

*Hewlett Packard
DeskJet 600/800 Series
Printers*



Software Developer's PCL Guide

Print Date: September 1997

Development and Support

This DOS Software Developer's Guide is intended for those persons or companies who are registered partners in the HP Peripherals Development Program. If you are involved in the development of commercial software products and/or DOS printer drivers and you are not yet a member of the program, you may receive information about the program and an application packet by contacting the HP Peripherals Developer Program at (408) 345-8888, or via the Web at <http://www.hp.com/go/devexchange>.

This Guide Covers *Only* the printers in the DeskJet 600 and DeskJet 800 series of printers . Other Software Developer Guides cover other HP DeskJet printer models and other development platforms (i.e. Windows and Macintosh). Those guides are available through the HP Peripherals Developer program.

Technical Support for registered members of the Hewlett-Packard Peripherals Developer Program is available by sending an e-mail message to the internet address "isv_deskjet@vcd.hp.com" or a fax to (360)212-6515. Include your name, your company name, , Peripheral Developer Program registration number, and as much detail as required to fully describe the nature of your support request. If you intend to report an apparent defect with an HP DeskJet printer or printer driver, include the printer model or driver version. You must be able to reliably and repeatedly reproduce the problem, and you must be able to tell us how to cause the problem to appear so we can perform an analysis in our testing and R&D facilities.

NOTE

The phone number listed for DeskJet 500, 600, and 800 series printers in the Peripherals Developer Program handbook, (360)212-2620, is no longer in operation as a staffed support line. That number now plays a recording referring the caller to the new e-mail address and fax line.



HP DeskJet 600/800 Series Printers

Software Developer's PCL Guide

Including these HP DeskJet Printers:

DeskJet 600

DeskJet 660

DeskJet 670

DeskJet 680

DeskJet 690

DeskJet 820

DeskJet 850

DeskJet 855

DeskJet 870

DeskJet 890

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Preface: About this developer's guide

Much of the material contained in this guide has been directly extracted from the HP PCL Implementor's Guide, a PCL encyclopedia used for HP-internal development, and which contains proprietary information that prohibits its distribution outside of Hewlett-Packard. The information extracted from the PCL Implementor's Guide has been edited to remove any proprietary information, and to tailor the content to be as specific to the DeskJet 600 and DeskJet 800 series printers as much as possible. However, because of the nature of the source material, there may be occasional discrepancies between the documented application of a particular command and the actual behavior of the printer. Every possible effort has been made to eliminate or minimize the impact of these discrepancies.

Optical Character Reader (OCR) technology was used to scan much of the material contained in this guide. Proofing, editing, and reformatting was performed on the results. Efforts have been made to ensure the accuracy of, and to remove erroneous OCR artifacts from, the contents. However, should you encounter any errors in this guide, we would appreciate your reporting those errors so we can continue to improve the quality and content of the document. Please e-mail to *isv_deskjet@vcd.hp.com* or fax to (360) 212-6515 to report any errors found or problems encountered with this material.

Developer information focusing on interfacing Windows™ applications with the Hewlett-Packard DeskJet Printer Driver for Windows is available in a separate guide, titled "Software Developer's Guide for HP DeskJet printer drivers". Those guides are available through the HP Peripherals Developers program mentioned on the inside front cover of this guide.

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Introduction

This guide represents a remodeling of the previous PCL guides for the DeskJet 600 and 800 series printers offered to members of the HP Peripherals Developer Program. Where we previously offered a separate PCL guide for each printer series, we have reduced redundancy by combining material from each guide into a single document. Any differences that exist between the printer series for any given command or function have been delineated.

The presentation of the material in this guide assumes a familiarity with Hewlett-Packard's Printer Control Language (PCL). The command descriptions that follow contain only the essential information regarding each particular command. If you are new to PCL programming and require introductory material, please contact a technical support provider listed in your HP Peripherals Developer Program Handbook.

The following sections include important issues to keep in mind during the development of PCL programming for DeskJet 600 and 800 series printers. The information provided here is intended to emphasize new printer models and their particular features, points of change between various printer models, and points of potential problems or conflict.

What's New

Fall 1997 brings the introduction of two new DeskJet printers from Hewlett-Packard's Vancouver Division. These include the DeskJet 720C printers, which are the follow-on product to the DeskJet 820C, and the DeskJet 890C, which follows the DeskJet 870C.

DeskJet 890C (incl. 890Cxi, 890Cse)

The HP DeskJet 890 printers are the latest addition to the HP DeskJet 800 series printers. The DeskJet 890 printers provide significant improvements in print speed for both color and black printing. A new color print cartridge provides a dramatic increase in color image print quality. Two new photo image print media are supported by the printers, superseding the HP Premium Glossy Paper print media.

DeskJet 720C (incl. 720Cxi, 720Cse)

The HP DeskJet 720 printers comprise the follow-on printers for the HP DeskJet 820. Like the DeskJet 820, the DeskJet 720 is designed to function as a Windows-only printer, while operating in conjunction with the *HP DeskJet 720 Printer Driver for Windows*. The HP Printer driver has assumed the task of processing most of the data stream in place of firmware onboard the printer. This added processing load requires the host be a moderately powerful PC. As has been the case with the DeskJet 820, developers may experience a higher number of support requests from customers with DeskJet 720 printers running on a low-powered PC, who complain of poor printer and/or host performance. Adequate free space on the hard disk is also essential. Processing a 64K graphics image can, in some extreme cases, generate up to 20mb of temporary files. Larger and highly complex graphics images can require up to 200 MB of free hard disk.

Like the DeskJet 820 printer, the DeskJet 720 does not accept PCL. Bypassing the HP printer driver and writing a data stream directly to the printer port will fail to produce a valid print job. The HP DeskJet 720 Printer Driver for Windows processes the printer data stream written by a Window's application and sends the DeskJet 720 a string of unique commands. The format and protocol of that data stream are HP Proprietary.

DeskJet 670C (incl. 670Cxi, 670Cse)

The HP DeskJet 670 printers, which introduced in the Spring of '97, present the familiar DeskJet 660 with upgraded printer firmware. Faster, and with superior print quality, the DeskJet 670 printers are programmatically identical to the DeskJet 660C.

What's Different

The following section describes areas where DeskJet 600 and 800 series printers vary in behavior or characteristics from previous DeskJet printers, or from one another.

DeskJet 890C printers (incl. 890Cxi, 890Cse)

The DeskJet 850C and 870C platforms supported a 36-pin 1284-B parallel connector for PC hosts *and* an RS-422 serial connector for Macintosh hosts. The DeskJet 890C will *not* provide the RS-422 serial connector for Macintosh hosts. Neither will there be a Macintosh-specific version of the product.

Like the DeskJet 870C, the DeskJet 890C will *not* accept soft font downloads.

The DeskJet 890 printers replace support for HP Premium Glossy Paper with two new photo print media. Support for a new heavy duty plain paper is added as well. These new media are selectable with the **Media Type PCL** command

Memory

As with the DeskJet 870, the DOS print buffer in the DeskJet 890 was reduced from 370 KB (found in the DeskJet 850/855) to 255 KB, in order to provide system resources for other essential processes within the printer firmware. The reduction imposes a throughput reduction of up to 20% in Best mode for non-Windows operating environments (such as DOS).

Fonts

The following are font features that the DeskJet 800 series printers implement differently than previous DeskJets/DeskWriters.

- The DeskJet 800 series printers do not contain on-board bitmapped fonts. All built-in fonts are scalable typeface fonts, which are scaled to any requested point size by the font scaling technology included in the printer's firmware. The TFM (Tagged Font Metrics) files that accompany this Software Developers Guide are required to properly utilize the DeskJet series font scaling technology system. The DeskJet 800 Series printers are the first Vancouver product to support scalable fonts in hardware - in both Intellifont and TrueType format. Resolution Enhancement technology (RET) improves quality of draft print modes with minimal performance degradation. In addition, the DeskJet 800 Series printers support several new symbol sets for broader localization potential.
- The DeskJet 800 Series printers do not support asymmetrical, fixed-pitch fonts. These are fonts that are fat and squashed, such as Courier 6 point, 10 pitch, or tall and skinny, such as Letter Gothic 24 point, 24 pitch.
- The DeskJet 800 Series printers do not support algorithmic font enhancements (bold and half-height).
- The DeskJet 800 Series printers do not support double underlining.
- The DeskJet 850C and 855C printers support the LaserJet 4 version of the typeface word in the PCL Font Typeface (Primary) and Font Typeface (Secondary) commands, rather than the DeskJet 500/ LaserJet 3 version supported in earlier DeskJets.
- The DeskJet 870C and 890C printers *do not* support soft font downloads
- The DeskJet 870 and DeskJet 890 have reduced font buffers. HP testing found no measurable performance degradation related to this reduction.

DeskJet 800 Series Font Compatibility Issues

Although a goal of the DeskJet 800 Series firmware development effort is to make font selection as much like the DeskJet 500 series printer series as possible, there could be instances when the two printers will produce different font sizes in response to the same font request from the host application. This is because the DeskJet 800 series printers have scalable font technology and DJ 500 series does not. For example, if an application requests 13-point CG Times, the 550C will print 12-point CG Times, since PCL provides the closest matching point size when a font is requested, and 12 point is the closest size the DJ 550C has to 13-point CG Times. The DeskJet 850C on the other hand, because of its scalable font technology, will print 13-point CG Times as requested. This should not be a problem for most applications, since they know what point sizes the 550C has and will request only those sizes. However, failing to account for this difference may impact line breaks.

The DeskJet 800 series printers will not do algorithmic emboldening. They will, however, have resident bold versions of the fonts in the DJ 550/560C (i.e., Courier, Letter Gothic, and CG Times). Unfortunately, the algorithm used for emboldening in previous DeskJet's is not compatible with the defined bold font typefaces. Thus, there will be some escapement differences in the bold versions of these fonts between the DeskJet 800 series and previous DeskJet printers. Since, in most cases, the DeskJet 800 series fonts will have slightly smaller (1 pixel) sizes than DeskJet 500 series fonts, the line breaks should not be seriously affected. However, right justification may be more greatly impacted.

Another area of font incompatibility between DeskJet 600/800 series printers and previous DeskJets is in underlining, the older DeskJets provided a double underline, which was supported by the DeskJet bitmap font definitions. Double underlining is not supported in the LaserJet bitmap definition that the DeskJet 600/800 series printers use. In addition, DeskJet bitmap fonts had an underline thickness defined, and the DeskJet's used this value to render the underline. LaserJets do not use the underline value; they use a standard 1/100" underline. In fact, LaserJet fonts do not even provide underline information. When presented with a font that does not provide an underline thickness, the DeskJet 600/800 series printers will use the LaserJet default of 1/100".

The original DeskJet included a Times Roman-like font. Due to external circumstances, this font was removed from subsequent DeskJet models, however, spacings for this font were maintained (utilizing CG Times glyphs). The DeskJet 600/800 series printers do not carry these spacings.

Previous DeskJets carried CG Times in 10-, 12-, and 14-point sizes and then algorithmically halved them to get 5, 6, and 7 point. However, the algorithm used was not linear. Since the DeskJet 800 series printers will generate these fonts using linear, scalable technology, the spacings for 5-, 6-, and 7-point CG Times will be different from previous DeskJet's.

DeskJet 600/800 series printers will be using the LaserJet 4 Typeface definition instead of the DeskJet 500/LaserJet 3 definition. Both definitions have been defined such that exact matches are not affected; it is only the backup matching algorithm that is affected. The typeface numbers for some of the DeskJet 600/800 series printers' typefaces are different than LaserJet's numbers for the same typefaces. This is because the DeskJet licensing vendors are different than LaserJet's, causing the upper vendor-identification bits to be different. The result is that PCL files geared toward LaserJets should print the same typefaces on both the LaserJet and the DeskJet 600/800 series printers. However, PCL geared towards the DeskJet 600/800 series printers may result in different typeface choices on a LaserJet than on the DeskJet.

NOTE

The DeskJet 870C and DeskJet 890C printers *do not* accept soft font downloads

Merged Text and Graphics

The process for merging text and graphics with the HP DeskJet 600/800 series printers in both portrait and landscape orientation is the same as the landscape orientation method for the DeskJet 520, 540, 550C, and 560C printers, described in the **DeskJet 500 Series Technical Reference Guide**. The DeskJet 600/800 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 DeskJet 520, 540, 550C, and 560C printers, when merging text and graphics for the DeskJet 600/800 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.

NOTE

If you are modifying an existing DeskJet 500 series printer driver, which has correctly implemented the merging of text and graphics in the past, and wish to include other features for the HP DeskJet 600 and 800 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, obsoleted commands. However, if you are just beginning development, or you intend to *add* merged text and graphics capabilities for the DeskJet 600 and 800 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.

I/O

The DeskJet 850C, 855C, and 870C printers contains two I/O connectors to support both PC and Apple Macintosh hosts in a single platform. Only one connector should be used at a time. At power-up, the first connector that senses active incoming data will be dedicated to I/O. The other connector will remain inactive.

The DeskJet 890, and the 600 series printers are equipped with a single I/O port, making them platform-specific. The PC I/O connector for both the DeskJet 600 and 800 series printers is the same.

Overview

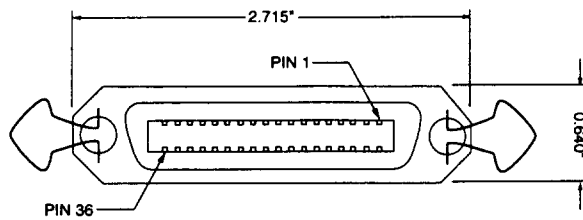
The PC I/O connector on the DeskJet 600 and 800 series printers is a 36-pin parallel port. The port will work in normal Centronics mode or can switch to IEEE STD-1284 when prompted. IEEE 1284 contains several reverse-channel protocols (ECP, Nibble, Byte, EPP). The transfer methods supported by the DeskJet 850C printer are Nibble mode, Byte mode, and ECP (Extended Capabilities Port) mode. (Any device that is IEEE-1284 compliant must support at least Nibble Mode.) For more information, see Standard Signaling Method for a Bi-Directional Parallel Interface for Personal Computers.

Connector

The following diagram is the physical drawing for the 1284-B connector, which is the existing 36-pin 0.085 centerline connector frequently used for parallel communication on the peripheral side were the host is a PC-based system.

1284-B Parallel Interface Signal Descriptions

For descriptions of the 1284 signals, see *Standard Signaling Method for a Bi-directional Parallel Peripheral Interface for Personal Computers, IEEE STD 1284 D2.00*. Copyright protection prevents this material from being reproduced herein.



1284-B Connector, Physical Drawing
(Receptacle)

The pin numbers and their assigned signal names for the 1284-B connector are given below. Note the abbreviations used in the "Source" column: H = host, P = printer, Bi-Dir = bidirectional.

Pin	Source	Compatible	Nibble	Byte	ECP
1	H	nStrobe	HostClk	HostClk	HostClk
2	Bi-Dir	Data 1 (Least significant bit)			
3	Bi-Dir	Data 2			
4	Bi-Dir	Data 3			
5	Bi-Dir	Data 4			
6	Bi-Dir	Data 5			
7	Bi-Dir	Data 6			
8	Bi-Dir	Data 7			
9	Bi-Dir	Data 8 (Most significant bit)			
10	P	nAck	PtrClk	PtrClk	PeriphClk
11	P	Busy	PtrBusy	PtrBusy	PeriphAck
12	P	pError	AckDataReq	AckDataReq	nAckReverse
13	P	Select	Xflag	Xflag	Xflag
14	H	nAutoFd	HostBusy	HostBusy	HostAck
15		Not defined			
16		Logic Ground			
17		Chassis Ground			
18	P	Peripheral Logic High			
19		Signal Ground (nStrobe)			
20		Signal Ground (Data 1)			
21		Signal Ground (Data 2)			
22		Signal Ground (Data 3)			
23		Signal Ground (Data 4)			
24		Signal Ground (Data 5)			
25		Signal Ground (Data 6)			
26		Signal Ground (Data 7)			
27		Signal Ground (Data 8)			
28		Signal Ground (pError, Select, nAck)			
29		Signal Ground (Busy, nFault)			
30		Signal Ground (nAutoFd, nSelectIn, nInit)			
31	H	nInit	nInit	nInit	nReverseRequest
32	P	nFault	nDataAvail	nDataAvail	nPeriphRequest
33		Not defined			
34		Not defined			
35		Not defined			
36	H	nSelectIn	1284 Active	1284 Active	1284 Active

For a detailed description of the interface signals, see Section 5, "Interface Signals," in *IEEE Standard 1284-19XX*.

Fonts

The DeskJet series printers each provide an assortment of built-in fonts, either in the form of discrete bitmap fonts, or in the form of scalable typefaces. The following section provides details regarding which bitmap fonts or scalable typefaces each printer contains.

DeskJet 600 series

The DeskJet 600 series firmware contains or is able to provide the bitmap fonts shown below. Font sizes shown in boldface are built-in. Other font sizes are produced by algorithmic transformations performed on the built-in fonts. DeskJet 600 series printers will also provide algorithmic emboldening of all built-in and transformed fonts.

Proportionally-Spaced Font Families	Available Point Sizes	
CG Times	5, 6, 7, 8, 10, 12, 14	
CG Times Italic	5, 6, 7, 8, 10, 12, 14	
Univers	5, 6, 7, 8, 10, 12, 14	
Univers Italic	5, 6, 10, 12	
Fixed-Pitch Font Families	Available Point Sizes	Available Pitches (cpi)
Courier	6, 12, 24	5, 10 , 16.67, 20
Courier Italic	6, 12, 24	5, 10 , 20
Letter Gothic	6, 12, 24	6, 12, 24
Letter Gothic	4.75, 9.5, 19	16.67
Letter Gothic Italic	6, 12, 24	6, 12, 24

The factory default font will be Courier 12 point, 10 pitch.

Font Storage and Rendering

DeskJet 600 series printers internal bitmap fonts are stored at 300 x 300 dpi. Firmware will use REt™ to render them at 600x300 dpi.

Fixed-Width Font Transformations

The DeskJet 600 series printers will be able to perform the following transformations on fixed-pitch (non-proportional), built-in fonts (Courier and Letter Gothic families):

- half width
- half height
- double width
- double height
- half size (half width/half height)
- half width/double height
- double width/half height
- double size (double width/double height)

Proportional Font Transformations

The DeskJet 600 series printers will be able to perform the following transformations on proportionally-spaced, built-in fonts (CG Times and Univers families):

- half size (half width/half height)
- double size (double width/double height)

Algorithmic Emboldening

DeskJet 600 series printers will provide algorithmic emboldening of all built-in and transformed fonts.

Font Download Support

DeskJet 600 series printers will support downloads of LaserJet bitmap fonts (soft fonts). DeskJet format soft fonts (those designed for use with Deskjet 500 series printers), will not work with HP DeskJet 600 series printers.

DeskJet 800 series

All DeskJet 800 series printers provide the same scalable typeface font technology as is found in the HP LaserJet printers. Because of this, there are no discrete bitmapped fonts built into the 800 series DeskJets. Instead, a selection of scalable typefaces have been included in the printer firmware. Typefaces have been provided to match the typefaces of the fonts found in DeskJet 600 printers. Tagged Font Metric files (TFMs) for use with the DeskJet 800 series printers' scalable typefaces are available from the Hewlett-Packard Peripherals Developer Program web site, or from the DeskJet ISV technical support staff at isv_deskjet@vcd.hp.com.

The DeskJet 850 and DeskJet 855 *do* provide buffer space for downloading discrete bitmapped fonts. However, the need to divert limited system resources to other critical printer functions resulted in the elimination of the soft font download buffer on the DeskJet 870 and 890 printers. The following table lists the scalable typefaces provided with each of the DeskJet 800 series printers.

Typeface Name	Treatments
Courier	Roman, Bold, Italic, Bold Italic
Letter Gothic	Roman, Bold, Italic, Bold Italic
CG Times	Roman, Bold, Italic, Bold Italic
Univers	Text, Bold, Italic, Bold Italic
Times New Roman	Text, Bold, Italic, Bold Italic
Arial	Text, Bold, Italic, Bold Italic
Symbol	Symbol
Wingdings	Symbol

Soft Fonts

HP DeskJet 600 series printers have retained the capability to utilize LaserJet4 soft fonts. All DeskJet 600 series printers contain enough font buffer to hold several medium fonts at a time. It may be possible to download a font so large that the font buffer is overflowed, in which case it is necessary to download only those characters that are actually needed. The old DeskJet soft font format is no longer supported, but instead, DeskJet 600 series and DeskJet 85x printers utilize the LaserJet 4 soft font format.

Banner Printing

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

Media Source Esc & ℓ #H

The DeskJet 680 and 690 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 (“#”), 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”.

DEVICE NOTE: The DeskJet 68x and 69x 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.

NOTE

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&ℓ0L) 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.

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*ℓ0L), 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 inch) = 1/8 inch

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

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.*

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 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.

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.

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.

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.

Printing Cutsheet with Z-Fold Media Loaded

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.

Sample PCL for a Banner Print Job

PCL Command	Escape Sequence	Notes
Reset	Esc E	Set PCL to default state
Media Source	Esc & ℓ-1 H	Continuous Forms
Media Size	Esc & ℓ2 A	US Letter
Perf Skip Off	Esc & ℓ0 L	Top/Bottom margins set to zero
CAP Position	Esc * p -300 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	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 & ℓ0 H	Advances one more page and allows user unloading
Reset	Esc E	Set 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.

PCL Commands

The Hewlett-Packard DeskJet printers are programmatically controlled via HP's Printer Control Language (PCL). The level of PCL an HP printer is capable of supporting depends on the amount of ROM on board the printer. Higher priced printer models, like the HP LaserJet printers, have more on-board RAM than do the DeskJet 600 and 800 series printers. Because of this, whereas the LaserJet printers are capable of using PCL 5 or PCL 6 commands, the DeskJet 600 and 800 series printers support PCL 3+ (the "+" representing enhancements to facilitate color printing).

NOTE

In the PCL escape sequences within this manual, the letter "ell" (l) is represented by a script character (ℓ) to differentiate between the "ell" and the character 1 (one). Where spaces have been added to commands for readability, those spaces must not be included in your code.

Control Codes and Special Character Codes

The following commands initiate printer control functions.

Escape Esc

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 is 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.

Print Modes

Transparent Data Mode Esc & p # X

#Value	DJ600	DJ660C	DJ680C	DJ690C	DJ85xC	DJ870C	DJ890C	Effect
1..n	✓	✓	✓	✓	✓	✓	✓	print control code symbols in next specified number of bytes in printer data stream
Default	na							
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.

Display Functions Mode ON Esc Y

#Value	DJ600	DJ660C	DJ680C	DJ690C	DJ85xC	DJ870C	DJ890C	Effect
n/a	✓	✓	✓	✓	✓	✓	✓	Display Functions turned on
Default	off							

This command turns on Display Functions Mode, so that a character code is then printed in one of the following:

- The currently active font.
- A mix of the current font and a font containing glyphs (graphic symbols).
- The currently active font and a blank place-holding character.

Turning Display Functions mode ON has the following effects:

- All control code and escape sequence functions except CR and EscZ are disabled. CR marks the paper and executes CR-LF. EscZ marks the paper and disables Display Functions Mode.
- All character codes, except CR and EscZ, 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.

Display Functions Mode OFF Esc Z

#Value	DJ600	DJ660C	DJ680C	DJ690C	DJ85xC	DJ870C	DJ890C	Effect
n/a	✓	✓	✓	✓	✓	✓	✓	Display Functions turned off
Default	off							

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

Text Enhancements

Enable Underline Esc & d # D

#Value	DJ600	DJ660C	DJ680C	DJ690C	DJ85xC	DJ870C	DJ890C	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

0

Range

0 to 4 - (default is selected for values > 4 or < 0).

Enables the automatic underline enhancement.

NOTE

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 DJ 8xx 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 DeskJet implementation of "floating" underline, each font defines the thickness of the underline character and its position relative to the baseline.

NOTE

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

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

Disable Underline *Esc & d @*

#Value	DJ600	DJ660C	DJ680C	DJ690C	DJ85xC	DJ870C	DJ890C	Effect
n/a	✓	✓	✓	✓	✓	✓	✓	underlining is OFF

Disables automatic text underlining.

Line Termination *Esc & k # G*

#Value	DJ600	DJ660C	DJ680C	DJ690C	DJ85xC	DJ870C	DJ890C	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, LF, and FF control characters. For example, a value field of 1 causes the printer to insert a carriage return (CR) and linefeed (LF) control code for every CR. A linefeed or formfeed is sent as is.

End-of-Line Wrap *Esc & s # C*

#Value	DJ600	DJ660C	DJ680C	DJ690C	DJ85xC	DJ870C	DJ890C	Effect
0	✓	✓	✓	✓	✓	✓	✓	Enables End-of-LineWrap
1	✓	✓	✓	✓	✓	✓	✓	Disables End-of-LineWrap
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, for horizontal text path direction, and the bottom margin, for vertical text path direction.

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) in the horizontal text path direction. In the vertical text path direction, a character or space that would move the CAP to below the bottom 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. For vertical text path direction, a character or space that would move CAP to below the bottom margin is clipped, and CAP is set to the bottom margin.

Job Control

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.

EscE 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.

EscE 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.

EscE “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 LMI 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.

NOTE

Since control panel settings can override the factory defaults, *EscE* uses the control panel settings as the default values.

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

Printer Control

Gray Balance Esc * b # B

#Value	DJ600	DJ660C	DJ680C	DJ690C	DJ85xC	DJ870C	DJ890C	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. *EscE* resets Gray Balance to the device-dependent default.

NOTE

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

The defaults for the DeskJet 540 and DeskJet 600 printers are Print Mode and Media Type dependent - as shown in the following table. The remaining DeskJet 600 series printers and the DeskJet 800 series 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	DeskJet 540			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)

DryTimer Esc&b#T

#Value	DJ600	DJ660C	DJ680C	DJ690C	DJ85xC	DJ870C	DJ890C	Effect
0	✓							Dry Timer is off
1..1200	✓							Dry 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.

EscE resets the dry timer to the default value of 0.

NOTE

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 DeskJet 600 and 800 series printers will respond to this command, the command is considered obsolete. Dependence on the command should be removed from your application.

The DeskJet 600 series and DeskJet 800 series printers use the following values as Dry Timer defaults when Media Type and Print Quality commands are used:

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.

Raster Graphics Quality *Esc * r # Q*

#Value	DJ600	DJ660C	DJ680C	DJ690C	DJ85xC	DJ870C	DJ890C	Effect
0	✓	✓	✓	✓	✓	✓	✓	User Default (remote front panel setting)
1	✓	✓	✓	✓	✓	✓	✓	Draft Quality
2	✓	✓	✓	✓	✓	✓	✓	High Quality
Default	0							
Range	0 to 2 - Command is ignored for out of range values.							

Determines the quality with which raster graphics are printed.

Selecting a value of 1 causes raster graphics to be printed at nearly double the normal speed. Print quality is traded for ink savings and increased throughput. The graphics quality is not reset by the End Raster Graphics (*Esc*rC*) command.

NOTE

DeskJet 600 series and DeskJet 800 series printers ignore this command if a **Print Quality** command has been processed since the last *EscE* or other reset. Otherwise, the requested print quality is applied to all data on an entire page. A value of 0 (user default) invokes the user default quality, as set with the remote front panel. A value of 1 (draft) invokes the **Print Quality** command's **EconoFast** mode. If the current **Print Quality** mode is **EconoFast**, a request for 2 (high quality) invokes **Print Quality's** Normal mode.

Mechanical Print Quality *Esc * o # Q* (also known as *Shingling*)

#Value	DJ600	DJ660C	DJ680C	DJ690C	DJ85xC	DJ870C	DJ890C	Effect
0	✓	✓	✓	✓	✓	✓	✓	Normal Quality (no shingling)
1	✓	✓	✓	✓	✓	✓	✓	Better Quality (2-pass printing)
2	✓	✓	✓	✓	✓	✓	✓	Best Quality (4-pass printing)
Default	0							
Range	0 to 2 - Command is ignored for out of range values.							

This command is superseded by the combination of the **Media Type** and **Print Quality** commands, and is only provided for backward compatibility.

The **Mechanical Print Quality** command provides access to three levels of a printing process (also referred to as **Mechanical Print Quality**) which may improve the print quality of a raster graphics image.

NOTE

DeskJet 600/800 series printers ignore this command if a **Print Quality** command has been processed since the last *EscE* or other reset. Otherwise, 0 (normal quality) is ignored. If the current **Print Quality** mode is **EconoFast**, 1 (better quality) invokes **Print Quality's** Normal mode. A request for 2 (best quality) invokes **Print Quality's** Best mode.

Shingling is a process for printing complex or dense graphics images which might otherwise cause problems stemming from excessive ink, including color bleeding or ink blooming on the print media. Shingling uses an algorithm of laying down a checkerboard-pattern of the dots in a graphic image, using multiple passes to fill in the vacant areas, giving the ink a moment to begin drying before more ink is placed in close proximity. This algorithm is useful for complex color images where dots of different colors are being laid down in close proximity to obtain an effective shade of some other color (dithering).

Any graphics data sent to the printer while shingling is active (a degree of shingling of 50% or 25%) will take longer to print than the same data would take to print with shingling turned off; although all the dots which compose the graphic image are printed, only a portion of the dots are printed during each pass of the print cartridge. Compared to using no shingling, 50% shingling would take twice as many passes of the print cartridge to print a given area (50% of the dots in each dot row printed during each pass), 25% shingling would take four times as many passes (25% of the dots in each dot row printed during each pass).

NOTE

Because of the non-porous nature of the print media, the application of at least 50% shingling is *essential* for obtaining quality results when printing graphics images on transparency film or on glossy paper.

<i>Print Quality</i>	<i>Esc*o#m/M</i>							
#Value	DJ600	DJ660C	DJ680C	DJ690C	DJ85xC	DJ870C	DJ890C	Effect
-1	✓	✓	✓	✓	✓	✓	✓	EconoFast mode selected
0	✓	✓	✓	✓	✓	✓	✓	Normal Quality selected
1	✓	✓	✓	✓	✓	✓	✓	Presentation Quality selected
Default	0							
Range	-1 to 1 (command is ignored for unsupported values).							

The Print Quality (PQ) command, in conjunction with the Media Type (*Ecs&#M*) command, provides a high-level print mode specifier and replaces the need for the following commands:

- Font Quality (Primary)** **Esc(s#Q**
- Font Quality (Secondary)** **Esc)s#Q**
- Raster Graphics Quality** **Esc*r#Q**
- Mechanical Print Quality (shingling)** **Esc*o#Q**

This command closes and prints the current page, and moves CAP to the top of form at the left margin on the next physical page.

NOTE

After receiving the Print Quality command, DeskJet 600 and 800 series printers ignore Font Quality (Primary), Font Quality (Secondary), Raster Graphics Quality, and Mechanical Print Quality commands until a Reset command or an equivalent device reset occurs.

Media Type Esc & ℓ #M

#Value	DJ600	DJ660C	DJ680C	DJ690C	DJ85xC	DJ870C	DJ890C	Effect
0	✓	✓	✓	✓	✓	✓	✓	Plain paper
1	✓	✓	✓	✓	✓	✓	✓	Bond paper
2	✓	✓	✓	✓	✓	✓	✓	Special paper (HP Premium Inkjet Paper)
3	✓	✓	✓	✓	✓	✓	✓	Glossy film/Photo media
4	✓	✓	✓	✓	✓	✓	✓	Transparency film
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.

NOTE

For DeskJet 600 and 800 series printers, the specified media type will affect output resolution, depletion, shingling, gray balancing, and dry time.

Printer Diagnostics

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 EscE 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 DeskJet 600 and 800 series printers provide several diagnostic print outs that are user-accessible via the printer front panel.

Page Control

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

Page Length Esc & ℓ # P

#Value	DJ600	DJ660C	DJ680C	DJ690C	DJ85xC	DJ870C	DJ890C	Effect
0	✓	✓	✓	✓	✓	✓	✓	Page length set to 66 lines
1..n	✓	✓	✓	✓	✓	✓	✓	Page length is set, in number of lines, at the current lpi.
Default	66							
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 LMI (Line 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 LMI. This command is ignored if LMI 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

DeskJet maximum page length is 14 inches for the DeskJet 600 and 800 series printers.

NOTE

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.

Page Size Esc & #A

#Value	DJ600	DJ660C	DJ680C	DJ690C	DJ85xC	DJ870C	DJ890C	Effect
n	✓	✓	✓	✓	✓	✓	✓	page size set to that indicated by value index in the tables below
Default	Regionally dependent (US Letter for printers sold in N. 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.

Selectable Sheet Media Sizes for DeskJet 600/800 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)

Selectable Card Sizes

Value	Card Description	Card Size
71	Japanese Hagaki Postcard	100 mm x 148 mm
72	Japanese Oufuku-Hagaki Postcarda	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"

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"

NOTE

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 DeskJet 600 and 800 series printers, all envelopes load in landscape (short edge first). Pre-DeskJet 550s load envelopes 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 DeskJet 600 and 800 series printers, the application should send the length of the custom page using the Page Length (*Esc&#P*) command.

Media Source Esc & # H

#Value	DJ600	DJ660C	DJ680C	DJ690C	DJ85XC	DJ870C	DJ890C	Effect
-1			✓	✓				Load z-fold media (banners)
0	✓	✓	✓	✓	✓	✓	✓	Print current page (source is unchanged)
1	✓	✓	✓	✓	✓	✓	✓	Load from tray
3	✓	✓	✓	✓	✓	✓	✓	Envelope Feed
Default	0							
Range	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.

Orientation Esc & ℓ # 0

#Value	DJ600	DJ660C	DJ680C	DJ690C	DJ85xC	DJ870C	DJ890C	Effect
0	✓	✓	✓	✓	✓	✓	✓	Portrait
1	✓	✓	✓	✓	✓	✓	✓	Landscape
2	✓	✓	✓	✓	✓	✓	✓	DJ6xx - maps to 0 (LaserJet compatibility) DJ8xx - Reverse Portrait
3	✓	✓	✓	✓	✓	✓	✓	DJ6xx - maps to 0 (LaserJet compatibility) DJ8xx - 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 print 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 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
 - CMI and LMI

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 cause clipping if graphics margins are insufficient.

NOTE

DeskJet 800 series printers automatically rotate fonts to the current orientation.

Character Motion Index (CMI) Esc & k # H (also known as HMI)

#Value	DJ600	DJ660C	DJ680C	DJ690C	DJ85xC	DJ870C	DJ890C	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.

CMI 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, CMI affects all printable characters, including the space and backspace characters. For proportionally spaced fonts, CMI 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 CMI.

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

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

For proportionally-spaced fonts, the CMI 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 CMI.

Line Motion Index (LMI) Esc & ℓ # C (also known as VMI)

#Value	DJ600	DJ660C	DJ680C	DJ690C	DJ85xC	DJ870C	DJ890C	Effect
n	✓	✓	✓	✓	✓	✓	✓	number of 1/48 inch increments between rows
Default	8							
Range	0 - 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 and half linefeed spacing. To convert lpi to LMI:

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

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

Line Spacing *Esc & ℓ # D*

#Value	DJ600	DJ660C	DJ680C	DJ690C	DJ85xC	DJ870C	DJ890C	Effect
n	✓	✓	✓	✓	✓	✓	✓	Sets the number of lines printed per inch
Default	6							
Range	0 to the current logical page length (max 32767) - command is ignored for unsupported values							

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

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

NOTE

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

Clear Horizontal Margins *Esc 9*

#Value	DJ600	DJ660C	DJ680C	DJ690C	DJ85xC	DJ870C	DJ890C	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.

NOTE

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.

Left Margin *Esc & a # L*

#Value	DJ600	DJ660C	DJ680C	DJ690C	DJ85xC	DJ870C	DJ890C	Effect
n	✓	✓	✓	✓	✓	✓	✓	Sets the left margin to the left edge of the specified column
Default	0							
Range	0 to right bound of logical page							

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.

NOTE

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

Right Margin *Esc & a # M*

#Value	DJ600	DJ660C	DJ680C	DJ690C	DJ85xC	DJ870C	DJ890C	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							

This command is ignored for columns preceding 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.

Top Margin *Esc & ℓ # E*

#Value	DJ600	DJ660C	DJ680C	DJ690C	DJ85xC	DJ870C	DJ890C	Effect
0..n	✓	✓	✓	✓	✓	✓	✓	top margin is set to specified number of lines at the current lines-per-inch setting
Default	.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 LMI 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.

NOTE

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

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

Text Length *Esc & ℓ # F*

#Value	DJ600	DJ660C	DJ680C	DJ690C	DJ85xC	DJ870C	DJ890C	Effect
0..n	✓	✓	✓	✓	✓	✓		Sets length of the text area, in lines, from the top margin
Default	Logical page length - top margin -1/2 inch*							
Range	0 to [logical page length - top margin] - Command is ignored for out of range values.							

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

This command is ignored if current LMI 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.

Perforation Skip Mode *Esc & ℓ # L*

#Value	DJ600	DJ660C	DJ680C	DJ690C	DJ85xC	DJ870C	DJ890C	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.

NOTE

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.

Horizontal Positioning Commands

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

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-strike. 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.

NOTE

DeskJet 600/800 series printers backspace using only the last proportional character width. The resulting cursor relocation is therefore not a fixed constant.

Carriage Return <CR>

Moves CAP to the left margin on the current row for horizontal text path direction.

Space <SP>

Moves CAP forward one character position (defined by CMI) 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.

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.

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)

NOTE

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

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 CMI.

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.

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

Move CAP Horizontal (Decipoints) Esc & a # H

#Value	DJ600	DJ660C	DJ680C	DJ690C	DJ85XC	DJ870C	DJ890C	Effect
n	✓	✓	✓	✓	✓	✓	✓	Moves CAP horizontally by the specified number of decipoints (1/720 inch).
Default	na							
Range	-32767 to +32767 (up to logical page right and left limits; rounded to the nearest PCL Unit or decimal place) - 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.

NOTE

DeskJet 600/800 series printers use 2 fractional digits and truncate to 1/3600-inch units.

Move CAP Horizontal (Columns) *Esc & a # C*

#Value	DJ600	DJ660C	DJ680C	DJ690C	DJ85xC	DJ870C	DJ890C	Effect
n	✓	✓	✓	✓	✓	✓	✓	Moves CAP horizontally by the specified number of columns
Default	na							
Range	-32767 to +32767 (or to the logical page right and left limits; rounded to the nearest 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.

NOTE

DeskJet 600/800 series printers use 2 fractional digits and truncate to 1/3600-inch units.

Move CAP Horizontal (PCL Units) *Esc * p #X*

#Value	DJ600	DJ660C	DJ680C	DJ690C	DJ85xC	DJ870C	DJ890C	Effect
n	✓	✓	✓	✓	✓	✓	✓	Moves CAP horizontally by the specified number of PCL Units
Default	na							
Range	-32767 to +32767 (up to logical page right and left limits) - 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.

NOTE

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

Vertical Positioning Commands

The following commands provide cursor positioning on the vertical axis.

Move CAP Vertical (Rows) Esc & a #R

#Value	DJ600	DJ660C	DJ680C	DJ690C	DJ85xC	DJ870C	DJ890C	Effect
n	✓	✓	✓	✓	✓	✓	✓	Moves CAP to the same column position on a new line based on the active line spacing
Default	na							
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:

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

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.

Move CAP Vertical (Decipoints) Esc & a #V

#Value	DJ600	DJ660C	DJ680C	DJ690C	DJ85xC	DJ870C	DJ890C	Effect
n	✓	✓	✓	✓	✓	✓	✓	Moves CAP to a new position along the vertical axis
Default	na							
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.

Move CAP Vertical (PCL Units) Esc *p # Y

#Value	DJ600	DJ660C	DJ680C	DJ690C	DJ85xC	DJ870C	DJ890C	Effect
n	✓	✓	✓	✓	✓	✓	✓	moves cap specified number of PCL units along the Y axis
Default	na							
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 PCL Unit is specified by the **Units of Measure (Esc&u#D)** command. Otherwise, the unit-per-inch for 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.

NOTE

DeskJet 600/800 series printers use 1/300".

Font Selection

Font Selection by Attribute

The user requests a font by designating its attributes with the following commands. For the 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 DeskJet 800 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.

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

#Value	DJ600	DJ660C	DJ680C	DJ690C	DJ85xC	DJ870C	DJ890C	Effect
ID	✓	✓	✓	✓	✓	✓	✓	Symbol set identification value from the table
Default	8U (Roman-8) or user-selected							
Range	na							

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.

Roman-8 (8U) is the default primary and secondary symbol set; but a user-default may be selected. Roman-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 DeskJet 600 and 800 series printers.

ID	Symbol Set Name	ID	Symbol Set Name
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	IS04: 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

ID	Symbol Set Name	ID	Symbol Set Name
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
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

ID	Symbol Set Name	ID	Symbol Set Name
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

Font Spacing (Primary) *Esc (s # P*
Font Spacing (Secondary) *Esc) s # P*

#Value	DJ600	DJ660C	DJ680C	DJ690C	DJ85xC	DJ870C	DJ890C	Effect
0	✓	✓	✓	✓	✓	✓	✓	Fixed spacing
1	✓	✓	✓	✓	✓	✓	✓	Proportional spacing
Default	0							
Range	0, 1 (unavailable values are ignored)							

Designates inter-character spacing as either proportional, fixed, or dual 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; otherwise a dual fixed spacing font is chosen.

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

If dual fixed spacing is requested but no fixed-pitch font is available, a fixed spacing font with the current pitch is chosen, if available; otherwise a proportional font is chosen.

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.

Font Pitch (Primary) *Esc (s # H*
Font Pitch (Secondary) *Esc) s # H*

#Value	DJ600	DJ660C	DJ680C	DJ690C	DJ85xC	DJ870C	DJ890C	Effect
n	✓	✓	✓	✓	✓	✓	✓	intercharacter spacing for current font is set
Default	10 cpi							
Range	> 0.0 - valid to 2 decimal places							

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.

Font Height (Primary) Esc (s # V
Font Height (Secondary) Esc) s # V

#Value	DJ600	DJ660C	DJ680C	DJ690C	DJ85xC	DJ870C	DJ890C	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.

NOTE

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

Font Style (Primary) Esc (s # S
 Font Style (Secondary) Esc) s # S

#Value	DJ600	DJ660C	DJ680C	DJ690C	DJ85xC	DJ870C	DJ890C	Effect
n	✓	✓	✓	✓	✓	✓	✓	Specified characteristics are applied to the font style request.
Default	0							
Range	0 to 32767 - values exceeding range are clamped.							

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.

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

	15	14	10	9	5	4	2	1	0
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 - 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:

1. Printers recognizing only style values 0, 1, and 2 discard requests for larger values.
2. 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.
3. 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 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:

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

Font Stroke Weight (Primary) Esc (s # B
 Font Stroke Weight (Secondary) Esc) s #B

#Value	DJ600	DJ660C	DJ680C	DJ690C	DJ85xC	DJ870C	DJ890C	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.

NOTE

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 PCL value of 0. This value may be assigned to "book" or "text" instead.

Font Typeface (Primary) Esc (s # T
 Font Typeface (Secondary) Esc) s # T

#Value	DJ600	DJ660C	DJ680C	DJ690C	DJ85xC	DJ870C	DJ890C	Effect
n	✓	✓	✓	✓	✓	✓	✓	Search algorithm set to specified typeface index
Default	3							
Range	0 to 65535 - unavailable values are ignored.							

Designates the HP typeface number of the font. Three versions of the value field have been used: the single-byte version for older fonts, the version used by DeskJet 500 and LaserJet III printers, and the new LaserJet 4 version. Since the earlier two versions are considered to be obsolete, we will provide only the LaserJet4 version here.

LaserJet 4/DeskJet 600 series/ DeskJet 800 series Version

The LaserJet 4 typeface word (also used by DeskJet 600 series printers and DeskJet 800 series printers) is shown below. The typeface family encompasses the 12 least significant bits. Printers may treat the typeface number as a single value and ignore a request in which a match cannot be made.

15	12	11	9	0
Vendor			Typeface Family	

LaserJet 4 supports a range for the typeface word of 0 to 65535.

The Vendor numbers are shown below:

- 0 Generic/HP
- 1 Agfa Division, Miles, Inc.
- 2 Bitstream, Inc.
- 3 Linotype Company
- 4 The Monotype Corporation plc
- 5 Adobe Systems, Inc.
- 6 Unique (small) vendors
- 7-15 Reserved

NOTE

The matching algorithm for laserJet 4, DeskJet 600 series and DeskJet 800 series printers are similar to that for LaserJet III.

Font Quality (Primary) Esc (s # Q
Font Quality (Secondary) Esc) s # Q

#Value	DJ600	DJ660C	DJ680C	DJ690C	DJ85xC	DJ870C	DJ890C	Effect
0	✓	✓	✓	✓	✓	✓	✓	Data processing
1	✓	✓	✓	✓	✓	✓	✓	Near letter quality
2	✓	✓	✓	✓	✓	✓	✓	Letter quality
Default	2							
Range	0 - 2 (unavailable values are ignored).							

Specifies font quality.

This command determines printing quality, not the actual font representation. If the requested quality is unavailable, the closest fit is chosen.

NOTE

DeskJet 600 series and DeskJet 800 series printers ignore these commands if the **Print Quality (Esc o#M)** command has been seen since the last reset. Otherwise, DeskJet 600 and 800 series printers invoke the **Print Quality** command's EconoFast mode for values of 0 (data processing) or 1 (near letter quality). If the current Print Quality mode is EconoFast, a value of 2 (letter quality) invokes Print Quality's Normal mode.

Font Selection by ID (Primary) Esc (# X
Font Selection by ID (Secondary) Esc) # X

#Value	DJ600	DJ660C	DJ680C	DJ690C	DJ85xC	DJ870C	DJ890C	Effect
n	✓	✓	✓	✓	✓	✓	✓	Font with indicated ID is selected
Default	na							
Range	0 to 32767 (unavailable values 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.

NOTE

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 an unbound font, symbol set is determined from the font select table. To specify a different symbol set, the Symbol Set selection command should be sent prior to the Font Selection by ID command.

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

Downloading Fonts

The DeskJet 600 series and DeskJet 85x printers do not accept DeskJet format soft fonts. They do, instead, accept LaserJet format soft fonts. The DeskJet format soft fonts are designed for use with the DeskJet 500 series printers. The following sections discuss the format for the LaserJet format soft fonts. This information is also available (and in somewhat greater detail) in the PCL 5 Printer Language Technical Reference Guide - HP part number 5961-0509.

The Font ID

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

Font ID *Esc * c #D*

#Value	DJ600	DJ660C	DJ680C	DJ690C	DJ85xC	DJ870C	DJ890C	Effect
n	✓	✓	✓	✓	✓			The subsequently downloaded font is given the specified ID number
Default	0							
Range	0 to 32767 - Command is ignored for out of range values.							

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 *c1D* 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.

NOTE

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.

The Font Definition

Download Font *Esc) s # W [font definition]*

#Value	DJ600	DJ660C	DJ680C	DJ690C	DJ85xC	DJ870C	DJ890C	Effect
n	✓	✓	✓	✓	✓			Downloads a font definition and assigns the font the current font ID
Default	na							
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 DeskJet 600 series and the DeskJet 85x printers are provided in the appendix to this manual.

- **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.

NOTE

DeskJet 600 series and DeskJet 85x printers do not support the “DeskJet” format, but, instead, support the LaserJet download formats.

Character Code	Esc * c # E							
#Value	DJ600	DJ660C	DJ680C	DJ690C	DJ85xC	DJ870C	DJ890C	Effect
n	✓	✓	✓	✓	✓			Establishes a decimal ASCII code for the next character downloaded
Default	0							
Range	0 to 65535							

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”.

DeskJet 600 series printers support a range of 0 - 65535.

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

Download Character Esc (s # W[Character Definition]

#Value	DJ600	DJ660C	DJ680C	DJ690C	DJ85xC	DJ870C	DJ890C	Effect
n	✓	✓	✓	✓	✓			Downloads a character definition with the specified number (n) of bytes
Default	na							
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.

Managing Fonts

Font Control Esc * c # F

#Value	DJ600	DJ660C	DJ680C	DJ690C	DJ85xC	DJ870C	DJ890C	Effect
0	✓	✓	✓	✓	✓			Delete all fonts (temp, permanent, and soft)
1	✓	✓	✓	✓	✓			Delete all temporary fonts (temp, permanent, and soft)
2	✓	✓	✓	✓	✓			Delete font (specified by the 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	na							
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.

Raster Graphics

The following PCL commands apply to the printing of raster graphic images on DeskJet 600 and 800 series printers, with the exception of the DeskJet 820. The DeskJet 720 is excluded from using these commands, as well as all other PCL commands listed in this guide.

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*rC*).

Implicit Start and End Raster Mode

Raster mode is started explicitly by *Esc*r#A* and ended explicitly by *Esc*rC*.

The Transfer Raster commands (*Esc*b#V*, *Esc*b#W*) can start raster mode implicitly, using the current raster resolution and left graphics margin. Text or non-raster commands other than those listed below can end raster mode implicitly, retaining the current raster resolution and left graphics margin. The left graphics margin can be changed by either EscE, which sets it to the left text margin, or by an explicit Start Raster command.

Hewlett-Packard strongly discourages use of implicit start/end graphics.

NOTE

Text does not cause an implicit End Raster for DeskJet 600 series printers.

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	Escr#U
Source Raster Width	Escr#S
Start Raster	Escr#A

Commands Allowed in Raster Mode

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

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

Start Raster *Esc * r #A*

#Value	DJ600	DJ660C	DJ680C	DJ690C	DJ85xC	DJ870C	DJ890C	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 or 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.

End Raster *Esc * r C*

#Value	DJ600	DJ660C	DJ680C	DJ690C	DJ85xC	DJ870C	DJ890C	Effect
na	✓	✓	✓	✓	✓	✓	✓	Printer returns to text mode command processing
Default	na							
Range	na							

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.

NOTE

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

Raster Resolution *Esc *t#R*

#Value	DJ600	DJ660C	DJ680C	DJ690C	DJ85xC	DJ870C	DJ890C	Effect
75	✓	✓	✓	✓	✓	✓	✓	graphics data printed at 75 dots per inch
100	✓	✓	✓	✓		✓	✓	graphics data printed at 100 dots per inch
150	✓	✓	✓	✓	✓	✓	✓	graphics data printed at 150 dots per inch
300	✓	✓	✓	✓	✓	✓	✓	graphics data printed at 300 dots per inch
600	✓*	✓*	✓*	✓*	✓*	✓*	✓*	graphics data printed at 600 dots per inch (applies to black data only)
Default	75							
Range	75, 100, 150, 300, 600* - Command is ignored for out of range values.							

* - Only black raster data can print at 600 dots per inch on a DeskJet 600 or 800 series printer.

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 highest supported resolution. For example, a request for 125 dpi on a DeskJet 600 or 800 series printer would result in 150 dpi being selected as the graphics print resolution.

During raster mode this command is locked out.

NOTE

DeskJet 600 and 800 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. Asymmetric resolutions (E.G. 300 x 600 dpi), which can only used with DeskJet 600 series printers, must be specified using the Configure Raster Data Command (CRD).

Source Raster Width *Esc *r#S*

#Value	DJ600	DJ660C	DJ680C	DJ690C	DJ85xC	DJ870C	DJ890C	Effect
n	✓*	✓*	✓*	✓*	✓	✓	✓	Raster region width is set to specified number of pixels (at current resolution)
Default	Logical page width							
Range	0 to 32767 - (clamped to right logical page boundary minus left graphics margin)							

* DeskJet 600 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.

NOTE

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*).

NOTE

On color devices, a zero-fill is not necessarily white. For example RGB data set to zero prints as black on a 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.

If raster scaling is desired, this command must precede the Start Raster (*Esc*r2A* or *Esc*r3A*) command. This command is ignored once raster mode starts.

Y Offset *Esc * b # Y*

#Value	DJ600	DJ660C	DJ680C	DJ690C	DJ85XC	DJ870C	DJ890C	Effect
	✓	✓	✓	✓	✓	✓	✓	Cursor is moved specified number of raster lines of vertical movement
Default	na							
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.

NOTE

Movement by this command is based on the graphics resolution.

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 or the Configure Raster Data (*Esc*g#W*) 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.

Transfer Raster by Plane *Esc * b # V[data]*

#Value	DJ600	DJ660C	DJ680C	DJ690C	DJ85XC	DJ870C	DJ890C	Effect
	✓	✓	✓	✓	✓	✓	✓	specified number of bytes of graphics data for a single plane of data is sent to the printer. The row pointer is not incremented
Default	na							
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*b0V*.

NOTE

The color of zero is defined by the current palette, where the raster data is indexed.

If fewer planes are sent than specified and the row ended early by *Esc *b0W*, the undefined planes are zero-filled (except in compression methods 3 and 9).

If more planes are sent than specified, the extra planes are ignored and the binary data discarded. If *Esc*b#W* is one of the extra planes, its data is ignored and the row incremented.

If an End Raster Graphics (*Esc*rC*) command is received before the row is completed, the row is not rendered but the row pointer incremented.

The data field is interpreted according to the current Compression Method (*Esc*b#M*).

This command implicitly starts raster mode at CAP in the absence of a Start Raster (*Esc*r#A*) command.

Transfer Raster by Row/Block *Esc * b # {data}*

#Value	DJ600	DJ660C	DJ680C	DJ690C	DJ85xC	DJ870C	DJ890C	Effect
n	✓	✓	✓	✓	✓	✓	✓	following specified number of data bytes sent to the printer as K data
Default	na							
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*).

NOTE

DeskJet 500 series, unlike the DeskJet 600 series printers do not truncate data in the unprintable region. Data, including graphics, falling into the unprintable region is printed on its own page; i.e. the surplus data is printed on a separate page, followed by a page feed to preserve proper pagination of subsequent data.

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*b0W*, *Esc*b0V*), or by offsetting the left graphic margin (*Esc*r1A*) or the vertical starting point (*Esc*b#Y*). The Compression Method (*Esc*b#M*) command provides several other ways of compressing data.

Compression Method *Esc * b #M*

#Value	DJ600	DJ660C	DJ680C	DJ690C	DJ85XC	DJ870C	DJ890C	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 (*EscE*) or End raster (*Esc*rC*).

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.

NOTE

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).

Replacement count (1 - 8)	Left offset from the current byte (0 - 30)
---------------------------	--

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 **offset byte** 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*b0W 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:

- Escb0W Repeat the previous row. The seed row is unchanged.
- Escb1Y Move down one raster row. Zero the seed row.
- Escb0Y 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*b1W 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	11111111	00000000	00000000	00000000
Row 2	00000000	11111111	11110000	00000000	00000000
Row 3	00001111	11111111	11110000	10101010	10101010

Esc*r1A

Start Raster initializes the seed row to all zeros.

Row 1 - Esc *b3m2 W(00000001)(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*b2W(00000010)(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*b5W(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
-------------	--------------	-------------------

- Control Bit:** 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
Control Bit = 0	Offset Count	Replacement Count		

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
Control Bit = 1	Offset Count	Replacement Count		

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*b0S was sent, then:

1. The Cyan plane would use the Cyan plane from the previous row as a seed plane.
2. The Magenta plane would use the Magenta plane from the previous row as a seed plane.
3. 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*b1S is sent, then:

1. The Cyan plane would use the Yellow plane from the previous row as a seed plane.
2. The Magenta plane would use the Cyan plane from the current row as a seed plane.
3. The Yellow plane would use the Magenta plane from the current row as a seed plane.

NOTE

In all In all DeskJet 600 and 800 series printers, the results of this command are undefined when the raster transfer is configured with a Configure Raster Data (CRD) (Escg#W) command.

Color

Simple Color Mode

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.

Simple Color *Esc * r # U* (also known as Set Planes Per Row)

#Value	DJ600	DJ660C	DJ680C	DJ690C	DJ85XC	DJ870C	DJ890C	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.							

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

NOTE

DeskJet 600 printers, which are single-pen devices, map 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 $2n$, with index values 0 to $2^n - 1$. For example a 4-plane palette has 16 entries, with index numbers 0 to 15.

This command creates a new palette and overwrites the current palette. PCL commands that modify the palette (*Esc*v#A*, *Esc*v#B*, *Esc*v#C*, *Esc*v#I*) are locked out. When a Simple Color palette is popped from the stack (*Esc*p#P*), it cannot be modified; and pixel encoding mode reverts to indexed planar.

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

A value field of 3 creates an 8-entry Device RGB palette (compatible with a 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.

NOTE

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 DeskJet 600 and 800 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.

Single Plane (black) Palette (value = 1)

Planes Per Row	Color	Data Pattern
1	White (no ink)	0
	Black	1

3- Plane CMY Color Palette (value = -3)

Planes per Row	Color Printed	Data Plane Pattern		
		C	M	Y
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

3-Plane RGB Color Palette (value = 3)

Planes per Row	Data Plane Pattern			Color Printed
	R	G	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)

4 Plane (KCMY) Color Palette (value = -4)

Planes per Row	Color Printed	Data Plane Pattern			
		K	C	M	Y
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>	<i>1</i>	<i>0</i>	<i>0</i>	<i>1</i>
	<i>Black/Magenta</i>	<i>1</i>	<i>0</i>	<i>1</i>	<i>0</i>
	<i>Black/Red</i>	<i>1</i>	<i>0</i>	<i>1</i>	<i>1</i>
	<i>Black/Cyan</i>	<i>1</i>	<i>1</i>	<i>0</i>	<i>0</i>
	<i>Black/Blue</i>	<i>1</i>	<i>1</i>	<i>0</i>	<i>1</i>
	<i>Black/Green</i>	<i>1</i>	<i>1</i>	<i>1</i>	<i>0</i>
<i>Black</i>	<i>1</i>	<i>1</i>	<i>1</i>	<i>1</i>	

Foreground Color

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

Foreground Color *Esc * v # S*

#Value	DJ600	DJ660C	DJ680C	DJ690C	DJ85xC	DJ870C	DJ890C	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 into a new index via modulo (palette size)							

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 PCL page marking primitives in DeskJet 600 and 800 series printers.

- Text characters
- Solid or monochrome patterned rectangular area fills (rules)
- Raster images

NOTE

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.

NOTE

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

Single Plane (black) Palette

Planes Per Row	Index	Color
1	0	White (no ink)
	1	Black

Three Plane (CMY) Color Palette

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

Three Plane (RGB) Color Palette

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

Four Plane (KCMY) Color Palette

Planes per Row	Index	Color Printed
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	

Configure Raster Data `Esc * g # W[data]`

#Value	DJ600	DJ660C	DJ680C	DJ690C	DJ85xC	DJ870C	DJ890C	Effect
n	✓	✓	✓	✓	✓	✓	✓	specified number of data bytes are interpreted as CRD data
Default	na							
Range	6 to 32767							

Configures the printer for complex raster data transfers.

NOTE

DeskJet 600 and 800 series printers lock out Simple Raster [Set Planes per Row] (`Esc*r#U`) and Raster Resolution (`Esc*t#R`) command after the receipt of a valid Configure Raster Data command. These sequences are locked out until a Reset (`EscE`) or an equivalent device reset, or a Configure Raster Data command is received with a value field of 0 (`Esc*g0W`). This Configure Raster Data command with a 0 value field not only unlocks Simple Raster (`Esc*r#U`) and Raster Resolution (`Esc*t#R`) commands but also resets the horizontal and vertical resolutions to 75 ppi and resets the raster mode to one bit direct (monochrome).

The data field must contain byte-aligned binary data, not ASCII. Unsupported or out-of-range values or other invalid configurations cause the entire command to be ignored and the data bytes to be discarded. Extra bytes are discarded. Value-field signs are ignored.

The CRD command provides the ability to configure raster transfers where the following conditions exist:

- Horizontal resolution differs from vertical resolution.
- Color components planes are specified at different resolutions.
- Multiple intensity levels are specified for one or more components.
- Indexed raster data is separate from the actual palette configuration.
- Direct raster data that does not affect the actual palette configuration.
- Mixed indexed raster data and monochrome data for sleek top-to-bottom printing.

The CRD configuration is overridden by Reset (*EscE*) and Simple Color (*Esc*r#U*) (also referred to as Set Planes Per Row).

Raster resolution is determined by the most recent CRD, even if it is of another form, or by a Raster Resolution (*Esc*t#R*) command. A Raster Resolution command issued after CRD does the following:

- For each component, sets horizontal and vertical resolutions to specified values.
- Matches the strip height for each component to the new resolution.
- Establishes a pixel-unit size for source raster height and width.
- Zeros the seed rows.
- For each component, sets the number of levels to 2.
- Has no effect on the number of expected components (raster indexing mode is unchanged).

The lowest horizontal resolution specified by a preceding CRD command determines the horizontal pixel size for Source Raster Width (*Esc*r#S*). Source Raster Width specifies the width to which all the planes of all the rows for all components are zero-filled or clipped. Similarly, the lowest vertical resolution specified by a preceding CRD command determines the vertical pixel size for Source Raster Height (*Esc*r#T*), which defines the vertical height of the raster area.

Missing data is zero-filled if Raster Resolution is changed or a *Y Offset* (*Esc*b#Y*) command is received after only part of the data defining a strip is sent.

As usual, the Transfer Raster Data commands (*Esc*b#W*, *Esc*b#V*) are used to download the raster data to the printer, and the *Compression Method* command (*Esc*b#M*) defines the compression rules

NOTE

The *Seed Row Source* (*Esc*b#S*) command should not be used with the *CRD* command-configured raster data, as the result is undefined.

Format 2: Complex Direct Planar

For Format 2, the only CRD command format recognized by the DeskJet 600 and 800 series printers, the order of the 4-component case is KCMY, and the data is always sent in component order. Complex Direct Planar is used to configure for raster transfers where:

- Horizontal resolution differs from vertical resolution.
- Color components are specified at different resolutions.
- Multiple intensity levels are specified for one or more components.

This format organizes the raster data for each color component into strips containing one or multiple raster pixel rows. The vertical displacement of all the strips is identical to the component with the lowest vertical resolution; therefore, higher resolution components require more rows to cover the same vertical displacement. The number of bytes required

to define a row varies with the horizontal resolution (e.g., 600-dpi rows contain 8 times as many bytes as 75-dpi rows). The highest horizontal and vertical resolutions must be multiples of lower horizontal or vertical resolutions, respectively. The CRD command is ignored for unsupported resolutions.

As shown below, the information specified for each color component consists of:

- horizontal resolution
- vertical resolution
- the number of levels of grayscale data

Byte	15 (MSB)	8	7 (LSB)	0	Byte
0	Format = 2 (UBYTE)		No of components (UBYTE)		1
2	Horizontal Resolution for Component 1 (UINT16)				3
4	Vertical Resolution for Component 1 (UINT16)				5
6	Number of Intensity Levels for Component 1 (UINT16)				7
...
6(n-1) + 2	Horizontal Resolution for Component n (UINT16)				6(n-1) + 3
6(n-1) + 4	Vertical Resolution for Component n (UINT16)				6(n-1) + 5
6(n-1) + 6	Number of Intensity Levels for Component n (UINT16)				6(n-1) + 7

Byte 0: Format Number

Value = 2
 Default = 2
 Range = 1 - 5

Format 2 configures the printer for direct (unindexed) monochrome, CMY, or CMYK data in planar format.

The CRD command is ignored for out-of-range values.

Byte 1: Number of Components

Value = 1 - Monochrome (K)
 = 3 - Three components (CMY)
 = 4 - Four components (KCMY)

Specifies the number of expected components. When the value is 3, the first component is cyan, the second magenta, and the third yellow. When the value is 4, the first component is black, the second cyan, the third magenta, and the fourth yellow. The Raster Transfer commands (*Esc*b#V*, *Esc*b#W*) must use this same component ordering to send the data.

The CRD command is ignored for values other than 1, 3, and 4.

Bytes 2 & 3, 8 & 9, etc.: Horizontal Resolution

Value = 1 - 65535

Specifies the horizontal resolution of each component in pixels per inch (ppi) of the source pixel. The "horizontal" axis is determined by the current Raster Presentation (*Esc*r#F*), Orientation (*Esc&l#O*), and Print Direction (*Esc&a#P*). Bytes 2 & 3 specify the horizontal resolution for component one, bytes 8 & 9 specify the horizontal resolution for component two, etc. The highest horizontal resolution must be a multiple of lower horizontal resolutions. The entire CRD command is ignored if a resolution is 0 or unsupported by the device.

Bytes 4&5, 10&11, etc.: Vertical Resolution

Value = 1 - 65535

Specifies the vertical resolution of each component in pixels per inch of the source pixel. The "vertical" axis is determined by the current Raster Presentation (*Esc*r#F*), Orientation (*Esc&#O*), and Print Direction (*Esc&a#P*). Bytes 4 & 5 specify the vertical resolution for component one, bytes 10 & 11 specify the vertical resolution for component two, etc. The highest vertical resolution must be a multiple of lower vertical resolutions. The entire CRD command is ignored if a resolution is 0 or unsupported by the device.

Bytes 6&7, 12&13, etc.: Number of Intensity Levels

Value = 2 to 255

Specifies the number of intensity or grayscale levels for each component. A level of 2 allows only 2 intensities, since a pixel is either On or Off. A level of 4 allows 4 intensities (Off, Low, Medium, High). The lowest intensity is 0; the highest intensity is Number of Levels - 1.

Bytes 6 and 7 specify the number of levels for component 1, bytes 12 and 13 specify the number of levels for component 2, etc.

The number of planes expected for each row is the ceiling function of log base 2 of the number of levels. For example, 3 levels require 2 planes. The lowest order plane is transmitted first and the highest order plane last for a given row.

Acceptable Combinations of Parameters for Format 2:

- A = Number of Components
- B = Horizontal Resolution of Component 1
- C = Vertical Resolution of Component 1
- D = Number of Intensity Levels of Component 1
- E = Horizontal Resolution of Component 2
- F = Vertical Resolution of Component 2
- G = Number of Intensity Levels of Component 2
- H = Horizontal Resolution of Component 3
- I = Vertical Resolution of Component 3
- J = Number of Intensity Levels of Component 4
- K = Horizontal Resolution of Component 4
- L = Vertical Resolution of Component 4
- M = Number of Intensity Levels of Component 4

Acceptable combinations of parameters for DeskJet 600/800 series printers:

A	B	C	D	E	F	G	H	I	J	K	L	M
1	600	600	2									
1	300	300	2									
1	600	300	2									
3	600	300	2	600	300	2	600	300	2			
3	300	300	2	300	300	2	300	300	2			
4	600	300	2	600	300	2	600	300	2	600	300	2
4	300	300	2	300	300	2	300	300	2	300	300	2
4	600	600	2	300	300	2	300	300	2	300	300	2

Example 1 of Format 2:

This example illustrates the basic form of Format 2.

Assume the following Configure Raster Data command is sent:

```
Format = 2
Number of components = 4
Horizontal resolution component 1 = 300
Vertical resolution component 1 = 300
Levels for component 1 = 2
Horizontal resolution component 2 = 300
Vertical resolution component 2 = 300
Levels for component 2 = 2
Horizontal resolution component 3 = 300
Vertical resolution component 3 = 300
Levels for component 3 = 2
Horizontal resolution component 4 = 300
Vertical resolution component 4 = 300
Levels for component 4 = 2
```

In this example, the vertical displacement of all four strips is 1/300 inch, since that is the displacement of the component with the lowest vertical resolution (300 ppi).

Component 1 consists of one row containing a plane of black (2 intensity levels require one plane for encoding, i.e., $\log_2 2 = 1$). Only one row is needed at 300-ppi vertical resolution to cover 1/300 inch of vertical displacement.

Component 2 consists of one row containing a plane of cyan (2 intensity levels require one plane for encoding, i.e., $\log_2 2 = 1$). Only one row is needed at 300-ppi vertical resolution to cover 1/300 inch of vertical displacement.

Component 3 consists of one row containing a plane of magenta (2 intensity levels require one plane for encoding, i.e., $\log_2 2 = 1$). Only one row is needed at 300-ppi vertical resolution to cover 1/300 inch of vertical displacement.

Component 4 consists of one row containing a plane of yellow (2 intensity levels require one plane for encoding, i.e., $\log_2 2 = 1$). Only one row is needed at 300-ppi vertical resolution to cover 1/300 inch of vertical displacement.

As shown below, components are sent in order from 1 to 4.

All planes of all rows use Transfer Raster by Plane (*Esc*b#V*) except the last plane of the last row within a strip, which uses Transfer Raster by Row/Block (*Esc*b#W*).

Component 1	row 1	Esc *b#V	300 ppi Black data
Component 2	row 1	Esc*b#V	300 ppi Cyan data
Component 3	row 1	Esc*b#V	300 ppi Magenta data
Component 4	row 1	Esc*b#W	300 ppi Yellow data

Example 2 of Format 2:

This example illustrates Format 2 with one component at a different resolution. This shows how the vertical displacement of each component of a strips is determined by the minimum resolution of all components.

Assume the following Configure Raster Data command is sent:

```
Format = 2
Number of components = 4
Horizontal resolution component 1 = 600
Vertical resolution component 1 = 600
Levels for component 1 = 2
Horizontal resolution component 2 = 300
Vertical resolution component 2 = 300
Levels for component 2 = 2
Horizontal resolution component 3 = 300
Vertical resolution component 3 = 300
Levels for component 3 = 2
Horizontal resolution component 4 = 300
Vertical resolution component 4 = 300
Levels for component 4 = 2
```

In this example, the vertical displacement of all four strips is 1/300 inch, since that is the displacement of the component with the lowest vertical resolution (300 ppi).

Component 1 consists of 2 single-plane rows of black (2 intensity levels require one plane for encoding, i.e., $\log_2 2 = 1$). Two rows of 600 ppi data are required to fill a 1/300 inch strip.

Component 2 consists of one row containing one plane of cyan (2 intensity levels require one plane for encoding, i.e., $\log_2 2 = 1$). Only one row is needed at 300 ppi vertical resolution to cover 1/300 inch of vertical displacement.

Component 3 consists of one row containing one plane of magenta (2 intensity require one plane for encoding, i.e., $\log_2 2 = 1$). Only one row is needed at 300 ppi resolution to fill a 1/300 inch strip.

Component 4 consists of one row containing one plane of yellow (2 intensity levels require one plane for encoding, i.e., $\log_2 2 = 1$). Only one row is needed at 300 ppi to fill a 1/300 inch strip.

As shown below, components are sent in order, from 1 to 4. In the same row, the least significant plane is sent first and the most significant plane last. Note that the 600 ppi planes contain twice as much data as the 300 ppi planes.

All planes of all rows use Transfer Raster by Plane (*Esc*b#V*) except the last plane of the last row within a strip, which uses Transfer Raster by Row/Block (*Esc*b#W*).

Component 1	row 1	Esc*b#V	600 x 600 ppi Black data
	row 2	Esc*b#V	600 x 600 ppi Black data
Component 2	row 1	Esc*b#V	300ppi Cyan data
Component 3	row 1	Esc*b#V	300 ppi Magenta data
Component 4	row 1	Esc*b#W	300ppiYellowdata

Example 3 of Format 2:

This example illustrates Format 2 with one component at a different resolution and the lower resolution components having more than 2 intensity levels. This shows how the vertical displacement of each component of a strips is determined by the minimum resolution of all components. This also shows how the components having more than 2 intensity levels require additional planes for the added data.

Assume the following **Configure Raster Data** command is sent:

```
Format = 2
Number of components = 4
Horizontal resolution component 1 = 600
Vertical resolution component 1 = 600
Levels for component 1 = 2
Horizontal resolution component 2 = 300
Vertical resolution component 2 = 300
Levels for component 2 = 4
Horizontal resolution component 3 = 300
Vertical resolution component 3 = 300
Levels for component 3 = 4
Horizontal resolution component 4 = 300
Vertical resolution component 4 = 300
Levels for component 4 = 4
```

In this example, the vertical displacement of all four strips is 1/300 inch, since that is the displacement of the component with the lowest vertical resolution (300 ppi).

Component 1 consists of 2 single-plane rows of black (2 intensity levels require 1 plane for encoding, i.e., $\log_2 2 = 1$). Two rows of 600 ppi data are required to fill a 1/300 inch strip.

Component 2 consists of one row containing 2 planes of cyan (4 intensity levels require 2 planes for encoding, i.e., $\log_2 4 = 2$). Only 1 row is needed at 300 ppi vertical resolution to cover 1/300 inch of vertical displacement.

Component 3 consists of 1 row containing 2 planes of magenta (4 intensity levels require 2 planes for encoding, i.e., $\log_2 4 = 2$). Only 1 row is needed at 300 ppi resolution to fill a 1/300 inch strip.

Component 4 consists of 1 row containing 2 planes of yellow (4 intensity levels require 2 planes for encoding, i.e., $\log_2 4 = 2$). Only 1 row is needed at 300 ppi to fill a 1/300 inch strip.

All planes of all rows use Transfer Raster by Plane (Esc*b#V) except the last plane of the last row within a strip, which uses Transfer Raster by Row/Block (Esc*bYW).

Component 1	row 1	Esc*b#V	600 x 600 ppi Black data	
	row 2	Esc*b#V	600 x 600 ppi Black data	
Component 2	row 1	Esc*b#V	300 ppi Cyan data	
	plane 2	Esc*b#V	300 ppi Cyan data	
Component 3	row 1	Esc*b#V	300 ppi Magenta data	
	plane 2	Esc*b#V	300 ppi Magenta data	
Component 4	row 1	Esc*b#V	300 ppi Yellow data	
	plane 2	Esc*b#W	300 ppi Yellow data	

Example 4 of Format 2:

This example illustrates the maximum flexibility of Format 2. There is no printer that implements this complex combination of parameters, however this should show how the sequence could meet a wide variety of future needs. This shows all component at a different resolutions and different number of intensity levels.

Assume the following Configure Raster Data command is sent:

Format	=	2
Number of components	=	4
Horizontal resolution component 1	=	300
Vertical resolution component 1	=	600
Levels for component 1	=	2
Horizontal resolution component 2	=	150
Vertical resolution component 2	=	75
Levels for component 2	=	16
Horizontal resolution component 3	=	75
Vertical resolution component 3	=	150
Levels for component 3	=	8
Horizontal resolution component 4	=	100
Vertical resolution component 4	=	300
Levels for component 4	=	4

In this example, the vertical displacement of all four strips is 1/75 inch, since that is the displacement of the component with the lowest vertical resolution (75 ppi).

Component 1 consists of eight single-plane rows of black (2 intensity levels require one plane for encoding - i.e., $\log_2 2=1$). Eight rows of 600 ppi vertical resolution data are required to fill a 1/75 inch strip.

Component 2 consists of one row containing four planes of cyan (16 intensity levels require four planes for encoding, i.e., $\log_2 16=4$). Only one row is needed at 75 ppi vertical resolution to cover 1/75 inch of vertical displacement.

Component 3 consists of two rows, each containing three planes of magenta (8 intensity levels require three planes). Two rows are needed at 150 ppi vertical resolution to fill a 1/75 inch strip.

Component 4 consists of four rows, each containing two planes of yellow (4 intensity levels require two planes). Four rows are needed at 300 ppi to fill a 1/75 inch strip.

As shown in the table below, components are sent in order, from 1 to 4. In the same row, the least significant plane is sent first and the most significant plane last. Note that the 600 ppi planes contain eight times as much data as the 75 ppi planes.

All planes of all rows use Transfer Raster by Plane (Esc*b#V) except the last plane of the last row within a strip, which uses Transfer Raster by Row/Block (Esc*b#W).

Component 1	row 1	<i>Esc*b#V</i>	300 x 600 ppi Black data	
	row 2	<i>Esc*b#V</i>	300 x 600 ppi Black data	
	row 3	<i>Esc*b#V</i>	300 x 600 ppi Black data	
	row 4	<i>Esc*b#V</i>	300 x 600 ppi Black data	
	row 5	<i>Esc*b#V</i>	300 x 600 ppi Black data	
	row 6	<i>Esc*b#V</i>	300 x 600 ppi Black data	
	row 7	<i>Esc*b#V</i>	300 x 600 ppi Black data	
	row 8	<i>Esc*b#V</i>	300 x 600 ppi Black data	
Component 2	row 1	<i>Esc*b#V</i>	150x75 ppi Cyan data	
	plane 2	<i>Esc*b#V</i>	150x75 ppi Cyan data	
	plane 3	<i>Esc*b#V</i>	150x75 ppi Cyan data	
	plane 4	<i>Esc*b#V</i>	150x75 ppi Cyan data	
Component 3	row 1	<i>Esc*b#V</i>	75x150 ppi Magenta data	
	plane 2	<i>Esc*b#V</i>	75x150 ppi Magenta data	
	plane 3	<i>Esc*b#V</i>	75x150 ppi Magenta data	
	row 2	<i>Esc*b#V</i>	75x150 ppi Magenta data	
	plane 2	<i>Esc*b#V</i>	75x150 ppi Magenta data	
	plane 3	<i>Esc*b#V</i>	75x150 ppi Magenta data	
Component 4	row 1	<i>Esc*b#V</i>	100x300 ppi Yellow data	
	plane 2	<i>Esc*b#V</i>	100x300 ppi Yellow data	
	row 2	<i>Esc*b#V</i>	100x300 ppi Yellow data	
	plane 2	<i>Esc*b#V</i>	100x300 ppi Yellow data	
	row 3	<i>Esc*b#V</i>	100x300 ppi Yellow data	
	plane 2	<i>Esc*b#V</i>	100x300 ppi Yellow data	
	row 4	<i>Esc*b#V</i>	100x300 ppi Yellow data	
	plane 2	<i>Esc*b#W</i>	100x300 ppi Yellow data	

Tagged Font Metrics Files (TFMs)

Hard copies of this Software Developer's Guide may include a 3.5 diskette containing TFM files for the scalable fonts built into the HP DeskJet 800 Series printers (except the DJ820). The Diskette also includes a TFM reader and a Readme file. These files are available along with this guide on the Hewlett-Packard Peripheral Developer Program web site.

The TFMs provided with this SDG function identically to those provided in the past with many of the HP LaserJet printers. The nature, manipulation, and use of these TFMs is thoroughly described in the [Hewlett Packard PCL 5 Developer's Guide](#) (part number 5967-0546) which is available by calling HP Parts Direct at 1-800-227-8164. The current cost for the manual is listed at \$60.00 U.S. currency.

If you have developed software for Hewlett-Packard LaserJet printers and utilized LaserJet scalable fonts and their associated TFM files, converting that experience for use in development for the HP DeskJet 800 series printers' internal scalable fonts and *their* TFM files should be a simple matter. If you have *not* used scalable fonts and TFM files in the past, learning to do so now will not only allow you to take advantage of the power and flexibility of the scalable font technology built into the HP 800 series printers, but will also provide an opportunity for you to move toward developing support for HP LaserJet printers and to take advantage of the vast installed base those printers possess

Documentation of the nature and use of scalable fonts and their associated TFM files is complex and voluminous. In order to ensure consistency and accuracy, that information will not be duplicated here. We apologize if this causes an inconvenience to our developer partners, but we are confident that those who require the documentation in the PCL 5 Developer's Guide will be satisfied with their investment.

NOTE

Please note that on page 8-11 of the [Hewlett-Packard PCL5 Developer's Guide](#), the formula listed for calculating TFM data has an error. The parenthesis in the second equation should read:

$$x = \text{round}(d/e * \text{EMsize}) * \text{uom/dpi}$$

While using the internal scalable fonts, be careful to note which of the fonts use True Type units of measure (1 point = $1/72$ inch) and which use the Intellifont units of measure (1 point = $1/72.307$). The Areal, Times New Roman, Symbol, and WingDings typefaces use the True Type point measurement. All others use the intellifont measure.

The "Glue.txt" on the TFM disk accompanying this guide provides the names of typefaces corresponding to each TFM file on the disk.

HP DeskJet PCL Printer Command Summary

The following tables list the body of PCL commands recognized by the HP DeskJet 600 and 800 series printers. Not all models in the DeskJet 600 and 800 series respond to all commands listed, and not all of these printers respond to all parameter options among those commands that are commonly recognized. Check commands of concern in the Command Comparison tables in the following section to determine which printers do recognize a particular command or command parameter option.

* These printer commands are listed in the order in which they must be sent.

Indicates the numeric parameter value field.

Note - Spaces in escape sequences are for readability and should not appear in actual command

Printer Feature	Printer Command	Decimal Equivalent	Hex. Equivalent
Printer Control			
Reset	Esc E	027 069	1B 45
Self test	Esc z	027 122	1B 7A
Paper Input Control (Media Source)			
Continuous forms (banners)	Esc &l-1H	027 038 108 046 049 072	1B 26 6C E2 31 48
Eject page	Esc &l0H	027 038 108 048 072	1B 26 6C 30 48
Feed from tray	Esc &l1H	027 038 108 049 072	1B 26 6C 31 48
Manual feed	Esc &l2H	027 038 108 050 072	1B 26 6C 32 48
Envelope feed	Esc &l 3H	027 038 108 051 072	1B 26 6C 33 48
Underline			
Single fixed	Esc &d1D	027 038 100 049 068	1B 26 64 31 44
Single floating	Esc &d3D	027 038 100 051 068	1B 26 64 33 44
Turn off	Esc &d@	027 038 100 064	1B 26 64 40
Line Termination			
CR ⇒ CR, LF ⇒ LF, FF ⇒ FF	Esc &k0G	027 038 107 048 071	1B 26 6B 30 47
CR ⇒ CR+LF, LF ⇒ LF, FF ⇒ FF	Esc &k1G	027 038 107 049 071	1B 26 6B 31 47
CR ⇒ CR, LF ⇒ CR + LF, FF ⇒ CR+FF	Esc &k2G	027 038 107 050 071	1B 26 6B 32 47
CR ⇒ CR+LF, LF ⇒ CR+LF, FF ⇒ CR+FF	Esc &k3G	027 038 107 051 071	1B 26 6B 33 47
End-of-Line Wrap			
Turn on	Esc &s0C	027 038 115 048 067	1B 26 73 30 43
Turn off	Esc &s1C	027 038 115 049 067	1B 26 73 31 43
Transparent Print Mode			
No. of bytes	Esc &p#X[data]	027 038 112 # 088 [data]	1B 26 70 # 58 [data]
Display Functions Mode			
Turn on	Esc Y	027 089	1B 59
Turn off	Esc Z	027 090	1B 5A

Printer Feature	Printer Command	Decimal Equivalent	Hex. Equivalent
Page Control			
Page Orientation*			
Portrait	Esc & ℓ 00	027 038 108 048 079	1B 26 6C 30 4F
Landscape	Esc & ℓ 10	027 038 108 049 079	1B 26 6C 31 4F
Reverse Portrait	Esc & ℓ 20	027 038 108 050 079	1B 26 6C 32 4F
Reverse Landscape	Esc & ℓ 30	027 038 108 051 079	1B 26 6C 33 4F
Print Quality			
Economy/Draft	Esc *o-1M	027 042 111 046 049 077	1B 2A 6F 2E 31 4D
Normal	Esc *o0M	027 042 111 048 077	1B 2A 6F 30 4D
Best	Esc *o1M	027 042 111 049 077	1B 2A 6F 31 4D
Media Type			
Plain Paper	Esc & ℓ 0M	027 038 108 048 077	1B 26 6C 30 4D
HP Premium Paper	Esc & ℓ 2M	027 038 108 050 077	1B 26 6C 32 4D
Glossy/Photo Paper	Esc & ℓ 3M	027 038 108 051 077	1B 26 6C 33 4D
Transparencies	Esc & ℓ 4M	027 038 108 052 077	1B 26 6C 34 4D
Paper Size*			
Executive	Esc & ℓ 1A	027 038 108 049 065	1B 26 6C 31 41
US Letter	Esc & ℓ 2A	027 038 108 050 065	1B 26 6C 32 41
US Legal	Esc & ℓ 3A	027 038 108 051 065	1B 26 6C 33 41
ISO A4	Esc & ℓ 26A	027 038 108 050 054 065	1B 26 6C 32 36 41
ISO A5	Esc & ℓ 25A	027 038 108 050 055 065	1B 26 6C 32 37 41
JIS B5	Esc & ℓ 45A	027 038 108 052 055 065	1B 26 6C 34 37 41
Card - 4 x 6	Esc & ℓ 74A	027 038 108 055 052 065	1B 26 6C 37 34 41
Card - 5 x 8	Esc & ℓ 75A	027 038 108 055 053 065	1B 26 6C 37 35 41
Card - A6 ISO/JIS	Esc & ℓ 24A	027 038 108 050 052 065	1B 26 6C 32 34 41
Card - hagaki	Esc & ℓ 71A	027 038 108 055 049 065	1B 26 6C 37 31 41
No. 10 envelope	Esc & ℓ 81A	027 038 108 056 049 065	1B 26 6C 38 31 41
Int'l DL Envelope	Esc & ℓ 90A	027 038 108 057 048 065	1B 26 6C 39 30 41
Int'l C6 Envelope	Esc & ℓ 92A	027 038 108 057 050 065	1B 26 6C 39 32 41
US A2 Envelope	Esc & ℓ 109A	027 038 108 049 048 057 065	1B 26 6C 31 30 39 41
Line Spacing			
Lines per inch (no. of lines)	Esc & ℓ #D	027 038 108 # 068	1B 26 6C # 44
Page Length*			
Number of lines	Esc & ℓ #P	027 038 108 # 080	1B 26 6C # 50
Perforation Skip Mode*			
On	Esc & ℓ 1L	027 038 108 049 076	1B 26 6C 31 4C
Off	Esc & ℓ 0L	027 038 108 048 076	1B 26 6C 30 4C
Top Margin*			
Number of lines	Esc & ℓ #E	027 038 108 # 069	1B 26 6C # 45
Text Length*			
Number of lines	Esc & ℓ #F	027 038 108 # 070	1B 26 6C # 46

Printer Feature	Printer Command	Decimal Equivalent	Hex. Equivalent
Side Margins*			
Left (column no.)	Esc &a#L	027 038 097 # 076	1B 26 61 # 4C
Right (column no.)	Esc &a#M	027 038 097 # 077	1B 26 61 # 4D
Cursor Positioning			
Unit of Measure	Esc &u#D	027 038 117 # 068	1B 26 75 # 44
Horizontal motion index number of 1/120th inch moves	Esc &k#H	027 038 107 # 072	1B 26 6B # 48
Move to column no.	Esc &a#C	027 038 097 # 067	1B 26 61 # 43
Horizontal no. (decipoints)	Esc &a#H	027 038 097 # 072	1B 26 61 # 48
Horizontal no. (PCL Units)	Esc *p#X	027 042 112 # 088	1B 2A 70 # 58
Vertical motion index no. of 1/48 inch moves	Esc & ℓ #C	027 038 108 # 067	1B 26 6C # 43
Move to row no.	Esc &a#R	027 038 097 # 082	1B 26 61 # 52
Vertical no. (decipoints)	Esc &a#V	027 038 097 # 086	1B 26 61 # 56
Vertical no. (PCL Units)	Esc *p#Y	027 042 112 # 089	1B 2A 70 # 59
Font Selection			
Character Set*			
PC-8	Esc (10U	027 040 049 048 085	1B 28 31 30 55
HP Roman8	Esc (8U	027 040 056 085	1B 28 38 55
PC-8 Danish/Norwegian	Esc (11U	027 040 049 049 085	1B 28 31 31 55
PC-850	Esc (12U	027 040 049 050 085	1B 28 31 32 55
ECMA-94 Latin 1	Esc (0N	027 040 048 078	1B 28 30 4E
German (ISO 21)	Esc (1G	027 040 049 071	1B 28 31 47
French (ISO 69)	Esc (1F	027 040 049 070	1B 28 31 46
Italian (ISO 15)	Esc (0I	027 040 048 073	1B 28 30 49
Spanish (ISO 17)	Esc (2S	027 040 050 083	1B 28 32 53
Swedish Names (ISO 11)	Esc (0S	027 040 048 083	1B 28 30 53
Norwegian1 (ISO 60)	Esc (0D	027 040 048 068	1B 28 30 44
United Kingdom (ISO 4)	Esc (1E	027 040 049 069	1B 28 31 45
ANSI ASCII (ISO 6)	Esc (0U	027 040 048 085	1B 28 30 55
HP Legal	Esc (1U	027 040 049 085	1B 28 31 55
PC-8 Turkish	Esc (9T	027 040 057 084	1B 28 39 54
PC-852	Esc (17U	027 040 049 055 085	1B 28 31 37 55
ISO 8859/2 Latin 2	Esc (2N	027 040 050 078	1B 28 32 4E
ISO 8859/5 Latin 5	Esc (5N	027 040 053 078	1B 28 35 4E
Windows 3.1 Latin 1	Esc (19U	027 040 049 057 085	1B 28 31 39 55
Windows 3.1 Latin 2	Esc (9E	027 040 057 069	1B 28 39 45
Windows 3.1 Latin 5	Esc (5T	027 040 053 084	1B 28 35 54
Spacing*			
Proportional	Esc (s1P	027 040 115 049 080	1B 28 73 31 50
Fixed	Esc (s0P	027 040 115 048 080	1B 28 73 30 50

Printer Feature	Printer Command	Decimal Equivalent	Hex. Equivalent
Print Pitch*			
Number of characters per inch	Esc (s#H	027 040 115 # 072	1B 28 73 # 48
Point Size (Character Height)*			
Number of 1/72nd inch	Esc (s#V	027 040 115 # 086	1B 28 73 # 56
Style*			
Upright	Esc (s0S	027 040 115 048 083	1B 28 73 30 53
Italic	Esc (s1S	027 040 115 049 083	1B 28 73 31 53
Stroke Weight*			
Bold	Esc (s3B	027 040 115 051 066	1B 28 73 33 42
Normal	Esc (s0B	027 040 115 048 066	1B 28 73 30 42
Extra bold	Esc (s7B	027 040 115 055 066	1B 28 73 37 42
Typeface*			
Courier	Esc (s3T	027 040 115 051 084	1B 28 73 33 54
CG Times	Esc (s4101T	027 040 115 052 049 048 049 084	1B 28 73 34 31 30 31 54
Letter Gothic	Esc (s6T	027 040 115 054 084	1B 28 73 36 54
Univers	Esc (s52T	027 040 115 053 050 084	1B 28 73 35 32 54
Times New Roman	Esc (s517T	027 040 115 053 049 055 084	1B 28 73 35 31 37 54
Arial	Esc (s218T	027 040 115 050 049 056 084	1B 28 73 32 31 38 54
Symbol	Esc (s302T	027 040 115 051 048 050 084	1B 28 73 33 30 32 54
Wingdings	Esc (s2730T	027 040 115 050 055 051 048 084	1B 28 73 32 37 33 30 54
Download Font Management			
Font ID no.	Esc *c#D	027 042 099 # 068	1B 2A 63 # 44
ASCII code no.	Esc *c#E	027 042 099 # 069	1B 2A 63 # 45
Delete all	Esc *c0F	027 042 099 048 070	1B 2A 63 30 46
Delete temporary	Esc *c1F	027 042 099 049 070	1B 2A 63 31 46
Delete last	Esc *c2F	027 042 099 050 070	1B 2A 63 32 46
Make temporary	Esc *c4F	027 042 099 052 070	1B 2A 63 34 46
Make permanent	Esc *c5F	027 042 099 053 070	1B 2A 63 35 46
Create font number of bytes	Esc)s#W[data]	027 041 115 # 087 [data]	1B 29 73 # 57 [data]
Download chr. No. of bytes	Esc (s#W[data]	027 040 115 # 087 [data]	1B 28 73 # 57 [data]
Raster Graphics			
Start Raster Graphics			
At left most position	Esc *r0A	027 042 114 048 065	1B 2A 72 30 41
Current cursor position	Esc *r1A	027 042 114 049 065	1B 2A 72 31 41
End Raster Graphics			
End Graphics	Esc *rbC	027 042 114 098 067	1B 2A 72 62 43
Resolution			
75 dots per inch	Esc *t75R	027 042 116 055 053 082	1B 2A 74 37 35 52
150 dots per inch	Esc *t150R	027 042 116 049 053 048 082	1B 2A 74 31 35 30 52
300 dots per inch	Esc *t300R	027 042 116 051 048 048 082	1B 2A 74 33 30 30 52
600 dots per inch	Esc *t600R	027 042 116 054 048 048 082	1B 2A 74 36 30 30 52
Configure Raster Data	Esc *g#W	027 042 103 # 087	1B 2A 67 # 57

Printer Feature	Printer Command	Decimal Equivalent	Hex. Equivalent
Set Raster Graphics Width			
Number of pixels	Esc *r#S	027 042 114 # 083	1B 2A 72 # 53
Set Raster Graphics Compression			
Method 0	Esc *b0M	027 042 098 048 077	1B 2A 62 30 4D
Method 1	Esc *b1M	027 042 098 049 077	1B 2A 62 31 4D
Method 2	Esc *b2M	027 042 098 050 077	1B 2A 62 32 4D
Method 3	Esc *b3M	027 042 098 051 077	1B 2A 62 33 4D
Method 9	Esc *b9M	027 042 098 057 077	1B 2A 62 39 4D
Seed Row Source	Esc *b#S	027 042 098 # 083	1B 2A 62 # 53
Transfer Raster Graphics			
Number of bytes	Esc *b#W[data]	027 042 098 # 087 [data]	1B 2A 62 # 57 [data]
Transfer graphics data by plane	Esc *b#V[data]	027 042 098 # 086 [data]	1B 2A 62 # 56 [data]
Relative Vertical Pixel Movement (formerly known as Y Offset)			
Number of dots	Esc *b#Y	027 042 098 # 089	1B 2A 62 # 59
Set Number of Raster Planes Per Row			
Single plane palette	Esc *r 1U	027 042 114 049 085	1B 2A 72 31 55
3 planes, CMY palette	Esc *r -3U	027 042 114 045 051 085	1B 2A 72 2D 33 55
3 planes, RGB palette	Esc *r 3U	027 042 114 051 085	1B 2A 72 33 55
4 planes, KCMY palette	Esc *r -4U	027 042 114 045 052 085	1B 2A 72 2D 34 55
Color Text			
Foreground color	Esc *v#S	027 042 118 # 083	1B 2A 76 # 53

Printer Command Comparison Tables

The following tables provide a comparison of the various PCL commands described in this guide and the HP DeskJet printers that support them. The tables are useful as a quick reference as to which printers support which escape sequences. You should keep in mind when referring to these tables that although a certain printer is indicated as supporting a particular command, the command may have certain command parameters which that printer *does not* support. Before using any particular command, you should be familiar with the full description of the command provided within the main body of this guide; it is those descriptions that will indicate which printers support which command parameters.

The printer command comparison tables use the following symbols which should clearly convey their meaning. Where no symbol appears under a particular command for a particular printer, that printer does not support the command. Using an unsupported command will produce unpredictable results. The printer may ignore the command or may print something other than what was intended.

✕ = Sequence supported

☆ = Requires Accessory Font Product

= Variable Parameter Value (see command description)

Printer Control

Function	Parameter	Command	DeskJet Printer Model							
			600	660C	670C	680C	690C	85xC	870C	890C
Reset		Esc E	✕	✕	✕	✕	✕	✕	✕	✕
Self Test		Esc z	✕	✕	✕	✕	✕	✕	✕	✕
Underline	Default	Esc &d0D	✕	✕	✕	✕	✕	✕	✕	✕
	Single fixed	Esc &d1D	✕	✕	✕	✕	✕	✕	✕	✕
	Double fixed	Esc &d2D	✕	✕	✕	✕	✕			
	Single float	Esc &d3D	✕	✕	✕	✕	✕	✕	✕	✕
	Double float	Esc &d4D	✕	✕	✕	✕	✕			
	Off	Esc &d@	✕	✕	✕	✕	✕	✕	✕	✕
Display Functions	On	Esc Y	✕	✕	✕	✕	✕	✕	✕	✕
	Off	Esc Z	✕	✕	✕	✕	✕	✕	✕	✕
Transparent Print Data	# of bytes	Esc &p#X	✕	✕	✕	✕	✕	✕	✕	✕
Perf Skip	On	Esc &l1L	✕	✕	✕	✕	✕	✕	✕	✕
	Off	Esc &l0L	✕	✕	✕	✕	✕	✕	✕	✕
End of Line Wrap	On	Esc &s0C	✕	✕	✕	✕	✕	✕	✕	✕
	Off	Esc &s1C	✕	✕	✕	✕	✕	✕	✕	✕
Line Termination	CR=CR LF=LF FF=FF	Esc &k0G	✕	✕	✕	✕	✕	✕	✕	✕
	CR=CR+LF LF=LF FF=FF	Esc &k1G	✕	✕	✕	✕	✕	✕	✕	✕
	CR=CR+LF LF=CR+LF FF=CR+FF	Esc &k2G	✕	✕	✕	✕	✕	✕	✕	✕

Printer Control

Function	Parameter	Command	DeskJet Printer Model							
			600	660C	670C	680C	690C	85xC	870C	890C
Foreground Color (color text)	White (no ink)	Esc *v0S	X	X	X	X	X	X	X	X
	True Black	Esc *v1S	X	X	X	X	X	X	X	X
	Cyan	Esc *v2S	X	X	X	X	X	X	X	X
	Magenta	Esc *v4S	X	X	X	X	X	X	X	X
	Blue	Esc *v6S	X	X	X	X	X	X	X	X
	Yellow	Esc *v8S	X	X	X	X	X	X	X	X
	Green	Esc *v10S	X	X	X	X	X	X	X	X
	Red	Esc *v12S	X	X	X	X	X	X	X	X
	Composite Black	Esc *v14S	X	X	X	X	X	X	X	X
Print Quality	Economy/Draft	Esc *o1M	X	X	X	X	X	X	X	X
	Normal	Esc *o0M	X	X	X	X	X	X	X	X
	Presentation	Esc *o1M	X	X	X	X	X	X	X	X
Paper Size	Executive	Esc A	X	X	X	X	X	X	X	X
	US Letter	Esc A	X	X	X	X	X	X	X	X
	US Legal	Esc A	X	X	X	X	X	X	X	X
	ISO A4	Esc A	X	X	X	X	X	X	X	X
	ISO A5	Esc A	X	X	X	X	X	X	X	X
	JIS B5	Esc -A	X	X	X	X	X	X	X	X
	Custom	Esc eA	X	X	X	X	X	X	X	X
	Card - 4 x 6 in.	Esc JA	X	X	X	X	X	X	X	X
	Card - 5 x 8 in.	Esc KA	X	X	X	X	X	X	X	X
	Card - A6 ISO/JIS	Esc A	X	X	X	X	X	X	X	X
	Card - Hagaki	Esc GA	X	X	X	X	X	X	X	X
	#10 Envelope	Esc QA	X	X	X	X	X	X	X	X
	Int'l DL Envelope	Esc ZA	X	X	X	X	X	X	X	X
	Int'l C6 Envelope	Esc \A	X	X	X	X	X	X	X	X
	US A2 Invitation	Esc mA	X	X	X	X	X	X	X	X
Media Type	Plain Paper	Esc �M	X	X	X	X	X	X	X	X
	Bond Paper	Esc M	X	X	X	X	X	X	X	X
	Premium	Esc M	X	X	X	X	X	X	X	X
	Transparency	Esc M	X	X	X	X	X	X	X	X
	Glossy/Photo Paper	Esc M	X	X	X	X	X	X	X	X
Paper Input Control	Continuous Forms	Esc H				X	X			
	Eject Page	Esc �H	X	X	X	X	X	X	X	X
	Feed From Tray	Esc H	X	X	X	X	X	X	X	X
	Manual Feed	Esc H	X	X	X	X	X	X	X	X
	Envelope Feed	Esc H	X	X	X	X	X	X	X	X
Page Orientation	Portrait	Esc �	X	X	X	X	X	X	X	X
	Landscape	Esc
	X	X	X	X	X	X	X	X
	Reverse Portrait	Esc 						X	X	X
	Reverse Landscape	Esc 						X	X	X
Page Length	# of Lines	Esc &#P	X	X	X	X	X	X	X	X
Top Margin	# of Lines	Esc &#E	X	X	X	X	X	X	X	X
Text Length	# of Lines	Esc &#F	X	X	X	X	X	X	X	X

Printer Control

Function	Parameter	Command	DeskJet Printer Model							
			600	660C	670C	680C	690C	85xC	870C	890C
Side Margins	Clear	Esc 9	X	X	X	X	X	X	X	X
	Left (column #)	Esc &a#L	X	X	X	X	X	X	X	X
	Right (column #)	Esc &a#M	X	X	X	X	X	X	X	X
Lines per Inch	# of Lines	Esc &l#D	X	X	X	X	X	X	X	X
Vertical CAP Move	to Row #	Esc &a#R	X	X	X	X	X	X	X	X
	# of Decipoints	Esc &a#V	X	X	X	X	X	X	X	X
	# of PCL Units	Esc *p#Y	X	X	X	X	X	X	X	X
Vertical Motion Index	# of 1/48" increments	Esc &l#C	X	X	X	X	X	X	X	X
Horiz. Motion Index	# of 1/120" increments	Esc &k#H	X	X	X	X	X	X	X	X
Horizontal CAP Move	to Column #	Esc &a#C	X	X	X	X	X	X	X	X
	# of Decipoints	Esc &a#H	X	X	X	X	X	X	X	X
	# of PCL Units	Esc *p#X	X	X	X	X	X	X	X	X

Font Selection

Function	Parameter	Command								
			600	660C	670C	680C	690C	85xC	870C	890C
Symbol Set	Roman8	Esc (8U	X	X	X	X	X	X	X	X
	ECMA 94	Esc (0N	X	X	X	X	X	X	X	X
	PC-8 (IBM-8)	Esc (10U	X	X	X	X	X	X	X	X
	PC-8 DN	Esc (11U	X	X	X	X	X	X	X	X
	PC-850	Esc (12U	X	X	X	X	X	X	X	X
	HP Legal	Esc (1U	X	X	X	X	X	X	X	X
	ISO 2: IRV	Esc (2U								
	ISO 4: UK	Esc (1E	X	X	X	X	X	X	X	X
	ISO 6: ANSI ASCII	Esc (0U	X	X	X	X	X	X	X	X
	ISO 11: Sweden	Esc (0S	X	X	X	X	X	X	X	X
	ISO 15: Italy	Esc (0I	X	X	X	X	X	X	X	X
	ISO 17: Spain	Esc (2S	X	X	X	X	X	X	X	X
	ISO 21: Germany	Esc (1G	X	X	X	X	X	X	X	X
	ISO 60: Norway 1	Esc (0D	X	X	X	X	X	X	X	X
	ISO 61: Norway2	Esc (1D	X	X	X	X	X	X	X	X
	ISO 69: France	Esc (1F	X	X	X	X	X	X	X	X
	ISO 88959/2 Latin-2	Esc (2N	X	X	X	X	X	X	X	X
	ISO 88959/9 Latin-5	Esc (5N	X	X	X	X	X	X	X	X
	ISO PC-852 Latin2	Esc (17U	X	X	X	X	X	X	X	X
PC-8 Turkish	Esc (9T	X	X	X	X	X	X	X	X	
Spacing	Fixed	Esc (s0P	X	X	X	X	X	X	X	X
	Proportional	Esc (s1P	X	X	X	X	X	X	X	X
Pitch	Chars. per Inch	Esc (s#H	X	X	X	X	X	X	X	X
Point Size	# of 1/72" units	Esc (s#V	X	X	X	X	X	X	X	X

Font Selection

Function	Parameter	Command								
			600	660C	670C	680C	690C	85xC	870C	890C
Style	Upright (normal)	Esc (s0S	X	X	X	X	X	X	X	X
	Italic	Esc (s1S	X	X	X	X	X	X	X	X
Stroke Weight	Light	Esc (s-3B	X	X	X	X	X	X	X	X
	Normal	Esc (s0B	X	X	X	X	X	X	X	X
	Bold	Esc (s3B	X	X	X	X	X	X	X	X
	Extra Bold	Esc (s7B	X	X	X	X	X	X	X	X

Font Management

Function	Parameter	Command								
			600	660C	670C	680C	690C	85xC	870C	890C
Font ID	Font ID #	Esc *c#D	X	X	X	X	X	X	X	X
Font Control	Delete All Fonts	Esc *c0F	X	X	X	X	X	X		
	Delete Temp Fonts	Esc *c1F	X	X	X	X	X	X		
	Delete Last Font	Esc *c2F	X	X	X	X	X	X		
	Delete Character	Esc *c3F	X	X	X	X	X	X		
	Make Font Temp.	Esc *c4F	X	X	X	X	X	X		
	Make Font Perm.	Esc *c5F	X	X	X	X	X	X		
Create Font	# of Bytes	Esc (s#W [data]	X	X	X	X	X	X		
Download Char.	# of Bytes	Esc (s#W [data]	X	X	X	X	X	X		

Graphics

Function	Parameter	Command	600	660C	670C	680C	690C	85xC	870C	890C
Planes Per Row (select palette) (simple color)	KCMY (4 plane)	Esc *r-4U	X	X	X	X	X	X	X	X
	CMY (3 plane)	Esc *r-3U	X	X	X	X	X	X	X	X
	K (black plane)	Esc *r-1U	X	X	X	X	X	X	X	X
	K (black plane)	Esc *r1U	X	X	X	X	X	X	X	X
	RGB	Esc *r3U	X	X	X	X	X	X	X	X
Resolution	75 ppi	Esc *t75R	X	X	X	X	X	X	X	X
	100 ppi	Esc *t100R	X	X	X	X	X		X	X
	150 ppi	Esc *t150R	X	X	X	X	X	X	X	X
	300 ppi	Esc *t300R	X	X	X	X	X	X	X	X
	600 ppi (k only)	Esc *t600R		X	X	X	X	X	X	X
Configure Raster Data (CRD)	Planar Direct	Esc*g2W		X	X	X	X	X	X	X
Graphics Width	# Pixels	Esc *r#S	X	X	X	X	X	X	X	X
Start Graphics	At Left-most Pos.	Esc *r0A	X	X	X	X	X	X	X	X
	At CAP	Esc *r1A	X	X	X	X	X	X	X	X

Graphics

Function	Parameter	Command	600	660C	670C	680C	690C	85xC	870C	890C
Seed Row Source	Same Plane of Previous Row	Esc *b0S	X	X	X	X	X	X	X	X
	Previous Plane	Esc *b1S	X	X	X	X	X	X	X	X
	2nd Previous	Esc *b2S	X	X	X	X	X	X	X	X
Compression	None (off)	Esc *b0M	X	X	X	X	X	X	X	X
	Method 1	Esc *b1M	X	X	X	X	X	X	X	X
	Method 2	Esc *b2M	X	X	X	X	X	X	X	X
	Method 3	Esc *b3M	X	X	X	X	X	X	X	X
	Method 9	Esc *b9M	X	X	X	X	X	X	X	X
Transfer by Plane	# of Bytes	Esc *b#V [data]	X	X	X	X	X	X	X	X
Transfer by Row	# of Bytes	Esc *b# W[data]	X	X	X	X	X	X	X	X
Vert. Pixel Move	Relative # Dots	Esc *b#Y	X	X	X	X	X	X	X	X
End Graphics		Esc *rC	X	X	X	X	X	X	X	X

Soft Font Formats

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 DeskJet 600 series or 85x printer, the *Font Descriptor Size* field *must* be set to exactly 64. The *First Code* and *Last Code* fields must also contain valid information. LaserJet printers do not enforce these restrictions, and it is therefore common for developers leveraging code and fonts from previous LaserJet development to experience problems.

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 CMI)				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

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 CMI)				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+1

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

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.

Descriptor Format (UBYTE)

Identifies the font as one of the following:

Value	Format
0	Standard Bitmap
20	Resolution-Specified Bitmap

Unrecognized values invalidate font creation.

NOTE

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

The DeskJet 600 series and DeskJet 85x printers only support formats 0 (Standard Bitmap), and 20 (Resolution-Specified Bitmap).

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 ¹ .
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. ¹
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).

¹. Access to those codes that are unprintable, yet have a character defined, requires the use of the Transparent Print (Esc&P#X) command.

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.

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.

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

15	14	10	9	5	4	2	1	0
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:

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

::

Baseline Position (UINT)

NOTE _____

DeskJet 600 series and DeskJet 85x printers ignore this field.

TrueType - Set to 0.

Cell Width (UINT)

NOTE _____

DeskJet 600 series and DeskJet 85x printers ignore this value.

Cell Height (UINT)

NOTE _____

DeskJet 600 series and DeskJet 85x printers ignore this value.

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)

NOTE _____

DeskJet 600 series printers will rotate the fonts to match the paper's physical coordinate system for various paper sizes.

Spacing (BOOL)

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

NOTE _____

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

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:

$$\text{Symbol Set Descriptor Field} = (\# \times 32) + (L - 64)$$

EXAMPLE

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.

Character Set (UINT16)

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

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 CMI 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 CMI has been changed.

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).

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

xHeight (UINT)

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

All DeskJet 500, 600 series and DeskJet 85x printers ignore this field.

Width Type (SBYTE)

NOTE

DeskJet printers ignore this field.

Style LSB (UBYTE)

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

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
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)

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 DeskJet 500 and LaserJet III printers, and the new LaserJet 4 version (also used by the DeskJet 600 series and DeskJet 85x printers).

Single-Byte Version

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

LaserJet III / 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.).

NOTE

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:

$$\text{Typeface Family} = \text{Typeface Base Value} + (\text{Version} \times 512) + (\text{Vendor} \times 2048)$$

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

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

Serif Style (UBYTE)

DeskJet 600 series and DeskJet 85x printers ignore this field.

Quality

DeskJet 600 series and DeskJet 85x printers ignore this field.

Placement

DeskJet 600 series and DeskJet 85x printers ignore this field.

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.

NOTE

DeskJet 600 series and DeskJet 85x printers use this field for auto-underlining.

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.

NOTE

DeskJet 600 series and DeskJet 85x printers use this field for auto-underlining.

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).

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).

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)

Last Code / Number of Characters (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.

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.

NOTE

DeskJet 500 series printers ignore this field. The 600 series and DeskJet 85x printers do not

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.

NOTE

DeskJet 500 series printers ignore this field. The 600 series and DeskJet 85x printers do not

Cap Height (UINT)

Cap height is a percentage of the Em of a font and is used to calculate the distance from the capline (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).

Font Number (UINT)

Bitmap Font - Should be ignored and set to 0.

Font Name (ASC16)

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

X Resolution (UINT)

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

Y Resolution (UINT)

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

Copyright

This optional field contains ASCII data.

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.

Segment Size

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

BR (Bitmap Resolution) Segment

The BR 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

X Resolution (UINT16)

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

Y Resolution (UINT16)

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

CE (Character Enhancement) Segment

The CE 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

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

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

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

15	8	7	0
Expansion	Reduction		

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

NOTE

DeskJet 600 series and DeskJet 800 printers support only 0.5 X/Y, 1.5 X/Y, and 2 X/Y.

DP (Dual-Pitch-Space Character Code) Segment

The 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

Full-Width-Space Character Code (UINT16)

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

Half-Width-Space Character Code

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

LaserJet Bitmap Character Definition

The format for the 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)	

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
10	Intellifont
12	DeskJet 500
15	TrueType

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

NOTE

DeskJet 600 and 85x series printers support only format 4.

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).

NOTE

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.

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

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.

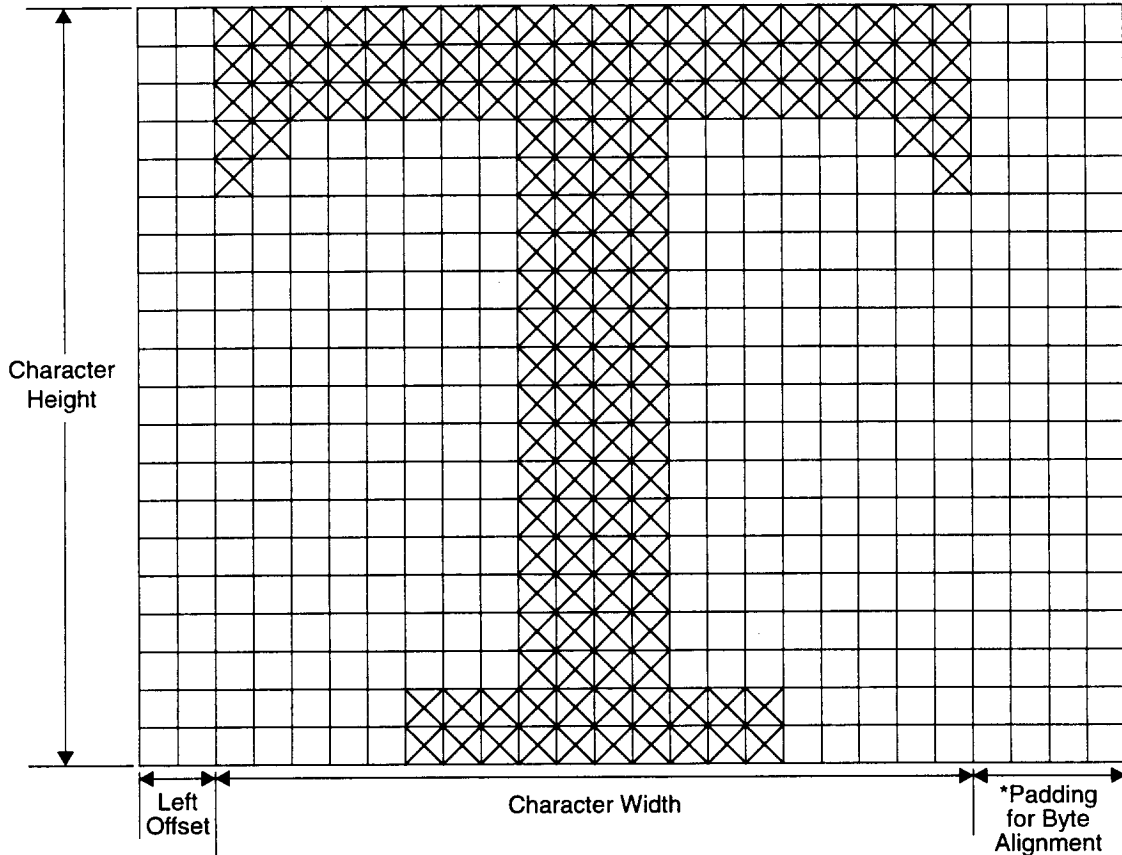
The number of bytes of the character data should be exactly the Character Width (in bytes) times the Character Height. Additional data is discarded. The character will consist only of the downloaded character data, even if this is insufficient.

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.



Line Repetition	Number White Pixels	Number Black Pixels	Number White Pixels	Number Black Pixels	Number White Pixels	Number Black Pixels
2	0	20	-	-	-	-
0	0	2	6	4	6	2
0	0	1	7	4	7	1
12	8	4	8	-	-	-
1	5	10	5	-	-	-

*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

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.

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.

DeskJet 600 series printers recognize a range of -16384 to 16384.

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.

DeskJet 600 series printers recognize a range of -16384 to 16384.

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.

DeskJet 600 series printers recognize a range of 1 to 16384.

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).

DeskJet 600 series printers recognize a range of 1 to 16384.

Delta X (SINT)

Bitmap fonts only. Specifies the number of quarter-dot units (radix dots) by which the horizontal position within the 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.

Character Data

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

Typeface Identification Tables

The following table provides a list of values for typeface families as of 8/03/92.

NOTE

Some of the typeface names in the table below may be registered trademarks of a third party. Use of these fonts may be conditional upon a license grant from the owners of the fonts. Hewlett-Packard makes no representation as to the quality or performance of the fonts, and references to the fonts does not grant any license or right to use the fonts.

Value	Typeface	Value	Typeface
0	Line Printer	44	Clarendon
3	Courier	45	ITC Zapf Dingbats
4	Helvetica	46	Cooper
5	Times Roman	47	ITC Bookman
6	Letter Gothic	48	Stick
7	Script	49	HP-GL Drafting
8	Prestige	50	HP-GL Spline
9	Caslon 540 & No. 3	51	Gill Sans
9	Caslon Antique (contour)	52	Univers
9	Caslon Open Face (in-line)	53	Bodoni
10	Orator	53	Poster Bodoni (black)
11	Presentation	54	Rockwell
13	Serifa	55	Melior
14	Futura	56	ITC Tiffany
15	Palatino	57	ITC Clearface
16	ITC Souvenir	58	Amelia
17	Optima	59	Park Avenue (italic)
17	Safeer (Arabic)	59	Falstaff (black)
18	ITC Garamond	60	Handel Gothic
20	Coronet	61	Dom Casual
21	Broadway	62	ITC Benguiat
23	Century Schoolbook	63	ITC Cheltenham
24	University Roman	64	Century Expanded
27	ITC Korinna	65	Franklin Gothic
28	Naskh	68	Plantin
29	Cloister Black	69	Trump Mediaeval
30	ITC Galliard	70	Futura Black

Value	Typeface	Value	Typeface
31	ITC Avant Garde Gothic	71	ITC American Typewriter
32	Brush	72	Antique Olive
33	Blippo	73	Uncial
34	Hobo	74	ITC Bauhaus
35	Windsor	75	Century Old Style
38	Peignot	76	ITC Eras
39	Baskerville	77	Friz Quadrata (ITC)
41	Trade Gothic	78	ITC Lubalin Graph
42	Goudy Old Style	79	Eurostile
43	ITC Zapf Chancery	80	Mincho
81	ITC Serif Gothic	122	Concorde
82	Snell Roundhand	123	Janson Text
83	Souvenir Gothic	124	Linotype Centennial
84	Stymie	125	Life
87	Bernhard Modern	126	Minister
89	Excelsior	127	New Century Schoolbook
90	Gando Ronde Script	152	Maru Gosikku (round gothic)
91	Ondine	153	Gosikku (Kaku, gothic)
91	EACT (Thai)	154	Socho
92	P.T. Barnum	155	Kyokasho (text book)
93	Kaufman	156	Kaisho
93	U-Thong (Thai)	157	Traditional Arabic Script
94	ITC Bolt (extended)	158	Arabic News
94	ITC Machine (condensed)	159	Post Antiqua
97	Revue	160	Devanagari (Hindi)
101	Garamond (Stempel)	161	Krishna (Gujarati)
102	Garth Graphic	162	Ranjit (Gurmukhi)
103	ITC Ronda	163	Raj Raja (Tamil)
104	OCR-A	164	Gyosho
105	Cochin	165	David
106	Englische Schreibschrift (italic)	166	Nork
106	Mister Earl (condensed)	167	Ousbouh
107	Flash	168	Koufi
108	Gothic (numbered)	169	Italia (ITC)
109	Stencil (ATF)	170	Bembo
110	OCR-B	171	Aachen
111	Akzidenz-Grotesk	172	Americana

Value	Typeface	Value	Typeface
112	Logos	173	Arnold Boecklin
113	Shannon	174	Copperplate Gothic (text)
114	ITC Stone Informal	175	Belwe
115	ITC Stone Sans	176	ITC Berkeley Oldstyle
116	ITC Stone Serif	177	Frutiger
117	Schneidler Mediaeval	178	Candida
118	ITC Symbol	179	Folio
119	ITC Weidemann	180	Corona
120	Copperplate Gothic (display)	181	ITC Kabel
121	Trajan	182	Garamond No. 3
183	Sabon	220	ITC Zapf Book
184	ITC Novarese	221	Linotype Technical Pi 1 & 2
185	Weiss	222	Linotype Textil Pi 1 & 2
186	Hiroshige	223	Poetical
187	French Script	223	Century Schoolbook Monospace
188	Meridien	224	Berliner Grotesk
189	Mistral	225	Christiana
190	Aster	226	Comenius-Antiqua
191	Caledonia	227	Delta
192	Nuptial Script	228	Italian Old Style
193	Lucida	229	Zingo
194	Adobe Wood Series 1	230	Octavian
195	Memphis	230	Borders & Ornaments 1
196	Lucida Sans	231	Footlight
197	Syntax	231	Borders & Ornaments 4
198	Utopia	232	Apollo
199	Berthold Walbaum Buch	232	Borders & Ornaments 5
200	Minion	233	Bremen
201	Marigold	233	Borders & Ornaments 6
202	ITC Tiepolo	234	Oranda
203	Versailles	234	Communication 1
204	ITC Leawood	235	Nubian
205	ITC Caslon No. 224	235	Communication 2
206	ITC Cushing	236	Cataneo
207	ITC Fenice	236	Communication 3
208	ITC Usherwood	237	Communication 6
209	ITC Benguiat Gothic	238	Modern

Value	Typeface	Value	Typeface
210	Spartan	238	Games & Sports 1
211	Neuzeit Grotesk	239	Games & Sports 2
212	PMN Caecilia	240	Games & Sports 3
213	ITC Busorama	241	Games & Sports 4
214	Agfa Wile Roman	242	Holidays 1
215	ITC Zapf International	243	Industry & Engineering 1
216	Poppl-Pontifex	244	Industry & Engineering 2
217	ITC Quay Sans	245	Transportation 1
218	Arial	246	Transportation 2
219	Fairfield	247	ITC Mendoza
248	Boton	284	Flyer
250	ITC Officina Serif	285	Wedding Text
251	ITC Officina Sans	286	Carolina
252	Goudy Modern	287	Avenir
253	Scotch Roman	288	Lucia
254	Temporary-Only Font	289	Tekton
255	-reserved	290	Charme
256	Bar Codes	291	ITC Flora
257	Hadriano	292	Basilica
258	Joanna	293	Auriol
259	Onyx	294	Kuenstler Script
260	non-Latin Helvetica	295	ITC New Baskerville
261	non-Latin Times	296	Berling
262	ITC Quorum	297	News Gothic
263	Engravers' Old English	298	Holiday Pi
264	Kennerley	299	Medici Script
265	Adobe Caslon	300	Aurora
266	Albertus	301	Carta
267	New Aurora Grotesque	302	Adobe Symbol
268	TBG Omnia	303	Insignia
269	Glypha	304	Perpetua
270	Tempo	305	Raleigh
270	Umbra (Tempo open shadow)	306	Romic
271	American Text	307	Formata
272	Pasquale	308	Cyrillic Univers
273	ITC Elan	308	Chuan Pim (like Univers)
274	Monotype Goudy Sans	308	Narkis Tam (like Univers)

Value	Typeface	Value	Typeface
275	Universal News & Commercial Pi	309	Bauer Bodoni
276	Thunderbird (extra condensed)	310	Industria
276	ITC Honda (black)	311	Decoration Pi
277	Shelley	312	Letraset Bramley
278	Universal Greek & Math Pi	313	Isabella
279	ITC Century	314	Cascade Script
280	Vineta	315	VAG Rounded
281	TBG Duc de Berry	316	Russell Square
282	Times Europa	317	Liberty
283	ITC Jamille	318	ITC Esprit
319	Clairvaux	358	Land Pi
320	Raphael	359	Oxford (italic)
321	ITC Franklin Gothic	360	MICR
322	Murray Hill	361	Imperial
323	Baker Signet	362	Charlemagne
324	Gambling Pi	363	Present Script
325	San Marco	364	Repro Script (italic)
326	Typo Roman	365	Baskerville No. 2
327	Engravers Text (inline)	366	Engravers' Roman
327	New Berolina (italic)	367	VGC Egyptian 505
328	Orbit-B	368	TBG Herculanum
329	McCullough	369	Clearface Gothic
330	ITC Isadora	370	Border Pi 1515-9
331	Audio Pi	371	Bundesbahn Pi
332	Letraset Crillee	372	Chemical Pi
333	Agfa Nadianne	373	Warning Pi
334	Compliment	374	Harry
335	ITC Giovanni	375	Alternate Gothic (numbered)
336	Neuzeit S	376	Figaro
337	Erbar	377	Formal Script
338	Parisian	378	Holland Title
339	Nofret	379	ITC Barcelona
340	City	380	Cartier
341	Old Style 7	381	Deepdene
342	Bell Centennial	382	Delphin
343	Lydian	383	Parsons
344	Monotype Ellington	384	Brighton

Value	Typeface	Value	Typeface
345	Impressum	385	Berthold Barmeno
346	Reporter No. 2	386	Berthold Colossalis
347	Freestyle Script	387	Berthold Cosmos
348	Serpentine	388	ITC Isbell
349	Lithos	389	ITC Mixage
350	Basilia	390	Sonata
351	Simplified Arabic	390	Badr, or Bayaan II
352	Maximus	391	ITC Newtext
353	ITC Slimbach	392	Happening
357	Berthold Garamond	393	Menue
394	Doric	430	Embassy
395	S'maragd	431	Latin Antique
396	Ornaments	431	Latin Wide (extended)
397	Berthold Bodoni Old Face	432	ITC Modern 216
398	Schadow	433	Serlio
399	Akzidens Grotesk Buch	434	Piranesi
400	Akzidens Grotesk Buch Stencil	435	Imago
401	Akzidens Grotesk Buch Schulbuch	436	Wilke
402	Bookman	438	Adobe Garamond
403	Bruce Old Style	439	Seagull
404	Bulmer	440	Latin MT
405	Madison	441	Runic MT
406	Textype	442	Moore Computer
407	Primer	443	Commercial Script
408	Garamond (Simoncini)	444	Dominante
409	Adobe Wood Series 2	445	Wilhelm Klingspor Gotisch
410	Rotis Serif	446	Trajanus
411	Rotis Semiserif	447	TSI Caxton
412	Rotis Sans Serif	448	Fette Fraktur
413	Rotis Semisans	449	European Pi
414	Arcadia	450	Banco
415	ITC Veljovik	451	Bodoni Antiqua
416	Armenian Aramian	452	Mathematical Pi
417	Armenian Barz	453	Congress
418	Helvetica Rounded	454	Cheq
419	Olympian	455	Berthold Walbaum Buch (B.metrics)
420	DIN Engschrift (condensed)	456	Huxley Vertical

Value	Typeface	Value	Typeface
420	DIN Mittelschrift	457	Grayda
421	Granjon	458	Penfield No. 3
422	Guardi	459	Michelangelo
423	Impact	460	Neo Didot
424	Sassoon Primary	461	Berthold Caslon Buch
425	Packard	462	Sans No. 1
426	Baskerville Book	463	Torino
427	ITC Pacella	464	Photina
428	Rusticana	465	Calligraphiques
429	Eccentric	466	Concorde Nova
467	Franco	512	Sackers Square Gothic
468	Goudy Text	512	Sackers English Script
469	Balloon (italic)	513	Heritage
470	Eusebius	514	Sackers Gothic
470	Eusebius Open (inline)	517	Times (Ten, New, etc.)
471	Digital	518	Berthold Script
471	Noris Script (italic)	519	Bernhard Tango (italic)
472	Poppl-Pontifex (B.metrics)	520	Castellar (inline)
473	Amigo	521	Else
473	Pelican (italic)	522	Basque (condensed)
473	Visigoth (bold italic)	522	Palace Script (italic)
474	Letraset Arta	523	Centaur
475	Post Medieval	524	Fine Hand
476	Adsans	525	Linotype Astrology Pi
477	Ariadne	526	Sackers Roman
478	Calligraphy	527	Kompact (ultra black italic)
479	Didot	527	Monoline Script (italic)
480	Ashely Script	528	Othello (bold condensed)
486	Animals	529	Sackers Classic Roman
487	Business & Services 1	529	Sackers Italian Script (italic)
488	Business & Services 2	530	Riviera (inline)
489	Commercial 1	531	Poppl-Residenz
490	Commercial 2	532	Rotation
491	Ecology	533	Bank Gothic
492	General Symbols 1	534	Delphian (inline)
493	General Symbols 2	535	Sackers Antique Roman
494	Medical & Pharmaceutical 1	536	Schwabacher

Value	Typeface	Value	Typeface
495	Musical	537	Egyptienne (condensed)
496	Special Alphabets 4	538	Artisan Roman (inline)
497	Special Alphabets 5	538	Forte (bold italic)
498	Special Alphabets 6	539	Burin Roman
499	Inflex	539	Burin Sans (light)
500	Monotype Old Style	540	Hellenic Wide (extended)
510	ITC Anna (condensed)	541	Thompson Quillscript
510	ITC Beesknees (black)	542	Kartoon
511	ITC Studio Script (italic)	543	Classic Roman
511	ITC Mona Lisa Recut (inline)	544	AG Old Face
545	Lucian	581	Spectrum
546	Della Robbia	582	Boulevard
547	Libra	583	Cheltenham
548	Brody (bold upright)	584	De Vinne
549	Ad Lib (bold)	585	London Text (inline)
550	Choc (black)	585	Profil (bold italic inline)
551	Handle Oldstyle	586	Imprint
552	Roman	587	Allegro (bold italic)
553	Antique Roman	587	Engraver's Gothic (text)
554	Goudy Catalogue, add'l Old Style faces	588	Bernhard (bold condensed)
554	Goudy Handtooled (inline)	588	Eckmann (text)
555	Calligrapher	589	Cloister Open Face (outline)
556	Lucida Bright	589	Davida (text)
557	Pi Collection	589	Klang (italic)
558	Broadpen	590	Fry's Baskerville
559	Amazone	591	Metro
560	Frank Ruehl	592	Mandate
561	Cloe	595	Bingham Script (text)
562	Discus	595	Block (bold)
563	Myriad	596	ITC Gorilla (text)
565	WTC Our Bodoni	596	ITC Pioneer (outline shadow)
566	Ideal Schreibschrift	598	Bodoni Campanile
567	Print	599	Linotype Modern
568	Lucida Blackletter	600	Monterey Script (italic)
569	Lucida Calligraphy	600	Playbill (condensed)
570	Data 70	601	Normande
571	Compacta (expanded)	602	Wave

Value	Typeface	Value	Typeface
571	Helvetica Inserat (condensed)	603	Bernhard Fashion (extra light)
572	Lucida Handwriting	603	Mercurius
573	Biffo	604	Stuyvesant (inline)
574	Calvert	605	Impuls (italic)
575	Cantoria	605	Romana (text & bold)
576	Dorchester Script	606	Shotgun
577	Grotesque	607	Ehrhardt
578	Pepita	608	ITC Grizzly
579	Vectora	609	ITC Grouch
580	Script Bold	610	ITC Tom's New Roman
611	Palette (italic)	671	Post Antiqua (B.metrics)
611	Hanseatic (ultrabold condensed)	672	Diotoma
612	Bison	673	Aldus
613	Jefferson	679	Marking Numbers Squares
614	Electra	679	Al Harf Al Jadid
615	Antique No. 3	680	Vivaldi
616	Flemish Script (italic)	681	Codex
617	Hallmark Bodoni	684	Lucida Fax
618	Modern #20	685	Bellevue
619	Westinghouse Gothic	686	Architect
620	Bloc (outline)	693	Cable
620	Empire (ultra condensed)	699	Studio
621	Oscar	701	Solemnis
623	Akzidenz-Grotesk (B.metrics)	704	Renault
624	Koch Antiqua	706	Mobil
625	Mirarae	708	Lucida Sans Typewriter
626	Horley Old Style	712	Lino Letter
627	Tango	713	Henche
632	Bank Script (italic)	719	Sans Serif Stencil
634	Concorde (B.metrics)	725	Hess Neobold
646	Bell Gothic	930	Akzidenz Grotesk Buch Rounded
652	Poppl-Laudatio	1030	Isil Gothic
670	Egyptienne F	2730	Wingdings

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).

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 $\frac{1}{4}$ 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

NOTE

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 $8\frac{1}{2}$ X 11 in.
* Set Portrait Orientation	Esc & ℓ 0 O	
Specify Bi-directional Print	Esc & k 1 W	
Set Text Scale Mode OFF	Esc & k 5 W	
Enable Perforation Skip Mode	Esc & ℓ 1 L	Default top margin is $\frac{1}{2}$ 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	$\frac{3}{4}$ in. margin X 8 lpi = 6 lines
Set Text Length	Esc & ℓ 72 F	11 in. page length - [$\frac{3}{4}$ in. margin + $\frac{1}{4}$ 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	$\frac{3}{4}$ in. margin = [6 columns X 12 cpi (selected font pitch)] + $\frac{1}{4}$ in. unprintable region
Set Right Margin	Esc & a 90 M	Page width is $8\frac{1}{2}$ in. The unprintable region accounts for $\frac{1}{4}$ in. leaving $8\frac{1}{4}$ in. (99 columns at 12 cpi). To set the $\frac{3}{4}$ in. margin set the page width at $7\frac{1}{2}$ in. (90 columns at 12 cpi).

Command Line/Action	Command	Comment
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 9/48 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		
Return CAP to Left Margin	<CR>	
Reset Printer	Esc E	Clears partially composed pages; returns printer to default settings.

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&l2a00 Esc&k1w5W Esc&l1l8d88p6e72F Esc(s0p12H Esc&a6l90M
Esc*p-95y+475X Esc(12U Esc(s6h12v0s3b6TDeskJet Printer Family Esc(&l9C
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**

The output produced by the above commands is represented in the figure below. 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.

DeskJet Printer Family

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 was intended as a superior print quality alternative for users intending to upgrade to 24 wire dot matrix printers.

In April 1989, the DeskJet PLUS was introduced with a U.S. list price of \$995 and the original DeskJet's price was reduced to \$795. New proportionally spaced font products were added for the DeskJet PLUS which also featured greatly improved throughput speed, and built in landscape capability. The DeskJet PLUS effectively took over the position of the original DeskJet which was then intended for users who did not require the increased functionality and versatility of the DeskJet PLUS.

Both printers received numerous industry awards, and contributed significantly to HP's shipping of over 1 million thermal inkjet printers by January 1990.

In September 1990 HP replaced the DeskJet and DeskJet PLUS printers with the DeskJet 500 printer at a U.S. list price of \$729. It is positioned as HP's most affordable 300 dpi printer. HP is also introducing a significantly improved, water-resistant ink (same part number) with the new DeskJet 500 printer. The new ink is shipping with the DeskJet 500 and will be available for all U.S. users in December 1990 (January 1991 for European and Intercon). This new printer has the ability to use kerned fonts. Four new font cartridges are offered to take advantage of this feature and also provide decorative typefaces. HP offers a full featured MS Windows 3.0, DeskJet 500 printer driver with scalable typeface support, that will include 3 scalable typefaces, WYSIWYG and compatibility with the HP Mastertype Library of scalable fonts. This driver compliments the DeskJet Family printer driver with font cartridge support for MS Windows 3.0.



Example Printout (reduced size, partial page)

3-plane color graphics

The following shows a simple 3 plane color graphics PCL file output that prints CMY colors, then blends them to produce BLACK, RED, GREEN and BLUE.

PCL Codes	HEX Data (Run Length Compression)	Description
<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>*rC		End Raster
<esc>E		Reset printer

4-plane color graphics

The following shows a simple 4 plane color graphics PCL file output that prints KCMY colors, then blends them to produce BLACK, RED, GREEN and BLUE.

PCL Codes	HEX Data (Run Length Compression)	Description
<esc>E		Reset printer
<esc>*r-4U		Simple color(4 plane)
<esc>*r0A		Start raster
<esc>*b1M		Compression method
<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>*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>*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>*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>*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>*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>*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>*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>*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

Configure Raster Data (CRD)

The following shows a simple CRD 4 plane color graphics PCL file output that prints KCMY colors, then blends them to produce BLACK, RED, GREEN and BLUE.

PCL Codes	HEX Data (Run Length Compression)	Description
<esc>E		Reset printer
<esc>*g26W	02 04 01 2C 01 2C 00 02 01 2C 01 2C 00 02 01 2C 01 2C 00 02 01 2C 01 2C 00 02	Config Raster Data
<esc>*r0A		Start raster
<esc>*b1M		Compression method
<esc>*b18V	24FF 2400 2400 2400 0100 2400 2400 2400 2400	(Black data)
<esc>*b18V	2400 24FF 2400 2400 0100 24FF 2400 24FF 24FF	(Cyan data)
<esc>*b18V	2400 2400 24FF 2400 0100 24FF 24FF 2400 24FF	(Magenta data)
<esc>*b18W	2400 2400 2400 24FF 0100 24FF 24FF 24FF 2400	(Yellow data)
<esc>*b18V	24FF 2400 2400 2400 0100 2400 2400 2400 2400	(Black data)
<esc>*b18V	2400 24FF 2400 2400 0100 24FF 2400 24FF 24FF	(Cyan data)
<esc>*b18V	2400 2400 24FF 2400 0100 24FF 24FF 2400 24FF	(Magenta data)
<esc>*b18W	2400 2400 2400 24FF 0100 24FF 24FF 24FF 2400	(Yellow data)
<esc>*b18V	24FF 2400 2400 2400 0100 2400 2400 2400 2400	(Black data)
<esc>*b18V	2400 24FF 2400 2400 0100 24FF 2400 24FF 24FF	(Cyan data)
<esc>*b18V	2400 2400 24FF 2400 0100 24FF 24FF 2400 24FF	(Magenta data)
<esc>*b18W	2400 2400 2400 24FF 0100 24FF 24FF 24FF 2400	(Yellow data)
<esc>*b18V	24FF 2400 2400 2400 0100 2400 2400 2400 2400	(Black data)
<esc>*b18V	2400 24FF 2400 2400 0100 24FF 2400 24FF 24FF	(Cyan data)
<esc>*b18V	2400 2400 24FF 2400 0100 24FF 24FF 2400 24FF	(Magenta data)
<esc>*b18W	2400 2400 2400 24FF 0100 24FF 24FF 24FF 2400	(Yellow data)
<esc>*b18V	24FF 2400 2400 2400 0100 2400 2400 2400 2400	(Black data)
<esc>*b18V	2400 24FF 2400 2400 0100 24FF 2400 24FF 24FF	(Cyan data)
<esc>*b18V	2400 2400 24FF 2400 0100 24FF 24FF 2400 24FF	(Magenta data)
<esc>*b18W	2400 2400 2400 24FF 0100 24FF 24FF 24FF 2400	(Yellow data)
<esc>*b18V	24FF 2400 2400 2400 0100 2400 2400 2400 2400	(Black data)
<esc>*b18V	2400 24FF 2400 2400 0100 24FF 2400 24FF 24FF	(Cyan data)
<esc>*b18V	2400 2400 24FF 2400 0100 24FF 24FF 2400 24FF	(Magenta data)
<esc>*b18W	2400 2400 2400 24FF 0100 24FF 24FF 24FF 2400	(Yellow data)
<esc>*b18V	24FF 2400 2400 2400 0100 2400 2400 2400 2400	(Black data)
<esc>*b18V	2400 24FF 2400 2400 0100 24FF 2400 24FF 24FF	(Cyan data)
<esc>*b18V	2400 2400 24FF 2400 0100 24FF 24FF 2400 24FF	(Magenta data)
<esc>*b18W	2400 2400 2400 24FF 0100 24FF 24FF 24FF 2400	(Yellow data)
<esc>*rC		End Raster
<esc>E		Reset printer

