24 Programming Hints

Introduction

This chapter provides information for use during the development of PCL software.

PCL Command Parsing

A job stream may contain commands that are device specific. If these commands are not supported by the PCL device, they are ignored. For example, a Duplex Print command has no effect on the HP LaserJet III, IIIP or LaserJet 4 printers, since these are non-duplexing printers. However, on printers which support duplex printing (such as the HP LaserJet IIID and LaserJet IIISi), the job is printed in duplex mode.

Printer Reset

Hewlett-Packard strongly recommends the use of both the **E$_C$E** command and the **E$_C$%–12345X** command (Universal Exit Language/Start of PJL — also referred to as the **UEL Command**) at the beginning and end of each job. (The order of these commands is critical; refer to Table 24-1 for an example.) This allows the next job to start with the default settings as a known base. Starting with the default environment at the beginning of each print job eliminates the need to set every feature each time a job is run.

Table 24-1 Structure of a Typical Job

E$_C$%–12345X	UEL Command (exit language).
E$_C$E	Printer Reset Command.
Preamble	Job Control Commands.
Page 1	Page Control Commands.
	Data
⋮	⋮
Page *n*	Page Control[1] Commands.
	Data.
E$_C$E	Printer Reset Command.
E$_C$%–12345X	UEL Command (exit language).

1. If a number of consecutive pages within a job have the same format (such as margins, VMI, HMI, etc.), the associated page control commands only need to be sent once for that group of pages.

Note

The UEL Command (**E$_C$%–12345X**) has the same effect as the **E$_C$E** command, and also enters PJL Mode of operation for printers that support PJL. The **E$_C$E** command should be included to ensure backward compatibility (the UEL command is ignored if received by a printer that does not support PJL).

Do not perform a printer reset *within* a job.

Paper Source

The primary use for the paper source command is to allow access to “locked out” (secured) paper trays.

Page Size

This command specifies the exact size of the page (media) to be used.

Text Area/Margins

Avoid setting the top margin or text length to values outside of the printable area. This may cause data loss.

Top Margin and Text Length commands use the current line spacing (the last VMI or lpi commands).

Specifying the text length establishes the bottom margin.

When using both the Top Margin and Text Length commands, send the Top Margin command before the Text Length command.

To address the entire logical page set the top margin to 0, set perforation skip mode OFF, and position the cursor to the desired location.

The user default VMI is selectable from the control panel printing menu, using the FORM menu item (refer to the printer *User’s Manua*l).

HMI

When a font is selected, HMI is set automatically to correspond to the pitch of the selected font if fixed-pitch, or the recommended (default) word space if proportional. Therefore, when using a non-standard HMI value, the value must be re-specified following each font selection.

PCL Cursor Positioning

Horizontal (decipoint, dot and column) positioning ignores margins, and therefore can be used to move the cursor anywhere along the present line.

When performing cursor positioning with decipoints, PCL Units, or rows and columns, do not use margins. Margins are intended for print and space (i.e., CR, LF, FF) applications.

Vertical (decipoint, dot and row) positioning allows the cursor to be moved into the perforation region.

The top margin is the reference point for *absolute* vertical positioning. The left edge of the logical page is the reference point for *absolute* horizontal positioning.

The current active position (CAP) is the reference point for *relative* vertical and horizontal positioning.

Refer to Chapter 6 for more information on cursor positioning.

Fonts

Character spacing information for proportionally-spaced fonts can be obtained in several ways. The preferred method is using Hewlett-Packard's AutoFont Support. AutoFont Support is a standard method for identifying font information. It provides basic font information including spacing information in AutoFont format, in a file with a TFM (tagged font metric) extension. AutoFont support files can be created for any soft font using Hewlett-Packard's **Type Director 2.0** (and later). AutoFont support for Hewlett-Packard's newer font cartridge products are furnished as TFM files on a disk.

Character spacing information for proportionally spaced fonts is available from Hewlett-Packard. Spacing information can be obtained from Hewlett-Packard's Type Director 2.0 typeface and font management program.

Character spacing information can also be obtained from listings generated through the operation of the spacing feature available from Hewlett-Packard's FontLoad Utility, HP product number 33407B.

Since line spacing is independent of font height, line spacing may require adjustment following font selection to ensure proper vertical alignment of text.

To ensure compatibility with future products, select fonts by specifying **all** of the font characteristics. If all of the characteristics are not designated, the primary and secondary font tables in the printer may not contain the correct information to select the requested font from those available in the printer.

The shortcut method of font selection is not recommended (as documented in some previous font product literature) and may not result in the desired font change. This is due to the increased number of available fonts in the printer.

The transparent print data command is required to access printable characters with character codes in the decimal range of 0, 7-15, and 27 in the PC symbol sets.

All information about the design of a font, as well as the design of its characters, can be found in the font and character descriptors.

A Space control code is executed when an attempt is made to print a non-existent character.

Using an ID number which has not been associated with a font results in no font change.

Font designers should not define the space character. Use the printer's Space control code should be used for character spacing. Defining the space character in the font results in a significant reduction in performance and inhibits the HMI command with proportional fonts.

Note Refer to "HP-GL/2 Vector Graphics" later in the chapter for hints on using HP-GL/2 text.

PCL Raster Graphics

To minimize I/O transmission time and conserve memory, avoid sending unnecessary raster data to the printer that represents white space. This is accomplished using the raster compression modes and raster reduction techniques available with the raster picture area.

Set resolution prior to the start raster graphics command. Once the start raster command is received, the resolution cannot be set until after a subsequent end raster graphics command.

Set presentation mode prior to the Start Raster Graphics command. Once the start raster command is received, the presentation mode cannot be set until after a subsequent End Raster Graphics Command.

Some applications and I/O drivers insert carriage returns or line feeds into the data stream sent to the printer. This modification of the data stream must be suppressed for correct printer operation.

The most efficient way to draw lines (horizontal and vertical) is using graphics rules (black-fill rectangular areas). The most efficient way to draw diagonal lines is using HP-GL/2 vector graphics.

Macros

When a macro ID is specified for which no macro has been defined, the macro invocation, macro deletion, and make macro permanent or temporary commands are ignored.

The macro enabled for auto macro overlay is executed on each page, until the macro is disabled or deleted, a reset occurs ("$^{E}_{C}E$" "UEL" or control panel), or the page length, page size or orientation is changed.

When the modified print environment is restored (upon exiting a called or overlaid macro), if the page length, page size, or the orientation has changed, or the primary or secondary font has been deleted, the following occurs:

1 If the original page length or page size is different than the current page length and page size, the current page is closed and printed, the page length and page size are changed to their original value, and the cursor is positioned at the left edge of the logical page at the top margin on the following page.

2 If the primary or secondary font is deleted, a new primary or secondary font is automatically selected from the remaining fonts using the current font characteristics.

HP-GL/2 is supported within a macro on some printers (refer to the "PCL Feature Support Matrix" in Chapter 1 of the *PCL 5 Comparison Guide*. HP-GL/2 implementation within macros matches that of PCL.

Macro problems can often be avoided by first ensuring that the data formats outside the macro environment.

HP-GL/2 Vector Graphics

There are different approaches (commands) and techniques that can be used to create an HP-GL/2 image. To assist in determining the most efficient approach to creating an image, several points are identified below:

- When using line caps and joins:
  - Most efficient - Round join with butt cap
  - Least efficient - Round join with triangular cap
- When using text, if you want the character to be printed at the same location as it would in PCL, use label origin position 21 (see “Label Origin” command, in Chapter 23).
- Default pen widths (5 dots wide or less) produce the highest speed.
- Hewlett-Packard recommends using polygon mode when the number of points in a polygon is 1000 or less.
- The Polyline Encoded command can reduce data by 60% to 70%.
- When drawing shapes, use a command that was designed to draw that shape. For example, to draw a rectangle, use the ER command to produce it, instead of stroking the shape line by line.
- When drawing arcs or circles, use the Bezier commands to eliminate the need to compute the chord angle, thus resulting in better quality and efficiency.
- To Scale text, use the HP-GL/2 font selection commands, such as SD or AD, that use Intellifont or TrueType to scale the text. Scaling text in HP-GL/2, using the SR or SI commands, is much less efficient.
- Font transformations in HP-GL/2, such as mirroring, scaling, slanting, rotating, and outlining are very processing intensive. An “ERROR 21’’ (print overrun) may occur. The error can be controlled by using the HP LaserJet “Page Protection” feature.

PCL Commands

Since PCL printers are command driven devices and each command takes a finite amount of time to process, pages composed of a large number of commands may not print at maximum speed. Most commands can be used frequently on a page without adversely affecting the printer's performance; however, certain commands take more time to process and therefore, if used frequently on a page, may decrease printer performance. An excessive number of font selections per page (selection using font characteristic commands or selection by ID number) may decrease printer performance.

Print Data

There is a limit on the amount of data, as well as the number of commands, that the printer can process per page at maximum speed.

Print Overrun

As data is received by the printer, it is processed and stored in an intermediate format. The intermediate data is later processed and printed. During the physical printing of a page, the page moves through the printer at a constant speed. Thus, some pages cannot be printed because the page's intermediate data cannot be processed fast enough to keep up with the physical speed of the page as it moves through the printer. When this condition occurs, an error number "21'' (ERR0R 21 - print overrun) is displayed on the printer's control panel. A page causing this error can be printed by setting the printer's page protection feature to ON (see next section).

Page Protection

If enabled, page protection reserves an amount of memory for the page image process, allowing the printer to create the entire page image (in memory) before physically moving the paper through the printer.

Note The page protection feature is available only with additional optional memory on many HP LaserJet printers. (One exception is the LaserJet 4 printer, which supports page protection for letter-size paper **in 300 dpi mode** with the standard 2 Mbytes memory.) Refer to the appropriate *User's Manual* for specific memory requirements.

The Page Protection feature can be used to prevent possible ERROR 21 conditions. ERROR 21 is reported when data is too complex for the printer to process concurrent with actual physical printing. A frequent cause of ERROR 21 when printing graphics is that the program sends commands to print a single point many times during the page run.

Page protection can be set for letter, A4, or legal sized pages. Set page protection for the page size most often used.

I/O

The Parallel (Centronics) I/O has higher throughput than the RS-232C serial I/O. While text processing may not benefit from a faster I/O, raster graphics processing and soft font downloads will usually benefit from increased I/O throughput.

End-of-Line Wrap

The End-of-Line Wrap command defines the action that occurs when a line of text reaches the right margin.

$^{E}_{C}$ & s # C

=0 - Enables End-of-Line Wrap
1 - Disables End-of-Line Wrap

When end-of-line wrap is enabled, a character or space that moves the cursor to the right of the right margin executes a CR-LF (prior to the printing of the character or space).

When end-of-line wrap is disabled, a character or space that would move the cursor to the right of the right margin may be clipped (refer to Chapter 2). When a character is clipped, the cursor is set to the right margin.

The primary use of this command is with display functions mode.

The factory default is end-of-line wrap disabled.

Example

To enable end-of-line wrap mode, send:

$^{E}_{C}$&s0C

Display Functions Mode

The Display Functions Mode command allows all escape sequences and control codes to be printed instead of being executed.

$^{E}_{C}$ **Y** - Enables Display Functions Mode

$^{E}_{C}$ **Z** - Disables Display Functions Mode

When the printer is in display functions mode, all control codes and escape sequences are printed and not executed, with the following exceptions:

- CR is printed and executed as CR-LF.
- $^{E}_{C}$**Z** is printed and executed.

Display functions mode instructs the printer to display rather than execute the data it receives. The data is printed using the current text area and selected font.

Note To print characters 0, 7-15, and 27 in fonts which have printable characters in these positions (such as PC-8), the printer must be in Display Function Mode, or be given a Transparent Print command.

Example

To enable display functions mode, send:

$^{E}_{C}$&s0C	Enables end-of-line wrap to prevent data truncation.
$^{E}_{C}$Y	Enable Display Functions Mode.
	•
	•
	•
	Data sent to the printer.
	•
	•
	•
$^{E}_{C}$Z	Disable Display Functions Mode.

Note Most symbol sets do not have printable characters defined in the control code decimal range 0 to 31 and 128 to 159. If a printable character is not defined, a Space control code is printed while in display functions mode. The PC symbol sets do have printable characters defined in this range.

Auto Continue Mode

Automatic error clearing (refer to the printer *User's Manual* for a list of clearable errors) can be achieved by setting Auto-Continue Mode to ON, using the Operator Control Panel configuration menu. When "Auto-Cont" is set to ON, the device displays a message for 10 seconds, and then attempts to continue printing the job. When "Auto-Cont" mode is set to OFF, all errors cause the device to stop printing.

20 ERROR

This error occurs when the printer runs out of memory during a font download, macro creation, raster graphic download, or page composition. To alleviate this error, the quantity of data sent to the printer must be reduced. This can be accomplished by eliminating unnecessary fonts or macros, reducing the raster graphics white space sent to the printer, or selecting a lower resolution for the raster graphics. An alternative solution is to install additional memory. Additional memory is available from your Hewlett-Packard Sales Representative or authorized dealer.

21 ERROR

This error results when a page is too complex to print. The error can be corrected by reducing the complexity of the page, or by enabling Page Protection mode from the control panel. (Refer to the “Print Overrun” section described earlier in this chapter for additional information.)

22 ERROR

This error indicates an I/O protocol problem between the printer and the host system. Make sure the printer and the host system protocol (hardware handshake or Xon/Xoff handshake) correspond and that your cable is correct for your host/printer configuration.

40 ERROR

An error occurred while transferring data from the computer to the printer. This error occurs if the computer is turned ON and OFF while the printer is on-line, or if the printer’s baud rate, parity, or data character size are not the same as the computer’s. To clear the error message press [[CONTINUE/RESET]] (refer to the printer *User’s Manual*). Make sure the printer is set to the same baud rate as the computer, and that your host I/O has been configured for your printer. If the error continues, call your HP Service Representative.

For additional printer errors, refer to the printer *User’s Manual*.