

**PRESCRIBE Commands**

# **Technical Reference**





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# Introduction

This manual contains information needed to use the firmware features provided by the Kyocera printing system. Among these features is PRESCRIBE, a highly accessible, human-readable command language that makes it easy for programmers to take full advantage of the printing system's capability.

The PRESCRIBE command language allows to:

- extensive manipulation of fonts and character code tables
- use the ability to draw objects by constructing and manipulating paths including ellipses and round boxes, etc.
- execute macros including carbon-copy macro
- control external optional units (feeders, etc.)

You can access the features of PRESCRIBE from any of the seven emulation modes. These modes include:

- Hewlett-Packard LaserJet emulation
- Hewlett-Packard HP 7550A (plotter) emulation
- IBM Proprinter X24E (24-pin dot matrix printer) emulation
- Epson LQ-850 (24-pin dot matrix printer) emulation
- Diablo 630 emulation
- generic line printer emulation
- KPDL (Apple LaserWriter II NTX (NT) emulation) [an option on some models]

# About the Technical Reference manual

The Technical Reference manual is organized into eight chapters. The first four chapters of this manual constitute an tutorial introduction to PRESCRIBE. The rests mainly concern advanced utilities and setups:

*Chapter 1 Introduction to PRESCRIBE* introduces some basic concepts of PRESCRIBE.

*Chapter 2 Graphics Tutorial* outlines the graphic handling features of PRESCRIBE.

*Chapter 3 Macros* introduces program macros, a concept that makes it easy to define sequences of PRESCRIBE commands, then call them repeatedly whenever they are needed.

*Chapter 4 Fonts* provides how to manage font selection and font samples.

Later, *Chapter 5 Barcodes* explains the barcode printing capabilities of the command language.

*Chapter 6 Permanent Parameters* explains how to reprogram the printing system's firmware for customization.

*Chapter 7 Emulation* gives notes on the printing system's various emulation modes.

An Index is also provided at the end of this manual.

## Notice

Most PRESCRIBE commands operate in the same way on all of these models. However, on particular models, some commands are irrelevant. Model-dependent differences are noted at the pertinent locations in this manual.

## Conventions

- *italic* is used for emphasis and also refers to a related chapter or section in this manual or another related document.
- `fixed-pitch` means text or commands that you must type exactly as it appears.

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## Introduction to PRESCRIBE

PRESCRIBE is the native language of the Kyocera printing systems including copiers (collectively referred to as *printing systems* hereafter). Consisting of easily remembered commands, such as 'SLM' for Set Left Margin, and 'BOX' to draw a box, it gives you the capability to control line and character spacing, adjust margins, change fonts, position text, draw graphics, and print multiple copies of each page. PRESCRIBE also gives freedom to control device settings including selection of paper source, output stack, and finishing operations such as sorting, stapling, etc.

Most application software controls printing systems by means of codes and escape sequences that are built into the program and are not directly visible to the user. In contrast, PRESCRIBE commands are made of ordinary characters that you can type in yourself and see on the computer screen. This makes it easy for you to customize printing and add features that may not be supported by your application.

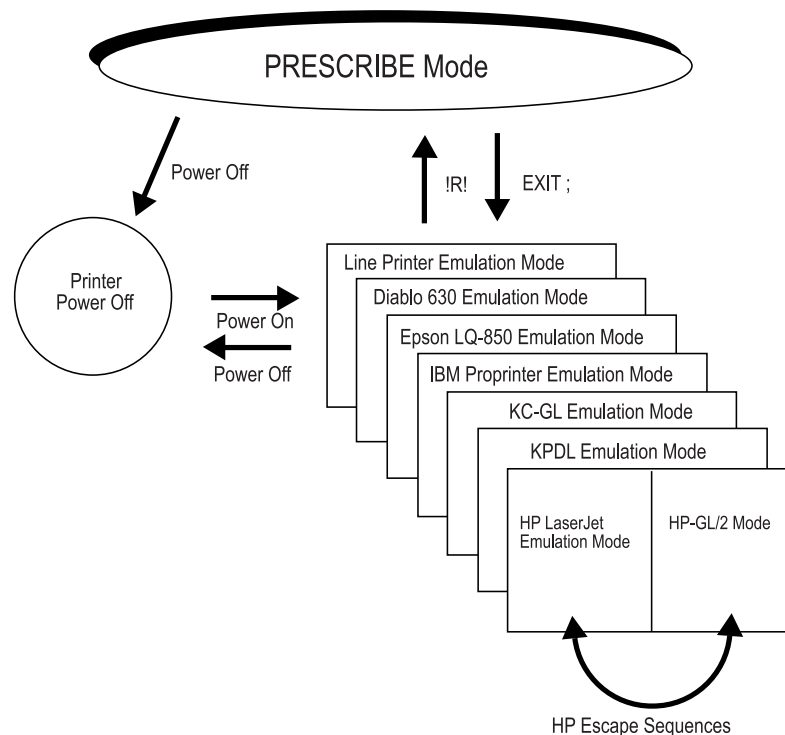
This chapter presents an introduction to PRESCRIBE starting with an explanation of the commands by which you start and exit PRESCRIBE. It is followed by an introduction to some basic concepts of PRESCRIBE, then a discussion of the command format and command parameters.

## Entry and Exit

The printing system can be thought of as having a multiple personality. When its power is switched on, it performs the normal printing system functions of printing out files and other data. Application software can control the printing system using one of the seven emulations. When the printing system uses an emulation, it is said to be printing in emulation mode.

PRESCRIBE is an additional mode of operation in which the printing system understands data it receives not as text to be printed, but as commands to be executed. The PRESCRIBE mode is available at any time during operation from any emulation mode. The initializing string that takes the printing system from the usual text-printing mode into the PRESCRIBE mode is **!R!**. The command that returns it from the PRESCRIBE mode to the emulation mode is **EXIT;**. These transitions are diagrammed in the figure below.

Figure 1.1. Mode Transitions



The printing system's emulation mode can be permanently set by the FRPO (Firmware RePrOgram) P1 command. See *Chapter 7* for details. The printing system is factory-set to emulate the Hewlett-Packard LaserJet.

The example below shows how these transitions can be used in a file. The lines beginning with **!R!** are PRESCRIBE commands. Note how each block of commands begins with **!R!** and ends with **EXIT;**. These sections are not printed; instead, they set margins, select three different fonts, and draw a box around one line of text. The remainder of the file consists of ordinary text, and is printed out as shown in the figure on the next page.

Figure 1. 2. Text Including PRESCRIBE Commands

```
!R! RES; SLM 1; STM 1; SPD 0.03; FTMD 13;
      SFNT "Helvetica-Bd"; EXIT;
WELCOME TO WINDFALL NATIONAL PARK
!R! SFNT "Times-Rom"; EXIT;
      The park entrance is located in the rolling hills of
the Northern Woods, a forested area abundant in deer,
elk, squirrel, rabbit, opossum, lynx, wolf, and other
wildlife. It is the park's most popular area, featuring
excellent trails and campsites for hiking and backpacking.
!R! BOX 3.4, 0.55; FSET 1s5B; EXIT;
      Hikers should avoid this area during hunting season.
!R! SFNT "Times-Rom"; EXIT;
      Hikers in search of high-altitude adventure will find
Mt.Baker a rewarding...
```

Figure 1. 3. PRESCRIBE Example

**WELCOME TO WINDFALL NATIONAL PARK**

The park entrance is located in the rolling hills of the Northern Woods, a forested area abundant in deer, elk, squirrel, rabbit, opossum, lynx, wolf, and other wildlife. It is the park's most popular area, featuring excellent trails and campsites for hiking and backpacking.

*Hikers should avoid this area during hunting season.*

Hikers in search of high-altitude adventure will find Mt.Baker a rewarding...

The previous example contains five sequences of PRESCRIBE commands. The basic configuration of a PRESCRIBE command sequence is:

```
!R! command; command; ...; command; EXIT;
```

There is a limit to the number of commands you can include between the initial !R! and the final EXIT;. The initial !R! must be followed by a space, and each command must end with a semicolon.



The use of PRESCRIBE commands in document files is conditional on the behavior of your word processing software. Some word processing programs add control codes that interfere with PRESCRIBE. If you cannot control software in this way, try using a non-word processing mode (ASCII text function, for example) of the software.

## Format of PRESCRIBE Commands

The basic format of a PRESCRIBE command is:

••• or •••• (command name) parameter, ..., parameter;

The command names generally consist of three or four letters. In most commands, the parameters must be followed by commas. The last parameter is always followed by a semicolon. Some commands (RES, for example) have no parameters. In this case, the command should be followed immediately by a semicolon (RES ;).

The length of a single PRESCRIBE command is limited to 255 characters, from the first letter of the command name through the final semicolon. Commands longer than 255 characters are not executed.

Spaces, carriage return codes, and line feed codes are generally ignored in PRESCRIBE command sequences. These characters are not generally counted in the command length. (*Exception:* Spaces are not ignored in quoted character strings.) To improve readability, place at least one space before each command or place each command on a separate line.

## Basic Concepts

This section discusses a few basic concepts concerning how the printing system prints on the page. These concepts are:

- Edge limits
- Margins
- Coordinate systems
- Text positioning/Character spacing
- Paths
- Logical page and physical page
- Page orientation and direction

### Edge Limits

The printing system cannot place print on the outside edges of the paper. The edge limits to which printing is possible are located 5 mm inside the edges of the paper; or 6 mm (5mm in landscape orientation) from the left edge and 4 mm from the top of the paper in HP LaserJet emulation. Refer to the figure *Edge Limits and Margins* on page 5.

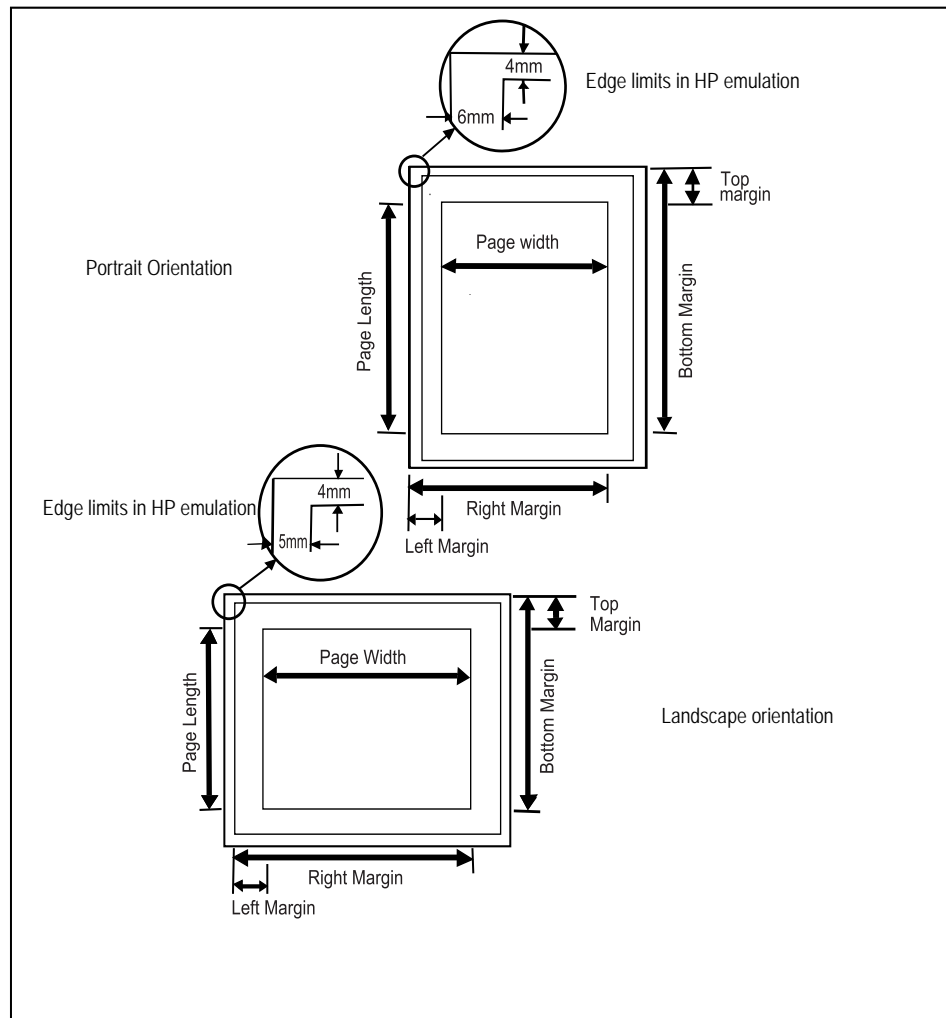
The edge limits adjust automatically to the size of the paper cassette (although not to the size of manually fed paper). The edge limits can also be set to various standard sizes by the SPSZ (set paper size) command, or by the equivalent HP LaserJet commands. In HP LaserJet emulation, the edge limits slightly vary according to the page orientation (as also shown in *Edge Limits and Margins* on page 5).

### Margins

The top and left margins are set in centimeters or inches in relation to the top and left edge limits of the page. The bottom and right margins can also be set as a distance from the top and left edge limits, or they can be set in terms of page width, page length, or lines per page.



Figure 1. 4. Edge Limits and Margins



When the printing system passes the bottom margin while printing text, it prints the page and feeds to the next page. Spacing is carried over, so if the bottom margin does not occur at an exact number of lines, excess space is printed at the top of the next page.

If you are using word-processing software that sets the margins automatically, you should not set them with PRESCRIBE commands.

## Page Orientation and Direction

The term *page orientation* refers to the direction in which text is placed on the page. In a vertical direction, it would be called portrait and a horizontal direction would be called landscape. The term *print direction*, which follows this section, refers to the orientation of the logical page's coordinate system with respect to the current page orientation.

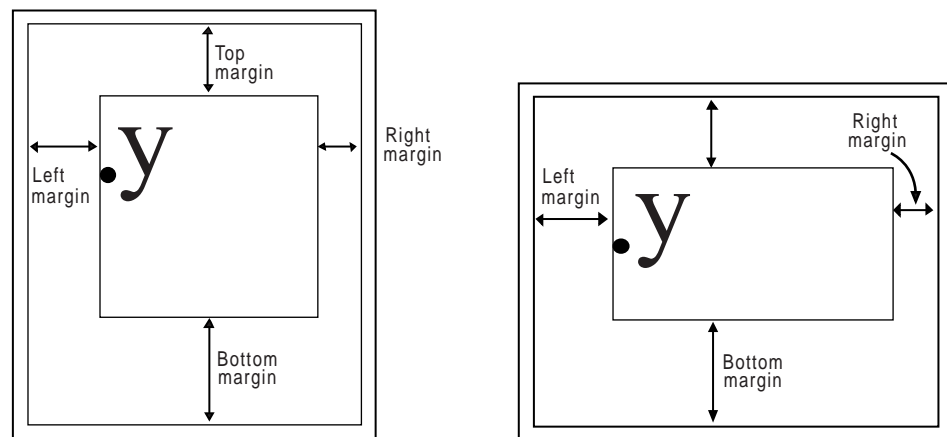
## Page Orientation

Changing the page orientation automatically adjusts the margins so that they remain the same distance from the four edges of the paper. If the printing system cannot make these margin settings (for example, if the left margin would be to the right of the right margin), it sets the margins to the edge limits.

Fonts are automatically rotated to match the current orientation.

Figure 1.5. Page Orientations

Portrait Orientation



## Print Direction

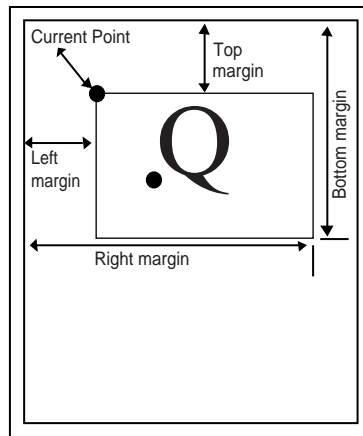
The print direction can be modified in 90° increments. These page orientations are referred to as portrait, landscape, reverse portrait, and reverse landscape. Changing the print direction rotates the page coordinate system in the same manner as changing the page orientation. However, in this case, *portrait* refers to the print direction in which the axes of the coordinate system are oriented in the same direction as for the currently selected page orientation.

Changing the print direction also changes the margins to maintain the same printable area as prior to the change. The current position (the physical location in which the next character will be printed) and its coordinate values remain the same as in the previous print direction.

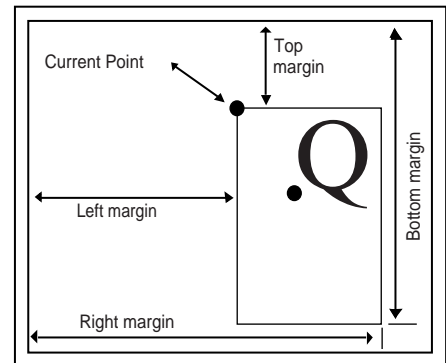
Changing the print direction also changes the orientation of any subsequent raster graphics and PRESCRIBE vector graphics. However, it does not affect the orientation of any subsequent HP-GL/2 graphics. (HP-GL/2 graphics can only be rotated with the HP-GL/2 RO command or the LaserJet orientation command.)

Figure 1. 6. Print Direction

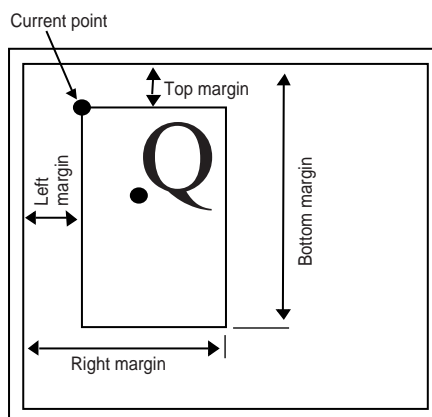
Portrait print direction



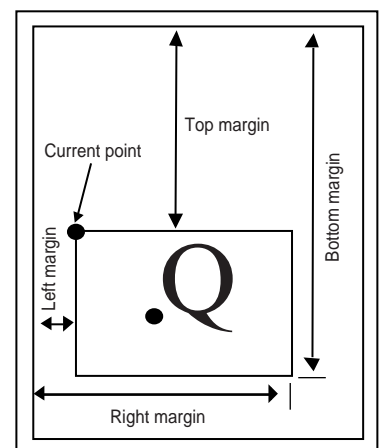
Landscape print direction



Reverse portrait print direction



Reverse landscape print direction



## Coordinate Systems

With PRESCRIBE, positions on a page are described in terms of  $X$  and  $Y$  coordinates. The origin of the coordinate system (the position at which  $X$  and  $Y$  both equal 0) is located at the intersection of the top margin and the left margin. Values of  $X$  greater than 0 indicate positions to the right of the origin, and values of  $Y$  indicate positions below the origin. See the figure on page 10. When the top and left margins are changed, the physical position of the origin changes accordingly.

## Text Positioning

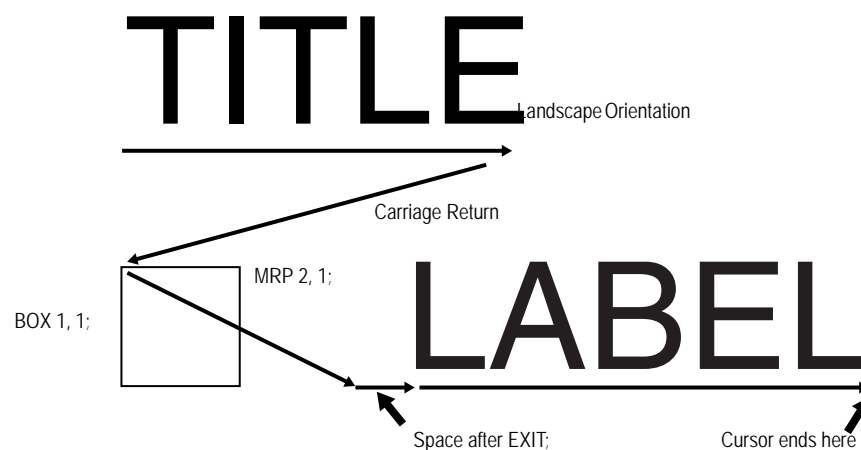
The printing system always keeps track of its current position on the page. The current position can be thought of as a cursor that moves as data is printed. At any instant, the

cursor indicates where the next character will be printed or the next graphics will be drawn. (The printing system does not have separate cursors for text and graphics.)

Text and graphics can be positioned at arbitrary locations on the page by moving the cursor with positioning commands (MAP, for example).

Figure 1. 7. Text Positioning

```
TITLE
!R! BOX 1, 1; MRP 2, 1;
EXIT; LABEL
```

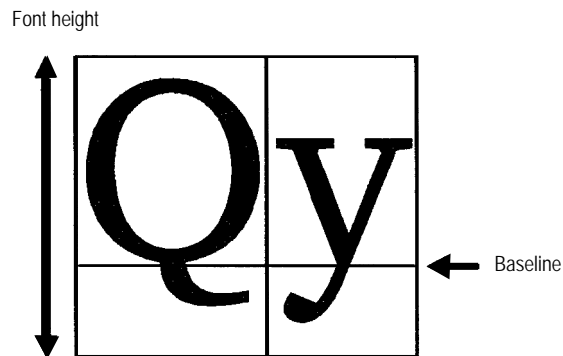


## Character Spacing

Each character is printed within an individual cell as shown below. The character sits on a line called the *baseline*. Characters such as **y** descend below the base line.

In some character fonts, all the character cells are the same size, so the number of character positions per inch is fixed. In other fonts, the size of character cells is proportional to the size of characters. These proportional fonts produce text that is easier to read. However, in order to align the right margin, you must use software that supports the printing system's proportional spacing.

Figure 1. 8. Character Spacing



## Paths

A path is a set of straight and curved line segments. Paths can be open, as in the case of lines, or closed, as in the case of rectangles, circles, or any fully enclosed area of any shape. The segments may be connected with one another, or they may be disconnected. Further, a path may contain multiple closed *subpaths*, representing several areas, and they may intersect themselves in arbitrary ways.

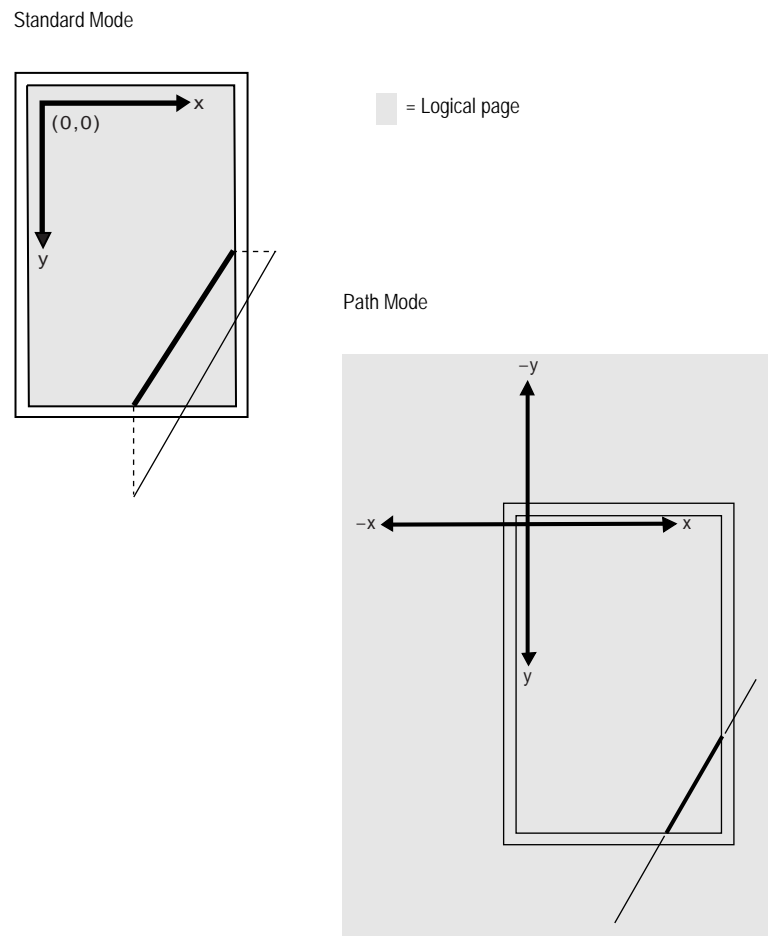
Paths can be used to draw lines and curves or specify boundaries of filled areas, including the outline of a character.

Paths are explained more fully in section *Path Mode Graphics* on page 16.

## Logical Page and Physical Page

The logical page defines the limits of the coordinates within which text and graphics can be located. There are two types of logical page, as shown in the following figure. The standard mode logical page imposes limits on specifiable coordinates. The coordinates have no limitations for the path mode logical page.

Figure 1. 9. Logical Page and Physical Page



With the *standard mode* logical page, any position specification that lies outside of the logical limits is automatically adjusted to bring it within the limits. For example, the page on the upper left in the preceding figure shows what happens if you attempt to draw a diagonal line from below the bottom edge limit to a point to the right of the right edge limit when the standard mode logical page is used. The fine line represents the line as specified by the user; the thick line shows what is actually drawn by the printing system.

With the *path mode* logical page, coordinates are not adjusted even if they fall outside of the edge limits. In this case, as shown in the lower right page in the preceding figure, the line is defined by the specified starting and ending points, but parts falling outside of the edge limits are clipped.

## Command Parameters

### Numeric Parameters

Many of the PRESCRIBE commands use number values to specify parameters. For example, numbers are used to specify distances in inches, centimeters, points, or dots. Negative numbers are also allowed.

For computer code values beyond four decimal places, the fifth and subsequent decimal places are ignored.

Examples:

Number output by computer	Number used by printing system
1234.1234	1234.1234
-1234.1234	-1234.1234
0.123456	0.1234

Some commands have angle parameters. Angles are specified in degrees. (The printing system does not recognize radians). The printing system rounds off all angles to the nearest integral degree. Only angles in the range from -360 degrees to 360 degrees are recognized. Angles less than -360 degrees are ignored, and angles greater than 360 degrees are treated as the remainder of the angle divided by 360.

Examples:

Angle output by computer	Angle used by printing system (degrees)
90	90
-90	-90
90.4	90
90.5	91
-400	Ignored

The printing system does not accept the exponential notation used in some computer languages. For example, do not specify 1E-3 instead of 0.001.

## Character Strings

PRESCRIBE text-printing commands have parameters that consist of character strings. A character string is any string of characters enclosed by quotation marks or apostrophes, such as shown in the example below.

```
TEXT 'You are about to enter PRESCRIBE.';
```

PRESCRIBE allows character strings to be enclosed in either single quotation marks (apostrophes) or double quotation marks. The following example has exactly the same meaning as the one above.

```
TEXT "You are about to enter PRESCRIBE.";
```

The beginning of a character string is recognized when the first single or double quotation mark appears. If the beginning quotation mark is a single quotation mark, the string does not end until the next single quotation mark. If the beginning quotation mark is a double quotation mark, the string does not end until the next double quotation mark.

Whatever comes in the middle of a character string, including commas, semicolons, and even PRESCRIBE command names, is recognized as part of the character string, and not as part of the PRESCRIBE command language. For example, the expression EXIT; in the following string is just text; it does not cause the printing system to exit from the PRESCRIBE mode.

```
TEXT 'NO EXIT; NO RETURN.';
```

When the string itself contains one type of quotation mark, the quotation mark must be enclosed in quotes of the other type. Here are two examples:

```
TEXT "You're about to enter PRESCRIBE.";  
TEXT ' " " " ';
```

In the first command above, the character string starts with a double quotation mark. The printing system therefore expects the string to end with a double quotation mark, and regards the apostrophe in the word *You're* as an ordinary character, not as the string terminator.

Similarly, the double quotation marks in the second command above are recognized as ordinary characters, not as string terminators.

Since an apostrophe or quotation mark can start a character string anywhere in a PRESCRIBE command sequence, it is important not to start character strings unintentionally. The following examples demonstrate incorrect use of apostrophes and double quotation marks.

Incorrect:

```
!R! CMNT Don't leave stray apostrophes; EXIT;
```

Incorrect:

```
!R! CMNT The symbol " means inches; EXIT;
```

In both of the above cases, the printing system assumes that the expression EXIT; is part of a character string started by the preceding apostrophe or quotation mark, and fails to exit the PRESCRIBE mode. The correct way to write these comments is:

Correct:

```
!R! CMNT "Don't leave stray apostrophes"; EXIT;
```

Correct:

```
!R! CMNT 'The symbol " means inches'; EXIT;
```

Character strings must not exceed the 255-character limit on total command length. If a character string exceeds this limit, the printing system terminates it forcibly and begins looking for the next PRESCRIBE command.

## Upper and Lowercase Letters

Regarding upper and lowercase characters, PRESCRIBE follows the same rule as many computer programming languages: it discriminates case inside character strings and ignores it elsewhere. You can type command names in upper or lowercase.

Correct:

```
!R! TEXT 'A'; CIR 1; EXIT;
```

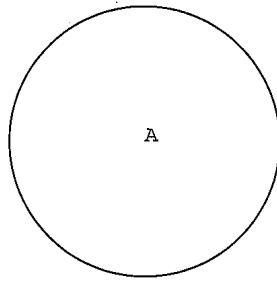
Also correct:

```
!R! text 'A'; cir 1; exit;
```

Also correct:



```
!R! Text 'A'; Cir 1; Exit;
```



Each of these commands prints the capital letter ‘A’ inside a circle. In the printout shown above, the unit is centimeters. The reason that the letter ‘A’ is off center in the circle is that the cursor is not located at the center of the circle, but at left corner of the letter ‘A’.

The command

```
!R! TEXT 'a'; CIR 1; EXIT;
```

prints a lowercase *a* because the letter occurs inside a character string.

The sole exception to upper and lowercase usage in PRESCRIBE commands occurs with the initializing !R! command. This command must always use an uppercase R. The printing system will not enter the PRESCRIBE mode in response to !r!.

In this manual, PRESCRIBE commands are printed in upper-case for readability.

Outside of PRESCRIBE mode, the printing system always distinguishes between upper-case and lowercase letters and prints exactly what is sent.

## Special Parameters

Some PRESCRIBE commands use unquoted strings of characters as parameters. Examples for these are the FSET (change current font set by characteristic) command and the CSET (change symbol set by symbol-set ID) command. (See *Chapter 4* for a detailed explanation of how these commands are used to select fonts.)

The FSET and CSET commands use parameters that closely resemble the command parameters used for font control in Hewlett-Packard’s printer control language. For example, the PRESCRIBE command

```
FSET 0p12h12v0s0b6T;
```

selects the font whose characteristics most closely matches the following font parameters:

- Monospaced font (0p)
- Character spacing of 12 characters/inch (12h)
- Character height of 12 points (12v)
- Upright style (0s)
- Medium weight (0b)
- LetterGothicBM12-Roman typeface (6T)

In Hewlett-Packard’s PCL, the corresponding command would be

```
ESC(s0p12h12v0s0b6T
```

Similarly, the PRESCRIBE command `CSET 11U`; designates use of the PC-8 Danish/Norwegian symbol set. The corresponding Hewlett-Packard PCL command is `ESC ( 11U`.

# Graphics Tutorial

PRESCRIBE provides a wide variety of graphics operators, allowing you to easily construct and print almost any imaginable shape or pattern.

This chapter introduces the various graphics concepts of PRESCRIBE, and illustrates how to use many of its graphic functions. It defines standard graphics mode, path mode graphics, and raster graphics. It explains how to use predefined fill patterns, how to define your own fill patterns, and introduces ways in which you can change the *print model*, the rules that determine the manner in which patterns and images are rendered on the paper.

## Standard Graphics

The standard graphics mode provides a number of operators for constructing a variety of filled shapes and lines. Using standard mode graphics, you can:

- Draw lines of any desired width
- Draw circles and rectangles
- Draw a variety of filled shapes, including boxes and arcs
- Draw pie charts

This is referred to as the standard graphics mode because it is a standard feature of all versions of PRESCRIBE.

## Drawing Lines

PRESCRIBE provides a number of *Draw to* commands for drawing lines in both standard and path modes. These include:

DAP (draw to absolute position)	Draws a line to an absolute position in a Cartesian coordinate system whose origin (0,0) is at the intersection of the left and top margins.
DZP (draw to zero-relative position)	Draws a line to an absolute position in a Cartesian coordinate system whose origin (0,0) is at the intersection of the left and top edge limits of the paper.
DRP (draw to relative position)	Draws a line to a position specified as a horizontal and vertical displacement from the current cursor position.
DRPA (draw to relative position specified by angle)	Draws a line to a position that is specified as a distance and angle from the current cursor position. Examples of these commands are given in the sections that follow.

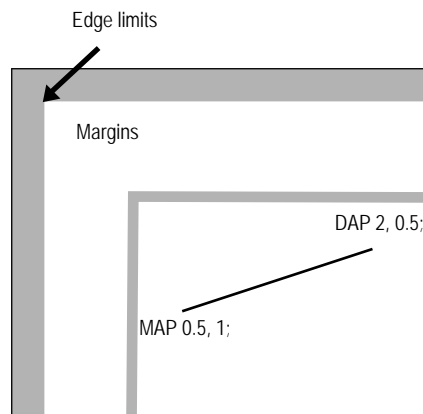
### *Lines to Absolute Position*

Begin with a simple task such as drawing a line between two arbitrary points on a page. Use the MAP and DAP commands to specify positions relative to the top and left margins.

This task has several distinct steps: selecting a line width, determining the starting point of the line, and determining the end point of the line. The following command sequence demonstrates this process.

```
!R! RES ;
    STM 0.5 ;
    SLM 0.5 ;
    SPD 0.01 ;
    MAP 0.5, 1 ;
    DAP 2, 0.5 ;
    PAGE ;
EXIT ;
```

Figure 2. 1. Result of Draw Commands: Absolute Lines



The initial !R! command switches the printing system to the PRESCRIBE mode. Remember that this command must always precede each sequence of PRESCRIBE commands.

The RES (RESet) clears the current page from printing system memory and re-establishes the printing system's permanent defaults. Although you would not include this command in every sequence of PRESCRIBE commands, we include it in this example to ensure consistent results. As a standard practice, include the RES at the beginning and end of each job.

The STM and SLM set both the top and left margins to 0.5 inches (1.27 centimeters).

The SPD (Set Pen Diameter) command determines the thickness of lines. In the standard graphics mode, this setting determines the thickness of all lines drawn after the command is issued. In this example, the line width is set to 0.01 inches.

The starting point of the line is established with the MAP (Move to Absolute Position) command. This command moves the cursor to a point that is a specified distance from the top and left margins. In this example, the point specified is 0.5 inches from the left margin and 1 inch from the top margin.

If the margins are changed, the position specified by MAP also changes correspondingly.

On the next line of the program, the DAP (Draw to Absolute Position) command draws a line from the starting position to the point 2 inches from the left margin and 0.5 inches from the top margin.

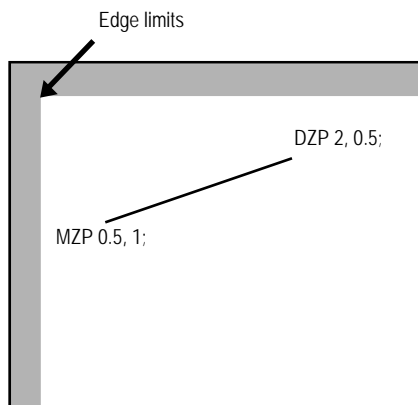
Finally, PAGE; prints out the page, allowing us to look at the result of our work.

## Zero-relative Lines

The line draw example below uses some new commands to draw another line.

```
!R! RES;  
    SPD 0.01;  
    MZP 0.5, 1;  
    DZP 2, 0.5;  
    PAGE;  
EXIT;
```

Figure 2.2. Result of Draw Commands: Zero-relative Lines



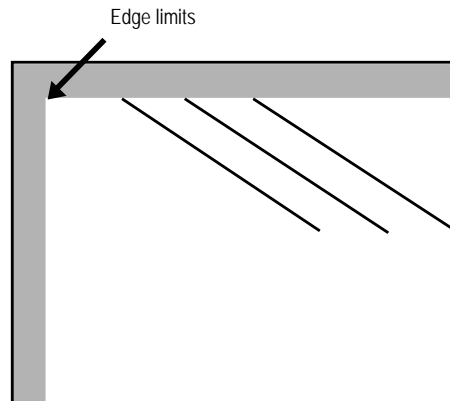
The first two lines switch the printing system to the PRESCRIBE mode, reset printing system parameters, and set the line width to 0.01 inch. On the third line, the MZP (Move to Zero-relative Position) differs from the MAP (Move to Absolute Position) command in one respect: the position specified is in relation to the top and left edge page limits of the page, rather than in relation to the top and left page margins. MZP moves the cursor to the point that is 0.5 inches from the left edge limit and 1 inch from the top edge limit. Similarly, on the next line, DZP (Draw to Zero-relative Position) draws a line from the starting position to the point 2 inches from the left edge limit and 0.5 inches from the top edge limit.

## Relative Lines

Another way to specify positions is in relation to the current cursor position. The following command sequence provides an example.

```
!R! RES;
  SPD 0.01;
  MRP 2, 1;
  DRP -1.5, -1;
  MRP 2, 1;
  DRP -1.5, -1;
  MRP 2, 1;
  DRP -1.5, -1;
  PAGE;
EXIT;
```

Figure 2. 3. Result of Draw Commands: Relative Lines



In this command sequence, the PRESCRIBE mode begins with the !R!, resets the printing system defaults to permanent settings with RES;, and establishes a pen width of 0.01 inches with the SPD 0.01;.

The MRP (Move to Relative Position) and DRP (Draw to Relative Position) specify positions in relation to the cursor's current position.

When the command sequence starts, the cursor is located at the intersection of the left and top margins. The command MRP 2, 1; on line 3 moves the cursor 2 inches to the right of its current position, and down 1 inch from its current position. Then the command DRP -1.5, -1; draws a line from that point to a point 1.5 inches to the left of the cursor position and 1 inch above it. The cursor winds up 0.5 inches to the right of the point where it started.

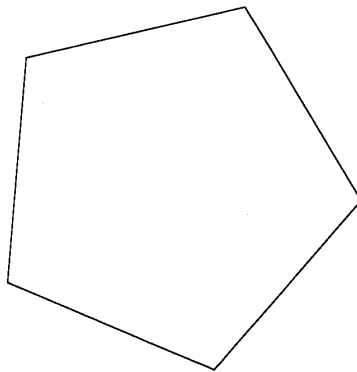
Lines 5 to 8 repeat the move-and-draw sequence two more times. This produces three parallel lines, as shown in the figure on the previous page.

### *Lines in Terms of Angles*

Until now, all of our examples have specified positions in terms of Cartesian (X,Y) coordinates. This example illustrates drawing lines of specified lengths and angles.

```
!R! RES;  
    SPD 0.01;  
    MZP 5, 4;  
    DRPA 2, 149;  
    DRPA 2, 221;  
    DRPA 2, 293;  
    DRPA 2, 365; CMNT Equivalent to 5 degrees;  
    DRPA 2, 437; CMNT Equivalent to 77 degrees;  
    PAGE;  
EXIT;
```

Figure 2. 4. Result of Draw Commands: Lines in Angles



The first two lines of this command sequence initiates the PRESCRIBE mode, resets printing system defaults to permanent settings, and sets the line width to 0.01 inches. Then the MZP command on line 3 moves the cursor to a point 5 inches to the right of the left edge limit and 4 inches below the top edge limit.

Next, DRPA 2, 149; on line 4 draws a line two inches long at an angle of 149 degrees. The angle is measured clockwise from the vertical axis. The subsequent DRPA commands draw additional 2-inch lines at angles that increase in increments of 72 degrees. As indicated by the CMNT (CoMMeNT) commands, angles that exceed 360 degrees are equivalent to the remainder of division of the angle by 360.

## Drawing Boxes and Circles

PRESCRIBE provides two commands especially for drawing boxes (BOX command) and circles (CIR command).

### *Drawing Boxes*

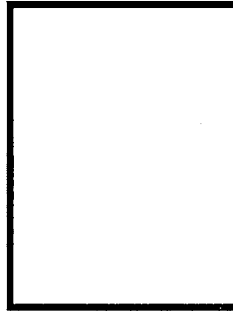
The BOX (draw box) command draws a box of a specified *width* and *height*. As with the line drawing commands, the thickness of the line used to draw the box is determined by the SPD (set pen diameter) command.

The following command sequence draws a box.

```
!R! RES;  
UNIT C;  
SPD 0.1;  
MZP 3, 3;  
BOX 3, 4;  
PAGE;  
EXIT;
```



Figure 2. 5. An Example of a Box



Line 1 places the printing system in the PRESCRIBE mode and resets printing system parameters. The UNIT C; command on the second line sets the unit of measurement to centimeters, and the SPD (Set Pen Diameter) command on line 3 sets the line width to 0.1 centimeters. (If you omit these two commands, the printing system will print using the default unit, inches; and the default line width, 3 dots.)

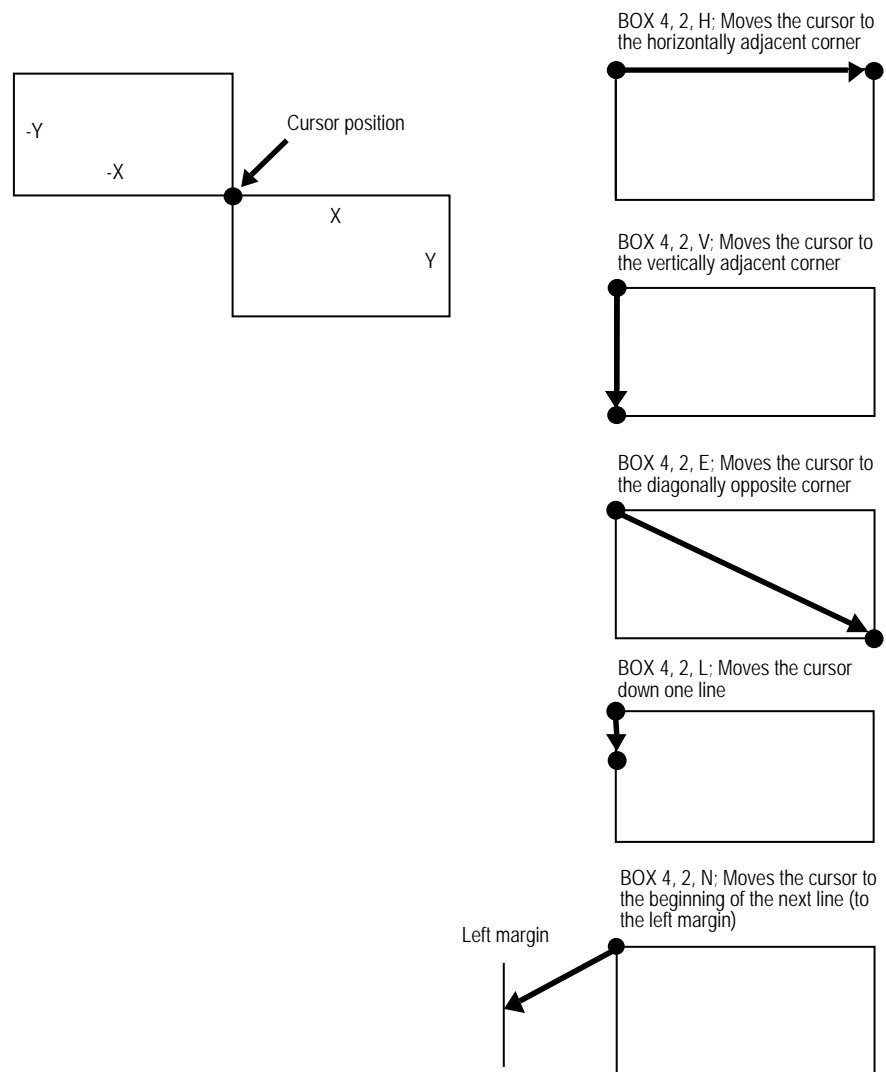
Next, the MZP command on line four moves the cursor to the point that is 3 centimeters to the right of the left edge limit and 3 centimeters below the top edge limit. This is the starting point from which the box is drawn.

On line 5, BOX 3, 4; draws a box with a width of 3 centimeters and a height of 4 centimeters.

The position of the box with respect to the cursor depends on the positive or negative value specified for *width* and *height*. The box is drawn to the right of the cursor if *width* is positive, and to the left of the cursor if *width* is negative. Similarly, the box is drawn below the cursor if *height* is positive, and above the cursor if *height* is negative. This relation is illustrated in the figure that follows.

By default, the position of the cursor is not affected by this command. However, you can also specify an *option* parameter to make the cursor move to an adjacent or diagonally opposite corner of the box, down by one text line, or to the left margin on the next text line. The following figure shows some examples.

Figure 2. 6. Cursor Positioning Options

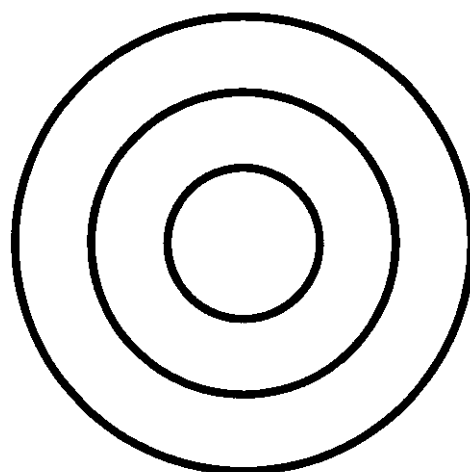


## Drawing Circles

The CIR (draw circle) command draws a circle of a specified radius using the line thickness set by the SPD (set pen diameter) command. The circle drawn is centered on the current cursor position; the position of the cursor remains unaffected. See the following example:

```
!R! RES;  
UNIT C;  
SPD 0.1;  
MZP 8, 8;  
CIR 1;  
CIR 2;  
CIR 3;  
PAGE;  
EXIT;
```

Figure 2. 7. Circles



Lines 1, 2 and 3 start PRESCRIBE mode, reset the printing system to its default parameters, establish the unit of measurement as centimeters, and set the line width to 0.1 centimeters.

Next, the MZP command moves the cursor to the point that is 8 centimeters to the right of the left edge limit and 8 centimeters below the top edge limit.

Lines 5, 6, and 7 draw three circles with radii of 1, 2, and 3 centimeters.

## Drawing Filled Shapes

The standard graphics mode provides two types of filled shapes: arcs and blocks. Such shapes are filled with one of the printing system's predefined patterns, or with a user defined pattern.

Filled areas of other shapes can be printed using path mode graphics. For details, see the explanation in section *Path Mode Graphics* on page 16.

A filled block consists simply of a rectangle of any desired dimensions. A filled arc is an area enclosed by an arc segment and the line segments extending from the ends of the arc to the center of the circle of which the arc is a part.

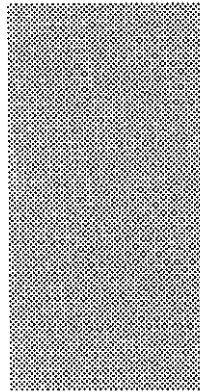
This section shows how to select a fill pattern and print a filled block or arc.

### *Drawing Filled Blocks*

The following command sequence prints the block shown below.

```
!R! RES;  
UNIT P;  
MZF 72, 72;  
PAT 6;  
BLK 72, -144, H;  
PAGE;  
EXIT;
```

*Figure 2.8. A Filled Block*



Lines 1 and 2 put the printing system in the PRESCRIBE mode, reset printing system parameters and set the unit of measurement to points. (One point is equal to  $1/72$  inches.)

Next, the MZF command moves the cursor to the position 72 points to the right of the left edge limit and 72 points below the top edge limit.

The PAT (select fill PATtern) command on line 4 of the program selects the fill pattern. In this program, pattern number 6 is selected.

You can select from among any of the printing system's 60 predefined fill patterns or choose to define a pattern using the XPAT (generate eXpanded PATtern) command. In either case, the selection is made with the PAT command. For 1200-dpi and 600-dpi models, the user can define the printing resolution (300, 600, 1200 dpi) of the pattern by giving a second parameter to the PAT command.

You can also select a shade of gray for filling the arc or block by using the GPAT (set Gray PATtern) command.

It is possible to apply a color to a pattern specified using PAT, FPAT, GPAT or XPAT. Note, however, that this may not always result in the exact same pattern as printed in monochrome.

The way a color looks may differ when used for different patterns even though the same color has been specified.

The BLK (draw filled-in BLock) command on line 5 actually draws the filled in block. This command closely resembles the BOX command explained in the preceding section. However, whereas the BOX command draws a line around a rectangular area, the BLK command fills a rectangular area with the currently selected pattern.

As with the BOX command, the position of the rectangular area with respect to the cursor depends on the sign of the values specified for width and height. The box is drawn to the right of the cursor if width is positive, and to the left of the cursor if width is negative; and the box is drawn below the cursor if height is positive, and above the cursor if height is negative.

As with the BOX command, you can specify an option parameter to make the cursor move to a specified location after the box is drawn. (The cursor remains unmoved if the option parameter is omitted.) Values for this option are H, V, E, L, N, and B, the same as for BOX.

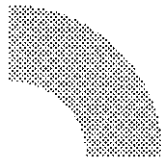
## *Drawing Filled Arcs*

The ARC (draw filled-in ARC) command is similar to the BLK command (described in the preceding section) in that it fills an area with a pre-defined pattern or a shade of gray. The arc is drawn centered around the current cursor position. The dimensions of the arc are determined by user specified inner radius, outer radius, starting angle, and ending angle.

The following PRESCRIBE demonstrates the ARC command.

```
!R! CMNT Enter PRESCRIBE mode;
RES;  CMNT Reset printing system parameters;
UNIT C; CMNT Set centimeters as unit;
PAT 9; CMNT Select pattern 9;
MZP 8, 8; CMNT Move cursor to point that is 8 cm;
        CMNT from left edge limit and;
        CMNT 8 cm from top edge limit;
ARC 1, 2, 0, 90;
PAGE;
EXIT;
```

*Figure 2. 9. A Filled Arc*



The ARC command on line 8 of the command sequence draws an arc with an inner radius of 1 centimeter, an outer radius of 2 centimeters, a starting angle of 0 (straight up), and an ending angle of 90 degrees.

The ARC command does not draw a line around the boundary of the filled-in area.

## Defining Fill Patterns

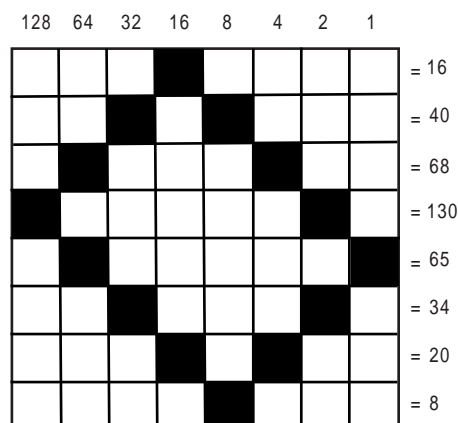
With a little work, you can construct your own fill patterns. You can generate  $8 \times 8$  dot patterns using the FPAT (generate Fill PATtern) command, or  $16 \times 16$  dot patterns using the XPAT (generate eXpanded fill PATtern) command. This section gives examples of both.

```
!R! RES;
    MZP 1, 1;
    FPAT 16, 40, 68, 130, 65, 34, 20, 8;
    BLK 1, 1;
    PAGE;
EXIT;
```

Line 4 of this command sequence prints a filled block using a fill pattern defined by the FPAT command on line 3.

Each of the eight numbers in the FPAT defines one row of an  $8 \times 8$  dot pattern. The pattern follows:

Figure 2. 10. Dot Pattern and a Filled Block



For this pattern, the numbers across the top indicate the value of each column. The numbers down the right side are the sums of the values of columns that contain black dots in that row.

Once this pattern has been defined by the FPAT command, it is used as the fill pattern until printing system parameters are reset with RES, another pattern is selected with PAT, a different pattern is defined with FPAT, or a shade of gray is defined and selected by GPAT.

Now let's look at an example using the XPAT command.

The XPAT command uses the format

```
XPAT pattern-number; bit map;
```

Note that the *pattern-number* parameter must be a value from 100 to 105 and followed by a **semicolon**, not a comma.

The following example demonstrates the XPAT command in a PRESCRIBE command sequence.

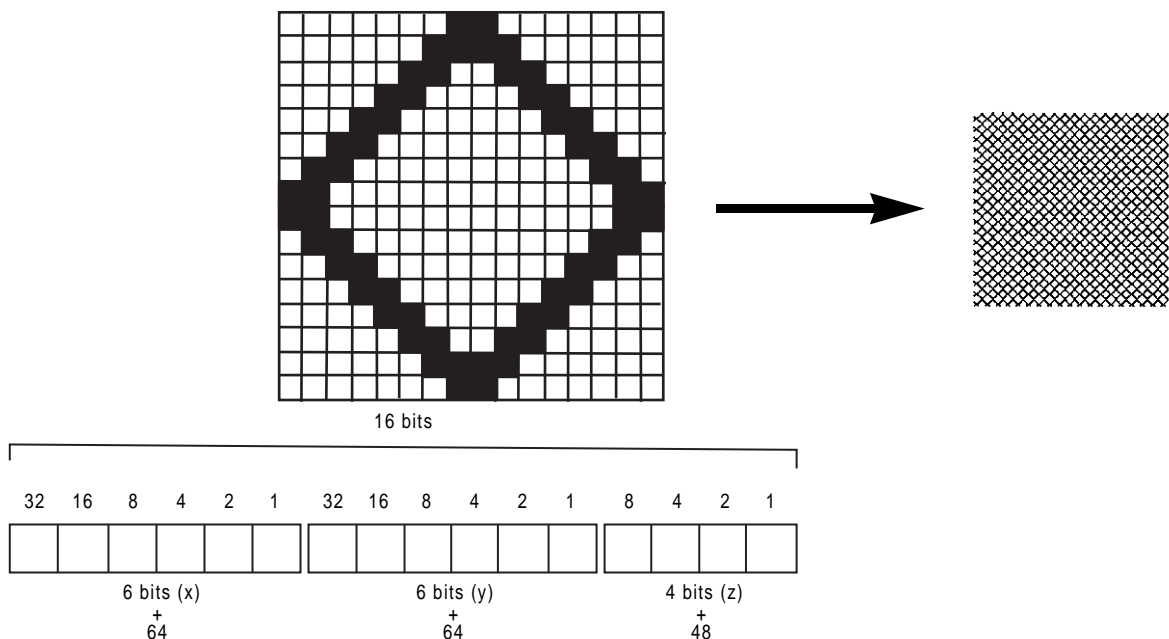
```

!R! RES;
  XPAT 100;
  @X0@ | 0Af0CC0FA8L@<X@6p@3p@3X@6L@<FA8CC0Af0@ | 0@X0;
  MZP 1, 1;
  PAT 100;
  BLK 1, 1;
  PAGE;
EXIT;

```

Lines 2 and 3 define the pattern shown in the figure on the next page, defining it as pattern 100. The PAT command on line 5 selects the pattern for use in fills. Line 6 prints the filled block.

*Figure 2. 11. Dot Pattern and a Filled Block*



The pattern is 16 dots high and 16 dots wide, and is encoded as a series of 16-bit words. Each 16-bit word is encoded by three characters, representing the most significant six bits, the next six bits, and the least significant four bits, respectively, as shown on the next page.

You obtain the characters that define the pattern by dividing each row-work into sections of six, six, and four bits, calculating the numerical value of each section (referred to as *x*, *y*, and *z*, respectively), treating it as a binary number in which the white dots are zeroes and the black dots are ones. Then add 64 (decimal) to the values of the 6-bit sections and 48 to the values of the 4-bit sections. The result is the ASCII code of the character that represents that section.

Column value

	0+64=64 (@) 24+64=88 (X) 0+48=48 (0)
	0+64=64 (@) 60+64=124 (I) 0+48=48 (0)
	1+64=65 (A) 38+64=102 (f) 0+48=48 (0)
	3+64=67 (C) 3+64=67 (C) 0+48=48 (0)
	6+64=70 (F) 1+64=65 (A) 8+48=56 (8)
	12+64=76 (L) 0+64=64 (@) 12+48=60 (<)
	24+64=88 (X) 0+64=64 (@) 6+48=54 (6)
	48+64=112 (p) 0+64=64 (@) 3+48=51 (3)
	48+64=112 (p) 0+64=64 (@) 3+48=51 (3)
	24+64=88 (X) 0+64=64 (@) 6+48=54 (6)
	12+64=76 (L) 0+64=64 (@) 12+48=60 (<)
	6+64=70 (F) 1+64=65 (A) 8+48=56 (8)
	3+64=67 (C) 3+64=67 (C) 0+48=48 (0)
	1+64=65 (A) 38+64=102 (f) 0+48=48 (0)
	0+64=64 (@) 60+64=124 (I) 0+48=48 (0)
	0+64=64 (@) 24+64=88 (X) 0+48=48 (0)

If the character resulting for section  $x$  of any row is @ (indicating that all bits in that section are white), then that character may be omitted. If sections  $x$  and  $y$  are both @, then both characters may be omitted. However, if the result for section  $y$  is @ and that for section  $x$  is a character other than @, then no characters may be omitted. In terms of the program example above, what this means is that the bit map string,

```
@X0@ | 0Af0CC0FA8L@<X@6p@3p@3X@6L@<FA8CC0Af0@ | 0@X0;
```

may be shortened by four characters to:

```
X0 | 0Af0CC0FA8L@<X@6p@3p@3X@6L@<FA8CC0Af0 | 0X0;
```

Patterns defined by the XPAT command remain effective until they are redefined by another XPAT command, or until the printing system is turned off.

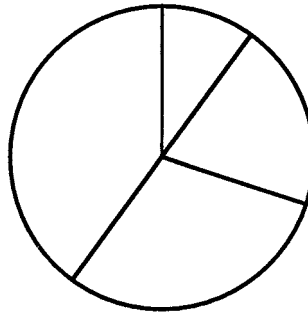
## Drawing Pie Charts

The standard graphics mode provides a convenient function for drawing pie charts. See the following example:

```
!R! RES; UNIT C; SPD .05;
MZP 10, 10;
PIE 2, 0, 10, 20, 30, 40;
PAGE;
EXIT;
```



Figure 2. 12. PIE Example



The PIE command uses the format

`PIE radius , starting angle , size of slice , ... ;`

In the example above, the *radius* is 2 centimeters (since we set the unit to centimeters with the UNIT command), and the starting angle is 0 degrees. Four pie slices are specified, with sizes of 10, 20, 30, and 40.

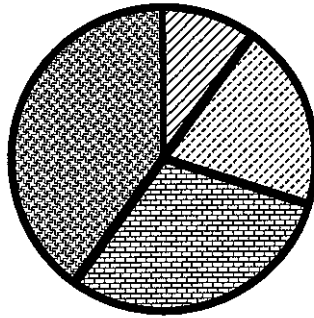
The printing system automatically converts the slice sizes to angles totalling 360 degrees. Then it draws the first slice with a cut at the angle specified by the second parameter (0 degrees in our example, or straight up). The remaining slices are drawn in sequence clockwise around the circle. The line thickness used for drawing the circle and the lines between slices are designated by the SPD (Set Pen Diameter) command.

Any number of pie slice sizes can be specified, provided that the total length of the command does not exceed 255 characters, and that the sum of the pie slices does not exceed 9999. All numbers specified for slice sizes must be non-negative integers.

The PIE command does not fill in the slices with any fill pattern. The PAT command can be used to create shaded areas. The previous example is expanded to fill in the slices.

```
!R! RES; UNIT C; SPD .1;
      MZP 10, 10;
      PAT 19; ARC 0, 2, 0, 36;
      PAT 41; ARC 0, 2, 36, 108;
      PAT 43; ARC 0, 2, 108, 216;
      PAT 48; ARC 0, 2, 216, 360;
      PIE 2, 0, 10, 20, 30, 40;
      PAGE;
EXIT;
```

Figure 2. 13. Pattern Filled PIE



This program first draws four filled arcs, each using a different fill pattern, then prints the pie chart over the arcs. Each arc has an inner radius of zero, an outer radius of 2 (the same as the pie chart), and a starting angle and ending angle that correspond to the relative size of the pie slices. Since the total size of the pie slices in the example is 100 (10+20+30+40), the angular extent of each arc is equal to  $360 \times \text{size of slice} / 100$ . For example, the angular extent of the first arc is  $360 \times 10 / 100 = 36$  degrees. The starting angle of each arc equals the starting angle of the pie chart (0 degrees), plus the angular extent of all the preceding arcs. The ending angle equals the starting angle plus the angular extent of the arc.

## Path Mode Graphics

With path mode graphics, images are constructed by defining lines and curves as *paths*, then rendering them as images by stroking along the paths or filling the area enclosed by them. PRESCRIBE provides a variety of path construction operators and painting operators for stroking or filling paths.

### Path

In PRESCRIBE, a path is a set of straight or curved line segments, either connected or disconnected, that describes the shape and position of one or more objects or regions. Paths can be used to draw lines and curves and to specify boundaries of filled areas.

A path is *stroked* by drawing a line of arbitrary width along it. The line may be solid black, all white, or any intermediate shade of gray. It may also be a dashed line of any pattern of segment lengths.

A path is *filled* by painting the entire area that it encloses with a gray scale pattern, ranging from black to white, or with one of the printing system's predefined patterns. In order to be filled, a path must be closed; that is, it must return to its starting point.

A path is constructed by means of one or more *path construction* operators. The path construction operators modify the current path, usually by appending to it. However, a path in itself does not produce any image on the page. Once a path has been constructed, it can be used to control the application of one of the painting operators of PRESCRIBE, defining the boundary of the area in which images can be printed.

There are no restrictions on the shape of a path. A single path may include multiple *closed* subpaths, representing several areas, and a path may intersect itself in an arbitrary manner.

The order of the segments that define a path is significant. A pair of line segments is said to connect only if they are defined consecutively, with the second segment starting where the first one ends. Non-consecutive segments that meet or intersect fortuitously are not connected.

A subpath is a sequence of connected segments. A path is made up of one or more subpaths. Subpaths may be either open or closed.

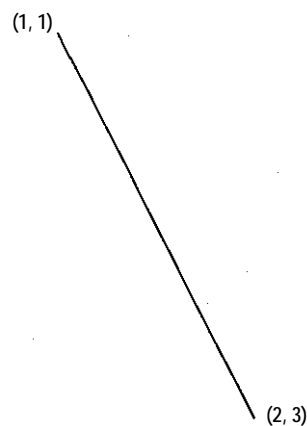
Path construction begins with a NEWP (NEW Path) command. Path construction ends with the CLSP (CLoSe Path) command or with any paint operator that paints the region enclosed by the path or draws a line along it (such as STRoKe or FILL).

## Drawing Lines

The following example shows how to draw a line in the path mode.

```
!R! RES;  
  NEWP;  
  PMZP 1, 1;  
  PDZP 2, 3;  
  STRK;  
  PAGE;  
EXIT;
```

*Figure 2. 14. Drawing Lines in Path Mode*



Line 1 of the program switches the printing system to the PRESCRIBE mode and resets printing system parameters, including the unit (to inches), line width (to 3 dots), and various other aspects of the graphics state.

Path construction begins with the NEWP command on line 2. This command empties the current path (if any), making it possible to start a new one. In doing so, it makes the position of the cursor undefined.

The PMZP (Path, Move to Zero-relative Position) command on line 3 moves the cursor to a position one inch from the top and left edge limits of the paper. The coordinates specified may be positive or negative.

On line 4, the PDZP (Path, Draw to Zero-relative Position) draws a line from the current cursor position to the position 2 inches from the left edge limit and 3 inches from the top edge limit. The cursor remains at this position after the line is drawn.

On line 5, the STRK command strokes the path onto the page.

After stroking the current path, the STRK command clears the path in the same manner as NEWP (start NEW Path).

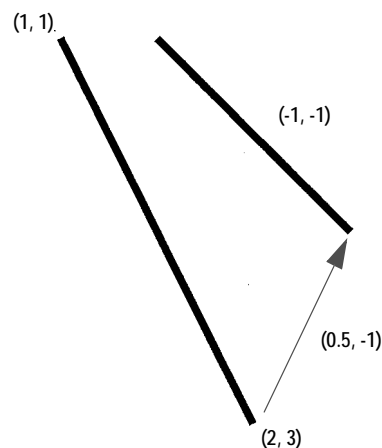
Finally, PAGE prints out the page, allowing us to look at the result of our work and cancelling all changes made during the course of the program, then EXIT ends the PRESCRIBE mode.

## Two Lines

The preceding example illustrated construction of a path between points specified in terms of absolute coordinates. The following program draws two lines, using both absolute coordinate specification and a new method: relative coordinate specification.

```
!R! RES;
  NEWP;
  PMZP 1, 1;
  PDZP 2, 3;
  PMRP .5, -1;
  PDRP -1, -1;
  SPD 0.04;
  STRK;
  PAGE;
EXIT;
```

Figure 2. 15. Drawing Two Lines



The first four lines of this program are identical to the preceding example. Line 1 switches the printing system to the PRESCRIBE mode and resets printing system parameters, line 2 empties the current path, and lines 3 and 4 draw a line between two points that are specified in terms of absolute coordinates.

On line 5, the PMRP (Path, Move to Relative Position) command moves the cursor to the point half an inch to the right and one inch above the current cursor position; that is, the point at which the first line ends. Then the PDRP (Path, Draw to Relative Position) command on line 6 draws a line to the point 1 inch to the left of the new position and 1 inch below it.

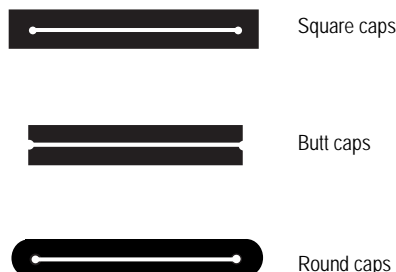
The line thickness is changed to 0.04 inches by the SPD command on line 7.

Finally, the STRK command on line 8 strokes the path onto the page, PAGE prints out the page, and EXIT ends the PRESCRIBE mode.

## Line Ends

The line end type determines how PRESCRIBE renders the ends of lines when they are stroked onto the page. PRESCRIBE provides three kinds of line ends. These include:

Figure 2. 16. Line Ends



The default line end type is butt caps. You can switch from the current line end type to any of the other types with the SCAP command. This command uses the following format:

```
SCAP line-cap mode ;
```

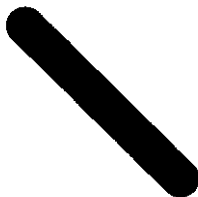
Values for *line-cap mode* include:

- 1 (for square caps)
- 2 (for butt caps)
- 3 (for round caps)

Use of this command is illustrated in the following example.

```
!R! RES;
  UNIT C; CMNT Sets unit to cm;
  NEWP; CMNT Starts new path;
  SPD .5; CMNT Sets line width to .5 cm;
  SCAP 1; CMNT Sets square caps;
  PMZP 2, 2;
  PDZP 4, 4;
  SCAP 3; CMNT Sets round caps;
  STRK;
  PAGE;
EXIT;
```

Figure 2. 17. Printout of SCAP Example



Note that the line is rendered with round caps, rather than with square ones. Although square caps is set before constructing the path, the line type is changed to round prior to

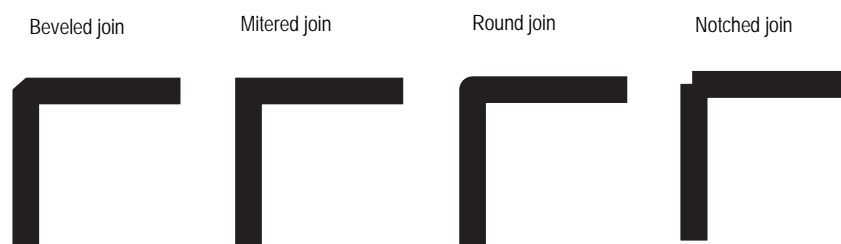
stroking the path. PRESCRIBE refers to the line cap type when the current path is stroked onto the page, rather than while the path is being constructed. Therefore, the program above renders the line with round caps rather than square ones.

## Line Joins

When a path consists of multiple connected line segments, the manner in which they are stroked onto the page depends on the current *line join* type.

PRESCRIBE provides four types of line joins. These are called *beveled*, *mitered*, *round*, and *notched*. These are illustrated below.

Figure 2. 18. Joins



The default line join type is beveled. With beveled joins, connected line segments end with butt caps, and the notch at the larger angle between the segments is filled with a triangle.

With mitered joins, the edges of connected line segments are extended until they meet. This type of join is limited by the *miter limit* (explained below).

With round joins, connected line segments are joined with circular caps.

Notched joins leave a notch at the larger angle between the connected line segments.

You can switch from the current line join type to any of the other types with the SLJN (Set Line JoiN) command. This command uses the following format:

```
SLJN line-join mode ;
```

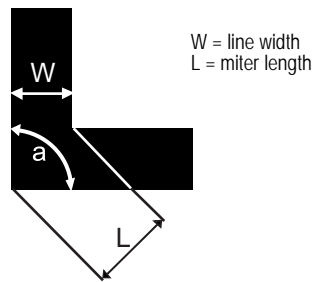
Values for *line-join mode* include:

- 1 (for beveled joins)
- 2 (for mitered joins)
- 3 (for round joins)
- 4 (for notched joins)

## Miter Limit

When using mitered line joins, the use of such joins is limited by the *miter limit*. The miter limit is the maximum ratio of the distance  $l$  between the inner and outer corners of a mitered join and the width  $w$  of the lines joined.

Figure 2. 19. Miter Limit



Miter limit = maximum ratio of  $L/w = 1/\sin(a/2)$

If the angle at which lines join is such that this limit is exceeded, the lines are joined with a beveled join, rather than a mitered one.

The purpose of the miter limit is to prevent objectionably long spikes when lines join at small angles. The default miter limit is 10, which results in beveled joins at angles of less than about 11.5 degrees.

You can set any desired miter limit with the **SMLT** (Set Miter LimiT) command. This command has the following format.

`SMLT limit-value ;`

Here are some representative *limit-values* and the corresponding angles at which the line join type switches between mitered and beveled.

limit-value	approx. angle
2	60
3	39
4	29
5	23
6	19
7	16
8	14
9	13

## Dash Type

By default, the STRK command strokes paths with solid lines. However, you can also use a predefined pattern of alternating black and white to stroke paths. This makes it possible to stroke paths as dashed lines. You can also define your own dashed line patterns.

The DPAT (select Dash PATtern) command selects one of PRESCRIBE's ten predefined dash patterns, or one of 10 dash patterns that you can define yourself. This command uses the format:

`DPAT pattern-number ;`



The following program illustrates use of this command.

```
!R! RES;
    UNIT C; CMNT Sets unit to cm;
    NEWP; CMNT Starts new path;
    SPD .5; CMNT Sets line width to .5 cm;
    PMZP 2, 2;
    PDZP 4, 4;
    DPAT 5;
    STRK;
    PAGE;
EXIT;
```

*Figure 2. 20. Printout of the DPAT Example*



In this program, the DPAT command selects the dash pattern with which the line is stroked.

Predefined dash patterns are selected by specifying values from 1 to 10 for pattern-number. (A value of 1 specifies solid lines.) User-defined patterns can be selected by specifying values from 11 to 20. The next section explains how to use the SDP (Store Dash Pattern) command to define your own dash patterns. Specifying an undefined user pattern number results in solid black lines.

## *User Defined Dash Patterns*

Using the SDP command, you can define your own dashed patterns for use in stroking lines, arcs, and curves. See the following example:

```
!R! RES;
    UNIT P;
    SDP 11, 2, 2, 5, 2;
    UNIT C; CMNT Sets unit to cm;
    NEWP; CMNT Starts new path;
    SPD .5; CMNT Sets line width to .5 cm;
    PMZP 2, 2;
    PDZP 4, 4;
    DPAT 11;
    STRK;
    PAGE;
EXIT;
```

Figure 2. 21. Printout of the SDP Example



The SDP command on line 3 defines a dashed pattern consisting of two lengths of black, two lengths of white, five lengths of black, and two lengths of white. On line 11, the DPAT command selects this pattern for stroking. The path defined by the PMZP (Path, Move to Zero-relative Position) and PDZP (Path, Draw to Zero-relative Position) commands is stroked using this pattern, with a result as shown in the figure above.

The SDP command uses the general format:

```
SDP pattern-number, dash1, space1, dash2, space2, ..., dash10, space10;
```

The value specified for *pattern-number* must be in the range from 11 to 20. Dash and space lengths are specified in pairs. Up to ten dash-space pairs can be specified. The dash length always comes first in each pair. If a pattern is to begin with a space, then specify 0 for *dash1*. However, if a pattern ends with a dash, the following *space* parameter can be omitted.

Dash patterns defined with this command remain valid until redefined with another SDP command, or until the printing system is turned off.

## Drawing Arcs and Curves

A path can include curves as well as lines. The PARC (Path, draw ARC) and PCRCP (Path, Curve to Relative Position) commands make it possible to draw circular arcs and arcs of more complex form.

The PARC command uses the format:

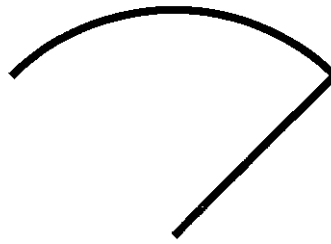
```
PARC x, y, radius, ang1, ang2;
```

where *x* and *y* describe the zero-relative coordinates of the center of the arc, *radius* describes the radius of the arc, *ang1* describes the arc's starting angle, and *ang2* describes the arc's ending angle. Coordinates and radius are measured in the unit currently designated by the UNIT command, and the starting and ending angles are measured clockwise from the positive *x* axis.

The PARC command draws a line between the cursor position and the beginning of the arc. See the following example:

```
!R! RES; UNIT C; NEWP; SPD .1;
    PMZP 5, 5;
    PARC 5, 5, 3, 45, 135;
    STRK;
    PAGE;
EXIT;
```

Figure 2. 22. Printout of the PARC Example



After the arc is drawn, the cursor is located at the end of the arc.

If you wish to eliminate the straight line segment in the above example, leaving only the arc, the cursor position must be moved in advance to the position at which drawing of the arc begins. This is shown in the following example, in which the cursor is moved to the coordinates as specified by the PMRA (Path, Move to Relative position specified by Angle) command prior to drawing the arc.

```
!R! RES UNIT C; NEWP; SPD .1;
    PMRA 5, 5, 3, 45;
    PARC 5, 5, 3, 45, 135;
    STRK;
    PAGE;
EXIT;
```

In this current example, the PMRA command moves the cursor from coordinates 5, 5, as measured from the left and top edge limits of the page, through the distance of 3 centimeters at the angle of 45 degrees from the positive x axis. At this point, the PARC command starts to draw the arc which ends at the angle of 135 degrees.

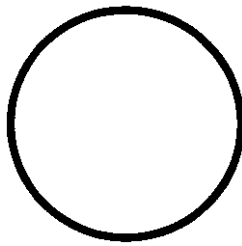
Figure 2. 23. Printout of the PMRA Example



Circles can be constructed by drawing arcs with angular extents of 360 degrees. To draw a circle, you will also need a PMRA command to eliminate the line extending from the center of the circle to the beginning of the circle. See the following example:

```
!R! RES; UNIT C; NEWP; SPD .1;
    PMRA 3, 3, 1.5, 0;
    PARC 3, 3, 1.5, 0, 360;
    STRK;
    PAGE;
EXIT;
```

Figure 2. 24. Printout of a Circle Made with PMRA

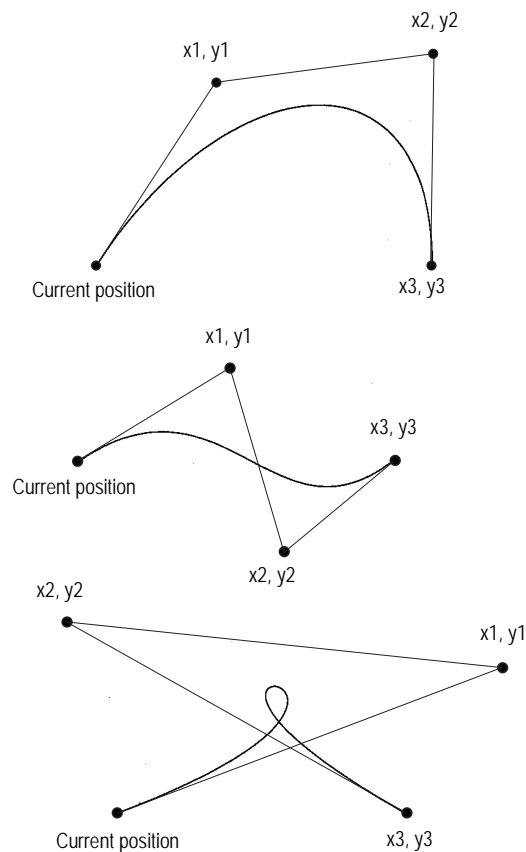


## Drawing Complex Curves

PRESCRIBE also provides a second curve-drawing operator for constructing complex curves that are referred to as *Bézier* curve segments. The PCRP (Path, Curve to Relative Position) uses the following format.

PCRP  $x1, y1, x2, y2, x3, y3;$

Figure 2. 25. Bézier Curves



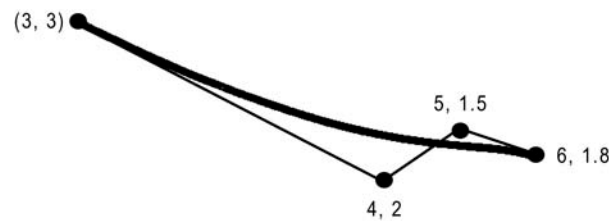
A Bézier curve segment is one that is geometrically defined by a starting point (the cursor's current position), two control points ( $x1, y1$  and  $x2, y2$ ), and an ending point ( $x3, y3$ ). Coordinates of each of these points are specified as an offset from the cursor's previous position.

The curve leaves the current position in the direction of  $x1, y1$ , and is tangent to the line between the current position and  $x1, y1$ . It bends towards  $x2, y2$ , then to  $x3, y3$ , and at the end point, is tangent to the line between  $x2, y2$  and  $x3, y3$ . The curve is always entirely enclosed by the complex quadrilateral defined by the starting point,  $x1, y1$ ,  $x2, y2$ , and  $x3, y3$ .

See the following examples:

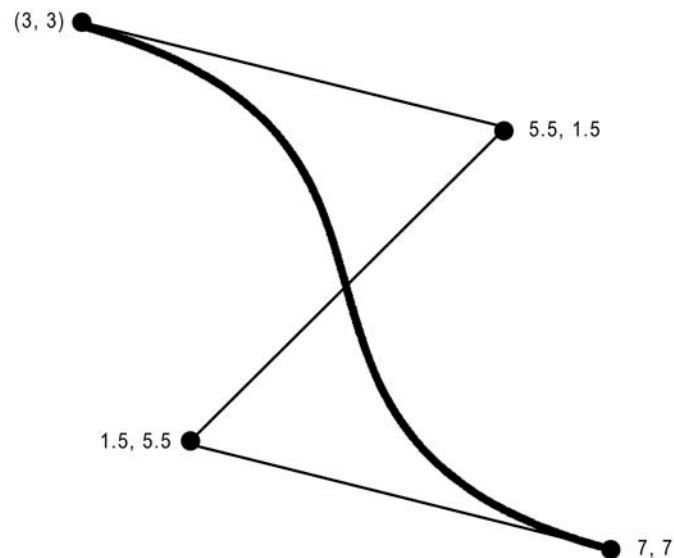
```
!R! RES; UNIT C; NEWP; SPD .1;
  PMZP 3, 3;
  PCRP 4, 2, 5, 1.5, 6, 1.8;
  STRK;
  PAGE;
EXIT;
```

Figure 2. 26. Printout of the PCRP Example



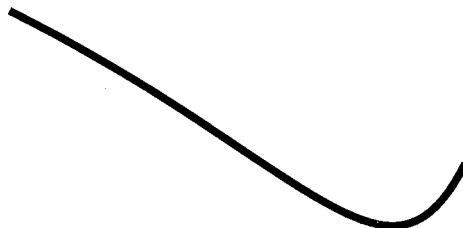
```
!R! RES; UNIT C; NEWP; SPD .1;
  PMZP 3, 3;
  PCRP 5.5, 1.5, 1.5, 5.5, 7, 7;
  STRK;
  PAGE;
EXIT;
```

Figure 2. 27. Second PCRP Example



```
!R! RES; UNIT C; NEWP; SPD .1;
  PMZP 3, 4;
  PCRP 4, 2, 5, 4, 6, 2;
  STRK;
  PAGE;
EXIT;
```

Figure 2. 28. Third PCRP Example



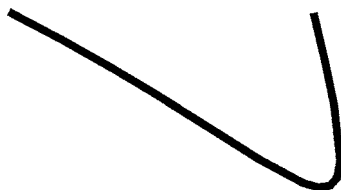
## Setting the Flatness of Curves

When PRESCRIBE renders any curve, it actually converts the curve to a series of connected straight line segments. The length of these line segments is referred to as a curve's *flatness*. You can change the degree of flatness with the FLAT (set FLATness) command. The default flatness is 1 (dot). Setting smaller values of flatness results in smoother curves, but more time is required for computing the larger number of line segments involved. (The difference is not noticeable for a single curve, but can be substantial in highly complex pages. Also, the difference is more noticeable with lower print resolutions [for example, 300 dpi resolution].)

The following programs illustrate the results of setting the flatness to higher values.

```
!R! RES; UNIT C; NEWP; SPD .1;
  FLAT 30;
  PMZP 5, 5;
  PCRP 4, 2, 5, 4, 4, 0;
  STRK;
  PAGE;
EXIT;
```

Figure 2. 29. Curve with Flatness 30

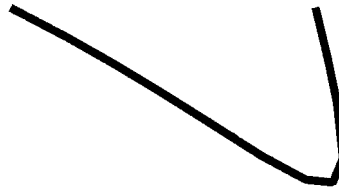


```

!R! RES; UNIT C; NEWP; SPD .1;
    FLAT 60;
    PMZP 5, 5;
    PCRP 4, 2, 5, 4, 4, 0;
    STRK;
    PAGE;
EXIT;

```

Figure 2. 30. Curve with Flatness 60



Both of these programs draw an identical curve. The only difference between the two is in the flatness, which is specified on line 2.

## Closed Paths

When the end point of a path connects to its starting point, the path is said to be *closed*. A closed path can be stroked, in the same manner as an open path, or it can be filled with gray-scale shading or a standard mode fill pattern.

Simply ending a path at the path's starting point does not make it a closed path; such a path remains open until it is closed. Closure can be done either explicitly, by means of the CLSP (CLOSe current Path) command, or implicitly by means of the FILL command.

The following example illustrates construction and closure of a path.

```

!R! RES; UNIT C; NEWP; SPD .5;
    PMZP 4, 2;
    PARC 3, 3, 1, 90, 270;
    PARC 5, 3, 1, 270, 90;
    CLSP;
    STRK;
    PAGE;
EXIT;

```

In this example, the PMZP command on line 2 places the current cursor at coordinates 4, 2, where the subsequent PARC command automatically starts to draw a line extending to the beginning of the arc. The PARC command then draws an arc from 90 degrees (straight up) to 270 degrees (straight down) around the center at coordinates 3, 3. After the arc is drawn, the cursor is located at the end of the arc. Then the PARC command on line 4 draws an arc from 270 degrees to 90 degrees around the center at coordinates 5, 3. Because the cursor position is defined at the end of the first arc when construction of the second arc starts, the second PARC command draws a line between the end of the first arc and the beginning of the second one. Finally, the CLSP command on line 5 explicitly closes the path, thereby constructing a line between the end of the second arc and the beginning of the first one.

Now the path has been closed. The STRK command goes on to stroke the path, producing the shape shown below.

Figure 2. 31. A Closed Path



## Filled Areas

```
!R! RES; UNIT C;
NEWP;
GPAT .5;
PMZP 4, 2;
PARC 3, 3, 1, 90, 270;
PARC 5, 3, 1, 270, 90;
FILL 1;
PAGE;
EXIT;
```

This program is similar to the previous one. In this case, we choose to fill the path instead of stroking it. We select a shade of gray for filling the path (.5, a value directly between black and white) with the GPAT (set Gray PATtern) command on line 3.

First, we construct the path by drawing arcs around the center points. However, we will not close it explicitly.

Then we execute the FILL command. This implicitly closes the path, drawing a line between the ending point of the second arc and the starting point of the first one, then fills the closed path with the selected gray scale pattern.

Note that we could have filled the path with a standard mode fill pattern instead of a gray-scale pattern. The only change necessary would be to replace the GPAT command on line 3 with a PAT or FPAT command specifying the pattern to be used.

The format of the FILL command is

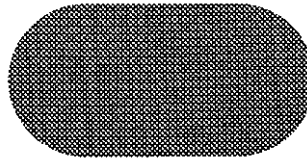
```
FILL rule;
```

The *rule* parameter specifies the convention according to which the path is filled.



With simple convex paths such as that shown below, the entire enclosed area is filled.

*Figure 2. 32. Simple Filled Paths*

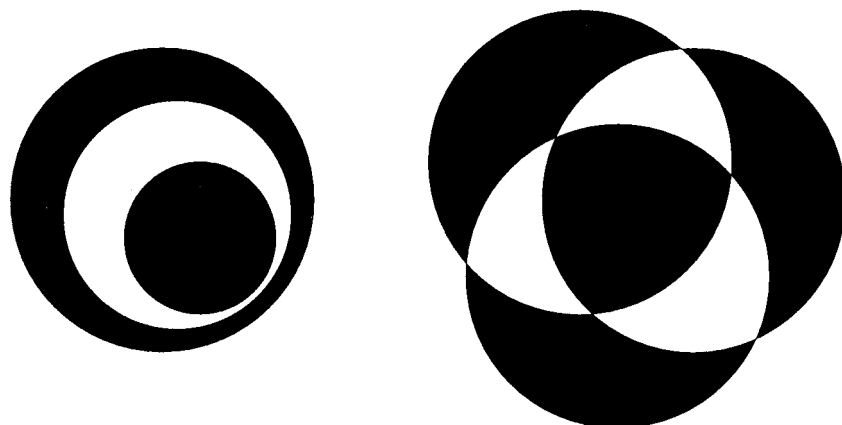


However, when a path consists of multiple closed subpaths or intersects itself as shown in the next two figures, the rule determines areas that are deemed to be inside the path.

```
!R! RES; UNIT C;
  PMZP 5, 5;
  PMRA 5, 5, 2, 0;
  PARC 5, 5, 2, 0, 360;
  PMRA 5.2, 5.2, 1.5, 0;
  PARC 5.2, 5.2, 1.5, 0, 360;
  PMRA 5.5, 5.5, 1, 0;
  PARC 5.5, 5.5, 1, 0, 360;
  FILL 1;

  PMZP 10.5, 4.5;
  PMRA 10.5, 4.5, 2, 0;
  PARC 10.5, 4.5, 2, 0, 360;
  PMRA 11, 6, 2, 0;
  PARC 11, 6, 2, 0, 360;
  PMRA 12, 5, 2, 0;
  PARC 12, 5, 2, 0, 360;
  FILL 1;
  PAGE;
EXIT;
```

*Figure 2. 33. Complex Filled Paths*



With 1 specified for the rule parameter of FILL, the method for determining whether a point is inside the path involves drawing a ray from that point in any direction and counting the number of times the ray crosses segments of the path. The point is said to be inside the path if the result is an odd number; if the result is an even number, the point is said to be outside the path.

The non-zero winding rule also draws a ray from a point in any direction to determine whether or not that point is inside the path and examines the points where a segment of the path crosses the ray. However, it then starts counting from zero and adds one each time a segment in the path crosses the ray from left to right; and subtracts one each time a segment in the path crosses the ray from right to left. If the result of counting all the crossings is zero, the point is said to be outside; otherwise the point is said to be inside the path.

After filling the current path, the FILL command clears the path in the same manner as NEWP.

## Clipping Rectangle

Up to this point, we have discussed graphics objects to be drawn or stroked or filled as paths. However, another PRESCRIBE command can be used to define a clipping template for clipping texts, paths, and raster graphics. For this purpose, the CLPR (CLIP Rectangular region) command is provided to define the rectangular region for clipping paths.

When the printing system is turned on or reset with PRESCRIBE's RES command, the clipping rectangle is identical to the printable limits of the page. Subsequently, executing the CLPR command reduces the clipping rectangle to the intersection of the objects on the page and the rectangle defined by CLPR.

The following is an example of CLPR.

```
!R! RES; UNIT C;
      NEWP;
      SPD 1;
      PMRA 6, 9, 3, 0;
      PARC 6, 9, 3, 0, 360;
      CLPR 3, 6, 9, 12;
      STRK;
EXIT;
```

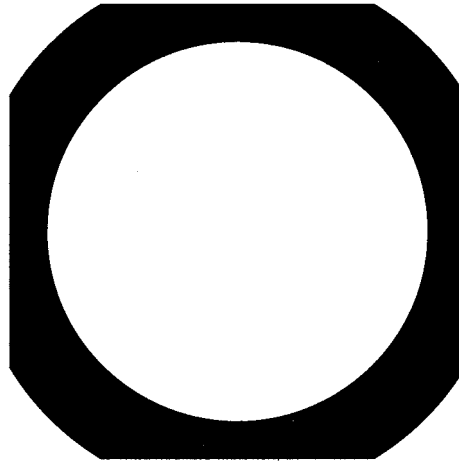
In this example, lines 1 through 5 draw a circle with an extra line thickness at the coordinates defined by the PMRA command.

The CLPR command on line 6 constructs a rectangle with its left-upper corner positioned at coordinates 3, 6 and its right-bottom corner positioned at coordinates 9, 12 (both measured from the top and left edge limits of the page).

As with the rectangular area clipping, those parts of the circle that lie outside of the clipping rectangle are erased when the path is stroked, producing the result as shown in the figure on the next page.

The rectangle defined by CLPR does not clip the graphics objects which are drawn by the standard mode graphics commands.

Figure 2. 34. Clipping Rectangle Example



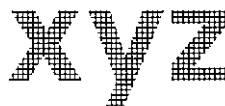
## Printing with Character Paths

When a resident scalable (outline) font is selected, you can treat a character as a path and add it to the current path. The PRESCRIBE command is CPTH (Character PaTH).

Paths created with the CPTH command can be either stroked or filled. See the following example.

```
!R! RES;
    UNIT P;
    NEWP;
    PAT 26;
    SFNT 'Helvetica-Bd', 54;
    PMZP 72, 144;
    CPTH "xyz";
    FILL 1;
    PAGE;
EXIT;
```

Figure 2. 35. Character Path



Line 2 of this program sets the unit to printing system's points (1 point= 1/72 inch), then the NEWP command on line 3 empties the current path (if any), making ready for construction of a new path. The PAT command on line 4 selects predefined pattern number 26 as the current fill pattern.

Next, the SFNT (Select current FoNT by typeface) on line 5 selects Helvetica Bold, a scalable (outline) font as the current font and scales the font to a height of 54 points. Use of SFNT and other font selection commands are explained more fully in *PRESCRIBE Commands Command Reference*.

The PMZP command on line 6 moves the cursor to the point that is 72 points (1 inch) from the left edge limit and 2 inches from the top edge limit.

The CPTH command on line 7 constructs a path using the outline of the characters in the string *xyz*. The cursor is moved to the end of the string.

Finally, the FILL command fills the path with the selected pattern, and PAGE prints out the page.

## Raster Graphics

While the graphics commands of the standard and path modes draw shapes such as lines, circles, and boxes, raster graphics commands specify individual dots to draw images. The dot resolution is selectable from 75 to 300 dots per inch for all models; and 600-dpi models have two more choices of 200 dpi and 600 dpi. Lower resolutions give a rougher appearance, but require less raster data for an image of a given size.

Raster graphics are limited in size only by the dimensions of the paper, and in complexity only by the dot resolution.

## Raster Data Compression Formats

PRESCRIBE supports raster data in three formats: uncompressed raster data, run-length encoded raster data, or raster data encoded in tagged image file format (TIFF).

### *Uncompressed Raster Data*

Uncompressed raster data consists of a simple, unencoded bit image consisting of binary data in which 1 bit represent black dots and 0 bit represent white dots. With this format, each dot line is divided into 8-dot segments. The settings of dots in each segment are controlled by the bit values of each byte of raster data. Bit 7 (the highest-order bit in the first byte of data received) corresponds to the first dot in the dot line, bit 0 corresponds to the eighth dot, and so forth.

### *Run-length Encoded Raster Data*

With run-length encoding, raster data is encoded in pairs of bytes. The first byte of each pair indicates a repetition count for the second byte. A value of zero in the first byte indicates that the pattern represented in second byte is not repeated; that is, it occurs only once. A value of 1 in the first byte indicates that the pattern is repeated once, and so forth. The first byte can specify any repetition count from 0 to 255.

### *Raster Data in Tagged Image File Format*

The tagged image file format (TIFF) combines features of the uncompressed format and run-length encoding. A *control byte* determines whether the following byte or bytes of

raster data represents a repeating pattern or an uncompressed (unencoded) pattern. It also determines the number of pattern repetitions or bytes of uncompressed data.

The control byte is a two's complement value that can be either zero, positive, or negative. A negative value (-1 to -127) indicates that the following byte represents a repeating pattern. The number of repetitions of the pattern is determined by the absolute value of the control byte.

If the control byte is zero or positive (1 to 127), the following byte(s) of data represent an uncompressed pattern. In this case, the value of the control byte plus one indicates the number of bytes making up the pattern.

In TIFF encoding, the two's complement value -128 indicates a non-operative control byte. The byte following such a byte is handled as a new control byte.

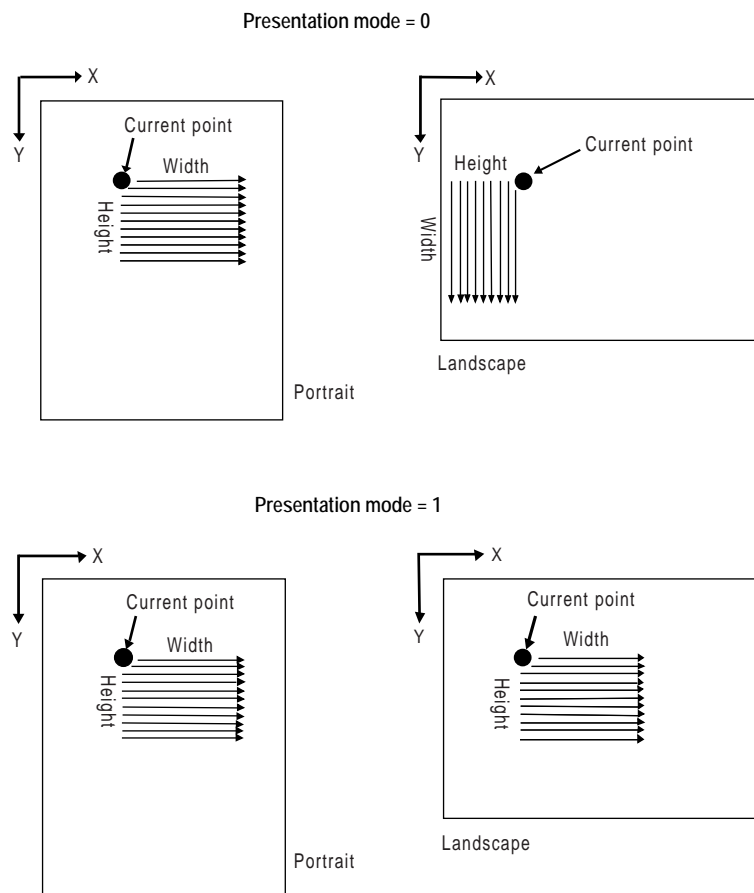
## Commands for Printing Raster Data

PRESCRIBE provides a number of commands for printing raster data, including:

- STR (SeT dot Resolution)
- RVRD (ReceiVe Raster Data)
- ENDR (END Raster data)
- RVCD (ReceiVe Compressed raster Data)
- SRO (Set Raster Options)

The principle function of the SRO command is to specify the *presentation mode*; i.e., the orientation of the raster image. If the presentation mode is 0 (the default mode), raster lines print along the width of the physical page, regardless of the current page orientation. If the presentation mode is 1, raster lines print in the orientation of the logical page. This is illustrated in the figure that follows.

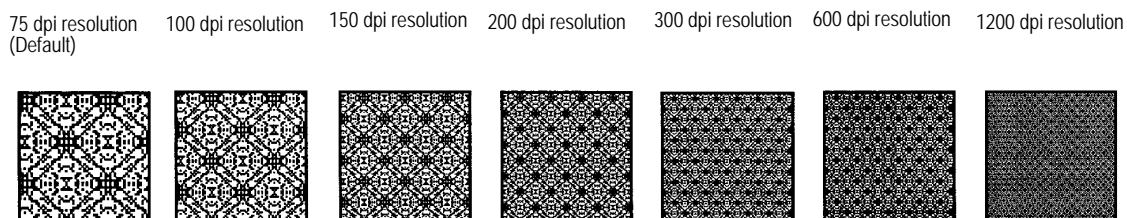
Figure 2. 36. Presentation Modes



A secondary function of the SRO command specifies the width and height of the raster area. When a width and height are explicitly specified, any part of the raster image that extends outside of the area is clipped.

The STR command specifies the resolution at which raster data is printed. The default resolution is 75 dots per inch, or the equivalent of 16 physical dots for each raster-line dot. The following figure shows how a single raster-line dot correlates to physical dots at each of the available raster data resolutions.

Figure 2. 37. Dot Resolutions



The RVRD and RVCD commands print raster data in the presentation mode specified by the SRO command and at the resolution specified by the STR command. Either command can be used. The RVRD command can only print uncompressed raster data. The RVCD command can print uncompressed raster data, run-length encoded raster data, or

tagged image file format raster data. Both commands are used with the ENDR (END Raster) command.

## Printing Raster Data

The normal sequence for printing raster data is to set the presentation mode (and, if desired, the height and width of the raster image area) with the SRO command, to set the dot resolution with the STR command, then to print the raster data with the RVRD or RVCD/ENDR command pair.

## Changing the Printing System's Imaging Model

The printing system's imaging model governs the way in which images and patterns are applied to each other. In short, it determines the transparency or opaqueness of images as images overlay one another and fill patterns are applied through images.

The image model applies to all PRESCRIBE image modes, and also to operation in the Hewlett-Packard LaserJet emulation mode.

In general, placing any image on a page involves three elements: *a pattern*, *a source image* whose black bits are replaced by the pattern, and *a destination image*, which is any earlier image onto which the source image and pattern are placed.

The fill pattern or gray scale pattern is defined by the PAT command, FPAT command, or GPAT command.

The source image is any raster graphics image, standard mode graphic, lines or shapes produced by filling or stroking a path, or text printed using any bitmap or scalable font.

The manner in which white bits in the pattern and source image are processed varies according to the *transparency mode*. There are two transparency modes: the *source transparency mode* and the *pattern transparency mode*.

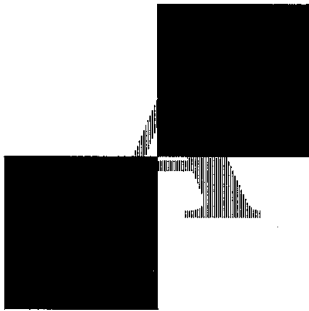
When the source transparency mode is *0* (transparent), white bits in the source image have no effect on the destination image; when the source transparency mode is *1* (opaque), white bits in the source image are applied to the destination image.

Similarly, when the pattern transparency mode is *0* (transparent), white bits in the pattern do not affect the destination image; but the area of the source image replaced by the pattern dots is applied to the destination image when the pattern transparency mode is *1* (opaque).

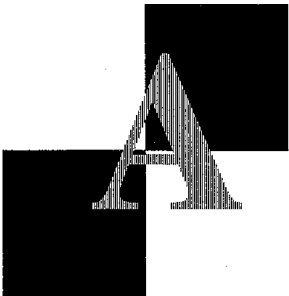
The figure on the next page illustrates the results that are obtained by printing images using image modes; that is, using different combinations of source and pattern transparency modes.

Figure 2. 38. Image Models

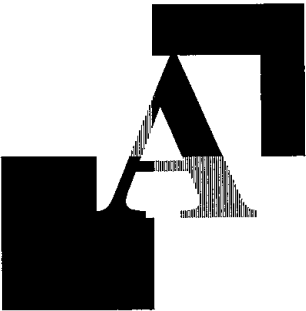
Source transparency mode = 0 (transparent)  
Pattern transparency mode = 0 (transparent)



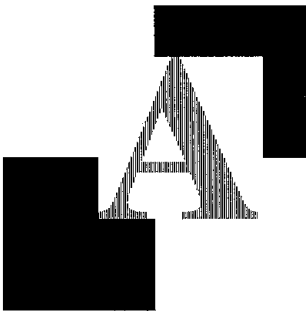
Source transparency mode = 0 (transparent)  
Pattern transparency mode = 1 (opaque)



Source transparency mode = 1 (opaque)  
Pattern transparency mode = 0 (transparent)



Source transparency mode = 1 (opaque)  
Pattern transparency mode = 1 (opaque)



PRESCRIBE establishes the printing system's imaging model with the SIMG (Set IMaGe model) command. This command uses the following format.

*SIMG operation-mode ;*

*operation-mode* is a number from 1 to 6 that determines the image model as follows.

Operation mode	Source image	Pattern
1	Transparent	—
2	Opaque	—



3	Transparent	Transparent
4	Transparent	Opaque
5	Opaque	Transparent
6	Opaque	Opaque

With operation modes 1 and 2, the SIMG command addresses the transparency of the source image only. For operation mode 1, the white pixels of the source image do not overlay on the destination. For example, you cannot pattern a character. With operation mode 2, the SIMG command applies the white pixels of the source image onto the destination directly.

The following program example illustrates use of the SIMG command. Try changing the value specified for SIMG on line 3 and see the effect on the result (the figure on the previous page).

```
!R! RES; UNIT C;
      NEWP;
      SIMG 3; CMNT Try changing this value;
      PMZP 5, 15;
      PMRP 2, 2;
      PDRP 0, -2, 2, 0, 0, 2, -2, 0;
      PDRP -2, 0, 0, 2, 2, 0, 0, -2;
      FILL 1;
      SFNT 'TimesNewRoman', 90;
      PMRP -1.2, 1;
      GPAT .6;
      TEXT 'A';
      FILL 1;
      PAGE;
EXIT;
```

## Saving and Restoring the Graphics State

The graphics state consists of a variety of items that affect how images are rendered on the page. The graphics state contains various information related to path mode graphics and raster mode graphics.

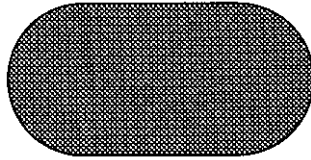
Items included in the graphics state include the following:

- Current path and cursor position (if defined)
- Current pen diameter (line width)
- Current line join type
- Current line cap type
- Current miter limit
- Current dash pattern
- Current flatness
- Current fill pattern (16 × 16 dots)
- Current clipping rectangle
- Current raster resolution
- Current image model

While working with graphics, there often are occasions when it is useful to save the graphics state, then later to restore it. One such situation occurs when a path must be used for both stroking and filling.

For example, construction of a filled and outlined shape such as that shown below requires that we draw the path and then fill it. However, filling the path also clears it, making it unavailable for stroking.

*Figure 2. 39. A Path both Stroked and Filled*



By saving the graphics state prior to filling the path, it becomes possible to restore the path after it has been filled, thereby allowing it to be stroked without reconstructing it.

The commands used for saving and restoring the graphics state are the SCG (Save Current Graphics state) command and the RPG (Return to Previous Graphics state) command.

The following program demonstrates the commands for constructing a path that is both filled and stroked.

```
!R! RES; UNIT C; NEWP;  
  PMZP 4, 2;  
  PARC 3, 3, 1, 90, 270;  
  PARC 5, 3, 1, 270, 90;  
  CLSP;  
  SCG;  
  STRK;  
  RPG;  
  GPAT .5;  
  FILL 1;  
  PAGE;  
EXIT;
```

The result appears in the figure above.

## Chapter 3

---

# Macros

After you have gone to the trouble of creating (and debugging) a PRESCRIBE command sequence, it is inefficient to use it only once, but it is a nuisance to type the same sequence repeatedly. The solution is to make the sequence into a macro. Then you can execute the entire sequence with a single CALL command. The procedure for defining a macro command sequence is simple.

Step 1: Assign a name to the sequence. Place the name at the top of the sequence (ending with a semicolon).

Step 2: Add the PRESCRIBE command MCRO in front of the name.

Step 3: Add the PRESCRIBE command ENDM at the end of the sequence.

## MCRO Command

The MCRO command assigns a name to the sequence of PRESCRIBE commands that follows, until the ENDM (END Macro) command appears. Thereafter, the entire sequence of commands can be executed by specifying the assigned name in a single CALL or AMCR (Automatic MaCRo) command. The MCRO command has the following format.

```
MCRO name [ dummy sign [ , comment ] ;
```

The *name* of a macro can be any length but only the first four characters are recognized by the PRESCRIBE command language. Any distinction between upper and lowercase letters is also ignored. For example, the following macro names are all the same:

```
ABCD
abcd
ABCDE
Abcdxyz
```

The name must start with a letter, but the other characters can include digits and special symbols such as hyphens. For example, F-1 and GRY2 are valid macro names.

The *dummy sign* (the default is the percent sign) indicates dummy parameters in the body of the macro. Dummy parameters enable you to place different variables when the macros are called. By using dummy parameters the same macro will execute differently according to the values given on the CALL command. Dummy parameters are written by writing the dummy sign followed by a number: %1 for the first dummy parameter, %2 for the second dummy parameter, and so on up to a maximum of 19 dummy parameters. The same dummy parameter can be used any number of times. Values are assigned to dummy parameters when the macro is called by the CALL command.

You do not have to specify the dummy sign in the MCRO command unless you want to use a dummy sign different from the percent sign or want to specify a comment. The printing system ignores the comment. A useful comment would be a list of the meanings of dummy parameters. In particular, a macro can contain the CALL command, permitting one macro to call another. Macro calls can be nested in this way up to a maximum depth of 20.

If the body of the macro contains TEXT, RTXT, or CTEXT commands and these have dummy parameters, the enclosing quotation marks should be included in the macro call, not in the macro definition. This enables strings containing commas, semicolons, consecutive spaces, apostrophes, and quotation marks to be printed.

If a macro with the same name has already been defined, the new definition is ignored. To redefine a macro, you must first delete the old definition with the DELM (DELeTe Macro) or DAM (Delete All Macros) command, or by switching the printing system power off.

There is no particular limit on the length of a macro. The maximum number of macros that can be defined is limited only by the amount of the available memory in the printing system. Each command in a macro is limited to 255 characters in length.

Figure 3. 1. PRESCRIBE Macro Limitations

Macro limitations are summarized as follows.

Maximum number of macros downloadable to the printing system	Depends on the available printing system's memory
Maximum nesting levels	20
Maximum length of macro name	4 characters
Maximum number of parameters	19
Maximum length of CALL command	255 bytes
PRESCRIBE commands that should not be contained within a macro definition	EXIT, LDFC, MCRO, DELM, DAM, RDMP, ENDD, ICCD, WRED, EPRM

## Examples of Macros

### Example 1

The following macro example draws a circle. It first names the macro that issues the PRESCRIBE commands for drawing a circle in the middle of a page.

```
!R! MCRO CIR1;
      MZP 4, 5.5; CIR 1;
      ENDM;
EXIT;
```

When completed, this macro will draw a circle after it has been sent to the printing system.

```
!R! CALL CIR1; EXIT;
```

If you want circles of different sizes, you can make the radius into a so-called *dummy parameter*. Dummy parameters in macro definitions are denoted using percent symbols (%) as below:

```
!R! MCRO CIRCLE;
      MZP 4, 5,5; CIR %1;
      ENDM;
EXIT;
```

After this definition: CALL CIRCLE, 1; draws a one-inch circle, CALL CIRCLE, 2; draws a two-inch circle, and so on. Note the commas are required to separate the macro name from the radius parameter in these CALL statements.

*Example 2*

The next file presents a more ambitious project. It makes the graph-drawing commands in the preceding section into a pair of macros to draw multiple graphs. This file may help you to better understand the macro creating process. The DAM command in the first line is a safety precaution that clears any previous macros out of memory.

```

!R! RES; UNITC; DAM;
  MCRO LOCATE;
    SLM %1;
    STM %2;
  ENDM;
  MCRO GRAPH;
    UNIT C;
    SPD 0.05; SCS 0.23;
    MAP 0, -7.3; TEXT %1;
    MAP 0, 0; BOX 6, -7;
    MAP -0.1, 0.5;
    TEXT 'Sun Mon Tue Wed Thu Fri Sat';
    MAP 0, -%2;
    DAP 1, -%3;
    DAP 2, -%4;
    DAP 3, -%5;
    DAP 4, -%6;
    DAP 5, -%7;
    DAP 6, -%8;
  ENDM;
  CALL LOCATE, 2, 9;
  CALL GRAPH, 'Temperature', 2.5, 3.5, 1.9, 3.0, 3.8, 2.8, 3.3;
  CALL LOCATE, 10, 9;
  CALL GRAPH, 'Humidity', 3.5, 1.0, 1.3, 2.6, 1.8, 6.4, 5.9;
  CALL LOCATE, 2, 20;
  CALL GRAPH, 'Paid Attendance', 5.2, 1.1, 0.9, 1.5, 1.3, 3.3, 4.4;
  CALL LOCATE, 10, 20;
  CALL GRAPH, 'Pages Completed', 0, 1.2, 4.4, 4.6, 3.2, 6.6, 0;
  PAGE;
EXIT;

```

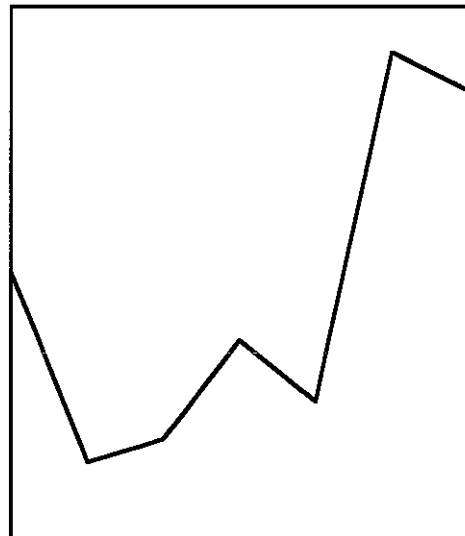
Figure 3. 2. Macro Example 2

Temperature



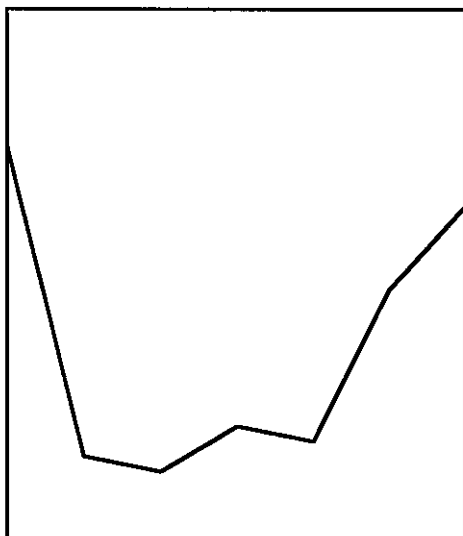
Sun Mon Tue Wed Thu Fri Sat

Humidity



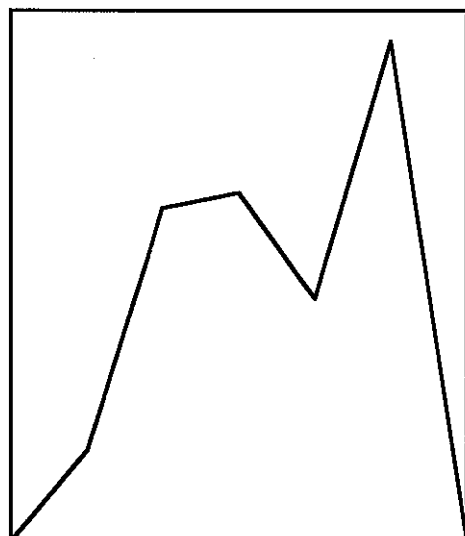
Sun Mon Tue Wed Thu Fri Sat

Paid Attendance



Sun Mon Tue Wed Thu Fri Sat

Pages Completed



Sun Mon Tue Wed Thu Fri Sat

This page is left blank intentionally.



# Chapter 4

---

## Fonts

This chapter covers font-related topics, including the printing system's resident and option fonts, character sets, and usage of font-selection and symbol creation commands.

A font is a set of characters of a particular design. The design is referred to as a *typeface*. Several characteristics identify a font. These include the font type (bit map or scalable), symbol set, spacing, pitch, height, style, stroke weight, and typeface family. In selecting a font, the printing system searches the available fonts to match these characteristics based on the highest priority. For details in this regard, see *Selecting Fonts Using the FSET Command* on page 4-9 in this chapter.

## Resident Fonts

The printing system provides one bitmap font and 136 scalable (outline) fonts as the resident fonts. Also, fonts may be downloaded to the printing system's memory from a computer or a memory card. These fonts are referred to as downloadable or soft fonts. The printing system accepts as many downloadable fonts as user memory allows.

When the HP LaserJet is the printing system's default emulation, the power-up (default) font is Courier. A different default font can be selected by using the FRPO (Firmware RePrOgram) command of parameters V3 (or using the printing system's operator panel key). For details, refer to *FRPO Parameters* on page 6-2.

## List of Fonts

Resident scalable fonts provide an outline of characters which can be sized according to sizing information for the font. These fonts can be scaled from 0.25 to 999.75 points in quarter point increments.

This section shows tables of the printing system's resident fonts. It is possible to print a full list of resident fonts by the FLST command (or using the printing system's operator panel key). To print a list of fonts, command:

```
!R! FLST; EXIT;
```

The following list shows all the resident fonts in the printing system. For example, *Univ-Bd* means a Universe style scalable font with bold weight.

### Font Name

Courier  
CGTimes  
CGTimes-Bd  
CGTimes-It  
CGTimes-BdIt  
CGOmega  
CGOmega-Bd  
CGOmega-It  
CGOmega-BdIt  
Coronet  
Clarendon-Cd  
Univers-Md  
Univers-Bd  
Univers-MdIt  
Univers-BdIt  
Univers-MdCd  
Univers-BdCd  
Univers-MdCdIt  
Univers-BdCdIt  
AntiqueOlive  
AntiqueOlive-Bd  
AntiqueOlive-It  
GaramondAntiqua

#### Font Name

Garamond-Hlb  
Garamond-Krsv  
Garamond-HlbKrsv  
Marigold  
Albertus-Md  
Albertus-ExBd  
Arial  
Arial-Bd  
Arial-It  
Arial-BdIt  
TimesNewRoman  
TimesNewRoman-Bd  
TimesNewRoman-It  
TimesNewRoman-BdIt  
Helvetica  
Helvetica-Bd  
Helvetica-Ob  
Helvetica-BdOb  
Helvetica-Nr  
Helvetica-NrBd  
Helvetica-NrOb  
Helvetica-NrBdOb  
Palatino  
Palatino-Bd  
Palatino-It  
Palatino-BdIt  
ITCAvantGardeGothic-Bk  
ITCAvantGardeGothic-Dm  
ITCAvantGardeGothic-  
BkOb  
ITCAvantGardeGothic-  
DmOb  
ITCBookman-Lt  
ITCBookman-Dm  
ITCBookman-LtIt  
ITCBookman-DmIt  
NewCenturySchoolbook-  
Rom  
NewCenturySchoolbook-Bd  
NewCenturySchoolbook-It  
NewCenturySchoolbook-  
BdIt  
Times-Rom  
Times-Bd  
Times-It  
Times-BdIt  
ITCZapfChancery-MdIt  
Symbol

Font Name  
SymbolPS  
Wingdings  
ITCZapfDingbats  
Courier-Bd  
Courier-It  
Courier-BdIt  
LetterGothic  
LetterGothic-Bd  
LetterGothic-It  
CourierPS  
CourierPS-Bd  
CourierPS-Ob  
CourierPS-BdOb  
LinePrinterBM8.5-Roman  
(Bitmap)

## KPDL Fonts

In KPDL (Kyocera Print-system Description Language) emulation, the printing system provides PostScript-compatible 47 scalable fonts. These fonts are also accessible by using the PRESCRIBE command.

Font Name  
Albertus-ExtraBold  
Albertus-Medium  
AntiqueOlive  
AntiqueOlive-Bold  
AntiqueOlive-Italic  
Arial  
Arial-Bold  
Arial-BoldItalic  
Arial-Italic  
AvantGarde-Book  
AvantGarde-BookOblique  
AvantGarde-Demi  
AvantGarde-DemiOblique  
Bookman-Demi  
Bookman-DemiItalic  
Bookman-Light  
Bookman-LightItalic  
CGOmega  
CGOmega-Bold  
CGOmega-BoldItalic  
CGOmega-Italic  
CGTimes  
CGTimes-Bold  
CGTimes-BoldItalic  
CGTimes-Italic

**Font Name**

Clarendon-Condensed-Bold  
Coronet  
Courier  
Courier-Bold  
Courier-BoldOblique  
Courier-Oblique  
CourierPCL  
CourierPCL-Bd  
CourierPCL-BoldItalic  
CourierPCL-Italic  
Garamond-Antiqua  
Garamond-Halbfett  
Garamond-Kursiv  
Garamond-KursivHalbfett  
Helvetica  
Helvetica-Bold  
Helvetica-BoldOblique  
Helvetica-Narrow  
Helvetica-Narrow-Bold  
Helvetica-Narrow-BoldOblique  
Helvetica-Narrow-Oblique  
Helvetica-Oblique  
LetterGothic  
LetterGothic-Bold  
LetterGothic-Italic  
Marigold  
NewCenturySchlbk-Bold  
NewCenturySchlbk-BoldItalic  
NewCenturySchlbk-Italic  
NewCenturySchlbk-Roman  
Palatino-Bold  
Palatino-BoldItalic  
Palatino-Italic  
Palatino-Roman  
Symbol  
Symbol MT  
Times-Bold  
Times-BoldItalic  
Times-Italic  
Times-Roman  
TimesNewRoman  
TimesNewRoman-Bold  
TimesNewRoman-BoldItalic  
TimesNewRoman-Italic  
Univers-Bold  
Univers-BoldItalic  
Univers-Condensed-Bold  
Univers-Condensed-BoldItalic

**Font Name**

Univers-Condensed-Medium  
 Univers-Condensed-MediumItalic  
 Univers-Medium  
 Univers-MediumItalic  
 Wingdings-Regular  
 ZapfChancery-MediumItalic  
 ZapfDingbats

## Substituting a Bitmap Font

The printing system does not contain any bitmap fonts except LinePrinterBM8.5-Roman. If the printing system receives a request for the bitmap fonts that the previous lineups of the printers supported (tabled on page 4-4), a scalable font is substituted.

For example, if Dutch801BM10-Roman, which means a Dutch 801 style bitmap font of 10-point and Roman-style and was resident to the previous models of Kyocera printers, the printing system substitutes a Times Roman style scalable font. Other options include weights for **bold** and *italic*.

The following table lists the bitmap fonts and the bitmap font numbers that the previous lineups of Kyocera printers support. The Kyocera printing system behaves exactly in the same manner when it receives these font numbers. It substitutes the scalable fonts for these fonts when required.

Font Name	Font Number		Height (Pts.)	Pitch (cpi)
	Port.	Land.		
CourierBM12-Roman	1	17	12	10
CourierBM12-Italic	37	18	12	10
CourierBM12-Bold	38	67	12	10
CourierBM12-BoldItalic	39	68	12	10
Dutch801BM10-Roman	2	19	10	Prop.
Dutch801BM10-Italic	3	20	10	Prop.
Dutch801BM10-Bold	4	21	10	Prop.
Dutch801BM10-BoldItalic	40	69	10	Prop.
Dutch801BM8-Roman	5	22	8	Prop.
Dutch801BM8-Italic	41	—	8	Prop.
Dutch801BM8-Bold	42	70	8	Prop.
Dutch801BM8-BoldItalic	43	—	8	Prop.
PrestigeEliteBM10-Roman	6	23	10	12
PrestigeEliteBM10-Italic	44	24	10	12
PrestigeEliteBM10-Bold	45	71	10	12
PrestigeEliteBM10-BoldItalic	46	72	10	12
PrestigeEliteBM7.2-Roman	7	25	7.2	16.67
PrestigeEliteBM7.2-Italic	47	—	7.2	16.67
PrestigeEliteBM7.2-Bold	48	73	7.2	16.67
PrestigeEliteBM7.2-BoldItalic	49	—	7.2	16.67
LetterGothicBM12-Roman	8	26	12	12

Font Name	Font Number		Height (Pts.)	Pitch (cpi)
	Port.	Land.		
LetterGothicBM12-Italic	50	27	12	12
LetterGothicBM12-Bold	9	28	12	12
LetterGothicBM12-BoldItalic	51	79	12	12
LinePrinterBM8.5-Roman	88	—	8.5	16.67
Swiss721BM14.4-Bold	10	29	14.4	Prop.
Swiss721BM14.4-BoldItalic	52	—	14.4	Prop.
Swiss721BM12-Bold	11	30	12	Prop.
Swiss721BM12-BoldItalic	53	—	12	Prop.
Swiss721BM10-Bold	12	31	10	Prop.
Swiss721BM10-BoldItalic	54	—	10	Prop.
Swiss721BM8-Roman	13	32	8	Prop.
Swiss721BM8-Italic	55	—	8	Prop.
Swiss721BM8-Bold	56	74	8	Prop.
Swiss721BM8-BoldItalic	57	—	8	Prop.
Swiss721BM6-Roman	14	33	6	Prop.
Swiss721BM6-Italic	58	—	6	Prop.
Swiss721BM6-Bold	59	75	6	Prop.
Swiss721BM6-BoldItalic	60	—	6	Prop.
LinePrinterBM9-Roman	15	34	9	16.67
LinePrinterBM9-Italic	61	35	9	16.67
LinePrinterBM9-Bold	62	76	9	16.67
LinePrinterBM9-BoldItalic	63	77	9	16.67
LinePrinterBM7-Roman	16	36	7	21.43
LinePrinterBM7-Italic	64	—	7	21.43
LinePrinterBM7-Bold	65	78	7	21.43
LinePrinterBM7-BoldItalic	66	—	7	21.43

## Font Selection

There are several ways to select the fonts: one way is to use the appropriate keys on the printing system's control panel; a second way is to place a **PRESCRIBE** command in the file to be printed, as in the examples in *Chapter 1*; a third way is to select a printing system driver within a software application. This third way is preferable because the fonts are integrated directly into the software. In the absence of this support, the user should read the following information on choosing and placing **PRESCRIBE** commands.

## Font Selection by **PRESCRIBE** Commands

The **PRESCRIBE** commands associated with font selection include:

- **FSET** (change current Font SETting by characteristic)
- **SFNT** (Select current FoNT by typeface)
- **ALTF** (select ALTerate Font) and **SETF** (SET alternate Font)
- **SCF** (Save Current Font) and **RPF** (Return to Previous Font)
- **SCCS** (Save Current Code Set) and **RPCS** (Return to Previous Code Set)

- CSET (Change current symbol SET)
- FTMD (set bitmap FonT MoDe)
- FONT (select current FONT by number)
- SFA (Set bitmap Font Attributes)

The FTMD and SFA commands are only valid with bitmap fonts (which are simulated by resident scalable fonts).

The following is a guideline to the use of these commands. Also, these commands are fully detailed in *PRESCRIBE Command Reference*.

## Selecting Fonts Using the SFNT Command

Use the SFNT command to specify a font by typeface or to assign a font number to a scalable font, making it possible to select a scalable font with the FONT command (See *Selecting Fonts with the FONT Command* on page 4-10.).

For example, to print text using the scalable Times font (TimesNewRoman) at 10 points, use the following sequence:

```
!R! SFNT 'TimesNewRoman', 10; EXIT;
```

Here, **TimesNewRoman** represents the typeface name and 10 represents font height in the unit of points. Note that the SFNT command recognizes all character heights in terms of points, regardless of the specified unit value.

The SFNT command is particularly useful when you want to assign the font number to a scalable font and alter its appearance by compressing, expanding, or obliquing it. The following example selects a scalable Dutch font, sizes it to 10 points, assigns it the font number 1001 and the Roman-8 symbol set, compresses it to 90 percent of its normal width, and obliques the font so that it tilts forward at an angle of 13.5 degrees.

```
!R! SFNT 'TimesNewRoman', 10, 1001, 277, .9, .3; EXIT;
```

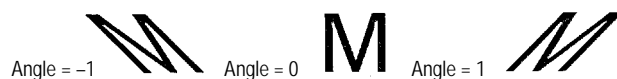
In this sequence, the assignment of font number 1001 enables it to be selected using the FONT command. Once this assignment has been made, it remains effective until changed with another SFNT command or until the power is turned off.

Following the font number assignment, value 277 selects the symbol set *Roman-8*. A full list of symbol sets and values appear on the SFNT command page in *PRESCRIBE Commands Command Reference*.

The value .9 following the symbol set parameter indicates compression to 90 percent of normal width. Compression can be specified in a range from 0.3 (30 percent) to 3 (300%).



Finally, the value .3 concluding the font selection sequence specifies a forward tilt of 13.5 degrees. The angle for normal characters is 0. Negative values result in backward-tilting characters. The angle parameter accepts any value from -1 (-45°) to 1 (45°). Examples appear below.





The parameters for symbol set, compression, and obliquing must be either all specified or all omitted.

## Selecting Fonts Using the FSET Command

The FSET command provides a method of selecting fonts based on font characteristics and font location in the printing system.

Font characteristics upon which selection is based appear in order of priority, from highest to lowest as follows:

Characteristic	Priority of selection
Symbol set	Highest
Spacing	2 nd
Pitch	3 rd
Point size (height)	4 th
Style	5 th
Stroke weight	6 th
Typeface family	7 th
Location	8 th
Orientation	Lowest

In selecting a font, the printing system searches the available fonts to match a characteristic based on the highest priority. If this matching produces only one font, that font is selected. If many fonts match this highest priority, then matching begins with the next highest characteristic. The printing system continues going down the list until only one font is left, then that font is selected.

A font may reside in any of three locations: printing system ROM (for resident fonts, and option fonts, if installed), memory card (for card option fonts), and printing system RAM (for downloaded fonts). A font in printing system ROM has lower priority than an identical font on a memory card, and a memory card font has a lower priority than an identical font in printing system RAM. Also, assuming all other characteristics are the same, a scalable font has lower priority than a bitmap font (simulated).

The last characteristic checked is the font orientation. If two fonts are found that differ only in orientation, the one selected is that which matches the page orientation. If only one font remains and its orientation does not match the orientation of the page, the printing system rotates the font to match the page orientation.

The example below shows an FSET command sequence that selects the 12-point, upright, normal-weight, CGTimes font. (The FSET command sequences for selecting the resident fonts appear on the font lists.)

```
FSET 1p12v0s0b4101T;
```

The FSET command sequence may be followed by a CSET (Change current symbol SET) command which selects the desired HP symbol set. In the example below, the Windows symbol set is selected.

```
CSET 9U;
```

HP symbol set values can be referenced on the CSET command page in *PRESCRIBE Commands Command Reference*.

## Selecting Fonts with the FONT Command

The FONT command uses font numbers to select fonts. A scalable font does not normally have the font number, therefore, you must take one extra step using the SFNT (Select FoNT by typeface) command. See *Selecting Fonts Using the SFNT Command* above. For example, to select the 10-point TimesNewRoman which was assigned with font number 1001, command:

```
!R!      SFNT 'TimesNewRoman', 10, 1001;
          FONT 1001;
EXIT;
```

## Bitmap Font Mode

If you use a bitmap font, a change in fonts can also affect the character spacing, line spacing, and page orientation. This depends on the *font mode* (FTMD). With bitmap fonts, setting the font mode to 15 enables the printing system to adjust all these parameters automatically. When you select font 23 (landscape PrestigeEliteBM10-Roman), for example, the printing system automatically changes the character spacing to 12 characters per inch, the line spacing to about 7.25 lines per inch, and the page orientation to landscape.

Remember that the font mode is only valid for bitmap fonts. Scalable fonts always adjust to the current page orientation. Also, with scalable fonts, you must use a line-spacing adjustment command to set the innate line spacing for the new font.

Each emulation has a default font mode for bitmap fonts which takes effect when the emulation is enabled. Font mode 15 is the default font mode of the Line Printer emulation. The other emulations have lower default font mode values.

If you use a variety of bitmap fonts, you will probably find font mode 13 most convenient. In font mode 13 character spacing and orientation are always correct, and the line spacing remains constant when you change fonts. Font mode 13 is the default font mode of the LaserJet emulation. To select font mode 13 in the other emulations, place the following sequence at the top of your program or file:

```
!R! RES; FTMD 13; EXIT;
```

(Place FTMD after RES, because RES resets the font mode.)

One reason for selecting font mode 13 over font mode 15 is that a self adjusting line spacing feature can create disastrous affects with software applications designed to handle line spacing without the assistance of PRESCRIBE.

For lower font mode, such as the default font modes in emulation modes 1 through 5, spacing and orientation adjustments may be necessary when you change fonts. Use the following commands:

SCS (Set Character Spacing) or SCPI (Set Characters Per Inch), to adjust the character spacing, SLS (Set Line Spacing) or SLPI (Set Lines Per Inch), to adjust the line spacing, SPO (Set Page Orientation), to adjust the page orientation.

The following sequences both use the FONT 19; command to select the 10-point Dutch 801 font with landscape orientation and proportional character spacing. Neither sequence affects the line spacing.

```
!R! FONT 19; SPO L; SCS 0; EXIT;
```

or

```
!R! FTMD 13; FONT 19; EXIT;
```

For making many font changes within a document, use the ALTF (change to ALternate Font) and SETF (SET alternate Font) commands instead of FONT. To switch repeatedly between fonts 6 and 8, for example, place the following sequence at the beginning of your document:

```
!R!      SETF 1,6; CMNT PrestigeEliteBM10-Roman;
          SETF 2, 8; CMNT LetterGothicBM12-Roman;
EXIT;
```

Then use !R! ALTF1; EXIT; within the document to select font 6 and !R! ALTF2; EXIT; to select font 8. The advantages of ALTF and SETF are that:

- The numbers are easy to remember (1 and 2 instead of 6 and 8).
- All the font number assignments are collected in one place, where they can be easily checked.
- If you change your mind and decide to use LetterGothicBM12-Bold (font 9) instead of LetterGothicBM12-Roman, all you have to change is one SETF command (from SETF 2, 8; to SETF 2, 9;).

In emulation modes 1, 2, and 5, the SETF command can team up in a very effective way with embedded word-processing commands. See *Chapter 7* for details.

The SCF (Save Current Font) and RPF (Return to Previous Font) commands enable font numbers to be managed in stack fashion. These commands are particularly useful at the beginning and end of macros, and when you are using embedded commands of word-processing software. To ensure that the saved font is retrieved with the correct code set, add the SCCS (Save Current Code Set) and RPCS (Return to Previous Code Set) commands to the SCF and RPF command, respectively.

For instance, to select a font using embedded commands, you can save the current font, call a new font, enter the text and return to the previous font, as in the following sequence.

```
!R! SCF; FONT 7; EXIT; (Text of footnote...)
!R! RPF; EXIT;
```

This sequence leaves the current font, prints the footnote in font 7 (PrestigeEliteBM7.2-Roman), then returns to the previous font.

## Placement of Font Commands

It is important to note that most existing word-processing software will not recognize PRESCRIBE font selection commands. However, this software typically accommodates embedded print commands whereby the PRESCRIBE command placed in a document is recognized as a print command and not as document text. The following command sequence demonstrates the embedded commands which might appear in a document.

Example of an appropriate command placement:

```
... end of previous paragraph.
!R! ALTF 2; EXIT;
Title or Heading !R! ALTF 1; EXIT;
Start of next paragraph ...
```

The first ALTF command appears on a blank line. The second ALTF command is placed at the end of a short title or heading, so that it fits on the same line and does not affect the line count.

## Font Selection by Embedded Commands

Word-processing programs with IBM and Epson printer drivers include support for a set of specific typefaces. The Kyocera printing system internally assigns these typefaces to match similar typefaces already in the printing system. Kyocera users may reassign these fonts to create a custom font list. To make this change, refer to the SETF command in *PRESCRIBE Commands Command Reference*.

Word-processing programs that support the Diablo 630 printer use embedded *ribbon-color* commands. The printing system translates these internally into ALTF commands. By placing two SETF commands at the top of a file, you can designate any two desired fonts by ribbon-color commands.

Word-processing programs that support the LaserJet printer have font description commands. Kyocera printing systems understand these commands. You can use them to select any of the fonts in the printing system.

When you select fonts by selecting your software's own commands, your software recognizes the command and is not thrown off in its tracking of characters per line or lines per page. The IBM, Epson, and LaserJet emulations support enough embedded commands to meet nearly all font selection needs. Only in the Line Printer emulation must you rely wholly on PRESCRIBE commands for font selection.

Details on font selection by embedded command appear in *Chapter 7*.

## Creation of New Symbols and Characters

With a little work, it is possible to design completely new bitmap characters by constructing their dot maps. This technique can be used to obtain special characters and symbols not provided in any of the symbol sets. The relevant command is the LDFC (Load Font Character) command.

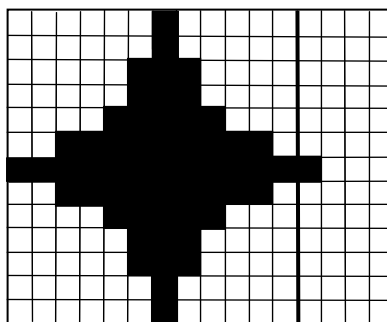
One LDFC command defines one character, specifying its font number, character code, dimensions, orientation, and bit map. An entire new font can be created by specifying an LDFC command for each character. The command format appears as follows.

LDFC *font, code, height, width, y-offset, x-offset,*  
*cell width, center, rotation, resolution; bit map;*

Some of the dimension parameters are specified in dots (1/300 inch). Other dimensions are specified in micro dots, a unit of measurement equal to 1/32 of 1 dot. These units are used regardless of the unit set by the UNIT command. The rotation parameter is a non-executable parameter. It does not change the orientation of the character. Instead, it tells the printing system what the character's orientation is, so that the printing system can adjust the page orientation correctly (when the font mode is 8 or higher), and can select the font in response to embedded word-processing commands for a particular rotation. The rotation parameter should be the same for all characters in the font.

The bit map can be constructed by drawing the character on square-ruled paper (shown at right) and proceeding as explained below. To demonstrate, we shall encode the bit map for a small diamond-shaped character (the figure below).

Figure 4. 1. Character dot pattern



The pattern is 13 dots high and 13 dots wide. The pattern is encoded as a series of 16-bit words. If necessary, blank cells may be added on the right to make the width a multiple of 16. For this reason, the three extra columns appear on the right (see the figure above).

Each 16-bit word is encoded with three characters, representing the most significant six bits, the next six bits, and the least significant four bits, respectively, as shown in *Defining Fill Patterns* in Chapter 2.

To obtain the character codes, divide the word into sections of *six*, *six*, and *four* bits and calculate the numerical value of each section (referred to as *x*, *y*, and *z*, respectively), treating it as a binary number in which the white dots are zeros and the black dots are ones. Then add an *offset* of 64 to the values of the six-bit sections and 48 to the values of the four-bit sections. The result is the ASCII code of the character representing that section (*x*, *y*, and *z*, respectively). Refer to the example of dot map and numerical derivation in *Defining Fill Patterns* in Chapter 2. The procedure for the numerical derivation is identical to creating fill patterns for XPAT.

Six-bit sections consisting of all black dots, as in the middle row of this symbol, are a special case. They encode by using the ASCII code 127, which is the unprintable delete code. Character 47 (/) may therefore be used instead.

The resolution may be specified for 300 or 600 (dpi) only in printing system models that support the 600-dpi resolution printing. LDFC generated 300 dpi characters may print when the default resolution is 300 or 600 dpi. It is not possible for 600 dpi LDFC generated characters to print at 300 dpi.

The bit map data proceeds from left to right across the character pattern, then from top to bottom. The data can be formatted by inserting line-feeds, but not spaces. If we assign this character an x-offset of 0 and a y-offset and cell width of 500 micro dots each, and make it ASCII code 42 (\*) of font 1000, it creates the following LDFC command:

```
!R! LDFC 1000, 42, 13, 13, 500, 0, 500, 250, 0;
    @'0@'0Ap0Ap0Cx00|At0//J80|At0Cx0Ap0Ap0@'0@'0;
    UNIT C;
    BOX 4.35, 0.75, L;
    FONT 1000;
    TEXT ' * * * * * * * * * * ';
EXIT;
```

## Symbol Set

The page printing system can produce sets of alphabet, numeric, and symbol characters. These sets, with each character assigned to a particular code, are known as symbol sets.

The following figure shows all the characters included in the most common symbol set, HP Roman-8.

*Figure 4. 2. Roman-8 Symbol Set*

!"#\$%&'()\*+,-./0123456789:;<=>?  
@ABCDEFGHIJKLMNPOQRSTUVWXYZ[\]^  
'\_abcdefghijklmnopqrstuvwxyz{|}~  
ÀÂËÊËÎÏ ÑÒÓÔÕÖ×ØÙÚÛÜÝÞ  
àêôûáéóúâèðüäëöüÅİŁŒǼıøÆǻİöÜĖİß  
ĂȂăĐđİİŎŌōŦŠšŮýŸþ•µ¼½¾◼◻◼◻◻

In addition to a large selection of bitmap and scalable fonts, the printing system supports many symbol sets (also referred to as *character sets*). The variety of Kyocera supported symbol sets can be attributed to the numerous printer emulations. Most of those symbol sets are the same regarding the letters of the alphabet, digits, and basic punctuation marks, but they differ considerably in their special symbols which lie in the upper half of the character code table, consisting of character codes 128 through 254 (hex 80 through FE).

Charts for the available symbol sets in each emulation appear in *Chapter 7*.

Only the resident fonts can be assigned with a new symbol set. All downloaded fonts contain specific symbol sets.

## International Characters

The INTL (print INternational characters) command provides quick access to printing characters from a different character set, characters not found in the default symbol set (US ASCII). By simply using the INTL command with appropriate parameters for language and country code, the Kyocera user can access a wide variety of specific characters.

The following sequence selects the ISO-4 U.K. symbol set for the Swiss721BM8-Roman font in the HP LaserJet emulation:

```
!R UNIT P; CMNT Emulation must be HPLJ;
FONT 13;
INTL 3, 1; CMNT ISO-4 U.K.;
EXIT;
```

The U.K. symbol set is identical to the US ASCII character set except that it has the pound currency symbol (\P) in place of the number sign (#).

It should be noted that the symbol set selected by INTL is specific to the currently emulated printer (HP LaserJet in the above example). If the current emulation is changed to Diablo 630 for the example above (by a SEM command, for example), the INTL command selects the Diablo U.K. symbol set instead of HP ISO-4 U.K. symbol set.

## Selecting HP Symbol Sets

The HP LaserJet emulation has considerably more supported symbol sets than can be accessed through the INTL command. To establish a symbol set, use one of the following commands.

- CSET (Change symbol SET)
- SFNT (Select current FoNT by typeface)

The CSET command selects a symbol set by specifying its identification code which closely resembles the command parameters of the HP printer control language. In the example below, the Windows symbol set is selected.

```
CSET 9U;
```

The CSET command may be preceded by an FSET font selection command. Remember that the symbol set has the highest priority in font selection. The following example still selects the ISO-4 U.K. symbol set for the Swiss742SWC-Roman font in the HP LaserJet emulation:

```
!R! UNIT P;
      FSET 1p12v0s0b4148T; CMNT 4148 means Universe;
      CSET 1E; CMNT ISO-4 U.K.;
EXIT;
```

The SFNT command, primarily used to select and size a scalable font as stated previously, also provides the parameter that specifies a symbol set for the font. It has the following format:

```
SFNT 'typeface'[, height[, font-number[, symbol-set, compression, angle]]];
```

In the above format, the *symbol-set* parameter specifies the symbol set for the font designated by typeface. The symbol-set value must be given together with the *compression* and *angle* parameters. In the example below, the symbol-set value 37 assigns the ISO-4 U.K. symbol set to the Universe medium font.

```
!R! UNIT P;
      SFNT 'Universe-Md', 12, 2000, 37, 1, 0;
      CMNT 37=ISO-4 U.K.;
EXIT;
```

The symbol set values are tabled in *LaserJet Symbol Sets* in Chapter 7.

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## *Chapter 5*

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# Barcodes

This chapter is a tutorial for encoding data into linear barcode and two-dimensional barcodes (PDF barcodes) by using **PRESCRIBE** commands. The former part of this chapter deals with how to implement the linear barcodes, the latter part explains the PDF417. They are step-by-step guide with a direct and practical approach.

# Linear Barcodes

The printing system is capable of printing a wide variety of barcodes, with human-readable text if desired. The user need only specify the type of barcode and the data to be encoded. The printing system performs the rest of the work, including bar and space generation, symbol translation, insertion of start and stop codes, checksum calculation, interleaving, padding, zero suppression, and parity reversal.



The scanability of barcodes is affected by the quality of the paper and the type of scanner used. Parameters of the BARC command enable the width of the bars and spaces to be adjusted to compensate for these factors. A certain amount of testing and experimentation may be needed to find the right parameter values for a particular set of conditions.

PRESCRIBE uses the BARC (draw BARCode) command to execute barcodes. This printing system feature is described fully in this chapter.

The BARC command uses the following format.

*BARC type, flag, 'string'[, short, tall[, bar1, bar2, bar3, bar4, space1, space2, space3, space4]];*

The BARC command prints specified data in barcode form. The cursor is located at the top left corner of the barcode for types 0 to 38, 40 and 41, and at the bottom left corner of the barcode for type 39, and does not move.

The *type*, *flag*, and *string* parameters are always required. The other parameters are optional. The type parameter is a number from 0 to 42 designating one of the barcode types listed in Numbers outside the range from 0 to 42 are regarded as type 15 (MSI barcode with no check digit).

The *flag* parameter specifies whether (Y or y) or not (N or n) to print a human-readable text under the barcode. The text is printed in the printing system's current font. Any desired font can be obtained by placing a font selection command before the BARC command. The flag parameter for barcodes 39 and 40 (USPS) must be N.

The *string* parameter gives the barcode data enclosed in apostrophes or quotation marks. The allowable length of the string and the characters that can be included depend on the barcode type. lists the allowed lengths and character sets.

also lists a default character that is used to fill out strings shorter than the minimum length and which may be substituted for any illegal characters in the string.

If the string is too long, it is truncated to the maximum allowed length.

Examples:

```
!R! UNIT I; BARC 11, N, '123456'; EXIT;
```



```
!R! BARC 0, Y, '12345678910'; EXIT;
```



The *short* and *tall* parameters specify the short and tall bar heights in the unit designated by the UNIT command (default: inches). The *short* and *tall* parameters must be both specified or both omitted. If they are omitted, the default values as shown in Table 5.3. must be specified.

Only barcode types 0 to 12, 35 to 38, and 39 have two bar heights. For types 13 to 34, 40, and 41, the bar height is determined by the short parameter and the tall parameter is ignored. Even when all bars are the same height, however, the command syntax requires that when a short parameter is specified, the tall parameter must be specified too.

Examples:

```
!R! UNIT I; BARC 15, N, '1234567890', .2, .2; EXIT;
```



```
!R! UNIT I; BARC 8, Y, '123456', .6, .7; EXIT;
```



When two bar heights with human-readable text are used, in some cases the tall bars may overlap the text.

The *bar1* to *bar4* and *space1* to *space4* parameters adjust the width of the bars and spaces. Fine adjustment of these parameters may be needed to obtain scannable barcodes for a particular scanner and type of paper. The dots unit (UNIT D;) is convenient. Barcode 40 (USPS FIM) ignores all these parameters and therefore has a constant height and space.

Some barcode types have only two classes of widths (*bar1*, *bar2*, *space1*, *space2*). Others have three or four classes. Regardless of the barcode type, when any width parameter is specified all eight width parameters must be specified together. In the case of two classes of widths, dummy values must be specified for *bar3*, *bar4*, *space3*, and *space4*.

The bar and space width parameters should be specified in ascending order. The maximum specifiable value is 200 dots.

$$1 \leq \text{bar1} \leq \text{bar2} \leq \text{bar3} \leq \text{bar4} \leq 200 \text{ (dots)}$$

$$1 \leq \text{space1} \leq \text{space2} \leq \text{space3} \leq \text{space4} \leq 200 \text{ (dots)}$$

If the bar and space width parameters are omitted, the printing system uses suitable default values. Table 5.3. indicates the number of width classes and the default values for each barcode type.

Barcode 19 (Code 39) has two width classes, which are set to 5 and 10 dots respectively in the example below. *Bar1* and *space1* are both 5 dots, and *bar2* and *space2* are 10 dots. *Bar3*, *space3*, *bar4*, and *space4* are all given dummy values of 10.

Examples:

```
!R! UNIT D;
BARC 19, Y, '0123ABC', 60, 60, 5, 10, 10, 10, 5, 10, 10, 10;
EXIT;
```



The above widths are doubled in the next example.

```
!R! UNIT D;
BARC 19, Y, '0123ABC', 60, 60, 10, 20, 20, 20, 10, 20, 20, 20;
EXIT;
```



Barcode 36 (EAN 8 with a five-digit supplement) has four width classes, which are set to 10, 20, 30, and 40 dots in the example below. Two bar heights are also used.

```
!R! UNIT D;
BARC 36, N, '012345678912', 180, 220, 10, 20, 30, 40, 10,
20, 30, 40;
EXIT;
```



Barcode 39 (USPS POSTNET) prints a POSTNET barcode on a mail piece. The United States Postal Service (USPS) utilizes POSTNET (POSTal Numeric Encoding Technique) to process bulk mail and business reply envelopes quickly and efficiently.

Though this barcode accepts any values within the range specified on the previous page, we recommend that all parameters except *type*, *flag*, and *string* **not** be specified as the scanability of the barcode is most effective with the default values. Also the *flag* parameter for this barcode must be N (do not print human-readable text). See the figure on 8. for POSTNET barcode location.

Barcode 41 (USPS FIM) prints a Facing Identification Mark pattern which may be printed on the envelope adjacent to the stamp. The combination of a FIM and the POST-NET (barcode 39) barcode enables faster processing by the USPS.

When generating a FIM pattern, all parameters except *type*, *flag*, and *string* are ignored. The flag parameter must be N. Characters permitted for the string parameter are 'A', 'B', 'C', and 'D' only, and each represents one of four different FIM patterns. For example, Courtesy Replay Mail and stamped reply mail require the FIM-A pattern, while Business Reply Mail and unstamped (prepaid) return mail require the FIM-C pattern. Also see the figure on 8 for FIM location.

Barcode 43 (Customer) has four bar heights. Only the shortest and tallest bar heights are specifiable, the heights for the intermediate two bars being adjusted automatically. Any values entered for bar and space widths are ignored and defaulted to 1.68 points respectively. The rules for the order of specifiable bar and space widths,  $\text{bar1} \leq \text{bar2} \leq \text{bar3} \leq \text{bar4}$  and  $\text{space1} \leq \text{space2} \leq \text{space3} \leq \text{space4}$ , must be adhered to, however.

*Table 5.1. Barcode Types (Sheet 1 of 2)*

No.	Type
0	UPC A
1	UPC A with two-digit supplement
2	UPC A with five-digit supplement
3	UPC D-1
4	UPC D-2
5	UPC D-3
6	UPC D-4
7	UPC D-5
8	UPC E
9	UPC E with two-digit supplement
10	UPC E with five-digit supplement
11	EAN-8
12	EAN-13
13	DUN-14 (Distribution Unit Number, EAN)
14	DUN-16 (Distribution Unit Number, EAN)
15	MSI with no check digit
16	MSI with single mod-10 check digit
17	MSI mod-10 followed by mod-10 check digit
18	MSI mod-11 followed by mod-10 check digit
19	Code 39 with no check digit (USD-3)
20	Code 39 with mod-43 check digit (USD-3)
21	Interleaved two of five (USD-1) with no check digit (See No. 41.)
22	Identicon two of five with no checksum
23	Code 128 (USD-6) manual code change
24	Code 128 (USD-6) automatic code change
25	Code 11 with only 'c' checksum (USD-8)
26	Code 11 with both 'c' and 'k' checksums (USD-8)
27	Code 93 with both 'c' and 'k' checksums (USD-7)
28	CODABAR with no check digits (USD-4)
29	Matrix two of five with no checksum
30	Datalogic two of five with no checksum
31	Industrial two of five with no checksum

Table 5.1. Barcode Types (Sheet 2 of 2)

No.	Type
32	Ames with no checksum
33	Delta distance 'a' (IBM) with no checksum
34	Delta distance 'a' (IBM) with checksum
35	EAN 8 with two-digit supplement
36	EAN 8 with five-digit supplement
37	EAN 13 with two-digit supplement
38	EAN 13 with five-digit supplement
39	POSTNET (USPS)
40	FIM (USPS)
41	Interleaved two of five (USD-1) with checksum
42	UCC/EAN 128
43	Customer
44	Wide gap CODABAR

Table 5.2. Length, Character Set, and Default (Sheet 1 of 2)

Type	Length	Character set	Default
0	11	0123456789	0
1	13		
2	16		
3	13		
4	18		
5	22		
6	25		
7	29		
8	6		
9	8		
10	11		
11	7		
12	12		
13	13		
14	15		
15	1-14		
16	1-14		
17	1-14		
18	1-14		
19	1-40	\$%+-. / 0123456789ABCDEFGHIJK LMNOPQRSTUVWXYZ and space	Space
20	1-40		
21	2-26	0123456789	0
22	1-25		
23	1-40	All printable characters (ASCII codes 32 to 126)	Space
24	2-40		
25	1-45	-0123456789	Space
26	1-45		
27	1-50	All printable characters (ASCII codes 32 to 126)	Space
28	3-32	\$+-. / 0123456789:abcdetn*	—

*Table 5.2. Length, Character Set, and Default (Sheet 2 of 2)*

Type	Length	Character set	Default
29	1–25	0123456789	0
30	1–25		
31	1–25		
32	1–25	-0123456789	0
33	1–25	0123456789KLMO	0
34	1–25		
35	9	0123456789	0
36	12		
37	14		
38	17		
39	139	0123456789	–
40	1	One of the following FIM pattern types: A – Country Reply Mail with POSTNET. B – Business Reply, Penalty and Franked Mail without POSTNET. C – Business Reply, Penalty and Franked Mail with POSTNET. D – OCR Readable Mail without POSTNET.	0
41	125	0123456789	0
42	80	All printable characters (ASCII codes 32 to 126)	
43	1-20	0123456789ABCDEFGHIJKLMNOPQRSTUVWXYZ	–
44	3-32	\$+-. /0123456789:abcdetn* and space	–

Table 5.3. Location of POSTNET and FIM

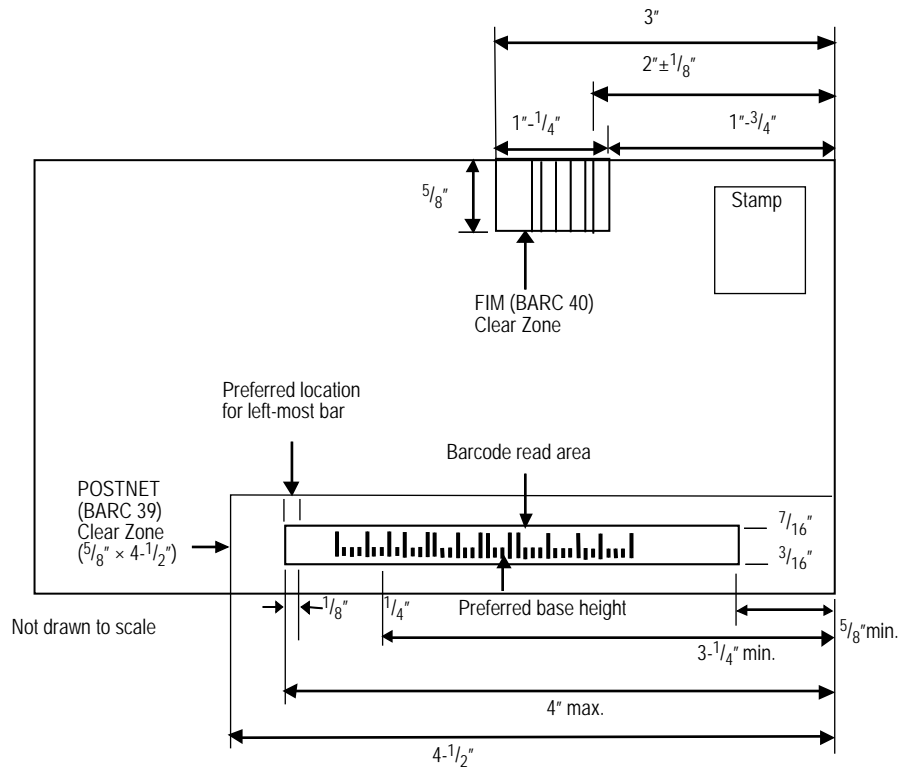


Table 5.4. Bar Height and Width Classes

Type	Tall bars	Width classes				Default (dots)			
		1	2	3	4	1	2	3	4
0	Yes	Yes	Yes	Yes	Yes	6	12	18	24
1	Yes	Yes	Yes	Yes	Yes	6	12	18	24
2	Yes	Yes	Yes	Yes	Yes	6	12	18	24
3	Yes	Yes	Yes	Yes	Yes	6	12	18	24
4	Yes	Yes	Yes	Yes	Yes	6	12	18	24
5	Yes	Yes	Yes	Yes	Yes	6	12	18	24
6	Yes	Yes	Yes	Yes	Yes	6	12	18	24
7	Yes	Yes	Yes	Yes	Yes	6	12	18	24
8	Yes	Yes	Yes	Yes	Yes	6	12	18	24
9	Yes	Yes	Yes	Yes	Yes	6	12	18	24
10	Yes	Yes	Yes	Yes	Yes	6	12	18	24
11	Yes	Yes	Yes	Yes	Yes	6	12	18	24
12	Yes	Yes	Yes	Yes	Yes	6	12	18	24
13	—	Yes	Yes	—	—	6	12	(18)	(24)
14	—	Yes	Yes	—	—	6	12	(18)	(24)
15	—	Yes	Yes	—	—	6	12	(18)	(24)
16	—	Yes	Yes	—	—	6	12	(18)	(24)
17	—	Yes	Yes	—	—	6	12	(18)	(24)
18	—	Yes	Yes	—	—	6	12	(18)	(24)
19	—	Yes	Yes	—	—	6	12	(18)	(24)
20	—	Yes	Yes	—	—	6	12	(18)	(24)
21	—	Yes	Yes	—	—	6	12	(18)	(24)



*Table 5.4. Bar Height and Width Classes*

Type	Tall bars	Width classes				Default (dots)			
		1	2	3	4	1	2	3	4
22	—	Yes	Yes	—	—	6	12	(18)	(24)
23	—	Yes	Yes	Yes	Yes	6	12	18	24
24	—	Yes	Yes	Yes	Yes	6	12	18	24
25	—	Yes	Yes	Yes	—	6	14	21	(21)
26	—	Yes	Yes	Yes	—	6	14	21	(21)
27	—	Yes	Yes	Yes	Yes	6	12	18	24
28	—	Yes	Yes	—	—	6	18	(18)	(18)
29	—	Yes	Yes	—	—	6	12	(18)	(24)
30	—	Yes	Yes	—	—	6	12	(18)	(24)
31	—	Yes	Yes	—	—	6	12	(18)	(24)
32	—	Yes	Yes	—	—	6	12	(18)	(24)
33	—	Yes	Yes	Yes	—	6	12	18	(24)
34	—	Yes	Yes	Yes	—	6	12	18	(24)
35	Yes	Yes	Yes	Yes	Yes	6	12	18	24
36	Yes	Yes	Yes	Yes	Yes	6	12	18	24
37	Yes	Yes	Yes	Yes	Yes	6	12	18	24
38	Yes	Yes	Yes	Yes	Yes	6	12	18	24
41	—	Yes	Yes	—	—	6	12	(18)	(24)
42	—	Yes	Yes	Yes	Yes	6	12	18	24
44	—	Yes	Yes	—	—	6	18	(18)	(18)

*Table 5.5. Bar Height, Width, Pitch, and Spacing for types 39, 40, and 43*

Type	Height	Width	Pitch	Spacing
39	Tall: 0.125" Short: 0.05"	0.02"	21 bars/inch	0.0475"
40	5/8"	0.031"	1/16"	(Tilt: $\pm 5^\circ$ )
43	Tall: 10.2 pt. Short: 3.4 pt.	1.68 pt.	—	1.68 pt.

## Two-dimensional Barcodes

PDF 417 is a two-dimensional stacked barcode symbology capable of encoding over a kilobyte of data per label. This is important for applications where a barcode must be more than merely an identifier, an index to reference a database.

The *portable data file* approach is well suited to applications where it is impractical to store item information in a database or where the database is not accessible when and where the item's barcode is read. Because a PDF417 symbol can store so much data, item data such as the content of a shipping manifest or equipment maintenance history can be carried on the item, without requiring access to a remote database.

Encoding data into a PDF417 barcode is a two-step process. First, data is converted into codeword values of 0-928, which represent the data. This is *high-level encoding*. Then the values are physically represented by particular bar/space patterns, which is *low-level encoding*. Decoding is the reverse process.

In addition, PDF417 is an error-correcting symbology designed for real-world applications where portions of labels can get destroyed in handling. It performs error correction by making calculations, if necessary, to reconstruct undecoded or corrupted portions of the symbol.

### PDF417 Symbol Description

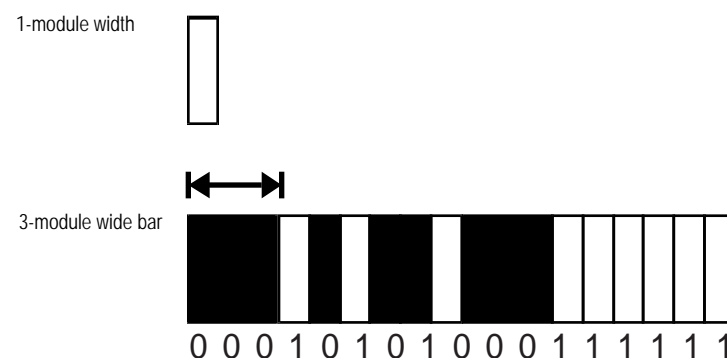
At first glance, a PDF417 symbol looks like a set of stacked barcodes. When we look closer to analyze how the symbol is put together, there are several key elements. These are *rows*, *start patterns*, *stop patterns*, *codewords*, and *modules*, whose definitions are explained below.

#### *module*

The narrowest width of a bar or space in the barcode. All bars or spaces are multiples (up to six times) of this width. The nominal unit of measure.

#### *codeword*

A single group of bars and spaces (or *elements*) representing one or more numbers, letters, or other symbols (i.e., codeword values for the data to be encoded). Each PDF417 codeword contains four bars and four spaces, for a total of 17 module widths. Each codeword starts with a bar and ends with a space. See figure below.



### *start pattern*

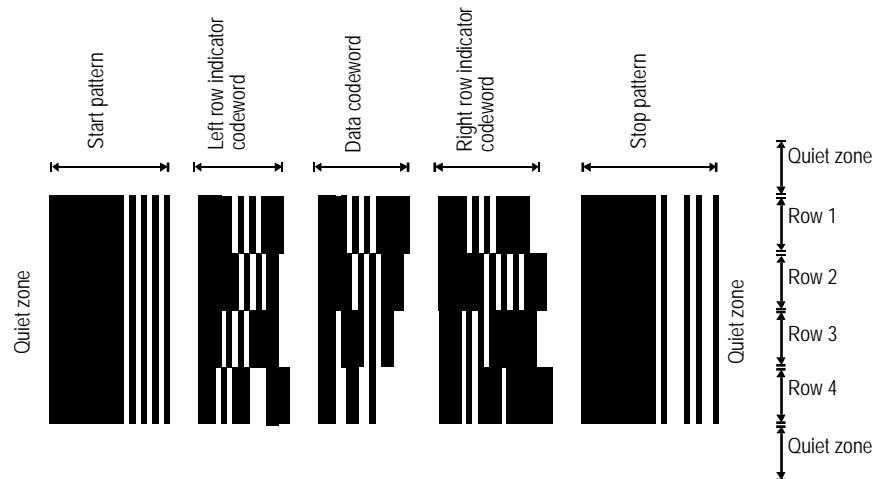
A unique pattern of light and dark elements which indicates the leftmost part of a bar-code label.

### *stop pattern*

A unique pattern of light and dark elements which indicates the rightmost part of a bar-code label.

### *row*

A lateral set of elements made up of a start pattern, codewords, and a stop pattern. Each PDF417 symbol must have at least 3 rows. See figure below.

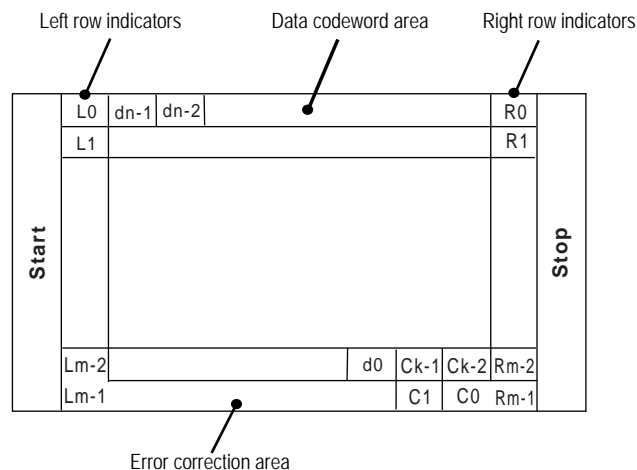


In each row, between left and right row indicators, there may be from 1 to 30 data codewords. Collectively, among all rows, these codewords form data columns.

### *Overall Symbol Structure*

Any PDF417 symbol is made up of at least 3 rows, and at most 90 rows. The minimum number of codewords in a row is 3; this includes the left row indicator codeword, 1 data codeword, and the right row indicator.

Every symbol contains 1 codeword (the first data codeword in row 0) indicating the total number of data codewords within the symbol, and at least 2 error-detection codewords. General PDF417 symbol structure is indicated in the following diagram:



## Printing a Two-dimensional Barcode

XBAR, XBCP, XBUF, and ENDB commands support two-dimensional barcode printing. Each command does the following to put data together for printing a barcode.

XBAR	Prints a two-dimensional barcode from the given data string. Must be followed by an ENDB command.
XBCP	Specifies various options for the barcode to be printed using XBAR depending on the mode following the command (0 through 19). See <i>Macro PDF417</i> on page 14.
XBUF	Defines a buffer name for a data input for XBAR command.
ENDB	Terminates a XBAR command sequence.

### Functions of XBCP

The *mode* parameter in XBCP command format identifies the various functions as listed below. These commands are detailed in the *PRESCRIBE Commands Command Reference*.

XBCP mode	Meaning
XBCP 0	Reset
XBCP 1	Narrowest element width
XBCP 2	Error correction (by percentage)
XBCP 3	Error correction (by predetermined level)
XBCP 4	Number of rows
XBCP 5	Number of columns
XBCP 6	Aspect ratio of height and width
XBCP 7	Bar height by a ratio of element width
XBCP 8	Number of rows and columns (XBCP 4 and 5)
XBCP 9	Truncation
XBCP 10 through 19	These modes give additional control options used to support Macro PDF417 barcodes. See more details in section <i>Macro PDF417</i> .

## Positioning the Barcodes

The following commands are positioning commands the PRESCRIBE language provides. These commands are useful and sometimes essential for proper positioning of the barcodes onto a medium such as label. More detailed discussion on these (and some other) positioning commands can be found in the *PRESCRIBE Commands Command Reference*.

By default the cursor is located at the top left corner of the barcode and stays there after printing is done.

MAP	Moves the cursor to a position relative to the top and left margins.
MRP	Moves the cursor from the current to a specified relative position.
MZP	Moves the cursor to a position relative to the top and left edge limits of the page.
UNIT	Sets the unit of measurement used in the PRESCRIBE commands including the above. The initial unit is inches. The other units are related to inches as: 1 inch=2.54 centimeters=72 points=300 or 600 dots (depending on the printing system model).

## Limitations of Two-dimensional Barcode

Item	Description
Encodable character set	256 international characters and binary data
Code type	Continuous
Character self checking	Yes
Bi-directional decoding	Yes
Number of row indicator codewords required per row	2
Number of symbol checksum codewords required	2
Minimum number of rows per symbol	3
Maximum number of rows per symbol	90
Minimum number of data columns	1
Maximum number of data columns	30
Number of symbol length descriptors required	1
Smallest nominal element width	0.0075 inch or 0.191 mm
Smallest nominal element height	0.01 inch or 0.254 mm
Maximum data characters per symbol	Assuming 928 codewords – 1 symbol length descriptor – 2 symbol checksum codewords = 925 data codewords. Binary/ASCII plus mode: 1108 bytes. Extended alphanumeric compaction mode (EXC): 1850 ASCII characters. Numeric compaction mode: 2725 digits.

For Macro PDF417, which transparently distributes information among a number of PDF417 symbols, the above storage limits are increased to more than one million bytes in Binary/ASCII Plus mode and more than 2.5 million bytes in EXC mode.

## Macro PDF417

Macro PDF417 provides a powerful mechanism for creating a distributed representation of files too large to be presented by a single PDF417 barcode. Macro PDF417 barcodes differ from ordinary PDF417 barcodes in that they contain additional control options which are added by modes 10 through 19 of the XBCP command. This allows a reader to make use of this information to correctly reconstruct and verify the file, independent of the barcode scanning order.



The terminology *PRESCRIBE* macro and macro PDF are not the same. Refer to the *PRESCRIBE Commands Command Reference* for the *PRESCRIBE* macro commands (MCRO, ENDM, etc.).

The following modes of XBCP are used for Macro PDF417 to represent additional control options for XBAR. Note that implementation of these parameters are optional except XBCP 17 and XBCP 18.

XBCP 10	File name
XBCP 11	Block count
XBCP 12	Time stamp
XBCP 13	Sender ID
XBCP 14	Addressee ID
XBCP 15	File size
XBCP 16	Check sum
XBCP 17	File ID
XBCP 18	Macro PDF417 execution
XBCP 19	Distributed barcodes positioning

## Creating a Macro PDF 417 Representation

A Macro PDF417 creation begins with giving *fileid* using XBCP 17 for the ensuing Macro PDF417 sequences. Each one XBAR command sequence is needed for each divided barcode which is succeeded by a XBCP 18 statement that defines a separate block index for each barcode. The block index is needed to ensure that the divided barcodes are reconstructed in the correct order as the whole file when the barcodes are read.

The basic command sequence for Macro PDF417 is as follows.

```

...
XBCP 17, 'fileid' ;           Gives the same file ID to all distributed barcodes.
MZF x1, y1 ;                 Position the first barcode at (x1, y1).
XBCP 18, 0 ;                 Block index for the first barcode.
XBAR ; data_string ; ENDB ;   Encode and print the first divided barcode.
MZF x2, y2 ;                 Position the second barcode at (x2, y2).
XBCP 18, 1 ;                 Assign block index 1 to the second barcode.
XBAR ; data_string ; ENDB ;   Encode and print the second divided barcode.
MZF x3, y3 ;                 Position the second barcode at (x3, y3).
XBCP 18, 2 ;                 Assign block index 2 to the second barcode.
...

```

The largest allowed block index is 99,998. Thus, up to 99,999 Macro PDF417 barcodes may comprise the distributed representation of a data file.

Some samples for Macro PDF417 are provided in *PRESCRIBE Commands Command Reference* on the XBCP page.





# Permanent Parameters

The printing system maintains a number of parameters in a non-volatile (flash) memory. These parameters control the initial state of the environment at power-up, including the initial emulation mode, page orientation, character set, buffer allocations in memory, interface parameters, and other options.

The parameters may be changed permanently with the FRPO (Firmware RePrOgram) command. Some FRPO parameters affect only the current interface (interface-dependent) and some affect all interfaces at once (non-interface-dependent). If the printing system is shared with other users, remember that any changes to any non-interface-dependent parameters may interfere with the print jobs of the other users. This chapter explains the FRPO command and gives examples of its use.

The current settings of the FRPO parameters are listed as option values on the printing system's service status page. Refer to the tables in this chapter to interpret the values. To print a service status page, command:

```
!R! STAT 1; EXIT;
```

Before changing any FRPO parameter, print out a service status page, so you will know the parameter values before the changes are made. To return FRPO parameters to their factory default values, send the FRPO INIT (FRPO-INITialize) command.

## FRPO Parameters

The FRPO command changes the value of one parameter in permanent memory. A separate command is required for each parameter change. The parameters, their meanings, and the specifiable values are listed below.

In these tables, the *Interface-dependent parameters* affect the environment on the current interface only. Any changes made to the parameters on one interface will not change parameters on the other interfaces. To change a similar parameter on another interface, first switch to that interface then issue the FRPO command.

The *Interface-independent parameters* affect all interfaces simultaneously. If the printing system is shared with other users, remember that changes made to non-interface-dependent parameters can affect users on other interfaces as well.



Certain parameters are available only when the printing system is installed with the relevant option equipment.

### Interface-dependent Parameters

Table 6.1. Interface-dependent Parameters (Sheet 1 of 3)

Environment	Parameter	Value	Factory setting
Top margin <sup>a</sup>	A1	Integer value in inches	0
	A2	Fraction value in 1/100 inches	0
Left margin <sup>a</sup>	A3	Integer value in inches	0
	A4	Fraction value in 1/100 inches	0
Page length <sup>a</sup>	A5	Integer value in inches	13 (17) <sup>b</sup>
	A6	Fraction value in 1/100 inches	61 (30) <sup>b</sup>
Page width <sup>a</sup>	A7	Integer value in inches	13 (17) <sup>b</sup>
	A8	Fraction value in 1/100 inches	61 (30) <sup>b</sup>
Page orientation <sup>a</sup>	C1	0: Portrait, 1: Landscape	0
Default font No. <sup>a</sup>	C5	First two digits of power-up font	00
	C2	Middle two digits of power-up font	00
	C3	Last two digits of power-up font	00
Operation panel settings saving	C6	0: Not saved at power-off	1
		1: Saved at power-off	
PCL font range <sup>c</sup>	C8	0: Includes proportional bitmap fonts	0
		1: Excludes proportional bitmap fonts in range	
KC-GL options <sup>a</sup>	G0	0: Mode A; formfeed to SP0	0
		1: Mode B; formfeed to SP0	
		2: Mode A; no formfeed to SP0	
		3: Mode B; no formfeed to SP0	
		4: Fixed mode A; formfeed	
		5: Fixed mode B; formfeed	
		6: Fixed mode A; no formfeed	
		7: Fixed mode B; no formfeed	
		8: Mode A; formfeed	
		9: Mode B; formfeed	
		10: Mode A; no formfeed	
		11: Mode B; no formfeed	
		12: Fixed mode A; formfeed	
		13: Fixed mode B; formfeed	
		14: Fixed mode A; no formfeed	
		15: Fixed mode B; no formfeed	
KC-GL pen width <sup>a</sup>	G1 through G8	0 to 99 dot	01/02/03/04/ 05/06/07/08
Interface release time-out	J2	0 to 99 in units of 5 seconds	6

**Table 6.1. Interface-dependent Parameters (Sheet 2 of 3)**

Environment	Parameter	Value	Factory setting
KC-GL enlarge mode <sup>a</sup>	J9	0: Off	0
		1: A2	
		2: A1	
		3: A0	
		4: B3	
		5: B2	
		6: B1	
		7: B0	
Duplex mode	N4	0: Simplex mode	0
		1: Long-edge binding	
		2: Short-edge binding	
Default emulation mode	P1	0: Line Printer	6
		1: IBM Proprinter X24E	
		2: Diablo 630	
		5: Epson LQ-850	
		6: HP LaserJet	
		8: KC-GL	
		9: KPD L	
Carriage-return action	P2	0: Ignores 0x0d	1
		1: Carriage-return	
		2: Carriage-return+linefeed	
Linefeed action	P3	0: Ignores 0x0d	1
		1: Linefeed	
		2: Linefeed+carriage-return	
Automatic emulation sensing <sup>d</sup>	P4	0: AES disabled	0
		1: AES enabled	
Alternative emulation	P5	Same as the P1 values except that 9 is ignored.	6 (HP LJ)
Automatic emulation switching trigger	P7	0: Page eject commands	10
		1: None	
		2: Page eject and Prescribe EXIT	
		3: Prescribe EXIT	
		4: Page eject commands	
		5: Formfeed (^L)	
		6: Page eject, Prescribe EXIT and formfeed	
		7: Prescribe EXIT and formfeed	
		8: Page eject commands; if AES fails, resolves to alternative emulation (P5)	
		9: None; if AES fails, resolves to alternative emulation	
		10: Page eject commands; if AES fails, resolves to KPD L	
Emulation switching after receiving !R!	P8	0: Current emulation	
		1: Default emulation (P1)	
		2: Alternative emulation (P5)	
Sorter sharing	S0	0: Stand alone	
		1: Multi users	
		2: Multiple interfaces	
Sorter mode	S1	0: Sorter	0
		1: Collator	
		2: Stacker	
		3: Mailbox	
Sorter message	S2	0: Remove sorter paper messaged	0
		1: Remove sorter paper deactivated except at power-up	
		2: Remove sorter paper deactivated	
Sorter overfilling behavior	S3	0: Interrupts printing until trays are emptied	0
		1: Bypasses printing to the face-down tray	
Job separate mode	S8	0: Whole pages	0
		1: 1st page only	
Line spacing <sup>a</sup>	U0	Lines per inch (integer value)	6
Line spacing <sup>a</sup>	U1	Lines per inch (fraction value)	0
Character spacing <sup>a</sup>	U2	Characters per inch (integer value)	10
Character spacing <sup>a</sup>	U3	Characters per inch (fraction value)	0
Country code	U6	0: US-ASCII	0
		1: France	
		2: Germany	

Table 6.1. Interface-dependent Parameters (Sheet 3 of 3)

Environment	Parameter	Value	Factory setting
		3: UK	
		4: Denmark	
		5: Sweden	
		6: Italy	
		7: Spain	
		8: Japan	
		9: US Legal	
		10: IBM PC-850 (Multilingual)	
		11: IBM PC-860 (Portuguese)	
		12: IBM PC-863 (Canadian French)	
		13: IBM PC-865 (Norwegian)	
		14: Norway	
		15: Denmark 2	
		16: Spain 2	
		17: Latin America	
		50 – 99:HP PCL symbol set coding (See page 7-37.)	
Code set at power up in daisywheel emulation	U7	0: Same as the default emulation mode (P1)	0
		1: IBM	
		2: Daisywheel	
		3: HP Roman8 (US ASCII)	
		4: Same as 3	
		5: Epson LQ-850	
		6: HP Roman-8	
		7 – 99:HP PCL symbol set coding (See page 7-37.)	
Font pitch for fixed-pitch scalable fonts	U8	Integer value in cpi: 0 – 99	10
	U9	Fraction value in 1/100 cpi: 0 – 99	0
Font height for the default scalable font <sup>a</sup>	V0	Integer value in 100 points: 0–9	0
	V1	Integer value in points: 0–99	12
	V2	Fraction value in 1/100 points: 0, 25, 50, or 75	0
Default scalable font <sup>a, e</sup>	V3	Name of typeface of up to 32 characters, enclosed with single or double quotation marks	—

<sup>a</sup> Ignored in some emulation modes.

<sup>b</sup> For models supporting A3 and ledger size paper.

<sup>c</sup> C8—PCL font range

The printing system offers several categories of resident fonts — PCL, KPD L and (simulated) bitmap fonts. The C8 parameter allows to prioritize font selection (evaluation) by excluding one or more font categories to simplify the printing system font environment.

For example, the command sequence C8, 1; lets the printing system to exclude bitmap fonts when font selection is performed in HP LaserJet emulation. (This will provide the closest matching PCL5 environment for font selection.)

<sup>d</sup> P4/P5—Automatic Emulation Switching

The FRPO P4 command establishes Automatic Emulation Switching (AES) between KPD L and the alternative emulation. With the P4 value of 1, the printing system will switch from KPD L emulation to non-KPD L emulation, or vice versa. Switching is triggered by the command specified by the FRPO P7 value.

The FRPO P5 value specifies the alternative emulation to which the printing system switches from KPD L. The factory default for P5 is the HP LaserJet.

The automatic emulation switching mode may not operate properly if the print job contains PRESCRIBE commands.

- e V0-V3 — Default (power-up) font
- These parameters define the default font at power up. The V3 parameter accepts a scalable font name of up to 32 characters and defines it to be the power-up font. The factory-set default font is Courier. The V0, V1, and V2 parameters specify the height of the font. The default size is 012.00 points (00, 12, 00, respectively).
- The V0-V3 parameters are ignored if the specified font is not present at power-up, and the printing system selects Courier as the default font for V3.
- The example below gives the PRESCRIBE sequence which changes the default font to TimesNewRoman, 14.25 points:
- ```
!R! FRPO V3, 'TimesNewRoman';
FRPO V0, 0;
FRPO V1, 14;
FRPO V2, 25;
EXIT;
```
- The power-up font can be a simulated bitmap font by giving a font number to the C5, C2 and C3 parameters in the same manner as for V0, 1 and 2. This will set the V3 value to null.

## Interface-independent Parameters

*Table 6.2. Interface-independent Parameters (Sheet 1 of 8)*

| Environment                                                        | Parameter | Value                                                                                                                                                                                                                                                                                | Factory setting                          |
|--------------------------------------------------------------------|-----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------|
| Downloadable PCL font compression                                  | B0        | 0: Off<br>1: On                                                                                                                                                                                                                                                                      | 0 (countries excluding Asia) or 1 (Asia) |
| Message language selection at power-on                             | B7        | 0: Automatically enters message language selection menu at the initial power-on. After a language is selected, B7=1 is set automatically.<br>1: Does not automatically enter message language selection menu at power-on.                                                            | 1                                        |
| Default pattern resolution (PAT, FPAT, GPAT)                       | B8        | 0: 300 dpi<br>1: 600 dpi<br>3: 1200 dpi                                                                                                                                                                                                                                              | 0                                        |
| Minimum memory allocation for resource protection/(in duplex mode) | B9        | 0: 12 MB or more (16 MB or more)<br>1: 10 MB (14 MB)<br>2: 8 MB (12 MB)<br>3: 6 MB (10 MB)<br>4: 4 MB (8 MB)<br>5: 2 MB (6 MB)                                                                                                                                                       | 0 or 1                                   |
| Copy count                                                         | C0        | Number of copies to print:1-999                                                                                                                                                                                                                                                      | 1                                        |
| KPDL font range                                                    | C9        | 0: KPDL fonts only<br>1: KPDL and PCL fonts                                                                                                                                                                                                                                          | 0                                        |
| Serial line control                                                | D0        | 0: XON is sent every 5 seconds during the printing system is ready or waiting. Error is ignored.<br>1: XON is sent every 5 seconds during the printing system is ready or waiting. Error is valid.<br>10: XON is not sent. Error is ignored.<br>11: XON is not sent. Error is valid. | 0                                        |
| A4 full page bleed <sup>a</sup>                                    | D1        | 0: Off<br>1: On                                                                                                                                                                                                                                                                      | 0                                        |
| Audio alarm                                                        | D2        | 0: Off<br>1: On                                                                                                                                                                                                                                                                      | 1                                        |
| Paper size error                                                   | D3        | 0: Not notified<br>1: Notified<br>2: Complies with MS certification                                                                                                                                                                                                                  | 0                                        |
| Print density                                                      | D4        | Number from 1 (Light) to 5 (Dark)                                                                                                                                                                                                                                                    | 3                                        |
| Service status page                                                | D5        | 0: Not printed<br>1: Printed                                                                                                                                                                                                                                                         | 1                                        |
| Paper jam retry timing                                             | D6        | 0: End of page<br>1: Fuser sensor activated<br>2: Fuser sensor deactivated<br>3: Page ejection<br>4: Same as 0; non-engine-dependent                                                                                                                                                 | 0                                        |
| Host buffer size                                                   | H0        | 0 to 99 in units of 10MB (0 to 990MB)                                                                                                                                                                                                                                                | 0                                        |

Table 6.2. Interface-independent Parameters (Sheet 2 of 8)

| Environment                                            | Parameter | Value                                                                                                                                                                           | Factory setting                                                                         |
|--------------------------------------------------------|-----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|
| Serial interface baud rate                             | H1        | 3: 300 bps (not valid for some models)                                                                                                                                          | 96                                                                                      |
|                                                        |           | 6: 600 bps (not valid for some models)                                                                                                                                          |                                                                                         |
|                                                        |           | 12: 1200 bps                                                                                                                                                                    |                                                                                         |
|                                                        |           | 24: 2400 bps                                                                                                                                                                    |                                                                                         |
|                                                        |           | 48: 4800 bps                                                                                                                                                                    |                                                                                         |
|                                                        |           | 96: 9600 bps                                                                                                                                                                    |                                                                                         |
|                                                        |           | 19: 19200 bps                                                                                                                                                                   |                                                                                         |
|                                                        |           | 38: 38400 bps                                                                                                                                                                   |                                                                                         |
|                                                        |           | 57: 57600 bps                                                                                                                                                                   |                                                                                         |
|                                                        |           | 11: 115200 bps                                                                                                                                                                  |                                                                                         |
| Serial interface data bits                             | H2        | 7 or 8                                                                                                                                                                          | 8                                                                                       |
| Serial interface stop bits                             | H3        | 1 or 2                                                                                                                                                                          | 1                                                                                       |
| Serial interface parity                                | H4        | 0: None                                                                                                                                                                         | 0                                                                                       |
|                                                        |           | 1: Odd                                                                                                                                                                          |                                                                                         |
|                                                        |           | 2: Even                                                                                                                                                                         |                                                                                         |
|                                                        |           | 3: Ignore                                                                                                                                                                       |                                                                                         |
| Serial interface protocol                              | H5        | 0: Combination of 1 and 3 below                                                                                                                                                 | 0                                                                                       |
|                                                        |           | 1: DTR, positive true                                                                                                                                                           |                                                                                         |
|                                                        |           | 2: DTR, negative true                                                                                                                                                           |                                                                                         |
|                                                        |           | 3: XON/XOFF                                                                                                                                                                     |                                                                                         |
|                                                        |           | 4: ETX/ACK                                                                                                                                                                      |                                                                                         |
|                                                        |           | 5: XON/XOFF recognized only as protocol                                                                                                                                         |                                                                                         |
| Buffer nearly-full threshold                           | H6        | Percentage of the received data buffer size.                                                                                                                                    | 90                                                                                      |
| Buffer nearly-empty threshold                          | H7        | Percentage of the received data buffer size.                                                                                                                                    | 70                                                                                      |
| Total host buffer size                                 | H8        | 0 to 99 in units of the size defined by FRPO S5                                                                                                                                 | 5 (monochrome model), 10 (monochrome model with network Interface), or 12 (color model) |
| Form feed time-out value                               | H9        | Value in units of 5 seconds (0 to 99).                                                                                                                                          | 6                                                                                       |
| Memory card partition reading at power-up <sup>b</sup> | I0        | Partition name on a memory card to be read automatically at power-up. Maximum of 15 printable ASCII characters (20H through 7EH), enclosed in single or double quotation marks. | —                                                                                       |
| Event log panel menu                                   | I1        | 0: Off                                                                                                                                                                          | 0                                                                                       |
|                                                        |           | 1: On                                                                                                                                                                           |                                                                                         |
| Character width                                        | I2        | 0: Normal                                                                                                                                                                       | 0                                                                                       |
|                                                        |           | 1: HP LaserJet compatible                                                                                                                                                       |                                                                                         |
| Sleep timer                                            | I5        | 0: Off                                                                                                                                                                          | 1                                                                                       |
|                                                        |           | 1: On                                                                                                                                                                           |                                                                                         |
| End-of-job interpretation for option interface OPT2    | I7        | Interprets EOJ given by NIC to the following:                                                                                                                                   | 0                                                                                       |
|                                                        |           | 0: None                                                                                                                                                                         |                                                                                         |
|                                                        |           | 1: ^L (0CH)                                                                                                                                                                     |                                                                                         |
|                                                        |           | 2: ^D (04H)                                                                                                                                                                     |                                                                                         |
|                                                        |           | 3: ^L and ^D                                                                                                                                                                    |                                                                                         |
|                                                        |           | 7: ^D and ^L                                                                                                                                                                    |                                                                                         |
| End-of-job interpretation for print server interface   | I8        | Interprets EOJ issued by print server to the following:                                                                                                                         | 0                                                                                       |
|                                                        |           | 0: None                                                                                                                                                                         |                                                                                         |
|                                                        |           | 1: ^L (0CH)                                                                                                                                                                     |                                                                                         |
|                                                        |           | 2: ^D (04H)                                                                                                                                                                     |                                                                                         |
|                                                        |           | 3: ^L and ^D                                                                                                                                                                    |                                                                                         |
|                                                        |           | 7: ^D and ^L                                                                                                                                                                    |                                                                                         |
| Reduce/enlarge ratio (Models supporting A3 size only)  | J0        | 0: 100%                                                                                                                                                                         | 0                                                                                       |
|                                                        |           | 5: 70%                                                                                                                                                                          |                                                                                         |
|                                                        |           | 6: 81%                                                                                                                                                                          |                                                                                         |
|                                                        |           | 7: 86%                                                                                                                                                                          |                                                                                         |
|                                                        |           | 8: 94%                                                                                                                                                                          |                                                                                         |
|                                                        |           | 9: 98%                                                                                                                                                                          |                                                                                         |
| Status send control <sup>c</sup>                       | M1        | 0: Reports status in KPD mode only.                                                                                                                                             | 0                                                                                       |
|                                                        |           | 1: Reports status in all emulations.                                                                                                                                            |                                                                                         |
|                                                        |           | 20: Treats all CTRL-T commands as data in all emulations.                                                                                                                       |                                                                                         |

**Table 6.2. Interface-independent Parameters (Sheet 3 of 8)**

| Environment                             | Parameter | Value                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Factory setting                                |
|-----------------------------------------|-----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------|
| Default interface                       | M2        | 1: Default Serial or Option Serial<br>2: Parallel<br>3: Default Network or Option Network<br>4: Option Network or Option2 Network<br>5: USB                                                                                                                                                                                                                                                                                                                                   | 2 or 3                                         |
| Host buffer mode <sup>d</sup>           | M3        | 0: Automatic<br>1: Fixed                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 0                                              |
| First buffer size                       | M4        | Size of the first buffer                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 3 (model with network interface) or 5 (other)  |
| Second (First) <sup>e</sup> buffer size | M5        | Size of the second (first) buffer                                                                                                                                                                                                                                                                                                                                                                                                                                             | 10 (model with network interface) or 5 (other) |
| Third (Second) buffer size              | M6        | Size of the third (second) buffer                                                                                                                                                                                                                                                                                                                                                                                                                                             | 1                                              |
| Forth (Third) buffer size               | M7        | Size of the forth (third) buffer number                                                                                                                                                                                                                                                                                                                                                                                                                                       | 5                                              |
| Fifth (Forth) buffer size               | M8        | Size of the fifth (forth) buffer number                                                                                                                                                                                                                                                                                                                                                                                                                                       | 5                                              |
| KIR mode                                | N0        | 0: Off<br>2: On                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 2                                              |
| Duplex binding                          | N4        | 0: Off<br>1: Long edge<br>2: Short edge                                                                                                                                                                                                                                                                                                                                                                                                                                       | 0                                              |
| Sleep timer time-out time               | N5        | Value in units of 5 minutes: 1 to 48 [5 to 240 min.]                                                                                                                                                                                                                                                                                                                                                                                                                          | 6                                              |
| Ecoprint level                          | N6        | 0: Off<br>2: On                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 0                                              |
| Duplex                                  | N7        | 0: Normal<br>1: Reverse output pages.<br>2: Allows duplex from the MP tray.<br>3: Allows duplex from the MP tray; reversing the output pages.                                                                                                                                                                                                                                                                                                                                 | 0                                              |
| Printing resolution                     | N8        | 0: 300 dpi<br>1: 600 dpi<br>3: 1200 dpi                                                                                                                                                                                                                                                                                                                                                                                                                                       | 1                                              |
| PCL resource protection                 | N9        | 0: Off<br>1: Protects permanent PCL resources and resets the environment.<br>2: Protects permanent and temporary PCL resources.                                                                                                                                                                                                                                                                                                                                               | 0                                              |
| Parallel interface mode                 | O0        | 0: Normal<br>1: High-speed<br>5: Nibble (High)<br>70: Auto (Negotiation)                                                                                                                                                                                                                                                                                                                                                                                                      | 5                                              |
| Message language                        | P0        | 0: English<br>1: French<br>2: German<br>3: Danish<br>4: Swedish<br>5: Italian<br>6: Spanish                                                                                                                                                                                                                                                                                                                                                                                   | 0                                              |
| Command recognition character           | P9        | ASCII code from 33 to 99                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 82 (R)                                         |
| Default stacker                         | R0        | 1: Face-down tray<br>2: Face-up tray<br>3: Bulk tray                                                                                                                                                                                                                                                                                                                                                                                                                          | 1                                              |
| Auto cassette switching                 | R1        | 0: Cassette not switched when empty.<br>1: Main cassette and the first feeder cassette.<br>2: Main cassette and the second feeder cassette.<br>3: The first feeder cassette and the second feeder cassette.<br>4: Main cassette, the first feeder cassette, and the second feeder cassette.<br>5: Main cassette and the third feeder cassette.<br>6: The first feeder cassette and the third feeder cassette.<br>7: The second feeder cassette and the third feeder cassette. | 0                                              |

Table 6.2. Interface-independent Parameters (Sheet 4 of 8)

| Environment        | Parameter | Value                                                                                                                                | Factory setting |
|--------------------|-----------|--------------------------------------------------------------------------------------------------------------------------------------|-----------------|
|                    |           | 8: Main cassette, the first feeder cassette, and the third feeder cassette.                                                          |                 |
|                    |           | 9: Main cassette, the second feeder cassette, and the third feeder cassette.                                                         |                 |
|                    |           | 10: The first feeder cassette, the second feeder cassette, and the third feeder cassette.                                            |                 |
|                    |           | 11: Main cassette, the first feeder cassette, the second feeder cassette, and the third feeder cassette.                             |                 |
|                    |           | 12: Main cassette and the fourth feeder cassette.                                                                                    |                 |
|                    |           | 13: The first feeder cassette and the fourth feeder cassette.                                                                        |                 |
|                    |           | 14: The second feeder cassette and the fourth feeder cassette.                                                                       |                 |
|                    |           | 15: The third feeder cassette and the fourth feeder cassette.                                                                        |                 |
|                    |           | 16: Main cassette, the first feeder cassette, and the fourth feeder cassette.                                                        |                 |
|                    |           | 17: Main cassette, the second feeder cassette, and the fourth feeder cassette.                                                       |                 |
|                    |           | 18: Main cassette, the third feeder cassette, and the fourth feeder cassette.                                                        |                 |
|                    |           | 19: The first feeder cassette, the second feeder cassette, and the fourth feeder cassette.                                           |                 |
|                    |           | 20: The first feeder cassette, the third feeder cassette, and the fourth feeder cassette.                                            |                 |
|                    |           | 21: The second feeder cassette, the third feeder cassette, and the fourth feeder cassette.                                           |                 |
|                    |           | 22: Main cassette, the first feeder cassette, the second feeder cassette, and the fourth feeder cassette.                            |                 |
|                    |           | 23: Main cassette, the first feeder cassette, the third feeder cassette, and the fourth feeder cassette.                             |                 |
|                    |           | 24: Main cassette, the second feeder cassette, the third feeder cassette, and the fourth feeder cassette.                            |                 |
|                    |           | 25: The first feeder cassette, the second feeder cassette, the third feeder cassette, and the fourth feeder cassette.                |                 |
|                    |           | 26: Main cassette, the first feeder cassette, the second feeder cassette, the third feeder cassette, and the fourth feeder cassette. |                 |
|                    |           | 99: Switched according to the page size command in data.                                                                             |                 |
| Default paper size | R2        | 0: Size of the default paper cassette (See R4.)                                                                                      | 0               |
|                    |           | 1: Monarch (3-7/8 × 7-1/2 inches)                                                                                                    |                 |
|                    |           | 2: Business (4-1/8 × 9-1/2 inches)                                                                                                   |                 |
|                    |           | 3: International DL (11 × 22 cm)                                                                                                     |                 |
|                    |           | 4: International C5 (16.2 × 22.9 cm)                                                                                                 |                 |
|                    |           | 5: Executive (7-1/4 × 10-1/2 inches)                                                                                                 |                 |
|                    |           | 6: US Letter (8-1/2 × 11 inches)                                                                                                     |                 |
|                    |           | 7: US Legal (8-1/2 × 14 inches)                                                                                                      |                 |
|                    |           | 8: A4 (21.0 × 29.7 cm)                                                                                                               |                 |
|                    |           | 9: JIS B5 (18.2 × 25.7 cm)                                                                                                           |                 |
|                    |           | 10: A3 (29.7 × 42 cm)                                                                                                                |                 |
|                    |           | 11: B4 (25.7 × 36.4 cm)                                                                                                              |                 |
|                    |           | 12: US Ledger (11 × 17 inches)                                                                                                       |                 |
|                    |           | 13: A5 (14.8 × 21 cm)                                                                                                                |                 |
|                    |           | 14: A6 (10.5 × 14.8 cm)                                                                                                              |                 |
|                    |           | 15: JIS B6 (12.8 × 18.2 cm)                                                                                                          |                 |
|                    |           | 16: Commercial #9 (3-7/8 × 8-7/8 inches)                                                                                             |                 |
|                    |           | 17: Commercial #6 (3-5/8 × 6-1/2 inches)                                                                                             |                 |
|                    |           | 18: ISO B5 (17.6 × 25 cm)                                                                                                            |                 |
|                    |           | 19: Custom (11.7 × 17.7 inches) <sup>f</sup>                                                                                         |                 |
|                    |           | 30: C4 (22.9 × 32.4 cm) <sup>f</sup>                                                                                                 |                 |
|                    |           | 31: Hagaki (10 × 14.8 cm) <sup>f</sup>                                                                                               |                 |
|                    |           | 32: Ofuku-Hagaki (14.8 × 20 cm) <sup>f</sup>                                                                                         |                 |
|                    |           | 33: Officio II                                                                                                                       |                 |
|                    |           | 36: A3 Wide                                                                                                                          |                 |



*Table 6.2. Interface-independent Parameters (Sheet 5 of 8)*

| Environment                        | Parameter | Value                                                                                                                                                                                                                                                                                                                                                                                                                  | Factory setting                 |
|------------------------------------|-----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------|
|                                    |           | 37: Ledger Wide<br>50: Statement<br>51: Folio<br>52: Youkei 2<br>53: Youkei 4                                                                                                                                                                                                                                                                                                                                          |                                 |
| Default margin settings            | R3        | 0: HP compatible margins.<br>1: Full PCL printable area.<br>2: Character pitch given by U2 and U3.<br>3: Full PCL printable area with character pitches given by U2 and U3.<br>10: IBM HT reference point as the left margin.<br>11: Full PCL printable area for HP emulation; HT reference point as the left margin in IBM emulation.<br>12: Uses Courier font for IBM emulation, using the pitch given by U2 and U3. | 0                               |
| Default cassette                   | R4        | 0: Multi-purpose tray<br>1: Cassette 1<br>2: Cassette 2<br>3: Cassette 3<br>4: Cassette 4 or Envelope/universal feeder<br>5: Cassette 5<br>6: Cassette 6<br>99: Envelope/universal feeder (FS-9000)                                                                                                                                                                                                                    | 1                               |
| Page protect                       | R5        | 1 – 3: Automatic<br>4 – 5: On                                                                                                                                                                                                                                                                                                                                                                                          | 1                               |
| MP tray paper size                 | R7        | Same as the R2 values except: 0                                                                                                                                                                                                                                                                                                                                                                                        | 0                               |
|                                    |           | 0: Maximum paper size of the printing system                                                                                                                                                                                                                                                                                                                                                                           |                                 |
| Daisywheel data length             | R8        | 7: 7-bit<br>8: 8-bit                                                                                                                                                                                                                                                                                                                                                                                                   | 7                               |
| Default envelope feeder paper size | R9        | Same as the R2 values except below<br>0: A4 or Letter                                                                                                                                                                                                                                                                                                                                                                  | 0                               |
| A4/letter equation                 | S4        | 0: Off<br>1: On                                                                                                                                                                                                                                                                                                                                                                                                        | 0                               |
| Host buffer size                   | S5        | 0: 10kB (x H8)<br>1: 100kB (x H8)<br>2: 1024kB (x H8)                                                                                                                                                                                                                                                                                                                                                                  | 1                               |
| RAM disk capacity                  | S6        | 0 to 1024 (MB)                                                                                                                                                                                                                                                                                                                                                                                                         | 50                              |
| RAM disk                           | S7        | 0: Disabled<br>1: Enabled                                                                                                                                                                                                                                                                                                                                                                                              | 0                               |
| Serial interface mode              | S9        | 0: Normal<br>1: Barcode reader                                                                                                                                                                                                                                                                                                                                                                                         | 0                               |
| MP tray mode                       | T0        | 0: Cassette mode<br>1: First mode (overrides other paper sources)                                                                                                                                                                                                                                                                                                                                                      | 1                               |
| Cassette 1 paper size <sup>g</sup> | T1        | 6: Letter<br>7: Legal<br>8: A4<br>9: B5<br>13: A5                                                                                                                                                                                                                                                                                                                                                                      | 6 (U.S.A) or 8 (Euro and other) |
| Cassette 2 paper size <sup>g</sup> | T2        | Same as above.                                                                                                                                                                                                                                                                                                                                                                                                         | 6 (U.S.A) or 8 (Euro and other) |
| Wide A4                            | T6        | 0: Off<br>1: On                                                                                                                                                                                                                                                                                                                                                                                                        | 0                               |
| MP tray direction <sup>h</sup>     | T8        | 0: Short edge<br>1: Long edge                                                                                                                                                                                                                                                                                                                                                                                          | 1                               |
| Paper thickness                    | T9        | 0: Normal<br>1: Thick<br>2: Thin<br>3: Extra thick                                                                                                                                                                                                                                                                                                                                                                     | 0                               |
| Status page print at power-up      | U5        | 0: Not printed automatically<br>1: Printed automatically at power-up                                                                                                                                                                                                                                                                                                                                                   | 0                               |
| Default Courier weight             | V9        | 0: Dark<br>1: Normal                                                                                                                                                                                                                                                                                                                                                                                                   | 0                               |

Table 6.2. Interface-independent Parameters (Sheet 6 of 8)

| Environment                                      | Parameter | Value                                                                                                                                                                                                                                                                                                               | Factory setting                    |
|--------------------------------------------------|-----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------|
| Color mode                                       | W1        | 0: Monochrome (grayscale)<br>1: Color (CMYK)<br>2: Quick color (CMY)                                                                                                                                                                                                                                                | 1                                  |
| Color quality                                    | W2        | 0: Normal<br>1: Quick color<br>2: Picture<br>3: Presentation                                                                                                                                                                                                                                                        | 0                                  |
| Color matching                                   | W3        | 0: None<br>1: Auto<br>2: Vivid color<br>3: Display                                                                                                                                                                                                                                                                  | 0                                  |
| Monitor simulation                               | W4        | 0: None<br>1: SMPTE240M<br>2: HDTV (sRGB)<br>3: SONY Trinitron<br>4: Apple AGB<br>5: NTSC<br>6: KC RGB<br>7: Custom                                                                                                                                                                                                 | 2 (For the FS-8000C, 0 and 2 only) |
| Ink simulation                                   | W5        | 1: None<br>2: SWOP<br>3: Euroscale<br>4: TOYO<br>5: DIC                                                                                                                                                                                                                                                             | 1                                  |
| Gloss mode                                       | W6        | 0: Low (normal)<br>1: High                                                                                                                                                                                                                                                                                          | 0                                  |
| Paper type for the MP tray                       | X0        | 1: Plain<br>2: Transparency<br>3: Preprinted<br>4: Label<br>5: Bond<br>6: Recycle<br>7: Vellum<br>8: Rough<br>9: Letterhead<br>10: Color<br>11: Prepunched<br>12: Envelope<br>13: Cardstock<br>21: Custom1<br>22: Custom2<br>23: Custom3<br>24: Custom4<br>25: Custom5<br>26: Custom6<br>27: Custom7<br>28: Custom8 | 1                                  |
| Paper type for paper cassettes 1 to 6            | X1 – X6   | 1: Plain<br>3: Preprinted<br>5: Bond<br>6: Recycled<br>8: Rough<br>9: Letterhead<br>10: Color<br>11: Prepunched<br>21: Custom1<br>22: Custom2<br>23: Custom3<br>24: Custom4<br>25: Custom5<br>26: Custom6<br>27: Custom7<br>28: Custom8                                                                             | 1                                  |
| Paper type for Envelope Feeder/ Universal Feeder | X7        | 1: Plain<br>3: Preprinted<br>4: Label<br>5: Bond<br>6: Recycled<br>8: Rough                                                                                                                                                                                                                                         | 1                                  |

*Table 6.2. Interface-independent Parameters (Sheet 7 of 8)*

| Environment                       | Parameter | Value                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Factory setting                                        |
|-----------------------------------|-----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------|
|                                   |           | 9: Letterhead                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                        |
|                                   |           | 10: Color                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                        |
|                                   |           | 11: Prepunched                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                        |
|                                   |           | 12: Envelope                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                        |
|                                   |           | 13: Cardstock                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                        |
|                                   |           | 21: Custom1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                        |
|                                   |           | 22: Custom2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                        |
|                                   |           | 23: Custom3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                        |
|                                   |           | 24: Custom4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                        |
|                                   |           | 25: Custom5                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                        |
|                                   |           | 26: Custom6                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                        |
|                                   |           | 27: Custom7                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                        |
|                                   |           | 28: Custom8                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                        |
| PCL paper source                  | X9        | 0: Performs paper selection depending on media type.<br>1: Performs paper selection depending on paper sources.<br>2: Performs paper selection which is compatible with HP-LJ8000.<br>3: Combination of value 1 and 2.<br>8: Performs paper selection in driver priority mode.<br>9: Combination of value 1 and 8.<br>10: Combination of value 2 and 8.<br>11: Combination of value 1, 2 and 8.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 8 (model supporting driver priority mode) or 0 (other) |
| Automatic continue for 'Press GO' | Y0        | 0: Off<br>1: On                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 0                                                      |
| Automatic continue timer          | Y1        | number from 000 to 495 in increments of 5 seconds                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 6                                                      |
| Quick fuser heater                | Y2        | 0: On<br>1: Off                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 0 or 1                                                 |
| Error message for device error    | Y3        | 0: Does not display an error message and pause the job when the device error occurs.<br>1: Displays an error message when duplex printing is not executed because of a possible limitation.<br>2: Displays an error message and pause the job when running out of staples.<br>3: Combination of value 1 and 2.<br>4: Displays an error message and pause the job when the waste punch box is full.<br>5: Combination of value 1 and 4.<br>6: Combination of value 2 and 4.<br>7: Combination of value 1, 2 and 4.<br>8: Displays an error message and pause the job when the maximum number of stapling is exceeded.<br>9: Combination of value 1 and 8.<br>10: Combination of value 2 and 8.<br>11: Combination of value 1, 2 and 8.<br>12: Combination of value 4 and 8.<br>13: Combination of value 1, 4 and 8.<br>14: Combination of value 2, 4 and 8.<br>15: Combination of value 1, 2, 4 and 8.<br>16: Displays an error message when stapling, punching, offset or rotate collate is not executed because of a possible limitation except 2, 4 and 8.<br>17: Combination of value 1 and 16.<br>18: Combination of value 2 and 16.<br>19: Combination of value 1, 2 and 16.<br>20: Combination of value 4 and 16.<br>21: Combination of value 1, 4 and 16.<br>22: Combination of value 2, 4 and 16.<br>23: Combination of value 1, 2, 4 and 16.<br>24: Combination of value 8 and 16.<br>25: Combination of value 1, 8 and 16.<br>26: Combination of value 2, 8 and 16.<br>27: Combination of value 1, 2, 8 and 16.<br>28: Combination of value 4, 8 and 16.<br>29: Combination of value 1, 4, 8 and 16.<br>30: Combination of value 2, 4, 8 and 16.<br>31: Combination of value 1, 2, 4, 8 and 16. | 0                                                      |

Table 6.2. Interface-independent Parameters (Sheet 8 of 8)

| Environment                                                                       | Parameter | Value                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Factory setting |
|-----------------------------------------------------------------------------------|-----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|
| Duplex operation for specified paper type (Prepunched, Preprinted and Letterhead) | Y4        | 0: Leaves the job as is when the job which the specified paper type is specified in simplex mode.<br>1: Adds blank pages and prints the job in duplex mode when the job which the specified paper type is specified in simplex mode.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 0               |
| Default operation for PDF direct printing                                         | Y5        | 0: Enlarges or reduces the image to fit in the current paper size. Loads paper from the current paper cassette.<br>1: Through the image. Loads paper which is the same size as the image.<br>2: Enlarges or reduces the image to fit in the current paper size. Loads Letter, A4 or A3 size paper depending on the image size.<br>3: Through the image. Loads Letter, A4 or A3 size paper depending on the image size.<br>8: Through the image. Loads paper from the current paper cassette.<br>9: Through the image. Loads Letter, Ledger or Legal size paper depending on the image size.<br>10: Enlarges or reduces the image to fit in the current paper size. Loads Letter, Ledger or Legal size paper depending on the image size. | 0               |
| e-MPS error                                                                       | Y6        | 0: Does not print the error report and display the error message.<br>1: Prints the error report.<br>2: Displays the error message.<br>3: Prints the error report and displays the error message.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 3               |

<sup>a</sup> Supported only by FS-1500 series, FS-1600 series, FS-3400 series, and FS-3600 series.

<sup>b</sup> I0—Name of the partition in memory card  
The FRPO I0 specifies a memory card partition name to be automatically read at power up. Only one partition may be specified. The data read from the named partition at power up will be available to users accessing the currently-active interface.  
The command uses the following format:

FRPO I0, 'partition-name' ;

Note that a comma must be placed after the I0 parameter. The partition name should not exceed 15 printable ASCII characters (20H through 7EH) and be enclosed by single or double quotation marks. Partition names are case-sensitive so the correct upper and lowercase characters must be used in the FRPO I0 string.

The FRPO M2 parameter enables the printing system to read the partition name into a port apart from the currently active one. For instance, if the active port were the parallel port but the M2 parameter specified the serial port, then the memory card data would be available to users accessing the serial interface.

<sup>c</sup> M1—Status send control

The FRPO M1 parameter enables the user to receive printing system status information through the serial interface. By sending CTRL-T (Hex 14) from the host computer to the printing system, the user can receive status information about ready or waiting states, the total page count for the printing system, the default page size, and the available memory size in bytes.

<sup>d</sup> M3—Host buffer mode

The M3 parameter determines the automatic or fixed host buffer mode.

If the M3 value is 0 (automatic), the first data arriving from the computer go into buffer #1, regardless of which interface they arrive on. While buffer #1 is in use, if data also begin to arrive on a second interface they are stored in buffer #2. The printing system will print these data after it has finished printing the job received through buffer #1. The general rule is that data go to the available buffer. If the M3 value is 1 (fixed), buffer #1 is fixed to receive only the data arriving in the parallel interface; and buffer #2 is fixed in the option interface (if installed). The first data arriving on one of the interfaces go into its fixed, dedicated buffer and the printing system begins printing these data and continues as above.

The factory setting of the total host buffer size is 60 kilobytes or 500 kilobytes depending on the model. This can be altered by the FRPO H8 command. If you alter the buffer size, you must reset the printing system to bring the change in effect.

- e M5/M6/M7/M8—Host buffer size  
The printing system utilizes each one buffer for its interfaces. This enables simultaneous receiving of data from the different host computers. The FRPO M5, M6, M7, and M8 parameters determine the ratio among the sizes allocated to these buffers. Parameters M6 and M7 are provided for option interfaces.  
For example, to allocate the buffers with size ratio of 5:1, use the following format:  

```
!R! FRPO M3, 1; FRPO M5, 5; FRPO M6, 1; EXIT;
```
- f Ignored in some emulation modes.
- g Models of low-end category only.
- h A3/ledger models only.



# Chapter 7

---

## Emulation

The printing systems emulate the operation of seven other printers:

- HP LaserJet (mode 6)
- HP 7550A (mode 8)
- IBM Proprinter X24E (mode 1)
- Epson LQ-850 (mode 5)
- Diablo 630 (mode 2)
- *Standard* line printer (mode 0)
- KPDL (mode 9) [PostScript compatible]

Word-processing and graphics software for any of the above printers also works with the printing system. All you need to do is to set the printing system to emulate the printer your software supports and select the appropriate printer driver.

In rare cases when your software does not support any of the printers above, install your software to drive the *standard* line printer and use PRESCRIBE commands to control line spacing, character spacing, etc.

Inappropriate selection of printer drivers and printer-based emulations will produce undesirable results.

When shipped from the factory, the printing system is set to emulate the HP LaserJet. For best results, look for an appropriate printer driver in your software application.

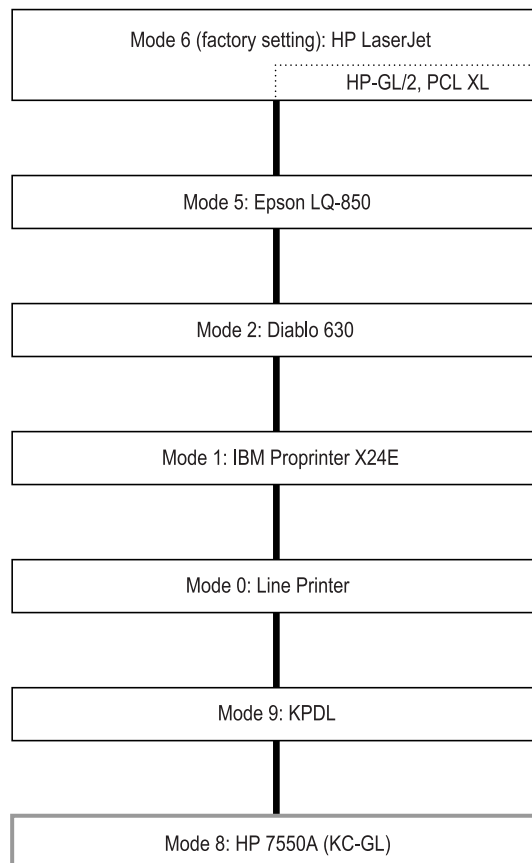
You can also find the appropriate printer driver for your model in the CD-ROM supplied with the product. Or, you are encouraged to visit our Internet home page to directly download the printer driver of the latest version.

This chapter first explains how to select an emulation. Then it gives some general information applying to all the emulation modes. Finally, it goes over each of the modes, explaining the printing system's word-processing capabilities and showing its character sets. Tables of control codes and escape sequences are also given at the end of each emulation section.

## Selecting an Emulation

When installing a printing system, you can select an emulation that best suits the requirement by the application software. In most cases, the emulation will be the factory default setting (mode 6: HP LaserJet). Refer to the following diagram to locate the next level emulation in case you need to change the emulation.

For example, in printing environments using the HP plotter model HP 7550A (KC-GL), the user should select mode 8. In PostScript printing environments, mode 9 should be selected (an option on some models) .



To set an emulation mode, send the printing system the FRPO commands listed in the table below.

**Table 7.1. Emulation Switching Command Sequence**

| Mode | Emulation           | FRPO Commands                     |
|------|---------------------|-----------------------------------|
| 0    | Line Printer        | !R! FRPO P1, 0; FRPO P3, 1; EXIT; |
| 1    | IBM Proprinter X24E | !R! FRPO P1, 1; FRPO P3, 2; EXIT; |
| 2    | Diablo 630          | !R! FRPO P1, 2; FRPO P3, 1; EXIT; |
| 5    | Epson LQ-850        | !R! FRPO P1, 5; FRPO P3, 2; EXIT; |
| 6    | HP LaserJet         | !R! FRPO P1, 6; FRPO P3, 1; EXIT; |
| 8    | HP 7550A            | !R! FRPO P1, 8; FRPO P3, 1; EXIT; |
| 9    | KPD L               | !R! FRPO P1, 9; EXIT;             |

The emulation mode can also be changed from the printing system's operator panel.



## Automatic emulation sensing

In printing systems that permit the selection of KPD L emulation, the automatic emulation sensing (AES) can be activated so that print jobs using other emulations will automatically print in the correct emulation. Refer to the AES related FRPO command parameters, P4 and P5, in *Interface-independent Parameters* on page 5 in *Chapter 6*.

## General Information on Emulation

The printing system's capability for supporting seven printer emulations is remarkably complete; although a few differences are noteworthy:

- The printing system cannot print on paper larger than the size of its cassette. In particular, it cannot print on continuous forms.
- The 600 dpi and 1200 dpi resolutions are supported only with HP LaserJet and KPD L emulations. Even for the models with 600 dpi and 1200 dpi support, printing occurs only with the 300 dpi resolution in Line Printer, IBM Proprinter, Diablo, and Epson emulation modes.
- The printing system's fonts do not duplicate the appearance of the fonts of the emulated printers exactly. For a fixed font, the printing system provides the same character spacing as the printer under emulation. This is not always true for proportional spacing. When proportional spacing is used, your word processing software, using an HP LaserJet driver, may be unable to properly right justify proportional text.
- The printing system supports scalable (outline) fonts. With the assistance of PRE-SCRIBE commands, the scalable fonts are available for printing in any one of the emulation modes. (See *Chapter 4* for details.)
- The graphics commands which create a path are also supported in all emulation modes. Instructions on how to create a path are described in *Chapter 2*.
- In all emulations, the printing system's margins differ slightly between emulations. The margins can be adjusted with PRESCRIBE margin commands. However, they cannot be moved outside the paper edge limits.
- PRESCRIBE commands can also be used for supplementary font control. Examples are given in each section (FONT, SFNT, etc.).

## Line Printer Emulation (Mode 0)

To set the power-up emulation for Line Printer, send the printing system the following PRESCRIBE command sequence:

```
!R! FRPO P1, 0 ; FRPO P3, 1; FRPO U6, 1; EXIT;
```

The Line Printer character set options are the same as for the IBM emulation. FRPO U6, 1 selects the full IBM US ASCII character set, which includes many international characters, graphic symbols, and mathematical symbols in addition to standard ASCII. If you leave the U6 parameter at its 0 factory setting, you will get a subset excluding some international characters and symbols. The other options are US Legal (FRPO U6, 9;) and the Danish character set (FRPO U6, 4;). See Section for details.

The line printer emulation is virtually featureless. It uses only the control codes listed below.

Table 7.2. Line Printer Control Codes

| Character code (decimal) | Abbreviation | Meaning         |
|--------------------------|--------------|-----------------|
| 8                        | BS           | Backspace       |
| 10                       | LF           | Linefeed        |
| 12                       | FF           | Formfeed        |
| 13                       | CR           | Carriage return |

Other control codes are ignored. In particular, the escape code (ESC: character code 27) is ignored. If the printing system receives the escape sequence ESC A, for example, it ignores the escape code and prints the letter A. Therefore, this emulation requires PRESCRIBE commands for controlling the printing system.

In font mode (FTMD) 15, the printing system automatically gives the innate character spacing, line spacing, and page orientation for each bitmap font, and character spacing and page orientation for each scalable font.


If a line overruns the right margin, word wrap occurs automatically in this emulation.

## IBM Proprinter X24E Emulation (Mode 1)

To set the power-up emulation for IBM Proprinter X24E, send the printing system the following PRESCRIBE command sequence:

```
!R! FRPO P1, 1; FRPO P3, 1; EXIT;
```

The IBM symbol sets include IBM PC-8 plus international characters, mathematical symbols, Greek letters, and graphic symbols, so you can print things like:

|                                                                                                                                                                      |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| $\alpha$ $\epsilon$ $\Sigma$ $\cap$ $\Omega$ $\sigma\theta \approx 4GM/r^0c^2$  |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|

Symbol sets PC-850, PC-860, PC-863, PC-865, US ASCII, and Denmark allow all ruling characters (hex B0 to DF) and underscore characters (5F) to be printed in the correct pitch for creating continuous lines.

The symbol set may be selected with the INTL command or the operator panel keys. Permanent setting of the symbol set is made with the FRPO U6 and U7 commands but not with the Proprinter escape sequences.

The following symbol sets list shows the support for the IBM emulation.

Table 7.3. IBM Proprinter X24E Symbol Sets

| Symbol set                | Message display | FRPO command             |
|---------------------------|-----------------|--------------------------|
| US ASCII                  | IBM PC-8        | FRPO U6, 0; FRPO U7, 1;  |
| Denmark                   | IBM PC-8 (D/N)  | FRPO U6, 4; FRPO U7, 1;  |
| US Legal                  | US Legal        | FRPO U6, 9; FRPO U7, 1;  |
| IBM PC-850 (Multilingual) | IBM PC-850      | FRPO U6, 10; FRPO U7, 1; |
| IBM PC-860 (Portuguese)   | IBM PC-860      | FRPO U6, 11; FRPO U7, 1; |

Table 7.3. IBM Proprinter X24E Symbol Sets

| Symbol set                   | Message display | FRPO command             |
|------------------------------|-----------------|--------------------------|
| IBM PC-863 (Canadian French) | IBM PC-863      | FRPO U6, 12; FRPO U7, 1; |
| IBM PC-865 (Norwegian)       | IBM PC-865      | FRPO U6, 13; FRPO U7, 1; |

By giving a particular value for the U6 and U7 parameters, it is possible to use another symbol set which the Diablo does not have. For details, see *LaserJet Symbol Sets* on page 37.

At power-up or after a reset, the printing system defaults to LetterGothic (12 points, 10 cpi). This default font emulates the IBM printer's Sans-serif 10cpi font. The default font cannot be changed in the IBM Proprinter X24E emulation. (The FRPO C5, C2, and C3 commands will be ignored in the IBM Proprinter X24E emulation.)

The printing system also emulates three other IBM-printer fonts: Courier, Prestige Elite, and Courier Proportional (See the table on next page). These fonts can be obtained by embedded commands or by using a printer driver from your word-processing software that supports the IBM Proprinter X24E. No PRESCRIBE commands are needed. An embedded command gives double-wide versions and another give double-high version of all four fonts. Samples are shown on the next page.

Figure 7.4. IBM Proprinter Emulation Print Samples

In the IBM emulation, you have five basic fonts to choose from. This is Draft Sans-serif, 10 cpi.

This is also Draft Sans-serif, but in 12 cpi.

And the same, in Condensed spacing, close to 17 cpi.

**This is Letter Quality Courier, 10 cpi.**

This is Letter Quality Courier, condensed.

This is Letter Quality Prestige Elite, 12 cpi.

This is Letter Quality Courier, Proportional.

IBM-PC word-processing capabilities include both **emphasized** and **double-strike** printing, superscripts<sup>(1)</sup> and subscripts<sub>(2)</sub>, underlines and overlines, **DOUBLE-WIDE**

and **DOUBLE-HIGH**, and even

**DOUBLE-WIDE and  
DOUBLE-HIGH!**

The IBM Proprinter X24E emulation supports embedded commands for double-wide/double-high printing, emphasized printing, double-strike printing, superscripts,

subscripts, underlining, backspace, vertical and horizontal tabulation, line spacing, and paper length.

The font mode set for the IBM Proprinter X24E emulation is 0 (the printing system adjusts nothing automatically for font attributes) unless you change it by the FTMD command. If you do not need exact character spacing, you can improve the appearance of some fonts by changing the font mode to 13.

```
!R! FTMD 13; EXIT;
```

It should be noted that for FTMD 13; the default Draft Sans-serif font will be printed in 12 cpi, and the Courier Proportional font will be printed in fixed pitch.

To use some of the page printing system's other fonts, you can select them with font selection commands, but a more convenient method is available. You can substitute other fonts for the four embedded fonts with SETF (SET alternate Font) commands. This works because the printing system obtains these fonts from the following default values of the SETF command:

*Table 7.5. IBM Proprinter Fonts*

| Font name        | Character spacing  | ALTf No. |
|------------------|--------------------|----------|
| Draft Sans-serif | 10 cpi, 12 cpi     | 0        |
| Courier          | 10 cpi             | 1        |
| Prestige Elite   | 12 cpi             | 2        |
| Draft Sans-serif | Condensed (15 cpi) | 3        |
| Courier Prop.    | Proportional       | 4        |

A substitute font can be any resident font if you use the SFNT command to assign the font number. (See the SFNT command page in *PRESCRIBE Commands Command Reference*.)

To assign a font number to resident fonts for substituting the emulated fonts in IBM Proprinter X24E emulation, all the option parameters (including *symbol-set*, *compression*, and *angle*) for the SFNT command must be specified.

Landscape orientation is another feature the printing system can offer that the IBM printer cannot. If you command !R! SPO L; EXIT; the printing system rotates the current font and prints text in landscape orientation.

The printing system supports the IBM printer's bit-image graphics in portrait orientation, so graphics software using the IBM Proprinter X24E emulation will print charts, graphs, and pictures without the need for PRESCRIBE commands. The print model and clipping features of the PRESCRIBE path mode graphics will be ignored with the IBM bit-image graphics, however.

If you attempt to print beyond the right margin, the characters will wrap around and print on the next line.

## IBM Proprinter X24E Control Codes

This section provides IBM Proprinter X24E control codes which is supported by the printing system under X24E Proprinter emulation.

Table 7.6. IBM Proprinter X24E Control Codes

| Command                | Function                                     | Code (hex)             | Supported |
|------------------------|----------------------------------------------|------------------------|-----------|
| BEL                    | Beeper                                       | 07                     | –         |
| BS                     | Backspace                                    | 08                     | Yes       |
| HT                     | Horizontal Tab                               | 09                     | Yes       |
| LF                     | Line Feed                                    | 0A                     | Yes       |
| VT                     | Vertical Tab                                 | 0B                     | Yes       |
| FF                     | Form Feed                                    | 0C                     | Yes       |
| CR                     | Carriage Return                              | 0D                     | Yes       |
| SO                     | Double-Wide Printing by line                 | 0E                     | Yes       |
| SI                     | Condensed Printing                           | 0F                     | Yes       |
| DC1                    | Select Printer                               | 11                     | –         |
| DC2                    | 10 CPI Print                                 | 12                     | Yes       |
| DC4                    | Cancel Double-Wide Printing by line          | 14                     | Yes       |
| CAN                    | Cancel Data                                  | 18                     | –         |
| ESC * m n1 n2 data     | Select Graphic Mode (AGM only)               | 1B 2A m n1 n2 data     | –         |
| ESC - n                | Continuous Underline                         | 1B 2D n                | Yes       |
| ESC 0                  | 1/8 Inch Line Spacing                        | 1B 30                  | Yes       |
| ESC 1                  | 7/72 Inch Line Spacing                       | 1B 31                  | Yes       |
| ESC 2                  | Start Text Line Spacing                      | 1B 32                  | Yes       |
| ESC 3 n                | Graphics Line Spacing                        | 1B 33 n                | Yes       |
| ESC 4                  | Set Top of Form                              | 1B 34                  | Yes       |
| ESC 5 n                | Automatic Line Feed                          | 1B 35 n                | Yes       |
| ESC 6                  | Select Character Set 2                       | 1B 36                  | Yes       |
| ESC 7                  | Select Character Set 1                       | 1B 37                  | Yes       |
| ESC :                  | 12 CPI Printing                              | 1B 3A                  | Yes       |
| ESC =                  | Character Font Image Down-load               | 1B 3D                  | –         |
| ESC A n                | Set Text Line Spacing                        | 1B 41 n                | Yes       |
| ESC B n1 n2...n64 null | Set Vertical Tabs                            | 1B 42 n1 n2...n64 0    | Yes       |
| ESC C n m              | Set Form Length in Line or Inches            | 1B 43 nm               | Yes       |
| ESC D n1 n2...n29 null | Set Horizontal Tabs                          | 1B 44 n1 n2...n28 0    | Yes       |
| ESC E                  | Emphasized Printing                          | 1B 45                  | Yes       |
| ESC F                  | Cancel Emphasized Printing                   | 1B 46                  | Yes       |
| ESC G                  | Double-Strike printing                       | 1B 47                  | Yes       |
| ESC H                  | Cancel Double-Strike Printing                | 1B 48                  | Yes       |
| ESC I n                | Select Print Mode                            | 1B 49 n                | Yes       |
| ESC J n                | Graphics Variable Line Spacing               | 1B 4A n                | Yes       |
| ESC K n1 n2 v1 v2...vn | Normal-Density Bit-Image Graphics            | 1B 4B n1 n2 v1 v2...vn | Yes       |
| ESC L n1 n2 v1 v2...vn | Dual-Density Bit-Image Graphics (Half-Speed) | 1B 4C n1 n2 v1 v2...vn | Yes       |
| ESC N n                | Set Automatic Perforation Skip               | 1B 4E n                | Yes       |
| ESC O                  | Cancel Automatic Perforation Skip            | 1B 4F                  | Yes       |
| ESC P n                | Proportional Space Mode                      | 1B 50 n                | Yes       |
| ESC Q n                | Deselect Printer                             | 1B 51 n                | –         |
| ESC R                  | Set All Tabs to Power on Settings            | 1B 52                  | Yes       |
| ESC S n                | Subscript or Superscript Printing            | 1B 53 n                | Yes       |
| ESC T                  | Cancel Subscript or Superscript              | 1B 54                  | Yes       |

Table 7.6. IBM Proprinter X24E Control Codes

| Command                   | Function                                         | Code (hex)                 | Supported |
|---------------------------|--------------------------------------------------|----------------------------|-----------|
| ESC U n                   | Set Print Direction                              | 1B 55 n                    | –         |
| ESC W n                   | Continuous Double-Wide Printing                  | 1B 57 n                    | Yes       |
| ESC X n m                 | Set Horizontal Margins                           | 1B 58 n m                  | Yes       |
| ESC Y n1 n2 v1 v2...vn    | Dual-Density Bit-Image Graphics (Normal Speed)   | 1B 59 n1 n2 v1 v2...vn     | Yes       |
| ESC Z n1 n2 v1 v2...vn    | High-Density Bit-Image Graphics                  | 1B 5A n1 n2 v1 v2...vn     | Yes       |
| ESC [ @ n1 n2 m1 m2 m3 m4 | Double-High Printing                             | 1B 5B 40 n1 n2 m1 m2 m3 m4 | Yes       |
| ESC [ K n1 n2 in id p1 p2 | Set Initial Condition                            | 1B 5B 4B n1 n2 in id p1 p2 | Yes       |
| ESC [ T n1 n2 0 0 c1 c2   | Set Code Page                                    | 1B 5B 54 n1 n2 0 0 c1 c2   | Yes       |
| ESC [ \ n1 n2 t1 t2 g1 g2 | Set Vertical Unit                                | 1B 5B 7C n1 n2 t1 t2 g1 g2 | Yes       |
| ESC [ g n1 n2 m data      | High-Resolution Graphics                         | 1B 5B 67 n1 n2 m data      | Yes       |
| ESC \ n1 n2               | Print Continuously From All Characters Chart     | 1B 7C n1 n2                | Yes       |
| ESC ^                     | Print Single Character from All Characters Chart | 1B 5E                      | Yes       |
| ESC _n                    | Continuous Overline                              | 1B 2D n                    | Yes       |
| ESC d n1 n2               | Relative Move Inline Forward                     | 1B 64 n1 n2                | Yes       |
| ESC j                     | Stop Printing                                    | 1B 6A                      | –         |
| ESC e n1 n2               | Relative Mode Inline Backward                    | 1B 65 n1 n2                | Yes       |

# IBM Symbol Sets

## IBM PC-8 (341)

|   | 0 | 1  | 2  | 3 | 4 | 5   | 6 | 7 | 8 | 9 | A | B | C | D | E | F |
|---|---|----|----|---|---|-----|---|---|---|---|---|---|---|---|---|---|
| 0 |   | ►  |    | 0 | @ | P   | ` | p | Ç | É | á | ☐ | L | ⌌ | α | ≡ |
| 1 | ☺ | ◄  | !  | 1 | A | Q   | a | q | ü | æ | í | ☐ | ⌌ | ⌌ | β | ± |
| 2 | ☹ | ↕  | "  | 2 | B | R   | b | r | é | Æ | ó | ☐ | T | ⌌ | Γ | ≥ |
| 3 | ♥ | !! | #  | 3 | C | S   | c | s | â | ô | ú | ⌌ | ⌌ | ⌌ | π | ≤ |
| 4 | ♦ | ⌌  | \$ | 4 | D | T   | d | t | ä | ö | ñ | ⌌ | ⌌ | ⌌ | Σ | ƒ |
| 5 | ♣ | §  | %  | 5 | E | U   | e | u | à | ò | Ñ | ⌌ | ⌌ | ⌌ | F | σ |
| 6 | ♠ | —  | &  | 6 | F | V   | f | v | å | û | õ | ⌌ | ⌌ | ⌌ | μ | ÷ |
| 7 | • | ↕  | '  | 7 | G | W   | w | w | ç | ù | Ö | ⌌ | ⌌ | ⌌ | τ | ≈ |
| 8 | ◼ | ↑  | (  | 8 | H | X   | h | x | ê | ÿ | ¿ | ⌌ | ⌌ | ⌌ | Φ | ° |
| 9 | ○ | ↓  | )  | 9 | I | Y   | i | y | ë | ö | ä | ⌌ | ⌌ | ⌌ | ⌌ | · |
| A | ◼ | →  | *  | : | J | Z   | j | z | è | Ü | Ä | ⌌ | ⌌ | ⌌ | Ω | · |
| B | ♂ | ←  | +  | ; | K | [   | k | { | ï | ø | ℓ | ⌌ | ⌌ | ⌌ | δ | √ |
| C | ♀ | L  | ,  | < | L | \   | l | l | î | £ | ñ | ⌌ | ⌌ | ⌌ | ∞ | ∞ |
| D | ♂ | ↔  | -  | = | M | ] m | } | } | ì | Ø | í | ⌌ | ⌌ | ⌌ | φ | 2 |
| E | ♂ | ▲  | .  | > | N | ^   | n | ~ | Ä | L | 3 | ⌌ | ⌌ | ⌌ | ε | ▪ |
| F | ☀ | ▼  | /  | ? | O | _   | o | ◊ | Å | ı | ı | ⌌ | ⌌ | ⌌ | ⌌ | ⌌ |

## IBM PC-8 (D/N) (373)

|   | 0 | 1  | 2  | 3 | 4 | 5   | 6 | 7 | 8 | 9 | A | B | C | D | E | F |
|---|---|----|----|---|---|-----|---|---|---|---|---|---|---|---|---|---|
| 0 |   | ►  |    | 0 | @ | P   | ` | p | Ç | É | á | ☐ | L | ⌌ | α | ≡ |
| 1 | ☺ | ◄  | !  | 1 | A | Q   | a | q | ü | æ | í | ☐ | ⌌ | ⌌ | β | ± |
| 2 | ☹ | ↕  | "  | 2 | B | R   | b | r | é | Æ | ó | ☐ | T | ⌌ | Γ | ≥ |
| 3 | ♥ | !! | #  | 3 | C | S   | c | s | â | ô | ú | ⌌ | ⌌ | ⌌ | π | ≤ |
| 4 | ♦ | ⌌  | \$ | 4 | D | T   | d | t | ä | ö | ñ | ⌌ | ⌌ | ⌌ | Σ | ƒ |
| 5 | ♣ | §  | %  | 5 | E | U   | e | u | à | ò | Ñ | ⌌ | ⌌ | ⌌ | F | σ |
| 6 | ♠ | —  | &  | 6 | F | V   | f | v | å | û | õ | ⌌ | ⌌ | ⌌ | μ | ÷ |
| 7 | • | ↕  | '  | 7 | G | W   | w | w | ç | ù | Ö | ⌌ | ⌌ | ⌌ | τ | ≈ |
| 8 | ◼ | ↑  | (  | 8 | H | X   | h | x | ê | ÿ | ¿ | ⌌ | ⌌ | ⌌ | Φ | ° |
| 9 | ○ | ↓  | )  | 9 | I | Y   | i | y | ë | ö | ä | ⌌ | ⌌ | ⌌ | ⌌ | · |
| A | ◼ | →  | *  | : | J | Z   | j | z | è | Ü | Ä | ⌌ | ⌌ | ⌌ | Ω | · |
| B | ♂ | ←  | +  | ; | K | [   | k | { | ï | ø | ℓ | ⌌ | ⌌ | ⌌ | δ | √ |
| C | ♀ | L  | ,  | < | L | \   | l | l | î | £ | ñ | ⌌ | ⌌ | ⌌ | ∞ | ∞ |
| D | ♂ | ↔  | -  | = | M | ] m | } | } | ì | Ø | í | ⌌ | ⌌ | ⌌ | φ | 2 |
| E | ♂ | ▲  | .  | > | N | ^   | n | ~ | Ä | L | 3 | ⌌ | ⌌ | ⌌ | ε | ▪ |
| F | ☀ | ▼  | /  | ? | O | _   | o | ◊ | Å | ı | ı | ⌌ | ⌌ | ⌌ | ⌌ | ⌌ |

IBM PC-850 (405)

|   | 0 | 1  | 2  | 3 | 4 | 5  | 6 | 7 | 8 | 9 | A | B | C | D | E | F  |
|---|---|----|----|---|---|----|---|---|---|---|---|---|---|---|---|----|
| 0 |   | ►  |    | 0 | @ | P  | ` | p | Ç | É | á | ☐ | L | ø | Ó | -  |
| 1 | ☺ | ◄  | !  | 1 | A | Q  | a | q | ü | æ | í | ☐ | ⊥ | Ð | ß | ±  |
| 2 | ↕ | ↕  | "  | 2 | B | R  | b | r | é | Æ | ó | ☐ | T | Ê | Ô | =  |
| 3 | ♥ | !! | #  | 3 | C | S  | c | s | â | ô | ú |   | ⊥ | È | Ò | ¾  |
| 4 | ♦ | ¶  | \$ | 4 | D | T  | d | t | ä | ö | ñ | ⊥ | ⊥ | È | ö | ¶  |
| 5 | ♣ | §  | %  | 5 | E | U  | e | u | à | ò | Ñ | Á | ⊥ | ı | Õ | §  |
| 6 | ♠ | —  | &  | 6 | F | V  | f | v | å | û | ª | À | ã | Í | μ | ÷  |
| 7 | • | ↑  | '  | 7 | G | W  | g | w | ç | ù | º | À | Ã | î | þ | ,  |
| 8 | ■ | ↑  | (  | 8 | H | X  | h | x | ê | ÿ | ¿ | © | ℒ | ï | þ | º  |
| 9 | ○ | ↓  | )  | 9 | I | Y  | i | y | ë | ö | ® | ℒ | ℒ | ı | Ú | .. |
| A | ☐ | →  | *  | : | J | Z  | j | z | è | Ü | ¬ |   | ⊥ | ı | Û | ·  |
| B | ♂ | ←  | +  | ; | K | [  | k | { | ï | ø | ½ | ⊥ | ⊥ | ■ | Û | ı  |
| C | ♀ | L  | ,  | < | L | \  | l |   | î | £ | ¼ | ⊥ | ⊥ | ■ | ý | ³  |
| D | ♪ | ↔  | -  | = | M | ]m | m | } | ì | Ø | ı | ¢ | = | ı | Ý | ²  |
| E | 🎵 | ▲  | .  | > | N | ^  | n | ~ | Ä | × | « | ¥ | ≠ | ı | - | ▪  |
| F | ☼ | ▼  | /  | ? | O | _  | o | △ | Å | f | » | ⊥ | α | ■ | , |    |

IBM PC-860 (30)

|   | 0 | 1  | 2  | 3 | 4 | 5  | 6 | 7 | 8 | 9 | A | B | C | D | E | F |
|---|---|----|----|---|---|----|---|---|---|---|---|---|---|---|---|---|
| 0 |   | ►  |    | 0 | @ | P  | ` | p | Ç | É | á | ☐ | L | ⊥ | α | ≡ |
| 1 | ☺ | ◄  | !  | 1 | A | Q  | a | q | ü | À | í | ☐ | ⊥ | ⊥ | ß | ± |
| 2 | ↕ | ↕  | "  | 2 | B | R  | b | r | é | È | ó | ☐ | T | ⊥ | Γ | ≥ |
| 3 | ♥ | !! | #  | 3 | C | S  | c | s | â | ô | ú |   | ⊥ | ⊥ | π | ≤ |
| 4 | ♦ | ¶  | \$ | 4 | D | T  | d | t | ä | ö | ñ | ⊥ | ⊥ | ⊥ | Σ | ı |
| 5 | ♣ | §  | %  | 5 | E | U  | e | u | à | ò | Ñ | ı | ⊥ | ⊥ | σ | J |
| 6 | ♠ | —  | &  | 6 | F | V  | f | v | Á | ú | ª | ⊥ | ⊥ | ⊥ | μ | ÷ |
| 7 | • | ↑  | '  | 7 | G | W  | g | w | Ç | ù | º | ⊥ | ⊥ | ⊥ | τ | ≈ |
| 8 | ■ | ↑  | (  | 8 | H | X  | h | x | é | ı | ¿ | ⊥ | ⊥ | ⊥ | Φ | º |
| 9 | ○ | ↓  | )  | 9 | I | Y  | i | y | Ê | Ö | ð | ⊥ | ⊥ | ⊥ | θ | • |
| A | ☐ | →  | *  | : | J | Z  | j | z | è | Ü | ¬ |   | ⊥ | ı | Ω | · |
| B | ♂ | ←  | +  | ; | K | [  | k | { | Í | ç | ½ | ⊥ | ⊥ | ■ | δ | √ |
| C | ♀ | L  | ,  | < | L | \  | l |   | Ô | £ | ¼ | ⊥ | ⊥ | ⊥ | ∞ | n |
| D | ♪ | ↔  | -  | = | M | ]m | m | } | İ | Û | ı | ⊥ | = | ı | φ | ² |
| E | 🎵 | ▲  | .  | > | N | ^  | n | ~ | Ã | ƒ | « | ı | ≠ | ⊥ | ε | ▪ |
| F | ☼ | ▼  | /  | ? | O | _  | o | △ | Â | Ó | » | ⊥ | ⊥ | ■ | ∪ |   |



IBM PC-863 (62)

|   | 0 | 1  | 2  | 3 | 4 | 5 | 6 | 7 | 8 | 9 | A | B  | C | D | E | F |
|---|---|----|----|---|---|---|---|---|---|---|---|----|---|---|---|---|
| 0 |   | ►  |    | 0 | @ | P | ` | p | Ç | É | ! | :: | L | ⌌ | α | ≡ |
| 1 | ☺ | ◄  | !  | 1 | A | Q | a | q | ü | Ê | ˘ | ⌘  | ⌒ | ⌒ | β | ± |
| 2 | ☹ | ↕  | "  | 2 | B | R | b | r | é | Ê | ó | ⌘  | T | π | Γ | ≥ |
| 3 | ♥ | !! | #  | 3 | C | S | c | s | â | ô | ú |    | ⌒ | ⌌ | π | ≤ |
| 4 | ♦ | ¶  | \$ | 4 | D | T | d | t | Â | Ê | ˘ | ⌒  | ⌒ | ⌒ | Σ | ⌒ |
| 5 | ♣ | §  | %  | 5 | E | U | e | u | à | ì | ˘ | ˘  | ⌒ | ⌒ | σ | ⌒ |
| 6 | ♠ | —  | &  | 6 | F | V | f | v | ¶ | ¶ | 3 | ⌒  | ⌒ | ⌒ | μ | ÷ |
| 7 | ● | ↕  | !  | 7 | G | W | g | w | Ç | ú | — | ⌒  | ⌒ | ⌒ | τ | ≈ |
| 8 | ◻ | ↑  | (  | 8 | H | X | h | x | ê | æ | î | ⌒  | ⌒ | ⌒ | Φ | ° |
| 9 | ◯ | ↓  | )  | 9 | I | Y | i | y | ë | ô | ⌒ | ⌒  | ⌒ | ⌒ | Θ | ● |
| A | ◼ | →  | *  | : | J | Z | j | z | è | ü | ˘ | ⌒  | ⌒ | ⌒ | Ω | · |
| B | ♂ | ←  | +  | ; | K | [ | k | { | ï | ç | ½ | ⌒  | ⌒ | ⌒ | δ | √ |
| C | ♀ | ⌒  | ,  | < | L | \ | l |   | î | é | ¼ | ⌒  | ⌒ | ⌒ | ∞ | n |
| D | ♪ | ↔  | -  | = | M | ] | m | } | — | À | ¾ | ⌒  | ⌒ | ⌒ | φ | ² |
| E | ♫ | ▲  | ·  | > | N | ^ | n | ~ | À | û | « | ⌒  | ⌒ | ⌒ | ε | ■ |
| F | ☼ | ▼  | /  | ? | O | _ | o | △ | Œ | ƒ | » | ⌒  | ⌒ | ⌒ | ∩ |   |

IBM PC-865 (94)

|   | 0 | 1  | 2  | 3 | 4 | 5 | 6 | 7 | 8 | 9  | A | B  | C | D | E | F |
|---|---|----|----|---|---|---|---|---|---|----|---|----|---|---|---|---|
| 0 |   | ►  |    | 0 | @ | P | ` | p | Ç | É  | á | :: | L | ⌌ | α | ≡ |
| 1 | ☺ | ◄  | !  | 1 | A | Q | a | q | ü | æ  | í | ⌘  | ⌒ | ⌒ | β | ± |
| 2 | ☹ | ↕  | "  | 2 | B | R | b | r | é | Æ  | ó | ⌘  | T | π | Γ | ≥ |
| 3 | ♥ | !! | #  | 3 | C | S | c | s | â | ô  | ú |    | ⌒ | ⌌ | π | ≤ |
| 4 | ♦ | ¶  | \$ | 4 | D | T | d | t | ä | ö  | ñ | ⌒  | ⌒ | ⌒ | Σ | ⌒ |
| 5 | ♣ | §  | %  | 5 | E | U | e | u | à | ò  | ñ | ⌒  | ⌒ | ⌒ | σ | ⌒ |
| 6 | ♠ | —  | &  | 6 | F | V | f | v | å | û  | a | ⌒  | ⌒ | ⌒ | μ | ÷ |
| 7 | ● | ↕  | !  | 7 | G | W | g | w | Ç | ú  | ° | ⌒  | ⌒ | ⌒ | τ | ≈ |
| 8 | ◻ | ↑  | (  | 8 | H | X | h | x | ê | ÿ  | ¿ | ⌒  | ⌒ | ⌒ | Φ | ° |
| 9 | ◯ | ↓  | )  | 9 | I | Y | i | y | ë | Ö  | ⌒ | ⌒  | ⌒ | ⌒ | Θ | ● |
| A | ◼ | →  | *  | : | J | Z | j | z | è | Ü  | ˘ | ⌒  | ⌒ | ⌒ | Ω | · |
| B | ♂ | ←  | +  | ; | K | [ | k | { | ï | ø  | ½ | ⌒  | ⌒ | ⌒ | δ | √ |
| C | ♀ | ⌒  | ,  | < | L | \ | l |   | î | ε  | ¼ | ⌒  | ⌒ | ⌒ | ∞ | n |
| D | ♪ | ↔  | -  | = | M | ] | m | } | ì | ø  | ı | ⌒  | ⌒ | ⌒ | φ | ² |
| E | ♫ | ▲  | ·  | > | N | ^ | n | ~ | Ä | Pt | « | ⌒  | ⌒ | ⌒ | ε | ■ |
| F | ☼ | ▼  | /  | ? | O | _ | o | △ | Å | ƒ  | » | ⌒  | ⌒ | ⌒ | ∩ |   |

## Diablo 630 Emulation (Mode 2)

To set the power-up emulation for Diablo 630, send the printing system the following PRESCRIBE command sequence:

```
!R! FRPO P1, 2; FRPO P3, 1; EXIT;
```

The Diablo uses ten symbol sets as shown below. To select one of these symbol sets, use the INTL command or the operator panel keys. Permanent setting of the symbol set is made with the FRPO U6 and U7 parameters.

The factory setting for the symbol set at power-up is IBM PC-8 for all emulation modes.

*Table 7.7. Diablo 630 Emulation Symbol Sets*

| Symbol set | Message display | FRPO commands           |
|------------|-----------------|-------------------------|
| US         | DIABLO US       | FRPO U6, 0; FRPO U7, 2; |
| France     | DIABLO France   | FRPO U6, 1; FRPO U7, 2; |
| Germany    | DIABLO Germany  | FRPO U6, 2; FRPO U7, 2; |
| UK         | DIABLO U.K.     | FRPO U6, 3; FRPO U7, 2; |
| Denmark    | DIABLO Denmark  | FRPO U6, 4; FRPO U7, 2; |
| Sweden     | DIABLO Sweden   | FRPO U6, 5; FRPO U7, 2; |
| Italy      | DIABLO Italy    | FRPO U6, 6; FRPO U7, 2; |
| Spain      | DIABLO Spain    | FRPO U6, 7; FRPO U7, 2; |
| Japan      | DIABLO Japan    | FRPO U6, 8; FRPO U7, 2; |
| US Legal   | US Legal        | FRPO U6, 9; FRPO U7, 2; |

The U0—U3 parameters of the FRPO command will be ignored in the Diablo emulation. The line and character spacing are always 6 lines and 10 characters per inch at power-up and after a reset.

In Diablo emulation, the printing system supports the embedded commands of word-processing software essentially the same way as the Diablo 630 printer does for the following features:

- Margins
- Horizontal and vertical tabulation
- Line and character spacing, including proportional spacing
- Half line feed, reverse line feed, and reverse half line feed
- Backspace and fine backspace
- Bold (shadow), double-strike, and underlining
- Graphics mode



**Note**

If you attempt to print beyond the right margin, the characters will not be printed.

A feature the printing system has that the Diablo does not is the landscape orientation. To print in landscape orientation, send the command SPO L; and select a landscape font.

*Example:*

To print in landscape, send the following command:

```
!R! SPO L; EXIT;
```

The automatic centering, justification and Hyplot mode of the Diablo printer are not supported.

Fonts can be selected by placing font commands in the file to be printed, or using SETF (set alternate font) and ALTF (change to alternate font) commands. To substitute scalable fonts for the embedded fonts using SETF command, employ the FSET command to apply the appropriate font number for that scalable font. The default font mode (FTMD) is 0, so the printing system will not adjust character spacing, line spacing, or page orientation.

The red/black ribbon feature of the Diablo 630 printer is implemented in an interesting way. The printing system translates the black ribbon command internally into an ALTF 0 command, and the red ribbon command into an ALTF 1 command. It also uses two pairs of SETF default values:

| Ribbon color | Simulated bitmap font | SETF default value |
|--------------|-----------------------|--------------------|
| Black        | CourierBM12-Roman     | SETF 0, 1;         |
| Red          | Dutch 801BM10-Roman   | SETF 1, 2;         |

Accordingly, if you use the embedded command that asks for red ribbon, you will get bitmap font 2, Dutch801BM10-Roman, which the printing system emulates using a resident scalable font. This font is proportionally spaced, so you should also specify proportional spacing with an embedded command. When you change back to black ribbon, the printing system changes to bitmap font 1, CourierBM12-Roman, also emulated using a scalable font.

With SETF commands you can select any two fonts you like which correspond to the black and red ribbons. For example, you can have black mean normal CGTimes and red mean CGTimes italicized. The appropriate setup is shown below, together with a short file and the printed result.

```
!R!

SFNT 'CGTimes', 10, 3000;
SFNT 'CGTimes-It', 10, 3001;
SETF 1, 3000; CMNT Red: 10-point CGTimes;
SETF 0, 3001; CMNT Black: 10-point CGTimes Italic;
EXIT;

^[A10,000 Maniacs: ^[BOur Time in Eden ^[A(Elektra)
^[AGarth Brooks: ^[BThe Chase ^[A(Liberty)
^[ARed Hot Chill Peppers: ^[BWhat Hits!? ^[A(EMI)
```

For red-ribbon, put ESC A (^[A in binary notation) at the point you would start to print in normal CGTimes, and put ESC B (^[B in binary notation) at the point to end using the font.

*Figure 7. 8. Diablo Font Printout*

```
10,000 Maniacs: Our Time in Eden (Elektra)
Garth Brooks: The Chase (Liberty)
Red Hot Chill Peppers: What Hits!? (EMI)
```

## Diablo 630 Control Codes

Table 7.9. *Diablo 630 Control Codes (Sheet 1 of 2)*

| Command    | Function                                 | Code (hex) | Supported |
|------------|------------------------------------------|------------|-----------|
| NUL        | Buffer code                              | 00         | Yes       |
| ETX        | End of text                              | 03         | Yes       |
| ACK        | Acknowledge                              | 06         | Yes       |
| BEL        | Sound bell                               | 07         | –         |
| BS         | Backspace                                | 08         | Yes       |
| HT         | Horizontal tab                           | 09         | Yes       |
| LF         | Line feed                                | 0A         | Yes       |
| VT         | Vertical tab                             | 0B         | Yes       |
| FF         | Form feed                                | 0C         | Yes       |
| CR         | Carriage return                          | 0D         | Yes       |
| SO         | Supplementary extended character set     | 0E         | –         |
| SI         | Primary extended character set           | 0F         | –         |
| DC1        | XON                                      | 11         | Yes       |
| DC2        | Enter printwheel table download mode     | 12         | –         |
| DC3        | XOFF                                     | 13         | Yes       |
| DC4        | Exit printwheel table download mode      | 14         | –         |
| NAK        | Printer error condition                  | 15         | Yes       |
| EM         | Access supplementary character set       | 19         | –         |
| DEL        | Same as NUL                              | 7F         | Yes       |
| ESC BS     | Backspace 1/120 inch                     | 1B 08      | Yes       |
| ESC HT n   | Absolute horizontal tab to column n      | 1B 09 n    | Yes       |
| ESC LF     | Reverse line feed                        | 1B 0A      | Yes       |
| ESC VT n   | Absolute vertical tab to line n          | 1B 0B n    | Yes       |
| ESC FF n   | Set n lines per page                     | 1B 0C n    | Yes       |
| ESC CR P   | Remote reset                             | 1B 0D 50   | Yes       |
| ESC SO DC2 | Enter printwheel table download mode     | 1B 0E 12   | –         |
| ESC SO M   | Enter program mode                       | 1B 0E 4D   | –         |
| ESC DC1 n  | Set offset to n                          | 1B 11 n    | Yes       |
| ESC SYN n  | Select printwheel type                   | 1B 16 n    | –         |
| ESC EM 1   | Upper cassette (for sheet 1)             | 1B 19 31   | Yes       |
| ESC EM 2   | Lower cassette (for sheet 2)             | 1B 19 32   | Yes       |
| ESC EM E   | Manual paper feed (for envelope)         | 1B 19 45   | Yes       |
| ESC EM R   | Eject page                               | 1B 19 52   | Yes       |
| ESC SUB SO | Memory test                              | 1B 1A 0E   | –         |
| ESC SUB 1  | Request status byte 1                    | 1B 1A 31   | –         |
| ESC SUB 3  | Request status byte 3                    | 1B 1A 33   | –         |
| ESC SUB I  | Initialize printer                       | 1B 1A 49   | Yes       |
| ESC SUB R  | Remote error reset                       | 1B 1A 52   | –         |
| ESC GS A   | Disable NAK error response from printer  | 1B 1D 41   | –         |
| ESC GS B   | Reenable NAK error response from printer | 1B 1D 42   | –         |
| ESC RS n   | Set (n-1)/48-inch line spacing           | 1B 1E n    | Yes       |
| ESC US n   | Set (n-1)/120-inch character spacing     | 1B 1F n    | Yes       |
| ESC %      | Increase carriage setting time           | 1B 25      | –         |
| ESC &      | Bold and shadow printing OFF             | 1B 26      | Yes       |
| ESC ,      | Set plot precision                       | 1B 2C      | –         |
| ESC -      | Set vertical tab at current position     | 1B 2D      | Yes       |
| ESC . n    | Change plot character                    | 1B 2E n    | –         |
| ESC /      | Auto backward printing ON                | 1B 2F      | –         |
| ESC \      | Auto backward printing OFF               | 1B 5C      | –         |
| ESC 0      | Set right margin at current position     | 1B 30      | Yes       |
| ESC 1      | Set horizontal tab at current position   | 1B 31      | Yes       |
| ESC 2      | Clear all vertical and horizontal tabs   | 1B 32      | Yes       |

Table 7.9. Diablo 630 Control Codes (Sheet 2 of 2)

| Command   | Function                                 | Code (hex) | Supported |
|-----------|------------------------------------------|------------|-----------|
| ESC 3     | Graphics mode ON                         | 1B 33      | Yes       |
| ESC 4     | Graphics mode OFF                        | 1B 34      | Yes       |
| ESC 5     | Forward printing mode                    | 1B 35      | Yes       |
| ESC 6     | Backward printing mode                   | 1B 36      | Yes       |
| ESC 7     | Print suppression                        | 1B 37      | –         |
| ESC 8     | Clear horizontal tab at current position | 1B 38      | Yes       |
| ESC 9     | Set left margin at current position      | 1B 39      | Yes       |
| ESC <     | Reverse printing mode ON                 | 1B 3C      | –         |
| ESC >     | Reverse printing mode OFF                | 1B 3E      | –         |
| ESC =     | Auto-center                              | 1B 3D      | –         |
| ESC ?     | Auto carriage return ON                  | 1B 3F      | Yes       |
| ESC !     | Auto carriage return OFF                 | 1B 21      | Yes       |
| ESC A     | Alternate font 1 (for red ribbon)        | 1B 41      | Yes       |
| ESC B     | Alternate font 0 (for black ribbon)      | 1B 42      | Yes       |
| ESC C     | Clear top and bottom margins             | 1B 43      | Yes       |
| ESC D     | Reverse half linefeed                    | 1B 44      | Yes       |
| ESC E     | Underline ON                             | 1B 45      | Yes       |
| ESC G     | Hyplot ON–absolute move                  | 1B 47      | –         |
| ESC G BEL | Hyplot ON–absolute plot                  | 1B 47 07   | –         |
| ESC L     | Set bottom margin at current position    | 1B 4C      | Yes       |
| ESC M     | Auto-justify                             | 1B 4D      | –         |
| ESC N     | Restore normal carriage settling time    | 1B 4E      | –         |
| ESC O     | Bold printing ON                         | 1B 4F      | Yes       |
| ESC P     | Proportional spacing ON                  | 1B 50      | Yes       |
| ESC Q     | Proportional spacing OFF                 | 1B 51      | Yes       |
| ESC R     | Underline OFF                            | 1B 52      | Yes       |
| ESC S     | Reset character spacing                  | 1B 53      | Yes       |
| ESC T     | Set top margin at current position       | 1B 54      | Yes       |
| ESC U     | Half linefeed                            | 1B 55      | Yes       |
| ESC V     | Hyplot ON–relative move                  | 1B 56      | –         |
| ESC V BEL | Hyplot–relative plot                     | 1B 56 07   | –         |
| ESC W     | Shadow printing ON                       | 1B 57      | Yes       |
| ESC X     | Bold, shadow, and underline OFF          | 1B 58      | Yes       |
| ESC Y     | Printwheel spoke-0 character             | 1B 59      | –         |
| ESC Z     | Printwheel spoke-95 character            | 1B 5A      | –         |

Diablo 630 Symbol Sets

DIABLO US (29)

|   | 0 | 1 | 2  | 3 | 4 | 5 | 6 | 7 | 8 | 9 | A | B | C | D | E | F |
|---|---|---|----|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 |   |   |    | 0 | @ | P | ` | p |   |   |   | — | à | Å | Á | Ð |
| 1 |   |   | !  | 1 | A | Q | a | q |   |   | À | Ý | é | î | Ã | þ |
| 2 |   |   | "  | 2 | B | R | b | r |   |   | Â | Ý | ô | ø | ä | · |
| 3 |   |   | #  | 3 | C | S | c | s |   |   | Ê | ° | û | Æ | Ð | μ |
| 4 |   |   | \$ | 4 | D | T | d | t |   |   | Ê | Ç | á | å | ð | ¶ |
| 5 |   |   | %  | 5 | E | U | e | u |   |   | Ë | Ç | é | í | í | ¾ |
| 6 |   |   | &  | 6 | F | V | f | v |   |   | Î | Ñ | ó | ø | î | — |
| 7 |   |   | '  | 7 | G | W | g | w |   |   | Ï | ñ | ú | æ | ó | ¼ |
| 8 |   |   | (  | 8 | H | X | h | x |   |   | ˆ | ı | à | À | Ö | ½ |
| 9 |   |   | )  | 9 | I | Y | i | y |   |   | ˆ | ı | è | ì | Õ | ¾ |
| A |   |   | *  | : | J | Z | j | z |   |   | ˆ | ı | ò | Ö | ö | ° |
| B |   |   | +  | ; | K | [ | k | { |   |   | ˆ | ı | ä | Ä | ä | ■ |
| C |   |   | /  | < | L | \ | l |   |   |   | ˆ | ı | ä | Ä | ä | ■ |
| D |   |   | -  | = | M | ] | m | } |   |   | ˆ | ı | ä | Ä | ä | ■ |
| E |   |   | ·  | > | N | ^ | n | ~ |   |   | ˆ | ı | ä | Ä | ä | ■ |
| F |   |   | /  | ? | O | _ | o |   |   |   | ˆ | ı | ä | Ä | ä | ■ |

Diablo France (61)

|   | 0 | 1 | 2  | 3 | 4 | 5 | 6 | 7 | 8 | 9 | A | B | C | D | E | F |
|---|---|---|----|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 |   |   |    | 0 | à | P | ` | p |   |   |   | — | à | À | Á | Ð |
| 1 |   |   | !  | 1 | A | Q | a | q |   |   | À | Ý | é | î | Ã | þ |
| 2 |   |   | "  | 2 | B | R | b | r |   |   | Â | Ý | ô | ø | ä | · |
| 3 |   |   | £  | 3 | C | S | c | s |   |   | Ê | ° | û | Æ | Ð | μ |
| 4 |   |   | \$ | 4 | D | T | d | t |   |   | Ê | Ç | á | å | ð | ¶ |
| 5 |   |   | %  | 5 | E | U | e | u |   |   | Ë | Ç | é | í | í | ¾ |
| 6 |   |   | &  | 6 | F | V | f | v |   |   | Î | Ñ | ó | ø | î | — |
| 7 |   |   | '  | 7 | G | W | g | w |   |   | Ï | ñ | ú | æ | ó | ¼ |
| 8 |   |   | (  | 8 | H | X | h | x |   |   | ˆ | ı | à | À | Ö | ½ |
| 9 |   |   | )  | 9 | I | Y | i | y |   |   | ˆ | ı | è | ì | Õ | ¾ |
| A |   |   | *  | : | J | Z | j | z |   |   | ˆ | ı | ò | Ö | ö | ° |
| B |   |   | +  | ; | K | ° | k | é |   |   | ˆ | ı | ä | Ä | ä | ■ |
| C |   |   | /  | < | L | Ç | l | ù |   |   | ˆ | ı | ä | Ä | ä | ■ |
| D |   |   | -  | = | M | § | m | è |   |   | ˆ | ı | ä | Ä | ä | ■ |
| E |   |   | ·  | > | N | ^ | n | " |   |   | ˆ | ı | ä | Ä | ä | ■ |
| F |   |   | /  | ? | O | _ | o |   |   |   | ˆ | ı | ä | Ä | ä | ■ |

Diablo U. K. (125)

|   | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | A | B | C | D | E | F |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 |   |   |   | 0 | @ | P | ` | p |   |   |   | — | â | Å | Á | Ð |
| 1 |   |   | ! | 1 | A | Q | a | q |   |   | À | Ý | ê | î | Ã | Þ |
| 2 |   |   | " | 2 | B | R | b | r |   |   | Â | Ý | ô | ø | ä | · |
| 3 |   |   | £ | 3 | C | S | c | s |   |   | Ê | ° | û | Æ | Ð | μ |
| 4 |   |   | § | 4 | D | T | d | t |   |   | Ê | Ç | á | à | ð | ¶ |
| 5 |   |   | % | 5 | E | U | e | u |   |   | Ë | Ç | é | í | ¼ |   |
| 6 |   |   | & | 6 | F | V | f | v |   |   | Î | Ñ | ó | ø | ì | — |
| 7 |   |   | ' | 7 | G | W | g | w |   |   | Ï | ñ | ú | æ | ó | ½ |
| 8 |   |   | ( | 8 | H | X | h | x |   |   | ˆ | ı | à | À | Ò | ½ |
| 9 |   |   | ) | 9 | I | Y | i | y |   |   | ˘ | ı | è | ì | Ö | a |
| A |   |   | * | : | J | Z | j | z |   |   | ˆ | œ | ò | ö | ö | ° |
| B |   |   | + | ; | K | [ | k | { |   |   | " | £ | ù | Û | Š | « |
| C |   |   | , | < | L | \ | l |   |   |   | ˜ | ¥ | ä | É | š | ■ |
| D |   |   | - | = | M | ] | m | } |   |   | Û | š | ë | ï | ú | » |
| E |   |   | · | > | N | ^ | n | — |   |   | Û | f | ö | ß | ÿ | ± |
| F |   |   | / | ? | O | _ | o | ☒ |   |   | £ | ç | ü | Ô | ÿ |   |

Diablo Germany (93)

|   | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | A | B | C | D | E | F |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 |   |   |   | 0 | ß | P | ` | p |   |   |   | — | â | Å | Á | Ð |
| 1 |   |   | ! | 1 | A | Q | a | q |   |   | À | Ý | ê | î | Ã | Þ |
| 2 |   |   | " | 2 | B | R | b | r |   |   | Â | Ý | ô | ø | ä | · |
| 3 |   |   | £ | 3 | C | S | c | s |   |   | Ê | ° | û | Æ | Ð | μ |
| 4 |   |   | § | 4 | D | T | d | t |   |   | Ê | Ç | á | à | ð | ¶ |
| 5 |   |   | % | 5 | E | U | e | u |   |   | Ë | Ç | é | í | ¼ |   |
| 6 |   |   | & | 6 | F | V | f | v |   |   | Î | Ñ | ó | ø | ì | — |
| 7 |   |   | ' | 7 | G | W | g | w |   |   | Ï | ñ | ú | æ | ó | ½ |
| 8 |   |   | ( | 8 | H | X | h | x |   |   | ˆ | ı | à | À | Ò | ½ |
| 9 |   |   | ) | 9 | I | Y | i | y |   |   | ˘ | ı | è | ì | Ö | a |
| A |   |   | * | : | J | Z | j | z |   |   | ˆ | œ | ò | ö | ö | ° |
| B |   |   | + | ; | K | Ä | k | ä |   |   | " | £ | ù | Û | Š | « |
| C |   |   | , | < | L | Ö | l | ö |   |   | ˜ | ¥ | ä | É | š | ■ |
| D |   |   | - | = | M | Ü | m | ü |   |   | Û | š | ë | ï | ú | » |
| E |   |   | · | > | N | ^ | n | ~ |   |   | Û | f | ö | ß | ÿ | ± |
| F |   |   | / | ? | O | _ | o | ☒ |   |   | £ | ç | ü | Ô | ÿ |   |

Diablo Denmark (157)

|   | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | A | B | C | D | E | F |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 |   |   |   | 0 | @ | P | ` | p |   |   |   | — | à | Á | À | Ā |
| 1 |   |   | ! | 1 | A | Q | a | q |   |   | À | Ý | é | î | Ã | Ḑ |
| 2 |   |   | " | 2 | B | R | b | r |   |   | Á | Ý | ô | ø | ă | · |
| 3 |   |   | £ | 3 | C | S | c | s |   |   | È | o | û | Æ | Đ | μ |
| 4 |   |   | § | 4 | D | T | d | t |   |   | Ê | ç | á | å | ð | ¶ |
| 5 |   |   | % | 5 | E | U | e | u |   |   | Ě | ç | é | í | í | ¼ |
| 6 |   |   | & | 6 | F | V | f | v |   |   | Ħ | ñ | ó | ø | ì | — |
| 7 |   |   | ' | 7 | G | W | g | w |   |   | İ | ñ | ú | æ | ó | ¾ |
| 8 |   |   | ( | 8 | H | X | h | x |   |   | ˆ | ı | à | Ä | ò | ½ |
| 9 |   |   | ) | 9 | I | Y | i | Y |   |   | ˘ | ı | è | ì | õ | ª |
| A |   |   | * | : | J | Z | j | z |   |   | ˆ | ø | ò | ö | ö | º |
| B |   |   | + | ; | K | Æ | k | æ |   |   | " | £ | ù | ű | š | « |
| C |   |   | , | < | L | Ø | l | ø |   |   | ˜ | ¥ | à | é | š | ■ |
| D |   |   | - | = | M | Å | m | å |   |   | ˜ | £ | è | ı | ú | » |
| E |   |   | . | > | N | ^ | n | ~ |   |   | û | f | ö | Û | ÿ | ± |
| F |   |   | / | ? | O | — | O | ☒ |   |   | £ | ç | ü | ô | ÿ |   |

Diablo Sweden (189)

|   | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | A | B | C | D | E | F |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 |   |   |   | 0 | @ | P | ` | p |   |   |   | — | â | Á | Á | Ð |
| 1 |   |   | ! | 1 | A | Q | a | q |   |   | À | ý | é | í | Ã | þ |
| 2 |   |   | " | 2 | B | R | b | r |   |   | Á | Ý | ô | ø | ä | · |
| 3 |   |   | # | 3 | C | S | c | s |   |   | Ê | ó | û | æ | ð | μ |
| 4 |   |   | § | 4 | D | T | d | t |   |   | Ê | ç | á | ä | ö | ¶ |
| 5 |   |   | % | 5 | E | U | e | u |   |   | Ë | ç | é | í | í | ¼ |
| 6 |   |   | & | 6 | F | V | f | v |   |   | Ĥ | ñ | ó | ø | ì | — |
| 7 |   |   | ' | 7 | G | W | g | w |   |   | İ | ñ | ú | æ | ó | ¾ |
| 8 |   |   | ( | 8 | H | X | h | x |   |   | ˆ | ı | à | Ä | Ò | ½ |
| 9 |   |   | ) | 9 | I | Y | i | Y |   |   | ˘ | ı | è | ì | Ö | ˆ |
| A |   |   | * | : | J | Z | j | z |   |   | ˘ | ı | ò | ö | ö | ˆ |
| B |   |   | + | ; | K | Ä | k | à |   |   | " | ı | ù | Ü | Š | « |
| C |   |   | , | < | L | Ö | l | ö |   |   | ˘ | ı | à | É | š | ■ |
| D |   |   | - | = | M | Å | m | å |   |   | ˘ | ı | ò | ö | ö | ˆ |
| E |   |   | . | > | N | ^ | n | ~ |   |   | ˘ | ı | ò | ö | ö | ˆ |
| F |   |   | / | ? | O | — |   |   |   |   | ˘ | ı | ò | ö | ö | ˆ |



# Diablo Spain (253)

|   | 0  | 1  | 2  | 3  | 4  | 5  | 6   | 7   | 8   | 9   | A   | B   | C   | D   | E   | F   |
|---|----|----|----|----|----|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 0 | 0  | 16 | 32 | 48 | 64 | 80 | 96  | 112 | 128 | 144 | 160 | 176 | 192 | 208 | 224 | 240 |
| 1 | 1  | 17 | 33 | 49 | 65 | 81 | 97  | 113 | 129 | 145 | 161 | 177 | 193 | 209 | 225 | 241 |
| 2 | 2  | 18 | 34 | 50 | 66 | 82 | 98  | 114 | 130 | 146 | 162 | 178 | 194 | 210 | 226 | 242 |
| 3 | 3  | 19 | 35 | 51 | 67 | 83 | 99  | 115 | 131 | 147 | 163 | 179 | 195 | 211 | 227 | 243 |
| 4 | 4  | 20 | 36 | 52 | 68 | 84 | 100 | 116 | 132 | 148 | 164 | 180 | 196 | 212 | 228 | 244 |
| 5 | 5  | 21 | 37 | 53 | 69 | 85 | 101 | 117 | 133 | 149 | 165 | 181 | 197 | 213 | 229 | 245 |
| 6 | 6  | 22 | 38 | 54 | 70 | 86 | 102 | 118 | 134 | 150 | 166 | 182 | 198 | 214 | 230 | 246 |
| 7 | 7  | 23 | 39 | 55 | 71 | 87 | 103 | 119 | 135 | 151 | 167 | 183 | 199 | 215 | 231 | 247 |
| 8 | 8  | 24 | 40 | 56 | 72 | 88 | 104 | 120 | 136 | 152 | 168 | 184 | 200 | 216 | 232 | 248 |
| 9 | 9  | 25 | 41 | 57 | 73 | 89 | 105 | 121 | 137 | 153 | 169 | 185 | 201 | 217 | 233 | 249 |
| A | 10 | 26 | 42 | 58 | 74 | 90 | 106 | 122 | 138 | 154 | 170 | 186 | 202 | 218 | 234 | 250 |
| B | 11 | 27 | 43 | 59 | 75 | 91 | 107 | 123 | 139 | 155 | 171 | 187 | 203 | 219 | 235 | 251 |
| C | 12 | 28 | 44 | 60 | 76 | 92 | 108 | 124 | 140 | 156 | 172 | 188 | 204 | 220 | 236 | 252 |
| D | 13 | 29 | 45 | 61 | 77 | 93 | 109 | 125 | 141 | 157 | 173 | 189 | 205 | 221 | 237 | 253 |
| E | 14 | 30 | 46 | 62 | 78 | 94 | 110 | 126 | 142 | 158 | 174 | 190 | 206 | 222 | 238 | 254 |
| F | 15 | 31 | 47 | 63 | 79 | 95 | 111 | 127 | 143 | 159 | 175 | 191 | 207 | 223 | 239 | 255 |

# Diablo Italy (221)

|   | 0  | 1  | 2  | 3  | 4  | 5  | 6   | 7   | 8   | 9   | A   | B   | C   | D   | E   | F   |
|---|----|----|----|----|----|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 0 | 0  | 16 | 32 | 48 | 64 | 80 | 96  | 112 | 128 | 144 | 160 | 176 | 192 | 208 | 224 | 240 |
| 1 | 1  | 17 | 33 | 49 | 65 | 81 | 97  | 113 | 129 | 145 | 161 | 177 | 193 | 209 | 225 | 241 |
| 2 | 2  | 18 | 34 | 50 | 66 | 82 | 98  | 114 | 130 | 146 | 162 | 178 | 194 | 210 | 226 | 242 |
| 3 | 3  | 19 | 35 | 51 | 67 | 83 | 99  | 115 | 131 | 147 | 163 | 179 | 195 | 211 | 227 | 243 |
| 4 | 4  | 20 | 36 | 52 | 68 | 84 | 100 | 116 | 132 | 148 | 164 | 180 | 196 | 212 | 228 | 244 |
| 5 | 5  | 21 | 37 | 53 | 69 | 85 | 101 | 117 | 133 | 149 | 165 | 181 | 197 | 213 | 229 | 245 |
| 6 | 6  | 22 | 38 | 54 | 70 | 86 | 102 | 118 | 134 | 150 | 166 | 182 | 198 | 214 | 230 | 246 |
| 7 | 7  | 23 | 39 | 55 | 71 | 87 | 103 | 119 | 135 | 151 | 167 | 183 | 199 | 215 | 231 | 247 |
| 8 | 8  | 24 | 40 | 56 | 72 | 88 | 104 | 120 | 136 | 152 | 168 | 184 | 200 | 216 | 232 | 248 |
| 9 | 9  | 25 | 41 | 57 | 73 | 89 | 105 | 121 | 137 | 153 | 169 | 185 | 201 | 217 | 233 | 249 |
| A | 10 | 26 | 42 | 58 | 74 | 90 | 106 | 122 | 138 | 154 | 170 | 186 | 202 | 218 | 234 | 250 |
| B | 11 | 27 | 43 | 59 | 75 | 91 | 107 | 123 | 139 | 155 | 171 | 187 | 203 | 219 | 235 | 251 |
| C | 12 | 28 | 44 | 60 | 76 | 92 | 108 | 124 | 140 | 156 | 172 | 188 | 204 | 220 | 236 | 252 |
| D | 13 | 29 | 45 | 61 | 77 | 93 | 109 | 125 | 141 | 157 | 173 | 189 | 205 | 221 | 237 | 253 |
| E | 14 | 30 | 46 | 62 | 78 | 94 | 110 | 126 | 142 | 158 | 174 | 190 | 206 | 222 | 238 | 254 |
| F | 15 | 31 | 47 | 63 | 79 | 95 | 111 | 127 | 143 | 159 | 175 | 191 | 207 | 223 | 239 | 255 |

Diablo Japan (285)

|   | 0 | 1  | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | A | B | C | D | E | F |
|---|---|----|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 |   |    |   | 0 | @ | P | ` | p |   |   |   | — | â | À | Á | Ð |
| 1 |   | !  | 1 | A | Q | a | q |   |   |   | À | ý | ê | í | Ã | þ |
| 2 |   |    | " | 2 | B | R | b | r |   |   | Â | ý | ô | ø | ä | · |
| 3 |   |    | # | 3 | C | S | c | s |   |   | È | ° | û | Æ | Ð | μ |
| 4 |   | \$ | 4 | D | T | d | t |   |   |   | Ê | ç | á | å | ð | ¶ |
| 5 |   |    | % | 5 | E | U | e | u |   |   | Ě | ç | é | í | ı | ¼ |
| 6 |   |    | & | 6 | F | V | f | v |   |   | Î | ñ | ó | ø | î | — |
| 7 |   |    | ' | 7 | G | W | g | w |   |   | İ | ñ | ú | æ | ó | ¾ |
| 8 |   |    | ( | 8 | H | X | h | x |   |   | ˆ | i | à | Ä | Ò | ½ |
| 9 |   |    | ) | 9 | I | Y | i | y |   |   | ˘ | ı | è | İ | Õ | ª |
| A |   | *  | : | J | Z | j | z |   |   |   | ˆ | α | ò | Ö | õ | º |
| B |   | +  | ; | K | [ | k | { |   |   |   | " | ε | ù | Ü | š | « |
| C |   |    | < | L | ¥ | l |   |   |   |   | ~ | ¥ | ä | Ĥ | š | ■ |
| D |   | -  | = | M | ] | m | } |   |   |   | Û | s | ë | İ | Ů | » |
| E |   | .  | > | N | ^ | n | ~ |   |   |   | Û | f | ö | ß | ÿ | ± |
| F |   | /  | ? | O | _ | o |   |   |   |   | £ | ç | ü | Ô | ÿ |   |

# Epson LQ-850 Emulation (Mode 5)

To set printing system to power up in the LQ-850 emulation with the LQ German symbol set, command:

```
!R! FRPO P1, 5; FRPO P3, 2; FRPO U6, 2; EXIT;
```

The Epson LQ-850 emulation uses 13 symbol sets that include both plain and italic characters. The desired symbol set can be selected with the U6 parameter of the FRPO command or changed temporarily with the INTL command or from the operator panel keys.

The Epson LQ-850 supports the following Epson symbol sets. Tables of the basic symbols are given at the end of this section.

The factory setting for the symbol set at power-up is IBM PC-8 for all emulation modes.

*Table 7.10. Epson LQ-850 Emulation Symbol Sets*

| Symbol set    | Message display | FRPO commands            |
|---------------|-----------------|--------------------------|
| U.S.A.        | LQ US           | FRPO U6, 0; FRPO U7, 0;  |
| France        | LQ France       | FRPO U6, 1; FRPO U7, 0;  |
| Germany       | LQ Germany      | FRPO U6, 2; FRPO U7, 0;  |
| U.K.          | LQ U.K.         | FRPO U6, 3; FRPO U7, 0;  |
| Denmark 1     | LQ Denmark      | FRPO U6, 4; FRPO U7, 0;  |
| Sweden        | LQ Sweden       | FRPO U6, 5; FRPO U7, 0;  |
| Italy         | LQ Italy        | FRPO U6, 6; FRPO U7, 0;  |
| Spain 1       | LQ Spain        | FRPO U6, 7; FRPO U7, 0;  |
| Japan         | LQ Japan        | FRPO U6, 8; FRPO U7, 0;  |
| Norway        | LQ Norway       | FRPO U6, 14; FRPO U7, 0; |
| Denmark II    | LQ Denmark2     | FRPO U6, 15; FRPO U7, 0; |
| Spain II      | LQ Spain2       | FRPO U6, 16; FRPO U7, 0; |
| Latin America | Latin America   | FRPO U6, 17; FRPO U7, 0; |

The printing system supports the Epson graphics character sets (code page tables) of PC 437 (Epson Extended Graphics), PC 850 (Multilingual), PC 860 (Portugal), PC 863 (Canada-French), and PC 865 (Norway). These sets are available only through the use of Epson control codes. Another Epson control code also provides the US Legal character set. The Korean character set is not supported.

When power is first switched on or after a reset, the printing system always defaults in the Courier font (10 cpi). This default font emulates LQ-850's Draft, 10 cpi and cannot be changed for the LQ-850 emulation.

The printing system also emulates the other four LQ-850 fonts (five in all). These fonts can be selected by embedded commands in the word processing software or using an Epson LQ-850 printer driver. Double-wide and double-high effects are available for all five fonts.

Figure 7.11. Epson LQ-850 Font Printout

This is Draft/Epson Courier font, 10 cpi. Various and condensed pitches are available.

This is Epson Roman, 10 cpi.

This is Epson Sans Serif, 10 cpi.

This is Epson Prestige, 10 cpi.

LQ-850 word processing capabilities include *italicization* at the press of a key, plus **emphasized** print and **double-strike** print, superscripts <sup>(1)</sup> and subscripts <sub>(2)</sub>, underlining and overlining, ~~strike-through~~, **DOUBLE-WIDE**,

**DOUBLE-HIGH**, and even

**DOUBLE-WIDE AND HIGH!**

The five LQ-850 fonts actually use the printing system's resident fonts. The font mode in the Epson emulation is 0. (The printing system does not automatically adjust character spacing.) If you do not need exact character spacing, you can improve the appearance of these fonts by changing to font mode 13. The printing system generates double-wide and double-high effects for these emulating fonts.

To use other printing system fonts, select them with font commands (FONT, SFNT, and FSET). Since the printing system emulates certain LQ-850 fonts in different spacings by using the same resident font, it should be noted that substituting one font will also change the other fonts emulated by that font. For example, if you change the Draft 15 cpi font which is emulated by the PrestigeEliteBM7.2-Roman font, this will also affect the other 15 cpi LQ-850 fonts using the same ALTF 7; setting.

Table 7.12. Epson LQ-850 Fonts (Sheet 1 of 2)

| Font name           | Character spacing                        | ALTF No. |
|---------------------|------------------------------------------|----------|
| Draft/Epson Courier | 10 cpi, Proportional                     | 0        |
|                     | 12 cpi                                   | 1        |
|                     | 15 cpi                                   | 7        |
|                     | Condensed 10 cpi                         | 8        |
|                     | Condensed 12 cpi, Condensed proportional | 9        |
| Epson Roman         | 10 cpi, proportional                     | 2        |
|                     | 12 cpi                                   | 3        |
|                     | 15 cpi                                   | 7        |
|                     | Condensed 10 cpi                         | 8        |
|                     | Condensed 12 cpi, Condensed proportional | 9        |
| Epson Sans Serif    | 10 cpi, 12 cpi, proportional             | 4        |
|                     | 15 cpi                                   | 5        |
|                     | Condensed 10 cpi                         | 8        |
|                     | Condensed 12 cpi, Condensed proportional | 9        |

Table 7.12. Epson LQ-850 Fonts (Sheet 2 of 2)

| Font name      | Character spacing                        | ALTF No. |
|----------------|------------------------------------------|----------|
| Epson Prestige | 10 cpi, 12 cpi, Proportional             | 6        |
|                | 15 cpi                                   | 7        |
|                | Condensed 10 cpi                         | 8        |
|                | Condensed 12 cpi, Condensed proportional | 9        |

You can alter these default SETF assignments to suit your own purposes. In the example below, four of the SETF assignments are changed to proportional fonts, and the font mode is changed to 15. The sample text is then printed by selecting pica for the title, elite for the first paragraph, compressed for the second paragraph, compressed elite for the third paragraph, and elite for the last paragraph.

```
!R! SETF 0, 12; CMNT Draft 10cpi: Swiss721BM12-Bold;
      SETF 1, 2; CMNT Draft 12cpi: Dutch801BM10-Roman;
      SETF 7, 13; CMNT Draft 15cpi: Swiss721BM8-Roman;
      SETF 8, 14; CMNT Condensed 10cpi: Swiss721BM6-Roman;
EXIT;
```

To select a scalable font for the SETF assignments, first assign a font number to the scalable font by sending the command SFNT commands to the printing system as shown below. The font number assigned should not duplicate a number already in use.

```
!R! SFNT 'Swiss742SWC-Bold', 12, 3000, 277, 1, 0;
      SFNT 'Dutch801SWC-Roman', 10, 3001, 277, 1, 0;
      SFNT 'Swiss742SWC-Roman', 8, 3002, 277, 1, 0;
      SFNT 'Swiss742SWC-Roman', 6, 3003, 277, 1, 0;
EXIT;
```

All option parameters for SFNT (including *symbol-set*, *compression*, and *angle*) are required for assigning font numbers to a scalable font when altering the SETF assignments for the Epson emulation.

Landscape printing is possible in the LQ-850 mode. If you send the command !R! SPOL; EXIT; the printing system rotates fonts and prints them in landscape orientation.

In portrait orientation, the printing system supports Epson bit-image graphics, so with graphics software for the LQ-850 printer, you can use it to print charts, graphs, and pictures. The 9-bit graphics mode is also supported.

If you attempt to print beyond the right margin, the characters wrap around and are printed on the next line.

## EPSON LQ-850 Control Codes

Table 7.13. Epson LQ-850 Control Codes

| Command                               | Function                              | Code (hex) | Supported |
|---------------------------------------|---------------------------------------|------------|-----------|
| <b>Printer Operation</b>              |                                       |            |           |
| ESC @                                 | Initialize Printer                    | 1B 40      | Yes       |
| DC 1                                  | Select Printer                        | 11         | –         |
| DC 3                                  | Deselect Printer                      | 13         | –         |
| DEL                                   | Delete Character                      | 7F         | –         |
| ESC <                                 | Select Unidirectional Mode (one line) | 1B 3C      | Yes       |
| ESC U n                               | Turn Unidirectional Mode On/Off       | 1B 55      | –         |
| <b>MSB Control</b>                    |                                       |            |           |
| ESC EM n                              | Control Cut Sheet Feeder              | 1B 19      | –         |
| ESC =                                 | Set MSB to 0                          | 1B 3D      | Yes       |
| ESC >                                 | Set MSB to 1                          | 1B 3E      | Yes       |
| ESC #                                 | Cancel MSB Control                    | 1B 35      | Yes       |
| <b>Data Control</b>                   |                                       |            |           |
| BEL                                   | Beeper                                | 07         | –         |
| CR                                    | Carriage Return                       | 0D         | Yes       |
| CAN                                   | Cancel Line                           | 18         | –         |
| <b>Vertical Motion</b>                |                                       |            |           |
| FF                                    | Form feed                             | 0C         | Yes       |
| ESC C n                               | Set Page Length in Lines              | 1B 43      | Yes       |
| ESC C null n                          | Set Page Length in Inches             | 1B 43 00   | Yes       |
| ESC N n                               | Set Skip Over Perforation             | 1B 4E      | Yes       |
| ESC O                                 | Cancel Skip Over Perforation          | 1B 4F      | Yes       |
| LF                                    | Line Feed                             | 0A         | Yes       |
| ESC + n                               | Set n/360-inch Line Spacing           | 1B 2B      | Yes       |
| ESC 0                                 | Select 1/8-inch Line Spacing          | 1B 30      | Yes       |
| ESC 2                                 | Select 1/6-inch Line Spacing          | 1B 32      | Yes       |
| ESC 3 n                               | Set n/180-inch Line Spacing           | 1B 33      | Yes       |
| ESC A n                               | Set n/60-inch Line Spacing            | 1B 41      | Yes       |
| ESC J n                               | Perform n/180-inch Line Feed          | 1B 4A      | Yes       |
| VT                                    | Tab Vertically                        | 0B         | Yes       |
| ESC B n1 n2...n16 null                | Set Vertical Tabs                     | 1B 42      | Yes       |
| ESC b n1 n2...n16 null                | Set Vertical Tabs in Channels         | 1B 62      | Yes       |
| ESC / n                               | Select Vertical Tab Channel           | 1B 2F      | Yes       |
| <b>Horizontal Motion</b>              |                                       |            |           |
| ESC I n                               | Set Left Margin                       | 1B 6C      | Yes       |
| ESC Q n                               | Set Right Margin                      | 1B 51      | Yes       |
| BS                                    | Backspace                             | 08         | Yes       |
| ESC \$ n1 n2                          | Set Absolute Print Position           | 1B 24      | Yes       |
| ESC \ n1 n2                           | Set Relative Print Position           | 1B 5C      | Yes       |
| HT                                    | Tab Horizontally                      | 09         | Yes       |
| ESC D n1 n2...n32 null                | Set Horizontal Tabs                   | 1B 44      | Yes       |
| <b>Overall Printing Style</b>         |                                       |            |           |
| ESC I n                               | Set Left Margin                       | 1B 6C      | Yes       |
| ESC Q n                               | Set Right Margin                      | 1B 51      | Yes       |
| BS                                    | Backspace                             | 08         | Yes       |
| ESC \$ n1 n2                          | Set Absolute Print Position           | 1B 24      | Yes       |
| ESC \ n1 n2                           | Set Relative Print Position           | 1B 5C      | Yes       |
| HT                                    | Tab Horizontally                      | 09         | Yes       |
| ESC D n1 n2...n32 null                | Set Horizontal Tabs                   | 1B 44      | Yes       |
| <b>Print Size and Character Width</b> |                                       |            |           |
| ESC P                                 | Select 10 CPI                         | 1B 50      | Yes       |

Table 7.13. Epson LQ-850 Control Codes

| Command                        | Function                                       | Code (hex) | Supported |
|--------------------------------|------------------------------------------------|------------|-----------|
| ESC M                          | Select 12 CPI                                  | 1B 4D      | Yes       |
| ESC g                          | Select 15 CPI                                  | 1B 67      | Yes       |
| ESC p n                        | Turn Proportional Mode On/Off                  | 1B 70      | Yes       |
| SI                             | Select Condensed Mode                          | 0F         | Yes       |
| ESC SI                         | Select Condensed Mode                          | 1B 0F      | Yes       |
| DC2                            | Cancel Condensed Mode                          | 12         | Yes       |
| SO                             | Select Double-wide Mode (one line)             | 0E         | Yes       |
| ESC SO                         | Select Double-wide Mode (one line)             | 1B 0E      | Yes       |
| ESC W n                        | Turn Double-wide Mode On/Off                   | 1B 57      | Yes       |
| DC4                            | Cancel Double-wide Mode (one line)             | 14         | Yes       |
| ESC w n                        | Turn Double-high Mode On/Off                   | 1B 77      | Yes       |
| <b>Print Enhancement</b>       |                                                |            |           |
| ESC E                          | Select Emphasized Mode                         | 1B 45      | Yes       |
| ESC F                          | Cancel Emphasized Mode                         | 1B 46      | Yes       |
| ESC G                          | Select Double-strike Mode                      | 1B 47      | Yes       |
| ESC H                          | Cancel Double-strike Mode                      | 1B 48      | Yes       |
| ESC S n                        | Select Superscript or Subscript                | 1B 53      | Yes       |
| ESC T                          | Cancel Superscript/Subscript Mode              | 1B 54      | Yes       |
| ESC (- n1 n2 m d1 d2           | Select Score                                   | 1B 28 2D   | Yes       |
| ESC - n                        | Turn Underline Mode On/Off                     | 1B 2D      | Yes       |
| ESC q                          | Select Character Style                         | 1B 67      | Yes       |
| <b>Word Processing</b>         |                                                |            |           |
| ESC a n                        | Select Justification                           | 1B 61      | –         |
| ESC SP n                       | Set Intercharacter Space                       | 1B 20      | Yes       |
| <b>Character Tables</b>        |                                                |            |           |
| ESC t n                        | Select Character Set                           | 1B 74      | Yes       |
| ESC 4                          | Select Italic Mode                             | 1B 34      | Yes       |
| ESC 5                          | Cancel Italic Mode                             | 1B 35      | Yes       |
| ESC R                          | Select an International Character Set          | 1B 52      | Yes       |
| <b>User-defined Characters</b> |                                                |            |           |
| ESC & null d1 d2...dn          | Define User-defined Characters                 | 1B 26      | –         |
| ESC : null n null              | Copy ROM to RAM                                | 1B 3A      | –         |
| ESC % n                        | Select User-defined Set                        | 1B 25      | –         |
| ESC 6                          | Enable Printable Characters                    | 1B 36      | Yes       |
| ESC 7                          | Enable Upper Control Codes                     | 1B 37      | Yes       |
| <b>Graphics</b>                |                                                |            |           |
| ESC K n1 n2 v1 v2...vn         | Select Single-density Graphics Mode            | 1B 4B      | Yes       |
| ESC L n1 n2 v1 v2...vn         | Select Double-density Graphics Mode            | 1B 4C      | Yes       |
| ESC Y n1 n2 v1 v2...vn         | Select High-speed Double-density Graphics Mode | 1B 59      | Yes       |
| ESC Z n1 n2 v1 v2...vn         | Select Quadruple-density Graphics Mode         | 1B 5A      | Yes       |
| ESC * m n1 n2 v1 v2...vn       | Select Graphics Mode                           | 1B 2A      | Yes       |
| ESC ? m n                      | Reassign Graphics Mode                         | 1B 3F      | Yes       |

LQ-850 Symbol Sets

LOUS (28)

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LQ France (60)

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LQ Germany (92)

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LQU.K. (124)

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LQ Italy (220)

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LQ Spain (252)

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LQ Japan (284)

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LQ Norway (316)

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LQ Spain 2 (380)

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LQ Denmark 2 (348)

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Latin America (412)

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LQ Denmark (156)

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LQ Sweden (188)

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# HP LaserJet Emulation (Mode 6)

On shipment from the factory, the printing system is set to power up in the HP LaserJet (PCL 6) emulation. The Kyocera printing systems support to emulate the following HP printer language as tabled below:

*Table 7.14. HP LaserJet Emulation by Model*

| No. | Model     | Printer Language      | Resolution (dpi)               | Fonts        |
|-----|-----------|-----------------------|--------------------------------|--------------|
| 1   | FS-1000   | PCL6, KPDL (Optional) | 600, 300                       | AGFA80 Fonts |
| 2   | FS-1000+  | PCL6, KPDL (Optional) | 600, 300                       | AGFA80 Fonts |
| 3   | FS-1010   | PCL 6, KPDL           | Fast 1200, 600, 300            | AGFA80 Fonts |
| 4   | FS-1050   | PCL 6, KPDL           | Fast 1200, 600, 300            | AGFA80 Fonts |
| 5   | FS-1200   | PCL 6, KPDL           | 600, 300                       | AGFA80 Fonts |
| 6   | FS-1714M  | PCL 6, KPDL           | Fine 1200, Fast 1200, 600, 300 | AGFA80 Fonts |
| 7   | FS-1750   | PCL 6, KPDL           | Fine 1200, Fast 1200, 600, 300 | AGFA80 Fonts |
| 8   | FS-1800   | PCL 6, KPDL           | Fine 1200, Fast 1200, 600, 300 | AGFA80 Fonts |
| 9   | FS-1800+  | PCL 6, KPDL           | Fine 1200, Fast 1200, 600, 300 | AGFA80 Fonts |
| 10  | FS-1900   | PCL 6, KPDL           | Fine 1200, Fast 1200, 600, 300 | AGFA80 Fonts |
| 11  | FS-3718M  | PCL 6, KPDL           | Fine 1200, Fast 1200, 600, 300 | AGFA80 Fonts |
| 12  | FS-3750   | PCL 6, KPDL           | Fine 1200, Fast 1200, 600, 300 | AGFA80 Fonts |
| 13  | FS-3800   | PCL 6, KPDL           | Fine 1200, Fast 1200, 600, 300 | AGFA80 Fonts |
| 14  | FS-5900C  | PCL 5C, KPDL          | 1200 (KPDL), 600               | Bitstream45  |
| 15  | FS-6900   | PCL 6, KPDL           | 600, 300                       | Bitstream45  |
| 16  | FS-8000C  | PCL 5C, KPDL 3        | 600 (bi-level), 600 (Contone)  | AGFA161      |
| 17  | FS-9100DN | PCL 6C, KPDL 3        | Fast 1200, 600, 300            | AGFA161      |
| 18  | FS-9500DN | PCL 6C, KPDL 3        | Fast 1200, 600, 300            | AGFA161      |
| 19  | KM-C830   | PCL 5C, KPDL 3        | 600 (bi-level), 600 (Contone)  | AGFA161      |
| 20  | KM-1510   | PCL 6, KPDL           | 600, 300                       | AGFA80 Fonts |
| 21  | KM-1530   | PCL 6, KPDL           | 600, 300                       | AGFA80 Fonts |
| 22  | KM-1810   | PCL 6, KPDL           | 600, 300                       | AGFA80 Fonts |
| 23  | KM-2030   | PCL 6, KPDL           | 600, 300                       | AGFA80 Fonts |
| 24  | KM-2530   | PCL 6C, KPDL 3        | Fast 1200, 600, 300            | AGFA161      |
| 25  | KM-3530   | PCL 6C, KPDL 3        | Fast 1200, 600, 300            | AGFA161      |
| 26  | KM-4230   | PCL 6, KPDL           | 600                            | AGFA80 Fonts |
| 27  | KM-5230   | PCL 6, KPDL           | 600                            | AGFA80 Fonts |
| 28  | KM-6230   | PCL 6, KPDL           | 600                            | AGFA80 Fonts |

The factory default symbol set is PC-8. To change this default symbol set, use the FRPO command with the U6 and U7 parameters. The default font is Courier.

To set the printing system to power up in LaserJet mode, send the following PRE-SCRIBE command:

```
!R! FRPO P1, 6; FRPO P3, 1; EXIT;
```

To use the TimesNewRoman font of 14.25 points as the default font, add the following lines:

```
FRPO V3, 'TimesNewRoman';
FRPO V1, 14;
FRPO V2, 25;
```

See *Chapter 6* for details of the FRPO V parameters.

The symbol set can be changed after power-up with the CSET or INTL command, or from the operator panel keys, or with LaserJet symbol sets typically accessed through software.

The printing system also supports as many HP symbol sets as the LaserJet regularly supports and still other symbol sets can be provided in downloaded fonts. (A full list of the supported symbol sets appear in section *LaserJet Symbol Sets* on page 37.) These symbol sets can be used by appropriate font selection commands as explained below.

Fonts can be selected with PRESCRIBE commands, or through the printer driver provided with your software. The following font sample was created through driver support.

Figure 7. 15. HP LaserJet Word-Processing Printout

## Word-Processing Features

In addition to *italics*, underlines, **horizontally** and **vertically** bolded type, etc., your LaserJet word-processing software can command all of the laser printer's fonts. Need French? *Appuyer simplement sur une touche pour sélectionner les caractères français* or German, UK, Danish/Norwegian, Swedish/Finnish, Italian, Spanish, Roman-8, or US Legal.

## Proportional Spacing

If your word-processing software supports proportional spacing, 10-point CGTimes is an excellent font with extremely good italic.

## Resident Italics

The reason for the high quality of 10-point CGTimes is that they are a separate resident font. *Compare the generated italics of 8-pint CGTimes (this line).*

## Small Print

This line is 6-point Univers. Note the clarity and good character form, despite the small size.

Additional *soft* fonts can be downloaded from external sources before printing begins. The printing system selects the fonts by a set of command codes (escape sequences) that describe the font attributes: character height, orientation, weight, character set, etc. (similar to the parameters used with the FSET command of PRESCRIBE). The printing system's resident fonts include the HP resident fonts and many of the fonts from the HP font cartridges.

The printing system supports the same soft fonts as the HP LaserJet printers. In addition, the printing system understands the LaserJet command codes and can use them to select any of its resident or downloaded fonts.

Since the LaserJet font selection codes are fairly complex (Refer to *LaserJet Font Selection* section.), software that supports the Laser Jet usually provides a simplified set of font selection commands which the software translates into LaserJet command codes.

Software-provided font selection commands will work for the printing system as they would for the HP LaserJet series printers. If a requested font is not present in the printing system's memory, the page printing system will choose from the characteristics of the closest matching font.



The LaserJet emulation supports 600/1200 dpi raster graphics for printing system models with the 300/600/1200 dpi resolution support. There is also support of delta row compression and compressed raster data for run length encoding and TIFF.

The printing system supports the LaserJet vector graphics, which draw vertical or horizontal ruled lines and create rectangles filled with a pattern or gray scale.

The margins in this emulation differ from the *A* parameters of the FRPO command. They recognize the page size of the default cassette. If you attempt to print beyond the right margin, the characters will be discarded.

| Cassette size | Line per page | Character per line |
|---------------|---------------|--------------------|
| Letter        | 60            | 80                 |
| A4            | 64            | 77                 |

(Assuming 6 lines per inch and 10 characters per inch)

The proportional spacing is not identical to the LaserJet's proportional spacing. Right-margin justification may not be correct when using the LaserJet printer driver (when a LaserJet driver is selected within the application software).

## LaserJet Fonts

The printing system emulates the LaserJet fonts as listed below.

*Table 7.16. LaserJet Fonts*

| No. | HP LaserJet Font | Kyocera Font  | Style                                                                    | Type Face Number |
|-----|------------------|---------------|--------------------------------------------------------------------------|------------------|
| 1   | Arial            | Arial         | Medium, Bold, Italic, BoldItalic                                         | 16602            |
| 2   | TimesNewRoman    | TimesNewRoman | Medium, Bold, Italic, BoldItalic                                         | 16901            |
| 3   | Symbol           | Symbol        | Medium                                                                   | 16686            |
| 4   | Wingdings        | Wingdings     | Medium                                                                   | 31402            |
| 5   | CG Times         | CG Times      | Medium, Bold, Italic, BoldItalic                                         | 4101             |
| 6   | Univers          | Univers-Md    | Medium, Bold, Italic, BoldItalic                                         | 4148             |
| 7   | Univers Cond     | Univers-Cd    | Medium Condensed, Bold Condensed, Italic Condensed, BoldItalic Condensed | 4148             |
| 8   | Courier          | Courier       | Medium, Bold, Italic, BoldItalic                                         | 4099             |
| 9   | Letter Gothic    | Letter Gothic | Medium, Bold, Italic                                                     | 4102             |
| 10  | Albertus         | Albertus-Md   | Medium, ExtraBold                                                        | 4362             |
| 11  | Antique Olive    | Antique Olive | Medium, Bold, Italic                                                     | 4168             |
| 12  | Clarendon Cond   | Clarendon-Cd  | BoldCondensed                                                            | 4140             |
| 13  | Coronet          | Coronet       | Italic                                                                   | 4116             |
| 14  | Garamond         | Garamond      | Antiqua, Halbfett, Kursiv, KursivHalbfett                                | 4197             |
| 15  | Marigold         | Marigold      | Medium                                                                   | 4297             |
| 16  | CG Omega         | CG Omega      | Medium, Bold, Italic, BoldItalic                                         | 4113             |

## LaserJet Font Selection

### Font Selection

Resolution does not effect the availability of scalable fonts. Bitmap fonts generated by LDFC present one limitation. If the printing system uses a 300-dpi resolution, LDFC-generated 600 dpi bitmap fonts may not be used. Whether these 600 dpi bitmaps are

LDFC fonts or downloaded bitmap fonts by the user, they will constantly print unpredictably if the printing system uses the resolution of 300 dpi.

## Font Priority

On the printing systems with the 600/1200 dpi resolution support, font selection in the HP LaserJet format adds an additional step to the font prioritization format. In font selection, the printing system evaluates the characteristics of the font and, by a process of matching features, reduces selection to a single font. The highest priority characteristic is symbol set, followed by spacing, pitch, point size, font style, stroke weight, and typeface. The LaserJet emulation (mode 6) adds resolution to this priority list. This additional priority is not available in the printing systems not supporting the 600/1200 dpi resolutions.

For example, the printing system might face a font selection scenario of four near identical types of the Dutch801 font (by the KPDLE emulation):

- CGTimes (LaserJet compatible Intelli font)
- Times (PostScript compatible font)
- TimesNewRoman (LaserJet compatible TrueType font)

These fonts have several common attributes and there is a possibility that selecting a Times may insert the TimesNewRoman font instead as a result of the internal font evaluation procedure. It is therefore important to understand how fonts are selected by the printing system. (See *Chapter 4* for a discussion of the printing system's internal font evaluation.)

The final (lowest) priority for font priority is the font source. The source refers to the place where the font is accessed. The following table shows how this characteristic is ordered.

| Ordering priority | Source                              | Priority within same source |
|-------------------|-------------------------------------|-----------------------------|
| 1                 | Downloaded and LDFC-generated fonts | Smaller font ID             |
| 2                 | Memory card fonts                   | Top slot > bottom slot      |
| 3                 | Resident and optional fonts         | Alphabetic order            |

Users should note two differences in the source priority of font selection. Ordering priority 1 uses the original HP method whereby the internal number assigned to a font would be evaluated and the lowest number given the higher priority. This method applies to fonts downloaded to the printing system and, any LDFC-generated fonts. Ordering priority 3 evaluates the font in alphabetic order. This method applies to the resident fonts and the KPDLE fonts.

An FRPO command (FRPO C8;) can modify this evaluation method by turning off evaluation of either the resident or scalable fonts, or KPDLE fonts or both. The resident scalable fonts are not affected by this FRPO command. These fonts were designed by Agfa and observe the alphabetic ordering method used by Agfa.

## Regular and Dark Courier/Letter Gothic

The stroke weight (bolding) of Courier and Letter Gothic is changeable between regular and dark. The default is regular and matches the Hewlett-Packard. It can be changed to dark which was the default stroke weight of Courier and Letter Gothic in order Kyocera printing systems by changing the FRPO V9 parameter.

## LaserJet Font Escape Sequences

The example below shows an HP font selection escape sequence that selects a LetterGothic font with fixed-pitch, 12-cpi, 12-point, upright-style, normal stroke weight.

| Characteristic | Value (example) | Escape Sequence |
|----------------|-----------------|-----------------|
| Symbol set     | Roman-8         | ESC(8U          |
| Spacing        | Fixed           | ESC(s0P         |
| Pitch          | 12-cpi          | ESC(s12H        |
| Height         | 12-point        | ESC(s12V        |
| Style          | Upright         | ESC(s0S         |
| Stroke weight  | Normal          | ESC(s0B         |
| Typeface       | Letter Gothic   | ESC(s4102T      |

To select this LetterGothic font, send the following escape sequence to the printing system:

```
ESC(8U ESC(s0P ESC(s12H ESC(s12V ESC(s0S ESC(s0B ESC(s4102T
```

Any escape sequence with two similar consecutive letters after the ESC parameter can be combined as in the transformation of the LetterGothic font below:

```
ESC(8U ESC(s0p12h12v0s0b4102T
```

The FSET command of PRESCRIBE utilizes a similar font selection method. (The symbol set selection is made with the CSET command.) Note the similarities in the FSET command sequence below:

```
FSET 0p12h12v0s0b4102T;
```

Several other LaserJet codes should be considered for font management. See the Font Management section of the HP LaserJetPrinter commands on page 56 and onwards.

## LaserJet Symbol Sets

Symbol set has the highest priority in the HP font selection. The factory default symbol set is IBM PC-8 (10U) for the LaserJet emulation. The LaserJet printer has many other symbol sets not directly accessed by the INTL command. Temporary selection of one of these symbol sets can be made with the CSET (Change symbol SET) command or from the operator panel keys. You can also assign one of these symbol sets to a particular font using the FSET (change current Font SETting) command. More information on these commands appear in *Chapter 4*.

By giving a particular value for the FRPO U6 and U7 parameters, you can set one of the HP symbol sets as the power-up symbol set. In general, symbol set value is:

(Escape sequence value field value  $\times$  32 + (Decimal value of escape sequence termination character - 64)  $[(U7 - 50) \times 100 + U6]$ )

### *Symbol Sets for Bitmap Fonts*

The printing system substitutes with a scalable font when a bitmap font is required for downward compatibility. The following symbol sets are supported when substituted bitmap fonts are in use. To power up the printing system in one of these symbol set, use the following FRPO U6 and U7 values.

**Table 7.17. Symbol Sets for Bitmap Fonts**

| Symbol Set      | HP Symbol Set ID (Value) | FRPO U6 Value | FRPO U7 Value |
|-----------------|--------------------------|---------------|---------------|
| ISO 60 Norway   | 0D (4)                   | 4             | 50            |
| HP Extension    | 0E (5)                   | 5             |               |
| ISO 25 France   | 0F (6)                   | 6             |               |
| HP German       | 0G (7)                   | 7             |               |
| ISO 15 Italian  | 0I (9)                   | 9             |               |
| ISO 14 Japan    | 0K (11)                  | 11            |               |
| ECMA-94 Latin 1 | 0N (14)                  | 14            |               |
| ISO 11 Sweden   | 0S (19)                  | 19            |               |
| ISO 6 ASCII     | 0U (21)                  | 21            |               |
| ISO 61 Norway   | 1D (36)                  | 36            |               |
| ISO 4 U.K.      | 1E (37)                  | 37            |               |
| ISO 69 France   | 1F (38)                  | 38            |               |
| ISO 21 Germany  | 1G (39)                  | 39            |               |
| HP Spanish      | 1S (51)                  | 51            |               |
| US Legal        | 1U (53)                  | 53            |               |
| ISO 57 China    | 2K (75)                  | 75            |               |
| ISO 17 Spain    | 2S (83)                  | 83            | 50            |
| ISO 2 IRV       | 2U (85)                  | 85            | 50            |
| ISO 10 Sweden   | 3S (115)                 | 15            | 51            |
| ISO 16 Portugal | 4S (147)                 | 47            | 51            |
| Roman-9         | 4U (179)                 | 79            | 51            |
| ISO 84 Portugal | 5S (179)                 | 79            | 51            |
| ISO 85 Spain    | 6S (211)                 | 11            | 52            |
| PC Set 1        | 8Q (273)                 | 73            | 52            |
| HP Roman-8      | 8U (277)                 | 77            | 52            |
| PC Extension    | 9Q (305)                 | 5             | 53            |
| IBM PC-8        | 10U (341)                | 41            | 53            |
| IBM PC-8 (D/N)  | 11U (373)                | 73            | 53            |
| IBM PC-850      | 12U (405)                | 5             | 54            |
| PC-858          | 13U (437)                | 37            | 54            |

## Symbol Sets for Scalable Fonts

The following table lists symbol set support for resident scalable fonts. To power up the printing system in one of these symbol set, use the following FRPO U6 and U7 values.

**Table 7.18. Symbol Sets for Scalable Fonts (Sheet 1 of 2)**

| Symbol Set      | HP Symbol Set ID (Value) | FRPO U6 Value | FRPO U7 Value |
|-----------------|--------------------------|---------------|---------------|
| ISO 60 Norway   | 0D (4)                   | 4             | 50            |
| ISO 15 Italian  | 0I (9)                   | 9             |               |
| ECMA-94 Latin 1 | 0N (14)                  | 14            |               |
| ISO 11 Sweden   | 0S (19)                  | 19            |               |
| ISO 6 ASCII     | 0U (21)                  | 21            |               |
| ISO 4 U. K.     | 1E (37)                  | 37            |               |
| ISO 69 France   | 1F (38)                  | 38            |               |
| ISO 21 Germany  | 1G (39)                  | 39            |               |
| US Legal        | 1U (53)                  | 53            |               |
| ISO Latin 2     | 2N (78)                  | 78            |               |
| ISO 17 Spain    | 2S (83)                  | 83            |               |

Table 7.18. Symbol Sets for Scalable Fonts (Sheet 2 of 2)

| Symbol Set       | HP Symbol Set ID (Value) | FRPO U6 Value | FRPO U7 Value |
|------------------|--------------------------|---------------|---------------|
| PC Cyrillic      | 3R (114)                 | 14            | 51            |
| PS math          | 5M (173)                 | 73            |               |
| ISO Latin 5      | 5N (174)                 | 74            |               |
| Windows Latin 5  | 5T (180)                 | 80            |               |
| MS Publishing    | 6J (202)                 | 2             | 52            |
| ISO Latin 6      | 6N (206)                 | 6             |               |
| Desktop          | 7J (234)                 | 34            |               |
| Greek-8          | 8G (263)                 | 63            |               |
| Math-8           | 8M (269)                 | 69            |               |
| Turkish-8        | 8T (276)                 | 76            |               |
| HP Roman-8       | 8U (277)                 | 77            |               |
| Windows Latin 2  | 9E (293)                 | 93            |               |
| Windows Greek    | 9G (295)                 | 95            |               |
| PC-1004          | 9J (298)                 | 98            |               |
| ISO Latin 9      | 9N (302)                 | 2             |               |
| Win Cyrillic     | 9R (306)                 | 6             | 53            |
| PC Turkish       | 9T (308)                 | 8             |               |
| Windows          | 9U (309)                 | 9             |               |
| PC-851 Greek     | 10G (327)                | 27            |               |
| PS text          | 10J (330)                | 30            |               |
| ISO Cyrillic     | 10N (334)                | 34            |               |
| PC-855 Serbia    | 10R (338)                | 38            |               |
| IBM PC-8         | 10U (341)                | 41            |               |
| PC-869 Greek     | 11G (359)                | 59            |               |
| IBM PC-8 D/N     | 11U (373)                | 73            |               |
| PC-8 Greek       | 12G (391)                | 91            |               |
| Macintosh        | 12J (394)                | 94            |               |
| ISO Greek        | 12N (398)                | 98            |               |
| USSR-GOST        | 12R (402)                | 2             |               |
| IBM PC-850       | 12U (405)                | 5             |               |
| ABICOMP Brazil   | 13P (432)                | 32            |               |
| PC-8 Bulgarian   | 13R (434)                | 34            |               |
| PC-8 Greek/ 437G | 14G (455)                | 55            |               |
| ABICOMP Int.     | 14P (464)                | 64            |               |
| PC Ukrainian     | 14R (466)                | 66            |               |
| Pi Font          | 15U (501)                | 1             | 55            |
| PC-857 Turkish   | 16U (533)                | 33            |               |
| PC-852 Latin 2   | 17U (565)                | 65            |               |
| ISO-10646        | 18N (590)                | 90            |               |
| PC-853 Turkish   | 18U (597)                | 97            |               |
| WinBalt          | 19L (620)                | 20            |               |
| Windows Latin 1  | 19U (629)                | 29            |               |
| PC-860 Portugal  | 20U (661)                | 61            |               |
| PC-861 Iceland   | 21U (693)                | 93            |               |
| PC-863 Canada    | 23U (757)                | 57            |               |
| PC-8 Polish      | 24Q (785)                | 85            |               |
| PC-865 Norway    | 25U (821)                | 21            |               |
| PC-775           | 26U (853)                | 53            | 58            |
| PC-8 PC Nova     | 27Q (881)                | 81            |               |

Example:

To power up in the TimesNewRoman font for the Windows symbol set:

```

!R! FRPO V3, 'TimesNewRoman';
      FRPO U6, 9; FRPO U7, 53;
      STAT;
EXIT;

```

The STAT command in the third line prints a status page that enables the user to confirm changes made with the preceding sequences. The power-up font and symbol set are shown in the *Interfaces* section.

## Resource Protection

The resource protection feature is Kyocera's implementation of the HP's *resource saving*. The feature preserves resources during emulation switching. The protected resources, user-defined symbol sets and patterns, fonts, and macros, remain intact when the user switches to and from the HP LaserJet emulation.

A permanent default can be set for resource protection using the following FRPO command:

```
!R! FRPO N9, 1; EXIT; or !R! FRPO N9, 2; EXIT;
```

The MENU key on the printing system's control panel may also be used to establish resource protection.

The following table summarizes the features and functions of the resource protection mode in the HP LaserJet emulation.

*Table 7.19. Resource Protection and FRPO N9 Value*

| Resource (Property)         | Emulation | N9 = 0   | N9 = 1   | N9 = 2   |
|-----------------------------|-----------|----------|----------|----------|
| Soft fonts (Permanent)      | HPLJ      | Deleted  | Retained | Retained |
| Soft fonts (Temporary)      | HPLJ      | Deleted  | Deleted  | Retained |
| Macros (Permanent)          | HPLJ      | Deleted  | Retained | Retained |
| Macros (Temporary)          | HPLJ      | Deleted  | Deleted  | Retained |
| User patterns (Permanent)   | HPLJ      | Deleted  | Retained | Retained |
| User patterns (Temporary)   | HPLJ      | Deleted  | Deleted  | Retained |
| User symbol set (Permanent) | HPLJ      | Deleted  | Retained | Retained |
| User symbol set (Temporary) | HPLJ      | Deleted  | Deleted  | Retained |
| Print environment           | HPLJ      | Deleted  | Deleted  | Retained |
| Permanent dictionary        | KPDL      | Retained | Retained | Retained |

A detailed description of the FRPO N9 command follows. Note that the factory default setting for the N9 command is 0.

N9 = 0, resource protection is off. No resources will be protected during emulation switching, regardless of whether they are temporary or permanent. When the user returns to the mode 6 emulation, the print environment will be reset. The print environment includes items such as number of copies, orientation, and margins.

- N9 = 1, permanent PCL resources are protected. The printing system will store in memory all resources marked as permanent (soft fonts, macros, user patterns and symbol sets) and protect these resources during emulation switching. All resources marked as temporary (soft fonts, macros, user patterns, and symbol sets) will be lost during emulation switching. The print environment will be reset when it is returned to the mode 6 emulation.
- N9 = 2, permanent and temporary PCL resources are protected. The printing system will store in memory all resources, both temporary and permanent, and protect them during emulation switching. Instead of resetting the mode 6 environment upon switching back, the printing system will restore the previous print environment. This option demands a large share of printing system memory.

Resource protection becomes operational under any of the following emulation switching conditions:

- An SEM command is sent to the printing system.
- The emulation is changed by the user from the operator panel keys.
- An automatic emulation sensing (AES) function is used for switching between KPDLL and PCL.
- An HP LaserJet PJJ command @PJJ ENTER LANGUAGE = ?? is received.

The KPDLL permanent dictionary is always protected, regardless of the values for N9.

The amount of memory saved under resource protection is limited by the user memory available. Resource protection requires extra memory for storing downloaded fonts and macros. This memory requirement extends beyond the standard memory that accompanies the printing system. The requirement varies based upon optional features installed in the printing system.

Note that a print environment using resource protection but whose space has been limited by user memory items like macros, symbol sets and fonts, will render the resource protection feature non-operational.

The property value (temporary or permanent) assigned to a resource must be given in the PCL command language. PRESCRIBE provides no commands for making a temporary or permanent designation. As a result, resource protection mode applies only to those resources generated with the HP PCL command language. A description of the memory requirements and property values for typical models appear in the following table.

### *Minimum memory requirement for Resource Protection*

The following tables are memory requirements for typical printing system models. For information on memory requirement on other printing system models, refer to the operation manual supplied with the printing system.

*Table 7.20. Example: FS-1000 Series*

| Printing Condition                                | Resolution |           |
|---------------------------------------------------|------------|-----------|
|                                                   | 300 dpi    | 600 dpi   |
| HPLJ 4                                            | 2 Mbytes   | 2 Mbytes  |
| HPLJ 4, duplex mode=None, raster memory=A4/Letter | 2 Mbytes   | 6 Mbytes  |
| HPLJ 4, duplex mode=None, raster memory=Legal     | 2 Mbytes   | 7 Mbytes  |
| HPLJ 4, duplex mode=on, raster memory=A4/Letter   | 3 Mbytes   | 10 Mbytes |

Table 7.20. Example: FS-1000 Series

| Printing Condition                                     | Resolution |           |
|--------------------------------------------------------|------------|-----------|
|                                                        | 300 dpi    | 600 dpi   |
| HPLJ 4, duplex mode=on, raster memory=Legal            | 3 Mbytes   | 11 Mbytes |
| HPLJ 4/KPDL, duplex mode=None, raster memory=A4/Letter | 2 Mbytes   | 6 Mbytes  |
| HPLJ 4/KPDL, duplex mode=None, raster memory=Legal     | 2 Mbytes   | 7 Mbytes  |
| HPLJ 4/KPDL, duplex mode=on, raster memory=A4/Letter   | 3 Mbytes   | 10 Mbytes |
| HPLJ 4/KPDL, duplex mode=on, raster memory=Legal       | 3 Mbytes   | 11 Mbytes |
| HPLJ 4/KPDL, resource protection, duplex mode=None     | 10 Mbytes  | 10 Mbytes |
| HPLJ 4/KPDL, resource protection, duplex mode=on       | 14 Mbytes  | 14 Mbytes |

Table 7.21. Example: FS-9500DN

| Printing Condition                                  | Resolution |         |           |           |
|-----------------------------------------------------|------------|---------|-----------|-----------|
|                                                     | 300 dpi    | 600 dpi | 1200 dpi  |           |
|                                                     |            |         | Fast mode | Fine mode |
| PCL 6, duplex mode=None                             | 8 MB       | 8 MB    | 8 MB      | 8 MB      |
| PCL 6, duplex mode=On                               | 8 MB       | 8 MB    | 8 MB      | 12 MB     |
| KPDL, duplex mode=None                              | 8 MB       | 8 MB    | 8 MB      | 8 MB      |
| KPDL, duplex mode=On                                | 8 MB       | 8 MB    | 12 MB     | 12 MB     |
| PCL 6/KPDL resource protection,<br>duplex mode=None | —          | 10 MB   | 10 MB     | 10 MB     |
| PCL 6/KPDL, resource protection,<br>duplex mode=On  | —          | 14 MB   | 14 MB     | 14 MB     |

## Switching the Print Resolution

Because the printing systems with the 1200 dpi resolution support print at 300, 600, 1200 dpi, the printing system provides an FRPO command to establish a default at either level of resolution.

For fine 1200 dpi resolution, command:

```
!R! FRPO N8, 3; EXIT;
```

For 600 dpi resolution, command:

```
!R! FRPO N8, 1; EXIT;
```

For 300 dpi resolution, command:

```
!R! FRPO N8, 0; EXIT;
```

When the printing resolution is changed between 1200 dpi, 600 dpi, and 300 dpi, the printing system loads the PJI current environment values.

In addition to the FRPO N8 command as explained above, printing systems that permit the resolution to be set at either 300, 600, or 1200 are provided with the RESL (change RESoLution) command which switches the resolution on the fly. For details about this command, refer to *PRESCRIBE Commands Command Reference*.



**Note**

The amount of available printing system memory will determine whether the 600/1200 dpi default can be effective. If factors such as resource protection, duplexing, and raster memory reduce memory too low, then the printing system will remain at 300 dpi resolution.



## HP LaserJet Reset State

The printing system resets to the following states when it receives a PCL reset command. Shown in parentheses are the related FRPO parameters.

*Table 7.22. HP LaserJet Emulation Reset State*

|                         |                            |                                               |
|-------------------------|----------------------------|-----------------------------------------------|
| Job control             | Number of copies           | 1                                             |
| Page control            | Cassette                   | Upper (R4)                                    |
|                         | Orientation                | Portrait (C1)                                 |
|                         | Paper size                 | Installed tray size (R2)                      |
|                         | VMI                        | 6 lpi (U0/U1)                                 |
|                         | HMI                        | 10 cpi                                        |
|                         | Top margin                 | 50 dots                                       |
|                         | Text length                | Paper size – (1/2-inch top + 1/2-inch bottom) |
|                         | Left margin                | Left logical                                  |
|                         | Right margin               | Right logical                                 |
|                         | Perforation skip           | On                                            |
|                         | Line termination           | CR=CR, LF=LF, FF=FF                           |
| Fonts                   | Font                       | Courier                                       |
|                         | Symbol set                 | IBM PC-8 (U6/U7)                              |
|                         | Underline mode             | Off                                           |
| Font management         | Font id                    | 0                                             |
|                         | Character code             | 0                                             |
| Raster graphics         | Raster graphics resolution | 75                                            |
| Rectangular area fill   | Horizontal rectangle size  | 0                                             |
|                         | Vertical rectangle size    | 0                                             |
|                         | Area fill id               | 0                                             |
| Macro                   | Macro id                   | 0                                             |
| Troubleshooting command | End of line wrap           | Off                                           |
|                         | Display functions          | Off                                           |

## LaserJet PJJ

The HP LaserJet emulation loads a Printer Job Language (PJJ) that controls communication between the printing system and the system. The PJJ works for both KPDJ and HP LaserJet emulations. It enables the user to change some default states but, more importantly, allows current printing system states to be communicated back to the host system.

The Kyocera printing systems described in this manual support only a subset of the HP PJJ commands. To check supported PJJ features, see the table that follows.

*Table 7.23. Supported PJJ Commands*

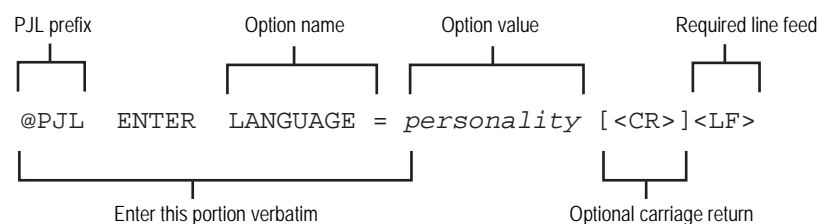
| Command Group           | Command                       | Description                                                                                                                                                     |
|-------------------------|-------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Kernel Commands         | Universal Exit Language (UEL) | Exits current printer language and returns control to PJJ. Resets the PJJ parser to start at the beginning of the line.                                         |
|                         | COMMENT                       | Tells PJJ to accept the command line as a comment.                                                                                                              |
|                         | ENTER                         | Chooses a printer language for processing the current job.                                                                                                      |
| Job Separation Commands | JOB                           | Informs printing system of the start of a print job, resets the page count, allows naming of the job, supports non-printing mode for printing portions of jobs. |
|                         | EOJ                           | Instructs printing system that the print job is complete, resets the page count.                                                                                |

Table 7.23. Supported PJI Commands

| Command Group              | Command    | Description                                                                                                                                                                                                    |
|----------------------------|------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Environment Commands       | DEFAULT    | Sets default for environment variables.                                                                                                                                                                        |
|                            | SET        | Sets an environment variable to a specified value during a PJI job.                                                                                                                                            |
|                            | INITIALIZE | Resets current and default PJI variables to factory default.                                                                                                                                                   |
|                            | RESET      | Defaults current PJI variables.                                                                                                                                                                                |
| Status Readback Commands   | INQUIRE    | Requires the current value for a specified environment variable.                                                                                                                                               |
|                            | DINQUIRE   | Requires the default value for a specified environment variable.                                                                                                                                               |
|                            | ECHO       | Returns the <words> portion of the command to the host computer.                                                                                                                                               |
|                            | INFO       | Requests a specified category of printing system information, such as printing system model, available printing system memory, configuration, status, environment variables, and unsolicited status variables. |
|                            | USTATUS    | Allows printing system to send unsolicited status messages for device status changes, end-of-job status, and the number of pages printed. Status can be sent at specified time intervals.                      |
|                            | USTATUSOFF | Deactivates all unsolicited status.                                                                                                                                                                            |
| Device Attendance Commands | RDYMSG     | Specifies a message that replaces the Processing message on the message display. Shown in offline state if the printing system is processing data (except in mode selection).                                  |
|                            | OPMSG      | Displays specified message on the message display and sets printing system offline.                                                                                                                            |
|                            | STMSG      | Displays specified message on the message display and sets printing system offline. If status readback is on, returns name of the key that is used to return the printing system online.                       |
| PJI File System Commands   | FSDELETE   | Deletes printing system mass storage files.                                                                                                                                                                    |
|                            | FSDOWNLOAD | Downloads files to the printing system mass storage system.                                                                                                                                                    |
|                            | FSINIT     | Initializes the printing system mass storage file system.                                                                                                                                                      |
|                            | FSMKDIR    | Creates a directory on the printing system mass storage file system.                                                                                                                                           |

## PJI command syntax

A PJI command line containing the ENTER command appears as follows:



PJI syntax also uses the following control codes and special identifiers.

|       |                                                    |
|-------|----------------------------------------------------|
| <HT>  | Horizontal tab character (ASCII 9)                 |
| <LF>  | Line feed character (ASCII 10)                     |
| <CR>  | Carriage return character (ASCII 13)               |
| <SP>  | Space character (ASCII 32)                         |
| <ESC> | Escape character (ASCII 27)                        |
| <FF>  | Form feed character (ASCII 12)                     |
| <WS>  | White space, a result of one of more <SP> or <HT>. |

<words> Printable characters (ASCII characters 33 through 255) and <WS>, starting with a printable character.

^D KPDL end-of-file indication. It is not part of PJP, but is used to end KPDL instructions.

The PJP command syntax should follow one of four formats:

*Format 1:*

```
<ESC>%-12345X
```

This format uses the Universal Exit Language (UEL) only.

*Format 2:*

```
@PJP [ <CR> ] <LF>
```

This format may be used to add a visual line break among the PJP command lines.

*Format 3:*

```
@PJP command [ <words> ] [ <CR> ] <LF>
```

This format is currently used for the COMMENT and ECHO commands only. For examples:

```
@PJP COMMENT ... <LF>
@PJP ECHO ... <LF>
```

*Format 4:*

```
@PJP command [command modifier : value] [option name
[=value]] [ <CR> ] <LF>
```

This format is used comprehensively for all of the other PJP commands.

```
@PJP DEFAULT LPARM : PCL PTFIT=14.25<LF>
```

## Rules for PJP Command Syntax

This section provides the rules that should be observed in using PJP commands:

- The prefix @PJP always must be uppercase. Other parts of the PJP command are not case-sensitive.
- Spacing between characters (white space) should either be the space character (ASCII 32) or the horizontal tab character (ASCII 9).

The placement of white space in PJP commands depends on its location within the command. Some white space is mandatory and some is optional:

- White space is required between the @PJP prefix and the PJP command name, and between the PJP command name and command modifiers. For example:

```
@PJP OPMSG DISPLAY or
@PJP ENTER LANGUAGE = personality
```

- If white space does not appear in any other place in the command, white space is optional.
- If white space appears between two portions of a PJP command, it is not allowed. An example of white space use appears between the optional carriage return and required line feed character that terminate most commands.

## *PJL variables*

PJL uses alphanumeric variables, numeric variables, and strings. The following explains the three types of variables and their ranges.

### **Alphanumeric variables**

Any combination of letters and digits, with the rule that the first character must always be a letter. Letters can consist of the uppercase letters (ASCII 65 through 90) and lowercase letters (ASCII 97 through 122). Digits can consist of numbers 0 through 9 (ASCII 48 through 57).

Example of valid alphanumeric variables:

```
Alpha 635  
X2000
```

Examples of invalid alphanumeric variables:

```
635Alpha  
(Alphanumeric variables must begin with a letter)  
X 2000  
(Space characters [ASCII 32] are not allowed in alphanumeric variables)
```

### **Numeric variables**

Any number consisting of digits, with one optional decimal point and an optional plus (+) or minus (−) sign preceding the first digit. Only one decimal point may be used. It must also be placed somewhere after the first digit. Digits are unnecessary after the decimal point.

Examples of valid numeric variables:

```
0.123456  
−123.456  
+657000  
2468.
```

Examples of invalid numeric variables:

```
.123456  
(The decimal point must be preceded by at least 1 digit).  
−123.45.6  
(Only 1 decimal point is allowed in a numeric variable).  
+657,000  
(Commas should not be used in numeric variables).
```

### **Strings**

Strings should be enclosed in quotation marks, and consist of any combination of characters of ASCII codes from 32 through 255 including 9 (horizontal tab) but excluding 34 (quotation marks). Examples are as follows.

Examples of valid strings:

```
"Model:<HT>FS-9500DN" — Tabs are allowed in a string.  
"The Arlington Ball Park"
```

Examples of invalid strings:

```
"It is 3.5" long." — A string should not contain quotation marks.  
"Telephone number<CR>01234-5678"  
— <CR> is out of the valid range of ASCII characters for a string.
```

## Invalid Commands

Invalid commands are in two general types: those with syntax errors and those with syntax or semantic warnings. The printing system handles each of those types different ways.

Syntax errors contain errors such as unrecognized commands and command modifiers, strings with missing closing double quotations, numeric values with missing digits before the decimal points, and numeric values encountered when alphanumeric values are to be expected. The printing system ignores the entire PJI commands when it receives commands having syntax errors. Some examples follow.

The JOB command's NAME option requires double quotations around its value part.

Valid command:

```
@PJI JOB NAME = "Job Number 50" <LF>
```

Invalid command:

```
@PJI JOB NAME = "Job Number 51 <LF>
```

The closing quotation is required.

Syntax warnings and semantic warnings are issued for such commands that have unsupported options, values out of range, values missing or of the incorrect type, or values added when none are allowed. When the printing system receives commands with syntax or semantic warnings, the part of the command including the warning is ignored.

In the following example, the START option is valid for the JOB command.

Valid command:

```
@PJI JOB START = 1 <LF>
```

While in the following, FINISH is not a valid option and ignored (END should be used).

Invalid command:

```
@PJI JOB START = 1 FINISH = HOME <LF>
```

## PJI Reset Status

The following table shows the PJI and equivalent FRPO commands that initialize the environments.

*Table 7.24. PJI Reset Status*

| Environment                           | PJI command | FRPO parameter |
|---------------------------------------|-------------|----------------|
| Printing resolution                   | RESOLUTION  | —              |
| Raster memory<br>(HP Page protection) | PAGEPROTECT | FRPO R5        |
| Personality                           | PERSONALITY | —              |
| KIR (HP RET)                          | RET         | FRPO N0        |
| Interface timeout                     | TIMEOUT     | FRPO N9        |
| Copy                                  | COPIES      | FRPO C0        |
| Paper size                            | PAPER       | FRPO R2        |
| Orientation                           | ORIENTATION | FRPO C1        |
| Manual feed                           | MANUAL FEED | FRPO R4        |
| Paper source                          | MANUAL FEED | FRPO R4        |
| Output stack                          | OUTBIN      | FRPO R0        |

*Table 7.24. PJI Reset Status*

| Environment  | PJI command | FRPO parameter |
|--------------|-------------|----------------|
| Duplex       | DUPLEX      | FRPO N4        |
| Default font | FONTNUMBER  | FRPO V3        |
| Point size   | PTSIZE      | FRPO V0-2      |
| Pitch        | PITCH       | —              |
| Symbol set   | SYMSET      | FRPO U6/U7     |

# HP LaserJet Printer Commands — PCL

In the tables below, *Yes* means that the command is supported and *No* means that the command is not supported.

*Table 7.25. HP LaserJet PCL Commands (Sheet 1 of 15)*

| Function                        | Parameter                           | Command     | Hexadecimal Value          | 1000<br>1000+ | 1800<br>1900<br>3800 | 6300<br>6750<br>6900 | 9100DN<br>9500DN | 8000C |
|---------------------------------|-------------------------------------|-------------|----------------------------|---------------|----------------------|----------------------|------------------|-------|
| <b>JOB CONTROL COMMANDS</b>     |                                     |             |                            |               |                      |                      |                  |       |
| <b>Reset</b>                    |                                     |             |                            |               |                      |                      |                  |       |
| Reset                           |                                     | ESCE        | 1B 45                      | Yes           | Yes                  | Yes                  | Yes              | Yes   |
| Number of Copies                | # of Copies (1-999)                 | ESC&#X      | 1B 26 6C #...# 58          | Yes           | Yes                  | Yes                  | Yes              | Yes   |
| Long-Edge (Left) Offset         | # of Decipoints (1/720")            | ESC&#U      | 1B 26 6C #...# 55          | Yes           | Yes                  | Yes                  | Yes              | Yes   |
| Short-Edge (Top) Offset         | # of Decipoints (1/720")            | ESC&#Z      | 1B 26 6C #...# 5A          | Yes           | Yes                  | Yes                  | Yes              | Yes   |
| Unit of Measure                 | # = Number of units per inch        | ESC&#D      | 1B 26 75 #...# 44          | Yes           | Yes                  | Yes                  | Yes              | Yes   |
| Exit PCL Language               | —                                   | ESC%-12345X | 1B 25 2D 31 32 33 34 35 58 | Yes           | Yes                  | Yes                  | Yes              | Yes   |
| <b>Simplex/Duplex Operation</b> |                                     |             |                            |               |                      |                      |                  |       |
| Simplex/Duplex Print            | Simplex                             | ESC&/0S     | 1B 26 6C 30 53             | No            | Yes                  | Yes                  | Yes              | Yes   |
|                                 | Duplex                              |             |                            |               |                      |                      |                  |       |
|                                 | Long-Edge-Binding                   | ESC&/lS     | 1B 26 6C 32 53             | No            | Yes                  | Yes                  | Yes              | Yes   |
|                                 | Short-Edge-Binding                  | ESC&/2S     | 1B 26 6C 32 53             | No            | Yes                  | Yes                  | Yes              | Yes   |
| Page Side Selection             | Next side                           | ESC&a0G     | 1B 26 61 30 47             | No            | Yes                  | Yes                  | Yes              | Yes   |
|                                 | Front Side                          | ESC&a1G     | 1B 26 61 31 47             | No            | Yes                  | Yes                  | Yes              | Yes   |
|                                 | Back Side                           | ESC&a2G     | 1B 26 61 32 47             | No            | Yes                  | Yes                  | Yes              | Yes   |
| Job Separation                  | —                                   | ESC&/IT     | 1B 26 6C 31 54             | No            | No                   | No                   | Yes              | No    |
| <b>PAGE CONTROL COMMANDS</b>    |                                     |             |                            |               |                      |                      |                  |       |
| <b>Page Length and Size</b>     |                                     |             |                            |               |                      |                      |                  |       |
| Paper Source                    | Current Tray (0)                    | ESC&/0H     | 1B 26 6C 30 48             | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                                 | Upper Paper Tray (1)                | ESC&/1H     | 1B 26 6C 31 48             | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                                 | Manual Feeder (2)                   | ESC&/2H     | 1B 26 6C 32 48             | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                                 | Manual Feeder (3)                   | ESC&/3H     | 1B 26 6C 33 48             | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                                 | Lower (1) Tray (4)                  | ESC&/4H     | 1B 26 6C 34 48             | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                                 | Lower (2) Tray (5)                  | ESC&/5H     | 1B 26 6C 35 48             | No            | Yes                  | Yes                  | Yes              | No    |
|                                 | Envelope Tray (6)                   | ESC&/6H     | 1B 26 6C 36 48             | No            | Yes                  | Yes                  | Yes              | No    |
|                                 | Auto Select (Media Type)            | ESC&/7H     | 1B 26 6C 37 48             | No            | Yes                  | Yes                  | Yes              | Yes   |
|                                 | 3rd Tray in PF-60/4th Tray in PF-30 | ESC&/20H    | 1B 26 6C 32 30 48          | No            | Yes                  | No                   | Yes              | No    |
|                                 | 5th Tray in PF-30                   | ESC&/21H    | 1B 26 6C 32 31 48          | No            | No                   | No                   | Yes              | No    |
|                                 | 6th Tray in PF-30                   | ESC&/22H    | 1B 26 6C 32 32 48          | No            | No                   | No                   | Yes              | No    |

Table 7.25. HP LaserJet PCL Commands (Sheet 2 of 15)

| Function          | Parameter                           | Command                    | Hexadecimal Value                               | 1000<br>1000+ | 1800<br>1900<br>3800 | 6300<br>6750<br>6900 | 9100DN<br>9500DN | 8000C |
|-------------------|-------------------------------------|----------------------------|-------------------------------------------------|---------------|----------------------|----------------------|------------------|-------|
| Output Bin        | Destination Tray 1 (Face down)      | ESC&i1G                    | 1B 25 6C 31 47                                  | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                   | Destination Tray 2 (Face up)        | ESC&i2G                    | 1B 25 6C 32 47                                  | No            | Yes                  | Yes                  | Yes              | Yes   |
|                   | Destination Tray 3 (Opt. Face down) | ESC&i3G                    | 1B 26 6C 33 47                                  | No            | No                   | No                   | Yes              | No    |
|                   | Destination Tray 1 (Face down)      | ESC&i4G                    | 1B 26 6C 34 47                                  | No            | No                   | No                   | Yes              | No    |
|                   | Destination Tray 2 (Face down)      | ESC&i5G                    | 1B 26 6C 35 47                                  | No            | No                   | No                   | Yes              | No    |
|                   | Destination Tray 3 (Face down)      | ESC&i6G                    | 1B 26 6C 36 47                                  | No            | No                   | No                   | Yes              | No    |
|                   | Destination Tray 4 (Face down)      | ESC&i7G                    | 1B 26 6C 37 47                                  | No            | No                   | No                   | Yes              | No    |
|                   | Destination Tray 5 (Face down)      | ESC&i8G                    | 1B 26 6C 38 47                                  | No            | No                   | No                   | Yes              | No    |
|                   | Destination Tray 6 (Face down)      | ESC&i9G                    | 1B 26 6C 39 47                                  | No            | No                   | No                   | Yes              | No    |
|                   | Destination Tray 7 (Face down)      | ESC&i10G                   | 1B 26 6C 31 30 47                               | No            | No                   | No                   | Yes              | No    |
|                   | Destination Tray 8 (Face down)      | ESC&i11G                   | 1B 26 6C 31 31 47                               | No            | No                   | No                   | Yes              | No    |
|                   | Destination Tray 9 (Face down)      | ESC&i12G                   | 1B 26 6C 31 32 47                               | No            | No                   | No                   | Yes              | No    |
| <b>Media Type</b> |                                     |                            |                                                 |               |                      |                      |                  |       |
| Media Type        | Automatic <sup>a</sup>              | ESC&n5Wd↵<br>Auto          | 35 57 64 61 75 74 6F                            | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                   | Plain                               | ESC&n6Wd↵<br>Plain         | 36 57 64 50 6C 61 69 6E                         | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                   | Transparency                        | ESC&n13Wd↵<br>Transparency | 31 33 57 64 54 72 61 6E 73 70 61 72 65 6E 63 79 | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                   | Preprinted                          | ESC&n11Wd↵<br>Preprinted   | 31 31 57 64 50 72 65 70 72 69 6E 74 65 64       | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                   | Labels                              | ESC&n7Wd↵<br>Labels        | 37 57 64 4C 61 62 65 6C 73                      | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                   | Bond                                | ESC&n5Wd↵<br>Bond          | 35 57 64 42 6F 6E 64                            | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                   | Recycled                            | ESC&n9Wd↵<br>Recycled      | 39 57 64 52 65 63 79 63 6C 65 64                | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                   | Vellum                              | ESC&n7Vellum               | 37 56 65 6C 6C 75 6D 0D                         | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                   | Rough                               | ESC&n6Wd↵<br>Rough         |                                                 | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                   | Letterhead                          | ESC&n11Wd↵<br>Letterhead   | 31 31 57 64 4C 65 74 74 65 72 68 65 61 64       | Yes           | Yes                  | Yes                  | Yes              | Yes   |



Table 7.25. HP LaserJet PCL Commands (Sheet 3 of 15)

| Function  | Parameter         | Command                  | Hexadecimal Value                               | 1000<br>1000+ | 1800<br>1900<br>3800 | 6300<br>6750<br>6900 | 9100DN<br>9500DN | 8000C |
|-----------|-------------------|--------------------------|-------------------------------------------------|---------------|----------------------|----------------------|------------------|-------|
|           | Color             | ESC&n6Wd←<br>Color       | 36 57 64 43 6F<br>6C 6F 72                      | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|           | Prepunched        | ESC&n11Wd←<br>Prepunched | 31 31 57 64 50<br>72 65 70 75 6E<br>63 68 65 64 | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|           | Envelope          | ESC&n9Wd←<br>Envelope    |                                                 | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|           | Card stock        | ESC&n11Wd←<br>Cardstock  | 31 30 57 64 43<br>61 72 64 73 74<br>6F 63 6B    | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|           | Custom 1          | ESC&n8Wd←<br>Custom1     |                                                 | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|           | Custom 2          | ESC&n8Wd←<br>Custom2     |                                                 | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|           | Custom 3          | ESC&n8Wd←<br>Custom3     |                                                 | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|           | Custom 4          | ESC&n8Wd←<br>Custom4     |                                                 | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|           | Custom 5          | ESC&n8Wd←<br>Custom5     |                                                 | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|           | Custom 6          | ESC&n8Wd←<br>Custom6     |                                                 | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|           | Custom 7          | ESC&n8Wd←<br>Custom7     |                                                 | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|           | Custom 8          | ESC&n8Wd←<br>Custom8     |                                                 | Yes           | Yes                  | Yes                  | Yes              | Yes   |
| Page Size | Executive         | ESC&/1A                  | 1B 26 6C 31 41                                  | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|           | Letter            | ESC&/2A                  | 1B 26 6C 32 41                                  | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|           | Legal             | ESC&/3A                  | 1B 26 6C 33 41                                  | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|           | Ledger            | ESC&/6A                  | 1B 26 6C 36 41                                  | No            | No                   | Yes                  | Yes              | No    |
|           | A5                | ESC&/25A                 | 1B 26 6C 32 35<br>41                            | Yes           | Yes                  | Yes                  | Yes              | No    |
|           | A4                | ESC&/26A                 | 1B 26 6C 32 36<br>41                            | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|           | A3                | ESC&/27A                 | 1B 26 6C 32 37<br>41                            | No            | No                   | Yes                  | Yes              | No    |
|           | JIS B5            | ESC&/45A                 | 1B 26 6C 34 35<br>41                            | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|           | JIS B4            | ESC&/46A                 | 1B 26 6C 34 36<br>41                            | No            | No                   | Yes                  | Yes              | No    |
|           | Hagaki            | ESC&/71A                 | 1B 26 6C 37 31<br>41                            | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|           | Oufuku-<br>Hagaki | ESC&/72A                 | 1B 26 6C 37 32<br>41                            | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|           | YOUKEI 2          | ESC&/78A                 | 1B 26 6C 37 38<br>41                            | No            | No                   | No                   | Yes              | No    |
|           | YOUKEI 4          | ESC&/79A                 | 1B 26 6C 37 39<br>41                            | No            | No                   | No                   | Yes              | No    |
|           | FOLIO             | ESC&/77A                 | 1B 26 6C 37 37<br>41                            | No            | No                   | No                   | Yes              | No    |
|           | STATEMENT         | ESC&/76A                 | 1B 26 6C 37 36<br>41                            | No            | No                   | No                   | Yes              | No    |
|           | OFICIO II         | ESC&/73A                 | 1B 26 6C 37 33<br>41                            | No            | No                   | No                   | Yes              | No    |

Table 7.25. HP LaserJet PCL Commands (Sheet 4 of 15)

| Function                         | Parameter                                                 | Command   | Hexadecimal Value    | 1000<br>1000+ | 1800<br>1900<br>3800 | 6300<br>6750<br>6900 | 9100DN<br>9500DN | 8000C |
|----------------------------------|-----------------------------------------------------------|-----------|----------------------|---------------|----------------------|----------------------|------------------|-------|
|                                  | International B5                                          | ESC&/100A | 1B 26 6C 31 30 30 41 | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                                  | Custom                                                    | ESC&/101A | 1B 26 6C 31 30 31 41 | Yes           | Yes                  | Yes                  | Yes              | No    |
|                                  | Monarch                                                   | ESC&/80A  | 1B 26 6C 38 30 41    | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                                  | COM 10                                                    | ESC&/81A  | 1B 26 6C 38 31 41    | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                                  | DL                                                        | ESC&/90A  | 1B 26 6C 39 30 41    | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                                  | International C5                                          | ESC&/91A  | 1B 26 6C 39 31 41    | Yes           | Yes                  | Yes                  | Yes              | Yes   |
| Page Length                      | # of Lines                                                | ESC&/#P   | 1B 26 6C #...# 050   | Yes           | Yes                  | Yes                  | Yes              | Yes   |
| <b>Orientation</b>               |                                                           |           |                      |               |                      |                      |                  |       |
| Orientation                      | Portrait                                                  | ESC&/0O   | 1B 26 6C 30 4F       | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                                  | Landscape                                                 | ESC&/1O   | 1B 26 6C 31 4F       | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                                  | Reverse Portrait                                          | ESC&/2O   | 1B 26 6C 32 4F       | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                                  | Reverse Landscape                                         | ESC&/3O   | 1B 26 6C 33 4F       | Yes           | Yes                  | Yes                  | Yes              | Yes   |
| Print Direction                  | Degrees of Rotation (counterclockwise 90°increments only) | ESC&a#P   | 1B 26 61 #...# 50    | Yes           | Yes                  | Yes                  | Yes              | Yes   |
| Character Text Path Direction    | Horizontal                                                | ESC&c0T   | 1B 26 63 30 54       | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                                  | Vertical Rotated                                          | ESC&c-1T  | 1B 26 63 2D 31 54    | Yes           | Yes                  | Yes                  | Yes              | Yes   |
| <b>Margins and Text Length</b>   |                                                           |           |                      |               |                      |                      |                  |       |
| Top Margin                       | # of Lines                                                | ESC&/#E   | 1B 26 6C #...# 45    | Yes           | Yes                  | Yes                  | Yes              | Yes   |
| Text Length                      | # of Lines                                                | ESC&/#F   | 1B 26 6C #...# 46    | Yes           | Yes                  | Yes                  | Yes              | Yes   |
| Left Margin                      | # of Columns                                              | ESC&a#L   | 1B 26 61 #...# 4C    | Yes           | Yes                  | Yes                  | Yes              | Yes   |
| Right Margin                     | # of Columns                                              | ESC&a#M   | 1B 26 61 #...# 4D    | Yes           | Yes                  | Yes                  | Yes              | Yes   |
| Clear Horizontal Margins         |                                                           | ESC9      | 1B 39                | Yes           | Yes                  | Yes                  | Yes              | Yes   |
| <b>Perforation Skip Mode</b>     |                                                           |           |                      |               |                      |                      |                  |       |
| Perforation Skip                 | Disable                                                   | ESC&/0L   | 1B 26 6C 30 4C       | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                                  | Enable                                                    | ESC&/1L   | 1B 26 6C 31 4C       | Yes           | Yes                  | Yes                  | Yes              | Yes   |
| <b>Horizontal Column Spacing</b> |                                                           |           |                      |               |                      |                      |                  |       |
| Horizontal Motion Index (HMI)    | # of 1/120" Increments                                    | ESC&/k#H  | 1B 26 6B #...# 48    | Yes           | Yes                  | Yes                  | Yes              | Yes   |
| <b>Vertical Line Spacing</b>     |                                                           |           |                      |               |                      |                      |                  |       |
| Vertical Motion Index (VMI)      | # of 1/48" Increments                                     | ESC&/#C   | 1B 26 6C #...# 43    | Yes           | Yes                  | Yes                  | Yes              | Yes   |
| Line Spacing (Lines per inch)    | 1 line/inch                                               | ESC&/1D   | 1B 26 6C 31 44       | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                                  | 2 lines/inch                                              | ESC&/2D   | 1B 26 6C 32 44       | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                                  | 3 lines/inch                                              | ESC&/3D   | 1B 26 6C 33 44       | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                                  | 4 lines/inch                                              | ESC&/4D   | 1B 26 6C 34 44       | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                                  | 6 lines/inch                                              | ESC&/6D   | 1B 26 6C 36 44       | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                                  | 8 lines/inch                                              | ESC&/8D   | 1B 26 6C 38 44       | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                                  | 12 lines/inch                                             | ESC&/12D  | 1B 26 6C 31 32 44    | Yes           | Yes                  | Yes                  | Yes              | Yes   |

Table 7.25. HP LaserJet PCL Commands (Sheet 5 of 15)

| Function                       | Parameter                                      | Command                      | Hexadecimal Value | 1000<br>1000+ | 1800<br>1900<br>3800 | 6300<br>6750<br>6900 | 9100DN<br>9500DN | 8000C |
|--------------------------------|------------------------------------------------|------------------------------|-------------------|---------------|----------------------|----------------------|------------------|-------|
|                                | 16 lines/inch                                  | ESC&i16D                     | 1B 26 6C 31 36 44 | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                                | 24 lines/inch                                  | ESC&i24D                     | 1B 26 6C 32 34 44 | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                                | 48 lines/inch                                  | ESC&i48D                     | 1B 26 6C 34 38 44 | Yes           | Yes                  | Yes                  | Yes              | Yes   |
| Alphanumeric ID                | # of bytes                                     | ESC&n#W [operation] [String] | 1B 26 6E #...# 57 | Yes           | Yes                  | Yes                  | Yes              | Yes   |
| <b>CURSOR POSITIONING</b>      |                                                |                              |                   |               |                      |                      |                  |       |
| <b>Vertical and Horizontal</b> |                                                |                              |                   |               |                      |                      |                  |       |
| Vertical Position              | # of Rows                                      | ESC&a#R                      | 1B 26 61 #...# 52 | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                                | # of Dots                                      | ESC*p#Y                      | 1B 2A 70 #...# 59 | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                                | # of Decipoints                                | ESC&a#V                      | 1B 26 61 #...# 56 | Yes           | Yes                  | Yes                  | Yes              | Yes   |
| Horizontal Position            | # of Columns                                   | ESC&a#C                      | 1B 26 61 #...# 43 | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                                | # of Dots                                      | ESC*p#X                      | 1B 2A 70 #...# 58 | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                                | # of Decipoints                                | ESC&a#H                      | 1B 26 61 #...# 48 | Yes           | Yes                  | Yes                  | Yes              | Yes   |
| Half Line Feed                 |                                                | ESC=                         | 1B 3D             | Yes           | Yes                  | Yes                  | Yes              | Yes   |
| <b>End-of-Line Termination</b> |                                                |                              |                   |               |                      |                      |                  |       |
| Line Termination               | CR = CR;<br>LF = LF;<br>FF = FF;               | ESC&k0G                      | 1B 26 6B 30 47    | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                                | CR = CR + LF<br>LF = LF<br>FF = FF             | ESC&k1G                      | 1B 26 6B 31 47    | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                                | CR = CR;<br>LF = CR + LF;<br>FF = CR + FF      | ESC&k2G                      | 1B 26 6B 32 47    | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                                | CR = CR + LF;<br>LF = CR + LF;<br>FF = CR + FF | ESC&k3G                      | 1B 26 6B 33 47    | Yes           | Yes                  | Yes                  | Yes              | Yes   |
| <b>Push/Pop Position</b>       |                                                |                              |                   |               |                      |                      |                  |       |
| Push/Pop Position              | Push                                           | ESC&f#S                      | 1B 26 66 30 53    | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                                | Pop                                            | ESC&f#S                      | 1B 26 66 31 53    | Yes           | Yes                  | Yes                  | Yes              | Yes   |
| <b>FONT SELECTION</b>          |                                                |                              |                   |               |                      |                      |                  |       |
| <b>Symbol Set Selection</b>    |                                                |                              |                   |               |                      |                      |                  |       |
| Primary Symbol Set             | ISO 60: Norwegian                              | ESC(0D                       | 1B 28 30 44       | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                                | ISO 4; United Kingdom                          | ESC(1E                       | 1B 28 31 45       | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                                | Windows 3.1 Latin 2                            | ESC(9E                       | 1B 28 39 45       | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                                | ISO 69: French                                 | ESC(1F                       | 1B 28 31 46       | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                                | ISO 21: German                                 | ESC(1G                       | 1B 28 31 47       | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                                | ISO 15: Italian                                | ESC(0I                       | 1B 28 30 49       | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                                | Microsoft publishing                           | ESC(6J                       | 1B 28 36 4A       | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                                | DeskTop                                        | ESC(7J                       | 1B 28 37 4A       | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                                | PC1004                                         | ESC(9J                       | 1B 28 39 4A       | No            | No                   | No                   | Yes              | No    |
|                                | PS Text                                        | ESC(10J                      | 1B 28 31 30 4A    | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                                | MC Text                                        | ESC(12J                      | 1B 28 31 32 4A    | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                                | Wingdings                                      | ESC(579L 4C                  | 1B 28 35 37 39 4C | No            | Yes                  | Yes                  | Yes              | Yes   |
|                                | PS Math                                        | ESC(5M                       | 1B 28 35 4D       | Yes           | Yes                  | Yes                  | Yes              | Yes   |

Table 7.25. HP LaserJet PCL Commands (Sheet 6 of 15)

| Function          | Parameter                    | Command  | Hexadecimal Value | 1000<br>1000+ | 1800<br>1900<br>3800 | 6300<br>6750<br>6900 | 9100DN<br>9500DN | 8000C |
|-------------------|------------------------------|----------|-------------------|---------------|----------------------|----------------------|------------------|-------|
|                   | Math-8                       | ESC(8M   | 1B 28 38 4D       | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                   | Symbol                       | ESC(19M  | 1B 28 31 39 4D    | No            | Yes                  | Yes                  | Yes              | Yes   |
|                   | ECMA-94 Latin 1              | ESC(0N   | 1B 28 30 4E       | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                   | ISO L2                       | ESC(2N   | 1B 28 32 4E       | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                   | ISO L5                       | ESC(5N   | 1B 28 35 4E       | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                   | ISO 8859-10 Latin 6          | ESC(6N   | 1B 28 36 4E       | No            | No                   | No                   | Yes              | No    |
|                   | ISO 11: Swedish              | ESC(0S   | 1B 28 30 53       | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                   | ISO 17: Spanish              | ESC(2S   | 1B 28 32 53       | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                   | Windows 3.1 Latin 5          | ESC(5T   | 1B 28 35 54       | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                   | PC Turkish                   | ESC(9T   | 1B 28 39 54       | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                   | ISO 6: ASCII                 | ESC(0U   | 1B 28 30 55       | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                   | Legal                        | ESC(1U   | 1B 28 31 55       | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                   | Roman-8                      | ESC(8U   | 1B 28 38 55       | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                   | Windows 3.0 Latin 1          | ESC(9U   | 1B 28 39 55       | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                   | PC-8                         | ESC(10U  | 1B 28 31 30 55    | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                   | PC-8 D/N                     | ESC(11U  | 1B 28 31 31 55    | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                   | PC 850                       | ESC(12U  | 1B 28 31 32 55    | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                   | Pi Font                      | ESC(15U  | 1B 28 31 35 55    | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                   | PC-852                       | ESC(17U  | 1B 28 31 37 55    | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                   | Windows 3.1 Latin 1 (ANSI)   | ESC(19U  | 1B 28 31 39 55    | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                   | PC-775                       | ESC(26U  | 1B 28 32 36 55    | No            | No                   | No                   | Yes              | No    |
|                   | Windows 3.1J (Japanese)      | ESC(19K  | 1B 28 31 39 4B    | Yes           | Yes                  | Yes                  | Yes              | Yes   |
| <b>Spacing</b>    |                              |          |                   |               |                      |                      |                  |       |
| Primary Spacing   | Fixed                        | ESC(s0P  | 1B 28 73 30 50    | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                   | Proportional                 | ESC(s1p  | 1B 28 73 31 50    | Yes           | Yes                  | Yes                  | Yes              | Yes   |
| <b>Pitch</b>      |                              |          |                   |               |                      |                      |                  |       |
| Primary Pitch     | # Characters/ inch           | ESC(s#H  | 1B 28 73 #...#48  | Yes           | Yes                  | Yes                  | Yes              | Yes   |
| Set Pitch Mode    | 10.0                         | ESC&k0S  | 1B 26 6B 30 53    | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                   | Compressed (16.5-16.7)       | ESC&k2S  | 1B 26 6B 32 53    | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                   | Elite (12.0)                 | ESC&k4S  | 1B 26 6B 34 53    | Yes           | Yes                  | Yes                  | Yes              | Yes   |
| <b>Point Size</b> |                              |          |                   |               |                      |                      |                  |       |
| Primary Height    | # Points                     | ESC(s#V  | 1B 28 73 #...#56  | Yes           | Yes                  | Yes                  | Yes              | Yes   |
| <b>Style</b>      |                              |          |                   |               |                      |                      |                  |       |
| Primary Style     | Upright (Solid)              | ESC(s0S  | 1B 28 73 30 53    | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                   | Italic                       | ESC(s1S  | 1B 28 73 31 53    | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                   | Condensed                    | ESC(s4S  | 1B 28 73 34 53    | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                   | Condensed Italic             | ESC(s5S  | 1B 28 73 35 53    | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                   | Compressed (Extra Condensed) | ESC(s8S  | 1B 28 73 38 53    | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                   | Expanded                     | ESC(s24S | 1B 28 73 32 34 53 | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                   | Outline                      | ESC(s32S | 1B 28 73 33 32 53 | Yes           | Yes                  | Yes                  | Yes              | Yes   |

Table 7.25. HP LaserJet PCL Commands (Sheet 7 of 15)

| Function                       | Parameter                | Command     | Hexadecimal Value          | 1000<br>1000+ | 1800<br>1900<br>3800 | 6300<br>6750<br>6900 | 9100DN<br>9500DN | 8000C |
|--------------------------------|--------------------------|-------------|----------------------------|---------------|----------------------|----------------------|------------------|-------|
|                                | Inline                   | ESC(s64S    | 1B 28 73 36 34 53          | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                                | Shadowed                 | ESC(s128S   | 1B 28 73 31 32 38 53       | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                                | Outline                  | ESC(s160S   | 1B 28 73 31 36 30 53       | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                                | Shadowed                 |             |                            |               |                      |                      |                  |       |
| <b>Stroke Weight</b>           |                          |             |                            |               |                      |                      |                  |       |
| Primary Font<br>Stroke Weight  | Ultra Thin               | ESC(s-7B    | 1B 28 73 2D 37 42          | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                                | Extra Thin               | ESC(s-6B    | 1B 28 73 2D 36 42          | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                                | Thin                     | ESC(s-5B    | 1B 28 73 2D 35 42          | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                                | Extra Light              | ESC(s-4B    | 1B 28 73 2D 34 42          | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                                | Light                    | ESC(s-3B    | 1B 28 73 2D 33 42          | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                                | Demi Light               | ESC(s-2B    | 1B 28 73 2D 32 42          | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                                | Semi Light               | ESC(s-1B    | 1B 28 73 2D 31 42          | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                                | Medium<br>(book or text) | ESC(s0B     | 1B 28 73 30 42             | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                                | Semi Bold                | ESC(s1B     | 1B 28 73 31 42             | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                                | Demi Bold                | ESC(s2B     | 1B 28 73 32 42             | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                                | Bold                     | ESC(s3B     | 1B 28 73 33 42             | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                                | Extra Bold               | ESC(s4B     | 1B 28 73 34 42             | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                                | Black                    | ESC(s5B     | 1B 28 73 35 42             | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                                | Extra Black              | ESC(s6B     | 1B 28 73 36 42             | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                                | Ultra Black              | ESC(s7B     | 1B 28 73 37 42             | Yes           | Yes                  | Yes                  | Yes              | Yes   |
| <b>Primary Typeface Family</b> |                          |             |                            |               |                      |                      |                  |       |
| Typeface<br>Family             | Albertus                 | ESC(s4362T  | 1B 28 73 34 31 36 32 54    | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                                | Antique Olive            | ESC(s4168T  | 1B 28 73 34 31 36 38 54    | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                                | Clarendon                | ESC(s4140T  | 1B 28 73 34 31 34 30 54    | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                                | Coronet                  | ESC(s4116T  | 1B 28 73 34 31 31 36 54    | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                                | Courier                  | ESC(s3T     | 1B 28 73 33 54             | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                                | GW-Kai                   | ESC(s37357T | 1B 28 73 33 37 33 35 37 54 | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                                | Courier                  | ESC(s4099T  | 1B 28 73 34 30 39 39 54    | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                                | ITC Zapf<br>Dingbats     | ESC(s4141T  | 1B 28 73 34 31 34 31 54    | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                                | Garamond<br>Antiqua      | ESC(s4197T  | 1B 28 73 34 31 39 37 54    | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                                | Letter Gothic            | ESC(s4102T  | 1B 28 73 34 31 30 32 54    | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                                | LinePrinter              | ESC(s0T     | 1B 28 73 30 54             | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                                | Marigold                 | ESC(s4297T  | 1B 28 73 34 32 39 37 54    | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                                | CG Omega                 | ESC(s4113T  | 1B 28 73 34 31 31 33 54    | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                                | CG Times                 | ESC(s4101T  | 1B 28 73 34 31 30 31 54    | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                                | Univers                  | ESC(s4148T  | 1B 28 73 34 31 34 38 54    | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                                | Arial                    | ESC(s16602T | 1B 28 73 31 36 36 30 32 54 | Yes           | Yes                  | Yes                  | Yes              | Yes   |

Table 7.25. HP LaserJet PCL Commands (Sheet 8 of 15)

| Function                                   | Parameter                                           | Command            | Hexadecimal Value             | 1000<br>1000+ | 1800<br>1900<br>3800 | 6300<br>6750<br>6900 | 9100DN<br>9500DN | 8000C |
|--------------------------------------------|-----------------------------------------------------|--------------------|-------------------------------|---------------|----------------------|----------------------|------------------|-------|
|                                            | MS Mincho                                           | ESC(s28752T        | 1B 28 73 32 38<br>37 35 32 54 | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                                            | MS Gothic                                           | ESC(s28825T        | 1B 28 73 32 38<br>38 32 35 54 | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                                            | Times New Roman                                     | ESC(s16901T        | 1B 28 73 31 36<br>39 30       | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                                            | SimHei                                              | ESC(s37110T        | 1B 28 73 33 37<br>31 31 30 54 | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                                            | SimSun                                              | ESC(s37058T        | 1B 28 73 33 37<br>30 35 38 54 | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                                            | Symbol                                              | ESC(s16686T        | 1B 28 73 31 36<br>36 38 36 54 | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                                            | Wingdings                                           | ESC(s6826T         | 1B 28 73 36 38<br>32 36 54    | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                                            | Wingdings                                           | ESC(s31402T        | 1B 28 73 33 31<br>34 30 32 54 | Yes           | Yes                  | Yes                  | Yes              | Yes   |
| <b>Font Default</b>                        |                                                     |                    |                               |               |                      |                      |                  |       |
| Font Default                               | Primary Font                                        | ESC(3@             | 1B 28 33 40                   | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                                            | Secondary Font                                      | ESC)3@             | 1B 29 33 40                   | Yes           | Yes                  | Yes                  | Yes              | Yes   |
| <b>Underline</b>                           |                                                     |                    |                               |               |                      |                      |                  |       |
| Underline                                  | Enable Fixed                                        | ESC&d0D            | 1B 26 64 30 44                | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                                            | Enable Floating                                     | ESC&d3D            | 1B 26 64 33 44                | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                                            | Disable                                             | ESC&d@             | 1B 26 64 40                   | Yes           | Yes                  | Yes                  | Yes              | Yes   |
| Text Parsing Method                        | 1-Byte                                              | ESC&t0P            | 1B 26 74 30 50                | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                                            | 1-Byte                                              | ESC&t1P            | 1B 26 74 31 50                | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                                            | 1-Byte/2-Byte                                       | ESC&t21P           | 1B 26 74 32 31<br>50          | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                                            | 1-Byte/2-Byte                                       | ESC&t31P           | 1B 26 74 33 31<br>50          | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                                            | 1-Byte/2-Byte                                       | ESC&t38P           | 1B 26 74 33 38<br>50          | Yes           | Yes                  | Yes                  | Yes              | Yes   |
| <b>Transparent Print</b>                   |                                                     |                    |                               |               |                      |                      |                  |       |
| Transparent Print Data                     | # of Bytes                                          | ESC&p#X↵<br>[Data] | 1B 26 70 #...# 58             | Yes           | Yes                  | Yes                  | Yes              | Yes   |
| <b>FONT MANAGEMENT</b>                     |                                                     |                    |                               |               |                      |                      |                  |       |
| AssignFontID                               | Font ID #                                           | ESC*c#D            | 1B 2A 63 #...#<br>44          | Yes           | Yes                  | Yes                  | Yes              | Yes   |
| Font and Character Control                 | Delete all Fonts                                    | ESC*c0F            | 1B 2A 63 30 46                | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                                            | Delete all temporary fonts                          | ESC*c1F            | 1B 2A 63 31 46                | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                                            | Delete last font ID specified                       | ESC*c2F            | 1B 2A 63 32 46                | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                                            | Delete last character specified                     | ESC*c3F            | 1B 2A 63 33 46                | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                                            | Make font temporary                                 | ESC*c4F            | 1B 2A 63 34 46                | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                                            | Make font permanent                                 | ESC*c5F            | 1B 2A 63 35 46                | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                                            | Copy/Assign the currently invoked font as temporary | ESC*c6F            | 1B 2A 63 36 46                | Yes           | Yes                  | Yes                  | Yes              | Yes   |
| <b>Soft Symbol Set Management/Creation</b> |                                                     |                    |                               |               |                      |                      |                  |       |
| SetSymbolSet                               | ID #                                                | ESC*c#R            | 1B 2A 63 #...#<br>52          | Yes           | Yes                  | Yes                  | Yes              | Yes   |

Table 7.25. HP LaserJet PCL Commands (Sheet 9 of 15)

| Function                                    | Parameter                                            | Command       | Hexadecimal Value | 1000<br>1000+ | 1800<br>1900<br>3800 | 6300<br>6750<br>6900 | 9100DN<br>9500DN | 8000C |
|---------------------------------------------|------------------------------------------------------|---------------|-------------------|---------------|----------------------|----------------------|------------------|-------|
| Define Symbol Set                           | # of Bytes                                           | ESC(f#W[DATA] | 1B 28 66 #...# 57 | Yes           | Yes                  | Yes                  | Yes              | Yes   |
| Symbol Set Control                          | Delete all symbol sets                               | ESC*c0S       | 1B 2A 63 30 53    | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                                             | Delete all temporary symbol sets                     | ESC*c1S       | 1B 2A 63 31 53    | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                                             | Delete current soft symbol set (last ID#)            | ESC*c2S       | 1B 2A 63 32 53    | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                                             | Make current soft symbol set temporary               | ESC*c4S       | 1B 2A 63 34 53    | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                                             | Make current soft symbol set permanent               | ESC*c5S       | 1B 2A 63 35 53    | Yes           | Yes                  | Yes                  | Yes              | Yes   |
| <b>Font Selection by ID number</b>          |                                                      |               |                   |               |                      |                      |                  |       |
| Select font (with ID #)                     | ID # primary font                                    | ESC(#X        | 1B 28 #...# 58    | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                                             | ID # secondary font                                  | ESC)#X        | 1B 29 #...# 58    | Yes           | Yes                  | Yes                  | Yes              | Yes   |
| <b>Soft Font Creation</b>                   |                                                      |               |                   |               |                      |                      |                  |       |
| Font descriptor (font header)               | # of bytes                                           | ESC)s#W[Data] | 1B 29 73 #...# 57 | Yes           | Yes                  | Yes                  | Yes              | Yes   |
| Download character                          | # of bytes                                           | ESC(s#W[Data] | 1B 28 73 #...# 57 | Yes           | Yes                  | Yes                  | Yes              | Yes   |
| Character code # (decimal)                  | Character code # (decimal)                           | ESC*c#E       | 1B 2A 63 #...# 45 | Yes           | Yes                  | Yes                  | Yes              | Yes   |
| <b>GRAPHICS</b>                             |                                                      |               |                   |               |                      |                      |                  |       |
| <b>PCL Vector Graphics Switching/Set-Up</b> |                                                      |               |                   |               |                      |                      |                  |       |
| Enter PCL Mode                              | Use previous PCL cursor position                     | ESC%0A        | 1B 25 30 41       | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                                             | Use current HP-GL/2 pen position for cursor position | ESC%1A        | 1B 25 31 41       | Yes           | Yes                  | Yes                  | Yes              | Yes   |
| Enter HP-GL/2 Mode                          | Use Previous HP-GL/2 pen position                    | ESC%0B        | 1B 25 30 42       | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                                             | Use current PCL cursor position                      | ESC%1B        | 1B 25 31 42       | Yes           | Yes                  | Yes                  | Yes              | Yes   |
| HP-GL/2 Plot Horizontal Size                | Horizontal size in inches                            | ESC*c#K       | 1B 2A 63 #...# 48 | Yes           | Yes                  | Yes                  | Yes              | Yes   |
| HP-GL/2 Plot Vertical Size                  | Vertical size in inches                              | ESC*c#L       | 1B 2A 63 #...# 4C | Yes           | Yes                  | Yes                  | Yes              | Yes   |
| Set Picture Frame Anchor Point              | Set anchor point to cursor position                  | ESC*c0T       | 1B 2A 63 30 54    | Yes           | Yes                  | Yes                  | Yes              | Yes   |
| Picture Frame Horizontal Size               | Decipoints                                           | ESC*c#X       | 1B 2A 63 #...# 58 | Yes           | Yes                  | Yes                  | Yes              | Yes   |
| Picture Frame Vertical Size                 | Decipoints                                           | ESC*c#Y       | 1B 2A 63 #...# 59 | Yes           | Yes                  | Yes                  | Yes              | Yes   |

Table 7.25. HP LaserJet PCL Commands (Sheet 10 of 15)

| Function                        | Parameter                               | Command        | Hexadecimal Value    | 1000<br>1000+ | 1800<br>1900<br>3800 | 6300<br>6750<br>6900 | 9100DN<br>9500DN | 8000C |
|---------------------------------|-----------------------------------------|----------------|----------------------|---------------|----------------------|----------------------|------------------|-------|
| <b>Raster Graphics</b>          |                                         |                |                      |               |                      |                      |                  |       |
| Raster Resolution               | 75 dots/inch                            | ESC*t75R       | 1B 2A 74 37 35 52    | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                                 | 100 dots/inch                           | ESC*t100R      | 1B 2A 74 31 30 30 52 | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                                 | 150 dots/inch                           | ESC*t150R      | 1B 2A 74 31 35 30 52 | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                                 | 200 dots/inch                           | ESC*t200R      | 1B 2A 74 32 30 30 52 | No            | Yes                  | No                   | Yes              | Yes   |
|                                 | 300 dots/inch                           | ESC*t300R      | 1B 2A 74 33 30 30 52 | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                                 | 600 dots/inch                           | ESC*t600R      | 1B 2A 74 36 30 30 52 | No            | Yes                  | No                   | Yes              | Yes   |
| <b>Orientation</b>              |                                         |                |                      |               |                      |                      |                  |       |
| <b>Raster Graphics</b>          |                                         |                |                      |               |                      |                      |                  |       |
| Raster Graphics Presentation    | Follows orientation                     | ESC*r0F        | 1B 2A 72 30 46       | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                                 | Follows physical page                   | ESC*r3F        | 1B 2A 72 33 46       | Yes           | Yes                  | Yes                  | Yes              | Yes   |
| Start Raster Graphics           | Left Raster Graphics Margin             | ESC*r0A        | 1B 2A 72 30 41       | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                                 | Current Cursor                          | ESC*r1A        | 1B 2A 72 31 41       | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                                 | Scale mode (logical left page boundary) | ESC*r2A        | 1B 2A 72 32 41       | No            | No                   | No                   | No               | Yes   |
|                                 | Scale mode (at CAP)                     | ESC*r3A        | 1B 2A 72 33 42       | No            | No                   | No                   | No               | Yes   |
| Raster Y Offset                 | # of Raster Lines of vertical movement  | ESC*b#Y        | 1B 2A 62 #...# 59    | Yes           | Yes                  | Yes                  | Yes              | Yes   |
| Set Raster Compression Mode     | Unencoded                               | ESC*b0M        | 1B 2A 62 30 4D       | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                                 | Run-Length Encoded                      | ESC*b1M        | 1B 2A 62 31 4D       | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                                 | Tagged Image File Format                | ESC*b2M        | 1B 2A 62 32 4D       | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                                 | Delta Row                               | ESC*b3M        | 1B 2A 62 33 4D       | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                                 | Adaptive compression                    | ESC*b5M        | 1B 2A 62 35 4D       | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                                 | Replacement Delta Row                   | ESC*b9M        | 1B 2A 98 39 4D       | Yes           | Yes                  | Yes                  | Yes              | Yes   |
| Transfer Raster Data by row     | # of Bytes                              | ESC*b#W [Data] | 1B 2A 62 #...# 57    | Yes           | Yes                  | Yes                  | Yes              | Yes   |
| Transfer Raster Data (by plane) | # of Bytes                              | ESC*b#V [Data] | 1B 2A 98 #...# 56    | No            | No                   | No                   | No               | Yes   |
| End Raster Graphics             | Old version                             | ESC*rB         | 1B 2A 72 42          | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                                 | Preferred                               | ESC*rC         | 1B 2A 72 43          | Yes           | Yes                  | Yes                  | Yes              | Yes   |
| Raster Height (Source)          | # Raster Rows                           | ESC*r#T        | 1B 2A 72 #...# 54    | Yes           | Yes                  | Yes                  | Yes              | Yes   |
| Raster Width (Source)           | # Pixels of the Specified Resolution    | ESC*r#S        | 1B 2A 72 #...# 53    | Yes           | Yes                  | Yes                  | Yes              | Yes   |
| <b>THE PRINT MODEL</b>          |                                         |                |                      |               |                      |                      |                  |       |
| <b>Imaging</b>                  |                                         |                |                      |               |                      |                      |                  |       |



Table 7.25. HP LaserJet PCL Commands (Sheet 11 of 15)

| Function                          | Parameter                                          | Command   | Hexadecimal Value    | 1000<br>1000+ | 1800<br>1900<br>3800 | 6300<br>6750<br>6900 | 9100DN<br>9500DN | 8000C |
|-----------------------------------|----------------------------------------------------|-----------|----------------------|---------------|----------------------|----------------------|------------------|-------|
| Select Current Pattern            | Solid Black (default)                              | ESC*v0T   | 1B 2A 76 30 54       | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                                   | Solid White                                        | ESC*v1T   | 1B 2A 76 31 54       | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                                   | HP-defined Shading Pattern                         | ESC*v2T   | 1B 2A 76 32 54       | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                                   | HP-defined Cross-Hatched Pattern                   | ESC*v3T   | 1B 2A 76 33 54       | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                                   | User defined pattern                               | ESC*v4T   | 1B 2A 76 34 54       | Yes           | Yes                  | Yes                  | Yes              | Yes   |
| Source Transparency Mode          | Transparent                                        | ESC*v0N   | 1B 2A 76 30 4E       | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                                   | Opaque                                             | ESC*v1N   | 1B 2A 76 31 4E       | Yes           | Yes                  | Yes                  | Yes              | Yes   |
| Pattern Transparency Mode         | Transparent                                        | ESC*v0O   | 1B 2A 76 30 4F       | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                                   | Opaque                                             | ESC*v1O   | 1B 2A 76 31 4F       | Yes           | Yes                  | Yes                  | Yes              | Yes   |
| Logical Operation                 | # = ROP3 input value                               | ESC*#O    | 1B 2A 6C #...# 4F    | Yes           | Yes                  | Yes                  | Yes              | Yes   |
| Pixel Placement                   | Grid Intersection                                  | ESC*v0R   | 1B 2A 6C 30 52       | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                                   | Pixel Placement                                    | ESC*v1R   | 1B 2A 76 31 52       | Yes           | Yes                  | Yes                  | Yes              | Yes   |
| <b>Rectangle Dimensions</b>       |                                                    |           |                      |               |                      |                      |                  |       |
| Rectangle Width (Horizontal Size) | # of dots                                          | ESC*c#A   | 1B 2A 63 #...# 41    | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                                   | # of decipoints                                    | ESC*c#H   | 1B 2A 63 #...# 48    | Yes           | Yes                  | Yes                  | Yes              | Yes   |
| Rectangle Height (Vertical Size)  | # of dots                                          | ESC*c#B   | 1B 2A 63 #...# 42    | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                                   | # of decipoints                                    | ESC*c#V   | 1B 2A 63 #...# 56    | Yes           | Yes                  | Yes                  | Yes              | Yes   |
| <b>Rectangular Area Fill</b>      |                                                    |           |                      |               |                      |                      |                  |       |
| Fill Rectangular Area             | Solid Black                                        | ESC*c0P   | 1B 2A 63 30 50       | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                                   | Erase (solid white fill)                           | ESC*c1P   | 1B 2A 63 31 50       | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                                   | Shaded Fill                                        | ESC*c2P   | 1B 2A 63 32 50       | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                                   | Cross-hatched Fill                                 | ESC*c3P   | 1B 2A 63 33 50       | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                                   | User-Defined                                       | ESC*c4P   | 1B 2A 63 34 50       | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                                   | Current Pattern                                    | ESC*c5P   | 1B 2A 63 35 50       | Yes           | Yes                  | Yes                  | Yes              | Yes   |
| Pattern ID                        | % of Shading or Type of Pattern or User Pattern ID | ESC*c#G   | 1B 2A 63 #...# 47    | Yes           | Yes                  | Yes                  | Yes              | Yes   |
| Shading                           | 2% Gray                                            | ESC*c2G   | 1B 2A 63 32 47       | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                                   | 10% Gray                                           | ESC*c10G  | 1B 2A 63 31 30 47    | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                                   | 15% Gray                                           | ESC*c15G  | 1B 2A 63 31 35 47    | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                                   | 30% Gray                                           | ESC*c30G  | 1B 2A 63 33 30 47    | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                                   | 45% Gray                                           | ESC*c45G  | 1B 2A 63 34 35 47    | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                                   | 70% Gray                                           | ESC*c70G  | 1B 2A 63 37 30 47    | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                                   | 90% Gray                                           | ESC*c90G  | 1B 2A 63 39 30 47    | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                                   | 100% Gray                                          | ESC*c100G | 1B 2A 63 31 30 30 47 | Yes           | Yes                  | Yes                  | Yes              | Yes   |

Table 7.25. HP LaserJet PCL Commands (Sheet 12 of 15)

| Function                                          | Parameter                     | Command  | Hexadecimal Value | 1000<br>1000+ | 1800<br>1900<br>3800 | 6300<br>6750<br>6900 | 9100DN<br>9500DN | 8000C |
|---------------------------------------------------|-------------------------------|----------|-------------------|---------------|----------------------|----------------------|------------------|-------|
| Pattern                                           | 1 Horiz.Line                  | ESC*c1G  | 1B 2A 63 31 47    | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                                                   | 2 Vert. Lines                 | ESC*c2G  | 1B 2A 63 32 47    | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                                                   | 3 Diagonal Lines              | ESC*c3G  | 1B 2A 63 33 47    | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                                                   | 4 Diagonal Lines              | ESC*c4G  | 1B 2A 63 34 47    | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                                                   | 5 Square Grid                 | ESC*c5G  | 1B 2A 63 35 47    | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                                                   | 6 Diagonal Grid               | ESC*c6G  | 1B 2A 63 36 47    | Yes           | Yes                  | Yes                  | Yes              | Yes   |
| <b>USER DEFINED PATTERN / MANAGEMENT CREATION</b> |                               |          |                   |               |                      |                      |                  |       |
| User-Defined Pattern Control                      | Delete all patterns           | ESC*c0Q  | 1B 2A 63 03 51    | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                                                   | Delete all temporary patterns | ESC*c1Q  | 1B 2A 63 03 51    | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                                                   | Delete current pattern        | ESC*c2Q  | 1B 2A 63 03 51    | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                                                   | Make pattern temporary        | ESC*c4Q  | 1B 2A 63 03 51    | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                                                   | Make pattern permanent        | ESC*c5Q  | 1B 2A 63 03 51    | Yes           | Yes                  | Yes                  | Yes              | Yes   |
| Set Pattern Reference Point                       | Rotate with orientation       | ESC*p0R  | 1B 2A 70 30 52    | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                                                   | Follow physical page          | ESC*p1R  | 1B 2A 70 31 52    | Yes           | Yes                  | Yes                  | Yes              | Yes   |
| <b>MACROS</b>                                     |                               |          |                   |               |                      |                      |                  |       |
| Macro ID                                          | Macro ID #                    | ESC&f#Y  | 1B 26 66 #...# 59 | Yes           | Yes                  | Yes                  | Yes              | Yes   |
| Macro Control                                     | Start Macro Definition        | ESC&f0X  | 1B 26 66 30 58    | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                                                   | Stop Macro Definition         | ESC&f1X  | 1B 26 66 31 58    | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                                                   | Execute Macro                 | ESC&f2X  | 1B 26 66 32 58    | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                                                   | Call Macro                    | ESC&f3X  | 1B 26 66 33 58    | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                                                   | Enable Overlay                | ESC&f4X  | 1B 26 66 34 58    | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                                                   | Disable Overlay               | ESC&f5X  | 1B 26 66 35 58    | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                                                   | Delete Macros                 | ESC&f6X  | 1B 26 66 36 58    | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                                                   | Delete All Temp. Macros       | ESC&f7X  | 1B 26 66 37 58    | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                                                   | Delete Macro ID               | ESC&f8X  | 1B 26 66 38 58    | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                                                   | Make Temporary                | ESC&f9X  | 1B 26 66 39 58    | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                                                   | Make Permanent                | ESC&f10X | 1B 26 66 31 30 58 | Yes           | Yes                  | Yes                  | Yes              | Yes   |
| <b>Set Status Readback</b>                        |                               |          |                   |               |                      |                      |                  |       |
| Status Readback Location Type                     | Invalid Location              | ESC*s0T  | 1B 2A 73 30 54    | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                                                   | Currently Selected            | ESC*s1T  | 1B 2A 73 31 54    | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                                                   | All Locations                 | ESC*s2T  | 1B 2A 73 32 54    | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                                                   | Internal                      | ESC*s3T  | 1B 2A 73 33 54    | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                                                   | Downloaded                    | ESC*s4T  | 1B 2A 73 34 54    | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                                                   | Cartridge                     | ESC*s5T  | 1B 2A 73 35 54    | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                                                   | User-installed ROM (SIMMs)    | ESC*s7T  | 1B 2A 73 37 54    | Yes           | Yes                  | Yes                  | Yes              | Yes   |

Table 7.25. HP LaserJet PCL Commands (Sheet 13 of 15)

| Function                                                  | Parameter                                            | Command | Hexadecimal Value | 1000<br>1000+ | 1800<br>1900<br>3800 | 6300<br>6750<br>6900 | 9100DN<br>9500DN | 8000C |
|-----------------------------------------------------------|------------------------------------------------------|---------|-------------------|---------------|----------------------|----------------------|------------------|-------|
| Set Status<br>Readback<br>Location Unit                   | All entities of the Location Type                    | ESC*s0U | 1B 2A 73 30 55    | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                                                           | Entity 1 or Temporary                                | ESC*s1U | 1B 2A 73 31 55    | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                                                           | Entity 2 or Permanent                                | ESC*s2U | 1B 2A 73 32 55    | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                                                           | Entity 3                                             | ESC*s3U | 1B 2A 73 33 55    | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                                                           | Entity 4                                             | ESC*s4U | 1B 2A 73 34 55    | Yes           | Yes                  | Yes                  | Yes              | Yes   |
| Inquire Status<br>Readback<br>Entity                      | Font                                                 | ESC*s0I | 1B 2A 73 30 49    | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                                                           | Macro                                                | ESC*s1I | 1B 2A 73 31 49    | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                                                           | User-defined Pattern                                 | ESC*s2I | 1B 2A 73 32 49    | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                                                           | Symbol Set                                           | ESC*s3I | 1B 2A 73 33 49    | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                                                           | FontExtended                                         | ESC*s4I | 1B 2A 73 34 49    | Yes           | Yes                  | Yes                  | Yes              | Yes   |
| Flush All<br>Pages                                        | Flush all complete pages                             | ESC&r0F | 1B 26 72 30 46    | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                                                           | Flush all page data                                  | ESC&r1F | 1B 26 72 31 46    | Yes           | Yes                  | Yes                  | Yes              | Yes   |
| Free Memory<br>Space                                      | Request free memory status                           | ESC*s1M | 1B 2A 73 31 4D    | Yes           | Yes                  | Yes                  | Yes              | Yes   |
| Echo                                                      | # = Echo value (-32767 to 32767)                     | ESC*s#X | 1B 2A 73 #...# 58 | Yes           | Yes                  | Yes                  | Yes              | Yes   |
| <b>PROGRAMMING HINTS</b>                                  |                                                      |         |                   |               |                      |                      |                  |       |
| End-of-Line<br>Wrap                                       | Enabled                                              | ESC&s0C | 1B 26 73 30 43    | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                                                           | Disabled                                             | ESC&s1C | 1B 26 73 31 43    | Yes           | Yes                  | Yes                  | Yes              | Yes   |
| Display<br>Functions                                      | ON                                                   | ESC Y   | 1B 59             | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                                                           | OFF                                                  | ESC Z   | 1B 5A             | Yes           | Yes                  | Yes                  | Yes              | Yes   |
| <b>PCL Vector Graphics Switching/Set-Up Picture Frame</b> |                                                      |         |                   |               |                      |                      |                  |       |
| Enter PCL<br>Mode                                         | Use previous PCL cursor position                     | ESC%0A  | 1B 25 30 41       | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                                                           | Use current HP-GL/2 pen position for cursor position | ESC%1A  | 1B 25 31 41       | Yes           | Yes                  | Yes                  | Yes              | Yes   |
| Enter HP-<br>GL/2 Mode                                    | Use Previous HP-GL/2 pen position                    | ESC%0B  | 1B 25 30 42       | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                                                           | Use current PCL cursor position                      | ESC%1B  | 1B 25 31 42       | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                                                           | Current PCL coordinate system/old HPGL pen position  | ESC%2B  | 1B 25 32 42       | Yes           | Yes                  | Yes                  | Yes              | Yes   |
|                                                           | Current PCL coordinate system/current PCL CAP        | ESC%3B  | 1B 25 33 42       | Yes           | Yes                  | Yes                  | Yes              | Yes   |
| HP-GL/2 Plot<br>Horizontal<br>Size                        | Horizontal size in inches                            | ESC*c#K | 1B 2A 63 #...# 4B | Yes           | Yes                  | Yes                  | Yes              | Yes   |
| HP-GL/2 Plot<br>Vertical Size                             | Vertical size in inches                              | ESC*c#L | 1B 2A 63 #...# 4C | Yes           | Yes                  | Yes                  | Yes              | Yes   |
| Set Picture<br>Frame Anchor<br>Point                      | Set anchor point to cursor position                  | ESC*c0T | 1B 2A 63 30 54    | Yes           | Yes                  | Yes                  | Yes              | Yes   |

Table 7.25. HP LaserJet PCL Commands (Sheet 14 of 15)

| Function                      | Parameter                         | Command | Hexadecimal Value    | 1000<br>1000+ | 1800<br>1900<br>3800 | 6300<br>6750<br>6900 | 9100DN<br>9500DN | 8000C |
|-------------------------------|-----------------------------------|---------|----------------------|---------------|----------------------|----------------------|------------------|-------|
| Picture Frame Horizontal Size | Decipoints                        | ESC*c#X | 1B 2A 63 #...#<br>58 | Yes           | Yes                  | Yes                  | Yes              | Yes   |
| Picture Frame Vertical Size   | Decipoints                        | ESC*c#Y | 1B 2A 63 #...#<br>59 | Yes           | Yes                  | Yes                  | Yes              | Yes   |
| <b>Colors</b>                 |                                   |         |                      |               |                      |                      |                  |       |
| Assign Color Index            | Index Number                      | ESC*v#I | 1B 2A 76 #...#<br>49 | No            | No                   | No                   | No               | Yes   |
| Color Component 1             | 1st Component                     | ESC*v#A | 1B 2A 76 #...#<br>41 | No            | No                   | No                   | No               | Yes   |
| Color Component 2             | 2nd Component                     | ESC*v#B | 1B 2A 76 #...#<br>42 | No            | No                   | No                   | No               | Yes   |
| Color Component 3             | 3rd Component                     | ESC*v#C | 1B 2A 76 #...#<br>43 | No            | No                   | No                   | No               | Yes   |
| Color Lookup Tables           | # of Bytes                        | ESC*l#W | 1B 2A 6C #...#<br>57 | No            | No                   | No                   | No               | Yes   |
| Configure Image Data          | # of Bytes                        | ESC*v#W | 1B 2A 76 #...#<br>57 | No            | No                   | No                   | No               | Yes   |
| Download Dither Matrix        | # of Bytes                        | ESC*m#W | 1B 2A 76 #...#<br>49 | No            | No                   | No                   | No               | Yes   |
| Foreground Color              | Index Number                      | ESC*v#S | 1B 2A 76 #...#<br>53 | No            | No                   | No                   | No               | Yes   |
| Gamma Correction              | Gamma number                      | ESC*t#I | 1B 2A 74 #...#<br>49 | No            | No                   | No                   | No               | Yes   |
| Monochrome Print Model        | Mixed Rendering                   | ESC&b#M | 1B 26 98 30 4D       | No            | No                   | No                   | No               | Yes   |
|                               | Gray Equivalent                   | ESC&b#M | 1B 26 98 31 4D       | No            | No                   | No                   | No               | Yes   |
| Palette Control ID            | Palette ID #                      | ESC&p#I | 1B 26 70 #...# 49    | No            | No                   | No                   | No               | Yes   |
| Palette Control               | Delete All Palettes in store      | ESC&p#C | 1B 26 70 30 43       | No            | No                   | No                   | No               | Yes   |
|                               | Delete All Palettes in stack      | ESC*p#C | 1B 26 70 31 43       | No            | No                   | No                   | No               | Yes   |
|                               | Delete Palette (last ID)          | ESC*p#C | 1B 26 70 32 43       | No            | No                   | No                   | No               | Yes   |
|                               | Copy Palette                      | ESC*p#C | 1B 26 70 36 43       | No            | No                   | No                   | No               | Yes   |
| Push/Pop Palette              | Push Palette                      | ESC*p#P | 1B 2A 70 30 50       | No            | No                   | No                   | No               | Yes   |
|                               | Pop Palette                       | ESC*p#P | 1B 2A 70 31 50       | No            | No                   | No                   | No               | Yes   |
| Render Algorithm              | Continuous tone detail            | ESC*t#J | 1B 2A 74 30 4A       | No            | No                   | No                   | No               | Yes   |
|                               | Snap to primaries                 | ESC*t#J | 1B 2A 74 31 4A       | No            | No                   | No                   | No               | Yes   |
|                               | Snap black/white, colors to black | ESC*t#J | 1B 2A 74 32 4A       | No            | No                   | No                   | No               | Yes   |
|                               | Device best dither                | ESC*t#J | 1B 2A 74 33 4A       | No            | No                   | No                   | No               | Yes   |
|                               | Error diffusion                   | ESC*t#J | 1B 2A 74 34 4A       | No            | No                   | No                   | No               | Yes   |
|                               | Monochrome device best dither     | ESC*t#J | 1B 2A 74 35 4A       | No            | No                   | No                   | No               | Yes   |
|                               | Monochrome error diffusion        | ESC*t#J | 1B 2A 74 36 4A       | No            | No                   | No                   | No               | Yes   |
|                               | Cluster ordered dither            | ESC*t#J | 1B 2A 74 37 4A       | No            | No                   | No                   | No               | Yes   |
|                               | Monochrome cluster ordered        | ESC*t#J | 1B 2A 74 38 4A       | No            | No                   | No                   | No               | Yes   |

Table 7.25. HP LaserJet PCL Commands (Sheet 15 of 15)

| Function                | Parameter                       | Command | Hexadecimal Value | 1000<br>1000+ | 1800<br>1900<br>3800 | 6300<br>6750<br>6900 | 9100DN<br>9500DN | 8000C |
|-------------------------|---------------------------------|---------|-------------------|---------------|----------------------|----------------------|------------------|-------|
|                         | User-defined dither             | ESC*t#J | 1B 2A 74 30 4A    | No            | No                   | No                   | No               | Yes   |
|                         | Monochrome user-defined dither  | ESC*t#J | 1B 2A 74 31 30 4A | No            | No                   | No                   | No               | Yes   |
|                         | Ordered dither                  | ESC*t#J | 1B 2A 74 31 31 4A | No            | No                   | No                   | No               | Yes   |
|                         | Monochrome ordered dither       | ESC*t#J | 1B 2A 74 31 32 4A | No            | No                   | No                   | No               | Yes   |
|                         | Noise ordered dither            | ESC*t#J | 1B 2A 74 31 33 4A | No            | No                   | No                   | No               | Yes   |
|                         | Monochrome noise ordered dither | ESC*t#J | 1B 2A 74 31 34 4A | No            | No                   | No                   | No               | Yes   |
|                         | Continuous tone smooth          | ESC*t#J | 1B 2A 74 31 35 4A | No            | No                   | No                   | No               | Yes   |
|                         | Mono, continuous tone detail    | ESC*t#J | 1B 2A 74 31 36 4A | No            | No                   | No                   | No               | Yes   |
|                         | Mono, continuous tone smooth    | ESC*t#J | 1B 2A 74 31 37 4A | No            | No                   | No                   | No               | Yes   |
|                         | Continuous tone basic           | ESC*t#J | 1B 2A 74 31 38 4A | No            | No                   | No                   | No               | Yes   |
|                         | Mono continuous tone basic      | ESC*t#J | 1B 2A 74 31 39 4A | No            | No                   | No                   | No               | Yes   |
| Select Palette          | Palette ID #                    | ESC&p#S | 1B 26 70 #...# 53 | No            | No                   | No                   | No               | Yes   |
| Set Viewing Illuminant  | # of Bytes                      | ESC*I#W | 1B 2A 69 #...# 57 | No            | No                   | No                   | No               | Yes   |
| Simple Color            | 3-Plane Device CMY Palette      | ESC*r#U | 1B 2A 72 2D 33 55 | No            | No                   | No                   | No               | Yes   |
|                         | 1-Plane K palette               | ESC*r#U | 1B 2A 72 31 55    | No            | No                   | No                   | No               | Yes   |
|                         | 3-Plane Device RGB Palette      | ESC*r#U | 1B 2A 72 33 55    | No            | No                   | No                   | No               | Yes   |
| Transfer Raster (Plane) | # of Bytes                      | ESC*b#V | 1B 2A 98 #...# 56 | No            | No                   | No                   | No               | Yes   |

<sup>a</sup> Not supported by HP PCL.

## HP-GL/2 Context Printer Commands

In the command tables below, parameters in brackets are optional.

*Table 7.26. HP-GL/2 Context Printer Commands (Sheet 1 of 2)*

| Command                        | Mnemonic         | Parameters                                                                                                                                                                                                   |
|--------------------------------|------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>DUAL CONTEXT EXTENSIONS</b> |                  |                                                                                                                                                                                                              |
| ENTER PCL MODE                 | ESC%#A           | 0 = Retain previous PCL cursor position<br>1 = Use current HP-GL/2 pen position                                                                                                                              |
| RESET                          | ESC <sub>E</sub> | None                                                                                                                                                                                                         |
| PRIMARY FONT                   | FI               | Font_ID                                                                                                                                                                                                      |
| SECONDARY FONT                 | FN               | Font_ID                                                                                                                                                                                                      |
| SCALABLE OR BITMAPPED FONTS    | SB               | 0 = Scalable fonts only<br>1 = Bitmapped fonts allowed                                                                                                                                                       |
| <b>PALETTE EXTENSIONS</b>      |                  |                                                                                                                                                                                                              |
| Color Range                    | CR               | [b_ref_red, w_ref_red, b_ref_grn,<br>w_ref_grn, b_ref_blue, w_ref_blue];                                                                                                                                     |
| Number of Pens                 | NP               | [n];                                                                                                                                                                                                         |
| Pen Color Assignment           | PC               | [pen [.red, green, blue]];                                                                                                                                                                                   |
| TRANSPARENCY MODE              | TR               | 0 = Off (opaque)<br>1 = On (transparent)                                                                                                                                                                     |
| SCREENED VECTORS               | SV               | [screen_type[,shading[,index]]]                                                                                                                                                                              |
| <b>VECTOR GROUP</b>            |                  |                                                                                                                                                                                                              |
| ARC ABSOLUTE                   | AA               | x_center,y_center,sweep_angle<br>[,chord_angle];                                                                                                                                                             |
| ARC RELATIVE                   | AR               | x_increment,y_increment,sweep_angle<br>[,chord_angle];                                                                                                                                                       |
| ABSOLUTE ARC THREE POINT       | AT               | x_inter,y_inter,x_end,y_end<br>[,chord_angle];                                                                                                                                                               |
| PLOT ABSOLUTE                  | PA               | [x,y...[,x,y]];                                                                                                                                                                                              |
| PLOT RELATIVE                  | PR               | [x,y...[,x,y]];                                                                                                                                                                                              |
| PEN DOWN                       | PD               | [x,y...[,x,y]];                                                                                                                                                                                              |
| PEN UP                         | PU               | [x,y...[,x,y]];                                                                                                                                                                                              |
| RELATIVE ARC THREE POINT       | RT               | x_incr_inter,y_incr_inter,x_incr_end,<br>y_incr_end [,chord_angle];                                                                                                                                          |
| POLYLINE ENCODED               | PE               | [flag[val]coord_pair...[flag[val]coord<br>_pair]];                                                                                                                                                           |
| <b>POLYGON GROUP</b>           |                  |                                                                                                                                                                                                              |
| BEZIER RELATIVE                | BR               | kind, x1_control_pt_increments,<br>y1_control_pt_increments,<br>x2_control_pt_increments,<br>y2_control_pt_increments,<br>x3_control_pt_increments,<br>y3_control_pt_increments,<br>[,params ... [,params]]; |
| CIRCLE                         | CI               | radius [,chord_angle];                                                                                                                                                                                       |
| FILL RECTANGLE ABSOLUTE        | RA               | x_coordinate,y_coordinate;                                                                                                                                                                                   |
| FILL RECTANGLE RELATIVE        | RR               | x_increment,y_increment;                                                                                                                                                                                     |
| EDGE RECTANGLE ABSOLUTE        | EA               | x_coordinate,y_coordinate;                                                                                                                                                                                   |
| EDGE RECTANGLE RELATIVE        | ER               | x_increment,y_increment;                                                                                                                                                                                     |
| FILL WEDGE                     | WG               | radius,start_angle,<br>sweep_angle [,chord_angle];                                                                                                                                                           |
| EDGE WEDGE                     | EW               | radius,start_angle,<br>sweep_angle[,chord_angle];                                                                                                                                                            |
| POLYGON MODE                   | PM               | polygon_definition;                                                                                                                                                                                          |
| FILL POLYGON                   | FP               |                                                                                                                                                                                                              |
| EDGE POLYGON                   | EP               |                                                                                                                                                                                                              |
| <b>CHARACTER GROUP</b>         |                  |                                                                                                                                                                                                              |
| SELECT STANDARD FONT           | SS               | None                                                                                                                                                                                                         |

Table 7.26. HP-GL/2 Context Printer Commands (Sheet 2 of 2)

| Command                        | Mnemonic | Parameters                                                                            |
|--------------------------------|----------|---------------------------------------------------------------------------------------|
| SELECT ALTERNATE FONT          | SA       | None                                                                                  |
| ABSOLUTE DIRECTION             | DI       | [run,rise];                                                                           |
| RELATIVE DIRECTION             | DR       | [run,rise];                                                                           |
| ABSOLUTE CHARACTER SIZE        | SI       | [width,height];                                                                       |
| RELATIVE CHARACTER SIZE        | SR       | [width,height];                                                                       |
| CHARACTER SLANT                | SL       | [tangent_of_angle];                                                                   |
| EXTRA SPACE                    | ES       | [width[,height]]                                                                      |
| STANDARD FONT DEFINITION       | SD       | [kind,value...[,kind,value]];                                                         |
| ALTERNATE FONT DEFINITION      | AD       | [kind,value...[,kind,value]];                                                         |
| CHARACTER FILL MODE            | CF       | [fill_mode[,edge_pen]];                                                               |
| LABEL ORIGIN                   | LO       | [position];LABEL                                                                      |
| LABEL                          | LB       | [char...[,char]]bterm                                                                 |
| DEFINE LABEL TERMINATOR        | DT       | [lbterm[,mode]];                                                                      |
| CHARACTER PLOT                 | CP       | [spaces,lines];                                                                       |
| TRANSPARENT DATA               | TD       | [mode];                                                                               |
| DEFINE VARIABLE TEXT PATH      | DV       | [path[,line]];                                                                        |
| LINE AND FILL ATTRIBUTES GROUP |          |                                                                                       |
| LINE TYPE                      | LT       | [line_type[,pattern_length[,mode]]];                                                  |
| LINE ATTRIBUTES                | LA       | [kind,value...[,kind,value]];                                                         |
| PEN WIDTH                      | PW       | [width[,pen]];                                                                        |
| PEN WIDTH UNIT SELECTION       | WU       | [type];                                                                               |
| SELECT PEN                     | SP       | [pen]; (required, 1 for black or 0 for white)                                         |
| SYMBOL MODE                    | SM       | [char];                                                                               |
| FILL TYPE                      | FT       | [fill_type[,option1 [,option2]]];                                                     |
| ANCHOR CORNER                  | AC       | [x_coordinate,y_coordinate];                                                          |
| RASTER FILL DEFINITION         | RF       | [index[,width,height,pen_nbr...pen_nbr]];<br>(width and height must be less than 255) |
| USER DEFINED LINE TYPE         | UL       | [index[,gap1...gapn]];                                                                |
| CONFIGURATION AND STATUS GROUP |          |                                                                                       |
| Advance Full Page              | PG       | [n];                                                                                  |
| SCALE                          | SC       | [x1,x2,y1,y2[,type[,left,bottom]]];<br>or<br>[x1,xfactor,y1,yfactor,2];               |
| INPUT WINDOW                   | IW       | [xLL,yLL,xUR,yUR];                                                                    |
| INPUT P1 AND P2                | IP       | [p1x,p1y[,p2x,p2y]];                                                                  |
| INPUT RELATIVE P1 AND P2       | IR       | [p1x,p1y[,p2x,p2y]];                                                                  |
| DEFAULT VALUES                 | DF       |                                                                                       |
| INITIALIZE                     | IN       | [n];                                                                                  |
| Replot                         | RP       | [n];                                                                                  |
| ROTATE COORDINATE SYSTEM       | RO       | [angle];                                                                              |
| TECHNICAL GRAPHICS EXTENSION   |          |                                                                                       |
| Begin Plot                     | BP       | [kind,value...[,kind,value]];                                                         |
| Chord Tolerance Mode           | CT       | [mode];                                                                               |
| Download Character             | DL       | [charnum [[,up], x, y...[,up],x,y]];                                                  |
| Frame Advance                  | FR       |                                                                                       |
| Media Type                     | MT       | [type];                                                                               |
| Merge Control                  | MC       | [mode [, opcod]];                                                                     |
| Output Error                   | OE       |                                                                                       |
| Output Hardclip Limits         | OH       |                                                                                       |
| Output Identification          | OI       |                                                                                       |
| Output P1 and P2               | OP       |                                                                                       |
| Output Status                  | OS       |                                                                                       |
| Pixel Placement                | PP       | [mode];                                                                               |
| Plot Size                      | PS       | [length [,width]];                                                                    |
| Quality Level                  | QL       | [quality level]                                                                       |

## PJL Syntax Comparison

Table 7.27. PJL Syntax Comparison

|                               |                                                                                                                     |
|-------------------------------|---------------------------------------------------------------------------------------------------------------------|
| <b>Suggested Syntax Rules</b> |                                                                                                                     |
| [ ]                           | Items in brackets “[ . . . ]” indicate optional parameters.                                                         |
| < >                           | Identifies a control code character                                                                                 |
| <b>Special Identifiers</b>    |                                                                                                                     |
| <HT>                          | Horizontal tab character (ASCII 9).                                                                                 |
| <LF>                          | Line feed character (ASCII 10).                                                                                     |
| <CR>                          | Carriage return character (ASCII 13).                                                                               |
| <SP>                          | Space character (ASCII 32).                                                                                         |
| <WS>                          | White space                                                                                                         |
| <ESC>                         | Escape character (ASCII 27).                                                                                        |
| <FF>                          | Form feed character (ASCII 12).                                                                                     |
| <Words>                       | Printable characters (ASCII characters 33 through 126) and <WS>                                                     |
| <b>PJL Commands</b>           |                                                                                                                     |
| COMMENT                       | @PJL COMMENT <Words> [<CR>] <LF>                                                                                    |
| DEFAULT                       | @PJL DEFAULT [LPARM: personality] variable = value [<CR>] <LF>                                                      |
| DINQUIRE                      | @PJL DINQUIRE [LPARM: personality] variable [<CR>] <LF>                                                             |
| Response                      | @PJL DINQUIRE [LPARM: personality] variable <CR> <LF> value <CR> <LF> <FF>                                          |
| ECHO                          | @PJL ECHO [<Words>] [<CR>] <LF>                                                                                     |
| Response                      | @PJL ECHO [<Words>] <CR> <LF> <FF>                                                                                  |
| ENTER                         | @PJL ENTER LANGUAGE = personality [<CR>] <LF>                                                                       |
| EOJ                           | @PJL EOJ [NAME = “job name”] [<CR>] <LF>                                                                            |
| INFO                          | @PJL INFO read only variable [<CR>] <LF>                                                                            |
| Response                      | @PJL INFO read only variable <CR> <LF> [1 or more lines of printable characters or <WS> followed by <CR> <LF>] <FF> |
| INITIALIZE                    | @PJL INITIALIZE [<CR>] <LF>                                                                                         |
| INQUIRE                       | @PJL INQUIRE [LPARM: personality] variable [<CR>] <LF>                                                              |
| Response                      | @PJL INQUIRE [LPARM: personality] variable <CR> <LF> value <CR> <LF> <FF>                                           |
| JOB                           | @ PJL JOB [NAME = “job name”] [START                                                                                |
| OPMSG                         | @PJL OPMSG DISPLAY = “message” [<CR>] <LF> ,                                                                        |
| RDYMSG                        | @PJL RDYMSG DISPLAY = “message” [<CR>] <LF> ,                                                                       |
| RESET                         | @PJL RESET [<CR>] <LF>                                                                                              |
| SET                           | @PJL SET [LPARM: personality] variable = value [<CR>] <LF> ,                                                        |
| STMSG                         | @PJL STMSG DISPLAY = “message” [<CR>] <LF> ,                                                                        |
| Response                      | @PJL STMSG DISPLAY = “message” <CR> <LF>                                                                            |
| UEL/SPJL                      | <ESC>%-12345X                                                                                                       |
| USTATUS                       | @PJL USTATUS variable = value [<CR>] <LF> ,                                                                         |
| Response                      | @PJL USTATUS variable <CR> <LF><br>[1 or more lines of printable characters or <WS> followed by <CR> <LF>] <FF> ,   |
| USTATUSOFF                    | @PJL USTATUSOFF [<CR>] <LF>                                                                                         |
| PJL                           | @PJL [<CR>] <LF>                                                                                                    |



LaserJet Symbol Sets

ISO-60 Norway (0D)

|   | 0 | 1 | 2  | 3 | 4 | 5 | 6 | 7 | 8 | 9 | A | B  | C | D | E | F |
|---|---|---|----|---|---|---|---|---|---|---|---|----|---|---|---|---|
| 0 |   |   |    | 0 | @ | P | ` | p |   |   |   | —  | â | Å | Á | Þ |
| 1 |   |   | !  | 1 | A | Q | a | q |   |   |   | À  | Ý | ê | î | þ |
| 2 |   |   | "  | 2 | B | R | b | r |   |   |   | Â  | ý | ô | ø | ã |
| 3 |   |   | #  | 3 | C | S | c | s |   |   |   | È  | ° | û | Æ | Ð |
| 4 |   |   | \$ | 4 | D | T | d | t |   |   |   | Ê  | Ç | á | å | ð |
| 5 |   |   | %  | 5 | E | U | e | u |   |   |   | Ë  | ç | é | í | ¾ |
| 6 |   |   | &  | 6 | F | V | f | v |   |   |   | Î  | Ñ | ó | ø | ì |
| 7 |   |   | ,  | 7 | G | W | g | w |   |   |   | Ï  | ñ | ú | æ | ¼ |
| 8 |   |   | (  | 8 | H | X | h | x |   |   |   | ,  | ì | à | Ä | ½ |
| 9 |   |   | )  | 9 | I | Y | i | y |   |   |   | `  | é | ì | Ö | ¾ |
| A |   |   | *  | : | J | Z | j | z |   |   |   | ^  | ò | ò | ö | ° |
| B |   |   | +  | ; | K | Æ | k | æ |   |   |   | .. | £ | ù | Š | « |
| C |   |   | ,  | < | L | Ø | l | ø |   |   |   | ~  | ¥ | ä | É | ■ |
| D |   |   | -  | = | M | Å | m | å |   |   |   | Ù  | § | ë | ï | » |
| E |   |   | .  | > | N |   | ^ | n |   |   |   | Û  | f | ö | ÿ | ± |
| F |   |   | /  | ? | O | — | o | o |   |   |   | £  | ¢ | ü | ô | ÿ |

ISO-15 Italian (0I)

|   | 0 | 1 | 2  | 3 | 4 | 5 | 6 | 7 | 8 | 9 | A | B  | C | D | E | F |
|---|---|---|----|---|---|---|---|---|---|---|---|----|---|---|---|---|
| 0 |   |   |    | 0 | § | P | ù | p |   |   |   | —  | â | Å | Á | Þ |
| 1 |   |   | !  | 1 | A | Q | a | q |   |   |   | À  | Ý | ê | î | þ |
| 2 |   |   | "  | 2 | B | R | b | r |   |   |   | Â  | ý | ô | ø | ã |
| 3 |   |   | £  | 3 | C | S | c | s |   |   |   | È  | ° | û | Æ | Ð |
| 4 |   |   | \$ | 4 | D | T | d | t |   |   |   | Ê  | Ç | á | å | ð |
| 5 |   |   | %  | 5 | E | U | e | u |   |   |   | Ë  | ç | é | í | ¾ |
| 6 |   |   | &  | 6 | F | V | f | v |   |   |   | Î  | Ñ | ó | ø | ì |
| 7 |   |   | ,  | 7 | G | W | g | w |   |   |   | Ï  | ñ | ú | æ | ¼ |
| 8 |   |   | (  | 8 | H | X | h | x |   |   |   | ,  | ì | à | Ä | ½ |
| 9 |   |   | )  | 9 | I | Y | i | y |   |   |   | `  | é | ì | Ö | ¾ |
| A |   |   | *  | : | J | Z | j | z |   |   |   | ^  | ò | ò | ö | ° |
| B |   |   | +  | ; | K | ° | k | à |   |   |   | .. | £ | ù | Š | « |
| C |   |   | ,  | < | L | ç | l | ò |   |   |   | ~  | ¥ | ä | É | ■ |
| D |   |   | -  | = | M | é | m | è |   |   |   | Ù  | § | ë | ï | » |
| E |   |   | .  | > | N | ^ | n | ì |   |   |   | Û  | f | ö | ÿ | ± |
| F |   |   | /  | ? | O | — | o | o |   |   |   | £  | ¢ | ü | ô | ÿ |

ECMA-94 Latin 1 (0N)

|   | 0 | 1 | 2  | 3   | 4 | 5 | 6 | 7 | 8 | 9 | A | B | C | D | E | F |
|---|---|---|----|-----|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 |   |   |    | 0   | @ | P | ` | p |   |   |   | ° | À | Ð | à | ð |
| 1 |   |   | !  | 1   | A | Q | a | q |   |   | i | ± | Á | Ñ | á | ñ |
| 2 |   |   | "  | 2   | B | R | b | r |   |   | ¢ | ² | Â | Ò | â | ò |
| 3 |   |   | #  | 3   | C | S | c | s |   |   | £ | ³ | Ã | Ó | ã | ó |
| 4 |   |   | \$ | 4   | D | T | d | t |   |   | ¤ | ´ | Ä | Ô | ä | ô |
| 5 |   |   | %  | 5   | E | U | e | u |   |   | ¥ | µ | Å | Ö | å | ö |
| 6 |   |   | &  | 6   | F | V | f | v |   |   | ¦ | ¶ | Æ | Ø | æ | ø |
| 7 |   |   | '  | 7   | G | W | g | w |   |   | § | · | Ç | × | ç | ÷ |
| 8 |   |   | (  | 8   | H | X | h | x |   |   | ¨ | , | È | Ø | è | ø |
| 9 |   |   | )  | 9   | I | Y | i | y |   |   | © | ¹ | É | Ù | é | ù |
| A |   |   | *  | :   | J | Z | j | z |   |   | ª | º | Ê | Ú | ê | ú |
| B |   |   | +  | ;   | K | [ | k | { |   |   | « | » | Ë | Û | ë | û |
| C |   |   | ,  | <   | L | \ | l |   |   |   | ¬ | ¼ | Ì | Ü | ì | ü |
| D |   |   | -  | =   | M | ] | m | } |   |   | - | ½ | Í | Ý | í | ý |
| E |   |   | .  | >   | N | ^ | n | ~ |   |   | ® | ¾ | Î | Þ | î | þ |
| F |   |   | /  | ? O | _ |   | o |   |   |   | - | ¿ | Ï | ß | ï | ÿ |

ISO 11 Sweden (0S)

|   | 0 | 1 | 2 | 3   | 4 | 5 | 6 | 7 | 8 | 9 | A | B | C | D | E | F |
|---|---|---|---|-----|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 |   |   |   | 0   | É | P | é | p |   |   |   | – | â | À | Á | Þ |
| 1 |   |   | ! | 1   | A | Q | a | q |   |   | À | Ý | ê | î | Ã | þ |
| 2 |   |   | " | 2   | B | R | b | r |   |   | Â | ý | ô | Ø | ä | . |
| 3 |   |   | # | 3   | C | S | c | s |   |   | È | ° | û | Æ | Ð | µ |
| 4 |   |   | ¤ | 4   | D | T | d | t |   |   | Ê | Ç | á | å | ð | ¶ |
| 5 |   |   | % | 5   | E | U | e | u |   |   | Ë | ç | é | í | Í | ¾ |
| 6 |   |   | & | 6   | F | V | f | v |   |   | Î | Ñ | ó | ø | Ì | – |
| 7 |   |   | ' | 7   | G | W | g | w |   |   | Ï | ñ | ú | æ | Ó | ¼ |
| 8 |   |   | ( | 8   | H | X | h | x |   |   | , | i | à | Ä | Ò | ½ |
| 9 |   |   | ) | 9   | I | Y | i | y |   |   | ` | ì | è | ì | Õ | ª |
| A |   |   | * | :   | J | Z | j | z |   |   | ^ | ò | ò | Ö | õ | ° |
| B |   |   | + | ;   | K | À | k | ä |   |   | ¨ | £ | ù | Ü | Š | « |
| C |   |   | , | <   | L | Ö | l | ö |   |   | ~ | ¥ | ä | É | š | ■ |
| D |   |   | - | =   | M | Å | m | å |   |   | Û | § | ë | ï | Ú | » |
| E |   |   | . | >   | N | Ü | n | ü |   |   | Û | f | ö | ß | ÿ | ± |
| F |   |   | / | ? O | _ |   | o |   |   |   | £ | ø | ü | Ô | ÿ |   |


ISO-6 ASCII (0U)

|   | 0 | 1  | 2  | 3  | 4  | 5  | 6   | 7   | 8   | 9   | A   | B   | C   | D   | E   | F   |
|---|---|----|----|----|----|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 0 | 0 | 16 | 32 | 48 | 64 | 80 | 96  | 112 | 128 | 144 | 160 | 176 | 192 | 208 | 224 | 240 |
| 1 | 1 | 17 | 33 | 49 | 65 | 81 | 97  | 113 | 129 | 145 | 161 | 177 | 193 | 209 | 225 | 241 |
| 2 | 2 | 18 | 34 | 50 | 66 | 82 | 98  | 114 | 130 | 146 | 162 | 178 | 194 | 210 | 226 | 242 |
| 3 | 3 | 19 | 35 | 51 | 67 | 83 | 99  | 115 | 131 | 147 | 163 | 179 | 195 | 211 | 227 | 243 |
| 4 | 4 | 20 | 36 | 52 | 68 | 84 | 100 | 116 | 132 | 148 | 164 | 180 | 196 | 212 | 228 | 244 |
| 5 | 5 | 21 | 37 | 53 | 69 | 85 | 101 | 117 | 133 | 149 | 165 | 181 | 197 | 213 | 229 | 245 |
| 6 | 6 | 22 | 38 | 54 | 70 | 86 | 102 | 118 | 134 | 150 | 166 | 182 | 198 | 214 | 230 | 246 |
| 7 | 7 | 23 | 39 | 55 | 71 | 87 | 103 | 119 | 135 | 151 | 167 | 183 | 199 | 215 | 231 | 247 |
| 8 | 8 | 24 | 40 | 56 | 72 | 88 | 104 | 120 | 136 | 152 | 168 | 184 | 200 | 216 | 232 | 248 |
| 9 | 9 | 25 | 41 | 57 | 73 | 89 | 105 | 121 | 137 | 153 | 169 | 185 | 201 | 217 | 233 | 249 |
| A |   | 26 | 42 | 58 | 74 | 90 | 106 | 122 | 138 | 154 | 170 | 186 | 202 | 218 | 234 | 250 |
| B |   | 27 | 43 | 59 | 75 | 91 | 107 | 123 | 139 | 155 | 171 | 187 | 203 | 219 | 235 | 251 |
| C |   | 28 | 44 | 60 | 76 | 92 | 108 | 124 | 140 | 156 | 172 | 188 | 204 | 220 | 236 | 252 |
| D |   | 29 | 45 | 61 | 77 | 93 | 109 | 125 | 141 | 157 | 173 | 189 | 205 | 221 | 237 | 253 |
| E |   | 30 | 46 | 62 | 78 | 94 | 110 | 126 | 142 | 158 | 174 | 190 | 206 | 222 | 238 | 254 |
| F |   | 31 | 47 | 63 | 79 | 95 | 111 | 127 | 143 | 159 | 175 | 191 | 207 | 223 | 239 | 255 |


ISO-4 U. K. (1E)

|   | 0 | 1  | 2  | 3  | 4  | 5  | 6   | 7   | 8   | 9   | A   | B   | C   | D   | E   | F   |
|---|---|----|----|----|----|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 0 | 0 | 16 | 32 | 48 | 64 | 80 | 96  | 112 | 128 | 144 | 160 | 176 | 192 | 208 | 224 | 240 |
| 1 | 1 | 17 | 33 | 49 | 65 | 81 | 97  | 113 | 129 | 145 | 161 | 177 | 193 | 209 | 225 | 241 |
| 2 | 2 | 18 | 34 | 50 | 66 | 82 | 98  | 114 | 130 | 146 | 162 | 178 | 194 | 210 | 226 | 242 |
| 3 | 3 | 19 | 35 | 51 | 67 | 83 | 99  | 115 | 131 | 147 | 163 | 179 | 195 | 211 | 227 | 243 |
| 4 | 4 | 20 | 36 | 52 | 68 | 84 | 100 | 116 | 132 | 148 | 164 | 180 | 196 | 212 | 228 | 244 |
| 5 | 5 | 21 | 37 | 53 | 69 | 85 | 101 | 117 | 133 | 149 | 165 | 181 | 197 | 213 | 229 | 245 |
| 6 | 6 | 22 | 38 | 54 | 70 | 86 | 102 | 118 | 134 | 150 | 166 | 182 | 198 | 214 | 230 | 246 |
| 7 | 7 | 23 | 39 | 55 | 71 | 87 | 103 | 119 | 135 | 151 | 167 | 183 | 199 | 215 | 231 | 247 |
| 8 | 8 | 24 | 40 | 56 | 72 | 88 | 104 | 120 | 136 | 152 | 168 | 184 | 200 | 216 | 232 | 248 |
| 9 | 9 | 25 | 41 | 57 | 73 | 89 | 105 | 121 | 137 | 153 | 169 | 185 | 201 | 217 | 233 | 249 |
| A |   | 26 | 42 | 58 | 74 | 90 | 106 | 122 | 138 | 154 | 170 | 186 | 202 | 218 | 234 | 250 |
| B |   | 27 | 43 | 59 | 75 | 91 | 107 | 123 | 139 | 155 | 171 | 187 | 203 | 219 | 235 | 251 |
| C |   | 28 | 44 | 60 | 76 | 92 | 108 | 124 | 140 | 156 | 172 | 188 | 204 | 220 | 236 | 252 |
| D |   | 29 | 45 | 61 | 77 | 93 | 109 | 125 | 141 | 157 | 173 | 189 | 205 | 221 | 237 | 253 |
| E |   | 30 | 46 | 62 | 78 | 94 | 110 | 126 | 142 | 158 | 174 | 190 | 206 | 222 | 238 | 254 |
| F |   | 31 | 47 | 63 | 79 | 95 | 111 | 127 | 143 | 159 | 175 | 191 | 207 | 223 | 239 | 255 |

ISO-69 France (1F)

|   | 0  | 1  | 2  | 3  | 4  | 5  | 6   | 7                                                                                     | 8   | 9   | A   | B   | C   | D   | E   | F   |
|---|----|----|----|----|----|----|-----|---------------------------------------------------------------------------------------|-----|-----|-----|-----|-----|-----|-----|-----|
| 0 |    |    |    | 0  | à  | P  | µ   | p                                                                                     |     |     |     | —   | â   | À   | Á   | Þ   |
| 1 |    |    | !  | I  | A  | Q  | a   | q                                                                                     |     |     | À   | Ý   | ê   | î   | Ã   | þ   |
| 2 |    |    | "  | 2  | B  | R  | b   | r                                                                                     |     |     | Â   | ý   | ô   | Ø   | ã   | .   |
| 3 |    |    | £  | 3  | C  | S  | c   | s                                                                                     |     |     | È   | °   | û   | Æ   | Ð   | µ   |
| 4 |    |    | \$ | 4  | D  | T  | d   | t                                                                                     |     |     | Ê   | Ç   | á   | å   | ð   | ¶   |
| 5 |    |    | %  | 5  | E  | U  | e   | u                                                                                     |     |     | Ë   | ç   | é   | í   | Í   | ¾   |
| 6 |    |    | &  | 6  | F  | V  | f   | v                                                                                     |     |     | Î   | Ñ   | ó   | ø   | ì   | —   |
| 7 |    |    | '  | 7  | G  | W  | w   | w                                                                                     |     |     | Ï   | ñ   | ú   | æ   | Ó   | ¼   |
| 8 |    |    | (  | 8  | H  | X  | h   | x                                                                                     |     |     | ’   | ì   | à   | Ä   | Ö   | ½   |
| 9 |    |    | )  | 9  | I  | Y  | i   | y                                                                                     |     |     | `   | í   | è   | ì   | Ö   | à   |
| A |    |    | *  | :  | J  | Z  | j   | z                                                                                     |     |     | ^   | œ   | ò   | Ö   | õ   | °   |
| B |    |    | +  | ;  | K  | °  | k   | é                                                                                     |     |     | ..  | £   | ù   | Ü   | Š   | «   |
| C |    |    | ,  | <  | L  | ç  | l   | ù                                                                                     |     |     | ~   | ¥   | ä   | É   | š   | ■   |
| D |    |    | -  | =  | M  | §  | m   | è                                                                                     |     |     | Û   | §   | ë   | ï   | Ú   | »   |
| E |    |    | .  | >  | N  | ^  | n   | ..                                                                                    |     |     | Ü   | f   | ö   | ß   | ÿ   | ±   |
| F |    |    | /  | ?  | O  | _  | o   |  |     |     | £   | ø   | ü   | Ô   | ÿ   |     |
|   | 15 | 31 | 47 | 63 | 79 | 95 | 111 | 127                                                                                   | 143 | 159 | 175 | 191 | 207 | 223 | 239 | 255 |

ISO-21 Germany (1G)

|   | 0  | 1  | 2  | 3  | 4  | 5  | 6   | 7                                                                                   | 8   | 9   | A   | B   | C   | D   | E   | F   |
|---|----|----|----|----|----|----|-----|-------------------------------------------------------------------------------------|-----|-----|-----|-----|-----|-----|-----|-----|
| 0 |    |    |    | 0  | §  | P  | `   | p                                                                                   |     |     |     | —   | â   | À   | Á   | Þ   |
| 1 |    |    | !  | I  | A  | Q  | a   | q                                                                                   |     |     | À   | Ý   | ê   | î   | Ã   | þ   |
| 2 |    |    | "  | 2  | B  | R  | b   | r                                                                                   |     |     | Â   | ý   | ô   | Ø   | ã   | .   |
| 3 |    |    | #  | 3  | C  | S  | c   | s                                                                                   |     |     | È   | °   | û   | Æ   | Ð   | µ   |
| 4 |    |    | \$ | 4  | D  | T  | d   | t                                                                                   |     |     | Ê   | Ç   | á   | å   | ð   | ¶   |
| 5 |    |    | %  | 5  | E  | U  | e   | u                                                                                   |     |     | Ë   | ç   | é   | í   | Í   | ¾   |
| 6 |    |    | &  | 6  | F  | V  | f   | v                                                                                   |     |     | Î   | Ñ   | ó   | ø   | ì   | —   |
| 7 |    |    | '  | 7  | G  | W  | w   | w                                                                                   |     |     | Ï   | ñ   | ú   | æ   | Ó   | ¼   |
| 8 |    |    | (  | 8  | H  | X  | h   | x                                                                                   |     |     | ’   | ì   | à   | Ä   | Ö   | ½   |
| 9 |    |    | )  | 9  | I  | Y  | i   | y                                                                                   |     |     | `   | í   | è   | ì   | Ö   | à   |
| A |    |    | *  | :  | J  | Z  | j   | z                                                                                   |     |     | ^   | œ   | ò   | Ö   | õ   | °   |
| B |    |    | +  | ;  | K  | Á  | k   | ä                                                                                   |     |     | ..  | £   | ù   | Ü   | Š   | «   |
| C |    |    | ,  | <  | L  | Ö  | l   | ö                                                                                   |     |     | ~   | ¥   | ä   | É   | š   | ■   |
| D |    |    | -  | =  | M  | Ü  | m   | ü                                                                                   |     |     | Û   | §   | ë   | ï   | Ú   | »   |
| E |    |    | .  | >  | N  | ^  | n   | ß                                                                                   |     |     | Ü   | f   | ö   | ß   | ÿ   | ±   |
| F |    |    | /  | ?  | O  | _  | o   |  |     |     | £   | ø   | ü   | Ô   | ÿ   |     |
|   | 15 | 31 | 47 | 63 | 79 | 95 | 111 | 127                                                                                 | 143 | 159 | 175 | 191 | 207 | 223 | 239 | 255 |

US Legal (1U)

|   | 0 | 1  | 2  | 3  | 4  | 5   | 6   | 7   | 8   | 9   | A   | B   | C   | D   | E   | F   |
|---|---|----|----|----|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 0 | 0 | 16 | 32 | 48 | 64 | 80  | 96  | 112 | 128 | 144 | 160 | 176 | 192 | 208 | 224 | 240 |
| 1 | 1 | 17 | 33 | 49 | 65 | 81  | 97  | 113 | 129 | 145 | 161 | 177 | 193 | 209 | 225 | 241 |
| 2 | 2 | 18 | 34 | 50 | 66 | 82  | 98  | 114 | 130 | 146 | 162 | 178 | 194 | 210 | 226 | 242 |
| 3 | 3 | 19 | 35 | 51 | 67 | 83  | 99  | 115 | 131 | 147 | 163 | 179 | 195 | 211 | 227 | 243 |
| 4 | 4 | 20 | 36 | 52 | 68 | 84  | 100 | 116 | 132 | 148 | 164 | 180 | 196 | 212 | 228 | 244 |
| 5 | 5 | 21 | 37 | 53 | 69 | 85  | 101 | 117 | 133 | 149 | 165 | 181 | 197 | 213 | 229 | 245 |
| 6 | 6 | 22 | 38 | 54 | 70 | 86  | 102 | 118 | 134 | 150 | 166 | 182 | 198 | 214 | 230 | 246 |
| 7 | 7 | 23 | 39 | 55 | 71 | 87  | 103 | 119 | 135 | 151 | 167 | 183 | 199 | 215 | 231 | 247 |
| 8 | 8 | 24 | 40 | 56 | 72 | 88  | 104 | 120 | 136 | 152 | 168 | 184 | 200 | 216 | 232 | 248 |
| 9 | 9 | 25 | 41 | 57 | 73 | 89  | 105 | 121 | 137 | 153 | 169 | 185 | 201 | 217 | 233 | 249 |
| A |   |    | *  | :  | J  | Z   | j   | z   |     |     |     |     |     |     |     |     |
| B |   |    | +  | ;  | K  | [   | k   | §   |     |     |     |     |     |     |     |     |
| C |   |    | ,  | =  | L  | @   | l   | ¶   |     |     |     |     |     |     |     |     |
| D |   |    | -  | =  | M  | ] m | †   |     |     |     |     |     |     |     |     |     |
| E |   |    | .  | ¢  | N  | © n | ™   |     |     |     |     |     |     |     |     |     |
| F |   |    | /  | ?  | O  | — o |     |     |     |     |     |     |     |     |     |     |

ISO Latin 2 (2N)

|   | 0 | 1  | 2  | 3  | 4  | 5   | 6   | 7   | 8   | 9   | A   | B   | C   | D   | E   | F   |
|---|---|----|----|----|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 0 | 0 | 16 | 32 | 48 | 64 | 80  | 96  | 112 | 128 | 144 | 160 | 176 | 192 | 208 | 224 | 240 |
| 1 | 1 | 17 | 33 | 49 | 65 | 81  | 97  | 113 | 129 | 145 | 161 | 177 | 193 | 209 | 225 | 241 |
| 2 | 2 | 18 | 34 | 50 | 66 | 82  | 98  | 114 | 130 | 146 | 162 | 178 | 194 | 210 | 226 | 242 |
| 3 | 3 | 19 | 35 | 51 | 67 | 83  | 99  | 115 | 131 | 147 | 163 | 179 | 195 | 211 | 227 | 243 |
| 4 | 4 | 20 | 36 | 52 | 68 | 84  | 100 | 116 | 132 | 148 | 164 | 180 | 196 | 212 | 228 | 244 |
| 5 | 5 | 21 | 37 | 53 | 69 | 85  | 101 | 117 | 133 | 149 | 165 | 181 | 197 | 213 | 229 | 245 |
| 6 | 6 | 22 | 38 | 54 | 70 | 86  | 102 | 118 | 134 | 150 | 166 | 182 | 198 | 214 | 230 | 246 |
| 7 | 7 | 23 | 39 | 55 | 71 | 87  | 103 | 119 | 135 | 151 | 167 | 183 | 199 | 215 | 231 | 247 |
| 8 | 8 | 24 | 40 | 56 | 72 | 88  | 104 | 120 | 136 | 152 | 168 | 184 | 200 | 216 | 232 | 248 |
| 9 | 9 | 25 | 41 | 57 | 73 | 89  | 105 | 121 | 137 | 153 | 169 | 185 | 201 | 217 | 233 | 249 |
| A |   |    | *  | :  | J  | Z   | j   | z   |     |     | §   | §   | £   | Ů   | é   | ú   |
| B |   |    | +  | ;  | K  | [   | k   | {   |     |     | ř   | ř   | Ě   | Ů   | ě   | ů   |
| C |   |    | ,  | <  | L  | \   | l   |     |     |     | Ž   | ž   | Ě   | Ů   | ě   | ü   |
| D |   |    | -  | =  | M  | ] m |     | }   |     |     | -   | "   | í   | Ý   | í   | ý   |
| E |   |    | .  | >  | N  | ^ n |     | ~   |     |     | Ž   | ž   | î   | Ť   | î   | ť   |
| F |   |    | /  | ?  | O  | — o |     | o   |     |     | Ž   | ž   | Đ   | Đ   | đ   | .   |

ISO-17 Spain (2S)

|   | 0 | 1 | 2  | 3 | 4 | 5 | 6 | 7 | 8 | 9 | A  | B | C | D | E | F |
|---|---|---|----|---|---|---|---|---|---|---|----|---|---|---|---|---|
| 0 |   |   |    | 0 | § | P | ` | p |   |   |    | — | â | À | Á | Â |
| 1 |   |   | !  | 1 | A | Q | a | q |   |   | À  | Ý | ê | í | Ã | þ |
| 2 |   |   | "  | 2 | B | R | b | r |   |   | Â  | ý | ô | Ø | ã | · |
| 3 |   |   | £  | 3 | C | S | c | s |   |   | È  | ° | û | Æ | Ð | μ |
| 4 |   |   | \$ | 4 | D | T | d | t |   |   | Ê  | Ç | á | â | ð | ¶ |
| 5 |   |   | %  | 5 | E | U | e | u |   |   | Ë  | ç | é | í | Í | ¾ |
| 6 |   |   | &  | 6 | F | V | f | v |   |   | Î  | Ñ | ó | ø | ì | — |
| 7 |   |   | '  | 7 | G | W | g | w |   |   | Ï  | ñ | ú | æ | Ó | ¼ |
| 8 |   |   | (  | 8 | H | X | h | x |   |   | ‘  | í | à | Ä | Ò | ½ |
| 9 |   |   | )  | 9 | I | Y | i | y |   |   | `  | ¿ | è | ì | Ô | à |
| A |   |   | *  | : | J | Z | j | z |   |   | ^  | ¤ | ò | Ö | ö | ° |
| B |   |   | +  | ; | K | I | k | o |   |   | .. | £ | ù | Ü | Š | « |
| C |   |   | ,  | < | L | Ñ | l | ñ |   |   | ~  | ¥ | ä | É | š | ■ |
| D |   |   | -  | = | M | ¿ | m | ç |   |   | Û  | § | ë | ï | Ú | » |
| E |   |   | .  | > | N | ^ | n | ~ |   |   | Û  | f | ö | ß | ÿ | ± |
| F |   |   | /  | ? | O | — | o |   |   |   | £  | ¢ | ü | ô | ÿ |   |

PC Cyrillic (3R)

|   | 0 | 1  | 2  | 3 | 4 | 5   | 6 | 7 | 8 | 9 | A | B | C | D | E | F |
|---|---|----|----|---|---|-----|---|---|---|---|---|---|---|---|---|---|
| 0 |   |    |    | 0 | @ | P   | ` | p | A | P | a | ⋮ | ⌒ | ⌒ | Р | Ё |
| 1 | ☺ | ◀  | !  | 1 | A | Q   | a | q | Б | С | б | ⚫ | ⌒ | ⌒ | С | ё |
| 2 | ☹ | ⬆  | "  | 2 | B | R   | b | r | В | Т | в | ⚫ | ⌒ | ⌒ | Т | ѐ |
| 3 | ♥ | !! | #  | 3 | C | S   | c | s | Г | У | г | ⌒ | ⌒ | ⌒ | У | є |
| 4 | ♦ | ¶  | \$ | 4 | D | T   | d | t | Д | Ф | д | ⌒ | ⌒ | ⌒ | Ф | ї |
| 5 | ♣ | §  | %  | 5 | E | U   | e | u | Е | Х | е | ⌒ | ⌒ | ⌒ | Х | і |
| 6 | ♠ | —  | &  | 6 | F | V   | f | v | Ж | Ц | ж | ⌒ | ⌒ | ⌒ | Ц | ѳ |
| 7 | ● | ⬆  | '  | 7 | G | W   | g | w | З | Ч | з | ⌒ | ⌒ | ⌒ | Ч | ѳ |
| 8 | ◼ | ↑  | (  | 8 | H | X   | h | x | И | Ш | и | ⌒ | ⌒ | ⌒ | Ш | о |
| 9 | ◯ | ↓  | )  | 9 | I | Y   | i | y | Й | Щ | й | ⌒ | ⌒ | ⌒ | Щ | · |
| A | ◼ | →  | *  | : | J | Z   | j | z | К | Ъ | к | ⌒ | ⌒ | ⌒ | Ъ | · |
| B | ♂ | ←  | +  | ; | K | I   | k | { | Л | Ы | л | ⌒ | ⌒ | ⌒ | Ы | ✓ |
| C | ♀ | ⌒  | ,  | < | L | \   | l |   | М | Ь | м | ⌒ | ⌒ | ⌒ | Ь | № |
| D | ♪ | ↔  | -  | = | M | ] m | } | } | Н | Э | н | ⌒ | ⌒ | ⌒ | Э | α |
| E | ♫ | ▲  | .  | > | N | ^   | n | ~ | О | Ю | о | ⌒ | ⌒ | ⌒ | Ю | ■ |
| F | ☼ | ▼  | /  | ? | O | —   | o | ◊ | П | Я | п | ⌒ | ⌒ | ⌒ | Я | я |

PS math (5M)

|   | 0 | 1 | 2 | 3 | 4 | 5  | 6 | 7 | 8 | 9 | A | B   | C | D | E | F |
|---|---|---|---|---|---|----|---|---|---|---|---|-----|---|---|---|---|
| 0 |   |   |   | 0 | ≡ | Π  | — | π |   |   |   | °   | ∞ | ∠ | ◇ | € |
| 1 |   |   | ! | 1 | A | Θ  | α | θ |   |   | ™ | ±   | § | ∇ | ( | ) |
| 2 |   |   | ∀ | 2 | B | P  | β | ρ |   |   | , | "   | ℝ | ® | Ⓜ | ∫ |
| 3 |   |   | # | 3 | X | Σ  | χ | σ |   |   | ≤ | ≥   | ∅ | © | Ⓢ | ∫ |
| 4 |   |   | ∃ | 4 | Δ | T  | δ | τ |   |   | / | ×   | ⊗ | ™ | ™ |   |
| 5 |   |   | % | 5 | E | Y  | ε | υ |   |   | ∞ | α   | ⊕ | Π | Σ | J |
| 6 |   |   | & | 6 | Φ | ς  | φ | ϖ |   |   | f | ∂   | ∅ | ✓ | ∫ |   |
| 7 |   |   | ∅ | 7 | Γ | Ω  | γ | ω |   |   | ♣ | •   | ∩ | • |   |   |
| 8 |   |   | ( | 8 | H | Ξ  | η | ξ |   |   | ♦ | ÷   | ∪ | ¬ |   |   |
| 9 |   |   | ) | 9 | I | Ψ  | ι | ψ |   |   | ♥ | ≠   | ⊃ | ∧ |   |   |
| A |   |   | * | : | ∅ | Z  | φ | ζ |   |   | ♠ | ≡   | ≡ | ∨ |   |   |
| B |   |   | + | ; | K | [  | κ | { |   |   | ↔ | ≈   | ≈ | ⇔ |   |   |
| C |   |   | , | < | Λ | ∴  | λ |   |   |   | ← | ... | ⊂ | ⇐ |   |   |
| D |   |   | — | = | M | ]μ | } | } |   |   | ↑ |     | ⊆ | ↑ |   |   |
| E |   |   | . | > | N | ⊥  | ν | ~ |   |   | → | —   | ⊃ | ⇒ |   |   |
| F |   |   | / | ? | O | —  | o |   |   |   | ↓ | ↵   | ↵ | ⇓ |   |   |

ISO Latin 5 (5N)

|   | 0 | 1 | 2  | 3 | 4 | 5  | 6 | 7 | 8 | 9 | A | B | C | D | E | F |
|---|---|---|----|---|---|----|---|---|---|---|---|---|---|---|---|---|
| 0 |   |   |    | 0 | @ | P  | , | p |   |   |   | ° | À | Ğ | à | ğ |
| 1 |   |   | !  | 1 | A | Q  | a | q |   |   | i | ± | Á | Ñ | á | ñ |
| 2 |   |   | "  | 2 | B | R  | b | r |   |   | ¢ | ² | Â | Ò | â | ò |
| 3 |   |   | #  | 3 | C | S  | c | s |   |   | £ | ³ | Ã | Ó | ã | ó |
| 4 |   |   | \$ | 4 | D | T  | d | t |   |   | ¤ | ´ | Ä | Ô | ä | ô |
| 5 |   |   | %  | 5 | E | U  | e | u |   |   | ¥ | μ | Å | Õ | å | õ |
| 6 |   |   | &  | 6 | F | V  | f | v |   |   | ¦ | ¶ | Æ | Ö | æ | ö |
| 7 |   |   | '  | 7 | G | W  | g | w |   |   | § | · | Ç | × | ç | ÷ |
| 8 |   |   | (  | 8 | H | X  | h | x |   |   | ¨ | , | È | Ø | è | ø |
| 9 |   |   | )  | 9 | I | Y  | i | y |   |   | © | ¹ | É | Ù | é | ù |
| A |   |   | *  | : | J | Z  | j | z |   |   | ª | º | Ê | Ú | ê | ú |
| B |   |   | +  | ; | K | [  | k | { |   |   | « | » | Ë | Û | ë | û |
| C |   |   | ,  | < | L | \  | l |   |   |   | ¬ | ¼ | Ì | Ü | ì | ü |
| D |   |   | -  | = | M | ]m | } | } |   |   | - | ½ | Í | Ý | í | ý |
| E |   |   | .  | > | N | ^  | n | ~ |   |   | ® | ¾ | Î | Ş | î | ş |
| F |   |   | /  | ? | O | —  | o | o |   |   | - | ¿ | Ï | ß | ï | ÿ |

Windows Latin 5 (5T)

|   | 0  | 1  | 2  | 3  | 4  | 5   | 6   | 7   | 8   | 9   | A   | B   | C   | D   | E   | F   |
|---|----|----|----|----|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 0 |    |    |    | 0  | @  | P   | `   | p   | €   |     |     | °   | À   | Ĝ   | à   | ğ   |
| 1 |    |    | !  | 1  | A  | Q   | a   | q   |     | ‘   | ı   | ±   | Á   | Ñ   | á   | ñ   |
| 2 |    |    | "  | 2  | B  | R   | b   | r   | ,   | ’   | ¢   | ²   | Â   | Ò   | â   | ò   |
| 3 |    |    | #  | 3  | C  | S   | c   | s   | f   | “   | £   | ³   | Ã   | Ó   | ã   | ó   |
| 4 |    |    | \$ | 4  | D  | T   | d   | t   | ”   | »   | ¤   | ’   | Ä   | Ô   | ä   | ô   |
| 5 |    |    | %  | 5  | E  | U   | e   | u   | ... | •   | ¥   | μ   | Å   | Ö   | å   | ö   |
| 6 |    |    | &  | 6  | F  | V   | f   | v   | †   | —   | ¦   | ¶   | Æ   | Ö   | æ   | ö   |
| 7 |    |    | '  | 7  | G  | W   | g   | w   | ‡   |     | §   | ·   | Ç   | ×   | ç   | ÷   |
| 8 |    |    | (  | 8  | H  | X   | h   | x   | ^   | ~   | ¨   | ,   | È   | Ø   | è   | ø   |
| 9 |    |    | )  | 9  | I  | Y   | i   | y   | ‰   | ™   | ©   | ¹   | É   | Ù   | é   | ù   |
| A |    |    | *  | :  | J  | Z   | j   | z   | Š   | š   | ª   | º   | Ê   | Ú   | ê   | ú   |
| B |    |    | +  | ;  | K  | [   | k   | {   | <   | >   | «   | »   | Ë   | Û   | ë   | û   |
| C |    |    | <  | <  | L  | \   | l   |     | Œ   | œ   | ¬   | ¼   | Ì   | Ü   | ì   | ü   |
| D |    |    | -  | =  | M  | ] m | }   |     |     |     | -   | ½   | Í   | Ý   | í   | ý   |
| E |    |    | .  | >  | N  | ^   | n   | ~   |     |     | ®   | ¾   | Î   | Ş   | î   | ş   |
| F |    |    | /  | ?  | O  | _   | o   |     |     |     | ÿ   | ı   | İ   | ß   | ï   | ÿ   |
|   | 15 | 31 | 47 | 63 | 79 | 95  | 111 | 127 | 143 | 159 | 175 | 191 | 207 | 223 | 239 | 255 |

MS publishing (6J)

|   | 0  | 1  | 2   | 3  | 4  | 5  | 6   | 7   | 8   | 9   | A   | B   | C   | D   | E   | F   |
|---|----|----|-----|----|----|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 0 |    |    |     |    | 2  |    | €   |     |     |     |     | °   |     |     | Ω   |     |
| 1 |    |    | 1   |    |    |    |     |     |     |     | ’   | •   | ’   | ’   |     |     |
| 2 |    |    | ”   |    |    | R  |     |     |     | ”   | ”   | •   | ’   | ’   |     |     |
| 3 |    |    | 3   |    |    | Š  | %   | š   |     | ^   | ^   | •   | ^   | ^   |     |     |
| 4 |    |    | 4   |    |    | ™  |     |     |     | ~   | ~   | °   | ~   | ~   |     |     |
| 5 |    |    | 5   |    |    |    |     |     |     |     |     | °   | —   | —   | 1   |     |
| 6 |    |    | 7   |    |    |    |     |     |     |     |     | ○   | ˘   | ˘   | ıı  | ıı  |
| 7 |    |    | ’   |    |    |    |     |     |     |     |     | ▪   | ˘   | ˘   | ı   |     |
| 8 |    |    | 9   |    |    |    |     |     |     |     |     | ■   | ˘   | ˘   | ı   |     |
| 9 |    |    | 0   |    |    | ÿ  |     |     |     |     | fi  | ■   |     |     |     |     |
| A |    |    | 8   |    |    | Ž  |     | ž   |     |     | fi  | ◻   | °   | °   |     |     |
| B |    |    | †   |    |    |    |     |     |     |     | ff  | ◻   | ’   | ’   |     |     |
| C |    |    | ,   | ”  | Ł  |    | ł   |     |     |     | ffi | ◻   |     |     |     |     |
| D |    |    | —   | ‡  | —  |    |     |     |     |     | ff  | %   | ”   | ”   |     |     |
| E |    |    | ... |    | —  | ˆ  |     |     |     | “   | “   | ◊   | ˘   | ˘   |     |     |
| F |    |    | /   |    | Œ  | =  | œ   |     |     | f   | f   | ◊   | ˘   | ˘   | ’   | ’   |
|   | 15 | 31 | 47  | 63 | 79 | 95 | 111 | 127 | 143 | 159 | 175 | 191 | 207 | 223 | 239 | 255 |



ISO Latin 6 (6N)

|   | 0 | 1 | 2  | 3   | 4 | 5 | 6 | 7 | 8 | 9 | A | B | C | D | E | F |
|---|---|---|----|-----|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 |   |   |    | 0   | @ | P | ` | p |   |   | ° | ° | À | Đ | ā | ð |
| 1 |   |   | !  | 1   | A | Q | a | q |   |   | A | a | Á | Ñ | á | ñ |
| 2 |   |   | "  | 2   | B | R | b | r |   |   | Ē | ē | Â | Ō | ā | ō |
| 3 |   |   | #  | 3   | C | S | c | s |   |   | Ĝ | ĝ | Ã | Ó | ã | ó |
| 4 |   |   | \$ | 4   | D | T | d | t |   |   | Ī | ī | Ä | Ô | ä | ô |
| 5 |   |   | %  | 5   | E | U | e | u |   |   | Ĩ | ĩ | Å | Õ | å | õ |
| 6 |   |   | &  | 6   | F | V | f | v |   |   | Ŧ | ķ | Æ | Ö | æ | ö |
| 7 |   |   | '  | 7   | G | W | g | w |   |   | Ŧ | · | İ | Ū | ı | ũ |
| 8 |   |   | (  | 8   | H | X | h | x |   |   | Ł | ł | Č | Ø | č | ø |
| 9 |   |   | )  | 9   | I | Y | i | y |   |   | Đ | đ | É | Ŭ | é | ų |
| A |   |   | *  | :   | J | Z | j | z |   |   | Š | š | Ė | Ų | ę | ú |
| B |   |   | +  | ;   | K | [ | k | { |   |   | Ŧ | Ŧ | Ė | Ŭ | ė | û |
| C |   |   | ,  | <   | L | \ | l |   |   |   | Ž | ž | Ė | Ŭ | ė | ü |
| D |   |   | -  | =   | M | ] | m | } |   |   | - | — | Í | Ý | í | ý |
| E |   |   | .  | >   | N | ^ | n | ~ |   |   | Ŭ | ū | İ | Þ | î | þ |
| F |   |   | /  | ? O | — |   | o |   |   |   | N | ŋ | İ | ß | ï | κ |

Desktop (7J)

|   | 0 | 1 | 2  | 3   | 4 | 5 | 6 | 7 | 8 | 9 | A   | B | C | D  | E  | F |
|---|---|---|----|-----|---|---|---|---|---|---|-----|---|---|----|----|---|
| 0 |   |   |    | 0   | @ | P | ` | p |   |   |     |   | “ | ◁  | a  | ’ |
| 1 |   |   | !  | 1   | A | Q | a | q |   |   | ¶   | ” | ± | ▷  | o  | ` |
| 2 |   |   | "  | 2   | B | R | b | r |   |   | §   | μ | × | «  | æ  | ^ |
| 3 |   |   | #  | 3   | C | S | c | s |   |   | †   | ‰ | ÷ | »  | Æ  | ˆ |
| 4 |   |   | \$ | 4   | D | T | d | t |   |   | ‡   | • | ° | ,  | ð  | ˜ |
| 5 |   |   | %  | 5   | E | U | e | u |   |   | ©   | ● | ’ | ”  | Đ  | ˇ |
| 6 |   |   | &  | 6   | F | V | f | v |   |   | ®   | ° | ” | ·  | ij | ˘ |
| 7 |   |   | '  | 7   | G | W | g | w |   |   | ™   | ◊ | ¼ | ı  | ı  | ” |
| 8 |   |   | (  | 8   | H | X | h | x |   |   | %   | ▪ | ½ | ı  | ı  | ° |
| 9 |   |   | )  | 9   | I | Y | i | y |   |   | ¢   | ■ | ¾ | Ps | Ł  | ˙ |
| A |   |   | *  | :   | J | Z | j | z |   |   | —   | ◻ | ı | ℓ  | œ  | — |
| B |   |   | +  | ;   | K | [ | k | { |   |   | —   | ◻ | 2 | £  | Œ  | , |
| C |   |   | ,  | <   | L | \ | l |   |   |   | ... | ’ | 3 | ¥  | ø  | ˘ |
| D |   |   | -  | =   | M | ] | m | } |   |   | fi  | ¬ | / | œ  | Ø  | ˙ |
| E |   |   | .  | >   | N | ^ | n | ~ |   |   | fi  | ı |   | f  | þ  | ı |
| F |   |   | /  | ? O | — |   | o |   |   |   |     |   | = | ß  | ß  |   |

Greek-8 (8G)

|   | 0 | 1 | 2  | 3         | 4 | 5 | 6 | 7 | 8 | 9 | A | B | C | D | E | F |
|---|---|---|----|-----------|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 |   |   |    | 0         | @ | P | ‘ | p |   |   |   |   |   | O | ó | o |
| 1 |   |   | !  | 1         | A | Q | a | q |   |   |   |   | A | Π | α | π |
| 2 |   |   | "  | 2         | B | R | b | r |   |   |   |   | B | P | β | ρ |
| 3 |   |   | #  | 3         | C | S | c | s |   |   |   |   | Γ | Σ | γ | σ |
| 4 |   |   | \$ | 4         | D | T | d | t |   |   |   |   | Δ | T | δ | τ |
| 5 |   |   | %  | 5         | E | U | e | u |   |   |   |   | E | Υ | ε | υ |
| 6 |   |   | &  | 6         | F | V | f | v |   |   |   |   | Z | Φ | ζ | φ |
| 7 |   |   | ,  | 7         | G | W | g | w |   |   |   |   | H |   | η | ς |
| 8 |   |   | (  | 8         | H | X | h | x |   |   |   |   | Θ | X | θ | χ |
| 9 |   |   | )  | 9         | I | Y | i | y |   |   |   |   | I | Ψ | ι | ψ |
| A |   |   | *  | : J Z j z |   |   |   |   |   |   |   |   |   | Ω |   | ω |
| B |   |   | +  | ; K [ k { |   |   |   |   |   |   |   |   | K | ά | κ | έ |
| C |   |   | ,  | < L \ l   |   |   |   |   |   |   |   |   | ï | Λ | ή | ί |
| D |   |   | -  | = M ] m } |   |   |   |   |   |   |   |   |   | Μ | ό | ώ |
| E |   |   | .  | > N ^ n ~ |   |   |   |   |   |   |   |   | ü | N | ν | · |
| F |   |   | /  | ? O _     |   |   |   |   |   |   |   |   |   | Ξ |   | ξ |

Math-8 (8M)

|   | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | A | B | C | D | E | F |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 |   |   |   | 0 | ∴ | Π | ∴ | π |   |   |   | — | ⊕ | Å | Γ | ] |
| 1 |   |   | ✓ | 1 | A | P | α | ρ |   |   | ↑ | ∇ | ⊖ | — | Γ | ] |
| 2 |   |   | " | 2 | B | Σ | β | σ |   |   | → | ε | ⊗ | — | Γ | ] |
| 3 |   |   | ° | 3 | Γ | T | γ | τ |   |   | ↓ | Τ | ⊖ | — | Γ | ] |
| 4 |   |   | ∞ | 4 | Δ | τ | δ | υ |   |   | ← | ⊥ | ⊙ | — | Γ | ] |
| 5 |   |   | ÷ | 5 | E | Φ | ε | φ |   |   | ↑ | ∪ | ∧ | — | Γ | ] |
| 6 |   |   | α | 6 | Z | X | ζ | χ |   |   | ⇒ | ∩ | ∇ | — | Γ | ] |
| 7 |   |   | , | 7 | H | Ψ | η | ψ |   |   | ↓ | ∈ | ∇ | — | Γ | ] |
| 8 |   |   | ( | 8 | Θ | Ω | θ | ω |   |   | ⇐ | ⇐ | ∇ | — | Γ | ] |
| 9 |   |   | ) | 9 | I | ∇ | ι | ϑ |   |   | ↕ | ∄ | ∅ | — | Γ | ] |
| A |   |   | × | e | K | δ | κ | φ |   |   | ↔ | ∩ | · | — | Γ | ] |
| B |   |   | + | ε | Λ | ς | λ | σ |   |   | ↕ | ∩ | · | — | Γ | ] |
| C |   |   | , | < | M | ≤ | μ | ≈ |   |   | ⇐ | ∄ | • | — | Γ | ] |
| D |   |   | — | = | N | ≠ | ν | ≡ |   |   | ⇐ | ∄ | ∅ | — | Γ | ] |
| E |   |   | . | > | E | ≥ | ξ | ≠ |   |   | ⇐ | ∄ | ∅ | — | Γ | ] |
| F |   |   | / | ≈ | O | — | o |   |   |   | — | ∩ | ∇ | — | Γ | ] |

Turkish-8 (8T)

|   | 0 | 1  | 2  | 3  | 4  | 5  | 6   | 7   | 8   | 9   | A   | B   | C   | D   | E   | F   |
|---|---|----|----|----|----|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 0 | 0 | 16 | 32 | 48 | 64 | 80 | 96  | 112 | 128 | 144 | 160 | 176 | 192 | 208 | 224 | 240 |
| 1 | 1 | 17 | 33 | 49 | 65 | 81 | 97  | 113 | 129 | 145 | 161 | 177 | 193 | 209 | 225 | 241 |
| 2 | 2 | 18 | 34 | 50 | 66 | 82 | 98  | 114 | 130 | 146 | 162 | 178 | 194 | 210 | 226 | 242 |
| 3 | 3 | 19 | 35 | 51 | 67 | 83 | 99  | 115 | 131 | 147 | 163 | 179 | 195 | 211 | 227 | 243 |
| 4 | 4 | 20 | 36 | 52 | 68 | 84 | 100 | 116 | 132 | 148 | 164 | 180 | 196 | 212 | 228 | 244 |
| 5 | 5 | 21 | 37 | 53 | 69 | 85 | 101 | 117 | 133 | 149 | 165 | 181 | 197 | 213 | 229 | 245 |
| 6 | 6 | 22 | 38 | 54 | 70 | 86 | 102 | 118 | 134 | 150 | 166 | 182 | 198 | 214 | 230 | 246 |
| 7 | 7 | 23 | 39 | 55 | 71 | 87 | 103 | 119 | 135 | 151 | 167 | 183 | 199 | 215 | 231 | 247 |
| 8 | 8 | 24 | 40 | 56 | 72 | 88 | 104 | 120 | 136 | 152 | 168 | 184 | 200 | 216 | 232 | 248 |
| 9 | 9 | 25 | 41 | 57 | 73 | 89 | 105 | 121 | 137 | 153 | 169 | 185 | 201 | 217 | 233 | 249 |
| A |   | 26 | 42 | 58 | 74 | 90 | 106 | 122 | 138 | 154 | 170 | 186 | 202 | 218 | 234 | 250 |
| B |   | 27 | 43 | 59 | 75 | 91 | 107 | 123 | 139 | 155 | 171 | 187 | 203 | 219 | 235 | 251 |
| C |   | 28 | 44 | 60 | 76 | 92 | 108 | 124 | 140 | 156 | 172 | 188 | 204 | 220 | 236 | 252 |
| D |   | 29 | 45 | 61 | 77 | 93 | 109 | 125 | 141 | 157 | 173 | 189 | 205 | 221 | 237 | 253 |
| E |   | 30 | 46 | 62 | 78 | 94 | 110 | 126 | 142 | 158 | 174 | 190 | 206 | 222 | 238 | 254 |
| F |   | 31 | 47 | 63 | 79 | 95 | 111 | 127 | 143 | 159 | 175 | 191 | 207 | 223 | 239 | 255 |

HP Roman-8 (8U)

|   | 0 | 1  | 2  | 3  | 4  | 5  | 6   | 7   | 8   | 9   | A   | B   | C   | D   | E   | F   |
|---|---|----|----|----|----|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 0 | 0 | 16 | 32 | 48 | 64 | 80 | 96  | 112 | 128 | 144 | 160 | 176 | 192 | 208 | 224 | 240 |
| 1 | 1 | 17 | 33 | 49 | 65 | 81 | 97  | 113 | 129 | 145 | 161 | 177 | 193 | 209 | 225 | 241 |
| 2 | 2 | 18 | 34 | 50 | 66 | 82 | 98  | 114 | 130 | 146 | 162 | 178 | 194 | 210 | 226 | 242 |
| 3 | 3 | 19 | 35 | 51 | 67 | 83 | 99  | 115 | 131 | 147 | 163 | 179 | 195 | 211 | 227 | 243 |
| 4 | 4 | 20 | 36 | 52 | 68 | 84 | 100 | 116 | 132 | 148 | 164 | 180 | 196 | 212 | 228 | 244 |
| 5 | 5 | 21 | 37 | 53 | 69 | 85 | 101 | 117 | 133 | 149 | 165 | 181 | 197 | 213 | 229 | 245 |
| 6 | 6 | 22 | 38 | 54 | 70 | 86 | 102 | 118 | 134 | 150 | 166 | 182 | 198 | 214 | 230 | 246 |
| 7 | 7 | 23 | 39 | 55 | 71 | 87 | 103 | 119 | 135 | 151 | 167 | 183 | 199 | 215 | 231 | 247 |
| 8 | 8 | 24 | 40 | 56 | 72 | 88 | 104 | 120 | 136 | 152 | 168 | 184 | 200 | 216 | 232 | 248 |
| 9 | 9 | 25 | 41 | 57 | 73 | 89 | 105 | 121 | 137 | 153 | 169 | 185 | 201 | 217 | 233 | 249 |
| A |   | 26 | 42 | 58 | 74 | 90 | 106 | 122 | 138 | 154 | 170 | 186 | 202 | 218 | 234 | 250 |
| B |   | 27 | 43 | 59 | 75 | 91 | 107 | 123 | 139 | 155 | 171 | 187 | 203 | 219 | 235 | 251 |
| C |   | 28 | 44 | 60 | 76 | 92 | 108 | 124 | 140 | 156 | 172 | 188 | 204 | 220 | 236 | 252 |
| D |   | 29 | 45 | 61 | 77 | 93 | 109 | 125 | 141 | 157 | 173 | 189 | 205 | 221 | 237 | 253 |
| E |   | 30 | 46 | 62 | 78 | 94 | 110 | 126 | 142 | 158 | 174 | 190 | 206 | 222 | 238 | 254 |
| F |   | 31 | 47 | 63 | 79 | 95 | 111 | 127 | 143 | 159 | 175 | 191 | 207 | 223 | 239 | 255 |

Windows Latin 2 (9E)

|   | 0 | 1 | 2  | 3 | 4 | 5   | 6 | 7 | 8   | 9 | A | B | C | D | E | F |
|---|---|---|----|---|---|-----|---|---|-----|---|---|---|---|---|---|---|
| 0 |   |   |    | 0 | @ | P   | ` | p | €   |   |   |   | ° | Ŕ | Đ | đ |
| 1 |   |   | !  | 1 | A | Q   | a | q |     | ‘ | „ | ± | Á | Ň | á | ň |
| 2 |   |   | "  | 2 | B | R   | b | r | ,   | ’ | ‚ | ˆ | Â | Ń | â | ñ |
| 3 |   |   | #  | 3 | C | S   | c | s |     | “ | ” | Ł | ł | Ă | ă | ó |
| 4 |   |   | \$ | 4 | D | T   | d | t | ”   |   | „ | ¤ | ’ | Ä | ä | ô |
| 5 |   |   | %  | 5 | E | U   | e | u | ... | • | • | À | μ | Í | í | ő |
| 6 |   |   | &  | 6 | F | V   | f | v | †   | – | – | ¶ | Ć | Ö | ć | ö |
| 7 |   |   | '  | 7 | G | W   | g | w | ‡   | — | — | § | • | Ç | ç | ÷ |
| 8 |   |   | (  | 8 | H | X   | h | x |     |   |   | ¨ | ‚ | Č | č | ř |
| 9 |   |   | )  | 9 | I | Y   | i | y | ‰   | ™ | ™ | © | ª | Ë | é | ű |
| A |   |   | *  | : | J | Z   | j | z |     |   |   |   |   | Ě | ě | ú |
| B |   |   | +  | ; | K | [   | k | { | ◁   | ◁ | ◁ | » | » | Ë | ë | ű |
| C |   |   | ,  | < | L | \   | l |   | Š   | š | š | Š | š | Ě | ě | ü |
| D |   |   | -  | = | M | ] m | } |   | Ť   | ť | ť | - | - | Í | í | ý |
| E |   |   | .  | > | N | ^   | n | ~ | Ž   | ž | ž | Ž | ž | Ě | ě | ı |
| F |   |   | /  | ? | O | _   | o | ☒ | Ž   | ž | ž | Ž | ž | Đ | đ | • |

Windows Greek (9G)

|   | 0 | 1 | 2  | 3 | 4 | 5   | 6 | 7 | 8   | 9 | A | B | C | D | E | F |
|---|---|---|----|---|---|-----|---|---|-----|---|---|---|---|---|---|---|
| 0 |   |   |    | 0 | @ | P   | ` | p | €   |   |   | ° | ĩ | Π | ϖ | π |
| 1 |   |   | !  | 1 | A | Q   | a | q |     | ‘ | „ | ± | Α | Ρ | α | ρ |
| 2 |   |   | "  | 2 | B | R   | b | r | ,   | ’ | Α | ² | Β |   | β | ς |
| 3 |   |   | #  | 3 | C | S   | c | s | ƒ   | “ | £ | ³ | Γ | Σ | γ | σ |
| 4 |   |   | \$ | 4 | D | T   | d | t | ”   |   | ¤ | ’ | Δ | Τ | δ | τ |
| 5 |   |   | %  | 5 | E | U   | e | u | ... | • | ¥ | μ | Ε | Υ | ε | υ |
| 6 |   |   | &  | 6 | F | V   | f | v | †   | – | – | ¶ | Ζ | Φ | ζ | φ |
| 7 |   |   | '  | 7 | G | W   | g | w | ‡   | — | § | • | Η | Χ | η | χ |
| 8 |   |   | (  | 8 | H | X   | h | x |     |   | ¨ | Ε | Θ | Ψ | θ | ψ |
| 9 |   |   | )  | 9 | I | Y   | i | y | ‰   | ™ | © | Η | Ι | Ω | ι | ω |
| A |   |   | *  | : | J | Z   | j | z |     |   | ª | Ι | Κ | Ī | κ | ϊ |
| B |   |   | +  | ; | K | [   | k | { | ◁   | ◁ | » | » | Λ | Υ | λ | ϖ |
| C |   |   | ,  | < | L | \   | l |   |     |   | ¬ | Ο | Μ | ά | μ | ό |
| D |   |   | -  | = | M | ] m | } |   |     |   | - | ½ | N | έ | ν | ύ |
| E |   |   | .  | > | N | ^   | n | ~ |     |   | ® | Υ | Ξ | ή | ξ | ώ |
| F |   |   | /  | ? | O | _   | o | ☒ |     |   | — | Ω | Ο | ι | ο |   |

PC-1004 (9J)

|   | 0  | 1  | 2  | 3  | 4  | 5  | 6   | 7   | 8   | 9   | A   | B   | C   | D   | E   | F   |
|---|----|----|----|----|----|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 0 | 0  | 16 | 32 | 48 | 64 | 80 | 96  | 112 | 128 | 144 | 160 | 176 | 192 | 208 | 224 | 240 |
| 1 | 1  | 17 | 33 | 49 | 65 | 81 | 97  | 113 | 129 | 145 | 161 | 177 | 193 | 209 | 225 | 241 |
| 2 | 2  | 18 | 34 | 50 | 66 | 82 | 98  | 114 | 130 | 146 | 162 | 178 | 194 | 210 | 226 | 242 |
| 3 | 3  | 19 | 35 | 51 | 67 | 83 | 99  | 115 | 131 | 147 | 163 | 179 | 195 | 211 | 227 | 243 |
| 4 | 4  | 20 | 36 | 52 | 68 | 84 | 100 | 116 | 132 | 148 | 164 | 180 | 196 | 212 | 228 | 244 |
| 5 | 5  | 21 | 37 | 53 | 69 | 85 | 101 | 117 | 133 | 149 | 165 | 181 | 197 | 213 | 229 | 245 |
| 6 | 6  | 22 | 38 | 54 | 70 | 86 | 102 | 118 | 134 | 150 | 166 | 182 | 198 | 214 | 230 | 246 |
| 7 | 7  | 23 | 39 | 55 | 71 | 87 | 103 | 119 | 135 | 151 | 167 | 183 | 199 | 215 | 231 | 247 |
| 8 | 8  | 24 | 40 | 56 | 72 | 88 | 104 | 120 | 136 | 152 | 168 | 184 | 200 | 216 | 232 | 248 |
| 9 | 9  | 25 | 41 | 57 | 73 | 89 | 105 | 121 | 137 | 153 | 169 | 185 | 201 | 217 | 233 | 249 |
| A | 10 | 26 | 42 | 58 | 74 | 90 | 106 | 122 | 138 | 154 | 170 | 186 | 202 | 218 | 234 | 250 |
| B | 11 | 27 | 43 | 59 | 75 | 91 | 107 | 123 | 139 | 155 | 171 | 187 | 203 | 219 | 235 | 251 |
| C | 12 | 28 | 44 | 60 | 76 | 92 | 108 | 124 | 140 | 156 | 172 | 188 | 204 | 220 | 236 | 252 |
| D | 13 | 29 | 45 | 61 | 77 | 93 | 109 | 125 | 141 | 157 | 173 | 189 | 205 | 221 | 237 | 253 |
| E | 14 | 30 | 46 | 62 | 78 | 94 | 110 | 126 | 142 | 158 | 174 | 190 | 206 | 222 | 238 | 254 |
| F | 15 | 31 | 47 | 63 | 79 | 95 | 111 | 127 | 143 | 159 | 175 | 191 | 207 | 223 | 239 | 255 |

ISO Latin 9 (9N)

|   | 0  | 1  | 2  | 3  | 4  | 5  | 6   | 7   | 8   | 9   | A   | B   | C   | D   | E   | F   |
|---|----|----|----|----|----|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 0 | 0  | 16 | 32 | 48 | 64 | 80 | 96  | 112 | 128 | 144 | 160 | 176 | 192 | 208 | 224 | 240 |
| 1 | 1  | 17 | 33 | 49 | 65 | 81 | 97  | 113 | 129 | 145 | 161 | 177 | 193 | 209 | 225 | 241 |
| 2 | 2  | 18 | 34 | 50 | 66 | 82 | 98  | 114 | 130 | 146 | 162 | 178 | 194 | 210 | 226 | 242 |
| 3 | 3  | 19 | 35 | 51 | 67 | 83 | 99  | 115 | 131 | 147 | 163 | 179 | 195 | 211 | 227 | 243 |
| 4 | 4  | 20 | 36 | 52 | 68 | 84 | 100 | 116 | 132 | 148 | 164 | 180 | 196 | 212 | 228 | 244 |
| 5 | 5  | 21 | 37 | 53 | 69 | 85 | 101 | 117 | 133 | 149 | 165 | 181 | 197 | 213 | 229 | 245 |
| 6 | 6  | 22 | 38 | 54 | 70 | 86 | 102 | 118 | 134 | 150 | 166 | 182 | 198 | 214 | 230 | 246 |
| 7 | 7  | 23 | 39 | 55 | 71 | 87 | 103 | 119 | 135 | 151 | 167 | 183 | 199 | 215 | 231 | 247 |
| 8 | 8  | 24 | 40 | 56 | 72 | 88 | 104 | 120 | 136 | 152 | 168 | 184 | 200 | 216 | 232 | 248 |
| 9 | 9  | 25 | 41 | 57 | 73 | 89 | 105 | 121 | 137 | 153 | 169 | 185 | 201 | 217 | 233 | 249 |
| A | 10 | 26 | 42 | 58 | 74 | 90 | 106 | 122 | 138 | 154 | 170 | 186 | 202 | 218 | 234 | 250 |
| B | 11 | 27 | 43 | 59 | 75 | 91 | 107 | 123 | 139 | 155 | 171 | 187 | 203 | 219 | 235 | 251 |
| C | 12 | 28 | 44 | 60 | 76 | 92 | 108 | 124 | 140 | 156 | 172 | 188 | 204 | 220 | 236 | 252 |
| D | 13 | 29 | 45 | 61 | 77 | 93 | 109 | 125 | 141 | 157 | 173 | 189 | 205 | 221 | 237 | 253 |
| E | 14 | 30 | 46 | 62 | 78 | 94 | 110 | 126 | 142 | 158 | 174 | 190 | 206 | 222 | 238 | 254 |
| F | 15 | 31 | 47 | 63 | 79 | 95 | 111 | 127 | 143 | 159 | 175 | 191 | 207 | 223 | 239 | 255 |

Win Cyrillic (9R)

|   | 0 | 1 | 2  | 3      | 4 | 5 | 6 | 7 | 8 | 9 | A | B | C | D | E | F |
|---|---|---|----|--------|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 |   |   |    | 0      | @ | P | ` | р | Ђ | ђ |   | ° | А | Р | а | Р |
| 1 |   |   | !  | 1      | A | Q | a | q | Ѓ | ‘ | Ў | ± | Б | С | б | с |
| 2 |   |   | "  | 2      | B | R | b | r | ‘ | ’ | Ў | I | В | Т | в | т |
| 3 |   |   | #  | 3      | C | S | c | s | ѓ | “ | Ј | i | Г | У | г | у |
| 4 |   |   | \$ | 4      | D | T | d | t | ” | ” | Ѡ | Г | Д | Ф | д | ф |
| 5 |   |   | %  | 5      | E | U | e | u | … | • | Г | μ | Е | Х | е | х |
| 6 |   |   | &  | 6      | F | V | f | v | † | - | — | ¶ | Ж | Ц | ж | ц |
| 7 |   |   | '  | 7      | G | W | g | w | ‡ | — | § | · | З | Ч | з | ч |
| 8 |   |   | (  | 8      | H | X | h | x | € |   | Ё | ё | И | Ш | и | ш |
| 9 |   |   | )  | 9      | I | Y | i | y | ‰ | ™ | © | № | Й | Щ | й | щ |
| A |   |   | *  | :<br>A | J | Z | j | z | Љ | љ | Є | є | К | Ъ | к | ъ |
| B |   |   | +  | :<br>B | K | [ | k | { | ‹ | › | « | » | Л | Ы | л | ы |
| C |   |   | ,  | <<br>C | L | \ | l |   | Њ | њ | Ў | ¬ | М | Ь | м | ь |
| D |   |   | -  | =<br>D | M | ] | m | } | Ќ | ќ | - | Ѕ | Н | Э | н | э |
| E |   |   | .  | ><br>E | N | ^ | n | ~ | Ћ | ћ | ® | Ѕ | О | Ю | о | ю |
| F |   |   | /  | ?<br>F | O | _ | o | ◼ | Ц | ц | İ | İ | П | Я | п | я |

PC-Turkish (9T)

|   | 0 | 1  | 2  | 3      | 4 | 5 | 6 | 7 | 8 | 9 | A | B | C | D | E | F |
|---|---|----|----|--------|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 |   | ►  |    | 0      | @ | P | ` | p | Ç | É | á | ◼ | L | ⊥ | α | ≡ |
| 1 | ☺ | ◄  | !  | 1      | A | Q | a | q | ü | æ | í | ◼ | ⊥ | ⊥ | β | ± |
| 2 | ☹ | ↕  | "  | 2      | B | R | b | r | é | Æ | ó | ◼ | T | π | Γ | ≥ |
| 3 | ♥ | !! | #  | 3      | C | S | c | s | â | ô | ú |   | ⊥ | π | π | ≤ |
| 4 | ♦ | ¶  | \$ | 4      | D | T | d | t | ä | ö | ñ | † | — | £ | Σ | ∫ |
| 5 | ♣ | §  | %  | 5      | E | U | e | u | à | ò | Ñ | † | + | F | σ | ∫ |
| 6 | ♠ | —  | &  | 6      | F | V | f | v | â | û | Ğ | † | ⊥ | π | μ | ÷ |
| 7 | • | ↕  | '  | 7      | G | W | g | w | ç | ù | ğ | † | ⊥ | ⊥ | τ | ≈ |
| 8 | ■ | ↑  | (  | 8      | H | X | h | x | ê | î | ı | † | ⊥ | ⊥ | Φ | ° |
| 9 | ○ | ↓  | )  | 9      | I | Y | i | y | ë | ö | ı | † | ⊥ | ⊥ | Θ | · |
| A | ◼ | →  | *  | :<br>A | J | Z | j | z | è | ü | ı | † | ⊥ | ⊥ | Ω | · |
| B | ♂ | ←  | +  | :<br>B | K | [ | k | { | ï | ø | ½ | † | ⊥ | ◼ | δ | √ |
| C | ♀ | ⊥  | ,  | <<br>C | L | \ | l |   | î | £ | ¼ | † | ⊥ | ◼ | ∞ | n |
| D | ♫ | ↔  | -  | =<br>D | M | ] | m | } | ı | ¥ | ı | † | ⊥ | ⊥ | φ | 2 |
| E | ♫ | ▲  | .  | ><br>E | N | ^ | n | ~ | Ä | Ş | « | † | ⊥ | ⊥ | ε | ▪ |
| F | ☼ | ▼  | /  | ?<br>F | O | _ | o | ◻ | Å | ş | » | † | ⊥ | ◼ | ∩ |   |

Windows (9U)

|   | 0 | 1 | 2  | 3   | 4   | 5 | 6 | 7 | 8 | 9 | A | B | C | D | E | F |
|---|---|---|----|-----|-----|---|---|---|---|---|---|---|---|---|---|---|
| 0 |   |   |    | 0   | @   | P | ` | p | € |   |   | ° | À | Ð | à | ð |
| 1 |   |   | !  | 1   | A   | Q | a | q |   | ‘ | ı | ± | Á | Ñ | á | ñ |
| 2 |   |   | "  | 2   | B   | R | b | r |   | ’ | ø | ² | Â | Ò | â | ò |
| 3 |   |   | #  | 3   | C   | S | c | s |   | £ | ₧ | ³ | Ã | Ó | ã | ó |
| 4 |   |   | \$ | 4   | D   | T | d | t |   | ¤ | ’ | Ä | Ô | ä | ô |   |
| 5 |   |   | %  | 5   | E   | U | e | u |   | ¥ | μ | μ | Å | Ö | å | ö |
| 6 |   |   | &  | 6   | F   | V | f | v |   | ¡ | ¡ | ¶ | Æ | Ö | æ | ö |
| 7 |   |   | '  | 7   | G   | W | g | w |   | § | · | · | Ç | × | ç | ÷ |
| 8 |   |   | (  | 8   | H   | X | h | x |   | ¨ | ¨ | ¨ | È | Ø | è | ø |
| 9 |   |   | )  | 9   | I   | Y | i | y |   | © | © | © | É | Ù | é | ù |
| A |   |   | *  | : J | Z   | j | z |   |   | ª | ª | ª | Ê | Ú | ê | ú |
| B |   |   | +  | ; K | [   | k | { |   |   | « | « | » | Ë | Û | ë | û |
| C |   |   | ,  | < L | \   | l |   |   |   | ¬ | ¬ | ¼ | Ì | Ü | ì | ü |
| D |   |   | -  | = M | ] m | } |   |   |   | - | ½ | ½ | Í | Ý | í | ý |
| E |   |   | .  | > N | ^ n | ~ |   |   |   | ® | ¾ | ¾ | Î | Þ | î | þ |
| F |   |   | /  | ? O | _ o |   |   |   |   | - | ¿ | ¿ | Ï | ß | ï | ÿ |

PC-851 Greek (10G)

|   | 0 | 1  | 2  | 3   | 4   | 5 | 6 | 7 | 8 | 9 | A | B | C | D | E | F |
|---|---|----|----|-----|-----|---|---|---|---|---|---|---|---|---|---|---|
| 0 |   | ►  |    | 0   | @   | P | ` | p | Ç | ‘ | ı | ⋮ | Ł | T | ζ | - |
| 1 | ☺ | ◄  | !  | 1   | A   | Q | a | q | ü |   | ı | ⏏ | ⌊ | Υ | η | ± |
| 2 | ☹ | ↕  | "  | 2   | B   | R | b | r | é | ‘ | ó | ⏏ | ⌋ | Φ | θ | υ |
| 3 | ♥ | !! | #  | 3   | C   | S | c | s | â | ô | ú | ı | ⌋ | X | ι | φ |
| 4 | ♦ | ¶  | \$ | 4   | D   | T | d | t | ä | ö | â | ⌋ | — | Ψ | κ | χ |
| 5 | ♣ | §  | %  | 5   | E   | U | e | u | à | ‘ | Y | B | K | ⌋ | Ω | λ |
| 6 | ♠ | —  | &  | 6   | F   | V | f | v | ‘ | â | û | Γ | Λ | Π | α | ψ |
| 7 | ● | ↕  | '  | 7   | G   | W | g | w | ç | ù | Δ | M | P | β | ν | ς |
| 8 | ■ | ↑  | (  | 8   | H   | X | h | x | ê | ‘ | Ω | E | N | ⌋ | γ | ξ |
| 9 | ◯ | ↓  | )  | 9   | I   | Y | i | y | ë | ö | Z | ⌋ | ⌋ | ⌋ | ο | · |
| A | ◼ | →  | *  | : J | Z   | j | z |   | è | Û | H | ⌋ | ⌋ | ⌋ | π | ω |
| B | ♂ | ←  | +  | ; K | [   | k | { |   | ï | á | ½ | ⌋ | ⌋ | ⌋ | ρ | ϋ |
| C | ♀ | ⌋  | ,  | < L | \   | l |   |   | î | £ | Θ | ⌋ | ⌋ | ⌋ | σ | ϖ |
| D | ♫ | ↔  | -  | = M | ] m | } |   |   | ‘ | É | I | ⌋ | ⌋ | ⌋ | ς | ώ |
| E | ♫ | ▲  | .  | > N | ^ n | ~ |   |   | Ä | ή | « | ⌋ | ⌋ | ⌋ | τ | ■ |
| F | ☼ | ▼  | /  | ? O | _ o |   |   |   | ‘ | ‘ | » | ⌋ | ⌋ | ⌋ | ’ |   |

PS text (10J)

|   | 0 | 1  | 2  | 3  | 4  | 5  | 6   | 7   | 8   | 9   | A   | B   | C   | D   | E   | F   |
|---|---|----|----|----|----|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 0 | 0 | 16 | 32 | 48 | 64 | 80 | 96  | 112 | 128 | 144 | 160 | 176 | 192 | 208 | 224 | 240 |
| 1 | 1 | 17 | 33 | 49 | 65 | 81 | 97  | 113 | 129 | 145 | 161 | 177 | 193 | 209 | 225 | 241 |
| 2 | 2 | 18 | 34 | 50 | 66 | 82 | 98  | 114 | 130 | 146 | 162 | 178 | 194 | 210 | 226 | 242 |
| 3 | 3 | 19 | 35 | 51 | 67 | 83 | 99  | 115 | 131 | 147 | 163 | 179 | 195 | 211 | 227 | 243 |
| 4 | 4 | 20 | 36 | 52 | 68 | 84 | 100 | 116 | 132 | 148 | 164 | 180 | 196 | 212 | 228 | 244 |
| 5 | 5 | 21 | 37 | 53 | 69 | 85 | 101 | 117 | 133 | 149 | 165 | 181 | 197 | 213 | 229 | 245 |
| 6 | 6 | 22 | 38 | 54 | 70 | 86 | 102 | 118 | 134 | 150 | 166 | 182 | 198 | 214 | 230 | 246 |
| 7 | 7 | 23 | 39 | 55 | 71 | 87 | 103 | 119 | 135 | 151 | 167 | 183 | 199 | 215 | 231 | 247 |
| 8 | 8 | 24 | 40 | 56 | 72 | 88 | 104 | 120 | 136 | 152 | 168 | 184 | 200 | 216 | 232 | 248 |
| 9 | 9 | 25 | 41 | 57 | 73 | 89 | 105 | 121 | 137 | 153 | 169 | 185 | 201 | 217 | 233 | 249 |
| A | A | 26 | 42 | 58 | 74 | 90 | 106 | 122 | 138 | 154 | 170 | 186 | 202 | 218 | 234 | 250 |
| B | B | 27 | 43 | 59 | 75 | 91 | 107 | 123 | 139 | 155 | 171 | 187 | 203 | 219 | 235 | 251 |
| C | C | 28 | 44 | 60 | 76 | 92 | 108 | 124 | 140 | 156 | 172 | 188 | 204 | 220 | 236 | 252 |
| D | D | 29 | 45 | 61 | 77 | 93 | 109 | 125 | 141 | 157 | 173 | 189 | 205 | 221 | 237 | 253 |
| E | E | 30 | 46 | 62 | 78 | 94 | 110 | 126 | 142 | 158 | 174 | 190 | 206 | 222 | 238 | 254 |
| F | F | 31 | 47 | 63 | 79 | 95 | 111 | 127 | 143 | 159 | 175 | 191 | 207 | 223 | 239 | 255 |

ISO Cyrillic (10N)

|   | 0 | 1  | 2  | 3  | 4  | 5  | 6   | 7   | 8   | 9   | A   | B   | C   | D   | E   | F   |
|---|---|----|----|----|----|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 0 | 0 | 16 | 32 | 48 | 64 | 80 | 96  | 112 | 128 | 144 | 160 | 176 | 192 | 208 | 224 | 240 |
| 1 | 1 | 17 | 33 | 49 | 65 | 81 | 97  | 113 | 129 | 145 | 161 | 177 | 193 | 209 | 225 | 241 |
| 2 | 2 | 18 | 34 | 50 | 66 | 82 | 98  | 114 | 130 | 146 | 162 | 178 | 194 | 210 | 226 | 242 |
| 3 | 3 | 19 | 35 | 51 | 67 | 83 | 99  | 115 | 131 | 147 | 163 | 179 | 195 | 211 | 227 | 243 |
| 4 | 4 | 20 | 36 | 52 | 68 | 84 | 100 | 116 | 132 | 148 | 164 | 180 | 196 | 212 | 228 | 244 |
| 5 | 5 | 21 | 37 | 53 | 69 | 85 | 101 | 117 | 133 | 149 | 165 | 181 | 197 | 213 | 229 | 245 |
| 6 | 6 | 22 | 38 | 54 | 70 | 86 | 102 | 118 | 134 | 150 | 166 | 182 | 198 | 214 | 230 | 246 |
| 7 | 7 | 23 | 39 | 55 | 71 | 87 | 103 | 119 | 135 | 151 | 167 | 183 | 199 | 215 | 231 | 247 |
| 8 | 8 | 24 | 40 | 56 | 72 | 88 | 104 | 120 | 136 | 152 | 168 | 184 | 200 | 216 | 232 | 248 |
| 9 | 9 | 25 | 41 | 57 | 73 | 89 | 105 | 121 | 137 | 153 | 169 | 185 | 201 | 217 | 233 | 249 |
| A | A | 26 | 42 | 58 | 74 | 90 | 106 | 122 | 138 | 154 | 170 | 186 | 202 | 218 | 234 | 250 |
| B | B | 27 | 43 | 59 | 75 | 91 | 107 | 123 | 139 | 155 | 171 | 187 | 203 | 219 | 235 | 251 |
| C | C | 28 | 44 | 60 | 76 | 92 | 108 | 124 | 140 | 156 | 172 | 188 | 204 | 220 | 236 | 252 |
| D | D | 29 | 45 | 61 | 77 | 93 | 109 | 125 | 141 | 157 | 173 | 189 | 205 | 221 | 237 | 253 |
| E | E | 30 | 46 | 62 | 78 | 94 | 110 | 126 | 142 | 158 | 174 | 190 | 206 | 222 | 238 | 254 |
| F | F | 31 | 47 | 63 | 79 | 95 | 111 | 127 | 143 | 159 | 175 | 191 | 207 | 223 | 239 | 255 |



PC-855 Serbia (10R)

|   | 0  | 1  | 2  | 3   | 4   | 5  | 6   | 7   | 8   | 9   | A   | B   | C   | D   | E   | F   |
|---|----|----|----|-----|-----|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 0 |    | ►  |    | 0   | @   | P  | `   | р   | ђ   | љ   | а   | ▣   | Л   | л   | Ј   | -   |
| 1 | ☺  | ◄  | !  | 1   | A   | Q  | a   | q   | Ђ   | Љ   | А   | ▤   | ┬   | Л   | Р   | Ы   |
| 2 | ☹  | ↕  | "  | 2   | B   | R  | b   | r   | Ѓ   | Њ   | Б   | ▥   | ┴   | М   | Р   | Ы   |
| 3 | ♥  | !! | #  | 3   | C   | S  | c   | s   | Ѓ   | Њ   | В   | ▧   | ┴   | М   | С   | З   |
| 4 | ♦  | ¶  | \$ | 4   | D   | T  | d   | t   | Ћ   | Ћ   | Ц   | ▨   | ┬   | Н   | С   | З   |
| 5 | ♣  | §  | %  | 5   | E   | U  | e   | u   | Ћ   | Ћ   | Ц   | ▩   | ┬   | Н   | Т   | Ш   |
| 6 | ♠  | —  | &  | 6   | F   | V  | v   | v   | Ћ   | Ћ   | Д   | ▪   | ┬   | К   | О   | Ш   |
| 7 | ●  | ↕  | '  | 7   | G   | W  | w   | w   | Ћ   | Ћ   | Д   | ▫   | ┬   | К   | У   | Э   |
| 8 | ◼  | ↑  | (  | 8   | H   | X  | h   | x   | Ћ   | Ћ   | Е   | ▬   | ┬   | П   | У   | Э   |
| 9 | ◯  | ↓  | )  | 9   | I   | Y  | i   | y   | Ћ   | Ћ   | Е   | ▭   | ┬   | П   | Ж   | Щ   |
| A | ◼  | →  | *  | : J | Z   | j  | z   | i   | Ћ   | Ћ   | Ф   | ▮   | ┬   | Ж   | Щ   |     |
| B | ♂  | ←  | +  | ; K | [   | k  | {   | {   | Ћ   | Ћ   | Ф   | ▯   | ┬   | В   | Ч   |     |
| C | ♀  | └  | ,  | < L | \   | l  |     |     | Ћ   | Ћ   | Г   | ▰   | ┬   | В   | Ч   |     |
| D | ♂  | ↔  | -  | = M | ] m | }  | }   | }   | Ћ   | Ћ   | Г   | ▱   | ┬   | П   | Ь   | §   |
| E | ♂  | ▲  | .  | > N | ^ n | ~  | ~   | ~   | Ћ   | Ћ   | Ј   | ▲   | ┬   | Я   | Ь   | ■   |
| F | ☼  | ▼  | /  | ? O | _ o | ◻  | ◻   | ◻   | Ћ   | Ћ   | Ј   | △   | ┬   | Я   | Њ   | №   |
|   | 15 | 31 | 47 | 63  | 79  | 95 | 111 | 127 | 143 | 159 | 175 | 191 | 207 | 223 | 239 | 255 |

PC-869 Greek (11G)

|   | 0  | 1  | 2  | 3   | 4   | 5  | 6   | 7   | 8   | 9   | A   | B   | C   | D   | E   | F   |
|---|----|----|----|-----|-----|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 0 |    | ►  |    | 0   | @   | P  | `   | ρ   |     | Ι   | ϊ   | ▣   | ┬   | Τ   | Ζ   | -   |
| 1 | ☺  | ◄  | !  | 1   | A   | Q  | a   | q   |     | Ι   | ϊ   | ▤   | ┬   | Υ   | η   | ±   |
| 2 | ☹  | ↕  | "  | 2   | B   | R  | b   | r   |     | Ο   | ο   | ▥   | ┴   | Φ   | θ   | υ   |
| 3 | ♥  | !! | #  | 3   | C   | S  | c   | s   |     | ϐ   |     | ▧   | ┴   | Χ   | ι   | φ   |
| 4 | ♦  | ¶  | \$ | 4   | D   | T  | d   | t   |     | Α   | α   | ▨   | ┬   | Ψ   | κ   | χ   |
| 5 | ♣  | §  | %  | 5   | E   | U  | e   | u   |     | Υ   | υ   | ▩   | ┬   | Ω   | λ   | §   |
| 6 | ♠  | —  | &  | 6   | F   | V  | v   | v   | Α   | ϐ   | Γ   | ▪   | ┬   | α   | μ   | ψ   |
| 7 | ●  | ↕  | '  | 7   | G   | W  | w   | w   |     | ©   | Δ   | ▫   | ┬   | β   | ν   | •   |
| 8 | ◼  | ↑  | (  | 8   | H   | X  | h   | x   | .   | Ω   | Ε   | ▬   | ┬   | γ   | ξ   | ο   |
| 9 | ◯  | ↓  | )  | 9   | I   | Y  | i   | y   | ┐   | 2   | Ζ   | ▭   | ┬   | ┐   | ο   | ..  |
| A | ◼  | →  | *  | : J | Z   | j  | z   | z   |     | 3   | Η   | ▮   | ┬   | π   | ω   |     |
| B | ♂  | ←  | +  | ; K | [   | k  | {   | {   | ,   | α   | ½   | ▯   | ┬   | ρ   | ϐ   |     |
| C | ♀  | └  | ,  | < L | \   | l  |     |     | ,   | £   | Θ   | ▰   | ┬   | σ   | ϐ   |     |
| D | ♂  | ↔  | -  | = M | ] m | }  | }   | }   | Ε   | έ   | Ι   | ▱   | ┬   | δ   | ς   | ώ   |
| E | ♂  | ▲  | .  | > N | ^ n | ~  | ~   | ~   | —   | ή   | «   | ▲   | ┬   | ε   | τ   | ■   |
| F | ☼  | ▼  | /  | ? O | _ o | ◻  | ◻   | ◻   | Η   | ι   | »   | △   | ┬   | Σ   | ,   |     |
|   | 15 | 31 | 47 | 63  | 79  | 95 | 111 | 127 | 143 | 159 | 175 | 191 | 207 | 223 | 239 | 255 |

PC-8 Greek (12G)

|   | 0 | 1  | 2  | 3 | 4 | 5   | 6 | 7 | 8 | 9 | A | B | C | D | E | F |
|---|---|----|----|---|---|-----|---|---|---|---|---|---|---|---|---|---|
| 0 |   | ►  |    | 0 | @ | P   | ` | p | A | P | ι | ⋮ | L | ⊥ | ω | ≡ |
| 1 | ☺ | ◄  | !  | 1 | A | Q   | a | q | B | Σ | κ | ⊞ | ⊥ | ≡ | ά | ± |
| 2 | ☹ | ↕  | "  | 2 | B | R   | b | r | Γ | T | λ | ⊞ | ⊥ | ⊥ | ξ | ≥ |
| 3 | ♥ | !! | #  | 3 | C | S   | c | s | Δ | Y | μ |   | ⊥ | ⊥ | ή | ≤ |
| 4 | ♦ | ¶  | \$ | 4 | D | T   | d | t | E | Φ | ν | ⊥ | ⊥ | ⊥ | ï | ı |
| 5 | ♣ | §  | %  | 5 | E | U   | e | u | Z | X | ξ | ≡ | ⊥ | ⊥ | ı | ı |
| 6 | ♠ | —  | &  | 6 | F | V   | f | v | H | Ψ | ο | ⊥ | ⊥ | ⊥ | ó | ÷ |
| 7 | ● | ⤴  | '  | 7 | G | W   | g | w | Θ | Ω | π | ⊥ | ⊥ | ⊥ | ú | ≈ |
| 8 | ◼ | ↑  | (  | 8 | H | X   | h | x | I | α | ρ | ⊥ | ⊥ | ⊥ | ü | ° |
| 9 | ◯ | ↓  | )  | 9 | I | Y   | i | y | K | β | σ | ⊥ | ⊥ | ⊥ | ώ | · |
| A | ◼ | →  | *  | : | J | Z   | j | z | Λ | γ | ς | ⊥ | ⊥ | ⊥ | Ω | · |
| B | ♂ | ←  | +  | ; | K | [   | k | { | M | δ | τ | ⊥ | ⊥ | ⊥ | δ | √ |
| C | ♀ | ⊥  | ,  | < | L | \   | l |   | N | ε | υ | ⊥ | ⊥ | ⊥ | ∞ | n |
| D | ♫ | ↔  | -  | = | M | ] m |   | } | E | ζ | φ | ⊥ | ⊥ | ⊥ | φ | 2 |
| E | ♫ | ▲  | .  | > | N | ^   | n | ~ | O | η | χ | ⊥ | ⊥ | ⊥ | € | ■ |
| F | ☼ | ▼  | /  | ? | O | _   | o |   | Δ | Π | θ | ⊥ | ⊥ | ⊥ | ⊥ | ⊥ |

Macintosh (12J)

|   | 0 | 1 | 2  | 3 | 4 | 5   | 6 | 7 | 8 | 9 | A  | B | C | D | E | F |
|---|---|---|----|---|---|-----|---|---|---|---|----|---|---|---|---|---|
| 0 |   |   |    | 0 | @ | P   | ` | p | Ä | ê | †  | ∞ | ¿ | — | ‡ | 🍏 |
| 1 |   |   | !  | 1 | A | Q   | a | q | Å | ë | °  | ± | ¡ | — | · | Ò |
| 2 |   |   | "  | 2 | B | R   | b | r | Ç | í | ¢  | ≤ | — | “ | , | Ú |
| 3 |   |   | #  | 3 | C | S   | c | s | É | ì | £  | ≥ | √ | ” | „ | Û |
| 4 |   |   | \$ | 4 | D | T   | d | t | Ñ | î | §  | ¥ | f | ‘ | ‰ | Ü |
| 5 |   |   | %  | 5 | E | U   | e | u | Ö | ï | •  | μ | ≈ | ’ | Â | ı |
| 6 |   |   | &  | 6 | F | V   | f | v | Ü | ñ | ¶  | ∂ | Δ | ÷ | Ê | ˆ |
| 7 |   |   | '  | 7 | G | W   | g | w | á | ó | β  | Σ | « | ◊ | Á | ˜ |
| 8 |   |   | (  | 8 | H | X   | h | x | à | ò | ®  | Π | » | ÿ | Ë | — |
| 9 |   |   | )  | 9 | I | Y   | i | y | â | ô | ©  | π | … | ÿ | È | ˘ |
| A |   |   | *  | : | J | Z   | j | z | ä | ö | ™  | ı |   | / | Í | · |
| B |   |   | +  | ; | K | [   | k | { | ã | õ | ’  | a | À | € | î | ° |
| C |   |   | ,  | < | L | \   | l |   | å | ú | .. | o | Ã | < | ï | , |
| D |   |   | -  | = | M | ] m |   | } | ç | ù | ≠  | Ω | ˆ | ˆ | ì | ” |
| E |   |   | .  | > | N | ^   | n | ~ | é | û | Æ  | æ | Œ | Œ | ó | ˘ |
| F |   |   | /  | ? | O | _   | o |   | è | ü | Ø  | ø | œ | Œ | ô | ˘ |

ISO Greek (12N)

|   | 0  | 1  | 2  | 3   | 4   | 5  | 6   | 7   | 8   | 9   | A   | B   | C   | D   | E   | F   |
|---|----|----|----|-----|-----|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 0 | 0  | 16 | 32 | 48  | 64  | 80 | 96  | 112 | 128 | 144 | 160 | 176 | 192 | 208 | 224 | 240 |
| 1 |    | !  | 1  | A   | Q   | a  | q   |     |     |     | ‘   | ±   | A   | P   | α   | ρ   |
| 2 | 1  | 17 | 33 | 49  | 65  | 81 | 97  | 113 | 129 | 145 | 161 | 177 | 193 | 209 | 225 | 241 |
|   |    |    | "  | 2   | B   | R  | b   | r   |     |     | ’   | 2   | B   |     | β   | ς   |
| 3 | 2  | 18 | 34 | 50  | 66  | 82 | 98  | 114 | 130 | 146 | 162 | 178 | 194 | 210 | 226 | 242 |
|   |    |    | #  | 3   | C   | S  | c   | s   |     |     | £   | 3   | Γ   | Σ   | γ   | σ   |
| 4 | 3  | 19 | 35 | 51  | 67  | 83 | 99  | 115 | 131 | 147 | 163 | 179 | 195 | 211 | 227 | 243 |
|   |    |    | \$ | 4   | D   | T  | d   | t   |     |     | €   | ’   | Δ   | T   | δ   | τ   |
| 5 | 4  | 20 | 36 | 52  | 68  | 84 | 100 | 116 | 132 | 148 | 164 | 180 | 196 | 212 | 228 | 244 |
|   |    |    | %  | 5   | E   | U  | e   | u   |     |     | “   | ”   | E   | Υ   | ε   | υ   |
| 6 | 5  | 21 | 37 | 53  | 69  | 85 | 101 | 117 | 133 | 149 | 165 | 181 | 197 | 213 | 229 | 245 |
|   |    |    | &  | 6   | F   | V  | f   | v   |     |     |     | ’A  | Z   | Φ   | ζ   | φ   |
| 7 | 6  | 22 | 38 | 54  | 70  | 86 | 102 | 118 | 134 | 150 | 166 | 182 | 198 | 214 | 230 | 246 |
|   |    |    | ’  | 7   | G   | W  | g   | w   |     |     | §   | ·   | H   | X   | η   | χ   |
| 8 | 7  | 23 | 39 | 55  | 71  | 87 | 103 | 119 | 135 | 151 | 167 | 183 | 199 | 215 | 231 | 247 |
|   |    |    | (  | 8   | H   | X  | h   | x   |     |     | ..  | ’E  | Θ   | Ψ   | θ   | ψ   |
| 9 | 8  | 24 | 40 | 56  | 72  | 88 | 104 | 120 | 136 | 152 | 168 | 184 | 200 | 216 | 232 | 248 |
|   |    |    | )  | 9   | I   | Y  | i   | y   |     |     | ©   | ’H  | I   | Ω   | ι   | ω   |
| A | 9  | 25 | 41 | 57  | 73  | 89 | 105 | 121 | 137 | 153 | 169 | 185 | 201 | 217 | 233 | 249 |
|   |    |    | *  | : J | Z   | j  | z   |     |     |     | ’I  | K   | İ   | κ   | ϊ   |     |
| B | 10 | 26 | 42 | 58  | 74  | 90 | 106 | 122 | 138 | 154 | 170 | 186 | 202 | 218 | 234 | 250 |
|   |    |    | +  | ; K | [   | k  | {   |     |     |     | «   | »   | Λ   | Ÿ   | λ   | ü   |
| C | 11 | 27 | 43 | 59  | 75  | 91 | 107 | 123 | 139 | 155 | 171 | 187 | 203 | 219 | 235 | 251 |
|   |    |    | ,  | < L | \   | l  |     |     |     |     | ¬   | ’O  | M   | ά   | μ   | ό   |
| D | 12 | 28 | 44 | 60  | 76  | 92 | 108 | 124 | 140 | 156 | 172 | 188 | 204 | 220 | 236 | 252 |
|   |    |    | -  | = M | ] m | }  |     |     |     |     | -   | ½   | N   | έ   | ν   | ύ   |
| E | 13 | 29 | 45 | 61  | 77  | 93 | 109 | 125 | 141 | 157 | 173 | 189 | 205 | 221 | 237 | 253 |
|   |    |    | ·  | > N | ^ n | ~  |     |     |     |     | ;   | ’Y  | E   | ή   | ξ   | ώ   |
| F | 14 | 30 | 46 | 62  | 78  | 94 | 110 | 126 | 142 | 158 | 174 | 190 | 206 | 222 | 238 | 254 |
|   |    |    | /  | ? O | -   | o  |     |     |     |     | —   | ’Ω  | O   | ί   | ο   |     |
|   | 15 | 31 | 47 | 63  | 79  | 95 | 111 | 127 | 143 | 159 | 175 | 191 | 207 | 223 | 239 | 255 |

USSR-GOST (12R)

|   | 0  | 1  | 2  | 3   | 4   | 5  | 6   | 7   | 8   | 9   | A   | B   | C   | D   | E   | F   |
|---|----|----|----|-----|-----|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 0 | 0  | 16 | 32 | 48  | 64  | 80 | 96  | 112 | 128 | 144 | 160 | 176 | 192 | 208 | 224 | 240 |
| 1 | ☺  | ◀  | !  | 1   | A   | Q  | a   | q   | ␣   | ␣   | ␣   | Б   | С   | б   | с   | ё   |
| 2 | ☹  | ⬆  | "  | 2   | B   | R  | b   | r   | ␣   | ␣   | ␣   | В   | Т   | т   | т   | ↗   |
| 3 | ♥  | !! | #  | 3   | C   | S  | c   | s   | ␣   | ␣   | ␣   | Г   | У   | у   |     | ↖   |
| 4 | ♦  | ¶  | \$ | 4   | D   | T  | d   | t   | ␣   | ␣   | ␣   | —   | Д   | Ф   | д   | ф   |
| 5 | ♣  | §  | %  | 5   | E   | U  | e   | u   | ␣   | ␣   | ␣   | Е   | Х   | е   | х   | ↗   |
| 6 | ♠  | —  | &  | 6   | F   | V  | f   | v   | ␣   | ␣   | ␣   | Ж   | Ц   | ж   | ц   | →   |
| 7 | ●  | ⬆  | '  | 7   | G   | W  | g   | w   | ␣   | ␣   | ␣   | З   | Ч   | з   | ч   | ←   |
| 8 | ◼  | ↑  | (  | 8   | H   | X  | h   | x   | ␣   | ␣   | ␣   | И   | Ш   | и   | ш   | ↑   |
| 9 | ◯  | ↓  | )  | 9   | I   | Y  | i   | y   | ␣   | ␣   | ␣   | Й   | Щ   | й   | щ   | ↓   |
| A | ◼  | →  | *  | : J | Z   | j  | z   |     |     |     | ␣   | К   | Ъ   | к   | ъ   | ÷   |
| B | ♂  | ←  | +  | ; K | [   | k  | {   |     |     |     | ␣   | Л   | Ы   | л   | ы   | ±   |
| C | ♀  | ␣  | ,  | < L | \   | l  |     |     |     |     | ␣   | М   | Ь   | м   | ь   | №   |
|   | 12 | 28 | 44 | 60  | 76  | 92 | 108 | 124 | 140 | 156 | 172 | 188 | 204 | 220 | 236 | 252 |
| D | ♂  | ↔  | -  | = M | ] m | }  |     |     |     |     | ␣   | Н   | Э   | н   | э   | я   |
| E | ♂  | ▲  | ·  | > N | ^ n | ~  |     |     |     |     | ␣   | О   | Ю   | о   | ю   | ■   |
| F | ☼  | ▼  | /  | ? O | -   | o  |     |     |     |     | ␣   | П   | Я   | п   | я   |     |
|   | 15 | 31 | 47 | 63  | 79  | 95 | 111 | 127 | 143 | 159 | 175 | 191 | 207 | 223 | 239 | 255 |

ABICOMP Brazil (13P)

|   | 0 | 1 | 2  | 3   | 4 | 5 | 6 | 7 | 8 | 9 | A | B  | C | D | E | F |
|---|---|---|----|-----|---|---|---|---|---|---|---|----|---|---|---|---|
| 0 |   |   |    | 0   | @ | P | ` | p |   |   |   | Ò  | ì | ò |   |   |
| 1 |   |   | !  | 1   | A | Q | a | q |   |   | À | Ó  | à | ó |   |   |
| 2 |   |   | "  | 2   | B | R | b | r |   |   | Á | Ô  | á | ô |   |   |
| 3 |   |   | #  | 3   | C | S | c | s |   |   | Â | Õ  | â | õ |   |   |
| 4 |   |   | \$ | 4   | D | T | d | t |   |   | Ã | Ö  | ã | ö |   |   |
| 5 |   |   | %  | 5   | E | U | e | u |   |   | Ä | Æ  | ä | æ |   |   |
| 6 |   |   | &  | 6   | F | V | f | v |   |   | Ç | Ù  | ç | ù |   |   |
| 7 |   |   | '  | 7   | G | W | g | w |   |   | È | Ú  | è | ú |   |   |
| 8 |   |   | (  | 8   | H | X | h | x |   |   | É | Û  | é | û |   |   |
| 9 |   |   | )  | 9   | I | Y | i | y |   |   | Ê | Ü  | ê | ü |   |   |
| A |   |   | *  | : J | Z | j | z |   |   |   | Ë | ÿ  | ë | ÿ |   |   |
| B |   |   | +  | ; K | Õ | k | õ |   |   |   | Ì | .. | ì | ß |   |   |
| C |   |   | ,  | < L | Ã | l | ã |   |   |   | Í | £  | í | á |   |   |
| D |   |   | -  | = M | Ç | m | ç |   |   |   | Î | '  | î | ° |   |   |
| E |   |   | .  | > N | ^ | n | ~ |   |   |   | Ï | §  | ï | ¿ |   |   |
| F |   |   | /  | ? O | _ | o |   |   |   |   | Ñ | °  | ñ | ± |   |   |

PC-8 Bulgarian (13R)

|   | 0 | 1  | 2  | 3   | 4 | 5 | 6 | 7 | 8 | 9 | A | B | C | D | E | F |
|---|---|----|----|-----|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 |   |    | ►  | 0   | @ | P | ` | p | A | P | a | p | ␣ | ␣ | α | ≡ |
| 1 | ☺ | ◄  | !  | 1   | A | Q | a | q | Б | С | б | с | ␣ | ␣ | β | ± |
| 2 | ☹ | ⬆  | "  | 2   | B | R | b | r | В | Т | в | т | ␣ | ␣ | Γ | ≈ |
| 3 | ♥ | !! | #  | 3   | C | S | c | s | Г | У | г | у | ␣ | ␣ | π | ≤ |
| 4 | ♦ | ⬇  | \$ | 4   | D | T | d | t | Д | Ф | д | ф | ␣ | ␣ | Σ | f |
| 5 | ♣ | §  | %  | 5   | E | U | e | u | Е | X | е | х | ␣ | ␣ | № | σ |
| 6 | ♠ | —  | &  | 6   | F | V | f | v | Ж | Ц | ж | ц | ␣ | ␣ | § | μ |
| 7 | ● | ⬆  | '  | 7   | G | W | g | w | З | Ч | з | ч | ␣ | ␣ | ≡ | τ |
| 8 | ◼ | ↑  | (  | 8   | H | X | h | x | И | Ш | и | ш | ␣ | ␣ | ␣ | ° |
| 9 | ◯ | ↓  | )  | 9   | I | Y | i | y | Й | Щ | й | щ | ␣ | ␣ | ␣ | · |
| A | ◼ | →  | *  | : J | Z | j | z |   | К | Ъ | к | ъ | ␣ | ␣ | Ω | · |
| B | ♂ | ←  | +  | ; K | ␣ | k |   | { | Л | Ы | л | ы | ␣ | ␣ | δ | √ |
| C | ♀ | ␣  | ,  | < L | ␣ | l | ␣ |   | М | Ь | м | ь | ␣ | ␣ | ∞ | n |
| D | ♫ | ↔  | -  | = M | ␣ | m |   | } | Н | Э | н | э | ␣ | ␣ | φ | 2 |
| E | ♫ | ▲  | .  | > N | ^ | n |   | ~ | О | Ю | о | ю | ␣ | ␣ | € | ■ |
| F | ☼ | ▼  | /  | ? O | _ | o |   | ◊ | П | Я | п | я | ␣ | ␣ | ␣ | ␣ |

PC-8 Greek/437G (14G)

|   | 0 | 1  | 2  | 3 | 4 | 5   | 6 | 7 | 8 | 9 | A | B | C | D | E | F |
|---|---|----|----|---|---|-----|---|---|---|---|---|---|---|---|---|---|
| 0 |   | ►  |    | 0 | @ | P   | ` | p | A | P | ι | ⋮ | L | ⊥ | ω | Ω |
| 1 | ☺ | ◄  | !  | 1 | A | Q   | a | q | B | Σ | κ | ⊞ | ⊥ | ≡ | ά | ± |
| 2 | ☹ | ↕  | "  | 2 | B | R   | b | r | Γ | T | λ | ⏏ | ⊥ | ⊥ | έ | ≥ |
| 3 | ♥ | !! | #  | 3 | C | S   | c | s | Δ | Υ | μ |   | ⊥ | ⊥ | ή | ≤ |
| 4 | ♦ | ¶  | \$ | 4 | D | T   | d | t | E | Φ | ν | ⊥ | ⊥ | ⊥ | ι | Γ |
| 5 | ♣ | §  | %  | 5 | E | U   | e | u | Z | X | ξ | ⊥ | ⊥ | ⊥ | ί | J |
| 6 | ♠ | —  | &  | 6 | F | V   | f | v | H | Ψ | ο | ⊥ | ⊥ | ⊥ | ό | ÷ |
| 7 | ● | ↕  | '  | 7 | G | W   | g | w | Θ | Ω | π | ⊥ | ⊥ | ⊥ | ύ | ≈ |
| 8 | ■ | ↑  | (  | 8 | H | X   | h | x | I | α | ρ | ⊥ | ⊥ | ⊥ | ϋ | ° |
| 9 | ○ | ↓  | )  | 9 | I | Y   | i | y | K | β | σ | ⊥ | ⊥ | ⊥ | ώ | £ |
| A | ◼ | →  | *  | : | J | Z   | j | z | Λ | γ | ς | ⊥ | ⊥ | ⊥ | Α | . |
| B | ♂ | ←  | +  | ; | K | [   | k | { | M | δ | τ | ⊥ | ⊥ | ⊥ | Ε | √ |
| C | ♀ | ⊥  | ,  | < | L | \   | l |   | N | ε | υ | ⊥ | ⊥ | ⊥ | Η | n |
| D | ♂ | ↔  | -  | = | M | ] m | } | } | E | ζ | φ | ⊥ | ⊥ | ⊥ | Ι | 2 |
| E | ♂ | ▲  | .  | > | N | ^   | n | ~ | O | η | χ | ⊥ | ⊥ | ⊥ | Ο | ■ |
| F | ☼ | ▼  | /  | ? | O | _   | o | ◊ | Π | θ | ψ | ⊥ | ⊥ | ⊥ | Υ |   |

ABICOMP Int. (14P)

|   | 0 | 1 | 2  | 3 | 4 | 5   | 6 | 7 | 8 | 9 | A | B  | C | D | E | F |
|---|---|---|----|---|---|-----|---|---|---|---|---|----|---|---|---|---|
| 0 |   |   |    | 0 | @ | P   | ` | p |   |   |   | Ò  | ì | ò |   |   |
| 1 |   |   | !  | 1 | A | Q   | a | q |   |   | À | Ó  | à | ó |   |   |
| 2 |   |   | "  | 2 | B | R   | b | r |   |   | Á | Ô  | á | ô |   |   |
| 3 |   |   | #  | 3 | C | S   | c | s |   |   | Â | Õ  | â | õ |   |   |
| 4 |   |   | \$ | 4 | D | T   | d | t |   |   | Ã | Ö  | ã | ö |   |   |
| 5 |   |   | %  | 5 | E | U   | e | u |   |   | Ä | Æ  | ä | æ |   |   |
| 6 |   |   | &  | 6 | F | V   | f | v |   |   | Ç | Ü  | ç | ù |   |   |
| 7 |   |   | '  | 7 | G | W   | g | w |   |   | È | Ù  | è | ú |   |   |
| 8 |   |   | (  | 8 | H | X   | h | x |   |   | É | Ê  | é | û |   |   |
| 9 |   |   | )  | 9 | I | Y   | i | y |   |   | Ê | Û  | ê | ü |   |   |
| A |   |   | *  | : | J | Z   | j | z |   |   | Ë | ÿ  | ë | ÿ |   |   |
| B |   |   | +  | ; | K | [   | k | { |   |   | Ì | .. | ì | β |   |   |
| C |   |   | ,  | < | L | \   | l |   |   |   | Í | £  | í | α |   |   |
| D |   |   | -  | = | M | ] m | } | } |   |   | Î | '  | î | ο |   |   |
| E |   |   | .  | > | N | ^   | n | ~ |   |   | Ï | §  | ï | ι |   |   |
| F |   |   | /  | ? | O | _   | o | ◊ |   |   | Ñ | °  | ñ | ± |   |   |

Pi font (15U)

|   | 0 | 1  | 2  | 3  | 4  | 5  | 6  | 7   | 8   | 9   | A   | B   | C   | D   | E   | F   |
|---|---|----|----|----|----|----|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 0 |   |    |    | -  | :: | Ø  | Г  | Г   |     |     |     |     |     |     |     |     |
| 1 |   | 0  | 16 | 32 | 48 | 64 | 80 | 96  | 112 | 128 | 144 | 160 | 176 | 192 | 208 | 224 |
| 2 |   | 1  | 17 | 33 | 49 | 65 | 81 | 97  | 113 | 129 | 145 | 161 | 177 | 193 | 209 | 225 |
| 3 |   | 2  | 18 | 34 | 50 | 66 | 82 | 98  | 114 | 130 | 146 | 162 | 178 | 194 | 210 | 226 |
| 4 |   | 3  | 19 | 35 | 51 | 67 | 83 | 99  | 115 | 131 | 147 | 163 | 179 | 195 | 211 | 227 |
| 5 |   | 4  | 20 | 36 | 52 | 68 | 84 | 100 | 116 | 132 | 148 | 164 | 180 | 196 | 212 | 228 |
| 6 |   | 5  | 21 | 37 | 53 | 69 | 85 | 101 | 117 | 133 | 149 | 165 | 181 | 197 | 213 | 229 |
| 7 |   | 6  | 22 | 38 | 54 | 70 | 86 | 102 | 118 | 134 | 150 | 166 | 182 | 198 | 214 | 230 |
| 8 |   | 7  | 23 | 39 | 55 | 71 | 87 | 103 | 119 | 135 | 151 | 167 | 183 | 199 | 215 | 231 |
| 9 |   | 8  | 24 | 40 | 56 | 72 | 88 | 104 | 120 | 136 | 152 | 168 | 184 | 200 | 216 | 232 |
| A |   | 9  | 25 | 41 | 57 | 73 | 89 | 105 | 121 | 137 | 153 | 169 | 185 | 201 | 217 | 233 |
| B |   | 10 | 26 | 42 | 58 | 74 | 90 | 106 | 122 | 138 | 154 | 170 | 186 | 202 | 218 | 234 |
| C |   | 11 | 27 | 43 | 59 | 75 | 91 | 107 | 123 | 139 | 155 | 171 | 187 | 203 | 219 | 235 |
| D |   | 12 | 28 | 44 | 60 | 76 | 92 | 108 | 124 | 140 | 156 | 172 | 188 | 204 | 220 | 236 |
| E |   | 13 | 29 | 45 | 61 | 77 | 93 | 109 | 125 | 141 | 157 | 173 | 189 | 205 | 221 | 237 |
| F |   | 14 | 30 | 46 | 62 | 78 | 94 | 110 | 126 | 142 | 158 | 174 | 190 | 206 | 222 | 238 |
|   |   | 15 | 31 | 47 | 63 | 79 | 95 | 111 | 127 | 143 | 159 | 175 | 191 | 207 | 223 | 239 |

PC Ukrainian (14R)

|   | 0 | 1  | 2  | 3 | 4 | 5 | 6 | 7 | 8 | 9 | A | B | C | D | E | F   |
|---|---|----|----|---|---|---|---|---|---|---|---|---|---|---|---|-----|
| 0 |   | ►  |    | 0 | @ | P | ` | p | A | P | a | ⋮ | ⋮ | ⋮ | ⋮ | Ë   |
| 1 | ☺ | ◄  | !  | 1 | A | Q | a | q | B | C | б | ⚫ | ⚫ | ⚫ | ⚫ | ë   |
| 2 | ☹ | ⬆  | "  | 2 | B | R | b | r | B | T | в | ⚫ | ⚫ | ⚫ | ⚫ | Г   |
| 3 | ♥ | !! | #  | 3 | C | S | c | s | Г | У | г | ⚫ | ⚫ | ⚫ | ⚫ | г   |
| 4 | ♦ | ¶  | \$ | 4 | D | T | d | t | Д | Ф | д | ⚫ | ⚫ | ⚫ | ⚫ | Є   |
| 5 | ♣ | §  | %  | 5 | E | U | e | u | Е | Х | е | ⚫ | ⚫ | ⚫ | ⚫ | є   |
| 6 | ♠ | —  | &  | 6 | F | V | f | v | Ж | Ц | ж | ⚫ | ⚫ | ⚫ | ⚫ | і   |
| 7 | ● | ⬆  | '  | 7 | G | W | g | w | З | Ч | з | ⚫ | ⚫ | ⚫ | ⚫ | ї   |
| 8 | ■ | ⬆  | (  | 8 | H | X | h | x | И | Ш | и | ⚫ | ⚫ | ⚫ | ⚫ | ії  |
| 9 | ◯ | ⬇  | )  | 9 | I | Y | i | y | Й | Щ | й | ⚫ | ⚫ | ⚫ | ⚫ | і   |
| A | ◼ | ➡  | *  | : | J | Z | j | z | К | Ь | к | ⚫ | ⚫ | ⚫ | ⚫ | ·   |
| B | ♂ | ⬅  | +  | ; | K | [ | k | { | Л | Ы | л | ⚫ | ⚫ | ⚫ | ⚫ | ✓   |
| C | ♀ | ⌞  | ,  | < | L | \ | l |   | М | Ь | м | ⚫ | ⚫ | ⚫ | ⚫ | №   |
| D | ♪ | ↔  | -  | = | M | ] | m | } | Н | Э | н | ⚫ | ⚫ | ⚫ | ⚫ | 252 |
| E | ♫ | ▲  | ·  | > | N | ^ | n | ~ | О | Ю | о | ⚫ | ⚫ | ⚫ | ⚫ | 253 |
| F | ☼ | ▼  | /  | ? | O | _ | o | △ | П | Я | п | ⚫ | ⚫ | ⚫ | ⚫ | 254 |
|   |   |    |    |   |   |   |   |   |   |   |   |   |   |   |   | 255 |

PC-852 Latin 2 (17U)

|   | 0 | 1  | 2  | 3 | 4 | 5 | 6 | 7 | 8 | 9 | A | B | C | D | E | F  |
|---|---|----|----|---|---|---|---|---|---|---|---|---|---|---|---|----|
| 0 |   | ►  |    | 0 | @ | P | ` | p | Ç | É | á | á | L | đ | Ó | -  |
| 1 | ☺ | ◄  | !  | 1 | A | Q | a | q | ü | Í | í | í | ⊥ | Đ | ß | ”  |
| 2 | ☹ | ↕  | "  | 2 | B | R | b | r | é | Í | ó | í | ⊥ | Đ | Ö | ˘  |
| 3 | ♥ | !! | #  | 3 | C | S | c | s | à | ô | ú | í | ⊥ | Đ | Ñ | ˘  |
| 4 | ♦ | ¶  | \$ | 4 | D | T | d | t | ä | ö | Á | á | ⊥ | đ | ń | ˘  |
| 5 | ♣ | §  | %  | 5 | E | U | e | u | û | Ĳ | á | á | ⊥ | Ñ | ñ | §  |
| 6 | ♠ | —  | &  | 6 | F | V | f | v | ć | Ĳ | Ž | Ž | ⊥ | Ĳ | š | ÷  |
| 7 | • | ↑↓ | '  | 7 | G | W | g | w | ç | Š | ž | ž | ⊥ | š | š | ,  |
| 8 | ■ | ↑  | (  | 8 | H | X | h | x | ı | ś | Ĳ | Ĳ | ⊥ | Ĳ | ŕ | °  |
| 9 | ○ | ↓  | )  | 9 | I | Y | i | y | ë | Ö | ę | ę | ⊥ | Ĳ | Ű | .. |
| A | ☐ | →  | *  | : | J | Z | j | z | Ó | Ü |   |   | ⊥ | Ĳ | ı | .  |
| B | ♂ | ←  | +  | ; | K | [ | k | { | ö | ŕ | ž | ž | ⊥ | ⊥ | Ű | ü  |
| C | ♀ | L  | ,  | < | L | \ | l |   | ı | ŕ | č | č | ⊥ | ⊥ | ŕ | ř  |
| D | ♪ | ↔  | -  | = | M | ] | m | } | ž | Ĳ | š | ž | ⊥ | ⊥ | ŕ | ř  |
| E | ♫ | ▲  | .  | > | N | ^ | n | ~ | Ä | × | « | » | ⊥ | ⊥ | ı | ▪  |
| F | ☼ | ▼  | /  | ? | O | _ | o | ◊ | Ć | č | » | » | ⊥ | ⊥ | ı | ,  |

PC-857 Turkish (16U)

|   | 0 | 1  | 2  | 3 | 4 | 5 | 6 | 7 | 8 | 9 | A | B | C | D | E | F  |
|---|---|----|----|---|---|---|---|---|---|---|---|---|---|---|---|----|
| 0 |   | ►  |    | 0 | @ | P | ` | p | Ç | É | á | á | L | ° | Ó | -  |
| 1 | ☺ | ◄  | !  | 1 | A | Q | a | q | ü | æ | í | í | ⊥ | a | ß | ±  |
| 2 | ☹ | ↕  | "  | 2 | B | R | b | r | é | Æ | ó | í | ⊥ | ⊥ | Ê | Ô  |
| 3 | ♥ | !! | #  | 3 | C | S | c | s | â | ô | ú | í | ⊥ | ⊥ | È | Ò  |
| 4 | ♦ | ¶  | \$ | 4 | D | T | d | t | ä | ö | ñ | ı | ⊥ | ⊥ | È | ö  |
| 5 | ♣ | §  | %  | 5 | E | U | e | u | à | ò | Ñ | Á | ⊥ | ⊥ | Ö | §  |
| 6 | ♠ | —  | &  | 6 | F | V | f | v | ă | â | Ğ | Ă | ā | ı | μ | ÷  |
| 7 | • | ↑↓ | '  | 7 | G | W | g | w | ç | ù | ğ | À | Ā | ı | ı | ,  |
| 8 | ■ | ↑  | (  | 8 | H | X | h | x | ê | î | ı | © | ⊥ | ı | × | °  |
| 9 | ○ | ↓  | )  | 9 | I | Y | i | y | ë | Ö | ® | ⊥ | ⊥ | Ĳ | Ű | .. |
| A | ☐ | →  | *  | : | J | Z | j | z | è | Ü | ı | ı | ⊥ | Ĳ | Ű | .  |
| B | ♂ | ←  | +  | ; | K | [ | k | { | ï | ø | ½ | ⊥ | ⊥ | ⊥ | Ű | ı  |
| C | ♀ | L  | ,  | < | L | \ | l |   | ı | £ | ¼ | ⊥ | ⊥ | ⊥ | ı | 3  |
| D | ♪ | ↔  | -  | = | M | ] | m | } | ı | Ø | ı | ı | ⊥ | ı | ÿ | 2  |
| E | ♫ | ▲  | .  | > | N | ^ | n | ~ | Ä | Ş | « | » | ⊥ | ⊥ | ı | ▪  |
| F | ☼ | ▼  | /  | ? | O | _ | o | ◊ | Å | ş | » | » | ⊥ | ⊥ | ı | ,  |

ISO-10646 (18N)

|   | 0 | 1  | 2  | 3   | 4   | 5 | 6 | 7 | 8 | 9 | A | B | C | D | E | F |
|---|---|----|----|-----|-----|---|---|---|---|---|---|---|---|---|---|---|
| 0 |   |    |    | 0   | @   | P | ` | p |   |   |   | ° | À | Ð | à | ð |
| 1 |   | !  | !  | 1   | A   | Q | a | q |   |   | i | ± | Á | Ñ | á | ñ |
| 2 |   | "  | "  | 2   | B   | R | b | r |   |   | ¢ | ² | Â | Ò | â | ò |
| 3 |   | #  | #  | 3   | C   | S | c | s |   |   | £ | ³ | Ã | Ó | ã | ó |
| 4 |   | \$ | \$ | 4   | D   | T | d | t |   |   | ¤ | ´ | Ä | Ô | ä | ô |
| 5 |   | %  | %  | 5   | E   | U | e | u |   |   | ¥ | µ | Å | Ö | å | ö |
| 6 |   | &  | &  | 6   | F   | V | f | v |   |   | ¦ | ¶ | Æ | Ö | æ | ö |
| 7 |   | '  | '  | 7   | G   | W | g | w |   |   | § | · | Ç | × | ç | ÷ |
| 8 |   | (  | (  | 8   | H   | X | h | x |   |   | ¨ | , | È | Ø | è | ø |
| 9 |   | )  | )  | 9   | I   | Y | i | y |   |   | © | ¹ | É | Ù | é | ù |
| A |   | *  | *  | : J | Z   | j | z |   |   |   | ª | º | Ê | Ú | ê | ú |
| B |   | +  | +  | ; K | [   | k |   |   |   |   | » | » | Ë | Û | ë | û |
| C |   | ,  | ,  | < L | \   | l |   |   |   |   | ¼ | ¼ | Ì | Ü | ì | ü |
| D |   | -  | -  | = M | ] m |   |   |   |   |   | ½ | ½ | Í | Ý | í | ý |
| E |   | .  | .  | > N | ^ n |   |   |   |   |   | ¾ | ¾ | Î | Þ | î | þ |
| F |   | /  | /  | ? O | _ o |   |   |   |   |   | ¿ | ¿ | Ï | ß | ï | ÿ |

PC-853 Turkish (18U)

|   | 0 | 1  | 2  | 3   | 4   | 5 | 6 | 7 | 8 | 9 | A | B | C | D | E | F |
|---|---|----|----|-----|-----|---|---|---|---|---|---|---|---|---|---|---|
| 0 |   | ►  |    | 0   | @   | P | ` | p | Ç | É | á | ⋮ | ◌ |   | Ó | - |
| 1 | ☺ | ◄  | !  | 1   | A   | Q | a | q | ü | ç | í | ☒ | ◌ |   | ß |   |
| 2 | ☹ | ↕  | "  | 2   | B   | R | b | r | é | ç | ó | ☒ | ◌ | Ê | Ô | ℓ |
| 3 | ♥ | !! | #  | 3   | C   | S | c | s | â | ô | ú | ◌ | ◌ | Ë | Ö | ˆ |
| 4 | ♦ | ¶  | \$ | 4   | D   | T | d | t | ä | ö | ñ | ◌ | ◌ | È | Ğ | ˘ |
| 5 | ♣ | §  | %  | 5   | E   | U | e | u | à | ò | Ñ | Á | ◌ | ı | ğ | § |
| 6 | ♠ | —  | &  | 6   | F   | V | f | v | ê | û | Ğ | Â | Ş | İ | µ | ÷ |
| 7 | ● | ⬆  | '  | 7   | G   | W | g | w | ç | ğ | À | Ş | İ | ı | ı | ı |
| 8 | ◼ | ⬆  | (  | 8   | H   | X | h | x | ê | İ | Â | Ş | İ | ı | ı | ı |
| 9 | ◯ | ⬇  | )  | 9   | I   | Y | i | y | ë | Ö | ĥ | ◌ | ◌ | ı | ı | ı |
| A | ◼ | →  | *  | : J | Z   | j | z |   |   | Ü |   | ◌ | ◌ | ı | ı | ı |
| B | ♂ | ←  | +  | ; K | [   | k |   |   |   | ½ | ◌ | ◌ | ◌ | ı | ı | ı |
| C | ♀ | ◌  | ,  | < L | \   | l |   |   |   | ı | ı | ◌ | ◌ | ı | ı | ı |
| D | ♫ | ↔  | -  | = M | ] m |   |   |   |   | ı | ı | ı | ı | ı | ı | ı |
| E | ♫ | ▲  | .  | > N | ^ n |   |   |   |   | ı | ı | ı | ı | ı | ı | ı |
| F | ☼ | ▼  | /  | ? O | _ o |   |   |   |   | ı | ı | ı | ı | ı | ı | ı |



Winbalt (19L)

|   | 0  | 1  | 2  | 3  | 4  | 5  | 6   | 7   | 8   | 9   | A   | B   | C   | D   | E   | F   |
|---|----|----|----|----|----|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 0 | 0  | 16 | 32 | 48 | 64 | 80 | 96  | 112 | 128 | 144 | 160 | 176 | 192 | 208 | 224 | 240 |
| 1 | 1  | 17 | 33 | 49 | 65 | 81 | 97  | 113 | 129 | 145 | 161 | 177 | 193 | 209 | 225 | 241 |
| 2 | 2  | 18 | 34 | 50 | 66 | 82 | 98  | 114 | 130 | 146 | 162 | 178 | 194 | 210 | 226 | 242 |
| 3 | 3  | 19 | 35 | 51 | 67 | 83 | 99  | 115 | 131 | 147 | 163 | 179 | 195 | 211 | 227 | 243 |
| 4 | 4  | 20 | 36 | 52 | 68 | 84 | 100 | 116 | 132 | 148 | 164 | 180 | 196 | 212 | 228 | 244 |
| 5 | 5  | 21 | 37 | 53 | 69 | 85 | 101 | 117 | 133 | 149 | 165 | 181 | 197 | 213 | 229 | 245 |
| 6 | 6  | 22 | 38 | 54 | 70 | 86 | 102 | 118 | 134 | 150 | 166 | 182 | 198 | 214 | 230 | 246 |
| 7 | 7  | 23 | 39 | 55 | 71 | 87 | 103 | 119 | 135 | 151 | 167 | 183 | 199 | 215 | 231 | 247 |
| 8 | 8  | 24 | 40 | 56 | 72 | 88 | 104 | 120 | 136 | 152 | 168 | 184 | 200 | 216 | 232 | 248 |
| 9 | 9  | 25 | 41 | 57 | 73 | 89 | 105 | 121 | 137 | 153 | 169 | 185 | 201 | 217 | 233 | 249 |
| A | 10 | 26 | 42 | 58 | 74 | 90 | 106 | 122 | 138 | 154 | 170 | 186 | 202 | 218 | 234 | 250 |
| B | 11 | 27 | 43 | 59 | 75 | 91 | 107 | 123 | 139 | 155 | 171 | 187 | 203 | 219 | 235 | 251 |
| C | 12 | 28 | 44 | 60 | 76 | 92 | 108 | 124 | 140 | 156 | 172 | 188 | 204 | 220 | 236 | 252 |
| D | 13 | 29 | 45 | 61 | 77 | 93 | 109 | 125 | 141 | 157 | 173 | 189 | 205 | 221 | 237 | 253 |
| E | 14 | 30 | 46 | 62 | 78 | 94 | 110 | 126 | 142 | 158 | 174 | 190 | 206 | 222 | 238 | 254 |
| F | 15 | 31 | 47 | 63 | 79 | 95 | 111 | 127 | 143 | 159 | 175 | 191 | 207 | 223 | 239 | 255 |

Windows Latin 1 (19U)

|   | 0  | 1  | 2  | 3  | 4  | 5  | 6   | 7   | 8   | 9   | A   | B   | C   | D   | E   | F   |
|---|----|----|----|----|----|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 0 | 0  | 16 | 32 | 48 | 64 | 80 | 96  | 112 | 128 | 144 | 160 | 176 | 192 | 208 | 224 | 240 |
| 1 | 1  | 17 | 33 | 49 | 65 | 81 | 97  | 113 | 129 | 145 | 161 | 177 | 193 | 209 | 225 | 241 |
| 2 | 2  | 18 | 34 | 50 | 66 | 82 | 98  | 114 | 130 | 146 | 162 | 178 | 194 | 210 | 226 | 242 |
| 3 | 3  | 19 | 35 | 51 | 67 | 83 | 99  | 115 | 131 | 147 | 163 | 179 | 195 | 211 | 227 | 243 |
| 4 | 4  | 20 | 36 | 52 | 68 | 84 | 100 | 116 | 132 | 148 | 164 | 180 | 196 | 212 | 228 | 244 |
| 5 | 5  | 21 | 37 | 53 | 69 | 85 | 101 | 117 | 133 | 149 | 165 | 181 | 197 | 213 | 229 | 245 |
| 6 | 6  | 22 | 38 | 54 | 70 | 86 | 102 | 118 | 134 | 150 | 166 | 182 | 198 | 214 | 230 | 246 |
| 7 | 7  | 23 | 39 | 55 | 71 | 87 | 103 | 119 | 135 | 151 | 167 | 183 | 199 | 215 | 231 | 247 |
| 8 | 8  | 24 | 40 | 56 | 72 | 88 | 104 | 120 | 136 | 152 | 168 | 184 | 200 | 216 | 232 | 248 |
| 9 | 9  | 25 | 41 | 57 | 73 | 89 | 105 | 121 | 137 | 153 | 169 | 185 | 201 | 217 | 233 | 249 |
| A | 10 | 26 | 42 | 58 | 74 | 90 | 106 | 122 | 138 | 154 | 170 | 186 | 202 | 218 | 234 | 250 |
| B | 11 | 27 | 43 | 59 | 75 | 91 | 107 | 123 | 139 | 155 | 171 | 187 | 203 | 219 | 235 | 251 |
| C | 12 | 28 | 44 | 60 | 76 | 92 | 108 | 124 | 140 | 156 | 172 | 188 | 204 | 220 | 236 | 252 |
| D | 13 | 29 | 45 | 61 | 77 | 93 | 109 | 125 | 141 | 157 | 173 | 189 | 205 | 221 | 237 | 253 |
| E | 14 | 30 | 46 | 62 | 78 | 94 | 110 | 126 | 142 | 158 | 174 | 190 | 206 | 222 | 238 | 254 |
| F | 15 | 31 | 47 | 63 | 79 | 95 | 111 | 127 | 143 | 159 | 175 | 191 | 207 | 223 | 239 | 255 |

PC-861 Iceland (21U)

|   | 0 | 1  | 2  | 3 | 4 | 5 | 6 | 7 | 8 | 9  | A | B | C | D | E | F |
|---|---|----|----|---|---|---|---|---|---|----|---|---|---|---|---|---|
| 0 |   | ►  |    | 0 | @ | P | ` | p | Ç | É  | á |   | L | ⊥ | α | ≡ |
| 1 | ☺ | ◄  | !  | 1 | A | Q | a | q | ü | æ  | í |   | ⊥ | ⌘ | β | ± |
| 2 | ⊕ | ↕  | "  | 2 | B | R | b | r | é | Æ  | ó |   | ⊥ | ⌘ | Γ | ≥ |
| 3 | ♥ | !! | #  | 3 | C | S | c | s | â | ô  | ú |   | ⊥ | ⌘ | π | ≤ |
| 4 | ♦ | ¶  | \$ | 4 | D | T | d | t | ä | ö  | Á | ⊥ | ⊥ | ⌘ | Σ | ∫ |
| 5 | ♣ | §  | %  | 5 | E | U | e | u | à | þ  | Í | ⊥ | ⊥ | ⌘ | σ | ∫ |
| 6 | ♠ | —  | &  | 6 | F | V | f | v | á | û  | Ó | ⊥ | ⊥ | ⌘ | μ | ÷ |
| 7 | ● | ↕  | '  | 7 | G | W | g | w | ç | Ý  | Ú | ⊥ | ⊥ | ⌘ | τ | ≈ |
| 8 | ■ | ↑  | (  | 8 | H | X | h | x | ê | ý  | ¿ | ⊥ | ⊥ | ⌘ | Φ | ° |
| 9 | ○ | ↓  | )  | 9 | I | Y | i | y | ë | Ö  | ⌘ | ⊥ | ⊥ | ⌘ | Θ | · |
| A | ☒ | →  | *  | : | J | Z | j | z | è | Ü  | ⌘ | ⊥ | ⊥ | ⌘ | Ω | · |
| B | ♂ | ←  | +  | ; | K | [ | k | { | Ð | ø  | ½ | ⊥ | ⊥ | ⌘ | δ | √ |
| C | ♀ | ⌘  | ,  | < | L | \ | l |   | ð | £  | ¼ | ⊥ | ⊥ | ⌘ | ∞ | n |
| D | ♪ | ↔  | -  | = | M | ] | m | } | þ | Ø  | · | ⊥ | ⊥ | ⌘ | ² |   |
| E | ♫ | ▲  | ·  | > | N | ^ | n | ~ | Ä | Ps | « | ⊥ | ⊥ | ⌘ | ε | ■ |
| F | ☼ | ▼  | /  | ? | O | _ | o | △ | Å | f  | » | ⊥ | ⊥ | ⌘ | ∪ |   |

PC-860 Portugal (20U)

|   | 0 | 1  | 2  | 3 | 4 | 5 | 6 | 7 | 8 | 9  | A | B | C | D | E | F |
|---|---|----|----|---|---|---|---|---|---|----|---|---|---|---|---|---|
| 0 |   | ►  |    | 0 | @ | P | ` | p | Ç | É  | á |   | L | ⊥ | α | ≡ |
| 1 | ☺ | ◄  | !  | 1 | A | Q | a | q | ü | À  | í |   | ⊥ | ⌘ | β | ± |
| 2 | ⊕ | ↕  | "  | 2 | B | R | b | r | é | È  | ó |   | ⊥ | ⌘ | Γ | ≥ |
| 3 | ♥ | !! | #  | 3 | C | S | c | s | â | ô  | ú |   | ⊥ | ⌘ | π | ≤ |
| 4 | ♦ | ¶  | \$ | 4 | D | T | d | t | ä | ö  | ñ | ⊥ | ⊥ | ⌘ | Σ | ∫ |
| 5 | ♣ | §  | %  | 5 | E | U | e | u | à | ò  | Ñ | ⊥ | ⊥ | ⌘ | σ | ∫ |
| 6 | ♠ | —  | &  | 6 | F | V | f | v | á | Ú  | a | ⊥ | ⊥ | ⌘ | μ | ÷ |
| 7 | ● | ↕  | '  | 7 | G | W | g | w | ç | ù  | ° | ⊥ | ⊥ | ⌘ | τ | ≈ |
| 8 | ■ | ↑  | (  | 8 | H | X | h | x | ê | ì  | ¿ | ⊥ | ⊥ | ⌘ | Φ | ° |
| 9 | ○ | ↓  | )  | 9 | I | Y | i | y | ê | Ò  | ò | ⊥ | ⊥ | ⌘ | Θ | · |
| A | ☒ | →  | *  | : | J | Z | j | z | è | Ü  | ⌘ | ⊥ | ⊥ | ⌘ | Ω | · |
| B | ♂ | ←  | +  | ; | K | [ | k | { | Í | ø  | ½ | ⊥ | ⊥ | ⌘ | δ | √ |
| C | ♀ | ⌘  | ,  | < | L | \ | l |   | Ô | £  | ¼ | ⊥ | ⊥ | ⌘ | ∞ | n |
| D | ♪ | ↔  | -  | = | M | ] | m | } | ì | Ù  | · | ⊥ | ⊥ | ⌘ | ² |   |
| E | ♫ | ▲  | ·  | > | N | ^ | n | ~ | Ã | Ps | « | ⊥ | ⊥ | ⌘ | ε | ■ |
| F | ☼ | ▼  | /  | ? | O | _ | o | △ | Â | Ó  | » | ⊥ | ⊥ | ⌘ | ∪ |   |

PC-863 Canada (23U)

|   |   |    |    |     |     |   |   |   |   |   |   |   |   |   |   |   |
|---|---|----|----|-----|-----|---|---|---|---|---|---|---|---|---|---|---|
|   | 0 | 1  | 2  | 3   | 4   | 5 | 6 | 7 | 8 | 9 | A | B | C | D | E | F |
| 0 |   | ►  |    | 0   | @   | P | ` | p | Ç | É | ! | ▤ | L | ⊥ | α | ≡ |
| 1 | ☺ | ◄  | !  | 1   | A   | Q | a | q | ü | È | ' | ▥ | ⌊ | ⌋ | β | ± |
| 2 | ☹ | ↕  | "  | 2   | B   | R | b | r | é | Ê | ó | ▧ | ⌈ | ⌉ | Γ | ≥ |
| 3 | ♥ | !! | #  | 3   | C   | S | c | s | â | ô | ú | ▨ | ⌊ | ⌋ | π | ≤ |
| 4 | ♦ | ¶  | \$ | 4   | D   | T | d | t | Á | Ë | ¨ | ▩ | ⌊ | ⌋ | Σ | ∫ |
| 5 | ♣ | §  | %  | 5   | E   | U | e | u | à | ï | , | ▬ | ⌊ | ⌋ | σ | ∫ |
| 6 | ♠ | —  | &  | 6   | F   | V | f | v | ¶ | û | 3 | ▮ | ⌊ | ⌋ | μ | ÷ |
| 7 | ● | ↕  | '  | 7   | G   | W | w | w | ç | ù | - | ▯ | ⌊ | ⌋ | τ | ≈ |
| 8 | ■ | ↑  | (  | 8   | H   | X | h | x | ê | æ | î | ▰ | ⌊ | ⌋ | Φ | ° |
| 9 | ○ | ↓  | )  | 9   | I   | Y | i | y | ë | ô |  | ▱ | ⌊ | ⌋ | Θ | . |
| A | ◼ | →  | *  | : J | Z   | j | z | z | è | Ü |  | ▲ | ⌊ | ⌋ | Ω | . |
| B | ♂ | ←  | +  | ; K | [   | k | { | { | ï | ø | ½ | △ | ⌊ | ⌋ | δ | √ |
| C | ♀ | ⌊  | ,  | < L | \   | l |   |   | î | £ | ¼ | ▴ | ⌊ | ⌋ | ∞ | n |
| D | ♪ | ↔  | -  | = M | ] m | } | } | } | ù |  | ¾ | ▾ | ⌊ | ⌋ | φ | 2 |
| E | ♫ | ▲  | .  | > N | ^ n | ~ | À | Â | « | » | » | ▵ | ⌊ | ⌋ | ε | ▪ |
| F | ☼ | ▼  | /  | ? O | _   | o | ◊ | ◊ | § | f | f | ▹ | ⌊ | ⌋ | ∩ |   |

PC-8 Polish (24Q)

|   |   |    |    |     |     |   |   |   |   |   |   |   |   |   |   |   |
|---|---|----|----|-----|-----|---|---|---|---|---|---|---|---|---|---|---|
|   | 0 | 1  | 2  | 3   | 4   | 5 | 6 | 7 | 8 | 9 | A | B | C | D | E | F |
| 0 |   | ►  |    | 0   | @   | P | ` | p | Ç | Ę | Ż | ▤ | L | ⊥ | α | ≡ |
| 1 | ☺ | ◄  | !  | 1   | A   | Q | a | q | ü | ę | ż | ▥ | ⌊ | ⌋ | β | ± |
| 2 | ☹ | ↕  | "  | 2   | B   | R | b | r | é | ł | ó | ▧ | ⌈ | ⌉ | Γ | ≥ |
| 3 | ♥ | !! | #  | 3   | C   | S | c | s | â | ô |  | ▨ | ⌊ | ⌋ | π | ≤ |
| 4 | ♦ | ¶  | \$ | 4   | D   | T | d | t | ä | ö | ń | ▩ | ⌊ | ⌋ | Σ | ∫ |
| 5 | ♣ | §  | %  | 5   | E   | U | e | u | à | ć | ń | ▬ | ⌊ | ⌋ | σ | ∫ |
| 6 | ♠ | —  | &  | 6   | F   | V | f | v | a | û | ż | ▮ | ⌊ | ⌋ | μ | ÷ |
| 7 | ● | ↕  | '  | 7   | G   | W | w | w | ç | ù | ż | ▯ | ⌊ | ⌋ | τ | ≈ |
| 8 | ■ | ↑  | (  | 8   | H   | X | h | x | ê | ś | § | ▰ | ⌊ | ⌋ | Φ | ° |
| 9 | ○ | ↓  | )  | 9   | I   | Y | i | y | ë | ö |  | ▱ | ⌊ | ⌋ | Θ | . |
| A | ◼ | →  | *  | : J | Z   | j | z | z | è | Ü |  | ▲ | ⌊ | ⌋ | Ω | . |
| B | ♂ | ←  | +  | ; K | [   | k | { | { | ï | ½ | △ | ⌊ | ⌋ | ⌊ | δ | √ |
| C | ♀ | ⌊  | ,  | < L | \   | l |   |   | î | ¼ | ▴ | ⌊ | ⌋ | ⌊ | ∞ | n |
| D | ♪ | ↔  | -  | = M | ] m | } | } | } | ć |  |  | ▾ | ⌊ | ⌋ | φ | 2 |
| E | ♫ | ▲  | .  | > N | ^ n | ~ | Ä | Ś | « | » | » | ▵ | ⌊ | ⌋ | ε | ▪ |
| F | ☼ | ▼  | /  | ? O | _   | o | ◊ | ◊ | Ą | f | f | ▹ | ⌊ | ⌋ | ∩ |   |

PC-775 (26U)

|   | 0 | 1  | 2  | 3 | 4 | 5   | 6 | 7 | 8 | 9 | A | B | C | D | E | F |
|---|---|----|----|---|---|-----|---|---|---|---|---|---|---|---|---|---|
| 0 |   | ►  |    | 0 | @ | P   | ` | p | Ć | É | Ā | ▤ | L | a | Ó | - |
| 1 | ☺ | ◄  | !  | 1 | A | Q   | a | q | ü | æ | Ī | ▥ | └ | č | β | ± |
| 2 | ↕ | ↕  | "  | 2 | B | R   | b | r | é | Æ | ó | ▧ | T | e | Ö | “ |
| 3 | ♥ | !! | #  | 3 | C | S   | c | s | ā | ō | Ž | ▨ | ┘ | è | Ń | ¾ |
| 4 | ♦ | ¶  | \$ | 4 | D | T   | d | t | ä | ö | ž | ┙ | ┐ | i | ø | ¶ |
| 5 | ♣ | §  | %  | 5 | E | U   | e | u | g | Ġ | ž | A | + | š | Œ | § |
| 6 | ♠ | —  | &  | 6 | F | V   | f | v | à | ø | ” | Č | U | u | μ | ÷ |
| 7 | • | ↕  | '  | 7 | G | W   | g | w | ć | ś | ı | E | Ū | ū | ń | ” |
| 8 | ■ | ↑  | (  | 8 | H | X   | h | x | ı | ś | © | È | Ł | ż | Ų | ° |
| 9 | ○ | ↓  | )  | 9 | I | Y   | i | y | ē | Ö | ® | ▩ | F | ┘ | ķ | • |
| A | ☑ | →  | *  | : | J | Z   | j | z | Ŕ | Ü | ¬ | ▬ | ▬ | ┘ | Ĳ | • |
| B | ♂ | ←  | +  | : | K | [   | k | { | ŕ | ø | ½ | ▮ | ▮ | ┘ | ı | 1 |
| C | ♀ | L  | ,  | < | L | \   | l |   | ī | £ | ¼ | ▮ | ▮ | ┘ | ŋ | 3 |
| D | ♪ | ↔  | -  | = | M | ] m | } | } | ž | Ø | Ł | ▮ | = | ┘ | Ē | 2 |
| E | ♫ | ▲  | .  | > | N | ^   | n | ~ | Ä | × | « | Š | ▮ | ┘ | Ň | ▪ |
| F | ☀ | ▼  | /  | ? | O | _   | o | ◊ | Å | ǻ | » | ┘ | Ž | ┘ | , |   |

PC-865 Norway (25U)

|   | 0 | 1  | 2  | 3 | 4 | 5   | 6 | 7 | 8 | 9  | A | B | C | D | E | F |
|---|---|----|----|---|---|-----|---|---|---|----|---|---|---|---|---|---|
| 0 |   | ►  |    | 0 | @ | P   | ` | p | Ç | É  | á | ▤ | L | └ | α | ≡ |
| 1 | ☺ | ◄  | !  | 1 | A | Q   | a | q | ü | æ  | í | ▥ | └ | ┐ | β | ± |
| 2 | ↕ | ↕  | "  | 2 | B | R   | b | r | é | Æ  | ó | ▧ | T | ┐ | Γ | ≥ |
| 3 | ♥ | !! | #  | 3 | C | S   | c | s | â | ô  | ú | ▨ | ┘ | └ | π | ≤ |
| 4 | ♦ | ¶  | \$ | 4 | D | T   | d | t | ä | ö  | ñ | ┙ | ┐ | └ | Σ | ı |
| 5 | ♣ | §  | %  | 5 | E | U   | e | u | à | ò  | ñ | ┙ | ┐ | └ | F | σ |
| 6 | ♠ | —  | &  | 6 | F | V   | f | v | å | û  | a | ▮ | ┐ | └ | μ | ÷ |
| 7 | • | ↕  | '  | 7 | G | W   | g | w | ç | ù  | ° | ▮ | ┐ | └ | τ | ≈ |
| 8 | ■ | ↑  | (  | 8 | H | X   | h | x | ê | ÿ  | ı | ▮ | ┐ | └ | Φ | ° |
| 9 | ○ | ↓  | )  | 9 | I | Y   | i | y | ë | Ö  | ┘ | ▮ | ┐ | └ | Θ | • |
| A | ☑ | →  | *  | : | J | Z   | j | z | è | Ü  | ¬ | ▬ | ▬ | ┘ | Ω | • |
| B | ♂ | ←  | +  | : | K | [   | k | { | ï | ø  | ½ | ▮ | ▮ | ┘ | δ | √ |
| C | ♀ | L  | ,  | < | L | \   | l |   | î | £  | ¼ | ▮ | ▮ | ┘ | ∞ | n |
| D | ♪ | ↔  | -  | = | M | ] m | } | } | ì | Ø  | ı | ▮ | = | ┘ | φ | 2 |
| E | ♫ | ▲  | .  | > | N | ^   | n | ~ | Ä | ℙs | « | ▮ | ▮ | ┘ | ε | ▪ |
| F | ☀ | ▼  | /  | ? | O | _   | o | ◊ | Å | f  | ǻ | ┘ | ┐ | ┘ | ┘ | ┘ |

PC-8 PC Nova (27Q)

|   | 0 | 1 | 2  | 3   | 4 | 5 | 6 | 7 | 8 | 9  | A | B        | C | D | E | F |
|---|---|---|----|-----|---|---|---|---|---|----|---|----------|---|---|---|---|
| 0 |   | ► |    | 0   | Ž | P | ž | p | Ç | É  | á | ◼◼◼◼     | L | ⊥ | α | ≡ |
| 1 | ☺ | ◄ | !  | 1   | A | Q | a | q | ü | æ  | í | ◼◼◼◼◼◼◼◼ | ⊥ | ⊥ | β | ± |
| 2 | ☹ | ↕ | "  | 2   | B | R | b | r | é | Æ  | ó | ◼◼◼◼◼◼◼◼ | T | π | Γ | ≧ |
| 3 | ♥ | ! | #  | 3   | C | S | c | s | â | ô  | ú |          | ⊥ | ⊥ | π | ≦ |
| 4 | ♦ | ¶ | \$ | 4   | D | T | d | t | ä | ö  | ñ | ⊥        | ⊥ | ⊥ | Σ | ∫ |
| 5 | ♣ | § | %  | 5   | E | U | e | u | à | ò  | Ñ | ⊥        | ⊥ | ⊥ | F | σ |
| 6 | ♠ | — | &  | 6   | F | V | f | v | å | û  | a | ⊥        | ⊥ | ⊥ | μ | ÷ |
| 7 | ● | ↕ | '  | 7   | G | W | g | w | ç | ù  | ° | π        | ⊥ | ⊥ | τ | ≈ |
| 8 | ◼ | ↑ | (  | 8   | H | X | h | x | ê | ÿ  | ¿ | ⊥        | ⊥ | ⊥ | Φ | ° |
| 9 | ◯ | ↓ | )  | 9   | I | Y | i | y | ë | Ö  | ⊥ | ⊥        | ⊥ | ⊥ | Θ | · |
| A | ◼ | → | *  | :   | J | Z | j | z | è | Ü  | ⊥ | ⊥        | ⊥ | ⊥ | Ω | · |
| B | ♂ | ← | +  | ;   | K | Š | k | š | ï | ø  | ½ | ⊥        | ⊥ | ⊥ | δ | √ |
| C | ♀ | L | ,  | <   | L | Đ | l | đ | î | £  | ¼ | ⊥        | ⊥ | ⊥ | ∞ | ∞ |
| D | ♪ | ↔ | -  | =   | M | Ć | m | ć | ì | ¥  | ı | ⊥        | ⊥ | ⊥ | φ | ² |
| E | ♫ | ▲ | .  | >   | N | Č | n | č | Ä | Ps | « | ⊥        | ⊥ | ⊥ | ε | ▪ |
| F | ☼ | ▼ | /  | ? O | — |   |   | ◻ | Å | f  | » | ⊥        | ⊥ | ⊥ | ∩ |   |
|   |   |   |    |     |   |   |   |   |   |    |   |          |   |   |   |   |

## HP 7550A Emulation [KC-GL] (Mode 8)

The HP 7550A emulation applies only to the printing systems that handle A3-size paper.

The printing system emulates the Hewlett-Packard plotter model HP 7550A and uses the Kyocera Graphics Language (KC-GL). While it shares features with the HP-GL language, it is designed to provide additional features the plotter cannot give.

KC-GL uses a simple mnemonic graphic language consisting of two-letter instructions. Some typical examples are *PA* for *Plot to Absolute coordinates* and *SP* for *Select a Pen*. The KC-GL instructions are summarized at the end of this section.

To set the KC-GL for power-up emulation, send the printer the following FRPO command:

```
!R! FRPO P1, 8; EXIT;
```

The SEM (Set EMulation) 8; command temporarily switches the printer to the KC-GL emulation.

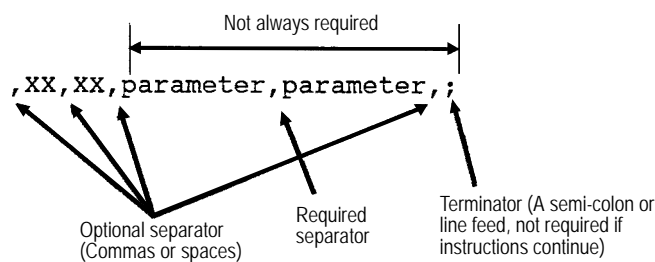
In the HP 7550A emulation the user can receive plotting status information from the printer via the RS-232C interface. Status information is not available when the parallel interface is used.

### Basic

This section explains basic information about the KC-GL language.

#### *KC-GL Instruction Format*

The syntax for KC-GL instructions consists of two letters followed by parameters (if any), then a terminator as shown below.



Some instructions use no parameters. For two or more parameters, they must be separated by at least one comma or space. In some cases, a plus (+) or minus (-) sign can be used as a separator. A comma or space can also be used as a separator before, after, or between instructions, and after a terminator. When a series of instructions is coded, the series should be terminated by a semicolon, but no semicolon is required between instructions in the series.

The printing system executes instructions as soon as it receives them. When too many instructions are issued, the printing system executes the allowed number of parameters and reports error number 2 (wrong number of parameters).

The SM (Symbol Mode) instruction defines the first succeeding character as a symbol character. The DT (Define label Terminator) instruction defines the first succeeding character as a character plot terminator.

The character plot terminator is used to terminate the LB (LaBel) instruction. The default terminator is the ETX character (End of Text), which uses ASCII code 3. If this terminator is inconvenient, the DT instruction enables the user to change the character plot terminator to a different character.

## Parameter Formats

KC-GL parameters are specified in one of the following formats:

### Integer

When not scaled, integers are valid in the range from  $-2^{23}$  to  $2^{23}-1$  plotter units. Digits to the right of the decimal point are ignored. If no sign is specified, the value is assumed to be positive.

### Real number (decimal)

Real numbers from  $-2^{23}$  to  $2^{23}-1$  are valid. They can include up to eight digits to the right of the decimal point. If no sign is specified, the value is assumed to be positive.

### Scaled real number (scaled decimal)

Real numbers from  $-2^{23}$  to  $2^{23}-1$  can be used with up to eight digits to the right of the decimal point. If no sign is specified, the value is assumed to be positive. Scaled real numbers are used only with scaled user units. All KC-GL parameters that are interpreted as user units are scaled.

### Character string

A combination of characters, numeric expressions, and string variables.

When coding an instruction with two or more parameters (*Examples*: PA, PR, PU, PD) remember that the parameters must be set apart by a separator.

## KC-GL Environment Options

The FRPO G0 command establishes various options for the KC-GL environment. The following table lists the meanings of the individual bits in the command. Each meaning is explained in the following sections according to the bit position.

*Table 7.28. FRPO G0 Command Options*

| Bit Position | Bit Value | Logic Value | Description                          |
|--------------|-----------|-------------|--------------------------------------|
| 0            | 0         | 0           | Plot coordinate mode A               |
|              | 1         | 1           | Plot coordinate mode B               |
| 1            | 0         | 0           | Form feed in response to SP          |
|              | 2         | 1           | SP                                   |
| 2            | 0         | 0           | Automatic plot coordinate transition |
|              | 4         | 1           | Fixed plot coordinate                |
| 3            | 0         | 0           | Normal mode                          |
|              | 8         | 1           | Enhance mode                         |

Table 7.28. FRPO G0 Command Options

| Bit Position | Bit Value | Logic Value | Description                   |
|--------------|-----------|-------------|-------------------------------|
| 4            | 0         | 0           | Landscape page orientation    |
|              | 16        | 1           | Page orientation to FRPO C1   |
| 5            | 0         | 0           | Default cursor at top left    |
|              | 32        | 1           | Default cursor at bottom left |

### Plot Coordinates (bit 0)

This bit defines one of two plotting coordinate modes. (See *Figure 7. 29.* on page 98.)

0 = Mode A

1 = Mode B

In mode A, the origin (0, 0) starts at bottom left. In mode B, the origin starts at the center of the page.

### Response to SP Instruction (bit 1)

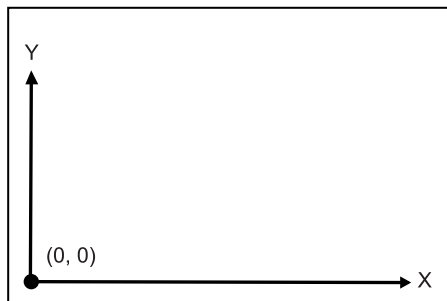
This bit defines the printing system response to the SP (Select Pen) instruction.

0 = Printing System feeds out a page when it receives a SP; or SP 0; instruction.

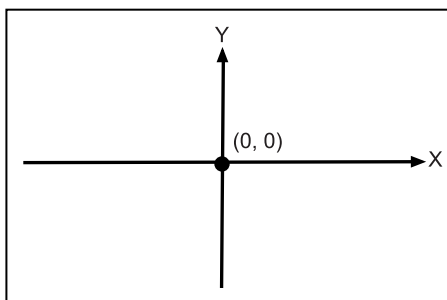
1 = Printing System returns the pen to the stall from which it came, in other words, it prints *nothing* when it receives a SP; or SP 0; instruction.

Figure 7. 29. Plot Coordinates

Mode A (G0, 0;)



Mode B (G0, 1;)



### Automatic Plot Coordinate Mode (bit 2)

0 = Printing System changes the plot coordinate from mode A to mode B when it receives a IP (Input P1 and P2) instruction using the negative parameter value. When the IN (INitalize) instruction is later given, the printing system reverts to mode A.



- 1 = Printing System remains in mode A even when the IP instruction includes a negative parameter value.

### Enhance Mode (bit 3)

This bit supports the enhance mode of HP 7550A and HP 758X plotters.

- 0 = Normal mode (HP 7550A standard mode and HP 758X emulation mode).  
 1 = Enhance mode (HP 7550A enhance mode and HP 758X standard mode).

The enhance mode should be turned on when the printing system uses the HP 758X mode. The enhance mode affects the KC-GL IW (Input Window), OW (Output Window), and UC (plot User-defined Character) instructions as follows:

IW: User units are used for specifying the parameters in scaling.

OW: Window outputs are made in user units in scaling.

UC: Values for the pen control, increments in x- and y-coordinates, the width and height of characters differ from the normal (non-enhance) mode as follows.

|              | Pen down    | Pen up       | x/y increment  | Char. width | Char. Height |
|--------------|-------------|--------------|----------------|-------------|--------------|
| Normal mode  | $\geq 99$   | $\leq -99$   | -98 to +98     | 6 grids     | 16 grids     |
| Enhance mode | $\geq 9999$ | $\leq -9999$ | -9998 to +9998 | 48 grids    | 64 grids     |

### Page Orientation (bit 4)

This bit defines page orientation.

- 0 = Landscape  
 1 = Observes the FRPO C1 value.

### Default Cursor Position (bit 5)

This bit defines the cursor position for the page at power-up.

- 0 = Upper-left corner of the page ( $X_{\min}$ ,  $Y_{\max}$ )  
 1 = Lower-left corner of the page ( $X_{\min}$ ,  $Y_{\min}$ )

## Pen Selection

On an actual plotter, pen thickness and color are selected by physically installing pens. On the printing system, the pen thickness is established with a PRESCRIBE command, or by a simple front-panel operation.

### Format

!R! FRPO Gn, xx; EXIT;

### Parameters

*n*:

pen number:

- 1 = pen 1  
 2 = pen 2  
 3 = pen 3  
 4 = pen 4  
 5 = pen 5  
 6 = pen 6

7 = pen 7

8 = pen 8

xx:

Line-width (in dots): 0 to 99 (0 - line not printed)

Positions in the plot area can be defined as plotter units or user units. These units are explained next.



Since the pen thickness is measured in the unit of dot, printing an object in the 600-dpi resolution will result in the thickness of lines being half that expected in the 300-dpi resolution. To avoid this, switch the printing resolution to 300 dpi using the FRPO N8 command or, temporarily, using the PRESCRIBE RESL command. Alternatively, if you need to use the 600-dpi resolution, increase the pen thickness to the double.

## Reducing Data Larger Than A2 Size

The KC-GL can print the data of paper sizes larger than A2 size reducing it onto a paper size specified using the SPSZ command. Reduction of data is achieved by the FRPO J9 parameter or from the printing system's control panel. See below.

### Format

```
!R! FRPO J9, x; EXIT;
```

x:

data size:

0 = no reduction

1 = A2

2 = A1

3 = A0

4 = B3

5 = B2

6 = B1

7 = B0

## Plotter Units and User Units

### Plotter Units

The plot area is subdivided into a grid with 0.025-mm steps. Each step is a plotter unit: the smallest unit of plotting motion. One millimeter corresponds to approximately 40 plotter units. In the plot area, you can specify positions in plotter units from  $-2^{23}$  to  $2^{23}-1$  (in the PA instruction). When using plotter units, only integer values are valid.

### User Units

The Scale instruction (SC) establishes a system of user units in the plot area by specifying the coordinates of two scaling points (P1 and P2). Parameters of the Scale instruction can use integer values from  $-2^{23}$  to  $2^{23}-1$ ; any digits to the right of the decimal place will be ignored. (Plot instructions use the same range of parameter values, but digits to the right of the decimal point are valid.) If designating 0, 0 and 1, 1 as scaling points, all data will be real numbers between 0 and 1.

## Setting the Scaling Points

At power-up, scaling point *P1* will be in the lower left corner of the paper, the default plot position. Point *P2* is always diagonally opposite to *P1*. These two points define the diagonal of a rectangle, which by default is centered on the paper. *P1* and *P2* can be moved by an instruction which defines any rectangle, independent of the actual paper size.

The default positions of the scaling points in modes A and B are listed at the end of this section as *Coordinate Values*.

## Sample KC-GL Program

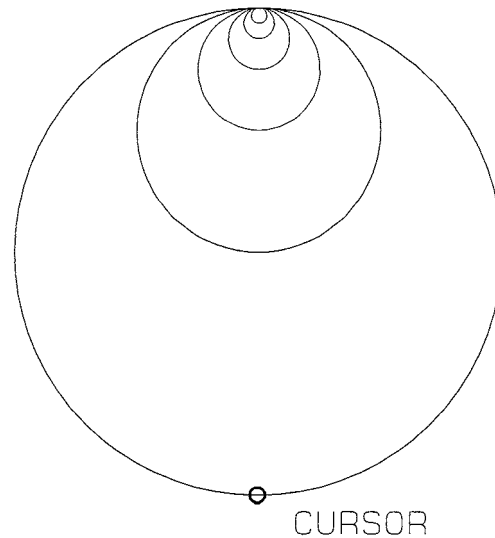
The following file draws circles according to the KC-GL instructions. The result appears in *Figure 7. 30.* on page 102.

|                         |                                        |
|-------------------------|----------------------------------------|
| IN;                     | “Initialize plotter”                   |
| IP0,0,400,400;          | “P1 and P2: 1-cm square <sup>1</sup> ” |
| SC0,1,0,1;              | “Scale: user unit = 1 cm”              |
| DT ;                    |                                        |
| SP1;                    | “Select pen 1”                         |
| PA10,19;                | “Move pen”                             |
| CI.1;PR0,-.1;           | “Draw four circles”                    |
| CI.2;PR0,-.2;           |                                        |
| CI.4;PR0,-.4;           |                                        |
| CI.8;PR0,-.8;           |                                        |
| SP2;                    | “Select pen 2”                         |
| CI1.6;PR0,-1.6;         | “Draw two circles”                     |
| CI3.2;PR0,-3.2;         |                                        |
| SP8;                    | “Select pen 8”                         |
| CI.1;PR.5,-.5;          | “Draw circle”                          |
| SP2;                    | “Select pen 2”                         |
| CS0;SI.2,.3;LBCURSOR* ; | “Print label <sup>2</sup> ”            |
| SP;                     |                                        |

<sup>1</sup> This instruction locates *P1* at 0, 0 and *P2* at 400, 400 in plotter units. 400 plotter units=1 cm (0.025 mm x 400).

<sup>2</sup> ETX (End of Text, character code 03) is required as a terminator.

Figure 7. 30. KC-GL Sample Program



## Plotter Status Information

When the RS-232C interface is used, in addition to receiving data, the plotter (printing system) can return information such as the current pen position, pen status, and error numbers. This return information applies to the following KC-GL instructions.

| Instruction | Description                              |
|-------------|------------------------------------------|
| OA          | Output Actual position and pen status    |
| OC          | Output Commanded position and pen status |
| OE          | Output Error                             |
| OF          | Output Factors                           |
| OH          | Output Hard-clip limits                  |
| OI          | Output Identification                    |
| OL          | Output Label length                      |
| OO          | Output Options                           |
| OP          | Output P1 and P2                         |
| OS          | Output Status                            |
| OT          | Output carousel Type                     |
| OW          | Output Window                            |

All of these instructions use the same syntax and must be followed immediately by a terminator. They use no parameters.

The functions of these instructions appear on the following pages. The last ASCII character sent by the plotter (printing system) in response to the instruction is a terminator, which will be designated here by the symbol TERM. The terminator is actually a carriage return unless changed by the ESC.M operator.

***OA [Output Actual position and pen status]***

The plotter returns the x- and y-coordinates of the current pen position and indicates whether the pen is currently up or down. This information is given by ASCII-coded integers in the following format:

X, Y, P TERM

X: x-coordinate in absolute plotter units

Y: y-coordinate in absolute plotter units

P: 0 if the pen is up; 1 if the pen is down

***OC [Output Commanded position and pen status]***

The plotter returns the x- and y-coordinates and pen status for the last valid pen positioning instruction. The pen position and status are ASCII-coded in the same way as the OA instruction. Coordinate values are given in plotter units if scaling is off, or user units if scaling is on.

***OE [Output Error]***

The plotter returns a decimal error number for the instruction executed immediately before the OE instruction. The error code is converted to a non-negative ASCII-coded integer whose identity is given in the following table.

| Error Number | Description                |
|--------------|----------------------------|
| 0            | No error                   |
| 1            | Instruction not recognized |
| 2            | Wrong number of parameters |
| 3            | Illegal parameter          |
| 4            | (Reserved)                 |
| 5            | Unknown character set      |
| 6            | Plot position overflow     |
| 7            | (Reserved)                 |

***OF [Output Factors]***

This instruction returns the number of plotter units per millimeter on each coordinate axis, as follows:

40, 40 TERM

This response indicates that plotter units are equal to 0.025 mm on both the x- and y-axes. The actual number of plotter units per millimeter is approximately 40.

***OH [Output Hard-clip limits]***

This instruction returns the lower left and upper right limiting coordinates of the plot area, in the following format:

X<sub>LL</sub>, Y<sub>LL</sub>, X<sub>UR</sub>, Y<sub>UR</sub> TERM

LL: lower left

UR: upper right

### *OI [Output Identification]*

This instruction returns a character string indicating the plotter model being emulated, as follows:

```
KC-GL option  Plotter model
(FRPO G0)
Mode A       7550A TERM
Mode B       7596A TERM
```

### *OL [Output Label length]*

This instruction returns information on the contents of the label buffer. This may be used together with the BL instruction for accessing the necessary space for the buffered label before printing it.

```
length, characters, linefeeds, TERM
```

*length*      The length of the longest line in the buffered label in character plot cell spaces.

*characters*   An integer representing the number of printing characters and spaces in the longest line of the buffered label. A backspace is counted as -1, whereas a character with automatic backspace counts as zero.

*linefeeds*    An integer representing the net number of linefeeds that will occur when the buffered label is drawn. An inversed line feed (VT) counts as -1, and a line-feed (LF) counts as +1.

### *OO [Output Options]*

This instruction returns eight ASCII-coded integers separated by commas. The integers indicate plotter options supported by the printing system, as follows:

```
1,1,0,0,1,1,0,1 TERM
```

- Buffer allocation
- Polygon instruction
- Arc and circle plotting instructions are supported.
- Pen selection is supported.
- Pen is not down until the paper feeding completes in auto-feed mode.

### *OP [Output P1 and P2]*

This instruction returns the coordinate values of the current scaling points P1 and P2. The coordinates are given in plotter units by ASCII-coded integers, as follows:

```
P1x, P1y, P2x, P2y TERM
```

## OS [Output Status]

This instruction returns an integer from 0 to 255 giving one byte of status information, as follows:

```
status TERM
```

The following table describes the individual bits in the status byte. After powered up or an IN instruction, bit positions 3 and 4 turn on making the bit value to be 24. Bit position 3 is cleared subsequently after delivering the status.

| Bit Position | Bit Value | Description                                                                                                                                             |
|--------------|-----------|---------------------------------------------------------------------------------------------------------------------------------------------------------|
| 0            | 1         | The pen is down.                                                                                                                                        |
| 1            | 2         | P1 or P2 has been changed. This bit is cleared when actual P1 and P2 values are read via the RS-232C interface, or when the IN instruction is executed. |
| 2            | 4         | A digitized point is ready for output. This bit is cleared when the point is output via the RS-232C interface, or when the IN instruction is executed.  |
| 3            | 8         | Initialized. This bit is cleared when a status byte is output via the RS-232C interface, or when the IN instruction is executed.                        |
| 4            | 16        | Ready to receive next data.                                                                                                                             |
| 5            | 32        | Error. This bit is cleared when an error number is output via the RS-232C interface, or when the IN instruction is executed.                            |
| 6            | 64        | SRQ was set.                                                                                                                                            |
| 7            | 128       | (Reserved)                                                                                                                                              |

## OT [Output carousel Type]

This instruction delivers information on the current carousel type and stall occupancy. This may be used to determine those information in a remote location.

```
OT TERM
```

*Response:*

```
type, map TERM
```

The current carousel type and its pen map are delivered as 2 ASCII integers, each separated by comma. The type field can contain the values -1 through 4, which have the following values:

| Bit value when stall is occupied | Pen stall |
|----------------------------------|-----------|
| 1                                | 1         |
| 2                                | 2         |
| 4                                | 3         |
| 8                                | 4         |
| 16                               | 5         |
| 32                               | 6         |
| 64                               | 7         |
| 128                              | 8         |

### *OW [Output Window]*

This instruction returns the x- and y-coordinates of two diagonally opposite corners of the current plottable area. Four ASCII-coded integers indicating the lower left and upper right corner coordinates are returned by using the following format:

X<sub>LL</sub>, Y<sub>LL</sub>, X<sub>UR</sub>, Y<sub>UR</sub>, TERM

LL: lower left

UR: upper right

## Device-Control Instructions

KC-GL uses device-control instructions to return buffer status information and other status information from the printing system via the RS-232C interface. Status information cannot be output on the parallel interface. If device-control instructions are received via the parallel interface, they are ignored.

The device-control instructions for status output appear below.

### *Output Buffer Space (ESC.B)*

This instruction returns 0 if the receive buffer is full, and 1024 if the receive buffer is empty.

### *Output Extended Error (ESC.E)*

This instruction normally returns 0, if an error has not occurred, and returns 15 if a framing error, parity error, or overrun error has occurred.

### *Output Buffer Size Label (ESC.L)*

This instruction always returns the value 1024.

### *Output Extended Status (ESC.O)*

This instruction returns printing system status information regarding:

- On-line status
- Cover open
- Paper empty
- Paper jam
- Buffer full

The following table describes this status information. The paper feed source is the internal cassette at all time. A complete list of device-control instructions appear in *Device-Control Instructions* on page 113.

*Table 7.31. Status Information*

| Response | Description                                             |
|----------|---------------------------------------------------------|
| 1        | The buffer is full.                                     |
| 9        | The buffer is empty (normal).                           |
| 17       | The buffer is full and the printing system is off-line. |



Table 7.31. Status Information

| Response | Description                                                                                                                |
|----------|----------------------------------------------------------------------------------------------------------------------------|
| 25       | The buffer is empty and the printing system is off-line.                                                                   |
| 33       | The buffer is full with the printing system under one of the following conditions: cover open, paper empty, or paper jam.  |
| 41       | The buffer is empty with the printing system under one of the following conditions: cover open, paper empty, or paper jam. |

## Fonts and Symbol Sets in KC-GL

KC-GL uses a special stroke font. The fonts employed in the other emulations cannot be used in KC-GL. The default height and width of the stroke font vary depending on the paper size. The following character sets are available for the KC-GL emulation.

Table 7.32. KC-GL Fonts and Symbol Sets

| No.   | Symbol Set                                | ISO No. |
|-------|-------------------------------------------|---------|
| 0/10  | ANSI ASCII                                | 006     |
| 1/11  | HP 9825 Character Set                     | –       |
| 2/12  | French/German                             | –       |
| 3/13  | Scandinavian                              | –       |
| 4/14  | Spanish/Latin American                    | –       |
| 6/16  | JIS ASCII                                 | 014     |
| 7/17  | Roman Extensions                          | –       |
| 8/18  | Katakana                                  | 013     |
| 9/19  | ISO IRV (International Reference Version) | 002     |
| 30/40 | ISO Swedish                               | 010     |
| 31/41 | ISO Swedish For Names                     | 011     |
| 32/42 | ISO Norwegian Version 1                   | 060     |
| 33/43 | ISO German                                | 021     |
| 34/44 | ISO French                                | 025     |
| 35/45 | ISO United Kingdom                        | 004     |
| 36/46 | ISO Italian                               | 015     |
| 37/47 | ISO Spanish                               | 017     |
| 38/48 | ISO Portuguese                            | 016     |
| 39/49 | ISO Norwegian Version 2                   | 061     |

KC-GL Symbol Sets

ANSI ASCII (0)

| CODE SET 0 |    |    |    |    |    |    |   |   |   |   |    |   |   |   |   |
|------------|----|----|----|----|----|----|---|---|---|---|----|---|---|---|---|
|            | 20 | 30 | 40 | 50 | 60 | 70 |   |   |   |   |    |   |   |   |   |
| 0          |    |    | @  | P  | ,  | p  | 1 | ! | " | # | \$ | % | & | ' | ( |
| 1          |    | 1  | A  | Q  | a  | q  | 2 |   |   |   |    |   |   |   | ) |
| 2          |    | 2  | B  | R  | b  | r  | 3 |   |   |   |    |   |   |   | * |
| 3          |    | 3  | C  | S  | c  | s  | 4 |   |   |   |    |   |   |   | + |
| 4          |    | 4  | D  | T  | d  | t  | 5 |   |   |   |    |   |   |   | , |
| 5          |    | 5  | E  | U  | e  | u  | 6 |   |   |   |    |   |   |   | - |
| 6          |    | 6  | F  | V  | f  | v  | 7 |   |   |   |    |   |   |   | . |
| 7          |    | 7  | G  | W  | g  | w  | 8 |   |   |   |    |   |   |   | / |
| 8          |    | 8  | H  | X  | h  | x  | 9 |   |   |   |    |   |   |   |   |
| 9          |    | 9  | I  | Y  | i  | y  | A |   |   |   |    |   |   |   |   |
| A          |    | .  | J  | Z  | j  | z  | B |   |   |   |    |   |   |   |   |
| B          |    | +  | K  | [  | k  | {  | C |   |   |   |    |   |   |   |   |
| C          |    | ,  | L  | /  | l  |    | D |   |   |   |    |   |   |   |   |
| D          |    | -  | M  | ]  | m  | }  | E |   |   |   |    |   |   |   |   |
| E          |    | .  | N  | ^  | n  | ~  | F |   |   |   |    |   |   |   |   |
| F          |    | /  | O  | _  | o  |    |   |   |   |   |    |   |   |   |   |

Roman Extensions (7)

| CODE SET 7 |    |    |    |    |    |    |   |  |  |  |  |  |  |  |  |
|------------|----|----|----|----|----|----|---|--|--|--|--|--|--|--|--|
|            | 20 | 30 | 40 | 50 | 60 | 70 |   |  |  |  |  |  |  |  |  |
| 0          |    | —  | ê  | Å  | À  | Ā  | 1 |  |  |  |  |  |  |  |  |
| 1          | Á  |    | ë  | î  | Ä  | ā  | 2 |  |  |  |  |  |  |  |  |
| 2          | Â  |    | ô  | ø  | Ǽ  |    | 3 |  |  |  |  |  |  |  |  |
| 3          | Ē  | °  | û  | Œ  | Ɔ  |    | 4 |  |  |  |  |  |  |  |  |
| 4          | Ê  | Œ  | ś  | Š  | Đ  |    | 5 |  |  |  |  |  |  |  |  |
| 5          | Ė  | Œ  | é  | ı  | ı  |    | 6 |  |  |  |  |  |  |  |  |
| 6          | Ħ  | Œ  | ò  | ø  | ı  |    | 7 |  |  |  |  |  |  |  |  |
| 7          | Ħ  | Œ  | ı  | æ  | ò  | ı  | 8 |  |  |  |  |  |  |  |  |
| 8          | ,  | ı  | ı  | ˆ  | ˆ  | ı  | 9 |  |  |  |  |  |  |  |  |
| 9          | /  | ı  | ı  | ı  | ı  | ı  | A |  |  |  |  |  |  |  |  |
| A          | ˆ  | ı  | ı  | ı  | ı  | ı  | B |  |  |  |  |  |  |  |  |
| B          | :  | ı  | ı  | ı  | ı  | ı  | C |  |  |  |  |  |  |  |  |
| C          | ı  | ı  | ı  | ı  | ı  | ı  | D |  |  |  |  |  |  |  |  |
| D          | ı  | ı  | ı  | ı  | ı  | ı  | E |  |  |  |  |  |  |  |  |
| E          | ı  | ı  | ı  | ı  | ı  | ı  | F |  |  |  |  |  |  |  |  |
| F          | ı  | ı  | ı  | ı  | ı  | ı  |   |  |  |  |  |  |  |  |  |

Katakana (8)

| CODE SET 8 |    |    |    |    |    |    |  |
|------------|----|----|----|----|----|----|--|
|            | 20 | 30 | 40 | 50 | 60 | 70 |  |
| 0          |    | ー  | ㇰ  | ㇱ  |    |    |  |
| 1          | 。  | ㇲ  | ㇳ  | ㇴ  |    |    |  |
| 2          | 「  | ㇵ  | ㇶ  | ㇷ  |    |    |  |
| 3          | 」  | ㇸ  | ㇹ  | ㇺ  |    |    |  |
| 4          | 、  | ㇻ  | ㇼ  | ㇽ  |    |    |  |
| 5          | 。  | ㇾ  | ㇿ  | ㈀  |    |    |  |
| 6          | ㇰ  | ㇱ  | ㇲ  | ㇳ  |    |    |  |
| 7          | ㇴ  | ㇵ  | ㇶ  | ㇷ  |    |    |  |
| 8          | ㇸ  | ㇹ  | ㇺ  | ㇻ  |    |    |  |
| 9          | ㇼ  | ㇽ  | ㇾ  | ㇿ  |    |    |  |
| A          | ㈀  | ㈁  | ㈂  | ㈃  |    |    |  |
| B          | ㈄  | ㈅  | ㈆  | ㈇  |    |    |  |
| C          | ㈈  | ㈉  | ㈊  | ㈋  |    |    |  |
| D          | ㈍  | ㈎  | ㈏  | ㈐  |    |    |  |
| E          | ㈒  | ㈓  | ㈔  | ㈕  |    |    |  |
| F          | ㈗  |    |    |    |    |    |  |

KC-GL International Characters

|                                           |                      | 23 | 24 | 40 | 5B | 5C | 5D | 5E | 60 | 7B  | 7C  | 7D  | 7E  |
|-------------------------------------------|----------------------|----|----|----|----|----|----|----|----|-----|-----|-----|-----|
|                                           |                      | 35 | 36 | 64 | 91 | 92 | 93 | 94 | 96 | 123 | 124 | 125 | 126 |
| ANSI ASCII                                | 0                    | #  | \$ | @  | [  | \  | ]  | ^  | `  | {   |     | }   | ~   |
|                                           | 1                    | #  | \$ | @  | [  | ✓  | ]  | ↑  | `  | π   | †   | →   | ~   |
|                                           | 2                    | £  | \$ | @  | [  | ç  | ]  | ^  | `  | °   | °   | °   | °   |
|                                           | 3                    | £  | \$ | @  | Ø  | Æ  | Ø  | æ  | `  | °   | °   | °   | °   |
|                                           | 4                    | ¿  | \$ | @  | [  | ¡  | ]  | ^  | `  | ~   | ~   | ~   | ~   |
| 9825 Character Set                        | 6                    | #  | \$ | @  | [  | ¥  | ]  | ^  | `  | {   |     | }   | ~   |
|                                           | 9                    | #  | ¤  | @  | [  | \  | ]  | ^  | `  | {   |     | }   | ~   |
|                                           | 30                   | #  | ¤  | @  | Ä  | Ö  | Å  | Ü  | é  | ä   | ö   | å   | ü   |
|                                           | 31                   | #  | ¤  | É  | Ä  | Ö  | Å  | Ü  | é  | ä   | ö   | å   | ü   |
|                                           | 32                   | #  | \$ | @  | Æ  | Ø  | Å  | ^  | `  | æ   | ø   | å   | ü   |
| ISO 10V (International Reference Version) | 33                   | #  | \$ | §  | Ä  | Ö  | Ü  | ^  | `  | ä   | ö   | ü   | ß   |
|                                           | 34                   | £  | \$ | à  | °  | ç  | §  | ^  | `  | é   | ú   | é   | :   |
|                                           | 35                   | £  | \$ | @  | [  | \  | ]  | ^  | `  | {   |     | }   | ~   |
|                                           | 36                   | £  | \$ | §  | °  | ç  | é  | ^  | `  | á   | ó   | é   | í   |
|                                           | 37                   | £  | \$ | §  | í  | ñ  | ¿  | ^  | `  | °   | ñ   | ç   | ¿   |
| ISO Swedish For Names                     | 38                   | #  | \$ | §  | Ä  | Ç  | Ö  | ^  | `  | ä   | ç   | ö   | °   |
|                                           | 39                   | §  | \$ | @  | Æ  | Ø  | Å  | ^  | `  | æ   | ø   | å   | ü   |
|                                           | Back Space Character |    |    |    |    |    |    |    |    |     |     |     |     |
|                                           |                      |    |    |    |    |    |    |    |    |     |     |     |     |
|                                           |                      |    |    |    |    |    |    |    |    |     |     |     |     |

## KC-GL Limits

This section provides limit values for the various KC-GL parameters. Plotter units are used unless otherwise specified.

### Standard Character Sizes

*Table 7.33. Standard Character Sizes*

| Paper size | Width (mm) | Height (mm) |
|------------|------------|-------------|
| A4         | 0.187      | 0.269       |
| A3         | 0.285      | 0.375       |
| Letter     | 0.187      | 0.269       |
| Ledger     | 0.285      | 0.375       |

### Maximum Plot Area

*Table 7.34. Maximum Plot Area*

| Paper size | X             |      | Y             |      |
|------------|---------------|------|---------------|------|
|            | Plotter units | Dots | Plotter units | Dots |
| A4         | 11477         | 3389 | 7999          | 2362 |
| A3         | 16398         | 4842 | 11487         | 3392 |
| Letter     | 10776         | 3182 | 8236          | 2432 |
| Ledger     | 16872         | 4982 | 10776         | 3182 |

### Coordinate Values

*Table 7.35. Coordinate Values, Mode A, RO 0*

| Paper size | P1x  | P1y | P2x    | P2y   |
|------------|------|-----|--------|-------|
| A4         | 430, | 200 | 10430, | 7400  |
| A3         | 380, | 430 | 15580, | 10430 |
| Letter     | 80,  | 320 | 10080, | 7520  |
| Ledger     | 620, | 80  | 15820, | 10080 |

*Table 7.36. Coordinate Values, Mode A, RO 90*

| Paper size | P1x  | P1y | P2x    | P2y   |
|------------|------|-----|--------|-------|
| A4         | 200, | 430 | 7400,  | 10430 |
| A3         | 430, | 380 | 10430, | 15580 |
| Letter     | 320, | 80  | 7520,  | 10080 |
| Ledger     | 80,  | 620 | 10080, | 15820 |

*Table 7.37. Coordinate Values, Mode B, RO 0*

| Paper size | P1x    | P1y   | P2x   | P2y  |
|------------|--------|-------|-------|------|
| A4         | -4700, | -2480 | 4700, | 2480 |
| A3         | -6680, | -4700 | 6680, | 4700 |
| Letter     | -4348, | -2598 | 4348, | 2598 |
| Ledger     | -6916, | -4348 | 6916, | 4348 |

*Coordinate Values, Mode B, RO 90*

| Paper size | P1x    | P1y   | P2x   | P2y  |
|------------|--------|-------|-------|------|
| A4         | -2480, | -4700 | 2480, | 4700 |
| A3         | -4700, | -6680 | 4700, | 6680 |
| Letter     | -2598, | -4348 | 2598, | 4348 |
| Ledger     | -4348, | -6916 | 4348, | 6916 |

## Summary of KC-GL Instructions

The table below lists KC-GL instructions supported by the printing system. The following legend is used:

[c] Character string

[d] decimal (-128.0000 to +127.9999)

[i] integer (-32768 to +32767)

[sd] scaled decimal (-32768.0000 to +32767.9999)

*Table 7.38. KC-GL Instructions (Sheet 1 of 2)*

| Instruction | Parameters                                                                    | Description                            |
|-------------|-------------------------------------------------------------------------------|----------------------------------------|
| AA          | x-coordinate [i/sd], y-coordinate [i/sd], center-angle [i] (, resolution [i]) | Arc absolute                           |
| AF          | –                                                                             | Advance page                           |
| AH          | –                                                                             | Advance page                           |
| AR          | $\Delta x$ [i/sd], $\Delta y$ [i/sd], arc-angle [i] (, resolution [i])        | Arc relative                           |
| BL          | character-string [c] terminator                                               | Buffer label                           |
| CA          | character-set-no. [i]                                                         | Designate alternate character set      |
| CI          | radius [i/sd] (, resolution [i])                                              | Circle                                 |
| CP          | horizontal-character-count [d], vertical-character-count [d]                  | Character plot                         |
| CS          | character-set-no. [i]                                                         | Designate standard character set       |
| CT          | –                                                                             | Chord tolerance for AA, AR, CI         |
| DF          | –                                                                             | Default                                |
| DI          | run [d], rise [d]                                                             | Absolute direction                     |
| DR          | run [d], rise [d]                                                             | Relative direction                     |
| DT          | terminator [c]                                                                | Define label terminator                |
| EA          | x-coordinate [i/sd], y-coordinate [i/sd]                                      | Edge rectangle absolute                |
| EP          | –                                                                             | Edge polygon for PM, RA, RR, WG        |
| ER          | $\Delta x$ [i/sd], $\Delta y$ [i/sd]                                          | Edge rectangle relative                |
| ES          | character-space [d](, line- space [d])                                        | Extra space for NCP                    |
| EW          | radius [i/sd], start-angle [i], center-angle [i] (, resolution [i])           | Edge wedge                             |
| FP          | –                                                                             | Fill polygon for PM, RA, RR, WG        |
| FT          | type [i] (,spacing [sd] (,angle [i]))                                         | Fill type                              |
| IM          | E-mask-value [i] (, S-mask-value [i] (,P-mask-value [i]))                     | Input mask                             |
| IN          | –                                                                             | Initialize                             |
| IP          | P1x [i], P1y [i] (, P2x [i], P2y [i])                                         | Input P1 and P2                        |
| IW          | $X_{LL}$ [i/sd], $Y_{LL}$ [i/sd], $X_{UR}$ [i/sd], $Y_{UR}$ [i/sd],           | Input window                           |
| LB          | character-string [c]                                                          | Label                                  |
| LO          | position-number [i]                                                           | Label origin                           |
| LT          | pattern-no. [i] (, pattern-length [d])                                        | Line type                              |
| OA          | –                                                                             | Output actual position and pen status* |

Table 7.38. KC-GL Instructions (Sheet 2 of 2)

| Instruction | Parameters                                                                                                                                | Description                               |
|-------------|-------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------|
| OC          | –                                                                                                                                         | Output commanded position and pen status* |
| OE          | –                                                                                                                                         | Output error*                             |
| OF          | –                                                                                                                                         | Output factors*                           |
| OH          | –                                                                                                                                         | Output hard-clip limits*                  |
| OI          | –                                                                                                                                         | Output identification*                    |
| OL          | –                                                                                                                                         | Output label length                       |
| OO          | –                                                                                                                                         | Output options*                           |
| OP          | –                                                                                                                                         | Output P1 and P2*                         |
| OS          | –                                                                                                                                         | Output status byte*                       |
| OT          | –                                                                                                                                         | Output carousel type                      |
| OW          | –                                                                                                                                         | Output window*                            |
| PA          | x1-coordinate [i/sd], y1-coordinate [i/sd] (,x2-coordinate [i/sd], y2-coordinate [i/sd], ..., xn-coordinate [i/sd], yn-coordinate [i/sd]) | Plot absolute                             |
| PB          | –                                                                                                                                         | Print buffered label                      |
| PD          | x1-coordinate [i/sd], y1-coordinate [i/sd] (, ... xn-coordinate [i/sd], yn-coordinate [i/sd])                                             | Pen down                                  |
| PM          | –                                                                                                                                         | Polygon mode                              |
| PR          | $\Delta x1$ [i/sd], $\Delta y1$ [i/sd] (, $\Delta x2$ [i/sd], $\Delta y2$ [i/sd], ..., xn-coordinate [i/sd], yn-coordinate [i/sd])        | Plot relative                             |
| PS          | paper-size [i]                                                                                                                            | Select paper size                         |
| PT          | pen-thickness [d]                                                                                                                         | Pen thickness                             |
| PU          | x1-coordinate [i/sd], y1-coordinate [i/sd] (, ... xn-coordinate [i/sd], yn-coordinate [i/sd])                                             | Pen up                                    |
| RA          | x-coordinate [i/sd], y-coordinate [i/sd]                                                                                                  | Fill rectangle absolute                   |
| RO          | angle-in-degrees [i]                                                                                                                      | Rotate coordinate system                  |
| RR          | $\Delta x$ [i/sd], $\Delta y$ [i/sd]                                                                                                      | Fill rectangle relative                   |
| SA          | –                                                                                                                                         | Select alternate character set            |
| SC          | Xmin [i], Xmax [i], Ymin [i], Ymax [i],                                                                                                   | Scale                                     |
| SI          | character-width [d], character-height [d]                                                                                                 | Absolute character size                   |
| SL          | tan $\theta$ [d]                                                                                                                          | Character slant                           |
| SM          | character [c]                                                                                                                             | Symbol mode                               |
| SP          | pen-number [i]                                                                                                                            | Select pen                                |
| SR          | character-width [d], character-height [d]                                                                                                 | Relative character size                   |
| SS          | –                                                                                                                                         | Select standard character set             |
| TL          | tick-length-in-positive-direction [d] (, tick-length-in-negative-direction [d])                                                           | Tick length                               |
| UC          | (pen-control [i],) $\Delta x$ [i], $\Delta y$ (,...) (, pen-control [i]) (,...)                                                           | Plot user-defined character               |
| WG          | radius [i/sd], start-angle [i], center-angle [i] (, resolution [i])                                                                       | Plot filled wedge                         |
| XT          | –                                                                                                                                         | X-tick                                    |
| YT          | –                                                                                                                                         | Y-tick                                    |

## E-Mask Bit Values

The IM instruction sets an E-mask that controls how errors are reported on the RS-232C interface. The E-mask value is the sum of the bit values in the following table.

Table 7.39. E-Mask Bit Values

| Bit Error No. | Description                |
|---------------|----------------------------|
| 1 0 1         | Command not recognized     |
| 2 1 2         | Wrong number of parameters |

Table 7.39. E-Mask Bit Values

| Bit Error No. | Description |   |
|---------------|-------------|---|
| 4             | 2           | 3 |
| 8             | 3           | 4 |
| 16            | 4           | 5 |
| 32            | 5           | 6 |
| 64            | 6           | 7 |
| 128           | 7           | 8 |

## S-Mask/P-Mask Values

Table 7.40. S-Mask/P-Mask Values

| S-Mask/P-Mask Values | Bit Value | Description            |
|----------------------|-----------|------------------------|
| 1                    | 0         | Pen down               |
| 2                    | 1         | Changed P1 or P2       |
| 4                    | 2         | Valid digitizing point |
| 8                    | 3         | Initialized            |
| 16                   | 4         | Ready                  |
| 32                   | 5         | Error                  |
| 64                   | 6         | –                      |
| 128                  | 7         | –                      |

## Device-Control Instructions

Table 7.41. Device-Control Instructions

| Instruction | Parameters                                                    | Description                                                                       |
|-------------|---------------------------------------------------------------|-----------------------------------------------------------------------------------|
| ESC.(       | –                                                             | Plotter ON <sup>a</sup>                                                           |
| ESC.Y       | –                                                             | Plotter ON <sup>a</sup>                                                           |
| ESC.)       | –                                                             | Plotter OFF <sup>a</sup>                                                          |
| ESC.Z       | –                                                             | Plotter OFF <sup>a</sup>                                                          |
| ESC.@       | [(<DEC>);(<DEC>)];                                            | Plotter configuration <sup>a</sup>                                                |
| ESC.B       | –                                                             | Output buffer space                                                               |
| ESC.E       | –                                                             | Output extended error                                                             |
| ESC.H       | [(<DEC>);(<ASC>);<br>(<ASC>); (;...<ASC>)]                    | Select handshaking mode 1 <sup>a</sup>                                            |
| ESC.I       | [(<DEC>);(<ASC>);<br>(<ASC>); (;...<ASC>)]                    | Select handshaking mode 2 <sup>a</sup>                                            |
| ESC.J       | –                                                             | Ignore device-control instructions <sup>a</sup>                                   |
| ESC.K       | –                                                             | Ignore plot instructions <sup>a</sup>                                             |
| ESC.L       | –                                                             | Output buffer size                                                                |
| ESC.M       | [(<DEC>);(<ASC>);<br>(<ASC>);<br>(<ASC>);(<ASC>);<br>(<ASC>)] | Select output mode (output trigger character, echo terminator, output terminator) |
| ESC.N       | [(<DEC>);(<ASC>);<br>(;...<ASC>)]                             | Select extended output and handshaking mode 1 <sup>a</sup>                        |
| ESC.O       | –                                                             | Output extended status                                                            |
| ESC.R       | –                                                             | Reset handshaking <sup>a</sup>                                                    |

<sup>a</sup> Ignored

## Default States (DF)

Table 7.42. Default States (DF)

| Function                  | Equivalent Instruction | Default Value                                                                    |
|---------------------------|------------------------|----------------------------------------------------------------------------------|
| Plotting mode             | PA;                    | Absolute (plotter units)                                                         |
| Polygon mode              | PM0; PM2;              | Empty polygon                                                                    |
| Line type                 | LT;                    | Solid line                                                                       |
| Line pattern length       | LTn,4;                 | 4% of distance between P1 and P2                                                 |
| Scaling                   | SC;                    | Off (plotter units used for x- and y-coordinates)                                |
| Input window              | IW;                    | Set to hard-clip limits                                                          |
| Circle and arc resolution | –                      | 5 degrees                                                                        |
| Symbol mode               | SM;                    | Off                                                                              |
| Tick length               | TL;                    | x-axis: 0.5 % of   P2y - P1y  <br>y-axis: 0.5% of   P2x - P1x                    |
| Mask value                | IM233,0,0;             | All errors recognized, but no response to service request or parallel port.      |
| Fill type                 | FT;                    | Type 1 (bidirectional fill)                                                      |
| Fill spacing              | FT;                    | 1% of distance between P1 and P2 (used only in fill types 3 and 4)               |
| Fill angle                | FT;                    | 0 degrees                                                                        |
| Pen thickness             | PT;                    | 0.3 mm (fill spacing for fill types 1 and 2)                                     |
| Label origin              | –                      | Current pen position                                                             |
| Relative direction        | DR1,0;                 | Horizontal characters                                                            |
| Relative size             | SR;                    | Character width: 0.75% of   P2x - P1x  <br>Character height: 1.5% of   P2y - P1y |
| Character space           | ES 0, 0;               | None                                                                             |
| Character slant           | SL;                    | 0 degrees                                                                        |
| Label buffer              | BL ETX;                | None                                                                             |
| Label terminator          | DT ETX;                | ETX (ASCII code 3)                                                               |
| Label origin              | LO;                    | Position number                                                                  |
| Character set             | SS;                    | Standard character set                                                           |
| Standard character set    | CS0;                   | Character set 0                                                                  |
| Code tolerance            | CT;                    | Angle mode of AA, AR, CI, or WG                                                  |
| Alternate character set   | CA0;                   | Character set 0                                                                  |

## Initial Conditions (IN)

Table 7.43. Initial Conditions (IN)

| Function                   | Equivalent instruction | Initial condition                   |
|----------------------------|------------------------|-------------------------------------|
| Default conditions         | DF;                    | Default values                      |
| Scaling points             | IP;                    | Initialized according to paper size |
| Coordinate system rotation | RO;                    | 0 degrees (default setting)         |



# KPDL Operators

This section describes the machine-independent part of KPDL, Kyocera's implementation of the PostScript command language. KPDL deployed in the printing system encompasses the features of LanguageLevel 3 of the PostScript command language.

The KPDL operators described in this section can be used for confirming and changing the printing system's internal settings. Most of the operators in this section are paired: one operator for setting an environmental parameter, and another operator for confirming the setting. The setting operator starts with the letters *set*. The confirmation operator has the same name, but without the initial *set*.

## Communication with the Printing System

The operations described below are performed by sending KPDL operators to the printing system in the KPDL mode. KPDL operators can be sent either by file transfer, or interactively using communications software. This section explains both methods. As an example, it uses the KPDL operator that sets the printing system to print a simple graphics sample as shown in *Figure 7. 44.* on page 116.

*Example:*

Operators to draw a text and an enclosing box. Note that, in KPDL mode, unit for distances is  $1/72$  inches.

|                             |                                 |
|-----------------------------|---------------------------------|
| !R! SEM 9; EXIT;            | % Enter KPDL mode               |
| %!                          |                                 |
| 3 setlinewidth              | % Set line width to 3           |
| 30 30 moveto                | % Move to (30 30)               |
| 0 60 rlineto                | % Draw line 60 above            |
| 225 0 rlineto               | % Draw line 225 to the right    |
| 0 -60 rlineto               | % Draw line 60 below            |
| closepath                   | % Close the above path          |
| gsave                       | % Save current graphics state   |
| 0.6 setgray                 | % Set gray level to 0.6         |
| fill                        | % Fill the path with gray       |
| grestore                    | % Restore saved graphics state  |
| 0 setgray                   | % Set gray level to 0           |
| stroke                      | % Stroke the path               |
| 1 setgray                   | % Set gray level to solid black |
| /Helvetica-Nr 30 selectfont | % Select and scale to 30 points |
| 50 50 moveto                | % Move to (100 100)             |
| (Have a nice day!) show     | % Print the string              |
| showpage                    | % Print the above on page       |
| ^D                          | % End of job (control-D)        |

The initial SEM 9; ensures that the printing system is in the KPDL mode. If the printing system is already in the KPDL mode, SEM 9; is ignored. The percent signs (%) and the words to the right are comments. Comments are included only to explain the operators, and can be omitted when typing operators.

Try using one of the methods explained on the following page to enable delivery of the result of the above example. The print result appears as shown in *Figure 7. 44.* on page 116.

Figure 7. 44. Sample Printout



### File transfer

One way to transfer a file is to place all lines above in a file and transfer the file to the printing system. The basic requirements are:

- Except for SEM 9; and EXIT; (which can be in either uppercase or lowercase letters), all operators must be typed in lowercase letters, exactly as shown.
- The file must not contain any extraneous control codes, as are frequently added by word-processing software.
- The file must be sent as a file, not printed. If you print the file, you will only obtain printed output.

## KPDL Summary

This section lists all KPDL operators, their operands, and their results.

When received from the computer, operators and operands are placed in an area in the printing system's memory called the *stack*. In the operator table, each operator is preceded by its list of operands (if any). These operands must be placed onto the stack prior to the operator itself. Each operator is followed by a list of its results (if any). The results returned by the operator are also placed onto the stack.

For example, the add operator is listed as follows:

```
num1 num2 add sum          add num1 and num2
```

The action of this operator is to remove the two numbers that precede it from the top of the stack, add them, and put their sum onto the stack.

If an operator does not require any preceding operands or does not place any result on the stack, the corresponding column in the table is blank.

The following abbreviations (and a few others) are used for operands:

|                 |                                                         |
|-----------------|---------------------------------------------------------|
| <i>ang</i>      | angle (specified in degrees)                            |
| <i>bool</i>     | boolean: the value true or false                        |
| <i>dict</i>     | dictionary                                              |
| <i>int</i>      | integer                                                 |
| <i>num</i>      | number (integer or real)                                |
| <i>obj</i>      | object (any object)                                     |
| <i>pattern</i>  | pattern dictionary                                      |
| <i>proc</i>     | procedure                                               |
| <i>tag</i>      | tag                                                     |
| <i>userpath</i> | array of path construction operators and their operands |



Note

Certain operators are hyphenated in the following tables because of the editorial limitation only. These operators must not be hyphenated to be executed.

## KPD L Page Description Operators

The following table summarizes the page description operators including all language levels of KPD L. In the following table, operators having the higher language level are indicated by ② (level 2) or ③ (level 3)

Table 7.45. KPD L Page Description Operators (Sheet 1 of 11)

| Preceding stack                    | Operator       | Result                                           | Description                                                 |
|------------------------------------|----------------|--------------------------------------------------|-------------------------------------------------------------|
| obj                                | =              |                                                  | Write object to standard output                             |
|                                    | =print         |                                                  |                                                             |
|                                    | =string        |                                                  |                                                             |
| obj                                | ==             |                                                  | Write object to standard output with syntax markings        |
|                                    | ② <<           | mark                                             | Push mark object on operand stack                           |
| mark key1 value1<br>...keyn valuen | ② >>           | dict                                             | Create a dictionary containing the specified key-value pair |
|                                    | [              | mark                                             | Push mark on stack                                          |
| mark obj0...obj (n-1)              | ]              | array                                            | End array starting at topmost mark                          |
| num1                               | abs            | num2                                             | Get absolute value of num1                                  |
| num1 num2                          | add            | sum                                              | Add num1 and num2                                           |
| array                              | aload          | a0...a(n-1) array                                | Load array elements into stack, below array                 |
| string target                      | anchorsearch   | tail target true or<br>string false              | Test whether target is initial substring of string          |
| int/bool1 int/bool2                | and            | int/bool3                                        | Bitwise or logical AND                                      |
| x y r ang1 ang2                    | arc            |                                                  | Create counterclockwise arc                                 |
| x y r ang1 ang2                    | arcn           |                                                  | Create clockwise arc                                        |
| x1 y1 x2 y2 r                      | ② arct         |                                                  | Create line ending in arc                                   |
| x1 y1 x2 y2 r                      | arcto          | xt1 yt1 xt2 yt2                                  | Create line ending in arc; return arc coordinates           |
| int                                | array          | array                                            | Create array of null objects                                |
| ax ay string                       | ashow          |                                                  | Print string with adjusted character spacing                |
| obj0...obj (n-1) array             | astore         | array                                            | Pop elements from stack into array                          |
| num den                            | atan           | angle                                            | Get arctangent of num/den in degrees                        |
| cx cy chr ax ay string             | awidthshow     |                                                  | Print string with ashow and widthshow effects               |
| dict                               | begin          |                                                  | Push dict on dictionary stack                               |
| proc                               | bind           | proc                                             | Replace operator names in proc by values                    |
| int1 count                         | bitshift       | int2                                             | Shift int1 bitwise by count (positive is left)              |
| file                               | bytesavailable | int                                              | Get number of bytes left to read in file                    |
|                                    | cachestatus    | bsize bmax<br>msize mmax<br>csize cmax<br>blimit | Get font cache information                                  |
| num1                               | ceiling        | num2                                             | Find least integer not less than num1                       |
| string bool                        | charpath       |                                                  | Create character outline                                    |
|                                    | clear          |                                                  | Clear entire stack                                          |
|                                    | cleardictstack |                                                  | Clear dictionary stack                                      |

Table 7.45. KPDL Page Description Operators (Sheet 2 of 11)

| Preceding stack                                                            | Operator                 | Result                                                                                                                 | Description                                                                                  |
|----------------------------------------------------------------------------|--------------------------|------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------|
| mark obj1...objn                                                           | cleartomark              |                                                                                                                        | Clear stack down through mark                                                                |
|                                                                            | clip                     |                                                                                                                        | Create new clipping path                                                                     |
|                                                                            | clippath                 |                                                                                                                        | Set current path as clipping path                                                            |
|                                                                            | ③ cliprestore            |                                                                                                                        | Restore stored clipping path                                                                 |
|                                                                            | ③ clipsave               |                                                                                                                        | Copy and save the current clipping path                                                      |
| file                                                                       | closefile                |                                                                                                                        | Close file                                                                                   |
|                                                                            | closepath                |                                                                                                                        | Connect subpath to starting point                                                            |
| width height bits/comp<br>matrix datasrc0 ...<br>datasrcn-1 multi<br>ncomp | colorimage               |                                                                                                                        | Paint a sample image                                                                         |
| key name array<br>key string array<br>key dict array                       | ③ composefont            | font                                                                                                                   | Refers CIF font specified in the second CMap object or array and compose CIF font dictionary |
| matrix                                                                     | concat                   |                                                                                                                        | Multiply current transform matrix by given matrix                                            |
| matrix1 matrix2<br>matrix3                                                 | concatmatrix             | matrix3                                                                                                                | Replace matrix3 with matrix1 x matrix2                                                       |
| obj1...objn n                                                              | copy                     | obj1...objn                                                                                                            | Duplicate top n objects on stack                                                             |
| dict1 dict2                                                                | copy                     | dict2                                                                                                                  | Copy dict1 to dict2                                                                          |
| array1 array2                                                              | copy                     | subarray2                                                                                                              | Copy array1 to initial subarray of array2                                                    |
| string1 string2                                                            | copy                     | substring2                                                                                                             | Copy string1 to initial substring of string2                                                 |
| gstate1 gstate2                                                            | copy                     |                                                                                                                        | Copy gstate1 to gstate2                                                                      |
|                                                                            | copypage                 |                                                                                                                        | Print and retain current page                                                                |
| angle                                                                      | cos                      | real                                                                                                                   | Find cosine of angle (degrees)                                                               |
|                                                                            | count                    | n                                                                                                                      | Count objects on stack                                                                       |
|                                                                            | countdictstack           | int                                                                                                                    | Count objects on dictionary stack                                                            |
|                                                                            | countexecstack           | int                                                                                                                    | Count objects on execution stack                                                             |
| mark obj1...objn                                                           | counttomark              | mark obj1... obj n                                                                                                     | Count objects on stack down to mark                                                          |
| proc string                                                                | ② cshow                  |                                                                                                                        | Show characters changing the font mapping algorithm                                          |
|                                                                            | ② currentblackgeneration | proc                                                                                                                   | Return the black generation function                                                         |
|                                                                            | ② currentcacheparams     | mark size lower<br>upper                                                                                               | Return font cache parameters                                                                 |
|                                                                            | ② currentcmykcolor       | cyan magenta<br>yellow black                                                                                           | Return the current color according to the cyan-magenta-yellow-black color space              |
|                                                                            | ② currentcolor           | comp1 comp2 ...<br>comp n                                                                                              | Return the components of the color                                                           |
|                                                                            | ② currentcolorrendering  | dict                                                                                                                   | Return the value of the CIE based color rendering dictionary                                 |
|                                                                            | ② currentcolorscreen     | redfreq redang redproc<br>greenfreq greenang<br>greenproc bluefreq<br>blueang blueproc<br>grayfreq grayang<br>grayproc | Return the current halftone screen parameters                                                |
|                                                                            | ② currentcolorspace      | array                                                                                                                  | Return the color space                                                                       |
|                                                                            | ② currentcolortransfer   | redproc greenproc<br>blueproc grayproc                                                                                 | Return the current transfer functions                                                        |
|                                                                            | currentdash              | array offset                                                                                                           | Get current dash pattern                                                                     |
| string                                                                     | ② currentdevparams       | dict                                                                                                                   | Return all parameters for device                                                             |

Table 7.45. KPDL Page Description Operators (Sheet 3 of 11)

| Preceding stack   | Operator                   | Result          | Description                                              |
|-------------------|----------------------------|-----------------|----------------------------------------------------------|
|                   | currentdict                | dict            | Push current dictionary on operand stack                 |
|                   | currentfile                | file            | Get file currently being executed                        |
|                   | currentflat                | num             | Get current flatness tolerance                           |
|                   | currentfont                | font            | Get current font dictionary                              |
|                   | ② currentglobal            | bool            | Return the VM allocation mode currently in effect        |
|                   | currentgray                | num             | Get current gray level                                   |
| gstate            | ② currentgstate            | gstate          | Copy the current graphics state                          |
|                   | ② currenthalftone          | halftone        | Return the current halftone dictionary                   |
|                   | currenthsbcolor            | hue sat brt     | Get current hue, saturation, and brightness              |
|                   | currentlinecap             | int             | Get current line end type                                |
|                   | currentlinejoin            | int             | Get current corner type                                  |
|                   | currentlinewidth           | num             | Get current line width                                   |
| matrix            | currentmatrix              | matrix          | Replace matrix with current transform matrix             |
|                   | currentmiterlimit          | num             | Get current miter length limit                           |
|                   | ② currentobjectformat      | int             | Return the object format parameter currently in effect   |
|                   | ② currentoverprint         | bool            | Return the value of the overprint parameter              |
|                   | ② currentpacking           | bool            | Return the current array packing mode                    |
|                   | ② currentpagedevice        | dict            | Return a device parameter on the current page            |
|                   | currentpoint               | x y             | Get coordinates of current point                         |
|                   | currentrgbcolor            | red green blue  | Get current red/green/blue levels                        |
|                   | currentscreen              | freq angle proc | Get current halftone screen                              |
|                   | currentshared              |                 | Return the current stroke adjust parameter               |
|                   | ③ currentsmoothness        | num             | Returns the current arc smoothness                       |
|                   | ② currentstrokeadjust      | bool            | Return the current stroke adjust parameter               |
|                   | ② currentsystemparams      | dict            | Return current values of all system parameters           |
|                   | currenttransfer            | proc            | Get current gray transfer function                       |
|                   | ② currentundercolorremoval | proc            | Return the under color removal function                  |
|                   | ② currentuser params       | dict            | Return current values of all user parameters             |
| x1 y1 x2 y2 x3 y3 | curveto                    |                 | Create Bézier cubic curve from current point to (x3, y3) |
| num/string        | cvi                        | int             | Convert number or string to integer                      |
| obj               | cvlit                      | obj             | Convert object to literal                                |
| string            | cvn                        | name            | Convert string to name                                   |
| num/string        | cvr                        | real            | Convert number or string to real                         |
| num radix string  | cvrs                       | substring       | Convert number to representation in radix                |
| obj string        | cvs                        | substring       | Convert object to substring of string                    |
| obj               | cvx                        | obj             | Convert object to executable object                      |
| key value         | def                        |                 | Place key and value in current dictionary                |

Table 7.45. KPD L Page Description Operators (Sheet 4 of 11)

| Preceding stack                 | Operator             | Result            | Description                                                                                      |
|---------------------------------|----------------------|-------------------|--------------------------------------------------------------------------------------------------|
| matrix                          | defaultmatrix        | matrix            | Replace matrix with device default matrix                                                        |
| key font                        | definefont           | font              | Define font as a font dictionary associated with key                                             |
| key instance category           | ② defineresource     | instance          | Define a resource in a specified category                                                        |
| index any                       | ② defineuserobject   |                   | Establish an user object                                                                         |
| filename                        | ② deletefile         |                   | Remove the specified file                                                                        |
| int                             | dict                 | dict              | Create dictionary with capacity for <i>int</i> entries                                           |
| array                           | dictstack            | subarray          | Copy dictionary stack to array                                                                   |
| num1 num2                       | div                  | quotient          | Divide <i>num1</i> by <i>num2</i>                                                                |
| dx dy                           | dtransform           | dx' dy'           | Transform distance from user to device space                                                     |
| dx dy matrix                    | dtransform           | dx' dy'           | Transform distance by matrix                                                                     |
| obj                             | dup                  | obj obj           | Duplicate top object on stack                                                                    |
| bool                            | echo                 |                   | Turn interactive echoing on/off                                                                  |
|                                 | end                  |                   | Pop dictionary stack                                                                             |
|                                 | eoclip               |                   | Clip using even-odd rule                                                                         |
|                                 | eofill               |                   | Fill using even-odd rule                                                                         |
| any1 any2                       | eq                   | bool              | Pop two objects from the stack and pushes the boolean value true if they are equal, false if not |
|                                 | erasepage            |                   | Erase the current page                                                                           |
| obj1 obj2                       | exch                 | obj2 obj1         | Exchange top two objects on stack                                                                |
| obj                             | exec                 |                   | Execute preceding object                                                                         |
| form                            | ② execform           |                   | Paint a form                                                                                     |
| array                           | execstack            | subarray          | Copy execution stack into array                                                                  |
| index                           | ② execuserobject     |                   | Execute the user object                                                                          |
| array/file/string               | executeonly          | array/file/string | Enable execution access only                                                                     |
|                                 | exit                 |                   | Exit innermost loop                                                                              |
| base exponent                   | exp                  | real              | Raise base to exponent                                                                           |
|                                 | false                | false             | Push boolean value false on stack                                                                |
| string1 string2                 | file                 | file              | Open file named string1 in string2 access mode                                                   |
| template proc scratch           | ② filenameforall     |                   | Enumerate all files whose names match                                                            |
| file                            | ② fileposition       | position          | Return the current position in a file                                                            |
|                                 | fill                 |                   | Fill current path with current color                                                             |
| src tgt<br>param1...paramn name | ② filter             | file              | Create a filtered file                                                                           |
| name<br>string                  | ③ findcolorrendering | name bool         | Find the color rendering resource as specified by argument                                       |
| key                             | ② findencoding       | array             | Obtain an encoding vector                                                                        |
| key                             | findfont             | font              | Get a font dictionary identified by key                                                          |
| key category                    | ② findresource       | instance          | Obtain a named resource instance in a specified category                                         |
|                                 | flattenpath          |                   | Convert curves to piecewise linear segments                                                      |
| num1                            | floor                | num2              | Find greatest integer not exceeding num1                                                         |
|                                 | flush                |                   | Send data in buffer to standard output                                                           |
| file                            | flushfile            |                   | Send data in buffer to output file, or read and discard rest of input file                       |

Table 7.45. KPDL Page Description Operators (Sheet 5 of 11)

| Preceding stack            | Operator               | Result           | Description                                                                  |
|----------------------------|------------------------|------------------|------------------------------------------------------------------------------|
|                            | FontDirectory          | dict             | Push directory of font dictionaries on stack                                 |
| init incr limit proc       | for                    |                  | Execute <i>proc</i> for <i>init</i> to <i>limit</i> in steps of <i>incr</i>  |
| array proc                 | forall                 |                  | Do proc for each array element                                               |
| dict proc                  | forall                 |                  | Do proc for each element of dict                                             |
| string proc                | forall                 |                  | Do proc for each element of string                                           |
| any                        | ② gcheck               | bool             | Return residence mode of any                                                 |
| num/string1<br>num/string2 | ge                     | bool             | Test whether num/string1 is greater than or equal to num/string2             |
| array index                | get                    | obj              | Get array element at index location                                          |
| dict key                   | get                    | obj              | Get value associated with key in dictionary                                  |
| string index               | get                    | int              | Get string element at index location                                         |
| string index count         | getinterval            | substring        | Get substring. Index and count are starting location and length of substring |
| array index count          | getinterval            | subarray         | Get subarray. Index and count are starting element and length of subarray    |
|                            | ② globaldict           | dict             | Create a new dictionary object                                               |
|                            | ② GlobalFontDirectory  | dict             | Push a dictionary of defined font                                            |
| name                       | ② glyphshow            |                  | Show a single character                                                      |
|                            | grestore               |                  | Restore saved graphics state                                                 |
|                            | grestoreall            |                  | Restore to bottommost graphics state                                         |
|                            | gsave                  |                  | Save graphics state                                                          |
|                            | ② gstate               | gstate           | Create a new graphics state object                                           |
| num/string1<br>num/string2 | gt                     | bool             | Test whether num/string1 > num/string2                                       |
| matrix                     | identmatrix            | matrix           | Replace matrix with identity transform                                       |
| int1 int2                  | idiv                   | quotient         | Divide <i>int1</i> by <i>int2</i> ; integer quotient                         |
| dx' dy'                    | idtransform            | dx dy            | Transform distance from device to user space                                 |
| dx' dy' matrix             | idtransform            | dx dy            | Transform distance by inverse of matrix                                      |
| bool proc                  | if                     |                  | Do <i>proc</i> if <i>bool</i> is true                                        |
| bool proc1 proc2           | ifelse                 |                  | Do <i>proc1</i> if <i>bool</i> is true; otherwise do <i>proc2</i>            |
| dict                       | image                  |                  | Print bit-mapped image                                                       |
| wd ht bits matrix proc     | image                  |                  |                                                                              |
| dict                       | imagemask              |                  | Print binary mask                                                            |
| wd ht invt matrix proc     | imagemask              |                  |                                                                              |
| objn...obj0 n              | index                  | objn...obj0 objn | Copy n-th object to top of stack                                             |
| x y userpath               | ② ineofill<br>ineofill | bool             | Test the current path on the even-odd rule for insideness                    |
| x y userpath               | ② infill<br>infill     | bool             | Test the current path for insideness                                         |
|                            | initclip               |                  | Initialize clipping path                                                     |
|                            | initgraphics           |                  | Reset graphics state parameters                                              |
|                            | initmatrix             |                  | Initialize current transfer matrix                                           |
| x y userpath               | ② instroke<br>instroke | bool             | Test pixels in the current path for insideness                               |

Table 7.45. KPD L Page Description Operators (Sheet 6 of 11)

| Preceding stack                                      | Operator                 | Result                 | Description                                                   |
|------------------------------------------------------|--------------------------|------------------------|---------------------------------------------------------------|
| x y userpath<br>userpath1 userpath2                  | ② inueofill<br>inueofill | bool                   | Test the user path on the even-odd rule for insideness        |
| x y userpath<br>userpath1 userpath2                  | ② inufill<br>inufill     | bool                   | Test the user path for insideness                             |
| x y userpath                                         | ② inustroke              |                        |                                                               |
| x y userpath matrix                                  | inustroke                |                        |                                                               |
| userpath1 userpath2<br>userpath1 userpath2<br>matrix | inustroke<br>inustroke   | bool                   | Test pixels in the user path for insideness                   |
| matrix1 matrix2                                      | invertmatrix             | matrix2                | Replace matrix2 with inverse of matrix1                       |
|                                                      | ② ISOLatin1Encoding      | array                  | Push the ISO Latin-1 encoding vector                          |
| x' y'                                                | itransform               | x y                    | Transform coordinates from device to user space               |
| x' y' matrix                                         | itransform               | x y                    | Transform coordinates by inverse of matrix                    |
| dict key                                             | known                    | bool                   | Test whether key is in dictionary                             |
| proc string                                          | kshow                    |                        | Print string, executing proc between characters               |
|                                                      | ② languagelevel          | int                    | Return the language level                                     |
| num/string1<br>num/string2                           | le                       | bool                   | Test whether num/string1 is less than or equal to num/string2 |
| array                                                | length                   | int                    | Get number of elements in array                               |
| dict                                                 | length                   | int                    | Get number of key-value pairs in dict                         |
| string                                               | length                   | int                    | Get length of string                                          |
| name                                                 | length                   | int                    | Get length of name                                            |
| x y                                                  | lineto                   |                        | Create line from current point to (x, y)                      |
| num                                                  | ln                       | real                   | Get natural logarithm                                         |
| key                                                  | load                     | value                  | Search dictionary stack for key and return value              |
| num                                                  | log                      | real                   | Get logarithm                                                 |
| proc                                                 | loop                     |                        | Do proc until exit is encountered                             |
| num/string1<br>num/string2                           | lt                       | bool                   | Test whether num/string1 < num/string2                        |
| font matrix                                          | makefont                 | font'                  | Generate new font by matrix transformation                    |
| dict matrix                                          | ② makepattern            | pattern                | Create an instance from a prototype pattern                   |
|                                                      | mark                     | mark                   | Push mark on stack                                            |
|                                                      | matrix                   | matrix                 | Create identity matrix                                        |
| dict                                                 | maxlength                | int                    | Get capacity of dict                                          |
| int1 int2                                            | mod                      | remainder              | Find int1 module int2 (integers)                              |
| x y                                                  | moveto                   |                        | Move current point to (x, y)                                  |
| num1 num2                                            | mul                      | product                | Multiply num1 by num2                                         |
| obj1 obj2                                            | ne                       | bool                   | Test whether obj1 is not equal to obj2                        |
| num1                                                 | neg                      | num2                   | Get negative of num1                                          |
|                                                      | newpath                  |                        | Initialize current path to null path                          |
| array/dict/file/string                               | noaccess                 | array/dict/file/string | Disable all access                                            |
| int/bool1                                            | not                      | int/bool2              | Bitwise or logical not                                        |
|                                                      | null                     | null                   | Push null on operand stack                                    |
|                                                      | nulldevice               |                        | Install no-output device                                      |
| int/bool1 int/bool2                                  | or                       | int/bool3              | Bitwise or logical OR                                         |
| obj0...objn-1 n                                      | ② packedarray            | packedarray            | Create a packed array                                         |



Table 7.45. KPDL Page Description Operators (Sheet 7 of 11)

| Preceding stack                                                                                             | Operator                                                             | Result                      | Description                                                                                        |
|-------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------|-----------------------------|----------------------------------------------------------------------------------------------------|
|                                                                                                             | pathbbox                                                             | llx lly urx ury             | Get bounding box of current path                                                                   |
| move line curve close                                                                                       | pathforall                                                           |                             | Do named procedures for current path elements                                                      |
| obj                                                                                                         | pop                                                                  |                             | Discard top object on stack                                                                        |
| string                                                                                                      | print                                                                |                             | Write string to standard output                                                                    |
| obj tag                                                                                                     | ② printobject                                                        |                             | Write a binary object sequence to the standard output                                              |
|                                                                                                             | ② product                                                            | string                      | Get product name                                                                                   |
|                                                                                                             | prompt                                                               |                             | Prompt for interactive input                                                                       |
|                                                                                                             | pstack                                                               |                             | Write entire stack to standard out put                                                             |
| array index object                                                                                          | put                                                                  |                             | Insert object into array at index location                                                         |
| dict key value                                                                                              | put                                                                  |                             | Place key and value in dictionary                                                                  |
| string index int                                                                                            | put                                                                  |                             | Replace character in string at index location                                                      |
| array1 index array2                                                                                         | putinterval                                                          |                             | Replace subarray of <i>array1</i> starting at <i>index</i> by <i>array2</i>                        |
| string1 index string2                                                                                       | putinterval                                                          |                             | Replace substring of <i>string1</i> starting at <i>index</i> by <i>string2</i>                     |
|                                                                                                             | quit                                                                 |                             | Terminate KPDL interpreter                                                                         |
|                                                                                                             | rand                                                                 | int                         | Generate pseudo-random integer                                                                     |
| array/dict/file/string                                                                                      | rcheck                                                               | bool                        | Test if object is read-accessible                                                                  |
| dx1 dy1 dx2 dy2 dx3 dy3                                                                                     | rcurveto                                                             |                             | Create Bézier cubic curve to relative point                                                        |
| file                                                                                                        | read                                                                 | int true or false           | Read one character from file; return false if end of file                                          |
| file string                                                                                                 | readhexstring                                                        | substring bool              | Read hexadecimal characters from file into string                                                  |
| file string                                                                                                 | readline                                                             | substring bool              | Read line from file into string; return true if filled                                             |
| array/dict/file/string                                                                                      | readonly                                                             | array/dict/file/string      | Enable read access only                                                                            |
| file string                                                                                                 | readstring                                                           | substring bool              | Convert file of hexadecimal character codes into character string; return true if string is filled |
|                                                                                                             | ② realtime                                                           | int                         | Return the real time clock value                                                                   |
| x y width height<br>numarray/numstring                                                                      | ② rectclip<br>rectclip                                               |                             | Clip with a rectangular path                                                                       |
| x y width height<br>numarray/numstring                                                                      | ② rectfill<br>rectfill                                               |                             | Fill with a rectangular path                                                                       |
| x y width height<br>x y width height matrix<br>numarray<br>numarray matrix<br>numstring<br>numstring matrix | ② rectstroke<br>rectstroke<br>rectstroke<br>rectstroke<br>rectstroke |                             | Stroke with a rectangular path                                                                     |
| old new                                                                                                     | ② renamefile                                                         |                             | Change the name of a file                                                                          |
| int proc                                                                                                    | repeat                                                               |                             | Do proc int times                                                                                  |
| file                                                                                                        | resetfile                                                            |                             | Clear buffer for file                                                                              |
| template proc scratch category                                                                              | ② resourceforall                                                     |                             | Enumerate all instances of a specified resource category                                           |
| key category                                                                                                | ② resourcestatus                                                     | status size<br>true (false) | Return status information about a named resource instance                                          |
| save                                                                                                        | restore                                                              |                             | Restore saved virtual memory                                                                       |
|                                                                                                             | reversepath                                                          |                             | Reverse direction of current path printing system's software                                       |
|                                                                                                             | ② revision                                                           | int                         | Get product revision                                                                               |

Table 7.45. KPD L Page Description Operators (Sheet 8 of 11)

| Preceding stack                                                                                                        | Operator             | Result                                  | Description                                             |
|------------------------------------------------------------------------------------------------------------------------|----------------------|-----------------------------------------|---------------------------------------------------------|
| dx dy                                                                                                                  | rlineto              |                                         | Create line from current point to relative point        |
| dx dy                                                                                                                  | rmoveto              |                                         | Move current point by relative amount                   |
| ob(n-1)...ob0 n i                                                                                                      | roll                 | ob(i-1)..ob0<br>ob(n01)..obi            | Roll top n objects on stack by <i>i</i> (mod <i>n</i> ) |
|                                                                                                                        | ② rootfont           | font                                    | Return a root composite dictionary                      |
| angle matrix                                                                                                           | rotate               | matrix                                  | Rotate matrix transformation by angle (degrees)         |
| angle                                                                                                                  | rotate               |                                         | Rotate user space by angle (degrees)                    |
| num1                                                                                                                   | round                | num2                                    | Round off num1 to nearest integer                       |
|                                                                                                                        | rrand                | int                                     | Get random number seed                                  |
| string                                                                                                                 | run                  |                                         | Execute file                                            |
|                                                                                                                        | save                 | save                                    | Save virtual memory                                     |
| sx sy matrix                                                                                                           | scale                | matrix                                  | Define scaling matrix                                   |
| sx sy                                                                                                                  | scale                |                                         | Scale user space                                        |
| font scale                                                                                                             | scafont              | font'                                   | Generate new font by scaling old font                   |
| any                                                                                                                    | ② scheck             | bool                                    | Same as gcheck                                          |
| string target                                                                                                          | search               | post match head<br>true or string false | Search for target substring in string                   |
| key scale                                                                                                              | ② selectfont         |                                         | Select a font and establish the font dictionary         |
|                                                                                                                        | ② serialnumber       | int                                     | Return the serial number to represent the machine       |
| llx lly urx ury                                                                                                        | ② setbbox            |                                         | Establish a bounding box for the current path           |
| proc                                                                                                                   | ② setblackgeneration |                                         | Set the black generation function parameter             |
| wx wy llx lly urx ury                                                                                                  | setcachedevice       |                                         | Declare width and bounds of cached character            |
| w0x w0y llx lly urx ury w1x w1y vx vy                                                                                  | ② setcachedevice2    |                                         | Declare width and bounds of cached character            |
| num                                                                                                                    | setcachelimit        |                                         | Declare maximum byte size of cached character           |
| mark size lower upper                                                                                                  | ② setcacheparams     |                                         | Set the font cache parameters                           |
| wx wy                                                                                                                  | setcharwidth         |                                         | Declare width and bounds of uncached character          |
| cyan magenta yellow black                                                                                              | ② setmykcolor        |                                         | Set the color space to Device CMYK                      |
| comp1 comp2 ... comp n                                                                                                 | ② setcolor           |                                         | Set the current color parameter                         |
| dict                                                                                                                   | ② setcolorrendering  |                                         | Establish a CIE-based color rendering dictionary        |
| redfreq redang redproc<br>greenfreq greenang<br>greenproc bluefreq<br>blueang blueproc<br>grayfreq grayang<br>grayproc | ② setcolorscreen     |                                         | Set the halftone parameter                              |
| array (name)                                                                                                           | ② setcolorspace      |                                         | Specify a color space                                   |
| redproc greenproc<br>blueproc grayproc                                                                                 | ② setcolortransfer   |                                         | Set the transfer function parameter                     |
| array offset                                                                                                           | setdash              |                                         | Set dash pattern for lines                              |
| string dict                                                                                                            | ② setdevparams       |                                         | Set parameters for I/O device                           |
| file position                                                                                                          | ② setfileposition    |                                         | Reposition a file                                       |
| num                                                                                                                    | setflat              |                                         | Set flatness tolerance (smoothness of curves)           |
| font                                                                                                                   | setfont              |                                         | Set current font dictionary                             |

Table 7.45. KPDL Page Description Operators (Sheet 9 of 11)

| Preceding stack | Operator                | Result | Description                                                                                                                     |
|-----------------|-------------------------|--------|---------------------------------------------------------------------------------------------------------------------------------|
| bool            | ② setglobal             |        | Set the VM allocation mode                                                                                                      |
| num             | setgray                 |        | Set gray level from 0 (black) to 1 (white)                                                                                      |
| gstate          | ② setgstate             |        | Replace the current graphics state                                                                                              |
| halftone        | ② sethalftone           |        | Establish a halftone dictionary                                                                                                 |
| hue sat brt     | sethsbcolor             |        | Set hue, saturation, and brightness (converted to gray)                                                                         |
| int             | setlinecap              |        | Set butt (0), round (1), or square (2) line ends                                                                                |
| int             | setlinejoin             |        | Set miter (0), round (1), or bevel (2) corner type                                                                              |
| num             | setlinewidth            |        | Set line width                                                                                                                  |
| matrix          | setmatrix               |        | Replace current transform matrix with given matrix                                                                              |
| num             | setmiterlimit           |        | Set miter length limit                                                                                                          |
| int             | ② setobjectformat       |        | Establish the number representation                                                                                             |
| bool            | ② setoverprint          |        | Set the overprint parameter                                                                                                     |
| bool            | ② setpacking            |        | Set the array packing mode                                                                                                      |
| dict            | ② setpagedevice         |        | Install a page output device. Parameters for this operator is fully detailed in <i>KPDL Page Device Parameters</i> on page 135. |
| pattern         | ② setpattern            |        | Establish the specified pattern as the current color                                                                            |
| red green blue  | setrgbcolor             |        | Set red/green/blue levels (converted to gray level)                                                                             |
| freq angle proc | setscreen               |        | Set halftone screen                                                                                                             |
| bool            | ② setshared             |        | Same as setglobal                                                                                                               |
| num             | ③ setsmoothness         |        | Set the smoothness to <i>num</i>                                                                                                |
| bool            | ② setstrokeadjust       |        | Set the stroke adjust parameter                                                                                                 |
| dict            | ② setsystemparams       |        | Set the system parameters for interpreter                                                                                       |
| proc            | settransfer             |        | Set mapping from user gray scale to device gray scale                                                                           |
| mark blimit     | ② setucacheparams       |        | Set user path cache parameters                                                                                                  |
| proc            | ② setundercolor removal |        | Set the under color removal function parameter                                                                                  |
| dict            | ② setuserparams         |        | Set user parameters for each context                                                                                            |
| int             | ② setvmthreshold        |        | Set the allocation threshold used to trigger garbage collector                                                                  |
|                 | ② shareddict            | dict   | Same as globaldict                                                                                                              |
|                 | ② SharedFontDirectory   | dict   | Same as GlobalFontDirectory                                                                                                     |
| dict            | ③ shfill                |        | Fill the current clipping path with the shading defined by shading dictionary                                                   |
| string          | show                    |        | Print string on page                                                                                                            |
|                 | showpage                |        | Print and reset current page                                                                                                    |
| angle           | sin                     | real   | Find <i>sin</i> of angle (in degrees)                                                                                           |
| num             | sqrt                    | real   | Find square root of number                                                                                                      |
| int             | srand                   |        | Set random number seed                                                                                                          |
|                 | stack                   |        | Write entire stack to standard output as text                                                                                   |
|                 | StandardEncoding        | array  | Push standard character code/name array on stack                                                                                |
|                 | start                   |        | Make KPDL interpreter ready                                                                                                     |
| bool passwd     | ② startjob              | bool   | Start a new job with condition                                                                                                  |
| file            | status                  | bool   | Test if file is open                                                                                                            |

Table 7.45. KPD L Page Description Operators (Sheet 10 of 11)

| Preceding stack | Operator             | Result                            | Description                                                                                            |
|-----------------|----------------------|-----------------------------------|--------------------------------------------------------------------------------------------------------|
|                 | statusdict           | dict                              | Push statusdict on operand stack                                                                       |
|                 | stop                 |                                   | Terminate procedure executed by stopped operator                                                       |
| obj             | stopped              | bool                              | Execute object. Return true if stop operator is executed in object, false if object completes normally |
| key value       | store                |                                   | Replace topmost definition of key                                                                      |
| int             | string               | string                            | Create <i>string</i> of length <i>int</i>                                                              |
| string          | stringwidth          | wx wy                             | Get width of string in current font                                                                    |
|                 | stroke               |                                   | Draw line along current path                                                                           |
|                 | strokepath           |                                   | Compute outline of path                                                                                |
| num1 num2       | sub                  | difference                        | Subtract num2 from num1                                                                                |
|                 | systemdict           | dict                              | Push systemdict on operand stack                                                                       |
| file            | token                | token true or false               | Read and interpret token in file; return false if file is empty                                        |
| string          | token                | tail token true or false          | Read and interpret token in string return false if string is empty                                     |
| x y             | transform            | x' y'                             | Transform coordinates from user to device space                                                        |
| x y matrix      | transform            | x' y'                             | Transform coordinates by matrix                                                                        |
| tx ty           | translate            |                                   | Translate user space                                                                                   |
| tx ty matrix    | translate            | matrix                            | Define translation matrix                                                                              |
|                 | true                 | true                              | Push boolean value true on stack                                                                       |
| num1            | truncate             | num2                              | Discard fraction part of num1                                                                          |
| obj             | type                 | name                              | Get name identifying type of object                                                                    |
| userpath        | ② uappend            |                                   | Append the user path to the current path                                                               |
|                 | ② ucache             |                                   | Declare to cache the user path                                                                         |
|                 | ② ucachestatus       | mark bsize bmax rsize rmax blimit | Return user path cache parameters                                                                      |
| userpath        | ② ueofill            |                                   | Fill a user path using the evenodd rule                                                                |
| userpath        | ② ufill              |                                   | Interprets a user path to fill                                                                         |
| dict key        | ② undef              |                                   | Remove key and value from dictionary                                                                   |
| key             | ② undefinefont       |                                   | Remove a font definition                                                                               |
| key category    | ② undefineresource   |                                   | Remove the named resource                                                                              |
| index           | ② undefineuserobject |                                   | Undefine an user object                                                                                |
| bool            | ② upath              | userpath                          | Create a user path equivalent to the current path                                                      |
|                 | userdict             | dict                              | Push userdict on operand stack                                                                         |
|                 | ② UserObjects        | array                             | Return the current user object array                                                                   |
|                 | ② usertime           | int                               | Return time in milliseconds                                                                            |
| userpath        | ② ustroke            |                                   | Draw a line along a user path                                                                          |
| userpath matrix | ② ustroke            |                                   |                                                                                                        |
| userpath        | ② ustrokepath        |                                   | Compute outline of a user path                                                                         |
| userpath matrix | ② ustrokepath        |                                   |                                                                                                        |
|                 | version              | string                            | Return version of KPD L interpreter                                                                    |
| int             | ② vmreclaim          |                                   | Control the garbage collector                                                                          |

Table 7.45. KPDL Page Description Operators (Sheet 11 of 11)

| Preceding stack        | Operator       | Result                | Description                                                                                          |
|------------------------|----------------|-----------------------|------------------------------------------------------------------------------------------------------|
|                        | vmstatus       | level used<br>maximum | Return virtual memory status:<br>current save nesting depth,<br>bytes used, and maximum byte<br>size |
| array/dict/file/string | wcheck         | bool                  | Test if object is write-accessible                                                                   |
| key                    | where          | dict true or false    | Find dictionary in which key is<br>defined                                                           |
| cx cy char string      | widthshow      |                       | Print string with adjusted<br>spacing for specified character                                        |
| file int               | write          |                       | Write one character to file                                                                          |
| file string            | writehexstring |                       | Convert string into file of<br>hexadecimal character codes                                           |
| file obj tag           | ② writeobject  |                       | Write a binary object sequence<br>to file                                                            |
| file string            | writestring    |                       | Write string characters to file                                                                      |
| obj                    | xcheck         | bool                  | Test if object is executable                                                                         |
| int/bool1 int/bool2    | xor            | int/bool3             | Bitwise or logical exclusive OR                                                                      |
| string numarray        | ② xshow        |                       | Print characters with x<br>displacement                                                              |
| string numarray        | ② xyshow       |                       | Print characters with x/y<br>displacements                                                           |
| string numarray        | ② yshow        |                       | Print characters with y<br>displacement                                                              |

## KPDL Status Operators

The operations in the table below can be used when the status dictionary is open. Some also require a password.

Table 7.46. KPDL Status Operators (Sheet 1 of 5)

| Preceding stack | Operator          | Result          | Description                                                                                                           |
|-----------------|-------------------|-----------------|-----------------------------------------------------------------------------------------------------------------------|
|                 | buildtime         | int             | Identify the build of the interpreter                                                                                 |
|                 | byteorder         | bool            | Get the native order in binary encoded tokens<br>(true: low-order byte first, false: high-order<br>byte first)        |
| int (string)    | checkpassword     | bool            | Check printing system's password (true: valid<br>password, false: invalid password)                                   |
|                 | defaulttimeouts   | job manual wait | Get timeout values                                                                                                    |
|                 | diskonline        | bool            | Check disk online (true: disk unit online, false:<br>disk unit offline)                                               |
|                 | diskstatus        | free total      | Report total disk space and free space                                                                                |
|                 | dostartpage       | bool            | See whether printing system is set to print<br>status page at power-up (true: output status,<br>false: do not output) |
|                 | dosysstart        | bool            | See whether Sys/Start file is executed at<br>power-up (true: execute Sys/Start, false: do<br>nothing)                 |
| pages action    | initializedisk    |                 | Format all writable disks                                                                                             |
|                 | jobname           | string          | Get current job name                                                                                                  |
|                 | jobtimeout        | int             | Get number of seconds to job timeout (0:<br>never)                                                                    |
|                 | manualfeed        | bool            | Test whether printing system is in manual-feed<br>mode (true: manual feed on, false: manual feed<br>off)              |
|                 | manualfeedtimeout | int             | Get manual-feed time-out value                                                                                        |
|                 | margins           | top left        | Get top and left calibration margins                                                                                  |
|                 | newsheet          |                 | Feed out the single side printed page in duplex<br>mode                                                               |
|                 | pagecount         | int             | Get number of pages printed so far<br>(nonresettable)                                                                 |

Table 7.46. KPD L Status Operators (Sheet 2 of 5)

| Preceding stack       | Operator                           | Result    | Description                                                                                                             |
|-----------------------|------------------------------------|-----------|-------------------------------------------------------------------------------------------------------------------------|
|                       | pagestackorder                     | bool      | Get current stack tray (true: face down, false: face up)                                                                |
|                       | papersize                          | name bool | Get current paper size and orientation                                                                                  |
| string                | printername                        | substring | Get printing system name                                                                                                |
|                       | product                            | string    | Get printing system type                                                                                                |
|                       | ramsize                            | int       | Check available RAM size                                                                                                |
|                       | realformat                         | string    | Get native representation for real numbers in binary tokens                                                             |
|                       | revision                           | int       | Get KPD L revision number                                                                                               |
| [integer ... integer] | setcollatorstacker                 |           | Set sorter to collator mode                                                                                             |
| job manual wait       | setdefaulttimeouts                 |           | Set timeout values.                                                                                                     |
| bool                  | setdoprinterrors                   |           | Set error-printing mode (true: print errors, false: do nothing)                                                         |
| int                   | setdoret                           |           | Set KIR level                                                                                                           |
| bool                  | setdostartpage                     |           | Select whether to print status page at power-up (true: output power-on status, false: do not output)                    |
| bool                  | setdosysstart                      |           | Set Sys/Start file reading mode at power-up (true: execute Sys/Start, false: do nothing)                                |
| int                   | setjobtimeout                      |           | Set time-out value of current job                                                                                       |
| [integer ... integer] | setmailboxstacker                  |           | Set sorter to mailbox mode                                                                                              |
| top left              | setmargins                         |           | Set top and left calibration margins                                                                                    |
| int                   | setmultirayid                      |           | Set mail box identifier                                                                                                 |
| bool                  | setpagestackorder                  |           | Set stack tray (true: face down, false: face up)                                                                        |
| old new               | setpassword                        | bool      | Set printing system's password                                                                                          |
| string                | setprintername                     |           | Assign string as printing system name                                                                                   |
| [integer ... integer] | setsorterstacker                   |           | Set sorter to sorting mode                                                                                              |
| int                   | setuserdiskpercent                 |           | Adjust disk size for use with KPD L                                                                                     |
|                       | waittimeout                        | int       | Get wait time-out value                                                                                                 |
|                       | a3                                 |           | Set imageable area to A3 size. See <i>KPD L Printable Area</i> on page 140. This operator is in userdict.               |
|                       | b4                                 |           | Set imageable area to B4 size. See <i>KPD L Printable Area</i> on page 140. This operator is in userdict.               |
|                       | a4                                 |           | Set imageable area to A4 size. See <i>KPD L Printable Area</i> . This operator is in userdict.                          |
|                       | a4small                            |           | Set imageable area to small A4 size. See <i>KPD L Printable Area</i> on page 140. This operator is in userdict.         |
|                       | b5                                 |           | Set imageable area to B5 size. See <i>KPD L Printable Area</i> on page 140. This operator is in userdict.               |
|                       | dlenvelope<br>(110 x 220 envelope) |           | Set imageable area to International DL size. See <i>KPD L Printable Area</i> on page 140. This operator is in userdict. |
|                       | 11x17                              |           | Set imageable area to 11 x 17 (Ledger) size. See <i>KPD L Printable Area</i> on page 140. This operator is in userdict. |
|                       | legal                              |           | Set imageable area to legal size. See <i>KPD L Printable Area</i> on page 140. This operator is in userdict.            |
|                       | letter                             |           | Set imageable area to letter size. See <i>KPD L Printable Area</i> on page 140. This operator is in userdict.           |
|                       | lettersmall                        |           | Set imageable area to small letter size. See <i>KPD L Printable Area</i> on page 140. This operator is in userdict.     |
|                       | executivepage                      |           | Set imageable area to executive size. See <i>KPD L Printable Area</i> on page 140. This operator is in userdict.        |

Table 7.46. KPDL Status Operators (Sheet 3 of 5)

| Preceding stack | Operator                                 | Result | Description                                                                                                                                                                                                        |
|-----------------|------------------------------------------|--------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                 | com10envelope<br>(4.125 x 9.5 envelope)  |        | Set imageable area to Commercial 10 envelope size. See <i>KPDL Printable Area</i> on page 140. This operator is in userdict.                                                                                       |
|                 | monarcenvelope<br>(3.875 x 7.5 envelope) |        | Set imageable area to Monarch envelope size. See <i>KPDL Printable Area</i> on page 140. This operator is in userdict.                                                                                             |
|                 | com6envelope                             |        | Set imageable area to Commercial 6 envelope size. See <i>KPDL Printable Area</i> on page 140. This operator is in userdict.                                                                                        |
|                 | com9envelope<br>(3.75 x 8.875 envelope)  |        | Set imageable area to Commercial 9 envelope size. See <i>KPDL Printable Area</i> on page 140. This operator is in userdict.                                                                                        |
|                 | a5                                       |        | Set imageable area to A5 size. See <i>KPDL Printable Area</i> on page 140. This operator is in userdict.                                                                                                           |
|                 | a6                                       |        | Set imageable area to A6 size. See <i>KPDL Printable Area</i> on page 140. This operator is in userdict.                                                                                                           |
|                 | b6                                       |        | Set imageable area to B6 size. See <i>KPDL Printable Area</i> on page 140. This operator is in userdict.                                                                                                           |
|                 | b5envelope                               |        | Set imageable area to ISO B5 size. See <i>KPDL Printable Area</i> on page 140. This operator is in userdict.                                                                                                       |
|                 | c4envelope                               |        | Set imageable area to c4 envelope size. See <i>KPDL Printable Area</i> on page 140. This operator is in userdict.                                                                                                  |
|                 | c5envelope                               |        | Set imageable area to International C5 envelope size. See <i>KPDL Printable Area</i> on page 140. This operator is in userdict.                                                                                    |
|                 | custom                                   |        | Set imageable area to custom size. See <i>KPDL Printable Area</i> on page 140. This operator is in userdict.                                                                                                       |
|                 | postcard                                 |        | Set imageable area to postcard size. See <i>KPDL Printable Area</i> on page 140. This operator is in userdict.                                                                                                     |
|                 | doublepostcard                           |        | Set imageable area to double postcard size. See <i>KPDL Printable Area</i> on page 140. This operator is in userdict.                                                                                              |
| bool            | setdefaultduplexmode                     |        | Select whether or not to print in duplex mode as default. (true: duplex, false: simplex)                                                                                                                           |
|                 | defaultduplexmode                        | bool   | Get default duplex mode setting (true: duplex, false: simplex)                                                                                                                                                     |
| bool            | setduplexmode                            |        | Set/cancel duplex mode. (true: duplex, false: simplex)                                                                                                                                                             |
|                 | duplexmode                               | bool   | Get current setting of duplex mode. (true: duplex, false: simplex)                                                                                                                                                 |
| bool            | setdefaulttumble                         |        | Set duplex printing tumble mode for binding on short side (true) or long side (false) of page.                                                                                                                     |
|                 | defaulttumble                            | bool   | Get the default tumble mode setting. (true: short-edge bind, false: long-edge bind)                                                                                                                                |
| bool            | settumble                                |        | Set tumble mode. (true: short-edge bind, false: long-edge bind)                                                                                                                                                    |
|                 | tumble                                   | bool   | Get current tumble mode setting. (true: short-edge bind, false: long-edge bind)                                                                                                                                    |
|                 | firstside                                | bool   | During duplex printing, returns whether the current print side is the front or back. During simplex printing, returns whether the current page is even or odd. (true: front or odd page, false: back or even page) |
| int             | setdefaultpapertray                      |        | Set the default paper tray as:<br>0: tray 1<br>1: tray 2<br>2: envelope feeder<br>3: MP tray (Cassette mode)<br>4: tray 3<br>5: tray 4<br>6: tray 5<br>7: tray 6                                                   |

Table 7.46. KPD L Status Operators (Sheet 4 of 5)

| Preceding stack | Operator             | Result | Description                                                                                                                                                                                          |
|-----------------|----------------------|--------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                 | defaultpapertray     | int    | Get current default paper tray.                                                                                                                                                                      |
| int             | setpapertray         |        | Set current paper tray.                                                                                                                                                                              |
|                 | papertray            | int    | Get current paper tray.                                                                                                                                                                              |
| int             | setpapertray2        |        | Select a tray by converting the tray number that is currently specified by the PRESCRIBE tray number into a KPD L tray number.                                                                       |
|                 | papertray2           | int    | Convert the current tray number into a PRESCRIBE tray number.<br>PRESCRIBE tray numbers<br>0: MP tray<br>1: tray 1<br>2: tray 1<br>3: tray 1<br>4: tray 1<br>5: tray 1<br>6: tray 1<br>99: EF-1/UF-1 |
| bool            | setdefaulttrayswitch |        | Set the default paper tray switch.<br>(true: Autocass, false: Autocass off)                                                                                                                          |
|                 | defaulttrayswitch    | bool   | Get default paper tray switch.<br>(true: Autocass, false: Autocass off)                                                                                                                              |
| bool            | settrayswitch        |        | Set the current paper tray switch.<br>(true: Autocass, false: Autocass off)                                                                                                                          |
|                 | trayswitch           | bool   | Get the current paper tray switch.<br>(true: Autocass, false: Autocass off)                                                                                                                          |
|                 | a4tray               |        | Find tray containing A4 size paper, select it as current tray, and set imageable area for A4 size paper.                                                                                             |
|                 | a5tray               |        | Find tray containing A5 size paper, select it as current tray, and set imageable area for A5 size paper.                                                                                             |
|                 | a6tray               |        | Find tray containing A6 size paper, select it as current tray, and set imageable area for A6 size paper.                                                                                             |
|                 | b5tray               |        | Find tray containing B5 size paper, select it as current tray, and set imageable area for B5 size paper.                                                                                             |
|                 | b6tray               |        | Find tray containing B6 size paper, select it as current tray, and set imageable area for B6 size paper.                                                                                             |
|                 | legaltray            |        | Find tray containing legal size paper, select it as current tray, and set imageable area for legal size paper.                                                                                       |
|                 | lettertray           |        | Find tray containing letter size paper, select it as current tray, and set imageable area for letter size paper.                                                                                     |
|                 | executivetray        |        | Find tray containing executive size paper, select it as current tray, and set imageable area for executive size paper.                                                                               |
|                 | c4envelopetray       |        | Find tray containing International C4 envelopes, select it as current tray, and set imageable area for International C4 envelopes.                                                                   |
|                 | c5envelopetray       |        | Find tray containing International C5 envelopes, select it as current tray, and set imageable area for International C5 envelopes.                                                                   |
|                 | com10envelope-tray   |        | Find tray containing commercial #10 envelopes, select it as current tray, and set imageable area for commercial #10 envelopes.                                                                       |
|                 | com6envelope-tray    |        | Find tray containing commercial #6 envelopes, select it as current tray, and set imageable area for commercial #6 envelopes.                                                                         |
|                 | com9envelope-tray    |        | Find tray containing commercial #9 envelopes, select it as current tray, and set imageable area for commercial #9 envelopes.                                                                         |



Table 7.46. KPD L Status Operators (Sheet 5 of 5)

| Preceding stack | Operator             | Result | Description                                                                                                                                          |
|-----------------|----------------------|--------|------------------------------------------------------------------------------------------------------------------------------------------------------|
|                 | dlenvelopetray       |        | Find tray containing DL size envelopes, select it as current tray, and set imageable area for DL size envelopes.                                     |
|                 | monarcenvelopetray   |        | Find tray containing Monarch size envelopes, select it as current tray, and set imageable area for Monarch size envelopes.                           |
|                 | a3tray               |        | Find tray containing A3 size paper, select it as current tray, and set imageable area for A3 size paper.                                             |
|                 | b4tray               |        | Find tray containing B4 size paper, select it as current tray, and set imageable area for B4 size paper.                                             |
|                 | ledgertray           |        | Find tray containing ledger size paper, select it as current tray, and set imageable area for ledger size paper.                                     |
|                 | b5envelopetray       |        | Find tray containing ISO B5 size paper, select it as current tray, and set imageable area for ISO B5 size paper.                                     |
|                 | doublepostcardtray   |        | Find tray containing double postcard size paper, select it as current tray and set imageable area for double postcard size paper.                    |
|                 | postcardtray         |        | Find tray containing postcard size paper, select it as current tray, and set imageable area for postcard size paper.                                 |
|                 | customtray           |        | Find tray containing custom size paper, select it as current tray, and set imageable area for custom size paper.                                     |
| int             | setdefaultoutputtray |        | Set the default output tray:<br>0: Upper tray (face down tray)<br>1: Lower tray (face up tray)<br>2: Option tray (sorter, etc.)                      |
|                 | defaultoutputtray    | int    | Get the default output tray.                                                                                                                         |
| int             | setoutputtray        |        | Set the current output tray.                                                                                                                         |
|                 | outputtray           | int    | Get the current output tray.                                                                                                                         |
|                 | appletalktype        | string | Get string object designating type of printing system's AppleTalk name according to the AppleTalk Name Binding Protocol.                             |
|                 | doprinterrors        | bool   | Get setting of error information printout mode. (true: error print mode on, false: error print mode off)                                             |
| bool            | setdoautocontinue    |        | Set whether to display messages on front panel and wait for ONLINE key input when an error occurs. (true: do nothing, false: display error messages) |
|                 | doautocontinue       | bool   | Get setting of doautocontinue mode. (true: continue processing during errors, false: halt processing when ON LINE key is pressed)                    |
|                 | dojamrecovery        | bool   | Get setting of dojamrecovery mode. (true: perform jam recovery, false: do not perform jam recovery)                                                  |
|                 | usertime             | int    | Get time elapsed since beginning of job processing.                                                                                                  |
|                 | #copies              | int    | Get integer object indicating current number of copies setting. This operator is in userdict.                                                        |

## KPDL System Parameters

The following table summarizes the system parameters.

Table 7.47. KPDL System Parameters (Sheet 1 of 2)

| Preceding stack | Parameter                     | Result | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|-----------------|-------------------------------|--------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                 | BuildTime                     | int    | Timestamp for printer's date of manufacture                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|                 | ByteOrder                     | bool   | Byte order of binary encoded tokens. (true: low-order byte first, false: high-order byte first)                                                                                                                                                                                                                                                                                                                                                                                                                     |
|                 | CurDisplayList <sup>a</sup>   | int    | Indicate in bytes the memory block size used for storing <i>DisplayList</i> for the current page.                                                                                                                                                                                                                                                                                                                                                                                                                   |
|                 | CurFontCache <sup>a</sup>     | int    | Indicate in bytes the memory size used by the current font cache.                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|                 | CurFormCache <sup>a</sup>     | int    | Indicate in bytes the memory size used by the current form cache.                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|                 | CurOutlineCache <sup>a</sup>  | int    | Indicate in bytes the cache size used by <i>CharString</i> on the current harddisk.                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|                 | CurPatternCache <sup>a</sup>  | int    | Indicate in bytes the memory size used by the current pattern cache.                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                 | CurScreenStorage <sup>a</sup> | int    | Indicate in bytes the memory size used by the current screen.                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|                 | CurSourceList <sup>a</sup>    | int    | Indicate in bytes the host buffer size used by the current input device.                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|                 | CurUPathCache <sup>a</sup>    | int    | Indicate in bytes the memory size used by the current user path cache.                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|                 | DoAutoContinue                | bool   | Turn on/off the front panel display when a KPDL error occurs (true: error display off, false: error display on).                                                                                                                                                                                                                                                                                                                                                                                                    |
|                 | DoPrintErrors                 | bool   | Turn on/off error printing when a KPDL error occurs. (true: error print on, false: error print off)                                                                                                                                                                                                                                                                                                                                                                                                                 |
|                 | DoStartPage                   | bool   | Indicate whether or not to print status at power on as a bool object. (true: print status, false: do not print status)                                                                                                                                                                                                                                                                                                                                                                                              |
|                 | FactoryDefaults               | bool   | Indicate with a boolean object whether to initialize the following parameters at power on (true: initialize, false: do not initialize [factory default]).<br><i>SystemParamsPassword</i><br><i>StartJobPassword</i><br><i>FactoryDefaults</i><br><i>MaxFontCache</i><br><i>MaxDisplayList</i><br><i>MaxScreenStorage</i><br><i>MaxUPathCache</i><br><i>MaxPatternCache</i><br><i>MaxOutlineCache</i><br><i>MaxFormCache</i><br><i>FontResourceDir</i><br><i>GenericResourceDir</i><br><i>GenericResourcePathSep</i> |
|                 | FontResourceDir               | string | Identify the font resource directory on the harddisk. Defaults are in (fonts/).                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|                 | GenericResourceDir            | string | Identify the directory for resources other than fonts on the harddisk. Defaults are in (Resource/).                                                                                                                                                                                                                                                                                                                                                                                                                 |
|                 | GenericResource-PathSep       | string | Specify the separator character used between resource identifiers on the harddisk. Defaults are in (/).                                                                                                                                                                                                                                                                                                                                                                                                             |
|                 | JobTimeout                    | int    | Indicate the default job timeout value.                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|                 | MaxDisplayList                | int    | Indicate the maximum storage of <i>DisplayList</i> for the current page.                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|                 | MaxFontCache                  | int    | Indicate the maximum storage of the font cache.                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|                 | MaxFormCache                  | int    | Indicate the maximum storage of the form cache.                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|                 | MaxOutlineCache               | int    | Indicate the maximum storage of the <i>CharString</i> cache on the disk.                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|                 | MaxPatternCache               | int    | Indicate the maximum storage of the pattern cache.                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|                 | MaxScreenStorage              | int    | Indicate in bytes the maximum storage of the half-tone screen usable by the screen.                                                                                                                                                                                                                                                                                                                                                                                                                                 |

Table 7.47. KPDL System Parameters (Sheet 2 of 2)

| Preceding stack | Parameter             | Result      | Description                                                                                                                                              |
|-----------------|-----------------------|-------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|
|                 | MaxSourceList         | int         | Indicate in bytes the maximum storage of the host buffer used by the current input device.                                                               |
|                 | MaxUPathCache         | int         | Indicate in bytes the maximum storage which can be used by the user path cache.                                                                          |
|                 | PageCount             | int         | Indicate the total number of printed pages since the printer's manufacture.                                                                              |
|                 | Password              | int, string | Indicate the password necessary when changing system parameters and/or device parameters.                                                                |
|                 | PrinterName           | string      | Indicate the name given to the printer.                                                                                                                  |
|                 | RamSize               | int         | Indicate in bytes the total RAM capacity currently in the printer.                                                                                       |
|                 | RealFormat            | string      | Indicate the method of representing the numeric values of binary tokens.                                                                                 |
|                 | Revision              | int         | Indicate the interpreter's revision number.                                                                                                              |
|                 | StartJobPassword      | int, string | Indicate the password for <i>ExitServer</i> and <i>StartJob</i> .                                                                                        |
|                 | StartupMode           | int         | Indicate by numeric value whether to execute the (Sys/Start) file on the harddisk when first booting KPDL after power on. (0: default, 1: use Sys/Start) |
|                 | SystemParams-Password | int, string | Indicate the password for changing system parameters.                                                                                                    |
|                 | WaitTimeout           |             | Indicate the default wait timeout value.                                                                                                                 |
|                 | MaxImageBuffer        | int         | Limit the working area for processing a single image.                                                                                                    |
|                 | MaxStoredFontCache    | int         | Limit the maximum font cache value stored on the disk.                                                                                                   |
|                 | CurStoredFontCache    | int         | Return in bytes the font cache value found on the current disk                                                                                           |

<sup>a</sup> Read only

## KPDL User Parameters

The following table summarizes the user parameters. The user parameters establish temporary policies on functions such as naming the current job for a user.

Table 7.48. KPDL User Parameters

| Preceding stack | Parameter       | Result | Description                                                                                                                                     |
|-----------------|-----------------|--------|-------------------------------------------------------------------------------------------------------------------------------------------------|
|                 | AccurateScreens | bool   | Turn on/off the accurate mode flag for the <i>setscreen</i> operator. (true: detail screen on, false: default)                                  |
|                 | JobName         | string | Return the name of the job currently being processed by the printer.                                                                            |
|                 | JobTimeout      | int    | Return the current job timeout value.                                                                                                           |
|                 | MaxDictStack    | int    | Indicate the maximum size of the dictionary stack.                                                                                              |
|                 | MaxExecStack    | int    | Indicate the maximum size of the execution stack.                                                                                               |
|                 | MaxFontItem     | int    | Indicate the maximum number of bytes used by a pixel array for a single character in the font cache.                                            |
|                 | MaxFormItem     | int    | Indicate the maximum number of bytes used by the form of a single cached form.                                                                  |
|                 | MaxLocalVM      | int    | Indicate the maximum number of bytes of the local VM.                                                                                           |
|                 | MaxOpStack      | int    | Indicate the maximum size of the operand stack.                                                                                                 |
|                 | MaxPatternItem  | int    | Indicate the maximum number of bytes used by the form of a single cached pattern.                                                               |
|                 | MaxScreenItem   | int    | Indicate the maximum number of bytes used by a single half-tone screen.                                                                         |
|                 | MaxUPathItem    | int    | Indicate the maximum number of bytes used by a single cached user path.                                                                         |
|                 | MinFontCompress | int    | Indicate the threshold value for storing characters in the font cache not as complete pixel arrays but in compressed form.                      |
|                 | VMReclaim       | int    | Indicate the automatic garbage collection mode.                                                                                                 |
|                 | VMThreshold     | int    | Indicate the threshold at which automatic garbage collection is executed once this number of bytes has been allocated after garbage collection. |
|                 | WaitTimeout     | int    | Return the current wait timeout value.                                                                                                          |

## KPD L Page Device Parameters

The page device parameters for *setpagedevice* allow manipulating the output devices to receive or provide various finishing operations on the printed outputs. For example, the *OutputType* parameter allows to choose paper stack as follows:

To receive the output pages in the default printer stack:

```
<</OutputType (PRINTER_STACK)>> setpagedevice
```

To receive the output pages in the finisher for stapling:

```
<</OutputType (STAPLER)>> setpagedevice
```

**Table 7.49. KPD L Page Device Parameters (Sheet 1 of 3)**

| Preceding Stack | Parameter         | Result              | Description                                                                                                                                                                                                         |
|-----------------|-------------------|---------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                 | BeginPage         | array               | Indicate <i>BeginPage</i> procedure operations. This parameter is called together with the number of times <i>showpage</i> has executed since the beginning of the page. (default: {pop})                           |
|                 | Duplex            | bool                | Return as a boolean object the current duplex mode. (true: duplex, false: simplex)                                                                                                                                  |
|                 | EndPage           | array               | Indicate <i>EndPage</i> procedure operations. This parameter is called together with the number of times <i>showpage</i> has executed since the end of the page. (default: {exch pop 2 ne})                         |
|                 | ExitJamRecovery   | bool                | Return as a boolean value whether to perform recovery when a paper jam occurs. (Read only) [true]                                                                                                                   |
|                 | HWRResolution     | array               | Indicate the resolution of the physical device. (300dpi: [300 300], 600dpi: [600 600], 1200dpi: [1200 1200])                                                                                                        |
|                 | ImagingBBox       | array               | Specify any bounding box for the entire page. (default: null)                                                                                                                                                       |
|                 | InputAttributes   | dict                | Indicate the dictionary associated with a currently available input device (paper tray) using the number assigned to each.                                                                                          |
|                 | Install           | array               | Execute the procedure for installing values during graphics mode when calling the <i>setpagedevice</i> operator.                                                                                                    |
|                 | ManualFeed        | bool                | Set whether to perform manual feed. (true: MF on)                                                                                                                                                                   |
|                 | ManualFeedTimeout | int                 | Return the manual feed timeout. (Read only) [0]                                                                                                                                                                     |
|                 | Margins           | array               | Set the printer margins. (default: [0 0])                                                                                                                                                                           |
|                 | MediaColor        | string              | Use this parameter along with <i>/PageSize</i> , <i>/MediaWeight</i> , and <i>/MediaType</i> when the user selects a tray.                                                                                          |
|                 | MediaType         | string <sup>a</sup> | Use this parameter along with <i>/PageSize</i> , <i>/MediaWeight</i> , and <i>/MediaColor</i> when the user selects a tray. For details on media type, see footnote below.                                          |
|                 | MediaWeight       | int                 | Use this parameter along with <i>/PageSize</i> , <i>/MediaType</i> , and <i>/MediaColor</i> when the user selects a tray.                                                                                           |
|                 | NumCopies         | int                 | Set the current copy count. Normally null; when null is specified here, <i>#copies</i> in <i>userdict</i> takes precedence.                                                                                         |
|                 | OutputAttributes  | dict                | Indicate the dictionary containing media output entries available for the current output device (printer output tray, sorter, etc.).                                                                                |
|                 | OutputFaceUp      | bool                | Set the printer's output stack. (true: face up, false: face down)                                                                                                                                                   |
|                 | OutputType        | string              | Indicate parameters set by the user when selecting the output stack. See example below.                                                                                                                             |
|                 | PageSize          | array               | Use this parameter along with <i>/MediaColor</i> , <i>/MediaWeight</i> , and <i>/MediaType</i> when the user selects a tray. Refer to <i>KPD L Printable Area</i> on page 140 (Ex: [612 792] LETTER, [595 842] A4). |

Table 7.49. KPD L Page Device Parameters (Sheet 2 of 3)

| Preceding Stack | Parameter                    | Result | Description                                                                                                                                                                                                                                                          |
|-----------------|------------------------------|--------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                 | Policies                     | dict   | Execute the policies function. This is checked when the device cannot satisfy the user-specified <i>setpagedevice</i> .                                                                                                                                              |
|                 | PostRendering-Enhance        | bool   | Turn on/off KIR mode. (true: KIR on, false: KIR off)                                                                                                                                                                                                                 |
|                 | PostRendering-EnhanceDetails | dict   | Set the dictionary representing the KIR mode when <i>PostRenderingEnhance</i> is true.                                                                                                                                                                               |
|                 | SorterDetails <sup>b</sup>   | dict   | Set the dictionary object for current sorter status information.                                                                                                                                                                                                     |
|                 | TraySwitch                   | bool   | Set the current auto cassette (mode status) using a boolean value.<br>(true: Autocass, false: Autocass off)                                                                                                                                                          |
|                 | Tumble                       | bool   | Set the current tumble mode using a boolean value.<br>(true: shortedge, false: longedge)                                                                                                                                                                             |
|                 | DeferredMedia-Selection      | bool   | Define using a boolean object the processing when the page size selected during page setup differs from the paper size of the tray.<br>(true: display cassette error)                                                                                                |
|                 | ProcessColorModel            | name   | Return the engine type as a name object.<br>/Device Gray: Monochrome<br>/Device CMY: Three colors<br>/Device CMYK: Four colors                                                                                                                                       |
|                 | MediaPosition                | int    | Set the tray corresponding to the specified number as the current tray.                                                                                                                                                                                              |
|                 | OutputPage                   | bool   | Set whether to output paper.<br>(true: default, false: no output paper)                                                                                                                                                                                              |
|                 | Collate                      | bool   | Turn on/off the collate function.<br>(true: electric collate on (only when harddisk is installed))                                                                                                                                                                   |
|                 | CollateDetails               | dict   | Control the detailed parameters of the collate function. See <i>CollateDetails Parameters</i> on page 138.                                                                                                                                                           |
|                 | Fold                         | int    | Fold booklet pages. (DF-75 finisher)<br>0: Do not fold<br>3: Fold                                                                                                                                                                                                    |
|                 | FoldDetails                  | dict   | Control the detailed parameters of folding. See <i>FoldMode</i> and <i>FoldCount</i> below.                                                                                                                                                                          |
|                 | FoldMode                     | int    | 1: Fold/staple booklet pages                                                                                                                                                                                                                                         |
|                 | FoldCopy                     | int    | Control the number of pages to be folded.<br>0: Do not fold the pages whose number exceeds the maximum<br>-1: Fold the rest of the pages whose number exceeds the maximum<br>2: Fold every two pages<br>3: Fold every three pages<br>...<br>10: Fold every ten pages |
|                 | Jog                          | int    | Jog the output every n pages as given by the integer code.<br>0: Do not jog<br>3: Jog using the given jog offset (only when optional stacker is installed)                                                                                                           |
|                 | Staple                       | int    | Staple the output every n pages as given by the integer code.<br>0: Do not staple<br>3: Staple when job is finished                                                                                                                                                  |
|                 | StapleDetails <sup>c</sup>   | dict   | Control the detailed parameters of the staple function.                                                                                                                                                                                                              |
|                 | EconoMode                    | bool   | Control Econoprint mode.<br>true: Econoprint on<br>false: Econoprint off                                                                                                                                                                                             |
|                 | Punch <sup>d</sup>           | int    | Punch output pages. (DF-71/DF-75)<br>0: Do not punch<br>3: Punch when a set of job is printed.                                                                                                                                                                       |
|                 | PunchDetails                 | dict   | Controls the detailed parameters of the punch. See <i>PunchMode</i> below.                                                                                                                                                                                           |

Table 7.49. KPD L Page Device Parameters (Sheet 3 of 3)

| Preceding Stack | Parameter                | Result | Description                                                                                                                                                                                                                                                                                                               |
|-----------------|--------------------------|--------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                 | PunchMode                | int    | Punch using sub style. (DF-71)<br>1: Native style of punching<br>2: Sub style                                                                                                                                                                                                                                             |
|                 | SlipSheet                | int    | Insert transparency separator.<br>0: No separator<br>3: Insert a separator when a set of job is printed.                                                                                                                                                                                                                  |
|                 | SlipSheetDetails         | dict   | Control the detailed parameters of punching. See CopyMode below.                                                                                                                                                                                                                                                          |
|                 | CopyMode                 | int    | Print on transparency separator.<br>1: Do not print on separator<br>2: Print on separator                                                                                                                                                                                                                                 |
|                 | PreRenderingEnhance      | bool   | Control resolution enhancement.<br>When /HWResolution is set to 600 dpi.<br>true: Fast 1200dpi<br>false: 600dpi                                                                                                                                                                                                           |
|                 | DeviceRenderingVividInfo | dict   | Model FS-5900C only. Control vivid color mode.<br>Ex: << /DeviceRenderingVividInfo <<<br>/VividColor bool >> >> setpagedevice<br>bool (true: Vivid mode on, false: Vivid mode off)                                                                                                                                        |
|                 | DeviceRenderingRGBInfo   | dict   | Controls RGB emulation.<br>Ex: << /DeviceRenderingRGBInfo <<<br>/VirtualColorDevice << /ColorTransform name >><br>>> >> setpagedevice<br>name<br>/sRGB<br><< /DeviceRenderingRGBInfo <<<br>/VirtualColorDevice null >> >> setpagedevice<br>RGB emulation is not performed.                                                |
|                 | DeviceRenderingCMYKInfo  | dict   | Controls ink simulation.<br>Ex: << /DeviceRenderingCMYKInfo <<<br>/VirtualColorDevice << /ColorTransform name >><br>>> >> setpagedevice<br>name<br>/SWOP<br>/EURO<br>/Normal: Normal ink simulation<br><< /DeviceRenderingCMYKInfo <<<br>/VirtualColorDevice null >> >> setpagedevice<br>Does not perform ink simulation. |

<sup>a</sup> Available media type strings are as follows:

(Plain)  
(Transparency)  
(Preprinted)  
(Labels)  
(Bond)  
(Recycled)  
(Vellum)  
(Rough)  
(Letterhead)  
(Color)  
(Prepunched)  
(Envelope)  
(Card Stock)  
(CoatedPaper)  
(Duplex)  
(Custom Type1)  
(Custom Type2)  
(Custom Type3)  
(Custom Type4)  
(Custom Type5)  
(Custom Type6)  
(Custom Type7)  
(Custom Type8)

- b *SorterDetails* can specify tray arrangement and sorter operation mode as the following example:  
`<< /SorterDetails << /SorterTray[1 2]/SorterMode(SORTER)>> >>`  
`setpagedevice`  
 Tray arrangement array of [1 2] specifies tray 1 and tray 2 to be used. If tray numbers are omitted ([ ]), all trays are used. Sorter mode string of (SORTER) specifies sorter mode. Other options include (COLLATOR) and (MAILBOX).
- c A typical *StapleDetails* sequence is as follows. To staple each 20 pages at position 3 on the page:  
`<< /Staple 3 /StapleDetails << /StaplePosition 3 /Count 20 >> >>`  
`setpagedevice`
- d To punch in sub style, use the following example:  
`<< /Punch 3 /PunchDetails << /PunchMode 2 >> >>` `setpagedevice`

## CollateDetails Parameters

*CollateDetails* has the following parameters as tabled below according to the key of operations. By making */Collate* true, *CollateDetails* enables the printing system to implement the e-MPS function according to the keys explained in the following table.

Table 7.50. *CollateDetails* Parameters

| Key              | Type    | Meaning                                                          | Parameters                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | default |
|------------------|---------|------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|
| /Mode            | integer | Job mode                                                         | 0: HP Mopier mode/Job retention<br>1: Volatile job<br>2: Nonvolatile job<br>8: VirtualMailbox job                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 0       |
| /Type            | integer | Job Retention enable                                             | 8: Enable Job Retention                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | —       |
| /Hold            | integer | Job Retention mode                                               | 1: QuickCopy<br>2: Stored job<br>3: Proof and Hold                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | —       |
| /HoldType        | integer | Job Retention security                                           | 0: No security<br>1: Security with PIN code                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 0       |
| /HoldKey         | integer | PIN code                                                         | Number of 4 bytes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | —       |
| /Barcode         | integer | Barcode output                                                   | 0: Output on first page<br>1: Output on all pages<br>2: Do not output                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 2       |
| /BarcodePosition | integer | Barcode printing position<br>(viewed in portrait<br>orientation) | 0: Lower right (bar only)<br>1: Lower right perpendicular (bar only)<br>2: Upper right perpendicular (bar only)<br>3: Upper right (bar only)<br>4: Upper left (bar only)<br>5: Upper left perpendicular (bar only)<br>6: Lower left perpendicular (bar only)<br>7: Lower left (bar only)<br>128: Lower right (bar + ID)<br>129: Lower right perpendicular (bar + ID)<br>130: Upper right perpendicular (bar + ID)<br>131: Upper right (bar + ID)<br>132: Upper left (bar + ID)<br>133: Upper left perpendicular (bar + ID)<br>134: Lower left perpendicular (bar + ID)<br>135: Lower left (bar + ID) | 0       |
| /Share           | integer | Share flag                                                       | 0: Shared<br>1: Not shared                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 0       |
| /Name            | string  | Job name                                                         | Character string up to 31 bytes maximum                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | ()      |
| /User            | string  | User name                                                        | Character string up to 31 bytes maximum                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | ()      |
| /Time            | string  | Time stamp                                                       | Character string up to 31 bytes maximum                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | ()      |
| /Destination     | array   | VMB destination                                                  | —                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | []      |

## Programming with CollateDetails for Job Retention

*CollateDetails* enables the printing system to implement the e-MPS Job Retention function in KPDLe mode. The */Mode* key must be set to true for all of these functions. The



keys to the CollateDetails parameter should have the following integer values depending on the mode of each e-MPS function.

*Table 7.51. Enabling e-MPS Functions*

| e-MPS                  | /Collate | /CollateDetails << >> |       |       |            |          |
|------------------------|----------|-----------------------|-------|-------|------------|----------|
|                        |          | /Mode                 | /Type | /Hold | /Hold-Type | /HoldKey |
| Electronic sorting     | true     | 0                     |       | 0     |            |          |
| Temporary job storage  | true     | 1                     |       |       |            |          |
| Permanent job storage  | true     | 2                     |       |       |            |          |
| Virtual mailbox        | true     | 8                     |       |       |            |          |
| QuickCopy              | true     | 0                     | 8     | 1     | 0          |          |
| QuickCopy (Private)    | true     | 0                     | 8     | 1     | 1          | (1234)   |
| Proof and Hold         | true     | 0                     | 8     | 3     |            |          |
| Stored job             | true     | 0                     | 8     | 2     | 0          |          |
| Stored job—PIN secured | true     | 0                     | 8     | 2     | 1          | (1234)   |

*Examples:*

To post a print job into the virtual mailbox aliased Robert, a typical CollateDetails sequence of parameters will be as follows:

```
<< /Collate true /CollateDetails << /Mode 8
/destination [(Robert)]>> setpagedevice
```

## KPDL Error Messages

Depending on the setting of the *doautocontinue* parameter, the printing systems having the operator display display errors occurring during operation in the KPDL mode as follows.

|                                   |
|-----------------------------------|
| KPDL Error ##<br>.. Press ON LINE |
|-----------------------------------|

Any of the following error codes will appear if errors occur and *doautocontinue* is set to false. When *doautocontinue* is set to true, only error codes 00 and 98 are available. These error codes are also reported from the printer to the computer. Some software will display these error names on the computer screen.

*Table 7.52. KPDL Error Messages*

| Code | Error              | Meaning                                                   |
|------|--------------------|-----------------------------------------------------------|
| 00   |                    | Cannot initiate KPDL                                      |
| 01   | dictfull           | Dictionary full; no new entries can be added              |
| 02   | dictstackoverflow  | Too many begins                                           |
| 03   | dictstackunderflow | Too many ends                                             |
| 04   | execstackoverflow  | Execution stack nesting depth exceeded 250                |
| 05   | handle             | Name of error-reporting procedure                         |
| 06   | interrupt          | Control-C was received                                    |
| 07   | invalidaccess      | Attempted violation of access attribute                   |
| 08   | invalidexit        | Exit not enclosed in any loop                             |
| 09   | invalidfile        | Invalid access string for file operator                   |
| 10   | invalidfont        | Invalid font name or invalid font dictionary format       |
| 11   | invalidrestore     | Restore would destroy composite object created after save |

Table 7.52. KPDL Error Messages

| Code | Error              | Meaning                                                      |
|------|--------------------|--------------------------------------------------------------|
| 12   | ioerror            | Input/output error                                           |
| 13   | limitcheck         | Path too complex, more than 6 files open, etc.               |
| 14   | nocurrentpoint     | No current point is defined                                  |
| 15   | rangecheck         | Operand out of allowed range                                 |
| 16   | stackoverflow      | Operand stack overflow                                       |
| 17   | stackunderflow     | Operand stack underflow                                      |
| 18   | syntaxerror        | Syntax error in program                                      |
| 19   | timeout            | Time limit exceeded                                          |
| 20   | typecheck          | Wrong type of operand                                        |
| 21   | undefined          | Name not found in dictionary                                 |
| 22   | undefinedfilename  | File cannot be found                                         |
| 23   | undefinedresult    | Overflow, underflow, or meaningless result                   |
| 24   | unmatchedmark      | Expected mark not found on stack                             |
| 25   | unregister         | Internal error                                               |
| 26   | vmerror            | Virtual memory is exhausted, or illegal access was attempted |
| 27   | badpassword        | Bad password                                                 |
| 28   | invalidnumber      | Invalid number                                               |
| 29   | nomemory           | Memory unavailable                                           |
| 30   | configurationerror | <i>Setpagedevice</i> request cannot be satisfied             |
| 31   | invalidcontext     | Improper use of context operation                            |
| 32   | invalidid          | Invalid identifier for external object                       |
| 33   | undefinedresource  | Resource instance not found                                  |
| 98   | fatal              | Fatal error (User memory exhausted)                          |

## KPDL Printable Area

This printing system does not quite print to the edges of the paper. The edge limits of the printable area vary depending on the paper type as determined by the paper type KPDL operator. The edge limits are located as shown in the following figure and table. They adjust automatically to the size of the paper cassette (although not to the size of manually fed paper).

Figure 7.53. Printable Area

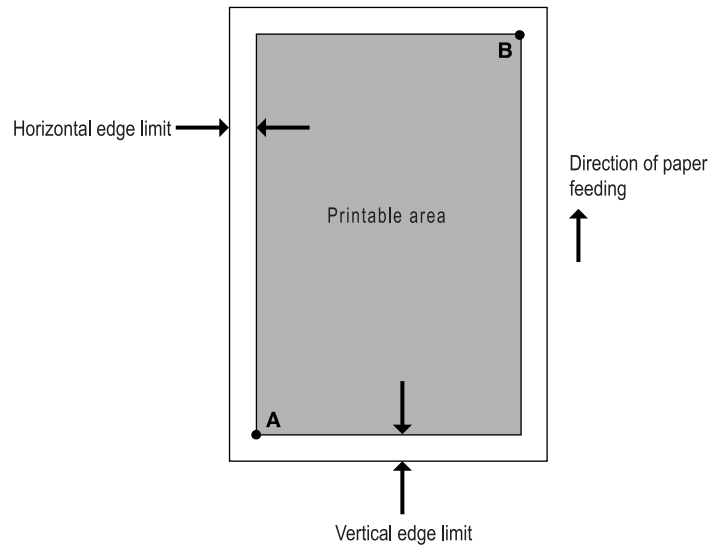


Table 7.54. Paper Sizes and Printable Area

| Paper type            | Paper size    |                        | Edge limits (A above) |     |          |     | Printable area (B above) |            |
|-----------------------|---------------|------------------------|-----------------------|-----|----------|-----|--------------------------|------------|
|                       |               |                        | Horizontal            |     | Vertical |     |                          |            |
|                       | cm            | Points                 | cm                    | Pt. | cm       | Pt. | cm                       | Pt.        |
| A3 <sup>a</sup>       | 29.7 x 42.0   | 842 x 1191             | 0.42                  | 12  | 0.35     | 10  | 28.85 x 41.31            | 818 x 1171 |
| B4 <sup>a</sup>       | 25.7 x 36.4   | 728 x 1032             | 0.42                  | 12  | 0.35     | 10  | 24.83 x 35.70            | 704 x 1012 |
| A4                    | 21.0 x 29.7   | 595 x 842              | 0.42                  | 12  | 0.35     | 10  | 20.14 x 28.99            | 571 x 822  |
| A4 Small              | 21.0 x 29.7   | 595 x 842              | 0.875                 | 25  | 0.875    | 25  | 19.22 x 27.94            | 545 x 792  |
| A5                    | 14.8 x 21.0   | 421 x 595              | 0.42                  | 12  | 0.35     | 10  | 14 x 20.28               | 397 x 575  |
| A6                    | 10.5 x 14.8   | 297 x 421              | 0.42                  | 12  | 0.35     | 10  | 9.63 x 14.14             | 273 x 401  |
| B5                    | 18.2 x 25.7   | 516 x 729              | 0.74                  | 21  | 0.35     | 10  | 16.72 x 25.01            | 474 x 709  |
| B6                    | 12.8 x 18.2   | 364 x 516              | 0.42                  | 12  | 0.35     | 10  | 11.99 x 17.49            | 340 x 496  |
| Int'l DL              | 11.0 x 22.0   | 312 x 624              | 0.42                  | 12  | 0.35     | 10  | 10.16 x 21.3             | 288 x 604  |
| Int'l B5              | 17.6 x 25.0   | 499 x 708              | 0.42                  | 12  | 0.42     | 12  | 16.75 x 24.13            | 475 x 684  |
| Int'l C4 <sup>a</sup> | 22.9 x 32.4   | 649 x 919              | 0.42                  | 12  | 0.35     | 10  | 22.0 x 31.7              | 625 x 899  |
| Int'l C5              | 16.2 x 22.9   | 459 x 649              | 0.42                  | 12  | 0.35     | 10  | 15.34 x 22.18            | 435 x 629  |
| Double-postcard       | 14.8 x 20.0   | 421 x 595 <sup>b</sup> | 0.42                  | 12  | 0.49     | 14  | 14.00 x 20.00            | 397 x 567  |
|                       |               | 420 x 567 <sup>a</sup> | 0.35                  | 10  | 0.35     | 10  | 14.11 x 19.30            | 400 x 547  |
| Postcard              | 10 x 14.8     | 297 x 421 <sup>b</sup> | 0.46                  | 13  | 0.35     | 10  | 9.56 x 14.14             | 271 x 401  |
|                       |               | 283 x 420 <sup>a</sup> | 0.35                  | 10  | 0.35     | 10  | 9.28 x 14.11             | 263 x 400  |
| Ledger <sup>a</sup>   | 11 x 17       | 792 x 1224             | 0.16                  | 12  | 0.11     | 8   | 10.68 x 16.78            | 768 x 1208 |
| Legal                 | 8.5 x 14      | 612 x 1008             | 0.16                  | 12  | 0.11     | 8   | 8.18 x 13.78             | 588 x 992  |
| Letter                | 8.5 x 11      | 612 x 792              | 0.16                  | 12  | 0.11     | 8   | 8.18 x 10.78             | 588 x 776  |
| Ltr Small             | 8.5 x 11      | 612 x 792              | 0.35                  | 25  | 0.35     | 25  | 7.8 x 10.3               | 562 x 742  |
| Executive             | 7.25 x 10.5   | 522 x 756              | 0.16                  | 12  | 0.11     | 8   | 6.93 x 10.28             | 498 x 740  |
| Com. #10              | 4.125 x 9.5   | 297 x 684              | 0.16                  | 12  | 0.11     | 8   | 3.79 x 9.28              | 273 x 668  |
| Monarch               | 3.875 x 7.5   | 279 x 540              | 0.16                  | 12  | 0.11     | 8   | 3.555 x 7.28             | 255 x 524  |
| Com. #6               | 3.625 x 6.5   | 261 x 468              | 0.16                  | 12  | 0.11     | 8   | 3.29 x 6.28              | 237 x 452  |
| Com. #9               | 3.875 x 8.875 | 279 x 639              | 0.16                  | 12  | 0.11     | 8   | 3.54 x 8.666             | 255 x 623  |
| Custom <sup>a</sup>   | 11.7 x 17.7   | 842 x 1274             | 0.11                  | 8   | 0.11     | 8   | 11.47 x 17.47            | 826 x 1258 |

<sup>a</sup> For A3/ledger models.<sup>b</sup> For A4/letter models.

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