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# HP DeskJet 600, 700, 800, 900 & HP 2000 Series PCL Developer's Guide

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Hewlett-Packard Vancouver Site

To aid in HP PCL printer driver development  
for HP DeskJet 600/700/800/900 & HP 2000  
Series printers



## 1.0 Preface and Printing History

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## 2.0 About this Developer's Guide

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### 2.1 Which printers are covered by this guide<sup>1</sup>

Throughout this HP PCL Developer's Guide you will see printer names referenced. Here is a list of actual names and the "Series" names used throughout this guide.

#### 2.1.1 HP DeskJet 600 Series: 630C\*, 640C\*, and 656C\*

**HP DeskJet 600** - HP DeskJet 600, HP DeskJet 600C  
**HP DeskJet 610C** - HP DeskJet 610C, HP DeskJet 610CL, HP DeskJet 612C  
**HP DeskJet 660C** - HP DeskJet 660C, HP DeskJet 660Cse  
**HP DeskJet 670C** - HP DeskJet 670C, HP DeskJet 670TV, HP DeskJet 672C  
**HP DeskJet 680C** - HP DeskJet 680C, HP DeskJet 682C  
**HP DeskJet 690C** - HP DeskJet 690C, HP DeskJet 692C, HP DeskJet 693C,  
HP DeskJet 694C  
**HP DeskJet 695C** - HP DeskJet 695C, HP DeskJet 695Cci, HP DeskJet 697C

#### 2.1.2 HP DeskJet 800 Series: 840C\*

**HP DeskJet 810C** - HP DeskJet 810C, HP DeskJet 812C, HP DeskJet 815C  
**HP DeskJet 830C** - HP DeskJet 830C  
**HP DeskJet 850C** - HP DeskJet 850C, HP DeskJet 855C, HP DeskJet 855Cse,  
HP DeskJet 855Cxi  
**HP DeskJet 870C** - HP DeskJet 870Cse, HP DeskJet 870Cxi  
**HP DeskJet 880C** - HP DeskJet 880C, HP DeskJet 882C  
**HP DeskJet 890C** - HP DeskJet 890C, HP DeskJet 890Cse, HP DeskJet 890Cxi,  
HP DeskJet 890CM  
**HP DeskJet 895C** - HP DeskJet 895Cse, HP DeskJet 895Cxi

#### 2.1.3 HP DeskJet 900 Series: 920C\*, 940C\*, 960C\*, 980C\*, and 990C\*

**HP DeskJet 930C, 950C, and 970C** - HP DeskJet 930Cxi, 950Cxi, and 970Cxi

#### 2.1.4 HP 2000C Series

**HP 2000C** - HP 2000C, HP 2000CN, HP 2000Cse, HP 2000Cxi

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1. HP DeskJet 710C, 712, HP DeskJet 720C, 722C, and HP DeskJet 820Cse, 820Cxi printers are "Windows" printers. See **Section 2.2.1** "Special Note" regarding these printers. \* Product will appear in December 2001 revision

## 2.2 Special Notes

- ✓ HP DeskJets were designed in series - the printer's internal firmware will usually report the series name, rather than the specific product name. All printers in a series will behave as the base model. For example, the HP DeskJet 810C Series printers were sold under the name of the HP DeskJet 810C, HP DeskJet 812C, and the HP DeskJet 815C. All three printer models have the same internal firmware, reporting the printer as a HP DeskJet 810C.

Note that the HP DeskJet 895Cse and HP DeskJet 895Cxi are both part of the HP DeskJet 895C Series family and are **NOT** derived from the HP DeskJet 890C Series.

- ✓ If a command is not covered in this guide, it is either obsolete or Hewlett-Packard proprietary information. No further information on these unsupported or proprietary commands is available.
- ✓ In the HP PCL escape sequences within this manual, the letter "el" (l) is represented by a script character (*ℓ*) to differentiate between the "el" and the character 1 (one). Where spaces have been added to commands for readability, those spaces must not be included in your code.
- ✓ Specifications on the ink cartridges (including the HP Photo Cartridge) are not available - this is Hewlett-Packard proprietary information and will not be provided.

### 2.2.1 Special Note - HP DeskJet 710C, 720C and 820C Series printers

- ✓ The HP DeskJet 710C, 720C, and 820C Series printers are "Windows" printers. These printers will **not** function from a DOS-only environment. However, they will work when accessed from a DOS box within Windows 3.1x, 95, 98.

For clarity, these printers are not included in the printer tables in this guide. If you wish to send PCL commands to these printers, use the HP DeskJet 660C Series printers as your guide in the tables.

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## 4.0 How This Developer's Guide Works

Below is a sample command description chart from this guide. On the following pages you can find descriptor names for the various parts of the graph.

### A 4.0.1 Page Length B

TABLE 1. Page Length - Esc & l # P C

F # Value	G DJ600	DJ610C	DJ660C	DJ670C	DJ680C	DJ690C	DJ695C	DJ810C	DJ830C	DJ850C	DJ870C	DJ880C	DJ890C	DJ895C	DJ970C	HP2000C	H EFFECT
0	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Page length set to 66 lines
1..n	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Page length is set, in number of lines, at the current lpi
Default	0 (66 lines per page)																
Range	1 to maximum supported paper size - Command is ignored for out of range values																

D Designates the number of lines on the logical page at the current VMI (Vertical Motion Index) setting.

I This command performs the following actions:

- ✓ Prints any unprinted pages.
- ✓ Ejects the current page if printable data has been received (FF-CR).
- ✓ Sets text length, top margin, left margin, and right margin to user defaults.
- ✓ Moves CA to the left edge of the logical page at the top of form.

The printer may select a different page size for the same line count, since lines are defined by the current VMI. This command is ignored if VMI is 0.

### 4.0.2 The Command Description Page A

Since some commands are not recognized by all HP DeskJet printers, or some family members do not recognize all options for a particular command, it is necessary to indicate which printers do respond to each command, and how each printer treats each command option.

### 4.0.3 Command Name B

The Command Name is the name by which each command is referred to within the text of this guide, and by which the command is referenced in the index.

#### 4.0.4 Escape Sequence **C**

This is the ASCII text version of the binary string, which causes the command to be invoked. The pound sign ("#") is used to represent where one of the command options, which are listed following the Command Summary, would be inserted.

#### 4.0.5 Command Summary **D**

A brief description of the purpose of a command is given. The Command Summary can be used to determine quickly if a particular command will perform the overall task you desire.

#### 4.0.6 Command Usage Table **E**

The Command Usage Table provides a quick key for the application of the available command options for each printer command. The column labeled "#Value" lists all options (also referred to as command parameters) for the command being discussed. The group of columns labeled with the model numbers of the HP DeskJet printers indicates which printers recognize each command option. The column labeled "Effect" briefly describes what result the use of each command option will have. The Command Usage Table is designed to let you quickly determine if a particular command and a selected command option will be recognized by your target printer, and what the effect of using that command and command option will be. The detailed command description can be carefully studied to gain a thorough understanding of the command once you determine if it is the one you want to use.

#### 4.0.7 Command Options **F**

All command options for a command are listed in the column of the Command Usage Table, which is labeled "Value". You should note that even though a particular member of the HP DeskJet printer family is indicated as recognizing a command, that printer may not recognize, and therefore not respond to, all listed command options.

#### 4.0.8 Command Option Recognition Grid **G**

This section of the table serves to quickly indicate which HP DeskJet printer models will recognize and respond to a particular command option. If a check mark ("✓") appears under a particular printer model in the row for a command option, that printer will recognize the option. If there is no check mark for a command option under a particular printer model number, that printer will not recognize or respond to that command option. If a command is used with an option the printer does not recognize, the results you obtain on your print media will be unpredictable; your printed page may not appear as you expect.

#### 4.0.9 Effect of Command Options **H**

The result of using the command with a given command option is briefly described. A detailed description of the impact of the command and its options are provided in the detailed command description, which follows the Command Usage Table.

#### 4.0.10 Detailed Command Description

This is where all aspects of the command are explained. All details of the command and its usage are covered, including the effect of the command on the printer and the printing environments, all the command's options and the effect of each of those options, and any extended impact the command may have which you should be aware of.

#### 4.0.11 Important Point



Where a blue exclamation point appears, special information that you should keep in mind is presented. *(As a side note, if you print this document on a monochrome printer, the exclamation point will appear a dark gray.)* This information may be of a cautionary nature, or it may be included in this emphasized format to point out special cases, which may apply for a command. Any information noted in these areas should be read carefully before you use the associated command.

## 5.0 Introduction to HP PCL

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### 5.1 History of HP PCL Printer Language

Hewlett-Packard created the HP PCL Printer Language 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 the HP PCL printer language to provide the optimal price and performance balance. HP PCL 3 continues to lead with enhancements to the HP PCL printer language in order to deliver powerful technology advances.

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

HP 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.

#### 5.1.1 What are Printer Commands?

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

- ✓ Control codes
- ✓ HP PCL commands

#### 5.1.2 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.

#### 5.1.3 HP PCL Commands

HP PCL commands provide access to the printer's HP PCL control structure. The HP PCL structure controls all of the printer's features.

HP PCL printer commands consist of two or more characters. The first character is always the ASCII escape character, identified by Esc. Esc 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 is "looking" for this character. When this character appears, the printer reads it and the subsequent string of characters as a command to be performed and not as data to be printed.



*HP PCL printer commands are also referred to as escape sequences. The two terms are used interchangeably throughout this manual.*

Once an HP PCL command sets a parameter, that parameter will remain set until that HP PCL command is repeated with a new value, the printer is reset to its user default environment, or another command makes a change. For example, if you send the printer a command to set line spacing to 3 lines/inch, each page will print 3 lines/inch until the printer receives a Line Spacing or VMI command or the printer is reset.

## 5.2 Syntax of Escape Sequences

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

### 5.2.1 Two-Character Escape Sequences

Two-character escape sequences have the following form:

Esc X

Where "X" is a character that defines the operation to be performed. (Note, "X" may be any character from the ASCII table within the range 48-126 decimal ["0" through "~"]).

Following are examples of two-character escape sequences:

Esc E a two-character escape sequence used for resetting the printer.

Esc 9 a two-character escape sequence used for resetting the left and right margins.

### 5.2.2 Parameterized Escape Sequences

Parameterized escape sequences have the following form:

Esc 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 "~") which specifies the group type of control being performed.

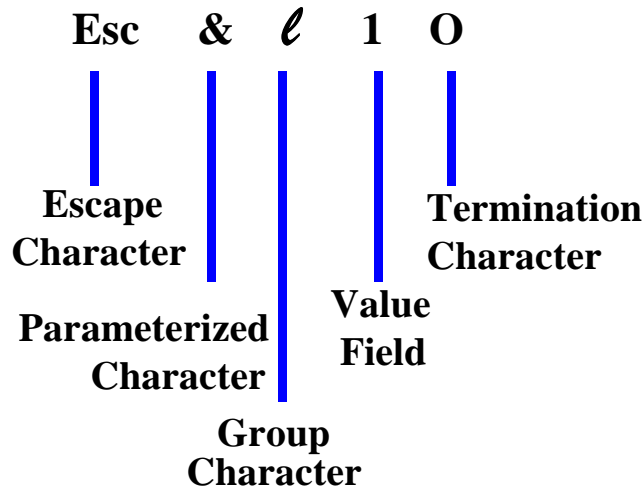
# Value Field - A group of characters specifying a numeric value. The numeric value is represented as an ASCII string of characters within the range 48-57 decimal ("0" through "9") that may be preceded by a + or - sign and may contain a fractional portion indicated by the digits after a decimal point (.). Numeric value fields are within the range -32767 to 32767. 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 64-96 decimal ("@" through "~"). This character specifies the parameter to which the previous value field applies. This character terminates the escape sequence and is always in the form of a capital letter, such as A, M, T, etc.

[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.

Following is an example of an escape sequence with a termination character and no parameter character. This escape sequence performs a single function of logical page orientation in landscape mode.

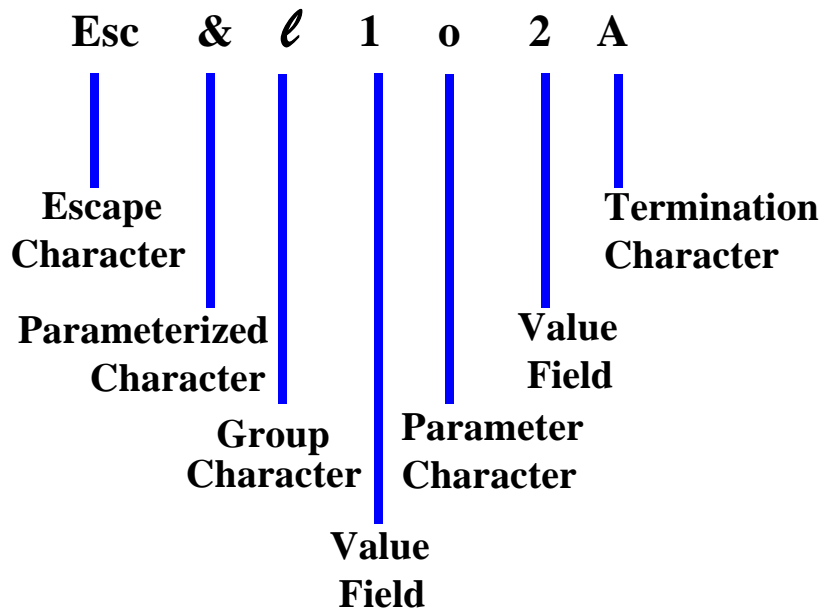


- ✓ Some escape sequences shown in this manual contain spaces between characters for clarity. Do not include these spaces when using escape sequences.
- ✓ Also, in the escape sequence a script "ℓ" is used to indicate a lower case "l" for clarity.

The following is an example of two escape sequences, each of which perform one function: the first sets the logical page orientation to Portrait Mode, and the second sets the page size to 8 ½ x 11 inches.

Esc & ℓ 0 O and Esc & ℓ 2 A

These two escape sequences can be combined into one escape sequence as follows:



Notice that the "Esc" and the "&" are dropped from the second printer command when they 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:

- ✓ The first two characters after "Esc" (the parameterized and group character) must be the same in all of the commands that will be combined. In the example above, these are "&" and "ℓ".
- ✓ All alphabetical characters within the combined printer command will be 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.
- ✓ 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.



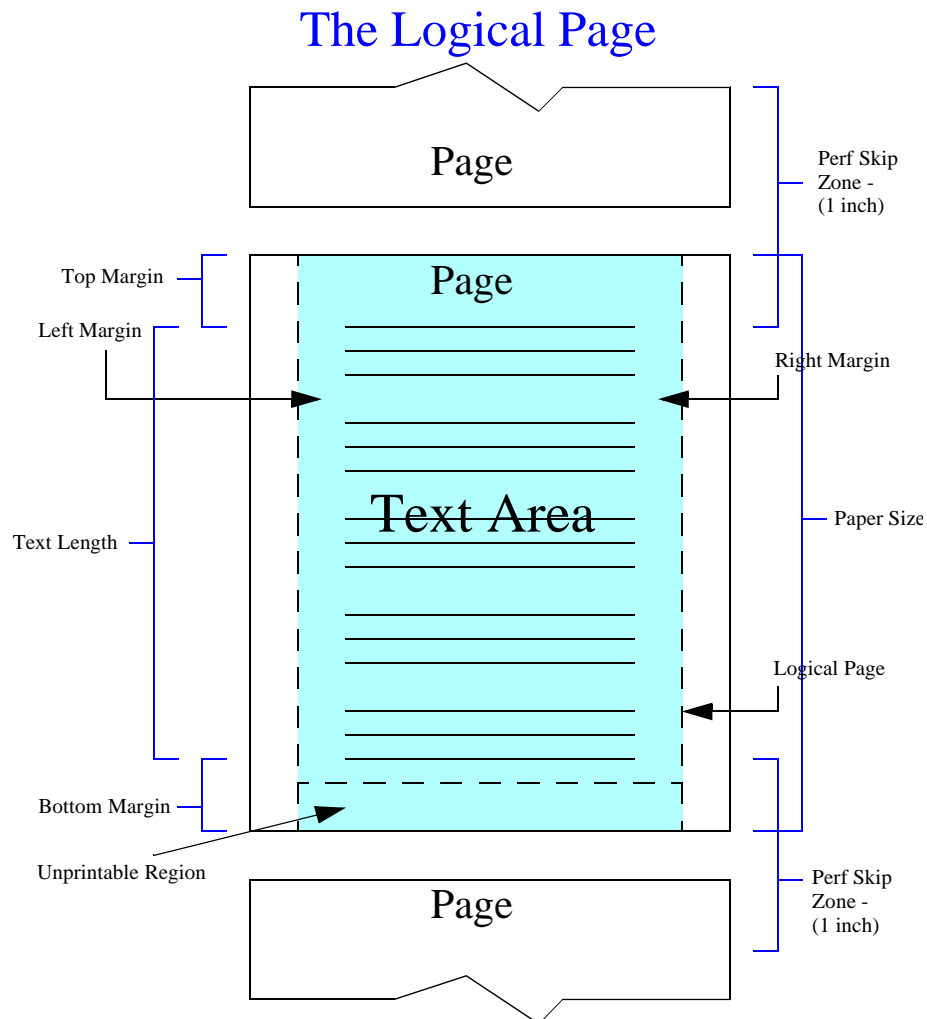
## 6.0 The Page

---

### 6.1 Logical Page, Physical Page

The HP PCL printer language distinguishes between the physical page and the logical page. The physical page is the actual sheet of paper. Its size is determined by the size of the media installed in the printer. The logical page defines the addressable area in which the cursor can be positioned.

CAP (Current Active Position) refers to the "cursor" position on the logical page, similar to the cursor used on most computer terminals. The CAP location on the logical page is the next position where a character will be placed. CAP cannot be moved outside of the logical page bounds. The figure below shows the layout of the logical page.



## 6.2 Page Layout

Referring to the previous figure, each page passed through the printer has a number of components. Text printing is normally limited to a specific printable area within the logical page known as the text area. The text area is entirely contained by the logical page, but may be smaller because of margins. There are unprintable regions along the outside edges and bottom of each sheet of print media. If printing is attempted outside the printable area at the bottom of the sheet, data may be printed on the following sheet. If printing is attempted in the unprintable regions, formatting or data may be lost.

The perforation skip zone extends from the bottom of the text area on one page to the top of the text area on the next page. When the Perforation Skip Mode is turned ON, a Line Feed that would normally move CAP into the bottom margin of the current page instead moves CAP to the top of the text area on the next page. If the Perforation Skip Mode is turned OFF, a Line Feed that would move CAP into the bottom margin is allowed. If text printing is attempted within the unprintable region at the bottom of the page, a hardware page break occurs, the text is printed on the next sheet of print media, and then a software page break occurs. The result is an unplanned, extra page, which contains only that portion of the text which invaded the unprintable region.

Allow  $\frac{1}{2}$  inch at the bottom of the page. This extra  $\frac{1}{2}$  inch can mean a loss of 3 lines. For example, on an 11 inch page, the full-page length is 66 lines (6 lines per inch). However, the effective page length is  $10 \frac{1}{2}$  inches, or 63 lines.

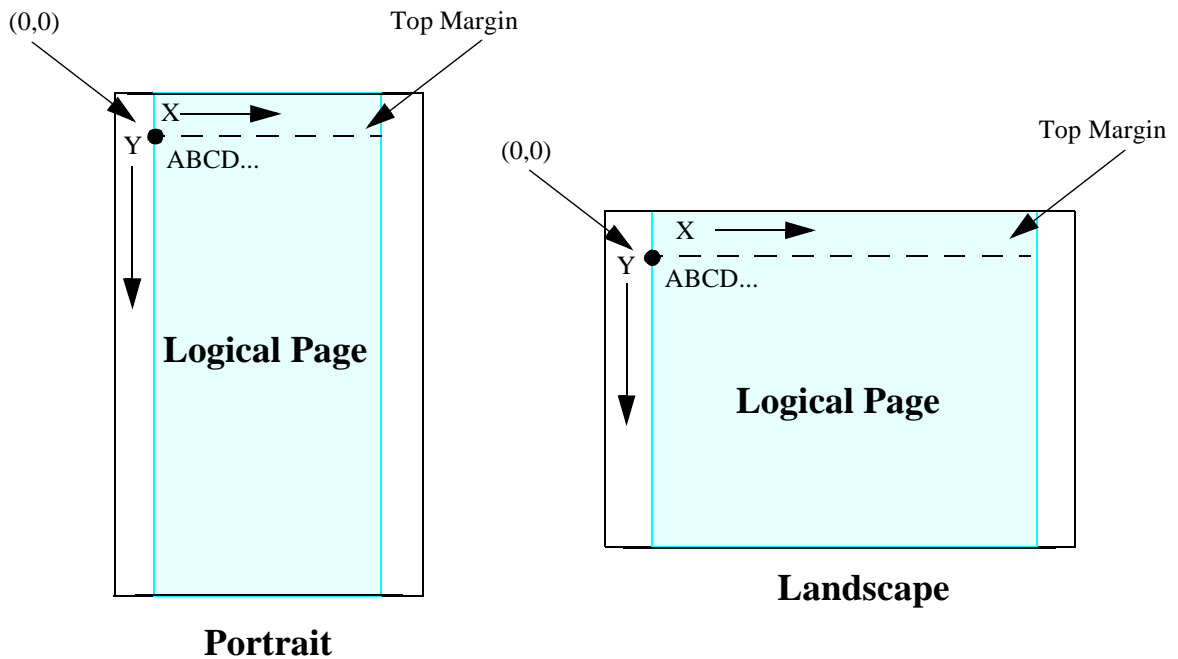
### 6.2.1 Current Active Position (CAP)

CAP is the position at which the next character will be printed on the page. This position can be moved to different points on the logical page using the cursor positioning commands. CAP cannot be moved outside the bounds of the logical page, except when moving to another logical page.

CAP position (0,0) is at the left edge of the logical page at the current top margin position. Since the top margin can be changed using a printer command, the physical location of the

point (0,0) may change. The point (0,0) then, does not necessarily equate to the top of the paper.

## CAP Position



### 6.2.2 CAP Reference Point

The first line starts at the (0,0) coordinate. CAP starts at (X,Y), where X= the left margin setting, and Y= the top margin setting. CAP is moved the distance of the Horizontal Motion Index to the right after printing a character and one dot row down after printing graphics. The physical location of the (X,Y) coordinate can change due to the size of the first printed character.

Characters are placed with their reference points at CAP. The reference point is on the character baseline, a horizontal line just under the bottom of the non-descending characters. This means that if the top margin is at the top of the logical page, text cannot be printed at (0,0) because most of the character would be above the top edge of the page.

Graphics, however, can be printed at (0,0) because they do not move above CAP. Graphics begin at the vertical level specified by CAP and then move downward on the page from that point.

## 7.0 The Print Environment

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The group of all the printer's current feature settings is collectively referred to as the print environment. Default settings refer to the settings the printer uses unless printer commands are used to select other settings. Default settings are settings that are programmed into the printer at the factory.

Each time a job is printed, some of the printer's feature settings may be changed from their default values to produce a desired output for that job. After the job has printed, the job specific feature settings are no longer needed, since the next job will likely have different output requirements. The next job should clear all previous job settings by performing a reset. This allows a job to start with the default settings as a base and vary only those settings that are needed. Returning to the default environment at the beginning of each print job eliminates the need for setting every feature each time a job is run.



*Starting your print job with the Reset command (Esc E) is the recommended procedure, since the escape sequence resets all programmable features to their default values.*

## 8.0 Merged Text and Graphics

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The process for merging text and graphics with the HP DeskJet 600/800/900 & HP 2000 Series printers in both portrait and landscape orientation is the same as the landscape orientation method for the HP DeskJet 520, 540, 550C, and 560C Series printers, described in the **HP DeskJet 500 Series Technical Reference Guide**. The HP DeskJet 600/800/900 & HP 2000 Series printers are capable of buffering an entire page of text in either portrait or landscape orientation. This capability dramatically simplifies the procedure for merging text and graphics.

As with the landscape orientation method for the HP DeskJet 520, 540, 550C, and 560C Series printers, when merging text and graphics for the HP DeskJet 600/800/900 & HP 2000 Series printers, the text for the entire page is first sent to the printer (without a Form Feed command), where it is stored in the printer's formatting buffer. Following the transmission of the text, the CAP is moved to the graphics starting position with cursor positioning commands. The graphics data for the page is then sent to the printer, and the page is printed as the graphics data is processed by the printer firmware.

It is important to note that once graphics data has been received for any particular raster row on the page, no text can be printed at that or any earlier position. You should not attempt to alter this procedure, for instance by sending a partial page of text, a partial page of graphics, then resuming with text transmission. Even if you do not violate the rule of sending text for a line (or preceding a line) where graphics data has been received, attempting to intermix the transmission of text and graphics data for a given page will render unpredictable results. Send *all* text for an entire page, then send *all* graphics data.

Follow the last of the graphics data with a Form Feed command, which will cause any remaining text data for the page to be printed, then proceed to the next page.



*If you are modifying an existing DeskJet 500 Series printer driver, which has correctly implemented the merging of text and graphics in the past, to include other features for the HP DeskJet 600/800/900 & HP 2000 Series printers, you need not re-write your old driver. Add support for the new features to existing code, being careful to consider the impact of old, obsolete commands. However, if you are just beginning development, or you intend to add merged text and graphics capabilities for the HP DeskJet 600/800/900 & HP 2000 Series printers, you should begin with the algorithm provided above.*

Be aware that highly complex pages, those with numerous font changes or cursor repositioning accompanying dense and complex graphics, may cause overflow condition with the printer buffer. If you encounter this problem, you may be able to remove some of the font or position changes in order to reduce the complexity of the page description.

## 9.0 Programming Hints

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The following are overall guidelines to keep in mind when programming with HP PCL printer language commands.

### 9.0.1 Follow Specifications

Follow the specifications for HP PCL printer language commands as described in this guide. Do not rely upon undocumented workarounds. For example, the HP DeskJet 500 Series printers do not allow a negative vertical cursor movement of more than 1/3 inch. While it is possible to create a workaround, the solution may produce undesirable results, as the printer paper-movement hardware is not designed to provide negative paper motion. Additionally, the homemade solution that works today may not work with future printer models.

### 9.0.2 Leverage from Previous Programs

If you have previously used HP PCL commands to create printer programs, you may be able use most of those same commands for the HP DeskJet 600/800/900 & HP 2000 Series printers. This is especially true if you have programmed for other HP DeskJet printers. Reusing previously developed code can save you a significant amount of time since you do not have to start a development effort from scratch.

When leveraging from previous programs, keep in mind that the HP DeskJet 600/800/900 & HP 2000 Series printers have a number of important differences from the HP LaserJet family printer.

- ✓ HP DeskJet 600/800/900 & HP 2000 Series printers are line oriented, whereas HP LaserJet printers are page oriented. The HP LaserJet printers format the entire page in internal memory and then the entire page is printed, whereas the HP DeskJet 600/800/900 & HP 2000 Series printers format and print consecutive horizontal lines of text or rows of graphics of the page content, one after another, until the entire page has been printed.
- ✓ HP LaserJet printers have full-page printing capability and can position the cursor anywhere on the page. HP DeskJet 600/800/900 & HP 2000 Series printers format from the top of the page to the bottom.
- ✓ Generally, HP DeskJet 600/800/900 & HP 2000 Series printer commands sent to the HP LaserJet printer will provide the expected printing results, but may not work as efficiently. Not all HP DeskJet 600/800/900 & HP 2000 Series commands will work with HP LaserJet printers.

### 9.0.3 Priority of Feature Set Commands

Printer features for the HP DeskJet 600/800/900 & HP 2000 Series printers are controlled by escape sequences and control codes. Software application commands override default settings. However, when the printer is reset, either by turning the printer off and then on again or by sending the Reset escape sequence (Esc E), the printer returns to the default settings.

#### 9.0.4 Priority of Commands

There are no finite rules when it comes to structuring your overall program. In general, start by setting the print environment with the printer control commands, such as Reset, Selecting the Media Source, and so on.

It is almost always advisable to start and end your program with the reset command (Esc E). This clears the printer environment and places your program back to the default settings. An exception to this general rule is when the printer settings are intended to carry across a multi-component print job.

Where specified in this manual, pay close attention to the order of commands. For example, raster graphics commands should be sent to the printer in the following order:

- ✓ End Raster Graphics
- ✓ Raster Graphics Resolution
- ✓ Raster Graphics Width
- ✓ Raster Graphics Compression Method
- ✓ Start Raster Graphics
- ✓ Transfer Raster Graphics Row(s) with or without Relative Vertical Pixel Movement
- ✓ End Raster Graphics

#### 9.0.5 Time Savers

The following list provides some helpful hints to make your program more efficient:

- ✓ You do not need to specify leading and trailing zeroes. The HP DeskJet 600/800/900 & HP 2000 Series printers will compensate if you do not include zeros that occur at the end of an escape sequence. For example, if you want to specify 10 pitch during a font selection sequence, simply specify 10, rather than 0010.00.
- ✓ Group printer control commands at the beginning of a print job. If a number of consecutive pages within a job have the same format (such as margins, HMI, VMI, etc.), the associated page formatting commands only need to be set once for that group of pages.
- ✓ Combine escape sequences where possible. Shortening commands improves throughput. For example, instead of sending the Page Length command (Esc & *l* # P) and the Top Margin command (Esc & *l* # E) separately, send them as one parameterized escape sequence (Esc & *l* # p # E). Follow the guidelines for parameterized escape sequences, which are described earlier in this chapter.
- ✓ Minimize escape sequences where possible. For example, if you wish to move the cursor two inches down the page, use one cursor movement command, rather than move the cursor by decipoints or dots a number of times.
- ✓ You do not need to send a request to load paper. However, you do need to specify envelope size and send a Media Source command to load envelopes.
- ✓ Avoid using tabs to move the cursor across the page. Using tabs may make you dependent upon the current font pitch. Instead, use cursor positioning commands.

- ✓ Avoid using a Start Raster Graphics and End Raster Graphics command on every line. Use these commands at the beginning and end of the graphics image.
- ✓ When setting the raster graphics width, calculate the widest point of the raster image. Use this value to set the width once for the entire raster graphics image.
- ✓ Avoid setting top margin or text length to values outside of the printable area. This may cause data loss.

When using both the top margin and text length commands, the top margin command should be sent before the text length command



## 10.0 HP PCL Commands

### 10.1 Control Codes and Special Character Codes

The following commands initiate printer control functions:

#### 10.1.1 Escape

Provides supplementary control of printer functions. The escape character itself is a prefix for the string of one or more characters that follow. Once an escape character is received by the printer, normal text processing is suspended, and the contents of the print data stream are interpreted as a printer command, until the command has been activated by a command termination character, or the escape sequence has been determined to be invalid.

### 10.2 Testing Commands

Transparent Data Mode, and Display Functions modes (both of them) are used for testing purposes, to allow you to print the actual setup strings rather than having HP PCL actually interpret and execute them.

You can use either Print Modes -or- the Display Functions Mode On and Off commands - whichever is more intuitive in your programming environment.

### 10.3 Print Modes

#### 10.3.1 Transparent Data Mode

TABLE 2. Transparent Data Mode - **Esc & p # X**

# Value	DJ600	DJ610C	DJ660C	DJ670C	DJ680C	DJ690C	DJ695C	DJ810C	DJ830C	DJ850C	DJ870C	DJ880C	DJ890C	DJ895C	DJ970C	HP2000C	EFFECT
1..n	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Prints all data rather than executing it.
Default	n/a																
Range	0 to 32767 - command is ignored for out of range values																

Prints the graphic symbols associated with hidden control code characters.

All subsequent character codes, for the specified number of bytes, are printed with the current font attributes. The parser ignores all control codes, including the *Esc* character. Instead, the code's graphic symbol in the current symbol set is printed. For example, in the PC-8 symbol set, *Esc* is printed as a left arrow.

10.3.2 Display Functions Mode ON

TABLE 3. Display Functions Mode ON - **Esc Y**

# Value	DJ600	DJ610C	DJ660C	DJ670C	DJ680C	DJ690C	DJ695C	DJ810C	DJ830C	DJ850C	DJ870C	DJ880C	DJ890C	DJ895C	DJ970C	HP2000C	EFFECT
1..n	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Display Functions turned on
Default	off																

This command turns on Display Functions Mode; a character code is then printed in the current active font.

Turning Display Functions mode ON has the following effects:

- ✓ All control code and escape sequence functions except CR and Esc Z are disabled. CR marks the paper and executes CR-LF. Esc Z marks the paper and disables Display Functions Mode.
- ✓ All character codes, except CR and Esc Z, either mark the paper or produce a blank space.

The exact implementation may vary between products. This mode is intended as a programmer's debugging aid, and is not to be used for document preparation.

10.3.3 Display Functions Mode OFF

TABLE 4. Display Functions Mode OFF - **Esc Z**

# Value	DJ600	DJ610C	DJ660C	DJ670C	DJ680C	DJ690C	DJ695C	DJ810C	DJ830C	DJ850C	DJ870C	DJ880C	DJ890C	DJ895C	DJ970C	HP2000C	EFFECT
1..n	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Display Functions turned off
Default	off																

This command turns Display Functions Mode OFF. If Display Function Mode is ON when Esc Z is received, the characters for the next sequence are printed, and Display Function Mode is disabled. If Display Function Mode is OFF when Esc Z is received, no operation is performed.

## 10.4 Text Enhancements

### 10.4.1 Enable Underline

TABLE 5. Enable Underline - **Esc & d # D**

# Value	DJ600	DJ610C	DJ660C	DJ670C	DJ680C	DJ690C	DJ695C	DJ810C	DJ830C	DJ850C	DJ870C	DJ880C	DJ890C	DJ895C	DJ970C	HP2000C	EFFECT
0	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Default - single underline
1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Single underline, fixed location below the baseline
2	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓		✓	✓	✓	Double underline, fixed location below the baseline
3	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Single underline, font dependent (“floating”) location
4	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓		✓	✓	✓	Double underline, font dependent (“floating”) location
Default	off																
Range	0 to 4 - (default is selected for values >4 or <0)																

Enables the automatic underline enhancement.



*This command must use a capital “D” as a terminator.*

Except when changing the left margin causes positive horizontal CAP movement, when underlining is enabled, each printed character or any positive horizontal motion (e.g., spaces, CAP moves) is automatically underlined.

Once enabled, underline remains enabled until explicitly disabled. The default state is underline disabled.

A single underline is produced if double underline is invoked but unavailable, as in the case of the DeskJet 850/870/890 Series printers.

When fixed location underlining is enabled, the underline is drawn a fixed, device-dependent distance below the baseline. When floating location underlining is enabled, the greatest underline distance specified in all of the fonts printed on the current line determines where the underline is positioned. The underline distance and height is defined in the font descriptor.

In the HP DeskJet implementation of “floating” underline, each font defines the thickness of the underline character and its position relative to the baseline.



With HP DeskJet 500 Series printers, if underlining is enabled and changing the left margin causes a positive horizontal cursor movement, the move is underlined. With HP DeskJet 600/800/900 & HP 2000 Series printers, the move is not underlined.

HP DeskJet 500 Series printers use a value (#) of 255 to disable underlining. HP DeskJet 600/800/900 & HP 2000 Series printers select Default for values over 4 or below 0.

### 10.4.2 Disable Underline

TABLE 6. Disable Underline - **Esc & d @**

# Value	DJ600	DJ610C	DJ660C	DJ670C	DJ680C	DJ690C	DJ695C	DJ810C	DJ830C	DJ850C	DJ870C	DJ880C	DJ890C	DJ895C	DJ970C	HP2000C	EFFECT
n/a	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Underlining is OFF

Disables automatic text underlining.

### 10.4.3 Line Termination

TABLE 7. Line Termination - **Esc & k # G**

# Value	DJ600	DJ610C	DJ660C	DJ670C	DJ680C	DJ690C	DJ695C	DJ810C	DJ830C	DJ850C	DJ870C	DJ880C	DJ890C	DJ895C	DJ970C	HP2000C	EFFECT
0	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	CR = CR; LF = LF; FF = FF
1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	CR = CR, LF; LF = LF; FF = FF
2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	CR = CR; LF = CR, LF; FF = CR, FF
3	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	CR = CR, LF; LF = CR, LF; FF = CR, FF
Default	0																
Range	0 to 3 - Command is ignored for out of range values																

This command controls how the printer interprets CR (Carriage Return), LF (Line Feed), and FF (Form Feed) control characters. For example, a value field of 1 causes the printer to execute a carriage return (CR) and linefeed (LF) for every CR received. A linefeed or formfeed is sent as is.

10.4.4 End-of-Line Wrap

TABLE 8. End-of-Line Wrap - **Esc & s # C**

# Value	DJ600	DJ610C	DJ660C	DJ670C	DJ680C	DJ690C	DJ695C	DJ810C	DJ830C	DJ850C	DJ870C	DJ880C	DJ890C	DJ895C	DJ970C	HP2000C	EFFECT
0	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Enables End-of-Line Wrap
1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Disables End-of-Line Wrap
Default	1																
Range	0 to 1 - Command is ignored for out of range values																

Defines the action that occurs when a line of text reaches the right margin.

When end-of-line wrap is enabled, a character or space that would move the CAP to the right of the right margin causes a CR-LF to be executed (prior to the printing of the character or space).

When end-of-line wrap is disabled, a character or space that would move CAP to the right of the right margin is not printed, and CAP is set to the right margin.

## 10.5 Job Control

### 10.5.1 Reset

#### Esc E

Performs a reset on the printer (this is NOT a hardware reset). The reset performs the following:

Prints all data received before the reset.

- ✓ “Floats” CAP.
- ✓ Resets all programmable features to their user default values.
- ✓ Deletes temporary fonts.
- ✓ Does not delete downloaded permanent features.
- ✓ Resets the color palette to black and white.

*Esc E* has no effect on I/O and causes no disruption in host-to-peripheral communication. The printer remains on-line and no data is lost.

*Esc E* should be the first command received at the beginning of a job (e.g., before font download) to establish default conditions; and it should be the last command at the end of a job to leave the machine in the user default state and clear any partially composed pages.

Esc E “floats” CAP on the current page if no printable data has been received; otherwise it ejects the current page and “floats” CAP on the next page.

CAP is floating prior to printable characters, or commands affecting CAP. (Commands affecting CAP are ASCII data, LF, CAP moves, space, etc.). Commands affecting top and left margins, line spacing, page length, and orientation can change CAP while it is floating.

CAP is fixed following printable characters or commands affecting CAP. CAP is fixed to the left margin and top margin plus 3/4 VMI upon receipt of printable characters or raster graphics commands that explicitly move CAP fix it at the specified location. Commands changing the top and left margins or line spacing cannot affect a fixed CAP; page length or orientation commands eject the page, moving CAP to the top-of-form on the subsequent page. If no printable data is received, page length and orientation commands eject the page only if the device cannot move the paper back to the top of form. The intent is to not eject unnecessary blank pages.

Since control panel settings can override the factory defaults, Esc E uses the control panel settings as the default values.

The SPACE character is not considered a printable character with respect to CAP.

## 10.6 Printer Control

### 10.6.1 Gray Balance

TABLE 9. Gray Balance - **Esc \* b # B**

# Value	DJ600	DJ610C	DJ660C	DJ670C	DJ680C	DJ690C	DJ695C	DJ810C	DJ830C	DJ850C	DJ870C	DJ880C	DJ890C	DJ895C	DJ970C	HP2000C	EFFECT
0	✓																Set gray balance to device default (enabled or disabled)
1	✓																Enable gray balancing
2	✓																Disable gray balancing
Default	Device dependent																
Range	0 to 2 - Command is ignored for out of range values																

Determines whether black optimization is performed to make process black (composite black—composed of color inks) appear more black.

When composite black is constructed by setting all the bits in the CMY color planes, the resulting color may not be isotonic. Gray balancing removes some dots to neutralize the hue shift. *Esc E* resets Gray Balance to the device-dependent default.



*The default for the HP DeskJet 550C is 2 (disable gray balancing).*

*The defaults for the HP DeskJet 540 and HP DeskJet 600 printers are Print Mode and Media Type dependent - as shown in the following table. Other HP DeskJet printers do not require gray balancing, as the gray balance function is built into the Media Type/Print Quality commands. The Gray Balance command is considered obsolete for those printers.*

#### Gray Balance Default Modes

Print Mode	HP DeskJet 540			HP DeskJet 600		
	Plain Paper	Special Paper	Glossy/Trans.	Plain Paper	Special Paper	Glossy/Trans.
EconoFast	(disabled)	(disabled)	(disabled)	(disabled)	(disabled)	(disabled)
Normal	(enabled)	(enabled)	(enabled)	(enabled)	(enabled)	(disabled)
Best	(enabled)	(enabled)	(enabled)	(enabled)	(enabled)	(disabled)

10.6.2 Dry Timer

TABLE 10. Dry Timer - **Esc & b # T**

# Value	DJ600	DJ610C	DJ660C	DJ670C	DJ680C	DJ690C	DJ695C	DJ810C	DJ830C	DJ850C	DJ870C	DJ880C	DJ890C	DJ895C	DJ970C	HP2000C	EFFECT
0	✓																Dry Timer is off
1..1200	✓																Dry timer is on - time set for specified number of seconds
Default	0																
Range	0 to 1200 - Command is ignored for out of range values																

Sets a minimum dry time between pages to ensure that a previous page dries before the next page is dropped on top of it.

The time required for ink to dry depends on media, print modes, and environment (temperature and humidity). For example, transparencies may need over 10 minutes in an unheated, damp environment.

**Esc E** resets the dry timer to the default value of 0.



*The Dry Timer function has been incorporated into the Media Type/Print Quality command combination. The parameters specified for those commands determine the Dry Timer setting. Although some HP DeskJet 600/800/900 & HP 2000 Series printers will respond to this command, the command is considered obsolete. Dependence on the command should be removed from your application.*

The HP DeskJet 600/800/900 & HP 2000 Series printers use the following values as Dry Timer defaults when Media Type and Print Quality commands are used:

**Dry Timer Defaults**

Media Type	EconoFast Mode		Normal Mode		Best Mode	
	Black	Color	Black	Color	Black	Color
Plain Paper	0 sec.	0 sec.	15 sec.	15 sec.	25 sec.	15 sec.
Special Paper	0 sec.	0 sec.	15 sec.	15 sec.	25 sec.	15 sec.
Transparency	60 sec.	120 sec.	180 sec.	360 sec.	240 sec.	360 sec.





10.6.4 Media Type

TABLE 12. Media Type - **Esc & l # M**

# Value	DJ600	DJ610C	DJ660C	DJ670C	DJ680C	DJ690C	DJ695C	DJ810C	DJ830C	DJ850C	DJ870C	DJ880C	DJ890C	DJ895C	DJ970C	HP2000C	EFFECT
0	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Plain paper
1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Bond paper
2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Special paper (HP Premium Inkjet Paper)
3	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Glossy film/Photo media
4	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Transparency film
5																✓	Quick Dry Glossy
6																✓	Quick Dry Transparency
Default	0																
Range	0 to 4 - Command is ignored for out of range values																

Sets the print mode required for printing on various media types.

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



*For HP DeskJet 600/800/900 & HP 2000 Series printers, the specified media type will affect output resolution, depletion, shingling, gray balancing, and dry time.*

10.6.5 Unit of Measure

TABLE 13. Unit of Measure - **Esc & u # D**

# Value	DJ600	DJ610C	DJ660C	DJ670C	DJ680C	DJ690C	DJ695C	DJ810C	DJ830C	DJ850C	DJ870C	DJ880C	DJ890C	DJ895C	DJ970C	HP2000C	EFFECT
300										✓	✓		✓			✓	300 units per inch
600										✓	✓		✓			✓	600 units per inch
Default	Device dependent																
Range	300,600 - command is ignored for all other values																

The value field establishes the number of units per inch used in the following commands. These commands formerly used a device's dot-per-inch resolution as the unit of measure. Printers that do not support this command still use dots as their unit of measure for these commands.

- ✓ Move CAP Vertical (PCL Units) - Esc \* p # Y
- ✓ Move CAP Horizontal (PCL Units) - Esc \* p # X
- ✓ Vertical Rectangle Size (PCL Units) - Esc \* c # B
- ✓ Horizontal Rectangle Size (PCL Units) - Esc \* c # A

In addition, since the current unit of measure setting affects how CAP movement values are rounded, it also affects the result of the following commands:

- ✓ Move CAP Horizontal (Columns) - Esc & a # C
- ✓ Horizontal Tab - <HT>
- ✓ Space - <SP>
- ✓ Backspace - <BS>

This command affects only the start of characters and PCL Unit commands. This may cause character spacing to be different on a 600 dpi printer vs. a 300 dpi printer, or on a 300 dpi printer that supports this command vs. a 300 dpi printer that does not. To get the same character placement on both printer, the unit of measure should be set to 300 and HMI command (Esc & k # H) should be sent after font selection has occurred.

This command does not affect binary raster data (bitmap fonts, raster graphics, patterns).

A control panel reset or Esc E defaults the measuring unit. Since the unit of measure is part of the user environment, it is saved and restored whenever a macro is called or an overlay invoked, but is defaulted when the user environment is established for an overlay.

Bitmap and scalable fonts must retain their initial metric information. Conversion to the current selected unit must use the original units to avoid cumulative errors due to successive rounding.

Out-of-range values are mapped to the supported value with the minimum relative error.

## 10.7 Printer Diagnostics

### 10.7.1 Self-Test

#### Esc z

Initiates printer self-test, which instructs the printer to perform the following actions:

- ✓ Process all data preceding the self-test.
- ✓ Perform Esc E reset (ejecting the page if printable data has been sent). Permanent downloaded fonts are not deleted.
- ✓ Move CAP to the top of form, if not already there.
- ✓ Perform the self-test.
- ✓ After self-test, move to the top of form, if not already there.
- ✓ Resume execution of the user data without data loss (programmable features need not be saved).

This should be as complete a self-test as the product is capable of performing. If no error is detected, the printer will remain on-line. If an error is detected, the printer will go to the off-line state.

In general, this command should not be used in an application. It is intended as a diagnostic tool for developers and support staff. The HP DeskJet 600/800/900 & HP 2000 Series printers provide several diagnostic print outs that are user-accessible via the printer front panel.

## 10.8 Page Control

The following commands facilitate the definition of a print job page.

### 10.8.1 Page Length

TABLE 14. Page Length - **Esc & l # P**

# Value	DJ600	DJ610C	DJ660C	DJ670C	DJ680C	DJ690C	DJ695C	DJ810C	DJ830C	DJ850C	DJ870C	DJ880C	DJ890C	DJ895C	DJ970C	HP2000C	EFFECT
0	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Page length set to 66 lines
1 .. n	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Page length is set, in number of lines, at the current lpi
Default	0 (66 lines per page)																
Range	1 to maximum supported paper size - Command is ignored for out of range values																

Designates the number of lines on the logical page at the current VMI (Vertical Motion Index) setting.

This command performs the following actions:

- ✓ Prints any unprinted pages.
- ✓ Ejects the current page if printable data has been received (FF-CR).
- ✓ Sets text length, top margin, left margin, and right margin to user defaults.
- ✓ Moves CAP to the left edge of the logical page at the top of form.

The printer may select a different page size for the same line count, since lines are defined by the current VMI. This command is ignored if VMI is 0.

For comparison purposes, the following table lists the page length line values associated with some standard paper sizes. To calculate the number of lines per page, multiply lines per inch (lpi) times the length of the physical page. For example, US Letter size paper is 11 inches; therefore, 6 x 11 = 66.

Page Length Line Values

Paper Size	6 lpi	8 lpi
Letter	66	88
Legal	84	112
A4	70	93
Executive	63	84

HP DeskJet maximum page length is 14 inches for the HP DeskJet 600/800/900 & HP 2000 Series printers.



*This command must be sent at the beginning of a page prior to any printable data; otherwise, when the command is sent, the current page is closed and printed.*

**10.8.2 Page Size**

**TABLE 15.** Page Size - **Esc & l # A**

# Value	DJ600	DJ610C	DJ660C	DJ670C	DJ680C	DJ690C	DJ695C	DJ810C	DJ830C	DJ850C	DJ870C	DJ880C	DJ890C	DJ895C	DJ970C	HP2000C	EFFECT
n	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Page size set to that indicated by value index in the following tables
Default	Regionally dependent (US Letter for printers sold in North America)																
Range	limited to values specified in tables below - Command is ignored for out of range values																

Designates the size of the media to be used.

This command performs the following actions:

- ✓ Prints any unprinted pages.
- ✓ Ejects the current page if printable data has been received (FF-CR).
- ✓ Sets text length, top margin, left margin, and right margin to user defaults.
- ✓ Moves CAP to the left edge of the logical page at the top margin.
- ✓ Disables the automatic macro overlay.

Since the logical page is defined to extend from the top and bottom edges of the physical page, this command also sets logical page length.

**TABLE 16.** Selectable Sheet Media Sizes for HP DeskJet 600/800/900 & HP 2000 Series printers

Value	Page Description	Page Size
1	US Executive	7.25" x 10.5"
2	US Letter	8.5" x 11"
3	US Legal	8.5" x 14"
25	ISO and JIS A5	148.5 mm x 210 mm
26	ISO and JIS A4	210 mm x 297 mm
45	JIS B5	182 mm x 257 mm
101	Custom	5.00" x 5.83" through 8.5" x 14 (127 mm x 148 mm-216mm x 356mm)

**TABLE 17.** Selectable Card Sizes

Value	Card Description	Card Size
71	Japanese Hagaki Postcard	100 mm x 148 mm
72	Japanese Oufuku-Hagaki Postcards	148 mm x 200 mm
73	ISO and JIS A6 Card	105 mm x 148 mm
74	US Index Card	4" x 6"
75	US Index Card	5" x 8"
78	3x5 Index Card	3" x 5" (HP 2000C Only)

**TABLE 18.** Selectable Envelope Sizes

Value	Envelope Description	Envelope Size
-81	U.S. Commercial #10 (portrait)	4 1/8" x 9 1/2"
81	U.S. Commercial-10 (landscape)	4 1/8" x 9 1/2"
90	International DL	110 mm x 220 mm
92	International C6	114 mm x 162 mm
109	U.S. A2	4 3/8" x 5 3/4"
112	Japanese Envelope #2	111.1 mm x 146 mm (HP 2000C Only)



*Unsigned or positive values specify that the short paper axis is aligned with printer's paper axis; negative values specify that the long paper axis is aligned with the printer's paper axis.*

With HP DeskJet 600/800/900 & HP 2000 Series printers, all envelopes load in landscape (short edge first). Before the HP DeskJet 550C Series printer, envelopes loaded in portrait. Envelope printing orientation defaults to portrait, except for Commercial 10 (value = 81), which defaults to landscape. Value = -81 prints Commercial 10 envelopes in portrait orientation.

To minimize the unprintable region on custom size media for the HP DeskJet 600/800/900 & HP 2000 Series printers, the application should send the length of the custom page using the **Page Length (Esc & l # P)** command.

10.8.3 Media Source

TABLE 19. Media Source - **Esc & l # H**

# Value	DJ600	DJ610C	DJ660C	DJ670C	DJ680C	DJ690C	DJ695C	DJ810C	DJ830C	DJ850C	DJ870C	DJ880C	DJ890C	DJ895C	DJ970C	HP2000C	EFFECT
-1					✓	✓	✓	✓		✓		✓		✓	✓		Load z-fold media (banners)
0	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Print current page (source is unchanged)
1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Load from tray
3	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Envelope feed
Default	0																
Range	-1, 0, 1, 3 - Command defaults for out of range values																

Selects the media source.

This command prints the current page and moves CAP to top of form at the left margin on the next physical page. The command remains effective until another tray is selected.



10.8.4 Orientation

TABLE 20. Orientation - **Esc & l # O**

# Value	DJ600	DJ610C	DJ660C	DJ670C	DJ680C	DJ690C	DJ695C	DJ810C	DJ830C	DJ850C	DJ870C	DJ880C	DJ890C	DJ895C	DJ970C	HP2000C	EFFECT
0	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Portrait
1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Landscape
2																	Reverse Portrait
3										✓	✓		✓				Reverse Landscape
Default	0																
Range	0 to 3 - Command is ignored for out of range values																

Defines the position of the logical page and the default direction of text printing with respect to the physical page.

If the printer has received printable data, an orientation change ejects the current page and opens another page in the new orientation. Since this command ejects the page, it cannot be used to change text orientation within a page. The command is ignored if the new orientation and the current orientation are the same.

This command does not affect graphics.

This command has the following effects:

- ✓ Prints all data received before the command.
- ✓ Executes a formfeed and carriage return.
- ✓ Sets the following to their user defaults:
  - logical page
  - print direction
  - page length
  - text length
  - top margin, left margin, right margin
  - HMI and VMI

This command should be sent at the beginning of a page because it ejects a page containing printable data. Since this command defaults the above features, it should be followed by commands that set any desired non-default values.

This command affects only text orientation - not raster graphics orientation. For example, if orientation is changed from portrait to landscape, graphics will continue to print in portrait. This can result in clipping if CAP is not positioned to take this into account.

10.8.5 Horizontal Motion Index

TABLE 21. Horizontal Motion Index (HMI) - **Esc & k # H**

# Value	DJ600	DJ610C	DJ660C	DJ670C	DJ680C	DJ690C	DJ695C	DJ810C	DJ830C	DJ850C	DJ870C	DJ880C	DJ890C	DJ895C	DJ970C	HP2000C	EFFECT
n	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Number of 1/120 inch increments
Default	Determined by the pitch or height (x 112%) value in the default font descriptor																
Range	0 to 126.99 - Command is ignored for out of range values																

Designates the width of columns used for horizontal movement calculations. In the vertical text path direction, designates the height of rows used for inter-character movement calculations.

HMI defaults to the invoked font's space character when any of the font's characteristics (orientation, character set, pitch, etc.) are changed, when switching between primary and secondary fonts with <SI> and <SO>.

For fixed pitch fonts, HMI affects all printable characters, including the space and backspace characters. For proportionally spaced fonts, HMI may affect only the space character: if the space character glyph exists, CAP moves the width of the space character; otherwise CAP moves according to the HMI.

For multiple fixed-pitch fonts, the HMI directly affects the nominal (full width) space of the font. Other spacings are scaled linearly according to the current HMI value, i.e., the character widths are multiplied by the ratio of the HMI to the nominal width.

In the vertical text path direction mode, the HMI defaults to the height (x 112%) of the font. In fixed-pitched or multiple-fixed-pitched fonts, the HMI takes on the height (x 112%) of the fixed-pitch font.

For proportionally-spaced fonts, the HMI may affect only the space character. If the space character glyph exists, CAP moves the height (x 112%) of the space character. Otherwise the CAP moves according to the HMI.

10.8.6 Vertical Motion Index

TABLE 22. Vertical Motion Index (VMI) - **Esc & ℓ # C**

# Value	DJ600	DJ610C	DJ660C	DJ670C	DJ680C	DJ690C	DJ695C	DJ810C	DJ830C	DJ850C	DJ870C	DJ880C	DJ890C	DJ895C	DJ970C	HP2000C	EFFECT
n	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Number of 1/48 inch increments between rows
Default	8																
Range	0 to Current logical page length up to 32767 - Command is ignored for out of range values																

Sets the vertical spacing between lines of print (the vertical distance CAP will move for a linefeed in horizontal text path mode and the horizontal distance the CAP will move for a linefeed in the vertical text path mode).

This command performs the same functions as **Line Spacing (Esc & ℓ # D)**, except the measurement interval is in 1/48-inch increments instead of lines per inch (lpi). Both commands set linefeed spacing. To convert lpi to VMI:

$$\text{VMI} = 48.0 / \text{lpi}$$

If the **Page Length (Esc & ℓ # P)** command follows an VMI change, physical page size is recalculated. Depending on the VMI modification, the printer may request a different page size.

10.8.7 Line Spacing

TABLE 23. Line Spacing - **Esc & ℓ # D**

# Value	DJ600	DJ610C	DJ660C	DJ670C	DJ680C	DJ690C	DJ695C	DJ810C	DJ830C	DJ850C	DJ870C	DJ880C	DJ890C	DJ895C	DJ970C	HP2000C	EFFECT
n	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Sets the number of lines printed per inch
Default	6																
Range	0 to Current logical page length up to 32767 - Command is ignored for out of range values																

This command performs the same functions as VMI (Esc & ℓ # C), except it identifies the VMI in lines per inch (lpi). Both commands set linefeed spacing. To convert VMI to lpi:

$$\text{lpi} = 48.0 / \text{VMI}$$



*In HP DeskJet printers, a value of 0 sets line spacing to 12 lpi.*

10.8.8 Clear Horizontal Margins

TABLE 24. Clear Horizontal Margins - **Esc 9**

# Value	DJ600	DJ610C	DJ660C	DJ670C	DJ680C	DJ690C	DJ695C	DJ810C	DJ830C	DJ850C	DJ870C	DJ880C	DJ890C	DJ895C	DJ970C	HP2000C	EFFECT
n/a	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Default left and right margins

Resets the left and right margins to their default positions. CAP is unchanged.

Left Margin = left bound of the logical page (column 0)

Right Margin = right bound of the logical page.



*This command is considered to be obsolete, and is listed for backward compatibility only. Do not use this command in new code, as subsequent HP DeskJet printers may not support the command.*

### 10.8.9 Left Margin

TABLE 25. Left Margin - **Esc & a # L**

# Value	DJ600	DJ610C	DJ660C	DJ670C	DJ680C	DJ690C	DJ695C	DJ810C	DJ830C	DJ850C	DJ870C	DJ880C	DJ890C	DJ895C	DJ970C	HP2000C	EFFECT
n	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Sets the left margin to the left edge of the specified column
Default	0																
Range	0 to right bound of logical page - Command is ignored for out of range values																

If CAP is to the left of the new left margin, it moves to the new left margin; otherwise, this command does not affect CAP. Attempts to set the left margin to the right of the right margin should be ignored; however, left and right margins can be set at the same location.



*Column 0 is the first column on the left edge of the logical page, not the physical page.*

### 10.8.10 Right Margin

TABLE 26. Right Margin - **Esc & a # M**

# Value	DJ600	DJ610C	DJ660C	DJ670C	DJ680C	DJ690C	DJ695C	DJ810C	DJ830C	DJ850C	DJ870C	DJ880C	DJ890C	DJ895C	DJ970C	HP2000C	EFFECT
n	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Sets the right margin to the right edge of the specified column
Default	Logical page right bound																
Range	Current left margin to logical page left bound - Command is ignored for out of range values																

This command is ignored for columns to the left of the left margin. Specifying a column beyond the right logical page limit sets the right margin to the right logical page limit. If CAP is to the right of the new right margin, CAP is moved to the new right margin; otherwise this command does not affect CAP.

Characters whose cells overlap with the right margin are not printed unless end-of-line wrap is enabled: then the character prints at the left margin on the next line. Attempts to set the right

margin to the left of the left margin should be ignored; however, left and right margins can be set to the same location.

10.8.11 Top Margin

TABLE 27. Top Margin - **Esc & ℓ # E**

# Value	DJ600	DJ610C	DJ660C	DJ670C	DJ680C	DJ690C	DJ695C	DJ810C	DJ830C	DJ850C	DJ870C	DJ880C	DJ890C	DJ895C	DJ970C	HP2000C	EFFECT
n	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Top margin is set to specified number of lines at the current lines-per-inch setting
Default	0.5 inch																
Range	0 to logical page length - Command is ignored for out of range values																

Specifies the distance between the top of the logical page and the top of the text area.

The top margin is specified in lines whose spacing is determined by the current line spacing. This command is ignored if the current line spacing is 0, or if a value beyond the current logical page length is received.

CAP is not moved if it is below the new top margin. If CAP is above the new top margin, CAP is placed at the baseline of the first row of characters. This position, called top of form, is calculated as follows: top of form = top margin in inches + (.75 x VMI in inches)

The first line of the logical page is always line 0. The vertical position of the first line of print on the logical page is at top of form as defined above.

The top margin represents a physical position: once the top margin is set, it is unaffected by subsequent changes in line spacing.



Since this command defaults text length, it should precede the **Text Length (Esc & ℓ # F)** command.

HP DeskJet printers default to 1/2" with perforation skip mode on, and 0" with perforation skip mode off.

10.8.12 Text Length

TABLE 28. Text Length - **Esc & ℓ # F**

# Value	DJ600	DJ610C	DJ660C	DJ670C	DJ680C	DJ690C	DJ695C	DJ810C	DJ830C	DJ850C	DJ870C	DJ880C	DJ890C	DJ895C	DJ970C	HP2000C	EFFECT
n	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Sets length of the text area, in lines, from the top margin
Default	Logical page length - top margin - 1/2 inch <sup>a</sup>																
Range	Current left margin to logical page left bound - Command is ignored for out of range values																

a. If the calculation is negative, text length defaults to (logical page length - top margin)

This command is ignored if current VMI is 0 or a text length greater than [logical page length - top margin] is requested. A value field of 0 defaults text length.

Text length determines the bottom margin when perforation skip is enabled. Text length is ignored when perforation skip is disabled.

10.8.13 Perforation Skip Mode

TABLE 29. Perforation Skip Mode - **Esc & ℓ # L**

# Value	DJ600	DJ610C	DJ660C	DJ670C	DJ680C	DJ690C	DJ695C	DJ810C	DJ830C	DJ850C	DJ870C	DJ880C	DJ890C	DJ895C	DJ970C	HP2000C	EFFECT
0	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Disables perforation skip mode
1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Enables perforation skip mode
Default	1																
Range	0, 1 - Command is ignored for other values																

Controls perforation skip mode.

The perforation region extends from the bottom of the text area to the top margin of the next page. **Text Length (Esc & ℓ # F)** determines the size of the perforation skip region (and, indirectly, the bottom margin).

If perforation skip is enabled, text length sets the bottom margin. Printing ends at the specified text length, and then starts again at the top margin of the next page.

If perforation skip is disabled, text is printed to the end of the page and onto the next page. Text length and top margin are ignored. Text in the unprintable region may be lost.



*Disabling perforation skip may cause text outside of the printable area to be lost. To prevent this, perforation skip should be enabled. Changing perforation skip mode defaults top margin and text length.*



## 10.9 Horizontal Positioning Commands

The following commands provide for cursor movement on the horizontal axis.

### 10.9.1 Backspace

**<BS>**

Moves CAP one character position backwards on the current line.

For horizontal text path direction, no action occurs if CAP is already at the left margin. If the CAP is to the left of the left margin (via one of the Move CAP commands), <BS> functions as if the left margin were column 0, the logical page left boundary.

For vertical text path direction, no action occurs if CAP is already at the top margin. If CAP is above the top margin (via one of the Move CAP commands), BS functions as if the top margin were row 0, the logical page top boundary.

In proportional spacing, a single <BS> centers the overstriking character with the character being over-struck. After printing the overstrike character, CAP is at the same position as before the <BS>. Multiple backspaces each move back the distance of the last printable character or space.



*HP DeskJet 600/800/900 & HP 2000 Series printers backspace using only the last proportional character width. The resulting cursor relocation is therefore not a fixed constant.*

### 10.9.2 Carriage Return

**<CR>**

Moves CAP to the left margin on the current row.

### 10.9.3 Space

**<SP>**

Moves CAP forward one character position (defined by HMI) on the current line.

CAP does not move if it is already at the right margin and end-of-line wrap is not enabled. If end-of-line wrap is enabled, CAP moves to the left margin of the next row and then prints the space.

### 10.9.4 Linefeed

**<LF>**

Moves CAP to the same horizontal position, one row down. If perforation skip mode is enabled, a linefeed that would go beyond the text length boundary moves CAP to the same horizontal position at the top of form on the next page. If perforation skip mode is disabled, text is printed to the end of the page and onto the next page. Text in the unprintable region may be lost.

#### **10.9.5 Formfeed**

**<FF>**

Formfeed advances CAP to the same horizontal position at the top of the form on the next page. Top of Form is at the vertical position computed by top of form = top margin + (3/4 x line spacing)



*Multiple formfeeds in sequence are not interpreted as a single formfeed.*

#### **10.9.6 Horizontal Tab**

**<HT>**

Horizontal Tab moves CAP to the next tab stop on the current line.

The first tab stop is at the left margin; additional tab stops are fixed at every 8 columns to the right margin. Tabs represent a logical position and, thus, refer to different physical positions for different settings of HMI.

The following are some boundary cases:

- ✓ If the requested tab stop is outside the right margin and CAP is at or to the left of the right margin, HT moves CAP to the right margin.
- ✓ If the requested tab stop is outside the printable area and CAP is to the right of the right margin, HT moves CAP to the edge of the printable area.
- ✓ If CAP is to the left of the left margin, HT moves CAP to the left margin.

Tabs do not cause lines to be wrapped if end-of-line-wrap mode is enabled.

HMI determines current column width. If HMI is changed, the physical location of each tab stop moves. HT has no effect if the HMI is 0.

10.9.7 Move CAP Horizontal (Decipoints)

TABLE 30. Move CAP Horizontal (Decipoints) - **Esc & a # H**

# Value	DJ600	DJ610C	DJ660C	DJ670C	DJ680C	DJ690C	DJ695C	DJ810C	DJ830C	DJ850C	DJ870C	DJ880C	DJ890C	DJ895C	DJ970C	HP2000C	EFFECT
n	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Moves CAP horizontally by the specified number of decipoints (1/720 inch)
Default	n/a																
Range	-32767 to +32767 (up to logical page right and left limits, rounded to the nearest HP PCL unit or decimal point) - Command is ignored for out of range values																

A signed value field indicates relative movement: plus (+) or minus (-) signs move CAP right or left relative to CAP, respectively. The absence of a sign indicates absolute movement: CAP moves an absolute distance from the logical page left edge.

This command ignores margins and can move CAP anywhere horizontally within the logical page. Attempts to go outside the logical page will move CAP to the appropriate logical page limit.

Devices not having an integral number of decipoints-to-dots should implement fractional decipoints for dot addressing.



*HP DeskJet 600/800/900 & HP 2000 Series printers use 2 fractional digits and truncate to 1/3600-inch units.*

10.9.8 Move CAP Horizontal (Columns)

TABLE 31. Move CAP Horizontal (Columns) - **Esc & a # C**

# Value	DJ600	DJ610C	DJ660C	DJ670C	DJ680C	DJ690C	DJ695C	DJ810C	DJ830C	DJ850C	DJ870C	DJ880C	DJ890C	DJ895C	DJ970C	HP2000C	EFFECT
n	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Moves CAP horizontally by the specified number of columns
Default	n/a																
Range	-32767 to +32767 (up to logical page right and left limits, rounded to the nearest HP PCL unit) - Command is ignored for out of range values																

A signed value field indicates relative movement: plus (+) or minus (-) signs move CAP right or left relative to CAP, respectively. The absence of a sign indicates absolute movement: CAP moves an absolute distance from the logical page left edge (column 0).

This command ignores margins and can move CAP horizontally anywhere within the logical page. Attempts to go outside the logical page will move CAP to the appropriate logical page limit.



*HP DeskJet 600/800/900 & HP 2000 Series printers use 2 fractional digits and truncate to 1/3600-inch units.*

10.9.9 Move CAP Horizontal (HP PCL Units)

TABLE 32. Move CAP Horizontal (HP PCL Units) - **Esc \* p # X**

# Value	DJ600	DJ610C	DJ660C	DJ670C	DJ680C	DJ690C	DJ695C	DJ810C	DJ830C	DJ850C	DJ870C	DJ880C	DJ890C	DJ895C	DJ970C	HP2000C	EFFECT
n	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Moves CAP horizontally by the specified number of HP PCL units
Default	n/a																
Range	-32767 to +32767 (up to logical page right and left limits, rounded to the nearest HP PCL unit) - Command is ignored for out of range values																

A signed value field indicates relative movement: plus (+) or minus (-) signs move CAP right or left relative to CAP, respectively. The absence of a sign indicates absolute movement: CAP moves an absolute distance from the logical page left edge.

This command ignores margins and can move CAP horizontally anywhere within the logical page. Attempts to go outside the logical page will move CAP to the appropriate logical page limit.

HP DeskJet printers prior to the HP DeskJet 600 Series printers use 1/300".

## 10.10 Vertical Positioning Commands

The following commands provide cursor positioning on the vertical axis.

### 10.10.1 Move CAP Vertical (Rows)

TABLE 33. Move CAP Vertical (Rows) - **Esc & a # R**

# Value	DJ600	DJ610C	DJ660C	DJ670C	DJ680C	DJ690C	DJ695C	DJ810C	DJ830C	DJ850C	DJ870C	DJ880C	DJ890C	DJ895C	DJ970C	HP2000C	EFFECT
n	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Moves CAP to the same column position on a new line based on the active line spacing
Default	n/a																
Range	-32767 to +32767 - Command is ignored for out of range values																

A signed value field indicates relative movement: plus (+) or minus (-) signs move CAP downward and upward relative to CAP, respectively. The absence of a sign indicates absolute movement: CAP moves from the top of the logical page, an absolute distance computed by:

$$\text{Distance from top of logical page} = \text{top margin} + (3/4 \times \text{VMI}/48.0) + (\text{value VMI})/48.0$$

Except for the following, the effect of this command is limited to the logical page:

- ✓ Positive relative positioning allows movement to the next logical page.
- ✓ Negative relative positioning allows movement above the top of form, up to the limit of the logical page or the top of the physical page.

After power on or reset, CAP moves to the top of form, if not already there.

10.10.2 Move CAP Vertical (Decipoints)

TABLE 34. Move CAP Vertical (Decipoints) - **Esc & a # V**

# Value	DJ600	DJ610C	DJ660C	DJ670C	DJ680C	DJ690C	DJ695C	DJ810C	DJ830C	DJ850C	DJ870C	DJ880C	DJ890C	DJ895C	DJ970C	HP2000C	EFFECT
n	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Moves CAP to a new position along the vertical axis
Default	n/a																
Range	-32767 to +32767 - Command is ignored for out of range values																

If no such position exists, moves CAP to the logical page limit.

A signed value field indicates relative movement: plus (+) or minus (-) signs move CAP downward and upward relative to CAP, respectively. The absence of a sign indicates absolute movement: CAP moves an absolute distance from the top margin.

Except for the following, the effect of this command is limited to the logical page:

- ✓ Positive relative positioning allows movement to the next logical page.
- ✓ Negative relative positioning allows movement above the top of form, up to the limit of the logical page or the top of the physical page.

After power on or reset, CAP moves to the top of form, if not already there.

Devices not having an integral number of decipoints-to-dots should implement fractional decipoints for dot addressing.

10.10.3 Move CAP Vertical (HP PCL Units)

TABLE 35. Move CAP Vertical (HP PCL Units) - **Esc \* p # Y**

# Value	DJ600	DJ610C	DJ660C	DJ670C	DJ680C	DJ690C	DJ695C	DJ810C	DJ830C	DJ850C	DJ870C	DJ880C	DJ890C	DJ895C	DJ970C	HP2000C	EFFECT
n	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Moves CAP specified number of HP PCL units along the Y axis
Default	n/a																
Range	-32767 to +32767 - Command is ignored for out of range values																

If no such position exists, the printer moves to the logical page limit.

A signed value field indicates relative movement: plus (+) or minus (-) signs move CAP downward and upward relative to CAP, respectively. The absence of a sign indicates absolute movement: CAP moves an absolute distance from the top margin.

The current size, in units-per-inch, of a HP PCL Unit is specified by the **Units of Measure (Esc & u # D)** command. Otherwise, the unit-per-inch for HP PCL movement defaults to 1/300 inch.

Except for the following, the effect of this command is limited to the logical page:

- ✓ Positive relative positioning allows movement to the next logical page.
- ✓ Negative relative positioning allows movement above the top of form, up to the limit of the logical page or the top of the physical page.

After power on or reset, CAP moves to the top of form, if not already there.

HP DeskJet 600/800/900 & HP 2000 Series printers use 1/300".



## 10.11 Font Selection

### 10.11.1 Font Selection by Attribute

The user requests a font by designating its attributes with the following commands. For the HP DeskJet 600 Series printers, successful selection requires the selected font is either one of the built-in bitmap fonts or a soft font that has been downloaded to the printer. For the HP DeskJet 850, 870, 890 Series printers, successful selection only requires that the typeface specified is one of those included in the printer's firmware; any specified point size will be generated by the printer's font scaling technology.

### 10.11.2 Font Symbol Set

TABLE 36.

Font Symbol Set (Primary) - **Esc ( ID**  
 Font Symbol Set (Secondary) - **Esc ) ID**

# Value	DJ600	DJ610C	DJ660C	DJ670C	DJ680C	DJ690C	DJ695C	DJ810C	DJ830C	DJ850C	DJ870C	DJ880C	DJ890C	DJ895C	DJ970C	HP2000C	EFFECT
ID	✓	✓	✓	✓	✓	✓	✓			✓	✓		✓				Symbol set identification value from the table
Default	10U - (PC-8, Code Page 437)																
Range	n/a																

Identifies the set of symbols in a font, consists of a decimal value and a letter value.

The ID (identification number) consists of a number portion and a letter portion. For example, to specify ASCII (0U) as the symbol set for the primary font, send Esc(0U. Some of the possible values for the identification number (ID) are listed on the symbol set tables on the following pages.

The legal range of the number portion of ID is 0 to 2047. The legal range of the letter portion of ID is the upper-case ASCII characters "A" through "Z", except for "X". Symbol sets with IDs of "X" can only be selected with the Font ID. "Q" is used with HP "Specials" symbol sets and not recommended for general use. "Y" is used for barcode symbol sets.

PC-8, Code Page 437 (10U) is the default primary and secondary symbol set; but a user-default may be selected. PC-8 is selected if the specified symbol set does not exist or cannot be satisfied by any font.

The following table lists printer-supported symbol sets and symbol set IDs for the HP DeskJet 600/800/900 & HP 2000 Series printers.

<b>ID</b>	<b>Symbol Set Name</b>	<b>ID</b>	<b>Symbol Set Name</b>
0A	Math-7 (same as 0M)	1G	ISO 21: German
0B	Line Draw-7 (same as 0L)	8G	Greek-8
0C	HP Large Characters (264x)	9G	Windows 3.1 Latin/Greek
0D	ISO 60: Danish/Norwegian	10G	PC-851 Latin/Greek
1D	ISO 61: Norwegian Version 2	12G	PC-8 Latin/Greek
2D	Devanagari	0H	Hebrew-7
0E	Roman Extension	7H	ISO 8859/8 Latin/Hebrew
1E	ISO4: United Kingdom	8H	Hebrew-8
9E	Windows 3.1 Latin 2	15H	PC-862 Latin/Hebrew
0F	ISO 25: French (obsolete)	0I	ISO 15: Italian
1F	ISO 69: French	6J	Microsoft Publishing
0G	HP German	7J	DeskTop
8J	Document	36L	Pi Set #6
9J	PC-1004	0M	Math-7
10J	PS Text	1M	Tech-7
11J	PS ISO Latin 1	5M	PS Math
12J	MC Text	6M	Ventura Math
13J	Ventura International	8M	Math-8
14J	Ventura US	10M	Universal Greek & Math Pi
16J	Swash Characters	11M	TEX Math Extension
17J	Small Caps and Old Style Figures	12M	TEXMath Symbol
18J	Old Style Figures	13M	TEX Math Italic
19J	Fractions	19M	Symbol
21J	Lining Figures	0N	ISO 8859/1 Latin 1
22J	Small Caps and Lining Figures	2N	ISO 8859/2 Latin 2
23J	Alternate Caps	3N	ISO 8859/3 Latin 3
0K	ISO 14: JIS ASCII	4N	ISO 8859/4 Latin4
1K	ISO 13: Katakana	5N	ISO 8859/5 Latin 5
2K	ISO 57: Chinese	6N	ISO8859/10 Latin 6
8K	Kana-8	10N	ISO 8859/15 Latin/Cyrillic
9K	Korean-8	0O	OCR-A
50K	JIS Kanji-1	1O	OCR-B
51K	JIS Kanji-2	2O	OCR-M
0L	Line Draw-7	10O	MICR
1L	HP Block Characters	OP	Typewriter Paired APL
2L	Tax Line Draw	1P	Bit Paired APL
8L	LineDraw-8	10P	Expert
9L	Ventura ITC Zapf Dingbats	11P	Alternate
10L	PS ITC Zapf Dingbats	12P	Fraktur

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## HP PCL Commands

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<b>ID</b>	<b>Symbol Set Name</b>	<b>ID</b>	<b>Symbol Set Name</b>
11L	ITC Zapf Dingbats Series 100	0R	Cyrillic ASCII (8859/5-1986)
12L	ITC Zapf Dingbats Series 200	1R	Cyrillic
13L	ITC Zapf Dingbats Series 300	3R	PC Cyrillic (CP 866)
20L	Carta	9R	Windows 3.1 Latin/Cyrillic
21L	Ornaments	0S	ISO 11: Swedish
22L	Universal News & Commercial Pi	1S	HP Spanish
23L	Chess	2S	ISO 17: Spanish
24L	Astrology 1	3S	ISO 10 Swedish
31L	Pi Set #1	4S	ISO 16: Portuguese
32L	Pi Set #2	5S	ISO 84: Portuguese
33L	Pi Set #3	6S	ISO 85: Spanish
34L	Pi Set #4	7S	HP European Spanish
579L	Wingdings	8S	HP Latin Spanish
35L	Pi Set #5	16S	HP-GL Download
17S	HP-GL Drafting	16U	PC-857 Turkish
18S	HP-GL Special Symbols	17U	PC-852, Latin 2
20S	Sonata	19U	Windows 3.1 Latin I
0T	Thai-8	20U	PC-860 Portugal
5T	Windows 3.1 Latin 5	21U	PC-861 Iceland
8T	Turkish-8	23U	PC-863 Canada French
9T	PC-8T, Turkish	25U	PC-865 Norway
10T	Teletex	26U	PC-775 Baltic
19T	TIS (TAPCI23)	27U	PC Latvian/Russian
0U	ISO 6: ASCII	28U	PC Lithuanian/Russian
1U	Legal	29U	PC Lithuanian/Russian (CP 772)
2U	ISO 2: Int'l Reference Version	10V	Code Page 864 Latin/Arabic
5U	HPL	8V	HP Arabic-8
7U	OEM-1	0Y	3 of 9 Barcode
8U	Roman-8	1Y	Industrial 2 of 5 Barcode
9U	Windows 3.0 Latin 1	2Y	Matrix 20f5 Barcode
10U	PC-8, Code Page 437	4Y	Interleaved 2 of 5 Barcode
11U	PC-8 D/N, Danish/Norwegian	5Y	CODABARBarcode
12U	PC-850, Multilingual	6Y	MSI/Plessey Barcode
15U	Pi Font	7Y	Code 11 Barcode
		8Y	UPC/EAN Barcode
		15Y	USPS ZIP

10.11.3 Font Spacing

TABLE 37. Font Spacing (Primary) - **Esc ( s # P**  
Font Spacing (Secondary) - **Esc ) s # P**

# Value	DJ600	DJ610C	DJ660C	DJ670C	DJ680C	DJ690C	DJ695C	DJ810C	DJ830C	DJ850C	DJ870C	DJ880C	DJ890C	DJ895C	DJ970C	HP2000C	EFFECT
0	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Fixed spacing
1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Proportional spacing
Default	0																
Range	0, 1 - Command is ignored for other values																

Designates inter-character spacing as either proportional or fixed.

If proportional spacing is specified and no proportional font is available in the requested symbol set, a fixed spacing font with the current pitch specification is chosen, if available.

If fixed spacing is requested but no fixed-pitch font is available, a proportional font is chosen, if available.

For fixed-space bitmap fonts, both pitch and height are used for selection of font character size. For fixed-space scalable fonts, only pitch is used. For proportional bitmap and scalable fonts, only height is used.

10.11.4 Font Pitch

TABLE 38. Font Pitch (Primary) - **Esc ( s # H**  
Font Pitch (Secondary) - **Esc ) s # H**

# Value	DJ600	DJ610C	DJ660C	DJ670C	DJ680C	DJ690C	DJ695C	DJ810C	DJ830C	DJ850C	DJ870C	DJ880C	DJ890C	DJ895C	DJ970C	HP2000C	EFFECT
n	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Inter character spacing for current font is set
Default	10 cpi																
Range	> 0.0 - valid to 2 decimal places - Command is ignored for out of range values																

Designates the horizontal spacing of a fixed-space or dual-fixed space (bitmap or scalable) font in characters per inch (cpi).

If the exact pitch is unavailable, the next larger pitch is selected. If a larger pitch is unavailable, the closest smaller pitch is selected.

Pitch is ignored when selecting proportional fonts, but saved in the font select table and available when a fixed space font is selected.

For fixed space bitmap fonts, both pitch and height are used for font selection. For fixed space scalable fonts, only pitch is used. For proportional scalable fonts, only height is used. For dual-fixed space fonts, only the pitch is used.

For scalable fonts, pitch is converted to a corresponding point size (height), which is scaled by the printer. Effective pitch ranges are thus limited by height constraints.

**10.11.5 Font Height**

**TABLE 39.** Font Height (Primary) - **Esc ( s # V**  
Font Height (Secondary) - **Esc ) s # V**

# Value	DJ600	DJ610C	DJ660C	DJ670C	DJ680C	DJ690C	DJ695C	DJ810C	DJ830C	DJ850C	DJ870C	DJ880C	DJ890C	DJ895C	DJ970C	HP2000C	EFFECT
n	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Height for current font is set
Default	12 points																
Range	> 0.0 - valid to 2 decimal places - Command is ignored for out of range values.																

Specifies font height in points (1/72 inch).

If the requested height is unavailable, the closest heights are chosen for the next selection criteria. The closest value is in terms of absolute difference: e.g., if 6, 8, and 12 point fonts are available and 10 is requested, both 8 and 12 point fonts are considered.

Fractional values may be specified when requesting height. All bitmap fonts within 0.25 points of the requested height are considered. If a 12 point font is requested, fonts between 11.75 and 12.25 are considered. Or, to put it another way, if 6, 8, and 11.75 point fonts are available and 10 is requested, both the 8 and 11.75 fonts are considered.

Height is ignored when selecting a fixed space scalable font; but the value is saved in the font select table and available when a proportional font is selected.

If no font within .25 points is available, HP DeskJet selects the next smaller height. If no smaller height is available, the next larger height is selected.

10.11.6 Font Style

TABLE 40. Font Style (Primary) - **Esc ( s # S**  
Font Style (Secondary) - **Esc ) s # S**

# Value	DJ600	DJ610C	DJ660C	DJ670C	DJ680C	DJ690C	DJ695C	DJ810C	DJ830C	DJ850C	DJ870C	DJ880C	DJ890C	DJ895C	DJ970C	HP2000C	EFFECT
n	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Specified characteristics are applied to font style request
Default	0																
Range	0 to 32767 - values exceeding range are ignored																

Identifies the posture, width, and structure of the font symbols. The partial sums for posture, width, and structure are added together to determine the desired value (#). The composition of the style word is shown below.

Style Word = Posture + (4 x Width) + (32 x Structure)

15	14	10	9	5	4	2	1	0
X	reserved	structure	width	posture				

Value (#) =	Posture
0	Upright
1	Italic
2	Alternate Italic
3	Reserved

Value (#) =	Width
0	Normal
1	Condensed
2	Compressed or extra condensed
3	Extra compressed
4	Ultra compressed
5	Reserved
6	Extended or expanded
7	Extra extended or extra expanded

Value (#) =	Structure (style word partial sum multiplied by 32)
0	Solid
1	Outline
2	In-line
3	Contour, Edge effects
4	Solid with shadow
5	Outline with shadow
6	In-line with shadow
7	Contour with shadow
8	Patterned (complex patterns, subjective to typeface)
12-15	Patterned with shadow
16	Inverse
17	Inverse in open border
18-30	Reserved
31	Unknown structure
Default = 0	
Range = 0 to 32767 (values greater than 32767 are clamped)	

### **MATCHING ALGORITHM**

The following procedure matches requested styles with available styles:

- ✓ Printers recognizing only style values 0, 1, and 2 discard requests for larger values.
- ✓ Printers recognizing style values from 0 to 255 convert requests for larger values to 255. The request is discarded if an exact match is not found after conversion.
- ✓ An exact match is required for style selection. If the requested value is within the range of the printer and a match is not made, the request is ignored, but saved in the font select table, available for the next selection.

Whenever a requested font parameter is ignored, the parameter is retained in the font select table for future font selections; and the current font selection process continues as if the parameter had never been requested.

In some HP PCL machines, the style word may be an operator: slanting, condensing, expanding, outlining, and shadowing operations are all theoretically possible. For example, if italic is unavailable, slant may be added to the upright face. No new command sequence is required to support such operations.

**EXAMPLE:** Assume that a font style of “italic compressed contour” is desired. The value(#) would be computed as follows:

$$1 + (2 \times 4) + (3 \times 32) = 105$$

10.11.7 Font Stroke Weight

TABLE 41. Font Stroke Weight (Primary) - **Esc ( s # B**  
 Font Stroke Weight (Secondary) - **Esc ) s # B**

# Value	DJ600	DJ610C	DJ660C	DJ670C	DJ680C	DJ690C	DJ695C	DJ810C	DJ830C	DJ850C	DJ870C	DJ880C	DJ890C	DJ895C	DJ970C	HP2000C	EFFECT
-7	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Ultra thin
-6	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Extra thin
-5	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Thin
-4	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Extra light
-3	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Light
-2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Demi-light
-1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Semi-light
0	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	“Book” or “text” weight
1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Semi-bold
2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Demi-bold
3	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Bold
4	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Extra bold
5	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Black
6	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Extra black
7	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Ultra black
Default	0																
Range	-7 to 7 (less than -7 maps to -7; greater than 7 maps to 7)																

Designates the thickness of the strokes that compose the characters of a font.

If the designated stroke weight is unavailable and 0 or greater, the closest thicker weight is selected. If a thicker weight is unavailable, the closest thinner weight is selected.

If the designated stroke weight is unavailable and less than 0, the closest thinner weight is selected. If a thinner weight is unavailable, the closest thicker weight is selected.

Many typefaces were designed for advertising, and a “medium” was used to describe the standard treatment. Later, additional treatments were designed for text use. Therefore, the typeface treatment designation “medium” may not always take a HP PCL value of 0. This value may be assigned to “book” or “text” instead.



10.11.8 Font Selection by ID

TABLE 42. Font Selection by ID (Primary) - **Esc ( # X**  
Font Selection by ID (Secondary) - **Esc ) # X**

# Value	DJ600	DJ610C	DJ660C	DJ670C	DJ680C	DJ690C	DJ695C	DJ810C	DJ830C	DJ850C	DJ870C	DJ880C	DJ890C	DJ895C	DJ970C	HP2000C	EFFECT
n	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Font with indicated ID is selected
Default	n/a																
Range	0 to 32767 - values exceeding range are ignored																

Designates a font by ID as primary or secondary. The designated font, if present, is selected as the primary/secondary font, and all the attributes in the primary/ secondary font select table are changed to match those of the designated font. Pitch, however, is not changed if the designated font is proportional. No action occurs if the designated font is unavailable. See the Font Symbol Set Command for Symbol Set ID Numbers.



*Pitch and height are unchanged if the designated font is scalable.*

*If a proportional-space scalable font is selected by ID, the Height command should be sent prior to the Font Selection ID command to specify point size. Otherwise, the size will be determined by the height of the former font (as listed in the font select table).*

*For shared or multi-user environments, HP recommends that soft fonts be selected by attribute rather than ID.*

## 10.12 Downloading Fonts

Currently, the HP DeskJet 600 Series and 850/855 Series printers are the only printers that accept downloaded fonts. Note that the HP DeskJet format soft fonts are designed for use with the HP DeskJet 500 Series printers. The following sections discuss the format for the HP LaserJet format soft fonts, which is the type used for the DeskJet 600 Series and 850/855 Series printers.

Before sending font data, the font must first be assigned an identification number so the font can be referenced by subsequent HP PCL commands.

### 10.12.1 Font ID

TABLE 43. Font ID - **Esc \* c # D**

# Value	DJ600	DJ610C	DJ660C	DJ670C	DJ680C	DJ690C	DJ695C	DJ810C	DJ830C	DJ850C	DJ870C	DJ880C	DJ890C	DJ895C	DJ970C	HP2000C	EFFECT
n	✓	✓	✓	✓	✓	✓	✓			✓							The subsequently downloaded font is given the specified ID number
Default	0																
Range	0 to 32767 - values exceeding range are ignored																

A font already having this ID number is deleted when the font definition is received, even if the new font is rejected because of memory constraints or invalid data fields.

This ID is used as the value field of the **Esc ( # X** and the **Esc ) # X** soft font selection commands.

EXAMPLE:

Assume that **Esc \* c 1 D** sets the current Font ID to 1. If this command is followed by a valid font definition (**Esc s # W**), a font with an ID of 1 is created.



*If this command is followed by a **Font Management (Esc \* c # F)** command, the appropriate action is executed for any font currently associated with an ID of 1.*

10.12.2 Download Font

TABLE 44. Download Font - **Esc ) s # W [font definition]**

# Value	DJ600	DJ610C	DJ660C	DJ670C	DJ680C	DJ690C	DJ695C	DJ810C	DJ830C	DJ850C	DJ870C	DJ880C	DJ890C	DJ895C	DJ970C	HP2000C	EFFECT
n	✓	✓	✓	✓	✓	✓	✓			✓							Downloads a font definition and assigns the font the current font ID
Default	n/a																
Range	0 to 32767 - command is ignored for invalid descriptor or insufficient memory and the font descriptor data is discarded																

This command must be sent prior to downloading the characters in the font.

Note that this command downloads the entire font definition, which includes the font descriptor, as well as any additional data segments such as the Global Intellifont Segment, the Global TrueType Segment, the Copyright, the Application Support Segment, etc. The value (#) of this command gives the size of the definition; the first word of the definition gives the size of the descriptor. The descriptor, which is the first part of the definition, defines characteristics common to all the characters of a font.

Some devices, such as PaintJet, may not use a font definition or may ignore some fields; but each field should contain a valid value for printer compatibility. Missing data and “reserved” fields should be set to 0; excess data should be discarded.

The two font definitions recognized by the HP DeskJet 600, 850, 870, 890, & HP 2000 Series printers are provided in the section of this guide entitled “Fonts”.

- ✓ **Bitmap** - Older definition for bitmap fonts. Not recommended for new devices.
- ✓ **Resolution** - Specified Bitmap - Replaces the previous Bitmap definition. Allows font resolution to be specified in dots-per-inch.

10.12.3 Character Code

TABLE 45. Character Code - **Esc \* c # E**

# Value	DJ600	DJ610C	DJ660C	DJ670C	DJ680C	DJ690C	DJ695C	DJ810C	DJ830C	DJ850C	DJ870C	DJ880C	DJ890C	DJ895C	DJ970C	HP2000C	EFFECT
n	✓	✓	✓	✓	✓	✓	✓			✓							Establishes a decimal ASCII code for the next character downloaded
Default	0																
Range	0 to 65535 - command is ignored for out of range values																

The character code is a state variable that must be designated prior to the download of a character descriptor. Any existing characters with the same code are deleted.

EXAMPLE: Esc \*c103E sets the character code to 103. If followed by the Character Descriptor (Esc ( s # W) command with a valid character descriptor and data, a character is defined in the code location corresponding to the ASCII lowercase “g”.

HP DeskJet 600, 830, 895, 900 & HP 2000 Series printers support a range of 0 - 65535.

After downloading the font definition, each character in the font must be defined.

10.12.4 Download Character

TABLE 46. Download Character - **Esc ( s # W [Character Definition]**

# Value	DJ600	DJ610C	DJ660C	DJ670C	DJ680C	DJ690C	DJ695C	DJ810C	DJ830C	DJ850C	DJ870C	DJ880C	DJ890C	DJ895C	DJ970C	HP2000C	EFFECT
n	✓	✓	✓	✓	✓	✓	✓			✓							Downloads a character definition with the specified (n) number of bytes
Default	n/a																
Range	0 to 32767 - command is ignored for out of range values																

Downloads a character definition with the character code assigned by **Esc \* c # E**.

The value field (#) contains the number of bytes to be downloaded up to a maximum of 32767. If more bytes are needed, this command is used again as many times as necessary. The

group of bytes sent by one command is called a block. A character definition consists of a first block and zero or more continuation blocks.

An unsupported or invalid character definition is ignored and discarded. An out-of-memory condition during character download deletes the entire font. Reserved fields should be set to 0.

10.12.5 Font Control

TABLE 47. Font Control - **Esc \* c # F**

# Value	DJ600	DJ610C	DJ660C	DJ670C	DJ680C	DJ690C	DJ695C	DJ810C	DJ830C	DJ850C	DJ870C	DJ880C	DJ890C	DJ895C	DJ970C	HP2000C	EFFECT
0	✓	✓	✓	✓	✓	✓	✓			✓							Delete all fonts (temp, permanent, and soft)
1	✓	✓	✓	✓	✓	✓	✓			✓							Delete all temporary fonts (temp, permanent, and soft)
2	✓	✓	✓	✓	✓	✓	✓			✓							Delete font (specified by last Font ID)
3	✓	✓	✓	✓	✓	✓	✓			✓							Delete character (last Font ID and Character Code)
4	✓	✓	✓	✓	✓	✓	✓			✓							Make font temporary (specified by last Font ID)
5	✓	✓	✓	✓	✓	✓	✓			✓							Make font permanent (specified by last Font ID)
Default	n/a																
Range	0 to 5 - Command is ignored for other values, or if no font has the specified ID																

Manipulates fonts and characters designated by Font ID and Character Code.

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

## 10.13 Raster Graphics

The following HP PCL commands apply to the printing of raster graphic images on HP DeskJet 600/800/900 & HP 2000 Series printers.

### 10.13.1 Raster Mode

The **Start Raster** (**Esc \* r # A**) command begins a restricted state called raster mode. Raster mode locks out commands that would affect rendering of the graphics image. These commands remain locked out until **End Raster** (**Esc \* r C**).

### 10.13.2 Commands Locked Out of Raster Mode

The following raster commands are ignored in raster mode. They should be used to define a graphic image's parameters before entering graphics mode.

Configure Raster Data	Esc * g # W
Simple Color	Esc r # U
Source Raster Width	Esc r # S
Start Raster	Esc r # A

### 10.13.3 Commands Allowed in Raster Mode

The following commands may be used in raster mode without implicitly ending raster mode.

Compression Method	Esc b # M
Seed Row Source	Esc b # S
Transfer Raster by Row/Block	Esc * b # W
Transfer Raster by Plane	Esc b # V
Y Offset	Esc b # Y

10.13.4 Start Raster

TABLE 48. Start Raster - **Esc \* r # A**

# Value	DJ600	DJ610C	DJ660C	DJ670C	DJ680C	DJ690C	DJ695C	DJ810C	DJ830C	DJ850C	DJ870C	DJ880C	DJ890C	DJ895C	DJ970C	HP2000C	EFFECT
0	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Start graphics at logical page left boundary (current vertical position)
1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Start graphics at CAP (current vertical and horizontal position)
Default	0																
Range	0 to 1 - Out of range values default to 0																

Starts raster mode and specifies the starting position of the raster image.

This command sets the left raster margin. A value of 0 starts the upper left corner of the picture at the current vertical position on the left edge of the logical page. A value of 1 starts the upper left corner of the picture at CAP (the current vertical and horizontal position).

*Start Raster* locks out the commands listed above and clears the seed row.

10.13.5 End Raster

TABLE 49. End Raster - **Esc \* r C**

# Value	DJ600	DJ610C	DJ660C	DJ670C	DJ680C	DJ690C	DJ695C	DJ810C	DJ830C	DJ850C	DJ870C	DJ880C	DJ890C	DJ895C	DJ970C	HP2000C	EFFECT
n/a	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Printer returns to text mode command processing
Default	n/a																
Range	n/a																

This command ends Raster Mode. It signifies the end of the transfer of a raster graphics image and ends the current raster row. It performs the following functions:

- ✓ Resets the seed row to zeros.
- ✓ Re-enables commands locked out of raster mode by **Esc \* r # A**.
- ✓ Defaults the compression method to 0.

- ✓ Resets the left graphics margin to 0.
- ✓ Moves CAP to the row immediately following the end of the raster area and zero-fills empty rows if source raster height was specified; otherwise to the next row.
- ✓ Resets the plane pointer to 1.



*If a value field is received, it is ignored and the command is still executed.*

**10.13.6 Raster Resolution**

**TABLE 50.** Raster Resolution - **Esc \* t # R**

# Value	DJ600	DJ610C	DJ660C	DJ670C	DJ680C	DJ690C	DJ695C	DJ810C	DJ830C	DJ850C	DJ870C	DJ880C	DJ890C	DJ895C	DJ970C	HP2000C	EFFECT
75	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	graphics data printed at 75 dpi
100	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	graphics data printed at 100 dpi
150	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	graphics data printed at 150 dpi
300	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	graphics data printed at 300 dpi
600	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	graphics data printed at 600 dpi (applies to black data only) <sup>a</sup>
Default	75																
Range	75, 100, 150, 300, 600 - Command is ignored for other values																

a. Only black raster data can print at 600 dots per inch on HP DeskJet 600/800/900 & HP 2000 Series printers.

Defines the resolution at which graphics data is to be printed

To assure that the graphic is printed without data loss, an unsupported resolution is mapped to the next higher supported resolution. For example, a request for 125 dpi on a HP DeskJet 600/810/830/895/900 or HP 2000 Series printer would result in 150 dpi being selected as the graphics print resolution.

During raster mode this command is locked out.



*HP DeskJet 600/800/900 & HP 2000 Series printers support 75, 100, 150, and 300 dpi for color and black printing. They also support 600 dpi for black data only. The default will be 75.*



10.13.7 Source Raster Width

TABLE 51. Source Raster Width - **Esc \* r # S**

# Value	DJ600	DJ610C	DJ660C	DJ670C	DJ680C	DJ690C	DJ695C	DJ810C	DJ830C	DJ850C	DJ870C	DJ880C	DJ890C	DJ895C	DJ970C	HP2000C	EFFECT
n	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Raster region width is set to specified number of pixels (at current resolution) <sup>a</sup>
Default	Logical page width																
Range	0 to 32767 - (clamped to right logical page boundary minus left graphics margin)																

a. HP DeskJet 600, 810, 830, 850, 895, 900 & HP 2000 Series printers round source raster width values that are not a multiple of 8 to the next higher multiple of eight (i.e., the next byte boundary).

Specifies the width in pixels of the raster area.

Raster width extends from the left graphics margin to one of the following:

- ✓ The distance specified by the **Source Raster Width (Esc \* t # H)** command.
- ✓ The right edge of the logical page, if the specified width would extend outside the printable area.
- ✓ The right edge of the printable area, if width is not specified.

HP DeskJet printers always clip at the right edge of the printable area.

The left graphics margin is set to one of the following:

- ✓ CAP (explicit Start Raster).
- ✓ Left edge of the logical page (explicit or implicit Start Raster).

The printer clips data that would extend outside the specified width. If width is not specified, the printer clips at the right edge of the printable area. If a width greater than the printable area is specified, the printer clips at the right edge of the logical page.

The printer zero-fills rows not specified for the full width. These zero-filled portions of a row map to either white or transparent, depending on the media type currently selected (**Esc \* v # N**).



*On color devices, a zero-fill is not necessarily white. For example RGB data set to zero prints as black on a HP DeskJet printer. Undefined graphics space would therefore print as black.*

Since width is in the direction that the raster rows are laid down, source raster width is relative to the current raster resolution or print quality setting.

10.13.8 Y Offset

TABLE 52. Y Offset - **Esc \* b # Y**

# Value	DJ600	DJ610C	DJ660C	DJ670C	DJ680C	DJ690C	DJ695C	DJ810C	DJ830C	DJ850C	DJ870C	DJ880C	DJ890C	DJ895C	DJ970C	HP2000C	EFFECT
	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Cursor is moved specified number of raster lines of vertical movement
Default	n/a																
Range	-32767 to 32767 - Command is ignored for out of range values																

Moves CAP vertically (relative to CAP) by the specified number of raster lines.

This command is recognized only in raster mode and only within the raster area.

This command zero-fills the offset area.

For Delta Row compression (methods 3 and 9), this command zeros the seed row.



*Movement by this command is based on the graphics resolution.*

## 10.14 Raster Data Transfer

The **Raster Transfer** commands (*Esc \* b # V*, *Esc \* b # W*) define how many bytes will be interpreted as binary raster data

The **Transfer Raster by Plane** (*Esc \* b # V*) command is used when the data is encoded by plane, as specified by the **Simple Color** (*Esc \* r # U*) command. Transfer Raster by Plane is used to send each plane in the row except the last; **Transfer Raster by Row** (*Esc \* b # W*) must be used to send the last plane and advance the row.

The **Transfer Raster by Row** (*Esc \* b # W*) command moves CAP to the beginning of the next pixel row after the graphics data in the command is sent to the printer. The command is used for single-color devices, for the last plane in a multi-plane row, or for color raster transfer when the data is encoded by pixel.

### 10.14.1 Transfer Raster by Plane

TABLE 53. Transfer Raster by Plane - *Esc \* b # V* [data]

# Value	DJ600	DJ610C	DJ660C	DJ670C	DJ680C	DJ690C	DJ695C	DJ810C	DJ830C	DJ850C	DJ870C	DJ880C	DJ890C	DJ895C	DJ970C	HP2000C	EFFECT
	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Specified number of bytes of graphics data for a single plane of data is set to the printer. The row pointer is not incremented.
Default	n/a																
Range	0 to 32767 - Command is ignored for out of range values																

Sends a plane of data to the printer and advances to the next plane, but not to the next row.

The number of planes per row is specified by the **Simple Color** (*Esc \* r # U*) command (also known as *Set Planes per Row*). The first plane sent represents the least significant bit in the pixel.

Since **Transfer Raster by Plane** (*Esc \* b # V*) does not advance the row, it cannot be used for the last plane or for single-plane rows. Only **Transfer Raster by Row** (*Esc \* b # W*) can advance the row.

The amount of data sent varies from plane to plane and is independent of raster width. Planes whose data specifies a row shorter than the raster width are zero-filled. Empty planes can be sent by *Esc \* b 0 V*.

10.14.2 Transfer Raster by Row/Block

TABLE 54. Transfer Raster by Row or Block - **Esc \* b # W [data]**

# Value	DJ600	DJ610C	DJ660C	DJ670C	DJ680C	DJ690C	DJ695C	DJ810C	DJ830C	DJ850C	DJ870C	DJ880C	DJ890C	DJ895C	DJ970C	HP2000C	EFFECT
n	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Following specified number of data bytes sent to the printer as K data
Default	n/a																
Range	0 to 32767 - Command is ignored for out of range values																

Transfers the number of bytes specified in the value field to the printer in a row by row or block format, depending on the current compression method (**Esc \* b # M**), then moves CAP to the next row.

This command is used in single-color and multi-color printers where data is encoded by row rather than by pixel. Because this command advances the row, it is also used for single-plane rows or the last plane in a multi-plane row.

CAP is updated for each row in both row or block formats. For row formats, CAP is reset to the left graphics margin. For block formats, CAP is reset to the X coordinate of the block; and the Y coordinate is incremented.

The amount of data sent by this command can vary from row to row. If the picture width allows more data than is sent, the undefined area is zero-filled. Undefined planes in a multi-plane row are zero-filled. Black and white devices interpret zeros as white; color devices interpret zero according to the current palette.

The plane pointer in a multi-plane row is reset to 1 after the data is transferred.

The data field is interpreted according to the current compression method (**Esc \* b # M**).

## 10.15 Raster Compression

Since raster images take a large amount of memory and processing time, raster data should be reduced as much as possible. White-space data transfer can be reduced by sending empty rows and planes (*Esc \* b 0 W*, *Esc \* b 0 V*), or by offsetting the left graphic margin (*Esc \* r 1 A*) or the vertical starting point (*Esc \* b # Y*). The **Compression Method** (*Esc \* b # M*) command provides several other ways of compressing data.

### 10.15.1 Compression Method

TABLE 55. Compression Method - **Esc \* b # M**

# Value	DJ600	DJ610C	DJ660C	DJ670C	DJ680C	DJ690C	DJ695C	DJ810C	DJ830C	DJ850C	DJ870C	DJ880C	DJ890C	DJ895C	DJ970C	HP2000C	EFFECT
0	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Unencoded
1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Run-length encoding
2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Tagged Image File Format (TIFF) revision 4.0 "Packbits" encoding
3	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Delta row encoding
9	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Compressed replacement delta row encoding
Default	0																
Range	0-3, 9 - Out of range values default to 0																

Determines how raster data is interpreted in the Transfer Raster by Row or Transfer Raster by Plane commands. The compression method stays in effect until explicitly changed to another method or reset by Reset (*Esc E*) or End raster (*Esc \* r C*).

#### Method 0- Unencoded

This is a simple binary transfer: no compression.

#### Method 1- Run-Length Encoding

Method 1 interprets raster data as byte pairs. The first byte tells how many times the second byte is repeated, i.e., a repetition count. The second byte is the data to be printed. The repetition count can be 0 through 255. A count of 0 means the byte pattern occurs once and is not repeated; a count of 1 means the pattern occurs twice; and a count of 255 means the pattern occurs 256 times.



*Method 1 requires byte pairs: a **Transfer Raster** (**Esc \* b # V** or **Esc \* b # W**) command with an odd value field is ignored and the data discarded.*

**Method 2 - Tagged Image File Format Encoding (TIFF revision 4)**

Method 2 (“packbit” encoding) combines methods 0 and 1, with blocks of repeated bytes and blocks of literal (unencoded) bytes. A control byte precedes the raster data; it indicates the number of succeeding bytes, and whether they are repeated or literal.

The control byte is in 2’s complement format. If bit 7 is set (byte = -1 to -127), the following bytes are repeated. The control byte’s absolute value is the number of repetitions (occurrences = repetitions + 1). For example, a control byte of -5 means the subsequent byte is repeated 5 times (6 occurrences).

If bit 7 of the control byte is zero (byte = 0 to 127), the following bytes are literal. The number of succeeding data bytes is 1 + the value of the control byte. A control byte of 0 means 1 literal byte follows; a control byte of 6 means 7 literal bytes follow.

A control byte of -128 is ignored; the next byte is then treated as a control byte.

It is more efficient to code two consecutive identical bytes as a repeated byte, unless these bytes are preceded and followed by literal bytes. Three-byte repeats should always be encoded as replicate runs.



*The row length indicated by the **Transfer Raster** commands (**Esc \* b # V**, **Esc \* b # W**) has precedence if it is met before the literal run count.*

EXAMPLES OF METHODS 0 - 2:

The following examples show how methods 0 - 2 can be used to send the raster row below:

Byte Number	#1	#2	#3	#4	#5	#6	#7
Bits	01010101.	01010101.	01010101.	01010101.	01000001.	01010100.	01010100
ASCII	U	U	U	U	A	T	T

Compression method 0 - Unencoded	
	Esc*r1 A
	Esc*b0m7WUUUUATT
	Esc*rC

Compression method 1 - Run-length encoding	
	Esc*r1 A
	Esc*b1 m6W(3)U(0)A(1)T
	Esc*rC
Compression method 2 - TIFF encoding	
	Esc*r1 A Esc*b2m6W(-3)U(0)A(-1)T -or-
	Esc*b2m6W(-3)U(2)ATT
	Esc*rC



*Parentheses in the above escape sequences are for readability only.*

### Method 3 - Delta Row Encoding

This method replaces only bytes in the current row that are different from the preceding row (seed row). Unreplaced bytes are replicated from the seed row. The current row then becomes the seed row.

A delta compression string consists of a command byte and the replacement (delta) bytes:

[(Command byte)(1 to 8 replacement bytes)]

The command byte has two parts: the number of consecutive replacement bytes that follow, and the left offset from the current byte position.

<b>7</b>	<b>5</b>	<b>4</b>	<b>0</b>
<b>Replacement count (1 - 8)</b>		<b>Left offset from the current byte (0 - 30)</b>	

Three bits of the command byte contain the replacement count: the number of consecutive replacement bytes that follow (000 = 1, 111 = 8).

Five bits contain the offset from the current byte to the next replacement byte. The current byte follows the last replacement byte or, at the beginning of a row, the left graphics margin. An offset of 0 is the current byte; an offset of 1 is the byte following the current byte.

For example, assume the current byte is the first byte in the row. An offset of 7 skips bytes 0 through 6, and a replacement count of 5 replaces bytes 7 through 11. The new current byte is 12. A second offset of 3 skips bytes 12, 13, and 14; byte 15 is the next byte to be replaced.

The values of the offset have the following definitions:

0 to 30:	The offset is 0 to 30.
31:	The offset is 31 or greater. If the offset is 31, an additional <b>offset byte</b> follows the command byte. The offset in the command byte is added to the offset byte. If the offset byte is 0, the offset is 31; if the offset byte is 255, additional offset bytes follow. The last offset byte will have a value less than 255. All the offset bytes are added to the offset in the command byte to get the offset value. For example, if there are 2 offset bytes, and the last byte contains 175, the total offset would be: 31 + 255 + 175 = 461.

If more than eight delta bytes are needed, additional command byte/delta bytes are added:

[(Command Byte)(1-8 Delta Bytes)][(Command Byte)(1-8 Delta Bytes)] . . .

The seed row is zeroed when raster mode is entered. Every raster transfer affects the seed row, regardless of the compression method. For example, an Esc \* b 0 W while in compression method 0 zeros the seed row. This allows method 3 to be combined with other methods in order to achieve better compression performance.

A vertical offset also affects the seed row: the Y Offset (Esc \* b # Y) command skips rows, leaving them blank, and zeros the seed row.

Method 3 operates on each plane independently, and a separate seed row is maintained for each graphic plane. However, a Y Offset affects all planes and seed rows simultaneously.

The examples below show how method 3 affects Raster Transfer and Y Offset commands:

Esc b 0 W	Repeat the previous row. The seed row is unchanged
Esc b 1 Y	Move down one raster row. Zero the seed row.
Esc b 0 Y	Move down zero raster rows. Zero the seed row

Seed row width is set to the source raster width at the beginning of raster mode. Source Raster Width (Esc \* r # S) updates seed row width.

If the Transfer Raster (Esc \* b # V or Esc \* b # W) command byte count is less than the control byte count, only the transfer byte count number of bytes are replaced. If the transfer count is greater than the control count, only the control byte number of bytes are replaced; for example, if the control byte count is 10 but the transfer count is 3, only 3 bytes are replaced.

If the last byte indicated by the transfer command value is a control byte, it is ignored. Therefore, Esc \* b 1 W does not affect the seed row, but causes the previous row to be repeated.

DELTA ROW EXAMPLE:



The following data is compressed using method 3. Italicized bytes are those needing replacement, i.e., bytes different from the seed row. Graphics data is binary.

Byte #:	1	2	3	4	5
Row 1	00000000	<i>11111111</i>	00000000	00000000	00000000
Row 2	00000000	11111111	<i>11110000</i>	00000000	00000000
Row 3	<i>00001111</i>	11111111	11110000	<i>10101010</i>	<i>10101010</i>

Esc \* r 1 A

**Start Raster** initializes the seed row to all zeros.

Row 1 - **Esc \* b 3 m 2 W (0000001 )( 11111111 )**

3m selects method 3, and 2W indicates that 2 bytes of data will follow. The upper three bits of the command byte are zero, indicating that one byte will be replaced. The lower five bits contain a relative offset of 1, indicating that the replacement occurs one byte in from the current position. The replacement byte follows and contains 11111111.

Row 2 - **Esc \* b 2 W (0000010)(11110000)**

The first three bits of the command byte are 0 indicating one byte will be replaced. The lower five bits contain a relative offset of 2; so the replacement will occur 2 bytes from the current position. The replacement byte 11110000 follows.

Row 3 - **Esc \* b 5 W (00000000)(00001111)(00100010)(10101010)(1010 1010)**

Three bytes are replaced using two commands. The first three bits of the first command byte are zero, indicating a single byte replacement, and the next five bits are zero, indicating a relative offset of zero. The replacement byte 00001111 follows.

The first three bits of the second command byte are 001, indicating the replacement of two bytes; and the lower five bits contain a relative offset of two. The two replacement bytes (10101010)(10101010) follow the command byte.

**Method 9 - Compressed Replacement Delta Row Encoding**

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

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

Command Byte	Optional Offset Bytes	Optional Replacement Count Bytes	Data Bytes
--------------	-----------------------	----------------------------------	------------

The command byte itself has three parts:

Control Bit	Offset Count	Replacement Count
-------------	--------------	-------------------

<b>Control Bit:</b>	Determines whether the replacement data is encoded, and also the bit boundaries of the command byte's other two fields.
Offset Count:	The number of bytes the replacement data is offset from the current position in the seed row.
Replacement Count:	The number of consecutive data bytes to be replaced.

Control Bit = 0

If the control bit is 0, the replacement data is uncompressed. Bits 0-2 contain the replacement count; bits 3-6 contain the offset count. The replacement count is the number of bytes to be replaced by the bytes following the command byte. The offset count is the location these replacement bytes will occupy relative to the current position in the seed row.

Like compression method 3, the current byte follows the last replacement byte or, at the beginning of a row, the left graphics margin. An offset of 0 is the current byte; an offset of 1 is the byte following the current byte.

7	6	3	2	0
<b>Control Bit = 0</b>	<b>Offset Count</b>		<b>Replacement Count</b>	

If the offset count is 15, an *offset count* byte follows the command byte and is added to the command byte's offset count. If the offset count byte is 0, the offset count is 15. If the offset count byte is 255, another offset count byte follows. The last offset count byte will be less than 255.

One more byte than that indicated by the replacement count will be replaced. That is, 000 = 1 and 111 = 8. For example, if the replacement count is 5, then 6 bytes are replaced.

If the replacement count is 7, a *replacement count* byte follows the command byte and any offset count bytes. If the replacement count byte is 0, then 8 bytes are replaced. If the replacement count byte is 255, another replacement count byte follows. The last replacement count byte will be less than 255. All of the replacement count bytes are added to the replacement count in the command byte to get the total replacement byte count. One more than the total replacement byte count will be replaced.

Control Bit = 1

Operation is similar if the control bit is 1, except that the replacement data is run length encoded and the bit boundaries are different. Bits 5 and 6 contain the offset count; bits 0 - 4 contain the replacement count. As when the control bit is 0, optional offset bytes and replacement bytes may be added.

7	6	5	4	0
<b>Control Bit = 1</b>	<b>Offset Count</b>		<b>Replacement Count</b>	

**Seed Row Source Esc \* b # S**

Specifies the plane of the seed row for multi-plane graphics in compression methods 3 and 9.

Value (#)	=	0 - Use the corresponding plane of the previous row.
	=	> 0 - Number of previous seed planes before the current plane
Default = 0		
Range = 0 to number of currently active planes.		

For example, if the printer is in 3-plane mode and Esc \* b 0 S was sent, then:

- ✓ The Cyan plane would use the Cyan plane from the previous row as a seed plane.
- ✓ The Magenta plane would use the Magenta plane from the previous row as a seed plane.
- ✓ The Yellow plane would use the Yellow plane from the previous row as a seed plane.

If the printer is in 3-plane CMY mode and Esc \* b 1 S is sent, then:

- ✓ The Cyan plane would use the Yellow plane from the previous row as a seed plane.
- ✓ The Magenta plane would use the Cyan plane from the current row as a seed plane.
- ✓ The Yellow plane would use the Magenta plane from the current row as a seed plane.

## 10.16 Color

### 10.16.1 Simple Color

TABLE 56. Simple Color - **Esc \* r # U** (Also known as **Set Planes Per Row**)

# Value	DJ600	DJ610C	DJ660C	DJ670C	DJ680C	DJ690C	DJ695C	DJ810C	DJ830C	DJ850C	DJ870C	DJ880C	DJ890C	DJ895C	DJ970C	HP2000C	EFFECT
1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Single plane K palette
-3	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	3 planes, device CMY palette
3	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	3 planes, device RGB palette
-4	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	4 planes, device KCMY palette
Default	1																
Range	-4, -3, 1, 3 - Command is ignored for out of range values																

The **Simple Color** (**Esc \* r # U**) command, sometimes referred to as **Set Planes Per Row**, allows color selection from a fixed palette. CMY or RGB raster data must be transferred by plane (**Esc \* b # V**) as well as by row (**Esc \* b # W**). The pixel encoding mode is indexed planar. Creates a fixed-size palette whose color specification cannot be modified.



*The HP DeskJet 600 printer, which is a single-pen device, maps a value parameter of -4 to 3-plane CMY, converting K data to composite black.*

The absolute value of the value field indicates the number of planes per row of raster data to be sent. The number of entries in the new palette is  $2^n$ , with index values 0 to  $2^n - 1$ . For example a 4-plane palette has 16 entries, with index numbers 0 to 15.

A value field of 1 creates a 2-entry black and white default HP LaserJet palette.

A value field of 3 creates an 8-entry Device RGB palette (compatible with a HP PCL Imaging Mode palette).

A value field of -3 creates an 8-entry palette in Device CMY color space.

A value field of -4 supports 4-plane Device KCMY color. Plane 1 is the black pen, and planes 2, 3, and 4 respectively are the CMY planes.

The four Simple Color palettes are shown below.



*The ordering for color data planes when the RGB palette is selected is RGB. The first Transfer By Plane command will send Red Data to the printer, the second will send Green Data, and the Blue Data is sent with a Transfer By Row command, which increments the*

*Row Pointer. The HP DeskJet 600/800/900 & HP 2000 Series printer firmware will complement the data and fire the pen as required to generate the appropriate CMY color. The RGB palette below shows both the RGB data values sent to the printer and the corresponding color printed.*

<b>Single Plane (black) Palette (value = 1)</b>		
<b>Planes Per Row</b>	<b>Color</b>	<b>Data Pattern</b>
1	White (no ink)	0
	Black	1

<b>3-Plane CMY Color Palette (value = -3)</b>				
<b>Planes per Row</b>	<b>Color Printed</b>	<b>Data Plane Pattern</b>		
		<b>C</b>	<b>M</b>	<b>Y</b>
3	White (no ink)	0	0	0
	Yellow	0	0	1
	Magenta	0	1	0
	Red	0	1	1
	Cyan	1	0	0
	Green	1	0	1
	Blue	1	1	0
	Composite Black	1	1	1

<b>3-Plane RGB Color Palette (Value = 3)</b>				
<b>Planes per Row</b>	<b>Data Plane Pattern</b>			<b>Color Printed</b>
	<b>R</b>	<b>G</b>	<b>B</b>	
3	0	0	0	Composite Black
	0	0	1	Blue
	0	1	0	Green
	0	1	1	Yellow
	1	0	0	Red
	1	0	1	Magenta
	1	1	0	Cyan
	1	1	1	White (no ink)

<b>4 Plane (KCMY) Color Palette (value = -4)</b>					
<b>Planes per Row</b>	<b>Color Printed</b>	<b>Data Plane Pattern</b>			
		<b>K</b>	<b>C</b>	<b>M</b>	<b>Y</b>
4	White	0	0	0	0
	Yellow	0	0	0	1
	Magenta	0	0	1	0
	Red	0	0	1	1
	Cyan	0	1	0	0
	Green	0	1	0	1
	Blue	0	1	1	0
	Composite Black	0	1	1	1
	Black	1	0	0	0
	<i>Black/Yellow</i>	1	0	0	1
	<i>Black/Magenta</i>	1	0	1	0
	<i>Black/Red</i>	1	0	1	1
	<i>Black/Cyan</i>	1	1	0	0
	<i>Black/Blue</i>	1	1	0	1
	<i>Black/Green</i>	1	1	1	0
	<i>Black</i>	1	1	1	1

10.16.2 Foreground Color

TABLE 57. Foreground Color - **Esc \* v # S**

# Value	DJ600	DJ610C	DJ660C	DJ670C	DJ680C	DJ690C	DJ695C	DJ810C	DJ830C	DJ850C	DJ870C	DJ880C	DJ890C	DJ895C	DJ970C	HP2000C	EFFECT
n	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Text will be printed in the color specified by the given index
Default	0																
Range	0 to the size of the current palette-1 Out of range values are mapped in to a new index via modulo (palette size)																

All HP PCL marking entities utilize foreground color, which is selected by **Esc \* v # S** from the current palette.

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

Out-of-range values are mapped into a new index via modulo (palette size). For example, if the current palette size is 8, and the selected index for the foreground color command is 10, the index is mapped into the index of 2 (i.e., 10 modulo 8).

Foreground color affects the following HP PCL page marking primitives in HP DeskJet 600/800/900 & HP 2000 Series printers.

- ✓ Text characters
- ✓ Solid or monochrome patterned rectangular area fills (rules) (800, 855, 870, 890 only)
- ✓ Raster images (see note below)



*The HP DeskJet 600 printer will ignore this command if the black pen is installed (foreground color will be black). When the color pen is installed, the printer will map a request for a four plane palette to a 3 plane palette, using composite black in place of black.*

*Foreground color interacts with color raster images on HP DeskJet 1200 Series and HP DeskJet 1600 Series printers. Foreground color does not affect raster color on HP DeskJet 600/800/900 & HP 2000 Series printers. If you are developing printer driver code that will be ported to drivers for HP DeskJet 1200 and/or 1600 Series printer, to avoid undesired interactions, select a black foreground color when transmitting raster images to the printer.*

**TABLE 58.** Single Plane (black) Palette

<b>Planes Per Row</b>	<b>Index</b>	<b>Color</b>
1	0	White (no ink)
	1	Black

---

**TABLE 59.** Three Plane (CMY) Color Palette

<b>Planes per Row</b>	<b>Index</b>	<b>Color</b>
3	0	White (no ink)
	1	Cyan
	2	Magenta
	3	Blue
	4	Yellow
	5	Green
	6	Red
	7	Composite Black

---

**TABLE 60.** Three Plane (RGB) Color Palette

<b>Planes per Row</b>	<b>Index</b>	<b>Color</b>
3	0	Composite Black
	1	Red
	2	Green
	3	Yellow
	4	Blue
	5	Magenta
	6	Cyan
	7	White (no ink)



**TABLE 61.** Four Plane (KCMY) Color Palette

<b>Planes per Row</b>	<b>Index</b>	<b>Color Printed</b>
4	0	White (no ink)
	1	White (no ink)
	2	Cyan
	3	Black
	4	Magenta
	5	Black
	6	Blue
	7	Black
	8	Yellow
	9	Black
	10	Green
	11	Black
	12	Red
	13	Black
	14	Composite Black
	15	Composite Black

## 11.0 Fonts

A soft font is composed of a Font Definition (font header) and a series of character definitions. Both are described below. In order to use the standard bitmap font definition on a HP DeskJet 600 or 85X Series printers, the *Font Descriptor Size* field *must* be set to exactly 64. The *First Code* and *Last Code* fields must also contain valid information. HP LaserJet printers do not enforce these restrictions, and it is therefore common for developers leveraging code and fonts from previous HP LaserJet development to experience problems.

### 11.1 Standard Bitmap Font Definition

(format 0):

Byte	15 (MSB)	8	7 (LSB)	0	Byte
0	Font Descriptor Size (64)				1
2	Descriptor Format (0)		Symbol Set Type		3
4	Style MSB		Reserved		5
6	Baseline Position				7
8	Cell Width				9
10	Cell Height				11
12	Orientation		Spacing		13
14	Symbol Set				15
16	Pitch (Default HMI)				17
18	Height				19
20	x-Height				21
22	Width Type		Style LSB		23
24	Stroke Weight		Typeface LSB		25
26	Typeface MSB		Serif Style		27
28	Quality		Placement		29
30	Underline Position		Underline Thickness		31
32	Text Height				33
34	Text Width				35
36	First Code				37
38	Last Code				39
40	Pitch Extended		Height Extended		41
42	Cap Height				43
44-46	Font Number				45-47
48-63	Font Name				49-63
64	Copyright (optional)				65

## 11.2 Resolution-Specified Bitmap Font Definition

### (Format 20)

The Resolution-Specified Bitmap font definition shown below is the same as the Standard Bitmap font definition, except that it allows specification of resolution (shaded fields). As with the Standard Bitmap Definition, the *Font Descriptor Size* field and the *First Code/Last Code* fields must be filled and valid. The *Font Descriptor Size* field for the Resolution Specified Bitmap must be at least 68.

Byte	15 (MSB)	8	7 (LSB)	0	Byte
0	Font Descriptor Size (68)				1
2	Format (20)		Symbol Set Type		3
4	Style MSB		Reserved		5
6	Baseline Position				7
8	Cell Width				9
10	Cell Height				11
12	Orientation		Spacing		13
14	Symbol Set				15
16	Pitch (Default HMI)				17
18	Height				19
20	x-Height				21
22	Width Type		Style LSB		23
24	Stroke Weight		Typeface LSB		25
26	Typeface MSB		Serif Style		27
28	Quality		Placement		29
30	Underline Position		Underline Thickness		31
32	Text Height				33
34	Text Width				35
36	First Code				37
38	Last Code				39
40	Pitch Extended		Height Extended		41
42	Cap Height				43
44-46	Font Number				45-47
48-62	Font Name				49-63
64	X Resolution				65
66	Y Resolution				67
68	Copyright (optional)				69
n	...				n+l

The following notation is used to define data types in the font definitions:

(BOOL) Boolean (0,1)  
 (UBYTE) Unsigned Byte (0 . . . 255)  
 (SBYTE) Signed Byte (-1 28 . . . 1 27)  
 (UINT) Unsigned Integer (0 . . . 65535)  
 (SINT) Signed Integer (-32768 . . . 32767)  
 (ULINT) Unsigned Long Integer (0 . . . (232-1 ))  
 (SLINT) Signed Long Integer (\_231 . . . (23 (ASCxx)  
 ASCII String (array (0 . . . (xx-1))) of characters

**11.2.1 Font Descriptor Size (UINT)**

This field contains the number of bytes in the font descriptor (not the font definition size, which is given by the escape sequence value field). See the font definition tables for the appropriate value. The font is invalid if the size is less than the minimum required.

**11.2.2 Descriptor Format (UBYTE)**

Identifies the font as one of the following:

ValueFormat  
 0 Standard Bitmap  
 20 Resolution-Specified Bitmap

Unrecognized values invalidate font creation.



*HP DeskJets prior to the HP DeskJet 600 Series use a value of 9 for landscape fonts or fonts larger than 18 points; all other HP DeskJet fonts use a value of 5.*

*The HP DeskJet 600 and 85X Series printers only support formats 0 (Standard Bitmap), and 20 (Resolution-Specified Bitmap).*

**11.2.3 Symbol Set Type (UBYTE)**

Describes the font’s relationship to symbol sets.

Value	Symbol Set Organization
0	Bound font, 7-bit (96 characters) - Character codes 32-127 [decimal] are printable <sup>a</sup>
1	Bound, 8-bit (192 characters) - Character codes 32-127 and 160-255 printable.
2	Bound font, 8-bit (256 characters) - All codes are printable except 0, 7-15, and 27 <sup>a</sup>
10	Unbound font, no symbol set affiliation - Character codes correspond to MSL numbers (for Intellifont unbound scalable fonts)
11	Unbound font, no symbol set affiliation - Character codes correspond to Unicode numbers (for TrueType unbound scalable fonts)

- a. Access to those codes that are unprintable, yet have a character defined, requires the use of the Transparent Print (Esc & P # X) command

#### 11.2.4 Font Type (UBYTE)

Identifies the font type as one of the following:

Value	Symbol Set Organization
0	7-bit (32 -1 27 are printable)
1	8-bit (32 -127 and 160 - 255 are printable)
2	PC-8 (0 - 255 are printable except 7 -1 5 and 27)
3	16-bit (all are printable except 0, 7 -1 5, 27, 65279, 65534, and 65535)

A type 3 font is a 16-bit font with character codes downloaded according to some native mapping (for example, Shift-JIS, JIS208, etc.). This native mapping allows the font to be used as a stand-alone font, or it can be bound to another symbol set and then used.

#### 11.2.5 Style MSB (UINT)

The style MSB (byte 4) is combined with the style LSB (byte 23) to make the style word, which is calculated from the partial sums for posture, width, and structure. The binary structure of the style word is shown below.

$$\text{Style Word} = \text{Posture} + (4 \times \text{Width}) + (32 \times \text{Structure})$$

<b>15</b>	<b>14</b>	<b>10</b>	<b>9</b>	<b>5</b>	<b>4</b>	<b>2</b>	<b>1</b>	<b>0</b>
X	reserved		structure		width		posture	

- Value(#) = Posture (style word partial sum)
- 0 - Upright
  - 1 - Italic
  - 2 - Alternate Italic
  - 3 - Reserved
- = Width (style word partial sum multiplied by 4)
- 0 - Normal
  - 1 - Condensed
  - 2 - Compressed or extra condensed
  - 3 - Extra compressed
  - 4 - Ultra compressed
  - 5 - Reserved
  - 6 - Extended or expanded
  - 7 - Extra extended or extra expanded
- = Structure (style word partial sum multiplied by 32)
- 0 - Solid
  - 1 - Outline
  - 2 - In-line
  - 3 - Contour, Edge effects
  - 4 - Solid with shadow

- 5 - Outline with shadow
- 6 - In-line with shadow
- 7 - Contour with shadow
- 8-11 -Patterned (complex patterns, subjective to typeface)
- 12-15 - Patterned with shadow
- 16 - Inverse
- 17 - Inverse in open border
- 18-30 - Reserved
- 31 - Unknown structure

The reserved bits (10 to 15) should be set to 0.

If a font style of “italic compressed contour” is downloaded, the value(#) would be:

$$1 + (2 \times 4) + (3 \times 32) = 105$$

#### 11.2.6 Baseline Position (UINT)



*HP DeskJet 600 and 85X Series printers ignore this field.*

**TrueType** - Set to 0.

#### 11.2.7 Cell Width (UINT)



*HP DeskJet 600 and 85X Series printers ignore this field.*

#### 11.2.8 Cell Height (UINT)



*HP DeskJet 600 and 85X Series printers ignore this field.*

#### 11.2.9 Orientation (UBYTE)

Specifies font orientation. All font characters must have the same orientation as those specified in the font descriptor; otherwise they are discarded as they are downloaded.

- 0 = portrait (0 degrees; the orientation of the printer's raster scan)
- 1 = landscape (90 degrees counterclockwise)
- 2 = reverse portrait (180 degrees counterclockwise)
- 3 = reverse landscape (270 degrees counterclockwise)



*HP DeskJet 600 and 85X Series printers will rotate the fonts to match the paper's physical coordinate system for various paper sizes.*

### 11.2.10 Spacing (BOOL)

Specifies the type of font spacing. Fixed spacing is 0; proportional spacing is 1; dual-fixed spacing is 2.



*HP DeskJet printers prior to the HP DeskJet 600 Series treat values other than 0 or 1 as 1, and require that landscape fonts have fixed spacing.*

### 11.2.11 Symbol Set (UINT)

**Bound Font** - Specifies the symbol set characteristic of the font.

The value for this field is derived from the symbol set identification number (ID) used by Esc(ID) in the font selection process. The number portion (#) and the ASCII value of the letter portion (L) of the ID are used to obtain the symbol set descriptor field value:

Symbol Set Descriptor Field = (# x 32) + (L - 64)

Assume the symbol set is US ASCII ISO-6. The symbol set table in the section "Font Selection by Attribute," identifies US ASCII as "0U". Since # = 0 and U = 85, the field value is 21:

$$\text{Symbol Set Descriptor Field} = (0 \times 32) + (85 - 64) = 21$$

**Unbound Font** - This field should be set to 56 (1X) for unbound fonts.

### 11.2.12 Character Set (UINT16)

The Character Set field specifies the native mapping of a large font.

### 11.2.13 Pitch (UINT)

**Bitmap Font** - Specifies the pitch of the font in quarter-dot units (i.e., four quarter-dot units equal one dot; also known as radix dots). It combines with Pitch Extended to specify the pitch of the font in 1/1024 dots. Pitch defines the default HMI for the font.

For example, at 300 dpi (1200 quarter-dots/inch), a 17-ppi font has a pitch field of 70 and a non-zero pitch extended field.

$$(1 \text{ inch} / 17 \text{ char}) \times (300 \text{ dots} / \text{inch}) \times (4 \text{ radix dots} / \text{dot}) = 70.588 \text{ radix dots}$$

The remainder 0.588 is converted back to dots and then to 1/1024 dots:

$$(0.588 \text{ radix dots} / 4 \text{ radix dots per dot}) \times (1024 \text{ units} / \text{dot}) = 150 \text{ units/dot}$$

Pitch Extended is set to 1501/1024 units.

For proportional fonts, the width "printed" for a control code space is determined by the pitch value unless HMI has been changed.

**11.2.14 Height (UINT)**

**Bitmap Font** - Specifies the font's height in quarter-dot units. The value, converted to points (1/72 inch), is used as the height characteristic of the font. Height combines with Height Extended to specify the design height of the font in 1/1024 dots.

For example, a 10 point font at 300 dpi has a height field of 166 quarter dots (1200 quarter dots/inch, 1/72 inch/ point).

$$(10 \text{ point}) \times (1 \text{ inch} / 72 \text{ point}) \times (300 \text{ dots/inch}) \times (4 \text{ quarter-dots/dot}) = 166.667$$

**11.2.15 xHeight (UINT)**

**Bitmap Font** - Specifies the height of the lower case "x" in quarter dots.

All HP DeskJet 600 and 85X Series printers ignore this field.

**11.2.16 Width Type (SBYTE)**



*HP DeskJet printers ignore this field.*

**11.2.17 Style LSB (UBYTE)**

The least significant byte of the style word. Refer to the Style MSB field.

**11.2.18 Stroke Weight (SBYTE)**

Specifies the thickness of the font characters. The standard stroke weight is 0 for a medium font, 3 for a bold font, and -3 for a light font.

Value	Stroke Weight
-7	Ultra thin
-6	Extra thin
-5	Thin
-4	Extra light
-3	Light
-2	Demi-light
-1	Semi-light
0	Medium, Book, or Text
1	Semi-bold
2	Demi-bold
3	Bold
4	Extra bold



Value	Stroke Weight
5	Black
6	Extra black
7	Ultra black
Default = 0	
Range = -7 to 7 (less than -7 maps to -7; greater than 7 maps to 7)	

### 11.2.19 Typeface [LSB/MSB] (UBYTE)

Specifies the HP typeface number of the font. Three versions of this field are used: the obsolete single-byte version for older fonts, the version used by HP DeskJet 500 and HP LaserJet III printers, and the new HP LaserJet 4 version (also used by the HP DeskJet 600 and 85X Series printers).

#### Single-Byte Version

HP DeskJets prior to HP DeskJet 500 and HP LaserJets prior to HP LaserJet IID used only the least significant byte (LSB). These printers ignore the upper byte (MSB) in the current version described below.

#### HP LaserJet III / HP DeskJet 500 Version

The typeface word includes a 4-bit field for the vendor number, a 2-bit field for the version number, and a 9-bit field for the actual typeface number. The most significant bit of the most significant byte is always zero. The typeface word is shown below.

#### Typeface Family Value

MSB				LSB			
15	14	11	10	9	8	0	
0	Vendor			Version		Typeface Base Value	

#### Typeface Base Value

- 0 Line Printer or Line Draw
- 3 Courier
- 4 Helvetica
- 5 Times Roman
- 6 Letter Gothic
- 7 Script
- 8 Prestige
- ...

#### Version (typeface word partial sum multiplied by 512)

- 0 1st version
- 1 2nd version

- 2 3rd version
- 3 4th version

**Vendor** (typeface word partial sum multiplied by 2048)

- 0 Reserved for generic typeface selection.
- 1 Reserved for HP use only.
- 2 Agfa Division, Miles Inc.
- 4 Bitstream Inc.
- 6 Linotype Company
- 8 The Monotype Corporation plc
- 10 Adobe Systems, Inc.

3, 5, 7, 9, 11-15 Reserved

Default = 3

Range = 0 to 65535 (unavailable values are ignored)

**Vendor Number** (bits 11-14) - This HP-assigned value is between 0 and 15.

**Vendor Version** (bits 10, 9) - This value is between 0 and 3. It will change when the vendor changes the width of a font or adds new characters to a font. A vendor code of 0 is reserved for generic typeface selection so that older one-byte typeface values can still be used in the generic typeface selection process.

**Typeface Base Value** (bits 0 to 8) - This value is between 0 and 511. Some of these values include appearance width and structure information (i.e., Helvetica Compressed and Helvetica Outline, etc.).



*A typeface family value in which both Vendor and Version numbers are 0 is reserved for generic typeface selection. That is, for typeface family values less than 512, the printer exactly matches the LSB typeface base value field. For typeface values greater than or equal to 512, the printer uses the full 16-bit typeface word.*

PROCEDURE:

Typeface Family = Typeface Base Value + (Version x 512) + (Vendor x 2048)

The HP typeface number for Agfa's Dom Casual typeface is 4157 (vendor value=2, version value=0, and typeface value = 61).

$$61+(0 \times 512)+(2 \times 2048)=4157$$

### 11.2.20 Serif Style (UBYTE)

HP DeskJet 600 and 85X Series printers ignore this field.

### 11.2.21 Quality

HP DeskJet 600 and 85X Series printers ignore this field.

### 11.2.22 Placement

HP DeskJet 600/800/900 & HP 2000 Series printers ignore this field.

### 11.2.23 Underline Position (SBYTE)

**Bitmap Font** - Specifies the distance from the baseline to the top dot row of the underline in dots. Zero specifies an underline position at the baseline. A positive value specifies an underline position above the baseline. A negative value specifies an underline position below the baseline.

**Scalable Font** - Set to 0. Underline Distance is ignored. The Master Underline Position field identifies this information for scalable fonts.



*HP DeskJet 600 and 85X Series printers use this field for auto-underlining.*

### 11.2.24 Underline Thickness (UBYTE)

Specifies the thickness of the underline in dots for a bitmap font.

**Bitmap Font** - Specified in dots. A bitmap font prints 3-dot thick underlines at 300 dpi and 6-dot thick underlines at 600 dpi.

**Scalable Font** - Should be ignored and set to 0. The Master Underline Height provides this information.



*HP DeskJet 600 and 85X Series printers use this field for auto-underlining.*

### 11.2.25 Text Height (UINT)

Specifies the font's optimum interline spacing for this font. This value is typically 120% of the height of the font.

**Bitmap Font** - Specified in quarter-dot units.

**Scalable Font** - Specified in design window units (defined in the Scale Factor field).

### 11.2.26 Text Width (UINT)

Specifies the font's average lowercase character width (it can be a weighted average).

**Bitmap Font** - Specified in quarter-dots.

**Scalable Font** - Specified in design window units (defined in the Scale Factor field).

### 11.2.27 First Code (UINT)

Specifies the character code of the first printable character in the font. The space character may be printable, and will print an image if one is defined; otherwise, a space control code is executed.

For a type 3 font, this field can have any value from 0 through 65535. First Code must be less than or equal to Last Code.

Symbol SetType	First Code/Last Code
0	32/127
1	32/127-160/255
2	0/255
10	Set to 0 (for unbound font)
11	Set to 0 (for unbound font)

### 11.2.28 Last Code/Number of Chars (UINT)

Specifies the character code of the last printable character in the font. This value may be greater than the last code of the symbol set as implied by the symbol set type because there may be components of compound characters that are not part of the symbol set, but must be downloaded.

For a bound font, this field specifies the last downloadable character code in the font. For an unbound font (type 10 or 11), it specifies the maximum number of characters that can be downloaded into the font.

For a type 3 font, this field can be any value from First Code through 65535. Last Code can be equal to First Code.

### 11.2.29 Pitch Extended (UBYTE)

**Bitmap Font** - This is an addition to the Pitch field that extends pitch an extra 8 bits to allow 10 bits of fractional dots. The value of this field is in 1/1024 dot units. For example, a 17-ppi font for a 300-ppi device would have a Pitch field of 70 (17.5 dots or 17.1429 cpi) and a Pitch Extended field of 150 (0.1465 dots additional, which adds to 17.6465 dots, or 17.0005 cpi). An example of calculating the Pitch and Pitch Extended fields is provided in the Pitch field description.

**Scalable Font** - This field is set to zero.



*HP DeskJet 500 Series printers ignore this field. The HP DeskJet 600 and 85X Series printers do not*

### 11.2.30 Height Extended (UBYTE)

**Bitmap Font** - This is an addition to the Height field that extends the height an extra 8 bits to allow 10 bits of fractional dots. The value of this field is in 1/1024 dot units. For example, a 10

point font for a 300-ppi device would have a height of 166 (41.5 dots, or 9.96 points) and a Height Extended field of 170 (0.1660 dots additional, which adds to 9.9998 points). This field is similar to the Pitch Extended field (refer to the Pitch field example).

**Scalable Font** - This field is ignored and should be set to zero.



*HP DeskJet 500 Series printers ignore this field. The HP DeskJet 600 and 85X Series printers do not.*

### 11.2.31 **Cap Height (UINT)**

Cap height is a percentage of the Em of a font and is used to calculate the distance from the cap line (top of an unaccented, upper-case letter, e.g., "H") to the baseline. An Em is a measure in decipoints of the height of a font; e.g., the em of a 10-point font is 100 decipoints.

**Bitmap Font** - Fonts containing a 0 in this field are assumed to have a cap height percentage of 70.87% of em. The Cap Height data is represented as the product of the cap height percentage and the maximum unsigned integer:

$$0.7087 \times 65535 = 46445$$

For nonzero values the Cap Height percentage is calculated as follows:

$$\% = (\text{Cap Height Data} / 65535) \times 100$$

**Scalable Font** - Contains the cap height in design window units (as defined in the Scale Factor field).

### 11.2.32 **Font Number (UINT)**

**Bitmap Font** - Should be ignored and set to 0.

### 11.2.33 **Font Name (ASC16)**

This is a 16 byte ASCII character field in which the user may assign a font name.

### 11.2.34 **X Resolution (UINT)**

In resolution-specified bitmap fonts, this field specifies the resolution of the font in the X dimension in dots per inch.

### 11.2.35 **Y Resolution (UINT)**

In resolution-specified bitmap fonts, this field specifies the resolution of the font in the Y dimension in dots per inch.

**11.2.36 Copyright**

This optional field contains ASCII data.

**11.2.37 Font Scaling Technology**

This field specifies either an Intellifont or TrueType scalable font or, for Format 16, a bitmap font.

Value	Font Scaling Technology
0	Intellifont
1	TrueType
254	bitmap

Using a value of 254 for bitmap fonts reserves the lower values for other font scaling technologies as they evolve.

**11.2.38 Segment Size**

The Segment Size field of a Format 16 font is 32 bits in length.

### 11.3 Bitmap Resolution Segment

The BR (Bitmap Resolution) segment is used to define the X resolution and Y resolution of the bitmap.

This segment must be present for bitmap fonts, otherwise the font is invalidated.

If the specified resolution is not supported by the device, the font is invalidated.

The structure for the BR segment is:

Byte	15	(MSB)	8	17	(LSB)	0	Byte
x	BR						x+1
x+2	Segment Size						x+3
x+4							x+5
x+6	X Resolution						x+7
x+8	Y Resolution						x+9

#### 11.3.1 X Resolution (UINT16)

In resolution-specified bitmap fonts, this field specifies the resolution of the font in the X dimension in dots per inch.

#### 11.3.2 Y Resolution (UINT16)

In resolution-specified bitmap fonts, this field specifies the resolution of the font in the Y dimension in dots per inch.

## 11.4 Character Enhancement Segment

The CE (Character Enhancement) segment is used to indicate if a downloaded font is allowed to use the printer's character enhancement algorithms. It allows soft-font vendors and ISVs to use the printer's algorithms to enhance their fonts.

The structure of the CE segment is:

Byte	15 (MSB)	8	17 (LSB)	0	Byte
x	CE				x+1
x+2	Segment Size				x+3
x+4					x+5
x+6	Style				x+7
x+8					x+9
x+10	Stroke Weight				x+11
x+12	Sizing				x+13

### 11.4.1 Style (UINT32)

This field specifies the style treatments that the printer is allowed to apply to the font characters.

Style Word = Posture + Structure

31	12	11	4	3	0
Structure			Reserved		Posture

Bit Positions (#) = Posture  
 1 italics  
 0,2,3 reserved  
 = Structure  
 12 Outline  
 13 Shadow  
 14- 31 reserved

### 11.4.2 Stroke Weight (UINT32)

This field specifies the stroke weight (thickness of the font character strokes) for the printer to apply to the font.

15	9	8	7	0
Bolding			Lightening	

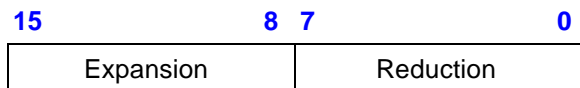


Bit Positions (#)	=	StrokeWeight
		0 - 6 reserved
		7 Semi Light
		8 "Book" or "Text"
		9 Semi-Bold
		10 Demi-Bold
		11 Bold
		12 Extra Bold
		13 Black
		14 Extra Black
		15 Ultra Black

### 11.4.3 Sizing (UINT16)

This field specifies the algorithmic size transformations that can be applied to the font. The operation can apply to either the X or Y dimension of the characters.

Sizing Word = Reduction + Expansion



Bit Positions (#)	=	Reduction
		0 0.5 X dimension
		1 0.5 Y dimension
		2 - 7 reserved
	=	Expansion
		8 1.5 X dimension
		9 1.5 Y dimension
		10 2 X dimension
		11 2 Y dimension
		12 - 15 reserved

HP DeskJet 600, 700, 800 and HP 2000 Series printers support only 0.5 X/Y, 1.5 X/Y, and 2 X/Y.

## 11.5 Dual-Pitch-Space Char Segment

The DP (Dual-Pitch-Space Character Code) segment is used to specify the space character code for full-width spacing (two-byte characters) and half-width spacing (one-byte characters).

The structure for the Dual-Pitch-Space Character Code segment is as follows:

Byte	15 (MSB) 8	7 (LSB) 0	Byte
x	DP		x+1
x+2	Segment Size		x+3
x+4			x+5
x+6	Full-Width-Space Character Code		x+7
x+8	Half-Width-Space Character Code		x+9

### 11.5.1 Full-Width-Space Character Code

**(UINT16)**

This field contains the character code for a full-width space character (for two-byte character sets).

### 11.5.2 Half-Width-Space Character Code

This field contains the character code for a half-width space character (for one-byte character sets).

## 12.0 HP LaserJet Bitmap Character Definition

The format for the HP LaserJet bitmap character definition and continuation block is shown below. Format is set to 4, and Descriptor Size is set to 14.

Byte	15 (MSB) 8	7 (LSB) 0
0	Format (4)	Continuation (0)
2	Descriptor Size (14)	Class (1)
4	Orientation	Reserved (0)
6	Left Offset	
8	Top Offset	
10	Character Width	
12	Character Height	
14	Delta X	
16	Bitmap Character Data: (in bytes) ....	
0	Format (4)	Continuation (non-zero)
2	Bitmap Character Data: (in bytes) ....	

### 12.0.1 Format (UBYTE)

Specifies the character descriptor format.

Value	Format
0	82906A
1	82450A
3	QuietJet
4	LaserJet bitmap
5	DeskJet
6	PaintJet
7	PaintJet XL
8	RuggedWriter
9	DeskJet PLUS
19	Intellifont
12	DeskJet 500
15	TrueType

The character is discarded if the format is different from that expected by the device.



*HP DeskJet 600 and 85X Series printers support only format 4.*

### 12.0.2 Continuation (BOOL)

Specifies whether the following data is a character descriptor block (0) or a continuation (non-zero) of the data associated with the previous character descriptor.

If the byte count in the value field of the Define Character command exceeds 32767, the character must be sent in 2 or more blocks. The additional bytes are sent in as many continuation blocks as needed (except compound characters).

Compound characters (e.g., accented characters) cannot be continued.

A character that has not received all the character data is an “incomplete” character. There is at most one incomplete character at a time. If an incomplete character is deleted, any subsequent continuation downloads are ignored.

A continuation block that is downloaded before the first block was received is ignored.

### 12.0.3 Descriptor Size (UBYTE)

Specifies character descriptor size in bytes. The descriptor follows the character header, which consists of the first two bytes of the character definition (the Format and Continuation fields). For bitmap characters, the descriptor size includes Descriptor Size through Delta X. For Intellifont characters, the descriptor size includes only Descriptor Size and Class. For TrueType characters, the descriptor size includes Descriptor Size and Class, but additional descriptor information can follow; therefore, the minimum TrueType descriptor size is 2.

Value	Device
6	DeskJet (Format 5 or 9 character descriptor)
7	DeskJet (Format 12 character descriptor)
2	Intellifont
2+	TrueType (additional descriptor information can be added)
14	LaserJet bitmap

### 12.0.4 Class (UBYTE)

Specifies the format of the character data.

Value	Class
1	Bitmap
2	Compressed bitmap
3	Intellifont
4	Compound Intellifont
15	TrueType

**Class 1: Bitmap Data** - Class 1 character data is a string of bytes containing the dot-per-bit image of the character, with no compression. A “1” bit causes the dot to be printed.

The data is grouped in dot rows describing a one-dot high strip of the character from left to right in the direction of the printer’s raster scan. The dot rows are organized from top to bottom

of the character (in portrait orientation): the first dot row of data corresponds to the first dot row of the character. The end of each row is padded with zero bits so it contains an integral number of bytes.

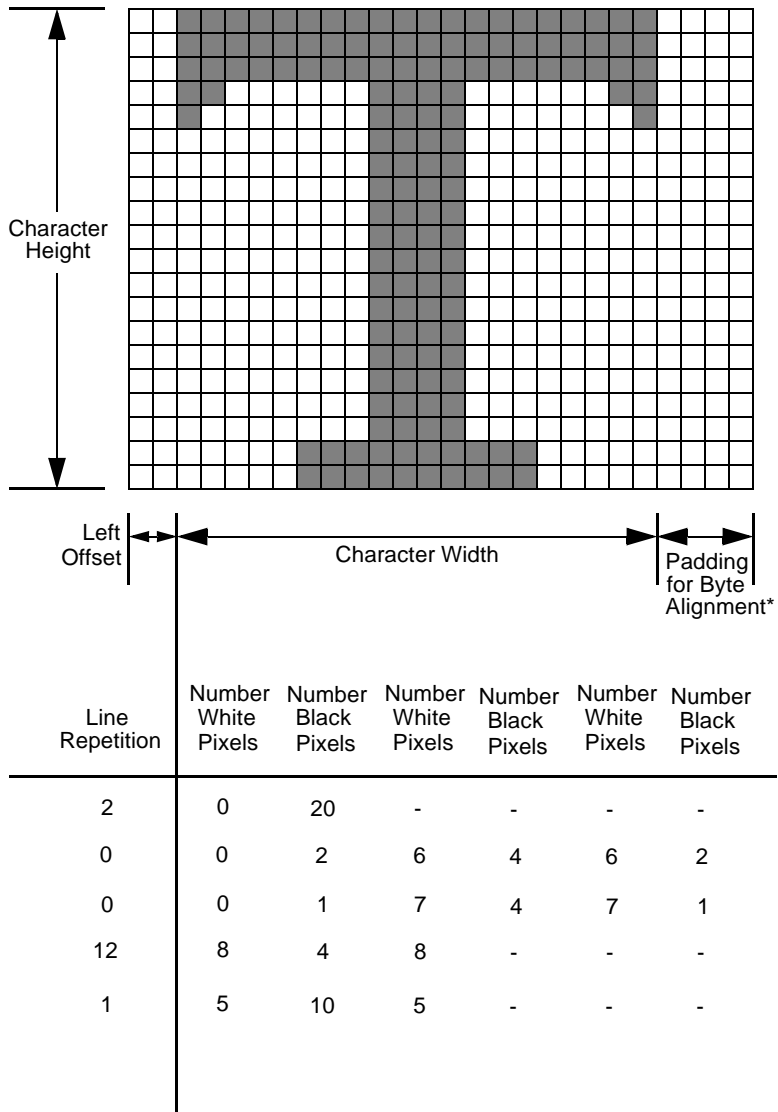
The number of bytes of the character data should be exactly the Character Width (in bytes) times the Character Height. Additional data is discarded. The character will consist only of the downloaded character data, even if this is insufficient.

**Class 2: Compressed Bitmap Character Data** - (see the figure below) Class 2 character data is composed of a string of bytes using a compressed run-length-with-line-repetition format. The first byte tells how many times the first row is repeated after the initial row. The second byte tells how many white dots start the row (if the first dot is black, the second byte is 0). The third byte tells how many black dots follow, the fourth byte tells how many white dots follow that, etc., until the end of the row.

The character width (dots) field in the character descriptor determines the row width: the dot count for each row in the character cell must equal the character width. For example, in the following figure, the cell width is 20; thus each row (excluding the repetition count byte) adds up to 20.

The fully described row is duplicated the number of times indicated by its first byte. After the duplication, the next byte indicates the repetition count for the next row.

More than 255 dots of the same type in a row is indicated by a byte containing 255, followed by a byte containing 0 (meaning there are none of the opposite type of dots), followed by a byte containing the count of the remaining dots of the current type.



\*Byte alignment is necessary only for raster data (i.e., not for compressed raster data).  
 Uncompressed - 60 bytes  
 Compressed - 25 bytes

**Class 2 Compressed Bitmap Character Data**

### 12.0.5 Orientation (UBYTE)

Bitmap fonts only. Specifies the orientation of the character. Character orientation must match the orientation in the font descriptor, as follows:

Value	Orientation
0	Portrait
1	Landscape
2	Reverse-portrait
3	Reverse-landscape

The character is discarded if the orientation is not supported or is different from the font orientation.

### 12.0.6 Left Offset (SINT)

Bitmap fonts only. Specifies the distance in dots from the reference point to the left side of the character pattern on the physical page coordinate system (i.e. this value is orientation dependent). The left and top offsets locate the character reference point about CAP.

HP DeskJet 600 and 85X Series printers recognize a range of -16384 to 16384.

### 12.0.7 Top Offset (SINT)

Bitmap fonts only. Specifies the distance in dots from the reference point to the top of the character pattern on the physical page coordinate system (i.e. this value is orientation dependent). The left and top offsets locate the character reference point about CAP.

HP DeskJet 600 and 85X Series printers recognize a range of -16384 to 16384.

### 12.0.8 Character Width (UINT)

Bitmap fonts only. Specifies the width of the character in dots on the physical coordinate system (i.e. this value is orientation dependent). Generally, this width is from the farthest left black dot to the farthest right black dot.

HP DeskJet 600 and 85X Series printers recognize a range of 1 to 16384.

### 12.0.9 Character Height (UINT)

Bitmap fonts only. Specifies the height of the character in dots on the physical coordinate system (i.e. this value is orientation dependent).

HP DeskJet 600 and 85X Series printers recognize a range of 1 to 16384.

**12.0.10 Delta X (SINT)**

Bitmap fonts only. Specifies the number of quarter-dot units (radix dots) by which the horizontal position within the HP PCL logical page coordinate system is incremented after printing the character. If the value field is negative, the value is set to 0. This value is used by the printer only when the font is proportionally spaced.

**12.0.11 Character Data**

The character data is in the format specified by the class field.



## 13.0 Banner Printing

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The following information concerns the printing of continuous forms (banners, z-fold media) on the HP DeskJet 680 and 690 Series printers. This is the only information made available by the VCD R&D lab. There are no new HP PCL commands for banner printing. The only HP PCL command that has actually been modified in association with printing on continuous media is the `^M` command. Only media sizes (as selected with the Media Size command) US Letter and ISO/JIS A4 can be used for continuous form printing.

### 13.0.1 Media Source

#### **Esc & *l* # H**

The HP DeskJet 680 and 690 Series printers add support for sources -1 (z-fold) and 1 (Tray 1, cut sheet).

Default media source is Tray 1.

Note that the value used for the variable parameter in the command ("`^M`"), like the rest of the command, is an ASCII character string. Therefore, a value of "-1" would actually be sent to the printer as a hex equivalent of "2E 31".



*The HP DeskJet 680 and 690 Series printers support values -1, 0, and 1. When the media source is z-fold, a value of "0" will eject one blank page. If media remains in the mechanism, the printer will enter a paper-unloading state (see *Unloading Continuous Media*, below). In this state, the top LED on the face of the printer will flash, and pressing the RESUME button will advance one page.*

The banner source is only supported for media sizes (see Esc & *l* # A) of US-Letter (11 inches) and ISO/JIS A4 (11 2/3 inches). All other media sizes will only load from the cut sheet media source (Tray 1). This is to ensure that only banners of lengths HP has tested will be printed.

If the printer runs out of paper in the middle of a banner, the rest of the banner data (until the Esc & *l* 0 L) will be discarded. There will be no front panel indication when this data is discarded.

In the absence of bidirectional communication, if Tray 1 is selected while continuous media is loaded at the paper sensor, the mechanism will print the cut sheet job on the continuous media, as if it were a cut sheet job.

### 13.0.2 Margins

Margins in banners are handled the same as margins with cutsheet media. Default top and bottom margins are 1/2 inch. If perforation skip is disabled (Esc \* ℓ 0 L), the margins are adjusted to 0 top and bottom. The initial cursor (CAP) position in each page is calculated by:

top margin + (3/4 \* current line feed) {where current line feed = 1/lines per inch}

With perf skip disabled, the default cursor position is:

$$0 + (3/4 * 1/6 \text{ inch}) = 1/8 \text{ inch}$$

To position raster graphics at position 0, it is necessary to execute a negative cursor move. For example Esc \* p - 38 Y will move backwards 1/8 inch. Esc \* p 0 Y also works when perf skip is disabled

### 13.0.3 Command Sequence

The media source must be selected for *Continuous Forms* before the negative cursor move is performed, as the Media Source command will default the cursor position to the top left corner of the defined logical page. In most cases, this defaulting action will leave some amount of top margin, resulting in a gap appearing in the banner image at the media perforation. By setting the media source first, and following that command with the negative cursor move, banner images can be printed. *Remember that the negative cursor move must be performed at the beginning of each new page.*

### 13.0.4 Moving to a New Logical Page

Since raster graphics moves are clipped to the current logical page, it is necessary to explicitly move to a new page once the current page is filled. As shown in the HP PCL example on the following page, this may be accomplished by sending a form feed (followed by the appropriate cursor positioning).

Raster graphics advances never move to the next page, any excess rasters (raster data that would exceed the logical page boundary) will be discarded. If a raster block spans a page boundary, it must be sent as multiple blocks, along with the appropriate cursor positioning to align on the physical media.

For text printing on continuous media, line feeds or form feeds may be used to advance to the next logical page.

### 13.0.5 Unloading Continuous Media

When the printer has completed a continuous-media print job, it will advance the paper to the end of the page after the current page. If media remains in the mechanism, the top LED will flash. Pressing the Resume button will advance one page. Media must be removed and reinserted between each banner print job.

**13.0.6 Power-On with Continuous Media**

The firmware will remember what media type is loaded. If powered down with continuous media loaded, the firmware will power on with the top LED flashing (as described above) allowing the user to unload the continuous media if cutsheet media is desired for the next print job.

**13.0.7 Power-Off with Continuous Media**

If the Power key is pressed while in the middle of a banner page, the media will first be advanced to the next top of form before turning the printer off. Any unprinted data will be lost.

**13.0.8 Printing Cutsheet with Z-Fold Media**

Attempting to print cutsheet media while z-fold media is loaded and there exists a bidirectional I/O connection between the host and printer, will halt the printer in an error state. Power cycling will clear the error.

Without a bidirectional I/O connection, the printer will format and print the cutsheet job on the z-fold media.

**13.1 Sample HP PCL for a Banner Print Job**

<b>HP PCL Command</b>	<b>Escape Sequence</b>	<b>Notes</b>
Reset	Esc E	Set HP PCL to default state
Media Source	Esc & ℓ -1 H	Continuous Forms
Media Size	Esc & ℓ 2 A	US Letter
Perf Skip Off	Esc & ℓ 0 L	Top/Bottom margins set to zero
CAP Position	Esc * p -300 Y or Esc * p 0 y	Move to top of logical page (move is clipped to page)
Transfer Rasters	Esc * b # V/W	Image data for one page
Form Feed	FF	Move to next logical page
CAP Position	Esc * p -300 Y or Esc * p 0 y	Move to top of logical page (move is clipped to page)
Transfer Rasters	Esc * b # V/W	Image data for another page
Form Feed	FF	Move to next logical page
Eject Banner	Esc & ℓ 0 H	Advances one more page and allows user unloading
Reset	Esc E	Set HP PCL to default state for next job

Spaces are included in the escape sequences in the preceding example to enhance readability. Spaces should not be included in the actual escape sequences sent to the printer.

## 14.0 HP PCL Code Samples

The following pages contain PCL code samples that are intended to address some of the most commonly asked support questions. Key among these questions are coding general page formatting, 4-plane color graphics, and using Configure Raster Data (CRD).

### 14.1 Page Formatting Program Example

The following example is old, but covers the essential page formatting commands. While there is no one best way to write a page formatting program, you can use this example as a starting point. When performed in the order given, the set of commands prints the output shown in the figure at the end of the example.

The example assumes the following formatting objectives:

- ✓ Select US Letter size paper
- ✓ Select portrait page orientation
- ✓ Set  $\frac{3}{4}$  in. top, left, and right margins
- ✓ Set  $1\frac{1}{4}$  in. bottom margin
- ✓ Establish a header centered approximately in the middle of the top margin
- ✓ Establish a footer  $\frac{5}{8}$  inch from the bottom of the paper
- ✓ Set line spacing at 8 lpi
- ✓ Use Letter Gothic and CG Times typefaces

*No assumption is made as to the status of the configuration switches.*



Command Line, Action	Command	Comment
Reset Printer	Esc E	Returns the printer to its default settings.
* Set Paper Size	Esc & ℓ 2 A	Selects U.S. Letter size paper 8 1/2 X 11 in.
* Set Portrait Orientation	Esc & ℓ 0 O	
Enable Perforation Skip Mode	Esc & ℓ 1 L	Default top margin is 1/2 in.
Set Line Spacing	Esc & ℓ 8 D	8 lpi is used for page length and margin calculations.
Specify Page Length	Esc & ℓ 88 P	11 in. X 8 lpi = 88 lines
Set Top Margin	Esc & ℓ 6 E	3/4 in. margin X 8 lpi = 6 lines

Command Line, Action	Command	Comment
Set Text Length	Esc & ℓ 72 F	11 in. page length - [3/4 in. margin + 1 1/4 in. bottom margin] = 9 in. 9 in. X 8 lpi = 72 lines
Specify Fixed 12 cpi	Esc (s 0 p 12 H	12 cpi is used to set columns for side margin calculations.
Set Left Margin	Esc & a 6 L	3/4 in. margin = [6 columns X 12 cpi (selected font pitch)] + 1/4 in. unprintable region
Set Right Margin	Esc & a 90 M	Page width is 8 1/2 in. The unprintable region accounts for 1/4 in. leaving 8 1/4 in. (99 columns at 12 cpi). To set the 3/4 in. margin set the page width at 7 1/2 in. (90 columns at 12 cpi).
Position CAP for Header	Esc * p - 95y + 475 X	Relative movement. 95 decipoints up 475 decipoints to the right.
Select Character Set	Esc (12U	Selects PC-850 character set.
Select Header Font	Esc (s 6 h 12 v 0 s 3 b 6 T	Sets font to Letter Gothic 6cpi 12 point bold.
Header Text	DeskJet Printer Family	
Set VMI to <sup>9</sup> / <sub>48</sub> in.	Esc & ℓ 9 C	Provides a desirable line spacing for 12 point font used in main text.
End Header	<CR> <LF>	Moves CAP out of header and positions it at top/left margin.
Set Main Text Font	Esc (s 1p 12v 0s 0b 4101T	Sets font to CG Times 12 point.
Main Text	In February 1988 HP introd.....	
Position CAP for Footer	Esc * p 2875 y 1800 X	Absolute movement
Specify Footer Font	Esc (s 0p 24h 6v 0s 0b 6T	Sets font to Letter Gothic
Footer Text		
Reset Printer	Esc E	Clears partially composed pages; returns printer to default settings.

## 14.2 Commands Sent to Printer

The series of escape sequences in the table above sends the following commands to the printer. The series of dots (...) indicate main text. Spaces in escape sequences are for clarity only; do not include them in the data stream.

**EscE Esc&2a0O Esc&k1w5W Esc& 18d88p6e72F Esc(s0p12H Esc&a690M Esc\*p-95y+475X Esc(12U Esc(s6h12v0s3b6TDeskJet Printer Family Esc(& 9C**

**Esc(s1p12v0s0b4101T**In February 1988, HP introduced the original DeskJet printer at a U.S. List price of \$995. The DeskJet's market position was "Laser Quality Output for Under \$1,000" and offered a superior print quality alternative for users intending to upgrade to 24 wire dot matrix printers.

In April 1989...

...support for MS Windows 3.0. **Esc\*p2875y1800X Esc(s0p24h6v0s0b6T**Copyright 1990 Hewlett-Packard Co. **EscE**

This example is a guideline to illustrate page formatting. Depending upon the application, other methods may be used to achieve the desired printed page. For example, if you want a header and/or footer to be placed on each page, you can turn Perforation Skip Mode **OFF**, allowing the header to sit at the top margin. You can then use vertical positioning commands to move CAP into position for the main text. Likewise, you can set the printer side margins to 0. You can then use horizontal positioning commands to position CAP for the start of each line.

### 14.3 3-Plane Color Graphics

The following shows a simple 3 plane color graphics PCL code sample that prints CYAN, MAGENTA, YELLOW, then blends them together to produce BLACK, RED, GREEN and BLUE.

<u>PCL Codes</u>	<u>HEX Data (Run Length Compression)</u>	<u>Description</u>
<esc>E		Reset printer
<esc>*r-3U		Simple color(3 plane)
<esc>*r0A		Start raster
<esc>*b1M		Compression method
<esc>*b16V	08FF 0800 0800 0800 08FF 0800 08FF 08FF	(Cyan data)
<esc>*b16V	0800 08FF 0800 0800 08FF 08FF 0800 08FF	(Magenta data)
<esc>*b16W	0800 0800 08FF 0800 08FF 08FF 08FF 0800	(Yellow data)
<esc>*b16V	08FF 0800 0800 0800 08FF 0800 08FF 08FF	(Cyan data)
<esc>*b16V	0800 08FF 0800 0800 08FF 08FF 0800 08FF	(Magenta data)
<esc>*b16W	0800 0800 08FF 0800 08FF 08FF 08FF 0800	(Yellow data)
<esc>*b16V	08FF 0800 0800 0800 08FF 0800 08FF 08FF	(Cyan data)
<esc>*b16V	0800 08FF 0800 0800 08FF 08FF 0800 08FF	(Magenta data)
<esc>*b16W	0800 0800 08FF 0800 08FF 08FF 08FF 0800	(Yellow data)
<esc>*b16V	08FF 0800 0800 0800 08FF 0800 08FF 08FF	(Cyan data)
<esc>*b16V	0800 08FF 0800 0800 08FF 08FF 0800 08FF	(Magenta data)
<esc>*b16W	0800 0800 08FF 0800 08FF 08FF 08FF 0800	(Yellow data)
<esc>*b16V	08FF 0800 0800 0800 08FF 0800 08FF 08FF	(Cyan data)
<esc>*b16V	0800 08FF 0800 0800 08FF 08FF 0800 08FF	(Magenta data)
<esc>*b16W	0800 0800 08FF 0800 08FF 08FF 08FF 0800	(Yellow data)
<esc>*b16V	08FF 0800 0800 0800 08FF 0800 08FF 08FF	(Cyan data)
<esc>*b16V	0800 08FF 0800 0800 08FF 08FF 0800 08FF	(Magenta data)
<esc>*b16W	0800 0800 08FF 0800 08FF 08FF 08FF 0800	(Yellow data)
<esc>*b16V	08FF 0800 0800 0800 08FF 0800 08FF 08FF	(Cyan data)
<esc>*b16V	0800 08FF 0800 0800 08FF 08FF 0800 08FF	(Magenta data)
<esc>*b16W	0800 0800 08FF 0800 08FF 08FF 08FF 0800	(Yellow data)
<esc>*b16V	08FF 0800 0800 0800 08FF 0800 08FF 08FF	(Cyan data)
<esc>*b16V	0800 08FF 0800 0800 08FF 08FF 0800 08FF	(Magenta data)
<esc>*b16W	0800 0800 08FF 0800 08FF 08FF 08FF 0800	(Yellow data)
<esc>*b16V	08FF 0800 0800 0800 08FF 0800 08FF 08FF	(Cyan data)
<esc>*b16V	0800 08FF 0800 0800 08FF 08FF 0800 08FF	(Magenta data)
<esc>*b16W	0800 0800 08FF 0800 08FF 08FF 08FF 0800	(Yellow data)
<esc>*rC		End Raster
<esc>E		Reset printer





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## HP PCL Code Samples

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<u>PCL Codes</u>	<u>HEX Data (Run Length Compression)</u>	<u>Description</u>
<esc>*b18W	0800 0800 0800 08FF 0100 08FF 08FF 08FF 0800	(Yellow data)
<esc>*b18V	08FF 0800 0800 0800 0100 0800 0800 0800 0800	(Black data)
<esc>*b18V	0800 08FF 0800 0800 0100 08FF 0800 08FF 08FF	(Cyan data)
<esc>*b18V	0800 0800 08FF 0800 0100 08FF 08FF 0800 08FF	(Magenta data)
<esc>*b18W	0800 0800 0800 08FF 0100 08FF 08FF 08FF 0800	(Yellow data)
<esc>*rC		End Raster
<esc>E		Reset printer

## 15.0 Printer Commands

Escape Sequence	Action - Result	Escape Sequence	Action - Result
Esc & a # C	Move CAP Horizontal (Columns)	<sup>a</sup> Esc * o # Q	Mechanical Print Quality
Esc & a # H	Move CAP Horizontal (Deci-points)	Esc * p # X	Move CAP Horizontal (HP PCL Units)
Esc & a # L	Left Side Margin Column #	Esc * p # Y	Move CAP Vertical (HP PCL Units)
Esc & a # M	Right Side Margin Column #	Esc * r # A	Start Raster
<sup>a</sup> Esc & a # R	Move CAP Vertical (Rows)	Esc * r C	End Raster
<sup>a</sup> Esc & a # V	Move CAP Vertical (Decipoints)	<sup>a</sup> Esc * r # Q	Raster Graphics Quality
<sup>a</sup> Esc & b # T	Dry Timer ( in seconds)	Esc * r # S	Source Raster Width
Esc & d # D	Enable Underline	Esc * r # U	Simple Color
Esc & d @	Disable Underline	Esc * t # R	Raster Resolution
Esc & k # G	Line Termination	Esc * v # S	Foreground Color
Esc & k # H	Horizontal Motion Index (HMI)	Esc ( # X	Font Selection by ID - Primary
Esc & ℓ # A	Page Size	Esc ) # X	Font Selection by ID - Secondary
Esc & ℓ # C	Vertical Motion Index (VMI)	Esc ( ID	Font Symbol Set - Primary
<sup>a</sup> Esc * b # B	Gray Balance	Esc ) ID	Font Symbol Set - Secondary
Esc & ℓ # D	Line Spacing (in lines per inch)	Esc ( s # B	Font Stroke Weight - Primary
<sup>a</sup> Esc * b # S	Seed Row Source	Esc ) s # B	Font Stroke Weight - Secondary
Esc & ℓ # E	Top Margin (in lines at current lpi)	Esc ( s # H	Font Pitch - Primary (in CPI)
Esc & ℓ # F	Text Length	Esc ) s # H	Font Pitch - Secondary (in CPI)
Esc & ℓ # H	Media Source	Esc ( s # P	Font Spacing - Primary
Esc & ℓ # L	Perforation Skip Mode	Esc ) s # P	Font Spacing - Secondary
Esc & ℓ # M	Media Type	Esc ( s # Q	Font Quality - Primary
Esc & ℓ # O	Orientation	Esc ) s # Q	Font Quality - Secondary
Esc & ℓ # P	Page Length (in lines-current lines per inch)	Esc ( s # S	Font Style - Primary
Esc & s # C	End-of-Line Wrap	Esc ) s # S	Font Style - Secondary
Esc * b # M	Compression Method	Esc ( s # T	Font Typeface - Primary
Esc * b # V	Transfer Raster by Plane	Esc ) s # T	Font Typeface - Secondary
Esc * b # W	Transfer Raster by Row/Block	Esc ( s # V	Font Height - Primary (in points)
Esc * b # Y	Raster Y Offset	Esc ) s # V	Font Height - Secondary (in points)
Esc * c # D	Font ID	Esc ( s # W	Download Character

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## Printer Commands

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Esc * c # E	Character Code	Esc ) s W	Download Font
Esc * c # F	Font Control	Esc Y	Display Functions Mode On
Esc * o # M	Print Quality	Esc Z	Display Functions Mode Off

a. Obsolete commands for 6XX printers and above.

## 16.0 Other Resources for Assistance

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### 16.1 HP Developer Exchange

Available on the World Wide Web - HP Printing & Imaging Solution Provider Program. Become a registered HP Developer, and receive other documents like this one on other HP products.

HP Printing & Imaging Solution Provider Program can be found at:

[http://dsportal.eservices.hp.com/dspp/home/home\\_DSPPJumpPage\\_IDX/](http://dsportal.eservices.hp.com/dspp/home/home_DSPPJumpPage_IDX/)

### 16.2 Comments & Feedback

Feedback on this guide is welcome - send any errors you may find to: [VAC\\_DESKJET@HP.COM](mailto:VAC_DESKJET@HP.COM). Please note - this email address is not for technical support - and you may not receive a personalized response from this email address.