PRINTRONIX®

Line Matrix Printers
PCL®-II/LinePrinter Plus®
Programmer's Reference Manual

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Table of Contents

1 *Introduction*

About this Guide

This manual explains how to work with the standard emulations provided with your printer so that it works properly and efficiently.

The *Technical Reference Manual* is designed so that you can quickly find the information you need to use and configure your Printronix® P8000 Series printer.

Warnings and Special Information

Read and comply with all information highlighted under special headings:

Warning 	**Warning messages call attention to situations that could hurt you or damage the equipment.**
Caution 	**Conditions that could damage the printer or related equipment.**
Note 	A note gives you helpful hints about printer operation and maintenance.

Related Product Information

Refer to the following books for printer operation:

- *P8000 User's Manual*
  Provides configuration instructions and descriptions and troubleshooting guidelines.
- *P8000 Quick Setup Guide*
  Describes the keys on the control panel and provides quick reference information on daily printer operations such as loading paper and replacing ribbons. Italian, French, German, and Spanish are included.
- *P8000 Maintenance Manual*
  This manual is not shipped with the printer, but can be ordered. It explains how to maintain and repair the LineJet printer at the field service level of maintenance. This manual covers alignments and adjustments, preventive and corrective maintenance, troubleshooting, and basic principles of operation.

Software Features

This section outlines many of the features available with the software described in this manual.

Note For software installation instructions, refer to the *User's Manual*.

PCL-II

The PCL®-II emulation software provides the following features:

- Graphics and a selection of print densities. You can enable graphics mode and specify a density mode (dots per inch).
- Print Attributes. Characters can be bold, italic, double high, double wide, etc.
- Page Formatting. PCL-II commands allow you to set line spacing, page length, and vertical forms control.
- Font Typefaces. Also referred to as print modes. The five typefaces include Near Letter Quality (NLQ), Data Processing (DP), High Speed (HS), OCR A, and OCR B.
- Character Sets. Forty-seven character sets are available. You can print the character sets in the different print modes. (OCR A and B character sets must be printed in OCR A and OCR B print modes.)
- Bar codes. Several bar codes are available, including Code 3 of 9, Industrial 2 of 5, Interleaved 2 of 5, UPC A, EAN 8, EAN 13, UCC/EAN-128, UPCE, Royal Mail (including KIX format), Postnet® 11.3 cpi, and Postnet 4 cpi.

P-Series

The P-Series emulation software provides the following features:

- Graphics and a selection of print densities. You can enable graphics mode and specify a density mode (dots per inch).
- Print Attributes. Characters can be bold, double high, double wide, etc.
- Page Formatting. Commands allow you to set line spacing, page length, and vertical tabbing.
- Font Typefaces. Also referred to as print modes. The five typefaces include: Near Letter Quality (NLQ) with or without serifs, Data Processing (DP), High Speed (HS), OCR A, and OCR B.
- Different character sets are available. You can print the character sets in the different print modes. (OCR A and B character sets must be printed in OCR A and OCR B print modes.)

Proprinter III XL

The Proprinter® emulation software provides the following features:

- Graphics and print densities. You can specify different graphics modes which use different dpi's (dots per inch).
- Print Attributes. Characters can be bold, italic, double high, double wide, etc.
- Page Formatting. Commands allow you to set line spacing, page length, and vertical tabbing.
- Font Typefaces. Also referred to as print modes. The five typefaces include: Near Letter Quality (NLQ) with or without serifs, Data Processing (DP), High Speed (HS), OCR A, and OCR B.
- Numerous character sets are available. You can print the character sets in the different print modes. (OCR A and B character sets must be printed in OCR A and OCR B print modes.)

Epson FX-1050

The Epson® emulation software provides the following features:

- Graphics and print densities. You can enable graphics mode and specify a density mode (dots per inch).
- Print Attributes. Characters can be bold, italic, double high, double wide, etc.
- Page Formatting. Epson commands allow you to set line spacing, page length, and vertical tabbing.
- Font Typefaces. Also referred to as print modes. The five typefaces include: Near Letter Quality (NLQ) with or without serifs, Data Processing (DP), High Speed (HS), OCR A, and OCR B.
- Character Sets. Thirty character sets are available. You can print the character sets in the different print modes. (OCR A and B character sets must be printed in OCR A and OCR B print modes.)

2 *HP PCL-II*

Introduction

This chapter describes the HP® PCL-II emulation host control codes that are supported for your P8000 printer. Emulation refers to the ability of a printer to execute the commands of a particular printer control language. A printer control language is the coding system used to convey, manipulate, and print data. It contains character codes and command sequences that configure the emulation. In this manual, the terms emulation, printer protocol, and printer control language are synonymous.

In the HP PCL-II emulation mode, your printer can print files coded for the HP PCL-II printer control language. To select the PCL-II emulation mode as the active printer emulation, select PCL-II in the ACTIVE EMULATION menu and then the PCL-II menu will appear under the EMULATION menu, as described in the User*'s Manual*.

The PCL-II emulation provides many configurable parameters. The default parameter values for this emulation are shown in Table 1. You can modify the emulation parameter values in two ways:

- The PCL-II host control codes. An extensive set of PCL-II control code commands can be sent to the printer from an attached host computer via the host data stream. Most of this chapter is devoted to describing the PCL-II control code commands.
- The printer configuration menus. You can modify a subset of the PCL-II emulation parameters using the printer configuration menus and control panel keys as described in the *User's Manual*.

A parameter value set by a host control code overrides a value set from the printer's control panel.

Note

Configuration values selected from the menus or via host control codes can be saved to memory so that they will not be lost when you power off the printer. The menu selection for saving a configuration to memory is described in the *User's Manual.*

HP PCL-II Emulation Default Settings

The factory settings for the PCL-II emulation menu options are shown in Table 1. Host control codes can override the settings for these menu options.

Table 1. PCL-II Menu Option Factory Settings

Parameter	Default Setting
Primary/Secondary Character Set	
ID	0
Symbol Set	Roman-8(8U)
Pitch	10.0 cpi
Density	Data Processing
Page Length Representation	Inches/Page
Face, CPI Delay	Enable
Graphics Density	60 dpi
Max. Line Width	13.2 inches
Perforation Skip	Disable
Display Functions	Disable
LF after CR	Disable
CR after LF	Disable
CR after FF	Disable
CR after VT	Enable
PTX Linefeed	Disable
LPI Adjust	6 LPI
Page L. /Lines	66 lines
Page L. /Inches	11 Inches
*Reset Cmd CFG Ld	Power-Up Config.

*The Reset Command can also be set to Disable, Current Config, or Factory Config. See the *User's Manual* for more information.

Switching between the Emulations

The printer supports four emulations: PCL-II (the default), LinePrinter Plus®, Code V™ and IGP/PGL. The LinePrinter Plus has three protocols from which to choose: P-Series, Proprinter III XL, and Epson FX-1050.

You can switch between PCL-II and any of the LinePrinter Plus protocols by sending one of the following commands:

ESC%-00000X	Switches from PCL-II to P-Series
ESC%-00001X	Switches from PCL-II to Proprinter III XL
ESC%-00002X	Switches from PCL-II to Epson FX-1050
SFCC|};K0	Switches from any of the LinePrinter Plus emulations to PCL-II

Note

The SFCC is the Special Function Control Code. From the P-Series protocol, this code is selectable from the front panel. The default value is hex 01. For the Proprinter and Epson emulations, the SFCC is always the ESC (hex 1B) character.

Configuring the PCL-II Emulation with Control Codes

The remainder of this chapter describes the PCL-II printer control language codes that may be sent from a host computer attached to the printer.

The escape (ESC) control code is used to select most of the programmable features.

Commands and control codes sent from a host system override settings in the configuration menus. However, any configuration settings from host control codes will be gone once the printer is powered off (or reset to the default values). Host control codes are *never* reflected in the PCL-II configuration menu. In order to save a configuration, it is necessary to select the desired options from the front panel and save the options to one of the printers eight user-selectable configurations. The *User's Manual* describes the menu option for saving changes to the printer memory.

Printer Feature Set Compatibility

The printer uses the “Printer Control Language” which standardizes printer features and user access of these features, providing compatibility between HP printers. “Printer Control Language” structure consists of five feature levels:

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

Each PCL level supersedes features of the levels below it. The P8000 printers are Level II printers, meaning that all applications for Level I and II printers will operate correctly on your printer with no modifications. In addition to supporting Level I and Level II features, the printer supports 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.

General Information

Programmatic Printer Control

Control codes, multi-character escape sequences, and parameterized escape sequences are all used to control the printers.

The 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 may cause erroneous printing since the printer may be unable to perform the requested operation.

Logical and Physical Pages

The limits of the logical page determine the area in which printing can take place. Logical page length is set programmatically (in lines per page). Physical page length is set via the control panel and indicates the actual size of a single page. The physical page length cannot be changed programmatically. Refer to the *Quick Reference Guide* for more information.

Table 2. Control Codes

Function	Symbol	Binary	Level	Description
Backspace	BS	1000	II	Move one column left.
Horizontal Tab	HT	1001	V	Move the current active position to the next tab stop on the current line. The tab stops are at the left margin and every 8th column between the left and right margins. If new position crosses the right margin, the new position is set to the right margin.
Line Feed	LF	1010	I	Move to next print line while maintaining current column position
Form Feed	FF	1100	I	Move to first line at top of the next page while maintaining current column position
Carriage Return	CR	1101	I	Move to the left margin on current print line

Table 2. Control Codes

Function	Symbol	Binary	Level	Description
Shift Out	SO	1110	I	Select following characters from the current secondary character font until receipt of a Shift In
Shift In	SI	1111	I	Select following characters from the current primary character font until receipt of a Shift Out
Escape	ESC	11011	I	The following characters are a special control sequence

Escape Sequences

An escape sequence consists of the ESC control code followed by one or more characters in succession. Both two-character and parameterized escape sequences control the printer. Two-character escape sequences take the form ESCX, where X is a character from the ASCII table (0 through ~). Parameterized escape sequences are structured in the following form:

ESCXy[parameter]Z

This sequence is explained below:

ESCXy **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 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 shown 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 (ESC&l[1-128]P) specify a range of values (1 through 128) for page length. To specify a page length of 35 lines, the escape sequence ESC&l35P would be sent to the printer.

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 10 ESC&a10L

Set right margin at position 99 ESC&a99M

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

ESC&a10l99M

The list below shows the escape sequences you can use with the printer. Note that the brackets [ ] used in these escape sequences are for clarification purposes only (the brackets are not actually part of the commands).

FUNCTION	ASCII CODE	PAGE
PCL LEVEL I		
Display Functions Mode on	ESCY	49
Display Functions Mode off	ESCZ	49
Perforation Skip Mode on	ESC&l1L	52
Perforation Skip Mode off	ESC&l0L	52
Print Mode Selection (10 & 16.67 cpi)	ESC&k[0,2]S	52
Programmable reset	ESCE	54
Raster Graphics start	ESC*rA	63
Raster Graphics data	ESC*b[#]W[*data*]	63
Raster Graphics end	ESC*rB	63
Self-test	ESCz	65
Stroke Weight (Bold)	ESC[(,)]s[#]B	65
Underline Mode on	ESC&d[DEFGLMNOTUVW\}^]	66
Underline Mode off	ESC&d[@CHIJKPQRSWXZ[]	66
PCL LEVEL II		
Character Font Selection	ESC[(,)]*ID*	45
Cursor Control (absolute row)	ESC&a[#]R	47
Cursor Control (absolute column)	ESC&a[#]C	47
Cursor Control (relative row)	ESC&a[+#]R	47
Cursor Control (relative column)	ESC&a[+/-#]C	47
Horizontal Margin Selection (Left)	ESC&a[*print position*]L	50
Horizontal Margin Selection (Right)	ESC&a[*print position*]M	50
Horizontal Margin Selection (Reset)	ESC9	50
Line Spacing	ESC&l[6,8]D	50
Logical Page Length Selection	ESC&l[1-128]P	51
Print Pitch Selection	ESC[(,)]s[*Cpi*]H	53
Text Length (Vertical Margin) Selection	ESC&l[1-128]F	66
Transparent Print Data	ESC&p[*# of bytes*]X	66

Bar Codes

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 bar code data. The following five escape sequences are used for bar code printing:

ESC*z#V Bar Code Selection

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 3. Bar Code Types

Bar Code Type	Character Length	Value Field No.
Code 3 of 9 (default)	Variable	0
Industrial 2 of 5	Variable	1
Interleaved 2 of 5	Variable	4
UPC A	Fixed	8
UPC E	Fixed	9
EAN 8	Fixed	10
EAN 13	Fixed	11
UCC/EAN 128	Fixed	12
Postnet	Fixed	13, 14
Royal Mail (including KIX format)	Variable	15, 16

Note The Postnet Barcodes type 13 & 14 print 24 bars per inch. See the section on 256x Postal Barcodes for information on the 20 bars per inch and 22.5 bars per inch Postal Barcodes.

ESC*z#H Bar Code Height

This escape sequence defines the height of the bar code label in tenths of an inch as specified in the value field (#). To specify a bar code height of .8 inches, the ESC*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.

ESC*z#C Bar Code Label Placement

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.

ESC*z#Q Bar Code Header Control

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.

ESC*z<Bar Code Data>Z Bar Code Label Data

This sequence sends the bar code label data 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 the checksum (if applicable-not for Code 3 of 9, Industrial 2 of 5, or Interleaved 2 of 5).

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

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 0.5 inches in height, have a header above the label, and are printed in the UPC A code.

ESC*z8v5h1Q

ESC*z8v	Select UPC A code
5h	Label is to be .5 inches high
1Q	Places header above bar 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 “Escape Sequences” on page 25 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.

ESC*z25c<1234567>Z

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

*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 (signalled 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:

ESC*z5c<label1>z20c<label2>z35c<label3>Z

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

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:

ESC*z0v25c1q<12345>Z

ESC*z0v	Selects Code 3 of 9
25c	Moves cursor to column 25
1q	Specifies header placement above label
<12345>	Bar code data
Z	Enables printing this portion of the bar code

ESC*z75CThis is textCRESC*z0q25c<12345>Z

ESC*z75C	Moves cursor to column 75
This is text	Text for right of bar code
CR	Carriage return without a line feed
ESC*z0q	Disables header for this portion
25c	Moves cursor to column 25
<12345>	Bar code data
Z	Initiates printing this portion

ESC*z25c0q<12345>Z

ESC*z25c	Moves cursor to column 25
0q	Disables header for lower portion
<12345>	Bar code data
Z	Initiates printing for lower portion of label

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, you may 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.

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

Table 4. Bar Code Character

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
UCC/EAN 128	19
Postnet	5 (6), 9(10), or 11(12)
Royal Mail (incl. KIX)	Variable

Note

For Postnet Barcodes printed using the P8000 style, if 5, 9, or 11 digits are sent, your printer will automatically calculate and print the check digit. If 6, 10, or 12 digits are sent, the printer will verify the check digit. Should the check digit be inaccurate, or an invalid bar code length is sent, your P8000 printer will not attempt to print the invalid data.

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. Optional checksums are not inserted in the bar code. The width of the printed bar code can be approximated by the following equation:

Width in inches = (number of characters)/3.14 + 0.50

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 the following equation:

Width in inches = (number of characters)/3.7 + 0.38

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 the following equations:

Width in inches = (even number of characters)/6.25 + 0.15

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 1.56 inches.

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 0.81 inches.

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.

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. 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 1.56 inches.

Royal Mail

A variable length data string may be printed using the “Royal Mail 4 State Customer Code”. The string may use any character from 0 through 9 and alpha characters A through Z. A complete bar code consists of a set of distinct bars and spaces for each character followed by a checksum character and enclosed by a unique start bar, stop bar and quiet zone. A second version of the Royal Mail barcode prints with no stop bar, start bar or checksum character.

The KIX format for Royal Mail does not include the start/stop code or the check digit, but will allow lowercase alpha characters a through z.

UCC/EAN 128

The UCC/EAN 128 bar code contains special characters which use unique codes to identify the leading and trailing end of the bar code. EAN/UCC 128 supports a full ASCII character set and provides standard alphanumeric keyboard characters and control and special characters.

The EAN/UCC 128 data structure requires an Application Identifier (AI) at the beginning of barcode data. Each AI determines the format and length of the data which follows. Refer to Table 5 for more detail.

Table 5. UCC/EAN 128 Application Identifiers

Application Identifier (AI)	Content	Format
00	Serial Shipping Container Code	n2+n18
02	Item Num. of Goods Within Another Unit	n2+n14
10	Batch or Lot Number	n2+an..20
11 (*)	Production Date (YYMMDD)	n2+n6
13 (*)	Packaging Date (YYMMDD)	n2+n6
15 (*)	Sell By Date (Quality) (YYMMDD)	n2+n6
17 (*)	Expiration Date (Safety) (YYMMDD)	n2+n6
20	Product Variant	n2+n2
21	Serial Number	n2+an..20
22	HIBCC = Quantity, Date, Batch and Link	n2+an..29
23 (**)	Lot Number (Transitional Use)	n3+n..19
240	Additional Product ID Assigned By Manufacturer	n3+an..30
250	Secondary Serial Number	n3+an..30
30	Quantity	n2+n..8
310 (***)	Net Weight, Kilograms	n4+n6
311 (***)	Length or 1st Dimension, Meters	n4+n6
312 (***)	Width, Diameter or 2nd Dimension, Meters	n4+n6
313 (***)	Depth, Thickness, Height or 3rd Dimension, Meters	n4+n6
314 (***)	Area, Square Meters	n4+n6
315 (***)	Volume, Liters	n4+n6
316 (***)	Volume, Cubic Meters	n4+n6
320 (***)	Net Weight, Pounds	n4+n6
321 (***)	Length or 1st Dimension, Inches	n4+n6
322 (***)	Length or 1st Dimension, Feet	n4+n6
323 (***)	Length or 1st Dimension, Yards	n4+n6
324 (***)	Width, Diameter, or 2nd Dimension, Inches	n4+n6
325 (***)	Width, Diameter, or 2nd Dimension, Feet	n4+n6
326 (***)	Width, Diameter, or 2nd Dimension, Yards	n4+n6
327 (***)	Depth, Thickness, Height, or 3rd Dimension, Inches	n4+n6
328 (***)	Depth, Thickness, Height, or 3rd Dimension, Feet	n4+n6
329 (***)	Depth, Thickness, Height, or 3rd Dimension, Yards	n4+n6
330 (***)	Gross Weight-Kilograms	n4+n6
331 (***)	Length or 1st Dimension, Logistics	n4+n6
332(***)	Width, Diameter, or 2nd Dimension, Meters, Logistics	n4+6
333 (***)	Depth, Thickness, Height or 3rd Dimension, Meters, Logistics	n4+n6

Table 5. UCC/EAN 128 Application Identifiers (continued)

Application Identifier (AI)	Content	Format
334 (***)	Area, Square Meters, Logistics	n4+n6
335 (***)	Gross Volume, Liters	n4+n6
336 (***)	Gross Volume, Cubic Meters	n4+n6
337 (***)	Kilograms Per Square Meter	n4+n6
340 (***)	Gross Weight, Pounds	n4+n6
341 (***)	Length or 1st Dimension, Inches, Logistics	n4+n6
342 (***)	Length or 1st Dimension, Feet, Logistics	n4+n6
343 (***)	Length or 1st Dimension, Yards, Logistics	n4+n6
344 (***)	Width, Diameter, or 2nd Dimension, Inches, Logistics	n4+n6
345 (***)	Width, Diameter, or 2nd Dimension, Feet, Logistics	n4+n6
346 (***)	Width, Diameter, or 2nd Dimension, Yards, Logistics	n4+n6
347 (***)	Depth, Thickness, Height or 3rd Dimension, Inches, Logistics	n4+n6
348 (***)	Depth, Thickness, Height or 3rd Dimension, Feet, Logistics	n4+n6
349 (***)	Depth, Thickness, Height or 3rd Dimension, Yards, Logistics	n4+n6
350 (***)	Area, Square Inches	n4+n6
351 (***)	Area, Square Feet	n4+n6
352 (***)	Area, Square Yards	n4+n6
353 (***)	Area, Square Inches, Logistics	n4+n6
354 (***)	Area, Square Feet, Logistics	n4+n6
355 (***)	Area, Square Yards, Logistics	n4+n6
356 (***)	Net Weight, Troy Ounce	n4+n6
357 (***)	Net Volume, Ounces	n4+n6
360 (***)	Volume, Quarts	n4+n6
361 (***)	Volume, Gallons	n4+n6
362 (***)	Gross Volume, Quarts	n4+n6
363 (***)	Gross Volume, Gallons	n4+n6
364 (***)	Volume, Cubic Inches	n4+n6
365 (***)	Volume, Cubic Feet	n4+n6
366 (***)	Volume, Cubic Yards	n4+n6
367 (***)	Gross Volume, Cubic Inches	n4+n6
368 (***)	Gross Volume, Cubic Inches	n4+n6
369 (***)	Gross Volume, Cubic Inches	n4+n6
37	Quantity of Units Contained (For Use With AI 02 Only)	n2+n..8
400	Customer's Purchase Order Number	n3+an..30
401	Consignment Number	n3+an..30
410	Ship To (Deliver To) Location Code Using EAN 13	n3+n13

Table 5. UCC/EAN 128 Application Identifiers (continued)

Application Identifier (AI)	Content	Format
411	Bill To (Invoice To) Location Code Using EAN 13	n3+n13
412	Purchase From (Location Code of Party From Whom Goods Are Purchased)	n3+n13
413	Ship For UCC/EAN Location Code	n3+n13
414	EAN Location Code For Physical Identification	n3+n13
420	Ship To (Deliver To) Postal Code Within a Single Postal Authority	n3+an..20
421	Ship To (Deliver To) Postal Code With 3-Digit ISO Country Code Prefix	n3+n3+an..9
8001	Roll Products-Width, Length, Core Diameter, Direction and Splices	n4+n14
8003	UPC/EAN Number and Serial Number or Returnable Asset	n4+n14+an..16
8004	UCC/EAN Serial Identification	n4+an..30
8005	Identifies the Price Per Unit of Measure	n4+n6
8006	Component of an Article	n4+n14+n2+n2
8018	Service Relation Number	n4+n18
8100	Coupon Extended Code-Number System Character and Offer	n4+n1+n5
8101	Coupon Extended Code-Number System Character, Offer and End of Offer	n4+n1+n5+n4
8102	Coupon Extended Code-Number System Character Preceded by Zero	n4+n1+n1
90	Mutually Agreed, Between Trading Partners	n2+an..30
91	Intra-Company (Internal)	n2+an..30
92	Intra-Company (Internal)	n2+an..30
93	Intra-Company (Internal)	n2+an..30
94	Intra-Company (Internal)	n2+an..30
95	Internal-Carriers	n2+an..30
96	Internal-Carriers	n2+an..30
97	Intra-Company (Internal)	n2+an..30
98	Intra-Company (Internal)	n2+an..30
99	Internal	n2+an..30

(*)To indicate only year and month, DD must be filled with “00”
(**) Plus one digit for length indication
(***) Plus one digit for decimal point indication

Data Value Representation:

a - alphabetic characters	n - numeric characters
an - alpha-numeric characters	n3 - 3 numeric characters, fixed length
an..3 - up to 3 alpha-numeric characters	n..3 - up to 3 numeric characters

US Postnet Barcodes

The P8000 printer can print barcodes in three different formats. The default, 24 bars per inch, uses the same syntax as the other barcodes. It is suggested to use the ESC*Z0Q command to disable placement of a header on postal barcodes. The P8000 printer will also print barcodes using the 256X format for 20 and 22.5 bars per inch postal barcodes. See the section on 256X - US Barcodes for more details. P8000 style Postnet barcodes will automatically generate the check digit if it is not present. The 256X-compatibility barcodes require the host to generate the check digit. 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 1.33 (5 digit), 2.17 (9 digit), or 2.59 (11 digit) inches.

256X US POSTNET BAR CODE

The US POSTNET Bar Code is an HP character set which meets the US Postal Office specifications for Postnet bar coding, including the latest Delivery Point Bar Code, or DPBC.

US POSTNET Bar Codes print at 4.0 cpi (20 bars per inch) and 11.3 cpi (22.5 bars per inch). Both bar codes are printed by replacing normal printable characters with vertical bars. Both options use different characters to represent the desired bar codes, as a result the methods by which they are produced are incompatible.

11.3 CPI (22.5 bars per inch) US POSTNET BAR CODE

Font Selection

You may select either of the US POSTNET character sets from either the front panel or through escape sequences. (Refer to the *User's Manual* for details on front panel menus.)

The following escape sequence will configure the 11.3 cpi POSTNET BAR CODE as a secondary font:

ESC)1KESC)s11.3H

The sequence above sets the secondary font symbol set to 11.3 cpi POSTNET BAR CODE, and sets the pitch to 11.3 cpi. Once the Secondary character set is configured for 11.3 cpi Postnet Bar Codes, the Shift Out command can be used to activate the bar codes:

Shift Out: hex 0E

After the bar code is printed, the normal print mode is activated by using the Shift In command:

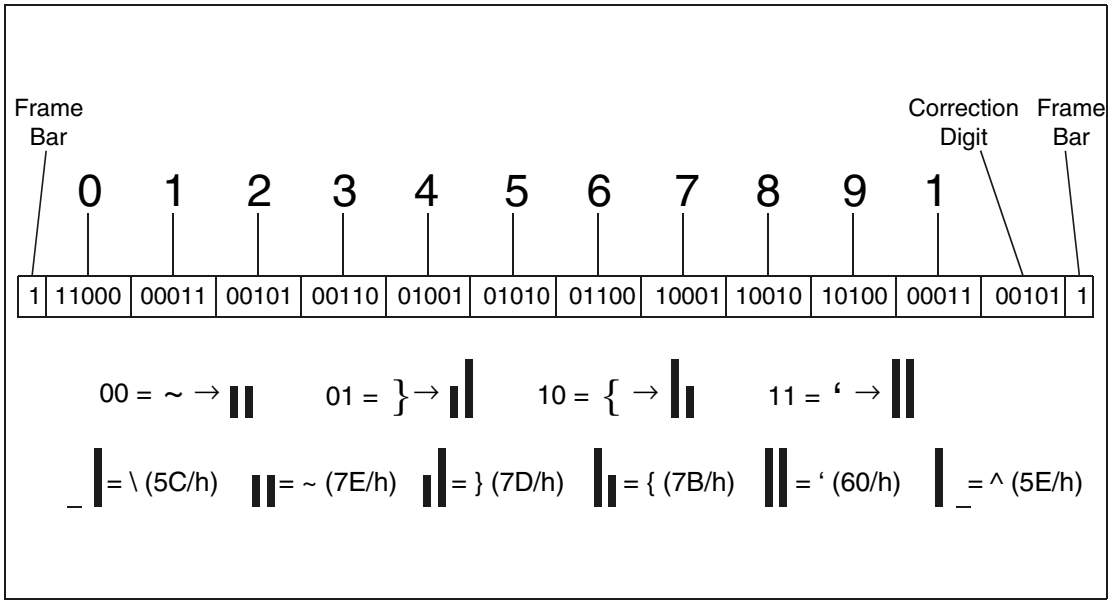
Shift In: hex 0F

Note 

It is recommended setting the US POSTNET Bar Code character set as the secondary set, with the normal operation mode as the primary font.

Printing 11.3 CPI US POSTNET Bar Code Information

The US POSTNET BAR CODES represent digits 0 - 9 with five vertical bars. Each digit consists of two long bars (1's) and three short bars (0's). The Delivery Point Bar Code font is designed to be printed only at 11.3 cpi or 22.5 bars per inch. A Delivery Point Bar Code is an eleven digit postal code. (For five or nine postal bar codes, use the 4.0 cpi US POSTNET Bar Code.) The eleven numeric characters are: ZIP + 4 + 2



Note

Each digit is five bars, with each printable character being two bars. Thus, 2 1/2 characters are needed to print one digit.

To make the bar code scannable, you must add frame bars and a check digit. The check digit is calculated by adding all of the digits and subtracting the sum from the next highest multiple of ten. Consequently, the sum of the eleven digits, and the check digit, will be an even multiple of ten.

The printer does not calculate the check digit or automatically generate frame bars. They must be generated by the computer resident software and sent to the printer. To do this, it is necessary to design a program that will convert a pair of digits into ten vertical bars.

Follow the example below to convert a ZIP Code into a bar code:

1. Calculate the check digit for the ZIP Code 45834-8844-70:
   a. Add the digits of the ZIP code:
      4+5+8+3+4+8+8+4+4+7+0 = 51
   b. Subtract from the next highest multiple of ten:
      60-51 = 9
   The check digit is 9, so the number for conversion is 45834-8844-709.
2. Separate the ZIP Code + digit into digit pairs:
   45834-8844-709 = 45 83 48 84 47 09
3. Convert the digit pairs into binary code:
   Example:
   45 = 01001 01010
4. Convert the binary code into pairs:
   01001 01010 = 01 00 10 10 10
5. Convert each pair into its text equivalent:
   01 00 10 10 10 = }~{{{
6. Add the frame bars. This can be done in one of two ways: Method 1 (Table 6) uses the frame bars as separate characters, and Method 2 (Table 7) “links” the frame bars to the first and last characters:

Table 6: Method 1

ZIP Code + digit	Frame Bar + Digit Pairs	Binary Code Conversion	Text Equivalent	Converted ZIP Code (Text To Printer)
45 83 48 84 47 09	Frame Bar	1	\	SO\}~{{{{}~}{}~`~{{}~{}}~}~}`~}}~^SI
	45	01 00 10 10 10	}~{{{	
	83	10 01 00 01 10	{}~}{	
	48	01 00 11 00 10	}~`~{	
	84	10 01 00 10 01	{}~{}	
	47	01 00 11 00 01	}~}~}	
	09	11 00 01 01 00	`~}}~	
	Frame Bar	1	^	

Note: SO = Shift Out (hex 0E), and SI = Shift In (hex 0F)

Table 7: Method 2

ZIP Code + digit	Frame Bar + Digit Pairs	Binary Code Conversion	Symbol Equivalent	Converted ZIP Code (Text To Printer)
45 83 48 84 47 09	Frame Bar + 4	10 10 01	{{}	SO{{}}}}~{~`~{}{}}~{}~{{}{~`{~{{}SI
	58	01 01 01 00 10	}}}~{	
	34	00 11 00 10 01	~`~{}	
	88	10 01 01 00 10	{}}~{	
	44	01 00 10 10 01	}~{{}	
	79	10 00 11 10 00	{~`{~	
	9 + Frame Bar	10 10 01	{{}	
Note: SO = Shift Out (hex 0E), and SI = Shift In (hex 0F)				

4.0 CPI (20 bars per inch) US POSTNET Bar Code

Font Selection

You may select either of the US POSTNET character sets from the front panel, or through escape sequences. (Refer to your *User's Manual* for details on front panel menus.)

The following escape sequence will configure the 4.0 cpi POSTNET BAR CODE as a secondary font:

ESC)0K (Compatible with 256XC series printers.)
ESC)0KESC)s4.0H (Compatible with C235XA series printers.)

The sequence above sets the secondary font symbol set to 4.0 cpi POSTNET BAR CODE, and sets the pitch to 4.0 cpi. Once the Secondary character set is configured for 4.0 CPI Postnet Bar Codes, the Shift Out command can be used to activate the bar codes:

Shift Out: hex 0E

After the bar code is printed, the normal print mode is activated by using the Shift In command:

Shift In: hex 0F

Note 

It is recommended setting the US POSTNET Bar Code character set as the secondary set, with the normal operation mode as the primary font.

Perform the following steps to determine the check digit for 45834-8844-70:

1. Calculate the check digit:
   Add the digits of the postal code: 4+5+8+3+4+8+8+4+4+7+0 = 51
2. Subtract from the next highest multiple of ten:
   60 - 51 = 9
   The check digit is 9.
3. Text sent to Printer:
   SONUL458348844709.SI

   SO = Shift Out (hex 0E)
   NUL = Nul (hex 00)
   SI = Shift In (hex 0F)

Character Density Selection

(PCL Level III)

Standard-density print, high-density print, and high-speed draft printing can be specified using the following escape sequences:

Primary Selection

ESC(s0Q Select Standard-Density (12 x 9 dot matrix, 120 x 72 dpi) for the primary font

ESC(s1Q Select High-Density (18 x 12 dot matrix, 180 x 96 dpi) for the primary font

ESC(s-1Q Select High-speed Draft Printing (12 x 6 dot matrix, 120 x 48 dpi) for the primary font

Secondary Selection

ESC)s0Q Select Standard-Density (12 x 9 dot matrix, 120 x 72 dpi) for the secondary font

ESC)s1Q Select High-Density (18 x 12 dot matrix, 180 x 96 dpi) for the secondary font

ESC)s-1Q Select High-speed Draft Printing (12 x 6 dot matrix, 120 x 48 dpi) for the secondary font

The default density is that of the default font specified from the control panel. If the symbol set selected is not available in the requested density, the printer will print blank space. However, OCR-A, OCR-B, and Postal Barcodes force density changes to ensure scanability.

When draft printing is selected, the printer prints less dots vertically (5 dots). This reduction in dots results in an increase in print speed of up to 30%.

ESC(0UESC(s10h0s-1Q

To cue high-speed draft with Roman Extension:

ESC(0EESC(s10h0s-1Q

The following table lists all the Symbol Sets available to the PCL II Emulation. Each Symbol Set is followed by its selection Code, and the Characters Per Inch (CPI) available in it. With the exception of OCR-A and OCR-B, selecting a symbol set in a CPI combination not listed in the chart below will result in spaces being printed in place of the desired character.

Table 8. Available Symbol Sets

Name	Code	CPI in High Speed (HS), Data Processing (DP) and Near Letter Quality (NLQ)
Roman-8	8U	5 - 20 cpi[1] in HS, DP and NLQ
Turkish-8	8T	5 - 20 cpi[1] in HS, DP and NLQ
Arab-8	8V	5 - 20 cpi[1] in DP and NLQ; 10 cpi in HS only
Cyrillic	8R	5 - 20 cpi[1] in HS, DP and NLQ
PC858 MtLi	13U	5 - 20 cpi[1] in HS, DP and NLQ
MC Text	12J	5 - 20 cpi[1] in HS, DP and NLQ
Roman-9	4U	5 - 20 cpi[1] in HS, DP and NLQ
Latin-9	9N	5 - 20 cpi[1] in HS, DP and NLQ
Win 3.0Lat-1	9U	5 - 20 cpi[1] in HS, DP and NLQ
Japan Postnet	15Y	4 cpi in NLQ only
Katakana Post	n/a[2]	11.25 cpi in NLQ only
ASCII	0U	5 - 20 cpi[1] in HS, DP and NLQ
Math Sym	0A/0M	5 - 20 cpi[1] in HS, DP and NLQ
LineDraw	0B/0L	5 - 20 cpi[1] in DP only
ISO Den/Nor	0D	5 - 20 cpi[1] in HS, DP and NLQ
Roman Ext.	0E	5 - 20 cpi[1] in HS, DP and NLQ
ISO UK	1E	5 - 20 cpi[1] in HS, DP and NLQ
ISO France	0F	5 - 20 cpi[1] in HS, DP and NLQ
ISO German	0G	5 - 20 cpi[1] in HS, DP and NLQ
Hebrew	0H	5 - 20 cpi[1] in HS, DP and NLQ
Japan ASCII	0K	5 - 20 cpi[1] in HS, DP and NLQ
Katakana	1K	10 cpi in DP and NLQ only
Block Char	1L	5 - 20 cpi[1] in DP only
OCR-A	0O	10 cpi in OCR typeface only
OCR-B	1O	10 cpi in OCR typeface only

Table 8. Available Symbol Sets (continued)

Name	Code	CPI in High Speed (HS), Data Processing (DP) and Near Letter Quality (NLQ)
ISO Swe/Fin	0S	5 - 20 cpi[1] in HS, DP and NLQ
ISO Spain	1S	5 - 20 cpi[1] in HS, DP and NLQ
ISO Italian	0I	5 - 20 cpi[1] in HS, DP and NLQ
ISO Portugu	4S	5 - 20 cpi[1] in HS, DP and NLQ
Latin-1	0N	5 - 20 cpi[1] in HS, DP and NLQ
Latin-2	2N	5 - 20 cpi[1] in HS, DP and NLQ
Latin-5	5N	5 - 20 cpi[1] in HS, DP and NLQ
Latin-6	6N	5 - 20 cpi[1] in HS, DP and NLQ
Baltic	19L	5 - 20 cpi[1] in HS, DP and NLQ
PC8 DanNor	11U	5 - 20 cpi[1] in HS, DP and NLQ
PC8 Cd437	10U	5 - 20 cpi[1] in HS, DP and NLQ
PC850 MtLi	12U	5 - 20 cpi[1] in HS, DP and NLQ
PC851 LtGk	12G	5 - 20 cpi[1] in HS, DP and NLQ
PC852 Lat2	17U	5 - 20 cpi[1] in HS, DP and NLQ
PC Turkish	9T	5 - 20 cpi[1] in HS, DP and NLQ
PC Hebrew	15H	5 - 20 cpi[1] in HS, DP and NLQ
PC Lat/Ara	10V	5 - 20 cpi[1] in DP and NLQ; 10 cpi in HS only
PC Cyrillic	3R	5 - 20 cpi[1] in HS, DP and NLQ
Win3.1Lat1	19U	5 - 20 cpi[1] in HS, DP and NLQ
Win3.1Lat-2	9E	5 - 20 cpi[1] in HS, DP and NLQ
Win3.1Lat-5	5T	5 - 20 cpi[1] in HS, DP and NLQ
Math-8	8M	5 - 20 cpi[1] in DP and NLQ only
PS Math	5M	5 - 20 cpi[1] in DP and NLQ only
Greek 7	12N	5 - 20 cpi[1] in HS, DP and NLQ
Postnet4	15Y	4 cpi in NLQ only
Postnet11.25	1K	11.25 cpi in NLQ only
Greek-8	8G	5 - 20 cpi[1] in HS, DP and NLQ
Hebrew-8	8H	5 - 20 cpi[1] in HS, DP and NLQ

Table 8. Available Symbol Sets (continued)

Name	Code	CPI in High Speed (HS), Data Processing (DP) and Near Letter Quality (NLQ)
Katakana-8	8K	10 cpi in DP and NLQ only
DEC 256 Greek	n/a[2]	5 - 20 cpi[1] in HS, DP and NLQ
ELOT 928 Greek	n/a[2]	5 - 20 cpi[1] in HS, DP and NLQ
Greek 3	n/a[2]	5 - 20 cpi[1] in HS, DP and NLQ
ABY Greek	n/a[2]	5 - 20 cpi[1] in HS, DP and NLQ
ABG Greek	n/a[2]	5 - 20 cpi[1] in HS, DP and NLQ
ELOT 927 Greek	n/a[2]	5 - 20 cpi[1] in HS, DP and NLQ
Greek 437	n/a[2]	5 - 20 cpi[1] in HS, DP and NLQ
Greek 8859-7	n/a[2]	5 - 20 cpi[1] in HS, DP and NLQ

NOTES

5 - 20 cpi[1] = 5, 10, 12, 13.3, 15, 16.67, 20 cpi

n/a[2] = not applicable. There is no designated code for this font; you can select it only from the control panel.

Character Font Selection

The printer can print several different character sets (fonts). By performing a printer self-test, you can see which fonts are installed in your printer. You may specify any of these fonts from 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.

Note

Many earlier models of HP printers could not select certain combinations of character sets. Your P8000 printer does not have this limitation. The P8000 printer produces different characters than the previous models, and your application may be requesting the old character set. You will need to modify your application's settings to prevent it from selecting the old character set.

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

- By entering the parameter number via the control panel (function 1 = primary character set; function 2 = secondary character set)
- By specifying the attributes of the desired fonts using escape sequences.

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, 20)
- Style (Upright/Italic)
- Density (High-Speed, Near Letter Quality)

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 (SO) and Shift In (SI) control codes. Notice that the only difference between the primary and secondary font escape sequences is the direction of the parentheses. The left parenthesis "(" is used for primary fonts and the right parenthesis ")" 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, from the control panel default font). 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 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.

Symbol Set Selection

The printer allows you to select a symbol set. 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 default font specified from the control panel.

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

ESC(*ID* Select symbol set for primary character font

ESC)*ID* Select symbol set for secondary character font

Table 8 lists the codes needed to select each symbol set. For example, to select the Roman-8 symbol set for the primary font, you would send the ESC(8U escape sequence. To select OCR-B for the secondary font, you would send ESC)1O to the printer.

An ASCII symbol set table is provided in Appendix A.

Note

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

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.

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 (ESC&dD), the underlined character is not considered an overstrike character. Therefore, if the underlining enhancement was used to underline a character, another character could still be printed over it without risking data loss.

Character Style Selection

The printer has 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:

ESC(s0S Selects the upright style for the primary font
ESC(s1S Selects the italic style for the primary font
ESC)s0S Selects the upright style for the secondary font
ESC)s1S Selects the italic style for the secondary font

Italics cannot be selected or saved from the control panel. The printer will default to the upright style when the printer is first powered on. Changing emulations, loading a configuration, or sending the ESCE command to the printer will cancel the italic style for the primary and secondary fonts.

Cursor Control

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

Absolute Vertical Cursor Position in Rows

ESC&a#R
Move cursor to absolute vertical cursor position in rows (where # is an unsigned integer)

Relative Vertical Cursor Position in Rows

ESC&a[+#]R

Move cursor vertically in rows relative to the current position (where # is a signed [+ only] integer)

Absolute Vertical Cursor Position in Decipoints

ESC&a#V

Move cursor to absolute vertical cursor position in decipoints (where # = *x*/720 inch increments). Fractional decipoint values are not allowed.

Relative Vertical Cursor Position in Decipoints

ESC&a[+/-#]V

Move cursor vertically in decipoints relative to the current position (where # is a signed [+/-] integer at *x*/720 inch increments). Fractional decipoint values are not allowed.

Absolute Horizontal Cursor Position in Columns

ESC&a#C

Move cursor to absolute horizontal cursor position in columns (where # is an unsigned integer)

Relative Horizontal Cursor Position in Columns

ESC&a[+/-#]C

Move cursor horizontally in columns relative to the current position (where # is a signed [+/-] integer)

Absolute Horizontal Cursor Position in Decipoints

ESC&a#H

Move cursor to absolute horizontal cursor position in decipoints (where # = *x*/720 inch increments). Fractional decipoint values are not allowed.

Relative Horizontal Cursor Position in Decipoints

ESC&a[+/-#]H

Move cursor horizontally in decipoints relative to the current position (where # is a signed [+/-] integer at *x*/720 inch increments). Fractional decipoint values are not allowed.

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 (horizontal) or backwards (vertical). The paper cannot be moved backwards past the top-of-form.

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 line spacing or *x*/720 inch line 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 or *x*/720 inch horizontal spacing.

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.

Cursor Positioning

The Cursor Positioning commands are used to move the cursor horizontally or vertically in 1/720 inch increments. Absolute and relative positions are supported, but not fractional decimals. Do not use Cursor Positioning commands to go beyond page boundaries.

Horizontal	ESC&a[#]H
Vertical	ESC&a[#]V
	Reverse paper motion may occur if vertical positioning is set to a value higher than the current position.

Note

After a Cursor Positioning command, the backspace commands do not function.

Display Functions Mode

(PCL Level I)

The display functions mode can be entered using the ESCY sequence. In the display functions mode, the printer prints 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 ESCZ sequence. The ESCZ will be printed before the mode is terminated. Display Functions Mode “off” is the printer default state.

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.

Horizontal Margin Selection

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

ESC&a[*print position*]L Set left margin

ESC&a[*print position*]M Set right margin

The print position specified indicates a decimal number in the range 0 through 131 @ 10cpi (0 - 65 for Double-size, 5 cpi, 0-219 for compressed, 16.67 cpi). 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 logical 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.

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. Power-on and set the margins to the maximum limits.

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.

To release the right margin use one of the following escape sequences:

ESC&a132M for 10 cpi
ESC&a158M for 12 cpi
ESC&a175M for 13.3 cpi
ESC&a198M for 15 cpi
ESC&a220M for 16.7 cpi

The ESC9 command resets the left and right margins. The left margin is set to the left edge of the logical page (column 0) and the right margin is set to the right edge of the logical page.

Line Spacing

Vertical line spacing of 6 or 8 LPI (lines per inch) can be selected either from the control panel or remotely using the ESC&l[6 or 8]D sequence. When the printer is reset, the vertical line spacing is as set from the 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.

Logical Page Length Selection

(PCL Level II)

Two page length definitions exist for the printer; physical page length and logical page length. The physical page length is the length of the paper in inches. The printer also allows you to set page length in lines per page.

The logical page length is that which 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 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 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 ESC&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.

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. The following escape sequences enable and disable the perforation skip mode:

ESC&l1L	Enable perforation skip mode
ESC&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 ESC&l[1-128]F sequence.

Perforation skip mode defaults as configured from the control panel.

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.

Print Mode Selection

The standard, compressed, and double-high/double-wide print modes are selected using the ESC&k[0,2,4,8]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 control panel. Only one print mode is allowed per line.

Table 9. Print Mode Selection

Mode	Horizontal Pitch (in characters/inch)	Vertical Pitch (in lines/inch)*
0	10.0	6 or 8
2	16.67	6 or 8
4	12.0	6 or 8
8**	5.0	3 or 4

* Dependent on current line spacing.

** Double high/double wide character set selection.

Print Pitch Selection

Print pitch is specified using the following escape sequences:

ESC(s[5,10,12,13.3,15,16.7,20.0]H
Select print pitch for primary character font

ESC)s[5,10,12,13.3,15,16.7,20.0]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 pitch will be set to 16.67. Only one pitch per line may be selected. The default print pitch is that of the primary font specified from the control panel.

Note

Refer to the *User's Manual* to see which pitches are available for different symbol set and typeface combinations.

Printing in the Hex 80 through Hex FF Region

The P8000 printer exhibits different behaviors as it processes characters in the hex 80 through FF range. Behavior is based upon the symbol set of the active font. If the symbol set of the active font is 7-bit, characters in the hex 80 through FF range will be ignored. If the symbol set is 8-bit, the printer will attempt to process the characters.

There are two different types of 8-bit sets. Some have characters that are printable in the hex 80 through 9F region, while others do not. If the active symbol set does not have printables in the hex 80 through 9F range, the characters are ignored.

To determine symbol set properties, perform a symbol set print from the PCL menu. 7-bit sets print only one line of characters, while 8-bit sets print two. 8-bit sets, with printables in the hex 80 through 9F range, print characters in the space below the control code on the first line. Those without printables in that range leave the area under the control codes blank.

PTX Linefeed

Determines the vertical text alignment when a Linefeed command is sent.

ESC*t1L	Enabled
ESC*t0L	Disabled

When PTX Linefeed is enabled, the Linefeed moves to the next line as calculated from the Top of Form position, thereby retaining vertical text alignment. When printing graphics or bar codes, you may want to set the PTX Linefeed parameter to Enable to maintain text alignment.

When PTX Linefeed is disabled, the Linefeed is to be performed as calculated from the bottom of the graphics or barcode, thereby disrupting the vertical text alignment.

See Figure 1 for an example of this parameter enabled and disabled.

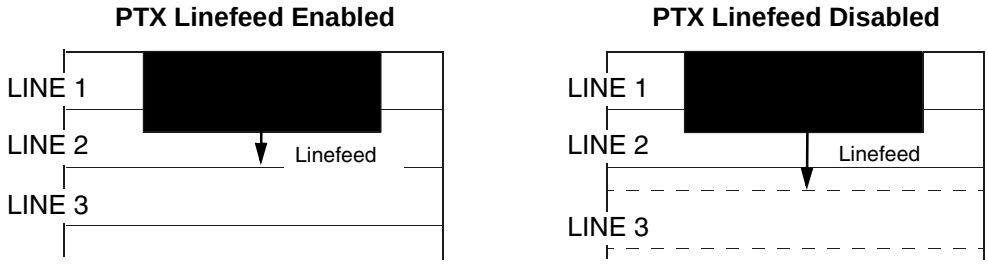


Figure 1. PTX Linefeed

Programmable Reset

The programmable reset escape sequence (ESCE*) 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 current printer configuration values to the following states. 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 control panel.
- Vertical line spacing (6/8 LPI) as configured from the 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 as defined by physical page length.
- Margins set at maximum limits and/or Left margin set at first column (0).
- Physical page length remains as configured from the 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 configured from the control panel.
- Display functions off and Underline enhance disabled.
- Perforation skip mode as configured from the control panel.
- Enable/Disable Label Card as configured from control panel.
- Printronix linefeed emulation as configured from control panel.
- Raster graphics horizontal resolution as configured from the control panel. Vertical resolution set to 72 dots per inch.

*The Reset Command can also be set to Disable, Current Config, or Factory Config. See the *User's Manual* for more information.

Programmable VFC

Programmable VFC allows the user to specify paper movement information other than the standard VFC definitions shown in Table 12. 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 the following escape sequence:

ESC&l[*byte count*]W[*VFC data*]

The *byte count* parameter specifies the number (in decimal 0 - 255) 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 ESC sequence are 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 ESC 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 is channel 16 and the least significant bit of each word is 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 ESC&l[0 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 page and text (form) length 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 channels 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*

The example on page 61 shows a VFC table which uses “standard” VFC definitions and also illustrates a programmable VFC.

Example: Defining a 3.5 inch form at six lines per inch.
1 inch = 6 lines x 3.5 inches = 21 lines

Programmable VFC Using PCL

Programmable VFC's using PCL 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 hard-coded into a program or ASCII file.

VFC's are best understood by reviewing an actual example of how to implement them. For this discussion, the example consists of a 3.5 inch form at six lines per inch with several different channels defined for use on the form to be printed.

1 inch = 6 lines per inch x 3.5 inches = 21 lines; therefore this would be a 21 line form.

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).

EXAMPLE FORM

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 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.

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, the manufacturer 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).

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

Note A “1” corresponds to a hole punched in a physical paper tape.

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. The VFC data portion of the escape sequence reverses the order of the channels. Once reversed, the 16 bits are then divided into two, 8-bit bytes, with channel 16 being the Most Significant Bit (MSB) of the word and channel 1 the Least Significant Bit (LSB) of the word. Refer to Table 10.

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 in Appendix A. 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. Some editors do 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.

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 be 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 e3000 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.

There are several methods to enter data in the Workstation Configurator:

- Entering data as a decimal number, i.e. 13 for a carriage return.
- As an OCTAL number (one byte at a time) by preceding the number with the % sign.
- As a two or three character mnemonic such as BS or DC1 (see Appendix B of the Workstation Configuration manual).
- By entering the control characters with the up-arrow or circumflex character preceding the character, i.e. a backspace would be an ^H.
- 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 10. Converting VFC Format to VFC Data

	Most Significant Byte								Least Significant Byte										
	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	Octal	ASCII	CTL
																	MSB/LSB	MSB/LSB	MSB/LSB
Line 1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	%000%005	NulEnq	@E
Line 2	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	%000%004	NulEot	@D
Line 3	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	%000%004	NulEot	@D
Line 4	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	%000%004	NulEot	@D
Line 5	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	%000%004	NulEot	@D
Line 6	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	%000%004	NulEot	@D
Line 7	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	%000%014	NulFF	@L
Line 8	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	%000%004	NulEot	@D
Line 9	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	%000%004	NulEot	@D
Line 10	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	%000%024	NulDc4	@T
Line 11	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	%000%004	NulEot	@D
Line 12	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	%000%004	NulEot	@D
Line 13	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	%000%004	NulEot	@D
Line 14	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	%000%004	NulEot	@D
Line 15	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	%000%004	NulEot	@D
Line 16	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	%000%004	NulEot	@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	NulEot	@D
Line 19	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	%000%004	NulEot	@D
Line 20	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	%000%104	NulD	@**D***
Line 21	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	%000%006	NulAck	@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 in an ASCII file or programmatically and be either embedded into the application or merged with the spool file.

Example VFC Data Entry Methods

The example escape sequence may be created while the DISPLAY FUNCTIONS key has been enabled as shown below.*

Top of Form
Bottom of Form
Single Spacing
Double Spacing**
Triple Spacing**
Half Form
Quarter Form
Tenth Line
Bottom of Form
Bottom of Form - 1
Top of Form - 1
Top of Form
Seventh Line
Sixth Line
Fifth Line
Fourth Line

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

*This sample shows a 21-line VFC table at 6 LPI. The text ends at line 14, leaving 6 blank lines (one inch) at the bottom of the page.

**These channels cause a move to the next double/triple space line.

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

ESC&142W@E@D@D@D@D@D@L@D@D@T@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 a text editor would be to do a CHANGE command replacement to convert the characters to ASCII characters. This is shown as:

```
\ADD 1
1 ESC&142WabcdefghijklmnopqrstuvwxyzABCDEFGHIJ
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 for the Workstation Configurator might be input in several formats. An example showing the various formats is shown below:

```
ESC, '&142W' ,NUL,ENQ, '@, 'D, 00, 04, %0, %4, ....%0, %6
```

As you can see, the escape sequence for the 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 in Appendix A. 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 SENSITIVE (upper/lower). 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.

Note

If either the RS-232E or the RS-422B 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 valid characters, so the user must either combine other channels on the same line to generate another character, or 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 *User's Manual*.

Raster Graphics

Graphics are sent to the printer using the following escape sequences:

ESC*t[70, 140]RRaster graphics resolution
ESC*r#L Horizontal raster graphics resolution
ESC*r#V Vertical raster graphics resolution

The ESC*r#L and ESC*r#V escape sequences allow you to set the horizontal and vertical raster graphics resolutions independently. Valid raster graphics resolutions are 70 DPI by 72 DPI, 140 DPI by 72 DPI, 70 DPI by 144 DPI, and 140 DPI by 144 DPI. The following table lists the graphics resolution and the corresponding escape sequence used to select that graphics resolution. There are many different valid ways to select a given graphics resolution. The following table lists only one of the many valid ways.

The ESC*t#R escape sequence allows you 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 ESC*t140R 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.

Table 11. Graphics Resolution

Horizontal DPI	Vertical DPI	Escape Sequence
70	72	ESC*r70l72V
140	72	ESC*r140l72V
70	144	ESC*r70l144V
140	144	ESC*r140l144V

ESC*rA or ESC*r#A	Prepare for raster graphics (PCL Level III)
ESC*b[*# of bytes*] W[*binary data*]	Raster data transfer (PCL Level I)
ESC*b[*# of raster lines*]Y	Move paper # number of raster lines
ESC*rB	Raster graphics complete (PCL Level I)

The ESC*rA or ESC*r#A sequence informs the printer that a raster graphics dump is to follow the sequence. If value of # is 0 and the printer has received a partial line of ASCII data before this sequence is received, then the ASCII data prints with a carriage return and line feed following. If the value of # is 1, then the graphics will start at the current horizontal position. If no value is entered for #, then 0 is assumed.

The ESC*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 ESC*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 ESC*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.

ESC*rAESC*b2WDc

ESC*rA	Prepares printer for raster graphics
ESC*b2W	Indicates two bytes of data to follow
D	First byte of graphics data
c	Second byte of graphics data

ESC*b2WL@

ESC*b2W	Indicates two bytes of data to follow
L	First byte of graphics data
@	Second byte of graphics data

ESC*b2W$+ESC*rB

ESC*b2W	Indicates two bytes of data to follow
$	First byte of graphics data
+	Second byte of graphics data
ESC*rB	Raster graphics complete

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, RESC=-219) may be used to suppress the automatic line feed along with carriage control directives, such as “+”.

Graphics files must be raster graphics files in the format described here in order to print on the printer. 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 printer.) Text and graphics cannot mix on the same line due to grid conflicts. Raster graphics use 8-bit data.

Self-test

(PCL Level I)

ESCz prints the PCL-II configuration report, which shows available character sets, symbol sets, bar codes, etc.

Standard (Computed) VFC

The printer VFC uses the logical page and form length (text length) to calculate the distance to be skipped for each VFC channel. 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 on page 61 that 1's are placed in the table at the half form position (lines 1 and 9). Then, for example, if the printer has finished printing line 2 and channel 6 is selected, the paper will be advanced to line 9.

To use the standard VFC, perform the ESC&l[0-16]V sequence using the appropriate parameter number listed in Table 12.

Stroke Weight (Bold)

The Stroke Weight command designates the thickness of the strokes that compose the characters of a font.

ESC(s#B Primary stroke weight

ESC)s#B Secondary stroke weight

The value field (#) must be **0** for standard stroke weight, or **3** for bold stroke weight.

Switching Character Fonts

Character fonts can be accessed using the Shift In/Shift Out (SI/SO) control codes.

The SO (CTRL N) control code is sent to the printer to access the secondary font; the SI (CTRL O) control code is sent to select the primary font.

Text Length (Vertical Margin) Selection

(PCL Level II)

The length of a form within a logical page is set using the ESC&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 than 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.

Transparent Print Data

This feature allows the printing of binary data which is required in certain applications. The escape sequence ESC&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 CR and ESCZ) are executed. The number specified in the value field is the exact number of bytes that will be interpreted as binary.

Underline Mode

The ESC&dD sequence enables the automatic underlining mode. In this mode, each printed character and space is underlined until the printer receives an ESC&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.

Vertical Forms Control (VFC)

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, half form, double space, and triple space, are referred to as channels (0 through 16) and are stored in a VFC “table.”

The printer has both a standard (computed) VFC and a programmable VFC.

Note

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

Table 12. VFC Default Channel Definitions

Prefix	Parameter	Terminator	Explanation
ESC&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 ESC&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.

HP e3000 Information

This section contains information which is specific to HP e3000 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.

Feature Access and Transparent Modes

During system device configuration, the P8000 printer is 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.

VFC Download with a Serial Interface

Typically, VFC download was only possible for 256X and HP 2300 Series 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.

When using the VFC file created using Workstation Configurator, the user must specify the terminal type file in the HP e3000 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 spool file.

Carriage-Control Directives

The HP e3000 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
```

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.")

Printing in the Perforation Skip Region

When using the HP e3000, 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 (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.

HP 1000 Information

The P8000 printer may be commanded in either 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). 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**

Downloading VFC

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

B-4 Carriage-Control Directives

The HP 1000 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).

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).

3 P-Series Printer Emulation

Overview

This chapter describes the P-Series emulation host control codes. “Emulation” refers to the ability of a printer to execute the commands of a particular printer control language. A printer control language is the coding system used to convey, manipulate, and print data. It contains character codes and command sequences that configure the emulation. In this manual, the terms emulation, printer protocol, and printer control language are synonymous.

In the P-Series emulation mode, your printer can print files coded for the P-Series printer control language. To select the P-Series emulation mode as the active printer emulation, select LinePrinter+ from the EMULATION menu and P-Series from the Printer Protocol menu, as described in the *User's Manual.*

The P-Series emulation provides many configurable parameters. The default parameter values for this emulation are shown in Table 13. You can modify the emulation parameter values in two ways:

- **The P-Series host control codes.** An extensive set of P-Series control code commands can be sent to the printer from an attached host computer via the host data stream. Most of this chapter is devoted to describing the P-Series control code commands.
- **The printer configuration menus.** You can modify a subset of the P-Series emulation parameters using the printer configuration menus, control panel keys and LCD, as described in the *User's Manual.*

A parameter value set by a host control code generally overrides a value set from the printer's control panel.

Note

Configuration values selected from the menus or via host control codes can be saved to the printer's NVRAM memory so that they will not be lost when you power off the printer or reset it to the factory defaults. The menu selection for saving a configuration to memory is described in the *User's Manual.*

P-Series Default Values and States

The factory settings for the P-Series emulation menu options are shown in Table 13. Table 14 lists additional factory settings for parameters provided by the LinePrinter+ formatting menus. (The EMULATION menu options are described in the *User's Manual*). Host control codes can override many of the settings for these menu options.

Table 13. P-Series Default Settings

Characteristic	Default Setting
Control Code 06	8.0 LPI
Control Code 08	Elongated
Define CR Code	CR = CR
Auto LF	Disable
Overstrike	Enable
Define LF Code	LF = CR + LF
Select SFCC	1
EVFU Selected	Enable
Alternate Set 80-9F	Control Code
Character Set	IBM PC
Primary Subset	ASCII (USA)
Extended Subset	Code Page 437
SFCC d Command	Even Dot Plot

Table 14. LinePrinter+ Menu Option Factory Settings

Characteristic	Default Setting
CPI	10.0
LPI	6.0
Typeface	Data Processing
Proportional Spacing	Disable
Bold Print	Disable
Italic Print	Disable
Slashed Zero	Disable
Left Margin	0 columns
Right Margin	0 columns
Bottom Margin	0 lines
Perforation Skip	Disable
Form Length	11.0 inches 279.4 millimeters 66 lines
Form Width	13.6 inches 345.4 millimeters 136 characters
Reset Cmd CFG Ld	Disable

Configuring the P-Series Emulation with Control Codes

The remainder of this chapter describes the P-Series printer control language codes that may be sent from a host computer attached to the printer, in order to invoke and configure numerous P-Series emulation functions.

Format for Control Code Descriptions

The following information is listed for each code function (where applicable):

Name The title or function of the command.

ASCII Code The ASCII mnemonic for the command is shown. Command sequences are in 7-bit (ASCII) form.

Hex Code The code or command sequence in hexadecimal numbers.

Dec Code The code or command sequence in decimal numbers.

Purpose The function(s) of the control code.

Discussion A discussion of the uses of the code or command sequence, including exceptions or limitations to its use.

Example A sample is provided for some control codes when it is possible to illustrate the effect of a control code, or if a specific syntax is required to complete the program statement (i.e. Horizontal Tab set, Vertical Tab set/clear).

Note

If you specify any parameters for a control code other than the ones that are defined in the control code description, unpredictable results may occur.

Switching Between the Emulations

The printer supports several different emulations. PCL-II is the default. P-Series, Proprinter III XL, and Epson FX-1050 are all a part of the LinePrinter Plus emulation.

The following command switches from PCL-II to P-Series:

ESC%-00000X

To switch from P-Series to PCL-II, send the following command to the printer:

ESCl};KD

Special Function Control Code (SFCC) Header

A Special Function Control Code (SFCC) is used to extend the control code protocol. The SFCC is the control code introducer (or header); it is the first input in the sequence of parameters. The general control code sequence is:

(SFCC)(parameter 1)(parameter 2)...(parameter *n*)

P-Series codes can be configured to use any value from 1 through 127 (hex 01 through hex 7F) as control code introducers. For example, bold print could be configured to be enabled in the P-Series protocol using any of the control code introducers listed in Table 15.

Table 15. SFCC Example (Bold Print)

ASCII	Hex	Decimal
SOH G	01 47	01 71
ETX G	03 47	03 71
ESC G	1B 47	27 71
^ G	5E 47	94 71
~ G	7E 47	126 71

SFCC Command Line

Print format, print mode, or international language selection can be controlled by a longer sequence known as a command line. Command lines are string type commands placed between complete lines of text and affect the text which follows. The protocol has six command lines: PMODE, OSET, PSET, LPI, LINES, and INCHES. Each of these command lines is discussed in this chapter under the appropriate Control Code function.

For example, the forms length (in inches) can be set using the following command line:

SFCC INCHES; *n.f*

where: *n* is the whole number of inches, and *f* is the fractional increment in 0.5 inch increments.

When using the SFCC in a command line, the SFCC must be the first non-blank symbol in the line (space, hex 20, is a blank symbol). In addition, characters following spaces (other than a valid line terminator) in a command line are ignored so that user comments can be included on the command line. The valid line terminators are Form Feed (FF), Line Feed (LF), and Carriage Return (CR); however, when used in the command line, these line terminators do *not* cause any paper motion. If a command line contains an error, the command will not be executed.

Attribute Set and Reset Codes

Certain print attributes are set and reset (turned on or off) by using the appropriate SFCC code sequence and the numbers 1 or 0. These may be either the hexadecimal code 01 and 00, or the ASCII code for the printable symbols of decimal 1 and 0 (hexadecimal code 31 and 30, respectively). Expanded Print, Super/Subscript Print, and Underline are attributes that are set/reset this way.

NUL Code

NUL (hex 00) is ignored by the printer and can be used as a fill character; however, it can not be used to add blank spaces since it is not a space character.

Note

Hex 80 in the 0437 PC Character Set and hex 7F in the 0850 PC Character Set are treated as a NUL; however, these two controls can not be used as parameter terminators.

Print Modes Supported for Character Sets

All print modes are supported for all character sets; however, for the character sets listed in Table 16, only the print modes listed are supported.

Table 16. Print Modes Supported

Character Set	Mode	Pitch
Barcode 10 cpi	DP	10
Multinational DP 10 cpi	DP	10
Multinational DP 12 cpi	DP	12
Multinational NLQ 10 cpi	NLQ	10
Greek DP 10 cpi	DP	10
Greek DP 12 cpi	DP	12
Greek NLQ 10 cpi	NLQ	10
Graphic DP 10 cpi	DP	10
Graphic NLQ 10 cpi	NLQ	10
Scientific DP 10 cpi	DP	10
Scientific DP 12 cpi	DP	12
Scientific NLQ 10 cpi	NLQ	10
OCR-A	OCR-A	10
OCR-B	OCR-B	10

The Control Codes

This index lists each printer command by function, ASCII mnemonic, and the page where the command is explained in detail. “N/A” means not applicable. The rest of this chapter defines the control code functions for P-Series Emulation mode. The commands are listed in alphabetical order.

Note

Some control code functions can be accomplished using another control code sequence or via control panel selection.

Backspace

ASCII Code BS

Hex Code 08

Dec Code 08

Purpose Moves the logical print head to the left one character space toward the first character column.

Discussion When configured from the control panel for backspace, BS moves the character position indicator (the logical print head position) one character space to the left at the current character pitch setting. The code is ignored if the logical print head is positioned at the first character column.

Example If you were to print five “T” characters, then two BS commands, then two “=” characters, the output would look like the sample below:

TTT==

Bell

ASCII Code BEL

Hex Code 07

Dec Code 07

Purpose Sounds the printer's buzzer/beeper.

Discussion The BEL function will sound the buzzer/beeper for 0.2 seconds upon receipt of this command.

Bold Print

ASCII Code SFCC G SFCC j

Hex Code SFCC 47 SFCC 6A

Dec Code SFCC 71 SFCC 106

Purpose Selects bold character printing.

Discussion When the bold character printing control code is received, all characters are printed in bold until reset by the bold print reset control code or printer reset. Bold Print is the same as emphasized printing.

When SFCC j is used, bold printing is selected for one line only and reset by the bold print reset control code, emulation reset, or a paper motion command.

Example The following sample illustrates bold character printing.

```
Control code ESC G
selects bold character printing,
for example: AaBbCcDdEeFfGgHhIiJjKkLlMmNnOoPp.
Control code ESC H
cancels bold character printing.
```

Bold Print Reset

ASCII Code SFCC H

Hex Code SFCC 48

Dec Code SFCC 72

Purpose Resets bold character printing.

Discussion This control code resets the bold print character attribute. Other print attributes such as double wide printing are not affected.

Example Refer to the Bold Print control code for a sample of bold character print set and reset.

Carriage Return

ASCII Code CR

Hex Code 0D

Dec Code 13

Purpose Returns the logical print head to the first character column (resets the pointer to the first character position).

Discussion The CR code may or may not cause printing or paper motion, depending on the Define CR Code value defined in the configuration menus. If the Define CR Code submenu displays:

```
Define CR Code
CR = CR*
```

The characters following the CR are printed over the previous characters on the line. If identical characters are placed in the same position on the line, those characters will be printed in emphasized print when the Overstrike mode is enabled from the control panel.

The CR=CR configuration causes subsequent printable data to overprint previous data at half speed if Overstrike is enabled from the control panel (and prints somewhat faster if Overstrike is disabled), unless an intervening paper motion command is received.

If the Define CR Code submenu displays:

```
Define CR Code
CR = CR+LF*
```

Control code CR is converted to perform a carriage return and line feed function.

Character Set Select

ASCII Code SFCC l *xyz* (lowercase “L”)

Hex Code SFCC 6C *xyz*

Dec Code SFCC 108 *xyz*

Purpose Selects the character set, extended character set, and the international language for a specific character set.

where *x* is the character set (Table 17);

y is the international language for the selected character set (Table 18);

z is the extended character set for the selected character set (Table 19);

Discussion An asterisk (*) (hex 2A) may be submitted for *x, y,* or *z*. If the asterisk (*) is the value selected for *x*, the character set will not change. If * is the value selected for *y* or *z*, the previously selected international language and/or extended character set for the selected character set will be used.

The character set, international language and extended character set can also be selected from the printer control panel, via the Character Set and Print Language options; however, the control code setting will override the control panel selection. Except for the asterisk value discussed above, values other than those shown in the tables will result in the control sequence being terminated.

Table 16 on page 76 provides detailed notes on print mode support for each character set.

Table 17. Character Set Select (*x*)

x	Character Set
0 (hex 30)	IBM PC
1 (hex 31)	Multinational
2 (hex 32)	ECMA Latin 1
3 (hex 33)	DEC Multinational

Table 18. International Language Select (*y*)

y	*x* = 0 (hex 30)	*x* = 1 (hex 31)	*x* = 2 (hex 32)	*x* = 3 (hex 33)
	IBM PC	**Multinational**	**ECMA Latin 1**	**DEC Multinational**
0 (hex 30)	ASCII (USA)	ASCII (USA)	ASCII (USA)	ASCII (USA)
1 (hex 31)	French	EBCDIC	German	French
2 (hex 32)	German		Swedish	German
3 (hex 33)	English (UK)		Danish	English (UK)
4 (hex 34)	Danish		Norwegian	Norwegian/Danish
5 (hex 35)	Swedish		Finnish	Swedish
6 (hex 36)	Italian		English (UK)	Italian
7 (hex 37)	Spanish		Dutch	Spanish
8 (hex 38)	Japanese		French	Japanese
9 (hex 39)	French Canadian		Spanish	French Canadian
10 (hex 3A)	Latin American		Italian	Dutch
11 (hex 3B)	Norwegian		Turkish	Finnish
12 (hex 3C)	Danish-II		Japanese	Swiss
13 (hex 3D)	Spanish-II			
14 (hex 3E)	Latin American-II			

Table 19. International Language Select (*z*)

z	*x* = 0 (hex 30)	*x* = 1 (hex 31)	*x* = 2 (hex 32)	*x* = 3 (hex 33)
	IBM PC	**Multinational**	**ECMA Latin 1**	**DEC Multinational**
0 (hex 30)	IBM PC (0437)	Mult. Extended Set	Barcode 10 cpi	DEC Mult. Ext. Set
1 (hex 31)	IBM PC (0850)		Mult. DP 10 cpi	
2 (hex 32)			Mult. DP 12 cpi	
3 (hex 33)			Mult. NLQ 10 cpi	
4 (hex 34)			Greek DP 10 cpi	
5 (hex 35)			Greek DP 12 cpi	
6 (hex 36)			Greek NLQ 10 cpi	
7 (hex 37)			Graphics DP 10 cpi	
8 (hex 38)			Graphics NLQ 10 cpi	
9 (hex 39)			Scientific DP 10 cpi	
10 (hex 3A)			Scientific DP 12 cpi	
11 (hex 3B)			Scientific NLQ 10 cpi	
12 (hex 3C)			Multinational (at Primary set mode and pitch)	

Character Set Select: ECMA Latin 1 Extended

ASCII Code SFCC OSET; *n*

Purpose Selects the print mode and pitch at which the extended characters will print.

OSET is valid *only* when the ECMA Latin 1 character set has been selected from the control panel. OSET will be ignored if the IBM PC, Multinational, or DEC Multinational Character Sets are active.

Discussion *n* ranges from 0 through 12 (hex 00 through 0B) to select the print mode/pitch combinations available from Table 20. All other values will result in an error message.

Extended characters will print at the print mode and pitch selected by the OSET command, even if that mode and pitch differs from the currently selected print mode and pitch. If the print mode differs between the extended and primary characters, the first character in the data stream selects the print mode at which that line will print. Different pitches can be printed on the same line.

Table 20. Print Modes/Pitches Available Using P-Series OSET (ECMA Latin 1, Extended Character Set Only)

n	Print Mode/Pitch Select
0	Barcode DP 10 cpi
1	Multinational DP 10 cpi
2	Multinational DP 12 cpi
3	Multinational NLQ 10 cpi
4	Greek DP 10 cpi
5	Greek DP 12 cpi
6	Greek NLQ 10 cpi
7	Graphics DP 10 cpi
8	Graphics NLQ 10 cpi
9	Scientific DP 10 cpi
10	Scientific DP 12 cpi
11	Scientific NLQ 10 cpi
12	Multinational at Primary Character Set Mode and Pitch

Character Set Select: International Languages

ASCII Code SFCC PSET;*n* SFCC R *n*

Hex Code SFCC 52 *n*

Dec Code SFCC 82 *n*

Purpose Specifies the international language set identified by *n* in the basic character set selected from the control panel (ECMA Latin 1, IBM PC, Multinational, and DEC Multinational).

where *n* specifies a language, as shown in Table 21.

Table 21. International Character Sets

n		**Character Set Selected**			
SFCC R (hex)	**PSET**	**ECMA Latin 1**	**IBM PC (0437 or 0850)**	**Multinational**	**DEC Multinational**
0 (30)	0	ASCII (USA)	ASCII (USA)	ASCII (USA)	ASCII (USA)
1 (31)	1	German	French	EBCDIC	French
2 (32)	2	Swedish	German		German
3 (33)	3	Danish	English (UK)		English (UK)
4 (34)	4	Norwegian	Danish		Norw./Danish
5 (35)	5	Finnish	Swedish		Swedish
6 (36)	6	English (UK)	Italian		Italian
7 (37)	7	Dutch	Spanish		Spanish
8 (38)	8	French	Japanese		Japanese
9 (39)	9	Spanish	French Canadian		French Canadian
0A (3A)	10	Italian	Latin American		Dutch
0B (3B)	11	Turkish	Danish-II		Finnish
0C (3C)	12	Japanese	Spanish-II		Swiss
0D (3D)	13		Latin American-II		
0E (3E)	14	**(currently undefined)**			
0F (3F)	15				
10 (40)	16				
11 (41)	17				
12 (42)	18				
13 (43)	19				
14 (44)	20				
15 (45)	21				

Discussion The international character set can also be selected from the control panel via the Print Language option; however, the control code setting will override the control panel character set selection. Values other than those selectable from Table 21 will be ignored.

Example The following example illustrates international character selection using the IBM PC character set.

```
Control code ESC R 5 selects
the Swedish character set shown beneath
the USA (ASCII) characters.

A B C D [ \ ] ^ _ ` { ¦ } ~
A B C D Ä ö Å Ü _ é ä ö å ü
```

Characters 80-9F (Control Codes)

ASCII Code SFCC 7

Hex Code SFCC 37

Dec Code SFCC 55

Purpose Selects hex codes 80 through 9F in the character sets as control codes. Cancels the command SFCC 6.

Discussion This control code overrides the control panel setting.

Characters 80-9F (Printable Symbols)

ASCII Code SFCC 6

Hex Code SFCC 36

Dec Code SFCC 54

Purpose Selects hex codes 80 through 9F in the character sets as printable symbols. Cancels the command SFCC 7.

Discussion This control code overrides the control panel setting.

Elongated (Double High) Print, One Line Only

ASCII Code SFCC h BS

Hex Code SFCC 68 08

Dec Code SFCC 104 08

Purpose Selects elongated (double high) character printing for one line only. Elongated characters are approximately double height but standard width.

Discussion The elongated character control code is a line-by-line print attribute; when the control code is received, one entire line of elongated characters is printed and then automatically reset.

When configured for double high print, the P-Series control code BS (Hex 08) also selects elongated character printing for a single line.

When using this feature with relative line slewing, the paper will be moved *n* + 1 lines rather than *n* lines. Refer to “Vertical Page Formatting” on page 207 for more information on relative line slewing. When using small line spacing and the lines overlap, an unexpected print format may result.

Example The following sample illustrates elongated character printing.

```
Control code
ESC h selects
elongated character printing
for one line only.
```

Elongated (Double High) Print, Set/Reset

ASCII Code SFCC w *n*

Hex Code SFCC 77 *n*

Dec Code SFCC 119 *n*

Purpose Turns double-high character printing on and off. Double-high characters are standard width but twice as high.

where *n* = 1 or 49 (hex 01 or hex 31) turns double high printing on
n = 0 or 48 (hex 00 or hex 30) turns double high printing off

Discussion The OCR A and OCR B fonts cannot be printed in double high.

Note

It is recommended to use double Line Feeds and Carriage Returns when double-high character printing is on (after an SFCC w control code has been sent), or else the printer will overstrike text that has already printed.

If Superscript/Subscript (SFCC S) is combined with Double High printing, *only* Double High printing will occur.

Example The following illustrates double-high character printing.

```
Control Code ESC w
Selects Double High printing.
Cancels Double High printing.
```

Emphasized Print

ASCII Code SFCC E

Hex Code SFCC 45

Dec Code SFCC 69

Purpose Selects emphasized character print format.

Discussion When the emphasized print control code is received, all characters will be printed in emphasized print until reset by the emphasized print reset control code or printer reset. The emphasized print attribute is implemented by horizontal “shadow” printing.

Emphasized print is ignored during superscript or subscript printing, and when 15-20 cpi characters have been selected.

Example The following sample illustrates emphasized character printing.

```
Control code
ESC E selects
emphasized character printing.
Control code ESC F
cancels emphasized character printing.
```

Emphasized Print Reset

ASCII Code SFCC F

Hex Code SFCC 46

Dec Code SFCC 70

Purpose Resets emphasized character printing.

Discussion The emphasized print reset control code only resets the emphasized print character attribute.

Example See the Emphasized Print control code example for an example of Emphasized Print Reset.

Emulation Reset

ASCII Code SFCC @

Hex Code SFCC 40

Dec Code SFCC 64

Purpose Initializes all print mode related parameters to their factory default or power-up configuration values.

Discussion Print mode, line spacing, international language selection, margins, form length, skip-over perforation, and character pitch are reset to their selected power-up configuration values. Character-by-character and line-by-line attributes are canceled. The vertical format unit is cleared. The current line is set to the top-of-form position. Interface parameters and printer protocol selection are not affected.

If the menu option “Reset Cmd CFG Ld” is disabled, the factory default configuration is loaded. If it is enabled, the power-up configuration is used. The default is the factory default.

Expanded Print (Double Wide), One Line Only

ASCII Code SFCC k

Hex Code SFCC 6B

Dec Code SFCC 107

Purpose Selects expanded (double wide) print for one line only.

Discussion This expanded print control code is a line-by-line print attribute; when the SFCC k control code is received, the current line is printed double wide and then automatically reset.

This control code can be reset by a paper motion control code (LF, VT, CR, etc.), SFCC @ (printer reset), CAN or SFCC W (double wide print).

Example The following sample illustrates Expanded Print for one line only. Another example of expanded printing is shown for Expanded (Double Wide) Print, SFCC W on page 90.

```
Control code
SO selects
expanded character printing
for one line only.
```

Expanded Print (Double Wide), Set/Reset

ASCII Code SFCC W *n*

Hex Code SFCC 57 *n*

Dec Code SFCC 87 *n*

Purpose Selects or resets expanded (double wide) print.

where *n* = SOH (hex 01) or 1 (hex 31) selects expanded print.
n = NUL (hex 00) or 0 (hex 30) resets expanded print.

Discussion When expanded print using SFCC W is received, all characters will be printed double wide until reset by the expanded print reset control code or a printer reset.

Example The following sample illustrates expanded character printing and expanded character printing reset.

```
Control code
ESC W 1 selects
expanded character printing.
Control code
ESC W 0 resets
expanded character printing.
```

Extended Character Set

ASCII Code	SO	SFCC SO	SFCC n	SFCC 4
Hex Code	0E	SFCC 0E	SFCC 6E	SFCC 34
Dec Code	14	SFCC 14	SFCC 110	SFCC 52

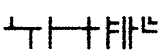
Purpose Accesses the extended character set in the range hex A0 through FF using codes 32 through 127 (hex 20 through 7F).

Discussion Used in 7-bit systems as if data bit 8 was set to 1. For example, sending code hex 20 accesses the symbol at code point hex A0. If a printable symbol is not available at the code point, a space is printed.

SFCC 4 is not cancelled by the next paper motion command; SO, SFCC SO, and SFCC n are cancelled by paper motion.

Example The following sample illustrates the Extended Character Set and Extended Character Set Cancel (see page 91) control codes.

```
Control code
ESC 4 selects the extended character set
and ESC 5 selects the primary character set
which is displayed beneath the extended character set.
```



```
ABCDEFGH
```

Extended Character Set Cancel (Primary Set Select)

ASCII Code	SI	SFCC SI	SFCC o	SFCC 5
Hex Code	0F	SFCC 0F	SFCC 6F	SFCC 35
Dec Code	15	SFCC 15	SFCC 111	SFCC 53

Purpose Cancels Extended Character Set as selected by SO, SFCC SO, SFCC n, and SFCC 4, and selects the Primary Character Set.

Discussion Used in 7-bit systems. If data bit 8 is disabled, this control code selects the range as if data bit 8 is set to 0, and data is printed as characters from 32 through 127 (hex 20 through 7F).

Example Refer to the Extended Character Set example on page 91.

Form Feed

ASCII Code FF

Hex Code 0C

Dec Code 12

Purpose Prints the data in the buffer, advances the paper position to the next top-of-form and moves the character position to the first character column.

Discussion The default forms length is determined by the printer configuration. Forms length is set by using the control panel or forms length control codes. Code FF cancels all single-line only print attributes.

The default form length is 11 inches. The Form Feed command will react differently when the VFU is active. Refer to Chapter 7.

Forms Length Set (Inches)

ASCII Code SFCC INCHES; *n.f*

Purpose Sets the length of forms (paper) in inches.

where *n* = 1 through 24 (hex 01 through 18) specify the number of inches on a page.

f = fractional number in .5-inch increments (minimum forms length is .5 inches).

Discussion Upon receipt of this code, the current line becomes the first line of the form, and the form length set becomes the current forms length. Vertical tab positions set below the bottom of the form are cleared.

Forms length is defined in inches; therefore, subsequent line spacing changes do not affect the result of this command. Increments of .5-inch can be specified; for example, sending the following command will result in a form length setting of 7½ inches: SFCC INCHES; 7.5

The maximum forms length is 24 inches. All other values are ignored. In INCHES mode, incorrect values will produce an error message.

Forms length can be set by the control panel. The control code forms length setting from the host computer will override the control panel setting. If the VFU is enabled and loaded, this command is ignored.

Forms Length Set (Lines)

ASCII Code SFCC LINES; *n*

Purpose Sets the length of a form (paper) in lines.

where *n* = 1 through 192 (hex 01 through C0) specify the number of lines per page at the current line spacing.

Discussion The forms length is set to the number of lines defined by the quotient of *n* and the current line spacing so that the units are in inches. In LINES mode, the maximum form length is 24 inches, and *n* values in excess of 24 inches will cause an error message.

If the calculated forms length in lines is not an exact multiple of the target machine dot size, the forms length value will be adjusted down to the next possible multiple.

If the VFU is enabled and loaded, this command is ignored.

Line Feed

ASCII Code LF

Hex Code 0A

Dec Code 10

Purpose Prints the data in the buffer (if any) and advances the vertical character position one line at the current line space setting.

Discussion If configured for LF equals new line (LF=CR+LF), the logical print head is positioned at character column 1 of the new line. Otherwise, the logical print head does not move when configured for LF function only (LF=LF ONLY). The LF function cancels all single line print attributes such as double high (elongated) and double wide (expanded) characters.

This code is always configured for LF=CR+LF in the P-Series protocol.

In the P-Series Even Dot Plot mode (high density graphics), the LF code does not cause paper position motion; the data in the buffer is plotted and the logical print head is positioned at character column 1 in anticipation of the Odd Dot Plot control code to complete high density graphic plotting.

In the P-Series Odd Dot Plot mode (normal density graphics), the LF code plots the data in the buffer, advances the paper position a single dot row at the current vertical dot density, and positions the logical print head at character column 1.

Line Spacing 1/6 Inch (6 lpi)

ASCII Code SFCC 2 SFCC LPI; *n*

Hex Code SFCC 32

Dec Code SFCC 50

Purpose Sets line spacing to 6 lpi or as set by SFCC A (page 96).

Discussion For SFCC LPI; *n*, the value of *n* can be 6 or 8 only. If *n* = 6, this command sets line spacing to 1/6 inch. Values of *n* other than 6 or 8 will cause an error message.

SFCC 2 asserts *n*/72-inch line spacing as set by SFCC A (page 96). If no distance has been set by SFCC A, the distance is 1/6”

The control code line spacing selection will override the control panel line spacing setting.

Example The following example illustrates 1/6-inch line spacing and assumes that a distance has not been set by ESC A.

```
Control code ESC 2 sets
line spacing at
6 lpi for all subsequent lines
until reset or another spacing is selected.
```

Line Spacing 1/8 Inch (8 lpi)

ASCII Code SFCC 0 SFCC LPI; *n*

Hex Code SFCC 30

Dec Code SFCC 48

Purpose Specifies continuous line spacing at 1/8-inch increments (8 lpi).

Discussion When the 1/8-inch line spacing control code is received, all lines will be printed at 8 lpi until a new line spacing is selected or the printer is reset. The control code line spacing selection will override the control panel line spacing setting.

For SFCC LPI; *n*, the value of *n* can be 6 or 8 only. If *n* = 8, this command sets line spacing to 1/8 inch. Values of *n* other than 6 or 8 will cause an error message.

Example The following example illustrates 1/8-inch line spacing.

```
Control code ESC 0 sets
line spacing at
1/8 (8 lpi) inch for all subsequent lines
until reset or another spacing is selected.
```

Line Spacing 8 or 10.3 lpi (1 Line Only)

ASCII Code ACK SFCC f

Hex Code 06 SFCC 66

Dec Code 06 SFCC 102

Purpose Selects line spacing of 8 or 10.3 lpi for the current line only.

Discussion The default line spacing is reselected automatically after one line. Line spacing may be selected either through the control panel or by line spacing control codes. The control code setting will override the control panel line spacing setting.

If the alternate line spacing selected from the control panel is 8 lpi, the ACK control code will set the line spacing to 8 lpi. If 10.3 lpi was selected from the control panel, the ACK control code will set the line spacing to 10.3 lpi (7/72").

Example The following example illustrates printing a single line of text at 8 lpi.

```
Control code ACK
selects 8 lpi line spacing
for one line only.
The default line spacing is
then reselected automatically.
```

Line Spacing 7/72 Inch

ASCII Code SFCC 1

Hex Code SFCC 31

Dec Code SFCC 49

Purpose Specifies the line spacing at 7/72-inch (10.3 lpi) increments.

Discussion When the 7/72-inch line spacing control code is received, all lines will be printed at the 7/72-inch line spacing until a new line spacing is selected or the printer is reset. The control code line spacing selection will override the control panel line spacing setting, and the message display will reflect the line spacing as 10.3 lines per inch.

Caution should be used when combining this control code with other print attributes such as Elongated (Double High), Superscript, or Subscript; overlapping lines may occur. Printing at different horizontal and vertical densities will not overlap.

Example The following example illustrates 7/72-inch line spacing.

```
Control code ESC 1 sets
line spacing at
7/72 inch for all subsequent lines
until reset or another spacing is selected.
```

Line Spacing *n*/72 Inch

ASCII Code SFCC A *n*

Hex Code SFCC 41 *n*

Dec Code SFCC 65 *n*

Purpose Stores a line spacing of *n*/72-inch increments.

where *n* = 1 through 85 (hex 01 through 55). All others are ignored.

Discussion When the SFCC A control sequence is received, all line feed commands following an SFCC 2 sequence* will be at *n*/72-inch line spacing until a new line spacing is selected or the printer is reset. The control code line spacing selection will override the control panel line spacing setting.

*The SFCC 2 sequence (page 94) asserts the line spacing which was stored by the preceding SFCC A sequence.

Small values of *n* may result in overlapping lines. Overlapping lines may also occur if print attributes such as Elongated (Double High), Superscript, or Subscript characters are used on the same line. Printing at different horizontal and vertical densities will not overlap.

Example The following example illustrates 20/72-inch line spacing.

```
Control code ESC A 20 sets
line spacing at 20/72 inch

increments for all subsequent lines

until reset or another spacing is selected.
```

Line Spacing *n*/216 Inch

ASCII Code SFCC 3 *n*

Hex Code SFCC 33 *n*

Dec Code SFCC 51 *n*

Purpose Specifies the line spacing at *n*/216-inch increments.

where *n* = 1 through 255 (hex 01 through FF).

Discussion When the *n*/216-inch line spacing control code is received, all line feeds following will be at *n*/216-inch line spacing until a new line spacing is selected or the printer is reset. The control code line spacing selection will override the control panel line spacing setting.

The vertical character position moves only in multiples of the current dot row spacing. If the distance to move is other than a multiple of the current dot row spacing, the remainder is added to the next paper motion command.

Caution should be used when combining this control code with other print attributes such as Elongated (Double High), Superscript, or Subscript; overlapping lines may occur. Printing at different horizontal and vertical densities will not overlap.

Example The following example illustrates *n*/216-inch line spacing.

```
Control code ESC 3 50 sets
line spacing at 50/216 inch
increments for all subsequent lines
until reset or another spacing is selected.
```

Overscoring

ASCII Code SFCC _ *n*

Hex Code SFCC 5F *n*

Dec Code SFCC 95 *n*

Purpose Enables or disables automatic overscoring of all characters.

where *n* = SOH (hex 01) or 1 (hex 31) selects overscore print.
n = NUL (hex 00) or 0 (hex 30) resets overscore print.

Discussion When automatic overscore is enabled, all characters, including spaces, will be overscored until disabled.

Example The following sample illustrates automatic overscoring and overscoring reset.

```
Control code ESC _ 1
enables automatic overscoring.
Control code ESC _ 0
disables automatic overscoring.
```

Plot, Even Dot (P-Series High Density Graphics)

ASCII Code EOT SFCC d

Hex Code 04 SFCC 64

Dec Code 04 SFCC 100

Purpose Prints dots at the even numbered dot columns.

Discussion The even dot plot code is used for programming high density graphics and must be used in conjunction with the Odd Dot Plot code (hex 05). Refer to the Plot Mode section in Chapter 6 for detailed plot mode information.

Example Print two high density plot boxes using odd and even dot plot for high density graphics. Compare the example below to the normal density odd dot plot example.

EVEN AND ODD DOT PLOT

Plot, Odd Dot (P-Series Normal Density Graphics)

ASCII Code ENQ SFCC e

Hex Code 05 SFCC 65

Dec Code 05 SFCC 101

Purpose Prints dots at the odd numbered dot columns.

Discussion This is the P-Series programming normal density graphics control code. The ENQ code should occur before any printable data in the data stream. For high density graphics, the Even Dot Plot code (04 hex) must be used in conjunction with (and precede) the Odd Dot Plot code. Refer to the P-Series Compatible Plot mode section in Chapter 6 for detailed plot mode information.

Example Print two normal density plot boxes using odd dot plot. Compare the odd dot plot example below to the high density Even Dot Plot example.

ODD DOT PLOT

Print Mode/Pitch Selection

ASCII Code	SFCC PMODE; *n*	SFCC X *mn*	SFCC [*n* q
Hex Code		SFCC 58 *mn*	SFCC 5B *n* 71
Dec Code		SFCC 88 *mn*	SFCC 91 *n* 113

Purpose Selects the print mode and character pitch in characters per inch (cpi).

where In SFCC PMODE; *n*
n = 0 through 11 to select the print mode/pitch combinations available from Table 22. All other values will result in an error message.

where In SFCC [*n* q
n = Print Mode/Pitch code (values other than those shown in Table 23 are ignored.)
q = Command sequence terminator

where In SFCC X *mn*
m = Print Mode code
n = Pitch (cpi)

An asterisk (*) (hex 2A) may be substituted for *m* or *n.* Whenever the asterisk replaces *m* or *n*, its current value will not change. Values other than those shown in Table 24 and Table 25 are ignored.

Note

The print mode must be changed before the first printable symbol or space of a print line or the command sequence is deferred until the next line.

Discussion P-Series PMODE switches to the Primary Character Set and selects print mode and pitch.

Print mode and pitch can also be selected from the control panel. The print mode/pitch select control code from the host computer will override the control panel print mode setting and the print mode and pitch selection will be reflected on the message display.

If PMODE 7 through 11 are selected to enable upside down characters, the printing is still left to right. Even though characters are upside down, you must reverse the order to read left to right.

A complete set of tables identifying print mode, pitch, and dot densities for all print modes follows.

Table 22. Print Mode and Pitch (SFCC PMODE;*n*)

n	Print Mode and Pitch
0	DP 10 cpi
1	DP 12 cpi
2	DP 15 cpi
3	NLQ 10 cpi
4	HS 10 cpi
5	OCR-A 10 cpi
6	OCR-B 10 cpi
7	DP 10 cpi upside down
8	DP 12 cpi upside down
9	DP 13 cpi upside down
10	DP 15 cpi upside down
11	DP 17 cpi upside down

Table 23. Print Mode and Pitch (SFCC [*n*q)

n	Print Mode and Pitch
1 (hex 31)	NLQ 10 cpi
2 (hex 32)	DP 10 cpi
3 (hex 33)	HS 12 cpi
4 (hex 34)	DP 12 cpi
5 (hex 35)	DP 13 cpi

Table 24. Horizontal and Vertical Dot Density (SFCC X)

m (Hex*)	Horiz. Density Resolution	Vertical Density	Print Mode
0 (30)	120 dpi	72 dpi	DP
1 (31)	180 dpi	96 dpi	NLQ
2 (32)	120 dpi	48 dpi	HS
3 (33)	120 dpi	48 dpi	HS
4 (34)	120 dpi	48 dpi	HS
5 (35)	120 dpi	144 dpi	OCR-A
6 (36)	120 dpi	144 dpi	OCR-B
7 (37)	180 dpi	96 dpi	NLQ2
8 (38)	180 dpi	96 dpi	NLQ2

*The hex values shown (i.e., 0 and 30) are equal. Either value can be used in your program expression.

Table 25. Print Mode and Character Pitches (SFCC X)

Characters Per Inch									
value of *n*:	value of *m*:								
Print Mode*	DP 0 (30)	NLQ 1 (31)	HS 2 (32)	HS 3 (33)	HS 4 (34)	OCR-A 5 (35)	OCR-B 6 (36)	NLQ2 7 (37)	NLQ2 8 (38)
0 (30)	10	10	10	10	10	10	10	10	10
1 (31)	12	12	12	12	12	–	–	12	12
2 (32)	13	13	13	13	13	–	–	13	13
3 (33)	15	15	15	15	15	–	–	15	15
4 (34)	17	17	17	17	17	–	–	17	17
5 (35)	20	17	20	20	20	–	–	17	17

*The hex values shown (i.e., 0 and 30) are equal. Either value can be used in your program expression. The value of *m* is represented by the font choice line.

Note The character set used when OCR-A or OCR-B is selected depends on the Standard character set currently selected. The character set can be changed by using SFCC I or by using the front panel.

Example Any of the BASIC expressions listed below will select the DP print mode at 17 cpi.

where *m* (print mode) = SOH (hex 00) or 0 (hex 30)
n (pitch) = EOT (hex 04) or 4 (hex 34)

```
CHR$(1);“X”;CHR$(0);CHR$(4);

CHR$(1);“X”;CHR$(30);CHR$(34);

CHR$(1);“X04”;
```

Reverse

ASCII Code SFCC } ; *n*

Hex Code SFCC 7D 3B *n*

Dec Code SFCC 125 59 *n*

Purpose Moves the logical print head up.

Discussion If *n* is “L,” the print head moves up one line. (Reverse line feed.) If *n* is “P,” the print head moves up to the previous top of form. (Reverse form feed.)

Superscript/Subscript Printing

ASCII Code SFCC S *n*

Hex Code SFCC 53 *n*

Dec Code SFCC 83 *n*

Purpose Selects superscript or subscript printing.

Discussion An SFCC S code can be set for superscript or subscript printing, as follows:

where *n* = SOH (hex 01) or 1 (hex 31) enables subscript printing.
n = NUL (hex 00) or 0 (hex 30) enables superscript printing.

When this control code is received, all characters will be superscript or subscript until reset by the super/subscript printing reset control code (SFCC T) or printer reset. Use caution when combining this command with other print attributes; arbitrary combinations might yield unexpected results.

Note

Superscript and subscript characters print at the same size as the current font. They are shifted up or down one half of a line.

Example The following sample illustrates superscript/subscript printing.

```
CONTROL CODE ESC S 0 SELECTS SUPERSCRIPT
A^2+B^2=C^2
CONTROL CODE ESC S 1 SELECTS SUBSCRIPT
31 HEX=49 DEC
CONTROL CODE ESC T CANCELS
SUPERSCRIPT/SUBSCRIPT PRINTING
```

Superscript/Subscript Printing Reset

ASCII Code SFCC T

Hex Code SFCC 54

Dec Code SFCC 84

Purpose Resets superscript and subscript printing.

Example See the Superscript/Subscript Printing command example.

Underline

ASCII Code SFCC - *n*

Hex Code SFCC 2D *n*

Dec Code SFCC 45 *n*

Purpose Enables or disables automatic underlining of all characters.

where *n* = SOH (hex 01) or 1 (hex 31) enables automatic underlining.
n = NUL (hex 00) or 0 (hex 30) disables automatic underlining.

Discussion When automatic underline is enabled, all characters, including spaces, will be underlined until disabled.

Example The following sample illustrates automatic underlining.

```
Control code ESC -1
enables automatic underlining.
Control code ESC -0
disables automatic underlining.
```

VFU Commands

ASCII Code Refer to the P-Series VFU section in Chapter 7.

Purpose Load and execute the VFU.

Discussion Refer to Chapter 7 for detailed information.

Vertical Tab

ASCII Code VT

Hex Code 0B

Dec Code 11

Purpose Prints the data in the buffer and advances the paper to the next vertical tab position.

Discussion If a vertical tab format is defined in the EVFU (channel 12) and the VFU is enabled, the paper is moved to the next vertical tab position.

If a vertical tab format is not defined, the paper is advanced to the next line at the current line spacing. More information on Vertical Tabs is provided in the EVFU section of Chapter 7.

4 IBM Proprinter III XL Emulation

Overview

This chapter describes the Proprinter III XL emulation host control codes. “Emulation” refers to the ability of a printer to execute the commands of a particular printer control language. A printer control language is the coding system used to convey, manipulate, and print data. It contains character codes and command sequences that configure the emulation. In this manual, the terms “emulation”, “printer protocol”, and “printer control language” are synonymous.

In the Proprinter III XL emulation mode, your printer can print files coded for the Proprinter III XL printer control language. To select the Proprinter emulation as the active printer emulation, select LinePrinter+ from the EMULATION menu and Proprinter III XL from the Printer Protocol menu, as described in the *User's Manual.*

The Proprinter III XL emulation provides many configurable parameters. The default parameter values for this emulation are shown in Table 26. You can modify these parameter values in two ways:

- **The Proprinter III XL host control codes.** An extensive set of Proprinter III XL control code commands can be sent to the printer from an attached host computer via the host data stream. Most of this chapter is devoted to describing the Proprinter III XL control code commands.
- **The printer configuration menus.** You can modify a subset of the Proprinter III XL emulation parameters using the printer configuration menus, control panel keys, and LCD, as described in the *User's Manual.*

Control codes sent from a host system generally override previous settings that result from the configuration menus.

Note

Configuration values selected from the menus or via host control codes can be saved to the printer's NVRAM memory so that they will not be lost when you power off the printer or reset it to the factory default configuration. The menu selection for saving a configuration to memory is described in the *User's Manual.*

Proprinter III XL Emulation Default Settings

The factory settings for the Proprinter III XL emulation menu options are shown in Table 26. Table 27 lists additional factory settings for parameters provided by the LinePrinter+ formatting menus. (The EMULATION menu options are described in the *User's Manual*.) Host control codes can override many of the settings for these menu options.

Table 26. Proprinter III XL Menu Option Factory Settings

Characteristic	Default Setting
Define CR Code	CR = CR
Auto LF	Enable
Define LF Code	LF = LF
FF Valid at TOF	Enable
Character Set	Code Page 437
Alt. Char Set	Set 1
20 CPI Condensed	Enable

Table 27. LinePrinter+ Menu Option Factory Settings

Characteristic	Default Setting
CPI	10.0
LPI	6.0
Typeface	Data Processing
Proportional Spacing	Disable
Bold Print	Disable
Italic Print	Disable
Slashed Zero	Disable
Left Margin	0 columns
Right Margin	0 columns
Bottom Margin	0 lines
Perforation Skip	Disable
Form Length	11.0 inches 279.4 millimeters 66 lines
Form Width	13.6 inches 345.4 millimeters 136 characters
Reset Cmd CFG Ld	Disable

Configuring the Proprinter III XL Emulation with Control Codes

The remainder of this chapter describes the Proprinter printer control language codes that may be sent from a host computer attached to the printer, in order to configure numerous Proprinter emulation parameters.

Format for Control Code Descriptions

In this chapter, the following information is listed for each control code (where applicable):

Name The title or function of the command.

ASCII Code The ASCII mnemonic for the command is shown. Command sequences are in 7-bit (ASCII) form.

Hex Code The code or command sequence in hexadecimal numbers.

Dec Code The code or command sequence in decimal numbers.

Purpose The function(s) of the control code.

Discussion A discussion of the uses of the code or command sequence, including exceptions or limitations to its use.

Example A sample is provided when it is possible to illustrate the effect of a control code or if a specific syntax is required.

Note

If you specify any parameters for a control code other than the ones that are defined in the control code description, unpredictable results may occur. The PI line is never recognized in Proprinter III XL Emulation mode.

Escape Control Codes Overview

Printer capability is greatly increased by the use of escape control code sequences. Escape sequences always begin with the ASCII escape sequence introducer, ESC (hex 1B). Many of the ASCII control codes described in this chapter are escape sequences.

Note

An Escape code can occur anywhere in the datastream and is acted upon immediately if it precedes a valid command.

An ESC sequence introducer in the data stream signals the printer to wait for special instructions, even if it is ready and printing. The character codes following the ESC character tell the printer what to do.

Note

For readability, code sequences appear in this manual with spaces inserted between command elements. Do not insert spaces between code characters when you are programming unless the ASCII space character (SP) is part of a code sequence. For example, a code sequence printed in this manual as ESC [1 is programmed as ESC[1.

An escape sequence uses two or more bytes to define a specific printer control function. The format for an escape sequence is:

ASCII	ESC	*X*	*n*
Hex	1B	00-7F	0-FF
	Escape Sequence Introducer	Character(s)	Numerical parameter(s)

After the ESC character are one or more characters which indicate the action of the control code. One or more numerical parameters may in turn follow these characters. For example, the sequence ESC S *n* tells the printer to begin the superscript print attribute if *n* is an even number, or to begin the subscript attribute if *n* is an odd number.

If the characters following the ESC code are not within the defined ranges, or if they are within the defined ranges but not recognized as a function of this printer, the entire sequence is ignored.

Graphics Control Codes Overview

The individual control codes that set graphics print quality are described starting on page 115. Some additional background information about graphics printing for the Proprinter III XL emulation is provided here.

The Proprinter III XL emulation provides one data protocol for printing graphics information; the Bit Image graphics protocol allows an image block to be printed. When using the Bit Image protocol, you can mix text and graphics on the same line.

Setting Bit Image Modes via Control Codes

Control codes select bit image modes. The following bit image modes can be mixed on the same line as text characters:

Table 28. Bit Image Modes

Control Code	Bit Image Mode
ESC K *n1 n2 data*	Normal Density
ESC L *n1 n2 data*	Double Density
ESC Y *n1 n2 data*	Double Density, Double Speed
ESC Z *n1 n2 data*	Quadruple Density

Parameters *n1* and *n2* together represent a 16-bit (hexadecimal) unsigned number of the quantity (*n1* + 256*n2*), which equals the number of bit image characters (i.e. data bytes) to follow. If *n1* and *n2* are programmed so that data extends past the last character position, the data is truncated at the last character position. If *n1* and *n2* are both zero, the ESC sequence is ignored.

See Chapter 6 for details on bit image graphics.

Dot Density Versus Printing Speed

When you select ESC K (normal density), the dot columns are printed at 60 dots per inch (dpi) horizontally and 72 dpi vertically. This does not decrease printing speed.

If ESC L (double density) is selected, the dot columns are printed at 120 dpi horizontally and 72 dpi vertically. Double density reduces printing speed by one half.

With ESC Y (double density, double speed), dot columns are printed at 120 dpi horizontally and 72 dpi vertically, but adjacent dots are not printed. Double density, double speed does not decrease printing speed.

When ESC Z (quadruple density) is selected, the dot columns are printed at 240 dpi horizontally and 72 dpi vertically. Quadruple density reduces printing speed by one half.

All line-by-line character print attributes are ignored in Bit Image graphics. The most significant bit for each data character is the uppermost dot position in the vertical dot image pattern. A bit value of 1 indicates a dot; a value of 0 indicates a blank. In 7-bit RS-232E serial interface protocol, the most significant bit (bit 8) is cleared to 0.

Code Page and Character Set Control Codes

A code page is a set of symbols consisting of letters, numbers, and graphic elements. For the Proprinter III XL emulation, your printer supports characters from IBM's Code Page 0437 and Code Page 0850, among an extensive array of different print quality and print language sets. The print language sets are selected using the Print Language configuration menu option, which is described in detail in your *User's Manual.*

Two columns of characters, hex 80 through 9F, may be configured as either control codes or printable symbols. Control code ESC 7 selects Character Set 1 (hex 80-9F configured as control codes). Control code ESC 6 selects Character Set 2 (hex 80-9F configured as printable symbols).

Ignored Codes

The control codes recognized by the Proprinter III XL emulation software are described in this chapter. Control codes not described in this chapter are undefined and ignored. In addition, codes that represent printable characters (hex 10, 11, 15, 21-7E, and 80-FF) are not available as Proprinter III XL control codes.

Note 

Entering control codes that are not defined in this chapter may produce unpredictable results.

The ASCII control code ETX (hex code 03 or 1B 03) is ignored as a Proprinter III XL control code, but is valid for the Serial Interface Protocol.

Reserved Codes

The Download Characters control code (ASCII code ESC =, hex code 1B 3D) is a reserved code. It is not implemented at this time. When implemented, this code is usually followed by large blocks of data. The Proprinter III XL emulation will currently ignore this control code and any data applicable to it.

Switching Between the Emulations

The printer supports several different emulations. PCL-II is the default. P-Series, Proprinter III XL, and Epson FX-1050 are all a part of the LinePrinter Plus emulation.

The following command switches from PCL-II to Proprinter:

ESC%-00001X

To switch from Proprinter to PCL-II, send the following command to the printer:

ESCl};KD

The Control Codes

This index lists each printer command by function, ASCII mnemonic, and the page where the command is explained in detail. The rest of this chapter defines the control code functions for Proprinter III XL emulation mode. The commands are listed in alphabetical order.

Backspace

ASCII Code BS

Hex Code 08

Dec Code 08

Purpose Moves the logical print head left one character space toward the first character column.

Discussion BS moves the character position indicator one character space to the left at the current character pitch setting. This code is ignored if the logical print head is positioned at the first character column.

When the backspace code is received, printing speed will be reduced. If the printer is in double width mode, the backspace code moves the print head left two normal character spaces.

Example If you were to print five “T” characters, then two BS commands, then two “=” characters, the output would look like the sample below:

TTT==

Bell

ASCII Code BEL

Hex Code 07

Dec Code 07

Purpose Sounds a buzzer/beeper.

Discussion The BEL function will sound one beep upon receipt of this command.

Bit Image Mode, Single Density (Normal Speed)

ASCII Code ESC K *n1 n2*

Hex Code 1B 4B *n1 n2*

Dec Code 27 75 *n1 n2*

Purpose Selects single (normal) density bit image graphics.

where *n1* + 256*n2* defines the number of data bytes to follow.
DATA = ASCII characters for the dot pattern bytes.
n1 = (Number of DATA bytes) - 256(*n2*)
(remainder of division of number of DATA bytes by 256, sometimes referred to as MOD 256)
n2 = (Number of DATA bytes) / 256
(quotient of division)

Discussion This code prints specified data as bit image graphics at normal density, 60 dots per inch horizontally and 72 dots per inch vertically. For more information, see “Bit Image Graphics” on page 193.

Example The following example produces a pattern of Single Density Bit Image graphics. The 9-byte bit pattern is repeated 27 times. Compare this example to the double density and quadruple density examples.

```
Single Density Bit Image Graphics
```

Bit Image Mode, Double Density (Half Speed)

ASCII Code ESC L *n1 n2*

Hex Code 1B 4C *n1 n2*

Dec Code 27 76 *n1 n2*

Purpose Selects double density bit image graphics.

where *n1* + 256*n2* defines the number of data bytes to follow.
DATA = ASCII characters for the dot pattern bytes.
n1 = (Number of DATA bytes) - 256(*n2*)
(remainder of division of number of DATA bytes by 256, sometimes referred to as MOD 256)
n2 = (Number of DATA bytes) / 256
(quotient of division)

Discussion This code prints specified data as bit image graphics at double horizontal density, 120 dots per inch horizontally and 72 dots per inch vertically. This code causes print speed to be reduced by half from normal density speed. For more information, see “Bit Image Graphics” on page 193.

Example The following example produces Double Density Bit Image graphics of the pattern used in the Single Density Bit Image Mode example. Note that the amount of data must be doubled in order to produce this pattern for double density (the data is used 54 times rather than 27).

```
Double Density Bit Image Graphics
NNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
```

Bit Image Mode, Double Density (Normal Speed)

ASCII Code ESC Y *n1 n2*

Hex Code 1B 59 *n1 n2*

Dec Code 27 89 *n1 n2*

Purpose Selects double density bit image graphics at single density speed.

where *n1* + 256*n2* defines the number of data bytes to follow.
DATA = ASCII characters for the dot pattern bytes.
n1 = (Number of DATA bytes) - 256(*n2*)
(remainder of division of number of DATA bytes by 256, sometimes referred to as MOD 256)
n2 = (Number of DATA bytes) / 256
(quotient of division)

Discussion This code prints specified data as bit image graphics at double horizontal density, 120 dots per inch horizontally and 72 dots per inch vertically. By ignoring adjacent dots, the print speed is not reduced from the normal density speed. For more information, see “Bit Image Graphics” on page 193.

Example The following example produces a Double Density Normal Speed Bit Image graphics for the same pattern as in the Normal (Single) Density example. Note that the amount of data must be doubled for double density (the data is used 54 times rather than 27).

```
Double Density Double Speed Bit Image Graphics
NNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
```

Bit Image Mode, Quadruple Density (Half Speed)

ASCII Code ESC Z *n1 n2*

Hex Code 1B 5A *n1 n2*

Dec Code 27 90 *n1 n2*

Purpose Selects quadruple density bit image graphics.

where *n1* + 256*n2* defines the number of data bytes to follow.
DATA = ASCII characters for the dot pattern bytes.
n1 = (Number of DATA bytes) - 256(*n2*)
(remainder of division of number of DATA bytes by 256, sometimes referred to as MOD 256)
n2 = (Number of DATA bytes) / 256
(quotient of division)

Discussion This code prints specified data as bit image graphics at quadruple density, 240 dots per inch horizontally and 72 dots per inch vertically. This code causes print speed to be reduced by half. For more information, see “Bit Image Graphics” on page 193.

Example The following example produces quadruple density graphics of the pattern used in the Single Density Bit Image Mode example. Note that the amount of data must be quadrupled for quadruple density (the data is used 108 times rather than 27).

```
Quad Density Bit Image Graphics
```

Bold Printing

ASCII Code ESC G

Hex Code 1B 47

Dec Code 27 71

Purpose Selects bold character printing.

Discussion When this command is received, all characters are printed in bold until reset by the Bold Print Reset control code or printer reset. The bold print attribute is implemented by increasing the dot density for the bold text (with a result similar to emphasized printing). Bold printing reduces the current print speed by one half.

Note

The ESC E (page 125) and ESC G commands are equivalent; they produce the same print effect.

Example The following sample illustrates bold character printing.

```
Control code ESC G
selects bold character printing,
for example: AaBbCcDdEeFfGgHhIiJjKkLlMmNnOoPp.
Control code ESC H
cancels bold character printing.
```

Bold Printing, Cancel

ASCII Code ESC H

Hex Code 1B 48

Dec Code 27 72

Purpose Cancels bold printing.

Discussion No other print attributes are changed.

Cancel

ASCII Code CAN

Hex Code 18

Dec Code 24

Purpose Clears the print buffer of all symbols since the last paper motion command was received.

Discussion The CAN command cancels all characters sent to the printer after the last paper motion command.

This command will cancel the double wide attribute if set by SO. No other print attributes are affected.

Carriage Return

ASCII Code CR

Hex Code 0D

Dec Code 13

Purpose Returns the logical print head to the first character column (resets the pointer to the first character position). May be configured to include a line feed.

Discussion The CR code is configured via the ESC 5 code or via the control panel menus (described in the *User's Manual*). The CR = CR configuration causes the character position indicator to be positioned at character column one; subsequent printable data preceding a paper motion command overstrikes previously printed data. The CR = CR + LF configuration causes the CR code to perform a carriage return plus a line feed.

The CR code also cancels expanded (double wide) print when set by code SO (single line printing attribute).

Carriage Return Set

ASCII Code ESC 5 *n*

Hex Code 1B 35 *n*

Dec Code 27 53 *n*

Purpose Defines the result from the Carriage Return (CR) code.

where *n* may range from 0 through 255 (hex 00 through hex FF).
If *n* = 0, 2, 4 ... (any even value), then CR = CR (the default).
If *n* = 1, 3, 5 ... (any odd value), then CR = CR + LF.

Discussion This command overrides the configuration menu setting.

- CR = CR (default) configuration causes the character position indicator to be positioned at character column one. Subsequent printable data preceding a paper motion command overstrikes previous printable data.
- CR = CR + LF configuration causes the CR code to perform a carriage return plus a line feed.

Character Pitch 12 cpi

ASCII Code ESC :

Hex Code 1B 3A

Dec Code 27 58

Purpose Sets character pitch to 12 cpi.

Discussion An ESC : code overrides any control panel setting.

Character Set Select: Set 1 (A)

ASCII Code ESC 7

Hex Code 1B 37

Dec Code 27 55

Purpose Selects hex codes 80 through 9F in the character sets as control codes. Cancels the command ESC 6.

Discussion This code overrides the control panel setting Alt. Char Set.

Character Set Select: Set 2 (B)

ASCII Code ESC 6

Hex Code 1B 36

Dec Code 27 54

Purpose Selects hex codes 80 through 9F in the character sets as printable symbols. Cancels the command ESC 7.

Discussion This control code overrides the control panel setting Alt. Char Set. Appendix C shows the printable symbols for hex codes 80 through 9F.

Condensed Print

ASCII Code SI ESC SI

Hex Code 0F 1B 0F

Dec Code 15 27 15

Purpose Sets condensed print.

Discussion If the emulation is set at 5 cpi, it is changed to 8.55 cpi.
If the emulation is set at 10 cpi, it is changed to 17.1 cpi.
If the emulation is set at 12 cpi, it is changed to 20 cpi.
If the emulation is set at NLQ 12 cpi, it is changed to 17.1 cpi.

You may enable/disable condensed print using the control panel; the default is Enable. Once you enable condensed print using the control panel, this control code sets condensed print to enabled until it is canceled by control code DC2, a printer reset, or a new print mode (ESC I) control code.

Example The following sample shows condensed character printing and reset.

```
Control code
SI selects
condensed character printing.
Control code DC2
resets condensed character printing.
```

Condensed Print, Cancel

ASCII Code DC2 ESC DC2

Hex Code 12 1B 12

Dec Code 18 27 18

Purpose Cancels condensed character printing and sets pitch to 10 cpi.

Discussion The Condensed Print Cancel command sets the character pitch to 10 cpi, or 5 cpi if printing is set for double wide.

Example See the SI control code above for an example of Condensed Print Cancel.

Deselect Printer

ASCII Code ESC Q 22

Hex Code 1B 51 16

Dec Code 27 81 22

Purpose Stops the printer from processing data received from the host computer.

Discussion This code is for diagnostic use; it instructs the printer to stop processing data received from the host system. In order to resume processing data, the printer must be reset from the host system.

Double Wide Print

ASCII Code ESC W *n*

Hex Code 1B 57 *n*

Dec Code 27 87 *n*

Purpose Selects or cancels double wide (expanded) print.

where *n* may range from 0 through 255 (hex 00 through hex FF).
If *n* = 1, 3, 5 ... (any odd value), double wide print is selected.
If *n* = 0, 2, 4 ... (any even value), double wide print is cancelled.

Discussion An ESC W code sets or cancels double wide print, as follows:

When expanded print using ESC W is received, all characters print double wide until cancelled by an even parameter hex code.

Double wide print can also be set via the command SO and ESC SO, double wide print for one line only. An ESC W code overrides these settings.

Example The following sample illustrates expanded character printing and expanded character printing reset.

```
Control code
ESC W 1 selects
expanded character printing.
Control code
ESC W 0 resets
expanded character printing.
```

Double Wide Print (One Line Only)

ASCII Code SO ESC SO

Hex Code 0E 1B 0E

Dec Code 14 27 14

Purpose Selects double wide print for one line only.

Discussion This expanded print command is a line-by-line print attribute; when the SO or ESC SO command is received, the current line will be printed double wide and automatically reset. This command can be reset by a paper motion command (FF, LF, VT, CR), by the DC4 (double wide cancel) code, CAN or ESC W (double wide print).

Example The following sample illustrates Expanded Print for one line only.

```
Control code
SO selects
expanded character printing
for one line only.
```

Double Wide Print (One Line Only) Cancel

ASCII Code DC4 ESC DC4

Hex Code 14 1B 14

Dec Code 20 27 20

Purpose Cancels double wide print, if it was set by command SO.

Discussion The DC4 code cancels Double Wide Print command SO. If Double Wide Print is not enabled, the DC4 code is ignored. A DC4 code can occur at any place in the datastream and is acted upon immediately.

Emphasized Print

ASCII Code ESC E

Hex Code 1B 45

Dec Code 27 69

Purpose Selects emphasized character print format.

Discussion When the emphasized print command is received, all characters will be printed in emphasized (bold) print until reset by the Emphasized Print Reset command or printer reset. Emphasized print reduces the current print speed.

Note

The ESC G (page 119) and ESC E commands are equivalent; they produce the same print effect.

Example The following sample illustrates emphasized character printing.

```
Control code
ESC E selects
emphasized character printing.
Control code ESC F
cancels emphasized character printing.
```

Emphasized Print, Cancel

ASCII Code ESC F

Hex Code 1B 46

Dec Code 27 70

Purpose Cancels emphasized character printing.

Discussion The emphasized print reset command only resets the emphasized print character attribute. See Example for using ESC E combined with ESC F.

Form Feed

ASCII Code FF

Hex Code 0C

Dec Code 12

Purpose Prints the data in the buffer, advances the paper to the next top-of-form, and moves the logical printhead to the first character column.

Discussion Forms length is set by using the control panel or forms length control codes. This code cancels double wide (expanded) characters if set by the SO command. The Form Feed command will react differently when the VFU is active. Refer to Chapter 7 in this manual for further information. The Form Feed command will react differently when the control panel selection “FF Valid at TOF” is disabled. Refer to the *User's Manual* for further information.

Forms Length Set in Inches

ASCII Code ESC C NUL *n*

Hex Code 1B 43 00 *n*

Dec Code 27 67 0 *n*

Purpose Sets the length of forms (paper) in inches.

where *n* = whole numbers from 1 through 21 (hex 01 through hex 15) to specify the number of inches on a page. (All larger values are ignored.)

Discussion Upon receipt of this code, the current line becomes the first line of the form, and the forms length set becomes the current forms length. Vertical tab positions set below the bottom of the form are ignored; in addition, once a new forms length is set the bottom margin is set to zero.

Line spacing changes do not affect the result of this command. If the forms length is set smaller than the line spacing, a form feed advances the paper position to the next top-of-form position.

Forms length in inches can also be set at the control panel via the LinePrinter+ Form Length menu option (refer to the *User's Manual*). However, this host control code overrides the control panel setting.

Forms Length Set in Lines

ASCII Code ESC C *n*

Hex Code 1B 43 *n*

Dec Code 27 67 *n*

Purpose Sets the length of a form (paper) in lines.

where *n* = 1 through 168 (hex 01 through hex A8) to specify the number of lines per page at the current line spacing.

Discussion The forms length is defined in inches as the quotient of *n* divided by the current lines per inch (lpi) setting. Once the forms length has been set, subsequent line spacing changes do not affect the result of this command.

If the forms length is set smaller than the line spacing, a form feed advances the paper position to the next top-of-form position.

If the forms length derived from the quotient of *n* lines divided by lines per inch is not an exact multiple of the printer dot resolution, the value is adjusted down until the forms length and dot resolution distance match.

Forms length can also be set at the control panel via the LinePrinter+ Form Length menu option (refer to the *User's Manual*). However, this host control code overrides the control panel setting.

Initialize Parameters

ASCII Code ESC [K *n1* NUL *n2 n3 n4 n5*

Hex Code 1B 5B 4B *n1* 00 *n2 n3 n4 n5*

Dec Code 27 91 75 *n1* 0 *n2 n3 n4 n5*

Purpose Sets the printer's initial condition.

Discussion This command causes the printer to reset and defines the configuration that will be loaded to the printer during the reset. Several variables must be specified to define the load configuration, as described below.

Note

An ESC[K code can occur at any place in the datastream and is acted upon immediately. All numerical parameters are in the hex 00 through FF range unless stated otherwise. Only specified parameters are supported. Other values may be ignored or cause unpredictable results, and should be avoided.

n1

The value of *n1* defines which of the following *n* bytes will be included in the command line, as shown in Table 29.

Table 29. *n1* Values

n1 Hex Value	Function
1	One byte follows (*n2*)
3	Three bytes follow (*n2, n3* and *n4*)
4	Four bytes follow (*n2, n3, n4* and *n5*)

Note

Specifying any value for *n1* other than 1, 3, or 4 may cause unpredictable results, and should be avoided.

n2

The 2-digit hexadecimal value for *n2* defines the load configuration for the printer. The Proprinter III XL supports six values for this parameter: 00, 01, 04, 05, 254, and 255 (hex 00, 01, 04, 05, FE, and FF). Any other value will be ignored.

If any of the six supported values is entered for the *n2* parameter, then the printer will reset to the factory default configuration. Configuration parameters defined by command bytes *n4* and *n5*, if present, will override conflicting factory default values.

n3

Parameter *n3* is provided for compatibility with the Proprinter III XL printer control language standard. You may define any value for this parameter. (For Proprinters, this bit must define the attached printer as either Proprinter, value 03, or Proprinter III XL, value 22 [hex 16].)

n4 and *n5*

Parameter bytes *n4* and *n5* allow you to define several configuration parameters that will override conflicting factory default and memory-based configuration values when the printer is reinitialized. Possible values for *n4* and *n5* are listed in Table 30 and Table 31, respectively.

Note

In addition to the formatting from bytes *n4* and *n5*, this command sets the current line as top-of-form. It also clears vertical tabs and sets the horizontal tabs at every eight columns, starting at column 9.

Table 30. *n4* Values

n4 Bit	Function	OFF (0)	ON (1)
7	Process this byte	Process	Ignore
6	Reserved	Reserved	Reserved
5	n/a	n/a	n/a
4	Line Feed =	LF	LF + CR (add CR with each LF)
3	Carriage Return =	CR	CR + LF (add LF with each CR)
2	Set forms length	11 inches	12 inches
1	Slashed Zero	Disable	Enable
0	Character set	1 (A)	2 (B)

Table 31. *n5* Values

n5 Bit	Function	OFF (0)	ON (1)
7	Process this byte	Process	Ignore
6	Code page	437	850
5	Unidirectional Printing	Bidirectional	Unidirectional
4	12 cpi compressed to 20	20	12
3	n/a	n/a	n/a
2	Form feed at TOF	Enable	Ignore
1	Print Width	13.2 inches	8 inches
0	Sheet feeder	n/a	n/a

Line Feed

ASCII Code LF

Hex Code 0A

Dec Code 10

Purpose Prints the data in the buffer (if any) and advances the paper one line at the current line space setting.

Discussion If configured for LF equals new line (LF = CR + LF), the logical print head is positioned at character column 1 of the new line. Otherwise, the logical print head does not move when configured for LF function only (LF = LF only). The LF function cancels double wide (expanded) characters if set by the SO command.

Line feed can occur at any place in the datastream and is acted upon immediately.

Line Feed *n*/216 Inch (One Line Only)

ASCII Code ESC J *n*

Hex Code 1B 4A *n*

Dec Code 27 74 *n*

Purpose Advances the vertical character position *n*/216 inch for one line only.

where *n* = 1 through 255 (hex 01 through hex FF).

Discussion The *n*/216-inch line feed control code is effective for one line only. All single-line-only print attributes are canceled.

If the emulation is configured for LF equals newline (LF=CR+LF), the paper advances one line at the *n* line spacing setting and the logical print head is positioned at character column 1.

The paper position moves only in multiples of the current dot row spacing. If the distance to move is other than a multiple of the current dot row spacing, the remainder is added to the next paper motion command.

Small values of *n* may result in overlapping lines. Overlapping lines may also occur if print attributes such as Elongated (Double High), Superscript, or Subscript characters are used on the same line. Printing at different horizontal and vertical densities will not overlap.

Example The following example illustrates *n*/216-inch line spacing.

```
Control code ESC J 200




performs a 200/216 inch
line feed function for one line only.
```

Line Spacing 1/8 Inch (8 lpi)

ASCII Code ESC 0

Hex Code 1B 30

Dec Code 27 48

Purpose Specifies continuous line spacing at 1/8-inch increments (8 lpi).

Discussion When the 1/8-inch line spacing control code is received, all lines will be printed at 8 lpi until a new line spacing is selected or the printer is reset.

Example The following example illustrates 1/8-inch line spacing.

```
Control code ESC 0 sets
line spacing at
1/8 (8 lpi) inch for all subsequent lines
until reset or another spacing is selected.
```

Line Spacing 7/72 Inch (10.3 lpi)

ASCII Code ESC 1

Hex Code 1B 31

Dec Code 27 49

Purpose Specifies the line spacing at 7/72-inch (10.3 lpi) increments.

Discussion When the 7/72-inch line spacing control code is received, all lines will be printed at the 7/72-inch line spacing until a new line spacing is selected or the printer is reset. The control code line spacing selection will override the control panel line spacing setting, and the message display will reflect the line spacing as 10.3 lines per inch.

Caution should be used when combining this control code with other print attributes such as Elongated (Double High), Superscript, or Subscript; overlapping lines may occur.

Example The following example illustrates 7/72-inch line spacing.

```
Control code ESC 1 sets
line spacing at
7/72 inch for all subsequent lines
until reset or another spacing is selected.
```

Line Spacing *n*/72 Inch (Executes)

ASCII Code ESC 2

Hex Code 1B 32

Dec Code 27 50

Purpose ESC 2 sets line spacing to 6 lpi or as set by ESC A.

Discussion ESC 2 asserts *n*/72-inch line spacing as set by ESC A (page 134). If no distance has been set by ESC A, the distance is 1/6 inch.

The control code line spacing selection will override the control panel line spacing setting.

Example The following example illustrates 1/6-inch line spacing and assumes that a distance has not been set by ESC A.

```
Control code ESC 2 sets
line spacing at
6 lpi for all subsequent lines
until reset or another spacing is selected.
```

Line Spacing *n*/72 Inch (Storage)

ASCII Code ESC A *n*

Hex Code 1B 41 *n*

Dec Code 27 65 *n*

Purpose Stores a line spacing of *n*/72-inch increments.

where *n* = 1 through 255 (hex 01 through hex FF).
All others values are ignored.

Discussion This control code stores a value for line spacing of *n*/72 inch. The ESC 2 control code (described on page 133) executes the line spacing stored by the preceding ESC A, until a new line spacing is selected or the printer is reset. A control code line spacing overrides a control panel line spacing setting. (The control panel display shows line spacing in lines per inch.)

Small values of *n* may result in overlapping lines. Overlapping lines may also occur if print attributes such as Elongated (Double High), Superscript, or Subscript characters are used on the same line. Common values of *n* are listed in Table 32.

Table 32. Line Spacing values

n	Line Spacing
24	3 lpi
18	4 lpi
12	6 lpi
9	8 lpi
8	9 lpi
6	12 lpi

Example The following example illustrates 20/72-inch line spacing.

```
Control code ESC A 20 sets
line spacing at 20/72 inch

increments for all subsequent lines

until reset or another spacing is selected.
```

Line Spacing *n*/216 Inch

ASCII Code ESC 3 *n*

Hex Code 1B 33 *n*

Dec Code 27 51 *n*

Purpose Specifies the line spacing at *n*/216-inch increments.

where *n* = 1 through 255 (hex 01 through hex FF).

Discussion When the *n*/216-inch line spacing control code is received, all line feeds following will be at *n*/216-inch line spacing until a new line spacing is selected or the printer is reset. The control code line spacing selection will override the control panel line spacing setting.

The vertical character position moves only in multiples of the current dot row spacing. If the distance to move is other than a multiple of the current dot row spacing, the remainder is added to the next paper motion command.

Caution should be used when combining this control code with other print attributes such as Elongated (Double High), Superscript, or Subscript; overlapping lines may occur.

Example The following example illustrates *n*/216-inch line spacing.

```
Control code ESC 3 50 sets
line spacing at 50/216 inch
increments for all subsequent lines
until reset or another spacing is selected.
```

Margin, Bottom

ASCII Code ESC N *n*

Hex Code 1B 4E *n*

Dec Code 27 78 *n*

Purpose Sets the bottom margin.

Discussion *n* defines the number of lines above the bottom of the form to set as the bottom margin. *n* has a range from 1 through 255 (hex 01 through hex FF). The actual margin in inches is the quotient of *n* divided by the current lines per inch (lpi).

If a line feed command causes the active position to advance below the bottom margin, the paper advances to the top of the next form. If the bottom margin set is equal to or greater than the form length, printing is only allowed on the top line of each page. If the forms length is changed by the ESC C code (Forms Length sequence), the bottom margin is set to zero.

The bottom margin setting can also be selected from the control panel; however, the host control code will override the control panel setting. Any vertical tabs set within the bottom margin zone will be ignored.

Margin Cancel, Bottom

ASCII Code ESC O

Hex Code 1B 4F

Dec Code 27 79

Purpose Resets the bottom margin to zero.

Margins, Horizontal

ASCII Code ESC X *n m*

Hex Code 1B 58 *n m*

Dec Code 27 88 *n m*

Purpose Sets left and right margins in character positions.

where *n* = left margin position
m = right margin position

Discussion The values of *n* and *m* must be in the range from 0 through 255 (hex 00 through hex FF). The margins are measured in character positions at the current characters per inch (cpi).

n is the column number from the left edge of the paper. For example, *n* = 5 means that the line starts at column number 5. Therefore it has a left margin of 4.

m is the column number from the right edge of the paper. For example, *m* = 56 means that the line ends on column 80 if the form width is 136.

Overscoring

ASCII Code ESC _ *n*

Hex Code 1B 5F *n*

Dec Code 27 95 *n*

Purpose Enables or disables automatic overscoring of all characters.

where *n* may range from 0 through 255 (hex 00 through hex FF).
n = 0, 2, 4... disables automatic overscoring (any even value from hex 00 through hex FE)
n = 1, 3, 5... enables automatic overscoring (any odd value from hex 01 through hex FF)

Discussion When automatic overscore is enabled, all characters, including spaces, are overscored. Full-height graphics characters are not overscored.

Example The following sample illustrates automatic overscoring and overscoring reset.

```
Control code ESC _ 1
enables automatic overscoring.
Control code ESC _ 0
disables automatic overscoring.
```

Print All Characters

ASCII Code ESC \ *n1 n2*

Hex Code 1B 5C *n1 n2*

Dec Code 27 92 *n1 n2*

Purpose Prints the characters assigned to code points as characters, rather than interpreting the code values as commands.

where *n1* + 256*n2* defines the number of data bytes to follow
n1 = (Number of DATA bytes) - 256(*n2*)
(remainder of division of number of DATA bytes by 256, sometimes referred to as MOD 256)
n2 = (Number of DATA bytes) / 256
(quotient of division)

Discussion The number of data bytes specified by *n1* + 256*n2* will print as text. Valid numerical parameters are in the range 0 through 255 (hex 00 through hex FF). Data values that do not correspond to standard ASCII codes will print as spaces.

Print Next Character

ASCII Code ESC ^ *n*

Hex Code 1B 5E *n*

Dec Code 27 94 *n*

Purpose Prints the graphic character assigned to *n*, rather than interpreting the code value as a command.

Discussion This command may appear anywhere in the data stream, and will be acted upon immediately. Valid numerical parameters are in the range 0 through 255 (hex 00 through hex FF).

Print Mode

ASCII Code ESC I *n* (uppercase “i”)

Hex Code 1B 49 *n*

Dec Code 27 73 *n*

Purpose Selects a print mode.

Discussion This control code selects a print mode from among the choices listed in Table 33.

Table 33. Print Mode Values

n Hex	Function
00	DP 10 cpi
01	HS 12 cpi
02	NLQ Sans Serif 10 cpi
03	NLQ 10 cpi
04	DP 10 cpi
05	HS 12 cpi
06	NLQ Sans Serif 10 cpi
07	NLQ 10 cpi
0B	NLQ Italic Proportional
0F	NLQ Italic 10 cpi

There are several duplicate function values that select the same print quality. These are provided for compatibility with the Proprinter III XL standard.

Note If you specify any value other than the ones shown in Table 33, unpredictable results may occur.

Print Quality

ASCII Code ESC x *n*

Hex Code 1B 78 *n*

Dec Code 27 120 *n*

Purpose This code selects a print quality.

where *n* = 0 or 48 (hex 00 or hex 30) selects DP print quality
n = 1 or 49 (hex 01 or hex 31) selects NLQ print quality
n = 2 or 50 (hex 02 or hex 32) selects HS print quality
n = 3 or 51 (hex 03 or hex 33) selects OCR A print quality
n = 4 or 52 (hex 04 or hex 34) selects OCR B print quality

Comment When you select NLQ, the font is serif. Print qualities selected with this command override control panel selections. Selecting an OCR print quality overrides any character attributes already set, such as condensed, double-wide, etc. These attributes will not return when another print quality is set. Character attributes set when OCR is selected will be ignored.

Proportional Spacing

ASCII Code ESC P *n*

Hex Code 1B 50 *n*

Dec Code 27 80 *n*

Purpose Enables/disables proportional spacing of characters.

where *n* may range from 0 through 255 (hex 00 through hex FF).
n = 1, 3, 5...(any odd value) enables proportional spacing
n = 0, 2, 4...(any even value) disables proportional spacing

Comment This command is ignored when a non-proportional font is used.

Select Attributes

ASCII Code ESC [@ *n1* NUL NUL NUL *n2 n3*

Hex Code 1B 5B 40 *n1* 00 00 00 *n2 n3*

Dec Code 27 91 64 *n1* 0 0 0 *n2 n3*

Purpose Selects double high and double wide attributes, and single or double high line spacing.

Discussion Parameter *n1* selects the attributes from *n2* and *n3*, as follows:

Table 34. Select Attributes *n1* Values

***n1* (Hex)**	**Function**
03	Set character height and line feed settings according to the value of *n2*. (If *n1* = 03, there is no *n3*).
04	Set character height, line feed, and character settings according to the values of *n2* and *n3*.

Parameter *n2* defines the height attributes, as follows:

Table 35. Select Attributes *n2* Values

***n2* (Hex)**	**Function**
00	No change
01	Set single height characters
02	Set double height characters
10	Set single line spacing
11	Set single height characters and single line spacing
12	Set double high characters and single line spacing
20	Set double line spacing
21	Set single height characters and double line spacing
22	Set double high characters and double line spacing

Parameter *n3* defines the width attributes, as follows:

Table 36. Select Attributes *n3* Values

n3 (Hex)	Function
00	No change
01	Set single wide characters
02	Set double wide characters

An ESC [@ code can occur at any place in the datastream and is acted upon immediately.

All numerical parameters are in the hex 00 through FF range unless stated otherwise.

Set Top-of-Form

ASCII Code ESC 4

Hex Code 1B 34

Dec Code 27 52

Purpose Sets the current paper position as the top-of-form.

Superscript/Subscript Printing

ASCII Code ESC S *n*

Hex Code 1B 53 *n*

Dec Code 27 83 *n*

Purpose Selects superscript or subscript printing.

where *n* may range from 0 through 255 (hex 00 through hex FF).
n = 1, 3, 5 (any odd value), selects subscript printing.
n = 0, 2, 4 (any even value), selects superscript printing.

Discussion When the super/subscript command is received, all characters will be superscript or subscript until reset by the super/subscript reset command or printer reset. Super/subscript print modes are not available for the double high attribute.

You can print both superscript and subscript characters in the same character column by using the Backspace (BS) control code, but these characters will not print when double high printing is in effect.

Note

Superscript and subscript characters print at the same size as the current font, shifted up or down relative to the print line.

Example The following sample illustrates superscript/subscript printing.

```
CONTROL CODE ESC S 0 SELECTS SUPERSCRIPT
A2+B2=C2
CONTROL CODE ESC S 1 SELECTS SUBSCRIPT
31HEX=49DEC
CONTROL CODE ESC T CANCELS
SUPERSCRIPT/SUBSCRIPT PRINTING
```

Superscript/Subscript Printing, Cancel

ASCII Code ESC T

Hex Code 1B 54

Dec Code 27 84

Purpose Cancels superscript and subscript printing (as set by ESC S). This code can occur at any place in the datastream and is acted upon immediately.

Tab, Horizontal

ASCII Code HT

Hex Code 09

Dec Code 09

Purpose Moves the logical printhead right to the next horizontal tab stop.

Discussion Power-on default horizontal tabs are set at every eighth character starting at position 9 (9, 17, 25). If there are no horizontal tabs set or the logical printhead is located at the last character column, the code is ignored and no movement occurs.

If double-wide, double-high attributes are enabled, single-wide character spacing is used. Horizontal tabs are stored as a relative position; therefore, character pitch changes will change horizontal tab positions. Refer to the ESC D control code description (page 142) to set new tab positions.

Tab Set/Clear, Horizontal

ASCII Code ESC D *n1 n2...nk* NUL

Hex Code 1B 44 *n1 n2...nk* 00

Dec Code 27 68 *n1 n2...nk* 0

Purpose Sets up to 28 horizontal tab positions.

Discussion *n1, n2,* up to *nk* denote character column positions for tab stops (at the current character pitch), where *n1* and *n2* represent the

first two tab stops and *nk* is the final tab stop. You may specify from 1 up to 28 tab stops (all parameters after 28 are ignored). The leftmost character column position is 1. The value for each tab stop can range from 1 through 255 (hex 01 through hex FF), inclusive, and all tabs must be specified in ascending order. Any out-of-order symbols are ignored, though the remainder of the sequence is processed.

If you are defining a sequence of tabs, terminate the string with a 00H (*not* an ESC D 00H). If you want every column to be set with a horizontal tab, use ESC D 00H. If only one tab position is set and it is beyond the right margin, then every column is also set as a horizontal tab. Any change in character pitch within a line changes the tab positions for the entire line. All control codes that define horizontal distance expressed in units of characters are stored internally in character columns.

Example The following example illustrates horizontal tab setting and accessing.

```
Control code
ESC D CHR$(4);CHR$(10);CHR$(0)
sets tab stops at columns 4 and 10.
Control code HT
accesses the tab stops as follows:
   column 4
          column 10
```

Tab, Vertical

ASCII Code VT

Hex Code 0B

Dec Code 11

Purpose Prints the data in the buffer and advances the paper to the next vertical tab position.

Discussion In the Proprinter III XL emulation, vertical tab positions are set by control code ESC B and executed by control code VT. In this mode, if vertical tabs are loaded, the paper position moves to the next vertical tab position.

If a vertical tab format is not defined, the paper position is advanced to the next line at the current line spacing. If a vertical tab format is defined but no vertical tab positions are set between the current print position and the end of the form, the paper position is advanced to the top of the next form. The VT code resets all single line print attributes. More information on vertical tabs is provided in the Chapter 7.

If configured for LF = CR + LF (LF equals new line), the character position indicator is positioned at character column 1 of the new line. Otherwise, the character position indicator does not move.

Tab Set/Clear, Vertical

ASCII Code ESC B *n1 n2 ... nk* NUL

Hex Code 1B 42 *n1 n2 ... nk* 00

Dec Code 27 66 *n1 n2 ... nk* 0

Purpose Sets or clears vertical tab positions.

Discussion The physical position on the paper is defined by *n* and the current line spacing.

where *n* = vertical tab setting (in lines), and
k = number of tabs possible.

The value of *n* can be defined in the range of 1 through 255 (hex 01 through hex FF), inclusive, while *k* is defined in the range of 1 through 64 (hex 01 through 40). Any value for *k* over 64 is ignored. Subsequent line spacing changes affect the tab position. If the value of *n* exceeds the forms length, that tab position is ignored.

Vertical tab positions are set by the command ESC B and executed by the command VT. The tab positions must be in ascending order, or the emulation ignores the out-of-order symbols. If the ESC B command is followed immediately by hex 00, the vertical tab positions are cleared.

Example The following sample illustrates Vertical Tab Setting. To run the sample, set your printer at top-of-form.

```
Line one - The control code
ESC B 5 10 0 sets a vertical tab at line 5 and at line 10.
Control code VT moves paper to the next vertical tab.

Control code VT moves paper to the next vertical tab.



This is line ten.
```

Tabs, Clear All (Return to default)

ASCII Code ESC R

Hex Code 1B 52

Dec Code 27 82

Purpose Clears all horizontal and vertical tab stops.

Discussion When ESC R is invoked, horizontal tab stops reinitialize to every eight columns, starting at column 9 (9, 17, 25). In addition, the vertical tabs are cleared.

Underline

ASCII Code ESC - *n*

Hex Code 1B 2D *n*

Dec Code 27 45 *n*

Purpose Enables or disables automatic underlining of all characters.

Discussion When automatic underline is enabled, all characters, including spaces, are underlined until disabled.

where *n* may range from 0 through 255 (hex 01 through hex FF).
n = 1, 3, 5 (any odd value) selects underlining.
n = 0, 2, 4 (any even value) cancels underlining.

Example The following sample illustrates automatic underlining and underlining reset.

```
Control code ESC -1
enables automatic underlining.
Control code ESC -0
disables automatic underlining.
```

Unidirectional Printing

ASCII Code ESC U *n*

Hex Code 1B 55 *n*

Dec Code 27 85 *n*

Purpose Sets or cancels unidirectional printing. While this feature reduces print speed by 1/2, the increased print quality will improve the readability of barcodes and graphics.

Discussion This code sets or cancels unidirectional printing, as follows:

where *n* may range from 0 through 255 (hex 00 through hex FF).
n = 1, 3, 5 (any odd value) selects unidirectional text printing.
n = 0, 2, 4 (any even value) cancels unidirectional text printing.

5 *Epson FX-1050 Emulation*

Overview

This chapter describes the Epson FX emulation host control codes. “Emulation” refers to the ability of a printer to execute the commands of a particular printer control language. A printer control language is the coding system used to convey, manipulate, and print data. It contains character codes and command sequences that configure the emulation. In this manual, the terms emulation, printer protocol, and printer control language are synonymous.

In Epson FX emulation mode, your printer can print files coded for the Epson FX printer control language. To select the Epson FX emulation as the active printer emulation, select LinePrinter Plus from the EMULATION menu and Epson FX from the Printer Protocol menu, as described in the *User's Manual.*

The Epson FX emulation provides many configurable parameters. The default parameter values for this emulation are shown in Table 37. You can modify these parameter values in two ways:

- **The Epson FX host control codes.** An extensive set of Epson FX control code commands can be sent to the printer from an attached host computer via the host data stream. Most of this chapter is devoted to describing the Epson FX control code commands.
- **The printer configuration menus.** You can modify a subset of the Epson FX emulation parameters using the control panel switches and LCD display, as described in the *User's Manual.*

A parameter value set by a host control code generally overrides a value set from the printer's control panel.

Note

Configuration values selected from the menus or via host control codes can be saved to the printer's NVRAM memory so that they will not be lost when you power off the printer or reset it to the factory defaults. The menu selection for saving a configuration to memory is described in the *User's Manual.*

Epson FX-1050 Default Values and States

The factory settings for the Epson FX-1050 emulation menu options are shown in Table 37. Table 38 lists additional factory settings for parameters provided by the LinePrinter+ formatting menus. (The EMULATION menu options are described in the *User's Manual*). Host control codes can override many of the settings for these menu options.

Table 37. Epson Emulation Menu Option Factory Settings

Characteristic	Default Setting
Define CR Code	CR = CR
Auto LF	Enable
Define LF Code	LF = LF
Printer Select	Disable
Character Set	Epson Set
20 CPI Condensed	Enable
Alt. Set 80-9F	Control Code

Table 38. LinePrinter+ Menu Option Factory Settings

Characteristic	Default Setting
CPI	10.0
LPI	6.0
Typeface	Data Processing
Proportional Spacing	Disable
Bold Print	Disable
Italic Print	Disable
Slashed Zero	Disable
Left Margin	0 columns
Right Margin	0 columns
Bottom Margin	0 lines
Perforation Skip	Disable
Form Length	11.0 inches 279.4 millimeters 66 lines
Form Width	13.6 inches 345.4 millimeters 136 characters
Reset Cmd CFG Ld	Disable

Epson Emulation Exceptions and Differences

Because of mechanical differences between your line matrix printer and Epson printers (moving printhead serial matrix printers), some Epson features are approximated or not supported.

- Epson codes that produce different behavior in your printer are indicated by a “dagger” (†) in the Control Code Index.
- The Epson emulation supports the following fonts: DP, NLQ Serif and Sans Serif, Draft with 10 cpi, 12 cpi and 15 cpi in either condensed or normal widths, and OCR A and OCR B in 10 cpi. Condensed printing at 10 cpi in DP quality maps to 17.1 cpi. Character pitches other than 10 DP cpi map to 20 cpi in DP and 17.1 cpi in NLQ.
- Epson bit-image graphics are supported, including all plotter and CRT densities.
- Many character sets are available, including IBM-PC Graphics (IBM Code Page 0437) and Epson. You can configure the zero character to contain a slash or no slash.
- The Double Wide print control codes (ESC W, SO) double character width, but *not* inter-character spacing, unlike the Epson FX-1050. The formulas for total character spacing are as follows:

Epson FX-1050	2 (char + 1 dot + space)
Epson Emulation	2 (char + 1 dot) + space

- The Condensed Print (SI) control code condenses character width but *not* inter-character spacing, unlike the Epson FX-1050 which condenses both character width and spacing.
- If one or more Backspace control codes follow directly after a Bit Image Graphics command (ESC K, ESC L, ESC Y, or ESC Z), the printer will backspace into the graphic pattern, the number of dots depending on the current cpi setting. For an Epson FX-1050 printer, one Backspace will send the logical printhead directly to the beginning of the graphics pattern.
- When backspacing over proportionally spaced characters, Epson printers move back the width of each proportional character; this emulation moves back based on the current cpi setting, as if proportional spacing is disabled.

Epson Character Sets

Epson printers use five character sets. The IBM PC code page, OCR A, OCR B, and an extensive array of print language sets may be selected from the configuration menus. In addition, there is a unique Epson character set. The Epson character set (shown in Table 39) is the ASCII character set with the upper, non-ASCII set defined as italics, and the usually unprintable codes designated as international characters.

Table 39. Epson Character Set

Hex	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	à	§	SP	0	@	P	‘	p	*à*	*§*	*SP*	*0*	*@*	*P*	*‘*	*p*
1	è	ß	!	1	A	Q	a	q	*è*	*ß*	*!*	*1*	*A*	*Q*	*a*	*q*
2	ù	DC2	"	2	B	R	b	r	*ù*	*Æ*	*"*	*2*	*B*	*R*	*b*	*r*
3	ò	DC3	#	3	C	S	c	s	*ò*	*æ*	*#*	*3*	*C*	*S*	*c*	*s*
4	ì	DC4	$	4	D	T	d	t	*ì*	*ø*	*$*	*4*	*D*	*T*	*d*	*t*
5	°	ø	%	5	E	U	e	u	*°*	*ø*	*%*	*5*	*E*	*U*	*e*	*u*
6	£	¨	&	6	F	V	f	v	*£*	*¨*	*&*	*6*	*F*	*V*	*f*	*v*
7	BEL	Ä	‘	7	G	W	g	w	*i*	*Ä*	*’*	*7*	*G*	*W*	*g*	*w*
8	BS	CAN	(	8	H	X	h	x	*¿*	*Ö*	*(*	*8*	*H*	*X*	*h*	*x*
9	HT	Ü	)	9	I	Y	i	y	*Ñ*	*Ü*	*)*	*9*	*I*	*Y*	*i*	*y*
A	LF	ä	*	:	J	Z	j	z	*ñ*	*ä*	*	*:*	*J*	*Z*	*j*	*z*
B	VT	ESC	+	;	K	[	k	{	*¤*	*ö*	+	*;*	*K*	*[*	*k*	*{*
C	FF	ü	’	<	L	\	l	|	*Pt*	*ü*	*,*	<	*L*	**	*l*	|
D	CR	É	–	=	M	]	m	}	*Å*	*É*	–	=	*M*	*]*	*m*	*}*
E	SO	é	.	>	N	^	n	~	*å*	*é*	.	>	*N*	^	*n*	~
F	SI	¥	/	?	O	_	o	DEL	*Ç*	*¥*	*/*	*?*	*O*	_	*o*	*ø*

The international characters in hex 00-1F and hex 80-9F can be printed when you invoke control code ESC I 1 (see page 165). You may use the Epson configuration menus described in the *User's Manual* (or the ESC R control code) to select an international character set.

Normally, these characters are either blank or control codes. The implementation is that the control codes hide the non-italic international characters, even in hex 00 through 1F, and DEL. DEL conceals the non-italic slashed zero.

Configuring the Epson FX-1050 Emulation with Control Codes

The remainder of this chapter describes the Epson printer control language codes that may be sent from a host computer attached to the printer, in order to invoke and configure numerous Epson emulation functions.

Format for Control Code Descriptions

The following information is listed for each control code (where applicable):

Name The title or function of the command.

ASCII Code The ASCII mnemonic for the command is shown. Command sequences are in 7-bit (ASCII) form.

Hex Code The code or command sequence in hexadecimal numbers.

Dec Code The code or command sequence in decimal numbers.

Purpose The function(s) of the control code.

Discussion A discussion of the uses of the code or command sequence, including a description of exceptions or limitations to normal use.

Example A sample is provided when it is possible to illustrate the effect of a control code or if a specific syntax is required.

† (“dagger”) This symbol means the code produces non-Epson behavior in your printer.

Note

If you specify any parameters for a control code other than the ones that are defined in the control code description, unpredictable results may occur.

Escape Sequences

An Epson control code consisting of more than one character is called an escape sequence because the first character in the sequence is always the ASCII ESCape character. ESC alerts the printer that a special function command (not printable characters) follows.

The format for an Epson escape sequence is:

(ESC)(parameter 1)(parameter 2)...(parameter *n*)

For example, to select emphasized (offset) print, send the ESC character immediately followed by the E character (do not add a space character):

ASCII: ESC E **Hex**: 1B 45

Attribute Set and Reset Codes

Set and reset are another way of saying turn on and turn off, select and deselect, or enable and disable.

Some printer features are set and reset with an escape sequence and the numbers 1 or 0. In such cases you can represent 1 and 0 as hexadecimal codes 01 and 00, or as the ASCII codes for the numerals 1 and 0 (hexadecimal 31 and 30).

NUL Code

NUL (Hex 00) is ignored by the printer and can be used as a fill character; however, it can not be used to add blank spaces since it is not a space character. NUL can also be used as a parameter terminator for the Set Horizontal Tabs (page 171) or Set Vertical Tabs multibyte control code (page 192).

Note

Hex 80 in the 0437 PC Character Set and hex 7F in the 0850 PC Character Set are treated as a NUL; however, these two controls can not be used as parameter terminators.

Switching Between the Emulations

The printer supports several different emulations. PCL-II is the default. P-Series, Proprinter III XL, and Epson FX-1050 are all a part of the LinePrinter Plus emulation.

The following command switches from PCL-II to Epson:

ESC%-00002X

To switch from Epson to PCL-II, send the following command to the printer:

ESCl};KD

The Control Codes

The following index lists the control codes by function, ASCII mnemonic, and page number. Some control code functions can also be selected at the control panel.

† = Produces non-Epson behavior in your printer.

Emphasis

Print Quality Control

Character Set Manipulation

Data Manipulation

Graphics

Miscellaneous Printer Control

Backspace

ASCII Code BS

Hex Code 08

Dec Code 08

Purpose Moves the logical print head to the left one character space toward the first character column.

Discussion Assures that the previous printable characters will be printed, then moves the logical print head one character space to the left at the current pitch setting (which includes double wide and ESC SP). If the logical print head bumps into the left margin, it stops.

† When backspacing over proportionally spaced characters, Epson printers move back the width of each proportional character; this emulation moves back based on the current cpi setting, as if proportional spacing is disabled.

† If one or more Backspace control codes follow directly after a Bit Image Graphics command (ESC K, ESC L, ESC Y, or ESC Z), your printer will backspace into the graphic pattern, the number of dots depending on the current cpi setting. For an Epson FX-1050 printer, one Backspace will send the logical printhead directly to the beginning of the graphics pattern.

Example If you were to print five “T” characters, then two BS commands, then two “=” characters, the output would look like the sample below:

TTT==

Bell

ASCII Code BEL

Hex Code 07

Dec Code 07

Purpose Sounds the printer's buzzer/beeper.

Discussion The BEL function will sound the buzzer/beeper for 0.2 seconds upon receipt of this command.

Cancel Line

ASCII Code CAN

Hex Code 18

Dec Code 24

Purpose Clears all unprinted data from a line, but does not affect control codes.

Discussion You can use this control code to delete a line, but do so with caution to avoid possible misprinting. This control code cancels the double wide attribute set by SO. No other print attributes are

affected. The logical print head goes to the print position it had after the last CR or paper motion command.

Carriage Return

ASCII Code CR

Hex Code 0D

Dec Code 13

Purpose Prints the data in the buffer, then returns the logical print head to the left margin.

Discussion Subsequent data are shifted 1/2 dot position to the right. A line feed will be appended if the printer is configured from the control panel for CR = CR + LF. When CR = CR + LF, this code cancels all one-line-only emphasis and font controls: double-wide from SO and ESC SO, and unidirectional printing from ESC <.

Character Pitch 10 CPI

ASCII Code ESC P

Hex Code 1B 50

Dec Code 27 80

Purpose Sets character pitch to 10 characters per inch (cpi).

Discussion This command is normally used to cancel 12 cpi.

Character Pitch 12 CPI

ASCII Code ESC M

Hex Code 1B 4D

Dec Code 27 77

Purpose Sets character pitch to 12 characters per inch (cpi).

Discussion This command is available in all print modes except OCR A and OCR B.

Character Pitch 15 CPI

ASCII Code ESC g

Hex Code 1B 67

Dec Code 27 103

Purpose Sets character pitch to 15 characters per inch (cpi).

†**Discussion** This command is not defined in Epson FX printers. It is included in this emulation for compatibility with the Okidata KX-P1180 printer. This command is available in all print modes except OCR A and OCR B.

Character Set Select: International Languages

ASCII Code ESC R *n*

Hex Code 1B 52 *n*

Dec Code 27 82 *n*

Purpose Specifies a language overlay that prints the characters shown in Table 40 when the specified code is invoked.

where *n* = 0 through 15 (hex 00 through 0E) to determine the language overlay shown in Table 40 below. Epson only defines character sets through hex 0C.

Table 40. Epson International Character Sets

(Hex) If *n*=	International Character Set Is:	Hex Codes 23	24	40	5B	5C	5D	5E	60	7B	7C	7D	7E
0	USA	#	$	@	[	\	]	^	`	{	¦	}	~
1	French	#	$	à	º	ç	§	^	`	é	ù	è	¨
2	German	#	$	§	Ä	Ö	Ü	^	`	ä	ö	ü	ß
3	English (UK)	£	$	@	[	\	]	^	`	{	¦	}	~
4	Danish I	#	$	@	Æ	Ø	Å	^	`	æ	ø	á	~
5	Swedish	#	¤	É	Ä	Ö	Å	Ü	é	ä	ö	á	ü
6	Italian	#	$	@	º	\	é	^	ù	à	ò	è	ì
7	Spanish I	₧	$	@	¡	Ñ	¿	^	`	¨	ñ	}	~
8	Japanese	#	$	@	[	¥	]	^	`	{	¦	}	~
9	Norwegian	#	¤	É	Æ	Ø	Å	Ü	é	æ	ø	á	ü
A	Danish II	#	$	É	Æ	Ø	Å	Ü	é	æ	ø	á	ü
B	Spanish II	#	$	á	¡	Ñ	¿	é	`	í	ñ	ó	ú
C	Latin American I	#	$	á	¡	Ñ	¿	é	ü	í	ñ	ó	ú
D	French Canadian	#	$	à	â	ç	ê	î	ô	é	ù	è	û
E	Latin American II	#	$	@	[	Ñ	]	ú	í	ó	á	é	ü

Discussion This control code setting overrides a character set selection made at the control panel.

Example The following example illustrates international character selection using the IBM PC character set.

```
Control code ESC R 5 selects
the Swedish character set shown beneath
the USA (ASCII) characters.

A B C D [ \ ] ^ _ ` { ¦ } ~
A B C D Ä ö Å Ü _ é ä ö å ü
```

Clear Bit 7 of Incoming Data Bytes to 0

ASCII Code ESC =

Hex Code 1B 3D

Dec Code 27 61

Purpose Sets the most significant bit (MSB) of all incoming data to 0.

†**Discussion** The MSB is bit number 7. This command only affects text and control code data. Graphics data passes through unchanged. Some applications always set the MSB of print data to one (1), which results in italic or graphics printing in Epson printers. This command overcomes the problem.

This command does not suppress hex FF from printing.

Condensed Print

ASCII Code SI ESC SI

Hex Code 0F 1B 0F

Dec Code 15 27 15

Purpose Condenses print pitch as close to 60% of the former character width as possible (up to 20 characters per inch).

Discussion The condensed print command affects all subsequent characters. After the printer receives code SI, all characters are printed condensed (approximately 60 per cent of the width of normal characters) until the printer is reset by ESC M, ESC P, DC2, a printer reset, or a new print mode control code. SI code (hex 0F) is equivalent to the ESC SI code. If condensed print is not allowed in the current font, this code is ignored. Proportionally spaced text cannot be condensed. Proportional spacing overrides condensed printing.

When condensed print is selected, the following character pitches go into effect:

- DP 10 cpi condenses to DP 17.1 cpi. NLQ 10, 12, and 15 cpi condense to NLQ 17.1 cpi. Draft 10 cpi condenses to Draft 17.1 cpi.
- DP 12 and 15 cpi condense to DP 20. Draft 12 and 15 cpi condense to Draft 20.

† This control code condenses character width but *not* inter-character spacing. An actual Epson FX-1050 printer condenses both character width and spacing. If Condensed Print is combined with Double High (ESC w) printing, *only* Double High printing will occur.

Example This sample shows condensed character printing and reset.

```
Control code
SI selects
condensed character printing.
Control code DC2
resets condensed character printing.
```

Condensed Print Reset

ASCII Code DC2

Hex Code 12

Dec Code 18

Purpose Cancels the condensed print mode set by SI, ESC SI, or the control panel.

Discussion This returns the printer to the font that was active before condensed print occurred. Other print attributes are not affected.

Example See the Condensed Print control code (page 160) for an example of Condensed Print Reset.

Cut-Sheet / Paper Feed Control

ASCII Code ESC EM *n*

Hex Code 1B 19 *n*

Dec Code 27 25 *n*

Purpose This code controls the paper feed mechanism on Epson printers.

†**Discussion** The printer ignores this command.

Define a Download Character

ASCII Code ESC &

Hex Code 1B 26

Dec Code 27 38

Purpose Defines a download character.

†**Discussion** The printer ignores this command and removes all downloaded font data from the data stream.

Delete Character

ASCII Code DEL

Hex Code 7F

Dec Code 127

Purpose Deletes the previous character on a line.

Discussion This command is ignored if it occurs immediately after a CR or a paper motion command. Characters truncated due to line length restrictions are not affected by this code.

Double High Print, Set/Reset

ASCII Code ESC w *n*

Hex Code 1B 77 *n*

Dec Code 27 119 *n*

Purpose Turns double-high character printing on and off. Double-high characters are standard width but twice as high.

where *n* = 1 or 49 (hex 01 or hex 31) turns double high printing on
n = 0 or 48 (hex 00 or hex 30) turns double high printing off

Discussion The OCR A and OCR B fonts cannot be printed in double high.

Note

It is recommended to use double Line Feeds and Carriage Returns when double-high character printing is on (after an ESC w control code has been sent), or else the printer will overstrike text that has already printed.

If Superscript/Subscript (ESC S) or Condensed Print (SI) is combined with Double High printing, *only* Double High printing will occur.

Example The following sample illustrates double-high character printing.

```
Control Code ESC w
Selects Double High printing.
Cancels Double High printing.
```

Double Strike

ASCII Code ESC G

Hex Code 1B 47

Dec Code 27 71

Purpose Makes text bolder by double printing each dot twice.

Discussion This command makes text bolder by printing each dot twice, the second dot offset to the right of the first by a distance equal to 1/2 the width of a dot, the same as with ESC E.

Example The following sample illustrates double strike character printing.

```
Control code ESC G
selects bold character printing,
for example: AaBbCcDdEeFfGgHhIiJjKkLlMmNnOoPp.
Control code ESC H
cancels bold character printing.
```

Double Strike, Cancel

ASCII Code ESC H

Hex Code 1B 48

Dec Code 27 72

Purpose Turns off the double strike printing set by ESC G or ESC !.

Discussion This control code resets only the double strike print attribute. Other print attributes, such as double wide printing, are not affected.

Double Wide Print

ASCII Code ESC W *n*

Hex Code 1B 57 *n*

Dec Code 27 87 *n*

Purpose Turns double wide print on and off.

where *n* = 1 or 49 (hex 01 or hex 31) turns double wide print on
n = 0 or 48 (hex 00 or hex 30) turns double wide print off

Discussion When ESC W is received, all characters are printed twice as wide until reset. This command overrides SO, ESC SO, and DC4. The OCR A and OCR B fonts cannot be printed in double wide.

† This control code doubles character width, but does *not* double inter-character spacing, unlike the Epson FX-1050. The formulas for total character spacing are as follows:

Epson FX-1050	2(char + 1 dot + space)
Epson Emulation	2(char + 1 dot) + space

Example The following sample illustrates double wide character printing.

```
Control code
ESC W 1 selects
expanded character printing.
Control code
ESC W 0 resets
expanded character printing.
```

Double Wide Print (One Line)

ASCII Code SO ESC SO

Hex Code 0E 1B 0E

Dec Code 14 27 14

Purpose Selects double wide print for one line only.

Discussion This control code is a line-by-line print attribute; when SO or ESC SO is received, the characters on the current line print twice as wide, then automatically reset.

This control code is cancelled by the DC4 code or by a CR code, as in the Epson FX-1050. It is *also* cancelled by a paper motion control code (LF, VT, etc.), as in the IBM Proprinter III XL.

† This control code doubles character width, but does *not* double inter-character spacing, unlike the Epson FX-1050. The formulas for total character spacing are as follows:

Epson FX-1050	2(char + 1 dot + space)
Epson Emulation	2(char + 1 dot) + space

Example The following sample illustrates double wide print for one line only.

```
Control code
SO selects
expanded character printing
for one line only.
```

Double Wide Print (One Line), Cancel

ASCII Code DC4

Hex Code 14

Dec Code 20

Purpose Cancels the double wide print for one line only selected by SO or ESC SO.

Discussion This command cancels the double wide print selected by SO or ESC SO, but does not cancel double wide printing selected by ESC W or ESC !.

Emphasized Print

ASCII Code ESC E

Hex Code 1B 45

Dec Code 27 69

Purpose Selects emphasized character print format.

Discussion Emphasized print makes text bolder by printing each dot twice, the second dot offset to the right of the first by a distance equal to 1/2 the width of a dot. This command is available in both DP and NLQ modes.

Example The following sample illustrates emphasized character printing.

```
Control code
ESC E selects
emphasized character printing.
Control code ESC F
cancels emphasized character printing.
```

Emphasized Print, Cancel

ASCII Code ESC F

Hex Code 1B 46

Dec Code 27 70

Purpose Cancels emphasized character printing selected by ESC E or ESC !

Discussion This command is available in both DP and NLQ modes.

Enable Printing Hex Codes 00-1F and 80-9F

ASCII Code ESC I *n* (uppercase “i”)

Hex Code 1B 49 *n*

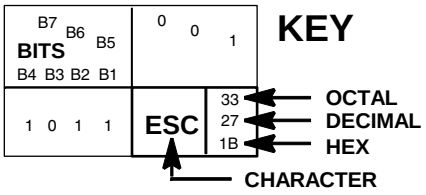
Dec Code 27 73 *n*

Purpose Permits you to print hex codes 00-1F and 80-9F.

where *n* = 1 allows hex codes 00-1F and 80-9F to be printable and to be used for user-defined characters.
n = 0 returns hex 00-1F and 80-9F to control codes.

Discussion The printable characters that are included in hex codes 00 through 1F and 80 through 9F are usually not printable in the default state on Epson printers. Sending ESC I 1 enables you to print characters in this range. Sending ESC I 0 returns the codes to non-printable status.

Figure 2 shows the types of characters and their addresses; it is not a sample of printer output.



B8 B7 B6 B5 BITS B4 B3 B2 B1	ROW	0 0 0 0 COLUMN 0		0 0 0 1 1	
0 0 0 0	0	à	0 0 0	§	20 16 10
0 0 0 1	1	è	1 1 1	ß	21 17 11
0 0 1 0	2	ù	2 2 2	DC2	22 18 12
0 0 1 1	3	ò	3 3 3	DC3	23 19 13
0 1 0 0	4	ì	4 4 4	DC4	24 20 14
0 1 0 1	5	o	5 5 5	ø	25 21 15
0 1 1 0	6	£	6 6 6	¨	26 22 16
0 1 1 1	7	BEL	7 7 7	Ä	27 23 17
1 0 0 0	8	BS	10 8 8	CAN	30 24 18
1 0 0 1	9	HT	11 9 9	Ü	31 25 19
1 0 1 0	10	LF	12 10 0 A	ä	32 26 1A
1 0 1 1	11	VT	13 11 0 B	ESC	33 27 1B
1 1 0 0	12	FF	14 12 0 C	ü	34 28 1C
1 1 0 1	13	CR	15 13 0 D	É	35 29 1D
1 1 1 0	14	SO	16 14 0 E	é	36 30 1E
1 1 1 1	15	SI	17 15 0 F	¥	37 31 1F

B8 B7 B6 B5 BITS B4 B3 B2 B1	ROW	1 0 0 0 COLUMN 8		1 0 0 1 9	
0 0 0 0	0	*à*	200 128 80	*§*	220 144 90
0 0 0 1	1	*è*	201 129 81	*ß*	221 145 91
0 0 1 0	2	*ù*	202 130 82	*Æ*	222 146 92
0 0 1 1	3	*ò*	203 131 83	*æ*	223 147 93
0 1 0 0	4	*ì*	204 132 84	*Ø*	224 148 94
0 1 0 1	5	o	205 133 85	*ø*	225 149 95
0 1 1 0	6	*£*	206 134 86	¨	226 150 96
0 1 1 1	7	*¡*	207 135 87	*Ä*	227 151 97
1 0 0 0	8	*¿*	210 136 88	*Ö*	230 152 98
1 0 0 1	9	*Ñ*	211 137 89	*Ü*	231 153 99
1 0 1 0	10	*ñ*	212 138 8A	*ä*	232 154 9A
1 0 1 1	11	¤	213 139 8B	*ö*	233 155 9B
1 1 0 0	12	P_t	214 140 8C	*ü*	234 156 9C
1 1 0 1	13	*Å*	215 141 8D	*É*	235 157 9D
1 1 1 0	14	*å*	216 142 8E	*é*	236 158 9E
1 1 1 1	15	*ç*	217 143 8F	¥	237 159 9F

Figure 2. Epson Printable Codes (Hex 00-1F and 80-9F)

Form Feed

ASCII Code FF

Hex Code 0C

Dec Code 12

Purpose Prints the data in the buffer, if any, then moves the paper to the top of the next form.

Discussion The logical print head moves to the left margin. This code cancels all one-line-only emphasis and font controls: double-wide from SO and ESC SO, and unidirectional printing from ESC <.

Graphics, Standard Density

ASCII Code ESC K *n1 n2*

Hex Code 1B 4B *n1 n2*

Dec Code 27 75 *n1 n2*

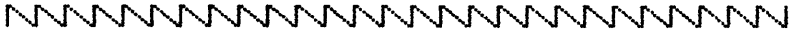
Purpose Selects normal density bit image graphics of 60 dots per inch horizontally and 72 dots per inch vertically.

where (*n1* + 256*n2*) defines the number of data bytes to follow.
DATA = ASCII characters for the dot pattern bytes.
n1 = (Number of DATA bytes) - 256(*n2*)
(remainder of division of number of DATA bytes by 256, sometimes referred to as MOD 256)
n2 = (Number of DATA bytes) / 256 (quotient of division)

Discussion You can change graphics density with the ESC ? command.

Example The following example produces a pattern of standard density bit image graphics. The 9 data-bit pattern is repeated 27 times. Compare this example to the double density and quadruple density examples.

```
Single Density Bit Image Graphics
```



Graphics, Double Density

ASCII Code ESC L *n1 n2*

Hex Code 1B 4C *n1 n2*

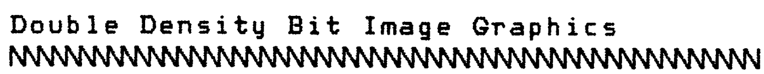
Dec Code 27 76 *n1 n2*

Purpose Selects double density bit image graphics of 120 dots per inch horizontally and 72 dots per inch vertically.

where (*n1* + 256*n2*) defines the number of data bytes to follow.
DATA = ASCII characters for the dot pattern bytes.
n1 = (Number of DATA bytes) - 256(*n2*)
(remainder of division of number of DATA bytes by 256, sometimes referred to as MOD 256)
n2 = (Number of DATA bytes) / 256 (quotient of division)

Discussion Double density printing reduces print speed to half that of normal density printing. You can change graphics density with the ESC ? command. This feature is widely used to move the print head precisely, by printing blank dot columns.

Example The following example produces double density bit-image graphics of the pattern used in the standard density bit-image mode example. The amount of data must be doubled for double density (the data are used 54 times rather than 27).



Graphics, Double Density Double Speed

ASCII Code ESC Y *n1 n2*

Hex Code 1B 59 *n1 n2*

Dec Code 27 89 *n1 n2*

Purpose Selects double density, double speed bit-image graphics of 120 dpi horizontally and 72 dpi vertically.

where (*n1* + 256*n2*) defines the number of data bytes to follow.
DATA = ASCII characters for the dot pattern bytes.
n1 = (Number of DATA bytes) - 256(*n2*)
(remainder of division of number of DATA bytes by 256, sometimes referred to as MOD 256)
n2 = (Number of DATA bytes) / 256 (quotient of division)

Discussion This mode prints double density with no adjacent dots. It is similar to ESC L, except that if the graphics data contain horizontally adjacent dots, the data may print incorrectly. This feature is widely used to move the print head precisely, by printing blank dot columns.

Example The following example produces a double density, double speed graphic image of the pattern used in the standard density example. The amount of data must be doubled for double density (the data are used 54 times rather than 27).

```
Double Density Double Speed Bit Image Graphics
NNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
```

Graphics, Quadruple Density

ASCII Code ESC Z *n1 n2*

Hex Code 1B 5A *n1 n2*

Dec Code 27 90 *n1 n2*

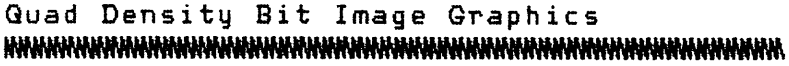
Purpose Selects Quadruple Density Bit Image graphics of 240 dpi horizontally and 72 dpi vertically.

where (*n1* + 256*n2*) defines the number of data bytes to follow.
DATA = ASCII characters for the dot pattern bytes.
n1 = (Number of DATA bytes) - 256(*n2*)
(remainder of division of number of DATA bytes by 256, sometimes referred to as MOD 256)
n2 = (Number of DATA bytes) / 256 (quotient of division)

Discussion This mode is similar to ESC L, except that four dot columns are printed in the space normally taken by two columns. You can change graphics density with the ESC ? command.

Example The following example produces quadruple density graphics of the pattern used in the standard density example. The amount of data must be quadrupled for quadruple density (the data are used 108 times rather than 27).

```
Quad Density Bit Image Graphics
```



Half Speed Mode, On/Off

ASCII Code ESC s *n*

Hex Code 1B 73 *n*

Dec Code 27 115 *n*

Purpose Reduces printer speed 50%

where *n* = 1 or 49 (hex 00 or 30) turns half speed mode off
n = 0 or 48 (hex 01 or 31) turns half speed mode on

†**Discussion** This is simulated in your printer by unidirectional printing.

Horizontal Tab Execute

ASCII Code HT

Hex Code 09

Dec Code 09

Purpose Moves the logical print head to the next horizontal tab stop.

Discussion Power-on default horizontal tabs are set at every eighth character at the current character spacing. Tab positions are not affected by a change of font or character width. Blank spaces between HT stops are underlined in underline mode.

Horizontal Tab Set/Release

ASCII Code ESC D *n1 ... nk* NUL

Hex Code 1B 44 *n1 ... nk* 00

Dec Code 27 68 *n1 ... nk* 0

Purpose Sets up to 32 horizontal tab positions.

where *n1* through *n32* specify the character column of the tab positions. NUL (hex 00) is the sequence terminator. ESC D 0 clears all tabs.

Discussion The values of *n* must be listed in ascending order or they are ignored. Tabs greater than 32 or those positioned beyond the right margin are ignored. The physical tab position is the product of *n* and the current cell width (1/pitch), excluding double wide.

After the tabs are set, HT moves the logical print head to the next tab stop. Sending ESC @ initializes the printer and resets the tabs to every eighth character column (which is the default). In proportional mode, the size of 10 CPI characters determines tab positions.

Example The following example illustrates how to set horizontal tabs.

```
Control code
ESC D CHR$(4);CHR$(10);CHR$(0)
sets tab stops at columns 4 and 10.
Control code HT
accesses the tab stops as follows:
    column 4
           column 10
```

Initialize Printer

ASCII Code ESC @

Hex Code 1B 40

Dec Code 27 64

Purpose Resets all print-related parameters to the power-up configuration.

Discussion Restores the power-up values and clears the print buffer of printable data on the line preceding the command. Current position is set as top-of-form.

Font, international language selection, forms length, skip-over perforation, and character pitch are reset to their power-up values.

Character-by-character and line-by-line attributes are canceled.

All channels of the vertical format unit are cleared.

This command resets the horizontal tabs to every eighth character column. Interface parameters and printer protocol selection are not affected.

Italic Printing

ASCII Code ESC 4

Hex Code 1B 34

Dec Code 27 52

Purpose Turns on italic character printing.

Discussion Character graphics (IBM graphic set hex B0 through DF and F0 through FE) cannot be italicized. Italic printing will reduce throughput.

Italic Printing, Cancel

ASCII Code ESC 5

Hex Code 1B 35

Dec Code 27 53

Purpose Turns off italic character printing.

Line Feed

ASCII Code LF

Hex Code 0A

Dec Code 10

Purpose Prints the data in the buffer (if any) and advances the vertical character position a distance of one line at the current line spacing.

Discussion The logical print head keeps the same distance from the margin. The current line is printed and the logical printhead moves down a distance equal to the current line spacing. If there are no dots, paper moves and no printing occurs. When possible, successive line feeds are accumulated and moved at once.

This code cancels all one-line-only emphasis and font selections: double-wide from SO and ESC SO, and unidirectional printing from ESC <.

Line Feed *n*/216 Inch

ASCII Code ESC J *n*

Hex Code 1B 4A *n*

Dec Code 27 74 *n*

Purpose Immediately advances the paper *n*/216 inch.

where *n* = 0 through 255 (hex 00 through hex FF).

Discussion *n* = 0 is ignored. Paper movement occurs in multiples of 3/216 inch. This command produces an immediate line feed but does not affect line spacing or produce a carriage return. Any one-line-only print attributes in effect are canceled.

Small values of *n* may result in overlapping lines. Overlapping lines may also occur if print attributes such as double high, superscript, or subscript characters are used on the same line.

Example The following example illustrates *n*/216-inch line spacing.

```
Control code ESC J 200




performs a 200/216 inch
line feed function for one line only.
```

Line Spacing 1/6 Inch (6 lpi)

ASCII Code ESC 2

Hex Code 1B 32

Dec Code 27 50

Purpose Sets the line spacing to 1/6 inch (6 lpi) for subsequent line feeds.

Discussion The 2 is ASCII *character* 2, not hex 02.
When ESC 2 is received, all lines are printed at 6 lpi until a new line spacing is selected or the printer is reset.

This control code overrides line spacing set at the control panel.

Example The following example illustrates 1/6-inch line spacing.

```
Control code ESC 2 sets
line spacing at
6 lpi for all subsequent lines
until reset or another spacing is selected.
```

Line Spacing 1/8 Inch (8 lpi)

ASCII Code ESC 0

Hex Code 1B 30

Dec Code 27 48

Purpose Sets the line spacing to 1/8 inch (8 lpi) for subsequent line feeds.

Discussion The 0 is ASCII character 0 (zero), not hex 00. When ESC 0 is received, all lines are printed at 8 lpi until a new line spacing is selected or the printer is reset. This control code overrides line spacing set at the control panel.

Example The following example illustrates 1/8-inch line spacing.

```
Control code ESC 0 sets
line spacing at
1/8 (8 lpi) inch for all subsequent lines
until reset or another spacing is selected.
```

Line Spacing 7/72 Inch

ASCII Code ESC 1

Hex Code 1B 31

Dec Code 27 49

Purpose Sets the line spacing to 7/72 inch (10.3 lpi) for subsequent line feeds.

Discussion All lines are printed at the 7/72-inch line spacing until a new line spacing is selected or the printer is reset. This control code overrides line spacing set at the control panel.

Printing speed is reduced if printed lines overlap.

Example The following example illustrates 7/72-inch line spacing.

```
Control code ESC 1 sets
line spacing at
7/72 inch for all subsequent lines
until reset or another spacing is selected.
```

Line Spacing *n*/216 Inch

ASCII Code ESC 3 *n*

Hex Code 1B 33 *n*

Dec Code 27 51 *n*

Purpose Specifies the line spacing at *n*/216-inch increments.

where *n* = 1 through 255 (hex 01 through hex FF).

Discussion All line feeds following receipt of this code are at *n*/216 inch line spacing until a new line spacing is selected or the printer is reset. Line spacing set by this control code overrides line spacing setting set at the control panel.

The vertical character position moves only in multiples of the current dot row spacing. If the distance to move is other than a multiple of the current dot row spacing, the remainder is added to the next paper motion command.

Paper movement occurs in multiples of 3/216 only.

Use caution when combining this control code with other print attributes such as Elongated (Double High), Superscript, or Subscript; overlapping lines may occur. Print speed is reduced if lines overlap.

Example The following example illustrates *n*/216-inch line spacing.

```
Control code ESC 3 50 sets
line spacing at 50/216 inch
increments for all subsequent lines
until reset or another spacing is selected.
```

Line Spacing *n*/72 Inch

ASCII Code ESC A *n*

Hex Code 1B 41 *n*

Dec Code 27 65 *n*

Purpose Sets a line spacing of *n*/72 inch for subsequent line feeds.

where *n* = 1 through 255 (hex 01 through hex FF).

Discussion When this control sequence is received, all subsequent line feeds are *n*/72-inch until a new line spacing is selected or the printer is reset. This setting overrides line spacing set at the control panel.

Small values of *n* may result in overlapping lines. Overlapping lines may also occur if print attributes such as Elongated (Double High), Superscript, or Subscript characters are used on the same line. If lines overlap, printing speed is reduced. Any values set by ESC 3 (line spacing *n*/216 inch) are replaced.

Example The following example illustrates 20/72-inch line spacing.

```
Control code ESC A 20 sets
line spacing at 20/72 inch

increments for all subsequent lines

until reset or another spacing is selected.
```

Make Hex 80-9F Control Codes

ASCII Code ESC 7

Hex Code 1B 37

Dec Code 27 55

Purpose Selects codes hex 80-9F in the character sets as control codes.

Discussion This is the default when the Epson character set is selected as the default set at the control panel.

Make Hex 80-9F Printable

ASCII Code ESC 6

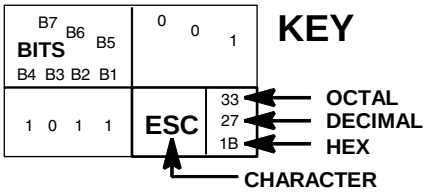
Hex Code 1B 36

Dec Code 27 54

Purpose Selects codes hex 80-9F in the character sets as printable characters.

Discussion This is the default when the IBM PC character set (code page 0437) is selected as the default set at the control panel.

Figure 3 shows the hex 80-9F printable characters for the Epson character set and for the IBM PC graphic character set.



B8 B7 B6 B5 / BITS B4 B3 B2 B1	ROW	1 0 0 0 COLUMN 8		1 0 0 1 9	
0 0 0 0	0	à	200 128 80	§	220 144 90
0 0 0 1	1	è	201 129 81	ß	221 145 91
0 0 1 0	2	ù	202 130 82	Æ	222 146 92
0 0 1 1	3	ò	203 131 83	æ	223 147 93
0 1 0 0	4	ì	204 132 84	Ø	224 148 94
0 1 0 1	5	○	205 133 85	ø	225 149 95
0 1 1 0	6	£	206 134 86	¨	226 150 96
0 1 1 1	7	¡	207 135 87	Ä	227 151 97
1 0 0 0	8	¿	210 136 88	Ö	230 152 98
1 0 0 1	9	Ñ	211 137 89	Ü	231 153 99
1 0 1 0	10	ñ	212 138 8A	ä	232 154 9A
1 0 1 1	11	¤	213 139 8B	ö	233 155 9B
1 1 0 0	12	₧	214 140 8C	ü	234 156 9C
1 1 0 1	13	Å	215 141 8D	É	235 157 9D
1 1 1 0	14	å	216 142 8E	é	236 158 9E
1 1 1 1	15	ç	217 143 8F	¥	237 159 9F

Epson USA Character Set

B8 B7 B6 B5 / BITS B4 B3 B2 B1	ROW	1 0 0 0 COLUMN 8		1 0 0 1 9	
0 0 0 0	0	Ç	200 128 80	É	220 144 90
0 0 0 1	1	ü	201 129 81	æ	221 145 91
0 0 1 0	2	é	202 130 82	Æ	222 146 92
0 0 1 1	3	â	203 131 83	ô	223 147 93
0 1 0 0	4	ä	204 132 84	ö	224 148 94
0 1 0 1	5	à	205 133 85	ò	225 149 95
0 1 1 0	6	å	206 134 86	û	226 150 96
0 1 1 1	7	ç	207 135 87	ù	227 151 97
1 0 0 0	8	ê	210 136 88	ÿ	230 152 98
1 0 0 1	9	ë	211 137 89	Ö	231 153 99
1 0 1 0	10	è	212 138 8A	Ü	232 154 9A
1 0 1 1	11	ï	213 139 8B	¢	233 155 9B
1 1 0 0	12	î	214 140 8C	£	234 156 9C
1 1 0 1	13	ì	215 141 8D	¥	235 157 9D
1 1 1 0	14	Ä	216 142 8E	₧	236 158 9E
1 1 1 1	15	Å	217 143 8F	ƒ	237 159 9F

IBM 437 Code Page

Figure 3. Epson Printable Codes (Hex 80-9F)

Master Print Select

ASCII Code ESC ! *n*

Hex Code 1B 21 *n*

Dec Code 27 33 *n*

Purpose Selects or changes print attributes in a single command.

where *n* = an 8-bit number with the bits set to specify print attributes, as shown in Table 41.

Table 41. Master Print Select Bit Values

Bit No.	Bit = 0	Bit = 1
0	10 cpi	† 12 cpi
1	Monospaced	† Proportional
2	Normal	Condensed
3	Normal	Emphasized
4	Normal	† Double Strike
5	Normal	Double Wide
6	Normal	Italic
7	Normal	Underlined

Discussion Emphasized is substituted for double strike. Graphics and grey scale characters are not underlined. Proportional spacing overrides condensed or 12 cpi printing if both are selected.

Paper Out Detection, Enable

ASCII Code ESC 9

Hex Code 1B 39

Dec Code 27 57

Purpose Asserts a paper out condition immediately when the end of the paper supply is sensed.

†**Discussion** The printer decodes and ignores this command.

Paper Out Detection, Disable

ASCII Code ESC 8

Hex Code 1B 38

Dec Code 27 56

Purpose Enable printing to the end of the paper supply when a paper out condition is sensed.

†**Discussion** The printer decodes and ignores this command.

Pass Bit 7 from Host

ASCII Code ESC #

Hex Code 1B 23

Dec Code 27 35

Purpose Passes bit 7 (the eighth and most significant bit) whether it is 1 or 0, thereby cancelling ESC > and ESC =.

Discussion This command affects only text and control code data; bit 8 of graphics data is always passed through.

Printer Select

ASCII Code DC1

Hex Code 11

Dec Code 17

Purpose Places printer in the selected state.

Discussion The configuration parameter Printer Select must be set to Enable. Refer to the *User's Manual* for information about this menu option.

This control code allows the printer to receive and print data from the host if it was deselected by DC3. If the printer was not deselected by DC3, this code is ignored.

Printer Deselect

ASCII Code DC3

Hex Code 13

Dec Code 19

Purpose Places printer in the deselected state.

Discussion The configuration parameter Printer Select must be set to Enable. Refer to the *User's Manual* for information about this menu option.

When the printer receives this command it ignores data until a DC1 (Printer Select) command is received.

Reassign Graphics Mode

ASCII Code ESC ? *s m*

Hex Code 1B 3F *s m*

Dec Code 27 63 *s m*

Purpose Changes one graphics mode to another.

Discussion *s* is character K, L, Y, or Z, which is changed to mode *m* (0-7) from Table 42 (page 181). Thereafter, sending data to the bit image command makes the data print according to the graphics mode you select with *m.*

Remove Downloaded Characters

ASCII Code ESC : NUL *n* NUL

Hex Code 1B 3A 00 *n* 00

Dec Code 27 58 0 *n* 0

Purpose Erases all downloaded characters.

†**Discussion** The printer ignores this command but removes all data sent.

Select Graphics Mode

ASCII Code ESC * *m n1 n2*

Hex Code 1B 2A *m n1 n2*

Dec Code *27 42 m n1 n2*

Purpose Turns on 8-pin bit image graphics mode *m*. Table 42 charts the graphics modes available.

Discussion The total number of columns = *n1* + 256*n2.*
n1 = (Number of DATA bytes) - 256(*n2*)
(remainder of division of number of DATA bytes by 256, sometimes referred to as MOD 256)
n2 = (Number of DATA bytes) / 256 (quotient of division)

This command does not suppress hexadecimal FF from printing.

Table 42. Epson Graphics Modes

m	Option	Alternate Code	Density* (dots per inch)	Resolution** (dots per inch)
0	Single density	ESC K	60	120
1	Double density	ESC L	120	120[1]
2	High-speed double density	ESC Y	60	120[2]
3	Quadruple density	ESC Z	120	240[1,2,3]
4	CRT I	none	80	160
5	Plotter (1:1)	none	72	144
6	CRT II	none	90	180
7	Double density plotter	none	144	144[1]

[1] Prints at half speed.

[2] Data can be sent incorrectly. In these modes, no dots can be closer horizontally than the current font dot density. Sending incorrect data does not damage the printer.

[3] 240 dpi is simulated by combining the dots from two adjacent columns into one 120 dpi dot column.

* Number of horizontal dots per inch the printer can make.

** Number of dot columns available.

Select Italic Character Set

ASCII Code ESC t *n*

Hex Code 1B 74 *n*

Dec Code 27 116 *n*

Purpose Selects the italics characters from hex 80 through hex FF, or selects the graphics characters from hex 80 through hex FF.

where *n* = hex 01 selects the graphics character set
n = hex 00 selects the italics character set

Discussion The graphics character set is the IBM Graphics Code Page 437.

Select 9-Pin Graphics Mode

ASCII Code ESC ^ *m n1 n2 d1 ... dk*

Hex Code 1B 5E *m n1 n2 d1 ... dk*

Dec Code 27 94 *m n1 n2 d1 ... dk*

Purpose Turns on 9-pin bit image graphics mode.

Discussion *m* defines the plot density as shown in Table 42 on page 181.
n1 + 256*n2* = The total number of columns.
n1 = (Number of DATA bytes) - 256(*n2*)
(remainder of division of number of DATA bytes by 256, sometimes referred to as MOD 256)
n2 = (Number of DATA bytes) / 256 (quotient of division)

This mode requires two bytes of graphic data for every column of print. Each column is sent as a pair: *d1, d3, ... d*(*k*-1) set the top 8 bits of a normal dot column, just like ESC K; *d2, d4, ... dk* set the ninth dot in the column (the most significant bit) just below the bottom-most dot of columns *d1, d3, ... d*(*k*-1).

Select Print Quality

ASCII Code ESC x *n*

Hex Code 1B 78 *n*

Dec Code 27 120 *n*

Purpose Selects print quality.

where *n* may be in the range from 0 through 4. Values in the range 5-255 are invalid.
n = 0 or 48 (hex 00 or hex 30) selects DP print quality
n = 1 or 49 (hex 01 or hex 31) selects Near Letter Quality (NLQ)
n = 2 or 50 (hex 02 or hex 32) selects HS print quality
n = 3 or 51 (hex 03 or hex 33) selects OCR A print quality
n = 4 or 52 (hex 04 or hex 34) selects OCR B print quality

Discussion This command overrides control panel print quality selections.

Note

Some print attributes (such as condensed, double-wide, etc.) may not return to their previous setting when changing from OCR-A or OCR-B back to another Print Quality. For guaranteed results, all print attributes should be set after the Print Quality is selected.

Selecting an OCR print quality overrides any character attributes set, such as condensed, double-wide, etc. Setting character attributes when OCR is set may cause unexpected results.

† Draft, OCR A, and OCR B print qualities (*n* = 2, 3, or 4) are not defined in Epson-FX printers.

Select/Deselect Proportional Spacing

ASCII Code ESC p *n*

Hex Code 1B 70 *n*

Dec Code 27 112 *n*

where *n* = 0 = Off
n = 1 = On

Purpose Turns proportional mode on and off.

Select Serif or Sans Serif Font

ASCII Code ESC k *n*

Hex Code 1B 6B *n*

Dec Code 27 107 *n*

†**Purpose** Selects an NLQ font.

where *n* may range from 0 through 255 (hex 00 through hex FF).

n = 0, 2, 4 .. (any even value), the font selected is a serif NLQ font (Courier, instead of standard Epson Roman).

n = 1, 3, 5 .. (any odd value), the font selected is a sans serif NLQ font.

Select User-Defined Font

ASCII Code ESC % *n*

Hex Code 1B 25 *n*

Dec Code 27 37 *n*

Purpose Selects a user-defined font.

†**Discussion** The printer ignores this command and removes all font data sent from the data stream.

Select Vertical Tab Channel

ASCII Code ESC / *c*

Hex Code 1B 2F *c*

Dec Code 27 47 *c*

Purpose Selects a vertical tab channel set by ESC b.

where *c* = 0 through 7.

Discussion Subsequent VT (Hex 0B) commands use tab table specified by *c*. If no tab table is selected, channel 0 is used.

Set Absolute Horizontal Print Position in 1/60 Inch

ASCII Code ESC $ *n1 n2*

Hex Code 1B 24 *n1 n2*

Dec Code 27 36 *n1 n2*

Purpose Moves the logical print head to an absolute horizontal print position, using 1/60 inch increments.

where (*n1* + [256*n2*]) / 60 = the unsigned distance in inches from the left margin.
n1 = (Number of DATA bytes) - 256(*n2*)
(remainder of division of number of DATA bytes by 256, sometimes referred to as MOD 256)
n2 = Number of DATA bytes) / 256 (quotient of division)

Discussion If the distance goes beyond right margin, the sequence is ignored.

Set Bit 7 of Incoming Data Bytes to 1

ASCII Code ESC >

Hex Code 1B 3E

Dec Code 27 62

Purpose Sets the most significant bit (MSB) of all incoming data to 1.

Discussion The MSB is bit number 7. This command only affects text and control code data. Graphics data pass through unchanged.

Set Form Length in Inches

ASCII Code ESC C NUL *n*

Hex Code 1B 43 00 *n*

Dec Code 27 67 0 *n*

Purpose Sets form length to *n* inches.

where *n* = whole numbers from 1 through 24 to specify the number of inches on a form.

Discussion Upon receipt of this code, the current line becomes the first line of the form, and the form length set becomes the current forms length. Vertical tab positions set below the bottom of the form are ignored. Forms length is defined in inches; therefore, subsequent line spacing changes do not affect the result of this command.

Values of *n* greater than 24 are ignored.

When forms length is set by an ESC C sequence, the skip-over perforation set by ESC N is cancelled.

This control code overrides forms length set at the control panel.

Set Form Length in Lines

ASCII Code ESC C *n*

Hex Code 1B 43 *n*

Dec Code 27 67 *n*

Purpose Sets the form length by lines.

where *n* = 1 through 192 (hex 01 through C0) to specify the number of lines per form at the current line spacing.

Discussion The forms length is set to the number of lines defined by the quotient of *n* divided by the current lines per inch so that the units are in inches.

The current line becomes the first line of the form. The forms length is always defined in inches; therefore, changing the lpi after this control code has been issued does not change the forms length.

If the calculated forms length in lines is not an exact multiple of the target machine dot size, the forms length value will be adjusted down to the next possible multiple.

When forms length is set by an ESC C sequence, the skip-over perforation set by ESC N is cancelled.

Set Intercharacter Spacing in 1/120 Inch

ASCII Code ESC SP *n*

Hex Code 1B 20 *n*

Dec Code 27 32 *n*

Purpose Permits character spacing adjustments in 1/120 inch increments.

where *n* = 0 through 127 (hex 00 through 7F).

Set Margin, Left

ASCII Code ESC l *n* (lowercase “L”)

Hex Code 1B 6C *n*

Dec Code 27 108 *n*

where *n* = number of columns from the left edge of the physical page to the beginning of the print line;
n = 1 through 232 (hex 00 through hex E8)

Purpose Sets the left margin to *n* columns in the current font.

Discussion Be sure to use the alphabetic lowercase “L” (as in left) rather than the numeral “1” (one) for this command. The number of inches of margin does not vary if the font, character width, or horizontal dot density changes. This command automatically clears and resets horizontal tabs to every eight characters. The smallest possible space between the left and right margins is the

width of one double-wide, 10 cpi character. If a margin control code violates this minimum distance, it is ignored. Settings in proportional mode are treated as 10 CPI.

Set Margin, Right

ASCII Code ESC Q *n*

Hex Code 1B 51 *n*

Dec Code 27 81 *n*

where *n* = number of columns from the left edge of the physical page to the end of the print line;
n = 1 through 232 (hex 00 through hex E8)

Purpose Sets the right margin to *n* columns at the current character width.

Discussion The number of inches of margin does not vary if the font, character width, or horizontal dot density changes. This command automatically clears and resets horizontal tabs to every eight characters. The smallest possible space between the left and right margins is the width of one-double wide, 10 cpi character. If a margin control code violates this minimum distance, it is ignored. Settings in proportional mode are treated as 10 CPI.

Set Relative Horizontal Print Position in 1/120 Inch

ASCII Code ESC \ *n1 n2*

Hex Code 1B 5C *n1 n2*

Dec Code 27 92 *n1 n2*

Purpose Moves the logical print head to a relative horizontal print position, using 1/120 inch increments.

Discussion Adds (*n1* + 256*n2*) / 120 inches to the horizontal position of the logical print head. The number sent is two's complement, with negative numbers moving to the left. The command is ignored if it would move the logical print head beyond the page margins.

Set Vertical Tabs in Channels

ASCII Code ESC b *c n1 n2 n3 ... n16* NUL

Hex Code 1B 62 *c n1 n2 n3 ... n16* 00

Dec Code 27 98 *c n1 n2 n3 ... n16* 0

Purpose Assigns vertical tabs to channels selected by ESC /.

where *c* = 0 through 7
n = 0 through 255 (hex 00 through FF).
n1 through *nk* specify the line number for the vertical tab(s), up to a maximum of 16 tab positions. NUL must end the sequence.

Discussion Channels are selected by ESC /. The distance of each tab stop from TOF is the current line spacing times the number of lines given in *n.*

If paper movement is commanded to a value of *n* greater than the page length, the paper movement command is ignored. The values of *n* must be in ascending order. If they are not, the sequence up to and including the out of sequence number is ignored. The rest of the load is processed. Skip over perforation is ignored.

You can clear any channel by sending ESC b *c* NUL, where *c* is the channel number.

Skip Over Perforation

ASCII Code ESC N *n*

Hex Code 1B 4E *n*

Dec Code 27 78 *n*

Purpose Selects the number of lines (at the current line spacing) for the paper to skip at the bottom of the page.

where *n* = 1 through 127 (hex 01 through 7F)

Discussion *n* is the number of lines skipped between the last line printed on one page and the first line on the next page. The actual distance set is the product of *n* and the current line spacing. If the value of *n* exceeds the current form length, the skip is set to one line smaller than the form length or to 0, whichever is greater.

Skip over perforation set by this command overrides control panel settings. This feature is canceled by ESC O, ESC C, ESC C 0.

Skip Over Perforation, Cancel

ASCII Code ESC O

Hex Code 1B 4F

Dec Code 27 79

Purpose Cancels the skip over perforation set by ESC N and resets the bottom margin to zero.

Discussion O is ASCII uppercase o, not zero (0).

Superscript and Subscript Printing

ASCII Code ESC S *n*

Hex Code 1B 53 *n*

Dec Code 27 83 *n*

Purpose Selects superscript or subscript printing.

where *n* = NUL (hex 00) or 0 (hex 30) to enable superscript printing
n = SOH (hex 01) or 1 (hex 31) to enable subscript printing

†**Discussion** Superscript prints full-sized characters with a baseline higher than the normal characters. Subscript prints full-sized characters with a baseline lower than the normal characters. When the control code is received, all characters are superscript or subscript until reset by ESC T or printer reset. (This differs from the Epson standard, which utilizes half-size characters for superscript and subscript printing.)

You can print both superscript and subscript characters in the same character column by using the Backspace (BS) control code, but these characters will not print when double high printing is in effect.

If Superscript/Subscript is combined with Double High (ESC w) printing, *only* Double High printing will occur.

Example The following sample illustrates superscript and subscript printing.

```
CONTROL CODE ESC S 0 SELECTS SUPERSCRIPT
A^2+B^2=C^2
CONTROL CODE ESC S 1 SELECTS SUBSCRIPT
31 HEX=49 DEC
CONTROL CODE ESC T CANCELS
SUPERSCRIPT/SUBSCRIPT PRINTING
```

Superscript and Subscript Printing, Cancel

ASCII Code ESC T

Hex Code 1B 54

Dec Code 27 84

Purpose Cancels superscript and/or subscript printing as set by ESC S *n.*

Underline

ASCII Code ESC - *n*

Hex Code 1B 2D *n*

Dec Code 27 45 *n*

Purpose Turns automatic underlining on and off.

where *n* = NUL (hex 00) or 0 (hex 30) to turn off underlining
n = SOH (hex 01) or 1 (hex 31) to turn on underlining

Discussion Spaces are underlined, but graphics and grey scale characters are not.

Example The following sample illustrates underlining.

```
Control code ESC -1
enables automatic underlining.
Control code ESC -0
disables automatic underlining.
```

Unidirectional Printing, 1 Line

ASCII Code ESC <

Hex Code 1B 3C

Dec Code 27 60

Purpose Causes printing to occur from left to right for one line only.

Discussion Printing normally occurs in both directions of shuttle movement. This command causes the printer to print from left to right for one line. The command is cancelled by a CR.

Unidirectional Printing, Set/Reset

ASCII Code ESC U *n*

Hex Code 1B 55 *n*

Dec Code 27 85 *n*

Purpose Causes printing to occur in only one direction of shuttle movement (left to right).

where *n* = NUL (hex 00) or 0 (hex 30) to turn off unidirectional printing
n = SOH (hex 01) or 1 (hex 31) to turn on unidirectional printing

Discussion Printing normally occurs in both directions of shuttle movement. Unidirectional printing slows the printer down approximately 50%, but is sometimes used when very accurate dot placement is desired in graphics.

Vertical Tab, Execute

ASCII Code VT

Hex Code 0B

Dec Code 11

Purpose Advances the logical print head to the next vertical tab position selected by ESC /.

Discussion If no vertical channel was selected, channel 0 is used. If no vertical tabs were set, the paper advances one line.

The logical print head moves to the left margin. If a tab position is on the current line, the paper is moved to the next tab position. If there are no tab positions between the current line and the end of the form, the paper is moved to the top of the next form.

This code cancels all one-line-only emphasis and font controls: double-wide from SO and ESC SO, and unidirectional printing from ESC <.

Vertical Tab, Set/Clear

ASCII Code ESC B *n1 n2 n3...nk* NUL

Hex Code 1B 42 *n1 n2 n3...nk* 00

Dec Code 27 66 *n1 n2 n3...nk* 0

Purpose Sets up to 16 vertical tab positions.

where *n* = 1 through 255 (hex 01 through FF).
k = 1 through 16 (hex 01 through 10).
n1 through *nk* specify the line numbers for the vertical tab(s), up to a maximum of 16 tab positions. NUL must end the sequence

To clear the tab settings, send ESC B NUL (1B 42 00).

Discussion The values of *n* range from 1 through 255 (hex 01 through FF) and must be in ascending order. The distance of each tab stop from TOF is the current line spacing times the number of lines given in *n*. If the value of *n* exceeds the form length, commands to move to that tab position are ignored.

If values of *n* are not in ascending order, the sequence up to and including the out-of-sequence number is ignored, and the rest of the load is processed. Skip over perforation is ignored.

This command always sets channel 0. You can clear channel 0 by sending ESC B NUL. (See also the channel selection command, ESC /, and the channel loading command, ESC b.)

6 *Graphics*

Overview

This chapter explains how the printer produces graphic images.

The quickest way to produce graphic images is to use one of the many graphics software applications available. Any graphics program that is compatible with the Epson FX, Proprinter XL, or P-Series emulation should provide excellent results.

You can also use the Intelligent Graphics Processor (IGP) Printronix emulation or the Code V Printronix emulation. Both allow you to create and store forms, generate logos, bar codes, expanded characters, and other graphics.

Printing text and characters is the default mode of operation. However, your printer can print graphics.

- When the emulation is in the Proprinter XL or Epson FX protocol mode, Bit Image graphics is used for graphics printing.
- When the emulation is in the P-Series protocol mode, Odd/Even dot plotting is used for graphics printing.

Each line of graphics data must include a graphics control code to enable the emulation for the desired graphics mode of operation.

Bit Image Graphics

When the printer uses the IBM Proprinter XL or Epson FX emulation, it creates graphics by accepting bit image graphics data.

Note 

Text and graphics can be mixed on the same line when the printer plots bit images in the Epson or Proprinter XL emulation.

Bit image graphics are created by vertically printing the bit pattern of a series of data bytes. For example, the bit pattern of the ASCII character A (hex 41, decimal 65) is shown in Figure 4. If we rotate this data byte 90 degrees clockwise, we have a vertical data byte with the most significant bit (MSB) at the top. If we then print each 1 (true) bit as a dot, the result is a “bit image” plot of the ASCII character A.

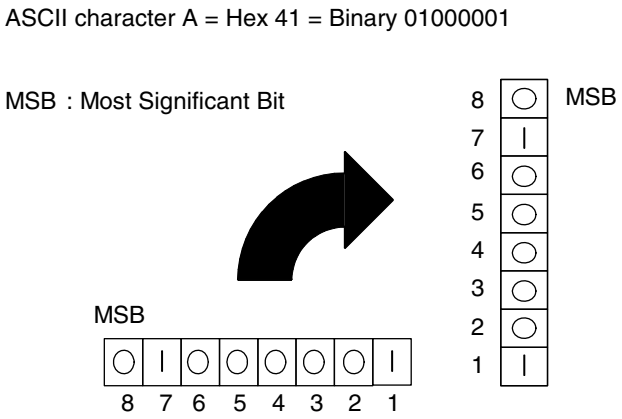


Figure 4. Vertical Data Byte Pattern

The relationship between the ASCII character, its decimal value, and its bit image plot is shown in Figure 5. All 8 bits of the data byte are used in all fonts, but some fonts have taller and shorter characters. (You may have to adjust the line spacing in order to print without horizontal gaps.) Data bytes are identified by their binary, octal, hexadecimal, or decimal equivalents. These numeric equivalents are combined in data streams to form graphic patterns such as the one illustrated in Figure 6.

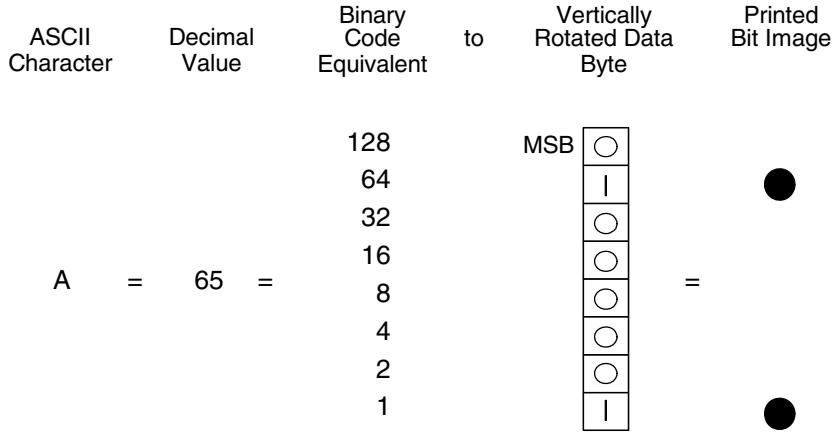


Figure 5. Bit Image Pattern from an ASCII Character

Bit Image plotting is not limited to printable ASCII characters. You can print Bit Image patterns for any 8-bit data byte with decimal values ranging from 0 through 255. (The ASCII character set is charted in Appendix A.)

Designing a Bit Image Pattern

A Bit Image pattern is produced in four steps:

1. On a quadrille pad or graph paper, lay out the graphic pattern you want to print. (See Figure 6.)
2. Determine the decimal equivalent of each vertical data byte in your pattern. (The sum of the decimal equivalent of each true bit in the vertical data byte is the decimal equivalent of the data byte.)
3. Write a program to generate the pattern.
4. Enter and run the program on the host computer.

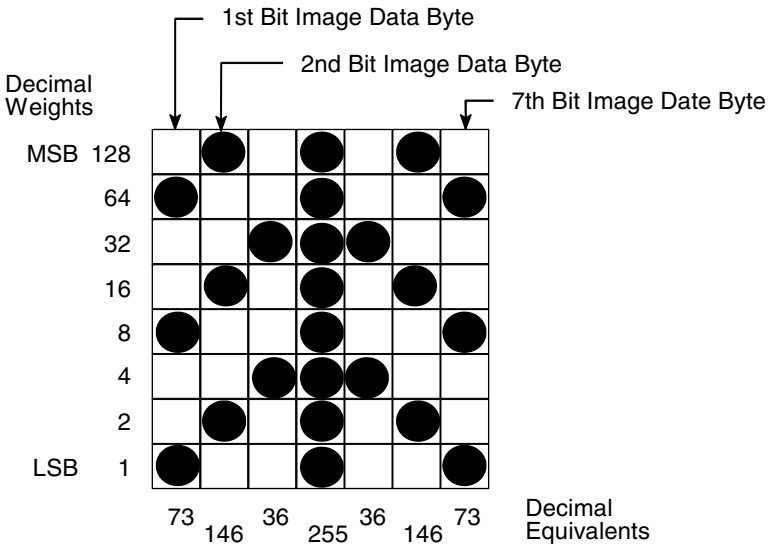


Figure 6. Bit Image Pattern Plan

Bit Image Density

You can print bit image graphics in different dot densities. Select dot densities by sending a control code in the data stream.

Note

Every line of graphics data must include the necessary plot mode command so the printer can perform the chosen graphics functions.

Single Density Mode: ESC K

Single density bit image graphics in a Data Processing (DP) print quality are printed at 60 dots per inch (dpi) horizontally and 72 dpi vertically. For NLQ print quality, the horizontal dot density is 90 dpi and vertical dot density is 96 dpi. For High Speed (HS) draft print quality, horizontal dot density is 60 dpi and vertical dot density is 48 dpi.

Double Density Mode: ESC L

Double density mode prints up to twice the number of dots per inch horizontally in the same space used for single density. The vertical dot density remains the same as in single density mode. Double horizontal density requires twice the number of input data bytes to print the same length line as single density. Printing double density reduces the printing speed by half.

Double Speed - Double Density Mode: ESC Y

When the double density - double speed control code is received, data bytes print at double the current horizontal dot density, but adjacent dots are not printed. Since double density graphics are printed at half speed, double speed - double density graphics are printed at the same speed as single density graphics. This mode is often used to position a simulated print head precisely by sending blank dot columns.

Quadruple Density Mode: ESC Z

When printing quadruple density graphics, the printer combines adjacent quadruple density bit image bytes. The compounded data are then printed in double density mode.

Bit Image Programming Format

The bit image command format is:

ESC *CC n1 n2 DATA*

where:

ESC	the serial matrix SFCC
CC	K, L, Y or Z to select dot density (K = single, L = double, Y = double density - double speed, Z=quadruple density)
n1	(Number of DATA bytes) - 256(*n2*) (remainder of division of number of DATA bytes by 256, sometimes referred to as MOD 256)
n2	(Number of DATA bytes) / 256 (quotient of division)
DATA	the dot pattern bytes

The syntax of the bit image expression must be correct.

The number of data bytes and the *n1, n2* definition must be equal.

Any characters following *n1* and *n2* are interpreted and plotted as data until the *n1, n2* definition is satisfied.

If *n1* = *n2* = 0, then control codes K, L, Y, or Z are ignored.

The maximum number of data bytes that can be included in the DATA portion of the program statement (when using 132 column paper) varies according to the dot density:

At 60 dpi, single density = 792 bytes
double density = 1584 bytes
quadruple density = 3168 bytes

Data that go past the right margin are discarded if automatic line feed is disabled. If automatic line feed is enabled, data that go past the right margin trigger an automatic line feed (LF) and are printed on the next line.

Bit Image Sample Program

The program below, written in BASIC, produces the single density bit image pattern shown in Figure 7. The 7-byte pattern is repeated 40 times. Depending on the host computer system, it may be necessary to add a width statement to the BASIC program.

```
10 WIDTH “LPT1:”, 255
20 LPRINT “Single Density Bit Image Graphics”
30 LPRINT CHR$(27);“K”;CHR$(24);CHR$(1);
40 FOR N=1 TO 40
50 RESTORE
60 FOR I=1 TO 7
70 READ R
80 LPRINT CHR$(R);
90 NEXT I
100 NEXT N
110 DATA 73, 146, 36, 255, 36, 146, 73
120 LPRINT
```

Figure 7. Sample Single-Density Bit Image Graphics

Plot Mode

Plot mode is available for the P-Series protocol only.

This subsection describes the P-Series compatible odd/even dot Plot mode of operation. The P-Series plot has a rigid format wherein each line of data contains a plot command code, the plot data, and an LF code (hex 0A).

The P-Series codes (hex 04 and 05, respectively) can be placed anywhere on the command line.

When P-Series Plot mode is enabled by an EOT (hex 04) or ENQ (hex 05) code, all control codes except LF, CR, and FF, are ignored. Any control sequence parameter prior to a plot code is acted upon immediately.

If any combination of EOT (hex 04) or ENQ (hex 05) code is received in a single line, the priority of action is:

- EOT (hex 04) takes priority over ENQ (hex 05)
- ENQ has the same priority level and is acted upon in the order received

A printable symbol is defined as any character or command that might cause the head of a serial printer to move away from character column one.

Plot Density

Plot density refers to the number of dots per inch (dpi) printed in a single dot row. Two types of plot density are available with P-Series Plot mode graphics: normal density and high density. The densities can be mixed within the printed page on a dot row-by-row basis, but the two densities cannot be mixed on the same dot row.

Normal density plotting is selected with the odd dot plot control code ENQ (hex 05). The odd numbered dot columns are addressed to produce a vertical density that varies based on the font selected: 72 dpi vertical for Letter Gothic (DP), and 144 dpi vertical for Courier (NLQ). Figure 8 illustrates normal density dot plot.

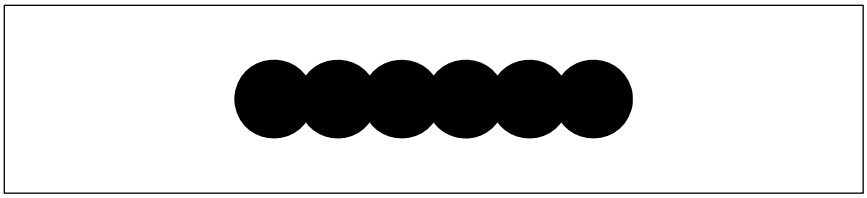


Figure 8. Normal Density Plot

High density plotting is selected with the even dot plot control code EOT (hex 04) in conjunction with the odd dot plot control code ENQ (hex 05). The odd and even numbered dot columns are addressed to double the horizontal density. The vertical density remains the same in normal and high density plotting, though vertical density is based on the current print mode. Figure 9 illustrates high density plotting.

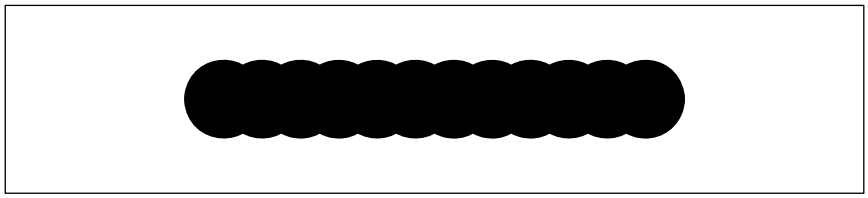


Figure 9. High Density Plot

Plot Data Byte Format

In P-Series Plot Mode, the format is as follows:

1. Each data byte specifies six out of twelve plot dot columns.
2. Using odd dot plot mode, bits 1 to 6 of the data byte address the odd-numbered dot columns; using even dot plot mode, bits 1 to 6 of the data byte address the even-numbered dot columns.
3. Bit 6 and/or bit 7 of the data byte must be a “1” (or true) bit in the Plot mode.
4. Bit 8 of the data byte is not used in the Plot mode and may be 1 or 0.
5. The binary equivalent of the plot data bytes must be known to accurately address specific dot positions.

As shown in Figure 10, a dot is printed at the location addressed by each of bits 1 to 6 in the data byte that is set (1 or true).

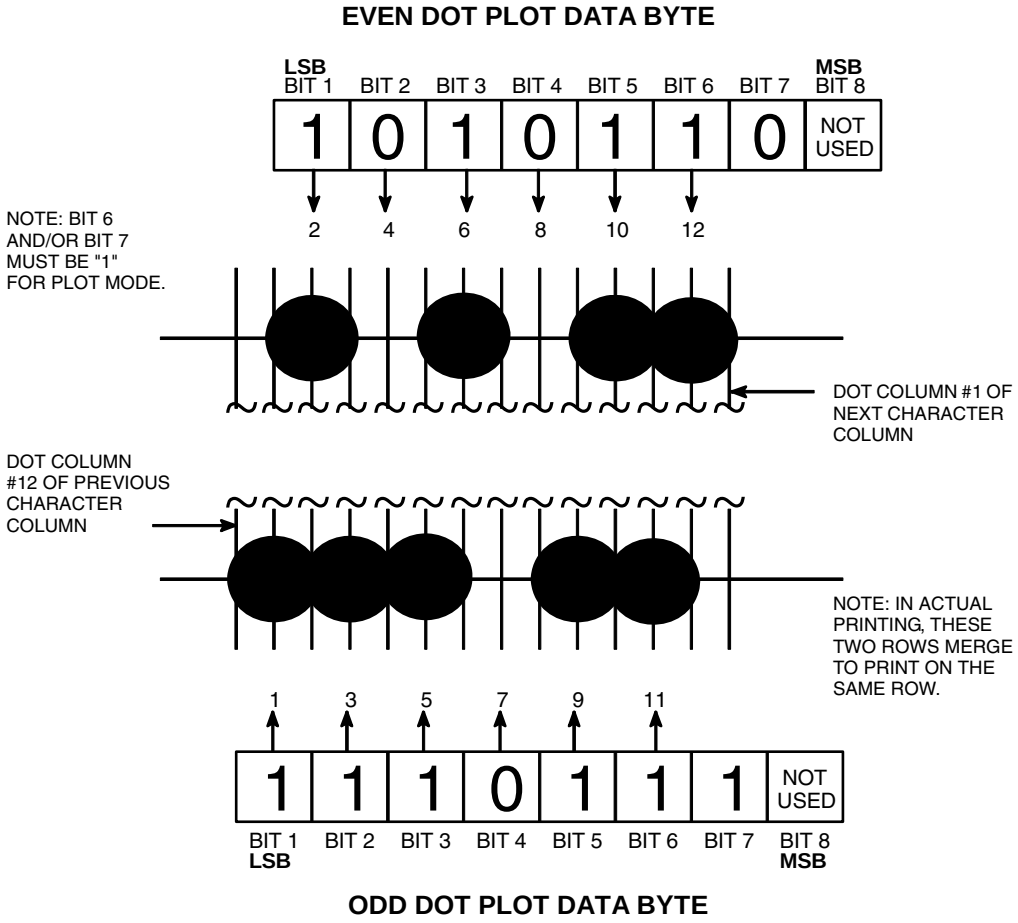


Figure 10. P-Series Plot Data Byte Format

Plot Data Line Format

A plot data line may contain the following plot data bytes: When using 132 column paper, the maximum bytes are 132 for a horizontal dot density of 60 dpi or 198 bytes for a horizontal dot density of 90 dpi. If Auto Line Feed is disabled, any bytes over the maximum are lost. If the maximum is exceeded and Auto Line Feed is enabled, a Line Feed (LF) is forced and the remaining plot data is printed as text on the next line.

The plot mode control code may occur anywhere in the line prior to the line terminator, but plot speed may decrease if it is not at the beginning of the line.

Normal Density Plot

For normal density plot, the plot line contains: Control Code hex 05, plot data bytes, and a Line Terminator (hex 0A or hex 0C). The control sequence for sending the P-Series Normal Density Plot is as follows:

1. Send the plot command code ENQ (hex 05).
2. Send the plot data bytes (refer to page 205).
3. Send a line terminator, either a Line Feed (LF, hex 0A) or a Form Feed (FF, hex 0C). A Carriage Return (CR) may also be used instead of the LF code, provided the Carriage Return has been configured for Carriage Return = Carriage Return + Line Feed (CR = CR + LF).
    a. A line feed (hex 0A) used as the line terminator plots the contents of the buffer and advances the paper position a single dot row, based on the vertical density of the current mode.
    b. A form feed (hex 0C) used as the line terminator plots the contents of the buffer and advances the paper to the next TOF.
4. Regardless of which line terminator code is sent, the emulation will default to the previously selected print mode unless further plot control codes are provided with the data.

Double Density Plot

For double density plot, the plot line contains: Control Code hex 04, plot data bytes, a Line Terminator (hex 0A or hex 0C), Control Code hex 05, plot data bytes, and a Line Terminator. The control sequence for sending P-Series Double Density Plot is as follows:

1. Send the even dot plot control code EOT (hex 04), followed by plot data bytes (refer to page 205).
2. Send a line terminator, which causes the emulation to plot the data bytes; the paper position is not advanced in Double Density Plot; the emulation now waits for the second plot command and plot data bytes.
3. Send the odd dot plot control code ENQ (hex 05) and a second line of data, followed by a line terminator.
    a. A line feed (hex 0A) used as the line terminator plots the contents of the buffer and advances the paper position a single dot row, based on the vertical density of the current mode. A CR (if CR = CR + LF is configured) may also be used with the same result.
    b. A form feed (hex 0C) used as the line terminator plots the data bytes and advances the paper position to the next TOF.
4. Regardless of which line terminator code is sent, the emulation will default to the previously selected print mode unless further plot control codes are provided with the data.

Plotting the Data

P-Series Plot Mode plots the image from the horizontal bit pattern. Figure 11 duplicates the pattern shown in Figure 6 but is modified for Odd Dot Plot. Eight dot rows are required, two characters per row, six columns per character.

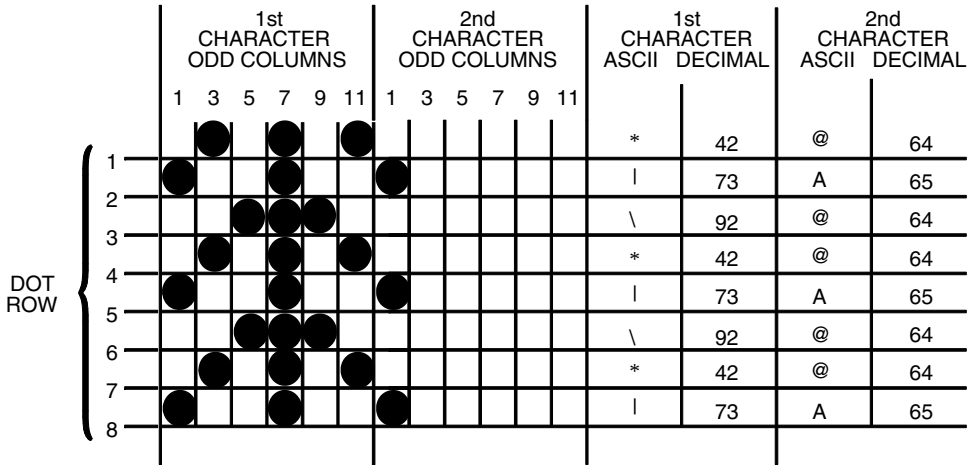


Figure 11. Odd Dot Plot Pattern Plan

The following program uses the Odd Dot Plot control code to produce the image. The image is printed 25 times as shown in Figure 12. An entire dot row is plotted in one printing pass. Consequently, the first row of all 25 images is printed in one pass, followed by the second row, etc., until all rows have been printed.

```
10 LPRINT “Odd Dot Plot”
20 FOR I=1 TO 8
30 READ R1
40 READ R2
50 LPRINT CHR$(5);
60 FOR N=1 TO 25
70 LPRINT CHR$(R1);CHR$(R2);
80 NEXT N
90 LPRINT
100 NEXT I
110 DATA 42, 64, 73, 65, 92, 64, 42, 64, 73, 65, 92, 64, 42, 64, 73, 65
120 LPRINT
```

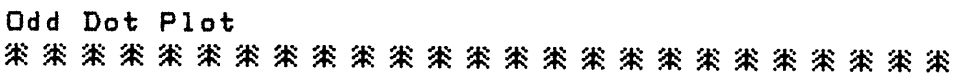


Figure 12. Sample Odd Dot Plot

Exiting from P-Series Plot Mode

When returning to the print mode from the P-Series Plot Mode, an extra line feed should be included in the data stream to maintain proper print line registration relative to the last line of plot graphics. If the extra line feed is not included, the first character line after the graphics data may be truncated, as shown in Figure 13.

A text line follows plot data, preceded by a single line terminator code. (Text characters may extend into the range of the previously printed plot line and appear truncated.)

A text line follows plot data, but is preceded by an additional line terminator or LF code. (Characters are printed at full-height.)

Figure 13. Truncated Character Line

Note Adding the additional line terminator will cause the text lines for the remainder of the document to be shifted down from the text lines above the plot dot rows plotted into the last character row.

Combining Graphics and Text

The LinePrinter Plus Emulation is capable of combining graphics and characters (text) on the same page in two ways:

- Use Bit Image graphics or P-Series Plot mode to produce characters as well as graphics
- A combination of text (not plot) and graphics can be mixed on the same page within all protocols.

Text and graphics can be mixed on the same line, however, only by using the Bit Image graphics in the Epson FX or Proprinter XL protocols.

Any character or symbol can be created in the Plot mode or with Bit Image graphics simply by addressing and plotting the appropriate dot positions.

Either Bit Image or Plot mode graphics can be mixed with text within the page on a line by line basis. Each line of graphics data must include a graphics control code or the emulation will automatically default to the print mode. Using Bit Image graphics, it is possible to use the print mode to produce text on one print pass followed by a print pass to produce graphics on the same line; however, text characters can be affected by the Bit Image data when combined on the same line.

The plot data byte dot patterns shown on page 205 are referenced in the description of P-Series plot mode on page 200.

Plot Data Byte Dot Patterns

BINARY	OCT	DEC	HEX	ASCII	2 4 6 8 10 12 1 3 5 7 9 11	BINARY	OCT	DEC	HEX	ASCII	2 4 6 8 10 12 1 3 5 7 9 11	BINARY	OCT	DEC	HEX	ASCII	2 4 6 8 10 12 1 3 5 7 9 11
0100000	040	32	20	Space	○○○○○●	1000000	100	64	40	@	○○○○○○	1100000	140	96	60	`	○○○○○●
0100001	041	33	21	!	●○○○○●	1000001	101	65	41	A	●○○○○○	1100001	141	97	61	a	●○○○○●
0100010	042	34	22	"	○●○○○●	1000010	102	66	42	B	○●○○○○	1100010	142	98	62	b	○●○○○●
0100011	043	35	23	#	●●○○○●	1000011	103	67	43	C	●●○○○○	1100011	143	99	63	c	●●○○○●
0100100	044	36	24	$	○○●○○●	1000100	104	68	44	D	○○●○○○	1100100	144	100	64	d	○○●○○●
0100101	045	37	25	%	●○●○○●	1000101	105	69	45	E	●○●○○○	1100101	145	101	65	e	●○●○○●
0100110	046	38	26	&	○●●○○●	1000110	106	70	46	F	○●●○○○	1100110	146	102	66	f	○●●○○●
0100111	047	39	27	'	●●●○○●	1000111	107	71	47	G	●●●○○○	1100111	147	103	67	g	●●●○○●
0101000	050	40	28	(	○○○●○●	1001000	110	72	48	H	○○○●○○	1101000	150	104	68	h	○○○●○●
0101001	051	41	29	)	●○○●○●	1001001	111	73	49	I	●○○●○○	1101001	151	105	69	i	●○○●○●
0101010	052	42	2A	*	○●○●○●	1001010	112	74	4A	J	○●○●○○	1101010	152	106	6A	j	○●○●○●
0101011	053	43	2B	+	●●○●○●	1001011	113	75	4B	K	●●○●○○	1101011	153	107	6B	k	●●○●○●
0101100	054	44	2C	,	○○●●○●	1001100	114	76	4C	L	○○●●○○	1101100	154	108	6C	l	○○●●○●
0101101	055	45	2D	-	●○●●○●	1001101	115	77	4D	M	●○●●○○	1101101	155	109	6D	m	●○●●○●
0101110	056	46	2E	.	○●●●○●	1001110	116	78	4E	N	○●●●○○	1101110	156	110	6E	n	○●●●○●
0101111	057	47	2F	/	●●●●○●	1001111	117	79	4F	O	●●●●○○	1101111	157	111	6F	o	●●●●○●
0110000	060	48	30	0	○○○○●●	1010000	120	80	50	P	○○○○●○	1110000	160	112	70	p	○○○○●●
0110001	061	49	31	1	●○○○●●	1010001	121	81	51	Q	●○○○●○	1110001	161	113	71	q	●○○○●●
0110010	062	50	32	2	○●○○●●	1010010	122	82	52	R	○●○○●○	1110010	162	114	72	r	○●○○●●
0110011	063	51	33	3	●●○○●●	1010011	123	83	53	S	●●○○●○	1110011	163	115	73	s	●●○○●●
0110100	064	52	34	4	○○●○●●	1010100	124	84	54	T	○○●○●○	1110100	164	116	74	t	○○●○●●
0110101	065	53	35	5	●○●○●●	1010101	125	85	55	U	●○●○●○	1110101	165	117	75	u	●○●○●●
0110110	066	54	36	6	○●●○●●	1010110	126	86	56	V	○●●○●○	1110110	166	118	76	v	○●●○●●
0110111	067	55	37	7	●●●○●●	1010111	127	87	57	W	●●●○●○	1110111	167	119	77	w	●●●○●●
0111000	070	56	38	8	○○○●●●	1011000	130	88	58	X	○○○●●○	1111000	170	120	78	x	○○○●●●
0111001	071	57	39	9	●○○●●●	1011001	131	89	59	Y	●○○●●○	1111001	171	121	79	y	●○○●●●
0111010	072	58	3A	:	○●○●●●	1011010	132	90	5A	Z	○●○●●○	1111010	172	122	7A	z	○●○●●●
0111011	073	59	3B	;	●●○●●●	1011011	133	91	5B	[	●●○●●○	1111011	173	123	7B	{	●●○●●●
0111100	074	60	3C	<	○○●●●●	1011100	134	92	5C	\	○○●●●○	1111100	174	124	7C	|	○○●●●●
0111101	075	61	3D	=	●○●●●●	1011101	135	93	5D	]	●○●●●○	1111101	175	125	7D	}	●○●●●●
0111110	076	62	3E	>	○●●●●●	1011110	136	94	5E	^	○●●●●○	1111110	176	126	7E	~	○●●●●●
0111111	077	63	3F	?	●●●●●●	1011111	137	95	5F	—	●●●●●○	1111111	177	127	7F	Delete	●●●●●●

7 Vertical Page Formatting

Overview

Rapid vertical paper movement is called slewing. A vertical format unit (VFU) is a program you load into the printer that enables it to slew paper to preset locations on a page.

On your printer, LF commands and other commands that produce blank lines are accumulated and moved in one efficient paper motion. The VFUs are maintained for compatibility with earlier applications.

Following an introductory overview of how to plan a vertical page format, the following two methods of vertical formatting are described in this chapter:

- **Vertical tab table:** The IBM Proprinter XL and the Epson FX emulations each contain a vertical tab table. It is a set of programmed vertical tabs.
- **Electronic Vertical Format Unit (EVFU):** Only the P-Series emulation provides the EVFU capability.

Planning a Vertical Page Format

Vertical page formatting with a VFU consists of four steps:

1. Select the type of vertical format you want to use. This is covered in the next section.
2. Design the form, determining the spacing and channel assignments for every line. Channel assignments are discussed in the VFU sections.
3. Determine the programming sequence. The format of the sequence depends on the type of VFU you select and is discussed in each VFU section of this chapter.
4. Send the programming sequence to the printer in the host data stream. This loads the VFU program.

VFU Characteristics

Keep in mind the following information when programming and using a VFU:

Elongated Characters. You can use elongated (double high) characters in VFU programs. The VFU automatically counts one line of elongated characters as two character lines.

VFU Not Loaded. If the VFU is not loaded, the printer performs a single line feed in response to VFU commands.

Paper Runaway Protection. If the VFU memory is loaded and a channel code is sent that was not previously loaded, the printer moves the paper a single line feed.

Line Spacing. The printer can use either 6 or 8 lines per inch (lpi) spacing. These VFUs calculate the forms length by line density selected. The 6 and 8 lpi spacing may be mixed on the same form, but should be done carefully.

Form Feed. A form feed sent from the control panel or a command from the host moves the paper to the first channel 1, which is the top of form.

Vertical Tab. A VT command moves the paper to the next channel 12. If a channel 12 is not loaded, a line feed will occur.

Proprinter and Epson Vertical Tab Table

The IBM Proprinter XL and the Epson FX emulations each contain a vertical tab table. It is a set of programmed vertical tabs. Various lines of the form are assigned vertical tabs, which are then accessed by control code for rapid paper advancement to the tab position.

Two control codes are used for vertical tabbing: ESC B sets single channel vertical tabs, and VT executes a vertical tab. These codes are described in Chapters 4 and 5, which cover the Proprinter and Epson emulations, respectively. The Epson emulation also has ESC / to select one of eight tab channels and ESC b to set the tabs in a particular channel.

Executing Vertical Tabs

The vertical tab execute code is VT (hex 0B). It prints the contents of the print buffer (if data are in the buffer) and causes paper movement to the next predefined vertical tab position. If a tab position is not defined, the paper is moved to the next line at the current line spacing. If a tab position is at the current line, the paper is moved to the next tab position. If no tab positions are defined between the current line and the end of the form, the paper moves to the next TOF.

Vertical Tab Positions

Vertical tab positions are set by line number. A maximum of 16 vertical tab positions can be set on the form. A sample format is shown in Figure 14.

The first vertical tab is set at line 6 for part number data, a second tab is set at line 8 for part name data, and a third tab is set at line 14 for quantity data. The ESC B code assigns the vertical tabs to the lines of the form. Once the tab positions are set, sending the vertical tab execute code (VT) causes the paper (currently at the top-of-form position) to advance to the first tab position for PART NUMBER data. Sending another VT moves the paper to the second tab position for PART NAME, followed by a third VT to access the third tab position for QUANTITY data.

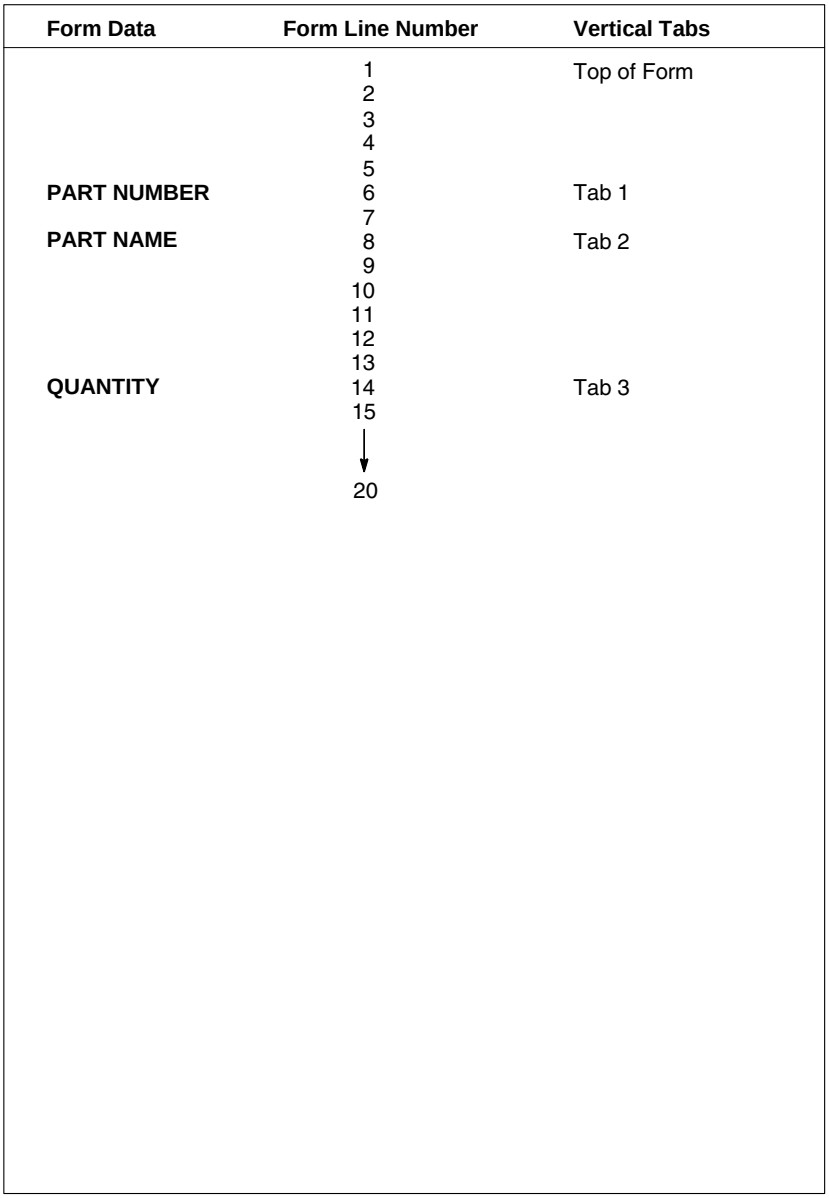


Figure 14. Example of Vertical Tab Positions

P-Series EVFU (Electronic Vertical Format Unit)

The EVFU may be selected in P-Series protocol. The EVFU provides 14 channels to identify up to 192 lines depending on the paper instruction. The programming sequence is 1) start load code; 2) line identification code; and 3) end load code.

Start Load Code - Hex 1E

The start load code clears and initializes the EVFU memory for the memory load program. The start load code is hex 1E.

Channel Assignment

The EVFU memory has the capacity for 192-line forms. The first line identification code (channel code) in the memory load program defines the first line on the form; the second line identification code defines the second line on the form, etc. Each line must have a line identification code. Filler channel codes are used for lines that will not be accessed by the print program. Any channel code can be used as a filler except channel code 1, which is reserved for the top-of-form, and channel code 12, which is reserved as the vertical tab channel. The same filler channel code can be repeated as necessary for any number of lines.

Channel 1. The top-of-form code, reserved as the first line on the form or the first line printed (top-of-form position). The operating program sends the channel 1 code to advance to the top of the next form. After the memory is loaded, a Form Feed code (FF, hex 0C) will move the paper to the next channel 1 (top-of-form).

Channels 2 through 11, 13 and 14. Used as general channel codes (line identification codes) or filler channels. Each line on the form must be identified by a channel code. When the operating program sends the channel code, the paper advances to the line identified by the channel code. Lines not used by the operating program must be identified by filler channels (unused channel codes).

Channel 12. Reserved as the Vertical Tab channel. The Vertical Tab code (VT, hex 0B) prints any data in the print buffer and rapidly slews the paper to the next line identified by the channel 12 code. If channel 12 is not loaded in the EVFU memory, a single line feed will be executed when a VT code is sent.

Channel 15 and 16. The codes for Channels 15 and 16 function as the Start Load and End Load codes.

End Load - Hex 1F

The end load code terminates the memory load program. The end load code is hex 1F. Channel codes in excess of 192 channels received prior to the end load code are discarded.

Using the EVFU

Once the EVFU program has been enabled and loaded, sending the appropriate channel code to the printer will cause any data in the buffer to print and will position the paper to the next line on the form having the specified channel number assigned in EVFU memory.

For a data byte to be recognized as an EVFU instruction, the following criteria must be met:

- Data bit 5 must be 1 (set)
- Data bits 6-8 must be 0 (not set)

Given these conditions, the lower four bits of a byte will specify the EVFU channel number. Table 43 lists the EVFU channels and their equivalent data bytes.

Table 43. P-Series EVFU Codes

ASCII			Data Bits								Channel
Hex	Dec.	Code	8	7	6	5	4	3	2	1	
10	16	DLE	0	0	0	1	0	0	0	0	1 (TOF)
11	17	DC1	0	0	0	1	0	0	0	1	2
12	18	DC2	0	0	0	1	0	0	1	0	3
13	19	DC3	0	0	0	1	0	0	1	1	4
14	20	DC4	0	0	0	1	0	1	0	0	5
15	21	NAK	0	0	0	1	0	1	0	1	6
16	22	SYN	0	0	0	1	0	1	1	0	7
17	23	ETB	0	0	0	1	0	1	1	1	8
18	24	CAN	0	0	0	1	1	0	0	0	9
19	25	EM	0	0	0	1	1	0	0	1	10
1A	26	SUB	0	0	0	1	1	0	1	0	11
1B	27	ESC	0	0	0	1	1	0	1	1	12 (VT)
1C	28	FS	0	0	0	1	1	1	0	0	13
1D	29	GS	0	0	0	1	1	1	0	1	14
1E	30	RS	0	0	0	1	1	1	1	0	Start Load
1F	31	US	0	0	0	1	1	1	1	1	End Load
(X = Undefined, 0, or 1) (1 = High) (0 = Low)											

Note The ESC code cannot be used simultaneously as the EVFU VT code and the Special Function Control Code (SFCC). Refer to the appropriate protocol chapter for more information on the SFCC.

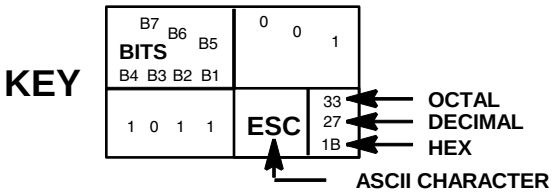
Clearing the EVFU Memory

The following actions will reset (clear) the EVFU memory:

1. Sending only the start load code.
2. Sending a start load code followed immediately by an end load code.
3. A second start load code is received, resulting in reinitialization of the EVFU. (This allows the host data to be restarted.)

When the EVFU memory is cleared, the forms length returns to the previously set value and the current print position becomes the top-of-form (TOF).

A *Standard ASCII Character Set*



BITS B7 B6 B5 / B4 B3 B2 B1	ROW	COLUMN 0 (0 0 0)		1 (0 0 1)		2 (0 1 0)		3 (0 1 1)		4 (1 0 0)		5 (1 0 1)		6 (1 1 0)		7 (1 1 1)	
0 0 0 0	0	NUL	0 0 0	DLE	20 16 10	SP	40 32 20	0	60 48 30	@	100 64 40	P	120 80 50	`	140 96 60	p	160 112 70
0 0 0 1	1	SOH	1 1 1	DC1 (XON)	21 17 11	!	41 33 21	1	61 49 31	A	101 65 41	Q	121 81 51	a	141 97 61	q	161 113 71
0 0 1 0	2	STX	2 2 2	DC2	22 18 12	"	42 34 22	2	62 50 32	B	102 66 42	R	122 82 52	b	142 98 62	r	162 114 72
0 0 1 1	3	ETX	3 3 3	DC3 (XOFF)	23 19 13	#	43 35 23	3	63 51 33	C	103 67 43	S	123 83 53	c	143 99 63	s	163 115 73
0 1 0 0	4	EOT	4 4 4	DC4	24 20 14	$	44 36 24	4	64 52 34	D	104 68 44	T	124 84 54	d	144 100 64	t	164 116 74
0 1 0 1	5	ENQ	5 5 5	NAK	25 21 15	%	45 37 25	5	65 53 35	E	105 69 45	U	125 85 55	e	145 101 65	u	165 117 75
0 1 1 0	6	ACK	6 6 6	SYN	26 22 16	&	46 38 26	6	66 54 36	F	106 70 46	V	126 86 56	f	146 102 66	v	166 118 76
0 1 1 1	7	BEL	7 7 7	ETB	27 23 17	'	47 39 27	7	67 55 37	G	107 71 47	W	127 87 57	g	147 103 67	w	167 119 77
1 0 0 0	8	BS	10 8 8	CAN	30 24 18	(	50 40 28	8	70 56 38	H	110 72 48	X	130 88 58	h	150 104 68	x	170 120 78
1 0 0 1	9	HT	11 9 9	EM	31 25 19	)	51 41 29	9	71 57 39	I	111 73 49	Y	131 89 59	i	151 105 69	y	171 121 79
1 0 1 0	10	LF	12 10 0 A	SUB	32 26 1A	*	52 42 2A	:	72 58 3A	J	112 74 4A	Z	132 90 5A	j	152 106 6A	z	172 122 7A
1 0 1 1	11	VT	13 11 0 B	ESC	33 27 1B	+	53 43 2B	;	73 59 3B	K	113 75 4B	[	133 91 5B	k	153 107 6B	{	173 123 7B
1 1 0 0	12	FF	14 12 0 C	FS	34 28 1C	,	54 44 2C	<	74 60 3C	L	114 76 4C	\	134 92 5C	l	154 108 6C	|	174 124 7C
1 1 0 1	13	CR	15 13 0 D	GS	35 29 1D	-	55 45 2D	=	75 61 3D	M	115 77 4D	]	135 93 5D	m	155 109 6D	}	175 125 7D
1 1 1 0	14	SO	16 14 0 E	RS	36 30 1E	.	56 46 2E	>	76 62 3E	N	116 78 4E	^	136 94 5E	n	156 110 6E	~	176 126 7E
1 1 1 1	15	SI	17 15 0 F	US	37 31 1F	/	57 47 2F	?	77 63 3F	O	117 79 4F	_	137 95 5F	o	157 111 6F	DEL	177 127 7F

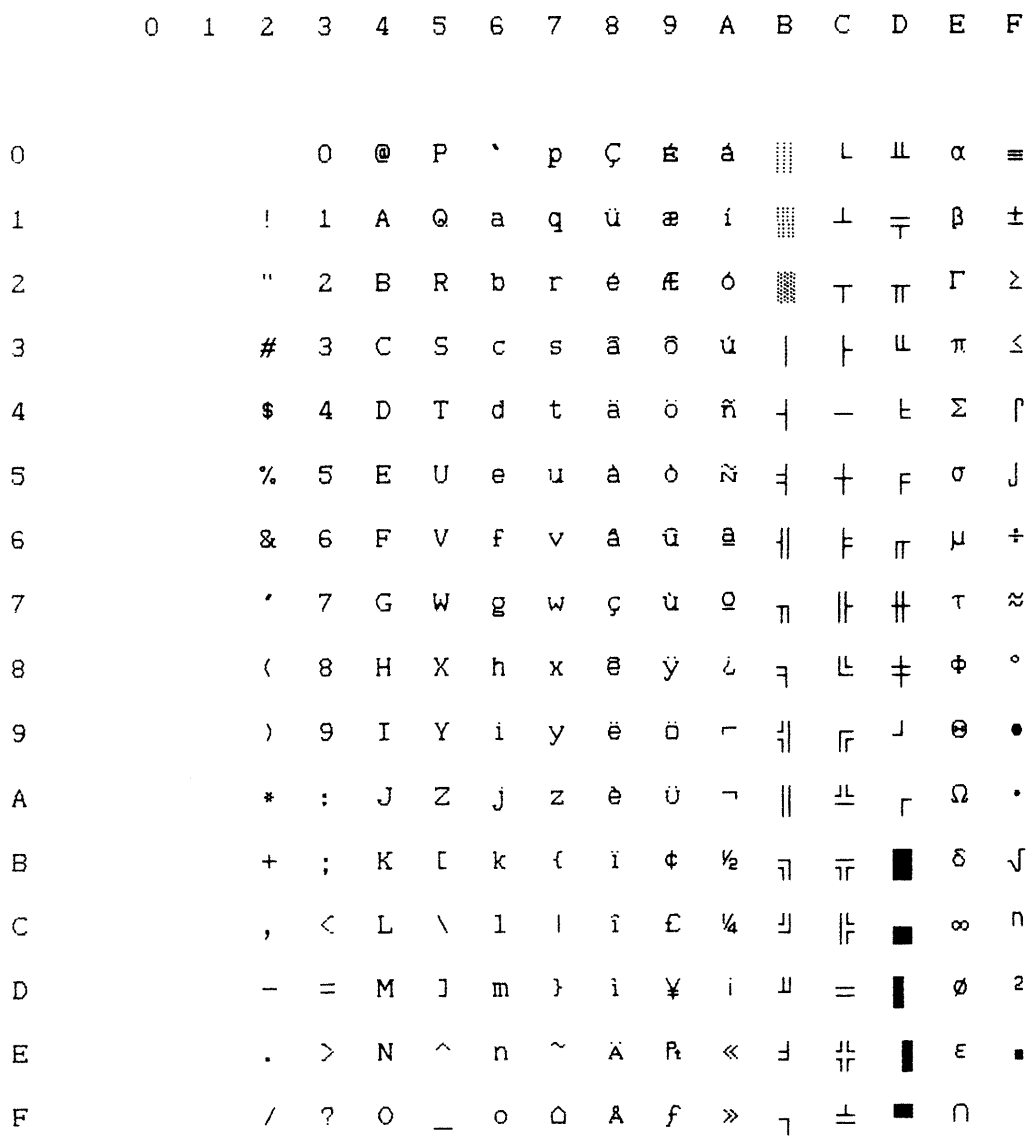
B *P-Series Emulation Character Sets*

Introduction

This appendix shows the character set charts (also referred to as code pages) for the P-Series emulation. The character sets are shown in Near Letter Quality (NLQ). They may be selected using the configuration menus, described in detail in your *User's Manual*. There are also several control codes that allow you to select different character sets, described in Chapter 3 of this book. These include "SFCC l", "SFCC OSET", "SFCC R" and "SFCC PSET".

The maximum set of printable symbols is shown for columns hex 80-9F (selected via the ESC 6 control code).

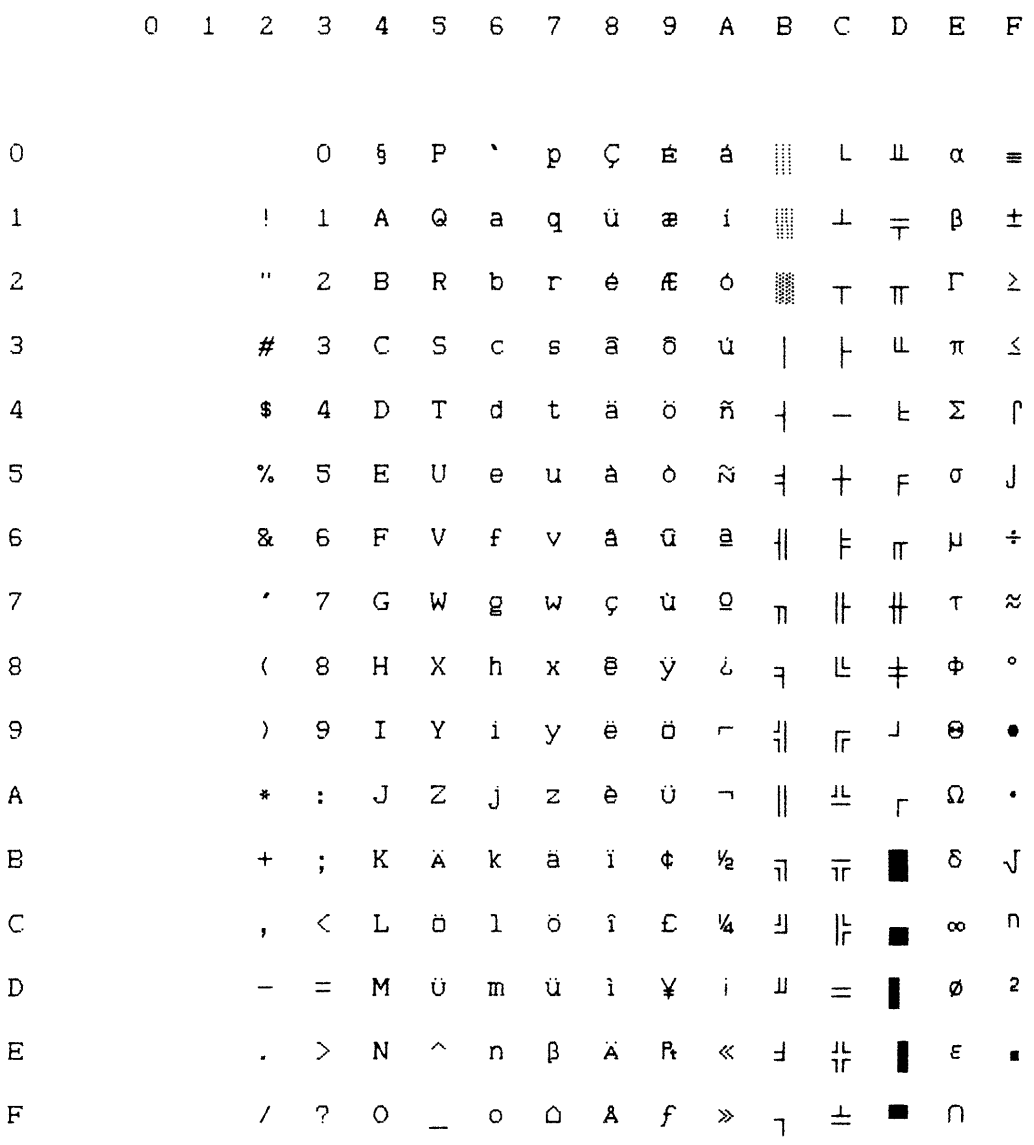
IBM PC, Primary Subset: ASCII (USA)



IBM PC, Primary Subset: French

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0				0	à	P	`	p	Ç	É	á	▒	└	╨	α	≡
1			!	1	A	Q	a	q	ü	æ	í	▒	┴	╤	ß	±
2			"	2	B	R	b	r	é	Æ	ó	▓	┬	╥	Γ	≥
3			#	3	C	S	c	s	â	ô	ú	│	├	╙	π	≤
4			$	4	D	T	d	t	ä	ö	ñ	┤	─	╘	Σ	⌠
5			%	5	E	U	e	u	à	ò	Ñ	╡	┼	╒	σ	⌡
6			&	6	F	V	f	v	å	û	ª	╢	╞	╓	µ	÷
7			'	7	G	W	g	w	ç	ù	º	╖	╟	╫	τ	≈
8			(	8	H	X	h	x	ê	ÿ	¿	╕	╚	╪	Φ	°
9			)	9	I	Y	i	y	ë	Ö	⌐	╣	╔	┘	Θ	∙
A			*	:	J	Z	j	z	è	Ü	¬	║	╩	┌	Ω	·
B			+	;	K	[	k	{	ï	¢	½	╗	╦	█	δ	√
C			,	<	L	\	l	|	î	£	¼	╝	╠	▄	∞	n
D			-	=	M	]	m	}	ì	¥	¡	╜	═	▌	ø	²
E			.	>	N	^	n	~	Ä	₧	«	╛	╬	▐	ε	■
F			/	?	O	_	o	⌂	Å	ƒ	»	┐	╧	▀	∩	

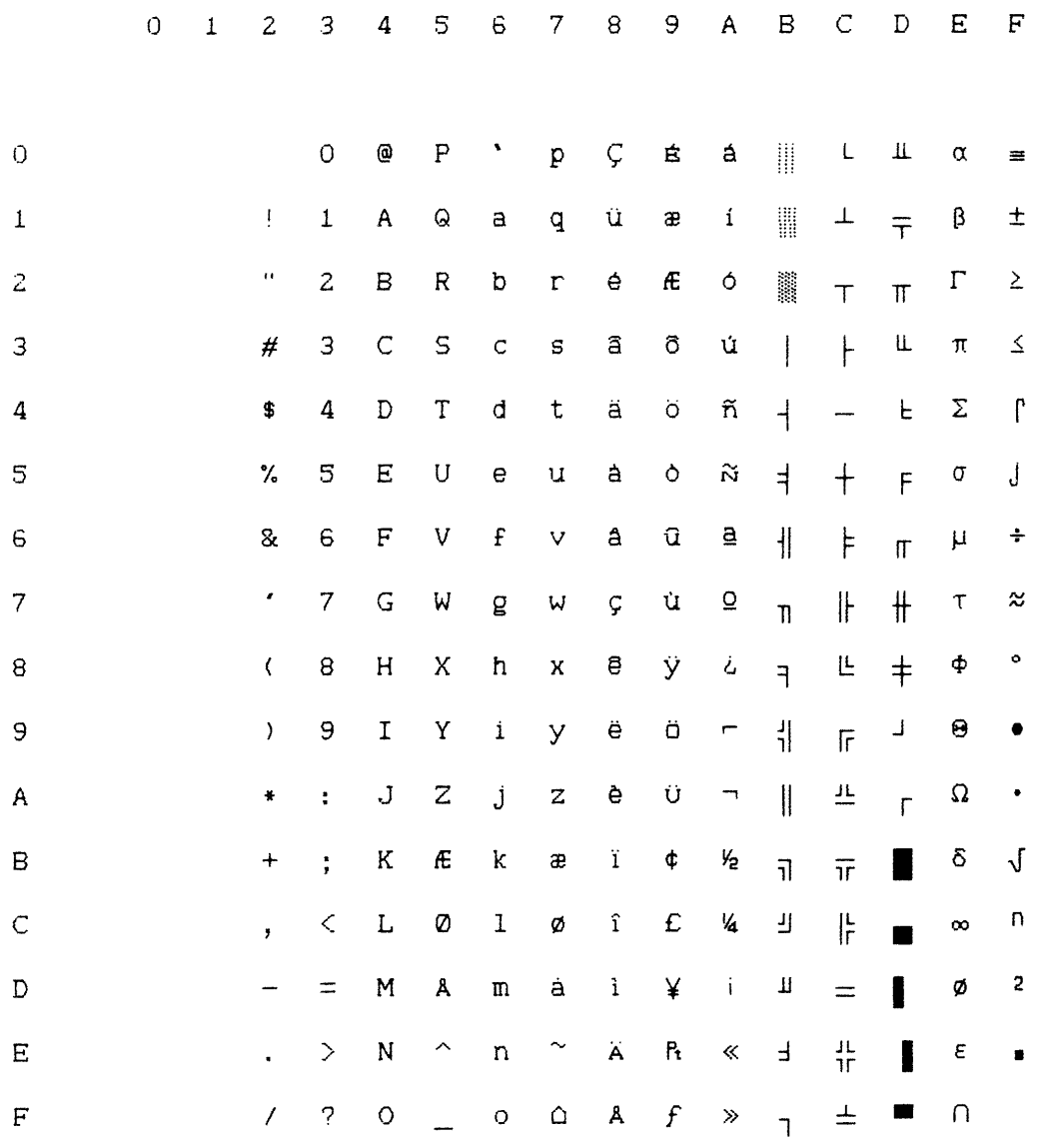
IBM PC, Primary Subset: German



IBM PC, Primary Subset: English (UK)

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0				0	@	P	`	p	Ç	É	á	▒	└	╙	α	≡
1			!	1	A	Q	a	q	ü	æ	í	▒	┴	╤	β	±
2			"	2	B	R	b	r	é	Æ	ó	▓	┬	╥	Γ	≥
3			£	3	C	S	c	s	ã	õ	ú	│	├	╙	π	≤
4			$	4	D	T	d	t	ä	ö	ñ	┤	─	╘	Σ	⌠
5			%	5	E	U	e	u	à	ò	Ñ	╡	┼	╒	σ	⌡
6			&	6	F	V	f	v	ª	û	ª	╢	╞	╓	µ	÷
7			'	7	G	W	g	w	ç	ù	º	╖	╟	╫	τ	≈
8			(	8	H	X	h	x	ê	ÿ	¿	╕	╚	╪	Φ	°
9			)	9	I	Y	i	y	ë	Ö	⌐	╣	╔	┘	Θ	∙
A			*	:	J	Z	j	z	è	Ü	¬	║	╩	┌	Ω	·
B			+	;	K	[	k	{	ï	¢	½	╗	╦	▉	δ	√
C			,	<	L	\	l	|	î	£	¼	╝	╠	▄	∞	n
D			-	=	M	]	m	}	ì	¥	¡	╜	═	▌	ø	²
E			.	>	N	^	n	~	Ä	₧	«	╛	╬	▐	ε	■
F			/	?	O	_	o	⌂	Å	ƒ	»	┐	╧	▄	∩	

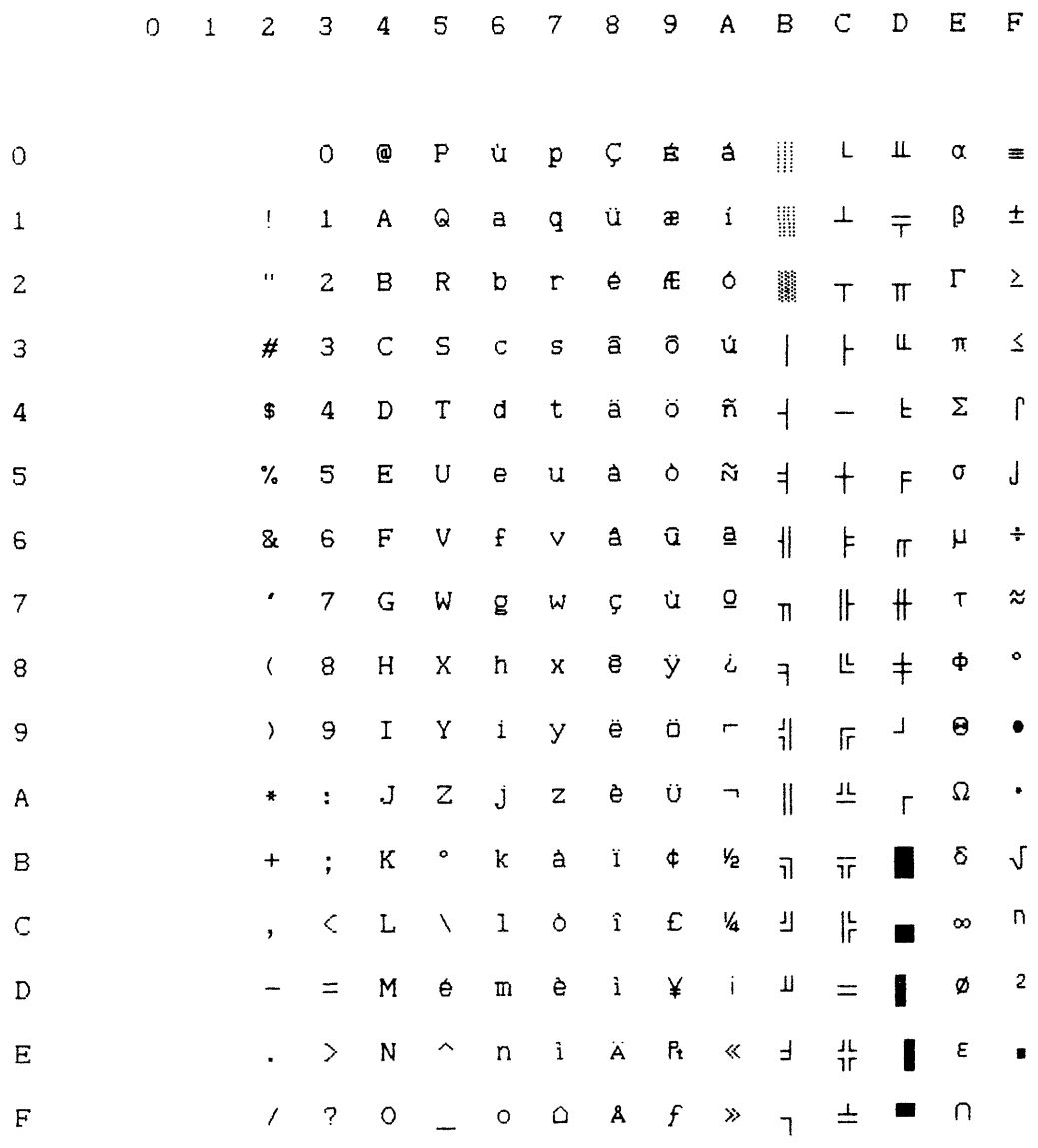
IBM PC, Primary Subset: Danish



IBM PC, Primary Subset: Swedish

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0				0	@	P	`	p	Ç	É	á	▒	└	╨	α	≡
1			!	1	A	Q	a	q	ü	æ	í	▒	┴	╤	β	±
2			"	2	B	R	b	r	é	Æ	ó	▓	┬	╥	Γ	≥
3			#	3	C	S	c	s	â	ô	ú	│	├	╙	π	≤
4			¤	4	D	T	d	t	ä	ö	ñ	┤	─	╘	Σ	⌠
5			%	5	E	U	e	u	à	ò	Ñ	╡	┼	╒	σ	⌡
6			&	6	F	V	f	v	å	û	ª	╢	╞	╓	µ	÷
7			'	7	G	W	g	w	ç	ù	º	╖	╟	╫	τ	≈
8			(	8	H	X	h	x	ê	ÿ	¿	╕	╚	╪	Φ	°
9			)	9	I	Y	i	y	ë	Ö	⌐	╣	╔	┘	Θ	∙
A			*	:	J	Z	j	z	è	Ü	¬	║	╩	┌	Ω	·
B			+	;	K	Ä	k	ä	ï	¢	½	╗	╦	█	δ	√
C			,	<	L	ö	l	ö	î	£	¼	╝	╠	▄	∞	n
D			-	=	M	Å	m	å	ì	¥	¡	╜	═	▌	ø	²
E			.	>	N	Ü	n	ü	Ä	₧	«	╛	╬	▐	ε	■
F			/	?	O	_	o	Ô	Å	ƒ	»	┐	╧	▀	∩	

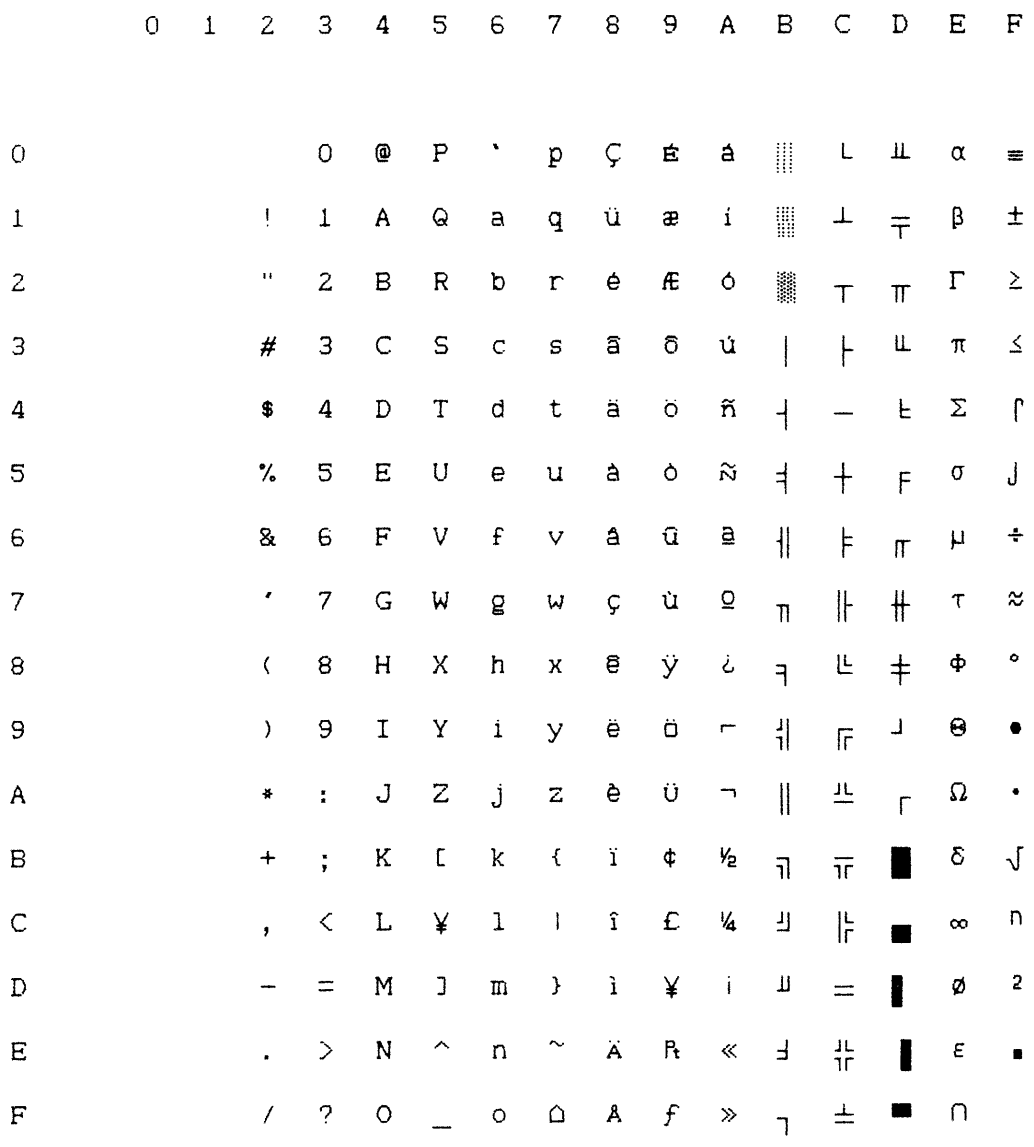
IBM PC, Primary Subset: Italian



IBM PC, Primary Subset: Spanish

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0				0	@	P	`	p	Ç	É	á	▒	└	╨	α	≡
1			!	1	A	Q	a	q	ü	æ	í	▒	┴	╤	β	±
2			"	2	B	R	b	r	é	Æ	ó	▓	┬	╥	Γ	≥
3			₧	3	C	S	c	s	â	ô	ú	│	├	╙	π	≤
4			$	4	D	T	d	t	ä	ö	ñ	┤	─	╘	Σ	⌠
5			%	5	E	U	e	u	à	ò	Ñ	╡	┼	╒	σ	⌡
6			&	6	F	V	f	v	å	û	ª	╢	╞	╓	µ	÷
7			'	7	G	W	g	w	ç	ù	º	╖	╟	╫	τ	≈
8			(	8	H	X	h	x	ê	ÿ	¿	╕	╚	╪	Φ	°
9			)	9	I	Y	i	y	ë	Ö	⌐	╣	╔	┘	Θ	•
A			*	:	J	Z	j	z	è	Ü	¬	║	╩	┌	Ω	·
B			+	;	K	[	k	{	ï	¢	½	╗	╦	█	δ	√
C			,	<	L	Ñ	l	ñ	î	£	¼	╝	╠	▄	∞	n
D			-	=	M	]	m	}	ì	¥	¡	╜	═	▌	ø	²
E			.	>	N	^	n	~	Ä	₨	«	╛	╬	▐	ε	■
F			/	?	O	_	o	⌂	Å	ƒ	»	┐	╧	▀	∩	

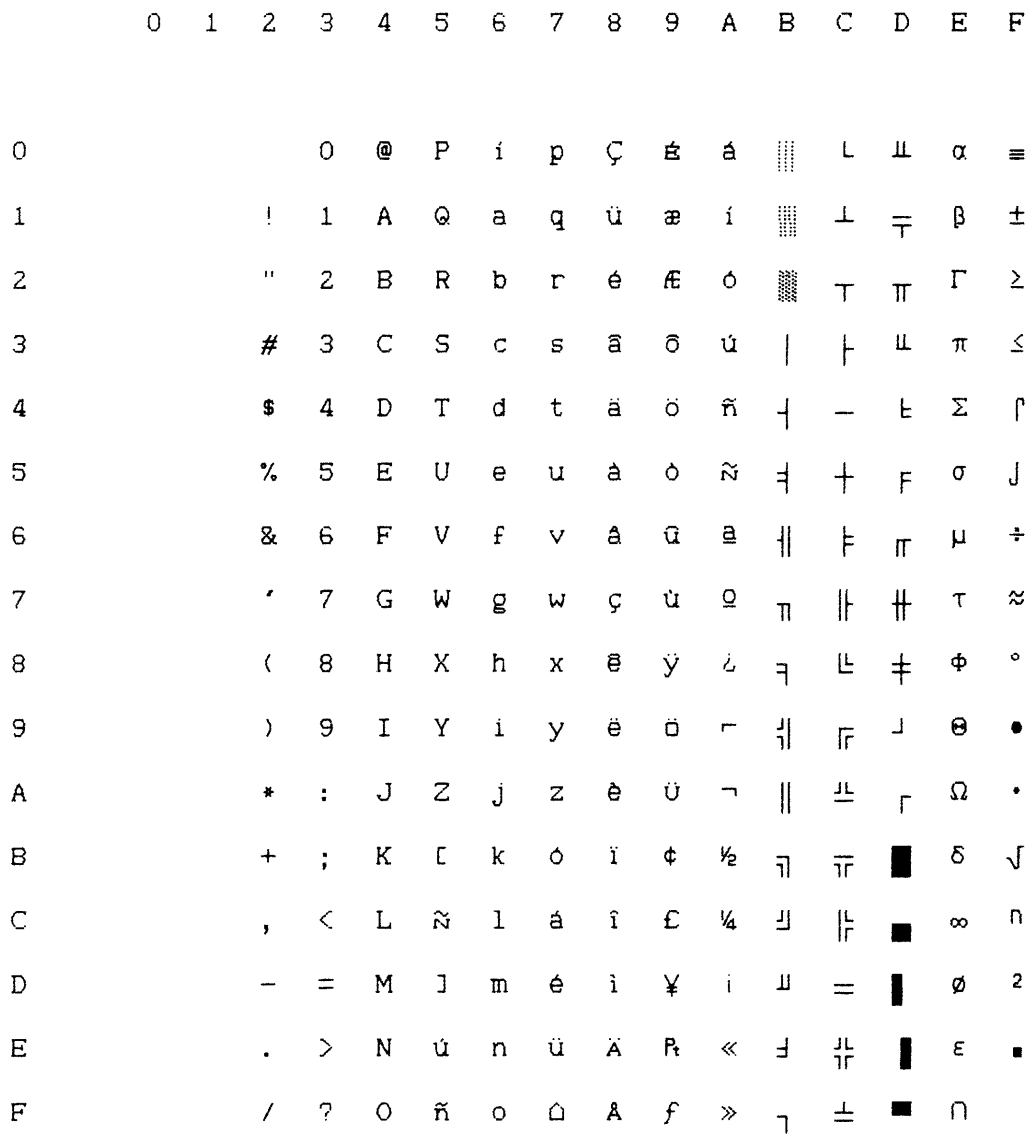
IBM PC, Primary Subset: Japanese



IBM PC, Primary Subset: French Canadian

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0				0	à	P	ô	p	Ç	É	á	▒	└	╨	α	≡
1			!	1	A	Q	a	q	ü	æ	í	▒	┴	╤	β	±
2			"	2	B	R	b	r	é	Æ	ó	▓	┬	╥	Γ	≥
3			#	3	C	S	c	s	â	ô	ú	│	├	╙	π	≤
4			$	4	D	T	d	t	ä	ö	ñ	┤	─	╘	Σ	⌠
5			%	5	E	U	e	u	à	ò	Ñ	╡	┼	╒	σ	⌡
6			&	6	F	V	f	v	å	û	ª	╢	╞	╓	µ	÷
7			'	7	G	W	g	w	ç	ù	º	╖	╟	╫	τ	≈
8			(	8	H	X	h	x	ê	ÿ	¿	╕	╚	╪	Φ	°
9			)	9	I	Y	i	y	ë	Ö	⌐	╣	╔	┘	Θ	•
A			*	:	J	Z	j	z	è	Ü	¬	║	╩	┌	Ω	·
B			+	;	K	ä	k	é	ï	¢	½	╗	╦	█	δ	√
C			,	<	L	ç	l	ù	î	£	¼	╝	╠	▄	∞	n
D			-	=	M	ë	m	è	ì	¥	¡	╜	═	▌	ø	²
E			.	>	N	î	n	û	Ä	₧	«	╛	╬	▐	ε	■
F			/	?	O	_	o	∩	Å	ƒ	»	┐	╧	▀	∩	

IBM PC, Primary Subset: Latin American



IBM PC, Primary Subset: Danish II

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0				0	@	P	`	p	Ç	É	á	▒	└	╨	α	≡
1			!	1	A	Q	a	q	ü	æ	í	▒	┴	╤	β	±
2			"	2	B	R	b	r	é	Æ	ó	▒	┬	╥	Γ	≥
3			#	3	C	S	c	s	â	ô	ú	│	├	╙	π	≤
4			$	4	D	T	d	t	ä	ö	ñ	┤	─	╘	Σ	⌠
5			%	5	E	U	e	u	à	ò	Ñ	╡	┼	╒	σ	⌡
6			&	6	F	V	f	v	å	û	ª	╢	╞	╓	µ	÷
7			'	7	G	W	g	w	ç	ù	º	╖	╟	╫	τ	≈
8			(	8	H	X	h	x	ê	ÿ	¿	╕	╚	╪	Φ	°
9			)	9	I	Y	i	y	ë	Ö	⌐	╣	╔	┘	Θ	∙
A			*	:	J	Z	j	z	è	Ü	¬	║	╩	┌	Ω	·
B			+	;	K	Æ	k	æ	ï	¢	½	╗	╦	▉	δ	√
C			,	<	L	Ø	l	ø	î	£	¼	╝	╠	▄	∞	n
D			-	=	M	Å	m	å	ì	¥	¡	╜	═	▌	ø	²
E			.	>	N	Ü	n	ü	Ä	₧	«	╛	╬	▐	ε	■
F			/	?	O	_	o	⌂	Å	ƒ	»	┐	╧	▀	∩	

IBM PC, Primary Subset: Spanish II

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0				0	à	P	`	p	Ç	É	á	▒	└	╨	α	≡
1			!	1	A	Q	a	q	ü	æ	í	▒	┴	╤	β	±
2			"	2	B	R	b	r	é	Æ	ó	▓	┬	╥	Γ	≥
3			#	3	C	S	c	s	â	ô	ú	│	├	╙	π	≤
4			$	4	D	T	d	t	ä	ö	ñ	┤	─	╘	Σ	⌠
5			%	5	E	U	e	u	à	ò	Ñ	╡	┼	╒	σ	⌡
6			&	6	F	V	f	v	â	û	ª	╢	╞	╓	µ	÷
7			'	7	G	W	g	w	ç	ù	º	╖	╟	╫	τ	≈
8			(	8	H	X	h	x	ê	ÿ	¿	╕	╚	╪	Φ	°
9			)	9	I	Y	i	y	ë	Ö	⌐	╣	╔	┘	Θ	•
A			*	:	J	Z	j	z	è	Ü	¬	║	╩	┌	Ω	·
B			+	;	K	[	k	{	ï	¢	½	╗	╦	█	δ	√
C			,	<	L	Ñ	l	ñ	î	£	¼	╝	╠	▄	∞	n
D			-	=	M	]	m	}	ì	¥	¡	╜	═	▌	ø	²
E			.	>	N	é	n	ú	Ä	₧	«	╛	╬	▐	ε	■
F			/	?	O	_	o	⌂	Å	ƒ	»	┐	╧	▀	∩	

IBM PC, Primary Subset: Latin American II

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0				0	à	P	ü	p	Ç	¢	á	⣿	└	╨	α	≡
1			!	1	A	Q	a	q	ü	æ	í	⣿	┴	╤	β	±
2			"	2	B	R	b	r	é	Æ	ó	▒	┬	╥	Γ	≥
3			#	3	C	S	c	s	â	ô	ú	│	├	╙	π	≤
4			$	4	D	T	d	t	ä	ö	ñ	┤	─	╘	Σ	⌠
5			%	5	E	U	e	u	à	ò	Ñ	╡	┼	╒	σ	⌡
6			&	6	F	V	f	v	â	û	ª	╢	╞	╓	µ	÷
7			'	7	G	W	g	w	ç	ù	º	╖	╟	╫	τ	≈
8			(	8	H	X	h	x	ê	ÿ	¿	╕	╚	╪	Φ	°
9			)	9	I	Y	i	y	ë	Ö	⌐	╣	╔	┘	Θ	•
A			*	:	J	Z	j	z	è	Ü	¬	║	╩	┌	Ω	·
B			+	;	K	[	k	{	ï	¢	½	╗	╦	█	δ	√
C			,	<	L	ñ	l	ñ	î	£	¼	╝	╠	▄	∞	n
D			-	=	M	¿	m	ó	ì	¥	¡	╜	═	▌	ø	²
E			.	>	N	é	n	ú	Ä	₧	«	╛	╬	▐	ε	■
F			/	?	O	_	o	⌂	Å	ƒ	»	┐	╧	▀	∩	

IBM PC, Extended Subset: 0437 PC Character Set

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0				0	@	P	`	p	Ç	É	á	▒	└	╨	α	≡
1			!	1	A	Q	a	q	ü	æ	í	▒	┴	╤	β	±
2			"	2	B	R	b	r	é	Æ	ó	▓	┬	╥	Γ	≥
3			#	3	C	S	c	s	â	ô	ú	│	├	╙	π	≤
4			$	4	D	T	d	t	ä	ö	ñ	┤	─	╘	Σ	⌠
5			%	5	E	U	e	u	à	ò	Ñ	╡	┼	╒	σ	⌡
6			&	6	F	V	f	v	å	û	ª	╢	╞	╓	µ	÷
7			'	7	G	W	g	w	ç	ù	º	╖	╟	╫	τ	≈
8			(	8	H	X	h	x	ê	ÿ	¿	╕	╚	╪	Φ	°
9			)	9	I	Y	i	y	ë	Ö	⌐	╣	╔	┘	Θ	∙
A			*	:	J	Z	j	z	è	Ü	¬	║	╩	┌	Ω	·
B			+	;	K	[	k	{	ï	¢	½	╗	╦	▉	δ	√
C			,	<	L	\	l	|	î	£	¼	╝	╠	■	∞	n
D			-	=	M	]	m	}	ì	¥	¡	╜	═	▊	ø	²
E			.	>	N	^	n	~	Ä	₧	«	╛	╬	▋	ε	■
F			/	?	O	_	o	⌂	Å	ƒ	»	┐	╧	▀	∩	

IBM PC, Extended Subset: 0850 PC Multilingual

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0				0	@	P	`	p	Ç	É	á	▒	└	ð	ó	-
1			!	1	A	Q	a	q	ü	æ	í	▒	┴	Ð	ß	±
2			"	2	B	R	b	r	é	Æ	ó	▒	┬	Ê	ô	‗
3			#	3	C	S	c	s	â	ô	ú	│	├	Ë	ò	¾
4			$	4	D	T	d	t	ä	ö	ñ	┤	─	È	õ	¶
5			%	5	E	U	e	u	à	ò	Ñ	Á	┼	ı	Õ	§
6			&	6	F	V	f	v	å	û	ª	Â	ã	Í	µ	÷
7			'	7	G	W	g	w	ç	ù	º	À	Ã	Î	Þ	¸
8			(	8	H	X	h	x	ê	ÿ	¿	©	╚	Ï	þ	°
9			)	9	I	Y	i	y	ë	Ö	®	╣	╔	┘	Ú	¨
A			*	:	J	Z	j	z	è	Ü	¬	║	╩	┌	Û	•
B			+	;	K	[	k	{	ï	ø	½	╗	╦	█	Ù	¹
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Multinational, ASCII (USA)

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1			!	1	A	Q	a	q	ij	▪	¡	±	Á	Ñ	á	ñ
2			"	2	B	R	b	r	Ŗ		¢	²	Â	Ò	ã	ò
3			#	3	C	S	c	s	ŀ		£	³	Ã	Ó	ã	ó
4			$	4	D	T	d	t	Ŧ		¤	´	Ä	Ô	ä	õ
5			%	5	E	U	e	u	ı		¥	µ	Å	Õ	à	õ
6			&	6	F	V	f	v	ĸ		¦	¶	Æ	Ö	æ	ö
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8			(	8	H	X	h	x	Ş		¨	¸	È	Ø	è	ø
9			)	9	I	Y	i	y	ş		ƒ	¹	É	Ù	é	ù
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Multinational, EBCDIC

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3			#	3	C	S	c	s	ł		£	³	Ã	Ó	ã	ó
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ECMA Latin 1, Primary Subset: ASCII (USA)

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9			)	9	I	Y	i	y	ş		©	¹	É	Ù	é	ù
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ECMA Latin 1, Primary Subset: German

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3			#	3	C	S	c	s	ł		£	³	Ã	Ó	ã	ó
4			$	4	D	T	d	t	Ł		¤	´	Ä	Ô	ä	õ
5			%	5	E	U	e	u	ı		¥	µ	Å	Õ	å	õ
6			&	6	F	V	f	v	ǧ		¦	¶	Æ	Ö	æ	ö
7			'	7	G	W	g	w	ğ		§	·	Ç	×	ç	÷
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9			)	9	I	Y	i	y	ş		©	¹	É	Ù	é	ù
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D			-	=	M	Ü	m	ü	ƒ		ÿ	½	Í	Ý	í	ý
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ECMA Latin 1, Primary Subset: Swedish

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5			%	5	E	U	e	u	ı		¥	µ	Å	Õ	à	õ
6			&	6	F	V	f	v	ǧ		¦	¶	Æ	Ö	æ	ö
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8			(	8	H	X	h	x	Ş		¨	¸	È	Ø	è	ø
9			)	9	I	Y	i	y	ş		©	¹	É	Ù	é	ù
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ECMA Latin 1, Primary Subset: Danish

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ECMA Latin 1, Primary Subset: Norwegian

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3			#	3	C	S	c	s	ǀ		£	³	Ã	Ó	ã	ó
4			¤	4	D	T	d	t	ℸ		¤	´	Ä	Ô	ä	Õ
5			%	5	E	U	e	u	ı		¥	µ	Å	Õ	à	õ
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8			(	8	H	X	h	x	Ş		¨	¸	È	Ø	è	ø
9			)	9	I	Y	i	y	ş		©	¹	É	Ù	é	ù
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ECMA Latin 1, Primary Subset: Finnish

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3			#	3	C	S	c	s	∣		£	³	Ã	Ó	ã	ó
4			¤	4	D	T	d	t	ℼ		¤	´	Ä	Ô	ä	ô
5			%	5	E	U	e	u	ı		¥	µ	Å	Õ	å	õ
6			&	6	F	V	f	v	ȷ		¦	¶	Æ	Ö	æ	ö
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ECMA Latin 1, Primary Subset: English (UK)

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2			"	2	B	R	b	r	₧		¢	²	Â	Ò	â	ò
3			£	3	C	S	c	s	ǀ		£	³	Ã	Ó	ã	ó
4			$	4	D	T	d	t	₸		¤	´	Ä	Ô	ä	õ
5			%	5	E	U	e	u	ı		¥	µ	Å	Õ	à	õ
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ECMA Latin 1, Primary Subset: Dutch

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ECMA Latin 1, Primary Subset: French

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ECMA Latin 1, Primary Subset: Spanish

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ECMA Latin 1, Primary Subset: Italian

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ECMA Latin 1, Primary Subset: Turkish

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7			'	7	G	W	g	w	ğ		§	·	Ç	×	ç	÷
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9			)	9	I	Y	i	y	ş		©	¹	É	Ù	é	ù
A			*	:	J	Z	j	z	ı		ª	º	Ê	Ú	ê	ú
B			+	;	K	ǵ	k	ş	¨		«	»	Ë	Û	ë	ū
C			,	<	L	ö	l	ö	ˇ		¬	¼	Ì	Ü	ì	ü
D			-	=	M	Ü	m	ü	f		ÿ	½	Í	Ý	í	ý
E			.	>	N	ğ	n	ı	‗		®	¾	Î	Þ	î	þ
F			/	?	O	_	o		¯		¯	¿	Ï	β	ï	

ECMA Latin 1, Primary Subset: Japanese

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
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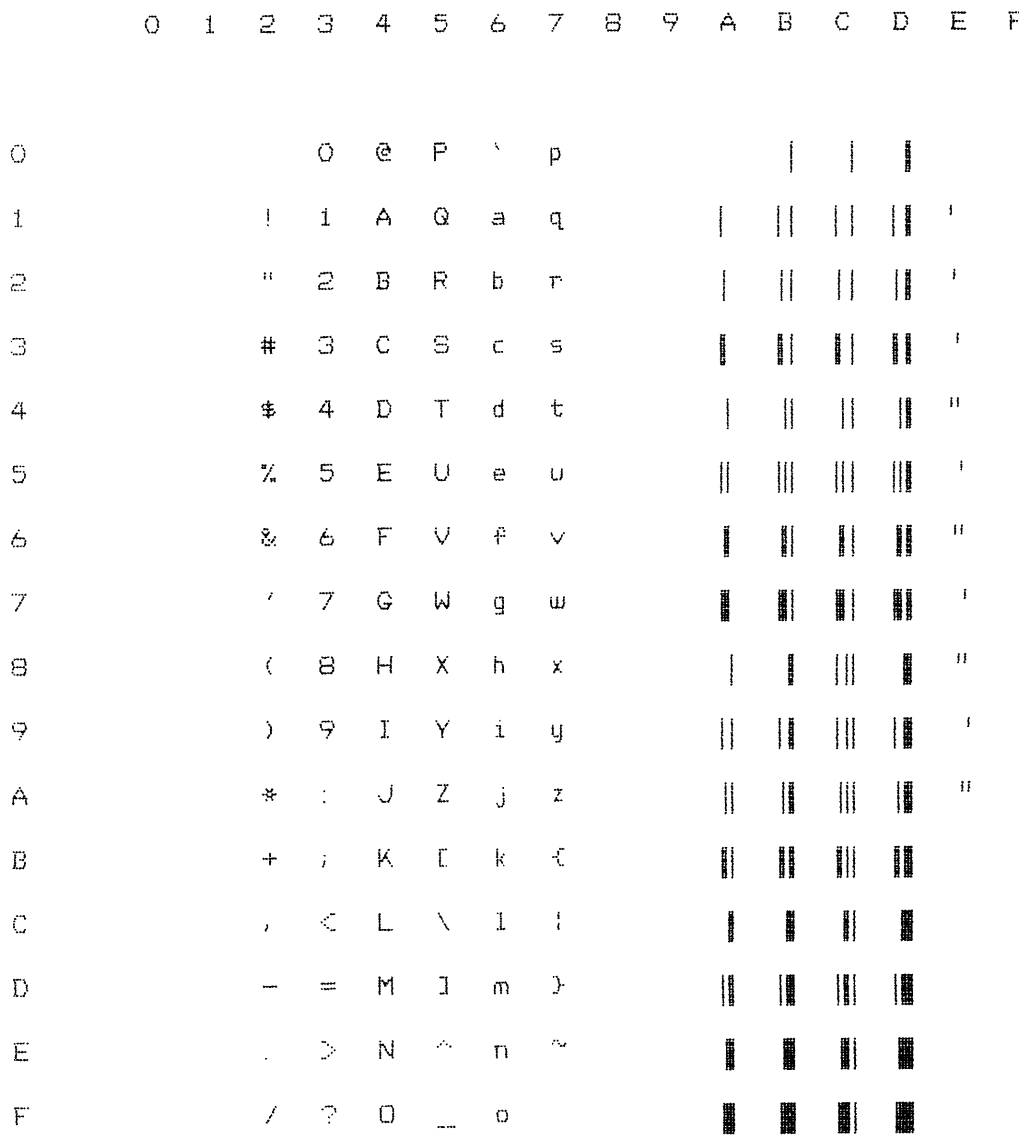
1			!	1	A	Q	a	q	ij	∎	¡	±	Á	Ñ	á	ñ
2			"	2	B	R	b	r	Ŗ		¢	²	Â	Ò	ã	ò
3			#	3	C	S	c	s	ŀ		£	³	Ã	Ó	ã	ó
4			$	4	D	T	d	t	Ŧ		¤	´	Ä	Ô	ä	õ
5			%	5	E	U	e	u	ŀ		¥	µ	Å	Õ	à	õ
6			&	6	F	V	f	v	ŋ		¦	¶	Æ	Ö	æ	ö
7			'	7	G	W	g	w	ŋ		§	·	Ç	×	ç	÷
8			(	8	H	X	h	x	Ş		¨	¸	È	Ø	è	ø
9			)	9	I	Y	i	y	ş		©	¹	É	Ù	é	ù
A			*	:	J	Z	j	z	ı		ª	º	Ê	Ú	ê	ú
B			+	;	K	[	k	{	¨		«	»	Ë	Û	ë	û
C			,	<	L	¥	l	¦	ˇ		¬	¼	Ì	Ü	ì	ü
D			-	=	M	]	m	}	ƒ		ÿ	½	Í	Ý	í	ý
E			.	>	N	^	n	~	═		®	¾	Î	Þ	î	þ
F			/	?	O	_	o		;		¯	¿	Ï	ß	ï	

ECMA Latin 1, Extended Subset: Multinational

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0				0	@	P	`	p	IJ	∓		°	À	Ð	à	ð
1			!	1	A	Q	a	q	ij	▪	¡	±	Á	Ñ	á	ñ
2			"	2	B	R	b	r	Ŗ		¢	²	Â	Ò	â	ò
3			#	3	C	S	c	s	ŀ		£	³	Ã	Ó	ã	ó
4			$	4	D	T	d	t	Ɪ		¤	´	Ä	Ô	ä	ô
5			%	5	E	U	e	u	ı		¥	µ	Å	Õ	å	õ
6			&	6	F	V	f	v	ǧ		¦	¶	Æ	Ö	æ	ö
7			'	7	G	W	g	w	ğ		§	·	Ç	×	ç	÷
8			(	8	H	X	h	x	Ş		¨	¸	È	Ø	è	ø
9			)	9	I	Y	i	y	ş		©	¹	É	Ù	é	ù
A			*	:	J	Z	j	z	ı		ª	º	Ê	Ú	ê	ú
B			+	;	K	[	k	{	¨		«	»	Ë	Û	ë	û
C			,	<	L	\	l	¦	ˇ		¬	¼	Ì	Ü	ì	ü
D			-	=	M	]	m	}	ƒ		ÿ	½	Í	Ý	í	ý
E			.	>	N	^	n	~	═		®	¾	Î	Þ	î	þ
F			/	?	O	_	o		;		¯	¿	Ï	β	ï	

ECMA Latin 1, Extended Subset: Barcode 10 cpi



ECMA Latin 1, Extended Subset: Greek

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
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1			!	1	A	Q	a	q			Ά	ΐ	Λ	γ	ς	
2			"	2	B	R	b	r			Έ	ό	Μ	δ	τ	
3			#	3	C	S	c	s			Ή	ύ	Ν	ε	υ	
4			$	4	D	T	d	t			Ί	ϋ	Ξ	ζ	φ	
5			%	5	E	U	e	u			Ϊ	ϋ	Ο	η	χ	
6			&	6	F	V	f	v			Ϊ	ώ	Π	θ	ψ	
7			'	7	G	W	g	w			Ό	Α	Ρ	ι	ω	
8			(	8	H	X	h	x			Τ	Β	Σ	κ		
9			)	9	I	Y	i	y			Τ	Γ	Τ	λ		
A			*	:	J	Z	j	z			Τ	Δ	Τ	μ		
B			+	;	K	[	k	{			ΰ	Ε	Φ	ν		
C			,	<	L	\	l	!			ά	Ζ	Χ	ξ		
D			-	=	M	]	m	}			έ	Η	Ψ	ο		
E			.	>	N	^	n	~			ή	Θ	Ω	π		
F			/	?	O	_	o				ί	Ι	α	ρ		

ECMA Latin 1, Extended Subset: Graphic

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0				0	@	P	`	p				⅝	┘	╝	△	
1			!	1	A	Q	a	q				⅜	┐	╕	▽	
2			"	2	B	R	b	r				⅘	┌	╒	▷	
3			#	3	C	S	c	s				√	├	╞	◁	
4			$	4	D	T	d	t			-	∂	┴	╧	□	
5			%	5	E	U	e	u			–	∓	┤	╡	☆	
6			&	6	F	V	f	v			—	♭	┬	╤	*	
7			'	7	G	W	g	w			—	„	┼	╪	⊕	
8			(	8	H	X	h	x			↑	◘	╞	╫	└	
9			)	9	I	Y	i	y			↕	♣	╨	╧	┘	
A			*	:	J	Z	j	z			◘	◊	┤	╢	┌	
B			+	;	K	[	k	{			¦	♥	╥	╤	┐	
C			,	<	L	\	l	¦			…	♠	╪	╫		
D			-	=	M	]	m	}			⅓	—	═	▣		
E			.	>	N	^	n	~			⅔	|	‖	○		
F			/	?	O	_	o				⅕	└	╚	□		

ECMA Latin 1, Extended Subset: Scientific 10 cpi

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1			!	1	A	Q	a	q			≡	¬	λ	ψ	ƒ	
2			"	2	B	R	b	r			∧	∀	A	Ψ	α	
3			#	3	C	S	c	s			∨	Ξ	ν	ω	ℵ	
4			$	4	D	T	d	t			∩	α	ξ	∫	χ	
5			%	5	E	U	e	u			U	β	Ξ	ϑ	□	
6			&	6	F	V	f	v			⊃	γ	π	∞	‖	
7			'	7	G	W	g	w			⊂	Γ	Π	∇	⊥	
8			(	8	H	X	h	x			⇐	δ	ρ	∂	↯	
9			)	9	I	Y	i	y			⇒	Δ	σ	~	└	
A			*	:	J	Z	j	z			∴	Ɛ	Σ	≈	<	
B			+	;	K	[	k	{			∵	ϗ	τ	≃	>	
C			,	<	L	\	l	¦			∈	η	υ	≅	′	
D			-	=	M	]	m	}			∋	ϴ	T	≤	″	
E			.	>	N	^	n	~			⊆	ϴ	ø	≠	∓	
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DEC Multinational, ASCII (USA)

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1			!	1	A	Q	a	q			¡	±	Á	Ñ	á	ñ
2			"	2	B	R	b	r			¢	²	Â	Ò	â	ò
3			#	3	C	S	c	s			£	³	Ã	Ó	ã	ó
4			$	4	D	T	d	t					Ä	Ô	ä	õ
5			%	5	E	U	e	u			¥	µ	Å	Õ	à	õ
6			&	6	F	V	f	v				¶	Æ	Ö	æ	ö
7			'	7	G	W	g	w			§	·	Ç	Œ	ç	œ
8			(	8	H	X	h	x			¤		È	Ø	è	ø
9			)	9	I	Y	i	y			©	¹	É	Ù	é	ù
A			*	:	J	Z	j	z			ª	º	Ê	Ú	ê	ú
B			+	;	K	[	k	{			«	»	Ë	Û	ë	û
C			,	<	L	\	l	¦				¼	Ì	Ü	ì	ü
D			-	=	M	]	m	}				½	Í	Ý	í	ý
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DEC Multinational, French

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1			!	1	A	Q	a	q			¡	±	Á	Ñ	á	ñ
2			"	2	B	R	b	r			¢	²	Â	ò	ã	ò
3			£	3	C	S	c	s			£	³	Ã	ó	ã	ó
4			$	4	D	T	d	t					Ä	ô	ä	õ
5			%	5	E	U	e	u			¥	µ	Å	õ	à	õ
6			&	6	F	V	f	v				¶	Æ	ö	æ	ö
7			'	7	G	W	g	w			§	·	Ç	Œ	ç	œ
8			(	8	H	X	h	x			¤		È	Ø	è	ø
9			)	9	I	Y	i	y			©	¹	É	Ù	é	ù
A			*	:	J	Z	j	z			ª	º	Ê	Ú	ê	ú
B			+	;	K	°	k	é			«	»	Ë	Û	ë	û
C			,	<	L	ç	l	ù				¼	Ì	Ü	ì	ü
D			-	=	M	§	m	è				½	Í	Ý	í	ý
E			.	>	N	^	n	¨					Î		î	
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DEC Multinational, German

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
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1			!	1	A	Q	a	q			¡	±	Á	Ñ	á	ñ
2			"	2	B	R	b	r			¢	²	Â	Ò	ã	ò
3			#	3	C	S	c	s			£	³	Ã	Ó	ã	Ó
4			$	4	D	T	d	t					Ä	Ô	ä	Õ
5			%	5	E	U	e	u			¥	µ	Å	Õ	à	õ
6			&	6	F	V	f	v				¶	Æ	Ö	æ	ö
7			'	7	G	W	g	w			§	·	Ç	Œ	ç	œ
8			(	8	H	X	h	x			¤		È	Ø	è	ø
9			)	9	I	Y	i	y			©	¹	É	Ù	é	ù
A			*	:	J	Z	j	z			ª	º	Ê	Ú	ê	ú
B			+	;	K	Ä	k	ä			«	»	Ë	Û	ë	û
C			,	<	L	Ö	l	ö				¼	Ì	Ü	ì	ü
D			-	=	M	Ü	m	ü				½	Í	Ý	í	ý
E			.	>	N	^	n	ß					Î		î	
F			/	?	O	_	o					¿	Ï	ß	ï	

DEC Multinational, English (UK)

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0				0	@	P	`	p				°	À		à	
1			!	1	A	Q	a	q			¡	±	Á	Ñ	á	ñ
2			"	2	B	R	b	r			¢	²	Â	Ò	â	ò
3			£	3	C	S	c	s			£	³	Ã	Ó	ã	Ó
4			$	4	D	T	d	t					Ä	Ô	ä	Õ
5			%	5	E	U	e	u			¥	µ	Å	Õ	à	õ
6			&	6	F	V	f	v				¶	Æ	Ö	æ	ö
7			'	7	G	W	g	w			§	·	Ç	Œ	ç	œ
8			(	8	H	X	h	x			¤		È	Ø	è	ø
9			)	9	I	Y	i	y			©	¹	É	Ù	é	ù
A			*	:	J	Z	j	z			ª	º	Ê	Ú	ê	ú
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C			,	<	L	\	l	¦				¼	Ì	Ü	ì	ü
D			-	=	M	]	m	}				½	Í	Ý	í	ý
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DEC Multinational, Norwegian/Danish

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1			!	1	A	Q	a	q			¡	±	Á	Ñ	á	ñ
2			"	2	B	R	b	r			¢	²	Â	Ò	â	ò
3			#	3	C	S	c	s			£	³	Ã	Ó	ã	Ó
4			$	4	D	T	d	t					Ä	Ô	ä	Õ
5			%	5	E	U	e	u			¥	µ	Å	Õ	å	õ
6			&	6	F	V	f	v				¶	Æ	Ö	æ	ö
7			'	7	G	W	g	w			§	·	Ç	Œ	ç	œ
8			(	8	H	X	h	x			¤		È	Ø	è	ø
9			)	9	I	Y	i	y			©	¹	É	Ù	é	ù
A			*	:	J	Z	j	z			ª	º	Ê	Ú	ê	ú
B			+	;	K	Æ	k	æ			«	»	Ë	Û	ë	û
C			,	<	L	Ø	l	ø				¼	Ì	Ü	ì	ü
D			-	=	M	Å	m	å				½	Í	Ý	í	ý
E			.	>	N	Ü	n	ü					Î		Î	
F			/	?	O	_	o					¿	Ï	ß	Ï	

DEC Multinational, Swedish

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
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1			!	1	A	Q	a	q			¡	±	Á	Ñ	á	ñ
2			"	2	B	R	b	r			¢	²	Â	Ò	â	ò
3			#	3	C	S	c	s			£	³	Ã	Ó	ã	ó
4			¤	4	D	T	d	t					Ä	Ô	ä	ô
5			%	5	E	U	e	u			¥	µ	Å	Õ	å	õ
6			&	6	F	V	f	v				¶	Æ	Ö	æ	ö
7			'	7	G	W	g	w			§	·	Ç	×	ç	÷
8			(	8	H	X	h	x			¤		È	Ø	è	ø
9			)	9	I	Y	i	y			©	¹	É	Ù	é	ù
A			*	:	J	Z	j	z			ª	º	Ê	Ú	ê	ú
B			+	;	K	Ä	k	ä			«	»	Ë	Û	ë	û
C			,	<	L	Ö	l	ö				¼	Ì	Ü	ì	ü
D			-	=	M	Å	m	å				½	Í	Ÿ	í	ÿ
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DEC Multinational, Italian

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3			£	3	C	S	c	s			£	³	Ã	Ó	ã	ó
4			$	4	D	T	d	t					Ä	Ô	ä	Õ
5			%	5	E	U	e	u			¥	µ	Å	Õ	å	õ
6			&	6	F	V	f	v				¶	Æ	Ö	æ	ö
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DEC Multinational, Spanish

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1			!	1	A	Q	a	q			¡	±	Á	Ñ	á	ñ
2			"	2	B	R	b	r			¢	²	Â	Ò	â	ò
3			£	3	C	S	c	s			£	³	Ã	Ó	ã	ó
4			$	4	D	T	d	t					Ä	Ô	ä	Õ
5			%	5	E	U	e	u			¥	µ	Å	Õ	å	õ
6			&	6	F	V	f	v				¶	Æ	Ö	æ	ö
7			'	7	G	W	g	w			§	·	Ç	Œ	ç	œ
8			(	8	H	X	h	x			¤		È	Ø	è	ø
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D			-	=	M	¿	m	ç				½	Í	Ÿ	í	ÿ
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DEC Multinational, Japanese

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1			!	1	A	Q	a	q			¡	±	Á	Ñ	á	ñ
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3			#	3	C	S	c	s			£	³	Ã	Ó	ã	Ó
4			$	4	D	T	d	t					Ä	Ô	ä	Õ
5			%	5	E	U	e	u			¥	µ	Å	Õ	å	õ
6			&	6	F	V	f	v				¶	Æ	Ö	æ	Ö
7			'	7	G	W	g	w			§	·	Ç	Œ	ç	œ
8			(	8	H	X	h	x			¤		È	Ø	è	ø
9			)	9	I	Y	i	y			©	¹	É	Ù	é	ù
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C			,	<	L	¥	l	¦				¼	Ì	Ü	ì	ü
D			-	=	M	]	m	}				½	Í	Ý	í	ý
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DEC Multinational, French Canadian

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1			!	1	A	Q	a	q			¡	±	Á	Ñ	á	ñ
2			"	2	B	R	b	r			¢	²	Â	ò	ã	ò
3			#	3	C	S	c	s			£	³	Ã	ó	ã	ó
4			$	4	D	T	d	t					Ä	ô	ä	õ
5			%	5	E	U	e	u			¥	µ	Å	õ	à	õ
6			&	6	F	V	f	v				¶	Æ	ö	æ	ö
7			'	7	G	W	g	w			§	·	Ç	Œ	ç	œ
8			(	8	H	X	h	x			¤		È	Ø	è	ø
9			)	9	I	Y	i	y			©	¹	É	Ù	é	ù
A			*	:	J	Z	j	z			ª	º	Ê	Ú	ê	ú
B			+	;	K	ã	k	é			«	»	Ë	Û	ë	û
C			,	<	L	ç	l	ù				¼	Ì	Ü	ì	ü
D			-	=	M	õ	m	è				½	Í	Ý	í	ý
E			.	>	N	î	n	û					Î		Î	
F			/	?	O	_	o					¿	Ï	ß	Ï	

DEC Multinational, Dutch

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0				0	à	P	õ	p				°	À		à	
1			!	1	A	Q	a	q			¡	±	Á	Ñ	á	ñ
2			"	2	B	R	b	r			¢	²	Â	ò	ã	ò
3			ù	3	C	S	c	s			£	³	Ã	ó	ã	ó
4			$	4	D	T	d	t					Ä	ô	ä	õ
5			%	5	E	U	e	u			¥	µ	Å	õ	à	õ
6			&	6	F	V	f	v				¶	Æ	ö	æ	ö
7			'	7	G	W	g	w			§	·	Ç	Œ	ç	œ
8			(	8	H	X	h	x			¤		È	Ø	è	ø
9			)	9	I	Y	i	y			©	¹	É	Ù	é	ù
A			*	:	J	Z	j	z			ª	º	Ê	Ú	ê	ú
B			+	;	K	é	k	ä			«	»	Ë	Û	ë	û
C			,	<	L	ç	l	ö				¼	Ì	Ü	ì	ü
D			-	=	M	ê	m	ü				½	Í	Ý	í	ý
E			.	>	N	î	n	û					Î		Î	
F			/	?	O	è	o					¿	Ï	ß	Ï	

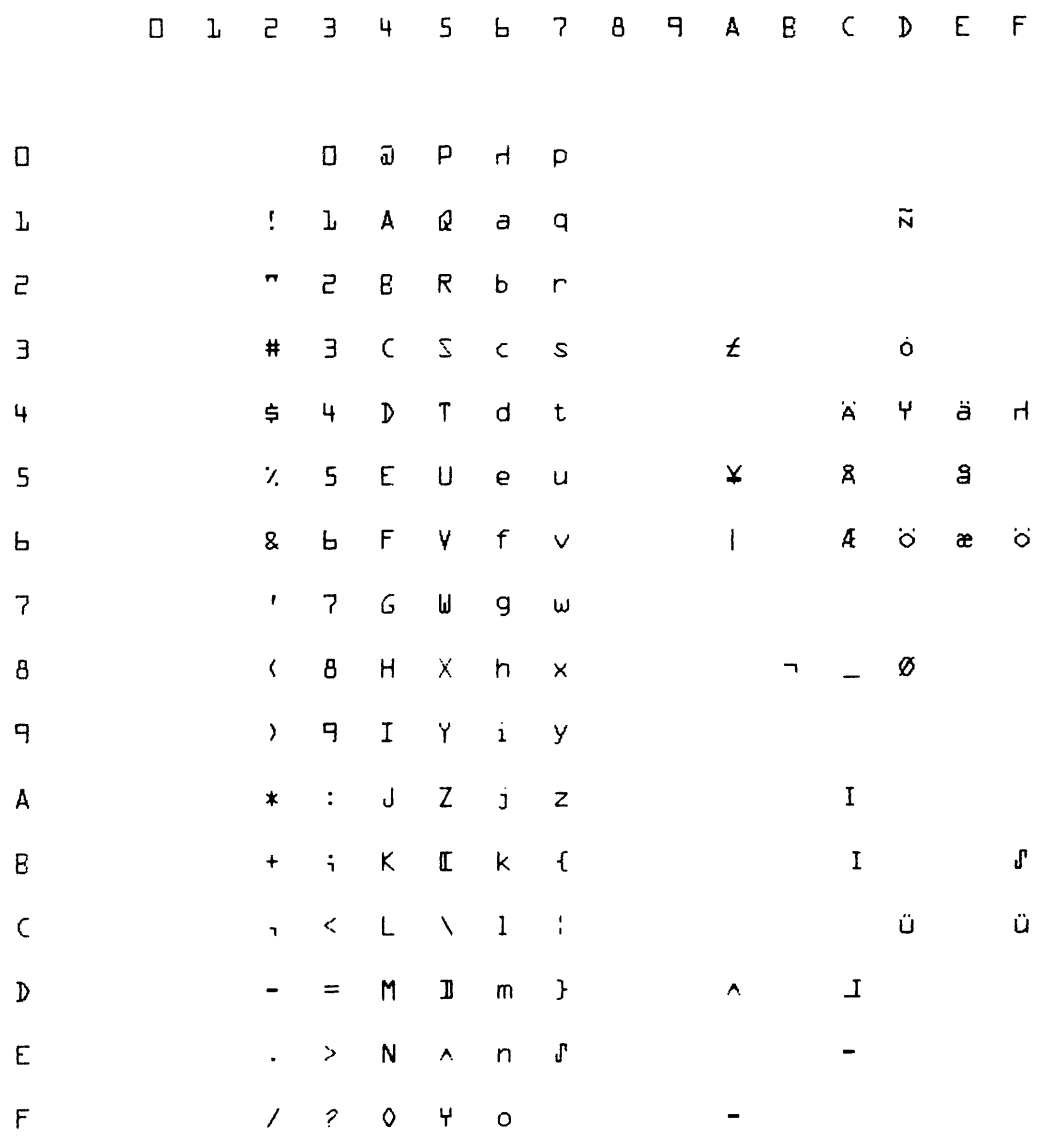
DEC Multinational, Finnish

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0				0	@	P	é	p				°	À		à	
1			!	1	A	Q	a	q			¡	±	Á	Ñ	á	ñ
2			"	2	B	R	b	r			¢	²	Â	Ò	ã	ò
3			#	3	C	S	c	s			£	³	Ã	Ó	ã	ó
4			¤	4	D	T	d	t					Ä	Ô	ä	Õ
5			%	5	E	U	e	u			¥	µ	Å	Õ	à	õ
6			&	6	F	V	f	v				¶	Æ	Ö	æ	ö
7			'	7	G	W	g	w			§	·	Ç	Œ	ç	œ
8			(	8	H	X	h	x			¤		È	Ø	è	ø
9			)	9	I	Y	i	y			©	¹	É	Ù	é	ù
A			*	:	J	Z	j	z			ª	º	Ê	Ú	ê	ú
B			+	;	K	Ä	k	ä			«	»	Ë	Û	ë	û
C			,	<	L	Ö	l	ö				¼	Ì	Ü	ì	ü
D			-	=	M	Å	m	à				½	Í	Ÿ	í	ÿ
E			.	>	N	Ü	n	ü					Î		Î	
F			/	?	O	_	o					¿	Ï	ß	ï	

DEC Multinational, Swiss

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0				0	@	P	`	p				°	À		à	
1			!	1	A	Q	a	q			¡	±	Á	Ñ	á	ñ
2			"	2	B	R	b	r			¢	²	Â	Ò	â	ò
3			£	3	C	S	c	s			£	³	Ã	Ó	ã	ó
4			$	4	D	T	d	t					Ä	Ô	ä	õ
5			%	5	E	U	e	u			¥	µ	Å	Õ	à	õ
6			&	6	F	V	f	v				¶	Æ	Ö	æ	ö
7			'	7	G	W	g	w			§	·	Ç	Œ	ç	œ
8			(	8	H	X	h	x			¤		È	Ø	è	ø
9			)	9	I	Y	i	y			©	¹	É	Ù	é	ù
A			*	:	J	Z	j	z			ª	º	Ê	Ú	ê	ú
B			+	;	K	[	k	{			«	»	Ë	Û	ë	û
C			,	<	L	\	l	|			¼	Ì	Ü	ì	ü
D			-	=	M	]	m	}				½	Í	Ý	í	ý
E			.	>	N	^	n	~					Î		î	
F			/	?	O	_	o					¿	Ï	ß	ï	

OCR A



OCR B

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0				0	@	P	'	p					↑	Z		z
1			!	1	A	Q	a	q			¡		↓	Ñ		
2			"	2	B	R	b	r					→			
3			#	3	C	S	c	s			£			ö		
4			$	4	D	T	d	t			¤	'	Ä		ä	
5			%	5	E	U	e	u			¥		Å		å	
6			&	6	F	V	f	v			¦		Æ	ö	æ	ö
7			'	7	G	W	g	w			§				ç	
8			(	8	H	X	h	x				-	_	ø		ø
9			)	9	I	Y	i	y							é	
A			*	:	J	Z	j	z					I		ë	
B			+	;	K	[	k	{					I			
C			,	<	L	\	l	¦						Ü		
D			-	=	M	]	m	}			^		I	IJ		ij
E			.	>	N	^	n	~					-			
F			/	?	O	_	o				-	¿	_	ß		

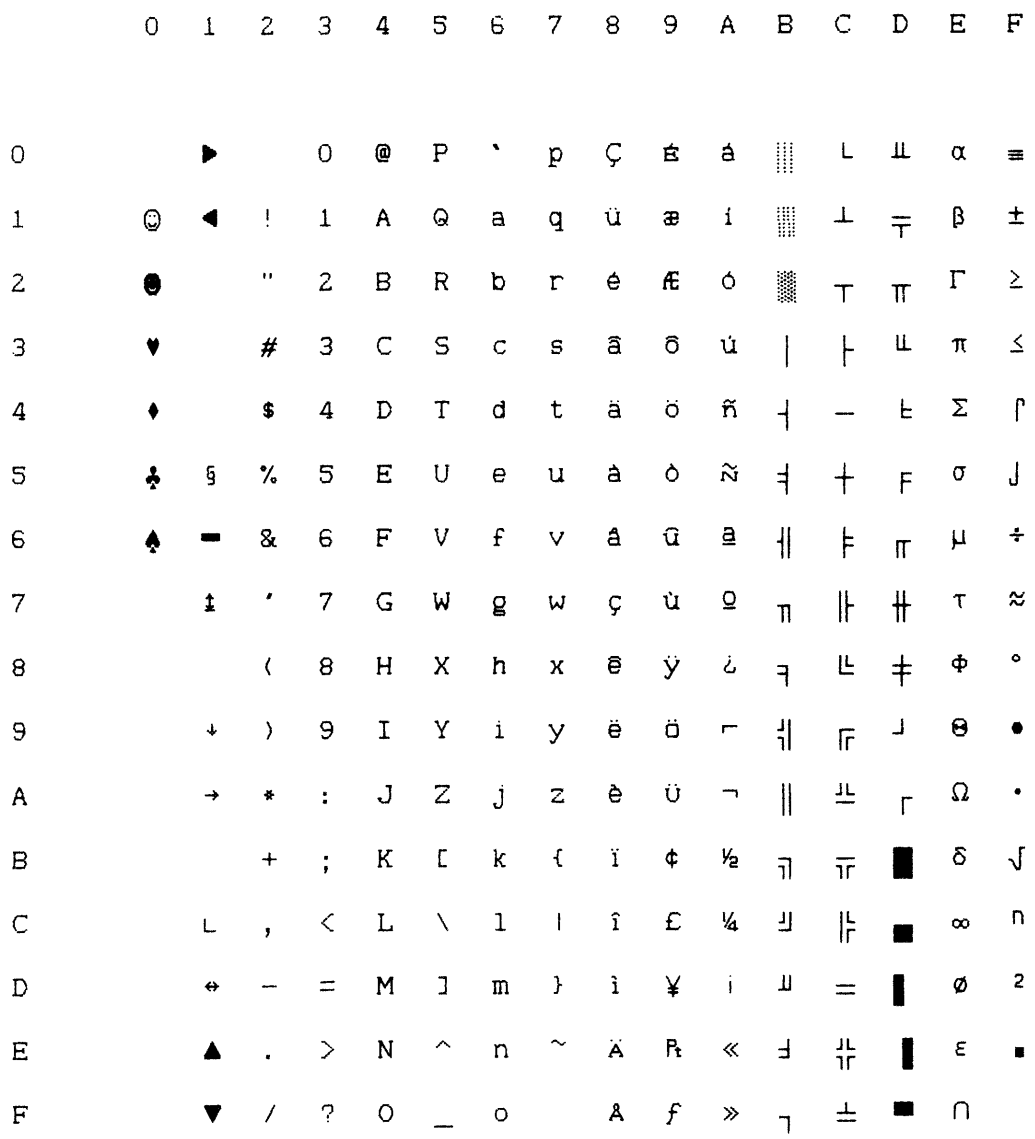
C *Proprinter Emulation Character Sets*

Introduction

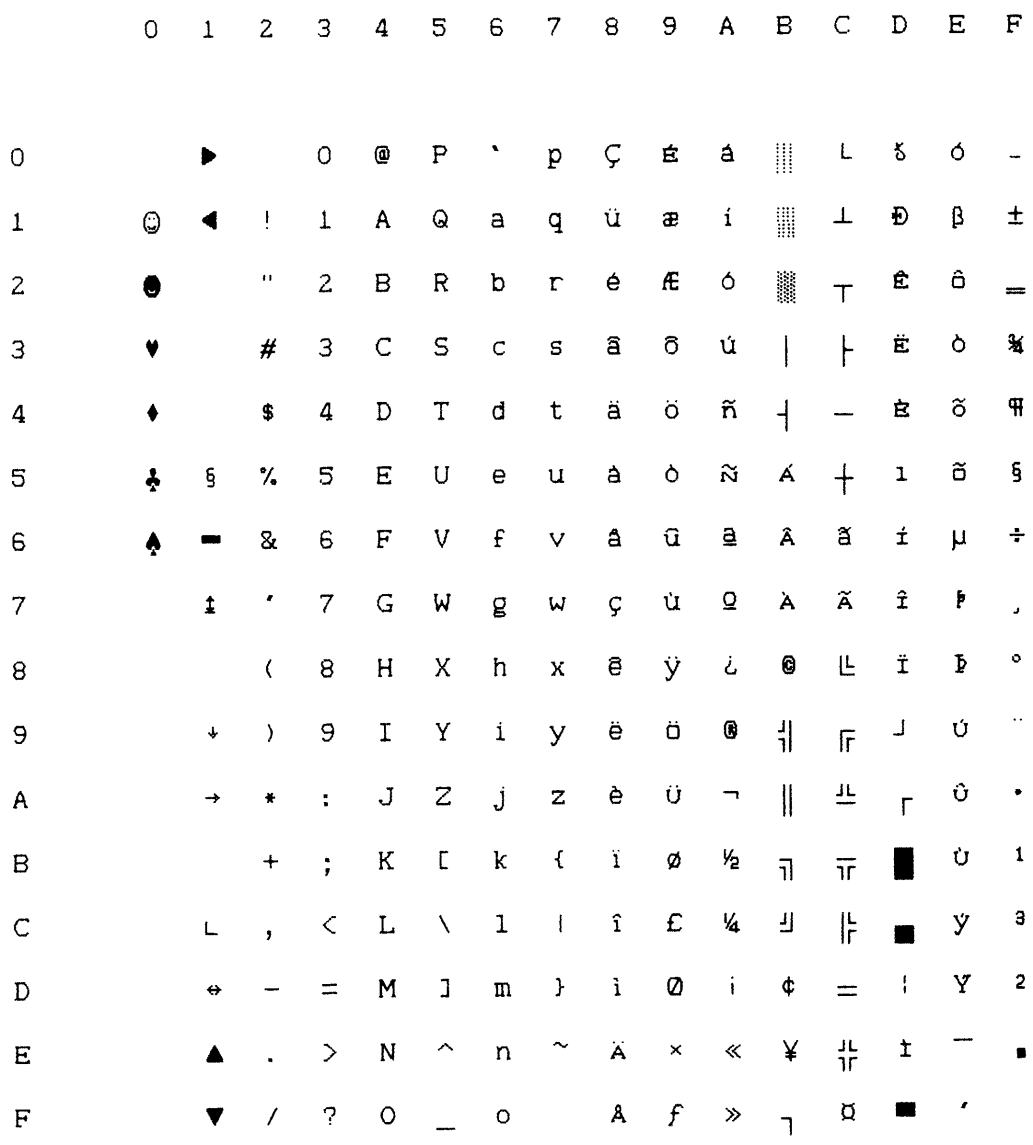
This appendix shows the character set charts (also referred to as code pages) for the Proprinter emulation. The character sets are shown in Near Letter Quality (NLQ). They may be selected using the configuration menus, described in detail in your *User's Manual*.

The maximum set of printable symbols is shown for columns hex 80-9F (selected via the ESC 6 control code).

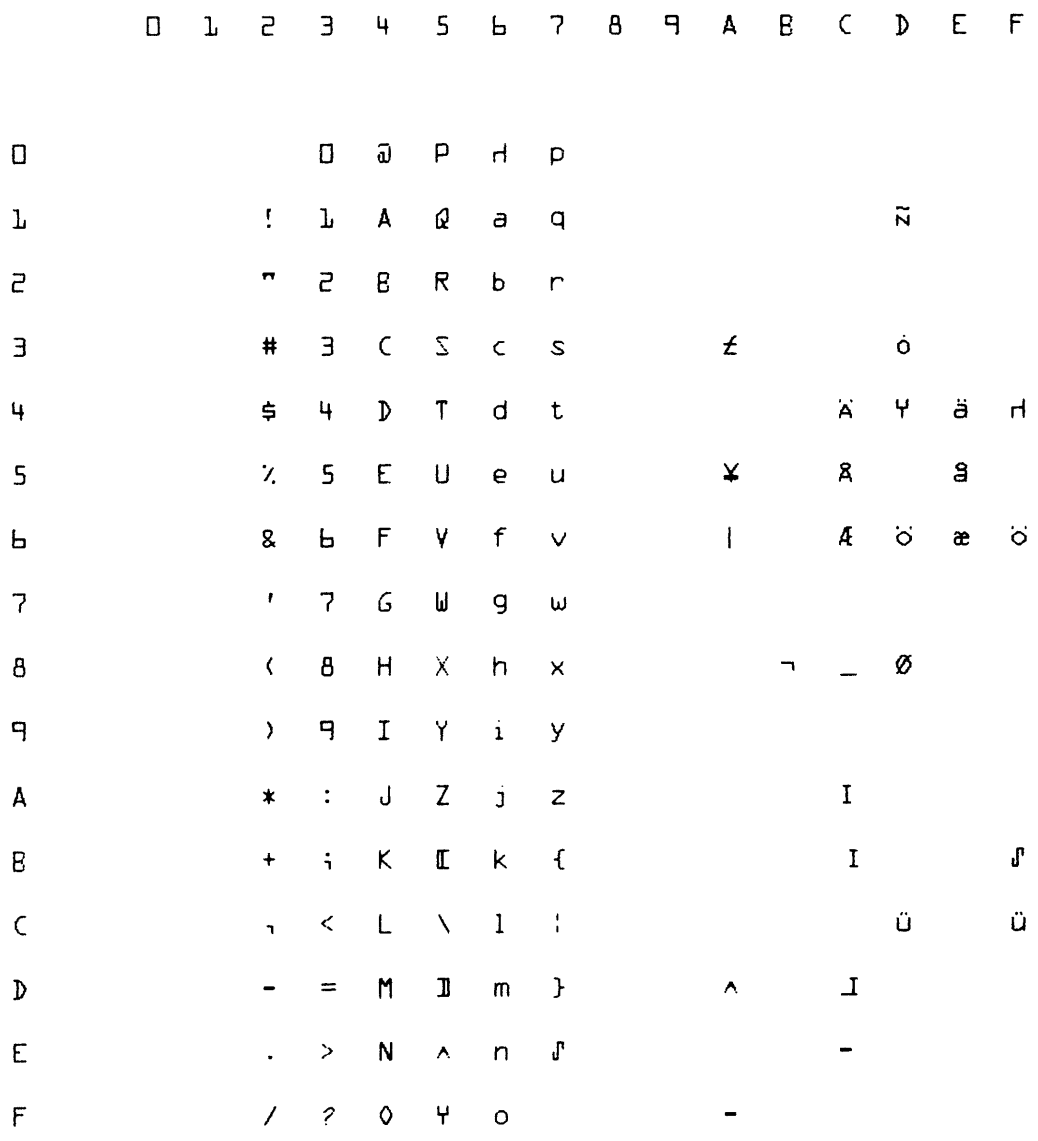
0437 PC Character Set



0850 PC Multilingual



OCR A



OCR B

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0				0	@	P	'	p					↑	Z		z
1			!	1	A	Q	a	q			¡		↓	Ñ		
2			"	2	B	R	b	r					→			
3			#	3	C	S	c	s			£			ò		
4			$	4	D	T	d	t			¤	'	Ä		ä	
5			%	5	E	U	e	u			¥		Å		å	
6			&	6	F	V	f	v			¦		Æ	ö	æ	ö
7			'	7	G	W	g	w			§				ç	
8			(	8	H	X	h	x				-	_	ø		ø
9			)	9	I	Y	i	y							é	
A			*	:	J	Z	j	z					I		ë	
B			+	;	K	[	k	{					I			
C			,	<	L	\	l	¦						Ü		
D			-	=	M	]	m	}			^		_I	IJ		ij
E			.	>	N	^	n	~					-			
F			/	?	O	_	o				-	¿	_	ß		

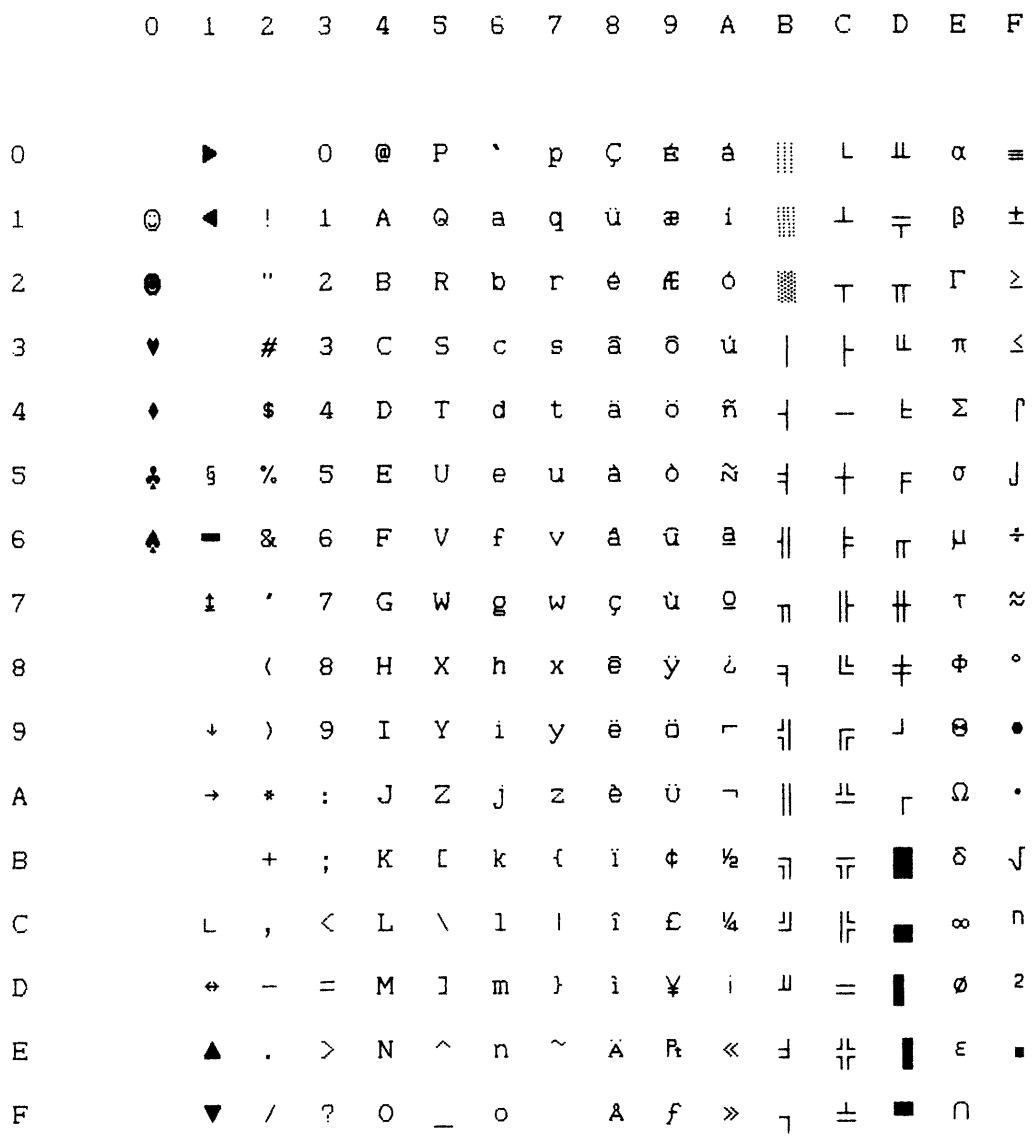
D *Epson Emulation Character Sets*

Introduction

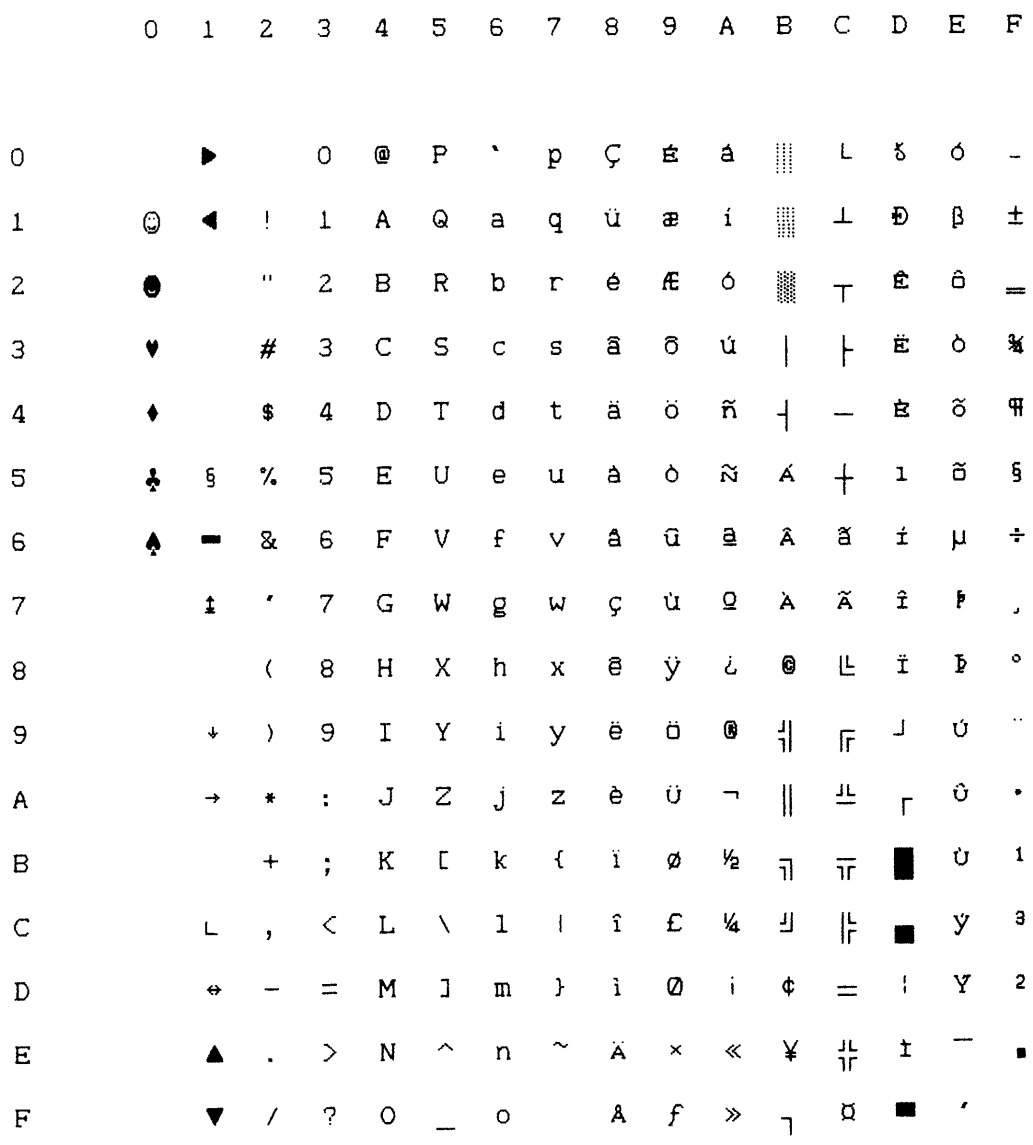
This appendix shows the character set charts (also referred to as code pages) for the Epson emulation. The character sets are shown in Near Letter Quality (NLQ). They may be selected using the configuration menus, described in detail in your *User's Manual*. The international character sets may be selected using the ESC R *n* control code (see page 159).

The maximum set of printable symbols is shown for columns hex 80-9F (selected via the ESC I or ESC 6 control code).

0437 PC Character Set



0850 PC Multilingual



Epson Set, ASCII (USA)

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	à	§		0	@	P	`	p	à	§		0	@	P	`	p
1	è	ß	!	1	A	Q	a	q	è	ß	!	1	A	Q	a	q
2	ù		"	2	B	R	b	r	ù	Æ	"	2	B	R	b	r
3	ò		#	3	C	S	c	s	ò	æ	#	3	C	S	c	s
4	ì		$	4	D	T	d	t	ì	Ø	$	4	D	T	d	t
5	°	ø	%	5	E	U	e	u	°	ø	%	5	E	U	e	u
6	£	¨	&	6	F	V	f	v	£	¨	&	6	F	V	f	v
7		Ä	'	7	G	W	g	w	ì	Ä	'	7	G	W	g	w
8			(	8	H	X	h	x	¿	ö	(	8	H	X	h	x
9		Ü	)	9	I	Y	i	y	ñ	Ü	)	9	I	Y	i	y
A		ä	*	:	J	Z	j	z	ñ	ä	*	:	J	Z	j	z
B			+	;	K	[	k	{	Ø	ö	+	;	K	[	k	{
C		ü	,	<	L	\	l	¦	Ñ	ü	,	<	L	\	l	/
D		É	−	=	M	]	m	}	Å	É	−	=	M	]	m	}
E		é	.	>	N	^	n	~	ä	é	.	>	N	^	n	~
F		¥	/	?	O	_	o		ç	¥	/	?	O	_	o	Ø

Epson Set, French

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	à	§		0	à	P	`	p	*à*	*§*		*0*	*@*	*P*	*`*	*p*
1	è	β	!	1	A	Q	a	q	*è*	*β*	*!*	*1*	*A*	*Q*	*a*	*q*
2	ù		"	2	B	R	b	r	*ù*	*Æ*	*"*	*2*	*B*	*R*	*b*	*r*
3	ò		#	3	C	S	c	s	*ò*	*æ*	*#*	*3*	*C*	*S*	*c*	*s*
4	ì		$	4	D	T	d	t	*ì*	*Ø*	*$*	*4*	*D*	*T*	*d*	*t*
5	°	ø	%	5	E	U	e	u	*°*	*ø*	*%*	*5*	*E*	*U*	*e*	*u*
6	£	¨	&	6	F	V	f	v	*£*	*¨*	*&*	*6*	*F*	*V*	*f*	*v*
7		Ä	'	7	G	W	g	w	*ì*	*Ä*	*'*	*7*	*G*	*W*	*g*	*w*
8			(	8	H	X	h	x	*¿*	*ö*	*(*	*8*	*H*	*X*	*h*	*x*
9		Ü	)	9	I	Y	i	y	*Ñ*	*Ü*	*)*	*9*	*I*	*Y*	*i*	*y*
A		ä	*	:	J	Z	j	z	*ñ*	*ä*	*	*:*	*J*	*Z*	*j*	*z*
B			+	;	K	°	k	é	*ò*	*ö*	*+*	*;*	*K*	*[*	*k*	*{*
C		ü	,	<	L	ç	l	ù	*Ñ*	*ü*	*,*	*<*	*L*	**	*l*	*|*
D		É	−	=	M	§	m	è	*À*	*É*	*−*	*=*	*M*	*]*	*m*	*}*
E		é	.	>	N	^	n	¨	*à*	*é*	*.*	*>*	*N*	*^*	*n*	*~*
F		¥	/	?	O	_	o		*ç*	*¥*	*/*	*?*	*O*	*_*	*o*	*Ø*

Epson Set, German

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	à	§		0	§	P	`	p	à	§		0	@	P	`	p
1	è	ß	!	1	A	Q	a	q	è	ß	!	1	A	Q	a	q
2	ù		"	2	B	R	b	r	ù	Æ	"	2	B	R	b	r
3	ò		#	3	C	S	c	s	ò	æ	#	3	C	S	c	s
4	ì		$	4	D	T	d	t	ì	Ø	$	4	D	T	d	t
5	°	ø	%	5	E	U	e	u	°	ø	%	5	E	U	e	u
6	£	¨	&	6	F	V	f	v	£	¨	&	6	F	V	f	v
7		Ä	'	7	G	W	g	w	ì	Ä	'	7	G	W	g	w
8			(	8	H	X	h	x	¿	ö	(	8	H	X	h	x
9		Ü	)	9	I	Y	i	y	ñ	Ü	)	9	I	Y	i	y
A		ä	*	:	J	Z	j	z	ñ	ä	*	:	J	Z	j	z
B			+	;	K	Ä	k	ä	¤	ö	+	;	K	[	k	{
C		ü	,	<	L	ö	l	ö	ñ	ü	,	<	L	\	l	|
D		é	-	=	M	Ü	m	ü	Á	é	-	=	M	]	m	}
E		é	.	>	N	^	n	ß	á	é	.	>	N	^	n	~
F		¥	/	?	O	_	o		ç	¥	/	?	O	_	o	Ø

Epson Set, English (UK)

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	à	§		0	@	P	`	p	à	§		0	@	P	`	p
1	è	β	!	1	A	Q	a	q	è	β	!	1	A	Q	a	q
2	ù		"	2	B	R	b	r	ù	Æ	"	2	B	R	b	r
3	ò		£	3	C	S	c	s	ò	æ	#	3	C	S	c	s
4	ì		$	4	D	T	d	t	ì	Ø	$	4	D	T	d	t
5	°	ø	%	5	E	U	e	u	°	ø	%	5	E	U	e	u
6	£	¨	&	6	F	V	f	v	£	¨	&	6	F	V	f	v
7		Ä	'	7	G	W	g	w	ì	Ä	'	7	G	W	g	w
8			(	8	H	X	h	x	¿	ö	(	8	H	X	h	x
9		Ü	)	9	I	Y	i	y	ñ	Ü	)	9	I	Y	i	y
A		ä	*	:	J	Z	j	z	ñ	ä	*	:	J	Z	j	z
B			+	;	K	[	k	{	ò	ö	+	;	K	[	k	{
C		ü	,	<	L	\	l	¦	Ñ	ü	,	<	L	\	l	¦
D		É	-	=	M	]	m	}	Å	É	-	=	M	]	m	}
E		é	.	>	N	^	n	~	ä	é	.	>	N	^	n	~
F		¥	/	?	O	_	o		ç	¥	/	?	O	_	o	Ø

Epson Set, Danish I

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	à	§		0	@	P	`	p	á	§		0	@	P	`	p
1	è	ß	!	1	A	Q	a	q	é	ß	!	1	A	Q	a	q
2	ù		"	2	B	R	b	r	ú	Æ	"	2	B	R	b	r
3	ò		#	3	C	S	c	s	ó	æ	#	3	C	S	c	s
4	ì		$	4	D	T	d	t	í	Ø	$	4	D	T	d	t
5	°	ø	%	5	E	U	e	u	°	ø	%	5	E	U	e	u
6	£	¨	&	6	F	V	f	v	£	¨	&	6	F	V	f	v
7		Ä	'	7	G	W	g	w	ì	Ä	'	7	G	W	g	w
8			(	8	H	X	h	x	¿	ö	(	8	H	X	h	x
9		Ü	)	9	I	Y	i	y	Ñ	Ü	)	9	I	Y	i	y
A		ä	*	:	J	Z	j	z	ñ	ä	*	:	J	Z	j	z
B			+	;	K	Æ	k	æ	Ø	ö	+	;	K	[	k	{
C		ü	,	<	L	Ø	l	ø	Ñ	ü	,	<	L	\	l	|
D		É	−	=	M	Å	m	å	Å	É	−	=	M	]	m	}
E		é	.	>	N	^	n	~	á	é	.	>	N	^	n	~
F		¥	/	?	O	_	o		ç	¥	/	?	O	_	o	Ø

Epson Set, Swedish

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	à	§		0	É	P	é	p	á	§		0	@	P	'	p
1	è	β	!	1	A	Q	a	q	è	β	!	1	A	Q	a	q
2	ù		"	2	B	R	b	r	ù	Æ	"	2	B	R	b	r
3	ò		#	3	C	S	c	s	ò	æ	#	3	C	S	c	s
4	ì		¤	4	D	T	d	t	ì	Ø	$	4	D	T	d	t
5	°	ø	%	5	E	U	e	u	°	ø	%	5	E	U	e	u
6	£	¨	&	6	F	V	f	v	£	¨	&	6	F	V	f	v
7		Ä	'	7	G	W	g	w	ì	Ä	'	7	G	W	g	w
8			(	8	H	X	h	x	¿	ö	(	8	H	X	h	x
9		Ü	)	9	I	Y	i	y	ñ	Ü	)	9	I	Y	i	y
A		ä	*	:	J	Z	j	z	ñ	ä	*	:	J	Z	j	z
B			+	;	K	Ä	k	ä	¤	ö	+	;	K	[	k	{
C		ü	,	<	L	ö	l	ö	Ñ	ü	,	<	L	\	l	|
D		É	-	=	M	Å	m	å	Á	É	-	=	M	]	m	}
E		é	.	>	N	Ü	n	ü	á	é	.	>	N	^	n	~
F		¥	/	?	O	_	o		ç	¥	/	?	O	_	o	Ø

Epson Set, Italian

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	à	§		0	@	P	ù	p	*à*	*§*		*0*	*@*	*P*	'	*p*
1	è	ß	!	1	A	Q	a	q	*è*	*ß*	*!*	*1*	*A*	*Q*	*a*	*q*
2	ù		"	2	B	R	b	r	*ù*	*Æ*	*"*	*2*	*B*	*R*	*b*	*r*
3	ò		#	3	C	S	c	s	*ò*	*æ*	*#*	*3*	*C*	*S*	*c*	*s*
4	ì		$	4	D	T	d	t	*ì*	*Ø*	*$*	*4*	*D*	*T*	*d*	*t*
5	°	ø	%	5	E	U	e	u	*°*	*ø*	*%*	*5*	*E*	*U*	*e*	*u*
6	£	¨	&	6	F	V	f	v	*£*	¨	*&*	*6*	*F*	*V*	*f*	*v*
7		Ä	'	7	G	W	g	w	*ì*	*Ä*	'	*7*	*G*	*W*	*g*	*w*
8			(	8	H	X	h	x	*¿*	*ö*	*(*	*8*	*H*	*X*	*h*	*x*
9		Ü	)	9	I	Y	i	y	*Ñ*	*Ü*	*)*	*9*	*I*	*Y*	*i*	*y*
A		ä	*	:	J	Z	j	z	*ñ*	*ä*	*	:	*J*	*Z*	*j*	*z*
B			+	;	K	°	k	à	*Ö*	*ö*	+	;	*K*	*[*	*k*	*{*
C		ü	,	<	L	\	l	ò	*Ñ*	*ü*	,	<	*L*	\	*l*	*|*
D		É	−	=	M	é	m	è	*À*	*É*	−	=	*M*	*]*	*m*	*}*
E		é	.	>	N	^	n	ì	*à*	*é*	.	>	*N*	^	*n*	~
F		¥	/	?	O	_	o		*ç*	*¥*	/	*?*	*O*	_	*o*	*Ø*

Epson Set, Spanish I

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	à	§		0	@	P	`	p	*à*	*§*		*0*	*@*	*P*	*`*	*p*
1	è	β	!	1	A	Q	a	q	*è*	*β*	*!*	*1*	*A*	*Q*	*a*	*q*
2	ù		"	2	B	R	b	r	*ù*	*Æ*	*"*	*2*	*B*	*R*	*b*	*r*
3	ò		₧	3	C	S	c	s	*ò*	*æ*	*#*	*3*	*C*	*S*	*c*	*s*
4	ì		$	4	D	T	d	t	*ì*	*Ø*	*$*	*4*	*D*	*T*	*d*	*t*
5	°	ø	%	5	E	U	e	u	*°*	*ø*	*%*	*5*	*E*	*U*	*e*	*u*
6	£	¨	&	6	F	V	f	v	*£*	*¨*	*&*	*6*	*F*	*V*	*f*	*v*
7		Ä	'	7	G	W	g	w	*ì*	*Ä*	*'*	*7*	*G*	*W*	*g*	*w*
8			(	8	H	X	h	x	*¿*	*ö*	*(*	*8*	*H*	*X*	*h*	*x*
9		ü	)	9	I	Y	i	y	*Ñ*	*Ü*	*)*	*9*	*I*	*Y*	*i*	*y*
A		ä	*	:	J	Z	j	z	*ñ*	*ä*	*	*:*	*J*	*Z*	*j*	*z*
B			+	;	K	¡	k	¨	*Ò*	*ö*	+	*;*	*K*	*[*	*k*	*{*
C		ü	,	<	L	Ñ	l	ñ	*₧*	*ü*	,	*<*	*L*	**	*l*	*|*
D		É	−	=	M	¿	m	}	*À*	*É*	−	=	*M*	*]*	*m*	*}*
E		é	.	>	N	^	n	~	*à*	*é*	.	*>*	*N*	*^*	*n*	*~*
F		¥	/	?	O	_	o		*ç*	*¥*	*/*	*?*	*O*	*_*	*o*	*Ø*

Epson Set, Japanese

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	à	§		0	@	P	`	p	à	§		0	@	P	`	p
1	è	β	!	1	A	Q	a	q	è	β	!	1	A	Q	a	q
2	ù		"	2	B	R	b	r	ù	Æ	"	2	B	R	b	r
3	ò		#	3	C	S	c	s	ò	æ	#	3	C	S	c	s
4	ì		$	4	D	T	d	t	ì	Ø	$	4	D	T	d	t
5	°	ø	%	5	E	U	e	u	°	ø	%	5	E	U	e	u
6	£	¨	&	6	F	V	f	v	£	¨	&	6	F	V	f	v
7		Ä	'	7	G	W	g	w	ì	Ä	'	7	G	W	g	w
8			(	8	H	X	h	x	¿	ö	(	8	H	X	h	x
9		Ü	)	9	I	Y	i	y	ñ	Ü	)	9	I	Y	i	y
A		ä	*	:	J	Z	j	z	ñ	ä	*	:	J	Z	j	z
B			+	;	K	[	k	{	¤	ö	+	;	K	[	k	{
C		ü	,	<	L	¥	l	¦	Ñ	ü	,	<	L	\	l	/
D		É	-	=	M	]	m	}	Å	É	-	=	M	]	m	}
E		é	.	>	N	^	n	~	ä	é	.	>	N	^	n	~
F		¥	/	?	O	_	o		ç	¥	/	?	O	_	o	Ø

Epson Set, Norwegian

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	à	§		0	É	P	é	p	á	§		*0*	*@*	*P*	'	*p*
1	è	β	!	1	A	Q	a	q	*è*	*β*	*!*	*1*	*A*	*Q*	*a*	*q*
2	ù		"	2	B	R	b	r	*ù*	*Æ*	*"*	*2*	*B*	*R*	*b*	*r*
3	ò		#	3	C	S	c	s	*ò*	*æ*	*#*	*3*	*C*	*S*	*c*	*s*
4	ì		¤	4	D	T	d	t	*ì*	*Ø*	*$*	*4*	*D*	*T*	*d*	*t*
5	°	ø	%	5	E	U	e	u	*°*	*ø*	*%*	*5*	*E*	*U*	*e*	*u*
6	£	¨	&	6	F	V	f	v	*£*	*¨*	*&*	*6*	*F*	*V*	*f*	*v*
7		Ä	'	7	G	W	g	w	*ì*	*Ä*	*'*	*7*	*G*	*W*	*g*	*w*
8			(	8	H	X	h	x	*¿*	*ö*	*(*	*8*	*H*	*X*	*h*	*x*
9		Ü	)	9	I	Y	i	y	*ñ*	*Ü*	*)*	*9*	*I*	*Y*	*i*	*y*
A		ä	*	:	J	Z	j	z	*ñ*	*ä*	*	*:*	*J*	*Z*	*j*	*z*
B			+	;	K	Æ	k	æ	*ò*	*ö*	*+*	*;*	*K*	*[*	*k*	*{*
C		ü	,	<	L	Ø	l	ø	*ñ*	*ü*	*,*	*<*	*L*	**	*l*	*|*
D		É	-	=	M	Å	m	å	*Å*	*É*	*-*	*=*	*M*	*]*	*m*	*}*
E		é	.	>	N	Ü	n	ü	*ä*	*é*	*.*	*>*	*N*	*^*	*n*	*~*
F		¥	/	?	O	_	o		*ç*	*¥*	*/*	*?*	*O*	*_*	*o*	*Ø*

Epson Set, Danish II

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	à	§		0	É	P	é	p	*à*	*§*		*0*	*@*	*P*	'	*p*
1	è	ß	!	1	A	Q	a	q	*è*	*ß*	*!*	*1*	*A*	*Q*	*a*	*q*
2	ù		"	2	B	R	b	r	*ù*	*Æ*	*"*	*2*	*B*	*R*	*b*	*r*
3	ò		#	3	C	S	c	s	*ò*	*æ*	*#*	*3*	*C*	*S*	*c*	*s*
4	ì		$	4	D	T	d	t	*ì*	*Ø*	*$*	*4*	*D*	*T*	*d*	*t*
5	°	ø	%	5	E	U	e	u	*°*	*ø*	*%*	*5*	*E*	*U*	*e*	*u*
6	£	¨	&	6	F	V	f	v	*£*	*¨*	*&*	*6*	*F*	*V*	*f*	*v*
7		Ä	'	7	G	W	g	w	*ì*	*Ä*	*'*	*7*	*G*	*W*	*g*	*w*
8			(	8	H	X	h	x	*¿*	*ö*	*(*	*8*	*H*	*X*	*h*	*x*
9		Ü	)	9	I	Y	i	y	*ñ*	*Ü*	*)*	*9*	*I*	*Y*	*i*	*y*
A		ä	*	:	J	Z	j	z	*ñ*	*ä*	*	*:*	*J*	*Z*	*j*	*z*
B			+	;	K	Æ	k	æ	*ò*	*ö*	*+*	*;*	*K*	*[*	*k*	*{*
C		ü	,	<	L	Ø	l	ø	*ñ*	*ü*	*,*	*<*	*L*	**	*l*	*|*
D		É	-	=	M	Å	m	à	*À*	*É*	*-*	*=*	*M*	*]*	*m*	*}*
E		é	.	>	N	Ü	n	ü	*à*	*é*	*.*	*>*	*N*	*^*	*n*	*~*
F		¥	/	?	O	_	o		*ç*	*¥*	*/*	*?*	*O*	*_*	*o*	*Ø*

Epson Set, Spanish II

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	à	§		0	à	P	`	p	*à*	*§*		*0*	*@*	*P*	*`*	*p*
1	è	β	!	1	A	Q	a	q	*è*	*β*	*!*	*1*	*A*	*Q*	*a*	*q*
2	ù		"	2	B	R	b	r	*ù*	*Æ*	*"*	*2*	*B*	*R*	*b*	*r*
3	ò		#	3	C	S	c	s	*ò*	*æ*	*#*	*3*	*C*	*S*	*c*	*s*
4	ì		$	4	D	T	d	t	*ì*	*Ø*	*$*	*4*	*D*	*T*	*d*	*t*
5	°	ø	%	5	E	U	e	u	*°*	*ø*	*%*	*5*	*E*	*U*	*e*	*u*
6	£	¨	&	6	F	V	f	v	*£*	*¨*	*&*	*6*	*F*	*V*	*f*	*v*
7		Ä	'	7	G	W	g	w	*ì*	*Ä*	*'*	*7*	*G*	*W*	*g*	*w*
8			(	8	H	X	h	x	*¿*	*ö*	*(*	*8*	*H*	*X*	*h*	*x*
9		Ü	)	9	I	Y	i	y	*Ñ*	*Ü*	*)*	*9*	*I*	*Y*	*i*	*y*
A		ä	*	:	J	Z	j	z	*ñ*	*ä*	*	*:*	*J*	*Z*	*j*	*z*
B			+	;	K	[	k	{	*ò*	*ö*	*+*	*;*	*K*	*[*	*k*	*{*
C		ü	,	<	L	Ñ	l	ñ	*ñ*	*ü*	*,*	*<*	*L*	**	*l*	*|*
D		é	-	=	M	¿	m	ó	*à*	*é*	*-*	*=*	*M*	*]*	*m*	*}*
E		è	.	>	N	è	n	ú	*ä*	*è*	*.*	*>*	*N*	*^*	*n*	*~*
F		¥	/	?	O	_	o		*ç*	*¥*	*/*	*?*	*O*	*_*	*o*	*Ø*

Epson Set, Latin American I

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	à	§		0	@	P	ì	p	À	§		0	@	P	'	p
1	è	β	!	1	A	Q	a	q	È	β	!	1	A	Q	a	q
2	ù		"	2	B	R	b	r	Ù	Æ	"	2	B	R	b	r
3	ò		#	3	C	S	c	s	Ò	æ	#	3	C	S	c	s
4	ì		$	4	D	T	d	t	Ì	Ø	$	4	D	T	d	t
5	°	ø	%	5	E	U	e	u	°	ø	%	5	E	U	e	u
6	£	¨	&	6	F	V	f	v	£	¨	&	6	F	V	f	v
7		Ä	'	7	G	W	g	w	ì	Ä	'	7	G	W	g	w
8			(	8	H	X	h	x	¿	ö	(	8	H	X	h	x
9		Ü	)	9	I	Y	i	y	Ñ	Ü	)	9	I	Y	i	y
A		ä	*	:	J	Z	j	z	ñ	ä	*	:	J	Z	j	z
B			+	;	K	[	k	ó	Ö	ö	+	;	K	[	k	{
C		ü	,	<	L	Ñ	l	á	Ñ	ü	,	<	L	\	l	|
D		É	−	=	M	]	m	é	Á	É	−	=	M	]	m	}
E		é	.	>	N	ú	n	ü	á	é	.	>	N	^	n	~
F		¥	/	?	O	_	o		ç	¥	/	?	O	_	o	Ø

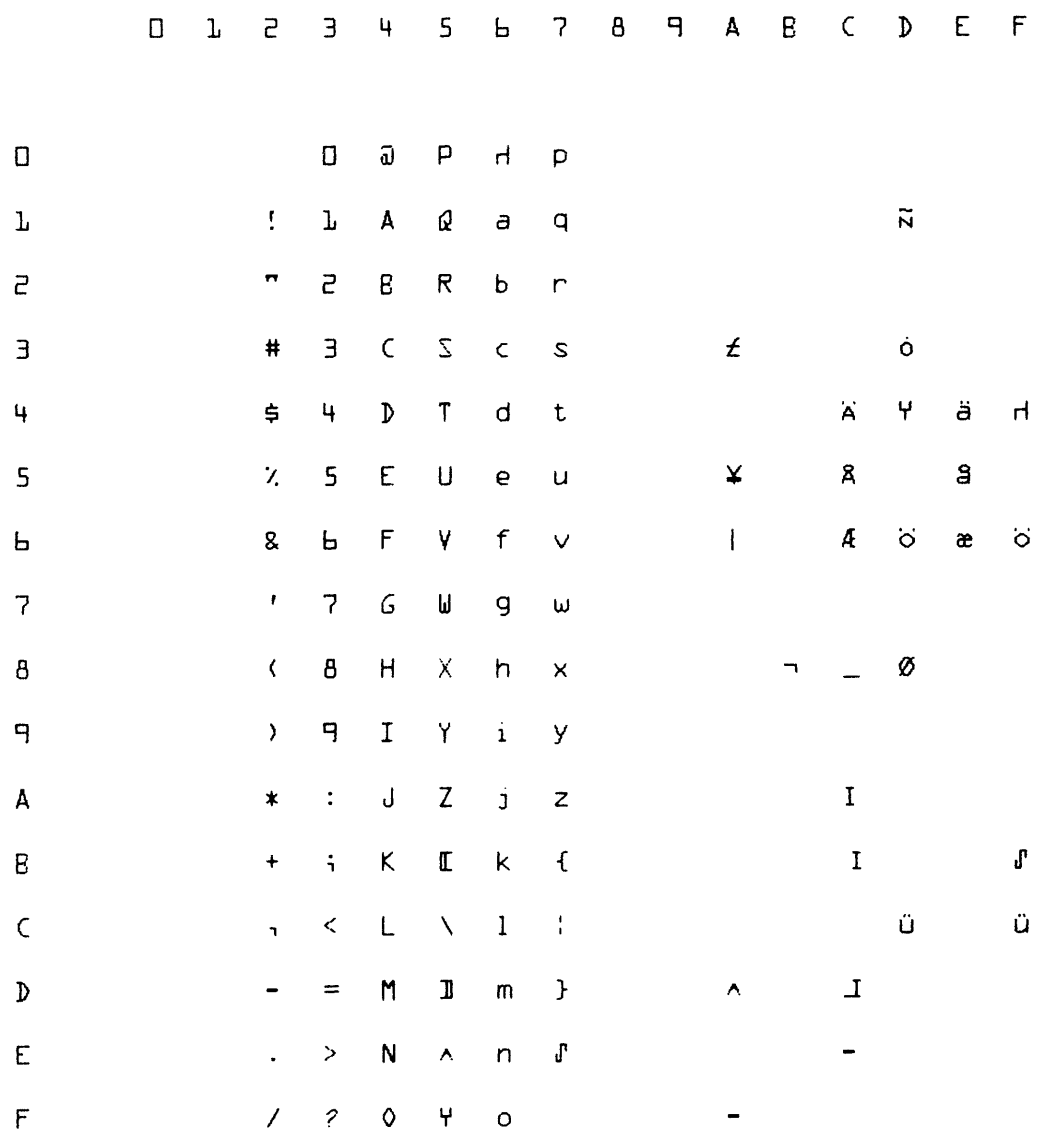
Epson Set, French Canadian

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	à	§		0	à	P	õ	p	á	§		0	@	P	'	p
1	è	β	!	1	A	Q	a	q	è	β	!	1	A	Q	a	q
2	ù		"	2	B	R	b	r	ú	Æ	"	2	B	R	b	r
3	ò		#	3	C	S	c	s	ó	æ	#	3	C	S	c	s
4	ì		$	4	D	T	d	t	í	Ø	$	4	D	T	d	t
5	°	ø	%	5	E	U	e	u	°	ø	%	5	E	U	e	u
6	£	¨	&	6	F	V	f	v	£	¨	&	6	F	V	f	v
7		Ä	'	7	G	W	g	w	ì	Ä	'	7	G	W	g	w
8			(	8	H	X	h	x	¿	ö	(	8	H	X	h	x
9		Ü	)	9	I	Y	i	y	Ñ	Ü	)	9	I	Y	i	y
A		ä	*	:	J	Z	j	z	ñ	ä	*	:	J	Z	j	z
B			+	;	K	â	k	é	Ø	ö	+	;	K	[	k	{
C		ü	,	<	L	ç	l	ù	ñ	ü	,	<	L	\	l	|
D		É	-	=	M	ê	m	è	Á	É	-	=	M	]	m	}
E		é	.	>	N	î	n	û	á	é	.	>	N	^	n	~
F		¥	/	?	O	_	o		ç	¥	/	?	O	_	o	Ø

Epson Set, Latin American II

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	à	§		0	à	P	ü	p	á	§		0	@	P	'	p
1	è	β	!	1	A	Q	a	q	è	β	!	1	A	Q	a	q
2	ù		"	2	B	R	b	r	ú	Æ	"	2	B	R	b	r
3	ò		#	3	C	S	c	s	ó	æ	#	3	C	S	c	s
4	ì		$	4	D	T	d	t	í	Ø	$	4	D	T	d	t
5	°	ø	%	5	E	U	e	u	°	ø	%	5	E	U	e	u
6	£	¨	&	6	F	V	f	v	£	¨	&	6	F	V	f	v
7		Ä	'	7	G	W	g	w	ì	Ä	'	7	G	W	g	w
8			(	8	H	X	h	x	¿	ö	(	8	H	X	h	x
9		Ü	)	9	I	Y	i	y	Ñ	Ü	)	9	I	Y	i	y
A		ä	*	:	J	Z	j	z	ñ	ä	*	:	J	Z	j	z
B			+	;	K	[	k	{	Ø	ö	+	;	K	[	k	{
C		ü	,	<	L	Ñ	l	ñ	Ñ	ü	,	<	L	\	l	|
D		é	-	=	M	¿	m	ó	Á	é	-	=	M	]	m	}
E		é	.	>	N	é	n	ú	á	é	.	>	N	^	n	~
F		¥	/	?	O	_	o		ç	¥	/	?	O	_	o	Ø

OCR A



OCR B

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0				0	@	P	'	p					↑	Z		z
1			!	1	A	Q	a	q			¡		↓	Ñ		
2			"	2	B	R	b	r					→			
3			#	3	C	S	c	s			£			ò		
4			$	4	D	T	d	t			¤	'	Ä		ä	
5			%	5	E	U	e	u			¥		Å		å	
6			&	6	F	V	f	v			¦		Æ	ö	æ	ö
7			'	7	G	W	g	w			§				ç	
8			(	8	H	X	h	x				-	_	ø		ø
9			)	9	I	Y	i	y							é	
A			*	:	J	Z	j	z					I		ë	
B			+	;	K	[	k	{					I			
C			,	<	L	\	l	¦						Ü		
D			-	=	M	]	m	}			^		I	IJ		ij
E			.	>	N	^	n	~					-			
F			/	?	O	_	o				-	¿	_	ß		

E Contact Information

Printronix Customer Support Center

IMPORTANT **Please have the following information available prior to calling the Printronix Customer Support Center:**

- Model number
- Serial number (located on the back of the printer)
- Installed options (i.e., interface and host type if applicable to the problem)
- Configuration printout:

  Thermal Printer
  See “Printing A Configuration” in the *Quick Setup Guide*.

  Line Matrix Printer
  Press PRT CONFIG on the control panel, then press Enter.
- Is the problem with a new install or an existing printer?
- Description of the problem (be specific)
- Good and bad samples that clearly show the problem (faxing of these samples may be required)

Americas	(714) 368-2686
Europe, Middle East, and Africa	(31) 24 6489 311
Asia Pacific	(65) 6548 4114
China	(86) 800-999-6836

http://www.printronix.com/support.aspx

Printronix Supplies Department

Contact the Printronix Supplies Department for genuine Printronix supplies.

Americas	(800) 733-1900
Europe, Middle East, and Africa	33 (0) 1 46 25 19 07
Asia Pacific	(65) 6548 4116 or (65) 6548 4182
China	(86) 400-886-5598
India	(800) 102-7869

http://www.printronix.com/supplies-parts.aspx

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