

# Chapter 6: Printer Control

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## 6.1 PCL Job Control

Job control languages like PJP and PML can perform job setup. PCL also contains many job control commands for setting printer features to a known state at the beginning of a job.

Although there may be exceptions, there are two general rules governing when to use a job control language and when to use PCL for setting environment variables:

1. Job control language is used for language switching (e.g., PCL to PostScript).
2. Job control language is used by the system administrator for general network setup.
3. PCL job setup is used for local setup of a specific machine. It is analogous to control panel setup for a particular job. After that job, the control panel is reset to user defaults.

At the beginning of every print job, PCL job control commands are issued before sending print data. Job control commands are usually grouped together and sent at job boundaries. Job control commands control the output of the entire print job and are grouped together at the beginning of a print file.

### Reset *Esc E*

Returns all device features to their user-defaults (control panel settings). Control-panel settings are used because they can override factory defaults. Specifically, *EscE* performs the following:

- Prints all data received before the reset.
- Moves CAP to the intersection of the top of form and default left margin on the current page if the page is clean (no printable data has been sent); otherwise the page is ejected and CAP goes to the intersection of the top of form and default left margin on the next page.
- Deletes downloaded temporary (not permanent), fonts, symbol sets, patterns, and macros.
- Returns control to PCL if executed in HP-GL/2 mode.
- Executes an HP-GL/2 *IN* command (but does not create a default HP-GL/2 palette).
- Disables the auto macro overlay.
- Clears the palette stack
- Defaults the following:
  - Color palette to a 2-pen non-programmable black and white palette
  - Color lookup tables
  - Color pipeline
  - Logical page size
  - Logical page orientation
  - Print direction
  - Picture frame
  - Render algorithm
  - Viewing illuminant
  - Gamma correction
  - Print model logical operators
  - Foreground color
  - Source and pattern transparency modes
  - Text parsing method
  - Text path direction

*EscE* should be the first PCL command at the beginning of a job 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* 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* is a valid HP-GL/2 terminator and is the same as *IN*, but in addition:

- Creates a PCL 2-pen non-programmable black and white palette
- Defaults CAP
- Defaults to the PCL logical page orientation
- Defaults the picture frame
- Defaults the anchor point
- Defaults the HP-GL/2 plot size

Within an HP-GL/2 label in normal mode (TD0), *EscE* is a special case: it causes a device to reset and transition to the PCL environment. In transparent data mode (TD1), *EscE* does not reset the device.

## **Job Separation    *Esc & l # t/T***

Provides a means for distinguishing print job boundaries when multiple print jobs exist in the output tray.

Value(#) = 0 (obsolete) Sets stacking position to a known state  
           = 1 Performs a job offset  
 Default = NA  
 Range = 1

This command should be sent at the beginning of a print job, immediately following *EscE*.

Job separation occurs before a page goes to the output bin if the command is received before closing the page (the back side of the page in duplexing mode). Multiple job separation commands on the same page cause only one offset.

DEVICE NOTE: LJ500 physically offsets jobs. *Esc&l0T* sets the stacker to the default position. *Esc&l1T* sets the stacker to the position opposite that of the previous position.

DEVICE NOTE: LJ2000 performs job separation by inserting an identifying sheet edged with a heavy black bar between jobs.

DEVICE NOTE: LJIII Si and LJ4 Si physically offset the jobs in the output stacker. Job separation is not supported when the face-up output tray is selected.

DEVICE NOTE: The HP5000 fanfold prints 'tick' marks between jobs on tractor feed strips.

DEVICE NOTE: DJs below 1200 do not eject the current page.

## Media Destination *Esc & l # g/G*

Selects the destination bin for which the print job should be delivered.

Value(#) = 0 Automatic selection  
          = 1 Selects destination tray #1  
          = 2 Selects destination tray #2  
          = 3 Selects destination tray #3  
Default = 0  
Range = 0 to 3

DEVICE NOTE: LJIII Si and 4Si support values 1 and 2 only; tray #1 is the stacker unit on top of the printer and tray #2 is the face-up tray on the rear of the printer.

DEVICE NOTE: Color LJ supports 0, 1, and 2. Tray 1 is defined to be the correct-order, face-down stacker on top of the printer; tray 2 refers to the pull-out tray (which also serves as the lid to the main cassette) for reverse-order, face-up outputs.

## Simplex/Duplex *Esc & l # s/S*

Designates either single-sided or double-sided printing mode for duplex printers.

Value(#) = 0 Simplex  
          = 1 Duplex, vertical binding  
          = 2 Duplex, horizontal binding  
Default = 0  
Range = 0 to 2

*Horizontally bound* duplexed pages are bound along the width (short side) of the physical page. Horizontal binding duplex mode rotates back side data 180 degrees from front side data (Figure 6-1).

*Vertically bound* duplexed pages are bound along the length (long side) of the physical page. Vertical binding duplex mode does not change orientation from front to back (Figure 6-2).

This command causes a conditional page eject (if printable data has been sent).

DEVICE NOTE: DeskJets below 1200 do not eject the page.

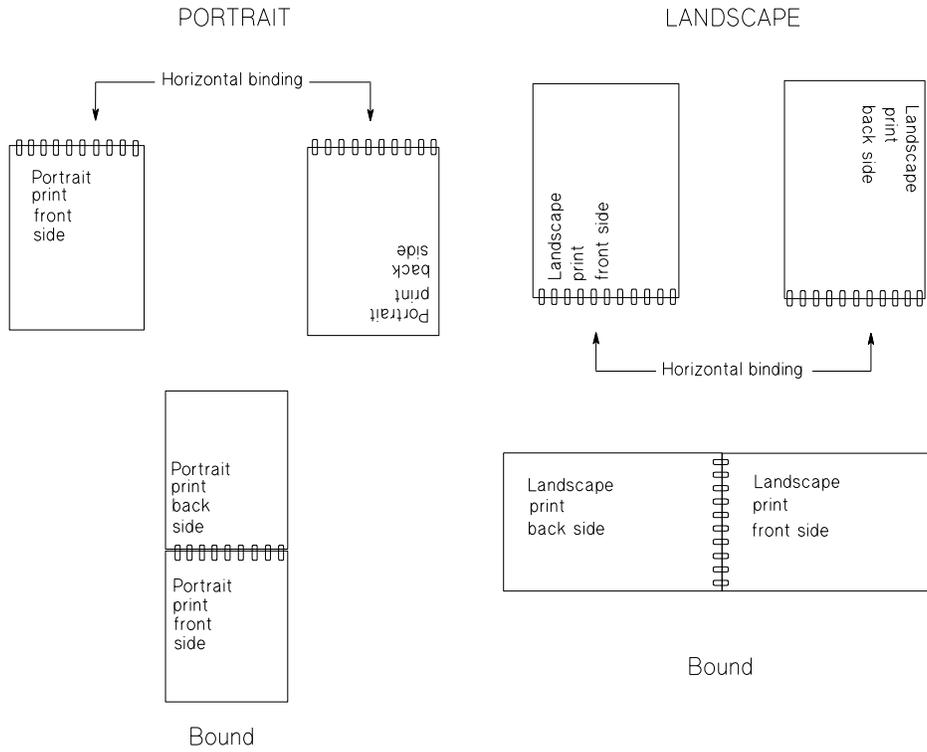
## Duplex Page Side *Esc & a # g/G*

Designates which side of the sheet to print.

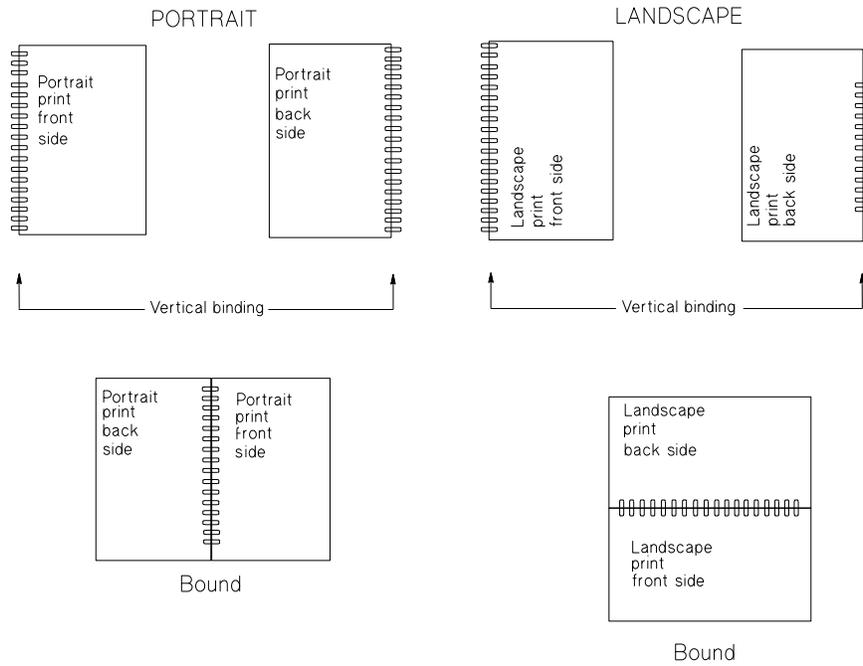
Value(#) = 0 Next side  
          = 1 Front side  
          = 2 Back side  
Default = 0  
Range = 0 to 2

This command causes a conditional page eject (if printable data has been sent). It may be used to skip a page; for example, a chapter typically begins on the front (odd) side of a page.

DEVICE NOTE: DeskJets below 1200 do not eject the page.



**Figure 6-1 Horizontal Binding Mode**



**Figure 6-2 Vertical Binding Mode**

## Left Registration *Esc & l # u/U*

Positions the logical page across the width (short side) of the physical sheet. Fractional units can be used to position to dot (device) accuracy.

Value(#) = Number of decipoints (1/720 inch)  
Default = 0 (the default position of the logical page)  
Range =  $-2^{31}$  to  $2^{31}-1$

Positive values move the logical page to the right along the width of the physical page, except on the back side of sheets printed in vertical binding duplex mode, where they move it to the left. Movement is independent of orientation. (As shown in figures 6-3 and 6-4, positive moves are in the direction away from the binding).

Negative values move the logical page to the left along the width of the physical page, except on the back side of sheets printed in vertical binding duplex mode, where they move it to the right. Movement is independent of orientation. (Figures 6-3 and 6-4).

**NOTE:** The +/- value is absolute with respect to the logical page default position, not relative to the present location.

**NOTE:** Registration may cause data loss by moving the logical page outside the printable area.

## Top Registration *Esc & l # z/Z*

Determines the position of the logical page along the length (long side) of the physical sheet. Fractional units can be used to position to dot (device) accuracy.

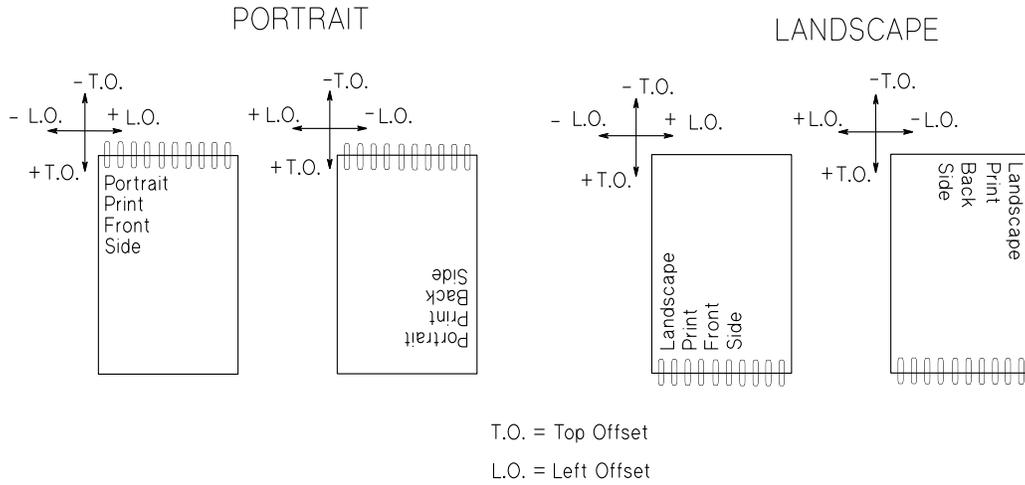
Value(#) = Number of decipoints (1/720 inch)  
Default = 0 (the default position of the logical page)  
Range =  $-2^{31}$  to  $2^{31}-1$

Positive values move the logical page down the length of the physical page, except on the back of sheets printed in horizontal binding duplex mode, where they move it up. Movement is independent of orientation. (Figures 6-3 and 6-4).

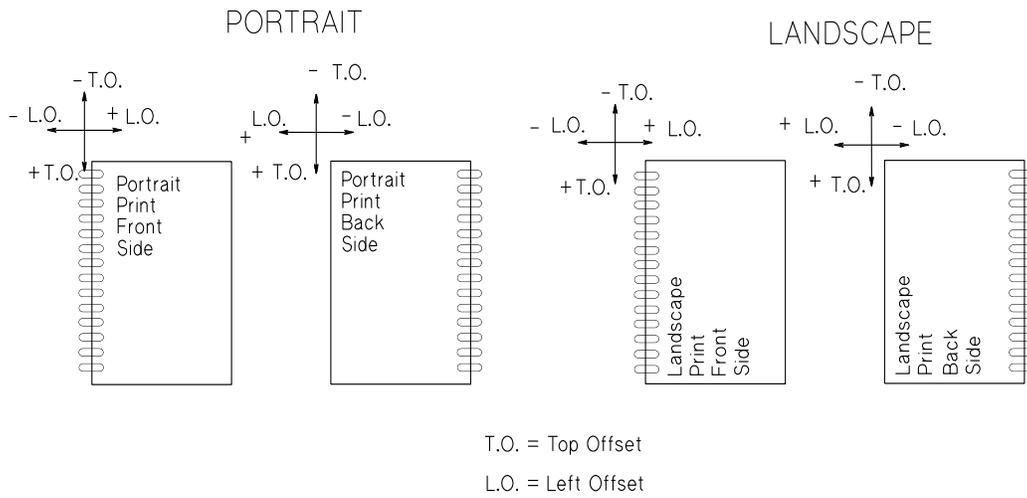
Negative values move the logical page up the length the physical page, except on the back of sheets printed in horizontal binding duplex mode, where they move it down. Movement is independent of orientation. (Figures 6-3 and 6-4).

**NOTE:** The +/- value is absolute with respect to the logical page default position, not relative to the present location.

**NOTE:** Registration may cause data loss by moving the logical page outside the printable area.



**Figure 6-3 Horizontal Binding Mode Offset**



**Figure 6-4 Vertical Binding Mode Offset**

## **Copies**    *Esc & l # x/X*

Selects the number of printed copies of each page.

Value(#) = Number of copies  
Default = 1  
Range = 1 to  $2^{32}-1$  (negative values map to absolute values)

When this command is received anywhere on a page, it affects current and subsequent pages.

DEVICE NOTE: LJII series, LJIII, and LJIIID support 1-99. LJIIISi and LJ4 series support 1-32767.

DEVICE NOTE: Since the HP-GL/2 Replot command (RP) is inactive in dual context PCL5, *Esc&l#X* may be sent for multiple plots; it must be sent prior to closing the page on which the plot is defined.

## **Negative Motion**    *Esc & a # n/N*

Specifies whether negative motion will be used.

Value(#) = 0 Picture contains negative motion (page formatting printers)  
          = 1 Picture contains no negative motion (swath printers)  
Default = 0  
Range = 0, 1

Negative motion includes:

- Vertical motion toward the top of the page.
- HP-GL/2 operations.
- Print directions other than 0 degrees.
- Landscape text.
- When the top of the character cell on the next line is above the top of the character cell on the current line.

The default value of 0 delays printing until all the processing of input data for a page is complete.

A value of 1 allows data to be printed as received, rather than first stored in a buffer. Otherwise, printing will be delayed until all the processing of input data is complete.

**NOTE:** This command must be sent before any printable data is received.

DEVICE NOTE: Only PJ, PJXL, PJXL300, DJ1200C, and DJ1600C use this command.

## Unit of Measure *Esc & u # d/D*

Establishes the size of a PCL Unit (formerly "dot").

Value (#) = Number of units per inch  
 Default = Device dependent  
 Range = 96, 100, 120, 144, 150, 160, 180, 200, 225, 240, 288, 300, 360, 400,  
 450, 480, 600, 720, 800, 900, 1200, 1440, 1800, 2400, 3600, 7200

DEVICE NOTE: DJ850C implements only 300 and 600 and ignores all other values.

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

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

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

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

In addition, devices supporting this command — regardless of whether this command has been sent — round a selected font's CMI to the nearest PCL unit, rather than to the nearest internal unit. This may cause character spacing to be different on a 600 dpi printer vs a 300 dpi printer, or on a 300 dpi printer that supports this command vs a 300 dpi printer that does not. To get the same character placement on both printers, the unit of measure should be set to 300 and the CMI command (*Esc&k#H*) should be sent after font selection has occurred.

DEVICE NOTE: DJ850C does not round CMI to the nearest PCL Unit; so this command affects only the start of characters and PCL Unit commands.

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

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

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

Out-of-range values are mapped to the supported value with the minimum relative error. For example, the relative error of a unit selection of 4801 is closer to 7200 than 3600 — i.e.,  $ABS(4801 - 7200) / 7200 < ABS(4801 - 3600) / 3600$ .

## Peripheral Configuration *Esc & b # w/W*

Provides communication with the AppleTalk driver or the Peripheral Management Language (PML) parser.

Value(#) = Number of binary data bytes  
 Default = NA  
 Range = 0 to  $2^{32}-1$

DEVICE NOTE: DJ850C supports a value field range of 0 to 32767.

The data fields must contain byte-aligned binary data, not ASCII. Invalid configurations are ignored and the data discarded. Value field signs are ignored. Extra bytes are discarded.

### Encapsulated PML

This command provides a way for PCL to send PML commands to devices that support “encapsulated” PML. PCL is used as a PML transport when a bidirectional link is unavailable or synchronization between the PCL data stream and the asynchronous control of PML is desired. Only the SET and DISABLE PML commands are accepted (GET and ENABLE are ignored). However, SET and DISABLE are not acknowledged. The format is:

PML<sp><PML command>

### AppleTalk

This command can configure the device to receive PCL print jobs over an AppleTalk connection. AppleTalk may use this command to provide a job name, a document name, a page count, or to rename the printer for identification on the AppleTalk network.

In AppleTalk, the binary data field is in the format [key][space][value]. The *key* is a character string with a length of 1 to the device-supported length. An ASCII space character separates the key string and the value string: the first occurrence of a space signifies the end of the key. The *value* is a character string with a range of 1 to the device-supported length. Value strings are terminated by either a NULL character or expiration of binary data within the binary data field. While both the key and value strings can contain from 0 to 4,294,967,295 bytes each, their sum total must be less than the maximum allowed by the command. AppleTalk recognizes the following binary sequences:

JOB <job name>  
 RENAME <new name>  
 TYPE <type name>  
 ZONE <zone name>  
 DOCUMENT <document name>

**JOB**<sp>**jobname** renames the current job. All character names are valid. Only the first 127 characters (bytes) are used. There is no default job name.

**RENAME**<sp>**devicename** renames the name field of the printer's AppleTalk Network Identifier (Name Binding Protocol name field). The valid characters of the printer name include 0-255 except for the characters NULL <00H>, "@" <40H>, ":" <3AH>, "\*" <2AH>, "=" <3DH>, "~" <C5H>, and <FFH>. If the printer encounters a NULL <00H> in the device name, it uses the NULL character to terminate the device name. All the characters preceding the NULL will be used as the device name. The printer checks for invalid characters and ignores the escape sequence if an invalid character is encountered. A name must contain at least one character, and only the first 31 characters are used. The printer's name is not changed if the name is invalid.

**TYPE**<sp>**devicetype** renames the type field of the printer's AppleTalk Network Identifier (Name Binding Protocol type field). The valid characters for type include 0-255 except for the characters (from the Apple Character Set): NULL <00H>, "@" <40H>, ":" <3AH>, "\*" <2AH>, "=" <3DH>, "~" <C5H>, and <FFH>. If the printer encounters a NULL <00H> in the devicetype, it uses the NULL character to terminate the device type. All the characters preceding the NULL will be used as the device type. The printer checks for invalid characters and ignores the escape sequence if an invalid character is encountered. A type must contain at least one character, and only the first 31 characters are used. The printer's type is not changed if the type is invalid. Type changes occur only after the present job is completed.

**ZONE**<sp>**zonename** changes the zone field of the printer's AppleTalk Network Identifier (Name Binding Protocol zone field). The valid characters for the zone include 0-255 except for the characters NULL <00H>, "@" <40H>, ":" <3AH>, "\*" <2AH>, "=" <3DH>, "~" <C5H>, and <FFH>. If the printer encounters a NULL <00H> in the zone name, it uses the NULL character to terminate the zone name. All the characters preceding the NULL will be used as the zone name. The printer checks for invalid characters and ignores the escape sequence if an invalid character is encountered. The zone must contain at least one character, and only the first 31 characters are used. The printer's zone is not changed if the zone is invalid. Zone changes occur only after the present job is completed.

**DOCUMENT**<sp>**documentname** renames the current document. The valid characters for the document name include 0-255 except for the characters NULL <00H> and ":" <3AH>. If the printer encounters a NULL <00H> in the document name, it uses the NULL character to terminate the document name. All the characters preceding the NULL will be used as the document name. A document name must contain at least one character, and only the first 31 characters are used.

**NOTE:** AppleTalk commands are not used in DOS.

## 6.2 Printer Diagnostics

### Self-test *Esc z*

A self-test performs the following actions:

- Processes all data preceding the self-test.
- Performs a full Reset (*EscE*). The page is ejected if printable data has been sent. Downloaded fonts are not deleted.
- Moves CAP to the top of form, if not already there.
- Performs the self-test.
- After self-test, moves CAP to the top of form, if not already there.
- Resumes execution without data loss (programmable features need not be saved).
- Prints results.

If no error is detected, the printer should remain on-line. If an error is detected, the printer should go to the off-line state.

DEVICE NOTE: HP5000 fanfold printers do not perform a full reset in a self-test.

DEVICE NOTE: LJ5P initiates either self-test or PCL fontlist, depending on a PJI environmental variable.

## 6.3 Device Specific Control

### Gray Balance *Esc \* b # b/B*

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

Value(#) = 1 Enable gray balancing  
 = 2 Disable gray balancing  
 Default = Device-dependent  
 Range = 1,2

When black is constructed by setting all the bits in the CMY color planes, the resulting color may have a non-black hue.

### Dry Timer *Esc & b # t/T*

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

Value(#) = Dry time in seconds  
 Default = Device-dependent  
 Range = 0 to 1200

The drying time for ink depends on media, print modes, and environment. For example, transparencies may need over 10 minutes in an unheated environment.

### Color Raster Graphics Depletion *Esc \* o # d/D*

Specifies the depletion method for raster image printing.

Value(#) = 1 No depletion  
 = 2 25% depletion of color data  
 = 3 50% depletion of color data  
 = 4 25% depletion of color data with color linearity compensation  
 = 5 50% depletion of color data with color linearity compensation  
 Default = Device-dependent  
 Range = 1 to 5

Graphics depletion selectively removes pixels from a graphics image to reduce the amount of ink placed on the page. Depletion will alter the color appearance.

Values 4 and 5 perform linear compensation by selectively depleting certain color intensities differently than other intensities for a more linear color intensity curve. In general, the gamma-corrected depletions result in better color output.

DEVICE NOTE: DJ550C does not deplete single-plane raster images or foreground color. Only the color planes (CMY) are depleted on 4-plane raster images (CMYK).

DEVICE NOTE: DJ850C maintains the proper hue and implements 4 identical to 2 and 5 identical to 3.

## **Mechanical Print Quality** *Esc \* o # q/Q*

Determines print quality for graphics on paper.

Value(#)	=	-1	Maps to 1
	=	0	No shingling
	=	1	50% shingling
	=	2	25% shingling
	=	3	25% shingling for 600 x 300 dpi data
Default	=	0	
Range	=	-1 to 3	

"Shingling" is an interlace technique with checkerboard masking to remove "banding" effects.

DEVICE NOTE: This command is interpreted this way for DJs below 1200; it is interpreted as shown below for PJXL300, DJ1200C, and DJ1600C.

## **Mechanical Print Quality** *Esc \* o # q/Q*

Determines print quality for graphics on paper.

Value(#)	=	-1	EconoFast
	=	0	Normal quality
	=	1	Presentation
Default	=	0	
Range	=	-1 to 2	

DEVICE NOTE: This command is interpreted this way for PJXL300, DJ1200C, and DJ1600C; it is interpreted as shown above for DJs below 1200.

## **Print Quality** *Esc \* o # m/M*

Specifies the desired print quality for a page.

Value(#)	=	-1	Draft, Economy, or EconoFast mode
	=	0	Normal quality
	=	1	Presentation quality
Default	=	0	
Range	=	-1,0,1	

The functional means of achieving the requested quality level are device specific.

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 current page is printed and CAP moves to the top of form at the left margin of the next physical page.

This command, in conjunction with the Media Type command (*Esc&l#M*), provides a high-level print mode specifier and replaces the need for the following:

Font Quality (Primary)	<i>Esc(s#Q</i>
Font Quality (Secondary)	<i>Esc)s#Q</i>
Raster Graphics Quality	<i>Esc*r#Q</i>
Mechanical Print Quality	<i>Esc*o#Q</i>

DEVICE NOTE: After this command, DJ660C and 850C ignore the Primary and Secondary Font Quality, Raster Graphics Quality, and Mechanical Print Quality commands until a reset.

## **Media Type**    *Esc & l # m/M*

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

Value(#)	=	0	Plain paper
	=	1	Bond Paper
	=	2	Special paper
	=	3	Glossy film
	=	4	Transparency film
Default	=	0	
Range	=	0 to 4	

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.

## 6.4 Internal HP Sequences

**NOTE:** Do not document the following escape sequences outside HP.

The following sequences should not appear in any user or ISV documentation.

### **Designate Primary Font**    *Esc ( # @*

Designates the font or symbol set used for the primary font. (This command is used for testing. It should not appear in user or ISV documentation.)

Value(#)	=	0,1	Designates the symbol set of the default primary font.
	=	2	Designates the most recently requested symbol set for the primary font.
	=	3	Designates all default primary font attributes.
Default	=	NA	
Range	=	0 to 3	

A value field of 2 sets the symbol set of the primary font to the most recently requested symbol set (this may not be the symbol set of the current font). A value field of 3 sets all primary font attributes except orientation to those of the default font. Pitch is not changed if the font is proportional.

**NOTE:** This command is used for testing. It should not appear in user or ISV documentation.

### **Designate Secondary Font**    *Esc ) # @*

Designates the font or symbol set to be used for the secondary font. (This command is used for testing. It should not appear in user or ISV documentation.)

Value(#)	=	0	Designates the symbol set of the default secondary font.
	=	1	Designates the symbol set of the default primary font.
	=	2	Designates the most recently requested symbol set for the secondary font.
	=	3	Designates default secondary font attributes except orientation.
Default	=	NA	
Range	=	0 to 3	

A value field of 2 sets the symbol set of the secondary font to the most recently requested symbol set (this may not be the symbol set of the current font). A value field of 3 sets all secondary font attributes except orientation to those of the default font. Pitch is not changed if the font is proportional.

**NOTE:** This command is used for testing. It should not appear in user or ISV documentation.

## Driver Function Configuration *Esc \* o # w/W [data]*

Allows drivers to configure parameters that might change after the printer is shipped.

Value(#) = Number of bytes of binary data  
 Default = 0  
 Range = 0 to  $2^{32} - 1$

To avoid proliferation of undocumented escape sequences, this sequence can perform multiple functions by encapsulating a block of parameters in a binary transfer. If the printer recognizes this sequence, the first byte of data is a format number. The printer ignores the sequence if it does not recognize the sequence or format number.

Byte 1: Format number (key)  
 Bytes 2-n: Function dependent

For format 1 to 3, the format of the function dependent bytes is:

Byte 1: Format number  
 Byte 2: Function index  
 Byte 3: Sign of parameter: either "+" (2BH), "-" (2DH), or Null (00H)  
 Bytes 4-5: Function dependent parameter (unsigned 16-bit integer: byte 4 is the most significant and byte 5 is the least significant)

DEVICE NOTE: Format 1 is understood by DJ500C; Format 2 by DJ500, 510, and 550C; Format 3 by DJ520 and 560C; Format 4 by DJ540 and 660C; Format 5 by OfficeJet; Format 6 by DJ310 and Color LJ; Format 7 by DJ850C. Commands of a lower format number may be understood by a printer from the same class that understands a higher format number, i.e., some of the Format 1 and 2 commands are understood by DJ520 and 560C.

DEVICE NOTE: As described below, Color LaserJet uses this sequence to specify lightness, saturation, under-color removal, scaling algorithm, color mode, and to download a color map specification.

### Driver Configuration *Esc\*o#W[device\_id function\_index arguments]*

Specifies lightness, saturation, under-color removal, scaling algorithm, color mode, and to download a color map specification.

device_id (key) =	6	Specifies device as Color LaserJet
function_index =	0	Lightness - argument range [-100..100]
	1	Saturation - argument range [-100..100]
	2	Under-color removal - argument range [shadow, highlight, gamma] 0-255, unsigned bytes
	3	Scaling algorithm - argument [ 0 Pixel replication 1 Bilinear interpolation 2 Modified bilinear interpolation ]
	4	Select color mode - argument [ 0 No adjustment 1 Business blue 2 Transparency 3 Vivid graphics 4 Out of gamut (DIC) 5 CIE Lab match (DIC) ]
	5	Download color map - Color space [ 1 CMY 3 CIELab ] Mapid [see valid Mapid list] Data [14739 bytes]

**Lightness:** Negative values darken (unlighten) color images, text or graphics, but have no effect on black or white data. Positive values lighten the image. Zero turns lightness adjustment off. This replaces *Esc\*u#L*. This function index requires three bytes of data.

**Saturation:** Negative values desaturate (gray) color images, text or graphics, but have no effect on black or white data. Positive values increase saturation, making the image more vivid. Zero turns saturation adjustment off. This replaces *Esc\*u#S*. This function index requires three bytes of data.

**Under-Color Removal:** Three values are specified: Shadow, Highlight, and Gamma. This function index requires five bytes of data:

- Shadow: unsigned byte, range [0..255]
- Highlight: unsigned byte, range [0..255]
- Gamma: ubytes in unsigned byte, range [0..255], internally scaled by 10 such that internal representation is [0..255]

**Scaling:** The backward compatible scaling algorithm is pixel replication. Bilinear Interpolation is a high quality scaling algorithm for smooth edge interpolated scaling. Modified Bilinear only interpolates when it is best to do so. This function index requires three bytes of data.

**Select Color Mode:** Specifies the color treatment mode for rendering the ensuing job.

- No adjustment:
  1. No color correction: the user sees pure engine behavior.
    - + HP stays out of the way.
    - Non-linear response/output to linear color input. (color gradients/ramps show large hue shifts.)
    - Halftone dependent: hues vary according to the halftone chosen.
  2. Linearization only: the user sees the device as a linear device.
    - + Non-halftone dependent: linearization for every supported halftone.
    - + 3-space linear response to numerically linear input (i.e., smooth gradients that are independent of hue).
    - Output is not as vivid/saturated as users may prefer.
    - HP has calibrated.
  3. Same as Vivid Graphics: no adjustment #2, with the addition of user-preferred enhancements, like a boost in saturation/vividness.
- Business Blue: Same as Vivid Graphics (linearization plus user-preferred enhancements with the addition of mapping process blue (visually printed as purple) to a blue closer to a standard monitor.
- Transparency: Uses a map to render the best color output on transmissive media.
- Vivid Graphics: Produces a more saturated rendition of the input image.
- Out of Gamut: Prints colors that are out of gamut: all colors that are in gamut snap to white.
- CIE Lab Match: This map performs a true color match to requested CIE Lab input: there are no user-preferred enhancements.

NOTE: For screen matching, the long form of the CID command is used and the color maps are generated internally, dependent on the monitor calibration data: i.e., this command is not needed.

**Download Color Map:** The printer supports the downloading of color adjustment maps according to the halftone requested, the type of color treatment desired (including device-dependent or independent), and the type of media. This is to ensure the ability to provide the best output in the future as more is known about the stability/operation point of engines and customer preference.

## Valid Mapid List

Description	Mapid
Cluster - No Adjust - LinearCMY	1
Disperse - No Adjust - LinearCMY	2
Scatter - No Adjust - LinearCMY	3
ErrorDiffusion - No Adjust - LinearCMY	4
Cluster - Business Blue - LinearCMY	5
Disperse - Business Blue - LinearCMY	6
Scatter - Business Blue - LinearCMY	7
ErrorDiffusion - Business Blue - LinearCMY	8
Cluster - Transparency - LinearCMY	9
Disperse - Transparency - LinearCMY	10
Scatter - Transparency - LinearCMY	11
ErrorDiffusion - Transparency - LinearCMY	12
Cluster - VividGraphics - LinearCMY	13
Disperse - VividGraphics - LinearCMY	14
Scatter - VividGraphics - LinearCMY	15
ErrorDiffusion - VividGraphics - LinearCMY	16
Cluster - OutOfGamut - LinearCMY	17
Disperse - OutOfGamut - LinearCMY	18
Scatter - OutOfGamut - LinearCMY	19
ErrorDiffusion - OutOfGamut - LinearCMY	20
Cluster - TrueMatch - LinearCMY	21
Disperse - TrueMatch - LinearCMY	22
Scatter - TrueMatch - LinearCMY	23
ErrorDiffusion - TrueMatch - LinearCMY	24
Cluster - No Adjust - LabToCMY	51
Disperse - No Adjust - LabToCMY	52
Scatter - No Adjust - LabToCMY	53
ErrorDiffusion - No Adjust - LabToCMY	54
Cluster - Business Blue - LabToCMY	55
Disperse - Business Blue - LabToCMY	56
Scatter - Business Blue - LabToCMY	57
ErrorDiffusion - Business Blue - LabToCMY	58
Cluster - Transparency - LabToCMY	59
Disperse - Transparency - LabToCMY	60
Scatter - Transparency - LabToCMY	61
ErrorDiffusion - Transparency - LabToCMY	62
Cluster - VividGraphics - LabToCMY	63
Disperse - VividGraphics - LabToCMY	64
Scatter - VividGraphics - LabToCMY	65
ErrorDiffusion - VividGraphics - LabToCMY	66
Cluster - OutOfGamut - LabToCMY	67
Disperse - OutOfGamut - LabToCMY	68
Scatter - OutOfGamut - LabToCMY	69
ErrorDiffusion - OutOfGamut - LabToCMY	70
Cluster - TrueMatch - LabToCMY	71
Disperse - TrueMatch - LabToCMY	72
Scatter - TrueMatch - LabToCMY	73
ErrorDiffusion - TrueMatch - LabToCMY	74

**Underware Function Configuration** *Esc & i # w/W [data]*

Allows access to underware functions for testing.

Value(#) = Number of bytes of binary data  
 Default = 0  
 Range = 0 to  $2^{32} - 1$

To avoid proliferation of undocumented escape sequences, this sequence can perform multiple functions by encapsulating a block of parameters in a binary transfer. If the printer recognizes this sequence, the first byte of data is a format number. The printer ignores the sequence if it does not recognize the sequence or format number. The format and usage of the binary data is device-dependent. One example might be the sending of a *key* (composed of several digits) that switches to a specialized testing language. The sequence can be used on multiple products just by changing the key, which is unlikely to be discovered by accident.

Byte 1: Format number (key)  
 Bytes 2-n: Function dependent

For format 1 to 3, the format of the function-dependent bytes is:

Byte 1: Format number  
 Byte 2: Function index  
 Byte 3: Sign of parameter: either "+" (2BH), "-" (2DH), or Null (00H)  
 Bytes 4-5: Function dependent parameter (unsigned integer: byte 4 is the most significant)

DEVICE NOTE: Format 0 is understood by PJXL300, DJ1200C, and DJ1600C; Format 1 by DJ500C; Format 2 by DJ510 and 550C; Format 3 by DJ520 and 560C; Format 4 by DJ540 and 660C; Format 5 by OfficeJet; Format 6 by Color LaserJet; Format 7 by DJ850C.