d i g i t a l ™

LG*plus* Series Printer
LinePrinter Plus™
Programmer's Reference Manual

Digital Equipment Corporation

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1 **Introduction**

Chapter Contents

About This Manual

This manual is designed so that you can quickly find the information you need to program the LinePrinter Plus™ emulations that are provided with your Digital LG*plus* printer. Brief descriptions follow for each chapter in this book :

- **Chapter 1, "Introduction."** Provides an overview of this book, printer features, and line matrix printing technology.

- **Chapter 2, "Proprinter® XL Emulation."** Describes the Proprinter XL control code commands that you can send to the printer through the host data stream. These commands allow you to send instructions to the printer and configure many Proprinter XL emulation parameters.

- **Chapter 3, "Epson® FX Emulation."** Explains the Epson control code commands that you can send to the printer through the host data stream. These commands allow you to send instructions to the printer and configure many Epson FX emulation parameters.

- **Chapter 4, "P-Series® Emulation."** Covers the P–Series control code commands that you can send to the printer through the host data stream. These commands allow you to send instructions to the printer and configure many P–Series emulation parameters.

- **Chapter 5, "Graphics."** Consists of overview information about bit image graphics printing and programming. Descriptions are provided for designing a bit image pattern, using control codes to set bit image density, and issuing commands for bit image programming. A bit image sample program is included.

- **Chapter 6, "Vertical Page Formatting."** Includes information on programming and using vertical format unit (VFU) programs that regulate vertical paper movement and vertical tabs for printing forms.

- **Appendices.** Several appendices provide charts for the character sets available with the three LinePrinter Plus emulations.

How to Use This Manual

You can locate information three ways:

- Use the **Table of Contents** at the front of the manual.

- Use the **Chapter Contents** listed at the front of each chapter.

- Use the **Index** at the back of the manual for references to topics and tasks described in this manual.

- Use the **Glossary** at the back of the manual to find definitions for commonly used terminology.

Warnings and Special Information

Read and comply with all information highlighted under special headings:

WARNING

Conditions that could harm you as well as damage the equipment.

CAUTION

Conditions that could damage the printer or related equipment.

IMPORTANT

Information vital to proper operation of the printer.

NOTE: Information affecting printer operation.

Related Documentation

Following is a list of related documentation for the LG*plus* printer.

- *LG*plus* Series Maintenance Manual* (P/N EK–LGPLE–MM) – Explains how to maintain and repair the LG*plus* line matrix printer at the field service level of maintenance. This manual covers alignments and adjustments, preventive and corrective maintenance, troubleshooting, and basic principles of operation.

- *LG*plus* Series Operator's Guide* (P/N EK–LGPLE–OG) – Describes the keys on the control panel and provides quick reference information on daily printer operations such as loading paper and replacing ribbons.

- *LG*plus* Series Setup Guide* (P/N EK–LGPLS–SG) – Describes how to unpack, install, configure, run diagnostics, and clean the printer, and how to troubleshoot simple fault conditions.

- *LG*plus* LG Emulation Programmer's Reference Manual* (P/N EK–LGPLP–RM) – Describes the host control codes and character sets available with the Digital LG printer control language.

- *LG*plus* Series VGL Programmer's Manual* (P/N EK–LGVGL–PM) — Provides information used with the optional Code V Printronix® emulation enhancement feature. The Code V Printronix emulation allows you to create and store forms; generate logos, bar codes, and expanded characters; create other graphics, and merge graphics with alphanumeric data as a document is printed.

- *LG*plus* PGL Programmer's Manual* (P/N EK–LGPGL–PM) — Provides information used with the optional IGP Printronix emulation enhancement feature. The IGP Printronix emulation allows you to create and store forms; generate logos, bar codes, and expanded characters; create other graphics, and merge graphics with alphanumeric data as a document is printed.

The LG*plus* Line Matrix Printer

The Digital LG*plus* printer is a line matrix printer. It uses a variable-speed shuttle, micro-step paper feed control, and multi-phase hammer firing to generate a wide range of horizontal and vertical dot densities with no speed penalties. For a brief discussion of line matrix printing, see page 1–7.

Printer Features

Several standard features are provided with the Digital LG*plus* printer, as described below.

Printer Emulations

Six printer emulations (or protocols) are selectable at the operator panel:

- LG emulation
- Proprinter XL emulation
- Epson FX emulation
- P–Series emulation
- PGL (Printronix Graphics Language) emulation
- Code V Graphics Language emulation

The Proprinter XL, Epson FX, and P–Series emulations may be configured using the emulation host control codes described in this book, or can be configured via the operator panel, as described in the *Setup Guide*. The LG emulation host control codes are described in the *LG*plus* LG Emulation Programmer's Reference Manual.* The PGL and VGL emulations are described in the user's manuals provided for those enhancement options.

Host Computer Interfaces

Three hardware interfaces are available with the LG*plus* printer:

- Centronics® Parallel interface
- Dataproducts® parallel interface
- RS–232 serial interface

Text Formatting and Language Options

You can modify several parameters used primarily for printing text, either by means of the host data stream or the configuration menus.

The text formatting and language options include:

- Selectable print quality
- Selectable alternate horizontal and vertical dot densities that enable you to tailor output to a wider variety of printing requirements
- Selectable forms length and width
- Character-by-character attribute specification
    1) Selectable pitch: normal, expanded, and compressed
    2) Emphasized (shadow) print
    3) Bold print
    4) Overscoring
    5) Single underline
    4) Superscript and subscript printing
- Resident multinational character sets

Graphics and Vertical Formatting

Brief descriptions follow for some graphics and vertical format capabilities:

- Bit image graphics is provided for the Proprinter and Epson emulations
- Plot mode graphics is provided for the P–Series emulation
- Programmable electronic vertical formatting provides rapid vertical paper movement to specified lines for printing repetitive and continuous forms. The following two methods are provided:
    1) Vertical tab table: a set of programmed vertical tabs for use with the Proprinter and Epson emulations
    2) Electronic Vertical Format Unit (EVFU): a vertical formatting program available with the P–Series emulation.

Diagnostics

The *Setup Guide* for these printers discusses the following diagnostic features in more detail:

- Built-in diagnostic self-tests

- Configuration printout

- Data stream hexadecimal code printout

Line Matrix Printing Overview

The Digital LG*plus* printer is an impact printer; it creates characters by printing ink dots on paper. The dots are printed on an invisible matrix mapped in printer memory. (See Figure 1–1.) Dot impressions are made by an array of steel hammers mounted on a rapidly oscillating shuttle. The hammers strike the paper through a moving ink ribbon.

Matrix visible only to the printer
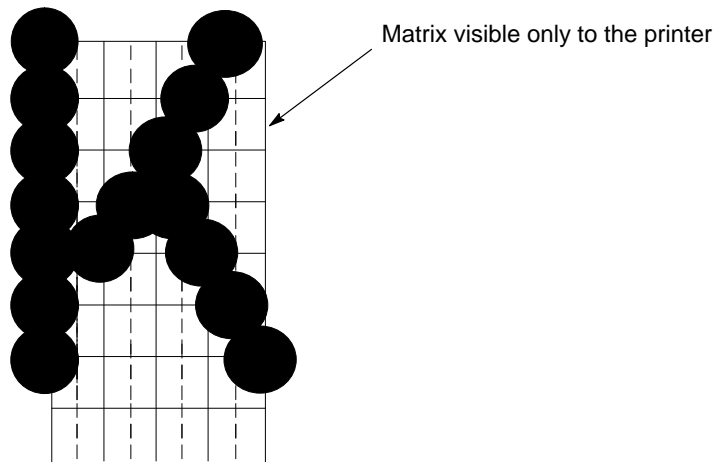
Figure 1–1. Dot Matrix Character Formation

Unlike serial dot matrix printers, which form whole characters one at a time with a moving printhead, the LG*plus* printer divides every printable line into horizontal dot rows. These printers print a dot row of the entire line with every lateral sweep of the shuttle. (See Figure 1–2.)

During each sweep of the shuttle, the hammers print dots at the required positions in the dot row. When the shuttle reaches the end of a sweep, it reverses direction, the paper is advanced one dot row, and the hammers print the next row of dots as the shuttle sweeps in the opposite direction.

After a line of characters is printed, hammer action stops while the paper is advanced to the first dot row of the next print line. The number of rows allowed for line separation depends on the line spacing you select.
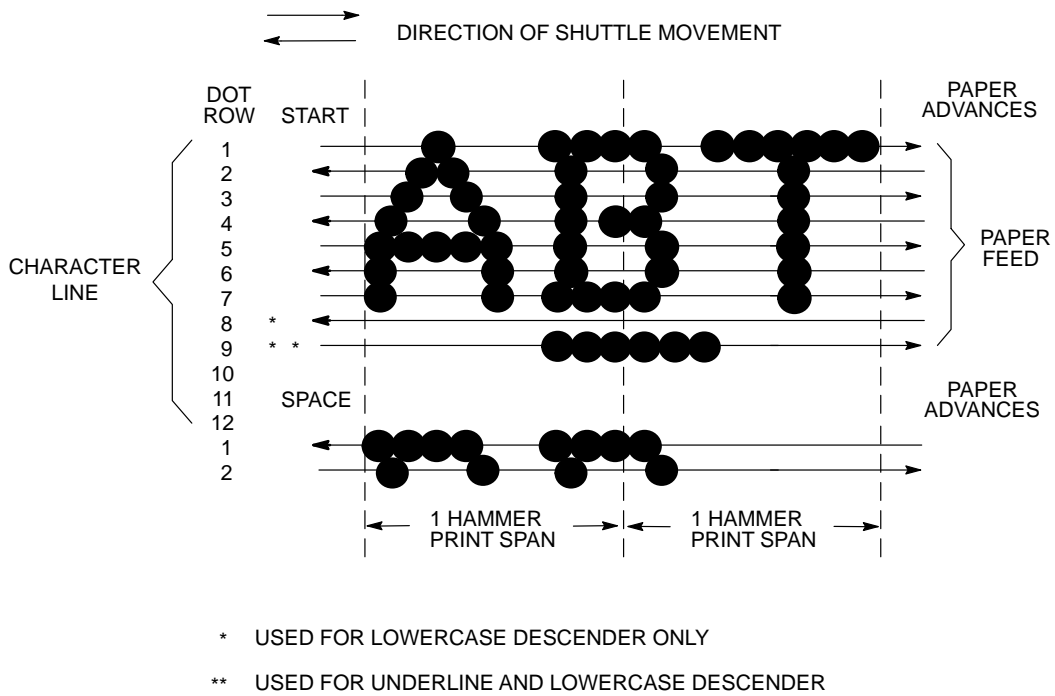
Figure 1–2. Dot Matrix Line Printing

Introduction

Printing Speed

The speed at which text prints is measured in lines per minute (lpm). This speed is inversely proportional to the number of dot rows required to produce a character line, regardless of the number of characters in the line. More dot rows are required to print lowercase characters with descenders; consequently, those character lines print at a fractionally lower rate.

The LG*plus* printer also prints dot-addressable graphic images. The speed at which graphics are plotted is measured in inches per minute (ipm). Unidirectional plotting produces slightly better print quality, and takes about twice as long as bidirectional plotting. You can select either plotting mode from the operator panel.

Printing and plotting rates also vary according to the print quality you select. Print quality refers to the way you instruct the printer to create characters. If, for example, you select near letter quality (NLQ), the printer uses more dot rows to form characters than if you choose high speed (HS) print quality. Character formation and print speed are faster in HS because the printer uses fewer dot rows to form characters. Vertical dot density is thus a factor in printing speed. Nominal printing rates are charted in Appendix A of the *Setup Guide*.

2 IBM Proprinter XL Emulation

Chapter Contents

Overview

This chapter describes the Proprinter XL emulation host control codes that are supported for the Digital LG*plus* 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 Proprinter XL emulation mode, the LG*plus* can print files coded for the Proprinter XL printer control language. To select the Proprinter XL emulation as the active printer emulation, select LinePrinter+ from the ACTIVE EMULATION menu and Proprinter XL from the EMULATION menu, as described in Chapter 4 of the *LGplus Series Printer Setup Guide*.

The Proprinter XL emulation provides many configurable parameters. The default parameter values for this emulation are shown in Table 2–1. You can modify these parameter values in two ways:

- **The Proprinter XL host control codes.** An extensive set of Proprinter 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 XL control code commands.

- **The printer configuration menus.** You can modify a subset of the Proprinter XL emulation parameters using the printer configuration menus, control panel keys, and LCD display, as described in Chapter 4 of the LG*plus Series Printer Setup Guide*.

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 *LGplus Series Printer Setup Guide*.

Proprinter XL Emulation Default Settings

The factory settings for the Proprinter XL emulation menu options are shown in Table 2–1. Table 2–2 lists additional factory settings for parameters provided by the LinePrinter+ formatting menus. (The EMULATION menu options are described in Chapter 4 of the *LG^plus Series Printer Setup Guide*.) Host control codes can override many of the settings for these menu options.

Table 2–1. Proprinter 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	Disable
Character Set	Code Page 437, Set 1
20 CPI Condensed	Enable

Table 2–2. 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, or 66 lines
Form Width	13.6 inches, 136 characters

Configuring the Proprinter 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 XL emulation parameters.

Commands and control codes sent from a host system generally override previous settings that result from 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), unless you have saved them to memory using the configuration menus. The *LG^{plus} Series Printer Setup Guide* describes the configuration menu option for saving changes to the printer's memory.

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 for the LG^{plus} printer and the Proprinter XL protocol. 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.

Expression   The control codes used in the BASIC programming language.

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 program written in BASIC programming language is provided when it is possible to illustrate the effect of a control code or if a specific syntax is required. The programs in this chapter were run on an IBM Personal Computer using Microsoft** GW-BASIC** version 3.22.

IMPORTANT

All print samples in this chapter were run on an impact printer that has a dot resolution of 1/60–inch horizontally and 1/72–inch vertically.

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.

NOTE: The PI line is never recognized in Proprinter 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.

IMPORTANT

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 – 5F	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 2–14. Some additional background information about graphics printing for the Proprinter XL emulation is provided here.

The Proprinter 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:

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 ($n1 + 256n2$), 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, then the ESC sequence is ignored.

See Chapter 5 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-232D serial interface protocol, the most significant bit (bit 8) is cleared to 0.

Code Page and Character Set Control Codes Overview

A code page is a set of symbols consisting of letters, numbers, and graphic elements. For the Proprinter XL emulation, the LG*plus* printer supports characters from IBM's Code Page 437 and Code Page 850, among an extensive array of different print quality and print language sets. Appendix B provides samples of the Proprinter character sets. The print language sets are selected using the Print Language configuration menu option, which is described in detail in your *LG*plus* Series Printer Setup Guide*.

Two columns of characters, 80 to 9F, may be configured as either control codes or printable symbols. The following control codes are used to configure this option:

Control Code	Character Set Selected
ESC 7	Character Set 1 (80–9F configured as control codes)
ESC 6	Character Set 2 (80–9F configured as printable symbols)

Ignored and Reserved Codes

The control codes recognized by the LG*plus* Proprinter 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 XL control codes.

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

The following control code is ignored as a Proprinter XL control code, but is valid for the Serial Interface Protocol:

Hex Code	ASCII Code	Function
03 or 1B 03	ETX	If this code is used in the Serial Interface Protocol (SIP), the SIP function takes precedence.

The Download Characters control code 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 XL emulation will currently ignore this control code and any data applicable to it. The Hex and ASCII codes for this function are as follows:

Hex Code	ASCII Code	Function
1B 3D	ESC =	Download Characters

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 Proprinter XL emulation mode. The commands are listed in alphabetical order.

FUNCTION	ASCII CODE	PAGE
Paper Motion		
Form Feed	FF	2–27
Line Feed	LF	2–33
Line Feed *n*/216"	ESC J *n*	2–34
Tab, Vertical	VT	2–52
Tab Set/Clear, Vertical	ESC B	2–53
Tabs, Clear All (Return to default tabs)	ESC R	2–54
Format		
Backspace	BS	2–12
Cancel	CAN	2–18
Carriage Return	CR	2–19
Carriage Return Set	ESC 5 *n*	2–19
Forms Length Set in Inches	ESC C 0 *n*	2–28
Forms Length Set in Lines	ESC C *n*	2–29
Margin, Bottom	ESC N *n*	2–40
Margin Cancel, Bottom	ESC O	2–40
Margins Set, Horizontal	ESC X	2–41
Set Top-of-Form	ESC 4	2–49
Tab, Horizontal	HT	2–50
Tab Set/Clear, Horizontal	ESC D *n1* n2 *nk* 0	2–51
Tabs, Clear All (Return to default tabs)	ESC R	2–54
Line Spacing		
1/8" Line Spacing	ESC 0	2–35
7/72" Line Spacing	ESC 1	2–36
n/72" Line Spacing (Executes spacing as set by ESC A)	ESC 2	2–37
n/72" Line Spacing (Sets spacing)	ESC A *n*	2–38
n/216" Line Spacing	ESC 3 *n*	2–39

FUNCTION	ASCII CODE	PAGE
Selection of Character Set		
Character Set Select: Set 1 (A)	ESC 7	2–21
Character Set Select: Set 2 (B)	ESC 6	2–21
Print Quality		
Bold Printing	ESC G	2–17
Bold Printing Cancel	ESC H	2–17
Character Pitch 12 cpi	ESC :	2–20
Condensed Print	SI	2–22
Condensed Print Cancel	DC2	2–23
Double Wide Print	ESC W *n*	2–24
Double Wide Print (One Line Only)	SO	2–25
Double Wide Print (One Line Only) Cancel	DC4	2–25
Emphasized Print	ESC E	2–26
Emphasized Print Cancel	ESC F	2–26
Overscoring	ESC _ *n*	2–42
Print Mode	ESC I *n*	2–44
Print Quality	ESC x	2–45
Proportional Spacing	ESC P	2–45
Select Attributes	ESC [@	2–46
Superscript/Subscript Printing	ESC S *n*	2–48
Superscript/Subscript Printing Cancel	ESC T	2–49
Underline	ESC - *n*	2–54
Bit Image		
Bit Image, Single Density (Normal Speed)	ESC K *n1 n2*	2–13
Bit Image, Double Density (Half Speed)	ESC L *n1 n2*	2–14
Bit Image, Double Density (Normal Speed)	ESC Y *n1 n2*	2–15
Bit Image, Quadruple Density (Half Speed)	ESC Z *n1 n2*	2–16
Other Functions		
Bell	BEL	2–12
Deselect Printer	ESC Q *n*	2–23
Escape Sequence	ESC	2–6
Initialize Parameters	ESC [K	2–30
Print All Characters	ESC \	2–43
Print Next Character	ESC ^	2–43
Unidirectional Printing	ESC U *n*	2–55

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	Print and backspace two character positions.

```
10 LPRINT "TTTTT";
20 LPRINT CHR$(8);CHR$(8);
30 LPRINT "=="
```

```
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.
Example	The following line will sound the printer buzzer: 10 LPRINT CHR$(7);

Bit Image Mode, Single Density (Normal Speed)

ASCII Code   ESC K *n1 n2*

Hex Code   1B 4B

Dec Code   27 75 *n1 n2*

Expression   CHR$(27);″K″;CHR$(*n1*);CHR$(*n2*);″DATA″

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.

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 page 5–6, "Bit Image Density."

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.

```
10 WIDTH "lpt1:",255
20 LPRINT "Single Density Bit Image Graphics"
30 LPRINT CHR$(27);"K";CHR$(244);CHR$(0);
40 FOR N=1 TO 27
50 RESTORE
60 FOR I=1 TO 9
70 READ R
80 LPRINT CHR$(R);
90 NEXT I
100 NEXT N
110 LPRINT CHR$(255)
120 DATA 255,128,64,32,16,8,4,2,1
```

Single Density Bit Image Graphics
NNNNNNNNNNNNNNNNNNNNNNNNNNNNN

Bit Image Mode, Double Density (Half Speed)

ASCII Code   ESC L *n1 n2*

Hex Code   1B 4C

Dec Code   27 76 *n1 n2*

Expression   CHR$(27);″L″;CHR$(*n1*);CHR$(*n2*);″DATA″

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.

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 page 5–6, "Bit Image Density."

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).

```
10 WIDTH "lpt1:",255
20 LPRINT "Double Density Bit Image Graphics"
30 LPRINT CHR$(27);"L";CHR$(231);CHR$(1);
40 FOR N=1 TO 54
50 RESTORE
60 FOR I=1 TO 9
70 READ R
80 LPRINT CHR$(R);
90 NEXT I
100 NEXT N
110 LPRINT CHR$(255)
120 DATA 255,128,64,32,16,8,4,2,1
```

```
Double Density Bit Image Graphics
NNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
```

Bit Image Mode, Double Density (Normal Speed)

ASCII Code   ESC Y *n1 n2*

Hex Code   1B 59

Dec Code   27 89 *n1 n2*

Expression   CHR$(27);″Y″;CHR$(*n1*);CHR$(*n2*);″DATA″

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.

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 page 5–6, "Bit Image Density."

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).

```
10 WIDTH "lpt1:",255
20 LPRINT "Double Density Double Speed Bit Image Graphics"
30 LPRINT CHR$(27);"Y";CHR$(231);CHR$(1);
40 FOR N=1 TO 54
50 RESTORE
60 FOR I=1 TO 9
70 READ R
80 LPRINT CHR$(R);
90 NEXT I
100 NEXT N
110 LPRINT CHR$(255)
120 DATA 255,128,64,32,16,8,4,2,1
```

```
Double Density Double Speed Bit Image Graphics
NVWWWWWWWWWWWWWWWWWWWWWWWWWWWWWWWWWWWWWWWWWWWWWW
```

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*

Expression   CHR$(27);″Z″;CHR$(*n1*);CHR$(*n2*);″DATA″

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.

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 page 5–6, "Bit Image Density."

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).

```
10 WIDTH "lpt1:",255
20 LPRINT "Quad Density Bit Image Graphics"
30 LPRINT CHR$(27);"Z";CHR$(205);CHR$(3);
40 FOR N=1 TO 108
50 RESTORE
60 FOR I=1 TO 9
70 READ R
80 LPRINT CHR$(R);
90 NEXT I
100 NEXT N
110 LPRINT CHR$(255)
120 DATA 255,128,64,32,16,8,4,2,1
```

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 similar result to double strike printing). Bold printing reduces the current print speed by one half.

> **NOTE:** The ESC E (page 2–26) and ESC G commands are equivalent; they produce the same print effect.

Example The following sample program illustrates bold character printing.

```
10 LPRINT "Control code ESC G"
20 LPRINT CHR$(27);"G";
30 LPRINT "selects bold character printing,"
40 LPRINT "for example: AaBbCcDdEeFfGgHhIiJjKkLlMmNnOoPp. "
50 LPRINT "Control code ESC H"
60 LPRINT CHR$(27);"H";
70 LPRINT "cancels 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 Chapter 4 of the *LG^plus Series Printer Setup Guide*). 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 to 255
                          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 to 9F in the character sets as control codes. Cancels the command ESC 6.

Discussion   This control code overrides the control panel setting (described in Chapter 4 of the *LG^plus Series Printer Setup Guide*).

Character Set Select: Set 2 (B)

ASCII Code   ESC 6

Hex Code   1B 36

Dec Code   27 54

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

Discussion   This control code overrides the control panel setting (described in Chapter 4 of the *LG^plus Series Printer Setup Guide*). Appendix B shows the printable symbols for hex codes 80 to 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.

                 Once this code sets condensed print, you may enable/disable condensed
                 print using the control panel (described in Chapter 4 of the *LG^{plus} Series
                 Printer Setup Guide);* the default is Enable. 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 program shows condensed character printing and
                 reset.

```
10 LPRINT "Control code"
20 LPRINT "SI selects"
30 LPRINT CHR$(15);
40 LPRINT "condensed character printing."
50 LPRINT "Control code DC2"
60 LPRINT CHR$(18);
70 LPRINT "resets condensed character printing."
```

```
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 (page 2–22) for an example of Condensed Print Cancel.

Deselect Printer

ASCII Code   ESC Q 22

Hex Code   1B 51 *22*

Dec Code   27 81 *22*

Expression   LPRINT CHR$(27);CHR$(81);CHR$(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.

Example   Using the BASIC language, you may deselect the Proprinter XL with the following:

                    LPRINT CHR$(27);CHR$(81);CHR$(22);

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 to 255 –
                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 program illustrates expanded character printing and expanded character printing reset.

```
10 LPRINT "Control code"
20 LPRINT "ESC W 1 selects"
30 LPRINT CHR$(27);"W";CHR$(1);
40 LPRINT "expanded character printing."
50 LPRINT "Control code"
60 LPRINT "ESC W O resets"
70 LPRINT CHR$(27);"W";CHR$(O);
80 LPRINT "expanded character printing."
```

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

Double Wide Print (One Line Only)

ASCII Code   SO

Hex Code   0E

Dec Code   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 program illustrates Expanded Print for one line only.

```
10 LPRINT "Control code"
20 LPRINT "SO selects"
30 LPRINT CHR$(14);
40 LPRINT "expanded character printing"
50 LPRINT "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 2–17) and ESC E commands are equivalent; they produce the same print effect.

Example   The following sample program illustrates emphasized character printing.

```
10 LPRINT "Control code"
20 LPRINT "ESC E selects"
30 LPRINT CHR$(27);"E";
40 LPRINT "emphasized character printing."
42 LPRINT "Control code ESC F"
50 LPRINT CHR$(27);"F";
60 LPRINT "cancels 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 (this page).

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 6 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 Chapter 4 in the *LG^plus Series Printer Setup Guide* for further information.

Forms Length Set in Inches

ASCII Code   ESC C 0 *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 (hex value) from 1 to 24 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 Chapter 4 of the *LG^{plus} Series Printer Setup Guide*). 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 to 192 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 Chapter 4 of the *LG^plus Series Printer Setup Guide*). However, this host control code overrides the control panel setting.

Initialize Parameters

ASCII Code   ESC [K *n1* 0 *n2 n3 n4 n5*

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

Dec Code   27 91 75 *n1* 00 *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 00 to FF hex 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 the table below:

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 XL supports six hexadecimal values for this parameter: 00, 01, 04, 05, 254, and 255. 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 XL printer control language standard. You may define any value for this parameter for use with the LG*plus* printer. (For Proprinters, this bit must define the attached printer as either Proprinter, value 03, or Proprinter XL, hex value 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.

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.

n4 Bit	Function	OFF (0)	ON (1)
7	Process this byte.	Process	Ignore
6	Reserved	Reserved	Reserved
5	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"	12"
1	Slashed zero	Disable	Enable
0	Character set	1 (A)	2 (B)

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	——	——
2	Form feed at TOF	Enable	Ignore
1	Print width	13.2 inch	8 inch
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 to 255

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 new line (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.

```
10 LPRINT "Control code ESC J 200
20 LPRINT CHR$(27);"J";CHR$(200);
30 LPRINT "performs a 200/216 inch"
40 LPRINT "line feed function for one line only."
```

```
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 power is reset.

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

```
10 LPRINT "Control code ESC O sets"
20 LPRINT CHR$(27);"O";
30 LPRINT "line spacing at"
40 LPRINT "1/8 (8 lpi) inch for all subsequent lines"
50 LPRINT "until reset or another spacing is selected."
```

```
Control code ESC O 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 power 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.

```
10 LPRINT "Control code ESC 1 sets"
20 LPRINT CHR$(27);"1";
30 LPRINT "line spacing at"
40 LPRINT "7/72 inch for all subsequent lines"
50 LPRINT "until reset or another spacing is selected."
```

```
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 2–38). 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.

```
10 LPRINT "Control code ESC 2 sets"
20 LPRINT CHR$(27);"2";
30 LPRINT "line spacing at"
40 LPRINT "6 lpi for all subsequent lines"
50 LPRINT "until reset or another spacing is selected."
```

```
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 to 255 (all others are ignored)

Discussion   This control code stores a value for line spacing of *n*/72 inch. The ESC 2 control code (described on page 2–37) 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* follow:

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.

```
10 LPRINT "Control code ESC A 20 sets"
20 LPRINT CHR$(27);"A";CHR$(20);CHR$(27);"2";
30 LPRINT "line spacing at 20/72 inch"
40 LPRINT "increments for all subsequent lines"
50 LPRINT "until reset or another spacing is selected. "
```

```
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 to 255

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.

```
10 LPRINT "Control code ESC 3 50 sets"
20 LPRINT CHR$(27);"3";CHR$(50);
30 LPRINT "line spacing at 50/216 inch"
40 LPRINT "increments for all subsequent lines"
50 LPRINT "until reset or another spacing is selected."
```

```
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. 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

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 to 255. The margins are measured in character positions at the current characters per inch (cpi).

The value set for *n* is the left margin, where *n* is the number of character positions from the left edge of the paper. The left margin in inches is the quotient of the value for *n* divided by the current cpi. Once the left margin is set, later changes in the cpi do not affect the margin setting.

The value set for *m* is the right margin, where *m* is the number of character positions from the right edge of the paper. The right margin in inches is the quotient of the value for *m* divided by the current cpi. Once the right margin is set, later changes in the cpi do not affect the margin setting.

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 to 255
>
>   *n* = 00, 02, 04... disables automatic overscoring (any even value from hex 00 to hex FE)
>
>   *n* = 01, 03, 05... enables automatic overscoring (any odd value from hex 01 to 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 program illustrates automatic overscoring and overscoring reset.

```
10 LPRINT "Control code ESC _ 1"
20 LPRINT CHR$(27);"_";CHR$(1);
30 LPRINT "enables automatic overscoring."
40 LPRINT "Control code ESC _ 0"
50 LPRINT CHR$(27);"_";CHR$(0);
60 LPRINT "disables automatic overscoring."
```

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

IBM Proprinter XL Emulation

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:** $n1 + 256n2$ defines the number of data bytes to follow.

Discussion   The number of data bytes specified by $n1 + 256n2$ will print as text. Valid numerical parameters are in the range hex 00 to 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 hex 00 to hex FF.

Print Mode

ASCII Code   ESC I *n*

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 following choices:

n **Hex**	**Function**
X0	Draft
X1	Draft 12 CPI
X2	NLQ
X3	NLQ
X4	Draft
X5	Draft 12 CPI
X6	NLQ
X7	NLQ
XB	NLQ Italic
XF	NLQ Italic

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

NOTE: If you specify any value other than the ones shown in the table, unpredictable results may occur.

IBM Proprinter XL Emulation

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* = hex 0 or hex 30 selects Draft print quality
                      n = hex 1 or hex 31 selects NLQ print quality
                      n = hex 2 or hex 32 selects HS print quality
                      n = hex 3 or hex 33 selects OCR A print quality
                      n = hex 4 or hex 34 selects OCR B print quality

Comment   When you select NLQ, the font is sans 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 to 255
                      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* 0 0 0 *n2* *n3*

Hex Code   1B 5B 40 *n1* 0 0 0 *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:

n1 Hex Value	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:

n2 Hex Value	Function
00	No change
01	Set single line 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:

n3 Hex Value	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 00 to FF hex range unless stated otherwise.

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 to 255
> *n* = 01, 03, 05 (any odd value), selects subscript printing.
> *n* = 00, 02, 04 (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 program illustrates superscript/subscript printing.

```
10 LPRINT "Control Code ESC S 0 selects";
20 LPRINT CHR$(27);"S";CHR$(0);" SUPERSCRIPT";CHR$(27);"T"
30 LPRINT "A";CHR$(27);"S";CHR$(0);"2",CHR$(27);"T";
40 LPRINT "+B";CHR$(27);"S";CHR$(0);"2";CHR$(27);"T";
50 LPRINT "=C";CHR$(27);"S";CHR$(0);"2";
60 LPRINT CHR$(27);"T"
70 LPRINT "Control Code ESC S 1 selects";
80 LPRINT  CHR$(27);"S";CHR$(1);" SUBSCRIPT";CHR$(27);"T"
90 LPRINT "31";CHR$(27);"S";CHR$(1);"HEX";CHR$(27);"T";
100 LPRINT "= 49 ';CHR$(27);"S";CHR$(1);"DEC";
110 LPRINT CHR$(27);"T"
120 LPRINT "Control Code ESC T cancels"
130 LPRINT "superscript/subscript printing. "
```

```
Control Code ESC S 0 selects SUPERSCRIPT
A²+B²=C²
Control Code ESC S 1 selects SUBSCRIPT
31HEX= 49 DEC
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.

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.

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 2–51) to set new tab positions.

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Tab Set/Clear, Horizontal

ASCII Code   ESC D *n1 n2...nk* 0

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

Dec Code   27 68 *n1 n2...nk* 00

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, 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.

```
10 LPRINT "Control code"
20 LPRINT "ESC D CHR$(4);CHR$(10);CHR$(0)"
30 LPRINT "sets tab stops at columns 4 and 10."
40 LPRINT "Control code HT"
50 LPRINT "accesses the tab stops as follows:"
60 LPRINT CHR$(27);"D";CHR$(4);CHR$(10);CHR$(0);
70 LPRINT CHR$(9);
80 LPRINT "column 4"
90 LPRINT CHR$(9);CHR$(9);
100 LPRINT "column 10"
```

```
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 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 6.

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* 0

Hex Code   1B 42 *n1 n2 nk* 00

Dec Code   27 66 *n1 n2 nk* 00

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 to 255, inclusive, while *k* is defined in the range of 1 to 64. 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 00H, the vertical tab positions are cleared.

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

```
10 LPRINT "Line one - The control code"
20 LPRINT "ESC B 5 10 0 sets a vertical tab at line 5 and at line 10."
30 LPRINT CHR$(27);"B";CHR$(5);CHR$(10);CHR$(0);
40 LPRINT "Control code VT moves paper to the next vertical tab."
50 LPRINT CHR$(11);
60 LPRINT "Control code VT moves paper to the next vertical tab."
70 LPRINT CHR$(11);
80 LPRINT "This is line ten."
```

```
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 to 255
    n = 01, 03, 05 ... (any odd value) selects underlining.
    n = 00, 02, 04 ... (any even value) cancels underlining.

Example   The following sample program illustrates automatic underlining and underlining reset.

```
10 LPRINT "Control code ESC -1"
20 LPRINT CHR$(27);"-";CHR$(1);
30 LPRINT "enables automatic underlining."
40 LPRINT "Control code ESC -0"
50 LPRINT CHR$(27);"-";CHR$(0);
60 LPRINT "disables automatic underlining."
```

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

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Unidirectional Printing

ASCII Code   ESC U *n*

Hex Code   1B 55 *n*

Dec Code   27 85 *n*

Purpose   Sets or cancels unidirectional printing.

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

       where: *n* may range from 0 to 255

                        n = 01, 03, 05 ... (any odd value) selects unidirectional text printing.
                        n = 00, 02, 04 ... (any even value) cancels unidirectional text printing.

IBM Proprinter XL Emulation

3 Epson FX Emulation

Chapter Contents

Overview

This chapter describes the Epson FX emulation host control codes that are supported for the LG^{plus} 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 Epson FX emulation mode, the LG^{plus} 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 ACTIVE EMULATION menu and Epson FX from the EMULATION menu, as described in Chapter 4 of the LG^{plus} *Series Printer Setup Guide*.

The Epson FX emulation provides many configurable parameters. The default parameter values for this emulation are shown in Table 3–1. 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 message display, as described in Chapter 4 of the *Setup Guide*.

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 *LG^{plus} Series Printer Setup Guide*.

Epson FX Emulation Default Settings

The factory settings for the Epson FX emulation menu options are shown in Table 3–1. Table 3–2 lists additional factory settings for parameters provided by the LinePrinter Plus formatting menus. (The EMULATION menu options are described in Chapter 4 of the *Setup Guide*). Host control codes can override the settings for these menu options.

Table 3–1. Epson FX Menu Option Factory Settings

Characteristic	Default Setting
Define CR Code	CR = CR
Auto Line Feed	Enable
Define LF Code	LF = LF
Printer Select	Disable
Character Set	Epson Set
20 CPI Condensed	Enable

Table 3–2. LinePrinter Plus 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, or 66 lines
Form Width	13.6 inches, or 136 characters

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 and code section.

- The Epson emulation supports the following fonts: DP, NLQ Serif and Sans Serif, High Speed 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.

Epson Character Sets

Epson printers use five character sets. The IBM Graphics code page 437, IBM PC Multilingual code page 0850, OCR A, and OCR B character sets may be selected from the configuration menus. In addition, there is a unique Epson character set. The Epson character set (shown in Figure 3–1) is basically the ASCII character set with the upper, non–ASCII set defined as italics, and the usually unprintable codes designated as international characters.

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	β	!	1	A	Q	a	q	*è*	*β*	*!*	*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	|	*P_t*	*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*

Figure 3–1. Epson Character Set

The international characters in 00–1F and 80–9F appear when you invoke control code "ESC I 1". You may use the Epson configuration menus described in Chapter 4 of the *Setup Guide* (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 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 configure numerous Epson emulation parameters.

Commands and control codes sent from a host system generally override previous settings that result from 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), unless you have saved them to memory using the configuration menus. The *Setup Guide* describes the configuration menu option for saving changes to the printer's memory.

Format for Control Code Descriptions

The following information is listed for each command sequence (where applicable):

Name   The title or function of the command.

ASCII Code   The ASCII mnemonic for the command is shown for the LG*plus* printer and the Epson FX protocol. 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.

Expression   The control codes used in the BASIC programming language.

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 written in BASIC programming language is provided when it is possible to illustrate the effect of a control code or if a specific syntax is required. The programs in this chapter were run on an IBM Personal Computer using Microsoft** GW-BASIC** version 3.22.

† ("dagger") This symbol means the code produces non–Epson behavior in your printer.

IMPORTANT

All print samples in this chapter were run on an impact printer that has a dot resolution of 1/60–inch horizontally and 1/72–inch vertically.

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   **BASIC:** CHR$(27);"E";

† **NOTE:**   In a BASIC program ESC sequences must end with a semicolon (;) or with text following the escape sequence. A paper motion command directly following an escape sequence may result in unwanted paper movement.

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).

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.

FUNCTION	ASCII CODE	PAGE
Vertical Motion and Print Execution		
Line Feed	LF	3–36
Carriage Return	CR	3–13
Line Feed n/216 Inch	ESC J	3–37
Form Feed	FF	3–27
Set Form Length by Lines	ESC C	3–56
Set Form Length in Inches	ESC C 0	3–57
Skip Over Perforation	ESC N	3–59
Skip Over Perforation, Cancel	ESC O	3–59
Vertical Tab, Execute	VT	3–63
Vertical Tab Set/Clear	ESC B	3–64
Select Vertical Tab Channel	ESC /	3–53
Set Vertical Tabs in Channels	ESC b	3–58
Line Spacing 1/6 Inch (6 lpi)	ESC 2	3–38
Line Spacing 1/8 Inch (8 lpi)	ESC 0	3–39
Line Spacing 7/72 Inch	ESC 1	3–40
Line Spacing n/216 Inch	ESC 3	3–41
† Line Spacing n/72 Inch	ESC A	3–42
† Disable Paper Out Detection	ESC 8	3–46
† Enable Paper Out Detection	ESC 9	3–46
Horizontal Motion		
Carriage Return	CR	3–13
Backspace	BS	3–12
Horizontal Tab Execute	HT	3–32
Horizontal Tab Set/Release	ESC D	3–33
Set Absolute Horizontal Print Position in 1/60"	ESC $	3–53
Set Relative Horizontal Print Position in 1/120"	ESC \	3–54
Set Intercharacter Spacing in 1/120"	ESC SP	3–54
Character Pitch 12 cpi	ESC M	3–14

FUNCTION	ASCII CODE	PAGE
Horizontal Motion (continued)		
Character Pitch 10 cpi	ESC P	3–14
Set Margin (Left)	ESC l	3–55
Set Margin (Right)	ESC Q	3–55
Proportional Spacing, Select/Deselect	ESC p	3–51
Emphasis		
Cancel Emphasized (Offset) Print	ESC F	3–24
Cancel Italic Printing	ESC 5	3–35
Cancel Superscript or Subscript Printing	ESC T	3–61
Condensed Print	SI (or ESC SI)	3–17
Condensed Print Reset	DC2	3–18
† Double High Print, Set/Reset	ESC w	3–20
Double Strike	ESC G	3–21
Double Strike, Cancel	ESC H	3–21
Double Wide Print	ESC W	3–22
† Double Wide Print (One Line)	SO (or ESC SO)	3–23
Double Wide Print (One Line), Cancel	DC4	3–23
Emphasized (Offset) Print	ESC E	3–24
Select Italic Printing	ESC 4	3–35
† Select Superscript Printing	ESC S 0	3–60
Underline	ESC –	3–61
Print Quality Control		
† Master Print Select	ESC !	3–45
† Select User–Defined Font	ESC %	3–52
† Define a Download Character	ESC &	3–19
† Remove Downloaded Characters	ESC :	3–48
† Character Pitch 15 cpi	ESC g	3–14
† Select Serif or Sans Serif Font	ESC k	3–52
† Select Print Quality	ESC x	3–51

† = Produces non–Epson behavior in your printer.

FUNCTION	ASCII CODE	PAGE

Character Set Manipulation

Make 80–9F Hex Printable	ESC 6	3–43
Make 80–9F Control Codes	ESC 7	3–43
Enable Printing of Hex Codes 00–1F and 80–9F	ESC I	3–25
Set International Character Set	ESC R	3–15

Data Manipulation

	Cancel Line	CAN	3–13
	Delete Character	DEL	3–19
	Pass Bit 7 from Host	ESC #	3–46
†	Clear Bit 7 of Incoming Data Bytes to 0	ESC =	3–16
	Set Bit 7 of Incoming Data Bytes to 1	ESC >	3–54

Graphics

†	Select Graphics Mode	ESC *	3–49
	Reassign Graphics Mode	ESC ?	3–48
	Select 9–Pin Graphics Mode	ESC ^	3–50
	Single Density Bit–Image Graphics	ESC K	3–28
	Double Density Bit–Image Graphics	ESC L	3–29
	Double Density, Double Speed	ESC Y	3–30
	Quadruple Density Graphics	ESC Z	3–31

Miscellaneous Printer Control

	Initialize Printer	ESC @	3–34
	Printer Select	DC1	3–47
	Printer Deselect	DC3	3–47
	Unidirectional Printing, 1 Line	ESC <	3–62
	Unidirectional Printing, Set/Reset	ESC U	3–62
†	Turn Half–Speed Mode On or Off	ESC s	3–32
	Bell (Printer beeps 200 ms)	BEL	3–12
†	Cut–Sheet/Paper Feed Control	ESC EM	3–18

† = Produces non–Epson behavior in your printer.

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. If this code is sent immediately after graphics printing, it moves the logical print head back to the beginning of the graphics.

Example   Print and backspace two character positions.

```
10 LPRINT "TTTTT";
20 LPRINT CHR$(8);CHR$(8);
30 LPRINT "=="
```

```
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 emphasized. A line feed will be appended if the printer is configured from the control panel for CR = CR+LF. If a CR occurs after a character sequence that generates no dots, the dot–less data are not printed. 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 available in all print modes except OCR A and OCR B.
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.

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 3–3 when the specified code is invoked.

      where   *n* = hex 0 through e to determine the language overlay shown in Table 3–3 below. Epson only defines character sets through hex c.

Table 3–3. Epson International Character Sets

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

Discussion   This control code setting overrides a character set selection made at the control panel. Values of *n* not in Table 3–3 are ignored.

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

```
10 LPRINT "Control code ESC R 5 selects"
20 LPRINT "the Swedish character set shown beneath"
30 LPRINT "the USA (ASCII) characters. "
40 LPRINT
50 LPRINT "A B C D [ \ ] ^ - ` { | } ~"
60 LPRINT CHR$(27);"R";CHR$(5);
70 LPRINT "A B C D [ \ ] ^ - ` { | } ~"
80 LPRINT CHR$(27);"R";CHR$(0);
```

```
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 pass 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.

† **NOTE:**   This command does not suppress hexadecimal '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. The 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. HS 10 cpi condenses to HS 17.1 cpi.

- DP 12 and 15 cpi condense to DP 20. HS 12 and 15 cpi condense to HS 20.

Example   The program below shows condensed character printing and reset.

```
10 LPRINT "Control code"
20 LPRINT "SI selects"
30 LPRINT CHR$(15);
40 LPRINT "condensed character printing."
50 LPRINT "Control code DC2"
60 LPRINT CHR$(18);
70 LPRINT "resets condensed character printing."
```

```
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 3–17) 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* = hex 1 or hex 31 turns double high printing on
                  n = hex 0 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.

Example   The following program illustrates double-high character printing.

```
10 LPRINT "Control Code ESC w"
20 LPRINT
30 LPRINT CHR$(27);"w";CHR$(1);
40 LPRINT "Selects Double High printing."
50 LPRINT CHR$(27);"w";CHR$(0);
60 LPRINT "Cancels Double High printing."


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

Epson FX Emulation

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 program illustrates double strike character printing.

```
10 LPRINT "Control code ESC G"
20 LPRINT CHR$(27);"G";
30 LPRINT "selects bold character printing,"
40 LPRINT "for example: AaBbCcDdEeFfGgHhIiJjKkLlMmNnOoPp."
50 LPRINT "Control code ESC H"
60 LPRINT CHR$(27);"H";
70 LPRINT "cancels bold 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* = hex 1 or hex 31 turns double wide print on
n = hex 0 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.

Example   The following program illustrates double wide character printing.

```
10 LPRINT "Control code"
20 LPRINT "ESC W 1 selects"
30 LPRINT CHR$(27);"W";CHR$(1);
40 LPRINT "expanded character printing. "
50 LPRINT "Control code"
60 LPRINT "ESC W O resets"
70 LPRINT CHR$(27);"W";CHR$(O);
80 LPRINT "expanded character printing. "
```

```
Control code
ESC W 1 selects
expanded character printing.
Control code
ESC W O 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. It is *also* cancelled by a paper motion control code (LF, VT, etc.), as in the IBM Proprinter XL.

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

```
10 LPRINT "Control code"
20 LPRINT "SO selects"
30 LPRINT CHR$(14);
40 LPRINT "expanded character printing"
50 LPRINT "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 program illustrates emphasized character printing.

```
10 LPRINT "Control code"
20 LPRINT "ESC E selects"
30 LPRINT CHR$(27);"E";
40 LPRINT "emphasized character printing."
42 LPRINT "Control code ESC F"
50 LPRINT CHR$(27);"F";
60 LPRINT "cancels 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*

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 through1F 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.

The printable codes in the Epson character set are shown in Figure 3–2. The mapping of 00 through 1F and 80 through 9F are the same in this case. (Figure 3–2 shows the types of characters and their addresses; it is not a sample of printer output.)

Appendix C provides samples of the many character sets available with the Epson emulation.

KEY

BITS B7 B6 B5 / B4 B3 B2 B1	0 0 1	
1 0 1 1	**ESC**	33 ← OCTAL 27 ← DECIMAL 1B ← HEX

CHARACTER

B8 B7 B6 B5 — BITS B4 B3 B2 B1	ROW	COLUMN 0 (0 0 0 0)		1 (0 0 0 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	°	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

Figure 3–2. 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.

Expression   CHR$(27);″K″;CHR$(*n1*);CHR$(*n2*);″DATA″

> **where**   *(n1 + 256n2)* defines the number of data bytes to follow.
>   DATA = ASCII characters for the dot pattern bytes.

> † **NOTE:**   "DATA" consist of 8–bit dot columns, with the MSB at the top, and
>   "1" bits producing dots. For more information, refer to Chapter 5.

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.

```
10 WIDTH "lpt1:",255
20 LPRINT "Single Density Bit Image Graphics"
30 LPRINT CHR$(27);"K";CHR$(244);CHR$(0);
40 FOR N=1 TO 27
50 RESTORE
60 FOR I=1 TO 9
70 READ R
80 LPRINT CHR$(R);
90 NEXT I
100 NEXT N
110 LPRINT CHR$(255)
120 DATA 255,128,64,32,16,8,4,2,1
```

```
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.

Expression   CHR$(27);″L″;CHR$(*n1*);CHR$(*n2*);″DATA″

   where   *(n1 + 256n2)* defines the number of data bytes to follow.
            DATA = ASCII characters for the dot pattern bytes.

   † NOTE: "DATA" consist of 8–bit dot columns, with the MSB at the top, and
            "1" bits producing dots. For more information, refer to Chapter 5.

Discussion   Double density printing reduces print speed. You can change graphics
         density with the *ESC ?* command.

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).

```
10 WIDTH "lpt1:",255
20 LPRINT "Double Density Bit Image Graphics"
30 LPRINT CHR$(27);"L";CHR$(231);CHR$(1);
40 FOR N=1 TO 54
50 RESTORE
60 FOR I=1 TO 9
70 READ R
80 LPRINT CHR$(R);
90 NEXT I
100 NEXT N
110 LPRINT CHR$(255)
120 DATA 255,128,64,32,16,8,4,2,1
```

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

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.

Expression   CHR$(27);″Y″;CHR$(n1);CHR$(n2);″DATA″

> **where**   *(n1 + 256n2)* defines the number of data bytes to follow.
> DATA = ASCII characters for the dot pattern bytes.

> † **NOTE:** "DATA" consist of 8–bit dot columns, with the MSB at the top, and
> "1" bits producing dots. For more information, refer to Chapter 5.

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).

```
10 WIDTH "lpt1:",255
20 LPRINT "Double Density Double Speed Bit Image Graphics"
30 LPRINT CHR$(27);"Y";CHR$(231);CHR$(1);
40 FOR N=1 TO 54
50 RESTORE
60 FOR I=1 TO 9
70 READ R
80 LPRINT CHR$(R);
90 NEXT I
100 NEXT N
110 LPRINT CHR$(255)
120 DATA 255,128,64,32,16,8,4,2,1
```

Double Density Double Speed Bit Image Graphics
NNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNN

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.

Expression   CHR$(27);"Z";CHR$(*n1*);CHR$(*n2*);"DATA"

     where   *(n1 + 256n2)* defines the number of data bytes to follow.
                  DATA = ASCII characters for the dot pattern bytes.

    † **NOTE:**   "DATA" consist of 8–bit dot columns, with the MSB at the top, and
                  "1" bits producing dots. For more information, refer to Chapter 5.

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).

```
10 WIDTH "lpt1:",255
20 LPRINT "Quad Density Bit Image Graphics"
30 LPRINT CHR$(27);"Z";CHR$(205);CHR$(3);
40 FOR N=1 TO 108
50 RESTORE
60 FOR I=1 TO 9
70 READ R
80 LPRINT CHR$(R);
90 NEXT I
100 NEXT N
110 LPRINT CHR$(255)
120 DATA 255,128,64,32,16,8,4,2,1
```

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* = hex 00 or 30 turns half speed mode off
                  n = 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* 0

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

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

Purpose   Sets up to 32 horizontal tab positions.

Expression   CHR$(27);″D″;CHR$(*n1*);...CHR$(*n32*);CHR$(0);
$n = 1–255$; $k = 1–32$

> **where**   *n1* through *n32* specify the character column of the tab positions plus 1. CHR$(0) 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.

```
10 LPRINT "Control code"
20 LPRINT "ESC D CHR$(4);CHR$(10);CHR$(O)"
30 LPRINT "sets tab stops at columns 5 and 11."
40 LPRINT "Control code HT"
50 LPRINT "accesses the tab stops as follows:"
60 LPRINT CHR$(27);"D";CHR$(4);CHR$(10);CHR$(O);
70 LPRINT CHR$(9);
80 LPRINT "column 5 "
90 LPRINT CHR$(9);CHR$(9);
100 LPRINT "column 11 "
```

```
Control code
ESC D CHR$(4);CHR$(10);CHR$(O)
sets tab stops at columns 5 and 11.
Control code HT
accesses the tab stops as follows:
    column 5
            column 11
```

Initialize Printer

ASCII Code   ESC @

Hex Code   1B 40

Dec Code   27 64

Purpose   Resets all print–related parameters to their default values.

Discussion   Restores the default 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 default 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.

See page 3–3, "Epson FX Emulation Default Settings," for more detail.

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

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.

```
10 LPRINT "Control code ESC J 200
20 LPRINT CHR$(27);"J";CHR$(200);
30 LPRINT "performs a 200/216 inch"
40 LPRINT "line feed function for one line only."
```

```
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 for subsequent line feeds.

Discussion   This control code overrides line spacing set at the control panel.

Example   The following example illustrates 1/6–inch line spacing.

```
10 LPRINT "Control code ESC 2 sets"
20 LPRINT CHR$(27);"2";
30 LPRINT "line spacing at"
40 LPRINT "6 lpi for all subsequent lines"
50 LPRINT "until reset or another spacing is selected."
```

```
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 When ESC 0 is received, all lines are printed at 8 lpi until a new line
                spacing is selected or power is reset. This control code overrides line
                spacing set at the control panel.

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

```
10 LPRINT "Control code ESC 0 sets"
20 LPRINT CHR$(27);"0";
30 LPRINT "line spacing at"
40 LPRINT "1/8 (8 lpi) inch for all subsequent lines"
50 LPRINT "until reset or another spacing is selected."
```

```
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.

```
10 LPRINT "Control code ESC 1 sets"
20 LPRINT CHR$(27);"1";
30 LPRINT "line spacing at"
40 LPRINT "7/72 inch for all subsequent lines"
50 LPRINT "until reset or another spacing is selected."
```

```
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 $n = 0$ through 255

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.

If the vertical distance to move is other than a multiple of *n*/216 inch, 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.

```
10 LPRINT "Control code ESC 3 50 sets"
20 LPRINT CHR$(27);"3";CHR$(50);
30 LPRINT "line spacing at 50/216 inch"
40 LPRINT "increments for all subsequent lines"
50 LPRINT "until reset or another spacing is selected. "
```

```
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* = 0 through 255

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.

```
10 LPRINT "Control code ESC A 20 sets"
20 LPRINT CHR$(27);"A";CHR$(20);CHR$(27);"2";
30 LPRINT "line spacing at 20/72 inch"
40 LPRINT "increments for all subsequent lines"
50 LPRINT "until reset or another spacing is selected."
```

```
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 80–9F Hex Control Codes

ASCII Code   ESC 7

Hex Code   1B 37

Dec Code   27 55

Purpose   Selects codes 80–9F hex 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 80–9F Hex Printable

ASCII Code   ESC 6

Hex Code   1B 36

Dec Code   27 54

Purpose   Selects codes 80–9F in the character sets as hex 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.

                  Appendix C shows the 80–9F hex printable characters for the IBM PC
                  character set (code page 0437). Figure 3–3 shows the 80–9F hex
                  printable characters for the Epson character set.

KEY

BITS (B7 B6 B5)	0 0 1	
BITS (B4 B3 B2 B1) 1 0 1 1	ESC	33 ← OCTAL / 27 ← DECIMAL / 1B ← HEX

CHARACTER
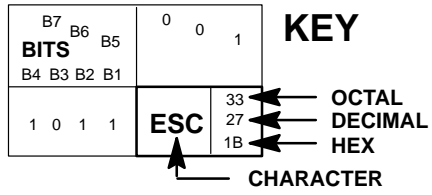
BITS B4 B3 B2 B1	ROW	COLUMN 8 (1 0 0 0)		COLUMN 9 (1 0 0 1)	
0 0 0 0	0	à	200 128 80	§	220 144 90
0 0 0 1	1	è	201 129 81	β	221 145 91
0 0 1 0	2	ù	202 130 82	Æ	222 146 92
0 0 1 1	3	ò	203 131 83	æ	223 147 93
0 1 0 0	4	ì	204 132 84	Ø	224 148 94
0 1 0 1	5	°	205 133 85	ø	225 149 95
0 1 1 0	6	£	206 134 86	¨	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	Pt	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 3–3. 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 below.

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

†   Emphasized is substituted for double strike. Graphics and grey scale characters are not underlined. Proportional spacing overrides condensed 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.

† 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.

† 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 *LG^plus Series Printer Setup Guide* 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 *LG^plus Series Printer Setup Guide* 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 3–4 (page 3–49). 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 : 0 *n* 0

Hex Code 1B 3A 00 *n* 00

Dec Code 27 58 00 *n* 00

Purpose Erases all downloaded characters.

† The printer ignores this command.

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 3–4 charts the graphics modes available.

Discussion   The total number of columns = *n1* + 256*n2*.

† **NOTE:**   This command does not suppress hexadecimal 'FF' from printing.

Table 3–4. 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 character set from hex 80 through hex FF.

where   *n* = hex 1 selects the graphics character set
n = hex 0 selects the italics character set

Discussion   The graphics character set is the IBM 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 3–4 on page 3–49.
n1 + 256*n2* = The total number of columns.

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 to 4. Values in the range 5–255 are invalid.

n = hex 0 or hex 30 selects DP print quality
n = hex 1 or hex 31 selects Near Letter Quality (NLQ)
n = hex 2 or hex 32 selects high speed (HS) DP print quality
n = hex 3 or hex 33 selects OCR A print quality
n = hex 4 or hex 34 selects OCR B print quality

Discussion   This command overrides control panel print quality selections.

† 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.

† High speed DP, 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* is an integer
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**   *if n* = 0, 2, 4 ... (any even value), the font selected is a serif NLQ font (Courier, instead of standard Epson Roman).

                     if 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.

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 the tab table specified by *c*. If no tab table is selected, table 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 $\dfrac{(n1 + (256n2))}{60}$ = the unsigned distance in inches from the left margin.

Discussion   If the distance goes beyond the 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 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 $(n1 + 256n2)/120$ 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 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.

Set Margin, Left

ASCII Code   ESC l *n*

Hex Code   1B 6C *n*

Dec Code   27 108 *n*

Purpose   Sets the left margin to *n* columns in the current font.

        where   *n* = number of columns from the left edge of the physical page to the beginning of the print line; *n* = a hex value.

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 right edge of the physical page to the end of the print line; *n* = a hex value.

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 Form Length by 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* = hex 1 through hex FF 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.

† **NOTE:**   The maximum forms length you may define is 24 inches. If the forms length that is calculated by the quotient of *n* divided by the current lines per inch is greater than 24 inches, then *n* will automatically be adjusted so that the forms length is equal to 24 inches.

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 Inches

ASCII Code   ESC C 0 *n*

Hex Code   1B 43 30 *n*

Dec Code   27 67 48 *n*

Purpose   Sets form length to *n* inches.

where   *n* = whole numbers (hex values) 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 Vertical Tabs in Channels

ASCII Code   ESC b *c n1 n2 n3 ... n16* 0

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
                 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* 0, 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 perforation.

      where   *n* = 1 through 127

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.

Example   The following program illustrates superscript and subscript printing.

```
10 LPRINT "Control Code ESC S 0 selects";
20 LPRINT CHR$(27);"S";CHR$(0);" SUPERSCRIPT";CHR$(27);"T"
30 LPRINT "A";CHR$(27);"S";CHR$(0);"2";CHR$(27);"T";
40 LPRINT "+B";CHR$(27);"S";CHR$(0);"2";CHR$(27);"T";
50 LPRINT "=C";CHR$(27);"S";CHR$(0);"2";
60 LPRINT CHR$(27);"T"
70 LPRINT "Control Code ESC S 1 selects";
80 LPRINT  CHR$(27);"S";CHR$(1);" SUBSCRIPT";CHR$(27);"T"
90 LPRINT "31";CHR$(27);"S";CHR$(1);"HEX";CHR$(27);"T";
100 LPRINT "= 49 ';CHR$(27);"S";CHR$(1);"DEC";
110 LPRINT CHR$(27);"T"
120 LPRINT "Control Code ESC T cancels"
130 LPRINT "superscript/subscript printing. "
```

```
Control Code ESC S 0 selects SUPERSCRIPT
A²+B²=C²
Control Code ESC S 1 selects SUBSCRIPT
31HEX= 49 )EC
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 or 0 (hex 00 or hex 30) to turn off underlining
                    n = SOH or 1 (hex 01 or hex 31) to turn on underlining

Discussion Spaces are underlined, but graphics and grey scale characters are not.

Example The following program illustrates underlining.

```
10 LPRINT "Control code ESC -1"
20 LPRINT CHR$(27);"-";CHR$(1);
30 LPRINT "enables automatic underlining."
40 LPRINT "Control code ESC -0"
50 LPRINT CHR$(27);"-";CHR$(0);
60 LPRINT "disables automatic 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 or 0 (hex 00 or 30) turns unidirectional mode off
   n = SOH or 1 (hex 01 or 31) turns unidirectional mode on

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 in the channel 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. If the printing crosses the page boundary, the VT command causes the paper to move 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* 0

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
          k = 1 through 16
          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.

          To clear the tab settings, send ESC B NUL (1B 42 00).

Expression   CHR$(27);″B″;CHR$(*n1*);...CHR$(*nk*);CHR$(0);

Discussion   The values of *n* range from 1 through 255 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 0. (See also the channel selection command, *ESC /*, and
the channel loading command, *ESC b*.)

4 **P–Series Printer Protocol**

Chapter Contents

Overview

This chapter describes the P–Series emulation host control codes that are supported for the Digital LG*plus* 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 P–Series emulation mode, the LG*plus* 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 ACTIVE EMULATION menu and P–Series from the EMULATION menu, as described in Chapter 4 of the *LGplus Series Printer Setup Guide*.

The P–Series emulation provides many configurable parameters. The default parameter values for this emulation are shown in Table 4–1. 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 display, as described in Chapter 4 of the *Setup Guide*.

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 *LGplus Series Printer Setup Guide*.

P–Series Emulation Default Settings

The factory settings for the P–Series emulation menu options are shown in Table 4–1. Table 4–2 lists additional factory settings for parameters provided by the LinePrinter+ formatting menus. (The EMULATION menu options are described in Chapter 4 of the *Setup Guide*). Host control codes can override the settings for these menu options.

Table 4–1. P–Series Menu Option Factory 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 Select	Enable
Alternate Set 80–9F	Control Code
Character Set	IBM PC

Table 4–2. 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, or 66 lines
Form Width	13.6 inches, 136 characters

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 configure numerous P–Series emulation parameters.

Commands and control codes sent from a host system generally override previous settings that result from 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), unless you have saved them to memory using the configuration menus. The *Setup Guide* describes the menu option for saving changes to the printer's memory.

Format for Control Code Descriptions

The following information is listed for each code function (where applicable and possible).

Name   The title or function of the command.

ASCII Code   The ASCII mnemonic for the command is shown for the Digital LG*plus* printer, and the P-Series protocol. 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.

Expression   The control codes used in the BASIC programming language (where applicable).

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 written in BASIC programming language 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). The programs in this chapter were run on an IBM Personal Computer using Microsoft** GW-BASIC** version 3.22.

IMPORTANT

All print samples in this chapter were run on an impact printer that has a dot resolution of 1/60–inch horizontally and 1/72–inch vertically.

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.

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 use SOH, ETX, ESC, ^ (hat) or ~ (tilde) as control code introducers. For example, bold print can be enabled in the P–Series protocol using any of the following control code introducers:

ASCII:		**Hex:**		**Dec:**		**BASIC:**	
SOH G		01 47		01 71		CHR$(1);"G";	
ETX G		03 47		03 71		CHR$(3);"G";	
ESC G		27 47		27 71		CHR$(27);"G";	
^ G		5E 47		94 71		CHR$(94);"G";	
~ G		7E 47		126 71		CHR$(126);"G";	

NOTE: The SFCC has been set to ESC for all examples.

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; these commands 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 Discussions 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.

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.

FUNCTION	ASCII CODE	PAGE
Paper Motion		
Form Feed	FF	4–29
Line Feed	LF	4–33
Vertical Tab	VT	4–49
Page Format		
Backspace	BS	4–10
Carriage Return	CR	4–13
Forms Length Set (Inches)	SFCC INCHES	4–30
Forms Length Set (Lines)	SFCC LINES	4–31
Form Margins, Set	SFCC v	4–32
Line Spacing 1/6 Inch (6 lpi)	SFCC 2 SFCC LPI	4–34
Line Spacing 1/8 Inch (8 lpi)	SFCC 0 SFCC LPI	4–35
Line Spacing 8 or 10.3 LPI (1 line only)	ACK SFCC f	4–36
Line Spacing 7/72 Inch	SFCC 1	4–37
Line Spacing n/72 Inch (as executed by ESC 2)	SFCC A	4–38
Line Spacing n/216 Inch	SFCC 3	4–39
VFU Commands (P–Series)	N/A	4–49
Print Attributes		
Bold Print	SFCC G	4–11
Bold Print (1 line only)	SFCC j	
Bold Print Reset	SFCC H	4–12

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   Print and backspace two character positions.

```
10 LPRINT "TTTTT";
20 LPRINT CHR$(8);CHR$(8);
30 LPRINT "=="
```

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 (or SFCC j, to bold print one line only)

Hex Code   SFCC 47

Dec Code   SFCC 71

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 Print.

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

Example   The following sample program illustrates bold character printing.

```
10 LPRINT "Control code ESC G"
20 LPRINT CHR$(27);"G";
30 LPRINT "selects bold character printing,"
40 LPRINT "for example: AaBbCcDdEeFfGgHhIiJjKkLlMmNnOoPp."
50 LPRINT "Control code ESC H"
60 LPRINT CHR$(27);"H";
70 LPRINT "cancels 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   The Bold Print Reset control code only 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 program 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

then the characters following the CR are printed over the previous characters on the line. When the Overstrike mode is enabled from the control panel, the characters following the CR are shifted 1/2 dot to the right. If the overstrike mode is disabled, the characters before the CR are ignored, and only the characters after the CR are printed.

The CR=CR configuration causes subsequent printable data to overprint previous data at half speed if Overstrike is enabled from the control panel.

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 1 *xyz* (lowercase "L")

Hex Code SFCC 6C *xyz*

Dec Code SFCC 76 *xyz*

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

Expression CHR$(27);″1″;CHR$(*x*);CHR$(*y*);CHR$(*z*);

    where *x* is the character set (Table 4–3);

        y is the international language for the selected character set (Table 4–4);

        z is the extended character set for the selected character set (Table 4–5);

Discussion An asterisk (*, hex 2A) may be substituted 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. 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.

Refer to Appendix D for individual character set charts.

Table 4–3. Character Set Select (*x*)

x	Character Set
0(30)	IBM PC
1(31)	Multinational
2(32)	ECMA 94 Latin 1
3(33)	DEC Multinational
(2A)	unchanged

Table 4–4. International Language Select (*y*)

y	x 0(30) IBM PC	1(31) Multinational	2(32) ECMA 94 Latin 1	3(33) DEC Multinational
0(30)	ASCII (USA)	ASCII (USA)	ASCII (USA)	ASCII (USA)
1(31)	French	EBCDIC	German	French
2(32)	German		Swedish	German
3(33)	English		Danish	English
4(34)	Danish		Norwegian	Norwegian/Danish
5(35)	Swedish		Finnish	Swedish
6(36)	Italian		English	Italian
7(37)	Spanish		Dutch	Spanish
8(38)	Japanese		French	Japanese
9(39)	French Canadian		Spanish	French Canadian
10(3A)	Latin American		Italian	Dutch
11(3B)			Turkish	Finnish
12(3C)			Japanese	Swiss
(2A)	unchanged			

Table 4–5. Extended Character Set Select (*z*)

z	x	0(30) IBM PC	1(31) Multinational	2(32) ECMA 94 Latin 1	3(33) DEC Multinational
0(30)		IBM PC Extended Set	Multinational Extended Set	Barcode 10 cpi	DEC Multinational Extended Set
1(31)				Multinational LG 10 cpi	
2(32)				Multinational LG 12 cpi	
3(33)				Multinational Courier 10 cpi	
4(34)				Greek LG 10 cpi	
5(35)				Greek LG 12 cpi	
6(36)				Greek Courier 10 cpi	
7(37)				Graphics LG 10 cpi	
8(38)				Graphics Courier 10 cpi	
9(39)				Scientific LG 10 cpi	
10(3A)				Scientific LG 12 cpi	
11(3B)				Scientific Courier 10 cpi	
12(3C)				Multinational (at Primary set mode and pitch)	
(2A)		unchanged			

Characters 80–9F (Control Codes)

ASCII Code   SFCC 7

Hex Code   SFCC 37

Dec Code   SFCC 55

Purpose   Selects hex codes 80 to 9F in the character sets as control codes.

Discussion   This control code overrides the control panel setting (described in Chapter 4 of the *Setup Guide*).

Characters 80–9F (Printable Symbols)

ASCII Code   SFCC 6

Hex Code   SFCC 36

Dec Code   SFCC 54

Purpose   Selects hex codes 80 to 9F in the character sets as printable symbols.

Discussion   This control code overrides the control panel setting (described in Chapter 4 of the *Setup Guide*).

Appendix D shows the printable symbols for columns 80 to 9F.

Character Set Select: ECMA 94 Latin 1 Extended

ASCII Code   SFCC OSET;*n*

Purpose   Selects the Extended Character Set and the print mode and pitch at which the extended character will print. Valid only in the ECMA 94 Latin 1 Extended Character Set; otherwise, this command is ignored.

Discussion   *n* ranges from 0 to 12 to select the print mode/pitch combinations available from Table 4–6. All other values will be ignored.

OSET is valid *only* when the ECMA 94 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.

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 4–6. Print Modes/Pitches Available Using P–Series OSET (ECMA 94 Latin 1, Extended Character Set Only)

n	Print Mode/Pitch Select
0	Bar Code LG 10 cpi
1	Multinational LG 10 cpi
2	Multinational LG 12 cpi
3	Multinational Courier 10 cpi
4	Greek LG 10 cpi
5	Greek LG 12 cpi
6	Greek Courier 10 cpi
7	Graphics LG 10 cpi
8	Graphics Courier 10 cpi
9	Scientific LG 10 cpi
10	Scientific LG 12 cpi
11	Scientific Courier 10 cpi
12	Multinational at Primary Character

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–94 Latin 1, IBM
               PC, Multinational, and DEC Multinational).

    where   *n* specifies a language, as shown in Table 4–7.

Table 4–7. International Character Sets

n		Character Set Selected			
SFCC R (hex)	**PSET (decimal)**	**ECMA 94 Latin 1**	**IBM PC**	**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		English
4(34)	4	Norwegian	Danish		Norwegian/Danish
5(35)	5	Finnish	Swedish		Swedish
6(36)	6	English	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			Finnish
0C(3C)	12	Japanese			Swiss
0D(3D)	13				
0E(3E)	14				
0F(3F)	15				
10(40)	16				
11(41)	17	*(currently undefined)*			
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. The control code setting will override the control panel character set selection. Values other than those selectable from Table 4–7 will be ignored. Refer to Appendix D for individual character set charts.

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

```
10 LPRINT "Control code ESC R 5 selects"
20 LPRINT "the Swedish character set shown beneath"
30 LPRINT "the USA (ASCII) characters."
40 LPRINT
50 LPRINT "A B C D [ \ ] ^ _ ` { | } ~"
60 LPRINT CHR$(27);"R";CHR$(5);
70 LPRINT "A B C D [ \ ] ^ _ ` { | } ~"
80 LPRINT CHR$(27);"R";CHR$(0);
```

```
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
```

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 the "Vertical Page Formatting" chapter 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 program illustrates elongated character printing.

```
10 LPRINT "Control code"
20 LPRINT "ESC h selects"
30 LPRINT CHR$(27);"h";
40 LPRINT "elongated character printing"
50 LPRINT "for one line only."
```

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

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 program illustrates emphasized character printing.

```
10 LPRINT "Control code"
20 LPRINT "ESC E selects"
30 LPRINT CHR$(27);"E";
40 LPRINT "emphasized character printing. "
42 LPRINT "Control code ESC F"
50 LPRINT CHR$(27);"F";
60 LPRINT "cancels 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 default values.

Discussion   The current line is set to the top–of–form position. Print mode, line spacing, international language selection, margins, form length, skip–over perforation, and character pitch are reset to their default values. Character–by–character and line–by–line attributes are canceled. The vertical format unit is cleared. See page 4–3, "P–Series Emulation Default Settings," for more detail.

Expanded Print (Double Wide)

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

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 program illustrates expanded character printing and expanded character printing reset.

```
10 LPRINT "Control code"
20 LPRINT "ESC W 1 selects"
30 LPRINT CHR$(27);"W";CHR$(1);
40 LPRINT "expanded character printing."
50 LPRINT "Control code"
60 LPRINT "ESC W 0 resets"
70 LPRINT CHR$(27);"W";CHR$(0);
80 LPRINT "expanded character printing."
```

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

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 program illustrates Expanded Print for one line only. Another example of expanded printing is shown for Expanded (Double Wide) Print, SFCC W on page 4–24.

```
10 LPRINT "Control code"
20 LPRINT "SFCC k selects"
30 LPRINT CHR$(27);"k";
40 LPRINT "expanded character printing"
50 LPRINT "for one line only."
```

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

Extended Character Set

ASCII Code   SO (Shift Out)
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 A0 to FF hex using codes 20 to 7F hex.

Discussion   Used in 7–bit systems as if data bit 8 was set to 1. For example, sending code 20 hex accesses the symbol at code point A0 hex. 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; 50, SFCC 50, SFCC nE are cancelled by paper motion. Refer to the character set charts in Appendix D.

Example   The following sample program illustrates the Extended Character Set and Extended Character Set Cancel (see page 4–28) control codes.

```
10 LPRINT "Control code"
20 LPRINT "ESC 4 selects the extended character set"
30 LPRINT "and ESC 5 selects the primary character set"
40 LPRINT "which is displayed beneath the extended character set."
50 LPRINT
60 LPRINT CHR$(27);"4";
70 LPRINT "ABCDEFGH"
80 LPRINT CHR$(27);"5"
90 LPRINT "ABCDEFGH"
```

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 (Shift In)
                  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
                  20 to 7F hex.

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

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 configuration stored in the printers' system memory. 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 the "Vertical Page Formatting" chapter.

Forms Length Set (Inches)

ASCII Code   SFCC INCHES; *n.f*

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

      where n = whole number from 1 to 24 to 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. Forms length is defined in inches; therefore, subsequent line spacing changes do not affect the result of this command.

The maximum forms length is 24 inches. All values over 24 are ignored.

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

Also, .5–inch increments can be specified. For example, sending the following command will result in a form length setting of 7–1/2 inches:

SFCC INCHES; 7.5

Forms Length Set (Lines)

ASCII Code   SFCC LINES;*n*

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

      where   *n* = 1 to 192 (P–Series) to 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 be ignored.

    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.

Form Margins, Set

ASCII Code   SFCC v *n1 n2 n3 n4*

Hex Code   SFCC 76 *n1 n2 n3 n4*

Dec Code   SFCC 118 *n1 n2 n3 n4*

Purpose   Selects left (*n1*), right (*n2*), top (*n3*), and bottom (*n4*) form margins.

      where   *n1* = The width of the left margin (hex value) in character columns at the current cpi. If the requested margin is larger than the current (form width–right margin), the value is ignored.

                n2 = The width of the right margin (hex value) in character columns at the current cpi. If the requested margin is larger than the current (form width–left margin), the value is ignored.

                n3 = The length of the top margin (hex value) in character lines at the current lpi. If the requested margin is larger than the current (form length–bottom margin), the value is ignored.

                n4 = The length of the bottom margin (hex value) in character lines at the current lpi. If the requested margin is larger than the current (form length–top margin), the value is ignored.

Discussion   A hex value of FF for *n1*, *n2*, *n3*, or *n4* indicates that the margin remains unaffected.

            When set, the right and bottom margins take effect immediately; the left margin takes effect for the current line only if no horizontal motion has occurred for the line, otherwise it takes effect on the next line. The top margin always takes effect on the next form.

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 A *n*
SFCC LPI ; *n*
SFCC 2

Hex Code SFCC 41 or SFCC 32

Dec Code SFCC 65 or SFCC 50

Purpose Sets line spacing to 6 lpi or as set by SFCC A.

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/ESC 2 asserts *n*/72–inch line spacing as set by SFCC/ESC A (page 4–38). If no distance has been set by SFCC/ESC A, the distance is 1/6 inch.

When the 1/6–inch line spacing control code is received, all lines will be printed at 6 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.

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

```
10 LPRINT "Control code ESC 2 sets"
20 LPRINT CHR$(27);"2";
30 LPRINT "line spacing at"
40 LPRINT "6 lpi for all subsequent lines"
50 LPRINT "until reset or another spacing is selected."
```

```
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 LPI ; *n*   SFCC 0

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.

```
10 LPRINT "Control code ESC O sets"
20 LPRINT CHR$(27);"O";
30 LPRINT "line spacing at"
40 LPRINT "1/8 (8 lpi) inch for all subsequent lines"
50 LPRINT "until reset or another spacing is selected."
```

```
Control code ESC O 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 (One 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.

```
10 LPRINT "Control code ACK"
20 LPRINT "selects 8 lpi line spacing"
30 LPRINT CHR$(6);"for one line only."
40 LPRINT "The default line spacing is"
50 LPRINT "then reselected automatically. "
```

```
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.

```
10 LPRINT "Control code ESC 1 sets"
20 LPRINT CHR$(27);"1";
30 LPRINT "line spacing at"
40 LPRINT "7/72 inch for all subsequent lines"
50 LPRINT "until reset or another spacing is selected."
```

```
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 to 85 (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 4–34) 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.

```
10 LPRINT "Control code ESC A 20 sets"
20 LPRINT CHR$(27);"A";CHR$(20);CHR$(27);"2";
30 LPRINT "line spacing at 20/72 inch"
40 LPRINT "increments for all subsequent lines"
50 LPRINT "until reset or another spacing is selected."
```

```
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 to 255

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.

```
10 LPRINT "Control code ESC 3 50 sets"
20 LPRINT CHR$(27);"3";CHR$(50);
30 LPRINT "line spacing at 50/216 inch"
40 LPRINT "increments for all subsequent lines"
50 LPRINT "until reset or another spacing is selected."
```

```
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* = 0 to disable automatic overscoring (hex 00 or hex 30)
                        n = 1 to enable automatic overscoring (hex 01 or hex 31)

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

Example   The following sample program illustrates automatic overscoring and overscoring reset.

```
10 LPRINT "Control code ESC _ 1"
20 LPRINT CHR$(27);"_";CHR$(1);
30 LPRINT "enables automatic overscoring."
40 LPRINT "Control code ESC _ 0"
50 LPRINT CHR$(27);"_";CHR$(0);
60 LPRINT "disables automatic overscoring."
```

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

Plot, Even Dot (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 (05 hex). Refer to the "Plot Mode" section in the "Graphics" chapter 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 on page 4–42.

```
10 LPRINT "EVEN AND ODD DOT PLOT" : LPRINT
20 LPRINT CHR$(4); "??????@@@@@@??????"
30 LPRINT CHR$(5); "??????@@@@@@??????"
40 FOR I=1 TO 36
50 LPRINT CHR$(4); "A@@@@ @@@@@@A@@@@ "
60 LPRINT CHR$(5); "A@@@@ @@@@@@A@@@@ "
70 NEXT I
80 LPRINT CHR$(4); "??????@@@@@@??????"
90 LPRINT CHR$(5); "??????@@@@@@??????"
```

EVEN AND ODD DOT PLOT

Plot, Odd Dot (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 "Plot Mode" section in the "Graphics" chapter 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 on page 4–41.

```
10 LPRINT "ODD DOT PLOT" : LPRINT
20 LPRINT CHR$(5);"??????@@@@@??????"
30 FOR I=1 TO 36
40 LPRINT CHR$(5);"A@@@@ @@@@@@A@@@@ "
50 NEXT I
60 LPRINT CHR$(5);"??????@@@@@??????"
```

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 (Letter Gothic, Courier, or OCR) and character pitch in characters per inch (cpi).

         where   In SFCC PMODE; *n*
                   n ranges from 0 to 6 to select the print mode/pitch combinations available from Table 4–8. Values other than those shown in Table 4–8 are ignored.

         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 4–10 and Table 4–11 are ignored.

         where: In SFCC [*n*q
                   n = Print Mode/Pitch code (values other than those shown in Table 4–9 are ignored.)
                   q = Command sequence terminator

      NOTE: The print mode must be changed before the first printable symbol 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.

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

Table 4–8. 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

Table 4–9. Print Mode and Pitch – (SFCC [*n*q)

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

Table 4–10. Horizontal and Vertical Dot Density – (SFCC X)

m (Hex*)	Horizontal Density Resolution	Vertical Density	Discussion
0(30)	120 dpi	72 dpi	DP
1(31)	180 dpi	96 dpi	NLQ
2(32)	120 dpi	48 dpi	High Speed
3(33)	120 dpi	48 dpi	High Speed
4(34)	120 dpi	48 dpi	High Speed
5(35)	120 dpi	144 dpi	OCR–A
6(36)	120 dpi	144 dpi	OCR–B
7(37)	120 dpi	72 dpi	DP
8(38)	120 dpi	72 dpi	DP

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

Table 4–11. Print Mode and Character Pitches (SFCC X)

value of *n*: **Print Mode***	value of *m*: **DP** **0(30)**	**NLQ** **1(31)**	**HS** **2(32)**	**HS** **3(33)**	**HS** **4(34)**	**OCR–A** **5(35)**	**OCR–B** **6 (36)**	**DP** **7 (37)**	**DP** **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

(header spanning: **Characters per inch**)

*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: When using the Multinational character set in OCR–A or OCR–B print mode, a unique character set is used. Refer to the multinational character sets section on page 4–19 for more information.

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

where: *m* (print mode) = 0 or 30 for Letter Gothic; and
           n (pitch) = 4 or 34 for 17 cpi.

CHR$(1);"X";CHR$(0);CHR$(4);

CHR$(1);"X";CHR$(30);CHR$(34);

CHR$(1);"X04";

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* = 0 to enable superscript printing (hex 00 or hex 30)
       n = 1 to enable subscript printing (hex 01 or hex 31)

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.

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. They are shifted up or down one half of a line.

Example   The following sample program illustrates superscript/subscript printing.

```
10 LPRINT "Control Code ESC S 0 selects";
20 LPRINT CHR$(27);"S"; CHR$(0);"SUPERSCRIPT"; CHR$(27); "T"
30 LPRINT "A"; CHR$(27); "S"; CHR$(0);"2"; CHR$(27); "T"
40 LPRINT "+B"; CHR$(27);"S"; CHR$(0); "2"; CHR$(27); "T";
50 LPRINT "=C"; CHR$(27); "S"; CHR$(0); "2";
60 LPRINT CHR$(27); "T"
70 LPRINT "Control Code ESC S 1 selects";
80 LPRINT CHR$(27); "S"; CHR$(1); " SUBSCRIPT"; CHR$(27); "T"
90 LPRINT "31"; CHR$(27); "S"; CH$(1); "HEX"; CHR$(27); "T";
100 LPRINT "=49"; CHR$(27); "S"; CHR$(1); "DEC";
110 LPRINT CHR$(27); "T"
120 LPRINT "Control Code ESC T cancels"
130 LPRINT "superscript/subscript printing."
```

Control Code ESC S 0 selects $^{\text{SUPERSCRIPT}}$
$A^2+B^2=C^2$
Control Code ESC S 1 selects $_{\text{SUBSCRIPT}}$
31 $_{\text{HEX}}=49_{\text{DEC}}$
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* = 0 to disable automatic underlining (hex 00 or hex 30)
                      n = 1 to enable automatic underlining (hex 01 or hex 31)

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

Example   The following sample program illustrates automatic underlining.

```
10 LPRINT "Control code ESC -1"
20 LPRINT CHR$(27);"-";CHR$(1);
30 LPRINT "enables automatic underlining."
40 LPRINT "Control code ESC -0"
50 LPRINT CHR$(27);"-";CHR$(0);
60 LPRINT "disables 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 EVFU" section in Chapter 6.

  NOTE: If the SFCC being used is ESC, the PI line must be set high when using the EVFU.

Purpose   Load and execute the VFU.

Discussion   Refer to Chapter 6 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 "P–Series EVFU" section of Chapter 6.

5 **Graphics**

Chapter Contents

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.

NOTE: The plot dot size is adjusted automatically so that one plot dot has a horizontal diameter of 1/60 inch and a vertical diameter of 1/72 inch.

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 5–1. 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.

ASCII character A = Hex 41 = Binary 01000001

MSB : Most Significant Bit
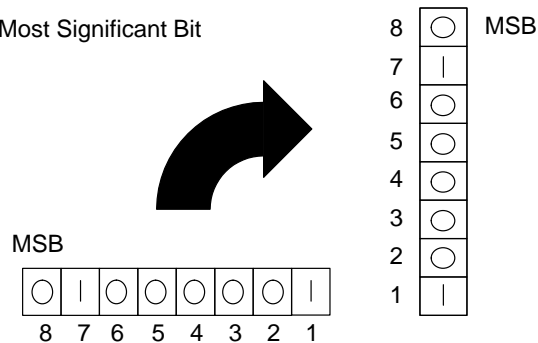
Figure 5–1. Vertical Data Byte Pattern

The relationship between the ASCII character, its decimal value, and its bit image plot is shown in Figure 5–2. 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 5–3.

ASCII Character		Decimal Value		Binary Code Equivalent	to	Vertically Rotated Data Byte		Printed Bit Image
				128		MSB ○		
				64		|		●
				32		○		
				16		○		
A	=	65	=	8		○	=	
				4		○		
				2		○		
				1		|		●
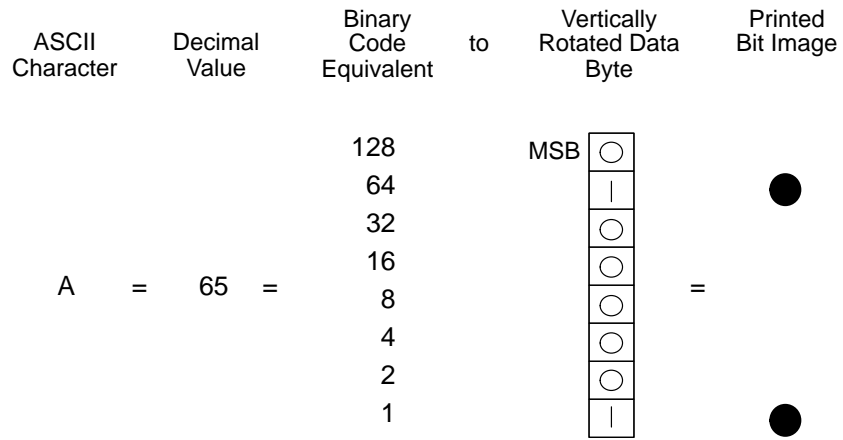
Figure 5–2. Bit Image Pattern from an ASCII Character

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 to 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 5–3.)

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.
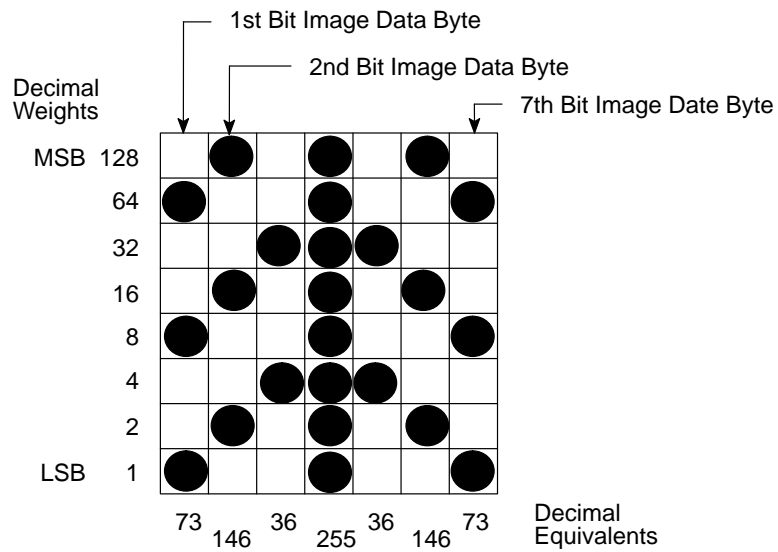
Figure 5–3. Bit Image Pattern Plan

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*)
n2	=	(Number of DATA bytes) / 256
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 5–4. 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 5–4. 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 (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 (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. The dots are plot dots (*not* target machine dots) measuring 1/60" horizontally x 1/72" vertically. 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 (05 hex). 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 5–5 illustrates normal density dot plot.
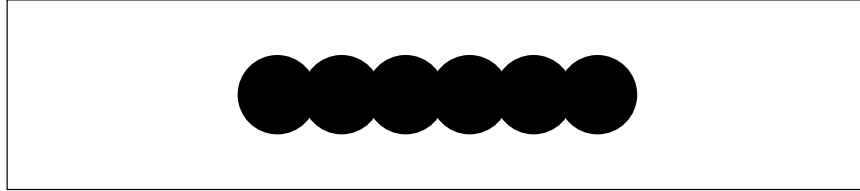
Figure 5–5. Normal Density Plot

High density plotting is selected with the even dot plot control code EOT (04 hex) in conjunction with the odd dot plot control code ENQ (05 hex). 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 5–6 illustrates high density plotting.
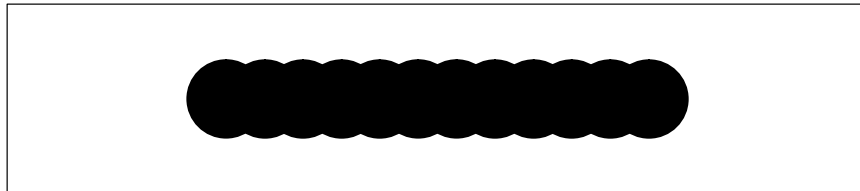
Figure 5–6. High Density Plot

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 5–7, 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).

EVEN DOT PLOT DATA BYTE

NOTE: BIT 6 AND/OR BIT 7 MUST BE "1" FOR PLOT MODE

DOT COLUMN #1 OF NEXT CHARACTER COLUMN

DOT COLUMN #12 OF PREVIOUS CHARACTER COLUMN

NOTE: IN ACTUAL PRINTING, THESE TWO ROWS MERGE TO PRINT ON THE SAME ROW.

ODD DOT PLOT DATA BYTE
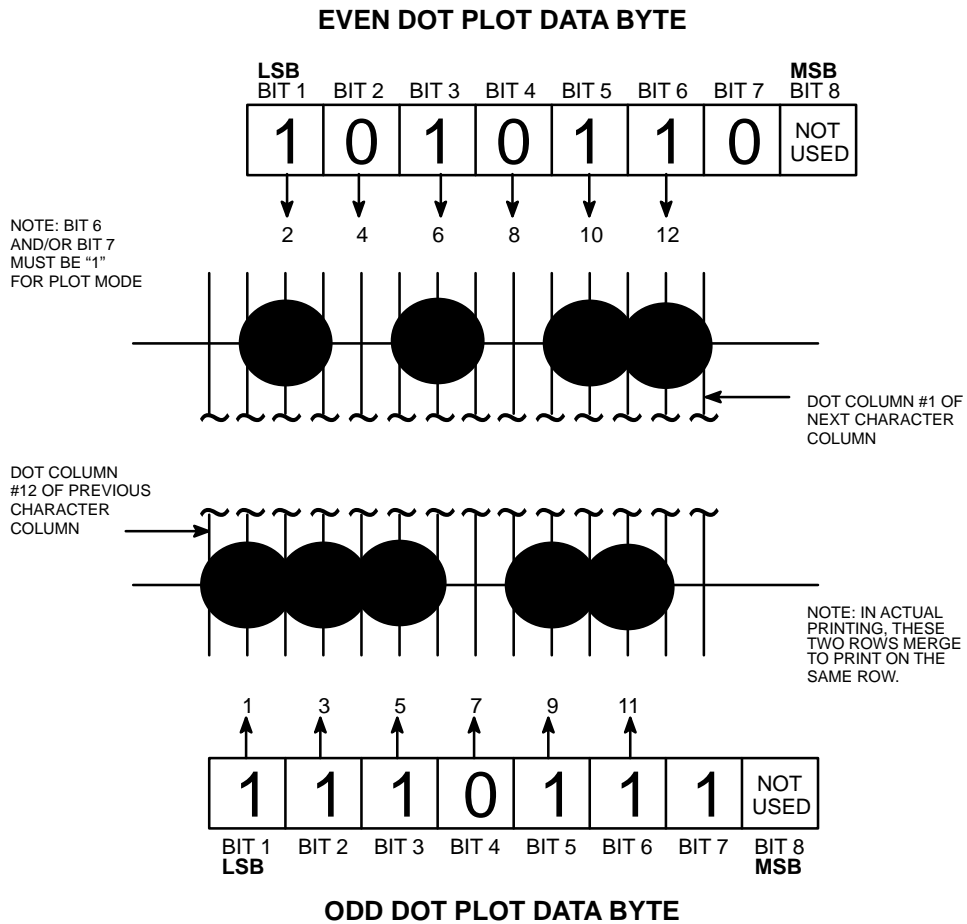
Figure 5–7. P–Series Plot Data Byte Format

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 05 hex, plot data bytes, and a Line Terminator (0A hex or 0C hex). The control sequence for sending the P–Series Normal Density Plot is as follows:

1. Send the plot command code ENQ (05 hex).

2. Send the plot data bytes (refer to Table 5–1 on page 5–16).

3. Send a line terminator, either a Line Feed (LF, 0A hex) or a Form Feed (FF, 0C hex). 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 (0A hex) 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 (0C hex) 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 04 hex, plot data bytes, a Line Terminator (0A hex or 0C hex), Control Code 05 hex, 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 (04 hex), followed by plot data bytes (refer to Table 5–1 on page 5–16).

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 (05 hex) and a second line of data, followed by a line terminator.

    a. A line feed (0A hex) 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 (0C hex) 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 5–8 duplicates the pattern shown in Figure 5–3 but is modified for Odd Dot Plot. Eight dot rows are required, two characters per row, six columns per character.

DOT ROW	1st CHARACTER ODD COLUMNS (1 3 5 7 9 11)	2nd CHARACTER ODD COLUMNS (1 3 5 7 9 11)	1st CHARACTER ASCII	DECIMAL	2nd CHARACTER ASCII	DECIMAL
1			*	42	@	64
2			|	73	A	65
3			\	92	@	64
4			*	42	@	64
5			|	73	A	65
6			\	92	@	64
7			*	42	@	64
8			|	73	A	65
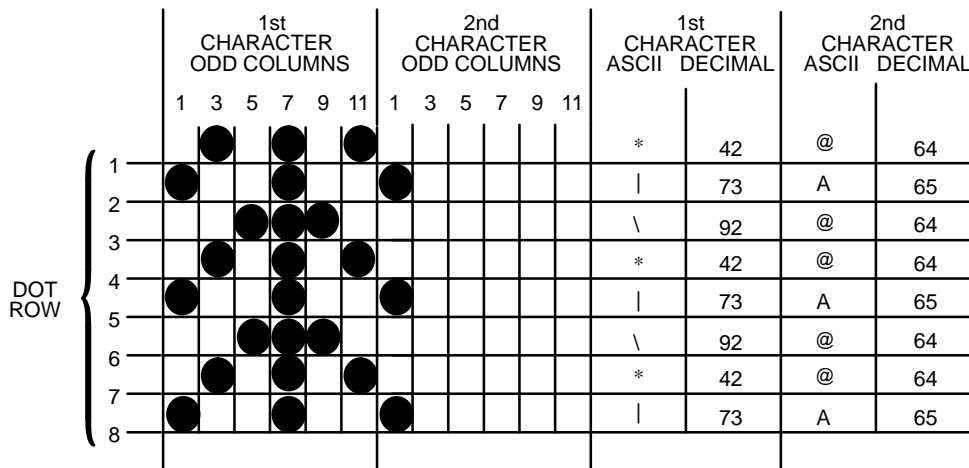
Figure 5–8. Odd Dot Plot Pattern Plan

The following program uses the Odd Dot Plot control code to produce the image. The image is printed 25 times as shown in Figure 5–9. 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
```

Odd Dot Plot

Figure 5–9. 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 5–10.
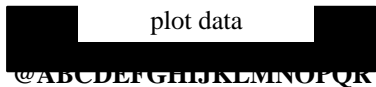
A text line follows plot data, preceded by a single line terminator code. (Text characters may extend into the range of the previously printed plot line and appear truncated.)
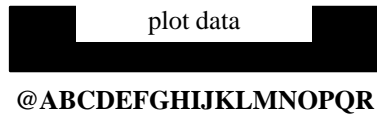
A text line follows plot data, but is preceded by an *additional* line terminator or LF code. (Characters are printed at full–height.)

Figure 5–10. Truncated Character Line

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.

Table 5–1 on the following page 5–16 shows the plot data byte dot patterns that are referenced in the description of P–Series plot mode on page 5–12.

Table 5–1. Plot Data Byte Dot Patterns

BINARY	OCT	DEC	HEX	ASCII	Dot Pattern (2 4 6 8 10 12 / 1 3 5 7 9 11)
0100000	040	32	20	Space	
0100001	041	33	21	!	
0100010	042	34	22	"	
0100011	043	35	23	#	
0100100	044	36	24	$	
0100101	045	37	25	%	
0100110	046	38	26	&	
0100111	047	39	27	'	
0101000	050	40	28	(	
0101001	051	41	29	)	
0101010	052	42	2A	*	
0101011	053	43	2B	+	
0101100	054	44	2C	,	
0101101	055	45	2D	–	
0101110	056	46	2E	.	
0101111	057	47	2F	/	
0110000	060	48	30	0	
0110001	061	49	31	1	
0110010	062	50	32	2	
0110011	063	51	33	3	
0110100	064	52	34	4	
0110101	065	53	35	5	
0110110	066	54	36	6	
0110111	067	55	37	7	
0111000	070	56	38	8	
0111001	071	57	39	9	
0111010	072	58	3A	:	
0111011	073	59	3B	;	
0111100	074	60	3C	<	
0111101	075	61	3D	=	
0111110	076	62	3E	>	
0111111	077	63	3F	?	

BINARY	OCT	DEC	HEX	ASCII	Dot Pattern (2 4 6 8 10 12 / 1 3 5 7 9 11)
1000000	100	64	40	@	
1000001	101	65	41	A	
1000010	102	66	42	B	
1000011	103	67	43	C	
1000100	104	68	44	D	
1000101	105	69	45	E	
1000110	106	70	46	F	
1000111	107	71	47	G	
1001000	110	72	48	H	
1001001	111	73	49	I	
1001010	112	74	4A	J	
1001011	113	75	4B	K	
1001100	114	76	4C	L	
1001101	115	77	4D	M	
1001110	116	78	4E	N	
1001111	117	79	4F	O	
1010000	120	80	50	P	
1010001	121	81	51	Q	
1010010	122	82	52	R	
1010011	123	83	53	S	
1010100	124	84	54	T	
1010101	125	85	55	U	
1010110	126	86	56	V	
1010111	127	87	57	W	
1011000	130	88	58	X	
1011001	131	89	59	Y	
1011010	132	90	5A	Z	
1011011	133	91	5B	[	
1011100	134	92	5C	\	
1011101	135	93	5D	]	
1011110	136	94	5E	^	
1011111	137	95	5F	_	

BINARY	OCT	DEC	HEX	ASCII	Dot Pattern (2 4 6 8 10 12 / 1 3 5 7 9 11)
1100000	140	96	60	`	
1100001	141	97	61	a	
1100010	142	98	62	b	
1100011	143	99	63	c	
1100100	144	100	64	d	
1100101	145	101	65	e	
1100110	146	102	66	f	
1100111	147	103	67	g	
1101000	150	104	68	h	
1101001	151	105	69	i	
1101010	152	106	6A	j	
1101011	153	107	6B	k	
1101100	154	108	6C	l	
1101101	155	109	6D	m	
1101110	156	110	6E	n	
1101111	157	111	6F	o	
1110000	160	112	70	p	
1110001	161	113	71	q	
1110010	162	114	72	r	
1110011	163	115	73	s	
1110100	164	116	74	t	
1110101	165	117	75	u	
1110110	166	118	76	v	
1110111	167	119	77	w	
1111000	170	120	78	x	
1111001	171	121	79	y	
1111010	172	122	7A	z	
1111011	173	123	7B	{	
1111100	174	124	7C			
1111101	175	125	7D	}	
1111110	176	126	7E	~	
1111111	177	127	7F	Delete	

6 **Vertical Page Formatting**

Chapter Contents

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 three 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 2 and 3, 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. 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 6–1.

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.

Form Data	Form Line Number	Vertical Tabs
	1	Top of Form
	2	
	3	
	4	
	5	
PART NUMBER	6	Tab 1
	7	
PART NAME	8	Tab 2
	9	
	10	
	11	
	12	
	13	
QUANTITY	14	Tab 3
	15	
	↓	
	20	

Figure 6–1. Example of Vertical Tab Positions

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 – 1E

The start load code clears and initializes the EVFU memory for the memory load program. The start load code is 1E hex.

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, 0C hex) 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, 0B hex) 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 – 1F or 6F Hex

The end load code terminates the memory load program. The end load code is 1F hex. 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 6–1 lists the EVFU channels and their equivalent data bytes.

Table 6–1. 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	DCI	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 Character (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).

Vertical Page Formatting

A ASCII Character Set

KEY

BITS B7 B6 B5 / B4 B3 B2 B1	0 0 1
1 0 1 1	**ESC** — 33 (OCTAL equivalent), 27 (DECIMAL equivalent), 1B (HEX equivalent) — ASCII Character Name

Each cell format: character — OCTAL / DECIMAL / HEX

BITS B4 B3 B2 B1	ROW	Column 0	Column 1	Column 2	Column 3	Column 4	Column 5	Column 6	Column 7
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 12/10/0A	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 13/11/0B	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 14/12/0C	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 15/13/0D	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 16/14/0E	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 17/15/0F	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 Proprinter XL Character Sets

Chapter Contents

Overview

This appendix shows the character set charts (also referred to as code pages) for the Proprinter XL emulation. The character sets are shown in Near Letter Quality (NLQ) print mode. These character sets may be selected using the configuration menus, described in the *Setup Guide*.

For code pages 0437 and 0850, the Print All Characters (ESC \) control code has been used to show a full set of printable symbols for columns 00–1F. The maximum set of printable symbols is shown for columns 80–9F (selected via the ESC 6 control code).

NLQ

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	▓	┬	π	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	╡	┼	F	σ	⌡
6	♠	▬	&	6	F	V	f	v	å	û	ª	╢	╞	π	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	»	┐	╧	▀	∩	

NLQ

`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
C		∟	,	<	L	\	l			î	£	¼	╝	╠	▄	ý	³
D		↔	-	=	M	]	m	}	ì	Ø	¡	¢	=	¦	Ý	²
E		▲	.	>	N	^	n	~	Ä	×	«	¥	╬	Ì	¯	■
F		▼	/	?	O	_	o		Å	ƒ	»	┐	¤	■	´	

NLQ

0876 OCR A

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0				0	@	P	⌐	p								
1			!	1	A	Q	a	q						Ñ̃		
2			"	2	B	R	b	r								
3			#	3	C	S	c	s			£			ȯ		
4			$	4	D	T	d	t					Ä	Ч	ä	⌐
5			%	5	E	U	e	u			¥		Ȣ		Ǝ	
6			&	6	F	V	f	v			|		Æ	ö	æ	ö
7			'	7	G	W	g	w								
8			(	8	H	X	h	x				¬	_	Ø		
9			)	9	I	Y	i	y								
A			*	:	J	Z	j	z					I			
B			+	;	K	[	k	{					I			♪
C			¬	<	L	\	l	¦						ü		ü
D			-	=	M	]	m	}			^		I			
E			.	>	N	^	n	♪						-		
F			/	?	O	Ч	o							-		

NLQ

`0877 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			£			ȯ		
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					Ï		ë	
B			+	;	K	[	k	{					Ï			
C			,	<	L	\	l	|						Ü		
D			-	=	M	]	m	}			^		Ī	IJ		ij
E			.	>	N	^	n	~			−					
F			/	?	O	_	o					¿	_	ß		

C Epson FX Character Sets

Chapter Contents

Overview

This appendix shows the character set charts (also referred to as code pages) for the Epson FX emulation. The character sets are shown in Near Letter Quality (NLQ) print mode. The character sets may be selected using the configuration menus, described in the *Setup Guide*. The international character sets may be selected using the "ESC R *n"* control code (page 3–15).

The maximum set of printable symbols is shown for columns 80–9F (selected via the ESC I or ESC 6 control code).

	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	¥	¡	╜	═	▌	φ	²
E		▲	.	>	N	^	n	~	Ä	₧	«	╛	╬	▐	ε	■
F		▼	/	?	O	_	o		Å	ƒ	»	┐	╧	▀	∩	

NLQ

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
C		∟	,	<	L	\	l			î	£	¼	╝	╠	▄	ý	³
D		↔	-	=	M	]	m	}	ì	Ø	¡	¢	=	¦	Ý	²
E		▲	.	>	N	^	n	~	Ä	×	«	¥	╬	Ì	¯	■
F		▼	/	?	O	_	o		Å	ƒ	»	┐	¤	■	´	

Epson FX Character Sets   C–5

NLQ

`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	β	!	1	A	Q	a	q	è	β	!	1	A	Q	a	q
2	ù		"	2	B	R	b	r	ü	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	í	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	¦	₧	ü	,	<	L	\	l	¦
D	É		—	=	M	]	m	}	Å	Æ	—	=	M	]	m	}
E	é		.	>	N	^	n	~	ä	é	.	>	N	^	n	~
F	¥		/	?	O	_	o		ç	¥	/	?	O	_	o	Ø

NLQ

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	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	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	í	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	Ø	ö	+	;	K	[	k	{
C		ü	,	<	L	ç	l	ù	Ñ	ü	,	<	L	\	l	|
D		É	–	=	M	§	m	è	Á	É	–	=	M	]	m	}
E		é	.	>	N	^	n	¨	à	é	.	>	N	^	n	~
F		¥	/	?	O	_	o		ç	¥	/	?	O	_	o	Ø

NLQ

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	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	¡	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	Ø	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	β	ä	é	.	>	N	^	n	~
F		¥	/	?	O	_	o		ç	¥	/	?	O	_	o	Ø

NLQ

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	ü	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	í	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	¦	₧	ü	,	<	L	\	l	¦
D		É	—	=	M	]	m	}	Å	É	—	=	M	]	m	}
E		é	.	>	N	^	n	~	à	é	.	>	N	^	n	~
F		¥	/	?	O	_	o		ç	¥	/	?	O	_	o	Ø

NLQ

```
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	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	i	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	i	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	Ŕ	ü	,	<	L	\	l	|
D		É	–	=	M	Å	m	ä	Å	É	–	=	M	]	m	}
E		é	.	>	N	^	n	~	ä	é	.	>	N	^	n	~
F		¥	/	?	O	_	o		ç	¥	/	?	O	_	o	Ø

NLQ

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	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	Ä	k	ä	¤	ö	+	;	K	[	k	{
C		ü	,	<	L	ö	l	ö	₧	ü	,	<	L	\	l	|
D		É	–	=	M	Å	m	å	Á	É	–	=	M	]	m	}
E		é	.	>	N	Ü	n	ü	ã	é	.	>	N	^	n	~
F		¥	/	?	O	_	o		ç	¥	/	?	O	_	o	Ø

NLQ
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	β	!	1	A	Q	a	q	è	β	!	1	A	Q	a	q
2	ù		"	2	B	R	b	r	ü	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	í	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	Ø	ö	+	;	K	[	k	{
C		ü	,	<	L	\	l	ò	ñ	ü	,	<	L	\	l	|
D		É	–	=	M	é	m	è	Å	É	–	=	M	]	m	}
E		é	.	>	N	^	n	ì	ä	é	.	>	N	^	n	~
F		¥	/	?	O	_	o		ç	¥	/	?	O	_	o	Ø

	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	ú	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	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	¡	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	₧	ü	,	<	L	\	l	|
D		É	–	=	M	¿	m	}	Á	É	–	=	M	]	m	}
E		é	.	>	N	^	n	~	ä	é	.	>	N	^	n	~
F		¥	/	?	O	_	o		ç	¥	/	?	O	_	o	Ø

	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	ü	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	í	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	}	Á	É	−	=	M	]	m	}
E		é	.	>	N	^	n	~	ä	é	.	>	N	^	n	~
F		¥	/	?	O	_	o		ç	¥	/	?	O	_	o	Ø

NLQ

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	à	§		0	@	P	`	p
1	è	β	!	1	A	Q	a	q	ê	β	!	1	A	Q	a	q
2	ù		"	2	B	R	b	r	ü	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	Ø	ö	+	;	K	[	k	{
C	ü	,	<	L	Ø	l	ø	Å	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

NLQ

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	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	í	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	à	Å	É	–	=	M	]	m	}
E		é	.	>	N	Ü	n	ü	ä	é	.	>	N	^	n	~
F		¥	/	?	O	_	o		ç	¥	/	?	O	_	o	Ø

NLQ

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	ü	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	í	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	ì	k	í	¤	ö	+	;	K	[	k	{
C		ü	,	<	L	ñ	l	ñ	₧	ü	,	<	L	\	l	|
D		É	—	=	M	¿	m	ó	Á	É	—	=	M	]	m	}
E		é	.	>	N	é	n	ú	à	é	.	>	N	^	n	~
F		¥	/	?	O	_	o		ç	¥	/	?	O	_	o	Ø

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	à	§		0	@	P	í	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	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	í	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	+	;	K	[	k	{
C		ü	,	<	L	ñ	l	á	₧	ü	,	<	L	\	l		
D		É	—	=	M	]	m	é	Á	É	—	=	M	]	m	}
E		é	.	>	N	ú	n	ü	ä	é	.	>	N	^	n	~
F		¥	/	?	O	_	o		ç	¥	/	?	O	_	o	Ø

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	à	§		0	à	P	õ	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	ï	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	¤	ö	+	;	K	[	k	{
C		ü	,	<	L	ç	l	ù	ß	ü	,	<	L	\	l	¦
D		É	—	=	M	ê	m	è	Å	É	—	=	M	]	m	}
E		é	.	>	N	î	n	û	ä	é	.	>	N	^	n	~
F		¥	/	?	O	_	o		ç	¥	/	?	O	_	o	Ø

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	à	§		0	à	P	ü	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	ü	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	í	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	í	Ŭ	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	ä	é	.	>	N	^	n	~
F		¥	/	?	O	_	o		ç	¥	/	?	O	_	o	Ø

OCR A

◇CR A

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0				0	@	P	⊢	p								
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	Ÿ	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							
8				(	8	H	X	h	x				¬	_	Ø	
9				)	9	I	Y	i	y							
A				*	:	J	Z	j	z					I		
B				+	;	K	[	k	{					I		♪
C				¬	<	L	\	l	¦						ü		ü
D				-	=	M	]	m	}			^		I		
E				.	>	N	^	n	♪					-		
F				/	?	O	_	o				-				

OCR B

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			£			ȯ		
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					Ì		ë	
B			+	;	K	[	k	{					Í			
C			,	<	L	\	l	¦						Ü		
D			–	=	M	]	m	}			^		Î	IJ		ij
E			.	>	N	^	n	~					–			
F			/	?	O	_	o				–	¿	_	ß		

D P–Series Emulation Character Sets

Chapter Contents

Overview

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 Chapter 4 of the *Setup Guide*. There are also several control codes that allow you to select different character sets, described in Chapter 4 of this book. These include "SFCC l", "SFCC OSET", and "SFCC PSET".

The maximum set of printable symbols is shown for columns 80–9F (selected via the ESC 6 control code).

	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	»	┐	╧	▀	∩	

NLQ

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	▦	┴	╤	β	±
2			"	2	B	R	b	r	é	Æ	ó	▓	┬	π	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	╡	┼	F	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	é	ï	¢	½	╗	╦	█	δ	√
C			,	<	L	ç	l	ù	î	£	¼	╝	╠	▄	∞	ⁿ
D			–	=	M	§	m	è	ì	¥	¡	╜	=	█	ø	²
E			.	>	N	^	n	¨	Ä	₧	«	╛	╫	█	ε	∎
F			/	?	O	_	o	û	Å	ƒ	»	┐	╧	▄	∩	

NLQ

`IBM PC, PRIMARY SUBSET: GERMAN`

	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	Ü	m	ü	ì	¥	¡	╜	═	▌	ø	²
E			.	>	N	^	n	ß	Ä	₧	«	╛	╬	█	ε	■
F			/	?	O	_	o	⌂	Å	ƒ	»	┐	╧	■	∩	

NLQ

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	▓	┬	π	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	»	┐	╧	■	∩	

P–Series Emulation Character Sets

NLQ

IBM PC, PRIMARY SUBSET: DANISH

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0			0	@	P	`	p	Ç	É	á	á	▓	└	╨	α	≡
1			!	1	A	Q	a	q	ü	æ	í	▒	┴	╤	β	±
2			"	2	B	R	b	r	é	Æ	ó	▓	┬	π	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	╢	╞	π	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	^	n	~	Ä	₧	«	╛	╬	█	ε	■
F			/	?	O	_	o	⌂	Å	ƒ	»	┐	╧	■	∩	

NLQ

IBM PC, PRIMARY SUBSET: SWEDISH

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0				0	É	P	é	p	Ç	É	á	▒	└	╨	α	≡
1			!	1	A	Q	a	q	ü	æ	í	▓	┴	╤	β	±
2			"	2	B	R	b	r	é	Æ	ó	▓	┬	π	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	Ω	Å	ƒ	»	┐	╧	▀	∩	

NLQ

IBM PC, PRIMARY SUBSET: ITALIAN

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0				0	@	P	ù	p	Ç	É	á	▒	└	╨	α	≡
1			!	1	A	Q	a	q	ü	æ	í	▒	┴	╤	β	±
2			"	2	B	R	b	r	é	Æ	ó	▓	┬	π	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	╢	╞	π	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	à	ï	¢	½	╗	╦	█	δ	√
C			,	<	L	\	l	ò	î	£	¼	╝	╠	▄	∞	∩
D			–	=	M	é	m	è	ì	¥	¡	╜	=	█	ø	²
E			.	>	N	^	n	ì	Ä	₧	«	╛	╬	█	ε	∎
F			/	?	O	_	o	⌂	Å	ƒ	»	┐	┴	■	∩	

P–Series Emulation Character Sets

NLQ

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	▓	┬	π	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	i	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	»	┐	╧	■	∩	

NLQ

IBM PC, PRIMARY SUBSET: JAPANESE

	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	▓	┬	π	Γ	≥
3			#	3	C	S	c	s	â	ô	ú	│	├	Ш	π	≤
4			$	4	D	T	d	t	ä	ö	ñ	┤	─	╘	Σ	⌠
5			%	5	E	U	e	u	à	ò	Ñ	╡	┼	F	σ	⌡
6			&	6	F	V	f	v	å	û	ª	╢	╞	π	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	»	┐	┴	▀	∩	

NLQ

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	[	k	{	ï	¢	½	╗	╦	█	δ	√
C			,	<	L	ç	l	ù	î	£	¼	╝	╠	▄	∞	ⁿ
D			-	=	M	ê	m	è	ì	¥	¡	╜	═	█	ø	²
E			.	>	N	î	n	û	Ä	₧	«	╛	╬	█	ε	∎
F			/	?	O	_	o	⌂	Å	ƒ	»	┐	╧	▄	∩	

P–Series Emulation Character Sets

NLQ

IBM PC, PRIMARY SUBSET: LATIN AMERICAN

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0				0	@	P	í	p	Ç	É	á	▓	└	╨	α	≡
1			!	1	A	Q	a	q	ü	æ	í	▓	┴	╤	β	±
2			"	2	B	R	b	r	é	Æ	ó	▓	┬	π	Γ	≥
3			#	3	C	S	c	s	â	ô	ú	│	├	Ш	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	ó	ï	¢	½	╗	╦	█	δ	√
C			,	<	L	ñ	l	á	î	£	¼	╝	╠	▄	∞	∩
D			−	=	M	]	m	é	ì	¥	¡	╜	═	█	ø	²
E			.	>	N	ú	n	ü	Ä	₧	«	╛	╬	█	ε	■
F			/	?	O	ñ	o	û	Å	ƒ	»	┐	╧	▀	∩	

NLQ

IBM PC, PRIMARY SUBSET: DANISH II

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0				0	É	P	é	p	Ç	É	á	▓	└	╨	α	≡
1			!	1	A	Q	a	q	ü	æ	í	▒	┴	╤	β	±
2			"	2	B	R	b	r	é	Æ	ó	▓	┬	π	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	╡	┼	F	σ	⌡
6			&	6	F	V	f	v	å	û	ª	╢	╞	π	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	╝	╠	█	∞	∩
D			–	=	M	Å	m	à	ì	¥	¡	╜	=	█	ø	²
E			.	>	N	Ü	n	ü	Ä	₧	«	╛	╬	█	ε	∎
F			/	?	O	_	o	⌂	Å	ƒ	»	┐	╧	█	∩	

	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	▓	┬	π	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	╡	┼	F	σ	⌡
6			&	6	F	V	f	v	å	û	ª	╢	╞	π	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	í	ï	¢	½	╗	╦	█	δ	√
C			,	<	L	ñ	l	ñ	î	£	¼	╝	╠	█	∞	∩
D			─	=	M	¿	m	ó	ì	¥	¡	╜	═	█	ø	²
E			.	>	N	é	n	ú	Ä	₧	«	╛	╬	█	ε	∎
F			/	?	O	_	o	û	Å	ƒ	»	┐	╧	█	∩	

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0			0	à	P	ü	p	Ç	É	á	▒	└	╨	α	≡
1			!	1	A	Q	a	q	ü	æ	í	▒	┴	╤	β	±
2			"	2	B	R	b	r	é	Æ	ó	▓	┬	π	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	╝	╠	▄	∞	∩
D			−	=	M	¿	m	ó	ì	¥	¡	╜	═	▌	ø	²
E			.	>	N	é	n	ú	Ä	₧	«	╛	╬	▐	ε	∎
F			/	?	O	_	o	û	Å	ƒ	»	┐	╧	▀	∩	

	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	¥	¡	╜	═	▌	φ	²
E			.	>	N	^	n	~	Ä	₧	«	╛	╬	▐	ε	■
F			/	?	O	_	o	⌂	Å	ƒ	»	┐	╧	▀	∩	

NLQ

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	▒	└	╨	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	»	┐	╧	▀	∩	

NLQ

MULTINATIONAL, ASCII (USA)

	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	Pt		¢	²	Â	Ò	â	ò
3			#	3	C	S	c	s	|		£	³	Ã	Ó	ã	ó
4			$	4	D	T	d	t	π		¤	´	Ä	Ô	ä	õ
5			%	5	E	U	e	u	ı		¥	µ	Å	Õ	å	õ
6			&	6	F	V	f	v	ǵ		¦	¶	Æ	Ö	æ	ö
7			'	7	G	W	g	w	ǧ		§	·	Ç	=	ç	Pt
8			(	8	H	X	h	x	Ş		¨	,	È	Ø	è	ø
9			)	9	I	Y	i	y	ş		ƒ	¹	É	Ù	é	ù
A			*	:	J	Z	j	z	İ		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	Y	í	ý
E			.	>	N	^	n	~	=		®	¾	Î	Þ	î	þ
F			/	?	O	_	o	⌐	¸		—	¿	Ï	ß	ï	ˇ

NLQ
MULTINATIONAL, EBCDIC

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0				0	@	P	`	p	IJ	Ŧ	▪	°	À	Đ	à	ð
1			!	1	A	Q	a	q	ij	▪	¡	±	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	π		¤	´	Ä	Ô	ä	ô
5			%	5	E	U	e	u	1		¥	µ	Å	Õ	å	õ
6			&	6	F	V	f	v	ǵ		¦	¶	Æ	Ö	æ	ö
7			'	7	G	W	g	w	ǧ		§	·	Ç	=	ç	₨
8			(	8	H	X	h	x	Ş		¨	‚	È	Ø	è	ø
9			)	9	I	Y	i	y	ş		ƒ	¹	É	Ù	é	ù
A			*	:	J	Z	j	z	İ		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	Y	í	ý
E			.	>	N	¬	n	~	_		®	¾	Î	Þ	î	þ
F			/	?	O	_	o		;		─	¿	Ï	β	ï	ˇ

P–Series Emulation Character Sets

NLQ

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ECMA LATIN 1, PRIMARY SUBSET: ASCII (USA)
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	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0			0	@	P	`	p	IJ	Ŧ		°	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	|		£	³	Ã	Ó	ã	ó
4			$	4	D	T	d	t	Π		¤	´	Ä	Ô	ä	ô
5			%	5	E	U	e	u	ł		¥	µ	Å	Õ	à	õ
6			&	6	F	V	f	v	ĝ		¦	¶	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	İ		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
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NLQ

ECMA LATIN 1, PRIMARY SUBSET: GERMAN

	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
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P–Series Emulation Character Sets

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P–Series Emulation Character Sets

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BARCODE

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7			'	7	G	W	g	w			Ό	Α	Ρ	ι	ω	
8			(	8	H	X	h	x			Ύ	Β	Σ	κ		
9			)	9	I	Y	i	y			Ϋ	Γ	Τ	λ		
A			*	:	J	Z	j	z			Ϋ	Δ	Υ	μ		
B			+	;	K	[	k	{			Ω	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		

P–Series Emulation Character Sets

NLQ

ECMA LATIN 1, EXTENDED SUBSET: GRAPHIC NLQ 10 CPI

	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				⅚	┌	╓	▷	
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				⅛	└	╚	□		

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0				0	@	P	`	p				⊖	κ	Χ	√	
1			!	1	A	Q	a	q			≡	¬	λ	ψ	ƒ	
2			"	2	B	R	b	r			∧	∀	A	Ψ	α	
3			#	3	C	S	c	s			∨	Ǝ	ν	ω	%.	
4			$	4	D	T	d	t			∩	α	ξ	∫	Χ	
5			%	5	E	U	e	u			∪	β	Ξ	ƒ	□	
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	~	L	
A			*	:	J	Z	j	z			∴	Ε	Σ	≈	<	
B			+	;	K	[	k	{			∵	Z	τ	≅	>	
C			,	<	L	\	l	¦			∈	η	υ	≅	'	
D			—	=	M	]	m	}			∃	Θ	T	≤	"	
E			.	>	N	^	n	~			⊆	Θ	ø	≠	∓	
F			/	?	O	_	o				⊇	ι	Φ	≥		

NLQ

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DEC MULTINATIONAL, ASCII (USA)
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	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	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	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	Ÿ	í	ÿ
E			.	>	N	^	n	~					Î		î	
F			/	?	O	_	o					¿	Ï		ß	ï

NLQ
DEC MULTINATIONAL, FRENCH

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0				0	à	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	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	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	Ÿ	í	ÿ
E			.	>	N	^	n	¨					Î		î	
F			/	?	O	_	o					¿	Ï	ß	ï	

```
DEC MULTINATIONAL, GERMAN
```

	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	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	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	Ÿ	í	ÿ
E			.	>	N	^	n	ß					Î		î	
F			/	?	O	_	o				¿		Ï	ß	ï	

NLQ

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	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	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	Ÿ	í	ÿ
E			.	>	N	^	n	~					Î		î	
F			/	?	O	_	o				¿		Ï	β	ï	

P–Series Emulation Character Sets

NLQ
DEC MULTINATIONAL, NORWEGIAN/DANISH

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0				0	Ä	P	ä	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	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	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	Ÿ	í	ÿ
E			.	>	N	Ü	n	ü					Î		î	
F			/	?	O	_	o				¿		Ï	β	ï	

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0				0	É	P	é	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	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	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	å				½	Í	Ÿ	í	ÿ
E			.	>	N	Ü	n	ü					Î		î	
F			/	?	O	_	o				¿		Ï	β	ï	

P–Series Emulation Character Sets

NLQ

DEC MULTINATIONAL, ITALIAN

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0				0	@	P	ù	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	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	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	à			«	»	Ë	Û	ë	û
C			,	<	L	ç	l	ò				¼	Ì	Ü	ì	ü
D			—	=	M	é	m	è				½	Í	Ÿ	í	ÿ
E			.	>	N	^	n	ì					Î		î	
F			/	?	O	_	o				¿		Ï		ß	ï

NLQ
DEC MULTINATIONAL, SPANISH

	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	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	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	ñ	l	ñ				¼	Ì	Ü	ì	ü
D			–	=	M	¿	m	ç				½	Í	Ý	í	ÿ
E			.	>	N	^	n	~					Î		î	
F			/	?	O	_	o				¿		Ï	ß	ï	

NLQ

`DEC MULTINATIONAL, JAPANESE`

	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	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	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	Ÿ	í	ÿ
E			.	>	N	^	n	~					Î		î	
F			/	?	O	_	o				¿		Ï	β	ï	

NLQ
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DEC MULTINATIONAL, FRENCH CANADIAN
```

	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	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	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	â	k	é			«	»	Ë	Û	ë	û
C			,	<	L	ç	l	ù				¼	Ì	Ü	ì	ü
D			–	=	M	ê	m	è				½	Í	Ÿ	í	ÿ
E			.	>	N	î	n	û					Î		î	
F			/	?	O	_	o				¿	¡	Ï	β	ï	

NLQ
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	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	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	ē	m	ü				½	Í	Ÿ	í	ÿ
E			.	>	N	î	n	û					Î		î	
F			/	?	O	è	o				¿		Ï	ß	ï	

NLQ

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	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	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
E			.	>	N	Ü	n	ü					Î		î	
F			/	?	O	_	o					¿	Ï	β	ï	

NLQ

DEC MULTINATIONAL, SWISS

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0				0	½	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	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	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	ij	k	¨			«	»	Ë	Û	ë	û
C			,	<	L	½	l	ƒ				¼	Ì	Ü	ì	ü
D			−	=	M	|	m	¼				½	Í	Ÿ	í	ÿ
E			.	>	N	^	n	´					Î		î	
F			/	?	O	_	o				¿		Ï		ß	ï

OCR A

OCR A

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0			□	@	P	⊣	p									
1			!	1	A	Q	a	q						Ñ		
2			"	2	B	R	b	r								
3			#	3	C	S	c	s			≢			ó		
4			$	4	D	T	d	t					Ä	¥	ä	⊣
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OCR B

OCR B

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Glossary

A

active column   The horizontal location on the paper where the next character will print.

active line   The vertical location on the paper where the next character will print.

active position   The position on the paper where the next character will print. The intersection of the active column and the active line.

ASCII   *Abbrev. for* American Standard Code for Information Interchange. A standard character encoding scheme introduced in 1963 and used widely on many computers and printers. It is a 7-bit code with 128 different bit patterns. There is no parity recommendation.

attributes, print   Operations performed on text that alter its appearance but do not change the font. Examples: underlining, superscripting, bold, etc.

B

bar code   A printed code consisting of parallel bars of varied width and spacing and designed to be read by a one-dimensional scanning device.

baud   A unit of speed that measures the rate at which information is transferred. Baud rate is the reciprocal of the length in seconds of the shortest pulse used to carry data. For example, a system in which the shortest pulse is 1/1200 second operates at 1200 baud. On RS-232 serial lines, the baud rate equals the data flow rate in bits per second (bps). To communicate properly, a printer must be configured to operate at the same baud rate as its host computer.

bold   A print attribute specifying text of a heavy line thickness. *See also* **character weight**.

buffer
A reserved area in memory where data is written and read during data transfers.

bus
A circuit for the transfer of data or electrical signals between two devices.

C

character cell
The invisible rectangular space occupied by a character, including the white space around the character. The height of a cell remains constant even iwth changes in the current line spacing, and the width is equal to the current character spacing. Used as a unit of spacing.

character proportion
The ratio of character height to character width.
See also **compressed** and **expanded**.

character set
A set of codes, each of which represents a printable character, including symbols, punctuation, numbers, diacritical markings, and alphabet characters. Each character is assigned a unique code value.

character weight
The degree of lightness and thickness of printed text. For example: **"Bold" refers to a heavy or thick character weight.** "Medium," "normal," or "book weight" refer to the character weight used in this sentence.

checksum
A stored or transmitted numerical value used to verify data integrity.

command sequence
Two or more bytes that instruct the printer to perform a special function. The first character in the sequence is a special function control character (SFCC), which alerts the printer that the string is a command sequence.
See also **escape sequence**, **SSCC**, and **SFCC**.

compatibility
The ability of one printer to accept and properly process commands meant for a different printer.
See also **emulation** and **protocol**.

compressed	Refers to a typeface with a font width approximately 60% smaller than normal. Character height is not changed.
configuration	Refers to the operating properties that define how the printer responds to signals and commands received from the host computer at the printer interface. These properties are called configuration parameters and must be set to match the operating characteristics of the host computer system.
controller	An independent logic unit in a data processing system that controls data paths between the central processing unit and one or more units of peripheral equipment.
cpi	*Abbrev. for* characters per inch. A measurement of monospaced fonts indicating the horizontal character density. For example, 10 cpi means 10 characters can be printed in one horizontal inch. *See also* **pitch**.
cps	*Abbrev. for* characters per second. A measurement of the print speed of a serial (character) printer.

D

decipoint	One tenth of a point. A unit of length equal to 1/720 inch. *See also* **point**.
default	A value, parameter, attribute, or option assigned by a program or system if another is not specified by the user.
descender	The portion of a printed, lowercase character that appears below the base line. For example, "g," "j," "p," "q," and "y" all are characters with lowercase descenders.
diagnostic	Pertains to the detection and isolation of printer malfunctions or mistakes.
DIP	*Acronym for* dual in-line package. A method of packaging semiconductor components in rectangular cases with parallel rows of electrical contacts (pins).

DIP switch	A DIP equipped with switches. A typical DIP switch has from four to ten individual switches mounted in its package. The individual switches are typically toggle, rocker, or slide switches.
disable	To deactivate, make "false" (0), or set to OFF.
DP	*Abbrev. for* data processing font (see HS).

E

EIA/TIA	Electronics Industries Association.
Elite	A name indicating a monospaced font with a pitch of 12 cpi (and usually 10 points in height).
em	A unit of measure in typesetting: the width of a piece of type about as wide as it is tall. (Derived from uppercase M, usually the widest character in a set.)
emulation	Refers to the ability of a printer to execute the commands of another printer language (protocol). *See also* **compatibility** and **protocol**.
en	A unit of measure in typesetting equal to half the width of an em.
enable	To activate, make "true" (1), or set to ON.
escape sequence	A command sequence in which the first byte is always the ASCII ESC character. *See also* **command sequence**, **SSCC**, and **SFCC**.
expanded	Refers to a typeface with a font width larger than normal. Character height is not changed.

F

family (or type)	A set of all variations and sizes of a type style.

fixed-pitch fonts	*See* **font, monospaced**.
font	The complete set of a given size of type, including characters, symbols, figures, punctuation marks, ligatures, signs, and accents. To fully describe a font, you must specify seven characteristics:

1) typeface (Courier, Helvetica, Swiss, etc.)
2) spacing (proportional or monospaced)
3) type size (12 point, 14 point, etc.)
4) scale factor (character height/width ratio)
5) type style (Roman or italic)
6) character weight (bold, normal, etc.)
7) character proportion (normal, compressed, expanded).

font, monospaced	Also called fixed-pitch font and mono-font. Every character, regardless of horizontal size, occupies the same amount of font pattern space. All monospaced fonts use specific pitch size settings. Monospaced fonts are sometimes used when strict character alignment is desired (tables, charts, spreadsheets, etc.).
font name	*See* **typeface**.
font pattern	A font pattern is the matrix of pixels which represents a character, symbol, or image.
font, proportional	A font in which the width of a character cell varies with the width of the character. For example, [i] takes less space to print than [m]. Using proportional fonts generally increases the readability of printed documents, giving text a typeset appearance.
font weight	The thickness of the lines making up a character. For example, **"bold"** and "light" are different font weights.
font width	The measurement of the width of a character cell in dots.

H

hex codes	Codes based on a numeral system with a radix of 16.

host computer	The computer that stores, processes, and sends data to be printed, and which communicates directly with the printer. The term "host" indicates the controlling computer, since modern printers are themselves microprocessor-controlled computer systems.
HS	*Abbrev. for* high speed font.
Hz	*Abbrev. for* Hertz. Cycles per second, a measure of frequency.

I

IEEE	Institute of Electrical and Electronic Engineers, Inc.
IGP	Intelligent Graphics Processor. An interface that converts graphics commands received from the host computer to binary plot data that is usable by the printer.
initialization	A series of processes and self-tests to set power-up default conditions and parameters.
interface	The hardware components used to link two devices by common physical interconnection, signal, and functional characteristics.
invoke	To put into effect or operation.
ipm	*Abbrev. for* inches per minute. A measurement of the speed of a printer printing in graphics print mode (plotting speed).
italic	A slanted type style. *This is an italic type style.*

L

landscape	Printed perpendicular to the paper motion.
LCD	*Abbrev. for* liquid-crystal display. The LCD is located on the control panel. Its purpose is to communicate information to the operator concerning the operating state of the printer.
LED	*Abbrev. for* light-emitting diode. The printer control panel has LEDs that indicate the status of the printer to the operator.
logical link	The parameters that specify data transfer, control, or communication operations.
lpi	*Abbrev. for* lines per inch. A measurement indicating the vertical spacing between successive lines of text. For example, 8 lpi means eight lines of text for every vertical inch.
lpm	*Abbrev. for* lines per minute. A measurement of the print speed of a line printer printing in text print mode.

M

monospaced	*See* **font, monospaced**.

N

NLQ	*Abbrev. for* near letter quality font.

O

OCR	*Abbrev. for* optical character recognition. A process by which a machine can "read" characters printed in a special standardized font. Data are read by a photoelectric optical scanner and can be

recorded on magnetic tape or disk. OCR-A and OCR-B are two widely used OCR fonts.

P

parity (check)
Parity checking is the addition of non-data bits to data, resulting in the number of bits that are set to a "1" being either always even or always odd. Parity is used to detect data errors.

PCBA
Abbrev. for printed circuit board assembly.

pica
A name indicating a monospaced font with a pitch of 10 cpi (and usually 12 points in height). Pica is also used in typography as a unit of measurement equal to 1/6 inch .

pitch
The number of text characters printed per horizontal inch. Specified in characters per inch (cpi).
See also **cpi**.

pixel
Derived from picture (PIX) ELement. The smallest displayable picture element on a video monitor or printable unit. In printing, a pixel is a dot.

point
A unit of length in printing and typography, used to specify type sizes, heights of font characters, etc. There are 72 points in a vertical inch; thus, one point equals 1/72 inch, or approximately 0.0139 inch. Some examples of point sizes are: This is 8 point type. This manual is printed in 11 point type. This is 14 point type.

port
A channel used for receiving data from or transmitting data to one or more external devices.

portrait
Printed parallel to the short edge of a page.

print mode
Font.

proportion, character
See **character proportion**.

proportional   *See* **font, proportional**.

protocol   A set of rules or conventions governing the exchange of information between computer systems, or between a printer and a host computer. For computer printers, a protocol is the coding convention used to convey and print data. A printer protocol includes codes for printing text and graphics, as well as codes instructing the printer to perform special operations, and machine-to-machine communication codes.
                          See also **compatibility** and **emulation**.

R

RAM   *Acronym for* random-access memory. Also called "main memory" or "working memory." RAM is the active memory of a printer, into which programs are loaded. This memory can be read from or written to at any time. RAM is also termed "volatile" because whatever information is in RAM is lost when power is turned off or interrupted.
                          See also **ROM**.

read   To retrieve data from memory (RAM) or from mass storage (hard disk, floppy diskette, etc.).

reset   To turn off, deactivate, disable, or return to a previously determined state.

resolution   A measure expressing the number of component units in a given range used to create an image. In printing, this is expressed as the number of dots per inch (dpi) horizontally and vertically.

ROM   *Acronym for* read-only memory. Programs, instructions, and routines permanently stored in the printer. Information in ROM is not lost when power is turned off. ROM cannot be written to—hence the term "read-only."
                          See also **RAM**.

roman   A type style in which the characters are upright. This sentence is printed in a roman type style.

S

serial communications	The sequential transmission of data, in which each element is transferred in succession.
set	To turn on, activate, invoke, or enable.
SFCC	*Abbrev. for* special function control character. The first character in a printer command sequence. In P-Series emulation mode, you can select one of five characters as the SFCC. In Epson FX and Proprinter emulation mode, the SFCC must always be the ASCII ESC character. *See also* **command sequence** and **escape sequence**.
size, type	*See* **point**.
slewing	Rapid vertical paper movement.
spacing	*See* **font, proportional** and **font, monospaced**.
SSCC	*Abbrev.* for SuperSet Control Code. It is of the form | } ; and is used to execute superset commands.
start bits	In serial data transfer, a signal indicating the beginning of a character or data element.
stop bits	In serial data transfer, a signal indicating the end of a character or data element.
string	Two or more bytes of data or code treated as a unit.
style, type	*See* **type style**.
superset commands	Commands which are an extension to the base LinePrinter+ printer protocol, such as the bar code commands for the Epson FX protocol.
symbol set	*See* **character set**.

T

type family   *See* **typeface**.

type size   *See* **point**.

type style   Refers to either the upright or italic character style in a specific
                           font family. Roman is upright, *italic is slanted.*

typeface   A descriptive name or brand name that identifies a particular
                           design of type. Examples are: Courier, Helvetica, and Swiss. Also
                           called type family.

typographic font   *See* **font, proportional**.

V

VFU   *Abbrev. for* vertical format unit.

W

weight   *See* **character weight**.

write   To store data to memory (RAM) or to mass storage (hard disk,
                           floppy diskette, etc.).

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