WY-60 Programmer's Guide

WYSE

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1 Introduction

Terminal Features

This terminal is a full-function ASCII and ANSI terminal with advanced display, communications, and keyboard features:

- Seventeen ASCII-based operating modes
- Three ANSI-based operating modes
- 26/44-line by 80/132-column display
- Up to seven pages of display memory
- Hidden or nonhidden, character/line/page-based display attributes, and double-high, double-wide line attributes
- Eight predefined character sets and 512 user-definable characters
- Multiple keyboard options, U.S. and international, all with programmable function and editing keys

What You'll Find In This Guide

This guide supplements the *User's Guide*, which contains the basic information necessary to set up and operate the terminal. Here you'll find more detailed information on how to take advantage of the terminal's programmable features in your computer programs.

Table 1-1 lists the sections of the manual that describe the commands recognized by the terminal; the remaining appendixes contain reference tables. The command descriptions assume familiarity with terminal programming concepts.

Table 1-1 Summary of Command Descriptions

Section	Descriptions
Chapters 2-7	Commands supported by the terminal in the native mode.[1]
Appendix D	Native mode commands from Chapters 2-7 listed in ASCII order.
Appendix F	Supplementary information on commands supported by the terminal in nonnative ASCII personalities.[2] (Supplements Table D-2 in *User's Guide*.)
Appendix G	Commands and key codes supported by the terminal in the ANSI personalities.

1. The term "native mode" refers to the terminal's normal operating mode.
2. The term "personality" refers to operating modes characteristic of one or more other terminals.

Entering Commands

The terminal responds to control codes and escape sequences received from the keyboard or from the computer.

- To send an escape sequence from the computer, preface it with the ASCII ESC character.
- To enter an escape sequence from the keyboard, press and release the ESC key before you press the next key(s) in the sequence. (The terminal must be in block mode to execute escape sequences entered from the keyboard.)
- Enter a control code by holding down the CTRL key together with another key.

☐ **Note** When you enter commands that change the terminal's operating parameters, the changes aren't stored in nonvolatile memory unless you save them in setup mode.

■ **Caution** Execute only documented commands. Invalid commands may cause unpredictable results, including loss of data.

Conventions and Syntax Notation

Please note the following conventions.

Control Codes and Escape Sequences

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 italicized letters. 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 either immediately after the command or in reference tables.

Key Functions

Key functions are described in the text as follows:

- The key name on the WY-60 ASCII keyboard is listed in the text, followed in parentheses by the key names on the other keyboards if they are different. For example,

  [SETUP] ([RESET], [SYS REQ], [SELECT])

  identifies the SETUP key on the WY-60 ASCII keyboard, the RESET key on the 316X-style keyboard, the SYS REQ key on the AT-style keyboard, and the SELECT key on the Enhanced PC-style keyboard.

- When a key name in the text refers to one of two names on a key on the keyboard, the action of other keys may be implied. For example, reference to [PRINT] on the WY-60 ASCII keyboard indicates that [SHIFT] is also pressed; [SEND] would mean the same key by itself (unshifted). Similarly, reference to [BREAK] on the 316X-style keyboard indicates that [CTRL] is also pressed, since "BREAK" appears on the front face of the key.

2 Communicating With The Computer

Selecting A Personality

■ **Caution** The terminal may clear the display memory when executing this command.

Select terminal personality **ESC - *mode***

where *mode* is the operating mode characteristic of the terminals listed.

mode	**Personality**	**Terminals**
"	WY50+	Wyse WY-50, WY-50+, WY-100
#	TVI 910+	TeleVideo 910/910+
$	TVI 925	TeleVideo 925
%	ADDS VP A2	ADDS Viewpoint A2
&	HZ 1500	Hazeltine 1500
'	TVI 912/920	TeleVideo 912, 920
(	TVI 950	TeleVideo 950
)	DG200	Data General DASHER D100/D200
*	IBM 3101-1X	IBM 3101, Model 1X
+	ADM 31	Lear Siegler ADM 3A, ADM 5, ADM 31
,	TVI 955	TeleVideo 955
-	WY 75	Wyse WY-75
4	WY-60	Native mode
5	PC Term	PC/AT/XT type
6	VT 52	Digital Equipment VT52
7	IBM 3101-2X	IBM 3101, Model 2X
8	ADDS VP-60	ADDS Viewpoint 60
9	IBM 3161	IBM 3161
:	DG 210	Data General DASHER D210
;	VT 100	Digital Equipment VT100

Enhance Mode

Turn enhance mode off — **ESC - SPACE**
Turn enhance mode on (default) — **ESC - !**

In enhance mode, the terminal supports additional features in some nonnative personalities (see Table D-2 in the *User's Guide*).

Monitor Mode

Turn monitor mode on — **ESC U**
Turn monitor mode off (default) — **ESC u** or **ESC X**

When monitor mode is on, the terminal displays symbolic representations of received codes but does not execute the codes.

The symbols displayed depend on the terminal's current personality and active character set (see WyseWorks ASCII Table). Table D-1 in Appendix D lists the symbols displayed in the native mode.

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**

The only key codes automatically transmitted to the computer in block mode are those generated by the BREAK key, the FUNCT key, and the function keys when their direction is *remote*.

Turn ACK mode off — **ESC e 6**
Turn ACK mode on (default) — **ESC e 7**

When ACK mode is on, the terminal sends the ASCII ACK character to the computer when it receives a CTRL E, or after executing

- Commands that change a port's operating parameters
- Page print commands
- Font load or clear commands

Configuring The Ports

Select MODEM port for data communications, AUX port as printer port — **ESC e 8**
Select AUX port for data communications, MODEM port as printer port — **ESC e 9**

The different baud rates available for each port still apply after the port's function is changed.

Set MODEM port operating parameters **ESC c 0** *baud stop parity word*

Set AUX port operating parameters **ESC c 1** *baud stop parity word*

where *baud* is the baud rate.

stop is the number of stop bits.

parity is the parity bit.

word is the number of bits in a data word.

MODEM Port		AUX Port	
baud	**Baud Rate**	*baud*	**Baud Rate**
0	38400	0	19200
1	19200	1	9600 (default)
2	9600 (default)	2	7200
3	4800	3	4800
4	2400	4	3600
5	2000	5	2400
6	1800	6	2000
7	1200	7	1800
8	600	8	1200
9	300	9	600
:	150	:	300
;	134.5	;	150
<	110	<	134.5
=	75	=	110
>	50		

stop	**Stop Bits**
0	1 (default)
1	2

parity	**Parity Bit**	*word*	**Data Word**
0	None (default)	0	7 bits
1	Odd	1	8 bits (default)
2	Mark		
3	Even		

☐ **Note** Unless ACK mode is off, the terminal sends an ACK character to the computer after executing a change in operating parameters. No data should be sent to the terminal until the ACK is received. The ACK and all subsequent data are sent in the new data format.

Set MODEM port receive handshaking protocol **ESC c 2** *hndshk*
Set AUX port receive handshaking protocol **ESC c 3** *hndshk*
Set MODEM port transmit handshaking protocol **ESC c 4** *hndshk*
Set AUX port transmit handshaking protocol **ESC c 5** *hndshk*

hndshk	Handshaking Protocol Receive	Transmit
0	None (default)	None (default)
1	X-on/X-off	X-on/X-off
2	DTR (MODEM port)* DSR (AUX port)	
3	Both	

* DTR transmit handshaking is always active on the AUX port.

Set maximum data transmission speed **ESC c 6 *max***

max	Maximum Speed
1	60 characters per second
2	None (default)
3	150 characters per second

☐ **Note** A separate command sets the transmission speed of the key definitions (see "Redefining the Keys" in Chapter 3).

Sending A Break

Pressing sends a break signal through the MODEM port. The effect of this will depend on how your computer interprets this condition.

☐ **Note** You can't send a break through the AUX port even if it's configured as the data port.

Identifying The Terminal

Send terminal ID **ESC SPACE**

The terminal returns to the computer the three-byte sequence

6 0 CR

Program answerback message **ESC c ; *answer* CTRL Y**
Conceal answerback message **ESC c =**

where *answer* is a string of up to 20 characters.

CTRL Y is the delimiter that terminates the sequence.

The answerback message is displayed in setup mode unless you send the command to conceal it. Once concealed, the message can't be displayed again unless you reprogram it.

You can save the answerback message in nonvolatile memory only in setup mode; it shares approximately 350 bytes of nonvolatile memory with key redefinitions and function key labels.

Send answerback message **ESC c <**

The terminal responds to this command by returning the answerback message to the computer, followed by the ASCII ACK character. If no message has been defined, only the ACK is sent.

Turn answerback mode off **ESC e SPACE**
Turn answerback mode on **ESC e !**

When the terminal receives an ENQ character (CTRL E), it returns an ACK character when answerback mode is off; when answerback mode is on, it sends the answerback message followed by an ACK character.

Loading The Time

Load time of day **ESC c 8 *hh mm***

where *hh* is a two-digit decimal number between 00 and 23 identifying the hour.

mm is a two-digit decimal number between 00 and 59 identifying the minutes.

This sequence loads the time of day into the terminal's memory. The format requires a 24-hour (military) clock, beginning with midnight (*hh* = 00). However, the terminal displays the time in a 12-hour format with a.m. and p.m. indicators. When the terminal is turned on, the time defaults to 08:00.

☐ **Note** The time is accurate within about five seconds per day. If the terminal is left on continuously, the clock may gain or lose up to a minute every two weeks.

3 Controlling Keyboard Functions

Editing Modes

Turn local edit mode on, duplex edit mode off **ESC k**
Turn duplex edit mode on, local edit mode off (default) **ESC l**

When the terminal is in local edit mode, editing key codes are sent only to the terminal regardless of the terminal's communication mode. (Refer to Table 3-3 for a list of the editing keys.)

Wyseword Mode

Turn Wyseword mode off (default) **ESC - .**
Turn Wyseword mode on **ESC - /**

When Wyseword mode is on, designated keys send WordStar-compatible codes (listed in the *User's Guide*). These codes take precedence over any other key codes except application key codes.

Application Key Mode

Turn application key mode off (default) **ESC - 2**
Turn application key mode on **ESC - 3**

When application key mode is on, certain keys on the WY-60 ASCII keyboard send 8-bit codes (Table 3-1) that override

existing codes, including key redefinitions and Wyseword codes. An application program incorporating these unique codes can readily interpret what key has been pressed, regardless of user reprogramming.

Table 3-1 Key Codes in Application Key Mode*

Key	Hex Value Unshifted	Shifted	Key	Hex Value Unshifted	Shifted
Editing Keys					
▲	D3	D8	DEL CHAR/	DD	F3
▼	D2	D7	LINE		
▶	D1	D6	ENTER	BA	BA
◀	DO	D5	HOME	D4	D9
CLR LINE/	DE	F4	INS CHAR/	DC	F2
SCRN			LINE		
			REPL/INS	DF	F5
Function Keys					
CTRL F1	80	90	CTRL F9	88	98
CTRL F2	81	91	CTRL F10	89	99
CTRL F3	82	92	CTRL F11	8A	9A
CTRL F4	83	93	CTRL F12	8B	9B
CTRL F5	84	94	CTRL F13	8C	9C
CTRL F6	85	95	CTRL F14	8D	9D
CTRL F7	86	96	CTRL F15	8E	9E
CTRL F8	87	97	CTRL F16	8F	9F
Numeric Keypad Keys					
0	B0	B0	7	B7	B7
1	B1	B1	8	B8	B8
2	B2	B2	9	B9	B9
3	B3	B3	,	CC	CC
4	B4	B4	-	CD	CD
5	B5	B5	.	CE	CE
6	B6	B6			

* WY-60 ASCII keyboard only. The terminal and the computer must be in 8-bit data configuration.

Terminal and Keyboard Controls

Sounding the Bell	Sound bell	CTRL G
Controlling the Margin Bell	Set margin bell at cursor position	ESC ' J
	Turn margin bell off	ESC e L
	Turn margin bell on	ESC e M

These commands set the margin bell at the current cursor column and control whether or not the bell sounds when the cursor reaches the column setting. (Default settings are column 72 in 80-column mode and column 124 in 132-column mode.)

Locking the Keyboard

Lock keyboard	**CTRL O or ESC #**
Unlock keyboard	**CTRL N or ESC "**

When the keyboard is locked, all keys are ignored except [BREAK], [SETUP] ([SYS REQ], [SELECT]), [FUNCT] ([HOLD], [SCROLL LOCK]), and the function keys.

Miscellaneous Setup-Related Keyboard Commands

Turn keyclick off	**ESC e $**
Turn keyclick on (default)	**ESC e %**
Turn CAPS LOCK on	**ESC e &**
Turn CAPS LOCK off (default)	**ESC e '**
Turn key repeat off	**ESC e ,**
Turn key repeat on (default)	**ESC e -**
Define CAPS LOCK key as CAPS LOCK (default)	**ESC e T**
Define CAPS LOCK key as REV	**ESC e U**

Redefining The Keys

You can redefine the function keys and editing keys from the computer 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 programmable editing key and redefines its direction.

Key definitions share approximately 350 bytes of nonvolatile memory with the function key labels and answerback message. The definitions can be saved in nonvolatile memory by putting the terminal in setup mode and exiting with the SAVE ALL 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.

Programming a Key

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 value from Table 3-2.

key is a value from Table 3-3.

sequence is up to 64 bytes to be loaded in the key.

dir is the key's direction.

dir	Direction
0	Normal
1	Remote (default)
2	Local

Table 3-2 Function Key Values

Function Key	*fkey* Unshifted	*fkey* Shifted	Function Key	*fkey* Unshifted	*fkey* Shifted
F1	@	`	F9	H	h
F2	A	a	F10	I	i
F3	B	b	F11	J	j
F4	C	c	F12	K	k
F5	D	d	F13	L	l
F6	E	e	F14	M	m
F7	F	f	F15	N	n
F8	G	g	F16	O	o

Table 3-3 Editing Key Values[1]

Keyboard Style WY-60 ASCII	IBM 316X	AT	Enhanced PC	*key* value
ESC	ESC	ESC	ESC	SPACE
SHIFT ESC	SHIFT ESC	SHIFT ESC	SHIFT ESC	%
TAB	TAB →	TAB →	TAB →	!
SHIFT TAB	SHIFT TAB →	SHIFT TAB →	SHIFT TAB →	&
BACKSPACE	←BACKSPACE	←(BACKSPACE)	←BACKSPACE	"
SHIFT BACKSPACE	SHIFT ←BACKSPACE	SHIFT ←(BACKSPACE)	SHIFT ←BACKSPACE	'
DEL		DEL		#
SHIFT DEL		SHIFT DEL		(
RETURN	RETURN		ENTER	$
SHIFT RETURN	SHIFT RETURN		SHIFT ENTER	)
HOME	HOME	HOME	HOME	*
SHIFT HOME	SHIFT HOME	SHIFT HOME	SHIFT HOME	/
▲	↑	↑	↑	+

1. A blank in any column indicates that the value is unrecognized on that keyboard and the command is ignored.

Table 3-3 Editing Key Values,[1] Continued

Keyboard Style WY-60 ASCII	IBM 316X	AT	Enhanced PC	*key* value
SHIFT ▲	SHIFT ↑	SHIFT ↑	SHIFT ↑	0
▼	↓	↓	↓	,
SHIFT ▼	SHIFT ↓	SHIFT ↓	SHIFT ↓	1
◀	←	←	←	-
SHIFT ◀	SHIFT ←	SHIFT ←	SHIFT ←	2
▶	→	→	→	.
SHIFT ▶	SHIFT →	SHIFT →	SHIFT →	3
ENTER	ENTER	ENTER	ENTER[2]	s
SHIFT ENTER	SHIFT ENTER	SHIFT ENTER	SHIFT ENTER[2]	4
INS CHAR	INSERT	INS	INSERT	q
INS LINE	SHIFT INSERT	SHIFT INS	SHIFT INSERT	p
NEXT PAGE	PAGE	PG DN	PAGE DOWN	r
PREV PAGE	SHIFT PAGE	SHIFT PG DN	SHIFT PAGE DOWN	w
SEND	SEND			u
PRINT	SHIFT SEND			t
CLR LINE	CLEAR			}
CLR SCRN	SHIFT CLEAR			z
DEL CHAR	DELETE		DELETE	5
DEL LINE	SHIFT DELETE		SHIFT DELETE	6
REPL				7
INS				8
	ERASE EOF			Q
	SHIFT ERASE EOF			W
	JUMP			v
	SHIFT JUMP			x
	PRINT	PRT SC	PRINT SCREEN	R
	SHIFT PRINT	SHIFT PRT SC	SHIFT PRINT SCREEN	X
	SEND LINE			S
	SHIFT SEND LINE			Y
	PRINT LINE			T
	SHIFT PRINT LINE			Z
	←TAB			P
	SHIFT ←TAB			V
		END	END	
		+[2]		^
		SHIFT END	SHIFT END	]

2. Key is located on the numeric keypad.

Table 3-3 Editing Key Values,[1] Continued

Keyboard Style WY-60 ASCII	IBM 316X	AT	Enhanced PC	*key* value
		SHIFT +[2]		_
		–[2]		|
		SHIFT –[2]		y
		PG UP	PAGE UP	:
		SHIFT PG UP	SHIFT PAGE UP	;
		5[2]		<
		SHIFT 5[2]		=

Reading Key Direction and Definition

Read key direction and definition **ESC Z ~ *key***

The terminal shows the key's definition and direction in the format

dir fkey/key sequence DEL

(Refer to *dir* values and to Tables 3–2 and 3–3 for *fkey* and *key* values.) If the key has not been redefined, the terminal sends

dir key DEL

Setting Function Key Transmission Speed

Set maximum function key transmission speed **ESC c 7 *max***

max	Maximum Speed
1	60 characters per second
2	None (default)
3	150 characters per second

This sequence applies to any key that has been redefined. If the key hasn't been redefined, the rate of transmission is determined by the speed of transmission for the the data port.

Clearing Key Definitions

Clear key definition **ESC z *fkey* DEL or ESC z *key* DEL**

Clear all programmable key definitions **ESC c U**

where *fkey* is a value from Table 3–2.

key is a value from Table 3–3.

These commands return a specific key or all programmable keys to their default values.

4 Controlling The Screen Display

Controlling General Display Features

General display features include the appearance of the screen and the configuration of the three screen areas: the status line, the label line, and the data area.

Controlling Display Visibility

Turn screen display off	**ESC ' 8**
Turn screen display on (default)	**ESC ' 9**
Turn screen saver off	**ESC e P**
Turn screen saver on (default)	**ESC e Q**

Reversing the Screen

Reverse screen	**ESC ^ 1**
Restore normal screen	**ESC ^ 0**

Controlling Scrolling Speed and Type

Set scrolling speed and type — **ESC ' *scroll***

scroll	Scrolling Type	Speed (Lines per Second)
@	Jump scroll (default)	
<	Smooth scroll	1
=	Smooth scroll	2
>	Smooth scroll	4
?	Smooth scroll	8

If you choose smooth scrolling, select some type of receive handshaking for the data port.

Displaying the Cursor

Set cursor display features — **ESC ' *cursor***

cursor	Cursor Display
0	Off
1	On (default)
2	Steady block (default)
5	Blinking block
4	Steady line
3	Blinking line

Displaying the Status Line

Turn on extended status line	**ESC ' a**
Turn on standard status line (default)	**ESC ' b**
Turn off status line display	**ESC ' c**

The standard status line displays the time according to the terminal's clock (default 8:00 a.m.) and cursor line and column indicators. The extended status line displays editing status messages (see Appendix B). Computer messages can be displayed on either the standard or extended status line.

Programming a Status Line Message

Program and display computer message on status line — **ESC F *message* CR**

where *message* is a string of up to 46 characters for an 80-column screen or 98 characters for a 132-column screen.

Programming a Label Line Message

Program and display computer message on unshifted label line	**ESC z (*text* CR**
Program computer message on shifted label line	**ESC z) *text* CR**
Display shifted label line	**ESC z P 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 78 characters for an 80-column screen or 130 characters for a 132-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 the SHIFT key is pressed.

☐ **Note** You can prevent the display of the unshifted label line by assigning the invisible 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* is a field code from Table 4-1. You can label up to

8 fields (shiftable to 16) on an 80-column screen

16 fields (shiftable to 32) on a 132-column screen

and *label* is a character string of up to

9 characters for an 80-column screen

7 characters for a 132-column screen

Table 4-1 Function Key Field Codes

Key	Field Code Unshifted	Shifted	Key	Field Code Unshifted	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	?	_

Saving Function Key Labels

Don't save function key labels **ESC e J**
Save function key labels **ESC e K**

These commands determine whether or not function key labels are saved in nonvolatile memory, where they share approximately 350 bytes of memory with key definitions and the answerback message.

Defining the Data Area

You can change the line and column display either in setup mode or from the computer.

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 delay of 150 ms before sending data to the terminal.

Unless width-change-clear mode is on, the screen isn't cleared when the terminal executes these commands. The commands are ignored when economy 80-column mode is on.

Width-Change-Clear Mode

Turn width-change-clear mode off (default) **ESC e .**
Turn width-change-clear mode on **ESC e /**

When width-change-clear mode is on, the terminal clears the screen when executing a command to change the number of columns.

☐ **Note** When entering or leaving economy 80-column mode, the terminal clears the screen regardless of the status of width-change-clear mode.

Economy 80-Column Mode

Turn off economy 80-column mode (default) **ESC e F**
Turn on economy 80-column mode **ESC e G**

■ **Caution** When executing these commands, the terminal clears the entire display memory, including the status line.

Economy 80-column mode makes additional pages of display memory available (see "Working in Display Memory," Table 4-2).

This mode must be off if you want to select the standard 80-column or the 132-column display.

Changing the Number of Data Lines

Display 24 data lines (default)	**ESC e (**
Display 25 data lines	**ESC e)**
Display 42 data lines	**ESC e ***
Display 43 data lines	**ESC e +**

■ **Caution** The terminal clears the display memory when executing these commands.

When you display 25 or 43 data lines, commands to display function key labels or a label line message are ignored.

☐ **Note** The terminal supports only 24 lines to a page in all nonnative terminal personalities except WY-50+, DG200, DG210, and PC Term modes.

Working In Display Memory

With the commands in this section you can define and display different configurations of the terminal's display memory.

Defining a Page

Divide memory into pages **ESC w** *length*

where *length* is a value that defines the length of the page by a multiple of the number of data lines displayed on the screen at the time this command is executed.

length	Multiple	Length of Page
G	1 x lines	Equal to the number of data lines (default)
H	2 x lines	Double the number of data lines
I	4 x lines	Four times the number of data lines
J	*	One page contains the number of data lines; a second page contains the rest of the lines remaining in memory

☐ **Note** ESC w I is available only in the WY50+ personality.

■ **Caution** Executing these page definition commands clears the display memory.

Not all *length* values are valid for the data lines in effect. Table 4-2 summarizes the number of pages of each page length available for 24, 25, 42, or 43 lines in the terminal's native mode. (See Table F-3 in Appendix F for additional page configurations available in some of the nonnative personalities.) If you select an invalid value for *length*, the terminal defaults to 1 x lines.

Table 4-2 Valid Page Configurations

Data Lines	Multiplier	80/132 Column Lines Per Page	80/132 Column No. of Pages	Economy 80 Column Lines Per Page	Economy 80 Column No. of Pages
24	1 x lines	24	2	24	3
	2 x lines	48	1	48	1
	*	24 and 24	2	24 and 56	2
25	1 x lines	25	1	25	3
	2 x lines	NA		50	1
	*	NA		25 and 55	2
42	1 x lines	42	1	42	1
43	1 x lines	43	1	43	1

When executing any of the page definition commands, the terminal

- Clears all pages to null characters
- Displays page 0 with the cursor at the home position
- Restores a previously split screen to a full screen format (clearing the pages)

Moving from Page to Page

Display previous page **ESC w B**
Display next page **ESC w C**
Display specific page **ESC w *page***

where *page* is the number of the page to be displayed.

page	Page
0	0
1	1
2	2 (when economy 80-column mode is on)

☐ **Note** *page* values 3, 4, 5, and 6 are available in nonhidden attribute modes (see "Nonhidden Attributes" in Appendix F).

As you display the pages,

- The cursor maintains its previous position on each page
- The status of protect mode on each page is preserved
- Assigned display attributes on each page are preserved
- Commands for clearing or sending data apply only to the current page

Although all pages share the same display characteristics (for example, number of columns and type of cursor display), each page's relative independence makes it a separate *workspace* where data entered is independent of the data on other pages.

You can simulate workspace areas in a single long page by means of the same command that displays a specific page (ESC w *page*).

1. Before entering data in an area of the page, send the command to display a specific page, for example, ESC w 0.
2. Before entering data in another area of the page, send the command to display a different page, for example, ESC w 1.
3. Send the commands again when you want to return to those areas of the page.

These areas of the same page aren't really independent, but they'll be displayed as if they were separate pages—each area will move instantly onto the screen, with the cursor in its previous position.

The following section describes the workspaces you can create when you split the screen.

Splitting the Screen

By dividing the screen's data area into two horizontal segments (windows), you can view selected areas of two pages at the same time—or two areas of the same page if only one page is defined. You can work in the *active* window while the data in the other window remains fixed.

From the page in the active window you can move the cursor through all other pages (including the page that's fixed in the inactive window). Or you can display pages in the active window, with the cursor maintaining its position in each.

You can split the screen with separate commands according to the workspaces you want to create. Table 4-3 summarizes these commands, as well as the commands that restore a full screen format.

Table 4-3 Split Screen Commands

Workspaces	Split Screen Save Data	Split Screen Clear Pages	Restore Full Screen Save Data	Restore Full Screen Clear Pages
Two pages only	ESC x A *line*	ESC x 1 *line*	ESC x @	ESC x 0
Single page longer than 24 lines or multiple pages	ESC x C *line*	ESC x 3 *line*	ESC x @	ESC x 0

Split Screen Workspaces in Two Pages Only

Split screen horizontally **ESC x A *line***
Split screen horizontally and clear pages **ESC x 1 *line***

where *line* is a line code corresponding to the line number on the screen that you want to become the top line in the lower (inactive) window. The values for *line* are in Table H-1 in Appendix H.

Executing these commands

- Homes the cursor on all pages
- Displays the top of the current page in the upper window and makes this the active window
- Displays the top of the following page in the lower window
- Either saves the data (ESC x A) or clears all pages to space characters and turns off protect mode (ESC x 1)

When you split the screen with these commands, you're confined to the two workspaces displayed on the screen—you can't move the cursor to other areas of the page in either window, display another page, or adjust the windows.

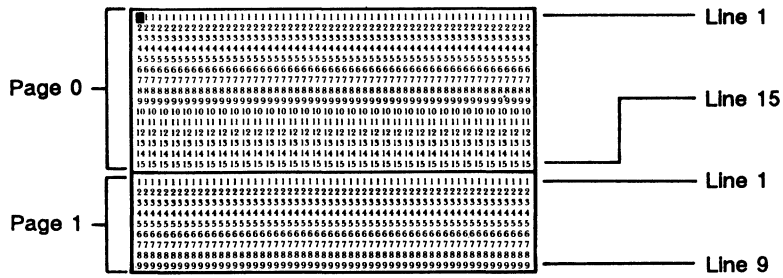
Example
If you want the first line of the lower window to be line 16 of the screen's data area, send

ESC x A /

where / is the value for line 16.

Figure 4-1 illustrates the workspaces created when you send this command from page 0.

Figure 4–1 Workspaces Created with ESC x A Command



Split Screen Workspaces in Multiple Pages

Split screen horizontally	**ESC x C** *line*
Split screen horizontally and clear pages	**ESC x 3** *line*

where *line* is the line code (from Table H–1) corresponding to the line number of the line you want to become the top line in the lower (inactive) window.

☐ **Note** The line you choose for the split is a reference point on the data area of the screen—it has no relation to the length of the page.

Executing these commands

- Either saves the data on all pages (ESC x C), retaining the cursor's previous position on each page, or clears all pages to space characters and homes the cursor (ESC x 3)
- Displays a portion of the current page in the upper window
- Displays a portion of the following page in the lower window if more than one page is defined, or a portion of the same page if only one page is defined

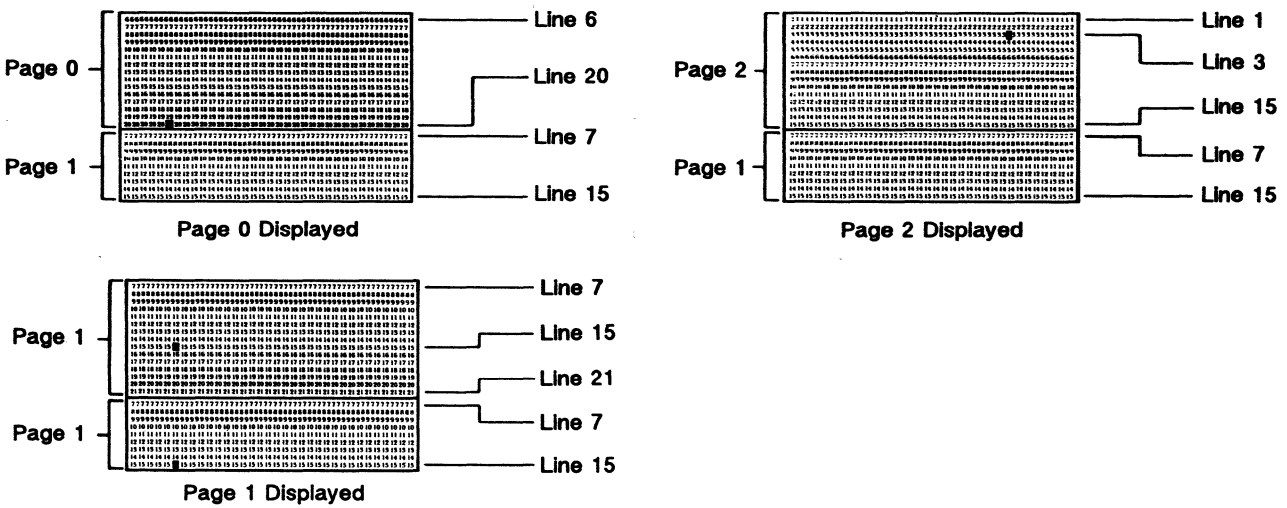
Example

Figure 4–2 illustrates the workspaces created on each page when you split the screen at line 16 with the ESC x C command, and

- You send the command from page 0
- The terminal is in economy 80–column mode with memory divided into three 24–line pages

- The cursor is on
  line 20 of page 0
  line 15 of page 1
  line 3 of page 2

Figure 4-2 Workspaces Created with ESC x C Command



Notice that the position of the cursor on each page determines what lines are displayed.

- The display adjusts to show the cursor line in both windows and as many additional lines as possible.
- As many lines of data as necessary disappear from view (no data is lost).
- The page fixed in the inactive window is always the page following the page where the split was made, regardless of which page is being displayed in the active window.
- When you display the same page in the active window that is fixed in the inactive window, the cursor appears in both windows.

Activating a Window

Activate upper window	ESC]
Activate lower window	ESC }
Activate the other window	ESC J or ESC K

When you activate the other window, the cursor appears in the position it last occupied on the page in that window. The data in the original window becomes fixed.

☐ **Note** When the screen has not been split, the ESC J or ESC K commands display the other page when two pages are defined.

Adjusting the Windows

You can adjust the windows of a split screen by one line at a time in two ways:

- By raising or lowering the split in the screen, you can enlarge either the active or inactive window at the expense of the other. The display of the page in each window adjusts accordingly.
- By rolling the active window up or down, you can see a new line of the page in that window. As a new line appears at the bottom of the window, a line disappears from the top of the window, and vice-versa.

Both these adjustments are nondestructive.

Lower horizontal split **ESC x P**
Raise horizontal split **ESC x R**

Lowering the split displays one more line of the page in the upper window and one less line of the page in the lower window.

Raising the split displays one more line of the page in the lower window and one less line of the page in the upper window.

The cursor doesn't move when these commands are executed. If the split is raised or lowered to the last line remaining in the window, the commands have no further effect.

Roll window up in page **ESC w E**
Roll window down in page **ESC w F**

These commands move the active window up or down in the current page. The data in the inactive window isn't affected.

The cursor doesn't move when these commands are executed unless it's at the bottom of the window when the window is rolled up, or at the top of the window when the window is rolled down. In either case, the cursor is "dragged" back onto the new top or bottom line in order to stay in the window.

Restoring a Full Screen Format

Redefine screen as one window **ESC x @**
Redefine screen as one window and clear pages **ESC x 0**

The ESC x @ command

- Homes the cursor if you have split the screen with the ESC x A command
- Preserves the cursor's position on all pages if you have split the screen with the ESC x C command

The ESC x 0 command clears the data from all pages, homes the cursor, and turns off protect mode.

Assigning Display Attributes

The terminal has five character display attributes that you can assign individually or in combination: dim, reverse, underline, blink, and invisible. See Appendix I for the available combinations of these attributes.

The display attributes are hidden, i.e., they don't occupy a character space on the screen. See "Nonhidden Attributes" in Appendix F for information on display attributes in the terminal personalities that have nonhidden attributes.

You can assign character display attributes to areas of the screen, to a page, a line, or a character position. You can also assign them specifically to protected characters.

Assigning a Display Attribute to a Message Field

Assign display attribute to a message field **ESC A *field attr***

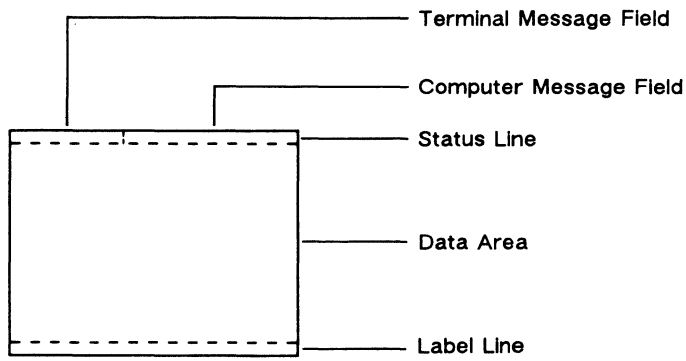
where *attr* is a character display attribute value from Table I–1 in Appendix I.

field is one of the message fields shown in Figure 4–3.

field	**Message Field**
0	Data area
1	Label line
2	Terminal message field on status line
3	Computer message field on status line

☐ **Note** In the terminal's native mode, only the reverse attribute can be assigned to the data area.

Figure 4-3 Message Fields



Assigning Character Display Attributes

Assign character display attribute **ESC G *attr***

where *attr* is a character display attribute value from Table I-1 in Appendix I.

This command assigns the attribute according to the attribute mode in effect.

Defining the Attribute Mode

Turn character attribute mode off	**ESC e 0**
Turn character attribute mode on (default)	**ESC e 1**
Turn page attribute mode on	**ESC e 2**
Turn line attribute mode on	**ESC e 3**

When the terminal is in character attribute mode, sending ESC G assigns the attribute to the next character entered and each succeeding character on the page.

In page or line attribute mode, the assigned attribute extends to all character positions from the cursor to the end of the page or line, or until another attribute is encountered.

Turning off character attribute mode turns on either page or line attribute mode, whichever was last active. If neither was previously selected, the terminal defaults to page attribute mode.

Assigning Attributes to Write-Protected Characters

Assign display attribute to write-protected characters **ESC ' *wpca***

where *wpca* is the attribute value for write-protected characters.

wpca	Display Attribute
6	Reverse
7	Dim (default)
A	Normal
B	Blink on
C	Invisible on
E	Underline on
F	Reverse on
G	Dim on

This command assigns a display attribute to subsequently received characters when write-protect mode is on.

The last five values (B through G) enable you to combine attributes. Assigning any of the first three values (6, 7, A) clears all other write-protected character attributes.

Assigning Line Attributes

Assign line attribute **ESC G *lattr***

lattr	Line Attribute
@	Single-high, single-wide characters (default)
A	Single-high, double-wide characters
B	Top half of double-high, single-wide characters
C	Bottom half of double-high, single-wide characters
D	Top half of double-high, double-wide characters
E	Bottom half of double-high, double-wide characters
G	Normal background
H	Bold background
I	Invisible background (default)
J	Dim background

This command lets you change the height and width of the characters, and the background intensity of the line, on a line by line basis. The line attributes can be combined with the character display attributes.

Entering Double-Wide Characters

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

1. Send ESC G A.
2. Enter a maximum of half the number of characters permitted on a normal line.

Entering Double-High Characters
To display a line with characters twice as high as normal,

1. Send ESC G B to tell the terminal to display the top half of characters entered on the line.
3. Move to the next line.
4. Send ESC G C to tell the terminal to display the bottom half of characters entered on the line.
5. Enter exactly the same characters again.

Entering Double-High, Double-Wide Characters
To display a line with characters twice as wide and twice as high as normal,

1. Send ESC G D to display the top half of the characters entered on the line.
2. Enter a maximum of half the number of characters permitted on a normal line.
3. Send ESC G E to display the bottom half of the characters entered on the line.
4. Enter exactly the same line of characters entered in Step 2.

Protecting Data

To protect data,

1. Turn on write-protect mode, then enter the data to be protected.
2. Turn on protect mode to protect the write-protected data.

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.

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 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 protected line cannot be deleted, nor can a line be inserted at a protected line.

Displaying Graphics Characters

The terminal's default character set contains 16 line-drawing graphics characters. 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 *key***

where *key* is the key shown in Table 4-4.

When graphics mode is on, pressing a key indicated in Table 4-4 displays the corresponding graphics character. You can't enter normal alphanumeric text, but you can enter commands. When protect mode is on, graphics characters are automatically protected.

Table 4-4 Graphics Character Codes

Graphics Character	*key*	Graphics Character	*key*	Graphics Character	*key*
┬	0	│	6	═	<
└	1	■	7	┴	=
┌	2	┼	8	╫	>
┐	3	┤	9	▒	?
├	4	─	:		
┘	5	▒	;		

Controlling The Cursor

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 received CR mode off (default)	ESC e 4
	Turn received CR mode on	ESC e 5
	Turn autopage mode off (default)	ESC d *
	Turn autopage mode on	ESC d +
	Turn autoscrolling mode off	ESC N
	Turn autoscrolling mode on (default)	ESC O

Locking the Cursor Line

Turn line lock mode on **ESC ' H**
Turn line lock mode off (default) **ESC ' I**

The ESC ' H command locks the cursor line (so that the line remains fixed when the display scrolls) and moves the cursor down to the next unlocked line. If there is no unlocked line below, the cursor moves up to the nearest unlocked line. The cursor cannot move into a locked line. Turning off line lock mode unlocks all the lines on the page.

☐ **Note** When line lock mode is on, smooth scrolling is inhibited.

Addressing/Reading the Cursor

In all the commands in this section,

- *lll* is a one- to three-digit decimal value of the line, relative to home, that corresponds to the line where you want to position the cursor
- *ccc* is a one- to three-digit decimal value of the column, relative to home, that corresponds to the column where you want to position the cursor
- *line* is the line code (Table H-1 in Appendix H) that corresponds to the line on the page where you want to position the cursor
- *col* is the column code (Table H-2 in Appendix H) that corresponds to the column where you want to position the cursor
- *page* or *wnd* is the number of the page or the window of a split screen where the cursor will be moved

wnd/page	**Window or Page**
0	Page 0 or upper window
1	Page 1 or lower window
2	Page 2 (when economy 80-column mode is on)

☐ **Note** *wnd/page* values 3, 4, 5, and 6 are available in nonhidden attribute modes (see Table F-2 in Appendix F).

- The cursor can be addressed to a protected position but it can't write anything there

Addressing the Cursor

Address cursor in current 80-column page	**ESC =** *line col*
Address cursor in specific 80-column page	**ESC w @** *page line col*
Address cursor in specific 80-column window/page	**ESC -** *wnd line col* **ESC -** *page line col*
Address cursor in current 80/132-column page	**ESC a** *lll* **R** *ccc* **C**

where R is the ASCII character "R."

C is the ASCII character "C."

Reading the Cursor's Address

Read cursor address in current 80-column page	**ESC ?**
Read 80-column page number and cursor address	**ESC w '**
Read 80-column window (or page) number and cursor address	**ESC /**

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-column page **ESC b**

The terminal returns an eight-byte address in the format

lll **R** *ccc* **C**

No CR character is sent after the coordinates.

5 Editing 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**
Backtab	**ESC I**

If the tab stop is at a protected position, the cursor moves to the next or previous unprotected position.

Don't initialize tabs	**ESC e :**
Initialize tabs from nonvolatile memory	**ESC e ;**

These commands determine whether tab stops saved in nonvolatile memory are active when the terminal is turned on or reset.

Inserting Data

Turn insert mode on, replace mode off	**ESC q**
Turn insert mode off, replace mode on (default)	**ESC r**
Turn page edit mode off (default)	**ESC e "**
Turn page edit mode on	**ESC e #**

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.

When page edit mode is off, the data that moves beyond the end of the line or beyond the start of a protected field is lost.

When page edit mode is on, the data wraps to the next (unlocked) line; only data that moves past the end of the page is lost.

If protect mode is on, the page edit command is ignored. Turning on protect mode turns off page edit mode.

Inserting Space Characters

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.

Inserting a Column

Insert column of null characters **ESC c M**

Data following the inserted column moves right one column. The command is ignored if a line is locked.

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. If page edit mode is on, data wraps onto the line from the following lines.

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.

Delete cursor column **ESC c J**

This command deletes the cursor column, pulling the following columns left one column. The command is ignored if a line is locked.

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 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***

where *char* is the character that replaces unprotected characters.

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**
Clear unprotected page foreground to space characters	**ESC c P**
Clear unprotected page foreground to null characters	**ESC c Q**
Clear unprotected line foreground to space characters	**ESC c R**
Clear unprotected line foreground to null characters	**ESC c S**

These commands replace unprotected characters from the cursor position to the end of the page or line, or the start of a protected field.

Clear unprotected to end of line with null characters	**ESC c L**
Clear unprotected to end of line with space characters	**ESC c O**

These commands replace all unprotected characters from the cursor to the end of the line (skipping over protected fields).

Clearing a Column

Clear unprotected column to null characters	**ESC c K**
Clear unprotected column to specific character	**ESC c I *char***

where *char* is the character that replaces the unprotected characters in the cursor column.

These commands clear the cursor column on the entire page. They are ignored if a line is locked.

Boxing and Clearing a Rectangle

In the following commands for boxing and clearing a rectangle,

- The rectangle is limited to the current page
- The command is ignored if the defined rectangle encompasses a locked line
- The cursor doesn't move when the command is executed

Boxing a Rectangle

Box rectangle in 80-column page	**ESC c G** *line col*
Box rectangle in 132-column page	**ESC c G** *line - col*

where *line* and *col* are line and column codes (Appendix H) that define the dimensions of a rectangle extending in any direction from the cursor position.

These commands draw a rectangle around an area of the page defined by a horizontal line between the cursor position and the specified column and by a vertical line between the cursor position and the specified line.

Box rectangle to right of cursor	**ESC c N** *width height*

where *width* and *height* are line and column codes from Appendix H that define the dimensions of a rectangle extending to the right and down from the cursor position. In this command the line and column codes represent the *number* of character positions, not screen coordinates. The column code defines the number of columns in the width of the horizontal line; the line code defines the number of lines in the height of the vertical line.

For example, specifying ESC c N ! $ draws a rectangle that extends two columns to the right of the cursor position and five lines down from the cursor position.

Clearing a Rectangle

Clear unprotected rectangle in 80-column page	**ESC c F** *line col char*
Clear unprotected rectangle in 132-column page	**ESC c F** *line - col char*
Clear entire rectangle in 132-column page	**ESC c H** *line - col char*
Clear entire rectangle in 80-column page	**ESC c H** *line col char*

where *line* is a line code from Table H-1 in Appendix H.

col is a column code from Table H-2 in Appendix H.

char is the character that replaces the characters within the area of the rectangle.

6 Sending Data

Defining Print/Send Operations

Begin print/send operations at top of page (default) **ESC d '**
Begin print/send operations at top of screen **ESC d &**

These commands define whether the print and send commands described in this chapter affect data from home through the cursor position or from the top of the screen's data area through the cursor position.

Sending Data In Block Mode

When you send data in block mode to either the computer or the printer,

- The terminal automatically includes end–of transmission delimiters (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 not sent .
- Unless the beginning or end point is otherwise defined, 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 entire cursor line **ESC 6**
Send unprotected cursor line **ESC 4**

No delimiter is sent after the cursor character is sent.

Sending a Page

Send entire 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 computer.

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 entire block **ESC s**
Send unprotected characters **ESC S**

These commands send the data between the first STX character left of the cursor and the first ETX character. (The STX and ETX characters are not sent.)

When the entire 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 \).

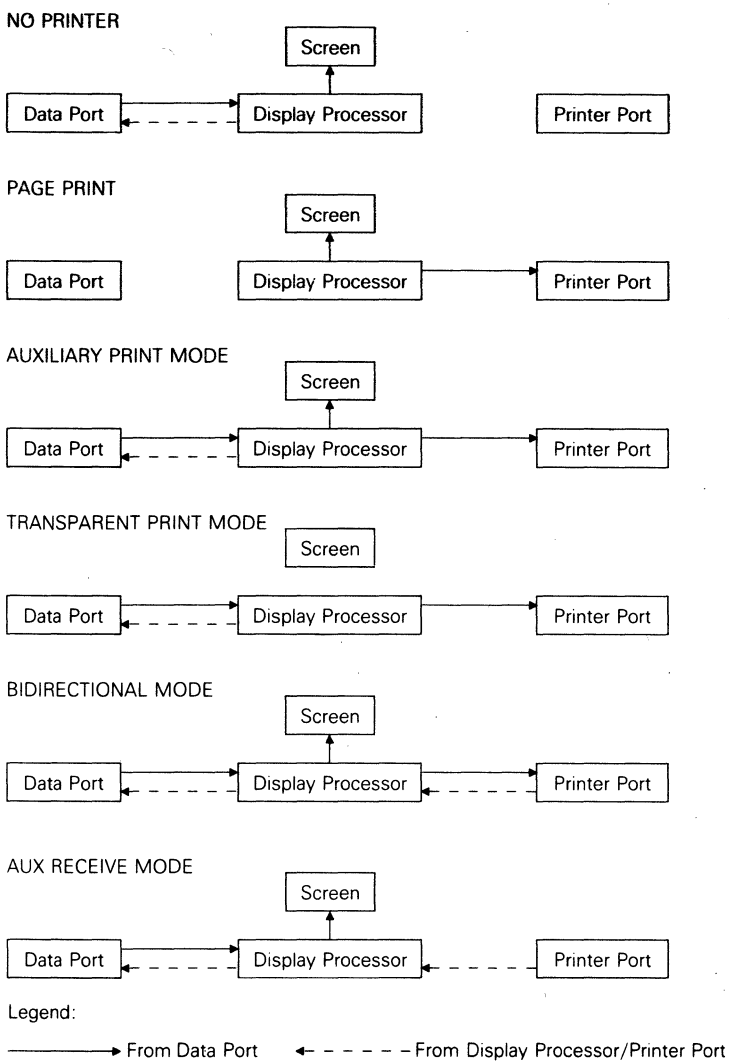
Printing Data

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 computer

Figure 6–1 shows how the terminal handles data through the printer port.

Figure 6–1 Communications through the Printer Port



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
- And ACK mode is on, the terminal sends an ACK to the computer at the end of the print operation

Print entire formatted page ESC P
Print formatted unprotected page ESC @
Print unformatted page ESC p
or ESC L

No line terminators are sent with the unformatted page.

Print Modes

When one of the terminal's two buffered print modes is on, the terminal sends all data received from the computer 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 #

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 data port and printer port.

Turn secondary receive mode off (default) ESC d SPACE
Turn secondary receive mode on ESC d !

In secondary 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 data port without affecting the screen display. Data received from the data 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 secondary receive and auxiliary print modes. Data received by the data port is displayed on the screen and sent to the printer port. Data received by the printer port is sent directly to the data port without affecting the screen display.

Turning off bidirectional mode turns off secondary receive mode and all print modes.

7 Displaying Character Sets

Introduction

The characters displayed by the terminal are organized into eight predefined character sets, each having room for 128 characters. Four of these character sets at a time (a maximum 512 characters) can be loaded into the terminal's *font banks*, where they're available for display as a *primary* or *secondary* character set.

Primary and Secondary Character Sets

The terminal's primary and secondary character sets contain the characters to be displayed in response to received codes.

With the commands described in this chapter, you can

- Choose four of the eight predefined character sets to load into the terminal's font banks
- Define one of the four font banks as your primary character set and another as your secondary character set
- Shift back and forth between the primary and secondary character sets to display the characters residing in each
- Design new characters and load them into any of the four font banks

Selecting the Primary or Secondary Character Set

Select primary character set (default) **ESC c D**
Select secondary character set **ESC c E**

These commands select the primary or secondary character set for display.

Example
To display the Greek letter pi (π) that resides in the terminal's default secondary character set,

1. Send ESC c E to select the secondary character set.
2. Find the hex value (00 through 7F) of the character's position in the character set: Read across to the hex value at the top of the secondary character set in Figure 7–1, then down to the hex value in the vertical column.
3. Send 63H to display the character.
4. Send ESC c D to select the primary character set again.

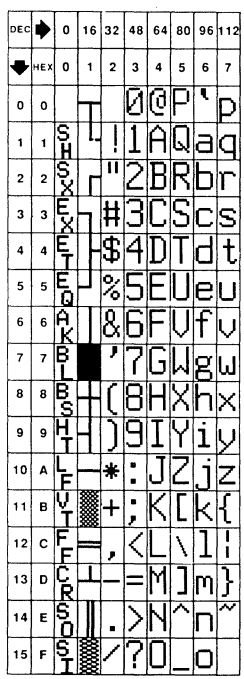
Default Character Sets

Figure 7–1 shows the terminal's default primary and secondary character sets. (See Table F–1 in Appendix F for the default character sets displayed in other terminal personalities.)

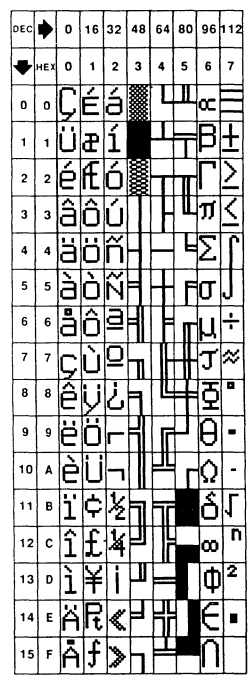
☐ **Note** In the figure, DEC stands for decimal, HEX for hexadecimal.

Figure 7–1 Default Primary and Secondary Character Sets

Primary



Secondary



Defining the Primary and Secondary Character Sets

Define primary character set **ESC c B *bank***
Define secondary character set **ESC c C *bank***

where *bank* is one of the terminal's font banks, each holding a predefined character set.

bank	Font Bank
0	Font bank 0
1	Font bank 1
2	Font bank 2
3	Font bank 3

☐ **Note** After defining the primary and secondary character sets, you still need to select one of them for display.

In the terminal's native mode,

- The default primary character set (Figure 7–1) is stored in font bank 0
- The default secondary character set is stored in font bank 1
- The character sets held in reserve in font banks 2 and 3 contain the same characters as font banks 0 and 1, but in the compressed font designed for a 42– or 43–line display

Automatic Font Loading

Turn automatic font loading off **ESC e N**
Turn automatic font loading on (default) **ESC e O**

Unless you turn off automatic font loading, the terminal automatically loads the font banks with the fonts appropriate to the number of lines displayed and to the terminal's current personality. (The display may go blank for a few seconds while the terminal is loading the fonts.)

When automatic font loading is off, the terminal doesn't load new fonts—you are responsible for loading the font banks.

Loading the Font Banks

Load font bank with predefined character set **ESC c @ *bank set***
Clear font bank **ESC c ? *bank***

bank	Font Bank
0	0
1	1
2	2
3	3

set	**Predefined Character Set**
@	Native mode
A	Multinational
B	Standard ASCII
C	Graphics 1
D	PC equivalent
E	Graphics 2
F	Graphics 3
G	Standard ANSI
‘	44-line native mode
a	44-line multinational
b	44-line PC equivalent
c	44-line Standard ASCII
d	44-line Standard ANSI

Figure 7-2 shows the predefined character sets.

Figure 7-2 Predefined Character Sets

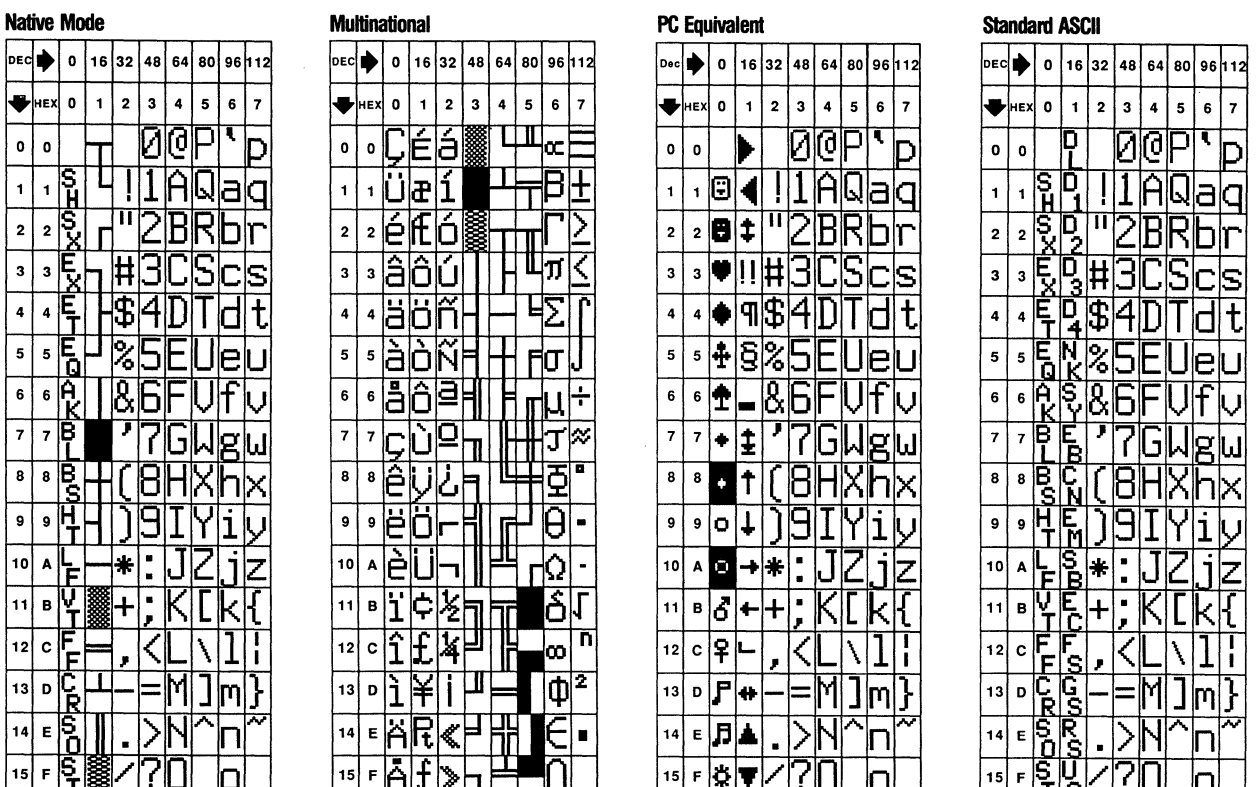
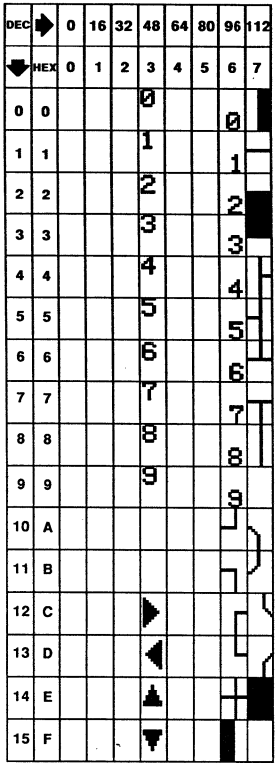
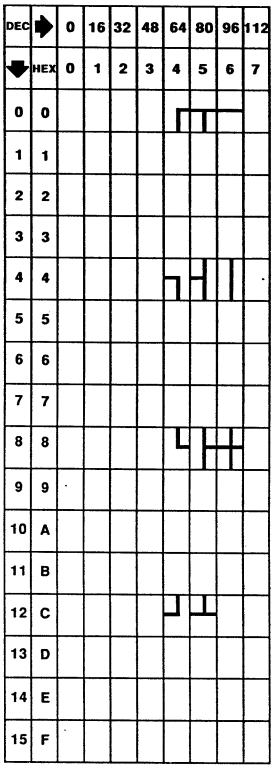


Figure 7–2 Predefined Character Sets, Continued

Graphics 1



Graphics 2



Graphics 3

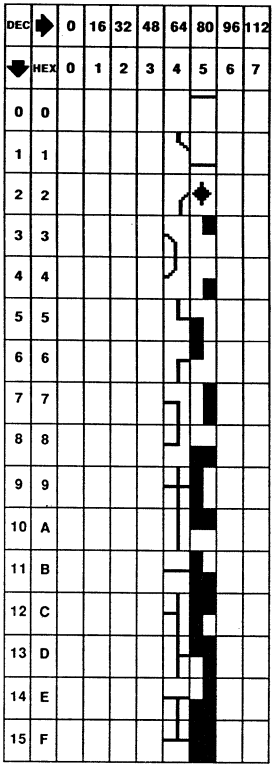
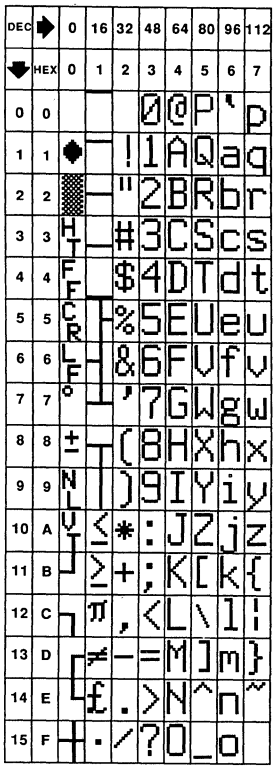
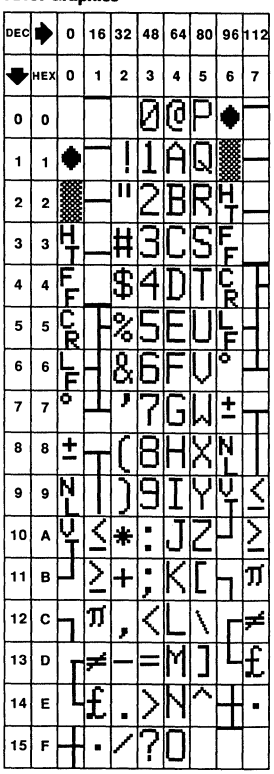


Figure 7-2 Predefined Character Sets, Continued

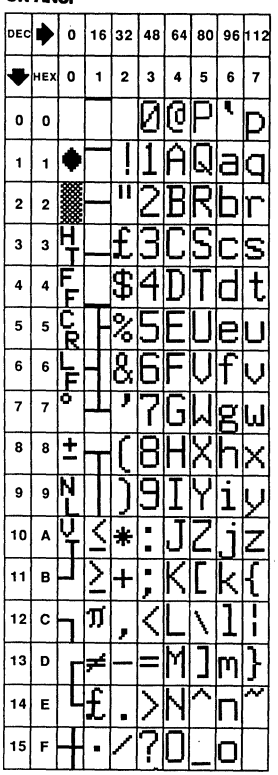
Standard ANSI



ANSI Graphics



UK ANSI



If ACK mode is on, the terminal sends an ACK character to the computer after loading or clearing a font bank.

☐ **Note** If you clear a font bank from the activated primary or secondary character set, the screen blanks until you load the font bank again.

Designing and Loading Characters

To design and load a character, follow these steps:

1. Load one of the font banks with the predefined character set that will contain the new character.

2. Select the character position where the new character will reside in the character set (00H through 7FH).
3. Design the character and define its bit pattern in hexadecimal equivalents.
4. Send the escape sequence that defines and loads the new character.

Defining and Loading a Character

Define and load character **ESC c A *bank pp bb...bb* CTRL Y**

where *bank* is the font bank (0 through 3) where the character will reside.

pp is the 2-byte hex value of the character's position in the character set.

bb...bb is a 32-byte character string that defines the bit pattern of the character.

The command aborts if CTRL Y is sent before all 32 values of *bb...bb* are included. (Details on *bb...bb* are given in the following section.)

Your defined characters remain in the character set until

- You turn the power off
- You reload or clear the font bank containing the character
- You change to another terminal personality, or change between a 26-line and 44-line display, while automatic font load is on

Designing the Character

The format of the screen defines the dimensions of the character in a cell matrix, as shown in Table 7-1.

Table 7-1 Character and Cell Dimensions

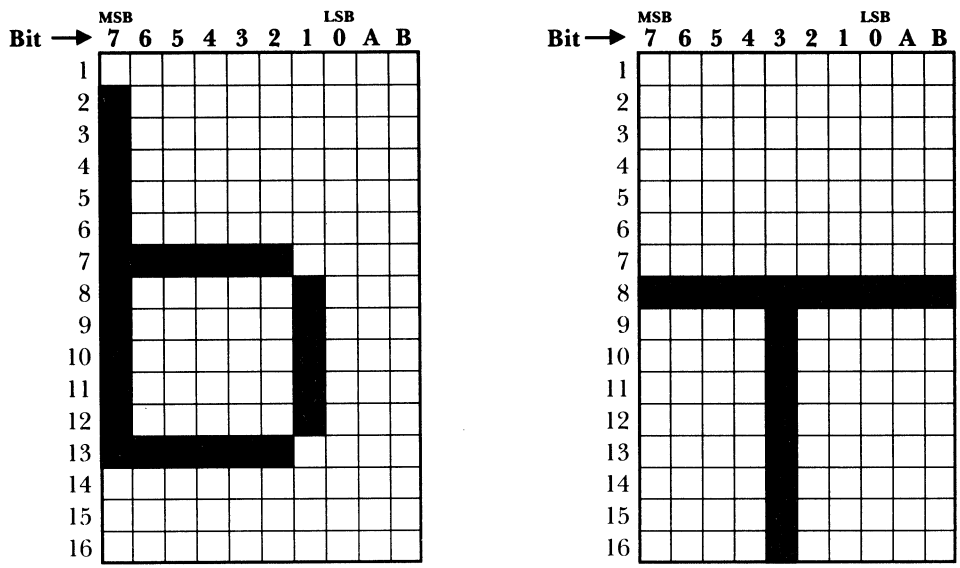
Cell Matrix No. of Lines	Character Matrix	80-Column Screen	132-Column Screen
26	7 x 12	10 x 16	9 x 16
44	5 x 7	10 x 9	9 x 9

Figure 7-3 illustrates a lowercase alphabetic character and a line-drawing character in a 10 x 16 cell.

Notice that the alphanumeric character is confined to the seven leftmost boxes of the cell, whereas the graphics character extends across the whole cell. The terminal automatically extends whatever is in column 0 to columns A and B as well, causing consecutive characters to touch and allowing you to create graphic shapes with adjoining characters.

In designing alphanumeric characters, leave column 0 blank to reserve space between the characters. Likewise, reserve at least one line at the top or bottom of the cell to provide vertical space between the characters.

Figure 7-3 Sample Predefined Characters in 10 x 16 Cell



Procedure

To design a character, follow these steps:

1. Map the character on a grid representing the cell matrix.
2. Mark the grid with 1's and 0's representing the bit pattern.
3. Convert the bit pattern of each horizontal line of the matrix into hexadecimal equivalents and combine them in a string that completely describes the character.

Example

Figure 7–4 illustrates the first two steps in designing the lowercase "b" shown in Figure 7–3:

1. Mark the appropriate boxes on the grid to delineate the character.
2. Translate the pattern into bit values: Write a 1 in each box marked for the character; write a 0 in each unmarked box in the cell matrix.

Figure 7–4 Delineating a Character

Bit →	MSB 7	6	5	4	3	2	1	0 LSB	A	B
1										
2	X									
3	X									
4	X									
5	X									
6	X									
7	X	X	X	X	X	X				
8	X						X			
9	X						X			
10	X						X			
11	X						X			
12	X						X			
13	X	X	X	X	X	X				
14										
15										
16										

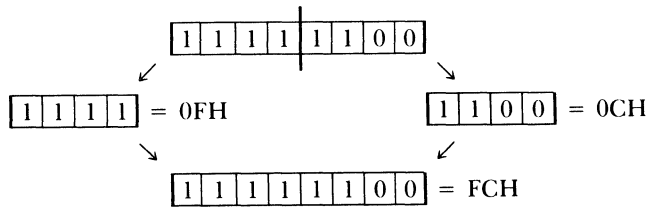
Bit →	MSB 7	6	5	4	3	2	1	0 LSB	A	B
1	0	0	0	0	0	0	0	0	0	0
2	1	0	0	0	0	0	0	0	0	0
3	1	0	0	0	0	0	0	0	0	0
4	1	0	0	0	0	0	0	0	0	0
5	1	0	0	0	0	0	0	0	0	0
6	1	0	0	0	0	0	0	0	0	0
7	1	1	1	1	1	1	0	0	0	0
8	1	0	0	0	0	0	1	0	0	0
9	1	0	0	0	0	0	1	0	0	0
10	1	0	0	0	0	0	1	0	0	0
11	1	0	0	0	0	0	1	0	0	0
12	1	0	0	0	0	0	1	0	0	0
13	1	1	1	1	1	1	0	0	0	0
14	0	0	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0	0	0
16	0	0	0	0	0	0	0	0	0	0

You now have a binary value for each of the 16 horizontal lines.

To convert these binary values to hex equivalents that define the line's pattern for the terminal, it is convenient to divide the line into two 4-bit "nibbles" and assign a hex value to each. (Columns A and B may be ignored, as they are always an extension of the values in Column 0.)

Figure 7–5 illustrates this principle for line 7 in Figure 7–4.

Figure 7-5 Dividing the Line



3. Divide each horizontal line into two four-bit "nibbles" and find the hex equivalent for each in Table 7-2.

Table 7-2 Hex Equivalents of Bit Patterns

Bit Pattern	Hex Equivalent	Bit Pattern	Hex Equivalent
0 0 0 0	0	1 0 0 0	8
0 0 0 1	1	1 0 0 1	9
0 0 1 0	2	1 0 1 0	A
0 0 1 1	3	1 0 1 1	B
0 1 0 0	4	1 1 0 0	C
0 1 0 1	5	1 1 0 1	D
0 1 1 0	6	1 1 1 0	E
0 1 1 1	7	1 1 1 1	F

4. Write down the hex values for each line. Figure 7-6 shows the result.

Figure 7-6 Line Values

Bit →	3	2	1	0	3	2	1	0	A	B	Hex Equivalent
1	0	0	0	0	0	0	0	0	0	0	00
2	1	0	0	0	0	0	0	0	0	0	80
3	1	0	0	0	0	0	0	0	0	0	80
4	1	0	0	0	0	0	0	0	0	0	80
5	1	0	0	0	0	0	0	0	0	0	80
6	1	0	0	0	0	0	0	0	0	0	80
7	1	1	1	1	1	1	0	0	0	0	FC
8	1	0	0	0	0	0	1	0	0	0	82
9	1	0	0	0	0	0	1	0	0	0	82
10	1	0	0	0	0	0	1	0	0	0	82
11	1	0	0	0	0	0	1	0	0	0	82
12	1	0	0	0	0	0	1	0	0	0	82
13	1	1	1	1	1	1	0	0	0	0	FC
14	0	0	0	0	0	0	0	0	0	0	00
15	0	0	0	0	0	0	0	0	0	0	00
16	0	0	0	0	0	0	0	0	0	0	00

5. The result is the 32-character string defining the softfont (from top to bottom):

   0 0 8 0 8 0 8 0 8 0 8 0 F C 8 2 8 2 8 2 8 2 8 2 F C 0 0 0 0 0 0 0

6. To load the lowercase "b" into its default position, the entire sequence is

   ESC c A 0 62 00 80 80 80 80 80 FC 82 82 82 82 82 FC 00 00 00 CTRL Y

Appendix **A**

Specifications

Screen	14 in. (35.56 cm) flat screen (measured diagonally) Phosphor: P–31 green, P134 amber, or P188 white Swivel: 360°; tilt: –7° to +34°
Option	Height–adjustable arm
Display Format	26 or 44 lines (24/25/42/43 data lines); 80 or 132 columns; horizontally split screen
Character Formation	26 lines: 7 x 12 matrix in 10 x 16 (80–column) or 9 x 16 (132–column) cell with 3–dot descenders 44 lines: 5 x 7 matrix in 10 x 9 (80–column) or 9 x 9 (132–column) cell with 1–dot descenders
Character Sets	Multinational ASCII: 512 downloadable characters, eight selectable character sets (ASCII characters, control code symbols, graphics characters)
Cursor Control	Home, up, down, left, right, tab, carriage return
Cursor Attributes	Block/underline; blinking/steady; off
Print Capabilities	Page print (formatted/unformatted), auxiliary print, transparent print, bidirectional/secondary receive modes
Communications Interfaces	Two interchangeable, buffered, bidirectional RS–232C ports (MODEM, AUX)
Communications Modes	Block, half duplex, full duplex, and half–duplex block
Word Structure	7 or 8 data bits; 1 or 2 stop bits
Parity	Odd, even, mark, or none
Communications Protocol	MODEM and AUX ports: independent transmit (X–on/X–off or none) and receive (X–on/X–off, DTR, both, or none)
Baud Rates	MODEM port: 15 (50 to 38.4K) AUX port: 14 (110 to 19.2K)
Video Attributes	Hidden and nonhidden: normal, dim, invisible, bold, blink, underline, and reverse (combinable); character/line/page–based. Double–wide, double–high, dim, bold, invisible line attributes

Editing Functions

Insert character/line/column, delete character/line/column; clear page/line/ column; clear/box rectangle; insert/replace; Wyseword

Keyboards

Low-profile detached with 6-foot (1.83m) 4-wire coiled cable; two-position tilt (low position meets DIN specification); N-key rollover with ghost key lockout; sculpted keycaps

WY-60 ASCII

101 keys, including 16 programmable function keys, shiftable to 32; total of 66 programmable key functions; numeric keypad

IBM 316X-Style

106 keys, including 16 programmable function keys, shiftable to 32; total of 74 programmable key functions; numeric keypad

AT-Style

84 keys, including 10 programmable function keys, shiftable to 20; total of 54 programmable key functions; numeric keypad

Enhanced PC-Style

102 keys, including 12 programmable function keys, shiftable to 24; total of 56 programmable key functions; numeric keypad

Fields

Normal and protected

Memory

Four pages of 24 lines by 80/132 columns in nonhidden attribute modes, two pages in hidden attribute modes; seven pages of 24 lines by 80 columns in economy 80-column mode (nonhidden attributes), three pages in hidden attribute modes

Personalities

Wyse WY-60, WY-50, WY-50+, WY-75, Lear Siegler ADM 3A/5/31, ADDS Viewpoint A2/60, DASHER D100/D200/D210, Digital Equipment VT52/VT100, Hazeltine HZ-1500, IBM 3101-1X/3101-2X/3161, PC Term, TeleVideo 910/910+/912/920/925/950/955

Power Requirements

115 VAC, 60 Hz (U.S.); 230 VAC, 50 Hz

Weight

Net: 19 lbs. (8.6 kg)
Shipping: 24 lbs. (11.6 kg)

Dimensions

	Height		Width		Depth	
	(in)	(cm)	(in)	(cm)	(in)	(cm)
Terminal	12.75	31.8	12.5	29.2	13.0	33.0
Keyboards						
WY-60 ASCII	2.25	5.72	17.25	43.82	7.60	19.30
IBM 316X-Style	2.25	5.72	18.70	47.60	6.90	17.60
AT-Style	2.40	6.10	17.70	44.90	5.60	14.20
Enhanced PC-Style	2.25	5.72	18.70	47.60	6.90	17.60

Appendix B Terminal Status Messages

Table B-1 Terminal Status Messages

Message	Meaning
FDX	The terminal is in full-duplex mode.
HDX	The terminal is in half-duplex mode.
BLK	The terminal is in block or half-duplex block mode.
<FDX[1] <HDX[1] <BLK[1]	The terminal is sending data to the computer while in the indicated communication mode.
HLD[1]	The corner key is engaged in its hold-screen function.
CONV[1]	The terminal is in ADDS VP-60 conversation mode.
MSG[1]	The terminal is in ADDS VP-60 message mode.
PAGE[1]	The terminal is in ADDS VP-60 page mode.
<AUX	The terminal is in secondary receive mode.
>AUX	The terminal is in auxiliary print or transparent print mode
=AUX	The terminal is in bidirectional mode.
%AUX	The printer port is receiving data from the terminal's display memory.
1...6	The terminal is displaying the indicated page. (No message appears when page 0 is displayed.)
hh:mm	The standard status line is displaying the current time (with an a.m. or p.m. indicator).
nn-nnn	The standard status line is displaying the cursor line and column numbers.
INS	Insert mode is on.
PROT	Protect mode is on.
WRPT	Write-protect mode is on (displayed only when protect mode is also on).
w	Wyseword mode is on.
*	Monitor mode is on.[2]
LOCK	The keyboard is locked.[3]
NUM	NUM LOCK is on (AT-style and Enhanced PC-style keyboards).[4]
CAPS	The CAPS LOCK key is on.
L1...L4	Simulated keyboard LED (L1, L2, L3, L4) is on (ANSI modes only).

1. These messages supersede FDX, HDX, BLK.
2. If both monitor mode and Wyseword mode are on, the monitor mode indicator takes precedence over the Wyseword indicator.
3. The LOCK message takes precedence over the NUM or CAPS message.
4. The NUM message takes precedence over the CAPS message.

Appendix C Remote Keyboard Functions

Table C-1 describes the remote functions of the keys in the terminal's native mode. (Refer to the *User's Guide* for local keyboard commands and key codes.)

Table C-1 Remote Keyboard Functions

Keyboard Style WY-60 ASCII	IBM 316X	AT	Enhanced PC	Description
BACKSPACE	← (BACKSPACE)	← BACKSPACE	← BACKSPACE	Moves the cursor left one position.
BREAK	BREAK	BREAK	BREAK	Sends a break signal to the MODEM port.
CLR LINE	ERASE EOF		END	Clears the cursor line to space characters, starting at cursor position.
CLRSCRN	ER EOP		SHIFT END	Clears page to space characters, starting at cursor position.
CTRL	CTRL	CTRL	CTRL	When pressed with another key, generates a control code.
CURSOR KEYS	CURSOR KEYS	CURSOR KEYS*	CURSOR KEYS*	Moves the cursor in the direction of the arrow.
DEL	DEL	DEL*	DEL*	Sends ASCII DEL code.
DEL CHAR	DELETE		DELETE	Deletes the cursor character, moving all characters to the right of the cursor left one position.
DEL LINE	DEL LN		SHIFT DELETE	Deletes the entire cursor line, moving the lines below it up one line.

* When NUM LOCK is off.

Table C-1 Remote Keyboard Functions, Continued

Keyboard Style WY-60 ASCII	IBM 316X	AT	Enhanced PC	Description
ENTER	ENTER	ENTER	ENTER	If ENTER setup parameter is set to CR or CRLF, moves the cursor to the first position of the current or next line; if the parameter is set to TAB, acts like the TAB key.
F1-F16	F1-F16	F1-F10	F1-F12	Shifted and unshifted, these keys send a sequence of codes or characters to the computer.
FUNCT	HOLD	SCROLL LOCK	SCROLL LOCK	If CORNER KEY setup parameter is set to "FUNCT," sends an ASCII SOH, another key's code, and an ASCII CR when pressed together with an alphanumeric key. If the parameter is set to "HOLD," holds the current data on the screen until pressed again.
HOME	HOME	HOME*	HOME	Moves the cursor to the top left corner of the page.
INS	INSERT	SHIFT INS*	INSERT	Turns on insert mode.
INS CHAR				Inserts a space at the character position, moving all succeeding characters right one position.
INS LINE	INS LN			Inserts a line of space characters below the cursor line.
	LF			Moves the cursor down to the same position in the next line.
PREV PAGE	SHIFT PAGE	PG UP*	PAGE UP	Displays the previous page (or upper window if screen has been split).
NEXT PAGE	PAGE	PG DN*	PAGE DOWN	Displays the next page (or lower window if screen has been split).
PRINT	PRINT	PRT SC	PRINT SCREEN	Sends the formatted page to the printer port.
REPL		INS*	SHIFT INSERT	Turns on replace mode.

Table C-1 Remote Keyboard Functions, Continued

Keyboard Style WY-60 ASCII	IBM 316X	AT	Enhanced PC	Description
RETURN	RETURN			If the RETURN setup parameter is set to CR, moves the cursor to the first position of the current line; if parameter is set to CRLF, moves the cursor to the first position of the next line. If parameter is set to TAB, functions the same as the TAB key.
SEND	SEND			Sends the data from the top of the page through the cursor position to the data port.
	SEND LINE			Sends the cursor line to the data port, starting at cursor position.
	SN MSG			Sends the unprotected characters in a block to the data port.
SHIFT	SHIFT	SHIFT	SHIFT	Pressed with another key, selects the upper character shown on the key, or capitalizes alphabetic characters. Changes operation of some special keys (e.g., HOME, TAB).
TAB	TAB→	TAB	TAB→	Moves cursor to next tab stop.
SHIFT TAB	←TAB	SHIFT TAB	SHIFT TAB→	Moves cursor to previous tab stop (backtab).

Appendix D

Control Codes And Escape Sequences

This appendix lists the control codes (Table D-1) and escape sequences (Table D-2) recognized in the terminal's native mode. In both tables, a blank in the *Action* column indicates that the code or sequence is not recognized.

Table D-1 Control Codes

Control Key	Hex Value	ASCII Character	Symbol*	Action
@ or ‘	00	NUL		
A or a	01	SOH	SH	
B or b	02	STX	SX	
C or c	03	ETX	EX	
D or d	04	EOT	ET	
E or e	05	ENQ	EQ	Send ACK (if ACK mode is on)
F or f	06	ACK	AK	
G or g	07	BEL	BL	Sound bell
H or h	08	BS	BS	Cursor left
I or i	09	HT	HT	Tab cursor
J or j	0A	LF	LF	Cursor down (linefeed); scroll
K or k	0B	VT	VT	Cursor up; no scroll
L or l	0C	FF	FF	Cursor right
M or m	0D	CR	CR	Cursor to start of line
N or n	0E	SO	SO	Unlock keyboard
O or o	0F	SI	SI	Lock keyboard
P or p	10	DLE	⊤	
Q or q	11	DC1 (XON)	⌊	Enable transmission (when transmit handshake is X-on/X-off)
R or r	12	DC2	⌈	Auxiliary print mode on
s	13	DC3 (XOFF)	⌉	Stop transmission (when transmit handshake is X-on/X-off)
T or t	14	DC4	⊢	Turn all print modes off
U or u	15	NAK	⌋	
V or v	16	SYN	|	

* Monitor mode symbols in terminal's native mode.

Table D-1 Control Codes, Continued

Control Key	Hex Value	ASCII Character	Symbol*	Action
W or w	17	ETB	▮	
X or x	18	CAN	┼	Transparent print on (if enhance mode off)
Y or y	19	EM	┤	
Z or z	1A	SUB	–	Clear unprotected page to spaces
{ or [	1B	ESC	▓	Initiate escape sequence
| or \	1C	FS	=	
} or]	1D	GS	⊥	
^ or ~	1E	RS	‖	Home cursor
_ or DEL	1F	US	▒	Cursor to start of next line

Table D-2 Escape Sequences in ASCII Order

Sequence	Escape Action
ESC SPACE	Send terminal ID
ESC !	
ESC "	Unlock keyboard
ESC #	Lock keyboard
ESC $	
ESC %	
ESC &	Protect mode on
ESC '	Protect mode off
ESC (	Write-protect mode off
ESC)	Write-protect mode on
ESC *	Clear page to nulls
ESC +	Clear page to spaces
ESC ,	Clear page to write-protected spaces
ESC - *wnd/page line col*	Address cursor in specific 80-column window/page
ESC . *char*	Clear unprotected page to specific character
ESC /	Read 80-column window/page and cursor address
ESC 0	Clear all tab stops
ESC 1	Set tab stop
ESC 2	Clear tab stop
ESC 3	
ESC 4	Send unprotected cursor line

Table D-2 Escape Sequences in ASCII Order, Continued

Escape Sequence	Action
ESC 5	Send unprotected page
ESC 6	Send entire cursor line
ESC 7	Send entire page
ESC 8	Mark block beginning
ESC 9	Mark block end
ESC :	Clear unprotected page to nulls
ESC ;	Clear unprotected page to spaces
ESC <	
ESC = *line col*	Address cursor in current 80-column page
ESC >	
ESC ?	Read cursor address in current 80-column page
ESC @	Print formatted unprotected page
ESC A *field attr*	Assign display attribute to message field
ESC B	Block mode on
ESC C ESC D F	Full-duplex mode on
ESC C ESC D H	Half-duplex mode on
ESC D H ESC B	Half-duplex block mode on
ESC E	Insert line of spaces
ESC F *message* CR	Program and display computer message on status line
ESC G *attr*	Assign character display attribute
ESC G *lattr*	Assign line attribute
ESC H *key*	Display graphics character
ESC H CTRL B	Graphics mode on
ESC H CTRL C	Graphics mode off
ESC I	Backtab
ESC J	Activate other window/display previous page
ESC K	Activate other window/display next page
ESC L	Print unformatted page
ESC M	Send cursor character
ESC N	Autoscrolling mode off
ESC O	Autoscrolling mode on
ESC P	Print formatted page
ESC Q	Insert space character
ESC R	Delete cursor line
ESC S	Send unprotected characters in block
ESC T	Clear unprotected line to spaces from cursor

Table D-2 Escape Sequences in ASCII Order, Continued

Escape Sequence	Action
ESC U	Monitor mode on
ESC V	Clear cursor column
ESC W	Delete cursor character
ESC X	Monitor mode off
ESC Y	Clear unprotected page to spaces from cursor
ESC Z *dir key sequence* DEL	Program key direction and definition
ESC Z ~ *key*	Read key direction and definition
ESC [	
ESC \	
ESC]	Activate upper window
ESC ^ 0	Restore normal screen
ESC ^ 1	Reverse screen
ESC _	
ESC ' *scroll*	Set scrolling speed and type
ESC ' *wpca*	Assign write-protected character attribute
ESC ' *cursor*	Set cursor display features
ESC ' 8	Turn screen display off
ESC ' 9	Turn screen display on
ESC ' :	Select 80-column display
ESC ' ;	Select 132-column display
ESC ' H	Line lock mode on
ESC ' I	Line lock mode off
ESC ' J	Set margin bell at cursor position
ESC ' a	Extended status line on
ESC ' b	Standard status line on
ESC ' c	Status line display off
ESC a *ll* R *ccc* C	Address cursor in current 80/132-column page
ESC b	Read cursor address in current 80/132-column page
ESC c 0 *baud stop parity word*	Set MODEM port operating parameters
ESC c 1 *baud stop parity word*	Set AUX port operating parameters
ESC c 2 *hndshk*	Set MODEM port receive handshaking
ESC c 3 *hndshk*	Set AUX port receive handshaking
ESC c 4 *hndshk*	Set MODEM port transmit handshaking
ESC c 5 *hndshk*	Set AUX port transmit handshaking

Table D-2 Escape Sequences in ASCII Order, Continued

Escape Sequence	Action
ESC c 6 *max*	Set maximum data transmission speed
ESC c 7 *max*	Set maximum function key transmission speed
ESC c 8 *hh mm*	Load time of day
ESC c ; *answer* CTRL Y	Program answerback message
ESC c <	Send answerback message
ESC c =	Conceal answerback message
ESC c ? *bank*	Clear font bank
ESC c @ *bank set*	Load font bank
ESC c A *bank pp bb...bb* CTRL Y	Define and load character
ESC c B *bank*	Define primary character set
ESC c C *bank*	Define secondary character set
ESC c D	Select primary character set
ESC c E	Select secondary character set
ESC c F *line col char*	Clear unprotected rectangle in 80-column page
ESC c F *line ~ col char*	Clear unprotected rectangle in 132-column page
ESC c G *line col*	Box rectangle in 80-column page
ESC c G *line ~ col*	Box rectangle in 132-column page
ESC c H *line col char*	Clear entire rectangle in 80-column page
ESC c H *line ~ col char*	Clear entire rectangle in 132-column page
ESC c I *char*	Clear unprotected column to specific character
ESC c J	Delete cursor column
ESC c K	Clear unprotected column to nulls
ESC c L	Clear unprotected to end of line with nulls
ESC c M	Insert column of nulls
ESC c N *width height*	Box rectangle to right of cursor
ESC c O	Clear unprotected to end of line with spaces
ESC c P	Clear unprotected page foreground to spaces
ESC c Q	Clear unprotected page foreground to nulls
ESC c R	Clear unprotected line foreground to spaces
ESC c S	Clear unprotected line foreground to nulls
ESC c U	Clear all programmable keys

Table D-2 Escape Sequences in ASCII Order, Continued

Escape Sequence	Action
ESC d SPACE	Secondary receive mode off
ESC d !	Secondary receive mode on
ESC d #	Transparent print mode on
ESC d $	Bidirectional mode off
ESC d %	Bidirectional mode on
ESC d &	Begin print/send at top of screen
ESC d '	Begin print/send at top of page
ESC d *	Autopage mode off
ESC d +	Autopage mode on
ESC d .	End-of-line wrap mode off
ESC d /	End-of-line wrap mode on
ESC e SPACE	Answerback mode off
ESC e !	Answerback mode on
ESC e "	Page edit mode off
ESC e #	Page edit mode on
ESC e $	Keyclick off
ESC e %	Keyclick on
ESC e &	CAPS LOCK on
ESC e '	CAPS LOCK off
ESC e (	Display 24 data lines
ESC e)	Display 25 data lines
ESC e *	Display 42 data lines
ESC e +	Display 43 data lines
ESC e ,	Key repeat off
ESC e -	Key repeat on
ESC e .	Width-change-clear mode off
ESC e /	Width-change-clear mode on
ESC e 0	Character attribute mode off
ESC e 1	Character attribute mode on
ESC e 2	Page attribute mode on
ESC e 3	Line attribute mode on
ESC e 4	Received CR mode off
ESC e 5	Received CR mode on
ESC e 6	ACK mode off
ESC e 7	ACK mode on
ESC e 8	Select MODEM port for data communications

Table D-2 Escape Sequences in ASCII Order, Continued

Escape Sequence	Action
ESC e 9	Select AUX port for data communications
ESC e :	Don't initialize tabs
ESC e ;	Initialize tabs
ESC e F	Economy 80-column mode off
ESC e G	Economy 80-column mode on
ESC e J	Don't save function key labels
ESC e K	Save function key labels
ESC e L	Margin bell off
ESC e M	Margin bell on
ESC e N	Automatic font loading off
ESC e O	Automatic font loading on
ESC e P	Screen saver off
ESC e Q	Screen saver on
ESC e T	Define CAPS LOCK key as CAPS LOCK
ESC e U	Define CAPS LOCK key as REV
ESC f	
ESC g	
ESC h	
ESC i	Tabulate cursor
ESC j	Move cursor up; scroll
ESC k	Local edit mode on, duplex edit mode off
ESC l	Duplex edit mode on, local edit mode off
ESC m	
ESC n	
ESC o	
ESC p	Print unformatted page
ESC q	Insert mode on, replace mode off
ESC r	Insert mode off, replace mode on
ESC s	Send entire block
ESC t	Clear unprotected line to nulls from cursor
ESC u	Monitor mode off
ESC v	
ESC w *length*	Divide memory into pages
ESC w *page*	Display specific page
ESC w B	Display previous page
ESC w C	Display next page

Table D-2 Escape Sequences in ASCII Order, Continued

Escape Sequence	Action
ESC w E	Roll window up in page
ESC w F	Roll window down in page
ESC w @ *page line col*	Address cursor in specific 80-column page
ESC w '	Read 80-column page number and cursor address
ESC x 0	Redefine screen as one window and clear pages
ESC x 1 *line*	Split screen and clear pages (two pages only
ESC x 3 *line*	Split screen and clear pages
ESC x @	Redefine screen as one window
ESC x A *line*	Split screen (two pages only)
ESC x C *line*	Split screen
ESC x P	Lower horizontal split
ESC x R	Raise horizontal split
ESC y	Clear unprotected page to nulls from cursor
ESC z *fkey sequence* DEL	Program function key definition
ESC z *key* DEL	Clear key definition
ESC z *field label* CR	Program/display function key label
ESC z *field* CR	Clear function key label
ESC z (*text* CR	Program/display unshifted label line
ESC z) *text* CR	Program shifted label line
ESC z (CR	Clear unshifted label line message
ESC z) CR	Clear shifted label line message
ESC z P CR	Display shifted label line
ESC z DEL	Shifted label line off
ESC {	Home cursor
ESC |	
ESC }	Activate lower window
ESC ~ SPACE	Enhance mode off
ESC ~ !	Enhance mode on
ESC ~ .	Wyseword mode off
ESC ~ /	Wyseword mode on
ESC ~ 2	Application key mode off
ESC ~ 3	Application key mode on
ESC ~ *mode*	Select terminal personality
ESC DEL	

Appendix **E**

ASCII Code Conversion Listing

ASCII Character	Dec	Hex	ASCII Character	Dec	Hex
NUL	000	00	SP	032	20
SOH	001	01	!	033	21
STX	002	02	"	034	22
ETX	003	03	#	035	23
EOT	004	04	$	036	24
ENQ	005	05	%	037	25
ACK	006	06	&	038	26
BEL	007	07	'	039	27
BS	008	08	(	040	28
HT	009	09	)	041	29
LF	010	0A	*	042	2A
VT	011	0B	+	043	2B
FF	012	0C	,	044	2C
CR	013	0D	-	045	2D
SO	014	0E	.	046	2E
SI	015	0F	/	047	2F
DLE	016	10	0	048	30
DC1	017	11	1	049	31
DC2	018	12	2	050	32
DC3	019	13	3	051	33
DC4	020	14	4	052	34
NAK	021	15	5	053	35
SYN	022	16	6	054	36
ETB	023	17	7	055	37
CAN	024	18	8	056	38
EM	025	19	9	057	39
SUB	026	1A	:	058	3A
ESC	027	1B	;	059	3B
FS	028	1C	<	060	3C
GS	029	1D	=	061	3D
RS	030	1E	>	062	3E
US	031	1F	?	063	3F

ASCII Character	Dec	Hex	ASCII Character	Dec	Hex
@	064	40	`	096	60
A	065	41	a	097	61
B	066	42	b	098	62
C	067	43	c	099	63
D	068	44	d	100	64
E	069	45	e	101	65
F	070	46	f	102	66
G	071	47	g	103	67
H	072	48	h	104	68
I	073	49	i	105	69
J	074	4A	j	106	6A
K	075	4B	k	107	6B
L	076	4C	l	108	6C
M	077	4D	m	109	6D
N	078	4E	n	110	6E
O	079	4F	o	111	6F
P	080	50	p	112	70
Q	081	51	q	113	71
R	082	52	r	114	72
S	083	53	s	115	73
T	084	54	t	116	74
U	085	55	u	117	75
V	086	56	v	118	76
W	087	57	w	119	77
X	088	58	x	120	78
Y	089	59	y	121	79
Z	090	5A	z	122	7A
[	091	5B	{	123	7B
\	092	5C	¦	124	7C
]	093	5D	}	125	7D
^	094	5E	~	126	7E
—	095	5F	DEL	127	7F

Appendix F ASCII Personalities

This appendix provides supplementary information on the terminal's operation in nonnative ASCII personalities. See the *User's Guide* for a complete list of the commands and key codes supported in these personalities.

Character Sets

Unless automatic font load is turned off, the terminal loads the character sets listed in Table F-1 when it enters another personality. (The character sets are illustrated in Chapter 7.)

Table F-1 Default Character Sets in ASCII Personalities

Personality	Character Set
WY50+	Native Mode
TVI 910+	Native Mode
TVI 925	Native Mode
ADDS VP A2	Standard ASCII
HZ 1500	Native Mode
TVI 912/920	Native Mode
TVI 950	Native Mode
DG200	Standard ASCII
IBM 3101-1X	Standard ASCII
ADM 31	Native Mode
TVI 955	Standard ASCII
PC Term	PC Equivalent
IBM 3101-2X	Standard ASCII
IBM 3161	Standard ASCII
ADDS VP 60	Standard ASCII

Nonhidden Attributes

The following ASCII personalities have nonhidden (embedded) display attributes that appear on the screen as space characters:

- WY-50+
- ADM 31
- ADDS VP A2

- o HZ 1500
- o TVI 910+
- o TVI 912/920
- o TVI 925
- o TVI 950

Nonhidden attributes affect some of the commands described in Chapter 4. The effects are listed in Table F-2 and explained in the following sections.

Table F-2 Command Variations in Nonhidden Attribute Modes

Command	Description
ESC w *length*	More pages of memory are available.
ESC w *page** ESC w @ *page line col* ESC - *page line col*	In these three commands, *page* values can be 0 through 6, depending in the number of lines and the status of economy mode (see Table F-3).
ESC z *field*	Function key labels are limited to eight *label* CR characters for an 80-column screen.
ESC A *field attr*	All display attributes can be assigned to the data area field.
ESC G *attr*	Display attributes are assigned to the screen or line, not to a character or page.
ESC ! *attr*	A page can be cleared to a display attribute.

* Also available are local keyboard commands CTRL 4, CTRL 5, and CTRL 6, which display pages 4, 5, and 6. These number keys are located on the numeric keypad.

More Pages of Memory

Table F-3 shows the number of pages available in the nonhidden attribute modes. (Table 4-2 in Chapter 4 summarizes the pages available in the hidden attribute modes.)

☐ **Note** The terminal supports only 24 lines to a page in all nonhidden attribute personalities except WY-50+.

Table F-3 Valid Page Configurations in Nonhidden Attribute Modes

Data Lines	Multiplier	80/132 Columns Lines Per Page	80/132 Columns No. of Pages	Economy 80 Columns Lines Per Page	Economy 80 Columns No. of Pages
24	1 x lines	24	4	24	7
	2 x lines	48	2	48	3
	4 x lines	96	1	96	1
	*	24 and 79	2	24 and 145	2
25	1 x lines	25	4	25	6
	2 x lines	50	2	50	3
	4 x lines	100	1	100	1
	*	25 and 78	2	25 and 144	2
42	1 x lines	42	2	42	4
	2 x lines	84	1	84	2
	4 x lines	NA		168	1
	*	42 and 61	2	42 and 127	2
43	1 x lines	43	2	43	3
	2 x lines	86	1	86	1
	*	43 and 60	2	43 and 126	2

Display Attributes

In the nonhidden attribute modes, you can assign all the display attributes to the data area of the screen.

The ESC G *attr* command assigns the display attribute from the cursor position to the end of the screen (or line in line attribute mode).

Additional Command

The following command is available in the nonhidden attribute modes:

Clear unprotected page to display attribute ESC ! *attr*

The attribute replaces all unprotected characters on the page, regardless of the cursor's position, but is only displayed as data is entered.

☐ **Note** After you clear the page to any display attribute except the normal attribute, avoid entering data in the first position (line 1, column 1) or the attribute won't take effect in that line.

Additional Information On Individual Personalities	
WY-50+ Mode	For complete compatibility with the WY-50+ terminal, enhance mode must be off.
ADDS VP-60 Mode	The line terminator is selected by the VP60 BLK END parameter in setup mode. The terminal supports the following local print functions: o [PRINT] sends unprotected data to the printer. o [SEND] sends all data to the computer.
DG200 and DG210 Modes	In leaving setup mode, the terminal sets the END-OF-LINE WRAP parameter to "off" and disables protect mode. The terminal supports the following local print functions: o [PRINT] sends all characters to the printer (like CTRL Q). o [SEND] sends unprotected characters to the printer (like CTRL A). o [CTRL] [PRINT] toggles transparent print mode.
IBM Modes	A special group of setup parameters displays on the screen when you select the MISC setup level (F6) while in an IBM personality. These parameters are described in Chapter 2 of the *User's Guide*. Table F-4 lists local key functions in IBM modes.
PC Term Mode	Keys send scan codes (see *User's Guide*). No keys can be redefined in this personality. A special receive handshaking protocol is selectable in the COMM level of setup mode (see the XPC HANDSHAKE parameter in the setup chapter of the *User's Guide*).
TeleVideo 955 Mode	The TVI 955 ATTRIBUTE parameter in setup mode controls whether display attributes are hidden or nonhidden in TVI 955 mode.

Table F-4 IBM Mode Local Key Functions

Function	Keyboard Style IBM 316X	WY-60 ASCII	AT	Enhanced PC
Select cursor style	ALT CSR[1]			
Send break to MODEM port	BREAK	BREAK	BREAK	BREAK
Hold data on screen[2]	HOLD	FUNCT	SCROLL LOCK	SCROLL LOCK
Toggle line drawing mode	LINE DRAW[1]			
Print page	PRINT	PRT SC	PRINT SCREEN	
Print line	PRINT LINE			
Print message	PR MSG			
Partially reset terminal, including communication; unlock keyboard; turn off all print modes	RESET	SETUP	SYS REQ	SELECT
Put terminal in setup mode	SETUP	SHIFT SETUP	SHIFT SYS REQ	SHIFT SELECT
Send page	SEND	SEND		
Send line	SEND LINE			
Send message	SN MSG			
Toggle subscript mode	SUB[1]			
Toggle superscript mode	SUPER[1]			

1. Always local.
2. When CORNER KEY setup parameter is set to HOLD.

Appendix G

ANSI Personalities

This appendix describes the commands supported in the terminal's ANSI personalities:

- o WY-75
- o VT52
- o VT100

The command descriptions assume a basic working knowledge of ANSI-based terminals.

Table G-1 lists the commands under functional headings. Within a command sequence, parameters are underlined: *Pn* represents a numeric parameter; *Ps* represents a selective parameter whose values are listed immediately following the command.

Table G-2 lists mnemonic names. Tables G-3 through G-6 list key codes.

Table G-1 ANSI Commands

Function	Mnemonic	Command Sequence WY-75/VT100	VT52
Communicating with the Computer			
Send ACK/ answerback message		CTRL E	CTRL E
Resume transmission (after suspension by CTRL S)		CTRL Q	CTRL Q
Suspend transmission (when transmit handshaking is X-on/X-off)		CTRL S	CTRL S
Delay processing for about 250 milliseconds	WYDELAY	ESC ,	
Request terminal ID	WYID	ESC SPACE	
	DECID	ESC Z	ESC Z
	DA	ESC [0 c	
Response (WYID): 75 CR (WY-75 mode) 60 CR (all other modes)			

Table G-1 ANSI Commands, Continued

Function	Mnemonic	Command Sequence WY-75/VT100	VT52
Response (DECID or DA): ESC [? 1 ; 0 c (WY 75 mode)[1] ESC [? 1 ; 2 c (VT100 mode)[2] ESC / Z (VT 52 mode)			
Request status report	DSR	ESC [*Ps* n	
Ps Request Report 5 Terminal status Ready: ESC [0 n 6 Cursor position Line/column: ESC [*Pn*;*Pn* R 15 Printer status Ready: ESC [? 10 n Busy: ESC [? 11 n			
Abort escape sequence, display error character		CTRL X or CTRL Z	CTRL X or CTRL Z
Controlling the Terminal			
Enter VT100 mode (from VT52 mode)			ESC <
Terminal modes on (set)	SM	ESC [*Ps*; ...;*Ps* h	
Terminal modes off (reset)[3]	RM	ESC [*Ps*; ...;*Ps* l	

Ps[4]	Mode	Mnemonic	Default[5]
1	Transfer enhanced data[6]	GATM	On
2	Keyboard lock	KAM	Off
3	Monitor	CRM	Off
4	Insert character	IRM	Off
6	Clear enhanced data[6]	ERM	On
12	Local echo disable	SRM	NVR
13	Disable control execution	FEAM	Off
16	Cursor transfer termination	TTM	On
20	Newline (received CR mode)	LNM	NVR
?1	Cursor key	DECCKM	Off
?2	VT100[7]	DECANM	NVR
?3	132-column	DECCOLM	NVR
?4	Smooth scroll	DECSCLM	NVR
?5	Reverse screen	DECSCNM	NVR
?6	Origin	DECOM	Off
?7	Character wrap (end-of-line wrap mode)	DECAWM	NVR
?8	Auto repeat (key repeat mode)	DECARM	NVR
?10	Block	DECEDM	NVR
?18	Print form feed	DECPFF	Off
?19	Print full screen	DECPEX	On
?25	Enable cursor	DECTCEM	NVR

1. Mode without AVO. Attributes are nonhidden in WY-75 mode.
2. Mode with AVO. Attributes are hidden in VT100 (and VT52) mode.
3. Final character in sequence is a lowercase L.
4. Up to 16 modes can be changed with one sequence. When a Ps value contains a question mark (?), subsequent parameters are treated as if they were immediately preceded by a question mark.
5. When terminal is turned on or reset. "NVR" signifies that the mode is on or off according to the value saved in nonvolatile memory.
6. WY 75 mode only.
7. When off, VT52 mode is enabled.

Table G-1 ANSI Commands, Continued

Function	Mnemonic	Command Sequence WY-75/VT100	VT52
Ps[4] Mode	Mnemonic	Default[5]	
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	
40 Select 25th/43rd data line	WYSEDL	NVR	
41 Select 42/43 data lines	WYSL44	NVR	
42 WY 60 (from VT100 or WY 75 mode)	WY60	NVR	
43 WY-75 (from VT100 mode)	WY75	NVR	
44 VT100 (from WY 75 mode)	VT100	NVR	
Reset terminal to initial state[8]	RIS	ESC c	
Reset all terminal modes[8]	DECSTR	ESC ! p	
Sound bell		CTRL G	CTRL G
Keypad application mode on	DECKPAM	ESC =	ESC =
Keypad application mode off	DECKPNM	ESC >	ESC >
Restore saved cursor position, character sets, and attribute[9]	DECRC or WYRC	ESC 8 ESC [u	
Save cursor position, character sets, and attribute[9]	DECSC or WYSC	ESC 7 or ESC [s	
Programming Message Fields and Function Keys			
Load text	WYTLOAD	ESC [> *Ps delim text delim*	
Clear text	WYTLOAD	ESC [> *Ps delim delim*	

text = character string[10]

delim = *text* terminator (any ASCII character not used in *text*)[11]

Ps = Computer message field or function key:

8. When X-on/X-off handshaking is active, an XON (DC1) character is sent after execution of this command.
9. Attribute in VT100 mode only.
10. Including any ASCII character except NUL, DEL, or DC1 and DC3 if XON/XOFF handshaking is enabled. (SO and SI have the special function indicated in note 12.)
11. Except NUL, DEL, SO, SI, or DC1 and DC3 if X-on/X-off handshaking is enabled.

Table G-1 ANSI Commands, Continued

Function	Mnemonic	Command Sequence WY-75/VT100	VT52

Ps	Computer Message Field[12]	Maximum *text* Characters 80 Columns	132 Columns
+	Status line	46	98
,	Unshifted label line	78	130
-	Shifted label line	78	130

	Ps			*Ps*	
Key[13]	Unshifted	Shifted	Key[13]	Unshifted	Shifted
F1	A	F	F9	d	o
F2	B	G	F10	e	p
F3	C	H	F11	f	q
F4	D	I	F12	g	r
F5	E	J	F13	h	s
F6	a	l	F14	i	t
F7	b	m	F15	j	u
F8	c	n	F16	k	v

Screen Display/Attributes

Display screen alignment pattern (fill screen with *E*'s)	DECALN	ESC # 8
Display next page *Pn* = number of pages forward	NP	ESC [*Pn* U
Display previous page *Pn* = number of pages back	PP	ESC [*Pn* V
Define scrolling region *Pn* = beginning line number; ending line number[14]	DECSTBM	ESC [*Pn*; *Pn* r

12. The following field attributes may be assigned to the message fields by including the control characters SO (CTRL N) and SI (CTRL O) in the text string as indicated:

Normal	SO SI @	Reverse, dim	SO SI Q
Dim	SO SI A	Reverse, blink	SO SI R
Blink	SO SI B	Reverse, blink, dim	SO SI S
Blink, dim	SO SI C	Reverse, invisible	SO SI T
Invisible	SO SI D	Reverse, invisible, dim	SO SI U
Invisible, dim	SO SI E	Reverse, underline	SO SI X
Underline	SO SI H	Reverse, underline, dim	SO SI Y
Underline, dim	SO SI I	Reverse, underline, blink	SO SI Z
Underline, blink	SO SI J	Reverse, underline, blink, dim	SO SI [
Underline, blink, dim	SO SI K	Reverse, underline, invisible	SO SI \
Underline, invisible,	SO SI L	Reverse, underline, invisible, dim	SO SI]
Underline, invisible, dim	SO SI M	Reverse, underline, invisible,	SO SI ^
Underline, invisible, blink	SO SI N	blink	
Underline, invisible, blink, dim	SO SI O	Reverse, underline, invisible,	SO SI _
Reverse	SO SI P	blink, dim	

13. Maximum text characters in function key are 64.
14. If the second parameter is 0 or absent, the ending line is the last line on the screen.

Table G-1 ANSI Commands, Continued

Function	Mnemonic	Command Sequence WY-75/VT100	VT52

Control simulated keyboard LEDs in computer message field — DECLL — ESC [*Ps*; ...;*Ps* q

Ps	LED
0	L1 to L4 off
1	L1 on
2	L2 on
3	L3 on
4	L4 on

Define video attribute — SGR — ESC [*Ps*;...;*Ps* m

Ps	Video Attribute WY-75 Mode[15]	Video Attribute VT100 Mode[16]	*Ps*	Video Attribute WY-75 Mode	Video Attribute VT100 Mode[16]
0	Normal	Attributes off	7		Reverse
Non-0	Enhanced[17]		8		Invisible[18]
1		Bold[18]	22		Normal
2		Dim[18]	24		Underline off
4		Underline	25		Blink off
5		Blink	27		Reverse off

Define enhance attribute (WY-75 mode only; see SGR) — WYNNAT — ESC [*Ps* t

Ps	Attribute
0	Dim
1	Reverse
2	Underline
3	Blink
4	Invisible

Assign field attribute from cursor location to end of screen or start of next attribute (WY-75 mode only) — WYFDAT — ESC [*Ps* p

Ps	Attribute	*Ps*	Attribute	*Ps*	Attribute
0	Normal	11	Underline, blink, dim	22	Reverse, invisible
1	Dim	12	Underline, invisible	23	Reverse, invisible, dim
2	Blink	13	Underline, invisible dim	24	Reverse, underline
3	Blink, dim	14	Underline, invisible, blink	25	Reverse, underline, dim
4	Invisible	15	Underline, invisible, blink, dim	26	Reverse, underline, blink
5	Invisible, dim	16	Reverse	27	Reverse, underline, blink, dim
6	Invisible	17	Reverse, dim	28	Reverse, underline, invisible
7	Invisible, dim	18	Reverse, blink	29	Reverse, underline, invisible, dim
8	Underline	19	Reverse, blink, dim	30	Reverse, underline, invisible, blink
9	Underline, dim	20	Reverse, invisible	31	Reverse, underline, invisible, blink, dim
10	Underline, blink	21	Reverse, invisible, dim		

15. Standard ANSI characters are always displayed with the normal attribute.
16. ANSI Graphics characters are displayed with the current attribute.
17. See WYNNAT.
18. Bold, dim, and invisible cannot be combined.

Table G-1 ANSI Commands, Continued

Function	Mnemonic	Command Sequence WY-75/VT100	VT52
Enable top half of double-high, double-wide line	DECDHL	ESC # 3	
Enable bottom half of double-high, double-wide line	DECDHL	ESC # 4	
Enable single-high, single-wide line	DECSWL	ESC # 5	
Enable single-high, double-wide line	DECDWL	ESC # 6	
Enable top half of double-high, single-wide line	WYDHL	ESC # :	
Enable bottom half of double-high, single-wide line	WYDHL	ESC # ;	
Controlling the Cursor			
Cursor right one column		ESC [C	ESC C
Cursor right *Pn* columns	CUF	ESC [*Pn* C	
Cursor left one column		CTRL H	CTRL H or ESC D
Cursor left *Pn* columns	CUB	ESC [*Pn* D	
Cursor up one line; no scroll			ESC A
Cursor up one line; scroll	RI	ESC M	ESC I
Cursor up *Pn* lines	CUU	ESC [*Pn* A	
Cursor up *Pn* lines and to column 1	CPL	ESC [*Pn* F	
Cursor down *Pn* lines and to column 1	CNL	ESC [*Pn* E	
Cursor down one line; scroll	IND	ESC D	
Cursor down one line; scroll (LF)		CTRL J or CTRL K or CTRL L	CTRL J or CTRL K or CTRL L or ESC B
Cursor down *Pn* lines	CUD	ESC [*Pn* B	
Cursor to start of line (CR)		CTRL M	CTRL M
Cursor to start of next line; scroll	NEL	ESC E	
Cursor to column *Pn*	CHA	ESC [*Pn* G	
Cursor to line *Pn*; column *Pn*	CUP HVP	ESC [*Pn*; *Pn* H or ESC [*Pn*; *Pn* f	ESC Y *line col*[19]

19. line and col are the hexidecimal codes for the line or column number plus 1FH (or the ASCII line and column codes in Appendix H).

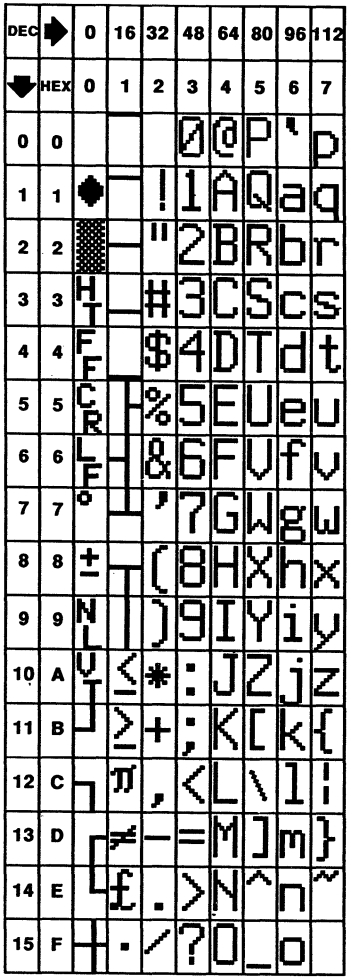
Table G-1 ANSI Commands, Continued

Function	Mnemonic	Command Sequence WY-75/VT100	VT52
Editing			
Home cursor			ESC H
Set tab stop at cursor position	HTS	ESC H	
Clear tab stop at cursor position	TBC	ESC [0 g	
Clear all tab stops	TBC	ESC [3 g	
Move cursor to next tab stop, or right margin		CTRL I	CTRL I
Move cursor forward *Pn* tab stops	CHT	ESC [*Pn* I	
Move cursor backward *Pn* tab stops	CBT	ESC [*Pn* Z	
Insert *Pn* null characters beginning at cursor column	ICH	ESC [*Pn* @	
Insert *Pn* lines of null characters beginning at cursor line	IL	ESC [*Pn* L	
Delete *Pn* lines beginning at cursor line	DL	ESC [*Pn* M	
Delete *Pn* characters beginning at cursor column	DCH	ESC [*Pn* P	
Erase in display	ED		
From cursor to end of screen		ESC [0 J	ESC J
From beginning through cursor		ESC [1 J	
Entire screen		ESC [2 J	
Erase only normally enhanced data (WY-75 mode only)	DECSED		
From cursor to end of screen		ESC [? 0 J	
From beginning through cursor		ESC [? 1 J	
Entire screen		ESC [? 2 J	
Erase in line	EL		
From cursor to end of line		ESC [0 K	ESC K
From start of line through cursor		ESC [1 K	
Entire line		ESC [2 K	
Erase only normally enhanced data in line (WY-75 mode only)	DECSEL		
From cursor to end of line		ESC [? 0 K	
From start of line through cursor		ESC [? 1 K	
Entire line		ESC [? 2 K	
Erase *Pn* characters beginning at cursor column	ECH	ESC [*Pn* X	

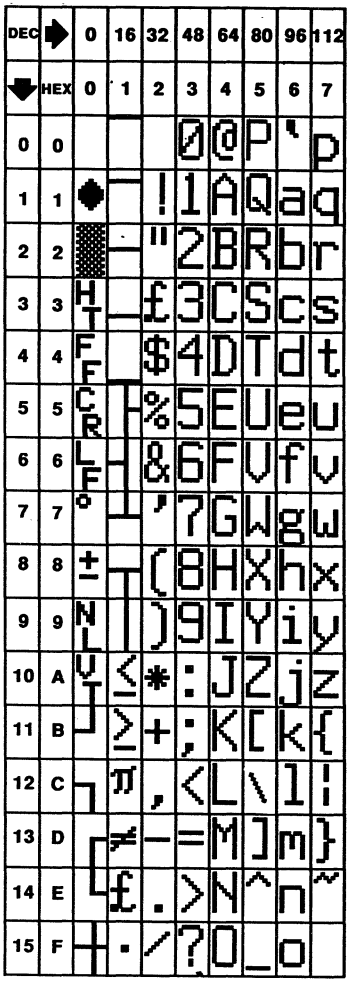
Table G-1 ANSI Commands, Continued

Function	Mnemonic	Command Sequence WY-75/VT100	VT52
Sending/Printing Data			
Media copy	MC	ESC [*Ps* i	
Ps Action			
0 Copy entire screen display to printer port			
2 Copy entire screen display to data port			
4 Turn off transparent print mode			
5 Turn on transparent print mode			
?1 Copy cursor line to printer port			
?3 Copy cursor line to data port			
?4 Turn off auxiliary print mode			
?5 Turn on auxiliary print mode			
Send cursor character (WY-75 mode only)	WYXCH	ESC 5	
Copy screen display to printer port			ESC]
Copy cursor line to printer port			ESC V
Auxiliary print mode on			ESC ^
Auxiliary print mode off			ESC _
Transparent print mode on			ESC W
Transparent print mode off			ESC X
Character Sets			
Select G0 character set	SCS	CTRL O	CTRL O
Select G1 character set	SCS	CTRL N	CTRL N
Select ANSI Graphics character set	SCS		ESC F
Select Standard ANSI character set	SCS		ESC G
Change G0 character set to ANSI Graphics set	SCS	ESC (0	
Change G0 character set to UK ANSI set	SCS	ESC (A	
Change G0 character set to Standard ANSI set	SCS	ESC (B	
Change G1 character set to ANSI Graphics set	SCS	ESC) 0	
Change G1 character set to UK ANSI set	SCS	ESC) A	
Change G1 character set to Standard ANSI set	SCS	ESC) B	

Standard ANSI



UK ANSI



ANSI Graphics

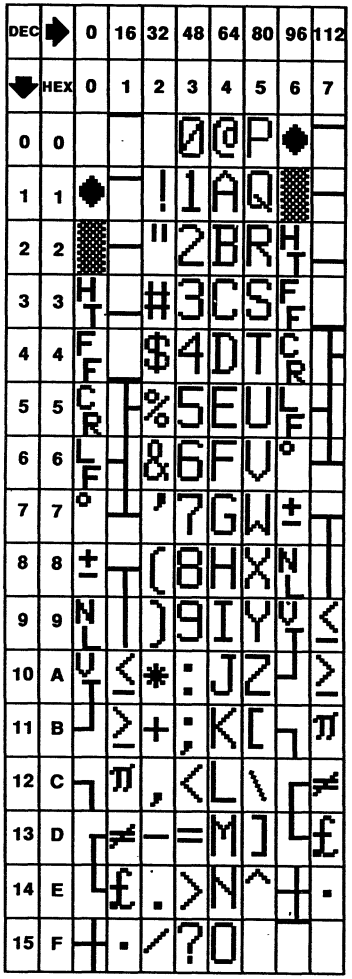


Table G-2 Mnemonic Names

Mnemonic*	Name	Mnemonic*	Name
CBT	Cursor Backward Tabulation	FEAM	Format Effector Action Mode
CHA	Cursor Horizontal Absolute	GATM	Guarded Area Transfer Mode
CHT	Cursor Horizontal Tabulation	HTS	Horizontal Tabulation Set
CNL	Cursor Next Line	HVP	Horizontal and Vertical Position
CPL	Cursor Preceding Line	ICH	Insert Character
CRM	Control Representation Mode	IL	Insert Line
CUB	Cursor Backward	IND	Index
CUD	Cursor Down	IRM	Insertion-Replacement Mode
CUF	Cursor Forward	KAM	Keyboard Action Mode
CUP	Cursor Position	LNM	Line Feed New Line Mode
CUU	Cursor Up	MC	Media Copy
DA	Device Attributes	NEL	Next Line
DCH	Delete Character	NP	Next Page
DECALN	Screen Alignment Display	PP	Preceding Page
DECANM	ANSI/VT52 Mode	RI	Reverse Index
DECARM	Auto Repeat Mode	RIS	Reset to Initial State
DECAWM	Autowrap Mode	RM	Reset Mode
DECCKM	Cursor Keys Mode	SCS	Select Character Set
DECCOLM	Column Mode	SGR	Select Graphic Rendition
DECDHL	Double-Height Line	SM	Set Mode
DECDWL	Double-Width Line	SRM	Send-Receive Mode
DECEDM	Editing Mode	TBC	Tabulation Clear
DECID	Identify Terminal	TTM	Transfer Termination Mode
DECKPAM	Keypad Application Mode	VT100	VT100 Mode
DECKPNM	Keypad Numeric Mode	WY60	WY-60 Mode
DECLL	Load LEDS	WY75	WY-75 Mode
DECOM	Origin Mode	WYCLRM	Width-Change-Clear Disable Mode
DECPEX	Print Extent	WYCRTSAVM	CRT Saver Mode
DECPFF	Printer Form Feed	WYDELAY	Delay Processing
DECRC	Restore Cursor	WYDHL	Double High Line
DECSC	Save Cursor	WYDSCM	Disable Screen Mode
DECSCLM	Scrolling Mode	WYFDAT	Field Attribute
DECSCNM	Screen Mode	WYID	Terminal Identification
DECSED	Selective Erase in Display	WYNNAT	Define Enhance Attribute
DECSEL	Selective Erase in Line	WYRC	Restore Cursor
DECSTBM	Set Top and Bottom Margins	WYSC	Save Cursor
DECSTR	Soft Terminal Reset	WYSEDL	Select Extra Data Line
DECSWL	Single-Width Line	WYSL44	Select 44 Lines
DECTCEM	Text Cursor Enable	WYSTCURM	Steady Cursor Mode
DL	Delete Line	WYSTLINM	Status Line Display Mode
DSR	Device Status Report	WYTLOAD	Text Load
ED	Erase in Display	WYULCURM	Underline Cursor Mode
EL	Erase in Line	WYXCH	Transmit Character
ERM	Erasure Mode		

* Mnemonics beginning with "WY" are Wyse Technology private mnemonics; those beginning with "DEC" are Digital Equipment Corporation private mnemonics; all others are ANSI mnemonics.

Table G-3 Function Key Default Codes

Key	Keyboard Style WY-60 ASCII/IBM 316X Unshifted	Shifted	AT[1]	Enhanced PC[1]
F1	ESC [? 5 i[2]	ESC [5 i[3]	ESC P P	ESC P P
F2	ESC [? 3 i	ESC [? 1 i	ESC P Q	ESC P Q
F3	ESC [2 i	ESC [0 i	ESC P R	ESC P R
F4	ESC [@	ESC [L	ESC P S	ESC P S
F5	ESC [M	ESC [K	Same	Same
F6	ESC [17 ~	ESC [31 ~	Same	Same
F7	ESC [18 ~	ESC [32 ~	Same	Same
F8	ESC [19 ~	ESC [33 ~	Same	Same
F9	ESC [20 ~	ESC [34 ~	Same	Same
F10	ESC [21 ~	ESC [35 ~	Same	Same
F11	ESC [23 ~	ESC [1 ~		Same
F12	ESC [24 ~	ESC [2 ~[4]		Same
F13	ESC [25 ~	ESC [3 ~[5]		
F14	ESC [26 ~	ESC [4 ~		
F15	ESC [28 ~	ESC [5 ~		
F16	ESC [29 ~	ESC [6 ~[6]		

1. On the AT-style and Enhanced PC-style keyboards, function keys F1 through F4, shifted and unshifted, send PF key codes (see Table 2). The remaining function keys send the same codes as the other keyboards.
2. With auxiliary print mode off. Sends ESC [? 4 i if auxiliary print mode is on.
3. With transparent print mode off. Sends ESC [4 i if transparent print mode is on.
4. In full duplex mode. In block mode, toggles insert mode.
5. In full duplex mode. In block mode, deletes cursor character.
6. In full duplex mode. In block mode, clears from cursor to end of screen.

Table G-4 Simulated PF-Key Codes

Key	Keyboard Style WY-60 ASCII	IBM 316X	AT	Enhanced PC	Code WY-75/ VT100	VT52
PF1	INS CHAR/LINE	JUMP	F1	F1	ESC P P	ESC P
PF2	DEL CHAR/LINE	PAGE	F2	F2	ESC P Q	ESC Q
PF3	CLR LINE/SCRN	SEND LINE	F3	F3	ESC P R	ESC R
PF4	REPL/INS	SELECT	F4	F4	ESC P S	ESC S

Table G-5 Keypad Application Mode Codes

Numeric Keypad Key	WY-75 VT100	VT52	Numeric Keypad Key	WY-75 VT100	VT52
*[1]	ESC O l	ESC ? l	4	ESC O t	ESC ? t
,[2]	ESC O l	ESC ? l	5	ESC O u	ESC ? u
-	ESC O m	ESC ? m	6	ESC O v	ESC ? v
.	ESC O n	ESC ? n	7	ESC O w	ESC ? w
0	ESC O p	ESC ? p	8	ESC O x	ESC ? x
1	ESC O q	ESC ? q	9	ESC O y	ESC ? y
2	ESC O r	ESC ? r	ENTER[3]	ESC O M	ESC ? M
3	ESC O s	ESC ? s			

1. AT-style and Enhanced PC-style keyboards only.
2. WY-60 ASCII and 316X-style keyboards only.
3. Not applicable to AT-style keyboard.

Table G-6 Editing and Special Key Codes[1]

Key[2]	Keyboard Style WY-60 ASCII	IBM 316X	AT	Enhanced PC
BACKSPACE	CTRLH	CTRL H	CTRLH	CTRL H
BREAK	(local)[3]	(local)[3]		(local)[3]
SHIFT BREAK	(local)[4]	(local)[4]		(local)[4]
CLR LINE/SCRN[5]	ESC P R			
▲[6]	ESC [A	ESC [A	ESC [A	ESC [A
▼[6]	ESC [B	ESC [B	ESC [B	ESC [B
▶[6]	ESC [C	ESC [C	ESC [C	ESC [C
◀[6]	ESC [D	ESC [D	ESC [D	ESC [D
DEL	(local)[7]	DEL	DEL	DEL
SHIFT DEL	(local)[7]	CTRL X	CTRL X	CTRL X

1. Unless otherwise noted, codes are for both the unshifted and shifted key. Codes for keys located on the numeric keypad apply only in keypad numeric mode and only when NUM LOCK is off on the AT-style and Enhanced PC-style keyboards.
2. Keys are listed alphabetically. Some key names imply the pressing of another key as well--the other key is not specified. (For example, PRINT on the WY-60 ASCII keyboard is a shifted key; BREAK on the IBM 316X keyboard requires the simultaneous pressing of CTRL.)
3. Sends break to MODEM port. Length depends on BREAK parameter selection in setup mode.
4. Sends two-second disconnect break to MODEM port.
5. In VT52 mode, the (first) P is not sent.
6. In VT52 mode, [is not sent. In WY-75 and VT100 modes, [is replaced with O when cursor key mode is on.
7. Toggles block mode.

Table G-6 Editing and Special Key Codes[1]

Key[2]	Keyboard Style WY-60 ASCII	IBM 316X	AT	Enhanced PC
DEL CHAR/LINE[5]	ESC P Q			
ENTER[8]	CTRL M or CTRL M CTRL J or CTRL I	CTRL M or CTRL M CTRL J or CTRL I	CTRL M or CTRL M CTRL J or CTRL I	CTRL M or CTRL M CTRL J or CTRL I
ESC	CTRL [	CTRL [	CTRL [	CTRL [
FUNCT	(local)[9]			
HOLD		(local)[9]		
HOME[6]	ESC [H	ESC [H	ESC [H	ESC [H
SHIFT HOME[10]	(local)	(local)	(local)	(local)
INS/REPL[5]	ESC P S			
INS CHAR/LINE[5]	ESC P P			
LF		CTRL J		
PAGE NEXT/PREV	CTRL J			
PRINT	CTRL X			
RESET		(local)[11]		
RETURN[12]	CTRL M or CTRL M CTRL J or CTRL I	CTRL M or CTRL M CTRL J or CTRL I		
SCROLL LOCK			(local)[9]	(local)[9]
SELECT				(local)[11]
SHIFT SELECT				(local)[13]
SEND	DEL			
SETUP	(local)[11]	(local)[13]		
SHIFT SETUP	(local)[13]			
SYS REQ			(local)[11]	
SHIFT SYS REQ			(local)[13]	
TAB (right)	CTRL I	CTRL I	CTRL I	CTRL I
TAB (left)		ESC [Z		
SHIFT TAB	ESC [Z		ESC [Z	ESC [Z

8. Code depends on ENTER parameter selection in setup mode.
9. Action or code depends on CORNER KEY parameter selection in setup mode.
10. Homes cursor and clears screen.
11. Clears modes and error conditions.
12. Code depends on RETURN parameter selection in setup mode.
13. Puts terminal in setup mode.

Appendix H ASCII Line and Column Codes

Table H-1 ASCII Line Codes[1]

Line	Native Code[2]	ADDS VP A2/60[3] DASHER D200/D210 HZ-1500	Line	Native Code[2]	Line	Native Code[2]
1	SPACE	CTRL @	33	@	65	‘
2	!	CTRL A	34	A	66	a
3	"	CTRL B	35	B	67	b
4	#	CTRL C	36	C	68	c
5	$	CTRL D	37	D	69	d
6	%	CTRL E	38	E	70	e
7	&	CTRL F	39	F	71	f
8	’	CTRL G	40	G	72	g
9	(	CTRL H	41	H	73	h
10	)	CTRL I	42	I	74	i
11	*	CTRL J	43	J	75	j
12	+	CTRL K	44	K	76	k
13	,	CTRL L	45	L	77	l
14	-	CTRL M	46	M	78	m
15	.	CTRL N	47	N	79	n
16	/	CTRL O	48	O	80	o
17	0	CTRL P	49	P	81	p
18	1	CTRL Q	50	Q	82	q
19	2	CTRL R	51	R	83	r
20	3	CTRL S	52	S	84	s
21	4	CTRL T	53	T	85	t
22	5	CTRL U	54	U	86	u
23	6	CTRL V	55	V	87	v
24	7	CTRL W	56	W	88	w
25	8		57	X	89	x
26	9		58	Y	90	y
27	:		59	Z	91	z
28	;		60	[	92	{
29	<		61	\	93	|
30	=		62	]	94	}
31	>		63	^	95	~
32	?		64	_	96	DEL/RUB

1. The terminal supports only 24 lines to a page in all ASCII personalities except WY-50+, DG200, DG210, and PC Term.
2. Native codes also recognized in WY-50+, ADM 31, IBM 3101, IBM 3161, and TeleVideo 910+/920/925/950/955, and PC Term modes.
3. ADDS Viewpoint codes are for vertical addressing (CTRL K). Absolute cursor addressing (ESC Y) codes are the same as the native mode codes.

Table H-2 ASCII Column Codes

Column	Native Code[1]	ADDS VP A2/60[2]	DASHER D200/D210	HZ-1500
1	SPACE	CTRL @	CTRL @	CTRL @
2	!	CTRL A	CTRL A	CTRL A
3	"	CTRL B	CTRL B	CTRL B
4	#	CTRL C	CTRL C	CTRL C
5	$	CTRL D	CTRL D	CTRL D
6	%	CTRL E	CTRL E	CTRL E
7	&	CTRL F	CTRL F	CTRL F
8	'	CTRL G	CTRL G	CTRL G
9	(	CTRL H	CTRL H	CTRL H
10	)	CTRL I	CTRL I	CTRL I
11	*	CTRL P	CTRL J	CTRL J
12	+	CTRL Q	CTRL K	CTRL K
13	,	CTRL R	CTRL L	CTRL L
14	-	CTRL S	CTRL M	CTRL M
15	.	CTRL T	CTRL N	CTRL N
16	/	CTRL U	CTRL O	CTRL O
17	0	CTRL V	CTRL P	CTRL P
18	1	CTRL W	CTRL Q	CTRL Q
19	2	CTRL X	CTRL R	CTRL R
20	3	CTRL Y	CTRL S	CTRL S
21	4	SPACE	CTRL T	CTRL T
22	5	!	CTRL U	CTRL U
23	6	"	CTRL V	CTRL V
24	7	#	CTRL W	CTRL W
25	8	$	CTRL X	CTRL X
26	9	%	CTRL Y	CTRL Y
27	:	&	CTRL Z	SPACE
28	;	'	CTRL [	!
29	<	(	CTRL \	"
20	=	)	CTRL]	#
31	>	0	CTRL ^	$
32	?	1	CTRL _	%
33	@	2	SPACE	&
34	A	3	!	'
35	B	4	"	(
36	C	5	#	)
37	D	6	$	*
38	E	7	%	+

1. Native codes also recognized in WY-50+, ADM 31, IBM 3101, IBM 3161, TeleVideo 910+/920/925/950/955, and PC Term modes.
2. ADDS Viewpoint codes are for horizontal addressing (CTRL P). Absolute cursor addressing (ESC Y) codes are the same as the native codes.

Table H-2 ASCII Column Codes

Column	Native Code[1]	ADDS VP A2/60[2]	DASHER D200/D210	HZ-1500
39	F	8	&	,
40	G	9	'	-
41	H	@	(	.
42	I	A	)	/
43	J	B	*	0
44	K	C	+	1
45	L	D	,	2
46	M	E	-	3
47	N	F	.	4
48	O	G	/	5
49	P	H	0	6
50	Q	I	1	7
51	R	P	2	8
52	S	Q	3	9
53	T	R	4	:
54	U	S	5	;
55	V	T	6	<
56	W	U	7	=
57	X	V	8	>
58	Y	W	9	?
59	Z	X	:	@
60	[	Y	;	A
61	\	/	<	B
62	]	a	=	C
63	^	b	>	D
64	_	c	?	E
65	`	d	@	F
66	a	e	A	G
67	b	f	B	H
68	c	g	C	I
69	d	h	D	J
70	e	i	E	K
71	f	p	F	L
72	g	q	G	M
73	h	r	H	N
74	i	s	I	O
75	j	t	J	P
76	k	u	K	Q
77	l	v	L	R
78	m	w	M	S
79	n	x	N	T
80	o	y	O	U

Appendix I

Display Attributes

Table I-1 Character Display Attribute Values

attr	Display Attribute	*attr*	Display Attribute
SPACE	Space character	p	Dim
0	Normal	q	Dim, invisible
1	Invisible (no display)	r	Dim, blink
2	Blink	s	Dim, blink, invisible
3	Blink, blank	t	Dim, reverse
4	Reverse	u	Dim, reverse, invisible
5	Reverse, invisible	v	Dim, reverse, blink
6	Reverse, blink	w	Dim, reverse, blink, invisible
7	Reverse, blink, invisible	x	Dim, underline
8	Underline	y	Dim, underline, invisible
9	Underline, invisible	z	Dim, underline, blink
:	Underline, blink	{	Dim, underline, blink, invisible
;	Underline, blink, invisible	|	Dim, underline, reverse
<	Underline, reverse	}	Dim, underline, reverse, invisible
=	Underline, reverse, invisible	~	Dim, underline, reverse, blink
>	Underline, reverse, blink	DEL	Dim, underline, reverse, blink, invisible
?	Underline, reverse, blink, invisible		

Table I-2 Write-Protected Character Display Attribute Values

wpca	Display Attribute
6	Reverse
7	Dim (default)
A	Normal
B	Blink on
C	Invisible on
E	Underline on
F	Reverse on
G	Dim on

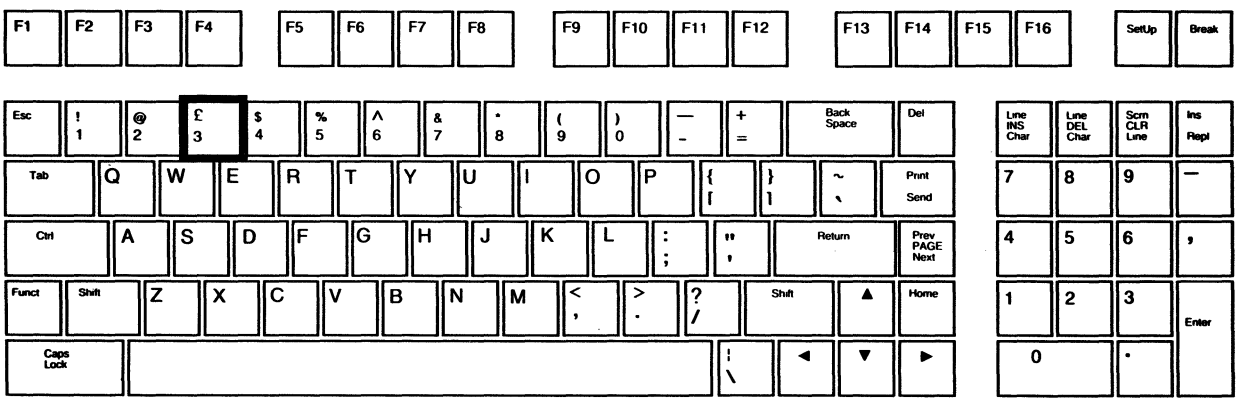
Table I-3 Line Attribute Values

lattr	**Line Attribute**
@	Single-high, single-wide characters (default)
A	Single-high, double-wide characters
B	Top half of double-high, single-wide characters
C	Bottom half of double-high, single-wide characters
D	Top half of double-high, double-wide characters
E	Bottom half of double-high, double-wide characters
G	Normal background
H	Bold background
I	Invisible background (default)
J	Dim background

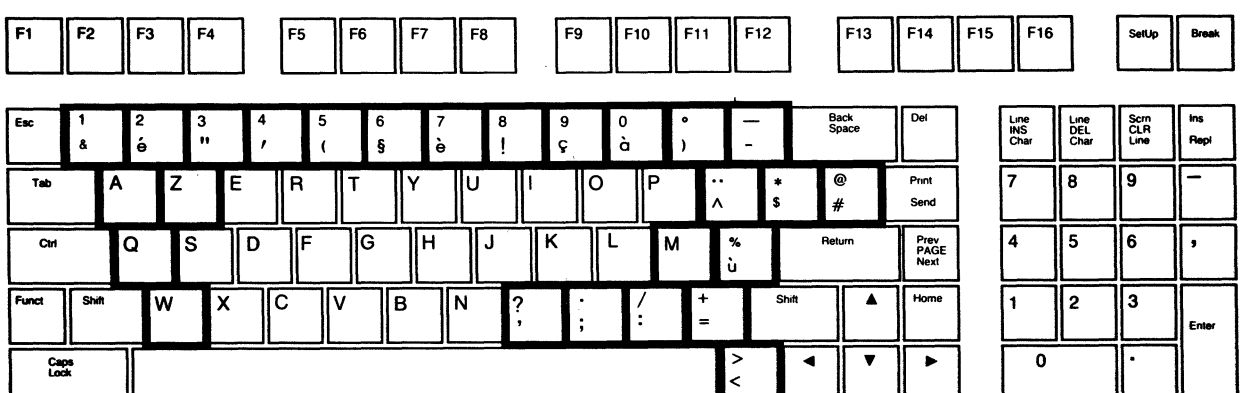
Appendix

J International Keyboard Layouts

Figure J-1 WY-60 ASCII/ANSI International Keyboards

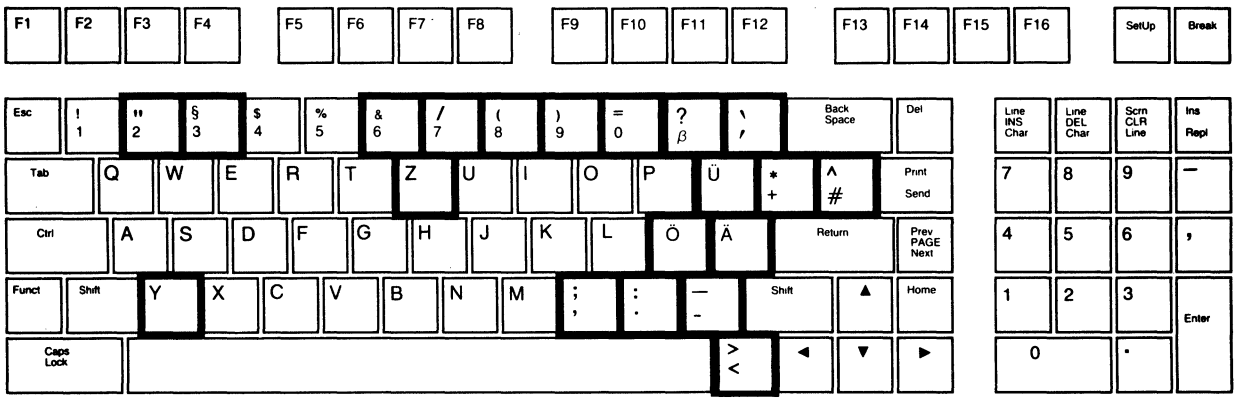


U.K.

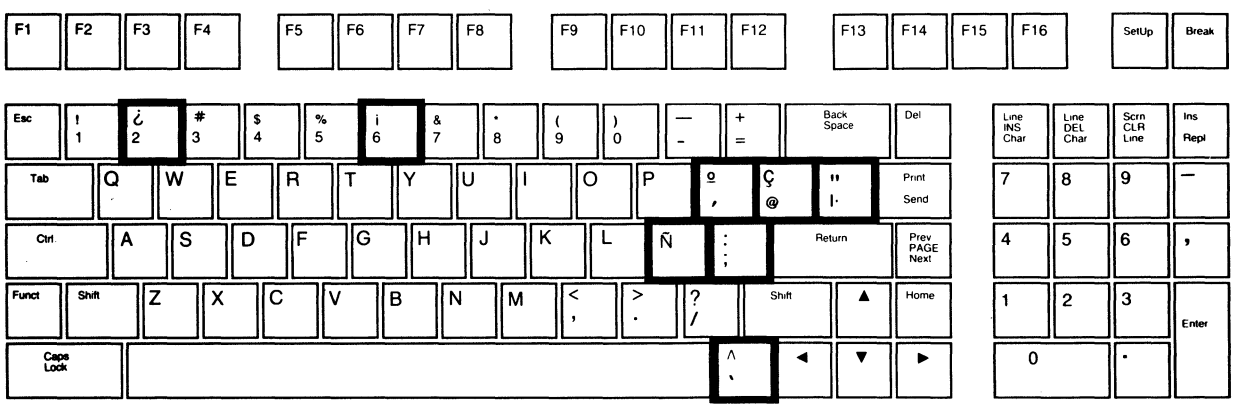


France

Figure J-1 WY-60 ASCII/ANSI International Keyboards, Continued

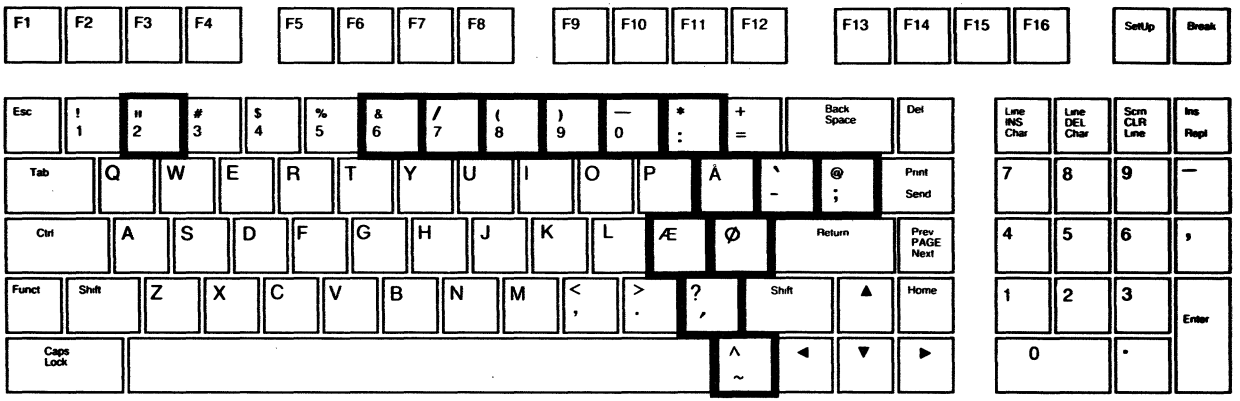


Germany

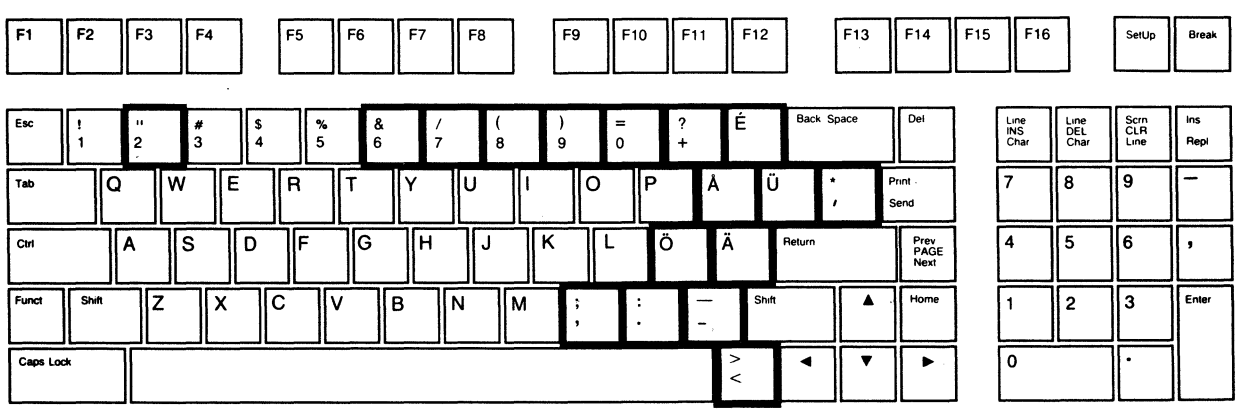


Spain

Figure J-1 WY-60 ASCII/ANSI International Keyboards, Continued

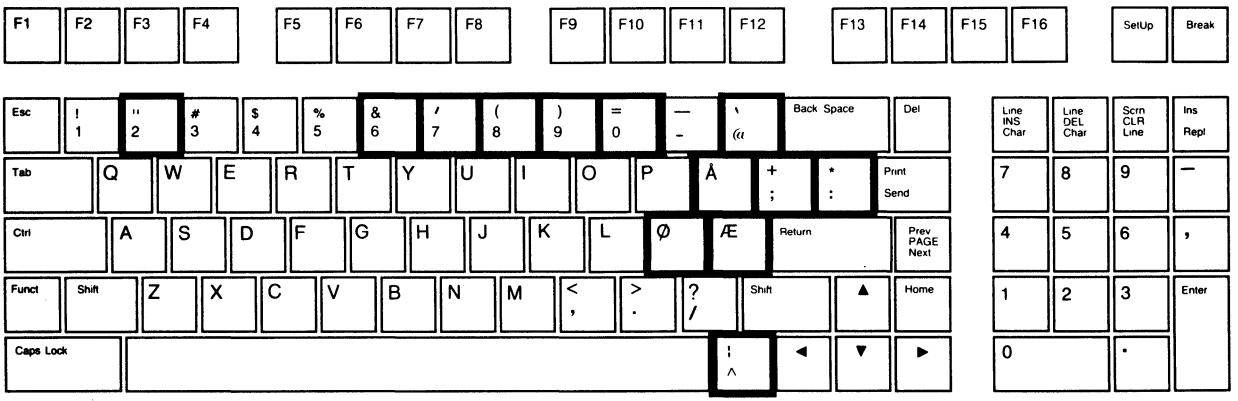


Denmark



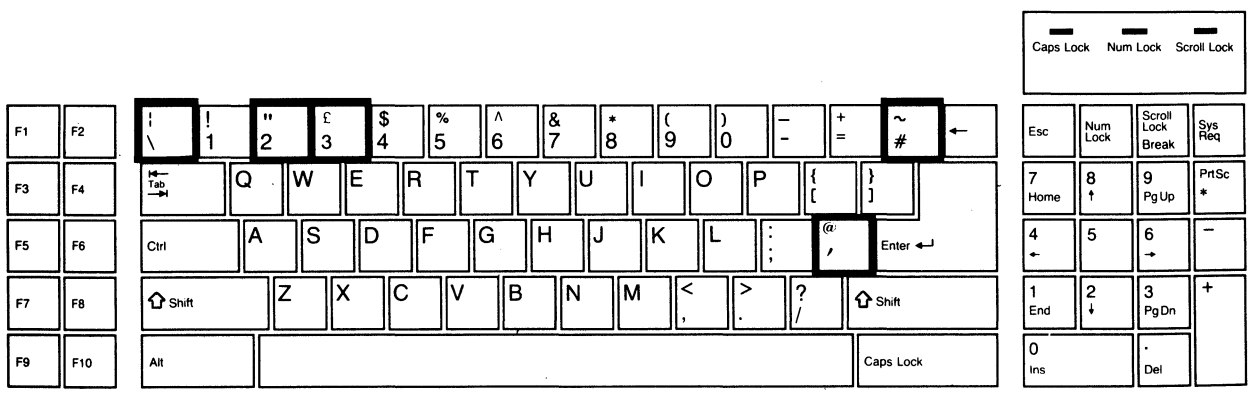
Sweden

Figure J-1 WY-60 ASCII/ANSI International Keyboards, Continued



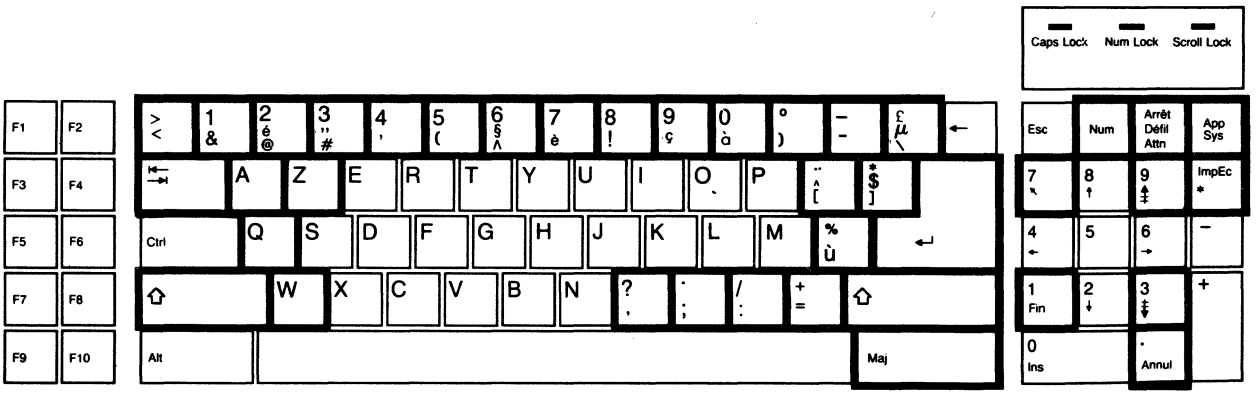
Norway

Figure J-2 AT-Style International Keyboards

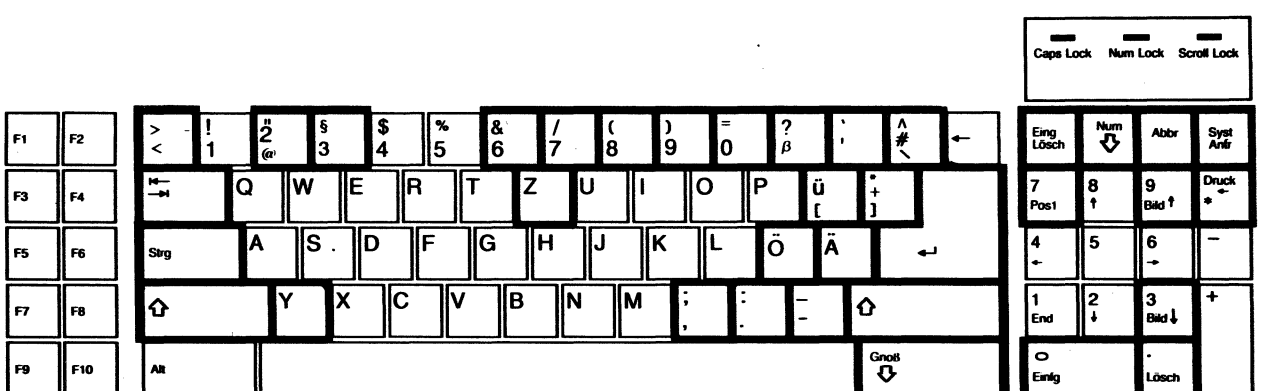


U.K.

Figure J-2 AT-Style International Keyboards, Continued

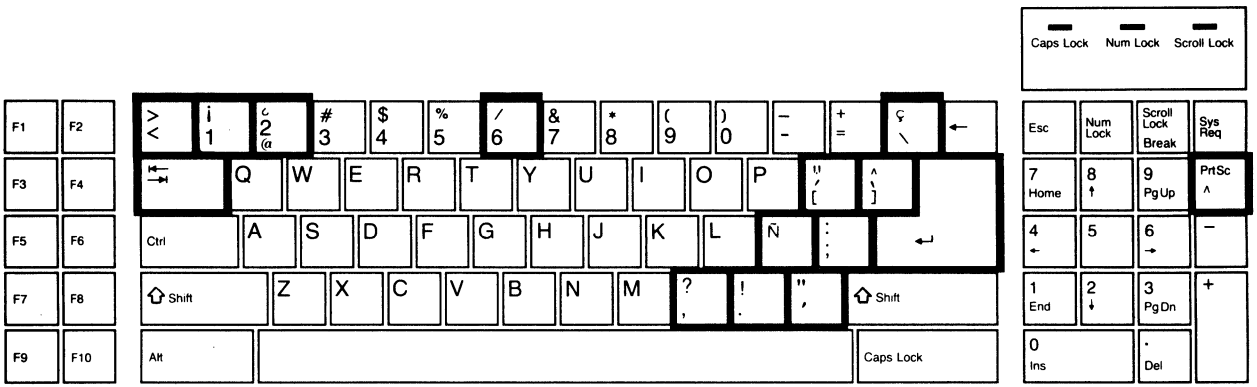


France



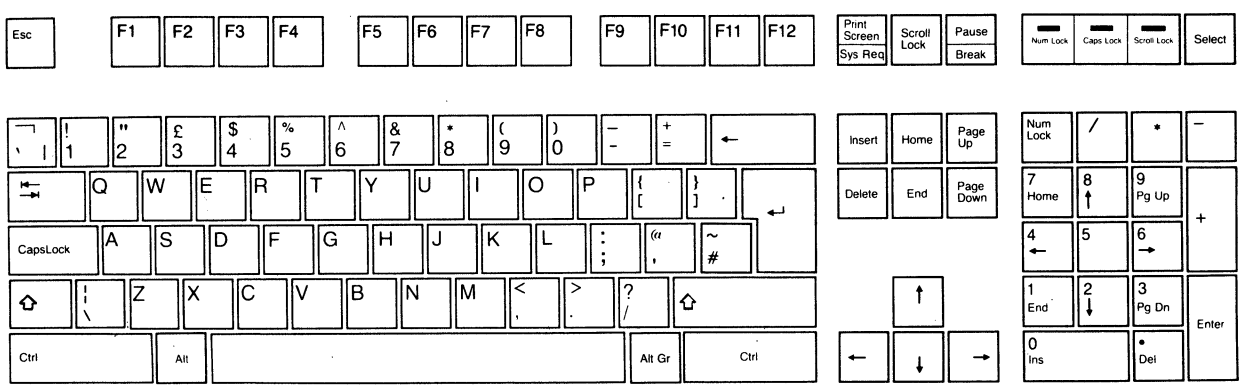
Germany

Figure J-2 AT-Style International Keyboards, Continued



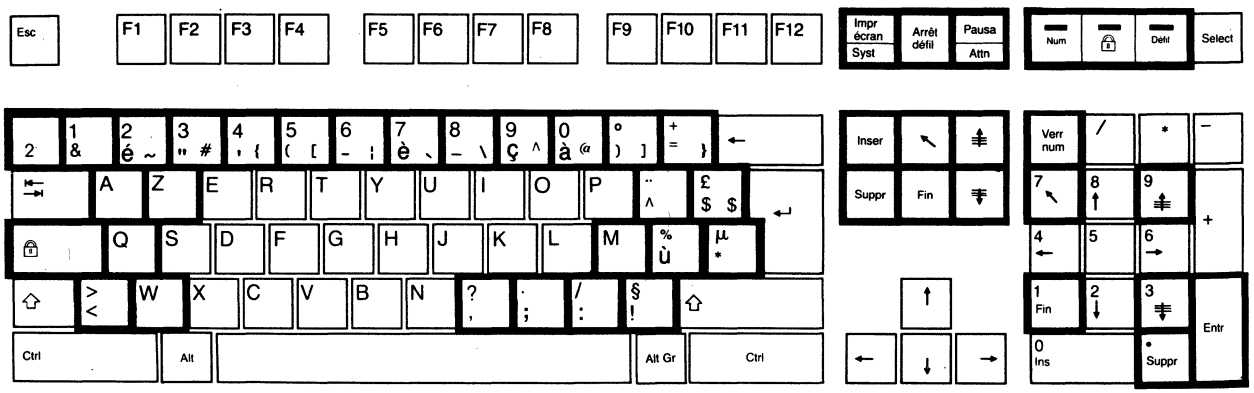
Spain

Figure J-3 Enhanced PC-Style International Keyboards

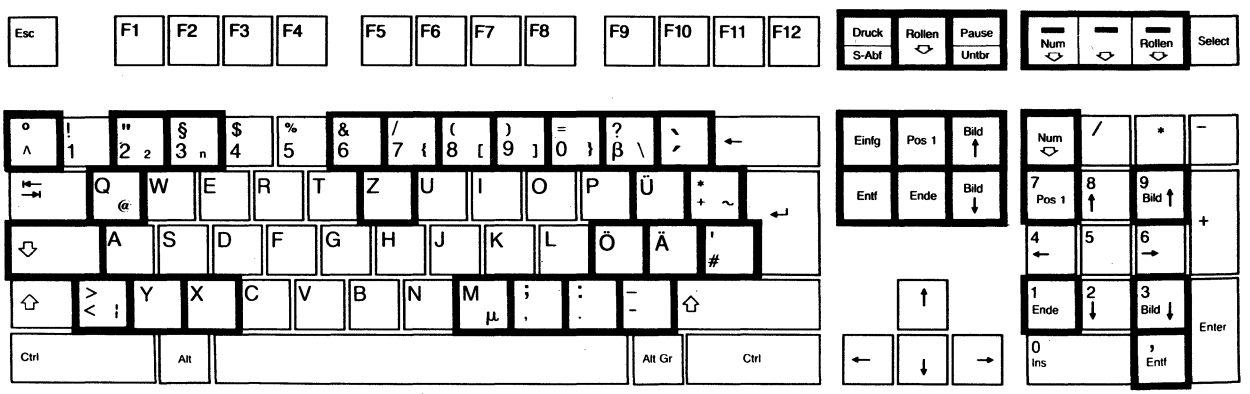


U.K.

Figure J-3 Enhanced PC-Style International Keyboards, Continued

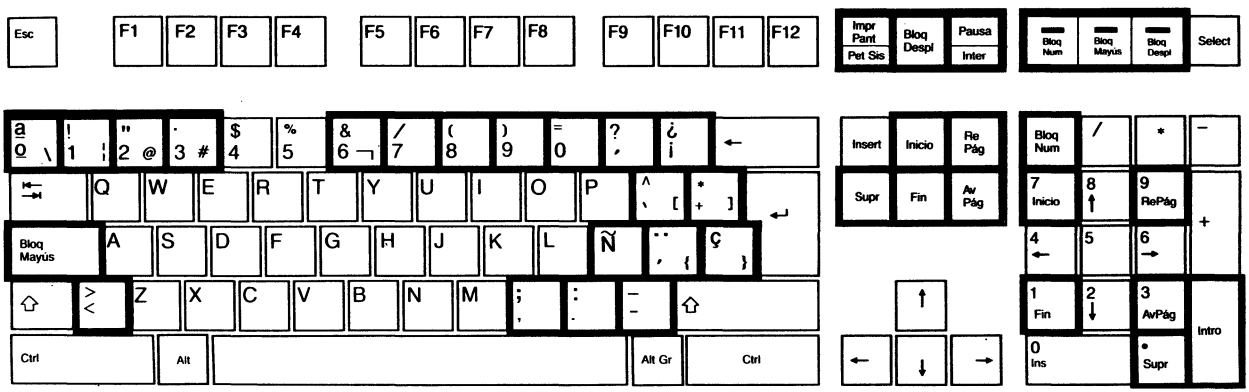


France



Germany

Figure J-3 Enhanced PC-Style International Keyboards, Continued



Spain

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