the command group you wish to execute.



- 5 Press **PLAY ▶**.

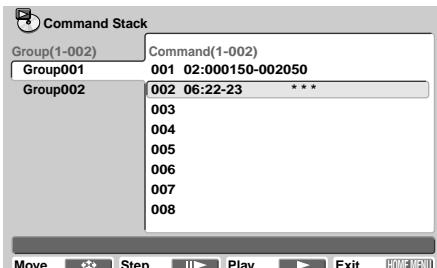
- The set group begins executing.



Execute a step within a group

- 1 Load the disc.
- 2 Press PLAY MODE and select "Command Stack."
- 3 Select "Select Command" and press ENTER.
- 4 Use the **↑/↓** (cursor up/down) buttons to select the number of the command group you wish to execute and press ENTER.

- 5 Use the **↑/↓** (cursor up/down) buttons to select the number of the step you wish to execute.



- 6 Press **PLAY ▶** or **ENTER**.

- The set group and step begin executing.
- If the **II▶/I◀** button is pressed instead of **PLAY ▶**, execution proceeds one step at a time. To proceed to the next step, press the **▶I** button. To return to the previous step, press the **I◀** button.
- If "Stack Repeat" is selected in PLAY MODE, execution of the group plays/loops repeatedly.



Important

- Some titles do not support calling up and executing steps.

Example: Titles without on-screen chapters, time displays or that do not support search functions will reject a search command.

Chapter 11

Additional information

Taking care of your player and discs

Handling discs

When holding discs of any type, take care not to leave fingerprints, smears or scratches on the disc surface. Hold the disc by an edge or pinched between the center hole and an edge. Damaged or dirty discs can affect playback performance. Take care also not to scratch the label side of the disc. Although not as fragile as the recorded side, scratches can still result in a disc becoming corrupted or unusable. Should a disc become marked with fingerprints, dust, etc., clean using a soft, dry cloth, wiping the disc lightly from the center to an outside edge as shown in the diagram below.



Wipe lightly from the center of the disc using straight strokes.



Don't wipe the disc surface using circular strokes.

If necessary, use a cloth soaked in alcohol, or a commercially available CD/DVD cleaning kit to clean a disc more thoroughly. Never use benzine, or any other cleaning agents, including products designed for cleaning vinyl records.

Storing discs

Although CDs and DVD discs are more durable than vinyl records, you should still handle and store discs carefully. When not in use, return the disc to its jewel case or jacket and store vertically. Avoid leaving discs in excessively cold, humid, or hot environments (including in direct sunlight).

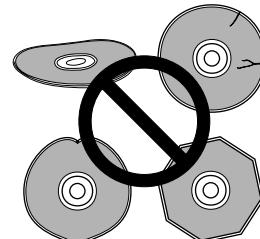
Do NOT place paper stickers onto the disc. When writing on a disc, do NOT mark with a pencil, ball-point pen, or other sharp-tipped writing instrument that may damage a disc.



For more detailed care information see the instructions that come with the discs.
Do not load more than one disc into the player at a time.

Discs to avoid

Discs spin at high speeds inside the player. Discs that are cracked, chipped or warped can damage or possibly destroy the player's optics.



This player is designed for use with conventional, circular discs only. Shaped discs such as business card sized are not recommended for this product. Pioneer disclaims all liability arising in connection with the use of shaped discs.

Cleaning the unit's exterior

- Use a polishing cloth or dry cloth to wipe off dust and dirt. If the surfaces are very dirty, wipe with a soft cloth dipped in some neutral cleanser diluted five or six times with water. Wring out the cloth well before wiping then use a dry cloth to wipe again.
- Do not use furniture wax or cleaners. Never use thinners, benzine or insecticide sprays or other chemicals on or near this unit since these chemicals can corrode the surfaces.
- If you use a chemically-treated cleaning cloth, read the instructions carefully before use. These cloths may leave smear marks on half-mirror finish surfaces; if this happens, finish with a dry cloth.
- Unplug the unit when cleaning.

Cleaning the pickup lens

The DVD player's lens should not become dirty in normal use; if for some reason it should malfunction due to dust or dirt, consult your nearest Pioneer-authorized service center. Although lens cleaners for CD players are commercially available, we do not recommend using them since some may damage the lens.

Problems with condensation

Condensation may form inside the player if it is brought into a warm room from outside, or if the temperature of the room rises quickly. Although the condensation won't damage the player, it may temporarily impair its performance. For this reason you should allow it to adjust to the warmer/cooler temperature for approximately an hour before switching on the unit.

Hints on installation

We want you to enjoy using this product for years to come, so please bear in mind the following points when choosing a suitable location for it:

Do...

- Use in a well-ventilated room
- Place on a solid, flat, level surface, such as a table, shelf or stereo rack

Don't...

- Place where exposed to high temperatures or humidity, including near radiators and other heat-generating appliances
- Place on a window sill or other place where the player will be exposed to direct sunlight
- Use in an excessively dusty or damp environment
- Place directly on top of an amplifier, or other component in your playback system that becomes hot in use
- Use near a television or monitor as you may experience interference-especially if the television uses an indoor antenna
- Use close to a room where the player may be exposed to smoke or steam
- Use on a thick rug or carpet or cover with cloth-this may prevent proper cooling of the unit
- Place on an unstable surface, or one that is not large enough to support all four of the unit's supports

Moving the player

If you need to move the player, first press  STANDBY/ON on the front panel to turn the player off. Wait for POWER indicator to turn orange then unplug the power cable. Never lift or move the unit when a disc is playing or is still spinning as this shift may cause damage.

Power cable caution

Handle the power cable by the plug part. Do not pull out the plug by tugging the cable. Never touch the power cable when your hands are wet as this could cause a short circuit or electrical shock. Do not place anything on the power cord that could pinch or damage the cable in any other way. Never make a knot in the cable or tie it in a bundle with other cables. Power cables should be routed so that they are not likely to be stepped on. A damaged power cable can cause a fire or give an electrical shock. Inspect the cord periodically for damage or wear. If it needs to be replaced, ask your nearest Pioneer authorized service center or your dealer for a replacement.

Screen sizes and disc formats

DVD-Video discs come in several different screen aspect ratios, ranging from TV programs, which are generally 4:3, to CinemaScope widescreen movies, with an aspect ratio of up to about 7:3. Televisions, too, come in different aspect ratios; 'standard' 4:3 and widescreen 16:9.

Widescreen TV users

For Widescreen TVs, set the player's **TV Screen** option (page 21) to the widescreen aspect ratio, **16:9 (Wide)**.

When watching discs with the standard 4:3, use the TV controls to select how the picture appears. Your TV may offer various zoom and stretch options; see the operating instructions provided with your TV or monitoring system. Please note that some movie aspect ratios are wider than 16:9. Thus, although the picture is shown in widescreen, these video clips play in a 'letter box' style with black bars at the top and bottom of the screen.

Standard TV users

If you have a standard TV, the **TV Screen** setting (page 21) of this player should be set to **4:3 (Letter Box)** or **4:3 (Pan&Scan)**, depending on your preferences.

4:3 (Letter Box), widescreen discs are shown with black bars above and below the picture.



4:3 (Pan&Scan), widescreen discs are shown with the left and right sides cropped. While the picture appears larger, the visible area is actually reduced.



Please note that many widescreen productions override the player's settings so that the disc is shown in the author's chosen aspect ratio, regardless of the setting.

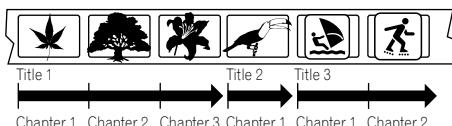


Note

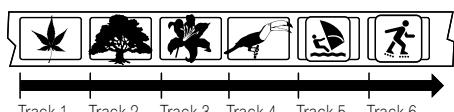
- Using the 16:9 (Wide) setting with a standard 4:3 TV/monitor, or either of the 4:3 settings with a widescreen TV, results in a distorted picture.

Titles, Chapters and Tracks

DVD discs are generally divided into one or more titles. Titles may be further subdivided into chapters.



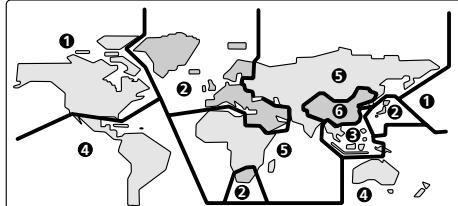
CDs and Video CDs are divided into tracks.



DVD-Video Regions

DVD-Video region marks designate compatible playback area(s) for each DVD-Video disc. DVD players also have a region mark, usually found on the rear panel. Discs and players with different regions are incompatible. Discs marked ALL are compatible with this player model.

The diagram below shows the various DVD regions of the world.

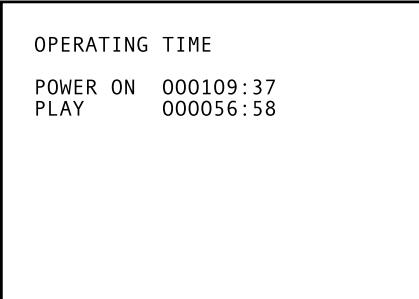


Play Duration & Power-On Time Display

This unit is capable of displaying how long the unit has been playing discs (accumulative) and how long the power has been turned ON. The play time and power ON time can be displayed as described below.

1 Press and hold DISPLAY on the front panel of the main unit before turning power ON then press \odot STANDBY/ON.

- The following is an example:



- Power on time: 109 hours 37 minutes
- Total play time: 56 hours 58 minutes

2 When an operation (playback from the remote, for example) is performed, the time information disappears and normal operation begins.



Note

- Time is measured by the CPU clock thus the information includes up to a 2% error margin.
- This feature is incapable of resetting the total play time or power ON time to a working condition or maintenance timing of 0.
- The play and power ON times data are only available when the disc is not spinning.
- If the power is turned off externally during video playback then that play time is not stored in memory.

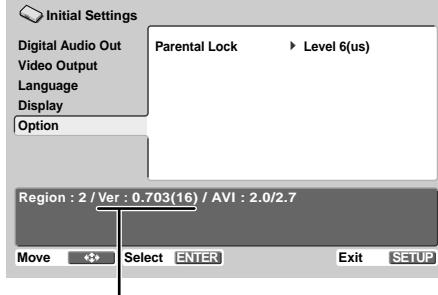
Confirm the Firmware Version

1 Press HOME MENU and select "Initial Settings" from the on-screen display.



2 Select "Option" and press DISPLAY.

- The firmware version appears in the window.



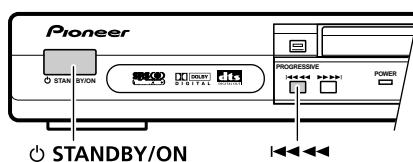
Here, the "Ver: 0.703" indicates the version of firmware; "(16)" indicates the capacity of the Flash Memory (16 Mbit) being used.

Resetting the Player

Use this procedure to reset all the player's settings to the factory default.

**1 Switch the player into Standby mode.
2 Using the front panel buttons, hold down $\blacktriangleleft\blacktriangleleft\blacktriangleleft$ and press \odot STANDBY/ON to turn the player back on.**

- The settings have returned to the defaults.



Language Code List

Language (Language code letter), **Language code**

Japanese (ja), 1001	Bhutani (dz), 0426	Kirghiz (ky), 1125	Sinhalese (si), 1909
English (en), 0514	Esperanto (eo), 0515	Latin (la), 1201	Slovak (sk), 1911
French (fr), 0618	Estonian (et), 0520	Lingala (ln), 1214	Slovenian (sl), 1912
German (de), 0405	Basque (eu), 0521	Laothian (lo), 1215	Samoan (sm), 1913
Italian (it), 0920	Persian (fa), 0601	Lithuanian (lt), 1220	Shona (sn), 1914
Spanish (es), 0519	Finnish (fi), 0609	Latvian (lv), 1222	Somali (so), 1915
Chinese (zh), 2608	Fiji (fj), 0610	Malagasy (mg), 1307	Albanian (sq), 1917
Dutch (nl), 1412	Faroese (fo), 0615	Maori (mi), 1309	Serbian (sr), 1918
Portuguese (pt), 1620	Frisian (fy), 0625	Macedonian (mk), 1311	Siswati (ss), 1919
Swedish (sv), 1922	Irish (ga), 0701	Malayalam (ml), 1312	Sesotho (st), 1920
Russian (ru), 1821	Scots-Gaelic (gd), 0704	Mongolian (mn), 1314	Sundanese (su), 1921
Korean (ko), 1115	Galician (gl), 0712	Moldavian (mo), 1315	Swahili (sw), 1923
Greek (el), 0512	Guarani (gn), 0714	Marathi (mr), 1318	Tamil (ta), 2001
Afar (aa), 0101	Gujarati (gu), 0721	Malay (ms), 1319	Telugu (te), 2005
Abkhazian (ab), 0102	Hausa (ha), 0801	Maltese (mt), 1320	Tajik (tg), 2007
Afrikaans (af), 0106	Hindi (hi), 0809	Burmese (my), 1325	Thai (th), 2008
Amharic (am), 0113	Croatian (hr), 0818	Nauru (na), 1401	Tigrinya (ti), 2009
Arabic (ar), 0118	Hungarian (hu), 0821	Nepali (ne), 1405	Turkmen (tk), 2011
Assamese (as), 0119	Armenian (hy), 0825	Norwegian (no), 1415	Tagalog (tl), 2012
Aymara (ay), 0125	Interlingua (ia), 0901	Occitan (oc), 1503	Setswana (tn), 2014
Azerbaijani (az), 0126	Interlingue (ie), 0905	Oromo (om), 1513	Tonga (to), 2015
Bashkir (ba), 0201	Inupiak (ik), 0911	Oriya (or), 1518	Turkish (tr), 2018
Byelorussian (be), 0205	Indonesian (in), 0914	Punjabi (pa), 1601	Tsonga (ts), 2019
Bulgarian (bg), 0207	Icelandic (is), 0919	Polish (pl), 1612	Tatar (tt), 2020
Bihari (bh), 0208	Hebrew (iw), 0923	Pashto, Pushto (ps), 1619	Twi (tw), 2023
Bislama (bi), 0209	Yiddish (ji), 1009	Quechua (qu), 1721	Ukrainian (uk), 2111
Bengali (bn), 0214	Javanese (jw), 1023	Rhaeto-Romanic (rm), 1813	Urdu (ur), 2118
Tibetan (bo), 0215	Georgian (ka), 1101	Kirundi (rn), 1814	Uzbek (uz), 2126
Breton (br), 0218	Kazakh (kk), 1111	Romanian (ro), 1815	Vietnamese (vi), 2209
Catalan (ca), 0301	Greenlandic (kl), 1112	Kinyarwanda (rw), 1823	Volapuk (vo), 2215
Corsican (co), 0315	Cambodian (km), 1113	Sanskrit (sa), 1901	Wolof (wo), 2315
Czech (cs), 0319	Kannada (kn), 1114	Sindhi (sd), 1904	Xhosa (xh), 2408
Welsh (cy), 0325	Kashmiri (ks), 1119	Sangho (sg), 1907	Yoruba (yo), 2515
Danish (da), 0401	Kurdish (ku), 1121	Serbo-Croatian (sh), 1908	Zulu (zu), 2621

Country Code List

Country, **Country code**, Country code letter

Argentina, 0118 , ar	Hong Kong, 0811 , hk	Philippines, 1608 , ph
Australia, 0121 , au	India, 0914 , in	Portugal, 1620 , pt
Austria, 0120 , at	Indonesia, 0904 , id	Russian Federation, 1821 , ru
Belgium, 0205 , be	Italy, 0920 , it	Singapore, 1907 , sg
Brazil, 0218 , br	Japan, 1016 , jp	Spain, 0519 , es
Canada, 0301 , ca	Korea, Republic of, 1118 , kr	Sweden, 1905 , se
Chile, 0312 , cl	Malaysia, 1325 , my	Switzerland, 0308 , ch
China, 0314 , cn	Mexico, 1324 , mx	Taiwan, 2023 , tw
Denmark, 0411 , dk	Netherlands, 1412 , nl	Thailand, 2008 , th
Finland, 0609 , fi	New Zealand, 1426 , nz	United Kingdom, 0702 , gb
France, 0618 , fr	Norway, 1415 , no	USA, 2119 , us
Germany, 0405 , de	Pakistan, 1611 , pk	

Extend Terminal

To activate a function, create a switch contact with an electrical ground (Pin 1). Refer to page 71 "Interface Connector" to verify pin (Pin 6 through Pin 13) and terminal (SW1 ~ SW8) assignments. There are three switch (SW) functions in the **EXTEND TERMINAL CONTROL**.

1 To recall Barcode/Command Stacks and execute

The function, STACK GROUP 1 to STACK GROUP 27, is similar to a combination of remote control buttons that recall and execute a stack.

2 To execute the function as a remote control command

The function acts in the same manner as remote control buttons (ENTER, PLAY, STOP, etc.) excluding SCAN FWD/REV.

When the remote control's SCAN buttons (\blacktriangleleft , \triangleright) are pressed and released, the scan operation continues. However, the SCAN FWD/SCAN REV keys on the Extend Terminal operate only while held down; the operation stops when the keys are released.

3 To execute as an advanced remote control button

Advanced remote control commands such as numbers from 10 to 20 may be sent as a switch control command.

Function Assignment

Create a Circuit Controller or a Diode Matrix Circuit (refer to the table below).

Diode Assignment List (Standard setting and User default setting)

No.	SW1 ↑	SW2 ↓	SW3 ←	SW4 →	SW5 ENTER	SW6 X	SW7 Y	SW8 Z	Function
1	X								↑
2		X							↓
3			X						←
4				X					→
5					X				ENTER
6						X			STACK GROUP1
7							X		STACK GROUP2
8								X	STACK GROUP3
9		X						X	STACK GROUP4
10			X					X	STACK GROUP5
11				X				X	STACK GROUP6
12	X	X							MENU
13			X	X					TITLE MENU
14	X					X			1
15		X				X			2
16			X			X			3
17				X		X			4
18	X						X		5
19		X					X		6
20	X			X					
21		X		X					
22		X	X						
23	X		X						

Additional Information

No.	SW1	SW2	SW3	SW4	SW5	SW6	SW7	SW8	Function
	↑	↓	←	→	ENTER	X	Y	Z	
24					X	X			PLAY
25					X		X		STOP
26					X			X	PAUSE
27							X	X	RETURN
28			X				X		7
29				X			X		8
30	X							X	9
31					X	X	X		STEP FWD
32					X	X		X	STEP REV
33					X		X	X	DISPLAY
34	X	X	X						SCAN FWD
35	X	X		X					SCAN REV
36	X		X	X					SKIP FWD
37		X	X	X					SKIP REV
38			X			X	X		10
39				X		X	X		11
40	X	X					X		12
41	X	X				X			13
42	X		X			X			14
43	X			X		X			15
44		X	X			X			16
45		X		X		X			17
46			X	X		X			18
47	X					X	X		19
48		X				X	X		20
49	X		X				X		STACK GROUP7
50	X			X			X		STACK GROUP8
51		X	X				X		STACK GROUP9
52		X		X			X		STACK GROUP10
53			X	X			X		STACK GROUP11
54	X						X	X	STACK GROUP12
55		X					X	X	STACK GROUP13
56			X				X	X	STACK GROUP14
57				X			X	X	STACK GROUP15
58	X	X						X	STACK GROUP16
59	X		X					X	STACK GROUP17
60	X			X				X	STACK GROUP18
61		X	X					X	STACK GROUP19
62		X		X				X	STACK GROUP20
63			X	X				X	STACK GROUP21
64	X					X		X	STACK GROUP22
65		X				X		X	STACK GROUP23
66			X			X		X	STACK GROUP24
67				X		X		X	STACK GROUP25
68						X	X		STACK GROUP26
69						X		X	STACK GROUP27
70						X	X	X	OPEN/CLOSE
71	X				X	X			RECALL

No.	SW1	SW2	SW3	SW4	SW5	SW6	SW7	SW8	Function
	↑	↓	←	→	ENTER	X	Y	Z	
72	X				X		X		HOME MENU
73	X				X			X	MEMORY
74		X			X	X			ZOOM
75		X			X		X		REPEAT
76		X			X			X	REPEAT A-B
77			X		X	X			AUDIO
78			X		X		X		ANGLE
79			X		X			X	SUBTITLE
80				X	X	X			TITLE/CHP/FRM/TIME
81					X	X		X	0
82					X	X			CLEAR

Controller

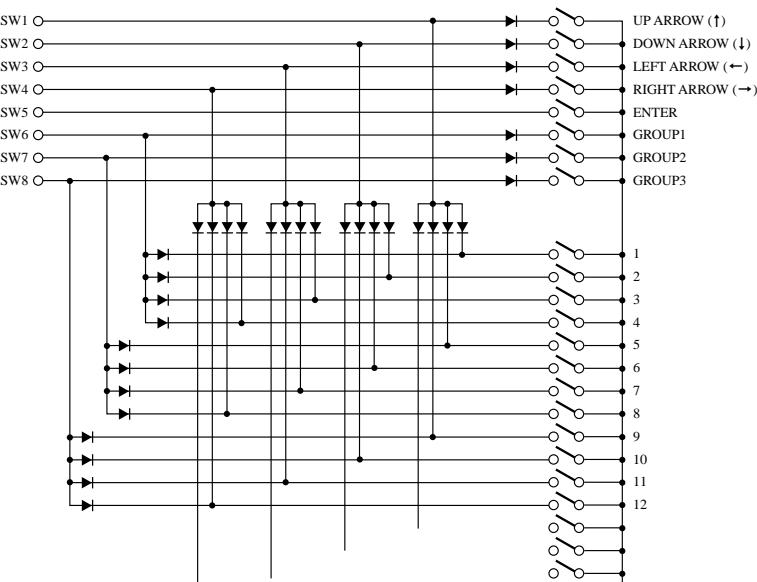
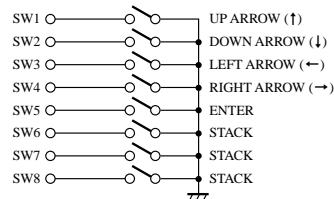
Switch Specifications

On Resistance	Less than 1 ohm
Off Resistance	More than 1 M ohms
Type	Non-Locking

Diode Specifications

Forward Voltage Drop (VF)	Less than 0.7 (IF 1 ma)
Surge Forward Current (IFSM)	Less than 100 ma
Forward Current	Less than 10 μ a

Diode Matrix Circuit



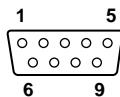
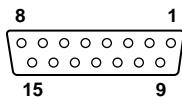
Please refer to the "DVD-V5000 COMMAND PROTOCOL MANUAL" for details about serial control and extend terminal control.

Interface Connector

A computer may be connected to the DVD-V5000 using a 15-pin D-Sub connector (e.g., a JAE DALC-J15SAF connector with a suitable plug such as the JAE DA-15PF-N) to the RS-232C serial port or to the parallel port.

This unit includes a 9-pin male connector for use as a serial control connector. Through the ADV. SETUP menu, either a 15-pin or 9-pin connector can be used. However, the 9-pin and 15-pin connectors cannot be accessed simultaneously.

The pins are identified below:



Serial Interface Pin Specification

15-pin D-Sub connector

Pin #	Terminal	Input/Output	Function
1	GND	--	ground
2	TxD	Output	send data
3	RxD	Input	receive data
4	DTR	Output	enable data receiving
5	POWER	Input	external power control
6	SW1	Input	Extend Terminal
7	SW2	Input	Extend Terminal
8	SW3	Input	Extend Terminal
9	SW4	Input	Extend Terminal
10	SW5	Input	Extend Terminal
11	SW6	Input	Extend Terminal
12	SW7	Input	Extend Terminal
13	SW8	Input	Extend Terminal
14	DLTST	Input	Extend Terminal
15	NC		used only for servicing the unit — reserved

9-pin D-Sub connector

Pin #	Terminal	Input/Output	Function
1	NC		
2	TxD	Output	send data
3	RxD	Input	receive data
4	DTR	Output	enable data receiving
5	GND	--	ground
6	DSR	Input	data set ready
7	RTS	Output	request to send
8	CTS	Input	clear to send
9	NC		

Computer Control Functions

Serial Control

The player and computer are based upon the RS-232C protocol and connect through the **TxD**, **RxD**, **DTR** and **GND** terminals.

Extend Terminal

Control the player with the Extend Terminal (SW#).

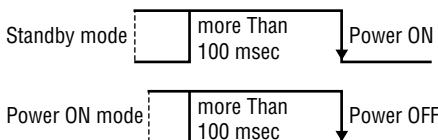
External Power Control

Control the player's power with the Power Pin within the Interface Connector.

If the player detects a high signal throughput (100m/sec or more) during the Standby mode, the player powers ON. If the player detects the same signal during the Power ON mode, the player powers OFF and switches to the Standby mode.

The specifications for the Power pin are as follows:

Maximum Input Voltage	Less Than 12 V
High Level Signal	More Than 4.5 V
Low level Signal	Less Than 0.5 V



Serial Control

The signal interface is a standard RS-232C connection.

Data Type

Data Length: 8 bit
Stop Bit: 1 bit
Parity bit: No Parity

Data Transfer Speed (Baud Rate)

The data transfer speed may be set to either 19200 or 9600 bps through the ADV. SETUP menu (see page 42).

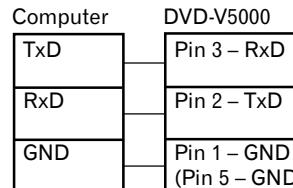


Note

- The factory default is 19200 bps.

Communication with a Computer

The DVD-V5000 communicates to the computer through the RS-232C port using pins 2 and 3 for communication and Pin 1 on the 15-pin D-sub connector or Pin 5 on the 9-pin D-sub connector for grounding. Control or "handshaking" lines other than the **TxD** and **RxD** connections are not required. Please refer to the diagram below for clarification.



Some computers require the **CTS** port to be set to **HIGH** during communication. It is best to connect the **CTS** and **DSR** port on the computer to the **DTR** port on the player. During normal operation the player's **DTR** is set to **HIGH** thus the unit is able to receive a command at any time.

Command and Status

During normal operation when a computer transmits commands to a DVD-V5000, the player responds with the status message, 'execution complete'.

Example

COMPUTER	DVD-V5000
(1) "Search to Frame 1000"	→ (2) Search Execution ← (3) Complete
(4) "Play to Frame 2000"	→ (5) Play Execution ← (6) Complete

Example

10SE 20PL<CR> : Search to Chapter 10
then play to 20

The command string enters the buffer with the first character and continues sequentially from left to right. When <CR> is entered, the commands are executed sequentially beginning with the first command in the buffer. In the example above, the first command is **10SE**.

When all the commands in a string have finished executing, the player transmits or returns the "complete" message that is represented by a capital letter **R**.

If an error occurs, the player returns an error message such as **E04**. The message indicates an error has occurred as well as the type of error. Error messages are in the form of **EXX** where XX represents a 2-digit error code.

Error Messages

If an error occurs during a command execution, the player returns an error code. The table below lists each code with a description of the error:

Code	Message	Description
E00	Communication error	Communication Line Error due to framing error or buffer overflow
E04	Feature not available	Non-Usable Function has been tried – either the command mnemonic is wrong or the command can not be used in this mode
E06	Missing argument	Correct parameter is not specified
E11	Disc does not exist	There is no disc in the tray
E12	Search error	Search address is missing
E15	Picture stop	Playback has been stopped by VOBU Still while in the Auto Play mode
E16	Interrupt by other device	The command(s) sent via the serial line were not executed before commands were sent from the front panel buttons and/or remote control
E99	Panic	Unrecoverable Error occurred – possible that a disc cannot be loaded and/or playing cannot continue

Command Structure

The DVD-V5000 supports the commands listed below.

COMMAND		SUPPORTING FORMAT		
Name	Mnemonic	DVD	CD	VCD
Open	OP	X	X	X
Close	CO	X	X	X
Reject	RJ	X	X	X
Start	SA	X	X	X
Play	(adrs)	PL	X	X
Pause		PA	X	X
Still		ST	X	X
Step Forward		SF	X	X
Step Reverse		SR	X	
Scan Forward		NF	X	X
Scan Reverse		NR	X	X
Scan Stop		NS	X	X
Multi-Speed Forward	(adrs)	MF	X	X
Multi-Speed Reverse	(adrs)	MR	X	
Speed	arg	SP	X	X
Search	adrs	SE	X	X
Search & Play	adrs	SL	X	X
Stop Marker	adrs	SM	X	X
Lead Out Symbol		LO	X	X
Clear		CL	X	X
Frame		FR	X	

COMMAND		SUPPORTING FORMAT		
Name	Mnemonic	DVD	CD	VCD
Time	TM	X	X	X
Chapter	CH	X		
Title	TI	X		
Track	TR		X	X
Select Subtitle	arg SU	X		
Select Audio	arg AU	X		
Select Aspect	arg AP	X		
Select Angle	arg AG	X		
Select Parental-Level	arg PT	X		
Audio Control	arg AD	X	X	X
Video Control	arg VD	X	X	X
Display Control	arg DS	X	X	X
Keylock	arg KL	X	X	X
Stack Group Set	arg GP	X		
Barcode / Command Stack Play	arg BS	X		
Command Stack Data Upload	BU	X	X	X
Command Stack Data Download	BD	X	X	X
P-Block Number Request	?A	X	X	X
Title/Track Number Request	?R	X	X	X
Chapter Number Request	?C	X		
Time Code Request	?T	X	X	X
Frame Number Request	?F	X		
Total Frame Request	?Y	X		
TOC Information Request	?Q		X	X
Disc Region Code Request	?G	X		
DVD Disc Status Request	?V	X		
CD Disc Status Request	?K		X	X
Register A Set (Display)	arg RA	X	X	X
Register D Set (Tx/D Term)	arg RD	X	X	X
Print Character	arg PR	X	X	X
Clear Screen	CS	X	X	X
Advanced Setup	arg MS	X	X	X
Communication Control Set	arg CM	X	X	X
Player Active Mode Request	?P	X	X	X
Player Model Name Request	?X	X	X	X
Advanced Setup Request	?S	X	X	X
Player Region Code Request	?H	X	X	X
CCR Mode Request	?M	X	X	X
Input Number Request	?N	X	X	X
Error Code Request	?E	X	X	X
Firmware Version Request	?Z	X	X	X
Input Unit Request	#I	X	X	X
Input Barcode Data Request	#B	X	X	X
Register A Request	\$A	X	X	X
Register D Request	\$D	X	X	X
Menu Call	arg MC	X		

COMMAND		SUPPORTING FORMAT		
Name	Mnemonic	DVD	CD	VCD
Numeric Button	arg NB	X		
Button Select	arg CU	X		
ENTER Button	(arg) ET	X		
Get Information	arg GI	X		
Memory Data Upload *1	MU	X	X	X



Note

- **arg** (argument) or **ards** (address) prefaces a command with an argument or address parameter. If the arg or ards is in parentheses (), the parameter is optional.

Command Mnemonic

Each command is expressed as two (2) ASCII characters. There is no distinction between uppercase and lowercase letters except when the Character strings are in a **PR** command.

Argument

An Argument, expressed in either ASCII characters or ten digits, consists of either an address or an integer. If a command requires an argument, it is always placed before the command.

An Address can be a Title, a Chapter, a Track, a Frame Number, or a Time Code depending upon how the address flag is set. The Address must not exceed ten characters and/or digits.

Address Type	Media Type	Format	Range (Min – Max)
Title Number	DVD	N ₁ N ₂	0 – 99
Chapter Number	DVD	N ₁ N ₂	0 – 99
Frame Number	DVD	N ₁ N ₂ N ₃ N ₄ N ₅ N ₆ N ₇	0 – 1079999
Time Code	DVD	N ₁ N ₂ N ₃ N ₄ N ₅	0 – 599 : 59
Track Number	CD/VCD	N ₁ N ₂ N ₃ N ₄	0 – 99 : 59
	CD/VCD	N ₁ N ₂	1 – 99

Glossary

Analog audio

An electrical signal that directly represents sound. Compare this to digital audio which can be an electrical signal, but is an indirect representation of sound. See also *Digital audio*.

Aspect ratio

The width of a TV screen relative to its height. Conventional TVs are 4:3 (in other words, the screen is almost square); widescreen models are 16:9 (the screen is almost twice as wide as it is high).

Digital audio

An indirect representation of sound by numbers. During recording, the sound is measured at discrete intervals (44,100 times a second for CD audio) by an analog-to-digital converter, generating a stream of numbers. On playback, a digital-to-analog converter generates an analog signal based on these numbers. See also *Sampling frequency* and *Analog audio*.

Dolby Digital



Using a maximum of 5.1 channels of audio, this high quality surround system is used in many of the finer movie theaters around the world.

The on-screen display shows which channels are active, for example showing 3/2.1. The 3 being the two front channels and the center channel; the 2 being the surround channels, and the .1 being the LFE channel.

DTS



DTS stands for Digital Theater Systems. DTS is a surround system different from Dolby Digital that has become a popular surround sound format for movies.

Dynamic range

The difference between the quietest and loudest sounds possible in an audio signal (without distorting or getting lost in noise). Dolby Digital and DTS soundtracks are capable of a very wide range, delivering dramatic cinema-like effects.

MPEG audio

An audio format used on Video CDs and some DVD discs. This unit can convert MPEG audio to PCM format for wider compatibility with digital recorders and AV amplifiers. See also *PCM (Pulse Code Modulation)*.

MPEG video

The video format used for Video CDs and DVDs. Video CD uses the older MPEG-1 standard, while DVD uses the newer and much better quality MPEG-2 standard.

PBC (PlayBack Control) (Video CD only)

A system of navigating a Video CD through on-screen menus recorded onto the disc. Especially good for discs that you would normally not watch from beginning to end all at once—karaoke discs, for example.

PCM (Pulse Code Modulation)

The most common system of encoding digital audio, found on CDs and DAT. Excellent quality, but requires a lot of data compared to formats such as Dolby Digital and MPEG audio. For compatibility with digital audio recorders (CD, MD and DAT) and AV amplifiers with digital inputs, this unit can convert Dolby Digital, DTS and MPEG audio to PCM. See also *Digital audio*.

Regions (DVD-Video only)

These associate discs and players with particular areas of the world. This unit will only play discs that have compatible region codes. You can find the region code of your unit by looking on the rear panel. Some discs are compatible with more than one region (or all regions).

Sampling frequency

The rate at which sound is measured to be turned into digital audio data. The higher the rate, the better the sound quality, but the more digital information is generated. Standard CD audio has a sampling frequency of 44.1kHz, which means 44,100 samples (measurements)

Troubleshooting

A slight operational mistake may make the DVD player appear to be broken. Always check other factors in your system such as the monitor or television, the AV amplifier and speakers, etc. When the problem is not obvious after this inspection, please review the points below before contacting the store where you bought the player or take the player to your nearest PIONEER authorized service center.

Power does not come on

- Connect the power cord to the outlet properly.

Even when the disc tray is closed, it comes out

- Set the disc in the disc tray properly (page 28).
- Clean the disc (page 63).
- Check the region no. (pages 9, 65).

The screen does not appear

- Check the setting of the video output selector at the rear of this player with the connected video terminal (page 11, 12).
- Confirm that connections are correct (pages 11–13).
- Make the television or AV amplifier setting, etc., to DVD playback setting.

Cannot play back.

- Clean the disc (page 63).
- Set the disc in the disc tray properly (page 28).
- Remove the condensation in the player (page 64).
- SECAM format discs cannot be played back.
- Insert the disc with the proper side up.

The contents of the settings disappear

- When the power has been turned off due to a power outage and the power cord having been pulled out while the power is turned on, the contents of the settings disappear.

Make sure to pull out the power cord after the **STANDBY/ON** button has been pressed and the **POWER** indicator has turned orange.

The screen stops and the commands from the buttons are not accepted

- After pressing **STOP** button, play back once more.
- The player is set "Key Lock" (page 44).

Cannot use the remote control

- Operate within the usage range of the remote control (page 8).
- Replace the dry cell batteries of the remote control with new ones (page 8).
- The player is set "Key Lock" (page 44).

No sound comes from the speakers or the sound is distorted

- Confirm that the audio cable is properly connected (pages 11, 13).
- Some discs prohibit 96 kHz digital output of Linear PCM audio. With these kinds of discs, even if the [96 kHz PCM Out] setting of [Digital Audio Out] of Initial setting menu screen is set to [96 kHz], it is automatically changed to 48 kHz and output (page 20).
- During playback of a DVD recorded at 96 kHz in 16:9, when [4:3 (Letter Box)] of [TV Screen] is selected, even if the setting of [96 kHz PCM Out] is set to [96 kHz], it is automatically changed to 48 kHz and output (page 20).
- Clean the disc (page 63).
- If it has been set to the pause or slow playback mode, change to the playback mode (page 32).
- If the volume of the television or AV amplifier, etc., has been set to "minimum," raise the volume.
- Confirm that the connector plug has been sufficiently inserted and that it has not been disconnected.
- If the connector plug and terminal are dirty, wipe them.

Screen is extended vertically or horizontally

- Adjust the [TV Screen] setting (pages 21, 65).

There are difference in volume between DVD and CD

- This is due to the difference in the disc recording methods.

The picture is distorted or dark during DVD playback

- This player has the copy guard of an analog copy protect system. Some discs have a copy prohibition signal. When those types of discs are played back, a condition such as lateral stripes on part of the screen appears, but this is not a malfunction.

The playback screen is distorted when a DVD video has been recorded on a VCR and played back on a VCR

- This player has the copy guard of an analog copy protect system. Some discs have a copy prohibition signal and when that kind of disc is played back on a VCR, and recorded and played back on a VCR, it cannot be played back normally due to the copy guard.

The television, etc., malfunctions

- Some televisions with a wireless remote control function malfunction due to the remote control of this player. Use them separated from this player.

Cannot control the player with RS-232C interface.

- Confirm the "SERIAL PORT" setting in the ADV. SETUP menu (page 42).

**Tip**

- This player may not operate normally due to outside influences such as static electricity. At such times it may operate normally after the power cord has been temporarily unplugged and plugged in again. When the problem has not been solved by this procedure, consult the store where you purchased the player or the nearest service provider.

Specifications

General

System	DVD player
Power requirements	AC 120 V, 50/60 Hz
Power consumption	11 W
Power consumption (standby)	0.8 W
Weight	2.5 kg / 5 lb 8 oz
Dimensions	420 (W) x 55 (H) x 283 (D) mm (16.5 (W) x 2.2 (H) x 11.1 (D) in.)
Operating temperature	+5 °C to +35 °C (+41 °F to +95 °F)
Operating humidity	5 % to 85 % (no condensation)

Component video output

Y (luminance) - Output level	1 Vp-p (75 Ω)
PB (color) - Output level	0.65 Vp-p (75 Ω)
PR (color) - Output level	0.65 Vp-p (75 Ω)
Jack	RCA jacks

S-video output

Y (luminance) - Output level	1 Vp-p (75 Ω)
C (color) - Output level	265 mVp-p (75 Ω)
Jack	S-video jack

Video output

Output level	1 Vp-p (75 Ω)
Jack	RCA jack

Audio output (1 stereo pair)

Output level	During audio output 200 mVrms (1 kHz, -20 dB)
Number of channels	2
Jack	RCA jacks

Digital audio characteristics

Frequency response	4 Hz to 44 kHz (DVD fs: 96 kHz)
S/N ratio	115 dB
Dynamic range	101 dB
Total harmonic distortion	0.0016 %
Wow and flutter	Limit of measurement (±0.001% W. PEAK) or lower

Other terminals

Coaxial digital output	RCA jack
RS-232C	D-sub 9-pin, male
RS-232C and extended	D-sub 15-pin, female

Accessories

Audio/video cable	1
Power cable	1
Remote control	1
AA/R6P dry cell batteries	2
Operating Instructions	1
Warranty card	1



Note

- The specifications and design of this product are subject to change without notice, due to improvement.

Should this product require service in the U.S.A. and you wish to locate the nearest Pioneer Authorized Independent Service Company, or if you wish to purchase replacement parts, operating instructions, service manuals, or accessories, please call the number shown below.

(800) 421 - 1613

Please do not ship your product to Pioneer without first calling the Customer Support Division at the above listed number for assistance.

Pioneer Electronics (USA) Inc.
Customer Support Division
P.O. BOX 1760, Long Beach,
CA 90801-1760, U.S.A.

For warranty information please see the Limited Warranty sheet included with your product.

Should this product require service in Canada, please contact a Pioneer Canadian Authorized Dealer to locate the nearest Pioneer Authorized Service Company in Canada. Alternatively, please contact the Customer Satisfaction Department at the following address:

Pioneer Electronics of Canada, Inc.
Customer Satisfaction Department
300 Allstate Parkway, Markham, Ontario L3R OP2
(905)479-4411
1(877)283-5901

For warranty information please see the Limited Warranty sheet included with your product.

Si ce produit doit être réparé au Canada, veuillez vous adresser à un distributeur autorisé Pioneer du Canada pour obtenir le nom du Centre de Service Autorisé Pioneer le plus près de chez-vous. Vous pouvez aussi contacter le Service à la clientèle de Pioneer:

Pioneer Électroniques du Canada, Inc.
Service à la clientèle
300, Allstate Parkway, Markham, Ontario L3R OP2
(905)479-4411
1(877)283-5901

Pour obtenir des renseignements sur la garantie, veuillez vous reporter au feuillet sur la garantie restreinte qui accompagne le produit.

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DVD-V5000

Industrial DVD Player

RS-232C

COMMAND PROTOCOL MANUAL

Manual Version 1.00

June 30, 2004

Pioneer Corporation
Pioneer Electronics (USA) Inc.
Business Solutions Division

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The equipment described in this manual has been tested and found to comply with the limits for a Class B digital device in accordance with the specifications in Part 15 of FCC rules. These specifications are designed to provide reasonable protection against radio and television reception interference in a residential installation. There is no guarantee that interference will not occur in a particular installation.

To determine if your player is causing interference, turn the device OFF. If the player is causing the interference, try one or more of the following corrective measures:

- verify the cables and connectors between components are shielded.
- increase separation between the player and components.
- connect the changer into an outlet or circuit different from that which the components are connected.
- consult dealer or experienced radio/television technician for help.

The Federal Communications Commission offers a handbook that may help you with eliminating interference. The handbook is titled *Interference Handbook* (stock number 004-000-00493-1) and may be ordered from the U.S. Government Printing Office, Washington, D.C. 20402.

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1. INTRODUCTION

This document defines the RS-232C command protocol for the Pioneer DVD-V5000 Industrial DVD Player.

The DVD-V5000 is capable of playing DVD, CD and VCD discs. The device has three control methods, front panel, remote control or computer interface through the RS-232C serial port.

This manual addresses the various commands and precautions required when using the Pioneer DVD-V5000 player with a computer. Please refer to the *DVD-V5000 Operating Instructions* for details on operating the unit via the front panel and/or remote control.

Chapter Number	Description
Chapter 2	describes the Interface Connector Specifications and the computer control features of the DVD-V5000
Chapter 3	discusses Baud Rate Settings, Interface Operation, Control Protocol, and Internal Operation via computer
Chapter 4	explains the Player Command Structure in detail
Chapter 5	reviews each command in detail
Chapter 6	defines Address and Player Condition requests
Chapter 7	relates to the various operating modes
Chapter 8	discusses the internal registers
Chapter 9	details the extend terminal control functions

CAUTION: The material in this manual is subject to change without notice.

2. INTERFACE

2.1 Interface Connector

A computer may be connected to the DVD-V5000 using a 15-pin D-Sub connector (e.g., a JAE DALC-J15SAF connector with suitable plug such as the JAE DA-15PF-N) to the RS-232C serial port or to the parallel port.

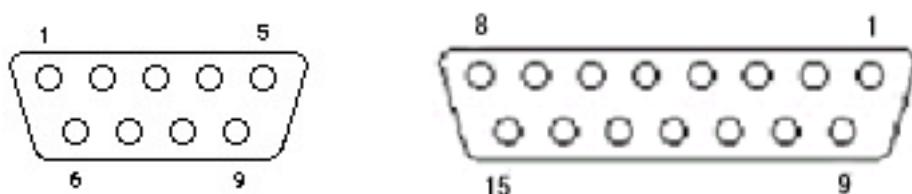
This unit is also equipped with 9pin connector for serial control.

In advanced setup user can choose which port to be used for serial control depends on the cable availability.

Either 9pin cross cable or conventional 15pin cable (same cable to be used with DVD-V7400).

The factory default setup is 15pin.

The pins are identified below:



2.2 Serial Interface Pin Specification

15-pin D-Sub connector

Pin #	Terminal	Input/Output	Function
1	GND	--	ground
2	TxD	Output	send data
3	RxD	Input	receive data
4	DTR	Output	enable data receiving
5	POWER	Input	external power control
6	SW1	Input	
7	SW2	Input	
8	SW3	Input	
9	SW4	Input	
10	SW5	Input	
11	SW6	Input	
12	SW7	Input	
13	SW8	Input	
14	DLTST	Input	used only for servicing the unit – do not connect
15		NC	

9-pin D-Sub connector

Pin #	Terminal	Input/Output	Function
1	NC		
2	TxD	Output	send data
3	RxD	Input	receive data
4	DTR	Output	enable data receiving
5	GND	--	ground
6	DSR	Input	data set ready
7	RTS	Output	request to send
8	CTS	Input	clear to send
9	NC		

2.3 Computer Control Functions

2.3.1 Serial Control (see Chapters 3, 4, 5 and 6)

The player and computer are based upon the RS-232C protocol and are connected through the TxD, RxD, DTR and GND terminals.

2.3.2 Extend Terminal Control (see Chapter 9)

Control the player with the Extend Terminal Switches (SW#).

Even if the Key Lock is set (active), the extend terminal control is available.

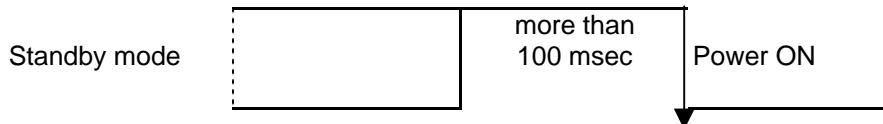
2.3.3 External Power Control

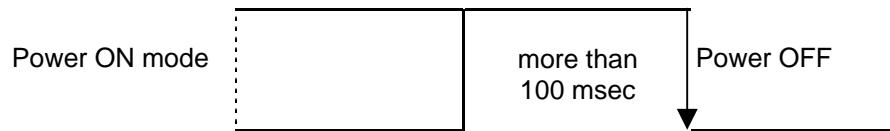
Control the player's power with the Power Pin within the Interface Connector.

If the player detects a high signal throughput (100m/sec or more) during the Standby mode, the player powers ON. If the player detects the same signal during the Power ON mode, the player powers OFF and switches to the Standby mode.

The specifications for the Power pin are as follows:

Maximum Input Voltage	Less Than 12V
High Level Signal	More Than 4.5V
Low Level Signal	Less Than 0.5V





Check the Key Lock condition. If the Key Lock mode is active, the player ignores the control (refer to the Key Lock command description).

3. SERIAL CONTROL

3.1 Serial Interface Specifications

3.1.1 Signal Interface

The signal interface is a standard RS-232C connection.

3.1.2 Data Type

Data Length: 8 bit

Stop Bit: 1 bit

Parity bit: No Parity

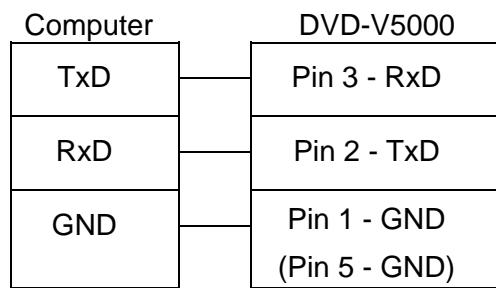
3.1.3 Data Transfer Speed (Baud Rate)

The data transfer speed may be set to either 19200 or 9600 baud through the Advanced Setup Menu screen or with the Advanced Feature Menu Set command (refer to the DVD-V5000 Operating Instructions for command description).

NOTE: The factory default is 19200 baud; however, the player memorizes the transfer speed each time the power is cycled.

3.2 Communication with a Computer

The DVD-V5000 communicates to the computer through the RS-232C port using pins 2 and 3 for communication and Pin 1 for grounding in case of using 15-pin D-sub connector or Pin 5 for grounding in case of using 9-pin D-sub connector. Control or "handshaking" lines other than the TxD and RxD connections are not required. Please refer to the diagram below for clarification.



Some computers require the CTS port to be set to HIGH during communication. It is best to connect the CTS and DSR port on the computer to the DTR port on the player. During normal operation the player's DTR is set to HIGH thus the unit is able to receive a command at any time.

3.3 Command and Status

During normal operation, when a computer transmits commands to a DVD-V5000, the player responds with the status message, 'execution complete'.

Example

<u>COMPUTER</u>		<u>DVD-V5000</u>
(1) "Search to Frame 1000"	⇒	(2) Search Execution
	⇐	(3) Complete
(4) "Play to Frame 2000"	⇒	(5) Play Execution
	⇐	(6) Complete

NOTE: The length of a command string is limited to 32 characters. Please refer to COMMAND STRUCTURE for additional information.

When using a computer to control the DVD-V5000 player, follow the command protocols listed below:

- ASCII characters are used for actual commands and status response
- Command mnemonic is expressed as two (2) ASCII characters
- Uppercase letters are recommended; however, usually there are no distinctions between the uppercase and lowercase letters
- Some commands require an argument (e.g. Chapter number or speed)
- Use a command as the terminator of an argument

The player executes a command as soon as the carriage return <CR> is received. The <CR> acts as the command line terminator.

Example

CH<CR> : Set Chapter for address mode
10SE<CR> : Search to Chapter 10

The player has a command buffer, which stores a command string of up to 32 characters in length.

Example

10SE 20PL<CR> : Search to Chapter 10 then play to 20

The command string enters the buffer with the first character and continues sequentially from left to right. When the <CR> is entered, the commands are executed sequentially beginning with the first command in the buffer. In the example above, the first command is 10SE.

NOTE: The player ignores codes in the command string such as <SPACE> or <LF> (line feed) that have no affect on the player.

NOTE: Some commands, sent after a specialty command that includes an AUTOSTOP setting, (PL, MF, MR, etc.), cause the player to execute the new command before the AUTOSTOP is enacted (see Chapter 5, Command Descriptions).

When all the commands in a string have finished executing, the player transmits or *returns* the "complete" message that is represented by the capital letter R.

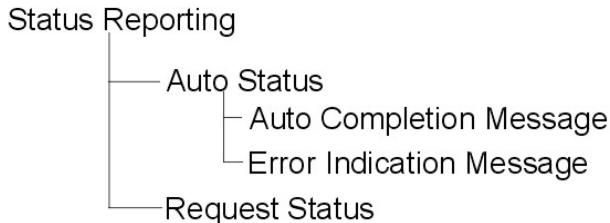
The player returns an R after a command has been executed. This response is called the Automatic Status. The Automatic Status signals the computer program to send the next command. If this function is not used, the command processing Time must be taken into consideration before the next command is sent.

If an error occurs, the player returns an error message such as E04. The message indicates an error has occurred as well as the type of error. Error messages are in the form of EXX where XX represents a 2-digit error code.

In some cases, an incorrect command sends the player to Search within a non-recorded area and the player returns an error message. Use the *Request Status* function to determine current status (actual player hardware failures are rare).

- ?P to determine the Active mode of the player
- ?X, ?M, ?H, ?S to determine the player information, model name, player region code, the setting of Advanced Setup Menu, etc.
- ?F, ?T, ?C, or ?R to determine the current Frame, Time, Chapter, Title/Track number, respectively.
- ?V, ?K, ?G, ?Y, or ?Q to determine the disc information, disc type, total Frame number, TOC information, etc.

The status functions are summarized below:



3.4 Error Messages

If an error occurs during a command execution, the player returns an error code. The table below lists each code with a description of the error:

Code	Message	Description
E00	Communication error	<i>Communication Line Error due to framing error or buffer overflow</i>
E04	Feature not available	<i>Non-Usable Function has been tried – either the command mnemonic is wrong or the command can not be used in this mode</i>
E06	Missing argument	<i>Correct parameter is not specified</i>
E11	Disc does not exist	<i>There is no disc in the tray</i>
E12	Search error	<i>Search address is missing</i>
E15	Picture stop	<i>Playback has been stopped by VOBU Still while in the Auto Play mode</i>
E16	Interrupt by other device	<i>The command(s) sent via the serial line were not executed before commands were sent from the front panel buttons and/or remote control</i>
E99	Panic	<i>Unrecoverable Error occurred – possible that a disc cannot be loaded and/or playing does not continue</i>

3.5 Initial Setting

The following table provides the default internal register and switch settings. Take care when setting the required parameters for an application program.

Register/Switch	Setting at Power ON
Video Switch	1 : ON
Audio Switch	3 : Audio 1
Display Switch	0 : OFF
Address mode	1 : Time
Speed Parameter	15 : 1/4 Speed
CCR	3 : Mode 3
Register A	3 : Title/Chapter and Frame Display (DVD) Track/Time Display (CD, VCD)
Register D	0 : CR

4. COMMAND STRUCTURE

The DVD-V5000 supports the commands listed below.

COMMAND		SUPPORTING FORMATS		
Name	Mnemonic	DVD	CD	VCD
Open	OP	X	X	X
Close	CO	X	X	X
Reject	RJ	X	X	X
Start	SA	X	X	X
Play	(adrs) PL	X	X	X
Pause	PA	X	X	X
Still	ST	X		X
Step Forward	SF	X		X
Step Reverse	SR	X		
Scan Forward	NF	X	X	X
Scan Reverse	NR	X	X	X
Scan Stop	NS	X	X	X
Multi-Speed Forward	(adrs) MF	X		X
Multi-Speed Reverse	(adrs) MR	X		
Speed	arg SP	X		X
Search	adrs SE	X	X	X
Search & Play	adrs SL	X	X	X
Stop Marker	adrs SM	X	X	X
Lead Out Symbol	LO	X	X	X
Clear	CL	X	X	X
Frame	FR	X		
Time	TM	X	X	X
Chapter	CH	X		
Title	TI	X		
Track	TR		X	X
Select Subtitle	arg SU	X		
Select Audio	arg AU	X		
Select Aspect	arg AP	X		
Select Angle	arg AG	X		
Select Parental-Level	arg PT	X		
Audio Control	arg AD	X	X	X
Video Control	arg VD	X	X	X
Display Control	arg DS	X	X	X
Keylock	arg KL	X	X	X
Stack Group Set	arg GP	X		
Barcode / Command Stack Play	arg BS	X		
Command Stack Data Upload	BU	X	X	X
Command Stack Data Download	BD	X	X	X
Block Number	BK		X	
Index	IX		X	

COMMAND		SUPPORTING FORMATS		
Name	Mnemonic	DVD	CD	VCD
P-Block Number Request	?A	X	X	X
Title/Track Number Request	?R	X	X	X
Chapter Number Request	?C	X		
Time Code Request	?T	X	X	X
Frame Number Request	?F	X		
Total Frame Request	?Y	X		
TOC Information Request	?Q		X	X
Disc Region Code Request	?G	X		
DVD Disc Status Request	?V	X		
CD Disc Status Request	?K		X	X
Block Number Request	?B		X	
Index Number Request	?I		X	
Register A Set (Display)	arg RA	X	X	X
Register D Set (TxD Term)	arg RD	X	X	X
Print Character	arg PR	X	X	X
Clear Screen	CS	X	X	X
Advanced Setup	arg MS	X	X	X
Communication Control Set	arg CM	X	X	X
Player Active Mode Request	?P	X	X	X
Player Model Name Request	?X	X	X	X
Advanced Setup Request	?S	X	X	X
Player Region Code Request	?H	X	X	X
CCR Mode Request	?M	X	X	X
Input Number Request	?N	X	X	X
Error Code Request	?E	X	X	X
Firmware Version Request	?Z	X	X	X
Input Unit Request	#I	X	X	X
Input Barcode Data Request	#B	X	X	X
Register A Request	\$A	X	X	X
Register D Request	\$D	X	X	X
Menu Call	arg MC	X		
Numeric Button	arg NB	X		
Button Select	arg CU	X		
ENTER Button	(arg) ET	X		
Get Information	arg GI	X		
Memory Data Upload *1	MU	X	X	X

NOTE: arg (argument) or ards (address) prefaces a command with an argument or address parameter. If the arg or ards is in parentheses (), the parameter is optional.

4.1 Command Mnemonic

Each command is expressed as two (2) ASCII characters. There is no distinction between uppercase and lowercase letters except when the Character strings are in a PR command.

4.2 Argument

An Argument, expressed in either ASCII characters or ten digits, consists of either an address or an integer. A Control Register uses an integer value to set a specified value or condition.

If a command requires an argument, it is always placed before the command.

Example :

Minimum 000 ~ Maximum 300	$N_1N_2N_3$
	(except MS command)
Minimum 000 ~ Maximum 2047	(Only MS command)

NOTE: If a command requires an argument but one is not supplied, the player returns an error message.

An Address can be a Title, a Chapter, a Track, a Frame Number, or a Time Code depending upon how the address flag is set. The Address must not exceed ten characters and/or digits.

Address Type	Media Type	Format	Range (Min-Max)
Title Number	DVD	N_1N_2	1 ~ 99
Chapter Number	DVD	N_1N_2	1 ~ 99
Frame Number	DVD	$N_1N_2N_3N_4N_5N_6$	1 ~ 999999
Time Code	DVD	$N_1N_2N_3N_4N_5^a$	0 ~ 599:59
	CD/VCD	$N_1N_2N_3N_4^b$	0 ~ 99:59
Track Number	CD/VCD	N_1N_2	1 ~ 99
Block Number	CD	$N_1N_2N_3N_4N_5N_6^c$	0 ~ 995974

4.3 Command String

A command string consists of multiple commands on one line. The maximum length of a command string is 32 characters. All command strings are terminated by the Carriage Return <CR> code (0DH hex).

Example : FR2000SE 2300PL<CR>

NOTE: Assign the following commands individually.

^a $N_1N_2N_3$ minutes N_4N_5 seconds.

^b N_1N_2 minutes N_3N_4 seconds.

^c N_1N_2 minutes N_3N_4 seconds N_5N_6 Block.

- Print Character [PR]
- Stack Data Upload [BU]
- Stack Data Download [BD]
- Memory Data Upload [MU]

Once the <CR> termination command is added to the string, the command string is executes from left to right in sequential order.

If an error occurs during the execution of a String, the remainder of the string following that command is ignored.

If a new command string is input before the current string executes completely, the current string is aborted and the remaining commands are cleared.

To cancel an executing string, send the termination command <CR> alone.

If a new command without [?*], [#*] or [\$*] is input while playing the current command stack, the remaining commands are cleared.

The DVD-V5000 does not accept other commands during the execution of a Search command, returning an E04 error message. After issuing a Search command, wait until the Return (R) status appears before issuing another command. An exception to this rule is the Mark Frame Play command (i.e. FR1200PL), when it is unnecessary to wait for the R status before sending additional commands.

4.4 Status Returns

The completion message used in the Automatic Status is **R**.

Example: R<CR>

4.5 Error Message

An error message consists of an **E** followed by a two-character error code.

Example: EN₁N₂<CR>

The error message occurs when the given command cannot be processed.

4.6 Request Status Return

In response to a single request command, the status returns as a line of letters terminated by <CR>.

If multiple commands are sent within the same String, the player returns a separate status value upon completion of each command. A status value is a character string with a <CR> termination code.

Example: ?C?F<CR> ⇒ 02<CR>
10260<CR>

When the command is at the end of the command string, the **R** within the completion message is omitted.

Example: ST?F<CR> ⇒ 23005<CR> (completion omitted)

Example: ?FST<CR> ⇒ 23005<CR>R<CR> (not omitted)

4.7 Timing

A player needs a brief period after receiving a command before returning a Status Value or "R <CR>". It is defined as follows:

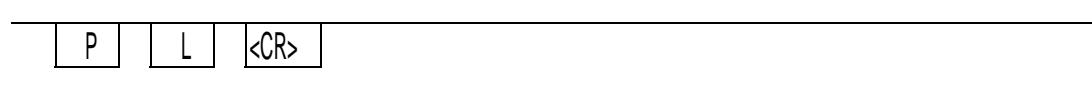
T1 represents the time between the termination of the command string <CR> received and the beginning of the command execution. It is approximately 35ms maximum.

T2 represents the time for executing the command, depending upon the command type and the player's condition. In case of a status request command such as "?F", T2 requires less than 1ms.

T3 represents the time that is needed for transferring data (TxD) per byte. It requires a maximum of 6ms per byte. In case of the return data for "?F" request, a player is supposed to be back 8 bytes data, that is composed of 7 digit Frame number and "<CR>". In this case the transfer time of each byte is not exactly the same with 6ms, it takes usually around 10ms for transferring 8 bytes data total, and it takes less than 20ms.

Example:

RxD



TxD



5. COMMAND DESCRIPTIONS

5.1 Open

Function : Door Opens (Tray Ejects)

Format : OP

Explanation : If the command is sent while the player is in the Park mode, the tray ejects and the player enters the Open mode. After the tray is ejected, the player returns a completed status message.

If the player is in any mode other than Open or Park, the disc stops, the player enters Open mode and the door opens.

If the player is already in Open mode, an error message is returned.

Execution:

String	Status Return	DVD player
OP<CR>	R<CR>	Park mode to Open mode

5.2 Close

Function : Door closes (Tray closes)

Format : CO

Explanation : If the command is sent while the player door is open, the door closes then the player enters the Park mode. After the door closes, the player returns the completed status message.

If the player is in any mode other than Open or if the player door is already closed, an error message is returned.

Execution :

String	Status Return	DVD player
CO<CR>	R<CR>	Open mode to Park mode

5.3 Reject

Function : Disc rotation stops

Format : RJ

Explanation : If the command is sent while the player is in Random Access mode or Setup mode, the player enters Reject mode and the disc stops

rotating. Once the disc completely stops, the player enters Park mode and returns the completed status message.

If the command is sent while the player is in Park mode, the player enters the Open mode and the tray extends.

Execution :

String	Status Return	DVD player
RJ<CR>	R<CR>	Random Access mode to Park mode

NOTE: Sending a second Eject command causes the player to open the tray.

5.3.1 Reject

Function : Disc rotation stops

Format : 99RJ

Explanation : If the command is sent while the player is in Random Access mode or Setup mode, the player enters Reject mode and the disc stops rotating. Once the disc completely stops, the player enters Park mode and returns the completed status message.

If the command is sent while the player is in Park mode, the player returns the completed status message immediately without entering Open mode.

5.4 Start

Function : Disc rotation starts

Format : SA

Explanation : If the command is sent while the player is in Open, Park or Reject mode, the player immediately enters Setup and the disc begins spinning up. The player is ready for playback when the device reaches the beginning of the program (DVD, CD or VCD disc pauses or stills at the first Track). The player returns the completed status when the disc pauses or stills.

If the player receives the command while playing a menu, the player returns an error message. However, if the disc program does not allow new commands once playback begins, the player ignores the command.

Execution :

String	Status Return	DVD player
SA<CR>	R<CR>	Park mode to Pause mode
SA<CR>	E11<CR>	Open mode to Park mode <i>Error – No disc in tray</i>

5.5 Play

Function : Pictures and sound are reproduced (Option - Auto Stop)

Format : (Address)PL

Explanation : If the command is sent while the player is in Open mode, a DVD disc plays according to the menu selection or from the first Title if a menu is absent. If the command is sent while the player is in Park, or Reject mode, a DVD disc plays from the first Title. A CD/VCD disc plays from the first Track. The player returns the completed status message after playback begins.

If the player is in Random Access mode when the Play command is sent, the player enters Play mode and returns the completed status message. The Play is the only mode in which audio plays back simultaneously with video.

If an address is specified, an Auto Stop occurs on the selected sequence. The specified address is written as a Mark Frame or Mark Time and is compared with the current address. If the current address matches the specified address, the player enters Still mode and returns the completed status message.

If the Frame count difference is less than 24 Frames between the present Frame and the specified Frame, the player returns an E06 error message and the marker is not set.

The Auto Stop command is canceled if another command is sent before the player reaches the specified address. When this occurs, the player enters normal Play mode (the Stop Marker command is similar in function to Auto Stop).

If a VOBU Still is detected before the player reaches the specified address, the player enters Still mode and returns an error message. However, if the disc program does not allow a stop, the player ignores the command and it returns an error message.

The available address modes are listed below:

Address Mode	DVD	CD	VCD
FR (Frame)	X		
TM (Time)	X	X	X
CH (Chapter)	X		
TI (Title)	X		
BK(Block)		X	
IX(Index)		X	
TR (Track)		X	X

Execution :

String	Status Return	DVD player
PL<CR>	R<CR>	Park mode to Play mode
TM0325PL<CR>	<i>plays to 3 minutes 25 seconds</i> R<CR>	Pause mode to Play mode Play mode to Still mode

5.6 Pause

Function : Playback ceases temporarily

Format : PA

Explanation : If the command is sent while the player is in Random Access mode, the pause occurs at the current disc location. The player returns the completed status message immediately.

In Pause mode, Still and Video Squelch are ACTIVE. However, if the disc program does not allow a pause, the player ignores the command and returns an error message (E04).

Execution :

String	Status Return	DVD player
PA<CR>	R<CR>	Play mode to Pause mode
PL<CR>	R<CR>	Return to Play mode

5.7 Still (DVD, VCD)

Function : Playback is stopped on a selected visual

Format : ST

Explanation : If the command is sent while the player is in Random Access mode, playback stops at the current disc position and the player enters Still mode. The player returns the completed status message immediately.

However, if the disc program does not allow a pause, the player ignores the command and returns an error message (E04).

Execution :

String	Status Return	DVD player
ST<CR>	R<CR>	Play mode to Still mode
PL<CR>	R<CR>	Return to Play mode

5.8 Step Forward or Reverse (DVD)

Function : Playback is moved forward or in reverse by one Frame

Format : SF (Step Forward)

SR (Step Reverse)

Explanation : If the command is sent while the player is in Random Access mode, the picture moves one Frame forward or one Frame in reverse. After the move is accomplished, the player enters Still mode and returns the completed status message.

If the disc program does not allow a pause, the player ignores the command and returns an error message (E04).

NOTE: A Video CD disc does not support the Step Reverse command

Execution :

String	Status Return	DVD player
SF<CR>	<i>Moves 1 Frame forward</i>	Play mode
	R<CR>	Still mode
SRSRSR<CR>	<i>Moves 3 Frames backwards</i>	Play mode
	R<CR>	Still mode

5.9 Scan Forward, Reverse, or Stop

Function : Playback moves quickly forward or in reverse

Format : NF (Quick Forward scanning of the disc)

NR (Quick Reverse scanning of the disc)

NS (Stop Quick Forward/Reverse scanning and return to normal playback)

Explanation : If the command is sent while the player is in Random Access mode, the screen proceeds forward (NF) or in reverse (NR) quickly. When

scanning is finished, the player resumes the Random Access mode and returns the completed status message.

If the SCAN command is sent while the player is in Fast Forward or Reverse Playback, the player enters Scan mode.

Once the NS command is sent, the player resets to the normal Playback mode and returns the completed status message.

Execution :

String	Status Return	DVD player
NF<CR> or NR<CR>	R<CR>	Play mode to Scan mode
NS<CR>	R<CR>	Return to Play mode

5.10 Multi-Speed Forward or Reverse (DVD)

Function : Playback occurs at the speed specified in the Speed Register
(Option - Auto Stop)

Format : (Address)MF (Multi-Speed Forward)
(Address)MR (Multi-Speed Reverse) (Address > 0)

Explanation : If the player is in Random Access mode when the command is executed, the player enters Multi-Speed mode and returns the completed status message immediately.

While in Multi-Speed mode, pictures are reproduced at the speed specified by the Speed Register. No audio tracks are played during Multi-Speed playback.

NOTE: These speeds are approximate values only.

If an address is specified, an Auto Stop occurs on the selected sequence. The specified address is written as a Mark Frame or Mark Time and is compared with the current address. If the current address matches the specified address, the player enters Pause or Still mode and returns the completed status message. This command functions in a similar manner as the Stop Marker command.

If another command is issued before the player reaches the specified Address, the Auto Stop command is canceled and the player enters normal Multi-Speed mode. However, if the disc program does not allow a pause, the player ignores the command.

NOTE: DVD offers only fixed speed reverse.

VCD offers 1/2 to 1/16 speed forward only. Sometimes, depending on its forward speed, VCD Multi-Speed Forward may finish several frames earlier than the target address because playback does not rely on Frame counts.

Sometimes an Auto Stop command within a Multi-Speed command misses the specific address. Depending upon when the command is sent, a playback address may be missed by a maximum of ten-Blocks.

The available address modes in each disc type are listed below:

Address Mode	DVD	CD	VCD
FR (Frame)	X		
TM (Time)	X		X
CH (Chapter)	X		
TI (Title)			
TR (Track)			X

Execution :

String	Status Return	DVD player
MF<CR>	R<CR>	Play to Multi-Speed mode
-----	-----	-----
TM0325MF<CR>	plays to 3 min. 25 secs R<CR>	Pause to Multi-Speed mode Pause mode

5.11 Speed (DVD, VCD)

Function : Specifies the speed for Multi-Speed playback

Format : Integer SP

Explanation : The command rewrites the contents of the Speed Register and returns the completed status message. The current mode of the player remains the same.

The speed parameter indicates the number of fields per second. The range is 0 through 90 with a default value of 15. The relationship between the integer, speed parameter and the actual speed of the player is as follows:

Integer	Speed Parameter	Speed
60	46~90	1/1
30	23~45	½
15	12~22	¼
7	6~11	1/8
4	3~5	1/16
1	0~2	1/30

NOTE: DVD only offers fixed reverse speeds that varies from about 1/8 to about 1/16 depending on the transfer rate.

NOTE: VCD only offers 1/2 to 1/16 forward speeds. Reverse speed is not available for VCD. Speeds are approximate values only.

Execution :

String	Status Return	DVD player
4SPMF<CR>	R<CR>	Play mode to $\frac{1}{16}$ speed forward
30SP<CR>	R<CR>	Multi-Speed to $\frac{1}{2}$ Multi-Speed
4SPMR<CR>	R<CR>	Slow speed reverse

5.12 Search

Function : Search to specified address

Format : Address SE

Explanation : The specified address is written into the Search Register in accordance with the current Search address mode.

When the Search command is sent to the player, the specified address is compared with the current address. The pick-up is moved so that the difference becomes 0.

Upon reaching the specified address, the player enters the Pause mode for a CD or the Still mode for others disc types. The player then returns the completed status message. If the player misses the specified address or cannot find it, an error message (E06 or E12) is returned. However, if the disc program disallows a Time, Chapter or Title Search, the player ignores the command and an error message (E04) is returned. In addition, if the disc program blocks the Pause command, the player ignores the command.

The DVD-V5000 does not accept other commands during the execution of a Search command, returning an E04 error message. After issuing a Search command, wait until the Return (R) status appears before issuing another command. An exception to this rule is the Mark Frame Play command (i.e.

FR1200PL), when it is unnecessary to wait for the R status before sending additional commands.

The available address modes are listed below:

Address Mode	DVD	CD	VCD
FR (Frame)	X		
TM (Time)	X	X	X
CH (Chapter)	X		
TI (Title)	X		
BK(Block)		X	
IX(Index)		X	
TR (Track)		X	X

Execution :

String	Status Return	DVD player
FR4500SE<CR>	<i>Search to Frame 4500</i> R<CR>	Play mode Address Mode set = Frame Still mode (DVD)
CH5SE<CR>	<i>Search to Chapter 5</i> R<CR>	Play mode Address mode set = Chapter Still mode
TR2SE<CR>	<i>Searches to Track 2</i> R<CR>	Play mode Address mode set = Track Still mode (VCD)

5.13 Search & Play

Function : Searches to specified address and starts to play immediately

Format : (Address) SL

Explanation : The specified address is written into an appropriate register according to the Address. The player then compares the address with the current address. The pick-up moves so that the difference becomes 0.

The player plays a disc immediately after reaching the specific address. In case the player misses or fails to locate the address, it returns an error code (E06 or E12). If Frame is selected in Address Mode, the player ignores the command.

The available address modes are listed below:

Address Mode	DVD	CD	VCD
FR (Frame)			
TM (Time)	X	X	X
CH (Chapter)	X		
TI (Title)	X		
BK(Block)		X	
IX(Index)		X	
TR (Track)		X	X

Execution :

String	Status Return	DVD player
CH5SL<CR>		Play mode
	R<CR>	Search Chapter 5 and Play
TR2SL<CR>	R<CR>	Search Track 2 and Play

5.14 Stop Marker

Function : Stop Marker is set to the specified address

Format : Address SM

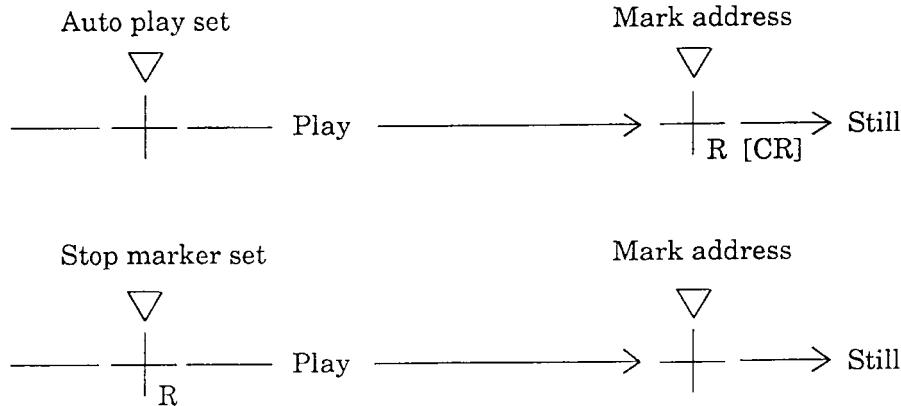
Explanation : The specified address is written into the Mark-Frame Register or Mark-Chapter Register in accordance with the address specification flag. The player returns the completed status message immediately.

The Stop Marker is cleared when the player reaches the marked address via a Play command, a Multi-Speed operation or other action. The player enters the Pause mode (CD) or the Still mode (other disc types) with no messages returned. However, if the disc program does not allow a pause, the player ignores the command.

If the Frame count difference is less than 24 Frames between the present Frame and the stop marker address, the player returns an E06 error message and the marker is not set.

A Time Code or Chapter Number request notes if the player reaches the marked address. The Clear and Reject commands remove the marker.

The Stop Marker is the same in functionality as the Play (or Multi-Speed) Auto Stop commands. The primary difference is when the player return a status message. The Auto Stop command returns the completed status message when the player reaches the marked address. The Stop Marker command returns the message as soon as the Stop Marker is set.



The available address modes are listed below:

Address Mode	DVD	CD	VCD
FR (Frame)	X		
TM (Time)	X	X	X
CH (Chapter)	X		
TI (Title)	X		
BK(Block)		X	
IX(Index)		X	
TR (Track)		X	X

Execution :

String	Status Return	DVD player
TM0325SMPL<CR>	R<CR>	Pause mode to Play mode
MF<CR>	R<CR>	Multi-Speed mode
PL<CR>	R<CR>	Play mode <i>plays to 3 minutes 25 seconds</i> ⇒ Still mode

5.15 Lead-Out Symbol

Function : Lead-Out is set for an address

Format : LO Command <CR>

Explanation : This symbol can be used in place of a Time Code or a Frame number as a target address for the Search or Auto Stop functions.

If the player has read the Table of Contents (TOC) from a disc, the Lead-Out Address or Frame Number can be translated into the lead-out Time.

The Lead-Out Search command on a CD or VCD disc stops the player at the end of a program area prior to the read-out area while the Lead-Out Search command on a DVD disc stops the player at the end of this Title.

NOTE: On a VCD disc, the Search address is set several seconds prior to the lead-out point because the Lead-Out command requires the player to read video data in advance.

Execution :

String	Status Return	DVD player
LOSE<CR>	R<CR>	Search to Still mode
?T<CR>	13642<CR>	<i>Time code in program end area</i>
LOPL<CR>	R<CR>	<i>Continue playing to lead-out and then return R<CR></i>

5.16 Clear

Function : Clears the digit buffer or mode

Format : CL

Explanation : The command clears the digit buffer content (input value) and returns the completed status message immediately.

The command releases the Auto Stop or the Stop Marker modes and returns the completed status message immediately. After the commands are released, the player begins normal playback. But the command does not release the Multi Speed command.

The Clear command releases the Repeat mode and erases the Command Stack selections.

Execution :

String	Status Return	DVD player
FR22000CL2300SE<CR>	<i>searches to Frame 2300</i>	Play mode
R<CR>	R<CR>	Still mode
TM500SMPL<CR>	R<CR>	Play with Stop Marker
CL<CR>	R<CR>	<i>Stop Marker is released and player begins normal playback</i>

5.17 Frame (DVD)

Function : Address specification flag is set to Frame

Format : FR

Explanation : Address assignment proceeds Frame by Frame. All subsequent addresses are handled as a Frame number.

NOTE: The player returns E04 when playing Video Recording format DVD.

Execution :

String	Status Return	DVD player
FR123450SE<CR>	<i>searches to Frame 123450</i>	Play to Search mode
R<CR>		Still mode

[maximum number of Frames is 6-digits in length (999999)]

5.18 Block Number (CD)

Function : Address specification flag is set to Block

Format : BK

Explanation : Address assignment proceeds by Block. All subsequent addresses are handled as a Block number.

1 second consists of 75 Blocks.

The player is unable to Search to a Block Number on VCD disc.

Execution :

String	Status Return	DVD player
BK243020SE<CR>	<i>searches to 24 min, 30 secs, 20 Blocks</i>	Play to Search mode
R<CR>		Pause mode

5.19 Time (excludes discs without Time Codes)

Function : Address specification flag is set to Time

Format : TM

Explanation : Address assignment proceeds by Time Code. All subsequent addresses are handled as a Time Code.

(please refer to section 8.10 Serial Use Address Flag)

Execution :

String	Status Return	DVD player
TM12345SE<CR>	<i>Search to 123 min, 45 secs</i>	Play to Search mode
R<CR>		Still mode

[maximum number for time is 5-digits in length (99959)]

5.20 Chapter (DVD)

Function : Address flag is set to Chapter

Format : CH

Explanation : Address assignment proceeds by Chapter number. All subsequent addresses are handled as a Chapter number. If the Chapter number is not recorded on the disc, an error message is returned.

(please refer to section 8.10 Serial Use Address Flag)

Execution :

String	Status Return	DVD player
CH23SE<CR>	<i>Search to Chapter 23</i>	Play to Search mode
R<CR>		Still mode

5.21 Title (DVD)

Function : Address flag is set to Title

Format : TI

Explanation : Address assignment proceeds by Title. All subsequent addresses are handled as a Title number.

(please refer to section 8.10 Serial Use Address Flag)

Execution :

String	Status Return	DVD player
TI5SE<CR>	<i>Search to Title 5</i>	Play to Search mode
R<CR>		Still mode

5.23 Index (CD)

Function : Address flag is set to Index

Format : IX

Explanation : Address assignment proceeds by Index. All subsequent addresses are handled as an Index number.

(please refer to 8.10 Serial Use Address Flag)

Execution :

String	Status Return	DVD player
IX1204SE<CR>	<i>Search to Index 4, Track 12</i> R<CR>	Play to Search mode Pause mode (CD)

5.24 TRACK (CD, VCD)

Function : Address flag is set to Track

Format : TR

Explanation : Address assignment proceeds by Track. All subsequent addresses are handled as a Track number.

(please refer to section 8.10 Serial Use Address Flag)

Execution :

String	Status Return	DVD player
TR15SE<CR>	<i>Search to Track 15</i> R<CR>	Play to Search mode Pause mode

5.25 Select Subtitle (DVD)

Function : Set Subtitle

Format : Integer SU

Explanation : The command sets the Subtitle (caption). The player allows up to 32 subtitles for playback. If an unavailable number is selected, the player returns an E06 error message.

Execution :

String	Status Return	DVD player
0SU<CR>	R<CR>	Play mode Subtitle off

5.26 Select Audio (DVD)

Function : Select Audio

Format : Integer AU

Explanation : The command selects the audio channel (Audio Track). The player allows up to 8 audio channels for playback. If an unavailable number is selected, the player returns an E06 error message.

NOTE: If the setting is 0, the Audio Mute is ON.

Execution :

String	Status Return	DVD player
0AU<CR>		Play mode
	R<CR>	Audio Mute ON

5.27 Select Aspect (DVD)

Format : Select Aspect Ratio

Function : Integer AP

Explanation : The command sets the Aspect Ratio for playback. The three ratios are Pan & Scan, Letter Box or Wide. If a disc does not offer video output options, the player returns an E04 error message.

Argument	Aspect Ratio (Video output)
1	Pan & Scan
2	Letter Box
3	Wide

5.28 Select Angle (DVD)

Function : Select Angle

Format : Integer AG

Explanation : The command selects a viewing angle. The player allows up to 9 angles (1AG through 9AG) for playback. If an unavailable angle is selected, the player returns an error message (E04 or E06).

Execution :

String	Status Return	DVD player
1AG<CR>		Play mode
	R<CR>	Angle is changed

5.29 Select Parental-Level (DVD)

Function : Set Parental Level

Format : Integer PT

Explanation : The command sets the parental level. The player allows up to 8 levels for playback. If an unavailable level is selected, the player returns an error message.

Note: The player accepts this command only when playing a DVD disc.

5.30 Audio Control (DVD, CD, VCD)

Function : Control Audio Output

Format : Integer AD

Explanation : The command allows changes to the audio output from the default value then returns the completed status message. The player resets to the default value when the tray opens or when the power cycles.

NOTE: The player automatically resets the audio control to 3 (Audio 1), when it is powered ON. And the player resets the audio control to 7 when CD or VCD is loaded.

The output channel assignment for each integer (argument) is listed below:

Argument	DVD	CD ¹	VCD
0	Off	Off	Off
1	Audio 2	---	---
2	Audio 3	---	---
3	Audio 1	---	---
4	Off	Off	Off
5	Audio 5	L	L
6	Audio 6	R	R
7	Audio 4	Stereo	Stereo

When playing DVD VR with bilingual audio, the output channel assignment for each integer (argument) is listed below:

Argument DVD VR with bilingual

0	Off
1	---
2	---
3	---
4	Off
5	Main
6	Sub
7	Main + Sub

Execution :

String	Status Return	DVD player
5AD<CR>	R<CR>	audio output = Stereo becomes audio output = Audio 5, L-ch

5.31 Video Control

Function : Video switch is turned ON / OFF

Format : Integer VD

Explanation : The command switches the video output ON or OFF then returns the completed status message. The default is 1 (video ON).

The squelch switch adjusts the video output when the video control is ON (during playback). If the player is in Park or Pause mode, the video output is OFF and the color background is displayed.

When the Video Control is set to 0 (OFF), the video is squelched at all times.

Argument	Function	Video Switch
0	OFF	OFF
1	ON	ON

Execution :

String	Status Return	DVD player
0VD<CR>	R<CR>	Video Switch = ON to Video Switch = OFF

5.32 Display Control

Function : Character display is turned ON / OFF

Format : Integer DS

Explanation : The player rewrites the Display Control Register (argument) then returns the completed status message. The default register value is 0 (display switched OFF). Arguments can display User's Area Characters, Title Number, Time Code, Chapter Number and Audio Output information.

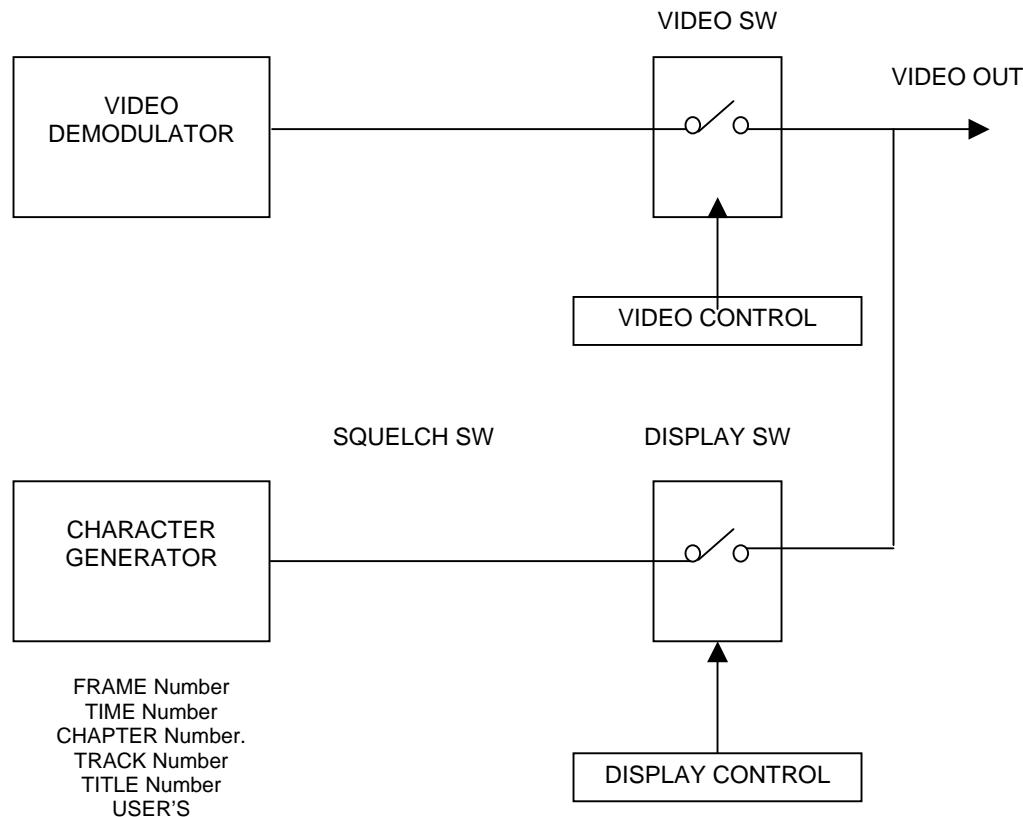
Display changes are restricted when Argument 1 is set through the serial connection. The remote control is blocked from changing the on-screen display.

NOTE: The displayed Frame number attempts to auto-correct to the actual Frame number, however, Frames continue to advance during playback.

Argument	Function
0	OFF
1	Displays user's area that is set by Register A
2	When playing DVD: Title, Number of total Title, play time Remain time and total time based on each Title Audio, Subtitle, Angle When playing CD/VCD: Track, Number of total Track, play time Remain time and total time based on each Title
3	When playing DVD: Chapter, Number of total Chapter, play time Remain time and total time based on each Chapter Transfer rate When playing CD/VCD: Play time, remain time and total time based on Disc

Execution :

String	Status Return	DVD player
1DS<CR>	R<CR>	Display Switch = OFF to Display Switch = ON <i>Display condition is set on Register A</i>
3DS<CR>	R<CR>	Display condition = 3
DS<CR>	R<CR>	Display Switch = OFF



5.33 Key Lock

Function : The key lock switches ON / OFF

Format : Integer KL

Explanation : The command enables/disables the remote control and access through the front panel. The default value is 0 (OFF) thus the player is unlocked.

If the key lock switch is set to 1, all buttons (front panel and remote control) including the power control are disabled and IR and FRONT in ADV.SETUP is set to Disable. Use this setting for a PC-controlled player to lessen interference from outside sources such as remote controls.

If the key lock switch is set to 2, only the tray open button/key is disabled and the OP command no longer controls the tray. And the setting of TRY LOCK in ADV.SETUP is set to ON. Thus, after powering OFF the player, the locked tray protects the disc from unauthorized personnel.

Argument	Function
0	Unlock
1	Locks all keys include power
2	Locks only tray open

Execution :

String	Status Return	DVD player
1KL<CR>	R<CR>	Key Lock ON
OKL<CR>	R<CR>	Key Lock OFF (unlocked)
2KL<CR>	R<CR>	Tray Open Lock ON

5.34 Stack Group Set (DVD)

Function : Set the Command Stack Group

Format : Integer GP

Explanation : The command sets the stack group for execution or access. It is added in conjunction with the [BS] (BARCODE/COMMAND STACK PLAY) command.

1 to 300, decimal system integer number is used in the argument.

5.35 Barcode /Command Stack Play (DVD)

Function : Execute Barcode/Command Stack

Format : Integer BS

Explanation : The command executes the Barcode/Command stack group after specifying the group number with the GP command.

The player returns an E06 error message if the BS command is issued with an unknown or unspecified group/step number.

1 to 300, decimal system integer number is used in the argument.

Execution :

String	Status Return	DVD player
25GP16BS<CR>	R<CR>	Execute from group 25/step 16

5.36 Stack Data Upload

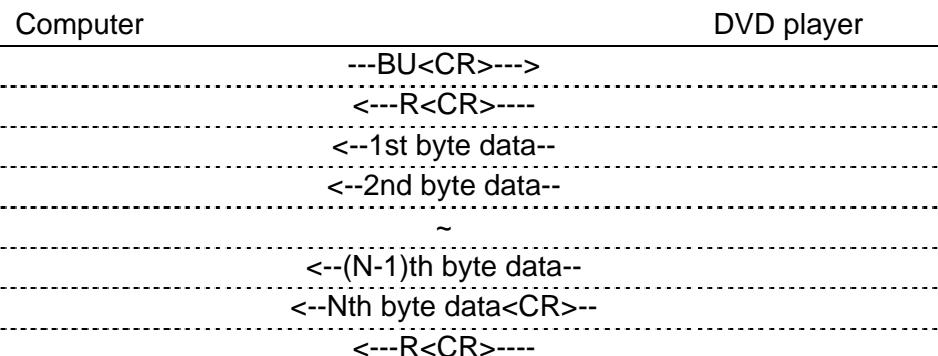
Function : Reads the data in the player: Command Stack data

Format : BU

Explanation : The player, while in Park mode, sends the data to the computer after sending the command.

The Communication flows as shown below.

(N=9320)



Format of the data:

BP	Contents	Numbers of bytes
0 - 1	(1) Total number of the transfer data (fixed number = 2468H)	2 bytes
2 - 3	(2) The version of this data format (fixed value)	2 bytes
4 - 5	(3) Barcode #1 Search Pointer	2 bytes
6 - 7	Barcode #2 Search Pointer	2 bytes
~	~	~
600 - 601	Barcode #299 Search Pointer	2 bytes
602 - 603	Barcode #300 Search Pointer	2 bytes
604 - 605	(4) Number of Next Barcode Data	2 bytes
606 - 607	(5) Number of Next Barcode Group	2 bytes
608 - 1207	(6) fixed data ffH	600 bytes
1208 - 1213	(7) fixed data ffH	6 bytes
1214 - 1215	(8) Next Data Address	2 bytes
1216 - 9315	(9) Command Stack Data	8100 bytes
9316 - 9319	(10) Checksum	4 bytes

- (1) Fixed data:
 - indicates the total data bytes of this transfer with HEX digits
 - 2468H = 9320
- (2) Fixed data:
 - indicates the version of this data format is (0200H) now
 - To avoid errors, this code must remain intact. Do not change any digits within this code.
- (3)
 - indicates the head address of the #Nth Command Stack data
 - The head address is a relative address. The base address is (BP = 1216) and (BP = 1216) is the head byte of the Command Stack Data in this format.
 - (N = 1 ~ 300)
 - If the data of #Nth is invalid, it shows (ffffH).
- (4)
 - indicates the numbers of the registered Command Stacks
 - It is available from 0 to 299 in a HEX digit format.
- (5)
 - indicates the group number of the next Command Stack
 - It is available from 0 to 299 in a HEX digit format.
- (6) Fixed data:
- (7) Fixed data:
- (8)
 - indicates the head address of the next Command Stack data
 - The head address is a relative address. The base address is (BP = 1216) and (BP = 1216) is the head byte of the Command Stack Data in this format.
- (9)
 - Comprises the body of the data
- (10)
 - checksum of the data that indicates the result of adding up BP 0 through BP 9315 and shows in HEX (double word) format

Format of Barcode / Command Stack data in the data:

The length of Command Stack data is 16 bytes. This is a fixed length. Each byte is made up of aH (upper nibble) and one digit of the Barcode Command (lower nibble). The Barcode Command length is available up to 16 digits. If the command length is less than 16 digits, it fills with (00H).

Example:

Segment Play Command : Title 02, from Frame 3600 to Frame 4800
> 4020036000048007

BP	Data	Explanations
1216 + BARCODE_SRP #n	a4H	
+ 1	a0H	
+ 2	a2H	
+ 3	a0H	
+ 4	a0H	
+ 5	a3H	
+ 6	a6H	
+ 7	a0H	
+ 8	a0H	
+ 9	a0H	
+ 10	a0H	
+ 11	a4H	
+ 12	a8H	
+ 13	a0H	
+ 14	a0H	
+ 15	a7H	

*BARCODE_SRP #n : Barcode #n Search Pointer

Outline of Barcode Command : Barcode Command has these formats as follows.

- DVD 4 digits command (sets the player, the video and the audio control)
- DVD 6 digits command (sets the attribute control)
- DVD 10 digits command (Chapter Search Command)
- DVD 12-digit command (Chapter Segment Play)
- DVD 14-digit command (Frame Search)
- DVD 16-digit command (Segment Play)

The following four command functions in Command Stack are not regulated in Barcode Format. These commands are regulated as follows.

- 1) End of Group mark: The first byte is (ffH), the others are (00H)
- 2) REPEAT: (49a3H)
- 3) WAIT: (4bxxxxH)
- 4) GOTO: (4axxxxH)

*Refer to the Barcode Format

Execution :

String	Status Return	DVD player
BU<CR>		Park mode
	R<CR>	Receives the command and
	20e40010....02	starts the transfer of the data,
	6743<CR>	9320 bytes (ends with <CR>)
	R<CR>	

5.37 Stack Data Download

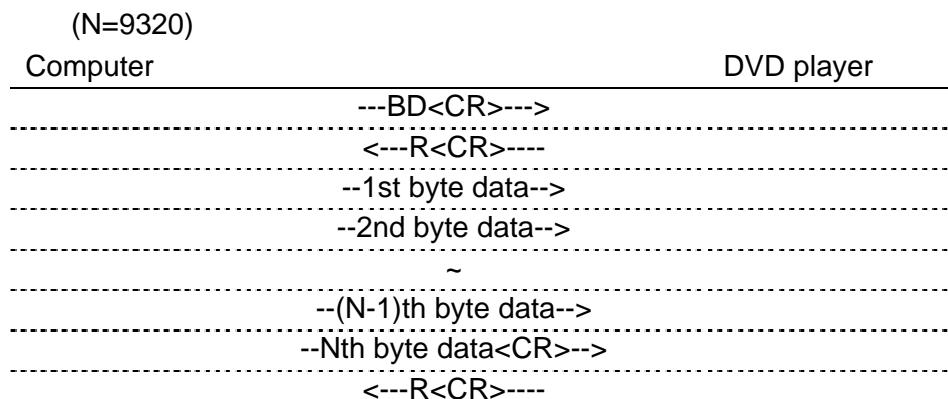
Function : Sends the following data to the player; Command Stack data

Format : BD

Explanation : The computer sends Command Stack data to the Parked player if a disc is in the tray.

Refer to the descriptions of Command Stack Data Upload.

The Communication flows as follows.



Execution :

String	Status Return	DVD player
BD<CR>		Park mode
	R<CR>	Receives the command and
20e40010....0267		starts the receiving data, 9320 bytes. It ends with <CR>.
43<CR>		
	R<CR>	

6. CURRENT PLAYER CONDITION REQUEST DESCRIPTIONS

6.1 P-Block Number Request

Function : The command returns information for the following groups:
DVD – Title Numbers, Chapter Numbers, Time
CD/VCD – Track Numbers, Index Numbers, Block Numbers, Time

Format : ?A

Explanation : If the P-Block Number Request command is sent to a DVD disc, Title numbers, Chapter numbers and Time Code information are grouped together then the data is returned in a single report. A request sent to a CD/VCD disc returns Track numbers, Index numbers, Block numbers and Time Codes.

The continuous Frame count information may be missing from a report if the P-Block Number Request is sent while the player is in normal playback mode. The player does not update Frame counts while processing this command. Rather than returning an incorrect Frame count, the player ignores the request.

If the player is in Random Access Mode, the report contains correct values.

NOTE: The Time Code shows the elapsed time based on the chapter when playing DVD Video disc. And it shows the elapsed time based on the title when playing DVD VR disc.

Execution :

String	Status Return	DVD player
?A<CR>	1201033545<CR>	Play mode (CD) <i>Track 12, Index 1, 3 minutes, 35 seconds 45 Blocks</i>
?A<CR>	0135001247<CR>	Play mode (DVD) <i>Title 1, Chapter 35, 12 minutes, 47 seconds</i>

6.2 Title/Track Number Request

Function : Returns the current Title/Track number

DVD : Title

CD/VCD : Track

Format : ?R

Explanation : The player returns the contents of the Title/Track Number Register. The Track number is a 2-digit integer. Correct values show only when the player is in Random Access Mode.

Execution :

String	Status Return	DVD player
?R<CR>	12<CR>	Play mode (CD) <i>Player plays Track 12</i>

6.3 Chapter Number Request (DVD)

Function : Returns the current Chapter number

Format : ?C

Explanation : The player returns the contents of the Chapter Number Register.

The Chapter number is a 2-digit integer. If a disc does not have Chapter numbers, the player returns an error message (E04). Correct values show only when the player is in Random Access Mode.

Execution :

String	Status Return	DVD player
?C<CR>	12<CR>	Play mode (DVD) <i>Player plays Chapter 12</i>

6.4 Time Code Request

Function : Returns the current Time Code

Format : ?T

Explanation : The player returns the contents of the Current Time/Frame Register.

If a DVD disc is playing, a 3-digit number is assigned for minutes and a 2-digit number is assigned for seconds.

If a CD or VCD disc is playing, a 1-digit number is assigned for hours (fixed 0), a 2-digit number is assigned for minutes and a 2-digit number is assigned for seconds.

If the player is in Random Access mode, the returned value is current.

If a disc lacks Time information, the player returns error message E04.

If a disc Time Code fails to be read correctly, the player retains the previous Time Code.

Execution :

String	Status Return	DVD player
		Play mode
?T<CR>	03213<CR>	32 minutes, 13 seconds(CD/VCD)
?T<CR>	11742<CR>	117 minutes, 42 seconds(DVD)

6.5 Block Number Request (CD)

Function : Returns the current Block number

Format : ?B

Explanation : The player returns the value of the current Block number as a 7-digit integer. Correct values show only when the player is in Random Access mode.

If a Block number is unavailable, the player retains the previous value.

Execution :

String	Status Return	DVD player
?B<CR>	0115310<CR>	Play mode 11 min, 53 sec, 10 Blocks

6.6 Frame Number Request (DVD)

Function : Returns the current Frame number

Format : ?F

Explanation : The player returns the contents of the Current Frame Register.

The player may experience a conflict between the command receiving/handling and the Frame number updating. Thus, continuous Frame numbers may be unavailable when the system is in Playback mode.

If the command is sent to a disc without Frame numbers, the player returns error message E04.

Accurate, current values are available when the player is in Random Access mode.

If a disc Frame number is unavailable, the player retains the previous value.

Execution :

String	Status Return	DVD player
?F<CR>	0002047<CR>	Play mode <i>Frame 2047</i>
?F<CR>	0095010<CR>	Play mode <i>Frame 95010</i>

6.7 Index Number Request (CD)

Function : Returns the current Index number

Format : ?I

Explanation : The player returns the current Index number as a 4-digit integer.
Correct values show only when the player is in Random Access Mode.

Execution :

String	Status Return	DVD player
?I<CR>	0102<CR>	Play mode <i>Track 1, Index 2</i>

6.8 Total Frame Request (DVD)

Function : Returns the total Frame number of the current Title

Format : ?Y

Explanation : The player returns the total Frame number of the current Title.

Execution :

String	Status Return	DVD player
?Y<CR>	0124832<CR>	Play mode <i>Frame 124832</i>

6.9 TOC Information Request (CD/VCD)

Function : Returns the Table of Contents (TOC) information

Format : ?Q

Explanation : The player returns the Track number of the first Track, the Track number of the last Track and the absolute time of starting lead-out.

Status information is returned in the following format:

C₁C₂C₃C₄C₅C₆C₇C₈C₉C₁₀<CR>

C ₁ C ₂	first Track number
C ₃ C ₄	last Track number
C ₅ C ₆ C ₇ C ₈ C ₉ C ₁₀	absolute Time of starting lead-out

Execution :

String	Status Return	DVD player
?Q<CR>	0109665544<CR>	Play mode <i>first Track is 1, last Track is 9, lead-out Time is 66 min, 55 sec, 44 Blocks</i>

6.10 Disc Region Code Request (DVD)

Function : Returns the region code of the disc

Format : ?G

Explanation : The player returns the approved region code(s) designated on the disc. Each bit indicates a region in a returned byte from the player. Bit 0 (LSB) indicates region 1, bit 1 indicates region 2, ..., bit 5 indicates region 6. Value 0 shows the disc as playable in its region.

Execution :

String	Status Return	DVD player
?G<CR>	F9<CR> (=11111001B)	Play mode <i>Region code 2 and 3</i>
?G<CR>	C0<CR> (=11000000B)	Play mode <i>Region code 1, 2, 3, 4, 5 and 6 (ALL)</i>

6.11 DVD Disc Status Request

Function : Returns the attributes of the DVD disc being played

Format : ?V

Explanation : The player returns the attributes of a DVD disc. Discs other than DVD, cause the player to return an error message (E04).

Status information is returned in the following format:

C₁C₂C₃C₄C₅<CR>

C ₁	Disc Mount	0 = No	1 = Yes	X = Unknown
C ₂	Layer Structure	0 = Single	1 = Dual	X = Unknown
C ₃	Path Type	0 = Parallel	1 = Opposite	X = Unknown
C ₄	Chapter Search	0 = Disable	1 = Available	X = Unknown
C ₅	Time Search	0 = Disable	1 = Available	X = Unknown

Execution :

String	Status Return	DVD player
?V<CR>	0XXXX<CR>	<i>Disc is not mounted</i>
?V<CR>	10010<CR>	<i>available Chapter Search but disable Time Search</i>
?V<CR>	E04<CR>	<i>Error – except DVD disc loaded</i>

6.12 CD Disc Status Request

Function : Returns the attributes of the CD disc being played

Format : ?K

Explanation The player returns the attributes of the CD disc. If the disc is other than a CD, the player returns an error message (E04).

Status information is returned in the following format:

C₁C₂C₃C₄C₅C₆C₇C₈<CR>

C ₁	Disc Mount	0 = No	1 = Yes	X = Unknown
C ₂	Not Used	X (fixed)		
C ₃	Not Used	X (fixed)		
C ₄	Not Used	X (fixed)		
C ₅	Not Used	X (fixed)		
C ₆	VCD	0 = No	1 = Yes	X = Unknown
C ₇	Reserved	X (fixed)		
C ₈	Reserved	X (fixed)		

Execution :

String	Status Return	DVD player
?K<CR>	0XXXXXXXX<CR>	<i>Disc is not mounted</i>
?K<CR>	1XXXX1XX<CR>	<i>VCD</i>
?K<CR>	E04<CR>	<i>DVD</i>

6.13 Register A Set

Function : The current setting of Resister A is rewritten

Format : Integer RA

Explanation : The command rewrites detailed display attributes into Register A.

The player offers three settings:

- Frame Number/Time code
- Title, Chapter Number/Track Number
- User's Area

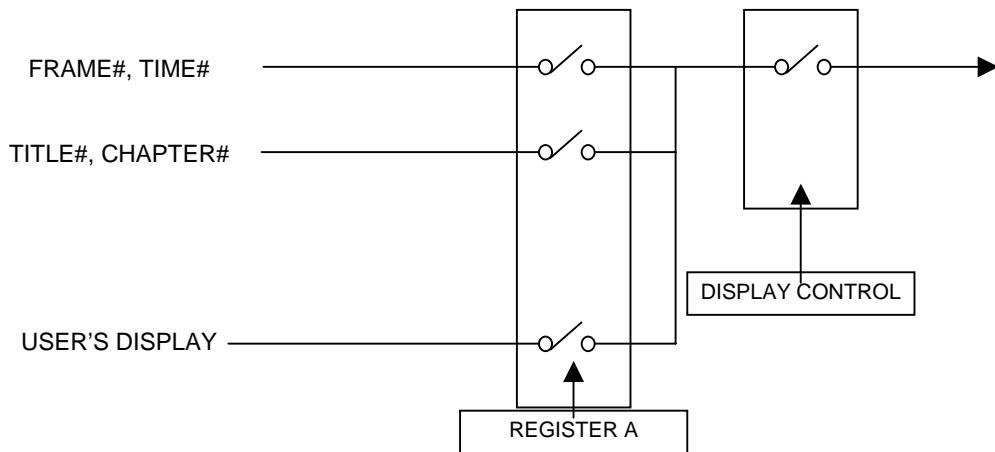
NOTE: The displayed Frame number attempts to auto-correct to the actual Frame number, however, Frames continue to advance during playback.

Note: When selecting Frame Number/Time code while playing a DVD disc, the Frame Number is displayed on the screen. However, when playing back a DVD disc and selecting Time Code(DVD), Time Code is displayed. Time Code is displayed when playing back a CD or VCD disc.

The available display combinations are listed in the following table (Default value is 3):

Arg	Function	User's	T&CH / Track	Frame / Time	Time (DVD)
0	Display OFF	0	0	0	0
1	Frame Number (DVD)/Time Code (CD,VCD)	0	0	1	0
2	Title & Chapter Number/Track Number	0	1	0	0
3 (default)	Frame Number (DVD) / Time Code (CD, VCD) + Title, Chapter, Frame/Track, Time	0	1	1	0
4	User's area	1	0	0	0
5	User's area + Argument 1	1	0	1	0
6	User's area + Argument 2	1	1	0	0
7	User's area + Argument 3	1	1	1	0
11	Time Code (DVD, CD, VCD)	0	0	1	1
13	Time Code (DVD, CD, VCD) + Title & Chapter Number/Track Number	0	1	1	1
15	Time Code (DVD, CD, VCD) + User's Area	1	0	1	1
17	Time Code (DVD, CD, VCD) + Title & Chapter Number/Track Number + User's Area	1	1	1	1

The Display Control command turns the character display ON or OFF. The Register A Set command specifies what is displayed on the screen.



The screen display positions are pictured below.

Line 0 displays the Time Code/Frame Number and/or Title/Chapter/Track Number(s).

The user's area has lines numbered from 0 to 9 with a total of 10 lines available. If line 0 is designated to show system information, all following lines are hidden.

The player allows/displays up to 320 characters (32 characters per line with 10 lines available). Follow the instructions below to create a User's Display:

1. Select User's Display in Register A
2. Set the display data using a print character command
3. Turn display switch ON

Execution :

String	Status Return	DVD player
1DS<CR>	R<CR>	Display Off to Display On
1RA<CR>	R<CR>	<i>Only Frame number is displayed</i>

6.14 Register D Set

Function : current setting of Register D is rewritten

Format : Integer RD

Explanation : Register D contains the termination setting of the serial communication (RS232). There are two choices, "CR" or "CR + LF". The default for Register D is 0.

Argument	Function
0 (default)	CR
64	CR + LF

6.15 Print Character

Function : Characters are written into the User's Display Area

(Not to be issued simultaneously with other commands)

Format : Integer PR <CR>

Character string <CR>

Explanation : The command writes a character string for one line into the User Display Area (turn ON the User Display Specification in Register A).

Follow the instructions listed below to create printed characters.

1. Specify the line number using an integer in the range 0 ~ 9

2. Enter the command character PR
3. Enter the terminate code <CR>
4. Specify the character string to enter in the next command string
(enter a character string up to 32 characters in length)

Available characters are shown in the table below (from 20h through 9Fh):

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
2	!	"	#	\$	%	&	'	()	*	+	,	-	.	/	
3	0	1	2	3	4	5	6	7	8	9	:	;	<	=	>	?
4	@	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
5	P	Q	R	S	T	U	V	W	X	Y	Z	[¥]	^	_
6	'	a	b	c	d	e	f	g	h	i	j	k	L	m	n	o
7	p	q	r	s	t	u	v	w	x	y	z	{		}	~	*1
C	À	Á	Â	Ã	Ä	Å	Æ	Ç	È	É	Ê	Ë	Ì	Í	Î	Ï
D	Ð	Ñ	Ò	Ó	Ô	Õ	Ö	×	Ø	Ù	Ú	Û	Ü	Ý	Þ	ß
E	à	á	â	ã	ä	å	æ	ç	è	é	ê	ë	ì	í	î	ï
F	ð	ñ	ò	ó	ô	õ	ö	÷	ø	ù	ú	û	ü	ý	þ	ÿ

*1 cannot be used

Execution :

String	Status Return	DVD player
4RA1DS<CR>	R<CR>	Register A and Display control set
4PR<CR>	R<CR>	Select Line 4
*** DVD player ***<CR>	R<CR>	Displays the characters like this ***DVD player***

6.16 Clear Screen

Function : Clears the characters shown in the User Display Area

Format : CS

Explanation : The player clears all characters from the User Display area. To clear only a particular line, use the PR command to overwrite the line with spaces.

Execution :

String	Status Return	DVD player
CS<CR>	R<CR>	All lines are cleared
3PR<CR>	R<CR>	Select line 3
HELLO!<CR>	R<CR>	Write letters on line 3, HELLO!

6.17 Advanced Setup

Function : current setting of Advanced Setup Menu is rewritten

Format : Integer MS

Explanation : The command rewrites the Advanced Setup Menu settings, which is expressed as an integer. The integer value is made up of the sum of the selected arguments. The player returns an error code if the command is issued while the Advanced Setup Menu is on the screen. The factory default value is 0.

The Advanced Feature Menu Request command (?S) reveals the current setting.

Argument	Function	Description	
		0	1
1	Reserved		
2	POWER ON START	OFF	ON
4	TITLE PLAY MODE	SINGLE	ALL
8	REPEAT MODE	(0) OFF, (8) CHAPTER	
16		(16) TITLE, (24) DISC *1)	
32	BAUD RATE	19200bps	9600bps
64	TRAY LOCK	OFF	ON
128	IR LOCK	OFF	ON
256	FRONT LOCK	OFF	ON
512	SYNC OUT(DURING SQ)	OFF	ON
1024	EXTEND TERMINAL	Standard	User

*1): (Available when Title Play Mode is set to ALL)

The setting value is calculated as follows.

The value = 1 * (0 or 1) + 2 * (0 or 1) + 4 * (0 or 1) + (0 or 8 or 16 or 24) + 32 * (0 or 1) + 64 * (0 or 1) + 128 * (0 or 1) + 256 * (0 or 1) + 512 * (0 or 1) + 1024 * (0 or 1)

Execution :

String	Status Return	DVD player
112MS<CR>	R<CR> (return rate is 9600bps)	Title repeat mode (16) Baud rate is 9600bps (32) Tray lock on (64)

6.18 Communication Control Set

Function : Selects the communication mode

Format : Integer CM

Explanation : command rewrites the contents of the Communication Control Register (CCR)

The CCR default value is set to Mode 3 (ON); however, the CCR Automatic Status may be switched OFF. Use the command to toggle the register ON or OFF.

Argument	Mode	Auto Status
2	Mode-2	OFF
3	Mode-3	ON

Execution :

String	Status Return	DVD player
2CM<CR>		CCR = 3 (<i>Default Communication Mode</i>) to CCR = 2 (<i>Communication Mode-2</i>)

6.19 Player Active Mode Request

Function : returns the player's current activity mode

Format : ?P

Explanation : The command confirms whether the player is running in the Random Access mode. The player returns an Active mode classification (refer to the table below).

Mode	Status
P00	Open
P01	Park
P02	Setup
P03	Unload
P04	Play

Mode	Status
P05	Still
P06	Pause
P07	Search
P08	Scan
P09	Multi-speed

The following table provides fuller explanations for each Active mode:

P00 (Open)	Disc tray is open
P01 (Park)	Disc rotation is stopped
P02 (Setup)	Preparation is being made for playback
P03 (Unload)	Disc rotation stops and disc tray opens
P04 (Play)	Audio and video are played at normal speed
P05 (Still)	Playback stops with video held on screen
P06 (Pause)	Playback stops and video is erased from screen
P07 (Search)	A specified address is searched for, a multi-track jump is in progress, or a Search for user's code is in progress
P08 (Scan)	Fast forward/reverse is in progress
P09 (Multi-speed)	Playback occurs at any one of several speeds

Execution :

String	Status Return	DVD player
?P<CR>	P04<CR>	Play mode
ST<CR>	R<CR>	Still mode
?P<CR>	P05<CR>	Still mode

6.20 Player Model Name Request

Function : Returns player model name

Format : ?X

Explanation : The command returns the player's name as P1570XX where P1570 is the series name and XX is a 2-digit serial code (not the product serial number).

Execution :

String	Status Return	DVD player
?X<CR>	P157001<CR>	Series name P1570 and code 01

6.21 Advanced Setup Request

Function : Returns the current setting of Advanced Setup Menu.

Format : ?S

Explanation : The player returns the current setting of the Advanced Setup Menu. The return is expressed as an integer value. The value is made up of the sum of the selected arguments. The factory default is set to 0. The player returns an error code if the command is issued when the player is showing

Advanced Setup Menu on the screen. See the description of Advanced Setup (MS).

NOTE: E04 is returned from a player when the command is issued while the Advanced Setup Menu is displayed.

Execution :

String	Status Return	DVD player
?S<CR>	112<CR>	<i>Title repeat mode (16)</i>
		<i>Baud rate is 9600bps (32)</i>
		<i>Tray lock on (64)</i>

6.22 Player Region Code Request

Function : Returns player region code

Format : ?H

Explanation : The command returns the player's region code.

Execution :

String	Status Return	DVD player
?H<CR>	02<CR>	<i>Region Code 2</i>

6.23 CCR Mode Request

Function : Returns the current communication mode

Format : ?M

Explanation : The command returns the contents of the Communication Control Register (CCR).
The CCR default value is set to Mode 3 (ON).

CM2	Mode-2
CM3	Mode-3

Execution :

String	Status Return	DVD player
?M<CR>	CM3<CR>	<i>CCR = 3 (Default Communication Mode)</i>

6.24 Input Number Request

Function : returns input numbers

Format : ?N

Explanation : The player waits the input of number from the remote controller and returns the input number.

Execution :

String	Status Return	DVD player
?N<CR>		<i>Waits to input the numeric numbers</i>
7<CR>	7<CR>	<i>7 entered from remote controller</i>

6.25 Error Code Request

Function : returns the latest error code

Format : ?E

Explanation : The player returns the most recent error codes. The report consists of Error Codes logged since the player was powered ON.

6.26 Input Unit Request

Function : returns a code for data input through a Remote control

Format : #I

Explanation : The player returns a four-digit ASCII-Hex code that represents commands sent through the remote control.

There are two code types, either a four-digit or eight-digit code (Extension code). When the input command data is two words (eight-digit) in length, the player truncates or shortens the information. A truncated code consists of an Upper Byte from the first code and a Lower Byte from the second code. The player creates a Returning Code or Double Code from these two bytes.

Once the player returns an Input Code, a FFFFh Code (no reactions from the remote control) repeats until a new code is sent from the remote control.

Execution :

String	Status Return	DVD player
		<i>Receives the Pause Key command -A39F</i>
#I<CR>	A39F<CR>	
#I<CR>	FFFFh<CR>	<i>Receives the Audio Key command - A399_A3BE</i>
#I<CR>	A3BE<CR>	
#I<CR>	FFFFh<CR>	

6.27 Input Barcode Data Request

Function : returns input data through a Barcode Reader

Format : #B

Explanation : The player returns an ASCII code that represents commands sent from a barcode reader.

NOTE: When the input data is unacceptable for the current disc type, the player returns an invalid code.

Execution :

String	Status Return	DVD player
#B<CR>	4307<CR>	<i>Receives a Play code about DVD disc</i>

6.28 Register A Request

Function : returns the contents of Register A

Format : \$A

Explanation : The player returns a detailed list of the Register A attributes.

Status information is returned in the following format:

AC₈C₇C₆C₅C₄C₃C₂C₁<CR>

C ₈ , C ₇ , C ₆	(Fixed 0)		
C ₅	Displays Time Code when playing DVD	0 = Off	1 = On
C ₄	(Fixed 0)		
C ₃	Displays User's Area	0 = Off	1 = On
C ₂	Displays Title & Chapter Numbers	0 = Off	1 = On
C ₁	Displays Frame Number (DVD) or Time Code (CD, VCD)	0 = Off	1 = On

Execution :

String	Status Return	DVD player
3RA<CR>	R<CR>	<i>Sets to Register A</i>
\$A<CR>	A00000011<CR>	<i>Requests information from Register A</i>

6.29 Register D Request

Function : returns the contents of Register D

Format : \$D

Explanation : The player returns the TxD termination setting from Register D

Status information is returned in the following format:

DC₈C₇C₆C₅C₄C₃C₂C₁<CR>

C ₈	Fixed 0		
C ₇	TxD termination	0 = CR	1 = CR + LF
C ₆	Fixed 0		
C ₅	Fixed 0		
C ₄	Fixed 0		
C ₃	Fixed 0		
C ₂	Fixed 0		
C ₁	Fixed 0		

Execution :

String	Status Return	DVD player
64RD<CR>	R<CR>	Sets the Register D
\$D<CR>	D01000000<CR>	Requests information from Register D

6.30 Menu Call (DVD)

Function : calls a disc menu or goes back to the former address

Format : Integer MC

Explanation : If the disc has a disc menu, the root menu or the Title menu comes up on the screen. If the screen is Still or if it is playing, these menus come up on the display. The command specifies the menu type with two integer numbers.

Integer	Menu type
1	Title
2	Root

If the player receives the command without an integer (while playing a menu), the player reverts to the previous Stilled or played address.

If the command is valid for the situation, the player immediately returns "R<CR>"*.

If the disc is missing the requested menu, [1 or 2 MC<CR>], the player returns an error message (E04).

*: However, the command is held or incompletely executed.

Execution :

String	Status Return	DVD player
		Plays some video Title
2MC<CR>	R<CR>	Shows the root menu
MC<CR>	R<CR>	Reverts back to the previously played Title

6.31 Numeric Button (DVD)

Function : Selects the button and executes by number

Format : Integer NB

Explanation : The command selects the menu button highlighted on the screen and executes the action assigned to the button. The command emulates the "digit" key on the remote control while the button resides on the display.

If the command is valid for the current player activity, the player immediately returns "R<CR>"*.

If the disc that is being played does not have the button in that screen when the command is issued, an error message (E06) is returned.

* However, this does not confirm that the command is executed completely.

Execution :

String	Status Return	DVD player
		Shows the disc menu
3NB<CR>	R<CR>	Selects and executes the button #3

6.32 Button Select (DVD)

Function : Selects the button (arrow key emulation)

Format : Integer CU

Explanation : The command selects the menu button displayed on the screen.

The command emulates the "arrow" key on the remote control while the button exists on the screen. The command specifies the direction using four numbers:

Integer	directions
1	Up
2	Down
3	Left
4	Right

If the command is valid for the situation, the player immediately returns “R<CR>”*.

If there are no buttons on the screen when the command is issued, an error message (E04) is returned.

*: However, this does not confirm that the command is executed completely.

Execution :

String	Status Return	DVD player
		Shows the disc menu
2CU<CR>	R<CR>	Moves the cursor down to the next button

6.33 Enter Button (DVD)

Function : sets the button and executes

Format : (Integer) ET

Explanation : The command fixes the button on the screen after executing the CU command with an integer. The player executes the program that is assigned to that button. This command emulates the “enter” key on the remote control while the button is on the screen.

If the command is appropriate for the situation, the player returns immediately “R<CR>”*.

If there are no buttons on the screen when the command is issued, an error message (E04) is returned.

*: However, this does not confirm that the command is executed completely.

Execution :

String	Status Return	DVD player
		Shows the disc menu
2CU<CR>	R<CR>	Moves to the below button from the prior one
ET<CR>	R<CR>	Fixes the selection and executes the program that is assigned on it

Function : emulates the “left” click of the mouse

Format : argument1, argument2 ET

Explanation : The command emulates the “left” click of the mouse while the cursor is on the screen. The command specifies the position of the cursor with two arguments. The upper left on the screen is (0,0), the lower right on the screen is (719, 479) for NTSC playback, or (719, 575) for PAL. The format is stated below.

Argument1	Argument 2	Position
000000		Upper left limitation on the screen
	719479	Lower right limitation on the screen
X ₁ X ₂ X ₃ Y ₁ Y ₂ Y ₃		Anywhere on the screen

If the arguments are available, the player immediately returns “R<CR>*.

If the argument number is unavailable, an error message (E06) is returned.

* The return “R<CR>” refers only to checking for an argument number. The player is incapable of verifying the existence of a button with this command.

Execution :

String	Status Return	DVD player
256384ET<CR>	R<CR>	Emulates the “left” click at the point (256,384) on the screen

6.34 Get Information (DVD)

Function : gets the disc information

Format : Integer GI

Explanation : The command, combined with a 4-digit ID and a 4-digit Sub-ID, returns the requested information to the player.

Integer = XXXXYYYY

ID (XXXX)	Sub-ID (YYYY)	Return Data from the Player
0000	Any number	E06 (argument error)
0001	0000 to 0023	System Parameter Info (4-digit)
0001	More than 0023	E06 (argument error)
0002 or more	Any number	E06 (argument error)

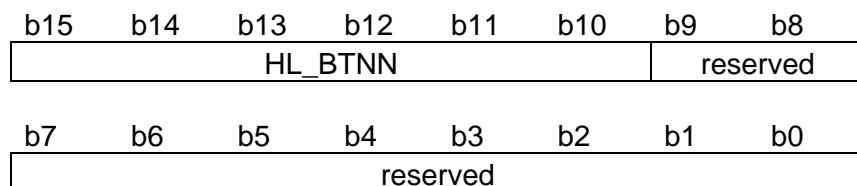
The player only returns system parameter information in cases where ID = 0001, otherwise the player returns error message E06.

Below is a list of the (SPRM) System Parameter. For more information, refer to "Table 4.6.1.2-1:System Parameters (SPRMs) in the DVD Specifications for a Read-Only Disc, (Part 3 VIDEO SPECIFICATIONS).

SPRM	Explanation
0	Menu Description Language Code (M_LCD)
1	Audio stream number (ASTN) for TT_DOM
2	Sub-picture stream number (SPSTN) & TT_DOM On/Off flag
3	Angle number (AGLN) for TT_DOM
4	Title number (TTN) for TT_DOM
5	VTS Title number (VTS_TTN) for TT_DOM
6	Title PGC number (TT_PGCN) for TT_DOM
7	Part_of_Title number (PTTN) for One_Sequential_PGC_Title
8	Highlighted Button number (HL_BTNN) for Selection state
9	Navigation Timer (NV_TMR)
10	TT_PGCN for NV_TMR
11	Player Audio Mixing Mode (P_AMXMD) for Karaoke
12	Country Code (CTY_LVL) for Parental Management
13	Parental Level (PTL_LVL)
14	Player Configuration (P_CFG) for Video
15	P_CFG for Audio
16	Initial Language Code (INI_LCD) for AST
17	INI_LCD_EXT for AST
18	INI_LCD for SPST
19	(INI_LCD_EXT) Initial Language Code extension for SPST
20	Player Region Code
21	reserved
22	reserved
23	reserved for extended playback mode

For example

SPRM(8): Highlighted Button number (HL_BTNN) for Selection state



HL_BTNN..... 1 to 36: HL_BTNN value
 Others: reserved

Execution :

String	Status Return	DVD player
00010008GI<CR>	1400<CR>	Selecting button #5 now

6.35 Memory Data Upload

Function : reads the data from internal memory in a player

Format : MU

Explanation : The player, while in Park mode, sends the data to the computer with the total bytes equaling 11,134bytes

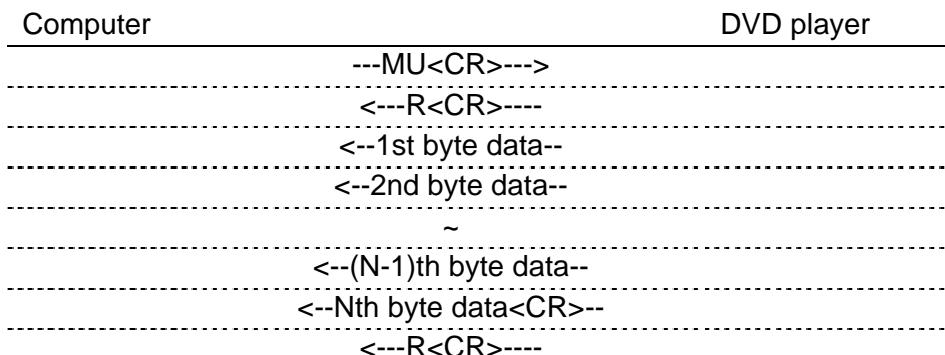
- * 1,796bytes in data composed of Condition, Last memory (SETUP, ADV.SETUP, Error History, Program area, etc.)

- * 9,332 bytes data such as Command Stack data

Both sets of information can be read at the same time.

The Communication flows as shown below.

(N=11,134)



Format of the data:

BP	Contents	Numbers of bytes
0 - 1	(1) Total number of the transfer data (fixed number = 2B7EH)	2 bytes
2 - 5	(2) 00000000	4 bytes
6 - 9	(3) Player ID (501570XX)	4 bytes
10 - 9,333	(4) Command Stack Data	9,324 bytes
9,334-9,361	(5) All FF	28 bytes
9,362 – 11,049	(6) Setup data	1688 bytes
11050 – 11065	(7) ADV.SETUP setting data	16 bytes
11,066 – 11,129	(8) Extend Terminal user setting data	64bytes
11130 – 11133	(9) check sum	4 bytes

Execution :

String	Status Return	DVD player
		Park mode
MU<CR>	R<CR>	Receives the command and starts the transfer of the data, 11,134 bytes (ends with <CR>)
	... (11,134 bytes)...<CR>	
	R<CR>	

6.36 Return Firmware Version

Function : Returns player firmware version

Format : ?Z

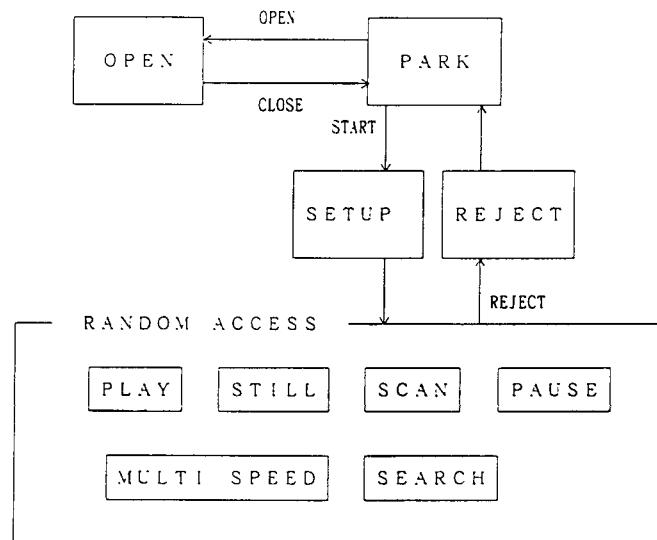
Explanation : The command lists a number on the monitor that is the player's current firmware version.

Execution :

String	Status Return	DVD player
?Z<CR>	1.026	Returns current firmware version

7. OPERATING MODES

The Operating or Active mode consists of five sub-modes; Open, Park, Setup, Random Access and Reject. A command causes the player to change from one sub-mode to another. The five sub-modes are described below.



7.1 Open

The disc tray is open.

7.2 Park

The player enters the Park mode when the tray is closed.

7.3 Setup

If the Start command is sent while a disc is in the player, the disc spins up and the player proceeds to the Setup mode.

7.4 Random Access

The player enters the Random Access mode when the disc is ready for playback.

The Random Access mode is divided into six sub-modes; Play, Still, Scan, Pause, Multi Speed and Search. Various picture controls in the Random Access mode are available when playing a DVD or VCD disc. The effects are achieved

through highly detailed mode transfers. Refer to the previous figure for mode relationship information.

7.5 Reject

When the Reject command is sent to the player, video playback stops. Once the disc rotation has stopped, the player enters the Park mode.

8. DVD-V5000 INTERNAL REGISTERS

When arguments (e.g., Title number, Chapter number, Time Code, etc.), accompany commands to the player, argument values are set in the appropriate player registers. This Chapter describes each internal register of the player.

8.1 Current Time/Frame

The register contains the current time while a DVD disc is playing. A CD/VCD disc provides both a current Time Code and a Block number within the register.

8.2 P-TIME

The P-TIME Register contains the elapsed time within a Track or a Chapter.

8.3 Current Title/Track (Current Chapter)

The register contains the current Title/Track Number (Chapter Number).

8.4 Current Index

The register contains the current Index number.

8.5 Serial Digit Buffer

The register contains the command argument values. The commands are placed in a separate, exclusive register.

When the player evaluates a command, the contents of the buffer are transferred to a specified register.

8.6 Remote Control Use Address Flag

When a Search command is sent through the remote control to the player, a flag specifies if the address assigned is a Title/Track, Chapter, Time or Frame.

8.7 Remote Control Digit Buffer

The register contains the numbers input through the remote control.

8.8 Remote Control Data Register

The register contains the temporary data input through the remote control.

8.9 Laser Barcode Buffer

The register contains the compatible Laser Barcode data transmitted via the remote control.

8.10 Serial Use Address Flag

When the Serial Interface controls the player, a flag specifies if the address assigned is a Title/Track, Chapter, Time or Frame.

8.11 Search Time/Frame

The register contains a goal Frame number or Time Code.

8.12 Search Title/Track (Search Chapter)

The register contains a goal Title/Track number (Chapter number) during a Search.

This function is identical to the Search Time/Frame (refer to 8.10).

8.13 Search Index

The register contains a goal Index number during a Search.

This function is identical to the Search Time/Frame command (refer to 8.11).

8.14 Mark Time/Frame

The register contains a marker (representing the Frame number to Time Code or Block number) that indicates the end point of an Auto Play.

When the player performs an Auto Play, the contents of the Mark Time/Frame and the Current Time/Frame are compared.

8.15 Mark Title/Track (Mark Chapter)

The register contains the Title/Track (mark Chapter) as a marker.

The function is identical to the Mark Time/Frame (refer to 8.12).

8.16 Mark Index

The register contains the Index number as a marker.

The function is identical to the Mark Time/Frame command (refer to 8.14).

8.17 Video Control

The player uses the register to control the Video ON/OFF switch.

8.18 Audio Control

The player uses the register to select the audio output.

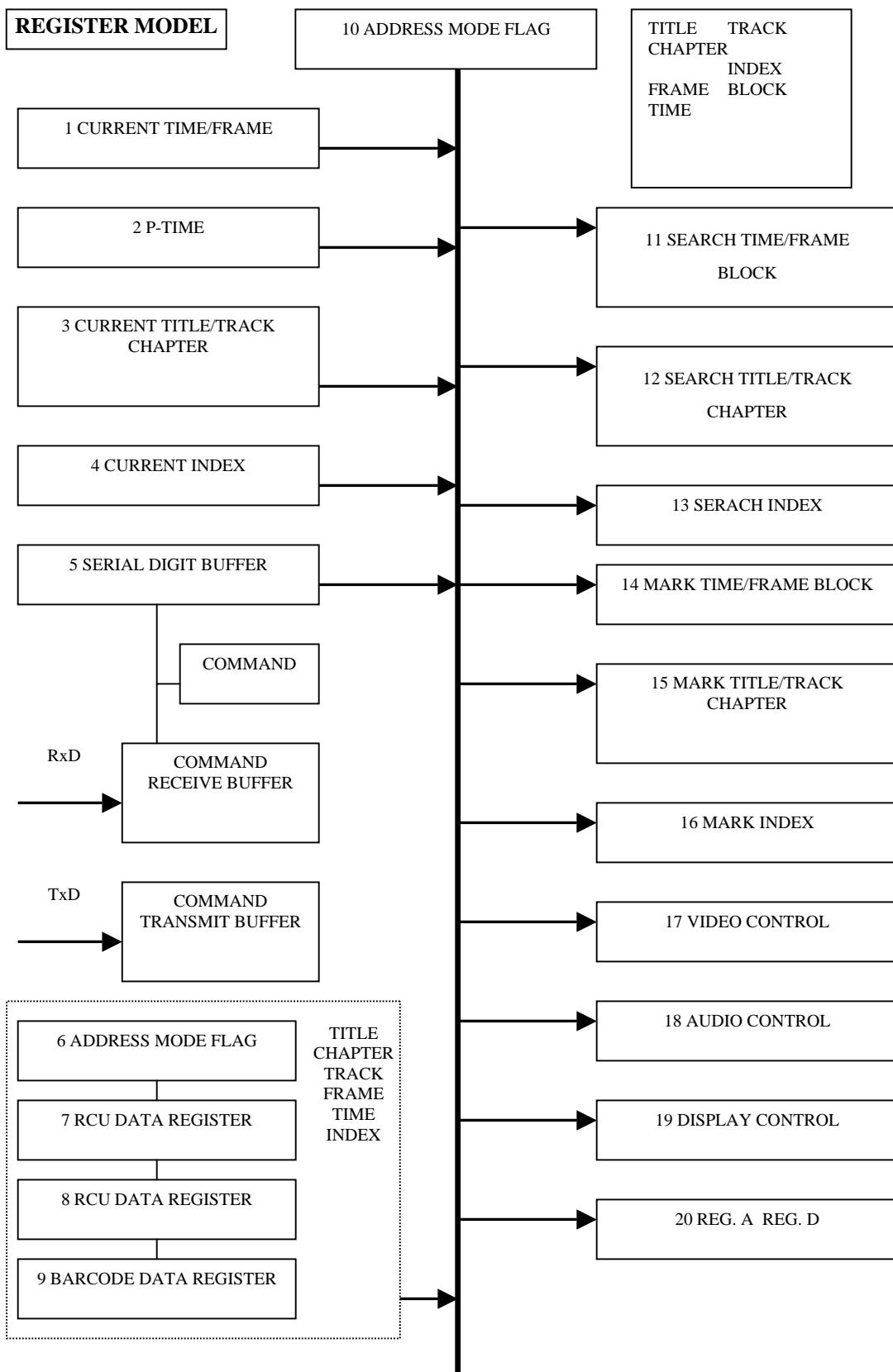
8.19 Display Control

The player uses the register to toggle the Character Display switch ON/OFF.

The Character Display tracks on-screen information such as Time/Frame number, Title/Track number, etc.

8.20 Registers

There are two registers, A and D. The registers are reserved exclusively for CPU internal operations.



9. EXTEND TERMINAL CONTROL

To activate a function, create a switch contact with an electrical ground (Pin 1). Check Chapter 2 to verify pin (Pin 6 through Pin 13) and terminal (SW1 ~ SW8) assignments.

There are three SW functions in the EXTEND TERMINAL CONTROL.

1. To recall Barcode/Command Stacks and execute

The function, STACK GROUP 1 to STACK GROUP 27, is similar to a combination of remote control buttons to recall and execute a stack.

2. To execute the function as a remote control command

The function acts the same as the buttons (ENTER, PLAY, STOP, etc.) on a remote control excluding SCAN FWD/REV.

DVD-V5000 continues execute SCAN FWD/REV even when the button on the remote control is released. But in case of EXTEND TERMINAL CONTROL, it stops to execute SCAN FWD/REV when button is released.

(In case of remote control “releasing SCAN button” will not discontinue the SCAN.

But in case of EXTEND TERMINAL, releasing SCAN switch will terminate SCAN operation.)

3. To execute as an advanced remote control button

Advanced remote control commands such as numbers from 10 to 20 may be sent as a switch control command.

Note: for additional assistance, please refer to Product Information Bulletin (PIB) 152601 DVD-V7400 and Jama Port Control available on the Pioneer Electronics website under Service & Support – Business Solutions Products.

9.1 Function Assignment

Create a Circuit Controller or a Diode Matrix Circuit (refer to the table below).

Diode Assignment List (Standard setting and User default setting)

No.	SW1	SW2	SW3	SW4	SW5	SW6	SW7	SW8	Function
1	X								↑
2		X							↓
3			X						←
4				X					→
5					X				ENTER
6						X			STACK GROUP1
7							X		STACK GROUP2
8								X	STACK GROUP3
9		X						X	10
10			X					X	11
11				X				X	12
12	X	X							OPEN/CLOSE
13			X	X					DISPLAY
14	X					X			1
15		X					X		2
16			X			X			3
17				X		X			4
18	X						X		5
19		X					X		6
20	X			X					↗
21		X		X					↘
22	X	X							↖
23	X		X						↖
24					X	X			PLAY
25					X		X		STOP
26					X			X	PAUSE
27							X	X	TOP MENU
28			X				X		7
29				X			X		8
30	X							X	9
31					X	X	X		STEP FWD
32					X	X		X	STEP REV
33					X		X	X	RETURN
34	X	X	X						SCAN FWD
35	X	X		X					SCAN REV
36	X		X	X					SKIP FWD
37		X	X	X					SKIP REV
38			X			X	X		STACK GROUP4
39				X		X	X		STACK GROUP5
40	X	X					X		STACK GROUP6
41	X	X				X			13
42	X		X			X			14

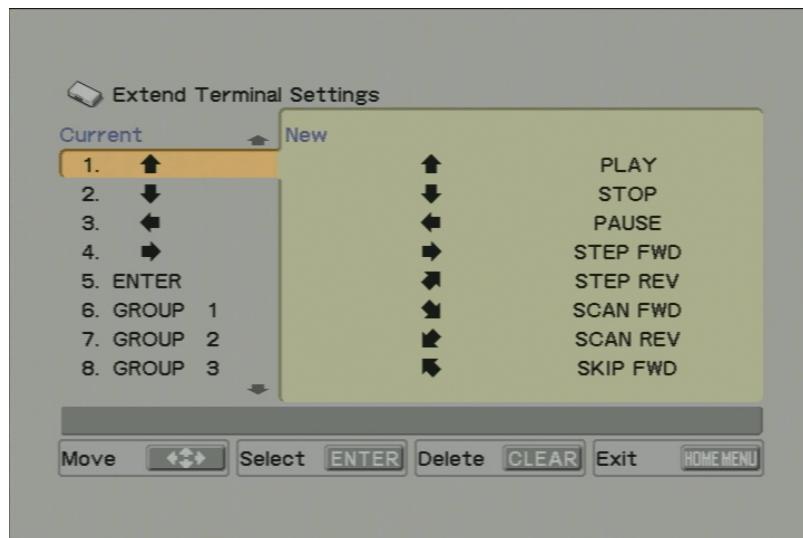
43	X			X		X			15
44		X	X			X			16
45		X		X		X			17
46			X	X		X			18
47	X					X	X		19
48		X				X	X		20
49	X		X				X		STACK GROUP7
50	X			X			X		STACK GROUP8
51		X	X				X		STACK GROUP9
52		X		X			X		STACK GROUP10
53			X	X			X		STACK GROUP11
54	X						X	X	STACK GROUP12
55		X					X	X	STACK GROUP13
56			X				X	X	STACK GROUP14
57				X			X	X	STACK GROUP15
58	X	X						X	STACK GROUP16
59	X		X					X	STACK GROUP17
60	X			X				X	STACK GROUP18
61		X	X					X	STACK GROUP19
62		X		X				X	STACK GROUP20
63			X	X				X	STACK GROUP21
64	X				X			X	STACK GROUP22
65		X				X		X	STACK GROUP23
66			X			X		X	STACK GROUP24
67				X		X		X	STACK GROUP25
68					X		X		STACK GROUP26
69						X		X	STACK GROUP27
70						X	X	X	MENU
71	X				X	X			RECALL
72	X				X		X		HOME MENU
73	X				X			X	MEMORY
74		X			X	X			>10
75		X			X		X		REPEAT
76		X			X			X	REPEAT A-B
77			X		X	X			AUDIO
78			X		X		X		ANGLE
79			X		X			X	SUBTITLE
80				X	X	X			TITLE/CHP/FRM/TIME
81				X	X		X		0
82				X	X			X	CLEAR

9.2 Function User Setting

Function assignment for Numbers1 through 30 can be changed in Advanced Setup.

The procedure is given below for an example of GROUP 3 setting change to "MENU".

- Open ADV SETUP and switch EXTEND TERMINAL to User and press Enter.
- And then the following window opens.



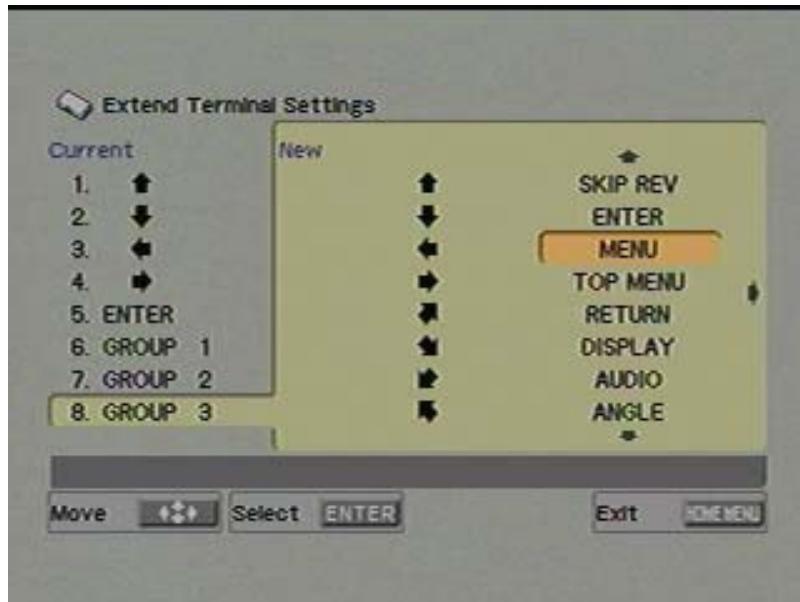
- DOWN button to select "GROUP 3"



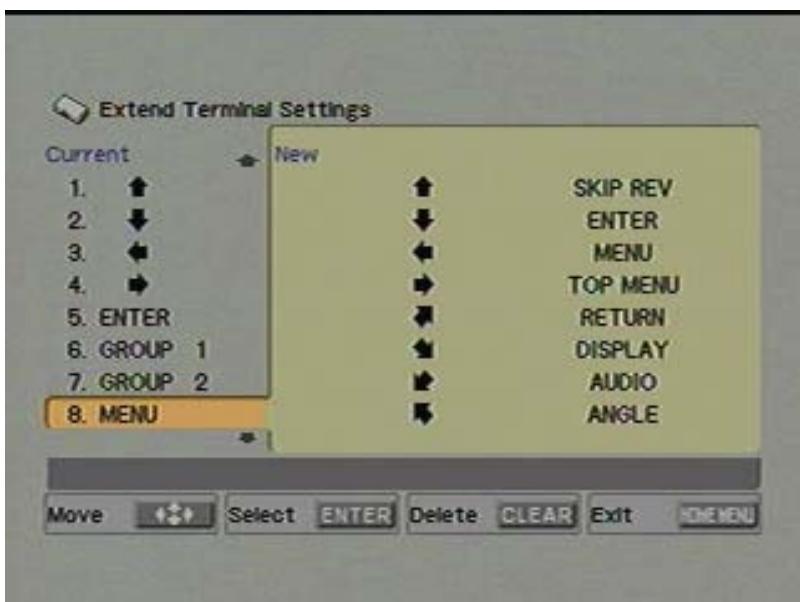
- RIGHT Button



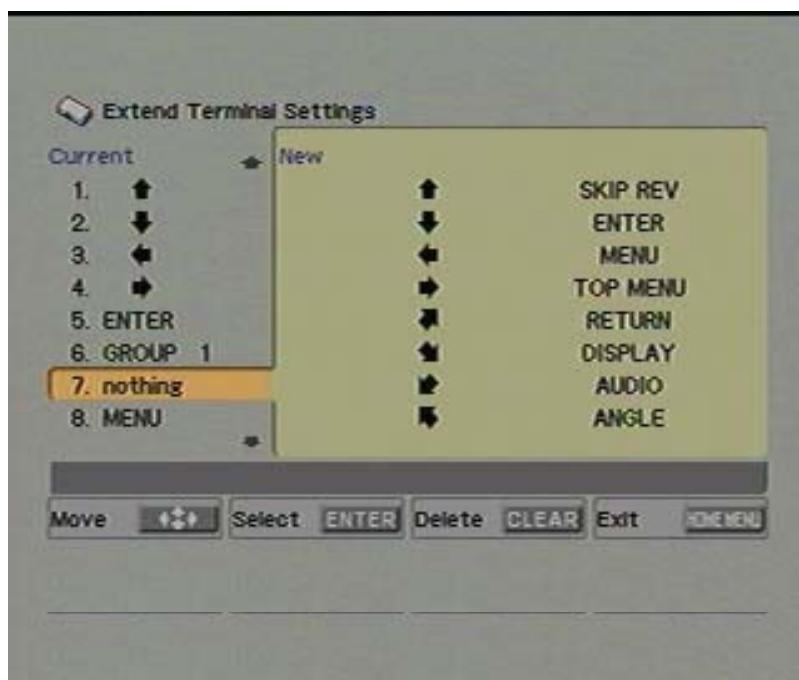
- DOWN Button to select "MENU"



- ENTER button to change the function of switch 8 to MENU



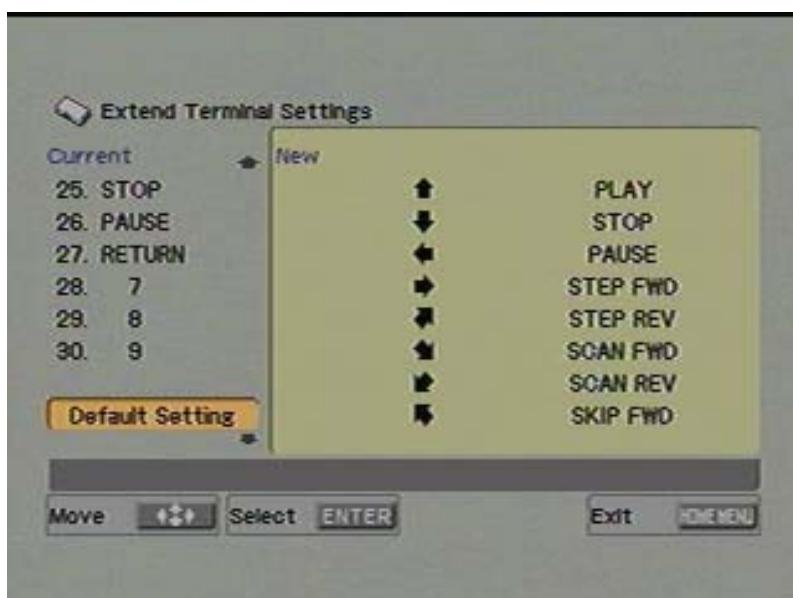
In order to DISABLE the switch function, please select the switch and Press the "CLEAR" button. The switch displays "nothing" as shown below.



The modification of the switch setting will be reserved within memory area even with power-off.

In order to recover the initial factory setting, please select "Default Setting" and press ENTER.

For an initial setting, Standard and User are the same.



9.3 Controller

Examples of Switch and Diode specifications are charted below.

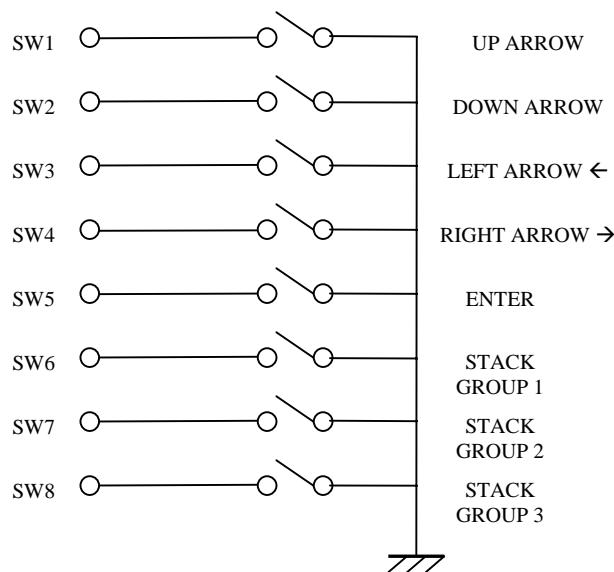
Switch Specifications

On Resistance	Less than 1 ohm
Off Resistance	More than 1 M ohm
Type	Non-Locking

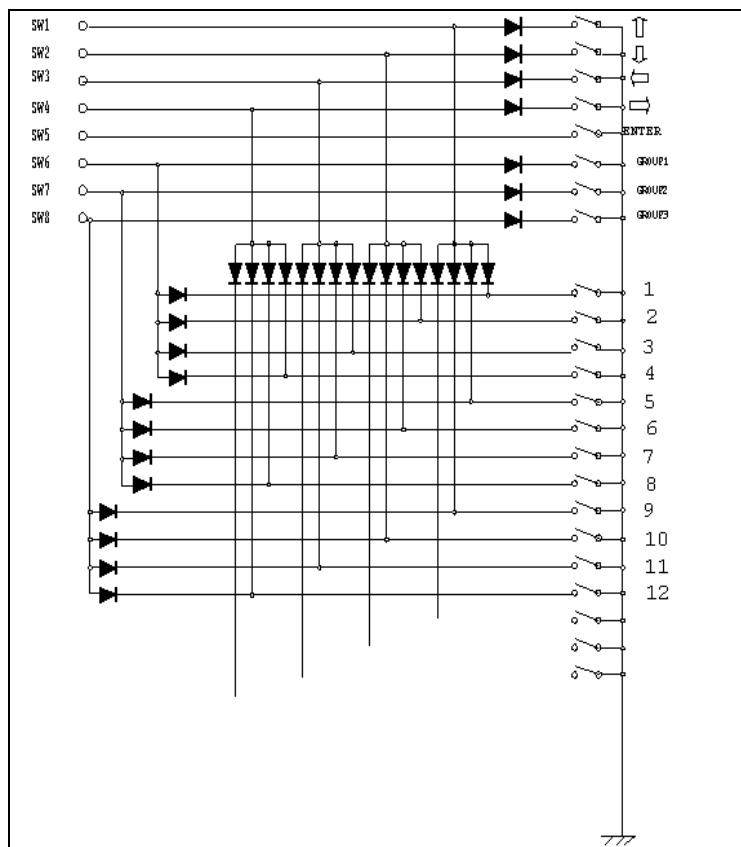
Diode Specifications

Forward Voltage Drop (VF)	Less than 0.7 (IF 1ma)
Surge Forward Current (IFSM)	Less than 100ma
Forward Current	Less than 10µa

9.3.1 Simple Circuit



9.2.2 Diode Matrix Circuit



10. ADDITIONAL NOTES

1. If a video has a picture stop code, when the player reaches the stop code point, it enters the Still mode.
2. If Prohibit Pause is set for Stop Marker playback, an error is issued at any Stop Marker Point.
3. When a computer is controlling the player, send the KEY LOCK command to eliminate possible interference from the front panel buttons and/or the remote control.
4. If an invalid address is set within a command for a CD or VCD disc, the player returns an E04 error.

APPENDIX A - COMPLETE COMMAND LIST BY NAME

NOTE: arg or ards (argument or address) prefaces commands with an argument or an address parameter. If arg or ards is in (), then the parameter is optional.

COMMAND		SUPPORTING FORMATS		
Name	Mnemonic	DVD	CD	VCD
Audio Control	arg AD	x	x	x
Block Number	BK		x	
Block Number Request	?B		x	
Barcode Stack Play	arg BS	x		
CCR Mode Request	?M	x	x	x
CD Disc Status Request	?K		x	x
Chapter	CH	x		
Chapter Number Request	?C	x		
Clear	CL	x	x	x
Clear Screen	CS	x	x	x
Close	CO	x	x	x
Command Stack Data Download	BD	x	x	x
Command Stack Data Upload	BU	x	x	x
Communication Control Set	arg CM	x	x	x
Current Address Request	?A	x	x	x
Disc Region code Request	?G	x		
Display Control	arg DS	x	x	x
DVD Disc Status Request	?V	x		
Error Code Request	?E	x	x	x
Frame	FR	x		
Frame Number Request	?F	x		
Index	IX		x	
Index Number Request	?I		x	
Input Barcode Data Request	#B	x	x	x
Input Number Request	?N	x	x	x
Input Unit Request	#I	x	x	x
Key Lock	arg KL	x	x	x
Lead Out Symbol	LO	x	x	x
LVP Model Name Request	?X	x	x	x
Multi-Speed Forward	(adrs) MF	x		x
Multi-Speed Reverse	(adrs) MR	x		
Open	OP	x	x	x
Pause	PA	x	x	x
Play	(adrs) PL	x	x	x

COMMAND		SUPPORTING FORMATS		
Name	Mnemonic	DVD	CD	VCD
Print Character	arg PR	x	x	x
Register A Request	\$A	x	x	x
Register A Set (Display)	arg RA	x	x	x
Reject	RJ	x	x	x
Scan Forward	NF	x	x	x
Scan Reverse	NR	x	x	x
Scan Stop	NS	x	x	x
Search	adrs SE	x	x	x
Select Angle	arg AG	x		
Select Aspect	arg AP	x		
Select Audio	arg AU	x		
Select Subtitle	arg SU	x		
Speed	arg SP	x		x
Stack Group Set	arg GP	x		
Start	SA	x	x	x
Step Forward	SF	x		x
Step Reverse	SR	x		
Still	ST	x		x
Stop Marker	adrs SM	x	x	x
Time	TM	x	x	x
Time Code Request	?T	x	x	x
Title	TI	x		
Title/Track Number Request	?R	x	x	x
TOC Information Request	?Q		x	x
Track	TR		x	x
Video Control	arg VD	x	x	x

APPENDIX B - COMPLETE COMMAND LIST BY MNEMONIC

NOTE: arg or ards (argument or address) prefaces commands with an argument or an address parameter. If arg or ards is in (), then the parameter is optional.

COMMAND		SUPPORTING FORMATS		
Mnemonic	Name	DVD	CD	VCD
#B	Input Barcode Data Request	x	x	x
#I	Input Unit Request	x	x	x
\$A	Register A Request	x	x	x
?A	Current Address Request	x	x	x
?B	Block Number Request		x	
?C	Chapter Number Request	x		
?E	Error Code Request	x	x	x
?F	Frame Number Request	x		
?G	Disc Region code Request	x		
?H	Player Region Code Request	x	x	x
?I	Index Number Request		x	
?K	CD Disc Status Request		x	x
?M	CCR Mode Request	x	x	x
?N	Input Number Request	x	x	x
?P	Player Active Mode Request	x	x	x
?Q	TOC Information Request		x	x
?R	Title/Track Number Request	x	x	x
?T	Time Code Request	x	x	x
?V	DVD Disc Status Request	x		
?X	LVP Model Name Request	x	x	x
?Z	Firmware Version Request	x		
arg AD	Audio Control	x	x	x
arg AG	Select Angle	x		
arg AP	Select Aspect	x		
arg AU	Select Audio	x		
BD	Command Stack Data Download	x	x	x
BK	Block Number		x	
arg BS	Barcode Stack Play	x		
BU	Command Stack Data Upload	x	x	x
CH	Chapter	x		
CL	Clear	x	x	x
arg CM	Communication Control Set	x	x	x
CO	Close	x	x	x
CS	Clear Screen	x	x	x
arg DS	Display Control	x	x	x
FR	Frame	x		
arg GP	Stack Group Set	x	x	x
IX	Index		x	
arg KL	Key Lock	x	x	x

COMMAND		SUPPORTING FORMATS		
Mnemonic	Name	DVD	CD	VCD
LO	Lead Out Symbol	x	x	x
(adrs) MF	Multi-Speed Forward	x		x
(adrs) MR	Multi-Speed Reverse	x		
NF	Scan Forward	x	x	x
NR	Scan Reverse	x	x	x
NS	Scan Stop	x	x	x
OP	Open	x	x	x
PA	Pause	x	x	x
(adrs) PL	Play	x	x	x
arg PR	Print Character	x	x	x
arg RA	Register A Set (Display)	x	x	x
RJ	Reject	x	x	x
SA	Start	x	x	x
adrs SE	Search	x	x	x
SF	Step Forward	x		x
adrs SM	Stop Marker	x	x	x
arg SP	Speed	x		x
SR	Step Reverse	x		
ST	Still	x		x
arg SU	Select Subtitle	x		
TI	Title	x		
TM	Time	x	x	x
TR	Track		x	x
arg VD	Video Control	x	x	x

APPENDIX C - DVD COMMAND LIST

NOTE: arg or ards (argument or address) prefaces commands with an argument or an address parameter. If arg or ards is in (), then the parameter is optional.

COMMAND	
Name	Mnemonic
Audio Control	arg AD
Command Stack Data Download	BD
Command Stack Data Upload	BU
Barcode Stack Play	arg BS
CCR Mode Request	?M
Chapter	CH
Chapter Number Request	?C
Clear	CL
Clear Screen	CS
Close	CO
Communication Control Set	arg CM
Current Address Request	?A
Disc Region code Request	?G
Display Control	arg DS
DVD Disc Status Request	?V
Error Code Request	?E
Firmware Version	?Z
Frame	FR
Frame Number Request	?F
Input Barcode Data Request	#B
Input Number Request	?N
Input Unit Request	#I
Key Lock	arg KL
Lead Out Symbol	LO
LVP Model Name Request	?X
Multi-Speed Forward	(adrs) MF
Multi-Speed Reverse	(adrs) MR
Open	OP
Pause	PA
Play	(adrs) PL
Player Active Mode Request	?P
Player Region Code Request	?H
Print Character	arg PR
Register A Request	\$A
Register A Set (Display)	arg RA

COMMAND	
Mnemonic	Name
Reject	RJ
Scan Forward	NF
Scan Reverse	NR
Scan Stop	NS
Search	adrs SE
Select Angle	arg AG
Select Aspect	arg AP
Select Audio	arg AU
Select Subtitle	arg SU
Speed	arg SP
Stack Group Set	arg GP
Start	SA
Step Forward	SF
Step Reverse	SR
Still	ST
Stop Marker	adrs SM
Time	TM
Time Code Request	?T
Title	TI
Title/Track Number Request	?R
Video Control	arg VD

APPENDIX D - CD COMMAND LIST

NOTE: arg or ards (argument or address) prefaces commands with an argument or an address parameter. If arg or ards is in (), then the parameter is optional.

COMMAND	
Name	Mnemonic
Audio Control	arg AD
Block Number	BK
Block Number Request	?B
Command Stack Data Download	BD
Command Stack Data Upload	BU
CCR Mode Request	?M
CD Disc Status Request	?K
Clear	CL
Clear Screen	CS
Close	CO
Communication Control Set	arg CM
Current Address Request	?A
Display Control	arg DS
Error Code Request	?E
Index	IX
Index Number Request	?I
Input Barcode Data Request	#B
Input Number Request	?N
Input Unit Request	#I
Key Lock	arg KL
Lead Out Symbol	LO
LVP Model Name Request	?X
Open	OP
Pause	PA
Play	(adrs) PL
Player Active Mode Request	?P
Player Region Code Request	?H
Print Character	arg PR
Register A Request	\$A
Register A Set (Display)	arg RA
Reject	RJ
Scan Forward	NF
Scan Reverse	NR
Scan Stop	NS
Search	adrs SE
Stack Group Set	arg GP
Start	SA
Stop Marker	adrs SM
Time	TM

Time Code Request	?T
Title/Track Number Request	?R
TOC Information Request	?Q
Track	TR
Video Control	arg VD

APPENDIX E - VCD COMMAND LIST

NOTE: arg or ards (argument or address) prefaces commands with an argument or an address parameter. If arg or ards is in (), then the parameter is optional.

COMMAND	
Name	Mnemonic
Audio Control	arg AD
Command Stack Data Download	BD
Command Stack Data Upload	BU
CCR Mode Request	?M
CD Disc Status Request	?K
Clear	CL
Clear Screen	CS
Close	CO
Communication Control Set	arg CM
Current Address Request	?A
Display Control	arg DS
Error Code Request	?E
Input Barcode Data Request	#B
Input Number Request	?N
Input Unit Request	#I
Key Lock	arg KL
Lead Out Symbol	LO
LVP Model Name Request	?X
Multi-Speed Forward	(adrs) MF
Open	OP
Pause	PA
Play	(adrs) PL
Player Active Mode Request	?P
Player Region Code Request	?H
Print Character	arg PR
Register A Request	\$A
Register A Set (Display)	arg RA
Reject	RJ
Scan Forward	NF
Scan Reverse	NR
Scan Stop	NS
Search	adrs SE
Speed	arg SP
Stack Group Set	arg GP
Start	SA
Step Forward	SF
Still	ST

COMMAND	
Mnemonic	Name
Stop Marker	adrs SM
Time	TM
Time Code Request	?T
Title/Track Number Request	?R
TOC Information Request	?Q
Track	TR
Video Control	arg VD

APPENDIX F - ERROR CODES

Code	Message	Description
E00	communication error	Communication Line Error due to framing error or buffer overflow.
E04	feature not available	Non-Usable Function has been tried. Either the command mnemonic is wrong or the command cannot be used in this mode.
E06	missing argument	Necessary parameter is not specified.
E11	disc does not exist	There is no disc in the tray.
E12	Search error	Search address cannot be found.
E15	picture stop	Playback has been stopped by VOBU Still while in auto play mode.
E16	interrupt by other device	The command(s) sent via the serial line were not executed before commands were sent from the front panel buttons and/or remote control.
E99	panic	Unrecoverable Error occurred. Is possible a disc cannot be loaded and/or playing cannot continue.

DVD-V5000

Industrial DVD Player RS-232 Command Protocol

Pioneer Electronic Corporation
4-1, Meguro 1-chome
Meguro-ku, Tokyo 153
JAPAN
<http://www.pioneer.co.jp>

Pioneer Electronics (USA) Inc.
Business Solutions Division
2265 East 220th Street
Long Beach, California 90810
United States of America
(310) 952-2000
<http://www.pioneerelectronics.com>

APPENDIX C

Audio System



Louroe Electronics

AUDIO MONITORING KITS

ASK-4[®] KIT #401

AUDIO MONITORING KIT

DESCRIPTION

The ASK-4 Kit #401 is a **single zone** audio monitoring system that contains two Verifact A Microphones, combined to expand the area to be monitored. Model RN-2 Mixer brings the microphone signals together. Model APR-1 Audio Base Station contains a built-in speaker for providing both live audio and audio playback from a DVR/VCR or other audio recording devices that accept line level input. A 12 Vdc Power Supply and a dual RCA cable (for connection to recording device) complete the kit contents. Wiring requirement for ASK-4 Kit #401 is 2 conductor shielded, 22 gauge with a 24 gauge drain wire. (not supplied by Louroe)

IMPORTANT REMINDER

The two microphones are designed to expand the area of coverage and are not separate zones. Both microphones serve as one audio zone. Approximate coverage in a normal acoustical environment is 30' x 60'.

APPLICATION

The ASK-4 Kit #401 can be used in any audio monitoring situation where one microphone will not adequately provide required coverage due to size or length of area:

- Hallways
- Day Care Centers
- Show Rooms
- Convenience Stores
- Cashier Booths
- Anywhere CCTV cameras are installed

IMPORTANT NOTICE

When this equipment is used as part of an audio monitoring system, the law requires that the public be given notice of AUDIO MONITORING ON THE PREMISES. A decal notice is included with each microphone shipped.



Federal Law References:
Federal Regulations, US Code, Title 18. Crime and Criminal Procedure, Sec 2510.



WIRING REQUIREMENTS

2 Conductor shielded cable, 22 gauge with a 24 gauge drain wire.

West Penn 452 or equivalent

ASK-4 KIT #401

AUDIO MONITORING KIT

ASK-4 KIT #401

AUDIO MONITORING KIT



DESCRIPTION

The Verifact Model A is an omni-directional, low impedance, electret condenser microphone with built-in preamp for producing line level audio. It is housed in a high impact ABS dome designed for ceiling or wall mounting. Normal pick-up pattern is approximately 15' from the microphone location, all directions, or within 30' diameter circle.

The Verifact Model B Microphone is identical to the Model A, except that it has an extension cable for positioning the microphone from 3' to 10' from its dome housing. It is used with high ceiling installations.

Models A and B are compatible with all Louroe Base Stations.

APPLICATION

When part of a Louroe Audio System, the Model A and Model B Microphones can be used in situations such as:

- Convenience Stores ■ Sleep Disorder Centers
- Fast Food Restaurants ■ Therapy Labs
- Booking Rooms ■ Cashier Booths
- Interrogation Rooms ■ Gas Stations
- Day Care Centers ■ Anywhere CCTV Cameras Are Installed

IMPORTANT NOTICE

When this equipment is used as part of an audio monitoring system, the law requires that the public be given notice of AUDIO MONITORING ON THE PREMISES. A decal notice is included with each microphone shipped.



Federal Law References:
Federal Regulations, US Code, Title 18. Crime and Criminal Procedure, Sec 2510.



WIRING REQUIREMENTS

2 Conductor **shielded** cable, 22 gauge with a 24 gauge drain wire.

West Penn 452 or equivalent

NOTE: Unshielded cable is not satisfactory for audio systems.



MODEL A MICROPHONE



MODEL B MICROPHONE

FEATURES

- Sturdy ABS housing
- Microphone can pick up normal sounds 15' away
- Easy surface mount to wall or ceiling
- May be located up to 1000' from base station
- Phantom powered from Louroe Base Station
- Microphone preamp contains sensitivity switch for lowering gain

SPECIFICATIONS

■ Sensitivity (microphone & preamp)	80 dB SPL input provides 0.254V rms
■ Frequency response	40 Hz to 15 kHz ± 1 dB
■ Output	Line Level (0 dB @ 1000Ω)
■ Current drain	4 mA
■ Supply voltage	12 Vdc
■ Output impedance	600Ω unbalanced
■ Microphone housing	High impact ABS
■ Dimensions	4" dia x 1 1/2" H
■ Weight	0.5 Lb (0.2 Kg)



LOUROE
ELECTRONICS

BASE STATIONS

APR-1

AUDIO MONITORING BASE STATION

DESCRIPTION

The Model APR-1 is a single zone non-alarming audio base station. As a system, (with a LOUROE Microphone) it provides one-way live audio with a 3" built-in speaker. Unit contains input/out jacks for connecting to a DVR/VCR for recording and audio playback. The APR-1 has special filtering to enhance audio playback from a 24 hour time lapse recorder. Other features include adjustable volume control and 3.5mm headphone jack. All LOUROE Microphones (Model A, B, C, D, E, K and L-DT) are compatible with the APR-1.

APPLICATION

As part of a Louroe Audio Monitoring System, the Model APR-1 Base Station can be used in situations such as:

- | | |
|---------------------------|---------------------------------------|
| ■ Convenience Stores | ■ Sleep Centers |
| ■ Booking Rooms | ■ Speech Therapy Labs |
| ■ Fast Food Restaurants | ■ Interrogation Rooms |
| ■ Casino Soft Count Rooms | ■ Anywhere CCTV Cameras Are Installed |

IMPORTANT NOTICE

When this equipment is used as part of an audio monitoring system, the law requires that the public be given notice of AUDIO MONITORING ON THE PREMISES. A decal notice is included with each microphone shipped.



Federal Law References:
Federal Regulations, US Code, Title 18. Crime and Criminal Procedure, Sec 2510.

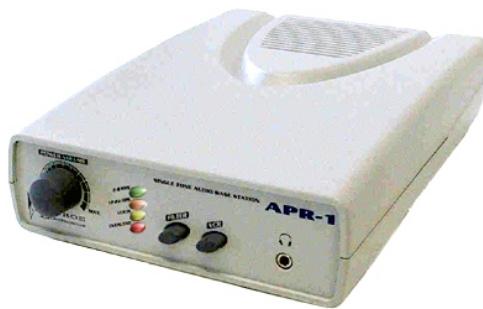
WIRING REQUIREMENTS

From microphone to APR-1:

2 Conductor shielded cable, 22 gauge with a 24 gauge drain wire.

West Penn 452 or equivalent

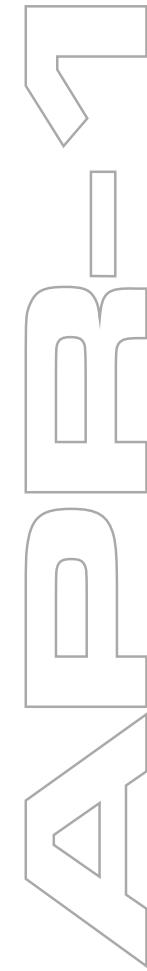
NOTE: Unshielded cable is not satisfactory for audio systems.



MODEL APR-1

FEATURES

- Built-in 3" speaker for monitoring live audio
- Audio input/output jacks for recording and playback from a DVR/VCR
- Built-in filter for improving playback from 12/24 hour time-lapse recorders
- Adjustable monitor level control
- Easy DVR/VCR in/out connection
- 3.5 mm headphone jack for private monitoring
- Desktop model
- 12 Vdc power transformer included
- 19" Rack Mount Kit available, request RM-1935/APR-1 Rack Mount Kit



SPECIFICATIONS

■ Input sensitivity (from remote mic)	0.78Vrms
■ Monitor power output	1W @ 8Ω
■ Insertion gain	2 dB @ 1kHz
■ Audio line output impedance	600Ω or higher
■ Audio input impedance	10kΩ
■ Audio frequency response	100 Hz to 10kHz
■ Audio frequency response (enhanced)	-20 dB @ 200 Hz to +5dB @ 2 kHz -10dB @ 6 kHz
■ Headphone impedance	8 to 600Ω
■ Power supply	12 Vdc, 500 mA
■ Dimensions	8 1/4" L x 5 3/4" W x 1 3/8" H
■ Weight, net	1.5 lbs (.68 kg)



LOUROE
ELECTRONICS

MICROPHONE MIXERS

RN-2

MICROPHONE MIXER

DESCRIPTION

Model RN-2 is an audio mixer used for combining two Louroe microphones or speaker/microphones for the purpose of expanding the area to be audio monitored. It has an input side (terminal block) for accepting the two microphones and an output side (terminal block) for home running back to a Louroe audio base station or to other audio receiving devices. The unit contains a potentiometer for microphone balance control. The RN-2 receives phantom power from the Louroe base station.

Special Note: The RN-2 is strictly a microphone mixer that combines the audio signals picked up by the two microphones. It does not function as a two-channel audio base station.

IMPORTANT NOTICE

When this equipment is used as part of an audio monitoring system, the law requires that the public be given notice of AUDIO MONITORING ON THE PREMISES. A decal notice is included with each microphone shipped.



Federal Law References:
Federal Regulations, US Code, Title 18. Crime and Criminal Procedure, Sec 2510.

Microphone only:

2 conductor shielded, 22 gauge with a 24 gauge drain wire
West Penn 452 or equivalent

Speaker/Microphone:

4 conductor, consisting of:
2 conductor shielded 20 gauge with 22 drain (microphone connection)
2 conductor unshielded 18 gauge (speaker connection)
West Penn 356 or equivalent



MODEL RN-2

FEATURES

- Allows for zone expansion by combining two microphones or two speaker/microphones
- Phantom powered from the Louroe Base Station
- Potentiometer for adjusting microphone balance
- Mounting holes for securing to wall or flat surface

SPECIFICATIONS

■ Input Impedance	600Ω
■ Output Impedance	600Ω
■ Output Gain	+5dB
■ Dimensions	6 1/8" L x 4 1/2" W x 1 7/8" H
■ Weight	5.5 oz.(156 g)
■ Input/Output connections	Terminal block

APPENDIX D

Miscellaneous Components

ii3-ED ethernet intercom

Users' Guide



**EDB EDW
LAN 10/100
Ethernet
Intercoms**

ii3 Series models
ii3-EDW-110
ii3-EDW-220
ii3-EDB-110
ii3-EDB-220

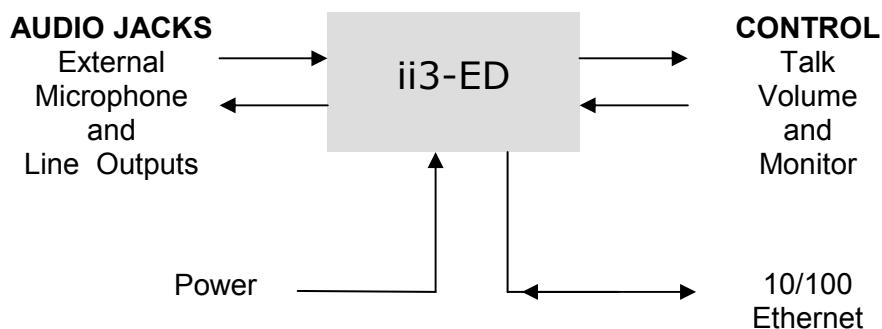
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OVERVIEW

Digital Acoustics IP (Internet Protocol) Intercom modules provide a functional audio equivalent to the basic "push to talk" (PTT) intercom. Simply connect the ii3-ED Desktop intercoms to a 10/100 Ethernet connection and communicate to a host server PC by voice.

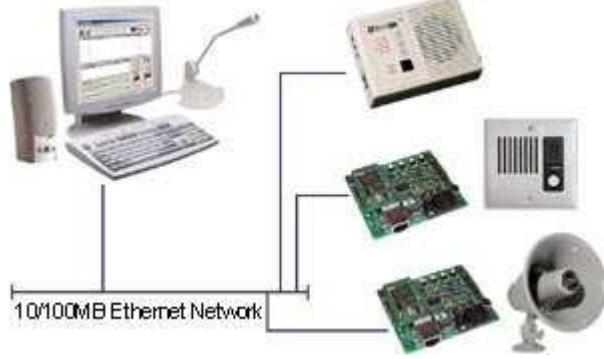
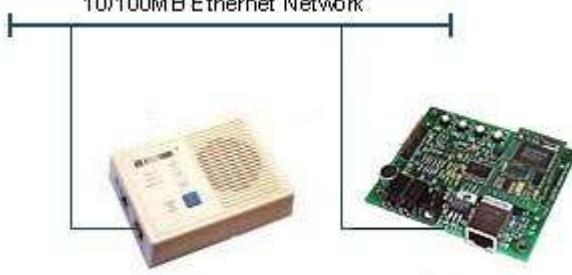
- Talk to/from any station to host PC server
- High quality, clear transmit and playback audio
- Simple operation utilizes push buttons for commands
- Fixed and automatic and DHCP compliant IP assignment
- Hands-free listen mode at stations
- Directly connects through 10/100 ethernet system
- Highly scaleable and seamless expansion
- Field upgradeable OS using internal *Flash* memory
- TalkMaster™ host software access and controls ii3 clients
- Application SDK for Windows® available for developers
- Perfect for business, industrial and consumer applications



Audio features include:

- Audio modes compatible with PC multimedia PCM, WAV and uLAW codecs
- High quality, internal low noise microphone amplifier with dynamic gain, AGC and compression
- Buffered audio line out and internal 2 watt speaker amplifier
- Digital volume control, adjustable locally and remotely.
- Low latency, with optimized and adjustable buffering

TYPICAL SYSTEM CONFIGURATIONS

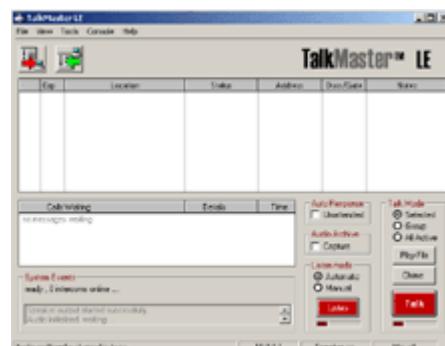
PC-SERVER MODE Server PC with TalkMaster™ software connected to Intercom Client array	
DIRECT MODE One ii3 Intercom configured as 'Server' , connected to another as 'Client'	

CONFIGURATION AND IP ADDRESSES

TalkMaster™ LE software downloads are available online
Access www.digitalacoustics.com/ii3 for downloads and mode information.

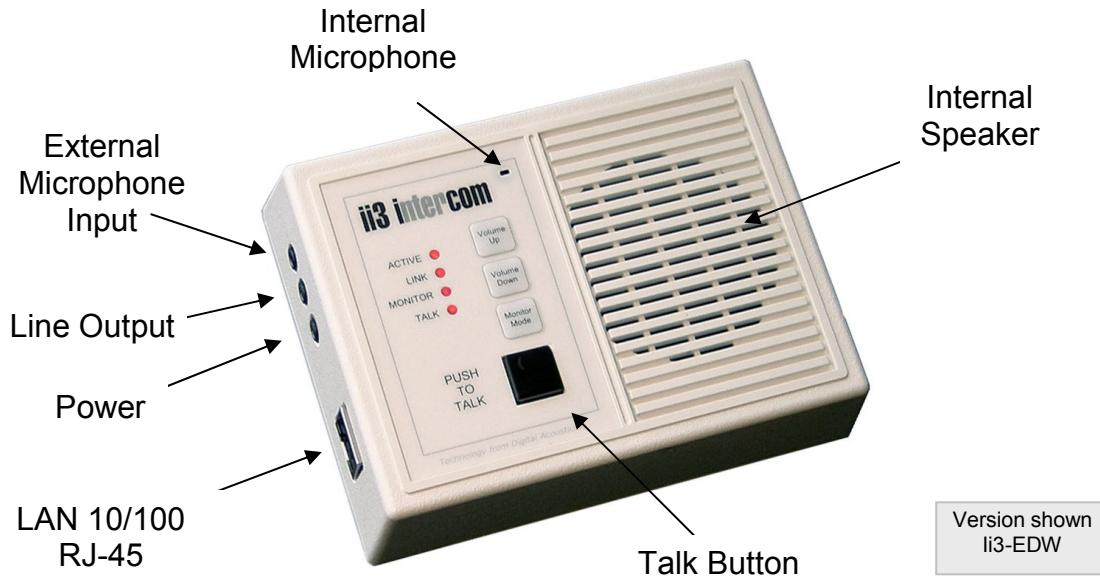
TalkMaster™

1. Install and start TalkMaster™ software
2. To configure your intercoms, select menu option Tools → Configure Intercoms
3. Select and assign intercoms IP addresses
4. Press **Exit**



Refer to the TalkMaster User Guide for more information on setup and configuration options!

INTERFACE CONNECTIONS



INTERFACE CONNECTION DETAIL

EXTERNAL CONNECTIONS

LAN 10/100	RJ-45	TCP, UDP, IP, ARP, ICMP, 10/100 Base-T Ethernet (Auto detection) MAC
MIC INPUT JACK	3.5MM	External Microphone Input. Use of this jack automatically disconnects the onboard electret microphone. See following section for recommended microphone specifications
AUDIO OUT JACK	3.5MM	External audio out jack. Capable of driving headphones or external amplifier. Use of this jack interrupts connection to onboard speaker.
POWER JACK	2.1 MM	Unregulated DC input 7.5VDC to 9VDC 300ma. Use 500ma supply when utilizing onboard speaker amplifier and 4 ohm speakers. POSITIVE TIP polarity <i>REQUIRES JMP1</i>

INTEGRATED SWITCHES

Talk	Push to Talk. Enables local microphone.
Monitor/Open	In 'Client' mode (default) Monitor sets 'Talk' ON, as if the Talk button is being held down for hands free speaking. In 'Server' mode Monitor sets <i>listen mode</i> , turning the remote (client) microphone on (to listen-in at the remote station). In 'Server' mode / Direct Mode, pressing and holding this button activates the door relay on an EW2W Intercom.
Volume Up Volume Down	Sets volume locally (also set via TalkMaster)

LED INDICATORS

Operational Mode	Active	Link	Monitor	Talk
Normal operational mode. TalkMaster is active. Intercom can communicate.	ON	ON	-	-
LAN connection is inactive. The RJ45 may be unplugged, or LAN lost power.	FLASH	OFF	-	-
Cannot connect, or if DHCP IP is enabled, address is not being assigned (Beeps will occur at 60 second intervals)	FLASH	ON	ON	ON
TalkMaster™ Server software is not running or not set to communicate.	FLASH	ON	ON	-
TalkMaster software at the server has "Scanned" for intercoms in the Configuration Mode utility setup	FAST FLASH	ON	ON	-
Connection lost while TalkMaster was active on	FLASH	OFF	ON	-
Receiving audio. The server software (TalkMaster™) / PC microphone is on.	ON	ON	-	FLASH
Sending audio. Talk button is pressed or server has engaged "listen" mode.	ON	ON	-	ON
Intercom is in "Server" mode, waiting for a client to request connection (Active LED flash alternates 1sec fast - 1sec slow)	DUAL FLASH	-	-	-
Local "Monitor" button has been depressed. Microphone is set to constant "Talk" mode for monitoring	ON	ON	ON	ON

FIRMWARE OS UPGRADES

All ii3™ intercoms use internal *Flash* memory. Operating system (OS) and firmware may be upgraded to include new revisions or custom options. TalkMaster™ software is required to enable and program access the Flash memory upgrade feature.

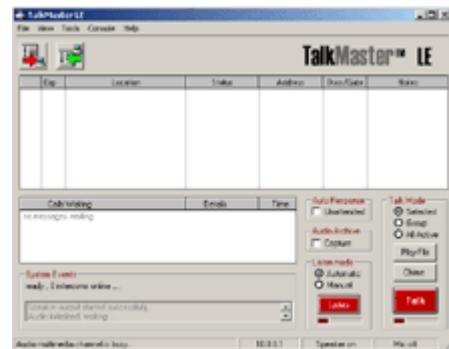
SOFTWARE SUPPORT

Talk Master™

ii3-TalkMaster™ software is required for IP address configuration and setup

Features:

- Control and detection for intercom stations
- Audio access for all ii3 intercoms with Master call to page all stations
- Program ii3 intercom internal OS/Flash memory
- Pop-up screens for identifying incoming station ID and audio
- Utilizes PC Multimedia microphone/speaker for access to intercoms
- Integrated UDP polling on to automatically detects all stations
- API available for easy custom GUIs with sample program (VB6)
- Windows® 98, Me, 2000, XP, Server 2003



TalkMaster™ software manuals and downloads are available at
www.digitalacoustics.com/ii3

CUSTOM SOFTWARE AND iTALK/X SDK

iTalk/X API development package is available to create custom TalkMaster™ applications and is available under Non-Disclosure and/or license for selected OEM applications. Contact your sales agent or oemsales@digitalacoustics.com for additional information

EXTERNAL MICROPHONE SELECTION

ii3 supports high quality *voiceband* audio. Integrated AGC amplifiers support a wide range of microphone inputs and low cost electret microphones (\$3usd) will have similar intelligibility as expensive "professional" microphones (\$10-\$50usd). Microphones mounted externally should be in a vibration and moisture free environment.

EXTERNAL SPEAKER CONNECTIONS

A *line out* connection is provided for headphone or external speakers. Weather resistant and vandal-proof speaker enclosures are available from a wide variety on sources. External amplifiers or powered speaker are *required* when using the external speaker jack.

NETWORK WIRING USING CAT5

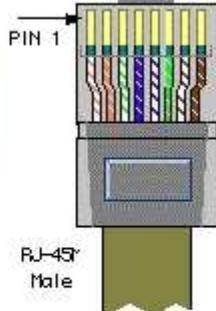
Ii3 series products connect to network hubs and switches using standard *Straight Through* wiring, similar to PC connections and do not support auto-detection. No special connections or cabling changes are needed under normal operating environments.

Crossover Cable Connections

Use a Crossover cable ONLY when using 2 ii3 intercoms in DIRECT CONNECTION (Server/Client) or when using a PC to single ii3 intercom WITHOUT a hub/switch interconnect.

Crossover Cable		Straight Through Cable	
RJ-45 PIN	RJ-45 PIN	RJ-45 PIN	RJ-45 PIN
1 Rx+	3 Tx+	1 Tx+	1 Rx+
2 Rc-	6 Tx-	2 Tx-	2 Rc-
3 Tx+	1 Rc+	3 Rc+	3 Tx+
6 Tx-	2 Rc-	6 Rc-	6 Tx-

PIN 1



RJ-45 Male

Cat-5 Wiring reference

SPECIFICATIONS

Items	Specification
Hardware Protocols	TCP, UDP, IP, ARP, ICMP, Ethernet MAC
Network Interface	10/100 Base-T Ethernet (Auto detection)
Command protocols	Proprietary, available under NDA
Switch capabilities	User defined, programmable, bi-directional
Audio Rate	80khz with adjustable 500 ms buffers
Audio Resolution	PCM-8bit and uLAW-16 bit 8bit
Audio Sample Rate	8 kHz (Voice band)
Audio Buffers	4KB TX and RX
Internal Amplifier	2w Max @ 4 ohms
Microphone sensitivity	-42db integrated electret
Microphone AGC	37db with limiting and automatic leveling
PHY Interface	RealTek RTL8201BL single-port PHYceiver
Temperature	0'C ~ 70'C (Operating) -40~85'C (Storage)
Humidity	10~90%
Power	7.5-9 VDC ext. (400MA min)
Connector types	Power 2.1 mm (positive center) Audio 3.5 mm
Size	135mm x 102mm x 37mm
Weight	7.5oz (213 grams)

TROUBLESHOOTING

- ❑ Verify power connections. The "Active" LED on should be on or flashing.
- ❑ Refer to LED Indicator section earlier in this manual for valuable diagnostic information.
- ❑ If you cannot detect ii3 units when you SCAN then be sure to verify that the LINK LED is on and TalkMaster is running on the SAME network.
- ❑ If you have multiple network cards on this PC verify that intercoms are connected to the system that is using this computer's IP #. Verify that your connection is on the SAME network that is running TalkMaster.
- ❑ ii3 Intercoms may operate across some firewalls or specific VPN's. They will need to be configured locally (for setup) and will need to be assigned correct STATIC IP addresses for correct detection.
- ❑ If using DHCP addressing try assignments using static IP addresses.
- ❑ If you hear beeps try re-scanning a few seconds after the beep to override DHCP addressing if you think that the intercoms are set for DHCP and are running on a non DHCP network.
- ❑ If you cannot detect any intercoms using the TalkMaster SCAN ALL utility screen try directly connecting the PC (running TalkMaster) to the ii3 intercom *using a crossover cable* (disconnected from the network).



- ❑ Refer to the TalkMaster Software Manual for additional diagnostic techniques and troubleshooting tools.

TECHNICAL SUPPORT

Information online www.digitalacoustics.com
Email techsupport@digitalacoustics.com
Telephone +1 (203)-227-9700 M-F 9-5

ORDERING INFORMATION

ii3 Series models

- ii3-EDW-110
- ii3-EDW-220
- ii3-EDB-110
- ii3-EDB-220



Digital Acoustics Corporation 263 Market Square, Lake Forest, IL 60045 U.S.A.

This document may contain advance information. Contact factory for technical specification before product design and/or use. Design and specifications are subject to change without notice.

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ii3-m-1216D
Rev 1 2004/12/08

Talk Master™

ii3 intercom system

Software Users' Guide



For all ii3 series 10/100
Ethernet Intercoms
Models ii3-m, EDB, EDW



DIGITAL
ACOUSTICS
CORPORATION

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Welcome To TalkMaster

Welcome

Welcome to TalkMaster™ LE! TalkMaster LE and ii3™ Ethernet Intercoms are products of the Digital Acoustics Corporation.

If you are upgrading from an earlier version of TalkMaster™, please review the Release Notes.

To setup and configure your ii3 series intercoms, please review Configure Intercoms.

If you would like help on using TalkMaster™, please review TalkMaster Overview.



Release Notes

TalkMaster™ Version 1.7 Released June, 2005

TalkMaster™ version 1.7 contains the following enhancements and corrections:

- New Paging Messages dialog with up to eighteen predefined messages
- New Password protected Paging Setup dialog
- Intercom Configuration Tool now sorts by Location Name/ICOM ID for easier setup
- GPIO 4 Mode supports new options for Relay controls*
- Improved speed and reliability of Console Forward / Retrieve operations *
- When "Hide when minimized" preference is set, clicking the 'X' in the upper right hand corner of the screen causes TalkMaster to minimize to the system tray instead of closing
- Intercom Configuration Tool prevents Intercom IP address from ending with 255 or 0
- Accessing the Play Audio Archive dialog requires the administrator password
- The Preference "Talk button enabled by mouse click and hold" has been renamed to "Hold down Talk button while speaking (PTT)"
- Corrected "Intercom configuration changes fail" when Windows Regional Options are not set to English
- Corrected "UDP Audio problems" when Windows Regional Options are set to Japanese
- Corrected "Multimedia Card Selection" when multiple cards are present in the PC

* Use of this feature requires current Intercom Firmware. Please refer to our website for information on the current Firmware.

TalkMaster™ Version 1.6 Released January, 2005

TalkMaster™ version 1.6 contains the following enhancements:

- Call Announcement mode with audio and visual notification of incoming calls
- Automatic removal of entries from the Calls Waiting queue when a call is completed
- The Calls Waiting Audio Player is automatically closed at the end of a call
- Ability to select a multimedia card used for the Speaker and Microphone operation

TalkMaster version 1.6 contains the following bug fixes:

- Applying Intercom configuration changes fails in non-U.S. localizations
- Talk VU meter does not work
- Intercom Startup Audio is not always played
- Spurious error messages occur during TalkMaster Startup
- "Details" column size under Calls Waiting is too narrow
- In Automatic mode, TalkMaster's Listen button can be turned off by pressing the Intercom's Call button
- Multiple Intercoms behind a NAT Firewall do not function properly in TalkMaster

TalkMaster™ Version 1.5.215 Released July, 2004

TalkMaster™ version 1.5.215 contains the following enhancements:

- Simplified screen
- Password protected Intercom search and configure
- Console forwarding and retrieval
- Enhanced Audio Archive functions
- The Door Open function appears on the main screen
- Keyboard control of the Talk and Listen buttons

New firmware is available for the ii3 IP Intercoms. Units must be flashed with new firmware to accommodate the following features. Please refer to Configure Intercoms for details:

- Location names flashed into the Intercom
- Audio sent to multiple intercoms is sent as a single UDP broadcast
- Console forwarding and retrieval

- Specify alternative IP addresses for intercom forwarding in the event of TalkMaster™ console failure
- Specify duration of time for activation of door/open relay within the ii3 IP Intercom

System Requirements

To utilize all of the features of TalkMaster, you need the following:

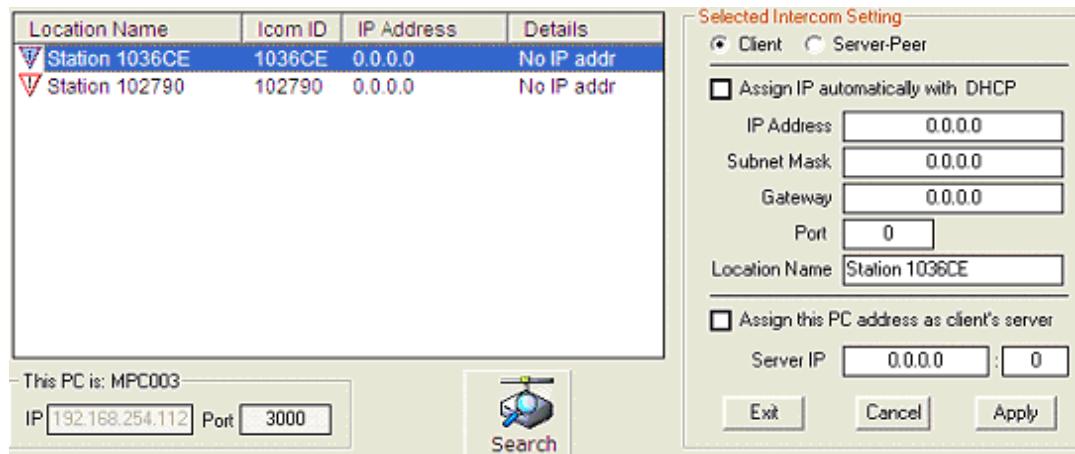
- Windows 98SE, Windows 2000, or Windows XP
- Pentium III 750mHz or faster
- 128 MB RAM (256 MB suggested)
- 50 MB Available Disk Space
- Windows supported Sound Card with microphone and speakers

Using TalkMaster

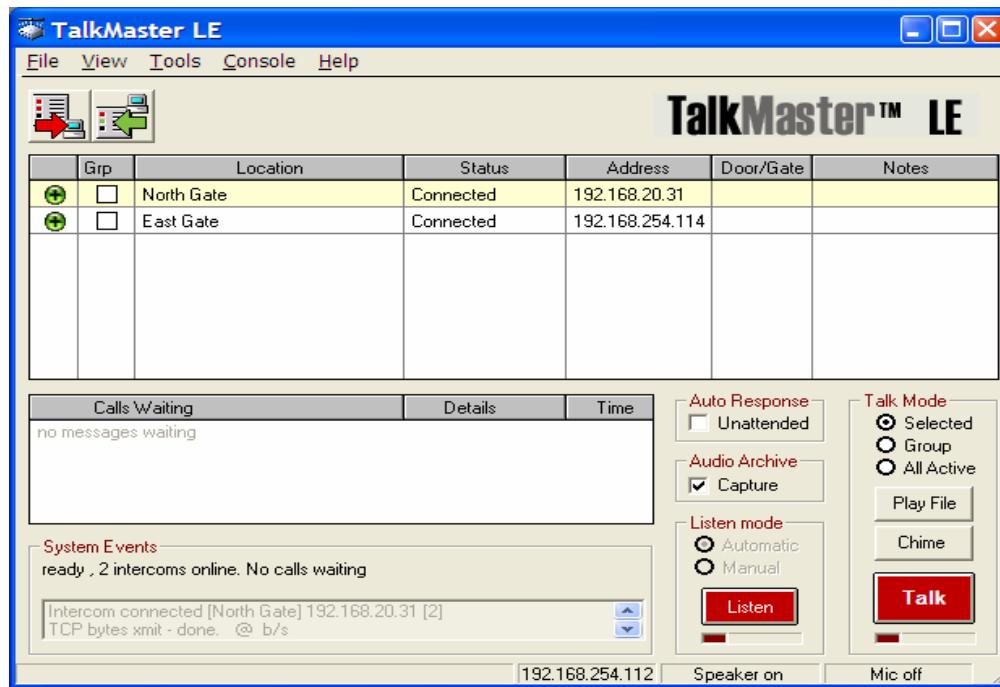
TalkMaster Overview

TalkMaster™ is a software program designed to work with Digital Acoustics' ii3 IP Intercoms. TalkMaster™ has two main functions.

First, TalkMaster™ must be used to configure the IP address information and related features for your ii3 intercoms. Intercoms are delivered without IP address settings. You must use TalkMaster to search for the Intercoms and specify the IP address settings before use.



Secondly, TalkMaster™ allows multiple intercoms to connect to the software via TCP/IP so they can be monitored by the TalkMaster console operator. The audio from an intercom can be heard on the PC's speakers and the PC's microphone is used to send audio to an intercom. Calls can be initiated from any intercom to TalkMaster or from TalkMaster to any intercom.



TalkMaster can listen for incoming calls in one of three "modes":

Call Announcement with audio and visual alerts

In this mode, pressing the Intercom button notifies the TalkMaster operator by an audible and/or visual alert. The TalkMaster operator responds and controls the microphone at that intercom to enable user hands-free operation. To set up Call Announcement mode, check the box next to **Activate Call Announcement** in the Preferences - Options tab

Automatic mode

In this mode, when an intercom user presses the button, their voice is used to notify the TalkMaster operator of the incoming call. The TalkMaster operator can respond and control the microphone to enable hands-free operation. To set up Automatic mode, select the Automatic option under Listen Mode on the main screen.

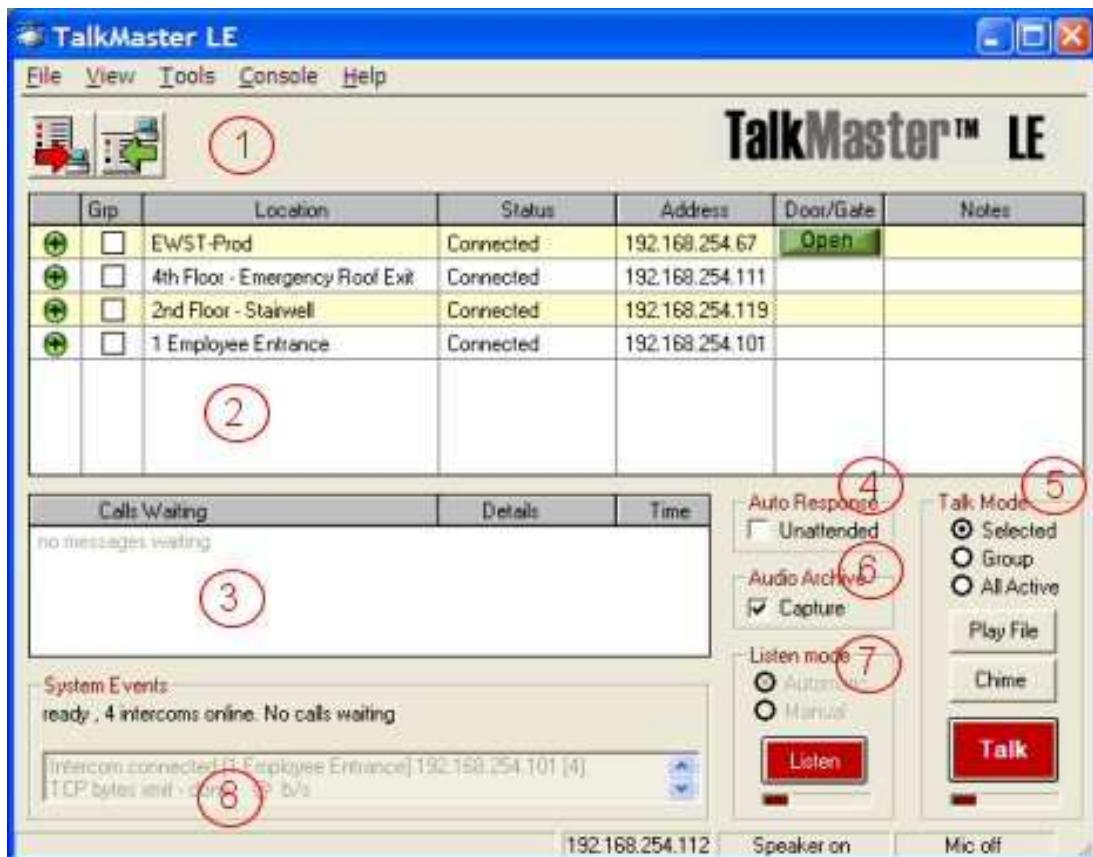
Manual mode

In Manual mode, when an intercom user presses the button, their voice is used to notify the TalkMaster operator of the incoming call. The TalkMaster operator can respond and optionally allow the user to control the PTT button them selves. To set up Manual select the Manual option under Listen Mode on the main screen.

TalkMaster Main Screen

Before you can use your Digital Acoustics ii3 IP Intercoms, they must be configured with IP address information. Please see Configure Intercoms.

The following sections describe the areas of the TalkMaster™ main screen.



- 1 Tool Bar
- 2 Active Intercom List
- 3 Calls Waiting Queue
- 4 Auto Response setting
- 5 Talk Mode setting
- 6 Audio Archive setting
- 7 Listen Mode setting
- 8 System Events window

Tool Bar



Forward Intercoms to an alternate TalkMaster Console. Please see Forward Intercoms for details.



Retrieve Intercoms from an alternate TalkMaster Console. Please see Retrieve Intercoms for details.



The **Answer Later** button is displayed only when the **Activate Call Announcement** option in [Preferences - Options tab](#) has been checked and a call is incoming. Pressing this button sends a message (i.e. "one moment please") to the intercom allowing the TalkMaster operator time to complete another task before answering the incoming call.

Active Intercom List

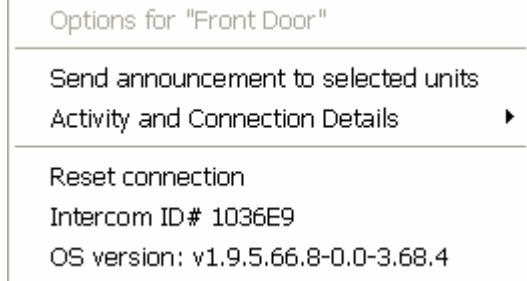
This list will show all the intercoms that have connected to the TalkMaster™ console during this session. Clicking on an intercom allows you to communicate with it by clicking the **Talk** or **Listen** buttons. The selected Intercom will be highlighted in blue. Right clicking on an open area in the list will de-select the selected intercom.

Grp	Location	Status	Address	Door/Gate	Notes
<input type="checkbox"/>	EWST-Prod	Connected	192.168.254.67	Open	
<input type="checkbox"/>	4th Floor - Emergency Roof Exit	Connected	192.168.254.111		
<input type="checkbox"/>	2nd Floor - Stairwell	Connected	192.168.254.119		
<input type="checkbox"/>	1 Employee Entrance	Connected	192.168.254.101		

- The first column indicates intercom.
- The Grp column creates a group of linked intercoms by check box
- The Location column identifies the Intercom by Name
- The Status column displays the Intercoms status
- The Address column contains the Intercoms IP address

- The Door/Gate column shows if the Intercom has a Door Relay option configured. Clicking the green button will turn on the Door Relay for the amount of time that has been configured in the intercom. For Intercoms that do not have the latest firmware, the Door Relay will turn on for 5 seconds
- The Notes column displays information about intercom communications

You can right click on an Intercom to display detailed information about the intercom.



Calls Waiting

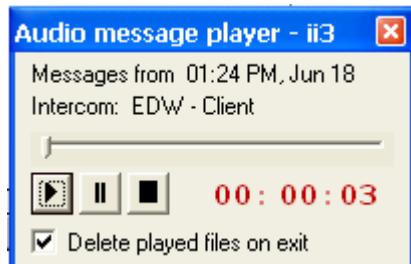
This list shows calls that have come in while another call was in progress. A call is considered "in progress" when either the Talk or Listen button is active.

Calls Waiting	Details	Time
Front Door	message in at 07:57 AM	00:03

- If you single click on the entry, that intercom is selected in the Active Intercom List allowing you to communicate with it
- If you double-click on it, the Audio Player pops up so you can play back the original call

Audio Player

The Audio Message Player is automatically started by clicking on messages in the **Calls Waiting** list. It allows messages that have arrived while communicating with another intercom to be played back.



- Once you play the audio clip, the "Delete played files on exit" is automatically checked and clicking the X in the right hand corner closes the Audio Player and deletes the clip
- If you choose to leave the Audio Player open, you can delete a call by right clicking on it and selecting the Delete option

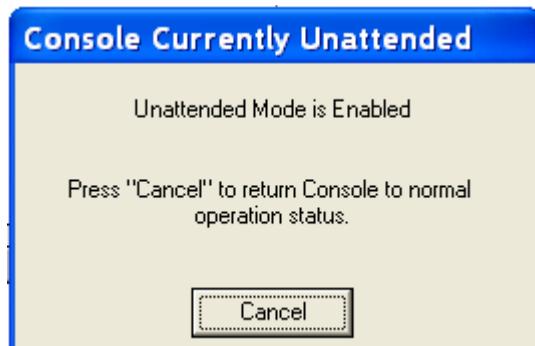
- If **Call Announcement** is activated, the audio clip is automatically deleted and the Audio Player closed when the call is completed

Auto Response

The **Auto Response** function allows you to temporarily suspend the console's operation. This function can also be activated by using the menu **Console → Unattended Console**.



Once you check the **Unattended** box, a dialog pops up reminding you that this mode has been set.



Any intercom that tries to contact the console is notified that no one is available to take their call. Please see Unattended Console for more information.

Clicking the **Cancel** button returns the console to normal operation.

This setting is saved between TalkMaster™ sessions.

Talk Mode

The **Talk Mode** setting determines which intercom(s) will hear audio sent from TalkMaster™.



Selected - refers to the intercom currently highlighted in blue in the **Active Intercom List**

Group - refers to any intercom that has an **X** in the **Grp** column of the **Active Intercom List**.

All Active - refers to all intercoms in the **Active Intercom List**.

Switching from **Selected** to either **Group** or **All Active** will automatically change the **Listen Mode** to **Manual**.

This setting is saved between TalkMaster™ Sessions.

When using **Selected** mode, audio is sent to the intercom using a single TCP/IP stream. This allows you to communicate with an Intercom located anywhere that you can connect to through TCP/IP.

When using **Group** or **All Active** modes, audio is sent to the intercoms using a single UDP Broadcast stream. Since UDP Broadcasts are filtered by many routers, the **Group** and **All Active** options may only work on the current segment of a Local Area Network. Please refer to the TalkMaster installation CD for instructions on installing the UBAM™ software if you need to broadcast on multiple network segments.

Pressing the **Talk**, **Chime**, or **Play File** button will send audio to the intercom(s) you have indicated.

Play File - Brings up the Paging Messages dialog. **Play File** changes to **Stop File** while a file is being set one or more intercoms. You can terminate the active file by clicking **Stop File**.

To play a .wav file on the Intercom(s), audio files must be encoded in either 8khz 8 bit PCM or 16 bit uLaw format. Commercial or free software is available to create these formats.

Chime - plays the page.wav file from the iSupport subdirectory located under the TalkMaster™-ii3 program directory. Page.wav is a recording of four successive beeps that you can play to get someone's attention at an intercom(s).

Talk will turn on the PC's microphone to send the audio to the Intercom(s). Please refer to Talk button for details.

Talk button

The **Talk** button turns on the PC's microphone and allows you to speak to the intercom(s) selected in the **Active Intercom List**.



By default, the state of the **Talk** button is toggled by:

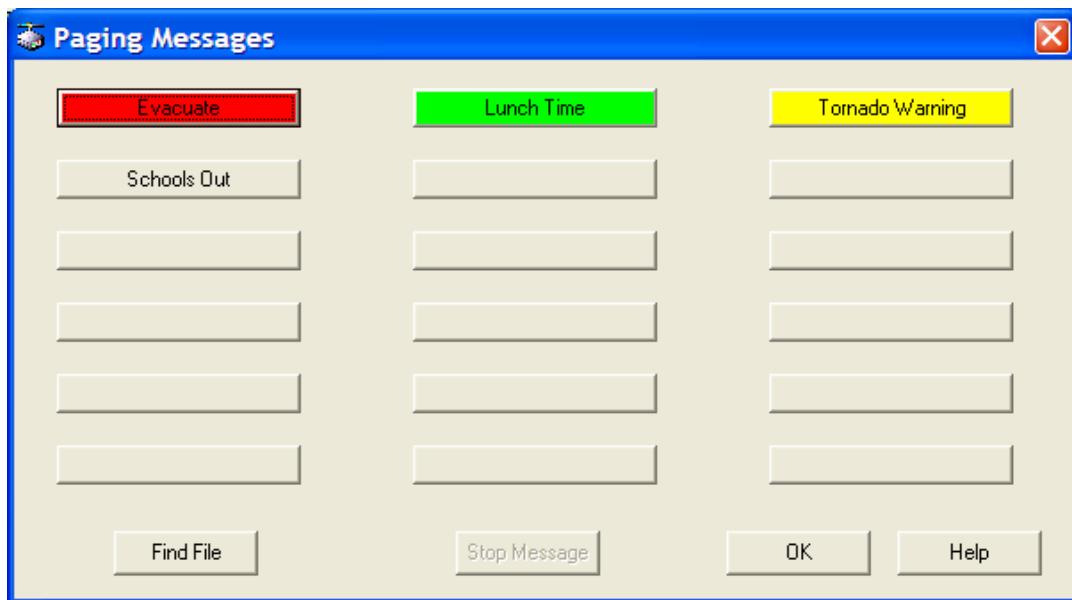
- Single clicking the **Talk** button with the mouse or
- Pressing the space bar

By checking the **Hold down Talk button while speaking (PTT)** box in Preferences - Options tab , the Talk button can be activated by:

- Clicking and holding the mouse on the **Talk** button or
- Pressing and holding the Space Bar

Paging Messages

Clicking the **Play File** button brings up the **Paging Messages** dialog. The buttons on this screen are defined via the Paging Setup dialog.



When a button is pressed, the associated file is played to the Intercom(s) specified by the **Talk Mode**.

When a Paging button is pressed, the **Stop Message** button becomes active till the file has completed. Pressing the **Stop Message** button terminates file being played.

If the **OK** button is pressed you are returned to the main TalkMaster screen. If a file is still being played, the **Play File** button changes to **Play Stop** allowing you to terminate the recording.

Please note that you cannot respond to any calls until the paging message has completed.

If the **Find File** button is available, you can select a file of your choosing to play.

Listen Mode

The **Listen Mode** determines if the **Listen** button is automatically turned on when the **Talk** button is turned off.

If this option is grayed out, refer to Call Announcement.

Listen mode
<input checked="" type="radio"/> Automatic
<input type="radio"/> Manual

When set to **Automatic**, the Listen button is automatically turned on when the Talk button is turned off. This allows the intercom user to operate in a "hands free" mode.

When set to **Manual**, the Listen button must be activated by the TalkMaster operator or by pressing the PTT button on the intercom.

This setting is saved between TalkMaster™ sessions.

Example of using Listen mode Automatic

Please note that the following example uses the option of holding the space bar to activate the Talk button. Please see *Preferences - Options tab* for an alternate method of controlling the Talk button

- Intercom user presses and holds the PTT button on one of the Intercoms and begins speaking.

- The Intercom is automatically selected in TalkMaster™ and the audio is played through the PC speakers.
- The Intercom user releases the PTT button when done speaking
- The TalkMaster™ operator responds by holding down the **space bar** on the keyboard and speaking into the microphone.
- When the TalkMaster™ operator releases the **space bar**, the **Talk** button is turned off and the **Listen** button is turned on. This action allows the Intercom user to operate "Hands Free"
- Each time the TalkMaster™ operator holds down the **space bar**, the **Talk** button is activated. When the **space bar** is released, the **Talk** button is turned off and the **Listen** button is engaged.
- To end the conversation with an Intercom, the TalkMaster™ operator presses the **Escape key** on the keyboard while the **Listen** button is active.

*An important benefit of using **Automatic mode** is that other intercoms are precluded from interrupting your "conversation" because the **Talk** or **Listen** button is always active. TalkMaster™ will not interrupt a call if there is already one in progress. Any other intercom that tries to contact TalkMaster™ will be placed in the **Calls Waiting list**.*

Example of using Listen mode Manual:

*Please note that the following example uses the option of clicking and holding the space bar to activate the **Talk** button. Please see Preferences - Options tab for an alternate method of controlling the **Talk** button*

- Intercom user presses and holds the PTT button on one of the Intercoms and begins speaking.
- The Intercom is selected in TalkMaster™ and the audio is through the PC speakers.
- The Intercom user releases the PTT button when done speaking
- The TalkMaster™ operator responds by holding down the **space bar** on the keyboard and speaking into the microphone..
- When the TalkMaster™ operator releases the **space bar**, the **Talk** button turns off. The TalkMaster™ operator can then click the Listen button or allow the Intercom user to respond by using the PTT button.
- To end the conversation with an Intercom, the TalkMaster™ operator presses the **Escape key** on the keyboard while the **Listen** button is active.

*In Manual mode, it is possible for another intercom to interrupt your conversation by pressing the PTT button when neither the **Talk** nor **Listen** button is active.*

Listen button

The **Listen** button can be activated by the TalkMaster operator or by the PTT button on an Intercom. You may only listen to a single intercom at one time.

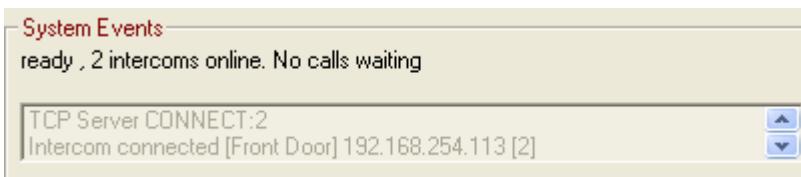


In TalkMaster, the Listen button can be toggled by:

- Single clicking the **Talk** button with the mouse or
- Pressing the **Escape** key on your keyboard

System Events

The **System Events** window tracks activities from TalkMaster™. Information in this window can be used by Digital Acoustics Technical Support for diagnosing support issues.



Capture Audio Archive

This option will capture all audio data to the file system. It is started from the menu option **File** → **Capture Audio Archive** or by checking the box on the main display.



Each time microphone or speaker output is produced, a separate file is created using the following naming convention

XXX-YYYYYYYYYYYY-HHMMSS.wav where:

- **XXX** - IN for speaker audio, OUT for microphone audio
- **YYYYYYYYYYYY** - the twelve digit Ethernet MAC address of the intercom that was communicated with.
- **HHMMSS** - Hours, minutes and seconds of the day in 24 hour format
- **.wav** - standard PCM wave file format.

The files are stored under the TalkMaster-ii3/iArchive directory. Each day an additional sub-directory is created so all audio archives for that day are stored in a single directory. The directory name is formatted as YYYYMMDD where YYYY is the year, MM is the month and DD is the Day of the month.

It is the user's responsibility for backing up and managing the size of the iArchive subdirectory!

The Play Audio Archive function can be used to easily find and play audio files for any date and time.

Audio Archive

Checking the **Capture** box allows you to archive speaker and microphone audio for playback at a later time. This function can also be activated by using the menu option **File** → **Capture Audio Archive**. Please refer to Capture Audio Archive for more information.



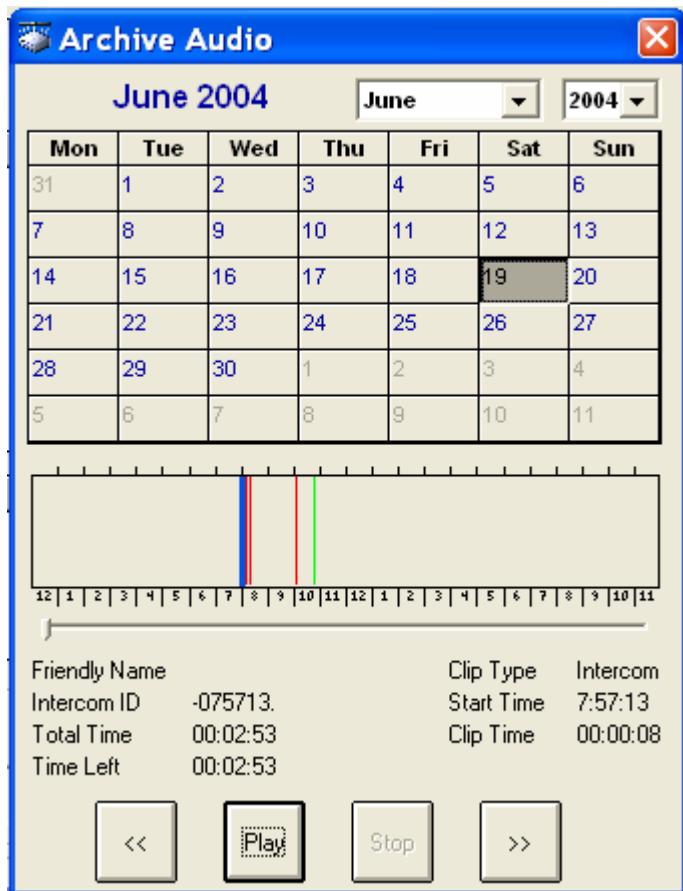
To play back archived audio, use the menu option **File → Play Archive Audio**.

Un-checking the **Capture** box turns off the archiving feature.

This setting is saved between TalkMaster™ sessions.

Play Audio Archive

The Play Audio Archive function allows you to select and play a series of audio clips that have been archived. It can be accessed from the menu option **File → Play Audio Archive**. You will be required to enter your administrator password to access this screen (default password is **admin**).



Use the drop down boxes to select the month and year and then click on the day. Any audio streams which have been recorded are shown with vertical lines above the hour of the day.

The green lines represent the start of microphone audio and the red lines represent the start of speaker audio. The blue bar indicates the current position for the Play button.

Click on a vertical bar and click **Play**. The audio will be played to the end of the audio clip you selected. As the audio is played, the display changes to indicate which intercom the audio came from or was sent to.

If you want to skip backwards or forward between audio clips, use the << or >> keys.

Using Call Announcement

Call Announcement

Call Announcement causes an audible and/or visual alert to be issued to the TalkMaster operator when the Call or PTT button on an intercom is pressed.

Selecting menu option View → Preferences and checking **Activate Call Announcement** in the Options tab turns this option on. If this option is selected, **Listen Mode** is set to **Automatic** and is grayed out.

If the TalkMaster screen is minimized and the button on the Intercom is pressed, the Incoming Call dialog will be displayed.

If multiple Intercoms call in, they will be queued in a "first in - first out" basis.

If an Intercom user calls in when no calls are active, the **Answer Later** button appears on the tool bar. Pressing the **Answer Later** button will acknowledge the Audible and Visual notifications and send a message (i.e. "one moment please") to the Intercom. This allows the TalkMaster operator to complete another task before answering the incoming call.

Example of using Call Announcement:

Please note that the following example uses the option of holding down the space bar to activate the **Talk** button and pressing the **Escape** key to activate the **Listen** button. Please see Preferences - Options tab for alternate methods of controlling the **Talk** and **Listen** button.

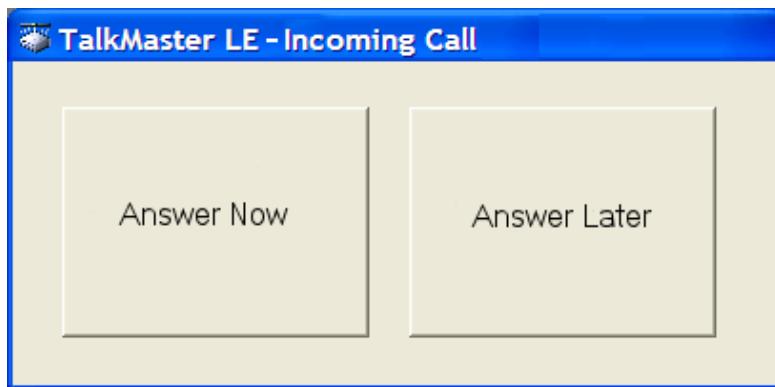
- A user presses and releases the "Call" or PTT button on the Intercom
- A short message (i.e. "your call is being connected") is returned to the Intercom.
- The Title Bar and the Icon in the Task Bar begin to flash and/or the audible notification is played at the TalkMaster console up to 4 times or until the operator engages the **Talk**, **Listen** or **Answer Later** button.
- An entry for the intercom is added to the Call Queue
- The Intercom is selected (highlighted with a blue background) in the Active Intercom list
- The TalkMaster™ operator responds by holding down the **space bar** on the keyboard and speaking into the microphone.
- When the TalkMaster™ operator releases the **space bar**, the **Talk** button is turned off and the **Listen** button is turned on. This allows the Intercom user to operate "Hands Free"
- Each time the TalkMaster™ operator holds down the **space bar**, the **Talk** button is activated. When the **space** bar is released, the **Talk** button is turned off and the **Listen** button is engaged.
- To end the conversation with an Intercom, the TalkMaster™ operator presses the **Escape key** on the keyboard while the **Listen** button is active.
- The Intercom is de-selected in the Active Intercom list
- The entry is deleted from the Calls Waiting list
- If another entry is in the Calls Waiting list, it is automatically selected so the TalkMaster™ operator can start the next call by pressing the space bar

An important benefit of using **Call Announcement** is that any other intercom is prevented from interrupting your "conversation" because the **Talk** or **Listen** button is always active.

TalkMaster™ will not interrupt a call if there is already one in progress. Any other intercom that tries to contact **TalkMaster™** will be placed in the **Calls Waiting list**.

Incoming Call

The Incoming Call dialog appears when the **Activate Call Announcement** option has been selected in Preferences - Options tab and the TalkMaster screen has been minimized.



Clicking the **Answer Now** button with the mouse or pressing the Enter or Space Bar key brings up the main TalkMaster window.

Clicking the **Answer Later** button with the mouse sends a message (i.e. "one moment please") message to the Intercom, closes the dialog and turns off the Visual and Audible Alerts. This action allows the TalkMaster operator to complete another task before answering the incoming call. If the call is not answered within 30 seconds, the Incoming Call dialog will open again and the Visual and Audible alerts will be triggered. Clicking the TalkMaster Icon in the Windows Task Bar or System Tray restores the TalkMaster screen with the Intercom selected in the Active Intercom list.

See Call Announcement for complete details.

Preferences and Setup

Preferences

Preferences are used to specify various settings for TalkMaster™. This is accessed from the menu option **View → Preferences**.

The Options tab is used to customize the way TalkMaster works.

The Multimedia tab is used to select the speaker and microphone devices

The Settings tab is used to change the Volume on an Intercom

The Advanced tab is retained for compatibility with older Intercoms

Preferences - Options tab

The **Options** tab sets options that affect the behavior of all intercoms.



Ping Interval - sets how often TalkMaster™ will send a Ping command to the intercoms to verify the connection

Startup Audio - Determines if a beep or a wav file is played when the Intercom connects to TalkMaster™. If you select **Speech**, you can select from a variety of .wav files or record your own.

Use beep tones at start and end of incoming calls - When this option is checked a beep is inserted at the beginning and end of each audio segment.

Hide when minimized - When this option is checked TalkMaster™ is minimized to the

Windows System Tray when either the - or X in the upper right hand corner of the screen are pressed.

To close TalkMaster, use menu option File → Exit or right click on the TalkMaster ICON is the system tray and select Close Program

If you check this box, it is recommended that you also check **Activate Call Announcement** so that the Incoming Call dialog is displayed when TalkMaster™ is minimized. Otherwise, TalkMaster can only be recalled by double clicking the TalkMaster™ ICON in the system tray.

Hold down Talk button while speaking (PTT) - When this option is checked, the **Talk** button can be activated by pressing and holding down the Space Bar or by clicking on the **Talk** button and holding the mouse button down.

If this option is not checked, the Talk button can be activated/deactivated by single clicking the **Talk** button or tapping the Space Bar on your computer keyboard.

Activate Call Announcement - When this option is checked, the button on the Intercom is treated as a Call button. After pressing and releasing the Intercom's Call button, the message "your call is being connected" is played at the Intercom. The **Call Announcement Notifications** will then be triggered in TalkMaster. Please see Call Announcement for more details.

Call Announcement Notification - These notifications alert the TalkMaster operator to an incoming call. The alerts will be triggered up to four times at 5 second intervals until the incoming call is answered. If the TalkMaster operator is already on a call, the alerts will not be triggered.

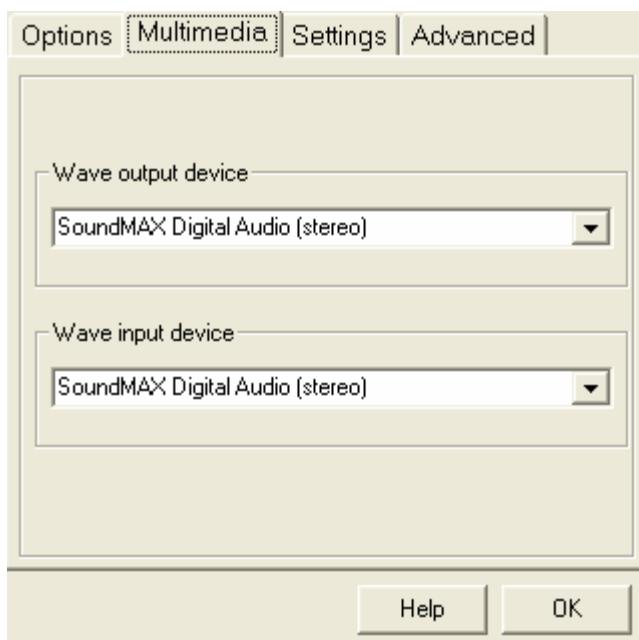
Visual Notification - Checking this box causes the TalkMaster title bar and task bar icon to flash.

Audible Notification - Checking this box causes the selected audio file to be played at the TalkMaster console. Select the Door Bell or the Custom option from the list. If you select Custom, you can record over the custom_announcement.wav file in the iSupport subdirectory of the TalkMaster program directory. *If you record a new wave file, it should only be one or two seconds long since the wav file will not be interrupted once it starts playing! See Changing Recordings for more information.*

Record Audio in Call Waiting Queue - If a call is added to the Calls Waiting queue, checking this box allows audio captured during the Intercom's initial button press to be made available for playback from the Calls Waiting Queue.

Preferences - Multimedia tab

The **Multimedia** tab is used to select the multimedia device to be used for the speaker and microphone.



Preferences - Settings tab

The **Settings** tab is used to make adjustments to individual Intercoms.



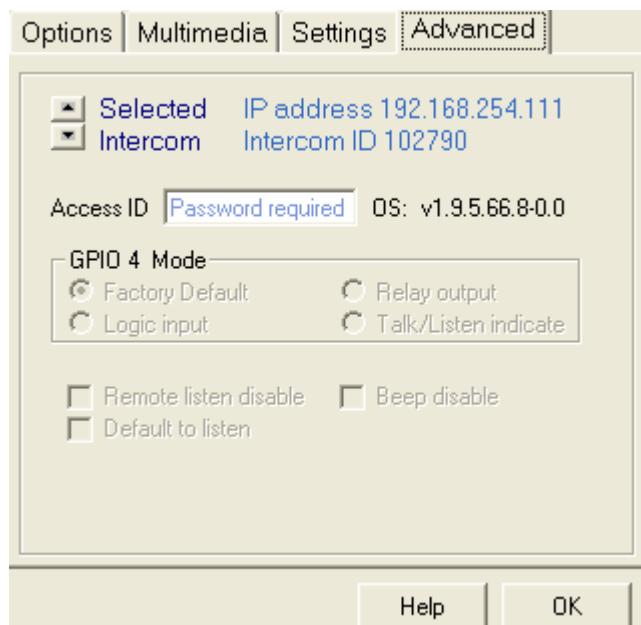
Selected Intercom - You can use the up and down arrows to select an Intercom from the list of intercom connected to TalkMaster™.

Audio Volume - sets the audio volume on the selected Intercom. This can be overridden at the Intercom by using the Volume Up and Volume Down buttons.

Friendly Name (Alias) - Displays the selected Intercom's Name.

Preferences - Advanced tab

The **Advanced** tab is used to change configuration settings on individual Intercoms. It is retained for compatibility with older intercoms as these options are now included in the Configure Intercoms menu item. **This will only re-program Intercoms with an ICOM version of 1.8 or earlier.**



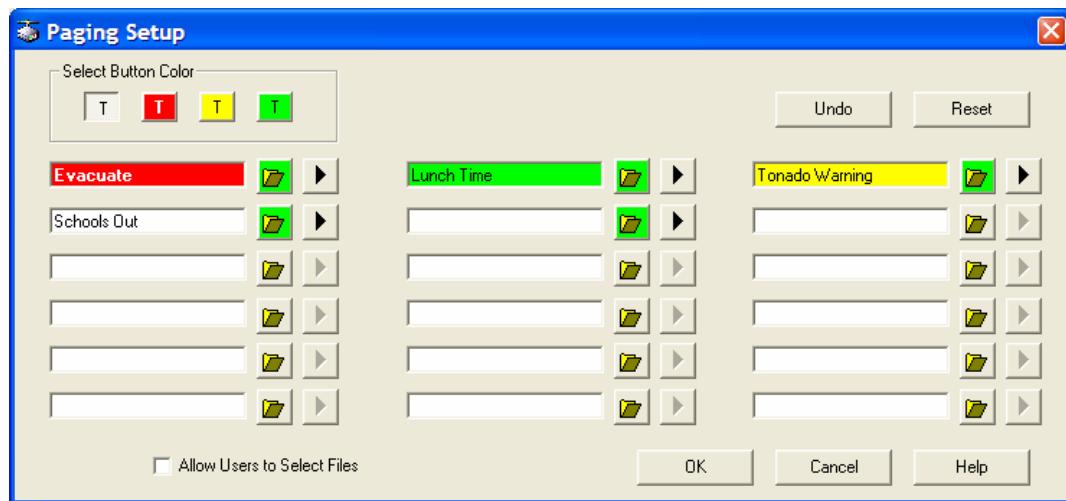
Selected Intercom - You can use the up and down arrows to select an Intercom from the list of intercom connected to TalkMaster™.

Access ID - Enter the administrator password to continue to make changes. The default value is **admin** but this can be changed. Please see Configuration File Menu for more information.

Please refer to the Advanced Configuration section of the Intercom configuration tool for the definition of these options.

Paging Setup

The Paging Setup screen is accessed via the menu option Tools → Paging Setup. The administrator password is required to enter this screen (default password is **admin**).



Up to 18 buttons can be associated with pre-recorded wav files in the Paging Messages dialog. Buttons can have one of four colors.

- Select a button "slot" and type in the text to be displayed on the button.
- Assign a color to the button, by clicking on one of the four choices.



- Click the Folder Icon and select the wav file to be associated with the button. A folder icon with a green background indicates that a file has been associated with this button.

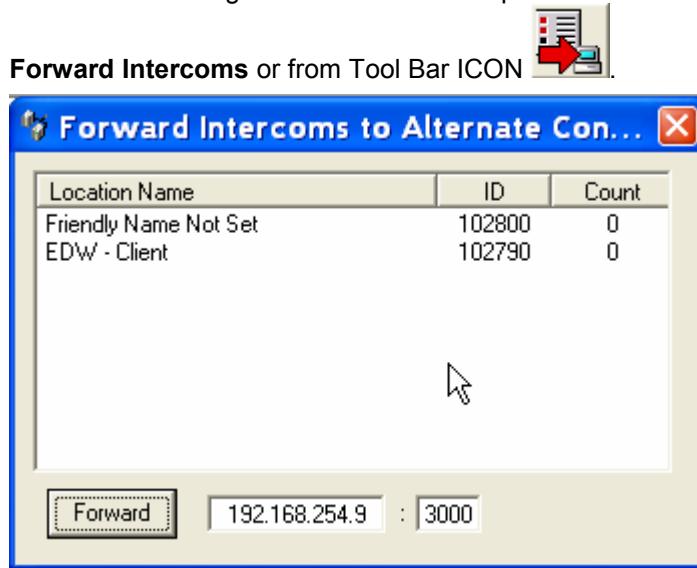
Please note: the file must be in 8kHz 8 bit PCM or 16 bit uLaw or it will not play on the Intercom Commercial or free software is available to create these formats.

- Click the Play button to verify the audio recording.
- Checking the "Allow Users to Select Files" places a "Find File" button on the paging dialog, allowing the user to select a file of their own choosing.
- Clicking the **Undo** button, clears any changes that have been made in this session
- Clicking the **Reset** button clears all buttons
- Clicking the **Cancel** button closes the dialog without saving changes
- Click the **OK** button save any changes and closes the dialog

TalkMaster Console Forwarding

Forward Intercoms

The Forward Intercoms function allows you to temporarily assign all of your intercoms to another PC running TalkMaster™. This option can be accessed from menu option **Console →**



Once you forward the intercoms, the **Forward** Intercom window will stay open and the **Forward** button will change to **Return**. The Pressing the **Return** button will send a message to the alternate console indicating that the intercoms will be retrieved. If the alternate console does not respond within 15 seconds, you will be asked if you want to retrieve the intercoms anyway.

If you need to shut down the TalkMaster™ console while this dialog is open, the Intercoms will stay forwarded to the Alternate Console. To return the Intercoms to this console, you will need to use the menu option **Console → Retrieve** when you open up TalkMaster™ the next time.

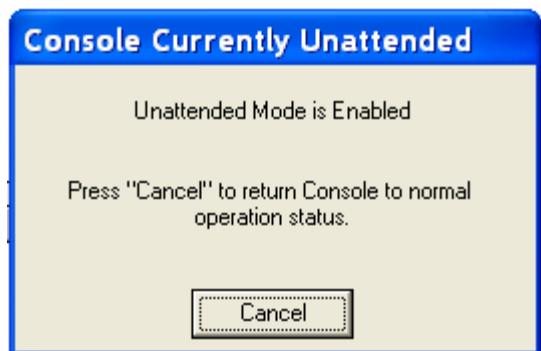
Retrieve Intercoms

The Retrieve Intercoms function will retrieve Intercoms that have been forwarded with the Forward Intercoms or that have been automatically forwarded via the Fail Forward function. Only those Intercoms that have their default Server IP set to this TalkMaster™ console will be returned to this console. This option can be accessed from menu option **Console → Forward**



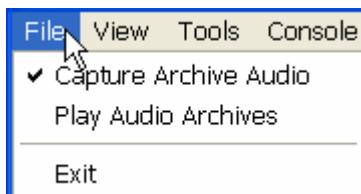
Unattended Console

Setting the TalkMaster™ software to Unattended mode makes the console temporarily unavailable. If the PTT button is pushed on an intercom, a message indicating that says "We are unavailable to take your call at this time" will be sent. This message can be changed by re-recording the unavailable.wav file in the iSupport subdirectory of the TalkMaster-ii3 directory. See Changing Recordings for details.



TalkMaster Menu Options

File Menu



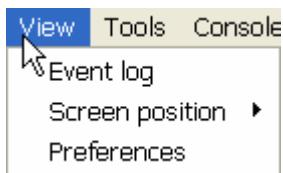
The File menu has three options:

Capture Audio Archives - toggles on and off the capture of mic and speaker audio.

Play Audio Archives - opens up a dialog that allows you to select audio archives by date and time.

Exit - will end the TalkMaster™ server session.

View Menu



The View menu has three options:

Event Log - allows you to display the TalkMaster™ event log and save it as a text file.

Screen Position - has two options: **Save current view** saves the current window size and **Reset to default** - sets it back to the size that the product originally shipped with.

Preferences - opens up the Preferences dialog.

Tools Menu



Mic and Speaker Levels - adjusts audio levels sent to and received from the intercoms. You can also change the source used for the Talk button from the microphone to Internet/Line In which allows you to play other sources of audio through the intercoms.



Common IP Ports - is a list of commonly used port numbers. You may reference this if you need to change the standard ports used by TalkMaster™ or the ii3 intercoms.

Record program events to file - should only be checked if directed by Digital Acoustics Technical Support. Leaving this option checked for an extended period of time can cause TalkMaster™ performance to be affected.

Configure Intercoms - brings up the Intercom Configuration Tool. This is used to setup the intercoms with IP addresses, other configuration information and to load new firmware.

Paging Setup - brings up the Paging Setup dialog. This is used to setup the Paging Messages dialog with pre-recorded messages. You are required to enter the administrator password before proceeding to this dialog.

Reset All Connections - will cause TalkMaster™ to drop all current IP connections to active intercoms and force them to reconnect to TalkMaster™.

ii3 Intercom OS update - is retained for compatibility with Intercoms that have OS version beginning with 1.8 or earlier. It should only be used under the direction of Digital Acoustics Technical Support.

Console Menu



Forward Intercoms - brings up a dialog box allowing you to temporarily forward all of the active intercoms to another PC running TalkMaster™. Refer to Forward Intercoms for complete instructions.

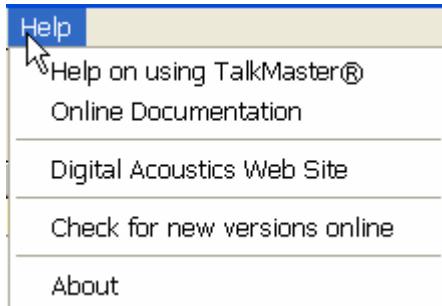
Retrieve Intercoms - will retrieve any intercoms from other PC's running TalkMaster™ that have this PC's IP address assigned as their primary server to connect to. This can be used to retrieve intercoms that have been forwarded to another console or have failed forward to another console.

Unattended Console - allows you to temporarily suspend the consoles operation. Any intercom that tries to contact the console is notified that no one is available to take their call. A

dialog pops up reminding you that this mode has been set. Clicking the **Cancel** button returns the console to normal operation.

This setting is saved between TalkMaster™ sessions.

Help Menu



Help on using TalkMaster - Opens up Help

Online Documentation - Directs you to online documents on the Digital Acoustics Web site

Digital Acoustics Website - Directs you to the Homepage for ii3 Intercoms

Check for new versions online - Runs an automatic software update check to see if you are running the most current version of the TalkMaster™

About - Displays the current version information about TalkMaster™

Configuring Intercoms

Configure Intercoms

When Intercoms are shipped from Digital Acoustics, they do not have IP address information configured. To configure them, you must connect them to your network, install TalkMaster™ and select the menu option **Tools → Configure Intercoms**. You will be asked for a Password. Enter the default password of **admin** to continue.



The Intercom Configuration Tool will immediately search for all Digital Acoustics intercoms connected to your current network segment. You must match the Icom ID displayed on the TalkMaster™ screen to the ID# printed on the back of the intercom and then configure the Intercom's IP address information and the IP address of the server it will connect to.

If you have intercoms located in a different network segment, you may not find them since many routers filter out UDP Broadcasts. You can either install these intercoms on the current network segment or you can install a copy of TalkMaster™ in the other network segment to configure your intercoms. You may also refer to the TalkMaster installation CD for instructions on installing the UBAM™ software which will allow you to configure units across different networks.

A network segment is determined by looking at the subnet mask and the corresponding bits in the IP Address. For example, on IP Address 192.168.2.175 Subnet 255.255.255.0, the network segment is 192.168.2, and on IP Address 126.10.11.12 Subnet 255.0.0.0, the network segment is 126.

To configure Intercoms to connect to TalkMaster™, see Intercom Configuration - TalkMaster Clients.

To configure two Intercoms to communicate with each other in Direct Mode, see Intercom Configuration - Direct Mode.

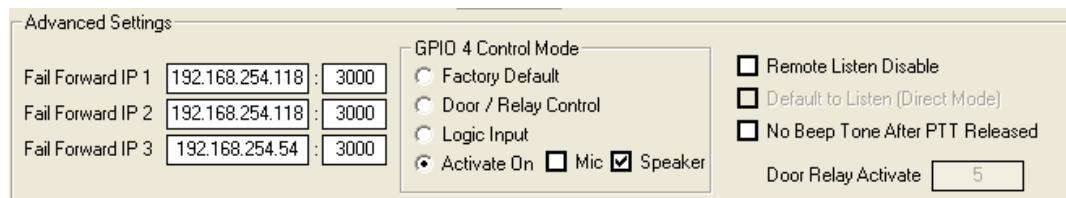
PLEASE CHANGE THE DEFAULT PASSWORD:

Before leaving the Intercom Configuration Tool, change the default password by selecting the menu option **File → Set Administrator Password**. Make sure to record your new password in a secure place or you will not be able to access the Intercom Configuration Tool.

Advanced Configuration

When the Advanced Configuration option is checked in the Intercom Configuration Tool **View Menu**, you can specify addition options for an ii3 Intercom.

If these options are grayed out, you have an intercom with older firmware. You can configure intercoms with older firmware from the main TalkMaster™ screen using the menu option **View → Preferences** and selecting the Advanced tab. To update the firmware, see Updating Firmware.



Fail Forward IP 1,2,3 allow you to specify up to three IP addresses of alternate TalkMaster™ consoles that this Intercom will attempt to connect to if its current TalkMaster™ console becomes unavailable. If an Intercom has failed forward to an alternate IP and its default TalkMaster™ console is restarted, the default TalkMaster™ console can reacquire the intercom by using the menu option **Console → Retrieve Intercoms**.

GPIO 4 Mode allows you to specify how General Purpose I/O (GPIO) port 4 is used. On Intercom models M2W, EW2W, MST, and EWST, GPIO 4 is connected to a relay (dry contact). On EDW and EDB models, GPIO 4 is connected to the Monitor button.

The normal state for GPIO 4 is logic high (+5 volts). When activated, it changes to logic low (0 Volts).

- **Factory Default** - on EDW/EDB units, causes GPIO 4 to control the Monitor button. On all other units, this setting has no effect.
- **Door / Relay Output** - on ii3 Intercom models that include a relay (dry contact), the Door/Gate button will become visible in the **Active Intercom List**. This option is used in conjunction with **Door Relay Activate** (see below) which sets the amount of time the relay will stay active
- **Logic Input** - used with custom developed applications to monitor other equipment.
- **Activate On MIC / Speaker** - Selecting this option turns on GPIO 4 when ever the Intercom's Microphone and/or Speaker are activated. When both **Mic** and **Speaker** are checked, the Intercom will wait for 1 second of inactivity before turning off GPIO 4. *Use of the **Mic** option requires the Intercom's OS Version to be 1.9.5.70 or higher.*

Remote Listen Disable - disables the ability to remotely turn on the Intercoms Microphone. With this option set, the Intercom Operator must press the PTT button on the Intercom in order for the other end to listen to the Intercom.

Default to Listen (Direct Mode) - is only available if option **Set as Server-Peer** is enabled. Enables the Server-Peer intercom in Direct Mode to automatically turn on the remote Intercom's Microphone when the Intercoms connect.

No Beep Tone After PTT Released - turns off the soft beep that is played on the intercom after the PTT button is released

Door Relay Activate - on ii3 Intercom models that include a relay for opening a door or gate, this option sets the number of seconds that the intercom's relay will stay active when the Door/Gate button is pressed in the Active Intercom List. This is used in conjunction with **GPIO 4 - Door / Relay Output**

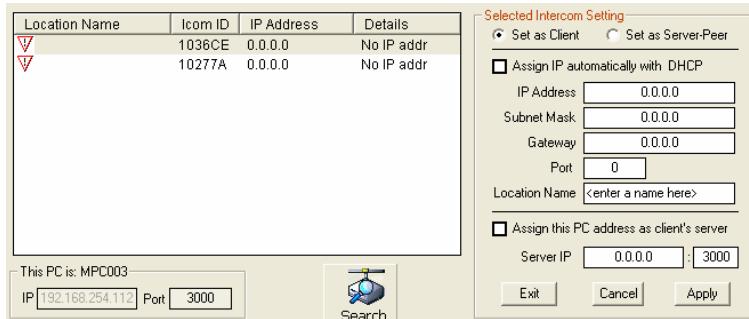
Intercom Configuration - TalkMaster Clients

Configuring intercoms for use with TalkMaster (Point to MultiPoint)

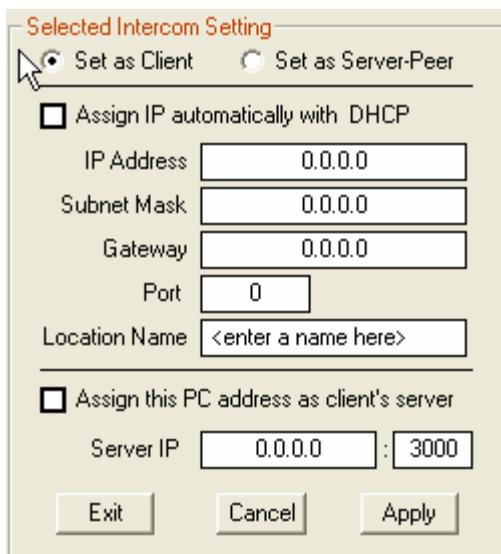
This procedure configures Intercoms to connect to the IP address of the PC running TalkMaster™. This connection can be on a LAN, WAN or across the Internet.

To configure two intercoms to connect to each other, please see Intercom Configuration - Direct Mode.

From the main TalkMaster™ screen, select the menu option **Tools → Configure Intercoms** and enter your password to proceed. The system will scan the local network segment using a UDP Broadcast to find all ii3 Intercoms. New Intercoms will show up with IP addresses of zero. **The Icom ID displayed on the screen will match the ID# printed on the back of the Intercom.**



If you have intercoms located in a different network segment, you may not find them since many routers filter out UDP Broadcasts. You can either configure these intercoms on the current network segment prior to installing them on the desired network or you can install a copy of TalkMaster™ in the other network segment to configure your intercoms. You may also refer to the TalkMaster installation CD for instructions on installing the UBAM™ software which will allow you to configure units across different networks.



For **each** intercom that you want to configure, click on it and then set the options as follows:

- **Set as Client** - Click this option
- **Assign IP automatically with DHCP** - This option determines how the Intercom's IP address is assigned. The Intercom IP address information can be assigned as a Static IP address or can be dynamically assigned if your network has a DHCP server. To use DHCP, check the box Assign IP automatically with DHCP.

Your system MUST have DHCP assignment capability if you choose to use this option. If you are unsure do NOT use DHCP.

To assign a Static IP address, uncheck the box **Assign IP automatically with DHCP** and fill in the **IP Address**, **Subnet Mask** and **Gateway**. The **Port** field does not have to be filled out.

- **Location Name** - Assign a descriptive text name that uniquely identifies the Intercom. This name will display in the main TalkMaster™ screen.
- **Assign this PC address as client's server** - This option determines the TalkMaster IP address that the Intercom will connect to. Check **Assign this PC address as the client's server** to have the Intercom connect to this PC. To specify a different TalkMaster™ console, uncheck the box and fill in the IP address and the default Port number of 3000.
- **Apply** - This option will save your settings to the selected intercom. After applying changes to an intercom, the unit will be reset and will be unavailable for 10-15 seconds
- **Cancel** - This option cancels changes that have not been Applied

Exit - This option closes the Intercom Configuration Tool screen and returns to the main screen *after you have completed configuring all intercoms.*

This PC is: XXXXXXXX - This option allows you to change the default Port number used by TalkMaster™. If you change this setting, it will be reflected in the **Assign this PC address as client's server** for you.



Search - will re-search for all Digital Acoustics' ii3 Intercoms so you can verify all of your changes. Please note, that if you **Apply** changes to an intercom, the unit will be unavailable for 10 -15 seconds. If an intercom does not appear in the list, try searching a second time.



If you need to change other options on the intercoms, make sure that you check menu option **View → Advanced**. Refer to Advanced Configuration for details.

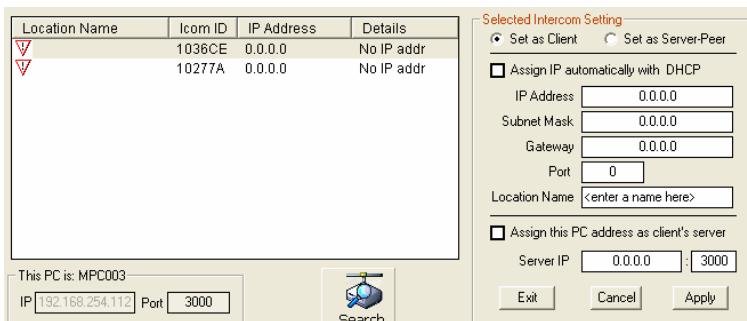
Intercom Configuration - Direct Mode

Configuring two intercoms in Client-Server mode (Direct Mode - No PC required)

This procedure configures two Intercoms to connect to each other. This connection can be on a LAN, WAN or across the Internet.

To configure intercoms to connect to TalkMaster™, please see Intercom Configuration - TalkMaster Clients.

From the main TalkMaster™ screen, select the menu option **Tools → Configure Intercoms** and enter your password to proceed. The system will scan the local network segment using a UDP Broadcast to find all ii3 Intercoms. New Intercoms will show up with IP addresses of zero. **The Icom ID displayed on the screen will match the ID# printed on the back of the Intercom.**



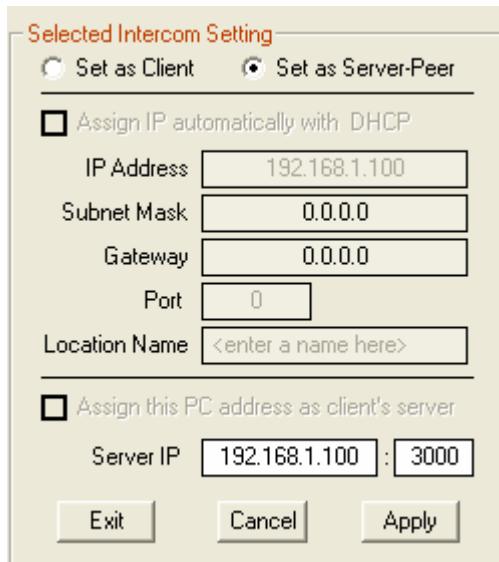
If you have intercoms located in a different network segment, you may not find them since many routers filter out UDP Broadcasts. You can either configure these intercoms on the current network segment prior to installing them on the desired network or you can install a copy of TalkMaster™ in the other network segment to configure your intercoms. You may also refer to the TalkMaster installation CD for instructions on installing the UBAM™ software which will allow you to configure units across different networks.

Determine which of the two intercoms will be the **Server-Peer** and which will be the **Client**.

If the Server-Peer is an EDW/EDB:

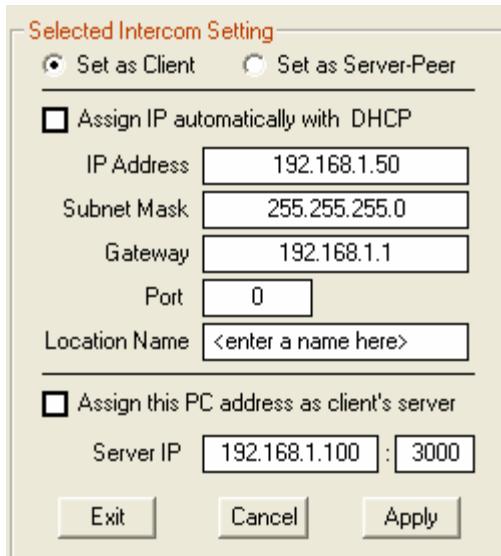
- Pressing the Monitor/Open button allows audio the Client Intercom to be monitored without the Client having to press a button. The Server-Peer can talk to the client by pressing its PTT button. The client operates in a fully "hands free" mode
- Activate the Relay on an EW2W or EWST Client Intercom to open a door by pressing and holding the EDW/EDB Monitor/Open button until a dual tone beep is heard. The relay will remain active for the number of seconds specified in the **Door Relay Activate** option under Advanced Configuration.

To set up the **Server-Peer**:



- **Set as Server-Peer** - Click this option
- **Assign IP automatically with DHCP** - This option is automatically grayed out
- **Location Name** - This option is automatically grayed out
- **Assign this PC address as client's server** - Uncheck **Assign this PC address as the client's server** and enter a fixed IP address and the Port number of the Server-Peer. You can change the default Port of 3000 as long as you specify the same port in the **Client**.
- **Apply** - This option will save your settings to the selected intercom. After applying changes to an intercom, the unit will be reset and will be unavailable for 10-15 seconds

To set up the **Client**:



- **Set as Client** - Click this option
- **Assign IP automatically with DHCP** - The Intercom IP address information can be assigned as a Static IP address or can be dynamically assigned if your network has a DHCP server. To use DHCP, check the box **Assign IP automatically with DHCP**. *Your system MUST have DHCP assignment capability if you choose to use this option. If you are unsure do NOT use DHCP.* To assign an IP address, uncheck the box **Assign IP automatically with DHCP** and fill in the **IP Address**, **Subnet Mask** and **Gateway**. You do not have to fill out the **Port**.
- **Location Name** - the unique name you assign to this Intercom
- **Assign this PC address as client's server** - This is automatically unchecked so you can enter the IP address and Port number of the Server-Peer.
- **Apply** - This option will save your settings to the selected intercom. After applying changes to an intercom, the unit will be reset and will be unavailable for 10-15 seconds

Search - You can re-search for Intercoms to verify all of your changes. Please note, that if you **Apply** changes to an intercom, the unit will be unavailable for 10 -15 seconds. If an Intercom does not appear in the list, try searching a second time.



The configured intercoms will look something like this:

Location Name	Icom ID	IP Address	Details
Front Door	1036CE	192.168.1.100	Server
Back Door	10277A	192.168.1.50	Client

If you need to change other options on the intercoms, make sure that you check menu option **View → Advanced**. Refer to Advanced Configuration for details.

Exit - This option closes the Intercom Configuration Tool screen

The **Server-Peer** will play a short beep and the Active and Link lights will turn solid on both intercoms indicating that they have made a connection.

Updating Firmware

Updating firmware should only be done under the direction of Digital Acoustics Technical Support. Improperly flashing Intercoms can render the units inoperable.

Intercoms must have minimum firmware levels of 1.9.5.66.1-xx.x-3.68.4 to use the following features:

- Console Forwarding
- UDP Broadcast
- Fail Forward IP addresses
- Door Relay Activation time
- Location Name Stored in Intercom

Intercoms shipped with TalkMaster™ include the most current firmware. To verify the firmware level, right click on an intercom in the main TalkMaster™ screen and view the OS version. In the following example, v1.9.5.66.8 is the ICOM version and 3.68.4 is the NIC version.



If you would like to update firmware in your intercoms, please contact Digital Acoustics Technical Support to verify upgradeability and to obtain the current firmware. Please have the Intercom ID# and OS Version available for each intercom that you would like to upgrade.

In order to update NIC Firmware, see NIC Firmware Updating

In order to update ICOM Firmware, see ICOM Firmware Updating

NIC Firmware Updating

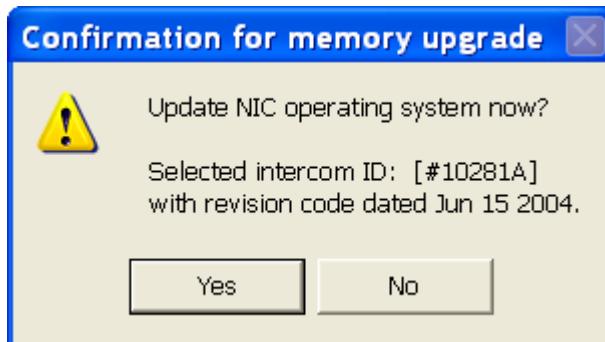
If you are going to perform a NIC firmware update, please consult with Digital Acoustics Technical Support to verify upgradeability and to obtain the current firmware. Please have the serial number and OS Version available for each intercom that you would like to upgrade.

In order to update the NIC firmware, you must configure the Intercom to connect to the copy of TalkMaster™ that you will be doing the update from. Please refer to Intercom Configuration - TalkMaster Clients.

It is strongly recommended that the update be done on a local area connection (LAN) instead of on a wide area connection (WAN) due to the critical nature of firmware updating.

Use the **Tools → Configure Intercoms** menu option to open the Intercom Configuration Tool. You will need to supply your password to access this screen.

Click on the Intercom you wish to update and select Action → NIC Firmware Upload.



TalkMaster™ will connect to the Intercom and begin uploading the firmware. When the upload is completed, a dialog box will be presented informing you that the action was successful. Once you click OK, the screen will lock for 30 seconds while the firmware re-programming takes place.

DO NOT TURN THE INTERCOM OFF WHILE THE FIRMWARE RE-PROGRAMMING TAKES PLACE!

ICOM Firmware Updating

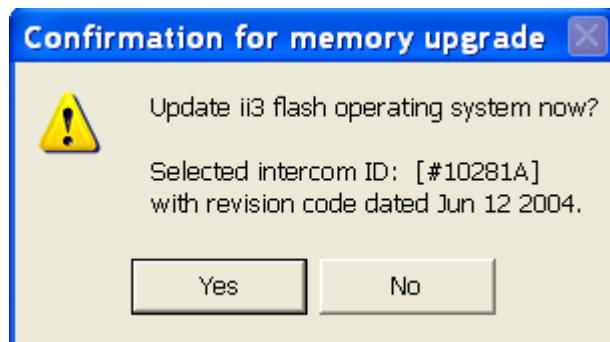
If you are going to perform an ICOM firmware update, please consult with Digital Acoustics Technical Support to verify upgradeability and to obtain the current firmware. Please have the serial number and OS Version available for each intercom that you would like to upgrade.

In order to update the ICOM firmware, you must configure the Intercom to connect to the copy of TalkMaster™ that you will be doing the update from. Please refer to Intercom Configuration - TalkMaster Clients.

It is strongly recommended that the update be done on a local area connection (LAN) instead of on a wide area connection (WAN) due to the critical nature of firmware updating.

Use the **Tools → Configure Intercoms** menu option to open the Intercom Configuration Tool. You will need to supply your password to access this screen.

Click on the Intercom you wish to update and select Action → ICOM Firmware Upload.

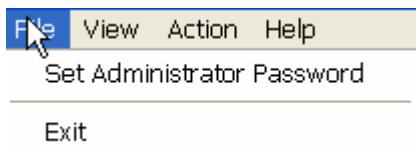


TalkMaster™ will connect to the Intercom and begin uploading the firmware. When the upload is completed, a dialog box will be presented informing you that the action was successful. Once you click OK.

DO NOT TURN THE INTERCOM OFF WHILE THE FIRMWARE IS UPLOADING!

Intercom Configuration Tool Menu Options

Configuration File Menu

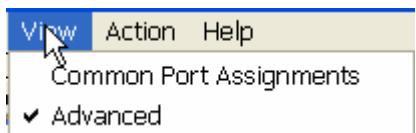


Set Administrator Password - allows you to change the default password of **admin** used to access the **Intercom Configuration Tool**, the **Paging Setup** dialog and the **Play Audio Archives** dialog.

*Please Note: an administrator password is created for each Windows user that signs on to a machine. The default password for each user is **admin***

Exit - exits the Intercom Configuration Tool

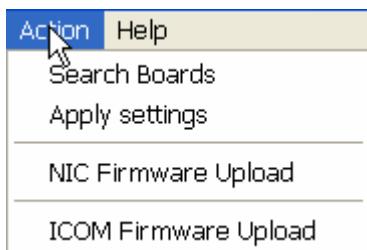
Configuration View Menu



Common Port Assignments - is a reference list of the common IP port settings

Advanced - makes the Advanced Settings section of the Intercom Configuration Tool available. Please see Advanced Configuration for details. This setting is remembered between TalkMaster™ sessions.

Configuration Action Menu



Search Boards - will search the current network segment for ii3 intercoms

Apply Settings - saves changes made to the current intercom

NIC Firmware Upload - updates a portion of the ii3 intercom firmware. This option will only display if NIC firmware is present on your Hard Drive.

ICOM Firmware Upload - updates a portion of the ii3 intercom firmware. This option will only display if ICOM Firmware is present on your Hard Drive.

Contact Digital Acoustics Technical Support if you have any questions on Firmware updates.

Configuration Help Menu



Help with Configuration Tool opens the Help window

Test DHCP connections - determines whether there is a DHCP server available on your network

Digital Acoustics Home Page - opens the default web browser to the ii3 intercom home page

Troubleshooting

Troubleshooting

Intercom Configuration Tool cannot find Intercoms

- Verify that the ACTIVE or LD10 LED is on or flashing. If not, check the power connections.
- Verify that the LINK or LD9 LED is on. If not, verify the network cable between the Intercom and the network switch.
- Verify that the Intercoms are on the same network segment as TalkMaster. TalkMaster uses a UDP Broadcast to search for Intercoms. Since most routers are configured to block UDP Broadcasts, you will not be able to configure the Intercoms in other networks. Perform the configuration in a single network, or install UBAM™ software from the TalkMaster Installation CD.
- If you have multiple network cards in the TalkMaster PC, verify that intercoms are connected to the card that TalkMaster has recognized. You can verify the IP address that TalkMaster is using by looking in the Intercom Configuration Tool under "This PC is: XXXXXXXX":



- If the Intercoms are configured for DHCP and no DHCP server is available, try re-powering the Intercom, wait 30 seconds, then try Searching 2 -3 times.
- If you cannot detect any intercoms using the Intercom Configuration Utility, connect the PC directly to the i3 intercom *using a crossover cable*. Verify that you have a valid IP address, start TalkMaster and then try to Search for the Intercom again.
- You can also refer to the LED Indicator section in your hardware manual and review the diagnostic information presented there.

Group, All Active functions do not work to Intercoms in other Networks

- If Intercoms are not in the same network as the TalkMaster, install the UBAM™ software off of the TalkMaster Installation CD. UBAM™ is a software product that will send/receive TalkMaster UDB Broadcast traffic between networks.

Configured Intercoms do not connect to TalkMaster

- Incorrect subnet or gateway address in the Intercom. Re-configure the Intercom using the correct information.
- Incorrect Server IP address. Re-configure the Intercom using the correct information.
- Intercoms have been Forwarded or Fail Forwarded to a different IP Address. Use the Retrieve button to reset all intercoms to connect back to their default IP address.

Changing Recordings

You can change the audio wav files played in TalkMaster or sent to the Intercoms.

The wav files that are played at the TalkMaster console are used when Call Announcement is activated in the Preferences - Options and an incoming call is received. The Audio Notification can be set to Doorbell or Custom. It is best to keep the recording to 1 or 2 seconds. Once it starts playing, it will play until it is done and will be repeated in 5 second intervals unless a keyboard operation or mouse click occurs.

Wave File	When Played	Verbiage
custom_announcement.wav	Call Announcement incoming call	custom
Doorbell_announcement.wav	Call Announcement incoming call	Chime

The wav files sent to the Intercoms must be encoded in either 8khz 8 bit PCM or 16 bit uLaw format. Commercial or free software is available to create these formats.

Wave File	When Played	Verbiage
announce.wav	Call Announcement greeting	Your call is being connected
announce_busy.wav	Call Announcement - TalkMaster Answer Later button pressed	Please Hold
End.wav	End of call from TM	beep
i_activated_au.wav	Intercom Connection to TalkMaster (Australian)	Intercom activated
i_activated_fr.wav	Intercom Connection to TalkMaster(French)	Intercom activated
i_activated_po.wav	Intercom Connection to TalkMaster (Portuguese)	Intercom activated
i_activated_uk.wav	Intercom Connection to TalkMaster (U.K.)	Intercom activated
i_activated_us.wav	Intercom Connection to TalkMaster (U.S.)	Intercom activated
in_page.wav	No longer used	Chime
page.wav	Chime button	bell
please_wait.wav	TalkMaster is on another call	Please hold while your call is being connected. Someone will get back to you as soon as possible
Start.wav	Start of call from	Beep

	TalkMaster	
unavailable.wav	Unattended mode is set in TalkMaster	We are unavailable to take your call at this time

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Two-Way Radio User's Guide



KEM-PK14146

Model SX700 series

- Ministry of Health (Canada) Safety Code 6. Limits of Human Exposure to Radiofrequency Electromagnetic Fields in the Frequency Range from 3 KHz to 300 GHz, 1999
- Australian Communications Authority Radiocommunications (Electromagnetic Radiation—Human Exposure) Standard, 2003
- ANATOL ANNEX to Resolution No. 303 of July 2, 2002 "Regulation of limitation of exposure to electrical, magnetic and electromagnetic fields in the radio frequency range between 9 KHz and 300GHz" and "Attachment to resolution #303 from July 2, 2002"

To assure optimal radio performance and make sure human exposure to radio frequency electromagnetic energy is within the guidelines set forth in the above standards, always adhere to the following procedures.

Portable Radio Operation and EME Exposure

Antenna Care

Use only the supplied or an approved replacement antenna. Unauthorized antennas, modifications, or attachments could damage the radio and may violate FCC regulations.

Do NOT hold the antenna when the radio is "IN USE." Holding the antenna affects the effective range.

Body-Worn Operation

To maintain compliances with FCC/Health Canada RF exposure guidelines, if you wear a radio on your body when transmitting, always place the radio in a Motorola-supplied or approved clip, holder, holster, case or body harness for this product. Use of non-Motorola-approved accessories may exceed FCC/Health Canada RF exposure guidelines. If you do not use one of the Motorola-supplied or approved body-worn accessories and are not using the radio held in the normal use position, ensure the radio and its antenna are at least 1 inch (2.5 cm) from your body when transmitting.

Data Operation

If applicable, when using any data feature of the radio with or without an accessory cable, position the radio and its antenna at least one inch (2.5 cm) from the body.

Approved Accessories

For a list of approved Motorola accessories, visit our Web site at www.Motorola.com.

Electromagnetic Interference/Compatibility

Note: Nearly every electronic device is susceptible to electromagnetic interference (EMI) if inadequately shielded, designed or otherwise configured for electromagnetic compatibility. This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

1. This device may not cause harmful interference; and
2. This device must accept any interference received, including interference that may cause undesired operation.

Facilities

To avoid electromagnetic interference and/or compatibility conflicts, turn off your radio in any facility where posted notices instruct you to do so. Hospitals or health care facilities may be using equipment that is sensitive to external RF energy.

Aircraft

When instructed to do so, turn off your radio when onboard an aircraft. Any use of a radio must be in accordance with applicable regulations per airline crew instructions.

Medical Devices – Pacemakers

The Advanced Medical Technology Association recommends that a minimum separation of 6 inches (15 cm) be maintained between a handheld wireless radio and a pacemaker. These recommendations are consistent with the independent research by and recommendations of the U.S. Food and Drug Administration.

For More Information

For further information, you may call Motorola at 1-800-638-5119 (U.S. and Canada) or visit us on the Internet at <http://www.motorola.com>.

Safety and General Information

Important Information on Safe and Efficient Operation

Read This Information Before Using Your Radio.

The information provided in this document supersedes the general safety information in user guides published prior to December 1, 2002.

Transmit and Receive Procedure

Your two-way radio contains a transmitter and a receiver. To control your exposure and ensure compliance with the general population/uncontrolled environment exposure limits, always adhere to the following procedure:

- Transmit no more than 50% of the time.
- To receive calls, release the PTT button.
- To transmit (talk), press the Push to Talk (PTT) button.

Transmitting 50% of the time, or less, is important because the radio generates measurable RF energy exposure only when transmitting (in terms of measuring standards compliance).

Exposure to Radio Frequency Energy

Your Motorola two-way radio complies with the following RF energy exposure standards and guidelines:

- United States Federal Communications Commission, Code of Federal Regulations; 47CFR part 2 sub-part J
- American National Standards Institute (ANSI)/Institute of Electrical and Electronic Engineers (IEEE) C95.1-1992
- Institute of Electrical and Electronics Engineers (IEEE) C95.1-1999 Edition
- International Commission on Non-Ionizing Radiation Protection (ICNIRP) 1998

People with pacemakers should:

- ALWAYS keep the radio more than 6 inches (15 cm) from their pacemaker when the radio is turned ON.
- Not carry the radio in the breast pocket.
- Use the ear opposite the pacemaker to minimize the potential for interference.
- Turn the radio OFF immediately if there is any reason to suspect that interference is taking place.

Medical Devices – Hearing Aids

Some digital wireless radios may interfere with some hearing aids. In the event of such interference, you may want to consult your hearing aid manufacturer to discuss alternatives.

Other Medical Devices

If you use any other personal medical device, consult the manufacturer of your device to determine if it is adequately shielded from RF energy. Your physician may be able to assist you in obtaining this information.

Safety and General Use While Driving

Check the laws and regulations regarding the use of radios in the area where you drive, and always obey them. If you do use your radio while driving, please:

- Give full attention to driving and to the road.
- Use hands-free operation, if available.
- Pull off the road and park before making or answering a call if driving conditions so require.

Do not place a portable radio in the area over an air bag or in the air bag deployment area. Air bags inflate with great force. If a portable radio is placed in the air bag deployment area and the air bag inflates, the radio may be propelled with great force and cause serious injury to occupants of the vehicle.

Potentially Explosive Atmospheres

Turn off your radio prior to entering any area with a potentially explosive atmosphere. Only radio types that are especially qualified should be used in such areas as "Intrinsically Safe." Do not remove, install or charge batteries in such areas. Sparks in a potentially explosive atmosphere can cause an explosion or fire resulting in bodily injury or even death.

Note: The areas with potentially explosive atmospheres referred to above include fueling areas such as below decks on boats, fuel or chemical transfer or storage facilities, areas where the air contains chemicals or particles (such as grain, dust or metal powders) and any other area where you would normally be advised to turn off your vehicle engine. Areas with potentially explosive atmospheres are often—but not always—posted.

Blasting Caps and Areas

To avoid possible interference with blasting operations, turn off your radio when you are near electrical blasting caps, in a blasting area, or in areas posted "Turn off two-way radios." Obey all signs and instructions.

Operational Cautions

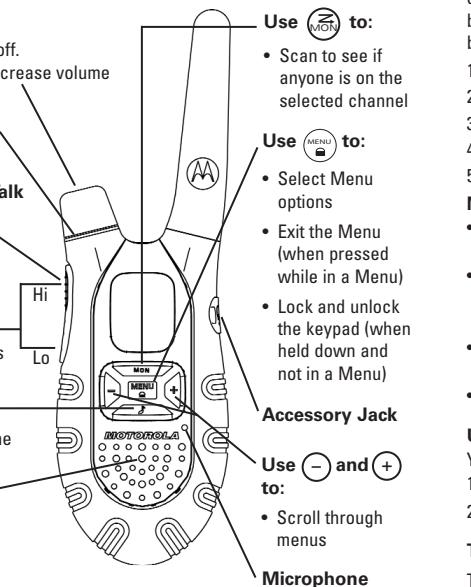
Antennas

Do not use any portable radio that has a damaged antenna. If a damaged antenna comes into contact with your skin, a minor burn can result.

Batteries

All batteries can cause property damage and/or bodily injury such as burns if a conductive material—like jewelry, keys or beaded chains—touch exposed terminals. The conductive material may complete an electrical circuit (short circuit) and become quite hot. Exercise care in handling any charged battery, particularly when placing it inside a pocket, purse or other container with metal objects.

Control Buttons



Using the Desk Stand Charger (Optional Accessory)

The desk stand charger provides drop-in charging convenience for NiMH batteries and can be placed on any flat surface, such as a desk or workbench. Charge the NiMH battery overnight (at least 16 hours) before using it for the first time. After the initial charge, an empty battery is fully charged within 14 hours.

1. Follow the steps above to install a NiMH Battery Pack.
2. Plug the AC power supply into the plug on the desk stand.
3. Plug the AC power supply into a standard wall outlet.
4. Remove the battery pocket inserts from the charger pockets.
5. With a radio facing forward, slide it into one of the charging pockets.

Notes

- The light on the AC power supply will glow continuously when radio/battery is inserted.
- When moving between hot and cold temperatures, do not charge the battery until the battery temperature acclimates (usually about 20 minutes).
- For optimal battery life, remove the radio or battery from the charger within 16 hours. Do not store the radio in the charger.
- Turn radio off while in charging tray.

Using the Belt Holster

Your radio includes a holster so you may carry it easily on your belt.

1. Adjust the holster's clip so it fits onto your belt.
2. Slide your radio into the holster.

Turning Your Radio On and Off

Turn clockwise to turn the radio on and counterclockwise to turn the radio off.

1. The radio chirps and briefly shows all features icons available on your radio.
2. The display then shows the current channel, code and features that are selected.

Setting the Volume

Press and hold while rotating until you reach a comfortable listening level.

1. Rotate clockwise to increase the volume.
2. Rotate counterclockwise to decrease the volume.

Do not hold the radio close to your ear. If the volume is set to an uncomfortable level, it could hurt your ear.

Display Screen Guide



Battery Meter

ON – On/Off for each feature

Channel Indicator

– Vibrate

Scan

– Call Tone, Keypad Tone

Lock

– Weather Alert

Call Tone Confirmation (Roger Beep)

iVOX – Hands-Free Use Without Accessories

Noise Filtering

QT – QT

Note: If you are on an FRS only channel (see channel and frequencies chart) the radio will only use QT power when either portion of the is pressed.

Monitor Button

Pressing and holding for three seconds allows you to listen to the volume level of the radio when you are not receiving. This allows you to adjust the volume, if necessary. You can also press to check for activity on the current channel before you talk.

Push to Talk (PTT) Timeout Timer

To prevent accidental transmissions and save battery life, the radio emits a continuous warning tone and stops transmitting if you press for 60 continuous seconds.

Initial Setup

Selecting the Channel

Your radio has 22 channels. Channels 8-14 are FRS 0.5 Watt only and all other channels are GMRS. When you press the bottom portion of the all channels are 0.5 Watt . If you press the top portion of the to boost the power GMRS channels will be 2 Watt .

Note: When on FRS only channel top or bottom press of will only be 0.5Watt .

1. With the radio on, press . The current channel flashes.
2. Press or to set the channel.
3. Press to save the channel setting or to continue set up.

Channels and Frequencies

Channel	Frequency	Description	Channel	Frequency	Description
1	462.5625 MHz	GMRS/FRS	12	467.6625 MHz	FRS
2	462.5875 MHz	GMRS/FRS	13	467.6875 MHz	FRS
3	462.6125 MHz	GMRS/FRS	14	467.7125 MHz	FRS
4	462.6375 MHz	GMRS/FRS	15	462.5500 MHz	GMRS
5	462.6625 MHz	GMRS/FRS	16	462.5750 MHz	GMRS
6	462.6875 MHz	GMRS/FRS	17	462.6000 MHz	GMRS
7	462.7125 MHz	GMRS/FRS	18	462.6250 MHz	GMRS
8	467.5625 MHz	FRS	19	462.6500 MHz	GMRS
9	467.5875 MHz	FRS	20	462.6750 MHz	GMRS
10	467.6125 MHz	FRS	21	462.7000 MHz	GMRS
11	467.6375 MHz	FRS	22	462.7250 MHz	GMRS

Continued on back

SX700

VibraCall® Alert

VibraCall is a vibrating alert that notifies you that your radio is receiving a message. This is useful in noisy environments. When the alert is on, the radio vibrates once every 30 seconds when you receive a message on the channel and code you set.

1. To turn vibrating alerts on, press until is displayed. The current setting will flash.
2. Press or to change the setting to Off/On.
3. Press to set or to continue set up.

QT Noise Filtering

The QT noise-filtering feature helps to ensure uninterrupted communication with other Motorola radios that have this feature. This feature filters out unwanted transmissions from other radios. This is useful in places where there is heavy radio traffic, such as amusement parks or ski resorts.

Note: QT noise filtering is not available when the radio is scanning. To turn QT noise filtering on or off:

1. Short press until QT displays. The current setting On/Off will flash.
2. Press or to turn noise filtering On or Off.
3. Press to confirm your selection or to continue set up.

To transmit to a radio that has QT noise filtering turned on:

1. Select the same channel and Interference Eliminator Code as the other radio.
2. Press to send a call tone. This allows your voice to pass through the QT noise filter on the receiving radio.

3. Press and speak normally.

Note: If you skip step 2, the beginning of your message may not be heard on the receiving radio. For a 30-second period, starting after the last transmission, all transmissions received on the selected channel and code will pass through the QT noise filter.

Keypad Tones

You may enable or disable the speaker key tones. You will hear the key tone each time a button is pushed.

1. Press until appears. The current setting On/Off will flash.
2. Press either or to turn On or Off.
3. Press to confirm or to continue set up.

When the Key Tone Feature is off, the following are not disabled:

- Transmit timeout alert tone;
- Power-down alert tone;
- Low battery alert tone; or
- The transmitted Talk Confirmation Tone.

Transmitting a Talk Confirmation Tone

You can set your radio to transmit a unique tone when you finish transmitting. It is like saying "Roger" or "Over" to let others know you are finished talking.

1. With the radio on, press until the appears. The current setting On/Off flashes.
2. Press or to turn On or Off.
3. Press to set or to continue set up.

Special Features

Keypad Lock

To avoid accidentally changing your radio settings:

1. Press and hold until displays.
2. When in lock mode, you can turn the radio on and off, adjust the volume, receive, transmit, send a call tone, and monitor channels. All other functions are locked.

To unlock the radio, press and hold until is no longer displayed.

Enhanced Scanning

Use scanning to monitor channels and codes for transmissions or to find someone in your group who has accidentally changed channels. With enhanced scanning, your home channel is scanned more frequently than any other channel. The home channel is the channel where your radio was set when you started to scan. If you activate scan while your radio's Interference Eliminator Code is set to a number between 1 and 121, the radio checks for activity on each channel—but only in the specific code selected. All transmissions using code 0 or any other code are ignored.

1. To start scanning, briefly press and release . The scan indicator displays , and the radio begins to scroll through the channel and Interference Eliminator Code combinations.
2. When the radio detects channel activity, it stops scanning and you can hear the transmission.
3. To respond and talk to the person transmitting, press within five seconds.
4. To stop scanning, briefly press and release .

Note: If you press while the radio is scanning, the radio will transmit on the channel you selected before you activated scan. If no transmission occurs within five seconds, scanning will resume.

Advanced Scan

If the radio stops scanning on a channel you do not want to listen to, briefly press and release or to resume scanning for the next active channel.

Removing Channels from the Scan List (Nuisance Delete Feature)

1. To prevent the radio from scanning a channel, press and hold or for at least three seconds, then release, when the scan first stops on that channel. This temporarily removes the channel from the scan list.
2. Press to exit scan mode.

3. Press a second time to activate scan again.
4. To restore a previously deleted channel, turn the radio off and then back on. The channel is now restored.

Note: You cannot remove your home channel from the scan list. The home channel is the channel your radio was set to when you started the scanning.

Using Audio Accessories:

Many accessories (sold separately) are available for your radio. For more information, visit our Web site at www.motorola.com.

Hands-Free Use With Accessories (VOX)

You can transmit hands-free with the use of optional accessories. Once VOX is turned on, the radio detects your voice and transmits when you speak.

1. Turn the radio off and plug the VOX accessory into the accessory port.
2. Turn the radio on. VOX shows on the display.
3. Adjust the volume appropriately by rotating . Lower the volume before placing the accessory on your head or in your ear.
4. To turn off, simply remove accessory.

Note: There is a short delay between the time you start talking and when the radio transmits. There is a short delay before the transmission is completed.

Weather

Your radio can tune in to broadcasts by the United States National Oceanic and Atmospheric Administration (NOAA) Weather Radio and Environment Canada Weatheradio.

You can listen to a weather channel or set your radio to alert you to emergency weather broadcasts that interrupt routine broadcasts. When you listen to a weather channel, you cannot use your radio in scan mode or for two-way communications.

Both NOAA and Environment Canada have transmitters located throughout the United States and Canada, respectively. These transmitters broadcast watches, forecasts, and other information 24 hours a day.

Weather Channels and Frequencies

Weather Channel	Frequency	Weather Channel	Frequency
WX1	162.550 MHz	WX7	162.525 MHz
WX2	162.400 MHz	WX8	161.650 MHz
WX3	162.475 MHz	WX9	161.775 MHz
WX4	162.425 MHz	WX10	161.750 MHz
WX5	162.450 MHz	WX11	162.000 MHz
WX6	162.500 MHz		

Note: NOAA weather radio stations are assigned to cover specific areas and service may be limited. Please check with your local weather office for frequency and details, or visit www.nws.noaa.gov/nwr in the US or www.msc-smc.ec.gc.ca/cd/factsheets/wxradio in Canada to view the appropriate transmitter for your area.

The use of the NOAA logo does not provide an endorsement or implied endorsement by NOAA's National Weather Service, nor does the use of the Weatheradio logo provide an endorsement or implied endorsement by Environment Canada.

Turning Weather Channel Reception On and Off

1. To turn weather reception on, press and hold for three seconds.
2. To turn off, press or turn the radio off and then back on.

Setting the Weather Channel

Your radio receives weather frequencies:

1. After turning weather reception on, press . The current channel flashes.
2. Press or to select the channel.
3. Press to save the weather channel setting.

Setting the Weather Alert

Your radio receives weather frequencies:

1. After turning weather reception on, press twice. Off/On displays.
2. Press or to select Off/On. If you activate Weather Alert and return to two-way mode, will display.
3. Press to save the weather channel setting.

As with two-way radio reception, weather channel reception depends on how close you are to a transmitter and whether you are indoors or outdoors. Because weather channels are transmitted without codes, they may contain static or noise.

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Warranty

Limited Warranty for Personal Communication Products, Accessories and Software Purchased in the United States or Canada

What Does this Warranty Cover?

Subject to the exclusions contained to the right, Giant International Ltd. warrants the Motorola branded wireless telephones, pagers, and consumer two-way radios that operate via Family Radio Service or General Mobile Radio Service that it manufactures ("Products"), the Motorola branded or certified accessories sold for use with these Products that it manufactures ("Accessories") and Motorola branded software contained on CD-Roms or other tangible media and sold for use with these Products that it manufactures ("Software") to be free from defects in materials and workmanship under normal consumer usage for the period(s) outlined below. This limited warranty is a consumer's exclusive remedy, and applies as follows to new Motorola branded Products, Accessories and Software manufactured by Giant International Ltd., and purchased by consumers in the United States or Canada, which are accompanied by this written warranty:

Products Covered

A. Products and Accessories as defined above, unless otherwise provided for below.

1. Decorative Accessories and Cases.

Decorative covers, bezels, PhoneWrap® covers and cases.

2. Monaural Headsets.

Ear buds and boom headsets that transmit mono sound through a wired connection.

3. Consumer Two-Way Radio Accessories.

Products and Accessories that are Repaired or Replaced.

4. The balance of the original warranty or for ninety (90) days

from the date returned to the consumer, whichever is longer.

Length of Coverage

A. One (1) year from the date of purchase by the first consumer purchaser of the product unless otherwise provided for below.

1. Limited lifetime warranty

for the lifetime of ownership by the first consumer purchaser of the product.

2. Limited lifetime warranty

for the lifetime of ownership by the first consumer purchaser of the product.

3. Ninety (90) days

from the date of purchase by the first consumer purchaser of the product.

4. The balance of the original warranty or for ninety (90) days

from the date returned to the consumer, whichever is longer.

Exclusions

Normal Wear and Tear. Periodic maintenance, repair and replacement of parts due to normal wear and tear are excluded from coverage. Batteries. Only batteries whose fully charged capacity falls below 80% of their rated capacity and batteries that leak are covered by this limited warranty.

Abuse & Misuse. Defects or damage that result from: (a) improper operation, storage, misuse or abuse, accident or neglect, such as physical damage (cracks, scratches, etc.) to the surface of the product resulting from misuse; (b) contact with liquid, water, rain, extreme humidity or heavy perspiration, sand, dirt or the like, extreme heat, or food; (c) use of the Products or Accessories for commercial purposes or subjecting the Product or Accessory to abnormal usage or conditions; or (d) other acts which are not the fault of Motorola or Giant International Ltd., are excluded from coverage.

Use of Non-Motorola branded Products and Accessories. Defects or damage that result from the use of Non-Motorola branded or certified Products, Accessories, Software or other peripheral equipment are excluded from coverage.

Unauthorized Service or Modification. Defects or damages resulting from service, testing, adjustment, installation, maintenance, alteration, or modification in any way by someone other than Motorola, Giant International Ltd. or its authorized service centers, are excluded from coverage.

Altered Products. Products or Accessories with (a) serial numbers or date tags that have been removed, altered or obliterated; (b) broken seals or that show evidence of tampering; (c) mismatched board serial numbers; or (d) nonconforming or non-Motorola branded housings, or parts, are excluded from coverage.

Communication Services. Defects, damages, or the failure of Products, Accessories or Software due to any communication service or signal you may subscribe to or use with the Products Accessories or Software is excluded from coverage.

Who is covered?

This warranty extends only to the first consumer purchaser, and is not transferable.

What will GIANT INTERNATIONAL LTD. Do?

GIANT INTERNATIONAL LTD., at its option, will at no charge repair, replace or refund the purchase price of any Products, Accessories or Software that does not conform to this warranty. We may use functionally equivalent reconditioned/refurbished/pre-owned or new Products, Accessories or parts. No data, software or applications added to your Product, Accessory or Software, including but not limited to personal contacts, games and ringer tones, will be reinstated. To avoid losing such data, software and applications please create a back up prior to requesting service.

How to Obtain Warranty Service or Other Information?

To obtain service or information, please call:

USA Two-Way Radios

1-800-638-5119

Canada Two-Way Radios

1-800-638-5119

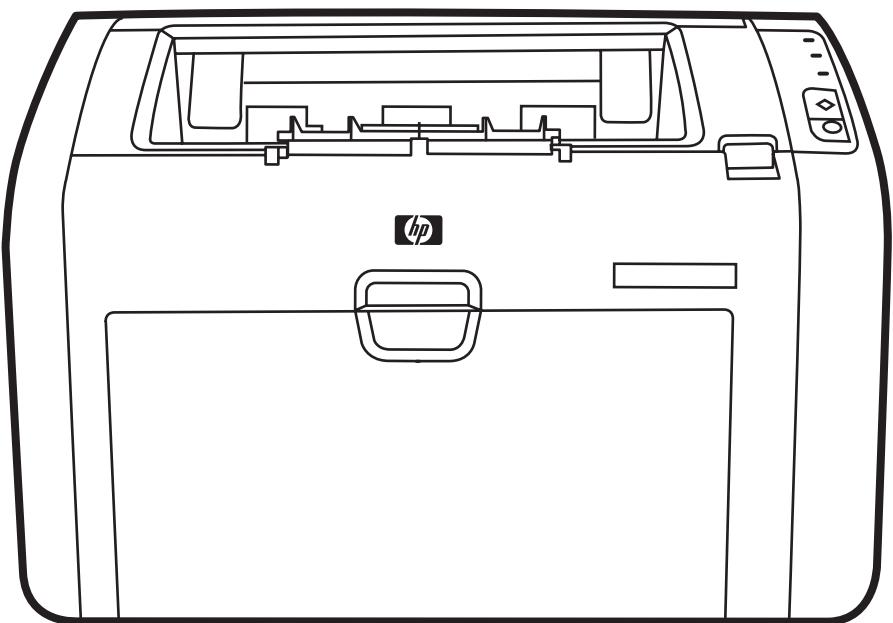
For Accessories and Software, please call the telephone number designated above for the product with which they are used.

You will receive instructions on how to ship the Products, Accessories or Software, at your expense, to a GIANT INTERNATIONAL LTD. Authorized Repair Center. To obtain service, you must include: (a) a copy of your receipt, bill of sale or other comparable proof of purchase; (b) a written description of the problem; (c) the name of your service provider, if applicable; (d) the name and location of the installation facility (if applicable) and, most importantly; (e) your address and telephone number.

Some states and jurisdictions do not allow the limitation or exclusion of incidental or consequential damages, or limitation on the length of an implied warranty, so the above limitations or exclusions may not apply to you. This warranty gives you specific legal rights, and you may also have other rights that vary from state to state or from one jurisdiction to another.

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HP LaserJet 1022, 1022n, 1022nw User Guide



HP LaserJet 1022, 1022n, and 1022nw printers

User Guide

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Printer basics

This chapter provides information on the following topics:

- [Quick access to more information](#)
- [Printer configurations](#)
- [Walkaround](#)
- [Printer control panel](#)
- [Media paths](#)
- [Printer software](#)
- [Printer media considerations](#)

Quick access to more information

The following sections provide resources for additional information about the HP LaserJet 1020 series printer.

NOTE

The HP LaserJet 1020 series printer includes the HP LaserJet 1022, 1022n, and 1022nw printer models.

Web links for drivers, software, and support

If you need to contact HP for service or support, use one of the following links.

HP LaserJet 1022 printer

- In the United States, see <http://www.hp.com/support/lj1022/>.
- In other countries/regions, see <http://www.hp.com/>.

User guide links

- [Walkaround](#) (location of printer components)
- [Changing the print cartridge](#)
- [Problem solving](#)
- [Ordering supplies](#)

Where to look for more information

- **CD user guide:** Detailed information on using and troubleshooting the printer. Available on the CD-ROM that came with the printer.
- **Online Help:** Information on printer options that are available from within printer drivers. To view a Help file, access the online Help through the printer driver.
- **HTML (online) user guide:** Detailed information on using and troubleshooting the printer. Available at <http://www.hp.com/support/lj1022/>. Once connected, select **Manuals**.

Printer configurations

Below are the standard configurations for the HP LaserJet 1022, 1022n, and 1022nw printers.

HP LaserJet 1022 printer

- 18 pages per minute (ppm) A4 media and 19 ppm for letter media
- First page out in as few as 8 seconds
- ProRes 1200 print quality setting that provides fine-line detail at 1200 x 1200 dots per inch (dpi)
- 250-sheet main input tray
- Priority feed slot
- 100-sheet output capacity
- EconoMode (saves toner)
- Print watermarks, booklets, multiple pages per sheet (N-up), and first page on different media than rest of the document
- 8 MB RAM
- 2,000-page print cartridge
- Host-based and PCL5e printer drivers
- USB 2.0 High Speed
- Power switch
- 26 PCL fonts

HP LaserJet 1022n printer

The HP LaserJet 1022n printer includes an internal network port.

NOTE

For more information about printer drivers, see <http://www.hp.com/support/lj1022>.

HP LaserJet 1022nw printer

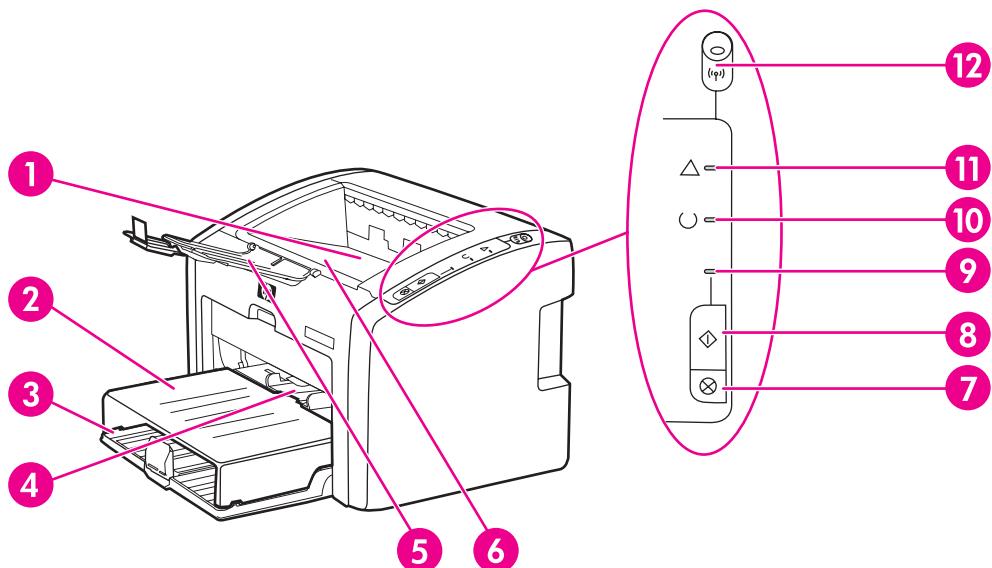
The HP LaserJet 1022nw printer includes all of the features of the HP LaserJet 1022n printer with the addition of integrated 802.11b/g wireless connectivity.

NOTE

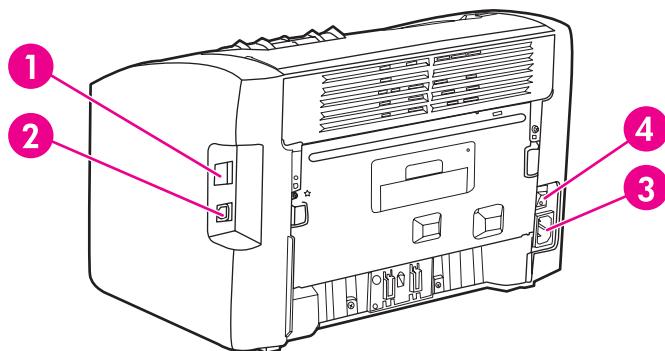
For more information about this product, see the *HP LaserJet 1022nw Wireless User Guide*.

Walkaround

The following illustrations identify the components of the HP LaserJet 1022, 1022n, and 1022nw printers.



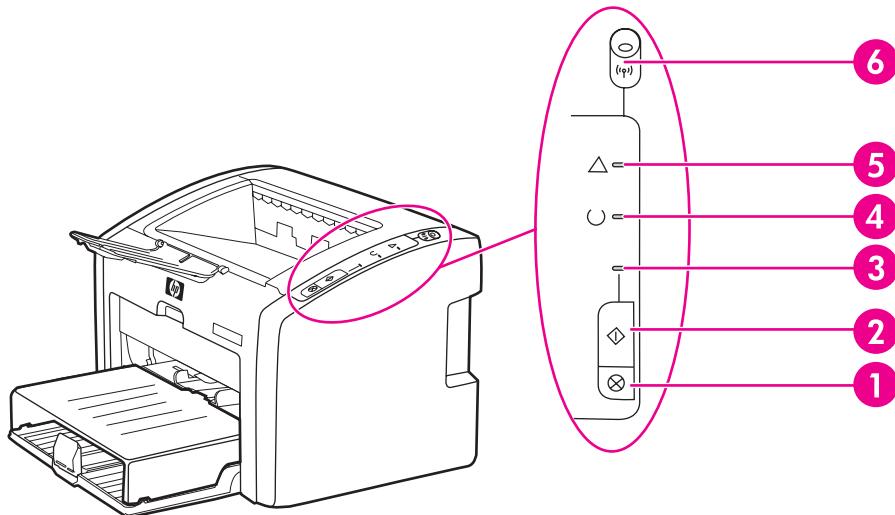
- 1 Output bin
- 2 Input tray cover
- 3 250-sheet main input tray
- 4 Priority feed slot
- 5 Output media support
- 6 Print cartridge door
- 7 **CANCEL** button
- 8 **Go** button
- 9 Go light
- 10 Ready light
- 11 Attention light
- 12 Wireless light (HP LaserJet 1022nw printer only)



- 1 Internal network port (HP LaserJet 1022n and HP LaserJet 1022nw printers only)
- 2 USB port
- 3 Power receptacle
- 4 On/off switch

Printer control panel

The printer control panel is composed of three lights and two buttons. The HP LaserJet 1022nw printer has an additional light at the top of the control panel. These lights produce patterns that identify your printer's status.



- 1 **CANCEL** button: To cancel the print job that is currently printing, press the **CANCEL** button.
- 2 **Go** button: To print a Demo page or to continue printing while in manual feed mode, press and release the **Go** button. To print a Configuration page, press and hold the **Go** button for 5 seconds.
- 3 Go light: Indicates that the printer is receiving data when flashing.
- 4 Ready light: Indicates that the printer is ready to print.
- 5 Attention light: Indicates that the printer media input trays are empty, the print cartridge door is open, the print cartridge is missing, or other errors. See [Printer information pages](#) for more information.
- 6 Wireless light: (HP LaserJet 1022nw printer only) When the Wireless light is on solid, a wireless connection has been established. When the Wireless light is off, wireless operation is disabled. When the Wireless light is flashing, the printer is trying to establish a wireless connection.

NOTE

See [Status light patterns](#) for a description of the light patterns.

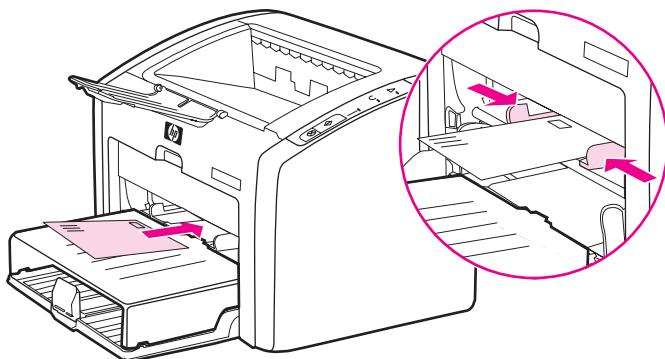
Media paths

The following sections describe the input trays and output bin.

Priority feed slot

You should use the priority feed slot when feeding one sheet of paper, envelope, postcard, label, or transparency. You can also use the priority feed slot to print the first page on different media than the rest of the document.

Media guides ensure that the media is correctly fed into the printer and that the print is not skewed (crooked on the media). When loading media, adjust the media guides to match the width of the media that you are using.

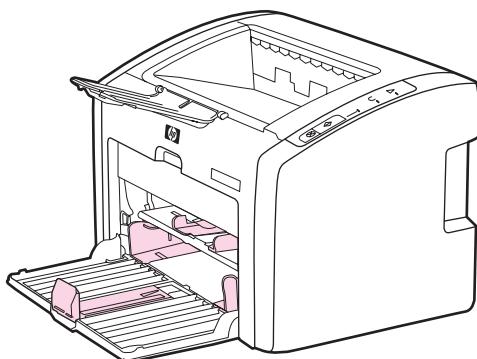


See [Choosing paper and other media](#) for more information about media types.

Main input tray

The main input tray, accessed from the front of the printer, holds up to 250 sheets of 20-lb paper or other media. For information about media specifications, see [Printer capacities and ratings](#).

Media guides ensure the media is correctly fed into the printer and the print is not skewed (crooked on the media). The main input tray has both side and front media guides. When loading media, adjust the media guides to match the length and width of the media that you are using.



Output bin

The output bin is located on the top of the printer. Printed media is collected here in the correct sequence. The output media support provides improved stacking for large print jobs.

Printer software

The following sections describe the supported operating systems and the software that are provided with the HP LaserJet 1022, 1022n, and 1022nw printers.

NOTE

Not all software is available in all languages.

Supported operating systems

The printer comes with software for the following operating systems:

- Windows XP
- Windows 2000
- Windows ME
- Windows 98 Second Edition (SE)
- Windows Server 2003

For more information about upgrading from Windows 2000 Server to Windows Server 2003, go to <http://www.microsoft.com/>.

For more information about Windows Server 2003 Point and Print, go to <http://www.microsoft.com/>.

For more information about Windows Server 2003 Terminal Services and Printing, go to <http://www.microsoft.com/>.

- Mac OS X v10.2 and later

Printer software for Windows computers

The following sections provide instructions for installing the printer software on various Windows operating systems and the software that is available to all users of the printer.

To install printer software

Insert the software CD that came with the printer into the computer CD-ROM drive. **Follow the on-screen installation instructions.**

NOTE

If the Welcome screen does not open, click **Start** on the Windows task bar, click **Run**, type `Z:\setup` (where Z is your CD drive letter), and click **OK**.

Printer drivers

A printer driver is the software component that provides access to printer features and provides the means for the computer to communicate with the printer.

Printer properties (driver)

Printer properties control the printer. You can change the default settings, such as media size and type, printing multiple pages on a single sheet of media (N-up printing), resolution, and watermarks. You can access the printer properties in the following ways:

- Through the software application that you are using to print. This only changes the settings for the current software application.
- Through the Windows operating system. This changes the default settings for all future print jobs.

NOTE

Because many software applications use a different method of accessing the printer properties, the following section describes the most common methods used in Windows 98 SE, 2000, ME, and Windows XP.

To only change the settings for the current software application

NOTE

Although the steps can vary between software applications, this is the most common method.

1. From the **File** menu in the software application, click **Print**.
2. On the **Print** dialog, click **Properties**.
3. Change the settings, and click **OK**.

To change the default settings for all future print jobs in Windows 98 SE, 2000, and ME

1. In the Windows task bar, click **Start**, select **Settings**, and click **Printers**.
2. Right-click the HP LaserJet 1020 series printer icon.
3. Click **Properties** (in Windows 2000, you can also click **Printing Preferences**).
4. Change the settings, and click **OK**.

NOTE

In Windows 2000, many of these features are available from the **Printing Preferences** menu.

To change the default settings for all future print jobs in Windows XP

1. In the Windows task bar, click **Start**, select **Settings**, and click **Printers and Faxes**.
2. Right-click the HP LaserJet 1020 series printer icon.
3. Click **Properties**, or click **Printing Preferences**.
4. Change the settings, and click **OK**.

Printer properties online help

The printer properties (driver) online help includes specific information about the functions in the printer properties. This online help guides you through the process of changing your printer's default settings. For some drivers, online help gives instructions on using context-sensitive help. Context-sensitive help describes the options for the driver feature you are currently accessing.

To access the printer properties online help

1. From the software application, click **File**, and then click **Print**.
2. Click **Properties**, and then click **Help**.

Print setting priorities

There are two ways to change print settings for this printer: in the software application or in the printer driver. For the HP LaserJet 1022n and HP LaserJet 1022nw printers, you can also change print settings through the embedded web server. Changes made to print settings are prioritized according to where the changes are made, as follows:

- Changes made in the software application override settings changed anywhere else. Within a software application, changes made in the Page Setup dialog box override changes made in the Print dialog box.
- Changes made in the printer driver do not override settings changed in the software application.
- Changes made in the embedded web server have the lowest priority.

If a particular print setting can be changed in more than one of the ways listed above, use the method that has the highest priority.

Printer software for Macintosh computers

The following sections describe how to access the Macintosh software for the HP LaserJet 1022, 1022n, and 1022nw printers.

Accessing the printer driver (Mac OS X v10.2 and later)

1. **Print Center** or **Printer Setup Utility** should automatically launch. If it does not launch, perform the following steps:
 - a. Double-click the hard drive icon on the desktop.
 - b. Open the **Applications** folder, and then open the **Utilities** folder.
 - c. Double-click **Print Center** or **Printer Setup Utility**, depending on the operating system.
2. Click **Add**. The Add Printer List dialog box appears.
3. Select one of the following options from the top menu, depending on how the computer and the printer are connected:
 - **USB**
 - **Rendezvous** (for HP LaserJet 1022n and 1022nw printers only)
4. Select the printer name from the printer list.
5. Click **Add**.

Embedded web server

NOTE

This feature is only available on the HP LaserJet 1022n and HP LaserJet 1022nw printers.

With the embedded web server, you can gain access to the printer settings and information by typing an IP address or hostname of the printer in a web browser (such as Netscape Navigator or Microsoft® Internet Explorer) on any computer. You can use the embedded web server to configure the printer, view status information, purchase printer supplies, and obtain troubleshooting information.

The following web browsers support the embedded web server:

- Internet Explorer V5.5 (and later)
- Netscape Navigator V4.75 (and later)
- Apple Safari

See [Using the embedded web server](#) for more information.

Printer media considerations

HP LaserJet printers produce excellent print quality. The printer accepts a variety of media, such as cut-sheet paper (including recycled paper), envelopes, labels, transparencies, vellum, and custom-size paper. Properties such as weight, grain, and moisture content are important factors affecting printer performance and output quality.

The printer can use a variety of paper and other print media in accordance with the guidelines in this user guide. Media that does not meet these guidelines might cause the following problems:

- Poor print quality
- Increased media jams
- Premature wear on the printer, requiring repair

For best results, use only HP brand paper and print media. Hewlett-Packard Company cannot recommend the use of other brands. Because they are not HP products, HP cannot influence or control their quality.

It is possible for media to meet all of the guidelines in this user guide and still not produce satisfactory results. This might be the result of improper handling, unacceptable temperature and humidity levels, or other variables over which HP has no control.

Before purchasing a large quantity of media, make sure that it meets the requirements specified in this user guide and in the *HP LaserJet printer family print media guide*. The guidelines can be downloaded from <http://www.hp.com/support/ljpaperguide/> or see [Ordering supplies](#) for more information about ordering the guidelines. Always test media before you purchase a large quantity.

CAUTION

Using media that does not meet HP's specifications might cause problems for the printer, requiring repair. This repair is not covered by the HP warranty or service agreements.

Supported media sizes

For information about supported media sizes, see [Printer capacities and ratings](#).

2

Printer connections

This chapter provides information on the following topics:

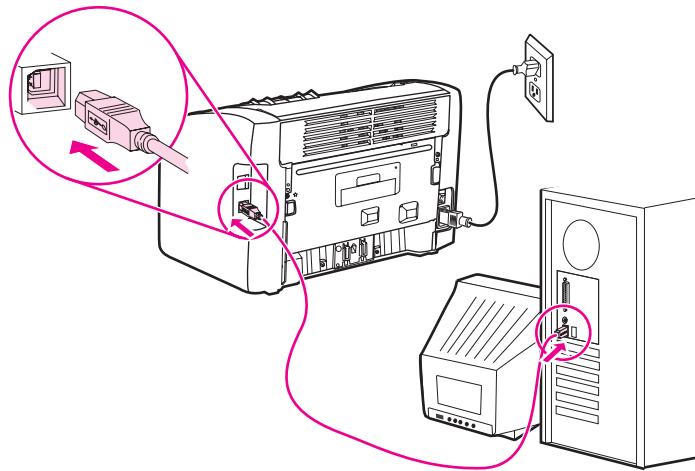
- [USB connections](#)
- [Network connections](#)
- [Wireless connections](#)
- [Wireless printing](#)

USB connections

The HP LaserJet 1022, 1022n, and 1022nw printer models support USB 2.0 High Speed connections.

Connecting the USB cable

1. Plug the USB cable into the printer.
2. Plug the other end of the USB cable into the computer when prompted to do so during the software installation.



Network connections

The HP LaserJet 1022n and HP LaserJet 1022nw printers can connect to networks through the internal network port. The HP LaserJet 1022nw printer can also connect to 802.11b/g wireless networks. External network print servers are available for the HP LaserJet 1022n and 1022nw printers. The following table identifies what is required to add networking to the printers.

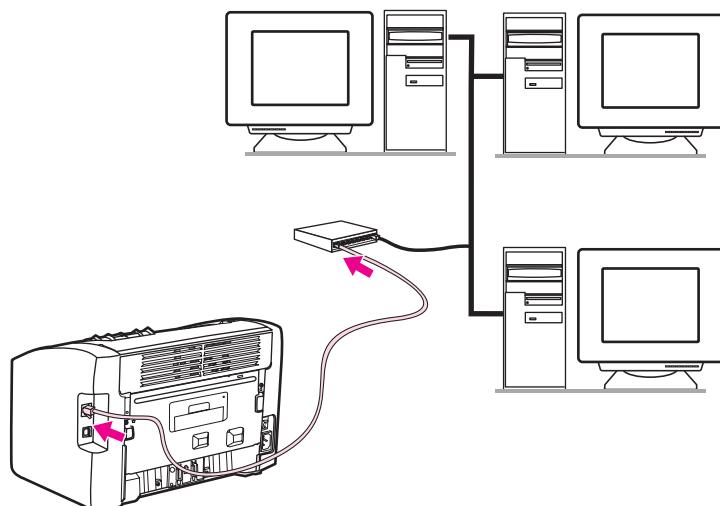
Networking options

HP LaserJet model	10/100Base-TX	802.11b/g	Bluetooth®
1022n	Included	HP Jetdirect 380x (802.11b only)	HP bt1300
1022nw	Included	Included	HP bt1300

To order the print server, see [10/100 networking and wireless print servers](#).

Connecting to the network

Connect one end of a network cable to the network connector on the back of the device, and connect the other end to the network. Be sure to install the printer driver on all computers that connect to the network and need to use the printer.



NOTE

The following procedures are for the HP LaserJet 1022n and HP LaserJet 1022nw printers only.

The Ethernet network must be functional before proceeding with the following instructions.

Connect the printer to a wired network

To connect the HP LaserJet 1022n or HP LaserJet 1022nw printer to a wired network, you need the following:

- Functional wired network
- CAT-5 Ethernet cable

To connect the printer to the network, perform the following steps:

1. Connect the CAT-5 Ethernet cable to an available port on the Ethernet hub port or router.
2. Connect the CAT-5 Ethernet cable to the internal network port on the back of the printer.
3. Check that one of the network lights (10 or 100) on the network port located on the back of the printer comes on.

NOTE

It might take a few moments for the printer network settings to become active and available for use. If one of the network lights does not come on, see [Wired network setup problem solving](#).

4. Print a Configuration page. When the printer is in the Ready state, press and hold the **Go** button for 5 seconds.

NOTE

To restore the printer configuration defaults, turn the printer off. Hold the **CANCEL** and **Go** buttons, and then turn on the printer. Continue to press the **Go** and **CANCEL** buttons until the printer is in the Ready state (from 5 to 30 seconds).

Install the printer software

1. Close all applications.
2. Insert the software installation CD into the computer's CD-ROM drive. The Welcome screen displays.
3. Click **Next**, and follow the installation instructions to check and prepare the system and install drivers, plug-ins, and software.

This might take several minutes.

Wireless connections

The HP LaserJet 1022nw printer includes the IEEE 802.11b/g standard for wireless networking.

NOTE

The HP LaserJet 1022n printer supports the IEEE 802.11b/g standard for wireless networking and Bluetooth wireless connectivity options through optional external accessories.

For a complete list of available internal HP Jetdirect wireless print servers and HP bt1300 Wireless Printer Adapters (Bluetooth), see [10/100 networking and wireless print servers](#).

For more information about wireless printing, see [Wireless printing](#).

Wireless printing

Wireless networks offer a safe, secure, and cost-effective alternative to traditional wired network connections. The HP LaserJet 1022nw printer has built-in wireless connectivity. For the other printer models, see [10/100 networking and wireless print servers](#) for a list of available wireless print servers.

IEEE 802.11b/g standard

With wireless IEEE 802.11b/g compliant connectivity, the printers can be placed in the office or home and connected to a wireless network running Microsoft, Apple, NetWare, UNIX®, or Linux® network operating systems. This wireless technology provides a high-quality printing solution without the physical constraints of wiring. Peripherals can be conveniently placed in an office or home and can be easily moved without changing network cables.

Optional external HP Jetdirect 802.11b/g print servers are available for USB connections.

See the documentation that came with the HP LaserJet 1022nw printer for more information.

Bluetooth

Bluetooth wireless technology is a low-power, short-range radio technology that can be used to wirelessly connect computers, printers, personal digital assistants, cell phones, and other devices.

Unlike infra-red technology, Bluetooth's reliance on radio signals means that devices do not have to be in the same room, office, or cubicle with an unobstructed line of sight in order to communicate. This wireless technology increases portability and efficiency within business network applications.

3

Managing the printer

This chapter provides information on the following topics:

- [Printer information pages](#)
- [Using the embedded web server](#)

Printer information pages

Special pages reside within the memory of the printer. These pages help you to diagnose and solve problems with the printer.

Demo page

The Demo page contains examples of text and graphics. To print the Demo page from the printer, press the **Go** button when the printer is ready (Ready light on).

Configuration page

The Configuration page lists current settings and properties of the printer. It also contains a status log report. You can print a Configuration page from the printer or the embedded web server.

To print the Configuration page from the printer, press the **Go** button for 5 seconds when the printer is ready (Ready light on).

Printer Test page

The Printer Test page contains information about printer driver and port settings. The page also contains information about the printer name and model, computer name, and so on. You can print the Printer Test page from the printer driver.

Using the embedded web server

The embedded web server can be directly accessed on the HP LaserJet 1022n and HP LaserJet 1022nw printers. You do not need to install any software on the computer. You only need to have a supported web browser. To use the embedded web server, you must have Apple Safari, Microsoft Internet Explorer V5.5 or later, or Netscape Navigator V4.75 or later.

NOTE

The embedded web server does not provide e-mail or status alerts.

The embedded web server is available in English only.

The embedded web server allows you to view printer and network status and to manage printing functions from your computer instead of from the printer control panel. Below are examples of what you can do using the embedded web server:

- View printer status information.
- View and print internal pages.
- Order new supplies.
- Set the type of paper loaded in each tray.
- View and change the printer default configuration settings.
- View and change network configuration.

The embedded web server works when the printer is connected to an IP-based network. The embedded web server does not support IPX-based printer connections.

NOTE

You do not have to have Internet access to open and use the embedded web server.

However, if you click a link in the **Other Links** area, you must have Internet access to go to the site associated with the link.

To open the embedded web server

1. In a supported web browser, type the IP address or hostname for the printer. To find the IP address, print a Configuration page at the printer by pressing and holding the **Go** button for 5 seconds.

NOTE

Once you open the URL, you can bookmark it so that you can return to it quickly in the future.

2. The embedded web server has three tabs that contain settings and information about the printer: the **Information** tab, the **Settings** tab, and the **Networking** tab. Click the tab that you want to view.

Information tab

The Information tab consists of the following pages:

- **Device Status:** This page displays product information such as the network name, network address, and model information.
- **Configuration:** This page shows the information found on the printer Configuration page.

Settings tab

This tab allows you to configure the printer settings from your computer, such as default paper size and EconoMode. If this printer is networked, always consult with the printer administrator before changing the settings on this tab.

Networking tab

This tab allows the network administrator to control network-related settings for the printer when it is connected to an IP-based network.

Other links

This section contains links that connect you to the Internet. You must have Internet access to use any of these links. If you use a dial-up connection and did not connect when you first opened the embedded web server, you must connect before you can visit these websites. Connecting might require that you close and then reopen the embedded web server.

- **HP Instant Support:** This link connects you to a set of dynamic web pages to solve specific problems and to determine what additional services are available for the printer.
- **Product Registration:** This link connects you to the product registration page on the HP website.
- **Order Supplies:** This link connects you to the Sure Supply website to order genuine HP supplies from HP or a reseller of your choice.
- **Product Support:** This link connects you to the support site for the HP LaserJet 1020 series printer. You can search for help regarding general topics.

NOTE

The HP LaserJet 1020 series printer includes the HP LaserJet 1022, 1022n, and 1022nw printer models.

4

Printing tasks

This chapter provides information on the following topics:

- [Manual feed](#)
- [Cancelling a print job](#)
- [Understanding print quality settings](#)
- [Optimizing print quality for media types](#)
- [Guidelines for using media](#)
- [Choosing paper and other media](#)
- [Loading media into the input trays](#)
- [Printing an envelope](#)
- [Printing multiple envelopes](#)
- [Printing on transparencies or labels](#)
- [Printing on letterhead and preprinted forms](#)
- [Printing on custom-size media and cardstock](#)
- [Printing on both sides of the paper \(manual two-sided printing\)](#)
- [Printing multiple pages on a single sheet of paper \(N-up printing\)](#)
- [Printing booklets](#)
- [Printing watermarks](#)

Manual feed

You can use manual feed when printing mixed media, for example, an envelope, then a letter, then an envelope, and so on. Feed an envelope into the priority feed slot and load letterhead into the main input tray.

To print using manual feed

1. Access the printer properties (or printing preferences in Windows 2000 and XP). See [Printer properties \(driver\)](#) for instructions.
2. On the **Paper/Quality** tab, select **Manual Feed** from the **Source is** drop-down list.
3. Feed media into the priority feed slot, and press the **Go** button each time to print.

Canceling a print job

You can cancel a print job from a software application or a print queue.

To stop the printer immediately, remove the remaining paper from the printer. After the printer stops, use one of the following options.

- **Printer control panel:** To cancel the print job, press and release the **CANCEL** button on the printer control panel.
- **Software application:** Typically, a dialog box appears briefly on your screen, allowing you to cancel the print job.
- **Windows print queue:** If a print job is waiting in a print queue (computer memory) or print spooler, delete the job there. Click **Start**, **Settings**, and **Printers or Printers and Faxes**. Double-click the **HP LaserJet 1022** icon to open the window, select your print job, and click **Delete** or **Cancel**.
- **Desktop print queue (Mac OS X):** Open **Print Center**, double-click the printer name, select the print job, and click **Delete**.
- **Embedded web server:** Open the printer's embedded web server page, and click **Cancel Job**. See [Using the embedded web server](#) for more information.

If the status lights on the control panel continue to blink after you cancel a print job, the computer is still sending the job to the printer. Either delete the job from the print queue or wait until the computer finishes sending data. The printer will return to the Ready state.

Understanding print quality settings

Print quality settings affect how light or dark the print is on the page and the style in which the graphics are printed. You can also use the print quality settings to optimize the print quality for a specific media type. See [Optimizing print quality for media types](#) for more information.

You can change the settings in the printer properties to accommodate the types of jobs you are printing. The following are the settings:

- **ProRes 1200:** This setting provides fine-line detail at 1200 x 1200 dpi.
 - **FastRes 1200:** This setting provides 1200 dpi effective output quality.
 - **600 dpi:** This setting provides 600 x 600 dpi output with Resolution Enhancement technology (REt) for improved text.
 - **EconoMode (Save Toner):** Text is printed using less toner. This setting is useful when you are printing drafts. You can turn on this option independently of other print quality settings.
1. Access the printer properties (or printing preferences in Windows 2000 and XP). See [Printer properties \(driver\)](#) for instructions.
 2. On the **Finishing** tab (the **Layout** tab for some Macintosh drivers), select the print quality setting you want to use.

NOTE

Not all printer features are available in all drivers or operating systems. See the printer properties (driver) online Help for information about the availability of features for that driver.

NOTE

To change the print quality settings for all future print jobs, access the properties through the **Start** menu in the Windows task bar. To change the print quality settings only for the current software application, access the properties through the **Print Setup** menu in the application you are using to print. See [Printer properties \(driver\)](#) for more information.

Optimizing print quality for media types

Media type settings control the temperature of your printer's fuser. You can change the settings for the media that you are using to optimize the print quality.

You can access the optimizing feature from the **Paper/Quality** tab in your printer driver or from the embedded web server.

The HP LaserJet 1022, 1022n, and 1022nw printers provide a number of print modes that allow the unit to adapt more specifically to the printer's media environment. The following tables provide an overview of the driver print modes.

NOTE

When using the CARDSTOCK, ENVELOPE, LABEL, and ROUGH modes, the printer pauses between pages and the number of pages per minute decreases.

Driver print default modes

Mode	Media
PLAIN	75 to 104 g/m ² (20 to 27 lb)
LIGHT	< 75 g/m ² (20 lb)
HEAVY	90 to 105 g/m ² (24 to 28 lb)
CARDSTOCK	Cardstock or thick media
TRANSPARENCY	4-mil, 0.1 monochrome overhead transparencies (OHTs)
ENVELOPE	Standard envelopes
LABEL	Standard HP LaserJet labels
BOND	Bond paper
ROUGH	Rough paper
COLOR	Plain media
LETTERHEAD	Plain media
PREPRINTED	Plain media
PREPUNCHED	Plain media
RECYCLED	Plain media
VELLUM	Plain media

Guidelines for using media

The following sections provide guidelines and instructions for printing on transparencies, envelopes, and other special media. Guidelines and specifications are included to help you select media that optimizes print quality and avoid media that might cause jams or damage the printer.

Paper

For best results, use conventional 75 g/m² (20 lb) paper. Make sure that the paper is of good quality and free of cuts, nicks, tears, spots, loose particles, dust, wrinkles, voids, and curled or bent edges.

If you are unsure about what type of paper you are loading (such as bond or recycled), check the label on the package of paper.

Some paper causes print quality problems, jamming, or damage to the printer.

Paper usage

Symptom	Problem with paper	Solution
Poor print quality or toner adhesion Problems with feeding	Too moist, too rough, too smooth, or embossed Faulty paper lot	Try another kind of paper: between 100-250 Sheffield and 4-6% moisture content. Check the printer and make sure that the appropriate media type has been selected.
Dropouts, jamming, or curl	Stored improperly	Store paper flat in its moisture-proof wrapping.
Increased gray background shading	Might be too heavy	Use lighter paper.
Excessive curl Problems with feeding	Too moist, wrong grain direction, or short-grain construction	Use long-grain paper. Check the printer and make sure that the appropriate media type has been selected.
Jamming or damage to printer	Cutouts or perforations	Do not use paper with cutouts or perforations.
Problems with feeding	Ragged edges	Use good quality paper.

NOTE

The printer uses heat and pressure to fuse toner to the paper. Make sure that any colored paper or preprinted forms use inks that are compatible with the printer temperature. The printer's maximum temperature is 200°C (392°F) for 0.1 second.

Do not use letterhead that is printed with low-temperature inks, such as those used in some types of thermography.

Do not use raised letterhead.

Do not use transparencies designed for Inkjet printers or other low-temperature printers. Use only transparencies that are specified for use with HP LaserJet printers.

Labels

HP recommends that you print labels from the priority feed slot.

CAUTION

Do not feed a sheet of labels through the printer more than once. The adhesive degrades and might damage the printer.

Label construction

When selecting labels, consider the quality of the following components:

- **Adhesives:** The adhesive material should be stable at 200°C (392°F), the printer's maximum temperature.
- **Arrangement:** Only use labels with no exposed backing between them. Labels can peel off sheets that have spaces between the labels, causing serious jams.
- **Curl:** Prior to printing, labels must lie flat with no more than 13 mm (0.5 inches) of curl in any direction.
- **Condition:** Do not use labels with wrinkles, bubbles, or other indications of separation.

Transparencies

Transparencies must be able to withstand the printer's maximum temperature of 200°C (392°F).

Envelopes

HP recommends that you print envelopes from the priority feed slot.

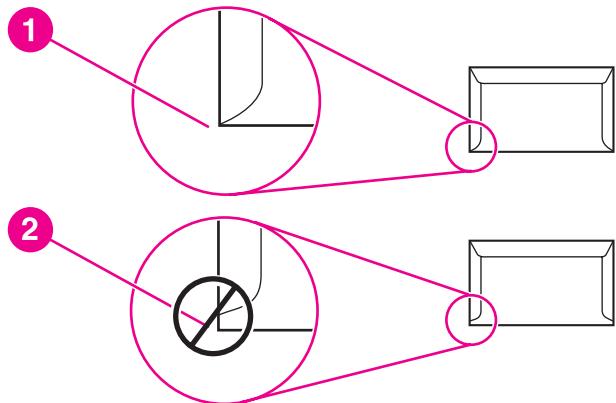
Envelope construction

Envelope construction is critical. Envelope fold lines can vary considerably, not only between manufacturers, but also within a box from the same manufacturer. Successful printing on envelopes depends upon the quality of the envelopes. When selecting envelopes, consider the following components:

- **Weight:** The weight of the envelope paper should not exceed 90 g/m² (24 lb) or jamming might result.
- **Construction:** Prior to printing, envelopes should lie flat with less than 6 mm (0.25 inches) curl and should not contain air. Envelopes that trap air might cause problems. Do not use envelopes that contain clasps, snaps, tie strings, transparent windows, holes, perforations, cut outs, synthetic materials, stamping, or embossing. Do not use envelopes with adhesives that do not require moistening, but rely instead on pressure to seal them.
- **Condition:** Make sure that the envelopes are not wrinkled, nicked, or otherwise damaged. Make sure that the envelopes do not have any exposed adhesive.
- **Sizes:** The envelope size ranges from 90 x 160 mm (3.5 x 6.3 inches) to 178 x 254 mm (7 x 10 inches).

Envelopes with double-side seams

An envelope with double-side-seam construction has vertical seams at both ends of the envelope rather than diagonal seams. This style might be more likely to wrinkle. Make sure that the seam extends all the way to the corner of the envelope as shown in the following illustration.



- 1 acceptable envelope construction
- 2 unacceptable envelope construction

Envelopes with adhesive strips or flaps

Envelopes with a peel-off adhesive strip or with more than one flap that folds over to seal must use adhesives compatible with the heat and pressure in the printer. The printer's maximum temperature is 200°C (392°F). The extra flaps and strips might cause wrinkling, creasing, or jams.

Envelope storage

Proper storage of envelopes contributes to good print quality. You should store envelopes flat. If air is trapped in an envelope, creating an air bubble, the envelope might wrinkle during printing.

Cardstock and heavy media

You can print many types of cardstock from the media input trays, including index cards and postcards. Some cardstock performs better than others because its construction is better suited for feeding through a laser printer.

For optimum printer performance, do not use paper heavier than 157 g/m² (42 lb). Paper that is too heavy might cause misfeeds, stacking problems, paper jams, poor toner fusing, poor print quality, or excessive mechanical wear.

NOTE

You might be able to print on heavier paper if you do not fill the input tray to capacity and if you use paper with a smoothness rating of 100-180 Sheffield.

Cardstock construction

- **Smoothness:** The 135-157 g/m² (36-42 lb) cardstock should have a smoothness rating of 100-180 Sheffield; 60-135 g/m² (16-36 lb) cardstock should have a smoothness rating of 100-250 Sheffield.
- **Construction:** Cardstock should lie flat with less than 5 mm (0.2 inches) of curl.
- **Condition:** Make sure that the cardstock is not wrinkled, nicked, or otherwise damaged.
- **Sizes:** Only use cardstock within the following size ranges:
 - **Minimum:** 76 x 127 mm (3 x 5 inches)
 - **Maximum:** 216 x 356 mm (8.5 x 14.0 inches)

Cardstock guidelines

Set margins at least 2 mm (0.08 inches) away from the edges.

Letterhead and preprinted forms

Letterhead is premium paper that often has a watermark, sometimes uses cotton fiber, and is available in a wide range of colors and finishes with matching envelopes. Preprinted forms can be made of a broad spectrum of paper types ranging from recycled to premium.

Many manufacturers now design these grades of paper with properties optimized for laser printing and advertise the paper as laser-compatible or laser-guaranteed.

NOTE

Some page-to-page variation is normal when printing with laser printers. This variation cannot be observed when printing on plain paper. However, this variation is obvious when printing on preprinted forms because the lines and boxes are already placed on the page.

To avoid problems when using preprinted forms, embossed paper, and letterhead, observe the following guidelines:

- Avoid using low-temperature inks (the kind used with some types of thermography).
- Use preprinted forms and letterhead paper that have been printed by offset lithography or engraving.
- Use forms that have been created with heat-resistant inks that will not melt, vaporize, or release undesirable emissions when heated to 200°C (392°F) for 0.1 second. Typically, oxidation-set or oil-based inks meet this requirement.
- When the form is preprinted, be careful not to change the moisture content of the paper, and do not use materials that change the paper's electrical or handling properties. Seal the forms in moisture-proof wrap to prevent moisture changes during storage.
- Avoid processing preprinted forms that have a finish or coating.
- Avoid using heavily embossed or raised-letterhead papers.
- Avoid papers that have heavily textured surfaces.
- Avoid using offset powders or other materials that prevent printed forms from sticking together.

Choosing paper and other media

HP LaserJet printers produce excellent print quality documents. You can print on a variety of media, such as paper (including up to 100% recycled fiber content paper), envelopes, labels, transparencies, and custom-size media. The following are the supported media sizes:

- **Minimum:** 76 x 127 mm (3 x 5 inches)
- **Maximum:** 216 x 356 mm (8.5 x 14 inches)

Properties such as weight, grain, and moisture content are important factors that affect printer performance and quality. To achieve the best possible print quality, only use high-quality media designed for laser printers. See [Printer media considerations](#) for detailed paper and media specifications.

NOTE

Always test a sample of the media before you purchase large quantities. Your media supplier should understand the requirements specified in the *HP LaserJet printer family print media guide* (HP part number 5851-1468). See [Printer media considerations](#) for more information.

HP media

HP recommends the following HP media:

- HP Multipurpose Paper
- HP Office Paper
- HP All-in-One Printing Paper
- HP LaserJet Paper
- HP Premium Choice LaserJet Paper

Media to avoid

The HP LaserJet 1022, 1022n, and 1022nw printers can handle many types of media. Use of media outside the printer's specifications will cause a loss of print quality and increase the chance of paper jams.

- Do not use paper that is too rough.
- Do not use paper with cutouts or perforations other than standard three-hole punched paper.
- Do not use multipart forms.
- Do not use paper with a watermark if you are printing solid patterns.

Media that might damage the printer

In rare circumstances media can damage the printer. The following media must be avoided to prevent possible damage:

- Do not use media with staples attached.
- Do not use transparencies designed for Inkjet printers or other low-temperature printers. Use only transparencies that are specified for use with HP LaserJet printers.

- Do not use photo paper intended for Inkjet printers.
- Do not use paper that is embossed or coated and is not designed for the temperatures of the printer's image fuser. Select media that can tolerate temperatures of 200°C (392°F) for 0.1 second. HP produces a selection of media that is designed for the HP LaserJet 1022, 1022n, and 1022nw printers.
- Do not use letterhead paper with low-temperature dyes or thermography. Preprinted forms or letterhead must use inks that can tolerate temperatures of 200°C (392°F) for 0.1 second.
- Do not use any media that produces hazardous emissions, or that melts, offsets, or discolors when exposed to 200°C (392°F) for 0.1 second.

To order HP LaserJet printing supplies, go to <http://www.hp.com/go/ljsupplies/> in the U.S. or to <http://www.hp.com/ghp/buyonline.html/> worldwide.

Loading media into the input trays

The following sections describe how to load media into the different input trays.

CAUTION

If you try to print on media that is wrinkled, folded, or damaged in any way, a jam might occur. See [Printer media considerations](#) for more information.

Priority feed slot

The priority feed slot holds one sheet of media up to 163 g/m² (43 lb) or one envelope, transparency, or cardstock. Load media with the top forward and the side to be printed facing up. To prevent jams and skewing, always adjust the side media guides before feeding the media.

250-sheet main input tray

The input tray holds up to 250 pages of 75 g/m² (20 lb) paper or fewer pages of heavier media of 25 mm (0.9 inches) or less stack height. Load media with the top forward and the side to be printed facing up. To prevent jams and skewing, always adjust the side and front media guides.

NOTE

When you add new media, make sure that you remove all of the media from the input tray and straighten the stack of new media. This helps prevent multiple sheets of media from feeding through the printer at one time, reducing media jams.

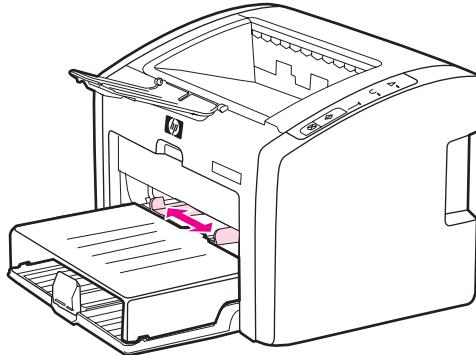
Printing an envelope

Only use envelopes that are recommended for laser printers. See [Printer media considerations](#) for more information.

NOTE

Use the priority feed slot for printing one envelope. Use the main input tray for printing multiple envelopes.

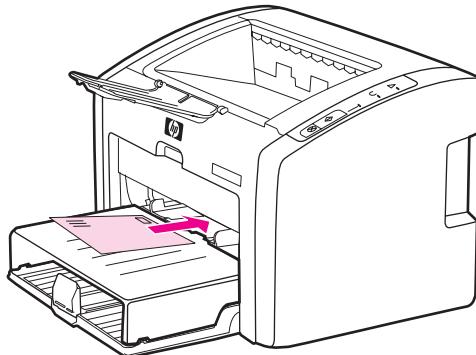
1. Before loading the envelope, slide the media guides outward to slightly wider than the envelopes.



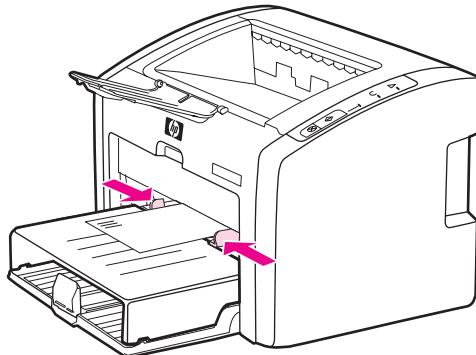
NOTE

If the envelope has a flap on the short edge, feed that edge into the printer first.

2. Place the envelope with the side to be printed facing up and the top edge along the left media guide.



3. Adjust the media guides to the width of the envelope.



4. Access the printer properties (or printing preferences in Windows 2000 and XP). See [Printer properties \(driver\)](#) for instructions.
5. On the **Paper/Quality** tab (the **Paper Type/Quality** tab for some Macintosh drivers), select **Envelope** as the media type.

NOTE

Not all printer features are available in all drivers or operating systems. See the printer properties (driver) online Help for information about availability of features for that driver.

6. Print the envelope.

To print using manual feed, see [Manual feed](#).

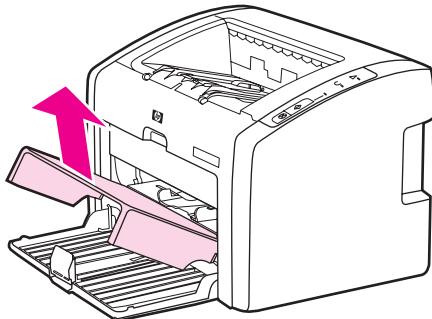
Printing multiple envelopes

Only use envelopes that are recommended for laser printers. See [Printer media considerations](#) for more information.

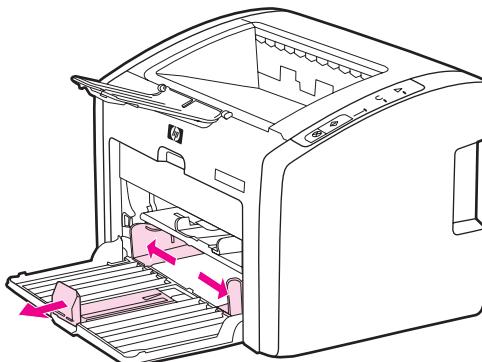
NOTE

Use the priority feed slot for printing one envelope. Use the main input tray for printing multiple envelopes.

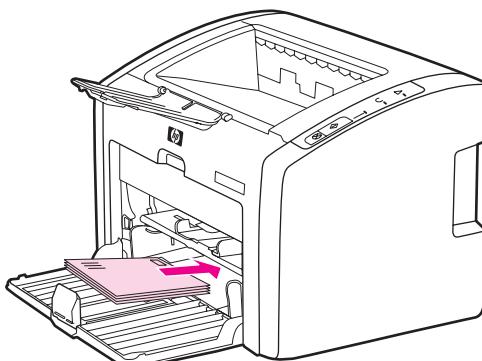
1. Open the input tray cover.



2. Before loading the envelopes, slide the media guides outward to slightly wider than the envelopes.



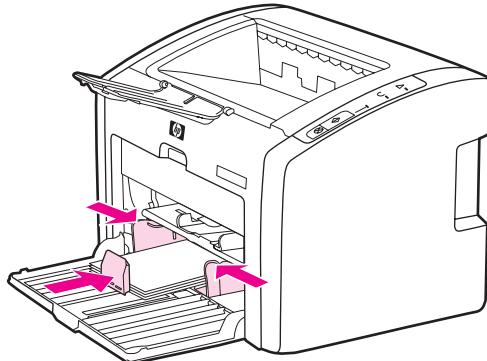
3. Place the envelopes with the side to be printed facing up and the top edge along the left media guide. Stack up to 15 envelopes.



NOTE

If the envelopes have a flap on the short edge, feed that edge into the printer first.

4. Adjust the media guides to the length and width of the envelopes.

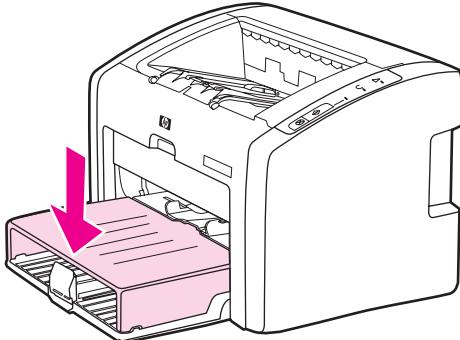


5. Access the printer properties (or printing preferences in Windows 2000 and XP). See [Printer properties \(driver\)](#) for instructions.

NOTE

Not all printer features are available from all drivers or operating systems. See the printer properties (driver) online Help for information about availability of features for that driver.

6. On the **Paper/Quality** tab (the **Paper Type/Quality** tab for some Macintosh drivers), select **Envelope** as the media type.
7. Close the input tray cover.



8. Print the envelopes.

Printing on transparencies or labels

Use only transparencies and labels that are recommended for use in laser printers, such as HP transparency film and HP LaserJet labels. See [Printer media considerations](#) for more information.

CAUTION

Be sure to set the correct media type in the printer settings as instructed below. The printer adjusts the fuser temperature according to the media type setting. When printing on special media such as transparencies or labels, this adjustment prevents the fuser from damaging the media as it passes through the printer.

CAUTION

Inspect the media to make sure that it is not wrinkled or curled and that it does not have any torn edges or missing labels.

1. Load a single page in the priority feed slot or load multiple pages in the main input tray. Make sure that the top of the media is forward and the side to be printed (rough side) is facing up.
2. Adjust the media guides.
3. Access the printer properties (or printing preferences in Windows 2000 and XP). See [Printer properties \(driver\)](#) for instructions.
4. On the **Paper/Quality** tab (the **Paper Type/Quality** tab for some Macintosh drivers), choose the correct media type.
5. Print the document.

Printing on letterhead and preprinted forms

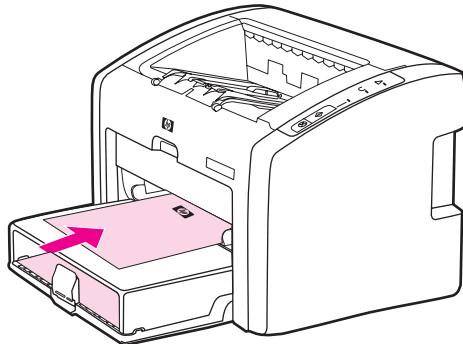
The HP LaserJet 1022, 1022n, and 1022nw printers can print on letterhead and preprinted forms that can withstand temperatures of 200°C (392°F).

1. Load the paper with the top forward and the side to be printed facing up. Adjust the media guides to fit the width of the paper.
2. Access the printer properties (or printing preferences in Windows 2000 and XP). See [Printer properties \(driver\)](#) for instructions.
3. On the **Paper/Quality** tab (the **Paper Type/Quality** tab for some Macintosh drivers), choose the correct media type.
4. Print the document.

To print using manual feed, see [Manual feed](#).

NOTE

To print a single-page cover letter on letterhead, followed by a multiple-page document, load the standard paper in the main input tray, and then feed the letterhead face up in the priority feed slot. The printer automatically prints from the priority feed slot first.



Printing on custom-size media and cardstock

The HP LaserJet 1022, 1022n, and 1022nw printers can print on custom-size media or cardstock between 76 x 127 mm (3 x 5 inches) and 216 x 356 mm (8.5 x 14 inches).

Use the main input tray for multiple sheets. See [Main input tray](#) for the supported media sizes.

CAUTION

Make sure that the sheets are not stuck together before you load them.

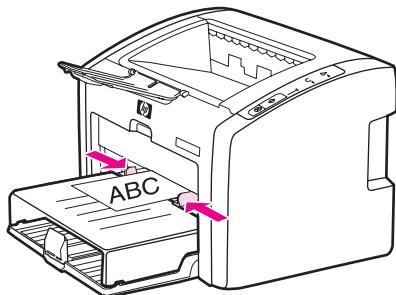
1. Load the media with the narrow side forward and the side to be printed facing up. Adjust the side and front media guides to fit the media.
2. Access the printer properties (or printing preferences in Windows 2000 and XP). See [Printer properties \(driver\)](#) for instructions.
3. On the **Paper/Quality** tab (the **Paper Type/Quality** tab for some Macintosh drivers), select the custom-size option. Specify the dimensions of the custom-size media.

NOTE

Not all printer features are available in all drivers or operating systems. See the printer properties (driver) online Help for information about availability of features for that driver.

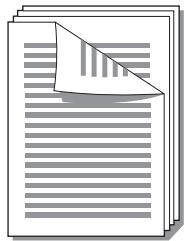
4. Print the document.

To print using manual feed, see [Manual feed](#).



Printing on both sides of the paper (manual two-sided printing)

To print on both sides of the paper (manual two-sided printing), you must run the paper through the printer twice.



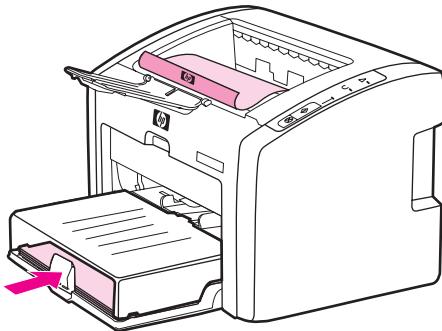
NOTE

Manual two-sided printing can cause the printer to become dirty, reducing print quality. See [Cleaning the printer](#) for instructions if the printer becomes dirty.

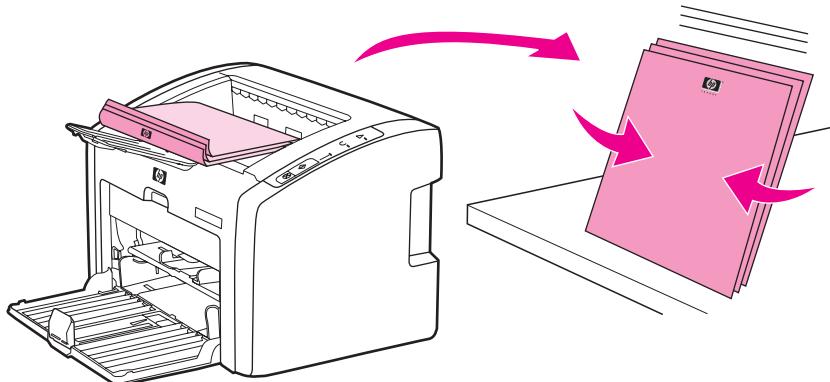
1. Access the printer properties (or printing preferences in Windows 2000 and XP). See [Printer properties \(driver\)](#) for instructions.
2. On the **Finishing** tab, select **Print On Both Sides (Manually)** (select **Manual Duplex** for some Macintosh drivers). Select the appropriate binding option, and click **OK**.
3. Print the document.

NOTE

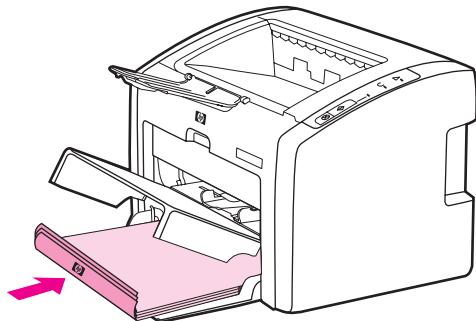
Not all printer features are available from all drivers or operating systems. See the printer properties (driver) online Help for information about availability of features for that driver.



4. After side one has printed, gather the printed pages. Turn the printed side down, and straighten the stack.



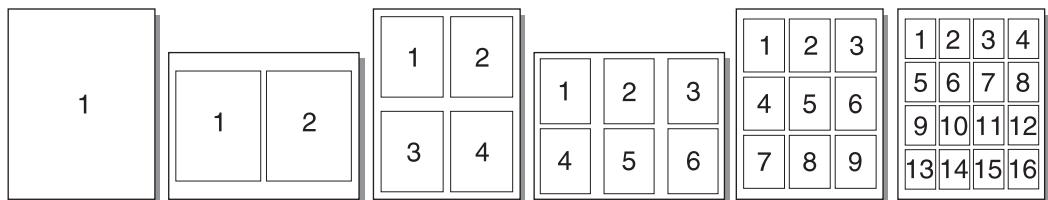
5. Place the stack back in the input tray. Side one should be facing down with the bottom edge feeding into the printer first. Replace the media input tray cover.



6. Press the **Go** button on the control panel to print side two.

Printing multiple pages on a single sheet of paper (N-up printing)

You can select the number of pages that you want to print on a single sheet of paper. If you choose to print more than one page per sheet, the pages appear smaller and are arranged on the sheet in the order that they would otherwise be printed.



1. From your software application, access the printer properties (or printing preferences in Windows 2000 and XP). See [Printer properties \(driver\)](#) for instructions.
2. On the **Finishing** tab (the **Layout** tab for some Macintosh drivers), select the correct number of pages per side of media.

NOTE

Not all printer features are available from all drivers or operating systems. See the printer properties (driver) online Help for information about availability of features for that driver.

3. (Optional steps) To include page borders, select the check box. To specify the order of pages printed on the sheet, select the order from the drop-down menu.
4. Print the document.

Printing booklets

You can print booklets on letter or A4 paper.

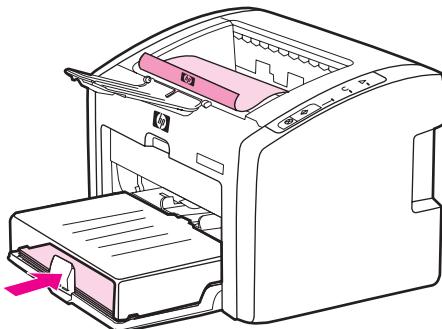
NOTE

Macintosh computers do not currently support this feature.

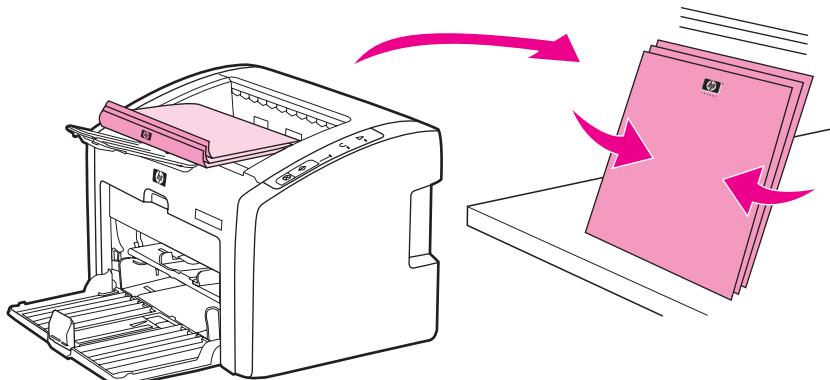
1. Load the paper in the main input tray.
2. Access the printer properties (or printing preferences in Windows 2000 and XP). See [Printer properties \(driver\)](#) for instructions.
3. On the **Finishing** tab, select the option to **Print On Both Sides (Manually)**. Select the appropriate binding option, and click **OK**. Print the document.

NOTE

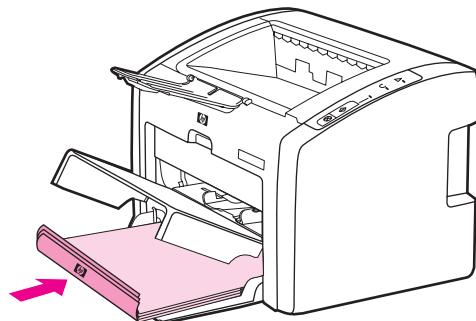
Not all printer features are available from all drivers or operating systems. See the printer properties (driver) online Help for information about availability of features for that driver.



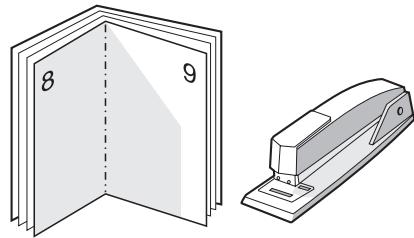
4. After side one has printed, gather the printed pages. Turn the printed side down, and straighten the stack.



5. Place the pages from side one back in the input tray. Side one should be facing down with the bottom edge feeding into the printer first.



6. Press the **Go** button, and wait for side two to print.
7. Fold and staple the pages.

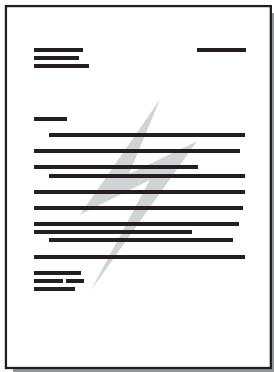


Printing watermarks

NOTE

Macintosh computers do not currently support this feature.

You can use the watermark option to print text "underneath" (in the background) of an existing document. For example, you might want to have large gray letters reading *Draft* or *Confidential* printed diagonally across the first page or all of the pages of a document.



1. From your software application, access the printer properties (or printing preferences in Windows 2000 and XP). See [Printer properties \(driver\)](#) for instructions.
2. On the **Effects** tab, select the watermark you want to use.

NOTE

Not all printer features are available from all drivers or operating systems. See the printer properties (driver) online Help for information about availability of features for that driver.

3. Print the document.

5 Maintenance

This chapter provides information on the following topics:

- [Cleaning the printer](#)
- [Changing the pickup roller](#)
- [Cleaning the pickup roller](#)
- [Changing the printer separation pad](#)
- [Redistributing toner](#)
- [Changing the print cartridge](#)

Cleaning the printer

Clean the outside of the printer with a clean, damp cloth when necessary.

CAUTION

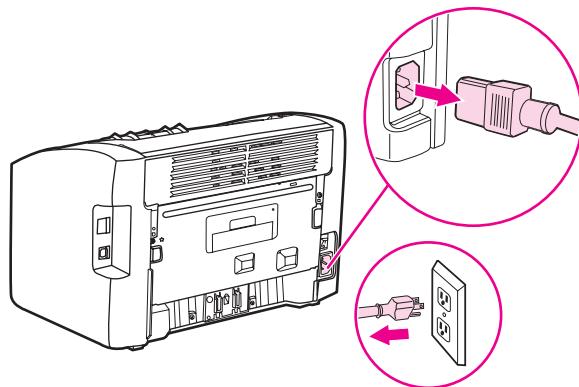
Do not use ammonia-based cleaners on or around the printer.

During the printing process, media, toner, and dust particles can accumulate inside the printer. Over time, this buildup can cause print quality problems, such as toner specks or smearing, and paper jams. To correct and prevent these types of problems, you can clean the print cartridge area and the printer media path.

Cleaning the print cartridge area

You do not need to clean the print cartridge area often. However, cleaning this area can improve the quality of your printed sheets.

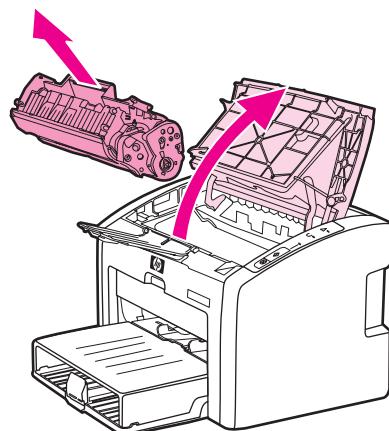
1. Turn the printer off, and then unplug the power cord. Wait for the printer to cool.



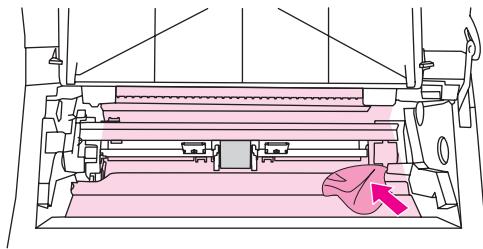
CAUTION

To prevent damage, do not expose the print cartridge to light. Cover the print cartridge if necessary. Also, do not touch the black sponge transfer roller inside the printer. By doing so, you can damage the printer.

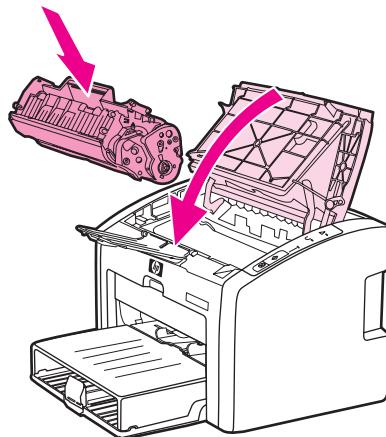
2. Open the print cartridge door, and remove the print cartridge.



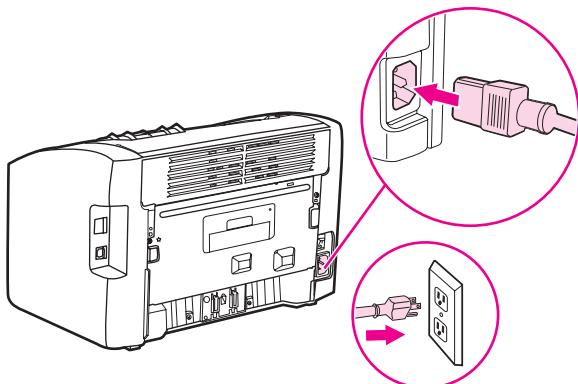
- With a dry, lint-free cloth, wipe any residue from the media path area and the print cartridge cavity.



- Replace the print cartridge, and close the print cartridge door.

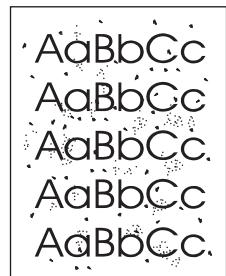


- Plug the printer into the power outlet, and then turn on the printer.



Cleaning the printer media path

If you are experiencing toner specks or dots on the printouts, you can use the HP LaserJet cleaning utility to remove excess media and toner particles that can accumulate on the fuser assembly and rollers. Cleaning the media path might extend the life of the printer.



NOTE

For best results use a sheet of transparency. If you do not have any transparencies, you can use copier-grade media, 70 to 90 g/m² (18 to 24 lb), with a smooth surface.

1. Make sure that the printer is idle and the Ready light is on.
2. Load the media in the input tray.
3. Print a cleaning page. Access the printer properties (or printing preferences in Windows 2000 and XP). See [Printer properties \(driver\)](#) for instructions.

NOTE

The cleaning process takes approximately 3 minutes. The cleaning page will stop periodically during the cleaning process. Do not turn the printer off until the cleaning process has finished. You might need to repeat the cleaning process several times to thoroughly clean the printer.

Changing the pickup roller

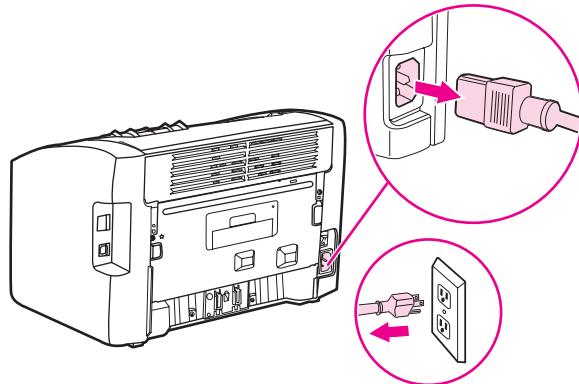
Normal use with good media causes wear. The use of poor media might require more frequent replacement of the pickup roller.

If the printer regularly mispicks (no media feeds through), you might need to change or clean the pickup roller. See [Ordering supplies](#) to order a new pickup roller.

CAUTION

Failure to complete this procedure might damage the printer.

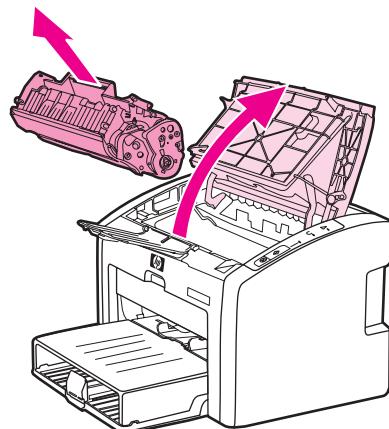
1. Turn the printer off, and then unplug the power cord from the printer. Wait for the printer to cool.



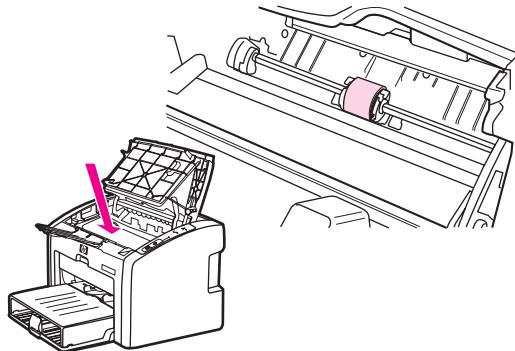
CAUTION

To prevent damage to the print cartridge, minimize its exposure to direct light. Cover the print cartridge with a sheet of paper.

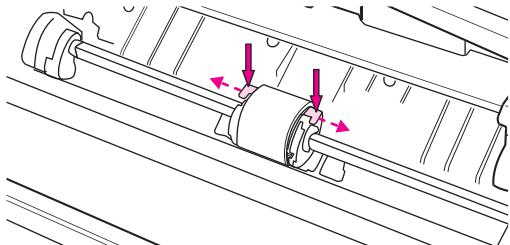
2. Open the print cartridge door, and remove the print cartridge.



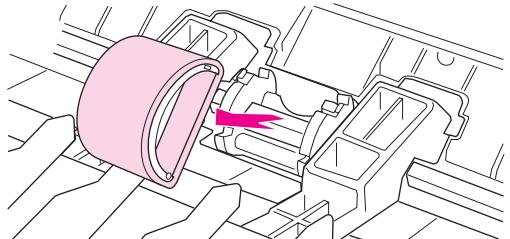
3. Find the pickup roller.



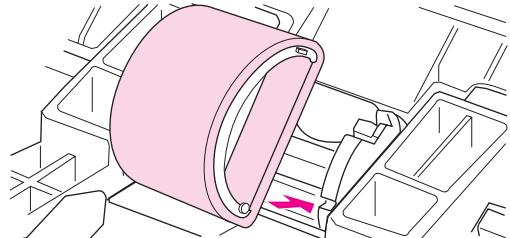
4. Release the small, white tabs on either side of the pickup roller, and rotate the pickup roller toward the front.



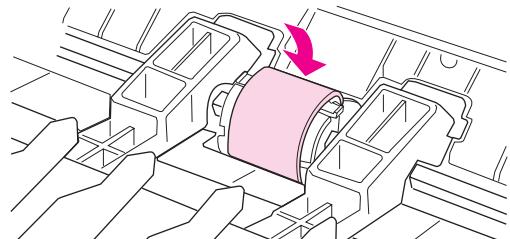
5. Gently pull the pickup roller up and out.



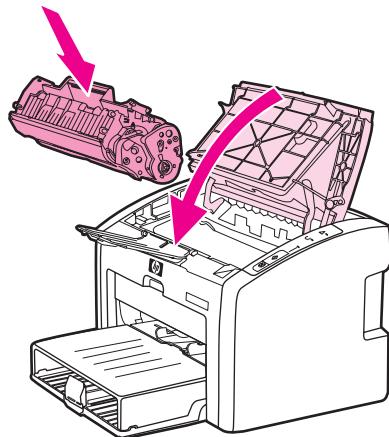
6. Position the new pickup roller in the slot. The circular and rectangular slots on each side will prevent you from installing the roller incorrectly.



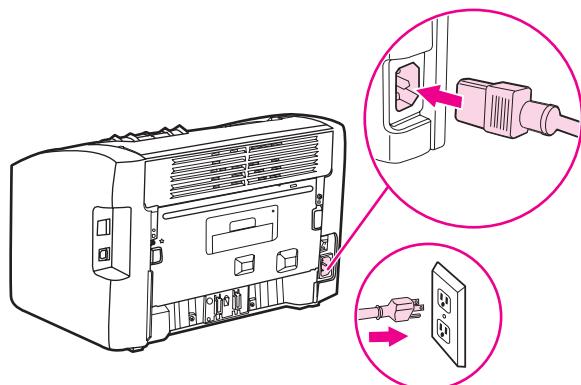
7. Rotate the top of the new pickup roller away from you until both sides snap into place.



8. Reinstall the print cartridge, and close the print cartridge door.



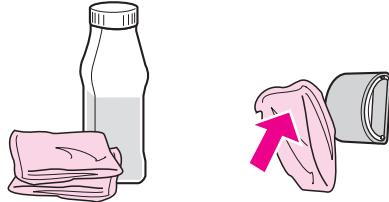
9. Plug the printer into the power outlet, and then turn on the printer.



Cleaning the pickup roller

If you want to clean the pickup roller rather than replace it, follow the instructions below:

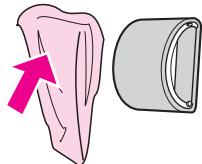
1. Remove the pickup roller as described in steps 1 through 5 of [Changing the pickup roller](#).
2. Dab a lint-free cloth in isopropyl alcohol, and scrub the roller.



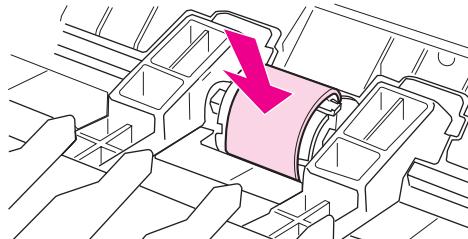
WARNING!

Alcohol is flammable. Keep the alcohol and cloth away from an open flame. Before you close the printer and plug in the power cord, allow the alcohol to dry completely.

3. Using a dry, lint-free cloth, wipe the pickup roller to remove loosened dirt.



4. Allow the pickup roller to dry completely before you reinstall it in the printer (see [Changing the pickup roller](#)).



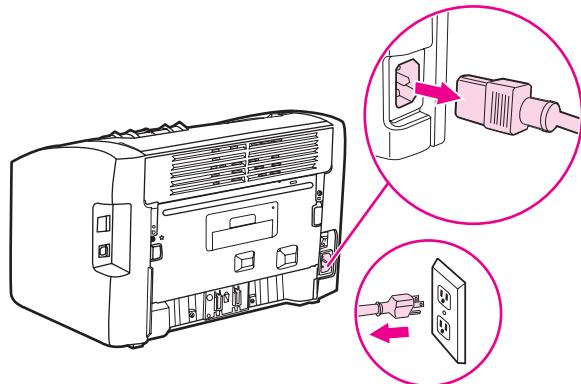
Changing the printer separation pad

Normal use with good media causes wear. The use of poor media might require more frequent replacement of the separation pad. If the printer regularly pulls multiple sheets of media at a time, you might need to change the separation pad. See [Ordering supplies](#) to order a new printer separation pad.

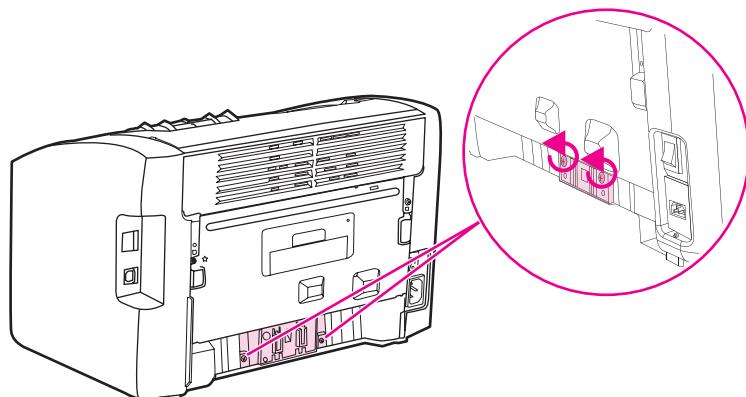
NOTE

Before you change the separation pad, clean the pickup roller. See [Cleaning the pickup roller](#).

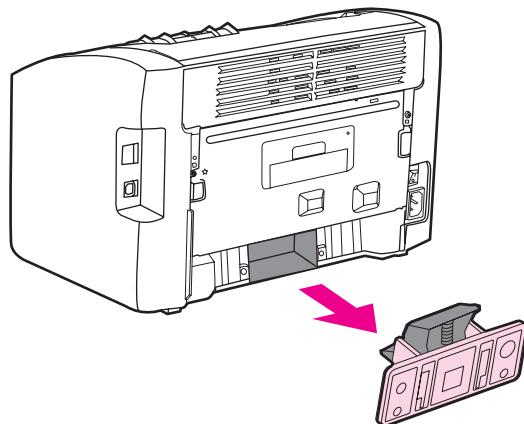
1. Turn the printer off, and then unplug the power cord from the printer. Wait for the printer to cool.



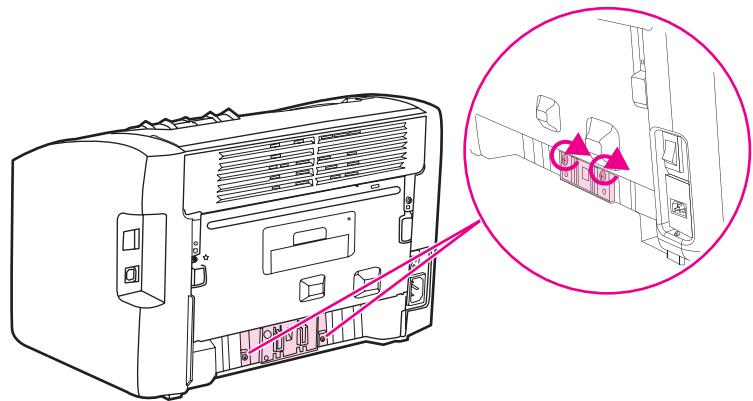
2. At the back of the printer, unscrew the two screws holding the separation pad in place.



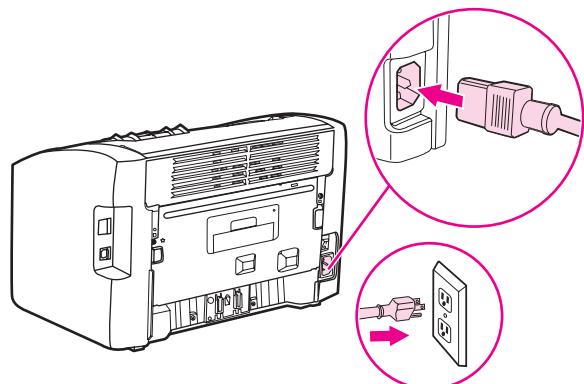
3. Remove the separation pad.



4. Insert the new separation pad, and screw it into place.



5. Plug the printer into the power outlet, and turn on the printer.



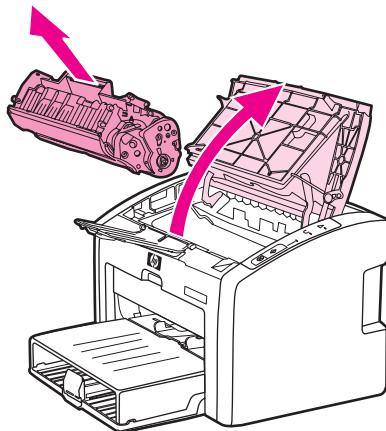
Redistributing toner

When toner is low, faded or light areas appear on the printed page. You might be able to temporarily improve print quality by redistributing the toner, which means that you might be able to finish the current print job before replacing the print cartridge.

CAUTION

To prevent damage to the print cartridge, minimize its exposure to direct light. Cover the print cartridge with a sheet of paper.

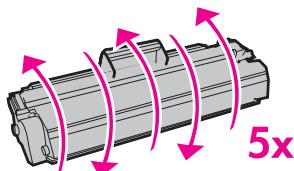
1. Open the print cartridge door, and remove the print cartridge from the printer.



CAUTION

To prevent damage to the print cartridge, hold the print cartridge at each end.

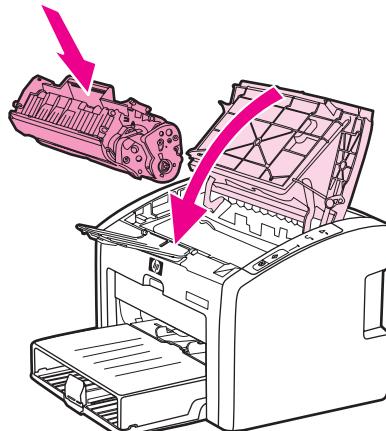
2. To redistribute the toner, gently rock the print cartridge from front to back.



CAUTION

If toner gets on your clothing, wipe it off with a dry cloth and wash the clothing in cold water.
Hot water sets toner into the fabric.

3. Reinsert the print cartridge into the printer, and close the print cartridge door.



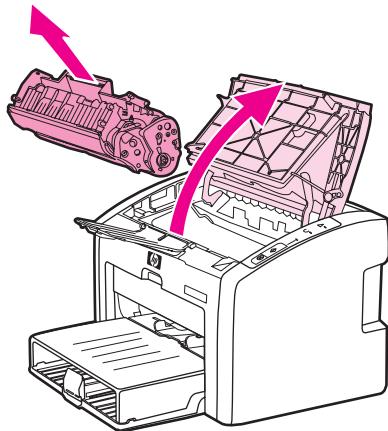
If the print is still light, install a new print cartridge. See [Changing the print cartridge](#) for instructions.

Changing the print cartridge

CAUTION

To prevent damage to the print cartridge, minimize its exposure to direct light. Cover the print cartridge with a sheet of paper.

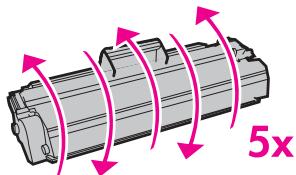
1. Open the print cartridge door, and remove the old print cartridge. See the recycling information inside the print cartridge box.



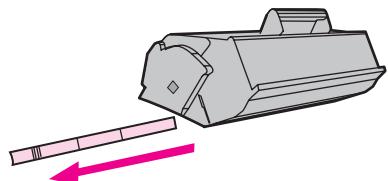
CAUTION

To prevent damage to the print cartridge, hold the print cartridge at each end.

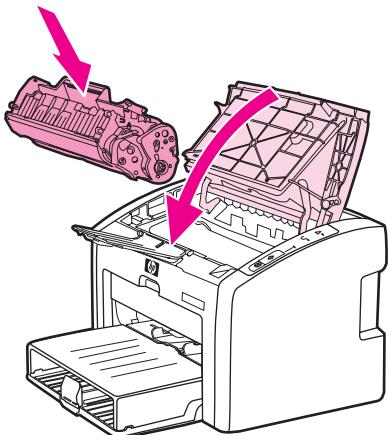
2. Remove the new print cartridge from the packaging, and gently rock the print cartridge from front to back to distribute the toner evenly inside the cartridge.



3. Pull the tab until all the tape is removed from the print cartridge. Put the tab in the print cartridge box to return for recycling.



4. Insert the new print cartridge in the printer, making sure that the print cartridge is in position. Close the print cartridge door.



CAUTION

If toner gets on your clothing, wipe it off with a dry cloth and wash the clothing in cold water.
Hot water sets toner into the fabric.

6

Problem solving

This chapter provides information on the following topics:

- [Finding the solution](#)
- [Status light patterns](#)
- [Paper handling problems](#)
- [Printed page is different than what appeared on screen](#)
- [Printer software problems](#)
- [Improving print quality](#)
- [Clearing jams](#)
- [Wired network setup problem solving](#)

Finding the solution

You can use this section to find the solution to common printer problems.

Step 1: Is the printer set up correctly?

- Is the printer plugged into a power outlet that is known to work?
- Is the no/off switch in the on position?
- Is the print cartridge properly installed? See [Changing the print cartridge](#).
- Is paper properly loaded in the input tray? See [Loading media into the input trays](#).

Yes	If you answered yes to the questions above, go to Step 2: Is the Ready light on?
No	If the printer will not turn on, Contact HP support .

Step 2: Is the Ready light on?

Do the control panel lights look like this picture?



NOTE

See [Printer control panel](#) for a description of the lights and buttons on the control panel.

Yes	Go to Step 3: Can you print a Demo page?
No	If the control panel lights do not look like the picture above, see Status light patterns . If you are unable to resolve the problem, Contact HP support .

Step 3: Can you print a Demo page?

Press the **Go** button to print a Demo page.

Yes	If the Demo page printed, go to Step 4: Is the print quality acceptable?
No	If no paper came out, see Paper handling problems . If you are unable to resolve the problem, Contact HP support .

Step 4: Is the print quality acceptable?

Yes	If the print quality is acceptable, go to Step 5: Is the printer communicating with the computer?
No	<p>If the print quality is poor, see Improving print quality.</p> <p>Verify that the print settings are correct for the media you are using. See Choosing paper and other media for information on adjusting the settings for various types of media.</p> <p>If you are unable to resolve the problem, Contact HP support.</p>

Step 5: Is the printer communicating with the computer?

Try printing a document from a software application.

Yes	If the document prints, go to Step 6: Does the printed page look like you expected?
No	<p>If the document does not print, see Printer software problems.</p> <p>If you are using a Macintosh computer, see Mac OS X problems.</p> <p>If you are unable to resolve the problem, Contact HP support.</p>

Step 6: Does the printed page look like you expected?

Yes	The problem should be resolved. If it is not resolved, Contact HP support .
No	<p>See Printed page is different than what appeared on screen.</p> <p>If you are unable to resolve the problem, Contact HP support.</p>

Contact HP support

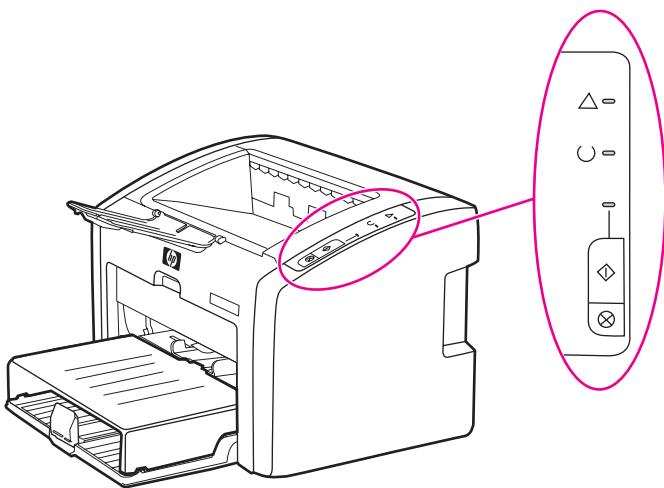
- In the United States, see <http://www.hp.com/support/lj1022/> for the HP LaserJet 1020 series printer.

NOTE

The HP LaserJet 1020 series printer includes the HP LaserJet 1022, 1022n, and 1022nw printer models.

- In other locations, see <http://www.hp.com>.

Status light patterns



Light status legend

○	Symbol for "light off"
○	Symbol for "light on"
○ ...○	Symbol for "light blinking"

Control panel light message

Light status	State of the printer	Action
○	Ready The printer is ready to print.	No action is necessary.
○ ○	Processing data The printer is receiving or processing data.	Wait for the job to print. To cancel the current job, press the CANCEL button.
○ ○ ○	Cleaning mode A Cleaning page or a Printer Test page is printing.	Wait until the cleaning page is finished printing and the printer is in the Ready state. This could take up to two minutes. Wait until the Printer Test page is finished printing and the printer is in the Ready state.

Control panel light message (continued)

Light status	State of the printer	Action
  	Out of memory The printer is out of memory.	The page you are printing might be too complex for the printer's memory capacity. Try lowering the resolution. See Understanding print quality settings for more information.
  	Attention: door open, media out, no print cartridge, or media jam This printer is in an error state that requires operator intervention.	Check the following: <ul style="list-style-type: none">• The print cartridge door is completely closed.• Media is loaded. See Loading media into the input trays for instructions.• The print cartridge is correctly installed in the printer. See Changing the print cartridge for instructions.• There is no media jam. See Clearing jams for instructions.
  	Printer initialization A printer initialization is taking place.	No action is necessary.
  	Fatal error All lights are on.	Unplug the printer for 30 minutes, and then plug the printer back in power outlet. If the printer still has an error, contact HP Support. See Contact HP support .
  	All lights are off.	Make sure that there is power. Unplug both ends of the power cord, and then plug the power cord back into the printer and the power outlet.

Return to [Finding the solution](#).

Paper handling problems

Choose the item that best describes the problem:

- [Media jam](#)
- [Print is skewed \(crooked\)](#)
- [More than one sheet of media feeds through the printer at one time](#)
- [Printer does not pull media from the media input tray](#)
- [Printer curled the media](#)
- [Print job is extremely slow](#)

Media jam

- See [Clearing jams](#) for more information.
- Make sure that you are printing with media that meets specifications. See [Printer media considerations](#) for more information.
- Do not print on used paper.
- Make sure that you are printing with media that is not wrinkled, folded, or damaged.
- Make sure that the printer is clean. See [Cleaning the printer](#) for more information.

Print is skewed (crooked)

A small amount of skew is normal and might become obvious when using preprinted forms.

- See [Page skew](#) for more information.
- Adjust the media guides to the width and length of the media that you are using and try reprinting. See [Media paths](#) or [Loading media into the input trays](#) for more information.

More than one sheet of media feeds through the printer at one time

- The media input tray might be too full. See [Loading media into the input trays](#) for more information.
- Make sure that the media is not wrinkled, folded, or damaged.
- Try paper from a new ream. Do not fan the paper before loading it into the input tray.
- The printer separation pad might be worn. See [Changing the printer separation pad](#) for more information.

Printer does not pull media from the media input tray

- Make sure that the printer is not in manual feed mode.
- Make sure that the media guides are adjusted properly.
- The pickup roller might be dirty or damaged. See [Cleaning the pickup roller](#) or [Changing the pickup roller](#) for instructions.

Printer curled the media

- See [Curl or wave](#) for more information.
- See [Media paths](#) or [Choosing paper and other media](#) for more information.

Print job is extremely slow

The maximum speed of the printer is up to 18 ppm for A4 media and 19 ppm for letter media for the HP LaserJet 1022, 1022n, 1022nw printers. Your print job might be very complex. Try the following:

- Reduce the complexity of your document (for example, reduce the number of multiple graphics).
- Access the printer properties in the printer driver. See [Printer properties \(driver\)](#) for instructions. Set the media type to plain paper.

NOTE

This may cause toner to fuse improperly if you are using heavy media.

- Narrow media or heavy media will slow printing. Use normal media.
- Print speed is based on computer processor speed, the amount of memory, and the amount of hard disk space available on your computer. Try increasing these components.

Return to [Finding the solution](#).

Printed page is different than what appeared on screen

Choose the item that best describes the problem:

- [Garbled, incorrect, or incomplete text](#)
- [Missing graphics or text, or blank pages](#)
- [Page format is different than on another printer](#)
- [Graphics quality](#)

NOTE

To preview a print job, use the **Print Preview** option in the software application (if available).

Garbled, incorrect, or incomplete text

- The wrong printer driver might have been selected when the software was installed. Make sure that the HP LaserJet 1022 printer driver is selected in the printer properties.
- If a specific file prints garbled text, there might be a problem with that specific file. If a specific application prints garbled text, there might be a problem with that application. Make sure that the appropriate printer driver is selected.
- There might be a problem with your software application. Try printing from another software application.
- The USB cable might be loose or defective. Try the following:

WARNING!

Before you connect the USB cable to the printer, always unplug the printer to prevent damage to the printer.

- Disconnect the cable and reconnect it at both ends.
- Try printing a job that you know works.
- If possible, attach the cable and printer to another computer, and try printing a job that you know works.
- Turn off the printer and the computer. Remove the USB cable, and inspect both ends of the cable for damage. Reconnect the USB cable, making sure that the connections are tight. Make sure that the printer is directly connected to the computer. Remove any switchboxes, tape backup drives, security keys, or any other devices that are attached between the USB port on the computer and the printer. These devices can sometimes interfere with communication between the computer and the printer. Restart the printer and the computer.

Missing graphics or text, or blank pages

- Make sure that your file does not contain blank pages.
- The sealing tape might still be in the print cartridge. Remove the print cartridge, and pull the tab on the end of the cartridge until the entire length of the tape is removed. Reinstall the print cartridge. See [Changing the print cartridge](#) for instructions. To check the printer, print a Demo page by pressing the **Go** button.

- The graphic settings in the printer properties might not be correct for the type of job that you are printing. Try a different graphic setting in the printer properties. See [Printer properties \(driver\)](#) for more information.
- Clean the printer, particularly the contacts between the print cartridge and the power supply.

Page format is different than on another printer

If you used an older or different printer driver (printer software) to create the document or the printer properties settings in the software are different, the page format might change when you try to print using your new printer driver or settings. To help eliminate this problem, try the following:

- Create documents and print them using the same printer driver (printer software) and printer properties settings regardless of which HP LaserJet printer you use to print them.
- Change the resolution, paper size, font settings, and other settings. See [Printer properties \(driver\)](#) for more information.
- For the HP LaserJet 1022n and 1022nw printers, use another printer driver.

Graphics quality

The graphics settings might be unsuitable for your print job. Check the graphic settings, such as resolution, in the printer properties and adjust them as necessary. See [Printer properties \(driver\)](#) for more information.

NOTE

Some resolution might be lost when converting from one graphics format to another.

Return to [Finding the solution](#).

Printer software problems

Windows problems

Problem	Solution
A printer driver for the HP LaserJet 1022 printer is not visible in the Printer folder.	<ul style="list-style-type: none">Restart the computer.Reinstall the printer software. In the Windows task bar, click Start, select Programs, select HP, select HP LaserJet 1020 series, and then click Uninstall HP LaserJet 1020 series. Turn the printer off. Install the printer software from the CD. Turn the printer back on. <p>NOTE</p> <p>Close any applications that are running. To close an application that has an icon in the system tray, right-click the icon, and select Close or Disable.</p> <ul style="list-style-type: none">Try plugging the USB cable into a different USB port on the computer.If you are trying to print to a shared printer, in the Windows task bar, click Start, select Settings, and select Printers. Double-click the Add Printer icon. Follow the instructions in the Add Printer Wizard.
An error message was displayed during the software installation.	<ul style="list-style-type: none">Restart the computer.Reinstall the printer software. In the Windows task bar, click Start, select Programs, select HP, select HP LaserJet 1020 series, and then click Uninstall HP LaserJet 1020 series. Turn the printer off. Install the printer software from the CD. Turn the printer back on. <p>NOTE</p> <p>Close any applications that are running. To close an application that has an icon in the task bar, right-click the icon, and select Close or Disable.</p> <ul style="list-style-type: none">Check the amount of free space on the drive where you are installing the printer software. If necessary, free up as much space as you can, and reinstall the printer software.If necessary, run the Disk Defragmenter, and reinstall the printer software.

Windows problems (continued)

Problem	Solution
The printer is in Ready mode, but nothing prints.	<ul style="list-style-type: none"> • Restart the computer. • Print a Configuration page from the control panel of the printer, and verify the printer functionality. • Verify that all of the cables are properly seated and within specifications. This includes the USB, network, and power cables. Try a new cable. • Reinstall the printer software. In the Windows task bar, click Start, select Programs, select HP, select HP LaserJet 1020 series, and then click Uninstall HP LaserJet 1020 series. Turn the printer off. Install the printer software from the CD. Turn the printer back on. <p>NOTE</p> <p>Close any applications that are running. To close an application that has an icon in the task bar, right-click the icon, and select Close or Disable.</p>

Mac OS X problems

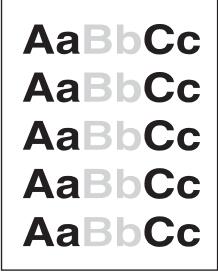
Symptom	Possible cause	Solution
For HP LaserJet 1022n and 1022nw printers only When using Mac OS X v10.2, the printer is not using Rendezvous (mDNS)		You might need to upgrade your Internal HP Jetdirect card to a version that supports Rendezvous.
Unable to print from a third-party USB card.	This error occurs when the software for USB printers is not installed.	When adding a third-party USB card, you might need Apple's USB Adapter Card Support software. The most current version of this software is available from Apple's website.

Return to [Finding the solution](#).

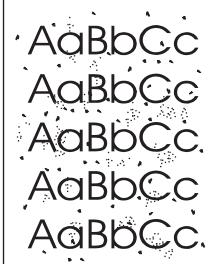
Improving print quality

This section provides information about identifying and correcting print defects.

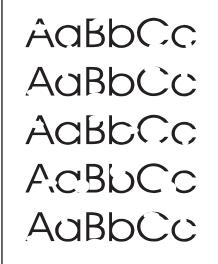
Light or faded print

	<ul style="list-style-type: none">The toner supply is low. See Redistributing toner for more information.The media might not meet HP's media specifications (for example, the media is too moist or too rough). See Printer media considerations for more information.If the whole page is light, the print density adjustment is too light or EconoMode might be turned on. Adjust the print density, and disable EconoMode in the printer properties. See Saving toner for more information.
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Toner specks

	<ul style="list-style-type: none">The media might not meet HP's media specifications (for example, the media is too moist or too rough). See Printer media considerations for more information.The printer might need to be cleaned. See Cleaning the printer or Cleaning the printer media path for instructions.
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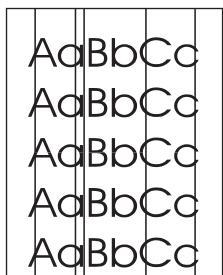
Dropouts

	<ul style="list-style-type: none">A single sheet of media might be defective. Try reprinting the job.The media's moisture content is uneven or the media has moist spots on its surface. Try printing with new media. See Printer media considerations for more information.The media lot is bad. The manufacturing processes can cause some areas to reject toner. Try a different type or brand of media.The print cartridge might be defective. See Changing the print cartridge for more information.
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NOTE

If these steps do not correct the problem, contact an HP-authorized dealer or service representative.

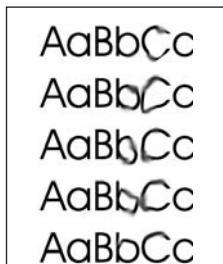
Vertical lines

	<ul style="list-style-type: none">• Make sure that the tray cover is in place.• The photosensitive drum inside the print cartridge has probably been scratched. Install a new HP print cartridge. See Changing the print cartridge for instructions.
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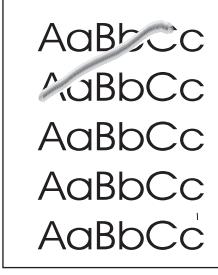
Gray background

	<ul style="list-style-type: none">• Make sure that the tray cover is in place.• Decrease the print density setting through printer properties. This decreases the amount of background shading. See Printer properties (driver).• Change the media to a lighter basis weight. See Printer media considerations for more information.• Check the printer's environment. Very dry (low humidity) conditions can increase the amount of background shading.• Install a new HP print cartridge. See Changing the print cartridge for instructions.
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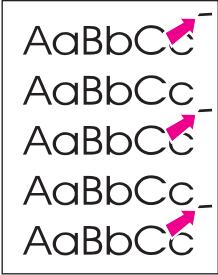
Toner smear

	<ul style="list-style-type: none">• If toner smears appear on the leading edge of the media, the media guides might be dirty. Wipe the media guides with a dry, lint-free cloth. See Cleaning the printer for more information.• Check the media type and quality.• Install a new HP print cartridge. See Changing the print cartridge for instructions.• The fuser temperature might be too low. In your printer driver, make sure that the appropriate media type is selected.
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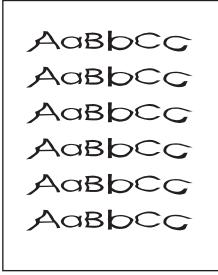
Loose toner

	<ul style="list-style-type: none">• Clean the inside of the printer. See Cleaning the printer for instructions.• Check the media type and quality. See Printer media considerations for more information.• Install a new HP print cartridge. See Changing the print cartridge for instructions.• In your printer driver, make sure that the appropriate media type is selected.• Plug the printer directly into an AC outlet instead of into a power strip.
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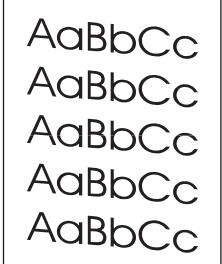
Vertical repetitive defects

	<ul style="list-style-type: none">• The print cartridge might be damaged. If a repetitive mark occurs at the same spot on the page, install a new HP print cartridge. See Changing the print cartridge for instructions.• The internal parts might have toner on them. See Cleaning the printer for more information. If the defects occur on the back of the page, the problem will probably correct itself after a few more printed pages.• In your printer driver, make sure that the appropriate media type is selected.
--	--

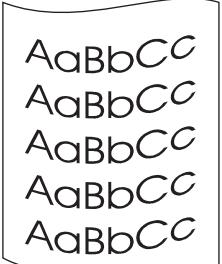
Misformed characters

	<ul style="list-style-type: none">• If characters are improperly formed, producing hollow images, the media stock might be too slick. Try a different media. See Printer media considerations for more information.• If characters are improperly formed, producing a wavy effect, the printer might need service. Print a Configuration page. If the characters are improperly formed, contact an HP-authorized dealer or service representative. See How to contact HP for more information.
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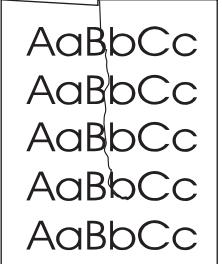
Page skew

	<ul style="list-style-type: none">• Make sure that the media is loaded correctly and the media guides are not too tight or too loose against the media stack. See Loading media into the input trays for more information.• The input bin might be too full. See Loading media into the input trays for more information.• Check the media type and quality. See Printer media considerations for more information.
---	---

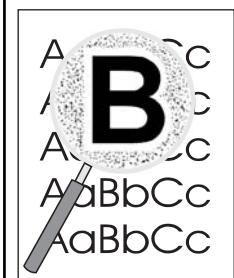
Curl or wave

	<ul style="list-style-type: none">• Check the media type and quality. Both high temperature and humidity cause media to curl. See Printer media considerations for more information.• The media might have been in the input tray too long. Turn over the stack of media in the tray. Also, try rotating the media 180° in the input tray.• The fuser temperature might be too high. In your printer driver, make sure that the appropriate media type is selected. If the problem persists, select a media type that uses a lower fuser temperature, such as transparencies or light media.
--	--

Wrinkles or creases

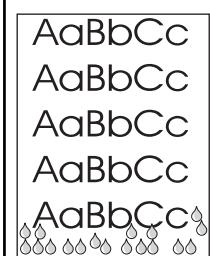
	<ul style="list-style-type: none">• Make sure that media is loaded properly. See Loading media into the input trays for more information.• Check the media type and quality. See Printer media considerations for more information.• Turn over the stack of media in the tray. Also, try rotating the media 180° in the input tray.• For envelopes, this can be caused by air pockets inside the envelope. Remove the envelope, flatten the envelope, and try printing again.
---	--

Toner scatter outline



- If large amounts of toner have scattered around the characters, the media might be resisting the toner. (A small amount of toner scatter is normal for laser printing.) Try a different media type. See [Printer media considerations](#) for more information.
- Turn over the stack of media in the tray.
- Use media designed for laser printers. See [Printer media considerations](#) for more information.

Water droplets on bottom edge



NOTE

Moisture in the printer is condensing on the fuser assembly and dropping onto the media. In excessively hot and humid areas, media retains moisture. Water droplets do not damage the printer.

- Use different media.
- Store media in an airtight container to minimize absorption of moisture.

Return to [Finding the solution](#).

Clearing jams

CAUTION To prevent damage to the printer when clearing jams, including jams in the output bin, always open the print cartridge door and remove the print cartridge. Keep the door open and the cartridge out until the jam has been cleared. Opening the print cartridge door and removing the print cartridge relieves tension on the printer rollers, which prevents damage to the printer and makes the removal of jammed pages easier.

Occasionally, media becomes jammed during a print job. You are notified of a media jam by an error from the software and the printer control panel lights. See [Status light patterns](#) for more information.

The following are some of the causes of media jams:

- The input trays are loaded improperly or are too full. See [Loading media into the input trays](#) for more information.

NOTE When you add new media, always remove all of the media from the input tray and straighten the stack of new media. This helps prevent multiple sheets of media from feeding through the printer at one time, reducing media jams.

- The media does not meet HP specifications. See [Printer media considerations](#) for more information.

Typical media jam locations

- **Print cartridge area:** See [Removing a jammed page](#) for instructions.
- **Input tray areas:** If the page is still sticking out of the input tray, gently try to remove it from the input tray without tearing the page. If you feel resistance, see [Removing a jammed page](#) for instructions.
- **Output path:** If the page is sticking out of the output bin, see [Removing a jammed page](#) for instructions.

NOTE There might be loose toner in the printer after a media jam. This toner clears up after a few sheets are printed.

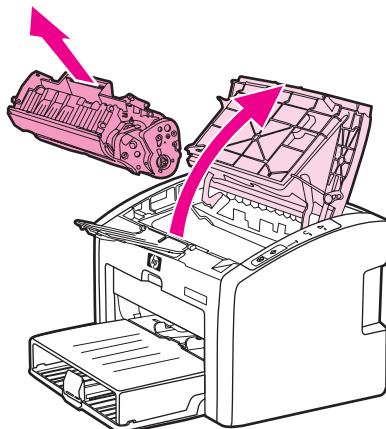
Removing a jammed page

CAUTION Media jams might result in loose toner on the page. If you get any toner on your clothes, wash them in cold water. *Hot water will permanently set the toner into the fabric.*

CAUTION

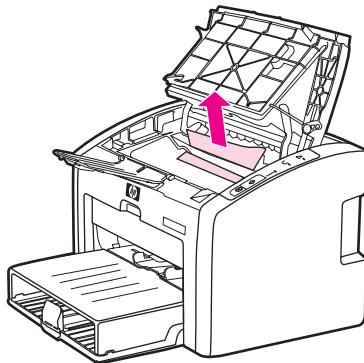
To prevent damage to the printer when clearing jams, including jams in the output bin, always open the print cartridge door and remove the print cartridge.

1. Open the print cartridge door, and remove the print cartridge.

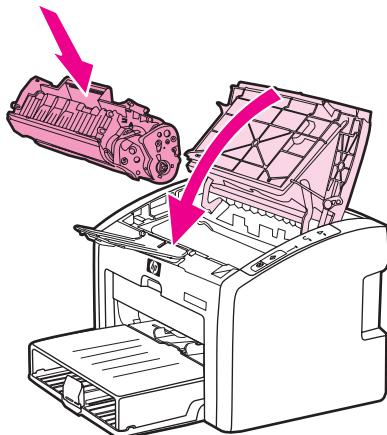
**CAUTION**

To prevent damage to the print cartridge, minimize its exposure to direct light. Cover the print cartridge with a sheet of paper.

2. With both hands, grasp the side of the media that is most visible (this includes the middle), and carefully pull it free from the printer.



- When you have removed the jammed media, replace the print cartridge, and close the print cartridge door.



After clearing a media jam, you might need to turn the printer off and turn it back on again.

NOTE

When you add new media, remove all of the media from the input tray and straighten the stack of new media.

Return to [Finding the solution](#).

Wired network setup problem solving

If the computer is unable to discover the HP LaserJet 1022n or HP LaserJet 1022nw printer, perform the following steps:

1. Check the cables to ensure that they are properly connected. Check all of the following connections:
 - Power cables
 - Cables between the printer and the hub or switch
 - Cables between the hub or switch and the computer
 - Cables to and from the modem or Internet connection, if applicable
2. To make sure that the computer's network connections are working properly (Windows only), perform the following steps:
 - On the Windows desktop, double-click **My Network Places** or **Network Neighborhood**.
 - Click the **Entire Network** link.
 - Click the **Entire Contents** link.
 - Double-click one of the network icons, and make sure that some devices are listed.
3. To verify that the network connection is active, perform the following steps:
 - Check the network light on the network (RJ-45) connector on the back of the printer.
 - If one of the lights is on solid, the printer is connected to the network.
 - If the green light is off, check the cable connections from the printer to the gateway, switch, or hub to ensure that the connections are secure.
 - If the connections are secure, turn off the power to the printer for at least 10 seconds, and then turn on the power to the printer.
4. To print a Configuration page, press the **Go** button on the control panel for 5 seconds or access the printer driver. See [Printer properties \(driver\)](#).
 - On the Configuration page, check to see if a non-zero IP address is assigned to the printer.
 - If the Configuration page does not have a valid, non-zero IP address, reset the Internal HP Jetdirect print server to the factory defaults. To cold-reset the Internal HP Jetdirect print server, turn off the printer. While pressing the **Go** and **CANCEL** buttons on the control panel, turn on the printer. Continue to press the **Go** and **CANCEL** buttons until the printer is in the Ready state (from 5 to 30 seconds).
 - Two minutes after the printer reaches the Ready state, print another Configuration page, and check to see if a valid IP address is assigned to the printer.
 - If the IP address is still zeros, [Contact HP support](#).

A

Printer specifications

This appendix provides information on the following topics:

- [Environmental specifications](#)
- [Acoustic emissions](#)
- [Electrical specifications](#)
- [Physical specifications](#)
- [Printer capacities and ratings](#)
- [Memory specifications](#)
- [Port availability](#)

Environmental specifications

Operating environment	Install in a well-ventilated, dust-free area. Printer plugged into an AC outlet: <ul style="list-style-type: none">• Temperature: 10°C to 32.5°C (50°F to 90.5°F)• Humidity: 20% to 80% (no condensation)
Storage environment	Printer unplugged from an AC outlet: <ul style="list-style-type: none">• Temperature: 0°C to 40°C (32°F to 104°F)• Humidity: 10% to 80% (no condensation)

NOTE

Values are current as of April 1, 2004. Values are subject to change without notice. See <http://www.hp.com/support/lj1022/> for current information.

Acoustic emissions

Acoustic emissions^{1, 2}

Sound power level	Declared per ISO 9296
Printing ³	$L_{WA_d} = <6.2$ Bels (A) and 62dB (A)
Ready (PowerSave)	Inaudible
Sound pressure level bystander position	Declared Per ISO 9296
Printing ³	$L_{WA_d} = \leq 4.9$ Bels (A) and 49dB (A)
Ready (PowerSave): essentially inaudible	Inaudible

¹ Values are subject to change without notice. See <http://www.hp.com/support/lj1022/> for current information.

² Configuration tested: HP LaserJet 1022 base unit, standard tray, A4 paper, and simplex continuous print.

³ HP LaserJet 1022 speed is 18 ppm for A4 and 19 ppm for letter.

Electrical specifications

WARNING!

Power requirements are based on the country/region where the printer is sold. Do not convert operating voltages. Doing so might damage the printer and void the product warranty.

	110-volt models	230-volt models
Power requirements	110-127v (+/-10%) 50/60 Hz (+/-2 Hz)	220v-240v (+/-10%) 50/60 Hz (+/-2 Hz)
Rated current	4 amps	2.5 amps

Power consumption (average in watts)^{1, 2}

Product model	Printing ⁴	Ready ³	Off
HP LaserJet 1022	300 W	2 W	0 W
HP LaserJet 1022n	300 W	2 W	0 W
HP LaserJet 1022nw	300 W	2 W	0 W

¹ Values are subject to change without notice. See <http://www.hp.com/support/lj1022/> for current information.

² Power reported is the highest value measured for monochrome printing using all standard voltages.

³ The default time from Ready mode to PowerSave mode and the recovery time from PowerSave mode to the start of printing is negligible (less than 10 seconds) because of the instant-on fusing.

⁴ HP LaserJet 1022 speed is 18 ppm for A4 media and 19 ppm for letter media.

⁵ The heat dissipation in Ready mode is 20 BTU/hour.

Physical specifications

Dimensions	<ul style="list-style-type: none">Width: 370 mm (14.6 inches)Depth: 245 mm (9.6 inches)Height: 241 mm (9.5 inches)
Weight (2,000-page cartridge installed)	6.3 kg (13.9 lb)

NOTE

Values are current as of April 1, 2004. Values are subject to change without notice. See <http://www.hp.com/support/lj1022/> for current information.

Printer capacities and ratings

Print speed	<ul style="list-style-type: none">• 18 ppm for A4 and 19 for letter• First page out in as low as 8 seconds
Main input tray capacity	250 sheets of regular weight 75 g/m ² (20 lb) paper
Priority feed slot capacity	10 sheets of media up to 163 g/m ² (43 lb)
Top (face down) output bin capacity	100 sheets of regular weight 75 g/m ² (20 lb) paper
Minimum paper size	76 x 127 mm (3 x 5 inches)
Maximum paper size	216 x 356 mm (8.5 x 14 inches)
Media weight	Output bin: 60 to 105 g/m ² (16 to 28 lbs)
Base memory	8 MB of RAM
Print resolution	<ul style="list-style-type: none">• ProRes 1200: This setting provides fine-line detail at 1200 x 1200 dpi.• FastRes 1200: This setting provides 1200 dpi effective output quality.• 600 dpi: This setting provides 600 x 600 dpi output with Resolution Enhancement technology (REt) for improved text.
Duty cycle	<ul style="list-style-type: none">• 8,000 single-sided pages per month (maximum)• 1,000 single-sided pages per month (average)

Memory specifications

Base memory	8 MB RAM
-------------	----------

Port availability

USB	Compatible with USB 2.0 High Speed specifications
Network (HP LaserJet 1022n and HP LaserJet 1022nw printers only)	RJ-45, Ethernet 10/100
Wireless (HP LaserJet 1022nw printer only)	802.11b/g

B

Regulatory information

FCC compliance

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy. If it is not installed and used in accordance with the instructions, it may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase separation between equipment and receiver.
- Connect equipment to an outlet on a circuit different from that to which the receiver is located.
- Consult your dealer or an experienced radio/TV technician.

NOTE

Any changes or modifications to the printer that are not expressly approved by Hewlett-Packard could void the user's authority to operate this equipment.

Use of a shielded interface cable is required to comply with the Class B limits of Part 15 of FCC rules.

Declaration of Conformity

Declaration of Conformity

according to ISO/IEC Guide 22 and EN 45014

Manufacturer's Name: Hewlett-Packard Company
Manufacturer's Address: 11311 Chinden Boulevard
Boise, Idaho 83714-1021, USA

declares that the product

Product Name⁴⁾: HP LaserJet 1022, HP LaserJet 1022n, and HP LaserJet 1022nw
Regulatory Model³⁾: BOISB-0405-00 / BOISB-0405-01
Product Options: ALL

conforms to the following Product Specifications:

Safety: IEC 60950:2001-1 / EN 60950:2001-1
IEC 60825-1:1993 +A1:1997 +A2:2001 / EN 60825-1:1994 +A11:1996 +A2:2001 (Class 1 Laser/LED Product)
GB4943-2001

EMC: CISPR 22:1997 / EN 55022:1998 Class B¹⁾
EN 61000-3-2:2000
EN 61000-3-3:1995 / A1
EN 55024:1998
FCC Title 47 CFR, Part 15 Class B²⁾ / ICES-003, Issue 4
GB9254-1998, GB17625.1-1998

Supplementary Information:

The product herewith complies with the requirements of the EMC Directive 89/336/EEC and the Low Voltage Directive 73/23/EEC, and carries the CE-marking accordingly.

- 1) The product was tested in a typical configuration with Hewlett-Packard Personal Computer Systems. Compliance testing of product to standard with exception of clause 9.5, which is not yet in effect.
- 2) This Device complies with Part 15 of the FCC Rules. Operation is subject to the following two Conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.
- 3) For regulatory purposes, this product is assigned a Regulatory model number. This number should not be confused with the product name or the product number(s).
- 4) Regulatory information regarding radio module approvals for the HP LaserJet 1022nw (Regulatory Model Number: BOISB-0405-01) can be found in the wireless user guide for that product.

Boise, Idaho 83714, USA

01 March 2005

For Regulatory Topics ONLY, contact:

Australia Contact: Product Regulations Manager, Hewlett-Packard Australia Ltd., 31-41 Joseph Street, Blackburn, Victoria 3130, Australia.

European Contact: Your Local Hewlett-Packard Sales and Service Office or Hewlett-Packard GmbH, Department HQ-TRE / Standards Europe, Herrenberger Straße 140, D-71034 Böblingen,, Germany, (FAX: +49-7031-14-3143)

USA Contact: Product Regulations Manager, Hewlett-Packard Company, PO Box 15, Mail Stop 160, Boise, Idaho 83707-0015, USA (Phone: 208-396-6000)

Regulatory statements

Laser safety statement

The Center for Devices and Radiological Health (CDRH) of the U.S. Food and Drug Administration has implemented regulations for laser products manufactured since August 1, 1976. Compliance is mandatory for products marketed in the United States. The printer is certified as a "Class 1" laser product under the U.S. Department of Health and Human Services (DHHS) Radiation Performance Standard according to the Radiation Control for Health and Safety Act of 1968.

Since radiation emitted inside the printer is completely confined within protective housings and external covers, the laser beam cannot escape during any phase of normal user operation.

WARNING!

Using controls, making adjustments, or performing procedures other than those specified in this user guide could result in exposure to hazardous radiation.

Canadian DOC regulations

Complies with Canadian EMC Class B requirements.

« Conforme à la classe B des normes canadiennes de compatibilité électromagnétiques (CEM). »

Korean EMI statement

사용자 안내문 (B급 기기)

이 기기는 비업무용으로 전자파장해 검정을 받은
기기로서, 주거 지역에서는 물론 모든 지역에서
사용할 수 있습니다.

Laser statement for Finland

LASERTURVALLISUUS LUOKAN 1 LASERLAITE KLASS 1 LASER APPARAT

HP LaserJet 1022, HP LaserJet 1022n, HP LaserJet 1022nw -laserkirjoitin on käyttäjän kannalta turvallinen luokan 1 laserlaite. Normaalissa käytössä kirjoittimen suojakotelointi estää lasersäteen pääsyn laitteen ulkopuolelle.

Laitteen turvallisuusluokka on määritetty standardin EN 60825-1 (1994) mukaisesti.

VAROITUS!

Laitteen käyttäminen muulla kuin käyttöohjeessa mainitulla tavalla saattaa altistaa käyttäjän turvallisuusluokan 1 ylittäville näkymättömälle lasersäteilylle.

VARNING!

Om apparaten används på annat sätt än i bruksanvisning specificerats, kan användaren utsättas för osynlig laserstrålning, som överskrider gränsen för laserklass 1.

HUOLTO

HP LaserJet 1022, HP LaserJet 1022n, HP LaserJet 1022nw -kirjoittimen sisällä ei ole käyttäjän huollettavissa olevia kohteita. Laitteen saa avata ja huoltaa ainoastaan sen huoltamiseen koulutettu henkilö. Tällaiseksi huoltotoimenpiteeksi ei katsota väriainekasetin vaihtamista, paperiradan puhdistusta tai muita käyttäjän käsikirjassa lueteltuja, käyttäjän tehtäväksi tarkoitettuja ylläpitotoimia, jotka voidaan suorittaa ilman erikoistyökaluja.

VARO!

Mikäli kirjoittimen suojakotelo avataan, olet alittiina näkymättömälle lasersäteilylle laitteen ollessa toiminnessa. Älä katso säteeseen.

VARNING!

Om laserprinterns skyddshölje öppnas då apparaten är i funktion, utsättas användaren för osynlig laserstrålning. Betrakta ej strålen.

Tiedot laitteessa käytettävän laserdiodin sääteilyominaisuksista:

Aallonpituus 785-800 nm

Teho 5 mW

Luokan 3B laser

Environmental product stewardship program

Protecting the environment

Hewlett-Packard Company is committed to providing quality products in an environmentally sound manner. This product has been designed with several attributes to minimize impacts on our environment.

Ozone production

This product generates no appreciable ozone gas (O_3).

Energy consumption

Power usage drops significantly while in PowerSave/Sleep mode, which saves natural resources and saves money without affecting the high performance of this product. This product qualifies for Energy Star® (version 3.0), which is a voluntary program to encourage the development of energy-efficient office products.



Energy Star is a U.S. registered service mark of the U.S. EPA. As an Energy Star partner, Hewlett-Packard Company has determined that this product meets Energy Star guidelines for energy efficiency. For more information, see <http://www.energystar.gov/>.

Toner consumption

EconoMode uses significantly less toner, which might extend the life of the print cartridge.

Paper use

This product's manual duplex feature (two-sided printing, see [Printing on both sides of the paper \(manual two-sided printing\)](#)) and N-up printing (multiple pages printed on one page) capability can reduce paper usage and the resulting demands on natural resources.

Plastics

Plastic parts over 25 grams (0.9 oz) are marked according to international standards that enhance the ability to identify plastics for recycling purposes at the end of the product's life.

HP LaserJet printing supplies

In many countries/regions, this product's printing supplies (for example, print cartridge, drum) can be returned to HP through the HP Printing Supplies Returns and Recycling Program. An easy-to-use and free take back program is available in more than 30 countries/regions. Multi-lingual program information and instructions are included in every new HP LaserJet print cartridge and supplies package.

HP printing supplies returns and recycling program information

Since 1992, HP has offered HP LaserJet supplies return and recycling free of charge in 86% of the world market where HP LaserJet supplies are sold. Postage-paid and pre-addressed labels are included within the instruction guide in most HP LaserJet print cartridge boxes. Labels and bulk boxes are also available through the website: <http://www.hp.com/recycle>.

More than 10 million HP LaserJet print cartridges were recycled globally in 2002 through the HP Planet Partners supplies recycling program. This record number represents 26 million pounds of print cartridge materials diverted from landfills. Worldwide, HP recycled an average of 80% of the print cartridge by weight consisting primarily of plastic and metals. Plastics and metals are used to make new products such as HP products, plastic trays and spools. The remaining materials are disposed of in an environmentally responsible manner.

U.S. recycling returns

For a more environmentally responsible return of used cartridges and supplies, HP encourages the use of bulk returns. Simply bundle two or more cartridges together and use the single, pre-paid, pre-addressed UPS label that is supplied in the package. For more information in the U.S., call 800-340-2445 or visit the HP website at <http://www.hp.com/recycle>.

Non-U.S. recycling returns

Non-US customers should visit the <http://www.hp.com/recycle> website for further information regarding availability of the HP Supplies Returns and Recycling program.

Paper

This product is capable of using recycled papers when the paper meets the guidelines outlined in the *Print Media Guide*. See [Ordering supplies](#) for ordering information. This product is suitable for the use of recycled paper according to EN12281:2002.

Material restrictions

This HP product does not contain batteries.

For more information

To obtain information about these environmental topics:

- Product environmental profile sheet for this and many related HP products
- HP's commitment to the environment
- HP's environmental management system

- HP's end-of-life product return and recycling program
- Material safety data sheets

Visit: <http://www.hp.com/go/environment> or <http://www.hp.com/hpinfo/community/environment/productinfo/safety>.

Material safety data sheet

Material Safety Data Sheets (MSDS) for supplies containing chemical substances (for example, toner) can be obtained by contacting the HP website at: <http://www.hp.com/go/msds> or <http://www.hp.com/hpinfo/community/environment/productinfo/safety>.

C

Warranty and licensing

Hewlett-Packard limited warranty statement

HP PRODUCT
HP LaserJet 1020 series printer

DURATION OF LIMITED WARRANTY
One-year limited warranty

HP warrants to you, the end-user customer, that HP hardware and accessories will be free from defects in materials and workmanship after the date of purchase, for the period specified above. If HP receives notice of such defects during the warranty period, HP will, at its option, either repair or replace products which prove to be defective. Replacement products may be either new or equivalent in performance to new.

HP warrants to you that HP software will not fail to execute its programming instructions after the date of purchase, for the period specified above, due to defects in material and workmanship when properly installed and used. If HP receives notice of such defects during the warranty period, HP will replace software which does not execute its programming instructions due to such defects.

HP does not warrant that the operation of HP products will be uninterrupted or error free. If HP is unable, within a reasonable time, to repair or replace any product to a condition as warranted, you will be entitled to a refund of the purchase price upon prompt return of the product.

HP products may contain remanufactured parts equivalent to new in performance or may have been subject to incidental use.

Warranty does not apply to defects resulting from (a) improper or inadequate maintenance or calibration, (b) software, interfacing, parts or supplies not supplied by HP, (c) unauthorized modification or misuse, (d) operation outside of the published environmental specifications for the product, or (e) improper site preparation or maintenance.

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TO THE EXTENT ALLOWED BY LOCAL LAW, THE REMEDIES IN THIS WARRANTY STATEMENT ARE YOUR SOLE AND EXCLUSIVE REMEDIES. EXCEPT AS INDICATED ABOVE, IN NO EVENT WILL HP OR ITS SUPPLIERS BE LIABLE FOR LOSS OF DATA OR FOR DIRECT, SPECIAL, INCIDENTAL, CONSEQUENTIAL (INCLUDING LOST PROFIT OR DATA), OR OTHER DAMAGE, WHETHER BASED IN CONTRACT, TORT, OR OTHERWISE. Some countries/regions, states or provinces do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you.

THE WARRANTY TERMS CONTAINED IN THIS STATEMENT, EXCEPT TO THE EXTENT LAWFULLY PERMITTED, DO NOT EXCLUDE, RESTRICT OR MODIFY AND ARE IN ADDITION TO THE MANDATORY STATUTORY RIGHTS APPLICABLE TO THE SALE OF THIS PRODUCT TO YOU.

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D

HP parts and accessories

This appendix provides information on the following topics:

- [Ordering supplies](#)
- [10/100 networking and wireless print servers](#)
- [Using HP print cartridges](#)

Ordering supplies

You can increase the printer's capabilities with optional accessories and supplies. Use accessories and supplies specifically designed for the HP LaserJet 1020 series printer to ensure optimum performance.

NOTE

The HP LaserJet 1020 series printer includes the HP LaserJet 1022, 1022n, and 1022nw printer models.

Ordering information

	Item	Description or use	Order number
Printing supplies	HP Multipurpose paper	HP brand paper for a variety of uses (1 box of 10 reams, 500 sheets each). To order a sample, in the U.S., call 800-471-4701.	HPM1120
	HP LaserJet paper	Premium HP brand paper for use with HP LaserJet printers (1 box of 10 reams, 500 sheets each). To order a sample, in the U.S., call 800-471-4701.	HPJ1124
	HP LaserJet transparency film	HP brand transparency film for use with HP LaserJet monochrome printers.	92296T (letter) 92296U (A4)
Print cartridges for the HP LaserJet 1020 series printer	Print cartridges	Replacement print cartridges for the HP LaserJet 1020 series printer. 2,000 page cartridge See Print cartridge life expectancy for more information	Q2612A
Supplementary documentation	<i>HP LaserJet printer family print media guide</i>	A guide to using paper and other print media with HP LaserJet printers.	5851-1468

NOTE

This document can be downloaded from <http://www.hp.com/support/ljpaperguide/>.

Ordering information (continued)

	Item	Description or use	Order number
Replacement parts	Media pickup roller	Used to pick the media from the input tray and advance it through the printer.	RL1-2066
	Separation pad for the printer	Used to keep multiple sheets from feeding through the printer path.	RL1-0269
	Input tray cover	Used to cover the media in the input tray.	0025B001AA

10/100 networking and wireless print servers

HP LaserJet 1022n

Item and description	Order number
HP Jetdirect 380x 802.11b wireless external print server (full-featured, USB port)	J6061A

Using HP print cartridges

The following sections provide information about HP print cartridges and instructions for redistributing toner and changing the print cartridge.

HP policy on non-HP print cartridges

Hewlett-Packard Company cannot recommend the use of non-HP print cartridges, either new, refilled, or remanufactured. Since they are not HP products, Hewlett-Packard cannot influence their design or control their quality. Service or repair that is required as a result of using non-HP print cartridges will not be covered under the printer warranty.

NOTE

The warranty does not apply to defects resulting from software, interfacing, or parts not supplied by Hewlett-Packard.

Storing print cartridges

Do not remove the print cartridge from its package until you are ready to use it.

CAUTION

To prevent damage to the print cartridge, minimize its exposure to direct light.

Some HP LaserJet print cartridge packages are stamped with an alphanumeric date code. This code represents a 30-month period beyond the date of production that facilitates efficient inventory management processes between HP and its resellers. It does not serve as an indication of toner life (shelf-life) or relate in any way to warranty terms and conditions.

Print cartridge life expectancy

The life of the print cartridge depends on the amount of toner that your print jobs require. When printing text at approximately 5% coverage, the print cartridge for the HP LaserJet 1020 series printer lasts for an average of 2,000 pages.

NOTE

It is possible that the toner supply will outlast the mechanical parts in the print cartridge. If the print quality begins to degrade under these circumstances, you must install a new print cartridge, even if there is toner supply remaining in the cartridge.

This life expectancy assumes that you set the print density to 3 and turn EconoMode off. (These are the default settings.)

Saving toner

While in EconoMode, the printer uses less toner on each page. Selecting this option will extend the life of the print cartridge and reduce your cost per page, but it will reduce print quality. HP does not recommend the full-time use of EconoMode.

E

Service and support

This appendix provides information on the following topics:

- [Hardware service](#)
- [Extended warranty](#)
- [Guidelines for repacking the printer](#)
- [How to contact HP](#)

Hardware service

If your hardware fails during the warranty period, Hewlett-Packard offers the following support options:

- **Hewlett-Packard repair services:** Hewlett-Packard will arrange to pick up the unit, repair it, and return it to you within 5 to 10 days, depending on your location.
- **Hewlett-Packard authorized service provider:** You can return the unit to a local authorized service dealer.

Extended warranty

HP SupportPack provides coverage for the HP hardware product and all HP supplied internal components. The hardware maintenance covers a three-year period from date of the HP product purchase. The customer must purchase HP SupportPack within 90 days of the HP product purchase. For more information, contact the HP Customer Care Service and HP Customer Support group. See [Quick access to more information](#).

Guidelines for repacking the printer

Use the following guidelines when repacking the printer:

- Remove and keep the print cartridge. If the print cartridge is left in the printer, severe damage to the printer may occur.

CAUTION

To prevent damage to the print cartridge, store the print cartridge in its original packing material, or store it so that it is not exposed to light.

- If possible, use the original shipping container and packing material. *Shipping damage as a result of inadequate packing is your responsibility.* If you have already disposed of the printer's packing material, contact a local mailing service for information on repacking the printer.
- Remove and keep any cables, trays, and optional accessories installed in the printer.
- If possible, include print samples and 5 to 10 sheets of paper or other media that did not print correctly.
- Hewlett-Packard recommends that you insure the equipment for shipment.

How to contact HP

If you need to contact HP for service or support, use one of the following links:

- In the United States, see <http://www.hp.com/support/lj1022/> for the HP LaserJet 1020 series printer.

NOTE

The HP LaserJet 1020 series printer includes the HP LaserJet 1022, 1022n, and 1022nw printer models.

- World Wide, see <http://welcome.hp.com/country/us/en/wwcontact.html/> or <http://www.hp.com/>.

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Q5912-90911

APPENDIX E

Passwords and IP Addresses

Appendix E

IP ADDRESSES AND PASSWORDS

In this document is all the supplemental information related to devices in the TMC Simulator at UCI.

1. CONTROL ROOM (RM. 520)

1.1 Omni-PC

IP Address: 192.168.251.8

Login: [Auto-login]

1.2 Paramics PC

IP Address: 192.168.251.45

Login: Paramics

Password: param23

1.3 CAD Station #1 (TMCSIM_01)

Ethernet IP Address: 192.168.251.13

Login: [Auto-login]

1.4 CAD Station #2 (TMCSIM_02)

Ethernet IP Address: 192.168.251.5

Login: [Auto-login]

1.5 ATMS Workstation

Ethernet IP Address: 192.168.251.31

Login: ucioper

Password: uci_oper

1.6 ii3 Ethernet Intercom

Ethernet IP Address: 192.168.251.11

1.7 HP 1022N Printer

Ethernet IP Address: 192.168.251.16

Appendix E
IP ADDRESSES AND PASSWORDS

2. CLASS ROOM (RM. 506)

2.1 ATMS Workstation #1

IP Address: 192.168.251.30

Login: ucioper

Password: uci_oper

2.2 MIO

IP Address: 192.168.251.35

Login: paramics

Password: param23

2.2 ATMS Workstation #2

IP Address: 192.168.251.29

Login: ucioper

Password: uci_oper

2.3 Caltrans Radio Dispatch

Left PC

IP Address: 192.168.251.???

Login: paramics

Password: param23

Right PC

IP Address: 192.168.251.43

Login: paramics

Password: param23

2.4 CHP CAD #1

IP Address: 192.168.251.33

Login: paramics

Password: param23

2.5 Activity Log

IP Address: 192.168.251.34

Login: paramics

Password: param23

Appendix E
IP ADDRESSES AND PASSWORDS

2.6 CHP CAD #2

IP Address: 192.168.251.41

Login: paramics

Password: param23

2.8 ii3 Intercom

IP Address: 192.168.251.12

3. SERVER ROOM (RM. 516)

3.1 ATMS Server

IP Address: 192.168.251.27

3.2 Lantronix ETS-16 Serial Server

IP Address: 192.168.251.9

Password: system

3.3 3com V3000 NBX

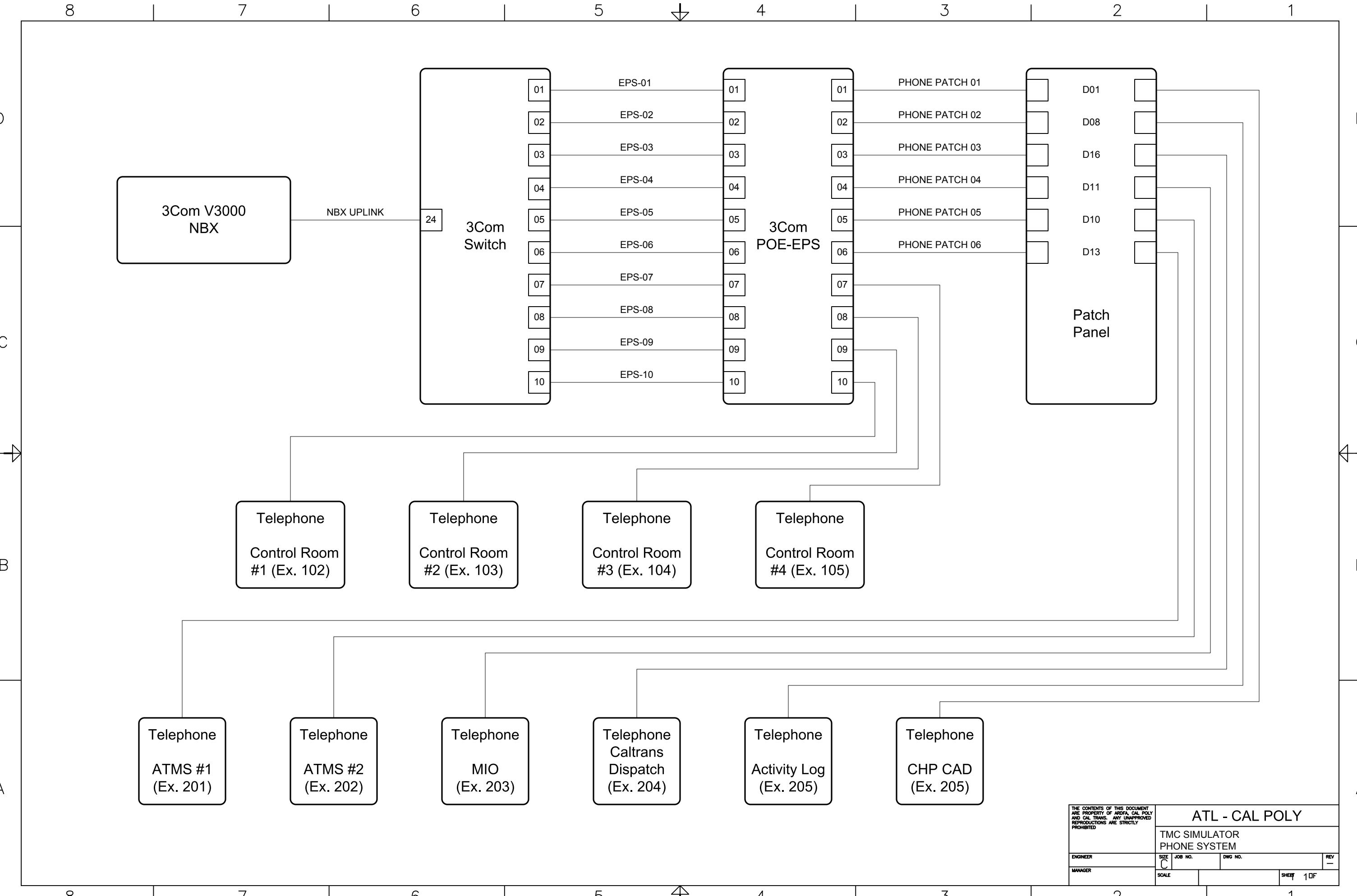
IP Address: 192.168.1.190 (Isolated Network)

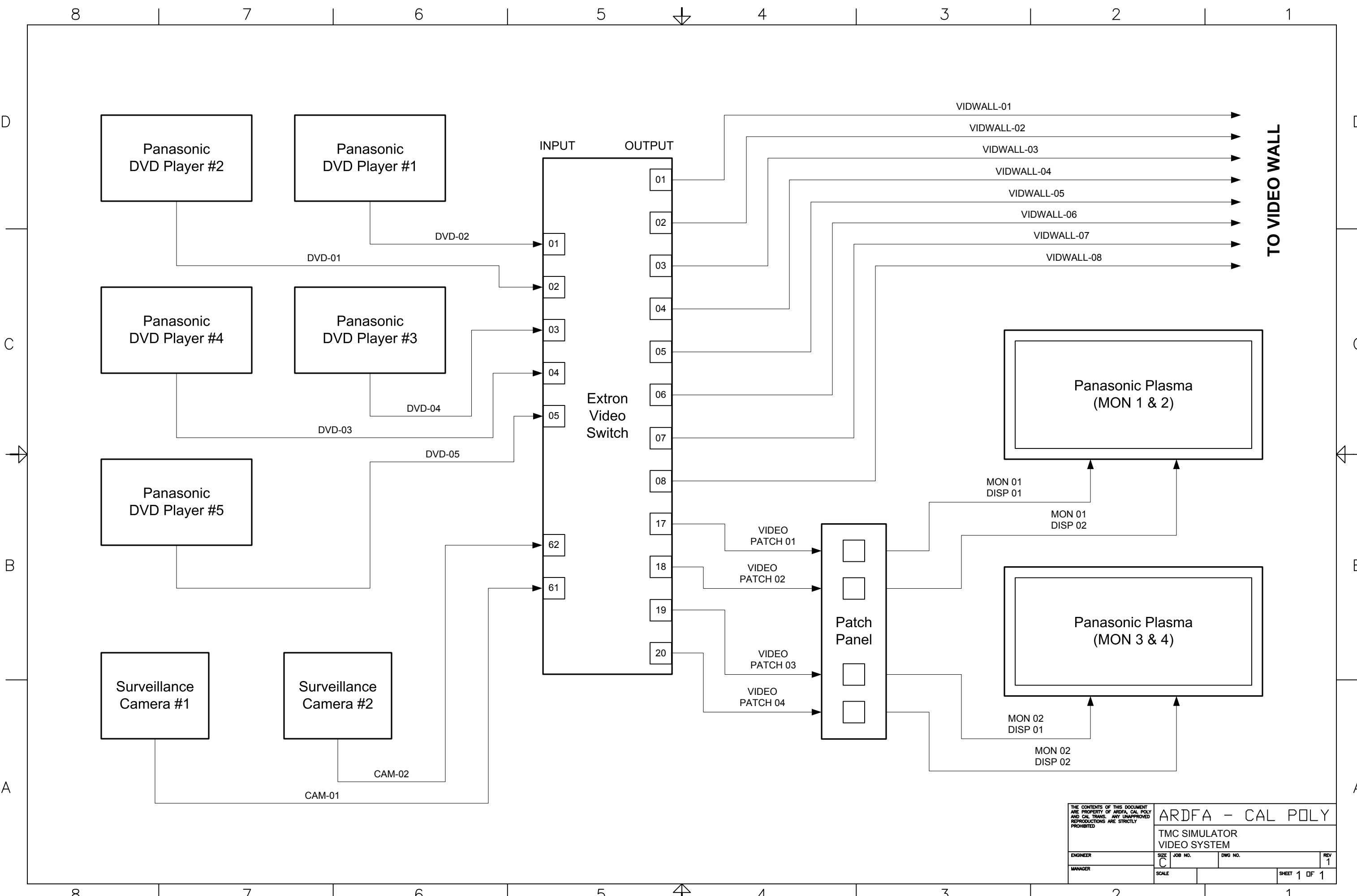
Login: administrator

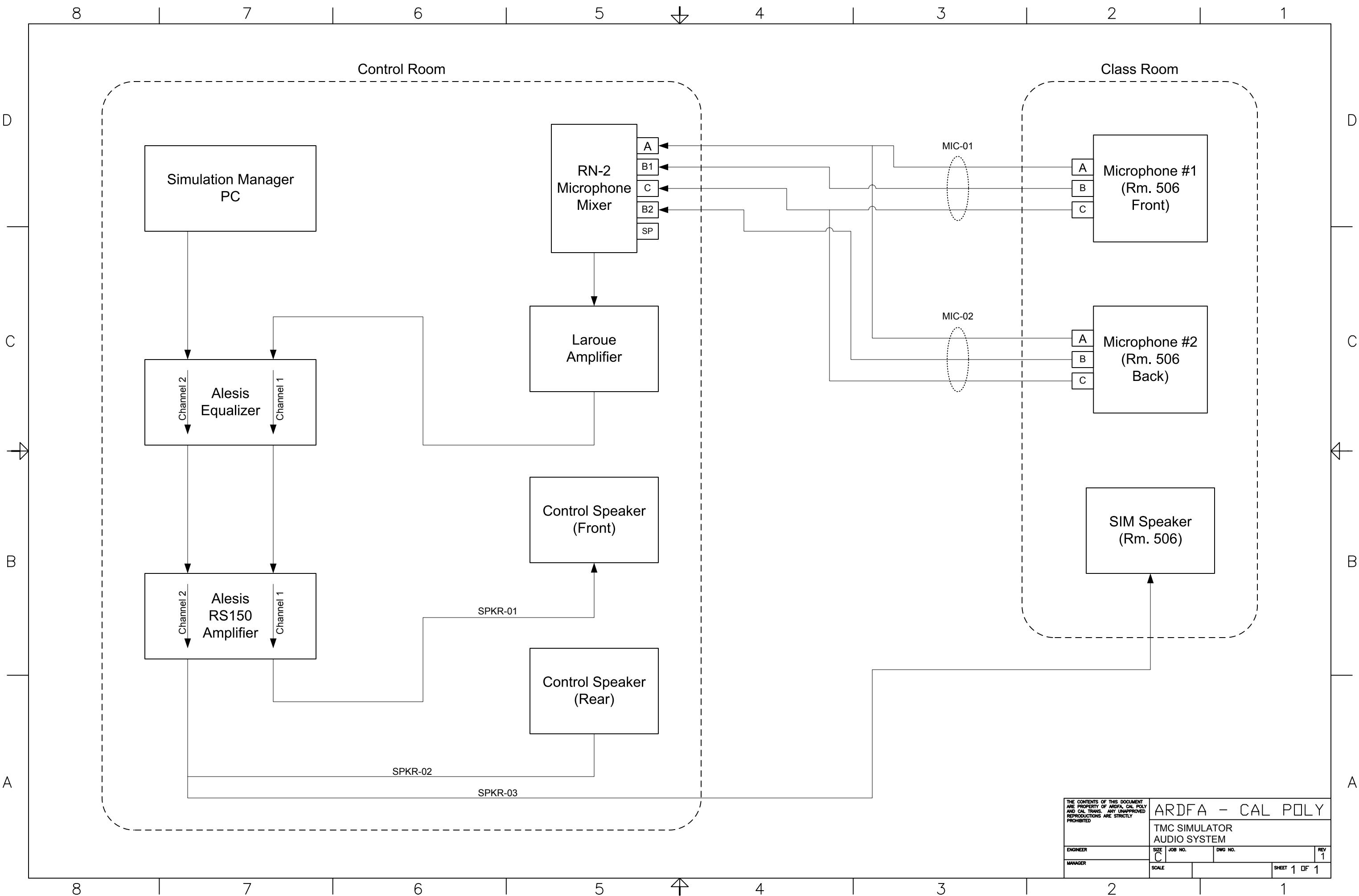
Password: 0000

APPENDIX F

Wiring Diagrams







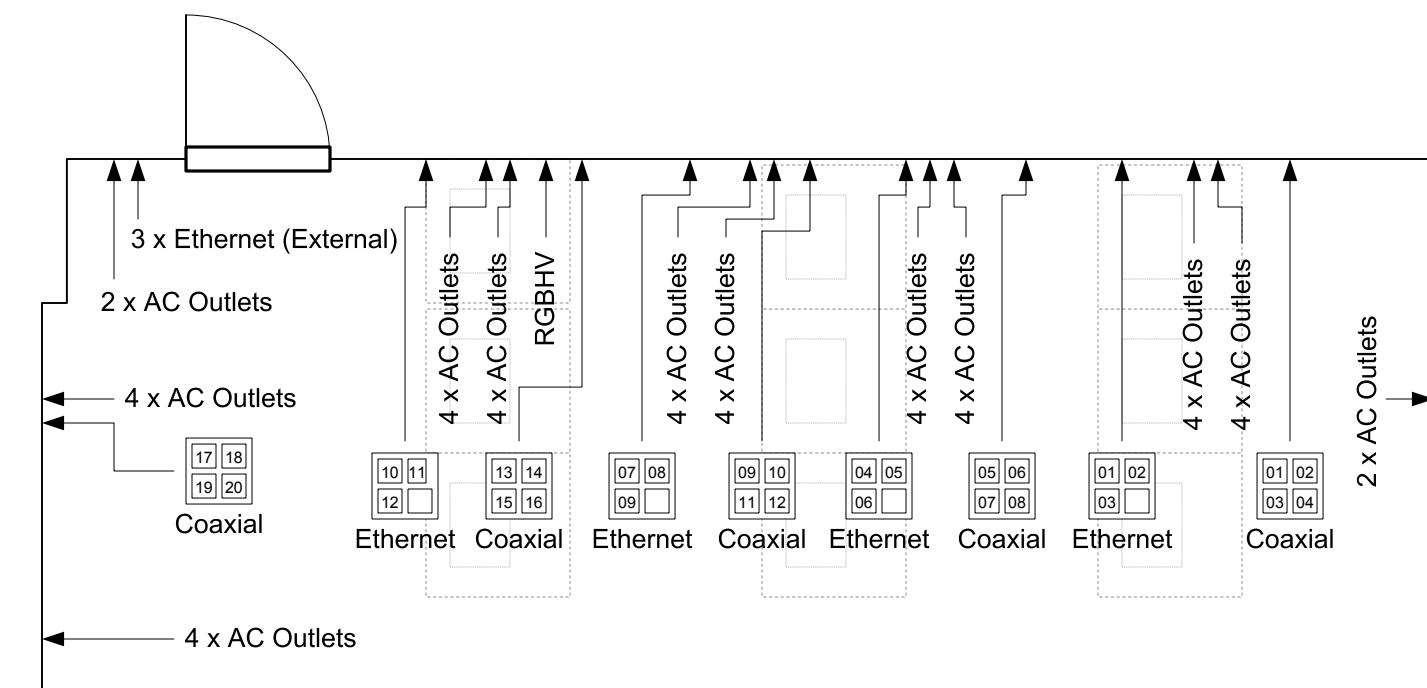
8 | 7 | 6 | 5 | 4 | 3 | 2 | 1

D

Ethernet Use

- D01 - TMCSIM Telephone #206
- D02 - Workstation
- D03 -
- D04 - Workstation
- D05 - Workstation
- D06 -
- D07 - Workstation
- D08 - TMCSIM Telephone #205
- D09 -
- D10 - TMCSIM Telephone #202
- D11 - TMCSIM Telephone #203
- D12 - Hub
- D13 - TMCSIM Telephone #201
- D14 - Hub
- D15 - Hub
- D16 - TMCSIM Telephone #204
- D17 - Workstation
- D18 -

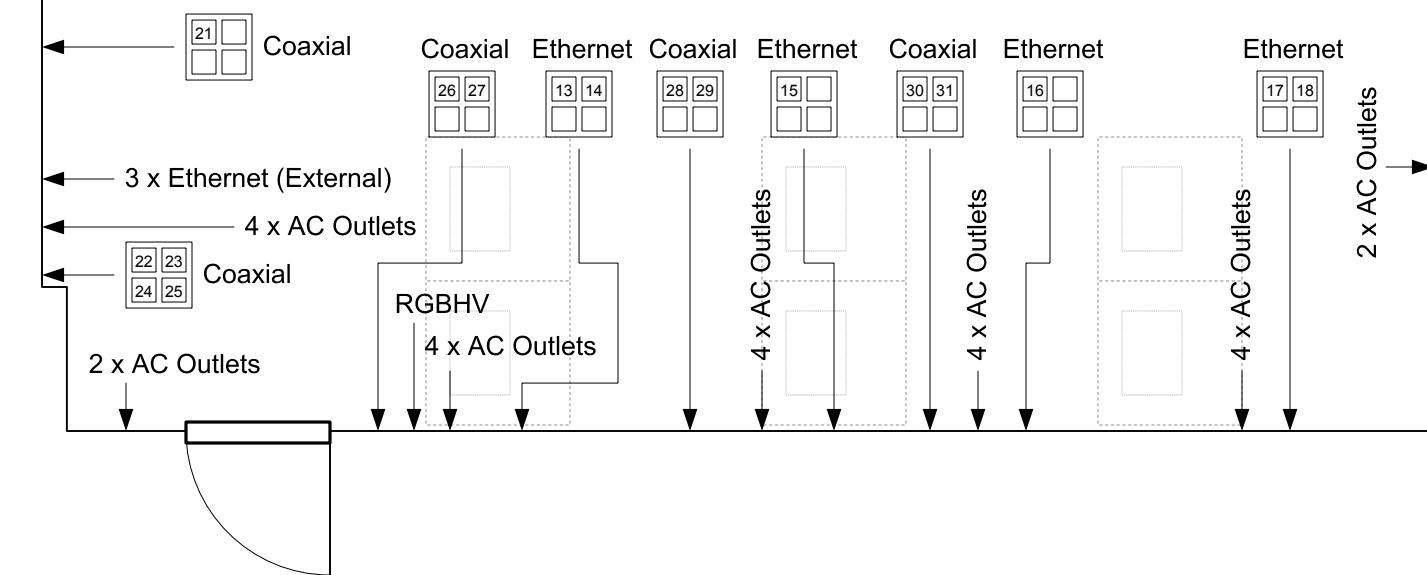
C



B

- #### Coaxial Use
- | | |
|-------|-----------------------------|
| D01 - | D17 - |
| D02 - | D18 - |
| D03 - | D19 - Right Plasma, Input 2 |
| D04 - | D20 - Right Plasma, Input 1 |
| D05 - | D21 - |
| D06 - | D22 - Left Plasma, Input 1 |
| D07 - | D23 - Left Plasma, Input 2 |
| D08 - | D24 - |
| D09 - | D25 - |
| D10 - | D26 - |
| D11 - | D27 - |
| D12 - | D28 - |
| D13 - | D29 - |
| D14 - | D30 - |
| D15 - | D31 - |
| D16 - | |

A



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TMC SIMULATOR		UCI Testbed: Room 506		
ENGINEER	SIZE	JOB NO.	DWG NO.	REV
MANAGER	SCALE		SHEET	OF

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