12 Configuring the NCD Terminal Emulator

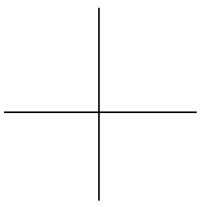
This chapter describes the local NCD Terminal Emulator (***ncdterm*** and ***ncdrunterm***), which provides VT320 terminal emulation.

The following topics are covered in this chapter:

Other Sources of Information on the Terminal Emulator

This chapter describes resources, escape sequences, and character coding for the NCD Terminal Emulator. Other documents and other chapters in this manual contain information about other aspects of the Terminal Emulator:

- ❏ Using the terminal emulator—The *NCDware User's Guide* describes the appearance and use of the NCD Terminal Emulator choosers and window.
- ❏ Basic configuration and Keymap Editor—The *NCDware System Administrator's Guide for UNIX Systems* provides information about basic configuration of the NCD Terminal Emulator (including its use for login), using the Keymap Editor, and starting the Terminal Emulator without logging in (***ncdrunterm***).



- Options and resources—The ***ncdterm***(1) man page provides details on command-line options and resources.
- Configuring printing from the Terminal Emulator—Items in the NCD Terminal Emulator's File menu allow the user to send the current screen or the current session log to a printer attached to the X terminal's serial or parallel port. For successful printing, you must configure the port and the NCD Terminal Emulator. See the *System Administrator's Guide* for configuration instructions.
- Downloadable character sets—The NCD Terminal Emulator supports the use of downloadable character sets (DRCS). See Chapter 17, Keyboards and Downloadable Keyboard Definitions, for more information.
- Technical details—For more detailed technical information about VT320 terminal emulation, see Digital Equipment Corporation publications.

Configuring Local Services in the Terminal Host Chooser

The Terminal Host Chooser provides easy access to the Local File Manager daemon (***filed***), Diagnostic daemon(***diagd***), and Configuration daemon (***configd***).

The **showLocal** resource must be set to "true" (the default) for these services to be listed automatically in the Terminal Host Chooser. The user can select Show Local from the Chooser's View menu to control the display locally.

To access the Local File Manager and Configuration daemon through the Terminal Host Chooser, you must first set their passwords in the Console (Setup ⇒ Change Setup Parameters ⇒ Access Control). If you do not set a password and select one of these local services in the Terminal Host Chooser, the terminal emulator window appears briefly, displays an "access denied" message, then disappears.

The resources listed in Table 12-1 control the automatic display of services in the Terminal Host Chooser. Users can select the corresponding View menu item to control the display of services locally.

Table 12-1 View Options in the Terminal Host Chooser

View Menu Name	Description	Default Setting	Resource Name
Show Local	Controls the automatic display of services available on the terminal	true	**showLocal**
Show Available LAT	Controls the automatic display of LAT services whose availability has been broadcast across the network	true	**showAvailableLat**
Show Default LAT	Controls the automatic display of LAT services listed in the **term-default-hosts** table	true	**showDefaultLat**
Show CTerm	Controls the automatic display of available CTERM hosts	true	**showCTerm**
Show Serial	Controls the automatic display of available serial sessions	true	**showSerial**
Show Telnet	Controls the automatic display of TELNET services listed in the **term-default-hosts** table	true	**showTelnet**

Configuring a Terminal for Serial Terminal Emulation

To use a serial port for a serial VT320 connection, you can open a serial terminal emulation session through the NCD Terminal Emulator local client. The client's **term -ctype serial** command allows you to log onto a host and run non-X applications. For X over a serial line, use XRemote.

On terminals with more than one serial port, you can configure more than one port for serial terminal emulation. When more than one port is used for serial terminal emulation, the serial terminal emulator displays a Chooser for selecting the desired serial connection.

Configuring an NCD terminal as an ASCII terminal involves making the physical connection and setting the parameters. Follow these steps:

1. Attach the terminal to a host via a modem or direct serial connection.
2. Make sure the **mode** parameter for the port that you wish to use is set to "terminal" in the **serial-interfaces-table**.
3. Set the other parameters in the **serial-interfaces-table** to match the host computer or modem on the other end of the serial line. Use the suggested values shown here or set these attributes to match the computer or modem on the other end of the line:

baud-rate	38400 (make this as high as possible)
data-bits	8
stop-bits	1
parity	None
handshake	DTR/DSR, RTS/CTS, or XON/XOFF

Configuring Key Translations

The Keymap Editor local client displays a layout of a keyboard that has keys labelled with their keycaps and the functions (called actions or translations) assigned to them. The Keymap Editor allows you to change the actions or translations. For detailed information about using the Keymap Editor, see the *System Administrator's Guide.*

If you are changing key translations using X resources instead of the Keymap Editor, note that you can specify key translations using more than one modifier (for example, Shift-Lock-F1).

The keymap action **keymap (*name*)** changes keypress translations while the terminal emulator is running. This action takes a single string argument that names a resource for dynamically defining a new translation table. The resource name is derived by appending the string 'Keymap' to ***name***. The keymap argument *None* restores the original translation table.

The following example shows how the keymap action can be used to add special keys for entering commonly typed expressions.

```
NCDterm.Translations:  #override <Key>F12: keymap (dbx)
NCDterm.dbxKeymap.translations:\\
     <Key>F14: keymap(None) \\n\\
     <Key>F17: string(“next”) string(0x0d) \\n\\
     <Key>F18: string(“step”) string(0x0d) \\n\\
     <Key>F19: string(“continue”) string(0x0d)
```

Configuring the Terminal Emulator Window and Menus

The NCD Terminal Emulator window provides the same features as an ASCII terminal. The window displays 24 or 25 lines of text in 80 or 132 columns, and you can resize it to display fewer or more rows (changing the height) or columns (changing the width).

The size of the window is affected by several factors, including the font used, escape sequences sent to the terminal emulator (described later), menu selections from the menu bar, and X resource specifications.

In addition, you can use character attributes to make text stand out or to protect fields. You can also choose the cursor.

NCD Terminal Emulator windows provide additional features not found on traditional terminals, including a scroll bar and menu bar.

Terminal Emulator Fonts

The font you choose for a terminal emulator window is important. It controls the size of the characters you see as well as whether certain terminal emulation features appear to work. If you do not know which font to choose, use the default selected by the terminal emulator.

Fonts are specified using a set of X resources: **foundry, family, pointSize**, and **subFont**. Together with the Fonts menu in the menu bar, these resources control the actual X font used in the display. See “The Fonts Menu” on page 12-10 for more information about fonts.

Terminal Emulator Scroll Bars

Scroll bars allow review of information that has passed off the screen. The ability to see past information is affected by some escape sequences (such as those that clear certain regions of the screen) and by how much information the terminal emulator can store.

Scrolling affects terminal memory usage. For more information about scrolling and memory usage, see the description of the **saveLines** resource in the ***ncdterm***(1) man page.

To turn off the scroll bars or change their location, use the **scrollbar** resource, also described in the ***ncdterm***(1) man page.

Terminal Emulator Menus

The menu bar provides access to menus for controlling other terminal emulation features. The menu bar can be disabled using the **menuBar** resource.

Five menus are accessible from the menu bar: File, Options, Fonts, Cursors, and Keys.

The File Menu

Table 12-2 summarizes the commands in the File menu.

Table 12-2 File Menu

Menu Item	Action
Redraw	Redraws the contents of the display window.
Soft Reset	Resets the terminal to the default state.
Hard Reset	Does a soft reset, deletes all content, and clears any selection.
Close Connection	Closes the current session and returns to the Terminal Host Chooser. This item can be disabled using the **disableExits** resource. For more information, see the ***ncdterm***(1) man page.
Start Debugging Log	Writes the contents of the session to a log file. This function requires special setup to execute correctly. For more information, see the ***ncdterm***(1) man page.

Table 12-2 File Menu (Continued)

Menu Item	Action
Print on Serial Line 1	Specifies the serial port to be used for printing. Serial line 1 is the Auxiliary serial port. If an ESP board is installed, serial line 2 is the serial port on the ESP board. If a Y connector is in use on an ESP board, the A connector is serial port 2 and the B connector is serial port 3. For terminals with more than one serial port, you can specify the default port by setting the **defaultHost** resource to the port number. The port can be specified in either of the following forms: ***n***, serial ***n***, or serial/***n***. For example, you can specify serial port 3 as 3, serial 3, or serial/3.
Print on Serial Line 2	
Print on Serial Line 3	
Print on Remote Unit ***NCD_name:port***	Sends print output to a printer attached to another NCD terminal. The terminal and port are specified using the **printerHost** resource. Remote printing is supported over TCP/IP.
Print on Parallel Line 1	Sends print output to parallel port 1.
Print on Parallel Line 2	Sends print output to parallel port 2 (on terminals with more than one parallel port).
Print Screen	Prints the contents of the display window.
Print Log Buffer	Prints the contents of the log buffer (the input and output you can see by scrolling). Printing starts at the top visible line and extends through the end of the buffer.
Print Selection	Prints selected text in the display window.
Send Break	Sends a break character.
Exit	Exits from the session. This item can be disabled using the **disableExits** resource. For more information, see the ***ncdterm***(1) man page.

The Options Menu

The Options menu offers a variety of terminal mode settings. The selections are all toggles. Options that are set are indicated by filled-in toggle buttons. The initial states of the Options menu selections are controlled by resources.

Table 12-3 summarizes the Options menu modes and names the associated resources.

Table 12-3 Options Menu and Associated Resources

Menu Item	Resource Name	Action
Menu Bar	**menuBar**	Enables the menu bar.
Jump Scroll	**jumpScroll**	Enables the terminal emulator to add lines to the screen quickly.
Reverse Video	**reverseVideo**	Reverses the foreground and background. For example, if your terminal is displaying dark characters on a light background, reverse video displays light characters on a dark background.
Visual Bell	**visualBell**	Specifies flashing instead of an audible bell.
Auto Wraparound	**autoWrap**	Specifies that the character typed after the cursor reaches the right border of the page automatically appears on the next line. By default, autowrap is enabled. If autowrap is turned off, a character typed after the cursor reaches the right border replaces the character at the end of the line.
Reverse Wraparound	**reverseWrap**	Allows the cursor to wrap from the leftmost column on the line to the rightmost column of the previous line, allowing you to backspace to the previous line.
Auto Linefeed	**autoLineFeed**	Generates a linefeed automatically. This is for use with programs that generate carriage returns without dropping down a line on the screen.

Table 12-3 Options Menu and Associated Resources (Continued)

Menu Item	Resource Name	Action
Application Cursor Mode	**appCursorMode**	Generates ANSI escape sequences rather than standard cursor movements when you use arrow keys.
Application Keypad Mode	**appKeypadMode**	Generates control functions rather than numeric characters when the keypad is used.
Local Flow Control	**localFlowControl**	Determines whether flow control characters (such as Ctrl-S) are passed to the host. By default, local flow control is enabled. If local flow control is disabled, flow control characters are passed to the host.
Allow 80/132 Switching	**c132**	Allows the terminal emulator to display in the 132-column format required by some applications.
80/132 Font Switching	**useCondensedFont**	Switches from the default font to a condensed font upon receipt of the control sequence that changes the terminal emulator from 80- to 132-column mode.
Clear Screen With Blanks	**clearScreenWithBlanks**	Specifies whether the terminal emulator clears the screen by erasing the entire screen or by inserting a screen full of blanks. Enabling this option allows scrolling to previously displayed information on terminals connected to certain hosts. The drawback to using this option is that it may use up the save-line buffer quickly. The default is “false,” which clears the screen by erasing.
Curses Emulation	**curses**	Emulates a bug in the UNIX ***curses*** screen-handling package.
Margin Bell	**marginBell**	Rings a bell when the cursor reaches the margin.

Table 12-3 Options Menu and Associated Resources (Continued)

Menu Item	Resource Name	Action
Strip Parity	**stripParity**	Strips parity from any data sent from the host so that the terminal emulator looks only at seven-bit bytes.
Grab Keyboard Input	**secureKeyboard**	Directs keyboard input to the terminal emulator window. Prevents another user from seeing key events being sent to the window.
ISO Latin 1 Font	**latin1Font**	Enables use of the ISO Latin Alphabet supplemental character set, which includes letters with accents and diacritical marks required in many European languages.
Blink Cursor	**blinkCursor**	Specifies whether the cursor should blink.
Visible Status Line	**statusLine**	Displays a 25th line at the bottom of the window, used by applications to display status information.
Log Output to File	Not applicable	Logs output to the file opened from the File menu. If no file is available for output logging, the item is not active in the Options menu.

The Fonts Menu

The Fonts menu allows you to change the size of the display font dynamically. The fonts generated through the Fonts menu are defined using a single set of resource specifications. The specification set defines the “Default” menu selection, and the terminal emulator uses the Default to generate the other sizes offered through the menu. The default font is:

```
-*-terminal-medium-*-normal--*-140-*-*-*-*-*-1
```

Table 12-4 lists the choices available through the menu and the resources for defining the Default item.

Table 12-4 Fonts Menu and Associated Resources

Menu Item	Resource Names		Font Selected
Default	**foundry**, **family pointSize**, **subFont**:		14 point
	foundry	The developer of the font; for example, adobe. Default: * (the wildcard character, which ensures that any foundry matches the font request)	
	family	The family name; for example, courier. Default: terminal	
	pointSize	The point size of the Default menu selection (in tenths of a point). Default: 140	
	subFont	The substitute font used if the requested font cannot be found; should be one of the built-in fonts. Default: 8x13	
Small	Not applicable		10.5 point
Large	Not applicable		14 point
Jumbo	Not applicable		18 point

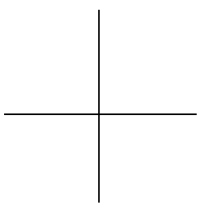
The Cursors Menu

The Cursors menu allows you to change the terminal emulator's cursor by selecting one of the descriptions in the menu.

You can also press Shift-MB3 (mouse button 3) to shift through the nine different types of cursors available.

The Keys Menu

The Keys menu (Keys ⇒ Keymap Editor) provides access to the Keymap Editor (see "Configuring Key Translations" on page 12-4).



Selecting in the Window

You can select arbitrary rectangular sections of an NCD Terminal Emulator window to cut and paste:

- Shift-MB1 (mouse button 1) starts the rectangular selection. The cursor changes to a plus sign (+).
- MB3 extends the selection. The cursor again changes to a plus sign in the corner of the selection nearest the cursor, allowing you to extend the selection.
- MB2 pastes the selection.

The **rectangularCutLineTerminator** resource allows you to specify the terminator added to the end of each line of the rectangular selection. The default terminator is \n, which inserts a carriage return followed by a linefeed.

Configuring the Window Disconnect Delay

The **disconnectDelay** resource allows you to specify the number of seconds to wait before removing a window after disconnecting from the host. The default value is one second.

This resource is useful because you can set the disconnect delay to permit viewing of error messages displayed when the terminal emulator fails to connect to a host. For example, if a user attempts to connect to the Configuration daemon without a password, the window can be set to remain on the terminal long enough for the user to read the message that says a password is required.

Configuring the Answer-Back Message

The terminal emulator includes the control character ENQ, which decodes to 5. When the terminal emulator receives this code from the host, it sends back the string in the **answerbackString** resource.

Typing Ctrl-E causes the terminal to send its answer-back message.

Using VT320 Terminal Emulator Escape Sequences

An escape sequences is a series of non-printing characters, beginning with an Escape character, that sends commands to devices. Escape sequences are used for printing, communications, and display management. The command in an escape sequence results in specified actions by devices. Escape sequences are also called control codes or control sequences.

Escape sequences are most often used in scripts, as in the following examples:

```
cursoroff:    echo "ESC[?25lcursor is off"
cursoron:     echo "ESC[?25hcursor is on"
```

The NCD Terminal Emulator includes a subset of the VT320 command set, as well as NCD-specific sequences. These escape sequences, their actions, and associated functions are listed in Table 12-5. Some of the sequences are described in more detail following the table.

The table lists sequences that differ depending on whether the environment requires eight-bit or seven-bit mode. The eight-bit mode sequence (for example, CSI. . .) is listed first, followed by the equivalent seven-bit mode sequence (for example, Esc[. . .).

Numerical variables are represented as ***pn***. Variables representing a number of rows or columns are represented as ***pr*** or ***pc***, respectively. Variables requiring a parameter setting from a number of specific choices are represented by ***ps***. Other variable types are defined in the table as required.

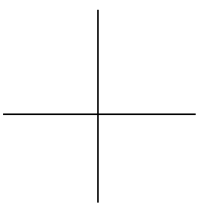


Table 12-5 Escape Sequences

Escape Sequence	Action	Control Function
CSI ***pn*** **@** **Esc [** ***pn*** **@**	Insert ***pn*** blank characters. Default: 1.	ICH
CSI ***ps*** **$ }** **Esc [** ***ps*** **$ }** See "Configuring the Status Line" on page 12-27 for more information.	Select the status line. ***ps*** specifies the display to which the terminal sends data. Permissible values: 0 Send characters to main display 1 Send characters to status line	
CSI ***ps*** **$ -** **Esc [** ***ps*** **$ -** See "Configuring the Status Line" on page 12-27 for more information.	Enable the status line. The variable parameter ***ps*** indicates the status line to use. Permissible values: 0 No status line 1 Indicator status line (no-op) 2 Host-writable status line	
CSI ! p **Esc [! p**	Soft reset	
CSI > c **Esc [> c** **or** **CSI > 0 c** **Esc [> 0 c**	Request secondary device attributes. Response is `C S I >` ***id*** , ***ver*** , 0 c, in which ***id*** is terminal identification and ***ver*** is version. Default response: `CSI>1;1;0c`	DA
CSI ? ps J **Esc [? ps J**	Selective erase in display. Permissible values for ***ps***: 0 Cursor to end of screen 1 Start to cursor 2 Entire screen	DECSED

Table 12-5 Escape Sequences (Continued)

Escape Sequence	Action	Control Function
CSI ? ps K **Esc [ps K**	Selective erase in line. Permissible values for ***ps*** are: 0 Cursor to end of line 1 Beginning to cursor 2 Entire line	DECSEL
CSI ? ***ps*** **;** ***ps*** **... h** **Esc [?** ***ps*** **;** ***ps*** **... h**	Set Digital private mode. Permissible values for ***ps***:	
	1 Cursor keys mode (keypad application) 3 Column mode (132 column) 4 Scrolling mode (smooth scroll) 5 Screen mode (reverse video) 6 Origin mode 7 Autowrap mode 8 Auto-repeat mode 9 Send MIT mouse row and column on button press 25 Text cursor enable mode (cursor visible) 40 Allow 80-to-132 mode 41 ***curses*** (1) fix 42 National replacement character set mode (enabled) 44 Turn on margin bell 45 Reverse wraparound mode 46 Start logging 47 Use alternate screen buffer	DECCKM DECCOLM DECSCLM DECSCNM DECOM DECAWM DECARM DECTCEM DECNRCM
CSI ? ***ps*** **i** **Esc [?** ***ps*** **i**	Digital private print control mode. Permissible values for ***ps*** are: 1 Print line with cursor 4 Exit autoprint mode 5 Enter autoprint mode 10 Print main display 11 Print main display	

Table 12-5 Escape Sequences (Continued)

Escape Sequence	Action	Control Function
CSI ? *ps* ; *ps* ... l **Esc [? *ps* ; *ps* ... l**	Reset Digital private mode. Permissible values for ***ps*** include: 1 Cursor keys mode (normal cursor keys) 3 Column mode (80 columns) 4 Scrolling mode (jump / fast scroll) 5 Screen mode (normal video) 6 Origin mode (normal cursor) 7 Autowrap mode (wraparound) 8 Auto-repeat mode (disabled) 9 Do not send MIT mouse row, column on button press 10 Text cursor enable mode (cursor invisible) 40 Do not allow 80-to-132 mode 41 No ***curses*** (1) fix 42 National replacement character set mode (disabled) 44 Turn off margin bell 45 No reverse wraparound mode 46 Stop logging 47 Use normal screen buffer	 DECCKM DECCOLM DECSCLM DECSCNM DECOM DECAWM DECARM DECTCEM DECNRCM
CSI ? *ps* n **Esc [? *ps* n**	See **CSI *ps* n**.	

Table 12-5 Escape Sequences (Continued)

Escape Sequence	Action	Control Function
CSI ? *ps* ; *ps* ... r **Esc [? *ps* ; *ps* ... r**	Store Digital private mode. Permissible values for ***ps***:	
	1 Cursor keys mode (normal / application keypad)	DECCKM
	3 Column mode (80 / 132 columns)	DECCOLM
	4 Scrolling mode (jump (fast) / scroll)	DECSCLM
	5 Screen mode (normal / reverse video)	DECSCNM
	6 Origin mode (normal / origin)	DECOM
	7 Autowrap mode (no wrap / wraparound)	DECAWM
	8 Auto-repeat mode (auto-repeat / no-auto-repeat)	DECARM
	9 Do not send / send MIT mouse row and column on button press	
	25 Not implemented	
	40 Disallow / allow 80-to-132 mode	
	41 Off / on ***curses*** (1) fix	
	42 National replacement character set mode (disabled)	DECNRCM
	44 Off / on margin bell	
	45 No reverse-wraparound / reverse wraparound mode	
	46 Stop / start logging	
	47 Use normal / alternate screen buffer	

Table 12-5 Escape Sequences (Continued)

Escape Sequence	Action	Control Function
CSI ? *ps* ; *ps* ... s	Restore Digital private mode. Permissible values for ***ps***: 1 Cursor keys mode (normal / application keypad) 3 Column mode (80 / 132 columns) 4 Scrolling mode (jump (fast) / scroll) 5 Screen mode (normal / reverse video) 6 Origin mode (normal / origin) 7 Autowrap mode (no wrap / wraparound) 8 Auto-repeat / no-auto-repeat keys 9 Do not send / send MIT mouse row and column on button press 25 Not implemented 40 Disallow / allow 80-to-132 mode 41 Off / on ***curses*** (1) fix 42 National replacement character set mode (disabled) 44 Off / on margin bell 45 No reverse-wraparound / reverse wraparound mode 46 Stop / start logging 47 Use normal / alternate screen buffer	 DECCKM DECCOLM DECSCLM DECSCNM DECOM DECAWM DECARM DECNRCM
CSI *ps* "q **Esc [*ps* " q**	Select character protection attribute. Permissible values for ***ps***: 0 Not protected 1 Protected 2 Not protected	DECSCA
CSI 0 c **CSI *pn* c** **Esc [*pn* c** **Esc Z**	Device attributes / terminal identification. The response is `CSI ?62;1;2;6;8c)`	DA1 DECID
CSI *pn* A **Esc [*pn* A**	Cursor up ***pn*** times. Default: 1.	CUU

Table 12-5 Escape Sequences (Continued)

Escape Sequence	Action	Control Function
CSI ***pn*** **B** **Esc [** ***pn*** **B**	Cursor down ***pn*** times. Default: 1.	CUD
CSI ***pn*** **C** **Esc [** ***pn*** **C**	Cursor forward ***pn*** times. Default: 1.	CUF
CSI ***pn*** **D** **Esc [** ***pn*** **D**	Cursor backward ***pn*** times. Default: 1.	CUB
CSI ***pr*** **;** ***pc*** **H** **Esc [** ***pr*** **;** ***pc*** **H**	Cursor position. Default: [1,1].	CUP
CSI ***ps*** **J** **Esc [** ***ps*** **J**	Erase in display. Permissible values for ***ps***: 0 Cursor to end of screen (default) 1 Start to cursor 2 Entire screen	ED
CSI ***ps*** **K** **Esc [** ***ps*** **K**	Erase in line. Permissible values for ***ps***: 0 Cursor to end of line (default) 1 Beginning to cursor 2 Entire line	EL
CSI ***pn*** **L** **Esc [** ***pn*** **L**	Insert ***pn*** lines. Default: 1.	IL
CSI ***pn*** **M** **Esc [** ***pn*** **M**	Delete ***pn*** lines. Default: 1.	DL
CSI ***pn*** **P** **Esc [** ***pn*** **P**	Delete ***pn*** characters. Default: 1.	DCH
CSI ***pn*** **X** **Esc [** ***pn*** **X**	Erase ***pn*** characters.	ECH
CSI ***pr*** **;** ***pc*** **f** **Esc [** ***pr*** **;** ***pc*** **f**	Horizontal and vertical position.	HVP

Table 12-5 Escape Sequences (Continued)

Escape Sequence	Action	Control Function
CSI ***ps*** **g** **Esc [** ***ps*** **g**	Tab clear. Permissible values for ***ps***: 0 Clear current tab stop (default) 2 Clear all tab stops 3 Clear all tab stops	TBC
CSI ***ps*** **;** ***ps*** **;** ***ps*** **... h** **Esc [** ***ps*** **;** ***ps*** **;** ***ps*** **... h**	Set Mode. Permissible values for ***ps***: 4 Insert mode 20 Line feed / new line	IRM LNM
CSI ***ps*** **i** **Esc [** ***ps*** **i**	Print control mode. Permissible values for ***ps***: 0 Print page that has cursor 4 Exit printer controller mode 5 Enter printer controller mode	
CSI ***ps*** **;** ***ps*** **;** ***ps*** **... l** **Esc [** ***ps*** **;** ***ps*** **;** ***ps*** **... l**	Reset Mode. Permissible values for ***ps***: 4 Replace mode 20 No line feed / no new line	IRM LNM

Table 12-5 Escape Sequences (Continued)

Escape Sequence	Action	Control Function
CSI ***ps*** **;** ***ps*** **;** ***ps*** **... m** **Esc [** ***ps*** **;** ***ps*** **;** ***ps*** **... m** (For more information, see "Configuring Color Text" on page 12-30.) *(continued on next page)*	Select graphic rendition (visual attributes). Permissible values for ***ps***: 0 Normal; clear all attributes 1 Bold 4 Underscore 5 Blink 7 Reverse video 22 Normal intensity, not bold 24 Not underlined 25 Not blinking 27 Normal video Foreground text color: 30 Black 31 Red 32 Green 33 Yellow 34 Blue 35 Magenta 36 Cyan 37 White Background text color: 40 Black 41 Red 42 Green 43 Yellow 44 Blue 45 Magenta 46 Cyan 47 White	SGR

Table 12-5 Escape Sequences (Continued)

Escape Sequence	Action	Control Function
(continued from previous page) **CSI** ***ps*** **;** ***ps*** **;** ***ps*** **... m** **Esc [** ***ps*** **;** ***ps*** **;** ***ps*** **... m**	Select graphic rendition (visual attributes). Color-pair selection (NCD-specific values): 90 Color-pair0 91 Color-pair1 92 Color-pair2 93 Color-pair3 94 Color-pair4 95 Color-pair5 96 Color-pair6 97 Color-pair7	

Table 12-5 Escape Sequences (Continued)

Escape Sequence	Action	Control Function
CSI ***ps*** **n** **Esc [** ***ps*** **n** or **CSI ?** ***ps*** **n** **Esc [?** ***ps*** **n**	Device status reports. ***ps*** Meaning — Response 5 Status report — CSI 0 n 6 Cursor position report — CSI r c R 15 Printer ready — CSI ? 10 n No printer — CSI ? 13 n 00 25 User-defined key status (unlocked) — CSI ? 20 n 26 Keyboard dialect — CSI ? 27 ***type*** n Permissible values for ***type***: 1 North American 2 British 3 Flemish 4 Canadian French 5 Danish 6 Finnish 7 German 8 Dutch 9 Italian 10 Swiss (French) 11 Swiss (German) 12 Swedish 13 Norwegian 14 French/Belgian 15 Spanish 16 Portuguese	DSR
CSI ***pt*** **;** ***pb*** **r** **Esc [** ***pt*** **;** ***pb*** **r**	Set top and bottom margins (***pt*** =top; ***bp***=bottom). Default: full-size window.	DECSTBM

Table 12-5 Escape Sequences (Continued)

Escape Sequence	Action	Control Function
8-bit mode: ***DCS pc ; pl*** | ***Ky1*** / ***St1*** ; . . . ***Kyn*** / ***Stn ST*** or ***DCS pc*** ; ***pl*** | ***Ky1*** \ ***St1*** ; . . . K***yn*** \ ***Stn ST*** 7-bit mode: ***Esc P pc ; pl*** | ***Ky1 / St1*** ; . . . ***Kyn*** / ***Stn ST*** or ***Esc P pc*** ; ***pl*** | ***Ky1*** \ ***St1*** ; . . . ***Kyn*** \ ***Stn ST*** (See "Programming Function Keys on N-108LK Keyboards" on page 12-28 for more information.)	User-defined keys (F6-F14, Do, Help, F17-F20): ***pc*** Clear parameter. Permissible values: 0 Clear all keys before starting (resetting) 1 Clear one key at a time, as overwritten ***pl*** Lock parameter (no-op). Permissible values: 0 Lock the keys 1 Unlock the keys ***Ky1*** / ***St1*** or ***Ky1*** \ ***St1*** Key definition strings ***ST*** String terminator character or ESC \	DECUDK
Esc G (*embedded space required*)	Sending 8-bit C1 control characters	S8C1T
Esc F (*embedded space required*)	Sending 7-bit C1 control characters	S7C1T
Esc }	Select locking shift of G2 character set, right	LS2R
Esc =	Keypad application mode	DECKPAM
Esc >	Keypad numeric mode	DECPNM
Esc # 3	Double-width, single-height line, top	DECDHL
Esc # 4	Double-width, single-height line, bottom	DECDHL
Esc # 5	Single-width, single-height line	DECSWL
Esc # 6	Double-width, single-height line	DECDWL
Esc # 8	Screen alignment pattern	DECALN

Table 12-5 Escape Sequences (Continued)

Escape Sequence	Action	Control Function
Esc (*ps* **Esc) *ps*** **Esc * *ps*** **Esc + *ps***	Designate character sets: Select character set G0. Select character set G1. Select character set G2. Select character set G3. Permitted values for ***ps***: ***ps*** Character set B ASCII %5 Digital supplementary < Digital user supplementary 0 Digital graphics A United Kingdom 4 Dutch C FINNISH 5 FINNISH 2 R French Q French Canadian 9 French Canadian 2 K German Y Italian E Norwegian 6 Norwegian 2 \ Norwegian 3 %6 Portuguese Z Spanish H Swedish 7 Swedish 2 = Swiss	SCS
Esc |	Select locking shift of G3 character set, right	LS3R
Esc ~	Select locking shift of G1 character set, right	LS1R
Esc 7	Save cursor	DECSC
Esc 8	Restore cursor	DECRC

Table 12-5 Escape Sequences (Continued)

Escape Sequence	Action	Control Function
Esc D	Index	IND
Esc E	New line	NEL
Esc H	Horizontal tab set	HTS
Esc M	Reverse index	RI
Esc N	Select single-shift of G2 character set	SS2
Esc O	Select single-shift of G3 character set	SS3
Esc Z **Esc [c**	Send device attributes / terminal identification. Response: `CSI?62;1;2;6;8c`	DECID
Esc c	Hard reset	RIS
Esc n	Select locking shift of G2 character set	LS2
Esc o	Select locking shift of G3 character set	LS3
OSC ***ps ; string NP*** **Esc]** ***ps ; string NP*** (For more information, see "Configuring Window and Icon Titles" on page 12-30.)	OSC Mode—Set icon and window titles. Parameter variables are: ***NP*** **—**Any non-printing character (discarded) ***string***—ASCII printable string (maximum 511 characters) ***ps*** 0 Use string as new icon name and title 1 Use string as new icon name only 2 Use string as new title only	
OSC ***ps ND string NP*** **Esc]** ***ps ND string NP*** (For more information, see "Configuring Color Text" on page 12-30.)	Color-pair specification (NCD-specific) Parameter variables are defined as follows: ***ps*** 90 to 97 ***ND*** Any non-digit character ***string*** ***foreground*** / ***background*** ***NP*** Any non-printing character	

Configuring the Status Line

The status line is referred to in Digital documents as “the 25th line of the display.“ Because NCD Terminal Emulator windows may have more than 24 lines, the status line must be treated as the hardware status line instead of line 25.

The NCD implementation of the status line allows the programmer to create a new line that appears at the bottom of the window. Normal programmatic editing operations are available for this line, but different character modes (such as blinking or bold) are not supported. To enter characters into the status line, the programmer switches from the main display to the status line display, then uses normal cursor control and text to add characters.

By default, the status line is not visible on the screen.

To use the status line, enable or disable it with the following sequence:

`CSI` ***ps*** `$ -`

where ***ps*** indicates which status line to use (or none):

0 No status line available

1 Indicator status line (no-op)

2 Host-writable status line

Hence, the value 2 makes the status line appear, and 0 makes it disappear. Note that content is not retained when the status line is hidden; the line is emptied.

To select the status line, use the following sequence:

`CSI` ***ps*** `$ }`

where ***ps*** represents the display area to which the terminal sends data:

0 Send characters to the main display

1 Send characters to the status line

Once the status line is selected, all character input is directed there until the main display is selected.

Programming Function Keys on N-108LK Keyboards

Fifteen of the twenty function keys on the N-108LK keyboards can be redefined by the user. The definable function keys are:

- F6 through F14
- Do and Help
- F17 through F20

When redefined, the shifted state of these keys takes on the defined values. The unshifted keys still work as usual; you cannot programmatically rebind the unshifted state.

The two permissible formats of the escape sequences follow:

`DCS` ***pc*** `;` ***pl*** `|` ***Ky1*** `/` ***St1*** `; ...` ***Kyn*** `/` ***Stn*** ***ST***

`DCS` ***pc*** `;` ***pl*** `|` ***Ky1*** `\` ***St1*** `; ...` ***Kyn*** `/` ***Stn*** ***ST***

The parts of a function key definition are:

DCS	Device control string
pc	Clear parameter: 0 Clear all keys before starting (reset) 1 Clear one key at a time, as overwritten
pl	Lock parameter (no-op on NCD terminals): 0 Lock the keys 1 Unlock the keys
Ky1/St1 or ***Ky1\St1***	Key definition string. There can be ***n*** of these, separated by semicolons. The format is a key selector number, a slash, then the rebinding. (See Table 12-6). The ***Ky1/St1*** version requires that you supply the hexadecimal values of the letters in the key definition string. NCD has added another option, ***Ky1\St1***, which allows you to supply ASCII characters for the string.
ST	String terminator character, or ESC \

Table 12-6 Key Selector Numbers

Key	Value
F6	17
F7	18
F8	19
F9	20
F10	21
F11	23
F12	24
F13	25
F14	26
Help	28
Do	29
F17	31
F18	32
F19	33
F20	34

Examples of function key definitions follow (spaces have been inserted for legibility, but must not be included in the definition):

`DCS 0 ; 1 | ST`	Clears all key rebindings
`DCS 1 ; 0 | ESC \`	Locks keys (no-op on NCD terminals)
`DCS 1 ; 1 | 34\ Print ST`	Rebinds F20 to string “Print“
`DCS 1 ; 1 | 34/5052494E54 ST`	Rebinds F20 to string “Print“

In the Digital implementation, there is a limitation of 256 characters combined for all programmable function keys. NCD has a limitation of 256 characters per rebound key.

With Digital computers, key locking and unlocking can be set through hardware. Because NCD does not have this hardware, this function does not work. Locking is not enforced.

Configuring Window and Icon Titles

Icon and window titles can be configured through the following escape sequence:

OSC ***ps ND string NP***

where:

ps Determines how the string is used:

0—Uses ***string*** as the new icon name and window title
1—Uses ***string*** as the new icon name only
2—Uses ***string*** as the new window name only

ND Is any non-alphanumeric character (and is discarded)

string Becomes the icon name and window title (or icon name only). This is an ASCII printable string that contains a maximum of 511 characters.

NP Is any non-printing character (and is also discarded)

Configuring Color Text

You can specify color text programmatically. This feature is based on the SGR (select graphic rendition) paradigm used to control blinking, bold, inverse, and other text attributes.

There are two methods of setting text color:

- Using a subset of the ISO 6429 standard for selection of basic colors for foreground and background
- The Hewlett-Packard color-pair model in which you can select pairs of any X colors for text (X colors are listed in the file **/usr/lib/X11/ncd/rgb.txt.)**

The color selection code is limited to eight combinations of colors at any given time.

The number of combinations can be effectively doubled by using the inverse graphics rendition, but the number of colors that can be displayed on the screen simultaneously is limited.

ISO 6429 Color Usage

The ISO specification defines SGR sequences to change the foreground and the background pens, as listed in Table 12-7.

Table 12-7 SGR Sequences for Foreground and Background Pens

Foreground Selection		Background Selection	
30	black	40	black
31	red	41	red
32	green	42	green
33	yellow	43	yellow
34	blue	44	blue
35	magenta	45	magenta
36	cyan	46	cyan
37	white	47	white

For example:

```
CSI 31 m or ESC[ 31 m
```

renders foreground text in red, and

```
CSI 44 m or ESC[ 31 m
```

renders background text in blue.

These selections can be mixed to use combinations of the foreground and background colors when rendering text. However, only eight combinations are permitted simultaneously on the screen. The eight color cells are reused as needed.

Note also that the combination of black text on a white background is always reserved for the first color cell; hence, there are really only seven combinations of these colors that you can select.

If you attempt to use more than seven combinations at one time, the resulting text is displayed using color cell zero (black on white).

Hewlett-Packard Color-Pair Usage

The eight available color cells can be assigned to any combination of foreground and background colors using NCDware-specific functionality.

This functionality builds on the SGR method of text specification with the addition of the range of new selections listed in Table 12-8.

Table 12-8 New Color-Pair Selection

Color Pair Selector	Color Pair
90	color-pair0
91	color-pair1
92	color-pair2
93	color-pair3
94	color-pair4
95	color-pair5
96	color-pair6
97	color-pair7

For example:

`CSI 91 m` or `ESC[ 91 m`

uses color-pair1 for rendering text.

Specify the colors associated with the selections by using an extension of the OSC functions in the following format:

`OSC` ***ps ND string NP***

where:

ps ranges from 90 to 97 for the color-pair selection

ND is any non-alphanumeric character (and is discarded)

string is in the format foreground / background

NP is any non-printing character (and is discarded)

For example:

```
OSC 91 ; orange/brown ^G or
ESC] 91 ; orange/brown ^G
```

sets color-pair1 to foreground orange, background brown.

The first color, color cell 0 (zero), is special—it is the default used for normal text. In addition, the background of the window is reset to the background specified with this color. In the ISO 6429 model, color cell 0 is always used for text specified as black text on a white background. Note that this may have been changed using the Hewlett-Packard method, which results in black text on a white background being stored in color-pair0.

You can use the two models together, but this is somewhat tricky in terms of cell reuse. The zero cell is never reused, but others are available to be reused if a free cell is needed and there are no matching colors for an existing cell on the screen. (The code scans the screen to determine if a color cell is in use when it needs to allocate a new color selection.) As a rule, you should limit color to eight combinations at any given time, or twice that using inverse text. If you attempt to use more colors, the result is plain color text.

Set up new color cells as early as possible and not within loops.

Reverse video inverts all the colors that are set programmatically. The user can select reverse video from the Options menu or use the **reverseVideo** resource.

Using Keyboard Escape Sequences

An escape sequence is a series of non-printing characters, beginning with an Escape character, that sends a command to a device. Escape sequences are used by some legacy applications for printing, communications, and display management. The command in an escape sequence results in specified actions by devices. Escape sequences are also called control codes or control sequences.

The tables in this section describe the escape sequences sent to the terminal emulator from the following NCD keyboards: N-101 / N-102, VT220 / N-108LK, and N-97 / N-Kana.

Escape key sequences are sent by the following types of keys:

- Pressing a function key sends an escape sequence to the terminal emulator. The following tables list the function key escape sequences for NCD keyboards:

  Table 12-10 N-101 / N-102 keyboard

  Table 12-14 VT220 / N-108LK keyboard

  Table 12-19 N-97 / N-Kana keyboard

- The keypad can be set in one of two modes: numeric or application. In numeric mode, pressing a keypad key results in a digit, numeric operator, or enter character. In application mode, the keypad keys are similar to the function keys in that pressing a key generates an escape sequence. The **appCursorMode** resource controls the mode; the Options menu includes a toggle (Application Cursor Mode) for local control.

  The following tables list the keypad escape sequences for NCD keyboards:

  Table 12-9 N-101 / N-102 keyboard

  Table 12-13 VT220 keyboard

  Table 12-18 N-97 / N-Kana keyboard

- Pressing a key in the cursor keypad or edit keypad results in an escape sequence. The cursor keypad can also be used in either application mode or non-application mode. The Options menu includes a toggle (Application Cursor Mode) to alter the mode.

The following tables list the edit keypad escape sequences:

Table 12-11 N-101/N-102 keyboard

Table 12-17 N-108LK keyboard

The following tables list the cursor keypad escape sequences:

Table 12-12 N-101/N-102 keyboard

Table 12-15 N-108LK keyboard

- Escape sequences for the Break, Shift, and Control keys for the N-108LK keyboard in the serial terminal emulator are listed in Table 12-16.

N-101/N-102 Keyboard Escape Sequences

The tables in this section list escape sequences for N-101/N-102 keyboards.

Table 12-9 N-101/N-102 Keypad Escape Sequences

Key	Application Mode Reset	Application Mode Set	
		8-bit	7-bit
0	0	SS3 p	Esc O p
1	1	SS3 q	Esc O q
2	2	SS3 r	Esc O t
3	3	SS3 s	Esc O s
4	4	SS3 t	Esc O t
5	5	SS3 u	Esc O u
6	6	SS3 v	Esc O v
7	7	SS3 w	Esc O w
8	8	SS3 x	Esc O x
9	9	SS3 y	Esc O y
Enter	Return	SS3 M	Esc O M
-	-	SS3 m	Esc O m
.	.	SS3 n	Esc O n
+	+	+	+

Table 12-9 N-101/N-102 Keypad Escape Sequences (Continued)

Key	Application Mode Reset	Application Mode Set	
		8-bit	7-bit
/	/	/	/
*	*	*	*

Table 12-10 N-101/N-102 Function Key Escape Sequences

Key	Escape Sequence	
	8-bit	7-bit
F1	CSI 1 1 ~	Esc [1 1 ~
F2	CSI 1 2 ~	Esc [1 2 ~
F3	CSI 1 3 ~	Esc [1 3 ~
F4	CSI 1 4 ~	Esc [1 4 ~
F5	CSI 1 5 ~	Esc [1 5 ~
F6	CSI 1 7 ~	Esc [1 7 ~
F7	CSI 1 8 ~	Esc [1 8 ~
F8	CSI 1 9 ~	Esc [1 9 ~
F9	CSI 2 0 ~	Esc [2 0 ~
F10	CSI 2 1 ~	Esc [2 1 ~
F11	CSI 2 3 ~	Esc [2 3 ~
F12	CSI 2 4 ~	Esc [2 4 ~

Table 12-11 N-101/N-102 Editing Keypad Escape Sequences

Key	Escape Sequence	
	8-bit	7-bit
Insert	CSI 2 ~	Esc [2 ~
Home	CSI ^ A	Esc [^ A
Page Up	CSI 5 ~	Esc [5 ~
Delete	CSI ^ ?	Esc [^ ?
End	CSI ^ B	Esc [^ B
Page Down	CSI 6 ~	Esc [6 ~

Table 12-12 N-101/N-102 Cursor Keypad Sequences

Arrow Key	Escape Sequence	
	8-bit	7-bit
Up	CSI A	Esc [A
Down	CSI B	Esc [B
Right	CSI C	Esc [C
Left	CSI D	Esc [D

N-108LK (VT220-Style) Keyboard Escape Sequences

The tables in this section list escape sequences for N-108LK and VT220 keyboards.

Table 12-13 N-108LK Keypad Escape Sequences

Key	Application Mode Reset		Application Mode Set	
	8-bit	7-bit	8-bit	7-bit
0	0	0	SS3 p	Esc O p
1	1	1	SS3 q	Esc O q
2	2	2	SS3 r	Esc O r
3	3	3	SS3 s	Esc O s
4	4	4	SS3 t	Esc O t
5	5	5	SS3 u	Esc O u
6	6	6	SS3 v	Esc O v
7	7	7	SS3 w	Esc O w
8	8	8	SS3 x	Esc O x
9	9	9	SS3 y	Esc O y
,	,	,	SS3 l	Esc O l
-	_	_	SS3 m	Esc O m
.	.	.	SS3 n	Esc O n
Enter	Return	Return	SS3 M	Esc O M
PF1	SS3 P	Esc O P	SS3 P	Esc O P
PF2	SS3 Q	Esc O Q	SS3 Q	Esc O Q
PF3	SS3 R	Esc O R	SS3 R	Esc O R
PF4	SS3 S	Esc O S	SS3 S	Esc O S

Table 12-14 N-108LK Function Key Escape Sequences

Key	VMS		ULTRIX	
	8-bit	7-bit	8-bit	7-bit
F1	hold screen	hold screen	hold screen	hold screen
F2	print screen	print screen	print screen	print screen
F3				
F4				
F5*	Break	Break	Break	Break
F6	CSI 1 7 ~	Esc [1 7 ~	CSI 1 7 ~	Esc [1 7 ~
F7	CSI 1 8 ~	Esc [1 8 ~	CSI 1 8 ~	Esc [1 8 ~
F8	CSI 1 9 ~	Esc [1 9 ~	CSI 1 9 ~	Esc [1 9 ~
F9	CSI 2 0 ~	Esc [2 0 ~	CSI 2 0 ~	Esc [2 0 ~
F10	CSI 2 1 ~	Esc [2 1 ~	CSI 2 1 ~	Esc [2 1 ~
F11	CSI 2 3 ~	Esc [2 3 ~	Esc _	Esc _
F12	CSI 2 4 ~	Esc [2 4 ~	Backspace	Backspace
F13	CSI 2 5 ~	Esc [2 5 ~	Newline	Newline
F14	CSI 2 6 ~	Esc [2 6 ~	CSI 2 6 ~	Esc [2 6 ~
Help	CSI 2 8 ~	Esc [2 8 ~	CSI 2 8 ~	Esc [2 8 ~
Do	CSI 2 9 ~	Esc [2 9 ~	CSI 2 9 ~	Esc [2 9 ~
F17	CSI 3 1 ~	Esc [3 1 ~	CSI 3 1 ~	Esc [3 1 ~
F18	CSI 3 2 ~	Esc [3 2 ~	CSI 3 2 ~	Esc [3 2 ~
F19	CSI 3 3 ~	Esc [3 3 ~	CSI 3 3 ~	Esc [3 3 ~
F20	CSI 3 4 ~	Esc [3 4 ~	CSI 3 4 ~	Esc [3 4 ~

*F5 is the break key in a serial terminal emulator only.

Table 12-15 N-108LK Cursor Keypad Sequences

Arrow Key	Cursor Key Mode Reset		Cursor Key Mode Set	
	8-bit	7-bit	8-bit	7-bit
Up	CSI A	Esc [A	SS3 A	Esc O A
Down	CSI B	Esc [B	SS3 B	Esc O B
Right	CSI C	Esc [C	SS3 C	Esc O C
Left	CSI D	Esc [D	SS3 D	Esc O D

Table 12-16 N-108LK Escape Sequences–Break, Shift, and Control

Key	Code Sent
Break*	250 millisecond Break
Shift-Break*	3.5 second Break & drop DTR
Control-@	NULL
Control-Space	NULL
Control-Shift-Space	NULL

* Break and Shift-Break apply to the serial terminal emulator only.

Table 12-17 N-108LK Editing Keypad Escape Sequences

Key	VMS		ULTRIX	
	8-bit	7-bit	8-bit	7-bit
Find	CSI 1 ~	Esc [1 ~	CSI 1 ~	Esc [1 ~
Insert	CSI 2 ~	Esc [2 ~	CSI 2 ~	Esc [2 ~
Remove	CSI 3 ~	Esc [3 ~	CSI 3 ~	Esc [3 ~
Select	CSI 4 ~	Esc [4 ~	CSI 4 ~	Esc [4 ~
Prior	CSI 5 ~	Esc [5 ~	CSI 5 ~	Esc [5 ~
Next	CSI 6 ~	Esc [6 ~	CSI 6 ~	Esc [6 ~

N-97/N-Kana Keyboard Escape Sequences

The tables in this section list escape sequences for N-97 and N-Kana keyboards.

Table 12-18 N-97/N-Kana Keypad Escape Sequences

Key	Application Mode Reset		Application Mode Set	
	8-bit	7-bit	8-bit	7-bit
0	0	0	SS3 p	Esc O p
1	1	1	SS3 q	Esc O q
2	2	2	SS3 r	Esc O r
3	3	3	SS3 s	Esc O s
4	4	4	SS3 t	Esc O t
5	5	5	SS3 u	Esc O u
6	6	6	SS3 v	Esc O v
7	7	7	SS3 w	Esc O w
8	8	8	SS3 x	Esc O x
9	9	9	SS3 y	Esc O y
,	,	,	SS3 l	Esc O l
-	_	_	SS3 m	Esc O m
.	.	.	SS3 n	Esc O n
Enter	Return	Return	SS3 M	Esc O M
PF1	SS3 P	Esc O P	SS3 P	Esc O P
PF2	SS3 Q	Esc O Q	SS3 Q	Esc O Q
PF3	SS3 R	Esc O R	SS3 R	Esc O R
PF4	SS3 S	Esc O S	SS3 S	Esc O S

Table 12-19 N-97/N-Kana Function Key Escape Sequences

Key	Escape Sequence	
	8-bit	**7-bit**
F1	CSI 1 1 ~	Esc [1 1 ~
F2	CSI 1 2 ~	Esc [1 2 ~
F3	CSI 1 3 ~	Esc [1 3 ~
F4	CSI 1 4 ~	Esc [1 4 ~
F5	CSI 1 5 ~	Esc [1 5 ~
F6	CSI 1 7 ~	Esc [1 7 ~
F7	CSI 1 8 ~	Esc [1 8 ~
F8	CSI 1 9 ~	Esc [1 9 ~
F9	CSI 2 0 ~	Esc [2 0 ~
F10	CSI 2 1 ~	Esc [2 1 ~
F11	CSI 2 3 ~	Esc [2 3 ~
F12	CSI 2 4 ~	Esc [2 4 ~

Using Compose Key Sequences

Compose sequences, available on all keyboards, allow you to type more characters than appear on the keyboard by using a sequence of keystrokes to compose a single special character. You can use compose sequences in the NCD Terminal Emulator (***ncdterm*** or ***ncdrunterm***).

Support for Dead Keys

Special characters called dead keys create automatic compose sequences. When a dead key is pressed, the next key you press determines the composed character. The N-102 French and Swiss keyboards provide dead-key support for the following accent marks:

- On the French keyboard, the dieresis (¨) and circumflex (ˆ)
- On the Swiss keyboard, the acute accent (´), grave accent (`), circumflex (ˆ), tilde (˜), and dieresis (¨)

When using these keyboards, you must first set the keyboard type to French or Swiss by using the Boot Monitor keyboard menu before booting. For information about the Boot Monitor keyboard menu, see Chapter 11, Boot Monitor and NVRAM.

Typing Compose Sequences

To quickly test compose sequences, display the Terminal Host Chooser (Console ⇒ Terminals ⇒ New Terminal). Type the compose sequences in the `Service:` window.

To type compose sequences in an NCD Terminal Emulator window (***ncdterm*** or ***ncdrunterm***):

1. Make sure the **eightBitInput** resource is set to “true.” For example:
   ```
   NCDrunterm*eightBitInput: true
   ```
2. Start the NCD Terminal Emulator and type:
   ```
   % stty -istrip cs8
   ```
3. If you are using the ***vi*** text editor to enter the compose sequences, set the environment variable LC_CTYPE to “iso_8859_1.”

4. Find the character you want in the Character column in Table 12-20.
   - — On the N-108LK keyboard, press the Compose Character key; then type the two characters in the third column.
   - — On any other type of keyboard, press Left / Alt and a space (hold down Left / Alt while pressing the space bar); then type the two characters in the Keystrokes column.

   Note that the notation (*sp*) in the Keystrokes column in Table 12-20 indicates that you must press the space bar.

Compose Sequence Table

Table 12-20 on page 12-46 lists the characters you can compose and the keystrokes to use.

Note The compose sequences for the currency sign and the registered trademark symbol do not work.

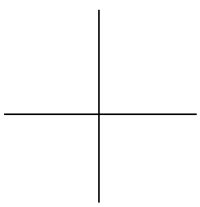


Table 12-20 Compose Sequences

Character	Name	Keystrokes
"	quotation mark	"(sp)
#	number sign	++
'	apostrophe	'(sp)
@	commercial at	AA
[	opening bracket	((
\	backslash	/ / or /<
]	closing bracket	))
^	circumflex accent	^(sp)
`	grave accent	'(sp)
{	opening brace	(-
|	vertical line	/^
}	closing brace	)-
~	tilde	~(sp)
¡	inverted !	!!
¢	cent sign	C/ or C|
£	pound sign	L- or L=
§	section sign	SO or S! or S0
¥	yen	Y- or Y=
¤	currency sign [1]	XO or X0
©	copyright sign	CO or C0
ª	female ordinal	A_
«	open angle brackets	«
°	degree sign	0^

Table 12-20 Compose Sequences (Continued)

Character	Name	Keystrokes
±	plus or minus sign	+ –
²	superscript 2	2^
³	superscript 3	3^
µ	micro sign	/ U*
¶	paragraph sign	P!
•	middle dot	.^
¹	superscript one	1^
º	masculine ordinal	O_
»	closed angle brackets	»
1/4	fraction one-quarter	1 4*
1/2	fraction one-half	1 2*
¿	inverted ?	??
À	A grave	A `
Á	A acute	A ´
Â	A circumflex	A ^
Ã	A tilde	A ~
Ä	A umlaut	A"
å	A ring	A*
Æ	AE diphthong	AE*
Ç	C cedilla	C,
È	E grave	E `

Table 12-20 Compose Sequences (Continued)

Character	Name	Keystrokes
Ë	E umlaut	E "
Ì	I grave	I `
Í	I acute	I ´
Î	I circumflex	I ^
Ï	I umlaut	I "
Ñ	N tilde	N ~
Ò	O grave	O `
Ó	O acute	O ´
Ô	O circumflex	O ^
Õ	O tilde	O ~
Ö	O umlaut	O "
Œ	OE diphthong †	OE *
Ø	O slash	O /
Ù	U grave	U `
Ú	U acute	U ´
Û	U circumflex	U ^
Ü	U umlaut	U "
Ÿ	Y umlaut †	Y "
β	German small sharp s	ss
à	a grave	a `
á	a acute	a ´
â	a circumflex	a ^
ã	a tilde	a ~

Table 12-20 Compose Sequences (Continued)

Character	Name	Keystrokes
ä	a umlaut	a "
å	a ring	a *
æ	ae diphthong	ae*
ç	c cedilla	c,
è	e grave	e `
é	e acute	e ´
ê	e circumflex	e ^
ë	e umlaut	e "
ì	i grave	i `
í	i acute	i ´
î	i circumflex	i ^
ï	i umlaut	i "
ñ	n tilde	n ~
ò	o grave	o `
ó	o acute	o ´
ô	o circumflex	o ^
õ	o tilde	o ~
ö	o umlaut	o "
œ	oe diphthong †	oe *
ø	o slash	o /
ù	u grave	u `
ú	u acute	u ´
û	u circumflex	u ^

Table 12-20 Compose Sequences (Continued)

Character	Name	Keystrokes
ü	u umlaut	u "
ÿ	y umlaut	y "
	no break space	sp sp
¦	broken vertical bar	| | or !
¬	logical not	-,*
–	soft (syllable) hyphen	- -
®	registered trademark [1]	RO
¯	macron	-^
¾	fraction three-quarters	3 4*
÷	division sign	-:
×	multiplication sign	xx
´	acute accent	"
¸	cedilla	"
¨	diaeresis	" "
Ý	Y acute	Y ´
ý	y acute	y ´
Þ	capital Icelandic thorn	TH
þ	small Icelandic thorn	th
Ð	capital Icelandic Eth	- D
ð	small Icelandic Eth	- d

[1] The compose sequences for the currency sign and registered trademark symbol do not work.

VT320 Character Coding Conventions

This section introduces VT320 character coding conventions and NCD Terminal Emulator character sets. It also includes code tables for NCD Terminal Emulator character sets.

VT320 character coding, conventions, and standards are described in detail in Digital publications.

Character Sets

The NCD Terminal Emulator includes the following character sets:

- ASCII (7-bit and 8-bit)
- DEC Supplemental Graphic
- ISO Latin Alphabet 1 supplemental graphic
- 12 National Replacement Character sets

The default character set configuration in the NCD Terminal Emulator is called the Digital Multinational character set. It is composed of the ASCII character set and the Digital Supplemental Graphic character set. The NCD Terminal Emulator maps the ASCII character set into the left side of the character table (see Table 12-21) as the GL codes. It maps the Digital Supplemental Graphic set into the right half (see Table 12-23) as the GR codes.

The ISO Latin Alphabet 1 supplemental graphic set is composed of the ASCII set and the ISO Latin-1 supplemental set. (See Table 12-22.) It includes many of the accented characters and diacritical marks used in European languages. To use the ISO Latin Alphabet 1 supplemental graphic character set, you select the ISO Latin 1 Font toggle in the Options menu.

By default, the NCD Terminal Emulator's ASCII character set is 8-bit ASCII. To change to 7-bit mode, use the Strip Parity toggle in the Options menu.

The 12 National Replacement Character sets are 7-bit character sets used with European language keyboards. (See Table 12-24.) Each varies slightly from the ASCII character set as required by the European language for which it is used.

Character Code Tables

The code tables in this section describe the character codes for the character sets included in NCD Terminal Emulator. The following conventions are used in the code tables:

- Columns and rows are numbered in the top row and right-most or left-most columns. The character codes are sometimes referred to by ***columnnumber*/*rownumber***. For example, in the Digital Multinational Character set, Table 12-21, the character 1/0 is the control character DLE.
- The binary representation of a character is obtained by finding the character code in the table, then looking at the binary representations next to the character's column and row numbers.
- The octal, decimal, and hexadecimal representations of each character are listed to its right; the octal representation is the top number, decimal representation is the middle number, and the hexadecimal representation is the bottom number. For example:

ESC	107	Octal
	71	Decimal
	45	Hexadecimal

Table 12-21 Digital Multinational Character Set: C0 and GL Codes

Row	Column 0		Column 1		Column 2		Column 3		Column 4		Column 5		Column 6		Column 7	
	b8 BITS b7 b6 b5 b4 b3 b2 b1		0 0 0 0		0 0 0 1		0 0 1 0		0 0 1 1		0 1 0 0		0 1 0 1		0 1 1 0		0 1 1 1	
0	0 0 0 0	NUL	o o o	DLE	20 16 10	SP	40 32 20	0	60 48 30	@	100 64 40	P	120 80 50	`	140 96 60	p	160 112 70
1	0 0 0 1	SOH	1 1 1	DC1	21 17 11	!	41 33 21	1	61 49 31	A	101 65 41	Q	121 81 51	a	141 97 61	q	161 113 71
2	0 0 1 0	STX	2 2 2	DC2	22 18 12	“	42 34 22	2	62 50 32	B	102 66 42	R	122 82 52	b	142 98 62	r	162 114 72
3	0 0 1 1	ETX	3 3 3	DC3	23 19 13	#	43 35 23	3	63 51 33	C	103 67 43	S	123 83 53	c	143 99 63	s	163 115 73
4	0 1 0 0	EOT	4 4 4	DC4	24 20 14	$	44 36 24	4	64 52 34	D	104 68 44	T	124 84 54	d	144 100 64	t	164 116 74
5	0 1 0 1	ENQ	5 5 5	NAK	25 21 15	%	45 37 25	5	65 53 35	E	105 69 45	U	125 85 55	e	145 101 65	u	165 117 75
6	0 1 1 0	ACK	6 6 6	SYN	26 22 16	&	46 38 26	6	66 54 36	F	106 70 46	V	126 86 56	f	146 102 66	v	166 118 76
7	0 1 1 1	BEL	7 7 7	ETB	27 23 17	‘	47 39 27	7	67 55 37	G	107 71 47	W	127 87 57	g	147 103 67	w	167 119 77
8	1 0 0 0	BS	10 8 8	CAN	30 24 18	(	50 40 28	8	70 56 38	H	110 72 48	X	130 88 58	h	150 104 68	x	170 120 78
9	1 0 0 1	HT	11 9 9	EM	31 25 19	)	51 41 29	9	71 57 39	I	111 73 49	Y	131 89 59	i	151 105 69	y	171 121 79
10	1 0 1 0	LF	12 10 A	SUB	32 26 1A	*	52 42 2A	:	72 58 3A	J	112 74 4A	Z	132 90 5A	j	152 106 6A	z	172 122 7A
11	1 0 1 1	VT	13 11 B	ESC	33 27 1B	+	53 43 2B	;	73 59 3B	K	113 75 4B	[	133 91 5B	k	153 107 6B	{	173 123 7B
12	1 1 0 0	FF	14 12 C	FS	34 28 1C	,	54 44 2C	<	74 60 3C	L	114 76 4C	\	134 92 5C	1	154 108 6C	|	174 124 7C
13	1 1 0 1	CR	15 13 D	GS	35 29 1D	-	55 45 2D	=	75 61 3D	M	115 77 4D	]	135 93 5D	m	155 109 6D	}	175 125 7D
		CO CODES		GL CODES (ASCII GRAPHIC)														

Table 12-21 Digital Multinational Character Set: C0 and GL Codes (Continued)

Row	Column	0		1		2		3		4		5		6		7	
	b8 BITS b7 b6 b5 b4 b3 b2 b1	0 0 0 0 0		0 0 0 0 1		0 0 0 1 0		0 0 1 1 1		0 1 0 0 0		0 1 0 1 1		0 1 1 1 0		0 1 1 1 1	
14	1 1 1 0	SO	16 14 E	RS	36 30 1E	.	56 46 2E	>	76 62 3E	N	116 78 4E	^	136 94 5E	n	156 110 6E	~	176 126 7E
15	1 1 1 1	S1	17 15 F	US	37 31 1F	/	57 47 2F	?	77 63 3F	O	117 79 4F	_	137 95 5F	o	157 111 6F	DEL	177 127 7F
		CO CODES				GL CODES (ASCII GRAPHIC)											

Table 12-22 Digital Multinational Character Set: C1 and GR Codes

8		9		10		11		12		13		14		15		Column	Row
1 0 0 0		1 0 0 1		1 0 1 0		1 0 1 1		1 1 0 0		1 1 0 1		1 1 1 0		1 1 1 1		b8 BITS b7 b6 b5 b4 b3 b2 b1	
	200 128 80	DCS	220 144 90		240 160 A0	°	260 176 B0	À	300 192 C0		320 208 D0	à	340 224 E0		360 240 F0	0 0 0 0	0
	201 129 81	PU1	221 145 91	¡	241 161 A1		261 177 B1	Á	301 193 C1	Ñ	321 209 D1	á	341 225 E1	ñ	361 241 F1	0 0 0 1	1
	202 130 82	PU2	222 146 92	¢	242 162 A2	2	262 178 B2	Â	302 194 C2	Ò	322 210 D2	â	342 226 E2	ò	362 242 F2	0 0 1 0	2
	203 131 83	STS	223 147 93	£	243 163 A3	3	263 179 B3	Ã	303 195 C3	Ó	323 211 D3	ã	343 227 E3	ó	363 243 F3	0 0 1 1	3
IND	204 132 84	CCH	224 148 94		244 164 A4		264 180 B4	Ä	304 196 C4	Ô	324 212 D4	ä	344 228 E4	ô	364 244 F4	0 1 0 0	4
NEL	205 133 85	MW	225 149 95	¥	245 165 A5	µ	265 181 B5	Å	305 197 C5	Õ	325 213 D5	å	345 229 E5	õ	365 245 F5	0 1 0 1	5
SSA	206 134 86	SPA	226 150 96		246 166 A6	¶	266 182 B6	Æ	306 198 C6	Ö	326 214 D6	æ	346 230 E6	ö	366 246 F6	0 1 1 0	6
ESA	207 135 87	EPA	227 151 97	§	247 167 A7	·	267 183 B7	Ç	307 199 C7	Œ	327 215 D7	ç	347 231 E7	œ	367 247 F7	0 1 1 1	7
HTS	210 136 88		230 152 98	¤	250 168 A8		270 184 B8	È	310 200 C8	ø	330 216 D8	è	350 232 E8	ø	370 248 F	1 0 0 0	8
HTJ	211 137 89		231 153 99	©	251 169 A9	1	271 185 B9	É	311 201 C9	Ù	331 217 D9	é	351 233 E9	ù	371 249 F9	1 0 0 1	9
VTS	212 138 8A		232 154 9A	ª	252 170 AA	º	272 186 BA	Ê	312 202 CA	Ú	332 218 DA	ê	352 234 EA	ú	372 250 FA	1 0 1 0	10
PLD	213 139 8B	CSI	155 171 9B	«	253 171 AB	»	273 187 BB	Ë	313 203 CB	Û	333 219 DB	ë	353 235 EB	û	373 251 FB	1 0 1 1	11
PLU	214 140 8C	ST	234 156 9C		254 172 AC	1/4	274 188 BC	ì	314 204 CC	Ü	334 220 DC	ì	354 236 EC	ü	374 252 FC	1 1 0 0	12
RI	215 141 8D	OSC	235 157 9D		255 173 AD	1/2	275 189 BD	Í	315 205 CD	Ÿ	335 221 DD	í	355 237 ED	ÿ	375 253 FD	1 1 0 1	13
C1 CODES				GR CODES (Digital SUPPLEMENTAL GRAPHICS)													

Table 12-22 Digital Multinational Character Set: C1 and GR Codes (Continued)

8		9		10		11		12		13		14		15		Column	Row
1 0 0 0		1 0 0 1		1 0 1 0		1 0 1 1		1 1 0 0		1 1 0 1		1 1 1 0		1 1 1 1		b8 BITS b7 b6 b5 b4 b3 b2 b1	
SS2	216 142 8E	PM	236 158 9E		256 174 AE		276 190 BE	Î	316 206 CE		336 222 DE	î	356 238 EE		376 254 FE	1 1 1 0	14
SS3	217 143 8F	APC	237 159 9F		257 175 AF	¿	277 191 BF	Ï	317 207 CF	ß	337 223 DF	ï	357 239 EF		377 255 FF	1 1 1 1	15
C1 CODES				GR CODES (Digital SUPPLEMENTAL GRAPHICS)													

Table 12-23 ISO Latin-1 Supplemental Character Set: C1 and GR Codes

8		9		10		11		12		13		14		15		Column	Row
1 0 0 0		1 0 0 1		1 0 1 0		1 0 1 1		1 1 0 0		1 1 0 1		1 1 1 0		1 1 1 1		b8 BITS b7 b6 b5 b4 b3 b2 b1	
	200 128 80	DCS	220 144 90	NBSP	240 160 A0	°	260 176 B0	À	300 192 C0	capital Iceld. eth*	320 208 D0	à	340 224 E0	small Iceld. eth*	360 240 F0	0 0 0 0	0
	201 129 81	PU1	221 145 91	¡	241 161 A1		261 177 B1	Á	301 193 C1	Ñ	321 209 D1	á	341 225 E1	ñ	361 241 F1	0 0 0 1	1
	202 130 82	PU2	222 146 92	¢	242 162 A2	2	262 178 B2	Â	302 194 C2	Ò	322 210 D2	â	342 226 E2	ò	362 242 F2	0 0 1 0	2
	203 131 83	STS	223 147 93	£	243 163 A3	3	263 179 B3	Ã	303 195 C3	Ó	323 211 D3	ã	343 227 E3	ó	363 243 F3	0 0 1 1	3
IND	204 132 84	CCH	224 148 94	¤	244 164 A4	´	264 180 B4	Ä	304 196 C4	Ô	324 212 D4	ä	344 228 E4	ô	364 244 F4	0 1 0 0	4
NEL	205 133 85	MW	225 149 95	¥	245 165 A5		265 181 B5	Å	305 197 C5	Õ	325 213 D5	å	345 229 E5	õ	365 245 F5	0 1 0 1	5
SSA	206 134 86	SPA	226 150 96	broken bar*	246 166 A6	¶	266 182 B6	Æ	306 198 C6	Ö	326 214 D6	æ	346 230 E6	ö	366 246 F6	0 1 1 0	6
ESA	207 135 87	EPA	227 151 97	§	247 167 A7	·	267 183 B7	Ç	307 199 C7	X	327 215 D7	ç	347 231 E7		367 247 F7	0 1 1 1	7
HTS	210 136 88		230 152 98	“	250 168 A8	´	270 184 B8	È	310 200 C8	ø	330 216 D8	è	350 232 E8	ø	370 248 F8	1 0 0 0	8
HTJ	211 137 89		231 153 99	©	251 169 A9	1	271 185 B9	É	311 201 C9	Ù	331 217 D9	é	351 233 E9	ù	371 249 F9	1 0 0 1	9
VTS	212 138 8A		232 154 9A	ª	252 170 AA	º	272 186 BA	Ê	312 202 CA	Ú	332 218 DA	ê	352 234 EA	ú	372 250 FA	1 0 1 0	10
PLD	213 139 8B	CSI	233 155 9B	«	253 171 AB	»	273 187 BB	Ë	313 203 CB	Û	333 219 DB	ë	353 235 EB	û	373 251 FB	1 0 1 1	11
PLU	214 140 8C	ST	234 156 9C	¬	254 172 AC	1/4	274 188 BC	Ì	314 204 CC	Ü	334 220 DC	ì	354 236 EC	ü	374 252 FC	1 1 0 0	12
C1 CODES		GR CODES (ISO LATIN-1 SUPPLEMENTAL GRAPHICS)															

* This character is illustrated in Table 12-20.

Table 12-23 ISO Latin-1 Supplemental Character Set: C1 and GR Codes (Continued)

8		9		10		11		12		13		14		15		Column	Row
1 0 0 0		1 0 0 1		1 0 1 0		1 0 1 1		1 1 0 0		1 1 0 1		1 1 1 0		1 1 1 1		b8 BITS b7 b6 b5 b4 b3 b2 b1	
RI	215 141 8D	OSC	235 157 9D	–	255 173 AD	1/2	275 189 BD	Í	315 205 CD	Y acute*	335 221 DD	í	355 237 ED	y acute*	375 253 FD	1 1 0 1	13
SS2	216 142 8E	PM	236 158 9E	®	256 174 AE	3/4	276 190 BE	Î	316 206 CE	EC	336 222 DE	î	356 238 EE	small Iceld. thorn*	376 254 FE	1 1 1 0	14
SS3	217 143 8F	APC	237 159 9F	–	257 175 AF	¿	277 191 BF	Ï	317 207 CF	ß	337 223 DF	ï	357 239 EF	ÿ	377 255 FF	1 1 1 1	15
C1 CODES				GR CODES (ISO LATIN-1 SUPPLEMENTAL GRAPHICS)													

* This character is illustrated in Table 12-20.

Table 12-24 National Replacement Character Sets

Character Set	2/3	4/0	5/11	5/12	5/13	5/14	5/15	6/0	7/11	7/12	7/13	7/14
ASCII	#	@	[	\	]	^	-	`	{	|	}	~
United Kingdom	£	@	[	\	]	^	-	`	{	|	}	~
Dutch	£	3§4	ÿ	1⁄2	|	^	-	`	¨	*f*	1⁄4	´
Finnish	#	@	Ä	Ö	Å	Ü	-	é	ä	ö	å	ü
French	£	à	°	ç	§	^	-	`	é	ù	è	¨
French Canadian	#	à	â	ç	ê	î	-	ô	é	ù	è	û
German	#	§	Ä	Ö	Ü	^	-	`	ä	ö	ü	ß
Italian	£	§		ç	é	^	-	ù	à	ò	è	ì
Norwegian / Danish	#	@	Æ	Ø	Å	^	-	`	æ	ø	å	~
Portuguese	#	@	Ã	Ç	Õ	^	-	`	ã	ç	õ	~
Spanish	£	§	¡	Ñ	¿	^	-	`	`	°	ñ	ç
Swedish	#	É	Ä	Ö	Å	Ü	-	é	ä	ö	å	ü
Swiss	ù	à	é	ç	ê	î	è	ô	ä	ö	ü	û