PCL 5 Comparison Guide

for the

HP LaserJet III

HP LaserJet IIID

HP LaserJet IIISi

HP LaserJet IIIP

HP LaserJet 4 Family

HP LaserJet 4000 series

HP Color LaserJet

HP Color LaserJet 5/5M

HP LaserJet 5 Family

HP LaserJet 6 Family

HP DeskJet 1200C

HP DeskJet 1600C

Printers

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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 Ø is used in some examples and escape sequences to distinguish the letter "**O**" from the number "**0**".
- 0x XX represents a hexadecimal number (XX).
- The ↩ character indicates that the current line of code is a continuation of the previous line.

Note Notes contain important information set off from the text.

Contents

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Printer Features

Introduction

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 guide covers the following HP LaserJet 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
DeskJet 1200C	May 1993
DeskJet 1200/PS	May 1993
Color LaserJet	September 1994
LaserJet 4LC	March 1995
DeskJet 1600C	March 1995
LaserJet 4LJ Pro	May 1995
LaserJet 5P, 5MP	May 1995
LaserJet 5L	September 1995
LaserJet 5Si, 5SiMx	November 1995
Color LaserJet 5, 5M	March 1996
LaserJet 5, 5M	April 1996
LaserJet 5Si Mopier	October 1996
LaserJet 6P, 6MP	October 1996
LaserJet 6L	September 1997
LaserJet 4000 series	November 1997

This guide also covers the HP 1200C and 1600C DeskJet printers.

PCL Feature Support

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 in Chapter 2.

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

Notes

- 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.

PCL 5 Technical Reference Manual Corrections

This section describes updates to the *PCL 5 Printer Language Technical Reference Manual* (5961-0509). Because this manual will not be updated, any changes to it are documented in this guide. Some errors have been identified in the *PCL 5 Printer Language Technical Reference Manual* since its printing. Those errors are identified and corrections are provided on this page.

Chapter 4 PCL Job Control Commands

Unit of Measure Command

In Figure 4-6 on page 4-18, the two escape sequences at the top should read "(Ec&u100D) and (Ec&u200D)" instead of "(Ec&u100B) and (Ec&u200B)."

Chapter 8 PCL Font Selection

Transparent Print Data Command

The last sentence in the note at the bottom of page 8-33 should read "Refer to the PCL 5 Comparison Guide, Appendix A, for character codes for the various symbol sets." instead of "Refer to Appendix A for character codes for the various symbol sets."

Chapter 13 The PCL Print Model

User-Defined Pattern Command

In Figure 13-10 on page 13-19, byte zero should read Format (20) instead of Format (0)

On page 13-21, Format (Byte 0) should read "0" for a 300 DPI user-defined pattern header and "20" for a resolution-specified user-defined pattern header.

Table 1-1. PCL 5 Feature Support Matrix

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

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

[1] Supported if duplex option is installed.

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

FUNCTION	COMMAND	Color LJ	Color LJ 5, 5M	4LJ Pro	4LC	5L 6L	5P 5MP	6P 6MP	5Si 5SiMx Mopier	5 5M	4000 series	Desk-Jet 1200C	Desk-Jet 1600C
MISCELLANEOUS													
Configuration (AppleTalk)	Ec&b#W[data]	✓	✓	✓	ns	ns	✓	✓	✓	✓	✓	✓	✓
JOB CONTROL													
Universal Exit/Start of PJL (UEL)	Ec%–12345X	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Reset	EcE	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Number of Copies	Ec&ℓ#X	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Simplex/Duplex Print	Ec&ℓ#S	ns	ns	ns	ns	ns	ns	ns	✓	✓	✓	ns	ns
Left (Long-Edge) Offset Registration	Ec&ℓ#U	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Top (Short-Edge) Offset Registration	Ec&ℓ#Z	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Unit Of Measure	Ec&u#D	ns	ns	✓	✓	✓	✓	✓	✓	✓	✓	ns	✓
Mechanical Print Quality	Ec*o#Q	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	✓	✓
Media Type	Ec&ℓ#M	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	✓	✓
Negative Motion	Ec&a#N	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	✓	✓

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

Table 1-1. PCL 5 Feature Support Matrix (continued)

FUNCTION	COMMAND	III	IIID	IIISi	IIIP	4 4M	4Si 4SiMx	4L	4ML 4P 4MP	4PJ	4 Plus 4M Plus	4V 4MV
PAGE CONTROL												
Page (Job) Size	Esc&ℓ#A											
Executive (1)		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Letter (2)		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Legal (3)		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Ledger (6)		ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	✓
A5 (25)		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	✓
JIS B5 Paper (45)		ns	ns	ns	ns	ns	ns	ns	ns	✓	ns	✓
JIS B4 Paper (46)		ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	✓
Monarch Envelope (80)		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Comm. 10 Envelope (81)		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Intl. DL Envelope (90)		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Intl. C5 Envelope (91)		✓	✓	ns	✓	✓	ns	✓	✓	✓	✓	✓
Intl. B5 Envelope (100)		ns	ns	ns	ns	✓	✓	✓	✓	✓	✓	✓
Custom (101)		ns	ns	ns	ns	ns	ns	ns	✓	✓	ns	✓[2]
Hagaki Postcard (71)		ns	ns	ns	ns	ns	ns	ns	ns	✓	ns	✓
Oufuku-Hagaki Postcard (72)		ns	ns	ns	ns	ns	ns	ns	ns	✓	ns	✓
Orientation	Esc&ℓ#O	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Page Side Selection[1]	Esc&a#G	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Job Separation	Esc&ℓ1T	ns	ns	✓	ns	ns	ns	ns	ns	ns	ns	ns

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

[1] On non-duplex printers, this command causes a conditional page eject.

[2] The custom size is 11.7" x 17.7" on the HP LaserJet 4V/4MV printers.

Table 1-1. PCL 5 Feature Support Matrix (continued)

FUNCTION	COMMAND	Color LJ	Color LJ 5, 5M	4LJ Pro	4LC	5L 6L	5P 5MP	6P 6MP	5Si 5SiMx Mopier	5 5M	4000 series	Desk-Jet 1200C	Desk-Jet 1600C
PAGE CONTROL													
Page (Job) Size	Ec&ℓ#A												
Executive (1)		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	ns	ns
Letter (2)		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Legal (3)		✓	✓[1]	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Ledger (6)		✓[4]	✓[1]	ns	ns	ns	ns	ns	✓	ns	ns	ns	ns
A5 (25)		ns	ns	ns	ns	ns	ns	✓	ns	✓	✓	ns	ns
A4 (26)		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
A3 (27)		✓	✓[1]	ns	ns	ns	ns	ns	✓	ns	ns	ns	ns
JIS B5 Paper (45)		ns	ns	✓	✓	ns	ns	✓	✓	✓	✓	ns	ns
JIS B4 Paper (46)		ns	ns	ns	ns	ns	ns	✓	✓	✓	ns	ns	ns
Monarch Envelope (80)		ns	ns	✓	✓	✓	✓	✓	✓	✓	✓	ns	ns
Com-10 Envelope (81)		ns	ns	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Intl. DL Envelope (90)		ns	ns	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Intl. C5 Envelope (91)		ns	ns	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Intl. B5 Envelope (100)		ns	ns	✓	✓	✓	✓	✓	✓	✓	✓	ns	ns
Custom (101)		ns	ns	✓	✓	ns[2]	✓	✓	✓[3]	✓	✓[5]	ns	ns
Hagaki Postcard (71)		ns	ns	✓	✓	ns	ns	ns	ns	ns	ns	ns	ns
Oufuku-Hagaki Postcard (72)		ns	ns	✓	✓	ns	ns	✓	ns	✓	ns	ns	ns
Orientation	Ec&ℓ#O	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Page Side Selection[4]	Ec&a#G	ns	ns	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Job Separation	Ec&ℓ1T	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns

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

[1] Black & White only

[2] For the HP LaserJet 5L printer, the printer driver sets the paper size to legal (3) when “custom” is selected.

[3] The custom size is 11.7" x 17.7" on HP LaserJet 5Si, 5SiMx, and 5Si Mopier printers.

[4] On non-duplex printers, this command causes a conditional page eject.

[5] For the LaserJet 4000 series printers, the custom size is configurable via the control panel or PML.

Table 1-1. PCL 5 Feature Support Matrix (continued)

FUNCTION	COMMAND	III	IIID	IIISi	IIIP	4 4M	4Si 4SiMx	4L	4ML 4P 4MP	4PJ	4 Plus 4M Plus	4V 4MV
PAGE CONTROL (continued)												
Paper (Media) Source	Ec&*l*#H											
Eject Page (0)		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Main (Front) Paper Source (1)		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Manual (Top/Rear) Feed (2)		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Manual Env. Feed (3)		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Alt. Paper Source (4)		ns	✓	✓	✓	✓	✓	ns	ns	ns	✓	✓
Opt. Large Source (5)		ns	ns	ns	ns	✓	✓	ns	ns	ns	✓	✓
Envelope Feeder (6)		ns	✓	✓	ns	✓	✓	ns	ns	ns	✓	ns
Auto Select (7)		ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
Tray 1 (right side) (8)		ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
HCI Trays 2-21 (20-39)		ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
Output (Media) Bin	Ec&*l*#G											
Automatic (0)		ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
Destination Tray 1 (1)		ns	ns	✓	ns	ns	✓	ns	ns	ns	ns	ns
Destination Tray 2 (2)		ns	ns	✓	ns	ns	✓	ns	ns	ns	ns	ns
Destination Tray 3 (3)		ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
Print Direction	Ec&a#P	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Character Text Path Dir.	Ec&c#T	ns	ns	ns	ns	ns	ns	ns	ns	✓	ns	✓
Left Margin	Ec&a#L	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Right Margin	Ec&a#M	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Clear Horizontal Margins	Ec9	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Top Margin	Ec&*l*#E	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Text Length	Ec&*l*#F	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Perforation Skip	Ec&*l*#L	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Horizontal Motion Index	Ec&k#H	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Vertical Motion Index	Ec&*l*#C	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Line Spacing	Ec&*l*#D	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
ALPHANUMERIC ID (Media selection by type/PCL mass storage command)												
Alphanumeric ID	Ec&n#W[operation] [string]	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns

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

Table 1-1. PCL 5 Feature Support Matrix (continued)

FUNCTION	COMMAND	Color LJ	Color LJ 5, 5M	4LJ Pro	4LC	5L 6L	5P 5MP	6P 6MP	5Si 5SiMx Mopier	5 5M	4000 series	Desk-Jet 1200C	Desk-Jet 1600C
PAGE CONTROL (continued)													
Paper (Media) Source	Ec&ℓ#H												
Eject Page (0)		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Main (Front) Paper Source (1)		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Manual (Top/Rear) Feed (2)		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Manual Env. Feed (3)		ns	ns	✓	✓	✓	✓	✓	✓	✓	✓	ns	ns
Alt. Paper Source (4)		✓	✓	ns	ns	ns	✓	✓	✓	✓	✓	ns	ns
Optional Source (5)		✓	✓	ns	ns	ns	ns	ns	✓	✓	✓	✓	ns
Envelope Feeder (6)		ns	ns	ns	ns	ns	ns	ns	✓	✓	✓	ns	ns
Auto Select (7)		ns	ns	ns	ns	ns	ns	ns	✓	✓	✓	ns	✓
Tray 1 (right side) (8)		ns	ns	ns	ns	ns	ns	ns	✓	ns	ns	ns	ns
HCI Trays 2-21 (20-39)		ns	ns	ns	ns	ns	ns	ns	✓	ns	✓[1]	ns	ns
Output (Media) Bin	Ec&ℓ#G												
Automatic (0)		ns	✓	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
Destination Tray 1 (1)		✓	✓	ns	ns	ns	ns	ns	✓	✓	✓	ns	ns
Destination Tray 2		✓	✓	ns	ns	ns	ns	ns	✓	✓	✓	ns	ns
Destination Tray 3		ns	ns	ns	ns	ns	ns	ns	✓	ns	ns	ns	ns
Print Direction	Ec&a#P	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Character Text Path Dir.	Ec&c#T	ns	ns	✓	✓	ns	✓	✓	✓	✓	✓	ns	ns
Left Margin	Ec&a#L	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Right Margin	Ec&a#M	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Clear Horizontal Margins	Ec9	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Top Margin	Ec&ℓ#E	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Text Length	Ec&ℓ#F	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Perforation Skip	Ec&ℓ#L	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Horizontal Motion Index	Ec&k#H	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Vertical Motion Index	Ec&ℓ#C	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Line Spacing	Ec&ℓ#D	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
ALPHANUMERIC ID (Media selection by type/PCL mass storage command)													
Alphanumeric ID	Ec&n#W[operation] [string]	ns	ns	ns	ns	ns	ns	ns	✓	✓	✓	ns	ns

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

[1] The LaserJet 4000 series printers support HCI trays 2– 41 (20 – 59)

Table 1-1. PCL 5 Feature Support Matrix (continued)

FUNCTION	COMMAND	III	IIID	IIISi	IIIP	4 4M	4Si 4SiMx	4L	4ML 4P 4MP	4PJ	4 Plus 4M Plus	4V 4MV
CURSOR POSITIONING												
Horizontal Position	Ec&a#C	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Ec*p#X	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Ec&a#H	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Vertical Position	Ec&a#R	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Ec*p#Y	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Ec&a#V	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Half Line Feed	Ec=	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Line Termination	Ec&k#G	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Push/Pop Position	Ec&f#S	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
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 ")".												
Symbol Set (Primary)	Ec(ID	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Spacing (Primary)	Ec(s#P	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Pitch (Primary)	Ec(s#H	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Height (Primary)	Ec(s#V	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Style (Primary)	Ec(s#S	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Stroke Weight (Primary)	Ec(s#B	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Typeface (Primary)	Ec(s#T	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Font Selection By ID # (Pri.)	Ec(#X	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Select Default Font (Primary)	Ec(3@	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Underline	Ec&d#D	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Ec&d@	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Transparent Print Data	Ec&p#X[data]	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Text Parsing Method	Ec&t#P	ns	ns	ns	ns	ns	ns	ns	ns	✓	ns	✓
FONT MANAGEMENT												
Assign Font ID #	Ec*c#D	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Font Control	Ec*c#F	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
USER-DEFINED SYMBOL SET												
Symbol Set ID Code	Ec*c#R	ns	ns	ns	✓	✓	✓	✓	✓	✓	✓	✓
Define Symbol Set	Ec(f#W[data]	ns	ns	ns	✓	✓	✓	✓	✓	✓	✓	✓
Symbol Set Control	Ec*c#S	ns	ns	ns	✓	✓	✓	✓	✓	✓	✓	✓

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

Table 1-1. PCL 5 Feature Support Matrix (continued)

FUNCTION	COMMAND	Color LJ	Color LJ 5, 5M	4LJ Pro	4LC	5L 6L	5P 5MP	6P 6MP	5Si 5SiMx Mopier	5 5M	4000 series	Desk-Jet 1200C	Desk-Jet 1600C
CURSOR POSITIONING													
Horizontal Position	Ec&a#C	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Ec*p#X	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Ec&a#H	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Vertical Position	Ec&a#R	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Ec*p#Y	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Ec&a#V	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Half Line Feed	Ec=	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Line Termination	Ec&k#G	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Push/Pop Position	Ec&f#S	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
FONT SELECTION													
The Primary font commands in this table can be changed to Secondary by replacing the left parenthesis "(" in the command with a right parenthesis ")".													
Symbol Set (Primary)	Ec(ID	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Spacing (Primary)	Ec(s#P	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Pitch (Primary)	Ec(s#H	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Height (Primary)	Ec(s#V	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Style (Primary)	Ec(s#S	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Stroke Weight (Primary)	Ec(s#B	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Typeface (Primary)	Ec(s#T	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Font Selection By ID # (Pri.)	Ec(#X	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Select Default Font (Primary)	Ec(3@	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Underline	Ec&d#D	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Ec&d@	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Transparent Print Data	Ec&p#X[data]	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Text Parsing Method	Ec&t#P	ns	ns	✓	✓	ns	✓	✓	✓	✓	✓	✓[1]	✓
FONT MANAGEMENT													
Assign Font ID #	Ec*c#D	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Font Control	Ec*c#F	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
USER-DEFINED SYMBOL SET													
Symbol Set ID Code	Ec*c#R	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Define Symbol Set	Ec(f#W[data]	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Symbol Set Control	Ec*c#S	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

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

[1] Available in code versions "B" and "C" only (see the DeskJet 1200C section near the end of this chapter).

Table 1-1. PCL 5 Feature Support Matrix (continued)

FUNCTION	COMMAND	III	IIID	IIISi	IIIP	4 4M	4Si 4SiMx	4L	4ML 4P 4MP	4PJ	4 Plus 4M Plus	4V 4MV
SOFT FONT CREATION												
Font Descriptor Range: 0 - 32767 Range: 0 - 65535	Ec)s#W[data]	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Character Code	Ec*c#E	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Download Character	Ec(s#W[data]	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
MACROS												
Macro ID	Ec&f#Y	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Macro Control	Ec&f#X	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
PRINT MODEL IMAGING												
Source Transparency Mode	Ec*v#N	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Pattern Transparency Mode	Ec*v#O	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Area Fill (Pattern) ID	Ec*c#G	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Select Current Pattern	Ec*v#T											
Solid Black (0)		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Solid White (1)		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
HP Shading Pattern (2)		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Cross-hatch Pattern (3) (HP-hatch Pattern)		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
User-defined Pattern (4)		ns	ns	ns	✓	✓	✓	✓	✓	✓	✓	✓
Logical Operation	Ec*ℓ#O	ns	ns	ns	ns	ns	ns	ns	✓	✓	✓	✓
Pixel Placement	Ec*ℓ#R	ns	ns	ns	ns	ns	ns	ns	✓	✓	✓	✓
USER-DEFINED PATTERN												
Define (Download) Pattern Range: 0 - 32767 Range: 0 - 65535	Ec*c#W[data]	ns ✓	ns ✓	ns ✓	✓ ✓	✓ ✓	✓ ✓	✓ ✓	✓ ✓	✓ ✓	✓ ✓	✓ ✓
Set Pattern Reference Point	Ec*p#R	ns	ns	ns	✓	✓	✓	✓	✓	✓	✓	✓
User-defined Pattern Control	Ec*c#Q	ns	ns	ns	✓	✓	✓	✓	✓	✓	✓	✓

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

Table 1-1. PCL 5 Feature Support Matrix (continued)

FUNCTION	COMMAND	Color LJ	Color LJ 5, 5M	4LJ Pro	4LC	5L 6L	5P 5MP	6P 6MP	5Si 5SiMx Mopier	5 5M	4000 series	Desk-Jet 1200C	Desk-Jet 1600C
SOFT FONT CREATION													
Font Descriptor	Ec)s#W[data]												
Range: 0 - 32767		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Range: 0 - 65535							✓	✓	✓	✓	✓		
Character Code	Ec*c#E	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Download Character	Ec(s#W[data]	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
MACROS													
Macro ID	Ec&f#Y	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Macro Control	Ec&f#X	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
PRINT MODEL IMAGING													
Source Transparency Mode	Ec*v#N	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Pattern Transparency Mode	Ec*v#O	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Area Fill (Pattern) ID	Ec*c#G	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Select Current Pattern	Ec*v#T												
Solid Black (0)		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Solid White (1)		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
HP Shading Pattern (2)		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Cross-hatch Pattern (3) (HP-hatch Pattern)		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
User-defined Pattern (4)		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Logical Operation	Ec*ℓ#O	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Pixel Placement	Ec*ℓ#R	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
USER-DEFINED PATTERN													
Define (Download) Pattern	Ec*c#W[data]	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Range: 0 - 32767		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Range: 0 - 65535							✓	✓	✓	✓	✓		
Set Pattern Reference Point	Ec*p#R	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
User-defined Pattern Control	Ec*c#Q	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

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

Table 1-1. PCL 5 Feature Support Matrix (continued)

FUNCTION	COMMAND	III	IIID	IIISi	IIIP	4 4M	4Si 4SiMx	4L	4ML 4P 4MP	4PJ	4 Plus 4M Plus	4V 4MV
RASTER GRAPHICS												
Raster Resolution	Ec*t#R											
75 Dots/Inch (75)		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
100 Dots/Inch (100)		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
150 Dots/Inch (150)		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
200 Dots/Inch (200) [1]		ns	ns	ns	ns	✓	✓	ns	✓[2]	✓	✓	✓
300 Dots/Inch (300)		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
600 Dots/Inch (600) [1]		ns	ns	ns	ns	✓	✓	ns	✓[2]	✓	✓	✓
Graphics Presentation	Ec*r#F	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Raster Height (Source)	Ec*r#T	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Raster Height (Destination)	Ec*t#V	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
Raster Width (Source)	Ec*r#S	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Raster Width (Destination)	Ec*t#H	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
Scale Algorithm	Ec*t#K	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
Start Raster Graphics	Ec*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	Ec*b#Y	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Set Compression Mode	Ec*b#M											
Unencoded (0)		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Run-Length Encoded (1)		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
TIFF Encoded (2)		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Delta Row Encoded (3)		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Mode 5 Adaptive (5)		ns	ns	ns	✓	✓	✓	✓	✓	✓	✓	✓
Replacement Delta Row (9)		ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
Transfer Raster (Row/Block)	Ec*b#W[data]	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Transfer Raster (Plane)	Ec*b#V[data]	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
End Graphics												
Version B	Ec*rB	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Version C (Preferred)	Ec*rC	ns	ns	✓	✓	✓	✓	✓	✓	✓	✓	✓

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

[1] Supported if printer resolution is 600 dpi.

[2] The 4ML printer does not support 200 or 600 dpi operation.

Table 1-1. PCL 5 Feature Support Matrix (continued)

FUNCTION	COMMAND	Color LJ	Color LJ 5, 5M	4LJ Pro	4LC	5L 6L	5P 5MP	6P 6MP	5Si 5SiMx Mopier	5 5M	4000 series	Desk-Jet 1200C	Desk-Jet 1600C
RASTER GRAPHICS													
Raster Resolution	Ec*t#R												
75 Dots/Inch (75)		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
100 Dots/Inch (100)		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
150 Dots/Inch (150)		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
200 Dots/Inch (200) [1]		ns	ns	✓	✓	✓	✓	✓	✓	✓	✓	ns	✓
300 Dots/Inch (300)		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
600 Dots/Inch (600) [1]		ns	ns	✓	✓	✓	✓	✓	✓	✓	✓	ns	✓
Graphics Presentation	Ec*r#F	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Raster Height (Source)	Ec*r#T	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Raster Height (Destination)	Ec*t#V	✓	✓	ns	ns	ns	ns	ns	ns	ns	ns	✓	✓
Raster Width (Source)	Ec*r#S	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Raster Width (Destination)	Ec*t#H	✓	ns	ns	ns	ns	ns	ns	ns	ns	ns	✓	✓
Scale Algorithm	Ec*t#K	ns	✓	ns	ns	ns	ns	ns	ns	ns	ns	✓	✓
Start Raster Graphics	Ec*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	✓	✓
At CAP, scaling ON (3)		✓	✓	ns	ns	ns	ns	ns	ns	ns	ns	✓	✓
Y Offset	Ec*b#Y	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Set Compression Mode	Ec*b#M												
Unencoded (0)		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Run-Length Encoded (1)		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
TIFF Encoded (2)		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Delta Row Encoded (3)		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Mode 5 Adaptive (5)		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Replacement Delta Row (9)		ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	✓
Transfer Raster (Row/Block)	Ec*b#W[data]	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Transfer Raster (Plane)	Ec*b#V[data]	✓	✓	ns	ns	ns	ns	ns	ns	ns	ns	✓	✓
End Graphics													
Version B	Ec*rB	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Version C (Preferred)	Ec*rC	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

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

[1] Supported if printer resolution is 600 dpi.

Table 1-1. PCL 5 Feature Support Matrix (continued)

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

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

Table 1-1. PCL 5 Feature Support Matrix (continued)

FUNCTION	COMMAND	Color LJ	Color LJ 5, 5M	4LJ Pro	4LC	5L 6L	5P 5MP	6P 6MP	5Si 5SiMx Mopier	5 5M	4000 series	Desk-Jet 1200C	Desk-Jet 1600C
RECTANGULAR AREA FILL													
Horizontal Rectangle Size	Ec*c#A	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Ec*c#H	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Vertical Rectangle Size	Ec*c#B	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Ec*c#V	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Pattern ID (Area Fill ID)	Ec*c#G												
1-100 for Shading		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
1-6 for Cross-hatch		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
0-32767 for User-defined		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Fill Rectangle Area	Ec*c#P												
Black (solid) (0)		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
(Solid) White (erase) (1)		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Shaded (gray) (2)		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Cross-hatch Pattern (3)		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
User-defined Pattern (4)		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Current Pattern (5)		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
STATUS READBACK													
Set Status Readback Location Type	Ec*s#T	ns	ns	✓	✓	✓	✓	✓	✓	✓	✓	ns	ns
Set Status Readback Location Unit	Ec*s#U	ns	ns	✓	✓	✓	✓	✓	✓	✓	✓	ns	ns
Inquire Status Readback Entity	Ec*s#I	ns	ns	✓	✓	✓	✓	✓	✓	✓	✓	ns	ns
Free Space	Ec*s1M	ns	ns	✓	✓	✓	✓	✓	✓	✓	✓	ns	ns
Flush All Pages	Ec&r#F	ns	ns	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Echo	Ec*s#X	ns	ns	✓	✓	✓	✓	✓	✓	✓	✓	ns	ns

✓ - 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 4SiMx	4L	4ML 4P 4MP	4PJ	4 Plus 4M Plus	4V 4MV
PICTURE FRAME (for Vector Graphics)												
Picture Frame Horiz. Size	Ec*c#X	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Picture Frame Vert. Size	Ec*c#Y	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Set Picture Frame Anchor Point	Ec*c0T	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
HP-GL/2 Horiz. Plot Size	Ec*c#K	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
HP-GL/2 Vert. Plot Size	Ec*c#L	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Enter HP-GL/2	Ec%#B											
_Stand-alone plotter (-1)		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
_Current PCL coordinates & current CAP (3)		ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
Enter PCL Mode	Ec%#A	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
PROGRAMMING HINTS												
Display Functions												
On	EcY	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Off	EcZ	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
End-Of-Line Wrap	Ec&s#C	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

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

Table 1-1. PCL 5 Feature Support Matrix (continued)

FUNCTION	COMMAND	Color LJ	Color LJ 5, 5M	4LJ Pro	4LC	5L 6L	5P 5MP	6P 6MP	5Si 5SiMx Mopier	5 5M	4000 series	Desk-Jet 1200C	Desk-Jet 1600C
PICTURE FRAME (for Vector Graphics)													
Picture Frame Horiz. Size	Ec*c#X	✓	ns	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Picture Frame Vert. Size	Ec*c#Y	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Set Picture Frame Anchor Point	Ec*c0T	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
HP-GL/2 Horiz. Plot Size	Ec*c#K	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
HP-GL/2 Vert. Plot Size	Ec*c#L	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Enter HP-GL/2	Ec%#B												
_Stand-alone plotter (-1)		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	✓	✓
_Current PCL coordinates & current CAP (3)		ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	✓	✓
Enter PCL Mode	Ec%#A	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
PROGRAMMING HINTS													
Display Functions													
On	EcY	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Off	EcZ	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
End-Of-Line Wrap	Ec&s#C	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

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

Table 1-1. PCL 5 Feature Support Matrix (continued)

FUNCTION	COMMAND	III	IIID	IIISi	IIIP	4 4M	4Si 4SiMx	4L	4ML 4P 4MP	4PJ	4 Plus 4M Plus	4V 4MV
PCL 5 COLOR COMMANDS												
Assign Color Index	Ec*v#I	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
Color Component 1	Ec*v#A	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
Color Component 2	Ec*v#B	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
Color Component 3	Ec*v#C	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
Color Lookup Tables	Ec*ℓ#W[data]	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
Configure Image Data	Ec*v#W[data]	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
Download Dither Matrix	Ec*m#W	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
Foreground Color	Ec*v#S	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
Gamma Correction	Ec*t#I	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
Monochrome Print Mode	Ec&b#M	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
Palette Control ID	Ec&p#I	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
Palette Control	Ec&p#C	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
Push/Pop Palette	Ec*p#P	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
Render Algorithm	Ec*t#J											
Range: 0 - 8		ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
Range: 9 - 10		ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
Range: 11 - 14		ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
Range: 15 - 19		ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
Select Palette	Ec&p#S	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
Set Viewing Illuminant	Ec*i#W[data]	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
Simple Color	Ec*r#U	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns

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

Table 1-1. PCL 5 Feature Support Matrix (continued)

FUNCTION	COMMAND	Color LJ	Color LJ 5, 5M	4LJ Pro	4LC	5L 6L	5P 5MP	6P 6MP	5Si 5SiMx Mopier	5 5M	4000 series	Desk-Jet 1200C	Desk-Jet 1600C
PCL 5 COLOR COMMANDS													
Assign Color Index	Ec*v#I	✓	✓	ns	ns	ns	ns	ns	ns	ns	ns	✓	✓
Color Component 1	Ec*v#A	✓	✓	ns	ns	ns	ns	ns	ns	ns	ns	✓	✓
Color Component 2	Ec*v#B	✓	✓	ns	ns	ns	ns	ns	ns	ns	ns	✓	✓
Color Component 3	Ec*v#C	✓	✓	ns	ns	ns	ns	ns	ns	ns	ns	✓	✓
Color Lookup Tables	Ec*ℓ#W[data]	✓	✓	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
Configure Image Data	Ec*v#W[data]	✓	✓	ns	ns	ns	ns	ns	ns	ns	ns	✓	✓
Download Dither Matrix	Ec*m#W	✓	✓	ns	ns	ns	ns	ns	ns	ns	ns	✓	✓
Foreground Color	Ec*v#S	✓	✓	ns	ns	ns	ns	ns	ns	ns	ns	✓	✓
Gamma Correction	Ec*t#I	✓	✓	ns	ns	ns	ns	ns	ns	ns	ns	✓	✓
Monochrome Print Mode	Ec&b#M	✓	✓	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
Palette Control ID	Ec&p#I	✓	✓	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
Palette Control	Ec&p#C	✓	✓	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
Push/Pop Palette	Ec*p#P	✓	✓	ns	ns	ns	ns	ns	ns	ns	ns	✓	✓
Render Algorithm	Ec*t#J												
Range: 0 - 8		✓	✓	ns	ns	ns	ns	ns	ns	ns	ns	✓	✓
Range: 9 - 10		✓	ns	ns	ns	ns	ns	ns	ns	ns	ns	✓	✓
Range: 11 - 14		✓	✓	ns	ns	ns	ns	ns	ns	ns	ns	✓	✓
Range: 15 - 19		ns	✓	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
Select Palette	Ec&p#S	✓	✓	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
Set Viewing Illuminant	Ec*i#W[data]	✓	✓	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
Simple Color	Ec*r#U	✓	✓	ns	ns	ns	ns	ns	ns	ns	ns	✓	✓

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

Table 1-1. PCL 5 Feature Support Matrix (continued)

FUNCTION	COMMAND	III	IIID	IIISi	IIIP	4 4M	4Si 4SiMx	4L	4ML 4P 4MP	4PJ	4 Plus 4M Plus	4V 4MV
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
Bezier	BR, BZ	ns	ns	ns	ns	✓	✓	✓	✓	✓	✓	✓
Begin Plot	BP	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
Chord Tolerance Mode	CT	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
(Relative) 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
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
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
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
Output Error	OE	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
Output Hardcopy Limits	OH	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
Output Identification	OI	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
Output P1 and P2	OP	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
Output Status	OS	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
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
Quality Level	QL	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
Replot	RP	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns

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

Table 1-1. PCL 5 Feature Support Matrix (continued)

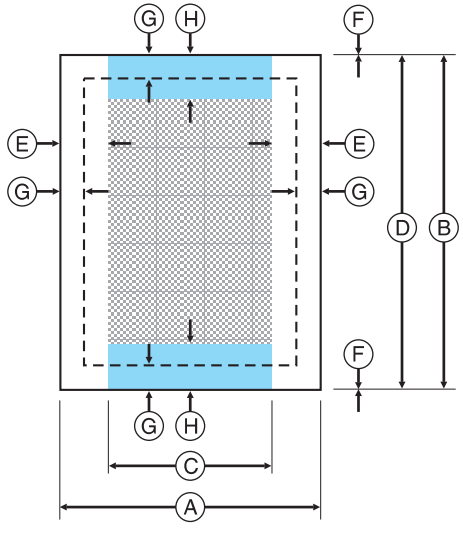
FUNCTION	COMMAND	Color LJ	Color LJ 5, 5M	4LJ Pro	4LC	5L 6L	5P 5MP	6P 6MP	5Si 5SiMx Mopier	5 5M	4000 series	Desk-Jet 1200C	Desk-Jet 1600C
HP-GL/2 GRAPHICS													
HP-GL/2—Commands listed in Table A-2 except as shown below		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Advance Full Page	PG	ns	ns	ns	ns	ns	ns	ns	ns	✓	✓	✓[1]	ns
Bezier	BR, BZ	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Begin Plot	BP	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	✓[1]	ns
Chord Tolerance Mode	CT	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	✓[1]	ns
(Relative) Color Range	CR	✓	✓	ns	ns	ns	ns	ns	ns	ns	ns	✓	✓
Download Character	DL	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	✓[1]	ns
Fill Type	FT												
Odd/Even		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Non-Zero Winding		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Frame Advance	FR	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	✓[1]	ns
Label origin	LO												
1-9 / 11-19		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
21		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Media Type	MT	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	✓[1]	ns
Merge Control	MC	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Number of Pens	NP	✓	✓	ns	ns	ns	ns	ns	ns	ns	ns	✓	✓
Output Error	OE	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	✓[1]	ns
Output Hardcopy Limits	OH	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	✓[1]	ns
Output Identification	OI	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	✓[1]	ns
Output P1 and P2	OP	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	✓[1]	ns
Output Status	OS	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	✓[1]	ns
Pen Color Assignment	PC	✓	✓	ns	ns	ns	ns	ns	ns	ns	ns	✓	✓
Pixel Placement	PP	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Plot Size	PS	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	✓[1]	ns
Quality Level	QL	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	✓[1]	ns
Replot	RP	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	✓[1]	ns

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

[1] Supported in stand-alone HP-GL/2 Mode only (DeskJet 1200)

Printable Area

The relationships between physical page, logical page, default picture frame, and printable area are illustrated in Figures 1-1 and 1-2. The tables list the variations in sizes for the different physical page sizes. For more information concerning printable area or logical/physical page differences, consult the *PCL 5 Printer Language Technical Reference Manual.*



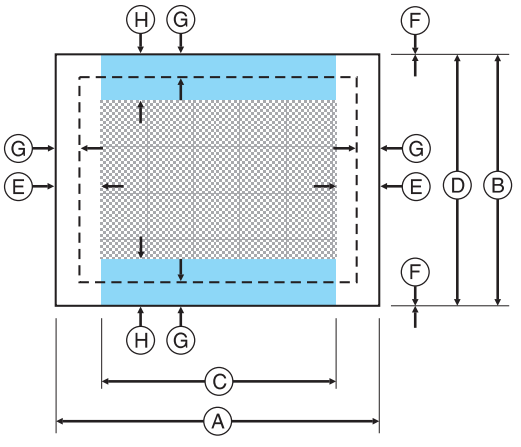
Physical Page
Printable Area
Logical Page
HP-GL/2 Default Picture Frame

A = Physical Page Width
B = Physical Page Length
C = Logical Page Width
D = Maximum Logical Page Length
E = Distance Between the Side Edge of the Physical Page and the Logical Page
F = Distance Between the Top/Bottom Edge of the Physical Page and the Logical Page
G = Distance Between the Edge of the Physical Page and the Printable Area
H = Distance Between the Edge of the Physical Page and the Edge of the Default HP-GL/2 Picture Frame

Width of the Printable Area = A – (2*G)
Length of the Printable Area = B – (2*G)

	DIMENSIONS (at 300 DPI - double for 600 DPI)							
PAPER SIZE	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**
Portrait Dimensions								
Letter	2550	3300	2400	3300	75	0	50	150
Legal	2550	4200	2400	4200	75	0	50	150
Ledger	3300	5100	3150	5100	75	0	50	150
Executive	2175	3150	2025	3150	75	0	50	150
A4	2480	3507	2338	3507	71	0	50	150
A3	3507	4960	3365	4960	71	0	50	150
Com-10	1237	2850	1087	2850	75	0	50	150
Monarch	1162	2250	1012	2250	75	0	50	150
C5	1913	2704	1771	2704	71	0	50	150
B5	2078	2952	1936	2952	71	0	50	150
DL	1299	2598	1157	2598	71	0	50	150
JIS B4	3035	4299	2893	4299	71	0	50	150
JIS B5	2149	3035	2007	3035	71	0	50	150
Hagaki	1181	1748	1039	1748	71	0	50	150
Oufuku-hagaki	1748	2362	1606	2362	71	0	50	150

Figure 1-1. Portrait Logical Page and Printable Area Boundaries



Physical Page
Printable Area
Logical Page
HP-GL/2 Default Picture Frame

A = Physical Page Width
B = Physical Page Length
C = Logical Page Width
D = Maximum Logical Page Length
E = Distance Between the Side Edge of the Physical Page and the Logical Page
F = Distance Between the Top/Bottom Edge of the Physical Page and the Logical Page
G = Distance Between the Edge of the Physical Page and the Printable Area
H = Distance Between the Edge of the Physical Page and the Edge of the Default HP-GL/2 Picture Frame

Width of the Printable Area = A – (2*G)
Length of the Printable Area = B – (2*G)

	DIMENSIONS (at 300 DPI - double for 600 DPI)							
PAPER SIZE	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**
Landscape Dimensions								
Letter	3300	2550	3180	2550	60	0	50	150
Legal	4200	2550	4080	2550	60	0	50	150
Ledger	5100	3300	4980	3300	60	0	50	150
Executive	3150	2175	3030	2175	60	0	50	150
A4	3507	2480	3389	2480	59	0	50	150
A3	4960	3507	4842	3507	59	0	50	150
Com-10	2850	1237	2730	1237	60	0	50	150
Monarch	2250	1162	2130	1162	60	0	50	150
C5	2704	1913	2586	1913	59	0	50	150
B5	2952	2078	2834	2078	59	0	50	150
DL	2598	1299	2480	1299	59	0	50	150
JIS B4	4299	3035	4181	3035	59	0	50	150
JIS B5	3035	2149	2917	2149	59	0	50	150
Hagaki	1748	1181	1630	1181	59	0	50	150
Oufuku-hagaki	2362	1748	2244	1748	59	0	50	150

Figure 1-2. Landscape Logical Page and Printable Area Boundaries

2

Printer-Specific Differences

Introduction

Each Hewlett-Packard printer implements minor variations of PCL 5 in order to best suit its intended use. This chapter describes specific differences that are important when developing applications for the various PCL 5 printers. The sections in this chapter 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.

HP LaserJet III and 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 2-1 below.

Table 2-1. 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 2-2. 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 2-2.

Table 2-2. 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 2-3. 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 2-3. 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 5 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 HP 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 HP 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 2-3. 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).

^EC**&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.

Notes

- PostScript in the HP LaserJet 4 printer supports the PostScript level 1 operators *setprintername*, AppleTalk*type*, 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.

$^{E}_{C}$&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.

Ec&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.

Ec&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 HP 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 HP LaserJet IIISi features listed in Table 2-1 with two exceptions. First, is that the HP 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 3, “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 5021-0380 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 5, "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 3, "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 3, “Internal Typefaces/Fonts and Symbol Sets,” for complete font support information).

Table 2-4. 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 (Ec*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 (Ec*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 (Ec*v#N) and Pattern Transparency (Ec*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.

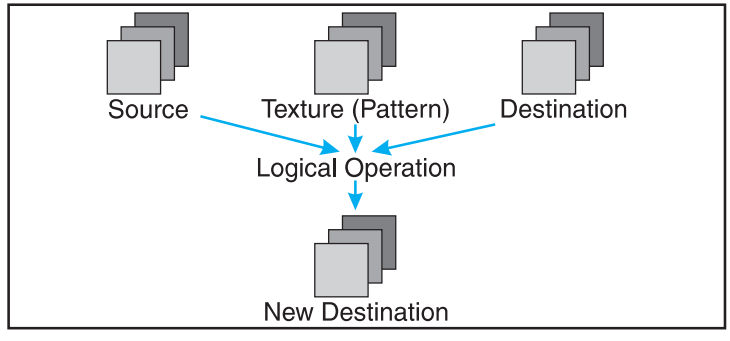
Operators

- 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.



Notes

- The Logical Operation command (Ec*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 2-5, Logical Operations (ROP3), on the following pages, are true only if source and pattern transparency (for white pixels) are explicitly set to opaque (Ec*v1N and Ec*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 2-6)

Default = 252 (TSo)

Range = 0 to 255

Note

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))

Notes

- 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 2-5. 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	1	1	1	1	1	0	0
	(decimal 252)							
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

Table 2-6, Logical Operations (ROP3), 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 2-6. 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 2-6. 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 2-6. 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 2-6. 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 2-6. 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 Command

This command determines how pixels are rendered in images.

$^{E}_{C}$***ℓ # 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 example shown in Figure 2-1 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.)

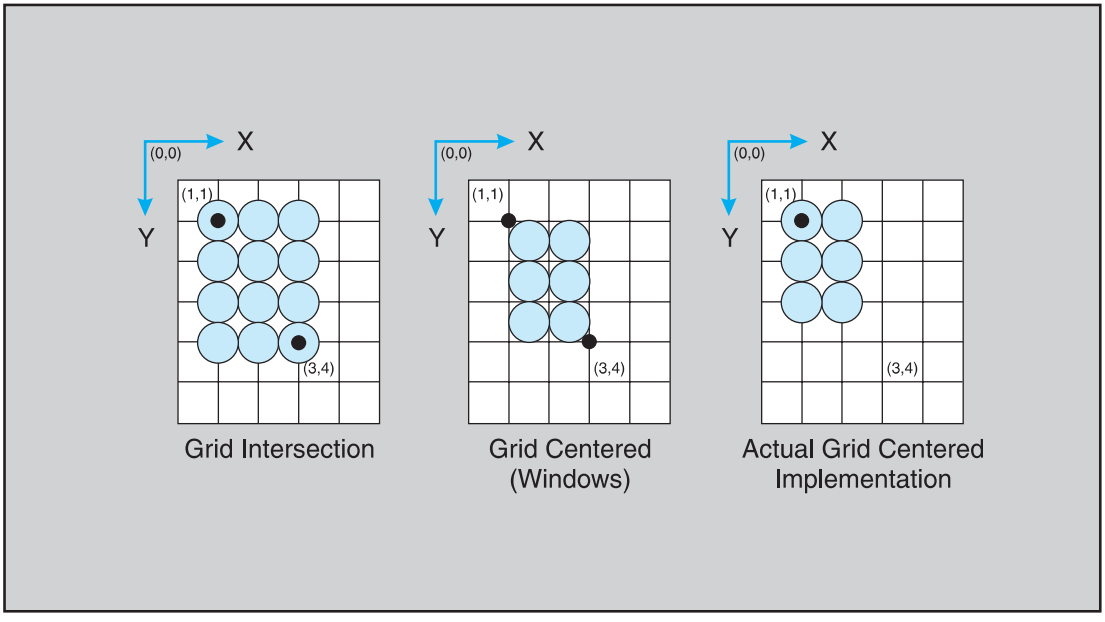


Figure 2-1. Pixel Placement

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 2-2). Grid centered places pixels in the center of the grid. In Figure 2-2, 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.

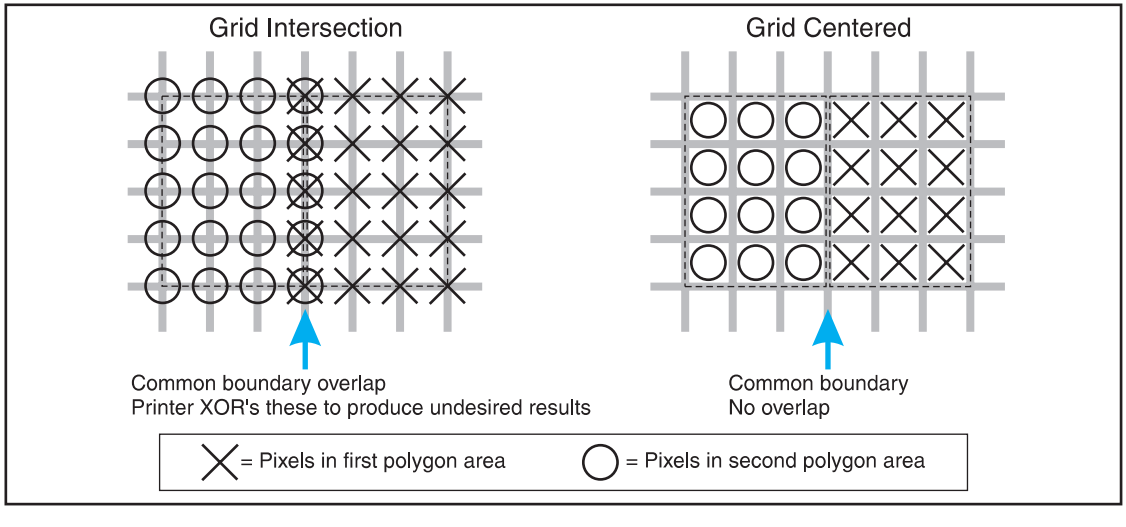


Figure 2-2. Pixel Placement Variations

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 2-1).

1 = grid centered; device draws pixels centered inside the boxes created by the grid (see Figure 2-1).

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.

Notes

- 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.

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 2-6, 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).

Notes

- 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.

Note When using the MC command, some pattern types will not produce the expected ROP result. This only occurs when using the FT (Fill Type) command pattern types 1, 2, 3, and 4, and the ROP includes an XOR operation. (This problem is due to the fact that these patterns are the result of a vector operation and do not produce raster data for use by a ROP operation.) All other Fill Type command patterns (types, 10, 11, 21, or 22) operate as expected.

opcode

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 (also see Table 2-6).

Table 2-7. 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 HP LaserJet 4P printer is the follow-on to the HP LaserJet IIIP printer. The HP 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 HP 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 3, “Internal Typefaces/Fonts and Symbol Sets,” for font support information.

HP LaserJet 4PJ Printer

The HP LaserJet 4PJ printer is a modified version of the HP LaserJet 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 HP 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 2-8 lists the PCL feature additions for this printer.

Table 2-8. 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 HP 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 (Ec&ℓ45A) and two Japanese postcard sizes: *Hagaki* (Ec&ℓ71A) and *Oufuku-Hagaki* (Ec&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.

Ec**&c#T**

\# = **0** - Horizontal printing

–1 - Vertical rotated printing

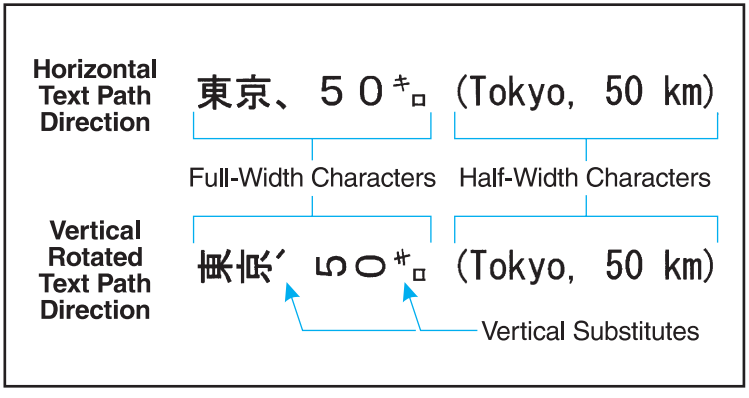
Default = 0

Range = 0, 1

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

Using Ec&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 (Ec&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.



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 two small characters are replaced with vertical substitutes. 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 HP 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 HP 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.

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°. The Vertical Rotation Segment sets 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 HP 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.

Table 2-9. Printer Segment Support for Font Format 16

Segment	LJ 4PJ	LJ 4V/ 4MV	LJ 4LC	LJ 4LJ Pro	DJ 1600	LJ 5P
Galley Character – GC	✓	✓	✓	✓	✓	✓
Vertical Substitution – VT	✓	✓	✓	✓	✓	✓
Typeface string – TF	✓	✓	✓	✓	✓	ns
Vertical Rotation – VR	✓	✓	✓	✓	✓	✓
Character Enhancement – CE	✓	✓	✓	✓	✓	✓
Bitmap Resolution – BR *	ns	✓	✓	✓	ns	✓
TrueType fonts	✓	✓	✓	✓	✓	✓
Bitmap fonts *	ns	✓	✓	✓	ns	✓

ns – not supported

* Format 16 bitmap font support is described beginning on page 2-63.

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 4	Data Segment Size (6*n+6) *		3 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 4	Data Segment Size (12) *		3 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

* 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.

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 substitution array. The segment definition is shown in the table below.

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

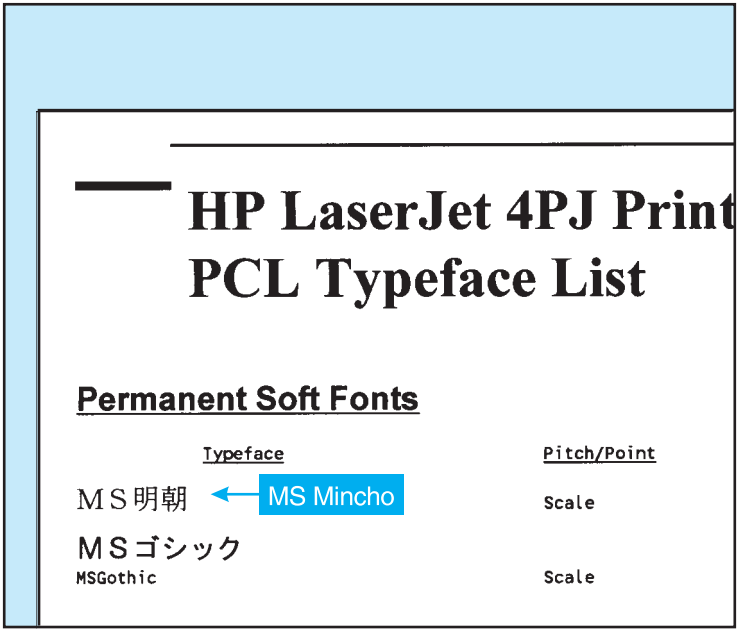
Typeface String Segments can be downloaded with any Font Format 15 or Font Format 16 font, regardless of font type.

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.

MS Mincho			
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
MS Gothic			
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.

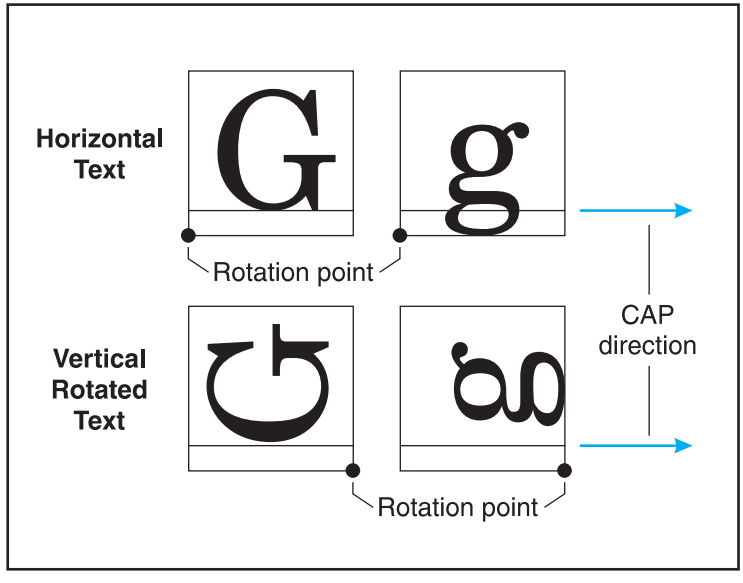
The following illustration shows how the PCL Typeface List would look.



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 4	Data Segment Size (4) *		3 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

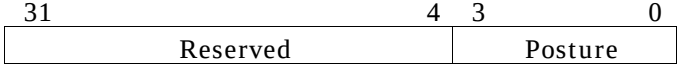
This segment indicates whether the pseudo-bold or pseudo-italic enhancements can be performed on a downloaded font.

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.

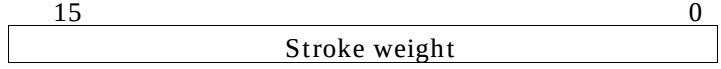


Bit Positions (#) = Posture

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.



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.

HP LaserJet 4PJ Programming Tips

This section provides programming tips concerning specific considerations for the HP 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 HP LaserJet 4PJ printer using PCL 5.

General Print Job Initialization

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

Output from pre-LaserJet 4PJ PCL drivers (for example, a HP LaserJet 4P driver) will only print correctly on the HP 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 HP LaserJet 4 family printers. The only difference is that it includes a PJL command to set the default PCL symbol set to Roman-8.

```
ESC%-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>
ESCEESC&l1x1s1h2a0o8c6e54FESC&a5LESC(0UESC(s1p9vs3b41
↪01T
```

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>
ECECE&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:

```
ECECE%-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 HP 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:

```
EC(19KEC(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. EC(#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:

```
EC(1XEC(s1s3B
```

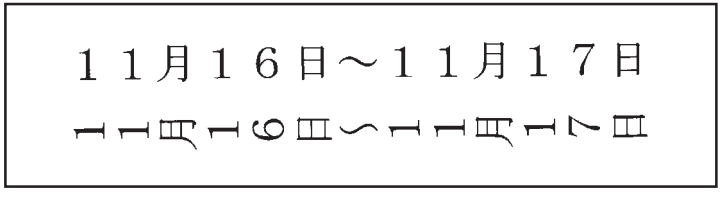
Other font effects, such as character shadowing, strike-through, and gray-shading can be accomplished using the print model.

Note HP-GL/2 as implemented in HP 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 (Ec&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 (Ec&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.



```
#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");        /* 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 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

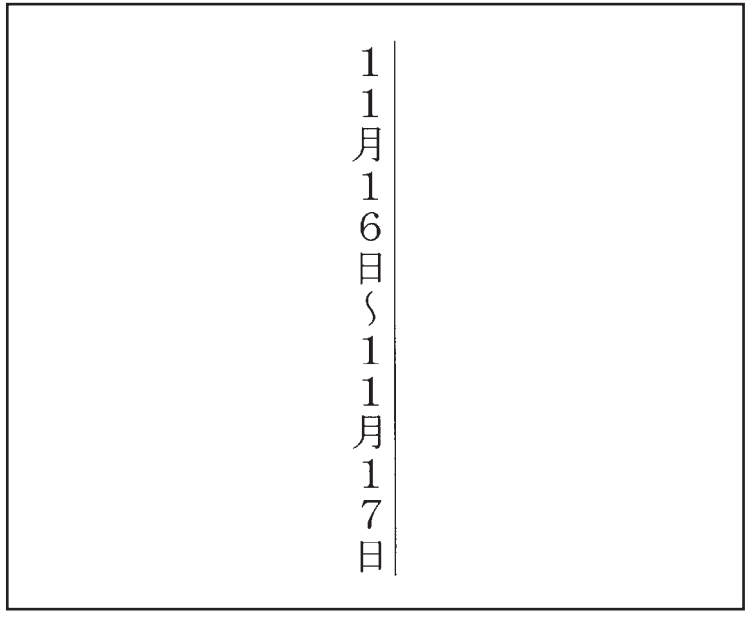

```
#include <stdio.h>
#include <fcntl.h>
#define KANJITXT "\225\127\226\173"
#define RUBYTXT  "\202\320\202\345\202\244 \202\331\202\361 "
FILE *prn;
main()
{
  int point_size=72;
  prn = fopen("lpt1","wb");        /* open lpt1 for writing */
  fprintf(prn,"\33%%-12345X");     /* send UEL to get to 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.

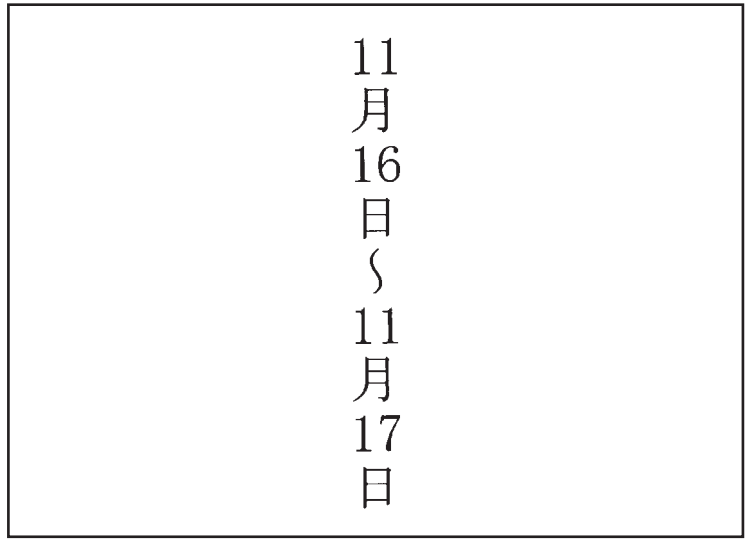


```
#include <stdio.h>
#include <fcntl.h>
#define MONTH    "\202P\202P\214\216"
#define DAY1     "\202P\202U\223\372"
#define TILDE    "\201\140"
#define DAY2     "\202P\202V\223\372"
#define KANJITXT MONTH DAY1 TILDE MONTH DAY2
FILE *prn;
main()
{
  int point_size=24;
  prn = fopen("lpt1","wb");        /* 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.



```
#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;
 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 */
}
```

Paper Size

Three new paper sizes were added to the HP LaserJet 4PJ printer. These paper sizes include: JIS B5, Hagaki, and Oufuku-hagaki. The logical page size in dots per inch are shown in the table below. See page 1-26 in this manual and pages 2-9 to 2-10 in the *PCL 5 Printer Language Technical Reference Manual* for an explanation of these values.

	DIMENSIONS (at 300 DPI - double for 600 DPI)							
PAPER SIZE	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**
Portrait Dimensions								
JIS B5	2149	3035	2007	3035	71	0	50	150
Hagaki	1181	1748	1039	1748	71	0	50	150
Oufuku-hagaki	1748	2362	1606	2362	71	0	50	150
Landscape Dimensions								
JIS B5	3035	2149	2917	2149	59	0	50	150
Hagaki	1748	1181	1630	1181	59	0	50	150
Oufuku-hagaki	2362	1748	2244	1748	59	0	50	150

HP LaserJet 4 Plus and 4M Plus Printers

HP LaserJet 4 Plus and 4M Plus printers are performance-enhanced follow-on products for HP LaserJet 4 and 4M printers, respectively. The HP 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 5 “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 HP 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 HP LaserJet 4 and 4M printers, except HP LaserJet 4 Plus and 4M Plus printers support Logical Operations (ROP3) as explained in the HP LaserJet 4ML printer section in this chapter. In addition, the internal fonts in HP LaserJet Plus and 4M Plus printers support the Latin 2 and Latin 5 symbol sets for all typefaces (in the HP 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 3, “Internal Typefaces/Fonts and Symbol Sets,” for font support information.

HP LaserJet 4V and 4MV Printers

HP LaserJet 4V and 4MV printers print at speeds up to 16 pages per minute and handle many paper sizes including 11"x17" paper. The HP LaserJet 4MV is the multi-platform (PostScript) version of the HP LaserJet 4V printer.

The HP LaserJet 4V/4MV PCL 5 feature set is similar to that of the HP 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 HP LaserJet 4PJ printer, including the following PCL enhancements:

- Font header support for large bitmap fonts
- Text parsing method
- Character text path direction
- Japanese media/postcard support
- Japanese fonts (large fonts)

As with HP LaserJet 4Plus and 4M Plus printers, the LaserJet 4V and 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 3, “Internal Typefaces/Fonts and Symbol Sets,” for font support information.

Font Header Format 16 Bitmap Font Support

Font Header Format 16 was introduced with the HP LaserJet 4PJ for downloading large TrueType fonts. For the HP LaserJet 4V, Font Header Format 16 has been extended to support large bitmap fonts as well. The Font Header command (Ec) s # W [font header data]) is used to download font header data to the printer.

A large font is a bound font with character codes that are not limited to 8-bit values. For this reason a large font is sometimes called a 16-bit font.

Font Header Format

Font Header Format 16 was introduced because some font data segments in large fonts could be larger than 65535 bytes, and this was not supported by Font Header Form at 15. The structures of Format 15 and Format 16 are identical with the exception of the Segment Size field in the Segmented Font Data format. Table 2-10 below shows the Format 15 and Format 16 Font Header format. Table 2-11 shows the Format 15 Segmented Font Data format. Table 2-12 shows the Format 16 Segmented Font Data format. Note that Format 15 does not support bitmap fonts.

Table 2-10. Format 15 and Format 16 Font Header

Byte	15 (MSB) 8	7 (LSB) 0
0	Font Descriptor Size (minimum 72)	
2	Header Format (15 or 16)	Font Type
4	Style MSB	Reserved
6	Baseline Position	
8	Cell Width	
10	Cell Height	
12	Orientation	Spacing
14	Symbol Set	
16	Pitch (default HMI)	
18	Height	
20	x-Height	
22	Width Type	Style LSB
24	Stroke Weight	Typeface LSB
26	Typeface MSB	Serif Style
28	Quality	Placement
30	Underline Position (Distance)	Underline Thickness
32	Text Height	
34	Text Width	
36	First Code	
38	Last Code/Number of Characters	
40	Pitch Extended	Height Extended
42	Cap Height	
44 - 47	Font Number	
48 - 63	Font Name	
64	Scale Factor	
66	Master Underline Position	
68	Master Underline Thickness	
70	Font Scaling Technology	Variety
72 . . .	*[additional data may be inserted here]*	
Desc. Size . . .	Segmented Font Data . . .	
# - 2	Reserved (0)	Checksum

Table 2-11. Format 15 Segmented Font Data

Byte	15 (MSB) 8	7 (LSB) 0
x + 0	First segment, Segment Identifier	
x + 2	First segment, Segment Size	
x + 4 . . .	First segment, Data Segment . . .	
x + 4 + 1st seg size	Second segment: Segment identifier, Size, Data Segment . . .	
. . .	. . .	
# - 6	Null Segment Identifier (FFFF - hex)	
# - 4	Null Segment Size (0)	
# - 2	Reserved (0)	Checksum
x = Font Descriptor Size # = Font header length (as defined in the Font Header command).		

Table 2-12. Format 16 Segmented Font Data

Byte	15 (MSB) 8	7 (LSB) 0
x + 0	First segment, Segment Identifier	
x + 2 x + 4	First segment, Segment Size	
x + 6 . . .	First segment, Data Segment . . .	
x + 6 + 1st seg size	Second segment: Segment identifier, Size, Data Segment . . .	
. . .	. . .	
# - 8	Null Segment Identifier (FFFF - hex)	
# - 6 # - 4	Null Segment Size (0)	
# - 2	Reserved (0)	Checksum
x = Font Descriptor Size # = Font header length (as defined in Font Header command).		

The Segment Size field, which is part of each segment within the Segmented Font Data, was changed from an unsigned integer in Format 15 to an unsigned long integer in Format 16. This allows segments to be up to 2^{32}– 1 bytes long.

Font Header Format 15 is described in more detail in the *PCL 5 Printer Language Technical Reference Manual* in the "Soft Font Creation" chapter.

Format 16 supports new segments and new values for the Font Type and Font Scaling Technology fields. New segments which are specific to large TrueType fonts are described in this chapter in the section titled "HP LaserJet 4PJ printer." (This information will included be in future versions of the *PCL 5 Printer Language Technical Reference Manual*.) The new segments and values which are specific to bitmap fonts are described below.

Header Format

The Header Format byte identifies the font header format. For large fonts, this field should be set to 16. Note that Format 15 does not support bitmap fonts.

Scale Factor

For bitmap fonts, set this field to 0.

Master Underline Position

For bitmap fonts, set this field to 0.

Master Underline Thickness

For bitmap fonts, set this field to 0.

Font Scaling Technology

For bitmap fonts, set this field to 254.

Variety

For bitmap fonts, set this field to 0.

The remaining fields should be set the same as in the Format 0 Font Header for PCL Bitmapped Fonts, with the following exceptions:

Font Type

Font type describes the font's relation to symbol sets. For Format 16 bitmap fonts, set this field to 3. A value of 3 is used to identify a large (16-bit) font. All character codes 0 to 65534 are printable, except 0, 7 to 15, and 27 [decimal]. Access to those codes which are unprintable, yet have a character defined, requires the use of the Transparent Print Data command. In older font header formats, PCL 5 LaserJet printers use this field to determine the first and last codes of the symbol set.

First Code

For Format 16 bitmap fonts, set this field to the first printable character in the font. In older bitmap font formats, PCL 5 LaserJet printers ignore this field.

Last Code

For Format 16 bitmap fonts, set this field to the last printable character in the font. In older bitmap font formats, PCL 5 LaserJet printers ignore this field.

One new data segment is defined for Format 16 bitmap fonts:

Bitmap Resolution Data Segment

The bitmap resolution data segment is used to define the x-resolution and y-resolution for the bitmap. This segment is required for Format 16 bitmap fonts.

The structure for the bitmap segment is shown in Table 2-13.

Table 2-13. Bitmap Resolution Data Segment

Byte	15 (MSB) 8	7 (LSB) 0
x + 0	Segment Identifier ('BR')	
x + 2 x + 4	Segment Size (4)	
x + 6	X Resolution	
x + 8	Y Resolution	

The decimal equivalent for the 'BR' mneumonic is 16978.

X Resolution (unsigned long integer)

This fields specifies the resolution of the font in the X dimension in dots per inch.

Y Resolution (unsigned long integer)

This fields specifies the resolution of the font in the Y dimension in dots per inch.

If the specified combination is not supported by the printer, the font will be invalidated. In the HP LaserJet 4V, supported combinations are (X Resolution=300,Y Resolution=300) and (X Resolution=600,Y Resolution=600).

Character Definition

The Character Descriptor and Data command ($^{E}_{C}$(s # W [character descriptor and data]) is used to download character data blocks to the printer. Format 4 is used to download character descriptors and data for bitmap characters. This command is described in detail in the *PCL 5 Printer Language Technical Reference Manual*.

Limitations

The following limitations apply to Format 16 Font Headers for bitmap fonts:

- The Font Type field for Format 16 bitmap fonts must be set to 3. This is the case for 1-byte as well as 2-byte bitmap fonts. First Code and Last Code fields need to be set.
- Format 16 optional data segments are ignored for bitmap fonts. These include the galley character segment, vertical substitution character segment, typeface string segment, and vertical rotation segment.
- Vertical rotated printing (character text path direction command, Ec&c-1T) is not available for bitmap fonts.

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 5961-0940). 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 HP LaserJet 4L section of this chapter and also in the *PCL 5 Color Technical Reference Manual*.

Table 2-14. 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.

Table 2-14. PCL Feature Additions for HP Color LaserJet Printer (continued)

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 HP 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 HP 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 LaserJet 4LJ Pro Printer

The HP LaserJet 4LJ Pro printer (C3935), released in May 1995, is designed primarily for the Japanese market. This printer provides a print resolution of 600 dpi, has a maximum print speed of 4ppm, 2Mb of internal base memory, and improved font cache algorithm. PCL operation for this printer is identical to that of the HP LaserJet 4PJ printer. For command support, refer to Table 1-1, PCL Feature Support Matrix and to the "HP LaserJet 4PJ Printer" section earlier in this chapter.

The HP LaserJet 4LJ Pro printer contains the same two Japanese typefaces, MS Mincho and MS Gothic (and WIN3.1J symbol set), as those in the HP LaserJet 4PJ printer. (The HP LaserJet 4PJ and the 4LJ Pro printers have a reduced set of Intellifont fonts from that of the standard HP LaserJet 4 printer family.) For detailed font information refer to Chapter 3.

HP LaserJet 4LC Printer

The HP LaserJet 4LC printer (C3932), released in March 1995, is designed primarily for the Chinese market. This printer provides a print resolution of 600 dpi, has a maximum print speed of 4 ppm, 2Mb of internal base memory, and improved font cache algorithm. PCL operation for this printer is identical to that of the LaserJet 4PJ printer. For specific PCL command support information, refer to Table 1-1, PCL Feature Support Matrix.

The HP LaserJet 4LC printer contains three new Chinese typefaces, SimSun, SimHei, and GW-Kai (and a new symbol set for these fonts, GB2312). The default typeface is SimSun and the default symbol set is GB2312. (The HP LaserJet 4LC printer contains the standard set of Intellifont fonts, unlike the HP LaserJet 4PJ and 4LJ Pro printers which have reduced Intellifont typeface sets.) Refer to Chapter 3 for detailed font information.

The typeface/font information, described in the "HP LaserJet 4PJ Printer" section earlier in this chapter for the

Japanese typefaces, also applies to the LaserJet 4LC printer's Chinese typefaces with the following differences. The default values for the Text Parsing Method command are different for the HP LaserJet 4LC. These default values are 0 or 38 (provided the default symbol set is GB2312, otherwise it is 0). Also, the examples in this section can be used for the Chinese fonts, provided the symbol set value field in the Symbol Set command is changed to 18C (for the GB2312 symbol set) and the typeface value in the font selection command string is changed to one of the Chinese fonts [for example, the Japanese font selection command Ec(19KEc(s1p10v1s4b2852T should be changed to Ec(18CEc(s1p10v1s4b37058T].

HP LaserJet 5P and 5MP Printers

The HP LaserJet 5P and 5MP printers were released March 6, 1995. These printers are similar to the HP LaserJet 4P printer except that they are designed to run faster, have an MP paper tray in place of the manual feed slot, and have a reduced control panel similar to the HP LaserJet 4L printer. The HP LaserJet 5P / 5MP printer's maximum print speed is 6 pages per minute (HP LaserJet 4P runs at 4 ppm) and has a print resolution of 600 dpi.

Another new feature on this printer is an IrDA-compliant infrared serial I/O port located on the front of the printer.

PCL operation is almost identical to that of the HP LaserJet 4 Plus printer. (Refer to Table 1-1, HP LaserJet Printer Feature Comparison, for the specific PCL implementation.)

HP LaserJet 5L Printer

The HP LaserJet 5L printer, introduced in September 1995, is much different in appearance than the LaserJet 4L printer, but it has a very similar feature set, including the same set of 26 internal typefaces. One of the main differences is that the LaserJet 5L printer offers 600 dpi printing. Although both printers have a print engine speed of 4 pages per minute, the LaserJet 5L printer has faster processing which increases performance. As the LaserJet 4L printer, the printer has a reduced-function control panel.

The HP LaserJet 5L printer has a vertical design and supports all paper sizes supported by the LaserJet 4L printer. In addition, the “custom” paper size is supported through the printer driver.

The default symbol set is PC-8 instead of Roman-8.

Manual feed operation is slightly different for the HP LaserJet 5L printer. When manual feed is selected, the printer pauses and waits for the user to insert the correct media into the printer (either in the paper input bin or the single sheet input slot) and press the control panel key.

PCL and PJL operation is almost identical to that of the HP LaserJet 4L printer. Two differences are that the LaserJet 5L printer adds support for the logical operations and pixel placement commands. These features are described in this chapter in the LaserJet 4ML section. (Refer to Table 1-1, HP LaserJet Printer Feature Comparison, for the specific PCL implementation.)

HP LaserJet 5Si and 5SiMx Printers

HP LaserJet 5Si and 5SiMx printers are designed for using in shared printing environments. The HP LaserJet 5SiMx printer is equivalent to the HP LaserJet 5Si printer, but also includes PostScript Level 2, 8 Mb of additional memory, and the HP JetDirect network interface card.

HP LaserJet 5Si and 5SiMx printers have features similar to those of HP LaserJet 4Si and 4SiMx printers, with improved performance and extra paper handling features. Some of the feature differences are listed below.

- The printers include the same set of internal fonts, but there are no font cartridge slots on the printers. Both printers support font/macro SIMMs and downloaded soft fonts and macros.
- The default symbol set is PC-8 instead of Roman-8.
- Additional paper and envelope sizes are supported, including ledger (11" x 17"). Executive size paper is only supported by the MP tray.
- There is no job offset mechanism in the printers.
- HP LaserJet 5Si and 5SiMx printers do not request the envelope size every time the power is cycled. It is assumed that the size does not usually change between power down and power up.
- Base HP LaserJet 5Si and 5SiMx printers have one 100-sheet multi-purpose tray (Tray 1), and two 500-sheet universal-input trays. Optional paper handling devices include a duplex unit, a power envelope feeder, a 2000-sheet input tray and a multi-bin mailbox.
- HP LaserJet 4Si and 4SiMx printers used “tray locking” to prevent automatic selection of a paper tray. HP LaserJet 5Si and 5SiMx printers accomplish “tray locking” using the Alphanumeric ID command to select the paper tray by media type.

Table 2-15 lists the PCL feature additions for HP LaserJet 5Si and 5SiMx printers.

Table 2-15. PCL Feature Additions for HP LaserJet 5Si/5SiMx Printers

Feature	Status	Comments
Paper (Media) Source	Modified	Additional parameters have been added to provide support for Tray 1, the printer's right side multi-purpose tray and the other optional trays (see the description of this command in the following paragraphs).
Output Bin	Modified	The Output Bin command (Ec&l#G) selects the destination bin for the print job.
Alphanumeric ID	New	Specifies alphanumeric String IDs for selecting and manipulating fonts, macros, and media types. Specifies media selection by the type of media and supports enhancements for the printer disk drive.

Descriptions of the *Paper (Media) Source*, *Output Bin, and Alphanumeric ID* commands are provided below.

Paper (Media) Source Command

The Paper (Media) Source command selects the specified input media source. Parameters have been added to enable printing from the LaserJet 5Si/5SiMx printer trays.

Ec**&l#H**

= **0** - Print current page (source is unchanged)

1 - Tray 2 (upper drawer)

2 - Manual feed (tray 1, right side tray)

3 - Manual envelope feed (tray 1, right tray)

4 - Tray 3 (lower drawer)

5 - High Capacity Input (HCI), first tray

6 - Optional envelope feeder

7 - Autoselect

8 - Tray 1 (right side tray)

20 - 39 - High Capacity Input (HCI) trays 2- 21

Default = 7

Range = 0 to 8, 20 - 39

The following table compares the paper/media source values and the trays they select on various printers.

Value (#)	LaserJet 4, 4 Plus, 4V	LaserJet 4Si/4SiMx	LaserJet 5Si/ 5SiMx
1	PC Tray	Upper Cassette	Tray 2 (upper drawer)
2, 3 (manual feed)	MP Tray	Manual Feed Slot	Tray 1 (right side, manual feed)
4	MP Tray as Cassette	Lower Cassette	Tray 3 (lower drawer)
5	LC Tray		First Tray of HCI
8	N/A	N/A	Tray 1 (right side, normal)

Output Bin Command

This command selects the destination bin into which the print job is output when printed.

^E_C**&l#G**

= **0** - Automatic selection

1 - Selects bin #1 (printer top/face-down bin)

2 - Selects bin #2 (printer left/face-up bin; this bin not available when the High Capacity Output (HCO) is attached)

3 - Selects bin #3 (HCO face up bin)

4 - Selects bin #4 (HCO #1 face down bin)

5 - Selects bin #5 (HCO #2 face down bin)

6 - Selects bin #6 (HCO #3 face down bin)

7 - Selects bin #7 (HCO #4 face down bin)

8 - Selects bin #8 (HCO #5 face down bin)

9 - Selects bin #9 (HCO #6 face down bin)

10 - Selects bin #10 (HCO #7 face down bin)

11 - Selects bin #11 (HCO #8 face down bin)

Default = 0

Range = 0 to 11

Note

The Output Bin command is not recommended. Instead, it is preferred that the PJL OUTBIN command be used to set the default media destination.

Alphanumeric ID Command

The Alphanumeric ID command performs several different functions depending on the *operation* specified. This command:

- Specifies the type of print media on which to print a job (rather than specifying its location)
- Specifies an ID string for different PCL objects (fonts and macros)
- Supports the mass storage PCL enhancements for the LaserJet 5Si/5SiMx printer disk (allowing, for example, downloading a font with a String ID to RAM— downloading to the printer disk must be done using PJL)

The format of the Alphanumeric ID command is as follows:

Esc**&n#W**[*Operation*][*String ID*]

= Number of bytes of String ID data

Default = 0

Range = 2 to 512

The value field (#) identifies the number of bytes in the String ID.

The *Operation* byte determines the type of operation and the type of object on which the operation is to be performed. The operations are listed in the table below.

The *String ID* begins with the second byte and can be up to 511 characters long.

Operation	Description
0	**Sets the current Font ID to the given String ID.** This operation allows the user to set the current PCL Font ID to a string name, which gives the user the ability to download fonts to a string name. If the current Font ID has been set with both the Alphanumeric ID command and the Font ID command (Ec*c#D), the ID last sent takes precedence. For example, if the current font ID was set to 10 and then to "Font1", the current font ID would be "Font1".
1	**Associates the current Font ID to the font with the String ID supplied.** This operation finds the font with the supplied String ID and assigns the current Font ID to that font so that the font now has two names. The original font name is used to perform font management commands on the font, and the new associated name is used when selecting the font for usage. Note that since fonts with string names can be associated to numeric Font IDs, these fonts are selectable in HP-GL/2 using the numeric Font ID.
2	**Selects the font referred to by the String ID as primary.** This operation finds the associated font using the supplied String ID and specifies that font as the current primary font. The command is ignored if there is no font with that String ID.
3	**Selects the font referred to by the String ID as secondary.** This operation functions the same as the primary font specification (operation number 2), however this command specifies the font as secondary.
4	**Sets the current Macro ID to the String ID.** This operation allows the user to set the current PCL Macro ID to a String ID name. If the current Macro ID has been set with both the Alphanumeric ID command and the Macro ID command (Ec&f#Y), the ID last sent takes precedence. For example, if the current Macro ID was set to 10 and then to "Macro1", the current macro ID would be "Macro1".
5	**Associates the current Macro ID to the supplied String ID.** This operation finds the macro with the supplied String ID and assigns the current Macro ID to that macro. This macro then has two names. The original Macro ID name is used to perform macro management commands on the macro, and the new associated name is used when executing, calling, or overlaying the macro.
20	**Deletes the font association named by the current Font ID.** The font must have been associated with an alphanumeric Font ID (using operation 0). No String ID is supplied (Ec&n1W20). This command removes the alphanumeric font name association, however the disk resource itself is not changed.

Operation	Description
21	**Deletes the macro association named by the current Macro ID.** The macro must have been associated with an alphanumeric Macro ID (using operation 4). No String ID is supplied (Ec&n1W21). This command removes the alphanumeric macro name association, however the disk resource itself is not changed.
100	**Media select (see media selection table).** Media types are specified using the printer control panel. The following table indicates which media type and paper size is used in the various media-select situations.

Note PCL objects stored on the printer disk cannot be deleted, set to temporary, set to permanent, or modified in any way using the PCL language.

Media Type	Paper Size	Paper Source	Size/Type Used
Not specified	Not specified	Not specified	Default size Default type
Not specified	Not specified	Specified (not manual feed)	Default size Type configured in specified tray
Not specified	Not specified	Specified (manual feed)	Manual feed request Default size
Not specified	Specified	Not specified	Specified size Default type
Not specified	Specified	Specified (not manual feed)	Specified size Type configured in specified tray
Not specified	Specified	Specified (manual feed)	Manual feed request Specified size
Specified	Not specified	Not specified	Default size Specified type
Specified	Not specified	Specified (not manual feed)	Default size Specified type
Specified	Not specified	Specified (manual feed)	Manual feed request Default size Specified type
Specified	Specified	Not specified	Specified size Specified type
Specified	Specified	Specified (not manual feed)	Specified size Specified type
Specified	Specified	Specified (manual feed)	Manual feed request Specified size Specified type

A paper source is considered to be not specified when a Media Source command has not been received or when the media source is set to autoselect (value 7). The media type is considered to be not specified when an Alphanumeric ID command for media type (value 100) has not been received.

Selecting the default media type causes the printer to consider the media type as not specified.

Selecting an undefined or unavailable ID causes the printer to generate a manual feed request.

Example: Using the Alphanumeric ID Command to Download a Font

Fonts can be downloaded to the printer disk using PJL, or using PCL you can download a font with a String ID to RAM. The following example demonstrates downloading a font to a string name using PCL.

Set the alphanumeric font ID to “TTFont1”

^EC&n8W0TTFont1

Download the font. It is assigned the String ID “TTFont1”

^ECsW[data]

Example: Using a Font with a String ID

When the user wants to use a font with a String ID, the user must first associate that font with a new Font ID number. This association is required so that whether the font is on disk or RAM, the procedure is the same.

Set the current Font ID to “AssociatedFontID”

^EC&n17W0AssociatedFontID

Find the font with ID “UnivRomanID” on disk or in RAM and give it the associated ID of “AssociatedFontID”

^EC&n12W1UnivRomanID

Set the current Font ID to 10

^EC*c10D

Find the font with String ID “TimesRmID” on disk or in RAM and give it the associated Font ID of 10

^EC&n10W1TimesRmID

Set the current secondary font to the font with a Font ID of 10 (which in this case, is an associated font)

^EC)10X

Specify the current font as primary using the alphanumeric ID command

$^{E}_{C}$&n17W2AssociatedFontID

Delete the name “AssociatedFontID” from the PCL database

$^{E}_{C}$&n17W0AssociatedFontID

$^{E}_{C}$&n1W20

Reset the printer. Resetting deletes all font and macro associations.

$^{E}_{C}$E

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 2-16. 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 (Ec%-1B), for using the current PCL coordinate system/previous HP-GL/2 pen position (Ec%2B), and for using the current PCL coordinate system/current PCL CAP (Ec%3B).
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 (Ec*t#H), Destination Raster Height (Ec*t#V), Scale Algorithm (Ec*t#K); 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.)
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:

- Unit of Measure (Ec&u#D)
- Status Readback (Ec*s#X, Ec*s#U, Ec*s#M, Ec*s#T, Ec*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 (Ec*m#W).

Enter HP-GL/2 Mode Command

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 (Ec%-1B), and the other two affect the coordinate system and pen position when switching into HP-GL/2 (Ec%2B and Ec%3B).

Ec%#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 (Ec*r#A), Reset (EcE), UEL command (Ec%-12345X), or power-on.

In stand-alone plotter mode (Ec%–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 Command

This command sets the print mode required for printing on various media types.

Esc**&l#M**

= **0** - Plain paper

1 - Bond paper

2 - Special paper

3 - Glossy film

4 - Transparency film

Default = 0

Range = 0 to 4

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

When transparency media is loaded, the printer automatically adjusts the media type to Transparency and the print quality to Presentation Graphics, regardless of the language or remote-panel selection.

The Media Type and Print Quality commands always override remote control panel settings if the printer detects a different type of media than was requested. It may override these commands and the remote control panel settings.

Note This command may override the remote panel. HP recommends programmatically setting media type, especially in network environments.

Print Quality Command

This command determines print quality and speed.

$^{E}_{C}$***o#Q**

= **-1** - EconoFast

0 - Normal quality

1 - Best/Presentation graphics

Default = 0

Range = -1, 0, 1

EconoFast prints black text at 300 dpi. When transparency or glossy media is loaded, the printer automatically adjusts the media type to Transparency and the print quality to Presentation graphics, regardless of the language or remote-panel selection.

The Media Type and Print Quality commands always override remote control panel settings if the printer detects a different type of media than was requested. It may override these commands and the remote control panel settings.

Note

This command must be sent at the beginning of the page before any printable data; otherwise, when the command is received, the current page is closed and printed.

Negative Motion Command

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

Esc**&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 Esc&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.

HP DeskJet 1600C Printer

The DeskJet 1600C printer is a follow-on to the DeskJet 1200C. It has 600 x 600 dpi black text resolution (plus TES, which is similar to RET) and 300-dpi color resolution. Like the 1200C, the DeskJet 1600C is font- and language-compatible with the latest LaserJet 4 series printers. The DeskJet 1200C and 1600C contain most of the same PCL 5 color features as the Color LaserJet (described in the *PCL 5 Color Technical Reference Manual*), with some exceptions and additions (see Table 1-1). DeskJet 1200C and 1600C drivers should work on the Color LaserJet, but not vice versa. Changes from the DeskJet 1200C are listed below.

Table 2-17. PCL Feature Additions for the HP DeskJet 1600C Printer

Feature	Status	Comments
Raster Resolution	Modified	200 and 600 dpi are supported.
Enter HP-GL/2 Mode	Modified	HP-GL/2 standalone mode (-1) is not supported.
Compression Method	Modified	Method 9, replacement delta row is added.
Unit of Measure	New	Same as LaserJet 4 series printers.
Paper Source	Modified	Autoselect (7) is added.
HP-GL/2 in PCL macros	New	HP-GL/2 commands may appear in PCL macros.
Noise Dither*	Modified	Noise ordered dither (13) and monochrome noise ordered dither (14) are added.
Downloaded dither Matrix*	Modified	The full 16-bit range for height and width is allowed.
Two-Byte Fonts*	New	Font header format 16 two-byte font downloading.
Text Parsing Method*	New	Same as LaserJet 4PJ printer.

* Also on "B" and "C" versions of the DeskJet 1200C.

Additional features include:

- **Simplified Control Panel.** The IEEE-P1284 ECP port described below allows front-panel simplification and the elimination of DIP switches. The DeskJet 1600C control panel is similar to that of the LaserJet 4L, with one button and four LED indicators.

- **IEEE-P1284.** This bi-directional enhanced capability port (ECP) allows most printer features to be monitored and controlled through Microsoft Windows or a DOS remote control panel shipped with the product. In previous HP printers, PJL provided some job-level status and control, but PJL is embedded in the data stream, synchronous with the printer description data. With the implementation if MLC (Multiple Logical Channels) on the ECP and MIO 6.0, the printer can be controlled and monitored on a separate channel, asynchronous to the data stream. PJL still provides control that must be synchronous with the data stream.
- **Energy Star.** The printer lowers its power consumption if it has not been used for 15 minutes.
- **Out-of-Ink Sensing.** An LED on the control panel lights when a pen runs out of ink.
- **MIO.** Modular I/O interface with auto-sensing I/O configuration.
- **JetDirect.** Optional network cards: Novell, TCP-IP, LocalTalk, EtherTalk, and third party.
- **PostScript.** A SIMM upgrade is available.
- **Optional Media Source.** An optional sheet feeder tray is available.
- **Media Detection.** Automatic detection of media size and media type (transparency).

- **PJL.** Unlike the DeskJet 1200C, which implemented only the PJL kernel, the DeskJet 1600C printer supports all of the PJL commands listed below. Full PJL implementation is not needed because of the multiple-channel capability of the IEEE-P1284 Extended Capabilities Port. DeskJet 1600C also supports page protection with the @PJL SET PAGEPROTECT command.

COMMENT	INQUIRE
DEFAULT	JOB
ECHO	RESET
ENTER	SET
EOJ	UEL

- **Print Modes.** The DeskJet 1600C has the following user-selectable print modes:

  EconoFast. The primary goal is cost per copy. The secondary goal is high speed.

  Presentation Graphics. Best quality graphics.

  Normal. Equal emphasis on quality and throughput. Best mode for most uses, minimizing the need to switch to other modes.

Media Source Command

The Paper (Media) Source command (Ec&l#H) for the DeskJet 1600C uses a value of 5 for its optional sheet feeder and also supports a value of 7 (autoselect). A value of 7 selects the current printer default source. The user, through the application, may select a particular tray for the first page or pages (for example, a fancy cover page), then choose autoselect to pull paper from a default tray (for example, containing standard paper). This is different than option 0, which continues printing from the currently selected source. The "default" source may be user-selected, or based upon the printer's own algorithm.

Compression Method Command

The Compression Method command (Ec*b#M) for the DeskJet 1600C supports Method 9 compression (compressed replacement delta row encoding) in addition to compression methods 0, 1, 2, 3, and 5.

Method 9 (Replacement Delta Row Encoding)

Like Method 3, this method replaces only bytes in the current row that differ from the preceding (seed) row. Unlike Method 3, the replacement (delta) bytes may be encoded.

The replacement byte string (delta compression string) consists of a command byte, optional offset bytes, optional replacement count bytes, and the replacement data.

Command Byte	Optional Offset Bytes	Optional Replacement Count Bytes	Data Bytes

The command byte itself has three parts:

Control Bit	Offset Count	Replacement Count

- **Control Bit.** Determines whether the replacement data is compressed, and also the bit boundaries of the command byte's other two fields.
- **Offset Count.** The left offset (number of bytes) the replacement data is offset from the current byte position in the seed row.
- **Replacement Count.** The number of consecutive bytes to be replaced. One more byte than the replacement count is replaced (for example, 6 bytes are replaced by a replacement count of 5).

Like compression method 3, the "current" byte follows the last replacement byte; at the beginning of a row, the current byte immediately follows left raster margin. An offset of 0 indicates the current byte; an offset of 1 indicates the byte following the current byte.

The size of the offset count and replacement count fields depends on the value of the control bit.

CONTROL BIT = 0

7	6 3	2 0
Control Bit = 0	Offset Count	Replacement Count

If the control bit is 0, the replacement data is uncompressed. If the control bit is 0, bits 0-2 indicate the replacement count and bits 3-6 indicate the offset count.

If the offset count is 15, an additional offset count byte follows and is added to the total offset count. If the offset count byte is 255, another offset count byte follows. The last offset count byte is indicated by a value less than 255.

If the replacement count is 7, an additional replacement count byte follows and is added to the total replacement

count. If the replacement count byte is 255, another replacement count byte follows. The last replacement count byte is indicated by a value less than 255. One more than the total replacement byte count will be replaced.

CONTROL BIT = 1

7	6 5	4 0
Control Bit = 1	Offset Count	Replacement Count

If the control bit is 1, the replacement data is run length encoded. the bit boundaries are different than if the control bit is 0: bits 5-6 contain the offset count, and bits 0-4 contain the replacement count. As when the control bit is 0, optional offset bytes and replacement bytes may be added.

HP LaserJet 5 and 5M Printers

HP LaserJet 5 and 5M printers are performance-enhanced follow-on products for HP LaserJet 4 Plus and 4M Plus printers, respectively. The enhanced PCL 5 printer language in these printers include all of the PCL 5 features supported by HP LaserJet 4 Plus and 4M Plus printers as well as the features listed in Table 2-18.

Table 2-18. PCL Feature Modifications for HP Color LaserJet 5 and 5M Printers

Feature	Status	Comments
Character Text Path Direction Command	Modified	A new algorithm decides whether or not to counter-rotate characters when using the vertical rotated printing mode.
Text Parsing Method Command	Modified	The default text parsing method is based on the font type and symbol set fields in the default font.
Label Mode (LM) Command	New	HP-GL/2 support for 2-byte applications.

Text Parsing

When 2-byte text parsing methods were introduced in HP LaserJets (from LaserJet 4PJ on), the default text parsing method was based on the default symbol set. For example, if a user selected Roman-8 as the default symbol set (via the control panel or a PJL command), then 1-byte text parsing was the default method. If they selected WINJ-DBCS as the default symbol set, Shift-JIS text parsing was the default method.

HP LaserJet printers (from LaserJet 5 and 5M on) now base the default text parsing method on the font type and symbol set fields in the default font. If the default font is a 16-bit font, the default text parsing method is set to one that matches the symbol set field. In all other cases, the default text parsing method is set to 1-byte text parsing.

Two-Byte HP-GL/2 Support

One-byte applications (which support non-orthogonal rotation, scaling, and shearing of text) have long been able to use HP-GL/2 to print to HP LaserJet printers. Two-byte applications have not had this capability until the introduction of HP LaserJet 5 and 5M printers.

The capability of 2-byte applications (which support non-orthogonal rotation, scaling, and shearing of text) to print to HP LaserJet printers using HP-GL/2 is provided by the Label Mode (LM) command.

Label Mode Command

Determines how the Label (LB) and Symbol Mode (SM) commands interpret characters. Used for printing a 2-byte character set such as WinJ-DBCS, GB2312, or Big-5.

Syntax:

LM*(mode,[row number]:)*

Parameter	Format	Functional Range	Default
mode	clamped integer	0, 1, 2, or 3	0 (8-bitmode)
row number	clamped integer	0 to 255	0

Comments:

- **MODE.** Determines the interpretation mode as follows:

  0 Interprets each byte as a character (8-bit mode where the default row_number equals "0"). Computed character code is equal to (row_number * 256) + 8-bit code sent in LB or SM command.

  1 Interprets the next two bytes as a character (16-bit mode). LB and SM commands will read two bytes to form one 2-byte character code equal to (first_byte * 256) + second_byte. Label terminator and 8-bit control codes must be preceded by a NULL byte. To turn symbol mode off while in 16-bit mode, you must send SM<NULL>; where NULL is ASCII or decimal 0.

  2 Same logic as mode 0, except that vertical substitutes are used if found in a VT segment of the current font. Characters are rotated counter clock-wise to match the vertical-rotated printing mode of the Character Text Path Direction command. Default row_number equals "0".

  3 Same input logic as mode 1, except that vertical substitutes are used if found in a VT segment of the current font. Full width characters are rotated counter clock-wise to match the vertical-rotated printing mode of the Character Text Path Direction command.

- **Row Number.** Used only in modes 0 and 2 (8-bit modes) when a 16-bit character set is selected. The row number indicates the first byte while the LB or SM instruction will supply the second byte.

  For example, if you send *LMO,37*, and you have selected a 16-bit character set, sending *LBAB*<TERM> would result in the device printing characters 65 and 66 from row 37 of the character set grid.

  If you are using an 8-bit character set in 16-bit mode (modes 1 or 3), you must specify the first byte of each character as 0. All other first byte calues are treated as undefined characters.

Notes:

- When LM switches modes, it turns off symbol mode (executes SM;).
- LM affects the way SM and LB interpret bytes.
- LM does not affect the DT or DL commands.
- DT allows 8-bit terminator definitions only. To terminate a label in 16-bit mode, precede the current label terminator by the null character (decimal 0). The only exception is the ^CE (Reset) instruction in dual-context devices. ^CE is executed regardless of the byte boundaries within LB and SM.

Vertical Writing with Proportional Fonts

The Character Text Path Direction command was introduced with the HP LaserJet 4PJ printer to allow users to vertically rotate Asian fonts which were dual pitched. That is, the single-byte characters were half-width and the other characters were full-width.

An algorithm was implemented to determine whether or not to counter-rotate characters when using the vertical-rotated printing mode of the Character Text Path Direction command. A character is rotated if the glyph is full-width; otherwise, the character is not rotated.

Since the introduction of the LaserJet 4PJ, many vendors have produced proportional versions of their Asian fonts. Thus, the algorithm described above is no longer appropriate for determining character rotation.

A new method to explicitly enumerate which characters should be counter-rotated in the font is being introduced with HP LaserJet 5 and 5M printers. The new method consists of adding an optional font segment to Font Format 16. The optional segment, which is called the Vertical Exception (VE) segment, has the following form:

```
UBYTE[2] SEGMENT ID      = 'VE'
UBYTE Format             = 0
      (other values reserved)
UBYTE NumRanges          = N
UINT16 Range1FirstCode
UINT16 Range1LastCode
     •
     •
     •
UINT16 RangeNFirstCode
UINT16 RangeNLastCode
```

The new algorithm for deciding whether or not to counter-rotate characters (when using the Character Text Path Direction command's vertical-rotated printing mode) is as follows:

```
if (the current font contains a VE segment)
{
   if(the character code* is NOT contained in
      a VE range)
      rotate
   else
      don't rotate
}
else
      use the old logic
```

* The original character code, even if a galley character were substituted at some point.

Examples:

	Japanese ShiftJIS		Japanese Unicode		
Segment ID	V	E	V	E	
Format/NumRanges	0	1	0	2	
Range1FirstCode	0x0000		0x0000		half-width latin characters
Range1LastCode	0x00FF		0x007F		
Range2FirstCode			0xFF61		half-width katakana
Range2LastCode			0xFF9F		

HP Color LaserJet 5 and 5M Printers

HP Color LaserJet 5 and 5M printers use new HP Image Resolution Enhancement technology 1200 (HP Image REt 1200) to project outstanding text, graphics, and more vibrant colors than before.

The HP Color LaserJet 5M printer is network-ready with genuine Adobe PostScript Level 2 software, 36 Mbytes of memory, and an HP JetDirect card. The HP Color LaserJet 5 printer is upgradable so you can tailor it to suit the needs of your particular environment.

HP Color LaserJet 5 and 5M printers can use glossy paper or transparency film for special output.

Modifications to the PCL language for HP Color LaserJet 5 and 5M printers are summarized in the table below and are described in detail in the *PCL 5 Color Technical Reference Manual* (P/N 5961-0940):

Table 2-19. PCL Feature Modifications for HP Color LaserJet 5 and 5M Printers

Feature	Status	Comments
Render Algorithm Command	Modified	Five new algorithms have been added.
Configure Image Data Command	Modified	Has unique functionality while in PCL Imaging mode.
Download Dither Matrix Command	Support	Not supported.
Driver Configuration Command	Support	Do not support all features of the function_index argument.
Download Pattern Command	Modified	Restricts the width and height of a user pattern to less than 16384 pixels.
Scale Algorithm Command	Support	Not supported.
Font Cartridges	Support	Not supported. Customized fonts, if needed, can be utilized via SIMMs.

Render Algorithm Command

The Render Algorithm command selects the algorithm to be used for rendering page marking entities on a given page.

E_C***t#J**

= 0-14 - See section 4, “Modifying Output Color” in the *PCL 5 Color Technical Reference Manual* for information on algorithms 0 through 14.

15 - Continuous tone smooth 150 lpi

16 - Monochrome continuous tone detail 300 lpi

17 - Monochrome continuous tone smooth 150 lpi

18 - Continuous tone basic 100 lpi

19 - Monochrome continuous tone basic 100 lpi

Default = 3

Range = 0 to 19 (invalid values are ignored; values 1, 2, 9, and 10 are ignored for device-independent color)

HP Color LaserJet 5 and 5M printers remap non-continous tone render algorithms (3 - 14) into continuous tone smooth (15) and monochrome continuous tone smooth (17) algorithms.

HP LaserJet 6P/ 6MP Printers

The HP LaserJet 6P and 6MP printers are similar to the LaserJet 5P and 5MP printers, with the addition of higher performance and faster print speed (up to 8 ppm). The PCL 5 feature set is identical to the LaserJet 5P/5MP printers, with the exception that the LaserJet 6P/6MP printers support some additional paper sizes (A5, JIS B5, JIS B4, and Oufuku-Hagaki postcards).

The HP LaserJet 6MP printer also includes the Adobe PostScript Level 2 printer language with 35 additional built-in PostScript fonts.

HP LaserJet 5Si Mopier

The HP LaserJet 5Si Mopier combines the performance and network strengths of the LaserJet 5Si/5SiMx printers with the ability to print, collate, and staple multiple copies of a document. The LaserJet 5Si Mopier has the same PCL feature set as the LaserJet 5Si/5Si printers, but allows you to download a document just once and then print as many originals as you need.

Multiple-original printing (“mopying”) and stapling is accomplished using PJL commands. The application software, using PJL commands, determines to which output bin the printed copy will be delivered. If the stapling bin is selected, the job is automatically stapled.

Note

Multiple mopies are produced using the PJL SET QTY command. In order for the mopier to produce more than one original of a print job, the PCL *number of copies* command (Ec&l#X) must not be included in the data stream, since this command will limit the job to one copy or produce multiple uncollated copies.

See the *PJL Printer Job Language Technical Reference Manual* for a PJL example of printing to the mopier.

HP LaserJet 6L Printer

The HP LaserJet 6L printer looks like the LaserJet 5L printer and has an identical PCL feature set. At 6 pages-per-minute, it prints two more pages per minute than the LaserJet 5L, contains the same standard typefaces, and supports the same paper sizes. Like the LaserJet 5L, the LaserJet 6L printer does not have a control panel.

(Refer to Table 1-1, *HP LaserJet Printer Feature Comparison*, for the specific PCL implementation.)

HP LaserJet 4000 Series Printers

The HP LaserJet 4000 series printers are similar to the LaserJet 5/5M printers in their design and PCL feature set. They support a very similar set of paper sizes. (Refer to Table 1-1, HP LaserJet Printer Feature Comparison, for the specific PCL implementation.)

Selecting Media Type

Besides using the Media Type command (Ec&ℓ#M) to select a print media, with the LaserJet 4000 series printers you can also use the Alphanumeric ID command as follows:

Ec&n11W[*binary 100*][*name]*

where *name* is a media type string such as “Preprinted”

For example:

Ec&n6W[*binary 100*]Legal

selects the “Legal” media type.

For more information on the Alphanumeric ID command, see page 2-79.

3

Internal Typefaces/Fonts and Symbol Sets

Introduction

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 typefaces and their symbol sets.

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

Bitmap Fonts and Symbol Sets

Table 3-1 identifies the resident bitmap fonts for the printers. The supported symbol sets for these bitmap fonts are shown in Table 3-2. 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, 5L, and 6L printers do 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 and 1600C support the same fonts and symbol sets as the HP LaserJet 4 printer.

Table 3-2 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 section "Scalable Typefaces and Symbol Sets."

Table 3-1. Bitmap Fonts (All Fixed Pitch)

Typeface	Pitch/Point Treatment	Orientation	III, IIID, IIIP, IIISi	4, 4M, 4P, 4MP, 4Si, 4ML, 4PJ, 4LJ Pro, 4LC, 4Plus, 4M Plus, 4000 series, 4V, 4MV, 5P, 5MP, 6P, 6MP, 5Si, 5SiMx, 5Si Mopier, 5, 5M, Color LJ, Color LJ 5, Color LJ 5M, DJ 1200C, DJ 1600C	4L	5L 6L
Courier	10/12 Med	P & L	✓	nr	nr	nr
Courier	10/12 Italic	P	✓	nr	nr	nr
Courier	10/12 Bold	P & L	✓	nr	nr	nr
Courier	12/10 Med	P	✓	nr	nr	nr
Courier	12/10 Italic	P	✓	nr	nr	nr
Courier	12/10 Bold	P	✓	nr	nr	nr
Line Printer	16.67/8.5 Med	P & L	✓	✓	nr	nr

nr - not resident P - Portrait L - Landscape

Table 3-2. 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	ISO 8859/10 Latin 6[4]

[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 resident on HP LaserJet 4, 4M, 4Si, 4SiMx, 4L, 4ML, 4P, 4MP, 4PJ, 4 Plus, 4M Plus, 4V, 4MV, 4LJ Pro, 4LC, 4000 series, HP LaserJet 5 family, LaserJet 6 family, HP Color LaserJet family, and HP DeskJet 1200C and 1600C printers.

[3] The ISO Latin 2 and 5 symbol sets are not supported on HP LaserJet III family and HP LaserJet 4, 4M, 4Si, 4SiMx, 4L, HP DeskJet 1200C and 1600C printers.

[4] Resident on HP LaserJet 5, 5M, and 4000 series printers only.

Scalable Typefaces and Symbol Sets

Table 3-3 lists the internal scalable Intellifont typefaces resident in the various printers. Table 3-4 lists the TrueType typefaces. 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 3-5, 3-6, and 3-7. (A list of all of the assigned symbol set and typeface codes is provided in Tables B-1, B-2, and B-3.)

Table 3-3. Scalable Intellifont Typefaces

Typeface	Treatment	Typeface Number	III, IIID, IIIP	IIISi	5P, 5Si, 5SiMx, 5Si Mopier, 6P, 6MP, Color LJ, Color LJ 5/5M, DJ 1200C, DJ 1600C, LJ 4 family, 4000 series	4PJ 4LJ Pro	4L 5L 6L	4LC	5 5M
ITC Zapf Dingbats	Med	4141	nr	✓	nr	nr	nr	nr	nr
CG Times	Med, It, Bld, Bld It	4101	✓	✓	✓	nr	✓	✓	nr
Univers	Med, It, Bld, Bld It	4148	✓	✓	✓	nr	✓	✓	nr
Univers Cond	Med Cnd, It Cnd, Bld Cnd, Bld It Cnd	4148	nr	✓	✓	nr	✓	✓	nr
Courier	Med, It, Bld, Bld It	4099	nr	nr	✓	✓	✓	✓	nr
Letter Gothic	Med, It, Bld	4102	nr	nr	✓	nr	✓	✓	nr
Albertus	Med (semi-bold), Extra Bld	4362	nr	nr	✓	nr	✓	✓	nr
Antique Olive	Med, It, Bld	4168	nr	nr	✓	nr	✓	✓	nr
Clarendon Cond.	Bld Cnd	4140	nr	nr	✓	nr	nr	✓	nr
Coronet	Med It	4116	nr	nr	✓	nr	✓	✓	nr
Garamond	Antiqua (Med), Kursiv (It), Halbfett (Bd), Kursiv Halb	4197	nr	nr	✓	nr	nr	✓	nr
Marigold	Med	4297	nr	nr	✓	nr	nr	✓	nr
CG Omega	Med, It, Bld, Bld It	4113	nr	nr	✓	nr	nr	✓	nr
Wingdings	Med	6826	nr	nr	nr	nr	✓	nr	nr

✓ - resident in the printer nr - not resident in the printer

Table 3-4. Scalable TrueType Typefaces

Typeface	Treatment	Typeface Number	III, IIID, IIIP	IIISi	5P, 5Si, 5SiMx, 5Si Mopier, 6P, 6MP, Color LJ, Color LJ 5/5M, DJ 1200C, DJ 1600C, LJ 4 family	4PJ 4LJ Pro	4L 5L 6L	4LC	5, 5M, 4000 series
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	✓	✓
CG Times	Med, It, Bld, Bld It	4101	nr	nr	nr	nr	nr	nr	✓
Univers	Med, It, Bld, Bld It	4148	nr	nr	nr	nr	nr	nr	✓
Univers Cond	Med Cnd, It Cnd, Bld Cnd, Bld It Cnd	4148	nr	nr	nr	nr	nr	nr	✓
Courier	Med, It, Bld, Bld It	4099	nr	nr	nr	nr	nr	nr	✓
Letter Gothic	Med, It, Bld	4102	nr	nr	nr	nr	nr	nr	✓
Albertus	Med (semi-bold), Extra Bld	4362	nr	nr	nr	nr	nr	nr	✓
Antique Olive	Med, It, Bld	4168	nr	nr	nr	nr	nr	nr	✓
Clarendon Cond.	Bld Cnd	4140	nr	nr	nr	nr	nr	nr	✓
Coronet	Med It	4116	nr	nr	nr	nr	nr	nr	✓
Garamond	Antiqua (Med), Kursiv (It), Halbfett (Bd), Kursiv Halb	4197	nr	nr	nr	nr	nr	nr	✓
Marigold	Med	4297	nr	nr	nr	nr	nr	nr	✓
CG Omega	Med, It, Bld, Bld It	4113	nr	nr	nr	nr	nr	nr	✓
Wingdings	Med	6826	nr	nr	nr	nr	nr	nr	nr
MS Mincho	Med[1]	28752	nr	nr	nr	✓	nr	nr	nr
MS Gothic	Med[1]	28825	nr	nr	nr	✓	nr	nr	nr
SimSun	Med[1]	37058	nr	nr	nr	nr	nr	✓	nr
Sim Hei	Med[1]	37110	nr	nr	nr	nr	nr	✓	nr
GW-Kai	Med[1]	37357	nr	nr	nr	nr	nr	✓	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.

Table 3-5. Scalable Symbol Sets

Symbol Set[1]	Printer			
	III, IIID, IIIP	IIISi	LaserJet 4 / 5 / 6 Families, Color LaserJet Family, DeskJet 1200C & 1600C	4PJ 4LJ Pro 4LC
Roman-8	✓	✓	✓	✓
ISO 8859/1 Latin 1	✓	✓	✓	✓
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	✓

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

[1] PCL 5 printers 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 soon to be obsolete, are not recommended for future use, and are not resident on any DeskJet 1200C or DeskJet 1600C.

Table 3-5. Scalable Symbol Sets (continued)

Symbol Set[1]	HP LaserJet Printer					
	III, IIID, IIIP	IIISi	LaserJet 4/5 Families Color LaserJet Family, DeskJet 1200C & 1600C	4LC	6L	5, 5M, 4000 series, 6P, 6MP
PC-1004 (OS/2)	nr	nr	nr	nr	nr	✓
DeskTop	✓	✓	✓	✓	✓	✓
Ventura International[2]	✓	✓	✓	✓	✓	nr
PS Text	✓	✓	✓	✓	✓	✓
Ventura US[2]	✓	✓	✓	✓	✓	nr
Microsoft Publishing	✓	✓	✓	✓	✓	✓
Math-8	✓	✓	✓	✓	✓	✓
Ventura Math[2]	✓	✓	✓	✓	✓	nr
PS Math	✓	✓	✓	✓	✓	✓
Pi Font	✓	✓	✓	✓	✓	✓
Ventura ITC Zapf Dingbats[2]	nr	✓	nr	nr	nr	nr
PS ITC Zapf Dingbats	nr	✓	nr	nr	nr	nr
ITC Zapf Dingbats 100	nr	✓	nr	nr	nr	nr
ITC Zapf Dingbats 200	nr	✓	nr	nr	nr	nr
ITC Zapf Dingbats 300	nr	✓	nr	nr	nr	nr
ISO 8859-2 Latin 2	nr	nr	✓	✓	✓	✓
ISO 8859-9 Latin 5	nr	nr	✓	✓	✓	✓
ISO 8859-10 Latin 6	nr	nr	nr	nr	nr	✓
PC 852	nr	nr	✓	✓	✓	✓
PC 775	nr	nr	nr	nr	nr	✓
PC Turkish	nr	nr	✓	✓	✓	✓
MC Text	nr	nr	✓	✓	✓	✓
Windows 3.1 Latin 1	nr	nr	✓	✓	✓	✓
Windows 3.1 Latin 2	nr	nr	✓	✓	✓	✓
Windows 3.1 Latin 5	nr	nr	✓	✓	✓	✓
Windows Baltic (not 3.1)	nr	nr	nr	nr	nr	✓
Windows 3.0 Latin 1	✓	✓	✓	✓	✓	✓
Windows 3.1J (WIN3.1J)	nr	nr	✓[3]	nr	✓[3]	nr
GB2312	nr	nr	nr	✓	nr	nr
Symbol	nr	nr	✓[4]	✓	✓[4]	✓
Wingdings	nr	nr	✓[4]	✓	✓[4]	✓

✓ - Indicates a symbol set is supported. nr - Indicates a symbol set is not resident.

[1] PCL 5 printers 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 soon to be obsolete and are not recommended for future use.

[3] The Japanese Windows 3.1J symbol set is only resident in the LaserJet 4PJ, 4LJ Pro, and LaserJet 4V, 4MV, 5Si, 5SiMx, 5Si Mopier printers if ESC/P SIMM installed.

[4] The HP LaserJet 4L, 5L, and 6L printers do not support the Symbol symbol set.

Table 3-6. Intellifont Typeface Symbol Set Support

PCL Symbol Set ID	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 family, DeskJet 1200C, LaserJet 4/5 families except 4PJ, 4LJ Pro, 4000 series, 5, and 5M. Courier is the only Intellifont typeface family supported by the LaserJet 4PJ printer.

◆ Additional fonts supported by DeskJet 1200C,1600C (B,C revs.) & LaserJet 4/5/6 families except 4,4M,4Si,4SiMx,4PJ,4LJ Pro,4000 series, 5,5M.

Table 3-6. Intellifont Typeface Symbol Set Support (continued)

PCL Symbol Set ID	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	◆	◆	◆	◆	
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					▲

• Supported by all LaserJet 4 / 5 / 6 family printers except 4PJ, 4L, 5L, 6L, 4LJ Pro, 4000 series, 5, and 5M.

▲ Additional font supported by the HP LaserJet 4L, 5L, 6L, DeskJet 1200C (B and C revisions), and 1600C only.

◆ Additional fonts supported by LaserJet 4ML, 4P, 4MP, 4LJ Pro, 4 Plus, 4M Plus, 4V,4MV,4000 series, Color LJ, LaserJet 5/6 families except 5, 5M.

Table 3-7. TrueType Typeface Symbol Set Support

Scalable TrueType Typefaces								Bitmap Font
PCL Symbol Set ID	Symbol Set	Arial	Times New Roman	Wing-dings	Symbol	MS Mincho, MS Gothic	Sim Sun Sim Hei GW-Kai	Line Printer
8U	Roman-8	•	•					•
0N	ISO 8859-1 Latin 1 (was ECMA 94 Latin 1)	•	•					•
10U	PC-8	•	•					•
11U	PC-8 D/N	•	•					•
12U	PC-850	•	•					•
19U	Windows 3.1 Latin 1 (Microsoft “ANSI”)	•	•					
9J	PC-1004 (OS/2)	◆	◆					
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 “Windows”)	•	•					
12J	MC Text	•	•					
17U	PC-852	•	•					
26U	PC-775	◆	◆					
9T	PC-Turkish	•	•					
9E	Windows 3.1 Latin 2	•	•					
19L	Windows Baltic (not 3.1)	◆	◆					
5T	Windows 3.1 Latin 5	•	•					
2N	ISO 8859-2 Latin 2	•	•					▲

• Fonts supported by HP LaserJet 4, 4Si, 4ML, 4P, 4MP, 4PJ, 4Plus, 4M Plus, 4V, 4MV, 4LJ Pro, 4LC, 4000 series, 5P, 5Si, 5SiMx, 5Si Mopier, 5, 5M, 6P, 6MP, Color LaserJet, Color LaserJet 5, and 5M printers.

◆ Additional fonts supported by HP LaserJet 5, 5M, and 4000 series printers.

★ Not supported by HP LaserJet 5, 5M, and 4000 series printers as well as Ventura synbol sets.

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

▲ Fonts supported by HP LaserJet 4ML, 4P, 4MP, 4PJ, 4 Plus, 4M Plus, 4V, 4MV, 4000 series, 5Si, 5SiMx, 5Si Mopier, 5, 5M, 6P, 6MP, Color LaserJet, Color LaserJet 5, and 5M printers.

Table 3-7. TrueType Typeface Symbol Set Support (continued)

Scalable TrueType Typefaces								Bitmap Font
PCL Symbol Set ID	Symbol Set	Arial	Times New Roman	Wing-dings	Symbol	MS Mincho, MS Gothic	Sim Sun Sim Hei GW-Kai	Line Printer
5N	ISO 8859-9 Latin 5	•	•					▲
6N	ISO 8859-10 Latin 6	◆	◆					◆
8M	Math-8	◆	◆					
5M	PS Math	◆	◆					
6M	Ventura Math							
15U	Pi Font	◆	◆					
19M	Symbol				•			
579L	Wingdings			•				
19K	Japanese Windows 3.1J (WIN3.1J)					★		
19C	GB2312						•	

- • Fonts supported by HP LaserJet 4, 4Si, 4ML, 4P, 4MP, 4PJ, 4Plus, 4M Plus, 4V, 4MV, 4LJ Pro, 4LC, 4000 series, 5P, 5Si, 5SiMx, 5Si Mopier, 5, 5M, 6P, 6MP, Color LaserJet, Color LaserJet 5, and 5M printers.
- ▲ Fonts supported by HP LaserJet 4ML, 4P, 4MP, 4PJ, 4 Plus, 4M Plus, 4V, 4MV, 5Si, 5SiMx, 5Si Mopier, 6P, 6MP, Color LaserJet, Color LaserJet 5, and 5M printers.
- ◆ Additional fonts supported by HP LaserJet 5, 5M, and 4000 series printers.
- ★ Only for HP LaserJet 4PJ, 4LJ Pro, & 4V/4MV, 5Si/5SiMx and 5Si Mopier if ESC/P SIMM installed.

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 3-8.

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 3-8. 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.

4

Print Environment

Introduction

All of a printer's current feature settings are collectively referred to as a print environment. A PCL printer maintains four print environments: Factory Default Environment, User Default Environment, Modified Print, and Overlay Environment.

This chapter identifies the Factory Default Environment and User Default Environment. The Factory Default Environment, which is programmed into a printer at the factory, is listed in Table 4-1 for the PCL context and Table 4-2 for the HP-GL/2 context. The User Default Environment, which can be set from a printer's control panel, is listed in Table 4-3.

Note

If a feature setting is not supported on a printer (for example, 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 that feature setting. In the following tables, not all values are used for all printers. See Table 1-1 to identify supported values for a certain HP printer.

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

Table 4-1. Factory Default Environment — 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 (Media) Source	Paper Source (Printer Specific Large Source)
Media Destination	0 (Automatic Selection)
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

[1] User can select default values from the printer's Operator Control Panel for these feature settings.

[2] Selectable from the printer Operator Control Panel if duplex is selected.

[3] Used on HP LaserJet IIISi and 4Si printers only.

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

Table 4-1. Factory Default Environment — 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

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

[2] User can select default values from the printer's Operator Control Panel for these feature settings.

[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—only available on the LaserJet 4PJ, 4LJ Pro, and LaserJet 4V/4MV printers if the ESC/P SIMM is installed. If the default symbol set is GB2312, the value is 38; otherwise it is 0.

[6] For the LaserJet 4PJ and 4LJ Pro printers, 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. For the LaserJet 4LC printer, the default symbol set is GB2312, default typeface is Sim Sun, and the default spacing is proportional. For the LaserJet 5L, 5Si, 5SiMx, 6P, 6MP printers and the LaserJet 5Si Mopier, the default symbol set is PC-8.

Table 4-1. Factory Default Environment — 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 4-2. Factory Default Environment — 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 4-2. Factory Default Environment — 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 4-3 lists the User Default Environment. This print environment is stored in non-volatile RAM (NVRAM), which allows it to be retained in the event of a power cycle (except for the HP LaserJet 4L, 5L, and 6L printers, which do not contain NVRAM). In earlier printers without PJL, the feature settings contained in the User Default Environment were selectable through the control panel only. In newer printers with PJL, these feature settings can be set from either the control panel (if the printer has one) or through PJL or both.

The User Default Environment is reset to the Factory Default Environment upon a cold reset.

Table 4-3. User Default Environment

Menu Item	Range	III	IIID	IIISi	IIIP	4	4Si	4L	4ML, 4P, 4PJ, 4MP, 4LJ Pro, 4LC	4 Plus, 4M Plus, 5P, 5MP	4V, 4MV
Copies	1* through 99[1]	✓	✓	✓	✓	1-999	1-999	1-999	1-999	1-999	1-999
Orientation	Portrait*, Land.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Font Source	Internal*, Cartridge, Soft Fonts	✓	✓	✓	✓	✓[2]	✓[2]	✓✓	✓[2,3]	✓[2]	✓[2]
Font Number	0* (Courier) to n	✓	✓	✓	✓	✓	✓	✓	✓[7]	✓	✓
Pitch [4]	10.00* .44 - 99.99	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Point Size[5]	12.00* 4 - 999.75	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Symbol Set	Roman-8*	✓	✓	✓	✓	✓	✓	✓	✓[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	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Duplex	Off* (simplex),On	ns	✓	✓	ns	ns	✓	ns	ns	✓[8]	ns
Binding	Long-edge*, Short-edge	ns	✓[8]	✓[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	✓	✓	✓	✓
Print Density	1, 2, 3*, 4, 5	ns	ns	ns	ns	ns	ns	✓	✓	✓	✓
EconoMode	On, Off*	ns	ns	ns	ns	ns	ns	✓	✓	✓	✓
Resource Saving	On, Off*	ns	ns	ns	ns	ns	✓	ns	ns	On, Off, Auto*	On, Off, Auto*

✓ - Supported * - Default value (see Chapter 3 for list) ns - Not Supported

[1] PCL range is 1 through 32767

[2] SIMMs also available

[3] The HP 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 and 4LJ Pro, WIN3.1J is the default symbol set and MS Mincho is default typeface; for the LaserJet 4LC, GB2312 is the default symbol set and SimSun is the 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/4MV also supports JIS B5, JIS B4, JPOST, JPOSTD, Commercial B5, and Custom (11.7" x 17.7").

Table 4-3. User Default Environment (continued)

Menu Item	Range	5L 6L	5, 5M 6P, 6MP	5Si 5SiMx 5Si Mopier	Color LaserJet	DeskJet 1200C DeskJet 1600C
Copies	1* through 999[1]	✓	✓	✓	✓	✓
Orientation	Portrait*, Land.	✓	✓	✓	✓	✓
Font Source	Internal*, Cartridge, Soft Fonts	✓ (no cartridges)	✓ (no cartridges)	✓ (no cartridges)	✓	✓
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*	PC-8*	✓	PC-8*	✓	✓
Form/Lines Text[4]	60* 5 - 128	✓	✓	✓	✓	✓
Paper (Job) Size	Letter*, Legal,	plus A4, Executive, Envelopes (Com-10, Monarch, C5, DL, B5) Custom (3" x 5" – 8.5" x 14")	plus A4, A5, Executive, Envelopes (Com10, Monarch, C5, DL, B5) (6P/6MP also includes Custom, JISB5, JPOST, JPOSTD)	plus A4, Executive, A3, B4, B5, Ledger (11" x 17"), Envelopes (Com-10, Monarch, DL, C5, B5	plus A4, 11x17, A3, Executive, plus COM10, DL, C5 envelopes	
Manual Feed	Off*, On	✓	✓	✓	✓	✓
Duplex	Off* (simplex),On	ns	5/5M (option) 6P/6MP (ns)	✓	ns	ns
Binding	Long-edge*, Short-edge	ns	5/5M (w/ duplex option)	✓	ns	ns
Output Bin (Media Bin)	Upper*, Lower	ns	ns	✓	✓	ns
Resolution Enhancement	Medium*, Light, Dark, Off, On	On*, Off	✓	On*, Off	✓	✓
Print Density	1, 2, 3*, 4, 5	✓	✓	✓	✓	✓
EconoMode	On, Off*	✓	✓	✓	✓	✓
Resource Saving	On, Off*	ns	On, Off, Auto*	On, Off, Auto*	On, Off, Auto*	On, Off, Auto*

✓ - Supported * - Default value (see Chapter 2 for list) ns - Not Supported

[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

Table 4-3. User Default Environment (continued)

Menu Item	Range	4000 series
Copies	1* through 999[1]	✓
Orientation	Portrait*, Land.	✓
Font Source	Internal*, Cartridge, Soft Fonts	✓ (no cartridges)
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*	✓
Form/Lines Text[4]	60* 5 - 128	✓
Paper (Job) Size	Letter*, Legal,	plus A4, A5, B5, JIS-B5, Executive, Envelopes (Com10, Monarch, C5, DL, B5)
Manual Feed	Off*, On	✓
Duplex	Off* (simplex),On	option
Binding	Long-edge*, Short-edge	(w/ duplex option)
Output Bin (Media Bin)	Upper*, Lower	ns
Resolution Enhancement	Medium*, Light, Dark, Off, On	✓
Print Density	1, 2, 3*, 4, 5	✓
EconoMode	On, Off*	✓
Resource Saving	On, Off*	On, Off, Auto*

✓ - Supported * - Default value (see Chapter 2 for list) ns - Not Supported

[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

5

Memory Usage

Introduction

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 6, LaserJet 5, and LaserJet 4 family printers except the 4, 4M, 4Si and 4SiMx)
- Adaptive Data Compression, ADC, (available on HP LaserJet 4, 4M, 4Si, 4SiMx and DeskJet 1200C printers)
- Following recommended practices for transmitting data, especially raster graphics, to the printer
- For the HP LaserJet 4L, using Raster Graphics Adaptive Compression (PCL compression mode five)

All HP LaserJet 4, 5 and 6 family printers have internal programming for optimizing the use of limited memory. HP LaserJet 4, 4M, 4Si, 4SiMx, and DeskJet 1200C printers compress raster graphics data using a system called Adaptive Data Compression or ADC. The other HP LaserJet 4 / 5 / 6 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 HP LaserJet 4, 5, and 6 family printers and the HP 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 some of the HP LaserJet 4, 5, and 6 family printers if required, but the technique varies. On the HP LaserJet 4, 4M and 4Si the user will have to add more memory to effectively remove the need for Image Adapt. Image Adapt can be disabled on some of the other HP LaserJet 4, 5, and 6 family printers by 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 HP LaserJet 4, 5, and 6 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 HP 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 HP 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 HP 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 large amount of memory (since the HP 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 When deleting font characters and patterns, remember that 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 HP LaserJet IIIP, Color LaserJet, all LaserJet 4, 5, and 6 family printers, and the DeskJet 1200C and 1600C printers.

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 HP 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 HP LaserJet 4, 5, and 6 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 HP printer language commands. Table A-1 lists PCL 5 commands in hierarchical order and gives the decimal and hexadecimal equivalents of each. Table A-2 lists HP-GL/2 commands, where as Table A-3 lists 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 Commands

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)*
Output (Media) Bin Selection	Automatic selection	Ec&ℓ0G *(g)*	027 038 108 048 071 *(103)*	1B 26 6C 30 47 *(67)*
	Upper Output Bin (Bin #1)	Ec&ℓ1G *(g)*	027 038 108 049 071 *(103)*	1B 26 6C 31 47 *(67)*
	Rear Output Bin[1] (Bin #2)	Ec&ℓ2G *(g)*	027 038 108 050 071 *(103)*	1B 26 6C 32 47 *(67)*
	Selects Bin #3	Ec&ℓ3G *(g)*	027 038 108 051 071 *(103)*	1B 26 6C 33 47 *(67)*
	Selects Bin #4	Ec&ℓ4G *(g)*	027 038 108 052 071 *(103)*	1B 26 6C 34 47 *(67)*
	Selects Bin #5	Ec&ℓ5G *(g)*	027 038 108 053 071 *(103)*	1B 26 6C 35 47 *(67)*
	Selects Bin #6	Ec&ℓ6G *(g)*	027 038 108 054 071 *(103)*	1B 26 6C 36 47 *(67)*
	Selects Bin #7	Ec&ℓ7G *(g)*	027 038 108 055 071 *(103)*	1B 26 6C 37 47 *(67)*
	Selects Bin #8	Ec&ℓ8G *(g)*	027 038 108 056 071 *(103)*	1B 26 6C 38 47 *(67)*
	Selects Bin #9	Ec&ℓ9G *(g)*	027 038 108 057 071 *(103)*	1B 26 6C 39 47 *(67)*
	Selects Bin #10	Ec&ℓ10G *(g)*	027 038 108 049 048 071 *(103)*	1B 26 6C 31 30 47 *(67)*
	Selects Bin #11	Ec&ℓ11G *(g)*	027 038 108 049 049 071 *(103)*	1B 26 6C 31 31 47 *(67)*

[1] For HP LaserJet 5Si/5SiMx printers, Ec&ℓ2G selects the “printer left/face up bin,” which is not available when the High Capacity Output (HCO) is attached.

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

FUNCTION	PARAMETER	COMMAND		DECIMAL VALUE		HEXADECIMAL VALUE	
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)*
PAGE CONTROL COMMANDS							
Page Length and Size							
Paper Source	Eject Page	Ec&ℓ0H	*(h)*	027 038 108 048 072	*(104)*	1B 26 6C 30 48	*(68)*
	Main Paper Source	Ec&ℓ1H	*(h)*	027 038 108 049 072	*(104)*	1B 26 6C 31 48	*(68)*
	Manual Feed	Ec&ℓ2H	*(h)*	027 038 108 050 072	*(104)*	1B 26 6C 32 48	*(68)*
	Manual Envelope Feed	Ec&ℓ3H	*(h)*	027 038 108 051 072	*(104)*	1B 26 6C 33 48	*(68)*
	Alternate Paper Source	Ec&ℓ4H	*(h)*	027 038 108 052 072	*(104)*	1B 26 6C 34 48	*(68)*
	Optional Large Paper Source	Ec&ℓ5H	*(h)*	027 038 108 053 072	*(104)*	1B 26 6C 35 48	*(68)*
	Envelope Feeder	Ec&ℓ6H	*(h)*	027 038 108 054 072	*(104)*	1B 26 6C 36 48	*(68)*
	Auto Select	Ec&ℓ7H	*(h)*	027 038 108 055 072	*(104)*	1B 26 6C 37 48	*(68)*
	Tray 1 (right tray)	Ec&ℓ8H	*(h)*	027 038 108 056 072	*(104)*	1B 26 6C 38 48	*(68)*
Page Size	Executive	Ec&ℓ1A	*(a)*	027 038 108 049 065	*(97)*	1B 26 6C 31 41	*(61)*
	Letter	Ec&ℓ2A	*(a)*	027 038 108 050 065	*(97)*	1B 26 6C 32 41	*(61)*
	Legal	Ec&ℓ3A	*(a)*	027 038 108 051 065	*(97)*	1B 26 6C 33 41	*(61)*
	Ledger	Ec&ℓ6A	*(a)*	027 038 108 054 065	*(97)*	1B 26 6C 36 41	*(61)*
	A3	Ec&ℓ27A	*(a)*	027 038 108 050 055 065	*(97)*	1B 26 6C 32 37 41	*(61)*
	A4	Ec&ℓ26A	*(a)*	027 038 108 050 054 065	*(97)*	1B 26 6C 32 36 41	*(61)*
	A5	Ec&ℓ25A	*(a)*	027 038 108 050 053 065	*(97)*	1B 26 6C 32 35 41	*(61)*
	A6	Ec&ℓ24A	*(a)*	027 038 108 050 052 065	*(97)*	1B 26 6C 32 34 41	*(61)*
	JIS B4 Paper	Ec&ℓ46A	*(a)*	027 038 108 052 054 065	*(97)*	1B 26 6C 34 36 41	*(61)*
	JIS B5 Paper	Ec&ℓ45A	*(a)*	027 038 108 052 053 065	*(97)*	1B 26 6C 34 35 41	*(61)*
	JIS B6 Paper	Ec&ℓ44A	*(a)*	027 038 108 052 052 065	*(97)*	1B 26 6C 34 34 41	*(61)*
	Hagaki Postcard	Ec&ℓ71A	*(a)*	027 038 108 055 049 065	*(97)*	1B 26 6C 37 31 41	*(61)*
	Oufuku-Hagaki	Ec&ℓ72A	*(a)*	027 038 108 055 050 065	*(97)*	1B 26 6C 37 32 41	*(61)*
	Monarch Envelope	Ec&ℓ80A	*(a)*	027 038 108 056 048 065	*(97)*	1B 26 6C 38 30 41	*(61)*
	COM 10 Envelope	Ec&ℓ81A	*(a)*	027 038 108 056 049 065	*(97)*	1B 26 6C 38 31 41	*(61)*
	DL Envelope	Ec&ℓ90A	*(a)*	027 038 108 057 048 065	*(97)*	1B 26 6C 39 30 41	*(61)*
	C5 Envelope	Ec&ℓ91A	*(a)*	027 038 108 057 049 065	*(97)*	1B 26 6C 39 31 41	*(61)*
	B5 Envelope	Ec&ℓ100A	*(a)*	027 038 108 049 048 048 065	*(97)*	1B 26 6C 31 30 30 41	*(61)*
	Custom	Ec&ℓ101A	*(a)*	027 038 108 049 048 049 065	*(97)*	1B 26 6C 31 30 31 41	*(61)*

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

FUNCTION	PARAMETER	COMMAND		DECIMAL VALUE		HEXADECIMAL VALUE	
Orientation							
Orientation	Portrait	Ec&ℓ0O	*(o)*	027 038 108 048 079	*(111)*	1B 26 6C 30 4F	*(6F)*
	Landscape	Ec&ℓ1O	*(o)*	027 038 108 049 079	*(111)*	1B 26 6C 31 4F	*(6F)*
	Reverse Portrait	Ec&ℓ2O	*(o)*	027 038 108 050 079	*(111)*	1B 26 6C 32 4F	*(6F)*
	Reverse Landscape	Ec&ℓ3O	*(o)*	027 038 108 051 079	*(111)*	1B 26 6C 33 4F	*(6F)*
Print Direction	# Degrees of Rotation (counter-clockwise, 90° increments only)	Ec&a#P	*(p)*	027 038 097 #...# 080	*(112)*	1B 26 61 #...# 50	*(70)*
Character Text Path Direction	Horizontal	Ec&c0T	*(t)*	027 038 099 048 084	*(116)*	1B 26 63 30 54	*(74)*
	Vertical Rotated	Ec&c-1T	*(t)*	027 038 099 045 049 084	*(116)*	1B 26 63 2D 31 54	*(74)*
Margins and Text Length							
Top Margin	# of Lines	Ec&ℓ#E	*(e)*	027 038 108 #...# 069	*(101)*	1B 26 6C #...# 45	*(65)*
Text Length	# of Lines	Ec&ℓ#F	*(f)*	027 038 108 #...# 070	*(102)*	1B 26 6C #...# 46	*(66)*
Left Margin	# of Columns	Ec&a#L	*(l)*	027 038 097 #...# 076	*(108)*	1B 26 61 #...# 4C	*(6C)*
Right Margin	# of Columns	Ec&a#M	*(m)*	027 038 097 #...# 077	*(109)*	1B 26 61 #...# 4D	*(6D)*
Clear Horizontal Margins	—	Ec9		027 057		1B 39	
Perforation Skip Mode							
Perforation Skip	Disable	Ec&ℓ0L	*(l)*	027 038 108 048 076	*(108)*	1B 26 6C 30 4C	*(6C)*
	Enable	Ec&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	Ec&k#H	*(h)*	027 038 107 #...# 072	*(104)*	1B 26 6B #...# 48	*(68)*
Vertical Line Spacing							
Vertical Motion Index (VMI)	# of 1/48" Increments	Ec&ℓ#C	*(c)*	027 038 108 #...# 067	*(99)*	1B 26 6C #...# 43	*(63)*
Line Spacing (Lines per inch)	1 line/inch	Ec&ℓ1D	*(d)*	027 038 108 049 068	*(100)*	1B 26 6C 31 44	*(64)*
	2 lines/inch	Ec&ℓ2D	*(d)*	027 038 108 050 068	*(100)*	1B 26 6C 32 44	*(64)*
	3 lines/inch	Ec&ℓ3D	*(d)*	027 038 108 051 068	*(100)*	1B 26 6C 33 44	*(64)*
	4 lines/inch	Ec&ℓ4D	*(d)*	027 038 108 052 068	*(100)*	1B 26 6C 34 44	*(64)*
	6 lines/inch	Ec&ℓ6D	*(d)*	027 038 108 054 068	*(100)*	1B 26 6C 36 44	*(64)*
	8 lines/inch	Ec&ℓ8D	*(d)*	027 038 108 056 068	*(100)*	1B 26 6C 38 44	*(64)*
	12 lines/inch	Ec&ℓ12D	*(d)*	027 038 108 049 050 068	*(100)*	1B 26 6C 31 32 44	*(64)*
	16 lines/inch	Ec&ℓ16D	*(d)*	027 038 108 049 054 068	*(100)*	1B 26 6C 31 36 44	*(64)*
	24 lines/inch	Ec&ℓ24D	*(d)*	027 038 108 050 052 068	*(100)*	1B 26 6C 32 34 44	*(64)*
	48 lines/inch	Ec&ℓ48D	*(d)*	027 038 108 052 056 068	*(100)*	1B 26 6C 34 38 44	*(64)*
ALPHANUMERIC ID							
Alphanumeric ID	# of bytes	Ec&n#W[operation] [String]		027 038 110 #...# 087		1B 26 6E #...# 57	

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

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

FUNCTION	PARAMETER	COMMAND	DECIMAL VALUE	HEXADECIMAL VALUE
Symbol Set Selection[1] - continued				
Primary Symbol Set	DeskTop	Esc(7J	027 040 055 074	1B 28 37 4A
	PS Text	Esc(10J	027 040 049 048 074	1B 28 31 30 4A
	MC Text	Esc(12J	027 040 049 050 074	1B 28 31 32 4A
	Ventura International	Esc(13J	027 040 049 051 074	1B 28 31 33 4A
	Ventura US	Esc(14J	027 040 049 052 074	1B 28 31 34 4A
	Ventura ITC Zapf Dingbats	Esc(9L	027 040 057 076	1B 28 39 4C
	PS ITC Zapf Dingbats	Esc(10L	027 040 049 048 076	1B 28 31 30 4C
	ITC Zapf Dingbats Series 100	Esc(11L	027 040 049 049 076	1B 28 31 31 4C
	ITC Zapf Dingbats Series 200	Esc(12L	027 040 049 050 076	1B 28 31 32 4C
	ITC Zapf Dingbats Series 300	Esc(13L	027 040 049 051 076	1B 28 31 33 4C
	Wingdings	Esc(579L	027 040 053 055 057 076	1B 28 35 37 39 4C
	PS Math	Esc(5M	027 040 053 077	1B 28 35 4D
	Ventura Math	Esc(6M	027 040 054 077	1B 28 36 4D
	Math-8	Esc(8M	027 040 056 077	1B 28 38 4D
	Symbol	Esc(19M	027 040 049 057 077	1B 28 31 39 4D
	ISO 8859-1 (ECMA-94) Latin 1	Esc(0N	027 040 048 078	1B 28 30 4E
	ISO 8859-2: Latin 2	Esc(2N	027 040 050 078	1B 28 32 4E
	ISO 8859-9: Latin 5	Esc(5N	027 040 053 078	1B 28 35 4E
	ISO 11: Swedish	Esc(0S	027 040 048 083	1B 28 30 53
	ISO 17: Spanish	Esc(2S	027 040 050 083	1B 28 32 53
	Windows 3.1 Latin 5	Esc(5T	027 040 053 084	1B 28 35 54
	PC 1004	Esc(9J	027 040 057 074	1B 28 39 4A
	PC 775	Esc(26U	027 040 050 054 085	1B 28 32 36 55
	Windows Baltic	Esc(19L	027 040 049 076	1B 28 31 4C
	ISO 8859-10: Latin 6	Esc(6N	027 040 054 078	1B 28 36 4E

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

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

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

FUNCTION	PARAMETER	COMMAND	DECIMAL VALUE	HEXADECIMAL VALUE
Style				
Primary Style	Upright (Solid)	Ec(s0S *(s)*	027 040 115 048 083 *(115)*	1B 28 73 30 53 *(73)*
	Italic	Ec(s1S *(s)*	027 040 115 049 083 *(115)*	1B 28 73 31 53 *(73)*
	Condensed	Ec(s4S *(s)*	027 040 115 052 083 *(115)*	1B 28 73 34 53 *(73)*
	Condensed Italic	Ec(s5S *(s)*	027 040 115 053 083 *(115)*	1B 28 73 35 53 *(73)*
	Compressed (Extra Condensed)	Ec(s8S *(s)*	027 040 115 056 083 *(115)*	1B 28 73 38 53 *(73)*
	Expanded	Ec(s24S *(s)*	027 040 115 050 052 083 *(115)*	1B 28 73 32 34 53 *(73)*
	Outline	Ec(s32S *(s)*	027 040 115 051 050 083 *(115)*	1B 28 73 33 32 53 *(73)*
	Inline	Ec(s64S *(s)*	027 040 115 054 052 083 *(115)*	1B 28 73 36 34 53 *(73)*
	Shadowed	Ec(s128S *(s)*	027 040 115 049 050 056 083 *(115)*	1B 28 73 31 32 38 53 *(73)*
	Outline Shadowed	Ec(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*.				
Stroke Weight				
Primary Font Stroke Weight	Ultra Thin	Ec(s–7B *(b)*	027 040 115 045 055 066 *(98)*	1B 28 73 2D 37 42 *(62)*
	Extra Thin	Ec(s–6B *(b)*	027 040 115 045 054 066 *(98)*	1B 28 73 2D 36 42 *(62)*
	Thin	Ec(s–5B *(b)*	027 040 115 045 053 066 *(98)*	1B 28 73 2D 35 42 *(62)*
	Extra Light	Ec(s–4B *(b)*	027 040 115 045 052 066 *(98)*	1B 28 73 2D 34 42 *(62)*
	Light	Ec(s–3B *(b)*	027 040 115 045 051 066 *(98)*	1B 28 73 2D 33 42 *(62)*
	Demi Light	Ec(s–2B *(b)*	027 040 115 045 050 066 *(98)*	1B 28 73 2D 32 42 *(62)*
	Semi Light	Ec(s–1B *(b)*	027 040 115 045 049 066 *(98)*	1B 28 73 2D 31 42 *(62)*
	Medium (book or text)	Ec(s0B *(b)*	027 040 115 048 066 *(98)*	1B 28 73 30 42 *(62)*
	Semi Bold	Ec(s1B *(b)*	027 040 115 049 066 *(98)*	1B 28 73 31 42 *(62)*
	Demi Bold	Ec(s2B *(b)*	027 040 115 050 066 *(98)*	1B 28 73 32 42 *(62)*
	Bold	Ec(s3B *(b)*	027 040 115 051 066 *(98)*	1B 28 73 33 42 *(62)*
	Extra Bold	Ec(s4B *(b)*	027 040 115 052 066 *(98)*	1B 28 73 34 42 *(62)*
	Black	Ec(s5B *(b)*	027 040 115 053 066 *(98)*	1B 28 73 35 42 *(62)*
	Extra Black	Ec(s6B *(b)*	027 040 115 054 066 *(98)*	1B 28 73 36 42 *(62)*
	Ultra Black	Ec(s7B *(b)*	027 040 115 055 066 *(98)*	1B 28 73 37 42 *(62)*

Table A-1. HP PCL 5 Commands (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)*
	GW-Kai	Ec(s37357T	*(t)*	027 040 115 051 055 051 053 055 084	*(116)*	1B 28 73 33 37 33 35 37 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)*
	SimHei	Ec(s37110T	*(t)*	027 040 115 051 055 049 049 048 084	*(116)*	1B 28 73 33 37 31 31 30 54	*(74)*
	SimSun	Ec(s37058T	*(t)*	027 040 115 051 055 048 053 056 084	*(116)*	1B 28 73 33 37 30 35 38 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 Commands (continued)

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

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

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

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

FUNCTION	PARAMETER	COMMAND		DECIMAL VALUE		HEXADECIMAL VALUE	
Raster Graphics							
Raster Graphics Presentation	Follows orientation	Ec*r0F	*(f)*	027 042 114 048 070	*(102)*	1B 2A 72 30 46	*(66)*
	Follows physical page	Ec*r3F	*(f)*	027 042 114 051 070	*(102)*	1B 2A 72 33 46	*(66)*
Start Raster Graphics	Left Raster Graphics Margin	Ec*r0A	*(a)*	027 042 114 048 065	*(97)*	1B 2A 72 30 41	*(61)*
	Current Cursor	Ec*r1A	*(a)*	027 042 114 049 065	*(97)*	1B 2A 72 31 41	*(61)*
	Scale mode (logical left page boundary)	Ec*r2A	*(a)*	027 042 114 050 065	*(97)*	1B 2A 72 32 41	*(61)*
	Scale mode (at CAP)	Ec*r3A	*(a)*	027 042 114 051 065	*(97)*	1B 2A 72 33 42	*(61)*
Raster Y Offset	# of Raster Lines of vertical movement	Ec*b#Y	*(y)*	027 042 098 #...# 089	*(121)*	1B 2A 62 #...# 59	*(79)*
Set Raster Compression Mode	Unencoded	Ec*b0M	*(m)*	027 042 098 048 077	*(109)*	1B 2A 62 30 4D	*(6D)*
	Run-Length Encoded	Ec*b1M	*(m)*	027 042 098 049 077	*(109)*	1B 2A 62 31 4D	*(6D)*
	Tagged Image File Format	Ec*b2M	*(m)*	027 042 098 050 077	*(109)*	1B 2A 62 32 4D	*(6D)*
	Delta Row	Ec*b3M	*(m)*	027 042 098 051 077	*(109)*	1B 2A 62 33 4D	*(6D)*
	Adaptive Compression	Ec*b5M	*(m)*	027 042 098 053 077	*(109)*	1B 2A 62 35 4D	*(6D)*
	Replacement Delta Row	Ec*b9M	*(m)*	027 042 098 057 077	*(109)*	1B 2A 98 39 4D	*(6D)*
Transfer Raster Data (by row)	# of Bytes	Ec*b#W[Data]		027 042 098 #...# 087		1B 2A 62 #...# 57	
Transfer Raster Data (by plane)	# of Bytes	Ec*b#V[Data]		027 042 062 #...# 086		1B 2A 98 #...# 56	
End Raster Graphics	Old version Preferred	Ec*rB Ec*rC	*(b)* *(c)*	027 042 114 066 027 042 114 067	*(98)* *(99)*	1B 2A 72 42 1B 2A 72 43	*(62)* *(63)*
Raster Height (Source)	# Raster Rows	Ec*r#T	*(t)*	027 042 114 #...# 084	*(116)*	1B 2A 72 #...# 54	*(74)*
Raster Width (Source)	# Pixels of the Specified Resolution	Ec*r#S	*(s)*	027 042 114 #...# 083	*(115)*	1B 2A 72 #...# 53	*(73)*
Raster Height (Destination)	# of Decipoints	Ec*t#H	*(h)*	027 042 116 #...# 072	*(104)*	1B 2A 74 #...# 48	*(68)*
Raster Width (Destination)	# of Decipoints	Ec*t#V	*(v)*	027 042 116 #...# 086	*(118)*	1B 2A 74 #...# 56	*(76)*
Scale Algorithm	Source with light background	Ec*t0K	*(k)*	027 042 116 048 075	*(107)*	1B 2A 74 30 4B	*(6B)*
	Source with dark background	Ec*t1K	*(k)*	027 042 116 049 075	*(107)*	1B 2A 74 31 4B	*(6B)*

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

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

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

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

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

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

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

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

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

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

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

FUNCTION	PARAMETER	COMMAND	DECIMAL VALUE	HEXADECIMAL VALUE
COLOR COMMANDS				
Assign Color Index	Index Number	Esc*v#I *(i)*	027 042 118 #...# 073 *(105)*	1B 2A 76 #...# 49 *(69)*
Color Component One	1st Component	Esc*v#A *(a)*	027 042 118 #...# 065 *(97)*	1B 2A 76 #...# 41 *(61)*
Color Component Two	2nd Component	Esc*v#B *(b)*	027 042 118 #...# 066 *(98)*	1B 2A 76 #...# 42 *(62)*
Color Component Three	3rd Component	Esc*v#C *(c)*	027 042 118 #...# 067 *(99)*	1B 2A 76 #...# 43 *(63)*
Color Lookup Tables	# of Bytes	Esc*ℓ#W[Data]	027 042 108 #...# 087	1B 2A 6C #...# 57
Configure Image Data	# of Bytes	Esc*v#W[Data]	027 042 118 #...# 087	1B 2A 76 #...# 57
Download Dither Matrix	# of Bytes	Esc*v#I *(i)*	027 042 118 #...# 073 *(105)*	1B 2A 76 #...# 49 *(69)*
Foreground Color	Index Number	Esc*v#S *(s)*	027 042 118 #...# 083 *(115)*	1B 2A 76 #...# 53 *(73)*
Gamma Correction	Gamma Number	Esc*t#I *(i)*	027 042 116 #...# 073 *(105)*	1B 2A 74 #...# 49 *(69)*
Monochrome Print Mode	Mixed Rendering	Esc&b0M *(m)*	027 038 062 048 077 *(109)*	1B 26 98 30 4D *(6D)*
	Gray Equivalent	Esc&b1M *(m)*	027 038 062 049 077 *(109)*	1B 26 98 31 4D *(6D)*
Palette Control ID	Palette ID #	Esc&p#I *(i)*	027 038 112 #...# 073 *(105)*	1B 26 70 #...# 49 *(69)*
Palette Control	Delete All Palettes in store	Esc&p0C *(c)*	027 038 112 048 067 *(99)*	1B 26 70 30 43 *(63)*
	Delete All Palettes in stack	Esc&p1C *(c)*	027 038 112 049 067 *(99)*	1B 26 70 31 43 *(63)*
	Delete Palette (last ID)	Esc&p2C *(c)*	027 038 112 050 067 *(99)*	1B 26 70 32 43 *(63)*
	Copy Palette	Esc&p6C *(c)*	027 038 112 054 067 *(99)*	1B 26 70 36 43 *(63)*
Push/Pop Palette	Push Palette	Esc*p0P *(p)*	027 042 112 048 080 *(112)*	1B 2A 70 30 50 *(70)*
	Pop Palette	Esc*p1P *(p)*	027 042 112 049 080 *(112)*	1B 2A 70 31 50 *(70)*
Render Algorithm	Continuous tone detail	Esc*t0J *(j)*	027 042 116 048 074 *(106)*	1B 2A 74 30 4A *(6A)*
	Snap to primaries	Esc*t1J *(j)*	027 042 116 049 074 *(106)*	1B 2A 74 31 4A *(6A)*
	Snap black/white, colors to black	Esc*t2J *(j)*	027 042 116 050 074 *(106)*	1B 2A 74 32 4A *(6A)*
	Device best dither	Esc*t3J *(j)*	027 042 116 051 074 *(106)*	1B 2A 74 33 4A *(6A)*
	Error diffusion	Esc*t4J *(j)*	027 042 116 052 074 *(106)*	1B 2A 74 34 4A *(6A)*
	Monochrome device best dither	Esc*t5J *(j)*	027 042 116 053 074 *(106)*	1B 2A 74 35 4A *(6A)*
	Monochrome error diffusion	Esc*t6J *(j)*	027 042 116 054 074 *(106)*	1B 2A 74 36 4A *(6A)*
	Cluster ordered dither	Esc*t7J *(j)*	027 042 116 055 074 *(106)*	1B 2A 74 37 4A *(6A)*
	Monochrome cluster ordered	Esc*t8J *(j)*	027 042 116 056 074 *(106)*	1B 2A 74 38 4A *(6A)*
	User-defined dither	Esc*t9J *(j)*	027 042 116 057 074 *(106)*	1B 2A 74 30 4A *(6A)*
	Monochrome user-defined dither	Esc*t10J *(j)*	027 042 116 049 048 074 *(106)*	1B 2A 74 31 30 4A *(6A)*
	Ordered dither	Esc*t11J *(j)*	027 042 116 049 049 074 *(106)*	1B 2A 74 31 31 4A *(6A)*
	Monochrome ordered dither	Esc*t12J *(j)*	027 042 116 049 050 074 *(106)*	1B 2A 74 31 32 4A *(6A)*
	Noise ordered dither	Esc*t13J *(j)*	027 042 116 049 051 074 *(106)*	1B 2A 74 31 33 4A *(6A)*
	Monochrome noise ordered dither	Esc*t14J *(j)*	027 042 116 049 052 074 *(106)*	1B 2A 74 31 34 4A *(6A)*
	Continuous tone smooth	Esc*t15J *(j)*	027 042 116 049 053 074 *(106)*	1B 2A 74 31 35 4A *(6A)*
	Mono. continuous tone detail	Esc*t16J *(j)*	027 042 116 049 054 074 *(106)*	1B 2A 74 31 36 4A *(6A)*
	Mono. continuous tone smooth	Esc*t17J *(j)*	027 042 116 049 055 074 *(106)*	1B 2A 74 31 37 4A *(6A)*
	Continuous tone basic	Esc*t18J *(j)*	027 042 116 049 056 074 *(106)*	1B 2A 74 31 38 4A *(6A)*
	Mono. continuous tone basic	Esc*t19J *(j)*	027 042 116 049 057 074 *(106)*	1B 2A 74 31 39 4A *(6A)*
Select Palette	Palette ID #	Esc&p#S *(s)*	027 038 112 #...# 083 *(115)*	1B 26 70 #...# 53 *(73)*
Set Viewing Illumination	# of Bytes	Esc*i#W[Data]	027 042 105 #...# 087	1B 2A 69 #...# 57
Simple Color	3-Plane Device CMY Palette	Esc*r–3U *(u)*	027 042 114 045 051 085 *(117)*	1B 2A 72 2D 33 55 *(75)*
	1-Plane K Palette	Esc*r1U *(u)*	027 042 114 049 085 *(117)*	1B 2A 72 31 55 *(75)*
	3-Plane Device RGB Palette	Esc*r3U *(u)*	027 042 114 051 085 *(117)*	1B 2A 72 33 55 *(75)*

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

FUNCTION	MNEMONIC	PARAMETERS*
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 Commands (continued)

FUNCTION	MNEMONIC	PARAMETERS*
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

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

Internal Symbol Set Charts

Introduction

This section includes symbol set tables showing character locations and decimal addresses. Individual tables are provided for the following symbol sets:

Roman-8
DeskTop
Windows 3.1 Latin 1 “ANSI”
ISO 8859/1 Latin 1
PC-8
PC-850
PS Text
MC Text
Ventura International
PC-8 D/N
Ventura US
Legal
Windows 3.0 Latin 1
Microsoft Publishing[1]
PC-852
PC-8 Turkish
ISO 8859/2 Latin 2
Windows 3.1 Latin 2
ISO 8859/9 Latin 5
Windows 3.1 Latin 5
Ventura Math[1]
Math-8[1]
Pi Font[1]
PS Math[1]
Symbol[2]
Wingdings[2]
PC 1004
PC 775
Windows Baltic
ISO 8859/10 Latin 6
Ventura ITC Zapf Dingbats[2]
PS ITC Zapf Dingbats[2]
ITC Zapf Dingbats series 100[2]
ITC Zapf Dingbats series 200[2]
ITC Zapf Dingbats series 300[2]

[1] Intellifont only except for HP LaserJet 5, 5M, and 4000 series printers where they are also True-Type. These math sets are inappropriate in script faces, italic faces, or any unusual weight or style. MS Publishing and Pi Font may be used with script, italic, or unusual weight styles, since these sets contain few “limited sensitivity” characters that conflict with the typeface sensitive characters of that typeface.

[2] Available in one typeface only.

The gray shaded areas in these tables denote printer control code areas. Math composite characters are shown with light-colored shades, and line-draw composite characters are shown with dark-colored shades. Composite characters are made by combining individual character elements into a large character.

The International Organization for Standardization (ISO) symbol sets and the HP German and HP Spanish symbol sets are represented by a character substitution table (see page B-19). The final table, the Roman-8 Character Conversion table identifies the hexadecimal, decimal, and octal codes for the Roman-8 symbol set.

Note To identify the symbol sets that are supported by a printer, refer to Chapter 3, Internal Typefaces/Fonts and Symbol Sets," in this document.

7J DeskTop (DT)

8U Roman-8 (R8)

0N ISO 8859/1 Latin 1 (E1)

19U Windows 3.1 Latin 1 (W1)

12U PC-850 Multilingual (PM)

10U PC-8 Code Page 437 (PC)

12J MC Text (MC)

10J PS Text (TS)

11U PC-8 Danish/Norwegian (PD)

13J Ventura International (VI)

1U Legal (LG)

14J Ventura US (VU)

6J Microsoft Publishing (PG)

9U Windows 3.0 Latin 1 (WO)

9T PC-Turkish (PT)

17U PC-852 Latin 2 (PE)

9E Windows 3.1 Latin 2 (WE)

2N ISO 8859/2 Latin 2 (E2)

5T Windows 3.1 Latin (WT)

5N ISO 8859/9 Latin 5 (E5)

9J PC-1004, Code Page 1004 (PU)

26U PC-775, Code Page 775 (PV)

19L Windows Baltic (WL)

6N ISO 8859/10 Latin 6 (E6)

8M Math-8 (M8)

6M Ventura Math (VM)

5M PS Math (MS)

15U Pi Font (PI)

579L Wingdings Font (L$)

19M Symbol Font (AS)

10L PS ITC Zapf Dingbats (DS)

9L Ventura ITC Zapf Dingbats (DV)

12L ITC Zapf Dingbats series 200 (D2)

11L ITC Zapf Dingbats series 100 (D1)

13L ITC Zapf Dingbats series 300 (D3)

ISO Substitution Table

This table provides a quick reference for the values of special characters contained in ISO (International Organization of Standardization) symbol sets. ISO symbol sets contain the same characters as the ASCII symbol set, except for the character positions listed in this table. For example, in the ISO 4 (United Kingdom) symbol set, the British pound sign replaces the number sign used in decimal position 35 of the ASCII symbol set.

Table B-1. ISO Substitution Characters

			Decimal Character Equivalents											
ISO	Name	ID	35	36	64	91	92	93	94	96	123	124	125	126
6	ASCII	0U	#	$	@	[	\	]	^	`	{	|	}	~
4	United Kingdom	1E	£	$	@	[	\	]	^	`	{	|	}	¯
69	French	1F	£	$	à	°	ç	§	^	µ	é	ù	è	¨
21	German	1G	#	$	§	Ä	Ö	Ü	^	`	ä	ö	ü	ß
15	Italian	0I	£	$	§	°	ç	é	^	ù	à	ò	è	ì
11	Swedish for Names	0S	#	¤	É	Ä	Ö	Å	Ü	é	ä	ö	å	ü
17	Spanish	2S	£	$	§	¡	Ñ	¿	^	`	°	ñ	ç	¨
60	Norwegian version 1	0D	#	$	@	Æ	Ø	Å	^	`	æ	ø	å	¯
2	Int'l. Ref. Version*	2U	#	¤	@	[	\	]	^	`	{	|	}	¯
25	French*	0F	£	$	à	°	ç	§	^	`	é	ù	è	¨
	HP German*	0G	£	$	§	Ä	Ö	Ü	^	`	ä	ö	ü	ß
14	JIS ASCII*	0K	#	$	@	[	¥	]	^	`	{	|	}	¯
57	Chinese*	2K	#	¥	@	[	\	]	^	`	{	|	}	¯
10	Swedish*	3S	#	¤	@	Ä	Ö	Å	^	`	ä	ö	å	¯
	HP Spanish*	1S	#	$	@	¡	Ñ	¿	°	`	{	ñ	}	¨
85	Spanish*	6S	#	$	·	¡	Ñ	Ç	¿	`	´	ñ	ç	¨
16	Portuguese*	4S	#	$	§	Ã	Ç	Õ	^	`	ã	ç	õ	°
84	Portuguese*	5S	#	$	´	Ã	Ç	Õ	^	`	ã	ç	õ	¨
61	Norwegian version 2*	1D	§	$	@	Æ	Ø	Å	^	`	æ	ø	å	|

* These symbol sets are becoming obsolete and are not recommended for future use and are not present on the HP LaserJet 4, 4M, 4Si, 4SiMx, 4L, 4ML, 4P, 4MP, 4PJ, 4LJ Pro, 4LC, 4 Plus, 4M Plus, 4V, 4MV, 4000 series, 5, 5M, 5P, 5L, 5Si, 5SiMx, 5Si Mopier, 6L, 6P, 6MP, Color LaserJet, Color LaserJet 5, 5M, and DeskJet 1200C, 1600C printers.

Conversion Table

Table B-2 gives the hexadecimal, decimal, and octal equivalent of each character in the Roman-8 symbol set. Use this table when your software requires hexadecimal, decimal, or octal values in place of your printer command characters.

This conversion table begins on the following page.

Table B-2. Roman-8 Character Conversion

Graphic	Hex	Dec	Oct	Description
	00	0	000	NUL (null)
	01	1	001	SOH (start of heading)
	02	2	002	STX (start of text)
	03	3	003	ETX (end of text)
	04	4	004	EOT (end of transmission)
	05	5	005	ENQ (enquiry)
	06	6	006	ACK (acknowledge)
	07	7	007	BEL (bell)
	08	8	010	BS (backspace)
	09	9	011	HT (horizontal tabulation)
	0A	10	012	LF (line feed)
	0B	11	013	VT (vertical tabulation)
	0C	12	014	FF (form feed)
	0D	13	015	CR (carriage return)
	0E	14	016	SO (shift out)
	0F	15	017	SI (shift in)
	10	16	020	DLE (data link escape)
	11	17	021	DC1 (device control 1 or X-ON)
	12	18	022	DC2 (device control 2)
	13	19	023	DC3 (device control 3 or X-OFF)
	14	20	024	DC4 (device control 4)
	15	21	025	NAK (negative acknowledge)
	16	22	026	SYN (synchronous idle)
	17	23	027	ETB (end of transmission block)
	18	24	030	CAN (cancel)
	19	25	031	EM (end of medium)
	1A	26	032	SUB (substitute)
	1B	27	033	ESC (escape)
	1C	28	034	FS (file separator)
	1D	29	035	GS (group separator)
	1E	30	036	RS (record separator)
	1F	31	037	US (unit separator)
	20	32	040	SP (space)
!	21	33	041	Exclamation point
"	22	34	042	Quotation mark
#	23	35	043	Number sign
$	24	36	044	Dollar sign
%	25	37	045	Percent sign
&	26	38	046	Ampersand
'	27	39	047	Closing single quote (apostrophe)

Table B-2. Roman-8 Character Conversion (continued)

Graphic	Hex	Dec	Oct	Description
(	28	40	050	Opening parenthesis
)	29	41	051	Closing parenthesis
*	2A	42	052	Asterisk
+	2B	43	053	Plus
,	2C	44	054	Comma
-	2D	45	055	Hyphen
.	2E	46	056	Period (point)
/	2F	47	057	Slant (solidus)
0	30	48	060	Zero
1	31	49	061	One
2	32	50	062	Two
3	33	51	063	Three
4	34	52	064	Four
5	35	53	065	Five
6	36	54	066	Six
7	37	55	067	Seven
8	38	56	070	Eight
9	39	57	071	Nine
:	3A	58	072	Colon
;	3B	59	073	Semicolon
<	3C	60	074	Less than sign
=	3D	61	075	Equals sign
>	3E	62	076	Greater than sign
?	3F	63	077	Question mark
@	40	64	100	Commercial At
A	41	65	101	Uppercase A
B	42	66	102	Uppercase B
C	43	67	103	Uppercase C
D	44	68	104	Uppercase D
E	45	69	105	Uppercase E
F	46	70	106	Uppercase F
G	47	71	107	Uppercase G
H	48	72	110	Uppercase H
I	49	73	111	Uppercase I
J	4A	74	112	Uppercase J
K	4B	75	113	Uppercase K
L	4C	76	114	Uppercase L
M	4D	77	115	Uppercase M
N	4E	78	116	Uppercase N
O	4F	79	117	Uppercase O

Table B-2. Roman-8 Character Conversion (continued)

Graphic	Hex	Dec	Oct	Description
P	50	80	120	Uppercase P
Q	51	81	121	Uppercase Q
R	52	82	122	Uppercase R
S	53	83	123	Uppercase S
T	54	84	124	Uppercase T
U	55	85	125	Uppercase U
V	56	86	126	Uppercase V
W	57	87	127	Uppercase W
X	58	88	130	Uppercase X
Y	59	89	131	Uppercase Y
Z	5A	90	132	Uppercase Z
[	5B	91	133	Opening square bracket
\	5C	92	134	Reverse slant
]	5D	93	135	Closing bracket
^	5E	94	136	Caret (circumflex)
_	5F	95	137	Underscore (low line)
‘	60	96	140	Opening Single Quote
a	61	97	141	Lowercase a
b	62	98	142	Lowercase b
c	63	99	143	Lowercase c
d	64	100	144	Lowercase d
e	65	101	145	Lowercase e
f	66	102	146	Lowercase f
g	67	103	147	Lowercase g
h	68	104	150	Lowercase h
i	69	105	151	Lowercase i
j	6A	106	152	Lowercase j
k	6B	107	153	Lowercase k
l	6C	108	154	Lowercase l
m	6D	109	155	Lowercase m
n	6E	110	156	Lowercase n
o	6F	111	157	Lowercase o
p	70	112	160	Lowercase p
q	71	113	161	Lowercase q
r	72	114	162	Lowercase r
s	73	115	163	Lowercase s
t	74	116	164	Lowercase t
u	75	117	165	Lowercase u
v	76	118	166	Lowercase v
w	77	119	167	Lowercase w

Table B-2. Roman-8 Character Conversion (continued)

Graphic	Hex	Dec	Oct	Description
x	78	120	170	Lowercase x
y	79	121	171	Lowercase y
z	7A	122	172	Lowercase z
{	7B	123	173	Opening brace (curly bracket)
|	7C	124	174	Vertical line
}	7D	125	175	Closing brace (curly bracket)
~	7E	126	176	Approximate (tilde)
▒	7F	127	177	DEL (delete, rubout)
	80	128	200	--undefined control code--
	81	129	201	--undefined control code--
	82	130	202	--undefined control code--
	83	131	203	--undefined control code--
	84	132	204	--undefined control code--
	85	133	205	--undefined control code--
	86	134	206	--undefined control code--
	87	135	207	--undefined control code--
	88	136	210	--undefined control code--
	89	137	211	--undefined control code--
	8A	138	212	--undefined control code--
	8B	139	213	--undefined control code--
	8C	140	214	--undefined control code--
	8D	141	215	--undefined control code--
	8E	142	216	--undefined control code--
	8F	143	217	--undefined control code--
	90	144	220	--undefined control code--
	91	145	221	--undefined control code--
	92	146	222	--undefined control code--
	93	147	223	--undefined control code--
	94	148	224	--undefined control code--
	95	149	225	--undefined control code--
	96	150	226	--undefined control code--
	97	151	227	--undefined control code--
	98	152	230	--undefined control code--
	99	153	231	--undefined control code--
	9A	154	232	--undefined control code--
	9B	155	233	--undefined control code--
	9C	156	234	--undefined control code--
	9D	157	235	--undefined control code--
	9E	158	236	--undefined control code--
	9F	159	237	--undefined control code--

Table B-2. Roman-8 Character Conversion (continued)

Graphic	Hex	Dec	Oct	Description
	A0	160	240	NBS (No Break Space)
À	A1	161	241	Uppercase A grave
Â	A2	162	242	Uppercase A circumflex
È	A3	163	243	Uppercase E grave
Ê	A4	164	244	Uppercase E circumflex
Ë	A5	165	245	Uppercase E dieresis
Î	A6	166	246	Uppercase I circumflex
Ï	A7	167	247	Uppercase I dieresis
´	A8	168	250	Lowercase acute accent
`	A9	169	251	Lowercase grave accent
^	AA	170	252	Lowercase circumflex accent
¨	AB	171	253	Lowercase dieresis accent
~	AC	172	254	Lowercase tilde accent
Ù	AD	173	255	Uppercase U grave
Û	AE	174	256	Uppercase U circumflex
£	AF	175	257	Italian lira (pound sterling)
¯	B0	176	260	Overscore (high line)
Ý	B1	177	261	Uppercase Y acute
ý	B2	178	262	Lowercase y acute
°	B3	179	263	Degree
Ç	B4	180	264	Uppercase C cedilla
ç	B5	181	265	Lowercase c cedilla
Ñ	B6	182	266	Uppercase N tilde
ñ	B7	183	267	Lowercase n tilde
¡	B8	184	270	Inverted exclamation mark
¿	B9	185	271	Inverted question mark
¤	BA	186	272	General currency symbol
£	BB	187	273	Pound sterling sign
¥	BC	188	274	Yen sign
§	BD	189	275	Section mark
ƒ	BE	190	276	Dutch guilder symbol
¢	BF	191	277	Cent sign
â	C0	192	300	Lowercase a circumflex
ê	C1	193	301	Lowercase e circumflex
ô	C2	194	302	Lowercase o circumflex
û	C3	195	303	Lowercase u circumflex
á	C4	196	304	Lowercase a acute
é	C5	197	305	Lowercase e acute
ó	C6	198	306	Lowercase o acute
ú	C7	199	307	Lowercase u acute

Table B-2. Roman-8 Character Conversion (continued)

Graphic	Hex	Dec	Oct	Description
à	C8	200	310	Lowercase a grave
è	C9	201	311	Lowercase e grave
ò	CA	202	312	Lowercase o grave
ù	CB	203	313	Lowercase u grave
ä	CC	204	314	Lowercase a dieresis
ë	CD	205	315	Lowercase e dieresis
ö	CE	206	316	Lowercase o dieresis
ü	CF	207	317	Lowercase u dieresis
Å	D0	208	320	Uppercase A ring
î	D1	209	321	Lowercase i circumflex
Ø	D2	210	322	Uppercase O oblique
Æ	D3	211	323	Uppercase AE diphthong
å	D4	212	324	Lowercase a ring
í	D5	213	325	Lowercase i acute
ø	D6	214	326	Lowercase o oblique
æ	D7	215	327	Lowercase ae diphthong
Ä	D8	216	330	Uppercase A dieresis
ì	D9	217	331	Lowercase i grave
Ö	DA	218	332	Uppercase O dieresis
Ü	DB	219	333	Uppercase U dieresis
É	DC	220	334	Uppercase E acute
ï	DD	221	335	Lowercase i dieresis
ß	DE	222	336	Lowercase es-zet ligature
Ô	DF	223	337	Uppercase O circumflex
Á	E0	224	340	Uppercase A acute
Ã	E1	225	341	Uppercase A tilde
ã	E2	226	342	Lowercase a tilde
Đ	E3	227	343	Uppercase Eth
đ	E4	228	344	Lowercase eth
Í	E5	229	345	Uppercase I acute
Ì	E6	230	346	Uppercase I grave
Ó	E7	231	347	Uppercase O acute
Ò	E8	232	350	Uppercase O grave
Õ	E9	233	351	Uppercase O tilde
õ	EA	234	352	Lowercase o tilde
Š	EB	235	353	Uppercase S hacek
š	EC	236	354	Lowercase s hacek
Ú	ED	237	355	Uppercase U acute
Ÿ	EE	238	356	Uppercase Y dieresis
ÿ	EF	239	357	Lowercase y dieresis

Table B-2. Roman-8 Character Conversion (continued)

Graphic	Hex	Dec	Oct	Description
Þ	F0	240	360	Uppercase Thorn
þ	F1	241	361	Lowercase thorn
·	F2	242	362	Middle Dot
µ	F3	243	363	Lowercase mu (micro)
¶	F4	244	364	Pilcrow (paragraph sign)
¾	F5	245	365	Vulgar fraction: three fourths
–	F6	246	366	Minus sign
¼	F7	247	367	Vulgar fraction: one fourth
½	F8	248	370	Vulgar fraction: one half
ª	F9	249	371	Female ordinal
º	FA	250	372	Male ordinal
«	FB	251	373	Left pointing guillemets (quotes)
■	FC	252	374	Medium solid box
»	FD	253	375	Right pointing guillemets (quotes)
±	FE	254	376	Plus over minus
	FF	255	377	--undefined--

C

Symbol Set and Typeface Codes

Introduction

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 C-2 identifies the Typeface Family values for the various type foundries. Table C-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 C-1. Symbol Set Values

Symbol Set Name[1]	Symbol Set ID	Kind1 Value[2]	Symbol Set Name[1]	Symbol Set ID	Kind1 Value[2]
GW-3212	18C	597	Line Draw-7	0L	12
ISO 60: Danish/Norwegian	0D	4	HP Block Characters	1L	44
Devanagari	2D	68	Tax Line Draw	2L	76
ISO 4: United Kingdom	1E	37	Line Draw-8	8L	268
Windows 3.1 Latin 2	9E	293	Ventura ITC Zapf Dingbats[3]	9L	300
ISO 69: French	1F	38	PS ITC Zapf Dingbats	10L	332
ISO 21: German	1G	39	ITC Zapf Dingbats Series 100	11L	364
Greek-8	8G	263	ITC Zapf Dingbats Series 200	12L	396
Windows 3.1 Latin/Greek	9G	295	ITC Zapf Dingbats Series 300	13L	428
PC-851 Latin/Greek	10G	327	Windows Baltic	19L	620
PC-8 Latin/Greek	12G	391	Carta	20L	652
Hebrew-7	0H	8	Ornaments	21L	684
ISO 8859/8 Latin/Hebrew	7H	232	Universal News & Commercial Pi	22L	716
Hebrew-8	8H	264	Chess	23L	748
PC-862 Latin/Hebrew	15H	488	Astrology 1	24L	780
ISO 15: Italian	0I	9	Pi Set #1	31L	1004
Microsoft Publishing	6J	202	Pi Set #2	32L	1036
DeskTop	7J	234	Pi Set #3	33L	1068
Document	8J	266	Pi Set #4	34L	1100
PC-1004	9J	298	Pi Set #5	35L	1132
PS Text	10J	330	Pi Set #6	36L	1164
PS ISO Latin1	11J	362	Wingdings	579L	18540
MC Text	12J	394	Math-7	0M	13
Ventura International[3]	13J	426	Tech-7	1M	45
Ventura US[3]	14J	458	PS Math	5M	173
Swash Characters	16J	522	Ventura Math[3]	6M	205
Small Caps & Old Style Figures	17J	554	Math-8	8M	269
Old Style Figures	18J	586	Universal Greek & Math Pi	10M	333
Fractions	19J	618	TeX Math Extension	11M	365
Lining Figures	21J	682	TeX Math Symbol	12M	397
Small Caps and Lining Figures	22J	714	TeX Math Italic	13M	429
Alternate Caps	23J	746	Symbol	19M	621
Kana-8 (JIS 210)	8K	267	ISO 8859/1 Latin 1	0N	14
Korean-8	9K	299	ISO 8859/2 Latin 2	2N	78

[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 C-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]
ISO 8859/3 Latin 3	3N	110	PC-8 Turkish	9T	308
ISO 8859/4 Latin 4	4N	142	Teletex	10T	340
ISO 8859/9 Latin 5	5N	174	ISO 6: ASCII	0U	21
ISO 8859/10 Latin 6	6N	206	Legal	1U	53
ISO 8859/5 Latin/Cyrillic	10N	334	HPL	5U	181
ISO 8859/6 Latin/Arabic	11N	366	OEM-1	7U	245
ISO 8859/7 Latin/Greek	12N	398	Roman-8	8U	277
OCR-A	0O	15	Windows 3.0 Latin 1	9U	309
OCR-B	1O	47	PC-8, Code Page 437	10U	341
OCR-M	2O	79	PC-8 D/N, Danish/Norwegian	11U	373
MICR (E13B)	10O	335	PC-850, Multilingual	12U	405
Typewriter Paired APL	0P	16	Pi Font	15U	501
Bit Paired APL	1P	48	PC-857	16U	533
Expert	10P	336	PC-852, Latin 2	17U	565
Alternate	11P	368	Windows 3.1 Latin 1	19U	629
Fraktur	12P	400	PC-860 Portugal	20U	661
Reserved for Specials	xQ	17+32x	PC-861 Iceland	21U	693
Cyrillic ASCII (8859/5-1986)	0R	18	PC-863 Canada-French	23U	757
Cyrillic	1R	50	PC-865 Norway	25U	821
PC Cyrillic	3R	114	PC-775	26U	853
Windows 3.1 Latin/Cyrillic	9R	306	Arabic-8	8V	278
ISO 11: Swedish	0S	19	Windows 3.1 Latin/Arabic	9V	310
ISO 17: Spanish[3]	2S	83	Code Page 864 Latin/Arabic	10V	342
HP European Spanish	7S	243	3 of 9 Barcode	0Y	25
HP Latin Spanish	8S	275	Industrial 2 of 5 Barcode	1Y	57
HP-GL Download	16S	531	Matrix 2 of 5 Barcode	2Y	89
HP-GL Drafting	17S	563	Interleaved 2 of 5 Barcode	4Y	153
HP-GL Special Symbols	18S	595	CODABAR Barcode	5Y	185
Sonata	20S	659	MSI/Plessey Barcode	6Y	217
Thai-8	0T	20	Code 11 Barcode	7Y	249
TISI 620-2533 (Thai)	1T	52	UPC/EAN Barcode	8Y	281
Windows 3.1 Latin 5	5T	180	MICR (CMC-7)	14Y	473
Turkish-8	8T	276	USPS ZIP	15Y	505

[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 and are not present on the HP LaserJet 4, 4M, 4Si, 4SiMx, 4L, 4ML, 4P, 4MP, 4PJ, 4LJ Pro, 4LC, 4 Plus, 4M Plus, 4V, 4MV, 4000 series, 5, 5M, 5P, 5L, 5Si, 5SiMx, 5Si Mopier, 6L, 6P, 6MP, Color LaserJet, and DeskJet 1200C, 1600C printers.

Table C-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]
Obsolete Symbol Sets[3]			**Obsolete Symbol Sets[3]**		
Math-7 (same as 0M)	0A	1	ISO 57: Chinese	2K	75
Line Draw-7 (same as 0L)	0B	2	HP Spanish	1S	51
HP Large Characters	0C	3	ISO 10: Swedish	3S	115
ISO 61: Norwegian Version 2	1D	36	ISO 16: Portuguese	4S	147
Roman Extension	0E	5	ISO 84: Portuguese	5S	179
ISO 25: French	0F	6	ISO 85: Spanish	6S	211
HP German	0G	7	ISO 2: International Reference	2U	85
ISO 14: JIS ASCII	0K	11	Arabic (McKay's version)	0V	22
ISO 13: Katakana	1K	43			

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 C-2. 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 C-3. Typeface Base Values

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

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Table C-3. Typeface Base Values (continued)

Value	Typeface Family[1]	Value	Typeface Family[1]
62	ITC Benguiat	93	Kaufmann
63	ITC Cheltenham	93	U-Thong (Thai)
64	Century Expanded	94	ITC Bolt (extended)
65	Franklin Gothic	94	ITC Machine (condensed)
65	Paetai (Thai)	97	Revue
68	Plantin	101	Garamond (Stempel)
69	Trump Mediaeval	102	Garth Graphic
70	Futura Black	103	ITC Ronda
71	ITC American Typewriter	103	Candy Bits (patterned)
72	Antique Olive	104	OCR-A
72	Greek Antique Olive	105	Cochin
73	Uncial	106	Englische Schreibschrift (italic)
74	ITC Bauhaus	106	Mister Earl (condensed)
75	Century Old Style	107	Flash (italic)
76	ITC Eras	107	Woodstock
77	Friz Quadrata (ITC)	108	Gothic (numbered)
78	ITC Lubalin Graph	109	Stencil (ATF)
79	Eurostile	110	OCR-B
79	Intanon (Thai)	111	Akzidenz-Grotesk
79	Greek Microstyle	112	Black White (patterned, outline, inline)
80	Mincho (Japanese)	112	Logos
80	Myoungjo (Korean)	113	Shannon
80	HanYang Batang Proportional (Korean)	114	ITC Stone Informal
81	ITC Serif Gothic	115	ITC Stone Sans
81	Saemmul (Korea)	116	ITC Stone Serif
81	Sammul (Korea)	117	Schneidler Mediaeval
82	Snell Roundhand	118	ITC Symbol
82	Pilgy (Korean)	119	ITC Weidemann
83	Souvenir Gothic	120	Copperplate Gothic (display)
84	Stymie	121	Trajan
87	Bernhard Modern	122	Concorde
89	Excelsior	123	Janson Text
90	Gando Ronde Script	124	Linotype Centennial
91	Ondine	125	Life
91	EACT (Thai)	126	Minister
92	P. T. Barnum	127	New Century Schoolbook

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Table C-3. Typeface Base Values (continued)

Value	Typeface Family[1]	Value	Typeface Family[1]
152	Maru Gosikku (round gothic Japan)	176	ITC Berkeley Oldstyle
152	Gulrim (Korean)	177	Frutiger
152	HanYang Gulrim Proportional (Korean)	178	Candida
153	Gosikku (Kaku, gothic Japan)	179	Folio
153	Gothic (Japan, Fixed Pitch)	180	Corona
153	HanYang Dotum Proportional (Korean)	181	ITC Kabel
154	Socho	181	Zeppelin (inline)
155	Kyokasho (text book)	182	Garamond No. 3
156	Kaisho	183	Sabon
157	Traditional Arabic Script	184	ITC Novarese
158	Arabic News	185	Weiss
159	Post Antiqua	186	Hiroshige
160	Aerospace Pi	187	French Script
160	Devanagari (Hindi)	188	Meridien
161	Maritime Pi	189	Mistral
161	Krishna (Gujarati)	190	Aster
162	Bits Pic Pi	191	Caledonia
162	Ranjit (Gurmukhi)	192	Nuptial Script
163	Keycap Pi	193	Lucida
163	Raj Raja (Tamil)	194	Song (China)
164	Tieman	194	Adobe Wood Series 1
164	Gyosho	195	Memphis
165	David	196	Lucida Sans
166	Nork	197	Syntax
167	Ousbouh	198	Utopia
168	Koufi	199	Berthold Walbaum Buch
169	Italia (ITC)	200	Minion
169	Hadassah	201	Marigold
170	Bembo	202	ITC Tiepolo
170	Sharif	203	Versailles
171	Aachen	204	ITC Leawood
171	Malik	205	ITC Caslon No. 224
172	Americana	206	ITC Cushing
173	Arnold Boecklin	207	ITC Fenice
174	Copperplate Gothic (text)	208	ITC Usherwood
175	Belwe	209	ITC Benguiat Gothic

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Table C-3. Typeface Base Values (continued)

Value	Typeface Family[1]	Value	Typeface Family[1]
210	Spartan	236	Cataneo
210	ITC Ozwald (fatface)	236	Communication 3
211	Neuzeit Grotesk	237	Wittenberger Fraktur
212	PMN Caecilia	237	Communication 6
213	ITC Busorama	238	Modern
214	Agfa Wile Roman	238	PL Modern
215	ITC Zapf International	238	Games & Sports 1
216	Poppl-Pontifex	239	Artistik
217	ITC Quay Sans	239	Games & Sports 2
218	Arial	240	Flintstones
219	Fairfield	240	Games & Sports 3
220	ITC Zapf Book	241	SnowCap
221	Lucida Casual	241	Games & Sports 4
221	Linotype Technical Pi 1 & 2	242	Bedrock
222	Graphite	242	Holidays 1
222	Linotype Textil Pi 1 & 2	243	Star Fleet
223	Poetica	243	Industry & Engineering 1
223	Century Schoolbook Monospace	244	Star Trek Film
224	Berliner Grotesk	244	Industry & Engineering 2
225	Christiana	245	Star Trek
226	Comenius-Antiqua	245	Transportation 1
227	Delta	246	Hei (China)
228	Italian Old Style	246	Star Trek Pi
229	Zingo	246	Transportation 2
230	Octavian	247	ITC Mendoza
230	Borders & Ornaments 1	248	Boton
231	Footlight	249	Jaeger Daily News
231	Borders & Ornaments 4	250	ITC Officina Serif
232	Apollo	251	ITC Officina Sans
232	Borders & Ornaments 5	252	Goudy Modern
233	Bremen	253	Scotch Roman
233	Borders & Ornaments 6	254	Temporary-Only Font
234	Oranda	256	Bar Codes
234	Communication 1	257	Hadriano
235	Nubian	258	Joanna
235	Communication 2	259	Onyx

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Table C-3. Typeface Base Values (continued)

Value	Typeface Family[1]	Value	Typeface Family[1]
260	Cyrillic Helvetica	287	Avenir
260	Greek Helvetica	288	Lucia
260	East Asian Helvetica	289	Tekton
261	Cyrillic Times	290	Charme
261	Greek Times	291	ITC Flora
261	East Asian Times	292	Basilica
262	ITC Quorum	293	Auriol
263	Engravers' Old English	294	Kuenstler Script
264	Kennerley	295	ITC New Baskerville
265	Adobe Caslon	296	Berling
266	Albertus	297	News Gothic
267	New Aurora Grotesque	298	Critter
268	TBG Omnia	298	Linotype Holiday Pi 1, 2, & 3
269	Glypha	299	Medici Script
270	Tempo	300	Aurora
270	Umbra (open shadow)	301	Carta
271	American Text	302	Adobe Symbol
272	Pasquale	303	Insignia
273	ITC Elan	304	Perpetua
274	Monotype Goudy Sans	305	Raleigh
275	Lutheresche Fraktur	306	Romic
275	Universal News & Commercial Pi	307	Formata
276	Thunderbird (extra condensed)	308	Cyrillic Univers
276	ITC Honda (black)	308	Chuan Pim (like Univers)
277	Shelley	308	Narkis Tam (like Univers)
277	Mr. Big	308	Greek Univers II
278	Macbeth	309	Bauer Bodoni
278	Universal Greek & Math Pi	310	Industria
279	ITC Century	311	Cutout
280	Vineta	311	Decoration Pi
281	TBG Duc de Berry	312	Letraset Bramley
282	Times Europa	313	Isabella
283	ITC Jamille	314	Cascade Script
284	Flyer	315	VAG Rounded
285	Wedding Text	316	Russell Square
286	Carolina	317	Liberty

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Table C-3. Typeface Base Values (continued)

Value	Typeface Family[1]	Value	Typeface Family[1]
318	ITC Esprit	351	Simplified Arabic
319	Clairvaux	352	Maximus
320	Raphael	353	ITC Slimbach
321	ITC Franklin Gothic	357	Berthold Garamond
322	Murray Hill	358	Rad
323	Baker Signet	358	Land Pi
324	Mythos	359	Oxford (italic)
324	Gambling Pi	359	Kino (bold condensed)
325	San Marco	360	Looney Tunes
326	Typo Roman	360	E13B MICR
327	Engravers Text (inline)	361	Imperial
327	New Berolina (italic)	361	CMC-7 MICR
328	Orbit-B	362	Charlemagne
329	McCollough	363	Present Script
330	ITC Isadora	364	Repro Script (italic)
331	Giddyup	364	Matura (bold)
331	Audio Pi	365	Baskerville No. 2
332	Letraset Crillee	366	Engravers' Roman
333	Agfa Nadianne	367	VGC Egyptian 505
334	Compliment	368	TBG Herculanum
335	ITC Giovanni	369	Clearface Gothic
336	Neuzeit S	370	Studz
337	Erbar	370	Border Pi 1515-9
338	Parisian	371	Toolbox
339	Nofret	371	Bundesbahn Pi
340	City	372	Quake
341	Old Style 7	372	Chemical Pi
342	Bell Centennial	373	Neuland (solid & inline)
343	Lydian	373	Newton Inline
344	Monotype Ellington	373	Warning Pi
345	Impressum	374	Harry
346	Reporter No. 2	375	Alternate Gothic (numbered)
347	Freestyle Script	376	Figaro
348	Serpentine	377	Formal Script
349	Lithos	378	Holland Title
350	Basilia	379	ITC Barcelona

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Table C-3. Typeface Base Values (continued)

Value	Typeface Family[1]	Value	Typeface Family[1]
380	Cartier	412	Rotis Sans Serif
381	Deepdene	412	Caravan LH Three
382	Delphin	413	Rotis Semisans
383	Parsons	413	Caravan LH Four
384	Brighton	414	Arcadia
385	Berthold Barmeno	415	ITC Veljovik
386	Berthold Colossalis	416	Armenian Aramian
387	Berthold Cosmos	417	Armenian Barz
388	ITC Isbell	418	Helvetica Rounded
389	ITC Mixage	419	Olympian
390	Sonata	420	DIN Engschrift (condensed)
390	Badr, or Bayaan II	420	DIN Mittelschrift
391	ITC Newtext	421	Granjon
392	Happening	422	Guardi
393	Menue	423	Impact
394	Doric	424	Sassoon Primary
395	S'maragd	425	Packard
396	Pierrot	426	Baskerville Book
396	Ornaments	427	ITC Pacella
397	Berthold Bodoni Old Face	428	Rusticana
398	Schadow	429	Eccentric
399	Akzidens Grotesk Buch	430	Embassy Script
400	Akzidens Grotesk Buch Stencil	430	Greek Florentine Script II
401	Akzidens Grotesk Buch Schulbuch	431	PL Latin Bold
402	Bookman	431	PL Latin Elongated (condensed)
403	Bruce Old Style	431	Latin Antique
404	Bulmer	431	Latin Wide (extended)
405	Madison	432	ITC Modern 216
406	Textype	433	Serlio
407	Primer	434	Piranesi
408	Garamond (Simoncini)	435	Imago
409	Adobe Wood Series 2	436	Wilke
410	Rotis Serif	437	Cyrillic 22
410	Caravan LH One	438	Adobe Garamond
411	Rotis Semiserif	439	Seagull
411	Caravan LH Two	440	Latin MT

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Table C-3. Typeface Base Values (continued)

Value	Typeface Family[1]	Value	Typeface Family[1]
441	Runic MT	471	Digital
442	Moore Computer	471	Noris Script (italic)
443	Commercial Script	472	Poppl-Pontifex (B.metrics)
444	Dominante	473	Amigo
445	Wilhelm Klingspor Gotisch	473	Pelican (italic)
446	Trajanus	473	Visigoth (bold italic)
447	TSI Caxton	474	Letraset Arta
447	Letraset Caxton	475	Post Mediaval
448	Fette Fraktur	476	Adsans
448	Sapphire (pattern 0)	477	Ariadne
448	Saphir (pattern 0)	478	Calligraphy
449	Rainbow Bass (pattern 0)	479	Didot
449	European Pi	480	Ashley Script (italic)
450	Banco	480	Ashley Crawford (bold)
451	Bodoni Antiqua	480	Ashley Inline (inline)
452	Sallwey Script	481	Catull
452	Mathematical Pi	482	Cremona
453	Congress	483	Audrey No. 2
454	Cheq	484	Lo-Type
455	Berthold Walbaum Buch (B.metrics)	485	Madame (patterned with shadow)
456	Huxley Vertical	486	Roundy
457	Grayda	486	Animals
458	Penfield No. 3	487	Ruling Script
459	Michelangelo	487	Business & Services 1
460	Neo Didot	488	Sho
461	Berthold Caslon Buch	488	Business & Services 2
462	Sans No. 1	489	Wiesbaden Swing
463	Torino	489	Commercial 1
464	Photina	490	Star Trek Next
465	Calligraphiques	490	Commercial 2
466	Concorde Nova	491	ITC Highlander
467	Franco	491	Ecology
468	Goudy Text	492	Helios II
469	Balloon (italic)	492	General Symbols 1
470	Eusebius	493	Kai Medium
470	Eusebius Open (inline)	493	General Symbols 2

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Table C-3. Typeface Base Values (continued)

Value	Typeface Family[1]	Value	Typeface Family[1]
494	Medical & Pharmaceutical 1	523	Centaur
495	Space	524	Fine Hand
495	Musical	525	Linotype Astrology Pi
496	Special Alphabets 4	526	Sackers Roman
497	Special Alphabets 5	527	Kompakt (ultra black italic)
498	Special Alphabets 6	527	Monoline Script (italic)
499	Inflex	528	Othello (bold condensed)
500	Monotype Old Style	529	Sackers Classic Roman
501	Ming	529	Sackers Italian Script (italic)
502	FangSong	530	Musketeer
503	Helinda Rook	530	Riviera (inline)
504	Original Script	531	Poppl-Residenz
505	Citadel Script	532	Rotation
506	Old Fashion Script	533	Bank Gothic
507	ITC Legacy Serif	534	Delphian (inline)
508	ITC Legacy Sans	534	Greeting Monotone
509	Athenaeum	535	Sackers Antique Roman
509	Athenaeum Negative (pattern 0)	536	Schwabacher
509	Athenaeum Positive (pattern 1)	537	Egyptienne (condensed)
510	ITC Anna (condensed)	538	Artisan Roman (inline)
510	ITC Beesknees (black)	538	Forte (bold italic)
511	ITC Studio Script (italic)	539	Burin Roman
511	ITC Mona Lisa Recut (inline)	539	Burin Sans (light)
511	ITC Mona Lisa Solid (upright)	540	Hellenic Wide (extended)
512	Sackers Square Gothic	541	Thompson Quillscript
512	Sackers English Script	542	Kartoon
513	Heritage	543	Classic Roman
514	Sackers Gothic	544	AG Old Face
516	Greek Helios II	545	Lucian
517	Times (Ten, New, etc.)	546	Della Robbia
518	Berthold Script	547	Libra
519	Bernhard Tango (italic)	548	Brody (bold upright)
520	Castellar (inline)	549	Ad Lib (bold)
521	Else	550	Choc (black)
522	Basque (condensed)	551	Handle Oldstyle
522	Palace Script (italic)	552	Roman

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Table C-3. Typeface Base Values (continued)

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

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Table C-3. Typeface Base Values (continued)

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

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Table C-3. Typeface Base Values (continued)

Value	Typeface Family[1]	Value	Typeface Family[1]
672	Diotima	702	Quirinus Bold (condensed)
673	Aldus	703	PL West Behemoth Semi Condensed (XBd Cd)
674	Chaplin (italic)	704	Renault
675	Uncle Sam Stars (pattern 0, shadow)	705	Forbes Bold
675	Uncle Sam Stripes (pattern 1, shadow)	706	Mobil
676	Wildstyle	707	Becket
677	Logan (pattern 0)	708	Lucida Sans Typewriter
677	Eon Age (pattern 1)	709	Cartoon Script Roman
677	System X3 (pattern 2)	710	Campanula
677	Galaxy Run (pattern 3)	711	Odilia
678	Jukebox (bold condensed)	712	Lino Letter
679	Marking Numbers Squares	713	Henche
679	Al Harf Al Jadid	714	Mahlau (condensed)
680	Vivaldi	715	Aquarias No. 8 (bold)
681	Codex	716	CG Frontiera
682	Metronome Gothic (bold extra condensed)	717	Globe Gothic
683	Salut (bold)	718	Signature
684	Lucida Fax	719	Sans Serif Stencil
685	Bellevue	720	Boldface PS
686	Architect	721	Title PS
687	Beton Extra Bold	725	Hess Neobold
688	Metropolis (extra bold, solid & inline)	726	Hollandse Mediaeval
689	PL Davison Zip Bold	727	Holland Seminar
690	Neon (Nebiolo)	728	CG Cloister
691	PL Benguiat Frisky	729	Adroit
692	PL Bartuska Trophy Oblique	730	Claire News
693	Cable	731	Triplett
694	PL Brazilia	732	Accolade
695	PL Radiant	733	Claridge
696	Ritmo Bold (italic)	734	Alpin Gothic
697	PL Fiedler Gothic Bold	735	Geometric
698	Egiziano Black	736	Heldustry
699	Studio	737	Busorama
700	PL Futura Maxi	738	Salto
701	Solemnis	739	Fehrle Display

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Table C-3. Typeface Base Values (continued)

Value	Typeface Family[1]	Value	Typeface Family[1]
740	Kismet	769	Kigali Roman
741	Digi Fraktur	770	Rundfunk Antiqua
742	Anglia	771	Rundfunk Grotesk
743	Jiffy	772	Apolline
744	Rosewood	773	Alisal
745	Zebrawood	774	Strider
746	Pepperwood (condensed)	775	Throhand
747	Copal (solid)	776	Cicero (e should be e-acute)
747	Copal (outline, patterned)	777	Antique Condensed Two
748	Motter Corpus (extrabold)	778	Asphalt Black
749	Cerigo	779	Avalon
750	Caflisch Script	780	Brok
751	Mezz	781	Citadel
752	Nueva	782	Hermes
753	Penumbra	783	Lafayette
754	Sanvito	784	Narcissus
755	Viva	785	Pilsner
756	Alexa (italic)	786	Showcard Moderne
756	Balzano	787	Streamline
756	Caliban (condensed italic)	788	Scherzo
757	Ex Ponto	789	Jante Antiqua
758	Neue Hammer Unziale 1	790	Albers Architype
758	Neue Hammer Unziale 2 (edge)	791	Aubette Architype
759	Galahad	792	Ballmer Architype
760	LiShu (China)	793	Bayer Type Architype
760	Gungse (Korean)	794	Schwitters Architype
760	HanYang GungSe Proportional (Korean)	795	Crane
761	Yuang (Yuan, XiYuang - China)	796	Runa Serif
762	Miryam	797	Comedia Serif
763	Ryadh	798	Breadline Normal
764	Arkona (ital script)	799	Revolution Normal
765	El Greco (ital script)	800	Virgin Roman Normal
766	Aja (ital script)	801	Gararond
767	Poppl-Exquisit (ital script)	802	Abacus
768	Sassafras Roman	803	Classic

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Table C-3. Typeface Base Values (continued)

Value	Typeface Family[1]	Value	Typeface Family[1]
804	Cupid	836	Alligators
805	Arepo	837	Carmela (italic)
806	Aureus Uncial (upright)	838	Dorothea (upright)
807	Connach (upright, norm and uncial lc)	839	Hrabanus (upright)
808	Cresci Rotunda (upright)	840	Lexie's Animals
809	Donatello (italic, black italic)	841	Mexican Birds
810	Francesca (lombardic, upright & cond)	841	Mexican Borders
810	Lombardic Capitals (upright)	841	Mexican Symbols
811	Ludovico Smooth (italic & flourishes)	842	Monmouth (upright)
811	Ludovico Woodcut (italic & flourishes)	843	Neuhengen (upright)
812	Mantegna (italic)	844	Ophelia Italic
813	Palatino Rotunda (upright)	845	Poggio Bookhand (upright)
814	Percival (upright)	846	Pompeii Capitals (upright)
815	Wolfdance (italic)	847	Ramsey (upright)
816	Adastra (bold italic inline)	848	Sallando Italic
817	Ampersands	849	Thalia Italic
818	Arwen (upright)	850	Trieste (upright)
819	Blocks (upright, solid filled)	851	Connach Historic
820	Elegant (inline & outline)	852	Lombardic Caps
821	Poetry (solid & inline)	853	Ludovico Smooth Flourish
822	Sphinx (extrabold, solid & inline)	853	Ludovico Woodcut Flourish
823	Tube (upright)	854	Newton Inline
824	Searsucker (solid, outline, patterned)	855	Lucida Typewriter
825	Hindenburg (upright)	930	Akzidenz Grotesk Buch Rounded
826	Informal (black, norm & condensed)	1030	Isil Gothic
827	Marquis (upright)	2128	HanYang Batang Fixed Pitch (Korean)
828	Questions	2128	MS Mincho (Japan, Proportional)
829	Maximilian (upright, inline)	2200	HanYang Gulrim Fixed Pitch (Korean)
830	Minimal (upright thin)	2201	HanYang Dotum Fixed Pitch (Korean)
831	Stalk (upright inline)	2201	MS Gothic (Japan, Proportional)
832	Mariposa (family)	2549	Ming Light (Japan, Proportional)
833	Mariposa Sans (family)	2730	Wingdings
834	Corvallis (upright & italic)	2808	HanYang GungSe Fixed Pitch (Korean)
835	Corvallis Sans (upright & italic)		

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