Using the 3270 Terminal Emulator

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November, 1998

Revision History

Revision history of this document:

Part Number	Revision Date	Description
9300677 Rev A	November, 1998	Added NCDware 5.1 features
9300380 Rev A	December, 1995	Added NCDware 4.1 and 3.5 features
9300359 Rev A	July, 1995	Changed binding; no technical changes.
9300281 Rev A	April, 1994	Initial publication of guide.

Before You Begin

Intended Audience

This document is for system administrators who install and maintain NCD terminals and for users of the 3270 emulator and the Keymap Editor.

Using this Manual

The following table lists the most commonly performed tasks described in this manual.

To Perform this Task...	See...
Getting a general description of emulator and Keymap Editor features	Chapter 1, Introduction
Setting up terminals to run the emulator	Chapter 2, Preparing Terminals and Hosts for Emulator Use
Installing NCDware	*NCDware Release Notes* and the NCDware CD insert
Getting information about basic emulator usage	Chapter 3, Getting Started with Emulator Usage
Starting an application	Chapter 3, Getting Started with Emulator Usage
Customizing emulator windows	Chapter 4, Using and Customizing the 3270 Emulator
Configuring the 3270 Host Chooser	Chapter 4, Using and Customizing the 3270 Emulator

To Perform this Task...	See...
Using the Keymap Editor	Chapter 4, Using and Customizing the 3270 Emulator
Using the 3287 print emulator and printing from 3270 emulator menus	Chapter 4, Using and Customizing the 3270 Emulator
Creating customized menus for starting applications and configuring the window manager to start automatically	Chapter 5, Using and Customizing the Local NCD Window Manager
Customizing application sessions using either record and play back macros or the EHLLAPI programmatic interface	Chapter 6, Application Programming Interface Methods
Finding the reason for an error message or contact NCD Technical Support	Chapter 7, Troubleshooting
Finding reference information about emulator menus	Appendix A
Finding reference information about emulator command-line options and X resources	Appendix B
Finding man pages for the 3270 emulator, the 3287 print emulator, and the Keymap Editor	Man pages are installed when you install NCDware
Finding definitions of words and concepts	Glossary

Text Conventions

This document uses the following conventions:

Ctrl-Z   indicates that you should press two keys at the same time; in this case the Ctrl key and Z.

⇒   indicates movement through menus. For example, the phrase "In the Console, select Statistics ⇒ Show Version" means that you display the Statistics menu and select the Show Version menu item.

bold   indicates a directory, file, or remote configuration parameter, such as **/tftpboot**, or **boot-automatically**.

bold italic   indicates a variable or a utility, such as **Xncd***xxx* where *xxx* indicates the variable portion.

italic   indicates emphasis or the name of a publication, such as *Using the 3270 Terminal Emulator.*

`courier`   indicates information displayed on the screen or entries in a file.

`bold courier`   indicates information you should type.

Where to Find More Information

For a list of publications about using NCDware and NCD terminals, see the *NCDware Release Notes* or the *Roadmap* accompanying your software.

NCD Technical Support is another source of information and help. For instructions on how to reach Technical Support, see Chapter 7.

For sources of information about the X Window System, see the Bibliography.

Comments on the Manual

You can send comments, suggestions, or questions about this document to the NCD Technical Publications Department by Internet e-mail. Write to **techpubs@ncd.com**.

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1 Introduction

This chapter introduces NCD terminals and *ncd3270*, NCD's 3270 terminal emulator.

NCD Terminals and the 3270 Emulator

An NCD terminal consists of a bit-mapped graphical display monitor, a keyboard and mouse for user input, and a base containing processors that run the X server (the software that controls terminal hardware and communicates with the network). NCD terminals permit quick and easy connection to Ethernet or Token-Ring networks.

Terminals running *ncd3270* provide access to applications on IBM mainframes (and on other hosts that run IBM software) while allowing simultaneous access to applications running on UNIX systems and on Microsoft Windows NT systems. Each application displays in its own window.

The *ncd3270* emulator is a local X client (application program) that is integrated into the X server. The local client echoes keystrokes to the display and performs locally all of the functions normally performed by a 3278 terminal.

Users of traditional 3278 terminals see a recognizable interface and easy-to-use features. Using a mouse and pulldown menus, users can open multiple 3270 windows (up to 16 at a time) and set options for each window.

System administrators can arrange for emulator windows to open automatically when the terminal starts, customize emulator windows, and configure menus for selecting multiple customized emulator windows or other applications.

Besides the 3270 terminal emulator, NCDware includes a local VT320 terminal emulator.

Features of the 3270 Emulator

This section describes features of the NCD 3270 terminal emulator.

Color Modes, Case Modes, and Extended Attributes

The NCD 3270 terminal emulator is fully compatible with IBM 3278 terminals, including:

❏ Extended attributes: blinking, reverse video, and underlining

❏ Full-color mode (8 and 16 colors), base-color mode, and monochrome or reverse video

❏ Full choice of colors

❏ Mixed-case and uppercase mode

Easy Access to Emulator Features

The 3270 emulator offers users easy access to its features:

❏ 3179 emulation (accessed through a separate Console menu item from the standard version of the 3270 emulator) for IBM mainframe graphics (Graphical Data Display Manager) applications

❏ Cut-and-paste or copy-and-paste within a 3270 emulator window, between 3270 emulator windows, and between a 3270 window and other programs. The user can cut or copy and paste by line, by input fields, or by rectangular regions of the window.

❏ A mouse-activated Key Pad that allows easy access to IBM keyboard functions from any NCD keyboard

❏ Optional 3270 keyboard

❏ Menu access to record and playback macros for mainframe application session management

❏ Simple terminal configuration for EHLLAPI usage

❏ An enhanced local status line (operator information area), displaying the status of the host connection, including error codes and other information that appears in a 3278 terminal's status line

❏ System request and attention key for session switching and requesting an LU (logical unit) session from the mainframe

❏ Dynamic resizing of fonts. An emulator window of any size always contains a properly scaled, full 3270 display screen. Each emulator window represents a full terminal session, whether it is full screen or some other size.

❏ 3270 Host Chooser for easy selection of application hosts

❏ Pulldown menus for access and print options, including:

— Connection, reconnection, and disconnection from application hosts

— 3278 model selection (2, 3, 4, and 5)

— Printing the window contents to a local or remote ASCII, Postscript, or Windows NT Postscript printer

❏ Pulldown menus for changing window options:

— Cut-and-paste or copy-and-paste styles

— Color modes

— Case modes

— Light pen (using the mouse as a light pen selector)

❏ Pulldown menus for the Key Pad and Keymap Editor

❏ 3287 emulator, including window access for printer selection and process termination, for printing from a mainframe to a printer on a local or a remote terminal

Ease of Administration

Features that make the 3270 emulator easy to manage are:

❏ Built-in network interfaces for Ethernet or Token-Ring networks and direct connection through the Telnet 3270 protocol or the Brixton PU2.1 SNA protocol over TCP/IP

❏ Booting from a network host or a local PC card

❏ Configurable 3270 Host Chooser

❏ Custom application menus through a local or a host-based window manager

❏ Dynamic and permanent keyboard remapping

❏ Ability to start the emulator from menus, command lines, and terminal configuration files

❏ Complete configurability through command-line options and X resources

Easy, Flexible Keyboard Use

When the emulator starts, it automatically maps IBM functions to any NCD keyboard. Users can access IBM keyboard functions from the keyboard or from the Key Pad.

An optional 3270 Lexmark keyboard makes the user interface more comfortable for users of traditional 3278 terminals. This is the same keyboard used by IBM for its 3270-style terminals.

The Keymap Editor provides a graphical method of assigning 3270 functions to any keyboard keys. You remap the keyboard through simple drag-and-drop operations with the mouse. An advanced mode offers complete flexibility and custom functions by providing a graphical interface to the complete X Window System key translation facility.

Keymap information can be maintained in files and applied to emulator windows automatically when the window opens. This allows key layouts to be customized per application, per user, and per site.

You can apply existing Brixton keymap files (version 1.2 only) to your emulator windows.

Local Window Management

The local NCD Window Manager (*ncdwm*) allows the user to manipulate multiple windows (resizing, moving, raising, and lowering). If you prefer, you can run your customary host-based window manager. You can use local Motif Window Manager if you have a license for it.

Using a local window manager or a host-based window manager, you can configure custom menus to offer users easy access to applications.

Application Programming Interface

Record and Playback Macros

To simplify management of mainframe application sessions, the 3270 emulator includes a macro language, accessible through the Macro menu, for recording and playing back sessions.

Chapter 6, Application Programming Interface Methods describes record and playback macros.

EHLLAPI

EHLLAPI (Extended High-Level Language Application Program Interface) is a programmatic interface to IBM host applications for 3270 terminals, used for writing emulator drivers in the C programming language.

Chapter 6 describes how to configure the terminal for EHLLAPI usage. The Brixton *EHLLAPI Programmatic Interface Manual* describes EHLLAPI usage in detail.

3270 Features Not Included

The *ncd3270* terminal emulator does not include file transfer through the emulator.

2 Preparing Terminals and Hosts for Emulator Use

This chapter contains information about the following system administration tasks:

❏ Making sure your terminals have sufficient memory to run the 3270 terminal emulator; you need the *NCDware Release Notes* for this task

❏ Licensing each terminal for 3270 emulation

❏ Setting up terminals and connecting them to an Ethernet or Token-Ring network

❏ Installing X servers on a network host accessible to the terminals and configuring terminals; you need the NCDware CD insert for this task

❏ Making sure that terminals can communicate with hosts

Supported Terminals and Memory Requirements

The *NCDware Release Notes* list the minimum terminal memory requirements.

License Requirements

A 3270 license is required for each terminal running the *ncd3270* emulator. Only one license is required per terminal, no matter how many emulator windows are opened.

Terminal Setup and Network Connection

Make sure your terminals are set up and attached to an Ethernet or Token-Ring network as described in the hardware booklet included with each terminal.

X Server Installation

You must have X servers installed on a network host before the terminal can boot (start up). See the *NCDware Release Notes* for descriptions of the X server and requirements for installation hosts. See the NCDware CD insert for software installation instructions.

You must install an X server on a host computer whether you intend to boot from the network or from a PC card.

The installation host must have the following protocol(s) enabled for downloading a server to the terminal or copying a server to a PC card:

❏ The usual protocol for downloading a server is TFTP (Trivial File Transfer Protocol). Terminals with Boot Monitor Version 2.6 or later can use NFS (Network File System) as well as TFTP for downloading a server.

❏ The protocols for copying a server from the installation host to a terminal's PC card are TFTP or NFS.

Host Computer Connection

TN3270
The TN3270 protocol is defined in the public domain, and products are widely available (for example, Brixton's BrxTN3270 Server).

The 3270 emulator uses the TN3270 protocol or the BrxPU2.1 SNA (Systems Network Architecture) protocol over TCP/IP to access applications running on a mainframe or midrange application host.

Connection Methods

There are four ways of connecting to an application host to run 3270 applications (Figure 2-1):

❏   The terminal connects directly to an application host on an Ethernet or Token-Ring network running TCP/IP. The application host must be running TCP/IP and TN3270. For example, you can connect directly to an application host running MVS TCP/IP.

BrxPU2.1
Brixton's PU2.1 SNA gateway software, providing a physical connection to the SNA network.

❏   The terminal connects to a general-purpose UNIX host computer (for example, an IBM RS/6000) on an Ethernet or Token-Ring network running TCP/IP. This host must be configured to serve as an SNA gateway and must run Brixton's BrxPU2.1 SNA software. In addition, the terminal must be configured for the BrxPU2.1 connection.

❏   The terminal connects to a general-purpose UNIX host computer (for example, an IBM RS/6000) on an Ethernet or Token-Ring network running TCP/IP and TN3270. This host (or another) can also be running the SNA gateway, such as the BrxPU2.1 server.

❏   The terminal connects to a special-purpose TELNET server host, such as an IBM 3172 LAN controller, on an Ethernet or Token-Ring network running TCP/IP.

In the first three connection options, the TN3270 server runs on the mainframe or on another host serving as an SNA gateway to the mainframe. A gateway host can be a general-purpose UNIX computer or a special-purpose host, such as an IBM 3172 LAN controller. The gateway converts SNA to TCP/IP.

Preparing Terminals and Hosts for Emulator Use **2-3**

In the fourth option, SNA runs on the main-frame, connecting to a general-purpose UNIX computer that is serving as a BrxPU2.1 SNA gateway. It appears to the mainframe that it is communicating directly to the terminals, allowing you to manage the terminals centrally from the mainframe.
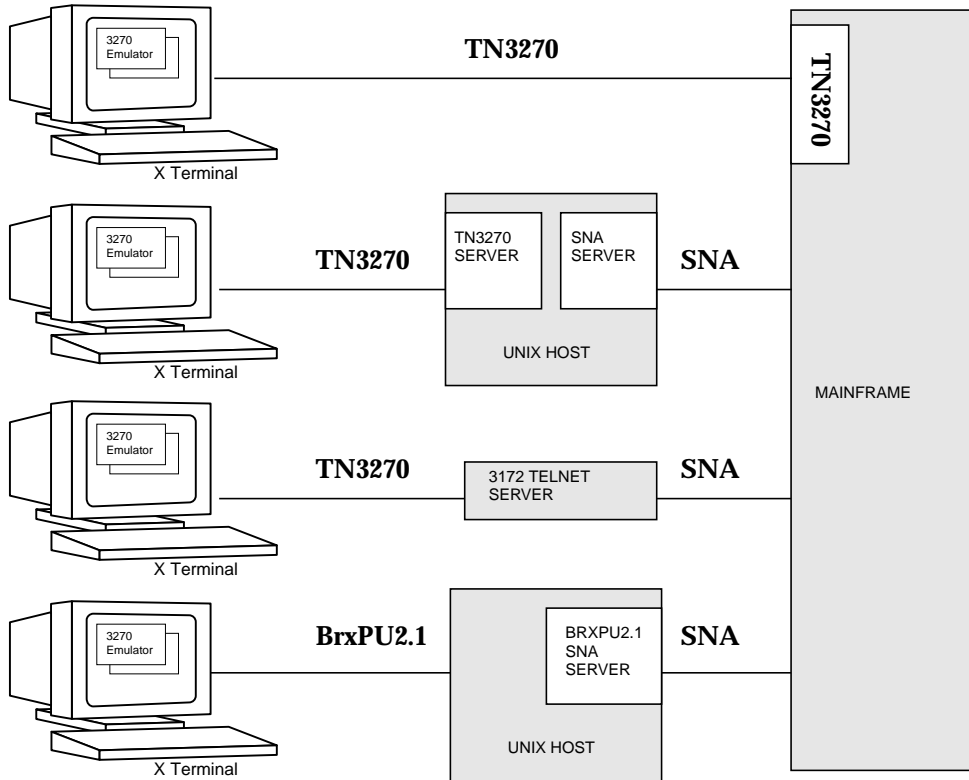
Figure 2-1 Connecting to a Host

Host Configuration

The configuration tasks necessary on an application host, gateway, or interconnect controller to support 3270 emulators are the same as the tasks for host-based 3270 emulators or 3278 terminals. See the documentation provided by the vendor of your TN3270 server software or Brixton SNA software.

Terminal Configuration for Connecting to a 3270 Host

To configure a terminal to connect to a 3270 application host, you may need to alter the default terminal configuration to establish the connection. The configuration steps include specifying:

❏ The protocol to use for connecting to the host

❏ The host to which the terminal should seek a connection

❏ The port to use for connecting to the host

If you are not familiar with methods of configuring terminals, see the *NCDware System Administrator's Guide* for more information.

Configuring a Terminal for TN3270

To connect to the host via TN3270 over TCP/IP, you do not need to alter the protocol specification. The default configuration uses TN3270.

The default settings establish a TN3270 connection via port number 23.

Tip
To specify the default host in a remote configuration file, use the **ncd3270-tn-default-host** parameter.

To specify an application host to which the terminal connects by default:

1. Select Setup ⇒ Change Setup Parameters ⇒ 3270 Terminal Emulation ⇒ TN3270 Default Host.

2. Click in the TN3270 Default Host field, delete the existing entry if there is one, and type the name or IP address of the host to which you want to connect.

3. Click Apply to apply the change for the current session.

Tip
To specify the default port in a remote configuration file, use the **ncd3270-tn-default-port** parameter.

To change the port used for the TN3270 connection:

1. Select Setup ⇒ Change Setup Parameters ⇒ 3270 Terminal Emulation ⇒ TN3270 Default tcp Port.

2. Click in the TN3270 Default tcp Port field and type the port number you want to use.

3. Click Apply to apply the change for the current session.

Configuring a Terminal for BrxPU2.1

Tip
To specify the default protocol in a remote configuration file, use the **ncd3270-default-protocol** parameter.

To connect to the host via the BrxPU2.1 SNA protocol over TCP/IP, you must specify BrxPU2.1 as the default protocol to use:

1. Select Setup ⇒ Change Setup Parameters ⇒ 3270 Terminal Emulation ⇒ NCD3270 Default Protocol.

2. Select `PU2.1` from the `NCD3270 Default Protocol` drop-down list.

3. Click `Apply` to apply the change for the current session.

Tip
To specify the default host in a remote configuration file, use the **ncd3270-pu21-default-host** parameter.

To specify the application host to which the terminal connects by default:

1. Select Setup ⇒ Change Setup Parameters ⇒ 3270 Terminal Emulation ⇒ PU2.1 Default Host.

2. Click in the `PU2.1 Default Host` field, delete the existing entry if there is one, and type the name or IP address of the application host to which you want to connect.

3. Click `Apply` to apply the change for the current session.

Tip
To specify the default port in a remote configuration file, use the **ncd3270-pu21-default-port** parameter.

The default port is 5020. To change the port used for the BrxPU2.1 connection:

1. Select Setup ⇒ Change Setup Parameters ⇒ 3270 Terminal Emulation ⇒ PU2.1 Default tcp Port.

2. Click in the `PU2.1 Default tcp Port` field and type the port number you want to use.

3. Click `Apply` to apply the change for the current session.

3 Getting Started with Emulator Usage

This section describes how to get the 3270 emulator running and connected to the application host.

The major steps are:

❏ Booting the terminal

❏ Starting the 3270 emulator

❏ Starting the local window manager (optional)

❏ Connecting to a host computer

❏ Using basic emulator and terminal features

❏ Disconnecting from the mainframe when you are finished with the application

❏ Terminating the 3270 emulator

Using the Mouse

Many of the procedures in this manual require the use of the mouse. Table 3-1 describes the different types of mouse actions.

Use mouse button 1 unless another button is specified. Mouse button 1 is the *left* mouse button unless the mouse has been reconfigured.

Table 3-1 Mouse Actions

Action	Description
Click	Move the mouse so the pointer is on the area you want to affect. Quickly press and release a button.
	For example, when using a window manager, clicking the left button in a window is the default method to specify the *active* window. The active window is the window that receives your input.
Double click	Click a mouse button twice quickly.

Table 3-1 Mouse Actions (Continued)

Action	Description
Press	Press a mouse button and hold it down for a while before releasing it.
Drag	Press a mouse button and move the mouse while holding the button down. For example, dragging is used with a window manager to move a window to a new location.
Release	Remove your finger from a mouse button to complete the action.

Booting the Terminal

Booting the terminal causes the X server to be loaded and executed.

To boot (start up) an NCD terminal:

1. If the terminal is turned off, turn on the power switch.

2. If the terminal is already turned on, use the Console's `Reboot` command:

    a. To display the Console window (Figure 3-1), press the Setup key. For NCD keyboards without a Setup key, use the key combinations listed in Table 3-2.

Menu Bar
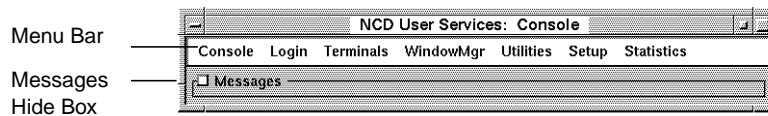
Messages
Hide Box

Figure 3-1 Console Window

    b. Select `Reboot` from the Console menu. In the Console menu bar, click Console; then click `Reboot`.

    c. A small `Reboot` window appears. Click `OK`.

3. The screen turns black and numerous messages appear.

4. A background pattern or color appears on the screen. Depending upon how your terminal is configured, you may see one or more windows on the screen.

5. If a login window appears, you can log in as you normally would.

Table 3-2 Setup Key Equivalents

Keyboard	Key Combinations
Sun Type-4-compatible	Press the Alt Graph key and the Help Setup key simultaneously.
VT220-style	Press the Compose key and the F3 key simultaneously.
108-key-style	Press the Alt key and the F3 key simultaneously.
122-key 3270-compatible	Press the Alt key and the Alt-ExSel key simultaneously.
Windows 95-compatible	Press the Pause key.

Starting the Emulator

To start the NCD 3270 emulator:

1. If the Console window is not on the screen, press the Setup key or the Setup key equivalent listed in Table 3-2.
2. Click `Terminals` in the Console menu bar to display the Terminals menu.
3. Start a 3270 terminal emulator:
    — Click `New 3270` to start a standard 3270 emulator window
    — Click `New 3179G` to start a 3270 emulator window for use with host IBM mainframe graphics applications (GDDM)

    A 3270 emulation window appears.

The 3270 Terminal Emulator Window

A typical emulator window is shown in Figure 3-2.

Window Frame

Emulator Menu Bar

Matte

Emulation Screen

Window Frame

Operator Information Area

```
                                        tn3270:  hansen

 File   Options   Keys   Macros


 ********************************************************************************
 *
 *                                 ACF/VTAM VERSION 3 RELEASE 3              *
 *                                 TERMINAL ID = U05S0310                    *
 ********************************************************************************

 AVAILABLE SYSTEM IDS ARE :
                                 WYL      = WYLBUR
                                 TSOA     = TSO ON MVS/XA "SCU2" SYSTEM
                                 TSOQ     = TSO ON MVS/XA "SCU1" SYSTEM
                                 VM       = VM/HPO
                                 VMXSC    = VM/XA
 MSG : READY
         ENTER SYSTEM ID :  █




 Connected                                  hansen:5500                  14   30
```
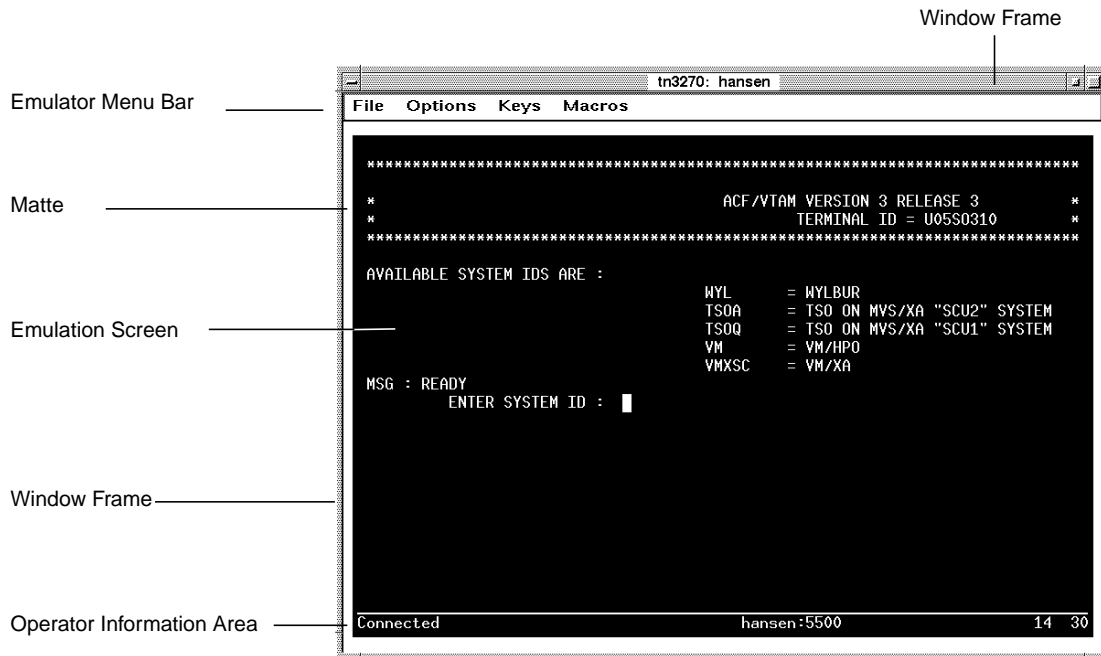
Figure 3-2 3270 Emulator Window

The window's parts are:

❏   The window frame running all around the window includes the title bar, window border, and buttons.

The frame is not part of the emulator; it is provided by another program, called a window manager. Most users of terminals use a window manager to manipulate the multiple windows that may appear on their screens.

If the window manager is not already running, see "Starting and Using the Local NCD Window Manager" on page 3-8.

❏   The menu bar offers menus from which to select emulator operations and options.

❏ The matte surrounds the emulation screen. The matte varies in size depending on the 3278 emulation model, the dimensions of the window, and the available font sizes.

❏ The emulation screen displays the data transmitted by host applications and accepts your keyboard input.

❏ The operator information area (also called the status line) displays the status of the network connection and the local status of the emulator.

The operator information area in Figure 3-2 shows that the emulator is currently connected to a TN3270 server, keyboard input is enabled, and the cursor is at column 30 in row 14. The emulator is waiting for input, is not in insert mode, and is connected to port 5500 on the host called hansen.

Figure 3-3 shows the fields in the operator information area for a TN3270 connection.
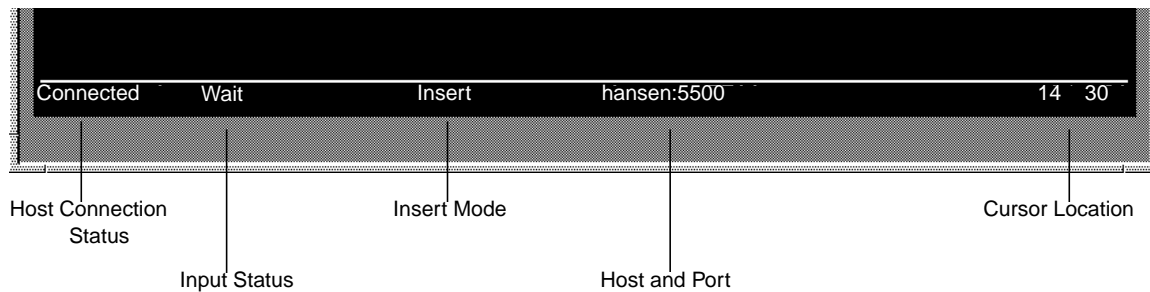
Figure 3-3 Operator Information Area Fields for a TN3270 Connection

Table 3-4 lists the operator information fields for a TN3270 connection.

Table 3-3 Operator Information Area Fields for a TN3270 Connection

Field	Terms	Meaning
Host connection status (TCP)	Connected	The emulator is connected to a host. A TN3270 terminal connection was successfully negotiated.
	Disconnected	The emulator is not connected to a host. A TN3270 negotiation failed or the connection hasn't been established yet.
Input status (also called Input Inhibit)	(blank)	If this field is blank, keyboard input is enabled.
	Wait	Keyboard input is disabled because the application host is busy.
	Kbd Locked	Incorrect input (operator error). Use the keyboard Reset function to enable the keyboard.
Insert mode	(blank)	If this field is blank, the emulator is not in insert mode.
	Insert	The emulator is in insert mode.
Host (or IP address) and port	*hostname:port* or *hostname:(port)*	The current hostname and port number of the host to which the emulator is connected. If the emulator is disconnected from the host, the hostname appears and the port number is shown in parentheses.
Cursor location	*row column*	The current location of the cursor.

Table 3-4 lists the operator information fields for a BrxPU2.1 SNA connection.

Table 3-4 Operator Information Area Fields for a BrxPU2.1 SNA Connection

Field	Terms	Meaning
Status	Inactive LU	The SSCP (System Services Control Point)-LU session has not been established by the host.
	System Operator	The SSCP-LU session owns the terminal display.
	My Job	The LU-LU session owns the display; the terminal display is connected to the operator's application program.
	Unowned	The LU-LU session owns the display.
	Disconnected	The BrxPU2.1 SNA connection has not been established.
Keyboard Input Readiness	Blank	Keyboard input is enabled.
	Wait	Keyboard input is disabled
Terminal Insert Modes	Blank	The emulator is not in insert mode.
	Insert	The emulator is in insert mode.
LU (EHLLAPI session name)	*LU_number*	Displays the current logical unit. If an EHLLAPI session has been established, the session name is displayed in parentheses following the LU.
PU	*PU_number*	Displays the current physical unit name.
Port	*port_number*	Displays the current PU port number.
Cursor	*row column*	Displays the current location of the cursor.

Starting and Using the Local NCD Window Manager

If you are running multiple 3270 emulators or running other applications besides the emulator, a window manager is essential. For example, if a window manager is running, you can stack windows, move them around, resize them, and *iconify* them (turn them into tiny representations of windows called *icons*).

NCDware includes the local NCD Window Manager, which runs in the terminal and provides all normal window manager functions plus a default menu for starting other local clients.

You can quickly tell if a window manager is running by the appearance of the windows on the screen. The window manager adds a title bar and borders to each window.

If the local NCD Window Manager is not already running, select Console ⇒ WindowMgr ⇒ NCD Window Manager.

To move a window into the foreground, place the mouse pointer in the window's title bar (rectangular area containing a title) and click the left button. For other window operations, see Figure 3-4.

For more information about using the window manager, see "Performing Window Manager Operations" on page 5-6.

Click the menu button once to
display the **Window menu**.
Double click to terminate the
emulator and close the window.

Click the **minimize**
button once to replace
the window with an icon.

The title bar identifies the application running in the
window. Click the left mouse button on the title bar to
bring the window into the foreground. Click the right
mouse button to send it behind all other windows.

Click the **maximize**
button once to expand
the window to cover the
entire screen. Click it
again to restore the
window's original size.


```
                                    tn3270: hansen
  File   Options   Keys   Macros

  ********                         ************************************

  *          HCS COMPUTE UTILITY        HCF/VTAM VERSION 3 RELEASE 3      *
  *          ACS HELP DESK  1-800/944-5444        TERMINAL ID = U05S0310  *
  *******************************************************************************

  AVAILABLE SYSTEM IDS ARE :
                                      UVL      = UVL PUB
                                                           "SCU2" SYSTEM
                                                           "SCU1" SYSTEM

  MSG : READY
             ENTER SYSTEM ID :  █




  Connected                          hansen:5500                    14   30
```
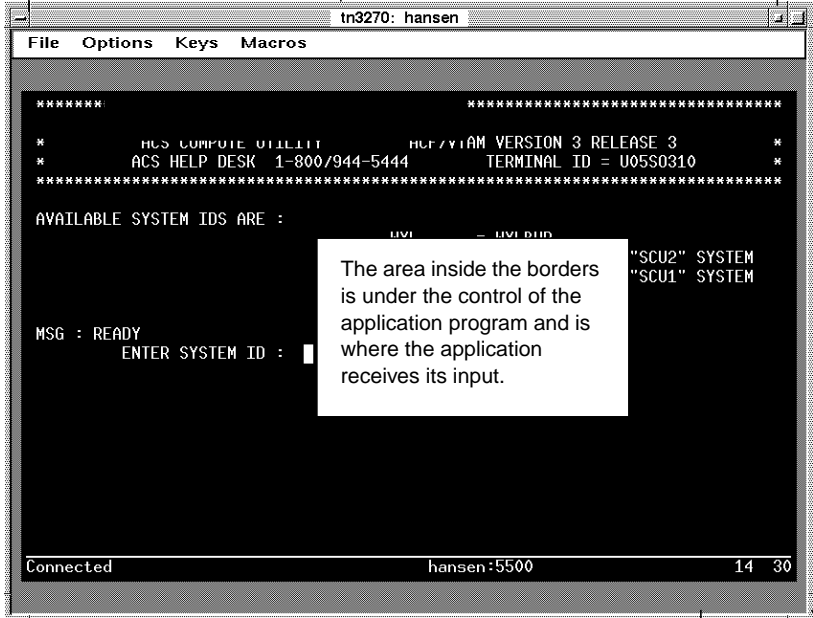
The area inside the borders
is under the control of the
application program and is
where the application
receives its input.

An icon. Double click it to convert it back
into a normal window. Click once on the
icon to display the Window menu.

Drag a corner or border to resize the
window. Click a corner or border to bring
the window into the foreground or send it
behind other windows.

Figure 3-4 Window Manager Operations—Mouse Method

Connecting to a Host Computer

This section explains how to connect to a host computer by selecting a host from the 3270 Host Chooser or entering the host's data in the Chooser. To connect to a host computer by entering its data in the Chooser, you need the following information:

❏ The protocol by which you are connecting to the host computer. You may be using TN3270 or BrxPU2.1.

❏ The name or IP address of the host to which the terminal is connected. Depending upon how the terminal is connected, the host may be a mainframe or another computer functioning as a gateway to the mainframe.

❏ If you are not using the default port number, you also need a TCP port number:

— If you are connecting to a Brixton TN3270 server, the default port number is 5030. The default for many other TN3270 servers is 23.

— If you are connecting to a BrxPU2.1 gateway, the default port number is 5020.

❏ The model (type of 3278 terminal to be emulated). The emulated models are:

Table 3-5 3278 Models

Model	Columns	Rows
2 (default)	80	24
3	80	32
4	80	43
5	132	27

Complete these steps to connect to a host computer:

1. The 3270 Host Chooser is displayed when the emulator starts (Figure 3-5).
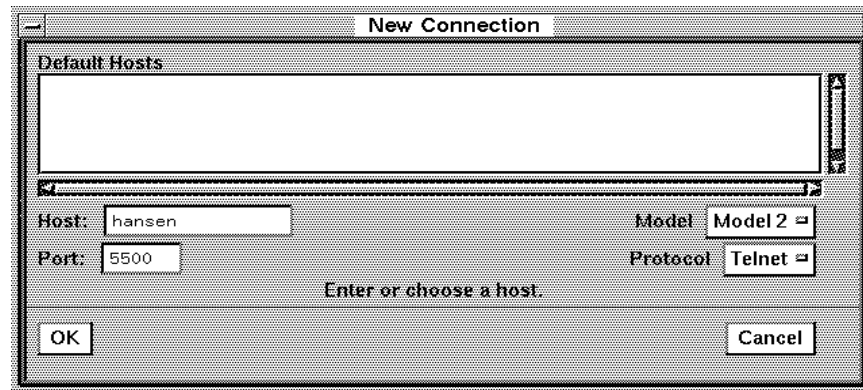
Figure 3-5 3270 Host Chooser

2. Select a host from the 3270 Host Chooser or enter the host data:

To select a host from the chooser:

a. Double click one of the hosts listed in the chooser window.

b. The chooser disappears, and the emulator connects to the host.

To enter host data:

a. Double click in the `Host:` field and type the name or IP address of the host to which the terminal is connected.

You may need to ask your system administrator for this information and for the port number referred to in the next step.

b. Double click in the `Port:` field and type the port number.

Tip
Changing the model after connecting to the mainframe disconnects you from the mainframe.

c. If the model number displayed is not the model you want, click in the `Model` field to display all of the available models. Click the correct model number.

d. If the protocol displayed is not what you need, click in the `Protocol` field to display the pulldown menu. Select the correct protocol.

Getting Started with Emulator Usage **3-11**

e. Click OK. The 3270 Host Chooser disappears, and the emulator connects to the host.

3. When the emulator connects to the host, a login screen appears in the 3270 window.

4. Click in the 3270 input area.

5. Log in and start the application just as you would on a 3270 terminal.

6. To redisplay the 3270 Host Chooser, click File in the menu bar, and click New Connection.

Using Basic Emulator Features

This section covers basic emulator usage.

If the Application Requires a Light Pen

If your application requires a light pen, display the emulator's Options menu and select Light Pen:

Tip
Using the mouse as a light pen in one 3270 emulator window does not affect mouse usage in other 3270 windows or in other applications.

1. Click Options in the menu bar.

2. Click Light Pen. The pointer changes to a pen shape.

3. The left mouse button now functions as a light pen. To select a field, place the pointer in the field and click.

4. To deselect Light Pen and return the mouse to its normal functions, repeat steps 1 and 2.

Using the Key Pad for IBM Key Functions

You can use IBM function keys from the keyboard or by using the mouse and Key Pad. Use the Key Pad if:

❑ You don't know which keys correspond to the IBM functions you need, or

❑ You prefer to use key functions from a menu using the mouse

To use the Key Pad:

1. In the 3270 menu bar, click `Keys` and then click `Key Pad` to display the Key Pad (Figure 3-6).

Click the left mouse button on a key.
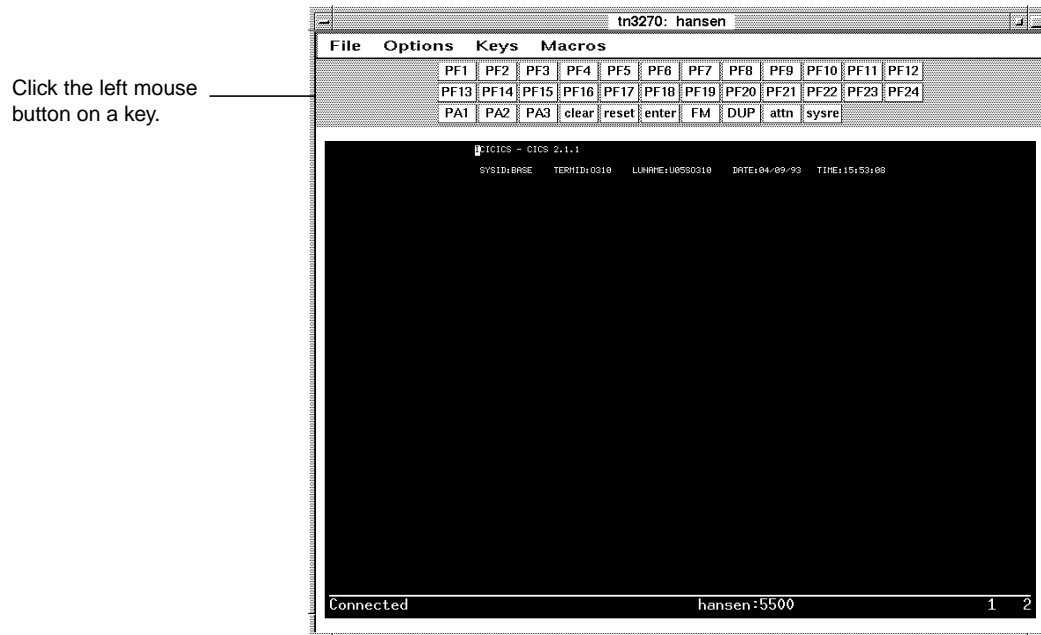
Figure 3-6 Emulator Key Pad

2. To use a function key, click the corresponding key in the Key Pad.

3. To remove the Key Pad from the display, click `Key Pad` in the Keys menu again.

Changing the Color Mode

To change the color mode of the emulator, use the Options menu:

1. To display the Options menu, click `Options` in the emulator menu bar.

2. Click the option you want. Your selection takes effect immediately.

   An option is on if the on/off button before its name is darkened.

Option selections do not affect the connection between the host and the emulator.

The following options define the color mode and reverse or normal video. Only one of these options can be in effect at any one time.

❏ Full Color

When this button is selected, terminals use IBM full-color mode. This is the default mode.

❏ Base Color

When this button is selected, terminals use IBM base-color mode. Unless the emulator has been customized to use different colors, the application displays in green and white.

❏ Monochrome

Use monochrome mode, which is green. Highlight fields are displayed in boldface.

❏ Reverse Video

If you select reverse video, the foreground and background colors are reversed.

Changing the Case of Text

The emulator can display text in mixed uppercase and lowercase or all capitals.

❏ Mixed Case

When selected, the emulator displays text in mixed uppercase and lowercase. This is the default mode.

❏ Uppercase

When selected, the emulator displays text in uppercase only.

Using Cut/Copy and Paste

You can use the mouse to select data from the display, copy or cut the data, and paste the data in a different place. Data cut or copied from a 3270 emulator window can be pasted into the same window, another 3270 window, or the window of almost any other application you may be using.

In the Options menu, select one of the following:

❏ Select Input Fields

When this option is selected, you can cut or copy characters from data entry fields only. Each field is treated as a separate line. A single field spanning multiple lines is treated as multiple lines.

Use this mode to transfer fields from one emulator window to another or to capture only the input field data.

When this mode is in effect, the pointer changes to a hand shape while you are making a selection.

❏ Select Whole Lines

When this option is selected, you can cut or copy characters across entire lines; that is you can select any amount of data, from one character to multiple lines. This is the normal X Window System cut/copy mode. This is the default mode.

When this mode is in effect, the pointer has an arrow shape while you are making a selection.

❏ Select Rectangle

The selection area is always a rectangle.

When this mode is in effect, the pointer changes to a cross shape while you are making a selection.

Follow these steps to copy and paste or cut and paste window data:

Tip
There is only one storage area for cut or copied data (called a *buffer*). If you select one set of characters and select another set before pasting the first, the first set is lost.

1. To select data, position the pointer and press the left mouse button. While holding the button down, drag the pointer to the final character in your selection.

2. To adjust the size of the selected area, position the pointer at the beginning or end of the selection and press the right

mouse button. While holding the button down, drag the pointer to make the desired adjustment.

3. To cut the selected data from the display, press the cut key combination Shift-PF3. When using a key combination, press and hold down the first key and tap the second key.

    Unless you use the cut key combination, the data is copied, not cut.

4. To paste the cut or copied data, move the pointer to the location where you want the paste to begin and press the middle mouse button.

Printing an Emulator Window

You can print the contents of a local terminal window to a local printer attached to the terminal's parallel or serial port, to remote printers attached to other NCD terminals, or to other network printers.

To print the contents of the current window to the default printer, select Print Screen from the File menu in the Terminal Emulator window.

To select a different printer:

1. Display the File menu in the terminal emulator window.

2. Click `Select Printer...`. The Select Printer window appears (Figure 3-7).

3. Select a printer from the list. The default is the first printer on the list.

4. Click `OK` to accept the selected printer.

5. To print the contents of the current screen to the printer you just selected, select `Print Screen` from the File menu.
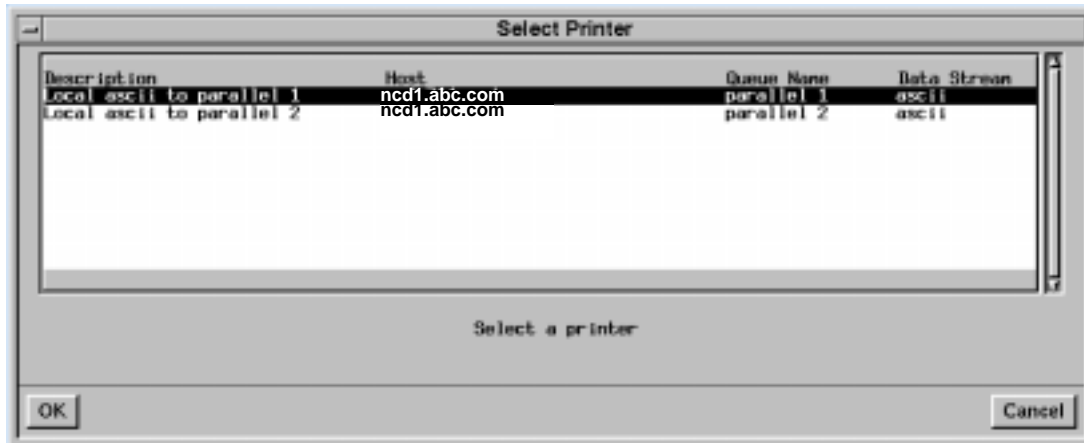
Figure 3-7   Select Printer Window

Using Terminal Hardware and Software Controls

The following terminal controls are different from those on ASCII terminals:

❏ Brightness and contrast controls—The brightness and contrast knobs are located in different places on each monitor. See the hardware booklet included with your monitor.

❏ Audible alarm—A terminal's alarm, a beeping sound, is controlled through the terminal's Console window. Click Setup ⇒ Change User Preferences ⇒ Bell. Drag the sliders to change the bell volume. When satisfied with the bell volume, click `Apply` in the lower left corner of the User Preferences window.

❏ Power on/off switch—The power switch is located in different places on each terminal model. See the hardware setup sheet or hardware booklet included with your terminal.

❏ Screen locking—Controlled through the terminal's Console. Click Utilities ⇒ Lock Screen. Enter a password and click `OK`.

❏ Power-on light—An LED located on the front of a terminal's base. A blinking power-on light indicates a hardware problem.

Getting Started with Emulator Usage **3-17**

❏ Test hardware—The terminal automatically tests its hardware when it is powered on or rebooted.

Reconnecting to the Host

If you accidentally disconnect from the host, you can reconnect to the same host and port by selecting `Reconnect` from the File menu:

1. Click `File` in the menu bar.
2. Click `Reconnect`.

Disconnecting from the Host

When you have finished your session with the host, complete these steps to terminate the session:

1. Click the `File` menu in the menu bar.
2. Click `Close Connection`.
3. The operator information area changes from `Connected` to `Disconnected`.

Terminating the Emulator

To exit from the 3270 emulator, complete these steps in each emulator window:

1. Click the `File` menu in the menu bar.
2. Click `Quit`.
3. The 3270 emulator window disappears from the display.

You can also terminate the emulator by double clicking on the button in the upper left corner of the window manager frame.

4 Using and Customizing the 3270 Emulator

This chapter describes the more advanced topics usually performed by a system administrator:

❏ Accessing files used by the terminal

❏ Methods of starting the emulator

❏ Methods of customizing the emulator

❏ Emulator options you may wish to change

❏ Using the Keymap Editor to remap IBM keyboard functions or add custom translations to keys

❏ Using the 3287 print emulator process

Guidelines for Accessing Files

Files that the terminal or 3270 emulator accesses from a host must be accessible through the terminal's file service table.

With only the default configuration, terminals can access files located on the boot host and possibly on other hosts that you have designated as file servers. For files located on other hosts, you must add the hosts and other information to the file service table.

You can view and configure the file service table through the Console (Setup ⇒ Change Setup Parameters ⇒ File Service) or through remote configuration. You can change the table permanently (retain the changes after the terminal reboots) by editing the remote configuration file or writing to the remote configuration file from Change Setup Parameters.

For information about configuring file access, see the *NCDware System Administrator's Guide*:

❏ For accessing files located on UNIX hosts, see Chapter 3.

❏ For accessing files located on Windows NT hosts, see the *NCDware System Administrator's Guide*.

Methods of Starting the Emulator

This section describes methods other than the Console for starting the emulator. Chapter 3, Getting Started with Emulator Usage, describes how to start the emulator from the Console.

Starting an Emulator from a Command Line

Tip
Terminal emulator commands should usually be run in the background (using the ampersand [&] at the end of the command line).

To start a 3270 terminal emulator from a command line (or from within a script), use an *rsh* or *remsh* command with the local client command. NCD X servers include a version of the *rshd* daemon for starting local clients on the local terminal or remote terminals.

Starting a Standard TN3270 Connection

The command-line syntax to start a basic TN3270 emulator is:

rsh *term_hostname* tn3270 [*options*]

For example:

% **rsh ncdu100 tn3270 &**

where:

ncdu100   is the hostname of the terminal. If you are not running a name service on the network, use the terminal's IP address instead of its hostname.

tn3270   is the command to start the emulator.

See Appendix B or the *ncd3270* man page for information about all command-line options and associated X resources.

Starting a BrxPU2.1 Connection

To start an emulator over a BrxPU2.1 connection from the command line, use the -**pu21** option. For example:

% **rsh ncdu100 tn3270 -pu21 -tcpport 5500 &**

where:

ncdu100   is the hostname of the terminal. If you are not running a name service on the network, use the terminal's IP address instead of its hostname.

      tn3270   is the command to start the emulator.

      -pu21   is the command-line option to start the emulator over a BrxPU2.1 connection.

      -tcpport is the command-line option to specify the PU2.1 TCP port to use.

Starting an Emulator for Use with IBM Graphics Applications

To start an emulator for use with IBM mainframe graphics applications, use the -**gddm** and -**loadps** options. For example:

```
% rsh ncdu100 tn3270 -gddm -loadps -T "3270 Graphics" -icontitle "3270 Graphics" &
```

where:

ncdu100   is the hostname of the terminal. If you are not running a name service on the network, use the terminal's IP address instead of its hostname.

tn3270   is the command to start the emulator.

-gddm   is the command-line option to enable IBM host graphics support. By default, this option is disabled.

-loadps   is the command-line option to enable support for *load programmed symbols*. By default, this option is disabled.

-T   is the command-line option to specify a title on the window. The string specifying the window title is enclosed in quotes following the option.

-icontitle   is the command-line option to specify a title on the window's icon. The string specifying the icon title is enclosed in quotes following the option.

Starting an Emulator Automatically

You can configure a terminal to display a 3270 emulator window automatically when the terminal reboots or resets.

The X server resets when the user logs out or the last remaining client terminates.

Using XDM (X Display Manager)

See the *NCDware System Administrator's Guide* for complete information about setting up and using XDM.

If you are using XDM to manage user sessions, you can place one or more emulator command lines in a system-wide or individual startup file (**Xsession** or **.xsession**). When the user logs in, commands in the file are executed.

The command lines follow the same syntax as the command line shown in "Starting an Emulator from a Command Line" on page 4-2.

Tip
XDM automatically sets the terminal's *DISPLAY* variable. This variable tells the X server where to display its output.

Figure 4-1 shows a short example startup file for the C shell. Besides displaying an emulator window, this file sets this *DISPLAY*, loads X resources (for configuring the 3270 emulator and other clients) from the user's **.Xdefaults** file, starts an *xterm* terminal emulator window for starting UNIX applications, displays a clock, and finally starts the local window manager.

```
#! /bin/csh
setenv DISPLAYHOST 'echo $DISPLAY | sed -e 's/:0//''
/usr/bin/X11/xrdb -display $DISPLAY -load $HOME/.Xdefaults
/usr/bin/X11/xterm -title "rudyard" -sb -wf &
xclock &
rsh ncdu100 tn3270 &
/usr/local/bin/X11/ncdrunwm
```

Figure 4-1 Sample Startup File

Using Remote Configuration

To start an emulator through remote configuration, add a command to the **exec**-**startup**-**commands** table in a remote configuration file. You can use remote configuration files to configure a single terminal or a group of terminals. When a terminal boots, the parameter settings are loaded into the X server before applications start.

For example:

```
exec-startup-commands = {
     {"tn3270 –h eagle -n 5500"}
     }
```

By default, the **exec**-**startup**-**commands** table contains commands for starting the Console and the XDM Login Chooser.

If you configured terminals when you installed X servers, remote configuration files were created. You can edit one or more of these files to add emulator commands to the **exec**-**startup**-**commands** parameter or create a new file.

Starting an Emulator from a Window Manager Menu

This section introduces window manager menus. For more information about window manager menus, see "Using and Configuring Root Menus" on page 5-3.

From the Default Window Manager Menu

If you have not defined window manager menus and attached them to the mouse buttons, any mouse button not attached to a custom menu displays a default menu.

To start *ncd3270* from the default window manager menu, the user clicks any mouse button on the root window and selects `Start 3270` or `Start 3179G` from the menu that appears.

Starting an Emulator from a Custom Window Manager Menu

You can place commands for starting emulators and other applications into menus defined in window manager configuration files. These menus are displayed on the root window and the user displays a menu by clicking a mouse

button on the root window. An application starts when the user clicks on its menu item.

Commands in menu configuration files follow the same syntax as the interactive command line shown in "Starting an Emulator from a Command Line" on page 4-2.

Methods of Customizing the Emulator

You can customize the emulator by:

❏ Changing the settings in the emulator's `Options` menu
❏ Changing X resource settings
❏ Setting command-line options

These methods are explained in the following subsections.

Options Menu

Chapter 3 and Appendix A describe the Options menu for configuring the emulator.

The Options menu allows you to configure emulators that are running, but the settings are not permanent. You must reconfigure every emulator each time you start it. Command-line options and X resources offer more permanent ways of configuring emulators and additional configurable attributes.

Configuring the Emulator with X Resources

X resources
Variables for changing the behavior or appearance of a client. Resources may take a numeric or string value or take a "true" or "false" value (Boolean resources).

Like most X clients, you can customize local clients such as the 3270 emulator using X resources. All of the resources for the emulator are listed in alphabetical order in Appendix B and in the man page.

You can set X resources in special resource files or through terminal remote configuration files. The variables for any number of different clients (X applications) can be set in one file and the file can have any name.

Before a local client can use resource settings, they must be loaded into the X server. Resources loaded after a client starts do not affect the client's characteristics. Once X resource settings are loaded into the X server, they affect every instance of the emulator (for a way around this limitation, see

"Creating a Named Version (Instance) of an Emulator" on page 4-10).

A basic resource setting consists of the resource name of the client, followed by a period or asterisk and a variable name. Then comes a colon and white space followed by the value of the variable:

resource name * *attribute*: *value*

The resource name of the client is usually the same as the client's name; the resource name for the 3270 emulator is **ncd3270**.

For example, the following resource settings change the default port number for all emulator windows to 5500, change the display mode to reverse video, remove the emulator menu bar, and place the title *WordProcessor* in the emulator window title bar:

```
ncd3270*portNumber:    5500
ncd3270*reverseVideoMode:    true
ncd3270*noMenuBarMode:    true
ncd3270*title:    WordProcessor
```

Using Resource Files

Tip
You can put 3270 resources into a file, then name the file in the resource **ncd3270*xdefaultsFile: *file***. Specify the **xdefaultsFile** resource using one of the standard methods: ***xrdb*** or a standard resource file.

You can set resources in files that take effect system-wide or establish resource files for individual users.

Resources set in resource files must be loaded into the server using the *xrdb*(1) client. Normally, you run *xrdb* from an XDM startup file so that resources are loaded into the server before client programs start.

Using Remote Configuration

Tip
If you are using XDM or a session manager such as the DECwindows session manager, do not use remote configuration files to set resources. The manager programs delete any resources already set. Use resource files instead, as described in the preceding section.

You can set X resources in a terminal remote configuration file, either a file that configures an individual terminal or a file affecting a group of terminals. When the terminal boots, the resources and other parameter settings are loaded into the server before any clients start.

To put 3270 resources (and resources for other local clients) in remote configuration files, use the **xserver-initial-x-resources** parameter. Write the resources as a single string, surrounded

by quotes, and escape all special characters with a backslash. (such as the end-of-line character).

For example:

```
xserver-initial-x-resources = {
     {"ncd3270*portNumber: 5500\n\
       ncd3270*reverseVideoMode: true\n\
       ncd3270*noMenuBarMode: true\n\
       ncd3270*title: Word Processor" }
       }
```

Configuring the Emulator with Command-Line Options

If you are starting an emulator from a command line, you may want to use command-line options to configure it.

You can use command-line options as your sole method of configuring the emulator or you can use options along with X resources. Command-line options override the corresponding X resource settings.

The syntax of an emulator command line with options is:

rsh *terminal_hostname* **tn3270** [*option ...*]

For example:

```
rsh ncdu100 tn3270 -s -b
```

All of the command-line options for the 3270 emulator are listed in alphabetical order in Appendix B and in the man page. Most command-line options have corresponding X resources.

Customizing the 3270 Host Chooser and Emulator

This section provides information about the following:

❏ Configuring the 3270 Host Chooser

❏ Creating a named instance of an emulator

❏ Changing colors and color modes

❏ Changing and adding fonts

❏ Removing the menu bar

❏ Changing the case mode

❏ Specifying the model type

❏ Specifying the initial size and placement of the emulator

❏ Changing the window or icon title

The methods for making these and other changes are described in the previous section.

The section, "Working with Keyboards" on page 4-16 describes procedures for creating and using a custom keymap or custom ASCII-to-EBCDIC conversion table.

Configuring the 3270 Host Chooser

You can specify hosts to list in the 3270 Host Chooser in a remote configuration file or in the Console's Setup menus.

Using the Remote Configuration File

1. Open the configuration file or create a new file using a text editor.

2. Configure the **ncd3270-default-hosts** parameter. If there is already a table in the file, edit the table. Otherwise, add a table to the file. Table 4-1 lists the fields in the table. For example:

```
ncd3270-default-hosts = {
   {telnet eagle 23 model-4 "Accounting Machine" }
   {telnet kestrel 23 model-2 "Sys Admin. Machine" }
  }
```

3. When you reboot the terminal and start an emulator, your entries are displayed in the host chooser.

Table 4-1 ncd3270-default-hosts Table

Field	Possible Values	Result
protocol	telnet or pu2.1	Protocol used by the emulator to connect to the host.
host	*hostname* or *IP address*	Name or IP address of the host where the TN3270 server software or the BrxPU2.1 gateway software is running.
port	*TCP port number*	TCP port number used by the TN3270 server or BrxPU2.1 gateway.
model	model-2, model-3, model-4, or model-5	3278 model being emulated.
description	*string*	Description of the host or service.

Using the Setup Menus

Tip
To use this configuration method, the terminal must be correctly configured to write configuration changes to a host-based remote configuration file. See the *NCDware System Administrator's Guide* for more information.

1. In the Console menu bar, click Setup ⇒ Change Setup Parameters ⇒ 3270 Terminal Emulation.

2. In the `Default Hosts` box, click `New`. Edit the resulting default insertion as necessary. If you need to delete an entry, click `Delete`. The fields are the same as those listed in Table 4-1.

3. Click the `Apply` field at the bottom of the Change Setup Parameters window.

4. When you reboot the terminal and start an emulator, your entries are displayed in the 3270 Host Chooser.

Creating a Named Version (Instance) of an Emulator

By naming versions (in the X Window System, these are called *instances*) of the emulator, you can create one or more emulators that look and behave differently from the default while retaining the option to use your default emulator. This is because resources set for a particular emulator instance do not affect any other emulators that you start. For example, you can display one emulator without the menu bar, while leaving

the menu bar on all other emulator windows, or change colors so one emulator can be distinguished quickly from the others.

Creating a named instance involves setting resources under a special class name and specifying this name while starting the emulator.

For example, the emulator started with this command:

```
rsh ncdu100 tn3270 -name Editor_3270
```

uses resources set under the class name Editor_3270.

Some example resources for this class name are:

```
Editor_3270*portNumber:     5500
Editor_3270*reverseVideoMode:    true
Editor_3270*noMenuBarMode:    true
Editor_3270*title:    WordProcessor
```

Tip
The emulator started under the name Editor_3270 does not use resources set under the resource name ncd3270.

Changing Colors and Color Modes

You can change both the color mode and the colors displayed on the screen.

Changing the Color Mode

The default color mode of the 3270 emulator is full color with a black background. You can change the color mode or video mode using X resources or command-line options.

Monochrome Mode or Reverse Video

To change the display of a color terminal to monochrome mode, use the -**m** command-line option or set the **monoMode** resource to "true." Monochrome is usually white text on a black background.

To change the display to reverse video when in monochrome mode, use the -**r** command-line option or set the **reverseVideoMode** resource to "true."

Base Color Mode

To change the display to base-color (two-color) mode, use the -**b** command-line option or set the **baseColorMode** resource to "true."

The default colors are green and white.

Changing Colors

The options and resources for setting colors (listed in Appendix B) refer to colors in two ways:

❏ Brixton color-ids, which are predefined colors that correspond to default color definitions. This information may be useful if you previously used the Brixton host-based 3270 terminal emulator.

❏ X Window System colors, which you can specify as predefined color names or a hexadecimal numbers that control the intensity of the three colors in the RGB color model (red, green, and blue). You can find a list of many color names in the **/usr/lib/X11/rgb.txt** file. The colors listed in this file are identified by descriptive names and decimal numbers that specify the amount of red, green, and blue in each color.

Appendix B lists the command-line options and resources for all of the IBM colors for full-color mode and base-color mode and for the foreground and background in monochrome mode.

Generally, to change a color, substitute a color name from the **rgb.txt** file for the default. For example:

```
rsh ncdu100 tn3270 -ibmRed IndianRed
```

or

```
ncd3270*ibmRed: IndianRed
```

You can also redefine the background color, which is black by default, using the -**ibmBackground** command-line option or **ibmBackground** resource. This variable controls the background in all color modes.

Changing and Adding Fonts

See the *NCDware System Administrator's Guide* for information about font names and the fonts included with NCDware.

The font sets used by the emulator are called *font pools*. The normal font pool defines the appearance of characters in the main emulator screen, and the OIA (operator information area) font pool defines characters in the operator information area.

The emulator's default fonts are the X server's built-in fonts. There are twelve default font sizes. The emulator selects a font size for the display on a *best fit* basis, determined by the size of the window.

You can specify different fonts for the emulator window and operator information area or add more fonts to the pool. The emulator can use any fixed-width X font.

To change the fonts in a font pool, use the **fontPoolNormal** resource for the main window and **fontPoolOIA** for the operator information area. The font names can be aliases or full XLFD font names.

Removing the Menu Bar from the Emulator

A menu bar is displayed at the top of an emulator window by default. If you do not want the menu bar displayed, use the -**noMbar** command-line option or set the **nomenuBarMode** option to "true."

Changing the Case Mode

By default, the emulator displays in mixed lowercase and uppercase characters. To change to all uppercase (capital) letters, use the -**s** command-line option or set the **monoCaseMode** resource to "true."

Specifying the 3278 Model Type

The model type determines how many lines and columns appear in the emulator window. The default is model 2, in which 24 lines and 80 columns are displayed. To change the default to a different model, use the -**S** command-line option or **modelType** resource.

The valid model types are:

2   24 lines and 80 columns

3   32 lines and 80 columns

4   43 lines and 80 columns

5   27 lines and 132 columns

Specifying Initial Size and Placement of the Emulator Window

The size and initial placement of a window is determined by its geometry specification. A geometry specification has the following components: width, height, and location of the window relative to the horizontal and vertical edges of the screen. The formal definition of the specification is a string in the following format:

width $\times$ *height* $\pm$ *x_offset* $\pm$ *y_offset*

The width, height, and offsets are specified in pixels or dots (smallest element of a display surface that can be addressed by a program). You can specify any or all of the elements in a geometry string; missing elements are supplied from the window's default specifications.

Window Placement

The offsets specify the x and y coordinates at which the window should be displayed.

To place a window in any of the *corners* of the screen, use the following coordinates:

+0+0   Places the window at the upper left corner of the screen.

+0-0   Places the window at the lower left corner of the screen.

-0+0   Places the window at the upper right corner of the screen.

-0-0   Places the window at the lower right corner of the screen.

To place a window someplace other than a corner, specify the location as an offset from the corner. For example, to start a window at the location ten pixels from the top of the screen and ten pixels from the left side of the screen and use the default window size:

```
rsh ncdu100 tn3270 -geometry +10+10
```

or

```
ncd3270*geometry: +10+10
```

By default, the first emulator window opens at +90+112. Subsequent windows open at an offset to this location, so that windows overlap but their title bars are all visible.

Window Size

Because monitors vary in the number of pixels displayed per inch, the displayed size of a window with the same dimensions is different on different monitors. This attribute of a monitor is expressed as dpi (dots per inch), and can be found in the hardware booklet or hardware sheet that came with your monitor.

For example, to open a window 800 pixels by 1000 pixels at an offset from the upper left corner of the screen:

```
rsh ncdu100 tn3270 -geometry 800x1000+10+10
```

or

```
ncd3270*geometry: 800x1000+10+10
```

The default 3270 emulator window is 830 pixels in width by 610 pixels in height.

Starting the Emulator as an Icon

To start the emulator as an icon instead of a window, use the -**iconic** option. For example:

```
rsh ncdu100 tn3270 -iconic
```

Changing the Window or Icon Title

The default title that appears in an emulator window's title bar is `tn3270:`*host*, where *host* is the name or IP address of the host to which the emulator is connected.

You can specify a different title for the window using a command-line option or resource. For example:

```
rsh ncdu100 tn3270 -T "Forms Review"
```

or

```
ncd3270*title: "Forms Review"
```

The default title that appears underneath an emulator window's icon is *host*, where *host* is the name or IP address of the host to which the emulator is connected.

You can specify a different title for the icon using a command-line option or resource. For example:

```
rsh ncdu100 tn3270 -icontitle "Forms Review"
```

or

```
ncd3270*icontitle: "Forms Review"
```

Working with Keyboards

This section describes:

❏ Basic information about NCD keyboards

❏ Using the Keymap Editor to remap the keyboard

❏ Alternative methods of remapping the keyboard

❏ The default 3270 emulator keymap

❏ Using alternative ASCII-to-EBCDIC conversion tables

For information about using the Key Pad for selecting IBM functions, see "Using the Key Pad for IBM Key Functions" on page 3-12.

About NCD Keyboards

When the 3270 emulator starts, it automatically senses the NCD-supported keyboard attached to the terminal and reads the keymap for that keyboard. The emulator automatically configures the keyboard to offer all of the IBM 3278 keyboard functions.

See the *NCDware System Administrator's Guide* for information about setting the keyboard version.

If you are not using the US English version of an NCD keyboard, you must specify which version you are using for the X server to correctly interpret key presses. You can specify the language in the Boot Monitor before the terminal loads the X server, in the Console (Setup ⇒ Change Setup Parameters ⇒ Input Devices), or through remote configuration (**xserver-keyboard-type**).

Using the Keymap Editor

This section provides a description of the Keymap Editor and instructions for the following procedures:

❏ Starting the Keymap Editor

❏ Remapping the basic IBM functions

❏ Saving a keymap to a file or applying a keymap to an open window

❏ Reading a keymap from a file or from an open window

❏ Remapping the keyboard using the full set of X key translations

About the Keymap Editor

The Keymap Editor is a local client that provides a simple way to edit translations (functions assigned to keyboard keys) for a single client, such as *ncdterm* or *ncd3270.* If you want to redefine a keymap for all clients, you need to use *xmodmap* (see "Alternative Ways of Changing Keymaps" on page 4-28).

Each key on a keyboard has a default action associated with it. For example, when you press an alphabetic or numeric key, the character printed on the key cap (key label) displays on the screen. Other keys perform a function instead of displaying a character. For example, an IBM 3270 keyboard has keys labelled with such actions as Clear and Insert. All of the functions associated with a keyboard comprise its keymap.

NCD's Keymap Editor local client displays a layout of a keyboard that has keys labelled with their keycaps and the IBM functions assigned to them. The Keymap Editor also allows you to change the functions (actions or translations) assigned to keyboard keys. For example, on the UNIX-style 97-key keyboard, the Cut action occurs when you press the PF3 key. Using the Keymap Editor, you can simply click the word Cut and drag it to another key.

The Keymap Editor can also be used to remap the keyboard for the VT320-style NCD Terminal Emulator (*ncdterm*), used for LAT, Telnet, CTerm, and serial connections.

The Keymap Editor offers two modes of operation:

❏ Basic mode—In basic mode you can reassign any of the actions associated with 3270 or VT320 terminal emulation. For example, in a VT320 window, you can assign the terminal bell to a key so that pressing the key in a VT320 window rings the bell. In a 3270 window, you might want to assign the tab function to a different key.

❏ Advanced mode—Advanced mode provides a full graphical interface for X keyboard translations. For example, in advanced mode you can assign multiple actions to a single key.

Starting the Keymap Editor

The Keymap Editor is a local client. You can start it in different ways:

❏ To start the Keymap Editor from the Console, select `Keymap Editor` from the Terminals menu.

❏ To start the Keymap Editor from an emulator window, select Keymap Editor from the window's Keys menu.

❏ To start the Keymap Editor from a command line, follow the directions in "Methods of Starting the Emulator" on page 4-2. Instead of the emulator command, use the *keymap_editor* command to start the Keymap Editor. See the man page for the command-line options.

❏ To start the Keymap Editor from the default window manager menu, click any mouse button on the root window and select the Keymap Editor from the menu that appears. This menu appears only if you have not defined other window manager menus and attached them to the mouse buttons.

Keymap Editor Window and Menus

Figure 4-2 shows a typical initial display for the Keymap Editor.

Keyboard Layout

The keyboard layout initially displayed is for the keyboard attached to your terminal.

The keyboard layout shows the keycaps (the legends printed on the keys) plus the names of any IBM function(s) associated with a key.

Although the keyboard layout shows only the US English version of a keyboard, every keypress on the keyboard shows up in the layout. This allows you to map actions to the correct keys no matter which keyboard version you are using.
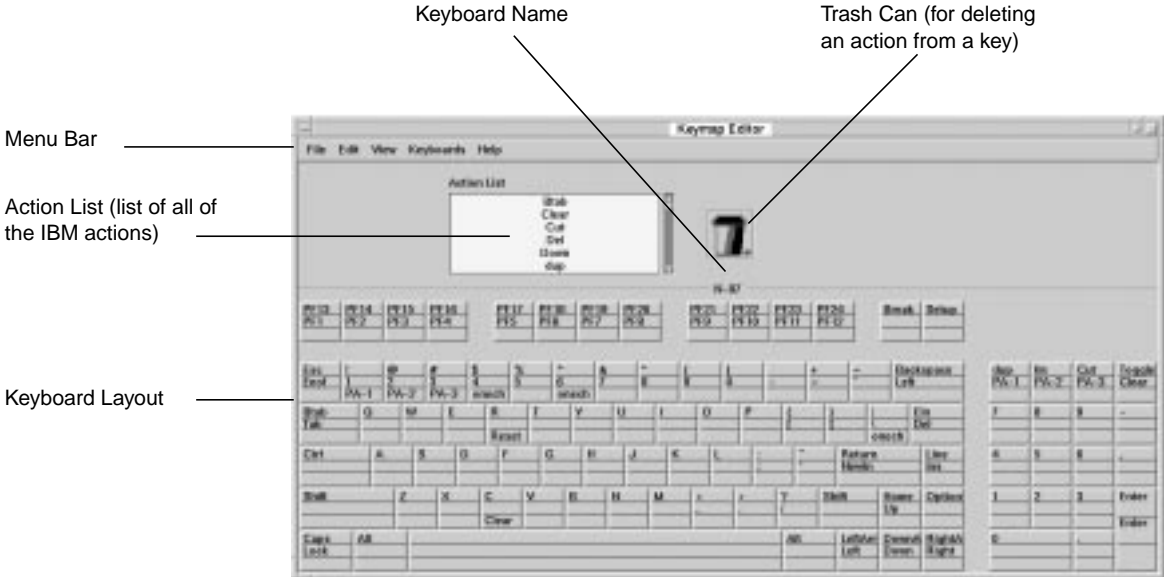
Figure 4-2 Keymap Editor Window—in Basic Mode

Keycap Sections

Each keycap in the layout has three sections. For keys other than the alphabetic keys, the first section shows the result of pressing the key along with the Shift key, and the middle section shows the result of pressing the key alone. The third section shows the result of pressing the key along with the Control key.
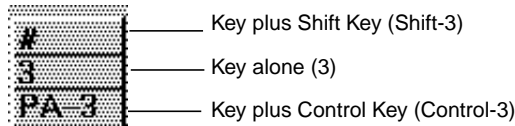
Figure 4-3 Keymap Editor—Key Sections

The File and Edit Menus

The File menu offers the functions for writing keymaps to files, importing them, and quitting from the Keymap Editor. (See "Writing a Keymap to a File and Applying a Keymap to a Window" on page 4-22 and "Importing a Keymap from a File or Window" on page 4-24.) The Edit menu offers the functions for changing the order of translations. (See "Using Advanced Mode" on page 4-25.)

The View, Keyboards, and Help Menus

The View menu offers options for displaying only the keycaps, only the translations, or both keycaps and translations. The View menu also allows you to move between the basic and advanced modes.

The Keyboards menu displays the layouts of all the NCD keyboards supported by the Keymap Editor.

The Help menu offers two kinds of help:

❏   Show Help Text displays quick reference information for basic or advanced mode. To see all of the help text, put the pointer on the button in the scroll bar at the right of the help window and drag it up or down.

❏   Show Help Key displays each keycap (next to the trash can) as you press the key on the keyboard layout (by clicking on the keycap). This is useful for reading longer key actions that do not fit on the keyboard layout.

Basic Mode—Mapping the Keyboard

Use the following directions to remap the keyboard in the Keymap Editor's basic mode.

The changes you make to the keymap only last as long as the emulator window is open. Once you close the window and exit from the emulator, the emulator reverts to its default keymap. "Writing a Keymap to a File and Applying a Keymap to a Window" on page 4-22 explains how to save a map and apply it to an emulator window manually or automatically.

Using the Mouse

The following directions use mouse button 1 (usually the left button) to select and move actions. An action is a function assigned to key, such as cutting the selected text. ("Starting the Emulator" on page 3-3 gives details about mouse usage.)

Removing an Action from a Key

To remove an action from a key:

1. Click the action.
2. Holding down the mouse button, drag the action to the trash can.
3. Release the mouse button.

Moving an Action from One Key to Another

To move an action to a key:

1. Click the action.
2. Holding down the mouse button, drag the action to the desired section of another key.
3. Release the mouse button.

Assigning an Action from the Action List

Actions are displayed in the `Action List` on the Keymap Editor window (Figure 4-4).

For an explanation of the actions, see "Default 3270 Emulator Keymap" on page 4-29.
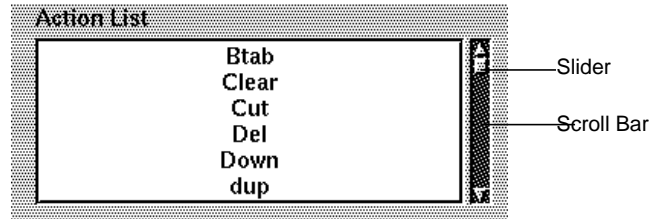
Figure 4-4 Keymap Editor—Action List

To assign an action from the Action List to a key:

1. To see more actions in the Action List, drag the slider in the scroll bar.

2. Click the desired action in the Action List.

3. Holding down the mouse button, drag the action to the destination key and section.

4. Release the mouse button.

Copying an Action from One Key to Another

To copy an action from one key to another:

1. Press the Shift key while clicking on the action.

2. Holding down the mouse button, drag the action to a key.

3. Release the mouse button.

After copying, both keys have the same action.

Writing a Keymap to a File and Applying a Keymap to a Window

Functions to write a keymap to a file and apply it to a window are available in both basic and advanced modes.

To write or apply translations, select Write Translations from the File menu. The Write Translations window appears (Figure 4-5).

Writing a Keymap to a File

You can write a keymap to a file and then apply this file to an open 3270 window or apply the file when starting the emulator from a command line.

To write a keymap to a file:

1. Display the `Write Translations` window (Figure 4-5) by selecting `Write Translations` from the File menu.

2. To write the currently displayed keymap to a file, click `Translation file` and type the complete pathname of the file.

3. Click `OK`.

4. The resulting file is a list of optional modifiers, keysyms, and actions. For example:

   ```
   <Key>KP_Enter: Enter()
   Ctrl<Key>4: onecharacter(0x4A)
   ```
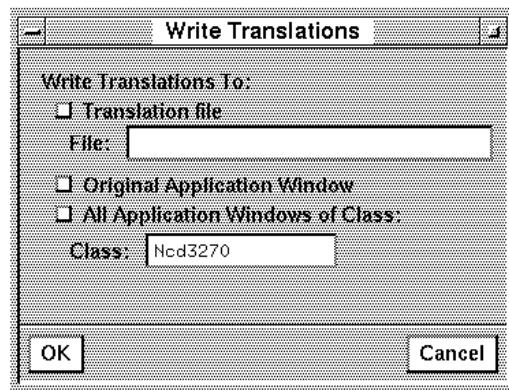

Figure 4-5 Keymap Editor—Write Translations Window

Applying Keymaps to Windows on the Desktop

Keymap changes do not affect windows on the desktop until you explicitly apply the keymap to the windows.

To apply the current keymap to the original window (the window from which you started the Keymap Editor), complete these steps.

1. Click `Original Application Window` in the `Write Translations` window.

2. Click `OK`.

To apply the current keymap to *all* open 3270 or VT320 windows, complete the following steps. Windows that you open after applying the keymap do not inherit the new keymap.

1. Click `All Application Windows of Class` in the `Write Translations` window.

2. Fill in the `Class:` field:
    —   For 3270 windows, type **Ncd3270**. This is the default so it may already be filled in. The current keymap is applied to all open 3270 emulator windows.
    —   For VT320 windows, type **NCDterm**. The current keymap is applied to all open VT320 emulator windows.
    —   In other contexts, the instance name overrides the class name.

3. Click `OK`.

Importing a Keymap from a File or Window

This function is available in both basic and advanced modes. You can import a keymap from a file into the Keymap Editor, and you can import a keymap from an open 3270 or VT320 window.

To display the `Read Translations` window (Figure 4-6) , select `Read Translations` from the File menu. When you read translations, the keymap is displayed in the keyboard layout and the `Action List` is filled in. In advanced mode, the `Translations` list is also filled in.

Importing a Keymap Editor File

Tip
To import files from a host computer, there must be an entry for the file system in the terminal's file service table. See "Guidelines for Accessing Files" on page 4-1.

To import a keymap file created by the Keymap Editor:

1. Click `Translation file` in the `Read Translations` window.

2. Type the full pathname of the keymap file.

3. Click `OK`.
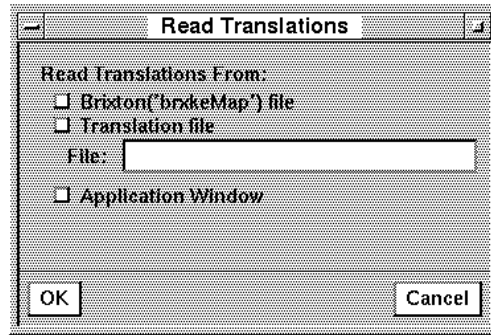
Figure 4-6 Keymap Editor—Read Translations Window

Importing a Brixton Keymap File

To import a keymap from a version 1.2 Brixton keymap file:

1. Click `Brixton ('brxkeMap')file` in the `Read Translations` window.

2. Type the full pathname of the file.

Importing a Keymap from a Window

To import a keymap from an open 3270 or VT320 window:

1. Click `Application Window`.

2. Click `OK`.

3. Click the window from which you want to read translations.

Using Advanced Mode

Advanced mode (Figure 4-7) allows complete graphical editing of keyboard translations. To enter advanced mode, select `Advanced Mode` from the View menu.

See an X Window System reference, such as Volume Four of the O'Reilly & Associates Guides, *X Toolkit Intrinsics Programming Manual,* for a complete description of key translations.

The subject of X translations is complex, and the following descriptions and instructions do not attempt to provide a complete description of the process of creating translations.

Advanced Mode Menus

Advanced mode offers the same File, View, and Keyboards menus as basic mode. The added functions in the Edit menu change the order of translations in the Translations list. They

are explained in "Changing the Order of Translations" on page 4-28.

To display quick reference information, select `Show Help Text` from the Help menu.

The Parts of a Translation

A translation has three parts:

❏   An action or action sequence

❏   Optional modifiers

❏   A key

Displays translations for one key at a time, as you press a key, instead of displaying all of the translations

Menu Bar

Action List (all of the actions associated with 3270 or VT320 emulation)

Translations List (all of the translations in the file or window).

Function keys for adding, replacing, and deleting in the Translations list.

Modifiers

Keyboard Layout
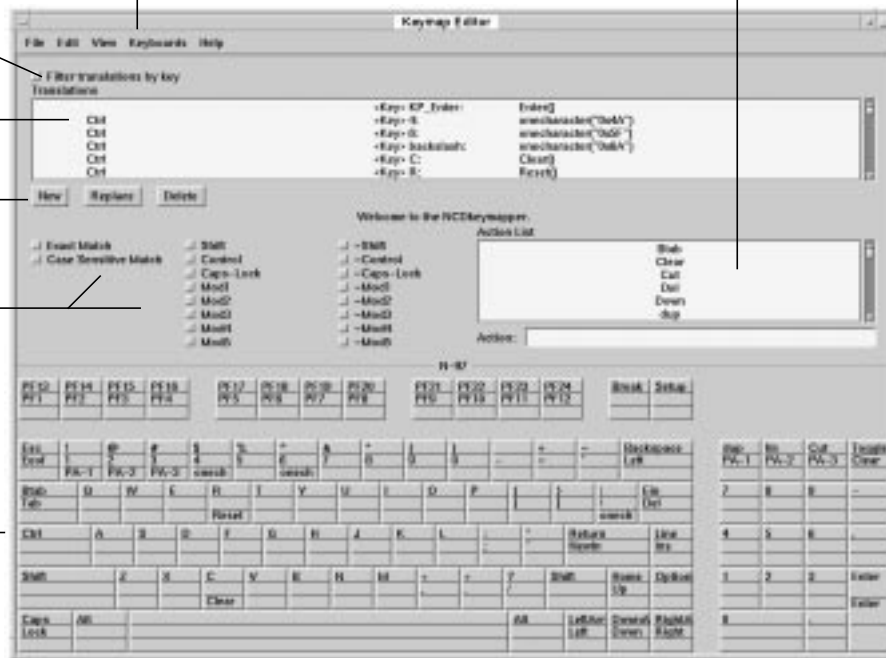
Figure 4-7 Keymap Editor Window—in Advanced Mode

Figure 4-8 is an enlarged view of the modifiers section in the advanced mode window and explains the functions of the various modifiers.

This selection specifies that the modifiers in the Translation List (and no others) must be present. The translation is prefaced by an exclamation mark (!).

These selections add modifier key(s) to the translation.

These selections specify that the selected modifier is not part of the translation.

This selection specifies a case distinction; for example, a and A are not treated identically. The translation is prefaced by a colon (:).

- ☐ Exact Match
- ☐ Case Sensitive Match

- ☐ Shift
- ☐ Control
- ☐ Caps-Lock
- ☐ Mod1
- ☐ Mod2
- ☐ Mod3
- ☐ Mod4
- ☐ Mod5

- ☐ ~Shift
- ☐ ~Control
- ☐ ~Caps-Lock
- ☐ ~Mod1
- ☐ ~Mod2
- ☐ ~Mod3
- ☐ ~Mod4
- ☐ ~Mod5

Figure 4-8 Keymap Editor—Translation Modifiers

Creating a Translation

To create a new translation:

1. Select the desired action(s) from the `Action List` or type the action(s) in the `Action:` field.
2. Select the desired modifier(s). Figure 4-8 explains the modifier selections.
3. Click `New`. The translation is added to the `Translations` list.

Replacing a Translation

To replace a translation:

1. Select a translation from the `Translations` list. The translation appears in the `Action:` field.
2. Make desired modifications by editing the `Action:` field or selecting modifiers from the modifier list (Figure 4-8) and actions from the `Action List`.
3. Click `Replace`.

Using and Customizing the 3270 Emulator **4-27**

Deleting a Translation

To delete a translation:

1.   Select a translation from the `Translations` list.

2.   Click `Delete`.

Changing the Order of Translations

To change the order of translations:

1.   Select a translation from the `Translations` list.

2.   From the Edit menu, select `Cut` or `Copy`.

3.   Select another translation and select `Paste Before` or `Paste After` from the Edit menu.

Quitting the Keymap Editor

To quit the Keymap Editor, select `Quit` from the File menu. To retain your current keymap, be sure to apply the keymap to a window or save it in a file before quitting.

Alternative Ways of Changing Keymaps

Instead of using the Keymap Editor, you can use the general X Window System methods of redefining the keymap:

❏   Using translations to redefine the keymap for specific clients

❏   Using *xmodmap* to redefine the keymap for all clients

Using Translations

You can put your key translations into an X resources file, into the **xserver**-**initial**-**x**-**resources** remote configuration parameter, or specify a translations file in an emulator command line.

Specifying Keymaps in an Emulator Command Line

To apply a keymap file to an emulator started with a command line (whether the command line is used in a remote configuration file, window manager menu, or startup file), use the -**transfile** *filename* option.

To apply a Brixton version 1.2 keymap file, use the -**k** option instead.

Specifying a Translation in an Emulator Command Line

You can use the -**trans** option to specify a translation directly; for example:

```
rsh ncd01 tn3270 -trans "<Key>KP_Enter:Enter()"
```

Do not specify multiple translations or include spaces in the translation.

Specifying Translations Using X resources

To apply a Brixton version 1.2 keymap to the 3270 emulator through resource settings, use the **kbdMapFilename** resource to specify the name of the Brixton keymap file.

To apply other translations to the 3270 emulator use the **translations** resource followed by a list of translations. For example:

```
ncd3270*translations: <Key>KP_Enter:Enter() \n\
    Ctrl<Key>4:onecharacter(0x4A)
```

Using Remote Configuration

For information about putting key translations into the **xserver-initial-x-resources** parameter, see the *NCDware System Administrator's Guide*.

Using *xmodmap*

See the *NCDware System Administrator's Guide* for information about how to create **xmodmap** files and invoke **xmodmap**.

Another method of reassigning keys is provided by the *xmodmap* X client. This client modifies the default keyboard mapping by executing a file containing the desired definitions. Unlike translations, however, *xmodmap* changes apply to all clients. An *xmodmap* command is usually executed from within an XDM startup file.

Default 3270 Emulator Keymap

Table 4-2 lists the keyboard functions necessary for 3270 operations and the corresponding keysyms (*key sym*bol). Each physical key is associated with a keysym, and the keysym name represents the keycap. By default, if you press the key or key combination corresponding to the keysym, the action listed in the table occurs.

The following notes explain the table entries:

❏ To use a key combination, press and hold down the first key listed, then type the next key(s).

❏ Keys prefaced by KP indicate a key in the numeric key pad section of the keyboard.

❏ AID stands for Attention Identifier key.

❏ The functions assigned to the PF1 through PF24 keys vary according to the application program running in the emulator window.

❏ Up, Down, Right, and Left refer to the arrow keys.

❏ To quickly locate a given IBM action on an NCD keyboard, view the keyboard layout using the Keymap Editor.

Table 4-2 Default Key Translations

Action	Result	Keysym
Enter	Perform the 3270 enter AID	KP_Enter
Clear	Perform the 3270 clear AID	Ctrl-c or KP_F4
Reset	Perform the 3270 terminal reset function	Ctrl-r
Btab	Move the cursor to the previous input field	Shift-Tab
Tab	Move the cursor to the next input field	Tab
Home	Move the cursor to the home (first) input field	Shift-Up
Newln	Move the cursor to the first input field on the next line	Return
Del	Delete the character in the current cursor position	Delete
Left	Move the cursor one position to the left	BackSpace
Right	Move the cursor one position to the right	Right
Up	Move the cursor one position up	Up
Down	Move the cursor one position down	Down

Table 4-2 Default Key Translations (Continued)

Action	Result	Keysym
Dup	Duplicate field	Shift-KP_F1
Fm	Field mark	Shift-KP_F1
Ein	Erase all the input fields	Shift-Delete
Eeof	Erase from current cursor position to end of field	Escape
Ins	Toggle insert mode	Linefeed
Cut	Delete the selected text	Shift-KP_F3
ToggleMbar	Toggle the display of the menu bar	Shift-KP_F4
onecharacter	Enter the EBCDIC character specified. This function is used to enter characters required by the application, but may not be on the keyboard.	Ctrl-4: the *cent* sign (¢) Ctrl-6: the *not* sign (¬) Ctrl-backslash: the broken bar.
The functions of the following Attention Identifier (AID) keys depend upon the operating system and the application running in the emulator window.		
PA-1	Perform the 3270 program attention AID	Ctrl-1 or KP_F1
PA-2	Perform the 3270 program attention AID	Ctrl-2 or KP_F2
PA-3	Perform the 3270 program attention AID	Ctrl-3 or KP_F3
The functions of the following Attention Identifier (AID) keys depend upon the application running in the emulator window.		
PF1	Perform the 3270 PF1 AID	F1
PF2	Perform the 3270 PF2 AID	F2
PF3	Perform the 3270 PF3 AID	F3
PF4	Perform the 3270 PF4 AID	F4
PF5	Perform the 3270 PF5 AID	F5
PF6	Perform the 3270 PF6 AID	F6

Table 4-2 Default Key Translations (Continued)

Action	Result	Keysym
PF7	Perform the 3270 PF7 AID	F7
PF8	Perform the 3270 PF8 AID	F8
PF9	Perform the 3270 PF9 AID	F9
PF10	Perform the 3270 PF10 AID	F10
PF11	Perform the 3270 PF11 AID	F11
PF12	Perform the 3270 PF12 AID	F12
PF13	Perform the 3270 PF13 AID	Shift-F1
PF14	Perform the 3270 PF14 AID	Shift-F2
PF15	Perform the 3270 PF15 AID	Shift-F3
PF16	Perform the 3270 PF16 AID	Shift-F4
PF17	Perform the 3270 PF17 AID	Shift-F5
PF18	Perform the 3270 PF18 AID	Shift-F6
PF19	Perform the 3270 PF19 AID	Shift-F7
PF20	Perform the 3270 PF20 AID	Shift-F8
PF21	Perform the 3270 PF21 AID	Shift-F9
PF22	Perform the 3270 PF22 AID	Shift-F10
PF23	Perform the 3270 PF23 AID	Shift-F11
PF24	Perform the 3270 PF24 AID	Shift-F12

Using an Alternative ASCII/EBCDIC Conversion Table

The 3270 emulator converts user input from ASCII to EBCDIC and application output from EBCDIC to ASCII.

Specifying an Alternate Conversion Table

The emulator's built-in conversion table is for US English keyboards. If you are using a different version of a keyboard, you must specify a conversion file containing a table configured for your language.

The NCDware distribution includes conversion tables for English, Spanish, German, and French. The installation program places the tables in the boot directory in the **3270kbds** subdirectory.

To specify a conversion file, use the -**a** command-line option or the **asciiEbcdicTableFilename** resource. For example:

```
rsh ncdu100 tn3270 -a SpanishTable
```
or
```
ncd3270*asciiEBCdicTableFilename: SpanishTable
```

The -**A** option (**asciiEbcdicTableFilenameAndDump** resource) performs the same function as -**a**, with the added feature of displaying the table in the Console Messages area.

Conversion File Format

A conversion file consists of 512 hexadecimal numbers separated by white space. A # character (pound sign) indicates that the remaining part of the line is a comment. An example ASCII-to-EBCDIC conversion file is shown in Figure 4-9.

The first 256 characters in the file define the EBCDIC-to-ASCII conversion. The emulator determines the translation of an EBCDIC character by using the character's EBCDIC code point as an index from the start of the first set of 256 characters.

The second 256 characters define the ASCII-to-EBCDIC conversion. The emulator determines the translation of an ASCII character by using the character's ASCII numeric code as an index from the start of the second set of 256 characters. Non-mapped characters in the ASCII-to-EBCDIC translation table should map to the nul character (0x00).

```
# Spanish Translation Tables
#              EBCDIC to ASCII
20 20 20 20 20 20 20 20 20 20 20 20 0a 0d 20 20  # 00-0f
20 20 20 20 20 0a 20 20 20 20 20 20 20 20 20 20  # 10-1f
20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20  # 20-2f
20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20  # 30-3f
20 20 20 20 E0 E1 20 20 E7 20 5B 2E 3C 28 2B 7C  # 40-4f
20 E9 20 20 E8 ED 20 EF 20 26 5D 24 2A 29 3B AC  # 50-5f
2D 2F 20 20 C0 C1 20 20 20 20 F1 2C 25 5F 3E 3F  # 60-6f
20 C9 20 20 C8 CD 20 CE 20 60 3A BA D1 27 3D 22  # 70-7f
20 61 62 63 64 65 66 67 68 69 20 20 20 20 20 20  # 80-8f
20 6A 6B 6C 6D 6E 6F 70 71 72 AA 20 20 20 20 20  # 90-9f
20 7E 73 74 75 76 77 78 79 7A A1 BF 20 20 20 20  # a0-af
20 20 20 B7 20 20 20 20 20 20 5E 21 20 20 B4 20  # b0-bf
7B 41 42 43 44 45 46 47 48 49 20 20 20 F2 F3 20  # c0-cf
7D 4A 4B 4C 4D 4E 4F 50 51 52 20 20 FC 20 FA 20  # d0-df
5C 20 53 54 55 56 57 58 59 5A 20 20 20 D2 D3 20  # e0-ef
30 31 32 33 34 35 36 37 38 39 20 20 DC 20 DA 20  # f0-ff
#              ASCII to EBCDIC
00 01 02 03 04 05 06 07 08 09 1e 0b 0c 0d 0e 0f  # 00-0f
00 01 02 03 04 05 06 07 08 09 0a 0b 0c 0d 0e 0f  # 10-1f
40 BB 7F 00 5B 6C 59 7D 4D 5D 5C 4E 6B 60 4B 61  # 20-2f
F0 F1 F2 F3 F4 F5 F6 F7 F8 F9 7A 5E 4C 7E 6E 6F  # 30-3f
7C C1 C2 C3 C4 C5 C6 C7 C8 C9 D1 D2 D3 D4 D5 D6  # 40-4f
D7 D8 D9 E2 E3 E4 E5 E6 E7 E8 E9 4A E0 5A BA 6D  # 50-5f
79 81 82 83 84 85 86 87 88 89 91 92 93 94 95 96  # 60-6f
97 98 99 A2 A3 A4 A5 A6 A7 A8 A9 C0 4F D0 A1 00  # 70-7f
00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  # 80-8f
00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  # 90-9f
00 AA 00 00 00 00 00 00 00 00 9A 00 5F 00 00 00  # a0-af
00 00 00 00 BE 00 00 B3 00 00 7B 00 00 00 00 AB  # b0-bf
64 65 00 00 00 00 00 00 74 71 00 00 00 75 00 77  # c0-cf
00 7C ED EE 00 00 00 00 00 00 FE 00 FC 00 00 00  # d0-df
00 6A CD CE 00 00 00 00 00 00 DE 00 DC 00 00 00  # f0-ff
```

Figure 4-9 Spanish ASCII-to-EBCDIC Conversion File

Setting Up Print Services

You can print output from applications by using the NCD 3287 print emulator, and you can print the emulator window contents using the NCD print table for local clients.

The emulator can print to a local printer attached to the terminal or to remote printers.

If you are attaching a local printer, see the following section, "Connecting a Printer to the Terminal". For directions on using the print emulator, see "Using the 3287 Print Emulator" on page 4-36. For information on printing window contents, see "Printing Window Contents" on page 4-39.

Connecting a Printer to the Terminal

If you are connecting a printer to an NCD terminal's serial or parallel port, follow the directions in this section for cabling and for configuring the terminal. Refer to your printer manual and terminal hardware booklet to determine which type of interface is supported on your hardware.

Cabling

For a serial port connection, use a null modem cable (DTE-to-DTE).

For a parallel port connection, use a cable equipped with a DB-25 connector on one end and a Centronics parallel interface on the other.

Configuring the Terminal for Printing

Terminal configuration for communicating with the printer and host differs depending on whether the printer is attached by a serial or a parallel port.

Configuring Serial Port Communication

To configure serial port communication:

1. Select Setup ⇒ Change Setup Parameters ⇒ Serial ⇒ Serial Interfaces Table.

2. To enable the serial port for printing:

    —   To print immediately, use the `Current Port Use` field. Click the existing value under `Current Port Use` to display a popup list of values. Select either `Printer` or `Serial Daemon`.

    —   To print after setting the communication parameters and rebooting the terminal, use the `Port Use at Boot` field. Click the existing value under `Port Use at Boot` to display a popup list of values. Select either `Printer` or `Serial Daemon`.

3. Click `Apply` to apply the changes.

4. The values listed in the `Serial Daemons Table` (Setup ⇒ Change Setup Parameters ⇒ Serial ⇒ Serial Daemons Table) configure communication between the terminal and the host. Except for the `Enable LAT Service` field, which you should set to "true," for most sites, the defaults are acceptable.

Configuring Parallel Port Communication

The `Parallel Daemons Table` (Setup ⇒ Change Setup Parameters ⇒ Parallel ⇒ Parallel Daemons Table) controls communication between the terminal and the host through the parallel port. Except for the `Enable LAT Service` field, which you should set to "true," the defaults in the table are acceptable.

Using the 3287 Print Emulator

The NCD 3287 print emulator is a local client for printing from a mainframe to a printer attached to the local terminal or a remote terminal via the serial or parallel port. The client, called *ncd3287*, requires a BrxPU2.1 connection to the host.

ncd3287 emulates LU Type 1 (SCS) and LU Type 3 (DCS) printers. Many *ncd3287* clients may be invoked at once, each controlling a single printer.

ncd3287 is a version of *Brx3287*, the Brixton 3287 print emulator process that has been customized for running on X terminals. Unlike the Brixton version, *ncd3287* includes a window with menus and X resources for specifying printer and terminal configuration.

Note The 3287 print emulator does not support PostScript printing.

To use *ncd3287*, you need to:

1. Connect the printer to the terminal and configure the terminal to communicate over serial or parallel lines with printer and host. See "Connecting a Printer to the Terminal" on page 4-35.

2. Find out which host the Brixton PU2.1 server is running on; you need the name of this host to start the print emulator. See the Brixton documentation.

3. Start the print emulator. See the following section, "Starting the Print Emulator".

Starting the Print Emulator

Tip
The LU (logical unit) and PU (physical unit) names must be listed in the SNA server's configuration file. See the Brixton SNA documentation for more information about SNA server configuration.

You start the print emulator by invoking *ncd3287* from a command line or from a startup script. To invoke *ncd3287*, use an *rsh* or *remsh* command.

For example:

```
% rsh ncd222 ncd3287 -h kestrel &
```

where:

ncd222 is the hostname of the terminal. If you are not running a name service on the network, use the terminal's IP address instead of its hostname.

ncd3287 is the command to start the print emulator.

-h   is the command-line option for indicating that the following string names the host running the BrxPU2.1 SNA software.

kestrel   is the hostname of the host running the BrxPU2.1 SNA software.

In this example, a small window with a plaid background, entitled NCD3287, appears on ncd222. The *ncd3287* process runs on the terminal named ncd222, sending print output from 3270 applications via the BrxPU2.1 gateway named kestrel to the printer attached to ncd222. Because they are not specified on the command line, the following defaults are used: 5020 for the TCP/IP port for the BrxPU2.1 gateway, serial-line mode, and serial port 1.

The following example enables serial mode printing from serial port 2:

`% rsh ncd222 ncd3287 -h kestrel -pm serial -pp 2 &`

where, in addition to the commands and options described in the preceding example:

-pm   is the default printing mode ("serial," "parallel," or "remote") at initialization.

-pp   specifies which port to use. The possible values for this option vary depending on the terminal hardware.

The NCD3287 window's root menu (accessed by clicking MB3 in the plaid background) provides a way of selecting a printer after initialization has occurred.

You can start the print emulator process using the *ncd3287* command as described earlier in this chapter for the *ncd3270* command:

❏   From a command line (as in the previous example)

❏   From an XDM **Xsession** or **.xsession** startup file

❏   From the **exec-startup-commands-table** parameter

❏   From a custom-made window manager menu

See "Methods of Starting the Emulator" on page 4-2 for more information about using these methods.

Similarly, you can use the same methods for configuring the *ncd3287* client as described for *ncd3270*:

❏ Command-line options (as in the previous example)

❏ X resources set either in resource files or through terminal remote configuration

See "Methods of Customizing the Emulator" on page 4-6 for more information about using command-line options and resources.

Terminating the Print Emulator

To terminate the print emulator:

1. Press MB3 within the plaid background of the NCD3287 window to access the 3287 menu.

2. Select Exit.

Printing Window Contents

Users can print the contents of a window by using the Select Printer and Print Screen commands in the emulator's File menu. When the Select Printer command is selected, the Select Printer dialog box appears; the printers in the terminal's print table are displayed in the dialog box.

You can set up the print table for users to print to a local printer attached to the terminal's parallel or serial port, to remote printers attached to other NCD terminals, or to other network printers.

Remote printing uses the LPD protocol, and the terminal sends a Postscript or ASCII data stream.

There may already be entries in the table. Some entries (for printing to the terminal's serial and parallel ports) appear automatically. The entries for parallel ports appear when the user selects a print command from the VT320 or 3270 terminal emulator's File menu. An entry for a serial port appears automatically if the system administrator configures the serial port for printing. Figure 4-10 shows two such entries. You can

edit any entry, but changes affect all of the local clients that use the print table. For more information about this topic, see the *NCDware System Administrator's Guide.*

You can add printers or edit existing entries in the local client print table. You can configure the table in the Console Setup menus or in a remote configuration file.

Using the Setup Menus

To configure the print table using the Setup menus:

1. From the Console, select Setup ⇒ Change Setup Parameters ⇒ Print. The Lpr Servers table appears (Figure 4-10).
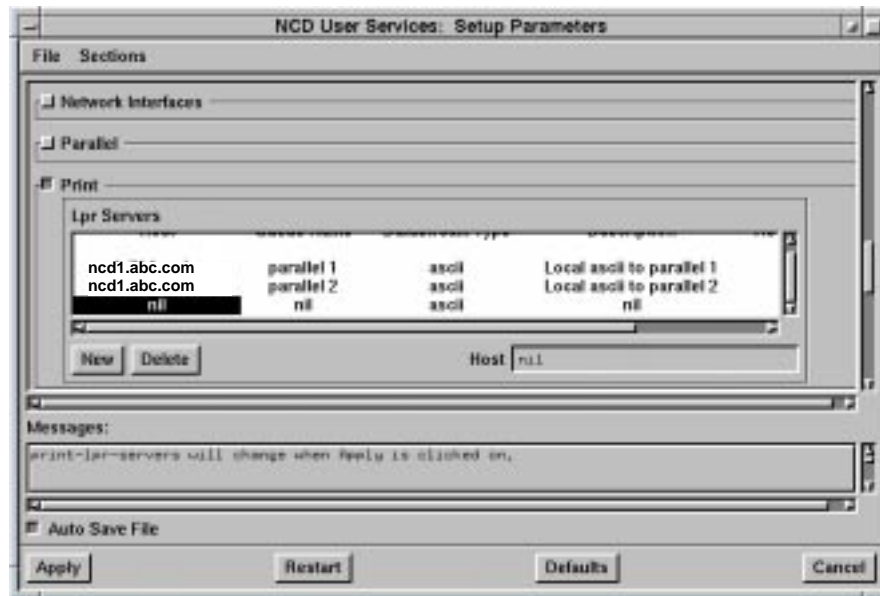

Figure 4-10 Printer Setup Window

2. Click New. A new entry appears in the table. and the Host text entry field appears.

    For details about configuring an entry for a local or remote printer, see "Specifying a Local Printer" on page 4-42 or "Specifying a Remote Printer" on page 4-42.

3. Type the name of the print server (the host to which the printer is attached) in the Host field. The name must be 30 characters or less. The host may be a remote host (either a different NCD terminal or other host) or the local terminal.

4. Select the Queue Name field in the Lpr Servers table. Type the queue name in the Queue text entry box that appears.

5. Select the Datastream Type field in the Lpr Servers table. From the pulldown menu that appears, select ASCII, PostScript, or NT PostScript. The default setting is ASCII.

6. Select the Description field in the Lpr Servers table. Type the printer description in the Description text entry box that appears.

Note Do not use curly brackets in a text field, such as the Description field. Using curly brackets in a remote configuration text field causes the NCD terminal to panic.

7. If you want a banner page to appear on the printer, select the Request Banner Page field. Click the Request Banner Page option that appears.

Note The Request Banner Page option works for remote LPD printing only.

To remove a printer:

1. Select any field in the Lpr Servers table.

2. Click Delete.

Using a Remote Configuration File

To configure the print table in a remote configuration file, list printers and their attributes in the **print-lpr-servers** remote configuration parameter (Figure 4-11).

```
                Print server       Printer                              Banner page
                host name       queue name                                   │
     print-lpr-servers = {                                                   │
        { "flurry" "asc" ascii "Ascii on Flurry" true }
        { "flurry" "optps" postscript "Postscript on Flurry" false }
        { "172.20.10.69" "parallel 1" ascii "Local Serial ASCII" false }
        { "ntpc" "ntps" nt-postscript "NT Postscript" false }
     }                             Printer type or
                                   data stream type        Description
```

Figure 4-11 Listing Printers in the print-lpr-servers Configuration Parameter

Specifying a Local Printer

For a local printer, the queue name can be **parallel** or **serial**, followed by a space, then the port number (1, 2, and so on); for example **parallel 1**. The default port number is 1.

Note   Use a space or a dash between the word *parallel* or *serial* and the port number. Do not use a colon.

The printer server name is the terminal's host name.

There may already be entries in the table for the terminal's serial or parallel ports because these entries can appear in the table automatically due to actions taken by the user in other local clients. For more information, see the *NCDware System Administrator's Guide.*

For serial printing, the port must be configured for printing.

Specifying a Remote Printer

To set up printing to a remote printer, you need the queue name and hostname for the printer server.

If the printer is on a Windows NT system, set the printer type field to "NT PostScript" (or "nt-postscript" in a remote configuration file). The printer must be available through the LPD protocol. See your host documentation for information about using the LPD protocol.

If the printer is on a remote NCD terminal, the queue name is *rmt:* followed by the serial port number. For example, the queue name for serial port 1 is rmt:87.

5   Using and Customizing the Local NCD Window Manager

This section describes:

❏ Alternative ways of starting the local window manager

❏ Root menus

❏ Alternative ways of shutting down the local window manager

❏ Alternative ways of performing window manager operations

Illustrations and usage directions in this section apply to the local and host-based versions of the NCD Window Manager and the local Motif Window Manager.

"Starting and Using the Local NCD Window Manager" on page 3-8 describes starting the window manager from the Console menu bar and using the mouse for window manager operations.

Starting the Local Window Manager

A drawback of starting the window manager from the Console is that the window manager does not read a configuration file. This means that the user has only the default window manager root menu (shown in Table 5-1 on page 5-4).

Starting the Window Manager from a Command Line

The following host-based utilities for starting the window manager allow you to provide custom root window menus for users.

The files you use to configure the menus are introduced in "Using and Configuring Root Menus" on page 5-3.

Binaries for these utilities are included in the NCDware distribution. If a binary for your host is not included in the distribution, visit the NCD web site or FTP site to see if there is a binary for your host in the archive of utilities. You can also call NCD Technical Support for help. See Chapter 7 for information on contacting Technical Support.

Using the *ncdrunwm* Utility

NCDware includes a host-based utility, *ncdrunwm,* used to start the local window manager from a command line. The *ncdrunwm* command starts the local NCD Window Manager and reads a window manager configuration file. Window manager configuration files define from one to three root window menus (see "Using and Configuring Root Menus" on page 5-3).

To start the local window manager on the local terminal, type the following command in a UNIX shell:

```
% ncdrunwm
```

Using the *ncdlaunchd* Utility

You can still use *ncdlaunchd*, the older host-based utility, to start the window manager with custom menus, but you must use the new version provided in this release of NCDware. You may wish to use *ncdlaunchd* if your startup files or terminal remote configuration files already specify this utility.

Start the local window manager using an *rsh* command and *ncdlaunchd* to read the window manager configuration file. If you don't care to use customized root window menus, you need not start the launcher.

```
% rsh hostname wm
% ncdlaunchd
```

Starting the Window Manager Automatically

You can start the window manager automatically when the user logs in from an XDM startup file or the remote configuration file.

Using an XDM Startup File

To start the local window manager automatically from an XDM startup file (**.xsession** or **Xsession**), insert into the file the command line(s) shown in the previous section.

Using Remote Configuration

To start the window manager automatically when the terminal reboots, you can add the window manager command to the **exec-startup-commands** table. When started in this fashion, the window manager cannot read configuration files to display customized menus.

For example, the following table entries start the local window manager and a 3270 emulator window:

```
exec-startup-commands = {
    { wm }
    { tn3270 }
}
```

Using and Configuring Root Menus

The NCD Window Manager provides a default root menu, and you can configure your own custom menus.

The Default Root Menu

The default menu (displayed on the root window if no other menu is configured) allows you to start local clients (see Table 5-1). For information about configuring the default root window menu, see the *NCDware System Administrator's Guide*.

Table 5-1 Default Root Window Menu

Root Window Menu Item	Function
Show Console	Displays the Console
Start Terminal	Displays the Terminals Chooser for starting a VT320 terminal emulation window
Start Dialer	Displays the Dialer Port Chooser for connecting to a host using a modem
Start 3270	Starts a 3270 emulation window
Start 3179G	Starts a 3270 emulation window for running mainframe graphics (GDDM) applications
Start Keymap Editor	Starts the Keymap Editor
Show Version	Displays information about terminal software and hardware
Show Memory	Displays information about installed and free memory
Show X Connections	Shows X clients connected to a terminal
Lock Screen	Starts the screen locking utility
Setup User Preferences	Starts the local client for configuring user preference items
Login	Displays the Login Chooser
Logout	Logs you out and ends the current session
Exit Window Manager	Terminates the local window manager

Configuring Custom Menus

You can also configure custom menus. Depending upon how you configure the menus, different types of root window menus may be available and each mouse button may display a different menu.

To display a root window menu and make a selection, follow these steps:

1. Move the pointer to any area of the root window (the background behind all other windows); the pointer changes to an X.

2. Click any mouse button to display a menu.

3. Click on your selection in the menu.

4. If you decide not to make a selection, move the pointer to the root window and click any button to remove the menu.

If you use *ncdrunwm* or *ncdlaunchd* to start the window manager, you can configure custom menus in a window manager configuration file. By default, *ncdrunwm* or *ncdlaunchd* looks first for a file called **.launchrc** in the user's home directory. If such a file does not exist, both programs look for the following files in the order listed:

❏   **.mwmrc** in the user's home directory

❏   **/usr/lib/X11/system.launchrc** system-wide file

❏   **/usr/lib/X11/system.mwmrc** system-wide file

You can also specify a different file by starting either program with a command line that includes the **-f** *filename* option.

The following example shows one line from a window manager configuration file. This line inserts a command for starting an emulator from a root window menu:

```
"Local 3270"   !"rsh ncdu100 tn3270 -display ncdu100:0 &"
```

In this example, `Local 3270` appears in a root window menu. When the user selects `Local 3270`, the command following the exclamation mark executes.

Note that you cannot simply insert this line into an empty window manager configuration file. Other entries are required.

Shutting Down the Window Manager

You can shut down the window manager by deselecting it from the Console's WindowMgr menu. From the default window manager menu, click on the root window and click on `Exit Window Manager`.

Performing Window Manager Operations

Window manager operations can be performed in three different ways (Table 5-2). The mouse method is the simplest.

To use the Window menu (shown in Table 5-3):

1. To display the menu from a window, click once with the left mouse button on the dash in the left corner of the window.

2. To display the menu from an icon, click once with the left mouse button in the icon.

3. To make a selection, click any mouse button on your selection.

4. To close the menu, click any mouse button on the root window.

Table 5-2 Window Manager Operations—Methods

Method	General Description
Mouse method	Place the pointer in a border or button and click a mouse button or press a button and drag the mouse. The borders and buttons and their associated functions are shown in Figure 3-4 on page 3-9.
Window menu method	Select an operation from the Window menu. Some functions require using the mouse. Window menu operations are shown in Table 5-3.
Keyboard method	Press a two-key combination for each operation. Some functions require the mouse. Keyboard method operations are shown in Table 5-3.

To use a keyboard shortcut (listed in Table 5-3), hold down the first two keys in the Keyboard Shortcut column and press the third.

Table 5-3 Window Menu and Keyboard Shortcuts

Window Menu Item	Keyboard Shortcut	What the Option Does
Restore	Alt-Ctrl-F5	Returns the window to its previous size and location. Changes an icon into a window.
Move	Alt-Ctrl-F7	Moves the window to a new location on the screen. Requires use of the mouse.
Size	Alt-Ctrl-F8	Changes the size of the window. Requires use of the mouse.
Minimize	Alt-Ctrl-F9	Replaces the window with a representative icon.
Maximize	Alt-Ctrl-F10	Expands the window to cover the entire screen.
Lower	Alt-Ctrl-F3	Moves the selected window to the bottom of the stack of windows on the screen.
Close	Alt-Ctrl-F4	Closes the window, terminating the program running in the window.

Minimizing a Window (Turning it into an Icon)

To remove a window from the display without closing it, you can replace it with a small representation, called an icon. The icon appears at the edge of the screen. Any operation running in the window continues, but you cannot enter input into an icon; you must restore the window first.

To minimize a window:

Mouse method	Click the minimize button (the smaller button in the top right corner of the window).
Menu method	Select `Minimize` from the Window menu.
Keyboard method	Select the window and use the Alt-Ctrl-F9 keyboard shortcut.

Restoring a Window from an Icon (Deiconifying)

You must restore a window from its iconified state before you can send input to the application.

To restore a window:

Mouse method	Double click on the icon with the left mouse button.
Menu method	Select `Restore` from the Window menu.
Keyboard method	Select the window and use the Alt-Ctrl-F5 keyboard shortcut.

Maximizing a Window

Maximizing a window expands it to cover the entire screen, obscuring any other windows or icons.

To maximize a window:

Mouse method	Click the maximize button (the larger button in the top right corner of the window).
Menu method	Select `Maximize` from the Window menu.
Keyboard method	Select the window and use the Alt-Ctrl-F10 keyboard shortcut.

Resizing a Window

To make a window a different size:

Mouse method	1. Place the pointer on a border or corner of the window you want to resize. 2. Using the left mouse button, drag the border to the desired shape and size. 3. Release the mouse button.
Menu method	1. Select `Size` from the Window menu. 2. Position the pointer on a border or corner. 3. Move the pointer to the new location of the border or corner. 4. Click any mouse button.
Keyboard method	Select the window and use the Alt-Ctrl-F3 keyboard shortcut.

As you resize a 3270 emulator window, the emulator selects a font size proportional to the size of the window.

Moving a Window or an Icon

To move a window or an icon to a different position on the screen:

Mouse method	1. Position the pointer in the title bar.
	2. Press and hold the left mouse button.
	3. Drag the pointer to the new location.
	4. Release the mouse button.
Menu method	1. Select `Move` from the Window menu.
	2. Drag the outline box to the new location.
	3. Click the left mouse button.
Keyboard method	1. Select the window.
	2. Use the Alt-Ctrl-F7 keyboard shortcut.
	3. Drag the outline box that appears to the new location.
	4. Click the left mouse button.

Raising or Lowering a Window

You can raise windows that are overlapped by others and send windows to the bottom of the stack when they are not in use.

To raise a window:

Mouse method	Click with the left mouse button in the title bar or border of the window you want to raise.

To lower a window:

Mouse method	Click with the right mouse button in the title bar or border of the window you want to lower.
Menu method	Select `Lower` from the Window menu.
Keyboard method	Select the window and use the Alt-Ctrl-F3 keyboard shortcut.

Closing a Window or an Icon

To close a window:

Mouse method	Double click on the menu button with the left mouse button.
Menu method	Select `Close` from the Window menu.
Keyboard method	Select the window and use the Alt-Ctrl-F4 keyboard shortcut.

To close an icon:

Menu method	Click the left mouse button on the icon and select `Close` from the Window menu.
Keyboard method	Select the icon and use the Alt-Ctrl-F4 keyboard shortcut.

6 Application Programming Interface Methods

The NCD 3270 terminal emulator includes support for two application programming interface methods to assist in integrating terminal, UNIX workstation, and IBM mainframe environments:

❏ 3270 application session record and playback macros accessed through the 3270 terminal emulator's Macros menu (available over TN3270 connections)

❏ Support for Brixton System's EHLLAPI (Extended High-Level Language Application Program Interface)

See Brixton's *EHLLAPI: Programmatic Interface Manual* for complete documentation of EHLLAPI.

This chapter describes how to use record and playback macros and how to configure the terminal for use of EHLLAPI.

Record and Playback Macros

The record and playback macros, accessed through the Macros menu, provide an easy method for recording a 3270 application session, saving the recording, and playing it back.

See the **ncd3270** man page for a complete list of keyboard translations.

Macros are composed of 3270 terminal emulator actions recorded as the user supplies keyboard input. The 3270 actions recorded in a macro file are almost identical to Xt-style translations for *ncd3270*.

The one difference is the 3270's Pause() function. Pause (), available only with macros, stops the macro to permit a user to enter security-sensitive input such as a password. To restart macro execution and recording, an Enter() action is needed. Pause() is mapped to Alt-a by default and to the Pause key on 3270 keyboards.

The following is an example of a macro recorded by a user logging into a mainframe application session. In this example, cc1 is the macro name and a613 is the user's identification.

```
"cc1": String(icicics) Newln() Enter() Clear() String (ici3) Enter() String(a613)
Tab() Pause() String(2) Enter() String(2) Tab() String(8) Enter()
```

Enabling and Disabling the Macro Feature

By default, the record and playback feature is enabled and accessible through the Macros menu on the 3270 terminal emulator's menu bar. To disable the Macros menu, set the **allowMacros** resource to "false." If you're starting a terminal emulator from a command line, use -**macrosOff** to disable the Macros menu.

Recording and Naming a Macro

Tips
The 3270 terminal emulator does not signal the beginning or ending of a recording session.

Trailing white space following strings is not recorded.

To begin recording a macro, select Macros ⇒ Start Recording from the 3270 terminal emulator's menu bar. As many as 32 subsequent keystrokes are recorded until you select Macros ⇒ Stop Recording.

If you try to record more than 32 key hits, when the macro is played back, the 33rd locks the keyboard. To successfully play back more than 32 keystrokes, insert a Pause(). This flushes the typeahead buffer, permitting you to play another 32 keystrokes.

To stop recording, select Stop Recording. A dialog box appears to prompt you to name the macro.

After you name a macro, it is available by name from the Macros ⇒ Run Macros pulldown menu.

Saving Macros in Files and Placing them in the Run Macros Menu

Tip
Be sure to give each macro file a unique name. Macros ⇒ Read From File . . . does not confirm that a file is unique before running it.

To save a macro in a file, select Macros ⇒ Save to File. A dialog box appears; enter the name of the macro.

To read a saved macro file at startup and place it in the Run Macros pulldown menu, name the file containing the macro in the **macroFile** resource.

"Playing a Macro" on page 6-3 describes two methods for playing macros saved in files.

Playing a Macro

To play a macro:

❑ Select Macros ⇒ Run Macros.

A pulldown menu lists macros that were recorded during the current session or read from files.

❑ Select Macros ⇒ Read from File.

A dialog box appears; type the name of the file containing the macro.

Stopping a Macro

To stop a running macro, press the Reset key (Ctrl-R). (This function is also available on the PF keypad.)

Renaming Macros

To rename a macro, select Macros ⇒ Rename Macro. A dialog box results, prompting you to select the name of the macro to be renamed and provide a new name.

Preparing to Use EHLLAPI

To use the Brixton EHLLAPI application programming interface for 3270 application drivers, you must have Brixton's host-side EHLLAPI libraries for support of remote host connections. Check with Brixton to find out what version you need.

To configure the terminal for EHLLAPI use:

1. Specify the default EHLLAPI A TCP port. In a remote configuration file, use the **ncd3270-ehllapia-default-port** parameter to specify the EHLLAPI A default TCP port. The default value is 5021.

2. Indicate to the EHLLAPI programs that *ncd3270* is acting as the EHLLAPI server by specifying the EHLLAPI session name (A through H) on the command line or in the **ehllapiName** resource.

For example, from the command line:

```
% rsh ncdu100 tn3270 -pu21 -e A &
```

where:

tn 3270   is the command to start the terminal emulator.

-pu21   is the option to start a BrxPU2.1 connection.

-e   is the option to specify the EHLLAPI session name.

7 Troubleshooting

This section lists the error messages produced by the *ncd3270* client, their causes, and the actions to take (if any). Directions are provided for contacting NCD Technical Support to get help for other problems you may encounter.

Error Messages Produced by *ncd3270*

NCDware reports information about actions of the X server. As the server executes, each software module generates its own messages and sends them to the built-in Diagnostic daemon. The daemon stores messages in an internal buffer and forwards them to the Console, where they appear in the Console Messages hide box. If you are using a diagnostic log file, messages are logged in the specified file.

See the *NCDware System Administrator's Guide* for information about setting up diagnostic logging.

Information reported in diagnostic messages includes successful completion of user requests, unsuccessful attempts to perform an action, and fatal errors that cause the *ncd3270* client to terminate.

Message Format and Severity Levels

Here is an example message and an explanation of its components:

```
%NCD3270-I-B3270006, Quit (User requested termination).
```

`%NCD3270`	is the reporting module.
`I`	shows that this is an informational message.
`B3270006`	is the message number. For more information, look up the message number in "List of Error Messages" on page 7-2.
`Quit (User requested termination).`	is the message text.

All *ncd3270* messages follow this format:

`%MODULE-S-IDENT, message`

The parts of a message are:

`%MODULE`   indicates the local client or other software module that issued the message.

S   is the level of severity:

> *I*   An informational message. The client has performed its activities successfully.
>
> *W*   A warning message; an error from which the client recovered. The client may have completed some, but not all, of the requested action. You may want to verify the results to make sure they are correct.
>
> *E*   An error from which the client may not recover. The client did not complete the requested activity, but is attempting to continue.
>
> *F*   An fatal (irrecoverable) error. The client did not complete the requested activity, and the client has terminated.

IDENT   is the message number. All messages are listed in the following section in message number order.

message   is the message text.

List of Error Messages

This section lists messages produced by the *ncd3270* local client, in message number order.

When displayed, all of these messages start with `%NCD3270` followed by the severity indicator.

Many messages include variable text, for example, *LU_name*. When the message is displayed, the variable is replaced by the actual data, for example, the LU name.

The **Explanation** paragraph describes the reason for the message and the effect on the local client.

The **User Action** paragraph describes the action (if any) that the user or system administrator should take when the message is displayed. For some errors, you are advised to contact NCD Technical Support. For information about contacting Technical Support, see "Contacting Technical Support" on page 7-16.

`F-B3270003, Open LU=`*LU_name* `PU=`*PU_name* `Port=`*port_number* `Host=`*hostname*
`failed. errno=`*UNIX_error_number* `brx_errno=`*Brixton_error_number*

Severity: Fatal

Explanation: Socket connection attempt to the BrxPU2 server failed. Possible reasons are:

1. The hostname is unknown.
2. The TCP/IP port number is not defined in the **/etc/services** file.
3. The TCP/IP port number does not match between the local system and the BrxPU2 server system.

User Action:

1. Verify the hostname of the BrxPU2 server system.
2. In the **/etc/services** file on the BrxPU2 system:
   — Verify that the service name **brx_pu2_espd** is in the file.
   — Make sure that the port number assignment on the local system matches the server system.

Troubleshooting **7-3**

`F-B3270005, Send Failed to PU2 Server, errno=`*UNIX_error_number*
`brx_errno=`*Brixton_error_number*

> **Severity:** Fatal
>
> **Explanation:** The connection to the PU2.1 server has failed.
>
> **User Action:** Check to make sure that the server is running.

`I-B3270006, Quit (User requested termination).`

> **Severity:** Informational
>
> **Explanation:** The user terminated the local client.
>
> **User Action:** None.

`E-B3270008, Unknown LU=`*LU_name* `PU=`*PU_name* `Port=`*port_number*

> **Severity:** Error
>
> **Explanation:** The specified LU, PU, or port is unknown or not available.
>
> **User Action:** Specify an alternate.

`W-B3270120, Unable to allocate color` *color_number.* `Using White instead.`

> **Severity:** Warning
>
> **Explanation:** The color map has been used up.
>
> **User Action:** Terminate the client that is using up the color map.

`W-B3270121, Unable to allocate color` *color_number.* `Using Black instead.`

> **Severity:** Warning
>
> **Explanation:** The color map has been used up.
>
> **User Action:** Terminate the client that is using up the color map.

W-B3270130, Err in getservbyname () during opening of ehllapi for *server_name* errno=*error_number*

> **Severity:** Warning
>
> **Explanation:** Specified *server_name* is not valid.
>
> **User Action:** Use a valid *server_name*. Valid *server_names* are A through H.

W-B3270132, Getting errno-EADDRINUSE from bind () during opening of ehllapi for errno=*error_number*.

> **Severity:** Warning
>
> **Explanation:** The EHLLAPI server is already in use.
>
> **User Action:** Use another server. Valid server names are A through H.

W-B3270133, Warning: Got error in setsockopt () during opening of ehllapi for *server_name*

> **Severity:** Warning
>
> **Explanation:** Internal error.
>
> **User Action:** Notify NCD Technical Support.

W-B3270134, Error in bind () during opening of ehllapi for *server_name* errno=*error_number*

> **Severity:** Warning
>
> **Explanation:** Internal error.
>
> **User Action:** Notify NCD Technical Support.

F-B3270150, Unable to load font *font_name*. Unable to continue.

> **Severity:** Fatal
>
> **Explanation:** The specified font could not be loaded, causing the client to terminate.
>
> **User Action:** Chose only fonts available to the X server. Use the *xlsfonts*(1) utility to list the available fonts.

`W-B3270151, Font` *font_name* `could not be found. Font will not be used.`

> **Severity:** Warning
>
> **Explanation:** When scanning the font pools at startup time, the emulator could not find this font.
>
> **User Action:** The specified font cannot be used. You must choose a font available to the X server. Use the *xlsfonts*(1) utility to list the available fonts.

`W-B3270152, Font` *font_name* `is not fixed width. Font will not be used.`

> **Severity:** Warning
>
> **Explanation:** When scanning the font pools at startup time, the emulator determined that the specified font was not a fixed-width font. Therefore, this font cannot be used.
>
> **User Action:** Choose only fonts with fixed-widths (character cells).

`W-B3270153, In the` *font_pool_name* `font pool, font` *font_name_1* `has same height and width as font` *font_name_2* `and hence will not be used.`

> **Severity:** Warning
>
> **Explanation:** *font_name_1* duplicates the height and width of existing *font_name_2* in the named pool. *font_name_1* is not used.
>
> **User Action:** Remove duplicate *font_name_1* from the font pool.

`F-B3270200, Failure initializing applications display widgets. Unable to continue.`

> **Severity:** Fatal
>
> **Explanation:** A preceding message was issued explaining why the emulator failed. The reason for the failure is that the server could not allocate sufficient memory.
>
> **User Action:** Check the preceding message(s) for information about why initialization is returning failure. It may be necessary to install more memory in the terminal.

F-B3270205, ehllapi name *server_name* is invalid.

      Severity: Fatal

      Explanation: EHLLAPI server name is invalid.

      User Action: Select a valid server names. Valid server names are A through H.

W-B3270206, asciiEbcdic Table *filename* not found. Default table will be used.

      Severity: Warning

      Explanation: The filename of the ASCII-to-EBCDIC conversion table that was given in the command-line option or X resource cannot be found or cannot be read. The emulator uses its built-in default conversion table.

      User Action: Specify an existing and valid ASCII-to-EBCDIC conversion file in your command-line option or X resource.

F-B3270209, Unrecognized invocation line args: *arguments*.

      Severity: Fatal

      Explanation: Invalid options were given in the command-line invoking the emulator. The emulator cannot run.

      User Action: A *usage* listing of the most important command-line options follows the message. This list should be adequate for getting the emulator started. Consult Appendix B, Emulator Options and X Resources for additional options.

F-B3270219, Unable to open keyboard map file *filename*.

      Severity: Fatal

      Explanation: The emulator was unable to open the specified keyboard mapping file. The emulator cannot run.

      User Action: Check the filename. Specify an existing or valid keyboard mapping file.

`F-B3270220, I/O error in reading keyboard mapping file` *filename*`.`

> **Severity:** Fatal
>
> **Explanation:** There was an error in an **fread()** call. The emulator cannot run.
>
> **User Action:** Check file integrity.

`F-B3270221, File` *filename* `is not a valid keyboard map file. File not read in.`

> **Severity:** Fatal
>
> **Explanation:** The specified file is not a validly formatted keyboard map file. The emulator cannot run.
>
> **User Action:** Specify a different file as the keyboard map file.

`W-B3270222, The` *font_pool_name* `font pool already has limit of` *integer* `fonts, font` *font_name* `is being ignored.`

> **Severity:** Warning
>
> **Explanation:** Too many fonts were specified in a resource or command-line argument. Only the number of fonts specified in the message can be used by the emulator.
>
> **User Action:** Specify fewer fonts.

`E-B3270a01, Unable to allocate Pixmap for internal versions of the 14 standard GDDM fill patterns. Internal versions won't be available.`

> **Severity:** Error
>
> **Explanation:** The terminal ran out of memory.
>
> **User Action:** Close applications to free memory or install additional memory in the terminal.

E-B3270a02, Can't open file 'name' for GDDM standard fill pattern
number *pattern_number*. Will use an internal version of that fill
pattern.

> **Severity:** Error
>
> **Explanation:** The terminal cannot open the required file.
>
> **User Action:** Check the Console Messages area for a more
> detailed explanation of the problem. For more detailed
> information in the Console, turn on Change Setup
> Parameters ⇒ File Service ⇒ Extended Diagnostics. Check
> Change Setup Parameters ⇒ File Service ⇒ File Service Table
> to make sure the terminal has access to the requested file.

E-B3270a03, File 'name' for GDDM standard fill pattern number
pattern_number is of invalid format. Will use internal version of that
fill pattern.

> **Severity:** Error
>
> **Explanation:** The file format is invalid.
>
> **User Action:** Check the Brixton documentation for a
> description of the required format.

E-B3270a04, Error in processing file 'name' for GDDM standard fill
pattern number *pattern_number*. Will use an internal version of that fill
pattern.

> **Severity:** Error
>
> **Explanation:** A processing error occurred.
>
> **User Action:** Check the file for format errors. Check the
> Brixton documentation for a description of the required
> format.

E-B3270a05, Unable to allocate Pixmap for GDDM Image Data commands so
must disable GDDM.

           Severity: Error

           Explanation: The terminal ran out of memory.

           User Action: Close applications to free memory or install
additional memory in the terminal.

E-B3270a06, Unable to allocate any symbol storage for Load PS so must
disable the Load PS structured field.

           Severity: Error

           Explanation: The terminal ran out of memory.

           User Action: Close applications to free memory or install
additional memory in the terminal.

E-B3270a07, Unable to allocate pixel storage for internal versions of
the 14 standard GDDM fill patterns so must disable GDDM.

           Severity: Error

           Explanation: The terminal ran out of memory.

           User Action: Close applications to free memory or install
additional memory in the terminal.

E-B3270a08, Unable to allocate 3 planes of symbol storage for Load PS
so can only support Single-plane Programmed Symbols.

           Severity: Error

           Explanation: The terminal ran out of memory.

           User Action: Close applications to free memory or install
additional memory in the terminal.

E-B3270a09, Unable to allocate Pixmap for painting Load PS symbols to
the text layer. Thus, when the graphics layer is non-empty,
transparent Load PS text will not be visible on the text layer.

> **Severity:** Error
>
> **Explanation:** The terminal ran out of memory.
>
> **User Action:** Close applications to free memory or install
> additional memory in the terminal.

E-B3270a0a, Unable to allocate Pixmap for painting Load PS symbols to
the graphics layer. If used there, they will not be visible.

> **Severity:** Error
>
> **Explanation:** The terminal ran out of memory.
>
> **User Action:** Close applications to free memory or install
> additional memory in the terminal.

E-B3270a0c, In the *font_pool* font pool, font *font_name* exceeds max height
(*height*) or width (*width*) allowed when the Load Programmed Symbols
structured field is enabled. Font will not be used.

> **Severity:** Error
>
> **Explanation:** The font exceeds the height or width parameters
> permitted.
>
> **User Action:** Use only fonts that match the specified height
> and width in the default font pool path.

E-B3270a0d, Unable to allocate backing-store Pixmap for graphics
layer so will be unable to restore it at expose events.

> **Severity:** Error
>
> **Explanation:** The terminal ran out of memory.
>
> **User Action:** Close applications to free memory or install
> additional memory in the terminal.

E-B3270a0e, GDDM 'Direct" mode not enabled and couldn't allocate a
Pixmap for graphics layer so must disable GDDM.

> **Severity:** Error
>
> **Explanation:** The terminal ran out of memory and the
> graphics layer pixmap could not be allocated.
>
> **User Action:** Close applications to free memory or install
> additional memory in the terminal. You can also try using
> GDDM in direct mode.

E-B3270a0f, Unable to allocate Pixmap for GDDM fill patterns from
LCID=0xf0. If used, they will not be visible.

> **Severity:** Error
>
> **Explanation:** The terminal ran out of memory.
>
> **User Action:** Close applications to free memory or install
> additional memory in the terminal.

E-B3270a10, Unable to allocate an XImage for installing internal
versions of the 14 standard GDDM fill patterns so must disable GDDM.

> **Severity:** Error
>
> **Explanation:** The terminal ran out of memory.
>
> **User Action:** Close applications to free memory or install
> additional memory in the terminal.

E-B3270a11, Unable to allocate an XImage for a GDDM Image Data block.
Block's image data not drawn. Some or all future GDDM Image Data may
be similarly lost.

> **Severity:** Error
>
> **Explanation:** The terminal ran out of memory.
>
> **User Action:** Close applications to free memory or install
> additional memory in the terminal.

`F-B3274002, Unable to open X display` *X_display_name*`, possible low`
`memory condition`

Severity: Fatal

Explanation: The X display name was badly constructed, the display name is unknown, you do not have access to the specified display, or the terminal is low on available memory.

User Action: Check the display name in the -**display** command-line option or the **display** X resource. If that seems correct, run *xhost* on the target terminal to add your host (terminal or other network host) to the list of accepted machines. You can use `xhost +` or `xhost +`*name* where *name* is the network name of your terminal or the terminal's X server access control parameters).

If the problem does not seem to be with the display name or lack of access, and the terminal has enough free memory, try setting the **net**-**minimum**-**data**-**buffers** parameter. Normally, this parameter is not used because buffers are allocated automatically as needed. You can specify up to 16,384 buffers.

`B3274004, No main X window for program has been created. Unable to`
`continue.`

Severity: Fatal

Explanation: The emulator did not create a main window. The emulator exits.

User Action: Notify NCD Technical Support.

`F-B3274913, Printring: trailing %%`

Severity: Fatal

Explanation: An internal error occurred.

User Action: Notify NCD Technical Support.

```
F-B3274914, Printring: Unknown format character
```
                        Severity: Fatal

                        Explanation: An internal error occurred.

                        User Action: Notify NCD Technical Support.

```
F-B3274915, No room in buffer for terminal type
```
                        Severity: Fatal

                        Explanation: An internal error occurred.

                        User Action: Notify NCD Technical Support.

```
I-B3274916, Connection closed at user request. Host: hostname, Port:
port_number
```
                        Severity: Informational

                        Explanation: The connection to the named host and port has been closed.

                        User Action: No action necessary.

```
I-B3274917, Using Font: font_name for Default Screen.
```
                        Severity: Informational

                        Explanation: The font named is being used for the default screen. The default screen is 3278 model 2.

                        User Action: No action necessary.

```
I-B3274918, Using Font: font_name for Alternate Screen.
```
                        Severity: Informational

                        Explanation: The font named is being used for the alternate screen. The alternate screen is the 3278 model that you selected.

                        User Action: No action necessary.

I-B3274919, Using Font: *font_name* for Status Line.

> **Severity:** Informational
>
> **Explanation:** The named font is being used for the Operator Information Area.
>
> **User Action:** No action necessary.

I-B3274920, Using asciiEbcdic conversion file: *filename*.

> **Severity:** Informational
>
> **Explanation:** The named file was read and has replaced the default ASCII-to-EBCDIC and EBCDIC-to-ASCII conversion tables.
>
> **User Action:** No action necessary.

I-B3274921, EBCDIC to ASCII Translation Table Dump.

> **Severity:** Informational
>
> **Explanation:** A dump of the EBCDIC-to-ASCII conversion table follows.
>
> **User Action:** Verify that the conversion table is correct.

I-B3274922, ASCII to EBCDIC Translation Table Dump.

> **Severity:** Informational
>
> **Explanation:** A dump of the ASCII-to-EBCDIC conversion table follows.
>
> **User Action:** Verify that the conversion table is correct

I-B3274923, Attn value is invalid, using default (1, BREAK)

> **Severity:** Informational
>
> **Explanation:** The specified -**tnattn** value is invalid.
>
> **User Action:** Valid values are 0, 1, and 2. See the *ncd3270* (1) man page for more information.

```
I-B3274924, SysReq value is invalid, using default (3, TESTREQ)
```
           Severity: Informational

           Explanation: The specified -**tnsysreq** value is invalid.

           User Action: Valid values are 0, 1, 2, and 3. See the *ncd3270* (1) man page for more information.

```
W-B3274925, Ignoring Programmed Symbols datastream, use -loadps
```
           Severity: Warning

           Explanation: The programmed symbols datastream is being ignored.

           User Action: Use the -**loadps** option.

```
W-B3274926, Ignoring Graphics datastream, use -gddm
```
           Severity: Warning

           Explanation: The graphics datastream is being ignored.

           User Action: Use the -**gddm** option.

Contacting Technical Support

If you encounter difficulties, you can send e-mail or a fax to NCD Technical Support, contact them by phone, or use the Web.

For information about services available from NCD Technical Support, contact your NCD representative or send e-mail to **info@ncd.com**.

Sending E-Mail or Faxes to Technical Support

NCD Technical Support uses an automated system for e-mail. Send e-mail to the Internet address **support@ncd.com**, or send a fax to (503) 641-2959. To ensure that your e-mail is answered quickly, please provide as much as possible of the information listed under "Information to Provide" on page 7-17.

Using the Web

You can also submit a request through NCD Web Services. Go to **http://www.ncd.com** to reach the Service and Support home page.

Phoning Technical Support

From the U.S. and Canada, you can phone (800) 800-9599 and ask for Technical Support. International customers can phone (503) 641-2200.

Be prepared to provide as much as possible of the information listed in the following section.

Information to Provide

Regardless of the method you use to report the problem to NCD, you must have the following information ready:

❏   Your name and title
❏   Company or organization
❏   Phone number
❏   FAX number
❏   E-mail address
❏   Billing address
❏   Shipping address
❏   For each hardware item:
   — Serial number
   — Description of the problem
   — Type of warranty (Standard, Express, Extended, Express Exchange, Out-of-Warranty)
❏   For a software problem:
   — Problem type: question, enhancement, bug, crash, or other
   — Type of host and its OS release
   — Window manager
   — Boot Method: TFTP, NFS, PROM, PC card, or MOP

— Model of NCD terminal
— Amount of installed memory
— NCDware version
— NCDware Boot Monitor version
— Detailed problem description
— If the problem involves a third-party application, the name of the application and which version you are running

A Emulator Menus

The 3270 emulator menu bar provides four menus, described in this appendix.

Note Menu selections displayed in a different color from the others or grayed out are not available.

File Menu

The File menu contains commands for printing, connecting to a host, and terminating the emulator:

❏ Select Printer

Displays the Select Printer dialog box and allows you to select a printer for printing from the emulator.

❏ Print Screen

Prints the contents of the current 3270 screen to the printer selected in the Select Printer dialog box.

❏ Reconnect

Reconnects to the same host and port, in case you were accidentally disconnected.

❏ New Connection

Displays the 3270 Host Chooser window. You can type a host name and port number or select from hosts listed in the chooser (requires configuring the terminal to display a list of hosts).

❏ Close Connection

Closes the current host connection.

❏ Quit

Terminates the emulator and closes the window.

Options Menu

Color mode, case, selector light pen, and cut/copy selection can be customized using the Options menu. Changes made in this fashion are not permanent; each time you start an emulator, you must reconfigure it. The advantages of the Options menu are:

❏ You can immediately change the attributes.

❏ The cut/copy selection and light pen options are available only in the Options menu.

Color Mode Options

These options define the color mode (on color terminals) and reverse or normal video:

❏ Full Color (the default mode)

   The emulator uses IBM full-color mode.

❏ Base Color

   The emulator uses IBM base-color mode. The defaults are green and white.

❏ Monochrome

   The emulator uses monochrome mode. The default is green, and can be changed through X resources.

❏ Reverse Video

   When selected, foreground and background colors are reversed. When deselected, use normal foreground and background colors.

Case Mode Options

These options define the case mode:

❏ Mixed Case (the default mode)

   Text appears in mixed uppercase and lowercase characters.

❏ Upper Case

   Text appears in uppercase characters only.

Light Pen Option

This option defines the mouse as a light pen:

❏ Light Pen

If selected, the left mouse button functions as a selector light pen. Clicking the mouse button within a field that is selectable using a light pen selects the field. Fields that you can select with a light pen are designated by a question mark (?). When selected, the field designator changes to a greater-than sign (>).

Cut/Copy and Paste Options

The following options define the selection mode for the cut/copy and paste functions. For information about using these functions, see "Using Cut/Copy and Paste" on page 3-15.

❏ Select Input Fields

Only cuts or copies characters from data entry fields. Each field is transmitted as a separate line. A field spanning multiple lines is transmitted as multiple lines. When this option is selected, all other cut/copy options are excluded.

Use this mode to transfer fields from one emulator window to another or to capture only the input field data.

❏ Select Whole Lines (the default mode)

Cuts or copies characters across entire lines. This is the normal X window system cut/copy mode. In this mode, field attribute bytes are translated to newlines.

❏ Select Rectangle

The selection area is always a rectangle.

❏ Graphics Cursor

Selected only when you connect to a graphics application. Other menu items are not available when the graphics cursor is enabled.

Keys Menu

The Keys menu contains commands for displaying the Key Pad and Keymap Editor.

❏ The Key Pad offers an alternative to the keyboard for selecting IBM function keys. The user selects a function key by clicking on the relevant button in the Key Pad window.

❏ The Keymap Editor displays a layout of an NCD keyboard, showing the location of the basic key actions (in basic mode) or the key actions and translations (in advanced mode) for 3270 or VT320 emulators. The editor allows you to change the keymap.

Macros Menu

The Macros menu contains commands for recording and playing back the 3270 terminal emulator actions occurring during a 3270 application session.

❏ Start Recording

Starts recording 3270 terminal emulator actions.

❏ Stop Recording . . .

Stops recording terminal emulator actions; displays a dialog box prompting you to enter a name for the macro.

❏ Rename Macro . . .

Displays a dialog box prompting you to rename a macro.

❏ Save to File . . .

Displays a dialog box prompting the user to name a file to which a macro should be saved.

❏ Read From File . . .

Displays a dialog box prompting you to select a specific macro file to be read.

❏ Run Macros . . .

Includes the macro file list in a pulldown menu.

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❏ Read from File . . .

Displays a dialog box in which you enter the name of a file to play.

❏ Run Macros

Displays a pulldown menu listing all the macros that have been recorded in the session or saved in files so that you can select one to play.

B Emulator Options and X Resources

The tables in this appendix list, in alphabetical order, all of the emulator options you can set through the command line or X resources. You can set most of the options using either method.

Command-Line Options

This table lists command-line options for the 3270 terminal emulator, *tn3270*.

Table B-1 Command-Line Options

Command-Line Option	Function and Values	Corresponding Resource (if any)
-**a** *asciiebcdic*	Specifies an ASCII-to-EBCDIC conversion file.	**asciiEbcdicTable Filename**
-**A** *asciiebcdic*	Same as **–a**, but prints the ASCII-to-EBCDIC conversion table to the Console.	**asciiEbcdicTable FilenameAnd Dump**
-**b**	Puts the emulator into base-color (two-color) mode. The defaults are green and white.	**baseColorMode**
-**display** *dpy*	Specifies the display name of the terminal on which the emulator should display its window. *dpy* has the format *hostname*:0.	(none)
-**e** *idname*	Names the EHLLAPI session identification, in a range of A through H.	**ehllapiName**
-**E**	Sets the terminal ID string transmitted during terminal negotiation to "extended." The default terminal ID string is "IBM-3278-2-E."	**extendedMode**

Table B-1 Command-Line Options (Continued)

Command-Line Option	Function and Values	Corresponding Resource (if any)
-**gddm**	Enables IBM mainframe-style graphics support (Graphical Data Display Manager). The default is disabled.	**gddmMode**
-**geometry** *geostr* or =*geostr*	Specifies the geometry (height, width, and placement on the screen) of the initial 3270 window.	**geometry**
-**h** *host*	Specifies the host used when connecting. The default is "local."	**hostname**
-**I** *termid-str*	Changes the terminal ID string transmitted during negotiation with the TN3270 server. The default is "IBM-3278-2," which specifies 3278 model 2. Some implementations of the TN3270 server may not work with the default string, requiring that you set the extended mode (-**E** option).	**termid**
-**ibmBlue** *color*	Specifies the color for blue fields. The default is "#a0a0ff." This is Brixton color-id 1.	**ibmBlue**
-**ibmRed** *color*	Specifies the color for red fields. The default is "red." This is Brixton color-id 2.	**ibmRed**
-**ibmPink** *color*	Specifies the color for pink fields. The default is "magenta." This is Brixton color-id 3.	**ibmPink**
-**ibmGreen** *color*	Specifies the color for green fields. The default is "green." This is Brixton color-id 4.	**ibmGreen**
-**ibmTurq** *color*	Specifies the color for turquoise fields. The default is "cyan." This is Brixton color-id 5.	**ibmTurq**
-**ibmYellow** *color*	Specifies the color for yellow fields. The default is "yellow." This is Brixton color-id 6.	**ibmYellow**
-**ibmWhite** *color*	Specifies the color for white fields. The default is "white." This is Brixton color-id 7.	**ibmWhite**

Table B-1 Command-Line Options (Continued)

Command-Line Option	Function and Values	Corresponding Resource (if any)
-**ibmBlack** *color*	Specifies the color for black fields. The default is "black." This is Brixton color-id 8.	**ibmBlack**
-**ibmDeepBlue** *color*	Specifies the color for deep blue fields. The default is "dark slate blue." This is Brixton color-id 9.	**ibmDeepBlue**
-**ibmOrange** *color*	Specifies the color for orange fields. The default is "orange." This is Brixton color-id 10.	**ibmOrange**
-**ibmPurple** *color*	Specifies the color for purple fields. The default is "violet." This is Brixton color-id 11.	**ibmPurple**
-**ibmPaleGreen** *color*	Specifies the color for pale green fields. The default is "pale green." This is Brixton color-id 12.	**ibmPaleGreen**
-**ibmPaleTurq** *color*	Specifies the color for pale turquoise fields. The default is "dark turquoise." This is Brixton color-id 13.	**ibmPaleTurq**
-**ibmGray** *color*	Specifies the color for gray fields. The default is "grey." This is Brixton color-id 14.	**ibmGray**
-**ibmWhiteFF** *color*	Specifies the color for white (0xFF) fields. The default is "white." This is Brixton color-id 15.	**ibmWhiteFF**
-**ibmBackground** *color*	Specifies the color for the emulator background. The default is "black." This is Brixton color-id 16.	**ibmBackground**
-**iconic**	Starts the emulator in icon form.	**iconic**
-**icontitle** *title*	Specifies a string to be used as a title on the window's icon. The default is "tn3270."	**icontitle**
-**k** *brxkeMap*	Specifies a Brixton keymap file. Only version 1.2 keymap files can be read by the client.	**kbdMapFilename**
-**lightpen**	Enables use of the mouse as a light pen.	**lightPen**

Table B-1 Command-Line Options (Continued)

Command-Line Option	Function and Values	Corresponding Resource (if any)
-loadps	Enables support for "load programmed symbols." The default is disabled.	**loadpsMode**
-**m**	Puts the emulator into monochrome color mode. Monochrome terminals always display the emulator in black and white. For color terminals, the default is green and black.	**monoMode**
-**macrosOff**	Disables the Macros menu. By default, the **allowMacros** resource, which enables the Macros menu, is true.	(see **allowMacros** and **macroFile**)
-**n** *portNumber*	Specifies the port used when connecting. The default is 23.	**portNumber**
-**name** *resname*	Changes the resource name to *resname*. The default resource name is "ncd3270." Allows you to identify an instance of an emulator in order to specify resource values associated with this instance.	(none)
-**noMbar**	Starts the emulator without its menu bar.	**noMenuBarMode**
-**ph** *host:port*	Specifies the remote printer host and TCP/IP port. Use the format *host:port*, where *host* is the name of the remote terminal (and may not contain a colon) and *port* is the TCP port number of the printer port. Printing to non-NCD hosts is unsupported. Use in conjunction with -**pm remote**.	**printerHost**
-**pm** *mode*	Specifies the default mode TN3270 uses for sending print output. Permitted modes are serial (the default), parallel, or remote. -**pm remote** is used in conjunction with -**ph** for naming the remote host.	**defaultPrintMode**
-**pp** *port*	Specifies the printer port number.	**printerPort**

Table B-1 Command-Line Options (Continued)

Command-Line Option	Function and Values	Corresponding Resource (if any)
-**pu21**	Specifies that the host connection is via BrxPU2.1. The default is false.	**pu21**
-**P**	Displays the current ASCII-to-EBCDIC conversion table in the Console Messages area.	(none)
-**r**	Puts the emulator into monochrome and reverse-video color mode.	**reverseVideoMode**
-**s**	Puts the emulator into uppercase mode.	**upperCaseMode**
-**S** *modelType*	Specifies the 3278 model type to use. The valid model types are: **Model Type** **Rows and Columns** 2 (the default) 24 x 80 3 32 x 80 4 43 x 80 5 27 x 132	**modelType**
-**T** *title* or -**title** *title*	Change the window title to *title*. The default title is "tn3270:*host*," where *host* is the hostname used in connecting to the TN3270 server.	**title**
-**tcpport** *port*	For use with BrxPU2.1 connections only, specifies the port to use to connect to the BrxPU2.1 SNA server.	**tcpport**
-**tn3270**	Specifies that the host connection is via TN3270. The default is true.	**tn3270**
-**trans** *translation*	Specifies a translation directly. Surround the translation with double quotes, do not specify multiple translations, and do not include spaces.	**translations**
-**transfile** *filename*	Specifies a file containing keyboard translations.	(none)

Table B-1 Command-Line Options (Continued)

Command-Line Option	Function and Values	Corresponding Resource (if any)
-u	Prints out the usage information and exits.	(none)
-**v**	Prints out the version information and exits.	(none)

X Resources

This table lists X resources for the 3270 terminal emulator.

Table B-2 X Resources

Resource	Function and Values		Command-Line Option (if any)
allowMacros	Specifies that the Macros menu is enabled by default.		(see -**macrosOff**)
asciiEbcdicTableFilename		Specifies an ASCII-to-EBCDIC conversion file.	-**a** *asciiebcdic*
asciiEbcdicTableFilenameAndDump		Same as **-a**, but prints the ASCII-to-EBCDIC conversion table to the Console.	-**A** *asciiebcdic*
baseColorMode	Puts the emulator into base-color (two-color) mode. The defaults are green and white. The resource accepts true/false values. If "true," the emulator displays in base color mode (two colors). The default is "false."		-**b**
defaultPrintMode	Specifies the default mode TN3270 uses for sending print output. Permitted modes are serial (the default), parallel, or remote. When the value is remote, use in conjunction with **printerHost**.		-**pm**

Table B-2 X Resources (Continued)

Resource	Function and Values	Command-Line Option (if any)
ehllapiName	Names the EHLLAPI session identification, in a range of A through H.	-**e** *identifier*
extendedMode	Sets the terminal ID string transmitted during terminal negotiation to "extended." The default terminal ID string is "IBM-3278-2-E." The resource has true/false values. If "true," extended mode terminal ID is negotiated with the TN3270 server. The default is "false."	-**E**
fontPoolNormal	Specifies the fonts for emulator text. The default list is "5x8 6x9 6x10 6x12 6x13 7x13 7x14 8x13 8x16 9x15 10x20 12x24."	(none)
fontPoolOIA	Specifies the fonts for the operator information area. The default list is "5x8 6x9 6x10 6x12 6x13 7x13 7x14 8x13 8x16 9x15 10x20 12x24."	(none)
gddmMode	Enables IBM mainframe-style graphics support (Graphical Data Display Manager). The default is disabled.	-**gddm**
geometry	Specifies the geometry (height, width, and placement on the screen) of the initial 3270 window.	-**geometry** *geostr* or =*geostr*
hostname	Specifies the host used when connecting. The default is "local."	-**h** *host*
ibmBlue	Specifies the color for blue fields. The default is "#a0a0ff." This is Brixton color-id 1.	-**ibmBlue** *color*
ibmRed	Specifies the color for red fields. The default is "red." This is Brixton color-id 2.	-**ibmRed** *color*

Table B-2 X Resources (Continued)

Resource	Function and Values	Command-Line Option (if any)
ibmPink	Specifies the color for pink fields. The default is "magenta." This is Brixton color-id 3.	-**ibmPink** *color*
ibmGreen	Specifies the color for green fields. The default is "green." This is Brixton color-id 4.	-**ibmGreen** *color*
ibmTurq	Specifies the color for turquoise fields. The default is "cyan." This is Brixton color-id 5.	-**ibmTurq** *color*
ibmYellow	Specifies the color for yellow fields. The default is "yellow." This is Brixton color-id 6.	-**ibmYellow** *color*
ibmWhite	Specifies the color for white fields. The default is "white." This is Brixton color-id 7.	-**ibmWhite** *color*
ibmBlack	Specifies the color for black fields. The default is "black." This is Brixton color-id 8.	-**ibmBlack** *color*
ibmDeepBlue	Specifies the color for deep blue fields. The default is "dark slate blue." This is Brixton color-id 9.	-**ibmDeepBlue** *color*
ibmOrange	Specifies the color for orange fields. The default is "orange." This is Brixton color-id 10.	-**ibmOrange** *color*
ibmPurple	Specifies the color for purple fields. The default is "violet." This is Brixton color-id 11.	-**ibmPurple** *color*
ibmPaleGreen	Specifies the color for pale green fields. The default is "pale green." This is Brixton color-id 12.	-**ibmPaleGreen** *color*
ibmPaleTurq	Specifies the color for pale turquoise fields. The default is "dark turquoise." This is Brixton color-id 13.	-**ibmPaleTurq** *color*

Table B-2 X Resources (Continued)

Resource	Function and Values	Command-Line Option (if any)
ibmGray	Specifies the color for gray fields. The default is "grey." This is Brixton color-id 14.	-**ibmGray** *color*
ibmWhiteFF	Specifies the color for white (0xFF) fields. The default is "white." This is Brixton color-id 15.	-**ibmWhiteFF** *color*
ibmBackground	Specifies the color for the emulator background. The default is "black." This is Brixton color-id 16.	-**ibmBackground** *color*
iconic	Iconify the window at startup.	-**iconic**
icontitle	Specifies a string to be used as a title on the window's icon. The default is "tn3270."	-**icontitle** *title*
kbdMapFilename	Specifies a Brixton keymap file. Only version 1.2 keymap files can be read by the client.	-**k** *brxkeMap*
loadpsMode	Enables support for "load programmed symbols." The default is disabled.	-**loadps**
macroFile	Specifies the default macro file to read and use.	(none)
modelType	Specifies the 3278 model type to use. The valid model types are: **Model Type**　　**Rows and Columns** 2 (the default)　　24 x 80 3　　32 x 80 4　　43 x 80 5　　27 x 132	-**S** *modelType*

Table B-2 X Resources (Continued)

Resource	Function and Values	Command-Line Option (if any)
monoMode	Puts the emulator into monochrome (one-color) color mode. The default is green (black background). The resource has true/false values. If true, the emulator displays in monochrome and highlighted text displays in boldface. The default is "false."	-**m**
monoModeForeground	Specifies the Brixton color id number to use for the foreground in monochrome mode. The default is "4," which maps to the **ibmGreen** option or resource.	(none)
monoModeBackground	Specifies the Brixton color id number to use for the background in monochrome mode. The default is "16," which maps to the **ibmBackground** resource or option. The default color is black.	(none)
noMenuBarMode	Starts the emulator without its menu bar. The resource has true/false values. If "true," the menu bar does not appear in the emulator window. The default is "false."	-**noMbar**
portNumber	Specifies the port used when connecting. The default is 23.	-**n** *portNumber*
printerHost	Sends print output to a remote terminal's serial or parallel port. Use the format *host:port*, where *host* is the name of the remote terminal (and may not contain a colon) and *port* is the TCP port number of the printer port. Printing to non-NCD hosts is unsupported. See also **defaultPrintMode.**	-**ph**

Table B-2 X Resources (Continued)

Resource	Function and Values	Command-Line Option (if any)
printerInit	Specifies a string sent to initialize the printer. Uses escape sequences or characters recognized by the printer.	**(none)**
printerPort	Specifies the port to use for printing. The value is used in conjunction with the value of **defaultPrintMode**. The default value is 1.	**-pp**
printerPostscript	Specifies that the printer used is a Postscript printer. The default is false.	**(none)**
pu21	Specifies that the host connection is via BrxPU2.1. The default is false.	**-pu21**
reverseVideoMode	Puts the emulator into monochrome and reverse-video color mode. The resource accepts true/false values. If "true," the emulator displays in monochrome and reverse video. The default is "false."	**-r**
tcpport	For use with BrxPU2.1 connections only, specifies the port to use to connect to the BrxPU2.1 SNA server.	**-tcpport** *port*
termid	Changes the terminal ID string transmitted during negotiation with the TN3270 server. The default is "IBM-3278-2," which specifies 3278 model 2. Some implementations of the TN3270 server may not work with the default string, requiring that you set the extended mode described above.	**-I** *termid-str*
title	Change the window title to *title*. The default title is "tn3270:*host*," where *host* is the hostname used in connecting to the TN3270 server.	**-T** *title* or **-title** *title*

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Table B-2 X Resources (Continued)

Resource	Function and Values	Command-Line Option (if any)
tn3270	Specifies that the host connection is via TN3270. The default is true.	-**tn3270**
translations	Specifies a list of key translations to use.	(none, however -**transfile** specifies a key translation file)
upperCaseMode	Puts the emulator into mono-case (all capitals) mode. The resource accepts true/false values. If "true," the emulator converts all text to upper case. The default is "false."	-**s**

Glossary

This glossary defines terms used in this document.

3270	A coded character data stream used by the *ncd3270* local client. A family of products that support a wide range of display applications. The classic 3270 display system has three components: a control unit, a display station, and a printer.
AID key	Attention Identifier key. A character in the 3270 data stream that indicates a user has pressed a key requiring action by the system. Examples of AID keys include the Enter, Print, PF, and PA keys. The function of an AID key depends upon the application the user is running in the emulator window.
application host	An IBM mainframe or midrange computer or other computer running application programs to be displayed on an NCD terminal.
ASCII	American National Standard Code for Information Interchange. A set of binary numbers representing the alphabet, punctuation, numerals, and special symbols used in text representation and communication protocols.

Boot Monitor PROM Boot Monitor	PROM (Programmable Read-Only Memory) in the terminal base that contains the Boot Monitor, which is firmware responsible for managing the booting process.
Boot Monitor Setup	A menu-style method of configuring a terminal in the Boot Monitor before booting the terminal.
booting	The process a terminal goes through when powered on or when executing a reboot command. Consists of loading and executing an X server and may include other processes, such as loading a configuration file and starting clients.
Change Quick Setup	Console menu selection for quick terminal configuration.
Change Setup Parameters	Console menu selection for all of the terminal configuration parameters.
client	An X Window System application program. Most clients run on a host computer. *See also* local client.
code memory	In terminals that have separate code and data memory, the memory used for loading and executing the X server. *See also* data memory.
compressed server	A compressed NCD X server designed to be copied to a terminal's PC card. Enables the terminal to boot locally instead of booting over the network.
Console	The local client that provides a hide box for displaying diagnostic messages and a menu bar for accessing other local clients.

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cursor	Symbol that indicates where the next character entered from the keyboard appears on the screen. Contrast with **pointer**.
data memory	In terminals with separate data and code memory, the memory used mainly by clients. *See also* code memory.
display name DISPLAY variable	The name that tells X clients which display to connect to, often stored in the DISPLAY environment variable. For NCD terminals, the display name consists of the terminal's hostname or IP address followed by :0.
ESP board	Ethernet/Serial/PC board. An NCD terminal interface board that incorporates two serial communication channels, an Ethernet interface, and a socket for a PC card.
Ethernet	A popular local area network protocol and a physical channel for transmitting data.
font pool	Collection of fonts for the emulator window area or the operation information area.
gateway	A computer that attaches to two or more networks and routes information from one to another. A gateway often translates from one network protocol to another; for example, from TCP/IP to SNA.
hide box	In the Console, one of the small boxes you click on to reveal additional information.

host computer	Computer that provides services for NCD terminals or provides application programs to run on NCD terminals.
icon	Small symbol representing a window.
IP address	Internet Protocol address. The 4-part address assigned to all hosts (including terminals) on a TCP/IP network.
key action	The result of pressing a keyboard key with or without modifiers.
Key Pad	Small emulator window in which you can select IBM function keys by using the mouse.
keycap	The label printed on a keyboard key.
keymap	A table that assigns a keysym (action taken when a key is pressed) to each key code (value assigned to each key) on a keyboard.
Keymap Editor	A local client for displaying keyboard layouts and the actions associated with each key, and for remapping the keyboard for 3270 and VT320 local terminal emulation windows. *See also keymap_editor.*
keymap_editor	The command for invoking the Keymap Editor. Can be used with *rsh* and *remsh* and in the **exec-startup-commands** remote configuration parameter.
keysym	The default action taken by a program when a physical key on a keyboard is pressed. A well-known code that corresponds to a keycap.

local client	An X Window System application that runs in the terminal instead of on a host computer. Local clients are part of the X server.
LPR/LPD	Line Printer Remote/Line Printing Daemon for printing in mixed, multi-platform environments.
modifier key	Keyboard key that modifies the action of another key (for example, Shift, Control, and Alt).
MOP	Maintenance Operations Protocol. Used with ULTRIX hosts for address resolution and server image downloading.
Motif	OSF/Motif. The Open Software Foundation graphical user interface. Used by the local NCD Window Manager and other window managers.
ncd3270	The local client that provides 3270 terminal emulation. Emulates IBM 3278 terminals for connecting to hosts using the TCP/IP TN3270 protocol. *See also tn3270.*
ncdinstall	Utility program for installing NCDware on a UNIX host computer, configuring terminals, and updating host software to support NCD terminals.
NCDware	NCD's software. Consists of the Boot Monitor, X servers, and host-based software.

NFS	Network File System. A protocol developed by Sun Microsystems that allows a set of computers to access each other's file systems as if they were local. Used on NCD terminals to load the X server, provide access to font files, the color definition file, and remote configuration files.
NVRAM	Non-volatile random-access memory used to store parameter settings in NCD terminals when the power is off.
operator information area	Last line of the emulator screen. Displays status of the host connection and local status of the emulator. Same as status line.
PC card	A small integrated circuit card defined by the Personal Computer Memory Card International Association. The card provides local memory for storing a terminal's X server, fonts, and configuration files.
pointer	A device, such as a mouse, with which the user communicates with the X server. Also the symbol that represents the device's location on the screen, such as an arrow. Contrast with **cursor**.
port	In TCP/IP, a number used to identify applications.
PostScript	A page description language that is used for high-quality printing on laser printers and other high-resolution printing devices.
reboot	Reload and re-execute the X server. Equivalent to power-cycling the terminal.

remote configuration	A method of configuring an NCD terminal by downloading a file containing operational parameters from a host computer or interactively accessing a terminal's configuration data through the network.
reset	Re-initialize the X server by selecting Logout from the Console's Login menu. Resetting restores settings not saved in NVRAM or downloaded from a remote configuration file to their default state.
rgb.txt	The X Window System color definition file.
root window	The window that fills the screen and forms the background for all other windows.
status line	Last line of the emulator screen. Displays status of the host connection and local status of the emulator. Same as operator information area.
TCP/IP	Transmission Control Protocol/ Internet Protocol. A common name for the Internet protocol family.
Telnet	The Internet standard protocol and an application program for remote terminal connection service.
terminal emulator	Software used in communication to make a computer or terminal seem to be the type expected by another computer. For example, the NCD 3270 terminal emulator enables an NCD terminal to pretend to be a mainframe terminal by using the procedures and codes expected by the mainframe.

TFTP	Trivial File Transfer Protocol. The Internet standard protocol for file transfer. Supported on NCD terminals for downloading X servers, and for accessing font files, the color definition file, and remote configuration files.
tn3270	Command for invoking the 3270 local client. This command can be used with *rsh* or *remsh* and in the **exec-startup-commands** remote configuration parameter.
TN3270	A TELNET protocol for use with 3270 applications.
TN3270 server	A host computer running TN3270.
Token-Ring	An IBM local area network architecture.
translation	A mapping between one or more input events (such as key strokes and mouse button clicks) and an action performed by a program.
TRP board	Token-Ring/PC. A terminal interface board that incorporates a Token-Ring connector and a socket for a PC card.
window	A rectangular area on the screen created by a client. Windows can be manipulated by a window manager.
window manager	A host-based or local client that allows you to manipulate windows on the display.
X resources	Variables used to customize the appearance or behavior of a client. Most clients allow many of their features to be customized.

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X server	The software that operates NCD terminals, providing display services for clients and handling keyboard and pointer input. The part of the X Window System that runs in terminals.
X terminal	An intelligent terminal designed to be used with the X Window System.
X Window System (also called X)	A network-based graphical window system developed at MIT to allow users to run applications running on multiple hosts. NCDware is an optimized implementation of X.
.Xdefaults	A file in a user's home directory for storing X resource settings.
XDM	X Display Manager. A protocol and X client that manages the user's X session from login to logout and can be configured to start the initial clients.
.xsession	A file stored in the user's home directory that contains a script executed by XDM at startup.
Xsession	An XDM configuration file containing the startup script used by all terminals to manage the X session.

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Bibliography

The following books describing the X Window System are available at computer book stores:

- ❏ *OSF/Motif User's Guide, Release 1.2*—Open Software Foundation. Prentice-Hall.
- ❏ *X: A guide For Users*—Jerry D. Smith. PTR Prentice-Hall.
- ❏ *X Window System User's Guide*—Valerie Quercia and Tim O'Reilly. O'Reilly and Associates.
- ❏ *Volume 3: X Window System User's Guide*—Valerie Quercia and Tim O'Reilly. O'Reilly & Associates, Inc.
- ❏ *Volume 4: X Toolkit Intrinsics Programming Manual*—Adrian Nye and Tim O'Reilly. O'Reilly & Associates, Inc. (Information about key translations).
- ❏ *Volume 8: X Window System Administrator's Guide*—Linda Mui and Eric Pearce. O'Reilly & Associates, Inc.

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