PCL 5 Comparison Guide

for the
HP LaserJet III, IIID, IIISi, IIIP
HP LaserJet 4, 4M
HP LaserJet 4Si, 4SiMx
HP LaserJet 4L, 4ML
HP LaserJet 4P, 4MP
HP LaserJet 4PJ
HP LaserJet 4 Plus, 4M Plus
HP LaserJet 4V, 4MV
HP Color LaserJet
HP DeskJet 1200C
Printers

Warranty

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Conventions

This manual uses the following conventions:

Bold indicates a term defined in the glossary.

Italic refers to a related document, or is used for emphasis.

The cursive letter ℓ is used in some examples to distinguish the letter "**l**" from the numeral "**1**" (one).

A slash zero ∅ is used in some examples and escape sequences to distinguish the letter "**O**" from the number "**0**".

0x XX represents a hexadecimal number (XX).

Note

Notes contain important information set off from the text.

Contents

1

LaserJet Printer Features

Hewlett-Packard printers which support the PCL 5 printer language contain slightly different feature sets, each suitable for that printer's intended use. Each printer implements minor variations of PCL 5 as a result of those differences. With new printer releases, new features may be added with new commands and/or PCL operations which require documentation.

The purpose of this guide is to identify the differences in the implementation of the PCL 5 Printer Language for different HP LaserJet and DeskJet printers, as compared to that described in the *PCL 5 Printer Language Technical Reference Manual*. This guide describes new commands and exceptions to existing commands unique to the printers, as well as internal typeface/font support and print environment settings.

This document covers the following HP printers:

	Introduction Date
■ LaserJet III	March 1990
■ LaserJet IIID	September 1990
■ LaserJet IIISi	February 1991
■ LaserJet IIIP	May 1991
■ LaserJet 4, 4M	October 1992
■ LaserJet 4Si, 4SiMx	April 1993
■ LaserJet 4L, 4ML	May 1993
■ LaserJet 4P, 4MP	September 1993
■ LaserJet 4 Plus, 4M Plus	May 1994
■ LaserJet 4PJ	May 1994
■ LaserJet 4V, 4MV	September 1994

■ Color LaserJet	September 1994
■ DeskJet 1200C	May 1993
■ DeskJet 1200/PS	May 1993

Table 1-1, the PCL Feature Support Matrix lists all the printer commands from the *PCL 5 Printer Language Technical Reference Manual* and identifies which of these commands are supported by the various printers. More detailed PCL information for each PCL 5 printer is provided following Table 1-1. These sections describe such information as new commands not contained in the *PCL 5 Printer Language Technical Reference Manual,* and other miscellaneous differences in PCL operation particular to that printer.

Note

The *PCL 5 Printer Language Technical Reference Manual* (part number 5961-0509) was revised for the release of the HP LaserJet 4 printer and contains all PCL language features up to the HP LaserJet 4 printer.

With the introduction of the HP LaserJet 4 printer, Hewlett-Packard enhanced the PCL 5 printer language to provide some new features. The major improvements to the PCL 5 printer language are listed below.

■ 600 dpi support for higher quality printing

■ 45 scalable typefaces for greater type variety

■ TrueType rasterizer (in addition to the Intellifont rasterizer) for fast Windows printing, and for matching Windows and printer type (easy WYSIWYG)

■ New graphics commands for faster and better curves and shading quality

■ Bi-directional I/O for easier use and sharing by providing printer status to computer applications

■ Automatic and faster printer language switching

■ Automatic I/O switching for faster I/O rates

- Improved memory management so most pages print in standard memory
- Improved PCL and HP-GL/2 performance for faster graphics and text printing

Note
- In Table 1-1, if the command value field parameters are not listed then all parameters are supported by printers that support that command.
- The value in parentheses following a command parameter identifies the parameter value field value (for example, the parameter "Letter (2)" indicates that the value field to select letter size in the Page Size command is "2").
- Commands which are not supported ("ns") by a printer are ignored.

Table 1-1. PCL Feature Support Matrix

FUNCTION	COMMAND	PCL 5 Printer[1]												
		III	IIID	IIISi	IIIP	4/4M	4Si	4L	4ML 4P 4MP	4PJ	4Plus /4M Plus	4V 4MV	Color LJ	DJ 1200
MISCELLANEOUS														
Configuration (AppleTalk)	E_C&b#W[data]	ns	ns	ns	ns	✓	✓	✓	✓	ns	✓	✓	✓	✓
JOB CONTROL														
Universal Exit/Start of PJL (UEL)	E_C%−12345X	ns	ns	✓	ns	✓	✓	✓	✓	✓	✓	✓	✓	✓
Reset	E_CE	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Number of Copies	E_C&ℓ#X	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Simplex/Duplex Print	E_C&ℓ#S	ns	✓	✓	ns	ns	✓	ns	ns	ns	✓[2]	ns	ns	ns
Left (Long-Edge) Offset Registration	E_C&ℓ#U	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Top (Short-Edge) Offset Registration	E_C&ℓ#Z	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Unit Of Measure	E_C&u#D	ns	ns	ns	ns	✓	✓	✓	✓	✓	✓	✓	ns	ns
Mechanical Print Quality	E_C*o#Q	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	✓
Media Type	E_C&ℓ#M	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	✓
Negative Motion	E_C&a#N	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	✓

[1] ✓ - Indicates a command is supported.   ns- Indicates a command is not supported.
[2] Supported if duplex option is installed.

Table 1-1. PCL Feature Support Matrix (continued)

FUNCTION	COMMAND	PCL 5 Printer[1]												
		III	IIID	IIISi	IIIP	4/4M	4Si	4L	4ML 4P 4MP	4PJ	4Plus /4M Plus	4V 4MV	Color LJ	DJ 1200
PAGE CONTROL														
Page (Job) Size	$_E$C&ℓ#A													
Executive (1)		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	ns
Letter (2)		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Legal (3)		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Ledger (6)		ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	✓	ns	ns
A4 (26)		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
A3 (27)		ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	✓	✓	ns
JIS B5 Paper (45)		ns	ns	ns	ns	ns	ns	ns	ns	✓	ns	3	ns	ns
Monarch Envelope (80)		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	ns	ns
Comm. 10 Envelope (81)		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	ns	✓
Intl. DL Envelope (90)		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	ns	✓
Intl. C5 Envelope (91)		✓	✓	ns	✓	✓	ns	✓	✓	✓	✓	✓	ns	✓
Intl. B5 Envelope (100)		ns	ns	ns	ns	✓	✓	✓	✓	✓	✓	✓	ns	ns
Custom (101)		ns	ns	ns	ns	ns	ns	ns	✓	✓	ns	✓[3]	ns	ns
Hagaki Postcard (71)		ns	ns	ns	ns	ns	ns	ns	ns	✓	ns	✓	ns	ns
Oufuku-Hagaki Postcard (72)		ns	ns	ns	ns	ns	ns	ns	ns	✓	ns	✓	ns	ns
Orientation	$_E$C&ℓ#O	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Page Side Selection[2]	$_E$C&a#G	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Job Separation	$_E$C&ℓ1T	ns	ns	✓	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns

[1] ✓ - Indicates a command is supported.   ns - Indicates a command is not supported.
[2] On non-duplex printers, this command causes a conditional page eject.
[3] The custom size is 11.7" x 17.7" on the LaserJet 4V/4MV printers.

Table 1-1.   PCL Feature Support Matrix (continued)

FUNCTION	COMMAND	PCL 5 Printer[1]												
		III	IIID	IIISi	IIIP	4/4M	4Si	4L	4ML 4P 4MP	4PJ	4Plus/ 4M Plus	4V 4MV	Color LJ	DJ 1200
PAGE CONTROL (continued)														
Paper Source	$_{E}c$&ℓ#H													
Eject Page (0)		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Main Paper Source (1)		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Manual Feed (2)		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Manual Env. Feed (3)		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	ns	ns
Alt. Paper Source (4)		ns	✓	✓	✓	✓	✓	ns	ns	ns	✓	3	✓	ns
Opt. Large Source (5)		ns	ns	ns	ns	✓	✓	ns	ns	ns	✓	3	✓	ns
Envelope Feeder (6)		ns	✓	✓	ns	✓	✓	ns	ns	ns	✓	ns	ns	ns
Output Bin	$_{E}c$&ℓ#G	ns	ns	✓	ns	ns	✓	ns	ns	ns	ns	ns	ns	ns
Print Direction	$_{E}c$&a#P	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Character Text Path Dir.	$_{E}c$&c#T	ns	ns	ns	ns	ns	ns	ns	ns	✓	ns	3	ns	ns
Left Margin	$_{E}c$&a#L	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Right Margin	$_{E}c$&a#M	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Clear Horizontal Margins	$_{E}c$9	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Top Margin	$_{E}c$&ℓ#E	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Text Length	$_{E}c$&ℓ#F	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Perforation Skip	$_{E}c$&ℓ#L	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Horizontal Motion Index	$_{E}c$&k#H	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Vertical Motion Index	$_{E}c$&ℓ#C	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Line Spacing	$_{E}c$&ℓ#D	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CURSOR POSITIONING														
Horizontal Position	$_{E}c$&a#C	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	$_{E}c$*p#X	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	$_{E}c$&a#H	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Vertical Position	$_{E}c$&a#R	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	$_{E}c$*p#Y	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	$_{E}c$&a#V	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Half Line Feed	$_{E}c$=	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Line Termination	$_{E}c$&k#G	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Push/Pop Position	$_{E}c$&f#S	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

[1] ✓ - Indicates a command is supported.   ns - Indicates a command is not supported.

Table 1-1. PCL Feature Support Matrix (continued)

FUNCTION	COMMAND	III	IIID	IIISi	IIIP	4/4M	4Si	4L	4ML 4P 4MP	4PJ	4Plus /4M Plus	4V 4MV	Color LJ	DJ 1200
FONT SELECTION														

The Primary font printer commands in this table can be changed to Secondary by replacing the left parenthesis "(" in the command with a right parenthesis ")".

FUNCTION	COMMAND	III	IIID	IIISi	IIIP	4/4M	4Si	4L	4ML 4P 4MP	4PJ	4Plus /4M Plus	4V 4MV	Color LJ	DJ 1200
Symbol Set (Primary)	$_C^E$(ID	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Spacing (Primary)	$_C^E$(s#P	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Pitch (Primary)	$_C^E$(s#H	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Height (Primary)	$_C^E$(s#V	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Style (Primary)	$_C^E$(s#S	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Stroke Weight (Primary)	$_C^E$(s#B	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Typeface (Primary)	$_C^E$(s#T	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Font Selection By ID # (Primary)	$_C^E$(#X	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Select Default Font (Primary)	$_C^E$(3@	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Underline	$_C^E$&d#D	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	$_C^E$&d@	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Transparent Print Data	$_C^E$&p#X[data]	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Text Parsing Method	$_C^E$&t#P	ns	ns	ns	ns	ns	ns	ns	ns	✓	ns	✓	ns	✓[2]
FONT MANAGEMENT														
Assign Font ID #	$_C^E$*c#D	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Font Control	$_C^E$*c#F	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
USER-DEFINED SYMBOL SET														
Symbol Set ID Code	$_C^E$*c#R	ns	ns	ns	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Define Symbol Set	$_C^E$(f#W[data]	ns	ns	ns	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Symbol Set Control	$_C^E$*c#S	ns	ns	ns	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

[1] ✓ - Indicates a command is supported.　　ns - Indicates a command is not supported.
[2] Available in code versions "B" and "C" only (see the DeskJet 1200C section near the end of this chapter).

Table 1-1.   PCL Feature Support Matrix (continued)

FUNCTION	COMMAND	III	IIID	IIISi	IIIP	4/4M	4Si	4L	4ML 4P 4MP	4PJ	4Plus/ 4M Plus	4V 4MV	Color LJ	DJ 1200
SOFT FONT CREATION														
Font Descriptor	E_C)s#W[data]	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Character Code	E_C*c#E	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Download Character	E_C(s#W[data]	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
MACROS														
Macro ID	E_C&f#Y	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Macro Control	E_C&f#X	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
PRINT MODEL IMAGING														
Source Transparency Mode	E_C*v#N	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Pattern Transparency Mode	E_C*v#O	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Area Fill ID	E_C*c#G	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Select Current Pattern	E_C*v#T													
Solid Black (0)		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Solid White (1)		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
HP Shading Pattern (2)		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Cross-hatch Pattern (3)		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
User-defined Pattern (4)		ns	ns	ns	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Logical Operation	E_C*ℓ#O	ns	ns	ns	ns	ns	ns	ns	✓	✓	✓	✓	✓	✓
Pixel Placement	E_C*ℓ#R	ns	ns	ns	ns	ns	ns	ns	✓	✓	✓	✓	✓	✓
USER-DEFINED PATTERN														
Define Pattern	E_C*c#W[data]	ns	ns	ns	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Set Pattern Reference Point	E_C*p#R	ns	ns	ns	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
User-defined Pattern Control	E_C*c#Q	ns	ns	ns	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

[1] ✓ - Indicates a command is supported.   ns - Indicates a command is not supported.

Table 1-1. PCL Feature Support Matrix (continued)

FUNCTION	COMMAND	PCL 5 Printer[1]												
		III	IIID	IIISi	IIIP	4/4M	4Si	4L	4ML 4P 4MP	4PJ	4Plus/ 4M Plus	4V 4MV	Color LJ	DJ 1200
RASTER GRAPHICS														
Resolution	$_{E_C}$*t#R													
75 Dots/Inch (75)		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
100 Dots/Inch (100)		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	ns	✓
150 Dots/Inch (150)		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
200 Dots/Inch (200) [2]		ns	ns	ns	ns	✓	✓	ns	✓[3]	✓	✓	✓	ns	ns
300 Dots/Inch (300)		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
600 Dots/Inch (600) [2]		ns	ns	ns	ns	✓	✓	ns	✓[3]	✓	✓	✓	ns	ns
Graphics Presentation	$_{E_C}$*r#F	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Raster Height (Source)	$_{E_C}$*r#T	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Raster Height (Destination)	$_{E_C}$*t#V	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	✓	✓
Raster Width (Source)	$_{E_C}$*r#S	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Raster Width (Destination)	$_{E_C}$*t#H	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	✓	✓
Scale Algorithm	$_{E_C}$*t#K	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	✓
Start Raster Graphics	$_{E_C}$*r#A													
At logical page left limit(0)		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
At CAP (1)		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
At logic. page left limit, scaling ON (2)		ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	✓	✓
At CAP, scaling ON (3)		ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	✓	✓
Y Offset	$_{E_C}$*b#Y	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Set Compression Mode	$_{E_C}$*b#M													
Unencoded (0)		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Run-Length Encoded (1)		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
TIFF Encoded (2)		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Delta Row Encoded (3)		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Mode 5 (5)		ns	ns	ns	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Transfer Raster (Row/Block)	$_{E_C}$*b#W[data]	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Transfer Raster (Plane)	$_{E_C}$*b#V[data]	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	✓	✓
End Graphics														
Version B	$_{E_C}$*rB	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Version C (Preferred)	$_{E_C}$*rC	ns	ns	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

[1] ✓ - Indicates a command is supported.   ns - Indicates a command is not supported.
[2] Supported if printer resolution is 600 dpi.
[3] The 4ML printer does not support 200 or 600 dpi operation.

Table 1-1. PCL Feature Support Matrix (continued)

FUNCTION	COMMAND	III	IIID	IIISi	IIIP	4/4M	4Si	4L	4ML 4P 4MP	4PJ	4Plus/ 4M Plus	4V 4MV	Color LJ	DJ 1200
RECTANGULAR AREA FILL														
Horizontal Rectangle Size	E_C*c#A	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	E_C*c#H	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Vertical Rectangle Size	E_C*c#B		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	E_C*c#V	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Pattern ID (Area Fill ID)	E_C*c#G													
1-100 for Shading		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
1-6 for Cross-hatch		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
0-32767 for User-defined		ns	ns	ns	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Fill Rectangle Area	E_C*c#P													
0-Black (solid) (0)		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
1-White (erase) (1)		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
2-Shaded (gray) (2)		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
3-Cross-hatch Pattern (3)		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
4-User-defined Pattern (4)		ns	ns	ns	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
5-Current Pattern (5)		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
STATUS READBACK														
Set Status Readback Location Type	E_C*s#T	ns	ns	ns	ns	✓	✓	✓	✓	✓	✓	✓	ns	ns
Set Status Readback Location Unit	E_C*s#U	ns	ns	ns	ns	✓	✓	✓	✓	✓	✓	✓	ns	ns
Inquire Status Readback Entity	E_C*s#I	ns	ns	ns	ns	✓	✓	✓	✓	✓	✓	✓	ns	ns
Free Space	E_C*s1M	ns	ns	ns	ns	✓	✓	✓	✓	✓	✓	✓	ns	ns
Flush All Pages	E_C&r#F	ns	ns	ns	ns	✓	✓	✓	✓	✓	✓	✓	ns	✓
Echo	E_C*s#X	ns	ns	ns	ns	✓	✓	✓	✓	✓	✓	✓	ns	ns

[1] ✓ - Indicates a command is supported. ns - Indicates a command is not supported.

Table 1-1. PCL Feature Support Matrix (continued)

FUNCTION	COMMAND	PCL 5 Printer[1]												
		III	IIID	IIISi	IIIP	4/4M	4Si	4L	4ML 4P 4MP	4PJ	4Plus/ 4M Plus	4V 4MV	Color LJ	DJ 1200
PICTURE FRAME (for Vector Graphics)														
Picture Frame Horiz. Size	E_C*c#X	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Picture Frame Vert. Size	E_C*c#Y	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Set Picture Frame Anchor Point	E_C*c0T	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
HP-GL/2 Horiz. Plot Size	E_C*c#K	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
HP-GL/2 Vert. Plot Size	E_C*c#L	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Enter HP-GL/2	E_C%#B													
Stand-alone plotter (-1)		ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	✓
Previous HP-GL (0)		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Current PCL CAP (1)		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Current PCL coordinates and old HP-GL/2 (2)		ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	✓
Current PCL coordinates & current CAP (3)		ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	✓
Enter PCL Mode	E_C%#A	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
PROGRAMMING HINTS														
Display Functions														
On	E_CY	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Off	E_CZ	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
End-Of-Line Wrap	E_C&s#C	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

1 ✓ - Indicates a command is supported.   ns - Indicates a command is not supported.

Table 1-1. PCL Feature Support Matrix (continued)

FUNCTION	COMMAND	PCL 5 Printer[1]												
		III	IIID	IIISi	IIIP	4/4M	4Si	4L	4ML 4P 4MP	4PJ	4Plus/ 4M Plus	4V 4MV	Color LJ	DJ 1200
PCL 5 COLOR COMMANDS														
Assign Color Index	E_C*v#I	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	✓	✓
Color Component 1	E_C*v#A	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	✓	✓
Color Component 2	E_C*v#B	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	✓	✓
Color Component 3	E_C*v#C	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	✓	✓
Color Lookup Tables	E_C*ℓ#W[data]	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	✓	ns
Configure Image Data	E_C*v#W[data]	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	✓	✓
Download Dither Matrix	E_C*m#W	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	✓	✓
Foreground Color	E_C*v#S	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	✓	✓
Gamma Correction	E_C*t#I	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	✓	✓
Monochrome Print Mode	E_C&b#M	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	✓	ns
Palette Control ID	E_C&p#I	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	✓	ns
Palette Control	E_C&p#C	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	✓	ns
Push/Pop Palette	E_C*p#P	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	✓	✓
Render Algorithm	E_C*t#J	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	✓	✓
Select Palette	E_C&p#S	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	✓	ns
Set Viewing Illuminant	E_C*i#W[data]	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	✓	ns
Simple Color	E_C*r#U	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	✓	✓

1 ✓ - Indicates a command is supported.   ns - Indicates a command is not supported.

Table 1-1. PCL Feature Support Matrix (continued)

FUNCTION	COMMAND	PCL 5 Printer[1]												
		III	IIID	IIISi	IIIP	4/4M	4Si	4L	4ML 4P 4MP	4PJ	4Plus/ 4M Plus	4V 4MV	Color LJ	DJ 1200
HP-GL/2 GRAPHICS														
HP-GL/2—Commands listed in Table A-2 except as shown below		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Advance Full Page	PG	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	✓[2]
Bezier	BR, BZ	ns	ns	ns	ns	✓	✓	✓	✓	✓	✓	✓	✓	✓
Begin Plot	BP	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	✓[2]
Chord Tolerance Mode	CT	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	✓[2]
Color Range	CR	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	✓	✓
Download Character	DL	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	✓[2]
Fill Type	FT													
Odd/Even		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Non-Zero Winding		ns	ns	ns	ns	✓	✓	✓	✓	✓	✓	✓	✓	✓
Frame Advance	FR	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	✓[2]
Label origin	LO													
1-9 / 11-19		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
21		ns	ns	ns	ns	✓	✓	✓	✓	✓	✓	✓	✓	✓
Media Type	MT	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	✓[2]
Merge Control	MC	ns	ns	ns	ns	ns	ns	ns	✓	✓	✓	✓	✓	✓
Number of Pens	NP	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	✓
Output Error	OE	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	✓[2]
Output Hardclip Limits	OH	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	✓[2]
Output Identification	OI	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	✓[2]
Output P1 and P2	OP	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	✓[2]
Output Status	OS	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	✓[2]
Pen Color Assignment	PC	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	✓	✓
Pixel Placement	PP	ns	ns	ns	ns	ns	ns	ns	✓	✓	✓	✓	✓	✓
Plot Size	PS	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	✓[2]
Quality Level	QL	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	✓[2]
Replot	RP	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	✓[2]

[1] ✓ - Indicates a command is supported.   ns - Indicates a command is not supported.
[2] Supported in stand-alone HP-GL/2 Mode only (DeskJet 1200)

HP LaserJet III/IIID Printers

With the introduction of the HP LaserJet III printer, Hewlett-Packard introduced the PCL 5 printer language. The PCL 5 printer language incorporated many new features over the PCL 4 language. A few of the more significant features included such things as the addition of a scalable font technology, HP-GL/2 vector graphics language support, print model features, raster graphics enhancements, and the Print Direction command.

The HP LaserJet IIID printer language support is basically identical to the HP LaserJet III printer except for the addition of the duplex feature, dual input bin, envelope feeder support and their associated commands (see Table 1-1).

HP LaserJet IIISi Printer

Several new PCL features were added to the PCL 5 language with the release of the HP LaserJet IIISi printer. These new features are summarized in Table 1-2 below.

Table 1-2.   PCL Feature Additions for HP LaserJet IIISi Printer

Feature	Status	Comments
Number of Copies	Modified	Greater range, 1 to 32,767.
Page Size	Modified	C5 Envelopes not supported.
Output Bin Selection Command	New	Allows programmatic selection of upper or lower output paper bins.
End Raster Graphics Command	New/Modified	Modified version of the existing End Raster Graphics command.
Job Separation	New Command	Causes the paper stacker to shift positions to offset the output paper stack.
Fonts	New Additions	Four variations of Univers Condensed; ITC Zapf Dingbats in five symbol sets.

HP LaserJet IIIP Printer

Several new PCL features were added to the PCL 5 language with the release of the HP LaserJet IIIP printer. These new features are summarized in Table 1-3. One new feature listed here is adaptive compression (method 5) for the Raster Compression Mode command. In addition to compressing data for transmission, if certain rules are followed (discussed below), the HP LaserJet IIIP printer will store adaptive compressed data in compressed format and only decompress it when required for printing. There are certain requirements which must be met for this data to be stored in compressed format. These requirements are discussed following Table 1-3.

Table 1-3.   HP LaserJet IIIP PCL Feature Additions

Feature/Command	Status	Comments
Set Compression Method	Modified	Adds Adaptive Compression method to the Set Compression Method command.
End Raster Graphics Command	Modified	Modified version of the End Raster Graphics command.
User-defined Patterns	New	Enables users to define and download their own user-defined pattern.
User-defined Pattern Command	New Feature	Used to download the binary data for user-defined pattern.
Set Pattern Reference Point Command	New	Sets pattern reference point.
Pattern Control Command	New	Used to make user-defined patterns permanent or temporary, or to delete them.
Select Pattern & Fill Rectangular Area Commands	Modified	Adds a parameter to support user-defined patterns.
Pattern ID Command	Modified	In addition to selecting internal patterns, this command is now used to assign an ID to a user-defined pattern as well as to select patterns. Also, parameter range is extended from 100 to 32,767.
User-defined Symbol Sets	New Feature	Enables user to build a symbol set which contains user-selected characters.
Define Symbol Set Command	New	Identifies the characters for a user-defined symbol set.
Symbol Set ID Code Command	New	Assigns a number for identification to the user-defined symbol set.
Symbol Set Control Command	New	Used to make user-defined symbol sets permanent or temporary, or to delete them.
Unbound Scalable Fonts	New Feature	Allows typefaces (unbound fonts), not just fonts (bound fonts) to be downloaded to the printer.
Unbound Scalable Font Descriptor	New	Addition of a new header used for unbound fonts (font type 10).

Raster Graphics Adaptive Compression (IIIP)

Adaptive compression was added to the PCL language with the introduction of the HP LaserJet IIIP printer. Adaptive compression (or method 5 as it is referred to) is a method for compressing raster data using the raster Set Compression Method command (parameter value 5). (Refer to the Set Compression Method command in the *PCL 5 Printer Language Technical Reference* manual for detailed information on using this compression technique.) Also, refer to Chapter 4 in this document, "Raster Graphics Adaptive Compression (Method 5)" for additional information.

HP LaserJet 4 Printer

Several new PCL features were added to the PCL 5 language with the release of the HP LaserJet 4 printer. These new features are summarized in Table 1-4. Most of these features are described in the revised *PCL 5 Printer Language Technical Reference Manual* (part number 5961-0509). (This revised technical reference manual is supplied as part of the *Technical Reference Documentation Package* which can be obtained by ordering part number 5961-0601.) In addition, there are some additional differences for the HP LaserJet 4 printer that are not covered in the technical reference manual but are described below.

Note

The HP LaserJet 4M printer, in addition to PCL, contains PostScript and a LocalTalk I/O for printing in the Macintosh environment. PCL operation and the PCL internal fonts for this printer are identical to the HP LaserJet 4 printer. Thus, for PCL information for the HP LaserJet 4M printer, refer to the HP LaserJet 4 printer features.

Table 1-4. PCL Feature Additions for HP LaserJet 4

Feature/Command	Support	Comments
Adaptive Compression System	New	Adaptive compression system enables the printer to compress internal raster data when memory becomes low. This operation occurs automatically; there are no PCL commands for this feature (refer to Chapter 4 for ADC information).
Configuration Command	New	Allows PCL jobs to be printed (using LocalTalk or EtherTalk MIO) using AppleTalk protocol.
Number of Copies	Modified	Supports 1-32,767 copies as does the LaserJet IIISi printer.
Units of Measure Command	New	Allows selection of the units of measure for cursor moves, drawing rules, and for character spacing (font metrics).
Page Size	Modified	A parameter value is added for B5 envelope size; the LaserJet 4 printer supports the four standard paper sizes and five envelope sizes.
Bitmap Font Support	New Header	Printer will expand 300 dpi bitmap fonts to 600 dpi. A new 300/600 dpi bitmap font descriptor has been added to allow bitmap fonts to be created that work at either 1/300 or 1/600 inch printer resolution.
Scalable Font Support	New Header	A new Universal header has been added to allow design of typefaces of different scaling technologies to be supported by one header. This header is used to support TrueType on the HP LaserJet 4 printer. (This header will be used to support any other new scaling technologies HP may add in the future).
True Type	New	TrueType scaling technology support has been added to the printer.
Internal Typefaces	New	Several new Intellifont and TrueType internal typefaces (and supporting symbol sets) are now provided in the printer.
Raster Resolution Command	Modified	Parameter values have been added to support raster resolutions of 200 dpi and 600 dpi.
User-defined Pattern	New Header	A new 300/600 dpi user-defined pattern header has been added to support patterns that work at either 1/300 or 1/600 inch printer resolution.

Continued on next page.

Table 1-4.   PCL Feature Additions for HP LaserJet 4 - continued

Feature/Command	Support	Comments
Status Readback	New Feature	The addition of 6 new status readback commands enable the user to receive certain information back from the printer about fonts, symbol sets, macros, user-defined patterns, and available memory.
Location Type Command	New	Used to specify a status readback type of location (current, all, internal, downloaded, cartridge, SIMMs).
Location Unit Command	New	Specifies a status readback location unit (all, temporary or permanent, highest-lowest priority, specific SIMM).
Inquire Entity Command	New	Requests the status from the location (type and unit) specified for fonts, symbol sets, macros, or user-defined patterns.
Flush All Pages Command	New	Allows the user to clear page data from printer memory.
Free Memory Command	New	This command returns the current available memory.
Echo Command	New	Allows the user to send a unique ID number to the printer to be used as a "place holder."
Bezier Curve Commands	New	HP-GL/2 commands (relative and absolute) that allow a user to draw complex curves with less data required than that required for arcs.
Label Origin	Modified	Label position LO 21 is provided for correct alignment of HP-GL/2 text with PCL text.
Fill Polygon	Modified	Previously, the HP-GL/2 Fill Polygon command filled polygons using the odd/even fill technique. A second technique, non-zero winding fill, has been added.
Macros	Modified	HP-GL/2 is now supported in macros.
Configuration Command	New	Added to allow the user to communicate with the MIO card in the printer.

Configuration Command (AppleTalk)

The Configuration command allows a user to send PCL jobs to the printer over AppleTalk. This data is sent in the form of "key/value" data pairs (refer to "AppleTalk Configuration" below for more information).

^E_C**&b#W [key]<sp>[value]**

\# Number of data bytes that follow command

Default = 0
Range = 0 - 32767

[**key**] can be 1 character through 32765 characters.
[**value**] can be 1 character through 32765 characters.

AppleTalk Configuration

The HP LaserJet 4 printer can be configured to receive PCL print jobs over an AppleTalk connection using the Configuration command. The HP LaserJet 4 MIO AppleTalk interfaces support three key values: **RENAME**, **JOB**, and **TYPE**. These keys are used for configuring an installed LocalTalk or EtherTalk MIO card to allow PCL print jobs generated by a Macintosh host to be printed.

■ PostScript in the HP LaserJet 4 printer supports the PostScript level 1 operators *setprintername*, *appletalktype*, and *jobname*, and the PostScript level 2 *setdevparams* operator to allow PostScript print jobs to change the Name Binding Protocol (NBP) printer name and printer type, as well as change the print job name.

■ MIO sub-system in the printer accepts a new NBP printer name, NBP printer type, and job name from either the PCL or PostScript personalities. The printer passes that information across the MIO interface to the installed MIO card which indicated support for the MIO AppleTalk extensions. The MIO sub-system will treat the PCL NBP type and the PostScript NBP type separately.

■ For information about AppleTalk Name Binding Protocol refer to *Inside AppleTalk* published by Addison Wesley Company, Inc..

RENAME

RENAME changes the printer name portion of the printer's AppleTalk Name Binding Protocol name field.

$_{\text{E}_{\text{C}}}$**&b#WRENAME<sp>printername**

Valid characters for the printer name include 0-255 except for characters $00, "@" ($40), ":" ($3A), "*" ($2A), "=" ($3D), and $C5. The printername must contain at least one character, and only the first 31 characters are used. If an invalid character ($00 is not treated as an invalid character) is contained in the printername, the printer will ignore the escape sequence. If the printer encounters the NULL ($00) character, the printer uses the NULL character to terminate the printer name. All the characters preceding the NULL will be used. If another device on the AppleTalk network uses the same printer name, another character is added to the end of the printer name.

The default printername is the printer model (for example, "HP LaserJet 4").

JOB

JOB renames the current job name.

> ^E_C**&b#WJOB<sp>jobname**

All characters are valid. For the job name the first 127 characters are used.

There is no default jobname.

TYPE

TYPE changes the type (device type) portion of the printer's AppleTalk Name Binding Protocol type field.

> ^E_C**&b#WTYPE<sp>devicetype**

Valid characters for the device type include 0-255 except for characters $00, "@" ($40), ":" ($3A), "*" ($2A), "=" ($3D), and $C5. The devicetype must contain at least one character, and only the first 31 characters are used. If an invalid character ($00 is not treated as an invalid character) is contained in the devicetype, the printer will ignore the escape sequence. If the printer encounters the NULL ($00) character in the devicetype, it uses the NULL character to terminate the device type. All the characters preceding the NULL will be used as the devicetype. If the device type is invalid then the printer's type is not changed.

The default device type for PCL is "HP LaserJet 4" and for PostScript is "LaserWriter".

HP LaserJet 4Si Printer

The HP LaserJet 4Si printer is the follow-on to the HP LaserJet IIISi printer. The HP LaserJet 4Si printer contains many new PCL features over the LaserJet IIISi. PCL support for the HP LaserJet 4Si printer is identical to the HP LaserJet 4 printer except for the addition of the duplex feature, dual output bin (see Table 1-1) and resource saving.

Like the HP LaserJet IIISi printer, the HP LaserJet 4Si supports the LaserJet IIISi features listed in Table 1-2 with two exceptions. First, is that the LaserJet 4Si does not support ITC Zapf Dingbats. Font support for the HP LaserJet 4Si is identical to the HP LaserJet 4 printer (refer to Chapter 2, "Internal Typefaces/Fonts and Symbol Sets," for complete font support information). The other exception concerns job separation. The PCL Job Separation command is not supported. The HP LaserJet 4Si printer handles job separation through the control panel. If a PCL Job Separation command is received by the printer it will be ignored. Refer to the *HP LaserJet 4Si User's Manual* (part number C2010-90901) for additional information.

Resource saving, a new feature in the HP LaserJet 4Si printer, allows saving information for the current language (PCL or PostScript) when switching to the other language. If resource saving is enabled (from the control panel or PJL; no PCL commands are required for this operation), all the permanent fonts, macros, and user-defined patterns plus some other miscellaneous data is saved in a reserved portion of printer memory. This data is stored until the language is enabled again. When the language is re-enabled, the stored data will be made available for use.

HP LaserJet 4L Printer

The HP LaserJet 4L printer is a smaller, low-cost HP LaserJet printer. The control panel on this printer is limited to one button with four indicators. Many of the control panel functions must be controlled programmatically using Hewlett-Packard's Printer Job Language (refer to the *Printer Job Language Technical Reference Manual* part number 5961-0704 for detailed PJL information).

The HP LaserJet 4L printer PCL command features are identical to those of the HP LaserJet 4 printer PCL features, except for some differences in parameter values (such as for paper source—refer to Table 1-1). Additional features which do not require PCL command control include EconoMode and HP Memory Enhancement technology (MEt). EconoMode causes the printer to print less dots, thus saving toner. Memory Enhancement technology involves some memory saving techniques to better utilize available memory (refer to Chapter 4 "Memory Usage" for additional information).

Typefaces in the HP LaserJet 4L printer are different from those of the HP LaserJet 4 printer. The HP LaserJet 4 printer contains both Intellifont and TrueType scaling technologies, but the 4L contains only Intellifont scaling technology. Thus, the 4L does not contain any of the TrueType typefaces, with one modification. The TrueType Wingdings typeface has been converted to Intellifont format and is available in the printer as an Intellifont typeface (refer to Chapter 2, "Internal Typefaces/Fonts and Symbol Sets" for additional information).

HP LaserJet 4ML Printer

The HP LaserJet 4ML printer is similar to the HP LaserJet 4L printer, however, the 4ML includes PostScript and a LocalTalk I/O for printing in the Macintosh environment. The HP LaserJet 4ML printer also includes some new PCL features: print model logical operation (ROP3) and pixel placement, as described on the following pages.

The HP LaserJet 4ML supports the typefaces that the HP LaserJet 4 printer supports. Several of the typefaces in the HP LaserJet 4ML printer have additional support for the Latin 2 and Latin 5 symbol sets (refer to Chapter 2, "Internal Typefaces/Fonts and Symbol Sets," for complete font support information).

Table 1-5.   PCL Feature Additions for HP LaserJet 4ML

Feature	Status	Comments
Paper (Job) Size Command	Modified	An additional parameter (101) has been added to provide support for custom size.
Logical Operations	New	Modifies the print model to allow logical operations (such as AND, OR, XOR, NOT) to be performed on source, texture, and destination.
Pixel Placement (PCL)	New	Allows user to select either grid intersection or grid centered placement of pixels when rendering an image in PCL.
Pixel Placement (HP-GL/2)	New	Allows user to select either grid intersection or grid centered placement of pixels when rendering an image in HP-GL/2.
Merge Control	New	Allows the user to use logical operations (ROP's) in HP-GL/2.

Logical Operations

With the introduction of the HP LaserJet 4ML printer the print model was expanded to include logical operations.

The basic print model defines how a pattern, source image, and destination image are applied to each other using the print model's transparent and opaque modes to produce a resulting image (refer to the *PCL 5 Printer Language Technical Reference Manual* for detailed information about the basic print model operation). The Logical Operations (E_C*ℓ#O) command can apply logical functions (e.g., AND, OR, XOR, NOT) to any of these operands except transparency, which must be specified first.

The print model process consists of the following steps:

1. Specify source and/or pattern transparency modes, if desired.

2. Specify the logical operation (or use the default).

3. Define the desired operands (source, destination, pattern).

Definitions

Source: The source image may be one of the following:

- HP-GL/2 primitives
- Rules
- Characters
- Raster images (single plane mask or multiplane color)

Destination: The destination image contains whatever is currently defined on the page. It includes any images placed through previous operations.

Pattern or Texture: The pattern is defined by Current Pattern (E_C*v#T). The terms pattern and texture are used interchangeably in this section.

Transparency Modes: The white pixels of the source and/or pattern may be made transparent (source transparency 0, pattern transparency 0). The destination shows through these areas.

Transparency modes are set by the Source Transparency (E_C*v#N) and Pattern Transparency (E_C*v#O) commands (refer to the *PCL 5 Printer Language Technical Reference Manual*).

The print model allows logical operations, such as AND, OR, XOR, NOT, to be performed on source, texture, and destination images. Transparency modes and Logical Operation must be specified before printable data is sent.

Operators

- Source Transparency (specified before logical operation; default is transparent)
- Pattern Transparency (specified before logical operation; default is transparent)
- Logical Operators (default is Texture OR Source)

Operands

- Source objects: character cell, raster image, rule, HP-GL/2 vectors and polygons
- Texture: pattern mask
- Destination: current page definition

Assuming three bits per pixel, the following diagram shows the print model process.
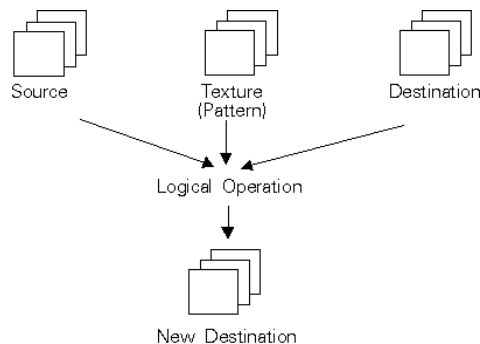
Note	■ The Logical Operation command (^{E_c}*ℓ#O) provides 255 possible logical operations. All of these logic operations map directly to their ROP3 (raster operation) counterparts (see the Microsoft Document, Reference, Volume 2, Chapter 11, Binary and Ternary Raster Operation Codes).
	■ The logical operations were defined by Microsoft Windows for an RGB color space (a "1" is white and a "0" is black).

Logical Operations and Transparency Interactions

As described above, transparency modes operate in addition to logical operations. The logical operations in Table 1-6, Logical Operations (ROP3), on the following pages, are true only if source and pattern transparency (for white pixels) are explicitly set to opaque (^{E_c}*v1N and ^{E_c}*v1O). If source and/or pattern transparency modes are transparent (defaulted), the additional operations shown on the following page must be performed to achieve the final result.

The four basic interactions are:

- Case 1: Source and Pattern are opaque.

  Return ROP3 (Dest, Src, Texture).

- Case 2: Source is opaque, Pattern is transparent.

  Temporary_ROP3 = ROP3 (Dest, Src, Texture).
  Image_A = Temporary_ROP3, & Not Src.
  Image_B = Temporary_ROP3 & Pattern.
  Image_C = Not Pattern & Src & Dest.
  Return Image_A | Image_B | Image_C

- Case 3: Source is transparent, Pattern is opaque.

  Temporary_ROP3 = ROP3 (Dest, Src, Texture).
  Image_A = Temporary_ROP3 & Src.
  Image_B = Dest & Not Src.
  Return Image_A | Image_B

- Case 4: Source and Pattern are transparent

  Temporary_ROP3 = ROP3 (Dest, Src, Texture).
  Image_A = Temporary_ROP3 & Src & Pattern.
  Image_B = Dest & Not Src.
  Image_C = Dest & Not Pattern.
  Return Image_A | Image_B | Image_C.

Logical Operation Command

Specifies the logical operation to be performed in RGB color space on the destination, source and texture to produce new destination data.

E_C*ℓ#**O**

= Logical operation value (see Table 1-7)

Default = 252 (TSo)
Range = 0 to 255

When source and/or pattern transparency modes are set opaque (not defaulted), values specified by this command map directly to the ROP3 (raster operation) table values on the following page. However, when source and/or pattern transparency modes are set transparent, the additional operations shown on the previous page must be performed to achieve the final result.

Logical operations in the table are shown in RPN (reverse polish notation). For example, the value 225 corresponds to TDSoxn, the logical function of

   NOT (texture XOR (source OR destination))

Note

■ This command is the PCL Version of the HP-GL/2 MC command.

■ This command sets the ROP value which affects not only PCL operation but also the HP-GL/2 ROP value.

EXAMPLE

The Logical Operation default value is 252 (TSo), corresponding to a logical function of:

(texture | source)

The result is computed below for both case 1 (source and pattern opaque) and case 4 (source and pattern transparent) on the previous page. Note that the ROP3 value of 252 results only with case 1, when both source and pattern transparency modes are set to opaque.

Table 1-6. Logical Operation (ROP3)

	Bits							
	7	6	5	4	3	2	1	0
Texture	1	1	1	1	0	0	0	0
Source	1	1	0	0	1	1	0	0
Destination	1	0	1	0	1	0	1	0
ROP3 (source & pattern are opaque)	1 (decimal 252)	1	1	1	1	1	0	0
ROP3 +Transparencies (source & pattern are transparent)	1	1	1	0	1	0	1	0

Each column of destination, source, and texture values are the input to the logical function. The result, 252, is the value that would be sent to identify the logical operation (source and pattern transparency modes are opaque). The last row, "ROP3 + Transparencies (source & pattern are transparent)" shows the result if source and pattern transparency modes are transparent (the default transparency mode).

Table of Logical Operations

The Logical Operations (ROP3) table (Table 1-7) shows the mapping between input values and their logical operations. Note that the logical operations are specified as RPN (reverse polish notation) equations. Here is a key to describe what the Boolean Function values mean;

S = Source	a = AND
T = Texture	o = OR
D = Destination	n = NOT
	x = EXCLUSIVE OR

Note

Since logical operations are interpreted in RGB space (white = 1 and black = 0) rather than in CMY space (white = 0 and black = 1), the results may not be intuitive. For example, ORing a white object with a black object in RGB space yields a white object. This is the same as ANDing the two objects in CMY space. It must be remembered that the printer operates in something similar to a CMY space and inverts the bits and reverses the order.

Table 1-7.   Logical Operations (ROP3)

Input Value	Boolean Function	Input Value	Boolean Function
0	0	27	SDTSxaxn
1	DTSoon	28	TSDTaox
2	DTSona	29	DSTDxaxn
3	TSon	30	TDSox
4	SDTona	31	TDSoan
5	DTon	32	DTSnaa
6	TDSxnon	33	SDTxon
7	TDSaon	34	DSna
8	SDTnaa	35	STDnaon
9	TDSxon	36	STxDSxa
10	DTna	37	TDSTanaxn
11	TSDnaon	38	SDTSaox
12	STna	39	SDTSxnox
13	TDSnaon	40	DTSxa
14	TDSonon	41	TSDTSaoxxn
15	Tn	42	DTSana
16	TDSona	43	SSTxTDxaxn
17	DSon	44	STDSoax
18	SDTxnon	45	TSDnox
19	SDTaon	46	TSDTxox
20	DTSxnon	47	TSDnoan
21	DTSaon	48	TSna
22	TSDTSanaxx	49	SDTnaon
23	SSTxDSxaxn	50	SDTSoox
24	STxTDxa	51	Sn
25	SDTSanaxn	52	STDSaox
26	TDSTaox	53	STDSxnox

Table 1-7. Logical Operations (ROP3) continued

Input Value	Boolean Function	Input Value	Boolean Function
54	SDTox	81	DSTnaon
55	SDToan	82	DTSDaox
56	TSDToax	83	STDSxaxn
57	STDnox	84	DTSonon
58	STDSxox	85	Dn
59	STDnoan	86	DTSox
60	TSx	87	DTSoan
61	STDSonox	88	TDSToax
62	STDSnaox	89	DTSnox
63	TSan	90	DTx
64	TSDnaa	91	DTSDonox
65	DTSxon	92	DTSDxox
66	SDxTDxa	93	DTSnoan
67	STDSanaxn	94	DTSDnaox
68	SDna	95	DTan
69	DTSnaon	96	TDSxa
70	DSTDaox	97	DSTDSaoxxn
71	TSDTxaxn	98	DSTDoax
72	SDTxa	99	SDTnox
73	TDSTDaoxxn	100	SDTSoax
74	DTSDoax	101	DSTnox
75	TDSnox	102	DSx
76	SDTana	103	SDTSonox
77	SSTxDSxoxn	104	DSTDSonoxxn
78	TDSTxox	105	TDSxxn
79	TDSnoan	106	DTSax
80	TDna	107	TSDTSoaxxn

Table 1-7.   Logical Operations (ROP3) continued

Input Value	Boolean Function	Input Value	Boolean Function
108	SDTax	135	TDSaxn
109	TDSTDoaxxn	136	DSa
110	SDTSnoax	137	SDTSnaoxn
111	TDSxnan	138	DSTnoa
112	TDSana	139	DSTDxoxn
113	SSDxTDxaxn	140	SDTnoa
114	SDTSxox	141	SDTSxoxn
115	SDTnoan	142	SSDxTDxax
116	DSTDxox	143	TDSanan
117	DSTnoan	144	TDSxna
118	SDTSnaox	145	SDTSnoaxn
119	DSan	146	DTSDToaxx
120	TDSax	147	STDaxn
121	DSTDSoaxxn	148	TSDTSoaxx
122	DTSDnoax	149	DTSaxn
123	SDTxnan	150	DTSxx
124	STDSnoax	151	TSDTSonoxx
125	DTSxnan	152	SDTSonoxn
126	STxDSxo	153	DSxn
127	DTSaan	154	DTSoaxn
128	DTSaa	155	SDTSoaxn
129	STxDSxon	156	STDnax
130	DTSxna	157	DSTDoaxn
131	STDSnoaxn	158	DSTDSaoxx
132	SDTxna	159	TDSxan
133	TDSTnoaxn	160	DTa
134	DSTDSoaxx	161	TDSTnaoxn

Table 1-7.   Logical Operations (ROP3) continued

Input Value	Boolean Function	Input Value	Boolean Function
162	DTSnoa	189	SDxTDxan
163	DTSDxoxn	190	DTSxo
164	TDSTonoxn	191	DTSano
165	TDxn	192	TSa
166	DSTnax	193	STDSnaoxn
167	TDSToaxn	194	STDSonoxn
168	DTSoa	195	TSxn
169	DTSoxn	196	STDnoa
170	D	197	STDSxoxn
171	DTSono	198	SDTnax
172	STDSxax	199	TSDToaxn
173	DTSDaoxn	200	SDToa
174	DSTnao	201	STDoxn
175	DTno	202	DTSDxax
176	TDSnoa	203	STDSaoxn
177	TDSTxoxn	204	S
178	SSTxDSxox	205	SDTono
179	SDTanan	206	SDTnao
180	TSDnax	207	STno
181	DTSDoaxn	208	TSDnoa
182	DTSDTaoxx	209	TSDTxoxn
183	SDTxan	210	TDSnax
184	TSDTxax	211	STDSoaxn
185	DSTDaoxn	212	SSTxTDxax
186	DTSnao	213	DTSanan
187	DSno	214	TSDTSaoxx
188	STDSanax	215	DTSxan

Table 1-7.   Logical Operations (ROP3) continued

Input Value	Boolean Function	Input Value	Boolean Function
216	TDSTxax	236	SDTao
217	SDTSaoxn	237	SDTxno
218	DTSDanax	238	DSo
219	STxDSxan	239	SDTnoo
220	STDnao	240	T
221	SDno	241	TDSono
222	SDTxo	242	TDSnao
223	SDTano	243	TSno
224	TDSoa	244	TSDnao
225	TDSoxn	245	TDno
226	DSTDxax	246	TDSxo
227	TSDTaoxn	247	TDSano
228	SDTSxax	248	TDSao
229	TDSTaoxn	249	TDSxno
230	SDTSanax	250	DTo
231	STxTDxan	251	DTSnoo
232	SSTxDSxax	252	TSo
233	DSTDSanaxxn	253	TSDnoo
234	DTSao	254	DTSoo
235	DTSxno	255	1

Pixel Placement   This command determines how pixels are rendered in images.

$_E{_C}*\ell$ # **R**

\# = 0 - Grid intersection
   1 - Grid centered

Default = 0
Range = 0, 1 (command is ignored for other values)

Two models are used for rendering pixels when an image is placed on paper:

- Grid Intersection Model
- Grid Centered Model

This command can be invoked multiple times during a page. It has no effect except to switch the model being used for imaging.

Note   ■ The PCL Pixel Placement command determines how pixels are placed for both PCL and HP-GL/2 operation.

The following example (Figure 1-1) illustrates the concepts of the two models. Assume a rectangle extends from coordinate position (1,1) to position (3,4). As shown below, each model produces a different result. (Since PCL printers print only at intersections, grid centered pixel placement is implemented as shown on the right.)
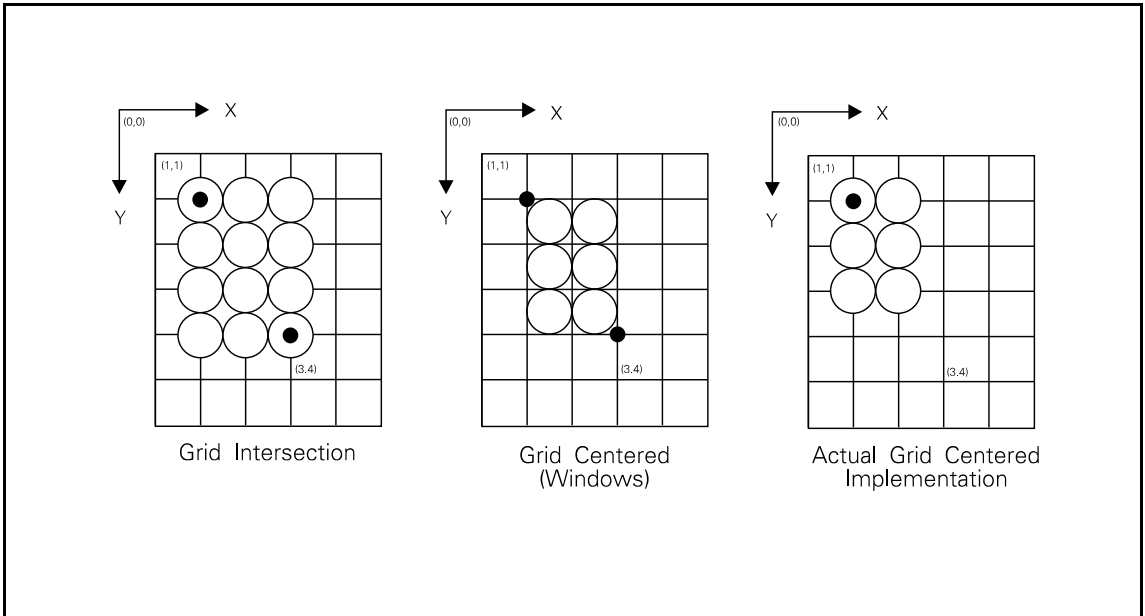
Figure 1-1. Pixel Placement

The grid centered model produces a rectangle that is one dot row thinner and one dot row shorter than the grid intersection model. The grid intersection model is the PCL default.

Note   The grid centered method is used by Microsoft Windows.

Placement Variations

PCL and HP-GL/2 (see following pages for HP-GL/2 pixel placement command description) provide two pixel placement modes: grid intersection (the default) and grid centered. Grid intersection places pixels on the intersections of the grid (see Figure 1-2). Grid centered places pixels in the center of the grid. In Figure 1-2, a rectangle extends from position (1,1) to (3,4). The grid centered model produces a rectangle one dot thinner and one dot shorter then the grid intersection model.

When rectangular area fills are used and grid intersection is used, an overlapping of pixels can occur if rectangular area fills are placed adjacent to one another (as shown below). Depending on the raster operation presently in effect, this overlap can produce undesirable results in the final printed image. To avoid this problem, use the grid centered method.

Note   Since PCL printers print only at intersections, grid centered is implemented as shown on the right.

Grid Intersection   Grid Centered

Common boundary overlap
Printer XOR's these to produce
undesired results

Common Boundary
No overlap

✕ =Pixels in first polygon area   ◯ =Pixels in second polygon area
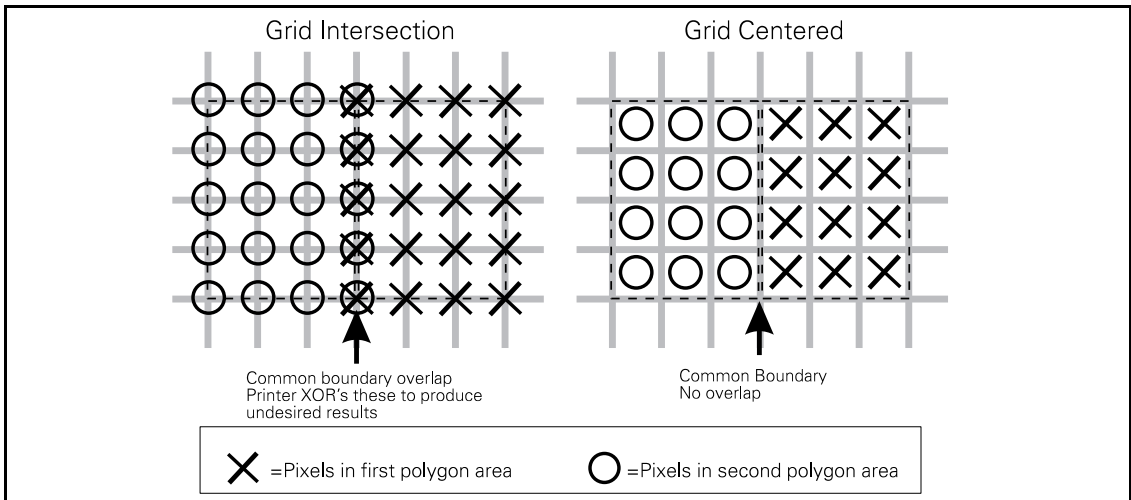
Figure 1-2.   Pixel Placement Variations

PP, Pixel Placement Command (HP-GL/2)

The Pixel Placement (PP) command controls how pixels are placed on the layout grid during polygon fills. Two pixel placement modes are grid intersection or grid centered.

PP [mode] ;

Pixel Placement Command (HP-GL/2)

Parameter	Format	Functional Range	Default
mode	clamped integer	0 or 1	0 (grid intersection)

mode

0 = grid intersection; device draws pixels centered at grid intersections (see Figure 1-1).

1 = grid centered; device draws pixels centered inside the boxes created by the grid (see Figure 1-1).

The command is the HP-GL/2 version of the PCL Pixel Placement command. Whatever mode is selected, using the HP-GL/2 PP command also applies to PCL operation. Likewise the PCL Pixel Placement command also affects HP-GL/2 pixel placement.

Note

■ Microsoft Windows fills polygons based on grid centered method.

■ This command determines how pixels will be placed for both HP-GL/2 and PCL operation.

■ The PP command is not defaulted by an IN command.

MC, Merge Control Command (HP-GL/2)

The Merge Control (MC) command specifies the raster operation (ROP's) to be performed in HP-GL/2. Raster Operations specify how source, destination, and patterns are combined to produce final images. This command supports all 256 Microsoft Windows ternary (ROP3) raster-operation codes.

MC [mode, [opcode]] ;

Merge Control Command (HP-GL/2)

Parameter	Format	Functional Range	Default
mode	clamped integer	0 or 1	0 (ROP 252)
opcode	clamped integer	0...255[1]	168, 252

1 - for opcode ROP values refer to Table 1-7, Logical Operation.

mode

0 = opcode value is ignored; printer sets ROP to 252.

1 = opcode value is used as the ROP value. If no opcode value is sent, printer sets ROP to 168. If opcode is out of range (some value other then 0-255), the command is ignored and the default ROP of 252 is used. (For example: **MC1,60; MC1,60-; MC1,+60; MC1,60+;** all set the ROP to 60; however, **MC1,-60;** or **MC1,300;** set the ROP to the default value (252).

Note

- This command is the HP-GL/2 version of the PCL Logical Operation command.
- This command sets a ROP value which affects not only HP-GL/2 operation but also the PCL ROP value.
- The MC command is defaulted by an IN command.

The operation code (opcode) specifies the logical operations that are performed on a source, destination, and patterned image prior to drawing the final image. The opcodes are created by listing all possible combinations of a single pattern, source and destination pixel, and constructing the desired final pixel values. The following table shows three common opcodes.

Table 1-8.   Common Opcodes

Pixel Combinations			Desired Destination Values		
Pattern Pixel	Source Pixel	Destination Pixel	Source Overwrite	Transparency (TR command)	Source Destination
0	0	0	0	0	0
0	0	1	0	1	1
0	1	0	1	1	1
0	1	1	1	1	0
1	0	0	0	0	0
1	0	1	0	1	1
1	1	0	1	1	1
1	1	1	1	1	0
Resulting Opcode			204 (0xCC)	238 (0xEE)	102 (0x66)

HP LaserJet 4P and 4MP Printers

The LaserJet 4P printer is the follow-on to the HP LaserJet IIIP printer. The LaserJet 4MP printer is the multi-platform (PostScript) version of the 4P printer. PCL operation and the internal fonts in these two printers are identical to that of the LaserJet 4ML printer. The 4P and 4MP printers have a control panel unlike the 4L and 4ML printers. Refer to Table 1-1, PCL Feature Support Matrix, for the commands these printers support and to Chapter 2, Fonts, for font support information.

HP LaserJet 4PJ Printer

The LaserJet 4PJ printer is a modified version of the Laser-Jet 4P printer designed specifically for the Japanese market. The enhanced PCL 5 printer language in this printer includes all of the PCL 5 features of the LaserJet 4P, plus special features which specifically support the Asian printing market. These features include large font support, support for vertical printing, and the ESC/P printer language. Table 1-9 lists the PCL feature additions for this printer.

Table 1-9.   PCL Feature Additions for HP LaserJet 4PJ

Feature	Status	Comments
Text Parsing Method Command	New	Provides a method for specifying character codes to select characters in large fonts (> 256 characters).
Character Text Path Direction Command	New	Allows vertical printing for Asian markets, which use both horizontal and vertical printing.
Font Header Format	Modified	Adds Font Format 16, a font header which supports large TrueType fonts. Five new font header segments are supported.
Fonts	New Additions and deletions	The resident typefaces are different than those in the LaserJet 4P printer. Two large fonts (fonts containing a large number of characters) are included to support the Japanese market: MS Mincho and MS Gothic. The printer also contains some Western TrueType typefaces (Arial and Times Roman families). The printer does not have any Intellifont typefaces except the Courier family.
Page Size Command	New Additions	Adds support for JIS B5 paper (^{E}c&ℓ45A) and two Japanese postcard sizes: *Hagaki* (^{E}c&ℓ71A) and *Oufuku-Hagaki* (^{E}c&ℓ72A).
Character Enhancements	New	Allows pseudo-bold and pseudo-italic enhancements to be applied to MS Mincho, MS Gothic, and certain downloaded TrueType fonts.

Descriptions of the *Text Parsing Method* Command, *Character Text Path Direction* Command, and *Font Format 16* are provided in the following paragraphs. Following that, a "LaserJet 4PJ Programming Tips" section offers examples and tips for performing specific tasks using PCL 5.

Text Parsing Method Command

The Text Parsing Method command informs the PCL parser whether character codes should be interpreted as 1-byte or 2-byte character codes as described below.

^E_C**&t#P**

 # = 0, 1 - All character codes are processed as one-byte characters.

21 - Character codes are processed as one-byte or two-byte characters as described below.

31 - Character codes are processed as one-byte or two-byte characters as described below.

38 - Character codes are processed as one-byte or two-byte characters as described below.

Default = 0 or 31 (if the default symbol set is WIN31J, the value is 31; otherwise it is 0)

Range = 0, 1, 21, 31, 38

If the value field is 21, character codes in the range 0x21-0xFF are processed as the first byte of a two-byte character. The following byte is processed as the second byte of the two-byte character. All character codes outside this range are processed as one-byte values. This method can be used for parsing characters in Asian seven-bit encoding specifications, including JIS X0208 (Japan), GB 2312-80 (China), and KS C 5601-1992 (Korea).

If the value field is 31, character codes in the range 0x81-0x9F and 0xE0-0xFC are processed as the first byte of a two-byte character. The following byte is processed as the second byte of the two-byte character. All character codes outside this range are processed as one-byte values. This method can be used for parsing characters in the Shift-JIS encoding specification.

If the value field is 38, character codes in the range 0x80-0xFF are processed as the first byte of a two-byte character. The following byte is processed as the second byte of the two-byte character. All character codes outside

this range are processed as one-byte values. This method can be used for parsing Asian eight-bit encoding specifications, such as the Big Five and TCA encoding specifications (Taiwan), and KS C 5601-1992 and GB 2312-80, which can be either 7 or 8 bit.

Character Text Path Direction Command

This command allows the user to vertically rotate text for use in vertical writing applications.
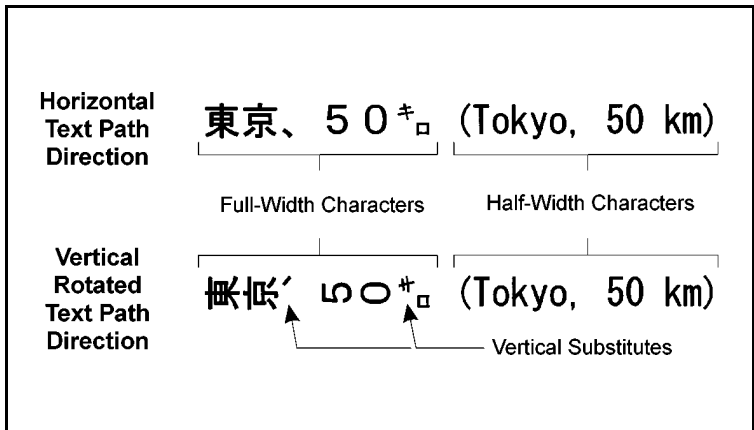
E_C**& c # T**

= **0** - Horizontal printing

   –1 - Vertical rotated printing

Default = 0

Using E_C&c0T, the printer's current active position (CAP) advances left to right, and linefeed advances top to bottom with horizontal, upright characters.

Using E_C&c–1T, the following actions occur:

- Full-width characters in large fonts are rotated counter-clockwise 90 degrees ("vertical rotated" characters).

- Vertical substitutes are made for characters which change their appearance, orientation, or positioning when written vertically.

- All other characters are unaffected by this setting.

- The vertical-rotated printing mode (E_C&c-1T) has the effect of transforming a portrait page with horizontal text into a landscape page with vertical text. The PCL Print Direction command can be used to achieve other text orientations.

Horizontal Text Path Direction	東京、５０㌔ (Tokyo, 50 km)

Full-Width Characters   Half-Width Characters

Vertical Rotated Text Path Direction	京東、５０㌔ (Tokyo, 50 km)

Vertical Substitutes

Vertical substitution characters are those characters which change their appearance, orientation, or positioning when written vertically. Examples in Japanese fonts include parentheses, brackets, punctuation and small kana. In the example above, the "C" and "A" characters, when rotated, are replaced with vertical substitutes which are the "C" and "A" characters rotated clockwise 90 degrees. Vertical substitution characters are accessed through the Vertical Substitutes Character Segment, which is described in more detail later in this chapter.

Font Header Format 16

The LaserJet 4PJ printer provides support for large fonts. Large fonts, such as the MS Mincho and MS Gothic fonts supplied in the printer, are fonts which are bound to large symbol sets. The LaserJet 4PJ printer supports a new font header to accomodate large bound fonts. New segments are provided for support of vertical substitutes, galley characters, typeface strings, and character enhancements.

The Font Header Command, described beginning on page 11-6 of the *PCL 5 Printer Language Technical Reference Manual*, has several different header formats. The support of large fonts adds Font Header Format 16 (Universal Font Header). Font Header Format 16 is identical in structure to format 15 (Universal Scalable Font Header) except that the size field for data segments has been enlarged from 16 bits

to 32 bits, and a new Font Type has been added for large fonts (Font Type 3).

New Font Format Header Segments

For the LaserJet 4PJ printer, Font Header Format 15 has been extended to include optional data segments for supporting galley characters, typeface strings, and character enhancements. Font Format 16 supports these segments plus optional segments for supporting vertical substitution and a vertical rotation offset. (Segmented Font Data is described beginning on page 11-45 of the *PCL 5 Printer Language Technical Reference Manual*.)

Galley Character Segment

If an application requests a character that does not exist within the current font, the printer checks the Galley Character Segment for a substitute character to print instead.

Vertical Substitution Character Segment

The Vertical Substitution Character Segment is used to identify vertical substitute glyphs for characters which change their appearance, orientation, or positioning when written vertically.

Typeface String Segment

The Typeface String Segment allows names of permanent downloaded fonts to be displayed, using non-Latin characters, in the appropriate typeface on the Typeface List.

Vertical Rotation Segment

When the character text path direction is set to vertical rotation, full-width characters are rotated counter-clockwise 90 degrees. The Vertical Rotation Segment specifies the point around which the character rotates, so that character alignment is compatible with the way Windows 3.1J rotates characters.

Character Enhancement Segment

The LaserJet 4PJ printer can apply pseudo-bold and pseudo-italic enhancements to MS Mincho, MS Gothic, and certain downloaded TrueType fonts. This segment is used to indicate that a particular downloaded font is able to have these character enhancements applied.

Description of Font Header Segments

Each font header data segment contains three parts:

- Segment Identifier
- Data Segment Size
- Data Segment

Segment Identifier Values

The Segment Identifier Values for the Galley Character, Vertical Substitution Character, Typeface String, Vertical Rotation, and Character Enhancement Segments are as shown in the following table.

Value	Mnemonic*	Data Segment
18243	GC	Galley Character Segment
22100	VT	Vertical Substitute Segment
21574	TF	Typeface String Segment
22098	VR	Vertical Rotation Segment
17221	CE	Character Enhancement Segment

* The mnemonic is obtained when the two bytes of this big-endian word are treated as ASCII characters.

Data Segment Size

The Data Segment Size indicates the number of bytes in the immediately following Data Segment. The size of this field is 4 bytes for Font Format 16 fonts, and 2 bytes for Font Format 15 fonts. The rest of the data segments are identical for both font formats.

Galley Character Segment

If an application requests a character that does not exist within the current font, the printer checks the Galley Character Segment for a substitute character to print instead. The Galley Character Segment specifies the character codes of the substitute characters to be printed. A different galley character can be specified for different regions of the symbol set. For example, this segment can be set up so that an asterisk prints when a non-existent character is selected in the region 0x81 - 0x9F, and a question mark for characters in the region 0xE0-0xFC.

Byte	15 (MSB) 8	7 (LSB) 0	Byte
0	GC (18243)		1
2	Data Segment Size (6*n+6) *		3
4			5
6	Format = 0		7
8	Default Galley Character		9
10	Number of Regions (n)		11
12	Region #1 Upper Left Character Code		13
14	Region #1 Lower Right Character Code		15
16	Region #1 Galley Character		17
. . .			. . .
6*n+6	Region #n Upper Left Character Code		6*n+7
6*n+8	Region #n Lower Right Character Code		6*n+9
6*n+10	Region #n Galley Character		6*n+11

* This segment is for Font Format 16. The Data Segment Size field for Font Format 16 fonts is 4 bytes; the segment for Font Format 15 fonts is identical except the Data Segment Size field is 2 bytes instead.

■ **Default Galley Character (UI)**—Character code of the character to be printed when a specified character is not within any of the defined regions.

■ **Number of Regions (UI)**—Number of regions for which galley characters are defined. Regions are defined for a table in which the first character code byte specifies the row and the second byte specifies the column.

- **Region #x Upper Left Character Code (UI)**— Character code defining upper left corner of Region #x.
- **Region #x Lower Right Character Code (UI)**— Character code defining lower right corner of Region #x.
- **Region #x Galley Character (UI)**—Character code of the character to be printed when a character within Region #x is missing from the selected font.

If the value of the galley character field is 0xFFFF, then if the font contains a missing character glyph, that glyph is printed. The missing character glyph can be downloaded using the PCL Download Character command with a character code = 0xFFFF and a glyph ID = 0.

If both the character specified by the original character code and by the galley character code are missing, the CAP is advanced in accordance with previous PCL rules for missing characters, that is, it is advanced according to the current setting of HMI (Horizontal Motion Index).

The Galley Character Segment will be invalid if the format number is not supported or if the segment size declared in the Segment Size field is larger or smaller than required for the number of regions (N). If the segment is invalid, the font download will be ignored.

Galley Character Segments can be downloaded with any Font Format 15 or 16 font, regardless of font type.

The Galley Character Segment can be used to implement a requirement of the *Microsoft Windows Version 3.1, Japanese Version, Microsoft Standard Character Set Specification* (March 11, 1993), which states "when there is an output request for a character of a specified typeface, even if the glyph corresponding to the specified character code does not exist, some glyph data will be output . . . For double-byte characters, the glyph of the default character defined for the given TrueType font is used. For single-byte characters, the glyph at 0xA5 (small dot, U+FF65) is used."

The following table shows a Galley Character Segment which follows the Japanese Windows specification.

Byte	15 (MSB) 8	7 (LSB) 0	Byte
0	GC (18243)		1
2	Data Segment Size (12) *		3
4			5
6	Format = 0		7
8	Default Galley Character = 0xFFFF		9
10	Number of Regions (n) = 1		11
12	Region #1 Upper Left Character Code = 0x0000		13
14	Region #1 Lower Right Character Code = 0x00FF		15
16	Region #1 Galley Character = 0x00A5		17

In this example segment, there is one galley character region. This region is applied to all one-byte characters (character codes 0x0000-0x00FF); any missing character in this region is replaced with the character at character code location 0x00A5. Any missing characters falling into this region (e.g. character codes 0x0100 - 0xFFFF) are replaced with the default galley character. Since in this example the Default Galley Character field = 0xFFFF, the missing character glyph is printed if it is present in the font.

Vertical Substitution Segment

The Vertical Substitution Segment contains pairs of glyph IDs. Each pair specifies the horizontal and vertical glyph ID for a character. The segment can be built directly from a TrueType *mort* table which contains a vertical substitu- tion array. The segment definition is shown in the following table.

Byte	15 (MSB) 8	7 (LSB) 0	Byte
0	VT (22100)		1
2	Data Segment Size (4*n+4) *		3
4			5
6	Horizontal Glyph ID #1		7

* This segment is for Font Format 16. The Data Segment Size field for Font Format 16 fonts is 4 bytes; the segment for Font Format 15 fonts is identical except the Data Segment Size field is 2 bytes instead.

Byte	15 (MSB) 8	7 (LSB) 0	Byte
8	Vertical Glyph ID #1		9
. . .			. . .
4*n+2	Horizontal Glyph ID #n		4*n+3
4*n+4	Vertical Glyph ID #n		4*n+5
4*n+6	End of table mark #1 = 0xFFFF		4*n+7
4*n+8	End of table mark #2 = 0xFFFF		4*n+9

The Horizontal Glyph ID field is used by TrueType as an ID number for the horizontal glyph data associated with a given character. The Vertical Glyph ID field contains the ID number for the vertical glyph data associated with the same character.

The vertical glyphs can be downloaded using the PCL Character Definition Command using a character code = 0xFFFF.

A TrueType *mort* table typically contains a header of 76 bytes, followed by the vertical substitution array which follows the segment format described here. However, the mort table header is designed to be variable-length, and the location of the vertical substitution data may be located elsewhere in mort tables in future fonts.

If the Font Type is not Type 3 (16-bit fonts), this data segment is ignored.

If the value pairs are not sorted by horizontal glyph ID, the data segment is invalid. If the End of Table mark #1 is not 0xFFFF, the data segment is invalid. The location of the end of the table is determined using the Data Segment Size field. If the segment is invalid, the font download will be ignored.

Typeface String Segment

The purpose of this segment is to provide a substitute string to print for a permanent downloaded font when doing a PCL Typeface List printout. It has the following structure:

Byte	15 (MSB) 8	7 (LSB) 0	Byte
0	TF (21574)		1
2 4	Data Segment Size (2*n+2) *		3 5
6	Embedded Font Name Flag	Substitute String Length (n)	7
8	Substitute String Character List		9
. . .			. . .

* This segment is for Font Format 16. The Data Segment Size field for Font Format 16 fonts is 4 bytes; the segment for Font Format 15 fonts is identical except the Data Segment Size field is 2 bytes instead.

- **Embedded Font Name Flag (UB)**—A zero value in this field is used to indicate that the ASCII name of the font (from the Font Name field) should be printed in addition to the substitute string. A non-zero value is used to indicate that only the substitute string should be printed.

- **Substitute String Length (UB)**—the number of UI characters in the Substitute String Character List.

- **Substitute String Character List (array of UI)**—the characters which make up the substitute string. Each character is represented as a UI value. If the font is a bound font, then the values are accessed by their character codes values; if the font is unbound, then the Unicode index numbers (see Appendix D) are used.

The Typeface String Segment will be invalid if the Data Segment Size declared in the Data Segment Size field is larger or smaller than required for substitute string length, or if the Data Segment Size is an odd number of bytes. If the segment is invalid, the font download will be ignored.

Typeface String Segments can be downloaded with any Font Format 15 or Font Format 16 font, regardless of font type.

The following tables are examples of Typeface String Segments for two downloaded fonts. The first is for MS Mincho, and has the embedded font name flag set to true.

The second is for MS Gothic, and has the embedded font name flag set to false.

Byte	15 (MSB) 8	7 (LSB) 0	Byte
0	TF (21574)		1
2 4	Data Segment Size (10) *		3 5
6	Embedded Font Name Flag = 1	Substitute String Length = 4	7
8 10 12 14	Substitute String Character List = 0x826c (Note: these are full-width 0x8272 Shift-JIS character codes 0x96be for "MS" and Kanji 0x92a9 "Mincho")		9 11 13 15

Byte	15 (MSB) 8	7 (LSB) 0	Byte
0	TF (21574)		1
2 4	Data Segment Size (14) *		3 5
6	Embedded Font Name Flag = 0	Substitute String Length = 6	7
8 10 12 14 16 18	Substitute String Character List = 0x826c (Note: these are full-width 0x8272 Shift-JIS character codes 0x8353 for "MS" and Katakana for 0x8356 "Gothic") 0x8362 0x834e		9 11 13 15 17 19

* This segment is for Font Format 16. The Data Segment Size field for Font Format 16 fonts is 4 bytes; the segment for Font Format 15 fonts is identical except the Data Segment Size field is 2 bytes instead.

The following illustration shows how the PCL Typeface List would look.

HP LaserJet 4PJ P
PCL Typeface List

Permanent Soft Fonts

Typeface	Pitch/Point
ＭＳ明朝 ← MS Mincho	Scale
ＭＳゴシック MSGothic	Scale

Vertical Rotation Segment

The Vertical Rotation Segment is used to define the lower boundary of the rotation box used when the character text path direction is set to vertical rotation. This is an optional segment which may be downloaded with Font Format 16 TrueType fonts.

The following illustration shows an example of character rotation. The boxes around each character represent the vertical rotation box. The distance between the baseline and the bottom of the character box is represented by the Descender value in the Vertical Rotation Segment.
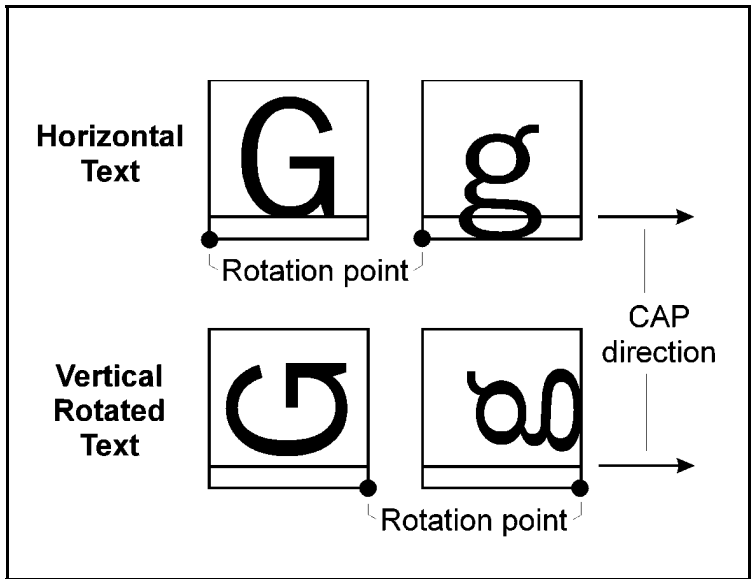
The structure of the Vertical Rotation Segment is:

Byte	15 (MSB) 8	7 (LSB) 0	Byte
0	VR (22098)		1
2	Data Segment Size (4) *			3
4			5
6	Format (0)		7
8	Descender value		9

* This segment is for Font Format 16. The Data Segment Size field for Font Format 16 fonts is 4 bytes; the segment for Font Format 15 fonts is identical except the Data Segment Size field is 2 bytes instead.

- **Format (UINT16)**—Set this value to 0.
- **Descender Value (SINT16)**—Set this value to equal the "sTypoDescender" value from the "OS/2" table of the TrueType font.

  If the Vertical Rotation Segment is not downloaded with the font definition, a default value is used for the

Descender value. The default value is set to the following:

Descender value = -36/256 * ScaleFactor

Where: ScaleFactor is Bytes 64 and 65 from the
Font Format 16 Font Header.

Character Enhancement Segment

This segment indicates whether the pseudo-bold or pseudo-italic enhancements can be performed on a downloaded font.

The structure of the Character Enhancement Segment is:

Byte	15 (MSB) 8	7 (LSB) 0	Byte
0	CE (17221)		1
2	Data Segment Size (8)		3
4			5
6	Style		7
8			9
10	Stroke Weight		11
12	Reserved		13

* This segment is for Font Format 16. The Data Segment Size field for Font Format 16 fonts is 4 bytes; the segment for Font Format 15 fonts is identical except the Data Segment Size field is 2 bytes instead.

■ **Style (UINT32)**—This field specifies the style types that the printer is allowed to perform on the font characters.

31 4	3 0
Reserved	Posture

Bit Positions (#) = Posture

1 = Italics

0, 2, 3 = Reserved

■ **Stroke Weight (UINT16)**—This field specifies the stroke weights which the printer is allowed to provide using the pseudo-bold enhancement algorithm.

15	0
Stroke weight	
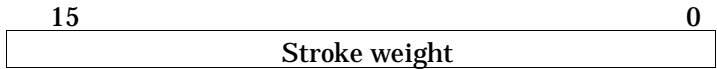
Bit Position (#) = Stroke Weight

0 =	Reserved	8 =	"Book" or "Text" Weight
1 =	Ultra Thin	9 =	Semi-Bold
2 =	Extra Thin	10 =	Demi-Bold
3 =	Thin	11 =	Bold
4 =	Extra Light	12 =	Extra Bold
5 =	Light	13 =	Black
6 =	Demi Light	14 =	Extra Black
7 =	Semi Light	15 =	Ultra Black

Note   Only stroke weights greater than the stroke weight of the font can be provided using the pseudo-bold enhancement algorithm.

LaserJet 4PJ Programming Tips

This section provides programming tips concerning specific considerations for the LaserJet 4PJ printer. This section covers general print job initialization, font metric calculation, vertical writing, and other issues which are pertinent to printing Japanese text on the LaserJet 4PJ printer using PCL 5.

General Print Job Initialization

This example demonstrates the general print job initialization procedure for the LaserJet 4PJ printer, which is slightly different than that used for other LaserJet printers.

Output from pre-LaserJet 4PJ PCL drivers (for example, a LaserJet 4P driver) will only print correctly on the LaserJet 4PJ printer if the default PCL symbol set is set to a value other than the Japanese Windows 3.1 (Win3.1J) symbol set. This is because the default PCL text parsing method is set based on the default PCL symbol set. When the default PCL symbol set is set to Win3.1J, the default text parsing method is Shift-JIS parsing; for any other value, such as Roman-8, the default text parsing method is 1-byte parsing. To set the default PCL symbol set value, use PJL or the control panel.

The first example given here is nearly identical to the initialization used for other LaserJet 4 family printers. The only difference is that it includes a PJL command to set the default PCL symbol set to Roman-8.

```
Ec%-12345X@PJL<CR><LF>
@PJL SET RESOLUTION=600<CR><LF>
@PJL PAGEPROTECT=OFF<CR><LF>
@PJL RET=MEDIUM<CR><LF>
@PJL COMMENT *** This command is added ***
@PJL SET LPARM:PCL SYMSET=ROMAN8<CR><LF>
@PJL ENTER LANGUAGE=PCL<CR><LF>
EcEEc&l1x1s1h2a0o8c6e54FEc&a5LEc(0UEc(s1p9vs3b4101T
```

The commands in the above example are explained in more detail in the PCL 5 and PJL technical reference manuals.

The second example given here initializes a PCL 5 print job for printing Japanese text. The major differences from the previous example are that it specifies A4 paper, initializes the text parsing method to Shift-JIS, selects Win3.1J as the primary symbol set, selects MS-Mincho as the primary font.

```
ᴱc%-12345X@PJL<CR><LF>
@PJL SET RESOLUTION=600<CR><LF>
@PJL PAGEPROTECT=OFF<CR><LF>
@PJL RET=MEDIUM<CR><LF>
@PJL ENTER LANGUAGE=PCL<CR><LF>
ᴱcEᴱc&l1x1h26a0o8c6e60Fᴱc&a5Lᴱc&t31Pᴱc(19K
➥ᴱc(s1p10v0s0b28752T
```

The last line (2 lines, as shown) in the above example is a PCL 5 initialization string. This set of commands resets the printer, specifies 1 copy, specifies the paper tray as a paper source, chooses A4-size paper, selects portrait orientation, VMI=8 (6LPI), sets top margin to 6 lines, selects a text length of 60 lines, a 5-column left margin, Shift-JIS parsing, WIN3.1J symbol set, and a proportional, 10-point, upright, text-weight MS-Mincho font.

After the PCL print data, the following commands would be used to complete the job:

```
ᴱcEᴱc%-12345X
```

Font Metric Calculation

Accurate character placement relies on the ability to predict character width and height. As a character's point size changes, so does its width and height. (CAP displacement, the distance the CAP moves for vertically rotated text, is a full-width calculation.)

In proportionally spaced fonts, character widths also vary from character to character within the font. Variable character widths add complexity to maintaining accurate line widths, page breaks, or WYSIWYG operation. To support most proportionally spaced fonts, font metrics must be extracted from the font metric files.

In the MS-Mincho and MS-Gothic fonts provided in the LaserJet 4PJ, font metric calculation is somewhat easier than for the Latin-based fonts. Width calculations are easier because all characters of these fonts conform to one of two different character widths at a particular point size. The characters are either considered full-width or half-width. One-byte characters are always half-width and two-byte characters are always full-width.

Full-width characters occupy the entire EM width at a particular point size. Half-width characters occupy half of an EM width. The following equations show how to calculate the EM width and character widths for a full-width and a half-width character.

*ppem = round (DeviceResolution * PointSize/72)*

*FullWidthDeltaX = round (ppem * PCLUnits/ DeviceResolution)*

*HalfWidthDeltaX=round ((ppem/2) * PCLUnits/DeviceResolution)*

where:

ppem = EM width in pixels

DeviceResolution = current device resolution in dots per inch (600 or 300dpi)

PointSize = point size requested

FullWidthDeltaX = character width of full-width character in PCL Units

HalfWidthDeltaX = character width of half-width character in PCL Units

PCLUnits = PCL Units

The PCL Unit of measure is explained in more detail in the *PCL 5 Technical Reference Manual*. The default PCL Unit size is 1/300th of an inch, but the *Unit of Measure* command can be used to set the PCL Unit size to other values.

Note that *HalfWidthDeltaX* may not be exactly half of *FullWidthDeltaX* because of rounding. For example, if *FullWidthDeltaX* = round(99.0) = 99, then the corresponding *HalfWidthDeltaX* = round(99.0/2) = round(49.5) = 50.

Character Enhancements

The HP LaserJet 4PJ printer supports PCL pseudo-bold and pseudo-italic character enhancements. These enhancements can be applied to the internal MS-Mincho and MS-Gothic fonts. They can also be applied to a TrueType soft font if a suitable "Character Enhancement" Segment is downloaded with the font header.

The enhancements are selected using PCL font selection commands. The pseudo-italic enhancement can be selected using the Style command. The pseudo-bold enhancement can be selected using the Stroke Weight command. The bold levels which can be applied to the internal MS-Mincho and MS-Gothic fonts are Semi Bold, Demi Bold, Bold, and Extra Bold. For example, to select a 10-point, Extra Bold, Italic, MS-Mincho font, use the following PCL command:

E_c(19K^E_c(s1p10v1s4b28752T

In the above command, Italics style (1s) and Extra Bold weight (4b) are selected. Since there is not an Extra Bold Italic MS-Mincho font resident in the printer, pseudo-italics and pseudo-bolding algorithms are applied to characters printed from the regular MS-Mincho font.

If a soft font is selected using the "Font Selection by ID" command (e.g. E_c(#X), the font is selected without any character enhancements applied. To select a soft font by ID with character enhancements, first select the font by ID, then select the desired attributes. For example, assume a soft font is downloaded with ID = 1 and a Character Enhancement Segment indicating that pseudo-bold and pseudo-italics character enhancements can be applied. The following command can be used to select that font with those enhancements:

E_c(1X^E_c(s1s3B

Other font effects, such as character shadowing, strikethrough, and gray-shading can be accomplished using the print model.

HP-GL/2 as implemented in LaserJet printers has no mechanism for parsing 2-byte characters. Therefore, HP-GL/2 character transformations (e.g. SI and SR commands) cannot be applied to these characters.

Vertical Writing

Vertical writing can be accomplished using the vertical rotated ("-1") mode of the Character Text Path command (E_c&c-1T). When using a vertical rotated text path direction, full-width characters are rotated and printed "on their sides." All other characters are unaffected and the CAP is still advanced in the horizontal direction. The "-1" mode has the effect of transforming a portrait page with horizontal full-width characters into a landscape page with vertical full-width characters. This can be combined with the Print Direction command (E_c&a#P) to achieve the desired text orientation (e.g. portrait, landscape, reverse portrait, or reverse landscape).

An example of horizontal and vertical rotated writing is shown below. The first line of text is horizontal writing and the second line is vertical rotated writing. Note that the "~" character is replaced with a vertical substitute on the second line. The C program that follows was used to generate the PCL commands for this example.
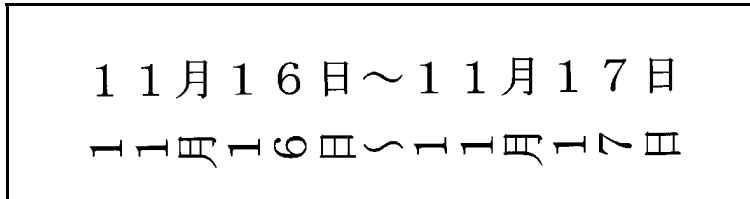
```
１ １ 月 １ ６ 日 ～ １ １ 月 １ ７ 日
```

```
#include <stdio.h>
#include <fcntl.h>

#define MONTH    "\202P\202P\214\216"

#define DAY1     "\202P\202U\223\372"

#define TILDE    "\201\140"

#define DAY2     "\202P\202V\223\372"

#define KANJITXT MONTH DAY1 TILDE MONTH DAY2
FILE *prn;
main()

{
  int point_size=24;
  prn = fopen("lpt1","wb");      /* open lpt1 for writing */
  fprintf(prn,"\33%%-12345X");   /* send down UEL to get to PJL */
  fprintf(prn,"@PJL ENTER LANGUAGE=PCL\n");     /* Enter PCL */
  fprintf(prn,"\33E");           /* send an esc E to reset printer */
  fprintf(prn,"\33&a4L");        /* left margin */
  fprintf(prn,"\33&t31P");       /* text parsing = Shift-JIS */
  fprintf(prn,"\33(19K");        /* symbol set = Win3.1J */
  fprintf(prn,"\33(s1p%dv0s0b28752T",point_size); /* MS-Mincho */
  fprintf(prn,"\n\n\n\r" KANJITXT); /* print horizontal version */
  fprintf(prn,"\33&c-1T");       /* select vertical writing */
  fprintf(prn,"\n\n\n\r" KANJITXT);   /* print vertical version */
  fprintf(prn,"\f");             /* formfeed */
  fprintf(prn,"\33%%-12345X");   /* send down UEL to get to PJL */

}
```

Printing Ruby Characters (Furigana)

Ruby characters, also known in Japanese as *furigana*, are small characters typically used as an aid in kanji pronunciation. Ruby characters are usually (but not always) hiragana. They are generally placed above the corresponding kanji in horizontal writing and to the right in vertical writing. Ruby characters can be generated using font scaling and cursor positioning commands.

An example of ruby characters is shown below. In this example, the ruby characters are printed at one-third the size of the kanji. The C program that follows was used to generate the PCL commands for this example.
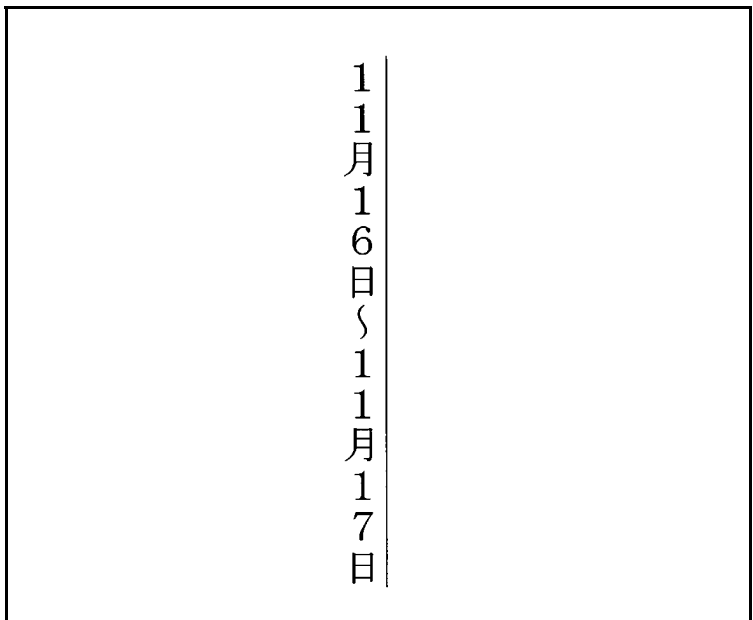
ひょう ほん
標本

```
#include <stdio.h>

#include <fcntl.h>

#define KANJITXT "\225\127\226\173"

#define RUBYTXT  "\202\320\202\345\202\244 \202\331\202\361 "
FILE *prn;
main()

{
  int point_size=72;
  prn = fopen("lpt1","wb");          /* open lpt1 for writing */
  fprintf(prn,"\33%%-12345X");       /* send UEL to get to PJL */
  fprintf(prn,"@PJL ENTER LANGUAGE=PCL\n");    /* Enter PCL */
  fprintf(prn,"\33E");               /* EscE to reset printer */
  fprintf(prn,"\33&t31P");           /* text parsing = Shift-JIS */
  fprintf(prn,"\33(19K");            /* symbol set = Win3.1J */
  fprintf(prn,"\33(s1p%dv0s0b28752T",point_size);  /* MS-Mincho */
  fprintf(prn,"\33*p300x400Y");      /* set cursor position */
  fprintf(prn,KANJITXT);             /* print kanji characters */
  fprintf(prn,"\33(s%dV",point_size/3); /*furigana point size */
  fprintf(prn,"\33*p300x%dY",400-4*point_size);/*cursor position*/
  fprintf(prn,RUBYTXT);              /* print ruby characters */
  fprintf(prn,"\f");                 /* formfeed */
  fprintf(prn,"\33%%-12345X");       /* send UEL to get to PJL */

}
```

Vertical Underlining

In Japanese writing, vertical underlines are placed to the right of vertical columns of text. This can be accomplished in PCL 5 using the Fill Rectangular Area command.

An underline is simply a long thin black-filled box. The length of the underline depends on the length of the text to be underlined.

An example of vertical underlining is shown below. The C program that follows was used to generate the PCL commands for this example.

11月16日〜11月17日

```
#include <stdio.h>
#include <fcntl.h>
#define MONTH     "\202P\202P\214\216"
#define DAY1      "\202P\202U\223\372"
#define TILDE     "\201\140"
#define DAY2      "\202P\202V\223\372"
#define KANJITXT MONTH DAY1 TILDE MONTH DAY2
```

```
FILE *prn;
main()

{
  int point_size=24;
  prn = fopen("lpt1","wb");          /* open lpt1 for writing */
  fprintf(prn,"\33%%-12345X");       /* send UEL to get to PJL */
  fprintf(prn,"@PJL ENTER LANGUAGE=PCL\n");    /* Enter PCL */
  fprintf(prn,"\33E");               /* Esc E to reset printer */
  fprintf(prn,"\33&t31P");           /* text parsing = Shift-JIS */
  fprintf(prn,"\33(19K");            /* symbol set = Win3.1J */
  fprintf(prn,"\33&a270P");          /* print direction = 270 */
  fprintf(prn,"\33*p500x1300Y");     /* set CAP position */
  fprintf(prn,"\33(s1p%dv0s0b28752T",point_size); /* MS-Mincho */
  fprintf(prn,"\33&c-1T");           /* select vertical writing */
  fprintf(prn, KANJITXT);            /* print vertical text */
  fprintf(prn,"\33*p500x%dY",1300-point_size*4); /* set CAP for
    underline*/
  /* draw underline */
  fprintf(prn,"\33*c%da3b0P",300 * strlen(KANJITXT)/2 *
    point_size/72);
  fprintf(prn,"\f");                 /* formfeed */
  fprintf(prn,"\33%%-12345X");       /* send UEL to get to PJL */

}
```

Vertical Clusters

Vertical clusters are groups of two or three narrow characters side-by-side in a vertical line of text. Vertical clusters containing half-width characters can be created by using a combination of print direction and cursor positioning commands.

An example of vertical clusters is shown below. The C program that follows was used to generate the PCL commands for this example. In this example, two half-width characters (e.g. 2-digit numbers) were printed as vertical clusters.

11
月
16
日
〜
11
月
17
日
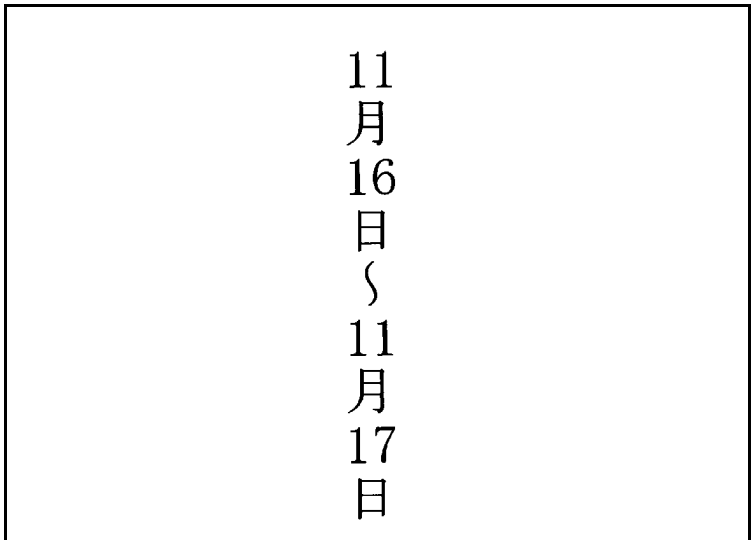
```
#include <stdio.h>

#include <fcntl.h>

#define MONTH    "\214\216"

#define TILDE    "\201\140"

#define DAY      "\223\372"

#define CLUSTER "\201\100\033&f0S\033&a0P%s%d\033&a270P\033&f1S"
FILE *prn;
main()

{
 int point_size=24;
```

```c
 int offset;
 char OFFSET[40];
 prn = fopen("lpt1","wb");   /* open lpt1 for writing */
 offset = (   36  * point_size * 300)  /
/*           __   _____                 */
         (  256  *    72     );
 sprintf(OFFSET,"\33*p-%dx-%dY",offset,offset);   /* used to
   place cluster */
 fprintf(prn,"\33%%-12345X");     /* send UEL to get to PJL */
 fprintf(prn,"@PJL ENTER LANGUAGE=PCL\n");    /* Enter PCL */
 fprintf(prn,"\33E");              /* Esc E to reset printer */
 fprintf(prn,"\33&t31P");          /* text parsing = Shift-JIS */
 fprintf(prn,"\33(19K");           /* symbol set = Win3.1J */
 fprintf(prn,"\33&a270P");         /* print direction = 270 */
 fprintf(prn,"\33*p500x1300Y");    /* set CAP position */
 fprintf(prn,"\33(s1p%dv0s0b28752T",point_size);  /* MS-Mincho */
 fprintf(prn,"\33&c-1T");       /* select vertical writing mode */
 fprintf(prn, CLUSTER MONTH, OFFSET, 11);       /* print month */
 fprintf(prn, CLUSTER DAY, OFFSET, 16);          /* print day */
 fprintf(prn, TILDE);                           /* print tilde */
 fprintf(prn, CLUSTER MONTH, OFFSET, 11);        /* print month */
 fprintf(prn, CLUSTER DAY, OFFSET, 17);          /* print day */
 fprintf(prn,"\f");                             /* formfeed */
 fprintf(prn,"\33%%-12345X");      /* send UEL to get to PJL */
```

LaserJet 4 Plus/ 4M Plus Printers

The LaserJet 4 Plus and 4M Plus printers are performance-enhanced follow-on products for the LaserJet 4 and 4M printers, respectively. The LaserJet 4M Plus printer is the multi-platform (PostScript) version of the LaserJet 4 Plus printer.

In addition to extra speed, these printers also have the following added features which are not controlled using PCL:

■ Memory Enhancement technology (MEt), which uses memory-saving techniques to better utilize available memory (refer to Chapter 4 "Memory Usage" for additional information). MEt is not controlled using PCL.

■ Resource saving, as in the LaserJet 4Si printer. Resource saving allows saving information for the current language (PCL or PostScript) when switching to another language. If resource saving is enabled, all the permanent fonts, macros, and user-defined patterns plus other miscellaneous data is saved in a reserved portion of printer memory. This data is stored until the language is enabled again. When the language is re-enabled, the stored data is made available for use. Resource saving is enabled from the control panel or using PJL—no PCL commands are required for this operation.

■ EconoMode, a feature supported by the LaserJet 4L and 4P printers, allows the user to reduce the amount of toner used by removing about 75% of the dots from the printed page. EconoMode is selected using PJL or from the control panel—it is not controlled using PCL.

■ Powersave mode, which minimizes power consumption when the printer is sitting idle. The amount of idle time required before the printer goes into powersave mode is configurable using the control panel or PJL.

PCL operation in these two printers is almost identical to that of the LaserJet 4 and 4M printers, except the LaserJet 4 Plus and 4M Plus printers support Logical Operations (ROP3) as explained in the LaserJet 4ML printer section in this chapter. In addition, the internal fonts in the LaserJet

Plus and 4M Plus printers support the Latin 2 and Latin 5 symbol sets for all typefaces (in the LaserJet 4, 4M, 4Si, and 4SiMx, only 15 of the 35 Intellifont typefaces support these symbol sets). Refer to Table 1-1, PCL Feature Support Matrix, for the commands these printers support and to Chapter 2, Fonts, for font support information.

HP LaserJet 4V/ 4MV Printers

The LaserJet 4V/4MV printers print at speeds up to 16 pages per minute and handle many paper sizes including 11" x 17" paper. The LaserJet 4MV is the multi-platform (PostScript) version of the LaserJet 4V printer.

The LaserJet 4V/4MV PCL 5 feature set is similar to that of the LaserJet 4 Plus/4M Plus printers, with the addition of wide format media support. As an option, the printer can also support Japanese printing as does the LaserJet 4PJ printer, including the following PCL enhancements:

- Text parsing method
- Character text path direction
- Japanese media/postcard support
- Japanese fonts

As with the LaserJet 4Plus/4M Plus printers, the LaserJet 4V/4MV printers support the following added features which are not controlled using PCL:

- Memory Enhancement technology (MEt)
- Resource saving
- EconoMode
- Powersave mode

Refer to Table 1-1, the PCL Feature Support Matrix, for the commands these printers support, and to Chapter 2, Fonts, for font support information.

HP Color LaserJet Printer

As its name implies, the HP Color LaserJet printer is a color laser printer. This 300 dpi printer adds several new features to the PCL 5 language. These new features are summarized in the table below and are described in detail in the *PCL 5 Color Technical Reference Manual* (part number 5961-0635). The printer also supports logical operations, the HP-GL/2 Merge Control command, and pixel placement (both PCL and HP-GL/2 commands). These commands are described in the LaserJet 4L section of this chapter and also in the *PCL 5 Color Technical Reference Manual.*

Table 1-10.   PCL Feature Additions for HP Color LaserJet Printer

Feature	Status	Comments
AppleTalk Configuration	Modified	In addition to supporting the RENAME, JOB, and TYPE key values, this printer also supports the ZONE value.
Assign Color Index	New	Assigns the three current color components to the specified palette index number.
Color Components 1, 2, 3	New	These three commands specify the three color components of any new color entry in the color palette.
Color lookup Tables	New	Enables and specifies color lookup tables to map color input data into a new output range based on point-by-point conversions. A lookup table is specified for each primary color.
CR (Color Range—HP-GL/2)	New	Sets the range for specifying relative color data.
Configure Image Data	New	Configures the printer for color imaging—establishes a modifiable color palette, sets the pixel encoding mode, and sets the number of bits per index and per primary color.
Download Dither Matrix	New	Specifies a single dither matrix for all three primary colors.
Download Pattern	New	Downloads user-defined patterns, including color patterns, to the printer.
Foreground Color	New	Sets the foreground color to the specified index of the current palette.
Gamma Correction	New	Specifies the gamma correction to be applied equally to each primary color.
Monochrome Print Mode	New	Provides a means to convert a color page to a quick-printing gray-scale equivalent.
NP (Number of Pens—HP-GL/2)	New	Resizes the palette after the IN or ^{E_c}*v#W commands.
Palette Control	New	Provides a mechanism for marking and deleting palettes.
Palette Control ID	New	Identifies a palette to be used for some of the palette control functions.

Feature	Status	Comments
PC (Pen Color—HP-GL/2)	New	Changes the pen color in a palette created by the IN or CID command (${}_{Ec}$*v#W).
Push/Pop Palette	New	Pushes or pops the palette from the palette stack.
Raster Scaling	New/Modified	Several commands are added for raster scaling: Destination Raster Width (${}_{Ec}$*t#H), Destination Raster Height (${}_{Ec}$*t#V); also, two parameters are added to the Start Raster Graphics command to initiate scaling (${}_{Ec}$*r2A and ${}_{Ec}$*r3A). (See the *PCL 5 Color Technical Reference Manual* for more information.)
Render Algorithm	New	Selects the algorithm to be used for rendering page marking entities on a given page.
Select Palette by ID	New	Activates a palette with the specified ID number.
Set Viewing Illuminant	New	Specifies the relative white point used in the determination of a viewing illuminant condition.
Simple Color	New	Specifies an unmodifiable fixed-size palette.
Transfer Raster Graphics (by plane)	New	Provides a means to send raster data by color plane. This command sends a plane of raster data to the printer and advances to the next plane.

AppleTalk Configuration Command

As discussed in the LaserJet 4 section of this chapter, the AppleTalk Configuration command allows a user to send PCL jobs to the printer over AppleTalk. In addition to the key values previously discussed (RENAME, TYPE, and JOB), the Color LaserJet printer also supports the ZONE key value as follows.

ZONE

ZONE changes the zone field of the printer's AppleTalk Network Identifier (Name Binding Protocol type field).

> ${}_{Ec}$**&b#WZONE<sp>zonename**

Valid characters for the zone name include 0-255 except for characters $00, "@" ($40), ":" ($3A), "*" ($2A), "=" ($3D), $C5, and ($FF). The zone name must contain at least one character, and only the first 31 characters are used. If the zone is invalid, then the printer's zone is not changed. Zone changes only occur after the present job has completed.

HP DeskJet 1200C Printer

The DeskJet 1200C is a 300-dpi LaserJet-compatible thermal inkjet color printer. It uses PCL 5 and is very compatible with the LaserJet 4 family of printers. The main differences between the DeskJet 1200C and the LaserJet 4 printer are summarized in the table below (for a complete listing, see Table 1-1).

Table 1-11. PCL Feature Additions for HP DeskJet 1200C Printer

Feature	Status	Comments
Enter HP-GL/2 Mode	Modified	Three additional parameters (-1, 2, 3) have been added to provide support for Standalone HP-GL/2 Mode (E_C%-1B), for using the current PCL coordinate system/previous HP-GL/2 pen position (E_C%2B), and for using the current PCL coordinate system/current PCL CAP (E_C3B).
Media Type	New	Sets the print mode required for printing on various media types.
Mechanical Print Quality	New	Determines the graphics print quality.
Negative Motion	New	Specifies whether negative motion will be used.
Raster Scaling	New/Modified	Several commands are added for raster scaling: Destination Raster Width (E_C*t#H), Destination Raster Height (E_C*t#V), Scale Algorithm (E_C*t#K); also, two parameters are added to the Start Raster Graphics command to initiate scaling (E_C*r2A and E_C*r3A). (See the *PCL 5 Color Technical Reference Manual* for more information.)
Color Commands	New	See Table 1-1 for a complete list of color commands supported by the printer. See the *PCL 5 Color Technical Reference Manual* for descriptions of the color commands.

The DeskJet 1200C printer does not support the following LaserJet 4 features:

- Units of Measure (E_C&u#D)
- Status Readback (E_C*s#X, E_C*s#U, E_C*s#M, E_C*s#T, E_C*s#I)
- Raster resolutions of 200 dpi and 600 dpi
- Page sizes: Executive, A4, JIS B5 paper, International B5 envelope, Monarch envelope
- HP-GL/2 in macros

Updated Features

Printers with a "B" or "C" revision code, indicated by the third digit in the serial number, have the following additional new features. (Print the self-test to see the serial number.)

Two-Byte Fonts	Provides support for two-byte (large) fonts with more than 256 characters. Two-byte fonts support such large symbol set mappings as Unicode, Shift-JIS, JIS208, and Big5. Two-byte fonts are compatible with current PCL data structures.
Frame Buffer/ MET Architecture	Provides MEt (Memory Enhancement technology), which overcomes memory contention problems. Drivers can use the PJL SET command (@PJL SET PAGEPROTECT=LETTER/LEGAL/ A4/OFF) to put the printer into a page protect mode that reserves the memory equivalent of a complete full-color frame buffer for the current page size. Page protect mode reserves printer memory blocks large enough to represent cyan, magenta, and yellow (CMY) bitmaps for an entire page of the currently selected media).
Noise Dither	Two new halftone render algorithms (noise dither and monochrome noise dither) have been added.
Arbitrary Dither Matrix Sizes	The printer now allows the full 16-bit range for downloaded dither matrix height and width (E_c*m#W).

Enter HP-GL/2 Mode

The Enter HP-GL/2 Mode command causes the printer to interpret data as HP-GL/2 commands instead of PCL commands. Three new parameters are added: one enables stand-alone plotter mode (E_C%-1B), and the other two affect the coordinate system and pen position when switching into HP-GL/2 (E_C%2B and E_C%3B).

E_C**%#B**

 # = –1 - Stand-alone plotter mode (single context)

0 - Use previous HP-GL/2 pen position

1 - Use current PCL CAP

2 - Use current PCL dot coordinate system and old HP-GL/2 pen position

3 - Use PCL dot coordinate system and the current PCL CAP

Default = 0

Range = –1 to 3

HP-GL/2 mode remains in effect until a Start Raster command (E_C*r#A), Reset (E_CE), UEL command (E_C%-12345X), or power-on.

In stand-alone plotter mode (E_C%–1B), only a single context can be used (HP-GL/2 and PCL cannot be merged on the same page).

A value field of 1 or 3 sets the HP-GL/2 pen position and the label carriage return point to the current PCL CAP. A value field of 2 or 3 transfers the current PCL dot coordinate system, including the PCL origin and axes; the coordinate system thus established is independent of the positions of P1 and P2.

This command cannot be executed from display functions mode or within a binary data transfer. HP-GL/2 ingnores this command.

Media Type

The Media Type command sets up the printer for printing on the specified media type.

$_{E_C}$**&ℓ#M**

= **0** - Plain paper

1 - Bond paper

2 - Special paper

3 - Glossy film

4 - Transparency film

Default = 0

Range = 0 to 4

When the printer receives this command, if no printable data has been sent, the CAP moves to the top of form at the left margin of the current page. If printable data has been sent, the page is printed and CAP moves to the top of form at the left margin of the next physical page.

Mechanical Print Quality

The Mechanical Print Quality command determines graphics print quality.

$_{E_C}$***o#Q**

= **0** - Normal quality

1 - Better quality

2 - Best quality

Default = 0

Range = 0 to 2

A value of 1 uses a 50% "shingling", an interlace technique used to remove banding effects. A value of 2 uses 25% shingling. The print time is increased when using parameters 1 and 2.

Negative Motion

The Negative Motion command specifies whether negative motion will be used, thus determining whether the full page must be buffered before printing can begin.

^E_C**& a#N**

=   **0** - Picture contains negative motion (page formatting printers)

1 - Picture contains no negative motion (swath printers)

Default = 0

Range = 0, 1

If the page contains no negative motion, using the ^E_C&a1N command increases print speed.

Negative motion includes:

- Vertical motion toward the top of the page
- HP-GL/2 operations
- Print directions other than 0 degrees
- Landscape text
- When the top of the character cell on the next line is above the top of the character cell on the current line

The default value of 0 delays printing until all the processing of input data for a page is complete. This is for software that needs to compose the data before printing.

A value of 1 allows data to be printed as received, rather than first stored in a buffer. Otherwise, printing will be delayed until all processing of input data is complete.

Note

This command must be sent before any printable data is received by the printer.

2

Internal Typefaces/Fonts and Symbol Sets

This chapter identifies the internal typefaces/fonts and their associated symbol sets available in the various printers. This information is presented first for bitmap fonts and their symbol sets, then for scalable fonts and their symbol sets.

Note

Internal refers to those typefaces/fonts and symbol sets which are resident in the printer.

Fonts and Symbol Sets

Table 2-1 identifies the resident bitmap fonts for the printers. The supported symbol sets for these bitmap fonts are shown in Table 2-2. The HP LaserJet III, IIID, IIIP, and IIISi printers contained all these bitmap fonts. However, with the introduction of the HP LaserJet 4 printer, the bitmap Courier was replaced by a scalable Courier typeface (refer to "Scalable Typefaces and Symbol Sets"). The HP LaserJet 4L printer does not contain any bitmap fonts. If this printer receives a request for Line Printer, the fixed-pitch scalable Courier typeface is substituted. Except as noted, the DeskJet 1200C supports the same fonts and symbol sets as the LaserJet 4 printer.

Table 2-2 identifies the symbol sets available for the internal bitmap fonts. Note that this list is for the bitmap fonts only. For the scalable typeface symbol sets, refer to the following section "Scalable Typefaces and Symbol Sets."

Table 2-1.   Bitmap Fonts (All Fixed Pitch)

Typeface	Pitch/Point Treatment	Orientation	III, IIID, IIIP, IIISi	4, 4M, 4P, 4MP, 4Si, 4ML, 4PJ,4Plus, 4M Plus, 4V, 4MV, Color LJ, DJ 1200C	4L
Courier	10/12 Med	P & L	✓	nr	nr
Courier	10/12 Italic	P	✓	nr	nr
Courier	10/12 Bold	P & L	✓	nr	nr
Courier	12/10 Med	P	✓	nr	nr
Courier	12/10 Italic	P	✓	nr	nr
Courier	12/10 Bold	P	✓	nr	nr
Line Printer	16.67/8.5 Med	P & L	✓	✓	nr

nr - not resident   P - Portrait   L - Landscape

Table 2-2.   Internal Bitmap Symbol Sets

Symbol Set[1]	
Roman-8	ISO 57 Chinese[2]
ISO 8859/1 Latin 1 (ECMA-94)	ISO 25 French[2]
PC-8	ISO 2 IRV[2]
PC-8 Danish/Norwegian	ISO 14 JIS ASCII[2]
PC-850	ISO 61 Norwegian v2[2]
ISO 6 ASCII	ISO 16 Portuguese[2]
Legal	ISO 84 Portuguese[2]
ISO 21 German	ISO 85 Spanish[2]
ISO 17 Spanish	ISO 10 Swedish/Finnish[2]
ISO 69 French	HP German[2]
ISO 15 Italian	HP Spanish[2]
ISO 60 Norwegian v1	ISO 8859/2 Latin 2[3]
ISO 4 United Kingdom	ISO 8859/9 Latin 5[3]
ISO 11 Swedish: names	

[1] PCL 5 printers support an extensive range of additional symbol sets. Some of the more common sets and their associated IDs are listed in Appendix C of this guide.

[2] These symbol sets are becoming obsolete, are not recommended for future use, and are not present on the HP LaserJet 4, 4M, 4Si, 4L, 4ML, 4P, 4MP, 4PJ, 4 Plus, 4M Plus, 4V, 4MV, Color LaserJet, and DeskJet 1200C printers.

[3] The ISO Latin 2 and 5 symbol sets are not supported on the LaserJet III family and LaserJet 4, 4M, 4Si, 4SiMx, 4L, and DeskJet 1200C printers.

Scalable Typefaces and Symbol Sets

Table 2-3 lists the internal scalable typefaces resident in the various printers. Most of these typefaces are unbound, that is they can be linked to any of the available symbol sets (with the limitations indicated). The symbol sets to which a typeface can be bound are identified in Tables 2-4, 2-5, and 2-6.

Table 2-3. Scalable Typefaces

Typeface	Treatment	Typeface Number	III, IIID, IIIP	IIISi	Color LaserJet DeskJet 1200C LaserJet 4 family except 4PJ, 4L	4PJ	4L
Intellifont Typefaces							
ITC Zapf Dingbats	Med	4141	nr	✓	nr	nr	nr
CG Times	Med, It, Bld, Bld It	4101	✓	✓	✓	nr	✓
Univers	Med, It, Bld, Bld It	4148	✓	✓	✓	nr	✓
Univers Cond	Med Cnd, It Cnd, Bld Cnd, Bld It Cnd	4148	nr	✓	✓	nr	✓
Courier	Med, It, Bld, Bld It	4099	nr	nr	✓	✓	✓
Letter Gothic	Med, It, Bld	4102	nr	nr	✓	nr	✓
Albertus	Med (semi-bold), Extra Bld	4362	nr	nr	✓	nr	✓
Antique Olive	Med, It, Bld	4168	nr	nr	✓	nr	✓
Clarendon Cond.	Bld Cnd	4140	nr	nr	✓	nr	nr
Coronet	Med It	4116	nr	nr	✓	nr	✓
Garamond	Antiqua (Med), Kursiv (It), Halbfett (Bld), Kursiv Halb (Bld It)	4197	nr	nr	✓	nr	nr
Marigold	Med	4297	nr	nr	✓	nr	nr
CG Omega	Med, It, Bld, Bld It	4113	nr	nr	✓	nr	nr
Wingdings	Med	6826	nr	nr	nr	nr	✓
TrueType Typefaces							
Arial	Med, It, Bld, Bld It	16602	nr	nr	✓	✓	nr
Times New Roman	Med, It, Bld, Bld It	16901	nr	nr	✓	✓	nr
Symbol	Med	16686	nr	nr	✓	✓	nr
Wingdings	Med	31402	nr	nr	✓	✓	nr
MS Mincho	Med[1]	28752	nr	nr	✓[2]	✓	nr
MS Gothic	Med[1]	28825	nr	nr	✓[2]	✓	nr

✓ - resident in the printer   nr - not resident in the printer
[1] Pseudo-bold, pseudo-italic, and pseudo-bold italic are available using character enhancements.
[2] Available in the LaserJet 4V/4MV printers if the ESC/P SIMM is installed.

Table 2-4. Internal Scalable Symbol Sets

Symbol Set[1]	LaserJet Printer			
	III, IIID, IIIP	IIISi	LaserJet 4 Family, Color LJ, DeskJet 1200C	4PJ
Roman-8	✓	✓	✓	✓
ISO 8859/1 Latin 1 (ECMA-94)	✓	✓	✓	✓
PC-8	✓	✓	✓	✓
PC-8 Danish/Norwegian	✓	✓	✓	✓
PC-850	✓	✓	✓	✓
ISO 6 ASCII	✓	✓	✓	✓
Legal	✓	✓	✓	✓
ISO 21 German	✓	✓	✓	✓
ISO 17 Spanish	✓	✓	✓	✓
ISO 69 French	✓	✓	✓	✓
ISO 15 Italian	✓	✓	✓	✓
ISO 60 Norwegian v1	✓	✓	✓	✓
ISO 4 United Kingdom	✓	✓	✓	✓
ISO 11 Swedish: names	✓	✓	✓	✓
ISO 57 Chinese[2]	✓	✓	nr	✓
ISO 25 French[2]	✓	✓	nr	✓
ISO 2 IRV[2]	✓	✓	nr	✓
ISO 14 JIS ASCII[2]	✓	✓	nr	✓
ISO 61 Norwegian v2[2]	✓	✓	nr	✓
ISO 16 Portuguese[2]	✓	✓	nr	✓
ISO 84 Portuguese[2]	✓	✓	nr	✓
ISO 85 Spanish[2]	✓	✓	nr	✓
ISO 10 Swedish/Finnish[2]	✓	✓	nr	✓
HP German[2]	✓	✓	nr	✓
HP Spanish[2]	✓	✓	nr	✓
Continued on next page.				

✓ - symbol set is resident.   nr - symbol set is not resident.

[1] HP LaserJet Printers and DeskJet 1200C support an extensive range of additional symbol sets. Some of the more common sets and their associated IDs are shown in Appendix C of this guide.

[2] These symbol sets are becoming obsolete, are not recommended for future use, and are not present on the HP LaserJet 4, 4M, 4Si, 4L, 4ML, 4P, 4MP, 4 Plus, 4M Plus, 4PJ, 4V, 4MV, Color LaserJet, and DeskJet 1200C printers.

Table 2-4.   Internal Scalable Symbol Sets - continued

Symbol Set[1]	LaserJet Printer			
	III, IIID, IIIP	IIISi	LaserJet 4 Family, Color LJ, DeskJet 1200C	4PJ
DeskTop	✓	✓	✓	✓
Ventura International [3]	✓	✓	✓	✓
PS Text	✓	✓	✓	✓
Ventura US [3]	✓	✓	✓	✓
Microsoft Publishing	✓	✓	✓	✓
Math-8	✓	✓	✓	✓
Ventura Math [3]	✓	✓	✓	✓
PS Math	✓	✓	✓	✓
Pi Font	✓	✓	✓	✓
Ventura ITC Zapf Dingbats [3]	nr	✓	nr	nr
PS ITC Zapf Dingbats	nr	✓	nr	nr
ITC Zapf Dingbats 100	nr	✓	nr	nr
ITC Zapf Dingbats 200	nr	✓	nr	nr
ITC Zapf Dingbats 300	nr	✓	nr	nr
ISO 8859-2 Latin 2	nr	nr	✓	3
ISO 8859-9 Latin 5	nr	nr	✓	3
PC 852	nr	nr	✓	3
PC Turkish	nr	nr	✓	3
MC Text	nr	nr	✓	3
Windows 3.1 Latin 1	nr	nr	✓	3
Windows 3.1 Latin 2	nr	nr	✓	3
Windows 3.1 Latin 5	nr	nr	✓	3
Windows 3.0 Latin 1	✓	✓	✓	✓
Windows 3.1J (WIN3.1J)	nr	nr	✓[2]	✓[2]
Symbol	nr	nr	✓	3
Wingdings	nr	nr	✓	3

✓ - Indicates a symbol set is supported.   nr - Indicates a symbol set is not resident.
[1] HP LaserJet Printers and DeskJet 1200C support an extensive range of additional symbol sets. Some of the more common sets and their associated IDs are shown in Appendix C of this guide.
[2] The Japanese Windows 3.1J symbol set is only resident in the LaserJet 4PJ, and in LaserJet 4V/4MV printers if ESC/P SIMM is installed.
[3] These symbol sets are soon to be obsolete and are not recommended for future use.

Table 2-5. HP LaserJet 4 Family, Color LaserJet, and DJ 1200C Intellifont Typeface Symbol Set Support

PCL Symbol Set ID	Typface Symbol Set	CG Times	Univers	Courier	Letter Gothic	Albertus	Antique Olive	Coronet	Univers Cond.
8U	Roman-8	•	•	•	•	•	•	•	•
0N	ISO 8859-1 Latin 1 (ECMA 94 Latin 1)	•	•	•	•	•	•	•	•
10U	PC-8	•	•	•	•	•	•	•	•
11U	PC-8 D/N	•	•	•	•	•	•	•	•
12U	PC-850	•	•	•	•	•	•	•	•
19U	Windows 3.1 Latin1 (ANSI)	•	•	•	•	•	•	•	•
7J	DeskTop	•	•	•	•	•	•	•	•
10J	PS Text	•	•	•	•	•	•	•	•
13J	Ventura International	•	•	•	•	•	•	•	•
14J	Ventura US	•	•	•	•	•	•	•	•
6J	Microsoft Publishing	•	•	•	•	•	•	•	•
1U	Legal	•	•	•	•	•	•	•	•
1E	ISO United Kingdom*	•	•	•	•	•	•	•	•
0U	ASCII*	•	•	•	•	•	•	•	•
0S	ISO Swedish: names*	•	•	•	•	•	•	•	•
0I	ISO Italian*	•	•	•	•	•	•	•	•
2S	ISO Spanish*	•	•	•	•	•	•	•	•
1G	ISO German*	•	•	•	•	•	•	•	•
0D	ISO Norwegian*	•	•	•	•	•	•	•	•
1F	ISO French*	•	•	•	•	•	•	•	•
9U	Windows 3.0 Latin 1	•	•	•	•	•	•	•	•
12J	MC Text	•	•	•	•	•	•	•	•
17U	PC-852	•	•	•	•	✚	✚	✚	✚
9T	PC-Turkish	•	•	•	•	✚	✚	✚	✚
9E	Windows 3.1 Latin 2	•	•	•	•	✚	✚	✚	✚
5T	Windows 3.1 Latin 5	•	•	•	•	✚	✚	✚	✚
2N	ISO 8859-2 Latin 2	•	•	•	•	✚	✚	✚	✚
5N	ISO 8859-9 Latin 5	•	•	•	•	✚	✚	✚	✚
8M	Math-8	•	•	•	•				
5M	PS Math	•	•	•	•				
6M	Ventura Math	•	•	•	•				
15U	Pi Font	•	•	•	•				
19M	Symbol								
579L	Wingdings								

• Fonts supported by Color LaserJet, DeskJet 1200C, HP LaserJet 4 family except 4PJ (Courier is the only Intellifont typeface family supported by the LaserJet 4PJ printer)

✚ Additional fonts supported by DeskJet 1200C (B,C revs.) and LaserJet 4 family except 4, 4M, 4Si, 4SiMx, 4PJ.

* These symbol sets are variations of the Roman-8 set.

Table 2-5. HP LaserJet 4 Family, Color LaserJet, DJ 1200C Intellifont Typeface Symbol Support - cont'd.

PCL Symbol Set ID	Typface Symbol Set	Clarend. Cond.	Marigold	CG Omega	Garmnd. Antiqua	Wingdings
8U	Roman-8	•	•	•	•	
0N	ISO 8859-1 Latin 1 (ECMA 94 Latin 1)	•	•	•	•	
10U	PC-8	•	•	•	•	
11U	PC-8 D/N	•	•	•	•	
12U	PC-850	•	•	•	•	
19U	Windows 3.1 Latin 1 (ANSI)	•	•	•	•	
7J	DeskTop	•	•	•	•	
10J	PS Text	•	•	•	•	
13J	Ventura International	•	•	•	•	
14J	Ventura US	•	•	•	•	
6J	Microsoft Publishing	•	•	•	•	
1U	Legal	•	•	•	•	
1E	ISO United Kingdom *	•	•	•	•	
0U	ASCII*	•	•	•	•	
0S	ISO Swedish: names*	•	•	•	•	
0I	ISO Italian*	•	•	•	•	
2S	ISO Spanish*	•	•	•	•	
1G	ISO German*	•	•	•	•	
0D	ISO Norwegian*	•	•	•	•	
1F	ISO French*	•	•	•	•	
9U	Windows 3.0 Latin 1 (Windows)	•	•	•	•	
12J	MC Text	•	•	•	•	
17U	PC-852	◆	u	◆	◆	
9T	PC-Turkish	◆	◆	◆	◆	
9E	Windows 3.1 Latin 2	◆	◆	◆	◆	
5T	Windows 3.1 Latin 5	◆	◆	◆	◆	
2N	ISO 8859-2 Latin 2	◆	◆	◆	◆	
5N	ISO 8859-9 Latin 5	◆	◆	◆	◆	
8M	Math-8					
5M	PS Math					
6M	Ventura Math					
15U	Pi Font					
19M	Symbol					
579L	Wingdings					▲

• Fonts supported by all LaserJet 4 family printers except 4PJ.　　　　▲ Additional font supported by the HP LaserJet 4L and

Table 2-6.   HP LaserJet 4 Family, Color LaserJet, DeskJet 1200C TrueType Typeface Symbol Set Support

PCL Symbol Set ID	Typeface Symbol Set	Arial	Times New	Wing-dings	Symbol	MS Mincho, MS Gothic	Line Printer
		Scalable TrueType					**Bitmap**
8U	Roman-8	•	•				•
0N	ISO 8859-1 Latin 1 (formerly ECMA 94 Latin 1)	•	•				•
10U	PC-8	•	•				•
11U	PC-8 D/N	•	•				•
12U	PC-850	•	•				•
19U	Windows 3.1 Latin 1 (Microsoft calls it ANSI)	•	•				
7J	DeskTop	•	•				
10J	PS Text	•	•				
13J	Ventura International	•	•				
14J	Ventura US	•	•				
6J	Microsoft Publishing						
1U	Legal	•	•				•
1E	ISO United Kingdom *	•	•				•
0U	ASCII*	•	•				•
0S	ISO Swedish: names*	•	•				•
0I	ISO Italian*	•	•				•
2S	ISO Spanish*	•	•				•
1G	ISO German*	•	•				•
0D	ISO Norwegian*	•	•				•
1F	ISO French*	•	•				•
9U	Windows 3.0 Latin 1 (formerly called Windows)	•	•				
12J	MC Text	•	•				
17U	PC-852	•	•				
9T	PC-Turkish	•	•				
9E	Windows 3.1 Latin 2	•	•				
5T	Windows 3.1 Latin 5	•	•				
2N	ISO 8859-2 Latin 2	•	•				▲
5N	ISO 8859-9 Latin 5	•	•				▲
8M	Math-8						
5M	PS Math						
6M	Ventura Math						
15U	Pi Font						
19M	Symbol				•		
579L	Wingdings			•			
19K	Japanese Windows 3.1J (WIN3.1J)					★	

• Fonts supported by HP LaserJet 4, 4Si, 4L, 4ML, 4P, 4MP, 4PJ, 4Plus, 4M Plus, 4V, 4MV, and Color LaserJet printers.

▲ Fonts supported by the HP LaserJet 4L, 4ML, 4P, 4MP, 4PJ, 4 Plus, 4M Plus, 4V, 4MV, and Color LaserJet printers.

★ Only for the LaserJet 4PJ and 4V/4MV if ESC/P SIMM installed.

* These subsets are variations of the Roman-8 set.

Typeface Selection Differences

With the introduction of the HP LaserJet IID printer, Hewlett-Packard expanded the typeface value field (in the font header) from a one-byte to a two-byte value field, thus expanding the typeface range from 0-255 to 0-32767. This expansion allows for additional typefaces.

Prior to the HP LaserJet IID printer, typeface values used a single byte (8-bits for a range of 0-255) for font selection. This value, referred to as the *typeface base value*, was used to identify fonts for selection. With the addition of the second byte in the typeface value field, one bit was added to the typeface base value range, increasing it from 8 bits to 9 bits (for a range of 0-511). This allows a greater range for typeface base value selection.

In addition to expanding the typeface base value, two other values were included in the two-byte typeface value: **vendor number** and **vendor version**. The vendor number identifies the font vendor and the vendor version identifies the version of the font. These two values are for a vendor to create an updated version of the typeface. The three values together represent the **typeface family value**. Refer to the *PCL 5 Printer Language Technical Reference Manual* Chapter 11, Font Creation - Typeface Family, for a more complete description of this two-byte typeface family value.

Note

With the introduction of the HP LaserJet 4 printer, HP redefined the typeface field again, this time eliminating the vendor version identifier and expanding the typeface family to encompass the 12 least significant bits (bits 11-0) of this 16 bit field (see the field description for "Typeface" in Chapter 11).

Both the typeface family value and the typeface base value can be used for font selection. Since the typeface family value (two-byte value) is based on the typeface base value (9 bit value), a font selection which specifies the typeface base value may select a font described by a typeface family value in the printer.

There is some variation in how font selection occurs between PCL 5 printer models when mixing the typeface family and base values. The typeface selection compatibility for two types of values is identified for the various PCL 5 printers in Table 2-7.

Some typeface (two-byte) family values and their corresponding base values are listed below. For a complete listing of typeface family and base values, refer to Tables C-2 and C-3 in Appendix C of this document.

Typeface Values

Family Value	Typeface Family	Base Value
0	Line Printer	0
16602	Arial	218
4168	Antique Olive	72
4127	ITC Avant Garde	31
4119	CG Century Schoolbook	23
4101	CG Times	5
4148	Univers	52

Table 2-7.   Base/Family Typeface Selection Compatibility

Typeface Selection Command ^E_C(s#T Type	Printer Font Descriptor Type	PCL 5 Printer	IIP	IID	series II[1]
Family Value	Family Value	Typeface Selected	Typeface Selected	Typeface Selected	Ignores typeface (value field too large)
Family Value	Base Value	Ignores typeface for font selection	Ignores typeface for font selection	Ignores typeface for font selection	Ignores typeface for font selection (value field too large)
Base Value	Family Value	Typeface Selected[2]	Ignores typeface for font selection	Ignores typeface for font selection	Typeface may be selected (font descriptor typeface MSB field is ignored)[3]
Base Value	Base Value	Typeface Selected	Typeface Selected	Typeface Selected	Typeface Selected

This table assumes that the typeface type specified is available in the printer.

[1]The LaserJet series II printer only accepts a typeface selection value field range of 0-255.
[2]If two fonts are available in the printer that have the same value in the lower (LSB) byte of the font descriptor typeface field (such as 5 and 4101), the typeface selected will be one of these selected at random.
[3]The MSB typeface byte in the Font Descriptor is ignored by the printer; only the LSB typeface byte is read.

3

Print Environment

This chapter identifies the factory default settings for the PCL print environment features. These factory default settings are identified in Tables 3-1 and 3-2. In addition to the factory default settings, the user default (control panel) features, which can be set from a printer's control panel, are identified in Table 3-3.

Note

If a feature is not supported on a printer (such as duplex on non-duplex printers, or status readback on printers which do not support that feature) then the printer's print environment does not contain those feature settings. Not all values in these tables are used for all printers. Refer to Table 1-1 to identify supported values.

The LaserJet 4PJ printer defaults to the ESC/P personality. The defaults listed here are for PCL only.

Table 3-1.   Print Environment Default Settings — PCL Context

JOB CONTROL	
Number of Copies[1]	1
Duplex[1]	Off (Simplex)
Binding[2]	Long-edge
Registration	Left=0, Top=0
Tray Lock[1]	All trays unlocked
Manual Feed[1]	Off
Job Separation[3]	Off
Output Bin	Upper (face down) bin
Units of Measure	300 Units/inch
PAGE CONTROL	
Print Direction	0
Orientation[1]	Portrait
Page Size[1]	Letter
Paper Source	Paper Source (Printer Specific Large Source)
Vertical Motion Index[1]	8 (6 lpi)
Horizontal Motion Index[4]	12 (10 cpi)
Top Margin	1/2" (150 dots)
Text Length	60 lines
Left Margin	Left logical page boundary
Right Margin	Right logical page boundary
Perforation Skip	On
Line Termination	CR→CR, LF→LF, FF→FF
Continued on next page.	

[1] User default values may be selected by the user from the printer's Operator Control Panel for these items.
[2] Selectable from the printer Operator Control Panel if duplex is selected.
[3] Used on HP LaserJet IIISi printers only.
[4] The font characteristics are determined by the default font. The default font can be the factory default font or the user selected default font from the Operator Control Panel or from a font cartridge with a default font.

Table 3-1.   Print Environment Default Settings — PCL Context (continued)

FONTS [1]	
Symbol Set[2,6]	Roman-8
Spacing[6]	Fixed
Pitch[3]	10 cpi
Height[4]	12 point
Style	Upright
Stroke Weight	Medium
Typeface[6]	Courier
UNDERLINING	
Underlining Mode	Off
CHARACTER TEXT PATH DIRECTION	
Character Text Path Direction	0 (horizontal)
TEXT PARSING	
Text Parsing Method[5]	0 or 31
FONT MANAGEMENT	
Font ID	0
Character Code	0
Symbol Set ID	0
RASTER GRAPHICS	
Presentation Mode	3 (Print image along the physical page width)
Left Graphics Margin	0
Resolution	75 dpi
Compression Mode	0
Raster Height	N/A
Raster Width	Logical Page Width
Continued on next page.	

[1] The font characteristics are determined by the default font. The default font can be the factory default font or the user selected default font from the Operator Control Panel or from a font cartridge with a default font.

[2] User default values may be selected by the user from the printer's Operator Control Panel for these items.

[3] Selectable from the front panel if a fixed-space scalable font was selected as the user default.

[4] Selectable from the front panel if a proportional scalable font was selected as the user default.

[5] If the default symbol set is WIN31J, the value is 31; otherwise, it is 0. This selection is only available on the LaserJet 4PJ and LaserJet 4V/4MV printers if the ESC/P SIMM is installed.

[6] For the LaserJet 4PJ printer, the default symbol set is WIN31J, the default typeface is MS Mincho, and the default spacing is proportional. For the LaserJet 4V/4MV printer, the default symbol set is Roman-8, default typeface is Courier, and spacing fixed—Japanese customers must explicitly change the defaults if desired.

Table 3-1. Print Environment Default Settings — PCL Context (continued)

PRINT MODEL	
Current Pattern	Solid
Source Transparency Mode	0 (transparent)
Pattern Transparency Mode	0 (transparent)
Pattern Reference Point	0, 0
Logical Operation	ROP 252
Pattern Rotation	0 (Pattern rotates with print direction)
RECTANGULAR AREA FILL	
Horizontal Rectangle Size	0
Vertical Rectangle Size	0
Area Fill ID	0
PICTURE FRAME	
Picture Frame Width	Logical page width
Picture Frame Height	Text length
Picture Frame Anchor Point	PCL Cursor at left edge of the logical page (top margin plus 75% of VMI)
HP-GL/2 Plot Horizontal Size	Picture frame horizontal size
HP-GL/2 Plot Vertical Size	Picture frame vertical size
MACRO	
Macro ID	0
TROUBLESHOOTING	
End-of-Line Wrap	Off
Display Functions	Off
STATUS READBACK	
Current Location Type	0 - Invalid location
Current Location Unit	0 - All units

Table 3-2.   Print Environment Default Settings — HP-GL/2 Context

CHARACTER GROUP	
Character Set	Roman-8
Font Spacing	Fixed
Pitch	10 cpi
Height	12 point
Posture	Upright
Stroke Weight	Medium
Typeface	HP-GL/2 stick
Character Direction	Horizontal
Character Direction Mode	Absolute
Character Size	Size transformation off
Character Size Mode	Absolute
Character Slant	0
Extra Horizontal Space	0
Extra Vertical Space	0
Character Fill Mode	Solidly filled, no edging
Label Origin	1
Label Terminator	Etx
Transparent Data Mode	Off
Primary Font ID	0
Secondary Font ID	0
Scalable or Bitmap Font	Select scalable fonts only
VECTOR GROUP	
Plotting Mode	Absolute
Pen State	Up
POLYGON GROUP	
Polygon Buffer	Cleared
Polygon Mode	Off

Table 3-2. Print Environment Default Settings — HP-GL/2 Context (continued)

LINE AND FILL ATTRIBUTE GROUP	
Line Type	Solid
Line Type Repeat Length	4% of the diagonal distance from P1 to P2
Line Cap	Butt
Line Join	Mitered
Miter Limit	5
Pen Width	0.35mm
Pen Width Selection Mode	Metric
Selected Pen	No pen
Symbol Mode	Off
Fill Type	Solid (bi-directional)
User-defined Line Type	Eight standard line types
Anchor Corner	(0,0) Plotter units
User-defined Fill Types	Solid fill
Transparency Mode	On (transparent)
Screened Vector	No screening
CONFIGURATION AND STATUS GROUP	
Scale Mode	Off
Window	PCL default picture frame (the PCL default logical page less 1/2 inch at the top and the bottom)
Coordinate System Orientation	Orientation of PCL default logical page coordinate system
P1, P2	Lower left, upper right corners, respectively, of picture frame

Note   Table 3-3 lists the user default settings. These settings are stored in NVRAM which allows them to be retained in the event of a power cycle (except for the HP LaserJet 4L which does not contain NVRAM). In earlier printers without PJL these settings were selectable through the control panel only. In newer printers with PJL these settings may be set from either the control panel (if the printer has one) or through PJL or both. (These settings are reset to the factory default settings upon a cold reset.)

Table 3-3. User Default (NVRAM) Environment Settings

Menu Item	Range	III	IIID	IIISi	IIIP	4	4Si	4L	4ML, 4P, 4PJ 4MP	4 Plus, 4M Plus	4V, 4MV
Copies	1* through 99[1]	✓	✓	✓	✓	1-999	1-999	1-999	1-999	1-999	1-999
Orientation	Portrait*, Land.	✓	✓	✓	✓	✓	✓	✓	✓	✓	3
Font Source	Internal*, Cartridge, Soft Fonts	✓	✓	✓	✓	✓[2]	✓[2]	✓[3]	✓[2,3]	✓[2]	✓[2]
Font Number	0* (Courier) to n	✓	3	✓	✓	✓	✓	✓	✓[7]	✓	✓
Pitch [4]	10.00* .44 - 99.99	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Point Size[5]	12.00* 4 - 999.75	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Symbol Set	Roman-8* (see Chapter 2 for list)	✓	✓	✓	✓	✓	✓	✓	✓[7]	✓	✓
Form/Lines of Text[6]	60* 5 - 128	✓	✓	✓	✓	✓	✓	✓	✓[7]	✓	✓
Paper (Job) Size	Letter*, Legal, Executive, A4, Com-10, Monarch, DL, C5	✓	✓	no C5	✓	plus B5	no C5	plus B5	plus B5 & Custom[6]	plus B5	plus A3, 11x17and more[9]
Manual Feed	Off*, On	✓	✓	✓	✓	✓	✓	✓	✓	✓	3
Duplex	Off* (simplex),On	ns	✓	✓	ns	ns	✓	ns	ns	✓[8]	ns
Binding	Long-edge*, Short-edge	ns	✓[8]	3[8]	ns	ns	✓[8]	ns	ns	✓[8]	ns
Output Bin	Upper*, Lower	ns	ns	✓	ns	ns	✓	ns	ns	ns	ns
Resolution Enhancement	Medium*, Light, Dark, Off	✓	✓	✓	✓	✓	On/Off	✓	✓	✓	3
Print Density	1, 2, 3*, 4, 5	ns	ns	ns	ns	ns	ns	✓	✓	✓	3
EconoMode	On, Off*	ns	ns	ns	ns	ns	ns	✓	✓	✓	3
Resource Saving	On, Off*	ns	ns	ns	ns	ns	✓	ns	ns	On, Off, Auto*	On, Off, Auto*

[1] PCL range is 1 through 32767
[2] SIMMs also available
[3] The LaserJet 4L, 4ML, 4PJ, and 4MP printers do not accept cartridges.
[4] Displayed for fixed-spaced scalable fonts only
[5] Displayed for proportional scalable fonts only
[6] Sets PCL text length
[7] For LaserJet 4PJ, WIN3.1J is the default symbol set, MS Mincho is default typeface, A4 is default paper size, 64 is default lines of text; printer also supports JIS B5 paper, Hagaki and Oufuku-Hagaki postcards.
[8] Supported if duplex is installed (duplex is an option on LaserJet 4 Plus and 4M Plus)
[9] LaserJet 4V/MV also supports JIS B5, JIS B4, JPOST, JPOSTD, Commercial B5, and Custom (11.7" x 17.7").
✓ - Supported   * - Default value   ns - Not Supported

Table 3-4.   User Default (NVRAM) Environment Settings

Menu Item	Range	Color LaserJet	DeskJet 1200C
Copies	1* through 999[1]	1-999	1-999
Orientation	Portrait*, Land.	✓	3
Font Source	Internal*, Cartridge, Soft Fonts	✓	✓
Font Number	0* (Courier) to n	✓	✓
Pitch [2]	10.00* .44 - 99.99	✓	✓
Point Size[3]	12.00* 4 - 999.75	✓	✓
Symbol Set	Roman-8* (see Chapter 2 for list)	✓	✓
Form/Lines of Text[4]	60* 5 - 128	✓	✓
Paper (Job) Size	Letter*, Legal,	plus A4, 11x17, A3, Executive, plus COM10, DL, C5 envelopes	
Manual Feed	Off*, On	✓	3
Duplex	Off* (simplex),On	ns	ns
Binding	Long-edge*, Short-edge	ns	ns
Output Bin	Upper*, Lower	✓	ns
Resolution Enhancement	Medium*, Light, Dark, Off	✓	3
Print Density	1, 2, 3*, 4, 5	✓	3
EconoMode	On, Off*	✓	3
Resource Saving	On, Off*	On, Off, Auto*	On, Off, Auto*

[1] PCL range is 1 through 32767
[2] Displayed for fixed-spaced scalable fonts only
[3] Displayed for proportional scalable fonts only
[4] Sets PCL text length
✓ - Supported   * - Default value   ns - Not Supported

4

Memory Usage

In some situations, the amount of available memory for printing pages may be smaller than that required for printing. To make more effective use of the available printer memory, newer HP PCL 5 printers incorporate new methods for managing memory. This smaller amount of available memory is made more usable by:

- Memory Enhancement technology, MEt, (available on all HP LaserJet 4 family printers except the 4, 4M, 4Si and 4SiMx)
- Adaptive Data Compression, ADC, (available on the LaserJet 4, 4M, 4Si, 4SiMx and DeskJet 1200C)
- Following recommended practices for transmitting data, especially raster graphics, to the printer
- For the LaserJet 4L, using Raster Graphics Adaptive Compression (PCL compression mode five).

All the LaserJet 4 family printers have internal programming for optimizing the use of limited memory. The LaserJet 4, 4M, 4Si, 4SiMx, and DeskJet 1200C printers compress raster graphics data using a system called Adaptive Data Compression or ADC. The other LaserJet 4 printers use MEt to compress not only raster graphics data, but also to compress fonts, improve memory usage for page protection, and provide an overall improvement in memory efficiency. Both systems operate automatically and without any intervention from the user.

The HP Color LaserJet printer has memory management features similar to MEt, but has additional features for color processing.

Operation of ADC and MEt

The goal of ADC is to automatically and transparently reduce Memory Out errors caused by raster graphics pages. MEt extends this goal to reducing all Memory Out errors and eliminating Print Overrun errors.

During the printing of a page, if available printer memory becomes low, all LaserJet 4 family printers and the Color LaserJet printer have the ability to automatically compress any already-stored raster graphics data using a variety of compression techniques. This allows the printing of many raster graphics pages which would have caused a Memory Out error on previous HP LaserJet printers having the same amount of memory.

With ADC or MEt, PCL 5 printers can typically print a full page of raster graphics in base memory without a memory out. This is especially true for line art and typical business graphics. Other types of graphics such as scanned photographs (especially if a technique called error-diffusion is used), cannot always be printed as easily by ADC or MEt as can line art graphics. Fortunately, another internal printer feature, **Image Adapt**, can be called upon to make the page fit in memory.

Image Adapt

Image Adapt is only used as a last resort for compressing raster graphics data and as such will rarely be seen. It reduces a raster graphic image to one-fourth its original size by trading off some of the image's fine detail. This loss of fine detail is often not noticeable.

Image Adapt can be disabled on the various LaserJet 4 family printers if required, but the technique varies. On the LaserJet 4, 4M and 4Si the user will have to add more memory to effectively remove the need for Image Adapt. The other LaserJet 4 family printers can disable Image Adapt using a PJL command (refer to the respective printer user manuals for further information—the Color LaserJet printer does not utilize Image Adapt). If Image Adapt is turned off, more pages will cause Memory Out errors.

All LaserJet 4 family printers also include enhancements to improve the internal storage of raster graphics data.

Additional MEt Features

With MEt, font data can also be compressed. All downloaded bitmap characters and characters scaled from internal or downloaded scalable outlines can be compressed. The amount of memory savings varies with the size of the characters involved (larger is better) but character sizes can typically be cut in half. This allows roughly twice as many fonts to be downloaded or scaled using a MEt-enhanced LaserJet printer as previously allowed on printers without MEt.

In prior PCL 5 printers, if the page could not be rendered as fast as the laser printed it, a Print Overrun error occurred unless page protection was manually turned on and memory was added to accommodate it. With MEt, the manual setting of Page Protection and the additional memory required to facilitate it is obsolete. MEt automatically assesses the complexity of the page being printed and if too complex turns on a new form of page protection which uses compression to remove the requirement for additional memory.

In rare circumstances MEt's assessment of the page may prove to be incorrect. For these cases there is some amount of control over this Page Protection process depending upon which MEt-equipped printer is being used. Page Protection may be explicitly turned on or off to avoid the complexity assessment and either always or never perform the page protection process. See the appropriate user manual for details.

MEt also includes other internal memory-saving techniques which improve the amount of memory required for the printer's internal representation of your page.

ADC and MEt Notes

For raster graphics compression to perform at its best it is recommended that the "Recommendations For Sending Data to the Printer," described below, be followed.

Character bitmaps can only be compressed if they can be stored uncompressed in contiguous printer memory first. This requirement implies that large point size characters may require more printer memory than would seem necessary.

During MEt's Page Protection, portions of the internal representation of the page are discarded to make room for other aspects of the page protection process. If a memory out condition occurs during this process (unlikely, but possible) a white band will be seen on the page. The best way to remedy this situation is to add memory to the printer.

Recommendations For Sending Data to the Printer

The HP PCL 5 printers perform best in terms of speed and memory utilization if the recommendations made below are followed. Failure to follow these recommendations will not harm the printer, but may increase the chances of a memory out condition or increase the time to print a page.

■ **Ordered Images** - Raster Graphic images or pictures should be sent from top to bottom with the data in one band (start raster, end raster pair). If one band is not possible, as few as possible multiple bands may be used as long as they exactly follow each other and are sent in top-to-bottom order. Also, multiple bands should be as large as possible.

■ **Band Sizes** - If an image is sent in bands (start raster, end raster pairs), the bands should be multiples of 32 lines high. This is especially critical for landscape graphics. If there is no way to send multiples of 32-line high bands, multiples of four for band height should be used. This allows Image Adapt to work better.

- **Avoid Non-Raster Commands** - During the transmission of sequential raster bands non-raster commands should be avoided. This includes cursor positioning commands.

- **Separation of Images** - If more than one image or picture is to be printed on a page, it is best to keep them separate. Separation consists of assuring that the new image starts with a new start raster command and that the one image does not exactly follow the next image (separate the image by at least one line vertically and sixteen pixels horizontally). This constraint improves the operation of Image Adapt.

- **Rectangular Images** - All LaserJet 4 family printers perform best if raster images are sent as rectangular images to the printer. This entails keeping the right margin of the image constant and keeping all lines the full image width (no lines are truncated). Also, avoid skipping lines. When whole blank lines appear in the image, either send zeroed data row(s) or use the Raster Y-Offset command.

- **Avoid Unnecessary Print Model Use** - Print model modes, other than source and pattern transparent, degrade memory efficiency. (This restriction is not true for the Color LaserJet printer.) For best results do not use an opaque source unless there is an image known to already be on the page in the same area. Following the other rules listed in this section minimizes the impact of using non-transparent print model modes.

- **Avoid Tall, Narrow Images** - For ADC, images which are taller than they are wide by more than eight to one disable the printer's ability to automatically separate images upon the page (this restriction is not true for the Color LaserJet printer). This violation is desirable in the case where the above rules are violated and multiple images are rendered as one image and sent to the printer as one combined image. Sending raster data as a checkerboard with non-full width bands sent left to right and top to bottom also disables the printer's automatic

image separation. In general, for all HP LaserJet printers, tall, narrow images should be avoided since they typically require more memory.

■ **Wide Patterns** - Patterns can use up a lot of memory—avoid them if possible. Avoid patterns which, in their final orientation, are not 1, 2, 4, 8, 16 or 32 (32 is for all but the 4L) bits wide. Patterns of other sizes will be tiled out to the full width of the page and can consume a lot of memory (since the Color LaserJet printer does not perform this way, it is not a factor for this printer). Note that a landscape pattern that is 16 wide by 5 high would become 5 wide by 16 high when rotated and be subjected to being tiled across the page.

■ **Avoid Unnecessary Pattern Selection** - In HP-GL/2, avoid issuing redundant Fill Type (FT) and Line Type (LT) commands. These commands may cause patterns to be rebuilt and tiled for each invocation.

■ **Avoid Many Small Polygons** - In HP-GL/2 avoid entering and exiting polygon mode repeatedly as it fragments memory. If possible send down fewer, larger polygons.

■ **Download Font Characters as Needed** - All PCL 5 printers operate best if fonts and outlines downloaded do not include information for characters which are not used upon the current page. It is also best to download bitmap characters in the orientation which they will be used.

Note   **Deleting Font Characters and Patterns**

If a pattern or font character is used on the current page, any deletion commands affecting it will not be executed until the page is printed.

Raster Graphics Adaptive Compression (Method 5)

Raster Graphics Adaptive Compression (Set Compression Method Command, mode 5) is implemented on the LaserJet IIIP, Color LaserJet, all LaserJet 4 family printers, and the DeskJet 1200C printer.

This compression method allows the host to compress data using a combination of PCL compression modes to obtain optimum compression (refer to the *PCL 5 Printer Language Technical Reference* manual, Set Compression Method Command, for details).

An added benefit of this method for the LaserJet 4L and LaserJet IIIP printers is that the data is not decompressed upon entry to the printer provided the image is portrait, 300 dpi, transparent print model and no patterns are being used. This allows the LaserJet 4L and IIIP to print many pages which would otherwise require more memory. As an added benefit these pages print faster. The other LaserJet 4 family printers decompress the data upon entry to the printer and rely upon ADC or MEt to compress the data if required.

For the HP LaserJet 4L printer it is critical that the image actually compress (not expand) if Adaptive Compression is used since MEt does not operate upon images meeting the requirements for delayed decompression.

A

Printer Commands

Introduction   This appendix lists the PCL 5 printer commands. Table A-1 lists the PCL context printer commands in hierarchical order and gives the decimal and hexadecimal equivalents of each. Table A-2 lists the HP-GL/2 context printer commands and Table A-4 lists the printer control codes.

Note   Values in parentheses "*(x)*" identify the lower case of the termination character which is used for combining commands.

Table A-1.   HP PCL 5 Printer Commands — PCL

FUNCTION	PARAMETER	COMMAND		DECIMAL VALUE		HEXADECIMAL VALUE	
JOB CONTROL COMMANDS							
Reset							
Configuration (AppleTalk)	Key/Value data pair	Ec&b#W[data]		027 038 098 #...# 87		1B 26 62 #...# 57	
Universal Exit Language (ULE)	—	Ec%−12345X		027 037 045 049 050 051 052 053 088		1B 25 2D 31 32 33 34 35 58	
Reset	—	EcE		027 069		1B 45	
Number of Copies	# of Copies	Ec&l#X	(x)	027 038 108 #...# 088	(120)	1B 26 6C #...# 58	(78)
Simplex/Duplex Print	Simplex	Ec l0S	(s)	027 038 108 048 083	(115)	1B 26 6C 30 53	(73)
	Duplex						
	Long Edge Binding	Ec l1S	(s)	027 038 108 049 083	(115)	1B 26 6C 31 53	(73)
	Short Edge Binding	Ec l2S	(s)	027 038 108 050 083	(115)	1B 26 6C 32 53	(73)
Long-Edge (Left) Offset Registration	# of Decipoints (1/720")	Ec&l#U	(u)	027 038 108 #...# 085	(117)	1B 26 6C #...# 55	(75)
Short-Edge (Top) Offset Registration	# of Decipoints (1/720")	Ec&l#Z	(z)	027 038 108 #...# 090	(122)	1B 26 6C #...# 5A	(7A)
Page Side Selection	Next Side	Ec&a0G	(g)	027 038 097 048 071	(103)	1B 26 61 30 47	(67)
	Front Side	Ec&a1G	(g)	027 038 097 049 071	(103)	1B 26 61 31 47	(67)
	Back Side	Ec&a2G	(g)	027 038 097 050 071	(103)	1B 26 61 32 47	(67)
Job Separation	—	Ec&l1T	(t)	027 038 108 049 084	(116)	1B 26 6C 31 54	(74)
Paper Destination (Output Bin)	Upper Output Bin	Ec&l1G	(g)	027 038 108 049 071	(103)	1B 26 6C 31 47	(67)
	Rear Output Bin	Ec&l2G	(g)	027 038 108 050 071	(103)	1B 26 6C 32 47	(67)
Unit of Measure	# Number of units per inch	Ec&u#D	(d)	027 038 117 #...# 068	(100)	1B 26 75 #...# 44	(64)
Mechanical Print Quality	Normal	Ec*o0Q	(q)	027 042 111 048 081	(113)	1B 2A 6F 30 51	(71)
	Better	Ec*o1Q	(q)	027 042 111 049 081	(113)	1B 2A 6F 31 51	(71)
	Best	Ec*o2Q	(q)	027 042 111 050 081	(113)	1B 2A 6F 32 51	(71)
Media Type	Plain	Ec&l0M	(m)	027 038 108 048 077	(109)	1B 26 6C 30 4D	(6D)
	Bond	Ec&l1M	(m)	027 038 108 049 077	(109)	1B 26 6C 31 4D	(6D)
	Special	Ec&l2M	(m)	027 038 108 050 077	(109)	1B 26 6C 32 4D	(6D)
	Glossy	Ec&l3M	(m)	027 038 108 051 077	(109)	1B 26 6C 33 4D	(6D)
	Transparency	Ec&l4M	(m)	027 038 108 052 077	(109)	1B 26 6C 34 4D	(6D)
Negative Motion	Contains negative motion	Ec&a0N	(n)	027 038 097 048 078	(110)	1B 26 61 30 4E	(6E)
	Does not contain negative motion	Ec&a1N	(n)	027 038 097 049 078	(110)	1B 26 61 31 4E	(6E)

Table A-1. HP PCL 5 Printer Commands — PCL (continued)

FUNCTION	PARAMETER	COMMAND		DECIMAL VALUE		HEXADECIMAL VALUE	
				PAGE CONTROL COMMANDS			
				Page Length and Size			
Paper Source	Eject Page	E꜀&ℓ0H	(h)	027 038 108 048 072	(104)	1B 26 6C 30 48	(68)
	Main Paper Source	E꜀&ℓ1H	(h)	027 038 108 049 072	(104)	1B 26 6C 31 48	(68)
	Manual Feed	E꜀&ℓ2H	(h)	027 038 108 050 072	(104)	1B 26 6C 32 48	(68)
	Manual Envelope Feed	E꜀&ℓ3H	(h)	027 038 108 051 072	(104)	1B 26 6C 33 48	(68)
	Alternate Paper Source	E꜀&ℓ4H	(h)	027 038 108 052 072	(104)	1B 26 6C 34 48	(68)
	Optional Large Paper Source	E꜀&ℓ5H	(h)	027 038 108 053 072	(104)	1B 26 6C 35 48	(68)
	Envelope Feeder	E꜀&ℓ6H	(h)	027 038 108 054 072	(104)	1B 26 6C 36 48	(68)
Page Size	Executive	E꜀&ℓ1A	(a)	027 038 108 049 065	(97)	1B 26 6C 31 41	(61)
	Letter	E꜀&ℓ2A	(a)	027 038 108 050 065	(97)	1B 26 6C 32 41	(61)
	Legal	E꜀&ℓ3A	(a)	027 038 108 051 065	(97)	1B 26 6C 33 41	(61)
	A4	E꜀&ℓ26A	(a)	027 038 108 050 054 065	(97)	1B 26 6C 32 36 41	(61)
	JIS B5 Paper	E꜀ ℓ45A	(a)	027 038 108 052 053 065	(97)	1B 26 6C 34 35 41	(61)
	Monarch	E꜀&ℓ80A	(a)	027 038 108 056 048 065	(97)	1B 26 6C 38 30 41	(61)
	COM 10	E꜀&ℓ81A	(a)	027 038 108 056 049 065	(97)	1B 26 6C 38 31 41	(61)
	DL	E꜀&ℓ90A	(a)	027 038 108 057 048 065	(97)	1B 26 6C 39 30 41	(61)
	C5	E꜀&ℓ91A	(a)	027 038 108 057 049 065	(97)	1B 26 6C 39 31 41	(61)
	B5 Envelope	E꜀&ℓ100A	(a)	027 038 108 049 048 048 065	(97)	1B 26 6C 31 30 30 41	(61)
	Hagaki	E꜀ ℓ71A	(a)	027 038 108 055 049 065	(97)	1B 26 6C 37 31 41	(61)
	Oufuku-Hagaki	E꜀ ℓ72A	(a)	027 038 108 055 050 065	(97)	1B 26 6C 37 32 41	(61)
	Custom	E꜀&ℓ101A	(a)	027 038 108 049 048 049 065	(97)	1B 26 6C 31 30 31 41	(61)

Table A-1. HP PCL 5 Printer Commands — PCL (continued)

FUNCTION	PARAMETER	COMMAND		DECIMAL VALUE		HEXADECIMAL VALUE	
Orientation							
Orientation	Portrait	ᴇc&ℓ0O	(o)	027 038 108 048 079	(111)	1B 26 6C 30 4F	(6F)
	Landscape	ᴇc&ℓ1O	(o)	027 038 108 049 079	(111)	1B 26 6C 31 4F	(6F)
	Reverse Portrait	ᴇc&ℓ2O	(o)	027 038 108 050 079	(111)	1B 26 6C 32 4F	(6F)
	Reverse Landscape	ᴇc&ℓ3O	(o)	027 038 108 051 079	(111)	1B 26 6C 33 4F	(6F)
Print Direction	# Degrees of Rotation (counter-clockwise, 90° increments only)	ᴇc&a#P	(p)	027 038 097 #...# 080	(112)	1B 26 61 #...# 50	(70)
Character Text Path Direction	Horizontal	ᴇc Ø	(t)	027 038 099 048 084	(116)	1B 26 63 30 54	(74)
	Vertical Rotated	ᴇc	(t)	027 038 099 045 049 084	(116)	1B 26 63 2D 31 54	(74)
Margins and Text Length							
Top Margin	# of Lines	ᴇc&ℓ#E	(e)	027 038 108 #...# 069	(101)	1B 26 6C #...# 45	(65)
Text Length	# of Lines	ᴇc&ℓ#F	(f)	027 038 108 #...# 070	(102)	1B 26 6C #...# 46	(66)
Left Margin	# of Columns	ᴇc&a#L	(l)	027 038 097 #...# 076	(108)	1B 26 61 #...# 4C	(6C)
Right Margin	# of Columns	ᴇc&a#M	(m)	027 038 097 #...# 077	(109)	1B 26 61 #...# 4D	(6D)
Clear Horizontal Margins	—	ᴇc9		027 057		1B 39	
Perforation Skip Mode							
Perforation Skip	Disable	ᴇc&ℓ0L	(l)	027 038 108 048 076	(108)	1B 26 6C 30 4C	(6C)
	Enable	ᴇc&ℓ1L	(l)	027 038 108 049 076	(108)	1B 26 6C 31 4C	(6C)
Horizontal Column Spacing							
Horizontal Motion Index (HMI)	# of 1/120" Increments	ᴇc&k#H	(h)	027 038 107 #...# 072	(104)	1B 26 6B #...# 48	(68)
Vertical Line Spacing							
Vertical Motion Index (VMI)	# of 1/48" Increments	ᴇc&ℓ#C	(c)	027 038 108 #...# 067	(99)	1B 26 6C #...# 43	(63)
Line Spacing (Lines per inch)	1 line/inch	ᴇc&ℓ1D	(d)	027 038 108 049 068	(100)	1B 26 6C 31 44	(64)
	2 lines/inch	ᴇc&ℓ2D	(d)	027 038 108 050 068	(100)	1B 26 6C 32 44	(64)
	3 lines/inch	ᴇc&ℓ3D	(d)	027 038 108 051 068	(100)	1B 26 6C 33 44	(64)
	4 lines/inch	ᴇc&ℓ4D	(d)	027 038 108 052 068	(100)	1B 26 6C 34 44	(64)
	6 lines/inch	ᴇc&ℓ6D	(d)	027 038 108 054 068	(100)	1B 26 6C 36 44	(64)
	8 lines/inch	ᴇc&ℓ8D	(d)	027 038 108 056 068	(100)	1B 26 6C 38 44	(64)
	12 lines/inch	ᴇc&ℓ12D	(d)	027 038 108 049 050 068	(100)	1B 26 6C 31 32 44	(64)
	16 lines/inch	ᴇc&ℓ16D	(d)	027 038 108 049 054 068	(100)	1B 26 6C 31 36 44	(64)
	24 lines/inch	ᴇc&ℓ24D	(d)	027 038 108 050 052 068	(100)	1B 26 6C 32 34 44	(64)
	48 lines/inch	ᴇc&ℓ48D	(d)	027 038 108 052 056 068	(100)	1B 26 6C 34 38 44	(64)

Table A-1. HP PCL 5 Printer Commands — PCL (continued)

FUNCTION	PARAMETER	COMMAND	DECIMAL VALUE	HEXADECIMAL VALUE
CURSOR POSITIONING				
Vertical and Horizontal				
Vertical Position	# of Rows	Ec&a#R *(r)*	027 038 097 #...# 082 *(114)*	1B 26 61 #...# 52 *(72)*
	# of Units	Ec*p#Y *(y)*	027 042 112 #...# 089 *(121)*	1B 2A 70 #...# 59 *(79)*
	# of Decipoints	Ec&a#V *(v)*	027 038 097 #...# 086 *(118)*	1B 26 61 #...# 56 *(76)*
Horizontal Position	# of Columns	Ec&a#C *(c)*	027 038 097 #...# 067 *(99)*	1B 26 61 #...# 43 *(63)*
	# of Units	Ec*p#X *(x)*	027 042 112 #...# 088 *(120)*	1B 2A 70 #...# 58 *(78)*
	# of Decipoints	Ec&a#H *(h)*	027 038 097 #...# 072 *(104)*	1B 26 61 #...# 48 *(68)*
Half Line Feed		Ec=	027 061	1B 3D
End-of-Line Termination				
Line Termination	CR=CR; LF=LF; FF=FF	Ec&k0G *(g)*	027 038 107 048 071 *(103)*	1B 26 6B 30 47 *(67)*
	CR=CR+LF; LF=LF; FF=FF	Ec&k1G *(g)*	027 038 107 049 071 *(103)*	1B 26 6B 31 47 *(67)*
	CR=CR; LF=CR+LF; FF=CR+FF	Ec&k2G *(g)*	027 038 107 050 071 *(103)*	1B 26 6B 32 47 *(67)*
	CR=CR+LF; LF=CR+LF; FF=CR+FF	Ec&k3G *(g)*	027 038 107 051 071 *(103)*	1B 26 6B 33 47 *(67)*
Push/Pop Position				
Push/Pop Position	Push	Ec&f0S *(s)*	027 038 102 048 083 *(115)*	1B 26 66 30 53 *(73)*
	Pop	Ec&f1S *(s)*	027 038 102 049 083 *(115)*	1B 26 66 31 53 *(73)*
FONT SELECTION				
Symbol Set Selection[1]				
Primary Symbol Set	ISO 60: Norwegian 1	Ec(0D	027 040 048 068	1B 28 30 44
	ISO 4: United Kingdom	Ec(1E	027 040 049 069	1B 28 31 45
	Windows 3.1 Latin 2	Ec(9E	027 040 057 069	1B 28 39 45
	ISO 69: French	Ec(1F	027 040 049 070	1B 28 31 46
	ISO 21: German	Ec(1G	027 040 049 071	1B 28 31 47
	ISO 15: Italian	Ec(0I	027 040 048 073	1B 28 30 49
	Microsoft Publishing	Ec(6J	027 040 054 074	1B 28 36 4A

[1]Additional symbol sets are supported, refer to Table C-1 for a list of these symbol sets.

Table A-1.   HP PCL 5 Printer Commands — PCL (continued)

FUNCTION	PARAMETER	COMMAND	DECIMAL VALUE	HEXADECIMAL VALUE
Symbol Set Selection[1] - continued				
Primary Symbol Set	DeskTop	E_c(7J	027 040 055 074	1B 28 37 4A
	PS Text	E_c(10J	027 040 049 048 074	1B 28 31 30 4A
	MC Text	E_c(12J	027 040 049 050 074	1B 28 31 32 4A
	Ventura International	E_c(13J	027 040 049 051 074	1B 28 31 33 4A
	Ventura US	E_c(14J	027 040 049 052 074	1B 28 31 34 4A
	Ventura ITC Zapf Dingbats	E_c(9L	027 040 057 076	1B 28 39 4C
	PS ITC Zapf Dingbats	E_c(10L	027 040 049 048 076	1B 28 31 30 4C
	ITC Zapf Dingbats Series 100	E_c(11L	027 040 049 049 076	1B 28 31 31 4C
	ITC Zapf Dingbats Series 200	E_c(12L	027 040 049 050 076	1B 28 31 32 4C
	ITC Zapf Dingbats Series 300	E_c(13L	027 040 049 051 076	1B 28 31 33 4C
	Wingdings	E_c(579L	027 040 053 055 057 076	1B 28 35 37 39 4C
	PS Math	E_c(5M	027 040 053 077	1B 28 35 4D
	Ventura Math	E_c(6M	027 040 054 077	1B 28 36 4D
	Math-8	E_c(8M	027 040 056 077	1B 28 38 4D
	Symbol	E_c(19M	027 040 049 057 077	1B 28 31 39 4D
	ISO 8859-1 (ECMA-94) Latin 1	E_c(0N	027 040 048 078	1B 28 30 4E
	ISO 8859-2: Latin 2	E_c(2N	027 040 050 078	1B 28 32 4E
	ISO 8859-9: Latin 5	E_c(5N	027 040 053 078	1B 28 35 4E
	ISO 11: Swedish	E_c(0S	027 040 048 083	1B 28 30 53
	ISO 17: Spanish	E_c(2S	027 040 050 083	1B 28 32 53
	Windows 3.1 Latin 5	E_c(5T	027 040 053 084	1B 28 35 54

[1]Additional symbol sets are supported, refer to Table C-1 for a list of these symbol sets.

Table A-1. HP PCL 5 Printer Commands — PCL (continued)

FUNCTION	PARAMETER	COMMAND		DECIMAL VALUE		HEXADECIMAL VALUE	
Symbol Set Selection[1] - continued							
Primary Symbol Set	PC Turkish	E_C(9T		027 040 057 084		1B 28 39 54	
	ISO 6: ASCII	E_C(0U		027 040 048 085		1B 28 30 55	
	Legal	E_C(1U		027 040 049 085		1B 28 31 55	
	Roman-8	E_C(8U		027 040 056 085		1B 28 38 55	
	Windows 3.0 Latin 1	E_C(9U		027 040 057 085		1B 28 39 55	
	PC-8	E_C(10U		027 040 049 048 085		1B 28 31 30 55	
	PC-8 D/N	E_C(11U		027 040 049 049 085		1B 28 31 31 55	
	PC-850	E_C(12U		027 040 049 050 085		1B 28 31 32 55	
	Pi Font	E_C(15U		027 040 049 053 085		1B 28 31 35 55	
	PC-852	E_C(17U		027 040 049 055 085		1B 28 31 37 55	
	Windows 3.1 Latin 1 (ANSI)	E_C(19U		027 040 049 057 085		1B 28 31 39 55	
	Windows 3.1J (Japanese)	E_C(19K		027 040 049 057 075		1B 28 31 39 4B	
Spacing							
Primary Spacing	Fixed	E_C(s0P	(p)	027 040 115 048 080	(112)	1B 28 73 30 50	(70)
	Proportional	E_C(s1P	(p)	027 040 115 049 080	(112)	1B 28 73 31 50	(70)
Pitch							
Primary Pitch	# Characters/inch	E_C(s#H	(h)	027 040 115 #...# 072	(104)	1B 28 73 #...# 48	(68)
Set Pitch Mode	10.0	E_C&k0S	(s)	027 038 107 048 083	(115)	1B 26 6B 30 53	(73)
	Compressed (16.5-16.7)	E_C&k2S	(s)	027 038 107 050 083	(115)	1B 26 6B 32 53	(73)
	Elite (12.0)	E_C&k4S	(s)	027 038 107 052 083	(115)	1B 26 6B 34 53	(73)
Point Size							
Primary Height	# Points	E_C(s#V	(v)	027 040 115 #...# 086	(118)	1B 28 73 #...# 56	(76)

[1]Additional symbol sets are supported, refer to Table C-1 for a list of these symbol sets.

Table A-1.   HP PCL 5 Printer Commands — PCL (continued)

FUNCTION	PARAMETER	COMMAND		DECIMAL VALUE		HEXADECIMAL VALUE	
				Style			
Primary Style	Upright (Solid)	E_C(s0S	*(s)*	027 040 115 048 083	*(115)*	1B 28 73 30 53	*(73)*
	Italic	E_C(s1S	*(s)*	027 040 115 049 083	*(115)*	1B 28 73 31 53	*(73)*
	Condensed	E_C(s4S	*(s)*	027 040 115 052 083	*(115)*	1B 28 73 34 53	*(73)*
	Condensed Italic	E_C(s5S	*(s)*	027 040 115 053 083	*(115)*	1B 28 73 35 53	*(73)*
	Compressed (Extra Condensed)	E_C(s8S	*(s)*	027 040 115 056 083	*(115)*	1B 28 73 38 53	*(73)*
	Expanded	E_C(s24S	*(s)*	027 040 115 050 052 083	*(115)*	1B 28 73 32 34 53	*(73)*
	Outline	E_C(s32S	*(s)*	027 040 115 051 050 083	*(115)*	1B 28 73 33 32 53	*(73)*
	Inline	E_C(s64S	*(s)*	027 040 115 054 052 083	*(115)*	1B 28 73 36 34 53	*(73)*
	Shadowed	E_C(s128S	*(s)*	027 040 115 049 050 056 083	*(115)*	1B 28 73 31 32 38 53	*(73)*
	Outline Shadowed	E_C(s160S	*(s)*	027 040 115 049 054 048 083	*(115)*	1B 28 73 31 36 30 53	*(73)*

Additional style values may be obtained from the related documentation provided with HP's font products.

PCL 5 LaserJet Printers allows the specification of complex structures (contours, outlines, shading, etc.) and widths as well as posture. Refer to the *PCL 5 Printer Language Technical Reference Manual.*

FUNCTION	PARAMETER	COMMAND		DECIMAL VALUE		HEXADECIMAL VALUE	
				Stroke Weight			
Primary Font Stroke Weight	Ultra Thin	E_C(s–7B	*(b)*	027 040 115 045 055 066	*(98)*	1B 28 73 2D 37 42	*(62)*
	Extra Thin	E_C(s–6B	*(b)*	027 040 115 045 054 066	*(98)*	1B 28 73 2D 36 42	*(62)*
	Thin	E_C(s–5B	*(b)*	027 040 115 045 053 066	*(98)*	1B 28 73 2D 35 42	*(62)*
	Extra Light	E_C(s–4B	*(b)*	027 040 115 045 052 066	*(98)*	1B 28 73 2D 34 42	*(62)*
	Light	E_C(s–3B	*(b)*	027 040 115 045 051 066	*(98)*	1B 28 73 2D 33 42	*(62)*
	Demi Light	E_C(s–2B	*(b)*	027 040 115 045 050 066	*(98)*	1B 28 73 2D 32 42	*(62)*
	Semi Light	E_C(s–1B	*(b)*	027 040 115 045 049 066	*(98)*	1B 28 73 2D 31 42	*(62)*
	Medium (book or text)	E_C(s0B	*(b)*	027 040 115 048 066	*(98)*	1B 28 73 30 42	*(62)*
	Semi Bold	E_C(s1B	*(b)*	027 040 115 049 066	*(98)*	1B 28 73 31 42	*(62)*
	Demi Bold	E_C(s2B	*(b)*	027 040 115 050 066	*(98)*	1B 28 73 32 42	*(62)*
	Bold	E_C(s3B	*(b)*	027 040 115 051 066	*(98)*	1B 28 73 33 42	*(62)*
	Extra Bold	E_C(s4B	*(b)*	027 040 115 052 066	*(98)*	1B 28 73 34 42	*(62)*
	Black	E_C(s5B	*(b)*	027 040 115 053 066	*(98)*	1B 28 73 35 42	*(62)*
	Extra Black	E_C(s6B	*(b)*	027 040 115 054 066	*(98)*	1B 28 73 36 42	*(62)*
	Ultra Black	E_C(s7B	*(b)*	027 040 115 055 066	*(98)*	1B 28 73 37 42	*(62)*

Table A-1.   HP PCL 5 Printer Commands — PCL (continued)

FUNCTION	PARAMETER	COMMAND		DECIMAL VALUE		HEXADECIMAL VALUE	
				Primary Typeface Family [1]			
Typeface Family	LinePrinter	Ec(s0T	(t)	027 040 115 048 084	(116)	1B 28 73 30 54	(74)
	Albertus	Ec(s4362T	(t)	027 040 115 052 051 054 050 084	(116)	1B 28 73 34 33 36 32 54	(74)
	Antique Olive	Ec(s4168T	(t)	027 040 115 052 049 054 056 084	(116)	1B 28 73 34 31 36 38 54	(74)
	Clarendon	Ec(s4140T	(t)	027 040 115 052 049 052 048 084	(116)	1B 28 73 34 31 34 30 54	(74)
	Coronet	Ec(s4116T	(t)	027 040 115 052 049 049 054 084	(116)	1B 28 73 34 31 31 36 54	(74)
	Courier	Ec(s3T	(t)	027 040 115 051 084	(116)	1B 28 73 33 54	(74)
	Courier	Ec(s4099T	(t)	027 040 115 052 048 057 057 084	(116)	1B 28 73 34 30 39 39 54	(74)
	ITC Zapf Dingbats	Ec(s4141T	(t)	027 040 115 052 049 052 049 084	(116)	1B 28 73 34 31 34 31 54	(74)
	Garamond Antiqua	Ec(s4197T	(t)	027 040 115 052 049 057 055 084	(116)	1B 28 73 34 31 39 37 54	(74)
	Letter Gothic	Ec(s4102T	(t)	027 040 115 052 049 048 050 084	(116)	1B 28 73 34 31 30 32 54	(74)
	Marigold	Ec(s4297T	(t)	027 040 115 052 050 057 055 084	(116)	1B 28 73 34 32 39 37 54	(74)
	CG Omega	Ec(s4113T	(t)	027 040 115 052 049 049 051 084	(116)	1B 28 73 34 31 31 33 54	(74)
	CG Times	Ec(s4101T	(t)	027 040 115 052 049 048 049 084	(116)	1B 28 73 34 31 30 31 54	(74)
	Univers	Ec(s4148T	(t)	027 040 115 052 049 052 056 084	(116)	1B 28 73 34 31 34 38 54	(74)
	Arial	Ec(s16602T	(t)	027 040 115 049 054 054 048 050 084	(116)	1B 28 73 31 36 36 30 32 54	(74)
	MS Mincho	Ec(s28752T	(t)	027 040 115 050 056 055 053 050 084	(116)	1B 28 73 32 38 37 35 32 54	(74)
	MS Gothic	Ec(s28825T	(t)	027 040 115 050 056 056 050 053 084	(116)	1B 28 73 32 38 38 32 35 54	(74)
	Times New Roman	Ec(s16901T	(t)	027 040 115 049 054 057 048 049 084	(116)	1B 28 73 31 36 39 30 31 54	(74)
	Symbol	Ec(s16686T	(t)	027 040 115 049 054 054 056 054 084	(116)	1B 28 73 31 36 36 38 36 54	(74)
	Wingdings	Ec(s6826T	(t)	027 040 115 054 056 050 054 084	(116)	1B 28 73 36 38 32 36 54	(74)
	Wingdings	Ec(s31402T	(t)	027 040 115 051 049 052 048 050 084	(116)	1B 28 73 33 31 34 30 32 54	(74)
				FONT DEFAULT			
Font Default	Primary Font	Ec(3@		027 040 051 064		1B 28 33 40	
	Secondary Font	Ec)3@		027 041 051 064		1B 29 33 40	
				UNDERLINE			
Underline	Enable Fixed	Ec&d0D	(d)	027 038 100 048 068	(100)	1B 26 64 30 44	(64)
	Enable Floating	Ec&d3D	(d)	027 038 100 051 068	(100)	1B 26 64 33 44	(64)
	Disable	Ec&d@		027 038 100 064		1B 26 64 40	
				TEXT PARSING METHOD			
Text Parsing Method	1-Byte	Ec&t0P	(p)	027 038 116 48 080	(112)	1B 26 74 30 50	(70)
	1-Byte	Ec&t1P	(p)	027 038 116 49 080	(112)	1B 26 74 31 50	(70)
	1-Byte/2-Byte	Ec&t21P	(p)	027 038 116 050 049 080	(112)	1B 26 74 32 31 50	(70)
	1-Byte/2-Byte	Ec&t31P	(p)	027 038 116 051 049 080	(112)	1B 26 74 33 31 50	(70)
	1-Byte/2-Byte	Ec&t38P	(p)	027 038 116 051 056 080	(112)	1B 26 74 33 38 50	(70)
				TRANSPARENT PRINT DATA			
Transparent Print Data	# of Bytes	Ec&p#X[Data]		027 038 112 #...# 088		1B 26 70 #...# 58	

[1]Additional typefaces are supported, refer to Table C-2 and C-3 for a list of these symbol sets.

Table A-1. HP PCL 5 Printer Commands — PCL (continued)

FUNCTION	PARAMETER	COMMAND		DECIMAL VALUE		HEXADECIMAL VALUE	
				FONT MANAGEMENT			
Assign Font ID	Font ID #	E_C*c#D	(d)	027 042 099 #...# 068	(100)	1B 2A 63 #...# 44	(64)
Font and Character Control	Delete all Fonts	E_C*c0F	(f)	027 042 099 048 070	(102)	1B 2A 63 30 46	(66)
	Delete all temporary fonts	E_C*c1F	(f)	027 042 099 049 070	(102)	1B 2A 63 31 46	(66)
	Delete last font ID specified	E_C*c2F	(f)	027 042 099 050 070	(102)	1B 2A 63 32 46	(66)
	Delete last character specified	E_C*c3F	(f)	027 042 099 051 070	(102)	1B 2A 63 33 46	(66)
	Make font temporary	E_C*c4F	(f)	027 042 099 052 070	(102)	1B 2A 63 34 46	(66)
	Make font permanent	E_C*c5F	(f)	027 042 099 053 070	(102)	1B 2A 63 35 46	(66)
	Copy/Assign the currently invoked font as temporary	E_C*c6F	(f)	027 042 099 054 070	(102)	1B 2A 63 36 46	(66)
				Soft Symbol Set Management / Creation			
Set Symbol Set	ID #	E_C*c#R	(r)	027 042 099 #...# 082	(114)	1B 2A 63 #...# 52	(72)
Define Symbol Set	# of Bytes	E_C(f#W[Data]		027 040 102 #...# 087		1B 28 66 #...# 57	
Symbol Set Control	Delete all symbol sets	E_C*c0S	(s)	027 042 099 048 083	(115)	1B 2A 63 30 53	(73)
	Delete all temporary symbol sets	E_C*c1S	(s)	027 042 099 049 083	(115)	1B 2A 63 31 53	(73)
	Delete current soft symbol set (last ID#)	E_C*c2S	(s)	027 042 099 050 083	(115)	1B 2A 63 32 53	(73)
	Make current soft symbol set temporary	E_C*c4S	(s)	027 042 099 052 083	(115)	1B 2A 63 34 53	(73)
	Make current soft symbol set permanent	E_C*c5S	(s)	027 042 099 053 083	(115)	1B 2A 63 35 53	(73)

Table A-1. HP PCL 5 Printer Commands — PCL (continued)

FUNCTION	PARAMETER	COMMAND		DECIMAL VALUE		HEXADECIMAL VALUE	
Font Selection by ID Number							
Select font (with ID #)	ID # primary font	E_C(#X		027 040 #...# 088		1B 28 #...# 58	
	ID # secondary font	E_C)#X		027 041 #...# 088		1B 29 #...# 58	
SOFT FONT CREATION							
Font descriptor (font header)	# of bytes	E_C)s#W[Data]		027 041 115 #...# 087		1B 29 73 #...# 57	
Download character	# of bytes	E_C(s#W[Data]		027 040 115 #...# 087		1B 28 73 #...# 57	
Character code	Character code # (decimal)	E_C*c#E	(e)	027 042 099 #...# 069	(101)	1B 2A 63 #...# 45	(65)
GRAPHICS							
Raster Graphics							
Raster Resolution	75 dots/inch	E_C*t75R	(r)	027 042 116 055 053 082	(114)	1B 2A 74 37 35 52	(72)
	100 dots/inch	E_C*t100R	(r)	027 042 116 049 048 048 082	(114)	1B 2A 74 31 30 30 52	(72)
	150 dots/inch	E_C*t150R	(r)	027 042 116 049 053 048 082	(114)	1B 2A 74 31 35 30 52	(72)
	200 dots/inch	E_C*t200R	(r)	027 042 116 050 048 048 082	(114)	1B 2A 74 32 30 30 52	(72)
	300 dots/inch	E_C*t300R	(r)	027 042 116 051 048 048 082	(114)	1B 2A 74 33 30 30 52	(72)
	600 dots/inch	E_C*t600R	(r)	027 042 116 054 048 048 082	(114)	1B 2A 74 36 30 30 52	(72)

Table A-1. HP PCL 5 Printer Commands — PCL (continued)

FUNCTION	PARAMETER	COMMAND		DECIMAL VALUE		HEXADECIMAL VALUE	
				Raster Graphics			
Raster Graphics Presentation	Follows orientation	E_C*r0F	(f)	027 042 114 048 070	(102)	1B 2A 72 30 46	(66)
	Follows physical page	E_C*r3F	(f)	027 042 114 051 070	(102)	1B 2A 72 33 46	(66)
Start Raster Graphics	Left Raster Graphics Margin	E_C*r0A	(a)	027 042 114 048 065	(97)	1B 2A 72 30 41	(61)
	Current Cursor	E_C*r1A	(a)	027 042 114 049 065	(97)	1B 2A 72 31 41	(61)
	Scale mode (logical left page boundary)	E_C*r2A	(a)	027 042 114 050 065	(97)	1B 2A 72 32 41	(61)
	Scale mode (at CAP)	E_C*r3A	(a)	027 042 114 051 065	(97)	1B 2A 72 33 42	(61)
Raster Y Offset	# of Raster Lines of vertical movement	E_C*b#Y	(y)	027 042 098 #...# 089	(121)	1B 2A 62 #...# 59	(79)
Set Raster Compression Mode	Unencoded	E_C*b0M	(m)	027 042 098 048 077	(109)	1B 2A 62 30 4D	(6D)
	Run-Length Encoded	E_C*b1M	(m)	027 042 098 049 077	(109)	1B 2A 62 31 4D	(6D)
	Tagged Image File Format	E_C*b2M	(m)	027 042 098 050 077	(109)	1B 2A 62 32 4D	(6D)
	Delta Row	E_C*b3M	(m)	027 042 098 051 077	(109)	1B 2A 62 33 4D	(6D)
	Adaptive Compression	E_C*b5M	(m)	027 042 098 053 077	(109)	1B 2A 62 35 4D	(6D)
Transfer Raster Data (by row)	# of Bytes	E_C*b#W[Data]		027 042 098 #...# 087		1B 2A 62 #...# 57	
Transfer Raster Data (by plane)	# of Bytes	E_C*b#V[Data]		027 042 062 #...# 086		1B 2A 98 #...# 56	
End Raster Graphics	Old version	E_C*rB	(b)	027 042 114 066	(98)	1B 2A 72 42	(62)
	Preferred	E_C*rC	(c)	027 042 114 067	(99)	1B 2A 72 43	(63)
Raster Height (Source)	# Raster Rows	E_C*r#T	(t)	027 042 114 #...# 084	(116)	1B 2A 72 #...# 54	(74)
Raster Width (Source)	# Pixels of the Specified Resolution	E_C*r#S	(s)	027 042 114 #...# 083	(115)	1B 2A 72 #...# 53	(73)
Raster Height (Destination)	# of Decipoints	E_C*t#H	(h)	027 042 116 #...# 072	(104)	1B 2A 74 #...# 48	(68)
Raster Width (Destination)	# of Decipoints	E_C*t#V	(v)	027 042 116 #...# 086	(118)	1B 2A 74 #...# 56	(76)
Scale Algorithm	Source with light background	E_C*t0K	(k)	027 042 116 048 075	(107)	1B 2A 74 30 4B	(6B)
	Source with dark background	E_C*t1K	(k)	027 042 116 049 075	(107)	1B 2A 74 31 4B	(6B)

Table A-1. HP PCL 5 Printer Commands — PCL (continued)

FUNCTION	PARAMETER	COMMAND		DECIMAL VALUE		HEXADECIMAL VALUE	
THE PRINT MODEL							
Imaging							
Select Current Pattern	Solid Black (default)	E_C*v0T	(t)	027 042 118 048 084	(116)	1B 2A 76 30 54	(74)
	Solid White	E_C*v1T	(t)	027 042 118 049 084	(116)	1B 2A 76 31 54	(74)
	HP-defined Shading Pattern	E_C*v2T	(t)	027 042 118 050 084	(116)	1B 2A 76 32 54	(74)
	HP-defined Cross-hatched Pattern	E_C*v3T	(t)	027 042 118 051 084	(116)	1B 2A 76 33 54	(74)
	User-defined Pattern	E_C*v4T	(t)	027 042 118 052 084	(116)	1B 2A 76 34 54	(74)
Source Transparency Mode	Transparent	E_C*v0N	(n)	027 042 118 048 078	(110)	1B 2A 76 30 4E	(6E)
	Opaque	E_C*v1N	(n)	027 042 118 049 078	(110)	1B 2A 76 31 4E	(6E)
Pattern Transparency Mode	Transparent	E_C*v0O	(o)	027 042 118 048 079	(111)	1B 2A 76 30 4F	(6F)
	Opaque	E_C*v1O	(o)	027 042 118 049 079	(111)	1B 2A 76 31 4F	(6F)
Logical Operation	# = ROP3 input value	E_C*ℓ#O	(o)	027 042 108 #...# 079	(111)	1B 2A 6C #...# 4F	(6F)
Pixel Placement	Grid Intersection	E_C*v0R	(r)	027 042 108 048 082	(114)	1B 2A 6C 30 52	(72)
	Pixel Placement	E_C*v1R	(r)	027 042 118 049 082	(114)	1B 2A 76 31 52	(72)
Rectangle Dimensions							
Rectangle Width (Horizontal Size)	# of dots	E_C*c#A	(a)	027 042 099 #...# 065	(97)	1B 2A 63 #...# 41	(61)
	# of decipoints	E_C*c#H	(h)	027 042 099 #...# 072	(104)	1B 2A 63 #...# 48	(68)
Rectangle Height (Vertical Size)	# of dots	E_C*c#B	(b)	027 042 099 #...# 066	(98)	1B 2A 63 # ... # 42	(62)
	# of decipoints	E_C*c#V	(v)	027 042 099 #...# 086	(118)	1B 2A 63 #...# 56	(76)

Table A-1.   HP PCL 5 Printer Commands — PCL (continued)

FUNCTION	PARAMETER	COMMAND		DECIMAL VALUE		HEXADECIMAL VALUE	
				Rectangular Area Fill			
Fill Rectangular Area	Solid Black	E_C*c0P	(p)	027 042 099 048 080	(112)	1B 2A 63 30 50	(70)
	Erase (solid white fill)	E_C*c1P	(p)	027 042 099 049 080	(112)	1B 2A 63 31 50	(70)
	Shaded Fill	E_C*c2P	(p)	027 042 099 050 080	(112)	1B 2A 63 32 50	(70)
	Cross-hatched Fill	E_C*c3P	(p)	027 042 099 051 080	(112)	1B 2A 63 33 50	(70)
	User-defined	E_C*c4P	(p)	027 042 099 052 080	(112)	1B 2A 63 34 50	(70)
	Current Pattern	E_C*c5P	(p)	027 042 099 053 080	(112)	1B 2A 63 35 50	(70)
Pattern ID	% of Shading or Type of Pattern or User Pattern ID	E_C*c#G	(g)	027 042 099 #...# 071	(103)	1B 2A 63 #...# 47	(67)
Shading	2% Gray	E_C*c2G	(g)	027 042 099 050 071	(103)	1B 2A 63 32 47	(67)
	10% Gray	E_C*c10G	(g)	027 042 099 049 048 071	(103)	1B 2A 63 31 30 47	(67)
	15% Gray	E_C*c15G	(g)	027 042 099 049 053 071	(103)	1B 2A 63 31 35 47	(67)
	30% Gray	E_C*c30G	(g)	027 042 099 051 048 071	(103)	1B 2A 63 33 30 47	(67)
	45% Gray	E_C*c45G	(g)	027 042 099 052 053 071	(103)	1B 2A 63 34 35 47	(67)
	70% Gray	E_C*c70G	(g)	027 042 099 055 048 071	(103)	1B 2A 63 37 30 47	(67)
	90% Gray	E_C*c90G	(g)	027 042 099 057 048 071	(103)	1B 2A 63 39 30 47	(67)
	100% Gray	E_C*c100G	(g)	027 042 099 049 048 048 071	(103)	1B 2A 63 31 30 30 47	(67)
Pattern	1 Horiz. Line	E_C*c1G	(g)	027 042 099 049 071	(103)	1B 2A 63 31 47	(67)
	2 Vert. Lines	E_C*c2G	(g)	027 042 099 050 071	(103)	1B 2A 63 32 47	(67)
	3 Diagonal Lines	E_C*c3G	(g)	027 042 099 051 071	(103)	1B 2A 63 33 47	(67)
	4 Diagonal Lines	E_C*c4G	(g)	027 042 099 052 071	(103)	1B 2A 63 34 47	(67)
	5 Square Grid	E_C*c5G	(g)	027 042 099 053 071	(103)	1B 2A 63 35 47	(67)
	6 Diagonal Grid	E_C*c6G	(g)	027 042 099 054 071	(103)	1B 2A 63 36 47	(67)

A-14 Printer Commands

Table A-1. HP PCL 5 Printer Commands — PCL (continued)

FUNCTION	PARAMETER	COMMAND		DECIMAL VALUE		HEXADECIMAL VALUE	
				USER DEFINED PATTERN / MANAGEMENT CREATION			
Define Pattern	# of bytes	E_C*c#W[Data]		027 042 099 #...# 087		1B 2A 63 #...# 57	
User-defined Pattern Control	Delete all patterns	E_C*c0Q	(q)	027 042 099 048 081	(113)	1B 2A 63 030 51	(71)
	Delete all temporary patterns	E_C*c1Q	(q)	027 042 099 049 081	(113)	1B 2A 63 031 51	(71)
	Delete current pattern	E_C*c2Q	(q)	027 042 099 050 081	(113)	1B 2A 63 032 51	(71)
	Make pattern temporary	E_C*c4Q	(q)	027 042 099 052 081	(113)	1B 2A 63 034 51	(71)
	Make pattern permanent	E_C*c5Q	(q)	027 042 099 053 081	(113)	1B 2A 63 035 51	(71)
Set Pattern Reference	Rotate with orientation	E_C*p0R	(r)	027 042 112 048 082	(114)	1B 2A 70 30 52	(72)
Point	Follow physical page	E_C*p1R	(r)	027 042 112 049 082	(114)	1B 2A 70 31 52	(72)
				MACROS			
Macro ID	Macro ID #	E_C&f#Y	(y)	027 038 102 #...# 089	(121)	1B 26 66 #...# 59	(79)
Macro Control	Start Macro Def.	E_C&f0X	(x)	027 038 102 048 088	(120)	1B 26 66 30 58	(78)
	Stop Macro Def.	E_C&f1X	(x)	027 038 102 049 088	(120)	1B 26 66 31 58	(78)
	Execute Macro	E_C&f2X	(x)	027 038 102 050 088	(120)	1B 26 66 32 58	(78)
	Call Macro	E_C&f3X	(x)	027 038 102 051 088	(120)	1B 26 66 33 58	(78)
	Enable Overlay	E_C&f4X	(x)	027 038 102 052 088	(120)	1B 26 66 34 58	(78)
	Disable Overlay	E_C&f5X	(x)	027 038 102 053 088	(120)	1B 26 66 35 58	(78)
	Delete Macros	E_C&f6X	(x)	027 038 102 054 088	(120)	1B 26 66 36 58	(78)
	Delete All Temp. Macros	E_C&f7X	(x)	027 038 102 055 088	(120)	1B 26 66 37 58	(78)
	Delete Macro ID	E_C&f8X	(x)	027 038 102 056 088	(120)	1B 26 66 38 58	(78)
	Make Temporary	E_C&f9X	(x)	027 038 102 057 088	(120)	1B 26 66 39 58	(78)
	Make Permanent	E_C&f10X	(x)	027 038 102 049 048 088	(120)	1B 26 66 31 30 58	(78)

Table A-1. HP PCL 5 Printer Commands — PCL (continued)

FUNCTION	PARAMETER	COMMAND		DECIMAL VALUE		HEXADECIMAL VALUE	
				STATUS READBACK			
Set Status Readback Location Type	Invalid Location	E_C*s0T	(t)	027 042 115 048 084	(116)	1B 2A 73 30 54	(74)
	Currently Selected	E_C*s1T	(t)	027 042 115 049 084	(116)	1B 2A 73 31 54	(74)
	All Locations	E_C*s2T	(t)	027 042 115 050 084	(116)	1B 2A 73 32 54	(74)
	Internal	E_C*s3T	(t)	027 042 115 051 084	(116)	1B 2A 73 33 54	(74)
	Downloaded	E_C*s4T	(t)	027 042 115 052 084	(116)	1B 2A 73 34 54	(74)
	Cartridge	E_C*s5T	(t)	027 042 115 053 084	(116)	1B 2A 73 35 54	(74)
	User-installed ROM (SIMMs)	E_C*s7T	(t)	027 042 115 055 084	(116)	1B 2A 73 37 54	(74)
Set Status Readback Location Unit	All entities of the Location Type	E_C*s0U	(u)	027 042 115 048 085	(117)	1B 2A 73 30 55	(75)
	Entity 1 or Temporary	E_C*s1U	(u)	027 042 115 049 085	(117)	1B 2A 73 31 55	(75)
	Entity 2 or Permanent	E_C*s2U	(u)	027 042 115 050 085	(117)	1B 2A 73 32 55	(75)
	Entity 3	E_C*s3U	(u)	027 042 115 051 085	(117)	1B 2A 73 33 55	(75)
	Entity 4	E_C*s4U	(u)	027 042 115 052 085	(117)	1B 2A 73 34 55	(75)
Inquire Status Readback Entity	Font	E_C*s0I	(i)	027 042 115 048 073	(105)	1B 2A 73 30 49	(69)
	Macro	E_C*s1I	(i)	027 042 115 049 073	(105)	1B 2A 73 31 49	(69)
	User-defined Pattern	E_C*s2I	(i)	027 042 115 050 073	(105)	1B 2A 73 32 49	(69)
	Symbol Set	E_C*s3I	(i)	027 042 115 051 073	(105)	1B 2A 73 33 49	(69)
	Font Extended	E_C*s4I	(i)	027 042 115 052 073	(105)	1B 2A 73 34 49	(69)
Flush All Pages	Flush All Complete Pages	E_C&r0F	(f)	027 038 114 048 070	(120)	1B 26 72 30 46	(66)
	Flush All Page Data	E_C&r1F	(f)	027 038 114 049 070	(120)	1B 26 72 31 46	(66)
Free Memory Space	—	E_C*s1M	(m)	027 042 115 049 077	(109)	1B 2A 73 31 4D	(6D)
Echo	# = Echo value (-32767 to 32767)	E_C*s#X	(x)	027 042 115 #...# 088	(120)	1B 2A 73 #...# 58	(78)
				PROGRAMMING HINTS			
End-of-Line Wrap	Enabled	E_C&s0C	(c)	027 038 115 048 067	(99)	1B 26 73 30 43	(63)
	Disabled	E_C&s1C	(c)	027 038 115 049 067	(99)	1B 26 73 31 43	(63)
Display Functions	ON	E_CY		027 089		1B 59	
	OFF	E_CZ		027 090		1B 5A	

A-16 Printer Commands

Table A-1.   HP PCL 5 Printer Commands — PCL (continued)

FUNCTION	PARAMETER	COMMAND		DECIMAL VALUE		HEXADECIMAL VALUE	
PCL VECTOR GRAPHICS SWITCHING/SET-UP PICTURE FRAME							
Enter PCL Mode	Use previous PCL cursor position	E$_c$%0A		027 037 048 65		1B 25 30 41	
	Use current HP-GL/2pen position for cursor position	E$_c$%1A		027 037 049 65		1B 25 31 41	
Enter HP-GL/2 Mode	Use previous HP-GL/2 pen position	E$_c$%0B		027 037 048 066		1B 25 30 42	
	Use current PCL cursor position	E$_c$%1B		027 037 049 066		1B 25 31 42	
	Stand-alone plotter mode	E$_c$%–1B		027 037 045 049 066		1B 25 2D 31 42	
	Current PCL coordinate system/old HP-GL pen position	E$_c$%2B		027 037 050 066		1B 25 32 42	
	Current PCL coordinate system/current PCL CAP	E$_c$%3B		027 037 051 066		1B 25 33 42	
HP-GL/2 Plot Horzontal Size	Horizontal size in inches	E$_c$*c#K	*(k)*	027 042 099 #...# 075	*(107)*	1B 2A 63 # ... # 4B	*(6B)*
HP-GL/2 Plot Vertical Size	Vertical size in inches	E$_c$*c#L	*(l)*	027 042 099 #...# 076	*(108)*	1B 2A 63 #...# 4C	*(6C)*
Set Picture Frame Anchor Point	Set anchor point to cursor position	E$_c$*c0T	*(t)*	027 042 099 048 084	*(116)*	1B 2A 63 30 54	*(74)*
Picture Frame Horizontal Size	Decipoints	E$_c$*c#X	*(x)*	027 042 099 #...# 088	*(120)*	1B 2A 63 #...# 58	*(78)*
Picture Frame Vertical Size	Decipoints	E$_c$*c#Y	*(y)*	027 042 099 #...# 089	*(121)*	1B 2A 63 #...# 59	*(79)*
DUAL CONTEXT EXTENSIONS							
Enter PCL Mode	E$_c$%#A	0 - Retain previous PCL cursor position 1 - Use current HP-GL/2 pen position					
Reset	E$_c$E	None					
Primary Font	FI	Font_ID					
Secondary Font	FN	Font_ID					

Table A-1. HP PCL 5 Printer Commands — PCL (continued)

FUNCTION	PARAMETER	COMMAND		DECIMAL VALUE		HEXADECIMAL VALUE	
COLOR COMMANDS							
Assign Color Index	Index Number	Ec*v#I	(i)	027 042 118 #...# 073	(105)	1B 2A 76 #...# 49	(69)
Color Component One	1st Component	Ec*v#A	(a)	027 042 118 #...# 065	(97)	1B 2A 76 #...# 41	(61)
Color Component Two	2nd Component	Ec*v#B	(b)	027 042 118 #...# 066	(98)	1B 2A 76 #...# 42	(62)
Color Component Three	3rd Component	Ec*v#C	(c)	027 042 118 #...# 067	(99)	1B 2A 76 #...# 43	(63)
Color Lookup Tables	# of Bytes	Ec*ℓ#W[Data]		027 042 108 #...# 087		1B 2A 6C #...# 57	
Configure Image Data	# of Bytes	Ec*v#W[Data]		027 042 118 #...# 087		1B 2A 76 #...# 57	
Download Dither Matrix	# of Bytes	Ec*v#I	(i)	027 042 118 #...# 073	(105)	1B 2A 76 #...# 49	(69)
Foreground Color	Index Number	Ec*v#S	(s)	027 042 118 #...# 083	(115)	1B 2A 76 #...# 53	(73)
Gamma Correction	Gamma Number	Ec*t#I	(i)	027 042 116 #...# 073	(105)	1B 2A 74 #...# 49	(69)
Monochrome Print Mode	Mixed Rendering	Ec&b0M	(m)	027 038 062 048 077	(109)	1B 26 98 30 4D	(6D)
	Gray Equivalent	Ec&b1M	(m)	027 038 062 049 077	(109)	1B 26 98 31 4D	(6D)
Palette Control ID	Palette ID #	Ec&p#I	(i)	027 038 112 #...# 073	(105)	1B 26 70 #...# 49	(69)
Palette Control	Delete All Palettes in store	Ec&p0C	(c)	027 038 112 048 067	(99)	1B 26 70 30 43	(63)
	Delete All Palettes in stack	Ec&p1C	(c)	027 038 112 049 067	(99)	1B 26 70 31 43	(63)
	Delete Palette (last ID)	Ec&p2C	(c)	027 038 112 050 067	(99)	1B 26 70 32 43	(63)
	Copy Palette	Ec&p6C	(c)	027 038 112 054 067	(99)	1B 26 70 36 43	(63)
Push/Pop Palette	Push Palette	Ec*p0P	(p)	027 042 112 048 080	(112)	1B 2A 70 30 50	(70)
	Pop Palette	Ec*p1P	(p)	027 042 112 049 080	(112)	1B 2A 70 31 50	(70)
Render Algorithm	Continuous tone	Ec*t0J	(j)	027 042 116 048 074	(106)	1B 2A 74 30 4A	(6A)
	Snap Primaries	Ec*t1J	(j)	027 042 116 049 074	(106)	1B 2A 74 31 4A	(6A)
	Snap Black to White/Colors to Black	Ec*t2J	(j)	027 042 116 050 074	(106)	1B 2A 74 32 4A	(6A)
	Device Best	Ec*t3J	(j)	027 042 116 051 074	(106)	1B 2A 74 33 4A	(6A)
	Error Diffusion	Ec*t4J	(j)	027 042 116 052 074	(106)	1B 2A 74 34 4A	(6A)
	Device Best (Monochrome)	Ec*t5J	(j)	027 042 116 053 074	(106)	1B 2A 74 35 4A	(6A)
	Monochrome Error Diffusion	Ec*t6J	(j)	027 042 116 054 074	(106)	1B 2A 74 36 4A	(6A)
	Cluster Ordered dither	Ec*t7J	(j)	027 042 116 055 074	(106)	1B 2A 74 37 4A	(6A)
	Monochrome Cluster Dither	Ec*t8J	(j)	027 042 116 056 074	(106)	1B 2A 74 38 4A	(6A)
	(continued on next page)						

Table A-1. HP PCL 5 Printer Commands — PCL (continued)

FUNCTION	PARAMETER	COMMAND	DECIMAL VALUE	HEXADECIMAL VALUE
COLOR COMMANDS				
Render Algorithm	User-Defined dither	E_C*t9J *(j)*	027 042 116 057 074 *(106)*	1B 2A 74 30 4A *(6A)*
(continued)	Monochrome User-Defined Dither	E_C*t10J *(j)*	027 042 116 049 048 074 *(106)*	1B 2A 74 31 30 4A *(6A)*
	Ordered Dither	E_C*t11J *(j)*	027 042 116 049 049 074 *(106)*	1B 2A 74 31 31 4A *(6A)*
	Monochrome Ordered Dither	E_C*t12J *(j)*	027 042 116 049 050 074 *(106)*	1B 2A 74 31 32 4A *(6A)*
Select Palette	Palette ID #	E_C&p#S *(s)*	027 038 112 #...# 083 *(115)*	1B 26 70 #...# 53 *(73)*
Set Viewing Illumination	# of Bytes	E_C*i#W[Data]	027 042 105 #...# 087	1B 2A 69 #...# 57
Simple Color	3-Plane Device CMY Palette	E_C*r–3U *(u)*	027 042 114 045 051 085 *(117)*	1B 2A 72 2D 33 55 *(75)*
	1-Plane K Palette	E_C*r1U *(u)*	027 042 114 049 085 *(117)*	1B 2A 72 31 55 *(75)*
	3-Plane Device RGB Palette	E_C*r3U *(u)*	027 042 114 051 085 *(117)*	1B 2A 72 33 55 *(75)*

Table A-2. HP-GL/2 Context Printer Commands

COMMAND	MNEMONIC	PARAMETERS*
PALETTE EXTENSIONS		
Color Range	CR	[b_ref_red, w_ref_red, b_ref_grn, w_ref_grn, b_ref_blue, w_ref_blue];
Number of Pens	NP	[n];
Pen Color Assignment	PC	[pen [,red, green, blue]];
Transparency Mode	TR	0 - Off (opaque)
		1 - On (transparent)
Screened Vectors	SV	[screen_type[,shading[,index]]]
VECTOR GROUP		
Arc Absolute	AA	x_center,y_center,sweep_angle [,chord_angle];
Arc Relative	AR	x_increment,y_increment,sweep_angle [,chord_angle];
Absolute Arc Three Point	AT	x_inter,y_inter,x_end,y_end[,chord_angle];
Bezier Absolute	BZ	x1_control_pt, y1_control_pt
		x2_control_pt, y2_control_pt
		x3_control_pt, y3_control_pt ...
		[x1_control_pt, y1_control_pt
		x2_control_pt, y2_control_pt
		x3_control_pt, y3_control_pt];
Bezier Relative	BR	x1_control_pt_increments,
		y1_control_pt_increments,
		x2_control_pt_increments,
		y2_control_pt_increments,
		x3_control_pt_increments,
		y3_control_pt_increments ...
		[x1_control_pt_increments,
		y1_control_pt_increments,
		x2_control_pt_increments,
		y2_control_pt_increments,
		x3_control_pt_increments,
		y3_control_pt_increments];
Circle	CI	radius [,chord_angle];
Plot Absolute	PA	[x,y ... [,x,y]];
Plot Relative	PR	[x,y ... [,x,y]];
Pen Down	PD	[x,y ... [,x,y]];
Pen Up	PU	[x,y ... [,x,y]];
Relative Arc Three Point	RT	x_incr_inter,y_incr_inter,x_incr_end,y_incr_end[,chord_angle];
Polyline Encoded	PE	[flag[val]	coord_pair ... [flag[val]	coord_pair]];
*Parameters in brackets are optional.		

Table A-2.   HP-GL/2 Context Printer Commands (continued)

COMMAND	MNEMONIC	PARAMETERS*
POLYGON GROUP		
Fill Rectangle Absolute	RA	x_coordinate,y_coordinate;
Fill Rectangle Relative	RR	x_increment,y_increment;
Edge Rectangle Absolute	EA	x_coordinate,y_coordinate;
Edge Rectangle Relative	ER	x_increment,y_increment;
Fill Wedge	WG	radius,start_angle,sweep_angle[,chord_angle];
Edge Wedge	EW	radius,start_angle,sweep_angle[chord_angle];
Polygon Mode	PM	polygon_definition;
Fill Polygon	FP	0- Odd/Even 1 - non-zero winding
Edge Polygon	EP	None
*Parameters in brackets are optional.		

Table A-2. HP-GL/2 Context Printer Commands (continued)

FUNCTION	PARAMETER	COMMAND
CHARACTER GROUP		
Select Standard Font	SS	None
Select Alternate Font	SA	None
Absolute Direction	DI	[run,rise];
Relative Direction	DR	[run,rise];
Absolute Character Size	SI	[width,height];
Relative Character Size	SR	[width,height];
Character Slant	SL	[tangent_of_angle];
Extra Space	ES	[width[,height]]
Standard Font Definition	SD	[kind,value ... [,kind,value]];
Alternate Font Definition	AD	[kind,value ... [,kind,value]];
Character Fill Mode	CF	[fill_mode[,edge_pen]];
Label Origin	LO	[position];
Label	LB	[char ... [char]]1bterm
Define Label Terminator	DT	[1bterm[,mode]];
Character Plot	CP	[spaces,lines];
Transparent Data	TD	[mode];
Define Variable Text Path	DV	[path[,line]];
LINE AND FILL ATTRIBUTES GROUP		
Line Type	LT	[line_type[,pattern_length[,mode]]];
Line Attributes	LA	[kind,value ... [,kind,value]];
Pen Width	PW	[width[,pen]];
Pen Width Unit Selection	WU	[type];
Select Pen	SP	[pen]; *(required, 1 for black (recommended) or 0 for white)*
Symbol Mode	SM	[char];
Fill Type	FT	[fill_type[,option1[,option2]]];
Anchor Corner	AC	[x_coordinate,y_coordinate];
Raster Fill Definition	RF	[index[,width,height,pen_nbr ... pen_nbr]]; *(width and height must be less than 255)*
User Defined Line Type	UL	[index[,gap1 ... gapn]];
*Parameters in brackets are optional.		

Table A-2. HP-GL/2 Context Printer Commands (continued)

FUNCTION	PARAMETER	COMMAND
CONFIGURATION AND STATUS GROUP		
Advance Full Page	PG	[n];
Scale	SC	[x1,x2,y1,y2[,type[,left,bottom]]]; or [x1,xfactor,y1,yfactor,2];
Input Window	IW	[xLL,yLL,xUR,yUR];
Input P1 and P2	IP	[p1x,p1y[,p2x,p2y]];
Input Relative P1 And P2	IR	[p1x,p1y[,p2x,p2y]];
Default Values	DF	None
Initialize	IN	[n];
Replot	RP	[n];
Rotate Coordinate System	RO	[angle];
TECHNICAL GRAPHICS EXTENSION		
Begin Plot	BP	[kind, value...[,kind, value]];
Chord Tolerance Mode	CT	[mode];
Download Character	DL	[charnum [[,up], x, y...[,up],x,y]];
Frame Advance	FR	
Media Type	MT	[type];
Merge Control	MC	[mode [, opcod]];
Output Error	OE	
Output Hardclip Limits	OH	
Output Identification	OI	
Output P1 and P2	OP	
Output Status	OS	
Pixel Placement	PP	[mode];
Plot Size	PS	[length [,width]];
Quality Level	QL	[quality level]
*Parameters in brackets are optional.		

Table A-3.   Control Codes

Control Codes			
Function	**Symbol**	**Decimal Value**	**Description**
Backspace	B_S	8	Move one column left unless at left margin, in which case no action is taken.
Horizontal Tab	H_T	9	Move to the next horizontal tab stop. The tab stops are at the left margin, and every eight columns to the right of the left margin.
Line Feed	L_F	10	Move to the next print line while maintaining current column position.
Form Feed	F_F	12	Move to the first line at top of the next page while maintaining current column position.
Carriage Return	C_R	13	Move to the left margin on the current print line.
Shift Out	S_O	14	Select characters that follow from the current secondary font until receipt of a Shift In.
Shift In	S_I	15	Select characters that follow from the current primary font until receipt of a Shift Out.
Escape	E_C	27	Indicates the beginning of a special control sequence (escape sequence).
Space	S_P	32	Move one column to the right unless already at the right margin, in which case no action is taken.

B

Symbol Set and Typeface Codes

The symbol set IDs in Table C-1 are used to select symbol sets using PCL commands. Kind1 values are used to select symbol sets using HP-GL/2 commands. The values under Kind1 are also used in the Font Descriptor (header) symbol set field (bytes 14/15, described in Chapter 11, Font Creation of the *PCL 5 Printer Language Technical Reference Manual*). Table B-2 identifies the Typeface Family values for the various type foundries. Table B-3 identifies all the currently assigned typeface base values.

Note	The HP-GL/2 Kind1 value can be calculated from the symbol set ID. The Kind1 value is the same value used for the Symbol Set value field in the Font Header (refer to Chapter 11, Symbol Set of the *PCL 5 Printer Language Technical Reference Manual*). The Kind1 value is computed by taking the value of the value field for the symbol set, multiplying it by 32, adding the decimal (ASCII) value of the termination character (the symbol set ID character value) of the escape sequence, and subtracting 64.

Font Descriptor Symbol Set Value =

```
(Escape Sequence Value Field Value * 32)
+

(Decimal Value of Escape Sequence
 Termination Character - 64).
```

For example, to calculate the Kind1 value for the symbol set 19M (M = ASCII 77):

Symbol set 19M = (19*32) + (77 -64) = 621

Table B-1. Symbol Set Values

Symbol Set Name[1]	Symbol Set ID	Kind1 Value[2]	Symbol Set Name[1]	Symbol Set ID	Kind1 Value[2]
PS ITC Zapf Dingbats	10L	332	ISO 60: Danish/Norwegian	0D	4
ITC Zapf Dingbats Series 100	11L	364	Devanagari	2D	68
ITC Zapf Dingbats Series 200	12L	396	ISO 4: United Kingdom	1E	37
ITC Zapf Dingbats Series 300	13L	428	Windows 3.1 Latin 2	9E	293
Carta	20L	652	ISO 69: French	1F	38
Ornaments	21L	684	ISO 21: German	1G	39
Universal News & Commercial Pi	22L	716	Greek-8	8G	263
Chess	23L	748	Windows 3.1 Latin/Greek	9G	295
Astrology 1	24L	780	PC-851 Latin/Greek	10G	327
Pi Set #1	31L	1004	PC-8 Latin/Greek	12G	391
Pi Set #2	32L	1036	Hebrew-7	0H	8
Pi Set #3	33L	1068	ISO 8859/8 Latin/Hebrew	7H	232
Pi Set #4	34L	1100	Hebrew-8	8H	264
Pi Set #5	35L	1132	PC-862 Latin/Hebrew	15H	488
Pi Set #6	36L	1164	ISO 15: Italian	0I	9
Wingdings	579L	18540	Microsoft Publishing	6J	202
Math-7	0M	13	DeskTop	7J	234
Tech-7	1M	45	Document	8J	266
PS Math	5M	173	PC-1004	9J	298
Ventura Math[3]	6M	205	PS Text	10J	330
Math-8	8M	269	PS ISO Latin1	11J	362
Universal Greek & Math Pi	10M	333	MC Text	12J	394
TeX Math Extension	11M	365	Ventura International[3]	13J	426
TeX Math Symbol	12M	397	Ventura US[3]	14J	458
TeX Math Italic	13M	429	Swash Characters	16J	522
Symbol	19M	621	Small Caps & Old Style Figures	17J	554
ISO 8859/1 Latin 1	0N	14	Old Style Figures	18J	586
ISO 8859/2 Latin 2	2N	78	Fractions	19J	618
ISO 8859/3 Latin 3	3N	110	Lining Figures	21J	682
ISO 8859/4 Latin 4	4N	142	Small Caps and Lining Figures	22J	714
ISO 8859/9 Latin 5	5N	174	Alternate Caps	23J	746
ISO 8859/10 Latin 6	6N	206	Kana-8 (JIS 210)	8K	267
ISO 8859/5 Latin/Cyrillic	10N	334	Korean-8	9K	299
ISO 8859/6 Latin/Arabic	11N	366	Line Draw-7	0L	12
ISO 8859/7 Latin/Greek	12N	398	HP Block Characters	1L	44
OCR-A	0O	15	Tax Line Draw	2L	76
OCR-B	1O	47	Line Draw-8	8L	268
OCR-M	2O	79	Ventura ITC Zapf Dingbats[3]	9L	300

[1] Contact your local software vendor for information regarding additional symbol set support.
[2] This value is also used for the Encoded Symbol Set Designator field in the user-defined symbol set descriptor, and for the Symbol Set field in the font headers.
[3] Not recommended for future use. These symbol sets are of limited usage and are being discontinued.

Table B-1. Symbol Set Values - Continued

Symbol Set Name[1]	Symbol Set ID	Kind1 Value[2]	Symbol Set Name[1]	Symbol Set ID	Kind1 Value[2]
MICR (E13B)	10O	335	Windows 3.1 Latin 1	19U	629
Typewriter Paired APL	0P	16	PC-860 Portugal	20U	661
Bit Paired APL	1P	48	PC-861 Iceland	21U	693
Expert	10P	336	PC-863 Canada-French	23U	757
Alternate	11P	368	PC-865 Norway	25U	821
Fraktur	12P	400	Arabic-8	8V	278
Reserved for Specials	xQ	17+32x	Windows 3.1 Latin/Arabic	9V	310
Cyrillic ASCII (8859/5-1986)	0R	18	Code Page 864 Latin/Arabic	10V	342
Cyrillic	1R	50	3 of 9 Barcode	0Y	25
PC Cyrillic	3R	114	Industrial 2 of 5 Barcode	1Y	57
Windows 3.1 Latin/Cyrillic	9R	306	Matrix 2 of 5 Barcode	2Y	89
ISO 11: Swedish	0S	19	Interleaved 2 of 5 Barcode	4Y	153
ISO 17: Spanish[3]	2S	83	CODABAR Barcode	5Y	185
HP European Spanish	7S	243	MSI/Plessey Barcode	6Y	217
HP Latin Spanish	8S	275	Code 11 Barcode	7Y	249
HP-GL Download	16S	531	UPC/EAN Barcode	8Y	281
HP-GL Drafting	17S	563	MICR (CMC-7)	14Y	473
HP-GL Special Symbols	18S	595	USPS ZIP	15Y	505
Sonata	20S	659			
Thai-8	0T	20	**Obsolete Symbol Sets[3]**		
TISI 620-2533 (Thai)	1T	52	Math-7 (same as 0M)	0A	1
Windows 3.1 Latin 5	5T	180	Line Draw-7 (same as 0L)	0B	2
Turkish-8	8T	276	HP Large Characters	0C	3
PC-8 Turkish	9T	308	ISO 61: Norwegian Version 2	1D	36
Teletex	10T	340	Roman Extension	0E	5
ISO 6: ASCII	0U	21	ISO 25: French	0F	6
Legal	1U	53	HP German	0G	7
HPL	5U	181	ISO 14: JIS ASCII	0K	11
OEM-1	7U	245	ISO 13: Katakana	1K	43
Roman-8	8U	277	ISO 57: Chinese	2K	75
Windows 3.0 Latin 1	9U	309	HP Spanish	1S	51
PC-8, Code Page 437	10U	341	ISO 10: Swedish	3S	115
PC-8 D/N, Danish/Norwegian	11U	373	ISO 16: Portuguese	4S	147
PC-850, Multilingual	12U	405	ISO 84: Portuguese	5S	179
Pi Font	15U	501	ISO 85: Spanish	6S	211
PC-857	16U	533	ISO 2: International Reference	2U	85
PC-852, Latin 2	17U	565	Arabic (McKay's version)	0V	22

[1] Contact your local software vendor for information regarding additional symbol set support.
[2] This value is also used for the Encoded Symbol Set Designator field in the user-defined symbol set descriptor and for the Symbol Set field in the font headers.
[3] These symbol sets are becoming obsolete and are not recommended for future use. They are not present on the HP LaserJet 4, 4M, 4Si, 4SiMx, 4L, 4ML, 4P, 4MP, 4PJ, 4 Plus, 4M Plus, 4V, 4MV, Color LaserJet, and DeskJet 1200C printers.

B-4 Symbol Set and Typeface Codes

Table C-2 represents the typeface family values assigned to type foundries. This value, plus the typeface *base value* (see Table C-3), produces the numeric code needed to access the typeface.

Table B-1.   Typeface Family Values

Vendor Name	Typeface Vendor Value
AGFA	4096
Bitstream Inc.	8192
Linotype Company	12288
Monotype Corporation	16384
Adobe Systems	20480
Bigelow & Holmes	28672

Examples:

```
CG Times from Agfa = 5 + 4096 = 4101.

801 from Bitstream Inc. = 5 + 8192 = 8197

Univers from Agfa = 52 + 4096 = 4148.

Times New Roman from Monotype = 517 + 16384 = 16901
```

Table B-3. Typeface Base Values

Value	Typeface Family[1]	Value	Typeface Family[1]
0	Line Printer	39	Baskerville
2	Elite	41	Trade Gothic
3	Courier	41	Pemai (Thai)
4	Helvetica	41	CG Trade
5	Times Roman	42	Goudy Old Style
6	Letter Gothic	43	ITC Zapf Chancery
7	Script	44	Clarendon
8	Prestige	45	ITC Zapf Dingbats
9	Caslon 540 & No. 3	46	Cooper
9	Caslon Antique (contour)	47	ITC Bookman
9	Caslon Open Face (inline)	47	Noparat (Thai)
10	Orator	48	Stick
11	Presentation	49	HP-GL Drafting
13	Serifa	50	HP-GL Spline
14	Futura	51	Gill Sans
15	Palatino	51	Unesco (Thai)
16	ITC Souvenir	52	Univers
17	Optima	53	Bodoni
17	Safeer (Arabic)	53	Poster Bodoni (black)
17	Komain (Thai)	54	Rockwell
18	ITC Garamond	55	Melior
20	Coronet (italic)	56	ITC Tiffany
20	Chevalier (bold expanded patterned)	57	ITC Clearface
21	Broadway	58	Amelia
23	Century Schoolbook	59	Park Avenue (italic)
24	University Roman	59	Falstaff (black)
27	ITC Korinna	60	Handel Gothic
28	Naskh	61	Dom Casual
29	Cloister Black	62	ITC Benguiat
30	ITC Galliard	63	ITC Cheltenham
31	ITC Avant Garde Gothic	64	Century Expanded
31	Tom (Thai)	65	Franklin Gothic
32	Brush (italic)	65	Paetai (Thai)
32	Stop	68	Plantin
33	Blippo (black)	69	Trump Mediaeval
33	Tea Chest (condensed)	70	Futura Black
34	Hobo	71	ITC American Typewriter
35	Windsor	72	Antique Olive
38	Peignot	73	Uncial

[1]These typeface names may be registered trademarks of a third party. Use of these fonts may be conditional upon a license grant from the owners of the fonts. Hewlett-Packard makes no representation as to the quality or performance of the fonts, and any reference to the fonts does not grant any license or right to use the fonts.

B-6 Symbol Set and Typeface Codes

Value	Typeface Family[1]	Value	Typeface Family[1]
74	ITC Bauhaus	111	Akzidenz-Grotesk
75	Century Old Style	112	Black White (patterned, outline, inline)
76	ITC Eras	112	Logos
77	Friz Quadrata (ITC)	113	Shannon
78	ITC Lubalin Graph	114	ITC Stone Informal
79	Eurostile	115	ITC Stone Sans
79	Intanon (Thai)	116	ITC Stone Serif
80	Mincho (Japanese)	117	Schneidler Mediaeval
80	Myoungjo (Korean)	118	ITC Symbol
81	ITC Serif Gothic	119	ITC Weidemann
81	Saemmul (Korea)	120	Copperplate Gothic (display)
81	Sammul (Korea)	121	Trajan
82	Snell Roundhand	122	Concorde
82	Pilgy (Korean)	123	Janson Text
83	Souvenir Gothic	124	Linotype Centennial
84	Stymie	125	Life
87	Bernhard Modern	126	Minister
89	Excelsior	127	New Century Schoolbook
90	Gando Ronde Script	152	Maru Gosikku (round gothic Japan)
91	Ondine	153	Gosikku (Kaku, gothic Japan)
91	EACT (Thai)	153	Gothic (Japan)
92	P.T.Barnum	154	Socho
93	Kaufmann	155	Kyokasho (text book)
93	U-Thong (Thai)	156	Kaisho
94	ITC Bolt (extended)	157	Traditional Arabic Script
94	ITC Machine (condensed)	158	Arabic News
97	Revue	159	Post Antiqua
101	Garamond (Stempel)	160	Aerospace Pi
102	Garth Graphic	160	Devanagari (Hindi)
103	ITC Ronda	161	Maritime Pi
104	OCR-A	161	Krishna (Gujarati)
105	Cochin	162	Bits Pic Pi
106	Englische Schreibschrift (italic)	162	Ranjit (Gurmukhi)
106	Mister Earl (condensed)	163	Keycap Pi
107	Flash (italic)	163	Raj Raja (Tamil)
107	Woodstock	164	Tieman
108	Gothic (numbered)	164	Gyosho
109	Stencil (ATF)	165	David
110	OCR-B	166	Nork

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Table B-3. Typeface Base Values - Continued

Value	Typeface Family[1]	Value	Typeface Family[1]
167	Ousbouh	201	Marigold
168	Koufi	202	ITC Tiepolo
169	Italia (ITC)	203	Versailles
169	Hadassah	204	ITC Leawood
170	Bembo	205	ITC Caslon No. 224
170	Sharif	206	ITC Cushing
171	Aachen	207	ITC Fenice
171	Malik	208	ITC Usherwood
172	Americana	209	ITC Benguiat Gothic
173	Arnold Boecklin	210	Spartan
174	Copperplate Gothic (text)	210	ITC Ozwald (fatface)
175	Belwe	211	Neuzeit Grotesk
176	ITC Berkeley Oldstyle	212	PMN Caecilia
177	Frutiger	213	ITC Busorama
178	Candida	214	Agfa Wile Roman
179	Folio	215	ITC Zapf International
180	Corona	216	Poppl-Pontifex
181	ITC Kabel	217	ITC Quay Sans
181	Zeppelin (inline)	218	Arial
182	Garamond No .3	219	Fairfield
183	Sabon	220	ITC Zapf Book
184	ITC Novarese	221	Lucida Casual
185	Weiss	221	Linotype Technical Pi 1 & 2
186	Hiroshige	222	Graphite
187	French Script	222	Linotype Textil Pi 1 & 2
188	Meridien	223	Poetica
189	Mistral	223	Century Schoolbook Monospace
190	Aster	224	Berliner Grotesk
191	Caledonia	225	Christiana
192	Nuptial Script	226	Comenius-Antiqua
193	Lucida	227	Delta
194	Song (China)	228	Italian Old Style
194	Adobe Wood Series 1	229	Zingo
195	Memphis	230	Octavian
196	Lucida Sans	230	Borders & Ornaments 1
197	Syntax	231	Footlight
198	Utopia	231	Borders & Ornaments 4
199	Berthold Walbaum Buch	232	Apollo
200	Minion	232	Borders & Ornaments 5

B-8 Symbol Set and Typeface Codes

Table B-3. Typeface Base Values - Continued

Value	Typeface Family[1]	Value	Typeface Family[1]
233	Bremen	258	Joanna
233	Borders & Ornaments 6	259	Onyx
234	Oranda	260	Cyrillic Helvetica
234	Communication 1	260	Greek Helvetica
235	Nubian	260	East Asian Helvetica
235	Communication 2	261	Cyrillic Times
236	Cataneo	261	Greek Times
236	Communication 3	261	East Asian Times
237	Wittenberger Fraktur	262	ITC Quorum
237	Communication 6	263	Engravers' Old English
238	Modern	264	Kennerley
238	PL Modern	265	Adobe Caslon
238	Games & Sports 1	266	Albertus
239	Artistik	267	New Aurora Grotesque
239	Games & Sports 2	268	TBG Omnia
240	Flintstones	269	Glypha
240	Games & Sports 3	270	Tempo
241	SnowCap	270	Umbra (open shadow)
241	Games & Sports 4	271	American Text
242	Bedrock	272	Pasquale
242	Holidays 1	273	ITC Elan
243	Star Fleet	274	Monotype Goudy Sans
243	Industry & Engineering 1	275	Lutheresche Fraktur
244	Star Trek Film	275	Universal News & Commercial Pi
244	Industry & Engineering 2	276	Thunderbird (extra condensed)
245	Star Trek	276	ITC Honda (black)
245	Transportation 1	277	Shelley
246	Star Trek Pi	277	Mr. Big
246	Transportation 2	278	Macbeth
247	ITC Mendoza	278	Universal Greek & Math Pi
248	Boton	279	ITC Century
249	Jaeger Daily News	280	Vineta
250	ITC Officina Serif	281	TBG Duc de Berry
251	ITC Officina Sans	282	Times Europa
252	Goudy Modern	283	ITC Jamille
253	Scotch Roman	284	Flyer
254	Temporary-Only Font	285	Wedding Text
256	Bar Codes	286	Carolina
257	Hadriano	287	Avenir

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Table B-3. Typeface Base Values - Continued

Value	Typeface Family[1]	Value	Typeface Family[1]
288	Lucia	323	Baker Signet
289	Tekton	324	Mythos
290	Charme	324	Gambling Pi
291	ITC Flora	325	San Marco
292	Basilica	326	Typo Roman
293	Auriol	327	Engravers Text (inline)
294	Kuenstler Script	327	New Berolina (italic)
295	ITC New Baskerville	328	Orbit-B
296	Berling	329	McCollough
297	News Gothic	330	ITC Isadora
298	Critter	331	Giddyup
298	Linotype Holiday Pi 1, 2, & 3	331	Audio Pi
299	Medici Script	332	Letraset Crillee
300	Aurora	333	Agfa Nadianne
301	Carta	334	Compliment
302	Adobe Symbol	335	ITC Giovanni
303	Insignia	336	Neuzeit S
304	Perpetua	337	Erbar
305	Raleigh	338	Parisian
306	Romic	339	Nofret
307	Formata	340	City
308	Cyrillic Univers	341	Old Style 7
308	Chuan Pim (like Univers)	342	Bell Centennial
308	Narkis Tam (like Univers)	343	Lydian
309	Bauer Bodoni	344	Monotype Ellington
310	Industria	345	Impressum
311	Cutout	346	Reporter No. 2
311	Decoration Pi	347	Freestyle Script
312	Letraset Bramley	348	Serpentine
313	Isabella	349	Lithos
314	Cascade Script	350	Basilia
315	VAG Rounded	351	Simplified Arabic
316	Russell Square	352	Maximus
317	Liberty	353	ITC Slimbach
318	ITC Esprit	357	Berthold Garamond
319	Clairvaux	358	Rad
320	Raphael	358	Land Pi
321	ITC Franklin Gothic	359	Oxford (italic)
322	Murray Hill	359	Kino (bold condensed)

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B-10 Symbol Set and Typeface Codes

Table B-3. Typeface Base Values - Continued

Value	Typeface Family[1]	Value	Typeface Family[1]
360	Looney Tunes	391	ITC Newtext
360	E13B MICR	392	Happening
361	Imperial	393	Menue
361	CMC-7 MICR	394	Doric
362	Charlemagne	395	S'maragd
363	Present Script	396	Pierrot
364	Repro Script (italic)	396	Ornaments
364	Matura (bold)	397	Berthold Bodoni Old Face
365	Baskerville No. 2	398	Schadow
366	Engravers' Roman	399	Akzidens Grotesk Buch
367	VGC Egyptian 505	400	Akzidens Grotesk Buch Stencil
368	TBG Herculanum	401	Akzidens Grotesk Buch Schulbuch
369	Clearface Gothic	402	Bookman
370	Studz	403	Bruce Old Style
370	Border Pi 1515-9	404	Bulmer
371	Toolbox	405	Madison
371	Bundesbahn Pi	406	Textype
372	Quake	407	Primer
372	Chemical Pi	408	Garamond (Simoncini)
373	Neuland	409	Adobe Wood Series 2
373	Warning Pi	410	Rotis Serif
374	Harry	410	Caravan LH One
375	Alternate Gothic (numbered)	411	Rotis Semiserif
376	Figaro	411	Caravan LH Two
377	Formal Script	412	Rotis Sans Serif
378	Holland Title	412	Caravan LH Three
379	ITC Barcelona	413	Rotis Semisans
380	Cartier	413	Caravan LH Four
381	Deepdene	414	Arcadia
382	Delphin	415	ITC Veljovik
383	Parsons	416	Armenian Aramian
384	Brighton	417	Armenian Barz
385	Berthold Barmeno	418	Helvetica Rounded
386	Berthold Colossalis	419	Olympian
387	Berthold Cosmos	420	DIN Engschrift (condensed)
388	ITC Isbell	420	DIN Mittelschrift
389	ITC Mixage	421	Granjon
390	Sonata	422	Guardi
390	Badr, or Bayaan II	423	Impact

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Table B-3. Typeface Base Values - Continued

Value	Typeface Family[1]	Value	Typeface Family[1]
424	Sassoon Primary	456	Huxley Vertical
425	Packard	457	Grayda
426	Baskerville Book	458	Penfield No. 3
427	ITC Pacella	459	Michelangelo
428	Rusticana	460	Neo Didot
429	Eccentric	461	Berthold Caslon Buch
430	Embassy	462	Sans No. 1
431	PL Latin Bold	463	Torino
431	PL Latin Elongated (condensed)	464	Photina
431	Latin Antique	465	Calligraphiques
431	Latin Wide (extended)	466	Concorde Nova
432	ITC Modern 216	467	Franco
433	Serlio	468	Goudy Text
434	Piranesi	469	Balloon (italic)
435	Imago	470	Eusebius
436	Wilke	470	Eusebius Open (inline)
438	Adobe Garamond	471	Digital
439	Seagull	471	Noris Script (italic)
440	Latin MT	472	Poppl-Pontifex (B.metrics)
441	Runic MT	473	Amigo
442	Moore Computer	473	Pelican (italic)
443	Commercial Script	473	Visigoth (bold italic)
444	Dominante	474	Letraset Arta
445	Wilhelm Klingspor Gotisch	475	Post Mediaval
446	Trajanus	476	Adsans
447	TSI Caxton	477	Ariadne
447	Letraset Caxton	478	Calligraphy
448	Fette Fraktur	479	Didot
448	Sapphire (pattern 0)	480	Ashley Script (italic)
448	Saphir (pattern 0)	480	Ashley Crawford (bold)
449	Rainbow Bass (pattern 0)	480	Ashley Inline (inline)
449	European Pi	481	Catull
450	Banco	482	Cremona
451	Bodoni Antiqua	483	Audrey No. 2
452	Sallwey Script	484	Lo-Type
452	Mathematical Pi	485	Madame (patterned with shadow)
453	Congress	486	Roundy
454	Cheq	486	Animals
455	Berthold Walbaum Buch (B.metrics)	487	Ruling Script

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B-12 Symbol Set and Typeface Codes

Table B-3. Typeface Base Values - Continued

Value	Typeface Family[1]	Value	Typeface Family[1]
487	Business & Services 1	517	Times (Ten, New, etc.)
488	Sho	518	Berthold Script
488	Business & Services 2	519	Bernhard Tango (italic)
489	Wiesbaden Swing	520	Castellar (inline)
489	Commercial 1	521	Else
490	Star Trek Next	522	Basque (condensed)
490	Commercial 2	522	Palace Script (italic)
491	ITC Highlander	523	Centaur
491	Ecology	524	Fine Hand
492	General Symbols 1	525	Linotype Astrology Pi
493	General Symbols 2	526	Sackers Roman
494	Medical & Pharmaceutical 1	527	Kompact (ultra black italic)
495	Space	527	Monoline Script (italic)
495	Musical	528	Othello (bold condensed)
496	Special Alphabets 4	529	Sackers Classic Roman
497	Special Alphabets 5	529	Sackers Italian Script (italic)
498	Special Alphabets 6	530	Musketeer
499	Inflex	530	Riviera (inline)
500	Monotype Old Style	531	Poppl-Residenz
501	Ming	532	Rotation
502	FangSong	533	Bank Gothic
503	Helinda Rook	534	Delphian (inline)
504	Original Script	534	Greeting Monotone
505	Citadel Script	535	Sackers Antique Roman
506	Old Fashion Script	536	Schwabacher
507	ITC Legacy Serif	537	Egyptienne (condensed)
508	ITC Legacy Sans	538	Artisan Roman (inline)
509	Athenaeum	538	Forte (bold italic)
509	Athenaeum Negative (pattern 0)	539	Burin Roman
509	Athenaeum Positive (pattern 1)	539	Burin Sans (light)
510	ITC Anna (condensed)	540	Hellenic Wide (extended)
510	ITC Beesknees (black)	541	Thompson Quillscript
511	ITC Studio Script (italic)	542	Kartoon
511	ITC Mona Lisa Recut (inline)	543	Classic Roman
511	ITC Mona Lisa Solid (upright)	544	AG Old Face
512	Sackers Square Gothic	545	Lucian
512	Sackers English Script	546	Della Robbia
513	Heritage	547	Libra
514	Sackers Gothic	548	Brody (bold upright)

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Table B-3. Typeface Base Values - Continued

Value	Typeface Family[1]	Value	Typeface Family[1]
549	Ad Lib (bold)	585	London Text (inline)
550	Choc (black)	585	Profil (bold italic inline)
551	Handle Oldstyle	586	Imprint
552	Roman	587	Allegro (bold italic)
553	Antique Roman	587	Engraver's Gothic (text)
554	Goudy Catalogue, addt'l Old Style faces	588	Bernhard (bold condensed)
554	Goudy Handtooled (inline)	588	Eckmann (text)
554	Goudy Heavyface (black)	589	Cloister Open Face (outline)
555	Calligrapher	589	Davida (text)
556	Lucida Bright	589	Klang (italic)
557	Pi Collection	590	Fry's Baskerville
558	Broadpen	591	Metro
559	Amazone	592	Mandate
560	Frank Ruehl	593	Star Trek Gen
561	Cloe	594	Virile
562	Discus	595	Bingham Script (text)
563	Myriad	595	Block (bold)
565	WTC Our Bodoni	596	ITC Gorilla (text)
566	Ideal Schreibschrift	596	ITC Pioneer (outline shadow)
567	Print	597	Ruzicka
568	Lucida Blackletter	598	Bodoni Campanile
569	Lucida Calligraphy	599	Linotype Modern
570	Data 70	600	Monterey Script (italic)
571	Compacta (expanded)	600	Playbill (condensed)
571	Helvetica Inserat (condensed)	601	Normande
572	Lucida Handwriting	602	Wave
572	Milestones	603	Bernhard Fashion (extra light)
573	Biffo	603	Mercurius
574	Calvert	604	Stuyvesant (inline)
575	Cantoria	605	Impuls (italic)
576	Dorchester Script	605	Romana (text & bold)
577	Grotesque	606	Shotgun
578	Pepita	607	Ehrhardt
579	Vectora	608	ITC Grizzly
580	Script Bold	609	ITC Grouch
581	Spectrum	610	ITC Tom's New Roman
582	Boulevard	611	Palette (italic)
583	Cheltenham	611	Hanseatic (ultrabold condensed)
584	De Vinne	612	Bison

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B-14 Symbol Set and Typeface Codes

Value	Typeface Family[1]	Value	Typeface Family[1]
613	Jefferson	645	Skjald
614	Electra	646	Bell Gothic
615	Antique No. 3	647	Gillies Gothic Bold (italic)
616	Flemish Script (italic)	648	Quaint Roman
617	Hallmark Bodoni	648	Chic (inline)
618	Modern #20	649	PL Westerveldt Light (condensed)
619	Westinghouse Gothic	650	PL Davison Americana
620	Bloc (outline)	651	TC Jasper
620	Empire (ultra condensed)	652	Poppl-Laudatio
621	Oscar	653	TC Europa Bold
622	Eagle Bold	654	Siena Black (italic)
622	Joanna Solotype (inline)	655	Yearbook
623	Akzidenz-Grotesk (B.metrics)	656	Koloss (extra bold)
624	Koch Antiqua	657	Phenix American (extra condensed)
625	Mirarae	658	PL Bernhardt
626	Horley Old Style	659	Orlando Caps
627	Tango	659	PL Barclay Outline (outline)
628	Pifont Circle Numbers	660	PL Britannia Bold
629	Pifont OCRA Numbers	661	PL Fiorello Condensed
630	Pifont Square Numbers	662	Fluidum Bold (italic)
631	Pifont Triangle Numbers	663	Woodblock (bold)
632	Bank Script (italic)	663	Sinaloa (pattern 0)
633	Serlio Dekoration (pi numbers)	664	Stratford Extra Bold
634	Concorde (B.metrics)	664	Matra (pattern 0)
635	Jets	665	PL Tower Condensed
636	Jetsons	666	Section Bold Condensed
637	Looney Type	667	Miehle Condensed
638	Pompeijana	668	Phyllis
639	Rusticana (Frutiger)	669	Modernique (extra bold)
640	Notre Dame	670	Egyptienne F
641	Beverly Hills (inline)	671	Post Antiqua (B.metrics)
641	Lotus (pattern 0)	672	Diotima
642	Advertisers Gothic Light	673	Aldus
642	Eclipse (pattern 0)	674	Chaplin (italic)
643	Capone Light	675	Uncle Sam Stars (pattern 0, shadow)
643	Victorian Silhouette (contour)	675	Uncle Sam Stripes (pattern 1, shadow)
644	Dynamo (extra bold)	676	Wildstyle
644	Modernistic (inline)	677	Logan (pattern 0)
645	Gallia (inline)	677	Eon Age (pattern 1)

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Table B-3. Typeface Base Values - Continued

Value	Typeface Family[1]	Value	Typeface Family[1]
677	System X3 (pattern 2)	714	Mahlau (condensed)
677	Galaxy Run (pattern 3)	715	Aquarias No. 8 (bold)
678	Jukebox (bold condensed)	716	CG Frontiera
679	Marking Numbers Squares	717	Globe Gothic
679	Al Harf Al Jadid	718	Signature
680	Vivaldi	719	Sans Serif Stencil
681	Codex	725	Hess Neobold
682	Metronome Gothic (bold extra condensed)	726	Hollandse Mediaeval
683	Salut (bold)	727	Holland Seminar
684	Lucida Fax	728	CG Cloister
685	Bellevue	729	Adroit
686	Architect	730	Claire News
687	Beton Extra Bold	731	Triplett
688	Metropolis (extra bold)	732	Accolade
689	PL Davison Zip Bold	733	Claridge
690	Neon (Nebiolo)	734	Alpin Gothic
691	PL Benguiat Frisky	735	Geometric
692	PL Bartuska Trophy Oblique	736	Heldustry
693	Cable	737	Busorama
694	PL Brazilia	738	Salto
695	PL Radiant	739	Fehrle Display
696	Ritmo Bold (italic)	740	Kismet
697	PL Fiedler Gothic Bold	741	Digi Fraktur
698	Egiziano Black	742	Anglia
699	Studio	743	Jiffy
700	PL Futura Maxi	744	Rosewood
701	Solemnis	745	Zebrawood
702	Quirinus Bold (condensed)	746	Pepperwood (condensed)
703	PL West Behemoth Semi Cd. (XBd Cd)	747	Copal (solid)
704	Renault	747	Copal (outline, patterned)
705	Forbes Bold	748	Motter Corpus (extrabold)
706	Mobil	930	Akzidenz Grotesk Buch Rounded
707	Becket	1030	Isil Gothic
708	Lucida Sans Typewriter	2730	Wingdings
709	Cartoon Script Roman		
710	Campanula		
711	Odilia		
712	Lino Letter		
713	Henche		

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B-16 Symbol Set and Typeface Codes

Index