23 The Character Group

Introduction

When you create an HP-GL/2 graphic and want to add text, you can either enter PCL mode to add text to your image or you can print text from within HP-GL/2 mode. If this is your first experience with HP-GL/2, you should know that the term “label” is used throughout this chapter to indicate the printing of text. This chapter discusses the various ways you can “label” your images using the printer’s vector graphics commands.

The information in this chapter enables you to perform the following:

- Position and print labels using any LaserJet font.
- Change label size, slant, and direction.
- Designate and select standard and alternate fonts.
- Print with proportional- and fixed-spaced fonts.
- Work with the character cell.

The following commands are described in this chapter:

Table 23-1 The Character Group Commands

Command	Summary
AD, Alternate Font Definition	Specifies an alternate font for labeling.
CF,Character Fill Mode	Specifies how outline fonts are rendered.
CP,Character Plot	Moves the pen the specified number of character cells from the current pen location.
DI,Absolute Direction	Specifies the slope of labels independent of P1 and P2 locations.

Table 23-1 The Character Group Commands (continued)

DR,Relative Direction	Specifies the slope of labels relative to P1 and P2 locations.
DT,Define Label Terminator	Defines the character or code that ‘turns off’ labeling.
DV,Define Variable Text Path	Specifies the label path as right, left, up, or down.
ES,Extra Space	Increases or reduces space between label characters and lines.
FI,Select Primary Font	Selects as standard a font previously assigned a PCL *font ID* number.
FN,Select Secondary Font	Selects as alternate a font previously assigned a PCL *font ID* number.
LB, Label	Prints text using the currently selected font.
LO, Label Origin	Positions labels relative to the current pen location.
SA, Select Alternate Font	Selects the font designated by AD for labeling.
SB, Scalable or Bitmap Fonts	Specifies the type of fonts to be used for labels.
SD, Standard Font Definition	Specifies the standard font for labeling.
SI, Absolute Character Size	Specifies an absolute character size (in centimeters).
SL, Character Slant	Specifies the slant at which labels are printed.
SR, Relative Character Size	Specifies the size of characters as a percentage of the P1/P2 distance.
SS, Select Standard Font	Selects the font designated by SD for labeling.

Table 23-1 The Character Group Commands (continued)

TD, Transparent Data	Specifies whether control characters perform their function or are printed as characters when printing text.

Printing Labels

Use the Label command (LB) to create text charts or to emphasize areas of a diagram or graph that need special attention or explanation. You can control almost all aspects of the label's appearance: its position, size, slant, spacing, and direction. All labels are drawn using the font currently designated (refer to the SD or AD commands) and selected for use (refer to the SS or SA commands).

If you are using a font other than the default, use SD (Standard Font Definition) or AD (Alternate Font Definition) commands to designate a font that can be selected. Then, use the SS (Select Standard Font) or SA (Select Alternate Font) commands to select the designated font. You can follow the LB (Label) command with virtually any characters, including non-printing control codes, such as a Line Feed or Carriage Return.

Note Symbol mode is a special case of a Label.

At the end of a label, you must use a special label terminator to signify the end of text. The default terminator is the ASCII end-of-text character ETX (decimal code 03), or you can define a terminator using the DT command. Without the label terminator in place, your printer continues to label your picture with all subsequent HP-GL/2 commands and parameters.

The following example demonstrates printing a simple label using the SD command to designate a font, the SS command to select that font, the DT command to define a label terminator, and the LB command to print the label, including Carriage Returns and Line Feeds.

Note In the examples in this chapter, the left column identifies the command sequence data for the plot. If the label command text is too wide for the column width, is it continued on a second line (which might indicate a Carriage Return in the text). In actual use, the text should be presented on one line, with no carriage-returns. If a Carriage Return is required in the example, it is indicated as "*CR-LF*."

Table 23-2 Example: Printing Labels

$^{E}_{C}$E	Reset the printer.
$^{E}_{C}$%0B	Enter HP-GL/2 mode.
IN;	Initialize HP-GL/2 mode.
SP1;	Select pen number 1. Even though there is no physical pen, the SP command must be used to enable printing.
PA1500,2500;	Specify absolute plotting and move to (1500,2500).
SD1,21,2,1,4,25, 5,1,6,0,7,52;	Designate the 25-point Univers Italic font as the standard font.
DT*,1;	Define the asterisk character as the label terminator (the 1 indicates the terminator shouldn't be printed).
SA;	Select the alternate font for printing. Since an alternate font hasn't been designated, the default 11.5-point Stick font is selected.
LBThis is the Stick Font Default) *CR-LF CR-LF* *;	Print the first line of text, followed by two Carriage Returns and two Line Feed control codes. Notice how the asterisk terminates the label.
SS;	Select the standard font.
LBThis is Univers Italic*;	Print the next line of text in the newly specified font.
$^{E}_{C}$%0A	Enter the PCL mode.
$^{E}_{C}$E	Send a reset to end the job and eject the page.

Figure 23-1

Moving to the Carriage Return Point

When you begin labeling, the current pen location is the Carriage Return point (the beginning of your line of text is the point at which the pen is “returned” when a Carriage Return control code is sent to the printer). When the printer encounters a Character Plot (CP) command, or a Carriage Return control code within a Label command, the pen moves to the Carriage Return point, adjusted up or down by any line feeds. (The Character Plot command is described later in this chapter.)

The following commands update the Carriage Return point to the current pen location:

Table 23-3 Commands Updating Carriage Return Point to Current Location

Mnemonic	Command Name[1]
AA	Arc Absolute
AR	Arc Relative
AT	Absolute Arc (Three Point)
BZ	Bezier Absolute
BR	Bezier Relative
DF	Default Values
DI	Absolute Direction
DR	Relative Direction

Table 23-3 Commands Updating Carriage Return Point to Current Location (continued)

DV	Define Variable Text Path
IN	Initialize
LO	Label Origin
PA	Plot Absolute
PE	Polyline Encoded
PR	Plot Relative
RO	Rotate Coordinate System
RT	Relative Arc (Three Point)

1. A PD or PU command **with parameters** also updates the Carriage Return point. The CP command with a nonzero lines parameter updates the Carriage Return point's vertical location.

The Label (LB) command does not update the Carriage Return point to the current pen location, but continues labeling from the current pen location. This feature allows you to issue several label commands that write one long label and still use a Carriage Return to get to the beginning of the entire label.

Control Codes

You can effectively use the following control characters in labels. All other control codes are ignored.

Table 23-4 Commands Updating Carriage Return Point to Current Location

Control Code	**DecimalCode**
Backspace	8
Horizontal tab	9
Line feed	10
Carriage return	13
Shift Out[1]	14

Table 23-4 Commands Updating Carriage Return Point to Current Location (continued)

Shift In[2]	15
Space	32

1. Equivalent to Select Alternate Font (SA) command.
2. Equivalent to Select Standard Font (SS) command.

Default Label Conditions

The following label default conditions are established when the printer is initialized, or set to default conditions. To change these settings, refer to the appropriate chapter or command.

- **Symbol Set (Character Set)** — Roman-8.
- **Font Spacing** — Fixed.
- **Pitch** — 9 characters per inch.
- **Height** — 11.5 point.
- **Posture** — Upright.
- **Stroke Weight** — Medium.
- **Typeface** — HP-GL/2 Stick.
- **Label terminator** — ASCII end-of-text character ETX (decimal code 3). Refer to the Define Label Terminator (DT) command.
- **Label starting point** — Current pen location (LO1). Refer to the Label Origin (LO) command.
- **Label direction** — Horizontal. Refer to the DI, DR, and DV commands.
- **Space between characters and lines** — Normal (no extra space). Refer to the Extra Space (ES) command.
- **Character Slant** — None (vertical). Refer to the Character Slant (SL) command.
- **Character Fill Mode** — Solid fill, no edging.

Enhancing Labels

You can enhance your labels by changing such aspects as the character size and slant, the space between characters and lines, and the orientation and/or placement of the label on the page. To effectively use these enhancements you should understand the properties of the character cell. Refer to “Working with the Character Cell” later in this chapter.

Character Size and Slant

You can change the size of the characters using the Absolute Character Size and the Relative Character Size (SI and SR) commands. The Absolute Character Size (SI) command establishes the nominal character width and CAP height in centimeters and maintains this character size independent of the location of P1 and P2 or the page size. The Relative Character Size (SR) establishes the nominal character width and CAP height as a percentage of the distance between P1 and P2. Subsequent changes in the location of P1 and P2 cause the character size to change with the SR command. Changing the character size changes the size of the CP (Character Plot) cell and proportionally changes the line width used in labels (refer to AD and SD).

Note When the Shift In (SI) or Shift Out (SO) control codes are used to select a font, the font size reverts to that font specified using the AD or SD commands.

You can use the Character Slant (SL) command to slant the characters at a specified angle in either direction from the left vertical side of the CP (Character Plot) cell. The CP cell is not altered.

Character Spaces and Text Lines

You can use the Extra Space (ES) command to automatically increase or decrease spaces between all characters or lines. For example, ES can be used to increase space between every character in a label such as, M E M O R A N D U M), or to increase or decrease space between every line of text (such as double-spacing).

You can use the Character Plot (CP) command to move the pen a specific number of lines or spaces (character cells) from the current pen location. Use the CP command, for example, to indent a label a certain number of spaces.

Label Orientation and Placement

You can place your labels anywhere on the page in any orientation. The Absolute Direction (DI) command specifies the angle at which you want to print the characters, independent of the location of P1 and P2. The Relative Direction (DR) command specifies the angle at which you want to print the characters as a function of the P1 and P2 distance; thus when you change P1 and P2, the label angle changes to maintain the same orientation.

The DI and DR commands allow you to print text at any angle with the letters in their normal side-by-side orientation.

Figure 23-2 Label Orientation and Direction

Note Bit map characters are always printed orthogonally to the page (refer to Figure 23-17). Scalable characters print in the direction specified.

The Define Variable Text Path (DV) command allows you to specify the text path (right, left, up, or down) and the direction of Line Feeds with respect to the text path.

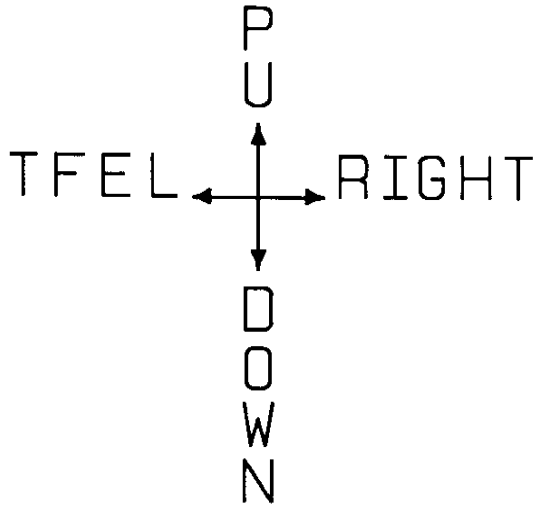


Figure 23-3 Define Variable Text Path Command

The Label Origin (LO) command simplifies placing labels on a drawing. Normally, the first character origin is the current pen location when the Label command is issued. The LO command allows you to specify that the label be centered and/or right- or left-justified from the current pen location. For example, the following illustration shows four centered lines of text.

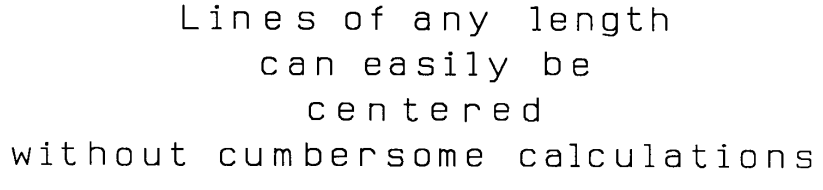


Figure 23-4 Label Origin Command

These lines use one (X,Y) coordinate pair, one LO command to center labels, and a Carriage Return and Line Feed after each line. Without this command, an alternative method would involve calculating the length of the line in CP (Character Plot) cells, dividing by two, and using the CP command to ‘Backspace’ the required number of cells. The LO command saves calculation, decreases the number of characters sent to the printer, and allows you to take advantage of proportional fonts when the character widths are not known to the software.

Terminating Labels

LB tells the printer to print every character following the command, rather than interpreting the characters as graphics commands. In order to allow the normal terminator, the semicolon (;), to be used in text, the command is defined so that you must use the special ‘print label terminator mode’ to tell the printer to once again interpret characters as graphics commands. (If the command had been defined otherwise, you wouldn’t be able to print semicolons in your text.)

The default label terminator is the non-printing ASCII end-of-text character ETX (decimal code 3). You must use the label terminator, or the printer prints the rest of your file as text instead of executing the commands. You can change the label terminator using the Define Label Terminator (DT) command.

Working with the Character Cell

In each font, the basis for each character or space is the character cell. Think of the character cell as a rectangular area around a character that includes blank areas above and to the right of the character. Refer to the Figure 23-5.

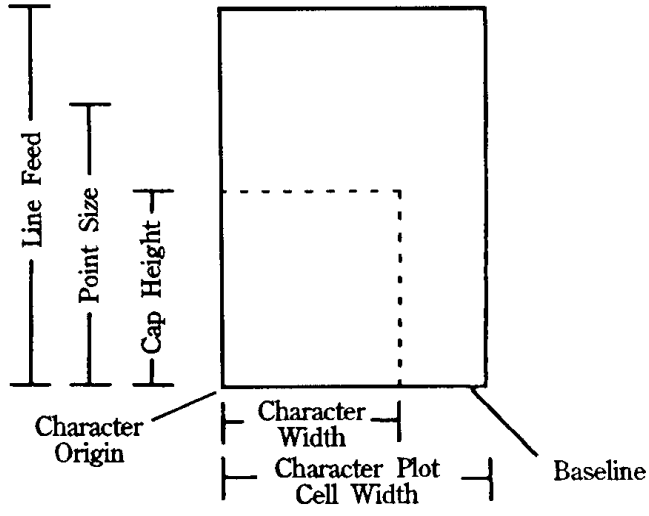


Figure 23-5 The Character Cell and HP-GL/2

Table 23-5

Term	Description
Baseline	The imaginary line on which a line of text rests. A character's descender (such as the bottom of a lowercase "g") extends below the baseline.
Linefeed	The distance from the baseline of a line of text to the baseline of the next character line above or below. For most fonts, the linefeed is about 1.2 times the point size (1.33 times the point size for Stick fonts).
Point Size	Traditional character measure roughly equivalent to the height of a capital letter M plus the depth of a descender.

Table 23-5 (continued)

Cap Height	The distance from the baseline to the top of a capital letter.
Character Origin	The point at which the baseline meets the left edge of the character cell.
Character Width	The lateral area allocated for character rendering.
Character Plot (CP) Cell Width	The distance from the left edge of one character to the beginning of the next character.
Character Plot (CP) Cell	A rectangular area with the height of a linefeed and a width extending from the beginning of one character to the beginning of the next.

The printer implements the following different types of fonts:

- Scalable outline font
- Bitmap font
- HP-GL/2 Stick and Arc font

These are described in more detail in “Using Fonts” later in this chapter. Figure 23-6 and Figure 23-7 show each type of font in relation to its character cell.

Note Proportional fonts do not actually have a fixed character “cell.” The width occupied by each character depends on the character’s shape.

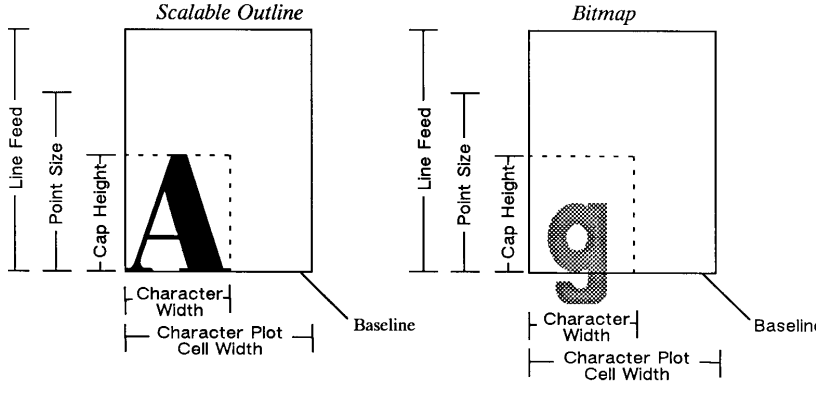


Figure 23-6 Scalable and Bitmap Character Cell

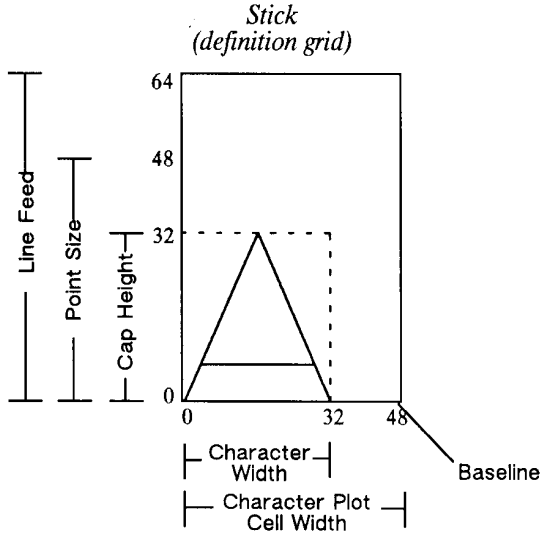


Figure 23-7 Stick Font Character Cell

When you use the SI (Absolute Character Size) or SR (Relative Character Size) commands to change the size of the characters, or use the ES (Extra Space) command to add extra space around them, you alter the size of the CP (Character Plot) cell.

You can control almost all aspects of the label's appearance: its position, size, slant, spacing, and direction. This chapter explains the commands that control these features. This chapter also tells you how to select fonts other than the default font.

Using Fonts

In HP-GL/2 mode, the printer uses three different types of fonts:

- **Scalable fonts** — Characters can be displayed at any size. The characters are defined as a set of points on the outline of a character and corresponding mathematical relationships describing the interaction between these outline points. A scalable outline character can be resized (using SI and SR), rotated (using DI and DR), and distorted (using SL).
- **Bitmap fonts** — Characters defined as an array of dots in a raster pattern. A bitmap character cannot be transformed using SI, SR, or SL, but they can be used with all of the other commands in this chapter (see the SB command). Bitmap characters are always placed in an orthogonal direction (to the PCL page) closest to the print direction established using the DI and DR commands (see Figure 23-17).
- **Stick and Arc fonts** — Characters are drawn as a series of vectors. The characters are defined as a set of endpoints. You can resize (using SI or SR), rotate (using DI and DR), and distort (using SL) Stick fonts. Stick fonts are defined on a dimensionless grid. The main body of each character fits within a 32- by 32-unit box, with descenders extending beneath. The Stick font is fixed-spaced, and the Arc font is proportional.

Printing with Fixed-Spaced and Proportional Fonts

Proportional fonts, by definition, use different amounts of horizontal space for each letter. This variation produces some differences in the definition of the character cell, and in the way some of the labeling commands work with these fonts. These differences are described in this section.

Figure 23-8 and Figure 23-9 show the difference between fixed-spaced and proportional fonts.

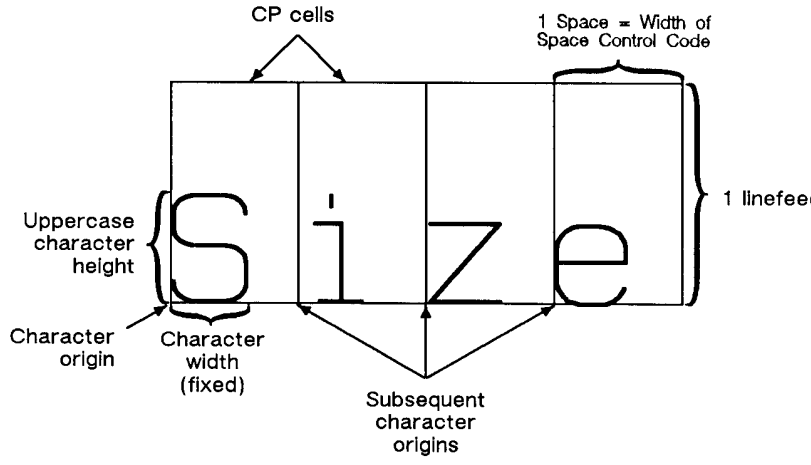


Figure 23-8 Fixed-Spaced Font

With proportional fonts, the actual space occupied by each character varies according to the character's width (Figure 23-9).

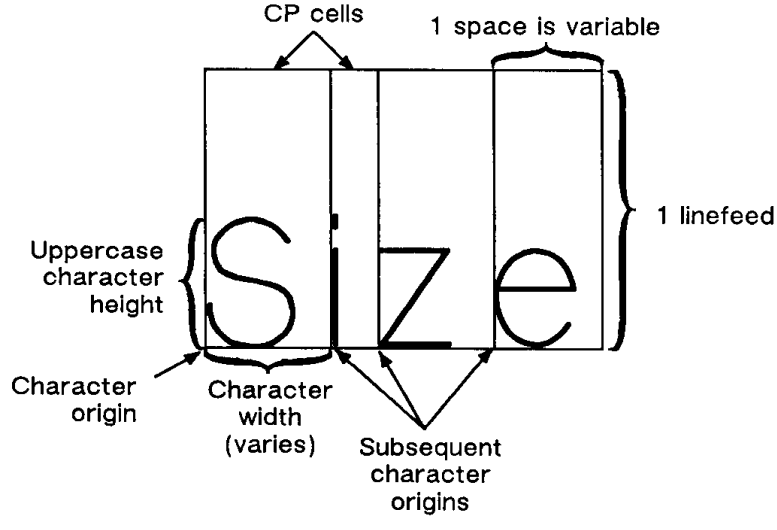


Figure 23-9 Proportional Font

When printing proportional fonts, the Character Plot (CP) command uses the width of the Space control code to determine horizontal spaces and the Line Feed height for determining vertical spacing. The Extra Space (ES) command uses the horizontal escapement distance (a font metric) to compute horizontal spaces and the Line Feed height for determining vertical spacing. Both of the character size commands (SI and SR) use cap height and average character width in calculating character size. Otherwise, these commands behave the same as they do with fixed-spaced fonts.

Designating and Selecting Fonts

If you intend to label with the default fixed-spaced font (Stick), you do not need to use the SD or AD commands for designating standard and alternate fonts. However, if you intend to use a different font (for example, to match accompanying PCL text), you must use the SD or AD commands to designate fonts before you can select those fonts for labeling (using either SA or SS).

Standard and Alternate Fonts

The following outlines some of the principles to use when labeling with different fonts:

- Designate the standard and alternate fonts using the SD and/or AD commands before labeling. If you are using the Stick font (the default) as your standard font, you need specify only your alternate font.
- Select either the standard or alternate font, using either the SS or SA command before labeling.
  - Note that labeling always begins with the standard font, unless you use the SA command before you begin your label (or finish the previous label in the alternate font).
- Switch from the standard font to the alternate font, either using SS and SA or the Shift In/Shift Out method. If you are changing fonts within a text string, the Shift In/Shift Out method is usually more efficient. Switch from the standard font to the alternate font using the ASCII Shift Out control character (SO, decimal code 14). Switch from the alternate font to the standard font using the ASCII Shift In control character (SI, decimal code 15). (Note that a Shift In or Shift Out outside of the label command string is ignored.)

AD, Alternate Font Definition

This command is similar to the Standard Font Definition (SD) command that defines the primary HP-GL/2 font. In addition the AD command defines an alternate HP-GL/2 font and its characteristics: font spacing, pitch, height, posture, stroke weight, and typeface. It allows the font characteristics to be assigned to the secondary (alternate) font definition. Use AD to set up an alternate font that you can easily access when labeling.

AD *kind,value...(,kind,value;)*

or

AD *(;)*

Parameter	Format	Functional Range	Default
kind	clamped integer	1 to 7	no default
value	clamped real	kind dependent*	kind dependent*

* Refer to the table following the parameter descriptions.

The AD command allows you to define another font and its font characteristics.

- **No Parameters** — Defaults the alternate font characteristics to that of the Stick font (see the following table).
- **Kind** — Specifies the characteristic for which you are setting a value (see the following table).

Table 23-6

Kind	Characteristic	Default Value	Description
1	Symbol Set	277	Roman-8
2	Font Spacing	0	fixed spacing
3	Pitch	9	characters per inch
4	Height	11.5	font point size
5	Posture	upright	upright

Table 23-6 (continued)

6	Stroke Weight	0	medium
7	Typeface	48	Stick (fixed vector)

- **Value** — Defines the properties of the characteristic specified by the *kind* parameter.

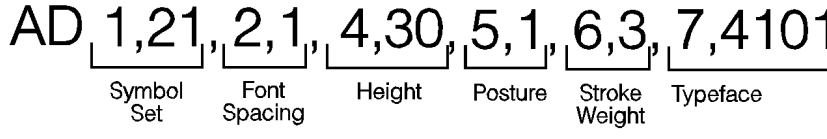
Note

When selecting fonts, the different characteristics (symbol set, spacing, pitch, etc.) are prioritized as shown in the table above, with symbol set being the highest priority and typeface being the lowest. The font selection priority is the same for HP-GL/2 as for PCL font selection. For more information about the priority of font characteristics, see the “Font Selection by Characteristic” discussion in Chapter 8.

Note

To avoid duplication of many pages of tables, the tables listing the *kind* parameters (symbol set, spacing, typeface, etc.) are located with the description of the SD (Standard Font Description) command.

The following example shows the command used to designate a 30-point *CG Times Bold Italic* font in the ASCII symbol set (use the Select Alternate Font (SA) command to select this font after it is designated):



Note that the *pitch* parameter is missing in the above command because the designated font is proportionally spaced.

Table 23-7

Related Commands	Group
FI, Select Primary Font FN, Select Secondary Font LB, Label	*The Character Group*

Table 23-7 (continued)

SA, Select Alternate Font	
SB, Scalable or Bitmap Fonts	
SD, Standard Font Definition	
SI, Absolute Character Size	
SR, Relative Character Size	
SS, Select Standard Font	
TD, Transparent Data	

CF, Character Fill Mode

The Character Fill Mode command specifies the way scalable fonts are filled and edged; bitmap and Stick fonts cannot be edged and can be filled only with raster fill, shading, or PCL cross-hatch patterns. Scalable characters may be filled with any of the fill patterns specified by the FT command (shading, hatching, cross-hatch, and user-defined raster fill patterns).

CF *fill mode[,edge pen[;]]*

or

CF *[;]*

Parameter	Format	Functional Range	Default
fill mode	clamped integer	0, 1, 2, or 3	0 (solid fill)
edge pen	integer	$-(2)^{30}$ to $2^{30} - 1$	0 (no edging)

- **No Parameters**— Defaults characters to solid fill with no edging. Equivalent to CF0,0.

- **Fill mode**— Specifies how the printer renders filled characters according to the following parameter values.
  - **0**— Specifies solid fill using the current pen and edging with the specified pen (or current pen if the edge pen parameter is not specified).
  - **1**— Specifies edging with the specified pen (or current pen if the edge pen parameter is not specified). Characters are filled only if they cannot be edged (bitmap or stick characters), using the edge pen.
  - **2**— Specifies filled characters using the current fill type (refer to the FT command in Chapter 20, *The Line and Fill Characteristics Group)*. The currently selected pen is used. Characters are not edged. If the edge pen parameter is specified, it is ignored.
  - **3**— Specifies filled characters using the current fill type (refer to the FT command in Chapter 20, *The Line and Fill Characteristics Group*). The currently selected pen is used. Characters are edged with the specified pen (or current pen if the edge pen parameter is not specified).
- **Edge pen**— For characters that are to be edged, this parameter indicates the pen that is used to edge the character (black or white).
- **0**—No edging.
- **1**—Black edging. The outline pen width is not selectable, but varies in thickness in proportion to the point size of the font.

Note that the Absolute Direction (DI) and Relative Direction (DR) commands do not cause rotation of fill patterns. Fill patterns remain fixed with respect to the current coordinate system. The CF command remains in effect until another CF command is executed, or the printer is initialized or set to default conditions.

Note The edge pen width is not specifiable; its thickness automatically increases in proportion with the point size.

The thickness of fill lines for hatching and cross hatch is selected using the PW (Pen Width) command. Due to the way hatching and cross-hatch lines are drawn, they may extend beyond the character outline by up to 1/2 of the current pen width. When using a small pen width and specifying a black edge pen, the edging covers up hatching lines that extend outside the character outline. However, as the pen width increases, the edge pen may not be wide enough to compensate for this, resulting in a fill that overlaps the character edges. To ensure that the character fill looks correct when using hatching patterns, use a narrow pen width, especially for small point sizes (see illustration below).

Figure 23-10 Character Fill Overflowing

Table 23-8 Example: Using the CF Command

$^{E}_{C}$E	Reset the printer.
$^{E}_{C}$%0B	Enter HP-GL/2 mode.
IN;	Initialize HP-GL/2 mode.
SP1;	Select pen number 1 (black).
SD1,21,2,1,4,140, 5,0,6,3,7,4148;SS;	Specify a 140-point Univers Bold font and select it for printing.
PA1000,3000;DT*;	Specify absolute plotting and move to (1000,3000); specify (*) as the label terminator.
FT3,50,45;	Specify a hatching fill type with 50 plotter units between each line, with the lines set at a 45° angle.
CF1,1;LBA*;	Select character fill mode 1 (edge) and edge with pen number 1 (black); print the letter “A”.
PR127,0;	Move the pen position 127 plu to the right.

Table 23-8 Example: Using the CF Command (continued)

PW.1;CF3,1;LBB*;	Set the pen width to .1 mm; select character fill mode 3 (fill & edge) and edge with pen number 1 (black); print the letter “B”.
PW.5;LBC*;	Set the pen width to .5 mm to change the thickness of the fill lines; print the letter “C”.
$^{E}_{C}$%0A	Enter the PCL mode.
$^{E}_{C}$E	Send a reset to end the job and eject the page.

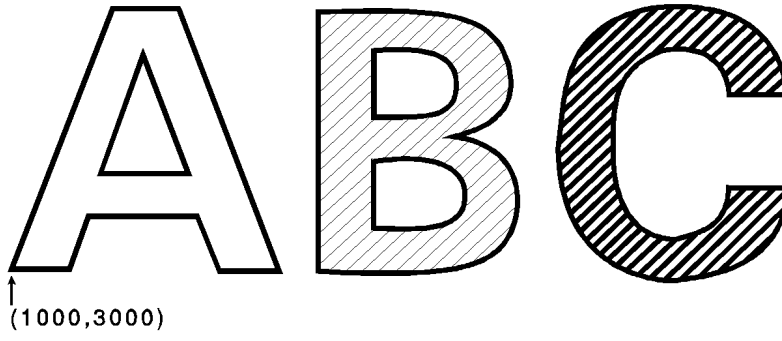


Figure 23-11

Table 23-9

Related Commands	**Groups**
DI, Absolute Direction DR, Relative Direction SB, Scalable or Bitmap Fonts	*The Character Group*
FT, Fill Type	*The Line and Fill Characteristics Group*

CP, Character Plot

This command moves the pen the specified number of spaces and lines from the current pen location. Use CP to position a label for indenting, centering, etc.

CP *spaces,lines [;]*

or

CP *[;]*

Parameter	Format	Functional Range	Default
spaces	clamped real	–32768 to 32767	no default
lines	clamped real	–32768 to 32767	no default

The CP (Character Plot) command includes an automatic pen up. When the command is completed, the original pen up/down status is restored.

CP moves the pen position in relation to the current position. CP is a movement command and does not affect the margin; to repeat the same movement for subsequent labels, you must issue new CP commands. (For information about the Carriage Return point, see “Moving to the Carriage Return Point” in the “Printing Labels” discussion near the beginning of this chapter. For more information on spaces, lines, and the character cell, refer to “Working with the Character Cell” earlier in this chapter.)

- **No Parameters**— Performs a Carriage Return and Line Feed (moves one line down and returns to the Carriage Return point).
- **Spaces**— Specifies the number of spaces the pen moves relative to the current pen location. Positive values specify the number of spaces the pen moves to the right of the current pen position; negative values specify the number of spaces the pen moves to the left. Right and left are relative to current label direction. The space width is uniquely defined for each font; use the ES command to adjust the width.

Note If you are using a proportionally-spaced font, the width of the Space control code is used.

- **Lines** — Specifies the number of lines the pen moves relative to the current pen location. Positive values specify the number of lines the pen moves up from the current pen position; negative values specify the number of lines the pen moves down (a value of –1 is equivalent to a Line Feed). Up and down are relative to the current label direction. The Line Feed distance is uniquely defined for each font; use the Extra Space (ES) command to adjust the height.

When you move the pen up or down a specific number of lines, the Carriage Return point shifts up or down accordingly.

The illustration below shows the interaction of label direction and the sign (+/–) of the parameters.

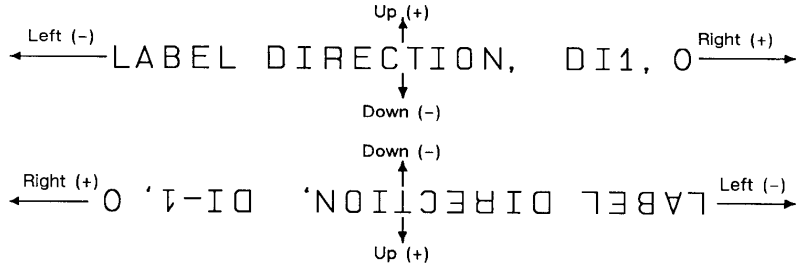


Figure 23-12 Interaction of Label Direction and Parameter Sign

The following illustration shows the direction of labeling with a vertical text path (set by (DV1) or (DV1,0); refer to the Define Variable Text Path (DV) command for more information).

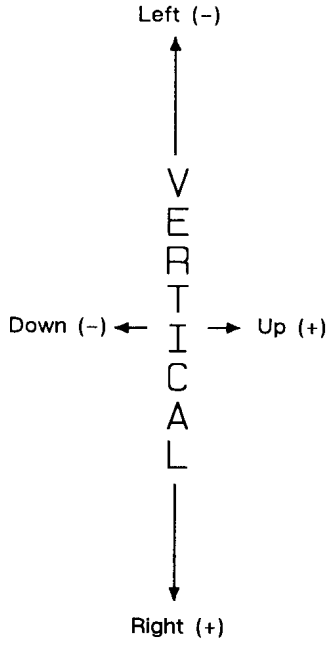


Figure 23-13 Labeling with a Vertical Text Path

The following example produces lettering along a line (but not directly on top of it), and aligns labels along a left margin. Movement of the Carriage Return point is demonstrated, as well as different methods of placing the text. The text is placed using the CP command with parameters, then with a Carriage Return-Line Feed (CR-LF) combination, and using a CP command without parameters to emulate a CR-LF.

Table 23-10 Example: Using the CP Command

$^{E}_{C}$E	Reset the printer.
$^{E}_{C}$%0B	Enter HP-GL/2 mode.
IN;	Initialize HP-GL/2 mode.
SP1;	Select pen number 1 (black).

Table 23-10 Example: Using the CP Command

PA5000,2500; PD1500,2500; PU;	Specify absolute plotting and move to (5000,2500); set the pen down and draw a line to (1500,2500); lift the pen.
CP5,.35;	Move the pen 5 spaces to the right and .35 lines up so that the label is placed just above the line.
DT$,1;	Define a label terminator ($) and specify that it does not print.
SD1,21,2,1,4,14,5, 0,6,3,7,4148;SS;	Designate a 14-point Univers Bold font and select it.
LBABOVE THE LINE$;	Print the first line of text. The label text is shown on two lines due to the column width restriction. When coding a single line label, it should all be placed on one line.
PA2500,2500; WG20,0,360;	Move the pen to (2500,2500) and draw a dot marking the new Carriage Return point (360° black-filled wedge with a diameter of 20 plu).
CP0,-.95LBBELOW THE LINE*CR-LF* WITH A NEAT$;	Print the second line; Carriage Return-Line Feed; print the third line.
CP;LBMARGIN$;	Print the fourth line. Notice how the CP command without parameters functions as a CR-LF.
$^{E}_{C}$%0A	Enter the PCL mode.
$^{E}_{C}$E	Send a reset to end the job and eject the page.

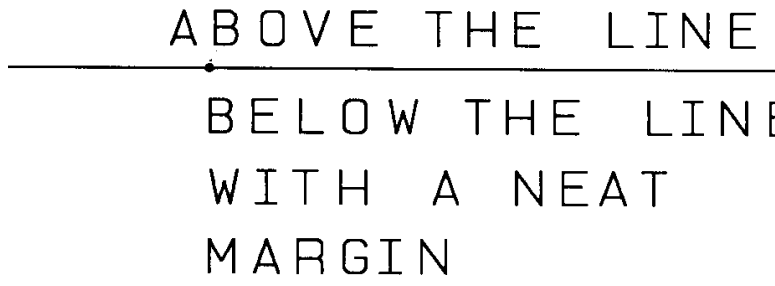


Figure 23-14

Table 23-11

Related Commands	Group
DI, Absolute Direction DR, Relative Direction DV, Define Variable Text Path ES, Extra Space LB, Label LO, Label Origin SB, Scalable or Bitmap Fonts SI, Absolute Character Size SR, Relative Character Size	*The Character Group*

DI, Absolute Direction

This command specifies the slope or direction at which characters are drawn, independent of P1 and P2 settings. Use DI to change labeling direction when you are labeling curves in line charts, schematic drawings, blueprints, and survey boundaries.

DI *run,rise [;]*

or

DI *[;]*

Table 23-12

Parameter	Format	Functional Range	Default
run (or cos θ)	clamped real	–32768 to 32767	1
rise (or sin θ)	clamped real	–32768 to 32767	0

The DI command updates the Carriage Return point to the current location. While DI is in effect, with or without parameters, the label direction is not affected by changes in the locations of P1 and P2. However, the Define Variable Text Path (DV) command interacts with the DI command (and DR), as explained later in this section.

- **No Parameters** — Defaults the label direction to absolute and horizontal (parallel to X-axis). Equivalent to (DI1,0).
- **Run or Cos θ** — Specifies the X-component of the label direction.
- **Rise or Sin θ** — Specify the Y-component of the label direction.
  - Together, the parameters specify the slope and direction of the label.

You can express the parameters in measured units as rise and run, or using the trigonometric functions cosine and sine according to the following relationship.

Where: run and rise = number of measured units

θ = the angle measured in degrees

$\sin \theta / \cos \theta = \text{rise/run}$

$\theta = \tan^{-1}(\text{rise/run})$

and

$\tan \theta = \sin \theta / \cos \theta$

Note that the run and rise determine the slope or angle of an imaginary line under the base of each character in the label. Refer to the following illustration.

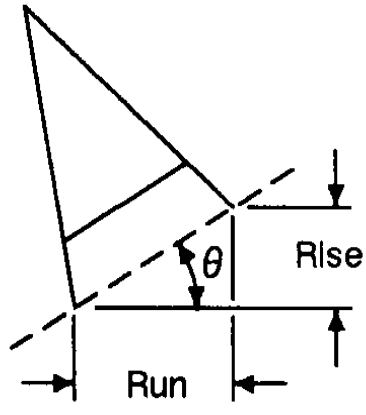


Figure 23-15 Character Slope Rise and Run

When plotting in horizontal mode (you have not used the DV command), the run and rise appear to determine the slope of the entire label. However, if you have used the Define Variable Text Path (DV) command to label in a vertical path, the label appears to slant in the opposite direction, even though the base of each letter is plotted on the same slope. The following illustration compares how labels plotted with the same run and rise parameters appear with horizontal (DV0) and vertical (DV1) text paths.

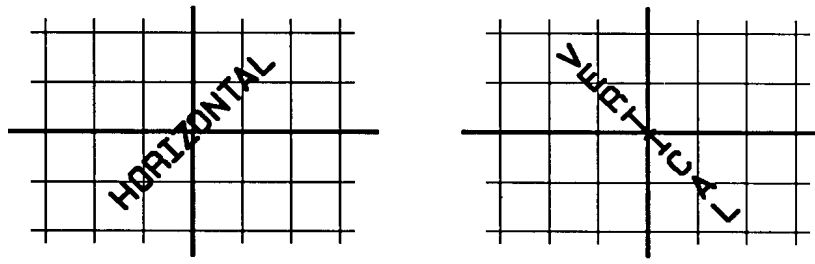


Figure 23-16 Effect of Horizontal and Vertical Text Paths

Note

If an SB1; command has been sent, the printer draws the label along the nearest perpendicular. In the case of bisection, the angle is rounded down (e.g., 45° would round to 0°). Refer to the following illustration.

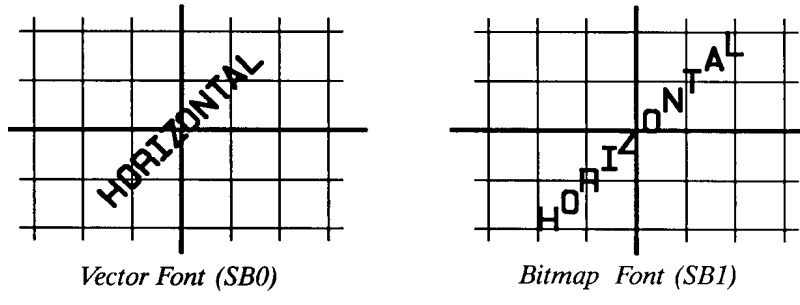
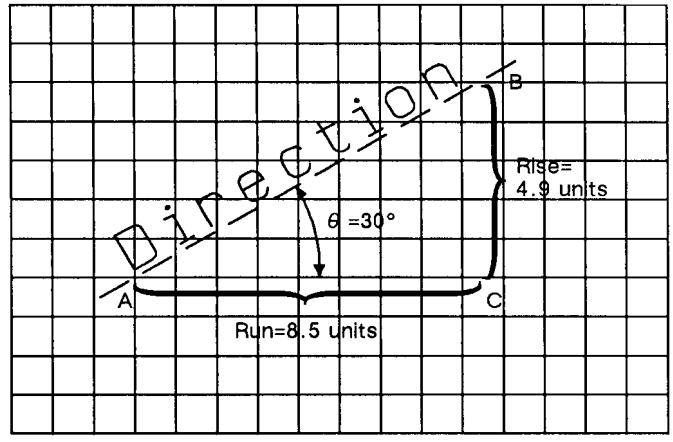


Figure 23-17 Scalable Versus Bitmap Variable Text Path Printing

Suppose you want your label plotted in the direction shown in the following illustration. You can do this in one of two ways: measure the run and rise, or measure the angle.



(D18.5,4.9)
(D1.866,.5)

Figure 23-18 Label Print Direction Rise and Run

To measure the run and rise, first draw a grid with the lines parallel to the X- and Y-axis. The grid units should be the same size on all sides, but their actual size is irrelevant. Then, draw a line parallel to the label and one parallel to the X-axis. The lines should intersect to form an angle.

Select a point on the open end of your angle (where another line would create a triangle). On the line parallel to the X-axis, count the number of grid units from the intersection of the two lines to your selected point. This is the run. In the illustration above, the run is 8.5. Now, count the number of units from your selected point along a perpendicular line that intersects the line along the label. This is the rise. In the illustration above, the rise is 4.9.

Your DI command using the run and rise is (DI8.5,4.9).

If you know the angle (θ), you can use the trigonometric functions sine (sin) and cosine (cos). In this example, $\theta = 30°$, cos 30° = 0.866, and sin 30° = 0.5.

Your DI command using the sine and cosine would be (DI.866,.5).

Whichever set of parameters you use, the label is drawn in the same direction as shown in the previous illustration.

When using either method, at least one parameter must not be zero. The ratio of one parameter to the other is more important than the actual numbers. The following table lists three common label angles produced by using 1's and 0's.

Table 23-13

DI Command	Label Direction
DI 1,0	horizontal
DI 0,1	vertical
DI 1,1 or DI 0.7,0.7 (or any parameters equal to each other)	45° angle

The relative size and sign of the two parameters determine the amount of rotation. If you imagine the current pen location to be the origin of a coordinate system for the label, you can see that the signs of the parameters determine which quadrant the label is in.

Table 23-14 Example: Using the DI Command

$^{E}_{C}$E	Reset the printer.
$^{E}_{C}$%0B	Enter HP-GL/2 mode.
IN;	Initialize HP-GL/2 mode.
SP1;	Select pen number 1. Even though there is no physical pen, the SP command must be used to enable printing.
PA3500,2500;	Enter absolute plotting mode and move to (3500,2500).
DT*;	Define (*) as the label terminator.
DI1,1;LB DIRECTION*CR**;	Print the word "DIRECTION" in the first quadrant and send a Carriage Return to return the pen to the Carriage Return point (3500,2500).
DI1,-1;LB DIRECTION*CR**;	Print the same word in the fourth quadrant and return the carriage to the Carriage Return point.

Table 23-14 Example: Using the DI Command (continued)

DI-1,-1;LB DIRECTION*CR*;	Print the same word in the third quadrant and Carriage Return.
DI-1,1;LB DIRECTION*CR*;	Print the word in the fourth quadrant and Carriage Return.
$^{E}_{C}$%0A	Enter the PCL mode.
$^{E}_{C}$E	Send a reset to end the job and eject the page.

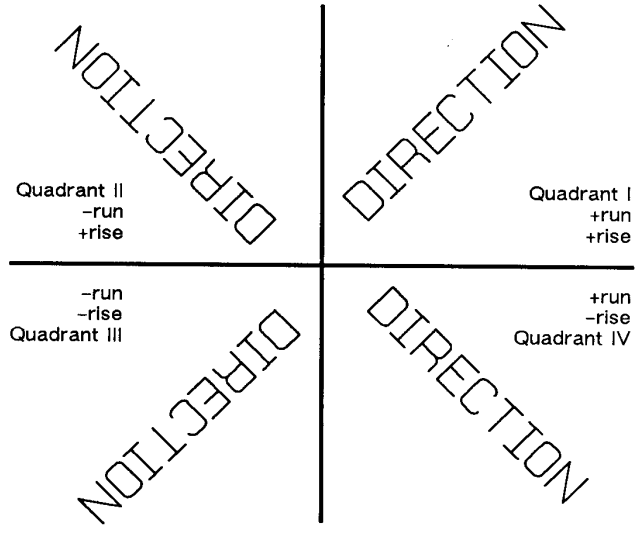


Figure 23-19 Varying Print Direction with DI Command Parameter Sign

The DI command remains in effect until another DI or DR command is executed, or the printer is initialized or set to default conditions.

The following example illustrates the use of positive and negative parameters, the use of the cosine and sine, how the LB command updates the current pen location, and how DI updates the Carriage Return point.

Table 23-15 Example: Another DI Example

$^{E}_{C}$E	Reset the printer.
$^{E}_{C}$%0B	Enter HP-GL/2 mode.
IN;	Initialize HP-GL/2 mode.
SP1;	Select pen number 1. Even though there is no physical pen, the SP command must be used to enable printing.
PA3500,2500;	Specify absolute plotting and move to (3500,2500).
DT#,1;	Define the "#" character as the label terminator.
DI0,1;LB__1990#;	Set the label direction to print at 90° and print "__1990".
DI1,1;LB__1991#;	Set the label direction to 45° and print "__1991".
DI1,0;LB__1992#;	Set the label direction to 0° and print "__1992";
DI,.71,-.71; LB1993#;	Change the label direction using the cosine and sine of 315° and print "__1993".
DI,0,-1;LB__1994 *CR*#;	Change the label direction using the cosine and sine of 270° and print "__1994"; Carriage Return.
DI,-.71,-.71; LB__1995 *CR*#;	Set the label direction using the cosine and sine of 270° and print "__1995"; Carriage Return.
DI,-1,0;LB__1996 *CR*#;	Set the label direction using the cosine and sine of -180° and print "__1996"; Carriage Return.
$^{E}_{C}$%0A	Enter the PCL mode.
$^{E}_{C}$E	Send a reset to end the job and eject the page.

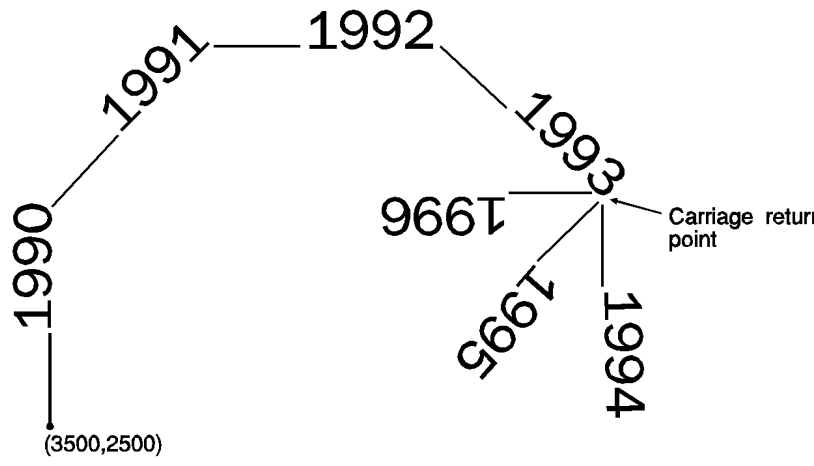


Figure 23-20

Table 23-16

Related Commands	Group
CF, Character Fill Mode CP, Character Plot DR, Relative Direction DV, Define Variable Text Path LB, Label SB, Scalable or Bitmap Fonts SI, Absolute Character Size SL, Character Slant SR, Relative Character Size	*The Character Group*

Table 23-17 POSSIBLE ERROR CONDITIONS

Error Condition	Printer Response
both parameters = 0 or number out of range	ignores command

DR, Relative Direction

This command specifies the direction in which labels are drawn, relative to the scaling points P1 and P2. Label direction is adjusted when P1 and P2 change so that labels maintain the same relationship to the scaled data. Use DR to change labeling direction when you are labeling curves.

DR *run,rise[;]*

or

DR *[;]*

Table 23-18

Parameter	Format	Functional Range	Default
run	clamped real	–32768 to 32767	1% of $P2_X$–$P1_X$
rise	clamped real	–32768 to 32767	0

The DR command updates the Carriage Return point to the current location. While DR is in effect, with or without parameters, the label direction is affected by changes in the location of P1 and P2. DR is also affected by the Define Variable Text Path (DV) command. Refer to the DI command earlier in this chapter for an explanation of this interaction.

- **No Parameters**— Defaults the label direction to relative and horizontal (parallel to the X-axis). Equivalent to (DR1,0).
- **Run**— Specifies a percentage of the distance between $P1_X$ and $P2_X$.
- **Rise**— Specifies a percentage of the distance between $P1_Y$ and $P2_Y$.

You define the parameters of run and rise as shown in the following illustration:

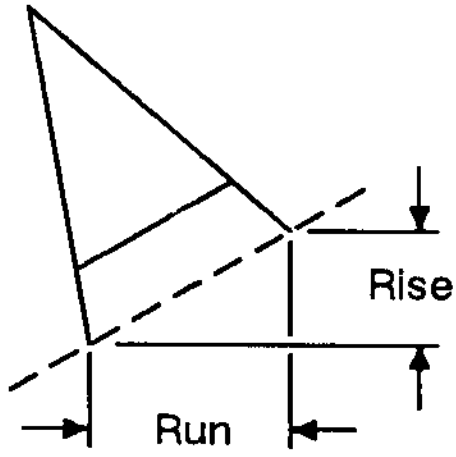


Figure 23-21 Rise and Run Parameters

With the DR command, the use of run and rise is somewhat different than with DI. Run is expressed as a percentage of the horizontal distance between P1 and P2; rise is expressed as a percentage of the vertical distance between P1 and P2.

$$\text{actual run} = \text{run parameter} \div 100 \times (P2_X - P1_X)$$

$$\text{actual rise} = \text{rise parameter} \div 100 \times (P2_Y - P1_Y)$$

The following illustration shows the effects of using three different sets of run/rise parameters. Notice how the text baseline varies as the run percentage is greater than, equal to, and less than the value for rise.

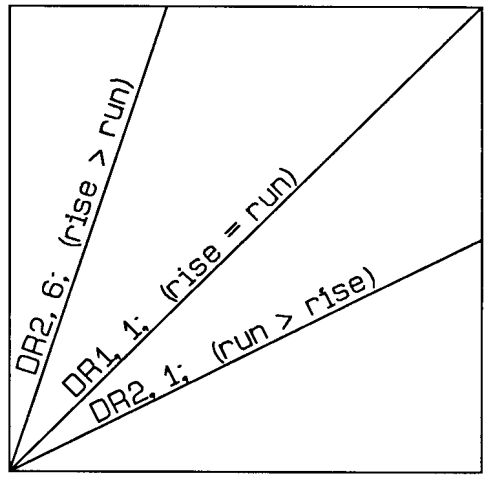


Figure 23-22 Effects of Different Rise/Run Parameters

If the P1/P2 rectangle is square, the DR and DI commands have exactly the same effect. The advantage of using the DR command is that, as the locations of P1 and P2 change, the slope of the baseline changes to match the stretching or compressing of the P1/P2 rectangle. For example, if the relative direction is set so that rise = run, the slope of the baseline is 45° as long as the P1/P2 rectangle is square. If the P1/P2 rectangle stretches so that it is twice as high as it is wide, the slope of the baseline remains parallel to an imaginary line running from P1 to P2 (see illustration below).

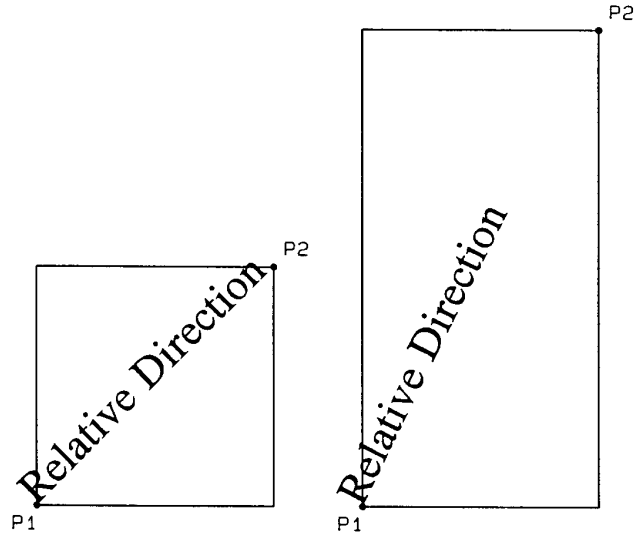


Figure 23-23 Effects of Scaling on Label Direction

Labels begin at the current pen location and thus are drawn parallel to the directional line, not necessarily on it. Also, negative parameters have the same effect on direction as described for the DI command.

At least one parameter must not be zero. The ratio of the parameters to each other is more important than the actual numbers. The table below lists three common label angles produced by using ones and zeros.

Table 23-19

DR Command	Label Direction
DR 1,0	horizontal
DR 0,1	vertical
DR 1,1 or DI 0.7,0.7 (any parameters equal to each other)	diagonal from P1 to P2

The relative size and sign of the two parameters determine the amount of rotation. If you imagine the current pen location to be the origin of a coordinate system for the label, you can see that the signs of the parameters determine in which quadrant the label is in.

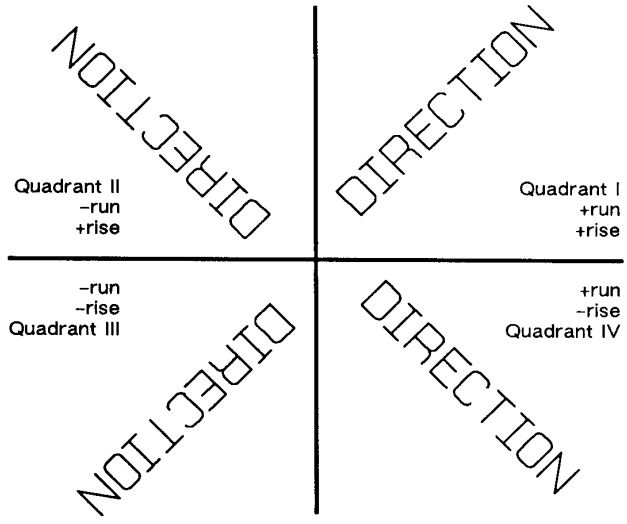


Figure 23-24 Varying Print Direction with DR Command Parameter Sign

A DR command remains in effect until another DR or DI command is executed, or until the printer is initialized or set to default conditions.

Example:Using the DR Command

This example illustrates the use of positive and negative parameters, how the LB command updates the current pen location, and how DR updates the Carriage Return point.

Note that this is the same example shown with the DI command. The only changes are switching the DI to DR and using the 1:0 ratio instead of the sine and cosine. However, if you print them both and measure them, you'll discover that they are slightly different sizes. The size difference results from the DR command's use of the percentage of the P2/P1 distance.

Note Labels begin at the current pen location and thus are drawn parallel to the directional line, not necessarily on it.

Table 23-20 Example: Using the DR Command

$^{E}_{C}$E	Reset the printer.
$^{E}_{C}$%0B	Enter HP-GL/2 mode.
IN;	Initialize HP-GL/2 mode.
SP1;	Select pen number 1 (black).
PA3500,2500;	Specify absolute plotting and move to (3500,2500).
DT#,1;	Define the “#” character as the label terminator.
DR0,1;LB __1990#;	Set the label direction and print “__1990”.
DR1,1;LB __1991#;	Set the label direction and print “__1991”.
DR1,0;LB__1992#;	Set the label direction and print “__1992”.
DR,1,-1; LB__1993#;	Change the label direction and print “__1993”.
DR,0,-1;LB__1994 *CR*#;	Set the label direction, print “__1994” and Carriage Return.
DR,-1,-1;LB__1995 *CR*#;	Set the label direction and print “__1995”; Carriage Return.
DR,-1,0;LB__1996 *CR*#;	Set the label direction and print “__1996”; Carriage Return.
$^{E}_{C}$%0A	Enter the PCL mode.
$^{E}_{C}$E	Send a reset to end the job and eject the page.

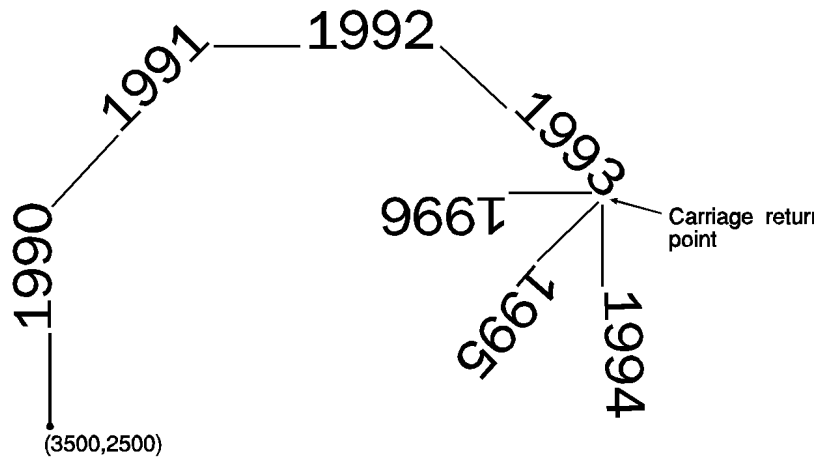


Figure 23-25

Table 23-21

Related Commands	Group
CF, Character Fill Mode CP, Character Plot DI, Absolute Direction DV, Define Variable Text Path LB, Label SB, Scalable or Bitmap Fonts SI, Absolute Character Size SL, Character Slant SR, Relative Character Size	*The Character Group*
IP, Input P1 and P2 IR, Input Relative P1 and P2	*The Configuration/Status Group*

Table 23-22 POSSIBLE ERROR CONDITIONS:

Error Condition	Printer Response
both parameters = 0 or number out of range	ignores command

DT, Define Label Terminator

This command specifies the character to be used as the label terminator and whether it is printed. Use DT to define a new label terminator if you desire a different one or if your computer cannot use the default (ETX, decimal code 3).

DT *label terminator[,mode;]*

or

DT;

Parameter	Format	Functional Range	Default
label terminator	label text	any character except NULL, LF, $^{E}_{C}$, and ; (decimal codes 0, 5, 27, and 59 respectively)	ETX (decimal code 3)
mode	clamped integer	0 or 1	1 (non-printing)

The character immediately following DT is interpreted to be the new label terminator. You must terminate all Label (LB) commands following a DT command with the specified label terminator.

- **No Parameter**— Defaults the label terminator to ETX (not a semicolon) and the mode to non-printing (1).
- **Label Terminator**— Specifies the label terminator as the character immediately following the DT mnemonic. (If you use a space between the mnemonic and the label terminator parameter the space becomes the label terminator.)

- **Mode**— Specifies whether the label terminator is printed.

  0— The label terminator prints if it is a printable character and performs its function if it is a control code.

  1— (Default) The label terminator does not print if it is a printing character and does not perform its function if it is a control code.

A DT command remains in effect until another DT command is executed, or the printer is initialized or set to default conditions.

The following command shows how to define and print using a non-printing label terminator:

```
DT#;LBThe label terminator WILL NOT print.#;
```

This command would print as:

The label terminator WILL NOT print.

This example shows how to define and use a printable label terminator:

```
DT#,0;LBThe label terminator WILL print.#;
```

This command would print as:

The label terminator WILL print.#

For another example using the DT command, see the example in the Character Plot (CP) command discussion.

Table 23-23

Related Commands	Group
LB, Label TD, Transparent Data	*The Character Group*

DV, Define Variable Text Path

This command specifies the text path for subsequent labels and the direction of Line Feeds as either right, left, up, or down. Use DV to “stack” characters in a column.

DV *path[,line;]*

or

DV *[;]*

Parameter	Format	Functional Range	Default
path	clamped integer	0, 1, 2, or 3	0 (horizontal)
line	clamped integer	0 or 1	0 (normal Line Feed)

The DV command determines the *text path*, the direction that the current location moves after each character is drawn and the direction that the Carriage Return point moves when a Line Feed is included in the label string.

- **No Parameter**— Defaults the text path to horizontal (not stacked) with normal Line Feed. Equivalent to (DV0,0).
- **Path**— Specifies the location of each character with respect to the preceding character, relative to the labeling direction defined by the DI or DR commands. The text path set by DV is not affected by changes in P1 and P2.
  - **0 — 0 degrees.**(Right) Within a label, each character begins to the right of the previous character. This is a horizontal text path (unless altered by DI or DR).
  - **1 — –90 degrees.**(Down) Within a label, each character begins below the previous character. This is a vertical text path (unless altered by DI or DR).
  - **2 — –180 degrees.**(Left) Within a label, each character begins to the left of the previous character. This is a horizontal text path (unless altered by DI or DR).

- **3 — –270 degrees.**(Up) Within a label, each character begins above the previous character. This is a vertical text path (unless altered by DI or DR).

The following illustration shows the four text paths.

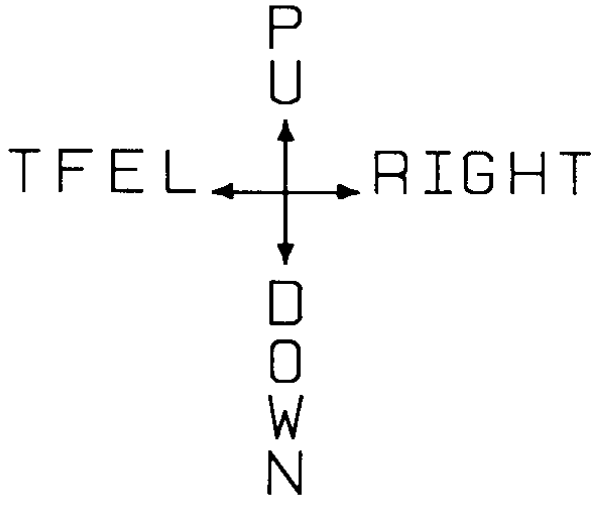


Figure 23-26 Four Text Paths

- **Line**— Specifies the location of each character with respect to the preceding character, relative to the labeling direction defined by the DI or DR commands.
- **0 — –90 degrees.**(Normal Line Feed) Sets the direction of Line Feeds –90 degrees with respect to the text path.

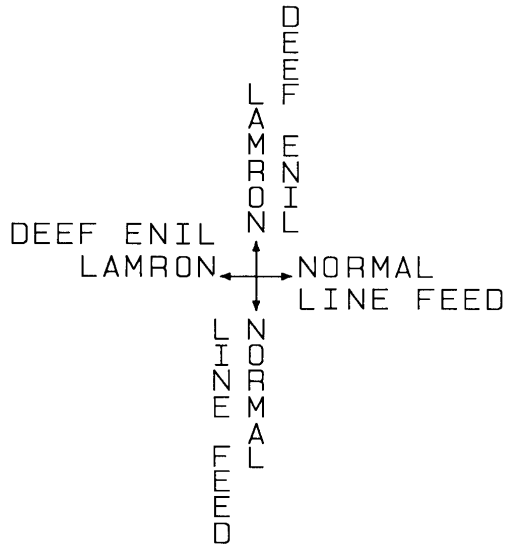


Figure 23-27 DV Command Character Position for Normal (0) Parameter

- **0 — +90 degrees.**(Reverse Line Feed) Sets the direction of Line Feeds +90 degrees with respect to the text path.

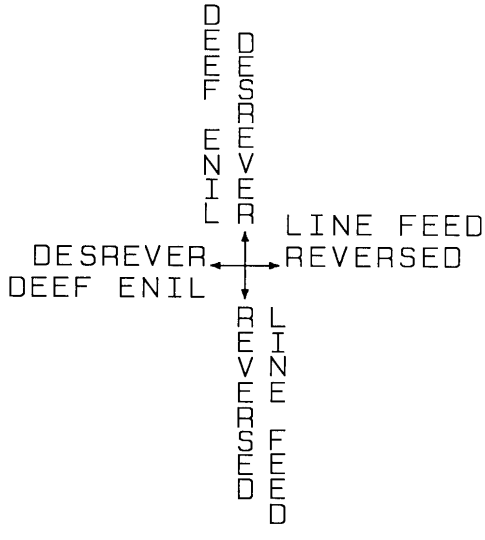


Figure 23-28 DV Command Character Position for Normal (90) Parameter

Example:Using theDV Command

The following example illustrates how Line Feeds and Carriage Returns affect vertical labels. Horizontal labels are shown for comparison.

Table 23-24 Example: Using the DV Command

$^{E}_{C}$E	Reset the printer.
$^{E}_{C}$%0B	Enter HP-GL/2 mode.
IN;	Initialize HP-GL/2 mode.
SP1;	Select pen number 1. Even though there is no physical pen, the SP command must be used to enable printing.
PA2000,3000;DV1;	Specify absolute plotting and move to (2000,3000). Define the text path so that each character begins below the previous character (vertical text path).
DT@;	Define the “@” character as the label terminator (non-printing).
LBABC *CR-LF*@;	Print ABC, followed by a Carriage Return/Line Feed (CR-LF).
LBDEF *LF*@;	Print DEF, followed by a Line Feed.
LBGHI *LF*@;	Print GHI, followed by a Line Feed.
LO3;	Change the label Origin to 3 (the default LO1 was used prior to this).
LBJKL@	Print JKL.
LO1;	Return to the default label Origin (LO1).
PA4000,3000;DV0;	Move to (4000,3000) and define the text path so that each character begins to the right of the previous one (horizontal [default] text path).
LBABC *CR-LF*@;	Print ABC, followed by CR-LF.
LBDEF *LF*@;	Print DEF, followed by Line Feed.
LBGHI@;	Print GHI (without CR or LF).

Table 23-24 Example: Using the DV Command (continued)

$^{E}_{C}$%0A	Enter the PCL mode.
$^{E}_{C}$E	Send a reset to end the job and eject the page.

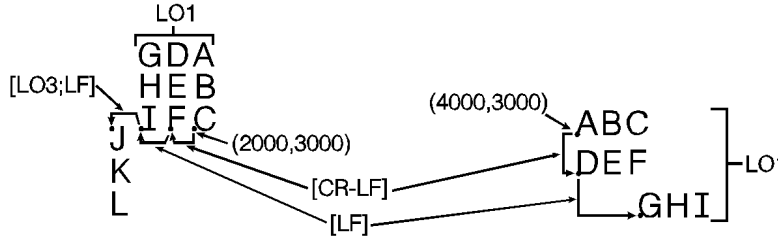


Figure 23-29

Table 23-25

Related Commands	Group
CP, Character Plot DI, Absolute Direction DR, Relative Direction LB, Label LO, Label Origin	*The Character Group*

Note Used with specific LO (Label Origin) settings, labels can be concatenated (see LO command description, later in this chapter).

ES, Extra Space

This command adjusts space between characters and lines of labels without affecting character size.

ES *width[,height;]*

or

ES *[;]*

Parameter	Format	Functional Range	Default
width	clamped real	–32768 to 32767	0
height	clamped real	–32768 to 32767	0

The printer interprets the parameters as follows:

- **No Parameters**— Defaults the spaces and lines between characters to no extra space. Equivalent to (ES0,0).
- **Width**— Specifies an increase (positive number) or decrease (negative number) in the space between characters. For maximum legibility, do not specify more than one extra space or subtract more than half a space.
- **Height**— Specifies an increase (positive number) or decrease (negative number) in the space between lines. For maximum legibility, do not specify more than two extra lines, or subtract more than half a line.

An ES command remains in effect until another ES command is executed, or until the printer is initialized or set to default conditions.

Table 23-26 Example: Using the ES Command

$^{E}_{C}$E	Reset the printer.
$^{E}_{C}$%0B	Enter HP-GL/2 mode.
IN;	Initialize HP-GL/2 mode.
SP1;	Select pen number 1. Even though there is no physical pen, the SP command must be used to enable printing.

Table 23-26 Example: Using the ES Command (continued)

PA2500,3200; SI.187,.269;	Specify absolute plotting and move to (2500,3200); specify a relative character size of .187 cm wide by .269 cm high.
DT#;ES;	Define the “#” character as the label terminator and set the extra space setting to default (no extra space).
LBES; CAUSES#;	Print “ES; CAUSES”.
CP;LBTHIS SPACING.#;	Send a CP command as a CR-LF and print “THIS SPACING.”
PA2500,2500;	Move to (2500,2500).
ES-.1,-.25; LBES-.1,-.25; CAUSES#;	Decrease the inter-character spacing by .1 and the inter-line spacing by .25; print “ES-.1,-.25; CAUSES”.
CP;LBTHIS SPACING.#;	Send CP in place of CR-LF and print “THIS SPACING.”
PA2500,1800;	Move to (2500,1800).
ES.2,.25;LBES.2,.25; CAUSES#;	Increase the inter-character spacing by .2 and the inter-line spacing by .25 of the Space control code; print “ES.2,.25; CAUSES”.
CP;LBTHIS SPACING.#;	Send CP in place of CR-LF and print “THIS SPACING.”
$^{E}_{C}$%0A	Enter the PCL mode.
$^{E}_{C}$E	Send a reset to end the job and eject the page.

ES; CAUSES
THIS SPACING.

ES-.1,-.25; CAUSES
THIS SPACING.

ES.2,.25; CAUSES
THIS SPACING.

Table 23-27

Related Commands	Group
CP, Character Plot LB, Label	*The Character Group*

FI, Select Primary Font

This command allows any accessible font that has been assigned a *font ID* number to be selected as the primary (standard) font (the font characteristics are assigned to the standard font). As mentioned, the font must be accessible to the printer as either a resident font, a downloaded font, or a loaded cartridge font. To be selected, the font must have been previously assigned a font ID number in PCL mode. Also, for scalable fonts, the FI command must be preceded by an SD command specifying the font's point size or pitch (see the "Using the FI Command" example).

FI *font_ ID[;]*

Parameter	Format	Functional Range	Default
font_ID	integer	0 to 32767	no default

When the printer receives this command and the requested font is present, the primary font characteristics are set to those of the requested font. If the selected font is proportionally spaced, the pitch characteristic is not changed.

Notes

This command does not select the font for label printing if you are currently using the alternate font.

The FI and FN commands implicitly change the value of SB. For example, if SB = 0 and FI selects a bitmap font, SB is set to 1. This affects the performance of certain HP-GL/2 commands. Refer to SB command later in this chapter.

Example:Using the FI Command

The following example demonstrates assigning a font ID number from within PCL mode, entering HP-GL/2 mode, using the FI command to select that font, and printing a short line of text.

Table 23-28 Example: Using the FI Command

$^{E}_{C}$E	Reset the printer.
$^{E}_{C}$*c15D	Specify a font ID number of 15.
$^{E}_{C}$(s1p18v0s3b4148T	Select an 18-point Univers Bold font as the primary font.
$^{E}_{C}$*c6F	Assign the currently selected font as a temporary font with the current ID number (15).
$^{E}_{C}$%0B	Enter HP-GL/2 mode.
IN;	Initialize HP-GL/2 mode.
SP1;	Select pen number 1. Even though there is no physical pen, the SP command must be used to enable printing.
PA1500,1500;	Move to location (1500,1500).
DT#;	Define “#” as a label terminator (non-printing).
LBLaserJet Printers *CR-LF*#;	Print “LaserJet Printers” in the currently selected font, which is the default Stick font; Carriage Return/Line Feed. (Note, label text should not contain carriage-returns or any control codes unless specifically desired for plotting. It is shown here on two lines (with a Carriage Return) for convenience only.
SD4,18;FI15;SS:	Use the SD command to designate an 18-point font from within HP-GL/2 mode; then select the PCL font with font ID number of 15 as the primary font. Then select the primary font for printing.
LBLaserJetPrinters#;	Print “LaserJet Printers” in the newly selected font.
$^{E}_{C}$%0A	Enter the PCL mode.
$^{E}_{C}$E	Send a reset to end the job and eject the page.

LaserJet Printers

Figure 23-30

Table 23-29

Related Commands	Group
AD, Alternate Font Definition LB, Label SA, Select Alternate Font SD, Standard Font Definition SS, Select Standard Font	*The Character Group*
$^{E}_{C}$(#X, Select Primary Font by ID # $^{E}_{C}$)#X, Select Secondary Font by ID # $^{E}_{C}$)*c#D, Assign Font ID $^{E}_{C}$)*c6F, Font Control, Copy Assign	*PCL Commands*

FN, Select Secondary Font

This command allows any accessible font that has been assigned a *font ID* number to be selected as the secondary (alternate) font (the font characteristics are assigned to the secondary font). The font must be accessible to the printer as either a resident font, a downloaded font, or a loaded cartridge font. To be selected, the font must have been previously assigned a font ID number in PCL mode. Also, the FN command must be accompanied by an AD command specifying the font's point size (see the "Using the FI Command" example).

FN *font_ID[;]*

Parameter	Format	Functional Range	Default
font_ID	integer	0 to 32767	no default

When the printer receives this command and the requested font is present, the secondary font characteristics are set to those of the requested font. If the selected font is proportionally spaced, the pitch characteristic is not changed.

Notes

This command does not select the font for label printing if you are currently using the standard font.

The FI and FN commands implicitly change the value of SB. For example, if SB = 0 and FI selects a bitmap font, SB is set to 1. This affects the performance of certain HP-GL/2 commands. Refer to SB command later in this chapter.

Example:Using the FN Command

The following example demonstrates assigning a font ID number from within PCL mode, entering HP-GL/2 mode, using the FN command to select that font, and printing a short line of text.

Table 23-30 Example: Using the FN Command

$^{E}_{C}$E	Reset the printer.
$^{E}_{C}$*c28D	Specify a font ID number of 28.
$^{E}_{C}$(s1p18v0s3b4148T	Select an 18-point Univers Bold font as the primary font.
$^{E}_{C}$*c6F	Assign the currently selected font as a temporary font with the current ID number (28).
$^{E}_{C}$%0B	Enter HP-GL/2 mode.
IN;	Initialize HP-GL/2 mode.
SP1;	Select pen number 1. Even though there is no physical pen, the SP command must be used to enable printing.
PA1500,1500;	Move to location (1500,1500).
DT#;	Define “#” as a label terminator (non-printing).

Table 23-30 Example: Using the FN Command

LBLaserJetPrinters *CR-LF#*;	Print “LaserJet Printers” in the currently selected font, which is the default Stick font; Carriage Return/Line Feed.
AD4,18;FN28;SA;	Use the AD command to designate an 18-point font from within HP-GL/2 mode; then assign the PCL font with font ID number of 28 as the secondary font. Then select the font.
LBLaserJetPrinters#;	Print “LaserJet Printers” in the newly selected font.
$^{E}_{C}$%0A	Enter the PCL mode.
$^{E}_{C}$E	Send a reset to end the job and eject the page.

Figure 23-31

Table 23-31

Related Commands	**Group**
AD, Alternate Font Definition LB, Label SA, Select Alternate Font SD, Standard Font Definition SS, Select Standard Font	*The Character Group*

Table 23-31

$^{E}_{C}$*c#D, Font ID (assign) $^{E}_{C}$*c6F, Font Control, Copy Assign $^{E}_{C}$(#X, Designate Font # as Primary $^{E}_{C}$)#X, Designate Font # as Secondary	*PCL Commands*

LB, Label

This command prints text using the currently defined font. Use LB to annotate drawings or create text-only charts.

LB *text . . . text label terminator*

Parameter	Format	Functional Range	Default
text . . . text	character	any character(s)	no default

The LB command includes an automatic *pen down* function. When the command is completed, the original pen up/down status is restored.

- **text . . . text**— ASCII characters. are drawn using the currently selected font. (Refer to AD, SA, SD, and SS commands for details on specifying and selecting fonts.)

  You can include non-printing characters such as the Carriage Return (CR, decimal code 13) and Line Feed (LF, decimal code 10). These characters invoke the specified function, but are not drawn. Refer to Appendixes A and B of the *PCL 5 Comparison Guide* for a list of ASCII characters.

  The label begins at the current pen location, (unless altered by LO). After each character is drawn, the pen location is updated to be the next character origin. (Refer to “Working With the Character Cell” earlier in the chapter.)

- **Label Terminator**— Terminates the LB command. You must use the special label terminator (refer to the DT command) to tell the printer to exit the label mode. If you do not use the label terminator, everything following the LB mnemonic is printed in the label, including other commands. The default label terminator is the non-printing end-of-text character ETX (decimal code 3). You can define a different terminator using the DT command.

Table 23-32 Example: Printing Text with the LB Command

$^{E}_{C}$E	Reset the printer.
$^{E}_{C}$%0B	Enter HP-GL/2 mode.
IN;	Initialize HP-GL/2 mode.
SP1;	Select pen number 1. Even though there is no physical pen, the SP command must be used to enable printing.
PA2500,2500;	Move to absolute location (2500,2500).
DT*;	Specify the asterisk (*) as the label terminator.
SD1,21,2,1,4,25,5,0, 6,3,7,4148;SS;	Designate the 25-point Univers Bold font as the standard font and select it.
LBThis is a Label.*;	Prints “This is a Label.” in the currently selected font.
$^{E}_{C}$%0A	Enter the PCL mode.
$^{E}_{C}$E	Send a reset to end the job and eject the page.

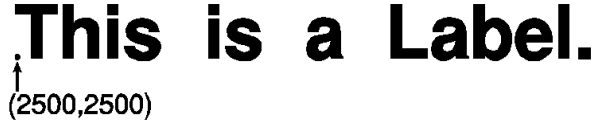


Figure 23-32

Table 23-33

Related Commands	Group
AD, Alternate Font Definition	*The Character Group*
CP, Character Plot	
DI, Absolute Direction	
DR, Relative Direction	
DT, Define Label Terminator	
DV, Define Variable Text Path	
ES, Extra Space	
FI, Select Primary Font	
FN, Select Secondary Font	
LO, Label Origin	
SA, Select Alternate Font	
SB, Scalable or Bitmap Fonts	
SD, Standard Font Definition	
SI, Absolute Character Size	
SL, Character Slant	
SR, Relative Character Size	
SS, Select Standard Font	
TD, Transparent Data	

LO, Label Origin

This command positions labels relative to the current pen location. Use the LO command to center, left justify, or right justify labels. The label can be drawn above or below the current pen location and can also be offset by an amount equal to .25 times the point size (or 16 grid units [0.33 times the point size] for the Stick font).

LO *position[;]*

or

LO *[;]*

Parameter	Format	Functional Range	Default
position	clamped integer	1 to 9 11 to 19 21	1

The printer interprets the parameters as follows:

- **No Parameters**— Defaults the label origin. Equivalent to (LO1).
- **Position**— The position numbers are graphically illustrated below. Each dot represents the current pen location.

The label positions LO 11 through LO 19 differ from LO 1 through LO 9 only in that the labels are offset from the current pen location.

The label position 21 provides a PCL-compatible label origin. The character(s) are printed at the same location as in PCL.

Notes

Label origins do not change text path. To change the text path, use the Define Variable Text Path (DV) command.

Label position 21 is not shown in Figure 23-33 because the exact location is dependent on the PCL position.

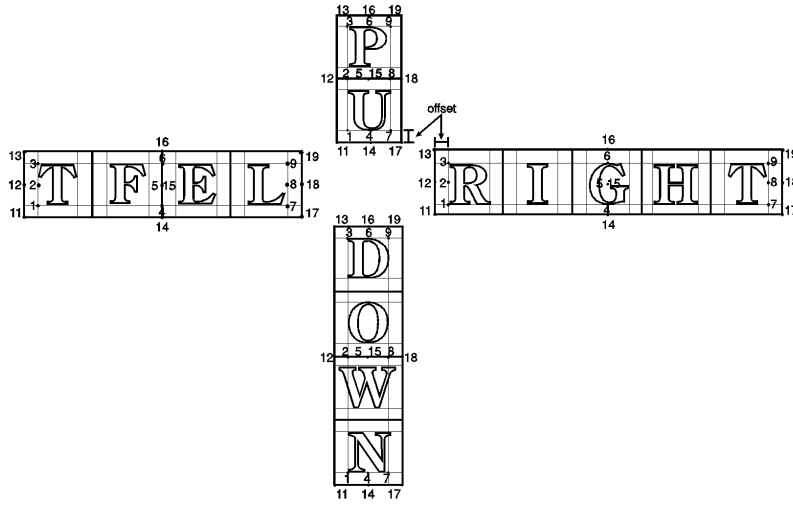


Figure 23-33 Label Origin Positioning

Each time an LO command is sent, the Carriage Return point is updated to the location the pen was in when the LO command was received. The current pen location (but not the Carriage Return point) is updated after each character is drawn and the pen automatically moves to the next character origin. If you want to return a pen to its previous location prior to the next label command, you can send a Carriage Return after the label text but before the label terminator.

When you embed Carriage Return characters in a label, each portion of the label is positioned according to the label origin, just as if they were written as separate label commands.

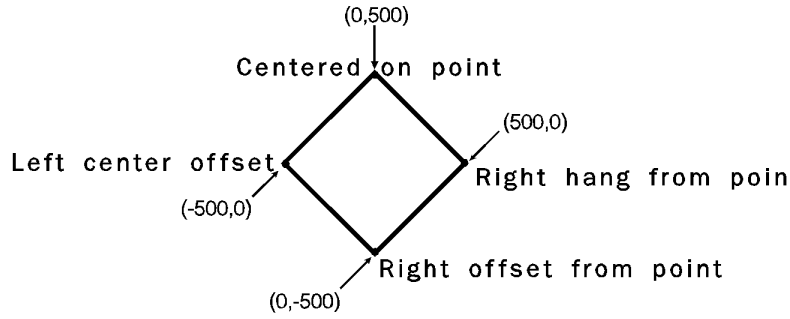
An LO command remains in effect until another LO command is executed, or the printer is initialized or set to default conditions.

Table 23-34 Example: Using the LO Command

$^{E}_{C}$E	Reset the printer.
$^{E}_{C}$%0B	Enter HP-GL/2 mode.
IN;	Initialize HP-GL/2 mode.
SP1;SC-4000,4000, -5000,5000;	Select pen number 1; specify scaling by assigning (-4000,-5000) to P1 and (4000,5000) to P2.

Table 23-34 Example: Using the LO Command (continued)

SI.17,.26;PA0,500;	Set the absolute character size to .17 cm wide by .26 cm high; move to (0,500).
PD-500,0,0,-500, 500,0,0,500;	Set the pen down and draw lines from (0,500) to (-500,0), to (0,-500), to (500,0), and then to (0,500).
DT#;	Define label terminator as “#” character.
CI10;LO4; LBCentered on point#;	Draw a small circle (radius – 10 plu) to represent the label origin point, specify a label origin of 4, and print “Centered on point.”
PU-500,0;CI10; LO18;	Lift the pen and move to (-500,0), draw another small circle, and specify a label origin of 18.
LBLeft center offset#;	Print “Left center offset.”
PU0,-500;CI10; LO13;	Lift the pen, draw another small circle, and specify label origin number 13.
LBRight offset from point#;	Print “Right offset from point.”
PA500,0;CI10;LO3;	Move to (500,0), draw another small circle (dot), and specify label origin number 3.
LBRight hang from point#;	Print the last label, “Right hang from point”.
$^{E}_{C}$%0A	Enter the PCL mode.
$^{E}_{C}$E	Send a reset to end the job and eject the page.



The pen position at the end of the label string depends on whether two successive LB commands concatenate together as though only one label was given. The DV/LO combinations which permit concatenation are:

Table 23-35

Text Path	Label Origin
DV0 (right)	LO's 1,2,3, and 11,12,13,21
DV1 (down)	LO's 3,6,9, and 13,16,19
DV2 (left)	LO's 7,8,9, and 17,18,19
DV3 (up)	LO's 1,4,7, and 11,14,17,21

The following two rules determine where the pen is positioned after a label string is drawn. Rule 1 is for DV/LO combinations which permit concatenation; rule 2 clarifies other DV/LO combinations:

1 If a concatenation combination is specified, the pen position is updated to give the normal delta X space between the last character of the first label, and the first character of the second label.

Note For proportional fonts that use a pair-wise spacing table, the pen position is updated using an average delta X space.

2 If a non-concatenation combination is specified, the pen position that existed immediately prior to the LB command is restored.

Table 23-36

Related Commands	Group
CP, Character Plot DV, Define Variable Text Path LB, Label	*The Character Group*

SA, Select Alternate Font

This command selects the alternate font (already designated by the AD command) for subsequent labeling. Use the SA command to shift from the currently selected standard font to the designated alternate font.

SA *[;]*

The SA command tells the printer to draw subsequent labeling commands using characters from the alternate symbol set previously designated by the AD command. The SA command is equivalent to using the Shift Out control character (SO, decimal 14) within a label string.

The default designated alternate font uses symbol set 277 (Roman-8). The alternate font remains in effect until an SS command is executed, a Shift In control character (SI, decimal 15) is encountered, or the printer is initialized or set to default conditions.

Table 23-37

Related Commands	Group
AD, Alternate Font Definition DT, Define Label Terminator FI, Select Primary Font FN, Select Secondary Font LB, Label SD, Standard Font Definition SS, Select Standard Font	*The Character Group*

SB, Scalable or Bitmap Fonts

This command specifies which types of fonts are used for labeling commands. It allows you to restrict font selection to only scalable fonts and the Stick and Arc fonts, disregarding bitmap fonts.

SB *[n;]*

or

SB *[;]*

Parameter	Format	Functional Range	Default
n	clamped integer	0 or 1	0

This command is defaulted by the Default Values (DF) command. The SB command takes effect immediately, changing both the standard (primary) and alternate (secondary) fonts to be *scalable only* or *bitmap allowed*, as requested.

- **No Parameter**— Defaults to scalable fonts. Equivalent to SB0.
- **n**— Determines the type of font according to the following parameter values:

  0— Scalable fonts only.

  1— Bitmap fonts allowed.

Note

When (SB1;) is active, *all* fonts obey the same restrictions as bitmapped fonts regarding Character Fill, Orientation, Size, and Slant (see table on next page).

Scalable fonts respond more accurately to some HP-GL/2 commands. The choice of scalable or bitmap fonts can affect the performance of the following HP-GL/2 commands:

Table 23-38 AffectedCommands

Command	Limitation
CF	Bitmapped characters cannot be edged.
DI,DR	Bitmapped characters can be printed only with orthogonal directions (0°, 90°, 180°, or 270°).
SI,SR	Sizes of bitmapped fonts are approximate only.
SL	The Slant command is ignored for bitmapped fonts.
AD,SD,CP,LB	

Note The FI and FN commands implicitly change the value of SB. For example, if SB = 0 and FI selects a bitmap font, SB is set to 1.

SD, Standard Font Definition

Defines the standard font and its characteristics: symbol set, font spacing, pitch, height, posture, stroke weight, and typeface.

SD *kind,value...[,kind,value;]*

or

SD *[;]*

Parameter	Format	Functional Range	Default
kind	clamped integer	1 to 7	no default
value	clamped real	kind dependent*	kind dependent*

* Refer to the table following the parameter descriptions.

- **No Parameters**— Defaults the standard font characteristics.
- **Kind**— Specifies the characteristic for which you are setting a value.

Table 23-39

Kind	Characteristic	Default Value	Description
1	Symbol Set	277	Roman-8
2	Font Spacing	0	fixed spacing
3	Pitch	9	characters per inch
4	Height	11.5	font point size
5	Posture	upright	upright
6	Stroke Weight	0	medium
7	Typeface	48	Stick (fixed vector)

- **Value**— Defines the properties of the characteristic specified by the *kind* parameter.

Note

When selecting fonts, the different characteristics (symbol set, spacing, pitch, etc.) are prioritized as shown in the table above, with symbol set being the highest priority and typeface being the lowest. The font selection priority is the same for HP-GL/2 as for PCL font selection. For more information about the priority of font characteristics, see the “Font Selection by Characteristic” discussion in Chapter 8.

The following tables list the *kind* parameters with their associated values (note that these tables are also valid for the AD [Alternate Font Definition] command):

Kind 1: Symbol Set

The symbol set characteristic defines the set of characters to be used in the alternate font. For a complete list of symbol set values, refer to Appendix C of the *PCL 5 Comparison Guide*.

Note Stick font is available only in ASCII, Roman-8, and Roman Extension symbol sets.

Kind 2: Font Spacing

The font spacing characteristic defines whether the spacing is fixed (all characters occupying an equal horizontal space) or proportional (each character occupying a space proportional to its size). Refer to “Using Fonts” in the beginning of this chapter.

Table 23-40 Kind 2: Font Spacing Values

Font SpacingValue	Description
0	fixed spacing (default)
1	proportional spacing

Kind 3: Pitch

The pitch characteristic is a horizontal measurement defining the number of characters-per-inch for fixed-spaced fonts.

Note When selecting proportional fonts, do not include pitch in the font definition command (SD or AD).

Table 23-41 Kind 3: Pitch Values

Pitch Values	Description
0 to 32 767.9999	characters per inch (default: 9)

Fixed-spaced fonts depend on pitch to determine character size. Proportional fonts ignore pitch. Note that with the SD and AD command you cannot create tall, skinny characters or short, wide characters; the character aspect ratio is preserved unless an SI or SR command overrides it.

Kind 4: Height

For proportional fonts, the height characteristic defines the font point size (the height of the character cell). (Fixed-spaced fonts ignore height; the point size is calculated using the font pitch.) There are approximately 72 points in an inch. Note that with the font definition command (SD or AD)., you cannot create tall, skinny characters or short, wide characters; the character aspect ratio is preserved.

Table 23-42 Kind 4: Height Values

Height Values	Description
0 to 32 767.9999	font point size (default: 11.5)

Kind 5: Posture

Posture defines the character's vertical posture. The default posture is upright.

Table 23-43 Kind 5: Posture Values

Posture Values	Description
0	Upright (Default)
1	Italic
2	Alternate Italic

Kind 6: Stroke Weight

The stroke weight characteristic defines the line thickness used in the font's design. The default stroke weight is medium. When relative sizing is in effect, changes in P1 and P2 cause the relative stroke weight to change in relation to the change in P1/P2. If the aspect ratio of the P1/P2 rectangle is maintained as P1 and P2 are moved, a medium stroke weight font still looks "medium" after it is enlarged or reduced.

Note Available stroke weights are the same as those available within PCL.

Table 23-44 Kind 6: Stroke Weight Values

Stroke WeightValue	Description
-7	Ultra Thin
-6	Extra Thin
-5	Thin
-4	Extra Light
-3	**Light**
-2	Demi Light
-1	Semi Light
0	**Medium, Book or Text**
1	Semi Bold
2	Demi Bold
3	**Bold**
4	Extra Bold
5	Black
6	Extra Black
7	Ultra Black
9999	Stick font only[1]

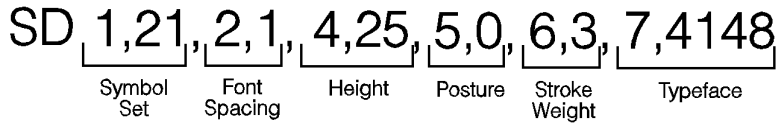
1. When the Stick font (typeface 48) is selected, the value 9999 renders it using the current pen width.

Kind 7: Typeface

The typeface characteristic selects the font's design style, which gives the font its distinctiveness. Typefaces can only be printed if the printer has access to them; if they are internal fonts, are soft fonts that are downloaded to the printer, or if they reside in a font cartridge or SIMM that is plugged into the printer. PCL 5 LaserJet printers have at least three internal scalable typefaces: Univers (4148), CG Times (4101), and the Stick font (48). (For more information about the printer's internal fonts, refer to Chapter 2 of the *PCL 5 Comparison Guide*.)

Example:Using the SD Command

The following example shows the SD command used to designate a 25-point *Univers Bold* font in the ASCII symbol set (use the Select Standard Font (SS) command to select this font after it is designated):



Note that the *pitch* parameter is missing in the above command because the designated font is proportionally spaced.

Table 23-45

Related Commands	Group
AD, Alternate Font Definition DT, Define Label Terminator FI, Select Primary Font FN, Select Secondary Font LB, Label SA, Select Alternate Font SI, Absolute Character Size SR, Relative Character Size SS, Select Standard Font	*The Character Group*

SI, Absolute Character Size

This command specifies the size of labeling characters in centimeters. Use SI to establish character size independent of P1 and P2.

SI *width, height[;]*

or

SI *[;]*

Parameter	Format	Functional Range	Default
width	clamped real	–32768 to 32767	dependent*
height	clamped real	–32768 to 32767	dependent*

* Dependent on the current pitch and font height set by the AD or SD commands.

While SI is in effect, with or without specifying parameter values, the size of characters in the currently selected font are not affected by changes in P1 and P2.

- **No Parameters**— Character size is as specified by the SD (Standard Font Definition) and AD (Alternate Font Definition) commands.
- **Width**— Specifies the width of the nominal character in centimeters. A negative width parameter mirrors labels in the right-to-left direction.

Note Changing character size also changes the width of line used to draw Stick font characters.

- **Height**— Specifies the cap height in centimeters. A negative height parameter mirrors labels in the top-to-bottom direction.

Note that in most languages the width of a letter is typically less than the height. If you set your characters to have a different ‘aspect ratio’, they may look odd to your readers.

An SI command remains in effect until another SI command is executed, an SR command is executed, or the printer is initialized or set to default conditions.

Notes

If the (SB1;) command is in effect, an SI command may not be executed accurately. Labels are rendered using the bitmap font that most closely approximates the character height or width specified by SI (character size is determined by height for proportional fonts and by width for fixed-spaced fonts).

When (SB1;) is in effect, characters cannot be mirrored with negative SI parameters.

Example:Using the SI Command

The following example demonstrates the SI command using both the default Stick typeface and the Univers typeface. The samples on the left were printed using the Stick font, first using the default (11.5-point) and then specifying an absolute character size of 1 cm wide by 1.5 cm high. On the right, a Univers font was used, first at 12-point and scaled to 1 cm by 1.5 cm using the SI command.

Table 23-46 Example: Using the SI Command

$^{E}_{C}$E	Reset the printer.
$^{E}_{C}$%0B	Enter HP-GL/2 mode.
IN;	Initialize HP-GL/2 mode.
SP1;	Select pen number 1. Even though there is no physical pen, the SP command must be used to enable printing.
PA700,3000;	Enter absolute plotting mode and move to (700,3000).
DT#;	Define the label terminator as the “#” character.
LBPrint#;	Print the word “Print” in the default font.
PA700,2000;SI1,1.5; LBPrint#;	Move to (700,2000), specify an absolute character size of 1cm wide by 1.5 cm high, and print the word “Print.”
SI;	Send SI with no parameters to return to the default size.
SD1,21,2,1,4,12, 5,0,6,0,7,4148;SS;	Designate a 12-point Univers font and select it.

Table 23-46 Example: Using the SI Command (continued)

PA4000,3000; LBPrint#;	Move to (4000,3000) and print “Print” in 12-point Univers.
PA4000,2000; SI1,1.5;LBPrint#;	Move the pen to (4000,2000) and specify a character size of 1 cm by 1.5 cm, then print “Print”.
$^{E}_{C}$%0A	Enter the PCL mode.
$^{E}_{C}$E	Send a reset to end the job and eject the page.

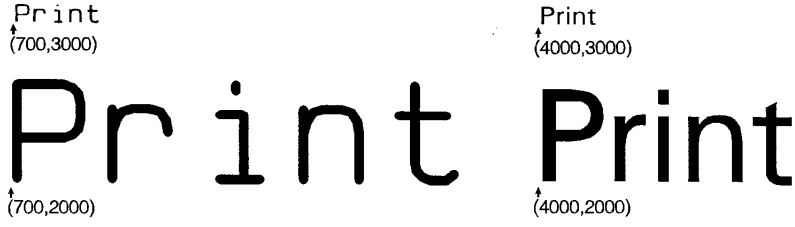


Figure 23-34

The following are examples of negative parameters producing mirror-images of labels. A negative width parameter mirrors labels in the right-to-left direction.

SI-.6,.9;LBPrint#;

Figure 23-35

A negative height parameter mirrors labels in the top-to-bottom direction.

SI.6,-.9;LBPrint#;

Figure 23-36

Negative width and height parameters together mirror labels in both directions, causing the label to appear to be rotated 180 degrees.

SI-.6,-.9;LBPrint#;

Figure 23-37

Table 23-47

Related Commands	Group
AD, Alternate Font Definition CP, Character Plot DI, Absolute Direction DR, Relative Direction LB, Label SB, Scalable or Bitmap Fonts SD, Standard Font Definition SR, Relative Character Size	*The Character Group*

SL, Character Slant

This command specifies the slant at which labels are drawn. Use SL to create slanted text for emphasis, or to re-establish upright labeling after an SL command with parameters has been in effect. (Note that the SL command has no effect when an (SB1;) command is in effect.)

SL *tangent of angle[;]*

or

SL *[;]*

Table 23-48

Parameter	Format	Functional Range	Default
tangent of angle	clamped real	–32768 to 32767	0

The printer interprets the parameters as follows:

- **No Parameter**– Defaults the slant to zero (no slant). Equivalent to (SL0).
- **Tangent of Angle**– Interpreted as an angle θ from vertical. The base of the character always stays on the horizontal as shown in the following illustration.

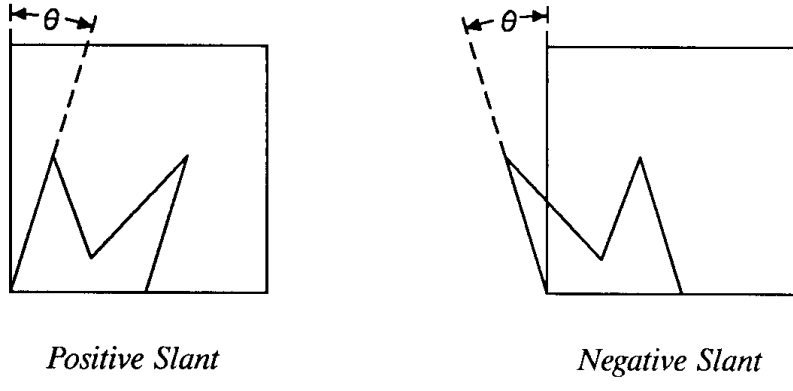


Figure 23-38 Character Slant

The SL command only affects each character relative to an imaginary line beside the label. The direction or placement of the label on the drawing does not affect the SL command; neither do the settings of P1 and P2. The DI and DR commands, however, do affect the slant direction, since the base of a character always stays on the baseline of the label.

You can specify the actual tangent value, or you can use the TAN function available in most computer languages.

An SL command remains in effect until another SL command is executed, or the printer is initialized or set to default conditions.

Example:Using the SL Command

The following example illustrates the Slant command using a tangent value listed in the previous table.

Note Many languages require that tangents be calculated in radians. Consult your programming language documentation if you are not familiar with your language's tangent function.

Table 23-49 Example: Using the SL Command

$^{E}_{C}$E	Reset the printer.
$^{E}_{C}$%0B	Enter HP-GL/2 mode.
IN;	Initialize HP-GL/2 mode.
SP1;	Select pen number 1. Even though there is no physical pen, the SP command must be used to enable printing.
SD1,21,2,1,4,25, 5,0,6,0,7,4101;	Designate the 25-point CG Times font as the standard (primary) font.
SI.7,1;PA1000,1000;	Set the absolute character size to .7 cm wide by 1 cm high; establish absolute plotting and move to (1000,1000).
DT#,1;	Specify a label terminator (#).
SL.36;LBSlant#;	Set the slant angle for 20° from vertical (forward slant), and print "Slant."

Table 23-49 Example: Using the SL Command (continued)

PA1000,300; SL-.36;LBSlant#;	Move to (1000,300), change the slant angle to -20° from upright and print “Slant.”
$^{E}_{C}$%0A	Enter the PCL mode.
$^{E}_{C}$E	Send a reset to end the job and eject the page.

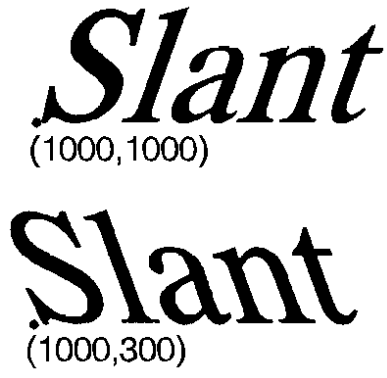


Figure 23-39

Table 23-50

Related Commands	**Group**
SB, Scalable or Bitmap Fonts DI, Absolute Direction DR, Relative Direction LB, Label	*The Character Group*

SR, Relative Character Size

This command specifies the size of characters as a percentage of the distance between P1 and P2. Use SR to establish relative character size so that if the P1/P2 distance changes, the character size adjusts to occupy the same relative amount of space.

SR *width height[;]*

or

SR *[;]*

Parameter	Format	Functional Range	Default
width	clamped real	–32768 to 32767	0.75% of P2X–P1X
height	clamped real	–32768 to 32767	1.5% of P2Y–P1Y

While the SR command is in effect (with or without parameters), changes in P1 and P2 affect the size of characters in the currently selected font.

- **No Parameters**— Defaults the relative character width to 0.75% of the distance (P2X – P1X) and the height to 1.5% of the distance (P2Y – P1Y).
- **Width**— Sets the character width to the specified percentage of the distance between the X-coordinates of P1 and P2. A negative width parameter mirrors labels in the right-to-left direction.

Note

Changing character size also changes the apparent stroke weight of labels; the printer adjusts characters relative to changes in P1/P2. As long as the aspect ratio remains the same with changes in P1/P2, characters will have the same appearance relative to the new P1/P2 rectangle.

- **Height**— Sets the character height to the specified percentage of the distance between the Y-coordinates of P1 and P2. A negative height parameter mirrors labels in the top-to-bottom direction.

The character size you specify with SR is a percentage of (P2X – P1X) and (P2Y – P1Y). The printer calculates the actual character width and height from the specified parameters as follows:

actual width = (width parameter/100) x ($P2_X$ – $P1_X$)

actual height = (height parameter/100) x ($P2_Y$ – $P1_Y$)

For example, suppose P1 and P2 are located at (–6956,–4388) and (6956,4388), respectively. If you establish relative sizing and specify a width of 2 and a height of 3.5, the printer determines the actual character size as follows:

width = || (2/100) x (6956 – (–6956)) = 278.24 plu or 0.695 cm

height = (3.5/100) x (4388 – (–4388)) = 307.16 plu or 0.768 cm

If you changed P1 and P2 settings to (100,100) and (5000,5000), but did not change the SR parameters, the character size would change as follows:

width = (2/100) x (5000 – 100) = || 98 plu or 0.245 cm

height = (3.5/100) x (5000 – 100) = 171.5 plu or 0.429 cm

Note that in most languages the width of a letter is typically less than the height. If you set your characters to have a different “aspect ratio”, they may look odd to your readers.

Note Either negative SR parameters or switching the relative position of P1 and P2 produces mirror-images of labels. When P1 is in the lower left and P2 is in the upper right, the SR command gives the same mirroring results as the SI command. However, if you move P1 to the right of P2, characters are mirrored right-to-left; when you move P1 above P2, characters are mirrored top-to-bottom. When both of these situations occur (using negative parameters in the SR command with an unusual P1/P2 position) double mirroring may result in either direction, in which case the two inversions cancel, and lettering appears normal.

An SR command remains in effect until another SR command is executed, an SI command is executed, or the printer is initialized or set to default conditions.

Example:Using the SR Command

The following example first shows a label with a character size relative to P1 and P2 (SR). Next, the locations of P1 and P2 are changed; then, the character size percentages are specified. Notice that the new character size has equal parameters of 2.5; because the P1/P2 area is square, the resulting characters are square.

Table 23-51 Example: Using the SR Command

$^{E}_{C}$E	Reset the printer.
$^{E}_{C}$%0B	Enter HP-GL/2 mode.
IN;	Initialize HP-GL/2 mode.
SP1;	Select pen number 1. Even though there is no physical pen, the SP command must be used to enable printing.
IP-6956,-4388, 6956,4388;	Move P1 to (-6956,-4388) and P2 to (6956,4388).
DT@;	Specify “@” as the label terminator.
SR;PA0,2700; LBRELATIVE LABEL SIZE@;	Default the character size as a percentage of the P1/P2 rectangle, move the pen to (0,2700), and print “RELATIVE LABEL SIZE.”
IP0,0,5500,5500; PA0,2000;	Move P1 to (0,0) and P2 to (5500,5500), then move the pen to (0,2000).
LBNEW P1 AND P2 CHANGE LABEL SIZE@;	Print “NEW P1 AND P2 CHANGE LABEL SIZE.”
PA0,1000;SR2.5,2.5;	Move to (0,1000) and set the character size to 2.5% by 2.5% of the P1/P2 rectangle.
LBNEW SRm INSTRUCTION@;CP ;	Print “NEW SR INSTRUCTION” and send CP for Carriage Return/Line Feed.
LBCHANGES LABEL SIZE@;	Print “CHANGES LABEL SIZE.”
$^{E}_{C}$%0A	Enter the PCL mode.
$^{E}_{C}$E	Send a reset to end the job and eject the page.

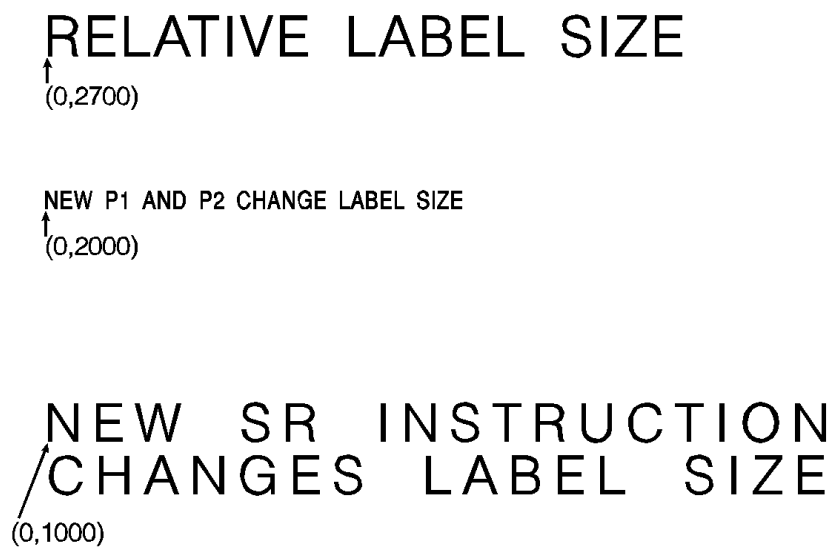


Figure 23-40

Table 23-52

Related Commands	Group
CP, Character Plot SB, Scalable or Bitmap Fonts DI, Absolute Direction DR, Relative Direction IP, Input P1 and P2 IR, Input Relative P1 and P2 SI, Absolute Character Size	*The Character Group*

SS, Select Standard Font

This command selects the standard font (already designated by the Standard Font Definition (SD) command) for subsequent labeling. Use the SS command to shift from the currently selected alternate font to the designated standard font.

SS *[;]*

The SS command tells the printer to print subsequent labeling commands using characters from the standard symbol set designated by the SD command. The SS command is equivalent to using the Shift In control character (SI, ASCII decimal code 15) within a label string.

The default designated standard font is the Stick font, and uses symbol set 277 (Roman-8). This font is in effect when the printer is initialized or set to default conditions. The SS command remains in effect until an SA command is executed.

Table 23-53

Related Commands	Group
AD, Alternate Font Definition DT,Define Label Terminator FI, Select Primary Font FN, Select Secondary Font LB, Label SA, Select Alternate Symbol set SD, Standard Font Definition	*The Character Group*

TD, Transparent Data

This command specifies whether control characters perform their associated function or print as characters when labeling. Use the TD command to print characters that function only as control characters in normal mode.

TD *mode[;]*

or

TD *[;]*

Table 23-54

Parameter	Format	Functional Range	Default
mode	clamped integer	0 or 1	0 (normal)

The printer interprets the parameters as follows:

- **No Parameters**– Defaults the labeling mode to normal. Equivalent to (TD0).
- **Mode**– Selects the normal or transparent data mode for labeling.
- **0 — Normal.**Control codes with an associated functionality perform their function and do not print. Refer to the symbol set tables in Appendix B of the *PCL 5 Comparison Guide*.
- **1 — Transparent.**All characters print and perform no other function (except the currently defined label terminator, which terminates the label). The printer prints a space for non-printing or undefined characters.

Transparent data mode must be enabled to access printable characters which have character codes with an associated functionality in normal mode. For example, the left arrow in the PC-8 symbol set has a character code of 27. In normal mode, a character code of 27 is interpreted as an escape character ($^{E}_{C}$); in transparent data mode, a character code of 27 prints a left arrow.

Table 23-55

Related Commands	Group
AD, Alternate Font Definition DT, Define Label Terminator LB, Label SA, Select Alternate Font SD, Standard Font Definition SS, Select Standard Font	*The Character Group*