1 Introduction to HP PCL

PCL PRINTER LANGUAGE HISTORY

Hewlett-Packard created the PCL printer language (simply referred to as “PCL” elsewhere in this manual) to provide an economical and efficient way for application programs to control a range of printer features across a number of printing devices. HP has evolved both the definition and implementations of PCL to provide the optimal price and performance balance. PCL 5 represents a new breakthrough in price/performance leadership. Its features were selected in direct response to customer requests. HP will continue to lead enhancements to the PCL printer language to deliver powerful technology advances.

PCL commands are compact escape sequence codes that are embedded in the print job data stream. This approach minimizes both data transmission and command decoding overhead. HP PCL formatters and fonts are designed to quickly translate application output into high-quality, device-specific, raster print images.

PCL printer language commonality from HP printer to HP printer helps to minimize printer support problems and protect HP printer customer investment in applications and printer driver software.

PCL Printer Language Architecture

PCL printer language structure has been useful to guide language functionality growth and command syntax definition. The PCL printer language has evolved through five major levels of functionality driven by the combination of printer technology developments, changing user needs, and application software improvements. The five phases of the PCL printer language evolution are:

PCL 1	*Print and Space* functionality is the base set of functions provided for simple, convenient, single-user workstation output.
PCL 2	*EDP (Electronic Data Processing) /Transaction* functionality is a superset of PCL 1. Functions were added for general purpose, multi-user system printing.
PCL 3	*Office Word Processing* functionality is a superset of PCL 2. Functions were added for high-quality, office document production.
PCL 4	*Page Formatting* functionality is a superset of PCL 3. Functions were added for new page printing capabilities.
PCL 5	*Office Publishing* functionality is a superset of PCL 4. New publishing capabilities include font scaling and HP-GL/2 graphics.

The PCL printer language model succeeds because the following points are observed:

- All HP LaserJet printers implement PCL printer language features consistently.
- HP printers implement the above language feature groups in very cost-effective formatters.
- HP printers have the ability to ignore most unsupported commands.

What are Printer Commands?

PCL **printer commands** provide access to printer features. There are four general types of HP printer language commands:

- control codes
- PCL commands
- HP-GL/2 commands
- PJL commands

Control Codes

A control code is a character that initiates a printer function, for example Carriage Return (CR), Line Feed (LF), Form Feed (FF), etc.

PCL Commands

PCL commands provide access to the printer's PCL control structure. The PCL structure controls all of the printer's features except those used for vector graphics, which are controlled by the HP-GL/2 commands.

PCL printer commands consist of two or more characters. The first character is always the ASCII escape character, identified by the ^{E}C symbol. ^{E}C is a special control code which identifies the subsequent string of characters as a printer command. As the printer monitors incoming data from a computer, it "looks" for this character. When this character appears, the printer reads it and its associated characters as a command to perform and not as data to print.

Note PCL printer commands (other than single-character control codes) are also referred to as **escape sequences**. The terms *printer command* and *escape sequence* are used interchangeably throughout this manual.

Once a PCL command sets a parameter, that parameter remains set until that PCL command is repeated with a new value, or the printer is reset to its user default environment. For example, if you send the printer a command to set line spacing to 3 lines/inch, each page prints 3 lines/inch until the printer receives a different Line Spacing command, or the printer is reset.

HP-GL/2 Commands

HP-GL/2, vector graphic commands are two letter mnemonic codes designed to remind you of the function name (such as **IN** for Initialize). Following the two letter mnemonic may be one or more parameters, which identify details of how to process the command. For additional information on HP-GL/2 commands, refer to Chapters 17 through 23.

PJL Commands

PJL (Printer Job Language) commands provide a different type of printer control. Unlike PCL and HP-GL/2, which control the placement of dots on the printed page, PJL supplies job-level control. One of the main features PJL offers is the ability to switch printer languages (personalities) between jobs. For example, applications supporting PJL can print one job using PCL, and then print the next job using PostScript or another printer language, without any operator intervention.

PJL also provides two-way communications with the printer. For example, PJL can request information from the printer such as printer model, configuration, printer status, and job status. PJL also can be used to change the printer's control panel settings and modify the message displayed on the control panel.

The PJL language is designed to be used by application developers and technical support personnel only.

Syntax of Escape Sequences

There are two forms of PCL escape sequences: two-character escape sequences and parameterized escape sequences.

Two-Character Escape Sequences

Two-character escape sequences have the following form:

$^{E}_{C}$ *X*

where "*X*" is a character that defines the operation to be performed. "*X*" may be any character from the ASCII table within the range 48-126 decimal ("0" through "~" - see Appendix A). For a list of the two-character escape sequences supported by the printer, refer to the "PCL Feature Support Matrix" in Chapter 1 of the ***PCL 5 Comparison Guide***.

Following are examples of two-character escape sequences:

$^{E}_{C}$ **E**	a two-character escape sequence used for resetting the printer.
$^{E}_{C}$ **9**	a two-character escape sequence used for resetting the left and right margins to the printer's default settings.

Parameterized Escape Sequences

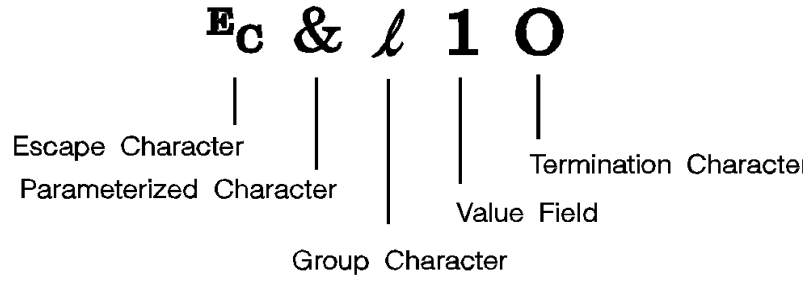
Parameterized escape sequences have the following form:

$$E_C\ X\ y\ z1\ \#\ z2\ \#\ z3\ ...\ \#\ Zn[data]$$

where *y, #, zi* (*z1, z2, z3...*) and *[data]* may be optional, depending on the command.

X	**Parameterized Character** - A character from the ASCII table within the range 33-47 decimal (“**!**” through “***/***”) indicating that the escape sequence is parameterized.
y	**Group Character** - A character from the ASCII table within the range 96-126 decimal (“ **‘** ” through “ **~** ”) that specifies the group type of control being performed.
#	**Value Field** - A group of characters specifying a numeric value. The numeric value is represented as an ASCII string of characters within the range 48-57 decimal (“0” through “9”) that may be preceded by a “+” or “—” sign and may contain a fractional portion indicated by the digits after a decimal point (“ **.** ”). Numeric value fields are within the range -32767 to 65535. If an escape sequence requires a value field and a value is not specified, a value of zero is assumed.
zi	**Parameter Character** - Any character from the ASCII table within the range 96-126 decimal (“ **‘** ” through “ **~** ”). This character specifies the parameter to which the previous value field applies. This character is used when combining escape sequences.
Zn	**Termination Character** - Any character from the ASCII table within the range 64-94 decimal (“ @ ” through “ **^ ”**). This character specifies the parameter to which the previous value field applies. This character terminates the escape sequence.
[data]	**Binary Data** is eight-bit data (for example, graphics data, downloaded fonts, etc.). The number of bytes of binary data is specified by the value field of the escape sequence. Binary data immediately follows the terminating character of the escape sequence.

The following is an example of an escape sequence with a termination character and no parameter character. This escape sequence performs a single function.

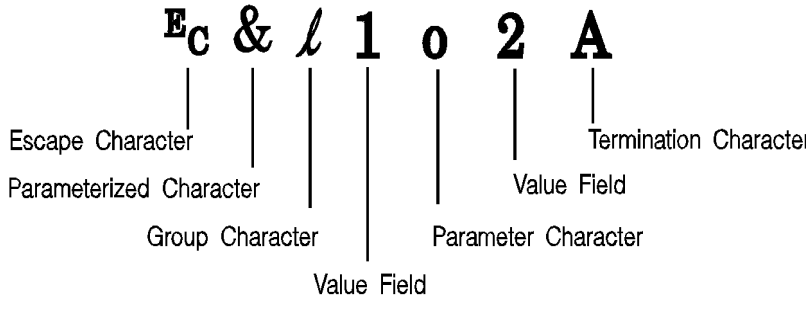


Notes

Some escape sequences shown in this manual contain spaces between characters for clarity. Do not include these spaces when using escape sequences.

Also, in the escape sequence a script "ℓ" is used to indicate a lower case "l" for clarity.

The following is an example of an escape sequence with a parameter character and a termination character. This escape sequence performs two functions. It is the combination of two commands (ESC&ℓ1O and ESC&ℓ2A):



Notice that the "ESC"and the "&ℓ"are dropped from the second printer command when the two commands are combined. Also, the upper-case "**O**" that terminated the first command becomes a lower-case "o" parameter character when these commands are combined.

Use these three rules to combine and shorten printer commands:

1 The first two characters after "Esc" (the parameterized and group character) must be the same in all of the commands to be combined. In the example above, these are "**&**" and "***ℓ***".

2 All alphabetic characters within the combined printer command are lower-case, except the final letter which is always upper-case. In the combined example above, "**O**" becomes "**o**". The final character in the printer command must always be upper-case to let the printer know that the command is complete.

3 The printer commands are performed in the order that they are combined (from left to right). Be sure to combine commands in the order that they are to be performed.