digital™

P/N EK–LGPLP–RM. Rev. A

LG*plus* Series Printer
Digital (LG) Emulation
Programmer's Reference Manual

Digital Equipment Corporation

The postpaid Reader's Comments forms at the end of this document request your critical evaluation to assist in preparing future documentation.

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1 Introduction

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About This Manual

This manual is designed so that you can quickly find the information you need to program the Digital LG emulation that is provided with your LG*plus* printer. Brief descriptions follow for each chapter in this book :

- **Chapter 1, "Introduction."** Provides an overview of this book, printer features, and line matrix printing technology.
- **Chapter 2, "Digital Emulation Control Codes."** Describes the LG emulation control code commands that you can send to the printer through the host data stream. These commands allow you to send instructions to the printer and configure many LG emulation parameters.
- **Chapter 3, "Character Sets."** Includes tables that list the hexadecimal and decimal codes for the foreign language and special character sets provided by the LG emulation.
- **Chapter 4, "Bar Codes."** Lists and describes the LG emulation control codes used for printing bar codes.
- **Appendices.** Several appendices provide character set charts for the Digital emulation, and information on configuring the VMS operating system for use with the LG*plus* printer.

How to Use This Manual

You can locate information three ways:

- Use the **Table of Contents** at the front of the manual.
- Use the **Chapter Contents** listed at the front of each chapter.
- Use the **Index** at the back of the manual for references to topics and tasks described in this manual.
- Use the **Glossary** at the back of the manual to find definitions for commonly used terminology.

Warnings and Special Information

Read and comply with all information highlighted under special headings:

WARNING

Conditions that could harm you as well as damage the equipment.

CAUTION

Conditions that could damage the printer or related equipment.

IMPORTANT

Information vital to proper operation of the printer.

NOTE: Information affecting printer operation.

Related Documentation

Following is a list of related documentation for the LG*plus* printer.

- *LG*plus *Series Maintenance Manual* (P/N EK–LGPLE–MM) – Explains how to maintain and repair the LG*plus* line matrix printer at the field service level of maintenance. This manual covers alignments and adjustments, preventive and corrective maintenance, troubleshooting, and basic principles of operation.
- *LG*plus *Series Operator's Guide* (P/N EK–LGPLE–OG) – Describes the keys on the control panel and provides quick reference information on daily printer operations such as loading paper and replacing ribbons.
- *LG*plus *Series Setup Guide* (P/N EK–LGPLS–SG) – Describes how to unpack, install, configure, run diagnostics, and clean the printer, and how to troubleshoot simple fault conditions.
- *LG*plus *Series LinePrinter Plus*TM *Programming Reference Manual* (P/N EK–LGPLE–RM) – Describes the host control codes and character sets available with the Digital LG printer control language.

- *LG^{plus} Series VGL Programmer's Manual* (P/N EK–LGVGL–PM) — Provides information used with the optional Code V Printronix® emulation enhancement feature. The Code V Printronix emulation allows you to create and store forms; generate logos, bar codes, and expanded characters; create other graphics, and merge graphics with alphanumeric data as a document is printed.
- *LG^{plus} PGL Programmer's Manual* (P/N EK–LGPGL–PM) — Provides information used with the optional IGP Printronix emulation enhancement feature. The IGP Printronix emulation allows you to create and store forms; generate logos, bar codes, and expanded characters; create other graphics, and merge graphics with alphanumeric data as a document is printed.

The LG^{plus} Line Matrix Printer

The Digital LG^{plus} printer is a line matrix printer. It uses a variable-speed shuttle, micro-step paper feed control, and multi-phase hammer firing to generate a wide range of horizontal and vertical dot densities with no speed penalties. For a brief discussion of line matrix printing, see page 1–7.

Printer Features

Several standard features are provided with the Digital LG*plus* printer, as described below.

Printer Emulations

Six printer emulations (or protocols) are selectable at the control panel:

- LG emulation
- Proprinter XL emulation
- Epson FX emulation
- P–Series emulation
- PGL – Printronix Graphics Language emulation (optional upgrade)
- VGL – Code V Graphics Language emulation (optional upgrade)

The LG emulation may be configured using the emulation host control codes described in this book, or can be configured via the control panel, as described in the *Setup Guide*.

The Proprinter XL, Epson FX, and P–Series emulation host control codes are described in the *LG*plus *LinePrinter Plus*TM *Programming Reference Manual.* (The LinePrinter Plus emulations can also be configured via the control panel, as described in the *Setup Guide.)* The PGL and VGL emulations are described in the user's manuals provided for those enhancement options.

Host Computer Interfaces

Three hardware interfaces are available with the printers:

- Centronics® parallel interface
- Dataproducts® parallel interface
- Serial (RS–232) interface

Text Formatting and Language Options

You can modify several parameters used primarily for printing text, either by means of the host data stream or the configuration menus.

The text formatting and language options include:

- Selectable print quality
- Selectable alternate horizontal and vertical dot densities that enable you to tailor output to a wider variety of printing requirements
- Selectable forms length and width
- Character-by-character attribute specification
    1) Selectable pitch: normal, expanded, and compressed
    2) Bold print
    3) Overscoring
    4) Single underline
    5) Superscript and subscript printing
- Resident multinational character sets

Bar Code Formatting

Several Digital emulation control codes that allow you to define and print bar codes are described in Chapter 4.

Diagnostics

The *Setup Guide* for these printers discusses the following diagnostic features in more detail:

- Built-in diagnostic self-tests
- Configuration printout
- Data stream hexadecimal code printout

Line Matrix Printing Overview

The Digital LG*plus* printer is an impact printer; it creates characters by printing ink dots on paper. The dots are printed on an invisible matrix mapped in printer memory. (See Figure 1–1.) Dot impressions are made by an array of steel hammers mounted on a rapidly oscillating shuttle. The hammers strike the paper through a moving ink ribbon.

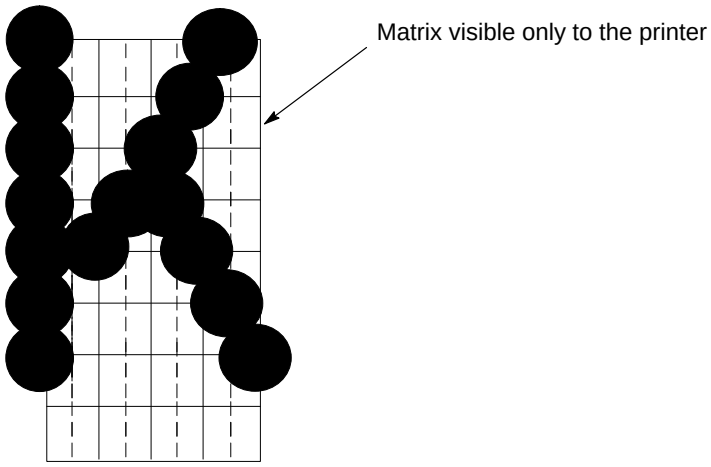
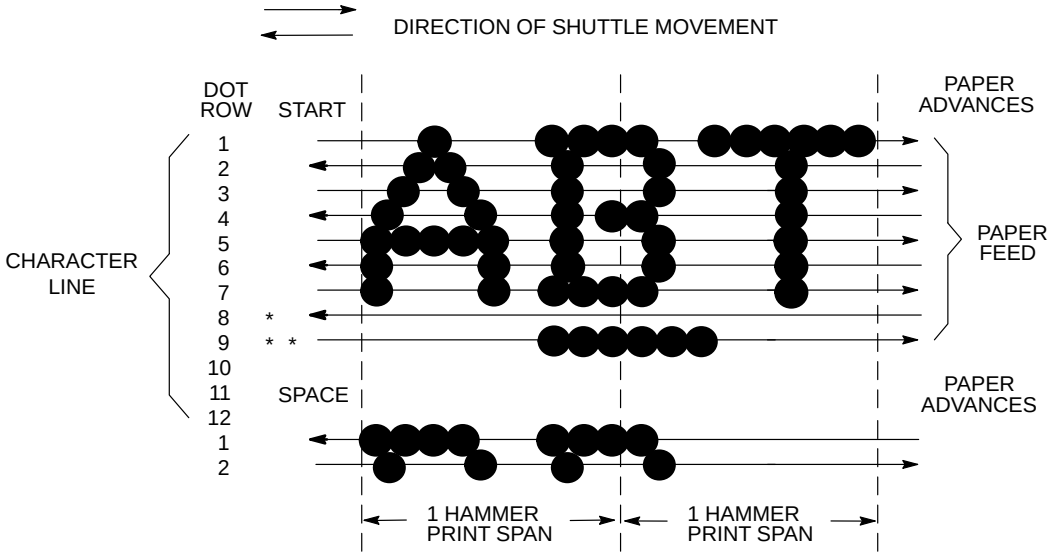


Figure 1–1. Dot Matrix Character Formation

Unlike serial dot matrix printers, which form whole characters one at a time with a moving printhead, the printer divides every printable line of text into dot rows. These printers print a dot row of the entire line with every lateral sweep of the shuttle. (See Figure 1–2.)

During each sweep of the shuttle, the hammers print dots at the required positions in the dot row. When the LG*plus* shuttle reaches the end of a sweep, it reverses direction, the paper is advanced one dot row, and the hammers print the next row of dots as the shuttle sweeps in the opposite direction.

After a line of characters is printed, hammer action stops while the paper is advanced to the first dot row of the next print line. The number of rows allowed for line separation depends on the line spacing you select.



* USED FOR LOWERCASE DESCENDER ONLY

** USED FOR UNDERLINE AND LOWERCASE DESCENDER

Figure 1–2. Dot Matrix Line Printing

Printing Speed

The speed at which text prints is measured in lines per minute (lpm). This speed is inversely proportional to the number of dot rows required to produce a character line, regardless of the number of characters in the line. More dot rows are required to print lowercase characters with descenders; consequently, those character lines print at a fractionally lower rate.

The LG*plus* printer also prints dot-addressable graphic images. The speed at which graphics are plotted is measured in inches per minute (ipm). Unidirectional plotting produces slightly better print quality, and takes about twice as long as bidirectional plotting. You can select either plotting mode from the control panel.

Printing and plotting rates also vary according to the print quality you select. Print quality refers to the way you instruct the printer to create characters. If, for example, you select near letter quality (NLQ), the printer uses more dot rows to form characters than if you choose high speed (HS) print quality. Character formation and print speed are faster in HS because the printer uses fewer dot rows to form characters. Vertical dot density is thus a factor in printing speed. Nominal printing rates are charted in Appendix A of the *Setup Guide*.

2 Digital Emulation Control Codes

Chapter Contents

Digital Emulation

Emulation refers to the ability of a printer to execute the commands of other printer control languages. Digital emulation mode (displayed as “LG” on the control panel) enables the LG*plus* to print files coded for a Digital LG02 printer. LG is the default printer emulation when the printer is powered on. If LG is not the active emulation, use the control panel configuration menus to select the LG option nested under the “ACTIVE EMULATION” main menu selection. (See Chapter 4 in your *LG*^{plus} *Series Setup Guide*.)

A printer control language (also called a printer protocol) is the coding system used to convey, manipulate, and print data. It contains character codes and command sequences.

A printer and its host computer must use the same printer control language. In this manual, the terms printer control language, emulation, and protocol are synonymous.

Bar Code Printing

Bar code printing is selected by control sequences, not via the operator control panel.

Bar code printing, including the control codes related to bar code printing, are described in Chapter 4 of this book.

Print Mode and Plot Mode

The LG*plus* provides a print mode and a plot mode for printing text and graphic elements, and a set of print fonts and plot fonts that are used in each mode. Some example print fonts and plot fonts are listed in the table of *P2* values on page 2–97. A report of the available font files can be requested using the font status sequences (see page 2–101), if you have a serial connection to the printer.

In print mode, the LG*plus* can print only the set of “print fonts.” This mode is often preferable, because it is very fast and optimized for printing text. The quality of the print font determines the print density in this mode.

Plot mode handles graphic elements such as vectors and bar codes,.as well as many built–in DEC plot fonts. Because graphic elements and built–in DEC fonts are plotted, this mode is much slower than printer mode.

The printer will automatically switch between print mode and plot mode, depending on the current print requirements. The default mode is print mode, but the printer will often switch to plot mode when various densities are needed to plot graphic elements. For instance, the DECSGD command will allow many different combinations of horizontal and vertical densities that cannot be used in print mode.

Plot mode is performed in graphic passes. In other words, all elements in a given density are printed in the same paper motion. If the user chooses ten elements in one density and then changes to another density, the ten previous elements are printed and the paper moves forward in one pass. The elements printed at the new density may cause reverse paper motion, depending on where they are to be printed. Therefore, the user should consider this when combining elements of various densities on a form.

When choosing print or plot fonts via the SGR command, the user should also be aware that these fonts will only be used in their respective mode. For instance, if the printer is in print mode, a selection of a plot font will not be chosen until the printer is forced into plot mode. Likewise, if the printer is in plot mode and a print font is chosen, this font will not be active until the printer returns from plot mode to print mode.

Optimizing Print Mode

When you send a command such as SPI, DECSHORP, SHS, and SGR to the printer to alter character spacing, font size, and font attributes, the printer will switch to plot mode, causing the density to change and the printer throughput to decrease.

To optimize print mode, set the Print Mode option to Enable with the control panel. The switch to plot mode will be avoided and printer throughput will be increased considerably.

Optimizing Plot Mode

Print mode text and graphic elements print at different densities. When the two are mixed, a paper reversal will usually occur because of the different densities. This is often the case when POSTNET bar code data is printed with text.

To optimize plot mode, set the Plot Mode option to Enable with the control panel. The POSTNET bar code, for example, will print in the current print mode density when in the portrait orientation. Setting to Enable can reduce paper reversals with POSTNET and increase printer throughput significantly. This is true only for the portrait orientation. All other orientations do not have plot mode optimization.

Character Printing

Print data sent to the printer consist of two types of character codes:

- Printable Characters are codes representing alphabet characters, punctuation marks, and graphic symbols
- Control Codes are one or more bytes that instruct the printer how to process and print characters and graphics

The LG*plus* processes the character codes of the DEC Multinational Character Set (page 2–6). Characters and codes from this chart are identified and located by their column and row numbers. For example, the ASCII character SUB is identified as 1/10, which means that it is located at column 1 row 10.

You may send data from the host computer in either 7–bit or 8–bit form. (The conversion processes from 7–bit to 8–bit form and vice versa are described on page 2–12.)

Printable Characters

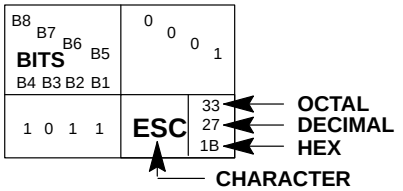
Columns 0 through 7 of the DEC Multinational Character Set (page 2–6), are the standard ASCII printable character set used in a 7–bit environment. If you choose an 8–bit environment, the printable character set expands to include columns 8 through 15.

If word length is 7–bits, printable characters are only generated from columns 2 through 7. If word length is set at 8–bits, printable characters can be generated from columns 2 through 7 and columns 10 through 15. (Note that in an 8–bit environment, columns 0 through 7 have the 8th bit set to zero, while columns 8 through 15 always have the 8th bit set to 1.)

NOTE: The actual characters printed may not always be those shown in the DEC Multinational Character Set because printable characters in the column/row positions vary, depending upon the character set used.

DEC Multinational Character Set

KEY



7–bit mode or bit 8 set to zero

Columns 8 and 9 can be converted to 7–bit Escape sequences.

Columns 10 thru 15 are only accessed in 8–bit mode.

B8 B7 B6 B5 / BITS B4 B3 B2 B1	ROW	COLUMN 0		COLUMN 1		COLUMN 2		COLUMN 3		COLUMN 4		COLUMN 5		COLUMN 6		COLUMN 7	
0 0 0 0	0	NUL	0 0 0		20 16 10	SP	40 32 20	0	60 48 30	@	100 64 40	P	120 80 50	`	140 96 60	p	160 112 70
0 0 0 1	1		1 1 1	DC1 (XON)	21 17 11	!	41 33 21	1	61 49 31	A	101 65 41	Q	121 81 51	a	141 97 61	q	161 113 71
0 0 1 0	2		2 2 2		22 18 12	″	42 34 22	2	62 50 32	B	102 66 42	R	122 82 52	b	142 98 62	r	162 114 72
0 0 1 1	3		3 3 3	DC3 (XOFF)	23 19 13	#	43 35 23	3	63 51 33	C	103 67 43	S	123 83 53	c	143 99 63	s	163 115 73
0 1 0 0	4	EOT	4 4 4		24 20 14	$	44 36 24	4	64 52 34	D	104 68 44	T	124 84 54	d	144 100 64	t	164 116 74
0 1 0 1	5		5 5 5		25 21 15	%	45 37 25	5	65 53 35	E	105 69 45	U	125 85 55	e	145 101 65	u	165 117 75
0 1 1 0	6		6 6 6		26 22 16	&	46 38 26	6	66 54 36	F	106 70 46	V	126 86 56	f	146 102 66	v	166 118 76
0 1 1 1	7		7 7 7		27 23 17	’	47 39 27	7	67 55 37	G	107 71 47	W	127 87 57	g	147 103 67	w	167 119 77
1 0 0 0	8	BS	10 8 8	CAN	30 24 18	(	50 40 28	8	70 56 38	H	110 72 48	X	130 88 58	h	150 104 68	x	170 120 78
1 0 0 1	9	HT	11 9 9		31 25 19	)	51 41 29	9	71 57 39	I	111 73 49	Y	131 89 59	i	151 105 69	y	171 121 79
1 0 1 0	10	LF	12 10 0 A	SUB	32 26 1A	*	52 42 2A	:	72 58 3A	J	112 74 4A	Z	132 90 5A	j	152 106 6A	z	172 122 7A
1 0 1 1	11	VT	13 11 0 B	ESC	33 27 1B	+	53 43 2B	;	73 59 3B	K	113 75 4B	[	133 91 5B	k	153 107 6B	{	173 123 7B
1 1 0 0	12	FF	14 12 0 C		34 28 1C	,	54 44 2C	<	74 60 3C	L	114 76 4C	\	134 92 5C	l	154 108 6C	|	174 124 7C
1 1 0 1	13	CR	15 13 0 D		35 29 1D	–	55 45 2D	=	75 61 3D	M	115 77 4D	]	135 93 5D	m	155 109 6D	}	175 125 7D
1 1 1 0	14	SO	16 14 0 E		36 30 1E	.	56 46 2E	>	76 62 3E	N	116 78 4E	^	136 94 5E	n	156 110 6E	~	176 126 7E
1 1 1 1	15	SI	17 15 0 F		37 31 1F	/	57 47 2F	?	77 63 3F	O	117 79 4F	_	137 95 5F	o	157 111 6F	DEL	177 127 7F

B8 B7 B6 B5 / BITS B4 B3 B2 B1	ROW	COLUMN 8		COLUMN 9		COLUMN 10		COLUMN 11		COLUMN 12		COLUMN 13		COLUMN 14		COLUMN 15	
0 0 0 0	0		200 128 80	DCS	220 144 90	(Not Used)	240 160 A0	*f*	260 176 B0	À	300 192 C0		320 208 D0	à	340 224 E0		360 240 F0
0 0 0 1	1		201 129 81		221 145 91	¡	241 161 A1	±	261 177 B1	Á	301 193 C1	₦	321 209 D1	á	341 225 E1	ñ	361 241 F1
0 0 1 0	2		202 130 82		222 146 92	¢	242 162 A2	2	262 178 B2	Â	302 194 C2	Ò	322 210 D2	â	342 226 E2	ò	362 242 F2
0 0 1 1	3		203 131 83		223 147 93	£	243 163 A3	3	263 179 B3	Ã	303 195 C3	Ó	323 211 D3	ã	343 227 E3	ó	363 243 F3
0 1 0 0	4	IND	204 132 84		224 148 94		244 164 A4		264 180 B4	Ä	304 196 C4	Ô	324 212 D4	ä	344 228 E4	ô	364 244 F4
0 1 0 1	5	NEL	205 133 85		225 149 95	¥	245 165 A5	µ	265 181 B5	Å	305 197 C5	Õ	325 213 D5	å	345 229 E5	õ	365 245 F5
0 1 1 0	6		206 134 86		226 150 96		246 166 A6	¶	266 182 B6	Æ	306 198 C6	Ö	326 214 D6	æ	346 230 E6	ö	366 246 F6
0 1 1 1	7		207 135 87		227 151 97	§	247 167 A7	•	267 183 B7	Ç	307 199 C7	Œ	327 215 D7	ç	347 231 E7	œ	367 247 F7
1 0 0 0	8	HTS	210 136 88		230 152 98	¤	250 168 A8		270 184 B8	È	310 200 C8	Ø	330 216 D8	è	350 232 E8	ø	370 248 F8
1 0 0 1	9		211 137 89		231 153 99	©	251 169 A9	!	271 185 B9	É	311 201 C9	Ù	331 217 D9	é	351 233 E9	ù	371 249 F9
1 0 1 0	10	VTS	212 138 8A		232 154 9A	a	252 170 AA	o	272 186 BA	Ê	312 202 CA	Ú	332 218 DA	ê	352 234 EA	ú	372 250 FA
1 0 1 1	11	PLD	213 139 8B	CSI	233 155 9B	≪	253 171 AB	≫	273 187 BB	Ë	313 203 CB	Û	333 219 DB	ë	353 235 EB	û	373 251 FB
1 1 0 0	12	PLU	214 140 8C	ST	234 156 9C		254 172 AC	¼	274 188 BC	Ì	314 204 CC	Ü	334 220 DC	ì	354 236 EC	ü	374 252 FC
1 1 0 1	13	RI	215 141 8D		235 157 9D		255 173 AD	½	275 189 BD	Í	315 205 CD	Ÿ	335 221 DD	í	355 237 ED	ÿ	375 253 FD
1 1 1 0	14	SS2	216 142 8E		236 158 9E		256 174 AE		276 190 BE	Î	316 206 CE		336 222 DE	î	356 238 EE		376 254 FE
1 1 1 1	15	SS3	217 143 8F		237 159 9F		257 175 AF	¿	277 191 BF	Ï	317 207 CF	b	337 223 DF	ï	357 239 EF	(Not Used)	377 255 FF

ASCII Control Codes

U.S. ASCII CHARACTER SET

Additional Control Codes

DEC SUPPLEMENTAL CHARACTER SET

Control Code Types

Control codes do not print; they drive printer activity. The printer recognizes two kinds of control codes:

- Single–byte control codes
- Escape sequences that include two or more bytes of control code information

The following topics describe single–byte control codes and Escape sequences in detail.

Control Codes

A control code is a single (one-byte) non–printing character that instructs the printer to perform a specific operation. When the printer receives a control character, it immediately performs the control operation instead of printing a graphic character. The LG*plus* printer recognizes two sets of control characters:

- ASCII control codes (7–bit codes)
- Additional control codes (8–bit codes)

ASCII Control Codes

Table 2–1 defines the ASCII control codes recognized by the printer in Digital emulation mode. These codes are located in columns 0 and 1 of the DEC Multinational Character Set (page 2–6), and the column/row coordinates from this chart are printed beneath the Mnemonic category in Table 2–1. These control codes are available in a 7–bit data environment or in an 8–bit environment if bit 8 is set to 1.

NOTE: On many computers, an ASCII control code can be sent from the input keyboard by holding down the CTRL key while depressing the key specified in Table 2–1.

Additional Control Codes

The additional control codes are 8–bit control characters defined by ANSI and Digital unique sequences, and are available in an 8–bit data environment when bit 8 is set to 1. Table 2–2 defines the additional control codes

recognized by the printer in Digital emulation mode. These codes are in columns 8 and 9 of the DEC Multinational Character Set (page 2–6), and the column/row coordinates from this chart are printed beneath the Mnemonic category in Table 2–2.

The 8–bit additional control codes may be sent in 7–bit form as equivalent escape sequences. Equivalent 7–bit escape sequences for the 8–bit additional control codes are listed in Table 2–3. Control code conversion from 7–bit to 8–bit data environments, and vice versa, is discussed on page 2–12.

Table 2–1. ASCII Control Codes

Mnemonic Column/Row	Name	Key Pressed with CTRL	Function
BEL 0/7	Bell	G	When a <BEL> control code is received, the printer produces a short audible tone.
HT 0/9	Horizontal Tab	I	HT advances the active tab position to the next horizontal tab stop on the line, or to the right margin if there are no more tab stops. The printer initially sets a horizontal tab stop every eight characters. Tab stops may be located either at column numbers or at physical positions on the page.
LF 0/10	Line Feed	J	LF advances the active line vertically by one line. If less than one vertical line space remains on the page, LF sets the active line to the first line on the next page. If line feed/new line (LNM) is set, LF also advances the active column to the left margin.
VT 0/11	Vertical Tab	K	VT moves the active line to the next vertical tab stop. The LG*plus* printer initially sets a vertical tab stop for every line on the page.
FF 0/12	Form Feed	L	FF advances the active line to the first printable line on the next page.
CR 0/13	Carriage Return	M	CR returns the active column to the left margin. If carriage return/new line mode is set, CR also advances the active line to the next line.

Continued next page

Table 2–1. ASCII Control Codes (Continued)

Mnemonic Column/Row	Name	Key Pressed with CTRL	Function
SO 0/14	Shift Out	N	SO locks character set G1 into GL.
SI 0/15	Shift In	O	SI locks character set G0 into GL.
DC1 (XON) 1/1	Device Control 1	Q	DC1 informs the host computer that the printer is ready to receive data.
DC3 (XOFF) 1/3	Device Control 3	S	DC3 tells the host computer to pause before sending more data until the printer sends DC1.
CAN 1/8	Cancel	X	CAN immediately ends an escape or control sequence. The printer interprets the characters following CAN as normal. CAN also cancels a Device Control String (DCS) when received within the command string of that DCS.
SUB 1/10	Substitute	Z	SUB immediately ends an escape or control sequence. SUB replaces a character received with an error in the sequence. SUB prints as a space character for sixel data.
ESC 1/11	Escape	[	ESC introduces an escape or control sequence. If received in the middle of a sequence, ESC immediately ends the sequence and starts a new sequence. ESC also immediately ends a Device Control String (DCS).
BS 0/8	Backspace	H	BS moves the active horizontal position back one Horizontal Advance Increment.

Table 2–2. Additional Control Codes

Mnemonic Column/Row	Name	Function
IND 8/4	Index	IND moves the active position down to the same position on the next line. If the new position is below the bottom margin, the active position moves to the top of the next page.
NEL 8/5	Next Line	NEL moves the active position to the left margin on the next line. If the new position is below the bottom margin, the active position moves to the top of the next page.
HTS 8/8	Horizontal Tab Set	HTS sets a horizontal tab at the active column.
VTS 8/10	Vertical Tab Set	VTS sets a vertical tab at the active line.
PLD 8/11	Partial Line Down	PLD moves the active position down one–half line. The distance moved is specified as a parameter of the font, not by vertical spacing escape sequences.
PLU 8/12	Partial Line Up	PLD moves the active position up one–half line. The distance moved is specified as a parameter of the font, not by vertical spacing escape sequences.
RI 8/13	Reverse Index	RI moves the active line position up to the same position on the preceding line.
SS2 8/14	Single Shift 2	SS2 moves character set G2 into Gl, to print one character.
SS3 8/15	Single Shift 3	SS3 moves character set G3 into Gl, to print one character.
DCS 9/0	Device Control String	DCS introduces a device control string.
CSI 9/11	Control String Introducer	CSI introduces a sequence of one or more bytes that define a control function.
ST 9/12	String Terminator	ST indicates the end of a device control string (DCS).
9/DH–9/FH		<OSC>, <PM>, <APC>: See “note”

NOTE: The LG*plus* recognizes the start of this control string but ignores all data that follow until this sequence is either aborted or terminated by an <ST> sequence.

Table 2–3. Equivalent 7–Bit and 8–Bit Additional Control Codes

Name	8–Bit Character Column/Row	7–Bit Sequence Column/Row
Index	**IND** 8/4	**ESC D** 1/11 4/4
Next Line	**NEL** 8/5	**ESC E** 1/11 4/5
Horizontal Tab Set	**HTS** 8/8	**ESC H** 1/11 4/8
Vertical Tab Set	**VTS** 8/10	**ESC J** 1/11 4/10
Partial Line Down	**PLD** 8/11	**ESC K** 1/11 4/11
Partial Line Up	**PLU** 8/12	**ESC L** 1/11 4/12
Reverse Index	**RI** 8/13	**ESC M** 1/11 4/13
Single Shift 2	**SS2** 8/14	**ESC N** 1/11 4/14
Single Shift 3	**SS3** 8/15	**ESC O** 1/11 4/15
Device Control String	**DCS** 9/0	**ESC P** 1/11 5/0
Control String Introducer	**CSI** 9/11	**ESC [** 1/11 5/11
String Terminator	**ST** 9/12	**ESC ** 1/11 5/12

NOTE: Printable characters in columns 10 through 15 of 8–bit character sets are not converted.

8–Bit to 7–Bit Control Code Conversion

Convert 8–bit additional control codes to 7–bit escape sequences as follows:

1. Insert the ESC character.
2. Set the eighth bit of the final character to 0 and set its seventh bit to 1.

NOTE: Only control codes found in columns 8 and 9 of the character sets may be converted as shown. Printable characters in columns 10 through 15 are not converted.

7–Bit to 8–Bit Control Code Conversion

Convert 7–bit escape sequences to 8–bit additional control codes as follows:

1. Remove the ESC character.
2. Set the eighth bit of the final character to 1 and set its seventh bit to 0.

Escape Code Sequences

The control codes discussed in the previous section are single–byte control codes. The number of printer capabilities is greatly increased, however, by combining character codes into escape sequences that contain two or more bytes of information. Escape sequences always begin with the ASCII ESCape character (location 1/11).

An ESC character in the data stream signals the printer to wait for special instructions. The character codes following the ESC character tell the printer what to do.

The printer in Digital emulation mode recognizes three types of escape code sequence:

- Escape Sequences (do not include variable parameters)
- Control Sequences (include variable parameters)
- Device Control Strings (include variable parameters)

Escape Sequences

NOTE: Code sequences appear in this manual with spaces inserted between command elements. This is done for readability; do not insert spaces between code characters when you are programming unless the ASCII space character is part of a code sequence. For example, a code sequence printed in this manual as ***ESC [1 ; 4 m*** is programmed as ***ESC[1;4m***

An escape sequence uses two or more bytes to define a specific printer control function, but does not include any variable parameters (although there may be intermediate characters). The format for an escape sequence is:

ESC	**I**	**F**
1/11	2/0 – 2/15	3/0 – 7/14
Escape Sequence Introducer	Intermediate character(s)	Final character

After the escape sequence introducer, ESC, intermediate characters may or may not follow in the sequence. These characters always come from the 2/0 through 2/15 (column/row) range of the DEC Multinational Character Set (page 2–6). The final character signals the end of the escape sequence and always comes from the 3/0 through 7/14 range of the DEC multinational character set.

For example, if the intermediate character is SP (hex 20) and the final character is G (hex 47), the resulting escape sequence is ESC SP G (hex 1B 20 47). This particular sequence tells the printer how to process data it sends back to the host computer: send data in 7–bit form and send additional control characters as 7–bit escape sequences.

If the characters following the ESC code are not within the defined ranges, or if they are within the defined ranges but not recognized as a function of this printer, the entire sequence is ignored.

Control Sequences

Control sequences begin with the control sequence introducer, CSI (9/11), in an 8–bit data environment. They are also escape sequences, however, because the 8–bit CSI control character can be represented by the 7–bit escape sequence, ESC [. Control sequences may contain variable parameters within the command sequence. The format for control sequences is:

CSI	**P**	**I**	**F**
9/11	3/0 to 3/15	2/0 to 2/15	3/0 to 7/14
8–Bit Control Sequence Introducer	Parameter character(s)	Intermediate character(s)	Final character
or			
ESC [			
1/11 5/11			
7–Bit Escape Code CSI equivalent			

Parameter characters modify the action or interpretation of the command sequence. There may be up to, but no more than, 16 parameters per sequence. The **;** (3/11) (semicolon) character is the delimiter that separates parameters. This delimiter must be used whenever there are multiple parameters in the control sequence.

Two kinds of parameters are used: numeric and selective. A numeric parameter represents a numerical value. Numeric parameters are represented in this manual as `Pn, Pn1, Pn2`, etc. A selective parameter chooses an action associated with the parameter value. Selective parameters are represented in this manual as `Ps, Ps1, Ps2,` etc.

Parameters are interpreted as unsigned decimal integers with the most significant digit first. Parameter values greater than the maximum allowable 65535 will be set to 65535. Do not use a decimal point in any parameter — the printer will ignore the entire command. If no value is specified, zero (0) is assumed. A value of zero or an omitted parameter indicates the printer default value should be used for that sequence.

If the printer receives the parameter characters 3AH, 3DH, or 3EH anywhere in the parameter string, it performs no action until the final character is received, then ignores the entire sequence. These parameter characters are sixel control codes and must not conflict with CSI sequences.

A CSI sequence containing one or more group(s) of invalid parameters is still processed, but only the valid parameters are used. If all parameters in a sequence are out of range or invalid, the printer waits for the final character, then ignores the entire sequence.

Intermediate and final characters define the control function. For example, the sequence, ESC [3 m (hex 1B 5B 33 6D), turns italic printing on. This sequence uses one selective parameter [3], no intermediate characters, and the final character [m].

The LG*plus* processes control sequences with one intermediate character only. If more than one intermediate character is received, the printer waits for the final character, then ignores the entire control sequence. If no intermediate characters are in the sequence, the final character determines the control function.

Device Control Strings

The format of a device control string is:

DCS	**P. . . P**	**I . . . I**	**F**	**D . . . D**	**F**
9/0	3/0 to 3/15	2/0 to 2/15	3/0 to 7/14		9/12
8–Bit Device Control String Introducer	Parameter character(s)	Intermediate character(s)	Final character	Data (0 or more characters)	String Terminator
Introducer	Protocol Selector				

The DCS control character is the Device Control String introducer. DCS has an 8-bit code of 9/0. This is equivalent to the escape sequence consisting of the ESC (1/11) and P (5/0) characters. Both encodings are recognized as DCS. After DCS is received, all characters received up to and including the String Terminator (ST) are not printed but are stored as part of the control string.

The protocol selector consists of parameter characters (P...P), intermediate characters (I...I), and the final character. These characters are processed identically to the format of a control sequence (see previous section). The intermediate characters, if any, and the final character, specify the meaning of the data. If present, the parameter string can further elaborate the interpretation of the data.

If the protocol selector is parsed but not recognized, all data that follows is ignored until it is either terminated by ST or aborted.

Special Parsing Requirements

Parsing is the process of separating a programming statement into basic units that can be translated into machine instructions. Special parsing requirements are necessary when invalid parameters are specified, when invalid control functions are specified, and when control characters are embedded in control functions. Generally, the printer recovers from these conditions by performing as much of the function as possible (or, parsing the valid parameter from the invalid).

When control sequences are not recognized by the printer or when selective parameters are invalid, the printer ignores them. Parameter values greater than the specified limit are set to the maximum allowable value for that parameter. If a CO (7–bit) control character is received within a control sequence, the control character is executed by the printer as if it was received before the control sequence. Parsing then resumes. The exceptions to this rule follow:

- When the control character is <CAN> (18 hex) or <SUB> (1A hex), the sequence is aborted and the control character processed.
- If the control character is ESC (1B hex), the sequence is aborted and a new sequence begins.
- If a C1 (8–bit) control character is received within an escape or control sequence, the sequence is aborted and the C1 control character is then processed, if it is applicable to the printer. If not, it is ignored.
- When the (A0 hex) character is received within a control sequence, it is processed as a <Space> (20 hex) character, and parsing then resumes.
- If character (FF hex) is received within a control sequence, it is processed as a <DEL> (7F hex) character, then parsing resumes.
- When a GR character is received during a control sequence, the eighth bit is ignored. The remaining seven bits define a GL character.

The following messages explain error codes that might arise when using the single shift control character:

- If a C0 or C1 control character is received after a single shift control character <SS2> (8E hex) or <SS3> (8F hex), the control character is processed and the single shift flag remains set. If a control sequence is received after <SS2> (8E hex) or <SS3> (8F hex), the sequence is processed and the single shift flag remains set.

When the characters <SP> (20 hex) or <DEL> (7F hex) are received after an SS2 or SS3, the following occurs:

- If the (94) character set resides in the set being accessed (either G2 or G3), the <Space> or <DEL> keys are processed and the single shift flag remains set.
- If the (94) character set resides in the set being accessed (either G2 or G3), the printer images the corresponding character of that set (A0 hex or FF hex), then reset the single shift flag.
- If a GR character is received after an SS2 or SS# sequence, the eighth bit is ignored. The single shift function then applies the remaining seven bits to define a GL character.

NOTE: An error condition exists any time a GR character follows an SS2 or SS3 sequence. The software should never send a GR character after an SS2 or SS3 character.

If either (A0 hex) or (FF hex) are received after SS2 or SS3, the following occurs:

- The LG*plus* prints the error character (a reverse question mark) and resets the single shift flag when a (94) character resides in the set being accessed (either G2 or G3).
- If a (96) character resides in the set being accessed (either G2 or G3), the printer images the corresponding character, (A0 hex) or (FF hex), of that set, then resets the single shift flag.

Control Code Description Format

The rest of this chapter discusses the control codes in detail. Where applicable, the following information is listed for each control code sequence:

Name The title or function of the control code. The Digital or ASCII mnemonic is in parentheses after the name.

ASCII Code The ASCII name for the control code. Escape sequences are in 7–bit (ASCII) form.

NOTE: In the code descriptions, the ASCII space character (2/0, hex 20, decimal 32) is represented by SP.

Hex Code The code or escape sequence in hexadecimal numbers.

Dec Code The code or escape sequence in decimal numbers.

Purpose The function(s) of the control code.

Discussion A discussion of the uses of the sequence, and descriptions of any exceptions or limitations to use.

Control Code Index

The Digital emulation mode control codes listed below are grouped by related functions.

Control code sequences in this manual are shown in 7–bit form. They can be either 7–bit or 8–bit form, depending on your requirements. Code conversion instructions are on page 2–12.

For commands that turn features on and off (set/reset, enable/disable), the page number for the enabling command is listed. The disabling command is on the same page.

IMPORTANT

In the index below SP represents the ASCII space character (decimal 32, 20_H). (A two–digit number followed by a subscripted capital "H" is a hexadecimal number. Numbers without subscripts are decimal numbers.)

Set/Reset Mode

	Set (Enable)	Reset (Disable)
ASCII Code	`ESC [ Ps h`	`ESC [ Ps l`
Hex Code	`1B 5B Ps 68`	`1B 5B Ps 6C`
Dec Code	`27 91 Ps 104`	`27 91 Ps 108`

Purpose Turns basic printing features on (set) or off (reset).

Discussion Set/Reset Mode controls certain printer features that have two settings: on or off. One sequence may be used to turn several features on or off. Parameter values `Ps` determine different printer modes.

Parameter values are either ANSI or Digital private. All parameters in a given sequence must be of the same type. Digital private parameters are preceded by the question mark (“?”) character.

On Set/Reset features, default settings go into effect when the printer is powered–up or a reset (RIS or DECSTR) sequence is sent.

Table 2–4. Set/Reset Mode Parameter Values

Ps (Parameter Values)	Printer Mode	Page No.
ANSI		
11	Position Unit Mode (PUM)	2–30
20	Line feed/New line Mode (LNM)	2–25
DEC Private		
?7	Autowrap Mode (DECAWM)	2–27
?29	Pitch Select Mode (DECPSM)	2–28
?40	Carriage Return/New Line Mode (DECCRNLM)	2–26
?70	Force Plot Mode (DECFPM)	2–32

Line Feed/New Line Mode (LNM)

	Set (Enable)	Reset (Disable)
ASCII Code	`ESC [ 2 0 h`	`ESC [ 2 0 l`
Hex Code	`1B 5B 32 30 68`	`1B 5B 32 30 6C`
Dec Code	`27 91 50 48 104`	`27 91 50 48 108`

Purpose Defines the paper position according to how the line feed features are enabled.

Discussion Advance the paper up one line by pressing the line feed key once. A half–second pause ensues, then the paper will feed one line. To feed paper continuously, hold down the line feed key. After a half–second pause, the paper feeds up one line in 3-hertz intervals.

To enable further line feed features, (i.e., microstepping), raise the printer cover and locate the control panel on the left side. Four keys—UP, NEXT, DOWN, and PREV—control additional line feed capabilities:

To move the paper up 1/600 inch, press the LINE FEED key and the NEXT key together. For continuous forward paper feed at 1/600 inch, hold down the LINE FEED key and the NEXT key; the paper will feed at 3–hertz intervals after a half–second pause.

Whether Line Feed/New Line mode is enabled or disabled, a Carriage Return <CR> control code is interpreted according to the DECCRNLM mode in use. (See “Carriage Return/New Line Mode,” page 2–26.)

LNM remains as selected from the last power–on session. Factory default is LNM reset.

Carriage Return/New Line Mode (DECCRNLM)

	Set (Enable)	Reset (Disable)
ASCII Code	`ESC [ ? 4 0 h`	`ESC [ ? 4 0 l`
Hex Code	`1B 5B 3F 34 30 68`	`1B 5B 3F 34 30 6C`
Dec Code	`27 91 63 52 48 104`	`27 91 63 52 48 108`

Purpose Defines printer response to the Carriage Return (CR) character.

Discussion When the printer receives the CR character with Carriage Return/New Line Mode enabled (set), it returns the active column to the left margin and advances paper one line.

When the printer receives the CR character with Carriage Return/New Line Mode disabled (reset), it returns the active column to the left margin without advancing the active line.

LNM remains as selected from the last power–on session. The factory default is LNM reset.

Autowrap Mode (DECAWM)

	Set (Enable)	Reset (Disable)
ASCII Code	`ESC [ ? 7 h`	`ESC [ ? 7 l`
Hex Code	`1B 5B 3F 37 68`	`1B 5B 3F 37 6C`
Dec Code	`27 91 63 55 104`	`27 91 63 55 108`

Purpose Determines what happens when text exceeds the right margin of the page.

Discussion When autowrap is enabled (set) and text runs past the right margin, the active position moves to the left margin on the next line, and no data are lost.

When autowrap is disabled (reset) and text runs past the right margin, the data are lost.

DECAWM remains as selected from the last power–on session. Factory default is DECAWM reset.

Pitch Select Mode (DECPSM)

	Set (Enable)	Reset (Disable)
ASCII Code	`ESC [ ? 2 9 h`	`ESC [ ? 2 9 l`
Hex Code	`1B 5B 3F 32 39 68`	`1B 5B 3F 32 39 6C`
Dec Code	`27 91 63 50 57 104`	`27 91 63 50 57 108`

Purpose Controls the Set Horizontal Pitch (DECSHORP) sequence.

Discussion When Pitch Select Mode is enabled (set), the current font determines the horizontal pitch.

When Pitch Select Mode is disabled (reset), the printer uses the horizontal pitch selected by the Set Horizontal Pitch (DECSHORP) sequence.

The power–up default is DECPSM reset. DECPSM is overridden by an SPI command (page 2–40) or an SHS command (page 2–44).

Set Page Orientation (DECSPO)

ASCII Code `ESC [ Ps & z`

Hex Code `1B 5B Ps 26 7A`

Dec Code `27 91 Ps 38 122`

Purpose Sets the intended reading orientation of the page with respect to the paper feed direction.

Discussion DECSPO is similar to the page orientation defined by PFS, but has no effect on the page size or number of lines and columns. All page related functions are interpreted in relation to page orientation (margins, line and character spacing). The default value is `Ps = 0`.

The selective parameters indicate the following:

Ps	Function
0	Portrait: Page orientation is in line with the paper feed direction
1	Landscape: Page orientation is perpendicular to the paper feed direction.

Position Unit Mode (PUM)

	Set (Enable)	Reset (Disable)
ASCII Code	`ESC [ 1  1  h`	`ESC [ 1  1  l`
Hex Code	`1B 5B 31 31 68`	`1B 5B 31 31 6C`
Dec Code	`27 91 49 49 104`	`27 91 49 49 108`

Purpose Selects a unit of measurement used with the escape sequences that control spacing parameters.

Discussion When Position Unit mode is enabled (set), it selects either decipoints or pixels, depending on the setting of the Select Size Unit (SSU) sequence.

When Position Unit mode is disabled (reset), it selects a spacing unit equal to one character position called a character cell. The width and height of the cell is equal to the currently selected horizontal and vertical spacing increment.

Power–up default is PUM reset.

Table 2–5 lists the escape sequences affected by the PUM and SSU settings.

Table 2–5. Escape Sequences With Spacing Parameters

Sequence Name	DEC Mnemonic	Page No.
Spacing Pitch Increment *	SPI *	2–40
Set Lines Per Physical Page	DECSLPP	2–71
Set Top and Bottom Margins	DECSTBM	2–72
Set Left and Right Margins	DECSLRM	2–73
Horizontal Position Absolute	HPA	2–77
Horizontal Position Relative	HPR	2–77
Horizontal Position Backward	HPB	2–78
Vertical Position Absolute	VPA	2–78
Vertical Position Relative	VPR	2–79
Vertical Position Backward	VPB	2–79
Set Horizontal Tab Stops	DECSHTS	2–84
Set Vertical Tab Stops	DECSVTS	2–85
Drawing Vectors *	DECVEC *	2–126
Select Barcode Parameters	DECSBCA	4–3

*Not affected by PUM setting.

Force Plot Mode (DECFPM)

	Reset (Disable)	Set (Enable)
ASCII Code	`ESC [ ? 7 0 l`	`ESC [ ? 7 0 h`
Hex Code	`1B 5B 3F 37 30 6C`	`1B 5B 3F 37 30 68`
Dec Code	`27 91 63 55 48 108`	`27 91 63 55 48 104`

Purpose Forces the printer to enter or stay in Plotting mode.

Discussion The printer normally operates in Printing mode (the default) to achieve maximum throughput of standard fonts and spacing. Plotting mode sacrifices speed but offers greater flexibility, such as special fonts, font sizes, and character spacing. Many of these features are available in print mode when the Print Mode option is set to Enable with the control panel.

Force Plot mode prevents accidental shifting between the printed and plotted fonts, and can reduce unnecessary paper shift. The default for DECFPM = reset state.

For further information about plot mode, see overview description on page 2–3.

Select Size Unit (SSU)

ASCII Code `ESC [ Ps SP I`

Hex Code `1B 5B Ps 20 49`

Dec Code `27 91 Ps 32 73`

Purpose Works with the Position Unit Mode (PUM) sequence to select a unit of measurement for spacing parameters.

Discussion When PUM is enabled (set), Select Size Unit selects either decipoints or pixels as the spacing unit, depending on the parameter settings shown below.

If the printer receives an SSU while PUM is disabled (reset), the selected unit will take effect when PUM is set and will then remain in effect until the printer receives either another SSU or a reset sequence. Default value at power–up or reset is decipoints. The printer will ignore all `Ps` values other than 2 or 7.

Ps	Spacing Unit
2	Decipoint (1/720 inch)
7	Pixel (1/600 inch)

The printer converts decipoints (D) into pixel (P) values by using the formula shown below and rounding off the result to the nearest integer:

$$P = \frac{D \times 5}{6}$$

All arithmetic operations are performed using integer instructions. For example, the formula above converts decipoints to the nearest pixel.

NOTE: If you select decipoint units, do not use horizontal position relative (HPR) and vertical position relative (VPR) sequences. Using these commands with decipoint units produces cumulative positioning errors because they are rounded–off.

NOTE: The JIS Katakana character set is only available in the 10 CPI font size. The GSS and SSU control codes can only be used with these character sets if 10 CPI is specified.

Graphic Size Selection (GSS)

ASCII Code `ESC [ Pn SP C`

Hex Code `1B 5B Pn 20 43`

Dec Code `27 91 Pn 32 67`

Purpose Sets the height and width of all characters in the selected font that start after the control sequence.

Discussion `Pn` is a decimal value that species the height of the font in units determined by the Select Size Unit (SSU) sequence. The width of the font is implicitly defined by the height. For example, the width of a 10–point font is 10 pitch. The initial value for Pn is `Pn = 100.`

If the desired font height cannot be matched exactly, the next smallest available font is selected. The GSS sequence remains in effect until the printer receives another GSS sequence or a Graphic Size Modification (GSM) sequence.

NOTE: The JIS Katakana character set is only available in the 10 CPI font size. The GSS and SSU control codes can only be used with these character sets if 10 CPI is specified.

Graphic Size Modification (GSM)

ASCII Code `ESC [ Pn1 ; Pn2 SP B`

Hex Code `1B 5B Pn1 3B Pn2 20 42`

Dec Code `27 91 Pn1 59 Pn2 32 66`

Purpose Modifies the height and width for all designated fonts as set by the GSS sequence.

Discussion `Pn1` is a decimal value that specifies the height of the font as a percentage of the height set by the GSS sequence. `Pn2` is a decimal value that specifies the width as a percentage of the width set by the GSS sequence. Data processing fonts can be modified by two or three times their default height and two times their default width.

GSM affects only the current print or plot mode. In Print mode, GSM always changes the current pitch according to the newly selected font. In Plot mode, the pitch is changed only if Pitch Select mode is set.

The GSM sequence is effective until the printer receives another GSM or GSS sequence.

NOTE: The GSM command will only work if the base font is DP 10. See the DECATFF command.

Setting Plot Density

The printer can plot in several different densities (dots per inch, or dpi), from 30 dpi to 200 dpi.

The Plot mode fonts contain the information for the vertical and horizontal densities they use. Determine non–text imaging densities (for sixels, bar codes) by using these innate commands. Default values for both the vertical and horizontal densities for graphic work are 100.

While density changes can occur anywhere on a page, they can also cause vertical negative paper motion while printing. Judicious planning minimizes this effect.

Plot speed is adversely affected by changes in density: the higher the density, the slower the speed. Hence, plotting in 50 x 50 density is four times faster than plotting in 100 x 100. If speed is a consideration, select lower density plotting. The lowest density plot font available is the 60 x 75 density.

Set Graphics Density (DECSGD)

ASCII Code `ESC [ Psh ; Psv & {`

Hex Code `1B 5B Psh 3B Psv 26 7B`

Dec Code `27 91 Psh 59 Psv 38 123`

Purpose Sets the darkness of drawn images.

Discussion DECSGD controls darkness via the density of the physical pixels. It does not change the resolution of the image (logical pixels), only the darkness of the segments drawn.

NOTE: Psh and Psv do not affect the density of plotted text. Text density comes from the current font.

DECSGD sets the density for graphics (sixels, logos, vectors, block characters, and bar codes). The selective parameters, Psh and Psv, designate the horizontal and vertical dot densities used for plotting graphics.

- Psh Parameter (Psh) selects the horizontal dot density.
- Psv Parameter (Psv) selects the vertical dot density.

The actions of Psh and Psv are dependent on the print orientation because x–direction print densities differ significantly from y–direction print densities. (This is the only printer instruction that is directly dependent on the current orientation setting.) Table 2–6 defines how orientation is designated by Psh and Psv.

Table 2–6. Psh and Psv Orientation

Direction	Portrait (Default)	Landscape
horizontal (Psh)	same as x	same as y
vertical (Psv)	same as y	same as x
x–density	same as horizontal	same as vertical
y–density	same as vertical	same as horizontal

Use Table 2–7 and Table 2–8 with Table 2–6 to establish the exact orientations designated by Psh and Psv.

Table 2–7. X–Density Values

Psh (Portrait–dflt)	X–Density (Dots/Inch)
0	No change
1	50
2	60
3	70
4	80
5	90
6	100 (default)
7	110
8	120
9	130
10	140
11	150
12	200

Table 2–8. Y–Density Values

Psv (Portrait–dflt)	Y–Density (Dots/Inch)
0	No change
1	30
2	40
3	50
4	60
5	66.67
6	75
7	86
8	100 (default)
9	120
10	150
11	200

Spacing

The five spacing sequences covered in this section affect the spacing of lines and characters. Horizontal pitch affects character spacing in characters per inch (CPI). Vertical pitch affects line spacing in lines per inch (lpi). DECSHORP and SHS affect character size in addition to spacing if Print Mode is set to Enable with the control panel.

Table 2–9. Line and Character Spacing Sequences

Sequence Name	DEC Mnemonic	Page No.
Spacing Pitch Increment	SPI	2–40
Select Vertical (Line) Spacing	SVS	2–42
Set Vertical Pitch	DECVERP	2–43
Select Horizontal (Character) Spacing	SHS	2–44
Set Horizontal Pitch	DECSHORP	2–45

Horizontal and vertical pitch values can be changed by using the Select Horizontal Spacing (SHS) and Select Vertical Spacing (SVS) sequences or the Spacing Pitch Increment (SPI) sequence. These sequences can accept two spacing units: decipoints or pixels. To select the unit of measurement, use the Position Unit Mode (PUM) and Select Size Unit (SSU) sequences. Alternatively, you can use Set Horizontal Pitch (DECSHORP) and Set Vertical Pitch (DECVERP) sequences to alter spacing.

Except for DECSHORP, all spacing commands are acted upon as soon as they are received, and the new spacing increments take effect immediately.

Spacing Pitch Increment (SPI)

ASCII Code `ESC [ Pn1 ;  Pn2 SP G`

Hex Code `1B 5B Pn1 3B Pn2 20 47`

Dec Code `27 91 Pn1 59 Pn2 32 71`

Purpose Sets the vertical and horizontal spacing increments for all characters that follow in the data stream. You can select one or both increments with a single Spacing Pitch Increment sequence. The SPI sequence gives you the greatest flexibility in adjusting white space (pitch) between characters and lines.

Discussion This command sequence uses decipoints or pixels as units. Select the unit with the Select Size Unit (SSU) sequence. Spacing Pitch Increment is not affected by the Position Unit Mode (PUM) sequence or by the page orientation. For example, if you set a vertical increment of 100 pixels (or 1/6 inch), the printer uses this setting for both portrait and landscaped pages.

`Pn1` selects the vertical spacing increment. `Pn2` selects the horizontal spacing increment. Parameters must be positive integers. If you use a decimal point, the printer will ignore the command. Printer default values are `Pn1` = 0 and `Pn2` = 0, which selects the spacing of the current font.

You can change the SPI setting for horizontal spacing in three ways:

- Use another SPI sequence.
- Use a Select Horizontal Spacing (SHS) sequence.
- Use a combination of the Pitch Select Mode (DECPSM) and Select Horizontal Pitch (DECSHORP) sequences. Most combinations are acceptable for this function.

You can change the SPI setting for vertical spacing in two ways:

- Use a Set Vertical Spacing (SVS) sequence.
- Use a Set Vertical Pitch (DECVERP) sequence.

NOTE: If `Pn1` or `Pn2` is 0 (or omitted), the printer defaults to the font file pitch setting.
If you set the Print Mode option to Enable with the control panel, this command will not force the printer into plot mode. The current print font will be used and throughput will be at its maximum.
If the Print Mode option is set to Disable, this command forces the printer into plot mode.

If a position command does not precede the printable (graphic) character, the printer will place that character to the right of the previously received character.

The distance between characters depends on the values of `Pn1` and `Pn2` in the most recent SPI, SHS, or DECSHORP sequence. If you set the `Pn1` or `Pn2` values to 0, or if you do not send an SPI sequence, the printer uses the default horizontal and vertical spacing for the font currently in use.

Horizontal spacing is the same for all font styles.

Select Vertical (Line) Spacing (SVS)

ASCII Code `ESC [ Ps SP L`

Hex Code `1B 5B Ps 20 4C`

Dec Code `27 91 Ps 32 76`

Purpose Selects the vertical spacing (pitch) between lines that is used by all fonts.

Discussion `Ps` selects the vertical pitch and vertical character position unit. SVS does not affect the vertical size of the selected font.

Ps	Vertical Pitch	Vertical Character Positioning Unit
0	6 lines per inch	1/6 inch (default)
1	4 lines per inch	1/4 inch
2	3 lines per inch	1/3 inch
3	12 lines per inch	1/12 inch
4	8 lines per inch	1/8 inch
5	5 lines per 30 inches	1/5 inch
9	2 lines per inch	1/2 inch
10	10 lines per inch	1/10 inch

Set Vertical Pitch (DECVERP)

ASCII Code `ESC [ Ps z`

Hex Code `1B 5B Ps 7A`

Dec Code `27 91 Ps 122`

Purpose Selects the number of lines printed per inch on the page.

Discussion Selects the line spacing (vertical pitch) used with all fonts.

`Ps` selects the vertical pitch (lines per inch).

Ps	Vertical Pitch
0	6 lines per inch (current default)
2	8 lines per inch
7	10 inches per line (This setting is accomplished by reversing the paper.)

Changing vertical pitch to 8 lpi or 10 lpi alters the physical size of the form, since form length is specified in terms of lines per page.

Vertical tab stops are not affected by changes to vertical pitch. For example, a vertical tab at line 15 remains set even if you change vertical pitch from 6 lpi to 10 lpi.

Select Horizontal (Character) Spacing (SHS)

ASCII Code `ESC [ Ps SP K`

Hex Code `1B 5B Ps 20 4B`

Dec Code `27 91 Ps 32 75`

Purpose Selects character spacing (horizontal pitch).

Discussion `Ps` selects the horizontal pitch and the horizontal character position unit. If Print Mode is set to Enable from the control panel, Ps will change the character size with respect to the selected pitch. If set to Disable, only the white space between characters varies.

Ps	Horizontal Pitch	Horizontal Character Position Unit
0	10 characters per inch	1/10 inch
1	12 characters per inch	1/12 inch
2	15 characters per inch	1/15 inch
3	6 characters per inch	1/6 inch

NOTE: If the Print Mode option is set to Disable with the control panel, the SHS command can force the printer into plot mode. If the page contains a dense concentration of text (many text lines and many characters per line), the SHS command will cause the LG*plus* to pause a few seconds between pages.
To ensure faster text printing, select an appropriate font and character size setting with DECATFF, SGR instead of SHS. If the Print Mode is set to Enable with the control panel, this command will not force the printer into plot mode and there should be no pause between pages.

Set Horizontal Pitch (DECSHORP)

ASCII Code `ESC [ Ps w`

Hex Code `1B 5B Ps 77`

Dec Code `27 91 Ps 119`

Purpose Selects the character spacing for monospaced fonts. This sequence selects the number of characters printed per horizontal inch on a line. If the Print Mode option is set to Enable with the control panel, the character size will change to match the selected pitch. If Print Mode is set to Disable, only the white space between the characters varies and can force the printer into plot mode.

Discussion Pitch Select Mode (DECPSM) activates the Set Horizontal Pitch (DECSHORP) sequence. When DECPSM is set (enabled), the printer uses the horizontal pitch of the current font. When DECPSM is reset (disabled), the printer uses the horizontal pitch selected by the last DECSHORP sequence.

In addition to changing the character size and/or the white space around characters, this sequence enacts the following:

- Resets the left and right margins to the printable limits.
- Resets the line home and line end positions to the printable limits. (Refer to the Page Format Select [PFS] sequence on page 2–67.)
- The current horizontal tabs remain as set.
- Can force the printer into plot mode when Print Mode is set to Disable with the control panel.

`Ps` selects the horizontal pitch (characters per inch).

Ps	Horizontal Pitch (cpi)
0	Current font pitch
1	10 characters per inch
2	12 characters per inch
3	13.3 characters per inch
4	16.7 characters per inch
5	5 characters per inch (normal width characters)
6	6 characters per inch
8	8.25 characters per inch
9	15 characters per inch

Vertical Format

Vertical format consists of two control codes that program the printer to make fast vertical paper movements (slewing) during print jobs. Vertical formatting increases printer efficiency and reduces printing time for repetitive printing jobs.

Vertical channels in the form are defined by downloading the Vertical Format Unit (VFU) from the host to the printer. Subsequent data is then printed on the form at the specified channel. These functions are achieved by using control sequences.

Two control sequences, Load VFU and End VFU, are used to enact the VFU load procedure. Besides loading the VFU, top–of–form is also defined. Top–of–form is determined by the actual paper position when the load VFU command is sent to the printer; therefore, be sure to align the paper at the desired top–of–form *before* sending the LOAD VFU command.

An example showing several VFU commands and the resulting output is provided on page D–13.

NOTE: In addition to using VFU commands, you may also ensure faster text printing by selecting an appropriate font and character size setting with DECATFF, SGR instead of the SHS command. The SHS command can force the printer into plot mode. If the page contains a dense concentration of text (many text lines and many characters per line), the SHS command will cause the LG*plus* to pause a few seconds between pages.

Load Vertical Format Unit (VFU)

ASCII Code `ESC [ < 1 h`

Hex Code `1B 5B 3C 31 68`

Dec Code `27 91 60 49 104`

Purpose Downloads the VFU from the host to the printer.

Discussion All data following the begin load sequence is placed in VFU memory except ASCII control codes. Any command entered during load VFU is ignored except the End Load sequence.

All data must be in the VFU load format. If an error occurs during the load, the load is cancelled. If a load overruns the maximum forms length, the load is cancelled and any remaining VFU data is printed. Cancelled loads default to the current form length setting (as set from the control panel or with the DECSLPP escape sequence).

VFU load format consists of 2 bytes (one byte pair) for each line on the page. The structure of each byte follows:

Table 2–10. Byte 1 Structure (First Character of Pair)

Bits:	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
Values:	x	1	C6	C5	C4	C3	C2	C1

Table 2–11. Byte 2 Structure (Second Character of Pair)

Bits:	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
Values:	x	1	C12	C11	C10	C9	C8	C7

The variables in the two bytes are defined as follows:

C1 – C12 represent channels 1 through 12 with binary 1s and 0s.
C1 identifies the top–of–form (TOF).
C12 identifies the bottom–of–form (BOF).

Bit 7 for each byte is not used. Bit 6 for each byte is always 1.

NOTE: An example showing several VFU commands and the resulting output is provided on page D–13.

End Load (VFU)

ASCII Code `ESC [ < 1 l`

Hex Code `1B 5B 3C 31 6C`

Dec Code `27 91 60 49 108`

Purpose Ends the Vertical Format Unit load.

Discussion When all VFUs are loaded, enact End Load VFU and the form length set is complete.

NOTE: Load VFU is a long control string format. Make sure that you do not send a CR, LF, or CR+LF in the middle of the VFU data. To avoid having to send a Carriage Return (CR) while entering the Load VFU command, you may wish to set a wide command line for your terminal device.
For example: for VMS, you may increase the command line width for the terminal device used to communicate with the printer to 132 characters, via the command **$set term/width=132**.

An example showing several VFU commands and the resulting output is provided on page D–13.

Channel Command

ASCII Code `ESC [ p1 & y`

Hex Code `1B 5B p1 26 79`

Dec Code `27 91 p1 38 121`

Purpose The channel commands control paper motion.

P1 consists of three digits: nnn. When the first n equals 9, reverse paper motion occurs. If the first n equals any value other than 0 or 9, the entire sequence is ignored. Table 2–12 gives the values of nnn for each channel.

Table 2–12. Channel Values

p1 nnn	Move Forward to Channel	nnn	Move Backward to Channel
000	1	900	1
001	2	901	2
002	3	902	3
003	4	903	4
004	5	904	5
005	6	905	6
006	7	906	7
007	8	907	8
008	9	908	9
009	10	909	10
010	11	910	11
011	12	911	12*
* Selecting any other channel than those in this table results in a default to channel 12.			

Beware of the following conditions when the selected channel is in the forward direction:

- If you try to print text at a channel not previously defined, the text prints at channel 12 (BOF).
- If you try to print text at a channel not previously defined and channel 12 is also undefined, text prints at the next line.

- If a VFU table is not loaded and channel commands are sent to it, a line feed occurs then the text prints.
- If you load a VFU table with more than one TOF and/or more than one BOF already defined, the load is terminated and a warning message is displayed on the front panel.

Beware of the following conditions when the selected channel is in the reverse direction:

- If you try to print text at a channel not previously defined, a reverse line feed occurs then the text prints.
- If you try to print text at a channel not previously defined and channel 12 is also undefined, a reverse line feed occurs then the text prints.
- If a VFU table is not loaded and channel commands are sent to it, a reverse line feed occurs then the text prints.
- If you load a VFU table with more than one TOF and/or more than one BOF already defined, the load is terminated and an error code is displayed on the front panel.

Forms

A form contains data. This data is a sequence of self–contained commands and text that can occupy one or more pages of the form. The data form can be downloaded then stored in printer memory for later use. The status report lists the form IDs loaded in the printer.

Once a form is downloaded, it is selectable. Stored data is merged with the fill–in data stream, and the merged data is printed as a completed form. When selected, the printed form can be printed repeatedly with different sets of fill–in data.

Fill–in data is a sequence of commands and text, usually variable and not repeated data, used to fill in the empty fields of a form. Each fill–in data field is terminated with a switch character, as explained in the following section. The fill–in data for the last field of a page must terminate with a switch character unless it is the last page of a form. In this case, use the Terminate Form sequence.

Forms and fill–in data conform to the following :

- Forms cannot be nested.
- Up to 32 forms can be loaded into the printer, subject to available memory.
- Form size must not exceed 65K bytes.
- Each form page must terminate with FF (0/12) and have at least one field.
- Do not use a form–feed character for fill–in data.

The following sections describe how to load a form into memory, select the form for printing, terminate form generation, and delete the form from storage. Appendix D provides an example of commands and output for generating a form, starting on page D–8.

Loading Forms Sequence (DECLFM)

ASCII Code `DCS P1 ; P2 & p RECORD ST`

Hex Code `90 P1 3B P2 26 70 RECORD 9C`

Dec Code `144 P1 59 P2 38 112 RECORD 156`

Purpose Allows you to load forms into printer memory.

Discussion The Pn parameters define the format of the form as well as which forms to delete. Forms can be loaded at any time except during another download operation, or while a form is printing. Once loaded, forms are selectable until:

- New forms are loaded with the P2 = 3 (replace all forms) command
- Another form with the same number is loaded (replacing the old form)
- System power is turned off (all loaded forms are lost)

P1 and P2 can be defined as follows:

- P1 is the form file indicator that specifies the form file format used in the command string. The value must be 0 and the file must be in the form file format, otherwise the entire load form sequence is ignored.

P1	Function
0	LG–series printer form file format
Other	Sequence is ignored

- P2 defines the replacement action: which forms to delete before the new form is loaded. If you choose to replace all forms, note that the forms are deleted even if the new form is not successfully loaded.

P2	Function
0/Missing	Replace the named form
	Replace all forms

The form record includes a form header that defines form parameters and size, and the form data string. It is constructed as follows:

- <ID length><Form ID><CNTL encoding character>
- <Form data switch character><Form length>
- <Form data string>

These form record fields are described in detail below:

- ID length is a two–digit number (01 – 99) that defines the length of the form ID.
- Form ID is a string of 1 – 99 printable characters. IDs exceeding 10 characters are truncated.
- The CNTL encoding character

The CNTL encoding character indicates the start of control–character encoding. The character is always in the 2/0 through 7/14 range and is followed by a two–digit hexadecimal number equivalent to the ASCII value of the control character to be encoded.

Every control character must be entered in its hexadecimal format and preceded by the control character. Do not embed a control character (0/0 through 1/15) in the form string. The following control characters and their hexadecimal values are allowable:

Control Char.	Hex Code	Control Char.	Hex Code
BEL	07	ESC	1B
BS	08	IND	84
HT	09	NEL	85
LF	0A	HTS	86
VT	0B	VTS	87
FF	0C	PLD	8A
CR	0D	PLU	8B
SO	0E	RI	8C
SJ	0F	SS2	8E
CAN	18	SS3	8E
SUB	1A	CSI	8E

All printable characters (except control characters) are encoded in the same manner. For example, to embed the control sequence: ESC [100 ‘, (CSI 100 ‘) into the form, replace ESC with the control–character encoding character (^) and the hexadecimal value for ESC (1B). The form’s sequence is ^1B[100‘.

- Form Data Switch Character designates the insertion of the form's fill–in data. The character, considered a field indicator character, is always in a range from 2/0 through 7/14. The form–data switch character must be different from the control–character encoding character. The form data switch character is not printable within the form and should not be used in any control sequence in the form.
- Form length is a five–digit number, 00001 through 65,535) that defines the length of the string to follow. The string count includes all characters other than uncoded control characters (0/0 through 1/15).
- Form Data String is the constant portion of the form: the data. Form data is a string of text and command sequences with encoded control characters. Terminate the string with an ST command. Uncoded control characters (other than ESC), act as formatting characters for editors. Though you can embed them in the form data string, they are not part of the form.

For more information, refer to Appendix D.

Form Types

A form can be printed in Print mode, in Plot mode, or in a combination of Print and Plot mode.

- In Plot mode, all positioning should be fully specified by the Digital positioning commands. The entire form is plotted if the following conditions exist:

  Contains any graphics (block characters, bar codes, vectors, logos)

  The pitch of the font does not exist in print mode

  The form uses justified text

- In Print mode, all positioning is controlled by the CR, LF, and tabs control characters. The entire form is printed if:

  It contains justified text and no font changes occur within a line

  It does not violate any other conditions of Print mode

Start Forms Sequence (DECIFM)

ASCII Code `DCS P1 & r FORM NAME ST`

Hex Code `90 P1 26 72 FORM NAME 9C`

Dec Code `144 P1 38 114 FORM NAME 156`

Purpose Selects any form loaded in RAM.

Discussion P1 is the Select Form Switch character. With this sequence, a form loaded in RAM is selectable for printing. When you select the form, the printer enters Form mode. The variable fill–in data is merged and printed with the form data. When the printer encounters an FF character in the form data portion of a multiple page form, it advances to the next page and continues merging with the fill–in data that follows. If there is more than one set of fill–in data, the same form constant data is merged with the new fill–in data to create additional forms.

The select form switch character always ranges from 2/0 through 7/14 decimal and designates the print source to switch back to form data (to the character after the form data switch character). The character does not have to be the same as the form data switch character; however, it is not printable within the fill–in data string.

The form name is the first ten characters of the loaded form's ID (or the full form ID if it is ten characters or less in length). If no such form exists, an error message displays and the fill–in data is printed as text data.

Note that the text and command strings corresponding to the last field of a multi–page form page must terminate with a switch character. However, the last field in the last page of a form must terminate with the Stop Form sequence and not with the switch character. To exit Form mode, enter a Terminate sequence.

Many special conditions might affect the printer output or performance in its various uses. See "Forms Considerations," page 2–58, for further information regarding these conditions.

Terminate Forms Sequence (DECTFM)

ASCII Code `ESC # SP 1`

Hex Code `1B 23 20 31`

Dec Code `27 35 32 49`

Purpose Terminates the printing of a form.

Discussion If no form is selected, this sequence is ignored.

Many special conditions might affect the printer output or performance in its various uses. See “Forms Considerations,” page 2–58, for further information regarding these conditions.

Delete Forms Sequence (DECDFM)

ASCII Code `DCS Ps & q FORMS ID ST`

Hex Code 90 Ps 26 71 FORMS ID 9C

Dec Code 144 Ps 38 113 FORMS ID 156

Purpose Deletes forms from printer memory.

Discussion Ps selects the forms to be deleted. The Form ID string identifies the forms to be deleted. If more than one Form ID is listed, separate them with colons. Form IDs with more than ten characters are ignored.

Ps	Function
0	Delete forms with the same name
3	Delete all stored forms

If you try to delete forms, logos, or fonts while they are printing, the printer will ignore the delete command.

Many special conditions might affect the printer output or performance in its various uses. See “Forms Considerations,” page 2–58, for further information regarding these conditions.

Forms Considerations

The following commands are not to be included in form data or fill–in data:

- Load a form, logo, or font
- Delete a form, logo, or font
- Invoke a Digital sequence
- Invokes an ESCc (RIS) sequence. This will exit you from the Form mode.

Be aware of the following conditions, which can affect the printer's output/performance in Forms mode:

- To minimize paper movement, print all text together and print all graphics together. Most importantly, print all of the same density material together.
- Encoded Escape sequences cannot start in the form and continue in the fill–in data, nor can the reverse occur.
- Changes made to the font, cursor position, density, or mode are not restored after you terminate a Form sequence.
- Block characters used in a form must begin and end on the same page. Form data switch characters and select form sequence switch characters are not printable as block characters unless they are encoded.
- Since mode settings, fonts, and spacing parameters can be changed between the time the form is loaded and the item is selected, the environment of the form (PUM or SSU) should be established in the form data.
- If ESC, CAN, or SUB is embedded in the form string, it will terminate form loading and the form will be discarded. Encoding DCS, RIS, CAN, or SUB in a form string will also stop form loading.
- If the form length in the header does not agree with the length of the form string received, the form is discarded.
- If the form is not terminated by a form feed (0/12), and does not contain at least one form–switch character, a form–switch character and an 0/12 are added at the end of the form.
- In general, the number of switch characters in the form data should be one more than the number of switch characters in the fill–in data.

When using bar codes, note the following:

- When using bar codes as part of the form data, make sure that the control character encoding character in the bar code differs from the control character encoding character and the switch character in the Loading Form sequence.
- When using bar codes as part of the fill–in data, make sure that the control character encoding character of the bar code differs from the switch character in the Select Form sequence.
- Bar codes must start and end on the same page of a form.

Request Forms Status (DECFMSR)

ASCII Code `CSI & ~`

Hex Code 9B 26 7E

Dec Code 155 38 126

Purpose Requests a status report of the forms available for printing.

Discussion Invoke this request if you need to know what forms are available for printing.

Form Status Report (DECRFMS)

ASCII Code `DCS & s FORM STRING ST`

Hex Code 90 26 73 FORM STRING 9C

Dec Code 144 38 115 FORM STRING 156

Purpose Printer response to a DECRMFS sequence.

Discussion The status string contains a list of all valid forms loaded in the printer. Each form name starts on a new line and is separated by commas.

Logos

A logo is a graphic image stored in the printer. Once a logo is downloaded, it can be printed repeatedly by referring to its identifying number. Up to 16 logos can reside in the printer, with a maximum size of 65,535 bytes per logo. The following subsections explain various ways in which to utilize the logo feature. For an example of commands and output for creating a logo, see page D–6.

Loading Logos Sequence (DECLLG)

ASCII Code DCS P1 ; P2 & t RECORD ST

Hex Code 90 P1 3B P2 26 74 RECORD 9C

Dec Code 144 P1 59 P2 38 116 RECORD 156

Purpose Loads logos into printer memory.

Discussion Pn parameters select the format and the logos to be deleted before loading this logo.

- P1 specifies the logo file indicator that chooses the logo file format used in the command string. The indicator number must be 0 and the file must be in the LG–series printer logo file format. If not, the entire load logo set is ignored. Default: P1 = 0.
- P2 lists the logos to be deleted.

P2	Function
0	Delete all logos
Others	Delete any logo with the same Logo ID as this one

Logos can be loaded at any time except during another download operation and during a form printing operation. When loaded, they are available for selection until:

- New logos are loaded with P2 = 3 (replace all logos).
- A logo with the same number is loaded (the new logo, though the same number, will replace the old).
- System power is turned off (all loaded logos are lost).

The logo record includes all data after the final character (t) and up to the string terminator, as well as the logo header portion and the row data strings portion. The logo header contents identify the logo and the size (number of characters) of the row data string. The logo record variables include:

- ID Length is a one digit number (1 through 4) that defines the length of the logo ID.
- Logo ID is a string of one to four numerals that identify the log.
- Comment Length is a one digit number (0 through 7) that defines the length of the comment field. The comment field provides additional logo information, and appears in the status report; however, it is not part of the logo identification. Also listed on the status report are the IDs and the comment field of the logos available in the printer.
- Logo Length is a five digit number (00001 through 65,535), that defines the length of the logo record. The logo length includes all characters other than CO control characters (0/0 through 1/15).

The row data string consists of one or more row records describing the format of the logo image. Within this string is a row record, which is a sequence of parameters that define the height and length of the black and white segments in mils. A row sequence has the following format: r;s; n1;n2;...\ where the following is true:

r = height of the segment in mils
s = row starting color. Defines whether the row starts with a white (0) or a black (1) segment. Each subsequent segment will be the opposite color from the previous segment.
n1; n2 = length of the segments in mils.
\ = row terminator

Note that none of the above parameters should exceed 65,535 in value. Editing control characters such as CR and LF, can be embedded within the logo record.

Select Logo Sequence (DECILG)

ASCII Code `CSI Pn & }`

Hex Code 9B Pn 26 7D

Dec Code 155 Pn 38 125

Purpose Prints selected logos present in printer memory.

Discussion Pn defines the ID of the selected logo. If no logo exists for that ID, the sequence is ignored. Logos are printed in the current page orientation and graphics density.

Before you select a logo sequence, set the logo density with DECSGD and the orientation. When the logo sequence is complete, reset the density and set cursor position. At the end of a Select Logo sequence, the cursor remains in the starting position.

If the height of the segments is not an integral multiple of the density selected, the size of the printed logo might change due to accumulated round–off errors. To maintain a uniform size, print logos only in the densities for which they were designed.

Deleting Logos Sequence (DECDLG)

ASCII Code `CSI P1 ; P2 ; ... ; Pn & |`

Hex Code 9B P1 3B P2 3B 2E2E2E 3B

Dec Code 155 P1 59 P2 59 464646 59

Purpose Deletes logos from printer memory.

Discussion P1 defines the logos to be deleted:

P1	Function
0	Delete all logos whose IDs are listed
3	Delete all stored logos

When P1 = 0, parameters P2 through P16 make up the ID of the logos to be deleted. You can select up to 16 logo IDs to delete. Deleting a logo within a form is not allowed.

Request Logo Status (DECRLGS)

ASCII Code `CSI ‘ p`

Hex Code `1B 27 70`

Dec Code `27 39 112`

Purpose Gives a status report of the logos available for printing.

Discussion Invoke this request if you need to know what logos are available for printing.

Logo Status Report (DECLGSR)

ASCII Code `DCS & w LOGO STRING ST`

Hex Code `90 26 77 LOGO STRING 9C`

Dec Code `144 38 119 LOGO STRING 156`

Purpose Reports the logo status in response to the DECRLGR sequence.

Discussion The logo string contains a list of all the valid logos loaded in the printer and their comment strings. Each logo number and comment start on a new line, separated by commas. Several examples of logo IDs and comment strings are shown in the table below:

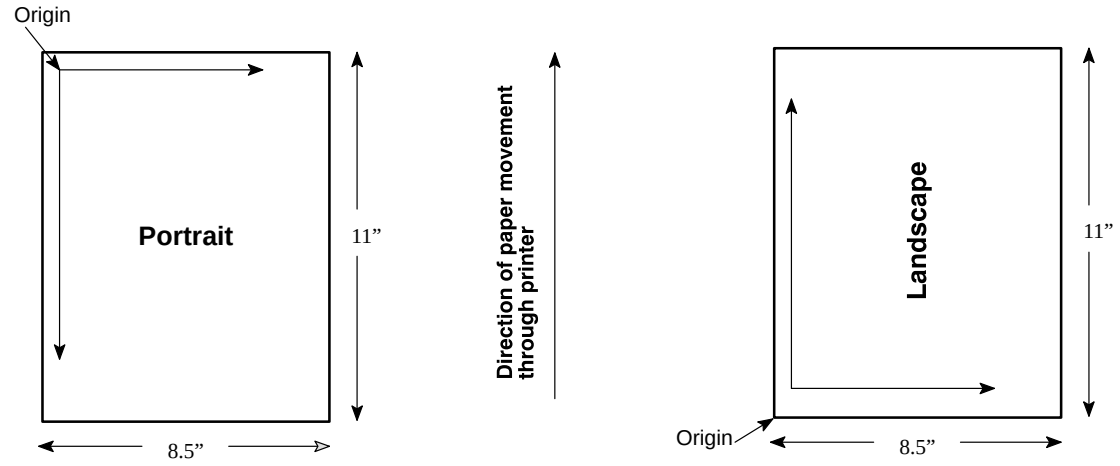
Logo #	Comment
1	Square,
3	Rectangle,
12	Rhombus,

Page Print Area and Margins

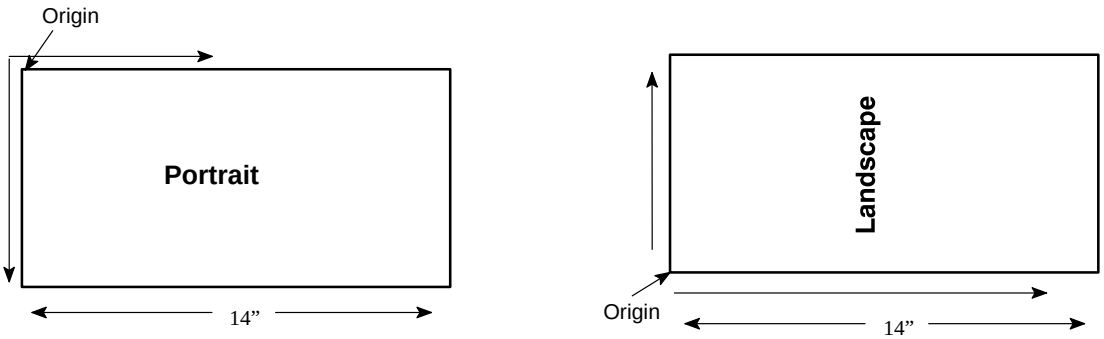
The LG*plus* has no print area limitations; however, smaller page areas can be selected by using the Page Format Select (PFS) sequence.

Figure 2–1 shows the two types of page orientation: portrait and landscape, for normal and extended page formats. If you use the default font (10 cpi, 6 lpi), the print areas are:

	Normal Page Format:	**Extended Page Format:**
Portrait font:	59 lines per page 72 characters per line	66 lines per page 132 characters per line
Landscape font:	38 lines per page 100 characters per line	79 lines per page 110 characters per line



(a) Normal Page Format (8.5 x 11 Inches)



(b) Extended Page Format (14 x 11 Inches)

Figure 2–1. Page Printing Orientations

In portrait mode, text or graphics prints horizontally (across the paper loaded in the printer). In landscape mode, text or graphics prints vertically (from bottom to top of the paper loaded in the printer).

Changing the Print Area

You can change the print area two ways:

1. Set the printed page to one of the predefined formats using the Page Format Select (PFS) sequence (see page 2–67). PFS permits you to set page format with one command.
2. Change the page margins and the number of lines per page with these sequences:
    a. Set Lines Per Physical Page (DECSLPP)
    b. Set Top and Bottom Margins (DECSTBM)
    c. Set Left and Right Margins (DECSLRM)

Page Format Select (PFS)

ASCII Code `ESC [ Ps SP J`

Hex Code `1B 5B Ps 20 4A`

Dec Code `27 91 Ps 32 74`

Purpose Selects a page format from a list of predefined formats.

Discussion `Ps` selects one of 12 page formats. Two kinds of format are available: normal and extended.

In the normal page format, the page home line is 0.5 inches below the top margin, and the page end line is 0.833 (5/6) inches above the bottom margin. Normal page formats are:

Ps	Format
0	Portrait text communication (default)
1	Landscape text communication
2	Portrait A4 (210 mm x 297 mm)
3	Landscape A4
4	Portrait North American (NA) letter
5	Landscape North American letter

In the extended page format, the page home line is at the top margin, and the page end line is at the bottom margin. Extended page formats are:

Ps	Format
6	Portrait extended (extend) A4 format
7	Landscape A4
?20	Portrait North American Digital private
?21	Landscape North American Digital private
?22	Portrait A4 Digital private
?23	Landscape A4 Digital private
?28	Portrait line printer: 11 inches high x 13.2 inches wide
?29	Landscape line printer: 13.2 inches high x 11 inches wide

The line home and line end positions serve as the left and right edges of the printed page for justified text. The line home position is the active position after a carriage return (CR). A carriage return may move the active position forward or backward in order to reach the line home position.

The page home line is the active line after a form feed (FF). The index (IND), next line (NL), and carriage return characters cause a form feed when they pass the page end line. Use the vertical position absolute and relative (VPA and VPR) sequences to move below the page end line. If a line feed passes the page end line, the printer prints the current page and performs a form feed to get to the next page.

Ps parameters 0 through 7 are public (ANSI) parameters: ASCII values 0 through 7. The other six Ps parameters are defined by Digital and are called Digital private parameters. These always start with the **?** (3/15) character. The kind of parameters used affect page format. If you chain commands, do not mix Digital private parameters with public parameters.

Table 2–13 shows the printable area selected with each PFS format. Text area is for justified text.

Table 2–13. Paper Dimensions Using PFS Formats

Minimum Paper Dimensions			Print Area (Inches)		Text Area (Inches)		Default
Ps	Width	Length	Width	Length	Width	Length	Lines*
Normal Page Formats:							
0	8.5	11.0	7.7	10.5	7.2	9.17	55
1	11.0	8.5	10.5	7.7	10.0	6.34	38
2	8.0	11.5	7.7	11.0	7.2	9.83	59
3	11.5	8.0	11.0	7.67	10.5	6.33	37
4	8.5	11.0	8.0	10.5	7.5	9.17	55
5	11.0	8.5	10.5	8.0	10.0	6.5	39
Extended Page Formats:							
6	8.0	11.0	7.7	11.0	7.2	11.0	66
7	11.0	7.5	11.0	7.33	10.5	7.33	44
?20	8.5	11.0	8.0	10.56	8.0	10.56	63
?21	11.0	8.5	10.0	8.5	9.68	8.0	47
?22	8.0	11.0	7.73	10.88	7.73	10.56	63
?23	10.5	8.0	9.68	7.92	9.68	7.92	47
?28	14.0	11.0	13.2	11.0	13.2	11.0	66
?29	11.0	14.87	11.0	13.2	11.0	13.2	79
*The number of lines available at the initial vertical spacing of 6 lines per inch.							

Table 2–14 shows the lines per page and the characters per line selected with the normal and extended PFS formats.

Table 2–14. Lines Per Page and Characters Per Line Using PFS Formats

Ps	Format Description	Lines Per Page in Text Area (Lines Per Inch)				Chars. Per Line in Text Area (Characters Per Inch)			
		8	6	4	3	10	12	15	6
Normal Page Formats:									
0	Portrait text comm.	73	59	36	27	72	86	108	43
1	Landscape text comm.	50	38	25	19	100	120	115	60
2	Portrait A4	79	59	39	29	72	86	108	43
3	Landscape A4	50	38	25	19	105	126	157	63
4	Portrait NA letter	73	55	36	27	75	90	112	45
5	Landscape NA letter	52	33	26	19	100	120	150	60
Extended Page Formats:									
6	Portrait extended A4	88	66	44	33	72	86.4	108	115.2
7	Landscape A4 format	58.4	43.98	29.32	21.99	105	126	157.5	168
?20	Portrait NA Digital	85	63	36	27	80	96	120	48
?21	Landscape NA Digital	63	47	26	19	100	116	150	60
?22	Portrait A4 Private Digital	84	63	42	31	73	87	109	43
?23	Landscape A4 Private Digital	63	47	31	23	96	116	145	79
?28	Portrait line printer	88	66	44	33	132	158	198	79
?29	Landscape line printer	105	79	52	39	110	132	165	66

Table 2–15 shows the printable area extending beyond the text area when working in normal and extended PFS formats.

Table 2–15. Printable Area Extending Beyond Text Area in PFS Formats

Ps	Format Description	Lines Above/Below Text Area (Lines Per Inch)				Char. Pos. to Left/Right of Text (Characters Per Inch)			
		8	6	4	3	10	12	15	6
Normal Page Formats:									
0	Portrait text comm.	4/6	3/5	2/3	1/2	5/2	6/2	7/3	3/0
1	Landscape text comm.	4/6	3/5	2/3	1/2	5/2	6/2	7/3	3/0
2	Portrait A4	4/6	3/5	2/3	1/2	5/2	6/2	7/3	3/0
3	Landscape A4	4/6	3/5	2/3	1/2	5/2	6/2	7/3	3/0
4	Portrait NA letter	4/6	3/5	2/3	1/2	5/2	6/2	7/3	3/0
5	Landscape NA letter	4/6	3/5	2/3	1/2	5/2	6/2	7/3	3/0

Extended Page Formats:									
6	Portrait extended A4	4/6	3/5	2/3	1/2	5/2	6/2	7/3	3/0
7	Landscape A4 format	4/6	3/5	2/3	1/2	5/2	6/2	7/3	3/0
?20	Portrait NA Digital	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0
?21	Landscape NA Digital	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0
?22	Portrait A4 Private Digital	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0
?23	Landscape A4 Private Digital	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0
?28	Portrait line printer	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0
?29	Landscape line printer	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0

NOTE: After a power–up or reset sequence, no page format is selected. Reset the printer with the Soft Terminal Reset (DECSTR) or the Reset to Initial State (RIS) sequence.

Backward Compatibility

The page formats described in this section are compatible with previous Digital printers. That is, the line home position is the first printable position on the left of the page, and the page home line is the top line on the page.

Likewise, the private PFS values, ?20 through ?29, set the margins, the line home position, and the page home line to the edge of the printable area, for compatibility with previous Digital printers. The PFS values depend upon the values in effect for character and line spacing.

Set Lines Per Physical Page (DECSLPP)

ASCII Code `ESC [ Pn t`

Hex Code `1B 5B Pn 74`

Dec Code `27 91 Pn 116`

Purpose Defines form length.

Discussion A form's length equals the maximum distance the paper moves when a form feed command is issued. Maximum form length is 33 inches.

DECSLPP sets the top margin to 1 and the bottom margin to the form length. Form length limits the range of possible settings for the Set Top and Bottom Margins (DECSTBM) sequence.

`Pn` sets the form length, subject to the limits discussed above. If `Pn` is 0 or is greater than the maximum size for the paper and origin, the form length will automatically be set to the maximum for the paper and origin. Units of measurement are character cells, decipoints, or pixels. Select the unit by using the Position Unit Mode (PUM) and Select Size Unit (SSU) sequences. If you use character cells, the height of each cell equals the current line height setting. You can change line height by changing the vertical spacing.

Initial value: `Pn` = 0. If a `Pn` value is not set, the form length is set to 66 lines.

Other control sequences are specified in "Forms," page 2–51.

Set Top and Bottom Margins (DECSTBM)

ASCII Code `ESC [ Pn1 ;  Pn2 r`

Hex Code `1B 5B Pn1 3B Pn2 72`

Dec Code `27 91 Pn1 59 Pn2 114`

Purpose Sets the top and bottom margins, and the page home line. These settings are relative to the current origin point for page coordinates. (Refer to “Page Format Select” on page 2–67.)

Discussion `Pn1` sets the top margin and the page home line. `Pn2` sets the bottom margin. If the first parameter is greater than the second parameter, the printer will ignore the sequence. The unit of measurement can be character cells, decipoints, or pixels. Select the unit by using the Position Unit Mode (PUM) and Select Size Unit (SSU) sequences. If you use character cells, the height of each cell equals the current line height setting. Change line height by changing the vertical spacing.

The top vertical margin defines the first printable line on a page. The bottom vertical margin defines the last printable line. These are called hard margins because you cannot print outside the area defined by the margins. The page home line is the position of the first printable line on the page after a form feed (FF).

Margins settings go into effect as soon as they are received. The printer will set the margins where specified, except in the following cases:

- If `Pn1` = 0 or is omitted, the top margin is unchanged.
- If `Pn2` = 0 or is omitted, the bottom margin is unchanged.
- If `Pn2` is greater than the form length, the bottom margin is set at the bottom of the form.
- If the active position is less than the new top margin, the active position is set to the new top margin. If the active line is greater than the new bottom margin, the next printable character causes a form feed (FF).
- If the sequence sets the top margin below the bottom margin, the command is ignored.
- The printer does not permit any part of the character box to be greater than the bottom margin line or less than the top margin line.

If the form length is changed, the printer sets the top margin to line 1 and the bottom margin to the form length.

Set Left and Right Margins (DECSLRM)

ASCII Code `ESC [ Pn1 ;  Pn2 s`

Hex Code `1B 5B Pn1 3B Pn2 73`

Dec Code `27 91 Pn1 59 Pn2 115`

Purpose Sets the left and right margins.

Discussion `Pn1` sets the left margin and the line home position. `Pn2` sets the right margin. If the first parameter is greater than the second parameter, the printer will ignore the sequence. The unit of measurement can be character cells, decipoints, or pixels. The maximum allowable value of the `Pn1` parameter is always one less than the `Pn2` parameter.

The left horizontal margin defines the first printable position on a line. The right horizontal margin defines the last printable position on a line. These are called hard margins because you cannot print outside the area defined by the margins, except under two conditions:

1. Using the Drawing Vectors (DECVEC) sequence, you can draw lines outside the margins.

2. If you justify text, but the spacing between words is less than the minimum specified width of the space character, the text will print unjustified and will exceed the right margin.

Margins settings go into effect as soon as they are received. The printer will set the margins where specified, except in the following cases:

- If `Pn1` = 0 or is omitted, the left margin is unchanged.
- If `Pn2` = 0 or is omitted, the right margin is unchanged.
- If `Pn2` is greater than the printable width, the right margin is set to the right printable limit.
- If the sequence sets the left margin to the right of the right margin, the command is ignored.
- If the active position is less than the new left margin, the active position is set to the new left margin.

- If Autowrap is enabled and the active position is grater than the specified right margin, the next printable character causes a carriage return/line feed before the next character is printed. If Autowrap is disabled (truncated), the characters that follow this command are ignored until the cursor is returned to the printable area.
- When character pitch is changed but the same physical margins are desired, reset the margins using this escape sequence before sending data. Changing horizontal pitch resets the left and right margins to their printable limits (column 1 and the furthest right position, respectively).

Active Column and Active Line (Cursor Motion)

This section describes cursor positioning command sequences. Line printers do not have a cursor like the blinking place–marker on most computer screens. The cursor position on a line printer is the space where the next character will print. In this manual, cursor refers to the currently active print position. Its location is the intersection of the active column and active line. Horizontal and vertical positioning command sequences allow you to move the active position anywhere on the logical page.

You can also specify either absolute or relative motion. Absolute motion specifies the distance to move from a specific point on the logical page. Relative motion specifies the distance to move from the currently active print position.

The Partial Line Up (PLU) and Partial Line Down (PLD) command sequences set half line increments for superscripting and subscripting.

NOTE: Next Line (NEL), Reverse Index (RI), and Index (IND) control characters also move the active position. (Refer to Table 2–2.)

Forward Index (IND)

ASCII Code `ESC D`

Hex Code `1B 44`

Dec Code 27 68

Purpose Causes the active position to move to the following line's corresponding horizontal character position.

Discussion `Pn` specifies the active position.

Attempts to move the cursor below the bottom margin cause the cursor to move to the corresponding horizontal position on the first printable line of the next form.

In 8–bit mode, the Forward Index 8–bit control code can be used for this function (refer to "Control Codes," page 2–7).

Reverse Index (RI)

ASCII Code ESC M

Hex Code 1B 4D

Dec Code 27 77

Purpose Causes the active position to move to the corresponding character position of the preceding line.

Discussion Pn specifies the active position. The Reverse Index command causes the active position to stop at the top of the margin.

In 8–bit mode, the Reverse Index 8–bit control code can be used for this function (refer to “Control Codes,” page 2–7).

Next Line (NEL)

ASCII Code ESC E

Hex Code 1B 45

Dec Code 27 69

Purpose Causes the active position to move to the first character position on the following line.

Discussion If you try to move the cursor past the bottom margin, the cursor moves to the first character position on the first printable line of the next form.

In 8–bit mode, the Next Line 8–bit control code can be used for this function.

Horizontal Position Absolute (HPA)

ASCII Code `ESC [ Pn ‘`

Hex Code `1B 5B Pn 60`

Dec Code `27 91 Pn 96`

Purpose Selects the active column on the active line.

Discussion `Pn` value specifies the new active column. Default value: `Pn` = 1.

If you try to move the active column to the right of the last position on the line, the active position stops at the last position on the line.

Horizontal Position Relative (HPR)

ASCII Code `ESC [ Pn a`

Hex Code `1B 5B Pn 61`

Dec Code `27 91 Pn 97`

Purpose Moves the active column by adding the value `Pn` to the currently active column.

Discussion `Pn` is the value added to the currently active column.
Default value: `Pn` = 1.

If you try to move the active column to the right of the last position on the line, the active position stops at the last position on the line.

Horizontal Position Backward (HPB)

ASCII Code `ESC [ Pn j`

Hex Code `1B 5B Pn 6A`

Dec Code `27 91 Pn 106`

Purpose Moves the active column backward by subtracting the value `Pn` from the currently active column.

Discussion `Pn` is the value subtracted from the currently active column. Default value: `Pn` = 1.

If you try to move the active column to the left of the first position on a line, the active position stops at the first position on that line.

Vertical Position Absolute (VPA)

ASCII Code `ESC [ Pn d`

Hex Code `1B 5B Pn 64`

Dec Code `27 91 Pn 100`

Purpose Causes the active position to be moved to the corresponding horizontal position at vertical position `Pn`.

Discussion `Pn` is the new active line at the currently active column. Default value: Pn = 1.

If Pn is less than the current active line, the active line moves backwards on the current page. If you try to move the active line below the bottom line, the active position stops at the bottom.

Vertical Position Relative (VPR)

ASCII Code `ESC [ Pn e`

Hex Code `1B 5B Pn 65`

Dec Code `27 91 Pn 101`

Purpose Moves the active line to the corresponding horizontal position by adding `Pn` to the value of the currently active line.

Discussion `Pn` is the value added to the currently active line. Default value: `Pn` = 1.

If you try to move the active line below the bottom line, the active position stops at the bottom line.

Vertical Position Backward (VPB)

ASCII Code `ESC [ Pn k`

Hex Code `1B 5B Pn 6B`

Dec Code `27 91 Pn 107`

Purpose Moves the active position to the corresponding column at the preceding vertical position set by the `Pn` value.

Discussion `Pn` is the value subtracted from the currently active line. Default value: `Pn` = 1.

If you try to move the active line above the top line, the active position stops at the top line.

Cursor Up (CUU)

ASCII Code `ESC [ Pn A`

Hex Code `1B 5B Pn 41`

Dec Code `27 91 Pn 65`

Purpose Causes the active position to move to the corresponding column at the preceding vertical position set by the `Pn` value.

Discussion If you try to move the active position above the top line, the active position stops at the top line.

`Pn` is the number of lines that the active line moves up at the current active column. Default value: `Pn` = 1.

Partial Line Up (PLU) — Superscripting

ASCII Code `ESC L`

Hex Code `1B 4C`

Dec Code `27 76`

Purpose Print superscripted characters.

Discussion This sequence moves the active position up a distance equal to 1/12”. The Partial Line Down (PLD) sequence returns the active position to the previous baseline.

The printer prints superscripted characters that go over the top page margin without disrupting the baseline of the superscripted characters. If PLU occurs while the active position is over the top margin, it has no effect; however, other active line-affecting control functions still produce their distinctive effect.

For example, if the active line is over the top margin, a carriage return <CR> places the active line at the top of the margin and characters are imaged as superscript until disabled. If the active line is below the bottom margin, a carriage return <CR> performs a form feed and characters are imaged as superscripts until disabled.

Partial Line Down (PLD) — Subscripting

ASCII Code `ESC K`

Hex Code `1B 4B`

Dec Code `27 75`

Purpose Print subscripted characters.

Discussion This sequence moves the active position down 1/12”. The Partial Line Up (PLU) sequence returns the active position to the previous baseline.

The printer prints subscripted characters that go over the top page margin without disrupting the baseline of the subscripted characters. If PLD occurs while the active position is over the top margin, it has no effect; however, other active line affecting control functions still produce their distinctive effect.

For example, if the active line is over the top margin, a carriage return <CR> places the active line at the top of the margin and characters continue to be imaged as subscript until disabled. If the active line is below the bottom margin, a carriage return <CR> performs a form feed and characters continue to be imaged as subscripts until disabled.

Tab Stops

A tab stop is a predetermined point to which the active position moves when you send the HT and VT tab commands. The active position is where the next character will print. A page can have a maximum of 32 horizontal tabs, and a maximum of 67 vertical tabs.

You can set horizontal and vertical tabs. The printer will ignore tab setting commands for tabs already set. Likewise, the printer will ignore tab clearing commands for tabs already cleared. The current origin of printing is the reference point for tabs.

Set Horizontal Tab Stops (DECSHTS)

ASCII Code `ESC [ Pn ;  ... ;  Pn u`

Hex Code `1B 5B Pn 3B ... 3B Pn 75`

Dec Code `27 91 Pn 59 ... 59 Pn 117`

Purpose `Pn` denotes a horizontal tab stop location.

Discussion DECSHTS allows you to select up to 16 horizontal tab stops at one time. Thirty–two possible horizontal tab stops are available, however, any sequence beyond 16 is ignored. The Pn values can be in any order in the escape sequence.

The unit of measurement can be character cells, decipoints, or pixels. It is selected by using the Position Unit Mode (PUM) and Select Size Unit (SSU) sequences. If you select character cells, the width of each cell equals the current character width setting. Character width is determined by setting the horizontal spacing.

When you assign a new tab stop value, each new tab stop value is inserted into the current tab stop list, starting after the old tab stop with the next lower value. If you assign more than the maximum of 16 new tab settings, the printer discards the old tab stop with the highest value before entering each additional new tab stop. If the new tab stop has the highest value and you have set the maximum allowed number of tab stops, the printer ignores the new tab stop.

If a tab stop is not on the boundary of a character cell, tabbing to that tab stop in print mode forces the printer to the nearest character position.

Set Horizontal Tab Stops (HTS)

ASCII Code `ESC H`

Hex Code `1B 48`

Dec Code `27 72`

Purpose Causes a horizontal tab stop to be set at the current position.

Discussion A horizontal tab stop can also be achieved in 8–bit mode by sending the HTS 8–bit control code.

Set Vertical Tab Stops (DECSVTS)

ASCII Code `ESC [ Pn ;  ... ;  Pn v`

Hex Code `1B 5B Pn 3B ... 3B Pn 76`

Dec Code `27 91 Pn 59 ... 59 Pn 118`

Purpose Sets vertical tabs at the rows indicated.

Discussion `Pn` denotes a vertical tab stop location. Select up to 16 vertical tabs in one sequence. Up to 67 vertical tab stops can be set per page. The default is set to stop at every line.

The unit of measurement can be character cells, decipoints, or pixels. It is selected by using the Position Unit Mode (PUM) and Select Size Unit (SSU) sequences. If you select character cells, the height of each cell equals the current character line–height setting. Character height is determined by setting the vertical spacing.

The printer sets vertical tab stops at positions you select. New tab stop values are added to the current tab stop list, starting with the lowest value to be added. If the number of tab settings exceeds the number of available positions, the printer ignores any tab stop after the 67 values are stored.

Set Vertical Tab Stops (VTS)

ASCII Code `ESC J`

Hex Code `1B 4A`

Dec Code `27 74`

Purpose Causes a vertical tab stop to be set at the current position.

Discussion A vertical tab stop can also be achieved in 8–bit mode by sending the HTS 8–bit control code.

Tab Clear (TBC)

ASCII Code `ESC [ Ps g`

Hex Code `1B 5B Ps 67`

Dec Code `27 91 Ps 103`

Purpose Clear one or all horizontal or vertical tab stops.

Discussion `Ps` selects which tab stops to clear.

Ps	Tab Clear Action
0	Clear one horizontal tab stop at the active position
1	Clear one vertical tab stop at the active line
2 or 3	Clear all horizontal tab stops
4	Clear all vertical tab stops

Character Set Selection

To make a character set available for printing, you must designate the set as either G0, G1, G2, or G3. The designated set is then invoked into GL or GR using single or locking shift, and can be used for printing.

National Replacement Characters (NRCs) are created by replacing the relevant characters in the U.S. ASCII character set upon receipt of the appropriate control sequences.

Single and Locking Shifts

A single shift (SS2 or SS3), effects only the first printable GL character following the single shift sequence (refer to “Special Parsing Requirements,” page 2–16).

A locking shift (LS2, LS3, LS1R, LS2R, or LS3R) persists until another locking shift is invoked.

Table 2–16 give the sequences that select the active character sets.

Table 2–16. Selecting Active Character Sets Using Single and Locking Shifts

Name	Mnemonic	Sequence (Escape/Hex)	Function
Single Shift 2	SS2	ESC N 1BH 4EH	The character that follows SS2 selects from the G2 character set.
Single Shift 3	SS3	ESC O 1BH 4FH	The character that follows SS3 selected from the G3 character set.
Locking Shift 0	LS0	<SI> 0FH	The G0 character set becomes the active GL character set.
Locking Shift 1	LS1	<SO> 0EH	The G1 character set becomes the active GL character set.
Locking Shift 2	LS2	ESC n 1BH 6EH	The G2 character set becomes the active GL character set.
Locking Shift 3	LS3	ESC o 1BH 6FH	The G3 character set becomes the active GL character set.
Locking Shift 1 Right	LS1R	ESC ~ 1BH 7EH	The G1 character set becomes the active GR character set.
Locking Shift 2 Right	LS2R	ESC } 1BH 7DH	The G2 character set becomes the active GR character set.
Locking Shift 3 Right	LS3R	ESC | 1BH 7CH	The G3 character set becomes the active GR character set.

Select Character Set Sequences (SCS)

The Select Character Set Sequence (SCS) assigns a character set to the G0, G1, G2, or G3 character set designators. Table 2–17 gives the sequences that select the available language sets.

Table 2–17. Selecting Language Sets Using Single and Locking Shifts

Character Set	G0	G1	G2	G3
U. S. ASCII	ESC (B	ESC) B	ESC * B	ESC + B
United Kingdom	ESC (A	ESC) A	ESC * A	ESC + A
Digital Finnish	ESC (5	ESC) 5	ESC * 5	ESC + 5
French (France)	ESC (R	ESC) R	ESC * R	ESC + R
Digital French (Canada)	ESC (9	ESC) 9	ESC * 9	ESC + 9
German	ESC (K	ESC) K	ESC * K	ESC + K
Italian	ESC (Y	ESC) Y	ESC * Y	ESC + Y
JIS Roman	ESC (J	ESC) J	ESC * J	ESC + J
Digital Norwegian/Danish	ESC (6	ESC) 6	ESC * 6	ESC + 6
Spanish	ESC (Z	ESC) Z	ESC * Z	ESC + Z
Digital Swedish	ESC (7	ESC) 7	ESC * 7	ESC + 7
Digital VT100 Special Graphics	ESC (0	ESC) 0	ESC * 0	ESC + 0
Digital Technical Set	ESC (>	ESC) >	ESC * >	ESC + >
ISO Norwegian/Danish	ESC (‘	ESC) ‘	ESC * ‘	ESC + ‘
Digital Dutch	ESC (4	ESC) 4	ESC * 4	ESC + 4
Digital Swiss	ESC (=	ESC) =	ESC * =	ESC + =
Digital Portugal	ESC (%6	ESC) %6	ESC * %6	ESC + %6
Digital Supplemental	ESC (%5 or ESC (<	ESC) %5 or ESC) <	ESC * %5 or ESC * <	ESC + %5 or ESC + <
ISO Latin 1		ESC – A	ESC . A	ESC / A
ISO Latin 2		ESC – B	ESC . B	ESC / B
ISO Latin 5		ESC – M	ESC . M	ESC / M
ISO Cyrillic		ESC – L	ESC . L	ESC / L
ISO Greek		ESC – F	ESC . F	ESC / F
ISO Hebrew		ESC – H	ESC . H	ESC / H
JIS Katakana	ESC (I	ESC) I	ESC . I	ESC + I

NOTE: Any other character following the above escape sequences causes the entire sequence to be ignored.

Assign User Preference Supplemental Set (DECAUPSS)

ASCII Code `DCS Ps ! u D...D ST`

Hex Code `90 Ps 21 75 *...* 9c`

Dec Code `144 Ps 33 117 *...* 156`

Purpose Assigns a particular character set to the User Preference Supplemental (UPS) set.

Discussion Assigns several of the ISO and special character sets to the User Preference Supplemental set. Before selecting one of the character sets in Table 2–18 via the SCS code, you may first assign it to the UPS set using this control code.

Table 2–18. UPS Character Sets

Character Set	Ps	D...D
DEC Supplemental	0	%5
ISO Latin–1 Supplemental	1	A
ISO Latin-Hebrew Supplemental	1	H
DEC Technical	0	>
ISO Latin-Greek Supplemental	1	F

NOTE: If values for Ps and D...D are selected other than those in Table 2–18, this command will be ignored.

Ps Parameter

Ps indicates whether the specified UPS set is a 94-character or a 96-character set:

Ps1	Function
0	94-character set
1	96-character set

D...D Parameter

D...D is a string that contains the character set identifier. See SCS in this chapter for a list of intermediate and final characters. The identifier for the character set in this command is the same as the final character(s) in the identifier listed for the Select Character Set (SCS) sequence (see page 2–88).

Examples

To assign DEC Supplemental as the User Preference Supplemental character set, use the following DECAUPSS command:

```
DCS 0 ! u %5 ST
```

To assign ISO Latin–1 Supplemental as the User Preference Supplemental set, use the following command:

```
DCS 1 ! u A ST
```

Product Identification (DA)

ASCII Code	`ESC [ c`	or	`ESC [ 0 c`
Hex Code	`1B 5B 63`		`1B 5B 30 63`
Dec Code	`27 91 99`		`27 91 48 99`

Purpose Shows the product identification.

Discussion When the host computer sends a device attributes (DA) sequence, the printer immediately sends an answering sequence that identifies the printer. The printer will answer as follows:
LG*plus* Product ID ESC [? <45>c 1B 5B 3F 34 35 63

Printer Status Requests and Reports

The host computer can send Device Status Requests (DSRs) to the printer, which will then respond with status reports about its operational condition.

The printer will send reports to the host that are brief or extended, and solicited or unsolicited. Unsolicited status reports are sent only when an error occurs and only when unsolicited status reports are specifically enabled. Unsolicited status reports are sent after the current page prints, and list each error type once. Printer default is unsolicited reports disabled.

NOTE: This option will work properly only if the printer has the serial interface selected, and if the RTS option on the host interface serial menu is set to True (the default). Refer to the *LG^{plus} Series Setup Guide,* Chapter 4, for the Host Interface menu.

Device Status Requests (DSRs) and Printer Responses

The host computer sends the DSR sequences listed below to request status reports and to enable or disable unsolicited status reports.

Table 2–19. DSR Sequences

Request Sequence	Printer Response
CSI 0 n or CSI 5 n	Send an extended status report
CSI 6 n	Send a cursor position report
CSI ? 1 n	Disables all unsolicited status reports from printer
CSI ? 2 n	Enable brief, unsolicited status reports and send an extended status report
CSI ? 3 n	Enable extended, unsolicited status reports and send an extended status report

NOTE: Unsolicited status reports, when enabled, are sent when any reportable status or error condition occurs. (Unsolicited reports are initially disabled.)

Printer responses to these commands are discussed on the following pages.

Printer Status Reports

The printer sends a Device Status Report (DSR) to the host via the serial line when requested by the host (DSR) or when unsolicited reports have been previously enabled and a reportable status condition has occurred. The host can request a brief or extended status report, as follows:

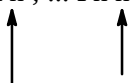
NOTE: The question mark (?) character occurs only once per DSR sequence.

- Brief, Unsolicited Messages Enabled:

Request Sequence	Printer Response
CSI n1 n	n1 = 3 If a malfunction is detected n1 = 0 After error condition has been corrected or if no malfunction exists

- Extended, Unsolicited Messages Enabled:

Request Sequence	Printer Response	
CSI 0 n	CSI ? 2 0 n	After error condition has been corrected or if no malfunction exists
CSI 3 n	CSI ? Pn ; ... Pn n	If a malfunction is detected



Specific error code (See Table 2–20.)

Generic error code (See Table 2–20.)

- Cursor Position Report: The unit of measurement can be character cells, decipoints, or pixels. It is selected by using the Position Unit Mode (PUM) and Select Size Unit (SSU) sequences.

Request Sequence	Cursor Position Report
CSI Pn1 ; Pn2 R	Pn1 is the active line Pn2 is the active column

Values of Pn (up to three digits) are defined in Table 2–20. Printer status codes are reported in pairs: a generic error code first, then a specific error code.

A hardware failure consists of any errors listed in “Self–test error messages” and “Font Checksum Errors found at Initialization.”

1. Communication failures are usually attributed to parity errors, framing errors, or receipt of an erroneous character.

2. Failures designated as events are reset only when an extended report is sent. If set for solicited reports, the events are reset only after the report is requested and reported. If set for unsolicited reports, the report is immediately sent and the event cleared.

3. RIS and DECSTR reset any event not reported.

4. All non–events are not latched, but continuously reflect the current state of the relevant parameter.

Table 2–20. Printer Status Error Codes

Generic Fault Codes	Specific Number Codes	LCD Message
21	134	Req Font Deleted
24	125	Off–Line
25		Paper Jam
26		Cover Open
27	206	Paper Out
31	907	Err in Font S/W
31		Emul Switch Err
32	216	Paper Fault
36	220	Platen Open
37	222	Bad Font Data
38	229	Ribbon Stall
40	124	Char. Not In Font
41	101	Page Too Complex
41	102	Margins Exceeded
41	105	Page Too Big
41	108	Out of Form Mem
42	112	Font Load Fault
43	116	Invalid Params
44	103	Too Many Fonts
44	108	Too Many Forms
44	109	Too Many Logos
47	113	Too Many Errors
48	118	Bad Form Data
48	119	Bad Logo Data
48	140	VFU Seq. Error
48	141	VFU Load Fmt Err
48	142	VFU TOF/BOF Err

Assigning and Selecting Font Files

Each font file stored in printer ROM includes data for one of the three standard character sets: ASCII, DEC Supplemental, and DEC Technical.

Each font file also includes data for one font, which is part of a type family. You can identify font files by *type family ID*, *font ID*, and *font file ID*. (Refer to Appendix C.)

The type family ID consists of seven characters. The type family IDs for the standard type families used with ROM–resident font files are listed below.

Type Family	Identification (ID) String
Data Processing	DBULTN1
Compressed Print	DCMPRSS
Correspondence Plot	DCRRSPL
Correspondence Print	DCRRSPN
Draft Plot	DDRAFT0
High Speed Draft Print	DDRAFT1
LG Near Letter Quality	DLGNRLQ
Low Density Plot	DLODENS
OCR A	ROCRA00
OCR B	ROCRB00

The font ID has 16 characters (no lowercase letters permitted) and describes the seven basic font attributes (including type family) of the ROM–resident fonts. Appendix C lists the standard type family, font, and font file IDs for the ROM–resident files.

To make a font file available for printing, you must assign a Select Graphic Rendition (SGR) number (page 2–97) to the file. Then you can select the SGR number for printing (page 2–99).

Default Fonts

When you power up or reset the printer, it selects SGR number 10 for printing and data processing, and SGR number 19 for plotting and LG Near Letter Quality, unless you have selected and saved another default.

Assign Type Family or Font (DECATFF)

ASCII Code `DCS Ps1 ; Ps2 } ID String ST`

Hex Code `90 Ps1 3B Ps2 7D ID String 9C`

Dec Code `144 Ps1 59 Ps2 125 ID String 156`

Purpose Assigns an SGR number to a font ID or type family ID.

Discussion The DECATTF sequence assigns a type family ID (seven characters) or a font ID (16 characters) to an SGR number from 10 to 19. The SGR sequence can then select that font for printing (see page 2–99).

Each font file contains an ID string as part of its font record.

Ps1 Parameter

Ps1 selects which font assignment to perform:

Ps1	Function
0	Same as 1 (default)
1	Assign font ID to SGR number
2	Assign type family ID to SGR number

Ps2 Parameter

Ps2 selects an SGR number (from 10 to 19) for a type family ID or font ID. The following table indicates the default SGR number assignments:

Ps2	Assignment	ID	Font or Type Family
10	Type Family	DBULTN1	Data Processing (print font)
11	Type Family	DCRRSPN	Correspondence Print (print font)
12	Font	ROCRA00	OCR A (print font)
13	Font	ROCRB00	OCR B (print font)
14	Type Family	DCMPRSS	Compressed (print font)
15	Type Family	DDRAFT1	High Speed Draft (print font)
16	Type Family	DLODENS	Low Density Plot (plot font)
17	Type Family	DCRRSPL	Correspondence Plot (plot font)
18	Type Family	DDRAFT0	Draft Plot (plot font)
19	Type Family	DLGNRLQ	LG Near Letter Quality (plot font)

Type Family ID or Font ID String

The type family ID or font ID identifies which font file to assign to the SGR number (Ps2). You must use only uppercase letters for a type family ID or a font ID.

You can assign up to 10 fonts at one time. Font Assignments may occur anywhere in the data stream. You can send an unlimited number of assign–font–number sequences to the printer.

The printer will accept an ID for a font file not currently stored, but if you try to print or plot a character from the missing font file the printer prints a filled–in rectangle instead. If you assign an ID to an SGR number that already has an ID assigned, the new assignment replaces the old one.

Selecting Fonts for Printing (SGR)

ASCII Code `CSI Ps m`

Hex Code `9B Ps 6D`

Dec Code `155 Ps 109`

Purpose Selects fonts for printing or plotting.

NOTE: This SGR sequence format is also used to select several character attributes. (Refer to page 2–103.) You can combine several SGR sequences by separating Ps values with semicolons (;).

Discussion The Ps values range from 10 through 19; each number corresponds to a font or type family used for printing, as defined by the DECATTF command (see page 2–97, which shows the default assignments for 10 to 19). If you want to print more than 10 fonts or type families on a page, you must reassign other IDs to these SGR numbers.

If you select a specific font, all seven font attributes are already assigned. If you select a type family, you have two choices for the other six font attributes (type size, spacing, etc.): you can use the default values for those attributes or you can change one or more attributes with control sequences. Thus, selecting a type family gives you more options.

You can use the select font sequence anywhere in the data stream. The selected font remains in effect until the printer receives another select font sequence or a Reset to Initial State (RIS) sequence. After a power–up RIS sequence, the printer uses SGR number 10 for print mode and SGR number 19 for plot mode.

If you send an assign type family or font (DECATFF) sequence for the current SGR number, the sequence takes effect immediately. You do not have to select the current SGR number.

If you select an SGR number that does not have a type family ID or a font ID assigned and you try to plot, the filled rectangle will print.

Deleting Fonts from RAM (DECLFF)

ASCII Code `DCS 0 ; 1 ; 0 y ST`

Hex Code `90 30 3B 31 3B 30 79 9C`

Dec Code `144 48 59 49 59 48 121 156`

Purpose Deletes fonts from RAM.

Discussion Digital LG printer emulation fonts are in portrait orientation by default. Each time you request a landscape orientation and select a font, the printer creates a rotated font in RAM. The RAM may fill if you create a number of fonts. The following command sequence lets you delete fonts from RAM.

NOTE: This command is also used in the LN03 printer for loading font files. This function is not present in LG–series printers.

Font Status Sequences

Font status sequences help the host computer control and manage font memory. The host sends a request font status sequence, and the printer responds by sending a font status report. The font status report tells the host which fonts are currently available in the printer.

Request Font Status (DECRFS)

ASCII Code `CSI Ps ; Ps ” {`

Hex Code `9B Ps 3B Ps 22 7B`

Dec Code `155 Ps 59 Ps 34 123`

Purpose The host computer sends this sequence to request a report of the fonts available for printing, the memory bytes available for loading new fonts, or both.

NOTE: This command works only when the printer is connected to the host through the serial interface.

Discussion The Ps parameter selects the type of font status requested:

Ps	Function
0	Send both reports (same as 1 and 2) (default)
1	Send status of ROM fonts
2	Send amount of RAM available for rotating fonts, forms, and logos

Font Status Report (DECFSR)

The printer uses this sequence to report the font status requested by the DECRFS sequence (page 2–101). There is a separate report for the two types of status requests.

NOTE: This command works only when the printer is connected to the host through the serial interface.

Response to a DECRFS request with a Ps parameter of 1:

ASCII Code `DCS 1 ″ { IDstring ST`

Hex Code `90 31 22 7B IDstring 9C`

Dec Code `144 49 34 123 IDstring 156`

Discussion The ID string includes the type family name, the type family ID in parentheses, a colon (:), then a new line(s) with each font name. A blank line indicates the end of the previous family. For example,

type family name (type family ID):
    font file ID;
    font file ID;
type family name (type family ID):
    font file ID;

Response to a DECRFS request with a Ps parameter of 2:

ASCII Code `DCS 2 ″ nnn ST`

Hex Code `90 32 22 nnn 9C`

Dec Code `144 50 34 nnn 156`

Discussion nnn represents a decimal number indicating the number of bytes available in RAM for rotating fonts.

Character Attributes (SGR)

Character attributes are enhancements that let you highlight your printed text. You can select ten character attributes by using Select Graphic Rendition (SGR) sequences:

- Select font (DEC multinational character set, NLQ, OCR–A, OCR–B)
- Character Expansion via Graphic Size Modification (GSM) sequences (Double height characters, triple height characters, double width characters), if the font was selected by family.
- Select Graphic Rendition (Bold, Italics, Underline, Strike through)

Character attribute sequences share the same basic format as the select font sequence. This type of sequence is called a Select Graphic Rendition (SGR) sequence:

```
ESC [ Ps m
```

You can select more than one character attribute in the same sequence by including several `Ps` values separated by semicolons:

```
ESC [ Ps ; Ps ; Ps m
```

Once set, a character attribute remains active until you turn it off or reset the printer.

`Ps` = 0 (zero) turns off all character attributes.

Character Expansion (GSM)

ASCII Code `ESC [ Pn1 ; n2 SP B`

Hex Code `1B 5B Ps1 3B n2 20 42`

Dec Code `27 91 Ps1 109 n2 32 66`

Purpose Pn1 multiplies height; n2 multiplies width.

Discussion The Character Expansion control sequence allows characters to be multiplied in both height and width.

Multiply Height

The printer prints double and triple height characters by expanding the single height character matrix to produce twice or three times the number of vertical dots per character, respectively. Blank lines are expanded to either twice or three times the normal height, equal to the height requested. To alter character height, choose from the following options:

Current Vertical Pitch (LPI)	Pn1 = 200 Double Height (LPI)	Pn1 = 300 Triple Height (LPI)
2	1	
3	1.5	
4	2	
5	2.5	1.7
6	3	2
8	4	2.7
10	5	3.3
12	6	6

When double/triple height mode is selected, the printer expands vertical print until the feature is disabled. This feature can be combined with double width characters. Mixing single, double, and triple height characters on the same horizontal line is allowable.

Multiply Width

The printer prints double width characters by expanding the single width character matrix to produce twice the number of horizontal dots per character. When double width characters are selected, the Space character also expands to twice the normal width. To double character width, invoke the following CPI:

Current Width Pitch (CPI)	n2 = 200 Double Width (CPI)
10	5
12	6
13.3	6.6
15	7.5
16.7	8.3

NOTE: The OCR–A and OCR–B fonts cannot be enlarged. If multiplication escape sequences are used with them, the escape sequence is ignored.

Double width characters are considered one–column wide by the printer. Therefore, existing tab stops are positioned with respect to double width columns. When double width characters are disabled, the tab stops reposition to normal width columns.

A default of 100 is used if no values are set for `Pn1` or `n2`.

When vertical expansion is selected, blank lines are also expanded by the appropriate factor. Likewise, when double width characters are selected, spaces are expanded to the appropriate factor.

`Pn1` and `n2` may both be set to 50 or 75 if a size reduction is desired.

Bold Printing

ASCII Code `ESC [ Ps m`

Hex Code `1B 5B Ps 6D`

Dec Code `27 91 Ps 109`

Purpose Turn bold printing on or off.

Discussion This sequence causes the printer to print bold text in the same font currently selected. The values of `Ps` turn bold printing on or off.

If the currently selected type family does not have a bold font on the system diskette, the printer will double–strike with a slight offset (“shadow print”) when you turn on bold printing. Printing speed is reduced during shadow printing because each character is created twice. Note that bolding is not available for OCR–A and OCR–B fonts.

Ps	Printer Action
1	Turn on bold printing
22	Turn off bold printing
0	Turn off all character attributes

If the Print Mode option is set to Enable with the control panel, bold printing will occur with the current print mode font with maximum printer throughput. If Print Mode is set to Disable, a plot mode font is used.

Crossed–Out Text

ASCII Code `ESC [ Ps m`

Hex Code `1B 5B Ps 6D`

Dec Code `27 91 Ps 109`

Purpose Turn crossed–out printing on or off.

Discussion When enabled, one or more characters print with a cross–through mark.

Ps	Printer Action
9	Enables crossed-out text
29	Disables crossed-out text

Note that crossed–through text printing is not available for OCR–A and OCR–B fonts.

If the Print Mode option is set to Enable with the control panel, crossed–out text will print with the current print mode font with maximum printer throughput. If set to Disable, a plot mode font is used.

Double Underlined Text

ASCII Code `ESC [ Ps m`

Hex Code `1B 5B Ps 6D`

Dec Code `27 91 Ps 109`

Purpose Turns double underlining on or off.

Discussion With double underlining on, the printer double underlines all following printable characters, including spaces. Double underlining remains in effect (even across page boundaries) until turned off. Note that if you use a tab with double underline enabled, the space is doubly underlined. `Ps` turns double underlining on or off.

Ps	Printer Action
21	Turn on double underlining
24	Turn off double underlining

This feature is available to all fonts and pitch settings, only when the printer is in Print mode and portrait. Double underlining is disabled when the printer is reset or powered–off.

Italic Printing

ASCII Code `ESC [ Ps m`

Hex Code `1B 5B Ps 6D`

Dec Code `27 91 Ps 109`

Purpose Turn italic printing on or off.

Discussion Text prints in italics only when OCR–A or OCR–B fonts are not in use and italic printing is selected. The values of `Ps` turn italic printing on or off.

When the Print Mode option is set to Enable with the control panel, print mode fonts (except for OCR) will be italicized when selected. If set to Disable, underlining is substituted.

Ps	Printer Action
3	Turn on italic printing
23	Turn off italic printing

Overlined

ASCII Code `ESC [ Ps m`

Hex Code `1B 5B Ps 6D`

Dec Code `27 91 Ps 109`

Purpose Turn overlined printing on or off.

Discussion When enabled, all characters and spaces following the code is overlined. The values of `Ps` turn overlined printing on or off.

Ps	Printer Action
53	Turn on overlined printing
55	Turn off overlined printing

Overlined text is only applicable in Print mode.

Turn Off All Attributes

ASCII Code `ESC [ 0 m`

Hex Code `1B 5B 0 6D`

Dec Code `27 91 0 109`

Purpose Turns off all font attributes.

Underlined Text

ASCII Code `ESC [ Ps m`

Hex Code `1B 5B Ps 6D`

Dec Code `27 91 Ps 109`

Purpose Turn underlining on or off.

Discussion With underlining on, the printer underlines all following printable characters, including spaces. Underlining remains in effect (even across page boundaries) until turned off. Note that if you use a tab with underline enabled, the space will be underlined. The values of `Ps` turn underlining on or off.

Ps	Printer Action
4	Turn on underlining
24	Turn off underlining

This feature is available to all fonts and pitch settings. Underlining is disabled when the printer is reset or powered–off.

Justification (JFY)

ASCII Code `ESC [ Ps SP F`

Hex Code `1B 5B Ps 20 46`

Dec Code `27 91 Ps 32 70`

Purpose Aligns text at left and right margins.

Discussion Justification changes the spacing between words. With a justified line, the first character of the first word is flush with the left margin, or at the line home position if it differs from the margin setting. The last character of the line will be at the right margin. Once enabled, justification remains on until you turn it off.

Justification places the printer in plot mode. Subsequent text is then printed in the plot font selected. If you do not select a font, solid rectangles are plotted.

The printer evenly spaces each word on a justified line. The space character (SP) indicates a word space to the printer, and you set the limits for word spacing with the `Ps` parameter, as follows:

Ps	Printer Action
0	Turn off justification (default)
2	Turn on justification with limits
?2	Turn on justification without limits

When justification with limits is set (`Ps` = 2), the printer does not shrink or expand the space character beyond the limits set by the current font (usually in the 50–200% range). If you select justification without limits (`Ps` = ?2), the printer can shrink the space character to zero.

The printer will not make hyphenation or end–of–line determinations when justification is turned on, nor will autowrap operate with justification turned on. Use the following sequences or control characters to make End–of–line determinations:

- Carriage Return <CR>
- Form Feed (FF)
- Line Feed (LF)
- Vertical Table (VT)
- Next Line (NEL)
- Forward Index (IND)
- Reverse Index (RI)
- Vertical Position Absolute (VPA)

The active font determines the distance between characters in a word. The printer will not autowrap text with justification turned on; therefore, text that exceeds the printable area is lost.

The printer does not justify leading spaces; instead, it uses the default width of the space character (SP). The printer will not shrink or expand the value of Horizontal Position Relative (HPR) sequences in the text. If a line contains Horizontal Tab (HT) or Horizontal Position Absolute (HPA), the printer justifies text between the last HT and the end of the line only.

Sixel Graphics Processing

A sixel is a group of six vertical picture elements (six pixels) that represents a section of a graphic image. It can be sent in one byte (7 or 8 bits). A bit value of 1 means print a pixel; a bit value of 0 means leave a space.

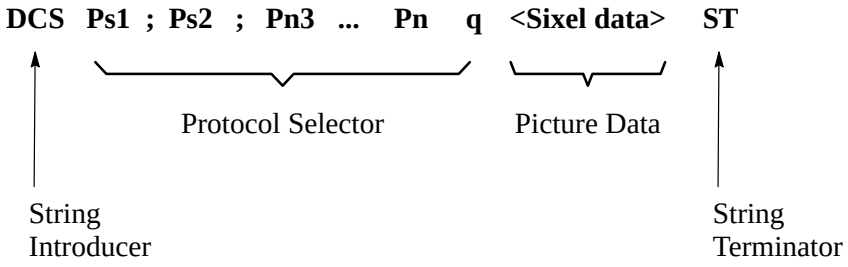
The sixel protocol is a bit–imaged rasterised method of transmitting and displaying graphic images. The printer receives and prints sixel files sent from the host. These images are printed in monochrome.

NOTE: Sixel graphics is invoked in one of two ways: for use with the new software and for use with older software versions. This section describes how to run sixel graphics with the new software. If you are running older software versions, refer to the appropriate Digital manual for sixel graphics information.

Sixel protocol is contained within an ANSI defined Device Control String (DCS) control code. It is invoked by a String Introducer (SI) and is terminated by the String Terminator (ST) control code. The following components make up the complete Device Control String for the sixel protocol:

- String Introducer
- Protocol Selector
- Picture Data
- String Terminator

The Device Control String is assembled as follows:



String Introducer

The String Introducer Control code (DCS) identifies the start of the sixel protocol. The DCS code is `90H` in 8–bit mode. In 7–bit mode, it is `1BH, 50H`.

Protocol Selector

The protocol selector consists of a string of zero, one, or more numeric parameters, each separated by the parameter separator character, ; (semicolon, 3BH). A valid numeric parameter consists of zero, one, or more digits in the range of 30H – 39H. The protocol selector has the following format:

ASCII Code Ps1 ; Ps2 ; Pn3 ... Pn q
This selector is defined as follows:

- Set Ps1 to zero and explicitly define the Horizontal Grid Size with the Pn3 parameter. Set the aspect ratio numerator and denominator using the Pn1 and Pn2 parameters in the Sixel Data Control sequence, “Set Raster Attributes,” page 2–119

Macro Value	Horizontal Grid Size (Inches)	Aspect Ratio (Vert. Pxls:Horz. Pxls)
0 or none	1/140 in (.0071)	200:100
1	1/140 in (.0071)	200:100
1	1/140 in (.0071)	200:100
2, default to:	1/180 in (.0056)	250:100
3, default to:	1/180 in (.0056)	250:100
4	1/180 in (.0056)	250:100
5, default to:	1/140 in (.0071)	200:100
6, default to:	1/140 in (.0071)	200:100
7, default to:	1/140 in (.0071)	200:100
8, default to:	1/140 in (.0071)	200:100
9, default to:	1/70 in (.0143)	100:100

- Macro values 2,3, and 5 through 8 are default definitions required by this printer. If Ps1 is greater than 9, default to Ps1 = 0.
- Ps2 is the background select parameter. It is not used by this printer.

- Pn3 selects horizontal grid size in decipoints (1/720in). This parameter, used with the aspect ratio, defines grid size.

The printer performs default horizontal grid sizes for some decipoint values. The following table identifies the horizontal grid size used for each parameter value.

Decipoints (1/720”)	Horizontal Grid Size
0 or none	No change to HGS defined by Ps1
1, 2, 3	1/180in (.0056 in)
4	1/180in (.0056 in)
5	1/180in (.0056 in)
6 default to:	1/180in (.0056 in)
7 default to:	1/180in (.0056 in)
8	1/180in (.0056 in)
9 default to:	1/180in (.0056 in)
10	1/180in (.0056 in)
11 – 19 default to:	1/180in (.0056 in)
20	1/180in (.0056 in)
21, 22, etc. default to:	1/180in (.0056 in)

If Pn3 is set to 0 or not present, the horizontal grid size is determined by the macro parameter (Ps1). Otherwise, Pn3 overrides the Horizontal Grid Size (HGS) portion of the macro parameter while attempting to preserve the aspect ratio (A/R). Therefore, when the 250:100 aspect ratio is selected by Ps1, Pn3 must take on one of the following values:

1/180 in, maintain 250:100 A/R and HGS = 1/180 in
1/140 in, maintain 250:100 A/R and HGS = 1/180 in
1/90 in, maintain 250:100 A/R and maintain HGS = 1/90 in
1/70 in, maintain 250:100 A/R and change to HGS = 1/90 in
1/35 in, maintain 250:100 A/R and change to HGS = 1/90 in

When the 200:100 aspect ratio is selected by Ps1, Pn3 must take on one of the following values:

1/180 in, change to 200:100 A/R and maintain HGS = 1/180 in
1/140 in, maintain 200:100 A/R and HGS = 1/140 in
1/90 in, maintain 200:100 A/R and change to HGS = 1/140 in

1/70 in, maintain 200:100 A/R and change to HGS = 1/70 in
1/35 in, maintain 200:100 A/R and change to HGS = 1/70 in

When the 100:100 aspect ratio is selected by Ps1, Pn3 must take on one of the following values:

1/180 in, change to 200:100 A/R and maintain HGS = 1/180 in
1/140 in, maintain 200:100 A/R and change to HGS = 1/140 in
1/90 in, maintain 200:100 A/R and change to HGS = 1/140 in
1/70 in, maintain 200:100 A/R and HGS = 1/70 in
1/35 in, maintain 200:100 A/R and change to HGS = 1/35 in

- Pn is reserved for future use. If parameters are received, they will be ignored without terminating this sequence.
- The final character is designated by the lowercase letter, q, where q identifies the sequence as the sixel protocol selector and places the printer in Sixel Graphics mode.

Three control characters cause the Protocol Selector sequence to terminate and enter Text mode. They are SUB, CAN, and ESC. After the sequence is terminated and Text mode is entered, the process (SUB, CAN, or ESC) enacts. All other codes, if received within the Protocol Selector sequence, are honored without terminating the sequence.

All C1 control codes received while you are defining the Protocol Selector sequence cause the sequence to terminate and the printer to exit from sixel character processing. C1 control codes applicable to this printer are then processed.

Picture Data

Picture data is made up of sixel printable characters and sixel control characters. All picture data is processed while in Sixel Graphics mode. In this mode, instead of standard ASCII Text mode processing, characters are processed by the printer as sixel data, and a graphic image prints.

String Terminator

When the Device Control String parameters have been entered, exit Sixel Graphics mode using the String Terminator (ST) control code. Exit always returns the printer to normal text processing.

Character Processing in Sixel Graphics Mode

In Sixel Graphics mode, characters are made up of standard ASCII text processed as sixel printable characters and sixel control characters.

Sixel Printable Characters

Sixel printable characters are GL characters in the 3F – 7E hex range decoded as printable characters. Each of these 64 values represent an encoding of six vertical pixels to be printed. The actual pixel size is defined by the Horizontal Grid Size parameter and the pixel aspect ratio.

For each bit set to 1, a corresponding print element (or group of elements in double scale), is activated to form a dot. The least significant bit (0) is associated with the top print element or group of elements.

An offset of 3FH is subtracted from each graphics printable character received. this produces a binary value in the 00 – 3F hex range. The 6–bit binary value obtained after this subtraction represents a six–pixel column definition. Note that GR characters in the BF – FE hex range are processed as GL characters by setting the eighth bit to 0. Table 2–21 shows the binary values for six–pixel column definition.

Table 2–21. Six–Pixel Column Definition

HEX Code	ASCII Symbol	Binary Value	Pixels	Action
3F	?	000000	None	Advance by a sixel space
40	@	000001	Top	Print top pixel only
5F	_	100000	Bottom	Print bottom pixel only
7E	~	111111	All	Print one full column

If you try to print past the furthest right position, the printer will truncate all remaining sixel data until the next Graphics Carriage Return ($) or Graphics New Line (–).

Sixel Control Codes

Sixel control codes are GL characters in the 20 – 3E hex range. The parameter separator (3B hex) and the parameter digits (30 – 39 hex) are also included in this range. GR characters in the A0 – BE hex range are processed as GL characters by setting the eighth bit to 0. Table 2–22 show how the assigned control characters are processed.

Table 2–22. Assigned Control Characters

HEX Code	ASCII Symbol	Action
21	!	Repeat Introducer
22	”	Set Raster Attributes
24	$	Graphic Carriage Return
2D	–	Graphic New Line
30 – 39	0 – 9	Numeric Parameters
3B	;	Parameter Separator

A Sixel Graphics Mode sequence begins with a sixel control character (30H – 39H, 3BH exclusive) and ends with a printable character or another sixel control character. If the following data is received:

```
! – 200 ~
```

the printer ignores the repeat control character, processes the Graphic New Line, ignores 200 (it is meaningless by itself), and prints the tilde character once.

Any unassigned control characters, parameters, or parameter separators are ignored by the printer until the next valid control character or ST is received.

Repeat Introducer (!) and Sequence

A repeat sequence allows repetition of certain characters when a valid printable character follows an exclamation point (!), the repeat introducer symbol. For example, the following sequence:

```
!    1   0   ?
21H  31H 30H 3FH
```

is interpreted to mean “repeat 10 graphic spaces.”

The numeric parameter specifies the number of times to print the character that follows the repeat introducer. The numeric parameter is a string of characters in the 30H – 39H range, which is evaluated as a decimal number. If a numeric parameter is not received or if the parameter is 0, a value of 1 is assumed. If the parameter is a value larger than the maximum value of 65535, the printer defaults to 65535. All decimal digits are processed as part of the count.

A repeat sequence is equivalent to receiving the printable character as many times as specified by the numeric parameter count. A printable character ends the repeat sequence processing and causes the printer to print.

Set Raster Attributes

Setting the raster attributes determines the size, shape, and position of the pixels to be drawn.

After entering Sixel Graphics mode, a valid Set Raster Attributes sequence must be received before the first sixel printable character is received. The Set Raster Attributes sequence effects all sixel data that follows.

If a Set Raster Attributes sequence is received after a sixel printable character is received, the printer still recognizes the sequence but disregards all parameters and continues processing all sixel data and control codes that follow the sequence, as if the sequence was never received.

If a Set Raster Attributes sequence is received after a sixel control code (21H – 24H, 2DH), the printer processes the control code and recognizes but ignores all Set Raster Attributes sequences that follow. If a Set Raster Attributes sequence is received after an unspecified Digital control code (20H, 25H – 2CH, 2EH, 2FH, 30H – 3EH), the printer ignores the code and processes the Set Raster Attribute sequence that follows. Because of this, you can specify a future control code to be received first, and it will be ignored without consequence to the Set Raster Attributes sequence until the code is recognized by the printer.

If a Set Raster Attributes sequence is received before any other sixel control code, the sequence is processed. The protocol selector has the following format:

ASCII Code ” Pn1 ; Pn2 ; Pn3 ; Pn4
This selector is defined as follows:

- The double quote (”) sets the raster attributes control characters.
- Pn1 sets the pixel aspect ratio numerator.
- Pn2 sets the pixel aspect ratio denominator.

  Pn1 and Pn2 are numeric parameters. A numeric parameter is a string of characters in the 30H – 39H range that is evaluated by the printer as a decimal number. If the parameter is a value larger than the 65535 maximum, the printer defaults to 65535.

  The pixel aspect ratio defines the shape of the pixel needed to reproduce the picture without distortion. This ratio is defined by two numbers, a numerator (Pn1) and a denominator (Pn2). It is the ratio of the vertical to the horizontal shape of the pixel. For example, an aspect ratio of 2:1 (or 200:100) represents a pixel twice as high as it is wide. The aspect ratio multiplied by the Horizontal Grid Size (HGS) yields the ideal Vertical Grid Size (VGS). That is:

  Pixel Aspect Ratio x HGS = Ideal VGS.

  Table 2–23 gives the aspect ratios supported by the printer.

Table 2–23. Aspect Ratios Supported by the LG*plus*

Aspect Ratio	Sixel Scale	HGS	Horiz. Dots/Pixel	VGS	Vert. Dots/Pixel
2.5:1	Full 2X	1/180 in 1/90 in	1 2	1/72 in 1/36 in	1 2
2:1	Full 2X	1/140 in 1/70 in	1 2	1/72 in 1/36 in	1 2
1:1	.5 Full 2X	1/140 in 1/70 in 1/35 in	1 1 2	1/144 in 1/72 in 1/36 in	1/2 1 2

When other aspect ratios (A/R) are requested, they are processed in the following manner:

– An aspect ratio of less than 1.5:1 uses 1:1 A/R.
– An A/R equal to or greater than 1.5:1, but less than 2.25:1 uses 2:1 A/R.
– An A/R equal to or greater than 2.25:1 uses 2.5:1 A/R.

When determining pixel size, the printer will attempt to preserve the A/R without exceeding the selected HGS. Therefore, note the following:

When 2.5:1 A/R is selected and the HGS is:

– 1/180 in, the printer maintains a 2.5:1 A/R and a HGS of 1/180 in
– 1/140 in, the printer maintains a 2.5:1 A/R and a HGS of 1/180 in
– 1/90 in, the printer maintains a 2.5:1 A/R and changes HGS to 1/90 in
– 1/70 in, the printer maintains a 2.5:1 A/R and changes HGS to 1/90 in
– 1/35 in, the printer maintains a 2.5:1 A/R and changes HGS to 1/90 in

Pixel Aspect Ratio x HGS = Ideal VGS.

When 2:1 A/R is selected and the HGS is:

– 1/180 in, change the printer to 2.5:1 A/R and HGS to 1/180 in
– 1/140 in, the printer maintains a 2:1 A/R and a HGS of 1/140 in
– 1/90 in, the printer maintains a 2:1 A/R and a HGS of 1/140 in
– 1/70 in, the printer maintains a 2:1 A/R and changes HGS to 1/70 in
– 1/35 in, the printer maintains a 2:1 A/R and changes HGS to 1/70 in

When 1:1 A/R is selected and the HGS is:

– 1/180 in, the printer maintains a 1:1 A/R and a HGS of 1/180 in
– 1/140 in, the printer maintains a 1:1 A/R and changes HGS to 1/140 in
– 1/90 in, the printer maintains a 1:1 A/R and changes HGS to 1/140 in
– 1/70 in, the printer maintains a 1:1 A/R and a HGS of 1/70 in
– 1/35 in, the printer maintains a 1:1 A/R and changes HGS to 1/35 in

Graphic Carriage Return ($)

The Graphic Carriage Return (GCR) control code causes the active position to move back to the furthest left position where the first sixel data was printed after entering Sixel Graphics mode. GCR allows sixel data to overprint lines by consecutively starting at the same horizontal position. For example, if the first sixel data prints at column 10, the GCR causes the next line of sixel data to start at column 10 and not at the left margin.

Graphic New Line (–)

The Graphic New Line (GNL) control code initiates printing, causes the active position to move to the furthest left position, and advances paper by one sixel height.

Numeric Parameters (0 – 9)

Some graphic control codes may be followed by a numeric value that is encoded as an ASCII decimal number (0 – 9) in the 30 – 39 hex range. A numeric value is terminated by any non–digit, specifically another control code or a graphics printable character. The default for any numeric parameter is 0.

Parameter Separator (;)

The parameter separator is used to separate a series of numeric parameters. If a number does not precede the separator or does not follow the separator, the printer assumes a value of zero.

ASCII Control Characters

In Sixel Graphics mode, the printer ignores all CO control characters received except CAN, SUB, and ESC. When the printer receives a CAN control character, it terminates Sixel graphics mode. A SUB control character is processed as 3FH (one sixel space), which limits the effect of some communication line errors. An ESC character terminates Sixel Graphics mode, but the printer still processes the ESC character.

In Sixel Graphics mode, all C1 control codes terminate Sixel Graphics mode, then process the C1 control code if it is recognized by the printer.

Graphic Substitute

In Sixel Graphics mode, the SUB character is interpreted as an error character. The printer remains in Sixel Graphics mode and processes SUB as a sixel space (3FH). If a repeat sequence is processing when SUB is selected, the number of sixel spaces required by the repeat count is printed.

Exit Sixel Graphics Mode

The printer exits Sixel Graphics mode when CAN, ESC, or ST are received. CAN causes the printer to exit Sixel Graphics mode. ESC causes the printer to exit Sixel Graphics mode and begin processing the ESC sequence. ST terminates Sixel Graphics mode.

Note that all stored sixel data is printed before the printer exits Sixel Graphics mode.

State After Exiting Sixel Graphics Mode

After exiting Sixel Graphics mode, the printer returns to the following conditions:

- The horizontal position before entering Sixel Graphics mode
- The horizontal pitch before entering Sixel Graphics mode
- The vertical position might be modified by control characters received while in Sixel Graphics mode
- The vertical pitch is the same as before entering Sixel Graphics mode
- All SGR attributes are restored to the state before entering Sixel Graphics mode
- Additionally, the first Text mode vertical motion command (LF, VT, etc.) causes the printer to advance to the next Text mode line before executing the command.

Processing Unused Control Strings

The printer ignores all unused control strings. Unused control strings include all Operating System commands (OSC), Privacy Messages (PM), and Application Program commands (APC), as well as all Device Control strings (DCS), unless they are within Sixel Graphics mode. The following table describes the different control strings:

Types of Control Strings	8–bit Mnemonic/ HEX	7–bit Mnemonic/ HEX
Device Control Strings	DCS 90H	ESC P 1BH 50H
Operating System Commands	OSC 9DH	ESC] 1BH 5DH
Privacy Messages	PM 9EH	ESC ^ 1BH 5EH
Application Program Commands	APC 9FH	ESC _ 1BH 5FH

Control string formats appear in the following ways:

Control String Introducer	Data String	String Terminator
DCS P...P I...I F	D...D	ST
OSC	D...D	ST
PM	D...D	ST
APC	D...D	ST

In the above table, P = parameters; I = intermediate characters; F = final character; D = data; and ST = string terminator (9CH).

Process unused control strings as follows:

- After DCS begins processing the introducer sequence, it will:
  1) enter Sixel Graphics mode if the final character is a q
  2) process any applicable CO received
  3) enter Text mode if ESC, CAN, SUB, ST, or a C1 is received
  4) ignore any GL or GR code received
- After OSC receives an ESC, CAN SUB, ST or C1, it will:
  1) enter Text mode
  2) ignore any other characters
- After PM receives an ESC, CAN SUB, ST or C1, it will:
  1) enter Text mode
  2) ignore any other characters
- After APC receives an ESC, CAN SUB, ST or C1, it will:
  1) enter Text mode
  2) ignore any other characters

Drawing Vectors (DECVEC)

ASCII Code `ESC [ Pn1 ; Pn2 ; Pn3 ; Pn4 ; Pn5 ; ! |`

Hex Code `1B 5B Pn1 3B Pn2 3B Pn3 3B Pn4 3B Pn5 3B 21 7C`

Dec Code `27 91 Pn1 59 Pn2 59 Pn3 59 Pn4 59 Pn5 59 33 124`

Purpose Draw horizontal or vertical lines with length and width

Discussion Margins do not affect line drawing so you can draw lines to the physical limits of the page. The DECVEC command sequence draws vectors without changing the currently active position.

Use the Pn parameters to select the length, width, and direction of the line. An incorrect Pn value cancels the entire sequence.

Pn1	Operation
0	Draw an x line; that is, horizontal with respect to page orientation.
1	Draw a y line; that is, vertical with respect to page orientation. orientation.

- Pn2 selects the x start position on the page in decipoints.
- Pn3 selects the y start position on the page in decipoints.
- Pn4 Selects the line length in the x direction for an x line.
  For a y line, it specifies the y direction length.
  0 value is equal to a line one decipoint in length.
- Pn5 Selects the line width in the y direction for a y line.
  For an x line, it specifies the x direction width.
  0 value is equal to a line one decipoint in length.

For an x line, Pn4 specifies the length in the x direction, and Pn5 specifies the width in the y direction. For a y line, Pn4 specifies the length in the y direction, and Pn5 specifies the width in the x direction.

Block Characters

The block character sequences define the parameters of the block characters, initiate the generation of block characters, and return the printer to normal printing. The following subsections describe how to enact these features.

Setting Block Character Parameters (DECBCS)

ASCII Code `ESC [ P1 ; P2 ;...P5 ‘ r`

Hex Code `1B 5B P1 3B P2 3B...P5 27 72`

Dec Code `27 91 P1 59 P2 59...P5 39 114`

Purpose Defines the parameters for block characters.

Discussion The ending sequence `‘r` may also be specified as ‘r . The Pn parameters define the height, width, background color, and character set of the block characters. If any parameters are illegal, the entire sequence is ignored. When block character parameters are defined, they remain valid until:

- A new valid Block Character Select Parameter sequence is sent
- A reset command occurs (setting the default values)
- The default values are set by powering–up

The character exists entirely and centrally within the character cell. The line feed distance is equal to the basic cell height multiplied by the vertical magnification factor. The magnification values specified in P1 and P2 are operated on the basic character cell.

Block character parameters are set according to the following choices.

- P1 defines the horizontal magnification factor.

P1	Function
0/missing	Magnification of 2 (default)
1–124	Defines the horizontal magnification factor
>124	Magnification factor of 156 used

The horizontal intercharacter gap for 0 degrees and for 180 degrees rotation is 1/60 in times the horizontal magnification factor. Characters rotated 90 degrees and 270 degrees have a horizontal intercharacter gap of 3/60 in times the vertical magnification factor.

- P2 defines the vertical magnification factor. The maximum value of P2 is limited by page length.

P2	Function
0/missing	Magnification of 2 (default)
1–124	Defines the vertical magnification factor
>124	Magnification factor of 156 used

- P3 defines the background color.

P3	Function
0/missing	White background (default)
1	Black background (inverse video)

- P4 designates the international character set.

P4	Function
0/missing	U. S. ASCII (default)
1	Germany
2	Digital Norway/Denmark
3	France
4	United Kingdom
5	Spain
6	Sweden
7	Italy
>	uses presevious setting

- P5 specifies the block character's orientation.

P5	Function
0/missing	Same as current orientation
1	Portrait (0 degree rotation
2	Landscape (90 degree rotation)
3	Reverse landscape (270 degree rotation)
4	Portrait upside down (180 degree rotation)

NOTE: When the sequence selects character rotation, each character is rotated around its axis by the above specified degree.

Start Block Character Mode (DECBLOCKC)

ASCII Code `ESC % SP 1`

Hex Code `1B 25 20 31`

Dec Code `27 37 32 49`

Purpose Generates the block characters from the characters that follow the sequence.

Discussion The block characters inherit the last set of parameters defined. If no prior sequence exists, the block characters are printed with:

- 0 degree rotation
- In the U. S. ASCII character set
- With a horizontal and vertical magnification factor of 2
- With a white background

Stop Block Character Mode

ASCII Code `ESC % @`

Hex Code `1B 25 40`

Dec Code `27 37 64`

Purpose Stops the generation of block characters

Discussion Once the block character sequence is stopped, the font attributes, the CPI settings, and the LPI settings are returned to their previous values.

Reset to Initial State (RIS)

ASCII Code `ESC c`

Hex Code `1B 63`

Dec Code `27 99`

Purpose Resets the value or state of several operating features.

Discussion This sequence resets the printer to a set of operating values and conditions similar to the factory default settings. The operating feature values after a reset are shown in Table 2–25 (see page 2–137).

This sequence and the DECSTR reset sequence have the same function.

Soft Terminal Reset (DECSTR)

ASCII Code `ESC [ ! p`

Hex Code `1B 5B 21 70`

Dec Code `27 91 33 112`

Purpose Resets the value or state of several operating features.

Discussion After receiving a DECSTR, the printer positions itself at the next top of form, then resets the value or state of several operating features. The operating feature values after a reset are shown in Table 2–25 (see page 2–137).

An event occurs when more than two intermediate characters are received by the printer. The printer notes this event, waits for the final character, then ignores the entire sequence.

Another way to reset the printer is via the RIS code.

Selecting LinePrinter Plus Emulations via DECIPEM

Digital emulation is the default when printer power is turned on, but you can select the LinePrinter Plus emulation via the DECIPEM control code sequence. (The SOCS control code sequences described on the following page accomplish the same result.) The syntax for this sequence follows:

ASCII:	CSI	?	5	8	h
Hex:	9BH	3FH	35H	38H	68H

Entering this control code will select the Proprinter III XL configuration for LinePrinter Plus.

Refer to the *LG^{plus} Series Printer Setup Guide* for information on selecting a LinePrinter Plus protocol and configuring emulation parameters.

Once you have selected LinePrinter Plus using this control code, you may enter the following Digital–compatible commands, depending on which emulation is currently selected within LinePrinter Plus:

- If you are in Epson FX or P–Series emulation mode, you may exit back to Digital emulation only by entering the RIS command (see page 2–131).
- If you are in Proprinter III XL emulation mode, you may enter any of the following three commands to return to the Digital (LG) emulation: RIS, DECSTR (see page 2–131), or DECIPEM. The DECIPEM escape sequence to exit from the Proprinter III XL emulation follows:

ASCII:	ESC	[	?	5	8	1
Hex:	1BH	5BH	3FH	35H	38H	6CH

Do not use the CSI control code in the DECIPEM control sequence; instead, use its 7–bit equivalent of ESC [.
Do not leave 0 (zero) in code 58.
Do not use any semicolons.

Selecting LinePrinter Plus Emulations via SOCS

Digital emulation is the default when printer power is turned on, but you can select the LinePrinter Plus emulation via two SOCS control code sequences. (The DECIPEM control code sequence described on the previous page accomplishes the same result.) Two acceptable control codes can accomplish this function, as follows:

ASCII:	ESC	%	=	
Hex:	1BH	25H	3DH	

ASCII:	ESC	%	SP	2
Hex:	1BH	25H	20H	32H

The first control code sequence selects the Proprinter emulation. The second control code selects the Epson FX–1050.

Refer to the *LG^{plus} Series Printer Setup Guide* for information on selecting a LinePrinter Plus protocol and configuring emulation parameters.

Once you have selected LinePrinter Plus using this control code, you may enter the following Digital–compatible commands depending on which emulation is currently selected within LinePrinter Plus:

- If you are in Epson FX or P–Series emulation mode, you may exit back to Digital emulation only by entering the RIS command (see page 2–131).
- If you are in Proprinter III XL emulation mode, you may enter any of the following three commands to return to the Digital (LG) emulation: RIS, DECSTR (see page 2–131), or ROCS. The ROCS escape sequence follows:

ASCII:	ESC	%	@
Hex:	1BH	25H	40H

7–Bit and 8–Bit Transmissions and Interpretations

This section explains how to select 7–bit or 8–bit encoding of control strings.

Select 7–Bit C1 Transmission (S7C1T)

The sequence below causes the printer to use 7–bit encoding for all C1 control characters transmitted. All C1 characters are then represented as two–character ESC sequences.

ASCII:	ESC	SP	F
Hex:	1BH	20	46

Select 8–Bit C1 Transmission (S8C1T)

The sequence below causes the printer to use 8–bit encoding for all C1 control characters transmitted. All C1 characters are then represented as one–character CSI sequences.

ASCII:	ESC	SP	G
Hex:	1BH	20	47

Select 7–Bit Code (S7C1R)

In a 7–bit environment, this sequence allows receipt of 7–bit control strings only.

ASCII:	ESC	SP	6
Hex:	1BH	20	4A

Select 8–Bit Code (S8C1R)

In an 8–bit environment, this sequence allows receipt of 8–bit control strings only.

ASCII:	ESC	SP	7
Hex:	1BH	20	37

Enter Draft Mode

ASCII Code `ESC % / 3`

Hex Code `1B 25 2F 33`

Dec Code `27 37 47 51`

Purpose Puts the emulation into high speed draft print mode.

Discussion All text following this command will be printed in the high speed draft font. This mode is slightly faster than the normal printing mode because of the simplified font. Only the ASCII character set is available in draft mode. However, if high speed draft is selected via the control panel or the SGR command, multinational character sets are also available.

The high speed draft font can also be selected using the operator's control panel. (Refer to Chapter 4 of the *LG^{plus} Series Printer Setup Guide*.)

Exit Draft Mode

ASCII Code `ESC % @`

Hex Code `1B 25 40`

Dec Code `27 37 64`

Purpose Exit high speed draft mode.

Discussion Upon receipt of this command, the printer returns to the previously selected font and resumes printing or plotting.

Default Values and States

The printer stores a set of typical operating states and conditions in ROM. The first time you power up the printer, the factory settings in Table 2–24 are automatically invoked.

Table 2–24. Factory Settings

Selectable Parameter	Control Function	Factory Set Condition
Printing Status	———	Off–line
Horizontal Pitch	DECSHORP	10 characters per inch
Vertical Pitch	DECVERP	6 lines per inch
Font	SGR	Data Processing
Forms Length	DECSLPP	66 lines (11 inches)
Active Position	———	Column 1, line 1
Top Margin	———	Line 1
Bottom Margin	———	Line 66
Left Margin	———	Column 1
Right Margin	———	Column 136
Underlining	SGR	Disabled
Bolding	SGR	Disabled
Italics	SGR	Disabled
Double Underline	SGR	Disabled
Overline	SGR	Disabled
Expansion	GSM	No character expansion
GL Character Set	———	US ASCII
GR Character Set	———	Digital Supplemental
G0 Character Set	———	US ASCII
G1 Character Set	———	VT100 Graphic Character Set
G2 Character Set	———	Digital Supplemental
G3 Character Set	———	US ASCII
Autowrap	DECAWM	Disabled
Line Feed/New Line Mode	LNM	Reset
Horizontal Tabs	———	Stop at every 8 columns (9, 17...137)
Super/Subscripts	———	Disabled
Carriage Return/NLM	DECCRNLM	Reset
Vertical Tabs	———	Stop at every line (1–66)

Table 2–25 shows the operating values after a reset.

Table 2–25. Reset Condition

Selectable Parameter	Control Function	Reset Condition
Printing Status	———	On–line (Ready)
Horizontal Pitch	DECSHORP	10 characters per inch
Vertical Pitch	DECVERP	6 lines per inch
Font	SGR	Data Processing
Forms Length	DECSLPP	66 lines (11 inches)
Active Position	———	Column 1 on the current active line
Top Margin	———	Line 1
Bottom Margin	———	Line 66
Left Margin	———	Column 1
Right Margin	———	Column 136
Underlining	SGR	Disabled
Bolding	SGR	Disabled
Italics	SGR	Disabled
Double Underline	SGR	Disabled
Overline	SGR	Disabled
Expansion	GSM	No character expansion
GL Character Set	———	US ASCII
GR Character Set	———	Digital Supplemental
G0 Character Set	———	US ASCII or the last NRC if selected
G1 Character Set	———	VT100 Graphic Character Set
G2 Character Set	———	Digital Supplemental
G3 Character Set	———	US ASCII
Autowrap	DECAWM	Disabled
Line Feed/New Line Mode	LNM	Reset
Horizontal Tabs	———	Stop at every 8 columns (9, 17...137)
Unsolicited Reports	DSR	Disabled
Super/Subscripts	———	Disabled
Carriage Return/ New Line Mode	DECCRNLM	Reset
Vertical Tabs	———	Stop at every line (1–66)
Note: The “All Interface Settings” and “National Replacement Character Set” remain as previously selected via escape sequences or the control panel.		

At power–up, the parameter values in Table 2–26 are automatically retained from the previous power–on session.

Table 2–26. Power–up Conditions

Selectable Parameter	Control Function	Factory Set Condition
Horizontal Pitch	DECSHORP	———
Vertical Pitch	DECVERP	———
Font	SGR	———
Forms Length	DECSLPP	———
Top and Bottom Margin	DECSTBM	———
Left and Right Margin	DECSLRM	———
Autowrap	DECAWM	———
Line Feed/New Line Mode	LNM	———
Carriage Return/New Line Mode	DECCRNLM	———
Horizontal Tabs	———	———
Vertical Tabs	———	———
Interface Settings	———	———
GL Character Set	———	US ASCII or the last NRC selected
GR Character Set	———	Digital Supplemental
G0 Character Set	———	US ASCII or the last NRC if selected
G1 Character Set	———	VT100 Graphic Character Set
G2 Character Set	———	Digital Supplemental
G3 Character Set	———	US ASCII
Printing Status	———	Off–line
Active Position	———	Column 1 on the current active line
Underlining	SGR	Disabled
Bolding	SGR	Disabled
Italics	SGR	Disabled
Double Underline	SGR	Disabled
Overline	SGR	Disabled
Expansion	GSM	No character expansion
Unsolicited Reports	DSR	Disabled
Super/Subscripts	———	Disabled
Justification	SSU	Disabled

3 Character Sets

Chapter Contents

Introduction

The character sets shown in this chapter are accessible only in Digital emulation mode. In this chapter, each character is described in tables that provide character descriptions, as well as hex and decimal character locations. (Appendix A provides graphic representations of the character set matrices.)

Selecting the Character Set and Language

In Digital emulation mode, the entire array of language and special character sets can be selected with host control codes as well as the control panel. Character set and language selection is made from the host computer using the SCS control code sequence, described on page 2–88.

There are no restrictions except for Katakana: It is available only in DP font 10 CPI pitch, and NLQ font 10 CPI pitch.

The DEC ASCII and all language character sets and several fonts can be selected at the printer control panel (see Chapter 4 of the *Setup Guide)*. You may select the language set and font style from the control panel as follows:

1. At the control panel, select the “LG Font” option, then the Font Character set suboption. Cycle through the Font Character set options, and select the desired language set.

2. Select the “LG Font” option, then the Font Style suboption. Cycle through the font style options, and select a font style.

OCR–A and OCR–B

OCR print modes may also be selected from the configuration menus, as described in Chapter 4 of the *Setup Guide*.

OCR print modes do not contain complete character sets. Available OCR–A standard characters are dictated by American National Standard Institute (ANSI) #X3.17–1981, and OCR–A international characters are in accordance with International Organization for Standardization (ISO) #646–1973. Available OCR–B standard and extended characters are dictated by ANSI #X3.49–1975. Undefined OCR characters are replaced with spaces. When an international language substitution is selected for a non–existent character, no substitution will occur.

ASCII Character Set

Graphic symbols of the ASCII character set are listed in numeric order by hexadecimal address. Included is the decimal code and the symbol's name.

Table 3–1. Graphic Symbols for the ASCII Character Set

Hexadecimal Value	Decimal Code	Symbol Name
020	032	Space
021	033	Exclamation Point
022	034	Quotation Marks
023	035	Number Sign
024	036	Dollar Sign
025	037	Percent Sign
026	038	Ampersand
027	039	Apostrophe
028	040	Open Parenthesis
029	041	Closed Parenthesis
02A	042	Asterisk
02B	043	Plus
02C	044	Comma
02D	045	Hyphen or Minus
02E	046	Period or Decimal Point
02F	047	Slash
030	048	Zero (Not Slashed)
031	049	One
032	050	Two
033	051	Three
034	052	Four
035	053	Five
036	054	Six
037	055	Seven
038	056	Eight
039	057	Nine

Continued next page

Table 3–1. Graphic Symbols for the ASCII Character Set (continued)

Hexadecimal Value	Decimal Code	Symbol Name
03A	058	Colon
03B	059	Semicolon
03C	060	Less Than Symbol
03D	061	Equals Symbol
03E	062	Greater Than Symbol
03F	063	Question Mark
040	064	At Sign
041	065	Uppercase A
042	066	Uppercase B
043	067	Uppercase C
044	068	Uppercase D
045	069	Uppercase E
046	070	Uppercase F
047	071	Uppercase G
048	072	Uppercase H
049	073	Uppercase I
04A	074	Uppercase J
04B	075	Uppercase K
04C	076	Uppercase L
04D	077	Uppercase M
04E	078	Uppercase N
04F	079	Uppercase O
050	080	Uppercase P
051	081	Uppercase Q
052	082	Uppercase R
053	083	Uppercase S
054	084	Uppercase T
055	085	Uppercase U
056	086	Uppercase V
057	087	Uppercase W
058	088	Uppercase X
059	089	Uppercase Y
05A	090	Uppercase Z

Continued next page

Table 3–1. Graphic Symbols for the ASCII Character Set (continued)

Hexadecimal Value	Decimal Code	Symbol Name
05B	091	Open Bracket
05C	092	Backslash
05D	093	Closed Bracket
061	094	Circumflex
05E	095	Underline
05F	096	Open Single Quotation Mark/Grave Accent
060	097	Lowercase a
062	098	Lowercase b
063	099	Lowercase c
064	100	Lowercase d
065	101	Lowercase e
066	102	Lowercase f
067	103	Lowercase g
068	104	Lowercase h
069	105	Lowercase i
06A	106	Lowercase j
06B	107	Lowercase k
06C	108	Lowercase l
06D	109	Lowercase m
06E	110	Lowercase n
06F	111	Lowercase o
070	112	Lowercase p
071	113	Lowercase q
072	114	Lowercase r
073	115	Lowercase s
074	116	Lowercase t
075	117	Lowercase u
076	118	Lowercase v
077	119	Lowercase w
078	120	Lowercase x
079	121	Lowercase y
07A	122	Lowercase z
07B	123	Open Brace

Continued next page

Table 3–1. Graphic Symbols for the ASCII Character Set (continued)

Hexadecimal Value	Decimal Code	Symbol Name
07C	124	Solid Vertical Line
07D	125	Closed Brace
07E	126	Tilde
07F	127	Delete

DEC Multinational Character Sets

A symbol set is the alphabet of a font; it is a character set that can be printed regardless of the font characteristics designated for the print job. The default symbol set for the fonts in the printer is the U.S. ASCII set. The U.S. ASCII set is the base onto which other symbol set overlay sequences may be loaded.

Character set overlays contain characters and symbols that replace certain ASCII characters to create international alphabets. The printer contains fourteen multinational character set overlays:

- DEC English
- DEC Dutch
- DEC Finnish
- French
- DEC French (Canadian)
- DEC Portuguese
- German
- Italian
- JIS Roman
- DEC Norwegian/Danish
- Spanish
- DEC Swedish
- DEC Swiss
- ISO Norwegian/Danish

The following tables list the replacement characters for the U.S. ASCII set used to make up language–specific symbols. Language symbol characters (National Replacement Characters, or NRCs) are substituted for the U.S. ASCII set at a maximum of twelve locations.

The U.S. ASCII and multinational sets may be selected via the front panel configuration menus or the SCS control code sequence, described on page 2–88.

NOTE: Appendix A provides graphic representations of the character set matrices.

Table 3–2. DEC English Character Set

Hexadecimal Value	Decimal Code	Symbol Name
023	035	Pound Sign

Table 3–3. DEC Dutch Character Set

Hexadecimal Value	Decimal Code	Symbol Name
023	035	Pound Sign
040	064	Fraction Three–Quarter
05B	091	Lowercase y with Umlaut
05C	092	Fraction One–Half
05D	093	Solid Vertical Bar
07B	123	Umlaut
07C	124	Lowercase f (with Fallback for Florin)
07D	125	Fraction One–Quarter
07E	126	Acute Accent

Table 3–4. DEC Finnish Character Set

Hexadecimal Value	Decimal Code	Symbol Name
05B	091	Uppercase A with Umlaut
05C	092	Uppercase O with Umlaut
05D	093	Uppercase A with Ring
05E	094	Uppercase U with Umlaut
060	096	Lowercase e with Acute Accent
07B	123	Lowercase a with Umlaut
07C	124	Lowercase o with Umlaut
07D	125	Lowercase a with Ring
07E	126	Lowercase u with Umlaut

Table 3–5. French Character Set

Hexadecimal Value	Decimal Code	Symbol Name
023	035	Pound Sign
040	064	Lowercase a with Grave Accent
05B	091	Degree Sign
05C	092	Lowercase c with Cedilla
05D	093	Section Sign
07B	123	Lowercase e with Acute Accent
07C	124	Lowercase u with Grave Accent
07D	125	Lowercase e with Grave Accent
07E	126	Diaeresis (Trema, Umlaut)

Table 3–6. DEC French (Canadian) Character Set

Hexadecimal Value	Decimal Code	Symbol Name
040	064	Lowercase a with Grave Accent
05B	091	Lowercase a with Circumflex Accent
05C	092	Lowercase c with Cedilla
05D	093	Lowercase e with Circumflex Accent
05E	094	Lowercase i with Circumflex Accent
060	096	Lowercase o with Circumflex Accent
07B	123	Lowercase e with Acute Accent
07C	124	Lowercase u with Grave Accent
07D	125	Lowercase e with Grave Accent
07E	126	Lowercase u with Circumflex Accent

Table 3–7. German Character Set

Hexadecimal Value	Decimal Code	Symbol Name
040	064	Section Sign
05B	091	Uppercase A with Umlaut
05C	092	Uppercase O with Umlaut
05D	093	Uppercase U with Umlaut
07B	123	Lowercase a with Umlaut
07C	124	Lowercase o with Umlaut
07D	125	Lowercase u with Umlaut
07E	126	Sharp S

Table 3–8. Italian Character Set

Hexadecimal Value	Decimal Code	Symbol Name
023	035	Pound Sign
040	064	Section Sign
05B	091	Degree Sign
05C	092	Lowercase c with Cedilla
05D	093	Lowercase e with Acute Accent
060	096	Lowercase u with Grave Accent
07B	123	Lowercase a with Grave Accent
07C	124	Lowercase o with Grave Accent
07D	125	Lowercase e with Grave Accent
07E	126	Lowercase i with Grave Accent

Table 3–9. JIS Roman Character Set

Hexadecimal Value	Decimal Code	Symbol Name
05C	092	Yen Sign

Table 3–10. DEC Norwegian/Danish Character Set

Hexadecimal Value	Decimal Code	Symbol Name
040	035	Uppercase A with Umlaut
05B	091	Uppercase AE Diphthong
05C	092	Uppercase O with Slash
05D	093	Uppercase A with Ring
05E	094	Uppercase U with Umlaut
060	096	Lowercase a with Umlaut
07B	123	Lowercase ae Diphthong
07C	124	Lowercase o with Slash
07D	125	Lowercase a with Ring
07E	126	Lowercase u with Umlaut

Table 3–11. Spanish Character Set

Hexadecimal Value	Decimal Code	Symbol Name
023	035	Pound Sign
040	064	Section Sign
05B	091	Inverted Exclamation Mark
05C	092	Uppercase N with Tilde
05D	093	Inverted Question Mark
07B	123	Degree Sign
07C	124	Lowercase n with Tilde
07D	125	Lowercase c with Cedilla

Table 3–12. DEC Swedish Character Set

Hexadecimal Value	Decimal Code	Symbol Name
040	064	Uppercase E with Acute Accent
05B	091	Uppercase A with Umlaut
05C	092	Uppercase O with Umlaut
05D	093	Uppercase A with Ring
05E	094	Uppercase U with Umlaut
060	096	Lowercase e with Acute Accent
07B	123	Lowercase a with Umlaut
07C	124	Lowercase o with Umlaut
07D	125	Lowercase a with Ring
07E	126	Lowercase u with Umlaut

Table 3–13. DEC Swiss Character Set

Hexadecimal Value	Decimal Code	Symbol Name
023	035	Lowercase u with Grave Accent
040	064	Lowercase a with Grave Accent
05B	091	Lowercase e with Acute Accent
05C	092	Lowercase c with Cedilla
05D	093	Lowercase e with Circumflex Accent
05E	094	Lowercase i with Circumflex Accent
05F	095	Lowercase e with Grave Accent
060	096	Lowercase o with Circumflex Accent
07B	123	Lowercase a with Umlaut Mark
07C	124	Lowercase o with Umlaut Mark
07D	125	Lowercase u with Umlaut Mark
07E	126	Lowercase u with Circumflex Accent

Table 3–14. DEC Portuguese Character Set

Hexadecimal Value	Decimal Code	Symbol Name
05B	091	Uppercase A with Tilde
05C	092	Uppercase C with Cedilla
05D	093	Uppercase O with Tilde
07B	123	Lowercase a with Tilde
07C	124	Lowercase c with Cedilla
07D	125	Lowercase o with Tilde

Table 3–15. ISO Norwegian/Danish Character Set

Hexadecimal Value	Decimal Code	Symbol Name
05B	091	Uppercase AE Diphthong
05C	092	Uppercase O with Slash
05D	093	Uppercase A with Ring
07B	123	Lowercase ae Diphthong
07C	124	Lowercase o with Slash
07D	125	Lowercase a with Ring

Additional ISO and Special Character Sets

The printer can print ten character sets in addition to the OCR–A, OCR–B, U.S. ASCII and DEC multinational character sets. These are:

- ISO 8859 Cyrillic
- ISO 8859 Greek
- ISO 8859 Hebrew
- ISO 8859 Latin 1
- ISO 8859 Latin 2
- ISO 8859 Latin 5
- JIS Katakana
- DEC Supplemental Character Set
- VT100 Line Drawing (DEC Special Graphics) Character Set
- DEC Technical Character Set

The Numeric Character listings for each character set follow. Appendix A provides graphic representations of the character set matrices.

NOTE: The Katakana character set is available only in DP font 10 CPI pitch, and NLQ font 10 CPI pitch.

The DECAUPSS sequence (page 2–89) may be used to assign the following character sets to the User Reference Supplemental set:

- DEC Supplemental, ISO Latin-1 Supplemental, ISO Latin-Hebrew Supplemental, DEC Technical, ISO Latin-Greek Supplemental

ISO Character Sets

Table 3–16. ISO Cyrillic Character Set

Hexadecimal Value	Decimal Code	Symbol Name
021	033	Uppercase IO
022	034	Uppercase Dje
023	035	Uppercase Gje
024	036	Uppercase Ie
025	037	Uppercase Dze
026	038	Uppercase I
027	039	Uppercase Yi
028	040	Uppercase Je
029	041	Uppercase Lje
02A	042	Uppercase Nje
02B	043	Uppercase Chje
02C	044	Uppercase Kje
02D	045	Space
02E	046	Uppercase short u
02F	047	Uppercase Dze
030	048	Uppercase A
031	049	Uppercase Be
032	050	Uppercase Ve
033	051	Uppercase Ghe
034	052	Uppercase De
035	053	Uppercase Ie
036	054	Uppercase Zhe
037	055	Uppercase Ze
038	056	Uppercase I
039	057	Uppercase I Kratkoe
03A	058	Uppercase Ka
03B	059	Uppercase El
03C	060	Uppercase Em
03D	061	Uppercase En
03E	062	Uppercase O
03F	063	Uppercase Pe
040	064	Uppercase Er
		Continued next page

Table 3–16. ISO Cyrillic Character Set (continued)

Hexadecimal Value	Decimal Code	Symbol Name
041	065	Uppercase Es
042	066	Uppercase Te
043	067	Uppercase U
044	068	Uppercase Ef
045	069	Uppercase Ha
046	070	Uppercase Tse
047	071	Uppercase Che
048	072	Uppercase Sha
049	073	Uppercase Shcha
04A	074	Uppercase Hard Sign
04B	075	Uppercase Yeru
04C	076	Uppercase Soft Sign
04D	077	Uppercase E
04E	078	Uppercase Yu
04F	079	Uppercase Ya
050	080	Lowercase A
051	081	Lowercase Be
052	082	Lowercase Ve
053	083	Lowercase Ghe
054	084	Lowercase De
055	085	Lowercase Ie
056	086	Lowercase Zhe
057	087	Lowercase Ze
058	088	Lowercase I
059	089	Lowercase I Kratkoe
05A	090	Lowercase Ka
05B	091	Lowercase El
05C	092	Lowercase Em
05D	093	Lowercase En
05E	094	Lowercase O
05F	095	Lowercase Pe
060	096	Lowercase Er
061	097	Lowercase Es
062	098	Lowercase Te

Continued next page

Table 3–16. ISO Cyrillic Character Set (continued)

Hexadecimal Value	Decimal Code	Symbol Name
063	099	Lowercase U
064	100	Lowercase Ef
065	101	Lowercase Ha
066	102	Lowercase Tse
067	103	Lowercase Che
068	104	Lowercase Sha
069	105	Lowercase Shcha
06A	106	Lowercase Hard Sign
06B	107	Lowercase Yeru
06C	108	Lowercase Soft Sign
06D	109	Lowercase E
06E	110	Lowercase Yu
06F	111	Lowercase Ya
070	112	Number Acronym
071	113	Lowercase Io
072	114	Lowercase Dje
073	115	Lowercase Gje
074	116	Lowercase Ie
075	117	Lowercase Dze
076	118	Lowercase I
077	119	Lowercase Yi
078	120	Lowercase Je
079	121	Lowercase Lje
07A	122	Lowercase Nje
07B	123	Lowercase Chje
07C	124	Lowercase Kje
07D	125	Section Sign
07E	126	Lowercase Short u
07F	127	Lowercase Dze

Table 3–17. ISO Greek Character Set

Hexadecimal Value	Decimal Code	Symbol Name
021	033	Grave Mark
022	034	Single Quotation Mark
023	035	Pound Sign
024–025	036–037	Space
026	038	Broken Bar
027	039	Section Sign
028	040	Diaeresis
029	041	Copyright
02A	042	Space
02B	043	Left Angle Quotation Mark
02C	044	Not Sign
02D–02E	045–046	Space
02F	047	Horizontal Bar
030	048	Degree Sign
031	049	Plus or Minus Sign
032	050	Superscript Two
033	051	Superscript Three
034	052	Rough
035	053	Diaeresis Accent Mark
036	054	Uppercase A with Rough
037	055	Small Dot
038	056	Uppercase Epsilon with Rough
039	057	Uppercase Eta with Rough
03A	058	Uppercase Iota with Rough
03B	059	Right Angle Quotation Mark
03C	060	Uppercase Omicron with Rough
03D	061	Fraction One–Half
03E	062	Uppercase Upsilon with Rough
03F	063	Uppercase Omega with Rough
040	064	Lowercase Iota with Rough & Diaeresis
041	065	Uppercase Alpha
042	066	Uppercase Beta
043	067	Uppercase Gamma
044	068	Uppercase Delta

Continued next page

Table 3–17. ISO Greek Character Set (continued)

Hexadecimal Value	Decimal Code	Symbol Name
045	069	Uppercase Epsilon
046	070	Uppercase Zeta
047	071	Uppercase Eta
048	072	Uppercase Theta
049	073	Uppercase Iota
04A	074	Uppercase Kappa
04B	075	Uppercase Lamda
04C	076	Uppercase Mu
04D	077	Uppercase Nu
04E	078	Uppercase Ksi
04F	079	Uppercase Omicron
050	080	Uppercase Pi
051	081	Uppercase Rho
052	082	Space
053	083	Uppercase Sigma
054	084	Uppercase Tau
055	085	Uppercase Upsilon
056	086	Uppercase Phi
057	087	Uppercase Khi
058	088	Uppercase Psi
059	089	Uppercase Omega
05A	090	Uppercase I with Diaeresis
05B	091	Uppercase Upsilon with Diaeresis
05C	092	Lowercase Alpha with Rough
05D	093	Lowercase Epsilon with Rough
05E	094	Lowercase Eta with Rough
05F	095	Lowercase Iota with Rough
060	096	Lowercase Epsilon with Umlaut and Rough
061	097	Lowercase Alpha
062	098	Lowercase Beta
063	099	Lowercase Gamma
064	100	Lowercase Delta
065	101	Lowercase Epsilon
066	102	Lowercase Zeta

Continued next page

Table 3–17. ISO Greek Character Set (continued)

Hexadecimal Value	Decimal Code	Symbol Name
067	103	Lowercase Eta
068	104	Lowercase Theta
069	105	Lowercase Iota
06A	106	Lowercase Kappa
06B	107	Lowercase Lambda
06C	108	Lowercase Mu
06D	109	Lowercase Nu
06E	110	Lowercase Ksi
06F	111	Lowercase Omicron
070	112	Lowercase Pi
071	113	Lowercase Rho
072	114	Lowercase Terminal Sign
073	115	Lowercase Sigma
074	116	Lowercase Tau
075	117	Lowercase Upsilon
076	118	Lowercase Phi
077	119	Lowercase Khi
078	120	Lowercase Psi
079	121	Lowercase Omega
07A	122	Lowercase Iota with Y with Diaeresis
07B	123	Lowercase Upsilon with Diaeresis
07C	124	Lowercase Omicron with Rough
07D	125	Lowercase Upsilon with Rough
07E	126	Lowercase Omega with Rough
07F	127	Space

Table 3–18. ISO Hebrew Character Set

Hexadecimal Value	Decimal Code	Symbol Name
021	033	Space
022	034	Cent Sign
023	035	Pound Sign
024	036	Currency Sign
025	037	Yen Sign
026	038	Broken Bar
027	039	Section Sign
028	040	Diaeresis
029	041	Copyright Symbol
02A	042	Multiply Sign
02B	043	Left Angle Quote
02C	044	Not Sign
02D	045	Space
02E	046	Registered Trade Mark
02F	047	Line Above
030	048	Degree Symbol
031	049	Plus or Minus
032	050	Superscript Two
033	051	Superscript Three
034	052	Single Quote
035	053	Lowercase Mu
036	054	Paragraph Sign
037	055	Small Dot
038	056	Cedilla
039	057	Superscript One
03A	058	Divide Sign
03B	059	Right Angle Quote
03C	060	Fraction One–Quarter
03D	061	Fraction One–Half
03E	062	Fraction Three–Quarters
03F	063	Space
040 – 05E	064 – 94	Space
05F	95	Double Low Line

Continued next page

Table 3–18. ISO Hebrew Character Set (continued)

Hexadecimal Value	Decimal Code	Symbol Name
060	096	Aleph
061	097	Bet
062	098	Gimel
063	099	Dalet
064	100	He
065	101	Waw
066	102	Zain
067	103	Chet
068	104	Tet
069	105	Yod
06A	106	Kaph with Terminal
06B	107	Kaph
06C	108	Lamed
06D	109	Mem with Terminal
06E	110	Mem
06F	111	Nun with Terminal
070	112	Nun
071	113	Samech
072	114	Ayin
073	115	Pe with Terminal
074	116	Pe
075	117	Zade with Terminal
076	118	Zade
077	119	Qoph
078	120	Resh
079	121	Shin
07A	122	Taw
07B – 07F	123 – 127	Space

Table 3–19. ISO Latin 2 Character Set

Hexadecimal Value	Decimal Code	Symbol Name
021	033	Uppercase A with Ogonek
022	034	Breve
023	035	Uppercase L with Bar
024	036	Currency Sign
025	037	Uppercase L with Caron
026	038	Uppercase S with Acute
027	039	Section Sign
028	040	Diaeresis
029	041	Uppercase S with Caron
02A	042	Uppercase S with Cedilla
02B	043	Uppercase T with Caron
02C	044	Uppercase Z with Acute
02D	045	Space
02E	046	Uppercase Z with Caron
02F	047	Uppercase Z with Dot
030	048	Degree
031	049	Lowercase A with Ogonek
032	050	Ogonek
033	051	Lowercase L with Bar
034	052	Acute Accent
035	053	Lowercase L with Caron
036	054	Lowercase S with Acute
037	055	Caron Mark
038	056	Cedilla
039	057	Lowercase S with Caron
03A	058	Lowercase S with Cedilla
03B	059	Lowercase T with Caron
03C	060	Lowercase Z with Acute
03D	061	D with Acute Accent
03E	062	Lowercase Z with Caron
03F	063	Lowercase 2 with Dot
040	064	Uppercase R with Acute

Continued next page

Table 3–19. ISO Latin 2 Character Set (continued)

Hexadecimal Value	Decimal Code	Symbol Name
041	065	Uppercase A with Acute
042	066	Uppercase A with Circumflex
043	067	Uppercase A with Breve
044	068	Uppercase A with Diaeresis
045	069	Uppercase L with Acute
046	070	Uppercase C with Acute
047	071	Uppercase C with Cedilla
048	072	Uppercase C with Caron
049	073	Uppercase E with Acute
04A	074	Uppercase E with Ogonek
04B	075	Uppercase E with Diaeresis
04C	076	Uppercase E with Caron
04D	077	Uppercase I with Acute
04E	078	Uppercase I with Circumflex
04F	079	Uppercase D with Caron
050	080	Uppercase D with Stroke
051	081	Uppercase N with Acute
052	082	Uppercase N with Caron
053	083	Uppercase O with Acute
054	084	Uppercase O with Circumflex
055	085	Uppercase O with Acute
056	086	Uppercase O with Diaeresis
057	087	Multiply Sign
058	088	Uppercase R with Caron
059	089	Uppercase U with Ring Above
05A	090	Uppercase U with Acute
05B	091	Uppercase UD with Acute
05C	092	Uppercase U with Diaeresis
05D	093	Uppercase Y with Acute
05E	094	Uppercase T with Cedilla
05F	095	Sharp S
060	096	Lowercase R with Acute
061	097	Lowercase A with Acute
062	098	Lowercase A with Circumflex

Continued next page

Table 3–19. ISO Latin 2 Character Set (continued)

Hexadecimal Value	Decimal Code	Symbol Name
063	099	Lowercase A with Breve
064	100	Lowercase A with Diaeresis
065	101	Lowercase L with Acute
066	102	Lowercase C with Acute
067	103	Lowercase C with Cedilla
068	104	Lowercase C with Caron
069	105	Lowercase E with Acute
06A	106	Lowercase E with Ogonek
06B	107	Lowercase E with Diaeresis
06C	108	Lowercase E with Circumflex
06D	109	Lowercase I with Acute
06E	110	Lowercase I with Circumflex
06F	111	Lowercase D with Caron
070	112	Lowercase D with Stroke
071	113	Lowercase N with Acute
072	114	Lowercase N with Caron
073	115	Lowercase O with Acute
074	116	Lowercase O with Circumflex
075	117	Lowercase OD with Acute
076	118	Lowercase O with Diaeresis
077	119	Divide Sign
078	120	Lowercase R with Caron
079	121	Lowercase U with Ring Above
07A	122	Lowercase U with Acute
07B	123	Lowercase UD with Acute
07C	124	Lowercase U with Diaeresis
07D	125	Lowercase Y with Acute
07E	126	Lowercase T with Cedilla
07F	127	Superscript Dot

Table 3–20. ISO Latin 5 Character Set

Hexadecimal Value	Decimal Code	Symbol Name
021	033	Inverted Exclamation Mark
022	034	Cent Sign
023	035	Pound Sign
024	036	Currency Sign
025	037	Yen Sign
026	038	Broken Bar
027	039	Section Sign
028	040	Diaeresis
029	041	Copyright Symbol
02A	042	Feminine Ordinal Indicator
02B	043	Left Angle Quotation Mark
02C	044	Not Sign
02D	045	Space
02E	046	Registered Trade Mark
02F	047	Macron
030	048	Degree Sign
031	049	Plus or Minus Sign
032	050	Superscript Two
033	051	Superscript Three
034	052	Single Quotation Mark
035	053	Lowercase Mu
036	054	Paragraph Sign
037	055	Small Dot
038	056	Cedilla
039	057	Superscript One
03A	058	Masculine Ordinal Indicator
03B	059	Right Angle Quotation Mark
03C	060	Fraction One–Quarter
03D	061	Fraction One–Half
03E	062	Fraction Three–Quarters
03F	063	Inverted Question Mark
040	064	Uppercase A with Grave
041	065	Uppercase A with Acute
042	066	Uppercase A with Circumflex

Continued next page

Table 3–20. ISO Latin 5 Character Set (continued)

Hexadecimal Value	Decimal Code	Symbol Name
043	067	Uppercase A with Tilde
044	068	Uppercase A with Diaeresis
045	069	Uppercase A with Ring
046	070	Uppercase AE Diphthong
047	071	Uppercase C with Cedilla
048	072	Uppercase E with Grave
049	073	Uppercase E with Acute
04A	074	Uppercase E with Circumflex
04B	075	Uppercase E with Diaeresis
04C	076	Uppercase I with Grave Mark
04D	077	Uppercase I with Acute
04E	078	Uppercase I with Circumflex
04F	079	Uppercase I with Diaeresis
050	080	Uppercase G with Breve
051	081	Uppercase N with Tilde
052	082	Uppercase O with Grave
053	083	Uppercase O with Acute
054	084	Uppercase O with Circumflex
055	085	Uppercase O with Tilde
056	086	Uppercase O with Diaeresis
057	087	Multiply Sign
058	088	Uppercase O with Slash
059	089	Uppercase U with Grave
05A	090	Uppercase U with Acute
05B	091	Uppercase U with Circumflex
05C	092	Uppercase U with Diaeresis
05D	093	Uppercase I with Ring Above
05E	094	Uppercase S with Cedilla
05F	095	Sharp S
060	096	Lowercase A with Grave
061	097	Lowercase A with Acute
062	098	Lowercase A with Circumflex
063	099	Lowercase A with Tilde
064	100	Lowercase A with Diaeresis

Continued next page

Table 3–20. ISO Latin 5 Character Set (continued)

Hexadecimal Value	Decimal Code	Symbol Name
065	101	Lowercase A with Ring Above
066	102	Lowercase AE Diphthong
067	103	Lowercase C with Cedilla
068	104	Lowercase E with Grave
069	105	Lowercase E with Acute
06A	106	Lowercase E with Circumflex
06B	107	Lowercase E with Diaeresis
06C	108	Lowercase I with Grave
06D	109	Lowercase I with Acute
06E	110	Lowercase I with Circumflex
06F	111	Lowercase I with Diaeresis
070	112	Lowecase G with Breve
071	113	Lowercase N with Tilde
072	114	Lowercase O with Grave
073	115	Lowercase O with Acute
074	116	Lowercase O with Circumflex
075	117	Lowercase O with Tilde
076	118	Lowercase O with Diaeresis
077	119	Divide Sign
078	120	Lowercase O with Slash
079	121	Lowercase U with Grave
07A	122	Lowercase U with Acute
07B	123	Lowercase U with Circumflex
07C	124	Lowercase U with Diaeresis
07D	125	Lowercase I
07E	126	Lowercase S with Cedilla
07F	127	Uppercase Y with Diaeresis

DEC Supplemental Graphic Character Set

The DEC Supplemental character set consists of graphic alphabetical symbols not included in the ASCII character set. Character positions identified as “reserved for future use” print the error character (reverse question mark).

The following table gives the 7–bit code for each character. The equivalent 8–bit code is obtained by adding octal 200 or hex 80 to the 7–bit code.

Table 3–21. DEC Supplemental Graphic Character Set

Hexadecimal Value	Decimal Code	Symbol Name
020	032	Space
021	033	Inverted Exclamation Mark
022	034	Cent Sign
023	035	Pound Sign
024	036	Reserved for Future Use
025	037	Yen Sign
026	038	Reserved for Future Use
027	039	Section Sign
028	040	General Currency Sign
029	041	Copyright Sign
02A	042	Feminine Ordinal Indicator
02B	043	Angle Quotation Mark—Left
02C–02F	044–047	Reserved for Future Use
030	048	Degree Sign
031	049	Plus/Minus Sign
032	050	Superscript 2
033	051	Superscript 3
034	052	Reserved for Future Use
035	053	Micro Sign
036	054	Paragraph Sign (Pilcrow)
037	055	Middle Dot
038	056	Reserved for Future Use
039	057	Superscript 1
03A	058	Masculine Ordinal Indicator

Continued next page

Table 3–21. DEC Supplemental Graphic Character Set (continued)

Hexadecimal Value	Decimal Code	Symbol Name
03B	059	Angle Quotation Mark (Right)
03C	060	Fraction One–Quarter Mark
03D	061	Fraction One–Quarter Mark
03E	062	Reserved for Future Use
03F	063	Inverted Question Mark
040	064	Uppercase A with Grave Accent
041	065	Uppercase A with Acute Accent
042	066	Uppercase A with Circumflex Accent
043	067	Uppercase A with Tilde
044	068	Uppercase A with Diaeresis
045	069	Uppercase A with Ring
046	070	Uppercase AE Diphthong
047	071	Uppercase C with Cedilla
048	072	Uppercase E with Grave
049	073	Uppercase E with Acute
04A	074	Uppercase E with Circumflex Accent
04B	075	Uppercase E with Diaeresis
04C	076	Uppercase I with Grave
04D	077	Uppercase I with Acute
04E	078	Uppercase I with Circumflex Accent
04F	079	Uppercase I with Diaeresis
050	080	Reserved for Future Use
051	081	Uppercase N with Tilde
052	082	Uppercase O with Grave
053	083	Uppercase O with Acute
054	084	Uppercase O with Circumflex Accent
055	085	Uppercase O with Tilde
056	086	Uppercase O with Diaeresis
057	087	Uppercase OE Ligature
058	088	Uppercase O with Slash
059	089	Uppercase O with Grave
05A	090	Uppercase U with Acute
05B	091	Uppercase U with Circumflex Accent
05C	092	Uppercase U with Diaeresis or Diaeresis

Continued next page

Table 3–21. DEC Supplemental Graphic Character Set (continued)

Hexadecimal Value	Decimal Code	Symbol Name
05D	093	Uppercase Y with Diaeresis
05E	094	Reserved for Future Use
05F	095	Sharp S
060	096	Lowercase a with Grave
061	097	Lowercase a with Acute
062	098	Lowercase a with Circumflex Accent
063	099	Lowercase a with Tilde
064	100	Lowercase a with Diaeresis
065	101	Lowercase a with Ring
066	102	Lowercase ae Diphthong
067	103	Lowercase c with Cedilla
068	104	Lowercase e with Grave
069	105	Lowercase e with Acute
06A	106	Lowercase e with Circumflex Accent
06B	107	Lowercase e with Diaeresis
06C	108	Lowercase i with Grave
06D	109	Lowercase i with Acute
06E	110	Lowercase i with Circumflex Accent
06F	111	Lowercase i with Diaeresis
070	112	Reserved for Future Use
071	113	Lowercase n with Tilde
072	114	Lowercase o with Grave
073	115	Lowercase o with Acute
074	116	Lowercase o with Circumflex Accent
075	117	Lowercase o with Tilde
076	118	Lowercase o with Diaeresis
077	119	Lowercase oe Ligature
078	120	Lowercase o with Slash
079	121	Lowercase u with Grave
07A	122	Lowercase u with Acute
07B	123	Lowercase u with Circumflex Accent
07C	124	Lowercase u with Diaeresis
07D	125	Lowercase y with Diaeresis
07E	126	Reserved for Future Use
07F	127	Delete

VT100 Special Graphic Character Set

The VT100 Special Graphic Character Set contains ASCII and special graphic symbols. Several characters in this set that are also found in the DEC Technical Character Set or the DEC Supplemental Character Set. Line drawing characters are identified in Table 3–22 by an asterisk after the hex value.

NOTE: This character set is available in DP font 10 CPI pitch only.

Table 3–22. VT100 Special Graphic Character Set

Hexadecimal Value	Decimal Code	Symbol Name
020	032	Space
021	033	Exclamation Point
022	034	Double Quotation Mark
023	035	Number Sign
024	036	Dollar Sign
025	037	Percent Sign
026	038	Ampersand
027	039	Single Quotation Mark
028	040	Open Parenthesis
029	041	Closed Parenthesis
02A	042	Asterisk
02B	043	Plus
02C	044	Comma
02D	045	Hyphen or Minus
02E	046	Period or Decimal Point
02F	047	Slash
030	048	Zero (Not Slashed)
031	049	One
032	050	Two
033	051	Three
034	052	Four
035	053	Five

*Denotes those characters used for line drawing.
[1]Denotes characters also found in the DEC Technical Character Set.
[2]Denotes characters also found in the DEC Supplemental Character Set.

Continued next page

Table 3–22. VT100 Special Graphic Character Set (continued)

Hexadecimal Value	Decimal Code	Symbol Name
036	054	Six
037	055	Seven
038	056	Eight
039	057	Nine
03A	058	Colon
03B	062	Semicolon
03C	060	Less Than Symbol
03D	061	Equals Symbol
03E	059	Greater Than Symbol
03F	063	Question Mark
040	064	At Sign
041	065	Uppercase A
042	066	Uppercase B
043	067	Uppercase C
044	068	Uppercase D
045	069	Uppercase E
046	070	Uppercase F
047	071	Uppercase G
048	072	Uppercase H
049	073	Uppercase I
04A	074	Uppercase J
04B	075	Uppercase K
04C	076	Uppercase L
04D	077	Uppercase M
04E	078	Uppercase N
04F	079	Uppercase O
050	080	Uppercase P
051	081	Uppercase Q
052	082	Uppercase R
053	083	Uppercase S
054	084	Uppercase T

*Denotes those characters used for line drawing.
[1]Denotes characters also found in the DEC Technical Character Set.
[2]Denotes characters also found in the DEC Supplemental Character Set.

Continued next page

Table 3–22. VT100 Special Graphic Character Set (continued)

Hexadecimal Value	Decimal Code	Symbol Name
055	085	Uppercase U
056	086	Uppercase V
057	087	Uppercase W
058	088	Uppercase X
059	089	Uppercase Y
05A	090	Uppercase Z
05B	091	Open Bracket
05C	092	Backslash
05D	093	Closed Bracket
05E	094	Circumflex
05F*	095	Space
060*	096	Solid Diamond
061*	097	Solid Box
062*	098	Horizontal Tab
063*	099	Form Feed
064*	100	Carriage Return
065*	101	Line Feed
066*	102	Degree Symbol[2]
067*	103	Plus/Minus Sign[2]
068*	104	New Line
069*	105	Vertical Tab
06A*	106	Graphics Bar Lower Right Corner
06B*	107	Graphics Bar Upper Right Corner
06C*	108	Graphics Bar Upper Left Corner
06D*	109	Graphics Bar Lower Left Corner
06E*	110	Crossing Lines
06F*	111	Horizontal Line, Scan 1
070*	112	Horizontal Line, Scan 3
071*	113	Horizontal Line, Scan 5
072*	114	Horizontal Line, Scan 7
073*	115	Horizontal Line, Scan 9

*Denotes those characters used for line drawing.
[1]Denotes characters also found in the DEC Technical Character Set.
[2]Denotes characters also found in the DEC Supplemental Character Set.

Continued next page

Table 3–22. VT100 Special Graphic Character Set (continued)

Hexadecimal Value	Decimal Code	Symbol Name
074*	116	Left T
075*	117	Right T
076*	118	Bottom T
077*	119	Top T
078*	120	Vertical Bar
079*	121	Less Than or Equal To Sign[1]
07A*	122	Greater Than or Equal To Sign[1]
07B*	123	Lowercase Greek Letter Pi[1]
07C*	124	Not Equal Sign[1]
07D*	125	Pound Sign[2]
07E*	126	Big Dot[2]
07F	127	Delete

*Denotes those characters used for line drawing.
[1]Denotes characters also found in the DEC Technical Character Set.
[2]Denotes characters also found in the DEC Supplemental Character Set.

DEC Technical Character Set

The DEC Technical Character Set contains Greek letters, mathematical symbols, and logical symbols. Additionally, it contains characters that may be used to construct larger mathematical symbols on character cell devices, such as large integral and summation signs. Select this character set via the SCS control sequence, as described on page 2–88.

The technical character set is output to the terminal via software that responds to the ANSI/ISO Single Shift 3 (SS3) non–locking shift control function. SS3 is already terminal–resident—just enter the hex value from Table 3–23 to produce the appropriate character. The set has no duplicate ASCII or DEC Supplemental characters. Eleven positions are reserved for future standardization, including the corners, 20H and 7FH.

The printer conforms to the following:

- Responds to the escape sequence that determines the DEC Technical Character Set. The printer cannot designate or invoke the DEC Technical Character Set by default.
- Positions reserved for future standardization in the DEC technical set are imaged as the error character (reverse question mark).
- Component characters are imaged so that adjacent component characters form connected lines at all pitches.

Table 3–23. DEC Technical Character Set

Hex Value	Decimal Code	Symbol Name
Greek:		
044	068	Uppercase Delta
046	070	Uppercase Phi
047	071	Uppercase Gamma
04A	074	Uppercase Theta
04C	076	Uppercase Lambda
050	080	Uppercase Pi
051	081	Uppercase Psi
053	083	Uppercase Sigma
057	087	Uppercase Omega
058	088	Uppercase Ksi
059	089	Uppercase Upsilon
061	097	Lowercase Alpha
062	098	Lowercase Beta
063	099	Lowercase Gamma
064	100	Lowercase Delta
065	101	Lowercase Epsilon
066	102	Lowercase Phi
067	103	Lowercase Gamma
068	104	Lowercase Eta
069	105	Lowercase Iota
06A	106	Lowercase Theta
06B	107	Lowercase Kappa
06C	108	Lowercase Lambda
06E	110	Lowercase Nu
070	112	Lowercase Pi
071	113	Lowercase Psi
072	114	Lowercase Rho
073	115	Lowercase Sigma
074	116	Lowercase Tau
077	119	Lowercase Omega
078	120	Lowercase Ksi
079	121	Lowercase Upsilon
07A	122	Lowercase Zeta

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Table 3–23. DEC Technical Character Set (continued)

Hex Value	Decimal Code	Symbol Name
Mathematical:		
03C	060	Less Than or Equal To
03D	061	Not Equal
03E	062	Greater Than or Equal To
03F	063	Integral
041	065	Variation or Proportional To[1]
042	066	Infinity
043	067	Division or Divided By
045	069	Nabla or Del
048	072	Is Approximate To
049	073	Similar or Equal To
04B	075	Times or Cross Product
056	086	Radical
06F	111	Partial Derivative
076	118	Function
07B	123	Left Arrow
07C	124	Upward Arrow
07D	125	Right Arrow
07E	126	Downward Arrow
Logic:		
040	064	Therefore
04D	077	If and Only If
04E	078	Implies
04F	079	Identical To
05A	090	Is Included In
05B	091	Includes
05C	092	Intersection
05D	093	Union
05E	094	Logical And
05F	095	Logical Or
060	096	Logical Not

Table 3–24. JIS Katakana Character Set

Hex Value	Decimal Code	Symbol Name
021	033	Katakana full stop
022	034	Katakana opening bracket
023	035	Katakana closing bracket
024	036	Katakana comma
025	037	Katakana conjunctive symbol
026	038	Katakana wo
027	039	Katakana small a
028	040	Katakana small i
029	041	Katakana small u
02A	042	Katakana small e
02B	043	Katakana small o
02C	044	Katakana small ya
02D	045	Katakana small yu
02E	046	Katakana small yo
02F	047	Katakana small tsu
030	048	Katakana prolonged sound symbol
031	049	Katakana a
032	050	Katakana i
033	051	Katakana u
034	052	Katakana e
035	053	Katakana o
036	054	Katakana ka
037	055	Katakana ki
038	056	Katakana ku
039	057	Katakana ke
03A	058	Katakana ko
03B	059	Katakana sa
03C	060	Katakana shi
03D	061	Katakana su
03E	062	Katakana se
03F	063	Katakana so
040	064	Katakana ta
041	065	Katakana chi
042	066	Katakana tsu

Continued next page

Table 3–24. JIS Katakana Character Set (continued)

Hex Value	Decimal Code	Symbol Name
043	067	Katakana te
044	068	Katakana to
045	069	Katakana na
046	070	Katakana ni
047	071	Katakana nu
048	072	Katakana ne
049	073	Katakana no
04A	074	Katakana ha
04B	075	Katakana hi
04C	076	Katakana fu
04D	077	Katakana he
04E	078	Katakana ho
04F	079	Katakana ma
050	080	Katakana mi
051	081	Katakana mu
052	082	Katakana me
053	083	Katakana mo
054	084	Katakana ya
055	085	Katakana yu
056	086	Katakana yo
057	087	Katakana ra
058	064	Katakana ri
059	077	Katakana ru
05A	078	Katakana re
05B	079	Katakana ro
05C	090	Katakana wa
05D	091	Katakana n(m)
05E	092	Katakana voiced sound symbol
05F	093	Katakana semi-voiced sound symbol
060 – 7E	094 – 126	(Reserved for future use)

Building Large Mathematical Symbols

Table 3–25 shows how to build large mathematical symbols. The characters are designed to connect to adjacent character cells at 10 cpi and 6 lpi to form technical characters that can occupy several vertically adjacent and/or horizontally adjacent character positions.

To use Table 3–25, find the character you want to build (along the top of the table). On the left side of the table are various pieces of the characters needed to create the whole. Follow the top row choice, say, Integral, all the way down the table. Designate the hex value called out beside the symbol names. For example, to build an oversize integral, you will need a top integral (024H), bottom integral (025H), and vertical connector (026H).

Table 3–25. Component Characters

Symbol Name/Hex Value		Radical	Integral	Square Bracket	Curly Bracket	Parenthesis	Summations
Left Radical	021	X					
Top Left Radical	022	X					
Horizontal Connector	023	X					X
Top Integral	024		X				
Bottom Integral	025		X				
Vertical Connector	026	X	X	X	X	X	
Top Left Square Bracket	027			X			
Bottom Left Square Bracket	028			X			
Top Right Square Bracket	029			X			
Bottom Right Square Bracket	02A			X			
Top Left Parenthesis	02B				X	X	
Bottom Left Parenthesis	02C				X	X	
Top Right Parenthesis	02D				X	X	
Bottom Right Parenthesis	02E				X	X	
Left Middle Curly Brace	02F				X		
Right Middle Curly Brace	030				X		
Top Left Summation	031						X
Bottom Left Summation	032						X
Top Vertical Summation Connector	033						X
Bottom Vertical Summation Connector	034						X
Top Right Summation	035						X
Bottom Right Summation	036						X
Right Middle Summation	037						X

4 Bar Codes

Contents

Bar Codes

A bar code is a graphic representation of alphanumeric characters that can be read by a scanning device. This chapter describes how to print bar codes using LG emulation control codes.

In Digital emulation, three escape sequences enable the printer to print bar codes. One escape sequence sets the bar code parameters, another starts bar code production, and the third sequence stops bar code printing.

Select Bar Codes Attributes Sequence (DECSBCA)

ASCII Code: `ESC [ P1; P2;...P9'q`

Hex Code: `1B 5B P1 3B P2 3B...P9 27 71`

Dec Code: `27 91 P1 59 P2 59...P9 39 113`

Purpose: Selects bar code type and orientation.

Discussion: Once defined, bar code parameters remain in effect until:

- A new bar code select parameter sequence is sent
- A reset command returns settings to default values
- On power–up, the default values are set

Bar code parameters are set according to the following choices:

- `P1` defines parameters for the various bar code styles:

P1	Function	P1	Function
0/missing	Code 39 (default)	8	Codabar b/n
1	Interleaved 2 of 5	9	Codabar c/*
2	Code 39	10	Codabar d/e
3	Extended Code 39	11	UPC–A
4	EAN–8	12	UPC–E
5	EAN–13	13	Postnet
6	Code 11	14	Code 128
7	Codabar a/t	15	Code 128–UCC

- P2 sets the width for the narrow bars and spaces in units specified by the SSU code.

  Default value = 10 pixels = 12 decipoints
  Minimum value = 9 pixels = 11 decipoints

  This does not apply to all UPC, EAN, and Postnet bar codes.

- P3 sets the width for the quiet zone. The printer's quiet zone is a constant pixel value of 150 pixels (180 decipoints) or ten times the narrow bar, whichever is greater.

  This does not apply to all UPC, EAN, and Postnet bar codes.

- P4 sets the width of the wide bars and wide spaces in units specified by the SSU code.

  Default value = 2.5 times the value of P2
  Minimum value = 2.4 times the narrow bar when the narrow bar is less than or equal to twelve pixels

  This does not apply to all UPC, EAN, Code 11, Code 128, and Postnet bar codes.

- P5 sets the intercharacter gap in units specified by the SSU code.

  Default value = 136 pixels

  This does not apply to the Interleaved 2 of 5 code, or to all UPC, Code 128, EAN, and Postnet bar codes.

- P6 sets the height of bars in units specified by the SSU code.

  Minimum value = 144 pixels = 173 decipoints
  Default value = 300 pixels = 360 decipoints

- P7 defines the control character encoding character (CCEC). Any character within a range of 2/0 through 7/15 indicates the start of control character encoding. The CCEC is followed by a two–digit hexadecimal number equal to the ASCII value of the character to be encoded. To bar code the ESC character, enter the CCEC, then the ESC character's hexadecimal format. The default is P7 = 0.

P7	Function
0/missing n	No encoding of control characters The decimal ASCII value representing the control character encoding character.

This only applies to Extended Code 39.

- P8 sets the orientation for the bar codes. Bar codes can be rotated to four different positions, though any characters beneath them are printed only in portrait or landscape orientations. The default is `P8 = 0`.

P8	Function
0/missing	Same as current page orientation
1	Horizontal (portrait)
2	Vertical, rotation of –90º (landscape)
3	Vertical, rotation of +90º (landscape)
4	Horizontal, upside down, rotation of 180º

- P9 sets the human–readable character option.

P9	Function
0/missing	No human–readable characters printed
1	No human–readable characters printed
2	human–readable characters printed in current font
3	human–readable characters printed in OCR–A
4	human–readable characters printed in OCR–B

NOTE: When printing the human–readable line for any rotations other than zero degrees (horizontal portrait mode), the special bar code font is used regardless of how the P9 parameter is set (2, 3, or 4). OCR–A and OCR–B are available only in portrait orientation.

This does not apply to the Postnet bar code.

IMPORTANT

If the printer's logical form–length setting DECSLPP or DECSTBM (or the control panel form length setting) does not match the physical form length of the paper in use, then bar codes located near (on or across) the logical perforation will not print correctly. Make sure that the forms length setting matches the physical form, and do not print bar codes on or across the perforation.

If an illegal parameter sequence is requested, the sequence is ignored and the last bar code parameter remains unchanged.

Start Bar Coding (DECBARC)

ASCII Code: `ESC % SP 0`

Hex Code: `1B 25 20 30`

Dec Code: `27 37 32 48`

Purpose: Generates bar codes using data that follow the sequence.

Discussion: Bar code parameters are defined by the last DECSBCA sequence. The printer continues to encode bar codes until it receives the Stop Bar Code sequence.

The printer begins to generate a bar code at the upper left–hand corner of the left quiet zone and ends at the lower right–hand corner of the right quiet zone. Bar codes that extend beyond the margins are truncated.

Stop Bar Coding (Return from Other Coding System: ROCS)

ASCII Code: `ESC % @`

Hex Code: `1B 25 40`

Dec Code: `27 37 64`

Purpose: Stops bar code printing.

Discussion: Once bar coding is stopped, the font selection and associated attributes are restored to the conditions prevailing prior to bar code printing.

Bar Code Characteristics

The printer supports fifteen bar code styles:

- Code 39 (default or user–selectable settings)
- Extended Code 39
- Interleaved 2 of 5
- EAN 8
- EAN 13
- Code 11
- Codebar a/t
- Codebar b/n
- Codebar c/*
- Codebar d/e
- UPC–A
- UPC–E
- Postnet
- Code 128 – USS (regular)
- Code 128 – UCC (serial shipping container code)

All bar code styles differ, though the differences can be subtle or obvious. The following subsections discuss bar code characteristics that are pertinent to printing readable bar codes.

Number of Bars per Character

Each bar code style is made up of a specific number of light and dark bars. Dark bars are the inked, machine–readable lines; light bars are the unprinted spaces between the dark bars. Several styles of light and dark bar combinations exist. For example:

- In the Code 39 style, both light and dark bars are encoded to define a single character.
- In the Interleaved 2 of 5 style, the light bars decode one character while the dark bars decode another character.

The light bars and dark bars can also be narrow or wide. These width variations are unique to each bar code style.

Bar Code Character Set

Different bar code styles allow certain parts of the ASCII character set to be used. Some styles allow only the numerals 0 – 9, while others allow the full ASCII character set, and still others allow variations in between.

START, STOP, and CENTER Code Characters

The START/STOP characters identify the beginning and end of the bar code symbol to the bar code reader. The START code is at the left end of the symbol, next to the most significant character. The STOP code is at the right end of the symbol, next to the least significant character.

Some bar code styles have a CENTER character code. This code divides the characters so that a digit that appears on both sides of the CENTER code can have a certain bar pattern on the left side that differs from the pattern on the right side. This is possible because the digits to the left of the CENTER character code are usually coded in odd parity, while the digits to the right of the CENTER bar are coded in even parity.

Quiet Zone

Both ends of the bar code structure require blank quiet zones. The quiet zones should be at least 0.25 inches wide and completely blank to ensure accurate reading of the START/STOP codes and to prevent adjacent bar codes from overlapping. The operator is responsible for providing sufficient space on the form for the quiet zones.

Intercharacter Gap

The intercharacter gap separates the last bar in one character from the first bar of the next character. The intercharacter gap is required in styles where each character begins and ends with a dark bar.

Number of Characters in a Bar Code

There is no set number of characters for all bar codes. Some styles have a specific number of characters necessary for making individual bar codes (for example, UPC–A uses an 11–character symbol). Code 39, however, uses character symbols of variable length.

Checksums

Checksums can be included within the bar code symbol. If a checksum digit is required for a particular style, it is computed by the user and sent along with the rest of the characters that make up the bar code symbol. The printer automatically computes the check digit and embeds it at the end of the bar code for the UPC, EAN, Code 11, Code 128, and Postnet bar codes.

Parity

You can use odd or even parity to send an individual character in styles EAN–8, EAN–13, UPC–A, and UPC–E. The individual digits (0 through 9, since these are the only allowable characters in these styles) might have different bar patterns, depending on whether the character is coded in odd or even parity.

Multiple Bar Codes

The printer can print multiple bar codes on the same line. To do this, use the following sequence:

POSITION (VPA)	START bar code	Print bar code	Stop bar code	POSITION (VPA)	Start next bar code	Print bar code	Stop bar code

The above method prints multiple bar codes on one line by means of multiple passes. For example, the printer will print the first bar code, reverse the paper, then print the next bar code on the same line.

The sequence for printing multiple bar codes is shown below, implemented via control codes described on the indicated pages:

<esc>[3d	<esc>% 0 data	<esc>% @	<esc>[3d	<esc>% 0 data	<esc>%@
↑	↑	↑	↑	↑	↑
VPA	DECBARC	ROCS	VPA	DECBARC	ROCS
2–78	4–6	4–6	2–78	4–6	4–6

Bar Code Styles

The following sections discuss the bar codes the printer can make. The characteristics of bar code styles, P1 – P9 values, and their defaults are also discussed.

Code 39

In the Code 39 style, there are five dark bars and four light bars for a total of nine bars. Three bars are wide and the other six are narrow. Both light and dark bars are coded to define the character. A narrow light/dark bar is assigned a binary 0 and a wide light/dark bar is assigned a binary 1.

Code 39 has the following characteristics:

- Character set includes ten digits (0 – 9), uppercase letters A – Z, plus eight additional characters (– . $ / + % SP *)
- START and STOP codes
- No CENTER code
- Definable intercharacter gap
- Variable length characters per complete symbol
- If a checksum is required for bar code readability, you must include it as part of the data.

Extended Code 39

For printable characters, Extended Code 39 prints like Code 39. With control characters, Extended Code 39 decodes and prints the control characters as their combined printable codes. See Table 4–1 for the Extended Code 39 ASCII character set.

Table 4–1. Extended Code 39 ASCII Character Set

ASCII	Code 39	ASCII	Code 39	ASCII	Code 39	ASCII	Code 39
NUL	%U	SP	Space	@	%V	‘	%W
SOH	$A	’	/A	A	A	a	+A
STX	$B	“	/B	B	B	b	+B
ETX	$C	#	/C	C	C	c	+C
EOT	$D	$	/D	D	D	d	+D
ENQ	$E	%	/E	E	E	e	+E
ACK	$F	&	/F	F	F	f	+F
BEL	$G	’	/G	G	G	g	+G
BS	$H	(	/H	H	H	h	+H
HT	$I	)	/I	I	I	i	I
LF	$J	*	/J	J	J	|	+J
VT	$K	+	/K	K	K	k	+K
FF	$L	,	/L	L	L	l	+L
CR	$M	—	—	M	M	m	+M
SO	$N	.	.	N	N	n	+N
SI	$O	/	/O	O	O	o	+O
DLE	$P	0	0	P	P	p	+P
DC1	$Q	1	1	Q	Q	q	+Q
DC2	$R	2	2	R	R	r	+R
DC3	$S	3	3	S	S	s	+S
DC4	$T	4	4	T	T	t	+T
NAK	$U	5	5	U	U	u	+U
SYN	$V	6	6	V	V	v	+V
ETB	$W	7	7	W	W	w	+W
CAN	$X	8	8	X	X	x	+X
EM	$Y	9	9	Y	Y	y	+Y
SUB	$Z	:	/Z	Z	Z	z	+Z
ESC	%A	;	%F	[	%K	{	%P
FS	%B	<	%G	\	%L	|	%Q
GS	%C		%H	]	%M	}	%R
RS	%D	>	%I	^	%N	~	%S
US	%E	?	%J	__	%O	DEL	%T %X %Y %Z

Code 11

In the Code 11 style, there are three dark bars and two light bars for a total of five bars. Both light and dark bars are coded to define the character. A narrow light/dark bar is assigned a binary 0 and a wide light/dark bar is assigned a binary 1.

Code 11 has the following characteristics:

- Character set includes ten digits (0 – 9) and the dash (–) character
- START and STOP codes
- No CENTER code
- Definable intercharacter gap
- Variable length characters per complete symbol
- Two checksums are computed automatically and embedded at the end of the bar code. The checksum data is not printed as part of the human–readable data field.

Codabar a/t

Codabar a/t has four dark bars and three light bars for a total of seven bars. Both light and dark bars are coded to define the character. A narrow light/dark bar is assigned a binary 0 and a wide light/dark bar is assigned a binary 1.

Codabar a/t has the following characteristics:

- Character set includes ten digits (0 – 9) plus six characters (– . $ / + :)
- Illegal characters are not processed and are ignored.
- START and STOP codes
- No CENTER code
- Definable intercharacter gap
- Variable length characters per complete symbol
- If a checksum is required for bar code readability, you must include it as part of the data.

Codabar b/n

Codabar b/n has four dark bars and three light bars for a total of seven bars. Both light and dark bars are coded to define the character. A narrow light/dark bar is assigned a binary 0 and a wide light/dark bar is assigned a binary 1.

Codabar b/n has the following characteristics:

- Character set includes ten digits (0 – 9) plus six characters (: / . + $ –)
- START and STOP codes
- No CENTER code
- Definable intercharacter gap
- Variable length characters per complete symbol
- If a checksum is required for bar code readability, you must include it as part of the data.

Codabar c/*

Codabar c/* has four dark bars and three light bars for a total of seven bars. Both light and dark bars are coded to define the character. A narrow light/dark bar is assigned a binary 0 and a wide light/dark bar is assigned a binary 1.

Codabar c/* has the following characteristics:

- Character set includes ten digits (0 – 9) plus six characters (: / . + $ –)
- Illegal characters are not processed and are ignored.
- START and STOP codes
- No CENTER code
- Definable intercharacter gap
- Variable length characters per complete symbol
- If a checksum is required for bar code readability, you must include it as part of the data.

Codabar d/e

Codabar d/e has four dark bars and three light bars for a total of seven bars. Both light and dark bars are coded to define the character. A narrow light/dark bar is assigned a binary 0 and a wide light/dark bar is assigned a binary 1.

Codabar d/e has the following characteristics:

- Character set includes ten digits (0 – 9) plus six characters (: / . + $ –)
- START and STOP codes
- No CENTER code
- Definable intercharacter gap
- Variable length characters per complete symbol
- If a checksum is required for bar code readability, you must include it as part of the data.

EAN–8

EAN–8 contains two dark bars and two light bars for a total of four bars. Each light and dark bar is 1 – 4 modules wide. A module is the smallest increment that can represent data. Zeros are represented by light modules and ones by dark modules. Each character contains some combination of seven modules that total two dark bars and two light bars.

The above is always true except with the START/STOP and CENTER character codes. The START/STOP character bar pattern consists of two dark bars and one light bar for a total of three bars. The CENTER character bar pattern has two dark bars and three light bar for a total of five bars.

Parameters P2 through P5 and P7 are not applicable and will be ignored.

EAN–8 has the following characteristics:

- Ten digit character set (0 – 9)
- START and STOP codes
- CENTER code
- Intercharacter gap not definable

- Fixed length of seven characters per complete symbol. The first digit is the number system code, followed by six digits of data. The printer computes the check digit automatically and embeds it in the bar code as the eighth digit. All eight digits are encoded in the bar code symbol with four digits to the left of the CENTER code in odd parity, and four digits to the right of the CENTER code in even parity.
- If more or less than seven characters are used, or if any of the characters used are illegal, an error message is printed.
- The minimum character height is set at 12 mm, per ISO STD–P6 limitation.

EAN–13

EAN–13 has two dark bars and two light bars for a total of four bars. Each light/dark bar is 1 – 4 modules wide. A module is the smallest increment that can represent data. Zeros are represented by light modules and ones by dark modules. Each character contains some combination of seven modules that total two dark bars and two light bars.

The above is always true except with the START/STOP and CENTER character codes. The START/STOP character bar pattern consists of two dark bars and one light bar for a total of three bars. The CENTER character bar pattern has two dark bars and three light bar for a total of five bars.

Parameters P2 through P5 and P7 are not applicable and will be ignored.

EAN–13 has the following characteristics:

- Ten digit character set (0 – 9)
- START and STOP codes
- CENTER code
- Intercharacter gap not definable
- Fixed length of twelve characters per complete symbol. The first digit is the number system code, followed by eleven digits of data, then the check digit. Only twelve of the digits (the second through the thirteenth) are encoded in the bar code symbol with six digits to the left of the CENTER code and six to the right of it. An EAN–13 number can have three different bar patterns depending on its position and number system code. The printer computes the check digit automatically and embeds it

in the bar code as the thirteenth digit. All thirteen digits are printable in the human–readable line.

- If more or less than twelve characters are used, or if any of the characters used are illegal, an error message is printed.
- The minimum character height is set at 12 mm, per ISO STD–P6 limitation.

Interleaved 2 of 5

The bar code symbol uses a series of wide and narrow bars and spaces to represent numeric characters. The structure is 2 wide elements (bars or spaces) and 3 narrow elements. In the bar code, two characters are interleaved (paired); bars are used to represent the first character in the pair and spaces are used to represent the second character in the pair.

The above is always true except with the START and STOP character codes. The START character bar pattern consists of two dark bars and two light bars for a total of four bars. The STOP character bar pattern has two dark bars and one light bar for a total of three bars.

This style includes the following characteristics:

- Ten digit character set (0 – 9)
- START and STOP codes
- Illegal characters are not processed and are ignored.
- No CENTER code
- Intercharacter gap not definable
- A variable length of characters per complete symbol. If an odd number of input digits is sent, the printer inserts a leading 0 to the data stream. This encodes in the bar code symbol and prints in the human–readable line.
- If a checksum is required for bar code readability, you must include it as part of the data.

UPC–A

UPC–A has two dark bars and two light bars for a total of four bars. Each light/dark bar is 1 – 4 modules wide. A module is the smallest increment that can represent data. Zeros are represented by light modules and ones by dark modules. Each character contains some combination of seven modules that total two dark bars and two light bars.

The above is always true except with the START/STOP and CENTER character codes. The START/STOP character bar pattern consists of two dark bars and one light bar for a total of three bars. The CENTER character bar pattern has two dark bars and three light bar for a total of five bars. Parameters P2 through P5 and P7 are not applicable and are ignored.

UCP–A has the following characteristics:

- Ten digit character set (0 – 9)
- START and STOP codes
- CENTER code
- Intercharacter gap not definable
- Fixed length of eleven characters per complete symbol. The first digit is the number system code, usually followed by a five digit vendor number. The next five digits are typically the product number. The printer automatically computes the check digit and embeds it at the end of the bar code. All twelve digits are encoded in the bar code symbol, with six digits to the left of the CENTER code in odd parity and six to the right of the CENTER code with even parity.
- If more or less than eleven characters are used or if any of the characters used are illegal, an error message is printed.

UPC–E

UPC–E has two dark bars and two light bars for a total of four bars. Each light/dark bar is 1 – 4 modules wide. A module is the smallest increment that can represent data. Zeros are represented by light modules and ones by dark modules. Each character contains some combination of seven modules that total two dark bars and two light bars.

The above is always true except with the START and STOP character codes. The START character bar pattern consists of two dark bars and one light bar for a total of three bars. The STOP character bar pattern has three dark bars and three light bar for a total of six bars.

Parameters P2 through P5 and P7 are not applicable and are ignored.

UPC–E has the following characteristics:

- Ten digit character set (0 – 9)
- START and STOP codes
- No CENTER code
- Intercharacter gap not definable
- Fixed length of eleven digits per complete symbol. The first character of the data field is interpreted as the number system code and must always equal 0. The next five digits represent the vendor number and the last five represent the product number.
- If more or less than eleven characters are used or if any of the characters are illegal, an error message is printed.

Six of the eleven digits are encoded into the bar code symbol. These six digits are taken from the eleven digit UPC input code as follows:

- If the vendor number (the first five digits after the number system code) ends in 000, 100, or 200, the product number (the second five digits) must fall between 00000 and 00999. The six digits that make up the bar code symbol are the first two characters of the vendor number, the last three characters of the product number, and the third character of the vendor number, in that order. Therefore, the sequence of digits taken is 1st, 2nd, 8th, 9th, 10th, 3rd.
- If the vendor number ends in 300, 400, 500, 600, 700, 800, or 900, the product number must fall between 00000 and 00099. The six digits that make up the bar code are the first three characters of the vendor number,

the last two characters of the product number, then a 3. Therefore, the sequence of digits taken is 1st, 2nd, 3rd, 9th, 10th, 3.

- If the vendor number ends in 10, 20, 30, 40, 50, 60, 70, 80, or 90, the product number must fall between 00000 and 00009. The six digits that make up the bar code symbol are the first four characters of the product number, followed by a 4. Therefore, the sequence of digits taken is 1st, 2nd, 3rd, 4th, 10th, 4.
- If the vendor number does not end in a zero, the product number must fall between 00005 and 00009. The six digits that make up the bar code symbol are all five digits of the vendor number, followed by the product number's last character. Therefore, the sequence of digits taken is 1st, 2nd, 3rd, 4th, 5th, 10th.
- If the digit input does not fall into one of the above four categories, it is considered invalid and an error message is printed.
- The printer computes a modulo 10 checksum digit so that the six digits to be encoded in the bar code symbol are selected correctly. However, the check digit is not encoded as part of the bar code symbol and is not printed in the human–readable line.

Table 4–2. UPC–E Number Pattern Sequences

If the Vendor Number is:	And the Product Number is:	Then the Encoded UPC–E Bar Code Symbol is:
X X 0 0 0 X X 1 0 0 X X 2 0 0	0 0 0 0 0 ⋮ 0 0 9 9 9	X X 0 0 0 0 X X ⋮ ⋮ ⋮ 1 X X 9 9 9 2
X X 3 0 0 ⋮ X X 9 0 0	0 0 0 0 0 ⋮ 0 0 0 9 9	X X 3 0 0 3 X X ⋮ ⋮ ⋮ 3 X X 9 9 9 3
X X X 1 0 ⋮ X X X 9 0	0 0 0 0 0 ⋮ 0 0 0 0 9	X X X 1 0 4 X X X ⋮ ⋮ 4 X X X 9 9 4
X X X X 1 ⋮ X X X X 9	0 0 0 0 5 ⋮ 0 0 0 0 9	X X X X 1 5 X X X X ⋮ ⋮ X X X X 9 9

NOTE: X may range from 0 to 9

Postnet

The Postnet bar code has two tall bars and three short bars for a total of five bars. These five bars represent a numeric digit with valid values from 0 to 9.

The above is always true except with the START/STOP character codes. The START character bar pattern has one tall bar and one space. The STOP character has one space and one tall bar. Parameters P2 through P5, P7, and P9 are not applicable and are ignored. Postnet has the following characteristics:

- Ten digit character set (0 – 9)
- Illegal characters are not processed and are ignored.
- START and STOP codes
- No CENTER code
- Variable length characters per complete symbol
- A checksum is calculated automatically then embedded at the end of the bar code.
- The human–readable data field is not printed.

Code 128 – USS

Code 128 includes three character subsets: A, B, and C. (Code 128–UCC uses subset C only.) All contain the same bar patterns, except for the unique start character that tells the bar code reader which subset is in use. Special characters are available for switching between the subsets in order to generate the shortest possible bar code. (Only subset C is used for 128–UCC, so mode selection is not allowed.)

The Code 128 and 128–UCC structure is shown in Figure 4–1 and described on the following pages.

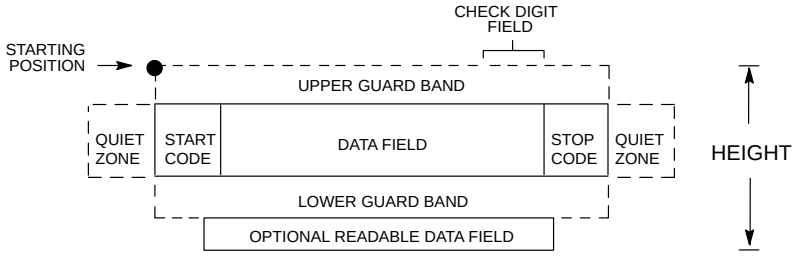


Figure 4–1. Code 128 Structure

Start/Stop Codes

Code 128 contains special characters which use unique start/stop codes to identify the leading and trailing end of the bar code. In the automatic mode, start and stop codes are generated automatically. In the manual mode, you must supply the start code, but the stop code is generated automatically.

Data Field

Code 128 bar codes support a full ASCII character set: Subset A provides standard alphanumeric keyboard characters, control and special characters; subset B includes all standard alphanumeric keyboard characters, lowercase alphabetical characters, and special characters; subset C provides 100 digit pairs, from 00 to 99 inclusive, plus special characters. Table 4–3 lists the full Code 128 character set. The “greater than” symbol (>), followed by one of various characters, allows you to manually shift between subsets, specify a particular subset to start with, or to include several non–printable control characters in the data set. (To include the “greater than” symbol itself, you must use >0.) This is described in the Mode Selection section below. The bars and spaces in the printed Code 128 bar code vary in width from 1 to 4 modules. Each character consists of 3 bars and 3 spaces that total 11 modules.

Readable Data

The optional readable data field provides a readable interpretation of the bar code data. Bar code data is printed below the horizontal bar code. The lower guard band is provided when the readable data field is selected. The readable data field is available only in the automatic mode. For 128–UCC, the optional readable data is broken up by spaces to denote 128–UCC data fields.

Check Digit

For Code 128, the modulo–103 check digit is automatically calculated and inserted in the bar code symbol. The check digit verifies accurate scanning. The start code is included in the modulo–103 check digit algorithm.

For 128–UCC, the modulo–10 and 103 check digits are automatically calculated and inserted in the bar code symbol. The check digit verifies accurate scanning.

Code 128 Mode Selection

The printer generates Code 128 bar codes in one of two modes: automatic or manual.

Automatic Mode

The printer creates the shortest possible bar code by automatically sending the subset switch character to switch from subset B into subset C whenever strings of four or more consecutive numeric characters are detected in the input data. As long as the data includes ordinary keyboard characters and no subset switch, the printer switches in and out of subsets B and C automatically before and after numeric character strings. Start codes, stop codes, and check digits are generated automatically.

NOTE: You must use >0 to represent the > character. The printer recognizes >0 as the “greater than” character (>) on a standard ASCII chart.

Manual Mode

Manual mode is selected by inputting a subset switch character (characters preceded by >) anywhere in the bar code data. In the manual mode, you must insert the special codes into the bar code to switch to another subset. When the printer finds a special code in the data, all automatic switching features are suspended, the readable data field option is cancelled, and the printer expects you to provide all special code switching commands. In manual mode, you must supply the start code; if no start code is provided, the printer inserts a subset B start code. Stop codes and check digits are generated automatically in the manual mode. More information about Manual Mode is provided in the following section.

Code 128 Manual Mode Operation

NOTE: In the manual mode, you are responsible for correct implementation of Code 128 in accordance with the Code 128 Standards Manual.

The Code 128 character set is shown in Table 4–3. The **Alternate** column identifies the special subset switch characters that switch the printer to the manual mode. These > characters are also horizontally aligned with functions also performed in an automatic mode. For example, >/ represents SI in subset A, o in subset B, and value 79 in subset C. Thus, the following commands generate the same bar code using **Alternate** characters, or subsets B or C:

Subset Switch Characters:	>7>,>–>.>/
Subset C:	>576777879
Subset B:	>6lmno

Non–ASCII characters are specified by using the subset switch characters (from >1 through >8 in the **Alternate** column on Table 4–3) which corresponds to your application. The **Value** column is used when manually translating subset B and C bar codes into their briefest form.

NOTE: The subset switch start codes, >5, >6, and >7 have two functions. At the beginning of a line, they start manual mode data in subset C, B, or A, respectively. When these codes are used anywhere in the data other than at the start of a line, they are interpreted as the non–ASCII characters in Table 4–3.

Subset B and C Switching – In the automatic mode, the printer creates the briefest, most compact bar code by automatically switching from subset B to subset C when necessary. For example, the data LT436682 could be entered directly into a typed bar code command as ESC%0LT436682ESC%@. The printer automatically selects the appropriate start code, and switches to subset C to compact the continuous numeric data characters (436682).

In the manual mode, however, you must specify the start code and all special function codes to switch subsets. For example, to create the same bar code as generated automatically in the previous paragraph (data of LT436682), the subset B start code is entered, followed by the alpha data (LT), and the subset switch character to switch to subset C is entered followed by the continuous numeric characters. A typical bar code command, in the manual mode, for the data is: ESC%0>6LT>5KbrESC%@. The pairs of continuous numeric

data were manually translated to subset B, data Kbr, corresponding to the subset C values of 436682, respectively, as shown in Table 4–3. If the data (LT436682) had been entered directly into the bar code command as ESC%0>6LT>5436682ESC%@ the bar code generated would have been: Start Code B: LT, subset C: 20 19 22 22 24 18, as determined by the value of the individual data characters in Table 4–3.

NOTE: If a start code is not entered in the manual mode, the printer provides a subset B start code.

Subset A – Subset A operates in the manual mode only. Subset A data characters include mostly normal printable ASCII characters which require no subset switching and can be entered directly. For example, the data ABC123 in subset A is input in the bar code command as: ESC%0>7ABC123ESC%@. Switching to another subset will not generate a shorter bar code.

You can generate non–printable control characters in subset A by:

1) using the subset B lowercase character equivalent from Table 4–3 (‘ through ~), which map to NUL through RS; or
2) using the subset switch characters (>1 through >8, or >SP through >/) from the **Alternate** column of Table 4–3.

Table 4–3. Code 128 Character Set

Value	Subset A	Subset B	Subset C	Value	Subset A	Subset B	Subset C	Alternate
0	SP	SP	00	54	V	V	54	
1	!	!	01	55	W	W	55	
2	″	″	02	56	X	X	56	
3	#	#	03	57	Y	Y	57	
4	$	$	04	58	Z	Z	58	
5	%	%	05	59	[	[	59	
6	&	&	06	60	\	\	60	
7	’	’	07	61	]	]	61	
8	(	(	08	62	^	^	62	
9	)	)	09	63	—	—	63	
10	*	*	10	64	NUL	‘	64	>SP
11	+	+	11	65	SOH	a	65	>!
12	′	′	12	66	STX	b	66	>″
13	–	–	13	67	ETX	c	67	>#
14	.	.	14	68	EOT	d	68	>$
15	/	/	15	69	ENQ	e	69	>%
16	0	0	16	70	ACK	f	70	>&
17	1	1	17	71	BEL	g	71	>’
18	2	2	18	72	BS	h	72	>(
19	3	3	19	73	HT	i	73	>)
20	4	4	20	74	LF	j	74	>*
21	5	5	21	75	VT	k	75	>+
22	6	6	22	76	FF	l	76	>,
23	7	7	23	77	CR	m	77	>–
24	8	8	24	78	SO	n	78	>.
25	9	9	25	79	SI	o	79	>/
26	:	:	26	80	DLE	p	80	
27	;	;	27	81	DC1	q	81	
28	<	<	28	82	DC2	r	82	
29	=	=	29	83	DC3	s	83	
30	>	>	30	84	DC4	t	84	
31	?	?	31	85	NAK	u	85	
32	@	@	32	86	SYN	v	86	
33	A	A	33	87	ETB	w	87	
34	B	B	34	88	CAN	x	88	
35	C	C	35	89	EM	y	89	
36	D	D	36	90	SUB	z	90	
37	E	E	37	91	ESC	{	91	
38	F	F	38	92	FS	¦	92	
39	G	G	39	93	GS	}	93	
40	H	H	40	94	RS	~	94	
41	I	I	41	95	US	DEL	95	>1
42	J	J	42	96	FNC3	FNC3	96	>2
43	K	K	43	97	FNC2	FNC2	97	>3
44	L	L	44	98	SHIFT	SHIFT	98	>4
45	M	M	45	99	CODE C	CODE C	99	>5
46	N	N	46	100	CODE B	FNC4	CODE B	>6
47	O	O	47	101	FNC4	CODE A	CODE A	>7
48	P	P	48	102	FNC1	FNC1	FNC1	>8
49	Q	Q	49					
50	R	R	50	103	START CODE A*			>7
51	S	S	51	104	START CODE B*			>6
52	T	T	52	105	START CODE C*			>5
53	U	U	53					

*Used at the beginning of manual mode commands.

Code 128 Examples

The following commands generate the horizontal default ratio Code 128 bar code below in the automatic mode. In the Start Bar Code sequence (DECBARC), SP represents the ASCII space character (hex 20).

ESC[14;;;;;;;;2’q
ESC%SP0ABC123456ESC%@

The following command generated the Code 128 bar code below in the automatic mode using data of 22446688ABC123456. The bar code data begins in subset B and automatically switches to subset C for the numeric data. In the Start Bar Code sequence (DECBARC), SP represents the ASCII space character (hex 20).

ESC[14;;;;;;;;2’q
ESC%SP022446688ABC123456ESC%@

The command below generates the following vertical Code 128 bar code with data of 123@25% in manual mode, subset A. In the Start Bar Code sequence (DECBARC), SP represents the ASCII space character (hex 20).

ESC[14;;;;;;;2;’q
ESC%SP0>7123@25%ESC%@

The command below generates the same vertical Code 128 bar code in the automatic mode, subset B. Because less than 4 consecutive numeric digits were provided in the data, no subset switching occurred, and the bar code remained in subset B. In the Start Bar Code sequence (DECBARC), SP represents the ASCII space character (hex 20).

ESC[14;;;;;;;2;’q
ESC%SP0123@25%ESC%@

Code 128 – UCC

The 128–UCC Serial Shipping Container Code is a restricted subset of the Code 128–USS standard. It is used as a standard for labeling shipping containers.

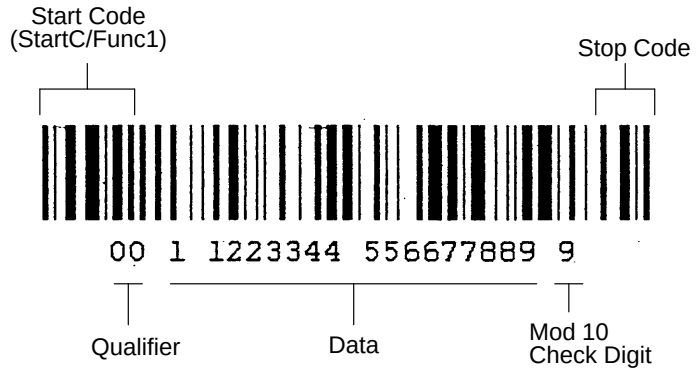
The 128–UCC Serial Shipping Container Code has the following parts:

- **Start Code** – The 128–UCC Serial Shipping Container Code consists of numeric data only, so the start code is always Start–C. This is followed by the function code 1 character, which is part of the 128–UCC standard. These are automatically generated by the printer.
- **Qualifier** – This 2–digit number helps identify the symbol as a 128–UCC Serial Shipping Container Code. It is always 00, and uses one character subset C symbol. This is automatically generated by the printer.
- **Data** – 17 numbers you choose to describe a particular shipping container. These are the only numbers that you need to specify; the printer generates the other elements of the bar code automatically.
- **Check Characters** – The 128–UCC Serial Shipping Container Code uses two check characters. The first is a modulo 10 check digit generated from your input data, and printed in human–readable characters. The second is the normal Code 128 modulo 103 check character. The printer calculates both of these numbers automatically.
- **Stop Code** – This is the normal stop code used in the Code 128 bar code. This character is automatically generated by the printer.

Code 128–UCC Example

A Code 128–UCC bar code created on the printer is shown below. The label data are **11223344556677889**. The DESBCA sequence selects UCC–128 with P1 = 15 and P9 = 2 for human readable characters. The DECBARC command starts the bar coding, and ROCS stops the bar coding. Notice that the printer automatically generated the start code, the qualifier, the check digits, and the stop code.

ESC[15;;;;;;;;2‘q
ESC%SP011223344556677889ESC%@



Density and Spacing Between Bar Codes

The following subsections describe the spacing between different combinations of horizontal and vertical spacings between the bar codes.

Horizontal Bar Codes (0 and 180 Degree Rotation)

The width of a horizontal bar code is a function of the number of characters in the bar code symbol, the style of the bar code symbol, and the ratio of wide light/dark bars to narrow light/dark bars. The bar code height is specified as a parameter where the default is 0.75 inches. The human–readable line is not included. If the human–readable line is printed, a gap of 0.1 inch is inserted between the bottom of the bar code symbol and the human–readable line. The human–readable line is printed below the bar code symbol.

Horizontal bar codes (0 and 180 degree rotation), are printed at 100 dots per inch (dpi) horizontally and 100 dpi vertically.

Horizontal Spacing Between Horizontal Bar Codes

A 0.25 inch leading space always appears before a bar code symbol and a 0.25 inch trailing space is inserted after a bar code symbol for a total of 0.5 inches of space between any two bar codes. The leading and trailing spaces are called quiet zones.

Three delimiters are allowed for all bar code styles:

- Space character (20H), except for bar code 39
- Comma character (2CH)
- Horizontal tab character (09H)

The space character adds an extra 0.1 inches of white space between the bar code, the comma adds no extra white space, and the horizontal tab adds the amount set by the tabs. This additional white space is added to the 0.5 inches of the quiet zones that separate the two bar codes.

The horizontal limit is specified by the width of the paper, typically 13.2 inches. Therefore, the width of the encoded bar code symbol plus any spacing between two or more symbols cannot exceed 13.2 inches. If a bar code symbol exceeds the right margin, the printable portion is printed and the remainder is truncated.

Vertical Spacing Between Horizontal Bar Codes

The vertical limit is equal to the maximum allowable height for a bar code symbol: 10 inches. If the human–readable line is printed, then a 0.1 inch gap plus character size is added to compute a total vertical distance.

If the human–readable line is printed, a space the size of the intercharacter gap exists between the human–readable line and the top of the bar code symbol on the next line, plus any linefeeds you have specified.

If there is no human–readable line, the vertical spacing is dependent on the user for how many linefeeds have been specified.

Vertical Bar Codes (90 and 270 Degree Rotation)

The width of the rotated bar code is close in size to the height of the original horizontal bar code (they are not quite the same since the density changes). If the human–readable line is printed, it is accounted for in the total horizontal distance travelled.

The vertical height of the rotated bar code includes the 0.25 inch leading space, the light and dark bars the comprise the bar code symbol, and the 0.25 inch trailing space.

Vertical bar codes are printed with a horizontal density of 100 DPI and a vertical density of 100 DPI.

Horizontal Spacing Between Vertical Bar Codes

The horizontal limit is the width of the paper (or 13.2 inches). The following equation applies with rotated bar codes, where N equals the number of bar code symbols to be printed and HEIGHT equals the height parameter entered for the original bar code:

(N)*(HEIGHT) + any spacing between two or more symbols must be less than or equal to 13.2 inches

Ensure proper horizontal spacing between two vertical bar codes. Note that the leading and trailing spaces rotate with the vertical bar codes.

The space character (20H) and the horizontal tab character (09H) produce the white spaces horizontally across the page, just as they do for the horizontal bar codes. The comma delimiter does not separate bar code symbols on the

paper. Therefore, if a line of input is rotated with the comma as the delimiter, the bar code symbols are printed one against another. You must use either the space character (20 hex) or the horizontal tab character (09 hex) to keep this from occurring.

If a human–readable line is printed, its 0.1 inch gap is computed into the total horizontal distance.

Vertical Spacing Between Vertical Bar Codes

Vertical spacing is achieved via user–supplied linefeeds.

The vertical limit of any vertical bar code (90 or 270 degree rotation) is the current forms length. The encoded bar code symbols, including quiet zones, are less than or equal to the current printable forms length for a given line of ASCII input.

If paper length is exceeded during printing, the bar code symbol prints as far as possible, then terminates.

A Character Set Charts

Contents

Introduction

IMPORTANT

The character sets in this Appendix are address reference charts, not print samples. These charts were not generated on the LG*plus* printer. Not all characters are available in all fonts.

This appendix contains character address charts for the LG emulation character sets and language overlays available with the LG*plus* printer. The first four tables show the character sets available only in the Proprinter emulation mode. They can be selected at the control panel or by control codes from the host computer. These character sets are not available in Digital emulation. The Digital character sets are available only in Digital emulation mode.

The Digital Emulation Languages Substitution Table (page A–7) identifies specific character substitutions available in the selected language. For example, if you select the U.S. ASCII character set, 023 hex represents the number sign (**#**). If you then select Digital Dutch, 023 hex represents the English pound symbol (**£**) instead of the number sign. For each language, only the characters that may differ from the ASCII character set are shown. If a character is not shown on the Digital Emulation Languages Substitution Table, it is the same as in the ASCII character set.

LG Emulation Character Set Charts

The following languages comprise the multinational character sets. These languages are only available in the Digital emulation. Included are the following:

- U.S. ASCII
- Digital British
- Digital Dutch
- Digital Finnish
- French
- Digital French (Canadian)
- German
- Italian
- JIS Roman
- Digital Norwegian/Danish
- Spanish
- Digital Swedish
- ISO Norwegian/Danish
- Digital Portuguese

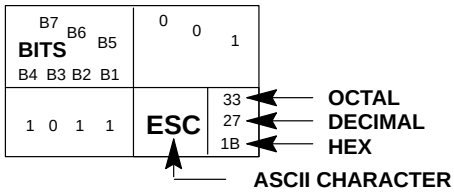
The Digital Emulation Languages Substitution Table (page A–7) identifies specific character substitutions available in the selected language. Hex addresses not shown on the substitution tables use the character in the hex address shown on the standard character set matrix.

U.S. ASCII Character Set

B7 B6 B5 / BITS B4 B3 B2 B1 / ROW	0 0 0	0 0 1	0 1 0	0 1 1	1 0 0	1 0 1	1 1 0	1 1 1
	COLUMN 0	1	2	3	4	5	6	7
0 0 0 0 / 0	NUL 0 0 0	DLE 20 16 10	SP 40 32 20	0 60 48 30	@ 100 64 40	P 120 80 50	` 140 96 60	p 160 112 70
0 0 0 1 / 1	SOH 1 1 1	DC1 (XON) 21 17 11	! 41 33 21	1 61 49 31	A 101 65 41	Q 121 81 51	a 141 97 61	q 161 113 71
0 0 1 0 / 2	STX 2 2 2	DC2 22 18 12	″ 42 34 22	2 62 50 32	B 102 66 42	R 122 82 52	b 142 98 62	r 162 114 72
0 0 1 1 / 3	ETX 3 3 3	DC3 (XOFF) 23 19 13	# 43 35 23	3 63 51 33	C 103 67 43	S 123 83 53	c 143 99 63	s 163 115 73
0 1 0 0 / 4	EOT 4 4 4	DC4 24 20 14	$ 44 36 24	4 64 52 34	D 104 68 44	T 124 84 54	d 144 100 64	t 164 116 74
0 1 0 1 / 5	ENQ 5 5 5	NAK 25 21 15	% 45 37 25	5 65 53 35	E 105 69 45	U 125 85 55	e 145 101 65	u 165 117 75
0 1 1 0 / 6	ACK 6 6 6	SYN 26 22 16	& 46 38 26	6 66 54 36	F 106 70 46	V 126 86 56	f 146 102 66	v 166 118 76
0 1 1 1 / 7	BEL 7 7 7	ETB 27 23 17	, 47 39 27	7 67 55 37	G 107 71 47	W 127 87 57	g 147 103 67	w 167 119 77
1 0 0 0 / 8	BS 10 8 8	CAN 30 24 18	(50 40 28	8 70 56 38	H 110 72 48	X 130 88 58	h 150 104 68	x 170 120 78
1 0 0 1 / 9	HT 11 9 9	EM 31 25 19	) 51 41 29	9 71 57 39	I 111 73 49	Y 131 89 59	i 151 105 69	y 171 121 79
1 0 1 0 / 10	LF 12 10 0 A	SUB 32 26 1A	* 52 42 2A	: 72 58 3A	J 112 74 4A	Z 132 90 5A	j 152 106 6A	z 172 122 7A
1 0 1 1 / 11	VT 13 11 0 B	ESC 33 27 1B	+ 53 43 2B	; 73 59 3B	K 113 75 4B	[133 91 5B	k 153 107 6B	{ 173 123 7B
1 1 0 0 / 12	FF 14 12 0 C	FS 34 28 1C	, 54 44 2C	< 74 60 3C	L 114 76 4C	\ 134 92 5C	l 154 108 6C	| 174 124 7C
1 1 0 1 / 13	CR 15 13 0 D	GS 35 29 1D	– 55 45 2D	= 75 61 3D	M 115 77 4D	] 135 93 5D	m 155 109 6D	} 175 125 7D
1 1 1 0 / 14	SO 16 14 0 E	RS 36 30 1E	. 56 46 2E	> 76 62 3E	N 116 78 4E	^ 136 94 5E	n 156 110 6E	~ 176 126 7E
1 1 1 1 / 15	SI 17 15 0 F	US 37 31 1F	/ 57 47 2F	? 77 63 3F	O 117 79 4F	_ 137 95 5F	o 157 111 6F	DEL 177 127 7F

Note: The character examples provided herein are representative and not exact replications generated by the printer. All characters are shown in 10 cpi; not all characters are available in all print modes.

KEY



DEC Multinational Character Set

7–bit mode or bit 8 set to zero

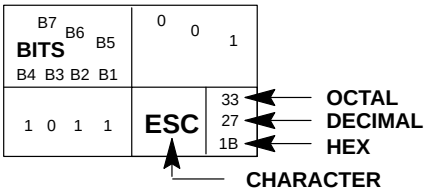
B8 B7 B6 B5 BITS B4 B3 B2 B1	ROW	COLUMN 0		1		2		3		4		5		6		7	
0 0 0 0	0	NUL	0 0 0		20 16 10	SP	40 32 20	0	60 48 30	@	100 64 40	P	120 80 50	`	140 96 60	p	160 112 70
0 0 0 1	1		1 1 1	DC1 (XON)	21 17 11	!	41 33 21	1	61 49 31	A	101 65 41	Q	121 81 51	a	141 97 61	q	161 113 71
0 0 1 0	2		2 2 2		22 18 12	″	42 34 22	2	62 50 32	B	102 66 42	R	122 82 52	b	142 98 62	r	162 114 72
0 0 1 1	3		3 3 3	DC3 (XOFF)	23 19 13	#	43 35 23	3	63 51 33	C	103 67 43	S	123 83 53	c	143 99 63	s	163 115 73
0 1 0 0	4	EOT	4 4 4		24 20 14	$	44 36 24	4	64 52 34	D	104 68 44	T	124 84 54	d	144 100 64	t	164 116 74
0 1 0 1	5		5 5 5		25 21 15	%	45 37 25	5	65 53 35	E	105 69 45	U	125 85 55	e	145 101 65	u	165 117 75
0 1 1 0	6		6 6 6		26 22 16	&	46 38 26	6	66 54 36	F	106 70 46	V	126 86 56	f	146 102 66	v	166 118 76
0 1 1 1	7		7 7 7		27 23 17	’	47 39 27	7	67 55 37	G	107 71 47	W	127 87 57	g	147 103 67	w	167 119 77
1 0 0 0	8	BS	10 8 8	CAN	30 24 18	(	50 40 28	8	70 56 38	H	110 72 48	X	130 88 58	h	150 104 68	x	170 120 78
1 0 0 1	9	HT	11 9 9		31 25 19	)	51 41 29	9	71 57 39	I	111 73 49	Y	131 89 59	i	151 105 69	y	171 121 79
1 0 1 0	10	LF	12 10 0A	SUB	32 26 1A	*	52 42 2A	:	72 58 3A	J	112 74 4A	Z	132 90 5A	j	152 106 6A	z	172 122 7A
1 0 1 1	11	VT	13 11 0B	ESC	33 27 1B	+	53 43 2B	;	73 59 3B	K	113 75 4B	[	133 91 5B	k	153 107 6B	{	173 123 7B
1 1 0 0	12	FF	14 12 0C		34 28 1C	,	54 44 2C	<	74 60 3C	L	114 76 4C	\	134 92 5C	l	154 108 6C	|	174 124 7C
1 1 0 1	13	CR	15 13 0D		35 29 1D	–	55 45 2D	=	75 61 3D	M	115 77 4D	]	135 93 5D	m	155 109 6D	}	175 125 7D
1 1 1 0	14	SO	16 14 0E		36 30 1E	.	56 46 2E	>	76 62 3E	N	116 78 4E	^	136 94 5E	n	156 110 6E	~	176 126 7E
1 1 1 1	15	SI	17 15 0F		37 31 1F	/	57 47 2F	?	77 63 3F	O	117 79 4F	_	137 95 5F	o	157 111 6F	DEL	177 127 7F

ASCII Control Codes

U.S. ASCII CHARACTER SET

Note: The character examples provided herein are representative and not exact replications generated by the printer. All characters are shown in 10 cpi; not all characters are available in all print modes.

KEY



Columns 8 and 9 can be converted to 7–bit Escape sequences.

Columns 10 thru 15 are only accessed in 8–bit mode.

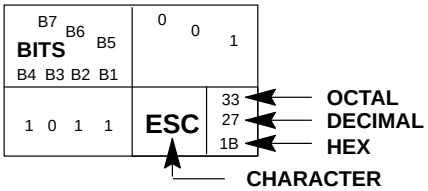
1 0 0 0	1 0 0 1	1 0 1 0	1 0 1 1	1 1 0 0	1 1 0 1	1 1 1 0	1 1 1 1
8	**9**	**10**	**11**	**12**	**13**	**14**	**15**
200 128 80	220 144 90	240 160 A0	260 176 B0	300 192 C0	320 208 D0	340 224 E0	360 240 F0
201 129 81	221 145 91	¡ 241 161 A1	± 261 177 B1	Á 301 193 C1	Ñ 321 209 D1	á 341 225 E1	ñ 361 241 F1
202 130 82	222 146 92	¢ 242 162 A2	2 262 178 B2	Â 302 194 C2	Ò 322 210 D2	â 342 226 E2	ò 362 242 F2
203 131 83	223 147 93	£ 243 163 A3	3 263 179 B3	Ã 303 195 C3	Ó 323 211 D3	ã 343 227 E3	ó 363 243 F3
204 132 84	224 148 94	244 164 A4	264 180 B4	Ä 304 196 C4	Ô 324 212 D4	ä 344 228 E4	ô 364 244 F4
205 133 85	225 149 95	¥ 245 165 A5	µ 265 181 B5	Å 305 197 C5	Õ 325 213 D5	å 345 229 E5	õ 365 245 F5
206 134 86	226 150 96	246 166 A6	¶ 266 182 B6	Æ 306 198 C6	Ö 326 214 D6	æ 346 230 E6	ö 366 246 F6
207 135 87	227 151 97	§ 247 167 A7	• 267 183 B7	Ç 307 199 C7	Œ 327 215 D7	ç 347 231 E7	œ 367 247 F7
210 136 88	230 152 98	¤ 250 168 A8	270 184 B8	È 310 200 C8	Ø 330 216 D8	è 350 232 E8	ø 370 248 F8
211 137 89	231 153 99	© 251 169 A9	1 271 185 B9	É 311 201 C9	Ù 331 217 D9	é 351 233 E9	ù 371 249 F9
212 138 8A	232 154 9A	a 252 170 AA	o 272 186 BA	Ê 312 202 CA	Ú 332 218 DA	^ e 352 234 EA	ú 372 250 FA
213 139 8B	233 155 9B	« 253 171 AB	» 273 187 BB	Ë 313 203 CB	Û 333 219 DB	ë 353 235 EB	û 373 251 FB
214 140 8C	234 156 9C	254 172 AC	¼ 274 188 BC	Ì 314 204 CC	Ü 334 220 DC	ì 354 236 EC	ü 374 252 FC
215 141 8D	235 157 9D	255 173 AD	½ 275 189 BD	Í 315 205 CD	Ÿ 335 221 DD	í 355 237 ED	ÿ 375 253 FD
216 142 8E	236 158 9E	256 174 AE	276 190 BE	Î 316 206 CE	336 222 DE	î 356 238 EE	376 254 FE
217 143 8F	237 159 9F	257 175 AF	¿ 277 191 BF	Ï 317 207 CF	β 337 223 DF	ï 357 239 EF	(Not Used) 377 255 FF

Additional Control Codes

DEC SUPPLEMENTAL CHARACTER SET

Note: The character examples provided herein are representative and not exact replications generated by the printer. All characters are shown in 10 cpi; not all characters are available in all print modes.

KEY



Each shaded box will print as a reverse question mark ¿.

Digital Emulation Languages Substitution Table

	Hex Address											
LANGUAGE	**0023**	**0040**	**005B**	**005C**	**005D**	**005E**	**005F**	**0060**	**007B**	**007C**	**007D**	**007E**
ASCII	#	@	[	\	]	^	_	`	{	|	}	~
English	£	@	[	\	]	^	_	`	{	|	}	~
French	£	à	°	ç	§	^	_	`	é	ù	è	¨
German	#	§	Ä	Ö	Ü	^	_	`	ä	ö	ü	β
Italian	£	§	°	ç	é	^	_	ù	à	ò	è	ì
JIS Roman	#	@	[	¥	]	^	_	`	{	|	}	~
Spanish	£	§	¡	Ñ	¿	^	_	`	°	ñ	ç	~
Digital Dutch	£	3/4	ÿ	1/2	|	^	_	`	¨	*f*	1/4	‘
Digital Finnish	#	@	Ä	Ö	Å	Ü	_	é	ä	ö	å	ü
Digital French Canadian	#	à	â	ç	ê	î	_	ô	é	ù	è	û
Digital Norwegian/ Danish	#	Ä	Æ	Ø	Å	Ü	_	ä	æ	ø	å	ü
Digital Portuguese	#	@	Ã	Ç	Õ	^	_	`	ã	ç	õ	~
Digital Swiss	ù	à	é	ç	ê	î	è	ô	ä	ö	ü	û
Digital Swedish	#	É	Ä	Ö	Å	Ü	_	é	ä	ö	å	ü
ISO Norwegian/ Danish	#	@	Æ	Ø	Å	^	_	`	æ	ø	å	~

Digital Special Character Sets and ISO Charts

The following character charts comprise the multinational font sets. Included are:

- Digital Supplemental Character Set
- Digital Technical Character Set
- Digital Special Graphics (VT100 Line Drawing) Character Set
- ISO 8859–7 Cyrillic
- ISO 8859–7 Greek
- ISO 8859–7 Hebrew
- ISO Latin 1
- ISO Latin 2
- ISO Latin 5
- JIS Katakana

NOTE: The Katakana character set is available only in DP font 10 CPI pitch, and NLQ font 10 CPI pitch.

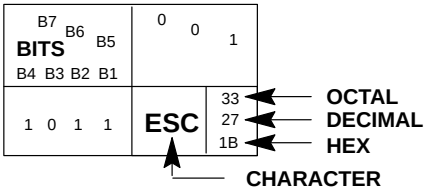
The following character matrices show the character sets available for each language and special character set.

Digital Supplemental Character Set

B7 B6 B5 / BITS B4 B3 B2 B1 / ROW	COLUMN 0	8	GL 1	GR 9	GL 2	GR 10	GL 3	GR 11	GL 4	GR 12	GL 5	GR 13	GL 6	GR 14	GL 7	GR 15
0 0 0 0 / 0		0 0 0		20 16 10	SP	40 32 20	°	60 48 30	À	100 64 40		120 80 50	à	140 96 60		160 112 70
0 0 0 1 / 1		1 1 1		21 17 11	¡	41 33 21	±	61 49 31	Á	101 65 41	Ñ	121 81 51	á	141 97 61	ñ	161 113 71
0 0 1 0 / 2		2 2 2		22 18 12	¢	42 34 22	2	62 50 32	Â	102 66 42	Ò	122 82 52	â	142 98 62	ò	162 114 72
0 0 1 1 / 3		3 3 3		23 19 13	£	43 35 23	3	63 51 33	Ã	103 67 43	Ó	123 83 53	ã	143 99 63	ó	163 115 73
0 1 0 0 / 4		4 4 4		24 20 14		44 36 24		64 52 34	Ä	104 68 44	Ô	124 84 54	ä	144 100 64	ô	164 116 74
0 1 0 1 / 5		5 5 5		25 21 15	¥	45 37 25	µ	65 53 35	Å	105 69 45	Õ	125 85 55	å	145 101 65	õ	165 117 75
0 1 1 0 / 6		6 6 6		26 22 16		46 38 26	¶	66 54 36	Æ	106 70 46	Ö	126 86 56	æ	146 102 66	ö	166 118 76
0 1 1 1 / 7		7 7 7		27 23 17	§	47 39 27	·	67 55 37	Ç	107 71 47	Œ	127 87 57	ç	147 103 67	œ	167 119 77
1 0 0 0 / 8		10 8 8		30 24 18	¤	50 40 28		70 56 38	È	110 72 48	Ø	130 88 58	è	150 104 68	ø	170 120 78
1 0 0 1 / 9		11 9 9		31 25 19	©	51 41 29	1	71 57 39	É	111 73 49	Ù	131 89 59	é	151 105 69	ù	171 121 79
1 0 1 0 / 10		12 10 0 A		32 26 1A	ª	52 42 2A	º	72 58 3A	Ê	112 74 4A	Ú	132 90 5A	ê	152 106 6A	ú	172 122 7A
1 0 1 1 / 11		13 11 0 B		33 27 1B	«	53 43 2B	»	73 59 3B	Ë	113 75 4B	Û	133 91 5B	ë	153 107 6B	û	173 123 7B
1 1 0 0 / 12		14 12 0 C		34 28 1C		54 44 2C	1/4	74 60 3C	Ì	114 76 4C	Ü	134 92 5C	ì	154 108 6C	ü	174 124 7C
1 1 0 1 / 13		15 13 0 D		35 29 1D		55 45 2D	1/2	75 61 3D	Í	115 77 4D	Ÿ	135 93 5D	í	155 109 6D	ÿ	175 125 7D
1 1 1 0 / 14		16 14 0 E		36 30 1E		56 46 2E		76 62 3E	Î	116 78 4E		136 94 5E	î	156 110 6E		176 126 7E
1 1 1 1 / 15		17 15 0 F		37 31 1F		57 47 2F	¿	77 63 3F	Ï	117 79 4F	ß	137 95 5F	ï	157 111 6F	DEL	177 127 7F

Note: The character examples provided herein are representative and not exact replications generated by the printer. All characters are shown in 10 cpi; not all characters are available in all print modes.

KEY



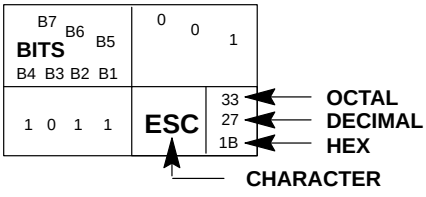
Each shaded box will print as a reverse question mark ¿.

Digital Technical Character Set

BITS B4 B3 B2 B1	ROW	0 0 0 COLUMN 0	8	0 0 1 GL 1	GR 9	0 1 0 GL 2	GR 10	0 1 1 GL 3	GR 11	1 0 0 GL 4	GR 12	1 0 1 GL 5	GR 13	1 1 0 GL 6	GR 14	1 1 1 GL 7	GR 15
0 0 0 0	0		200 128 80		220 144 90		240 160 A0	⊱	260 176 B0	∴	300 192 C0	⊤	320 208 D0	¬	340 224 E0	π	360 240 F0
0 0 0 1	1		201 129 81		221 145 91	⌟	241 161 A1	⌜	261 177 B1	∝	301 193 C1	Ψ	321 209 D1	α	341 225 E1	ψ	361 241 F1
0 0 1 0	2		202 130 82		222 146 92	⌜	242 162 A2	∠	262 178 B2	∞	302 194 C2		322 210 D2	β	342 226 E2	ρ	362 242 F2
0 0 1 1	3		203 131 83		223 147 93	—	243 163 A3	\	263 179 B3	÷	303 195 C3	Σ	323 211 D3	χ	343 227 E3	σ	363 243 F3
0 1 0 0	4		204 132 84		224 148 94	⌠	244 164 A4	/	264 180 B4	Δ	304 196 C4		324 212 D4	δ	344 228 E4	τ	364 244 F4
0 1 0 1	5		205 133 85		225 149 95	⌡	245 165 A5	¬	265 181 B5	∇	305 197 C5		325 213 D5	∈	345 229 E5		365 245 F5
0 1 1 0	6		206 134 86		226 150 96	⌡	246 166 A6	_	266 182 B6	Φ	306 198 C6	√	326 214 D6	ϕ	346 230 E6	*f*	366 246 F6
0 1 1 1	7		207 135 87		227 151 97	⌠	247 167 A7	⟩	267 183 B7	Γ	307 199 C7	Ω	327 215 D7	γ	347 231 E7	ω	367 247 F7
1 0 0 0	8		210 136 88		230 152 98	⌊	250 168 A8		270 184 B8	~	310 200 C8	Ξ	330 216 D8	η	350 232 E8	ξ	370 248 F8
1 0 0 1	9		211 137 89		231 153 99	⌝	251 169 A9		271 185 B9	≃	311 201 C9	T	331 217 D9	⌡	351 233 E9	υ	371 249 F9
1 0 1 0	10		212 138 8A		232 154 9A	⌟	252 170 AA		272 186 BA	Θ	312 202 CA	⊂	332 218 DA	Θ	352 234 EA	ζ	372 250 FA
1 0 1 1	11		213 139 8B		233 155 9B	⌠	253 171 AB		273 187 BB	χ	313 203 CB	⊃	333 219 DB	κ	353 235 EB	←	373 251 FB
1 1 0 0	12		214 140 8C		234 156 9C	⌠	254 172 AC	≤	274 188 BC	Λ	314 204 CC	∩	334 220 DC	λ	354 236 EC	↑	374 252 FC
1 1 0 1	13		215 141 8D		235 157 9D	⌡	255 173 AD	≠	275 189 BD	⇔	315 205 CD	U	335 221 DD		355 237 ED	→	375 253 FD
1 1 1 0	14		216 142 8E		236 158 9E	⌡	256 174 AE	≥	276 190 BE	⇒	316 206 CE	∧	336 222 DE	ν	356 238 EE	↓	376 254 FE
1 1 1 1	15		217 143 8F		237 159 9F	⌡	257 175 AF	∫	277 191 BF	≡	317 207 CF	∨	337 223 DF	ϑ	357 239 EF		377 255 FF

Note: The character examples provided herein are representative and not exact replications generated by the printer. All characters are shown in 10 cpi; not all characters are available in all print modes.

KEY



Each shaded box will print as a reverse question mark ⸮.

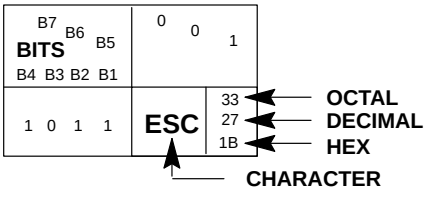
Digital Special Graphics (VT100 Line Drawing) Character Set

BITS B7 B6 B5 / B4 B3 B2 B1	ROW	0 0 0		0 0 1		0 1 0		0 1 1		1 0 0		1 0 1		1 1 0		1 1 1	
		COLUMN 0	8	GL 1	GR 9	GL 2	GR 10	GL 3	GR 11	GL 4	GR 12	GL 5	GR 13	GL 6	GR 14	GL 7	GR 15
0 0 0 0	0	NUL	0 0 0		20 16 10	SP	40 32 20	0	60 48 30	@	100 64 40	P	120 80 50	◆	140 96 60	— SCAN 3	160 112 70
0 0 0 1	1		1 1 1	DC1 (XON)	21 17 11	!	41 33 21	1	61 49 31	A	101 65 41	Q	121 81 51	▒	141 97 61	— SCAN 5	161 113 71
0 0 1 0	2		2 2 2		22 18 12	″	42 34 22	2	62 50 32	B	102 66 42	R	122 82 52	$^{H}_{T}$	142 98 62	— SCAN 7	162 114 72
0 0 1 1	3		3 3 3	DC3 (XOFF)	23 19 13	#	43 35 23	3	63 51 33	C	103 67 43	S	123 83 53	$^{F}_{F}$	143 99 63	— SCAN 9	163 115 73
0 1 0 0	4		4 4 4		24 20 14	$	44 36 24	4	64 52 34	D	104 68 44	T	124 84 54	$^{C}_{R}$	144 100 64	├	164 116 74
0 1 0 1	5		5 5 5		25 21 15	%	45 37 25	5	65 53 35	E	105 69 45	U	125 85 55	$^{L}_{F}$	145 101 65	┤	165 117 75
0 1 1 0	6		6 6 6		26 22 16	&	46 38 26	6	66 54 36	F	106 70 46	V	126 86 56	°	146 102 66	┴	166 118 76
0 1 1 1	7		7 7 7		27 23 17	′	47 39 27	7	67 55 37	G	107 71 47	W	127 87 57	±	147 103 67	┬	167 119 77
1 0 0 0	8	BS	10 8 8	CAN	30 24 18	(	50 40 28	8	70 56 38	H	110 72 48	X	130 88 58	$^{N}_{L}$	150 104 68	│	170 120 78
1 0 0 1	9	HT	11 9 9		31 25 19	)	51 41 29	9	71 57 39	I	111 73 49	Y	131 89 59	$^{V}_{T}$	151 105 69	≤	171 121 79
1 0 1 0	10	LF	12 10 0 A	SUB	32 26 1A	*	52 42 2A	:	72 58 3A	J	112 74 4A	Z	132 90 5A	┘	152 106 6A	≥	172 122 7A
1 0 1 1	11	VT	13 11 0 B	ESC	33 27 1B	+	53 43 2B	;	73 59 3B	K	113 75 4B	[	133 91 5B	┐	153 107 6B	π	173 123 7B
1 1 0 0	12	FF	14 12 0 C		34 28 1C	,	54 44 2C	<	74 60 3C	L	114 76 4C	\	134 92 5C	┌	154 108 6C	≠	174 124 7C
1 1 0 1	13	CR	15 13 0 D		35 29 1D	–	55 45 2D	=	75 61 3D	M	115 77 4D	]	135 93 5D	└	155 109 6D	£	175 125 7D
1 1 1 0	14	SO	16 14 0 E		36 30 1E	.	56 46 2E	>	76 62 3E	N	116 78 4E	^	136 94 5E	┼	156 110 6E	●	176 126 7E
1 1 1 1	15	SI	17 15 0 F		37 31 1F	/	57 47 2F	?	77 63 3F	O	117 79 4F	(BLANK)	137 95 5F	¯ SCAN 1	157 111 6F	DEL	177 127 7F

Note: The character examples provided herein are representative and not exact replications generated by the printer. All characters are shown in 10 cpi; not all characters are available in all print modes.

Each shaded box ▨ will print as a reverse question mark ¿.

KEY



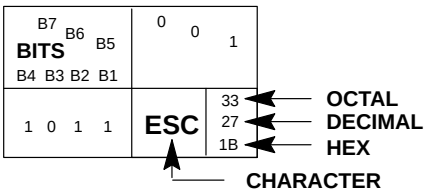
ISO 8859–7 Cyrillic Character Set

BITS B4 B3 B2 B1	ROW	COLUMN 0	8	GL 1	GR 9	GL 2	GR 10	GL 3	GR 11	GL 4	GR 12	GL 5	GR 13	GL 6	GR 14	GL 7	GR 15
0 0 0 0	0		0 0 0		20 16 10	NBSP	40 32 20	A	60 48 30	P	100 64 40	a	120 80 50	p	140 96 60	°	160 112 70
0 0 0 1	1		1 1 1		21 17 11	Ё	41 33 21	Б	61 49 31	C	101 65 41	б	121 81 51	c	141 97 61	ё	161 113 71
0 0 1 0	2		2 2 2		22 18 12	Ђ	42 34 22	B	62 50 32	T	102 66 42	B	122 82 52	T	142 98 62	ђ	162 114 72
0 0 1 1	3		3 3 3		23 19 13	Ѓ	43 35 23	Г	63 51 33	Y	103 67 43	r	123 83 53	y	143 99 63	ѓ	163 115 73
0 1 0 0	4		4 4 4		24 20 14	Є	44 36 24	Д	64 52 34	Ф	104 68 44	д	124 84 54	ф	144 100 64	є	164 116 74
0 1 0 1	5		5 5 5		25 21 15	S	45 37 25	E	65 53 35	X	105 69 45	e	125 85 55	x	145 101 65	s	165 117 75
0 1 1 0	6		6 6 6		26 22 16	I	46 38 26	Ж	66 54 36	Ц	106 70 46	ж	126 86 56	ц	146 102 66	i	166 118 76
0 1 1 1	7		7 7 7		27 23 17	Ї	47 39 27	З	67 55 37	Ч	107 71 47	з	127 87 57	ч	147 103 67	ї	167 119 77
1 0 0 0	8		10 8 8		30 24 18	J	50 40 28	И	70 56 38	Ш	110 72 48	и	130 88 58	ш	150 104 68	j	170 120 78
1 0 0 1	9		11 9 9		31 25 19	Љ	51 41 29	Й	71 57 39	Щ	111 73 49	й	131 89 59	щ	151 105 69	љ	171 121 79
1 0 1 0	10		12 10 0 A		32 26 1A	Њ	52 42 2A	К	72 58 3A	Ъ	112 74 4A	к	132 90 5A	ъ	152 106 6A	њ	172 122 7A
1 0 1 1	11		13 11 0 B		33 27 1B	Ћ	53 43 2B	Л	73 59 3B	Ы	113 75 4B	л	133 91 5B	ы	153 107 6B	ћ	173 123 7B
1 1 0 0	12		14 12 0 C		34 28 1C	Ќ	54 44 2C	М	74 60 3C	b	114 76 4C	м	134 92 5C	b	154 108 6C	ќ	174 124 7C
1 1 0 1	13		15 13 0 D		35 29 1D	–	55 45 2D	Н	75 61 3D	Э	115 77 4D	н	135 93 5D	э	155 109 6D	§	175 125 7D
1 1 1 0	14		16 14 0 E		36 30 1E	Ў	56 46 2E	О	76 62 3E	Ю	116 78 4E	о	136 94 5E	ю	156 110 6E	ў	176 126 7E
1 1 1 1	15		17 15 0 F		37 31 1F	Џ	57 47 2F	П	77 63 3F	Я	117 79 4F	п	137 95 5F	я	157 111 6F	џ	177 127 7F

Note: The character examples provided herein are representative and not exact replications generated by the printer. All characters are shown in 10 cpi; not all characters are available in all print modes.

Each shaded box will print as a reverse question mark ?.

KEY



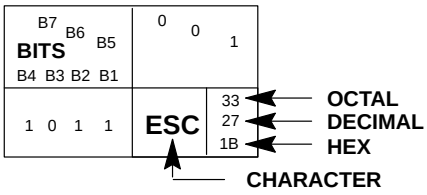
ISO 8859–7 Greek Character Set

B7 B6 B5 / BITS B4 B3 B2 B1	ROW	0 0 0 COLUMN 0	8	0 0 1 GL 1	GR 9	0 1 0 GL 2	GR 10	0 1 1 GL 3	GR 11	1 0 0 GL 4	GR 12	1 0 1 GL 5	GR 13	1 1 0 GL 6	GR 14	1 1 1 GL 7	GR 15
0 0 0 0	0		200 128 80		220 144 90	SP	240 160 A0	°	260 176 B0	΅ ϋ	300 192 C0	Ϋ	320 208 D0	ΰ	340 224 E0	π	360 240 F0
0 0 0 1	1		201 129 81		221 145 91	‘	241 161 A1	±	261 177 B1	**A**	301 193 C1	**P**	321 209 D1	α	341 225 E1	ρ	361 241 F1
0 0 1 0	2		202 130 82		222 146 92	’	242 162 A2	**2**	262 178 B2	**B**	302 194 C2		322 210 D2	β	342 226 E2	ς	362 242 F2
0 0 1 1	3		203 131 83		223 147 93	£	243 163 A3	**3**	263 179 B3	Γ	303 195 C3	Σ	323 211 D3	γ	343 227 E3	σ	363 243 F3
0 1 0 0	4		204 132 84		224 148 94		244 164 A4	΄	264 180 B4	Δ	304 196 C4	T	324 212 D4	δ	344 228 E4	τ	364 244 F4
0 1 0 1	5		205 133 85		225 149 95		245 165 A5	΅ ¨	265 181 B5	**E**	305 197 C5	T	325 213 D5	ε	345 229 E5	υ	365 245 F5
0 1 1 0	6		206 134 86		226 150 96	¦ ¦	246 166 A6	΄ **A**	266 182 B6	**Z**	306 198 C6	Φ	326 214 D6	ζ	346 230 E6	φ	366 246 F6
0 1 1 1	7		207 135 87		227 151 97	§	247 167 A7	΄	267 183 B7	**H**	307 199 C7	**X**	327 215 D7	η	347 231 E7	*x*	367 247 F7
1 0 0 0	8		210 136 88		230 152 98	¨	250 168 A8	΄ **Ε**	270 184 B8	Θ	310 200 C8	Ψ	330 216 D8	Θ	350 232 E8	ψ	370 248 F8
1 0 0 1	9		211 137 89		231 153 99	©	251 169 A9	΄ **Η**	271 185 B9	**I**	311 201 C9	Ω	331 217 D9	*i*	351 233 E9	ω	371 249 F9
1 0 1 0	10		212 138 8A		232 154 9A		252 170 AA	΄ **Ι**	272 186 BA	**K**	312 202 CA	¨ **Ι**	332 218 DA	*k*	352 234 EA	΅ ι	372 250 FA
1 0 1 1	11		213 139 8B		233 155 9B	<<	253 171 AB	>>	273 187 BB	Λ	313 203 CB	Ϊ	333 219 DB	λ	353 235 EB	ϋ	373 251 FB
1 1 0 0	12		214 140 8C		234 156 9C	¬	254 172 AC	**O**	274 188 BC	**M**	314 204 CC	΄ α	334 220 DC	μ	354 236 EC	΄ *o*	374 252 FC
1 1 0 1	13		215 141 8D		235 157 9D	–	255 173 AD	1/2	275 189 BD	**N**	315 205 CD	ε	335 221 DD	ν	355 237 ED	ΰ	375 253 FD
1 1 1 0	14		216 142 8E		236 158 9E		256 174 AE	΄ Τ	276 190 BE	Ξ	316 206 CE	η	336 222 DE	ξ	356 238 EE	ω	376 254 FE
1 1 1 1	15		217 143 8F		237 159 9F	―	257 175 AF	΄ Ω	277 191 BF	Ο	317 207 CF	ι	337 223 DF	*o*	357 239 EF		377 255 FF

Note: The character examples provided herein are representative and not exact replications generated by the printer. All characters are shown in 10 cpi; not all characters are available in all print modes.

Each shaded box will print as a reverse question mark ؟.

KEY

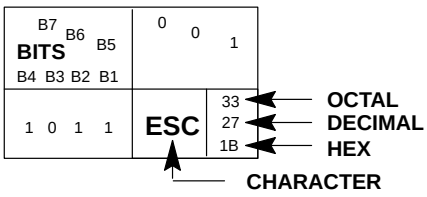


ISO 8859–7 Hebrew Character Set

BITS B4 B3 B2 B1	ROW	COLUMN 0	8	GL 1	GR 9	GL 2	GR 10	GL 3	GR 11	GL 4	GR 12	GL 5	GR 13	GL 6	GR 14	GL 7	GR 15
0 0 0 0	0		0 0 0		20 16 10		40 32 20	°	60 48 30	@	100 64 40	P	120 80 50	א	140 96 60	ג	160 112 70
0 0 0 1	1		1 1 1		21 17 11		41 33 21	±	61 49 31	A	101 65 41	Q	121 81 51	נ	141 97 61	ם	161 113 71
0 0 1 0	2		2 2 2		22 18 12	¢	42 34 22	2	62 50 32	B	102 66 42	R	122 82 52	ג	142 98 62	ע	162 114 72
0 0 1 1	3		3 3 3		23 19 13	£	43 35 23	3	63 51 33	C	103 67 43	S	123 83 53	ד	143 99 63	ף	163 115 73
0 1 0 0	4		4 4 4		24 20 14	¤	44 36 24	'	64 52 34	D	104 68 44	T	124 84 54	ה	144 100 64	פ	164 116 74
0 1 0 1	5		5 5 5		25 21 15	¥	45 37 25	µ	65 53 35	E	105 69 45	U	125 85 55	ו	145 101 65	ץ	165 117 75
0 1 1 0	6		6 6 6		26 22 16	¦	46 38 26	¶	66 54 36	F	106 70 46	V	126 86 56	ז	146 102 66	צ	166 118 76
0 1 1 1	7		7 7 7		27 23 17	§	47 39 27	·	67 55 37	G	107 71 47	W	127 87 57	ח	147 103 67	ק	167 119 77
1 0 0 0	8		10 8 8		30 24 18	¨	50 40 28	¸	70 56 38	H	110 72 48	X	130 88 58	ט	150 104 68	ר	170 120 78
1 0 0 1	9		11 9 9		31 25 19	©	51 41 29	1	71 57 39	I	111 73 49	Y	131 89 59	י	151 105 69	ש	171 121 79
1 0 1 0	10		12 10 0 A		32 26 1A	x	52 42 2A	÷	72 58 3A	J	112 74 4A	Z	132 90 5A	ך	152 106 6A	ת	172 122 7A
1 0 1 1	11		13 11 0 B		33 27 1B	<<	53 43 2B	>>	73 59 3B	K	113 75 4B	[	133 91 5B	ן	153 107 6B		173 123 7B
1 1 0 0	12		14 12 0 C		34 28 1C	¬	54 44 2C	1/4	74 60 3C	L	114 76 4C	\	134 92 5C	ף	154 108 6C		174 124 7C
1 1 0 1	13		15 13 0 D		35 29 1D	–	55 45 2D	1/2	75 61 3D	M	115 77 4D	]	135 93 5D	ם	155 109 6D		175 125 7D
1 1 1 0	14		16 14 0 E		36 30 1E	®	56 46 2E	3/4	76 62 3E	N	116 78 4E	^	136 94 5E	מ	156 110 6E		176 126 7E
1 1 1 1	15		17 15 0 F		37 31 1F	—	57 47 2F		77 63 3F	O	117 79 4F	_	137 95 5F	ן	157 111 6F		177 127 7F

Note: The character examples provided herein are representative and not exact replications generated by the printer. All characters are shown in 10 cpi; not all characters are available in all print modes.

KEY



Each shaded box will print as a reverse question mark ¿.

ISO Latin 1 Character Set

BITS B4 B3 B2 B1	ROW	B7 B6 B5 = 0 0 0 COLUMN 0	8	B7 B6 B5 = 0 0 1 GL 1	GR 9	B7 B6 B5 = 0 1 0 GL 2	GR 10	B7 B6 B5 = 0 1 1 GL 3	GR 11	B7 B6 B5 = 1 0 0 GL 4	GR 12	B7 B6 B5 = 1 0 1 GL 5	GR 13	B7 B6 B5 = 1 1 0 GL 6	GR 14	B7 B6 B5 = 1 1 1 GL 7	GR 15
0 0 0 0	0		0 0 0		20 16 10	NBSP	40 32 20	°	60 48 30	À	100 64 40	Ð	120 80 50	à	140 96 60	đ	160 112 70
0 0 0 1	1		1 1 1		21 17 11	¡	41 33 21	±	61 49 31	Á	101 65 41	Ñ	121 81 51	á	141 97 61	ñ	161 113 71
0 0 1 0	2		2 2 2		22 18 12	¢	42 34 22	2	62 50 32	Â	102 66 42	Ò	122 82 52	â	142 98 62	ò	162 114 72
0 0 1 1	3		3 3 3		23 19 13	£	43 35 23	3	63 51 33	Ã	103 67 43	Ó	123 83 53	ã	143 99 63	ó	163 115 73
0 1 0 0	4		4 4 4		24 20 14	¤	44 36 24	´	64 52 34	Ä	104 68 44	Ô	124 84 54	ä	144 100 64	ô	164 116 74
0 1 0 1	5		5 5 5		25 21 15	¥	45 37 25	µ	65 53 35	Å	105 69 45	Õ	125 85 55	å	145 101 65	õ	165 117 75
0 1 1 0	6		6 6 6		26 22 16	¦	46 38 26	¶	66 54 36	Æ	106 70 46	Ö	126 86 56	æ	146 102 66	ö	166 118 76
0 1 1 1	7		7 7 7		27 23 17	§	47 39 27	·	67 55 37	Ç	107 71 47	×	127 87 57	ç	147 103 67	÷	167 119 77
1 0 0 0	8		10 8 8		30 24 18	¨	50 40 28	¸	70 56 38	È	110 72 48	Ø	130 88 58	è	150 104 68	ø	170 120 78
1 0 0 1	9		11 9 9		31 25 19	©	51 41 29	1	71 57 39	É	111 73 49	Ù	131 89 59	é	151 105 69	ù	171 121 79
1 0 1 0	10		12 10 0 A		32 26 1A	a	52 42 2A	o	72 58 3A	Ê	112 74 4A	Ú	132 90 5A	ê	152 106 6A	ú	172 122 7A
1 0 1 1	11		13 11 0 B		33 27 1B	«	53 43 2B	»	73 59 3B	Ë	113 75 4B	Û	133 91 5B	ë	153 107 6B	û	173 123 7B
1 1 0 0	12		14 12 0 C		34 28 1C	¬	54 44 2C	1/4	74 60 3C	Ì	114 76 4C	Ü	134 92 5C	ì	154 108 6C	ü	174 124 7C
1 1 0 1	13		15 13 0 D		35 29 1D		55 45 2D	1/2	75 61 3D	Í	115 77 4D	Ý	135 93 5D	í	155 109 6D	ý	175 125 7D
1 1 1 0	14		16 14 0 E		36 30 1E	®	56 46 2E	3/4	76 62 3E	Î	116 78 4E	Þ	136 94 5E	î	156 110 6E	þ	176 126 7E
1 1 1 1	15		17 15 0 F		37 31 1F	¯	57 47 2F	¿	77 63 3F	Ï	117 79 4F	ß	137 95 5F	ï	157 111 6F	ÿ	177 127 7F

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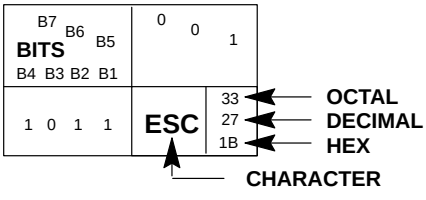
Each shaded box ▨ will print as a reverse question mark ¿.

KEY



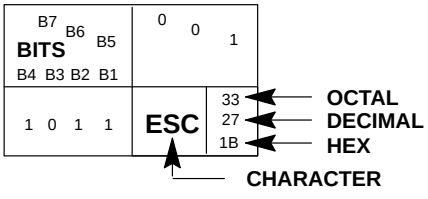
ISO Latin 2 Character Set

BITS B7 B6 B5 / B4 B3 B2 B1	ROW	COLUMN 0	8	GL 1	GR 9	GL 2	GR 10	GL 3	GR 11	GL 4	GR 12	GL 5	GR 13	GL 6	GR 14	GL 7	GR 15
0 0 0 0	0		200 128 80		220 144 90	NBSP	240 160 A0	°	260 176 B0	Ŕ	300 192 C0	Đ	320 208 D0	ŕ	340 224 E0	đ	360 240 F0
0 0 0 1	1		201 129 81		221 145 91	Ą	241 161 A1	ą	261 177 B1	Á	301 193 C1	Ń	321 209 D1	á	341 225 E1	ń	361 241 F1
0 0 1 0	2		202 130 82		222 146 92	˘	242 162 A2	Ł	262 178 B2	Â	302 194 C2	Ň	322 210 D2	â	342 226 E2	ň	362 242 F2
0 0 1 1	3		203 131 83		223 147 93	Ľ	243 163 A3	ł	263 179 B3	Ă	303 195 C3	Ó	323 211 D3	ă	343 227 E3	ó	363 243 F3
0 1 0 0	4		204 132 84		224 148 94	¤	244 164 A4	´	264 180 B4	Ä	304 196 C4	Ô	324 212 D4	ä	344 228 E4	ô	364 244 F4
0 1 0 1	5		205 133 85		225 149 95	Ľ	245 165 A5	ľ	265 181 B5	Ĺ	305 197 C5	Ő	325 213 D5	ĺ	345 229 E5	ő	365 245 F5
0 1 1 0	6		206 134 86		226 150 96	Ś	246 166 A6	ś	266 182 B6	Ć	306 198 C6	Ö	326 214 D6	ć	346 230 E6	ö	366 246 F6
0 1 1 1	7		207 135 87		227 151 97	§	247 167 A7	ˇ	267 183 B7	Ç	307 199 C7	×	327 215 D7	ç	347 231 E7	÷	367 247 F7
1 0 0 0	8		210 136 88		230 152 98	¨	250 168 A8	¸	270 184 B8	Č	310 200 C8	Ř	330 216 D8	č	350 232 E8	ř	370 248 F8
1 0 0 1	9		211 137 89		231 153 99	Š	251 169 A9	š	271 185 B9	É	311 201 C9	Ů	331 217 D9	é	351 233 E9	ů	371 249 F9
1 0 1 0	10		212 138 8A		232 154 9A	Ş	252 170 AA	ş	272 186 BA	Ę	312 202 CA	Ú	332 218 DA	ę	352 234 EA	ú	372 250 FA
1 0 1 1	11	¨	213 139 8B		233 155 9B	Ť	253 171 AB	ť	273 187 BB	Ë	313 203 CB	Ű	333 219 DB	ë	353 235 EB	ű	373 251 FB
1 1 0 0	12		214 140 8C		234 156 9C	Ź	254 172 AC	ź	274 188 BC	Ě	314 204 CC	Ü	334 220 DC	ě	354 236 EC	ü	374 252 FC
1 1 0 1	13		215 141 8D		235 157 9D	–	255 173 AD	”	275 189 BD	Í	315 205 CD	Ý	335 221 DD	í	355 237 ED	ý	375 253 FD
1 1 1 0	14		216 142 8E		236 158 9E	Ž	256 174 AE	ž	276 190 BE	Î	316 206 CE	ţ	336 222 DE	î	356 238 EE	ţ	376 254 FE
1 1 1 1	15		217 143 8F		237 159 9F	Ż	257 175 AF	ż	277 191 BF	Đ	317 207 CF	ß	337 223 DF	đ	357 239 EF	˙	377 255 FF

Note: The character examples provided herein are representative and not exact replications generated by the printer. All characters are shown in 10 cpi; not all characters are available in all print modes.

Each shaded box  will print as a reverse question mark ¿.

KEY



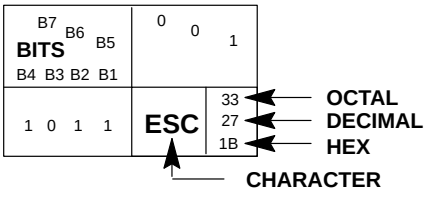
ISO Latin 5 Character Set

BITS B4 B3 B2 B1	ROW	COLUMN 0	8	GL 1	GR 9	GL 2	GR 10	GL 3	GR 11	GL 4	GR 12	GL 5	GR 13	GL 6	GR 14	GL 7	GR 15
0 0 0 0	0		0 0 0		20 16 10	NBSP	40 32 20	°	60 48 30	À	100 64 40	Ğ	120 80 50	à	140 96 60	ğ	160 112 70
0 0 0 1	1		1 1 1		21 17 11	¡	41 33 21	±	61 49 31	Á	101 65 41	Ñ	121 81 51	á	141 97 61	ñ	161 113 71
0 0 1 0	2		2 2 2		22 18 12	¢	42 34 22	2	62 50 32	Â	102 66 42	Ò	122 82 52	â	142 98 62	ò	162 114 72
0 0 1 1	3		3 3 3		23 19 13	£	43 35 23	3	63 51 33	Ã	103 67 43	Ó	123 83 53	ã	143 99 63	ó	163 115 73
0 1 0 0	4		4 4 4		24 20 14	¤	44 36 24	´	64 52 34	Ä	104 68 44	Ô	124 84 54	ä	144 100 64	ô	164 116 74
0 1 0 1	5		5 5 5		25 21 15	¥	45 37 25	µ	65 53 35	Å	105 69 45	Õ	125 85 55	å	145 101 65	õ	165 117 75
0 1 1 0	6		6 6 6		26 22 16	¦	46 38 26	¶	66 54 36	Æ	106 70 46	Ö	126 86 56	æ	146 102 66	ö	166 118 76
0 1 1 1	7		7 7 7		27 23 17	§	47 39 27	·	67 55 37	Ç	107 71 47	×	127 87 57	ç	147 103 67	÷	167 119 77
1 0 0 0	8		10 8 8		30 24 18	¨	50 40 28	¸	70 56 38	È	110 72 48	Ø	130 88 58	è	150 104 68	ø	170 120 78
1 0 0 1	9		11 9 9		31 25 19	©	51 41 29	1	71 57 39	É	111 73 49	Ù	131 89 59	é	151 105 69	ù	171 121 79
1 0 1 0	10		12 10 0 A		32 26 1A	a	52 42 2A	o	72 58 3A	Ê	112 74 4A	Ú	132 90 5A	ê	152 106 6A	ú	172 122 7A
1 0 1 1	11		13 11 0 B		33 27 1B	«	53 43 2B	»	73 59 3B	Ë	113 75 4B	Û	133 91 5B	ë	153 107 6B	û	173 123 7B
1 1 0 0	12		14 12 0 C		34 28 1C	¬	54 44 2C	1/4	74 60 3C	Ì	114 76 4C	Ü	134 92 5C	ì	154 108 6C	ü	174 124 7C
1 1 0 1	13		15 13 0 D		35 29 1D		55 45 2D	1/2	75 61 3D	Í	115 77 4D	İ	135 93 5D	í	155 109 6D	1	175 125 7D
1 1 1 0	14		16 14 0 E		36 30 1E	®	56 46 2E	3/4	76 62 3E	Î	116 78 4E	Ş	136 94 5E	î	156 110 6E	ş	176 126 7E
1 1 1 1	15		17 15 0 F		37 31 1F	―	57 47 2F	¿	77 63 3F	Ï	117 79 4F	β	137 95 5F	ï	157 111 6F	ÿ	177 127 7F

Note: The character examples provided herein are representative and not exact replications generated by the printer. All characters are shown in 10 cpi; not all characters are available in all print modes.

Each shaded box will print as a reverse question mark ¿.

KEY



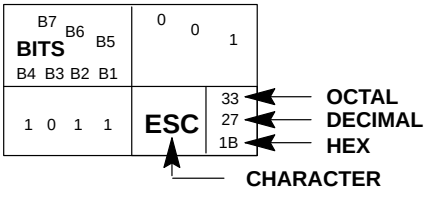
JIS Katakana Character Set

B7 B6 B5 / BITS B4 B3 B2 B1	ROW	0 0 0 COLUMN 0	8	0 0 1 GL 1	GR 9	0 1 0 GL 2	GR 10	0 1 1 GL 3	GR 11	1 0 0 GL 4	GR 12	1 0 1 GL 5	GR 13	1 1 0 GL 6	GR 14	1 1 1 GL 7	GR 15
0 0 0 0	0		0 0 0		20 16 10		40 32 20	ー	60 48 30	タ	100 64 40	ミ	120 80 50		140 96 60		160 112 70
0 0 0 1	1		1 1 1		21 17 11	・	41 33 21	ア	61 49 31	チ	101 65 41	ム	121 81 51		141 97 61		161 113 71
0 0 1 0	2		2 2 2		22 18 12	「	42 34 22	イ	62 50 32	ツ	102 66 42	メ	122 82 52		142 98 62		162 114 72
0 0 1 1	3		3 3 3		23 19 13	」	43 35 23	ウ	63 51 33	テ	103 67 43	モ	123 83 53		143 99 63		163 115 73
0 1 0 0	4		4 4 4		24 20 14	、	44 36 24	エ	64 52 34	ト	104 68 44	ヤ	124 84 54		144 100 64		164 116 74
0 1 0 1	5		5 5 5		25 21 15	・	45 37 25	オ	65 53 35	ナ	105 69 45	ユ	125 85 55		145 101 65		165 117 75
0 1 1 0	6		6 6 6		26 22 16	ヲ	46 38 26	カ	66 54 36	ニ	106 70 46	ヨ	126 86 56		146 102 66		166 118 76
0 1 1 1	7		7 7 7		27 23 17	ァ	47 39 27	キ	67 55 37	ヌ	107 71 47	ラ	127 87 57		147 103 67		167 119 77
1 0 0 0	8		10 8 8		30 24 18	ィ	50 40 28	ク	70 56 38	ネ	110 72 48	リ	130 88 58		150 104 68		170 120 78
1 0 0 1	9		11 9 9		31 25 19	ゥ	51 41 29	ケ	71 57 39	ノ	111 73 49	ル	131 89 59		151 105 69		171 121 79
1 0 1 0	10		12 10 0 A		32 26 1A	ェ	52 42 2A	コ	72 58 3A	ハ	112 74 4A	レ	132 90 5A		152 106 6A		172 122 7A
1 0 1 1	11		13 11 0 B		33 27 1B	ォ	53 43 2B	サ	73 59 3B	ヒ	113 75 4B	ロ	133 91 5B		153 107 6B		173 123 7B
1 1 0 0	12		14 12 0 C		34 28 1C	ャ	54 44 2C	シ	74 60 3C	フ	114 76 4C	ワ	134 92 5C		154 108 6C		174 124 7C
1 1 0 1	13		15 13 0 D		35 29 1D	ュ	55 45 2D	ス	75 61 3D	ヘ	115 77 4D	ン	135 93 5D		155 109 6D		175 125 7D
1 1 1 0	14		16 14 0 E		36 30 1E	ョ	56 46 2E	セ	76 62 3E	ホ	116 4E	゛	136 94 5E		156 110 6E		176 126 7E
1 1 1 1	15		17 15 0 F		37 31 1F	ッ	57 47 2F	ソ	77 63 3F	マ	117 79 4F	°	137 95 5F		157 111 6F		177 127 7F

Note: The character examples provided herein are representative and not exact replications generated by the printer. All characters are shown in 10 cpi; not all characters are available in all print modes.

Each shaded box will print as a reverse question mark ?.

KEY



B Interface Configuration with the VMS Operating System

Parallel Interface

When using the parallel interface with the VMS operating system, configure the printer with the SET PRINTER command, as shown below:

Printer LCA0:, device type unknown, is on–line, allocated record–oriented device, carriage control, device is spooled through an intermediate device, error logging is enabled.

Error count	0
Owner process	“SYMBIONT_0001”
Owner process ID	00000087
Reference Count	2
Page width	132
Carriage return	Formfeed
No passall	No Wrap
No Fallback	Tab
Intermediate device:	DUA1
Associated queue:	LCA0
Operations completed	1
Owner UIC	[0, 0]
Dev Prot	S:RWLP, 0:RWLP, W:RWLP
Default buffer size	132
Page length	66
Lowercase	
Printall	
No Truncate	

Serial Interface

When using the serial interface with the VMS operating system, configure the terminal characteristics with the SET TERM command, as shown below:

```
Terminal: _TXA3:   Device_Type: Unknown    Owner: SYMBIONT_0001
                                           Username: SYSTEM

Input:   9600*    LFfill: 0   Width: 136   Parity: None
Output: 9600*    CRfill: 0   Page:    66
```

Terminal Characteristics:

Interactive	Echo	Type_ahead	No_Escape
No_Hostsync	TTsync	Lowercase	Tab
No_Wrap	Scope	No_Remote	No_Eightbit
No_Broadcast	No_Readsync	Form	Fulldup
No_Modem	No_Local_echo	No_Autobaud	No_Hangup
No_Brdcstambx	No_DMA	No_Altypeahd	Set_speed
Line_Editing	Overstrike_editing	No_Fallback	No_Dialup
No_Secure_server	No_Disconnect	No_Pasthru	No_Syspassword
No_SIXEL_Graphics	No_Soft_Characters	No_Printer_Port	Numeric_Keypad
No_ANSI_CRT	No_Regis	No_Block_mode	No_Advanced_video
No_Edit_mode	No_DEC_CRT	No_DEC_CRT	

Device spooled to _DUAL:

* Match baud rate to printer settings.

C Type Family IDs, Font IDs, Font File IDs

Contents

“Built–In” Font File IDs

This appendix explains the values used in the font file identification strings (IDs) for the font files stored in printer ROM. It also lists all the font file IDs available in Digital emulation mode.

The Font File ID Field Definitions table on page C–3 lists and defines all the values in a font file ID. The values are based on 36 possible values (0–9, A–Z).

The table shows the relationship between type family IDs, font IDs, and font file IDs.

Notice, for example, that the 31–character **font file ID** also contains the type family ID and font ID. The **type family ID** is field 1 (the first 7 characters) of the 31–character font file ID. The **font ID** consists of fields 1 through 7 (the first 16 characters) of the 31–character font file ID.

Font File ID Field Definitions

	Field	Bytes	Field Name	Value	Meaning
Font ID	1	1 to 7	**Type family ID**	R	Registered internationally or in the public domain
				D	DIGITAL reserved
	2	8	Spacing	E	5 pitch
				I	6 pitch
				G	7 pitch
				W	8.33 pitch
				J	10 pitch
				2	10.3 pitch
				L	12 pitch
				4	13.3 pitch
				1	13.6 pitch
				O	15 pitch
				5	16.7 pitch
	3	9 to 11	Type Size	02S	10 point
				03C	12 point
				050	18 point
	4	12	Scale Factor	K	No scaling (1:1)
	5	13 to 14	Style	00	Normal
				01	Italic
	6	15	Weight	G	Regular
	7	16	Proportion	G	Regular
	8	17 to 18	Rotation	00	No rotation
	9	19 to 21	Character Set	01C	VT100
				01O	DEC supplemental
				01Q	DEC technical
				01U	ASCII
				GDE	ISO Latin 2
				GDI	ISO Greek
				GDK	ISO Hebrew
				GDO	ISO Cyrillic
				GDP	ISO Latin 5
	10	22 to 25	Character	ZZZZ	Full character set subset
	11	26 to 27	File encoding	02	Binary (See NOTE below.)
				B	100 dots per inch
	12	28	Resolution	D	200 dots per inch
				Z	Other
	13	29	Reserved	0	Reserved
	14	30	Reserved	0	Reserved
	15	31	Reserved	0	Reserved

NOTE: This field is used only for the file name and not to distinguish between a sixel file and a binary file.

Type Family IDs

The type families available in Digital emulation mode have the following names and identification strings:

Type Family Name	Identification String (ID)
Compressed Print	DCMPRSS
Correspondence Plot	DCRRSPL
Correspondence Print	DCRRSPN
Data Processing	DBULTN1
Draft Plot	DDRAFT0
High Speed Draft Print	DDRAFT1
LG Near Letter Quality	DLGNRLQ
Low Density Plot	DLODENS
OCR A	ROCRA00
OCR B	ROCRB00

The D in the ID string for DCRRSPN means the name Correspondence Print is registered with DIGITAL, but is not registered internationally. The R in the ID strings for OCR A and OCR B means these names are registered internationally or are in the public domain.

Font File IDs

This section lists all type family names, type family IDs, font IDs, and font file IDs available in Digital emulation mode.

The 31–character **font file ID** also contains the type family ID and font ID. The **type family ID** is the first 7 characters of the font file ID. The **font ID** is the first 16 characters of the 31–character font file ID.

Pitch	Type Size	Character Set	Font File ID (entire string) Font ID (First 16 characters)
1. Type Family Name: **DEC Built–in 1 (Data Processing)**			Type Family ID: DBULTN1
5	12	ASCII	DBULTN1 E 03C K 00 G G 00 01U ZZZZ 02 Z 0 0 0
5	12	DEC supp.	DBULTN1 E 03C K 00 G G 00 01O ZZZZ 02 Z 0 0 0
5	12	DEC tech.	DBULTN1 E 03C K 00 G G 00 01Q ZZZZ 02 Z 0 0 0
5	12	ISO Latin 2	DBULTN1 E 03C K 00 G G 00 GDE ZZZZ 02 Z 0 0 0
5	12	ISO Cyrillic	DBULTN1 E 03C K 00 G G 00 GDO ZZZZ 02 Z 0 0 0
5	12	ISO Greek	DBULTN1 E 03C K 00 G G 00 GDI ZZZZ 02 Z 0 0 0
5	12	ISO Hebrew	DBULTN1 E 03C K 00 G G 00 GDK ZZZZ 02 Z 0 0 0
5	12	ISO Latin 5	DBULTN1 E 03C K 00 G G 00 GDP ZZZZ 02 Z 0 0 0
5	12	VT 100	DBULTN1 E 03C K 00 G G 00 01C ZZZZ 02 Z 0 0 0
6	12	ASCII	DBULTN1 I 03C K 00 G G 00 01U ZZZZ 02 Z 0 0 0
6	12	DEC supp.	DBULTN1 I 03C K 00 G G 00 01O ZZZZ 02 Z 0 0 0
6	12	DEC tech.	DBULTN1 I 03C K 00 G G 00 01Q ZZZZ 02 Z 0 0 0
6	12	ISO Latin 2	DBULTN1 I 03C K 00 G G 00 GDE ZZZZ 02 Z 0 0 0
6	12	ISO Cyrillic	DBULTN1 I 03C K 00 G G 00 GDO ZZZZ 02 Z 0 0 0
6	12	ISO Greek	DBULTN1 I 03C K 00 G G 00 GDI ZZZZ 02 Z 0 0 0
6	12	ISO Hebrew	DBULTN1 I 03C K 00 G G 00 GDK ZZZZ 02 Z 0 0 0
6	12	ISO Latin 5	DBULTN1 I 03C K 00 G G 00 GDP ZZZZ 02 Z 0 0 0
6	12	VT 100	DBULTN1 I 03C K 00 G G 00 01C ZZZZ 02 Z 0 0 0
10	12	ASCII	DBULTN1 J 03C K 00 G G 00 01U ZZZZ 02 Z 0 0 0
10	12	DEC supp.	DBULTN1 J 03C K 00 G G 00 01O ZZZZ 02 Z 0 0 0
10	12	DEC tech.	DBULTN1 J 03C K 00 G G 00 01Q ZZZZ 02 Z 0 0 0
10	12	ISO Latin 2	DBULTN1 J 03C K 00 G G 00 GDE ZZZZ 02 Z 0 0 0
10	12	ISO Cyrillic	DBULTN1 J 03C K 00 G G 00 GDO ZZZZ 02 Z 0 0 0
10	12	ISO Greek	DBULTN1 J 03C K 00 G G 00 GDI ZZZZ 02 Z 0 0 0
10	12	ISO Hebrew	DBULTN1 J 03C K 00 G G 00 GDK ZZZZ 02 Z 0 0 0
10	12	ISO Latin 5	DBULTN1 J 03C K 00 G G 00 GDP ZZZZ 02 Z 0 0 0
10	12	VT100	DBULTN1 J 03C K 00 G G 00 01C ZZZZ 02 Z 0 0 0
12	12	ASCII	DBULTN1 L 03C K 00 G G 00 01U ZZZZ 02 Z 0 0 0
12	12	DEC supp.	DBULTN1 L 03C K 00 G G 00 01O ZZZZ 02 Z 0 0 0
12	12	DEC tech.	DBULTN1 L 03C K 00 G G 00 01Q ZZZZ 02 Z 0 0 0
12	12	ISO Latin 2	DBULTN1 L 03C K 00 G G 00 GDE ZZZZ 02 Z 0 0 0
12	12	ISO Cyrillic	DBULTN1 L 03C K 00 G G 00 GDO ZZZZ 02 Z 0 0 0
12	12	ISO Greek	DBULTN1 L 03C K 00 G G 00 GDI ZZZZ 02 Z 0 0 0
12	12	ISO Hebrew	DBULTN1 L 03C K 00 G G 00 GDK ZZZZ 02 Z 0 0 0
12	12	ISO Latin 5	DBULTN1 L 03C K 00 G G 00 GDP ZZZZ 02 Z 0 0 0
12	12	VT 100	DBULTN1 L 03C K 00 G G 00 01C ZZZZ 02 Z 0 0 0
15	10	ASCII	DBULTN1 O 02S K 00 G G 00 01U ZZZZ 02 Z 0 0 0
15	10	DEC supp.	DBULTN1 O 02S K 00 G G 00 01O ZZZZ 02 Z 0 0 0
15	10	DEC tech.	DBULTN1 O 02S K 00 G G 00 01Q ZZZZ 02 Z 0 0 0
15	10	ISO Latin 2	DBULTN1 O 02S K 00 G G 00 GDE ZZZZ 02 Z 0 0 0
15	10	ISO Cyrillic	DBULTN1 O 02S K 00 G G 00 GDO ZZZZ 02 Z 0 0 0
15	10	ISO Greek	DBULTN1 O 02S K 00 G G 00 GDI ZZZZ 02 Z 0 0 0
15	10	ISO Hebrew	DBULTN1 O 02S K 00 G G 00 GDK ZZZZ 02 Z 0 0 0
15	10	ISO Latin 5	DBULTN1 O 02S K 00 G G 00 GDP ZZZZ 02 Z 0 0 0
15	10	VT 100	DBULTN1 O 02S K 00 G G 00 01C ZZZZ 02 Z 0 0 0

NOTE: The font file IDs are spaced for clarity. The spaces are not part of the actual ID strings.

Pitch	Type Size	Character Set	Font File ID (entire string) Font ID (First 16 characters)
2. Type Family Name: **Correspondence Print**			Type Family ID: DCRRSPN
5	10	ASCII	DCRRSPN E 02S K 00 G G 00 01U ZZZZ 02 Z 0 0 0
5	10	DEC supp.	DCRRSPN E 02S K 00 G G 00 01O ZZZZ 02 Z 0 0 0
5	10	DEC tech.	DCRRSPN E 02S K 00 G G 00 01Q ZZZZ 02 Z 0 0 0
5	10	ISO Latin 2	DCRRSPN E 02S K 00 G G 00 GDE ZZZZ 02 Z 0 0 0
5	10	ISO Cyrillic	DCRRSPN E 02S K 00 G G 00 GDO ZZZZ 02 Z 0 0 0
5	10	ISO Greek	DCRRSPN E 02S K 00 G G 00 GDI ZZZZ 02 Z 0 0 0
5	10	ISO Hebrew	DCRRSPN E 02S K 00 G G 00 GDK ZZZZ 02 Z 0 0 0
5	10	ISO Latin 5	DCRRSPN E 02S K 00 G G 00 GDP ZZZZ 02 Z 0 0 0
5	10	VT 100	DCRRSPN E 02S K 00 G G 00 01C ZZZZ 02 Z 0 0 0
6	10	ASCII	DCRRSPN I 02S K 00 G G 00 01U ZZZZ 02 Z 0 0 0
6	10	DEC supp.	DCRRSPN I 02S K 00 G G 00 01O ZZZZ 02 Z 0 0 0
6	10	DEC tech.	DCRRSPN I 02S K 00 G G 00 01Q ZZZZ 02 Z 0 0 0
6	10	ISO Latin 2	DCRRSPN I 02S K 00 G G 00 GDE ZZZZ 02 Z 0 0 0
6	10	ISO Cyrillic	DCRRSPN I 02S K 00 G G 00 GDO ZZZZ 02 Z 0 0 0
6	10	ISO Greek	DCRRSPN I 02S K 00 G G 00 GDI ZZZZ 02 Z 0 0 0
6	10	ISO Hebrew	DCRRSPN I 02S K 00 G G 00 GDK ZZZZ 02 Z 0 0 0
6	10	ISO Latin 5	DCRRSPN I 02S K 00 G G 00 GDP ZZZZ 02 Z 0 0 0
6	10	VT 100	DCRRSPN I 02S K 00 G G 00 01C ZZZZ 02 Z 0 0 0
10	10	ASCII	DCRRSPN J 02S K 00 G G 00 01U ZZZZ 02 Z 0 0 0
10	10	DEC supp.	DCRRSPN J 02S K 00 G G 00 01O ZZZZ 02 Z 0 0 0
10	10	DEC tech.	DCRRSPN J 02S K 00 G G 00 01Q ZZZZ 02 Z 0 0 0
10	10	ISO Latin 2	DCRRSPN J 02S K 00 G G 00 GDE ZZZZ 02 Z 0 0 0
10	10	ISO Cyrillic	DCRRSPN J 02S K 00 G G 00 GDO ZZZZ 02 Z 0 0 0
10	10	ISO Greek	DCRRSPN J 02S K 00 G G 00 GDI ZZZZ 02 Z 0 0 0
10	10	ISO Hebrew	DCRRSPN J 02S K 00 G G 00 GDK ZZZZ 02 Z 0 0 0
10	10	ISO Latin 5	DCRRSPN J 02S K 00 G G 00 GDP ZZZZ 02 Z 0 0 0
10	10	VT 100	DCRRSPN J 02S K 00 G G 00 01C ZZZZ 02 Z 0 0 0
12	10	ASCII	DCRRSPN L 02S K 00 G G 00 01U ZZZZ 02 Z 0 0 0
12	10	DEC supp.	DCRRSPN L 02S K 00 G G 00 01O ZZZZ 02 Z 0 0 0
12	10	DEC tech.	DCRRSPN L 02S K 00 G G 00 01Q ZZZZ 02 Z 0 0 0
12	10	ISO Latin 2	DCRRSPN L 02S K 00 G G 00 GDE ZZZZ 02 Z 0 0 0
12	10	ISO Cyrillic	DCRRSPN L 02S K 00 G G 00 GDO ZZZZ 02 Z 0 0 0
12	10	ISO Greek	DCRRSPN L 02S K 00 G G 00 GDI ZZZZ 02 Z 0 0 0
12	10	ISO Hebrew	DCRRSPN L 02S K 00 G G 00 GDK ZZZZ 02 Z 0 0 0
12	10	ISO Latin 5	DCRRSPN L 02S K 00 G G 00 GDP ZZZZ 02 Z 0 0 0
12	10	VT 100	DCRRSPN L 02S K 00 G G 00 01C ZZZZ 02 Z 0 0 0
15	10	ASCII	DCRRSPN O 02S K 00 G G 00 01U ZZZZ 02 Z 0 0 0
15	10	DEC supp.	DCRRSPN O 02S K 00 G G 00 01O ZZZZ 02 Z 0 0 0
15	10	DEC tech.	DCRRSPN O 02S K 00 G G 00 01Q ZZZZ 02 Z 0 0 0
15	10	ISO Latin 2	DCRRSPN O 02S K 00 G G 00 GDE ZZZZ 02 Z 0 0 0
15	10	ISO Cyrillic	DCRRSPN O 02S K 00 G G 00 GDO ZZZZ 02 Z 0 0 0
15	10	ISO Greek	DCRRSPN O 02S K 00 G G 00 GDI ZZZZ 02 Z 0 0 0
15	10	ISO Hebrew	DCRRSPN O 02S K 00 G G 00 GDK ZZZZ 02 Z 0 0 0
15	10	ISO Latin 5	DCRRSPN O 02S K 00 G G 00 GDP ZZZZ 02 Z 0 0 0
15	10	VT 100	DCRRSPN O 02S K 00 G G 00 01C ZZZZ 02 Z 0 0 0

NOTE: The font file IDs are spaced for clarity. The spaces are not part of the actual ID strings.

Pitch	Type Size	Character Set	Font File ID (entire string) Font ID (First 16 characters)
3. Type Family Name: **OCR A**			Type Family ID: ROCRA00
10	10	ASCII	ROCRA00 J 02S K 00 G G 00 01U ZZZZ 02 Z 0 0 0
4. Type Family Name: **OCR B**			Type Family ID: ROCRB00
10	10	ASCII	ROCRB00 J 02S K 00 G G 00 01U ZZZZ 02 Z 0 0 0
5. Type Family Name: **Compressed Print**			Type Family ID: DCMPRSS
6.67	10	ASCII	DCMPRSS I 02S K 00 G G 00 01U ZZZZ 02 Z 0 0 0
6.67	10	DEC supp.	DCMPRSS I 02S K 00 G G 00 01O ZZZZ 02 Z 0 0 0
6.67	10	DEC tech.	DCMPRSS I 02S K 00 G G 00 01Q ZZZZ 02 Z 0 0 0
6.67	10	ISO Latin 2	DCMPRSS I 02S K 00 G G 00 GDE ZZZZ 02 Z 0 0 0
6.67	10	ISO Cyrillic	DCMPRSS I 02S K 00 G G 00 GDO ZZZZ 02 Z 0 0 0
6.67	10	ISO Greek	DCMPRSS I 02S K 00 G G 00 GDI ZZZZ 02 Z 0 0 0
6.67	10	ISO Hebrew	DCMPRSS I 02S K 00 G G 00 GDK ZZZZ 02 Z 0 0 0
6.67	10	ISO Latin 5	DCMPRSS I 02S K 00 G G 00 GDP ZZZZ 02 Z 0 0 0
6.67	10	VT 100	DCMPRSS 4 02S K 00 G G 00 01C ZZZZ 02 Z 0 0 0
8.33	10	ASCII	DCMPRSS W 02S K 00 G G 00 01U ZZZZ 02 Z 0 0 0
8.33	10	DEC supp.	DCMPRSS W 02S K 00 G G 00 01O ZZZZ 02 Z 0 0 0
8.33	10	DEC tech.	DCMPRSS W 02S K 00 G G 00 01Q ZZZZ 02 Z 0 0 0
8.33	10	ISO Latin 2	DCMPRSS W 02S K 00 G G 00 GDE ZZZZ 02 Z 0 0 0
8.33	10	ISO Cyrillic	DCMPRSS W 02S K 00 G G 00 GDO ZZZZ 02 Z 0 0 0
8.33	10	ISO Greek	DCMPRSS W 02S K 00 G G 00 GDI ZZZZ 02 Z 0 0 0
8.33	10	ISO Hebrew	DCMPRSS W 02S K 00 G G 00 GDK ZZZZ 02 Z 0 0 0
8.33	10	ISO Latin 5	DCMPRSS W 02S K 00 G G 00 GDP ZZZZ 02 Z 0 0 0
8.33	10	VT 100	DCMPRSS 4 02S K 00 G G 00 01C ZZZZ 02 Z 0 0 0
13.3	10	ASCII	DCMPRSS 4 02S K 00 G G 00 01U ZZZZ 02 Z 0 0 0
13.3	10	DEC supp.	DCMPRSS 4 02S K 00 G G 00 01O ZZZZ 02 Z 0 0 0
13.3	10	DEC tech.	DCMPRSS 4 02S K 00 G G 00 01Q ZZZZ 02 Z 0 0 0
13.3	10	ISO Latin 2	DCMPRSS 4 02S K 00 G G 00 GDE ZZZZ 02 Z 0 0 0
13.3	10	ISO Cyrillic	DCMPRSS 4 02S K 00 G G 00 GDO ZZZZ 02 Z 0 0 0
13.3	10	ISO Greek	DCMPRSS 4 02S K 00 G G 00 GDI ZZZZ 02 Z 0 0 0
13.3	10	ISO Hebrew	DCMPRSS 4 02S K 00 G G 00 GDK ZZZZ 02 Z 0 0 0
13.3	10	ISO Latin 5	DCMPRSS 4 02S K 00 G G 00 GDP ZZZZ 02 Z 0 0 0
13.3	10	VT 100	DCMPRSS 4 02S K 00 G G 00 01C ZZZZ 02 Z 0 0 0
16.7	10	ASCII	DCMPRSS 5 02S K 00 G G 00 01U ZZZZ 02 Z 0 0 0
16.7	10	DEC supp.	DCMPRSS 5 02S K 00 G G 00 01O ZZZZ 02 Z 0 0 0
16.7	10	DEC tech.	DCMPRSS 5 02S K 00 G G 00 01Q ZZZZ 02 Z 0 0 0
16.7	10	ISO Latin 2	DCMPRSS 5 02S K 00 G G 00 GDE ZZZZ 02 Z 0 0 0
16.7	10	ISO Cyrillic	DCMPRSS 5 02S K 00 G G 00 GDO ZZZZ 02 Z 0 0 0
16.7	10	ISO Greek	DCMPRSS 5 02S K 00 G G 00 GDI ZZZZ 02 Z 0 0 0
16.7	10	ISO Hebrew	DCMPRSS 5 02S K 00 G G 00 GDK ZZZZ 02 Z 0 0 0
16.7	10	ISO Latin 5	DCMPRSS 5 02S K 00 G G 00 GDP ZZZZ 02 Z 0 0 0
16.7	10	VT 100	DCMPRSS 5 02S K 00 G G 00 01C ZZZZ 02 Z 0 0 0
6. Type Family Name: **High Speed Draft Print**			Type Family ID: DDRAFT1
10	12	ASCII	DDRAFT1 J 03C K 00 G G 00 01U ZZZZ 02 Z 0 0 0
10	12	DEC Supp.	DDRAFT1 J 03C K 00 G G 00 01O ZZZZ 02 Z 0 0 0

NOTE: The font file IDs are spaced for clarity. The spaces are not part of the actual ID strings.

Pitch	Type Size	Character Set	Font File ID (entire string) Font ID (First 16 characters)
7. Type Family Name: **LG Near Letter Quality**			Type Family ID: DLGNRLQ
7	18	ASCII	DLGNRLQ G 050 K 00 G G 00 01U ZZZZ 02 D 0 0 0
7	18	DEC supp.	DLGNRLQ G 050 K 00 G G 00 01O ZZZZ 02 D 0 0 0
7	18	VT100	DLGNRLQ G 050 K 00 G G 00 01C ZZZZ 02 D 0 0 0
7	18	ISO Latin 1	DLGNRLQ G 050 K 00 G G 00 6DD ZZZZ 02 D 0 0 0
10	12	ASCII	DLGNRLQ J 03C K 00 G G 00 01U ZZZZ 02 D 0 0 0
10	12	DEC supp.	DLGNRLQ J 03C K 00 G G 00 01O ZZZZ 02 D 0 0 0
10	12	DEC tech.	DLGNRLQ J 03C K 00 G G 00 01Q ZZZZ 02 D 0 0 0
10	12	VT100	DLGNRLQ J 03C K 00 G G 00 01C ZZZZ 02 D 0 0 0
10	12	ISO Latin 1	DLGNRLQ J 03C K 00 G G 00 6DD ZZZZ 02 D 0 0 0
10	12	VT100 italic	DLGNRLQ J 03C K 01 G G 00 01C ZZZZ 02 D 0 0 0
10	12	ASCII italic	DLGNRLQ J 03C K 01 G G 00 01U ZZZZ 02 D 0 0 0
10	12	DEC supp. ital.	DLGNRLQ J 03C K 01 G G 00 01O ZZZZ 02 D 0 0 0
10	12	ISO Latin 1 ital.	DLGNRLQ J 03C K 01 G G 00 6DD ZZZZ 02 D 0 0 0
14.1	5	VT100	DLGNRLQ N 01N K 00 G G 00 01C ZZZZ 02 D 0 0 0
14.1	5	DEC supp.	DLGNRLQ N 01N K 00 G G 00 01O ZZZZ 02 D 0 0 0
14.1	5	ASCII	DLGNRLQ N 01N K 00 G G 00 01U ZZZZ 02 D 0 0 0
14.1	5	ISO Latin 1	DLGNRLQ N 01N K 00 G G 00 6DD ZZZZ 02 D 0 0 0
8. Type Family Name: **Draft Plot**			Type Family ID: DDRAFT0
10	12	ASCII	DDRAFT0 J 03C K 00 G G 00 01U ZZZZ 02 B 0 0 0
10	12	DEC supp.	DDRAFT0 J 03C K 00 G G 00 01O ZZZZ 02 B 0 0 0
10	12	DEC tech.	DDRAFT0 J 03C K 00 G G 00 01Q ZZZZ 02 B 0 0 0
10	12	VT100	DDRAFT0 J 03C K 00 G G 00 01C ZZZZ 02 B 0 0 0
10	12	ISO Latin 1	DDRAFT0 J 03C K 00 G G 00 6DD ZZZZ 02 B 0 0 0
9. Type Family Name: **Low Density Plot**			Type Family ID: DLODENS
10	10	ASCII	DLODENS J 03C K 00 G G 00 01U ZZZZ 02 Z 0 0 0
10. Type Family Name: **Correspondence Plot**			Type Family ID: DCRRSPL
10	10	ASCII	DCRRSPL J 02S K 00 G G 00 01U ZZZZ 02 D 0 0 0
10	10	DEC supp.	DCRRSPL J 02S K 00 G G 00 01O ZZZZ 02 D 0 0 0
10	10	VT100	DCRRSPL J 02S K 00 G G 00 01C ZZZZ 02 D 0 0 0
10	10	ISO Latin 1	DCRRSPL J 02S K 00 G G 00 6DD ZZZZ 02 D 0 0 0
10	10	VT100 italic	DCRRSPL J 02S K 01 G G 00 01C ZZZZ 02 D 0 0 0
10	10	DEC supp. ital.	DCRRSPL J 02S K 01 G G 00 010 ZZZZ 02 D 0 0 0
10	10	ASCII italic	DCRRSPL J 02S K 01 G G 00 01U ZZZZ 02 D 0 0 0
10	10	ISO Latin 1 ital.	DCRRSPL J 02S K 01 G G 00 6DD ZZZZ 02 D 0 0 0

NOTE: The font file IDs are spaced for clarity. The spaces are not part of the actual ID strings.

D Print Samples

Contents

Introduction

This appendix contains sample programs that illustrate how to use Digital control sequences and bar code control sequences in applications.

Digital control sequences are described in Chapter 2, “Digital Emulation.” Bar code control sequences are described in Chapter 4.

NOTE: The print samples in this appendix were printed on an LG*plus* printer.

Creating Block Characters

The block character examples use the following escape sequences:

```
ESC[P1;P2’r Set Block Character Parameters (DECBCS)
ESC%SP1 Start Block Character Mode (DECBLOCKC)
ESC%@   Stop Block Character Mode
```

The following command sequences create the block characters shown in Figure D–1:

Black Characters, White Background

```
CSI3;3;0;0;0’r
ESC% 1BLOCK CHARACTERSESC%@
```

White Characters, Black Background

```
CSI4;2;1;0;0’r
ESC% 1BLACK BACKGROUNDESC%@
```

Landscape Character Orientation

```
CSI2;4;0;0;2’r
ESC% 1LANDSCAPEESC%@
```

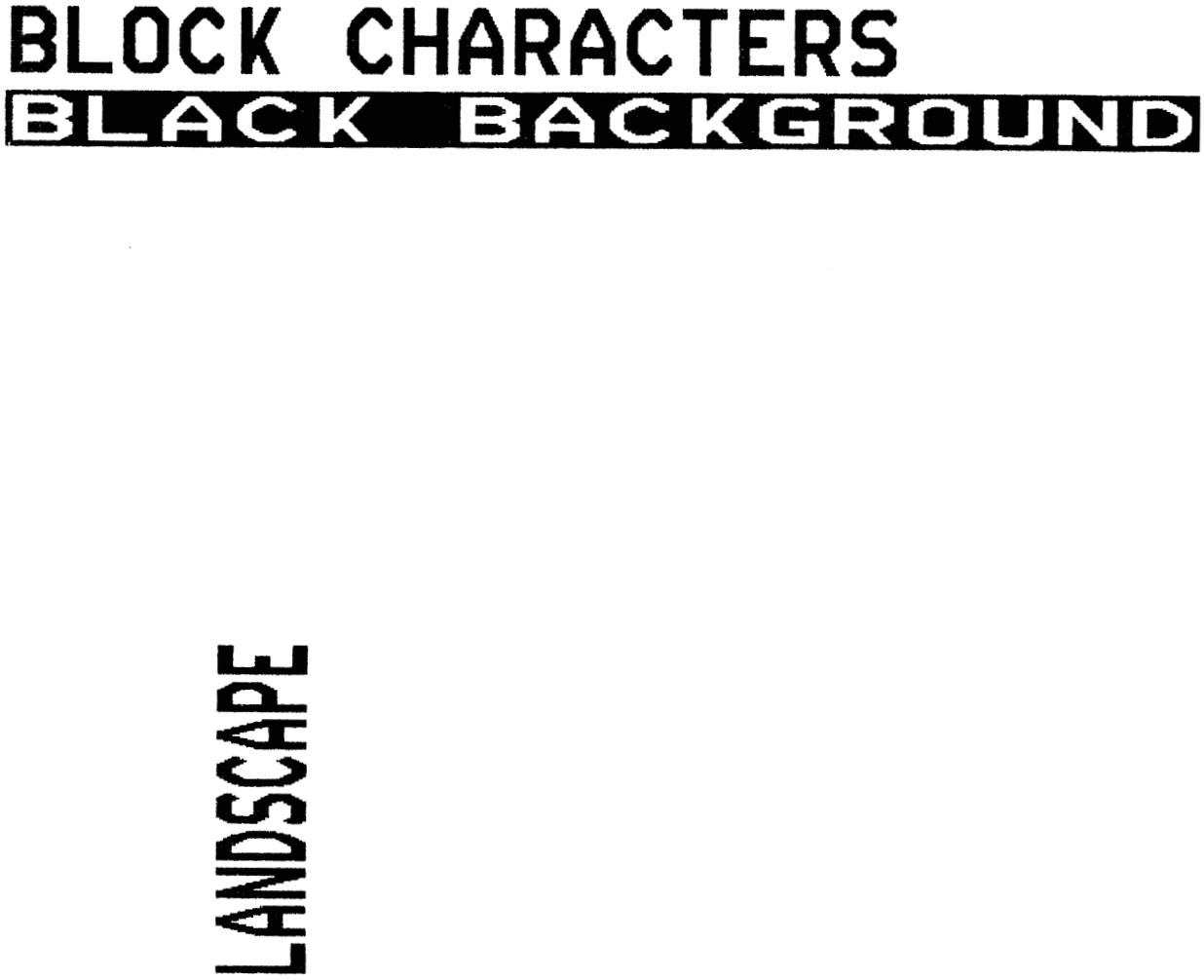


Figure D–1. Block Characters

Bar Codes

Bar code escape sequences determine the type of bar code, its attributes, and start and stop bar code printing. Bar code escape sequences are defined in Chapter 4.

The bar code examples in this section use the following escape sequences:

```
CSIP1;P2; ... P9'q  Select Bar Code Attributes
(DECSBCA)
ESC%SP0 Start Bar Coding (DECBARC)
ESC%@   Stop Bar Coding
```

Interleaved 2 of 5

The following command sequences create the bar code shown in Figure D–2. The bar code is oriented portrait and coded to include human–readable characters in the OCR–A font.

```
CSI1;;;;;;;;3'q
ESC% 00123456789ESC%@
```

Figure D–2. Interleaved 2 of 5 Bar Code

Code 39

The following command sequences create the bar code shown in Figure D–3. This bar code is rotated –90 degrees for landscape orientation and is coded to include human–readable characters in the currently active font.

```
CSI2;;;;;;;2;2'q
ESC% 00123456789ABCESC%@
```

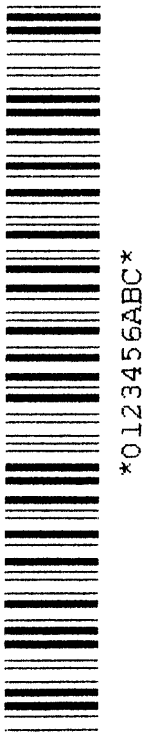


Figure D–3. Code 39 Bar Code

Logos

The following command sequences create the logo graphic shown in Figure D–4:

```
DCS0;1&t400016Square00086
250;1;1500\
333;1;250;1000;250\
333;1;250;333;333;333;250\
333;1;250;1000;250\
250;1;1500\
ST
CSI1&}
```

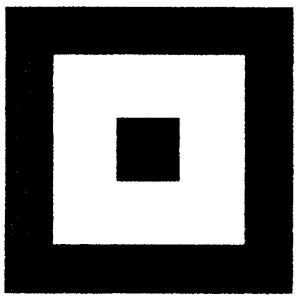


Figure D–4. Box Logo

Sixel Graphics

The command sequences listed below create the sixel graphics output shown in Figure D–5:

```
ESCP;;6q
!200~!200?!200~-
!200~!200?!200~-
!200~!200?!200~-
!200?!200~!200?-
!200?!200~!200?-
!200?!200~!200?-
!200~!200?!200~-
!200~!90?~!18'~!90?!200~-
!200~!200?!200~-
!200?!200~!200?-
!200?!200~!200?-
!200?!200~!200?-
!200~!200?!200~-
!200~!200?!200~-
!200~!200?!200~-
ST
```

Figure D–5. Sixel Graphic

The memo form shown in Figure D–6 was created with the program illustrated below.

```
ESC c DCS 0 ;3&p04Memo%@00234
%1B[ 2g%1B[ 11l%1B[ 5;127s%1B[ 2;66r%1B[ 45u
********************%0D%0A
*  d i g i t a l   *%09INTEROFFICE MEMO%0D%0A
********************%0D%0A%0A
TO: @%09DATE: @
%09FROM: @
%09DEPT: @
%09EXT:  @
%09LOC/MAIL STOP: @
%09ENG. NET. : @%1B[ 2e
SUBJECT: @%0D%1B[ 2e
@ ST


DCS 0 ; 64&rMemo ST Test and Verification@20  March 1995
@Jane Doe
@Engineering
@555–0009
@ENG/HDO
@NODE::SMITH DCS0&qMemo ST
@LG PERFORMANCE ANALYSIS
@Please do a performance analysis on the following functions.
ESC #  1
```

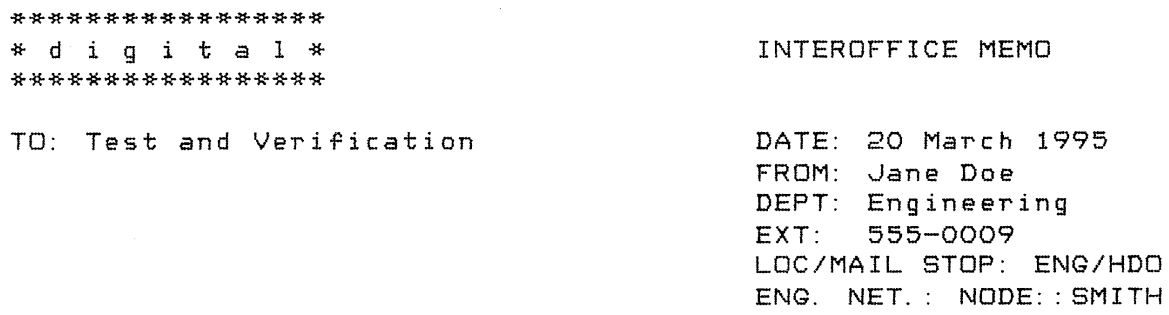


Figure D–6. Memo Form

The payroll deduction form shown in Figure D–7 (see page D–12) was created with the program illustrated below.

```
CSI 300 ; 5000s CSI 300 ; 6300r

DCS 0 ; 3&p07Payroll^~01367
^1B [ 11h^1B [ 7 I

^1B [ 0 ; 200 ; 1100 ; 4600 ; 5!¦
^1B [ 0 ; 4800 ; 1100 ; 5000 ; 5!¦
^1B [ 0 ; 200 ; 6100 ; 4605 ; 5!¦
^1B [ 0 ; 200 ; 1100 ; 5000 ; 5!¦

^1B [ 300 ‘ ^1B [ 1300d ^1B [ 3&}
^1B [ 2 ; 2 ; 0 ; 0 ; 0 ‘ r
^1B [ 300 ‘ ^1B [ 1500d^09^09^09^1B [ 2 ; 2 ; 0 ; 0 ; 0 ’ r ^1B% 1PAYROLL
DEDUCTIONS^1B%@
^1B [ 0 ; 300 ; 1900 ; 4400 ; 10!¦
^1B [ 0 ; 300 ; 2600 ; 4400 ; 10!¦
^1B [ 1600 ‘ ^1B [ 2000d ^1B [ 2 ; 1 ; 0 ; 0 ; 0 ’ r ^1B% 1INSTRUCTIONS ^1B%@
^1B [ 300 ‘ ^1B [ 2300d1. Complete the Appropriate section(s) below.
^1B [ 300 ‘ ^1B [ 2400d2. Be sure to sign, date and write your employee number
^1B [ 300 ‘ ^1B [ 2500d in each section you complete.
^1B [ 600 ‘ ^1B [ 2700d^1B% 1EMPLOYEE’S WITHHOLDING EXEMPTION^1B%@

^1B [ 0 ; 300 ; 2900 ; 2000 ; 10!¦
^1B [ 0 ; 300 ; 4300 ; 2000 ; 10!¦
^1B [ 0 ; 300 ; 2900 ; 1400 ; 10!¦
^1B [ 0 ; 2300 ; 2900 ; 1400 ; 10!¦
^1B [ 0 ; 300 ; 3100 ; 2000 ; 10!¦

^1B [ 0 ; 420 ; 3300 ; 200 ; 10!¦
^1B [ 0 ; 420 ; 3500 ; 200 ; 10!¦
^1B [ 1 ; 420 ; 3300 ; 200 ; 10!¦
^1B [ 1 ; 620 ; 3300 ; 200 ; 10!¦

^1B [ 0 ; 420 ; 3600 ; 200 ; 10!¦
^1B [ 0 ; 420 ; 3800 ; 200 ; 10!¦
^1B [ 1 ; 420 ; 3600 ; 200 ; 10!¦
^1B [ 1 ; 620 ; 3600 ; 200 ; 10!¦

^1B [ 0 ; 420 ; 3900 ; 200 ; 10!¦
^1B [ 0 ; 420 ; 4100 ; 200 ; 10!¦
^1B [ 1 ; 420 ; 3900 ; 200 ; 10!¦
^1B [ 1 ; 620 ; 3900 ; 200 ; 10!¦

^1B [ 0 ; 300 ; 4800 ; 2000 ; 10!¦
^1B [ 2300 ‘ ^1B [ 4790d Date
^1B [ 0 ; 2600 ; 4800 ; 1000 ; ’10!¦
```

```
^1B[1050‘^1B[3050dTax Status
^1B[650‘^1B[3400dSingle
^1B[650‘^1B[3700dMarried
^1B[650‘^1B[4000dMarried/higher single rate
^1B[300‘^1B[5200dEmployee Signature

^1B[0;;;;;;;1;2’q
^1B[2400‘^1B[5500d
^1B%00123456789^1B%@

^1B[470‘^1B[3350d^1B%1~^1B%@
^1B[470‘^1B[3650d^1B%1~^1B%@
^1B[470‘^1B[3950d^1B%1~^1B%@
^1B[300‘^1B[4790d~
^1B[2700‘^1B[4790d~
^ 0
ST
CSI18m CSI?70h
DCS0;126&rPayroll STX~~~JohnQ.Smith~Jan28,1995ESC#1
```

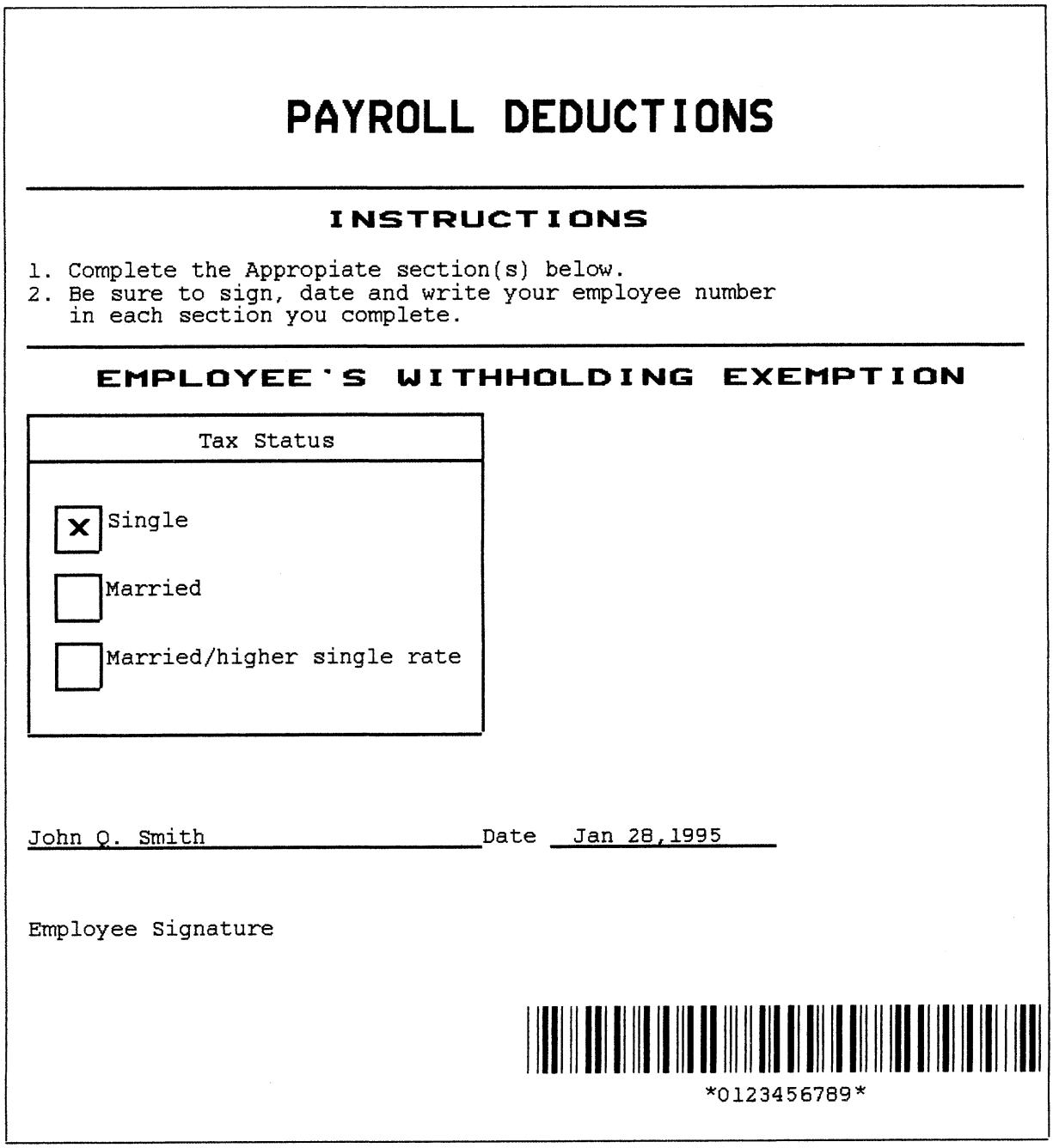


Figure D–7. Payroll Deduction Form

Vertical Format Unit (VFU)

The following command sequences create the vertical formatting shown in Figure D–8:

```
ESC[<1hA@@@@@B@@@@@D@@@@‘ ESC[<1l
ESC[002&y ESC[5‘Channel 3 line 7
ESC[900&y ESC[5‘TOF line 1
ESC[002&y ESC[25‘Channel 3 line 7
ESC[901&y ESC[25‘Channel 2 line 4
ESC[011&y ESC[5‘Bottom of form
CR FF
```

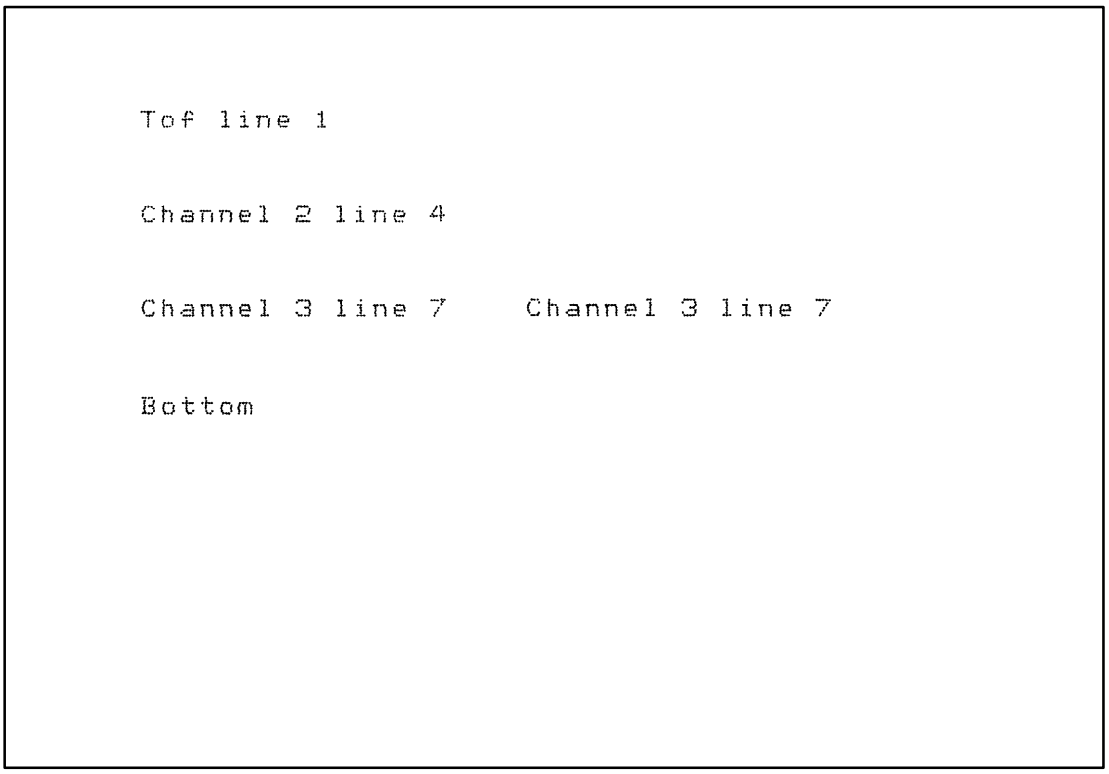


Figure D–8. Vertical Format Unit (VFU)

Glossary

active column	The horizontal location on the paper where the next character will print. After printing a character, the printer advances the active column.
active line	The vertical location on the paper where the next character will print. After printing a line, the printer advances the active line.
active position	The position on the paper where the next character will print. The active position is defined by the horizontal position (active column) and the vertical position (active line).
ASCII	Abbreviation of American Standard Code for Information Interchange.
baud	A unit of speed that measures the rate at which information is transferred. Baud rate is the reciprocal of the length in seconds of the shortest pulse used to carry data. For example, a system in which the shortest pulse is 1/1200 second operates at 1200 baud. On RS–232 serial lines, the baud rate equals the data flow rate in bits per second (bps). To communicate properly, a printer must be configured to operate at the same baud rate as its host computer.
bold	A dark thick character weight produced by a double strike print method. *See also* shadow printing, character weight.
buffer	A reserved area in printer memory that data is written to and read from during data transfers.
character cell	The invisible rectangular space occupied by a character, including the white space around the character. Used as a unit of spacing. The height of a cell is equal to the current line spacing, and the width of a cell is equal to the current character spacing.
character set	Instructions telling the printer how to construct a related group of printable characters, including symbols, punctuation, numbers, diacritical markings, and alphabet characters. Each character in a set is assigned a unique address in memory.

character weight The degree of lightness and thickness of printed text. For example: **Bold refers to a heavy or thick character weight.** Medium, normal, or book weight refer to the character weight used in this sentence.

control sequence Two or more bytes that instruct the printer to perform a special function. A control sequence begins with the control sequence introducer, CSI, in an 8–bit data environment. A control sequence can also be an escape sequence, however, because the 8–bit CSI control character can be represented by the 7–bit escape sequence, ESC [.

compressed Refers to a typeface with a smaller than normal character width, but no change to character height.

cpi characters per inch: a measurement of monospaced fonts indicating the horizontal character density. For example, 10 cpi is 10 characters produced in a one–inch (horizontal) space.

CSI Control Sequence Introducer: A non–printing control character (decimal 155, hex 9B) that is always the first byte of a control sequence in an 8–bit data environment. *See also* Control sequence.

decipoint One tenth of a point. A unit of measurement equal to 1/720 inch. *See also* point.

default A value, parameter, attribute, or option assigned by a program or system when another is not specified by the user.

diagnostic Pertains to the detection and isolation of printer malfunctions or mistakes.

DIP Dual In–line Package: a method of packaging semiconductor components in rectangular cases with parallel rows of electrical contacts.

DIP switch A DIP equipped with toggle switches.

disable To deactivate or set to OFF.

IA–232D Electronic Industry Association Specification: RS–232D interface that conforms to EIA standards.

Elite A name indicating a monospaced font with 12 cpi pitch (and usually 10 points in height).

Em A font width term equal to the maximum character width obtainable in a given font. (Derived from the width of an uppercase M, usually the widest character in a set.)

emulation Refers to the ability of a printer to execute the commands of another printer language or protocol.

En A font width term equal to one half em.

enable To activate or set to ON.

escape sequence Two or more bytes that describe a specific printer control function. In an escape sequence, the first byte is always the ASCII ESC character (decimal 27, hex 1B). *See also* control sequence.

expanded Refers to larger–than–normal character width with no change in character height.

false Off or zero. *Compare* true.

family (or type) A set of all variations and sizes of a type style.

fixed–pitch fonts *See* font, monospaced.

font The complete set of a given *size* of type, including characters, symbols, figures, punctuation marks, ligatures, signs, and accents. To fully describe a font, seven characteristics are usually specified:
1) Type family
2) Spacing (proportional or monospaced)
3) Type size (12 point, 14 point, etc.)
4) Scale factor (character height/width ratio)
5) Type style

6) Character weight
7) Character proportion (normal, condensed, expanded).

font name — *See* typeface.

font pattern — A font pattern is the matrix of pels which represents a character, symbol, or image.

font, landscape — A font printed parallel to the long edge of a page, or a font capable of being produced on a landscape page orientation.

font, monospaced — Also called fixed–pitch fonts. Every character, regardless of actual horizontal size, occupies the same amount of font pattern space. All monospaced fonts use specific pitch size settings. Monospaced fonts are sometimes used when strict character alignment is desired (tables, charts, spreadsheets, etc.).

font, portrait — A font printed parallel to the short edge of a page.

font, proportional — A font in which the width of the character cell varies with the width of the character. For example, “i” takes less space to print than “m.” Using proportional fonts generally increases the readability of printed documents, giving text a typeset appearance. This manual is printed in proportional fonts.

font weight — *See* character weight.

font width — The measurement of the width of a character cell in dots.

GL Characters — Graphic left: Graphic left characters map half of the character set table. The GL characters reside at 0 – 127 hex and comprise the ASCII portion of the table.

GR Characters — Graphic right: Graphic right characters map half of the character set table. The GR characters reside at 128 – 255 hex and comprise the Digital portion of the table.

hex dump — A hex dump is a translation of all host interface data to its hexadecimal equivalent. A hex dump is a printer self–test typically used to troubleshoot printer data reception problems.

HGS — Horizontal Grid Size

host computer	The host computer stores, processes, and sends data to be printed, and which communicates directly with the printer. The term host indicates the controlling computer, since modern printers are themselves microprocessor–controlled computer systems.
ipm	inches per minute: The speed at which graphics are plotted.
interface	The hardware components used to link two devices by common physical interconnection, signal, and functional characteristics. *See also* Printer Interface.
invoke	To put into effect or operation.
italic	A type style in which the characters are slanted. *This sentence is set in italics. Compare* Roman.
lpi	lines per inch: a measurement indicating the vertical spacing between successive lines of text. For example, 8 lpi is 8 printed lines per vertical inch.
lpm	lines per minute: A speed measurement indicating the number of lines printed every minute. (lpm usually defines the speed at which *text* prints.)
logical link	The parameters that specify data transfer, control, or communication operations.
memory	*See* RAM.
NLQ	Near letter quality.
nonvolatile memory	Nonvolatile memory stores variables that must be preserved when the printer is turned off, such as configuration parameters and printer usage statistics. Nonvolatile memory is preserved by means of an independent, battery–operated power supply. When printer power is turned off, the battery supplies the power needed to keep stored data active.
NOVRAM	*Acronym for* nonvolatile random access memory. *See also* nonvolatile memory.

OCR Optical Character Recognition is the process by which a machine reads characters printed in a special standardized font. Data are read by a photoelectric optical scanner and recorded on magnetic tape or disk. OCR–A and OCR–B are two widely used fonts.

off–line The non–printing operational state of the printer. When the printer is off–line, communication between the printer and the host computer is temporarily stopped and the message “Off–line/Emulation” appears on the display. Non–printing operations, such as printer configuration, paper loading, changing the ribbon, etc., are done with the printer off–line.

on–line The printing state. When the printer is on–line, it is ready to receive data and control commands from the host computer, and prints the data immediately. “On–line” appears on the message display and the control panel status lamps illuminate continuously.

ON LINE A switch on the operator control panel that toggles the printer between the on–line and off–line states.

parity (check) Parity checking is the addition of non–data bits to data, resulting in the number of 1 bits being either always even or always odd. Parity is used to detect transmission errors. Parity represents the value in the check digit of the received or transmitted data.

parsing Parsing is the process of separating a programming statement into basic units that can be translated into machine instructions. A printer can recover from an erroneous code sequence by performing as much of the function as possible or, parsing the valid parameter from the invalid.

PCBA Printed Circuit Board Assembly.

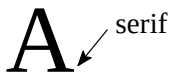
pel *See* pixel.

PI Paper instruction: A signal from the host with the same timing and polarity as the data lines.

Pica	A name indicating a monospaced font with a pitch of 10 cpi and usually a 12 point height. Pica is also used in typography as a unit of measurement: 1 pica = 1/6 inch.
pin configuration	Establishes the physical attachment and protocol conversion connections for the host interface.
pitch	The number of text characters printed per horizontal inch. Specified in characters per inch or cpi.
pixel	Acronym of picture element or picture cell. Also called a pel. The smallest displayable picture element on a video monitor or printable unit in a printer.
point	A unit of measure in printing and typography, used to specify type sizes, heights of font characters, etc. There are 72 points in a vertical inch; thus, one point equals 1/72 inch, or approximately 0.0138 inch. Examples: This is 6 point type. This is 11 point type. This is 16 point type.
port	A channel used for receiving data from or transmitting data to one or more external devices.
printer configuration	The operating properties that define how the printer responds to signals and commands received from the host computer. These properties are set to match the operating characteristics of the host computer system.
printer interface	The point where the data line from the host computer plugs into the printer.
protocol	A set of rules or conventions governing the exchange of information between computer systems. For computer printers, a protocol is the coding convention used to convey and print data. A printer protocol includes character codes, printer function codes, and machine–to–machine communication codes.
RAM	Random Access Memory. Also called “main memory” or “working memory,” this is the active memory of a printer, into which programs are loaded. This memory can be read from or written to at any time, hence the name random access. RAM is

	said to be volatile because all data are lost when power is turned off or interrupted. *Compare* ROM
read	To retrieve data from memory or mass storage (hard disk, floppy diskette, RAM, etc.).
reset	To turn off, deactivate, disable, or return to a previous state.
resolution	A measure expressing the number of component units in a given range used to create an image; in printing, expressed as the number of dots per inch (dpi) horizontally and vertically.
ROCS	Return from Other Coding System: A control sequence that allows you to return the printer to the previous emulation from any point in the printer's configuration.
ROM	Read–Only Memory. Programs, instructions, and routines permanently stored in the printer. ROM is not lost when power is turned off and cannot be written to—hence the name "read only." ROM–resident fonts are permanently stored in a printer and available at any time via software commands. *Compare* RAM.
roman	A type style in which characters are upright. This sentence is printed in a roman type style. *Compare* Italic.
sans serif	A typeface or font in which the characters do not have serifs. This font is sans serif.
serial communications	The sequential transmission of data, in which each element (bit) is transferred in succession.
serial matrix	Refers to the manner in which text characters are printed. In a serial matrix printer, a moving printhead uses pins to form whole characters one at a time and one after the other. The pins print dots according to programmed matrix patterns. Although data are sent to the printer interface either a serially or in parallel, the printhead receives the data serially in order to form each character. The LG06 printer also forms characters with dots in matrix patterns, but it feeds print data in parallel to many hammers mounted on a rapidly oscillating shuttle. The hammers fire simultaneously to print entire lines at a time.

serif — A short line stemming from and at an angle to the upper or lower end of the stroke of a letter or number character.



set — To turn on, activate, invoke, or enable.

shadow printing — A typeface with a heavy line thickness produced by doublestriking. The printer forms a character, then prints it again, but fractionally offset from the first position. *See also* bold, character weight.

sixel — A vertical column consisting of six pixels and treated as a unit in graphics applications.

slewing — Rapid vertical paper movement.

SOCS — Select Other Coding System: A control sequence that allows you to enable another emulation.

start bit — The signal that indicates the start of a character or element in a serial data stream.

stop bits — The signal that indicates the end of a character or element in a serial data stream.

string — Two or more bytes of data or code treated as a unit.

symbol set — *See* character set.

true — On or 1. “High true” refers to a positive relative voltage representing the ON state; “low true” refers to a negative relative voltage representing the ON state.

type style — Refers to either the upright (roman) or italic character style within a specific font family.

typeface — A descriptive name or brand name that identifies a particular design of type.

typographic font — *See* font, proportional.

weight	*See* character weight.
write	A process in which data is placed (written) into memory or mass storage (RAM, hard disk, floppy diskette).
X–off	A character transmitted by the printer announcing that the printer is off–line or the buffer is almost full.
X–on	A character transmitted by the printer announcing that the printer is on–line or the buffer is almost empty.

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