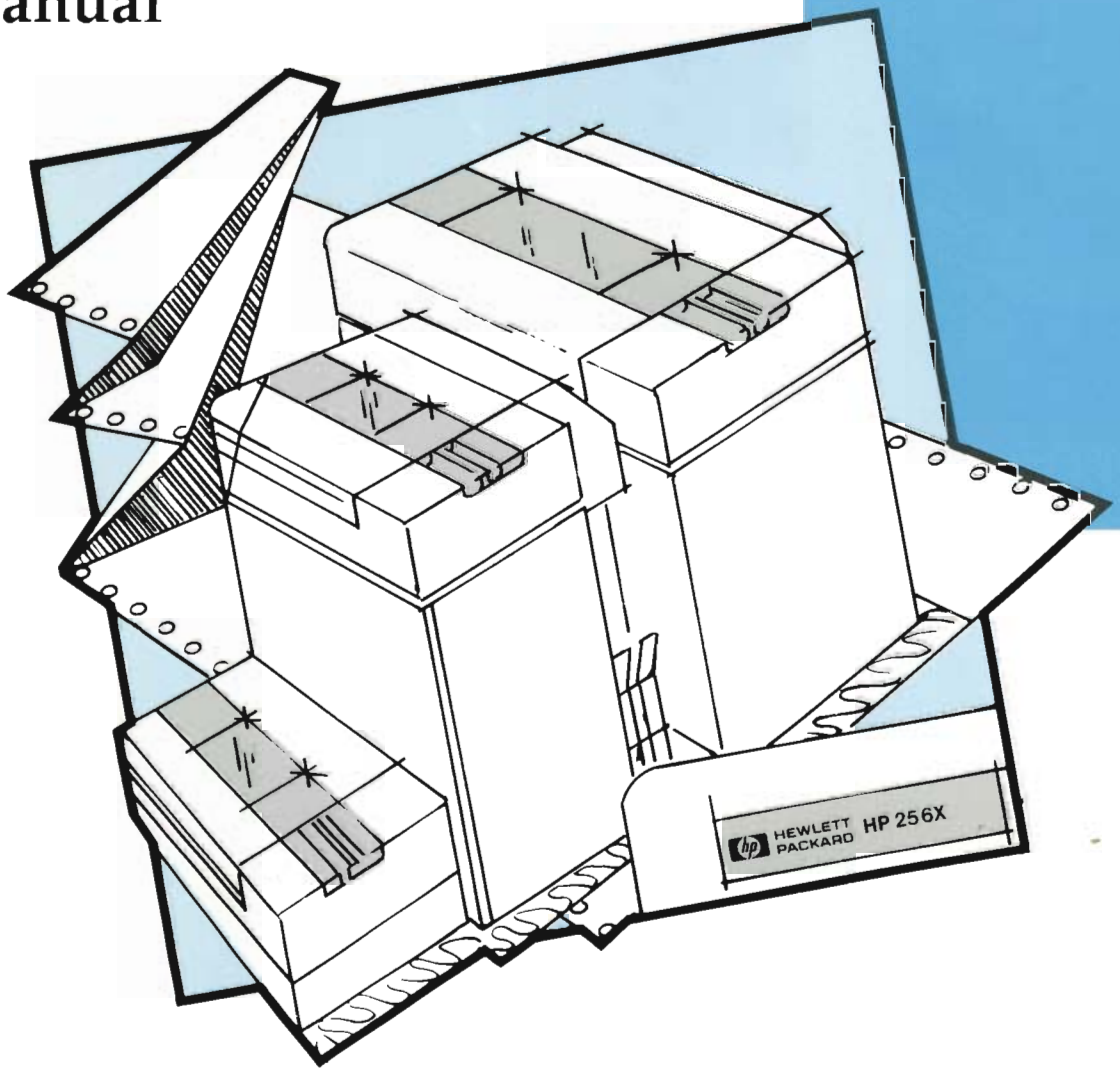
HEWLETT PACKARD

HP 256X Printer Family Technical Reference Manual



HP 256X PRINTER FAMILY TECHNICAL REFERENCE MANUAL

Manual Part No. 02564-90905

HEWLETT PACKARD

Publication History

Changes in text to document updates subsequent to the initial release are supplied in manual update notices and/or complete revisions to the manual. The history of any changes to this edition of the manual is given below. The last update itemized reflects the machine configuration documented in the manual.

Any changed pages supplied in an update package are identified by an update number adjacent to the page number. Changed information is specifically identified by a vertical line (revision bar) on the outer margin of the page.

First Edition	FEB 1986
Second Edition	NOV 1986
Third Edition	MAY 1987
Fourth Edition	DEC 1987
Fifth Edition	JUN 1989
Sixth Edition	APR 1990

NOTICE

The information contained in this document is subject to change without notice.

HEWLETT-PACKARD MAKES NO WARRANTY OF ANY KIND WITH REGARD TO THIS MATERIAL, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. Hewlett-Packard shall not be liable for errors contained herein or for incidental or consequential damages in connection with the furnishing, performance, or use of this material.

HP Computer Museum
www.hpmuseum.net

For research and education purposes only.

TABLE OF CONTENTS

HP 256X

INDEX

LIST OF TABLES PAGE

HP 256X

CHAPTER 1.
GENERAL INFORMATION

1-1. INTRODUCTION

This manual provides programming information for the HP 256X printers. The main portion of the manual lists the control codes and escape sequences for the printer and explains what each escape sequence does. An index is provided in the back of the manual to make it easy to find the information you need.

1-2. PRINTER FEATURE SET COMPATIBILITY

Hewlett-Packard has developed a "Printer Command Language" which standardizes printer features and user access of those features, providing compatibility between HP printers. The structure of the "Printer Command Language" consists of five levels of features:

- Level I Print and Space
- Level II EDP
- Level III Word Processing
- Level IV Page Formatting
- Level V Enhanced Page Formatting

Each PCL level is a superset of the features of the levels below it. The HP 256X printers are Level II printers, meaning that all applications written for standard Level I and II printers will operate correctly on your HP 256X printers with no modifications. In addition to supporting Level I and Level II features, the HP256X printers support a limited set of additional features that may not be supported by other HP products. Applications written using these additional features may not operate as intended on other Hewlett-Packard printers which do not have these capabilities. **Refer to TABLE 2-2 for a list of all features and in what level they belong.**

New features have been added to the 256X printers since the printers were first released. These features are not available on some printers and available on other printers at a specific release of firmware. to determine whether or not a feature is available on a specific printer, refer to TABLE 1-1. Printer Feature versus Date Code Availability.

HP 256X

Table 1-1. Printer Programmable Feature Date Code Availability *

FEATURE	2562C	2563A	2563B	2564B	2565A/66A	2566B	2567B
Option #007 Barcodes	N/A**	All	<2716	N/A**	N/A**	N/A**	N/A**
Barcodes/Text	All	2418	All	All	All	All	All
Option #008 Barcodes	All	2418	All	All	All	All	All
70/140 Raster Graphics	All	N/A**	All	All	N/A**	All	All
Label Card 70/140	All	N/A**	2716	2713	N/A**	2720	2720
Draft Print	All	N/A**	2825	2733	N/A**	N/A*	All
60/120 Raster Graphics	All	N/A**	2825	2733	N/A**	2809	2809
Graphics Mode Slew	All	N/A**	2825	2822	N/A**	2720	2720

* The printer firmware datecode for the printer can be found on the self-test printout to the right of the Formatter/Control Board heading. Unless otherwise indicated, the datecode in the table refers to that datecode or greater; "<2716" refers to printers with datecodes less than 2716.

** N/A - Not Available.

Table 1-1. Printer Programmable Feature Date Code Availability * (Continued)

FEATURE	2563C	2564C	2566C	2567C
Option #007 Barcodes	N/A**	N/A**	N/A**	N/A**
Barcodes/Text	All	ALL	All	All
Option #008 Barcodes	All	ALL	All	All
70/140 Raster Graphics	All	ALL	ALL	All
Label Card 70/140	All	ALL	ALL	ALL
Draft Print	All	ALL	ALL	ALL
60/120 Raster Graphics	All	ALL	ALL	ALL
Graphics Mode Slew	All	ALL	ALL	ALL

* The printer firmware datecode for the printer can be found on the self-test printout to the right of the Formatter/Control Board heading. Unless otherwise indicated, the datecode in the table refers to that datecode or greater; "<2716" refers to printers with datecodes less than 2716.

** N/A - Not Available.

1-3. RELATED INFORMATION

Additional information pertaining to the HP 256X printers can be obtained from the following related manuals:

- *HP 2562C Operators' Manual*, P/N 02562-90901
- *HP 2563B/64B Operators' Manual*, P/N 02564-90911
- *HP 2563A/B Service Manual*, P/N 02563-90924
- *HP 2563A/B Parts and Diagrams Manual*, P/N 02563-90926
- *HP 2564B Service Manual*, P/N 02564-90924
- *HP 2564B Parts and Diagrams Manual*, P/N 02564-90926
- *HP 2566B/67B Operator's Manual*, P/N 02566-90914
- *HP 2566/67B Service Manual*, P/N 02566-90915
- *HP Label Card Install./Operator's/Programming Manual*, P/N 26062-90902
- *HPIB Interface Manual*, P/N 26067-90901
- *Multipoint Interface Manual*, P/N 26067-90902
- *RS232C/422 Serial Interface Manual*, P/N 26067-90921
- *HP 2608A-Compatible Parallel Interface Man.*, P/N 26067-90905
- *Centronics Parallel Interface Manual*, P/N 26067-90906
- *Dataproducts Interface Manual*, P/N 26067-90907
- *HP 2563C/64C Operator's Manual*, P/N 02564-90988
- *HP 2566C/67C Operator's Manual*, P/N 02566-90990
- *Paper Stacking Aid Operator's Manual*, P/N 02564-90987
- *Powered Paper Stacker Installation Instructions*, P/N 02566-90995

CHAPTER 2. CONTROL CODES AND ESCAPE SEQUENCES

2-1. INTRODUCTION

This chapter contains a list of the HP 256X control codes and escape sequences. It also explains each command and provides some examples of their use.

2-2. GENERAL INFORMATION

Programmatic Printer Control

Control codes, two-character escape sequences, and parameterized escape sequences are all used to control the HP 256X printers.

The HP 256X printers execute parameters sequentially, in the order they are received. Therefore, the order of the parameters is significant. Unrecognized escape sequences are ignored in their entirety and do not cause erroneous printing.

Logical and Physical Pages

The limits of the logical page define the area in which printing can take place. Logical page length is set programmatically in lines per page (see Section 2-17). Physical page length is set via the Operator Control Panel either in lines per page or inches per page, and indicates the actual size of a single page. The physical page length cannot be changed programmatically. Refer to the appropriate printer Operator's Manual for more information.

2-3. CONTROL CODES

The selectable features of the HP 256X printers are accessed using control codes (listed in TABLE 2-1) which are transmitted to the printer. The escape (E_C) control code is used to select most of the programmable features.

TABLE 2-1. CONTROL CODES

FUNCTION	SYMBOL	BINARY	LEVEL	DESCRIPTION
Backspace	B_S	1000	II	Move one column left
Line Feed	L_F	1010	I	Move to next print line while maintaining current column position
Form Feed	F_F	1100	I	Move to first line at top of the next page while maintaining current column position
Carriage Return	C_R	1101	I	Move to the left margin on current print line
Shift Out	S_O	1110	I	Select following characters from the current secondary character font until receipt of a Shift In
Shift In	S_I	1111	I	Select following characters from the current primary character font until receipt of a Shift Out
Escape	E_C	11011	I	The following characters are a special control sequence

2-4. ESCAPE SEQUENCES

An escape sequence consists of the ^{E}c control code followed by one or more characters in succession. Both two-character and parameterized escape sequences control the HP 256X printers. Two-character escape sequences take the form ^{E}cX, where X is a character from the ASCII table (0 through ~). Parameterized escape sequences are structured in the following form:

^{E}CXy[parameter]Z

The above sequence is explained below:

^{E}CXy — Prefix--This part of the escape sequence indicates that the escape sequence is parameterized and also specifies which type of control is being performed. "X" is referred to as the parameterized character; "y" is referred to as the group character.

Parameter — Parameter--This string of ASCII characters specifies a value (either numeric or alphanumeric).

Z — Terminator--This ASCII character indicates the function to which the previous parameter value applies. If this character is lower case (a,b,c, etc.), it indicates a combined escape sequence, meaning that more parameterized information will follow. If the character is upper case (A,B,C, etc.), it terminates the escape sequence string.

NOTE

Brackets [] are used in many of the escape sequences for clarification purposes, but are not actually part of the escape sequence. For example, the brackets in the escape sequence for selecting page length (^{E}c&l[1-128]P) specify a range of values (1 to 128) for page length. To specify a page length of 35 lines, the escape sequence ^{E}c&l35P would be sent to the printer.

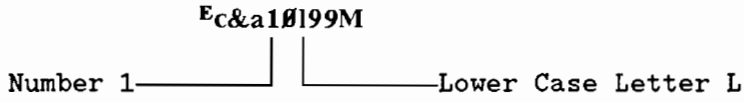
HP 256X

Combining Escape Sequences

Parameterized escape sequences can be combined to save keystrokes. Combining sequences involves adding the parameter value and terminator of one or more sequences to another escape sequence. Parameterized sequences can be combined only if their prefixes are identical. When a parameter/terminator of one sequence is added to another sequence, all of the terminators except the last should be lower case. For example, to set the left and right margins using two separate escape sequences, the following two sequences would be sent:

Set left margin at position **1Ø**	**Ec&a1ØL**
Set right margin at position **99**	**Ec&a99M**

Using one combined escape sequence, the following would be sent to the printer:



Maximizing Print Speed

Every escape sequence or control code sent to the printer requires time to process. Minimizing the number of commands in the application will maximize the print speed for the application. Since PCL commands remain active until disabled, there is no need to set the printer state on every line. Commands need only be sent when a change in the printer state is desired.

The HP256X family may also slow down when printing overstrikes (one character on top of another). For this reason, underlining should be done using the automatic underline feature whenever possible since this is always faster than overstriking with the underline character.

Intrinsic Printer Features

There are intrinsic features of printers that affect the compatibility of one printer with another. Hewlett-Packard has defined minimum standards for intrinsic features that all HP printers must meet. Using features beyond the HP defined minimums in an application will limit the number and type of printers that will run that application properly. Compatibility of an application with future HP printers may be compromised if the minimums are exceeded. The following intrinsic features will be common to all HP printers:

a. The ability to print eighty columns on a line in the normal pitch and 132 columns per line in the compressed pitch.

b. The ability to print six lines per inch.

c. Features remain active until specifically deactivated.

d. Support of at least one level of overstrike.

e. The ability to strip unsupported escape sequences and control codes.

Additionally, some PCL Level I & II printers may not be able to mix all available pitches on the same line.

The following table lists the escape sequences you can use with the HP 256X printers. Note that the brackets [] used in these escape sequences are for clarification purposes only (the brackets are not actually part of the commands). Also note that the bar code font is optional and that some features are not available on all the HP 256X printers.

HP 256X

TABLE 2-2. HP 256X ESCAPE SEQUENCES

STANDARD LEVEL I ESCAPE SEQUENCES

ESCAPE SEQUENCE	EXPLANATION
EcE	Programmable reset
EcY	Turn display functions mode on
EcZ	Turn display functions off
Ecz	Initiate self-test
Ec*rA	Prepare for raster data
Ec*b[#]W[binary data]	Send raster graphics
Ec*rB	Raster graphics complete
Ec&dD	Enable automatic underlining
Ec&d@	Disable automatic underlining
Ec&l1L	Enable perforation skip mode
Ec&lØL	Disable perforation skip mode
Ec&kØS	Select normal pitch (10 cpi)
Ec&k2S	Select compressed pitch (16.7 cpi)

TABLE 2-2. HP 256X ESCAPE SEQUENCES (Continued)

STANDARD LEVEL II ESCAPE SEQUENCES

ESCAPE SEQUENCES	EXPLANATION
Ec9	Reset margins
Ec([#ID]	* Designated symbol set--primary font
Ec)[#ID]	* Designate symbol set--secondary font
Ec(s[1Ø,16.7]H	Designate print pitch (primary font)
Ec)s[1Ø,16.7]H	Designate print pitch (secondary font)
Ec(s[12,13.3,15]H	** Designated print pitch--primary font
Ec)s[12,13.3,15]H	** Designate print pitch--secondary font
Ec&l[6 or 8]D	Select line spacing (6 or 8 lines/inch)
Ec&l[1-128]P	Select logical page length (# lines)
Ec&l[1-128]F	Select the text length (# of lines)
Ec&a[print position]L	Set left margin at print position specified. The first column is position 0.
Ec&a[print position]M	Set right margin at print position specified. The first column is position 0.
Ec&p[#]X	Transfer # bytes of print data (transparent)
Ec&a[#]R	Move to absolute row (# = unsigned integer) The first row is row zero.
Ec&a[#]C	Move to absolute column (# = unsigned integer) The first column is column zero.
Ec&a+[#]R	Move to relative row # from current position (where # is a signed (+) integer)
Ec&a[+/- #]C	Move to relative col. # from current position (where # is a signed (+/-) integer)

* = Refer to Section 2-7.
** = Applicable only if optional character set/graphics option is installed.

TABLE 2-2. HP 256X ESCAPE SEQUENCES (Continued)

LEVEL III ESCAPE SEQUENCES SUPPORTED BY THE HP256X PRINTERS

ESCAPE SEQUENCES	EXPLANATION
Ec(s[Ø,1]S	* Select character style - primary font (0=upright, 1=italics)
Ec)s[Ø,1]S	* Select character style - secondary font (0=upright, 1=italics)
Ec(s[Ø,1,-1]Q	* Designate density for the primary font. (0=standard, 1=high, -1=draft)
Ec)s[Ø,1,-1]Q	* Designate density for secondary font. (0=standard, 1=high, -1=draft)
Ec&k4S	* Select 12 pitch.

* = Applicable only if optional character set/graphics option is installed.

TABLE 2-2. HP 256X ESCAPE SEQUENCES (Continued)

ADDITIONAL ESCAPE SEQUENCES SUPPORTED BY THE HP256X PRINTERS

ESCAPE SEQUENCES	EXPLANATION
Ec*t[7Ø,14Ø]R	(**) Raster graphics resolution (Not available on HP2563A, 65A or 66A)
Ec*r[6Ø,7Ø,12Ø,14Ø]L	(**) Horizontal raster graphics resolution (60 and 120 not available on HP2563A, 65A, or 66A)
Ec*r[72,144]V	(**) Vertical raster graphics resolution (Not available on HP2563A, 65A and 66A)
Ec&lØV	(**) Conditional move to top of physical page (VFC ch. 0)
Ec&l[1 thru 16]V	(**) Select VFC channels 1 - 16
Ec&l[# bytes]W[VFC data]	(**) Programmable VFC
Ec*z[#]C	(**) * Horizontal bar code placement
Ec*z[#]H	(**) * Bar code height
Ec*z[#]Q	(**) * Bar code header control
Ec*z[#]V	(**) * Bar code selection
Ec*z<[Bar Code Data]>Z	(**) * Bar code label data
Ec*b[#]Y	(**) * Move paper # number of raster lines (Available on HP2566/67B and HP2566/67C only)
Ec*t[Ø,1]F	(**) * Enable/Disable Label Card (0 disables, 1 enables)
Ec*t[Ø,1]L	(**) * Enable/Disable Printronix Line Feed Emulation (0 disables, 1 enables)
Ec&k8S	(**) Select double-size print mode

* = Applicable only if optional character set/graphics option is installed.
(**)= These features are not standard EDP level features. Therefore, they are not necessarily compatible with other HP EDP level printers.

HP 256X

2-5. ESCAPE SEQUENCE DESCRIPTIONS

An explanation of each escape sequence is contained in this chapter.

2-6. PROGRAMMABLE RESET

The programmable reset escape sequence (EcE) causes the printer to eject paper to the Top of Form (position 0,0) if not already at Top of Form. This command resets all printer configurations to the default state. The printer remains on-line after a programmable reset. When the printer is reset, it is set to a known state as follows:

- Primary and secondary character sets (fonts) as configured from the Operator Control Panel
- Vertical line spacing (6/8 LPI) as configured from the Operator Control Panel
- Paper moves to the next Top of Form position (if not currently at Top of Form)
- Data buffer is printed and then the buffer is cleared
- Standard VFC channel assignments selected (see paragraph 2-18) as defined by physical page length.
- Margins set at maximum limits and/or Left margin set at first column (0)
- Physical page length remains configured from Operator Control Panel
- Logical page length = physical page length
- Text length = logical page length minus one inch
- All character font attributes (symbol set, pitch, style, and density) default to the character font as configured from the Operator Control Panel
- Display functions off and Underline enhance disabled
- Perforation skip mode as configured from the Operator Control Panel (except the HP 2563A, 2565A, and 2566A printers, which have perforation skip mode disabled in the default state).
- Enable/Disable HP Label Card as configured from Operator Control Panel
- Printronix linefeed emulation as configured from Operator Control Panel
- Raster graphics horizontal resolution as configured from the operator control panel. Vertical resolution set to 72 dots per inch.

2-7. CHARACTER FONT SELECTION

The HP 256X printers can print several different character sets (fonts). There is a maximum of two normal density and four high density character set ROMs due to the physical limit of slots available on the printer.

By performing a printer self-test, you can see which fonts are installed in your printer--you may specify any of these fonts during an application. On the self-test printout, each available character font is printed along with a parameter number to the left of the printed font.

There are two ways to select a font from those available:

1) Operator Control Panel Configuration

For the primary character set, enter the self-test printout parameter number of the desired font into configuration function 1.

For the secondary character set, enter the self-test printout parameter number of the desired font into configuration function 2.

NOTE

On 2563 printers with a firmware date code of 2710 or less, you must also set function 3 to the desired density and function 4 to the desired pitch.

The system driver may set font attributes without regard to the operator control panel setting.

2) Programmatic Selection

The following programmatic selections will override the Operator Control Panel settings until the printer is power cycled or reset. Some system drivers transmit a reset at the beginning of each job, requiring font selection via the operator control panel or programmatic selection following the host originated reset.

HP 256X

The list below contains the font attributes, listed in order of descending priority:

- Symbol Set (ASCII, Roman-8, Line Draw, etc.)
- Pitch (10,12,13.3,15,16.67, etc.)
- Style (Upright/Italic)
- Density (Standard, High, High-Speed Draft)

The attributes are specified for both primary and secondary fonts so that you may switch between the primary and secondary fonts using the Shift Out (^{S}O) and Shift In (^{S}I) control codes. Notice that the only difference between the primary and secondary font escape sequences is the direction of the parentheses, "(" for primary and ")" for secondary. Upon receiving these font attribute commands, the printer selects the best fitting font from those available.

It is not necessary to specify all four font attributes when selecting a font. If any of the attributes are not specified, the printer defaults to those attributes last specified (or, if none have been specified, the Operator Control Panel default font characteristics are used). For example, if you wish to select a font without selecting a print pitch, the print pitch last specified will be in effect. If you had not previously specified a print pitch, the printer will use the print pitch of the default font that was last specified from the Operator Control Panel, provided that the particular symbol set selected is available in the current pitch.

The escape sequences used for specifying the character font attributes are explained in the following paragraphs.

NOTE

Any number of fonts may be printed on each line, but to do this, each font must be the same pitch. That is, *only one print pitch is allowed per line.*

2-8. SYMBOL SET SELECTION (PCL Level II)

The HP 256X printers allow you to select from several 7- and 8-bit symbol sets. A symbol set is a set of characters that are mapped to certain locations in the printer's memory. Symbol sets differ from one another in the characters contained in the set and in their locations within memory. The default symbol set is that of the font specified from the Operator Control Panel.

The following escape sequences are used to specify the primary and secondary symbol sets:

Ec(#ID	Select symbol set for primary character font
Ec)#ID	Select symbol set for secondary character font

TABLE 2-3 lists the parameter (#) and ID numbers needed to select each symbol set. For example, to select the Roman-8 symbol set for the primary font, you would send the **Ec(8U** escape sequence. To select OCR-B for the secondary font, you would send **Ec)1O** to the printer.

An ASCII symbol set table is provided following Appendix B of this manual.

TABLE 2-3. SYMBOL SET SELECTION **

LANGUAGE	#	ID
Seven-bit Symbol Sets		
Power-up Default Set	0	@
Primary Default Set	1	@
Current Primary Set	2	@
Math Symbols	0	A
Line Draw Set *	0	B
ISO Denmark/Norway	0	D
Roman Extension Characters	0	E
ISO United Kingdom	1	E
ISO France	0	F
ISO German	0	G
Hebrew	0	H
Japanese ASCII	0	K
Katakana	1	K
Line Draw Set (Same as 0B)	0	L
Block Characters	1	L
Math Symbols (Same as 0A)	0	M
OCR-A	0	O
OCR-B	1	O
ISO Sweden/Finland	0	S
ISO Spain	1	S
ASCII	0	U
Eight-bit Symbol Sets		
Power-up Default Set	0	@
Primary Default Set	1	@
Current Primary Set	2	@
Greek-8	8	G
Hebrew-8	8	H
Katakana-8	8	K
Roman-8	8	U
Turkish-8	8	T
Arab-8	8	V

* Line Draw characters will connect vertically only when printing 8 lines/inch.

** See paragraph 2-29 for information on printing the bar code character sets. High Speed Draft printing is with the ASCII symbol set only. Draft, high-density, or standard print, is selected using the Character Density Selection command (see page 2-15).

2-9. PRINT PITCH SELECTION (PCL Level II)

Print pitch is specified using the following escape sequences:

Ec(s[1Ø,12,13.3,15,16.7]H	Select print pitch for primary character font
Ec)s[1Ø,12,13.3,15,16.7]H	Select print pitch for secondary character font

When specifying a pitch, if no font with the exact size specified is available, the next larger pitch will be designated. If a larger pitch does not exist, the next smaller pitch will be designated. **Only one pitch per line may be selected.** The default print pitch is that of the font specified from the Operator Control Panel.

NOTE

The 12-, 13.3-, and 15-pitch fonts are not available with the HP 2563A/65A/66A printers. Refer to self-test to see what pitches are installed in your printer.

2-10. CHARACTER STYLE SELECTION (PCL Level III)

The HP 256X printers have two types of character styles: upright and italic. The following escape sequences select either the upright or the italic print style for the primary and secondary character fonts:

Ec(sØS	Selects the upright style for the primary font
Ec(s1S	Selects the italic style for the primary font
Ec)sØS	Selects the upright style for the secondary font
Ec)s1S	Selects the italic style for the secondary font

The default style is that of the font specified from the Operator Control Panel. Character style requests are ignored if the requested style is not available for the designated symbol set and print pitch.

2-11. CHARACTER DENSITY SELECTION (PCL Level III)

Standard-density print, high-density print, and high-speed draft printing (sparse density--HP 2567B and 256XC models only) can be specified using the following escape sequences:

Primary Selection

Ec(sØQ	Select Standard-Density (5 x 9 dot matrix) for the primary font
Ec(s1Q	Select High-Density (7 x 18 dot matrix) for the primary font
Ec(s-1Q	Select High-speed Draft Printing (4 x 5 or 6 dot matrix) for the primary font

Secondary Selection

Ec)sØQ	Select Standard-Density (5 x 9 dot matrix) for the secondary font
Ec)s1Q	Select High-Density (7 x 18 dot matrix) for the secondary font
Ec)s-1Q	Select High-speed Draft Printing (4 x 5 or 6 dot matrix) for the secondary font

The default density is that of the font specified from the Operator Control Panel. If the symbol set selected is not available in the requested density, the available density in that character font will be printed.

When draft printing is selected, the printer prints less dots horizontally (4 dots) and less dots vertically (5 or 6 depending on the character set). This reduction in dots results in an increase in the print speed of up to 30%.

To print with the high-speed draft font, specify the ASCII symbol set, 10-pitch, upright style, and high-speed draft density [**EcØUEc(s1ØhØs-1Q**].

2-12. SWITCHING CHARACTER FONTS

Seven-bit fonts can be accessed using either the Shift In/Shift Out ($^{S}I/^{S}O$) control codes or the 8th-bit method. Eight-bit fonts can only be accessed using the Shift In/Shift Out method.

Using the $^{S}I/^{S}O$ method, the ^{S}O (CTRL N) control code is sent to the printer to access the secondary font; the ^{S}I (CTRL O) control code is sent to select the primary font. The 8th-bit method involves setting the 8th bit of every data word sent to the printer. Setting the 8th bit to 1 selects the secondary font; setting the 8th bit to 0 selects the primary font.

In the following example, Shift Out and Shift In are used to print only the word "HP 2566B" in the secondary font:

The ^{S}O **HP 2566B** ^{S}I is a 900 line/minute printer.

2-13. DISPLAY FUNCTIONS MODE (PCL Level I)

The display functions mode can be entered using the ^{E}cY sequence. In the display functions mode, the HP 256X printers print representative character symbols for the control code characters instead of actually executing the control characters. In this mode, the carriage return (CR) control character will cause a CR symbol to be printed and an actual carriage return and line feed to be performed. The display functions mode can be exited by sending an ^{E}cZ sequence. The ^{E}cZ will be printed before the mode is terminated. Display functions mode off is the printer default state. Configuration Function 80 must be sent to "0" if the display function mode is enabled.

NOTE

The system driver may only allow the printer to print one line in the display functions mode.

When the printer is printing in high-speed draft mode, display function characters will not be printed.

2-14. REMOTE SELF TEST (PCL Level I)

Self-test can be performed remotely using the ^{E}cz sequence. The complete standard self-test is performed unless an error is detected. In case of an error, the self-test will be terminated when the error is detected and the printer will go off-line. If no errors are detected, the printer will remain on-line. For more information concerning self-test, consult the Operator's Manual or Service Manual for your printer (see paragraph 1-3 for the manual part numbers).

2-15. PRINT MODE SELECTION

The standard, compressed, and double-high/double-wide print modes are selected using the ^{E}c&k[ø,2,4,8]S sequence as shown in the following table. This escape sequence affects both the primary and secondary character fonts. The default print mode is that of the default font specified from the Operator Control Panel. **Only one print mode is allowed per line.**

TABLE 2-4. PRINT MODE SELECTION

Mode	Horizontal Pitch (in characters/inch)	*Vertical Pitch (in lines/inch)	PCL Level
0	10.0	6 or 8	I
2	16.7	6 or 8	I
#4	12.0	6 or 8	III
8	**5.0 (double size)	3 or 4	HP256X feature

* Dependent on current line spacing.
** Double high/double wide character set selection.

The HP 2563A/65A/66A printers do not support this feature.

2-16. LINE SPACING (PCL Level II)

Vertical line spacing of 6 or 8 LPI (lines per inch) can be selected either from the Operator Control Panel or remotely using the **Ec&l[6 or 8]D** sequence. When the printer is reset, the vertical line spacing is as set from the Operator Control Panel. If a parameter other than 6 or 8 is entered, the command is ignored and no line spacing change is made.

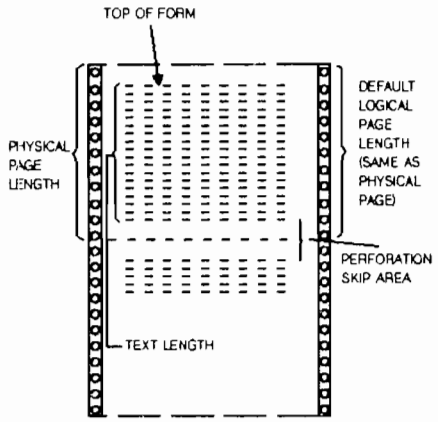
NOTE

Changing the line spacing causes the standard VFC table to be recalculated.

The system driver may set line spacing without regard to the Operator Control Panel setting.

2-17. LOGICAL PAGE LENGTH SELECTION (PCL Level II)

Two page length definitions exist for the HP 256X printers--physical page length and logical page length. The physical page length is the length of the paper in inches (a Control/Formatter PCA with a date code of 2712 or greater will allow you to set page length in lines-per-page). Page length is set from the Operator Control Panel and is stored in non-volatile RAM. The logical page length is received via an escape sequence and is calculated in lines-per-page. Therefore, one physical page can contain more than one logical page. The following illustration shows the relationship between page length, text length, and Top of Form.



The default logical page length is the physical page length. In most cases, formatting problems can be solved by changing the physical page length and using the default logical page length.

NOTE

When loading a different size of form in the printer, it is usually best to have the operator set the physical page (from the Operator Control Panel) to the actual size of the paper rather than programmatically setting the logical page to match the length of the new form (and leaving the physical page length at its previous value). This practice avoids problems if a paper-out occurs.

The logical page length is set using the **Ec&l[1-128]P** sequence, where the value field (1-128) is the desired number of lines-per-page. This command also defaults the text length to be one inch less than the logical page length, unless the logical page length is one inch or less, in which case the text length is set equal to the page length. Requests for a page length of zero cause the logical page length to equal the physical page length. Requests for a page length greater than 128 are ignored.

Although the logical page is specified in number of lines, this number represents the space occupied by that many lines (using the line spacing that was effective at the time the logical page length was specified). Therefore, if a logical page length of 66 lines is specified and the line spacing is currently at 6 LPI, the logical page length is 11 inches. If the line spacing is changed (to 8 LPI) in the middle of the page, the actual length of the page would still be 11 inches but the number of print lines would be 88 (8 LPI x 11 inches).

Before changing the page length, it is recommended that a VFC select of channel 0 be performed. This will bring the printer to the top of the next physical page (unless the printer is already at the top of the physical page).

Changing the logical page length changes the standard VFC table.

2-18. TEXT LENGTH (Vertical Margin) SELECTION (PCL Level II)

The length of a form within a logical page is set using the **Ec&l[1-128]F** sequence, where the number of lines desired (1-128) is specified. The first line of text is printed at the Top of Form position. The physical page length minus the text length defines the total vertical margin (top plus bottom margin) for the page.

If a text length of zero is received, the text length defaults to one inch less than the logical page length. The default text length, which is invoked any time the logical page length is changed, is one inch less then the logical page length. If the logical page length is one inch or less, the text length is set equal to the logical page length.

2-19. VERTICAL FORMS CONTROL (VFC) (HP256X feature)

Vertical forms control (VFC) is a feature which allows increased throughput by enabling the printer to skip to predetermined print locations. Key page locations, such as Top of Form (TOF), half form, double space, triple space and Bottom of Form (BOF), are referred to as channels (0 through 16), and are stored in a VFC "table".

The HP 256X printers have both a standard (computed) VFC and a programmable VFC. The following paragraphs explain each in more detail.

NOTE

In most situations, the printer's standard (computed) VFC as determined from the front panel page length setting meets the application requirements. Refer to the Printer Operators Manual for information on setting the page length from the front panel.

2-20. STANDARD (COMPUTED) VFC (HP256X feature)

The HP 256X VFC uses the logical page length and lines-per-inch setting to calculate the distance to be skipped for each VFC channel. This standard VFC is computed any time the printer is power cycled, reset or the page length, text length or LPI settings are altered. This information is then loaded into the printer's VFC "table". The "table" is 16 channels wide and N lines long, where N is the logical page length in number of lines. A VFC channel contains a 1 in this table on every line it can access. If the VFC channel cannot access the line, a 0 is placed on that line for that channel. For example, to specify a skip to the next half form, a program would specify VFC channel 6. Notice in the sample VFC TABLE (TABLE 2-6) that 1's are placed in the table at the half form position (lines 0 and 8). Then, for example, if the printer has finished printing line 2 and channel 6 is selected, the paper will be advanced to line 8. To use the standard VFC, perform the **Ec&l[ø through 16]V** sequence using the appropriate parameter number as listed in TABLE 2-5.

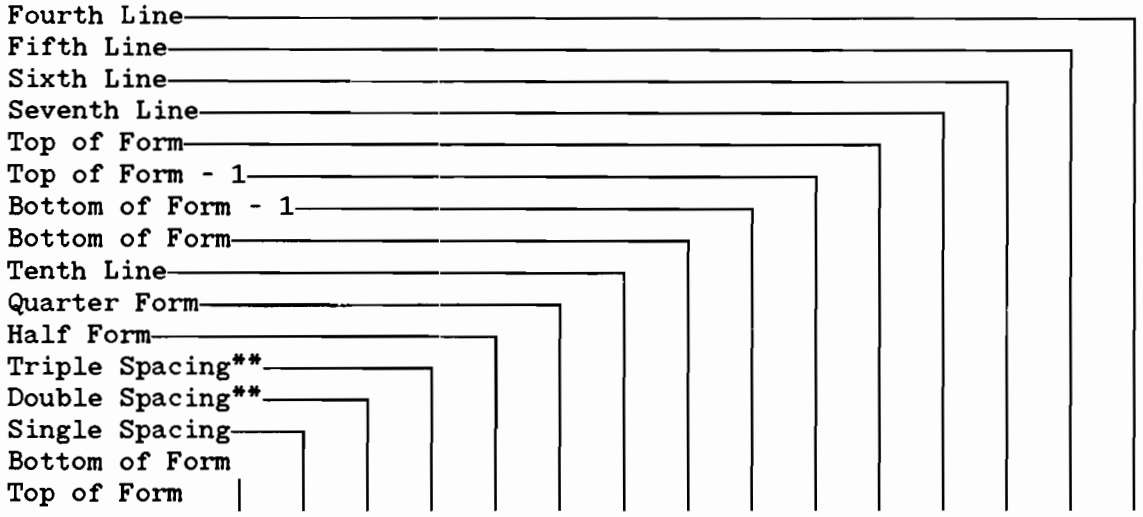
TABLE 2-5. VFC CHANNEL DEFINITIONS

PREFIX	PARAMETER	TERMINATOR	EXPLANATION
EC&l	0	v/V	*Conditional Top of Physical Page
	1		Top of Form (first line of text)
	2		Bottom of Form (last line of text)
	3		Single spacing
	4		**Double spacing
	5		**Triple spacing
	6		Half form
	7		Quarter form
	8		Tenth line
	9		Bottom of Form
	10		Bottom of Form - 1
	11		Top of Form - 1
	12		Top of Form
	13		Seventh line
	14		Sixth line
	15		Fifth line
	16		Fourth line

* All escape sequences except EC&l0V refer to the logical page rather than the physical page. This escape sequence causes a skip to the top of the next physical page (unless already at top of page).

** These channels cause a move to the next double/triple space line, and, therefore may not actually perform a double/triple space.

TABLE 2-6. SAMPLE STANDARD VFC*



LINES	CHANNELS 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1	1	0	1	1	1	1	1	1	0	0	0	1	1	1	1	1
2	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
3	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0
4	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0
5	0	0	1	1	0	0	1	0	0	0	0	0	0	0	0	1
6	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0
7	0	0	1	1	1	0	0	0	0	0	0	0	0	1	0	0
8	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0
9	0	0	1	1	0	1	1	0	0	0	0	0	0	0	0	1
10	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0
11	0	0	1	1	0	0	0	1	0	0	0	0	0	0	1	0
12	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
13	0	0	1	1	1	0	1	0	0	0	0	0	0	1	0	1
14	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0
15	0	1	1	1	0	0	0	0	1	0	0	0	1	0	0	0
16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0

* This sample shows a 21-line VFC table at 6 LPI using standard channel definitions. The text ends at line 15, leaving 6 blank lines (one inch) at the bottom of the page.

** These channels cause a move to the next double/triple space line, and, therefore may not actually perform a double/triple space.

2-21. PROGRAMMABLE VFC (HP256X feature)

In the rare cases that the standard (computed) VFC does not meet the application's requirements, programmable VFC allows the user to specify paper movement information other than the standard VFC definitions shown in TABLE 2-5. VFC information is stored in the memory (RAM) table just as the standard VFC is, only the bytes of information are loaded into RAM using one the following methods:

1) If the printer is connected to an HP3000 system using an HPIB interface, the HP3000 EDITOR can be used to create VFC files. These files can then be loaded into the printer VFC RAM by using either the ENV parameter of the file statement (preferred method) or by using the DOWNLOAD command. Refer to Appendix A, Section A-3 and A-4 for specific information.

2) If the printer is connected to an HP1000 system using an HPIB interface, refer to Appendix B for information.

3) If the printer is being used with the HP26062 Label card, refer to the QMS Users Manual for VFC loading information.

4) For all other systems and printer interfaces, custom drivers or utilities can be developed or the following escape sequence can be embedded in the application or initialization string (if applicable):

^{E}c&l[Byte Count]W[VFC Data]

The "byte count" parameter specifies the number (in decimal 0 - 256) of VFC data bytes to expect immediately following the termination of the escape sequence.

NOTE

An even byte count must be indicated. If an odd byte count is indicated, the VFC table in RAM will not be overwritten and the data bytes following the ^{E}c sequence will be read and discarded.

"VFC data" is the binary data which is loaded into the VFC table in RAM. These 8-bit bytes are sent in the following order following the ^{E}c sequence terminator: the most significant byte of the first word followed by the least significant byte of the first word, followed by the most significant byte of the second word, etc. The most significant bit of each word corresponds to channel 16 and the least significant bit of each word corresponds to channel 1.

VFC Data = (ms byte) (ls byte) (ms byte) (ls byte) . . .
(word 1 = line 1) (word 2 = line 2) . . .

Once the VFC has been loaded into the RAM table, the VFC channels are selected using the ^{E}c&l[Ø through 16]V sequence in the same manner as the standard VFC. The standard and programmable VFC both use the same table in RAM. Resetting the printer causes the standard VFC to be recalculated using the current logical page length and lines/inch setting, and a new table to be overwritten in RAM. The VFC table is also recalculated when the line spacing, text length, or page length changes.

NOTE

If the I/O is configured for 7 bit data, channels 8 and 16 cannot be downloaded with confidence since the eighth bit is used for the communication protocol. Selecting channel 8 or 16 for 7 bit data is not recommended.

Special VFC Considerations

Before loading a VFC table, it is recommended that a VFC select of channel 0 be performed. This will bring the printer to the top of the physical page.

When a programmed VFC is loaded into RAM, the logical page length is automatically calculated using the following formula:

Logical Page Length (in number of lines) = Byte Count /2

TABLE 2-6 shows a VFC table which uses "standard" VFC definitions and also illustrates a programmable VFC.

HP 256X

Programmable VFC using PCL:

Programmable VFCs using PCL (Printer Control Language) seem to cause a lot of problems and misunderstandings. Most of the misunderstanding concerns the use of the escape sequence used to set the VFC file. This escape sequence is used to override the default VFC of the printer. This escape sequence can be hardcoded into a program or EDITOR file, or placed in the VFC and Initialization Menu of Workstation Configurator, an HP3000 software product.

VFCs are best understood by reviewing an actual example of how to implement them. For this discussion, assume that the standard VFC shown in TABLE 2-6 is unacceptable for use. The form is the same 3.5" form length and print will be at 6 LPI with the ability to print without a vertical margin.

NOTE

The TEXT LENGTH command could be used in conjunction with the standard VFC and accomplish the above requirements. The assumption is there are reasons to use a customized VFC; this example has been simplified for clarification purposes.

First, establish the VFC length: with a 3.5" form and 6 LPI print, we have 21 potential lines of print (3.5 x 6 = 21). Refer to the following figure for an example of the desired finished output.

There are many methods to accomplish this task. The simplest way is to provide a "1" in CH3 (Channel 3) for all possible print lines and simply call CH3 for each line (including blank lines). This is called "line counting" and leaves the burden of positioning with the programmer (adding or deleting a line causes an adjustment elsewhere to be made).

A second method involves only providing a "1" in CH3 where print will occur. The programmer then simply calls CH3 and the blank lines are skipped. There still is no flexibility for adding or deleting lines without VFC modification, but line counting is minimized.

EXAMPLE LETTER

```
line 1  Company Name
line 2  Street Address
line 3
line 4
line 5
line 6
line 7   Opening Line
line 8
line 9
line 10  Body
line 11  Body
line 12  Body
line 13
line 14
line 15
line 16
line 17  Closing Line
line 18
line 19
line 20  P.S. Line
line 21
```

A third method involves assigning VFC channels to each section of the letter and performing a call to CH3 within each section. To do this, HP highly recommends following these guidelines:

CH1 should always define TOF and must be present for a valid load.

CH2 should always define BOF allowing for vertical margin (if any) and must be present for valid paper out conditions.

CH3 should be present for any potential print line except in the vertical margin area (if any).

For this example, CH1 will occur at line 1 and is aligned with the Company Name. We will arbitrarily assign CH4 to occur at line 7 (Opening Line), CH5 to occur at line 10 (Body), CH6 to occur on line 17 (Closing Line) and CH7 to occur on line 20 (P.S. Line).

HP 256X

With the above channel assignments in mind, the programmer would call CH1 to begin the letter. After printing the name and address (using calls to CH3 to "move" to each line) the programmer would call CH4 to skip to line 7 and print the opening line. Next, a call is made to CH5 to skip to line 10 and print the body, CH6 to print the closing and CH7 to print the P.S. line. This gives each section flexibility by allowing variable sizes, limited by the physical room available before interfering with the next section and avoiding the drudgery of line count.

The above VFC would look like:

	Channel 0 1111111 1234567890123456
line 1	1010000000000000
line 2	0010000000000000
line 3	0010000000000000
line 4	0010000000000000
line 5	0010000000000000
line 6	0010000000000000
line 7	0011000000000000
line 8	0010000000000000
line 9	0010000000000000
line 10	0010100000000000
line 11	0010000000000000
line 12	0010000000000000
line 13	0010000000000000
line 14	0010000000000000
line 15	0010000000000000
line 16	0010000000000000
line 17	0010010000000000
line 18	0010000000000000
line 19	0010000000000000
line 20	0010001000000000
line 21	0110000000000000

NOTE

A "1" corresponds to a hole punched in a paper tape on older printers.

Notice that for each line channel 3 is selected, this would select a single space advance. A 1 could be placed in any or all other channels and the VFC would still be valid since the printer will only look at the channel selected and advance to the next line that contained a 1 in that channel. For example, if the printer was on line 2 and channel 7 was selected, the printer would advance or slew down to line 20 which is the first line where there is a "1" in channel 7.

The next step would be to convert the above VFC definition into the escape sequence format. Since the format of the VFC data portion of the escape sequence is in the most significant byte and most significant bit being first followed by the least byte with the least significant bit being the last bit, the format of the VFC data is reversed. Once reversed, the 16 bits are then divided into two, 8-bit bytes, with channel 16 being the Most Significant Bit (MSB) and channel 1 the Least Significant Bit (LSB). Refer to TABLE 2-7.

Since the escape sequence requires the VFC data to be in ASCII format this binary data must be converted to ASCII. As in our example, many characters may convert to "unprintable" ASCII characters (below ASCII OCTAL 037). Refer to the ASCII Symbol Set chart at the end of this manual. Entering unprintable data can be done in several ways:

The easiest and preferred method involves using "dummy" VFC channels to cause the converted character to become a printable one. For example, always have bit 7 and bit 15 a "1", thus adding %100 to the unprintable character, and eliminating the confusion of entering unprintable data. Do not "call" the corresponding channel bit 7 or 15 or else improper spacing will occur.

If the VFC channels that bits 7 and 15 represent must be used, these unprintable characters must be manipulated for data entry. In most cases, this can be dealt with by using the DISPLAY FUNCTIONS mode of your terminal. Type in the "Esc&l[Byte count]W" followed by the ASCII characters using the CONTROL key with the corresponding letter. (Since the CONTROL key subtracts %100 (100 OCTAL) simply add %100 to the "unprintable" character. For example, 00000101 converts to %5, adding %100 gives you a %105 which is an E, therefore, pressing a CONTROL E gives the desired result.)

If your terminal doesn't have a DISPLAY FUNCTIONS mode, some EDITOR programs allow entering the OCTAL equivalents. The HP3000 EDITOR does not allow the user to directly enter OCTAL numbers. In this case, a "dummy" character would be entered as the "VFC data". Next, the EDITOR "CHANGE" command would be used to change the dummy character to the desired ASCII character. For example, place an "x" as a dummy character in the VFC data and use the CHANGE command to replace the "x" with an ASCII 01 (SOH character) by typing "CHANGEQ "x" to '01". This would replace the "x" with the unprintable ASCII 01; your escape sequence would appear one character shorter without DISPLAY FUNCTIONS mode turned on.

HP 256X

This could also be accomplished by changing the specific column to the ASCII character required. It is important to specify the starting and stopping column or the CHANGE command will act as a column INSERT. For example, if column 10 on line 2 is to changed to an ASCII 04 you would type "CHANGEQ 10/10 TO '04 IN 2".

NOTE

The "'" is the single quote and not the prime character.

The HP 3000 Workstation Configurator allows entering the VFC data in an initialization string. This is only applicable when using a printer with a serial interface and has some limitations. The most significant limitation is that the initialization string can contain only 120 formatted (compiled) characters. This limits use to VFCs of 57 lines or less (6 escape sequence characters + 114 VFC data characters = 120). Any other commands in the initialization string reduces this further. Space available in the initialization string data entry field (three lines) is NOT an accurate indicator of the number of formatted characters; careful counting is necessary Using VFC channels 8 and 16 is also not allowed due to a limitation of entering data with an octal value above 177. Refer to the Workstation Configurator Reference Manual (p/n 30239-90001) for more detailed information.

There are several methods to enter data in Workstation Configurator:

1. Entering data as a decimal number, i.e. 13 for a carriage return.
2. As an OCTAL number (one byte at a time) by preceding the number with the "%" sign.
3. As a two or three character mnemonic such as BS or DC1 (see Appendix B of the Workstation Configuration manual).
4. By entering the control characters with the up-arrow or circumflex character preceding the character, i.e. a backspace would be an 'H.
5. By entering the actual ASCII character within single quotes, i.e. 'A' would equate to an OCTAL %101.

Each character entered, with the exception of multiple ASCII characters within the single quote, MUST BE separated by commas. An example would be "ESC, '&16W', %101,'ABC',BS,13".

NOTE

Only one byte may be specified at a time in OCTAL, thus allowing a maximum of OCTAL 377 which would place a 1 in columns 1 - 8.

TABLE 2-7. CONVERTING VFC FORMAT TO VFC "DATA"

	Most Sig. Byte								Least Sig. Byte									Octal MSB	Octal LSB	ASCII MSB	ASCII LSB	CTL MLSBB
	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1						
Line 1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	=	%000	%005	Nul	Enq	@E
Line 2	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	=	%000	%004	Nul	Eot	@D
Line 3	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	=	%000	%004	Nul	Eot	@D
Line 4	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	=	%000	%004	Nul	Eot	@D
Line 5	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	=	%000	%004	Nul	Eot	@D
Line 6	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	=	%000	%004	Nul	Eot	@D
Line 7	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	=	%000	%014	Nul	FF	@L
Line 8	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	=	%000	%004	Nul	Eot	@D
Line 9	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	=	%000	%004	Nul	Eot	@D
Line 10	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	=	%000	%024	Nul	Dc4	@T
Line 11	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	=	%000	%004	Nul	Eot	@D
Line 12	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	=	%000	%004	Nul	Eot	@D
Line 13	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	=	%000	%004	Nul	Eot	@D
Line 14	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	=	%000	%004	Nul	Eot	@D
Line 15	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	=	%000	%004	Nul	Eot	@D
Line 16	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	=	%000	%004	Nul	Eot	@D
Line 17	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	=	%000	%044	Nul	$	@$*
Line 18	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	=	%000	%004	Nul	Eot	@D
Line 19	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	=	%000	%004	Nul	Eot	@D
Line 20	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	=	%000	%104	Nul	D	@D*
Line 21	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	=	%000	%006	Nul	Ack	@F

* Do NOT depress the Control Key on these **BOLDFACE** characters since they are printable characters.

This VFC data can now be entered into the escape sequence and either embedded into the application, merged with the spoolfile or, in this case placed in a Workstation Configurator initialization string (in this example, using Workstation Configurator is an alternative since it does not exceed the 120 formatted character limit). If the VFC data contains "unprintable" characters use one of the previously mentioned methods to manipulate them.

HP 256X

Example VFC Data Entry Methods:

The example escape sequence may be created while the DISPLAY FUNCTIONS key has been enabled as follows:

Press the CONTROL key before each letter of the VFC data except for the two **BOLDFACE** characters.

^{E}C&l42W@E@D@D@D@D@D@L@D@D@T@D@D@D@D@D@D@D@$@D@D@D@F
VFC data

This would display the corresponding ASCII character, i.e., the Nul for CTL @.

Another method using EDITOR would be to do a CHANGE command replacement to convert the characters to ASCII characters. This is shown as:

```
\ADD 1
 1 EC&l42Wabcdefghijklmnopqrstuvwxyz ABCDEFGHIJ
 2 //
\CHANGEQ 7/7 TO '00
\CHANGEQ 8/8 TO '05
\CHANGEQ 9/9 TO '00
          .
          .
          .
\CHANGEQ 48/48 TO '06
```

This could also be input by not entering the letters, but simply changing the specific column to the desired ASCII character. In the above example the "abc...HIJ" would not be entered and the CHANGE command would be used as follows:

```
\CHANGEQ 7 TO ;00 \CHANGEQ 8 TO '05
                .
                .
                .
```

An example in Workstation Configurator might be input several formats. An example showing the various formats is shown below:

ESC,'&l42W',NUL,ENQ,`@,`D,00,04,%0,%4,....%0,%6

As you can see, the escape sequence for Programmable VFC can be quite complicated. This should only be used after attempting to satisfy VFC requirements using the standard (computed) VFC and the TEXT and PAGE LENGTH escape sequences.

The most common errors in successfully implementing the Programmable VFC escape sequence usually involve improper VFC byte counting or attempting to manipulate "unprintable" characters and getting confused. Converting these "unprintable" characters to printable ones is the easiest way to avoid data entry confusion.

SUMMARY OF RECOMMENDED STEPS TO IMPLEMENT PROGRAMMABLE VFC:

1. Layout the required VFC in a standard channel 1-16 format.

2. Reverse the resulting bit image so that channel 1 is now where channel 16 was and channel 16 is now where channel 1 was.

3. Divide this 16 bit image into two 8-bit bytes.

4. Decode these 8-bit bytes into ASCII characters using the chart at the end of this manual. If the corresponding decoded character is not a printable character (below %37) it is highly suggested to convert to one by using a "dummy" channel (7 and/or 15).

5. Enter these characters into the Programmable VFC escape sequence as the VFC data. This data MUST be an even byte count and IS CASE (upper/lower) sensitive As in all escape sequences, do not include the brackets ([ ]); they are for clarification only.

6. This escape sequence must be sent to the printer before the data by embedding in the application or as part of an initialization string. A programmable or hardware RESET will clear the VFC ram causing the printer to return to the default VFC.

HP 256X

NOTE:

If either the RS232C or the RS422A interface is installed in the printer, the interface can be configured to have such things as STRIP NULLS AND DELETES. The Null and/or Delete character could be used as a valid characters, so the user must either combine other channels on the same line to generate another character, or do not configure the printer to strip these characters. Another factor may be the use of 8-bit data. If the user desires to use channels 8 and 16, then 8-bit data must be configured. For more detail please refer to the Serial Interface Manual (part number 26067-90904).

2-22. PERFORATION SKIP MODE (PCL Level I)

When perforation skip is enabled, the printer skips to the next Top of Form if the bottom margin is entered following a line feed. Perforation skip mode is only applicable when using line feed instruction applications (line count). If the application uses calls to VFC channels, the VFC definition of vertical margin is used and the state of the perforation skip mode has no effect. The following escape sequences enable and disable the perforation skip mode:

Ec&l1L Enable perforation skip mode

Ec&l0L Disable perforation skip mode

If a programmable VFC is enabled, the end of text is determined by the first occurrence of channel 2. If channel 2 is completely clear, the end of text is the end of the page (that is, there is no perforation region). The text length defaults to one inch less than the logical page length unless the text length has been specified with the **Ec&l[1-128]F** sequence.

Perforation skip mode defaults as configured from the Operator Control Panel (except the HP 2563A, 2565A, and 2566A printers, which have perforation skip mode disabled in the default state).

When the perforation skip mode is disabled, the printer will print in the margin space below the desired bottom of text. This can be avoided if a VFC select to the next Top of Form is performed immediately following the last desired line of text on the page.

NOTE

Many systems perform an automatic page eject which overrides the printer's perforation skip mode. If the user desires to print in the perforation skip region, the system's automatic page eject must be disabled. See paragraph A-9 for information on printing in the perforation skip region when using the HP 3000.

2-23. HORIZONTAL MARGIN SELECTION (PCL Level II)

Absolute left and right margin selection is accomplished using the following escape sequences:

^{E}c&a[print position]L Set left margin

^{E}c&a[print position]M Set right margin

The print position represents the column using the print pitch active when the margin is set. For example, if the character pitch is 10 characters/inch and the left margin is set to column 20, the left margin will be two inches from the left physical limit of the printer. If the pitch is then changed to 5 characters/inch, the left margin would still be in the same physical position, but column 20 would be four inches from the left physical limit of the printer instead of 2 inches.

Margins can be set at any column, regardless of the present printing position. If the new margin selected is to the right of the current print position, then the new setting takes effect immediately. If the new margin setting is to the left of the current print position, then the new setting does not take effect until the cursor is reset to zero (such as with a carriage return or a cursor control command ..as described in section 2-25).

The first column within a line is designated column 0. If a print position greater (or less) than the printer's physical limit is specified, the right (or left) margin will be set to the limits of the printer. The margins default to the maximum limits at power-on or after a reset.

Commands are ignored if the result would place the left margin to the right of the right margin. The only way to move the current active position outside the margins is by using the escape sequences for horizontal cursor control.

2-24. TRANSPARENT PRINT DATA (PCL Level II)

This feature allows the printing of binary data which is required in certain applications. The escape sequence **^{E}c&p[# of bytes]X** enables the printer to print data as in the display functions mode, except that no control codes or escape sequences (including ^{C}R and ^{E}cZ) are executed. The number specified in the value field is the exact number of bytes that will be interpreted as binary.

2-25. CURSOR CONTROL (PCL Level II)

Absolute and relative cursor control are provided for the HP 256X printers. Cursor moves are made in the current active pitch and current active vertical spacing. The following escape sequences perform these functions:

ABSOLUTE ROW	Ec&a#R	Move cursor to absolute row # (where # is an unsigned integer)
ABSOLUTE COLUMN	Ec&a#C	Move cursor to absolute column # (where # is an unsigned integer)
RELATIVE ROW	Ec&a+#R	Move cursor to relative row # from current position (where # is a signed [+ only] integer)
RELATIVE COLUMN	Ec&a[+/-]#C	Move cursor to relative column # from current position (where # is a signed [+/-] integer)

NOTE

A plus (+) or minus (-) sign in front of the value indicates that the new position is relative to the current active position. A (+) sign means the new position is to the right (horizontal) or that paper motion is forward (vertical). A (-) sign means that the new cursor position is to the left of the current active position. The HP 256X printers do not perform reverse paper motion.

The vertical cursor positioning commands move the current active position to the same column on a new line; the vertical movement is based on the active vertical spacing.

The horizontal cursor positioning commands move the current active position to a new column on the same line; the horizontal movement is based on the active horizontal print pitch.

The first column/row within a line/page is column/row zero. Therefore, the upper left-most position is position (0,0). This escape sequence ignores margins and can therefore be used to set the current active position to any location within the printer's physical limits. If a request is made for a location outside the printer's physical limits, the current active position is moved to the appropriate limit.

HP 256X

2-26. RASTER GRAPHICS

Graphics density is set by using the following escape sequences:

Ec*t[7Ø,14Ø]R	Raster graphics resolution	(HP256X feature)
Ec*r#L	Horizontal raster graphics resolution	(HP256X feature)
Ec*r#V	Vertical raster graphics resolution	(HP256X feature)

The **Ec*r#L** and **Ec*r#V** escape sequences allow you to set the horizontal and vertical raster graphics resolutions independently. The following table lists the graphics resolutions and an example escape sequence used to select each:

Graphics resolution Horizontal (dpi)	Vertical (dpi)	Escape sequence to select graphics resolution
60	72	**Ec*r6Ø172V**
70	72	**Ec*r7Ø172V**
120	72	**Ec*r12Ø172V**
140	72	**Ec*r14Ø172V**
60	144	**Ec*r6Ø1144V**
70	144	**Ec*r7Ø1144V**
120	144	**Ec*r12Ø1144V**
140	144	**Ec*r14Ø1144V**

The **Ec*t#R** escape sequence allows an alternate way to select a graphics resolution of either 70 x 72 dots per inch (default) or 140 x 144 dots per inch (high resolution). For example, to specify high-resolution, you would send the **Ec*t14ØR** escape sequence to the printer. Using the standard resolution, the maximum amount of graphics data that can be printed is 115.5 bytes versus 231 bytes for high-resolution.

Ec*rA Prepare for raster graphics (PCL Level I)

Ec*b[# of bytes]
W[binary data] Raster data transfer (PCL Level I)

Ec*b[# of raster lines]Y Move paper # number of raster lines
(Available on HP2566B/67B and HP2566C/67C only) (HP256X feature)

Ec*rB Raster graphics complete (PCL Level I)

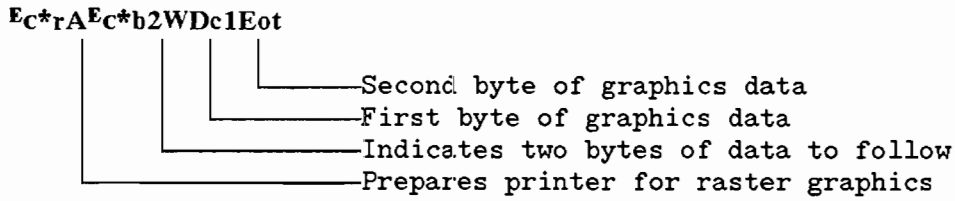
The **Ec*rA** sequence informs the printer that a raster graphics dump is to follow the sequence. If the printer has received a partial line of ASCII data before this sequence is received, this escape sequence causes the ASCII data to be printed and a carriage return and line feed to be performed.

The **Ec*b#W[binary data]** sequence actually sends the raster data to the printer. This escape sequence must be sent for each raster line to be printed. The "# of bytes" parameter is the decimal number of bytes of binary graphics data to be sent to the printer. The "binary data" consists of a 1 for every dot to be printed and a 0 for every blank space.

The **Ec*b#Y** escape sequence allows you to skip multiple adjacent blank lines. The "# of raster lines" parameter is the decimal number of blank raster lines to skip. The size of the blank raster line to be skipped is equivalent to the currently set vertical raster graphics resolution. The advantage of using this escape sequence over sending multiple raster data transfer escape sequences containing blank raster lines is the escape sequence is processed faster and the paper is moved faster. The **Ec*b#Y** escape sequence is available on HP 2566B/67B and HP2566C/67C printers only.

The **Ec*rB** sequence informs the printer that all the raster data has been transferred.

The following example illustrates how to send three lines of raster graphics to the printer.



HP 256X

$^{E}c*b2WL@$

- Second byte of graphics data~
- First byte of graphics data~
- Indicates two bytes of data to follow

$^{E}c*b2W\$+^{E}c*rB$

- Raster graphics complete
- Second byte of graphics data~
- First byte of graphics data~
- Indicates two bytes of data to follow

(~)Needs to be ASCII characters. An example would be the ASCII characters Dc1 Eot in the first line of the raster graphics would translate to the raster data format as 0001000100000100.

NOTE

Many systems perform an automatic line feed after each line of data. The system's automatic line feed must be suppressed or else the raster lines will not be adjacent to each other. A file equation which specifies the line length (for example -- REC=-219) may be used to suppress the automatic line feed along with carriage control directives, such as "+". See paragraph A-7.

Graphics files must be raster graphics files in the format described here in order to print on the HP 256X printers. To print vector graphics files, such as graphics files created for plotters, a vector-to-raster conversion must be performed on the data. (Vector-to-raster conversion is NOT a standard feature of the HP 256X printers.)

Text and graphics can not mix on the same line due to grid conflicts.

Raster graphics uses 8-bit data.

2-27. UNDERLINING (PCL Level I)

The ^{E}c&dD sequence enables the automatic underlining mode. In this mode, each printed character and space is underlined until the printer receives an ^{E}c&d@ sequence. The underline enhancement is disabled in the default state. Underlining only affects forward horizontal movement such as SP (space), DATA, or forward horizontal cursor moves; reverse movements such as BS (backspace), CR (carriage return) and negative horizontal cursor moves are not affected.

NOTE

If you are printing in the high-speed draft mode, automatic underlining may not be functional.

2-28. CHARACTER OVERSTRIKE

To create special symbols and underline selected portions of your output, one character (maximum) may be printed over another on a character-by-character or line-by-line basis.

A character overstrike is accomplished using either the backspace control code or a carriage return with no line feed. The overstrike print line will be held in the print buffer and will be merged with the next line to form a single printed line with superimposed characters. Lines with overstruck characters take twice as long to print as lines without overstruck characters.

NOTE

Attempting to print more than two characters in any one print location will result in a loss of data integrity. (Only the last two characters received will be retained.)

When the automatic underlining enhancement is used (^{E}c&dD), the underlined character is not considered an overstruck character. Therefore, if the underlining enhancement was used to underline a character, another character could still be printed over it without risking data loss.

2-29. BAR CODES (OPTIONAL)

Option 008 allows you to print bar codes with your printer. To print bar codes, escape sequences are sent to the printer specifying the type of code, bar code height, bar code header information, placement information, and the bar code data. The following five escape sequences are used for bar code printing:

^{E}c*z#V -- BAR CODE SELECTION (HP256X feature)

This sequence selects the type of bar code to be used in subsequent printing of bar code data. If a number other than those available is selected, the previously selected bar code type will be used. The following table lists the bar code types available and their corresponding value field numbers:

TABLE 2-8. BAR CODE TYPES

Bar Code Type	Character Length	Value Field No.
Code 3 of 9 (default)	Variable	0
Industrial 2 of 5	Variable	1
2 of 5 Interleaved	Variable	4
UPC A	Fixed	8
UPC E	Fixed	9
EAN 8	Fixed	10
EAN 13	Fixed	11

NOTE

The HP 2562, 2563, and 2564 printers print bar codes using an underlying grid of 110 dots per inch, while the HP 2565, 2566, and 2567 printers use a grid of 100 dots per inch. Because of this difference, the same bar code will print slightly larger when using the HP 2565, 2566, and 2567 printers than when using the HP 2562, 2563, and 2564 printers.

^{E}c*z#H -- BAR CODE HEIGHT (HP256X feature)

This escape sequence defines the height of the bar code label in tenths of an inch as specified in the value field (#). For example, to specify a bar code height of .8 inches, the **^{E}c*z8H** escape sequence would be sent to the printer. A zero in the value field specifies that bar code height is determined by the current line spacing (1/6 or 1/8 inch for 6/8 LPI respectively [or 1/3 or 1/4 inch for double-high/double-wide]). The default bar code height is 0.6 inches.

^{E}c*z#C -- BAR CODE LABEL PLACEMENT (HP256X feature)

This escape sequence specifies the horizontal starting location of a bar code by specifying the column number based on the currently active print pitch. The value field (#) indicates the absolute column position the bar code will begin printing. A plus or minus sign in the value field is ignored. A value field whose position is less than the current active printing position is illegal and causes the cursor to move to the next column position to the right of the current active printing position. When printing bar codes, always allow at least 1/4 inch margin in all directions from each bar code. This will limit the interference from other characters and help readability. If you need to print text and bar codes on the same line, see the "Printing Bar Codes With Text" discussion later in this chapter.

^{E}c*z#Q -- BAR CODE HEADER CONTROL (HP256X feature)

This sequence specifies the placement of the bar code header. A number 1 in the value field specifies that a header will be printed above the bar code label and a 2 specifies that it will be placed below the bar code. A zero in the value field specifies that no header will be printed. The printer default places the header above the bar code.

^{E}c*z<Bar Code Data>Z -- BAR CODE LABEL DATA (HP256X feature)

This sequence sends the bar code label data (up to 32 bytes) in the form of an alphanumeric string enclosed in angled brackets. The header (if enabled) will print in the location specified by the bar code header control sequence.

NOTE

Upon termination of the bar code label data escape sequence, the printer will print all buffered bar code data and generate a carriage return.

The printer automatically formats the bar code, inserts start and stop bits, and calculates and inserts checksums (if applicable--not for Code 3 of 9, Industrial 2 of 5, or 2 of 5 Interleaved).

For UPC E bar codes, a zero (0) must be in the first position of the bar code data.

Only one bar code selection per line is allowed.

HP 256X

PRINTING BAR CODES

Generally, sending bar code information to the printer is performed in two steps:

Step 1: Selecting the bar code printing specifications--bar code type, height, and header control information.

Step 2: Moving the cursor to the desired label location and sending the bar code data.

Step 1. Before positioning and printing the bar code data, the type of code, height of the label, and header placement may be specified. Once this is done, the succeeding labels will be printed using these specifications until a new type, height, or header control is specified. In other words, the bar code print specifications can be sent once and need not be sent again unless the printer is reset or new print specifications are desired. The following example specifies the print specifications for bar codes that are .5 inches in height, have a header above the label, and are printed in the UPC A code.

```
EC*z8v5h1Q
     |  |  └──Places header above bar code
     |  └─────Label is to be .5 inches high
     └────────Select UPC A code
```

Notice that the last letter in the escape sequence (Q) is upper-case while the other letters in the sequence (v and h) are lower-case. (See paragraph 2-4, "ESCAPE SEQUENCES", for more information concerning combining two or more sequences.)

Step 2. To print a bar code label, the cursor must be placed in the desired position and the bar code data must be sent. The following escape sequence moves the cursor to column 25, sends the data "1234567" to the printer, and initiates printing.

```
EC*z25c<1234567>Z
     |  |  |  |└──Upper case Z initiates printing *
     |  |  |  └───Signals end of bar code data
     |  |  └──────Bar code data
     |  └─────────Indicates start of bar code data
     └────────────Places start of label at column 25
```

* Note that an upper-case "Z" terminator results in the bar code being printed and an automatic carriage return (CR) being executed.

PRINTING MULTIPLE LABELS ON THE SAME LINE

Printing more than one label on the same line involves no more than positioning the cursor and sending the data for each label to be printed. Since the termination of the bar code data sequence (signaled by an upper-case Z) causes the bar code to be printed and a carriage return to be executed, all of the label information must be sent in the same escape sequence. The following example shows an escape sequence used to print three labels on a single line:

```
EC*z5c<label1>z20c<label2>z35c<label3>Z
                                    └──Initiates printing
                                  └────Bar code data
                                └──────Moves cursor to column 35
                              └────────Bar code data
                            └──────────Moves cursor to column 20
                          └────────────Bar code data
                        └──────────────Moves cursor to column 5
```

PRINTING BAR CODES WITH TEXT

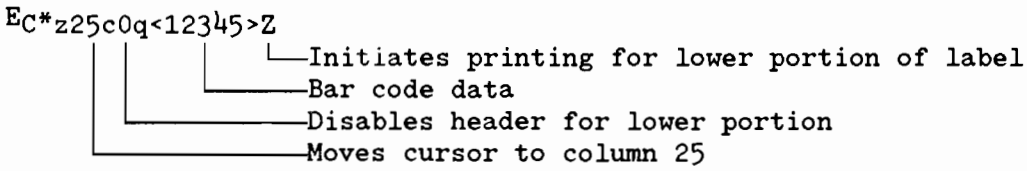
When printing bar codes with text, since the printer automatically generates a carriage return and line feed at the end of the terminating character (upper case Z), potential problems exist. As a general rule, for each line of bar code mixed with text, send the text information first, followed by a carriage return without a line feed (ASCII 13), and then overlay the bar code. (The carriage return is required so that the bar code cursor position will be correct.) The following example illustrates how to print text and bar codes on the same line.

This example involves a three-line bar code (and three escape sequences) as shown below:

```
EC*z0v25c1q<12345>Z
                  └──Enables printing this portion of the bar code
                └────Bar code data
              └──────Specifies header placement above label
            └────────Moves cursor to column 25
          └──────────Selects Code 3 of 9
```

```
EC*z75CThis is textCREC*z0q25c<12345>Z
                                    └──Initiates printing this portion
                                  └────Bar code data
                                └──────Moves cursor to column 25
                              └────────Disables header for this portion
                            └──────────Carriage return without a line feed
                          └────────────Text for right of bar code
                        └──────────────Moves cursor to column 75
```

HP 256X



NOTE

When a header is enabled, sending one line of information causes the printer to print two lines--one line containing the header along with any text you may have sent in that line, and one line containing the bar code label. When a header is enabled, no information can be printed on the same line as the bar code label. However, if the header is disabled, text can be placed next to the bar code label. For example, if you want a label and also wish to enclose the bar code with a box, you may not use automatic headers. Instead, set the height of the bar code to the text height and manually print the header.

BAR CODE WIDTH INFORMATION

The following paragraphs contain information concerning the size of the printed bar codes. If you are designing a form that contains bar codes, this information may prove useful in judging how much space the bar code will occupy. Note that the bar code width differs slightly between the 110 dpi bar code printers (HP 2562, 2563, 2564) and the 100 dpi bar code printers (HP 2565, 2566, 2567).

The following table lists the number of characters sent by the user for each type of bar code:

TABLE 2-9. BAR CODE CHARACTERS

BAR CODE	NUMBER OF CHARACTERS SENT
Code 3 of 9	Variable
Industrial 2 of 5	Variable
Interleaved 2 of 5	Variable
UPC A	11
UPC E	11
EAN 8	7
EAN 13	12

CODE 3 OF 9

A variable-length data string of up to 32 ASCII characters may be printed using the Code 3 of 9 bar code. The string may be an odd or even length and may use any of the standard characters (specified in MIL-STD-1189). If a non-valid character is used in the string, a blank non-readable bar code will be printed--non-valid characters are not substituted or deleted. The width of the printed bar code can be approximated by one of the following equations:

(110 dpi) WIDTH IN INCHES = (NUMBER OF CHARACTERS)/3.44 + .58

(100 dpi) WIDTH IN INCHES = (NUMBER OF CHARACTERS)/3.13 + .64

INDUSTRIAL 2 OF 5

A variable-length data string of up to 32 ASCII characters may be printed using the Industrial 2 of 5 bar code. The string may be an odd or even length and may use any character from 0 through 9. If a non-valid character is used in the string, a blank non-readable bar code will be printed--non-valid characters are not substituted or deleted. Optional checksums are not inserted in the bar code. The width of the printed bar code can be approximated by one of the following equations:

(110 dpi) WIDTH IN INCHES = (NUMBER OF CHARACTERS)/4.2 + .32

(100 dpi) WIDTH IN INCHES = (NUMBER OF CHARACTERS)/3.85 + .44

INTERLEAVED 2 OF 5

A variable-length data string of up to 32 ASCII characters may be printed using the Interleaved 2 of 5 bar code. The string may be an odd or even length. However, if the string is an odd length, a leading zero will be inserted to make a string of an even length. Valid data characters are 0 through 9. If a non-valid character is used in the string, a blank non-readable bar code will be printed--non-valid characters are not substituted or deleted. Optional checksums are not inserted in the bar code. The width of the printed bar code can be approximated by one of the following equations:

(110 dpi) WIDTH IN INCHES = (EVEN NUMBER OF CHARACTERS)/6.44 + .17

(100 dpi) WIDTH IN INCHES = (EVEN NUMBER OF CHARACTERS)/6.25 + .24

HP 256X

UPC A

A fixed-length data string of 11 ASCII characters may be printed using the UPC A bar code. The string must have a length of 11 and may use any of the standard characters 0 through 9. If a non-valid character or string length is used, a blank non-readable bar code will be printed--non-valid characters are not substituted or deleted. The width of the printed bar code does not vary and is 1.75 inches (110 dpi) or 1.88 inches (100 dpi).

UPC E

A fixed-length data string of 11 ASCII characters may be printed using the UPC E bar code. The string length must be 11 and may use any of the standard characters 0 through 9 (however, the data pattern must meet the format of UPC E bar codes--UPC E is a shortened version of very specific patterns printable with UPC A). If a non-valid character or string length is used, a blank non-readable bar code will be printed--non-valid characters are not substituted or deleted. For UPC E, a zero (0) is required in the first position of the bar code data (the number system character). The width of the printed bar code is not variable and is 0.94 inches (110 dpi) or 1.0 inches (100 dpi).

EAN 8

A fixed-length data string of 7 ASCII characters may be printed using the EAN 8 bar code. The string length must be 7 and may use any of the standard characters 0 through 9. If a non-valid character or string length is used, a blank non-readable bar code will be printed--non-valid characters are not substituted or deleted. The width of the printed bar code is not variable and is 1.25 inches (110 dpi) or 1.325 inches (100 dpi).

EAN 13

A fixed-length data string of 12 ASCII characters may be printed using the EAN 13 bar code. The string length must be 12 and may use any of the standard characters 0 through 9. The 13th charatcter is a check character calculated by the printer and is not printed in the bar code header. If a non-valid character or string length is used, a blank non-readable bar code will be printed--non-valid characters are not substituted or deleted. The width of the printed bar code is not variable and is 1.75 inches (110 dpi) or 1.9 inches (100 dpi).

HP 256X

HP LABEL CARD (HP256X feature)

To enable/disable the HP Label Card, use the following escape sequence (0 disables, 1 enables): **^{E}C*t[Ø,1]F**

To enable/disable the Printronix Line Feed Emulation, use the following escape sequence (0 disables, 1 enables): **^{E}C*t[Ø,1]L**

For additional information, refer to the HP Label Card Manual (P/N 26062-90902).

HP 256X

APPENDIX A.
HP 3000 INFORMATION

A-1. INTRODUCTION

This appendix contains information which is specific to HP 3000 users. It explains the use of the feature access and transparent modes, environment files, downloading VFC files, carriage control, perforation skip mode, and discusses recoverability.

A-2. FEATURE ACCESS AND TRANSPARENT MODES

During system device configuration, the HP 256X printers are configured to default to either the transparent or feature access mode. In the transparent mode, the printer prints (but does not execute) all data including control codes and escape sequences. In the feature access mode, the supported control codes and escape sequences are executed. The user can access the non-default mode using either the FDEVICECONTROL intrinsic (for programs) or an environment file (see paragraph A-3).

The HP 256X HPIB and Multipoint printers are configured as type 32, subtype 9 or 13 devices. The printer is set to subtype 9 if the system default is to be feature access and to subtype 13 if the system default is to be the transparent mode. The record width is suggested to be 66 words (132 bytes).

The HPIB driver name is **HIOCIPR0** (CIPER only) and the multipoint interface driver name is **IOMPLPØ**.

The CIPER protocol is the only HPIB protocol supported with the HP 3000 3X, 4X, 6X, 7X, and 9XX Series computers. CIPER protocol can be configured from the Operator Control Panel by setting configuration function 25 = 0 if you have a printer with a Control Board date code of 2418 or greater (the date code is the four digit number to the right of the words "CONTROL BOARD" in the upper left corner of the self-test printout). Printers with a Control Board date code prior to 2418 require a service call to modify function 25.

HP 256X

A-3. HP 256X ENVIRONMENT FILE SPECIFICATIONS (HPIB Only)

The HP 3000 system allows the user to create and use environment files to specify the printer mode (feature access or transparent), left margin, and programmable VFC. An environment file is a standard ASCII EDITOR file which consists of several 80-character records as formatted below. (Printers using an RS232C or RS422 interface must use the Workstation Configurator in MPE-V for accessing environment files--see paragraph A-5.) Refer to the PCL Programmable VFC example in Section 2-19 for a general guide on the whys and hows of VFCs. HP 3000 Application Note #23, part number 5958-5824R2709, contains detailed information on VFCs.

Record 1	MARGIN=nn	HP 2562/63/64/65/66/67 or 2608
Alternate Record 1/2	MODE=[TRANSPARENT] [FEATURE] *	HP 2562/63/64/65/66/67 or 2608S
Alternate Record 1/2/3	VFC,x,y,zzzzzzzz	HP 2562/63/64/65/66/67 or 2608
Record(s)	ASCII-coded binary VFC data	

Key:

nn = This number (1 through 16) specifies the position of the left margin indentation. The default is 0. To use default, do not send.

x = This number (6, 8, or blank) specifies print density in lines per inch. The default density is 6 lines per inch.

y = This number (0 through 127) specifies the number of lines (rows) in the VFC pattern to follow. If 0 is specified, the printer will default to the standard VFC.

z = This letter represents comments for further description of the VFC file for documentation purposes.

---

* Transparent text transmission with a Multipoint Interface is not implemented on the HP 256X or 2608S printers--use subtype 9 instead of subtype 13.

HP 256X

The following example illustrates an environment file which specifies a left margin of 6, feature access, and standard VFC definitions information for an 11 inch form, 6 lines/inch and up to 60 lines of text.

```
(LINE 1)  MODE=FEATURE
          MARGIN=6
          VFC,6,66
          1011100011111101
          0010000000000100
          0011000000001100
          0010100000010101
          0011000000001100
          0110000000000100
          0011100000011101
          0010000000000100
          .
          .
          .
          .
          0011000001000000
          0110000010000000
          0000000000000000
          0000000000000000
          0000000000000000
          0000000000000000
(LINE 69) 0000000000100000
```

NOTE

Channel 1 is the left column and channel 16 is the right column.

To conform with conventional VFC usage, channel 1 is Top of Form and channel 3 is skip one line.

Trailing "0's" may be left blank. Lines without any "1's" may be left blank.

This EDITOR file must be kept unnumbered

After the environment file is created, the environment is specified in the :FILE statement in the following form:

```
[ ;ENV={*formaldesignator} ]
[      {filereference}     ]
```

An example :FILE statement is as follows:

```
:FILE REPORT;DEV=15;ENV=EZENV
```

Note that if multiple copies are printed, the environment is downloaded for each copy.

HP 256X

A-4. DOWNLOADING VFC (HPIB Only)

VFC data which is stored in an EDITOR file can be used in either of two ways: as an environment file (as explained in paragraph A-2) or downloaded using the DOWNLOAD command. Downloading VFC is not recommended because recoverability is eliminated and because only the first copy of multiple copies will use the downloaded VFC. The DOWNLOAD command is used as follows:

:DOWNLOAD ldn [,filename]
[,MARGIN=nn]

---

ldn = The logical device number of the printer.

filename = The name of the unnumbered EDITOR file containing the download VFC information.

nn = The print position that the first byte of data will assume. This number can be between 1 and 16 inclusive. The default margin at the start of the print job is 1.

NOTE

Use of the DOWNLOAD command is not recommended because data recovery is not possible when using the command. In addition, since the HP 256X printers reset all programmable features between print jobs, a multicopy SPOOL file will require the operator to DOWNLOAD the appropriate VFC file as each copy is ready to print. The use of an environment file is recommended (only supported with HPIB interface on the HP 256X printers).

When a DOWNLOAD command is used, the FORMS message option of the :FILE statement or FOPEN intrinsic must be used. This will notify the operator that a DOWNLOAD command must be performed. Two operator replies will be required before the job will print. The DOWNLOAD must be performed after the first reply is made. For example:

User Request--

:FILE OUTLIST;DEV=LP;FORMS=PLEASE DOWNLOAD REPTVFC.
:LISTF;*OUTLIST

First Console Message--

timestamp/#Sx/pin/FORMS ON LDEV#nnn: PLEASE DOWNLOAD REPTVFC
?timestamp/#Sx/pin/IS "OUTLIST" ON LDEV# (Y/N)?

First Operator Reply---

:REPLY pin,Y

Second Console Message---

?timestamp/#Sx/pin/LDEV#nnn FORMS ALIGNED OK (Y/N)?

Second Operator Reply---

:DOWNLOAD nnn,REPTVFC
:REPLY pin,Y

When the first console message is issued, the file system is attempting to allocate a device for the file. When that allocation is made, the file system will command the HP 256X printers to reset all programmable features. If the DOWNLOAD is performed before the first :REPLY is made, the file will start printing. If the operator performs the DOWNLOAD after the second reply, conflicts could occur as the file system and the DOWNLOAD command attempt to access the device at the same time.

NOTE

An escape sequence cannot be placed within a VFC file.

A-5. VFC DOWNLOAD WITH A SERIAL INTERFACE

Typically, VFC download was only possible for 256X printers with an HPIB interface using the CIPER driver. MPE V/E T-MIT and above support a software product called Workstation Configurator that allows serial printers to "download" VFC by placing the VFC escape sequence in an initialization string instead of embedding them within the application.

The process of downloading VFC using Workstation Configurator is different than when using an HPIB printer. Workstation Configurator has a utility that allows modification to two different files that allow for, among other things, setting initialization strings, flow control, and VFC. Workstation Configurator has a terminal type file that is used for certain functions and a VFC file that is used for setting the initialization strings and the VFC. These files are not in the same format as the HPIB VFC file and must be created using Workstation Configurator.

HP 256X

When using the VFC file created using Workstation Configurator, the user must specify the terminal type file in the HP 3000 I/O Configuration, or by referencing it with the ENV parameter of the FILE statement. The DOWNLOAD command will NOT operate in this configuration.

If the ENV parameter of the FILE statement is used, the associated terminal type file that has been configured with the printer will still be sent to the printer first and the terminal type file that has been specified with the ENV parameter will be sent NEXT. This does not create any problems, it just should be noted when using a datascope or analyzing a spoolfile.

A-6. RECOVERABILITY

The HP 256X printers (HPIB CIPER and Multipoint only) automatically recover spooled print jobs following power failure or paper jams. Non-spooled print jobs cannot be recovered under these conditions. Those spooled jobs using environment files to download VFC information are fully recoverable while those using the DOWNLOAD command are not.

Following power failure or a paper jam, the printer begins printing the page which follows the last completely printed page (provided the data integrity is not in question). During job recovery, the printer displays status code 2 on the Operator Control Panel. DO NOT DISTURB THE JOB AT THIS TIME. This process may take several minutes, depending on the size of the job and the current capacity of the computer.

NOTE

Jobs which use an environment file to download VFC information recover from a power failure slower than those jobs which do not. Recovery of jobs which use environment files requires the system to restart at the beginning of the job, causing a slower recovery.

A-7. CARRIAGE-CONTROL DIRECTIVES

The HP3000 software drivers allow users to embed the following carriage-control directives in files:

ASCII SYMBOL	CARRIAGE ACTION
" "	Single space (with or without automatic page eject)
"+"	No space, return (next printing at column 1)
"-"	Triple space (without automatic page eject)
"0"	Double space (without automatic page eject)
"1"	Page eject (form feed)--Selects VFC channel 1
"C"	Sets single-space option, without automatic page eject (66 lines-per-page)

The carriage-control directive is placed in column 1 of the file and is executed (but not printed) when the file is printed. When using this feature, all other characters placed in column 1 will be ignored (not printed).

When using the carriage-control directives, the application must use carriage control and [;CCTL] must be included in the file equation as shown in the following example:

:file [filename];dev=[device number];cctl

A-8. GRAPHICS

When using graphics, the line feed generated by the driver must be suppressed or there will be 1/6" or 1/8" spacing between raster lines. One way to do this is to add a "+" to the front of the file as carriage control (the file equation must have ";CCTL" as explained in paragraph A-7.)

HP 256X

A-9. PRINTING IN THE PERFORATION SKIP REGION

When using the HP 3000, an automatic page eject occurs when the perforation skip region is entered. There are three ways to avoid a page eject and allow printing in the perforation skip region:

- Set the text length = logical page length = physical page length on the front panel.
- Use carriage control with a "C" in column 1 as specified in paragraph A-6 (the application must use carriage control).
- Set the carriage control to null (no CR-LF at end of line) and programmatically add a CR-LF to the end of each record.

APPENDIX B.
HP 1000 INFORMATION

B-1. INTRODUCTION

This appendix contains information which is specific to HP 1000 users.

B-2. FEATURE ACCESS AND TRANSPARENT MODE

The HP 256X printers may be commanded into either the transparent or feature access mode. In the transparent mode, the printer prints (but does not execute) all data including control codes and escape sequences. In the feature access mode, the control codes and escape sequences are executed.

All configuration information is located in the DVC12 Graphics Printer Driver Reference Manual (P/N 92068-90022). For HP 1000 A-Series information, refer to the Driver Reference Manual (P/N 92077-90011) and the RTE-A System Design Manual (P/N 92077-90013). *

B-3. DOWNLOADING VFC

All information concerning downloading VFC files is contained in the DVC12 Graphics Printer Driver Reference Manual (P/N 92068-90022).

* To set transparent mode with the DVC12 driver, the following command can be used where LU is the logical unit address of the printer: CN,LU,30B,20B

HP 256X

B-4. CARRIAGE-CONTROL DIRECTIVES

The HP1000 software drivers allow users to embed the following carriage-control directives in files:

ASCII SYMBOL	CARRIAGE ACTION
" "	Single space (with or without automatic page eject)
"+" or "*"	No space, return (next printing at column 1)
"-"	Triple space (without automatic page eject)
"0"	Double space (without automatic page eject)
"1"	Page eject (form feed)--Selects VFC channel 1

The carriage-control directive is placed in column 1 of the file and is executed (but not printed) when the file is printed. When using this feature, all other characters placed in column 1 are ignored (not printed).

B-5. PERFORATION SKIP MODE

To override the HP 1000 driver's automatic page eject, see the Control Requests section of the DVC12 Graphics Printer Driver Reference Manual (P/N 92068-90022).

ASCII Symbol Set

ASCII Char.	EQUIVALENT FORMS			
	Dec	Binary	Oct	Hex
NUL	0	00000000	000	00
SOH	1	00000001	001	01
STX	2	00000010	002	02
ETX	3	00000011	003	03
EOT	4	00000100	004	04
ENQ	5	00000101	005	05
ACK	6	00000110	006	06
BEL	7	00000111	007	07
BS	8	00001000	010	08
HT	9	00001001	011	09
LF	10	00001010	012	0A
VT	11	00001011	013	0B
FF	12	00001100	014	0C
CR	13	00001101	015	0D
SO	14	00001110	016	0E
SI	15	00001111	017	0F
DLE	16	00010000	020	10
DC1	17	00010001	021	11
DC2	18	00010010	022	12
DC3	19	00010011	023	13
DC4	20	00010100	024	14
NAK	21	00010101	025	15
SYNC	22	00010110	026	16
ETB	23	00010111	027	17
CAN	24	00011000	030	18
EM	25	00011001	031	19
SUB	26	00011010	032	1A
ESC	27	00011011	033	1B
FS	28	00011100	034	1C
GS	29	00011101	035	1D
RS	30	00011110	036	1E
US	31	00011111	037	1F
space	32	00100000	040	20
!	33	00100001	041	21
"	34	00100010	042	22
#	35	00100011	043	23
$	36	00100100	044	24
%	37	00100101	045	25
&	38	00100110	046	26
'	39	00100111	047	27
(	40	00101000	050	28
)	41	00101001	051	29
*	42	00101010	052	2A

ASCII Char.	EQUIVALENT FORMS			
	Dec	Binary	Oct	Hex
+	43	00101011	053	2B
,	44	00101100	054	2C
-	45	00101101	055	2D
.	46	00101110	056	2E
/	47	00101111	057	2F
0	48	00110000	060	30
1	49	00110001	061	31
2	50	00110010	062	32
3	51	00110011	063	33
4	52	00110100	064	34
5	53	00110101	065	35
6	54	00110110	066	36
7	55	00110111	067	37
8	56	00111000	070	38
9	57	00111001	071	39
:	58	00111010	072	3A
;	59	00111011	073	3B
<	60	00111100	074	3C
=	61	00111101	075	3D
>	62	00111110	076	3E
?	63	00111111	077	3F
@	64	01000000	100	40
A	65	01000001	101	41
B	66	01000010	102	42
C	67	01000011	103	43
D	68	01000100	104	44
E	69	01000101	105	45
F	70	01000110	106	46
G	71	01000111	107	47
H	72	01001000	110	48
I	73	01001001	111	49
J	74	01001010	112	4A
K	75	01001011	113	4B
L	76	01001100	114	4C
M	77	01001101	115	4D
N	78	01001110	116	4E
O	79	01001111	117	4F
P	80	01010000	120	50
Q	81	01010001	121	51
R	82	01010010	122	52
S	83	01010011	123	53
T	84	01010100	124	54
U	85	01010101	125	55

ASCII Char.	EQUIVALENT FORMS			
	Dec	Binary	Oct	Hex
V	86	01010110	126	56
W	87	01010111	127	57
X	88	01011000	130	58
Y	89	01011001	131	59
Z	90	01011010	132	5A
[	91	01011011	133	5B
\	92	01011100	134	5C
]	93	01011101	135	5D
^	94	01011110	136	5E
_	95	01011111	137	5F
`	96	01100000	140	60
a	97	01100001	141	61
b	98	01100010	142	62
c	99	01100011	143	63
d	100	01100100	144	64
e	101	01100101	145	65
f	102	01100110	146	66
g	103	01100111	147	67
h	104	01101000	150	68
i	105	01101001	151	69
j	106	01101010	152	6A
k	107	01101011	153	6B
l	108	01101100	154	6C
m	109	01101101	155	6D
n	110	01101110	156	6E
o	111	01101111	157	6F
p	112	01110000	160	70
q	113	01110001	161	71
r	114	01110010	162	72
s	115	01110011	163	73
t	116	01110100	164	74
u	117	01110101	165	75
v	118	01110110	166	76
w	119	01110111	167	77
x	120	01111000	170	78
y	121	01111001	171	79
z	122	01111010	172	7A
{	123	01111011	173	7B
|	124	01111100	174	7C
}	125	01111101	175	7D
~	126	01111110	176	7E
DEL	127	01111111	177	7F

INDEX

R

S

T

U

V

First Edition..... FEB 1986
Second Edition..... NOV 1986
Third Edition..... MAY 1987
Fourth Edition..... DEC 1987
Fifth Edition..... JUN 1989
Sixth Edition..... MAR 1990