Factory Default Print Environment Feature Settings (PCL)

**JOB CONTROL**
- NUMBER OF COPIES* = 1
- DUPLEX* = Off (Simplex)
- BINDING* = Long-Edge
- TRAY LOCK= All trays unlocked
- JOB SEPARATION = OFF
- MANUAL FEED* = OFF
- REGISTRATION (left = 0, top = 0)
- OUTPUT BIN = Upper
- UNITS OF MEASURE = 300 Units/Inch

**PAGE CONTROL**
- PRINT DIRECTION = 0
- CHARACTER TEXT PATH DIRECTION* = 0
- TEXT PARSING METHOD* = 0
- ORIENTATION* = Portrait
- PAGE SIZE* = Letter
- PAPER (MEDIA) SOURCE = Main Source (Printer Specific)
- VERTICAL MOTION INDEX * = 8 (6 lpi)
- HORIZONTAL MOTION INDEX = 12 (10 cpi)
- TOP MARGIN = 1/2" (150 dots or 3 lines)
- 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

**FONT SELECTION**
- SYMBOL SET* = ROMAN-8 ***
- SPACING = Fixed
- PITCH = 10 cpi
- HEIGHT = 12 point
- STYLE = Upright
- STROKE WEIGHT = Medium
- TYPEFACE = Courier
- UNDERLINING MODE = Off

**FONT MANAGEMENT**
- FONT ID = 0
- CHARACTER CODE = 0
- SYMBOL SET ID = 0

**MACRO**
- MACRO ID = 0

---

* For these items, select User Default values using the printer driver or control panel (or remote control panel for LaserJet 4L, 5L, and 5P).

** The font characteristics are determined by the default font. The default font can be the factory default font or the user selected default font from the control panel or from a font cartridge with a default font.

*** PC-8 is the default symbol set for the LaserJet 5L and 5Si/5SiMx printers.

---

Note: Feature support varies with each printer. See the PCL 5 Comparison Guide for specific feature support information.
Factory Default Print Environment Feature Settings (PCL)  
(continued)

PRINT MODEL
- SOURCE TRANSPARENCY MODE = 0 (Transparent)
- PATTERN TRANSPARENCY MODE = 0 (Transparent)
- CURRENT PATTERN = Solid (Black)
- PATTERN REFERENCE POINT = 0,0
- PATTERN ROTATION = 0

RECTANGULAR AREA FILL
- HORIZONTAL RECTANGLE SIZE = 0
- VERTICAL RECTANGLE SIZE = 0
- PATTERN (AREA FILL) ID = 0

RASTER GRAPHICS
- RESOLUTION = 75 dpi
- PRESENTATION = 3
- COMPRESSION MODE = 0
- LEFT GRAPHICS MARGIN = 0
- RASTER WIDTH = Logical Page
- RASTER HEIGHT = N/A

TROUBLESHOOTING COMMANDS
- END-OF-LINE WRAP = OFF
- DISPLAY FUNCTIONS = OFF

STATUS READBACK
- CURRENT LOCATION TYPE = 0
- CURRENT LOCATION UNIT = 0

Factory Default Print Environment Feature Settings  
(HP-GL/2)

LINE AND FILL 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
- 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 (transparency)
- SCREENED VECTOR = No screening
Factory Default Print Environment Feature Settings (HP-GL/2) (continued)

CONFIGURATION AND STATUS GROUP

- SCALE MODE = Off
- WINDOW = PCL default picture frame (PCL default logical page, less 1/2 inch at the top and bottom)
- COORDINATE SYSTEM ORIENTATION = Same as PCL default logical page
- P1,P2 Lower left, upper right corners of picture frame

CHARACTER GROUP

- SYMBOL 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 WIDTH = N/A
- CHARACTER HEIGHT = N/A
- CHARACTER SLANT = 0
- EXTRA HORIZONTAL SPACE = 0
- EXTRA VERTICAL SPACE = 0
- CHARACTER FILL MODE = No edging, solid fill
- LABEL ORIGIN = 1
- LABEL TERMINATOR = Etx
- TRANSPARENT DATA MODE = Off
- PRIMARY FONT ID = 0
- SECONDARY FONT ID = 0
- SCALABLE OR BITMAP FONT = Select scalable only

VECTOR GROUP

- PLOTTING MODE = Absolute
- PEN STATE = Up

POLYGON GROUP

- POLYGON BUFFER = Cleared
- POLYGON MODE = Off
Job Control

Universal Exit Language
Causes the printer to exit the current language and return control to PJL.
\[\text{FC} \% - 1 \ 2 \ 3 \ 4 \ 5 \ X\]

Configuration (AppleTalk)
Allows the user to configure the printer I/O to receive PCL jobs over AppleTalk I/O.
\[\text{FC} &\ b \ # \ W \ [\text{Key}]<sp>[\text{value}]\]
\# = Number of bytes of [key]/[value] data (count space <sp>).

Printer Reset
Restores the User Default Environment, deletes temporary fonts and macros, and prints any remaining data.
\[\text{FC} \ E\]

Number of Copies
Prints the specified number (#) of copies of each page.
\[\text{FC} &\ l \ # \ X\]
\# = Number of copies (1 to 99 for III/IIIID; 1 to 32,767 for IIISi, 4 family and 5 family)

Simplex/Duplex Print
Prints front side of a page or both sides (front and back - in either of two binding modes).
\[\text{FC} &\ l \ # \ S\]
\# = 0 - Single side (Simplex)
1 - Duplex, long-edge binding
2 - Duplex, short-edge binding

Left (Long-Edge) Offset Registration
Adjusts the position of the logical page across the width of the page.
\[\text{FC} &\ l \ # \ U\]
\# = Number of decipoints (1/720 inch)
[+ or – specifies the plus or minus move direction (for example, \# = –10).]

Top (Short-Edge) Offset Registration
Adjusts the position of the logical page across the length of the page.
\[\text{FC} &\ l \ # \ Z\]
\# = Number of decipoints (1/720 inch)
[+ or – specifies the plus or minus move direction (for example, \# = –10).]

Note: The printer ignores any commands sent to it that it does not support.
Job Control (continued)

Duplex Page Side Selection
Prints the logical page on the specified physical page side.

\[ \text{\texttt{\textit{\textbf{\text{\texttt{\$C \& a \# G}}}}}} \]

- \# = 0 - Select next side
- 1 - Select front side
- 2 - Select back side

If a non-duplex printer receives this command, it performs a page eject.

Job Separation
Toggles the printer's job separation mechanism.

\[ \text{\texttt{\textit{\textbf{\text{\texttt{\$C \& l 1 T}}}}}} \]

Output Bin
Selects the output paper bin for paper output.

\[ \text{\texttt{\textit{\textbf{\text{\texttt{\$C \& l \# G}}}}}} \]

- \# = 0 - Automatic selection
- 1 - Upper Output Bin (for the LaserJet 5Si, printer top/face-down bin—bin #1)
- 2 - Rear Output Bin (for the LaserJet 5Si, printer left/face-up bin—bin #2; this bin is 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)

Unit of Measure
Establishes the unit of measure for the PCL unit.

\[ \text{\texttt{\textit{\textbf{\text{\texttt{\$C \& u \# D}}}}}} \]

- \# = Number of units/inch (96, 100, 120, 144, 150, 160, 180, 200, 225, 240, 288, 300, 360, 400, 450, 480, 600, 720, 800, 900, 1200, 1440, 1800, 2400, 3600, 7200)
Page Control

Page Size

Designates the physical paper size which in turn defines the logical page.

\[ \text{EC} \& l \# A \]

\# = 1 - Executive (7.25" x 10.5")
2 - Letter (8.5" x 11")
3 - Legal (8.5" x 14")
6 - Ledger (11" x 17")
25 - A5 paper (148mm x 210mm)
26 - A4 paper (210mm x 297mm)
27 - A3 (297mm x 420mm)
45 - JIS B5 paper (182mm x 257mm)
46 - JIS B4 paper (250mm x 354mm)
71 - Hagaki postcard (100mm x 148mm)
72 - Oufuku-Hagaki postcard (200mm x 148mm)
80 - Monarch Envelope (3 7/8" x 7 1/2")
81 - Commercial Envelope 10 (4 1/8" x 9 1/2")
90 - International DL (110mm x 220mm)
91 - International C5 (162mm x 229mm)
100 - International B5 (176mm x 250mm)
101 - Custom (size varies with printer)

Correct paper tray must be installed for selected paper size.

Page Length (Obsolete—see Paper Size)

Selects the logical page length in lines (one logical page per physical page)

\[ \text{EC} \& l \# P \]

\# = Number of Lines

Paper (Media) Source

Designates one of four paper sources for paper feed.

\[ \text{EC} \& l \# H \]

\# = 0 - Print current page (paper source remains unchanged)
1 - Feed paper from main paper source
2 - Feed paper from manual input
3 - Feed envelope from manual input
4 - Feed paper from alternate paper source
5 - Feed from optional large paper source
6 - Feed envelope from envelope feeder *
7 - Autoselect
8 - Feed paper from Tray 1 (right side tray)
20 - 39 - High Capacity Input (HCl) Trays 2-21

* Must be used in conjunction with Paper Size.
Page Control (continued)

Page Orientation
Designates the logical page position with respect to the physical page.
\[ {\texttt{FC} \& \# \texttt{O}} \]
# = 0 - Portrait
1 - Landscape
2 - Reverse Portrait
3 - Reverse Landscape

Print Direction
Rotates the logical page coordinate system counterclockwise in 90 degree increments with respect to the orientation of the current logical page.
\[ {\texttt{FC} \& \# \texttt{P}} \]
# = Degrees of rotation (0, 90, 180, 270)

Character Text Path Direction
Specifies the direction text is printed on the page, providing a means of printing using either a horizontal or vertical text path.
\[ {\texttt{FC} \& \# \texttt{T}} \]
# = 0 - Horizontal printing
= –1 - Vertical rotated printing

Text Parsing Method
Specifies PCL parsing method as either 1-byte or 2-byte characters codes.
\[ {\texttt{FC} \& \# \texttt{P}} \]
# = 0, 1 - All character codes processed as one-byte characters
21 - Character codes processed as two-byte characters (see PCL 5 Comparison Guide)
31 - Character codes processed as two-byte characters (see PCL 5 Comparison Guide)
38 - Characters codes processed as two-byte characters (see PCL 5 Comparison Guide)

Left Margin
Sets the left margin to the left edge of the specified column.
\[ {\texttt{FC} \& \# \texttt{L}} \]
# = Column number

Right Margin
Sets the right margin to the right edge of the specified column.
\[ {\texttt{FC} \& \# \texttt{M}} \]
# = Column number
Page Control (continued)

**Top Margin**
Designates number of lines between top of logical page to top of text area.

```
EC & l # E
```

# = Number of lines

**Clear Horizontal Margins**
Resets left and right margins to their default settings.

```
EC 9
```

**Horizontal Motion Index (HMI)**
Designates the distance between columns. (The value field # is valid to 4 decimal places.)

```
EC & k # H
```

# = Number of 1/120 inch increments

**Vertical Motion Index (VMI)**
Designates the distance between rows. (The value field # is valid to 4 decimal places.)

```
EC & l # C
```

# = Number of 1/48 inch increments between rows

**Line Spacing**
Sets the number of lines printed per inch (an alternate method for designating VMI).

```
EC & l # D
```

# = 1 - 1 line/inch
2 - 2 lines/inch
3 - 3 lines/inch
4 - 4 lines/inch
6 - 6 lines/inch
8 - 8 lines/inch
12 - 12 lines/inch
16 - 16 lines/inch
24 - 24 lines/inch
48 - 48 lines/inch

**Text Length**
Designates the length of the text area in lines.

```
EC & l # F
```

# = Number of lines

**Perforation Skip**
Causes printing to skip from the end of the text area to the top of the next text area (top margin of new page).

```
EC & l # L
```

# = 0 - Disabled
1 - Enabled
Cursor Positioning

Cursor positioning can be either absolute or relative. Absolute positioning specifies the cursor move distances referenced from the left edge of the logical page and the top margin. Relative positioning specifies cursor move distances referenced from the current cursor position. Relative moves are indicated by using signed numbers (e.g. \# = +15 or –122); absolute moves are indicated by unsigned numbers (e.g. \# = 15 or 122).

Horizontal Cursor Positioning (in Columns)
Moves the cursor to a new column on the current line (column width determined by current HMI setting).

\[ \texttt{FC} \& \ a \ # \ C \]
\# = Column number

Horizontal Cursor Positioning (in Decipoints)
Moves the cursor to a new position along the x-axis.

\[ \texttt{FC} \& \ a \ # \ H \]
\# = Decipoint position (1/720 inch), valid to 2 decimal places.

Horizontal Cursor Positioning (PCL units)
Moves the cursor to a new position along the x-axis.

\[ \texttt{FC} \ast \ p \ # \ X \]
\# = Number of PCL units

Horizontal Cursor Positioning Control Codes

CR - Carriage-Return
Moves the cursor to the left margin on the current line.
(Operation of CR may be modified—see Line Termination command.)

SP - Space
Moves the cursor one column right on the current line for fixed-space font or moves the cursor the HMI distance for proportional fonts when space is a non-printing character.

BS - Backspace
Moves the cursor left, the distance of the last printed character, on the current line for fixed-space fonts. For proportionally-spaced fonts, backspace moves the cursor back along the current line the distance required to center the overstrike character over the last printed character. Subsequent BS command moves the width of the last printed character.

HT - Horizontal Tab
Moves the cursor to the next tab stop on the current line. (Tab stops are set every 8th column.)
Cursor Positioning (continued)

Vertical Cursor Positioning (Rows)
Moves the cursor to a new row in the same column (row distances are determined by the VMI setting).
\[ \text{EC} \; \& \; a \; \# \; R \]
\[ \# = \text{Row number} \]

Vertical Cursor Positioning (Decipoints)
Moves the cursor to a new vertical position along the y-axis.
\[ \text{EC} \; \& \; a \; \# \; V \]
\[ \# = \text{Decipoint position (1/720 inch), valid to 4 decimal places.} \]

Vertical Cursor Positioning (PCL units)
Moves the cursor to a new dot position along the y-axis.
\[ \text{EC} \; * \; p \; \# \; Y \]
\[ \# = \text{Number of PCL units} \]

Half Line-Feed
Moves the cursor to the same character position one-half line down (distance moved depends on current VMI).
\[ \text{EC} = \]

Vertical Cursor Positioning Control Codes
- **LF** - Line Feed
  Moves the cursor to the same horizontal position on the next line.
- **FF** - Form Feed
  Moves the cursor to the same horizontal position at the top of the next text area.

Line Termination
Controls the way the printer interprets CR, LF, and FF control codes.
\[ \text{EC} \; \& \; k \; \# \; G \]
\[ \# = \]
\[ 0 - \text{CR} = \text{CR}, \quad \text{LF} = \text{LF}, \quad \text{FF} = \text{FF} \]
\[ 1 - \text{CR} = \text{CR+LF}, \quad \text{LF} = \text{LF}, \quad \text{FF} = \text{FF} \]
\[ 2 - \text{CR} = \text{CR}, \quad \text{LF} = \text{CR+LF}, \quad \text{FF} = \text{CR+FF} \]
\[ 3 - \text{CR} = \text{CR+LF}, \quad \text{LF} = \text{CR+LF}, \quad \text{FF} = \text{CR+FF} \]

Push/Pop Cursor Position
Allows the cursor position to be stored and recalled for later use. (Up to 20 positions may be pushed onto the stack)
\[ \text{EC} \; \& \; f \; \# \; S \]
\[ \# = \]
\[ 0 - \text{Push (Store cursor position)} \]
\[ 1 - \text{Pop (Recall a cursor position)} \]


Font Selection

Any number of fonts may be printed per page, limited only by memory.

Symbol Set

Designates the set of symbols or characters contained in a font.

\[ \text{Font} \, \text{Set} \, \text{ID} \, \text{Primary} \]

\[ \text{Font} \, \text{Set} \, \text{ID} \, \text{Secondary} \]

ID = Symbol Set identifier

Common examples:

ID = 8M - HP Math-8 0N - ISO 8859-1 Latin 1
8U - HP Roman-8 0O - OCR A
10U - PC-8 1E - ISO 4: United Kingdom
1G - ISO 21: German 1U - HP US Legal
0U - ASCII 19U - Windows ANSI

See Table C-1 in the PCL 5 Comparison Guide for more symbol sets.

Spacing

Designates either a fixed or proportionally spaced font.

\[ \text{Spacing} \, \text{ID} \, \text{Primary} \]

\[ \text{Spacing} \, \text{ID} \, \text{Secondary} \]

# = 0 - Fixed spacing
1 - Proportional spacing

Pitch

Designates the horizontal spacing of a fixed spaced font in terms of the number of characters per inch.

\[ \text{Pitch} \, \text{ID} \, \text{Primary} \]

\[ \text{Pitch} \, \text{ID} \, \text{Secondary} \]

# = Pitch in characters/inch

Height (Point Size)

Designates the height of the font in points.

\[ \text{Height} \, \text{ID} \, \text{Primary} \]

\[ \text{Height} \, \text{ID} \, \text{Secondary} \]

# = Height in points
Font Selection (continued)

Style
Designates the font style.
\[
\text{\texttt{EC}} \ (s \ # \ S \ - \ \text{Primary}) \\
\text{\texttt{EC}} \ s \ # \ S \ - \ \text{Secondary} \\
# = \begin{cases} 
0 & \text{Upright} \\
1 & \text{Italic} \\
4 & \text{Condensed} \\
5 & \text{Condensed Italic} \\
8 & \text{Compressed, Extra Condensed} \\
24 & \text{Expanded} \\
32 & \text{Outline} \\
64 & \text{Inline} \\
128 & \text{Shadowed} \\
160 & \text{Outline Shadowed} 
\end{cases}
\]

Stroke Weight
Designates the thickness or weight of the stroke that composes the characters of a font.
\[
\text{\texttt{EC}} \ (s \ # \ B \ - \ \text{Primary}) \\
\text{\texttt{EC}} \ s \ # \ B \ - \ \text{Secondary} \\
# = \begin{cases} 
-7 & \text{Ultra thin} \\
-6 & \text{Extra Thin} \\
-5 & \text{Thin} \\
-4 & \text{Extra Light} \\
-3 & \text{Light} \\
-2 & \text{Demi Light} \\
-1 & \text{Semi Light} \\
0 & \text{Medium} \\
1 & \text{Semi Bold} \\
2 & \text{Demi Bold} \\
3 & \text{Bold} \\
4 & \text{Extra Bold} \\
5 & \text{Black} \\
6 & \text{Extra Black} \\
7 & \text{Ultra Black} 
\end{cases}
\]

Typeface Selection
Designates the design of the font.
\[
\text{\texttt{EC}} \ (s \ # \ T \ - \ \text{Primary}) \\
\text{\texttt{EC}} \ s \ # \ T \ - \ \text{Secondary} \\
# = \begin{cases} 
0 & \text{Line Printer} \\
3 & \text{Courier} \\
4 & \text{Helvetica} \\
6 & \text{Gothic} \\
7 & \text{Script} \\
8 & \text{Prestige} \\
4099 & \text{Courier (Scalable)} \\
4101 & \text{CG Times} \\
4148 & \text{Univers} \\
16602 & \text{Arial} 
\end{cases}
\]

See Table C-2 and C-3 in the PCL 5 Comparison Guide for more typeface values.

Font Selection by ID #
Selects a soft font using its specific ID #.
\[
\text{\texttt{EC}} \ (#X \ - \ \text{Designates soft font as primary}) \\
\text{\texttt{EC}} \ #X \ - \ \text{Designates soft font as secondary} \\
# = \text{Font Identification number (ID #; 0 through 32767)}
\]
Font Selection (continued)

Select Default Font
Sets all font characteristics (except orientation) to those of the default font.
\texttt{E}C (3 @ Default primary font characteristics
\texttt{E}C ) 3 @ Default secondary font characteristics

Transparent Print Data
Provides printing access to all characters in a font including those defined as unprintable.
\texttt{E}C & p # X [transparent data ]
\# = Number of bytes of transparent print data.

Underline
Controls automatic text underlining.
\texttt{E}C & d # D
\# = 0 - Underline On
3 - Floating Underline On
\texttt{E}C & d @ - Underline Off
Font Management

Font ID #
Specifies an identification number (ID #) for use in subsequent font management commands.

```
EC * c # D
# = ID # (0 through 32767)
```

Font Control
Provides the means for manipulating soft fonts within the printer.

```
EC * c # F
# =
  0 - Delete all soft fonts
  1 - Delete all temporary soft fonts
  2 - Delete soft font (last ID specified)
  3 - Delete Character Code (last ID and character code)
  4 - Make soft font temporary (last ID specified)
  5 - Make soft font permanent (last ID specified)
  6 - Copy/Assign current invoked font as temporary
```

Alphanumeric ID
Specifies alphanumeric String IDs for fonts, macros, and media types. Specifies media selection by the type of media and supports enhancements for the printer disk drive.

```
EC & n # W [operation][string]
# = Number of bytes of string data
```

Operations

```
0 - Set the current Font ID to the given String ID.
1 - Associates current Font ID to font with supplied String ID.
2 - Selects the font referred to by the String ID as primary.
3 - Selects the font referred to by the String ID as secondary.
4 - Sets the current Macro ID to the String ID.
5 - Associates the current Macro ID to the supplied String ID.
20 - Deletes the font association named by the current Font ID.
21 - Deletes the macro association named by the current Macro ID.
100 - Media select
```

Note: See the PCL 5 Printer Language Technical Reference Manual for additional information about the Font Descriptor command and the Character Descriptor command data fields.
User-Defined Symbol Set

Symbol Set ID Code
Assigns an identification code to a user-defined symbol set.

```
^C ^c ^R
```

# = Symbol set ID code.

Define Symbol Set
Downloads symbol set definition data for a user-defined symbol set.

```
^C ^f ^W [symbol set definition data]
```

# = Number of symbol set definition bytes.

Symbol Set Control
Provides a means for manipulating user-defined symbol sets.

```
^C ^c ^S
```

# =
0 - Delete user-defined symbol sets (temporary and permanent)
1 - Delete all temporary symbol sets
2 - Delete symbol set (last symbol set ID code specified)
4 - Make symbol set temporary (last symbol set ID code specified)
5 - Make symbol set permanent (last symbol set ID code specified)

Soft Font Creation

Font Descriptor
Downloads the font descriptor to the printer.

```
^C ) ^s ^W [ font descriptor data ]
```

# = Number of font descriptor data bytes

Character Code
Establishes the decimal character code that will be associated with the next character downloaded or deleted.

```
^C ^c ^E
```

# = Decimal character code

Character Descriptor/Data
Downloads the character descriptor and character data.

```
^C ( ^s ^W [binary data bytes]
```

# = Number of binary data bytes
Macros

Macro ID #
Specifies an ID # for a macro for use in subsequent macro commands.

& C & f # Y
# = Macro ID # (0 through 32767)

Macro Control
Provides the mechanism for definition, invocation, and deletion of macros.

& C & f # X
# = 0 - Start macro definition (for last ID specified)
    1 - Stop macro definition
    2 - Execute macro (for last ID specified)
    3 - Call macro (for last ID specified)
    4 - Enable macro for automatic overlay
        (for last ID specified)
    5 - Disable automatic overlay
    6 - Delete all macros
    7 - Delete all temporary macros
    8 - Delete macro (for last ID specified)
    9 - Make macro temporary (for last ID specified)
   10 - Make macro permanent (for last ID specified)
Print Model

Source Transparency Mode
Sets the source image's transparency mode to transparent or opaque.
\[ \text{\textbackslash{}EC} \ '' \ \text{\textbackslash{}V} \ \text{\#} \ \text{\textbackslash{}N} \]
\[ \text{#} = 0 \cdot \text{Transparent (default)} \]
\[ 1 \cdot \text{Opaque} \]

Pattern Transparency Mode
Sets the pattern's transparency mode to transparent or opaque.
\[ \text{\textbackslash{}EC} \ '' \ \text{\textbackslash{}V} \ \text{\#} \ \text{\textbackslash{}O} \]
\[ \text{#} = 0 \cdot \text{Transparent (default)} \]
\[ 1 \cdot \text{Opaque} \]

Pattern (Area Fill) ID
Specifies the level of shading, type of cross-hatch, or user-defined pattern to select via Select Pattern command. See the following page for command description.

Select Current Pattern
Identifies the type of pattern to be applied to the source.
\[ \text{\textbackslash{}EC} \ '' \ \text{\textbackslash{}V} \ \text{\#} \ \text{\textbackslash{}T} \]
\[ \text{#} = 0 \cdot \text{Solid Black (default)} \]
\[ 1 \cdot \text{Solid White} \]
\[ 2 \cdot \text{Shading Pattern} \]
\[ 3 \cdot \text{Cross-Hatch Pattern} \]
\[ 4 \cdot \text{User-Defined Pattern} \]

Logical Operation
Specifies the logical operation (ROP3) to be performed.
\[ \text{\textbackslash{}EC} \ '' \ \text{\textbackslash{}L} \ \text{\#} \ \text{\textbackslash{}O} \]
\[ \text{#} = 0 \cdot 255 \text{ (for specific operations refer to the PCL 5 Comparison Guide for the logical operation values)} \]

Pixel Placement
Determines how pixels are rendered in images.
\[ \text{\textbackslash{}EC} \ '' \ \text{\textbackslash{}L} \ \text{\#} \ \text{\textbackslash{}R} \]
\[ \text{#} = 0 \cdot \text{Grid intersection (default)} \]
\[ 1 \cdot \text{Grid centered} \]
Rectangular Area Fill Graphics

Horizontal Rectangle Size (Decipoints or Dots)
Specifies the rectangular fill area width in decipoints or dots.
\[ EC \cdot c \cdot H \cdot \text{Decipoints} \]
\[ # = \text{Number of decipoints (1/720 inch)} \]
\[ EC \cdot c \cdot A \cdot \text{Dots} \]
\[ # = \text{Number of dots (see Unit of Measure Command)} \]

Vertical Rectangle Size (Decipoints or Dots)
Specifies the rectangular fill area height in decipoints or dots.
\[ EC \cdot c \cdot V \cdot \text{Decipoints} \]
\[ # = \text{Number of decipoints (1/720 inch)} \]
\[ EC \cdot c \cdot B \cdot \text{Dots} \]
\[ # = \text{Number of dots (see Unit of Measure Command)} \]

Set Pattern Reference Point
Sets pattern reference point to cursor position and will either keep pattern
fixed or rotate with print direction changes.
\[ EC \cdot p \cdot R \]
\[ # = 0 - \text{Rotate patterns with print direction} \]
\[ 1 - \text{Keep patterns fixed} \]

Pattern (Area Fill) ID (Pattern ID)
Specifies the level of shading or type of cross-hatch to select via Fill
Rectangular Area command.
\[ EC \cdot c \cdot G \]

If Shading fill is selected: OR, if Cross-Hatch Pattern
fill is selected:
\[ # = 1 \text{ thru 2} = 1-2\% \text{ shade} \]
\[ 3 \text{ thru 10} = 2-10\% \text{ shade} \]
\[ 11 \text{ thru 20} = 11-20\% \text{ shade} \]
\[ 21 \text{ thru 35} = 21-35\% \text{ shade} \]
\[ 36 \text{ thru 55} = 36-55\% \text{ shade} \]
\[ 56 \text{ thru 80} = 56-80\% \text{ shade} \]
\[ 81 \text{ thru 99} = 81-99\% \text{ shade} \]
\[ 100 = 100\% \text{ shade} \]

OR, if User-Defined Pattern
\[ # = \# \text{ of Pattern} \]
Range = 0-32767

\[ # = 1 \text{ Pattern } #1 \]
\[ 2 \text{ Pattern } #2 \]
\[ 3 \text{ Pattern } #3 \]
\[ 4 \text{ Pattern } #4 \]
\[ 5 \text{ Pattern } #5 \]
\[ 6 \text{ Pattern } #6 \]
Rectangular Area Fill Graphics (continued)

Fill Rectangular Area

Causes the defined rectangular area to be filled with the specified rule pattern.

\[ E_\text{C} * c \# P \]

# = 0 - Solid area fill
1 - Solid white area fill
2 - Shading fill
3 - Cross-hatch pattern fill
4 - User-defined pattern
5 - Current pattern

User Defined Pattern

Downloads binary data that defines a user-defined pattern.

\[ E_\text{C} * c \# W [\text{pattern data}] \]

# = 0 - Number of pattern data bytes

Pattern Control

Provides a means for manipulating user-defined (soft) patterns.

\[ E_\text{C} * c \# Q \]

# = 0 - Delete all patterns (temporary and permanent)
1 - Delete all temporary patterns
2 - Delete pattern (last pattern ID specified)
3 - Reserved
4 - Make pattern temporary (last pattern ID specified)
5 - Make pattern permanent (last pattern ID specified)
Raster Graphics

Raster Graphics Resolution
Designates the graphics resolution for raster data operations.
\[ E_C \times t \# R \]
# = 75 - 75 dots-per-inch
100 - 100 dots-per-inch
150 - 150 dots-per-inch
200 - 200 dots-per-inch
300 - 300 dots-per-inch
600 - 600 dots-per-inch

Raster Graphics Presentation Mode
Specifies the presentation of the raster image on the logical page.
\[ E_C \times r \# F \]
# = 0 - image printed in the current print direction.
3 - image printed along the width of physical page.

Source Raster Height
Specifies the height in raster rows (pixels) of the raster picture area.
\[ E_C \times r \# T \]
# = Height in raster rows

Source Raster Width
Specifies the width in pixels of the raster picture area.
\[ E_C \times r \# S \]
# = width in pixels of the specified resolution

Destination Raster Width
Specifies the width in decipoints of the destination raster picture when raster scaling.
\[ E_C \times t \# H \]
# = Width in decipoints

Destination Raster Height
Specifies the height in decipoints of the destination raster picture when raster scaling.
\[ E_C \times t \# V \]
# = Height in decipoints

Scale Algorithm
Selects an algorithm for enhancing details when down-scaling color images having light or dark backgrounds.
\[ E_C \times t \# K \]
# = 0 Enhances color source image having a light background
# = 1 Enhances color source image having a dark background
Raster Graphics (continued)

Start Raster Graphics
Specifies the left raster graphics margin.
\[
\text{\texttt{\textbackslash E} \textbackslash C \textbackslash * \textbackslash r \ # \ A}
\]
# = 0 - sets left graphics margin at X-position 0.
1 - sets left graphics margin to the current column
(current X-position).
2 - Turn on scale mode (start raster at logical page left
boundary)
3 - Turn on scale mode (start raster at cursor position)

Y Offset
Moves the cursor vertically the specified number of raster lines from the
current line in the picture area.
\[
\text{\texttt{\textbackslash E} \textbackslash C \textbackslash * \textbackslash b \ # \ Y}
\]
# = Number of raster lines of vertical movement.

Compression Method
Determines how the printer interprets (decodes) the binary data in the
Transfer Raster Data command.
\[
\text{\texttt{\textbackslash E} \textbackslash C \textbackslash * \textbackslash b \ # \ M}
\]
# = 0 - Unencoded (default)
1 - Run-length encoding
2 - Tagged Image File Format (TIFF) revision 4.0
3 - Delta Row
5 - Adaptive Compression

Transfer Raster Data by Plane
Transfers a plane of raster data to the printer.
\[
\text{\texttt{\textbackslash E} \textbackslash C \ * \ b \ # \ V \ [\text{data}]}
\]
# = Number of bytes in the plane data

Transfer Raster Data by Row/Block
Transfers a row of raster graphics to the printer.
\[
\text{\texttt{\textbackslash E} \textbackslash C \ * \ b \ # \ W \ [\text{binary data bytes}]}
\]
# = Number of bytes in the raster row

End Raster Graphics
Signifies the end of a raster graphic image transfer.
\[
\text{\texttt{\textbackslash E} \textbackslash C \ * \ r \ B \textbackslash - \ All \ LaserJet \ printers \ III \ and \ newer}
\]
\[
\text{\texttt{\textbackslash E} \textbackslash C \ * \ r \ C \textbackslash - \ All \ LaserJet \ printers \ III Si \ and \ newer \ (Preferred)}
\]
Color

Simple Color

Creates a fixed-size palette whose color specifications cannot be modified.

\[ E_6 \text{C}\#_1 \#_2 \#_3 \]

Colors:
- \#_1 = -3 - 3 planes, device CMY palette
- \#_2 = 1 - Single plane black and white palette
- \#_3 = 3 - 3 planes, device RGB palette

Configure Image Data (CID)

The CID command provides configuration information for palette creation and raster data transmission in a single escape sequence by:

- designating the color space of the default palette,
- designating the size of the palette to be created,
- providing data for the resolution of color-space specific values into device-specific values,
- designating the format of raster data, and
- designating how primary components are combined to yield the raster presentation.

\[ E_6 \text{C}\#_1 \#_2 \{ \text{data} \} \]

Colors:
- \#_4 = Number of data bytes

Color Component One

Specifies the first component of any new color entry of the palette.

\[ E_6 \text{C}\#_4 \]

Colors:
- \#_4 = First component

Color Component Two

Specifies the second component of any new color entry of the palette.

\[ E_6 \text{C}\#_5 \]

Colors:
- \#_5 = Second component

Color Component Three

Specifies the third component of any new color entry of the palette.

\[ E_6 \text{C}\#_6 \]

Colors:
- \#_6 = Third component

Assign Color Index

Assigns the three current color components to the specified palette index number.

\[ E_6 \text{C}\#_7 \]

Colors:
- \#_7 = Index number
Color (continued)

Push / Pop Palette
Pushes or pops the palette from the palette stack. The last item pushed is
the first item popped.

$$EC \ p \ # \ P$$

- $# = 0$ - Push (save) palette
- $# = 1$ - Pop (restore) palette

Select Palette
Selects a new active palette by ID. The previously active palette is
unchanged.

$$EC \ & \ p \ # \ S$$

- $# =$ Palette ID number

Palette Control ID
Specifies the ID to be used by the Palette Control command.

$$EC \ & \ p \ # \ I$$

- $# =$ Palette ID number

Palette Control
Provides a mechanism for copying and deleting palettes.

$$EC \ & \ p \ # \ C$$

- $# = 0$ - Delete all palettes except those in the stack (active palette deleted)
- $# = 1$ - Delete all palettes in the stack (active palette is not affected)
- $# = 2$ - Delete palette specified by Palette Control ID
- $# = 6$ - Copy the active palette to the ID specified by the Palette Control ID

Foreground Color
Sets the foreground color to the specified index of the current palette.

$$EC \ * \ v \ # \ S$$

- $# =$ Palette Index number
Color (continued)

Render Algorithm
Selects an algorithm for rendering page marking entities on a given page.

\[ FC \times t \times J \]

- \# = 0 Continuous tone detail 300 lpi (device-best dither)
- \# = 1 Snap to primaries
- \# = 2 Snap black to white, color to black
- \# = 3 Device-best dither
- \# = 4 Error diffusion
- \# = 5 Monochrome device-best dither
- \# = 6 Monochrome error diffusion
- \# = 7 Cluster ordered dither
- \# = 8 Monochrome cluster ordered dither
- \# = 9 User-defined dither
- \# = 10 Monochrome user-defined dither
- \# = 11 Ordered dither
- \# = 12 Monochrome ordered dither
- \# = 13 Noise ordered dither
- \# = 14 Monochrome noise ordered dither
- \# = 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

Download Dither Matrix
Specifies a single dither matrix for all three primaries, or three matrices (one for each primary) which may have different sizes and contents.

\[ FC \times m \times W \text{ [binary data]} \]

\# = Number of bytes in the data field

Color Lookup Tables
Enables and specifies color lookup tables.

\[ FC \times l \times W \text{ [binary data]} \]

\# = Number of bytes in the data field

Gamma Correction
Specifies the gamma correction to be applied equally for each primary.

\[ FC \times t \times I \]

\# = Gamma number

Viewing Illuminant
Specifies the relative white point used in the determination of a viewing illuminant condition.

\[ FC \times i \times W \text{ [binary data]} \]

\# = Number of bytes in the data field
Color (continued)

Monochrome Print Mode
Designates either the current rendering mode or a fast gray-scale equivalent.

\[ \text{EC} \& b \# M \]
- \# = 0  Print in mixed render algorithm mode
- \# = 1  Print everything in gray equivalent

Status Readback

Set Status Readback Location Type
Sets the location type for an inquire entity status request.

\[ \text{EC} \* s \# T \]
- \# = 0  Invalid Location
- \# = 1  Currently Selected
- \# = 2  All Locations
- \# = 3  Internal
- \# = 4  Download entity
- \# = 5  Cartridge
- \# = 7  SIMMs

Set Status Readback Location Unit
Sets the location unit for an inquire entity status request.

\[ \text{EC} \* s \# U \]

<table>
<thead>
<tr>
<th>Location Type</th>
<th>Location Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Invalid location</td>
</tr>
<tr>
<td>1</td>
<td>Currently selected</td>
</tr>
<tr>
<td>2</td>
<td>All Locations</td>
</tr>
<tr>
<td>3</td>
<td>Internal</td>
</tr>
<tr>
<td>4</td>
<td>All downloaded</td>
</tr>
<tr>
<td>5</td>
<td>All cartridge</td>
</tr>
<tr>
<td>6</td>
<td>Temporary downloaded</td>
</tr>
<tr>
<td>7</td>
<td>Permanent downloaded</td>
</tr>
<tr>
<td>7</td>
<td>Cartridge</td>
</tr>
<tr>
<td>10</td>
<td>Highest priority cartridge</td>
</tr>
<tr>
<td>11</td>
<td>Lowest priority cartridge</td>
</tr>
<tr>
<td>12</td>
<td>All SIMMs</td>
</tr>
<tr>
<td>13</td>
<td>Highest priority SIMM</td>
</tr>
<tr>
<td>14</td>
<td>Lowest priority SIMM</td>
</tr>
</tbody>
</table>
Status Readback (continued)

Inquire Status Readback Entity

Identifies the entity type and causes the printer to create a status response.

\[ EC * s \# I \]

# =
0 - Font
1 - Macro
2 - User-defined pattern
3 - Symbol set
4 - Font extended

Free Space

Returns the amount of total available user memory and the largest block available.

\[ EC * s 1 M \]

Flush All Pages

Suspends accepting I/O data until all pages currently in printer are printed.

\[ EC \& r \# F \]

# =
0 - Flush all complete pages
1 - Flush all pages

Echo

Echoes the value field value back to the host.

\[ EC * s \# X \]

# = Echo value (-32767 to 32767)
Picture Frame

Picture Frame Horizontal Size in Decipoints
Specifies the horizontal dimension of the area to be allocated for rendering an HP-GL/2 plot.
\[ E\text{c} \times c \times X \]
# = Horizontal size in decipoints

Picture Frame Vertical Size in Decipoints
Specifies the vertical dimension of the area to be allocated for rendering an HP-GL/2 plot.
\[ E\text{c} \times c \times Y \]
# = Vertical size in decipoints

Set Picture Frame Anchor Point
Sets the picture frame anchor point to current PCL cursor position.
\[ E\text{c} \times c \times 0 \times T \]

HP-GL/2 Plot Horizontal Size
Specifies the horizontal size of the HP-GL/2 drawing being imported into PCL.
\[ E\text{c} \times c \times K \]
# = Horizontal size in inches

HP-GL/2 Plot Vertical Size
Specifies the vertical size of the HP-GL/2 drawing being imported into PCL.
\[ E\text{c} \times c \times L \]
# = Vertical size in inches

Enter HP-GL/2 Mode
Causes printer to begin interpreting the incoming data stream as HP-GL/2 commands instead of PCL commands.
\[ E\text{c} \times c \times \% \times B \]
# = 0 - Use previous HP-GL/2 pen position
1 - Use current PCL cursor position for HP-GL/2 pen position
2 - Use current PCL dot coordinate system and old HP-GL/2 pen position
3 - Use current PCL dot coordinate system and the current PCL cursor position

Enter PCL Mode
Causes printer to return to PCL mode from HP-GL/2 mode.
\[ E\text{c} \times c \times \% \times A \]
# = 0 - Return cursor to previous PCL position
1 - Use current HP-GL/2 pen position for cursor position
HP-GL/2

Configuration and Status Group

Default Values
Sets most programmable HP-GL/2 features to default conditions.

DF [ ; ]

Initialize
Sets all programmable HP-GL/2 features to default conditions.

IN [ ; ]

Input P1 and P2
Establishes new or default locations for the scaling points P1 and P2.

IP [ X P1 , Y P1 [ X P2 , Y P2 ] ] [ ; ]
X P1 , Y P1 = P1 location coordinates
X P2 , Y P2 = P2 location coordinates

Input Relative P1 and P2
Establishes P1 and P2 locations in relation to the PCL Picture Frame.

IR [ X P1 , Y P1 [ X P2 , Y P2 ] ] [ ; ]
X P1 , Y P1 = P1 location as percentage of PCL Picture Frame
X P2 , Y P2 = P2 location as percentage of PCL Picture Frame

Input Window
Sets up a window (soft-clip limits).

IW [ X LL , Y LL , X UR , Y UR ] [ ; ]
X LL = X coordinate (lower left)
Y LL = Y coordinate (lower left)
X UR = X coordinate (upper right)
Y UR = Y coordinate (upper right)

Rotate Coordinate System
Rotates the HP-GL/2 coordinate system.

RO [ angle ] [ ; ]
angle = 0, 90, 180, or 270

Scale
Establishes a user-unit coordinate system.

SC [ X 1 , X 2 , Y 1 , Y 2 [, type [, left, bottom ] ] ] [ ; ]
type = 2 (point factor)
or
SC X MIN , X FACTOR , Y MIN , Y FACTOR , type [ ; ]
X 1 , Y 1 = User-unit coordinates for P1
X 2 , Y 2 = User-unit coordinates for P2
type = 0 (Anisotropic) or 1 (isotropic)
left, bottom = Positions isometric area within P1/P2 limits
**HP-GL/2**

**Vector Group**

**Arc Absolute**
Draws an arc using absolute coordinates.
\[ \text{AA } X_{CTR}, Y_{CTR}, \text{sweep angle}[\text{,chord angle}]; \]

**Arc Relative**
Draws an arc using relative coordinates.
\[ \text{AR } X_{INCR}, Y_{INCR}, \text{sweep angle}[\text{,chord angle}]; \]

**Absolute Arc Three Point**
Draws an arc from the current pen location through two absolute points.
\[ \text{AT } X_{INTRM}, Y_{INTRM}, X_{END}, Y_{END}, \text{[chord angle]}; \]

**Bezier Absolute**
Draws a Bezier curve using absolute coordinates.
\[ \text{BZ } X_1, Y_1, X_2, Y_2, X_3, Y_3; \]

**Bezier Relative**
Draws a Bezier curve using relative coordinates.
\[ \text{BR } X_1, Y_1, X_2, Y_2, X_3, Y_3; \]

**Circle**
Draws a circle with a specified radius.
\[ \text{CI } \text{radius}[\text{,chord angle}]; \]

**Plot Absolute**
Enables movement to absolute coordinate locations (with respect to the origin \([0,0]\)).
\[ \text{PA } [X, Y]...[,X,Y]; \]

**Pen Down**
Lowers the logical “pen” to the page.
\[ \text{PD } [X, Y]...[,X,Y]; \]

**Polyline Encoded**
Encodes common HP-GL/2 commands to increase throughput.
\[ \text{PE } [\text{flag}] [\text{val}] | \text{coord pair}...[\text{flag}] [\text{val}] | \text{coord pair} ; \]
or
\[ \text{PE}; \]

Flag = < – pen up
   > – fractional data
   = – absolute
   7 – 7-bit data7
   : – Select pen
**HP-GL-2**

**Vector Group (continued)**

**Plot Relative**
Enables movement relative to the current pen location.

```
PR [ X,Y...[,X,Y ] ][;]
```

**Pen Up**
Lifts the logical “pen” from the page.

```
PU [ X,Y...[,X,Y ] ][;]
```

**Relative Arc Three Point**
Draws an arc from the current pen location through two relative points.

```
RT X INCR INTRM Y INCR INTRM X INCR END,
Y INCR END[,chord angle] [;]
```

**Polygon Group**

**Edge Rectangle Absolute**
Outlines a rectangle defined with absolute coordinates.

```
EA X,Y [;]
X,Y = Coordinates of opposite corner of rectangle.
```

**Edge Rectangle Relative**
Outlines a rectangle defined with relative coordinates.

```
ER X,Y [;]
X,Y = Coordinates of opposite corner of rectangle.
```

**Edge Wedge**
Defines and outlines a wedge-shaped polygon.

```
EW radius,start angle,sweep angle[,chord angle] [;]
```

**Edge Polygon**
Outlines the polygon resident in the polygon buffer.

```
EP [;]
```

**Fill Polygon**
Fills the polygon specified in the polygon buffer with the current fill type.

```
FP [fill method][;]
fill method = 0 - Odd/Even fill
1 - Non-zero winding fill
```
Polygon Group (continued)

Polygon Mode

Allows creation of user-defined polygons in the polygon buffer.

PM polygon definition [;]

polygon definition = 0 (Clears polygon buffer and enters polygon mode)
    1 (Closes current polygon or subpolygon and remains in polygon mode)
    2 (Closes current polygon or subpolygon and exits polygon mode)

Fill Rectangle Absolute

Fills a rectangle specified with absolute coordinates.

RA X,Y [;]

X,Y = Coordinates of opposite corner of rectangle.

Fill Rectangle Relative

Fills a rectangle specified with relative coordinates.

RR X,Y [;]

X,Y = Coordinates of opposite corner of rectangle.

Fill Wedge

Defines and fills a wedge-shaped polygon.

WG radius,start angle,sweep angle[,chord angle] [;]

Line and Fill Attributes Group

Anchor Corner

Specifies the starting point for fill patterns.

AC [ X,Y ] [:]

Fill Type

Selects the pattern to use when filling polygons.

FT [ fill type[,option1[,option2 ] ] ] [:]

<table>
<thead>
<tr>
<th>Fill Type = description</th>
<th>option1</th>
<th>option2</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 and 2 = Solid black</td>
<td>ignored</td>
<td>ignored</td>
</tr>
<tr>
<td>3 = Hatched</td>
<td>line spacing</td>
<td>angle</td>
</tr>
<tr>
<td>4 = Cross-hatched</td>
<td>line spacing</td>
<td>angle</td>
</tr>
<tr>
<td>10 = Shading</td>
<td>% shading</td>
<td>ignored</td>
</tr>
<tr>
<td>11 = User-defined</td>
<td>raster-fill index</td>
<td>ignored</td>
</tr>
<tr>
<td>21 = PCL Patterns</td>
<td>pattern type</td>
<td>ignored</td>
</tr>
<tr>
<td>22 = PCL User-defined</td>
<td>pattern ID</td>
<td>ignored</td>
</tr>
</tbody>
</table>
HP-GL/2

Line and Fill Attributes Group (continued)

Line Attributes
Specifies how line ends and joins are shaped.

LA [ kind, value...[,kind, value ] ] [:]

Attribute = Kind, Value - Description
Line Ends = 1, 1 - Butt (default)
           = 2, 2 - Square
           = 3, 3 - Triangular
           = 4, 4 - Round
Line Joins = 2, 1 - Mitered (default)
           = 2, 2 - Mitered/beveled
           = 3, 3 - Triangular
           = 4, 4 - Round
           = 5, 5 - Beveled
           = 6, 6 - No join applied
Miter Limit = 3, 1 to 32,767 - Max. length of miter
              (miter length/pen width ratio)
              (default = 5)

Line Type
Selects the line pattern to use for drawing lines.

LT [ line type[,pattern length[,mode ] ] ] [:]

mode = 0 (relative mode – interprets pattern length as
      percentage of diagonal distance between P1 and P2.
    = 1 (absolute – interprets the pattern length parameter
      in mm.

Pen Width
Specifies a new pen width.

PW [ width [,pen ] ] [:]

Raster Fill Definition
Defines a pattern for use as area fill.

RF [ index[,width, height, pen number [,...pen
    number ] ] ][:]

Symbol Mode
Draws a symbol (character) at each coordinate location.

SM [ character ][:]

Select Pen
Selects a pen for plotting.

SP [ pen ] [:]

pen = 0 (white)
    1 (black)

Default is no pen.
Screened Vectors
Selects type of area fill for vectors (lines, hatch lines, arcs, circles, edges of polygons, rectangles, and wedges).

SV [ screen type [.option1[,option2]][:]

<table>
<thead>
<tr>
<th>screen type</th>
<th>description</th>
<th>option 1</th>
<th>option 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>No screening</td>
<td>ignored</td>
<td>ignored</td>
</tr>
<tr>
<td>1</td>
<td>Shaded fill</td>
<td>% shading</td>
<td>ignored</td>
</tr>
<tr>
<td>2</td>
<td>User defined</td>
<td>index no.</td>
<td>pen flag</td>
</tr>
<tr>
<td>21</td>
<td>PCL Patterns</td>
<td>pattern type</td>
<td>ignored</td>
</tr>
<tr>
<td>22</td>
<td>PCL User-defined Patterns</td>
<td>pattern ID</td>
<td>ignored</td>
</tr>
</tbody>
</table>

Transparency Mode
Defines how the white areas of the source graphics image affect the destination graphics image.

TR [ n][;]

n = 1 (Transparency mode=on [default])
0 (Transparency mode=off)

User Defined Line Type
Defines a line pattern.

UL [ index[,gap1,. . .,gapn] ][;]

index = Line pattern number. [1–8]
gap = Percentage of pattern length for that portion (first gap is a pen-down move).

Pen Width Unit Selection
Specifies whether pen width is defined in millimeters or as a percentage of P1/P2 distance.

WU [ type][;]
type = 0 (millimeters)
1 (percentage of P1/P2 distance)
**Alternate Font Definition**

Specifies an alternate font for labeling.

```
AD [ kind, value...[,kind, value ] ] [:]
```

<table>
<thead>
<tr>
<th>Kind</th>
<th>Attribute</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Symbol Set</td>
<td>*</td>
</tr>
<tr>
<td>2</td>
<td>Font spacing</td>
<td>0 (fixed); 1 (prop.)</td>
</tr>
<tr>
<td>3</td>
<td>Pitch</td>
<td>characters per inch</td>
</tr>
<tr>
<td>4</td>
<td>Height</td>
<td>font point size</td>
</tr>
<tr>
<td>5</td>
<td>Posture</td>
<td>0 (upright); 1 (italic)</td>
</tr>
<tr>
<td>6</td>
<td>Stroke Weight</td>
<td>0 (medium); 3 (bold)*</td>
</tr>
<tr>
<td>7</td>
<td>Typeface</td>
<td>*</td>
</tr>
</tbody>
</table>

* See tables in Appendix C of the PCL 5 Comparison Guide.

**Character Fill Mode**

Specifies how outline fonts will be rendered.

```
CF [ fill mode [,edge pen*] ] [:]
```

- **fill mode** = 0 (solid fill and edged)
- 1 (edging with specified pen [or current pen if edge pen parameter not specified]; characters filled if can't be edged)
- 2 (fill with current fill type; characters are not edged)
- 3 (fill with current fill type; edge characters with the specified pen or current pen if edge pen parameter is not specified)

- **edge pen** = pen number to be used for edging.

* Using 0 means edge in pen 0.

**Character Plot**

Moves the pen the specified number of character “cells” from the current pen location.

```
CP [ spaces, lines ] [:]
```

**Absolute Label Direction**

Specifies the slope of labels independent of P1 and P2 locations.

```
DI [ run,rise ] [:]
```

- **run** = the X-component of the label direction or \( \cos \) of the angle
- **rise** = the Y-component of the label direction or \( \sin \) of the angle
HP-GL/2

Character Group (continued)

Relative Label Direction
Specifies the slope of labels relative to P1 and P2 locations.
DR [ run,rise ] [:]
run = percentage of distance between P1_X and P2_X
rise = percentage of distance between P1_Y and P2_Y.

Define Label Terminator
Defines the character that “turns off” labeling.
DT [ lblterm [,mode ] ];
lblterm = character to be used as terminator
mode = 0 (print label terminator)
1 (do not print terminator)

Define Variable Text Path
Specifies the label path as right, left, up, or down.
DV [ path [,line ] ] [:]
path = 0 (0 degrees – right)
1 (-90 degrees – down)
2 (-180 degrees – left)
3 (-270 degrees – up)
line = 0 (-90 degrees – normal line feed)
1 (+90 degrees – reverse line feed)

Extra Space
Increases or reduces space between characters and lines of text.
ES [ width [,height ] ] [:]
width = number (or fractional number) of character spaces
height = number (or fractional number) of lines

Select Primary Font ID
Selects as primary a font previously assigned a PCL font ID number.
FI font ID [:]
font ID = Font ID number assigned in PCL mode.

Select Secondary Font ID
Selects as secondary a font previously assigned a font ID number.
FN font ID [:]
font ID = Font ID number assigned in PCL mode.
Character Group (continued)

**Label**
Prints text using the currently selected font.

```
LB text . . . text lblterm [:]
text . . . text = Any characters.
lblterm = Label terminator (default Ext or defined with
         DT command).
```

**Label Origin**
Specifies the positioning of the characters within a label.

```
LO [ position] [:]
position = Number indicating label position relative to
         current cursor position (see command description
```

**Label Mode**
Determines how LB (Label) and SM (Symbol Mode) interpret characters. Most often used for printing a 2-byte character set such as Kanji.

```
LM [mode,[row number]:]
mode = determines the interpretation mode as follows:
  0  Interprets each byte as a character (8-bit mode).
  1  Interprets the next two bytes as a character (16-bit mode).
  2  Same logic as mode 0 except that vertical substitutes are
      used if found in a VT segment of the current font.
  3  Same logic as mode 1 except that vertical substitutes are
      used if found in a VT segment of the current font.
row number = indicates the first byte while the LB or SM
            instruction supplies the second byte. Used only in mode 0 when a
            16-bit character set is selected.
```

**Select Alternate Font**
Selects the font designated by AD.

```
SA [:]
```

**Scalable or Bitmap Fonts**
Specifies the type of fonts to be used for labels.

```
SB [ n] [:]
n = 0 (Scalable fonts [default])
     = 1 (Bitmap and scalable fonts)
```
HP-GL/2

Character Group (continued)

Standard Font Definition
Specifies the standard font for printing labels.
SD [ kind, value...[,kind, value ] ] [:]

<table>
<thead>
<tr>
<th>Kind</th>
<th>Attribute</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Symbol Set</td>
<td>*</td>
</tr>
<tr>
<td>2</td>
<td>Font spacing</td>
<td>0 (fixed); 1 (prop.)</td>
</tr>
<tr>
<td>3</td>
<td>Pitch</td>
<td>characters per inch</td>
</tr>
<tr>
<td>4</td>
<td>Height</td>
<td>font point size</td>
</tr>
<tr>
<td>5</td>
<td>Posture</td>
<td>0 (upright); 1 (italic)</td>
</tr>
<tr>
<td>6</td>
<td>Stroke Weight</td>
<td>0 (medium); 3 (bold)*</td>
</tr>
<tr>
<td>7</td>
<td>Typeface</td>
<td>*</td>
</tr>
</tbody>
</table>

* See tables in Appendix C of the PCL 5 Comparison Guide.

Absolute Character Size
Specifies an absolute character size (in centimeters).
SI [ width, height ] [:]

Character Slant
Specifies the slant at which labels are printed.
SL [ tangent of angle] [:]

tangent of angle = Tangent of slant angle (measured from vertical)

Relative Character Size
Specifies character size as a percentage of the P1/P2 distance.
SR [ width, height ] [:]

Select Standard Font
Selects the font designated by SD for printing labels.
SS [:]

Transparent Data
Specifies whether control characters perform their function or are printed as characters.
TD [ mode ] [:]

mode = 0 (Normal)
1 (Transparent)
**HP-GL/2**

**Technical Drawing Extensions Group**

**Merge Control**

Specifies the logical operation (ROP3) to be performed.

\[
\text{MC}[\text{mode}[.,\text{opcode}]]; \\
\text{mode} = 0 - \text{opcode value ignored (ROP set to 252 [default])} \\
1 - \text{opcode value used as ROP value} \\
\text{opcode} = \text{logical operation (ROP3 value)}
\]

**Pixel Placement**

Specifies either grid intersection or grid-centered pixel placement.

\[
\text{PP}[\text{mode}]; \\
\text{mode} = 0 - \text{grid intersection (default)} \\
1 - \text{grid centered}
\]

**Programming Hints**

**End-Of-Line Wrap**

Defines action that occurs when text reaches right margin: perform a carriage return or do not perform carriage return (truncate data).

\[
\text{EC} & \# C \\
\# = 0 - \text{Enables End-Of-Line Wrap} \\
1 - \text{Disables End-Of-Line Wrap}
\]

**Display Functions**

Causes all escape sequences and control codes to be printed instead of executed.

\[
\text{EC} Y \quad \text{– Enables Display Functions} \\
\text{EC} Z \quad \text{– Disables Display Functions}
\]
PJL

Kernel

Universal Exit Language
Terminates operation of current language and returns control to PJL.
Every job should begin and end with this command.

\[\text{\textless ESC} \% -12345X\]

Enter Language
Causes PJL to enable the specified language.

\[@PJL\] \text{ENTER LANGUAGE} = \begin{cases} 
\text{PCL} \\
\text{POSTSCRIPT} \\
\text{others}
\end{cases} \[CR\] <LF>

Comment
Allows one line of comment text to be entered in PJL.

\[@PJL\] \text{COMMENT} \hspace{1mm} \text{comment text . . . [CR]} <LF>

Job Separation

Job
Indicates the start of a print job, resets the page count and allows naming
of the job; supports non-printing mode. Also, used for providing the pass-
word for PJL security.

\[@PJL\] \text{JOB} \hspace{1mm} \begin{cases} 
\text{[NAME= "job name"]} \\
\text{[START= first page ]} \\
\text{[END= last page ]} \\
\text{[PASSWORD = number ]}
\end{cases} \[CR\] <LF>

End-Of-Job
Tells printer the job has completed, resets the page count.

\[@PJL\] \text{EOJ [NAME = "job name"] [CR]} <LF>
PJL Environment

Initialize

Resets current and default PJL variables to factory default values.

@PJL INITIALIZE [<CR>]<LF>

Reset

Resets current PJL variables to default values.

@PJL RESET [<CR>]<LF>

Default

Sets default value for environment variables.

@PJL DEFAULT [LP ARM : personality | IP ARM : port]
~ variable = value [<CR>] <LF>

Set

Sets the environment variable for the duration of a PJL job.

@PJL SET [LP ARM : personality | IP ARM : port]
~ variable = value [<CR>] <LF>

Status Readback

Inquire

Requests the current value for an environment variable.

@PJL INQUIRE [LP ARM : personality | IP ARM : port]
~ variable [<CR>] <LF>

Response

@PJL INQUIRE [LP ARM : personality | IP ARM : port]
~ variable<CR><LF>
value<CR><LF>
<FF>

Dinquire

Requests the default value for a specified environment variable.

@PJL DINQUIRE [LP ARM : personality | IP ARM : port]
~ variable [<CR>] <LF>

Response

@PJL DINQUIRE [LP ARM : personality | IP ARM : port]
~ variable<CR><LF>
value<CR><LF>
<FF>

- Indicates that the following data is part of the preceding line.
Info
Request a specified category of printer information.
@PJL INFO category [CR]<LF>
Response
@PJL INFO category <CR><LF>
[1 or more lines of printable characters or <WS> followed by]
<CR><LF>
<FF>

Echo
Returns the "words" portion of the command to the host computer.
@PJL ECHO [<Words>] [CR]<LF>
Response
@PJL ECHO [<Words>] <CR><LF>
<FF>

Ustatus
Allows printer to send unsolicited status messages.
@PJL USTATUS variable = value [CR]<LF>
Response
@PJL USTATUS variable <CR><LF>
[1 or more lines of printable characters or <WS> followed by]
<CR><LF>
<FF>

Ustatusoff
Turns off all unsolicited status.
@PJL USTATUSOFF [CR]<LF>
PJL

Device Attendance

Operator Message
Displays specified message on control panel and takes printer offline.
@PJL OPMSG DISPLAY = “message” [<CR>]<LF>

Ready Message
Specifies a message that replaces the READY message on the printer control panel. Doesn't affect on-line state.
@PJL RDYMSG DISPLAY = “message” [<CR>]<LF>

Status Message
Displays specified message on printer control panel and takes printer offline. Returns name of the key that is pressed by operator to put the printer back online.
@PJL STMSG DISPLAY = “message” [<CR>]<LF>
Response
@PJL STMSG DISPLAY = “message” [<CR>]<LF>
key [<CR>]<LF>
<FF>

File System

FSDELETE
Deletes printer disk files.
@PJL FSDELETE NAME = “pathname” [<CR>]<LF>

FSDOWNLOAD
Downloads a file to the printer disk file system.
@PJL FSDOWNLOAD FORMAT:BINARY [SIZE=int] [<CR>]<LF>

FSINIT
Initializes the printer disk file system.
@PJL FSINIT VOLUME = “pathname” [<CR>]<LF>

FSMKDIR
Creates the specified directory on the printer disk file system.
@PJL FSMKDIR NAME = “pathname” [<CR>]<LF>
# PCL Command Summary

## Job Control

<table>
<thead>
<tr>
<th>Command</th>
<th>Syntax</th>
</tr>
</thead>
<tbody>
<tr>
<td>Universal Exit Language</td>
<td><code>E_C % - 1 2 3 4 5 X</code></td>
</tr>
<tr>
<td>Configuration (I/O)</td>
<td><code>E_C &amp; b # W[data]</code></td>
</tr>
<tr>
<td>Printer Reset</td>
<td><code>E_C E</code></td>
</tr>
<tr>
<td>Number of Copies</td>
<td><code>E_C &amp; l # X</code></td>
</tr>
<tr>
<td>Simplex/Duplex</td>
<td><code>E_C &amp; l # S</code></td>
</tr>
<tr>
<td>Long-edge Offset Registration</td>
<td><code>E_C &amp; l # U</code></td>
</tr>
<tr>
<td>Short-edge Offset Registration</td>
<td><code>E_C &amp; l # Z</code></td>
</tr>
<tr>
<td>Duplex Page Side Selection</td>
<td><code>E_C &amp; a # G</code></td>
</tr>
<tr>
<td>Job Separation</td>
<td><code>E_C &amp; l 1 T</code></td>
</tr>
<tr>
<td>Output Bin (Media Bin)</td>
<td><code>E_C &amp; l # G</code></td>
</tr>
<tr>
<td>Unit-of-Measure</td>
<td><code>E_C &amp; u # D</code></td>
</tr>
</tbody>
</table>

## Page Control

<table>
<thead>
<tr>
<th>Command</th>
<th>Syntax</th>
</tr>
</thead>
<tbody>
<tr>
<td>Page Size</td>
<td><code>E_C &amp; l # A</code></td>
</tr>
<tr>
<td>Paper (Media) Source</td>
<td><code>E_C &amp; l # H</code></td>
</tr>
<tr>
<td>Page Length (Obsolete)</td>
<td><code>E_C &amp; l # P</code></td>
</tr>
<tr>
<td>Orientation</td>
<td><code>E_C &amp; l # O</code></td>
</tr>
<tr>
<td>Print Direction</td>
<td><code>E_C &amp; a # P</code></td>
</tr>
<tr>
<td>Character Text Path Direction</td>
<td><code>E_C &amp; c # T</code></td>
</tr>
<tr>
<td>Text Parsing Method</td>
<td><code>E_C &amp; t # P</code></td>
</tr>
<tr>
<td>Left Margin</td>
<td><code>E_C &amp; a # L</code></td>
</tr>
<tr>
<td>Right Margin</td>
<td><code>E_C &amp; a # M</code></td>
</tr>
<tr>
<td>Clear Horizontal Margins</td>
<td><code>E_C 9</code></td>
</tr>
<tr>
<td>Top Margin</td>
<td><code>E_C &amp; l # E</code></td>
</tr>
<tr>
<td>Text Length</td>
<td><code>E_C &amp; l # F</code></td>
</tr>
<tr>
<td>Perforation Skip</td>
<td><code>E_C &amp; l # L</code></td>
</tr>
<tr>
<td>Horizontal Motion Index</td>
<td><code>E_C &amp; k # H</code></td>
</tr>
<tr>
<td>Vertical Motion Index</td>
<td><code>E_C &amp; l # C</code></td>
</tr>
<tr>
<td>Line Spacing</td>
<td><code>E_C &amp; l # D</code></td>
</tr>
</tbody>
</table>
### Cursor Positioning

#### Horizontal Cursor Positioning
- **Columns**: \( E_C \& a \# C \)
- **Decipoints**: \( E_C \& a \# H \)
- **Units-of-Measure**: \( E_C \& a \# X \)

#### Control Codes
- **Carriage Return**: CR
- **Space**: SP
- **Backspace**: BS
- **Horizontal Tab**: HT

#### Vertical Cursor Positioning
- **Rows**: \( E_C \& a \# R \)
- **Decipoints**: \( E_C \& a \# V \)
- **Units-of-Measure**: \( E_C \& a \# Y \)
- **Half Line-Feed**: \( E_C = \)

#### Control Codes
- **Line-Feed**: LF
- **Form-Feed**: FF

#### Line Termination
- **Push/Pop Cursor Position**: \( E_C \& f \# S \)

### Font Selection
- **Symbol Set**†: \( E_C ( \# ID \) \)
- **Spacing**†: \( E_C ( \# s \# P \) \)
- **Pitch**†: \( E_C ( \# s \# H \) \)
- **Height**†: \( E_C ( \# s \# V \) \)
- **Style**†: \( E_C ( \# s \# S \) \)
- **Stroke Weight**†: \( E_C ( \# s \# B \) \)
- **Typeface**†: \( E_C ( \# s \# T \) \)
- **Font Selection by ID #**†: \( E_C ( \# X \) \)
- **Select Default Font**†: \( E_C ( \# @ \) \)
- **Transparent Print Data**: \( E_C \& p \# X [\text{transparent data}] \)
- **Underline - Enable**\( E_C \& d \# D \)
- **- Disable**\( E_C \& d \# @ \)

### Font Management
- **Font ID # (specify)**: \( E_C \& c \# D \)
- **Font Control**: \( E_C \& c \# F \)
- **Alphanumeric ID**: \( E_C \& n \# W [\text{operation}[\text{string}]] \)

### User-Defined Symbol Set
- **Symbol Set ID Code**: \( E_C \& c \# R \)
- **Define Symbol Set**: \( E_C ( f \# W [\text{symbol set definition data}] \)
- **Symbol Set Management**: \( E_C \& c \# S \)

† Command shown for primary only, reverse parenthesis for secondary command.
Font Creation

Font Descriptor/Data
\[ E_C \) s # W \{descriptor data\} \]
Character Code
\[ E_C \) * c # E \]
Character Descriptor/Data
\[ E_C \) ( s # W \{binary data\} \]

Macros

Macro ID # (specify)
\[ E_C \) & f # Y \]
Macro Control
\[ E_C \) & f # X \]

Print Model

Source Transparency Mode
\[ E_C \) * v # N \]
Pattern Transparency Mode
\[ E_C \) * v # O \]
Pattern (Area Fill) ID
\[ E_C \) * c # G \]
Select Current Pattern
\[ E_C \) * v # T \]
User-Defined Pattern
\[ E_C \) * c # W \{pattern data\} \]
Set Pattern Reference Point
\[ E_C \) * p # R \]
Pattern Control
\[ E_C \) * c # Q \]
Logical Operation
\[ E_C \) * l # O \]
Pixel Placement
\[ E_C \) * l # R \]

Rectangular Area Fill Graphics

Horizontal Rectangle Size
Decipoints
\[ E_C \) * c # H \]
Units-of-Measure
\[ E_C \) * c # A \]
Vertical Rectangle Size
Decipoints
\[ E_C \) * c # V \]
Units-of-Measure
\[ E_C \) * c # B \]
Pattern ID (Area Fill ID)
\[ E_C \) * c # G \]
Fill Rectangular Area
\[ E_C \) * c # P \]

Raster Graphics

Raster Resolution
\[ E_C \) * t # R \]
Presentation
\[ E_C \) * r # F \]
Source Raster Height
\[ E_C \) * r # T \]
Source Raster Width
\[ E_C \) * r # S \]
Destination Raster Height
\[ E_C \) * t # V \]
Destination Raster Width
\[ E_C \) * t # H \]
Scale Algorithm
\[ E_C \) * t # K \]
Start Raster Graphics
\[ E_C \) * r # A \]
Y Offset
\[ E_C \) * b # Y \]
Set Compression Mode
\[ E_C \) * b # M \]
Transfer Raster Data
\[ E_C \) * b # W \{raster data\} \]
End Raster Graphics
\[ E_C \) * r B \]
\[ E_C \) * r C \]
Color

Simple Color \texttt{EC} \* \texttt{r} \# \texttt{U}
Configure Image Data \texttt{EC} \* \texttt{v} \# \texttt{W}\{data\}
Color Component One \texttt{EC} \* \texttt{v} \# \texttt{A}
Color Component Two \texttt{EC} \* \texttt{v} \# \texttt{B}
Color Component Three \texttt{EC} \* \texttt{v} \# \texttt{C}
Assign Color Index \texttt{EC} \* \texttt{v} \# \texttt{l}
Push/Pop Palette \texttt{EC} \* \texttt{p} \# \texttt{P}
Select Palette \texttt{EC} \&\texttt{p} \# \texttt{S}
Palette Control ID \texttt{EC} \&\texttt{p} \# \texttt{l}
Palette Control \texttt{EC} \&\texttt{p} \# \texttt{C}
Foreground Color \texttt{EC} \* \texttt{v} \# \texttt{S}
Render Algorithm \texttt{EC} \* \texttt{t} \# \texttt{J}
Download Dither Matrix \texttt{EC} \* \texttt{m} \# \texttt{W} \{data\}
Color Lookup Tables \texttt{EC} \* \texttt{l} \# \texttt{W} \{data\}
Gamma Correction \texttt{EC} \* \texttt{t} \# \texttt{l}
Viewing Illuminant \texttt{EC} \* \texttt{i} \# \texttt{W} \{data\}
Monochrome Print Mode \texttt{EC} \&\texttt{b} \# \texttt{M}

Status Readback

Set Location Type \texttt{EC} \* \texttt{s} \# \texttt{T}
Set Location Unit \texttt{EC} \* \texttt{s} \# \texttt{U}
Inquire Entity \texttt{EC} \* \texttt{s} \# \texttt{l}
Free Space \texttt{EC} \&\texttt{r} \# \texttt{F}
Echo \texttt{EC} \* \texttt{s} \# \texttt{X}

Picture Frame

Picture Frame Horizontal Size \texttt{EC} \* \texttt{c} \# \texttt{X}
Picture Frame Vertical Size \texttt{EC} \* \texttt{c} \# \texttt{Y}
Set Picture Frame Anchor Point \texttt{EC} \* \texttt{c} \# \texttt{T}
HP-GL/2 Plot Horizontal Size \texttt{EC} \* \texttt{c} \# \texttt{K}
HP-GL/2 Plot Vertical Size \texttt{EC} \* \texttt{c} \# \texttt{L}
Enter HP-GL/2 Mode \texttt{EC} \% \# \texttt{B}
Enter PCL Mode \texttt{EC} \% \# \texttt{A}
Config./Status Group (HP-GL/2)

Default Values
Initialize
Input P1 and P2
Input Relative P1 and P2
Input Window
Rotate Coordinate System
Scale

Vector Group (HP-GL/2)

Arc Absolute
Arc Relative
Absolute Arc Three Point
Bezier Absolute
Bezier Relative
Circle
Plot Absolute
Pen Down
Polyline Encoded
Plot Relative
Pen Up
Relative Arc Three Point
Polygon Group (HP-GL/2)

- **Edge Rectangle Absolute**: EA X,Y[:]
- **Edge Polygon**: EP[:]
- **Edge Rectangle Relative**: ER X,Y[:]
- **Edge Wedge**: EW radius, start angle, sweep angle [,chord angle] [:]
- **Fill Polygon**: FP fill method[:]
- **Polygon Mode**: PM polygon definition[:]
- **Fill Rectangle Absolute**: RA X,Y[:]
- **Fill Rectangle Relative**: RR X,Y[:]
- **Fill Wedge**: WG radius, start angle, sweep angle [,chord angle] [:]

Line and Fill Attributes Group (HP-GL/2)

- **Anchor Corner**: AC [ X,Y][:]
- **Fill Type**: FT[ fill type[,option1 option2 ] ] [:]
- **Line Attributes**: LA [ kind, value...[,kind,value] ] [:]
- **Line Type**: LT [ line type[,pattern length [mode ] ] [:]
- **Pen Width**: PW[ width[,pen ] ] [:]
- **Raster Fill Definition**: RF[ index,width,height,pen number]...[ . . pen number] [:]
- **Symbol Mode**: SM[ character] [:]
- **Select Pen**: SP[ pen] [:]
- **Screened Vectors**: SV[ screen type[,option1 option2 ] ] [:]
- **Transparency Mode**: TR[ n] [:]
- **User Defined Line Type**: UL[ index[,gap1 . . . gapn] [:]
- **Pen Width Unit Selection**: WU[ type] [:]

Character Group (HP-GL/2)

- **Alternate Font Definition**: AD [ kind,value...[,kind,value]] [:]
- **Character Fill Mode**: CF[ fill mode,edge pen ] [:]
- **Character Plot**: CP [ spaces,lines ] [:]
- **Absolute Direction**: DI[ run,rise] [:]
- **Relative Position**: DR[ run, rise] [:]
- **Define Label Terminator**: DT[ lblterm[,mode ] ];
- **Define Variable Text Path**: DV[ path[,line ] ] [:]
- **Extra Space**: ES[ width[,height ] ] [:]
- **Select Primary Font**: FI font ID[:]
- **Select Secondary Font**: FN font ID[:]
- **Label**: LB text . . . text lblterm[:]
- **Label Origin**: LO[ position] [:]
- **Label Mode**: LM[mode[,row number];]
- **Select Alternate Font**: SA[:]
- **Scalable or Bitmap Fonts**: SB[ n] [:]
- **Standard Font Definition**: SD[ kind,value...[,kind,value ] ] [:]

- **Absolute Character Size**: SI[ width,height] [:]
- **Character Slant**: SL[ tangent of angle] [:]
- **Relative Character Size**: SR[ width,height] [:]
- **Select Standard Font**: SS[:]
- **Transparent Data**: TD[ mode] [:]
Technical Drawing Extensions Group (HP-GL/2)

- Merge Control: `MC[mode,.opcode]`
- Pixel Placement: `PP[mode]`
- End-Of-Line Wrap: `EC & s # C`
- Display Functions - Enable: `EC Y`
- Display Functions - Disable: `EC Z`