

EK-OLA50-RM-002

LA50 Printer

Programmer Reference Manual

Prepared by Educational Services
of
Digital Equipment Corporation

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1

FEATURES

1.1 GENERAL

The LA50 is a compact, dot matrix, serial printer. It was designed for use in personal computer systems, office workstations, and small-sized business computer systems.

The printer is available in four models.

LA50-RA - 120 V

LA50-RB - 220 V

LA50-RC - 240 V

LA50-RD - 100 V

The printer has an input buffer capacity of 2047 characters.

The LA50 receives characters and commands through an asynchronous serial interface. The interface operates at any of several selectable baud rates up to 4800 baud.

The paper feed mechanism is able to move paper both forward and reverse. The printhead is mounted on a carriage that scans horizontally across the paper. The printer is capable of bidirectional printing with automatic print direction determination. The ribbon is in a disposable cartridge.

The printer operates in either of two fundamental modes: text mode or graphic mode. In text mode, characters define the functions and character symbols usually associated with alphanumeric printers. In graphic mode, characters define a single column of 6 dots to be printed, not an entire character image as in text mode.

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1.1.1 Text Mode

In text mode, the printer uses a 9-element impact dot matrix printhead to print characters in an 8-dot character cell at 100 characters per second. Lines of 80, 96, or 132 characters can be selected to print in the 8-inch wide print region. An enhanced printing mode is available that allows more fully formed characters to be printed in a 16-dot character cell at 50 characters per second.

1.1.2 Graphic Mode

In graphic mode the LA50 allows the programmer to print graphic images by sending data that controls the dot printing elements individually.

1.1.3 LA50 Features

The following are the main features of the LA50.

- Compact size suitable for desk-top location
- ASCII and multinational character set
- VT100 special graphics character set
- Katakana character set for Japan
- Standard escape and control sequences
- Graphic image printing
- Enhanced printing
- High reliability
- Light weight
- Low cost

1.2 SPECIFICATIONS

The following are the specifications for the LA50.

Print method	Incremental with bidirectional lookahead
Print speed	100 characters/second (8 × 9 matrix printing) 44 lines/minute (80 columns printed per line)
Character format (including intercharacter space)	8 × 9 matrix at full speed 16 × 9 matrix at half speed

Horizontal pitch of 10, 12, 5, 6 characters/inch	Bold, underline, or enhanced density with the following restrictions: <ol style="list-style-type: none">1. No enhanced printing when using VT100 or Katakana character sets2. Bold and enhanced density cannot be used at the same time
Horizontal pitch of 8.25 characters/inch	Bold, underline (no enhanced density)
Horizontal pitch of 16.5 characters/inch	Underline (no bold, no enhanced density)
Graphic mode	144 or 180 dots/inch horizontal 72 dots/inch vertical 2 to 1 or 2-1/2 to 1 aspect ratio
Characters	94 ASCII 81 multinational 63 JIS Katakana 27 VT100 special graphics 1 error indicator
Character pitch	Compressed font – 16.5 characters/inch, 132 characters/line
	Double width – 8.25 characters/inch, 66 characters/line
	Elite pitch – 12 characters/inch, 96 characters/line
	Double width – 6 characters/inch, 48 characters/line
	Pica pitch – 10 characters/inch, 80 characters/line

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	Double width – 5 characters/inch, 40 characters/line
Line spacing	12, 8, 6, 4, 3, or 2 lines/inch Partial line up and down, 1/12 inch
Line feed speed	6 lines/inch at 100 ms/line
Form dimensions	Single sheets: 3 to 9 inches wide
Form thickness	Up to 0.011 inches, up to 3-part form
Paper feed method	Friction feed and sprocket/pin feed
Form loading	From rear-top
Ribbon cassette	Operator installable
Power requirements	LA50-RA 120 (104 – 128) Vac LA50-RB 220 (191 – 235) Vac LA50-RC 240 (208 – 256) Vac LA50-RD 100 (90 – 110) Vac 47 to 63 Hz
Power consumption	Less than 180 W
Weight	8.5 Kg (18.7 lb)
Dimensions	400 mm (W) × 295 mm (D) × 142 mm (H) (16 in × 11.8 in × 5.6 in)
Data interface	Serial RS232-C and RS423 EIA Standard

2

COMMUNICATION

2.1 DATA INTERFACE

The LA50 data interface is RS-232C and RS-423 compatible. It does not include an interface cable but does include a 25-position plug mounted on the rear of the cabinet. The printer contains the following interface signals listed in Table 2-1 for connection to an interface cable.

2.1.1 Interface Signals

The following paragraphs describe these interface signals.

2.1.1.1 Receive Data – The printer receives serial encoded characters on this line.

Table 2-1 Printer Interface Signals

Function	Direction	Pin	RS-232 Mnemonic
Receive data	To printer	3	BB
Send data	From printer	2	BA
Terminal ready	From printer	20	CD
Request to send	From printer	4	CA
Busy or ready	From printer	11	-
Protective ground	From printer	1	-
Signal ground	Common	7	AB

2.1.1.2 Send Data – The printer sends serial encoded characters on this line.

Although the bit rate within a character may be up to 4800 bits per second, the character transmission rate from printer to host for any two characters does not exceed 100 characters per second.

The printer, when transmitting to the host, always includes one stop bit with each character.

2.1.1.3 Terminal Ready – The printer sends signals on the Terminal Ready line which indicate the readiness of the printer to send and receive data. When this signal is ON the printer is capable of sending and receiving data. When this signal is OFF the printer is not ready for communication.

The terminal is ready to send and receive data after it completes its power-up initializations, and remains ready to communicate indefinitely.

2.1.1.4 Request to Send – The printer maintains the Request to Send line in the ON condition indefinitely.

2.1.1.5 Ready/Busy – This line carries the Busy/Ready signal, depending on the setting of the Ready/Busy Polarity switch. The printer is unable to receive characters if this signal is in the 'Busy' state and is able to receive characters if this signal is in the 'Ready' state.

2.1.1.6 Protective Ground – This line is connected via removable jumper into the chassis ground of the printer. The chassis is further connected to external grounds through the third wire of the power line cord.

2.1.1.7 Signal Ground – This line establishes the common ground reference potential for all other interface circuits.

2.2 DATA SYNCHRONIZATION

Data synchronization with the printer is attained by an input buffer used in conjunction with either the XON/XOFF protocol or the Ready/Busy protocol, depending on the position of the protocol switch.

2.2.1 Input Buffer

All characters received, except nulls and deletes, are temporarily stored in an input buffer before further processing. Nulls and deletes are ignored and do not occupy space in the input buffer. The input buffer has a 2047 character capacity.

If the printer falls too far behind the incoming data, the input buffer overflows and data is lost. If characters are lost due to input buffer overflow, a single substitute control character (octal 032) is placed in the input buffer at the point of loss. If a character is received with a parity error, the character is replaced in the input buffer by the substitute control character (octal 032) thus causing the error character (reverse question mark) to be printed. The 032 control character, thus indicates loss of characters, or a character received with parity error.

When the printer is capable of printing, characters are fetched from the input buffer and printed or otherwise processed as required. When the printer is incapable of printing, the printer scans the input buffer for printer status request control sequences even if the input buffer is full.

2.2.2 XON/XOFF Protocol

Using the XON/XOFF protocol, the data source becomes synchronized with the printer as described below.

After successfully powering up and becoming enabled to send, the printer sends an XON control character and constantly monitors the number of empty character positions in the input buffer. When the number is less than 128, the printer sends an XOFF control character, signaling the data source to temporarily stop sending data. Meanwhile, the printer continues to take characters from the input buffer and print or otherwise process them. When the number of empty positions in the buffer exceeds 224, the printer sends an XON control character, thus signaling that transmission may resume.

The printer also sends an XOFF control character when it is not ready due to error conditions or operator actions. Running out of paper or detecting a print-head position failure causes an XOFF control character to be sent. The operator actions of opening the cover or placing the printer off-line also cause an XOFF control character to be sent.

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The printer sends an XON control character whenever an XOFF state is present, and all of the following conditions are true.

- The printer is ready.
- All fault conditions are cleared.
- There are more than 224 empty positions for characters in the input buffer.

NOTE: At power up, an XOFF state is assumed.

The printer sends an XOFF control character whenever an XON state is present, and any of the following conditions is true.

- The printer is not ready.
- A fault condition occurs.
- There are less than 128 empty positions for characters in the input buffer.

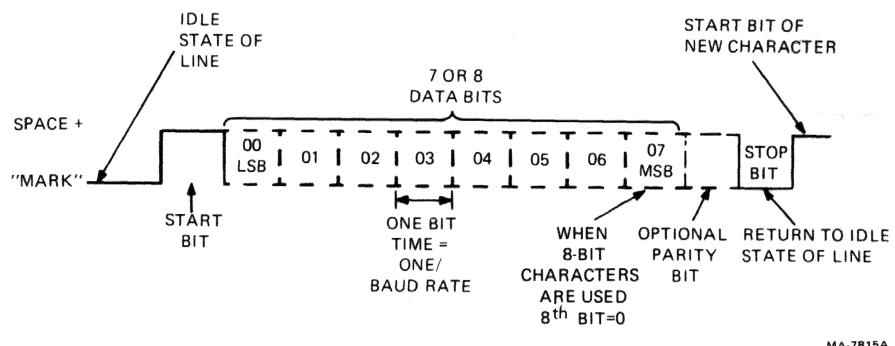
The printer sends an extra XOFF control character if more than 64 characters have been received since the first XOFF control character has been sent.

2.2.3 Ready/Busy Protocol

The Ready/Busy protocol is functionally the same as the XON/XOFF protocol. However, instead of sending an XOFF control character, the printer places the Ready/Busy signal in the Busy state, and instead of sending an XON control character, the printer places the Ready/Busy signal in the Ready state.

2.3 DATA TRANSMISSION

The LA50 printer communicates using serial characters. The serial character format used must be the same character format used by the computer. Serial characters are transmitted using a start bit, 7 or 8 data bits, an optional parity bit and 1 or more stop bits (Figure 2-1). The number of bits and the polarity of the parity (even or odd) is switch selectable. Parity errors can be detected for either polarity.



MA-7815A

Figure 2-1 Serial Character Format



PRINTER CONFIGURATION

3

3.1 GENERAL

This chapter describes the LA50 configuration switches located in the front of the printer under the access cover. There are two switch packs with eight slide switches in each pack. The switches are used to configure the:

- National character sets
- Graphics aspect ratio
- XON/XOFF and RDY/BUSY protocol
- Right margin
- Baud rate
- Data format.

Additional information regarding these items is included in subsequent chapters.

3.2 FRONT PANEL INDICATORS AND SWITCHES

The following indicators and switches are on the front panel of the LA50 (Figure 3-1).

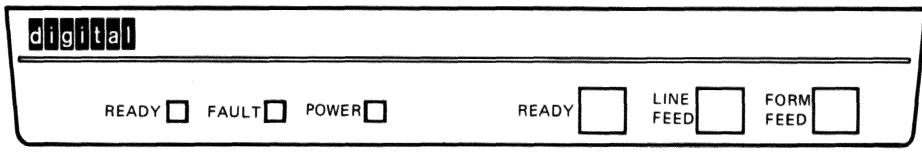


Figure 3-1 Front Panel Controls and Indicators

3.2.1 READY Indicator

The green READY light indicates the operating state of the printer. The light is on when the printer is ready to print or is printing. The light is off when the printer is not ready and will not start.

3.2.2 FAULT Indicator

The red FAULT light blinks when the printer detects an electronic fault. It stays on when the printer is out of paper.

3.2.3 POWER Indicator

The green POWER light is on when power is applied to the printer.

3.2.4 READY Switch

The READY switch controls the operating state of the printer. Pressing the switch alternately puts the printer in the Ready or Not Ready state. Observe the READY light to determine the state of operation.

3.2.5 LINE FEED Switch

Pressing the LINE FEED switch advances the paper one line.

3.2.6 FORM FEED Switch

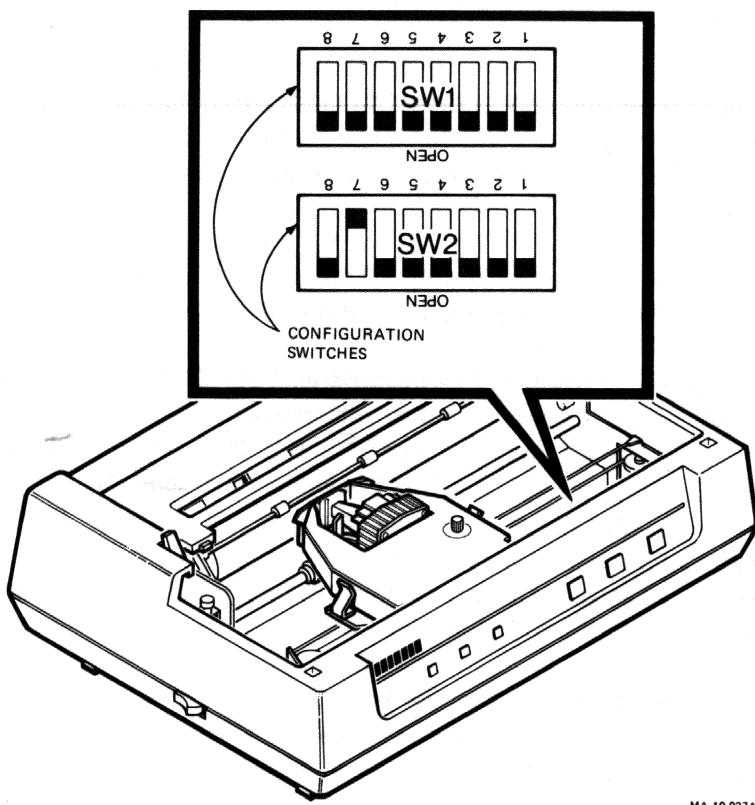
Pressing the FORM FEED switch advances the paper one full sheet.

3.3 CONFIGURATION SWITCHES

The configuration switches are set for printer use with DIGITAL systems in the United States. They are located under the access cover (Figure 3-2).

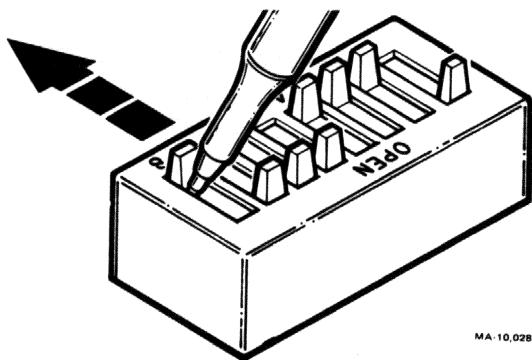
The switch positions can be changed by sliding the tab with a ballpoint pen or equivalent (Figure 3-3).

The rest of this chapter describes the switch positions for the system configurations.



MA-10,027A

Figure 3-2 LA50 Printer Configuration Switches



MA-10,028

Figure 3-3 Changing Switch Positions

3.3.1 National Character Set Switches

The national character set switches are designated SW1-1 through SW1-4. These switches are initially set to the United States position (all four switches open). The United States position is correct for many DIGITAL systems around the world, since it makes the ASCII, VT100 special graphics, and the multinational character sets available. In an 8-bit environment, no change in switch settings is necessary.

For those systems that do not have multinational capability, the character set switches may be set to match the national character set of the system.

Table 3-1 shows the character sets associated with G0 through G3 for each country. Table 3-2 shows the associated switch positions for that country. For example, if Britain is selected, SW1-1 is closed, and SW1-2, SW1-3, and SW1-4 are open. With this switch selection, G0 is the British character set, G1 is the VT100 character set, G2 is the multinational character set and G3 is the ASCII character set. With four switch settings, there are 16 possible combinations. Only 11 are shown in Tables 3-1 and 3-2. The remaining combinations of switch settings are equivalent to the United States position.

3.3.2 Graphics Aspect Ratio Switch SW1-5

Switch SW1-5 changes the horizontal to vertical dot ratio in graphic mode by changing the number of horizontal dots per inch. The number of vertical dots is kept constant at 72 dots per inch.

Ratio	Horizontal Dots/Inch	SW1-5 Switch Position
2 to 1*	144	Open
2.5 to 1	180	Closed

3.3.3 XON/XOFF and Ready/Busy Protocol Switches SW1-6 and SW1-7

DIGITAL systems use the XON/XOFF protocol. Other systems may require the Ready/Busy protocol. Switch SW1-6 selects the XON/XOFF or Ready/Busy protocol as shown in the SW1-6 chart below. If the Ready/Busy protocol is selected the polarity of the Busy or Ready signal is shown in the SW1-7 chart below.

SW1-6 Position	Protocol
Open*	XON/XOFF
Closed	Ready/Busy

* Initial setting

Table 3-1 Character Set Selection

Nation	G0	G1	G2	G3
United States	ASCII	VT100	Multinational	ASCII
Britain	British	VT100	Multinational	ASCII
Finland	Finnish	VT100	Multinational	ASCII
France	French	VT100	Multinational	ASCII
French Canada	French Canadian	VT100	Multinational	ASCII
Germany	German	VT100	Multinational	ASCII
Italy	Italian	VT100	Multinational	ASCII
Japan	JIS Roman	Katakana	Katakana	ASCII
Norway/Denmark	Norwegian/Danish	VT100	Multinational	ASCII
Spain	Spanish	VT100	Multinational	ASCII
Sweden	Swedish	VT100	Multinational	ASCII

Table 3-2 Character Set Switch Positions

Nation	Switch Positions				Factory Setting
	SW1-1	SW1-2	SW1-3	SW1-4	
United States	Open	Open	Open	Open	Factory Setting
Britain	Closed	Open	Open	Open	
Finland	Open	Closed	Open	Open	
France	Closed	Closed	Open	Open	
French Canada	Open	Open	Closed	Open	
Germany	Closed	Open	Closed	Open	
Italy	Open	Closed	Closed	Open	
Japan	Closed	Closed	Closed	Open	
Norway/Denmark	Open	Open	Open	Closed	
Spain	Closed	Open	Open	Closed	
Sweden	Open	Closed	Open	Closed	

SW1-7 Position	Signal Condition
Open*	Busy = high Ready = low
Closed	Busy = low Ready = high

3.3.4 Right Margin Switch SW1-8

Switch SW1-8 selects the method of controlling a line of characters that exceed the 8-inch line of print. If set to truncate, the printer is limited to printing the first 8 inches of characters. It drops the remaining characters. If set to wrap, the printer prints the remaining characters on the next line.

Selection	Switch Position
Truncate*	Open
Wrap	Closed

3.3.5 Baud Rate Select Switches SW2-1, SW2-2, SW2-3

These switches select the speed (bits per second) at which the printer communicates with the computer.

Baud Rate	Switch Positions		
	SW2-1	SW2-2	SW2-3
4800*	Open	Open	Open
2400	Open	Closed	Open
1200	Open	Closed	Closed
600	Closed	Open	Open
300	Closed	Open	Closed
200	Closed	Closed	Open
110	Closed	Closed	Closed

* Initial setting

3.3.6 Data Format Switches SW2-4, SW2-5, SW2-6

These switches select the data format to enable communication with the computer.

Data Format	Switch Position		
	SW2-4	SW2-5	SW2-6
7 bits plus odd parity	Open	Closed	Closed
7 bits plus even parity	Closed	Closed	Closed
7 bits plus 8th bit mark	Open	Open	Closed
7 bits plus 8th bit space	Closed	Open	Closed
8 bits plus odd parity	Open	Closed	Open
8 bits plus even parity	Closed	Closed	Open
8 bits, no parity*	Open	Open	Open

* Initial setting



4

TEXT MODE CHARACTER PROCESSING

4.1 TEXT MODE CHARACTER PROCESSING

This chapter describes the terminal's response to characters received while the printer is operating in text mode.

The terminal processes characters in accordance with the American National Standards Institute (ANSI) standards X3.4-1977. The ANSI system of character processing is based on the category (printable or control) of a character in the American National Standard Code for Information Interchange (ASCII) chart (Figure 4-1). The category of a character is determined by the character's position in the ASCII chart. In the eight column chart, columns 0 and 1 contain the control characters while the rest of the chart contains printable characters (except for SP and DEL). The printer is capable of printing from 14 different character sets which are described in Chapter 5. SP and DEL are always the same control characters regardless of the character set selected.

NOTE: The space character can be considered either an information separator control character or a printable character. It can be considered a printable character because it takes up space in the terminal memory and on the paper when printed.

The following paragraphs describe the terminal response to both printable characters and control characters while operating in text mode.

4.1.1 Active Column and Active Line

Active column is the column where the next character is to be printed. Active line is the line where the next character is to be printed. Column and line numbers begin with one, not zero. Printed characters usually increment the active column. Linefeeds, vertical tabs, and form feeds increment the active line.

20 TEXT MODE CHARACTER PROCESSING

BITS				B7	B6	B5	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	ROW	0	1	2	3	4	5	6	7						
B4	B3	B2	B1	NUL	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	0	SOH	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	0	1	STX	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	ETX	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	EOT	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	ENQ	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	ACK	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	BEL	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	BS	8	CAN	28 24 18	(48 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	HT	9	EM	29 25 19)	49 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	LF	10	SUB	30 26 1A	*	50 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	VT	11	ESC	31 27 18	+	51 43 28	;	73 59 3B	K	113 75 48	[133 91 58	k	153 107 68	{	173 123 7B
1	1	0	0	FF	12	FS	32 28 1C	,	52 44 2C	<	74 60 3C	L	114 76 4C	\	134 92 5C	l	154 108 6C		174 124 7C
1	1	0	1	CR	13	GS	33 29 1D	-	53 45 2D	=	75 61 3D	M	115 77 4D]	135 93 5D	m	155 109 6D	}	175 125 7D
1	1	1	0	SO	14	RS	34 30 1E	*	54 46 2E	>	76 62 3E	N	116 78 4E	^	136 94 5E	n	156 110 6E	~	176 126 7E
1	1	1	1	SI	15	US	35 31 1F	/	55 47 2F	?	77 63 3F	O	117 79 4F	-	137 95 5F	o	157 111 6F	DEL	177 127 7F

KEY

ASCII CHARACTER	ESC	33 27 18	OCTAL DECIMAL HEX
-----------------	-----	----------------	-------------------------

MA-7246

Figure 4-1 ASCII Chart

The active column and active line are collectively known as active position. Active position is only loosely linked to the physical position of the printer carriage and paper mechanism. In general, the active column is only recorded when a character is actually printed. Any previous history of active column values is insignificant.

4.1.2 Horizontal Advance Increment

Horizontal advance increment (HAI) is a unit equal to the width of a column. The printer allows HAI values of 1/5 inch, 1/6 inch, 1/8.25 inch, 1/10 inch, 1/12 inch, and 1/16.5 inch. Column numbers begin with one and are measured in units of HAI. Column numbers do not have fractional components.

4.1.3 Vertical Advance Increment

The vertical advance increment (VAI) is the unit of distance between lines. The printer allows VAI values of 1/2 inch, 1/3 inch, 1/4 inch, 1/6 inch, 1/8 inch, and 1/12 inch. Line numbers begin with one and are measured in units of VAI. Line numbers may have fractional components if the vertical pitch changes within a page.

4.2 PRINTABLE CHARACTERS

In text mode, printable ASCII characters are printed as they are received by the terminal. If the active column is not greater than the right margin, each received character is printed and the active column is incremented.

NOTE: The actual characters printed depend on the printable character set designated. Refer to the printable character sets in Chapter 5 and Appendix A for more detail.

Each printable or space character increases the active column by one unit of HAI. Characters in the octal range of 041 – 176 are normally interpreted as printable characters. If the active position is within the printable region, each printable character or space character prints and the active column increases as required. If the previous character was printed at the rightmost position and a printable or space character is received, one of two actions occurs, depending on the setting of the right margin switch. If the right margin switch is set to truncate, the character is ignored. If the right margin switch is set to wrap, an automatic carriage return and line feed occurs before printing the character.

4.3 CONTROL CHARACTERS

A control character is a single character function whose occurrence in a particular context starts, modifies, or stops a control function. Control functions are characters that provide control of the printing and processing of characters. Control functions are not printed.

Tables 4-1 and 4-2 list the control characters recognized by the terminal and the mnemonic and the function performed by the control character when operating in text mode. All other control characters received by the terminal cause no action.

NOTE: Each control function listed in this chapter is assigned a mnemonic. The mnemonic is an abbreviation of the control function name.

Table 4-1 Text Mode ANSI Control Characters

Printer Control Functions

Octal Code	Mnemonic	Function
010	BS	Backspace
011	HT	Horizontal tab
012	LF	Line feed
013	VT	Vertical tab
014	FF	Form feed
015	CR	Carriage return

Character Set Control Functions

Octal Code	Mnemonic	Function
016	SO	Shift out
017	SI	Shift in

Communication Control Functions

Octal Code	Mnemonic	Function
000	NUL	Null
030	CAN	Cancel
032	SUB	Substitute
033	ESC	Escape
177	DEL	Delete

The printer ignores all other ASCII control characters.

Table 4-2 Text Mode ANSI Control Characters

Name	Mnemonic	Octal Code	Function
Backspace	BS	010	Backspace decreases active column by one unit of HAI. If the active column is at the leftmost position, the backspace character is ignored.
Horizontal tabs	HT	011	A horizontal tab is a preselected point on a line to which the printhead advances when a horizontal tab (HT) control character is received. The printer has fixed horizontal tab stops every eight units of HAI. Tab stops are associated with column numbers, not physical positions on the paper. Thus, changing horizontal pitch also changes the physical position of tab stops. When no tab exists to the right of the active column, the right margin switch setting takes precedence. If this switch is set to wrap, the printer executes an automatic carriage return and a line feed. If the switch is set to truncate, the active column is set to beyond the rightmost print column. This causes the printer to ignore characters until the active column returns to within the printable region.

Table 4-2 Text Mode ANSI Control Characters (Cont)

Name	Mnemonic	Octal Code	Function
Line feed	LF	012	Line feed advances active line by one unit of VAI. If less than one unit of VAI remains unprinted on the page before execution of the Line Feed, then the line feed character sets the active line to the uppermost position on the next page.
Vertical tab	VT	013	Vertical tab functions the same as line feed.
Form feed	FF	014	Form feed advances the active line to the uppermost position on the next page.
Carriage return	CR	015	Carriage return returns the active column to the leftmost position.
Shift out	SO	016	Shift out selects the G1 character set as the active character set. For additional information, refer to Chapter 5.
Shift in	SI	017	Shift in selects the G0 character set as the active character set. For additional information, refer to Chapter 5.

Table 4-2 Text Mode ANSI Control Characters (Cont)

Name	Mnemonic	Octal Code	Function
Null Delete	NUL DEL	000 177	The null and delete characters may be used for timing. They cause no operation in the printer, and are different from ignored characters in that they are stripped from the data stream upon reception without occupying space in the input buffer.
Cancel	CAN	030	Cancel immediately ends any escape or control sequence.
Substitute	SUB	032	Substitute immediately ends any escape or control sequence. The character is interpreted as being in place of a character or characters received in error. In text mode, the substitute character is printed as the error character (reverse question mark).
Escape	ESC	033	Escape introduces an escape sequence. Refer to Chapter 5.



5

ESCAPE AND CONTROL SEQUENCES

5.1 GENERAL

The LA50 uses escape sequences standardized by the American National Standards Institute (ANSI) to control many of its features. For the LA50 features that lack an ANSI standard escape sequence, additional escape sequences have been defined and are within the extensions permitted by the ANSI system.

ANSI has established a flexible and comprehensive system for transmitting format and editing information. The system can be used with printing terminals like the LA50 as well as with video terminals and printers. The system has the following important advantages.

1. It is well defined and well documented. This greatly decreases the chances of incompatible implementations and aids in achieving device independence in output.
2. It has ample provisions for future extensions without sacrificing compatibility with older programs. The syntax used in ANSI controls allows a large number of new controls to be added with little difficulty.
3. It is compatible with all the frequently used communication protocols. In contrast, many other systems use control codes that are reserved for communication functions. In these other systems, codes used for line turnaround, disconnect and synchronization get confused with those used to send parameter values.

4. It has a flexible parameter passing convention that allows single parameters, multiple parameters, and default parameters. For example, in the graphic rendition escape sequence, the single parameter ESC [0 m causes bold and underline to be disabled; the multiple parameter ESC [1 ; 4 m causes bold and underline to be enabled; and ESC [n (no parameter included) uses the default parameter of 0 which is understood.

5.2 ESCAPE AND CONTROL SEQUENCES

Using the escape sequences described in this chapter, the programmer can control the following LA50 features.

- Partial line paper motion
- Horizontal pitch selection
- Vertical pitch selection
- Page length selection
- Character set selection
- Printing density selection
- Bold and underline selection
- Product identification
- Printer status request
- Printer status report
- Graphic mode

The escape sequences allow expansion of the control functions beyond the current limit of the 32 control characters. For compatibility, certain control character positions are left blank where the LA50 does not perform the function associated with that control character.

Control functions that require parameters are always invoked by control sequences. For example, setting horizontal pitch is invoked by a control sequence since the pitch can be set to 5, 6, 8.25, 10, 12, or 16.5, characters per inch.

The escape and control sequences are described in the following paragraphs. A summary of these sequences is provided in Appendix B.

Examples of the escape sequences use the ASCII character and the octal equivalent. For example, in the partial line down escape sequence ESC K (033 113), the K is the ASCII character and the 033 113 is the octal code for the ESC and K, respectively.

5.2.1 Partial Line Paper Motion

The following sequences cause partial line paper motion.

Partial Line Down (PLD)

ESC K
033 113

The above sequence moves paper forward (upward) 1/12 inch.

Partial Line Up (PLU)

ESC L
033 114

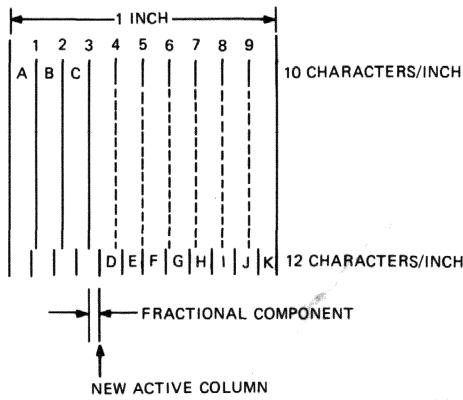
The above sequence moves paper reverse (downward) 1/12 inch.

The PLD and PLU sequences do not modify active line. Unless an equal number of PLU and PLD sequences are sent to the printer, the page boundary reference will have changed. Thus, PLD and PLU sequences may be used for remote adjustment of the form position, such as for modifying the top-of-form position.

5.2.2 Horizontal Pitch Selection

When the horizontal pitch changes, the printer converts the active column to the new horizontal pitch. The computation may yield a fractional component that is rounded up to the next integer so that all printing is on the column grid for the selected pitch. A variable amount of white space is included in the line at the point of horizontal pitch change.

As an example, consider a horizontal pitch of 10 characters per inch in a line that is to be converted to a horizontal pitch of 12 characters per inch. The pitch is to be changed after the third character is printed (Figure 5-1).



MA-10,085

Figure 5-1 Changing Horizontal Pitch

The following formula determines the precise location of active column when the horizontal pitch is changed.

$$\text{Newcol} = 1 + \frac{(\text{Newpitch} \times (\text{Oldcol}-1))}{\text{Oldpitch}}$$

where Newcol = the new active column
 Newpitch = the new pitch in characters/inch
 Oldcol = the old active column
 Oldpitch = the old pitch in characters/inch

The division performed above is integer division wherein any non-zero remainder rounds the quotient up to the next higher integer.

Changing horizontal pitch sets the rightmost position for printing to the specified maximum column and sets the single- or double- width attribute of characters as follows.

Horizontal Pitch	Maximum Column	Width
10	80	Single
12	96	Single
16.5	132	Single
5	40	Double
6	48	Double
8.25	66	Double

Double-width characters are considered to be one column wide, not two columns wide. Therefore, tab stops are every eight double-width columns in double-width pitches, and double-width characters are printed on a double-width grid.

The following sequences select single-width printing and set the horizontal pitch.

Set Horizontal Pitch (DECSHORP)

ESC [0 w 033 133 060 167	or	ESC [1 w 033 133 061 167
------------------------------	----	------------------------------

Either of the above sequences sets horizontal pitch to 10 characters/inch (HAI = 1/10 inch).

ESC [2 w 033 133 062 167

This sequence sets horizontal pitch to 12 characters/inch (HAI = 1/12 inch).

ESC [4 w 033 133 064 167

This sequence sets horizontal pitch to 16.5 characters/inch (HAI = 1/16.5 inch).

The following sequences select double-width printing and set the horizontal pitch.

Set Horizontal Pitch (DECSHORP)

ESC [5 w
033 133 065 167

The above sequence sets horizontal pitch to 5 characters/inch (HAI = 1/5 inch).

ESC [6 w
033 133 066 167

The above sequence sets horizontal pitch to 6 characters/inch (HAI = 1/6 inch).

ESC [8 w
033 133 070 167

The above sequence sets horizontal pitch to 8.25 characters/inch (HAI = 1/8.25 inch).

5.2.3 Vertical Pitch Selection

When the vertical pitch changes, no paper motion occurs, and the printer converts the active line to the new vertical pitch. The computation may yield a fractional component which is retained.

For example, assume a vertical pitch of 5 lines per inch is to be changed to a vertical pitch of 6 lines per inch as shown in Figure 5-2.

Note that the fractional component of vertical pitch occurs at the end of the page because there is no paper motion during change of vertical pitch. This is unlike the change of horizontal pitch where the fractional component occurs at the point where the pitch is changed.

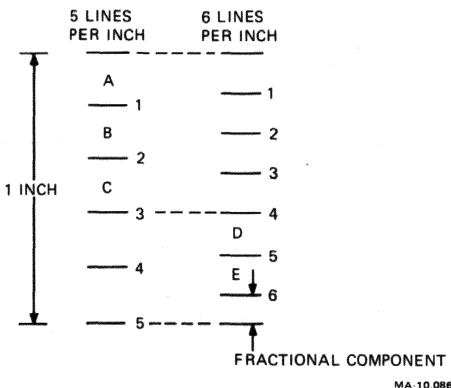


Figure 5-2 Changing Vertical Pitch

The following sequences set the vertical pitch.

Set Vertical Pitch (DECVERP)

ESC [0 z
033 133 061 172

or
ESC [1 z
033 133 061 172

Either of the above sequences sets vertical pitch to 6 lines/inch ($VAI = 1/6$ inch).

ESC [2 z
033 133 062 172

The above sequence sets vertical pitch to 8 lines/inch ($VAI = 1/8$ inch).

ESC [3 z
033 133 063 172

The above sequences sets vertical pitch to 12 lines/inch ($VAI = 1/12$ inch).

ESC [4 z
033 133 064 172

The above sequence sets vertical pitch to 2 lines/inch (VAI = 1/2 inch).

ESC [5 z
033 133 065 172

The above sequence sets vertical pitch to 3 lines/inch (VAI = 1/3 inch).

ESC [6 z
033 133 066 172

The above sequence sets vertical pitch to 4 lines/inch (VAI = 1/4 inch).

5.2.4 Page Length Selection

At power-up time, the page length is set to 11 inches, corresponding to 66 lines with the default vertical spacing.

The page length command sets the page length in inches. This is accomplished by providing a parameter representing the number of lines per page from 0 to 252. To calculate the desired parameter, (Pn) use the following equation.

Parameter (lines/page) = desired page length (inch/page)

× current vertical pitch (lines/inch)

The following chart gives the required parameter values for a small selection of page lengths as a function of vertical pitch.

Length in Inches	Vertical Pitch Selected					
	2	3	4	6	8	12
11	22	33	44	66	88	132
14	28	42	56	84	112	168

The page length can be set to any length from 1/12 inch per page to 21 inches per page in VAI units at the current vertical pitch. Or, if the page length is set to zero, the printer has no paging – all form feed characters are equivalent to line feed characters.

If the desired page length exceeds 21 inches then the printer sets the page length to 21 inches.

The following sequence sets the page length.

Set Page Length (DECSLPP)

```
ESC [ Pn t  
033 133 *** 164
```

The above sequence sets active line to top-of-form position and sets page length to Pn units of current VAI.

5.2.5 Character Set Selection

The normal mode of the printer is text mode. In text mode, the printer is capable of printing the 94 printable characters of the ASCII character set, the 81 additional characters of the multinational character set, the 63 additional characters of the JIS Katakana character set, the 27 additional characters of the VT100 special graphic character set, and the error character, which is a reverse question mark.

The 266 different characters are grouped into the 14 character sets in Appendix A. Each character set contains 94 characters. Many of the 266 characters appear in several character sets.

The printer is considered to be in 7-bit mode if the number of data bits has been set to 7 (refer to Chapter 3). In 7-bit mode, all characters are printed from the GL character set.

The printer is considered to be in 8-bit mode if the number of data bits has been set to 8 (refer to Chapter 3). In 8-bit mode all characters are printed from the GL character set if the eighth bit is 0 or from the GR set if the eighth bit is 1. The advantage of 8-bit mode is that two character sets (one in GL and one in GR) can be resident simultaneously.

A set of commands cause the GL and GR sets to select one of four intermediate pointers, G0 through G3. These pointers can be set to provide access to any of the 14 available character sets. Table 5-1 lists the commands and designate how the pointers select the GL or GR set. For example, the LS2 command causes the GL set to select the character set assigned to G2 and the LSR1 command causes the GR set to select the character set assigned to G1.

The character set escape sequences assign the character sets to the pointers as shown in Table 5-2.

5.2.6 Printing Density Selection

The following sequences select the printing density.

Select Density (DECDEN)

ESC [0 " z or ESC [1 " z
033 133 060 042 172 033 133 061 042 172

Either of the above sequences selects normal density printing.

ESC [2 " z
033 133 062 042 172

The above sequence selects enhanced density printing.

Enhanced density and bold printing cannot be performed at the same time. If both are specified, enhanced density takes precedence. Exceptions to this are as follows.

1. 16.5 characters/inch – Neither enhanced density nor bold can be printed.
2. 8.25 characters/inch – Bold printing prints and enhanced density does not.
3. VT100 – Bold printing prints and enhanced density does not.
4. Katakana – Bold printing prints and enhanced density does not.
5. Graphics – Neither enhanced density nor bold printing print.

Table 5-1 Active Character Set Selection

Command	Mnemonic	Escape Sequence	GL Set	GR Set
Shift in	SI	CTRL/O (017 octal)	G0	-
Shift out	SO	CTRL/N (016 octal)	G1	-
Single shift 2	SS2	ESC N 033 116	G2*	-
Single shift 3	SS3	ESC O 033 117	G3*	-
Locking shift 2	LS2	ESC n 033 156	G2	-
Locking shift 3	LS3	ESC o 033 157	G3	-
Locking shift 1 right	LS1R	ESC ~ 033 176	-	G1
Locking shift 2 right	LS2R	ESC } 033 175	-	G2
Locking shift 3 right	LS3R	ESC 033 174	-	G3

* A special case is the SS2 (single shift 2) and SS3 (single shift 3) commands. When these commands are given, the next character printed is selected from the G2 or G3 set respectively, regardless of the setting of the eighth bit. After this single character, printing continues from the GL or GR set. The locking shift commands (LS2, LS3, LS1R, LS2R, or LS3R) remain in effect until another locking shift is received.

Table 5-2 Character Set Selection

G0	G1	G2	G3	Character Set
ESC(B	ESC)B	ESC*B	ESC+B	ASCII
ESC(A	ESC)A	ESC*A	ESC+A	Britain
ESC(5	ESC)5	ESC*5	ESC+5	Finland
ESC(C	ESC)C	ESC*C	ESC+C	Finland
ESC(R	ESC)R	ESC*R	ESC+R	France
ESC(9	ESC)9	ESC*9	ESC+9	French Canada
ESC(Q	ESC)Q	ESC*Q	ESC+Q	French Canada
ESC(K	ESC)K	ESC*K	ESC+K	Germany
ESC(Y	ESC)Y	ESC*Y	ESC+Y	Italy
ESC(J	ESC)J	ESC*J	ESC+J	JIS Roman
ESC(I	ESC)I	ESC*I	ESC+I	JIS Katakana
ESC(6	ESC)6	ESC*6	ESC+6	Norway/Denmark
ESC(E	ESC)E	ESC*E	ESC+E	Norway/Denmark
ESC(Z	ESC)Z	ESC*Z	ESC+Z	Spain
ESC(7	ESC)7	ESC*7	ESC+7	Sweden
ESC(H	ESC)H	ESC*H	ESC+H	Sweden
ESC(<	ESC)<	ESC*<	ESC+<	Multinational
ESC(0	ESC)0	ESC*0	ESC+0	VT100 Special Graphics

If enhanced density is in effect or is selected while one of the above modes is in effect, the printer retains the enhanced density attribute in memory, but ignores it and prints in normal density. Subsequent selection of a mode that supports enhanced density printing causes the retained attribute to become active.

5.2.7 Selection of Bold and Underlined Printing

The following sequences select bold or underline as specified by the parameters (Pn). All following printable characters are rendered according to these parameters until the next selection. Parameters are evaluated from left to right.

Select Graphic Rendition (SGR)

ESC [Pn ; ... Pn m
033 133 *** 073 ... *** 155

Pn = 0
060

When Pn equals 0, the above sequence turns off bold printing and turns off underline printing.

Pn = 1
061

When Pn equals 1, the above sequence turns on bold printing.

Pn = 4
064

When Pn equals 4, the above sequence turns on underlined printing.

Pn = 2 2
062 062

When Pn equals 22, the above sequence turns off bold printing.

Pn = 2 4
062 064

When Pn equals 24, the above sequence turns off underlined printing.

NOTE: Any other parameter values received in the sequence are ignored, but do not invalidate the sequence. That is, the parameter values of 0, 1, 4, 22, and 24 may be specified along with other values not applicable to the printer.

Enhanced density and bold printing cannot be performed at the same time. If both are specified, enhanced density takes precedence. Exceptions to this are as follows.

1. 16.5 characters/inch – Neither enhanced density or bold can be printed.
2. 8.25 characters/inch – Bold printing prints and enhanced density does not.
3. VT100 – Bold printing prints and enhanced density does not.
4. Katakana – Bold printing prints and enhanced density does not.
5. Graphics – Neither enhanced density nor bold printing prints.

If the bold attribute is in effect or is selected while the printer is in one of the above modes, the printer retains the bold density attribute in memory, but ignores it and prints with bold printing off. Subsequent selection of a mode that supports the bold printing causes the retained attribute to become active.

5.2.8 Product Identification

The printer automatically sends an answer to a request for device attributes sequence. The following sequences cause the printer to send its product identification sequence.

Device Attribute (DA)

ESC [c	or	ESC 0 c
033 133 143		033 133 060 143

The printer sends

ESC [? 1 7 c
033 133 077 061 067 143

which forms the product identification of the printer.

5.2.9 Printer Status Request

The printer automatically sends an answer to a device status request sequence. The answer sent is in the form of a Device Status Report (see Paragraph 5.2.10). The following sequences control printer status reports and enable or disable unsolicited reports.

Device Status Request (DSR)

ESC [n or	ESC [0 n
033 133 156	033 133 060 156

Upon receiving either of the above sequences, the printer sends an extended status report.

ESC [? 1 n
033 133 077 061 156

Receipt of the above sequence disables all unsolicited status reports.

ESC [? 2 n
033 133 077 062 156

Receipt of the above sequence enables unsolicited brief status reports and the printer sends an extended status report.

ESC [? 3 n
033 133 077 063 156

Receipt of the above sequence enables unsolicited extended status reports and the printer sends an extended status report.

5.2.10 Printer Status Report

The printer is capable of sending brief and extended status reports. The reports may be solicited or unsolicited. Unsolicited reports, if enabled, are sent when any reportable status condition changes state. Unsolicited status reports are initially disabled. The following illustrates the specific formats and contents of the brief and extended printer status reports.

Device Status Report (Brief Report) (DSR)

ESC [0 n
033 133 060 156

The above sequence indicates that no malfunction was detected.

ESC [3 n
033 133 063 156

The above sequence indicates that a malfunction was detected.

Device Status Report (Extended Report) (DSR)

ESC [0 n
033 133 060 156

followed by

ESC [? 2 0 n
033 133 077 062 060 156

The above sequence indicates that no malfunction was detected.

ESC [3 n
033 133 063 156

followed by

ESC [? Pn ; ... Pn n
033 133 077 *** 073 ... *** 156

The above sequence indicates that a malfunction was detected. Pn may be any valid combination of the following values.

Pn	Failure
2 1 062 061	Hardware failure
2 2 062 062	Communication failure (event)
2 3 062 063	Input buffer overflow (event)
2 4 062 064	Printer deselected
2 6 062 066	Cover open
2 7 062 067	Paper empty

The only reportable hardware failure is printhead position failure. Communication failure may be parity or framing error or receipt of an erroneous character. Failures designated as events are reset upon sending an extended report, and are reportable only when they occur – not when they are reset.

5.2.11 Escape Sequences with 8-bit Equivalents

In 7-bit mode, there are 34 possible control characters as shown in columns 0 and 1, the SP in column 2 and the DEL in column 7 (refer to Figure 4-1).

Not all of these control characters are used by the LA50. The control characters used are shown in Appendix A.

Two character escape sequences from ESC @ (033 100) to ESC __ (033 137) can be replaced by an equivalent control character from 200₈ to 237₈ in 8-bit mode. These 8-bit control characters are mapped on a 1-to-1 basis with the two-character escape sequences.

For example, the ESC K (033 113₈) sequence for partial line down can be invoked in 8-bit mode by a control character of 213₈. The control character causes the data to be compressed, since only one character, rather than two, is required. Another example is the ESC L (033 114) sequence for partial line up which can be replaced by a control character of 214₈ in 8-bit mode.

5.2.12 Entering and Exiting Graphic and Text Mode

Graphic mode provides a means for selectively printing individual dot patterns, rather than predefined characters from the character set table.

The ESC P q (033 120 161) escape sequence is used for entering graphic mode. If an ESC P is sent, the LA50 looks for a lowercase q. If it receives a digit (60 to 71₈) it ignores the digit and looks for the lowercase q. When it receives the lowercase q, it enters graphic mode.

The following escape sequences cause the printer to enter a null state.

ESC __
033 137

ESC]
033 135

ESC ^
033 136

The above escape sequences are for compatibility with future software which may assign significance to these sequences. In the null state, the printer ignores everything until a substitute (SUB), cancel (CAN), or escape (ESC) control character is received, or until an ESC \ (033 134) escape sequence in 7-bit mode or a 220 (octal) control character in 8-bit mode is received. With the exception of the SUB character, any of these conditions will cause an exit from graphics mode to text mode or from the null state to text mode. If the printer receives a SUB character in graphic mode, it causes one column of no dots (graphic space) to be printed and the printer does not enter text mode.

The preferred exit from graphic mode to text mode is via the ESC \ escape sequence, or the 220 control character.

5.3 GRAPHIC MODE

In graphic mode, the graphic patterns are specified by sending characters in the range of 077 to 176 octal to the printer. Each of these 64 possible characters specifies a unique pattern formed by the upper six dots of the printhead. The bottom three dots are not used.

The pattern printed is determined by subtracting an offset of 077 octal from the octal value of the character. The result is an octal number with a binary equivalent. Where there is a 1 in the binary number, a dot is printed. The result is read from top to bottom with the least significant bit being at the top.

For example, if the character "@" (100 octal) is sent to the printer, only the top dot will be printed.

100 octal	• Least significant digit
-77 octal (offset)	o
01 octal or	o
	o
	o
	o
	o

If an attempt is made to print past the rightmost position, the printer automatically executes a graphic new line.

5.3.1 Graphic Control Characters

Graphic control characters are characters in the octal range of 040 – 076. Characters not assigned are ignored. The others are processed as follows.

Octal Code	ASCII Symbol	Action Performed
041	!	Repeat introducer
044	\$	Graphic carriage return
055	-	Graphic new line

5.3.2 Graphic Carriage Return

The graphic carriage return character “\$” (octal 044) causes the carriage to move back to the position where the first graphic character was printed after entering graphic mode. This feature allows you to overprint lines of graphic data starting at the same horizontal position.

5.3.3 Graphic New Line

The graphic new line character “-” (octal 055) causes the carriage to move back as with graphic carriage return, and moves the paper forward (upward) 1/12 inch. This feature allows printing consecutive lines of graphic data starting at the same horizontal position.

5.3.4 Repeat Sequence

The following is a repeat sequence.

<repeat introducer> <numeric parameter> <printable character>

The repeat introducer is the graphic control character “!” (octal 041).

The numeric parameter specifies the number of times to print the character that follows. The numeric parameter is a string of characters in the octal range of 060 – 071 which is evaluated as a decimal number. If a numeric parameter is not received, or a parameter evaluates as 0, a value of one is assumed. If the parameter evaluates to a value larger than 65535, a value of 65535 is assumed. All decimal digits shall be processed as part of the count.

The printable character (a character in the octal range of 077 to 176) is printed as many times as specified by the numeric parameter-count. A repeat sequence has the same effect as receiving the printable character that number of times. All printable characters end the repeat sequence processing and start the printing.

All other characters received during a repeat sequence are processed as usual except for the substitute control character, which is treated the same as a graphic space character.

The following examples illustrate the repeat sequence.

Repeat Sequence	Function
! 1 0 ? 041 061 060 077	Repeat ten graphic spaces.
! 6 @ 041 066 100	Repeat six patterns of top dot only.

5.3.5 Graphic Substitute

The substitute character is interpreted as being in place of a character or characters received in error. In graphic mode, it is considered to be a graphic space. If a repeat sequence is being processed, the processing is cancelled and the number of graphic spaces required by the repeat count is printed. The printer remains in graphic mode.

5.3.6 State After Exiting Graphic Mode

After an exit condition is met, the printer has the following state.

Horizontal position is the same as just before entering graphic mode.

Horizontal pitch is the same as just before entering graphic mode.

Vertical position is modified according to the control characters received while in graphic mode.

Vertical pitch is the same as just before entering graphic mode.

A

CHARACTER SET CHARTS

50 APPENDICES

Table A-1 ASCII Character Set

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

KEY

ASCII CHARACTER	33	OCTAL	27	DECIMAL	1B	HEX
ESC						

MA 7248

THIS CHART ASSUMES CHARACTER SET IS LOADED INTO GL. IF CHARACTER SET IS LOADED INTO GR (8-BIT MODE ONLY), ADD 200 TO THE OCTAL VALUE, 128 TO THE DECIMAL VALUE AND 80 TO THE HEX VALUE, TO SELECT THE CHARACTER FOR PRINTING.

Table A-2 VT100 Special Graphic Character Set

BITS B7 B6 B5		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				
B4	B3	B2	B1	ROW																
0	0	0	0	0	NUL	0		20 16 10	SP	40 32 20	0	60 48 30	@	100 64 40	P	120 80 50	140 96 60	— 112 SCAN 3	160 112 70	
0	0	0	1	1	DC1 (XON)	1		21 17 11	!	41	1	61 49 31	A	101 65 41	Q	121 81 51	141 97 61	— 113 SCAN 5	161 113 71	
0	0	1	0	2		2		22 18 12	"	42 34 22	2	62 50 32	B	102 66 42	R	122 82 52	142 98 62	— 114 SCAN 7	162 114 72	
0	0	1	1	3	DC3 (XOFF)	3		23 19 13	#	43 35 23	3	63 51 33	C	103 67 43	S	123 83 53	143 99 63	— 115 SCAN 9	163 115 73	
0	1	0	0	4		4		24 20 14	\$	44 36 24	4	64 52 34	D	104 68 44	T	124 84 54	144 100 64	— 116 74	164 116 74	
0	1	0	1	5		5		25 21 15	%	45 37 25	5	65 53 35	E	105 69 45	U	125 85 55	145 101 65	— 117 75	165 117 75	
0	1	1	0	6		6		26 22 16	&	46 38 26	6	66 54 36	F	106 70 46	V	126 86 56	146 102 66	— 118 76	166 118 76	
0	1	1	1	7		7		27 23 17	'	47 39 27	7	67 55 37	G	107 71 47	W	127 87 57	147 103 67	T	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	150 104 68	— 120 78	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	151 105 69	S	171 121 79
1	0	1	0	10	LF	12 10 A		SUB	32 26 1A	*	52 42 2A	:	72 58 3A	J	112 74 4A	Z	132 90 5A	152 106 6A	— 122 7A	172 122 7A
1	0	1	1	11	VT	13 11 B		ESC	33 27 1B	+	53 43 28	;	73 59 38	K	113 75 48	[133 91 58	153 107 68	— 123 78	173 123 78
1	1	0	0	12	FF	14 12 C			34 28 1C	,	54 44 2C	<	74 60 3C	L	114 76 4C	\	134 92 5C	154 108 6C	— 124 7C	174 124 7C
1	1	0	1	13	CR	15 13 D			35 29 1D	-	55 45 2D	=	75 61 3D	M	115 77 4D	J	135 93 5D	155 109 6D	— 125 7D	175 125 7D
1	1	1	0	14	SO	16 14 E			36 30 1E	.	56 46 2E	>	76 62 3E	N	116 78 4E	^	136 94 5E	156 110 6E	— 126 7E	176 126 7E
1	1	1	1	15	SI	17 15 F			37 31 1F	/	57 47 2F	?	77 63 3F	O	117 79 4F	(BLANK)	137 95 5F	— 111 6F	DEL	177 127 7F

KEY

ASCII CHARACTER

ESC	33
	27
	1B

OCTAL
DECIMAL
HEXHIGHLIGHTS DIFFERENCES
FROM ASCII

MA 72498

THIS CHART ASSUMES CHARACTER SET IS LOADED INTO GL. IF CHARACTER SET IS LOADED INTO GR (8-BIT MODE ONLY), ADD 200 TO THE OCTAL VALUE, 128 TO THE DECIMAL VALUE AND 80 TO THE HEX VALUE, TO SELECT THE CHARACTER FOR PRINTING.

52 APPENDICES

Table A-3 Finnish Character Set

BITS			0 0 0	0 0 1	0 1 0	0 1 1	1 0 0	1 0 1	1 1 0	1 1 1						
B4	B3	B2	B1	ROW	COLUMN	0	1	2	3	4	5	6	7			
0	0	0	0	NUL	0	20 16 10	SP	40 32 20	0	60 48 30	@	100 64 40	P	120 80 50		
0	0	0	1	DC1 (XON)	1 1 1	21 17 11	!	41 33 21	1	61 49 31	A	101 65 41	Q	121 81 51		
0	0	1	0	DC3 (XOFF)	2 2 2	22 18 12	"	42 34 22	2	62 50 32	B	102 66 42	R	122 82 52		
0	0	1	1	4	3 3 3	23 19 13	#	43 35 23	3	63 51 33	C	103 67 43	S	123 83 53		
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		
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		
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		
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		
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
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
1	0	1	0	10	LF	12 10 A	SUB	32 26 1A	*	52 42 2A	:	72 58 3A	J	112 74 4A	Z	132 90 5A
1	0	1	1	11	VT	13 11 B	ESC	33 27 1B	+	53 43 2B	;	73 59 3B	K	113 75 4B	Ä	133 91 58
1	1	0	0	12	FF	14 12 C		34 28 1C	,	54 44 2C	<	74 60 3C	L	114 76 4C	Ö	134 92 5C
1	1	0	1	13	CR	15 13 D		35 29 1D	-	55 45 2D	=	75 61 3D	M	115 77 4D	Å	135 93 5D
1	1	1	0	14	SO	16 14		36 30 1E	.	56 46 2E	>	76 62 3E	N	116 78 4E	Ü	136 94 5E
1	1	1	1	15	SI	17 15 F		37 31 1F	/	57 47 2F	?	77 63 3F	O	117 79 4F	—	137 95 5F

KEY

ASCII CHARACTER

ESC	33 27 1B	OCTAL DECIMAL HEX
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HIGHLIGHTS DIFFERENCES
FROM ASCII

MA 7420B

THIS CHART ASSUMES CHARACTER SET IS LOADED INTO GL. IF CHARACTER SET IS LOADED INTO GR (8-BIT MODE ONLY), ADD 200 TO THE OCTAL VALUE, 128 TO THE DECIMAL VALUE AND 80 TO THE HEX VALUE, TO SELECT THE CHARACTER FOR PRINTING.

Table A-4 French Character Set

BITS B7 B6 B5				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		
B4	B3	B2	B1	ROW																
0	0	0	0	0	NUL	0	0	20	SP	40	0	60	8	100	P	120	^	140	P	160
						0	0	16		32	0	48	8	64		80	96	60		112
						0	0	10		20	0	30	8	40		50		70		70
0	0	0	1	1	DC1	21	1	!	41	1	61	A	101	Q	121	a	141	q	161	
					(XON)	17	33		33	31	49	65		81		97	61	113	71	
0	0	1	0	2		2	22	!"	42	2	62	B	102	R	122	b	142	r	162	
						2	18	34		50	66		42		82	98	62	114	72	
0	0	1	0	3	DC3	23	19	E	43	3	63	C	103	S	123	c	143	s	163	
					(XOFF)	35	13		35	51	67	83		83		99	63	115	73	
0	1	0	0	4		4	24	\$	44	4	64	D	104	T	124	d	144	t	164	
						4	20	36		52	68		44		84	100	64	116	74	
0	1	0	1	5		5	25	%	45	5	65	E	105	U	125	e	145	u	165	
						5	21	37		53	69		45		85	101	65	117	75	
0	1	1	0	6		6	26	&	46	6	66	F	106	V	126	f	146	v	166	
						6	22	38		54	70		46		86	102	66	118	76	
0	1	1	1	7		7	27	/	47	7	67	G	107	W	127	g	147	w	167	
						7	23	39		55	71		47		87	103	67	119	77	
0	1	0	0	8	BS	10	CAN	30	(8	70	H	110	X	130	h	150	x	170	
						8	24	40		56	72		48		88	104	68	120	78	
1	0	0	1	9	HT	11)	51	9	71	I	111	Y	131	i	151	y	171	
						9	25	41		57	73		49		89	105	69	121	79	
1	0	1	0	10	LF	12	SUB	32	*	52	:	J	112	Z	132	j	152	z	172	
						10	26	42		58	74		4A		90	106	6A	122	7A	
1	0	1	1	11	VT	13	ESC	33	+	53	;	K	113	*	133	k	153	*	173	
						11	27	43		59	75		4B		91	107	6B	123	7B	
1	1	0	0	12	FF	14		34	54	74	L	114	C	134	l	154	ü	174		
						12	28	44		60	76		4C		92	108	6C	124	7C	
1	1	0	1	13	CR	15		35	-	55	M	115	S	135	m	155	*	175		
						13	29	45		61	77		4D		93	109	6D	125	7D	
1	1	1	0	14	SO	16		36	.	56	N	116	^	136	n	156	**	176		
						14	30	46		62	78		4E		94	110	6E	126	7E	
1	1	1	1	15	SI	17		37	57	76	O	117	-	137	o	157	DEL	177		
						15	31	47		63	79		4F		95	111	6F	127	7F	
						F	1F	2F												

KEY

ASCII CHARACTER

ESC	33
	27
	1B

OCTAL
DECIMAL
HEX

HIGHLIGHTS DIFFERENCES
FROM ASCII

MA-7425A

THIS CHART ASSUMES CHARACTER SET IS LOADED INTO GL. IF CHARACTER SET IS LOADED INTO GR (8-BIT MODE ONLY), ADD 200 TO THE OCTAL VALUE, 128 TO THE DECIMAL VALUE AND 80 TO THE HEX VALUE, TO SELECT THE CHARACTER FOR PRINTING.

Table A-5 French Canadian Character Set

		B7	B6	B5	0 0	0 0	0 1	0 1	1 0	1 0	1 0	1 1	1 1							
		BITS		COLUMN	0	1	2	3	4	5	6	7								
B4	B3	B2	B1	ROW																
0	0	0	0	0	NUL	0	20 16 10	SP	40 32 20	0	60 48 30	a	100 64 40	P	120 80 50	o	140 96 60	p	160 112 70	
0	0	0	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	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		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 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 B	ESC	33 27 1B	+	53 43 2B	:	73 59 3B	K	113 75 4B	g	133 91 58	k	153 107 6B	g	173 123 7B
1	1	0	0	12	FF	14 12 C		34 28 1C	,	54 44 2C	<	74 60 3C	L	114 76 4C	g	134 92 5C	l	154 108 6C	u	174 124 7C
1	1	0	1	13	CR	15 13 D		35 29 1D	-	55 45 2D	=	75 61 3D	M	115 77 4D	g	135 93 5D	m	155 109 6D	g	175 125 7D
1	1	1	0	14	SO	16 14 E		36 30 1E	.	56 46 2E	>	76 62 3E	N	116 78 4E	↑	136 94 5E	n	156 110 6E	o	176 126 7E
1	1	1	1	15	SI	17 15 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

KEY

ASCII CHARACTER

ESC	33	OCTAL
	27	DECIMAL
	1B	HEX



HIGHLIGHTS DIFFERENCES FROM ASCII

MA 7424A

THIS CHART ASSUMES CHARACTER SET IS LOADED INTO GL. IF CHARACTER SET IS LOADED INTO GR (8-BIT MODE ONLY), ADD 200 TO THE OCTAL VALUE, 128 TO THE DECIMAL VALUE AND 80 TO THE HEX VALUE, TO SELECT THE CHARACTER FOR PRINTING.

Table A-6 German Character Set

BITS				B7	B6	B5	0 0	0 0	0 1	0 1	0 0	1 0	1 0	1 1	1 1	1 1
B4	B3	B2	B1	ROW	COLUMN			0	1	2	3	4	5	6	7	
0	0	0	0	0	NUL	0	0	20	SP	40	0	60	8	100	P	120
0	0	0	0	0		0	0	16		32	0	48	64	80	'	96
0	0	0	1	1	DC1 (XON)	21	1	!	41	33	1	61	A	101	Q	121
0	0	0	1	1		17	1	11	33	21	1	49	51	41	a	81
0	0	1	0	2		2	2	22	''	42	2	62	B	102	R	122
0	0	1	0	2		2	2	18	34	50	2	50	66	42	b	82
0	0	1	0	2		2	2	12	22	32	2	32	42	52	r	62
0	0	1	1	3	DC3 (XOFF)	23	3	#	43	35	3	63	C	103	S	123
0	0	1	1	3		19	3	13	23	23	3	51	D	67	c	83
0	1	0	0	4		4	4	24	\$	44	4	64	D	104	T	124
0	1	0	0	4		4	4	20	36	52	4	64	D	68	d	84
0	1	0	1	5		5	5	25	%	45	5	65	E	105	U	125
0	1	0	1	5		5	5	21	37	52	5	53	E	69	e	85
0	1	0	1	5		5	5	15	25	34	5	35	E	45	e	55
0	1	1	0	6		6	6	26	&	46	6	66	F	106	V	126
0	1	1	0	6		6	6	22	38	54	6	54	F	70	f	86
0	1	1	0	6		6	6	16	26	36	6	36	F	46	v	56
0	1	1	1	7		7	7	27	/	47	7	67	G	107	W	127
0	1	1	1	7		7	7	23	39	55	7	71	G	71	g	87
0	1	1	1	7		7	7	17	27	37	7	37	G	47	g	57
1	0	0	0	8	BS	10	CAN	30	(50	8	70	H	110	X	130
1	0	0	0	8		8		24)	40	56	72	H	72	h	88
1	0	0	0	8		8		18		28	38	48	H	48	h	58
1	0	0	1	9	HT	11		31)	51	9	71	I	111	Y	131
1	0	0	1	9		9		25)	41	57	73	I	73	Y	89
1	0	0	1	9		9		19)	29	39	49	I	49	y	59
1	0	1	0	10	LF	12	SUB	32	*	52	:	72	J	112	Z	132
1	0	1	0	10		10		26	*	42	58	74	J	74	z	90
1	0	1	0	10		A		1A	2A	2A	3A	4A	J	4A	j	5A
1	0	1	1	11	VT	13	ESC	33	+	53	;	73	K	113	A	133
1	0	1	1	11		11		27	43	59	59	75	K	75	k	91
1	0	1	1	11		B		18	28	3B	3B	48	K	48	k	58
1	1	0	0	12	FF	14		34	,	54	<	74	L	114	O	134
1	1	0	0	12		12		28	44	60	60	76	L	76	o	92
1	1	0	0	12		C		1C	2C	3C	3C	4C	L	4C	o	5C
1	1	0	1	13	CR	15		35	-	55	=	75	M	115	U	135
1	1	0	1	13		13		29	45	61	61	77	M	77	u	93
1	1	0	1	13		D		1D	2D	3D	3D	4D	M	4D	u	5D
1	1	1	0	14	SO	16		36	.	56	>	76	N	116	A	136
1	1	1	0	14		14		30	46	62	62	78	N	78	a	94
1	1	1	0	14		E		1E	2E	3E	3E	4E	N	4E	n	5E
1	1	1	1	15	SI	17		37	/	57	?	77	O	117	—	137
1	1	1	1	15		15		31	47	63	63	79	O	79	o	5F
1	1	1	1	15		F		1F	2F	3F	3F	4F	O	4F	o	6F

KEY

ASCII CHARACTER

ESC	33	OCTAL
	27	DECIMAL
	1B	HEX

 HIGHLIGHTS DIFFERENCES FROM ASCII

MA 7423A

THIS CHART ASSUMES CHARACTER SET IS LOADED INTO GL. IF CHARACTER SET IS LOADED INTO GR (8-BIT MODE ONLY), ADD 200 TO THE OCTAL VALUE, 128 TO THE DECIMAL VALUE AND 80 TO THE HEX VALUE, TO SELECT THE CHARACTER FOR PRINTING.

Table A-7 Italian Character Set

BITS B7 B6 B5		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	
B4	B3	B2	B1	ROW													
0	0	0	0	0	NUL	0	20	SP	40	0	60	S	100	P	120	ù	140
0	0	0	1	1	DC1 (XON)	21	!	41	1	61	49	A	101	Q	121	a	141
0	0	1	1	1		17	33	21	49	41	65		51		81	q	161
0	0	1	0	2		22	"	42	2	62	50	B	102	R	122	b	142
0	0	1	0	2		18	34	22	50	66	42		42		82	r	162
0	0	1	1	3	DC3 (XOFF)	23	£	43	3	63	51	C	103	S	123	c	143
0	0	1	1	3		19	35	23	51	67			43		83	s	163
0	1	0	0	4		24	\$	44	4	64	52	D	104	T	124	d	144
0	1	0	0	4		20	36	24	52	68	44		44		84	t	164
0	1	0	1	5		25	%	45	5	65	53	E	105	U	125	e	145
0	1	0	1	5		21	37	25	53	69			45		85	u	165
0	1	1	0	6		26	&	46	6	66	54	F	106	V	126	f	146
0	1	1	0	6		22	38	26	54	70			46		86	v	166
0	1	1	1	7		16			36	56			46		56	w	167
0	1	1	1	7		7	/	47	7	67	55	G	107	W	127	g	147
0	1	1	1	7		23	39	27	55	71			47		87	w	168
0	1	1	1	7		17			37	57			47		57		76
1	0	0	0	8	BS	10	CAN	30	(50	70	H	110	X	130	h	150
1	0	0	0	8		8	24	40	56	72			48		88	x	170
1	0	0	0	8		8	18	28	38	48			48		58		120
1	0	0	1	9	HT	11		31)	51	71	I	111	Y	131	i	151
1	0	0	1	9		9	25	41	57	73			49		89	y	171
1	0	1	0	10	LF	12	SUB	32	*	52	:	J	112	Z	132	j	152
1	0	1	0	10		10	26	42	58	74			4A		90	z	172
1	0	1	1	11	VT	13	ESC	33	+	53	;	K	113	o	133	k	153
1	0	1	1	11		11	27	43	59	75			4B		91		107
1	0	1	1	11		8	1B	2B	3B	4B			4C		58		6B
1	1	0	0	12	FF	14		34	54	<	74	L	114	c	134	l	154
1	1	0	0	12		12	28	44	60	76			4C		92	o	174
1	1	0	0	12		C	1C	2C	3C	4C			4D		5C		7C
1	1	0	1	13	CR	15		35	55	=	75	M	115	€	135	m	155
1	1	0	1	13		13	29	45	61	77			4D		93	o	109
1	1	0	1	13		D	10	2D	3D	50			4E		5D		6D
1	1	1	0	14	SO	16		36	56	>	76	N	116	^	136	n	156
1	1	1	0	14		14	30	46	62	78			4E		94	o	110
1	1	1	0	14		E	1E	2E	3E	4E			4F		5E		6E
1	1	1	1	15	SI	17		37	57	?	77	O	117	-	137	o	157
1	1	1	1	15		15	31	47	63	79			4F		95	DEL	177
1	1	1	1	15		F	1F	2F	3F	4F			4F		5F		7F

KEY

ASCII CHARACTER	ESC	33 27 18	OCTAL DECIMAL HEX
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HIGHLIGHTS DIFFERENCES
FROM ASCII

MA-7247G

THIS CHART ASSUMES CHARACTER SET IS LOADED INTO GL. IF CHARACTER SET IS LOADED INTO GR (8-BIT MODE ONLY), ADD 200 TO THE OCTAL VALUE, 128 TO THE DECIMAL VALUE AND 80 TO THE HEX VALUE, TO SELECT THE CHARACTER FOR PRINTING.

Table A-8 Japanese (JIS Roman) Character Set

		BITS		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								
B4	B3	B2	B1	ROW															
0	0	0	0	0	NUL	0		20	SP	40	0	60	@	100	P	120	`	140	
						0	0	16	32	32	0	48	100	64	80	80	96	160	
						0	0	10	20	20	1	30	40	40	50	50	60	112	
0	0	0	1	1	DC1	(XON)	21	!	41	1	61	A	101	Q	121	a	141	161	
				1			17	33	33	1	49	101	65	81	81	97	113	113	
				1			11	21		31		41		41	51	51	61	71	
0	0	1	0	2			2	22	11	2	62	B	102	R	122	b	142	162	
				2			2	18	42	2	50	102	66	82	82	98	114	114	
				2			2	12	34	2	32		42		52	52	62	72	
0	0	1	1	3			3	DC3	(XOFF)	3	63	C	103	S	123	c	143	163	
				3			3	19	35	3	51	103	67	83	83	99	115	115	
				3			3	13	23	3	33		43		53	53	63	73	
0	1	0	0	4			4	24	\$	4	64	D	104	T	124	d	144	164	
				4			4	20	36	4	52	104	68	84	84	100	116	116	
				4			4	14	24	4	34		44		54	54	64	74	
0	1	0	1	5			5	25	%	5	65	E	105	U	125	e	145	165	
				5			5	21	45	5	53	105	69	85	85	101	117	117	
				5			5	15	37	5	35		45		55	55	65	75	
0	1	1	0	6			6	26	&	6	66	F	106	V	126	f	146	166	
				6			6	22	38	6	54	106	70	86	86	102	118	118	
				6			6	16	26	6	36		46		56	56	66	76	
0	1	1	1	7			7	27	/	7	67	G	107	W	127	g	147	167	
				7			7	23	39	7	55	107	71	87	87	103	119	119	
				7			7	17	27	7	37		47		57	57	67	77	
1	0	0	0	8	BS	10	CAN	30	(8	70	H	110	X	130	h	150	170	
				8			8	24	40	8	56	110	72	88	88	104	120	120	
				8			8	18	28	8	38		48		58	58	68	78	
1	0	0	1	9	HT	11		31)	9	71	I	111	Y	131	i	151	171	
				9			9	25	41	9	57	111	73	89	89	105	121	121	
				9			9	19	29	9	39		49		59	59	69	79	
1	0	1	0	10	LF	12	SUB	32	*	52	:	J	112	Z	132	j	152	172	
				10			10	26	42	52	58	112	74	90	90	106	122	122	
				A			1A	2A	2A	52	3A		4A		5A	5A	6A	7A	
1	0	1	1	11	VT	13	ESC	33	+	53	;	K	113	[133	k	153	173	
				11			11	27	43	53	59	113	75	91	91	107	123	123	
				B			1B	2B	2B	53	3B		4B		5B	5B	6B	7B	
1	1	0	0	12	FF	14		34	,	54	<	L	114	¥	134	l	154	174	
				12			12	28	44	54	60	114	76	92	92	108	124	124	
				C			1C	2C	2C	54	3C		4C		5C	5C	6C	7C	
1	1	0	1	13	CR	15		35	-	55	=	M	115]	135	m	155	175	
				13			13	29	45	55	61	115	77	93	93	109	125	125	
				D			1D	2D	2D	55	3D		4D		5D	5D	6D	7D	
1	1	1	0	14	SO	16		36	*	56	>	N	116	^	136	n	156	176	
				14			14	30	46	56	62	116	78	94	94	110	126	126	
				E			1E	2E	2E	56	3E		4E		5E	5E	6E	7E	
1	1	1	1	15	SI	17		37	/	57	?	O	117	-	137	o	157	177	
				15			15	31	47	57	63	117	79	95	95	111	127	127	
				F			1F	2F	2F	57	3F		4F		5F	5F	6F	7F	

KEY

ASCII CHARACTER

ESC	33	OCTAL
	27	DECIMAL
	18	HEX

HIGHLIGHTS DIFFERENCES FROM ASCII

MA 7247H

THIS CHART ASSUMES CHARACTER SET IS LOADED INTO GL. IF CHARACTER SET IS LOADED INTO GR (8-BIT MODE ONLY), ADD 200 TO THE OCTAL VALUE, 128 TO THE DECIMAL VALUE AND 80 TO THE HEX VALUE, TO SELECT THE CHARACTER FOR PRINTING.

Table A-9 Katakana Character Set

BITS B7 B6 B5		0 0		0 1		0 1		1 1		1 0		1 0		1 1		1 1	
		COLUMN 0		1		2		3		4		5		6		7	
B4	B3	B2	B1	ROW													
0	0	0	0	0	NUL	0	20	SP	40	—	60	タ	100	ミ	120	？	140
0	0	0	0	0			16		32		48	64	80	96	50	60	160
0	0	0	1	1	DC1	21	41			61	101	ム	121	？	141		161
0	0	0	1	1	(XON)	17	33	P	49	49	105	65	81	97	51	61	113
0	0	1	0	2		2	22		42	62	102	メ	122	？	142		162
0	0	1	0	2		2	18	フ	34	イ	50	ツ	82	98	52	62	114
0	0	1	0	2		2	12		22	50	42	メ	82	98	52	62	72
0	0	1	1	3	DC3	23	43	」	35	ウ	103	テ	123	？	143		163
0	0	1	1	3	(XOFF)	19	35		51	テ	67	モ	83	99	53	63	115
0	0	1	1	3		3	23		33	33	43	モ	83	99	53	63	73
0	1	0	0	4		4	24		44	64	104	ヤ	124	？	144		164
0	1	0	0	4		4	20		36	52	68	ヤ	84	100	54	64	116
0	1	0	0	4		4	14	・	24	34	44	ヤ	84	100	54	64	74
0	1	0	1	5		5	25		45	65	105	ユ	125	？	145		165
0	1	0	1	5		5	21	・	37	53	69	ユ	85	101	55	65	117
0	1	0	1	5		5	15		25	35	45	ユ	85	101	55	65	75
0	1	1	0	6		6	26		46	66	106	ヨ	126	？	146		166
0	1	1	0	6		6	22	ヲ	38	54	70	ヨ	86	102	56	66	118
0	1	1	0	6		6	16		26	36	46	ヨ	86	102	56	66	76
0	1	1	1	7		7	27		47	67	107	ラ	127	？	147		167
0	1	1	1	7		7	23	イ	39	55	71	ラ	87	103	57	67	119
0	1	1	1	7		7	17		27	37	47	ラ	87	103	57	67	77
1	0	0	0	8	BS	10	CAN	30	50	70	木	リ	130	？	150		170
1	0	0	0	8		8		40	56	72	木	リ	88	104	58	68	120
1	0	0	0	8		8		28	38	48	木	リ	88	104	58	68	78
1	0	0	1	9	HT	11		51	71	111	ル	131	？	151		171	
1	0	0	1	9		9		41	57	73	ル	89	105	59	69	121	
1	0	0	1	9		9		29	39	49	ル	89	105	59	69	79	
1	0	1	0	10	LF	12	SUB	32	52	72	ハ	レ	132	？	152		172
1	0	1	0	10		10		42	58	74	ハ	レ	90	106	5A	6A	122
1	0	1	0	10		A		2A	3A	4A	ハ	レ	90	106	5A	6A	7A
1	0	1	1	11	VT	13	ESC	33	53	73	ヒ	133	？	153		173	
1	0	1	1	11		11		43	59	75	ヒ	91	107	58	6B	123	
1	0	1	1	11		B		2B	3B	4B	ヒ	91	107	58	6B	7B	
1	1	0	0	12	FF	14		54	74	113	□	134	？	154		174	
1	1	0	0	12		12		44	60	75	□	92	108	5C	6C	124	
1	1	0	0	12		C		2C	3C	4C	□	92	108	5C	6C	7C	
1	1	0	1	13	CR	15		55	75	115	ン	135	？	155		175	
1	1	0	1	13		13		45	61	77	ン	93	109	5D	6D	125	
1	1	0	1	13		D		2D	3D	4D	ン	93	109	5D	6D	7D	
1	1	1	0	14	SO	16		56	76	116	、	136	？	156		176	
1	1	1	0	14		14		46	62	78	、	94	110	5E	6E	126	
1	1	1	0	14		E		2E	3E	4E	、	94	110	5E	6E	7E	
1	1	1	1	15	SI	17		57	77	117	・	137	？	157		177	
1	1	1	1	15		15		47	63	79	・	95	111	5F	6F	127	
1	1	1	1	15		F		2F	3F	4F	・	95	111	5F	6F	7F	

KEY

ASCII CHARACTER	ESC	33 27 18	OCTAL DECIMAL HEX
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SUPPLEMENTAL GRAPHIC SET

NOTE: ALL PRINT CHARACTERS IN THIS CHARACTER SET DIFFER FROM THE ASCII CHARACTER SET.

MA 7247K

THIS CHART ASSUMES CHARACTER SET IS LOADED INTO GL. IF CHARACTER SET IS LOADED INTO GR (8-BIT MODE ONLY), ADD 200 TO THE OCTAL VALUE, 128 TO THE DECIMAL VALUE AND 80 TO THE HEX VALUE, TO SELECT THE CHARACTER FOR PRINTING.

Table A-10 Multinational Character Set

		B7	B6	B5	0 0		0 0 1		0 1 0		0 1 1		1 0 0		1 0 1		1 1 0		1 1 1	
		BITS		COLUMN		0	1	2	3	4	5	6	7							
B4	B3	B2	B1	ROW																
0	0	0	0	0	NUL	0	0	20	SP	40	o	60	À	100	‘	120	à	140	‘	160
						0	0	16 10		32 20	48 30	40	Á	64	‘	80	à	96	‘	112
						1	1	21 17 11	i	41 33 21	49 31	42	Á	101	‘	50	à	60	‘	70
0	0	0	1	1	DC1 (XON)	1	1	22		42	62	40	À	102	ò	122	á	141	ñ	161
						2	2	18 12	£	34 22	50	42	À	66	ò	82	á	97	ñ	113
0	0	1	0	2		2	2	12		32	42	43	À	103	ó	122	á	142	ò	162
0	0	1	1	3	DC3 (XOFF)	3	3	19 13	£	43 35 23	51	43	À	67	ó	123	á	143	ó	163
0	1	0	0	4		4	4	24 20 14	£	44 36 24	52	44	À	104	ô	124	á	144	ô	164
0	1	0	1	5		5	5	25		45	65	45	À	68	ô	84	á	100	ô	116
						5	5	21 15	¥	37 25	53	35	Å	105	ö	125	ä	145	ö	165
0	1	1	0	6		6	6	26		46	66	46	Æ	106	ö	126	æ	146	ö	166
						6	6	22	£	38 26	54	36	Æ	70	ö	86	æ	102	ö	118
0	1	1	1	7		7	7	27		47	67	37	ç	107	œ	127	ç	147	œ	167
						7	7	23 17	§	39 27	55	37	ç	71	œ	87	ç	103	œ	119
						7	7	17					ç	47	œ	57	ç	67	œ	77
1	0	0	0	8	BS	10	8	CAN	24	30	50	56	È	110	ø	130	è	150	ø	170
						8	8	18	¤	40 28	48	38	È	72	ø	88	è	104	ø	120
1	0	0	1	9	HT	11	9		©	51	71	57	É	111	ú	131	é	151	ú	171
						9	9	25 19		41 29	53	39	É	73	ú	89	é	105	ú	121
1	0	1	0	10	LF	12	10	SUB	26	52	72	58	Ê	112	ú	132	ê	152	ú	172
						A	1A	1A	æ	2A	58	3A	Ê	74	ú	90	ê	106	ú	122
1	0	1	1	11	VT	13	11	ESC	27	53	73	59	Ë	113	û	133	ë	153	û	173
						B	1B	1B	«	43 2B	59 3B	38	Ë	75	û	91	ë	107	û	123
1	1	0	0	12	FF	14	12		»	54	74	60	Í	114	ü	134	í	154	ü	174
						C	1C		½	44 2C	54 3C	3E	Í	76	ü	92	í	108	ü	124
1	1	0	1	13	CR	15	13		¶	55	75	61	Í	115	ÿ	135	í	155	ÿ	175
						D	1D		½	45 2D	55 3D	3E	Í	77	ÿ	93	í	109	ÿ	125
1	1	1	0	14	SO	16	14		¶	56	76	62	Î	116	ç	136	í	156	ç	176
						E	1E		¶	46 2E	56 3E	3E	Î	78	ç	94	í	110	ç	126
1	1	1	1	15	SI	17	15		¶	57	77	63	Î	117	þ	137	í	157	þ	177
						F	1F		¶	47 2F	57 3F	3F	Î	79	þ	95	í	111	þ	127
													Þ	4F	þ	5F	þ	DEL		

KEY

ASCII CHARACTER

ESC	33	OCTAL
	27	DECIMAL
	1B	HEX

SUPPLEMENTAL GRAPHIC SET

NOTE: ALL PRINT CHARACTERS IN THIS CHARACTER SET DIFFER FROM THE ASCII CHARACTER SET.

MA-10,087

THIS CHART ASSUMES CHARACTER SET IS LOADED INTO GL. IF CHARACTER SET IS LOADED INTO GR (8-BIT MODE ONLY), ADD 200 TO THE OCTAL VALUE, 128 TO THE DECIMAL VALUE AND 80 TO THE HEX VALUE, TO SELECT THE CHARACTER FOR PRINTING.

Table A-11 Norwegian/Danish Character Set

		B7	B6	0 0		0 0 1		0 1 0		0 1 1		1 0 0		1 0 1		1 1 0		1 1 1	
		B5		0 0		0 1		0 1 0		1 0 1		1 0 0		1 0 1		1 1 0		1 1 1	
		BITS		COLUMN		0	1	2		3		4		5		6		7	
B4	B3	B2	B1	ROW															
0	0	0	0	0	NUL	0	0	20	16	SP	40	0	60	A	100	P	120	a	140
0	0	0	0	0				32	32		32	64	64	40	80	80	96	96	
0	0	0	1	1	DC1	(XON)	1	21	17	!	41	1	61	A	101	Q	121	a	141
0	0	0	1	1				11	21		33	49	49	31	41	81	51	97	161
0	0	1	0	2				22	18	"	42	2	62	B	102	R	122	b	142
0	0	1	0	2				12	22		34	50	50	32	42	82	52	98	162
0	0	1	1	3	DC3	(XOFF)	3	23	19	#	43	3	63	C	103	S	123	c	143
0	0	1	1	3				13	23		35	51	51	33	43	83	53	99	163
0	1	0	0	4				4	20	\$	44	4	64	D	104	T	124	d	144
0	1	0	0	4				14	24		36	52	52	34	44	84	54	100	164
0	1	0	1	5				5	25	%	45	5	65	E	105	U	125	e	145
0	1	0	1	5				15	21		37	53	53	35	45	85	55	101	165
0	1	1	0	6				6	26	&	46	6	66	F	106	V	126	f	146
0	1	1	0	6				16	22		38	54	54	36	46	86	56	102	166
0	1	1	1	7				7	27	/	47	7	67	G	107	W	127	g	147
0	1	1	1	7				17	23		39	55	55	37	47	87	57	103	167
1	0	0	0	8	BS	10	CAN	30	(50	8	70	H	110	X	130	h	150	
1	0	0	0	8				8	24)	40	56	72	48	72	88	58	104	170
1	0	0	1	9	HT	11		31	25)	51	9	71	I	111	Y	131	i	151
1	0	0	1	9				9	19		41	57	57	39	49	89	59	105	171
1	0	1	0	10	LF	12	SUB	32	*	52	:	72	J	112	Z	132	j	152	
1	0	1	1	11	VT	13	ESC	33	+	53	;	73	K	113	E	133	k	153	
1	0	1	1	11				11	27		59	59	75	48	75	91	58	107	173
1	1	0	0	12	FF	14		34	28	,	54	60	L	114	O	134	l	154	
1	1	0	1	13	CR	15		35	29	=	55	61	M	115	A	135	m	155	
1	1	1	0	14	SO	16		36	30	>	56	62	N	116	U	136	n	156	
1	1	1	0	14				E	1E	.	46	62	78	4E	94	95	110	111	176
1	1	1	1	15	SI	17		37	31	/	57	63	O	117	—	137	o	157	
				F				1F	47		47	3F	77	4F	79	95	5F	111	127

KEY

ASCII CHARACTER	ESC	33	OCTAL
		27	DECIMAL
		18	HEX

[HIGHLIGHTS DIFFERENCES FROM ASCII]

MA-7421A

THIS CHART ASSUMES CHARACTER SET IS LOADED INTO GL. IF CHARACTER SET IS LOADED INTO GR (8-BIT MODE ONLY), ADD 200 TO THE OCTAL VALUE, 128 TO THE DECIMAL VALUE AND 80 TO THE HEX VALUE, TO SELECT THE CHARACTER FOR PRINTING.

Table A-12 Spanish Character Set

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

KEY

ASCII CHARACTER

ESC	33	OCTAL
	27	DECIMAL
	1B	HEX

HIGHLIGHTS DIFFERENCES
FROM ASCII

MA 7247J

THIS CHART ASSUMES CHARACTER SET IS LOADED INTO GL. IF CHARACTER SET IS LOADED INTO GR (8-BIT MODE ONLY), ADD 200 TO THE OCTAL VALUE, 128 TO THE DECIMAL VALUE AND 80 TO THE HEX VALUE, TO SELECT THE CHARACTER FOR PRINTING.

Table A-13 Swedish Character Set

BITS			B7	B6	B5	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							
B4	B3	B2	B1	ROW																
0	0	0	0	NUL	0		20 16 10	SP	40 32 20	0	60 48 30	E	100 64 40	P	120 80 50	e	140 96 60	p	160 112 70	
0	0	0	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	11 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	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	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 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 B	ESC	33 27 1B	+	53 43 2B	;	73 59 3B	K	113 75 48	X	133 91 58	k	153 107 68	x	173 123 7B
1	1	0	0	12	FF	14 12 C		34 28 1C	,	54 44 2C	<	74 60 3C	L	114 76 4C	O	134 92 5C	l	154 108 6C	o	174 124 7C
1	1	0	1	13	CR	15 13 D		35 29 1D	-	55 45 2D	=	75 61 3D	M	115 77 4D	A	135 93 5D	m	155 109 6D	a	175 125 7D
1	1	1	0	14	SO	16 14 E		36 30 1E	.	56 46 2E	>	76 62 3E	N	116 78 4E	U	136 94 5E	n	156 110 6E	u	176 126 7E
1	1	1	1	15	SI	17 15 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

KEY

ASCII CHARACTER	ESC	33 27 18	OCTAL DECIMAL HEX
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 HIGHLIGHTS DIFFERENCES
FROM ASCII

MA 7422A

THIS CHART ASSUMES CHARACTER SET IS LOADED INTO GL. IF CHARACTER SET IS LOADED INTO GR (8-BIT MODE ONLY), ADD 200 TO THE OCTAL VALUE, 128 TO THE DECIMAL VALUE AND 80 TO THE HEX VALUE, TO SELECT THE CHARACTER FOR PRINTING.

Table A-14 United Kingdom Character Set

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

KEY

ASCII CHARACTER	ESC	33 27 1B	OCTAL DECIMAL HEX

HIGHLIGHTS DIFFERENCES FROM ASCII

MA 72488

THIS CHART ASSUMES CHARACTER SET IS LOADED INTO GL. IF CHARACTER SET IS LOADED INTO GR (8-BIT MODE ONLY), ADD 200 TO THE OCTAL VALUE, 128 TO THE DECIMAL VALUE AND 80 TO THE HEX VALUE, TO SELECT THE CHARACTER FOR PRINTING.

SUMMARY OF ESCAPE SEQUENCES AND SWITCHES

B

Escape Sequence Summary

Name/Mnemonic	Escape Sequence/Description							
Set horizontal pitch DECSHORP	ESC [Pn w							
	033 133 *** 167							
	Pn= 0 1 2 4 5 6 8							
	10 10 12 16.5 5 6 8.25 CPI							
Set vertical pitch DECVERP	ESC [Pn z							
	033 133 *** 172							
	Pn= 0 1 2 3 4 5 6							
	6 6 8 12 2 3 4 LPI							
Page length selection DECSLPP	ESC [Pn t							
	033 133 *** 164							
Pn = 0 to 252	Pn (lines/page) = Paper length (inches/page) X Vertical pitch (lines/inch)							
Partial line down PLD	ESC K	Move down 1/2 line (paper up 1/12 inch)						
	033 133							
Partial line up PLU	ESC L	Move up 1/2 line (paper down 1/12 inch)						
	033 114							
Select density DECDEN	ESC [Pn " z							
	033 133 *** 042 172							
	Pn = 0, 1	Select normal density printing						
	Pn = 2	Select enhanced density printing						
Select graphic rendition SGR	ESC [Pn ... Pn m							
	033 133 *** 073 *** 155							
◦ Pn = 0 - Reset								
◦ Pn = 1 - Bold on								
◦ Pn = 22 - Bold off								
◦ Pn = 4 - Underline on								
◦ Pn = 24 - Underline off								

Escape Sequence Summary (Cont)

Name/Mnemonic	Escape Sequence/Description					
Device attribute DA	ESC [c 033 133 143					
	Sends back identification code					
	ESC [? 1 7 c 033 133 077 061 067 143					
Device status report DSR	ESC [n 033 133 156					Send extended status report
	ESC [? 1 n 033 133 077 061 156					Disable all unsolicited status reports
	ESC [? 2 n 033 133 077 061 156					Enable unsolicited brief reports and send extended status report
	ESC [? 3 n 033 133 077 063 156					Enable unsolicited extended report and send extended status report
Brief status report (sent back by printer)	ESC [0 n 033 133 060 156					No malfunction detected
DSR	ESC [3 n 033 133 063 156					Malfunction detected
Extended status reports (sent back by printer)	ESC [0 n 033 133 060 156					No malfunction detected
DSR	followed by					
	ESC [? 2 0 n 033 133 077 062 060 156					
	ESC [3 n 033 133 063 156					Malfunction detected
	followed by					
	ESC [? Pn ... 0 n 033 133 077 *** 073 156					
	Pn = 21 Hardware failure					
	Pn = 22 Communication failure (event)					
	Pn = 23 Input buffer overflow (event)					
	Pn = 24 Printer deselected					
	Pn = 26 Cover open					
	Pn = 27 Paper empty					
Enter graphics mode	ESC P q 033 120 161					Enter graphics mode
	! n Repeat introducer, n = 0 to 65535					
	\$ Graphic carriage return					
	- Graphic new line					
Exit graphics mode	ESC \ 033 134					

Character Set Selection

SO	CTRL/N (016)	Select G0 to be GL
SI	CTRL/O (017)	Select G1 to be GL
SS2	ESC N (033 116)	Select next character from G2
SS3	ESC O (033 117)	Select next character from G3
LS2	ESC n (033 156)	Select G2 to be GL
LS3	ESC o (033 157)	Select G3 to be GL
LS1R	ESC ~ (033 176)	Select G1 to be GR
LS2R	ESC (033 175)	Select G2 to be GR
LS3R	ESC (033 174)	Select G3 to be GR

Assign Character Sets**ESC Gn Ch**

Assign set ch to Gn where Gn is

"(" = G0	"*" = G2
")" = G1	"+" = G3

and ch is from the list below

B - ASCII	J - JIS Roman
A - Britain	I - JIS Katakana
5 - Finland*	6 - Norway/Denmark*
C - Finland	E - Norway/Denmark
R - France	Z - Spain
9 - French Canada*	7 - Sweden*
Q - French Canada	H - Sweden
K - Germany	< - Multinational
Y - Italy	0 - VT100 Special Graphics

* Preferred

O = OPEN; C = CLOSED

Switch Bank 1**Switch**

Country	4	3	2	1
US (ASCII)	O	O	O	O
Britain	O	O	O	C
Finland	O	O	C	O
France	O	O	C	C
French Canada	O	C	O	O
Germany	O	C	O	C
Italy	O	C	C	O
Japan	O	C	C	C
Norway/Denmark	C	O	O	O
Spain	C	O	O	C
Sweden	C	O	C	O

Notes**1. For all countries except Japan:****G0 = Selected country, G1 = VT100, G2 = Multinational, and G3 = ASCII.****2. For Japan:****G0 = JIS Roman, G1 = Katakana, G2 = Katakana, and G3 = ASCII.****Switch Bank 2****Switch**

Baud Rate	1	2	3
4800	O	O	O
2400	O	C	O
1200	O	C	C
600	C	O	O
300	C	O	C
200	C	C	O
110	C	C	C

Switch Bank 2**Switch**

Data Format	4	5	6
7 Bits + odd parity	O	C	C
7 Bits + even parity	C	C	C
7 Bits + 8th bit mark	O	O	C
7 Bits + 8th bit space	C	O	C
8 Bits + odd parity	O	C	O
8 Bits + even parity	C	C	O
8 Bits + no parity	O	O	O

O = OPEN; C = CLOSED**Switch Bank 1**

Aspect Ratio	(Switch 5)	Protocol Switch	(Switch 6)
2:1	O	XON/XOFF	O
2:5.1	C	Ready/Busy	C
Signal Level	(Switch 7)	Right Margin	(Switch 8)
Busy = Hi: Ready = Lo	O	Truncated	O
Busy = Lo: Ready = Hi	C	Wrap	C

Power Up Conditions

Printer selected - on-line

Printer status report - disable unsolicited report

Horizontal pitch - 10 characters/inch

Vertical pitch - 6 lines/inch

Page length - 11 inches

Active position - top leftmost position

Bold, underline, double width - off

Printing density - normal

7-bit mode - GL = G0

8-bit mode - GL = G0; GR = G2

Character sets, aspect ratio, protocol, right margin, and data format are selected per switch settings.

Attributes	Vertical Pitch (Characters/Inch)					
	16.5	12	10	8.25	6	5
Enhanced		X	X		X	X
Bold		X	X	X	X	X
Underline	X	X	X	X	X	X
Maximum characters/line	132	96	80	66	48	40

