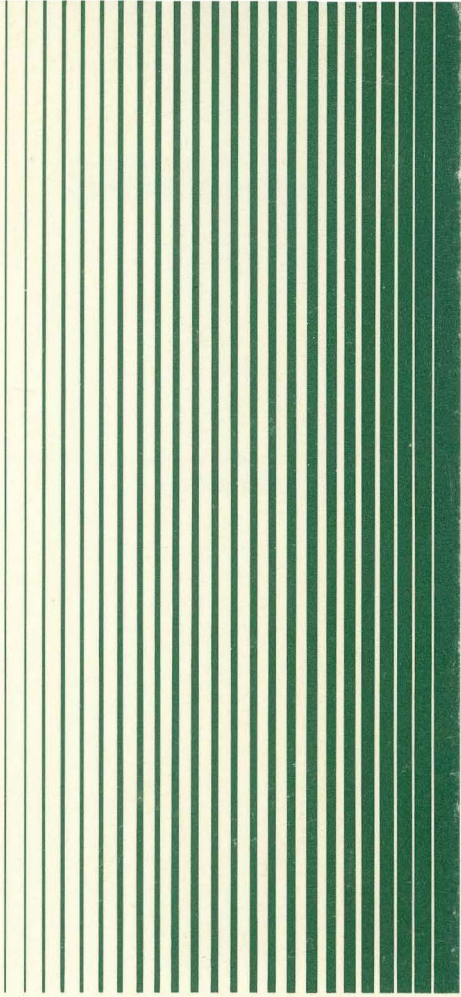

WY-370 Programmer's Guide

WYSE

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Overview

This guide provides the information you need to take advantage of the terminal's programmable features. How you control the terminal will depend on your host and programming language. Refer to your language manual for details on coding terminal commands.

This guide supplements the *WY-370 User's Guide*, which contains the basic information necessary to install, set up, and operate the terminal.

WHAT YOU'LL FIND IN THIS GUIDE

Chapters 1 through 10 describe the commands supported by the terminal in the *native* (Wyse 370) and other ANSI personalities. Command descriptions assume basic familiarity with ANSI terminal programming concepts. The guide is organized as follows:

- Chapter 1 introduces terminal features and programming procedures.
- Chapter 2 describes the commands that set and reset the terminal's functional modes, select terminal personalities, and control miscellaneous terminal processing.
- Chapter 3 explains function key programming and numeric keypad functions.
- Chapter 4 discusses how to display predefined character sets and how to design and load softfonts.
- Chapter 5 describes the commands that control the screen display, including a detailed discussion of how to combine colors and display attributes.
- Chapter 6 discusses the commands that divide display memory into pages, split the screen, and address the cursor in multiple pages.
- Chapter 7 describes standard cursor movement commands.
- Chapter 8 describes the editing commands that insert, delete, or erase data and set or clear tab stops.

- Chapter 9 discusses the commands that control the sending of data to the host and to the printer and other auxiliary devices.
- Chapter 10 explains terminal status report requests and responses.

The commands in Chapters 1 through 10 are summarized under functional categories in Appendix F, "ANSI Command Summary." A "Quick Reference Guide" (Appendix J) lists the same commands in ASCII order. Finally, a "Command Index" lists these commands alphabetically by mnemonic and references the page where the main discussion of each command can be found.

Appendix G, "Programming in Wyse 350 Personality," describes the commands supported by the terminal in Wyse 350 personality and summarizes those supported in other ASCII personalities.

Appendix H summarizes the commands supported in TEK 4010/4014 graphics personality.

The remaining appendixes provide technical reference material, including character sets, ASCII code conversions, key codes, local keyboard commands, and summaries of the control codes supported by the terminal.

CONVENTIONS AND SYNTAX NOTATION

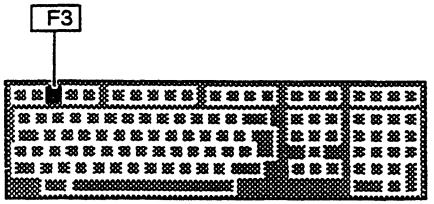
The term *personality* refers to a combination of operating characteristics typical of a particular terminal command set (e.g., *VT320/VT220 personality*).

Hexadecimal values are indicated by the letter H. For example, 63H is 63 hexadecimal (0110 0011 binary).

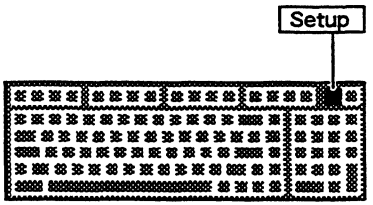
Key Functions

The names of keys are represented by boxed symbols or letters, for example, [Return]. Key functions described in the text are presented as follows:

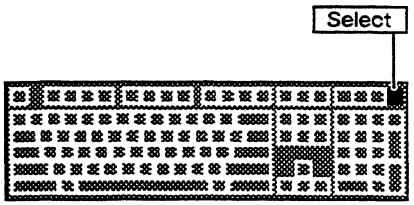
- The symbol for the key on the 105-key ANSI keyboard is shown first, followed by key symbols in parentheses that are different for the other keyboards. For example, [F3] ([Setup], [Select]) identifies the following keys:



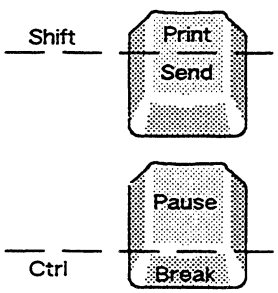
105-Key ANSI Keyboard



ASCII Keyboard



Enhanced PC-Style Keyboard



- When a key symbol in the text refers to one of two names on a key on the keyboard, the action of another key may be implied. For example, on the ASCII keyboard, [Print] is the upper name on the key that is also marked [Send]. When [Print] appears in the text, it indicates the key pressed simultaneously with [Shift]; when [Send] appears in the text, it means the same key by itself (unshifted). Or, on the Enhanced PC-style keyboard [Break] appears on the front face of the key that is also marked [Pause]. On this keyboard, the key functions named [Break] and [Sys Rq] are activated when [Ctrl] is pressed simultaneously with that key. Therefore, when [Break] appears in the text, it means the key pressed together with [Ctrl]; when [Pause] appears in the text, it means the same key by itself.
- When necessary, an italic notation follows the key name to identify a specific location on the keyboard. For example, [5 *kpd*] identifies the number key on the numeric keypad at the right side of the keyboard, and [Alt *left*] identifies the [Alt] key on the left side of the Enhanced PC-style keyboard.

Command Sequences

Unless otherwise noted, the commands described in this guide can be entered from the keyboard as well as coded into your program.

Control codes are shown with the notation CTRL indicating the [CTRL] key.

Command sequences appear in the text with a space between each character to make the command easier to read. Don't enter the spaces in your program statements. A space character that is part of a command sequence is explicitly shown, for example,

ESC SPACE

Commands are presented in the text with a mnemonic reference followed by a brief description and the command sequence. Mnemonics beginning with *WY* are Wyse private mnemonics; those

beginning with *DEC* are Digital Equipment Corporation private mnemonics; all others are ANSI mnemonics.

Command sequences are given in 8-bit format. Whenever an 8-bit control character is shown in the command line—for example, the control sequence introducer CSI—an equivalent 7-bit escape sequence can be used. (Equivalent 7-bit escape sequences are listed in Table 1-1 in Chapter 1.)

Within a command sequence, parameters are shown in italics. *Pn* signifies a numerical parameter value; *Ps* signifies a selective parameter value. Parameter values are listed immediately following the command.

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1 Introduction

TERMINAL FEATURES

This chapter describes the main features of the terminal, discusses its operating modes and available personalities, and introduces the command sequences that determine how it displays and processes data.

This flexible, high-performance alphanumeric and graphics color terminal sets new standards in terminal design for user productivity. Some of these design features are

- Modular architecture
- Dual-session capability for running two applications simultaneously
- High-resolution 16x20 character cell for 1280x520 text resolution
- 64 independently selectable foreground and background colors and user-selectable character attributes
- Three pages of display memory (up to four pages per session with memory expansion) and 26- or 52-line by 80-, 132-, or 161-column display
- Pulldown setup menus with real-time help messages
- Integrated desktop accessories, including a business calculator (modeled after the HP-18C Business Consultant calculator), calendar, and alarm clock
- Multiple keyboard selections

The terminal is available in two models:

- A North American model with English, French Canadian, and Latin American keyboard language support
- An international model that supports 16 keyboard languages

Operating Modes

The terminal has four operating modes: setup, on-line, local, and WyseWorks.

- Setup mode, selectable only from the keyboard (F3 , Setup , Select), allows you to configure the terminal's operating parameters, redefine colors and display attributes, set tab stops, define an answerback message, and redefine many keys on your keyboard.
- On-line mode, selectable in setup mode (On-Line/Local parameter), allows the terminal to communicate with the host.
- Local mode, selectable in setup mode (On-Line/Local setup parameter), allows you to experiment with the terminal's operating characteristics without physically disconnecting it from the host system. In local mode, data from the keyboard is sent only to the terminal, not to the host. Data coming from the host is ignored.
- WyseWorks mode, selectable from the keyboard (Ctrl F3 , Ctrl Setup , Ctrl Select), allows you to use the terminal's desktop accessories: a business calculator, a datebook calendar, and an alarm clock. See the *WY-370 User's Guide* for a description of WyseWorks mode.

Personalities

The terminal can operate in a number of different *personalities*, selectable in setup mode, to allow for smooth interaction with application programs written for typical terminal command sets.

ANSI Personalities

The default personality, Wyse 370, is compatible with American National Standards Institute (ANSI) command functions. It is called the *native personality* because it embodies the set of ANSI-based functions for which the terminal was designed. The native personality is compatible with applications written for many ANSI terminals, including the DEC VT320 and VT220 and compatible terminals.

Other ANSI-compatible personalities are

- VT320/VT220 and VT100 for applications written for the corresponding DEC (Digital Equipment Corporation) and DEC-compatible terminals
- Intecolor 220 for applications written for Intecolor Corporation's ColorTrend 220 and compatible color terminals

The VT52 personality is for use with application programs written for the DEC VT52 terminal.

Graphics Personality

The TEK 4010/4014 personality is designed to support Tektronix-compatible vector graphics applications.

ASCII Personalities

The terminal operates according to ASCII-based (American Standard Code for Information Interchange) command functions when an ASCII personality is selected in setup mode. The following are the terminal's ASCII personalities and the terminals they represent:

- Wyse 350 (WY-350 color terminal)
- TVI 950 (TeleVideo 950 terminal)
- Esprit III (Esprit III color terminal)
- ADDS A2 (ADDS Viewpoint A2 terminal)

Display Features

Terminal display features include

- 16x16 character cell (74 Hz) and 16x20 character cell (60 Hz)
- 64 independently selectable foreground and background colors and user-selectable character display attributes
- Line attributes, which allow you to display characters twice as wide, twice as high, or twice as wide and twice as high as normal characters
- Pulldown setup menus with real-time help messages
- Screen display with 24, 25, 50, or 51 data lines and 80, 132, or 161 columns

Keyboard Features

The keyboards supported by the terminal can be generally described as having four key groups.

Main Keypad

The standard alphanumeric keys on the main keypad send the ASCII characters shown on the keycaps. When pressed together with [Ctrl], some of these keys send control codes that direct the terminal to perform special functions (see Appendix E). The codes sent by the other keys depend on the terminal's current personality and on the settings of some of the keyboard setup parameters.

Editing Keypad

The editing keypad includes the cursor (arrow) keys and special editing keys. The codes sent by these keys depend on the terminal's current personality (see Appendix D).

Numeric Keypad

The numeric keypad contains numeric and arithmetic symbol keys and some special keys. The codes sent by these keys depend on the terminal's current personality (see Appendix D).

User-Definable Keys

The number and location of the function keys (F1 , F2 , etc.) depend on your keyboard. Most of these keys and many editing keys are user-definable in setup mode or with a command sequence (see Chapter 3 and Appendix G). If the keys haven't been redefined, they send the default codes listed in Appendix D.

Communications Modes

In on-line mode, the terminal communicates with the host according to the setting of the Communications Mode setup parameter (Port setup menu). Four modes of communication are possible between the terminal and the host: full duplex, half duplex, block, and half-duplex block. Figure 1-1 illustrates the flow of data in these modes.

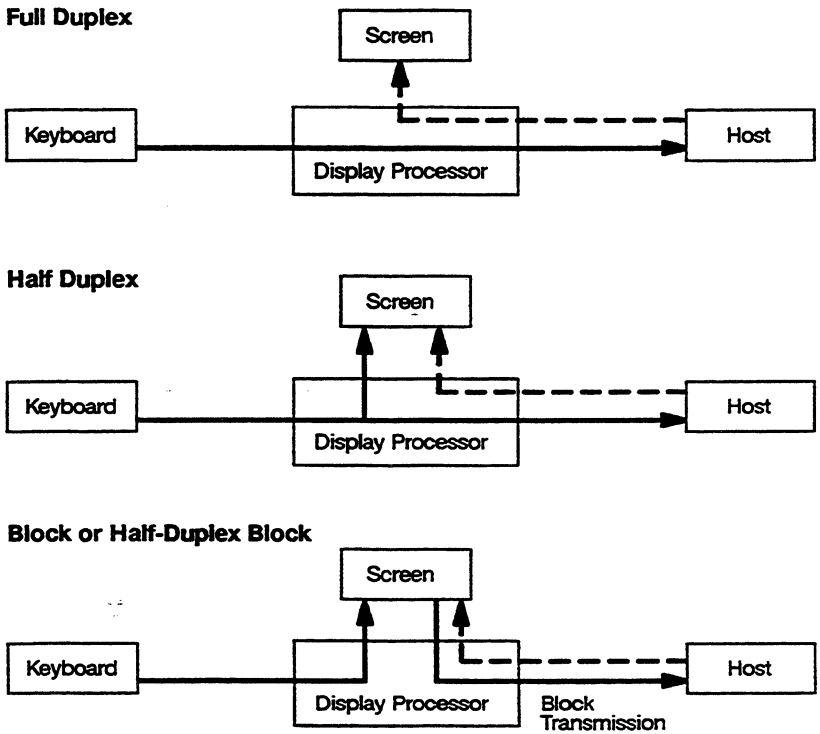
In *full-duplex* mode, data sent by the terminal is not displayed on the screen unless the host echoes it. In practice, most application programs do instruct the host to echo the data to the screen for the user to monitor.

In *half-duplex* mode, keyboard data is sent to the screen at the same time as to the host. Half-duplex mode should not be selected unless required—characters will display twice if the host also echoes the data to the screen.

In *block* mode, keyboard data is sent to the terminal only and is displayed on the screen. Data can be received from the host at any time and is displayed when received.

Half-duplex block mode is used for some modem communications and is equivalent to block mode.

Figure 1-1 Communication Modes



PROGRAMMING COMMAND SEQUENCES

The terminal responds to control codes and command sequences received from the host in on-line mode or from the keyboard in local mode. These control codes and command sequences determine how the terminal displays and processes data.

The terminal recognizes a large number of the control codes and command sequences specified in the ANSI x3.64 standard, plus numerous additional commands. In general, the terminal ignores commands that it doesn't support; however, sending codes other than those supported may cause unpredictable results.

As defined in the ANSI (American National Standards Institute) and ISO (International Organization for Standardization) standards, characters are classified as *graphic* or *control* characters. Graphic characters include alphanumeric characters, punctuation

marks, and any other characters that are normally displayed on the screen. Control characters, which are not normally displayed, are interpreted by the terminal as actions to be performed—for example, the CR control character causes the terminal to execute a carriage return.

☐ **Note** In controls display mode, the terminal displays symbolic representations of control characters instead of acting on them. This is useful for debugging programs.

The terminal's graphic and control characters are arranged into *character sets*, which are illustrated in Appendix A in the form of code tables that show the decimal and hexadecimal code for each character.

Control Characters

Two basic sets of control characters are recognized by the terminal:

- 7-bit control characters, designated as C0 (the eighth bit always 0, only seven bits defining the character)
- 8-bit control characters, designated as C1 (the eighth bit always 1, all eight bits defining the character)

C0 Control Characters

The terminal recognizes the C0 control characters in all terminal personalities and data transmission modes.

Table E-1 in Appendix E lists all the ANSI C0 control characters and identifies the actions of those supported by the terminal. C0 control characters can be generated from the keyboard by holding down the CTRL key while simultaneously pressing the alphanumeric key identified in Table E-1.

C1 Control Characters

The terminal recognizes the C1 control characters only in the native and VT320/VT220 8-bit personalities and only when the Data/Parity Bits setup parameter is set for 8-bit data.

Table E-2 in Appendix E lists all the ANSI C1 control characters and identifies the actions of those supported by the terminal. C1 control characters can be generated from the keyboard by sending the equivalent 7-bit escape sequence (press Ctrl [followed by the alphanumeric key corresponding to the ASCII character identified in Table E-2).

Control Functions

The terminal recognizes the C1 control characters only in an 8-bit environment. However, you can select their functions indirectly in a 7-bit environment by use of 7-bit *code extensions* specified in the ANSI x3.64 standard and described under "Escape Sequences" in the next section.

Some of the functions of the single-byte control codes listed in Tables E-1 and E-2 are directly related to the terminal's processing of text (e.g., CR, HTS, IND). Others function as *introducers* (e.g., ESC, CSI, SS2) or *string delimiters* (DCS, ST) for multiple-character command sequences that provide many more control functions.

Multiple-Character Control Functions

Most of the commands described in the remaining chapters in this manual are multiple-character control functions. There are three basic types:

- 7-bit escape sequences
- 8-bit control sequences
- Device control strings

Escape Sequences

Command sequences introduced by the C0 control character ESC are called *escape sequences*. An escape sequence consists of one or more ASCII graphic characters preceded by the ESC control character. For example, the sequence

ESC ! p

performs a terminal mode reset.

Escape sequences can be used in either a 7-bit or 8-bit environment.

As provided for in the ANSI standard, you can use escape sequences as 7-bit code extensions to incorporate the functions of the 8-bit (C1) control characters into programs that must be compatible with a 7-bit environment. Table 1-1 lists the equivalent 7-bit escape sequence for each of the C1 control characters recognized by the terminal.

Table 1-1 8-Bit Control Characters with 7-Bit Equivalents

Name	8-Bit Control Character	7-Bit Escape Sequence
Index	IND	ESC D
Next line	NEL	ESC E
Horizontal tab set	HTS	ESC H
Reverse index	RI	ESC M
Single shift 2	SS2	ESC N
Single shift 3	SS3	ESC O
Device control string	DCS	ESC P
Control sequence introducer	CSI	ESC [
String terminator	ST	ESC \
Operating system command	OSC	ESC]
Privacy message	PM	ESC ^
Application program command	APC	ESC _

Control Sequences

Control sequences are multiple-character command sequences introduced by the C1 control character CSI (*control sequence introducer*). For example, the sequence

CSI 5 W

clears all tab stops. Control sequences often contain variable parameters indicated by *Pn* or *Ps*. *Pn* signifies a direct numerical value, such as the number of a line or column position on the screen. *Ps* signifies an action or alternative meaning; for example, the sequence

CSI 49 ; *Ps* **w**

selects a background color, where *Ps* is a decimal value that stands for a color name.

The C1 control character CSI can be expressed by ESC [in a 7-bit environment.

Device Control Strings

Device control strings are multiple-character command sequences introduced by the C1 control character DCS (*device control string*) and terminated by the C1 control character ST (*string terminator*). A device control sequence always includes a data string—for example, a programmable key definition or a terminal report.

In a 7-bit environment DCS can be expressed by ESC P and ST by ESC \.

2 Controlling Functional Modes and Terminal Processing

INTRODUCTION

This chapter discusses

- Set/reset commands for functional modes
- Selecting terminal personalities
- Selecting 7- or 8-bit transmission
- Setting the date and time
- Processing commands
- Resetting the terminal
- Testing the terminal

SETTING AND RESETTING FUNCTIONAL MODES

Many specific terminal functions can be turned on (set) or off (reset) by set mode (SM) or reset mode (RM) control sequences called *functional mode commands.*

Functional mode commands have two versions, one with a ? character immediately following the control sequence introducer CSI and one without the ? character.

SM	**Set functional modes**	**(1) CSI** *Ps* **;** ... **;** *Ps* **h** **or (2) CSI ?** *Ps* **;** ... **;** *Ps* **h**
RM	**Reset functional modes**	**(1) CSI** *Ps* **;** ... **;** *Ps* **l** **or (2) CSI ?** *Ps* **;** ... **;** *Ps* **l**

where *Ps* is a parameter that selects the mode to be set or reset

h indicates set mode (SM)

l indicates reset mode (RM)

☐ **Note** The final character in the RM sequence is a lowercase L.

Table 2-1 lists the *Ps* parameter values for the two versions of the SM and RM commands.

Table 2-1 Parameter Values for SM and RM Commands

(1) *Ps*[1]	Mode	Mnemonic	Default[2]	(2) *? Ps*[1]	Mode	Mnemonic	Default[2]
2	Keyboard lock	KAM	Off	1	Cursor key application	DECCKM	NVR
3	Monitor	CRM	NVR	2	VT52[5]	DECANM	NVR
4	Insert	IRM	Off	3	132 column[6]	DECCOLM	NVR
12	Local echo disable	SRM	NVR	4	Scrolling	DECSCLM	NVR
13	Control execution disable	FEAM	NVR	5	Reverse screen	DECSCNM	NVR
16	Transfer termination	TTM	NVR	6	Origin	DECOM	Off
20	Newline	LNM	NVR[3]	7	Autowrap	DECAWM	NVR
30	Display disable	WYDSCM	Off	8	Key autorepeat	DECARM	NVR
31	Status line display	WYSTLINM	NVR	10	Block mode	DECEDM	NVR
32	Screen saver	WYCRTSAVM	NVR	18	Print form feed	DECPFF	NVR
33	Steady cursor	WYSTCURM	NVR	19	Print extent	DECPEX	NVR
34	Underline cursor	WYULCURM	NVR	25	Text cursor enable	DECTCEM	NVR
35	Width change clear disable	WYCLRM	NVR	38	TEK 4010/4014[7]	WYTEK	NVR
36	Delete key redefinition	WYDELKM	NVR	42	National replacement character set[8]	DECNRCM	NVR
37	Nonerasable area transmit	WYGATM	NVR	60	Horizontal panning[9]	DECHCCM	NVR
38	Send full screen	WYTEXM	NVR	61	Vertical panning[9]	DECVCCM	NVR
40	Extra data line	WYEXTDM	NVR	64	Page coupling[9]	DECPCCM	NVR
42	Wyse 350[4]	WYASCII	NVR	66	Keypad application[9]	DECNKM	NVR
				67	Delete key redefinition[9]	DECBKM	NVR
				68	Key legend[9]	DECKBUM	NVR
				80	161 column[9]	WY161	NVR
				83	52 line[9]	WY52	NVR
				84	Erasable/nonerasable attribute select[10]	WYENAT	Off
				85	Replacement character color[9]	WYREPL	Off

1. *Ps* values are listed in two groups: In the first group are the values for terminal modes that can be set with SM command sequence (1) or reset with RM command sequence (1); in the second group are the values for terminal modes that can be set with SM sequence (2) or reset with RM sequence (2). The latter group is shown as *? Ps* to indicate that sequence (2) includes a question mark immediately following the control sequence introducer CSI. Up to 16 *Ps* values can be specified (separated by semicolons) in any one SM or RM command sequence.
2. Mode status when terminal is turned on or reset. *NVR* (nonvolatile RAM) means that the status depends on the value last saved in battery-backed memory in setup mode.
3. Return setup parameter (Keyboard menu, Key Functions submenu).
4. Set mode (SM) only.
5. Reset mode (RM) only.
6. Command is ignored during dual-session operation with a vertically split screen.
7. Set mode (SM) only. Command is ignored if the terminal is set up for two sessions.
8. Command is ignored if Keyboard Language parameter is set to *U.S.*
9. Native and VT320/VT220 personalities only.
10. Native personality only. Enables separate assignment of attributes to erasable and nonerasable characters (by the SGR command); when reset, attributes extend to both.

You can specify up to 16 modes in any one SM or RM control sequence by entering multiple parameters separated by semicolons. For example,

CSI 4 ; 20 ; 34 h

selects insert mode, newline mode, and an underline cursor. Entering the sequence

CSI ? 1 ; 7 ; 80 h

selects cursor key application mode, autowrap mode, and a 161-column display.

Do not combine parameters listed for version (1) of the command with parameters listed for version (2). For example, the sequence

CSI 4 ; 20 ; 80 h

is invalid. To set the three modes represented by these parameters, you need to enter two sequences:

CSI 4 ; 20 h

to set insert and newline modes, and

CSI ? 80 h

to select 161 columns.

☐ **Note** A question mark entered anywhere in an SM or RM sequence makes it a version (2) command.

Table 2-2 lists the functional mode commands under the following functional headings:

Screen Display and Editing Functions

Keyboard Functions

Paging Functions

Cursor Control Functions

Sending and Printing Functions

Processing and Control Functions

Table 2-2 Set/Reset Functional Modes

Mnemonic	Command Sequence		Function
Screen Display and Editing Functions			
DECAWM (Autowrap)	CSI ? 7 h	Set:	Automatically wraps characters to the next line after the last position on the line is exceeded. When the cursor exceeds the last position on the last line of the screen, the display scrolls up one line at a time.
	CSI ? 7 l	Reset:	Characters do not wrap. Current character at the right margin is replaced with the next received character. (Default)
DECCOLM (132-column)	CSI ? 3 h[1]	Set:	Displays 132 columns per line if a page of 132 or 161 columns has been defined. Cursor returns to home position and screen is cleared if width change clear disable (WYCLRM) is reset.
	CSI ? 3 l	Reset:	Displays 80 columns per line. Cursor returns to home position and screen is cleared if width change clear disable (WYCLRM) is reset. (Default)
DECOM (Origin)	CSI ? 6 h	Set:	Designates the top line of the scrolling region as the first line of the active data region.
	CSI ? 6 l	Reset:	Designates the top line of the screen as the first line of the active data region, regardless of the defined scrolling region. (Default)
DECSCLM (Scrolling)	CSI ? 4 h	Set:	Display scrolls at the smooth scrolling speed of 4 lines per second.
	CSI ? 4 l	Reset:	Display jump scrolls as fast as the baud rate allows. (Default)
DECSCNM (Reverse screen)	CSI ? 5 h	Set:	Displays background color characters on the foreground color (reverse screen)
	CSI ? 5 l	Reset:	Displays foreground color characters on the background color (normal screen). (Default)
IRM (Insert/replace)	CSI 4 h	Set:	Displays each received character at the cursor position; moves cursor and all characters to right of cursor one position to the right. Data that moves past the right margin is lost (unless the Page Edit setup parameter has been set to *page*, in which case the data wraps to the next line).
	CSI 4 l	Reset:	Displays each received character at the cursor position, overwriting the current character; moves cursor one position to the right of the new character. (Default)

1. Command is ignored during dual-session operation with a vertically split screen.

Table 2-2 Set/Reset Functional Modes, Continued

Mnemonic	Command Sequence		Function
Screen Display and Editing Functions, Continued			
LNM (Newline)	**CSI 20 h**	Set:	When a LF, FF, or VT character is received, the cursor moves to the first column of the next line. When Return (Enter) is pressed, the terminal sends both a carriage return (CR) and a linefeed (LF). (Sets Received CR setup parameter to CR and Received LF, Return Key and Enter Key setup parameters to CRLF.)
	CSI 20 l	Reset:	When an LF, FF, or VT character is received, the cursor moves to the current column of the next line. When Return (Enter) is pressed, the terminal sends a CR only. The cursor returns to the first position of the current line. (Sets Received CR, Return Key, and Enter Key setup parameters to CR and Received LF setup parameter to LF.) (Default)
WY52[2] (52 line)	**CSI ? 83 h**	Set:	Sets 52-line display. Additional memory must be installed for certain line and column combinations (see Chapter 6).
	CSI ? 83 l	Reset:	Sets 24-line display. (Default)
WY161[2] (161 column)	**CSI ? 80 h**	Set:	Sets 161-column display. Additional memory must be installed for certain line and column combinations (see Chapter 6).
	CSI ? 80 l	Reset:	Sets 80-column display. (Default)
WYCLRM (Width change clear disable)	**CSI 35 h**	Set:	Screen does not clear when number of displayed columns (80/132/161) is changed.
	CSI 35 l	Reset:	Screen clears when number of displayed columns (80/132/161) is changed. (Default)
WYCRTSAVM (Screen saver)	**CSI 32 h**	Set:	Turns off the display when terminal receives no data or keyboard activity for approximately 15 minutes. Pressing any key or receiving new data restores the display. (Default)
	CSI 32 l	Reset:	Does not turn off display regardless of elapsed time since data was received.
WYDSCM (Display disable)	**CSI 30 h**	Set:	Blanks the terminal screen.
	CSI 30 l	Reset:	Displays data on the screen. (Default)

2. Native and VT320/VT220 personalities only.

Table 2-2 Set/Reset Functional Modes, Continued

Mnemonic	Command Sequence		Function
Screen Display and Editing Functions, Continued			
WYENAT[3] (Erasable/ nonerasable attribute select)	CSI ? 84 h	Set:	Enables separate assignment of attributes (SGR) to erasable and nonerasable characters.
	CSI ? 84 l	Reset:	Enables attribute assignment (SGR) to extend to both erasable and nonerasable characters. (Default)
WYEXTDM (Extra data line)	CSI 40 h	Set:	Designates the bottom line of the screen as an extra data line and sets the bottom scrolling margin to line 25 or 51.
	CSI 40 l	Reset:	Sets the bottom scrolling margin to line 24 or 50. (Default)
WYREPL[2] (Replacement character color)	CSI ? 85 h	Set:	Sets replacement character, used for clearing, erasing, and scrolling, to color of current character's background color.
	CSI ? 85 l	Reset:	Sets replacement character, used for clearing, erasing, and scrolling, to background color defined in color map mode. (Default)
WYSTLINM (Status line display)	CSI 31 h	Set:	Displays the user status line. (Default)
	CSI 31 l	Reset:	Does not display a status line.
Keyboard Functions			
DECARM (Key autorepeat)	CSI ? 8 h	Set:	When a key is pressed longer than 0.5 second, the key automatically repeats transmission of the character until released. (Default)
	CSI ? 8 l	Reset:	Transmits a character once each time a key is pressed. Holding down a key has no repeating effect.
DECBKM or **WYDELKM** (Delete key redefinition)	CSI ? 67 h CSI 36 h	Set:	Generates the BS (backspace) code for unshifted delete key; generates the DEL (delete) code for the shifted delete key.
	CSI ? 67 l CSI 36 l	Reset:	Generates the DEL (delete) code for unshifted delete key; generates the CAN (cancel) code for shifted delete key. (Default)
DECCKM (Cursor key application)	CSI ? 1 h	Set:	Cursor keys generate application sequences (see Appendix D).
	CSI ? 1 l	Reset:	Cursor keys generate ANSI cursor (normal) sequences (see Appendix D). (Default)

3. Native personality only.

Table 2-2 Set/Reset Functional Modes, Continued

Mnemonic	Command Sequence		Function
Keyboard Functions, Continued			
DECKBUM[2] (Key legend)	CSI ? 68 h	Set:	Keys send data processing character values (when available on keyboard) shown on the right legend of the key.
	CSI ? 68 l	Reset:	Keys send typewriter character values (left legend). (Default)
DECNKM[2] (Keypad application)	CSI ? 66 h	Set:	Numeric keypad keys send application sequences (see Appendix D).
	CSI ? 66 l	Reset:	Numeric keypad keys send characters shown on keycap. (Default)
DECNRCM[4] (National replacement character)	CSI ? 42 h	Set:	National mode on. Sends and receives 7-bit characters and translates them into the appropriate National Replacement Character (NRC) based on the keyboard language chosen.
	CSI ? 42 l	Reset:	National mode off. Displays 8-bit characters from the current GR set. (Default)
KAM (Keyboard lock)	CSI 2 h	Set:	Locks the keyboard except for the Break and Setup keys. Displays WAIT on the status line.
	CSI 2 l	Reset:	Unlocks the keyboard. (Default)
Paging Functions			
DECHCCM[2] (Horizontal panning)	CSI ? 60 h	Set:	Display adjusts to keep the cursor visible when it moves past the left or right margin. (Horizontal windowing must be turned on in setup mode.) (Default)
	CSI ? 60 l	Reset:	Cursor disappears when it moves past the left or right margin of the display.
DECPCCM[2] (Page coupling)	CSI ? 64 h	Set:	When the cursor moves to another page, that page is displayed. (Default)
	CSI ? 64 l	Reset:	The page where the cursor is addressed is not displayed. Current page continues to be displayed.
DECVCCM[2] (Vertical panning)	CSI ? 61 h	Set:	When the cursor moves past the top or bottom line, the display adjusts to keep the cursor in view. (Default)
	CSI ? 61 l	Reset:	Cursor disappears when it moves past the top or bottom line of the display.

4. Command is ignored if keyboard language is set to U.S.

Table 2-2 Set/Reset Functional Modes, Continued

Mnemonic	Command Sequence		Function
Cursor Control Functions			
DECTCEM (Text cursor enable)	**CSI ? 25 h**	Set:	Displays the cursor. (Default)
	CSI ? 25 l	Reset:	Does not display the cursor.
WYSTCURM (Steady cursor)	**CSI 33 h**	Set:	Displays a steady cursor.
	CSI 33 l	Reset:	Displays a blinking cursor. (Default)
WYULCURM (Underline cursor)	**CSI 34 h**	Set:	Displays an underline cursor.
	CSI 34 l	Reset:	Displays a block cursor. (Default)
Sending and Printing Functions			
DECEDM (Block mode)	**CSI ? 10 h**	Set:	Turns on block mode.
	CSI ? 10 l	Reset:	Turns off block mode; puts terminal in full-duplex mode. (Default)
DECPEX (Print extent)	**CSI ? 19 h**	Set:	Prints full page. (Default)
	CSI ? 19 l	Reset:	Prints scrolling region.
DECPFF (Print form feed)	**CSI ? 18 h**	Set:	Transmits the FF (form feed) print termination character to the printer after a print page operation.
	CSI ? 18 l	Reset:	Does not transmit a print termination character to the printer after a print page operation. (Default)
SRM (Local echo disable)	**CSI 12 h**	Set:	Local echo off (full-duplex mode). Characters sent from the terminal to the host are not displayed on the screen. The host must return any characters for display to the terminal. (Default)
	CSI 12 l	Reset:	Local echo on (half-duplex mode). Characters sent from the terminal to the host are simultaneously displayed on the screen.
TTM (Transfer termination)	**CSI 16 h**	Set:	Transmits data through the cursor position in the requested transmission area. (Default)
	CSI 16 l	Reset:	Transmits data from the entire requested area, regardless of the cursor position.

Table 2-2 Set/Reset Functional Modes, Continued

Mnemonic	Command Sequence		Function
Sending and Printing Functions, Continued			
WYGATM (Nonerasable area transmit)	CSI 37 h	Set:	Sends all characters, including nonerasable characters. (Default)
	CSI 37 l	Reset:	Sends erasable characters only.
WYTEXM (Send full page)	CSI 38 h	Set:	Sends full page. (Default)
	CSI 38 h	Reset:	Sends scrolling region.
Processing and Control Functions			
CRM (Monitor)	CSI 3 h	Set:	Controls mode on. Displays symbolic representations of control characters.
	CSI 3 l	Reset:	Controls mode off. Does not display control characters, but interprets them as actions to be executed. (Default)
DECANM (ANSI/VT52)			No set function. (To exit VT52 personality, see VT52 command, Table F-2.)
	CSI ? 2 l	Reset:	Selects VT52 personality.
FEAM (Control execution disable)	CSI 13 h	Set:	Inhibits execution of all control and escape sequences except ESC c (hard terminal reset) and CSI 13 l (control execution disable reset); executes LF (linefeed), FF (form feed), or VT (vertical tab) as CRLF (carriage return, linefeed).
	CSI 13 l	Reset:	Executes all control and escape sequences. (Default)
WYASCII (Wyse 350)	CSI 42 h	Set:	Selects Wyse 350 personality.
		Reset:	No reset function
WYTEK (TEK 4010/4014)	CSI ? 38 h	Set:	Selects TEK 4010/4014 personality. Command is ignored if the terminal is set up for two sessions.
		Reset:	No reset function.

SELECTING TERMINAL PERSONALITIES

DECSCL **Select native personality** **CSI 90 ; *Ps* " p**

where *Ps* **Bit Transmission**
0 8-bit
1 7-bit

DECSCL **Select VT320/VT220 personality** **CSI 63 ; *Ps* " p**
or CSI 62 ; *Ps* " p

where *Ps* **Bit Transmission**
1 7-bit
2 8-bit

DECSCL **Select Intecolor 220 personality** **CSI 91 " p**

DECSCL **Select VT100 personality** **CSI 61 " p**

DECSCL **Select ADDS A2 personality** **CSI 93 " p**

☐ **Note** Wyse 350 and VT52 personalities are selected by functional mode commands (see WYASCII and DECANM, Table 2-2).

The following commands apply only to the native and VT320/VT220 personalities.

S7C1T **Select 7-bit transmission mode** **ESC SPACE F**

This command sequence causes the terminal to send all C1 control characters as 7-bit escape sequences. Execution of the command changes the terminal's personality as follows:

Personality Before	Personality After
Native personality, 8-bit	Native personality, 7-bit
Native personality, 7-bit	Same (sequence ignored)
VT320/VT220 personality, 8-bit	VT320/VT220 personality, 7-bit
VT320/VT220 personality, 7-bit	Same (sequence ignored)

S8C1T **Select 8-bit transmission mode** **ESC SPACE G**

This command sequence causes the terminal to send C1 control characters to the host as single 8-bit characters. Execution of the command changes the terminal's personality as follows:

Personality Before	Personality After
Native personality, 8-bit	Same (sequence ignored)
Native personality, 7-bit	Native personality, 8-bit
VT320/VT220 personality, 8-bit	Same (sequence ignored)
VT320/VT220 personality, 7-bit	VT320/VT220 personality, 8-bit

SETTING THE DATE AND TIME

WYDTSET **Set date and time** **CSI 58 ;** *Ps ; Ps1 ; Ps2 ; Ps3 ; Ps4* **w**

where *Ps* is the day (1–31)
Ps1 is the month (1–12)
Ps2 is the year (0–99)
Ps3 is the hour (1–24)
Ps4 is the minute (0–59)

In the native personality only, this command sets the date and time that displays on the *system status line.* The date and time must be reset at each power-on.

The date alone can be set by including only the *Ps, Ps1,* and *Ps2* parameters in the command. The time alone can be set by omitting those three parameters, e.g.,

CSI 58 ; ; ; ; *Ps3* ; *Ps4* w

CONTROLLING TERMINAL PROCESSING

The commands described in this section control terminal processing and abort escape sequences.

DECSC
WYSC **Save cursor position** **ESC 7**
or CSI s

This command saves the following in the terminal's memory:

- Cursor position
- Character attributes set by the SGR command
- Character sets (G0, G1, G2, or G3) currently in GL and GR
- Wrap flag (autowrap/no autowrap)
- State of origin mode (DECOM)
- Selective erase attribute

DECRC
WYRC **Restore cursor position** **ESC 8**
or CSI u

This command restores the terminal to the state saved by the DECSC or WYSC command. If nothing was saved, the command

- Moves the cursor to the home position (upper left of screen)
- Resets origin mode (DECOM)
- Resets character attributes to normal
- Assigns the ASCII character set to GL and the Multinational Supplemental character set to GR

WYDELAY **Delay terminal processing** **ESC ,**

This escape sequence stops terminal processing for approximately 250 milliseconds.

BEL **Sound bell** **CTRL G**

This control sequence sounds the terminal bell unless the bell has been disabled in setup mode (Warning Bell parameter).

CAN **Abort escape sequence** **CTRL X**

This control sequence aborts the current escape sequence operation.

SUB **Abort escape sequence** **CTRL Z**

This control sequence aborts the current escape sequence operation and displays a reverse question mark (؟) in the native, VT320/VT220, and Intecolor personalities or a checkerboard character (▒) in VT100 or VT52 personalities.

OSC **Ignore subsequent data** **ESC]**
PM **or ESC ^**
APC **or ESC _**

These control sequences cause the terminal to ignore all subsequent data received until a string terminator (ST) is received.

RESETTING THE TERMINAL

The DECSTR and RIS commands reset many of the terminal's control functions (native and VT320/VT220 personalities only).

DECSTR **Soft terminal reset** **CSI ! p**

This command sequence issues a soft terminal reset, which

- Turns on the cursor (if off)
- Resets insert mode (IRM)
- Resets origin mode (DECOM)
- Sets autowrap mode (DECAWM) to value last saved in nonvolatile memory
- Resets keyboard lock mode (KAM)
- Resets keypad application mode (DECNKM)
- Resets cursor key application mode (DECCKM)
- Clears scrolling region (DECSTBM)

- Resets G0, G1, G2, G3, GL, and GR to their default selections
- Resets character attributes to normal
- Resets erase attribute to erasable
- Resets save cursor state to default
- Resets national mode (7-bit) to multinational mode (8-bit) (DECNRCM)
- Resets user-preferred character set to value last saved in nonvolatile memory (Character Set setup parameter) (DECAUPSS)
- Sets data destination to screen data area (DECSASD)

RIS **Hard terminal reset** **ESC c**

This escape sequence issues a hard terminal reset, which

- Turns on the cursor (if off)
- Resets insert mode (IRM)
- Resets origin mode (DECOM)
- Sets autowrap mode (DECAWM) to the value last saved in nonvolatile memory
- Resets keyboard lock mode (KAM)
- Resets keypad application mode (DECNKM)
- Resets cursor key application mode (DECCKM)
- Clears scrolling region (DECSTBM)
- Resets G0, G1, G2, G3, GL, and GR to their default selections
- Resets character attributes to normal
- Resets erase attribute to erasable
- Resets save cursor state to default
- Resets national mode (7-bit) to multinational mode (8-bit) (DECNRCM)
- Resets user-preferred character set to value last saved in setup mode (Character Set parameter) (DECAUPSS)
- Sets data destination to screen data area (DECSASD)
- Performs communication line disconnect and reconnect
- Restores all setup mode operating parameters, tab stops, answerback message, and function key definitions to values last saved in nonvolatile memory

- Clears softfonts
- Clears screen
- Homes cursor
- Clears screen hold (no scroll)
- Turns on display (if off)
- Clears CAPS LOCK mode
- Clears the XOFF receive state on the host port
- Clears the XOFF receive state on the printer port
- Clears the handshake state, raises DTR if low, and sends XON if XON/XOFF handshaking is enabled

WYSTR **Terminal mode reset** **ESC ! p**

This escape sequence issues a terminal mode reset, which

- Turns on display (if off)
- Clears block mode (sets to on-line mode)
- Resets insert mode (IRM)
- Clears function key lock
- Resets cursor key application mode (DECCKM)
- Resets keyboard lock mode (KAM)
- Resets keypad application mode (DECNKM)
- Clears the XOFF receive state on the host port
- Clears the XOFF receive state on the printer port
- Resets G0, G1, G2, G3, GL, and GR to their default selections
- Clears the handshake state, raises DTR if low, and sends XON if XON/XOFF handshaking is enabled

TESTING THE TERMINAL

DECALN **Display screen adjustment pattern** **ESC # 8**

This escape sequence fills the screen with uppercase E's. You can use the adjustment pattern to align the screen display.

3 Controlling the Keyboard

INTRODUCTION

This chapter discusses user-defined key programming and numeric keypad application mode. Refer to Appendix C for local keyboard commands and to Appendix D for key codes.

PROGRAMMING THE USER-DEFINED KEYS

The general syntax for the user-defined key programming device control string is

WYUDK (DECUDK) **Program user-defined keys** **DCS** *Ps* **;** *Ps1* **;** *Ps2* **|** *kc* **/** *hc* **ST**

where DCS is the 8-bit device control character (or the 7-bit escape sequence ESC P).

Ps indicates whether or not to clear existing key definitions before accepting new definitions.

Ps	**Clear**
0	Clear all key definitions before loading new definitions (default).
1	Clear key definitions only as they are redefined. When *Ps* is 1, you can redefine some keys while preserving the current definitions of others.

Ps1 indicates whether or not to lock the key definitions against further changes after they're redefined.

Ps1	**Key Lock**
0	Lock key definitions. If you want to load new values into the keys, you must unlock the keys in setup mode (User-Defined Keys parameter). If a key is locked and an application tries to redefine the key with a DECUDK sequence, the terminal ignores the sequence.
1	Do not lock key definitions. The keys can be redefined with another DECUDK string.

Ps2 defines the key's direction: remote, local, or normal. When the direction is *remote*, key definitions are sent to the host. When the direction is *local*, definitions are sent only to the terminal. When

the direction is *normal*, key definitions are sent according to the terminal's current communications mode.

Ps2	**Direction**
0	Remote (default)
1	Normal
2	Local

¦ identifies this control string as a DECUDK.

kc specifies the key being defined (see Table 3-1).

hc is a string of 2-digit hexadecimal codes (each digit in the 0–9 or A–F range) representing the ASCII values of the character string to be loaded into the key.

ST is the string terminator. ST is a C1 8-bit control character (use ESC \ in a 7-bit environment)

Table 3-1 Key Codes

Code		**Keyboard Style**		
kc **Unshifted**	***kc*** **Shifted**	**105-Key ANSI**	**ASCII**	**Enhanced PC**
42	22		F1	F1
51	31		F2	F2
52	32		F3	F3
53	33		F4	F4
54	34		F5	F5
37	17	F6	F6	F6
38	18	F7	F7	F7
39	19	F8	F8	F8
40	20	F9	F9	F9
41	21	F10	F10	F10
43	23	F11	F11	F11
44	24	F12	F12	F12
45	25	F13	F13	
46	26	F14	F14	
48	28	Help	F15	
49	29	Do	F16	
51	31	F17		
52	32	F18		
53	33	F19		
54	34	F20		

Table 3-1 Key Codes, Continued

Code		Keyboard Style		
kc Unshifted	*kc* Shifted	105-Key ANSI	ASCII	Enhanced PC
50	27		Esc	Esc
55	01	Tab	Tab	Tab
56	02	⌫	Back Space	Back Space
57	03	Remove	Del	
58	04	Return	Return	Enter
47	05		Home	Home
59	06	▲	▲	↑
60	07	▼	▼	↓
61	08	◀	◀	←
62	09	▶	▶	→
63	10	Enter	Enter	Enter
64	11	PF4	Ins Char	Insert
65	12	Next Scrn	Next Page	Page Down
66	13		Send	
67	14	PF3	Clr Line	
68	15	PF2	Del Char	Delete
69	16	PF1	Repl	
70	05	Insert Here		
71	13	Prev Scrn		
72	22	Find		
73	27	Select		
74	13			End
75	14			Page Up
76	03			Print Screen

You can specify multiple *kc/hc* parameters by separating them with semicolons (;).

A maximum of 512 bytes can be used for function key definitions, with a maximum of 78 bytes for any single function key.

Examples of DECUDK Device Control Strings

The sequence

DCS 0 ; 1 ¦ ST

clears all user-defined key definitions.

The sequence

DCS 1 ; 0 ¦ ST

locks the current user-defined key definitions.

The sequence

DCS1;1¦18/4C4F47494E2048454C454E0D;38/4C4F474F55540DST

- Clears only keys being redefined
- Does not lock the new key definitions
- Loads the code for LOGIN HELEN CR into Shift F7
- Loads the code for LOGOUT CR into F7

Until the keys are redefined, pressing Shift F7 is the same as entering LOGIN HELEN, followed by a carriage return, and pressing F7 is the same as entering LOGOUT, followed by a carriage return.

NUMERIC KEYPAD FUNCTIONS

The numeric keypad operates in two modes: application mode or numeric mode. These modes are selectable in setup mode (Numeric Keypad setup parameter) or with an escape sequence. In either mode, numeric keypad keys generate predefined codes.

Selecting Numeric Keypad Modes

DECKPAM	**Select numeric keypad application mode**	ESC =
DECKPNM	**Select numeric keypad numeric mode**	ESC >

In numeric mode the keys send the standard ASCII character codes represented on the keycaps. Table D-5 in Appendix D lists the application mode codes.

☐ **Note** The PF keys (Table D-4) send the same codes in both numeric and application mode.

RELATED FUNCTIONAL MODE COMMANDS

DECARM	**Key autorepeat mode**	**Set: CSI ? 8 h** **Reset: CSI ? 8 l**
DECBKM	**Delete key redefinition mode**	**Set: CSI ? 67 h** **Reset: CSI ? 67 l**
DECCKM	**Cursor key application mode**	**Set: CSI ? 1 h** **Reset: CSI ? 1 l**
DECKBUM	**Key legend mode**	**Set: CSI ? 68 h** **Reset: CSI ? 68 l**
DECNKM	**Keypad application mode**	**Set: CSI ? 66 h** **Reset: CSI ? 66 l**
DECNRCM	**National replacement character mode**	**Set: CSI ? 42 h** **Reset: CSI ? 42 l**
KAM	**Keyboard lock mode**	**Set: CSI 2 h** **Reset: CSI 2 l**
LNM	**Newline mode**	**Set: CSI 20 h** **Reset: CSI 20 l**
WYDELKM	**Delete key redefinition mode**	**Set: CSI 36 h** **Reset: CSI 36 l**

4 Defining and Displaying Character Sets

INTRODUCTION

This chapter describes the terminal's predefined character sets and explains how to define and load softfont characters.

Predefined character sets are illustrated in Appendix A.

DISPLAYING CHARACTER SETS

The character displayed on the screen depends on four variables:

- The currently *labeled* character set
- The currently *assigned* font bank
- The screen *resolution* (character cell size)
- The ASCII code of the character

The default screen resolution is 16x16 (74 Hz). The user can select a 16x20 screen resolution (60 Hz) from setup mode.

☐ **Note** At 74 Hz the screen is refreshed at a higher rate than at 60 Hz, eliminating screen flicker.

Two different character sets can be loaded into display memory at one time. The two sections of memory reserved for these character sets are referred to as *GL* (graphic left) and *GR* (graphic right). The GL memory area corresponds to the 7-bit ASCII character codes 21H through 7EH for character sets having 94 characters and 20H through 7FH for character sets having 96 characters. The GR memory area corresponds to the 8-bit ASCII character codes A1H through FEH for 94-character sets and A0H through FFH for 96-character sets.

You can select character sets for display by *labeling* character sets and *assigning* font banks in a two-step process, using separate escape sequences:

1 One escape sequence labels a specified character set as one of four font banks: G0, G1, G2, or G3.

2 Another escape sequence assigns the font bank to the GL or GR memory area.

Figure 4-1 shows a conceptual diagram for labeling character sets and assigning font banks into GL and GR.

Figure 4-1 Labeling Character Sets and Assigning Font Banks

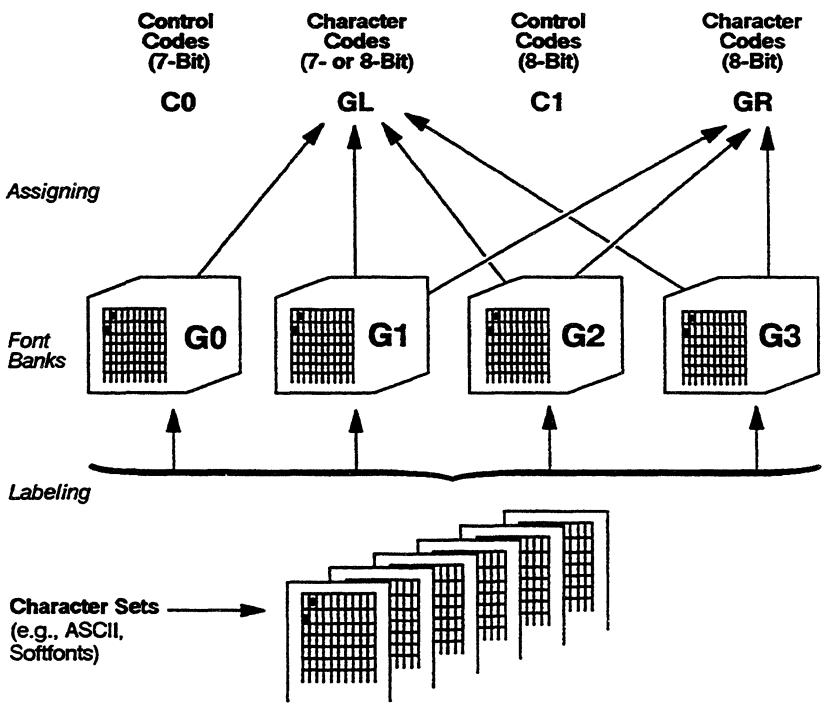


Table 4-1 lists the default predefined character sets in each personality.

Table 4-1 Default Character Sets

Personality	Default Character Set	Labeled	Assigned
Wyse 370	ASCII User-Preferred Supplemental*	G0, G1 G2, G3	G0 to GL G2 to GR
VT320/VT220 and Intecolor	ASCII User-Preferred Supplemental*	G0, G1 G2, G3	G0 to GL G2 to GR
VT100	ASCII	G0, G1	G0 to GL
VT52	ASCII	N/A	N/A

* Default is Multinational Supplemental

Selecting a User-Preferred Supplemental Character Set

In the native or VT320/VT220 personality you can select either the Multinational Supplemental (default) character set or the ISO Latin-1 character set as your 8-bit *user-preferred supplemental* character set.

DECAUPSS **Select Multinational Supplemental as the user-preferred supplemental set** **DCS 0 ! u % 5 ST**

DECAUPSS **Select ISO Latin-1 Supplemental as the user-preferred supplemental set** **DCS 1 ! u A ST**

Labeling Character Sets

The SCS escape sequence labels a specified character set as one of four font banks.

SCS **Label character set** **ESC** *fcode scode*

where *fcode* indicates the font bank (G0, G1, G2, or G3).

fcode	Font Bank
(	G0 (94-character set)
)	G1 (94-character set)
*	G2 (94-character set)
+	G3 (94-character set)
-	G1 (96-character set; native and VT320/VT220 only)
.	G2 (96-character set; native and VT320/VT220 only)
/	G3 (96-character set; native and VT320/VT220 only)

scode identifies the character set to be loaded in the font bank. Parameter values are listed in two groups. The second group is valid only when national replacement character set mode is set (DECNRCM) and when the language has been selected in setup mode (Keyboard Language setup parameter). Only one national replacement character (NRC) set is available at a time.

scode	**Character Set**
0	Special Graphics
A	ISO Latin-1 Supplemental (96-character set; native and VT320/VT220 only)
B	ASCII
<	User-preferred supplemental In native or VT320/VT220 personality, either the Multinational Supplemental or the ISO Latin-1 set, depending on the current selection in setup mode or by the DECAUPSS command
% 5	Multinational Supplemental (native and VT320/VT220 only)
name	Softfont name assigned by the *name* parameter in the softfont load command (DECDLD)

scode	**NRC Character Set**
A	UK
4	Dutch
C or 5	Finnish
R	French/Belgian
Q or 9	French Canadian
K	German
Y	Italian
X	Latin American Spanish
E or 6 or '	Norwegian/Danish
% 6	Portuguese
Z	Spanish
H or 7	Swedish
=	Swiss

☐ **Note** The ISO Latin-1 supplemental character set is the only predefined character set with 96 characters. All other predefined character sets have 94 characters. A 96-character set cannot be labeled G0.

Assigning Font Banks

Once a character set is labeled, you can assign it to the GL or GR memory area with one of the following escape or control sequences:

SI or LS1	**Assign G0 character set to GL**	**CTRL O**
SO or LS0	**Assign G1 character set to GL**	**CTRL N**
LS1R	**Assign G1 character set to GR**	**ESC ~**
LS2	**Assign G2 character set to GL**	**ESC n**
LS2R	**Assign G2 character set to GR**	**ESC }**
LS3	**Assign G3 character set to GL**	**ESC o**
LS3R	**Assign G3 character set to GR**	**ESC |**
SS2	**Assign G2 character set to GL for the next character only**	**ESC N**
SS3	**Assign G3 character set to GL for the next character only**	**ESC O**

Examples

Suppose you want to gain access to the special line-drawing characters in the 94-character Special Graphics character set (see Appendix A). To display the Special Graphics character set for ASCII codes 21H through 7EH (GL memory area),

1 Label the Special Graphics set as G1 **ESC) 0**

2 Assign G1 to GL **CTRL N**

3 Send characters (7 bit)

To display the 96-character ISO Latin-1 Supplemental character set for ASCII codes A0H through FFH (GR memory area),

1 Label the ISO Latin-1 set as G3 **ESC / A**

2 Assign G3 to GR **ESC |**

3 Send characters (8 bit)

CREATING AND LOADING SOFTFONTS

The terminal stores user-definable character sets in a font bank called a *softfont*. Initially, all character positions in the softfont are displayed as reverse question marks (¿).

☐ **Note** Softfonts are not supported in VT52 or VT100 personalities.

Overview

The display of softfonts depends on the screen resolution selected and the number of columns displayed. No softfonts are available in 16x20 (60 Hz) resolution when the screen size is 80 columns and 24

lines. In the default 16x16 (74 Hz) resolution, the 80-column softfonts are not interchangeable with those for a 132- or 161-column screen.

Screen Resolution

In 16x16 (74 Hz) screen resolution, you can design softfonts for an 80-column screen and for a 132-column or 161-column screen. An 80-column screen requires its own softfont; the softfont loaded for an 80-column screen cannot be displayed on a screen which has been defined as 132 or 161 columns. However, a softfont designed for a 132-column screen can be displayed on a 161-column screen. The terminal automatically switches to the correct softfont when the column width is changed.

Creating the Softfont

To create your own softfont,

1 Design the individual characters, as described in the next section, and encode their description in ASCII format so the terminal can recognize them.

2 Load the characters into the softfont with the DECDLD device control sequence, as described in the subsequent section called "Loading a Softfont."

Designing and Encoding the Softfont Character

Characters displayed on the screen are patterns of illuminated and nonilluminated *pixels* (picture elements). A pixel is the smallest unit of the display that can be turned on (illuminated) or off. Each character is designed to fit into a block of pixels called a *character cell*. The area of the cell that contains the pattern of the character is called the *character matrix*.

Designing a softfont character and encoding it for the terminal consists of the following steps:

1 Determine the character cell size.

2 Determine the character matrix size.

3 Diagram the character on a grid representing the pixels in the character cell.

4 Mark the grid with 1's and 0's, assigning a value of 1 to the "on" pixels and a value of 0 to the "off" pixels to represent the bit pattern of the character.

5 Convert the bit pattern of each vertical column of the grid to a binary number in groups of six pixels called *sixels*.

6 Convert the binary number for each sixel to an ASCII character equivalent.

7 List the ASCII characters in a string that completely describes the character to be loaded into the softfont.

Determining the Character Cell Size

Table 4-2 shows the character cell size for each configuration of screen lines and columns.

Table 4-2 Cell Sizes

Screen Size		Cell Size (Pixels)	
Lines	Columns	Width	Height
26	80	16	16
	132	10	16
	161	8	16
52	80	16	8
	132	10	8
	161	8	8

Determining the Character Matrix Size

The size of the actual character matrix varies according to the cell size and the type of character you are designing (text or line-drawing). Table 4-3 lists maximum character matrix dimensions.

Table 4-3 Maximum Matrix Sizes

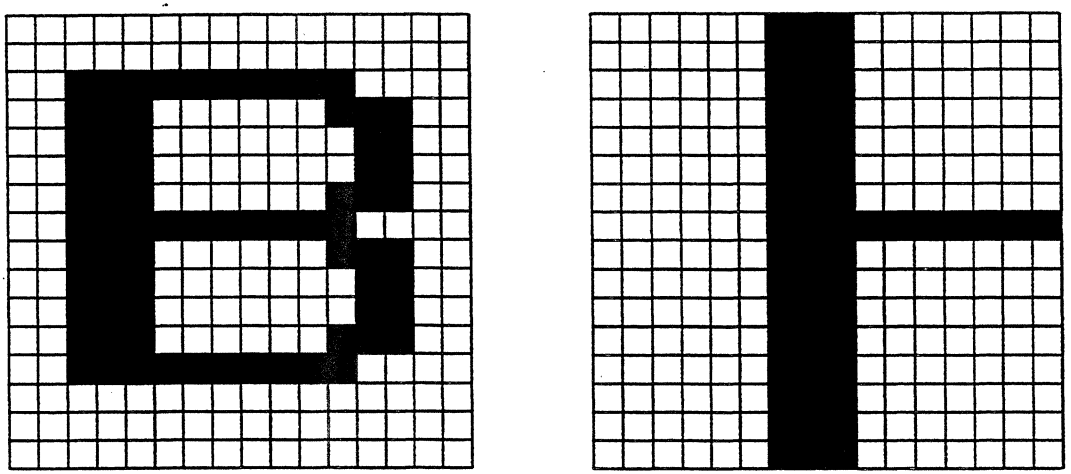
Screen Size			Character Matrix Width		Character
Lines	Columns	Cell Size	Text[1]	Line-Drawing[2]	Matrix Height
26	80	16x16	12	16	16
	132	10x16	7	10	16
	161	8x16	7	8	16
52	80	16x8	12	16	8
	132	10x8	7	10	8
	161	8x8	7	8	8

1. When *text cell* is selected in DECDLD command.
2. When *full cell* is selected in DECDLD command.

You specify the size of the character matrix with the values you send for the parameters *Ps3* (*character matrix width*) and *Ps6* (*character matrix height*) in the DECDLD device control string that loads the character.

Figure 4-2 shows the character matrix for a typical text character (uppercase B) and a typical line-drawing character in a 16x16 cell.

Figure 4-2 Typical Character Matrixes (16x16 Cell)



In deciding the width and height of the character matrix, you must take into account a basic difference between text and line-drawing characters. A line-drawing character typically extends to the outside edge of the cell so adjoining line-drawing characters can touch it in order to draw a graphic shape. But text characters require spacing between each character, so part of each cell must be left empty to create that space.

The terminal automatically allows for some spacing between text characters unless you specify a "full cell" for the font type parameter *Ps5* in the DECDLD device control sequence. (If you specify a full cell, the character matrix can be as wide as the character cell itself.) The number and position of cell columns which are left blank for text characters are listed in Table 4-4.

Table 4-4 Maximum Width of Text Characters

Screen Columns	Total Cell Width	Blank Cell Columns*	Maximum Character Width
80	16 pixels	1, 2, 15, 16	12
132	10	1, 9, 10	7
161	8	1	7

* By column number, starting at the left side of the cell

Diagramming a Character

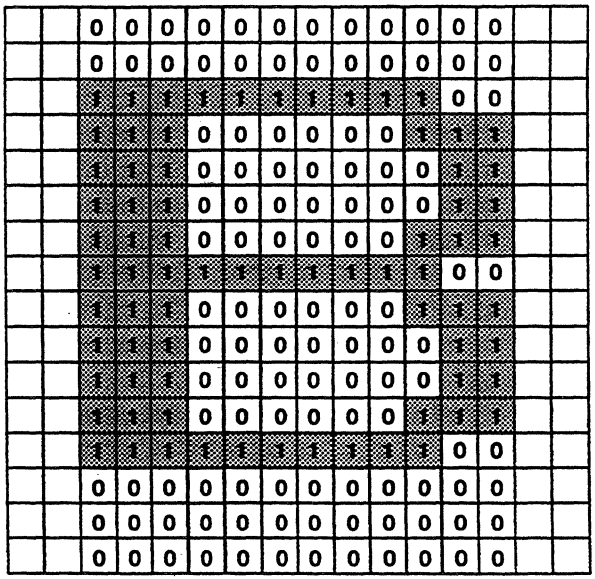
To diagram a character,

1 Draw a grid to represent each pixel in the character cell and map the "on" pixels that define the pattern of the character.

2 Draw a duplicate blank grid and translate the pattern from the first grid into the blank grid by marking 1's for each "on" pixel and 0's for each "off" pixel.

Figure 4-3 shows the bit pattern for the uppercase text character B illustrated in Figure 4-2.

Figure 4-3 Bit Pattern of Uppercase Text Character B



Sectioning the Grid into Sixels

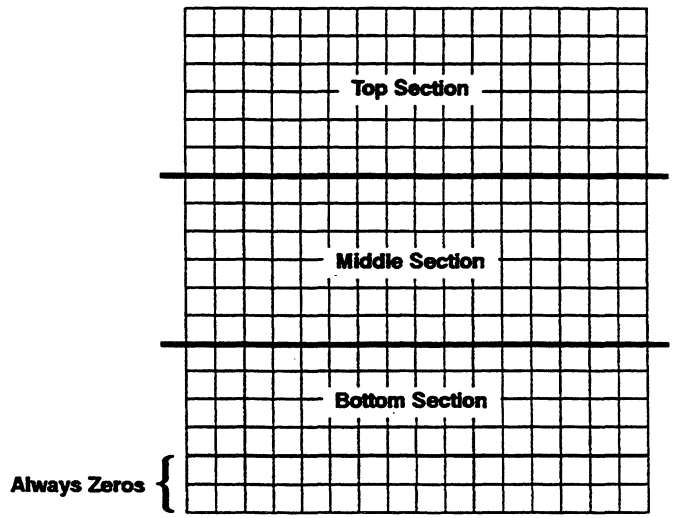
After you have marked the second grid with each pixel's bit value, divide each column of the grid into three groups of six pixels, called a *sixel*.

Figure 4-4 shows the sixel sections of a 16x16 character cell.

You must add two lines of zero pixels to fill out the bottom sixel section.

☐ **Note** If the cell is only eight lines high, you will have only two sixel sections; you will need to add four lines of zero pixels to fill out the bottom sixel section.

Figure 4-4 Sixel Sections



Converting the Sixels to ASCII Equivalents

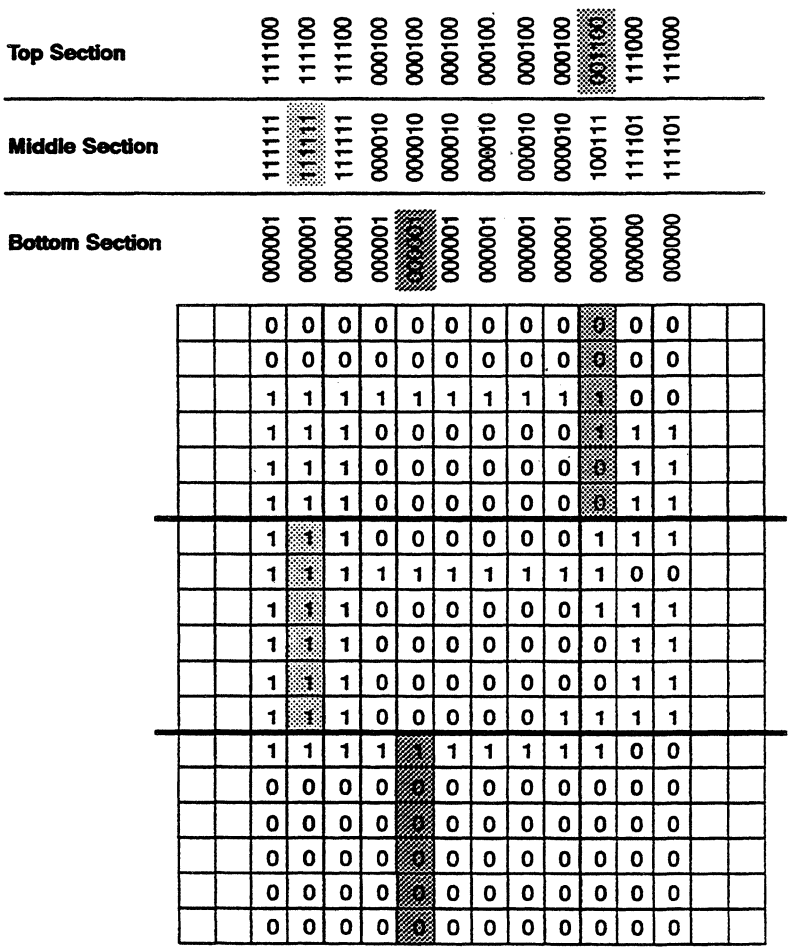
You encode the character for the terminal by converting the bit pattern of each sixel to an ASCII character equivalent. The ASCII characters are entered as a string of sixel bit pattern (*Sxbp*) values in the DECDLD device control sequence that loads the character.

To determine the ASCII characters required to represent the character you have designed,

1 Convert the bit pattern of each sixel in the top section to a binary number, starting with the leftmost column and continuing across the cell. The most significant bit is at the bottom of the sixel,

while the least significant bit is at the top. Figure 4-5 shows the resulting binary numbers for the example B character (from Figures 4-2 and 4-3). The shaded areas show the binary values corresponding to the bit patterns.

Figure 4-5 Representing the Sixels as Binary Values



2 In the same manner, convert the bit pattern of each sixel in the middle section to a binary number, then convert those in the bottom section.

3 Convert the binary numbers derived in steps 1 and 2 to ASCII character equivalents for each column of sixels. Refer to Table 4-5 for these equivalents. (The table is not a standard ASCII code conversion table.)

Table 4-6 shows the values for the example character B.

Table 4-5 Conversion Table (Bit Pattern Values to ASCII Characters)

Bit Pattern	Decimal	ASCII	Bit Pattern	Decimal	ASCII
000000	063	?	100000	095	_
000001	064	@	100001	096	`
000010	065	A	100010	097	a
000011	066	B	100011	098	b
000100	067	C	100100	099	c
000101	068	D	100101	100	d
000110	069	E	100110	101	e
000111	070	F	100111	102	f
001000	071	G	101000	103	g
001001	072	H	101001	104	h
001010	073	I	101010	105	i
001011	074	J	101011	106	j
001100	075	K	101100	107	k
001101	076	L	101101	108	l
001110	077	M	101110	109	m
001111	078	N	101111	110	n
010000	079	O	110000	111	o
010001	080	P	110001	112	p
010010	081	Q	110010	113	q
010011	082	R	110011	114	r
010100	083	S	110100	115	s
010101	084	T	110101	116	t
010110	085	U	110110	117	u
010111	086	V	110111	118	v
011000	087	W	111000	119	w
011001	088	X	111000	120	x
011010	089	Y	111010	121	y
011011	090	Z	111011	122	z
011100	091	[	111100	123	{
011101	092	\	111101	124	|
011110	093	]	111110	125	}
011111	094	^	111111	126	~

Table 4-6 Conversion of Sixel Bit Patterns to ASCII Characters

Sixel Section	Bit Pattern	Decimal	ASCII Equivalent
Top	111100	123	{
	111100	123	{
	111100	123	{
	000100	067	C
	000100	067	C
	000100	067	C
	000100	067	C
	000100	067	C
	000100	067	C
	001100	075	K
	111000	119	w
	111000	119	w
Middle	111111	126	~
	111111	126	~
	111111	126	~
	000010	065	A
	000010	065	A
	000010	065	A
	000010	065	A
	000010	065	A
	000010	065	A
	100111	102	f
	111101	124	¦
	111101	124	¦

Table 4-6 Conversion of Sixel Bit Patterns to ASCII Characters, Continued

Sixel Section	Bit Pattern	Decimal	ASCII Equivalent
Bottom	000001	064	@
	000001	064	@
	000001	064	@
	000001	064	@
	000001	064	@
	000001	064	@
	000001	064	@
	000001	064	@
	000001	064	@
	000001	064	@
	000000	063	?
	000000	063	?

4 You will first enter the ASCII characters that represent the top sixels, followed by the characters for the middle and bottom sixel sections. Enter the characters from left to right, and separate the characters for each sixel section (top, middle, and bottom) with a slash (/).

The resulting *Sxbp* string that describes the example character B is

{{{CCCCCCKww/~ ~ ~AAAAAAf¦¦/@@@@@@@@@@@@??

Loading a Softfont

DECDLD **Load softfont** **DCS** *Ps* ; *Ps1* ; *Ps2* ; *Ps3* ; *Ps4* ; *Ps5* ; *Ps6* ; *Ps7* { *name Sxbp* ; ... ; *Sxbp ST*

where *Ps* is the font number, which can be a value of either 0 or 1.

Ps1 is a decimal number identifying the position in the character set where the first character will be loaded. Character positions are numbered consecutively. Note that positions 20H and 7FH are not available for a 94-character set.

Ps1	**Initial Character Position**
0	21H (decimal 33) for a 94-character set 20H (decimal 32) for a 96-character set
1–94	21H (decimal 33) through 7EH (decimal 126)
95	7FH (decimal 127) for a 96-character set only

For example, if you wanted the first character in your softfont to be in the same position as the asterisk (*) in the ASCII character set (shown in Appendix A), you would enter a *Ps1* value of 10. If you were to load a total of 20 characters in sequence, the last character would be loaded in the position occupied by the equal sign (=) in the ASCII set.

Ps2 controls the erasing of characters in the softfont

Ps2	**Erase Control**
0	Erase all characters in the softfont before loading new characters (default)
1	Erase only the character(s) being replaced
2	Erase all characters in both the 80-column and 132-/161-column softfont rendition

Ps3 is the character matrix width:

- The value selected overrides the sixel pattern specified. For example, if *Ps3* = 8, only the first eight sixel values are recognized.
- Select values 2 or 3 only to load characters previously designed for a 10x10 character cell (DEC VT220-compatible). The terminal will automatically adjust the pattern of the character to fit the current cell dimensions.

Ps3	**Character Matrix Width**
0	16 pixels in 80-column display (default) 10 pixels in 132-column display (default) 8 pixels in 161-column display (default)
1	Illegal
2	5 pixels wide
3	6 pixels wide
4	7 pixels wide
5	5 pixels wide
6	6 pixels wide
7	7 pixels wide
8	8 pixels wide
9	9 pixels wide
10	10 pixels wide
11	11 pixels wide
12	12 pixels wide
13	13 pixels wide
14	14 pixels wide
15	15 pixels wide
16	16 pixels wide

Ps4 is the font width

Ps4	**Font Width**
0 or 1	80-column display (default)
2	132- or 161-column display

Ps5 is the font type. If a full cell is selected, all pixels in the cell can be individually addressed. If a text cell is selected, the terminal automatically provides character spacing by blanking some columns of the cell.

Ps5	**Font Type**
0 or 1	Text cell (default)
2	Full cell

Ps6 is the character matrix height

Ps6	**Character Matrix Height**
0	16 pixels (default)
1–16	Values correspond to the number of pixels (e.g., 4 = four pixels high)

Ps7 is the character set size (native and VT320/VT220 personalities only)

Ps7	**Character Set Size**
0	94-character set (default)
1	96-character set

{ is a separator

name is a one-, two-, or three-character name assigned to the softfont character set and referenced when labeling the set (SCS):

First character (optional) = ASCII character from SP to / (20H - 2FH)

Second character (optional) = ASCII character from SP to / (20H - 2FH)

Third character (required) = ASCII character from 0 to ~ (30H - 7EH)

Sxbp is the sixel bit pattern defining the character being loaded. Up to 94 or 96 individual character bit patterns, separated by semicolons (;) may be specified, depending on the character set size (*Ps7* parameter).

ST is the string terminator

☐ **Note** Parameters *Ps1* through *Ps7* must be separated by semicolons (;).

The sequence

```
DCS 0 ; 13 ; 1 ; 12 ; 0 ; 0 ; 11 ; 0 { # B
{{{CCCCCCKww/~ ~ ~AAAAAAf¦¦/@@@@@@@@@@@
?? ST
```

loads the example uppercase B text character

- In position 2DH (decimal 45)
- Without erasing the existing characters in any other positions in the softfont
- For an 80-column display
- In a 94-character set named # B

Displaying the Softfont Characters

To display characters from the softfont, you must label the softfont character set (SCS) and assign it to the GL or GR memory area as described in the section on "Predefined Character Sets."

☐ **Note** A 96-character set cannot be labeled G0.

THE WYLSFNT SOFTFONT LOAD COMMAND

The DECDLD command described in the previous section loads softfonts only in the DEC-compatible softfont areas of the terminal's font banks 2 and 3, where no predefined characters reside. With the command described in this section you can load

softfonts into any position in any of the font banks, allowing you to change or replace the terminal's predefined characters.

■ **Caution** Once changed, the terminal's predefined characters can only be restored at power-on or by a hard terminal reset.

These font banks are the default hardware-based storage locations for the characters displayed by the terminal. There are four font banks, each having 128 character positions. In 16x16 (74 Hz) resolution, the characters in all four font banks are available for display. However, when the screen is set for 80 columns and 26 lines in 16x20 (60 Hz) resolution, only the 256 characters in font banks 0 and 1 are available for display.

WYLSFNT **Load softfont** **DCS 0 ;** *Ps* **;** *Pn* **}** *ds...ds* **ST**

where *Ps* is the font bank in which the softfont character is to be loaded (Figure 4-6)

Ps	Font Bank
0	0
1	1
2	2 (not available in 16x20 resolution, 80x26 screen size)
3	3 (not available in 16x20 resolution, 80x26 screen size)

Pn is a decimal number from 0 through 127 identifying the character's position in the font bank (Figure 4-6)

} is a separator

ds...ds is a data string defining the character

ST is the string terminator

Figure 4-6 shows the terminal's font banks.

Figure 4-6 Font Banks

DEC → / HEX ↓	0	16	32	48	64	80	96	112
	0	1	2	3	4	5	6	7
0	0			0	@	P	`	p
1	1	S_H		1	A	Q	a	q
2	2	S_X		2	B	R	b	r
3	3	E_X		3	C	S	c	s
4	4	E_T		4	D	T	d	t
5	5	E_Q		5	E	U	e	u
6	6	A_K		6	F	V	f	v
7	7	B_L		7	G	W	g	w
8	8	B_S		8	H	X	h	x
9	9	H_T		9	I	Y	i	y
10	A	L_F		:	J	Z	j	z
11	B	V_T		;	K	[	k	{
12	C	F_F		<	L	\	l	|
13	D	C_R		=	M	]	m	}
14	E	S_O		>	N	^	n	~
15	F	S_I		?	O	_	o	D_T

Font Bank 0

DEC → / HEX ↓	0	16	32	48	64	80	96	112
	0	1	2	3	4	5	6	7
0	0			°	À	Ð	à	ð
1	1		¡	±	Á	Ñ	á	ñ
2	2	H_T	¢	2	Â	Ò	â	ò
3	3	F_F	£	3	Ã	Ó	ã	ó
4	4	C_R	¤	´	Ã	Ô	ã	ô
5	5	L_F	¥	µ	Å	Õ	å	õ
6	6	°	¦	¶	Æ	Ö	æ	ö
7	7	±	§	·	Ç	×	ç	÷
8	8	N_L	¨	¸	È	Ø	è	ø
9	9	V_T	©	¹	É	Ù	é	ù
10	A		ª	º	Ê	Ú	ê	ú
11	B		«	»	Ë	Û	ë	û
12	C		¬	¼	Ì	Ü	ì	ü
13	D		-	½	Í	Ý	í	ý
14	E		®	¾	Î	Þ	î	þ
15	F		¯	¿	Ï	ß	ï	ÿ

Font Bank 1

Figure 4-6 Font Banks, Continued

DEC ➡		0	16	32	48	64	80	96	112
⬇	HEX	0	1	2	3	4	5	6	7
0	0		D_L						
1	1		D_1						
2	2		D_2						
3	3		D_3						
4	4		D_4						
5	5		N_K						
6	6		S_Y						
7	7		E_B						
8	8		C_N						
9	9		E_M						
10	A		?						
11	B		E_C						
12	C		F_S						
13	D		G_S						
14	E		R_S						
15	F		U_S						

Font Bank 2

DEC ➡		0	32	32	48	64	80	96	112
⬇	HEX	0	1	2	3	4	5	6	7
0	0	8_0	D_C						
1	1	8_1	P_1						
2	2	8_2	P_2						
3	3	8_3	S_E						
4	4	I_N	C_C						
5	5	N_L	M_W						
6	6	S_S	S_P						
7	7	E_S	E_P						
8	8	H_S	9_8						
9	9	H_J	9_9						
10	A	V_S	9_A						
11	B	P_D	C_S						
12	C	P_U	S_T						
13	D	R_I	O_S						
14	E	S_2	P_M						
15	F	S_3	A_P						

Font Bank 3

To find the value of *Pn*, read across the top line of the font bank illustration and count down. For example, the decimal value of the uppercase text character W in font bank 0 is 87.

☐ **Note** If you want to load your softfont character in the "empty" softfont positions in font banks 2 or 3, you must select font bank 2 for an 80-column softfont and font bank 3 for a 132-/161-column

softfont. If you load softfonts over predefined characters, those characters on the screen will change immediately.

To display characters from the softfont, label and assign the character sets with the commands described in the section on "Displaying Character Sets."

Designing the Softfont Character

The steps in designing the softfont character are identical to the steps described for the DECDLD command in the previous section:

1 Determine the character cell size.

2 Determine the character matrix size.

3 Diagram the character on a grid representing the pixels in the character cell.

4 Assign a value of 1 to the "on" pixels and a value of 0 to the "off" pixels to represent the bit pattern of the character.

Refer to Table 4-2 earlier in this chapter for the character cell sizes for the various screen configurations. Refer to Table 4-3 for guidelines on determining the character matrix size; Figure 4-2 shows typical text and line-drawing characters in the default 16x16 character cell size.

☐ **Note** Unlike the DECDLD command, this command has no provision for automatically allowing for space between text characters. You must diagram the character to have the appropriate number of "off" pixels at each side of the cell, as well as at the top and bottom, to allow for spacing between text characters.

Encoding the Softfont Character

The way in which the softfont character is encoded into a data string that defines it for the terminal is completely different from the way the character is encoded for loading by the DECDLD command. Instead of encoding the bit pattern of the vertical columns, you encode the bit pattern of each horizontal line:

1 After you have assigned 1's and 0's to the pixels in the character cell, divide each line of the cell into groups of four bits (*nibbles*).

2 Record the binary value of each nibble in the line, starting at the left side of the top line of the cell.

3 Convert the binary values into ASCII character equivalents.

4 Combine the ASCII characters into a character string (*ds*) that defines the bit pattern of the character.

Figure 4-7 illustrates the same uppercase B text character in a 16x16 character cell that was used as an example in the previous section. The figure shows the bit pattern divided into nibbles and the conversion of the binary nibble values into ASCII characters. The shaded areas show selected binary nibble values matched with their corresponding ASCII values.

Figure 4-7 Converting the Nibbles to ASCII Values

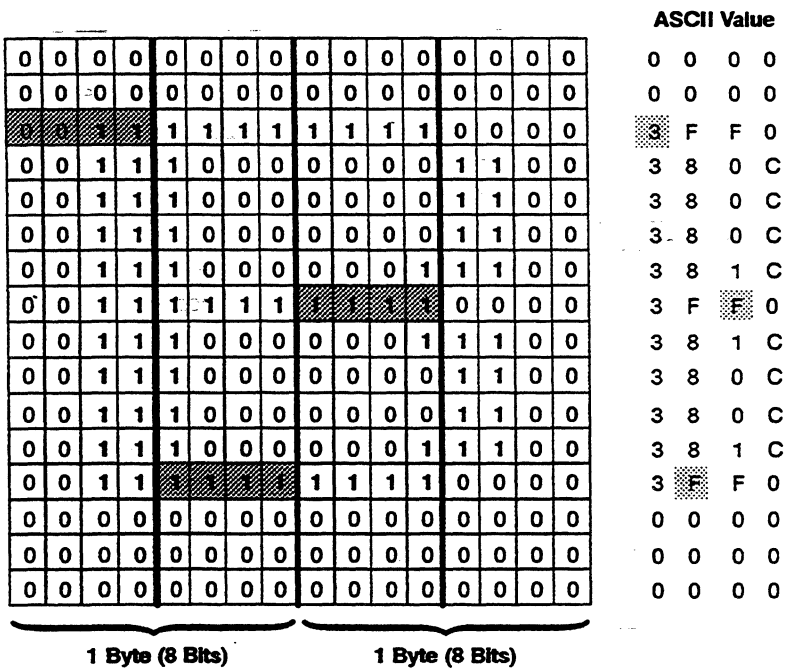


Table 4-7 shows the ASCII character for each possible nibble value.

Table 4-7 Conversion Table for Binary to ASCII Values

Binary	ASCII	Hex	Octal	Decimal
0000	0	30	060	048
0001	1	31	061	049
0010	2	32	062	050
0011	3	33	063	051
0100	4	34	064	052
0101	5	35	065	053
0110	6	36	066	054
0111	7	37	067	055
1000	8	38	070	056
1001	9	39	071	057
1010	A	41	101	065
1011	B	42	102	066
1100	C	43	103	067
1101	D	44	104	068
1110	E	45	105	069
1111	F	46	106	070

Number of Nibble Values

The number of nibble values that are necessary to define the character depends on the cell size. For example, the default 16x16 cell shown in Figure 4-7 has four nibbles per line for a total of 64 nibble values. However, an 8x16 cell will have only two nibbles per line for a total of 32 nibble values. Table 4-8 shows the total number of nibble values necessary to define the character in each cell size.

Table 4-8 Total Nibble Values

Columns	Lines	Cell Size	Total Nibble Values
80	26	16x20	80
		16x16	64
	52	16x8	32
132	26	10x16	48*
	52	10x8	24*
161	26	8x16	32
	52	8x8	16

* When the character cell is 10 pixels wide, you must add two zeros to the right side of each line to fill out the third nibble.

Recording the Character String

Combine the ASCII characters into a character string (*ds*), working across each line of the cell from left to right, and from top to bottom. When you have finished, verify that you have recorded the correct number of nibble values (Table 4-8) to define the character for your selected cell size.

Loading the Character

The following command loads the example text character B (Figure 4-7) in place of the Ð character in position 80 in font bank 1 (Figure 4-6).

```
DCS 0 ; 1 ; 80 } 00 00 00 00
3F F0 38 0C 38 0C 38 0C 38 1C
3F F0 38 1C 38 0C 38 0C 38 1C
3F F0 00 00 00 00 00 00 ST
```

RELATED FUNCTIONAL MODE COMMANDS

DECCOLM	**132-column mode**	**Set: CSI ? 3 h** **Reset: CSI ? 3 l**
DECNRCM	**National replacement character mode**	**Set: CSI ? 42 h** **Reset: CSI ? 42 l**
WY52	**52-line mode**	**Set: CSI ? 83 h** **Reset: CSI ? 83 l**
WY161	**161-column mode**	**Set: CSI ? 80 h** **Reset: CSI ? 80 l**

5 Controlling the Screen Display

INTRODUCTION

This chapter describes the commands that control how data is displayed on the screen. The bulk of the chapter is devoted to the use of color and the commands that assign display attributes. The main focus of this discussion, which begins with the section entitled "Assigning Display Attributes," is on

- How colors are associated to other display attributes
- How both colors and other attributes are assigned to characters in the terminal's four color modes
- How the SGR (select graphic rendition) command is interpreted in each of the four color modes

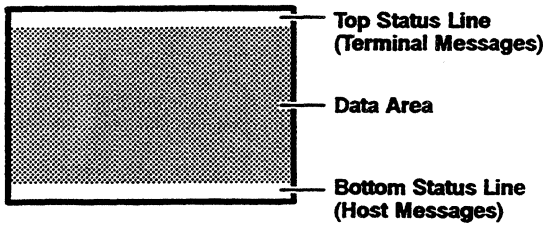
The first part of the chapter describes the commands that control the status line, scrolling, and the definition of erasable and nonerasable characters.

CONTROLLING THE STATUS LINE

The screen can display 26 or 52 lines down the screen and 80, 132, or 161 columns across the screen. Normally, two of the 26 or 52 lines serve as *status lines*, which display messages from the terminal and the host. The remaining area of the screen is the *data area*, available for displaying data from the keyboard or from the host. The functional mode commands that control the size of the screen's data area are described in Table 2-2 in Chapter 2.

Figure 5-1 shows the three screen areas.

Figure 5-1 Screen Areas



Status Line Messages

The top status line displays *terminal messages* on either a *user* or a *system* status line, selectable in setup mode or with a local key command (Ctrl ▶). The default is a user status line. Tables 5-1 and 5-2 list the top status line messages and their meanings.

Table 5-1 User Status Line Messages

Message	Description
*	The terminal is in controls display mode.
BLCK	The terminal is on-line in block communication mode.
CAPS	The LOCK (CAPS LOCK) key is engaged.
COMP[1]	A compose character sequence is in process.
CPRT	Autoprint (copy print, auxiliary print) mode is on.
HBLK	The terminal is on-line in half-duplex block communication mode.
HDX	The terminal is on-line in half-duplex communication mode.
HOLD	Data is being held on the screen (processing is suspended).
INS	Insert mode is on.
LINE	The terminal is on-line in full-duplex communication mode.
LOCL	The terminal is in local operating mode.
p:lll-ccc[1]	The page, line, and column number of cursor position.

1. ANSI personalities only.

Table 5-1 User Status Line Messages, Continued

Message	Description
PROT[2]	Protect mode is on.
WAIT	Keyboard has been locked.
WRPT[3]	Write-protect mode is on.
XPRT	Controller print (transparent print) mode is on.

2. ASCII personalities only.
3. ASCII personalities only. Displayed only when protect mode is also on.

Table 5-2 System Status Line Messages

Message	Description
AUX	Identifies port to which auxiliary device is connected
*day mo yr hr:min**	Displays date and time
HOST	Identifies port to which host is connected
PRNT	Identifies port to which printer is connected
SESSION	Identifies active session (01 or 02)

* Displayed only if time has been set in WyseWorks mode or through a command sequence (WYDTSET). If an alarm has been set, the message field replaces the date and time field when the alarm bell rings.

The bottom status line displays *host messages*. If the extra data line is enabled in setup mode or by a functional mode command (WYEXTDM), the bottom status line is not displayed.

You can control the display of the top and bottom status lines.

Selecting the Status Line Type

DECSSDT **Select status line type** CSI *Ps* $ ~

where *Ps* is the type of status line display

Ps	Type Displayed
0	No status line display
1	Top status line (displays terminal status messages)
2	Top and bottom status lines (bottom status line displays messages received from host)

With this command you can turn on the top and bottom status line, display the top status line only, or turn off both status line displays. The top status line displayed when the command is executed is the *user* status line.

If the extra data line has been enabled (WYEXTDM) when the command is sent to display a top and bottom status line, only the top status line is displayed.

Writing Data to the Bottom Status Line

DECSASD **Select data destination** **CSI *Ps* $ }**

where *Ps* is the data destination.

Ps	Destination
0	Data sent to screen's data area
1	Data sent to bottom status line (ignored if WYEXTDM is set)

Data can be written to the bottom status line if the bottom status line display is enabled (DECSSDT). When data is written to the bottom status line,

- The cursor is not displayed in the status line (it remains in the data area)
- All commands that move the cursor to another page are ignored (NP, PP, PPA, PPB, PPR)
- The commands listed in Table 5-3 have different effects than when data is written to the data area.

Table 5-3 Command Differences (Data Written to Status Line)

Mnemonic	Effect of Command: Data to Data Area	Effect of Command: Data to Status Line
CNL	Cursor moves to next line	Cursor moves to column 1
CPL	Cursor moves to previous line	Cursor moves to column 1
CUD VPR	Cursor moves down *n* lines	Ignored
CUP HVP	Cursor moves to line *n*, column *n*	Cursor moves to column *n* only
CUU	Cursor moves up *n* lines	Ignored
DECALN	Screen adjustment pattern is displayed	Ignored
DECANM	VT52 personality is selected	Ignored

Table 5-3 Command Differences (Data Written to Status Line), Continued

Mnemonic	Effect of Command: Data to Data Area	Effect of Command: Data to Status Line
DECSCL	Select terminal personality	Ignored
DECSTR	Soft reset occurs	Further data is sent to screen's data area
DL	*n* blank lines are deleted	Ignored
IL	*n* blank lines are inserted	Ignored
IND	Cursor moves down one line in current column	Data is cleared from status line
LF VT FF	Cursor moves down one line in current column	Data is cleared from status line
RI	Cursor moves up one line in current column	Data is cleared from status line
RIS	Hard terminal reset occurs	Status line is erased, and further data is sent to screen's data area
VPA	Cursor moves to line *n*	Ignored

SCROLLING

DECSTBM **Define scrolling region** **CSI *Pn* ; *Pn1* r**

where *Pn* is the line number of the top line of the scrolling region (optional)

Pn1 is the line number of the bottom line of the scrolling region (optional)

If *Pn* is omitted, the top line of the scrolling region defaults to the first data line on the page. If *Pn1* is omitted, the bottom line of the scrolling region defaults to the last data line on the page.

If *Pn1* is less than *Pn*, or is greater than the number of lines on the page, the command is ignored.

This control sequence defines the top and bottom margins of the scrolling region (the active data area of the page).

WYSCRATE **Set smooth scroll rate** **CSI *Ps* z**

where *Ps* is the number of lines per second

Ps	**Scroll Rate**
0	4 lines per second (default)
1	1 line per second
2	2 lines per second
3	4 lines per second
4	8 lines per second

This control sequence selects the scrolling rate if smooth scrolling has been selected (DECSCLM).

CONTROLLING THE ERASABILITY OF CHARACTERS

DECSCA **Define erasable/nonerasable characters** **CSI *Ps* " q**

where *Ps* defines succeeding characters as erasable or nonerasable by a selective erase control sequence

Ps	**Character Erasability**
0 or 2	Erasable. Characters are erased by a selective erase control sequence.
1	Nonerasable. Characters are not erased by a selective erase control sequence.

This command allows you to designate which characters will or will not be erased by the selective erase control sequences DECSED and DECSEL (see Chapter 8).

☐ **Note** When the WYENAT functional mode is set (see Chapter 2), this command can be used in connection with the SGR command (described later in this chapter) to assign display attributes separately to erasable and nonerasable characters.

ASSIGNING DISPLAY ATTRIBUTES

Display attributes are visual properties that affect the way characters appear on the screen. On a monochrome terminal, programs differentiate between areas of the screen and make some characters stand out visually be changing their intensity—making them bolder or dimmer—and by making them blink, underlined, reversed, or invisible (blank). For example,

- The first letter of a menu option can be assigned the bold attribute to indicate to the user what key to press to select that option
- Blinking characters can attract the user's attention to an error message

- A screen area that would otherwise display sensitive information, such as a password, can be blanked out so that the password will be invisible as it is entered

On a color terminal, characters are distinguished by color instead of or in addition to these traditional monochrome display attributes. By combining the terminal's 64 colors with 16 possible attribute combinations, you can achieve a variety of effective visual presentations.

Display Attribute Combinations

The terminal's display attributes are divided into two types:

- *Base character attributes* that correspond to the three intensities *normal*, *dim*, and *bold*. Every character displayed on the screen exhibits one—and only one—of these attributes, which are mutually exclusive. For example, a character cannot be displayed as normal and bold at the same time.
- *Associated attributes*, which can be added to each base character attribute either singly or in any combination. The associated attributes are *blink*, *blank*, *reverse*, and *underline*.

Combining a base character attribute with associated attributes results in 16 possible combinations. One of the sixteen is "none" (or "normal") meaning a base character attribute "without associated attributes" (and therefore distinguished by color alone).

The Basic SGR Command

The basic command that assigns display attributes to characters is the SGR (*select graphic rendition*) command. The SGR command is discussed in this section in relation to the terminal's default color map mode, in which only parameter values between 0 and 29 can be used. The color-specific parameter values 30 through 37 and 40 through 47 are discussed in a later section entitled "Color Extended SGR Mode."

SGR **Assign character attributes** **CSI** *Ps* ; ... ; *Ps* **m**

where *Ps* specifies the assigned attribute

Table 5-4 lists the attribute values for *Ps* and describes the selected attributes.

Table 5-4 Attribute Values (Nonextended)

Ps	Attribute	Description[1]
0	Normal	Displays normal characters with no associated attributes (resets all other attributes)
1	Bold	Displays bold characters (resets dim and blank)
2	Dim	Displays dim characters (resets bold and blank)
4	Underline	Displays underlined characters
5	Blink	Displays blinking characters
7	Reverse	Displays reversed characters (exchanges foreground and background colors)
8	Blank	Makes all received characters invisible[2]
9	Overstrike[3]	Displays characters with a line through them
22	Normal base attribute	Displays normal characters (resets bold, dim, and blank attributes)
24	Underline off	Displays characters without an underline (resets underline attribute)
25	Blink off	Displays nonblinking characters (resets blink attribute)
27	Reverse off	Restores characters to assigned foreground and background colors
28	Blank off	Displays characters (resets blank attribute)
29	Overstrike off	Displays characters without a line through them (resets overstrike attribute)

1. The terms *normal*, *bold*, and *dim* describe colors, not intensities.
2. In Intecolor 220 personality, also resets dim and bold.
3. You can position the overstrike anywhere on the character or use it to create a double underline (see WYSOVR).

The following principles apply to the basic SGR command:

- Attributes do not occupy a character position on the screen.
- You can combine attributes by entering multiple parameters within the command sequence and separating them with semicolons (;).

- The terminal recognizes the attributes in the order received, combining them with previously selected attributes unless the most recent selection resets one or more of them.
- Attributes affect only characters received by the terminal after the command is executed (i.e., the command will not change the appearance of data already displayed on the screen).
- The way in which the attributes are associated with character colors depends on the terminal's current *color mode*. The color modes are introduced in the section entitled "Working with Color," and the effect of the SGR command in each mode is discussed in succeeding sections.

Combining Attributes

The following example describes the way attributes are combined.

1 To display bold and blinking characters, send

CSI 1 ; 5 m

2 Sending the sequence

CSI 4 m

adds an underline. The characters remain bold and blinking.

3 Subsequently sending the sequence

CSI 24 ; 25 m

removes the underline and turns off blinking, leaving bold characters with no associated attributes

Selecting the Overstrike Position

WYSOVR **Select overstrike position** **CSI 53 ; *Pn* w**

where *Pn* is the line number (0 through 19) in the character cell where the overstrike is positioned (0 is the top line of the cell)

This control sequence selects the position where an overstrike line selected by the SGR command will appear on the character (see Chapter 4 for character cell dimensions). For example, in the default 16x16 character cell size, the values for *Pn* are 0 through 15. Sending the command

CSI 53 ; 8 w

positions the overstrike through the middle of the character.

You can create a double underline by assigning both an underline and overstrike attribute and positioning the overstrike on the second from the bottom line of the cell. For example, for a 16x16 character cell, sending the WYSOVR command

CSI 53 ; 13 w

followed by the SGR command

CSI 4 ; 9 m

displays subsequently entered characters with a double underline.

WORKING WITH COLOR

You can program the terminal in any one of four separate color modes. Table 5-5 briefly compares the four color modes that are described in detail in the following sections.

Table 5-5 Color Modes

Mode	Description
Color Map (default)	Assign foreground and background colors to an array of color and display attribute combinations called a *color map*; redefine the color map, selecting from 64 available colors and 16 attribute definitions. Commands: WYCOLOR, WYCAA
Color Extended SGR	Assign foreground and background colors directly to characters, selecting from eight foreground and eight background extended color values of the SGR command (without reference to the color map). Command: SGR
Color Direct	Assign foreground and background colors and attributes directly to characters (without reference to the color map); select from 64 available colors and 16 attribute combinations. Command: WYCDIR
Color Index	Create a customized color index by assigning your own numbers to the terminal's 64 colors; assign foreground and background colors directly to characters using these number values (without reference to the color map). Command: WYIND

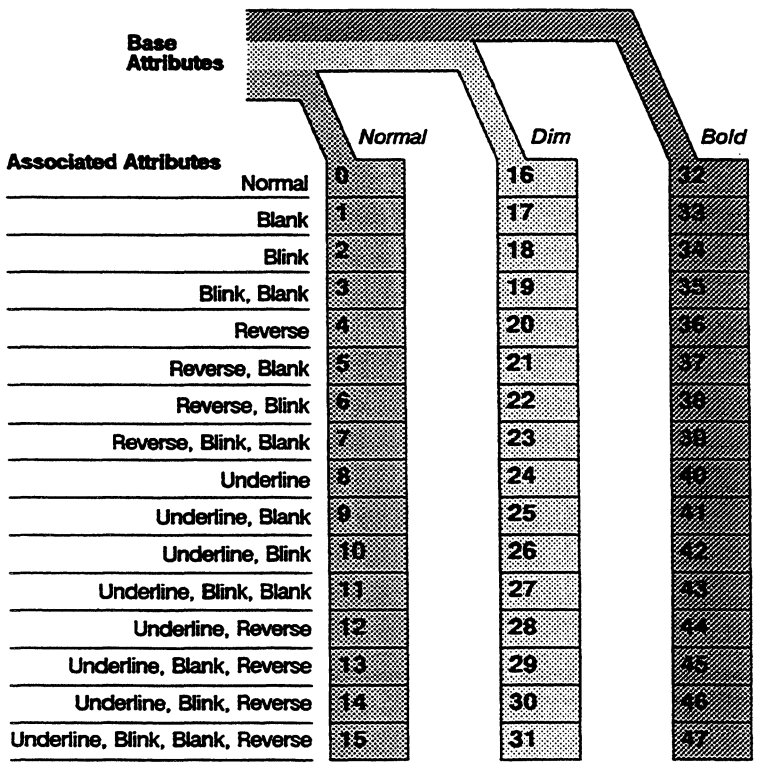
COLOR MAP MODE

Color map mode is the terminal's default color mode. It is the basis for the color and attribute selections made from the Attribute menu in setup mode.

In color map mode, colors are not assigned directly to characters. Instead, they are associated (*mapped*) to the display attributes assigned by the SGR command. The arrangement of colors and

display attributes from which the terminal makes these color/attribute associations is called a *color map*. Figure 5-2 shows the basic structure of the color map.

Figure 5-2 The Structure of the Color Map



The Color Map Attribute Associations

Each of the 48 numbered map positions in Figure 5-2 is called an *attribute association*. An attribute association is composed of a color and a particular combination of *base character attribute* and *associated attributes*.

☐ **Note** The three mutually exclusive base character attributes (normal, dim, or bold) multiplied by 16 associated attributes (blink, blank, reverse, and underline and their combinations) results in 48 possibilities for distinguishing characters displayed on the screen.

Characters are displayed in the color of the *one* attribute association that corresponds to the attributes assigned to them by the SGR command. For example, characters assigned only the blink attribute take their color from position 2 on the map. Characters assigned both the dim and blink attributes take their color from position 18; if an underline attribute is added to the dim and blink attributes, the characters pick up the color of the attribute association represented by position 26.

Introduction to Color Map Mode Commands

Three WYCOLOR command sequences determine the colors assigned to the attribute associations, as follows:

1 The command that assigns foreground colors assigns three separate colors simultaneously—one color to the *normal* attribute, another color to the *dim* attribute, and a third color to the *bold* attribute. Initially, as represented by the three shaded columns in Figure 5-2, the three colors of this *foreground color palette* extend to all the associated attributes that can be combined with a given base character attribute.

2 The command that assigns background colors assigns a common background color to all attribute associations (and to the border of the screen).

3 The third command redefines any one of the 48 individual attribute associations

- To display in a different foreground and/or background color from the palette-assigned foreground color or the previously assigned background color.
- To display different visual properties from its default definition by *adding* another associated attribute (blink, blank, underline, reverse) or *subtracting* one or more of the associated attributes that make up the default definition.

☐ **Note** Although you can select either the foreground color palette or the background color first, you must redefine an attribute association *after* selecting the foreground color palette. The command that selects a foreground color palette extends the new palette colors to all positions on the color map and resets all the attribute associations to their default definitions.

The commands in color map mode are easy to apply to existing applications because the color map automatically translates the program's existing display attributes into your selected colors or attribute redefinitions. For example, you can make all your color

selections ahead of time instead of having to mix color commands into the middle of the program.

The ability to redefine individual attribute associations makes it possible, for example, to do away with some or all blinking characters while still preserving their information value. For example, what might have been a bold, *blinking* green character on a white background could be redefined to be a bold *reversed* white character on a green background.

Selecting a Foreground Color Palette

WYCOLOR **Select foreground color palette** **CSI 48 ; *Ps* w**

where *Ps* is a value from Table 5-6 selecting the foreground color palette

Table 5-6 Foreground Color Palettes

	Base Character Attributes		
Ps	**Normal***	**Dim***	**Bold***
0	White	Charcoal gray	Gray
1	Red	Pale pink	Light purple
2	Blue	Light blue-purple	Electric blue
3	Amber	Orange-brown	Red-orange
4	Intecolor (green)	(Blue)	(White)
5	Black	Gray	Charcoal gray
6	Bright green	Grass green	Green
7	Pale cyan	Turquoise	Cyan

* These names are for convenience of reference in relation to traditional monochrome attributes. The actual colors don't necessarily carry any direct relationship to intensities such as brightness or dimness.

When you select a foreground color palette,

- The previous foreground color palette is overwritten with the new color palette
- All associated attributes are reset to their default definitions in the new foreground color

This command selects the foreground colors for all characters received after the command is executed. Characters already displayed retain their previously defined colors and attributes.

Figure 5-3 illustrates on the color map the effect of sending the command

CSI 48 ; 1 w

to select a red foreground color palette. Each base character attribute is assigned a separate color, which extends to all its associated attributes.

Characters assigned attributes by the SGR command pick up the corresponding foreground color from the color map. For example, sending

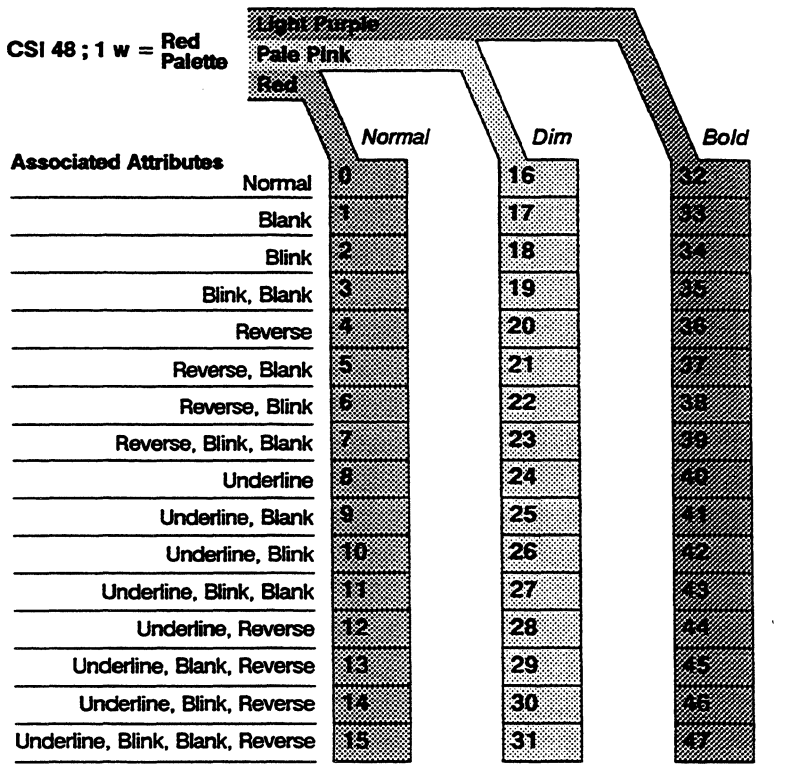
CSI 2 ; 5 m

(assigning dim and blink) displays a pale pink, blinking character (position 18 on the map). Sending

CSI 1 ; 4 ; 25 m

(assigning bold and underline and turning off blink) displays a light purple underlined character (map position 40).

Figure 5-3 Selecting the Foreground Color Palette



Selecting a Background Color

WYCOLOR **Select background color** **CSI 49 ; *Ps* w**

where *Ps* is a value from 0 to 64 from Table 5-7

This command assigns any one of 64 colors to the background of all characters received after the command is executed.

The selected background color also becomes the color of the screen border. (See "Mode-Independent Color Commands" later in this chapter for the WYCOLOR command that allows you to assign a separate color to the border.)

Table 5-7 Color Table*

Ps	Color	*Ps*	Color	*Ps*	Color	*Ps*	Color
0	Default	17	Brick red	34	Rose	51	Magenta
1	Black	18	Violet	35	Medium purple	52	Light purple
2	Dark blue	19	Indigo	36	Purple	53	Red-orange
3	Deep blue	20	Blue-purple	37	Orange brown	54	Pale pink
4	Blue	21	Khaki-green	38	Faded rose	55	Purple pink
5	Grass green	22	Charcoal gray	39	Purple-gray	56	Light violet
6	Teal blue	23	Powder blue	40	Purple-blue	57	Amber
7	Electric blue	24	Medium blue	41	Dull chartreuse	58	Tan
8	Bright blue	25	Medium green	42	Sage green	59	Faded purple
9	Bright green	26	Green-blue	43	Gray	60	Pale purple
10	Light blue-green	27	Blue-gray	44	Light blue-purple	61	Yellow
11	Turquoise	28	Light blue	45	Chartreuse	62	Pale yellow
12	Sky blue	29	Lime green	46	Pale green	63	Cream
13	Green	30	Seafoam green	47	Faded blue-green	64	White
14	Sea green	31	Pale blue-green	48	Pale cyan		
15	Blue-green	32	Light cyan	49	Red		
16	Cyan	33	Deep red	50	Hot pink		

* Color names are for convenience of reference and are not based on any scientific or artistic criteria. The names are intended only as guidelines within a range of colors.

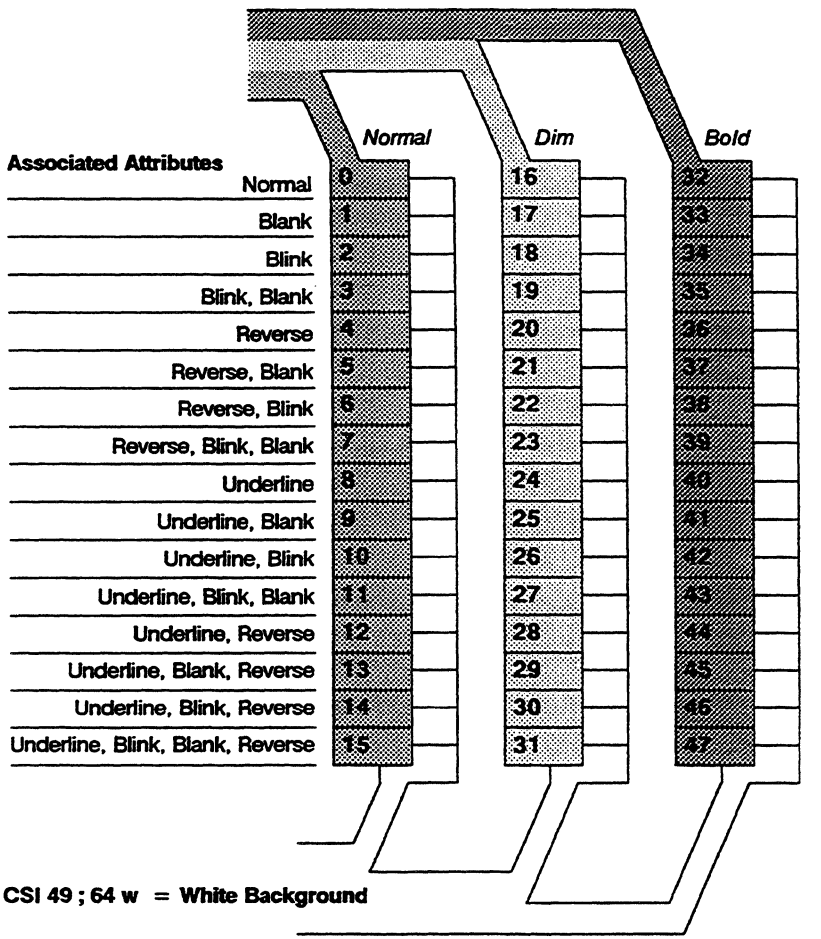
Figure 5-4 illustrates on the color map the effect of sending the command

CSI 49 ; 64 w

to select a white background color. All attribute associations are assigned the same background color.

☐ **Note** This command changes the background color of the characters as they are entered, not the background of the entire screen. Filling the screen with the background color can only be done with a clear command, such as DECSED (see Chapter 8), which is also affected by the setting of the WYREPL functional mode command (see Chapter 2).

Figure 5-4 Selecting a Background Color



Redefining an Attribute Association

WYCAA **Redefine character attribute association** CSI *Ps* ; *Ps1* ; *Ps2* ; *Ps3* w

where *Ps* is a value from 0 through 47 from Table 5-8 that specifies the existing attribute association to be redefined. (These values

correspond to the numbers for the color map positions on the figures illustrating the color map.)

Ps1 is a value from 0 through 64 from Table 5-7 assigning a new foreground color

Ps2 is a value from 0 through 64 from Table 5-7 assigning a new background color

Ps3 is a value from 0 through 15 from Table 5-9 specifying a new definition for the attribute association specified by *Ps*.

This command redefines one of the 48 attribute associations represented on the color map. Only characters subsequently received by the terminal are affected; characters previously displayed remain unchanged.

☐ **Note** If the attributes being redefined (*Ps*) are not currently assigned to characters, you won't see any effect on the screen until you assign them with the SGR command.

Table 5-8 The Attribute Associations

Associated Attribute	Base Character Attribute: Normal *Ps*	Dim *Ps*	Bold *Ps*
Normal (no attributes)	0	16	32
Blank	1	17	33
Blink	2	18	34
Blink and blank	3	19	35
Reverse	4	20	36
Reverse and blank	5	21	37
Reverse and blink	6	22	38
Reverse, blink, and blank	7	23	39
Underline	8	24	40
Underline and blank	9	25	41
Underline and blink	10	26	42
Underline, blank, and blink	11	27	43
Underline and reverse	12	28	44
Underline, blank, and reverse	13	29	45
Underline, blink, and reverse	14	30	46
Underline, blank, blink, and reverse	15	31	47

Table 5-9 Associated Attribute Values

Ps3	**Associated Attribute**	*Ps3*	**Associated Attribute**
0	Normal	8	Underline
1	Blank	9	Blank, underline
2	Blink	10	Blink, underline
3	Blank and blink	11	Blank, blink, and underline
4	Reverse	12	Reverse and underline
5	Blank and reverse	13	Blank, reverse, and underline
6	Blink and reverse	14	Blink, reverse, and underline
7	Blank, blink, and reverse	15	Blank, blink, reverse, and underline

Figure 5-5 shows the result of sending the command

CSI 42 ; 13 ; 63 ; 8 w

where

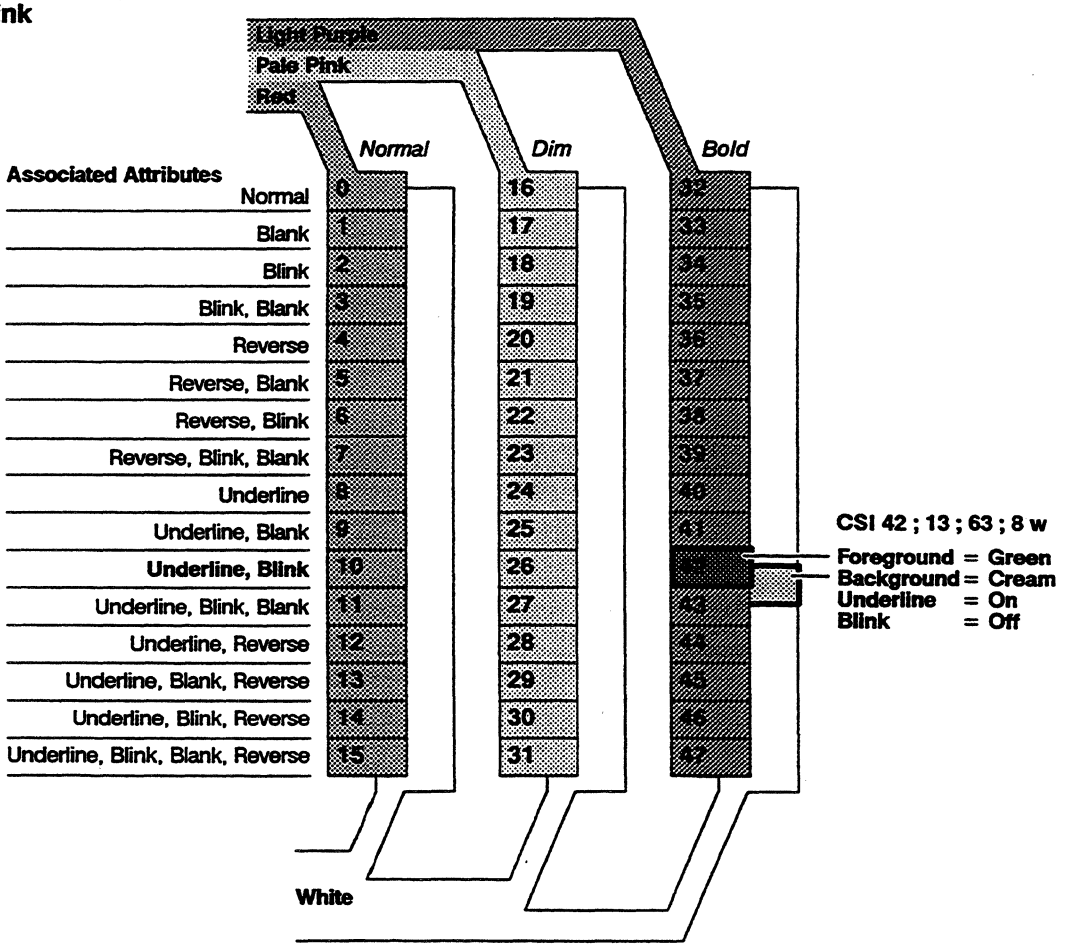
42 from Table 5-8 specifies position 42 on the color map, which consists of a light purple bold base character attribute associated to underline and blinking

13 selects a new foreground color (*green* from Table 5-7) for this attribute association

63 selects a new background color (*cream* from Table 5-7) for this attribute association

8 selects *underline* from Table 5-9, specifying underline only as the new definition of this attribute association (therefore turning off blink)

Figure 5-5 Redefining Bold, Underline, Blink



From now on, formerly light purple underlined, blinking characters on a white background are displayed instead as underlined, nonblinking green characters on a cream background.

The attribute associations are completely independent of one another. The command illustrated in Figure 5-5 has *no effect* on any other attribute associations, including

- Normal (position 10) or dim (position 26) characters associated with underline and blink; they continue to display the palette-assigned colors.
- Any other attribute association for bold characters (color map positions 32 through 47). For example, the command does *not* turn off blink for any other attribute association that has blink "on" (positions 34, 35, 38, 39, 43, 46, and 47); they continue to display their default definitions, which include blink.

Effect of Basic SGR Command in Color Map Mode

The effect of a basic SGR command sequence sent in color map mode depends on the current color map definitions. Attributes are additive, as they normally are with the SGR command. For example, given the color map definitions illustrated in Figures 5-3, 5-4, and 5-5, sending

CSI 0 ; 4 m

would display a red underlined character on a white background (map position 8). If the terminal then received

CSI 7 m

it would reverse the foreground and background colors to display white underlined characters on a red background (map position 12). Subsequently sending

CSI 2 ; 27 m

(turning on dim and turning off reverse) would display pale pink underlined characters on a white background (map position 24).

The following example demonstrates how an SGR command is interpreted if an attribute association has been redefined. Given the color map shown in Figure 5-5, the sequence

CSI 1 ; 5 m

would display light purple blinking characters on a white background (map position 34). If the terminal subsequently received the SGR sequence assigning the underline attribute

CSI 4 m

it would *not display* light purple underlined, blinking characters. Instead, picking up the attribute association representing bold, underlined, blinking characters (map position 42, which has been

redefined), the terminal would display green underlined (nonblinking) characters on a cream background.

Restoring Colors and Attribute Definitions

WYCOLOR — **Restore foreground and background colors to last saved in nonvolatile memory** — **CSI 50 w**

This command restores the foreground color palette and background color last saved in setup mode, resetting the border color to the color of the background.

COLOR EXTENDED SGR MODE

This section describes the use of the extended color parameters of the SGR command. In this mode the terminal is limited to one of eight foreground and eight background colors, which are assigned directly to the current character.

SGR — **Assign character attribute** — **CSI** *Ps* **;** ... **;** *Ps* **m**

where *Ps* is an extended color value from Table 5-10

Table 5-10 SGR Extended Color Values

Ps	Foreground Color: Normal	Foreground Color: Dim[1]	Foreground Color: Bold[2]	Background Color
30	Black	Charcoal gray	Black	
31	Red	Brick red	Hot pink	
32	Green	Pale green	Bright green	
33	Yellow	Pale yellow	Amber	
34	Blue	Light blue	Bright blue	
35	Magenta	Pale pink	Purple pink	
36	Cyan	Pale cyan	Turquoise	
37	White[3]	Gray	White	
40				Black[3]
41				Red
42				Green
43				Yellow
44				Blue
45				Magenta
46				Cyan
47				White

1. When dim attribute is also assigned
2. When bold attribute is also assigned
3. Default

Specifying any of the parameter values in Table 5-10 in an SGR command automatically takes the terminal out of the default color map mode and into color extended SGR mode. In this mode the terminal does not have access to the color map. Instead, the foreground and/or background color of subsequently received characters is set directly to one of eight basic colors.

If the foreground color is not specified, characters are displayed in the default white foreground color; if the background color is not specified, characters are displayed on the default black background.

You can combine the color extended parameter values with any of the other attribute values in the basic SGR command *except the reset parameter (0 = Normal)*. The reset parameter turns off color extended SGR mode and returns the terminal to the default color map mode. This would mean that from then on character colors would revert to the color map definitions.

☐ **Note** The terminal adjusts the foreground color as shown in Table 5-10 when the dim or bold (or normal = 22) parameter is specified in the SGR command.

Examples in Color Extended SGR Mode

The following examples demonstrate the effect of the SGR command in color extended SGR mode.

If you send the command

CSI 34 ; 43 m

the terminal displays subsequently received characters as blue on a yellow background. If you then send

CSI 4 m

the terminal turns on underline, and characters are blue and underlined on a yellow background. If you then send

CSI 2 ; 5 m

the foreground color changes to light blue and blink is turned on, resulting in underlined, blinking, light blue characters on a yellow background.

COLOR DIRECT MODE

In color direct mode you can assign any one of the terminal's 64 colors as the foreground or background color and any one of the associated attributes directly to characters. The terminal does not have access to the color map. There are no distinctions between normal, dim, and bold characters.

WYCDIR **Set current character color and attributes** CSI *Ps* ; *Ps1* ; *Ps2* x

where *Ps* is a value from 0 through 64 from Table 5-7 that selects the foreground color

Ps1 is a value from 0 through 64 from Table 5-7 that selects the background color

Ps2 is a value from 0 through 15 from Table 5-9 that selects the associated attribute

This command always changes the foreground and background color and resets the attributes of characters received by the terminal after the command is executed. If a parameter value is omitted, the default is selected (e.g., the normal attribute).

Examples of Color Direct Mode Commands

Sending the sequence

CSI 19 ; 61 ; 0 x

displays indigo characters on a yellow background. Sending

CSI 19 ; 61 ; 2 x

displays blinking indigo characters on a yellow background. Subsequently sending

CSI 19 ; 61 ; 6 x

adds the reverse attribute to display blinking yellow characters on an indigo background.

Effect of the SGR Command in Color Direct Mode

Sending the SGR command in color direct mode has the following effects:

- Dim and bold parameter values are ignored
- Specifying the reset (0 = Normal) parameter turns off color direct mode and returns the terminal to the default color map mode
- Specifying an extended color parameter turns off color direct mode and puts the terminal in color extended SGR mode
- All other attributes are simply turned on or off as specified

Example of SGR Command in Color Direct Mode

If you had sent the last WYCDIR command given in the previous example

CSI 19 ; 61 ; 6 x

displaying blinking (reversed) yellow characters on an indigo background, the subsequent SGR command

CSI 4 ; 25 m

would turn on underline and turn off blink. Since the reverse attribute is still on, the terminal would display yellow underlined characters on an indigo background.

COLOR INDEX MODE

Color index mode allows you to create your own customized list of numerical values for the terminal's 64 colors and use those values to assign foreground and background colors to characters. You do this by redefining any or all of the number values (0 to 63) in a default color index (Table 5-11).

Table 5-11 Default Color Index

Index Value	Color	Index Value	Color	Index Value	Color	Index Value	Color
0	Black	16	Brick red	32	Deep red	48	Red
1	Dark blue	17	Violet	33	Rose	49	Hot pink
2	Deep blue	18	Indigo	34	Medium purple	50	Magenta
3	Blue	19	Blue-purple	35	Purple	51	Light purple
4	Grass green	20	Khaki-green	36	Orange brown	52	Red-orange
5	Teal blue	21	Charcoal gray	37	Faded rose	53	Pale pink
6	Electric blue	22	Powder blue	38	Purple-gray	54	Purple pink
7	Bright blue	23	Medium blue	39	Purple-blue	55	Light violet
8	Bright green	24	Medium green	40	Dull chartreuse	56	Amber
9	Light blue-green	25	Green-blue	41	Sage green	57	Tan
10	Turquoise	26	Blue-gray	42	Gray	58	Faded purple
11	Sky blue	27	Light blue	43	Light blue-purple	59	Pale purple
12	Green	28	Lime green	44	Chartreuse	60	Yellow
13	Sea green	29	Seafoam green	45	Pale green	61	Pale yellow
14	Blue-green	30	Pale blue-green	46	Faded blue-green	62	Cream
15	Cyan	31	Light cyan	47	Pale cyan	63	White

For example, you might find it convenient to arrange the 64 colors so that those you perceive as dark colors are grouped together within a certain range of index numbers, medium colors in another range, and the lightest colors in another range.

Establishing the Color Index

WYIND **Turn color index mode on/off** **CSI 63 ; *Ps* w**

Ps	Color Index Mode
0	Off
1	On

WYIND **Redefine color index value** **CSI 66 ; *Ps* ; *Ps1* w**

where *Ps* is an index value from Table 5-11 to be redefined

Ps1 is a value from Table 5-7 specifying the new color to be represented by the index value *Ps*

This command changes the color represented by a numerical value in the default color index.

For example, to redefine the index value 35 from Table 5-11 to represent brick red instead of purple, send

CSI 66 ; 35 ; 17 w

where 17 is the value for brick red from Table 5-7. From now on, until you change the value again or restore the default index values, every time 35 is received in one of the color index mode commands described in the next section the color displayed will be brick red, not purple.

WYIND **Restore default color index values** **CSI 60 w**

This command defaults all index values to the color definitions represented in Table 5-11.

Selecting Colors in Color Index Mode

In color index mode the terminal does not have access to the color map. Colors are assigned directly to the current character without distinction between normal, dim, and bold characters.

WYIND **Assign current character foreground color** **CSI 61 ; *Ps* w**

WYIND **Assign current character background color** **CSI 62 ; *Ps* w**

where *Ps* is a value from the color index (see Table 5-11 for defaults)

Issuing either of these commands turns on color index mode if it is not already turned on.

☐ **Note** If you redefine an index value after assigning a color with either of these commands, you don't need to send these commands again to assign the new color. Changing the index value will change the color of subsequent characters immediately.

WYIND **Assign nonerasable character foreground color** **CSI 64 ; *Ps* w**

WYIND **Assign nonerasable character background color** **CSI 65 ; *Ps* w**

where *Ps* is a value from the color index (see Table 5-11 for defaults)

These commands allow you to distinguish between nonerasable and erasable characters (defined by DECSCA) by assigning a separate foreground and/or background color to the nonerasable characters.

Effect of the SGR Command in Color Index Mode

Sending the SGR command in color index mode has the following effects:

- Dim and bold parameter values are ignored
- Color extended parameter values are ignored
- All other attributes are simply turned on or off as specified

☐ **Note** Unlike its effect in color direct or color extended SGR modes, the reset parameter (0 = Normal) does not turn off color index mode; it simply resets all other attributes.

MODE-INDEPENDENT COLOR COMMANDS

This section describes commands that control color regardless of the color mode in effect.

Selecting the Border Color

WYCOLOR **Select border color** **CSI 51 ; *Ps* w**

where *Ps* is a value from 0 through 64 from Table 5-7 selecting the color of the display border

This command allows you to set the color of the border of the screen.

☐ **Note** In color map mode, if you want the border to display a different color from the screen background, you must issue this command *after* you set the background color.

Example
To define the screen's border as dark blue, send

CSI 51 ; 2 w

Selecting the Cursor Color

You can select a color for the cursor so that it stands out from the foreground or background color.

WYCOLOR **Select cursor color** **CSI 52 ; *Ps* w**

where *Ps* is a value from 0 through 64 from Table 5-7 selecting the color of the cursor

Selecting the Top Status Line Colors

WYCOLOR **Select user status line attributes and colors** **CSI 54 ; *Ps* ; *Ps1* ; *Ps2* w**

WYCOLOR **Select system status line attributes and colors** **CSI 55 ; *Ps* ; *Ps1* ; *Ps2* w**

where *Ps* is a value from 0 through 64 from Table 5-7 selecting the foreground color

Ps1 is a value from 0 through 64 from Table 5-7 selecting the background color

Ps2 is a value from 0 through 15 from Table 5-9 selecting the attributes

These commands allow you to select attributes and colors for the user and system status lines.

Selecting Replacement and Nonerasable Character Attributes and Colors

You can select attributes and colors for replacement and nonerasable characters.

WYCOLOR **Select replacement character attributes and colors** **CSI 56 ; *Ps* ; *Ps1* ; *Ps2* ; *Ps3* w**

where *Ps* is a value from 0 through 64 from Table 5-7 selecting the foreground color of the replacement characters.

Ps1 is a value from 0 through 64 from Table 5-7 selecting the background color of the replacement characters.

Ps2 is a value from 0 through 15 from Table 5-9 selecting the attributes for the replacement characters.

Ps3 is a decimal value specifying an ASCII character (from 0 through 255). The default is 32 (SPACE).

This command selects colors and attributes for characters that replace those displayed on the screen. Its effects are evident whenever new lines are scrolled onto the screen or when blank

characters are introduced by the editing commands DCH, DL, ED, DECSED, DECSEL, ECH, EL, IL, and ICH (see Chapter 8).

☐ **Note** The replacement character's background color is affected by the setting of the WYREPL functional mode command (see Table 2-2 in Chapter 2).

WYCOLOR **Select nonerasable character attributes and color** **CSI 57 ; *Ps* ; *Ps2* ; *Ps3* w**

where *Ps* is a value from 0 through 64 from Table 5-7 selecting the foreground color of the nonerasable characters

Ps1 is a value from 0 through 64 from Table 5-7 selecting the background color of the nonerasable characters

Ps2 is a value from 0 through 15 from Table 5-9 selecting the attributes for the nonerasable characters

This command allows you to differentiate nonerasable characters from erasable characters by assigning color and attribute values to the nonerasable characters.

DEFINING LINE ATTRIBUTES

DECDHL
DECSWL
DECDWL
WYDHL

Define line attributes **ESC # *Ps***

where *Ps* specifies the line attribute.

Ps	**Line Attribute**
3	Displays the top half of a double-high, double-wide line (DECDHL).
4	Displays the bottom half of a double-high, double-wide line (DECDHL).
5	Displays a normal single-high, single-wide line (DECSWL)
6	Displays a single-high line with double-wide characters (DECDWL)
:	Displays the top half of a double-high line with single-wide characters (WYDHL)
;	Displays the bottom half of a double-high line with single-wide characters (WYDHL)

To display a line with characters twice as wide as normal,

1 Begin the line with the ESC # 6 escape sequence

2 Enter the line of characters, remembering to enter a maximum of half the number of characters permitted on a normal line

To display a line with characters twice as high as normal,

1 Begin the first line with the ESC # : escape sequence

2 Enter the line of characters

3 Starting in the same column position on the next line, begin the second line with the ESC # ; escape sequence

4 Enter the same line of characters entered in step 2

To display a line with characters twice as wide and twice as high as normal,

1 Begin the first line with the ESC # 3 escape sequence

2 Enter the line of characters, remembering to enter a maximum of half the number of characters permitted on a normal line

3 Starting in the same column position on the next line, begin the second line with the ESC # 4 escape sequence

4 Enter the same line of characters entered in step 2

RELATED FUNCTIONAL MODE COMMANDS

CRM	**Controls mode on**	**Set: CSI 3 h** **Reset: CSI 3 l**
DECOLM	**Column mode**	**Set: CSI ? 3 h** **Reset: CSI ? 3 l**
DECOM	**Origin mode**	**Set: CSI ? 6 h** **Reset: CSI ? 6 l**
DECSCLM	**Scrolling mode**	**Set: CSI ? 4 h** **Reset: CSI ? 4 l**
DECSCNM	**Reverse screen mode**	**Set: CSI ? 5 h** **Reset: CSI ? 5 l**
FEAM	**Control execution disable mode**	**Set: CSI 13 h** **Reset: CSI 13 l**
WY52	**52-line mode**	**Set: CSI ? 83 h** **Reset: CSI ? 83 l**
WY161	**161-column mode**	**Set: CSI ? 80 h** **Reset: CSI ? 80 l**
WYCLRM	**Width change clear disable mode**	**Set: CSI 35 h** **Reset: CSI 35 l**

WYCRTSAVM	**Screen saver mode**	**Set: CSI 32 h** **Reset: CSI 32 l**
WYDSCM	**Display disable mode**	**Set: CSI 30 h** **Reset: CSI 30 l**
WYEXTDM	**Extra data line mode**	**Set: CSI 40 h** **Reset: CSI 40 l**
WYENAT	**Erasable/nonerasable attribute select mode**	**Set: CSI ? 84 h** **Reset: CSI ? 84 l**
WYLINM	**Status line display mode**	**Set: CSI 31 h** **Reset: CSI 31 l**
WYREPL	**Replacement character color mode**	**Set: CSI ? 85 h** **Reset: CSI ? 85 l**

6 Controlling Display Memory

INTRODUCTION

Display memory is the memory in which the terminal stores data. Display memory is divided into *pages* defined in setup mode or by a command sequence (WYDFPG). This chapter describes the commands that allow you to

- Define the page dimensions and the number of pages
- Split the screen to display two pages at the same time and manipulate the data in each page independently
- Address the cursor to another page and control its display
- Adjust the screen display (called *panning*) to see different areas of the page when the page is larger than the screen

SCREEN AND PAGE DISPLAY

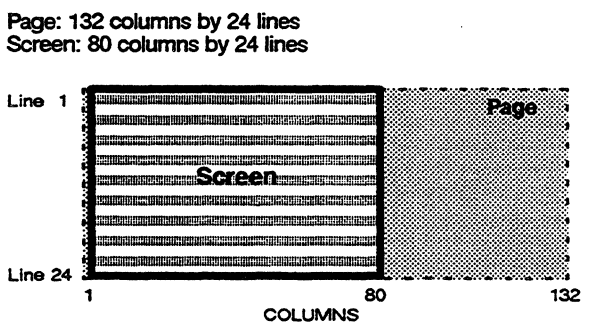
The data area of the screen serves as a *window* into a page of display memory. How much of the data on the page can be viewed on the screen at one time depends on the size of the screen display in relation to the size of the page. A page can have the same line and column dimensions as the screen or it can be larger than the screen; it cannot be smaller than the screen.

☐ **Note** The only situation in which the page could be said to be "smaller" than the screen is when the screen is configured for 132 or 161 columns and then split vertically to display an 80-column page in each window of the split screen.

The screen size is defined in setup mode. The number of data lines displayed on the screen can also be set by the functional mode commands WY52, WY161, and WYEXTDM (see Chapter 2). The page size can be defined in setup mode or by a command sequence (WYDFPG). The terminal's default configuration, illustrated in Figure 6-1, is as follows:

- A single session
- One page of 132 columns and 24 data lines
- A screen size of 80 columns and 24 data lines

Figure 6-1 Default Screen and Page Configuration



Sessions

The data processing activity resulting from the communication between the terminal and a host connected to one of the terminal's ports is called a *session*. In a *single session* the terminal is communicating through only one port. In *dual sessions* the terminal is communicating through two ports with one or more hosts—in effect it becomes two terminals, both of which can receive data and display it on the screen.

In a single session the entire screen can display the data coming from the host, or the data can be displayed on two pages in separate portions of a vertically or horizontally split screen. Each portion of the split screen is called a *window*.

In dual sessions, each session can be displayed on a full screen, one at a time. Or both sessions can be displayed at the same time on the two windows of a horizontally or vertically split screen; in this case the terminal displays a page from each session. Only one session can receive data from the keyboard. The session that is currently receiving data from the keyboard is called the *active session*.

Dual sessions are established by the user in setup mode. The characteristics of each session—such as personality, on-line or local communications mode, status line type, colors, and page and screen configurations—are defined separately. Configuring the terminal for dual sessions in setup mode is described in detail in the *WY-370 User's Guide*.

☐ **Note** Selecting dual sessions clears all existing softfonts, and a font loaded in one session overwrites the last font loaded by either session.

Table 6-1 summarizes the local keyboard commands that control sessions, pages, and the windows of a split screen.

Table 6-1 Local Keyboard Commands

Command	Keyboard Style: 105-Key ANSI	ASCII	Enhanced PC
Display next page	Ctrl Shift Next Scrn	Ctrl Next Page	Ctrl Page Down
Display previous page	Ctrl Shift Prev Scrn	Ctrl Prev Page	Ctrl Page Up
Activate other session	F4	Ctrl Shift Setup	Ctrl End
Select dual-session screen format	Ctrl F4	Ctrl Shift - *kpd*	Ctrl Shift - *kpd*
Activate other window*	Ctrl Shift F4	Ctrl Shift . *kpd*	Ctrl Shift + *kpd*
Move split point left (vertical split) or up (horizontal split)	Ctrl - *kpd*	Ctrl - *kpd*	Ctrl - *kpd*
Move split point right (vertical split) or down (horizontal split)	Ctrl . *kpd*	Ctrl . *kpd*	Ctrl + *kpd*
Toggle to other user-defined key buffer, if both are attached to active session	Ctrl Select	Ctrl Home	Ctrl Home

* Command is effective whether the windows are displaying two sessions or two pages from the same session.

CONTROLLING PAGES AND WINDOWS

The command sequences described in this section allow your program to

- Define the number and size of the pages for a session
- Split the screen, horizontally or vertically, to display two pages *of a single session*
- Activate the page in either window *of a single session*
- Manipulate the size of the windows of a split screen (whether the windows are displaying two pages of a single session or displaying two sessions)

Defining Pages

The WYDFPG command defines the number of pages and the number of lines and columns in a page for a session. The validity of certain combinations of page size and number of pages depends on (1) whether the terminal is operating a single session or dual sessions; (2) whether additional memory has been added to the terminal. These considerations are discussed in the section entitled "Valid Page Configurations" later in this chapter.

WYDFPG **Define page for session** **CSI 59 ;** *Ps* **;** *Ps1* **;** *Ps2* **;** *Ps3* **w**

where *Ps* selects the number of pages for a session. The terminal's standard memory can be divided into a maximum of three (*total*) pages. Four pages *per session* are available when additional memory has been installed.

Ps	**Number of Pages**
0 or 1	1 (default)
2	2
3	3
4	4

Ps1 selects the number of columns in the page.

Ps1	**Number of Columns**
0	80
1	132 (default)
2	161

Ps2 defines the basic configuration of page lines on which the total number of lines in the page is based (when multiplied by the *Ps3* multiplier)

Ps2	**Page Lines Definition**
0	24/25 (default)
1	50/51

Ps3 is the page lines multiplier; a multiplier of 4 is valid only if additional memory has been installed in the terminal.

Ps3	**Page Lines Multiplier**
0	1 (default)
1	2
2	4

Table 6-2 lists the total number of lines in the page that result from multiplying the page lines definition (*Ps2*) by the page lines multiplier (*Ps3*).

Table 6-2 Total Lines in Page

Page Lines Definition	Total Lines (x1)	(x2)	(x4)
24/25	24 (or 25*)	50	100
50/51	50 (or 51*)	102	204

* Displayed only when the extra data line has been enabled in setup mode or with the WYEXTDM functional mode command.

Executing the WYDFPG command

- Clears all pages
- Forces the screen size to 24 lines by 80 columns
- Restores a full screen if the screen has been split between two pages of a single session
- Does not remove the split from a screen split between sessions

Examples of Page Definition

To define one page of 50 lines and 80 columns so that the user can pan vertically through one long page on a 24-line, 80-column screen, send

CSI 59 ; 1 ; 0 ; 0 ; 1 w

where 1 selects one page; 1 selects 80 columns; 0 selects a page lines definition of 24/25 lines; 1 is a multiplier of 2.

The same amount of display memory can be configured as two 24- or 25-line, 80-column pages

CSI 59 ; 2 ; 0 ; 0 ; 0 w

that can either be displayed one at a time on a full 24- or 25-line, 80-column screen, or displayed

- side by side on a vertically split screen
- one above the other on a horizontally split screen

If the screen is split vertically, the first 40 columns of page 1 are displayed on the left side of the screen, and the first 39 columns of page 2 are displayed on the right side of the screen. The data on the remaining portion of either page can be viewed by panning horizontally (see "Panning" later in this chapter).

☐ **Note** One column is taken up by the vertical band that separates the two windows of the split screen. There is no visible separator when the screen is split horizontally.

If the screen is split horizontally, 12 lines of page 1 are displayed in the top window, and 12 (or 13) lines of page 2 are displayed in the bottom window. The remaining lines in each page can be viewed by panning vertically.

You can define three pages having 24 or 25 lines and 80 columns by sending

CSI 59 ; 3 ; 0 ; 0 ; 0 w

or one 50-line, 132-column page by sending

CSI 59 ; 1 ; 1 ; 1 ; 0 w

☐ **Note** The terminal's standard amount of display memory cannot accommodate more than one 50-line page. The page can be either 80- or 132-columns. One 161-column page is also possible with standard memory as long as it has no more than 24 or 25 lines.

Valid Page Configurations

Table 6-3 provides a guide to valid combinations of page size and number of pages. The numerical values in the table represent the approximate amount of memory used by the various combinations of page lines, page columns, and number of pages. Making full use of the table requires that you know whether or not additional memory has been added to the terminal.

Table 6-3 Page Configuration Values[1]

Page Lines	Page Columns	Number of Pages 1	2	3	4
24/25	80	2000	4000	6000	8000
	132	3300	6600	9900	13200
	161	4025	8050	12075	16100
50/51[2]	80	4080	8160	12240	16320
	132	6732	13464	20196	26928
	161	8211	16422	24633	
100	80	8000	16000	24000	
	132	13200	26400		
	161	16100			
102	80	8160	16320	24480	
	132	13464	26928		
	161	16422			

1. A blank in any column means the combination is not allowed.
2. Also the total number of lines when the page is 24/25 lines and the page multiplier is 2.

Table 6-3 Page Configuration Values[1], Continued

Page Lines	Page Columns	Number of Pages 1	2	3	4
204	80	16320			
	132	26928			
	161				

With the terminal's *standard memory*, page configurations are valid if the value in Table 6-3 does not exceed

- 7012 when the terminal is running a single session
- 6392 when the terminal is running dual sessions

With *expanded memory*, page configurations are valid if the value in Table 6-3 does not exceed

- 31588 when the terminal is running a single session
- 30968 when the terminal is running dual sessions

To calculate how many pages you can define in each situation and how big each of those pages can be,

1 Find the page dimensions in the first two columns (Page Lines and Page Columns) of Table 6-3.

2 Read across to find the value in the applicable column under Number of Pages. This is the value for one session.

3 If you are planning for dual sessions, add the total values from step 2 together.

Controlling the Windows

WYSSPLT **Split screen between pages** **CSI *Ps* v**

where *Ps* selects the type of split, if any

Ps	Type of Split
0	No split (full screen)
1	Horizontal split between two pages
2	Vertical split between two pages

This command splits the screen between two pages of the same session. In dual sessions, the command is ignored if the screen is already split between sessions.

WYSWDW **Activate other window (single session)** **CSI *Ps* w**

where *Ps* selects one of the windows of a split screen displaying two pages of a single session

Ps	**Window**
0 or 1	Left or upper window
2	Right or lower window

When the terminal is running a single session, and the screen is split between two pages, this control sequence determines which is the active data page (the page connected to the keyboard and displaying the cursor).

☐ **Note** This command cannot activate the other window when the terminal is operating dual sessions. The other session can be selected only by a local keyboard command.

WYMSPLM **Move split** **CSI *Ps* ; *Pn* y**

where *Ps* selects the direction the split in the screen will move (depending on the type of split)

Ps	**Direction**
0	Up or left
1	Down or right

Pn specifies the number of lines to move the split on a horizontally split screen or the number of columns to move the split on a vertically split screen

This control sequence moves the split point to enlarge one window and shrink the other by the specified number of lines or columns. At least one line or column always remains in the smaller window.

The command moves a split between sessions as well as a split between pages of a single session.

ADDRESSING THE CURSOR IN MULTIPLE PAGES

The commands in this section address the cursor to other pages (when more than one page is defined) and control its position and display. The commands are governed by the following principles:

- You can position the cursor on the new page in one of two ways:
  - *Transfer* the cursor to the same line and column coordinates that define its position on the current page
  - *Save* the cursor to the position it last occupied on the page to which it's addressed
- Whether the new page is displayed or not depends on the status of *page coupling*, as defined in setup mode or by the DECPCCM functional mode command:

  - If page coupling is off (DECPCCM reset) the new page is not displayed and the cursor is not visible. Data can be entered at the hidden cursor position.
  - If page coupling is on (DECPCCM set), the new page is displayed and the cursor remains visible. This is the default.
- A command to move the cursor to a following page is ignored if the cursor is already on the last page; likewise, any command to move the cursor to a preceding page is ignored if the cursor is already on the first page.

NP **Home cursor on a following page** **CSI *Pn* U**

where *Pn* is the number of pages forward (a value of either 0 or 1 moves the cursor to the next page)

PP **Home cursor on a preceding page** **CSI *Pn* V**

where *Pn* is the number of pages backward (a value of either 0 or 1 moves the cursor to the previous page)

PPA
WYPPA **Address cursor to a specific page** **CSI *Pn* ; *Ps* SPACE P**

where *Pn* is the number of the page to be displayed (a value of either 0 or 1 displays page 1)

Ps defines the cursor position on the new page

Ps	**Define Cursor Position**
0	Transfer cursor
1	Save cursor

PPR
WYPPR **Display a following page** **CSI *Pn* ; *Ps* SPACE Q**

where *Pn* is the number of pages forward (a value of either 0 or 1 displays the next page)

Ps defines the cursor position on the new page

Ps	**Define Cursor Position**
0	Transfer cursor
1	Save cursor

PPB
WYPPB **Display a preceding page** **CSI *Pn* ; *Ps* SPACE R**

where *Pn* is the number of pages backward (a value of either 0 or 1 displays the previous page)

Ps defines the cursor position on the new page

Ps	**Define Cursor Position**
0	Transfer cursor
1	Save cursor

PANNING

Panning lets the user view data on a page that is larger than the full-screen or split-screen window that is displaying the page. Panning is different from scrolling:

- In scrolling, you can think of a screen window fixed in position while the data on the page flows up or down relative to the window. Data that scrolls beyond the top or bottom of the page is lost from display memory.
- In panning, you can think of the page of data as fixed in position while the screen window moves up or down or side to side to frame different portions of the data on the page. Panning has no effect on the data.

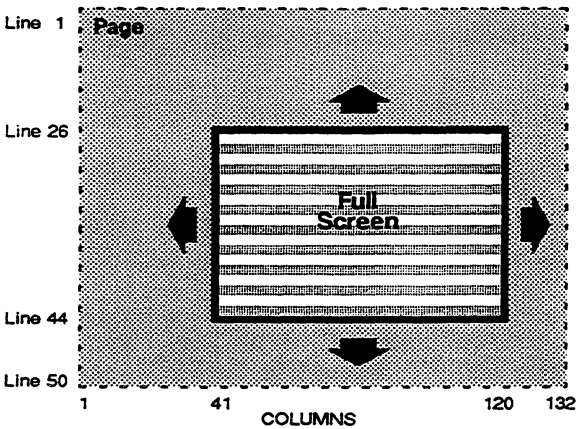
Figure 6-2 illustrates horizontal and vertical panning.

☐ **Note** The Horizontal Windowing setup parameter must be set to *on* for horizontal panning to occur. When Horizontal Windowing is off, the cursor cannot move beyond the right or left edge of the window. The default setting is *off*.

Figure 6-2 Horizontal and Vertical Panning

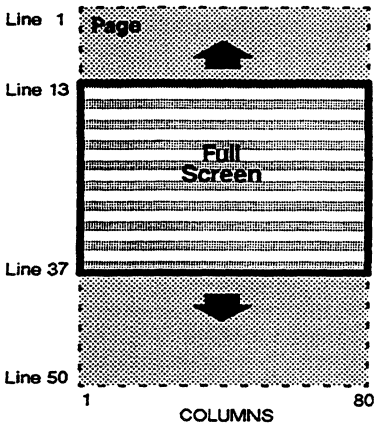
Horizontal and Vertical Panning

Page: 132 columns by 50 lines
Screen: 80 columns by 25 lines



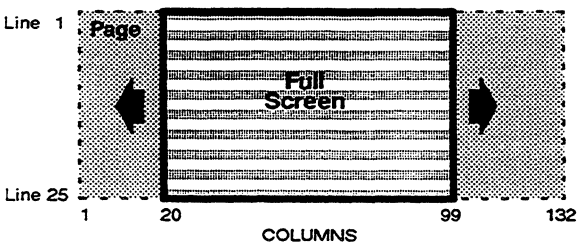
Vertical Panning

Page: 80 columns by 50 lines
Screen: 80 columns by 25 lines



Horizontal Panning

Page: 132 columns by 25 lines
Screen: 80 columns by 25 lines



Horizontal Panning of a Window

Page: 132 columns by 25 lines
Screen: 80 columns by 25 lines
Window: 40 columns by 25 lines

Table 6-4 summarizes the functional mode commands that enable or disable horizontal and vertical panning.

Table 6-4 Panning Commands

Command	Effect	Sequence
DECHCCM*	Pan horizontally, keep cursor in view (default)	CSI ? 60 h
DECHCCM*	Let cursor disappear beyond left or right margin	CSI ? 60 l
DECVCCM	Pan vertically, keep cursor in view (default)	CSI ? 61 h
DECVCCM	Let cursor disappear beyond top or bottom margin	CSI ? 61 l

* Horizontal windowing must be on in setup mode.

Effect of Setup Parameters

The following setup parameters allow the user to control panning, scrolling, and related page and screen functions from the Display menu in setup mode (Display Functions submenu):

- Autopage: When Autopage is *off*, the cursor cannot advance to the previous or next page. When Autopage is *on* and the cursor moves past the top or bottom of the page, the cursor goes to the previous or next page. (The default is *off*.)
- Page Coupling: When Page Coupling is *on* and the cursor moves to another page, the window displays the page where the cursor is located. When Page Coupling is *off* and the cursor moves to another page, the present page continues to be displayed in the window and the cursor is not visible. (The default is *on*.)

☐ **Note** The Page Coupling parameter also controls the effect of the next-page and previous-page keyboard commands.

- Horizontal Windowing: When Horizontal Windowing is *off*, the cursor isn't allowed to move past the right or left edge of data displayed in the window, even if the page contains additional data columns. When Horizontal Windowing is *on*, the cursor can move right or left to the limit of the page. (The default is *off*.)
- Horizontal Panning: When Horizontal Panning is *on* (which requires Horizontal Windowing to be *on*) and the cursor moves beyond the right or left of the data displayed in the window, the display adjusts to keep the cursor visible in the window. When

Horizontal Panning is *off* and the cursor moves beyond the data displayed in the window (which requires Horizontal Windowing to be *on*), the cursor won't be visible, although its off-screen position is reported on the user status line. (The default is *on*.)

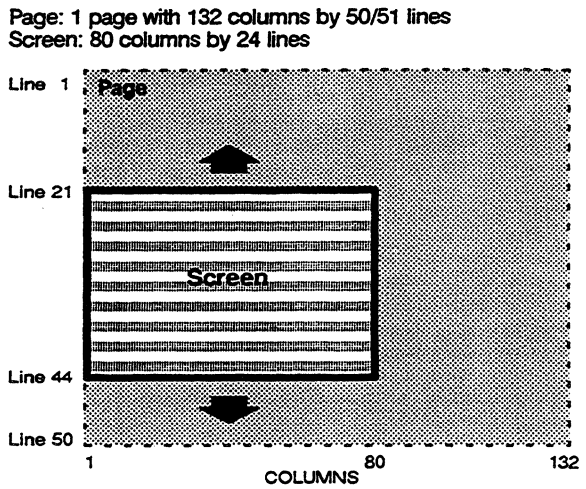
- Horizontal Panning Count: The value specified for Horizontal Panning Count is effective only if Horizontal Panning and Horizontal Windowing are *on*. This value can be set to *1*, *2*, or *4*, which determines how many columns of characters move into the window when the cursor moves one space beyond the window's right or left edge. (The default is *1*.)
- Vertical Autoscroll: When Vertical Autoscroll is *off*, the cursor cannot advance beyond the top or bottom of the current page. When Vertical Autoscroll is *on* and the cursor is located on the first or last line of the page,
  - The cursor can move up or down a line, which causes a new line to be inserted at the top or bottom of the page (respectively).
  - At the same time, the line of data at the bottom or top of the page (respectively) scrolls off the page.

  Keep in mind that *scrolling*—not *panning*—is involved here, so the cursor's movement can cause the lines of data to disappear from display memory. (The default is *off*.)
- Vertical Panning: When Vertical Panning is *on* and the number of lines on the page is greater than the number of lines on the screen and the cursor moves beyond the top or bottom of the data displayed in the window, the display adjusts to keep the cursor visible in the window. When Vertical Panning is *off* and the cursor moves beyond the data displayed in the window, the cursor won't be visible, although its off-screen position is reported on the user status line. (The default is *on*.)

Example of Panning Defaults

Figure 6-3 shows vertical panning in a 50-line, 132-column page displayed on a 24-line by 80-column screen.

Figure 6-3 Panning Defaults



When the setup parameters on the Display Functions submenu are unchanged from their default settings, the following conditions are in effect for the page and screen illustrated in Figure 6-3:

- The cursor cannot advance beyond column 80 on the right edge of the screen; therefore, no horizontal panning can occur (Horizontal Windowing *off*).
- The display pans to show each additional line on the screen as the cursor moves past line 24 toward the bottom line of the page (Vertical Panning *on*).
- When the cursor reaches the last position on the bottom line of the page, it can't go farther; no new blank lines are introduced that would cause data to scroll off the top of the page (Vertical Autoscrolling *off*).
- If the cursor moves upward in the page, the display again pans to keep the cursor in view (Vertical Panning *on*). When the cursor reaches the top line of the page, no new blank lines are introduced that would cause data to scroll off the bottom of the page (Vertical Autoscrolling *off*).

☐ **Note** In this example, the Autopage and Page Coupling setup parameters don't apply, because only one page is defined. When more than one page is defined, the default *off* setting of the Autopage parameter means that the cursor does not advance to

another page when it reaches the top or bottom of the current page.

RELATED FUNCTIONAL MODE COMMANDS

DECCOLM	**132-column mode**	**Set: CSI ? 3 h** **Reset: CSI ? 3 l**
DECHCCM	**Horizontal panning mode**	**Set: CSI ? 60 h** **Reset: CSI ? 60 l**
DECPCCM	**Page coupling mode**	**Set: CSI ? 64 h** **Reset: CSI ? 64 l**
DECVCCM	**Vertical panning mode**	**Set: CSI ? 61 h** **Reset: CSI ? 61 l**
WY52	**52-line mode**	**Set: CSI ? 83 h** **Reset: CSI ? 83 l**
WY161	**161-column mode**	**Set: CSI ? 80 h** **Reset: CSI ? 80 l**
WYEXTDM	**Extra data line mode**	**Set: CSI 40 h** **Reset: CSI 40 l**

7 Controlling the Cursor

CURSOR MOVEMENT COMMANDS

You can move the cursor to any screen location, either from the keyboard or from your program, with the specific control or escape sequences described in this chapter.

☐ **Note** Cursor movement commands related to paging functions (NP, PP, PPA, PPB, and PPR) are described in Chapter 6.

CHA
HPA

Move cursor to specified column — **CSI *Pn* G** or **CSI *Pn* `**

where *Pn* is the column number. Default is column 1.

This command moves the cursor to a column on the current line or to the end of the line if the column value exceeds the number of columns between the cursor and the end of the line. The cursor does not wrap to the next line.

CUU

Move cursor up — **CSI *Pn* A**

where *Pn* is the number of lines the cursor moves up. Default is one line.

This command moves the cursor up a specified number of lines in the current column. If the number of lines exceeds the top margin, the cursor stops at the top line.

CUD
VPR

Move cursor down — **CSI *Pn* B** or **CSI *Pn* e**

where *Pn* is the number of lines the cursor moves down. Default is one line.

This command moves the cursor down a specified number of lines in the current column. If the number of lines exceeds the bottom margin, the cursor stops on the bottom line.

CUF **Move cursor right** **CSI *Pn* C**
HPR **or CSI *Pn* a**

where *Pn* is the number of columns the cursor moves to the right of its current position. Default is one column.

If the *Pn* value exceeds the number of columns to the right, the cursor remains at the end of the line and does not wrap to the next line.

CUB **Move cursor left** **CSI *Pn* D**

where *Pn* is the number of columns the cursor moves to the left of its current position. Default is one column.

If the *Pn* value exceeds the number of columns to the left, the cursor remains at the left margin.

VPA **Move cursor to specified line** **CSI *Pn* d**

where *Pn* is the line number. Default is line 1.

This command moves the cursor to a specified line in the current column, or to the top or bottom line if the specified line is outside the boundaries of the display.

CUP **Move cursor to specified line and column** **CSI *Pn* ; *Pn1* H**
HVP **CSI *Pn* ; *Pn1* f**

where *Pn* is the line number. If *Pn* is 0 or 1, the cursor moves to the first line.

Pn1 is the column number. If *Pn1* is 0 or 1, the cursor moves to the first column.

If you omit *Pn*, the cursor defaults to line 1; if you omit *Pn1*, the cursor defaults to column 1.

IND **Move cursor down one line in current column** **ESC D**
or IND

This command moves the cursor down one line in the current column. If the cursor is at the bottom line of the scrolling region, the display scrolls up one line and the cursor moves to the new bottom line.

LF **Move cursor down** **CTRL J**
VT **or CTRL K**
FF **or CTRL L**

These commands move the cursor down one line in the current column. A carriage return (CR) is executed if newline mode (LNM) is set or if the Received LF setup parameter is set to CRLF.

RI **Move cursor up one line** **ESC M or RI**

This command moves the cursor up one line in the current column. If the cursor is at the top of the scrolling region, the display scrolls down one line and the cursor moves to the new top line.

NEL **Move cursor down one line and to column 1** **ESC E or NEL**

This command moves the cursor to the first column position on the next line. If the cursor is at the bottom line of the scrolling region, the display scrolls up one line and the cursor moves to the first position on the new bottom line.

CNL **Move cursor down and to column 1** **CSI *Pn* E**

where *Pn* is the number of lines the cursor moves down. Default is one line.

This command moves the cursor to column 1 and down a specified number of lines. If the number of lines exceeds the bottom margin, the cursor remains on the bottom line; the display does not scroll.

CPL **Move cursor up and to column 1** **CSI *Pn* F**

where *Pn* is the number of lines the cursor moves up. Default is one line.

This command moves the cursor to column 1 and up a specified number of lines. If the number of lines exceeds the top margin, the cursor remains on the top line; the display does not scroll.

BS **Backspace cursor** **CTRL H**

This command moves the cursor one column to the left on the current line. When the start of the line is reached, the cursor stops.

HT **Tab cursor** **CTRL I**

This commands moves the cursor to the next tab stop or to the end of the line; the cursor doesn't wrap to the next line.

CR **Move cursor to start of line (carriage return)** **CTRL M**

This command moves the cursor to the start of the same line. If the Received CR setup parameter is set to CRLF, a linefeed (LF) is also executed.

RELATED FUNCTIONAL MODE COMMANDS

DECAWM	**Autowrap mode**	**Set: CSI ? 7 h** **Reset: CSI ? 7 l**
DECHCCM	**Horizontal panning mode**	**Set: CSI 60 h** **Reset: CSI 60 l**
DECPCCM	**Page coupling mode**	**Set: CSI ? 64 h** **Reset: CSI ? 64 l**
DECTCEM	**Text cursor enable mode**	**Set: CSI ? 25 h** **Reset: CSI ? 25 l**
DECVCCM	**Vertical panning mode**	**Set: CSI ? 61 h** **Reset: CSI ? 61 l**
LNM	**Newline mode**	**Set: CSI 20 h** **Reset: CSI 20 l**
TTM	**Transfer termination mode**	**Set: CSI 16 h** **Reset: CSI 16 l**
WYSTCURM	**Steady cursor mode**	**Set: CSI 33 h** **Reset: CSI 33 l**
WYULCURM	**Underline cursor mode**	**Set: CSI 34 h** **Reset: CSI 34 l**

8 Editing

EDITING FUNCTIONS

The editing functions described in this chapter include commands that erase, insert, and delete characters, control tab settings, and define a rectangular area within a page (draw/clear box).

ERASING, INSERTING, DELETING

Issuing erase, insert, or delete commands results in the addition of blank characters or lines of blank characters to the existing data. These characters are called *replacement characters*.

Replacement Characters

By default, replacement characters are space characters. Other replacement characters can be specified in their place, and/or separate colors and display attributes can be assigned to distinguish the replacement characters from text data:

- A WYCOLOR command assigns colors and attributes to replacement characters and allows you to specify another ASCII character in place of the default space character. This command is described in Chapter 5 in the section, "Selecting Replacement and Nonerasable Character Attributes and Colors."
- If no WYCOLOR command has been sent to change the color of the replacement characters, the WYREPL functional mode command (Chapter 2) determines their background color. If WYREPL is reset (default), replacement characters are displayed in the background color assigned by the color map. If WYREPL is set, replacement characters are displayed in the background color most recently assigned to the current character.

Erasing

You can erase a specified number of characters, starting at the cursor position (ECH), erase all characters in specified areas of the display (ED), or erase all characters in specified portions of a line (EL). Or you can use the equivalent *selective erase* commands DECSED or DECSEL to erase only those characters defined as erasable by the DECSCA command (described in Chapter 5).

In all these commands the erased characters are replaced by space characters unless the replacement character is otherwise defined (WYCOLOR).

ECH **Erase specified number of characters** **CSI *Pn* X**

where *Pn* is the number of characters to be erased, starting at the cursor position

ED **Erase in display** **CSI *Ps* J**

where *Ps* is the parameter selecting the area of the display to erase.

Ps	**Display Area**
0	Erases all characters and character attributes from the cursor position to the end of the display; also erases line attributes except for current cursor line (Default)
1	Erases all characters and character attributes from the first position of the display area through the cursor position; also erases line attributes except for current cursor line
2	Erases the entire display (characters, character attributes, line attributes)

DECSED **Erase erasable characters in display** **CSI ? *Ps* J**

where *Ps* is the parameter selecting the area of the display in which to erase the erasable characters

Ps	**Display Area**
0	Erases all erasable characters from the cursor position to the end of the display; also erases line attributes except for current cursor line. (Default)
1	Erases all erasable characters from the first position of the display area through the cursor position; also erases line attributes except for current cursor line.
2	Erases all erasable characters.

Erasable characters are characters that have been assigned the erasable character attribute (DECSCA). If DECSCA has not been issued, this command erases all characters in the selected area of the display.

EL **Erase in line** **CSI *Ps* K**

where *Ps* is the parameter selecting the portion of the line to erase

Ps	Line Area
0	Erases all characters and character attributes from the cursor position to the end of the line (Default)
1	Erases all characters and character attributes from the start of the line through the cursor position
2	Erases the entire line (characters and character attributes)

This command does not erase line attributes.

DECSEL **Erase erasable characters in line** **CSI ? *Ps* K**

where *Ps* is the parameter selecting the portion of the line in which to erase the erasable characters

Ps	Line Area
0	Erases all erasable characters from the cursor position to the end of the line (Default)
1	Erases all erasable characters from the start of the line through the cursor position
2	Erases all erasable characters from the entire line

Erasable characters are characters that have been assigned the erasable character attribute (DECSCA). If DECSCA has not been issued, this command erases all characters in the specified portion of the line.

This command does not erase line attributes.

Inserting

ICH **Insert specified number of blank characters** **CSI *Pn* @**

where *Pn* is the number of blank characters to be inserted, starting at the cursor position

This command inserts the specified number of characters to the right of the cursor, starting at the cursor position. The effect on existing data is controlled by the setting of the Page Edit parameter in setup mode:

- When Page Edit is set to *line*, data that moves beyond the end of the line is lost from display memory. This is the default.
- When Page Edit is set to *page*, the data wraps to the next line; only data that moves past the bottom of the page is lost.

IL **Insert specified number of blank lines** **CSI *Pn* L**

where *Pn* is the number of blank lines to be inserted, starting at the line on which the cursor is positioned

This command inserts the specified number of blank lines, starting at the cursor line; lines that scroll off the bottom of the page are lost.

Deleting

DCH **Delete specified number of characters** **CSI *Pn* P**

where *Pn* is the number of characters to be deleted, starting at the cursor position

This command deletes the specified number of characters to the right of the cursor. The effect on existing data depends on the setting of the Page Edit parameter in setup mode:

- When Page Edit is set to *line*, blank characters are added at the end of the line. This is the default.
- When Page Edit is set to *page*, data wraps up to fill the line, and blank characters are added at the end of the page.

DL **Delete specified number of lines** **CSI *Pn* M**

where *Pn* is the number of lines to be deleted, starting from and including the line on which the cursor is positioned

This command deletes the specified number of lines, starting with the cursor line, adding blank lines at the bottom of the page.

CONTROLLING TABS

TBC
CTC **Clear tab stop** **CSI 0 g or CSI 2 W**

These commands clear the tab stop at the cursor position.

TBC
CTC **Clear all tabs** **CSI 3 g or CSI 5 W**

These commands clear all tab stops.

CTC
HTS **Set tab stop at cursor** **CSI 0 W or ESC H**

These commands set a tab stop at the cursor position.

CTC **Set tab every eighth column** **CSI ? 5 W**

This command sets a tab stop every eight columns, beginning at column 9 (9, 17, 25, and so on).

CHT		**Tab forward**	**CSI** *Pn* **I**
	where	*Pn* is the number of tab stops	
HT		**Tab forward one tab stop**	**CTRL I**
CBT		**Tab backward**	**CSI** *Pn* **Z**
	where	*Pn* is the number of tab stops	

DRAWING OR CLEARING A BOX

WYDRBX		**Draw a box**	**CSI** *Ps* **;** *Pn* **;** *Pn1* **p**
WYCLBX		**Clear a box**	**CSI** *Ps* **;** *Pn* **;** *Pn1* **o**

where *Ps* determines whether the values for the next two parameters, which specify the height (*Pn*) and width (*Pn1*) of the box, are based on an offset from the cursor position or on a real address:

Ps	**Address Type**
0	Offset (from cursor position) *Pn* Number of lines down from cursor position (vertical offset) *Pn1* Number of columns to right of cursor (horizontal offset)
1	Real (line and column coordinates)
Pn	Line number of vertically opposite corner *Pn1* Column number of horizontally opposite corner

These two commands have the same parameters for defining a rectangular area within a page: If *Ps* = 0, the box extends to the right and down from the cursor position; if *Ps* = 1, the box can extend in any direction from the cursor position. The difference between the two commands is that the WYDRBX command draws a box (border) around the specified area of the page without clearing the data within the box; the WYCLBX command clears the data in the specified area but does not draw the border around it.

☐ **Note** Draw and clear box commands use the current erasable or nonerasable character colors and attributes.

If the box defined by *Pn* and *Pn1* is larger than the page, the commands are still executed; the size of the box is just limited by the page boundaries.

Figure 8-1 illustrates two boxes in a page on which the cursor is positioned at line 5, column 43 when the commands in the following examples are sent. The first example draws a box using

an offset address to define the area of the box; the second example subsequently clears a box using a real address (line and column coordinates).

1 Sending the WYDRBX command

CSI 0 ; 9 ; 9 p

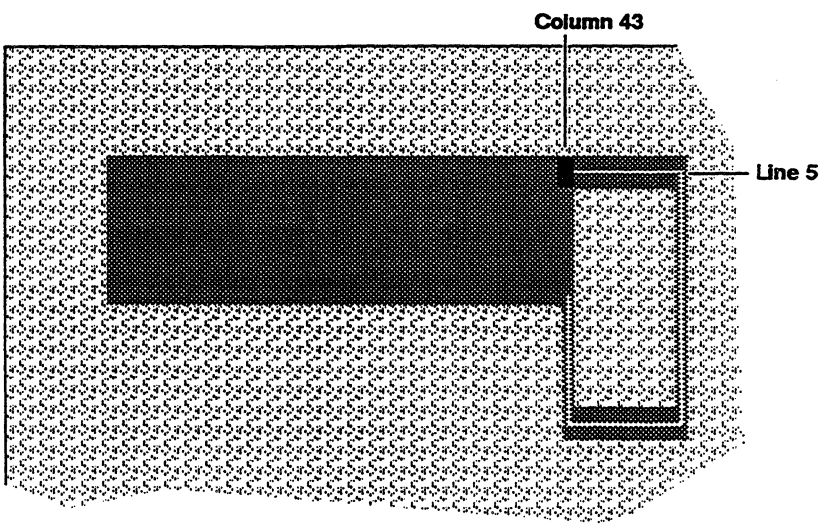
draws a rectangle that extends 9 lines down from the cursor position (from line 5 to line 14) and 9 columns to the right of the cursor (from column 43 to column 52).

2 Sending the WYCLBX command

CSI 1 ; 9 ; 9 o

clears a rectangular area 4 lines high (extending down from line 5 to line 9) and 34 columns wide (extending to the left from column 43 to column 9).

Figure 8-1 Drawing and Clearing a Box



RELATED FUNCTIONAL MODE COMMANDS

DECAWM	**Autowrap mode**	**Set: CSI ? 7 h** **Reset: CSI ? 7 l**
DECCOLM	**132 column mode**	**Set: CSI ? 3 h** **Reset: CSI ? 3 l**
DECOM	**Origin mode**	**Set: CSI ? 6 h** **Reset: CSI ? 6 l**
DECSCLM	**Scrolling mode**	**Set: CSI ? 4 h** **Reset: CSI ? 4 l**
IRM	**Insert/replace mode**	**Set: CSI 4 h** **Reset: CSI 4 l**

9 Sending Data

INTRODUCTION

This chapter describes the commands for data transmission to the host and printer.

TRANSMISSION TO THE HOST OR AUXILIARY PORT

MC **Copy** **CSI *Ps* i**

where *Ps* is the parameter selecting the transmission function defined in Table 9-1.

Table 9-1 Transmission Functions

Ps	Function
0	Print page. Copies data on the current page to the printer port, inserting the commands and characters described in Table 9-2.
2	Send page. Copies data on the current page to the host port.
4	Disable controller (transparent) print. The terminal processes data received from the host port but does not send it to the printer port.
5	Enable controller (transparent) print. The terminal sends data received from the host port directly to the printer port without processing. The terminal ignores all embedded commands except copy command CSI 4 i.
6	Disable printer port receive; data received from the printer port is ignored.
7	Enable printer port receive; data received from the printer port is sent directly to the host port.

Table 9-1 Transmission Functions, Continued

Ps	Function
? 1	Print line. Copies data on the current line to the printer port.
? 3	Send line. Copies data on the current line to the host port.
? 4	Disable autoprint (copy print) mode. Data received from the host port is not sent to the printer port.
? 5	Enable autoprint (copy print). Each line of data received from the host port is displayed on the screen and sent to the printer port whenever the cursor moves off the line (when autowrap mode is on [DECAWM] or in response to a linefeed command [LF, FF, VT]). Each line is terminated by a carriage return (CR) plus the character that caused the cursor movement (LF is sent when autowrap occurs). The terminal executes embedded commands and does not send them to the printer port.

MC **Send host data to Aux port** **CSI 5 ; 1 i**

This control sequence sends data received from the host port directly to the port configured for an auxiliary device.

The command

CSI 4 i

(which also disables controller print mode) turns off this mode.

WYXCH **Send cursor character** **ESC 5**

This escape sequence sends the character at the cursor position to the host port.

DECTTC **Define transmission of terminator character** **CSI *Ps* ¦**

where *Ps* defines whether or not to send an ASCII FF (form feed) character to the host port at the end of a send page operation

Ps	Termination Character
0	Do not send FF
1	Send FF

☐ **Note** The transmission of a terminator character at the end of a print page operation is defined by the DECPFF functional mode command.

Suspending and Resuming Transmission

DC3 — **Suspend transmission (XOFF)** **CTRL S**

When XON/XOFF handshaking is enabled, you can suspend data transmission to the host port with this control character.

DC1 — **Resume transmission (XON)** **CTRL Q**

When XON/XOFF handshaking is enabled and data transmission to the host port is suspended with DC3, you can resume transmission with this control character.

Sending the Answerback Message

ENQ — **Send answerback message** **CTRL E**

You can send the answerback message with the ENQ control character, CTRL E. You can define the answerback message in setup mode.

Embedded Commands and Characters Sent to Printer

The terminal inserts certain commands and characters in the data sent to the printer. These are dependent on two factors: whether 7 or 8 data bits are selected for the printer port (Data/Stop/Parity Bits parameter in setup mode), and whether *national, linedraw*, or *all* is selected in setup mode (Print Characters parameter).

The difference between the *national, linedraw*, and *all* selections determines the extent of the formatting of the data sent to the printer.

When *national* is selected, the terminal sends unformatted data from the ASCII character set only. When it encounters a special graphics character, the terminal creates an approximation of the character from the ASCII set. For example, a degree sign (°) is sent as a lowercase letter o, and some line-drawing characters are sent as plus signs (+). Softfont and control characters are sent as spaces.

When *linedraw* or *all* is selected, the terminal sends formatted data. Commands to label and assign character sets are embedded in the data stream to enable the selection of characters from different character sets.

- When *linedraw* is selected, the commands are limited to labeling character sets as font banks G0 or G1 and assigning them to GL with SI and SO switching commands.

- When *all* is selected, character sets can be labeled as any of the font banks (G0, G1, G2, and G3) and assigned to either GL or GR.

In both the *linedraw* and *all* settings, the terminal sends embedded character attribute and line attribute commands.

Table 9-2 summarizes the embedded commands sent to the printer for each Print Characters setup parameter setting.

Table 9-2 Embedded Commands Summary

Terminal Screen Data	Print Characters		
	National	**Linedraw**	**All**
Characters	Sends 7-bit ASCII characters and best ASCII representation of special graphics characters	Sends 7-bit ASCII, multinational, special graphics, and softfont characters with font bank loading information	Sends 7-bit ASCII, 8-bit multinational*, special graphics, and softfont characters with font bank loading information
Font Bank	None	Uses G0, G1, and GL font banks Sends SCS, SI, SO	Uses GL, GR, G0, G1, G2, G3 font banks Sends SCS, SI, SO, LS1R, LS2, LS2R, LS3, LS3R
Character Attributes	None	Sends all character attribute commands (Table 9-3)	Sends all character attribute commands Table 9-3)
Line Attributes	None	Sends all line attribute commands (Table 9-4)	Sends all line attribute commands (Table 9-4)
End-of-line Terminators	Sends CRLF	Sends CRLF	Sends CRLF

* Characters sent depend on the user-preferred character set selection (Multinational Supplemental or ISO Latin-1).

Table 9-3 summarizes the control sequences sent to the printer to flag character attributes.

Table 9-3 Character Attributes Sent to Printer

Character Attribute	Control Sequence*
Normal	CSI 0 m
Blink	CSI 5 m
Bold	CSI 1 m
Reverse	CSI 7 m
Underline	CSI 4 m
Dim	CSI 2 m

* The terminal sends a single command string for multiple character attributes, separating them by semicolons (e.g., a group of bold, blinking characters would be preceded by CSI 1 ; 5 m).

Table 9-4 summarizes the escape sequences sent to the printer to flag line attributes.

Table 9-4 Line Attributes Sent to Printer

Line Attribute	Escape Sequence	Line Attribute	Escape Sequence
Single wide, single high	ESC # 5	Bottom half, double-wide, double-high	ESC # 4
Double-wide, single-high	ESC # 6	Top half, single-wide, double-high	ESC # :
Top half, double-wide, double-high	ESC # 3	Bottom half, single-wide, double-high	ESC # ;

RELATED FUNCTIONAL MODE COMMANDS

DECAWM	**Autowrap mode**	**Set: CSI ? 7 h** **Reset: CSI ? 7 l**
DECPEX	**Print extent mode**	**Set: CSI ? 19 h** **Reset: CSI ? 19 l**
DECPFF	**Print form feed mode**	**Set: CSI ? 18 h** **Reset: CSI ? 18 l**
SRM	**Local echo disable mode**	**Set: CSI 12 h** **Reset: CSI 12 l**
TTM	**Transfer termination mode**	**Set: CSI 16 h** **Reset: CSI 16 l**
WYGATM	**Nonerasable area transmit mode**	**Set: CSI 37 h** **Reset: CSI 37 l**
WYTEXM	**Send full page mode**	**Set: CSI 38 h** **Reset: CSI 38 l**

10 Reports

INTRODUCTION

This chapter describes the host requests and terminal responses for various terminal status reports. Also included are commands for restoring terminal states. The host can use the information in the report to save the current terminal state. The host can then restore the terminal to the saved state at any time.

DEVICE ATTRIBUTES

DA (from host) **Request primary device attributes** **CSI 0 c**

In this exchange, the host requests the personality and general attributes of the terminal. The terminal's response depends on the personality selected and on the setting of the Terminal ID and Transmit Mode setup parameters. Table 10-1 lists the terminal responses.

Table 10-1 Primary Device Attribute Responses

Terminal ID	Response from Terminal to Host
VT320 (8-bit)	CSI ? 63 ; 1 ; 2 ; 6 ; 7 ; 8 ; 9 c
VT320 (7-bit)	ESC [? 63 ; 1 ; 2 ; 6 ; 7 ; 8 ; 9 c
VT220 (8-bit)	CSI ? 62 ; 1 ; 2 ; 6 ; 7 ; 8 ; 9 c
VT220 (7-bit)	ESC [? 62 ; 1 ; 2 ; 6 ; 7 ; 8 ; 9 c
VT100	ESC [? 1 ; 2 c
VT101	ESC [? 1 ; 0 c
VT102	ESC [? 6 c

DECID (from host) **Request terminal ID** **ESC Z**

This escape sequence requests the terminal ID; the responses are the same as those shown in Table 10-1 for the VT320, VT220, and VT100 terminal IDs.

WYID (from host) **Request terminal ID** **ESC SPACE 0**

This escape sequence requests the terminal ID.

The response of the terminal is **370 CR**

DA (from host) **Request secondary device attributes** **CSI > 0 c**

This command is a host request for the firmware revision level of the terminal.

The response of the terminal is **CSI > 24 ;** *Ps* **; 0 c**

where *Ps* is the current firmware revision level

DEVICE STATUS REPORTS

DSR (from host) **Request device status** **CSI** *Ps* **n** or **CSI ? *Ps* n**

where *Ps* is the status information requested

Table 10-2 lists each DSR request and the possible terminal responses.

Table 10-2 DSR Requests and Terminal Responses

Host Request	Terminal Response	Description
CSI 5 n		Terminal status?
	CSI 0 n	Terminal functioning and ready
CSI 6 n		Cursor position?
	CSI *Pn* **;** *Pn1* **R**	Cursor is at line *Pn*, column *Pn1*
CSI ? 15 n		Printer status?
	CSI ? 10 n	Printer is ready[1]
	CSI ? 11 n	Printer is not ready[2]
	CSI ? 13 n	No printer is associated to the active session

1. This is always the response if the printer associated to the active session is a *serial* printer.
2. Response applies only to a parallel printer connected to an installed cartridge.

Table 10-2 DSR Requests and Terminal Responses, Continued

Host Request	Terminal Response	Description
CSI ? 25 n		Function key definitions locked?
	CSI ? 20 n	Function key definitions are not locked
	CSI ? 21 n	Function key definitions are locked.
CSI ? 26 n		Current keyboard language?
	CSI ? 27 ; *Ps* n	Current keyboard language is

Ps	Language
1	US[3]
2	British
3	Belgian
4	French Canadian[3]
5	Danish
6	Finnish
7	German
8	Dutch
9	Italian
10	Swiss (French)
11	Swiss (German)
12	Swedish
13	Norwegian
14	French
15	Spanish
16	Portuguese
30	Latin American[3]

3. Only the US, French Canadian, and Latin American keyboard languages are supported by the North American model of the terminal.

TERMINAL STATE REPORT

The host can request (DECRQTSR) a report on the terminal's current operating state. In response, the terminal sends a detailed device control string (DECTSR) reporting the current settings of all the main functions and modes. This report can be stored in program memory and the settings restored later by the host (DECRSTS).

DECRQTSR (from host)

Request terminal state **CSI 1 $ u**

This control sequence requests the current operating state of the terminal.

DECTSR (to host) **Report terminal state** **DCS 1 $ s** *ds...ds c1 c2* **ST**

where *ds...ds* is a data string of up to 200 characters that encodes the information on the current operating state of the terminal. (This string is Wyse proprietary.)

c1 and *c2* are checksums.

ST is the string terminator.

DECRSTS (from host) **Restore terminal state** **DCS 1 $ p** *ds...ds c1 c2* **ST**

where *ds...ds* is the stored data string of up to 200 characters that encodes the information necessary for the host to restore the previously reported operating state of the terminal (same as DECTSR).

c1 and *c2* are checksums.

ST is the string terminator.

This command restores the terminal operating state reported to the host with the DECTSR control sequence.

☐ **Note** The command is ignored if received by the inactive session.

CURSOR AND TAB STOP REPORTS

The host can request a report containing cursor or tab stop information. The terminal's report can be saved in program memory to be restored later by the host. This is useful, for example, if your application needs to temporarily change cursor or tab stop positions.

See the "Tab Stop Report" section for examples of these operations.

DECRQPSR (from host) **Request cursor or tab stop report** **CSI** *Ps* **$ w**

where *Ps* identifies whether cursor or tab stop information is requested

Ps	**Request**
1	Cursor information
2	Tab stop information

In response, the terminal sends a cursor information report (DECCIR) or a tab stop report (DECTABSR).

Cursor Information Report

DECCIR (to host) **Report cursor information** **DCS 1 $ u *ds...ds* ST**

where *ds...ds* is the data string of encoded terminal response (Rs) bits. The format of the data string is

Rs ; *Rs1* ; *Rs2* ; *Rs3* ; *Rs4* ; *Rs5* ; *Rs6* ; *Rs7* ; *Rs8* ; *Rs9*

Rs Cursor line number (offset by the top scroll margin if DECOM is reset)

Rs1 Cursor column number

Rs2 Current page number

Rs3 Current display attributes:

@	=	Normal
A	=	Bold
B	=	Underline
C	=	Bold/underline
D	=	Blinking
E	=	Blinking/bold
F	=	Blinking/underline
G	=	Blinking/underline/bold
H	=	Reverse
I	=	Reverse/bold
J	=	Reverse/underline
K	=	Reverse/bold/underline
L	=	Reverse/blinking
M	=	Reverse/blinking/bold
N	=	Reverse/blinking/underline
O	=	Reverse/blinking/bold/underline
P	=	Blank
Q	=	Bold/blank
R	=	Underline/blank
S	=	Bold/underline/blank
T	=	Blinking/blank
U	=	Blinking/bold/blank
V	=	Blinking/underline/blank
W	=	Blinking/underline/bold/blank
X	=	Reverse/blank
Y	=	Reverse/bold/blank
Z	=	Reverse/underline/blank
[	=	Reverse/bold/underline/blank
\	=	Reverse/blinking/blank
]	=	Reverse/blinking/bold/blank
^	=	Reverse/blinking/underline/blank
_	=	Reverse/blinking/bold/underline/blank

Rs4 Current selective erase attributes

@ = None
A = Selective erase

Rs5 Flags

bit 7 = Always 0
bit 6 = Always 1
bit 5 = Always 0
bit 4 = Always 0
bit 3 = 1 if autowrap mode (DECAWM) is reset
bit 2 = 1 if G3 is assigned to GL for next character only
bit 1 = 1 if G2 is assigned to GL for next character only
bit 0 = 1 if DECOM (origin mode) is set

Rs6 Current character set assigned to GL

0 = G0 is assigned to GL
1 = G1 is assigned to GL
2 = G2 is assigned to GL
3 = G3 is assigned to GL

Rs7 Current character set assigned to GR

0 = G0 is assigned to GR
1 = G1 is assigned to GR
2 = G2 is assigned to GR
3 = G3 is assigned to GR

Rs8 Character set size

bit 7 = Always 0
bit 6 = Always 1
bit 5 = Always 0
bit 4 = Always 0
bit 3 = G3 character set size (0 = 94; 1 = 96)
bit 2 = G2 character set size (0 = 94; 1 = 96)
bit 1 = G1 character set size (0 = 94; 1 = 96)
bit 0 = G0 character set size (0 = 94; 1 = 96)

Rs9 String indicating which character sets are labeled as G0, G1, G2, and G3

If multinational mode is on:

B = ASCII
% 5 = Multinational Supplemental
A = ISO Latin-1 Supplemental
< = User-preferred supplemental (Multinational or ISO Latin-1 as defined by DECAUPSS or in setup mode)
0 = Special Graphics
name = One-, two-, or three-character name assigned to softfont character set in DECDLD softfont load command

If national mode is on:

A	=	UK
4	=	Dutch
C	=	Finnish
R	=	French/Belgian
Q	=	French Canadian
K	=	German
Y	=	Italian
E	=	Norwegian/Danish
Z	=	Spanish
H	=	Swedish
=	=	Swiss
X	=	Latin American Spanish
%6	=	Portuguese
B	=	ASCII
0	=	Special Graphics
name	=	One-, two-, or three-character name assigned to softfont character set in DECDLD softfont load command

Examples of *Rs9* Strings

The *Rs9* string

B B < <

reports the terminal's default character set labeling configuration: ASCII labeled as both G0 and G1; the user-defined supplemental set labeled as both G2 and G3.

The *Rs9* string

B % 5 $ $ 0 <

reports the following character set labels: ASCII labeled as G0; Multinational Supplemental labeled as G1; a softfont character set named $ $ 0 (as entered in the DECDLD softfont load command) labeled as G2; and the user-preferred supplemental character set labeled as G3.

DECRSPS (from host) **Restore cursor information** **DCS 1 $ t** *ds...ds* **ST**

where *ds...ds* is the data string that describes the current cursor information to be restored (same data string as described in DECCIR)

ST is the string terminator.

Tab Stop Report

DECTABSR (to host) — **Report tab stop information** — **DCS 2 $ u** *ds...ds* **ST**

where *ds...ds* is a data string identifying the column number where each tab stop is located, separated by slashes (/)

For example, if the terminal had tab stops set at columns 6, 11, 16, and 21, the DECTABSR sequence would be

DCS 2 $ u 6 / 11 / 16 / 21 ST

DECRSPS (from host) — **Restore tab stop information** — **DCS 2 $ t** *ds...ds* **ST**

where *ds...ds* is the data string that contains the coded information necessary to restore the tab stops (same data string as DECTABSR)

ST is the string terminator.

Examples

You can use the tab stop request and restore commands as a nondestructive method of setting tab stops in your application program. For example, if your application requires tab stops at columns 10, 20, 30, 40, 50, 60, and 70,

1 Send the host request (DECRQPSR)

CSI 2 $ w

2 Store the received terminal report (DECTABSR) in host memory

3 Format and send the restore command (DECRSPS), listing the tab stops for your application

DCS 2 $ t 10 / 20 / 30 / 40 / 50 / 60 / 70 ST

4 Send the restore command again, listing the values stored in host memory in step 2

As you can see from step 3 in the above example, you could also use the restore command by itself as a quick way to clear and set tab stops instead of using tab stop clearing and setting commands along with cursor movement commands.

CONTROL FUNCTION REPORTS

DECRQSS (from host) **Request control function selection or setting** **DCS $ q *Ps* ST**

where *Ps* is the parameter identifying the control function

Ps	Control Function	Mnemonic
$ }	Data destination	DECSASD
" q	Erase attributes	DECSCA
" p	Personality	DECSCL
$ ~	Status line type	DECSSDT
r	Top and bottom margins	DECSTBM
m	Character attributes	SGR

ST is the string terminator.

This command can request information on only one control function at a time.

DECRPSS (to host) **Report control function selection or setting** **DCS *Ps* $ r *ds...ds Ps1* ST**

where *Ps* is the parameter that indicates request validity

Ps	Request Validity
0	Host request is invalid
1	Host request is valid

Ps1 is the parameter identifying the control function (same as DECRQSS)

ds...ds is a data string that reports the current setting of the control function.

Current setting response format:

DECSASD ($})	**Data Destination**
ds = 0	Data destination is main display
ds = 1	Data destination is host-writable status line
DECSCA ("q)	**Erase Attributes**
ds = 0	Off
ds = 1	On
DECSCL ("p)	**Personality ID**
ds = 63 ; 1	Native or VT320/VT220, 7-bit
ds = 63 ; 2	Native or VT320/VT220, 8-bit
DECSSDT ($~)	**Status Line Type**
ds = 0	No status line
ds = 1	Terminal message
ds = 2	Terminal message and host-writable

DECSTBM (r)	**Top and Bottom Margins**
*ds*1 =	Top line of scroll region
*ds*2 =	Bottom line of scroll region

SGR (m)	**Character Attributes**
*ds** = 0	Normal
1	Bold
2	Dim
4	Underline
5	Blinking
7	Reverse
8	Blank
9	Overstrike
30	Black foreground
31	Red foreground
32	Green foreground
33	Yellow foreground
34	Blue foreground
35	Magenta foreground
36	Cyan foreground
37	White foreground
40	Black background
41	Red background
42	Green background
43	Yellow background
44	Blue background
45	Magenta background
46	Cyan background
47	White background

* If more than one attribute is active, *ds* data is separated by semicolons.

ST is the string terminator.

The following are examples of typical control function reports:

DCS 1 $ r 63 ; 1 " p ST
The current terminal personality is native or VT320/VT220, 7-bit

DCS 1 $ r 0 $ } ST
Data is written to the main display

DCS 1 $ r 1 ; 5 ; 7 m ST
Current character attributes are bold, blinking, and reverse

FUNCTIONAL MODE REPORTS

DECRQM (from host) — **Request functional mode status** — **(1) CSI *Ps* $ p** / **(2) CSI ? *Ps* $ p**

where *Ps* is the parameter representing the functional mode for which status is requested

(1) *Ps*	Mode	Mnemonic
2	Keyboard lock	KAM
3	Monitor mode	CRM
4	Insert/replace	IRM
10	Horizontal editing	HEM*
12	Local echo disable	SRM
20	Newline	LNM

* Mode is permanently reset.

(2) *Ps*	Mode	Mnemonic
1	Cursor key application	DECCKM
2	ANSI/VT52	DECANM
3	132 column	DECCOLM
4	Scrolling	DECSCLM
5	Reverse screen	DECSCNM
6	Origin	DECOM
7	Autowrap	DECAWM
8	Key autorepeat	DECARM
18	Print form feed	DECPFF
19	Print extent	DECPEX
25	Text cursor enable	DECTCEM
42	National replacement character set	DECNRCM
66	Keypad application	DECNKM
67	Delete key	DECBKM
68	Key legend	DECKBUM

DECRPM (to host) — **Report functional mode status** — **(1) CSI *Ps* ; *Ps1* $ y** / **(2) CSI ? *Ps* ; *Ps1* $ y**

where (1) *Ps* is the same mode identified in the DECRQM (1) request

(2) *Ps* is the same mode identified in the DECRQM (2) request

Ps1 is the parameter for the mode setting

Ps1	Mode Setting
0	Unrecognized mode
1	Mode is set
2	Mode is reset
3	Mode is permanently set
4	Mode is permanently reset

A ANSI Character Sets

DEC = decimal, HEX = hexadecimal; read across and then down.

DEC → / HEX ↓	0	16
	0	1
0	NUL	DLE
1	SOH	DC1
2	STX	DC2
3	ETX	DC3
4	EOT	DC4
5	ENQ	NAK
6	ACK	SYN
7	BEL	ETB
8	BS	CAN
9	HT	EM
10	LF	SUB
11	VT	ESC
12	FF	FS
13	CR	GS
14	SO	RS
15	SI	US

C0

DEC → / HEX ↓	32	48	64	80	96	112
	2	3	4	5	6	7
0	SP	0	@	P	`	p
1	!	1	A	Q	a	q
2	"	2	B	R	b	r
3	#	3	C	S	c	s
4	$	4	D	T	d	t
5	%	5	E	U	e	u
6	&	6	F	V	f	v
7	'	7	G	W	g	w
8	(	8	H	X	h	x
9	)	9	I	Y	i	y
10	*	:	J	Z	j	z
11	+	;	K	[	k	{
12	,	<	L	\	l	¦
13	-	=	M	]	m	}
14	.	>	N	^	n	~
15	/	?	O	_	o	DEL

ASCII

DEC → / HEX ↓	32	48	64	80	96	112
	2	3	4	5	6	7
0	SP	0	@	P	♦	─
1	!	1	A	Q	▒	─
2	"	2	B	R	H_T	─
3	#	3	C	S	F_F	─
4	$	4	D	T	C_R	├
5	%	5	E	U	L_F	┤
6	&	6	F	V	°	┴
7	'	7	G	W	±	┬
8	(	8	H	X	N_L	│
9	)	9	I	Y	V_T	≤
10	*	:	J	Z	┘	≥
11	+	;	K	[	┐	π
12	,	<	L	\	┌	≠
13	-	=	M	]	└	£
14	.	>	N	^	┼	·
15	/	?	O		¯	DEL

Special Graphics

DEC →		128	144
↓	HEX	8	9
0	0		DCS
1	1		PU1
2	2		PU2
3	3		STS
4	4	IND	CCH
5	5	NEL	MW
6	6	SSA	SPA
7	7	ESA	EPA
8	8	HTS	
9	9	HTJ	
10	A	VTS	
11	B	PLD	CSI
12	C	PLU	ST
13	D	RI	OSC
14	E	SS2	PM
15	F	SS3	APC

C1

DEC →		160	176	192	208	224	240
↓	HEX	A	B	C	D	E	F
0	0		°	À		à	
1	1	¡	±	Á	Ñ	á	ñ
2	2	¢	2	Â	Ò	â	ò
3	3	£	3	Ã	Ó	ã	ó
4	4			Ä	Ô	ä	ô
5	5	¥	µ	Å	Õ	å	õ
6	6		¶	Æ	Ö	æ	ö
7	7	§	·	Ç	Œ	ç	œ
8	8	¤		È	Ø	è	ø
9	9	©	1	É	Ù	é	ù
10	A	ª	º	Ê	Ú	ê	ú
11	B	«	»	Ë	Û	ë	û
12	C		¼	Ì	Ü	ì	ü
13	D		½	Í	Ÿ	í	ÿ
14	E			Î		î	
15	F		¿	Ï	ß	ï	

Multinational Supplemental

DEC →		160	176	192	208	224	240
↓	HEX	A	B	C	D	E	F
0	0	NBSP	°	À	Ð	à	ð
1	1	¡	±	Á	Ñ	á	ñ
2	2	¢	2	Â	Ò	â	ò
3	3	£	3	Ã	Ó	ã	ó
4	4	¤	′	Ä	Ô	ä	ô
5	5	¥	µ	Å	Õ	å	õ
6	6	¦	¶	Æ	Ö	æ	ö
7	7	§	·	Ç	×	ç	÷
8	8	¨	¸	È	Ø	è	ø
9	9	©	1	É	Ù	é	ù
10	A	ª	º	Ê	Ú	ê	ú
11	B	«	»	Ë	Û	ë	û
12	C	¬	¼	Ì	Ü	ì	ü
13	D	—	½	Í	Ý	í	ý
14	E	®	¾	Î	Þ	î	þ
15	F	¯	¿	Ï	ß	ï	ÿ

ISO Latin-1 Supplemental

NATIONAL REPLACEMENT CHARACTER SETS

When the terminal is in national mode (DECNRCM) the ASCII character set is modified by certain national replacement characters according to the keyboard language selected in setup mode. The character set illustrations in this section show the NRC characters (shaded) for each keyboard language.

☐ **Note** Only the French Canadian and Latin American Spanish NRC sets are supported by the North American model.

DEC ➡ / HEX ⬇	32 / 2	48 / 3	64 / 4	80 / 5	96 / 6	112 / 7
0 / 0	SP	0	à	P	`	p
1 / 1	!	1	A	Q	a	q
2 / 2	"	2	B	R	b	r
3 / 3	£	3	C	S	c	s
4 / 4	$	4	D	T	d	t
5 / 5	%	5	E	U	e	u
6 / 6	&	6	F	V	f	v
7 / 7	'	7	G	W	g	w
8 / 8	(	8	H	X	h	x
9 / 9	)	9	I	Y	i	y
10 / A	*	:	J	Z	j	z
11 / B	+	;	K	°	k	é
12 / C	,	<	L	ç	l	ù
13 / D	-	=	M	§	m	è
14 / E	.	>	N	^	n	¨
15 / F	/	?	O	_	o	DEL

Belgian NRC Set

DEC ➡ / HEX ⬇	32 / 2	48 / 3	64 / 4	80 / 5	96 / 6	112 / 7
0 / 0	SP	0	@	P	`	p
1 / 1	!	1	A	Q	a	q
2 / 2	"	2	B	R	b	r
3 / 3	#	3	C	S	c	s
4 / 4	$	4	D	T	d	t
5 / 5	%	5	E	U	e	u
6 / 6	&	6	F	V	f	v
7 / 7	'	7	G	W	g	w
8 / 8	(	8	H	X	h	x
9 / 9	)	9	I	Y	i	y
10 / A	*	:	J	Z	j	z
11 / B	+	;	K	Æ	k	æ
12 / C	,	<	L	Ø	l	ø
13 / D	-	=	M	Å	m	å
14 / E	.	>	N	^	n	~
15 / F	/	?	O	_	o	DEL

Danish NRC Set

DEC ➡ / HEX ⬇	32 / 2	48 / 3	64 / 4	80 / 5	96 / 6	112 / 7
0 / 0	SP	0	¾	P	`	p
1 / 1	!	1	A	Q	a	q
2 / 2	"	2	B	R	b	r
3 / 3	£	3	C	S	c	s
4 / 4	$	4	D	T	d	t
5 / 5	%	5	E	U	e	u
6 / 6	&	6	F	V	f	v
7 / 7	'	7	G	W	g	w
8 / 8	(	8	H	X	h	x
9 / 9	)	9	I	Y	i	y
10 / A	*	:	J	Z	j	z
11 / B	+	;	K	ij	k	¨
12 / C	,	<	L	½	l	ƒ
13 / D	-	=	M	¦	m	¼
14 / E	.	>	N	^	n	´
15 / F	/	?	O	_	o	DEL

Dutch NRC Set

DEC ➡		32	48	64	80	96	112
⬇	HEX	2	3	4	5	6	7
0	0	SP	0	@	P	é	p
1	1	!	1	A	Q	a	q
2	2	"	2	B	R	b	r
3	3	#	3	C	S	c	s
4	4	$	4	D	T	d	t
5	5	%	5	E	U	e	u
6	6	&	6	F	V	f	v
7	7	'	7	G	W	g	w
8	8	(	8	H	X	h	x
9	9	)	9	I	Y	i	y
10	A	*	:	J	Z	j	z
11	B	+	;	K	Ä	k	ä
12	C	,	<	L	Ö	l	ö
13	D	-	=	M	Å	m	å
14	E	.	>	N	Ü	n	ü
15	F	/	?	O	_	o	DEL

Finnish NRC Set

DEC ➡		32	48	64	80	96	112
⬇	HEX	2	3	4	5	6	7
0	0	SP	0	à	P	`	p
1	1	!	1	A	Q	a	q
2	2	"	2	B	R	b	r
3	3	£	3	C	S	c	s
4	4	$	4	D	T	d	t
5	5	%	5	E	U	e	u
6	6	&	6	F	V	f	v
7	7	'	7	G	W	g	w
8	8	(	8	H	X	h	x
9	9	)	9	I	Y	i	y
10	A	*	:	J	Z	j	z
11	B	+	;	K	°	k	é
12	C	,	<	L	ç	l	ù
13	D	-	=	M	§	m	è
14	E	.	>	N	^	n	¨
15	F	/	?	O	_	o	DEL

French NRC Set

DEC ➡		32	48	64	80	96	112
⬇	HEX	2	3	4	5	6	7
0	0	SP	0	à	P	ô	p
1	1	!	1	A	Q	a	q
2	2	"	2	B	R	b	r
3	3	#	3	C	S	c	s
4	4	$	4	D	T	d	t
5	5	%	5	E	U	e	u
6	6	&	6	F	V	f	v
7	7	'	7	G	W	g	w
8	8	(	8	H	X	h	x
9	9	)	9	I	Y	i	y
10	A	*	:	J	Z	j	z
11	B	+	;	K	â	k	é
12	C	,	<	L	ç	l	ù
13	D	-	=	M	ê	m	è
14	E	.	>	N	î	n	û
15	F	/	?	O	_	o	DEL

French Canadian NRC Set

DEC → / HEX ↓	32	48	64	80	96	112
	2	3	4	5	6	7
0	SP	0	§	P	`	p
1	!	1	A	Q	a	q
2	"	2	B	R	b	r
3	#	3	C	S	c	s
4	$	4	D	T	d	t
5	%	5	E	U	e	u
6	&	6	F	V	f	v
7	'	7	G	W	g	w
8	(	8	H	X	h	x
9	)	9	I	Y	i	y
10	*	:	J	Z	j	z
11	+	;	K	Ä	k	ä
12	,	<	L	Ö	l	ö
13	-	=	M	Ü	m	ü
14	.	>	N	^	n	ß
15	/	?	O	_	o	DEL

German NRC Set

DEC → / HEX ↓	32	48	64	80	96	112
	2	3	4	5	6	7
0	SP	0	§	P	ù	p
1	!	1	A	Q	a	q
2	"	2	B	R	b	r
3	£	3	C	S	c	s
4	$	4	D	T	d	t
5	%	5	E	U	e	u
6	&	6	F	V	f	v
7	'	7	G	W	g	w
8	(	8	H	X	h	x
9	)	9	I	Y	i	y
10	*	:	J	Z	j	z
11	+	;	K	°	k	à
12	,	<	L	ç	l	ò
13	-	=	M	é	m	è
14	.	>	N	^	n	ì
15	/	?	O	_	o	DEL

Italian NRC Set

DEC → / HEX ↓	32	48	64	80	96	112
	2	3	4	5	6	7
0	SP	0	@	P	é	p
1	!	1	A	Q	a	q
2	"	2	B	R	b	r
3	#	3	C	S	c	s
4	$	4	D	T	d	t
5	%	5	E	U	e	u
6	&	6	F	V	f	v
7	'	7	G	W	g	w
8	(	8	H	X	h	x
9	)	9	I	Y	i	y
10	*	:	J	Z	j	z
11	+	;	K	¡	k	í
12	,	<	L	Ñ	l	ñ
13	-	=	M	¿	m	ú
14	.	>	N	á	n	ü
15	/	?	O	_	o	DEL

Latin American Spanish NRC Set

DEC → / HEX ↓	32	48	64	80	96	112
	2	3	4	5	6	7
0	SP	0	@	P	`	p
1	!	1	A	Q	a	q
2	"	2	B	R	b	r
3	#	3	C	S	c	s
4	$	4	D	T	d	t
5	%	5	E	U	e	u
6	&	6	F	V	f	v
7	'	7	G	W	g	w
8	(	8	H	X	h	x
9	)	9	I	Y	i	y
10	*	:	J	Z	j	z
11	+	;	K	Æ	k	æ
12	,	<	L	Ø	l	ø
13	-	=	M	Å	m	å
14	.	>	N	^	n	~
15	/	?	O	_	o	DEL

Norwegian NRC Set

DEC → / HEX ↓	32	48	64	80	96	112
	2	3	4	5	6	7
0	SP	0	@	P	`	p
1	!	1	A	Q	a	q
2	"	2	B	R	b	r
3	#	3	C	S	c	s
4	$	4	D	T	d	t
5	%	5	E	U	e	u
6	&	6	F	V	f	v
7	'	7	G	W	g	w
8	(	8	H	X	h	x
9	)	9	I	Y	i	y
10	*	:	J	Z	j	z
11	+	;	K	Ã	k	ã
12	,	<	L	Ç	l	ç
13	-	=	M	Õ	m	õ
14	.	>	N	^	n	~
15	/	?	O	_	o	DEL

Portuguese NRC Set

DEC → / HEX ↓	32	48	64	80	96	112
	2	3	4	5	6	7
0	SP	0	§	P	`	p
1	!	1	A	Q	a	q
2	"	2	B	R	b	r
3	£	3	C	S	c	s
4	$	4	D	T	d	t
5	%	5	E	U	e	u
6	&	6	F	V	f	v
7	'	7	G	W	g	w
8	(	8	H	X	h	x
9	)	9	I	Y	i	y
10	*	:	J	Z	j	z
11	+	;	K	¡	k	°
12	,	<	L	Ñ	l	ñ
13	-	=	M	¿	m	ç
14	.	>	N	^	n	~
15	/	?	O	_	o	DEL

Spanish NRC Set

DEC →		32	48	64	80	96	112
↓ HEX		2	3	4	5	6	7
0	0	SP	0	É	P	é	p
1	1	!	1	A	Q	a	q
2	2	"	2	B	R	b	r
3	3	#	3	C	S	c	s
4	4	$	4	D	T	d	t
5	5	%	5	E	U	e	u
6	6	&	6	F	V	f	v
7	7	'	7	G	W	g	w
8	8	(	8	H	X	h	x
9	9	)	9	I	Y	i	y
10	A	*	:	J	Z	j	z
11	B	+	;	K	Ä	k	ä
12	C	,	<	L	Ö	l	ö
13	D	-	=	M	Å	m	å
14	E	.	>	N	Ü	n	ü
15	F	/	?	O	_	o	DEL

Swedish NRC Set

DEC →		32	48	64	80	96	112
↓ HEX		2	3	4	5	6	7
0	0	SP	0	à	P	ô	p
1	1	!	1	A	Q	a	q
2	2	"	2	B	R	b	r
3	3	ù	3	C	S	c	s
4	4	$	4	D	T	d	t
5	5	%	5	E	U	e	u
6	6	&	6	F	V	f	v
7	7	'	7	G	W	g	w
8	8	(	8	H	X	h	x
9	9	)	9	I	Y	i	y
10	A	*	:	J	Z	j	z
11	B	+	;	K	é	k	ã
12	C	,	<	L	ç	l	õ
13	D	-	=	M	ê	m	ũ
14	E	.	>	N	î	n	û
15	F	/	?	O	è	o	DEL

Swiss NRC Set

DEC →		32	48	64	80	96	112
↓ HEX		2	3	4	5	6	7
0	0	SP	0	@	P	`	p
1	1	!	1	A	Q	a	q
2	2	"	2	B	R	b	r
3	3	£	3	C	S	c	s
4	4	$	4	D	T	d	t
5	5	%	5	E	U	e	u
6	6	&	6	F	V	f	v
7	7	'	7	G	W	g	w
8	8	(	8	H	X	h	x
9	9	)	9	I	Y	i	y
10	A	*	:	J	Z	j	z
11	B	+	;	K	[	k	{
12	C	,	<	L	\	l	¦
13	D	-	=	M	]	m	}
14	E	.	>	N	^	n	~
15	F	/	?	O	_	o	DEL

United Kingdom NRC Set

CONTROLS DISPLAY MODE

When the Controls setup parameter is set to *display*, the terminal displays received codes instead of executing them. This is useful for debugging programs. In controls display mode, the terminal displays symbolic representations of the C0 and C1 control characters.

The following illustrations show the characters displayed in controls display mode.

DEC ➡		0	16	32	48	64	80	96	112
⬇ HEX		0	1	2	3	4	5	6	7
0	0		D_L		0	@	P	`	p
1	1	S_H	D_1	!	1	A	Q	a	q
2	2	S_X	D_2	"	2	B	R	b	r
3	3	E_X	D_3	#	3	C	S	c	s
4	4	E_T	D_4	$	4	D	T	d	t
5	5	E_Q	N_K	%	5	E	U	e	u
6	6	A_K	S_Y	&	6	F	V	f	v
7	7	B_L	E_B	'	7	G	W	g	w
8	8	B_S	C_N	(	8	H	X	h	x
9	9	H_T	E_M	)	9	I	Y	i	y
10	A	L_F	$S_\downarrow$	*	:	J	Z	j	z
11	B	V_T	E_C	+	;	K	[	k	{
12	C	F_F	F_S	,	<	L	\	l	¦
13	D	C_R	G_S	-	=	M	]	m	}
14	E	S_O	R_S	.	>	N	^	n	~
15	F	S_I	U_S	/	?	O	_	o	D_T

DEC ➡		128	144	160	176	192	208	224	240
⬇ HEX		8	9	A	B	C	D	E	F
0	0	8_0	D_C		°	À	Ð	à	ð
1	1	8_1	P_1	¡	±	Á	Ñ	á	ñ
2	2	8_2	P_2	¢	2	Â	Ò	â	ò
3	3	8_3	S_E	£	3	Ã	Ó	ã	ó
4	4	I_N	C_C	¤	´	Ã	Ô	ã	ô
5	5	N_L	M_W	¥	µ	Å	Õ	å	õ
6	6	S_S	S_P	¦	¶	Æ	Ö	æ	ö
7	7	E_S	E_P	§	·	Ç	×	ç	÷
8	8	H_S	9_8	¨	¸	È	Ø	è	ø
9	9	H_J	9_9	©	¹	É	Ù	é	ù
10	A	V_S	9_A	ª	º	Ê	Ú	ê	ú
11	B	P_D	C_S	«	»	Ë	Û	ë	û
12	C	P_U	S_T	¬	¼	Ì	Ü	ì	ü
13	D	R_I	O_S	–	½	Í	Ý	í	ý
14	E	S_2	P_M	®	¾	Î	Þ	î	þ
15	F	S_3	A_P	¯	¿	Ï	ß	ï	ÿ

Controls Display Mode (Characters Displayed in 74 Hz Screen Resolution)

DEC → / HEX ↓	0	16	32	48	64	80	96	112
	0	1	2	3	4	5	6	7
0	0				0	@	P	`	p
1	1	S_H		!	1	A	Q	a	q
2	2	S_X		"	2	B	R	b	r
3	3	E_X		#	3	C	S	c	s
4	4	E_T		$	4	D	T	d	t
5	5	E_Q		%	5	E	U	e	u
6	6	A_K		&	6	F	V	f	v
7	7	B_L		'	7	G	W	g	w
8	8	B_S		(	8	H	X	h	x
9	9	H_T	Ÿ	)	9	I	Y	i	y
10	A	L_F	Œ	*	:	J	Z	j	z
11	B	V_T	œ	+	;	K	[	k	{
12	C	F_F	ij	,	<	L	\	l	¦
13	D	C_R	ƒ	-	=	M	]	m	}
14	E	S_O	˚	.	>	N	^	n	~
15	F	S_I		/	?	O	_	o	D_T

DEC → / HEX ↓	128	144	160	176	192	208	224	240
	8	9	A	B	C	D	E	F
0	0	♦	—		°	À	Đ	à	ð
1	1	▒	—	¡	±	Á	Ñ	á	ñ
2	2	H_T	—	¢	2	Â	Ò	â	ò
3	3	F_F	—	£	3	Ã	Ó	ã	ó
4	4	C_R	├	¤	´	Ã	Ô	ã	ô
5	5	L_F	┤	¥	µ	Å	Õ	å	õ
6	6	°	┴	¦	¶	Æ	Ö	æ	ö
7	7	±	┬	§	·	Ç	×	ç	÷
8	8	N_L	│	¨	¸	È	Ø	è	ø
9	9	V_T	≤	©	¹	É	Ù	é	ù
10	A	┘	≥	ª	º	Ê	Ú	ê	ú
11	B	┐	π	≪	≫	Ë	Û	ë	û
12	C	┌	≠	¬	¼	Ì	Ü	ì	ü
13	D	└	£	–	½	Í	Ý	í	ý
14	E	┼	·	®	¾	Î	Þ	î	þ
15	F	¯	▲	¯	¿	Ï	ß	ï	ÿ

Controls Display Mode (Characters Displayed in 60 Hz Screen Resolution)

B ASCII Code Conversion Listing

Table B-1 ASCII Code Conversion Listing

ASCII Character	CTRL Codes	Bit 7——0	Octal	Decimal	Hex
NUL	@	00000000	000	000	00
SOH	A	00000001	001	001	01
STX	B	00000010	002	002	02
ETX	C	00000011	003	003	03
EOT	D	00000100	004	004	04
ENQ	E	00000101	005	005	05
ACK	F	00000110	006	006	06
BEL	G	00000111	007	007	07
BS	H	00001000	010	008	08
HT	I	00001001	011	009	09
LF	J	00001010	012	010	0A
VT	K	00001011	013	011	0B
FF	L	00001100	014	012	0C
CR	M	00001101	015	013	0D
SO	N	00001110	016	014	0E
SI	O	00001111	017	015	0F
DLE	P	00010000	020	016	10
DC1	Q	00010001	021	017	11
DC2	R	00010010	022	018	12
DC3	S	00010011	023	019	13
DC4	T	00010100	024	020	14
NAK	U	00010101	025	021	15
SYN	V	00010110	026	022	16
ETB	W	00010111	027	023	17
CAN	X	00011000	030	024	18
EM	Y	00011001	031	025	19
SUB	Z	00011010	032	026	1A

Table B-1 ASCII Code Conversion Listing, Continued

ASCII Character	CTRL Codes	Bit 7——0	Octal	Decimal	Hex
ESC	[	00011011	033	027	1B
FS	\	00011100	034	028	1C
GS	]	00011101	035	029	1D
RS	^	00011110	036	030	1E
US	-	00011111	037	031	1F
SP		00100000	040	032	20
!		00100001	041	033	21
"		00100010	042	034	22
#		00100011	043	035	23
$		00100100	044	036	24
%		00100101	045	037	25
&		00100110	046	038	26
' (apostrophe)		00100111	047	039	27
(		00101000	050	040	28
)		00101001	051	041	29
*		00101010	052	042	2A
+		00101011	053	043	2B
, (comma)		00101100	054	044	2C
- (hyphen)		00101101	055	045	2D
. (period)		00101110	056	046	2E
/		00101111	057	047	2F
0		00110000	060	048	30
1		00110001	061	049	31
2		00110010	062	050	32
3		00110011	063	051	33
4		00110100	064	052	34
5		00110101	065	053	35
6		00110110	066	054	36
7		00110111	067	055	37
8		00111000	070	056	38
9		00111001	071	057	39
:		00111010	072	058	3A
;		00111011	073	059	3B
<		00111100	074	060	3C
=		00111101	075	061	3D
>		00111110	076	062	3E
?		00111111	077	063	3F
@		01000000	100	064	40

Table B-1 ASCII Code Conversion Listing, Continued

ASCII Character	CTRL Codes	Bit 7——0	Octal	Decimal	Hex
A		01000001	101	065	41
B		01000010	102	066	42
C		01000011	103	067	43
D		01000100	104	068	44
E		01000101	105	069	45
F		01000110	106	070	46
G		01000111	107	071	47
H		01001000	110	072	48
I		01001001	111	073	49
J		01001010	112	074	4A
K		01001011	113	075	4B
L		01001100	114	076	4C
M		01001101	115	077	4D
N		01001110	116	078	4E
O		01001111	117	079	4F
P		01010000	120	080	50
Q		01010001	121	081	51
R		01010010	122	082	52
S		01010011	123	083	53
T		01010100	124	084	54
U		01010101	125	085	55
V		01010110	126	086	56
W		01010111	127	087	57
X		01011000	130	088	58
Y		01011001	131	089	59
Z		01011010	132	090	5A
[		01011011	133	091	5B
\		01011100	134	092	5C
]		01011101	135	093	5D
^		01011110	136	094	5E
_ (underline)		01011111	137	095	5F
`		01100000	140	096	60
a		01100001	141	097	61
b		01100010	142	098	62
c		01100011	143	099	63
d		01100100	144	100	64
e		01100101	145	101	65
f		01100110	146	102	66
g		01100111	147	103	67
h		01101000	150	104	68

Table B-1 ASCII Code Conversion Listing, Continued

ASCII Character	CTRL Codes	Bit 7——0	Octal	Decimal	Hex
i		01101001	151	105	69
j		01101010	152	106	6A
k		01101011	153	107	6B
l		01101100	154	108	6C
m		01101101	155	109	6D
n		01101110	156	110	6E
o		01101111	157	111	6F
p		01110000	160	112	70
q		01110001	161	113	71
r		01110010	162	114	72
s		01110011	163	115	73
t		01110100	164	116	74
u		01110101	165	117	75
v		01110110	166	118	76
w		01110111	167	119	77
x		01111000	170	120	78
y		01111001	171	121	79
z		01111010	172	122	7A
{		01111011	173	123	7B
¦		01111100	174	124	7C
}		01111101	175	125	7D
~		01111110	176	126	7E
DEL		01111111	177	127	7F

C Local Keyboard Commands

Table C-1 Native Personality Local Keyboard Commands

Command	Keyboard Style: 105-Key ANSI	ASCII	Enhanced PC
Turn CAPS LOCK on/off	Lock	Caps Lock	Caps Lock
Turn NUM LOCK on/off			Num Lock
Turn keyclick on/off	Ctrl Enter	Ctrl Enter	Ctrl Enter *kpd*
Hold data on screen	F1 or Compose Character [1]	Funct [1]	Scroll Lock or Alt *left* [1]
Print page	F2	Print	Print Screen
Enter or exit setup mode	F3	Setup	Select
Enter or exit WyseWorks mode	Ctrl F3 or Ctrl Lock	Ctrl Setup or Ctrl Caps Lock	Ctrl Select or Ctrl Caps Lock
Perform hard terminal reset [2]	Ctrl Shift F3	Ctrl Shift Break	Ctrl Shift Select
Perform terminal mode reset [3]	Shift F3	Shift Setup	Shift Select
Send break to host port	F5	Break	Break
Transmit answerback message	Ctrl Shift F5	Send	Ctrl Shift End
Lower RTS line on the host port for two seconds	Ctrl F5		Pause
Toggle block/full-duplex modes	Shift F5	Shift Break	Shift Break
Turn autoprint mode on/off	Ctrl Shift F2	Ctrl Print	Shift Sys Rq
Turn controls mode on/off	Ctrl Shift 1 *kpd*	Ctrl Shift 1 *kpd*	Ctrl Shift 1 *kpd*

1. When Corner Key setup parameter is set to *hold* and XON/XOFF handshaking is enabled for the host port.
2. See the "Resetting and Testing the Terminal" section of Table F-1 for the functions performed by the terminal.
3. See the "Resetting and Testing the Terminal" section of Table F-1 for the functions performed by the terminal. If command is executed *during* a print or send operation, the terminal aborts the print/send operation. The command must be executed again for the terminal to perform the terminal mode reset.

Table C-1 Native Personality Local Keyboard Commands, Continued

Command	Keyboard Style: 105-Key ANSI	ASCII	Enhanced PC
Turn trace mode on/off	Ctrl Shift 9 *kpd*	Ctrl Shift 9 *kpd*	Ctrl Shift 9 *kpd*
Turn instant screen saver on[4]	Ctrl Remove	Ctrl Clr Scrn	Ctrl Del *kpd*
Change status line display (user, system, off)	Ctrl ▶	Ctrl ▶	Ctrl →
Increase scrolling rate	Ctrl Shift ▲	Ctrl Shift ▲	Ctrl Shift ↑
Decrease scrolling rate	Ctrl Shift ▼	Ctrl Shift ▼	Ctrl Shift ↓
Home cursor and clear page[5]	Ctrl Prev Scrn	Ctrl Shift Home	Ctrl Shift Home
Display next page	Ctrl Shift Next Scrn	Ctrl Next Page	Ctrl Page Down
Display previous page	Ctrl Shift Prev Scrn	Ctrl Prev Page	Ctrl Page Up
Activate other session	F4	Ctrl Shift Setup	Ctrl End
Select dual-session screen format	Ctrl F4	Ctrl Shift - *kpd*	Ctrl Shift - *kpd*
Activate other window[6]	Ctrl Shift F4	Ctrl Shift . *kpd*	Ctrl Shift + *kpd*
Move split point left (vertical split) or up (horizontal split)	Ctrl - *kpd*	Ctrl - *kpd*	Ctrl - *kpd*
Move split point right (vertical split) or down (horizontal split)	Ctrl Shift . *kpd*	Ctrl Shift . *kpd*	Ctrl Shift + *kpd*
Toggle to other set of user-defined keys, if both are attached to active session	Ctrl Select	Ctrl Home	Ctrl Home

4. Screen Saver parameter must not be set to *off*.
5. Page is cleared to space characters displayed with the current replacement character color and attributes.
6. Command is effective whether the windows are displaying two sessions or two pages from the same session.

Table C-2 Local Keyboard Commands Supported in ASCII Personalities

Command	Keyboard Style: 105-Key ANSI	ASCII	Enhanced PC
Turn CAPS LOCK on/off	Lock	Caps Lock	Caps Lock
Turn NUM LOCK on/off			Num Lock
Turn keyclick on/off	Ctrl Enter	Ctrl Enter	Ctrl Enter *kpd*
Hold data on screen	F1 or Compose Character [1]	Funct [1]	Scroll Lock or Alt *left* [1]
Send function sequence	Compose Character [2]	Funct [2]	Alt *left* [2]
Enter or exit setup mode	F3	Setup	Select
Enter or exit WyseWorks mode	Ctrl F3 or Ctrl Lock	Ctrl Setup or Ctrl Caps Lock	Ctrl Select or Ctrl Caps Lock
Perform hard terminal reset [3]	Ctrl Shift F3	Ctrl Shift Break	Ctrl Shift Select
Perform soft terminal reset [3]	Shift F3	Shift Setup	Shift Select
Send break to host port	F5	Break	Break
Toggle block/full-duplex modes	Shift F5	Shift Break	Shift Break
Turn auxiliary print mode on/off	Ctrl Shift F2	Ctrl Print	Shift Sys Rq
Turn controls mode on/off	Ctrl Shift 1 *kpd*	Ctrl Shift 1 *kpd*	Ctrl Shift 1 *kpd*
Turn trace mode on/off	Ctrl Shift 9 *kpd*	Ctrl Shift 9 *kpd*	Ctrl Shift 9 *kpd*
Turn on instant screen saver [4]	Ctrl Remove	Ctrl Clr Scrn	Ctrl Del *kpd*
Change status line display (user, system, off)	Ctrl ▶	Ctrl ▶	Ctrl →
Increase scrolling rate	Ctrl Shift ▲	Ctrl Shift ▲	Ctrl Shift ↑
Decrease scrolling rate	Ctrl Shift ▼	Ctrl Shift ▼	Ctrl Shift ↓
Home cursor and clear page [5]	Ctrl Prev Scrn	Ctrl Shift Home	Ctrl Shift Home
Activate other session	F4	Ctrl Shift Setup	Ctrl End
Select dual-session screen format	Ctrl F4	Ctrl Shift - *kpd*	Ctrl Shift - *kpd*
Activate other window [6]	Ctrl Shift F4	Ctrl Shift . *kpd*	Ctrl Shift + *kpd*

1. When Corner Key setup parameter is set to *hold* and XON/XOFF handshaking is enabled for the host port.
2. When Corner Key setup parameter is set to *funct* and key is pressed together with an alphanumeric key, this command sends an ASCII SOH character, the other key's code, and an ASCII CR character.
3. A hard reset is equivalent to turning the terminal off and on again. A soft reset unlocks the keyboard, turns off all print modes, and resets communications (UART).
4. Screen Saver parameter must not be set to *off*.
5. Page is cleared to nulls in background color.
6. Command is effective whether the windows are displaying two sessions or two pages from the same session.

Table C-2 Local Keyboard Commands Supported in ASCII Personalities, Continued

Command	Keyboard Style: 105-Key ANSI	ASCII	Enhanced PC
Move split point left (vertical split) or up (horizontal split)	Ctrl - *kpd*	Ctrl - *kpd*	Ctrl - *kpd*
Move split point right (vertical split) or down (horizontal split)	Ctrl . *kpd*	Ctrl . *kpd*	Ctrl + *kpd*
Toggle to other set of user-defined keys, if both are attached to active session	Ctrl Select	Ctrl Home	Ctrl Home

Table C-3 Color Palette Commands (ASCII Personalities)[1]

Command	Key[2]
Select amber color palette	Ctrl 0
Select green color palette	Ctrl 1
Select white color palette	Ctrl 2
Select cyan color palette	Ctrl 3
Select light purple color palette	Ctrl 4
Select yellow color palette	Ctrl 5
Select sky blue color palette	Ctrl 6
Select light gray color palette	Ctrl 7
Select light green color palette	Ctrl 8
Select cream color palette	Ctrl 9

1. If a palette is changed in Esprit III personality at a time when non-Esprit attributes remain on the screen, only the non-Esprit attributes change color.
2. Number keys are located on the numeric keypad.

Table C-4 Local Keyboard Commands Supported in TEK 4010/4014 Personality

Command	Keyboard Style: 105-Key ANSI	ASCII	Enhanced PC
Turn CAPS LOCK on/off	Lock	Caps Lock	Caps Lock
Turn NUM LOCK on/off			Num Lock
Turn keyclick on/off	Ctrl Enter	Ctrl Enter	Ctrl Enter *kpd*
Hold data on screen[1]	F1 or Compose Character[1]	Funct[1]	Scroll Lock or Alt *left*[1]
Enter or exit setup mode	F3	Setup	Select
Enter or exit WyseWorks mode	Ctrl F3 or Ctrl Lock	Ctrl Setup or Ctrl Caps Lock	Ctrl Select or Ctrl Caps Lock
Perform hard terminal reset[2]	Ctrl Shift F3	Ctrl Shift Break	Ctrl Shift Select
Perform terminal mode reset[2]	Shift F3	Shift Setup	Shift Select
Send break to host port	F5	Break	Break
Toggle block/full-duplex modes	Shift F5	Shift Break	Shift Break
Turn controls mode on/off	Ctrl Shift 1 *kpd*	Ctrl Shift 1 *kpd*	Ctrl Shift 1 *kpd*
Turn on instant screen saver[3]	Ctrl Remove	Ctrl Clr Scrn	Ctrl Del *kpd*
Toggle to other set of user-defined keys, if both are attached to active session	Ctrl Select	Ctrl Home	Ctrl Home
Select alpha mode, home cursor (does not clear screen), select largest character size	Shift F14	Shift Home	Shift Home
Select alpha mode, home cursor, clear screen and bypass condition, retain character size	F14	Home	Home
Move alpha or GIN crosshair cursor	Cursor keys	Cursor keys	Cursor keys
Move GIN crosshair cursor quickly	Shifted cursor keys	Shifted cursor keys	Shifted cursor keys
Print graphics screen	F2	Print	Print Screen

1. When Corner Key setup parameter is set to *hold* and XON/XOFF handshaking is enabled for the host port.
2. A hard reset is equivalent to turning the terminal off and on again. A soft reset unlocks the keyboard, turns off all print modes, and resets communications (UART).
3. Screen Saver parameter must not be set to *off*.

D Key Codes

INTRODUCTION

The following tables list the key codes generated by the editing keys, special keys, and function keys:

- Tables D-1 through D-3 list editing and special key codes.
- Table D-4 lists PF key codes.
- Table D-5 lists numeric keypad application mode codes.
- Table D-6 lists cursor key application mode codes.
- Tables D-7 through D-9 list function key default codes.

Figure D-1 105-Key ANSI Keyboard

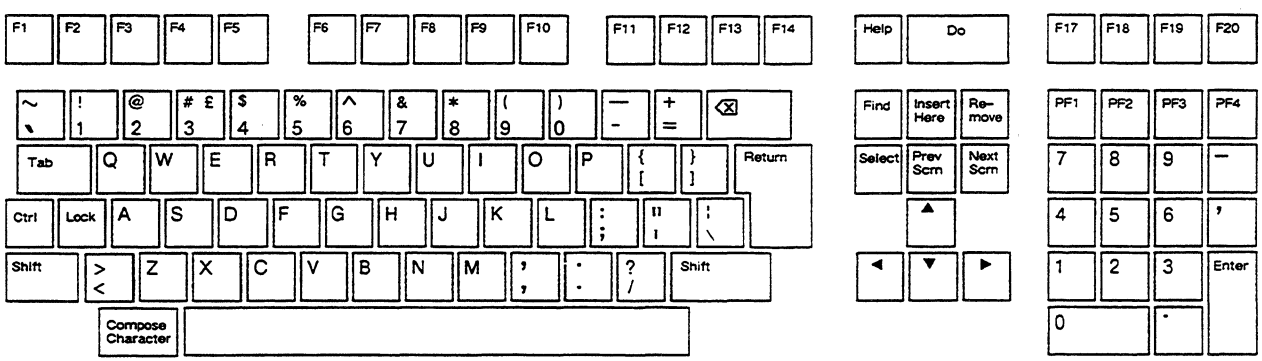


Table D-1 Editing and Special Key Codes—105-Key ANSI Keyboard

Key[1]	Native 7-Bit[2]	Native 8-Bit[2]	VT100	VT52	Wyse 350[3]	ADDS VP A2
▲	ESC [A	CSI A	ESC [A	ESC A	CTRL K[4]	CTRL Z
▼	ESC [B	CSI B	ESC [B	ESC B	CTRL J[5]	CTRL J
▶	ESC [C	CSI C	ESC [C	ESC C	CTRL L	CTRL F
◀	ESC [D	CSI D	ESC [D	ESC D	CTRL H	CTRL U
⌫[6]	DEL or CTRL H	Same	Same	Same	CTRL H	CTRL H
Shift ⌫[6]	CTRL X or DEL	Same	Same	Same	CTRL H	CTRL H
Enter[7]	CTRL M or CTRL M CTRL J or CTRL I	Same	Same	Same	Same	Same
Find[8]	ESC [1 ~	CSI 1 ~				
F2	Local[9]	Same	Same	Same	ESC P	ESC P
Insert Here[8]	ESC [2 ~	CSI 2 ~			ESC Q	ESC Q
Shift Insert Here					ESC E	ESC M
Next Scrn[8]	ESC [6 ~	CSI 6 ~			ESC K	ESC J
PF1	ESC O P	SS3 P	ESC O P	ESC P	ESC Q	ESC Q
Shift PF1					ESC E	ESC M
PF2	ESC O Q	SS3 Q	ESC O Q	ESC Q	ESC W	ESC W
Shift PF2					ESC R	ESC l
PF3	ESC O R	SS3 R	ESC O R	ESC R	ESC T	ESC K
Shift PF3					ESC Y	ESC k
PF4	ESC O S	SS3 S	ESC O S	ESC S	ESC r	ESC r
Shift PF4					ESC q	ESC q
Prev Scrn[8]	ESC [5 ~	CSI 5 ~			ESC J	ESC J

1. Codes for cursor keys apply only in normal mode; codes for numeric keypad keys apply only in numeric mode.
2. Codes also sent in VT320/VT220 and Intecolor personalities. Unless otherwise noted, shifted keys send the same code as unshifted.
3. Codes also sent in TVI 950 and Esprit III personalities. Unless otherwise noted, shifted keys send the same code as unshifted.
4. Shifted key sends ESC j in TVI 950 and Esprit III personalities.
5. Unshifted key sends CTRL V if the terminal is in TVI 950 or Esprit III personality; shifted key sends CTRL J.
6. Action or code depends on Delete Key parameter setting in setup mode.
7. Code depends on Enter parameter setting in setup mode.
8. Shifted key sends no code in native, VT320/VT220, Intecolor, VT100, and VT52 personalities.
9. Prints page.

Table D-1 Editing and Special Key Codes—105-Key ANSI Keyboard, Continued

Key[1]	Native 7-Bit[2]	Native 8-Bit[2]	VT100	VT52	Wyse 350[3]	ADDS VP A2
Remove[8]	ESC [3 ~	CSI 3 ~			DEL	DEL
Return[10]	CTRL M or CTRL M CTRL J or CTRL I	Same	Same	Same	Same	Same
Select[8]	ESC [4 ~	CSI 4 ~				
Tab	CTRL I	Same	Same	Same	Same	Same
Shift Tab	ESC [Z	CSI Z	ESC [Z	CTRL I	ESC I	ESC O

10. Code depends on Return parameter setting in setup mode.

Figure D-2 ASCII Keyboard

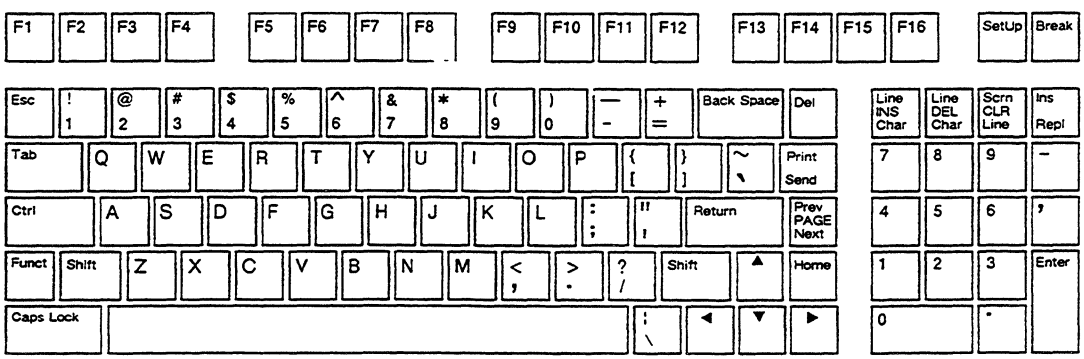


Table D-2 Editing and Special Key Codes—ASCII Keyboard

Key	Native 7-Bit[1]	Native 8-Bit[1]	VT100	VT52	Wyse 350[2]	ADDS VP A2
Back Space	CTRL H	Same	Same	Same	Same	Same
Break	Local[3]	Same	Same	Same	Same	Same
Shift Break	Local[4]	Same	Same	Same	Same	Same
Clr Line	ESC O R	SS3 R	ESC O R	ESC R	ESC T	ESC K
Clr Scrn	ESC O R	SS3 R	ESC O R	ESC R	ESC Y	ESC k
▲	ESC [A	CSI A	ESC [A	ESC A	CTRL K[5]	CTRL Z
▼	ESC [B	CSI B	ESC [B	ESC B	CTRL J[6]	CTRL J
▶	ESC [C	CSI C	ESC [C	ESC C	CTRL L	CTRL F
◀	ESC [D	CSI D	ESC [D	ESC D	CTRL H	CTRL U
Del	DEL[7] or CTRL H[7]	Same	Same	Same	DEL	DEL
Shift Del	CTRL X[7] or DEL[7]	Same	Same	Same	DEL	DEL
Del Char	ESC O Q	SS3 Q	ESC O Q	ESC Q	ESC W	ESC W
Del Line	ESC O Q	SS3 Q	ESC O Q	ESC Q	ESC R	ESC l
Enter[8]	CTRL M or CTRL M CTRL J or CTRL I	Same	Same	Same	Same	Same
Esc	CTRL [	Same	Same	Same	Same	Same
Funct	Local[9]	Same	Same	Same	Same	Same
Home	ESC [H	CSI H	ESC [H	ESC H	CTRL ^	CTRL A
Shift Home	ESC [H	CSI H	ESC [H	ESC H	ESC {	CTRL A
Ins	ESC O S	SS3 S	ESC O S	ESC S	ESC q	ESC q
Ins Char	ESC O P	SS3 P	ESC O P	ESC P	ESC Q	ESC Q
Ins Line	ESC O P	SS3 P	ESC O P	ESC P	ESC E	ESC M

1. Codes also sent in VT320/VT220 and Intecolor personalities. Unless otherwise noted, shifted keys send the same code as unshifted.
2. Codes also sent in TVI 950 and Esprit III personalities. Unless otherwise noted, shifted keys send the same code as unshifted.
3. Sends break to host port. Length of signal depends on setting of Break parameter in setup mode.
4. Toggles block mode.
5. Shifted key sends ESC j in TVI 950 and Esprit III personalities.
6. Unshifted key sends CTRL V if the terminal is in TVI 950 or Esprit III personality; shifted key sends CTRL J.
7. Code depends on Delete Key parameter setting in setup mode.
8. Code depends on Enter parameter setting in setup mode.
9. Code depends on Corner Key parameter setting in setup mode.

Table D-2 Editing and Special Key Codes—ASCII Keyboard, Continued

Key	Native 7-Bit[1]	Native 8-Bit[1]	VT100	VT52	Wyse 350[2]	ADDS VP A2
Next Page	ESC [U	CSI U	ESC [U		ESC K	ESC J
Prev Page	ESC [V	CSI V	ESC [V		ESC J	ESC J
Print	Local[10]	Same	Same	Same	ESC P	ESC P
Repl	ESC O S	SS3 S	ESC O S	ESC S	ESC r	ESC r
Return [11]	CTRL M or CTRL M CTRL J or CTRL I	Same	Same	Same	Same	Same
Send	Local[12]	Same	Same	Same	ESC 7	ESC 7
Setup	Local[13]	Same	Same	Same	Same	Same
Shift + Setup	Local[14]	Same	Same	Same	Same	Same
Tab	CTRL I	Same	Same	Same	Same	Same
Shift + Tab	ESC [Z	CSI Z	ESC [Z	CTRL I	ESC I	ESC O

10. Prints page.
11. Code depends on Return parameter setting in setup mode.
12. Sends answerback.
13. Puts terminal in setup mode.
14. Clears modes and error conditions.

Figure D-3 Enhanced PC-Style Keyboard

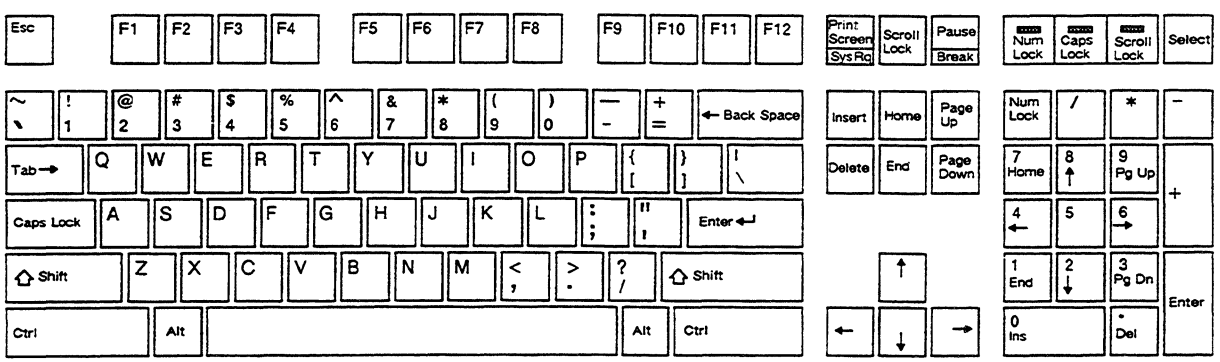


Table D-3 Editing and Special Key Codes—Enhanced PC-Style Keyboard

Key[1]	Native 7-Bit[2]	Native 8-Bit[2]	VT100	VT52	Wyse 350[3]	ADDS VP A2
← Back Space	CTRL H	Same	Same	Same	Same	Same
Break	Local[4]	Same	Same	Same	Same	Same
Shift Break	Local[5]	Same	Same	Same	Same	Same
↑	ESC [A	CSI A	ESC [A	ESC A	CTRL K[6]	CTRL Z
↓	ESC [B	CSI B	ESC [B	ESC B	CTRL J[7]	CTRL J
→	ESC [C	CSI C	ESC [C	ESC C	CTRL L	CTRL F
←	ESC [D	CSI D	ESC [D	ESC D	CTRL H	CTRL U
Del *kpd*	DEL	Same	Same	Same	Same	Same
Delete	DEL[8] or CTRL H[8]	Same	Same	Same	ESC W	ESC W
Shift Delete	CTRL X[8] or DEL[8]	Same	Same	Same	ESC R	ESC l
End *kpd*					ESC T	ESC K
End	ESC [1 ~	CSI 1 ~			ESC T	ESC K
Shift End					ESC Y	ESC k
Enter ↵ [9]	CTRL M or CTRL M CTRL J or CTRL I	Same	Same	Same	Same	Same
Enter *kpd*[10]	CTRL M or CTRL M CTRL J or CTRL I	Same	Same	Same	Same	Same
Esc	CTRL [	Same	Same	Same	Same	Same

1. Codes for numeric keypad keys apply only when NUM LOCK is off. Unless otherwise noted, shifted keys send the same code as unshifted.
2. Codes also sent in VT320/VT220 and Intecolor personalities. Unless otherwise noted, shifted keys send the same code as unshifted.
3. Codes also sent in TVI 950 and Esprit III personalities. Unless otherwise noted, shifted keys send the same code as unshifted.
4. Sends break to host port. Length of signal depends on setting of Break parameter in setup mode.
5. Toggles block mode.
6. Shifted key sends ESC j in TVI 950 and Esprit III personalities.
7. Unshifted key sends CTRL V if the terminal is in TVI 950 or Esprit III personality; shifted key sends CTRL J.
8. Code depends on Delete Key parameter setting in setup mode.
9. Code depends on Return parameter setting in setup mode.
10. Code depends on Enter parameter setting in setup mode.

Table D-3 Editing and Special Key Codes—Enhanced PC-Style Keyboard, Continued

Key[1]	Native 7-Bit[2]	Native 8-Bit[2]	VT100	VT52	Wyse 350[3]	ADDS VP A2
Home	ESC [H	CSI H	ESC [H	ESC H	CTRL ^	CTRL A
Shift Home	ESC [H	CSI H	ESC [H	ESC H	ESC {	CTRL A
Home *kpd*	ESC [H	CSI H	ESC [H	ESC H	CTRL ^	CTRL A
Ins *kpd*					ESC r	ESC r
Insert	ESC [2 ~	CSI 2 ~			ESC q	ESC q
Shift Insert					ESC r	ESC r
Pg Dn *kpd*	ESC [U	CSI U	ESC [U		ESC K	ESC J
Page Down	ESC [U[11]	CSI U[11]	ESC [U[11]		ESC K	ESC J
Pg Up *kpd*	ESC [V	CSI V	ESC [V		ESC J	ESC J
Page Up	ESC [V[11]	CSI V[11]	ESC [V[11]		ESC J	ESC J
Print Screen	Local[12]	Same	Same	Same	ESC P	ESC P
Scroll Lock	Local[13]	Same	Same	Same	Same	Same
Select	Local[14]	Same	Same	Same	Same	Same
Shift Select	Local[15]	Same	Same	Same	Same	Same
Tab →	CTRL I	Same	Same	Same	Same	Same
Shift Tab →	ESC [Z	CSI Z	ESC [Z	CTRL I	ESC I	ESC O

11. Shifted key sends no code.
12. Prints page.
13. Code depends on Corner Key parameter setting in setup mode.
14. Puts terminal in setup mode.
15. Performs soft terminal reset.

Table D-4 PF-Key Codes[1]

Keyboard Style 105-Key ANSI	ASCII	Enhanced PC	Codes Native 7-Bit[2]	Native 8-Bit[3]	VT52
PF1	Ins Char	F1	ESC O P	SS3 P	ESC P
PF2	Del Char	F2	ESC O Q	SS3 Q	ESC Q
PF3	Clr Line	F3	ESC O R	SS3 R	ESC R
PF4	Repl	F4	ESC O S	SS3 S	ESC S

1. ANSI personalities only. Shifted keys send the same code as unshifted.
2. Codes also sent in VT320/VT220, Intecolor, and VT100 personalities.
3. Codes also sent in VT320/VT220 and Intecolor personalities.

Table D-5 Numeric Keypad Application Mode Codes[1]

Key	Native 7-Bit[2]	Native 8-Bit[2]	VT100	VT52
-	ESC O m	SS3 m	ESC O m	ESC ? m
*[3]	ESC O l	SS3 l	ESC O l	ESC ? l
,[4]	ESC O l	SS3 l	ESC O l	ESC ? l
.	ESC O n	SS3 n	ESC O n	ESC ? n
0	ESC O p	SS3 p	ESC O p	ESC ? p
1	ESC O q	SS3 q	ESC O q	ESC ? q
2	ESC O r	SS3 r	ESC O r	ESC ? r
3	ESC O s	SS3 s	ESC O s	ESC ? s
4	ESC O t	SS3 t	ESC O t	ESC ? t
5	ESC O u	SS3 u	ESC O u	ESC ? u
6	ESC O v	SS3 v	ESC O v	ESC ? v
7	ESC O w	SS3 w	ESC O w	ESC ? w
8	ESC O x	SS3 x	ESC O x	ESC ? x
9	ESC O y	SS3 y	ESC O y	ESC ? y
Enter[5]	ESC O M	SS3 M	ESC O M	ESC ? M

1. ANSI personalities only. In numeric mode, these keys generate appropriate code for character on keycap.
2. Codes also sent in VT320/VT220 and Intecolor personalities.
3. Enhanced PC-style keyboard only.
4. 105-key ANSI and ASCII keyboards only.
5. In numeric mode, sends a carriage return code (CR or CRLF).

Table D-6 Cursor Key Application Mode Codes[1]

Key	Native 7-Bit[2]	Native 8-Bit[2]	VT100
▲	ESC O A	SS3 A	ESC O A
▼	ESC O B	SS3 B	ESC O B
▶	ESC O C	SS3 C	ESC O C
◀	ESC O D	SS3 D	ESC O D

1. ANSI personalities only.
2. Codes also sent in VT320/VT220 and Intecolor personalities.

Table D-7 Function Key Default Codes—105-Key ANSI Keyboard

Key[1]	Native 7-Bit[2]	Native 8-Bit[2]	VT52 VT100	Wyse 350[3]	ADDS VP A2
F6	ESC [17 ~	CSI 17 ~		SOH E CR	STX 6 CR
Shift F6				SOH e CR	STX & CR
F7	ESC [18 ~	CSI 18 ~		SOH F CR	STX 7 CR
Shift F7				SOH f CR	STX ' CR
F8	ESC [19 ~	CSI 19 ~		SOH G CR	STX 8 CR
Shift F8				SOH g CR	STX (CR
F9	ESC [20 ~	CSI 20 ~		SOH H CR	STX 9 CR
Shift F9				SOH h CR	STX) CR
F10	ESC [21 ~	CSI 21 ~		SOH I CR	STX : CR
Shift F10				SOH i CR	STX * CR
F11	ESC [23 ~	CSI 23 ~	CTRL [	SOH J CR	STX ; CR
Shift F11			CTRL [	SOH j CR	STX + CR
F12	ESC [24 ~	CSI 24 ~	CTRL H	SOH K CR	STX < CR
Shift F12			CTRL H	SOH k CR	STX , CR
F13	ESC [25 ~	CSI 25 ~	CTRL J	SOH L CR	STX = CR
Shift F13			CTRL J	SOH l CR	STX - CR

1. F1 through F5 activate local commands.
2. Codes also sent in VT320/VT220 and Intecolor personalities.
3. Codes also sent in TVI 950 and Esprit III personalities.

Table D-7 Function Key Default Codes—105-Key ANSI Keyboard, Continued

Key[1]	Native 7-Bit[2]	Native 8-Bit[2]	VT52 VT100	Wyse 350[3]	ADDS VP A2
F14	ESC [26 ~	CSI 26 ~	ESC [H[4]	SOH M CR	STX > CR
Shift F14			ESC [H[4]	SOH m CR	STX . CR
Help	ESC [28 ~	CSI 28 ~		SOH N CR	STX ? CR
Shift Help				SOH n CR	STX / CR
Do	ESC [29 ~	CSI 29 ~		SOH O CR	STX @ CR
Shift Do				SOH o CR	STX 0 CR
F17	ESC [31 ~	CSI 31 ~		SOH P CR	STX A CR
Shift F17				SOH p CR	STX 1 CR
F18	ESC [32 ~	CSI 32 ~		SOH Q CR	STX B CR
Shift F18				SOH q CR	STX 2 CR
F19	ESC [33 ~	CSI 33 ~		SOH R CR	STX C CR
Shift F19				SOH r CR	STX 3 CR
F20	ESC [34 ~	CSI 34 ~		SOH S CR	STX D CR
Shift F20				SOH s CR	STX 4 CR

1. ESC H in VT52 personality.

Table D-8 Function Key Default Codes—ASCII Keyboard

Key	Native 7-Bit[1]	Native 8-Bit[1]	Wyse 350[2]	ADDS VP A2
F1	ESC [? 5 i[3]	CSI ? 5 i[3]	SOH @ CR	STX 1 CR
Shift F1	ESC [5 i[4]	CSI 5 i[4]	SOH ' CR	STX ! CR
F2	ESC [? 3 i	CSI ? 3 i	SOH A CR	STX 2 CR
Shift F2	ESC [? 1 i	CSI ? 1 i	SOH a CR	STX " CR
F3	ESC [2 i	CSI 2 i	SOH B CR	STX 3 CR
Shift F3	ESC [0 i	CSI 0 i	SOH b CR	STX # CR

1. Codes also sent in VT320/VT220 and Intecolor personalities. No default codes are sent in VT100 or VT52 personalities.
2. Codes also sent in TVI 950 and Esprit III personalities.
3. With autoprint mode off. Sends ESC [? 4 i (7-bit) or CSI ? 4 i (8-bit) if autoprint mode is on.
4. With controller print mode off. Sends ESC [4 i (7-bit) or CSI 4 i (8-bit) if controller print mode is on.

Table D-8 Function Key Default Codes—ASCII Keyboard, Continued

Key	Native 7-Bit[1]	Native 8-Bit[1]	Wyse 350[2]	ADDS VP A2
F4	ESC [@	CSI @	SOH C CR	STX 4 CR
Shift F4	ESC [L	CSI L	SOH c CR	STX $ CR
F5	ESC [M	CSI M	SOH D CR	STX 5 CR
Shift F5	ESC [K	CSI K	SOH d CR	STX % CR
F6	ESC [17 ~	CSI 17 ~	SOH E CR	STX 6 CR
Shift F6	ESC [31 ~	CSI 31 ~	SOH e CR	STX & CR
F7	ESC [18 ~	CSI 18 ~	SOH F CR	STX 7 CR
Shift F7	ESC [32 ~	CSI 32 ~	SOH f CR	STX ' CR
F8	ESC [19 ~	CSI 19 ~	SOH G CR	STX 8 CR
Shift F8	ESC [33 ~	CSI 33 ~	SOH g CR	STX (CR
F9	ESC [20 ~	CSI 20 ~	SOH H CR	STX 9 CR
Shift F9	ESC [34 ~	CSI 34 ~	SOH h CR	STX) CR
F10	ESC [21 ~	CSI 21 ~	SOH I CR	STX : CR
Shift F10	ESC [35 ~	CSI 35 ~	SOH i CR	STX * CR
F11	ESC [23 ~	CSI 23 ~	SOH J CR	STX ; CR
Shift F11	ESC [1 ~	CSI 1 ~	SOH j CR	STX + CR
F12	ESC [24 ~	CSI 24 ~	SOH K CR	STX < CR
Shift F12	ESC [2 ~	CSI 2 ~	SOH k CR	STX , CR
F13	ESC [25 ~	CSI 25 ~	SOH L CR	STX = CR
Shift F13	ESC [3 ~	CSI 3 ~	SOH l CR	STX - CR
F14	ESC [26 ~	CSI 26 ~	SOH M CR	STX > CR
Shift F14	ESC [4 ~	CSI 4 ~	SOH m CR	STX . CR
F15	ESC [28 ~	CSI 28 ~	SOH N CR	STX ? CR
Shift F15	ESC [5 ~	CSI 5 ~	SOH n CR	STX / CR
F16	ESC [29 ~	CSI 29 ~	SOH O CR	STX @ CR
Shift F16	ESC [6 ~	CSI 6 ~	SOH o CR	STX 0 CR

Table D-9 Function Key Default Codes—Enhanced PC-Style Keyboard

Key	Native 7-Bit[1]	Native 8-Bit[1]	Wyse 350[2]	ADDS VP A2
F1	ESC O P	SS3 P	SOH @ CR	STX 1 CR
Shift F1	ESC O P	SS3 P	SOH ' CR	STX ! CR
F2	ESC O Q	SS3 Q	SOH A CR	STX 2 CR
Shift F2	ESC O Q	SS3 Q	SOH a CR	STX " CR
F3	ESC O R	SS3 R	SOH B CR	STX 3 CR
Shift F3	ESC O R	SS3 R	SOH b CR	STX # CR
F4	ESC O S	SS3 S	SOH C CR	STX 4 CR
Shift F4	ESC O S	SS3 S	SOH c CR	STX $ CR
F5	ESC [M	CSI M	SOH D CR	STX 5 CR
Shift F5	ESC [K	CSI K	SOH d CR	STX % CR
F6	ESC [17 ~	CSI 17 ~	SOH E CR	STX 6 CR
Shift F6	ESC [31 ~	CSI 31 ~	SOH e CR	STX & CR
F7	ESC [18 ~	CSI 18 ~	SOH F CR	STX 7 CR
Shift F7	ESC [32 ~	CSI 32 ~	SOH f CR	STX ' CR
F8	ESC [19 ~	CSI 19 ~	SOH G CR	STX 8 CR
Shift F8	ESC [33 ~	CSI 33 ~	SOH g CR	STX (CR
F9	ESC [20 ~	CSI 20 ~	SOH H CR	STX 9 CR
Shift F9	ESC [34 ~	CSI 34 ~	SOH h CR	STX) CR
F10	ESC [21 ~	CSI 21 ~	SOH I CR	STX : CR
Shift F10	ESC [35 ~	CSI 35 ~	SOH i CR	STX * CR
F11	ESC [23 ~	CSI 23 ~	SOH J CR	STX ; CR
Shift F11	ESC [1 ~	CSI 1 ~	SOH j CR	STX + CR
F12	ESC [24 ~	CSI 24 ~	SOH K CR	STX < CR
Shift F12	ESC [2 ~	CSI 2 ~	SOH k CR	STX , CR

1. Codes also sent in VT320/VT220 and Intecolor personalities. No default codes are sent in VT100 or VT52 personalities.
2. Codes also sent in TVI 950 and Esprit III personalities.

E Control Codes

Tables E-1 and E-2 list the control codes supported in the terminal's native personality. Table E-3 lists the control codes supported in ASCII personalities.

Table E-1 Native Personality 7-Bit Control Codes (C0)[1]

C0 Character	Symbol[2] 74 Hz	60 Hz[3]	Control Key[4]	Decimal Value	Hex Value	Action[5]
NUL			@ or Spacebar	000	00	
SOH	S_H	S_H	A	001	01	
STX	S_X	S_X	B	002	02	
ETX	E_X	E_X	C	003	03	
EOT	E_T	E_T	D	004	04	
ENQ	E_Q	E_Q	E	005	05	Send answerback message
ACK	A_K	A_K	F	006	06	
BEL	B_L	B_L	G	007	07	Sound bell, if enabled
BS	B_S	B_S	H	008	08	Cursor left (backspace)
HT	H_T	H_T	I	009	09	Tab cursor
LF	L_F	L_F	J	010	0A	Cursor down (linefeed)
VT	V_T	V_T	K	011	0B	Same as LF
FF	F_F	F_F	L	012	0C	Same as LF
CR	C_R	C_R	M	013	0D	Cursor to start of line
SO	S_O	S_O	N	014	0E	Load G1 character set into GL (LS1)
SI	S_I	S_I	O	015	0F	Load G0 character set into GL (LS0)
DLE	D_L		P	016	10	

1. Codes also supported in VT320/VT220, VT100, VT52, and Intecolor personalities.
2. Characters displayed when Controls Mode setup parameter is set to *display*. 74 Hz (16x16 character cell size) and 60 Hz (16x20 character cell size) refer to the screen resolution selected by the Screen Resolution setup parameter.
3. Refers only to 24/25x80 screen size. All other screen formats display the characters shown in the 74 Hz column.
4. Key pressed with Ctrl. Can be shifted or unshifted.
5. A blank in this column means the code is ignored.

Table E-1 Native Personality 7-Bit Control Codes (C0)[1], Continued

C0 Character	Symbol[2] 74 Hz	60 Hz[3]	Control Key[4]	Decimal Value	Hex Value	Action[5]
DC1 (Xon)	$^{D}_{1}$	╖	Q	017	11	Resume transmission (when transmit handshake is Xon/Xoff)
DC2	$^{D}_{2}$	╓	R	018	12	
DC3 (Xoff)	$^{D}_{3}$	╙	S	019	13	Stop transmission (when transmit handshake is Xon/Xoff)
DC4	$^{D}_{4}$	=	T	020	14	
NAK	$^{N}_{K}$	‖	U	021	15	
SYN	$^{S}_{Y}$	■	V	022	16	
ETB	$^{E}_{B}$	▒	W	023	17	
CAN	$^{C}_{N}$	≋	X	024	18	Abort escape sequence
EM	$^{E}_{M}$	Ÿ	Y	025	19	
SUB	?	Œ	Z	026	1A	Abort escape sequence; display reverse question mark
ESC	$^{E}_{C}$	œ	[or 3	027	1B	Initiate escape sequence
FS	$^{F}_{S}$	ij	\ or 4	028	1C	
GS	$^{G}_{S}$	*f*	] or 5	029	1D	
RS	$^{R}_{S}$	?	~ or 6	030	1E	
US	$^{U}_{S}$		_, 7, or /	031	1F	

Table E-2 Native Personality 8-Bit Control Codes (C1)[1]

C1 Character	Equivalent 7-Bit Code	Symbol[2] 74 Hz	60 Hz[3]	Decimal Value	Hex Value	Action[4]
		$^{8}_{0}$	♦	128	80	
		$^{8}_{1}$	≋	129	81	
		$^{8}_{2}$	$^{H}_{T}$	130	82	
		$^{8}_{3}$	$^{F}_{F}$	131	83	
IND	ESC D	$^{I}_{N}$	$^{C}_{R}$	132	84	Cursor down
NEL	ESC E	$^{N}_{L}$	$^{L}_{F}$	133	85	Cursor to start of next line

1. Codes also supported in VT320/VT220 and Intecolor personalities.
2. Characters displayed when Controls setup parameter is set to *display*. 74 Hz (16x16 character cell size) and 60 Hz (16x20 character cell size) refer to the screen resolution selected by the Screen Resolution setup parameter.
3. Refers only to 24/25x80 screen size. All other screen formats display the characters shown in the 74 Hz column.
4. A blank in this column means the code is ignored.

Table E-2 Native Personality 8-Bit Control Codes (C1)[1], Continued

C1 Character	Equivalent 7-Bit Code	Symbol[2] 74 Hz	60 Hz[3]	Decimal Value	Hex Value	Action[4]
SSA		S_S	°	134	86	
ESA		E_S	±	135	87	
HTS	ESC H	H_S	N_L	136	88	Set tab stop at cursor position
HTJ		H_J	V_T	137	89	
VTS		V_S	┘	138	8A	
PLD		P_D	┐	139	8B	
PLU		P_U	┌	140	8C	
RI	ESC M	R_I	└	141	8D	Cursor up
SS2	ESC N	S_2	┼	142	8E	Assign G2 character set to GL for next character
SS3	ESC O	S_3	⎺	143	8F	Assign G3 character set to GL for next character
DCS	ESC P	D_C	⎻	144	90	Introduce device control string
PU1		P_1	─	145	91	
PU2		P_2	⎼	146	92	
STS		S_E	_	147	93	
CCH		C_C	├	148	94	
MW		M_W	┤	149	95	
SPA		S_P	┴	150	96	
EPA		E_P	┬	151	97	
		9_8	│	152	98	
		9_9	≤	153	99	
		9_A	≥	154	9A	
CSI	ESC [	C_S	π	155	9B	Introduce control sequence
ST	ESC \	S_T	≠	156	9C	Device control string terminator
OSC	ESC]	O_S	£	157	9D	Ignore all subsequent data until ST (or ESC \) received
PM	ESC ^	P_M	·	158	9E	Ignore all subsequent data until ST (or ESC \) received
APC	ESC _	A_P	▲	159	9F	Ignore all subsequent data until ST (or ESC \) received

Table E-3 Control Codes Supported in ASCII Personalities

ASCII Character	Symbol[1]	Control Key[2]	Decimal Value	Hex Value	Action[3]
NUL		@ or ` [4]	000	00	
SOH	$^{S}_{H}$	A	001	01	
STX	$^{S}_{X}$	B	002	02	
ETX	$^{E}_{X}$	C	003	03	
EOT	$^{E}_{T}$	D	004	04	
ENQ	$^{E}_{Q}$	E	005	05	Send ACK (if ACK mode is on)
ACK	$^{A}_{K}$	F	006	06	
BEL	$^{B}_{L}$	G	007	07	Sound bell if enabled
BS	$^{B}_{S}$	H	008	08	Cursor left (backspace)
HT	$^{H}_{T}$	I	009	09	Tab cursor
LF	$^{L}_{F}$	J	010	0A	Cursor down (linefeed)
VT	$^{V}_{T}$	K	011	0B	Cursor up, no scroll
FF	$^{F}_{F}$	L	012	0C	Cursor right
CR	$^{C}_{R}$	M	013	0D	Cursor to start of line
SO	$^{S}_{O}$	N	014	0E	Unlock keyboard
SI	$^{S}_{I}$	O	015	0F	Lock keyboard
DLE	T	P	016	10	Pass next incoming character to printer port
DC1 (Xon)	⌊	Q	017	11	Enable transmission (when transmit handshake is Xon/Xoff)
DC2	⌐	R	018	12	Auxiliary print mode on
DC3 (Xoff)	¬	S	019	13	Stop transmission (when transmit handshake is Xon/Xoff)
DC4	⊦	T	020	14	Auxiliary and transparent print modes off
NAK	⌋	U	021	15	
SYN	|	V	022	16	
ETB	▮	W	023	17	
CAN	⊹	X	024	18	Transparent print mode on (if enhance mode is on)
EM	⊣	Y	025	19	

1. Characters displayed when Controls setup parameter is set to *display*.
2. Key pressed with Ctrl. Can be shifted or unshifted unless otherwise noted.
3. A blank in this column means the code is ignored.
4. Unshifted key only.

Table E-3 Control Codes Supported in ASCII Personalities, Continued

ASCII Character	Symbol[1]	Control Key[2]	Decimal Value	Hex Value	Action[3]
SUB	-	Z	026	1A	Clear unprotected page to spaces and home cursor
ESC	▒	[	027	1B	Initiate escape sequence
FS	=	\	028	1C	
GS	↓	]	029	1D	
RS	‖	~[5] or ^[5]	030	1E	Home cursor
US	▒	_[5]	031	1F	Cursor to start of next line

5. Shifted key only.

F ANSI Command Summary

Table F-1 lists the commands supported by the terminal in the native personality and in VT320/VT220, VT100, and Intecolor 220 personalities. Mnemonics beginning with WY are Wyse private mnemonics; those beginning with DEC are Digital Equipment Corporation private mnemonics; all others are ANSI mnemonics.

☐ **Note** The terminal does not support the VT100 CSI q (change the LEDS) command.

Command sequences and terminal report responses are shown in 8-bit format, which is recognized in the native, VT320/VT220, and Intecolor personalities. The following 7-bit equivalents for the 8-bit C1 control characters are recognized in all ANSI personalities.

8-Bit Control Character	7-Bit Equivalent
IND	ESC D
NEL	ESC E
HTS	ESC H
RI	ESC M
SS2	ESC N
SS3	ESC O
DCS	ESC P
CSI	ESC [
ST	ESC \
OSC	ESC]
PM	ESC ^
APC	ESC _

Within a command sequence, parameters are shown in italics. P*n* represents a numerical parameter; P*s* represents a selective parameter. Parameter values are listed immediately following the command.

Table F-2 lists the commands supported by the terminal in VT52 personality.

Table F-1 Commands Supported in ANSI Personalities

Command	Command Sequence	VT320/220 Intecolor	VT100	Mnemonic
Controlling Terminal Modes				
Terminal modes on (set)	(1) CSI *Ps* ;...; *Ps* h	Same	Same	SM
	(2) CSI *?* *Ps* ;...; *Ps* h	Same	Same	SM
Terminal modes off (reset)[1]	(1) CSI *Ps* ;...; *Ps* l	Same	Same	RM
	(2) CSI *?* *Ps* ;...; *Ps* l	Same	Same	RM

(1) *Ps*[2]	Mode	Mnemonic	Default[3]
2	Keyboard lock	KAM	Off
3	Monitor	CRM	NVR
4	Insert	IRM	Off
12	Local echo disable	SRM	NVR
13	Control execution disable	FEAM	NVR
16	Transfer termination	TTM	NVR
20	Newline	LNM	NVR[4]
30	Display disable	WYDSCM	Off
31	Status line display	WYSTLINM	NVR
32	Screen saver	WYCRTSAVM	NVR
33	Steady cursor	WYSTCURM	NVR
34	Underline cursor	WYULCURM	NVR
35	Width change clear disable	WYCLRM	NVR
36	Delete key redefinition	WYDELKM	NVR
37	Nonerasable area transmit	WYGATM	NVR
38	Send full screen	WYTEXM	NVR
40	Extra data line	WYEXTDM	NVR
42	Wyse 350[5]	WYASCII	NVR

(2) *?* *Ps*[2]	Mode	Mnemonic	Default[3]
1	Cursor key application	DECCKM	NVR
2	VT52[6]	DECANM	NVR
3	132 column[7]	DECCOLM	NVR
4	Scrolling	DECSCLM	NVR
5	Reverse screen	DECSCNM	NVR
6	Origin	DECOM	Off
7	Autowrap	DECAWM	NVR
8	Key autorepeat	DECARM	NVR
10	Block mode	DECEDM	NVR
18	Print form feed	DECPFF	NVR
19	Print extent	DECPEX	NVR
25	Text cursor enable	DECTCEM	NVR
38	TEK 4010/4014[8]	WYTEK	NVR
42	National replacement character set[9]	DECNRCM	NVR
60	Horizontal panning[10]	DECHCCM	NVR
61	Vertical panning[10]	DECVCCM	NVR
64	Page coupling[10]	DECPCCM	NVR
66	Keypad application[10]	DECNKM	NVR
67	Delete key redefinition[10]	DECBKM	NVR
68	Key legend[10]	DECKBUM	NVR
80	161 column[10]	WY161	NVR
83	52 line[10]	WY52	NVR
84	Erasable/nonerasable attribute select[11]	WYENAT	Off
85	Replacement character color[10]	WYREPL	Off

1. Final character in sequence is a lowercase L.
2. *Ps* values are listed in two groups: In the first group are the values for terminal modes that can be set with SM command sequence (1) or reset with RM command sequence (1); in the second group are the values for terminal modes that can be set with SM sequence (2) or reset with RM sequence (2). The latter group is shown as *? Ps* to indicate that sequence (2) includes a question mark immediately following the control sequence introducer CSI. Up to 16 *Ps* values can be specified (separated by semicolons) in any one SM or RM command sequence.
3. Mode status when terminal is turned on or reset. "NVR" (nonvolatile RAM) means that the status depends on the value last saved in battery-backed memory in setup mode.
4. Return setup parameter (Keyboard menu, Key Functions submenu).
5. Set mode (SM) only.
6. Reset mode (RM) only.
7. Command is ignored during dual-session operation with a vertically split screen.
8. Set mode (SM) only. Command is ignored if the terminal is set up for two sessions.
9. Command is ignored if Keyboard Language parameter is set to *U.S.*
10. Native and VT320/VT220 personalities only.
11. Native personality only. Enables separate assignment of attributes to erasable and nonerasable characters (by the SGR command); when reset, attributes extend to both.

Table F-1 Commands Supported in ANSI Personalities, Continued

Command	Command Sequence Native	VT320/220 Intecolor	VT100	Mnemonic
Save cursor position, attributes, character sets, wrap flag, and origin mode	ESC 7 or CSI s	Same	Same	DECSC WYSC
Delay processing about 250 ms	ESC ,	Same	Same	WYDELAY
Restore last saved cursor position, attributes, character sets, wrap flag, origin mode, and single-shift status	ESC 8 or CSI u	Same	Same	DECRC WYRC
Block mode on	CSI ? 10 h	Same	Same	DECEDM
Block mode off	CSI ? 10 l	Same	Same	DECEDM
Sound bell, if enabled	CTRL G	Same	Same	BEL
Set date and time[12]	CSI 58 ; *Ps* ; *Ps1* ; *Ps2* ; *Ps3* ; *Ps4* w			WYDTSET
Ps Day (1–31) *Ps3* Hour (1–24) *Ps1* Month (1–12) *Ps4* Minutes (0–59) *Ps2* Year (0–99)				
Abort escape sequence	CTRL X	Same	Same	CAN
Abort escape sequence; display reverse question mark	CTRL Z	Same	Same	SUB
Ignore all subsequent data until ST (or ESC \) received	ESC] or ESC ^ or ESC _	Same		OSC PM APC
Controlling the Screen Display				
Controls mode on	CSI 3 h	Same	Same	CRM
Controls mode off	CSI 3 l	Same	Same	CRM
Control execution off	CSI 13 h	Same	Same	FEAM
Control execution on	CSI 13 l	Same	Same	FEAM
Display disable (blank screen)	CSI 30 h	Same	Same	WYDSCM
Display screen	CSI 30 l	Same	Same	WYDSCM
Status line display	CSI 31 h	Same	Same	WYSTLINM
Blank status line	CSI 31 l	Same	Same	WYSTLINM
Screen saver on	CSI 32 h	Same	Same	WYCRTSAVM

12. Date alone can be set by including parameters *Ps* ; *Ps1* ; and *Ps2* only. Time alone can be set by CSI 58 ; ; ; ; *Ps3* ; *Ps4* w.

Table F-1 Commands Supported in ANSI Personalities, Continued

Command	Command Sequence Native	VT320/220 Intecolor	VT100	Mnemonic
Screen saver off	CSI 32 l	Same	Same	WYCRTSAVM
Width change clear off	CSI 35 h	Same	Same	WYCLRM
Width change clear on	CSI 35 l	Same	Same	WYCLRM
25th data line displayed	CSI 40 h	Same	Same	WYEXTDM
25th data line off	CSI 40 l	Same	Same	WYEXTDM
52-line display[10]	CSI ? 83 h	Same		WY52
24-line display[10]	CSI ? 83 l	Same		WY52
161-column display[10]	CSI ? 80 h	Same		WY161
80-column display[10]	CSI ? 80 l	Same		WY161
132-column display[7]	CSI ? 3 h	Same	Same	DECCOLM
80-column display	CSI ? 3 l	Same	Same	DECCOLM
Reverse screen	CSI ? 5 h	Same	Same	DECSCNM
Normal screen	CSI ? 5 l	Same	Same	DECSCNM
Line 1 is top line of scrolling region	CSI ? 6 h	Same	Same	DECOM
Line 1 is top line of data area	CSI ? 6 l	Same	Same	DECOM
Autowrap on	CSI ? 7 h	Same	Same	DECAWM
Autowrap off	CSI ? 7 l	Same	Same	DECAWM
Display cursor	CSI ? 25 h	Same	Same	DECTCEM
Cursor invisible	CSI ? 25 l	Same	Same	DECTCEM
Cursor steady (nonblinking)	CSI 33 h	Same	Same	WYSTCURM
Cursor blinking	CSI 33 l	Same	Same	WYSTCURM
Underline cursor on	CSI 34 h	Same	Same	WYULCURM
Block cursor on	CSI 34 l	Same	Same	WYULCURM
Data sent to screen's data area	CSI 0 $ }	Same		DECSASD
Data sent to bottom status line (host-writable)	CSI 1 $ }	Same		DECSASD
Turn off top and bottom status line display	CSI 0 $ ~	Same		DECSSDT
Display top status line (local)	CSI 1 $ ~	Same		DECSSDT

Table F-1 Commands Supported in ANSI Personalities, Continued

Command	Command Sequence Native	VT320/220 Intecolor	VT100	Mnemonic
Display top and bottom status line	CSI 2 $ ~	Same		DECSSDT
Set top/bottom margins	CSI *Pn* ; *Pn1* r	Same	Same	DECSTBM
Pn Top line number *Pn1* Bottom line number				
Smooth scrolling on	CSI ? 4 h	Same	Same	DECSCLM
Jump scrolling on	CSI ? 4 l	Same	Same	DECSCLM
Set 1 lps smooth scrolling speed[13]	CSI 1 z	Same	Same	WYSCRATE
Set 2 lps smooth scrolling speed[13]	CSI 2 z	Same	Same	WYSCRATE
Set 4 lps smooth scrolling speed[13]	CSI 0 z or CSI 3 z	Same	Same	WYSCRATE
Set 8 lps smooth scrolling speed[13]	CSI 4 z	Same	Same	WYSCRATE
Display Memory/Split Screen				
Display pans vertically to keep cursor in view	CSI ? 61 h	Same		DECVCCM
Cursor disappears when moves past top or bottom line	CSI ? 61 l	Same		DECVCCM
Display pans horizontally to keep cursor in view	CSI ? 60 h	Same		DECHCCM
Cursor disappears when moves past right or left margin	CSI ? 60 l	Same		DECHCCM
New page is displayed to keep cursor in view	CSI ? 64 h	Same		DECPCCM
Cursor disappears when moved to new page	CSI ? 64 l	Same		DECPCCM
Move horizontal split up *n* lines, or vertical split left *n* columns	CSI 0 ; *Pn* y			WYMSPLM
Move horizontal split down *n* lines, or vertical split right *n* columns	CSI 1 ; *Pn* y			WYMSPLM
Select type of split for one session	CSI *Ps* v			WYSSPLT
Ps 0 Full 1 Horizontal split 8 Vertical split				

13. Command is valid only if smooth scrolling has been enabled.

Table F-1 Commands Supported in ANSI Personalities, Continued

Command	Command Sequence Native	VT320/220 Intecolor	VT100	Mnemonic
Select other window (one session only)	CSI *Ps* t			WYSWDW
Ps 0 or 1 Left or upper window 2 Right or lower window				
Display a preceding page and home cursor	CSI *Pn* V	Same	Same	PP
Pn Number of pages back (0 or 1 = previous page)				
Display a preceding page	CSI *Pn* ; *Ps* SP R			
Pn Number of pages back (0 or 1 = previous page)				
Ps 0 Transfer cursor position 1 Save cursor position				PPB WYPPB
Display a following page and home cursor	CSI *Pn* U	Same	Same	NP
Pn Number of pages forward (0 or 1 = next page)				
Display a following page	CSI *Pn* ; *Ps* SP Q			
Pn Number of pages forward (0 or 1 = next page)				
Ps 0 Transfer cursor position 1 Save cursor position				PPR WYPPR
Display specific page	CSI *Pn* ; *Ps* SP P			
Pn Page number (0 or 1 = page 1)				
Ps 0 Transfer cursor position 1 Save cursor position				PPA WYPPA
Define page for session[14]	CSI 59 ; *Ps* ; *Ps1* ; *Ps2* ; *Ps3* w			WYDFPG
Ps **Number of Pages** 0 or 1 1 2 2 3 3 4 4 (with additional memory installed)	*Ps2* **Number of Lines**[15] 0 24/25 1 50/51			
Ps1 **Number of Columns** 0 80 1 132 2 161	*Ps3* **Multiplier**[15] 0 1 1 2 2 4			

14. Clears pages and defaults screen width to 80 columns. The command is ignored if received by the inactive session.
15. Value of *Ps2* times value of *Ps3* gives total number of data lines in page.

Table F-1 Commands Supported in ANSI Personalities, Continued

Command	Command Sequence Native	VT320/220 Intecolor	VT100	Mnemonic
Selecting Terminal Personalities				
Native on (8-bit transmit mode)	CSI 90 ; 0 " p	Same	Same	DECSCL
Native on (7-bit transmit mode)	CSI 90 ; 1 " p	Same	Same	DECSCL
VT320/VT220 on (8-bit transmit mode)	CSI 63 ; 2 " p or CSI 62 ; 2 " p	Same	Same	DECSCL
VT320/VT220 on (7-bit transmit mode)	CSI 63 ; 1 " p or CSI 62 ; 1 " p	Same	Same	DECSCL
Intecolor 220 on	CSI 91 " p	Same	Same	DECSCL
ADDS A2 on	CSI 93 " p	Same	Same	DECSCL
VT100 on	CSI 61 " p	Same	Same	DECSCL
VT52 on	CSI ? 2 1	Same	Same	DECANM
TEK 4010/4014 on[16]	CSI ? 38 h	Same	Same	WYTEK
Wyse 350 on	CSI 42 h	Same	Same	WYASCII
Labeling Character Sets				
Label character set	ESC *fcode scode*	Same	Same	SCS

fcode	**Font Bank**	*fcode*	**Font Bank**
(	G0 94 character	-	G1 96 character[10]
)	G1 94 character	.	G2 96 character[10]
*	G2 94 character[10]	/	G3 96 character[10]
+	G3 94 character[10]		

scode	**Character Set[17]**
0	Special Graphics
A	ISO Latin-1 Supplemental[18]
B	ASCII
<	User-preferred supplemental[19]
% 5	Multinational Supplemental[10]
name	Softfont name assigned by the *name* parameter in softfont load command (DECDLD)

scode	**Character Set (National Mode)[20]**
A	UK[21]
4	Dutch[21]
C or 5	Finnish[21]
R	French/Belgian[21]
Q or 9	French Canadian
K	German[21]
Y	Italian[21]
E or 6 or '	Norwegian/Danish[21]
Z	Spanish[21]
H or 7	Swedish[21]
=	Swiss[21]
X	Latin American Spanish
%6	Portuguese[21]

16. Command is ignored if the terminal is set up for two sessions.
17. See Appendix A for character set illustrations.
18. 96-character set only. Not available in VT100 personality.
19. Multinational (default) or ISO Latin-1 as defined by DECAUPSS or in setup mode. (VT100 personality supports only Multinational.)
20. Valid only when national replacement character mode is set and when Keyboard Language setup parameter is set to the corresponding language. Only one set is available at a time.
21. Available only if the language is supported in an installed cartridge.

Table F-1 Commands Supported in ANSI Personalities, Continued

Command	Command Sequence Native	VT320/220 Intecolor	VT100	Mnemonic
Assign Multinational as user-preferred supplemental set (default)	DCS 0 ! u % 5 ST	Same		DECAUPSS
Assign ISO Latin-1 as user-preferred supplemental set	DCS 1 ! u A ST	Same		DECAUPSS
National replacement character set mode on	CSI ? 42 h	Same	Same	DECNRCM
National replacement character set mode off	CSI ? 42 l	Same	Same	DECNRCM
Assigning Character Sets				
Assign G0 character set to GL	CTRL O	Same	Same	SI or LS1
Assign G1 character set to GL	CTRL N	Same	Same	SO or LS0
Assign G1 character set to GR	ESC ~	Same		LS1R
Assign G2 character set to GL	ESC n	Same		LS2
Assign G2 character set to GR	ESC }	Same		LS2R
Assign G3 character set to GL	ESC o	Same		LS3
Assign G3 character set to GR	ESC |	Same		LS3R
Assign G2 character set to GL for the next character only	ESC N	Same		SS2
Assign G3 character set to GL for the next character only	ESC O	Same		SS3
Loading Softfonts				
Load soft character font[22]	DCS *Ps* ; *Ps1* ; *Ps2* ; *Ps3* ; *Ps4* ; *Ps5* ; *Ps6* ; *Ps7* { *name Sxbp* ;...; *Sxbp* ST	Same		DECDLD

Ps Font number (0 or 1)

Ps1 **Initial Character Position**
A decimal number identifying the position of the initial character to be loaded. Character positions are numbered consecutively starting with 1 = 21H for a 94-character set or 0 = 20H for a 96-character set (i.e., position 20H is not available for a 94-character set).

Ps2 **Erase Control**
0 Erase all characters in the set before redefining (default)
1 Erase each character as it is redefined
2 Erase all characters in both 80- and 132-column sets

22. Command is ignored when a 16x20 character cell and 26-line by 80-column screen is selected. This screen size supports a total of only 256 displayable characters.

Table F-1 Commands Supported in ANSI Personalities, Continued

Command	Command Sequence			
	Native	VT320/220 Intecolor	VT100	Mnemonic

Ps3[23] **Character Matrix Width**[24]

Ps3[23]	Character Matrix Width[24]	*Ps3*[23]	Character Matrix Width[24]
0	16 pixels wide in 80-column mode (default) 10 pixels wide in 132-column mode 8 pixels wide in 161-column mode	8	8 pixels wide
		9	9 pixels wide
		10	10 pixels wide
1	Illegal	11	11 pixels wide
2	5 pixels wide	12	12 pixels wide
3	6 pixels wide	13	13 pixels wide
4	7 pixels wide	14	14 pixels wide
5	5 pixels wide	15	15 pixels wide
6	6 pixels wide	16	16 pixels wide
7	7 pixels wide		

Ps4 **Font Width**

0 or 1	80-column (default)
2	132- or 161-column display

Ps5 **Font Type**[25]

0 or 1	Text (default)
2	Full cell

Ps6	Cell Height	*Ps6*	Cell Height	*Ps6*	Cell Height
0	16 pixels (default)	7	7 pixels	13	13 pixels
1	1 pixel	8	8 pixels	14	14 pixels
2	2 pixels	9	9 pixels	15	15 pixels
3	3 pixels	10	10 pixels	16	16 pixels
4	4 pixels	11	11 pixels		
5	5 pixels	12	12 pixels		
6	6 pixels				

Ps7 **Character Set Size**

0	94-character set (default)
1	96-character set

{ A separator

name A one-, two-, or three-character name assigned to the softfont character set and referenced when labeling the set (SCS).

First character (optional):	ASCII character from SP to / (20H-2FH)
Second character (optional):	ASCII character from SP to / (20H-2FH)
Third character (required):	ASCII character from 0 to ~ (30H-7EH)

Sxbp The sixel bit pattern defining the character loaded. Up to 94 or 96 individual character bit patterns (separated by semicolons) may be specified, depending on character set size (*Ps7* parameter setting).

ST String terminator

23. In native personality, the *Ps3* parameter value overrides the sixel patterns that are specified. For example, if *Ps3* = 5, only the first five *Sxbp* values are recognized.
24. Select *Ps3* values of 2 or 3 to load characters already designed for a DEC VT220 10x10 cell.
25. If a full-cell font is selected, all pixels in the cell can be individually addressed. If a text font is selected, the terminal automatically provides character spacing by blanking the first two and the last two columns of the cell.

Table F-1 Commands Supported in ANSI Personalities, Continued

Command	Command Sequence Native	VT320/220 Intecolor	VT100	Mnemonic
Load softfont	DCS 0 ; *Ps* ; *Pn* } *ds...ds* ST			WYLSFNT

Ps	Font Bank	*Ps*	Font Bank
0	0	2	2 (not available in 16x20 resolution, 80x26)
1	1	3	3 (not available in 16x20 resolution, 80x26)

Pn Character position in character cell (Decimal number from 0-127)

ds...ds Hexadecimal data string (defining the character)

Controlling Attributes

Assign character attributes	CSI *Ps* ;...; *Ps* m	Same	Same	SGR	

Ps	Character Attribute[26]	*Ps*	Character Attribute[26]	*Ps*	Character Attribute[26]
0	Normal (all attributes off)	24	Underline off	35	Magenta character
1	Bold (dim, blank off)	25	Blink off	36	Cyan character
2	Dim (bold, blank off)	27	Reverse off	37	White character
4	Underline	28	Blank off	40	Black background
5	Blink	29	Overstrike off	41	Red background
7	Reverse	30	Black character	42	Green background
8	Blank	31	Red character	43	Yellow background
9	Overstrike	32	Green character	44	Blue background
22	Normal intensity (bold, dim, blank off)	33	Yellow character	45	Magenta background
		34	Blue character	46	Cyan background
				47	White background

Select overstrike position	CSI 53 ; *Pn* w			WYSOVR

Pn Number of line in character cell where overstrike is positioned (0-19)

Define erasable character	CSI 0 " q or CSI 2 " q	Same		DECSCA
Define nonerasable character	CSI 1 " q	Same		DECSCA
Enable separate assignment of attributes (SGR) to erasable and nonerasable characters	CSI ? 84 h			WYENAT
Enable attribute assignment (SGR) to extend to both erasable and nonerasable characters	CSI ? 84 l			WYENAT
Define top half of double-high, double-wide line	ESC # 3	Same	Same	DECDHL
Define bottom half of double-high, double-wide line	ESC # 4	Same	Same	DECDHL

26. Up to 16 attributes may be combined by separating character attribute parameters with semicolons (;).

Table F-1 Commands Supported in ANSI Personalities, Continued

Command	Command Sequence Native	VT320/220 Intecolor	VT100	Mnemonic
Define single-high, single-wide line	ESC # 5	Same	Same	DECSWL
Define single-high, double-wide line	ESC # 6	Same	Same	DECDWL
Define top half of double-high, single-wide line	ESC # :	Same	Same	WYDHL
Define bottom half of double-high, single-wide line	ESC # ;	Same	Same	WYDHL
Defining Color Associations				
Redefine character display attribute association	CSI *Ps* ; *Ps1* ; *Ps2* ; *Ps3* w			WYCAA

Ps A value from 0 to 47 specifying the existing attribute association (blank, blink, reverse, underline) to be redefined for a given base character attribute (normal, dim, or bold)

Attribute Association	Base Character Attribute Normal *Ps*	Dim *Ps*	Bold *Ps*
Normal (no attributes)	0	16	32
Blank	1	17	33
Blink	2	18	34
Blink and blank	3	19	35
Reverse	4	20	36
Reverse and blank	5	21	37
Reverse and blink	6	22	38
Reverse, blink, and blank	7	23	39
Underline	8	24	40
Underline and blank	9	25	41
Underline and blink	10	26	42
Underline, blank, and blink	11	27	43
Underline and reverse	12	28	44
Underline, blank, and reverse	13	29	45
Underline, blink, and reverse	14	30	46
Underline, blank, blink, and reverse	15	31	47

Ps1 A value from 0 to 64 specifying the new foreground color (see Color Table)

Ps2 A value from 0 to 64 specifying the new background color (see Color Table)

Color Table[27]

Value	Color	*Value*	Color	*Value*	Color
0	Default (NVR)	4	Blue	8	Bright blue
1	Black	5	Grass green	9	Bright green
2	Dark blue	6	Teal blue	10	Light blue-green
3	Deep blue	7	Electric blue	11	Turquoise

27. Color names are for convenience of reference and are not based on any scientific or artistic criteria. The names are intended only as guidelines within a range of colors.

Table F-1 Commands Supported in ANSI Personalities, Continued

Command	Command Sequence: Native	VT320/220 Intecolor	VT100	Mnemonic

Color Table[25], Continued

Value	Color	*Value*	Color	*Value*	Color
12	Sky blue	30	Seafoam green	48	Pale cyan
13	Green	31	Pale blue-green	49	Red
14	Sea green	32	Light cyan	50	Hot pink
15	Blue-green	33	Deep red	51	Magenta
16	Cyan	34	Rose	52	Light purple
17	Brick red	35	Medium purple	53	Red-orange
18	Violet	36	Purple	54	Pale pink
19	Indigo	37	Orange brown	55	Purple pink
20	Blue-purple	38	Faded rose	56	Light violet
21	Khaki-green	39	Purple-gray	57	Amber
22	Charcoal gray	40	Purple-blue	58	Tan
23	Powder blue	41	Dull chartreuse	59	Faded purple
24	Medium blue	42	Sage green	60	Pale purple
25	Medium green	43	Gray	61	Yellow
26	Green-blue	44	Light blue-purple	62	Pale yellow
27	Blue-gray	45	Chartreuse	63	Cream
28	Light blue	46	Pale green	64	White
29	Lime green	47	Faded blue-green		

Ps3 A value from 0 to 15 specifying the new attribute or attribute combination (see Attribute Table)

Attribute Table

Value	Attribute	*Value*	Attribute
0	Normal	8	Underline
1	Blank	9	Blank, underline
2	Blink	10	Blink, underline
3	Blank and blink	11	Blank, blink, and underline
4	Reverse	12	Reverse and underline
5	Blank and reverse	13	Blank, reverse, and underline
6	Blink and reverse	14	Blink, reverse, and underline
7	Blank, blink, and reverse	15	Blank, blink, reverse, and underline

Select foreground color — CSI 48 ; *Ps* w — WYCOLOR

Ps	Foreground Color Palette
0	Normal (white)
1	Red
2	Blue
3	Amber
4	Intecolor
5	Black
6	Green
7	Cyan

Table F-1 Commands Supported in ANSI Personalities, Continued

Command	Command Sequence Native	VT320/220 Intecolor	VT100	Mnemonic
Select background color[28]	CSI 49 ; *Ps* w			WYCOLOR
Ps A value (0-64) from the Color Table				
Restore foreground and background colors to last saved in NVR[28]	CSI 50 w			WYCOLOR
Select border color	CSI 51 ; *Ps* w			WYCOLOR
Ps A value (0-64) from the Color Table				
Select cursor color	CSI 52 ; *Ps* w			WYCOLOR
Ps A value (0-64) from the Color Table				
Select user status line attributes/colors	CSI 54 ; *Ps* ; *Ps1* ; *Ps2* w			WYCOLOR
Select system status line attributes/colors	CSI 55 ; *Ps* ; *Ps1* ; *Ps2* w			WYCOLOR
Select replacement character attributes/colors	CSI 56 ; *Ps* ; *Ps1* ; *Ps2* ; *Ps3* w			WYCOLOR
Select nonerasable character attributes/colors	CSI 57 ; *Ps* ; *Ps1* ; *Ps2* w			WYCOLOR
Set current character attributes/colors	CSI *Ps* ; *Ps1* ; *Ps2* x			WYCDIR
Ps Foreground color—a value (0–64) from the Color Table *Ps1* Background color—a value (0–64) from the Color Table *Ps2* Attribute value (0–15) from the Attribute Table *Ps3* Decimal value of ASCII character (0–255)				
Turn color index mode on/off[29]	CSI 63 ; *Ps* w			WYIND
Ps **Color Index** 0 Off 1 On				
Restore default color index values	CSI 60 w			WYIND
Assign current character foreground color[30]	CSI 61 ; *Ps* w			WYIND
Ps A value from Color Index Table (0–63) assigning new foreground color				

Color Index Table

Value	Color	*Value*	Color	*Value*	Color	*Value*	Color
0	Black	6	Electric blue	12	Green	18	Indigo
1	Dark blue	7	Bright blue	13	Sea green	19	Blue-purple
2	Deep blue	8	Bright green	14	Blue-green	20	Khaki-green
3	Blue	9	Light blue-green	15	Cyan	21	Charcoal gray
4	Grass green	10	Turquoise	16	Brick red	22	Powder blue
5	Teal blue	11	Sky blue	17	Violet	23	Medium blue

28. Also sets border color to background color selected.
29. When color index mode is on, colors are assigned to characters directly from a color index. Dim and bold attributes are not supported.
30. Also turns on color index mode.

Table F-1 Commands Supported in ANSI Personalities, Continued

Command	Command Sequence Native	VT320/220 Intecolor	VT100	Mnemonic

Color Index Table, Continued

Value	Color	*Value*	Color	*Value*	Color	*Value*	Color
24	Medium green	34	Medium purple	44	Chartreuse	54	Purple pink
25	Green-blue	35	Purple	45	Pale green	55	Light violet
26	Blue-gray	36	Orange brown	46	Faded blue-green	56	Amber
27	Light blue	37	Faded rose	47	Pale cyan	57	Tan
28	Lime green	38	Purple-gray	48	Red	58	Faded purple
29	Seafoam green	39	Purple-blue	49	Hot pink	59	Pale purple
30	Pale blue-green	40	Dull chartreuse	50	Magenta	60	Yellow
31	Light cyan	41	Sage green	51	Light purple	61	Pale yellow
32	Deep red	42	Gray	52	Red-orange	62	Cream
33	Rose	43	Light blue-purple	53	Pale pink	63	White

Assign current character background color[30]	CSI 62 ; *Ps* w			WYIND
Ps A value from Color Index Table (0–63) assigning new background color				
Change current nonerasable character foreground color[31]	CSI 64 ; *Ps* w			WYIND
Ps A value from Color Index Table (0–63) assigning new foreground color				
Change current nonerasable character background color[31]	CSI 65 ; *Ps* w			WYIND
Ps A value from Color Index Table (0–63) assigning new background color				
Redefine color index value	CSI 66 ; *Ps* ; *Ps1* w			WYIND
Ps A value from Color Index Table (0–63) that will be redefined				
Ps1 A value from the Color Table specifying the new color to be assigned to Color Index Table value				
Controlling Cursor Movement				
Move cursor to column *n*	CSI *Pn* G or CSI *Pn*	Same	Same	CHA HPA
Move cursor up *n* lines	CSI *Pn* A	Same	Same	CUU
Move cursor down *n* lines	CSI *Pn* B or CSI *Pn* e	Same	Same	CUD VPR
Move cursor right *n* columns	CSI *Pn* C or CSI *Pn* a	Same	Same	CUF HPR
Move cursor left *n* columns	CSI *Pn* D	Same	Same	CUB

31. This command assigns a separate color to nonerasable characters

Table F-1 Commands Supported in ANSI Personalities, Continued

Command	Command Sequence Native	VT320/220 Intecolor	VT100	Mnemonic
Move cursor to line *n*	CSI *Pn* d	Same	Same	VPA
Move cursor to line *n*, column *n*	CSI *Pn* ; *Pn* H or CSI *Pn* ; *Pn* f	Same	Same	CUP HVP
Move cursor down one line in current column, or scroll up if at bottom line of scrolling region	ESC D	Same	Same	IND
Move cursor down one line in current column; execute CR if newline mode is on	CTRL J or CTRL K or CTRL L	Same	Same	LF VT FF
Move cursor up one line in current column, or scroll down if at top line of scrolling region	ESC M	Same	Same	RI
Move cursor down one line and to column 1	ESC E	Same	Same	NEL
Move cursor down *n* lines and to column 1	CSI *Pn* E	Same	Same	CNL
Move cursor up *n* lines and to column 1	CSI *Pn* F	Same	Same	CPL
Backspace cursor	CTRL H	Same	Same	BS
Move cursor to next tab stop	CTRL I	Same	Same	HT
Move cursor to column 1 of current line	CTRL M	Same	Same	CR
Editing Functions				
Insert mode on	CSI 4 h	Same	Same	IRM
Insert mode off	CSI 4 l	Same	Same	IRM
Erase from cursor to end of display[32]	CSI 0 J	Same	Same	ED
Erase from start of display to cursor[32]	CSI 1 J	Same	Same	ED
Erase entire display[32]	CSI 2 J	Same	Same	ED
Erase from cursor to end of line	CSI 0 K	Same	Same	EL
Erase from start of line to cursor	CSI 1 K	Same	Same	EL
Erase entire line	CSI 2 K	Same	Same	EL
Erase erasable characters from cursor to end of display	CSI ? 0 J	Same		DECSED
Erase erasable characters from start of display to cursor	CSI ? 1 J	Same		DECSED

32. Erases characters and character and line attributes.

Table F-1 Commands Supported in ANSI Personalities, Continued

Command	Command Sequence Native	VT320/220 Intecolor	VT100	Mnemonic
Erase erasable characters in entire display	CSI ? 2 J	Same		DECSED
Erase erasable characters from cursor to end of line	CSI ? 0 K	Same		DECSEL
Erase erasable characters from start of line to cursor	CSI ? 1 K	Same		DECSEL
Erase erasable characters from entire line	CSI ? 2 K	Same		DECSEL
Erase *n* characters beginning at cursor	CSI *Pn* X	Same	Same	ECH
Erase a box	CSI *Ps* ; *Pn* ; *Pn1* o			WYCLBX
Draw a box	CSI *Ps* ; *Pn* ; *Pn1* p			WYDRBX
Ps **Address Type** 0 Offset from cursor position *Pn* Number of lines down (vertical offset) *Pn1* Number of columns to right (horizontal offset) 1 Real cursor address *Pn* Line number of opposite corner *Pn1* Column number of opposite corner				
Insert *n* blank characters beginning at cursor	CSI *Pn* @	Same	Same	ICH
Insert *n* blank lines beginning at cursor line	CSI *Pn* L	Same	Same	IL
Delete *n* lines beginning at cursor line	CSI *Pn* M	Same	Same	DL
Delete *n* characters beginning at cursor	CSI *Pn* P	Same	Same	DCH
Clear tab stop at cursor	CSI 0 g or CSI 2 W	Same	Same	TBC CTC
Clear all tab stops	CSI 3 g or CSI 5 W	Same	Same	TBC CTC
Set tab stop at cursor	CSI 0 W or ESC H	Same	Same	CTC HTS
Set tab stop every 8th column	CSI ? 5 W	Same	Same	CTC
Move forward *n* tab stops	CSI *Pn* I	Same	Same	CHT
Move backward *n* tab stops	CSI *Pn* Z	Same	Same	CBT
Move cursor to next tab stop	CTRL I	Same	Same	HT

Table F-1 Commands Supported in ANSI Personalities, Continued

Command	Command Sequence Native	VT320/220 Intecolor	VT100	Mnemonic
Controlling the Keyboard				
Keyboard lock on	CSI 2 h	Same	Same	KAM
Unlock keyboard	CSI 2 l	Same	Same	KAM
Set delete key to BS/DEL	CSI 36 h or CSI ? 67 h[10]	Same	Same	WYDELKM DECBKM
Reset delete key to DEL/CAN	CSI 36 l or CSI ? 67 l[10]	Same	Same	WYDELKM DECBKM
Set Return (Enter) to CRLF (newline mode)	CSI 20 h	Same	Same	LNM
Set Return (Enter) to CR (linefeed mode)	CSI 20 l	Same	Same	LNM
Key autorepeat on	CSI ? 8 h	Same	Same	DECARM
Key autorepeat off	CSI ? 8 l	Same	Same	DECARM
Keys send data processing values (right legend)	CSI ? 68 h	Same		DECKBUM
Keys send typewriter values (left legend)	CSI ? 68 l	Same		DECKBUM
Cursor keys send application-dependent codes	CSI ? 1 h	Same	Same	DECCKM
Cursor keys send cursor movement codes	CSI ? 1 l	Same	Same	DECCKM
Numeric keypad numeric mode on	ESC > or CSI ? 66 l	Same	Same	DECKPNM DECNKM
Numeric keypad application mode on	ESC = or CSI ? 66 h	Same	Same	DECKPAM DECNKM
Program user-defined keys[33]	DCS *Ps* ; *Ps1* ; *Ps2* ¦*kc*/*hc* ST	Same	Same	WYUDK (DECUDK)

Ps **Clear**
0 Clear all key definitions (default)
1 Clear keys only as they are redefined

Ps1 **Key Lock**
0 Lock key definitions
1 Don't lock key definitions

Ps2 **Direction**
0 Remote
1 Normal
2 Local

33. Multiple definitions can be programmed by entering the *kc*/*hc* parameters for each, separated by semicolons (;).

Table F-1 Commands Supported in ANSI Personalities, Continued

Command		Command Sequence			
		Native	VT320/220 Intecolor	VT100	Mnemonic
		Keyboard Style			
kc Unshifted	*kc* Shifted	105-Key ANSI	ASCII	Enhanced PC	
42	22		F1	F1	
51	31		F2	F2	
52	32		F3	F3	
53	33		F4	F4	
54	34		F5	F5	
37	17	F6	F6	F6	
38	18	F7	F7	F7	
39	19	F8	F8	F8	
40	20	F9	F9	F9	
41	21	F10	F10	F10	
43	23	F11	F11	F11	
44	24	F12	F12	F12	
45	25	F13	F13		
46	26	F14	F14		
48	28	Help	F15		
49	29	D0	F16		
51	31	F17			
52	32	F18			
53	33	F19			
54	34	F20			
50	27		Esc	Esc	
55	01	Tab	Tab	Tab	
56	02	⌫	Back Space	← Back Space	
57	03	Remove	Del		
58	04	Return	Return	Enter	
47	05		Home	Home	
59	06	▲	▲	↑	
60	07	▼	▼	↓	
61	08	◀	◀	←	
62	09	▶	▶	→	

Table F-1 Commands Supported in ANSI Personalities, Continued

Command	Command Sequence Native	VT320/220 Intecolor	VT100	Mnemonic
Keyboard Style				
kc Unshifted / *kc* Shifted / 105-Key ANSI / ASCII / Enhanced PC				
63 / 10 / Enter / Enter / Enter *kpd*				
64 / 11 / PF4 / Ins Char / Insert				
65 / 12 / Next Scrn / Next Page / Page Down				
66 / 13 / / Send /				
67 / 14 / PF3 / Clr Line /				
68 / 15 / PF2 / Del Char / Delete				
69 / 16 / PF1 / Repl /				
70 / 05 / Insert Here / /				
71 / 13 / Prev Scrn / /				
72 / 22 / Find / /				
73 / 27 / Select / /				
74 / 13 / / / End				
75 / 14 / / / Page Up				
76 / 03 / / / Print Screen				
hc Key definition (hexadecimal character string)				
Transmission/Printer Control				
Local echo disable	CSI 12 h	Same	Same	SRM
Local echo on	CSI 12 l	Same	Same	SRM
8-bit transmission mode on	ESC SP G	Same		S8C1T
7-bit transmission mode on	ESC SP F	Same		S7C1T
Send page	CSI 2 i	Same	Same	MC
Send line	CSI ? 3 i	Same	Same	MC
Send all characters	CSI 37 h	Same	Same	WYGATM
Send erasable characters only	CSI 37 l	Same	Same	WYGATM
Send cursor character	ESC 5	Same	Same	WYXCH
Send full screen	CSI 38 h	Same	Same	WYTEXM
Send scrolling region	CSI 38 l	Same	Same	WYTEXM
Send form feed after send operation	CSI 1 ¦	Same	Same	DECTTC
No form feed sent after send operation	CSI 0 ¦	Same	Same	DECTTC
Send form feed after print operation	CSI ? 18 h	Same	Same	DECPFF
No form feed sent after print operation	CSI ? 18 l	Same	Same	DECPFF
Send through cursor position	CSI 16 h	Same	Same	TTM

Table F-1 Commands Supported in ANSI Personalities, Continued

Command	Command Sequence Native	VT320/220 Intecolor	VT100	Mnemonic
Send through end of line or end of screen	CSI 16 l	Same	Same	TTM
Print full screen	CSI ? 19 h	Same	Same	DECPEX
Print scrolling region	CSI ? 19 l	Same	Same	DECPEX
Print page	CSI 0 i	Same	Same	MC
Print line	CSI ? 1 i	Same	Same	MC
Controller print mode off	CSI 4 i	Same	Same	MC
Controller print mode on	CSI 5 i	Same	Same	MC
Send host data to Aux port	CSI 5 ; 1 i	Same	Same	MC
PR receive mode off	CSI 6 i	Same	Same	MC
PR receive mode on	CSI 7 i	Same	Same	MC
Autoprint mode off	CSI ? 4 i	Same	Same	MC
Autoprint mode on	CSI ? 5 i	Same	Same	MC
Send answerback message	CTRL E	Same	Same	ENQ
Suspend transmission	CTRL S	Same	Same	DC3
Resume transmission	CTRL Q	Same	Same	DC1
Terminal Reports				
Request primary device attributes	CSI 0 c or ESC Z	Same	Same	DA DECID
Response:[34]				
VT320 (8-bit)	CSI ? 63 ; 1 ; 2 ; 6 ; 7 ; 8 ; 9 c			
VT320 (7-bit)	ESC [? 63 ; 1 ; 2 ; 6 ; 7 ; 8 ; 9 c			
VT220 (8 bit)	CSI ? 62 ; 1 ; 2 ; 6 ; 7 ; 8 ; 9 c			
VT220 (7 bit)	ESC [? 62 ; 1 ; 2 ; 6 ; 7 ; 8 ; 9 c			
VT100	ESC [? 1 ; 2 c			
VT101	ESC [? 1 ; 0 c			
VT102	ESC [? 6 c			
Request secondary device attributes	CSI > 0 c	Same	Same	DA
Response: *Ps* Current firmware revision	CSI > 24 ; *Ps* ; 0 c			
Request terminal ID	ESC SP 0	Same	Same	WYID
Response:	370 CR			
Request terminal status	CSI 5 n	Same	Same	DSR
Response:				
Terminal functioning and ready	CSI 0 n			
Request cursor position	CSI 6 n	Same	Same	DSR
Response:				
Cursor at line *n*, column *n*	CSI *Pn* ; *Pn1* R			

34. Response depends on settings of Terminal ID and Transmit Mode setup parameters.

Table F-1 Commands Supported in ANSI Personalities, Continued

Command	Command Sequence: Native	VT320/220 Intecolor	VT100	Mnemonic
Request printer status	CSI ? 15 n	Same		DSR
Response:				
Printer ready	CSI ? 10 n			
Printer not ready	CSI ? 11 n			
Printer not connected	CSI ? 13 n			
Request function key definition lock	CSI ? 25 n	Same		DSR
Response:				
Key definitions not locked	CSI ? 20 n			
Key definitions locked	CSI ? 21 n			
Request keyboard language	CSI ? 26 n	Same		DSR
Response:	CSI ? 27 ; *Ps* n			

Ps	Language	*Ps*	Language	*Ps*	Language
1	U. S.	7	German[35]	13	Norwegian[35]
2	U.K.[35]	8	Dutch[35]	14	French[35]
3	Belgian[35]	9	Italian[35]	15	Spanish[35]
4	French Canadian	10	Swiss (French)[35]	16	Portuguese[35]
5	Danish[35]	11	Swiss (German)[35]	30	Latin American Spanish
6	Finnish[35]	12	Swedish[35]		

Request terminal state	CSI 1 $ u	Same[36]	DECRQTSR
Response:	DCS 1 $ s *ds...ds c1 c2* ST[37]		DECTSR
Restore terminal state	DCS 1 $ p *ds...ds c1 c2* ST[37]	Same[36]	DECRSTS
Request terminal mode status	(1) CSI *Ps* $ p	Same[36]	DECRQM
	(2) CSI ? *Ps* $ p	Same[36]	DECRQM

(1) *Ps*	Mode	Mnemonic
2	Keyboard lock	KAM
3	Monitor	CRM
4	Insert	IRM
10	Horizontal editing	HEM[38]
12	Local echo disable	SRM
20	Newline	LNM

(2) *? Ps*	Mode	Mnemonic
1	Cursor key application	DECCKM
2	VT100	DECANM
3	132 column	DECCOLM
4	Scrolling	DECSCLM
5	Reverse screen	DECSCNM
6	Origin	DECOM
7	Autowrap	DECAWM
8	Key autorepeat	DECARM
18	Print form feed	DECPFF
19	Print extent	DECPEX
25	Text cursor enable	DECTCEM
42	National replacement character set	DECNRCM
66	Keypad application	DECNKM
67	Delete key	DECBKM
68	Key legend	DECKBUM

35. Available only if the language is supported in an installed cartridge.
36. VT320/220 personality only.
37. *ds...ds* is a data string (up to 200 characters) encoding information on the terminal's current operating state. *c1* and *c2* are checksums. The restore command is ignored if received by the inactive session.
38. Mode permanently reset.

Table F-1 Commands Supported in ANSI Personalities, Continued

Command	Command Sequence: Native	VT320/220 Intecolor	VT100	Mnemonic
Response:				
(1)	CSI *Ps* ; *Ps1* $ y	Same		DECRPM
(2)	CSI ? *Ps* ; *Ps1* $ y	Same		DECRPM
Ps **Mode**				
(1) Same as request (DECRQM)				
(2) Same as request (DECRQM)				
Ps1 **Mode Setting**				
0 Unrecognized mode				
1 Mode set				
2 Mode reset				
3 Mode permanently set				
4 Mode permanently reset				
Request cursor information	CSI 1 $ w	Same[36]		DECRQPSR
Response:	DCS 1 $ u *ds...ds* ST[39]			DECCIR
Restore cursor information	DCS 1 $ t *ds...ds* ST	Same[36]		DECRSPS
Request tab stop information	CSI 2 $ w	Same[36]		DECRQPSR
Response:	DCS 2 $ u *ds...ds* ST[39]			DECTABSR
Restore tab stop information	DCS 2 $ t *ds...ds* ST	Same[36]		DECRSPS
Request control function selection or setting	DCS $ q *Ps* ST	Same[36]		DECRQSS
Ps **Control Function** **Mnemonic**				
$ } Data destination DECSASD				
" q Erase attribute DECSCA				
" p Personality DECSCL				
$ ~ Status line type DECSSDT				
r Top and bottom margins DECSTBM				
m Character attributes SGR				
Response:	DCS *Ps* $ r *ds...ds* ST[40]			DECRPSS
Ps **Request Validity**				
0 Host request is invalid				
1 Host request is valid				

39. *ds...ds* is the data string that encodes the information.

40. *ds...ds* is a data string that reports the current setting of the control function.

Table F-1 Commands Supported in ANSI Personalities, Continued

Command	Command Sequence Native	VT320/220 Intecolor	VT100	Mnemonic
Resetting and Testing the Terminal				
Display screen adjustment pattern	ESC # 8	Same	Same	DECALN
Soft terminal reset[41]	CSI ! p	Same		DECSTR
Hard terminal reset[42]	ESC c	Same		RIS
Terminal mode reset[43]	ESC ! p	Same	Same	WYSTR

41 Performs the following functions:
Turns cursor on (if off)
Resets insert mode
Resets origin mode
Resets autowrap mode
Resets keyboard lock mode
Resets keypad application mode
Resets cursor key application mode
Clears block mode (sets to on-line)
Clears scrolling region
Resets G0, G1, G2, G3, GL, and GR to defaults
Resets character attributes to normal
Resets selective erase attribute to erasable
Resets save cursor state to default
Resets national replacement character set to Multinational
Resets user-preferred character sets to value last saved in setup mode
Resets data destination to screen data area

42. Performs the following functions in addition to all the functions of a soft terminal reset:
Performs communication line disconnect, reconnect
Restores all setup mode parameter settings to values last saved
Restores tab stops, answerback message, and function key definitions to values last saved in setup mode
Clears softfonts
Clears screen
Homes cursor
Turns on display, if off
Clears CAPS LOCK mode to value last saved
Clears Xoff receive state on data communications port
Clears Xoff receive state on printer port
Clears handshake state, raises DTR if low, and sends Xon if XON/XOFF handshaking is enabled

43. Performs the following functions:
Turns on display, if off
Clears block mode (sets to on-line)
Resets insert mode
Clears function key lock
Resets cursor key application mode
Resets keyboard action mode
Resets keypad application mode
Clears the Xoff receive state on the host port
Clears the Xoff receive state on the printer port
Resets G0, G1, G2, G3, GL, and GR to their default selections
Clears handshake state, raises DTR if low, and sends Xon if XON/XOFF handshaking is enabled

Table F-2 VT52 Personality Escape Sequences

Command	Sequence
Move cursor up one line	ESC A
Move cursor down one line	ESC B
Move cursor right one column	ESC C
Move cursor left one column	ESC D
Move cursor to home position	ESC H
Move cursor up one line with scroll	ESC I
Move cursor to line *line*, column *col*	ESC Y *line col*
Select graphics character set	ESC F
Select standard ASCII character set	ESC G
Erase from cursor to end of display	ESC J
Erase from cursor to end of line	ESC K
Print cursor line	ESC V
Print display	ESC]
Transparent print mode on	ESC W
Transparent print mode off	ESC X
Copy print mode on	ESC ^
Copy print mode off	ESC _
Keypad application mode on	ESC =
Keypad application mode off	ESC >
Select VT100 personality	ESC <
Identify terminal Response: VT52 ESC / Z	ESC Z

G Programming in Wyse 350 Personality

INTRODUCTION

Programs written for the WY-350 terminal will run without modification in Wyse 350 personality. In addition, you can take advantage of the following enhanced features

- Additional user-definable keys
- Programmable key direction
- Multiple pages and sessions
- Host-selectable personalities
- Enhanced international support
- 161-column display
- Commands controlling end-of-line wrap, autopage, printer receive, transparent print, and bidirectional modes

Command Descriptions

The description of the commands that control the terminal in Wyse 350 personality are grouped by function in the body of the appendix. Near the end of the appendix, in the section entitled "ASCII Command Summary," Table G-6 lists all commands supported by the terminal in all its ASCII personalities, including Wyse 350.

Conventions and Syntax Notation

Control codes are shown with the notation *CTRL* indicating the Ctrl key.

Escape sequences are shown with a space between each character to make the command easier to read—don't enter the spaces. When a space character is part of a command sequence, it's explicitly shown as

ESC SPACE

Variables within an escape sequence are shown in italics. For example, the format for the ESC G command is

ESC G *attr*

where *attr* represents a character display attribute value.

The values for the variables are listed alphabetically in Table G-7; some of them are also listed in the text immediately following the command.

SELECTING A PERSONALITY

Select terminal personality — **ESC ~** *pers*

where *pers* is the personality selected.

■ **Caution** The terminal may clear the display memory when executing this command.

Enhance Mode

Turn enhance mode off (default) — **ESC ~ SPACE**
Turn enhance mode on — **ESC ~ !**

In enhance mode, the terminal supports additional features in other ASCII personalities (see Table G-6 in the "ASCII Command Summary" section).

COMMUNICATING WITH THE COMPUTER

The commands described in this section control the transmission of data to the host, the terminal and its keyboard, and the way in which that communication occurs.

Communication Modes

Turn full-duplex mode on (default) — **ESC C ESC D F**
Turn half-duplex mode on — **ESC C ESC D H**
Turn block mode on — **ESC B**
Turn half-duplex block mode on — **ESC D H ESC B**

Figure 1-1 (in Chapter 1) illustrates the effects of these modes on how data is sent to the screen and the host.

The only key codes automatically transmitted to the host in block mode are those generated by

- The break key (F5 on the 105-Key ANSI keyboard, Break on the ASCII or Enhanced PC-style keyboard)
- The corner key (Compose Character , Funct , or Alt *left* depending on your keyboard) when the Corner Key setup parameter is set to *funct*
- The function keys when their direction is *remote*

Requesting the Terminal's ID

Send terminal ID **ESC SPACE**

When this sequence is received, the terminal returns to the host the four-byte sequence

350 CR

Sending an Acknowledgement

Send acknowledgement (ACK) **CTRL E**

If ACK mode is on in setup mode, the terminal returns an ACK (CTRL F) character in response to a received ENQ (CTRL E) character. If ACK mode is off, no ACK character is sent.

☐ **Note** Some escape sequences are designed to send an ACK after the command is executed; if ACK mode is off, the ACK will not be sent.

Controlling Transmission

Suspend transmission (XOFF) **CTRL S**

If you have set the Transmit Handshake parameter to XON/XOFF and the host supports XON/XOFF, this control character suspends data transmission to the host port.

Resume transmission (XON) **CTRL Q**

If you have set the Transmit Handshake parameter to XON/XOFF and suspended data transmission to the host port with DC3 (CTRL S), and the host supports XON/XOFF, this control character resumes data transmission.

CONTROLLING THE TERMINAL AND KEYBOARD

Sound bell **CTRL G**
Lock keyboard **CTRL O or ESC #**
Unlock keyboard **CTRL N or ESC "**

When the keyboard is locked, all keys are ignored except F5 (Break), F3 (Setup, Select), Compose Character (Funct, Alt *left*), and the function keys.

Turn keyclick off **ESC e $**
Turn keyclick on (default) **ESC e %**

Redefining the Keys

You can redefine the function keys and editing keys from the host with the following escape sequences:

- ESC z redefines a function key (shifted and unshifted); the direction defaults to *remote*.

- ESC Z redefines a function key or user-definable editing key and redefines its direction.

A total of 512 bytes of nonvolatile memory is available for storing key definitions. To save the definitions in nonvolatile memory, put the terminal in setup mode and exit with the *exit setup and save* option.

☐ **Note** If you connect another keyboard to the terminal after you've saved key redefinitions in nonvolatile memory, clear the definitions to their default values.

Program function key definition — **ESC z** *fkey sequence* **DEL**
Program key direction and definition — **ESC Z** *dir fkey sequence* **DEL** or **ESC Z** *dir key sequence* **DEL**

where *fkey* is a function key

key is a user-definable editing or special key

dir is the key's direction

sequence is the key's definition

The ESC z command redefines a function key. The ESC Z command redefines both the direction and definition of either a function key or a user-definable editing or special key. You can load up to 78 bytes in each key.

Clearing Key Definitions

Clear function key definition — **ESC z** *fkey* **DEL**

This command restores the default definition to the specified function key.

Clear redefinable key direction and definition — **ESC Z** *dir fkey* **DEL** or **ESC Z** *dir key* **DEL**

This command restores the default direction and definition to the specified user-definable key.

Controls Mode

Turn controls mode on — **ESC U**
Turn controls mode off (default) — **ESC u** or **ESC X**

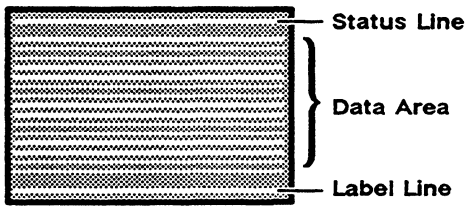
When controls mode (sometimes called *monitor mode*) is on, the terminal displays symbolic representations of received codes but does not execute the codes.

Table E-3 in Appendix E shows how control characters are displayed when controls mode is on.

CONTROLLING DISPLAY FEATURES

With the commands in this section you can control the appearance of the display and the configuration of the three screen areas: the status line (top), the label line (bottom), and the data area.

Figure G-1 Screen Areas



Turning on the Screen Display

Turn screen display off — **ESC ` 8**
Turn screen display on (default) — **ESC ` 9**

Reversing the Screen

Reverse screen — **ESC ^ 1**
Restore normal screen — **ESC ^ 0**

Reversing the screen exchanges the foreground and background colors.

Controlling Scrolling Speed and Type

Set scrolling speed and type — **ESC `** *scroll*

If you choose smooth scrolling, select some type of receive handshaking for the host port so the terminal can control the rate at which data is received. Since the screen may display data slower during smooth scrolling than it is receiving it, the buffer may overflow.

Displaying the Cursor

Set cursor display features — **ESC `** *cursor*

You can control whether the cursor is displayed as a block, blinks, or is blank.

Programming a Status Line Message

Program and display host message on status line — **ESC F** *message* **CR**

where *message* is a string of up to 47 characters for an 80-column screen, 99 characters for a 132-column screen, or 128 characters for a 161-column screen. The message is displayed on the top status line.

Programming a Label Line Message

Program and display unshifted label line	**ESC z (*text* CR**
Program and display shifted label line	**ESC z) *text* CR**
Turn off shifted label line display	**ESC z DEL**
Clear unshifted label line message	**ESC z (CR**
Clear shifted label line message	**ESC z) CR**

where *text* is a string of up to 79 characters for an 80-column screen, 131 characters for a 132-column screen, or 160 characters for a 161-column screen.

The unshifted label line message is displayed automatically. Unless you turn off the display of the shifted label line, it's displayed when Shift is pressed.

☐ **Note** You can prevent the display of the unshifted label line by assigning the blank display attribute (ESC A 1 1) to the label line. The assigned attribute will apply to both the unshifted and shifted label lines.

Programming a Function Key Label

Program and display a function key label	**ESC z *field label* CR**
Clear a function key label	**ESC z *field* CR**

where *field* selects the function key to be labeled

label is a character string

The number of columns displayed determines the number of function key fields you can label and the number of characters each of those labels can contain.

Table G-1 Function Key Label Sizes

No. of Columns	No. of Labels	No. of Characters in Label
80	8[1]	8
132	16[2]	7
161	16[2]	8

1. An additional 8 labels are available on the shifted function key label line.
2. An additional 16 labels are available on the shifted function key label line.

Defining the Data Area

You can change the line and column display either in setup mode or from the host.

Changing the Number of Displayed Columns

Before you change the number of displayed columns, clear the function key labels. You can program them again for the new display width.

Select 80-column display (default) **ESC ` :**
Select 132-column display **ESC ` ;**

Allow for a brief delay before sending data to the terminal.

The command to select 132 columns is ignored during dual-session operation with a vertically split screen.

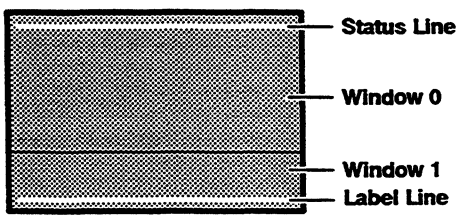
☐ **Note** Changing the terminal to 161 columns can be done only in setup mode.

Splitting the Screen

By dividing the screen's data area into two horizontal windows (as shown in Figure G-2), you can display data in one window while working in the other window. Although initially the top data window is the active window, your program can change the active window. Both windows display the same number of columns.

☐ **Note** Do not confuse this type of split screen with those discussed in Chapter 6. This type can be used in addition to a vertical split between sessions (but not with a horizontal split).

Figure G-2 Split Screen Format



Split screen horizontally and save data **ESC x A** *line*
Split screen horizontally and clear page **ESC x 1** *line*

where *line* is a value corresponding to the line number on the top line in what will be the lower window (Window 1 in Figure G-2).

Executing either of these commands moves the cursor to the home position of the upper window and displays the bottom portion of the page in the lower window.

Both commands turn off protect mode.

If these escape sequences originate from the host, the terminal returns an ACK character to the host (if ACK mode is on).

If you have also configured the terminal to display two sessions on a vertically split screen, you can split the screen horizontally within either or both of those sessions. You cannot, however, split the screen again if you've split it into horizontal windows.

☐ **Note** These commands are ignored if you have split the screen between two pages. The commands are only recognized when one page is defined.

Activating a Window

Activate upper window	**ESC]**
Activate lower window	**ESC }**
Activate the other window	**ESC J** or **ESC K**

When you reactivate a window, the cursor appears in its previous position within that window and the data in the other (now inactive) window becomes fixed.

☐ **Note** When the screen has not been split, the ESC J or ESC K commands display the previous or next page when more than one page is defined in setup mode.

Restoring a Full Screen Format

Redefine screen as one window	**ESC x @**
Redefine screen as one window and clear page	**ESC x 0**

Redefining the screen as one window homes the cursor and turns off protect mode.

If this sequence originates from the host, the terminal returns an ACK character to the host (if ACK mode is on).

PROTECTING DATA

The combination of write-protect and protect modes allows you to create forms in which some data cannot be changed by the user while filling in blank areas of the form. Protect mode also allows your program to control transmission of the data and keep it from scrolling off the screen.

Protecting data on the screen involves three steps:

1 Turn on write-protect mode.

2 Enter the data to be protected.

3 Turn on protect mode to protect the data entered in write-protect mode.

Protected data is treated differently from unprotected data in several editing, clear, and send commands. (See "Protecting Write-Protected Data" and "Editing.")

Writing Data to be Protected

Turn write-protect mode off (default) ESC (
Turn write-protect mode on ESC)

When write-protect mode is on, all subsequently received characters are displayed and stored with the display attribute selected for write-protected characters.

Assigning Display Attributes to Write-Protected Characters

Assign display attribute to write-protected characters ESC ' *wpca*

where *wpca* is a write-protected display attribute

wpca	**Display Attribute**
6	Reverse
7	Dim
A	Normal
B	Dim, reverse
C	Underline
D	Dim, underline
E	Underline, reverse
F	Dim, reverse, underline
G	Extended character set

When write-protect mode is on, this command assigns a display attribute to write-protected characters. The color of the characters depends on the currently selected color palette (see the next section, "Assigning Display Attributes and Colors," for a discussion of the color palettes). You can change the color of write-protected characters by sending the command

ESC m 8 *color* **0**

where *color* is one of the terminal's 64 colors from Table G-5 in the next section.

☐ **Note** Selecting the extended character set displays characters from the ISO Latin-1 character set, which is illustrated in Appendix A. (This is a different extended character set from that provided on the WY-350 terminal.)

Write-Protecting a Column

Clear cursor column to write-protected spaces ESC V

☐ **Note** The terminal doesn't have to be in write-protect mode to execute this command.

Protecting Write-Protected Data

Turn protect mode off (default) **ESC '**
Turn protect mode on **ESC &**

When protect mode is on,

- The cursor can't be moved into a protected area. If addressed there, it will jump to the first unprotected position when data is entered.
- Tabulating commands move the cursor to the first unprotected character position beyond a protected tab stop.
- No data can scroll off the screen.
- A line in a protected screen cannot be inserted or deleted.

ASSIGNING DISPLAY ATTRIBUTES AND COLORS

Five display attributes—*dim, reverse, underline, blink,* and *blank*—can be assigned, individually or in combination, to characters or to areas of the screen.

Each attribute or attribute combination is associated to one of four colors from the terminal's current *foreground color palette*. You can select from 16 premixed palettes, or you can create your own palettes from any of the terminal's 64 colors. Table G-2 summarizes the commands that allow you to select colors and display attributes and assign them to characters or to areas of the screen. These commands are discussed in detail in the sections that follow the table.

Table G-2 Display Attribute/ Color Commands

Command Name/Sequence	Description
Assign display attribute to a message field: **ESC A** *mf attr*	Assigns a display attribute/color to selected screen areas
Assign character display attribute: **ESC G** *attr*	Assigns a display attribute/color to characters
Assign write-protected* character display attribute: **ESC** ` *wpca*	Assigns a display attribute/color to write-protected characters
Select foreground color palette: **ESC %** *fcolor*	Selects one of the premixed palettes of colors that are associated to the display attributes

* Command discussed in previous section, "Protecting Data."

Table G-2 Display Attribute/ Color Commands, Continued

Command Name/Sequence	Description
Redefine color association: **ESC m** *attr-c color attr-n*	Redefines the palette's color/ attribute associations, allowing you to create a customized palette

Assigning Display Attributes to a Message Field

Assign display attribute to a message field **ESC A** *mf attr*

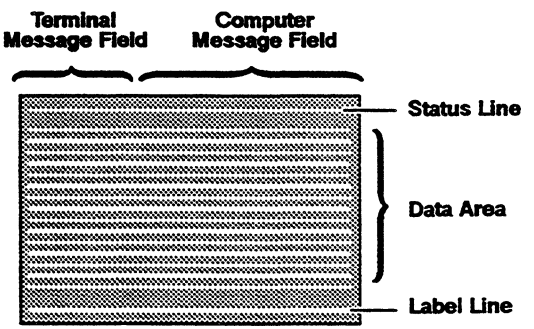
where *mf* is an area of the screen

mf	Screen Area
0	Data area
1	Label line
2	Terminal message field on status line
3	Computer message field on status line

attr is a display attribute from Table G-3

The message fields are shown in Figure G-3.

Figure G-3 Message Fields



This command assigns a display attribute to the specified area of the screen until another attribute is encountered.

Table G-3 Display Attributes

attr	Display Attribute	Color Association*
SPACE	Space character	
0	Normal	Normal
1	Blank (no display)	Normal
2	Blink	Normal
3	Blank and blink	Normal
4	Reverse	Reverse
5	Reverse and blank	Reverse
6	Reverse and blink	Reverse
7	Reverse, blink, blank	Reverse
8	Underline	Underline
9	Underline and blank	Underline
:	Underline and blink	Underline
;	Underline, blink, blank	Underline
<	Underline and reverse	Underline, reverse
=	Underline, reverse, blank	Underline, reverse
>	Underline, reverse, blink	Underline, reverse
?	Underline, reverse, blank, blink	Underline, reverse
p	Dim	Dim
q	Dim and blank	Dim
r	Dim and blink	Dim
s	Dim, blink, and blank	Dim
t	Dim and reverse	Dim, reverse
u	Dim, reverse, blank	Dim, reverse
v	Dim, reverse, blink	Dim, reverse
w	Dim, reverse, blank, blink	Dim, reverse
x	Dim and underline	Dim, underline
y	Dim, underline, and blank	Dim, underline
z	Dim, underline, and blink	Dim, underline
{	Dim, underline, blink, and blank	Dim, underline

* Color association in foreground color palette; refer to Table G-4 for colors.

Table G-3 Display Attributes, Continued

attr	Display Attribute	Color Association*
¦	Dim, reverse, underline	Dim, reverse, underline
}	Dim, reverse, underline, blank	Dim, reverse, underline
~	Dim, reverse, underline, blink	Dim, reverse, underline
DEL	Dim, reverse, underline, blank, blink	Dim, reverse, underline

Assigning Display Attributes to Characters

Assign character display attribute **ESC G** *attr*

where *attr* is a display attribute from Table G-3

The assigned display attribute is *nonhidden*; that is, it will occupy the current cursor position, appearing on the screen as a space character. It affects all characters to the right and below it—to the end of the screen or until a different attribute is encountered. If the starting position of an attribute is overwritten, the attribute is no longer assigned and the display will change.

The display attributes listed in Table G-3 are grouped into eight possible *color associations* for the purpose of color assignments. A color association is simply a named grouping of display attributes assigned a common color. For instance, all display attribute combinations of *underline* and *reverse* with *blink* and *blank* are grouped under a color association named *underline, reverse.*

Each character assigned a display attribute will be displayed in the foreground color that corresponds to its color association in the currently selected foreground color palette.

For example, a character assigned the underline, reverse attribute

ESC G <

will be displayed in the same color as a character assigned the underline, reverse, blank, blink attribute

ESC G ?

because they are both grouped under the color association *underline, reverse.*

Table G-4 lists the predefined colors assigned to each color association in the different color palettes.

☐ **Note** Background colors for characters can be selected only in setup mode.

Table G-4 Foreground Color Palettes

	Color Association							
Palette[1]	**Normal**	**Reverse**	**Underline**	**Underline, Reverse**	**Dim**	**Dim, Reverse**	**Dim, Underline**	**Dim, Reverse, Underline**
0	Amber	White	Pale yellow	Pale yellow	Red-orange	Red-orange	Red-orange	Red-orange
1	Green	Cyan	Faded blue-green	Faded blue-green	Light blue-green	Light blue-green	Light blue-green	Light blue-green
2	White	Yellow	Amber	Amber	Red	Red	Red	Red
3	Cyan	White	Green	Green	Electric blue	Electric blue	Electric blue	Electric blue
4	Light purple	Hot pink	Bright blue	Bright blue	Faded rose	Faded rose	Faded rose	Faded rose
5	Yellow	Red-orange	Orange-brown	Orange-brown	Deep red	Deep red	Deep red	Deep red
6	Sky blue	Blue-green	Chartreuse	Chartreuse	Bright green	Bright green	Bright green	Bright green
7	Light gray	Blue-purple	Medium blue	Medium blue	Charcoal gray	Charcoal gray	Charcoal gray	Charcoal gray
8	Light green	Chartreuse	Bright green	Bright green	Khaki green	Khaki green	Khaki green	Khaki green
9	Cream	Orange-brown	Sage green	Sage green	Tan	Tan	Tan	Tan
:	White[2]	Sky blue	Chartreuse	Magenta	Blue-green	Purple	Amber	White
;	White[2]	Red-orange	Green	Yellow	Blue	Light purple	Cyan	White

1. The ASCII characters in this column are the values for the command that selects the palette (ESC % *fcolor*). Palettes 0 through 9 can also be selected from the keyboard: Press Ctrl Shift together with the number key *on the numeric keypad.*
2. Palette for CRT color adjustment; display attributes are not active.

Table G-4 Foreground Color Palettes, Continued

	Color Association							
Palette[1]	Normal	Reverse	Underline	Underline, Reverse	Dim	Dim, Reverse	Dim, Underline	Dim, Reverse, Underline
<	Green[3]	Green	Green	Green	Bright green	Bright green	Bright green	Bright green
=	White[4]	White	White	White	Light gray	Light gray	Light gray	Light gray
>	Amber	Amber	Amber	Amber	Orange-brown	Orange-brown	Orange-brown	Orange-brown
?	White[2]	Red	Green	Yellow	Blue	Light purple	Cyan	Amber

3. Simulated monochrome green.
4. Simulated monochrome white.

The default color palette is the amber palette (0=amber, white, pale yellow, and red-orange).

☐ **Note** All color associations containing the dim attribute share the same color except in the three palettes provided for CRT color adjustment; those palettes assign a unique color to each color association.

Examples of Assigning Character Display Attributes

The following examples demonstrate the effects of assigning display attributes to characters.

When the default amber color palette is the current palette, the command

ESC G 2

displays blinking amber characters (blink attribute assigned; color association = normal). The command

ESC G 8

displays underlined pale yellow characters (underline attribute assigned; color association = underline). The command

ESC G >

displays blinking, underlined black characters on a pale yellow background (underline, reverse, blink attribute assigned; color association = underline, reverse)

Changing the Current Color Palette

Select foreground color palette **ESC % *fcolor***

where *fcolor* is a foreground color palette

fcolor	**Foreground Color Palette**
0	Amber
1	Green
2	White
3	Cyan
4	Light purple
5	Yellow
6	Sky blue
7	Light gray
8	Light green
9	Cream
:	Reverse tertiary colors
;	Reverse primary/secondary colors
<	Simulated monochrome green
=	Simulated monochrome white
>	Simulated monochrome amber
?	Normal primary/secondary

When you change the foreground color palette,

- All characters on the screen immediately change to the new palette colors (see Table G-4)
- Any color associations that have been redefined change back to their default definitions

Examples of Selecting a New Color Palette

Suppose you had sent the command

ESC G 8

to assign the underline attribute when the default amber palette was in effect, resulting in pale yellow underlined characters. If you then sent the command

ESC % 3

to change to the cyan palette, all characters on the screen that were formerly underlined pale yellow would change immediately to underlined green (see Table G-4).

Redefining the Color Associations

Redefine color association **ESC m** *attr-c color attr-n*

where *attr-c* is a color association in the currently selected color palette

attr-c	**Color Association**
0	Normal
1	Reverse
2	Dim
3	Underline
4	Dim, reverse
5	Underline, reverse
6	Dim, underline
7	Dim, reverse, underline
8	Write-protect

color is any one of 64 colors from Table G-5

attr-n is a new definition of the attribute characteristics of the color association

attr-n	**New Attribute**
0	Normal
-	Reverse
.	Underline
/	Underline, reverse

☐ **Note** An *attr-c* value of 8 (write-protect) assigns a new color, but not a new attribute, to write-protected characters; *attr-n* must be entered but will be ignored.

This command allows you to create your own color palette. When you issue the command, you first decide what color association in your selected palette you want to redefine (*attr-c*); then you select the new color (*color*) and the new attribute (*attr-n*).

Examples of Redefining the Color Association

The command

ESC m 5 , .

assigns the color *turquoise* to the *underline, reverse* color association in the currently selected color palette and, in addition, redefines it as underline only.

This redefinition affects *only* the one color association, *underline, reverse*. For example, if the white color palette were the current palette (ESC % 2), the *reverse* color association remains yellow and the *underline* color association remains amber (see Table G-4).

Table G-5 Color Table

color[6]	Foreground Color	*color*[6]	Foreground Color
1	Black (normal)	'	Medium green
)	Black	;	Khaki green
!	Black	m	Sage green
		p	Pale green
?	Indigo	o	Chartreuse
&	Violet	/	Dull chartreuse
x	Light violet		
		7	Yellow
"	Dark blue	}	Pale yellow
*	Deep blue	y	Amber
2	Blue	~	Cream
]	Powder blue		
^	Medium blue	8	White
a	Blue gray		
b	Light blue	z	Tan
		i	Orange brown
9	Electric blue		
:	Bright blue	u	Red orange
<	Sky blue	5	Red
\	Blue purple	-	Deep red
n	Light blue purple	%	Brick red
$	Teal blue	s	Hot pink
,	Turquoise	t	Magenta
>	Blue green	v	Pale pink
;	Light blue green	w	Purple pink
e	Pale blue green		
q	Faded blue green	h	Purple
		.	Medium purple
4	Cyan	6	Light purple
f	Light cyan	!	Pale purple
r	Pale cyan	{	Faded purple
=	Sea green	g	Rose
d	Sea foam green	j	Faded rose
`	Green blue		
#	Grass green	l	Purple blue
3	Green	k	Purple gray
+	Bright green	o	Light gray
c	Lime green	(	Charcoal gray

6. Color names are for convenience of reference and are not based on any scientific or artistic criteria. The names are intended only as guidelines within a range of colors.

The only characters on the screen that would be affected would be characters assigned the following attributes (see Table G-3):

- Underline and reverse (ESC G <)
- Underline, reverse, blank (ESC G =)
- Underline, reverse, blink (ESC G >)
- Underline, reverse, blank, blink (ESC G ?)

These characters would be displayed as turquoise and underlined (but not reversed).

The following example demonstrates how you might create your own customized color palette, starting with the default amber palette as the current palette:

1 Change the *reverse* color association to sage green (instead of white):

ESC m 1 m -

2 Change the *dim* color association to pale green (instead of red-orange):

ESC m 2 p 0

3 Change the *underline* color association to blue and reverse (instead of pale yellow and underlined)

ESC m 3 2 -

The color associations for the palette would now look like this:

Normal = amber

Reverse = *sage green*

Underline = *blue reversed*

Underline, reverse = pale yellow

Dim = *pale green*

Dim, reverse = red-orange

Dim, underline = red-orange

Dim, reverse, underline = red-orange

☐ **Note** Changing to a new foreground color palette changes all the colors and attributes to the default definitions in the new palette.

DISPLAYING GRAPHICS CHARACTERS

The Special Graphics character set contains 16 line-drawing graphics characters (shown in Table G-7 under the parameter *ldraw*). You can control these as a group in graphics mode, or

individually with an escape sequence that allows the characters to be entered one at a time in the normal operating mode.

Turn graphics mode on	**ESC H CTRL B**
Turn graphics mode off	**ESC H CTRL C**
Display one graphics character	**ESC H** *ldraw*

where *ldraw* is a single line-drawing character

When graphics mode is on, you can't enter normal alphanumeric text, but you can enter commands. When protect mode is on, graphics characters are automatically protected.

CONTROLLING THE CURSOR

These commands control the cursor's position on the screen, define what happens as additional data is entered, and allow you to move the cursor to an exact position or read its current location.

Cursor Movement

Move cursor left	**CTRL H**
Move cursor right	**CTRL L**
Move cursor up; no scroll	**CTRL K**
Move cursor up; scroll (reverse linefeed)	**ESC j**
Move cursor down; scroll (linefeed)	**CTRL J**
Move cursor to start of line	**CTRL M**
Move cursor to start of next line	**CTRL _**
Move cursor to home position in current page	**ESC {** **or CTRL ^**

Cursor Modes

Turn end-of-line wrap mode off	**ESC d .**
Turn end-of-line wrap mode on (default)	**ESC d /**
Turn autopage mode off (default)	**ESC w**
Turn autopage mode on	**ESC v**
Turn autoscrolling mode off	**ESC N**
Turn autoscrolling mode on (default)	**ESC O**

End-of-line wrap and autopage modes define whether or not data added as the cursor reaches the end of the line or page will be seen on the next available line or page.

When autoscrolling mode is on, entering a character on the last line at the last column position causes the data to scroll up one line, fills the last line with space characters, and moves the cursor to the first column of that line. The line that scrolled off the top of the screen is lost.

When autoscrolling is off, entering a character on the last line at the last column position moves the cursor to the home position (or the first unprotected position).

☐ **Note** Turning protect mode on temporarily disables autoscrolling mode and turns off page edit in setup mode.

Addressing/Reading the Cursor

With these commands you can define precisely the line, column, and page or window where the cursor is to be positioned, or request the terminal to report that position to the host.

☐ **Note** Although you can address the cursor to a protected position, it will not be able to write anything there.

Addressing the Cursor

Address cursor in current 80-column page — **ESC =** *line col*

Address cursor in specific 80-column window/page — **ESC –** *wnd/page line col*

Address cursor in current 80/132/161-column page — **ESC a** *ll* **R** *ccc* **C**

where R is the ASCII character R

C is the ASCII character C

Reading the Cursor Address

Read cursor address in 80-column current page — **ESC ?**

Read 80-column window (or page) number and cursor address — **ESC /**

☐ **Note** This window is not related to session-type splits.

In 80-column mode, the terminal returns the cursor's address in the following formats:

line col **CR**

page line col **CR**

wnd line col **CR** (if screen is split)

page line col **CR** (if screen is not split)

CR is the carriage return that terminates the sequence.

Read cursor address in current 80/132/161-column page — **ESC b**

The terminal returns a string of up to seven bytes in the format

ll **R** *ccc* **C**

where *ccc* One- to three-decimal value of column (relative to home) where the cursor is to be positioned

ll One- or two-decimal value of line (relative to home) where the cursor is to be positioned

No CR character is sent after the coordinates.

EDITING

This section describes tab stops and how to insert, delete, and clear data.

Tab Stops

Clear all tab stops	**ESC 0**
Set tab stop at cursor position	**ESC 1**
Clear tab stop at cursor position	**ESC 2**
Tabulate cursor	**ESC i** or **CTRL I**
Backtab	**ESC I**

☐ **Note** If you set a tab at any position, a tab is also automatically set at column one. Clearing the tab in column one makes it appear as though there are no other tabs set (temporarily disabling the other tabs).

When tabbing forward or backward, the cursor moves to the next or previous unprotected position if the tab stop is at a protected position.

Inserting Data

Turn insert mode on, replace mode off	**ESC q**
Turn insert mode off, replace mode on (default)	**ESC r**

When insert mode is off, each character entered replaces the existing character at the cursor position. When insert mode is on, the character at the cursor position and any characters to the right on the same line move right for each character entered.

Insert space character at cursor position	**ESC Q**
Insert line of space characters	**ESC E**

When a line of space characters is inserted, the line that moves off the bottom of the page is lost. If protect mode is on, the command is ignored.

Deleting Data

Delete cursor character **ESC W**

This command deletes the cursor character, pulling the following characters on the line back toward the cursor position. A space character is added at the end of the line or in the last position before a protected field.

Delete cursor line **ESC R**

This command deletes the entire cursor line, moving all following lines up one line and moving the cursor to the start of the line. If protect mode is on, the command is ignored.

Clearing Data

The following commands replace characters with nulls, spaces, or specified characters.

Clearing a Page

Clear page to null characters	**ESC ***
Clear page to space characters	**ESC +**
Clear page to write-protected space characters	**ESC ,**
Clear cursor column to write-protected spaces	**ESC V**
Clear unprotected page to space characters	**ESC ;** **or CTRL Z**
Clear unprotected page to null characters	**ESC :**
Clear unprotected page to a specific character	**ESC .** *char*

Executing these commands also homes the cursor and turns off protect mode. Executing ESC * or ESC + or ESC , also turns off write-protect mode and insert mode.

Clearing to the End of a Page or Line

Clear unprotected page to space characters from cursor	**ESC Y**
Clear unprotected page to null characters from cursor	**ESC y**
Clear unprotected line to space characters from cursor	**ESC T**
Clear unprotected line to null characters from cursor	**ESC t**

These commands replace unprotected characters from the cursor position to the end of the page or line, or to the start of a protected field, with space or null characters.

Clear unprotected page to display attribute **ESC !** *attr*

where *attr* is a display attribute from Table G-3

This sequence clears unprotected characters on the page to a display attribute, assigning the same attribute to every unprotected character position. This makes it easy to create forms that display primarily one kind of attribute for all fields. You can also clear the page to the normal attribute (ESC ! 0) to eliminate flashing when generating the form (i.e., the attribute won't flash onto the entire screen to the right of the cursor but will display only where data is entered).

☐ **Note** When you clear the screen to any except the normal attribute, don't enter data in the first position (line one, column one) or the attribute won't take effect in that line.

SENDING DATA IN BLOCK MODE

When you send data in block mode to either the host or the printer,

- The terminal automatically includes end-of-transmission delimiters (called *terminators*) according to the value selected for the Block End parameter in setup mode
- If protect mode is on, graphics characters are sent as space characters
- Null characters are sent as space characters
- Data is sent from the start of the page or line up to and including the cursor position

Sending a Character or Line

Send cursor character **ESC M**
Send cursor line **ESC 6**
Send unprotected cursor line **ESC 4**

No delimiter is sent after the cursor character is sent.

Sending a Page

Send page **ESC 7**
Send unprotected page **ESC 5**

If you've split the screen horizontally, only data from the active window is sent.

Sending a Block

To send a block of data,

1 Mark the beginning and end of the block with STX and ETX characters.

2 Send the block to the host.

Mark block beginning with STX character **ESC 8**
Mark block end with ETX character **ESC 9**

These sequences place a visible STX or ETX character at the cursor location.

Send block **ESC s**
Send unprotected characters in block **ESC S**

These commands send the data between the first STX character left of the cursor and the first ETX character after the first STX character to the left of the cursor. If no STX character is found to the left of the cursor, data is sent beginning at the home position. If no ETX character is found, the rest of the data on the page is sent. (The STX and ETX characters are not sent.)

When the block is sent, protected fields are bracketed with the ESC) code (write-protect on) and the ESC (code (write-protect off).

When only unprotected characters are sent, each protected field is replaced by the field separator code, FS (CTRL \).

PRINTING DATA

To send data to the terminal's printer port, either

- Send a page print command to print data from the terminal's display memory, or
- Turn on a print mode to print data coming from the host

Page Print Commands

When you print from the terminal's display memory,

- The printed copy can duplicate the format seen on the screen (formatted page) or it can be unformatted (i.e., a string of data)
- A formatted page includes the end-of-line delimiters CR, LF, and a null character
- No line terminators are sent with an unformatted page
- The terminal sends an ACK to the host at the end of the print operation (if ACK mode is on)

Print formatted page	**ESC P**
Print formatted unprotected page	**ESC @**
Print unformatted page	**ESC p** or **ESC L**
Pass next incoming character to printer port	**CTRL P** *schar*

where *schar* is a single ASCII character

Print Modes

When one of the terminal's two print modes is on, the terminal sends all data received from the host to the printer port.

Turn print modes off (default)	**CTRL T**
Turn auxiliary print mode on	**CTRL R**
Turn transparent print mode on	**ESC d #** or **CTRL X**

In auxiliary print mode, the data is displayed on the screen; in transparent print mode, the data isn't displayed.

Bidirectional Communication

Data can flow in both directions between devices attached to the terminal's host port and printer port.

Turn printer receive mode off (default)	**ESC d SPACE**
Turn printer receive mode on	**ESC d !**

In printer receive mode, data received by the terminal from a device connected to the printer port (such as a printer with a keyboard, or a bar-code reader) is sent directly to the host port without affecting the screen display. Data received from the host port is displayed on the screen but is not sent to the printer port.

Turn bidirectional mode off (default)	**ESC d $**
Turn bidirectional mode on	**ESC d %**

Turning on bidirectional mode automatically turns on both printer receive and auxiliary print modes. Data received by the host port is displayed on the screen and sent to the printer port. Data received by the printer port is sent directly to the host port without affecting the screen display.

Turning off bidirectional mode turns off printer receive mode and all print modes.

ASCII COMMAND SUMMARY

Table G-6 lists the commands supported by the terminal in its ASCII personalities. Table G-7 lists the values for the variable parameters in the commands in Table G-6. Table G-8 lists national replacement characters for each keyboard language in ASCII personalities.

In Table G-6, columns other than the Wyse 350 column show the support for the command in other ASCII personalities according to the following notations:

- Same = Same as Wyse 350 code—code is native to the other terminal
- Wyse = Wyse enhancement—Wyse 350 code is not native to the other terminal but is always executed
- ENH = Wyse enhancement—Wyse 350 code is not native to the other terminal but is executed in enhanced mode

A blank in any column indicates that the command is not supported. A specific code listed in any column other than the Wyse 350 column indicates that the other terminal's native code is supported.

☐ **Note** Codes native to other terminals are given in abbreviated form. Refer to the other terminal's documentation for complete information on the indicated command and its associated parameter values.

Variables are shown in italics. Their values are listed alphabetically in Table G-7.

The terminal does not support the following TeleVideo 950 and Esprit III commands:

- ESC c (enter local mode)
- ESC 0 (program send key)
- ESC Z (transmit user/status line)

Table G-6 Commands Supported in ASCII Personalities

Command	Command Sequence			
	Wyse 350	ADDS A2	TVI 950	Esprit III
Selecting Personalities				
Enhance mode off	ESC ~ SP	Wyse	Wyse	Wyse
Enhance mode on	ESC ~ !	Wyse	Wyse	Wyse
Select Wyse 350 personality	ESC ~ @	Wyse	Wyse	Wyse
Select ADDS VP A2 personality	ESC ~ %	Wyse	Wyse	Wyse
Select TeleVideo 950 personality	ESC ~ (	Wyse	Wyse	Wyse
Select Esprit III personality	ESC ~ A	Wyse	Wyse	Wyse
Select Wyse 370 personality[1]	ESC ~ B	Wyse	Wyse	Wyse
Select Wyse 370 personality[2]	ESC ~ C	Wyse	Wyse	Wyse
Select TEK 4010/4014 personality	ESC ~ >	Wyse	Wyse	Wyse
Communicating with the Computer				
Enable transmission[3]	CTRL Q	Same	Same	Same
Stop transmission[3]	CTRL S	Same	Same	Same
Enable DTR host port handshaking			CTRL N	CTRL N
Enable Xon/Xoff host port handshaking			CTRL O	CTRL O
Send ACK (if ACK mode on)	CTRL E		Wyse	Wyse
Full-duplex mode on	ESC C ESC D F	ENH	Same	Same
Half-duplex mode on	ESC C ESC D H	ENH	Same	Same
Block mode on	ESC B	ENH	Same	Same
Half-duplex block mode on	ESC D H ESC B	ENH	Same	Same
Controlling the Terminal and Keyboard				
Sound bell	CTRL G	Same	Same	Same
Unlock keyboard	CTRL N or ESC "	CTRL B or ESC 6	ESC "	ESC "
Lock keyboard	CTRL O or ESC #	CTRL D or ESC 5	ESC #	ESC #
Keyclick off	ESC e $	ENH	ESC <	ESC <
Keyclick on (low)	ESC e %	ENH	ESC >	ESC >
Controls (monitor) mode on	ESC U	ENH	Same	Same
Controls (monitor) mode off	ESC u or ESC X	ENH	Same	Same
Send terminal ID	ESC SP	ENH	ESC M	ESC M

1. 7-bit transmission.
2. 8-bit transmission.
3. When Transmit Handshake parameter is set to *Xon/Xoff* (host must support XON/XOFF handshaking).

Table G-6 Commands Supported in ASCII Personalities, Continued

Command	Command Sequence			
	Wyse 350	ADDS A2	TVI 950	Esprit III
Redefining the Keys				
Program function key definition	ESC z *fkey sequence* DEL	ENH	Wyse or ESC ¦	Wyse or ESC ¦
Program redefinable key direction and definition	ESC Z *dir fkey/key sequence* DEL	ENH		
Clear function key definition	ESC z *fkey* DEL	ENH	Wyse	Wyse
Clear redefinable key direction and definition	ESC Z *dir fkey/key* DEL	ENH		
Displaying the Message Fields				
Program/display computer message on status line	ESC F *message* CR	ENH	Wyse	Wyse
Program and display computer message on unshifted label line	ESC z (*text* CR	ENH	ESC f	ESC f
Turn on unshifted label line[4]			ESC g	ESC g
Turn off unshifted label line[4]			ESC h	ESC h
Clear unshifted label line	ESC z (CR	ENH	Wyse	Wyse
Program computer message on shifted label line	ESC z) *text* CR	ENH		
Turn off shifted label line display	ESC z DEL	ENH		
Clear shifted label line	ESC z) CR	ENH		
Program/display function key label	ESC z *field label* CR	ENH	Wyse	Wyse
Clear function key label	ESC z *field* CR	ENH	Wyse	Wyse
Screen and Cursor Display				
Screen display off	ESC ` 8	ENH	ESC o	ESC o
Screen display on	ESC ` 9	ENH	ESC n	ESC n
Reverse screen	ESC ^ 1	ENH	ESC b	ESC b
Restore normal screen	ESC ^ 0	ENH	ESC d	ESC d
Select 132-column display[5]	ESC ` ;	ENH		
Select 80-column display	ESC ` :	ENH		
Set scrolling speed and type	ESC ` *scroll*	ENH		
Smooth scrolling on			ESC 8	ESC 8
Smooth scrolling off			ESC 9	ESC 9
Set cursor display features	ESC ` *cursor*	ENH	ESC .	ESC .

4. The unshifted label line is automatically displayed in the native, Wyse 350, and ADDS VP A2 personalities. In these personalities the label line message (both unshifted and shifted) can be hidden by assigning the blank attribute (ESC A 1 1), and displayed again by assigning any nonblank attribute.
5. Command is ignored during a dual session if the screen is vertically split.

Table G-6 Commands Supported in ASCII Personalities, Continued

Command	Command Sequence			
	Wyse 350	ADDS A2	TVI 950	Esprit III
Cursor display off		CTRL W		
Cursor display on		CTRL X		
Display Memory/Split Screen				
Divide memory into two 24-line pages			ESC \ 1	ESC \ 1
Divide memory into one 48-line page			ESC \ 2	ESC \ 2
Display previous page	ESC J	ENH	ESC J	ESC J
Display next page	ESC K		ESC K	ESC K
Split screen horizontally[6]	ESC x A *line*	ENH		
Split screen horizontally and clear page[6]	ESC x 1 *line*	ENH		
Redefine screen as one window[6]	ESC x @	ENH		
Redefine screen as one window and clear page[6]	ESC x 0	ENH		
Activate upper window	ESC]	ENH		
Activate lower window	ESC }	ENH		
Activate other window	ESC J or ESC K	ESC J[7]		
Controlling the Cursor				
Cursor left (backspace)	CTRL H	Same or CTRL U	Same	Same
Cursor right	CTRL L	CTRL F	Same	Same
Cursor up; no scroll	CTRL K	CTRL Z	Same	Same
Cursor up; scroll (reverse linefeed)	ESC j	ENH	Wyse	Same
Cursor down; no scroll			CTRL V	CTRL V
Cursor down; scroll (linefeed)	CTRL J	Same	Same	Same
Cursor to start of line	CTRL M	Same	Same	Same
Cursor to start of next line	CTRL _	ENH	Same	Same
Home cursor	ESC { or CTRL ^	ENH or CTRL A	CTRL ^	CTRL ^
Cursor to specific column		CTRL P *col*		
Cursor to specific line		CTRL K *line*		
End-of-line wrap off	ESC d .	ENH		
End-of-line wrap on	ESC d /	ENH		
Autoscrolling mode off	ESC N	ENH		
Autoscrolling mode on	ESC O	ENH		
Autopage mode off	ESC w	ENH	ESC w	ESC w
Autopage mode on	ESC v	ENH	ESC v	ESC v

6. Command is recognized only when a single page is defined for the session.
7. With enhance mode on.

Table G-6 Commands Supported in ASCII Personalities, Continued

Command	Command Sequence			
	Wyse 350	ADDS A2	TVI 950	Esprit III
Address cursor in 80-column current page	ESC = *line col*	ENH	Same	Same
Address cursor in 80/132/161-column current page	ESC a *ll* R *ccc* C	ENH		
Address cursor in specific 80-column page[8]			ESC –	ESC –
Address cursor in specific 80-column window (or page[9])	ESC – *wnd/page line col*	ENH		
Read cursor address in 80-column current page	ESC ?	ENH	Same	Same
Read cursor address in 80/132/161-column current page	ESC b	ENH		
Read 80-column window (or page[9]) number and cursor address	ESC /	ENH	Same	Same
Line lock on			ESC ! 1	ESC ! 1
Line lock off			ESC ! 2	ESC ! 2
Display Attributes/Colors				
Select color palette	ESC % *fcolor*	ENH		
Redefine color association	ESC m *attr-c color attr-n*	ENH		
Assign display attribute to a message field	ESC A *mf attr*	ENH		
Assign character display attribute	ESC G *attr*	ENH	Same	Same
Clear unprotected characters to display attribute	ESC ! *attr*	ENH		
Set tag protect attribute		CTRL N		
Reset tag protect attribute		CTRL O		
Assign write-protected character attribute	ESC ` *wpca*	ESC 0		
Graphics Characters				
Graphics mode on	ESC H CTRL B	ENH	ESC $	ESC $
Graphics mode off	ESC H CTRL C	ENH	ESC %	ESC %
Display graphics character	ESC H *ldraw*	ENH	Wyse	Wyse

8. If more than one page is defined.

9 If more than one page is defined and screen is not split with standard ASCII command (ESC x).

Table G-6 Commands Supported in ASCII Personalities, Continued

Command	Command Sequence			
	Wyse 350	ADDS A2	TVI 950	Esprit III
Protecting Data				
Write-protect mode off	ESC (	CTRL O	Same	Same
Write-protect mode on	ESC)	CTRL N	Same	Same
Clear cursor column to write-protected spaces	ESC V	ENH	Same	Same
Protect mode off	ESC '	ENH	Same	Same
Protect mode on	ESC &	ENH	Same	Same
Editing				
Clear all tab stops	ESC 0		ESC 3	ESC 3
Set tab stop	ESC 1	ENH	Same	Same
Clear current tab stop	ESC 2	ENH	Same	Same
Tabulate cursor	ESC i or CTRL I	ENH	CTRL I	CTRL I
Backtab	ESC I	ENH	Same	Same
Field tab			ESC i	ESC i
Insert mode on, replace mode off	ESC q	ENH	Same	Same
Insert mode off, replace mode on	ESC r	ENH	Same	Same
Insert space character	ESC Q	ENH	Same	Same
Insert line of spaces	ESC E	ENH or ESC M	Same	Same
Delete cursor character	ESC W	ENH	Same	Same
Delete cursor line	ESC R	ENH or ESC l	Same	Same
Clearing Data				
Clear page to nulls	ESC *	ENH	Same	Same
Clear page to spaces	ESC +	ENH or CTRL L		
Clear page to write-protected spaces	ESC ,	ENH		
Clear cursor column to write-protected spaces	ESC V	ENH	Same	Same
Clear unprotected page to spaces	ESC ; or CTRL Z	ESC ;[7]	ESC ; or ESC +	ESC ; or ESC +
Clear unprotected page to protected spaces			ESC ,	ESC ,
Clear unprotected page to nulls	ESC :	ENH	Same	Same
Clear unprotected page to a specific character	ESC . *char*	ENH		
Clear unprotected page to a display attribute	ESC ! *attr*	ENH		

Table G-6 Commands Supported in ASCII Personalities, Continued

Command	Command Sequence			
	Wyse 350	ADDS A2	TVI 950	Esprit III
Clear unprotected to end of page with spaces from cursor	ESC Y	ESC k	Same	Same
Clear unprotected to end of page with nulls from cursor	ESC y	ENH	Same	Same
Clear unprotected to end of line with spaces from cursor	ESC T	ENH or ESC K	Same	Same
Clear unprotected to end of line with nulls from cursor	ESC t	ENH	Same	Same
Sending Data in Block Mode				
Send character at cursor	ESC M			
Send entire cursor line	ESC 6		Same	Same
Send unprotected line	ESC 4		Same	Same
Send entire page	ESC 7	ENH	Same	Same
Send unprotected page	ESC 5		Same	Same
Define block beginning	ESC 8	ENH		
Define block end	ESC 9	ENH		
Send entire block	ESC s	ENH	Same	Same
Send unprotected characters in block	ESC S	ENH	Same	Same
Print Functions				
Set print terminator			ESC p	ESC p
Define delimiters			ESC x	ESC x
Print formatted page	ESC P	ENH	Same	Same
Print formatted unprotected page	ESC @	ENH		
Print unformatted page	ESC p or ESC L	ESC p[7]	ESC L	ESC L
Print next character	CTRL P		CTRL P	CTRL P
Auxiliary print mode off	CTRL T	Same	ESC A	ESC A
Auxiliary print mode on	CTRL R	Same	ESC @	ESC @
Transparent print mode off	CTRL T	ESC 4	ESC a	ESC a
Transparent print mode on	ESC d # or CTRL X	ENH or ESC 3	ESC `	ESC `
Bidirectional mode off	ESC d $	ENH	CTRL T	CTRL T
Bidirectional mode on	ESC d %	ENH	CTRL R	CTRL R
Printer receive mode on	ESC d !	ENH		
Printer receive mode off	ESC d SP	ENH		
Pass next incoming character to printer port	CTRL P *schar*		Wyse	Wyse

Table G-7 Variable Values for Wyse 350 Commands

attr[1]	Display Attributes	*attr*[1]	Display Attributes
SP	Space character	p	Dim
0	Normal	q	Dim and blank
1	Blank (no display)	r	Dim and blink
2	Blink	s	Dim, blink, blank
3	Blink, blank	t	Dim and reverse
4	Reverse	u	Dim, reverse, blank
5	Reverse and blank	v	Dim, reverse, blink
6	Reverse and blink	w	Dim, reverse, blink, blank
7	Reverse, blink, blank	x	Dim and underline
8	Underline	y	Dim, underline, blank
9	Underline and blank	z	Dim, underline, blink
:	Underline and blink	{	Dim, underline, blink, blank
;	Underline, blink, blank	¦	Dim, reverse, underline
<	Underline and reverse	}	Dim, reverse, blank, underline
=	Underline, reverse, blank	~	Dim, reverse, blink, underline
>	Underline, reverse, blink	DEL	Dim, reverse, underline, blink, blank
?	Underline, reverse, blink, blank		

attr[2]	Display Attributes	*attr*[2]	Display Attributes
0	Green	8	Black
1	Cyan	9	Blue
2	Yellow	:	Red
3	White	;	Magenta
4	Green, reverse	<	Black, reverse
5	Cyan, reverse	=	Blue, reverse
6	Yellow, reverse	>	Red, reverse
7	White, reverse	?	Magenta, reverse

1. For Wyse 350 and ADDS A2 personalities; first 17 values (SP through ?) apply to TVI 950 personality also.
2. For Esprit III personality.

Table G-7 Variable Values for Wyse 350 Commands, Continued

attr-c	**Color Association**	*attr-c*	**Color Association**
0	Normal	5	Underline, reverse
1	Reverse	6	Dim, underline
2	Dim	7	Dim, reverse, underline
3	Underline	8	Write-protect[3]
4	Dim, reverse		

attr-n	**New Attribute**
0	Normal
-	Reverse
.	Underline
/	Underline, reverse

ccc One- to three-decimal value of column (relative to home) where cursor is to be positioned

char Character that replaces unprotected characters

Column	*col* **Wyse 350[4]**	*col* **ADDS A2[5]**	**Column**	*col* **Wyse 350[4]**	*col* **ADDS A2[5]**
1	SP	CTRL @	10	)	CTRL I
2	!	CTRL A	11	*	CTRL P
3	"	CTRL B	12	+	CTRL Q
4	#	CTRL C	13	,	CTRL R
5	$	CTRL D	14	-	CTRL S
6	%	CTRL E	15	.	CTRL T
7	&	CTRL F	16	/	CTRL U
8	'	CTRL G	17	0	CTRL V
9	(	CTRL H	18	1	CTRL W

3. Color association only; *attr-n* must be entered but will be ignored.
4. These codes are also recognized in TVI 950 and Esprit III personalities and in ADDS A2 personality absolute cursor addressing.
5. Horizontal addressing (CTRL P).

Table G-7 Variable Values for Wyse 350 Commands, Continued

Column	*col* Wyse 350[4]	*col* ADDS A2[5]	Column	*col* Wyse 350[4]	*col* ADDS A2[5]
19	2	CTRL X	58	Y	W
20	3	CTRL Y	59	Z	X
21	4	SP	60	[	Y
22	5	!	61	\	/
23	6	"	62	]	a
24	7	#	63	^	b
25	8	$	64	_	c
26	9	%	65	`	d
27	:	&	66	a	e
28	;	'	67	b	f
29	<	(	68	c	g
30	=	)	69	d	h
31	>	0	70	e	i
32	?	1	71	f	p
33	@	2	72	g	q
34	A	3	73	h	r
35	B	4	74	i	s
36	C	5	75	j	t
37	D	6	76	k	u
38	E	7	77	l	v
39	F	8	78	m	w
40	G	9	79	n	x
41	H	@	80	o	y
42	I	A	81	p	
43	J	B	82	q	
44	K	C	83	r	
45	L	D	84	s	
46	M	E	85	t	
47	N	F	86	u	
48	O	G	87	v	
49	P	H	88	w	
50	Q	I	89	x	
51	R	P	90	y	
52	S	Q	91	z	
53	T	R	92	{	
54	U	S	93	¦	
55	V	T	94	}	
56	W	U	95	~	
57	X	V	96	DEL/RUB	

Table G-7 Variable Values for Wyse 350 Commands, Continued

color[6]	Foreground Color	*color*[6]	Foreground Color
1	Black (normal)		Medium green
)	Black	;	Khaki green
!	Black	m	Sage green
		p	Pale green
?	Indigo	o	Chartreuse
&	Violet	/	Dull chartreuse
x	Light violet		
		7	Yellow
"	Dark blue	}	Pale yellow
*	Deep blue	y	Amber
2	Blue	~	Cream
]	Powder blue		
^	Medium blue	8	White
a	Blue gray		
b	Light blue	z	Tan
		i	Orange brown
9	Electric blue		
:	Bright blue	u	Red orange
<	Sky blue	5	Red
\	Blue purple	-	Deep red
n	Light blue purple	%	Brick red
$	Teal blue	s	Hot pink
,	Turquoise	t	Magenta
>	Blue green	v	Pale pink
;	Light blue green	w	Purple pink
e	Pale blue green		
q	Faded blue green	h	Purple
		.	Medium purple
4	Cyan	6	Light purple
f	Light cyan	'	Pale purple
r	Pale cyan	{	Faded purple
=	Sea green	g	Rose
d	Sea foam green	j	Faded rose
`	Green blue		
#	Grass green	l	Purple blue
3	Green	k	Purple gray
+	Bright green	o	Light gray
c	Lime green	(	Charcoal gray

6. Color names are for convenience of reference and are not based on any scientific or artistic criteria. The names are intended only as guidelines within a range of colors.

Table G-7 Variable Values for Wyse 350 Commands, Continued

cursor	**Cursor Display**
0	Off
1	On (default)
2	Steady block (default)
3	Blinking line
4	Steady line
5	Blinking block (default)

dir	**Key Direction**
0	Normal
1	Remote
2	Local

fcolor	**Foreground Color Palette**	*fcolor*	**Foreground Color Palette**	*fcolor*	**Foreground Color Palette**
0	Amber (default)	5	Yellow	:	Reverse tertiary colors
1	Green	6	Sky blue	;	Reverse primary/secondary colors
2	White	7	Light gray	<	Simulated monochrome green
3	Cyan	8	Light green	=	Simulated monochrome white
4	Light purple	9	Cream	>	Simulated monochrome amber
				?	Normal primary/secondary

Key	*field* **Unshifted**	*field* **Shifted**	**Key**	*field* **Unshifted**	*field* **Shifted**
F1	0	P	F9	8	X
F2	1	Q	F10	9	Y
F3	2	R	F11	:	Z
F4	3	S	F12	;	[
F5	4	T	F13	<	\
F6	5	U	F14	=	]
F7	6	V	F15	>	^
F8	7	W	F16	?	_

Table G-7 Variable Values for Wyse 350 Commands, Continued

fkey Unshifted	*fkey* Shifted	105-Key ANSI	Keyboard Style: ASCII	Keyboard Style: Enhanced PC
@	`		F1	F1
A	a		F2	F2
B	b		F3	F3
C	c		F4	F4
D	d		F5	F5
E	e	F6	F6	F6
F	f	F7	F7	F7
G	g	F8	F8	F8
H	h	F9	F9	F9
I	i	F10	F10	F10
J	j	F11	F11	F11
K	k	F12	F12	F12
L	l	F13	F13	
M	m	F14	F14	
N	n	Help	F15	
O	o	Do	F16	

key Unshifted	*key* Shifted	105-Key ANSI	Keyboard Style: ASCII	Keyboard Style: Enhanced PC
SP	%		Esc	Esc
!	&	Tab	Tab	Tab →
"	'	⌫	Back Space	← Back Space
#	(	Remove	Del	
$	)	Return	Return	Enter
*	/		Home	Home
+	0	▲	▲	↑
,	1	▼	▼	↓
-	2	◀	◀	←
.	3	▶	▶	→
s	4	Enter	Enter	Enter *kpd*
q	p	PF4	Repl	Insert
r	w	Prev Scrn	Next Page	Page Down
u	t	Find	Send	

Table G-7 Variable Values for Wyse 350 Commands, Continued

key Unshifted	*key* Shifted	105-Key ANSI	Keyboard Style: ASCII	Keyboard Style: Enhanced PC
}	z	PF3	Clr Line	
5	6	PF2	Del Char	Delete
7	8	PF1	Ins Char	
R	X	Next Scrn		Print Screen
:	;	Insert Here		Page Up
[	]	Select		End
P	V	F20		
Q	W	F17		
S	Y	F18		
T	Z	F19		

label A character string of up to 8 characters (80 or 161 columns)
7 characters (132 columns)

ldraw	Graphics Character	*ldraw*	Graphics Character	*ldraw*	Graphics Character	*ldraw*	Graphics Character
0	┬	4	├	8	┼	<	═
1	└	5	┘	9	┤	=	┴
2	┌	6	│	:	─	>	╫
3	┐	7	▓	;	▒	?	▒

Table G-7 Variable Values for Wyse 350 Commands, Continued

Line	*line* Wyse 350[7]	*line* ADDS A2[8]	Line	Wyse 350[7]	Line	Wyse 350[7]	Line	Wyse 350[7]
1	SP	CTRL @	25	8	49	P	73	h
2	!	CTRL A	26	9	50	Q	74	i
3	"	CTRL B	27	:	51	R	75	j
4	#	CTRL C	28	;	52	S	76	k
5	$	CTRL D	29	<	53	T	77	l
6	%	CTRL E	30	=	54	U	78	m
7	&	CTRL F	31	>	55	V	79	n
8	'	CTRL G	32	?	56	W	80	o
9	(	CTRL H	33	@	57	X	81	p
10	)	CTRL I	34	A	58	Y	82	q
11	*	CTRL J	35	B	59	Z	83	r
12	+	CTRL K	36	C	60	[	84	s
13	,	CTRL L	37	D	61	\	85	t
14	-	CTRL M	38	E	62	]	86	u
15	.	CTRL N	39	F	63	^	87	v
16	/	CTRL O	40	G	64	_	88	w
17	0	CTRL P	41	H	65	`	89	x
18	1	CTRL Q	42	I	66	a	90	y
19	2	CTRL R	43	J	67	b	91	z
20	3	CTRL S	44	K	68	c	92	{
21	4	CTRL T	45	L	69	d	93	¦
22	5	CTRL U	46	M	70	e	94	}
23	6	CTRL V	47	N	71	f	95	~
24	7	CTRL W	48	O	72	g	96	DEL/RUB

7. These codes are also recognized in TVI 950 and Esprit III personalities and in ADDS A2 personality absolute cursor addressing.
8. Vertical addressing (CTRL K).

Table G-7 Variable Values for Wyse 350 Commands, Continued

ll	One- or two-decimal value of line (relative to home) where cursor is to be positioned
message	A string of up to 47 characters (80 columns); 99 characters (132 columns) 128 characters (161 columns)
mf	**Screen Area**
0	Data area
1	Setup/label line
2	Terminal message field on status line
3	Computer message field on status line
pers	**Personality**
@	Wyse 350
%	ADDS A2
(	TVI 950
A	Esprit III
B	Wyse 370, 7-bit
C	Wyse 370, 8-bit
>	Tek 4010/4014
schar	Single ASCII character

scroll	**Scrolling Type**	**Speed (Lines per Second)**
@	Jump scroll (default)	
<	Smooth scroll	1
=	Smooth scroll	2
>	Smooth scroll	4
?	Smooth scroll	8

sequence	Up to 78 bytes to be loaded in key
text	A string of up to 79 characters (80 columns) 131 characters (132 columns) 160 characters (161 columns)
wnd/page	**Window or Page**
0	Page 1 or upper window
1	Page 2 or lower window

Table G-7 Variable Values for Wyse 350 Commands, Continued

wpca	**Write-Protected Display Attribute**
6	Reverse
7	Dim (default)
A	Normal
B	Reverse and dim
C	Underline
D	Dim and underline
E	Reverse and underline
F	Reverse, dim, underline
G	Extended character set (ISO Latin-1)[9]

9. The ISO Latin-1 set is illustrated in Appendix A. (This is a different extended character set from that provided on the WY-350 terminal.).

NATIONAL REPLACEMENT CHARACTERS

In keyboard languages other than *US*, the terminal's ASCII character set is modified by certain *national replacement characters*. Table G-8 lists the characters in each language that are *different* from the "ASCII" character set shown in Appendix A.

Table G-8 National Replacement Characters: ASCII Personalities

Keyboard Language / ASCII Hex	# (23H)	< (3CH)	> (3EH)	@ (4OH)	[(5BH)	\ (5CH)	] (5DH)	^ (5EH)	_ (5FH)	` (6OH)	{ (7BH)	¦ (7CH)	} (7DH)	~ (7EH)
Danish					Æ	Ø	Å				æ	ø	å	
Dutch	£			¾	ij	½	¦				¨	ƒ	¼	´
Finnish					Ä	Ö	Å	Ü		é	ä	ö	å	ü
French/Belgian	£			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
Latin American					¡	Ñ	¿	á		é	í	ñ	ú	ü
Norwegian					Æ	Ø	Å				æ	ø	å	¦
Portuguese					Ã	Ç	Õ				ã	ç	õ	
Spanish					¡	Ñ	¿				º	ñ	ç	¦
Swedish				É	Ä	Ö	Å	Ü		é	ä	ö	å	ü
Swiss (Fr/Ger)	£	[	]	ç	à	é	è				ä	ö	ü	¨
United Kingdom	£													

H TEK 4010/4014 Command Summary

TEK 4010/4014 PERSONALITY COMMANDS

This description of the terminal's operation in TEK 4010/4014 personality assumes a basic familiarity with Tektronix 4010/4014 graphics. Table H-1 summarizes the modes and command features supported by the terminal in this personality.

Table H-1 TEK 4010/4014 Personality Features

Feature	Function
Alpha mode	Process text
Graph mode	Draw vectors between specified absolute coordinates
Incremental plot mode	Plot points in one-point increments relative to current display beam position
Point plot mode	Draw single dots at points specified by absolute coordinates
Special point plot mode	Draw single dots as in point plot mode but with an intensity character preceding each point plotted; dots will be drawn only if the intensity is 50 percent or more
Graphic input (GIN) mode	Report graphic information to computer, position crosshair cursor from keyboard or mouse
Bypass condition	Prevent terminal response to data echoed from computer

Key Functions

Function keys are user-definable in setup mode; they send no default codes.

See Table C-4 for local keyboard commands supported in TEK 4010/4014 personality.

Control Codes and Escape Sequences

Table H-2 lists the control codes and escape sequences recognized by the terminal in TEK 4010/4014 personality. Following the table are "Programming Notes" with more detailed information on some of the commands listed in the table. These additional notes are referenced by a bracketed number, e.g., [1], in the "Notes" column of the table.

Table H-2 TEK 4010/4014 Personality Commands

Command	Sequence	Notes[1]
Modes		
Select 4010/4014 personality (alpha mode)	ESC [? 38 h	From Native, VT320/220 or VT100 personality
Return to personality from which entered	ESC [? 38 l	
Select foreground and background colors	ESC [*Ps*; *Ps1* x	[1]
Ps Foreground color (0-64) from Color Table		
Ps1 Background color (0-64) from Color Table		
Select graph mode	GS or ESC GS	GS = CTRL] [2]
Select incremental plot mode	RS or ESC RS	RS = CTRL ^ [3]
Select point plot mode	FS	FS = CTRL \ [4]
Select special point plot mode	ESC FS	FS = CTRL \ [5]
Select graphic input (GIN) mode	ESC SUB	SUB = CTRL Z [6]
Reset to alpha mode and clear bypass condition	US or ESC US	US = CTRL _
Reset to alpha mode, clear screen, home cursor, and clear bypass condition	ESC FF	FF = CTRL L
Terminal and Display Control		
Set bypass condition	ESC CAN	CAN = CTRL X Prevents response to data echoed from computer
Clear bypass condition	BEL	BEL = CTRL G Also sounds bell
Request terminal status	ESC ENQ	ENQ = CTRL E Also sets bypass condition [7]

1. Numbers in brackets refer to the Programming Notes that follow this table.

Table H-2 TEK 4010/4014 Personality Commands, Continued

Command	Sequence	Notes[1]
Terminal and Display Control, Continued		
Sound bell	BEL or ESC BEL	BEL = CTRL G Also clears bypass condition
Prevent response to carriage return/linefeed	ESC CR or ESC LF	CR = CTRL M LF = CTRL J Until cleared by receipt of any character or control code except CRLF
Direct beam without drawing (dark vector)	GS	GS = CTRL]
Select character size:		Alpha mode
80 characters/line, 36 lines/page	ESC 8 or ESC 9	
128 characters/line, 60 lines/page	ESC : or ESC ;	
Cursor Movement		
Move cursor left one position	BS	BS = CTRL H
Move cursor right one position	HT	HT = CTRL I
Move cursor down one line (linefeed)	LF	LF = CTRL J Also clears bypass condition
Move cursor up one line	VT	VT = CTRL K
Move cursor to start of line (carriage return)	CR	CR = CTRL M Also resets terminal from graph to alpha mode, cancels crosshair cursor, clears bypass condition
Print Screen		
Print the screen	ESC ETB	ETB = CTRL W[2] [8]

2. To print the screen from the keyboard, press F2 on the 105-Key ANSI keyboard, Print on the ASCII keyboard, or Print Screen on the Enhanced PC-style keyboard.

Programming Note [1]

Selecting Colors

Color Table

Ps/ Ps1	Color	*Ps/ Ps1*	Color	*Ps/ Ps1*	Color
0	Default	22	Charcoal gray	44	Light blue-purple
1	Black	23	Powder blue	45	Chartreuse
2	Dark blue	24	Medium blue	46	Pale green
3	Deep purple	25	Medium green	47	Faded blue-green
4	Blue	26	Green blue	48	Pale cyan
5	Grass green	27	Blue-gray	49	Red
6	Teal blue	28	Light blue	50	Hot pink
7	Electric blue	29	Lime green	51	Magenta
8	Bright blue	30	Seafoam green	52	Light purple
9	Bright green	31	Pale blue-green	53	Red-orange
10	Light blue-green	32	Light cyan	54	Pale pink
11	Turquoise	33	Deep red	55	Purple pink
12	Sky blue	34	Rose	56	Light violet
13	Green	35	Medium purple	57	Amber
14	Sea green	36	Purple	58	Tan
15	Blue-green	37	Orange brown	59	Faded purple
16	Cyan	38	Faded rose	60	Pale purple
17	Brick red	39	Purple-gray	61	Yellow
18	Violet	40	Purple-blue	62	Pale yellow
19	Indigo	41	Dull chartreuse	63	Cream
20	Blue-purple	42	Sage green	64	White
21	Khaki-green	43	Gray		

Programming Note [2]

Graph Mode

In graph mode vectors are drawn between specified absolute coordinates. The control character GS puts the terminal in graph mode; within graph mode GS defines the start of a vector by directing the display beam to the specified address without displaying the vector (dark vector).

☐ **Note** The graphics screen is cleared when setup mode is entered from TEK 4010/4014 personality.

Encoding Coordinates

By mapping TEK points to the nearest corresponding pixels on its 640- by 480-pixel display, the terminal supports the Tektronix address ranges of 1024X x 1024Y (requiring 10-bit addressing) or 4096X x 4096Y (requiring 12-bit addressing). (The matrix visible on the screen is 1024 x 780 or 4096 x 3128.) The display beam is addressed to a point on the screen by sending the binary equivalent of each coordinate, encoded into four bytes for 10-bit addressing or

five bytes for 12-bit addressing. Table H-3 lists these bytes in the order they must be sent and identifies their bit formats.

☐ **Note** Not all bytes must be sent again when specific bytes are changed; the right column in Table H-3 indicates what bytes must be sent again when the byte listed in the first column changes.

Table H-3 Coordinate Bit Formats

7-Bit ASCII Character Byte Name	7	6	5	4	3	2	1	Other Bytes to be Sent When Byte Changes
	Tag Bits		Address Bits[1]					
High Y	0	1	5 MSB of Y address					Low X
Extra[2]	1	1		Y2	Y1	X2	X1	Low Y, Low X
Low Y	1	1	5 IB of Y address					Low X
High X	0	1	5 MSB of X address					Low Y, Low X
Low X	1	0	5 IB of X address					None

1. MSB = Most significant bits; IB = Intermediate bits
2. Not applicable to 10-bit addressing; bits 4 and 3 are the least significant bits of the 12-bit Y address; bits 2 and 1 are the least significant bits of the 12-bit X address

Vector Patterns

Table H-4 lists the commands that select the vector pattern.

Table H-4 Vector Patterns

Command	Pattern*	Example
ESC `	Solid (default)	————————
ESC a	Dotted	. . . . .
ESC b	Dot-dashed	— . — . — . —
ESC c	Short dashed	- - - - - - - - - - - - - -
ESC d	Long dashed	— — — — — —
ESC e	Solid	————————
ESC f	Solid	————————
ESC g	Solid	————————
ESC h	Solid	————————

* Solid lines appear as finely dotted lines when drawn vertically.

Table H-4 Vector Patterns, Continued

Command	Pattern*	Example
ESC i	Dotted	.....
ESC j	Dot-dashed	— . — . — . —
ESC k	Short dashed	- - - - - - - - - - - - - -
ESC l	Long dashed	— — — — — —
ESC m	Solid	———————
ESC n	Solid	———————
ESC o	Solid	———————

Example

The following example draws the two vectors illustrated in Figure H-1, which also shows the four corners of the screen in TEK point coordinates. (TEK points are mapped to the nearest pixel to display the vectors on this screen.)

Refer to Table H-5, which provides ASCII and decimal values for the TEK point coordinates.

The following steps draw the vectors—a dotted line from 0X, 200Y to 500X, 200Y and a solid line from 500X, 200Y to 500X, 0Y.

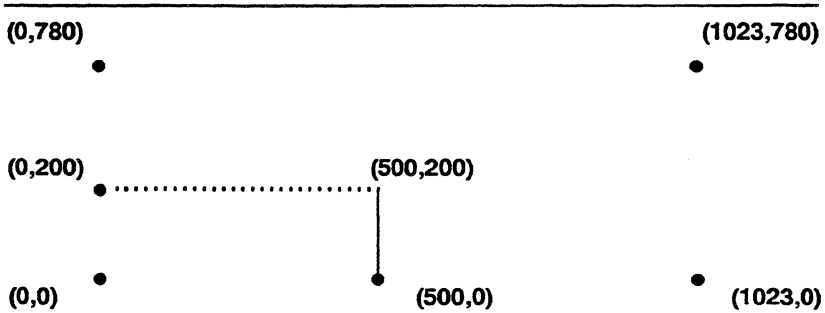
1 Send the command to enter graph mode.

GS

2 Send the command to select a dotted vector pattern (Table H-4).

ESC a

Figure H-1 Screen Coordinates (X, Y)



3 In Table H-5 find the coordinate byte values for the vector's starting point. Look them up in the order they must be sent (Table H-3): high Y, low Y, high X, low X.

- Find the Y coordinate (200) in the body of the chart. Find the high Y byte (ASCII &) at the top of the chart and the low Y byte (ASCII h) at the right.
- Find the X coordinate (0) in the body of the chart. Find the high X byte (ASCII SP) at the top of the chart and the low X byte (ASCII @) at the right.

4 Send the command to locate the display beam at the starting point. (Since GS precedes the four-byte coordinate address, no vector is drawn.)

GS & h SP @

5 Send the four-byte address for the 200Y, 500X coordinates to draw the dotted line.

& h / T

6 Send the four-byte address for the 0Y, 500X coordinates, prefaced by a command to select a solid line.

ESC ` SP ` / T

Table H-5 Coordinate Conversion Chart

ASCII Decimal	High X and Y SP 32	! 33	" 34	# 35	$ 36	% 37	& 38	' 39	Low X ASCII	Low X Dec	Low Y ASCII	Low Y Dec
	X or Y Coordinate											
0	32	64	96	128	160	192	224		@	64	`	96
1	33	65	97	129	161	193	225		A	65	a	97
2	34	66	98	130	162	194	226		B	66	b	98
3	35	67	99	131	163	195	227		C	67	c	99
4	36	68	100	132	164	196	228		D	68	d	100
5	37	69	101	133	165	197	229		E	69	e	101
6	38	70	102	134	166	198	230		F	70	f	102
7	39	71	103	135	167	199	231		G	71	g	103
8	40	72	104	136	168	200	232		H	72	h	104
9	41	73	105	137	169	201	233		I	73	i	105
10	42	74	106	138	170	202	234		J	74	j	106
11	43	75	107	139	171	203	235		K	75	k	107

Table H-5 Coordinate Conversion Chart, Continued

ASCII Decimal	High X and Y SP 32	! 33	" 34	# 35	$ 36	% 37	& 38	' 39	Low X ASCII	Low X Dec	Low Y ASCII	Low Y Dec
	X or Y Coordinate											
	12	44	76	108	140	172	204	236	L	76	l	108
	13	45	77	109	141	173	205	237	M	77	m	109
	14	46	78	110	142	174	206	238	N	78	n	110
	15	47	79	111	143	175	207	239	O	79	o	111
	16	48	80	112	144	176	208	240	P	80	p	112
	17	49	81	113	145	177	209	241	Q	81	q	113
	18	50	82	114	146	178	210	242	R	82	r	114
	19	51	83	115	147	179	211	243	S	83	s	115
	20	52	84	116	148	180	212	244	T	84	t	116
	21	53	85	117	149	181	213	245	U	85	u	117
	22	54	86	118	150	182	214	246	V	86	v	118
	23	55	87	119	151	183	215	247	W	87	w	119
	24	56	88	120	152	184	216	248	X	88	x	120
	25	57	89	121	153	185	217	249	Y	89	y	121
	26	58	90	122	154	186	218	250	Z	90	z	122
	27	59	91	123	155	187	219	251	[	91	{	123
	28	60	92	124	156	188	220	252	\	92	¦	124
	29	61	93	125	157	189	221	253	]	93	}	125
	30	62	94	126	158	190	222	254	^	94	~	126
	31	63	95	127	159	191	223	255	_	95	”	127
	256	288	320	352	384	416	448	480	@	64	`	96
	257	289	321	353	385	417	449	481	A	65	a	97
	258	290	322	354	386	418	450	482	B	66	b	98
	259	291	323	355	387	419	451	483	C	67	c	99
	260	292	324	356	388	420	452	484	D	68	d	100
	261	293	325	357	389	421	453	485	E	69	e	101
	262	294	326	358	390	422	454	486	F	70	f	102
	263	295	327	359	391	423	455	487	G	71	g	103
	264	296	328	360	392	424	456	488	H	72	h	104
	265	297	329	361	393	425	457	489	I	73	i	105
	266	298	330	362	394	426	458	490	J	74	j	106
	267	299	331	363	395	427	459	491	K	75	k	107
	268	300	332	364	396	428	460	492	L	76	l	108
	269	301	333	365	397	429	461	493	M	77	m	109
	270	302	334	366	398	430	462	494	N	78	n	110

Table H-5 Coordinate Conversion Chart, Continued

ASCII Decimal	High X and Y SP 32	! 33	" 34	# 35	$ 36	% 37	& 38	' 39	Low X ASCII	Low X Dec	Low Y ASCII	Low Y Dec
	X or Y Coordinate											
	271	303	335	367	399	431	463	495	O	79	o	111
	272	304	336	368	400	432	464	496	P	80	p	112
	273	305	337	369	401	433	465	497	Q	81	q	113
	274	306	338	370	402	434	466	498	R	82	r	114
	275	307	339	371	403	435	467	499	S	83	s	115
	276	308	340	372	404	436	468	500	T	84	t	116
	277	309	341	373	405	437	469	501	U	85	u	117
	278	310	342	374	406	438	470	502	V	86	v	118
	279	311	343	375	407	439	471	503	W	87	w	119
	280	312	344	376	408	440	472	504	X	88	x	120
	281	313	345	377	409	441	473	505	Y	89	y	121
	282	314	346	378	410	442	474	506	Z	90	z	122
	283	315	347	379	411	443	475	507	[	91	{	123
	284	316	348	380	412	444	476	508	\	92	¦	124
	285	317	349	381	413	445	477	509	]	93	}	125
	286	318	350	382	414	446	478	510	^	94	~	126
	287	319	351	383	415	447	479	511	_	95	"	127
	512	544	576	608	640	672	704	736	@	64	`	96
	513	545	577	609	641	673	705	737	A	65	a	97
	514	546	578	610	642	674	706	738	B	66	b	98
	515	547	579	611	643	675	707	739	C	67	c	99
	516	548	580	612	644	676	708	740	D	68	d	100
	517	549	581	613	645	677	709	741	E	69	e	101
	518	550	582	614	646	678	710	742	F	70	f	102
	519	551	583	615	647	679	711	743	G	71	g	103
	520	552	584	616	648	680	712	744	H	72	h	104
	521	553	585	617	649	681	713	745	I	73	i	105
	522	554	586	618	650	682	714	746	J	74	j	106
	523	555	587	619	651	683	715	747	K	75	k	107
	524	556	588	620	652	684	716	748	L	76	l	108
	525	557	589	621	653	685	717	749	M	77	m	109
	526	558	590	622	654	686	718	750	N	78	n	110
	527	559	591	623	655	687	719	751	O	79	o	111
	528	560	592	624	656	688	720	752	P	80	p	112
	529	561	593	625	657	689	721	753	Q	81	q	113

Table H-5 Coordinate Conversion Chart, Continued

ASCII Decimal	High X and Y SP 32	! 33	" 34	# 35	$ 36	% 37	& 38	' 39	Low X ASCII	Low X Dec	Low Y ASCII	Low Y Dec
	X or Y Coordinate											
	530	562	594	626	658	690	722	754	R	82	r	114
	531	563	595	627	659	691	723	755	S	83	s	115
	532	564	596	628	660	692	724	756	T	84	t	116
	533	565	597	629	661	693	725	757	U	85	u	117
	534	566	598	630	662	694	726	758	V	86	v	118
	535	567	599	631	663	695	727	759	W	87	w	119
	536	568	600	632	664	696	728	760	X	88	x	120
	537	569	601	633	665	697	729	761	Y	89	y	121
	538	570	602	634	666	698	730	762	Z	90	z	122
	539	571	603	635	667	699	731	763	[	91	{	123
	540	572	604	636	668	700	732	764	\	92	¦	124
	541	573	605	637	669	701	733	765	]	93	}	125
	542	574	606	638	670	702	734	766	^	94	~	126
	543	575	607	639	671	703	735	767	_	95	"	127
	768	800	832	864	896	928	960	992	@	64	`	96
	769	801	833	865	897	929	961	993	A	65	a	97
	770	802	834	866	898	930	962	994	B	66	b	98
	771	803	835	867	899	931	963	995	C	67	c	99
	772	804	836	868	900	932	964	996	D	68	d	100
	773	805	837	869	901	933	965	997	E	69	e	101
	774	806	838	870	902	934	966	998	F	70	f	102
	775	807	839	871	903	935	967	999	G	71	g	103
	776	808	840	872	904	936	968	1000	H	72	h	104
	777	809	841	873	905	937	969	1001	I	73	i	105
	778	810	842	874	906	938	970	1002	J	74	j	106
	779	811	843	875	907	939	971	1003	K	75	k	107
	780	812	844	876	908	940	972	1004	L	76	l	108
	781	813	845	877	909	941	973	1005	M	77	m	109
	782	814	846	878	910	942	974	1006	N	78	n	110
	783	815	847	879	911	943	975	1007	O	79	o	111
	784	816	848	880	912	944	976	1008	P	80	p	112
	785	817	849	881	913	945	977	1009	Q	81	q	113
	786	818	850	882	914	946	978	1010	R	82	r	114
	787	819	851	883	915	947	979	1011	S	83	s	115
	788	820	852	884	916	948	980	1012	T	84	t	116

Table H-5 Coordinate Conversion Chart, Continued

ASCII Decimal	High X and Y SP 32	! 33	" 34	# 35	$ 36	% 37	& 38	' 39	Low X ASCII	Low X Dec	Low Y ASCII	Low Y Dec
	X or Y Coordinate											
	789	821	853	885	917	949	981	1013	U	85	u	117
	790	822	854	886	918	950	982	1014	V	86	v	118
	791	823	855	887	919	951	983	1015	W	87	w	119
	792	824	856	888	920	952	984	1016	X	88	x	120
	793	825	857	889	921	953	985	1017	Y	89	y	121
	794	826	858	890	922	954	986	1018	Z	90	z	122
	795	827	859	891	923	955	987	1019	[	91	{	123
	796	828	860	892	924	956	988	1020	\	92	¦	124
	797	829	861	893	925	957	989	1021	]	93	}	125
	798	830	862	894	926	958	990	1022	^	94	~	126
	799	831	863	895	927	959	991	1023	_	95	DEL*	127

* If DEL = Low Y parameter in setup mode is set to *on*. If set to *off*, enter ESC ? instead.

Programming Note [3]

Incremental Plot Mode

In incremental plot mode, points are plotted relative to the current active position. Table H-6 lists the ASCII characters to be entered to turn the display beam off and on (changing the active position) and move it in the directions indicated.

☐ **Note** Movement is in TEK point increments; therefore, several characters may have to be entered before the actual pixel on this screen is turned on.

Table H-6 Incremental Plot Mode Controls

ASCII Character	Movement
SP	Beam off/pen up
P	Beam on/pen down
D	North
E	Northeast
A	East
I	Southeast
H	South
J	Southwest
B	West
F	Northwest

Programming Note [4]

Point Plot Mode

In point plot mode single dots are drawn at points specified by the same absolute coordinates as in graph mode (see Table H-3).

Programming Note [5]

Special Point Plot Mode

This mode is the same as point plot mode except that each point address is preceded by an intensity character, and the dot is drawn only if the intensity is 50 percent or more. Table H-7 lists the intensity characters.

Table H-7 Brightness Intensity Percentage

Percent	ASCII	Decimal	Percent	ASCII	Decimal
0	@	64	25	g	103
1	A	65	28	(	40
1	B	66	28	h	104
1	C	67	31	)	41
1	D	68	31	i	105
1	E	69	34	*	42
1	F	70	34	j	106
2	G	71	38	+	43
2	H	72	38	k	107
2	I	73	41	,	44
2	J	74	41	l	108
2	K	75	44	-	45
3	L	76	44	m	109
3	M	77	47	.	46
3	N	78	47	n	110
3	O	79	50	/	47
4	P	80	50	o	111
4	Q	81	56	0	48
4	R	82	56	8	56
5	S	83	56	p	112
5	T	84	56	x	120
5	U	85	62	1	49
6	V	86	62	9	57
6	W	87	62	q	113
7	X	88	62	y	121
8	Y	89	69	2	50
9	Z	90	69	:	58
10	[	91	69	r	114
11	\	92	69	z	122
12	]	93	75	3	51
12	^	94	75	;	59
13	-	95	75	s	115
14	SP	32	75	{	123
14	`	96	81	4	52
16	!	33	81	<	60
16	a	97	81	t	116
17	"	34	81	¦	124
17	b	98	88	5	53

Table H-7 Brightness Intensity Percentage, Continued

Percent	ASCII	Decimal	Percent	ASCII	Decimal
19	#	35	88	=	61
19	c	99	88	u	117
20	$	36	88	}	125
20	d	100	94	6	54
22	%	37	94	>	62
22	e	101	94	v	118
23	%	38	100	7	55
23	f	102	100	?	63
25	'	39	100	w	119

Programming Note [6]

Graphic Input (GIN) Mode

GIN mode is interactive: the terminal responds to computer requests for information. When the terminal enters GIN mode (ESC SUB),

- The bypass condition is set
- Keyboard or mouse input is sent to the computer with intersect address of crosshair cursor in 10-bit addressing format, followed by the GIN terminator if any (as selected in setup mode)

☐ **Note** The Microsoft Mouse is supported. This device sends serial data at 1200 baud with 8 data bits, 1 stop bit, and no parity.

Moving the Crosshair Cursor

In GIN mode the crosshair cursor can be repositioned by the cursor keys or by using a mouse. Once the cursor is at the desired location, pressing any ASCII key or a mouse button sends the key value or button identifier, the crosshair cursor address, and the GIN terminator (if any) to the computer and puts the terminal in alpha mode.

Mouse button identifiers are F0H for the left button and F1H for the right button. The terminal supports a Microsoft Serial Mouse, or equivalent, connected to the auxiliary port.

☐ **Note** When the terminal exits from GIN mode the bypass condition remains active until cleared by a control code.

Programming Note [7]

Terminal Response to ENQ

Alpha mode: Terminal status and address of bottom-left corner of current character

Graph mode:	Terminal status and address of display beam
GIN mode:	Crosshair cursor intersect address

Programming Note [8]

Printers

Printers supported are IBM Pro Printer or printers compatible with IBM graphics protocol.

I Termcap

INTRODUCTION

Termcaps are used by some computer systems to describe terminal capabilities so that one application may be used with many terminals. Unfortunately, there is no standard termcap. Many applications have custom extensions to the basic termcap, some of which are conflicting. For example, the *ct* capability means *clear tab* for one application and *color terminal* for another application. Because of this lack of standardization, terminal manufacturers cannot supply termcaps that will run on all applications. All termcaps must be checked and verified with the documentation supplied by the vendor for each application.

The following termcap is provided as a starting point for application vendors and users to build a termcap for their specific application.

- The termcap applies to a 24-line screen with a status line
- A different keyboard connected to the terminal will send different escape sequences
- In order for the cursor keys to work properly, the terminal may have to be configured for 8 data bits and 2 stop bits

Basic Terminal Without Function Keys

```
wn|wy370-nk|wyse 370 without function keys:\
    :5i:am:hs:mi:ms:xn:xo:bs:pt:\
    :co#80:li#24:\
    :AL=2*\E[%dL:DC=1*\E[%dP:DL=2*\E[%dM:DO=\E[%dB:\
    :IC=1*\E[%d@:LE=\E[%dD:RI=\E[%dC:UP=\E[%dA:ae=^O:\
    :al=2\E[L:as=^N:bt=\E[Z:cd=40\E[J:ce=10\E[K:\
    :ch=\E[%i%d`:cl=40\E[H\E[J:cm=1\E[%i%d;%dH:\
    :cs=\E[%i%d;%dr:ct=\E[3g:cv=\E[%i%dd:dc=1\E[P:\
    :dl=2\E[M:ds=\E[40l:ei=\E[4l:fs=\E[1;24r\E8:ho=\E[H:\
    :i1=4\E[90;1"p\E[?5W:im=\E[4h:ip=1:\
```

```
    :is=\E[2;4;20;30;40l\E[?1;10;16l\E[12h\E[?7;8;25h:ke=\E>:\
    :ks=\E[?1l\E=:nd=\E[C:pf=\E[4i:po=\E[5i:\
    :r1=\E[13l\E[3l\E!p\E[?4i:r2=\E[35h\E[?3l:r3=\E[?5l:rc=\E8:\
    :sc=\E7:se=\E[m:so=\E[7m:sr=2\EM:st=\EH:te=\E[\sR:\
    :ti=\E[\sQ:ts=\E[40h\E7\E[25;%i%dH:ue=\E[m:up=\E[A:\
    :us=\E[4m:ve=\E[34h\E[?25h:vi=\E[?25l:\
    :vs=\E[?25h\E[34l:
```

Function Key Set for the ASCII Keyboard

```
wo|wy370-101k|Wyse 370 with 101 key keyboard:\
    :k1=\E[?4i:k2=\E[?3i:k3=\E[2i:k4=\E[@:k5=\E[M:\
    :k6=\E[17~:k7=\E[18~:k8=\E[19~:k9=\E[20~:kb=\b:\
    :kd=\E[B:kh=\E[H:kl=\E[D:kr=\E[C:ku=\E[A:\
    :tc=wy370-nk:
```

Function Key Set for the 105-Key ANSI Keyboard

```
wp|wy370-105k|Wyse 370 with 105 key keyboard:\
    :k1=\EOP:k2=\EOQ:k3=\EOR:k4=\EOS:k6=\E[17~:k7=\E[18~:\
    :k8=\E[19~:k9=\E[20~:kb=\b:kd=\E[B:kh=\E[26~:kl=\E[D:\
    :kr=\E[C:ku=\E[A:l1=PF1:l2=PF2:l3=PF3:l4=PF4:\
    :tc=wy370-nk:
```

Function Key Set for the Enhanced PC-Style Keyboard

```
wq|wy370-EPC|Wyse 370 with EPC keyboard:\
    :k1=\EOP:k2=\EOQ:k3=\EOR:k4=\EOS:k5=\E[M:k6=\E[17~:k7=\E[18~:\
    :k8=\E[19~:k9=\E[20~:kb=\b:kd=\E[B:kh=\E[H:kl=\E[D:\
    :kr=\E[C:ku=\E[A:\
    :tc=wy370-nk:
```

Default for WY-370 Entry

```
wr|wy370|Wyse 370:\
    :tc=wy370-EPC:
```

Terminal with Visual Bell

```
ws|wy370-vb|Wyse 370 with visible bell:\
    :vb=300\E[30h\E,\E[30l:\
    :tc=wy370:
```

Terminal in 132-Column Mode

```
wt|wy370-w|Wyse 370 in 132-column mode:\
    :co#132:\
    :r2=70\E[35h\E[?3h:\
    :tc=wy370:
```

Terminal in 132-Column Mode with Visual Bell

```
wu|wy370-wvb|Wyse 370 with visible bell 132-columns:\
    :vb=300\E[30h\E,\E[30l:\
    :tc=wy370:
```

Terminal in Reverse Video

```
wv|wy370-rv|Wyse 370 reverse video:\
    :r3=\E[32h\E[?5h:\
    :tc=wy370:
```

J Quick Reference Guide

This appendix lists, in ASCII order, all of the commands presented in Chapters 2 through 10.

Sequence	Description	Mnemonic
CTRL E	Send answerback message	ENQ
CTRL G	Sound bell	BEL
CTRL H	Backspace cursor one column	BS
CTRL I	Tab cursor to next tab stop	HT
CTRL J	Move cursor down one line in current column	LF
CTRL K	Move cursor down one line in current column	VT
CTRL L	Move cursor down one line in current column	FF
CTRL M	Move cursor to start of line	CR
CTRL N	Assign G1 character set to GL	LS1 or SO
CTRL O	Assign G0 character set to GL	LS0 or SI
CTRL Q	Resume transmission (XON)	DC1
CTRL S	Suspend transmission (XOFF)	DC3
CTRL X	Abort current escape sequence	CAN
CTRL Z	Abort current escape sequence	SUB
ESC SPACE 0	Request terminal ID	WYID
ESC SPACE F	Select 7-bit transmission mode	S7CIT
ESC SPACE G	Select 8-bit transmission mode	S8CIT
ESC ! p	Terminal mode reset	WYSTR
ESC # 3	Display top half of double-high, double-wide line	DECDHL
ESC # 4	Display bottom half of double-high, double-wide line	DECDHL

Sequence	Description	Mnemonic
ESC # 5	Display single-high, single-wide line	DECSWL
ESC # 6	Display single-high, double-wide line	DECDWL
ESC # 8	Display screen adjustment pattern	DECALN
ESC # :	Display top half of double-high, single-wide line	WYDHL
ESC # ;	Display bottom half of double-high, single-wide line	WYDHL
ESC ,	Delay terminal processing	WYDELAY
ESC 5	Send cursor character	WYXCH
ESC 7	Save cursor position, attributes, character sets, wrap flag, and origin mode	DECSC
ESC 8	Restore cursor position, attributes, character sets, wrap flag, and origin mode	DECRC
ESC =	Select numeric keypad application mode	DECKPAM
ESC >	Select numeric keypad numeric mode	DECKPNM
ESC D	Move cursor down one line	IND
ESC E	Move cursor down one line and to column 1	NEL
ESC H	Set tab stop at cursor	HTS
ESC M	Move cursor up one line	RI
ESC N	Assign G2 character set to GL for next character only	SS2
ESC O	Assign G3 character set to GL for next character only	SS3
ESC Z	Request primary device attributes	DECID
ESC]	Ignore subsequent data	OSC
ESC ^	Ignore subsequent data	PM
ESC _	Ignore subsequent data	APC
ESC c	Hard terminal reset	RIS
ESC n	Assign G2 character set to GL	LS2
ESC o	Assign G3 character set to GL	LS3
ESC |	Assign G3 character set to GR	LS3R
ESC }	Assign G2 character set to GR	LS2R
ESC ~	Assign G1 character set to GR	LS1R

Sequence	Description	Mnemonic
ESC *fcode scode*	Label character sets	SCS
IND	Move cursor down one line	IND
NEL	Move cursor down one line and to column 1	NEL
HTS	Set tab stop at cursor	HTS
RI	Move cursor up one line	RI
SS2	Assign G2 character set to GL for next character only	SS2
SS3	Assign G3 character set to GL for next character only	SS3
DCS $ q *Ps* ST	Request control function selection or setting	DECRQSS
DCS 0 ! u % 5 ST	Assign Multinational as user-preferred supplemental character set	DECAUPSS
DCS 1 $ p *ds...ds c1 c2* ST	Restore terminal state	DECRSTS
DCS 1 $ s *ds...ds c1 c2* ST	Report terminal state	DECTSR
DCS 1 $ t *ds...ds* ST	Restore cursor information	DECRSPS
DCS 1 $ u *ds...ds* ST	Report cursor information	DECCIR
DCS 1 ! u A ST	Assign ISO Latin-1 as user-preferred supplemental character set	DECAUPSS
DCS 2 $ t *ds...ds* ST	Restore tab stop information	DECRSPS
DCS 2 $ u *ds...ds* ST	Report tab stop information	DECTABSR
DCS *Ps* $ r *ds...ds Ps1* ST	Report control function selection or setting	DECRPSS
DCS *Ps* ; *Ps1* ; *Ps2* | kc/hc ST	Program user-defined keys	WYUDK (DECUDK)
DCS 0 ; *Ps* ; *Pn* } *ds...ds* ST	Load softfont	WYLSFNT
DCS *Ps* ; *Ps1* ; *Ps2* ; *Ps3* ; *Ps4* ; *Ps5* ; *Ps6* ; *Ps7* { *name Sxbp* ; ... ; *Sxbp* ST	Load softfont	DECDLD

Sequence	Description	Mnemonic
CSI ! p	Soft terminal reset	DECSTR
CSI 0 " q	Define erasable character	DECSCA
CSI 0 $ }	Send data to screen's data area	DECSASD
CSI 0 $ ~	Turn off top and bottom status line display	DECSSDT
CSI 0 J	Erase from cursor to end of display	ED
CSI 0 K	Erase from cursor to end of line	EL
CSI 0 W	Set tab stop at cursor	CTC
CSI 0 c	Request primary device attributes	DA
CSI 0 g	Clear tab stop at cursor	TBC
CSI 0 i	Print page	MC
CSI 0 t	Activate left or upper window	WYSWDW
CSI 0 v	Select full screen (for single session)	WYSSPLT
CSI 0 ; *Pn* y	Move horizontal split up *n* lines, or vertical split left *n* columns	WYMSPLM
CSI 0 z	Set 4 lps smooth scrolling speed	WYSCRATE
CSI 0 ¦	No form feed sent after send operation	DECTTC
CSI 1 " q	Define nonerasable character	DECSCA
CSI 1 $ u	Request terminal state	DECRQTSR
CSI 1 $ w	Request cursor information	DECRQPSR
CSI 1 $ }	Send data to bottom (host-writable) status line	DECSASD
CSI 1 $ ~	Display local (top) status line	DECSSDT
CSI 1 J	Erase from start of display to cursor	ED
CSI 1 K	Erase from start of line to cursor	EL
CSI 1 t	Activate left or upper window	WYSWDW
CSI 1 v	Split screen horizontally between two pages (single session)	WYSSPLT
CSI 1 z	Set 1 lps smooth scrolling speed	WYSCRATE
CSI 1 ; *Pn* y	Move horizontal split down *n* lines, or vertical split right *n* columns	WYMSPLM
CSI 1 ¦	Send form feed after send operation	DECTTC

Sequence	Description	Mnemonic
CSI 2 " q	Define erasable character	DECSCA
CSI 2 $ w	Request tab stop information	DECRQPSR
CSI 2 $ ~	Display top and bottom status line	DECSSDT
CSI 2 J	Erase entire display	ED
CSI 2 K	Erase entire line	EL
CSI 2 W	Clear tab stop at cursor	CTC
CSI 2 h	Lock keyboard	KAM
CSI 2 i	Send page	MC
CSI 2 l	Unlock keyboard	KAM
CSI 2 t	Activate right or lower window	WYSWDW
CSI 2 v	Split screen vertically between pages (single session)	WYSSPLT
CSI 2 z	Set 2 lps smooth scrolling speed	WYSCRATE
CSI 3 g	Clear all tab stops	TBC
CSI 3 h	Controls mode on	CRM
CSI 3 l	Controls mode off	CRM
CSI 3 z	Set 4 lps smooth scrolling speed	WYSCRATE
CSI 4 h	Insert mode on	IRM
CSI 4 i	Controller print mode off	MC
CSI 4 l	Insert mode off	IRM
CSI 4 z	Set 8 lps smooth scrolling speed	WYSCRATE
CSI 5 W	Clear all tab stops	CTC
CSI 5 i	Controller print mode on	MC
CSI 5 ; 1 i	Send host data to Aux port	MC
CSI 5 n	Request terminal status	DSR
CSI 6 i	PR receive mode off	MC
CSI 6 n	Request cursor position	DSR
CSI 7 i	PR receive mode on	MC
CSI 8 v	Split screen vertically between two pages (single session)	WYSSPLT

Sequence	Description	Mnemonic
CSI 12 h	Disable local echo	SRM
CSI 12 l	Enable local echo	SRM
CSI 13 h	Control execution off (display control codes)	FEAM
CSI 13 l	Execute control codes	FEAM
CSI 16 h	Send through cursor position	TTM
CSI 16 l	Send through end of line or end of screen	TTM
CSI 20 h	When LF, FF, or VT is received, cursor moves to first column of next line; return key sends CRLF	LNM
CSI 20 l	When LF, FF, or VT is received, cursor moves to current column of next line; return key sends CR	LNM
CSI 30 h	Turn display off	WYDSCM
CSI 30 l	Turn display on	WYDSCM
CSI 31 h	Display status line	WYSTLINM
CSI 31 l	Turn off status line display	WYSTLINM
CSI 32 h	Screen saver on	WYCRTSAVM
CSI 32 l	Screen saver off	WYCRTSAVM
CSI 33 h	Cursor steady	WYSTCURM
CSI 33 l	Cursor blinking	WYSTCURM
CSI 34 h	Underline cursor on	WYULCURM
CSI 34 l	Block cursor on	WYULCURM
CSI 35 h	Width change clear off	WYCLRM
CSI 35 l	Width change clear on	WYCLRM
CSI 36 h	Set delete key to BS/DEL	WYDELKM
CSI 36 l	Set delete key to DEL/CAN	WYDELKM
CSI 37 h	Send all characters	WYGATM
CSI 37 l	Send erasable characters only	WHGATM
CSI 38 h	Send full page	WYTEXM
CSI 38 l	Send scrolling region	WYTEXM
CSI 40 h	Extra data line	WYEXTDM

Sequence	Description	Mnemonic
CSI 40 l	Extra data line	WYEXTDM
CSI 42 h	Select Wyse 350 personality	WYASCII
CSI 48 ; *Ps* w	Select foreground color palette	WYCOLOR
CSI 49 ; *Ps* w	Select background color	WYCOLOR
CSI 50 w	Restore foreground and background colors to last saved in NVR	WYCOLOR
CSI 51 ; *Ps* w	Select border color	WYCOLOR
CSI 52 ; *Ps* w	Select cursor color	WYCOLOR
CSI 53 ; *Pn* w	Select overstrike position	WYSOVR
CSI 54 ; *Ps* ; *Ps1* ; *Ps2* w	Select user status line attributes/colors	WYCOLOR
CSI 55 ; *Ps* ; *Ps1* ; *Ps2* w	Select system status line attributes/colors	WYCOLOR
CSI 56 ; *Ps* ; *Ps1* ; *Ps2* ; *Ps3* w	Select replacement character attributes/colors	WYCOLOR
CSI 57 ; *Ps* ; *Ps1* ; *Ps2* w	Select nonerasable character attributes/colors	WYCOLOR
CSI 58 ; *Ps* ; *Ps1* ; *Ps2* ; *Ps3* ; *Ps4* w	Set date and time	WYDTSET
CSI 59 ; *Ps* ; *Ps1* ; *Ps2* ; *Ps3* w	Define page for session	WYDFPG
CSI 60 w	Return color index values to default	WYIND
CSI 61 " p	Select VT100 personality	DECSCL
CSI 61 ; *Ps* w	Change current character foreground color	WYIND
CSI 62 ; 1 " p	Select VT220 7-bit personality	DECSCL
CSI 62 ; 2 " p	Select VT220 8-bit personality	DECSCL
CSI 62 ; *Ps* w	Change current character background color	WYIND
CSI 63 ; 1 " p	Select VT320 7-bit personality	DECSCL
CSI 63 ; 2 " p	Select VT320 8-bit personality	DECSCL
CSI 63 ; *Ps* w	Turn color index mode on/off	WYIND
CSI 64 ; *Ps* w	Change current nonerasable character foreground color	WYIND

Sequence	Description	Mnemonic
CSI 65 ; *Ps* w	Change current nonerasable character background color	WYIND
CSI 66 ; *Ps* ; *Ps1* w	Redefine color index value	WYIND
CSI 90 ; 0 " p	Select native (8-bit) personality	DECSCL
CSI 90 ; 1 " p	Select native (7-bit) personality	DECSCL
CSI 91 " p	Select Intecolor 220 personality	DECSCL
CSI 93 " p	Select ADDS A2 personality	DECSCL
CSI > 0 c	Request secondary device attributes	DA
CSI ? 0 J	Erase erasable characters from cursor to end of display	DECSED
CSI ? 0 K	Erase erasable characters from cursor to end of line	DECSEL
CSI ? 1 J	Erase erasable characters from start of display to cursor	DECSED
CSI ? 1 K	Erase erasable characters from start of line to cursor	DECSEL
CSI ? 1 h	Cursor keys send application-dependent codes	DECCKM
CSI ? 1 i	Print line	MC
CSI ? 1 l	Cursor keys send cursor movement codes	DECCKM
CSI ? 2 J	Erase erasable characters in entire display	DECSED
CSI ? 2 K	Erase erasable characters in entire line	DECSEL
CSI ? 2 l	Select VT52 personality	DECANM
CSI ? 3 h	132-column display	DECCOLM
CSI ? 3 i	Send line	MC
CSI ? 3 l	80-column display	DECCOLM
CSI ? 4 h	Smooth scrolling on	DECSCLM
CSI ? 4 i	Autoprint mode off	MC
CSI ? 4 l	Jump scrolling on	DECSCLM
CSI ? 5 W	Set tab stop every 8th column	CTC
CSI ? 5 h	Reverse screen	DECSCNM
CSI ? 5 i	Autoprint mode on	MC
CSI ? 5 l	Normal screen	DECSCNM

Sequence	Description	Mnemonic
CSI ? 6 h	Line 1 is top line of scrolling region	DECOM
CSI ? 6 l	Line 1 is top line of data area	DECOM
CSI ? 7 h	Autowrap on	DECAWM
CSI ? 7 l	Autowrap off	DECAWM
CSI ? 8 h	Key autorepeat on	DECARM
CSI ? 8 l	Key autorepeat off	DECARM
CSI ? 10 h	Block mode on	DECEDM
CSI ? 10 l	Block mode off	DECEDM
CSI ? 15 n	Request printer status	DSR
CSI ? 18 h	Send form feed after print operation	DECPFF
CSI ? 18 l	No form feed sent after print operation	DECPFF
CSI ? 19 h	Print full page	DECPEX
CSI ? 19 l	Print scrolling region	DECPEX
CSI ? 25 h	Display cursor	DECTCEM
CSI ? 25 l	Cursor invisible	DECTCEM
CSI ? 25 n	Request function key definition lock	DSR
CSI ? 26 n	Request keyboard language	DSR
CSI ? 38 h	Select TEK 4010/4014 personality	WYTEK
CSI ? 42 h	National replacement character set mode on	DECNRCM
CSI ? 42 l	National replacement character set mode off	DECNRCM
CSI ? 60 h	Display pans horizontally to keep cursor in view	DECHCCM
CSI ? 60 l	Cursor disappears when moved past right or left margin	DECHCCM
CSI ? 61 h	Display pans vertically to keep cursor in view	DECVCCM
CSI ? 61 l	Cursor disappears when moves past top or bottom line	DECVCCM
CSI ? 64 h	New page is displayed to keep cursor in view	DECPCCM
CSI ? 64 l	Cursor disappears when moved to new page	DECPCCM
CSI ? 66 h	Numeric keypad application mode on	DECNKM

Sequence	Description	Mnemonic
CSI ? 66 l	Numeric keypad numeric mode on	DECNKM
CSI ? 67 h	Set delete key to BS/DEL	DECBKM
CSI ? 67 l	Set delete key to DEL/CAN	DECBKM
CSI ? 68 h	Keys send data processing values	DECKBUM
CSI ? 68 l	Keys send typewriter values	DECKBUM
CSI ? 80 h	161-column display	WY161
CSI ? 80 l	80-column display	WY161
CSI ? 83 h	52-line display	WY52
CSI ? 83 l	24-line display	WY52
CSI ? 84 h	Enable separate assignment of attributes (SGR) to erasable and nonerasable characters	WYENAT
CSI ? 84 l	Enable attribute assignment (SGR) to extend to both erasable and nonerasable characters	WYENAT
CSI ? 85 h	Set replacement character to current character background color	WYREPL
CSI ? 85 l	Set replacement character to color map background color	WYREPL
CSI ? *Ps* $ p	Request functional mode status	DECRQM
CSI ? *Ps* ; *Psl* $ y	Report functional mode status	DECRPM
CSI s	Save cursor position, attributes, character sets, wrap flag, and origin mode	WYSC
CSI u	Restore last saved cursor position, attributes, character sets, wrap flag, and origin mode	WYRC
CSI *Pn* ; 0 SP P	Address cursor to same line and column on specified page	PPA
CSI *Pn* ; 1 SP P	Address cursor to position last occupied on specified page	WYPPA
CSI *Pn* ; 0 SP Q	Address cursor to same line and column position on a following page	PPR
CSI *Pn* ; 1 SP Q	Address cursor to position last occupied on a following page	WYPPR

Sequence	Description	Mnemonic
CSI *Pn* ; 0 SP R	Address cursor to same line and column position on a preceding page	PPB
CSI *Pn* ; 1 SP R	Address cursor to position last occupied on a preceding page	WYPPB
CSI *Pn* @	Insert *n* blank characters beginning at cursor	ICH
CSI *Pn* A	Move cursor up *n* lines	CUU
CSI *Pn* B	Move cursor down *n* lines	CUD
CSI *Pn* C	Move cursor right *n* columns	CUF
CSI *Pn* D	Move cursor left *n* columns	CUB
CSI *Pn* E	Move cursor down *n* lines and to column 1	CNL
CSI *Pn* F	Move cursor up *n* lines and to column 1	CPL
CSI *Pn* G	Move cursor to column *n*	CHA
CSI *Pn* ; *Pn* H	Move cursor to line *n*, column *n*	CUP
CSI *Pn* I	Move forward *n* tab stops	CHT
CSI *Pn* L	Insert *n* blank lines beginning at cursor line	IL
CSI *Pn* M	Delete *n* lines beginning at cursor line	DL
CSI *Pn* P	Delete *n* characters beginning at cursor	DCH
CSI *Pn* S	Move window down *n* lines in page	SU
CSI *Pn* T	Move window up *n* lines in page	SD
CSI *Pn* V	Display preceding page and home cursor	PP
CSI *Pn* X	Erase *n* characters beginning at cursor	ECH
CSI *Pn* Z	Move backward *n* tab stops	CBT
CSI *Pn* U	Display a following page and home cursor	NP
CSI *Pn* V	Display a preceding page and home cursor	PP
CSI *Pn* `	Move cursor to column *n*	HPA
CSI *Pn* a	Move cursor right *n* columns	HPR
CSI *Pn* d	Move cursor to line *n*	VPA
CSI *Pn* e	Move cursor down *n* lines	VPR
CSI *Pn* ; *Pn1* f	Move cursor to line *n*, column *n*	HVP

Sequence	Description	Mnemonic
CSI *Pn* ; *Pn1* r	Define scrolling region	DECSTBM
CSI *Ps* ; *Pn* ; *Pn1* p	Draw a box	WYDRBX
CSI *Ps* $ p	Request functional mode status	DECRQM
CSI *Ps* ; *Ps1* $ y	Report functional mode status	DECRPM
CSI *Ps* ;...; *Ps* m	Define character attributes	SGR
CSI *Ps* ; *Pn* ; *Pn1* o	Clear a box	WYCLBX
CSI *Ps* ; *Ps1* ; *Ps2* ; *Ps3* w	Redefine character display attribute association	WYCAA
CIS *Ps* ; *Ps1* ; *Ps2* x	Set current character attributes/color	WYCDIR
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PM		PM
APC		APC

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881133-02 Rev. A
June 1990
Printed in U.S.A.

Wyse Technology Inc.
3471 North First Street
San Jose, CA 95134

WYSE