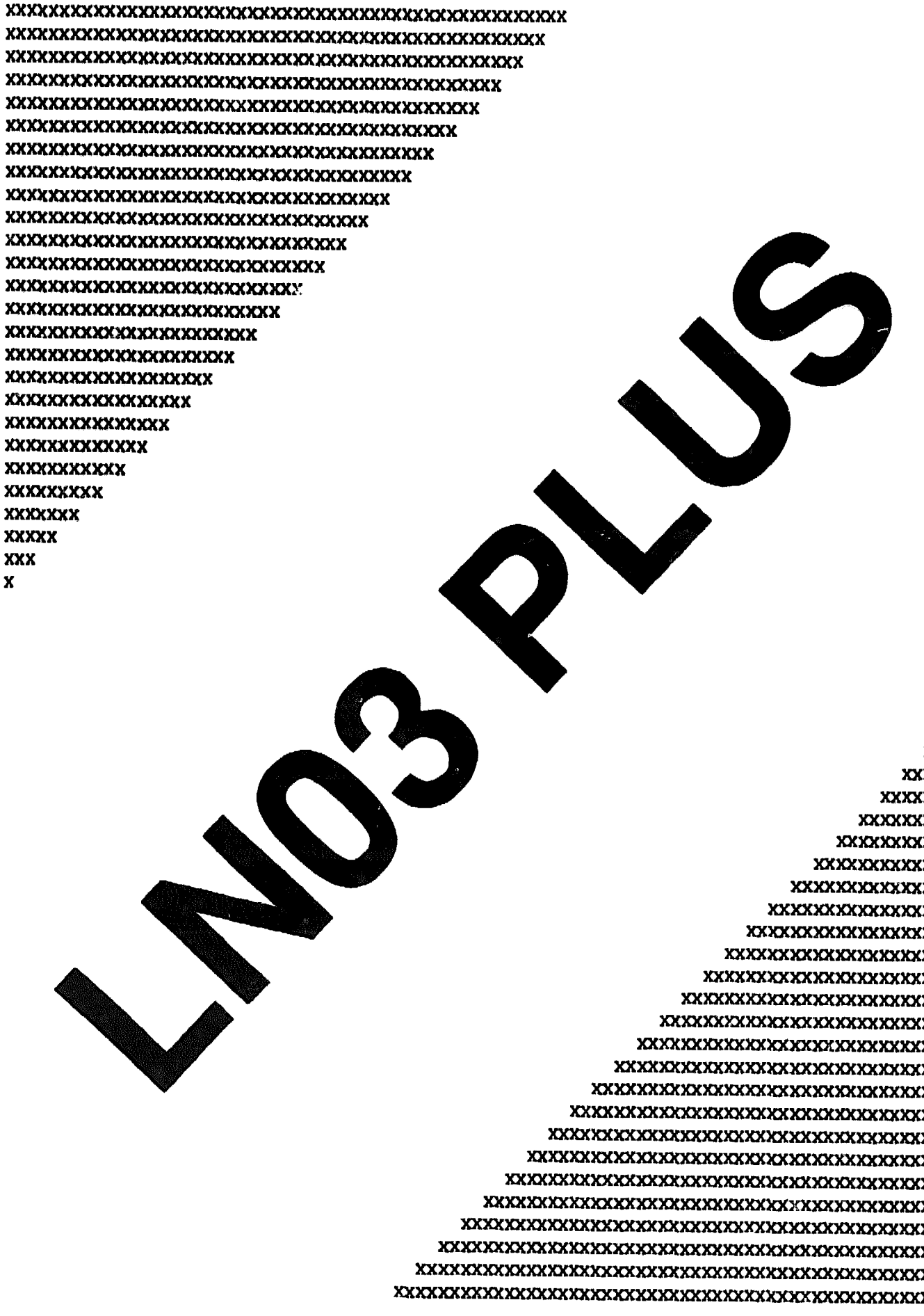
LN03 PLUS

EK-ISOPC-UG-002

Installing and Using the LN03 PLUS ISO/PC Cartridge

Prepared by Educational Services
of Digital Equipment Corporation

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DECSYSTEM-20	Professional	VT
DECUS	Rainbow	Work Processor
DECwriter		

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ABOUT THIS BOOK

Installing and Using the LN03 PLUS ISO/PC Cartridge is intended for three groups of users: users who are new to the LN03 PLUS printer, users who have some experience with the LN03 PLUS printer, and users with programming experience. This book provides directions for installing, using, and programming the LN03 PLUS with the ISO/PC cartridge. This book is organized into two sections: Section I contains information about installing and using the ISO/PC cartridge; Section II contains reference information for users with programming experience.

SECTION I INSTALLING AND USING THE LN03 PLUS ISO/PC CARTRIDGE

- **Chapter 1 Installing the LN03 PLUS ISO/PC Cartridge**
  This chapter is for people who have little or no experience using the LN03 PLUS printer. It describes how to connect your LN03 PLUS printer to a VAXmate, and how to unpack, install, and test the ISO/PC cartridge. This chapter also explains how to set the power-up default setting for the ISO/PC cartridge. **Read this chapter completely before you begin the installation procedure.**

- **Chapter 2 Using the ISO/PC Cartridge**
  This chapter is for people who have some experience with the LN03 PLUS printer. It describes how to choose and set the power-up default setting for the ISO/PC cartridge. The chapter also explains how the ISO/PC cartridge affects the output of your LN03 PLUS when the cartridge is in "Other" mode.

SECTION II PROGRAMMER REFERENCE MATERIAL

- **Chapter 3 Escape Sequences for Changing Modes**
- **Chapter 4 Escape Sequences for DEC Mode**
- **Chapter 5 IBM Proprinter Emulation Features and Control Characters**
- **Chapter 6 IBM Proprinter Emulation Character Sets**
- **Chapter 7 Escape Sequences IBM Proprinter Emulation**

The chapters in this section contain information for programmers. This section does not teach users how to program, but does provide a reference for users with programming experience. Applications programmers who are updating programs that require printing in IBM Proprinter emulation mode, or developing new programs for DEC mode, will find these chapters especially useful.

- **Appendix Examples of Software Packages Supported in "Other" Mode**

This appendix provides a partial list of popular software packages that can be used with the LN03 PLUS printer in "Other" mode.

WARNINGS, CAUTIONS, AND NOTES

The warnings, cautions, and notes in this guide have specific purposes.

WARNING: Contains information about preventing personal injury.

CAUTION: Contains information about preventing equipment damage.

NOTE: Contains important additional general information.

A Note about Terminology

In this book the terms "Other mode," "emulation mode," and "IBM Proprinter emulation mode" all refer to the mode that allows the LN03 PLUS printer with the ISO/PC cartridge to emulate the IBM Proprinter.

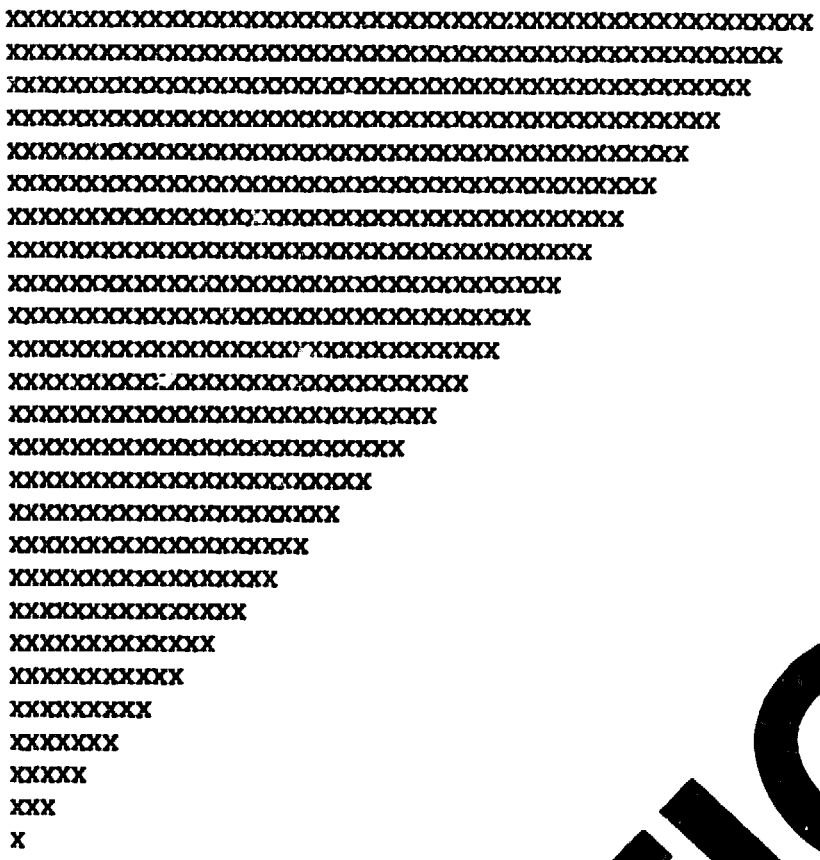
Related Documentation

Installing and Using the LN03 (EK-OLN03-UG-002)
Installing and Using the LN03A (EK-LN03A-UG-001)
LN03 Programmer Reference Manual (EK-OLN03-RM-002)
LN03 PLUS User Guide (EK-LN03S-UG-001)
LN03 PLUS Programmer Reference Manual (EK-LN03S-RM-001)

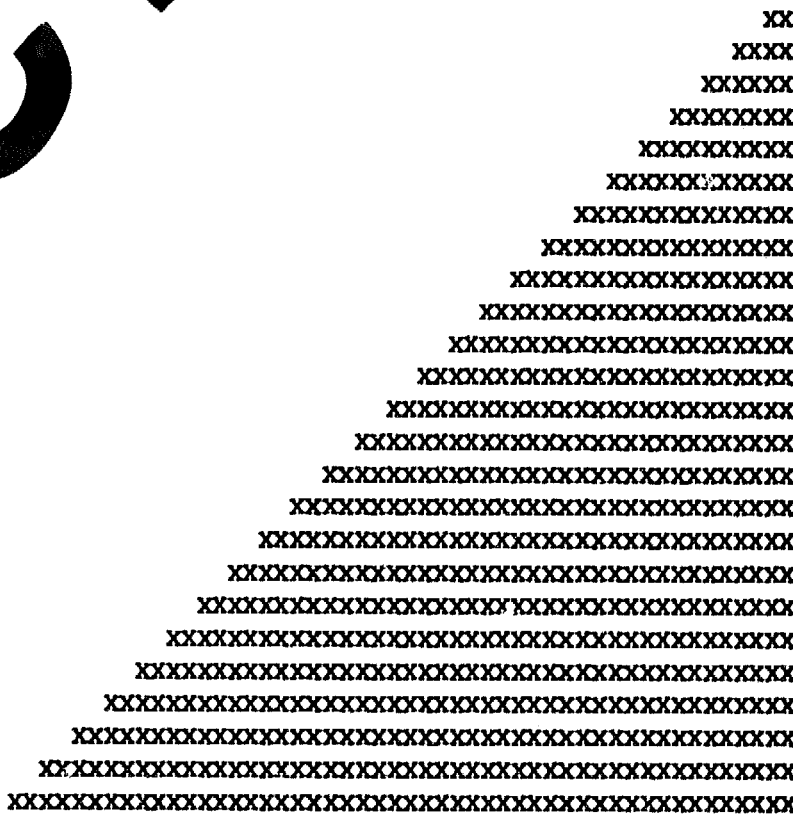
ABOUT THE ISO/PC CARTRIDGE

The ISO/PC cartridge is used with an LN03 PLUS and a VAXmate. The ISO/PC cartridge has two modes of operation: DEC mode and "Other" mode. In DEC mode, the cartridge gives the LN03 PLUS access to the ISO 8-Bit Supplemental Character Set. In "Other" mode, the cartridge allows the LN03 PLUS to emulate the IBM Proprinter.

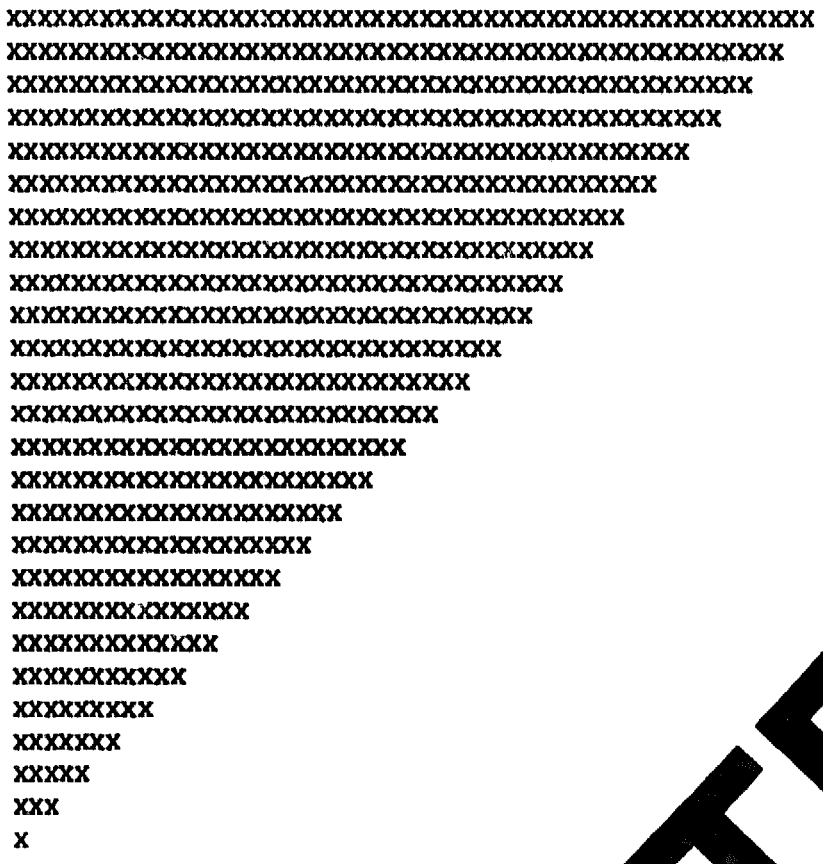
NOTE: The ISO/PC cartridge will only work in an LN03 printer that has the PLUS option (C.S. B or higher) installed. The LN03 PLUS must have base code 4.4 and PLUS code 1.1 or higher.



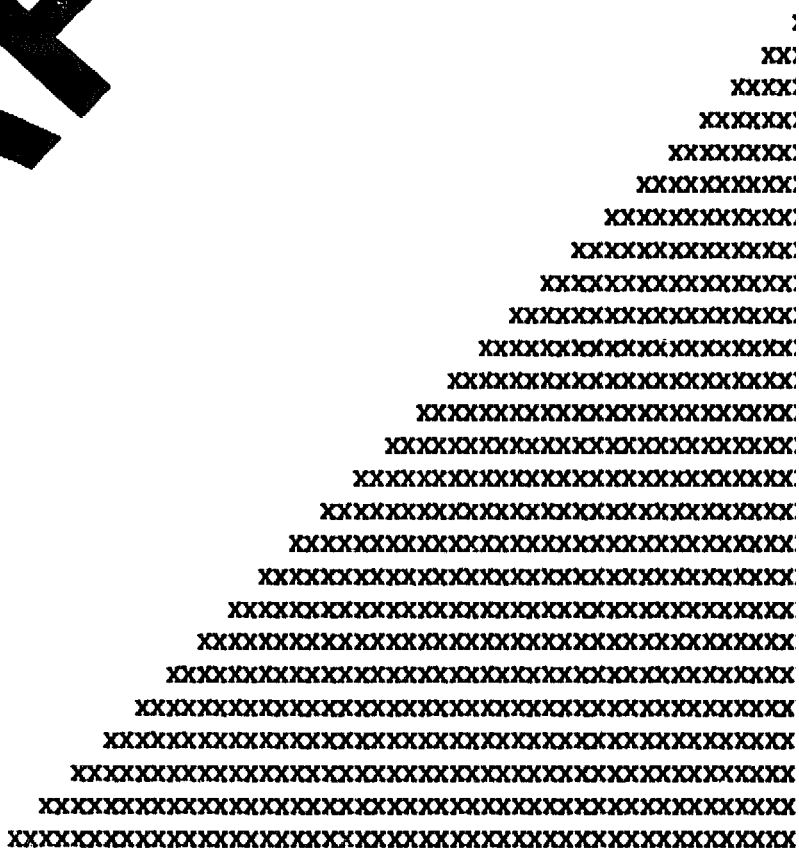
SECTION I



SECTION I
INSTALLING AND USING THE LN03 PLUS ISO/PC CARTRIDGE



CHAPTER 1

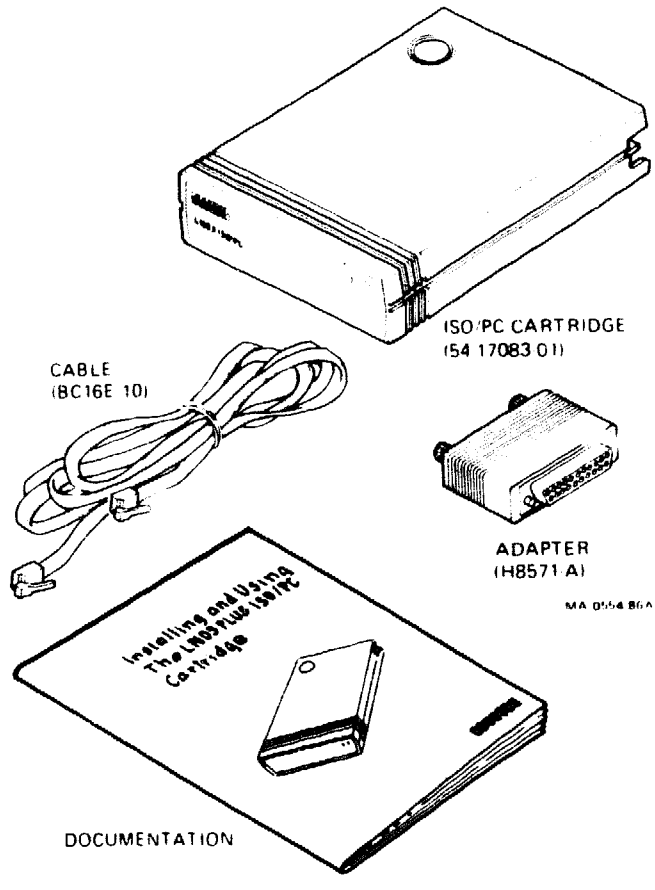


CHAPTER 1
INSTALLING THE LN03 PLUS ISO/PC CARTRIDGE

NOTE: Read this chapter completely before you begin the installation procedure.

CHECKING THE CONTENTS OF THE BOX

1. Open the box and make sure you have:



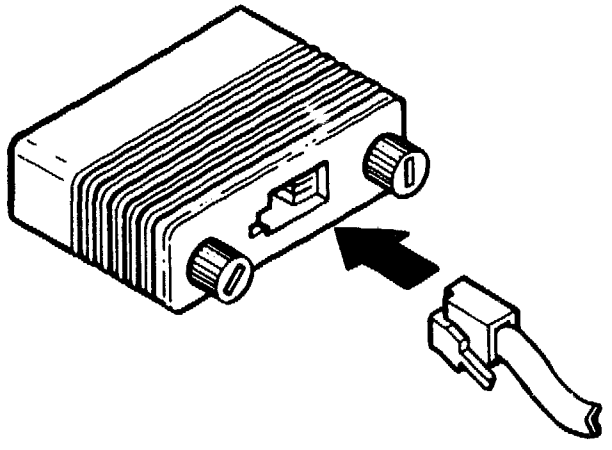
If an item is missing or damaged contact your local sales representative and your delivery agent.

To connect your LN03 PLUS directly to a VAXmate, follow the instructions listed below.

If your LN03 PLUS is already connected to a host other than a VAXmate, turn to page 1-5 to complete the installation procedure.

CONNECTING THE LN03 PLUS TO THE VAXmate

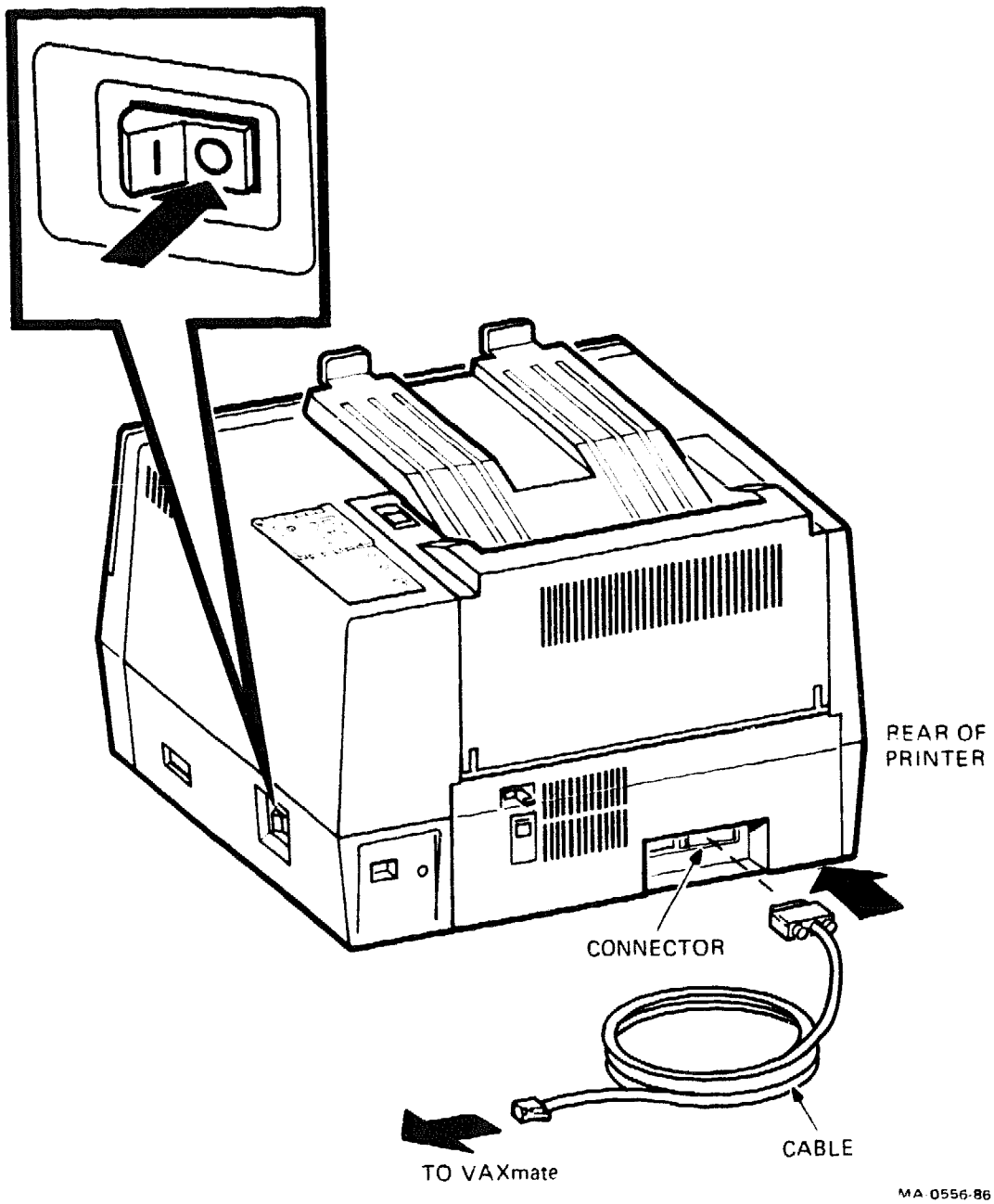
1. Connect the cable to the adapter.



2. Make sure the power switch on the LN03 PLUS is set to 0 (off).

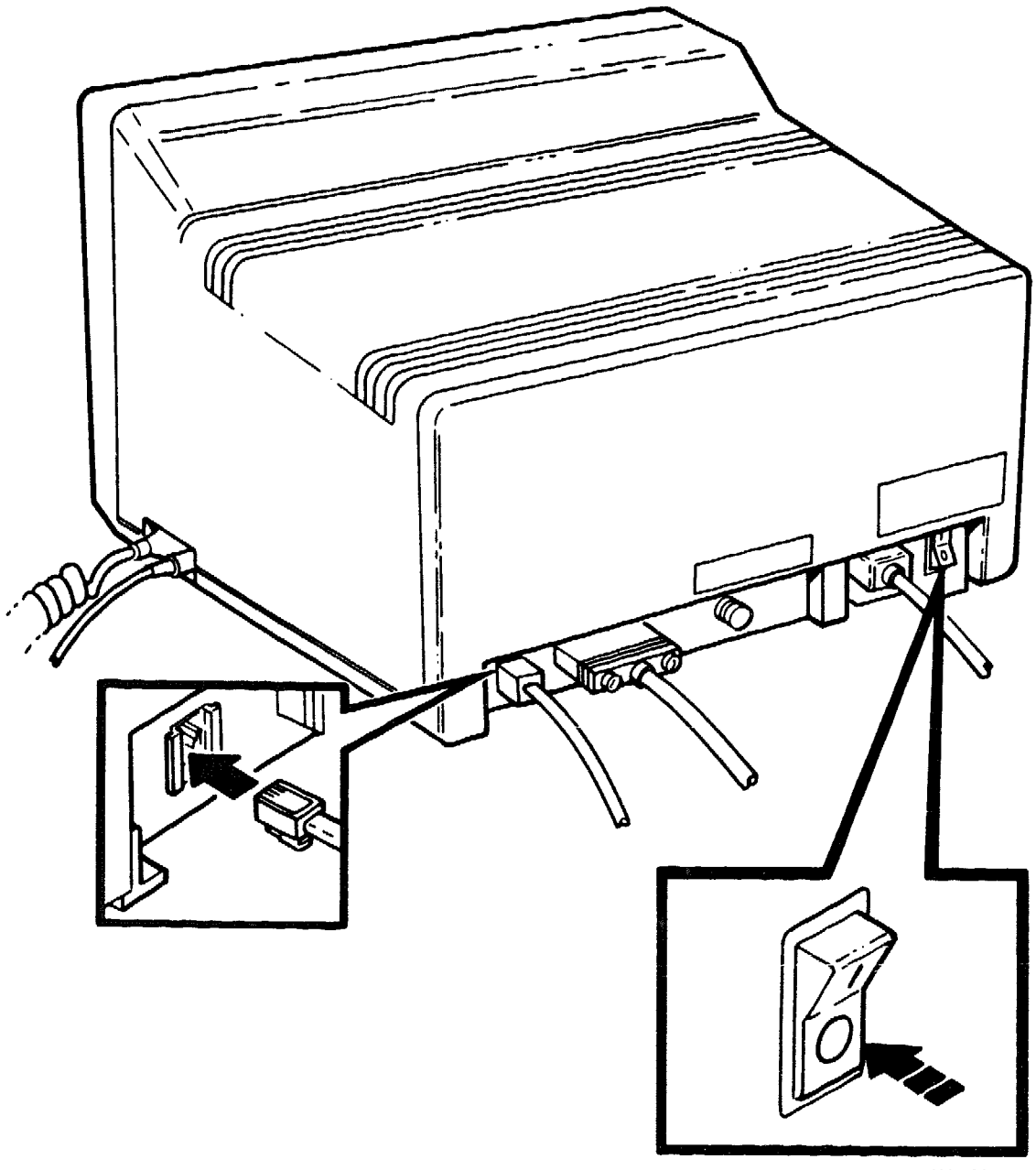
NOTE: Make sure the LN03 is within 10 feet of the VAXmate.

3. Connect the adapter with the cable to the back of the LN03 PLUS.



4. Make sure the power switch on the VAXmate is set to 0 (off).

5. Connect the other end of the cable to the VAXmate.



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INSERTING THE ISO/PC CARTRIDGE INTO THE LN03 PLUS

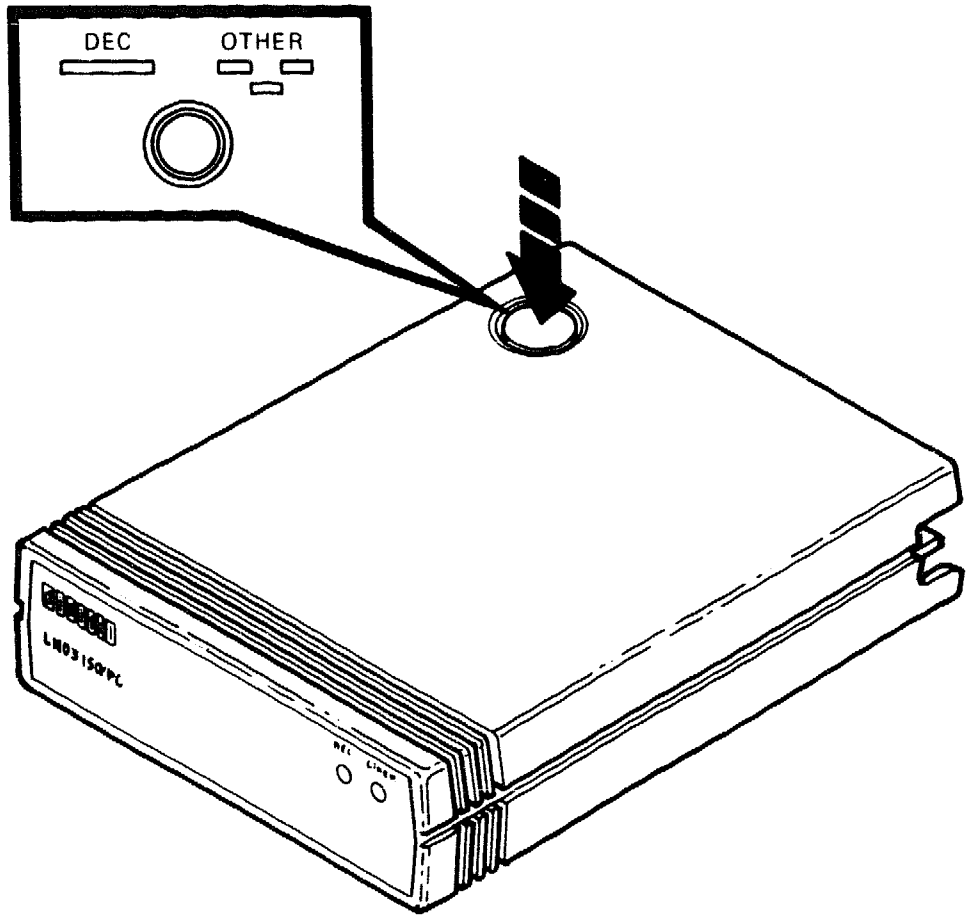
CAUTION: Make sure the power switches on the VAXmate and the LN03 PLUS are set to 0 (off) before starting this procedure.

1. Press the button on the ISO/PC cartridge down to choose "Other" mode. Release the button to choose DEC mode.

NOTE: The ISO/PC cartridge is factory set in DEC mode. If you want the LN03 PLUS to power up in DEC mode, choose DEC. If you want the LN03 PLUS to power up in "Other" mode, press the button on the ISO/PC cartridge.

   See Chapter 2, Using the ISO/PC Cartridge, for more information about choosing and setting default settings.

2. Insert the ISO/PC cartridge into the bottom font cartridge slot in the front of the LN03 PLUS.



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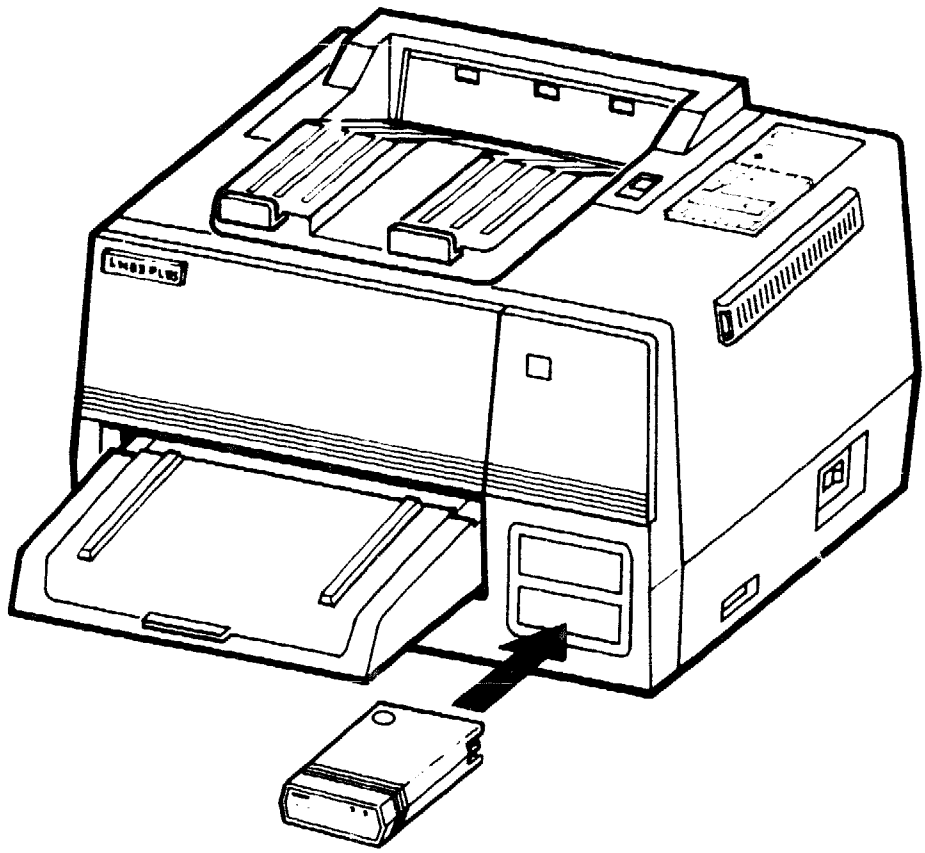
NOTE: You must insert the cartridge into the bottom slot.



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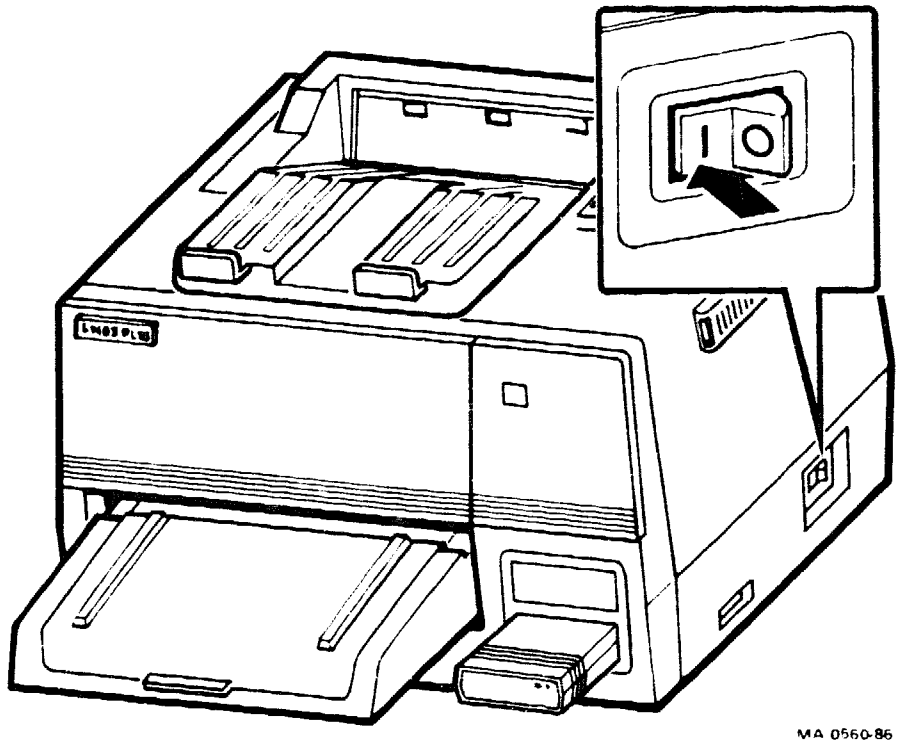
3. Set the LN03 PLUS power switch to 1 (on).



4. Set the VAXmate power switch to 1 (on).

5. Check the green indicator on the ISO/PC cartridge to be sure it is in the mode you selected.

NOTE: If an indicator does not light, check the indicator panel on the LN03 PLUS to see if any error codes are flashing. Refer to the Table 1-1 below if any error codes are listed.

Call Digital Field Service if you need help correcting any faults.

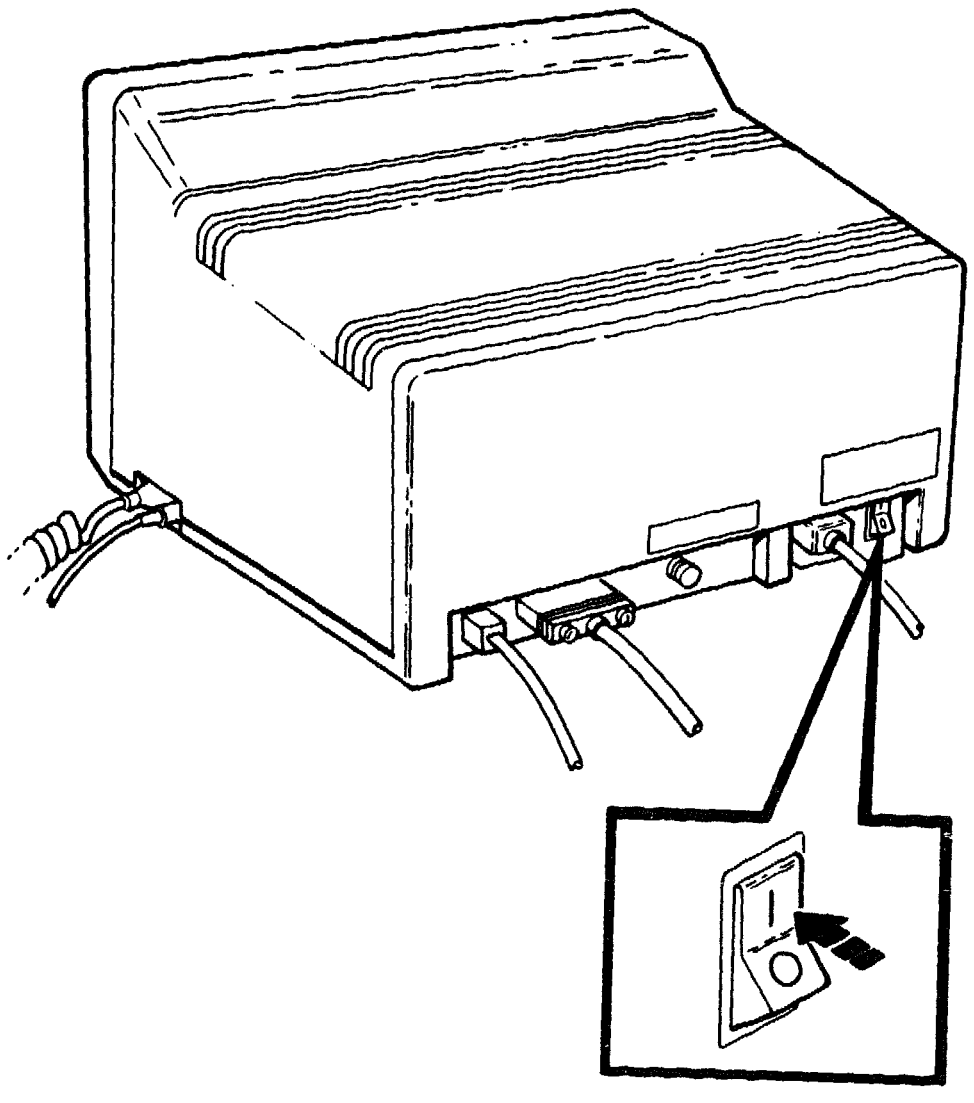


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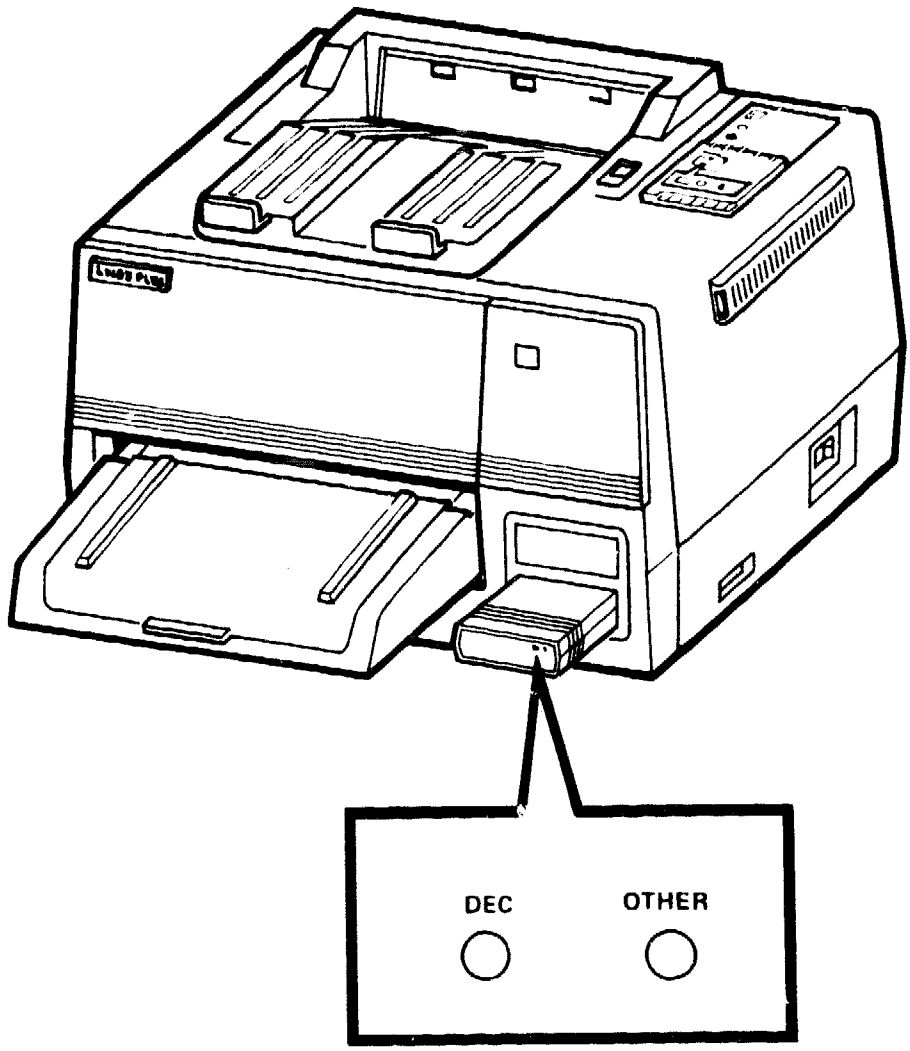
Table 1-1 Error Codes

Error Code	Meaning
45	The LN03 has not been updated to the correct LN03 PLUS version.
46	The cartridge is installed in the upper slot. The cartridge can be installed only in the bottom slot.
51 or 52	The cartridge is defective. Call Digital Field Service.



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VERIFYING CARTRIDGE INSTALLATION

1. Start the VAXmate from the MS-DOS diskette (labeled "VAXmate MS-DOS Version 3.10").

2. Hold down the Shift key and press the Prt Sc key (PF4 on the numeric key pad).

   A picture of the screen appears on the LN03 PLUS printer. If no picture appears or if the output is garbled, make sure the communication settings on the LN03 PLUS match the settings on the VAXmate. If the settings are correct, turn off the printer, remove the LN03X-IC cartridge, turn the printer back on and try the test again. If this corrects the problem, the cartridge may be faulty. If not, you must find and correct the problem and start the test again.

3. At the A> prompt on the VAXmate, type the commands:

   A> MODE BW640

   The screen display is cleared and the output mode changes to 640 × 200 black and white graphics. The characters appear blocky and the cursor disappears.

   A> GRAPHICS LA75STD

   This command loads the graphic screen printing software and defines the LN03 as an LA75 during IBM Proprinter emulation mode.

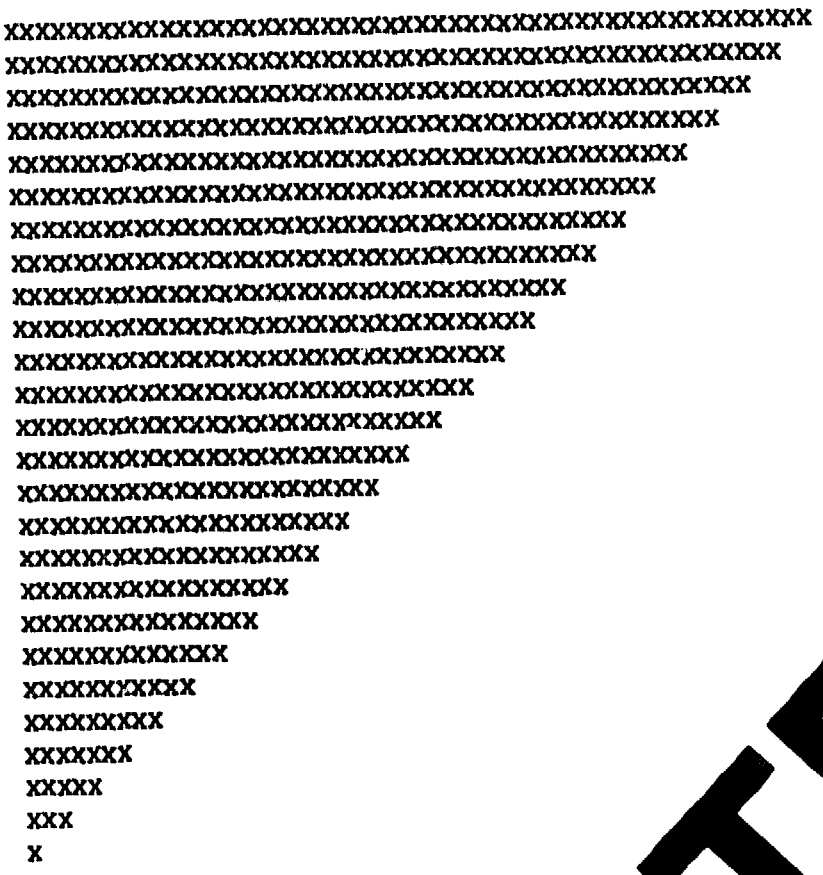
4. Hold down the Shift key and press the Prt Sc key.

   The VAXmate indicates that the printer programmed successfully.

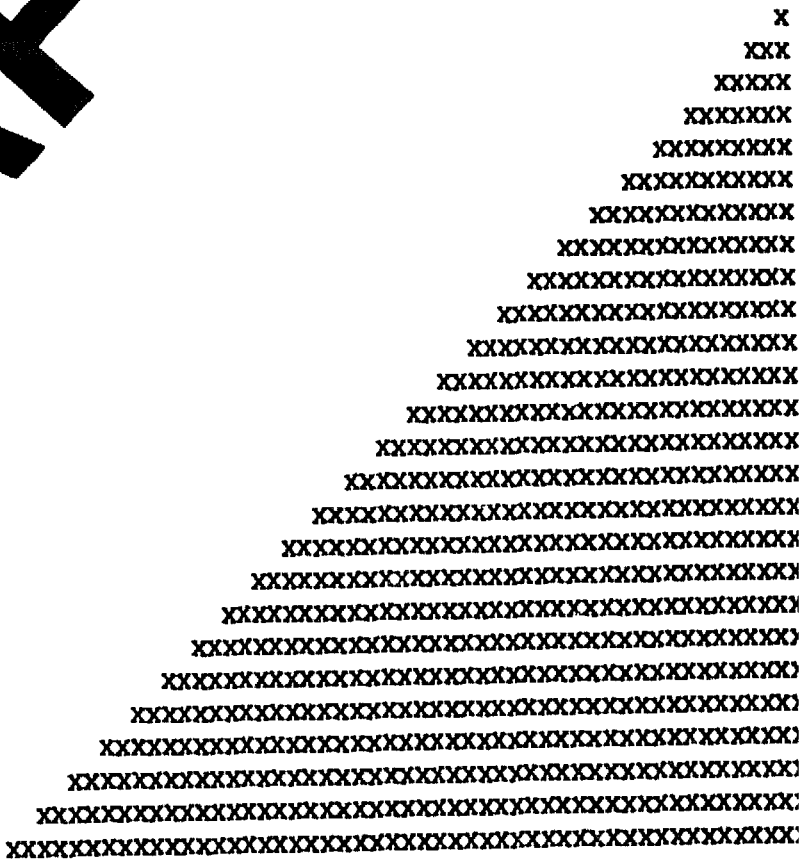
   The printer displays a flashing six (6) in the character display indicator on the control panel. This indicates that the LN03 PLUS printer is busy.

Wait one minute and then press the On Line/Off-line button twice, and the LN03 PLUS ejects a copy of the screen dump in a printed page.

If the LN03 PLUS does not eject a copy of the screen dump, or if the ejected copy is garbled, the cartridge may be installed improperly. Refer to the Installation section of this manual. Verify each step of the installation procedure, and try the test again. If the test still does not work, contact Digital Field Service for assistance.



CHAPTER 2



CHAPTER 2
USING THE LN03 PLUS ISO/PC CARTRIDGE

This chapter is for people with some LN03 PLUS printer experience. It describes how to match the ISO/PC cartridge default setting to your system's power-up default setting and explains how the cartridge allows you to use the LN03 PLUS in "Other" mode to emulate the IBM Proprinter. This chapter also explains how the ISO/PC cartridge affects the output of your LN03 PLUS when the cartridge is in "Other" mode.

DEC Mode and "Other" Mode

When the ISO/PC Cartridge is installed in the LN03 PLUS, the printer can operate in two modes–DEC mode and "Other" mode. DEC mode provides the same features available during normal LN03 PLUS operation. DEC mode also gives the LN03 PLUS access to the ISO 8-Bit Supplemental Character Set in the following font styles: courier 10; elite 12; and courier 13.6. The ISO 8-Bit Supplemental Character Set provides additional mathematical symbols and Icelandic characters. (See Figure 2-1, ISO 8-Bit Supplemental Character Set.)

"Other" mode allows the LN03 PLUS printer to emulate an IBM Proprinter. When the ISO/PC cartridge is in "Other" mode, you can use an LN03 PLUS printer to print files formatted for an IBM Proprinter. (There are a few printing differences which are discussed in this chapter.)

Choosing a Default Setting for the ISO/PC Cartridge

When you install the ISO/PC cartridge, you must choose the default setting for the cartridge. If you want your LN03 PLUS to power up in DEC mode, set the cartridge to DEC mode. If you want your LN03 PLUS to power up in "Other" mode, set the cartridge to "Other" mode.

Select the cartridge default setting that matches your printing needs. If you use the IBM Proprinter emulation mode infrequently, choose DEC mode as your default. If you use emulation mode often, choose "Other" mode as your default.

Setting the ISO/PC Cartridge Default
To set the ISO/PC cartridge default:

1. Make sure the power to the LN03 PLUS is set to 0 (off).

2. Press the button on the ISO/PC cartridge in for "Other" mode or release the button for DEC mode.

3. Insert the cartridge into the bottom LN03 PLUS font cartridge slot in the front of the printer.

NOTE: You must insert the cartridge into the bottom slot.

NOTE: The indicators on the cartridge show the printer's current operating mode. This means that if you choose DEC mode for your power-up default and then choose "Other" mode through your software package, the indicator on the cartridge will light to show that you are currently in "Other" mode.

NOTE: If an indicator does not light, check the indicator panel on the LN03 PLUS to see if any error codes are flashing. Refer to Table 2-1 if any error codes are listed.

Table 2-1 Error Codes

Error Code	Meaning
45	The LN03 has not been updated to the correct LN03 PLUS version.
46	The cartridge is installed in the upper slot. The cartridge can be installed only in the bottom slot.
51 or 52	The cartridge is defective. Call Digital Field Service.

Call Digital Field Service if you need help correcting any faults.

Changing Mode Settings for Printing Files

Software commands in your applications programs indicate to the LN03 PLUS what mode to print the file in. Software commands control the ISO/PC cartridge, when it is installed in the LN03 PLUS, and there is no need to remove the cartridge when you want your printer to print in a different mode.

Using the ISO/PC Cartridge in "Other" Mode

When the ISO/PC cartridge is in "Other" mode, it emulates the IBM Proprinter. Because the LN03 PLUS is a laser printer and the IBM Proprinter is a dot matrix printer, there are certain differences when using the LN03 PLUS in emulation mode. These differences are as follows.

Number of Dots Per Inch Printed

The LN03 PLUS is a laser printer. It prints 300 dots per inch horizontally and 300 dots per inch vertically. The IBM Proprinter is a dot matrix printer that prints 240 dots per inch horizontally and 144 dots per inch vertically. Printing resolution (dots per inch printed) affects the quality of printer output. A laser printer like the LN03 PLUS has a higher printing resolution than a dot matrix printer and can produce higher quality output.

Downline Loading IBM Fonts

Downline loading IBM fonts creates characters of poorer print quality than the fonts in the LN03 PLUS, or fonts that are downline loaded in DEC mode. Because downline loaded IBM fonts can have jagged edges, their use is not recommended.

Graphics Mode

The LN03 PLUS duplicates the output of an IBM Proprinter when printing graphics.

NOTE: Graphics produced in DEC mode are of higher quality than those in "Other" mode because DEC mode can fully use the LN03 PLUS's high printing resolution. Graphics may be 4% smaller in the vertical direction, and some graphic patterns may look different.

Paper Handling

The LN03 PLUS is a page printer and uses single sheets of paper that are fed into the printer one at a time. Therefore, an LN03 PLUS does not respond to escape sequences that set top of form.

The LN03 PLUS allows you to set the form length to be shorter than the paper in the printer, but does not allow you to set the form length to be longer than the paper in the printer.

Because the LN03 PLUS is a page printer and prints an entire page at a time, the printer ignores escape sequences for enabling/disabling the paper out feature. The printer automatically stops when it is out of paper.

Page Eject

Since the LN03 PLUS is a page printer, it prints and ejects a full page only after it has received a page terminator (such as a form feed).

To eject a page from the LN03 PLUS when the file printed does not contain a form feed, wait until a steady "6" appears on the printer's front panel and press the On-line/Off-line button twice to eject the page.

Printing Modes

The LN03 PLUS does not print draft quality text.

In emulation mode, the LN03 PLUS interprets requests for bold, letter quality, and bold/letter quality as requests for shadow bold.

To achieve letter quality output with some emphasized (bold) text in emulation mode, send documents in "draft mode" to the LN03 PLUS.

Printable Area and Vertical Pitch

The LN03 PLUS does not print within 1/4 inch of the paper edge. In order to maintain the correct number of lines per page, all vertical pitches are slightly smaller than corresponding IBM Proprinter vertical pitches.

Bidirectional/Unidirectional Printing

Since the LN03 PLUS is a page printer it ignores escape sequences for bidirectional and unidirectional printing.

"Set-Up" or Configuration Switches

The configuration switches on the LN03 PLUS are used only for DEC mode. There are no LN03 PLUS set-up functions or configuration switches to emulate the IBM Proprinter's configuration switches.

The following IBM Proprinter configuration switch functions can be emulated through escape codes. (See Chapter 4 for information on escape codes.)

- Auto Line Feed (IBM Proprinter switch position 3)
- Set Active Character Set (IBM Proprinter switch position 5)
- Select Letter Quality (IBM Proprinter switch position SW3-8)

IBM Proprinter functions emulated by escape codes:

- User-preference Supplemental character set at power up is always the Multinational character set.
- Set Form Length (IBM Proprinter switch position 4). A software switch exists for this feature. The LN03 PLUS will allow you to set the form length to be shorter than the paper in the printer, but does not allow you to set the form length to be longer than the paper in the printer.

NOTE: Software settings, unlike switch settings, are not retained by the printer when the power is turned off.

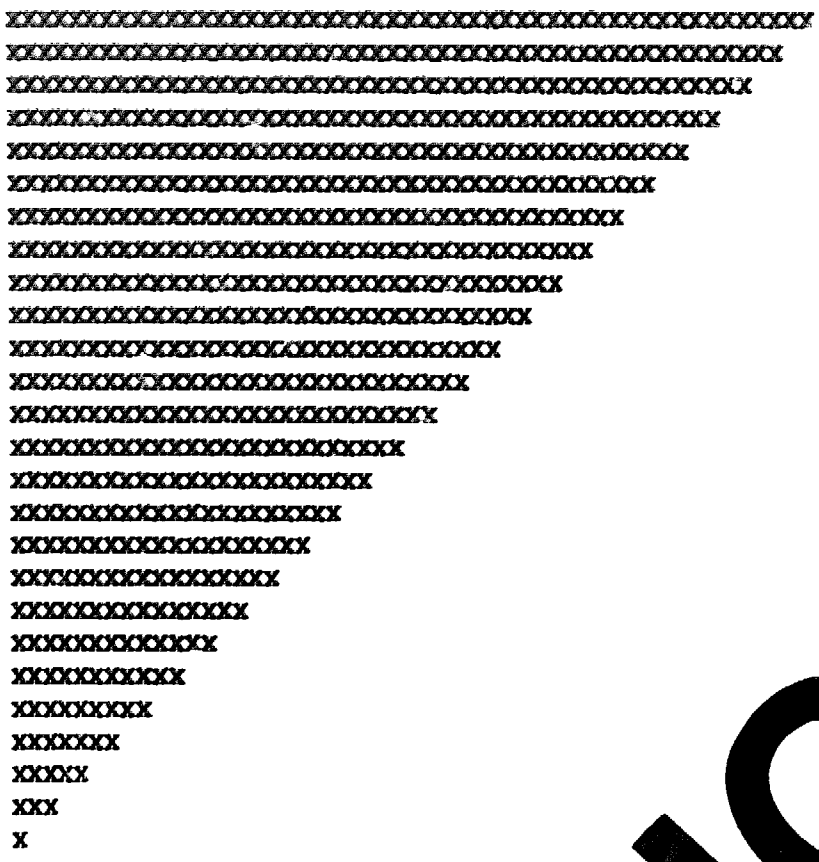
IBM Proprinter functions not emulated by escape codes:

- Bell (IBM Proprinter switch position 1). The LN03 PLUS has no bell.
- Slashed zero (IBM Proprinter switch position 2). The 0 character can easily be recognized from the letter O on the LN03 PLUS. A slashed 0 is available from the All Characters Set if needed.

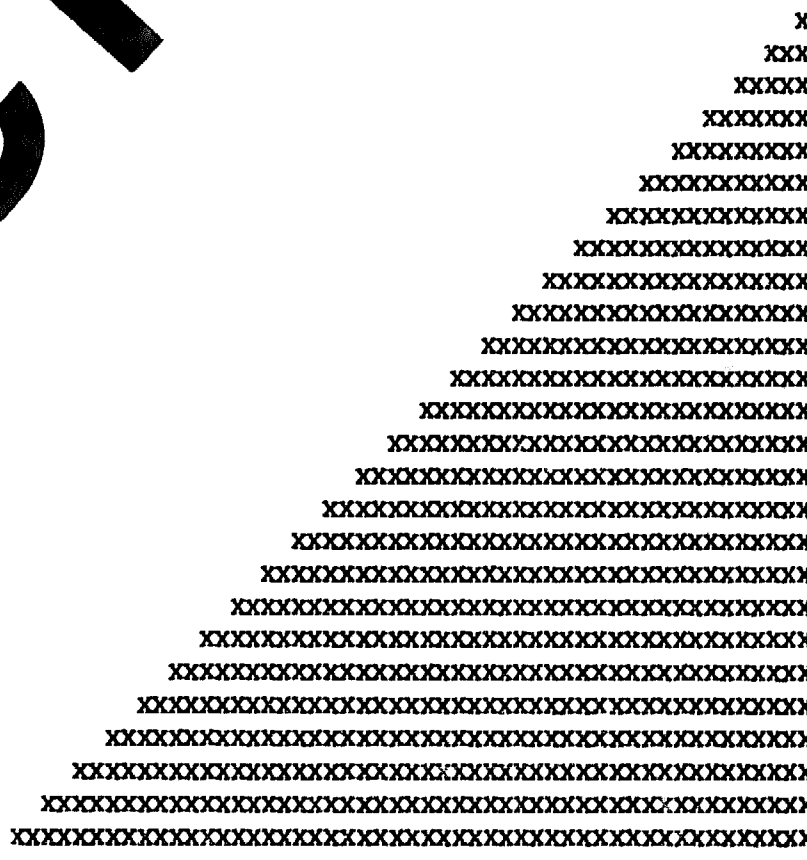
- Auto Carriage Return (IBM Proprinter switch position 6). There is no overriding escape sequence for this function.

  The LN03 Plus with the ISO/PC cartridge is set for auto carriage return in the "Other" mode. This setting cannot be changed.

- Print Density (IBM Proprinter switch position 7). This is not applicable to the LN03 PLUS.



SECTION II

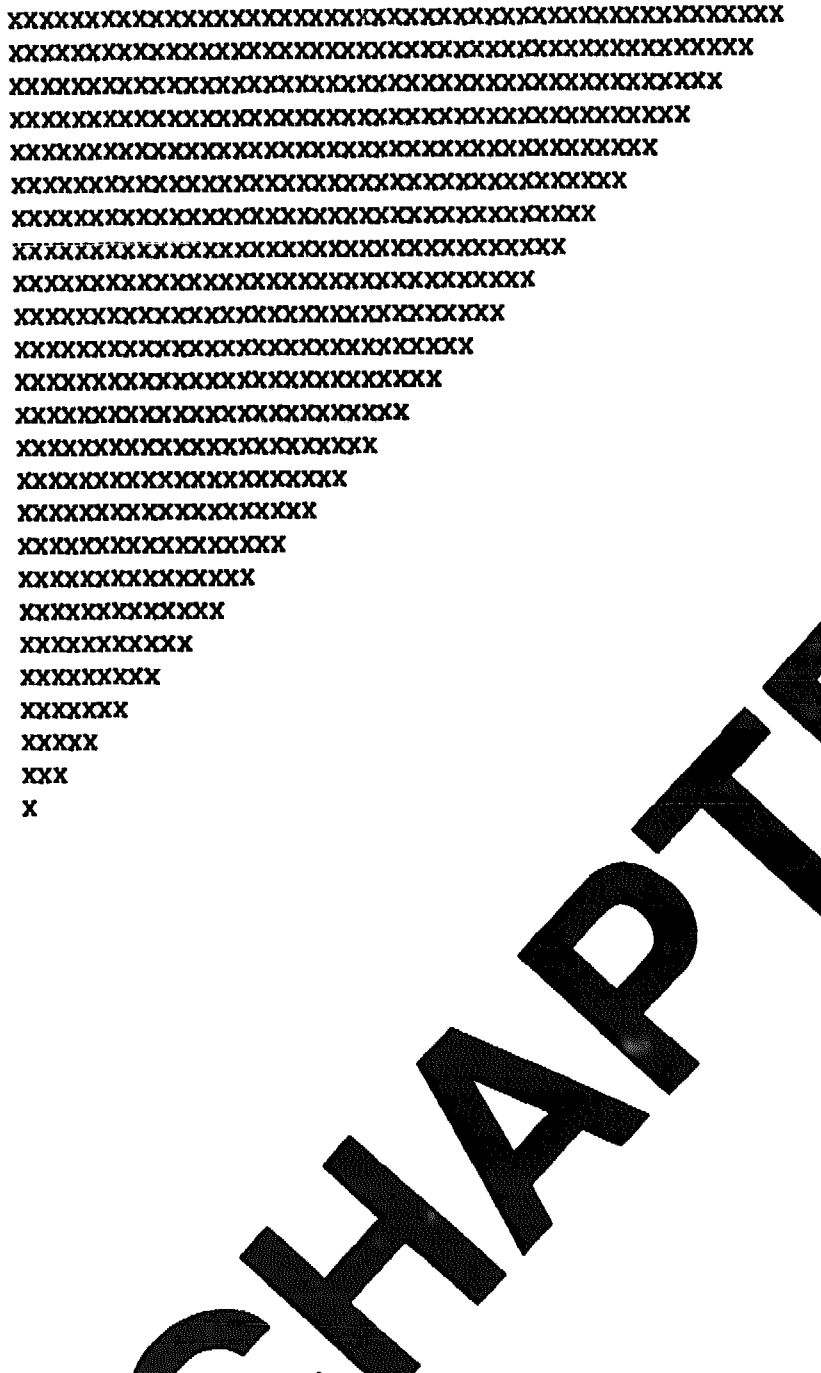


SECTION II
PROGRAMMER'S REFERENCE MATERIAL

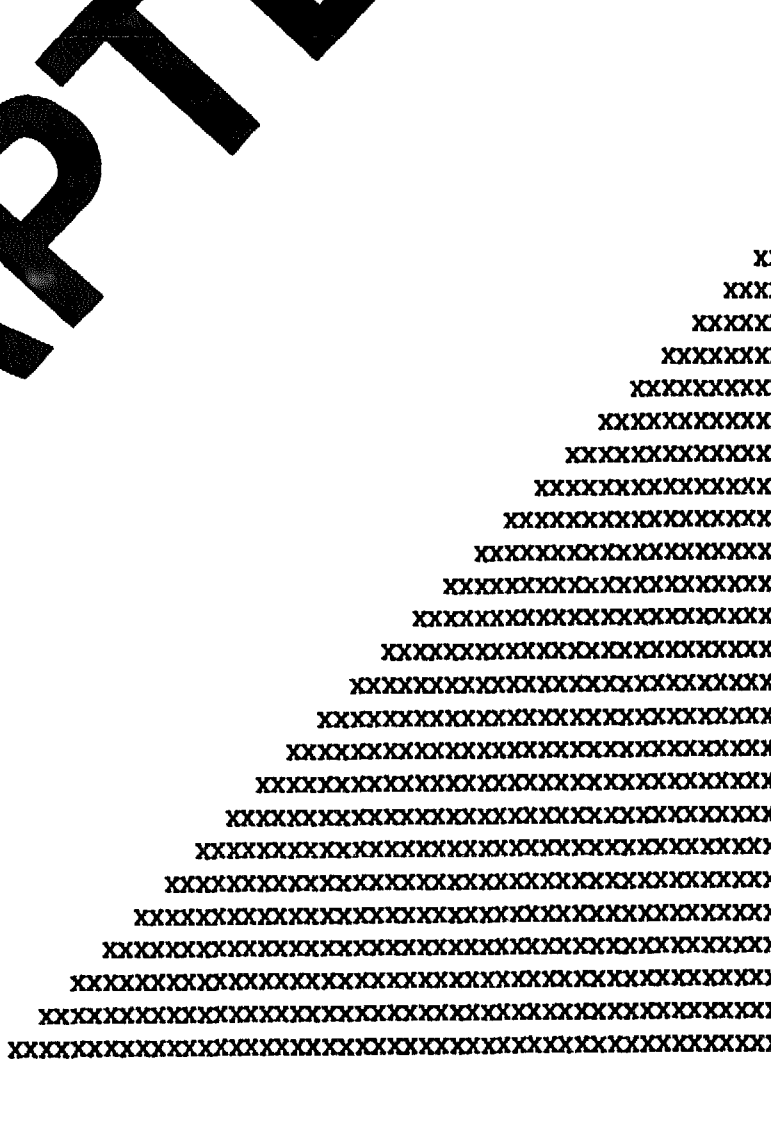
About This Section

The information in this section is reference material for users with programming experience. The applications programmer who is updating programs that require printing in IBM Proprinter emulation mode, or developing new programs for DEC mode, will find these chapters useful.

NOTE: DIGITAL suggests that programmers developing new software for the LN03 PLUS use DIGITAL escape sequences and protocols. (Refer to the LN03 PLUS Programmer's Reference Guide.)



CHAPTER 3



CHAPTER 3
ESCAPE SEQUENCES FOR CHANGING MODES

3.1 GENERAL

This chapter describes the escape sequences used to enable and disable the IBM Proprinter emulation mode. The light on the ISO/PC cartridge indicates which mode the printer is in when it is printing.

NOTE: Escape sequences are multiple-character strings that start with the escape character (ESC, 1/11). Escape sequences control the manner in which text and graphics are printed, but the escape sequence itself is not printed.

3.2 ENABLE IBM PROPRINTER EMULATION MODE

DECIPEM:	**CSI**	**?**	**5**	**8**	**h**
	9BH	3FH	35H	38H	68H

This sequence resets the conditions that were present when the IBM Proprinter emulation mode was last disabled. It does not cause a reset of the IBM Proprinter emulation mode to its initial condition. The printer ejects the page if printing has occurred on this page. The printer sets the active position to column 1, line 1 of the current page.

When the printer is in the "Other" mode, it processes only the following DEC mode sequences:

DECIPEM	Return to DEC mode
RIS	Reset to known ANSI state
DECSTR	Reset to known ANSI state (same as RIS)

NOTE: Do not send CSI to the printer when it is in "Other" mode. In "Other" mode "CSI" is processed as "ESC."

3.3 RETURN TO DEC MODE/DISABLE IBM PROPRINTER EMULATION ESCAPE SEQUENCES

DECIPEM	**ESC**	**[**	**?**	**5**	**8**	**l**
	1BH	5BH	3FH	35H	38H	6CH

This sequence returns the LN03 PLUS to DEC compatible text mode. The printer resets all the conditions that were present before the printer last exited DEC mode. These conditions include:

- Character and Line Pitch
- (SRG) Attributes
- Print Density
- Form Length
- Margins
- Tabs
- DSR Solicited/Unsolicited
- Active Character Sets (GL, GR, G0 - G3)

The printer ejects the page if printing has occurred on this page. The printer sets the active position to column 1, line 1 of the current page.

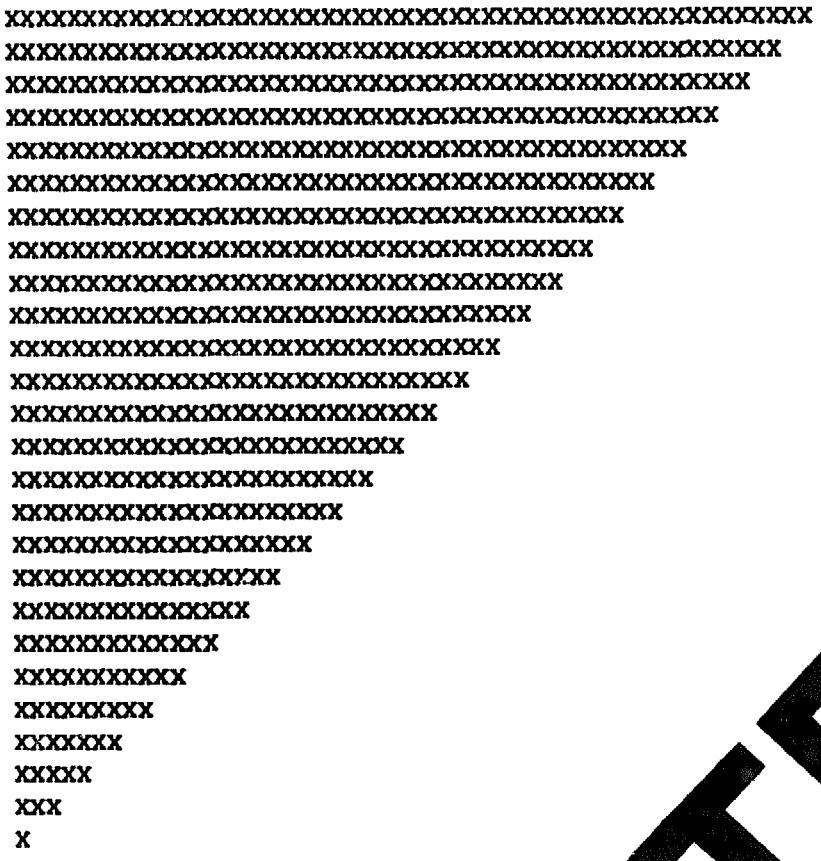
3.4 RESET TO KNOWN ANSI STATE/DISABLE ALL IBM PROPRINTER EMULATION ESCAPE SEQUENCE

DECSTR	**ESC**	**[**	**!**	**p**
	1BH	5BH	21H	70H

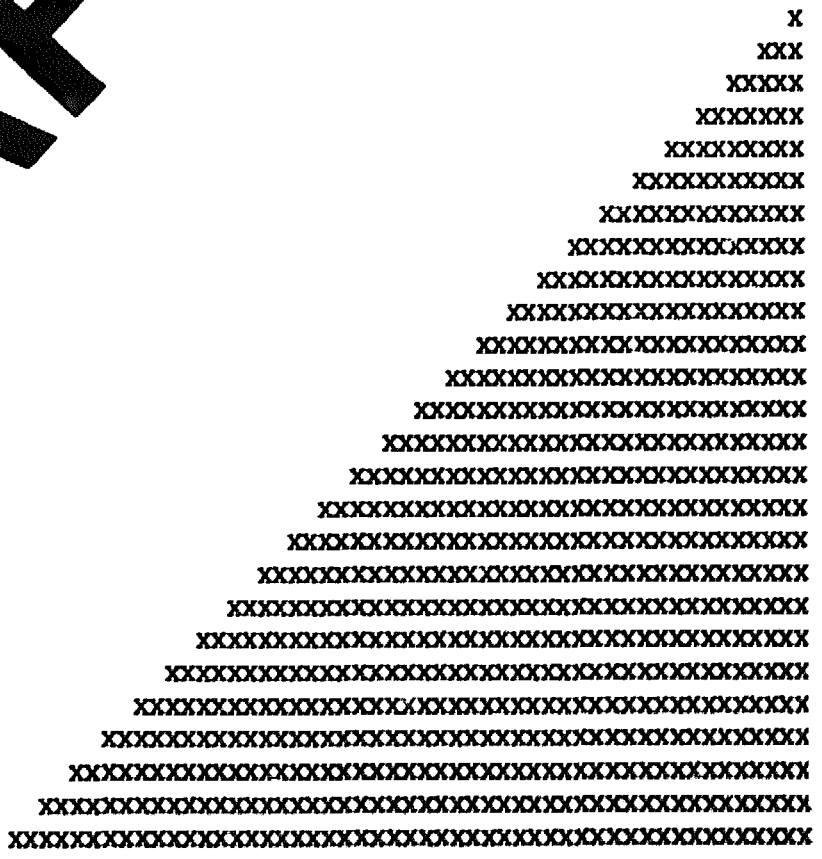
RIS	**ESC**	**c**
	1BH	63H

The sequences shown above reset the printer to DEC mode with DEC power-up settings (except for communications settings). The printer ejects the page if printing has occurred on this page. The printer sets the active position to column 1 line 1 of the current page.

NOTE: The printer always returns to DEC mode after processing this sequence, regardless of the power-up setting you select with the button on the ISO/PC cartridge.



CHAPTER 4



CHAPTER 4
ESCAPE SEQUENCES FOR DEC MODE

4.1 GENERAL

This chapter describes the escape sequences used to access the ISO 8-Bit Supplemental Character Set while the LN03 PLUS is in DEC mode. See Figure 4-1, ISO 8-Bit Suplemental Character Set.

NOTE: Escape sequences are multiple-character strings that start with the escape character (ESC, 1/11). Escape sequences control the manner in which text and graphics are printed, but the escape sequence itself is not printed.

4.2 SELECT ISO TYPE FAMILY

When you select ISO, you must first select the RCOURIR family of fonts for 10 pitch and the RELITE0 family for 12 pitch.

To select RCOURIR, send the following escape sequence to the printer:

ESC	**[**	**1**	**1**	**m**
1BH	5BH	31H	31H	6DH

NOTE: This is an SGR 11.

To select RELITE0, send the following escape sequence to the printer:

ESC	**[**	**1**	**2**	**m**
1BH	5BH	31H	31H	6DH

NOTE: This is an SGR 12.

Select the 13.6 pitch ISO by sending the printer an SGR 15 or by sending the printer an SGR 11 and using the Graphic Size selection or Graphic Size Modification as outlined in the *LN03 Programmer Reference Manual.*

4.3 LOAD ISO 8-BIT INTO G1

ESC	**-**	**A**
1BH	2DH	41H

Designates ISO 8-bit Supplemental as G1.

4.4 LOAD ISO 8-BIT INTO G2

ESC	**.**	**A**
1BH	2EH	41H

Designates ISO 8-bit Supplemental as G2.

4.5 LOAD ISO 8-BIT INTO G3

ESC	**/**	**A**
1BH	2FH	41H

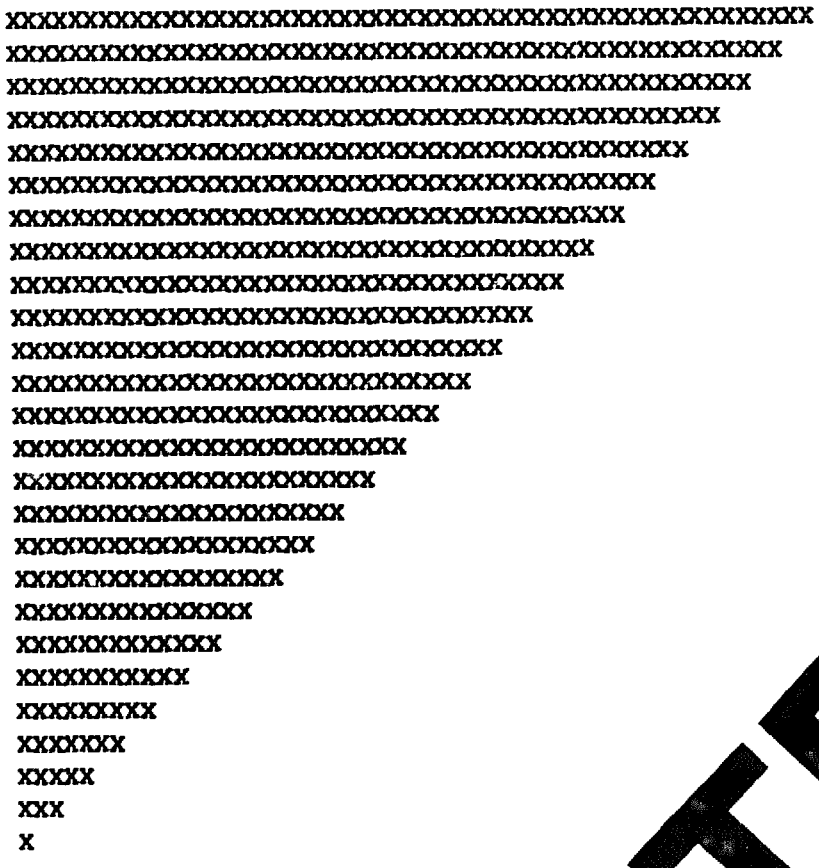
Designates ISO 8-bit Supplemental as G3.

NOTE: Use G2 for ISO since G2 is the default for the LN03 in GR (graphics right). If you use G1 or G3, you must map the set into GR. This mapping is described in the LN03 Programmer Reference Manual under Selecting Graphic Character Sets. Always use ISO from GR.

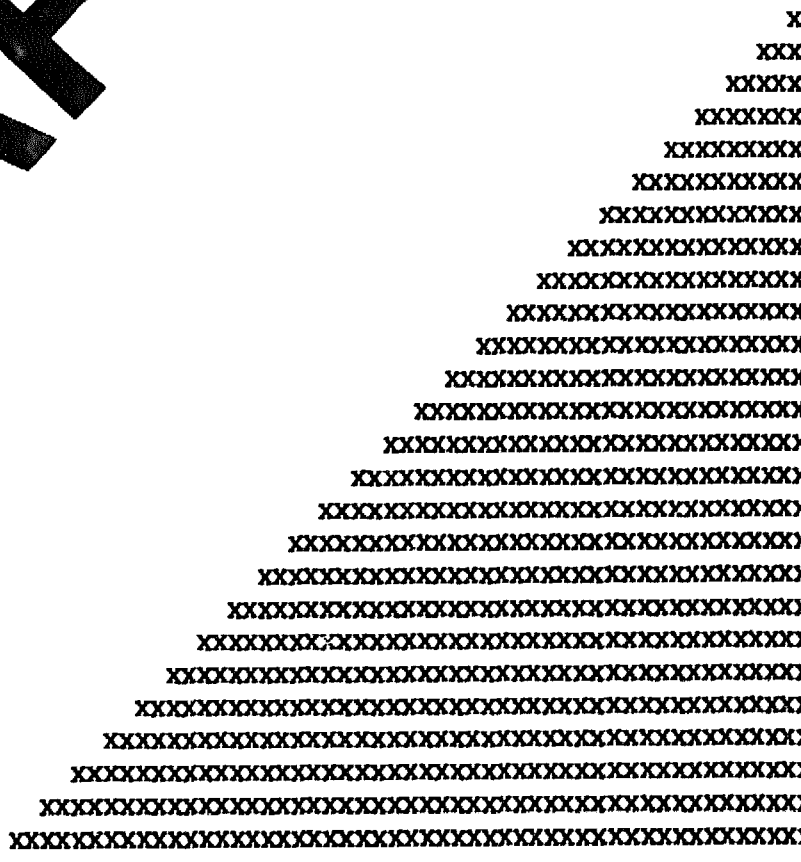
8	9	10	11	12	13	14	15
1 0 0 0	1 0 0 1	1 0 1 0	1 0 1 1	1 1 0 0	1 1 0 1	1 1 1 0	1 1 1 1
200 128 80	220 144 90 DCS	240 160 A0	260 176 B0	300 192 C0 À	320 208 D0 Ð	340 224 E0 à	360 240 F0 đ
201 129 81	221 145 91	241 161 A1 ¡	261 177 B1 ±	301 193 C1 Á	321 209 D1 Ñ	341 225 E1 á	361 241 F1 ñ
202 130 82	222 146 92	242 162 A2 ¢	262 178 B2 2	302 194 C2 Â	322 210 D2 Ò	342 226 E2 â	362 242 F2 ò
203 131 83	223 147 93	243 163 A3 £	263 179 B3 3	303 195 C3 Ã	323 211 D3 Ó	343 227 E3 ã	363 243 F3 ó
204 132 84 IND	224 148 94	244 164 A4 ¤	264 180 B4 ´	304 196 C4 Ä	324 212 D4 Ô	344 228 E4 ä	364 244 F4 ô
205 133 85 NEL	225 149 95	245 165 A5 ¥	265 181 B5 µ	305 197 C5 Å	325 213 D5 Õ	345 229 E5 å	365 245 F5 õ
206 134 86	226 150 96	246 166 A6	266 182 B6 ¶	306 198 C6 Æ	326 214 D6 Ö	346 230 E6 æ	366 246 F6 ö
207 135 87	227 151 97	247 167 A7 §	267 183 B7 •	307 199 C7 Ç	327 215 D7 ×	347 231 E7 ç	367 247 F7 ÷
210 136 88 HTS	230 152 98	250 168 A8 ¨	270 184 B8 ¸	310 200 C8 È	330 216 D8 Ø	350 232 E8 è	370 248 F8 ø
211 137 89	231 153 99	251 169 A9 ©	271 185 B9 1	311 201 C9 É	331 217 D9 Ù	351 233 E9 é	371 249 F9 ù
212 138 8A VTS	232 154 9A	252 170 AA a	272 186 BA o	312 202 CA Ê	332 218 DA Ú	352 234 EA ê	372 250 FA ú
213 139 8B PLD	233 155 9B CSI	253 171 AB «	273 187 BB »	313 203 CB Ë	333 219 DB Û	353 235 EB ë	373 251 FB û
214 140 8C PLU	234 156 9C ST	254 172 AC ¬	274 188 BC ¼	314 204 CC Ì	334 220 DC Ü	354 236 EC ì	374 252 FC ü
215 141 8D RI	235 157 9D OSC	255 173 AD -	275 189 BD ½	315 205 CD Í	335 221 DD Ý	355 237 ED í	375 253 FD ý
216 142 8E SS2	236 158 9E PM	256 174 AE ®	276 190 BE ¾	316 206 CE Î	336 222 DE Þ	356 238 EE î	376 254 FE þ
217 143 8F SS3	237 159 9F APC	257 175 AF ¯	277 191 BF ¿	317 207 CF Ï	337 223 DF ß	357 239 EF ï	377 255 FF ÿ
ADDITIONAL CONTROL SET	ISO 8-BIT SUPPLEMENTAL CHARACTER SET						

MA 100817

Figure 4-1 ISO 8-Bit Supplemental Character Set



CHAPTER 5



CHAPTER 5
IBM PROPRINTER EMULATION FEATURES AND CONTROL CHARACTERS

This chapter describes the features, control characters, and characters sets available for the LN03 PLUS in IBM Proprinter emulation mode ("Other" mode).

5.1 GENERAL

You can set the LN03 PLUS to operate in IBM emulation mode by using the power-up default switch (followed by power-on), or by using the DECIPEM control sequence. The "OTHER" indicator on the ISO/PC cartridge lights when the printer is in the IBM emulation mode.

In emulation mode, the LN03 PLUS with the ISO/PC cartridge uses IBM-compatible escape sequences. This allows software developed for the IBM Proprinter to run on the LN03 PLUS without modifications.

In IBM Proprinter emulation mode, the LN03 PLUS functions as both a text printer and a graphics printer. The following paragraphs describe these modes and character processing features.

5.1.1 Line-Oriented Buffer and Line Terminators

In DEC mode, the LN03 PLUS operates as a page printer; characters cannot be altered after they are sent to the printer. In IBM Proprinter emulation mode, the printer operates as a buffered lineprinter. This means that as the printer receives characters, they are stored in a buffer until the printer receives a line terminator character. Once the line terminator character is received, the entire contents of the buffer are printed. You can erase an entire line while it is still in the buffer. The following characters and escape sequences are line terminators and cause the contents of the buffer to print.

BS	Backspace
CR	Carriage return
LF	Line feed
VT	Vertical tab
FF	Form feed
ESC <	Same as Carriage return
ESC J	Variable line feed
ESC L	Enter graphics mode
ESC K	Enter graphics mode
ESC Y	Enter graphics mode
ESC Z	Enter graphics mode
	Exiting the emulator

NOTE: The buffer will also be emptied and the current line composed if the buffer becomes full.

If a CAN (HEX 18) character is sent to the printer, the buffer is emptied without composing the current line.

5.1.2 Graphics Mode

The graphics escape sequences operate differently than the line buffer operation described in Paragraph 3.1.1. Graphics escape sequences are self-terminating. Each sequence specifies the number of graphic data bytes. (See Chapter 6 for more information on IBM emulation mode escape sequences.)

5.1.3 Compatible Control Characters, Escape Sequences and Character Sets

In emulation mode, all escape sequences and control characters are compatible with software written for the IBM Proprinter. The characters sets used by the LN03 PLUS in "Other" mode are compatible with character sets used by the IBM Proprinter. The LN03 PLUS also provides line drawing compatibility with the IBM screen characters.

5.1.4 Character Height

In "Other" mode, the LN03 PLUS usually prints 1/8-inch high characters, although some characters are 1/6-inch high.

5.1.5 Character Width

In IBM emulation mode, the printer uses control characters to select standard or compressed printing. Compressed printing provides more characters per inch than standard printing. Control characters and escape sequences are also used for selecting double-width or single-width printing. When the printer receives a control character or an escape sequence that indicates double-width printing, the printer doubles the character size of the current standard or compressed printing. This allows six combinations of character sizes (Table 5-1).

Table 5-1 Available Character Sizes

Character Width Selection	Standard 10 Pitch	Standard 12 Pitch	Compressed
Single Width	10 cpi	12 cpi	17.1 cpi
Double Width	5 cpi	6 cpi	8.55 cpi

5.2 FONTS

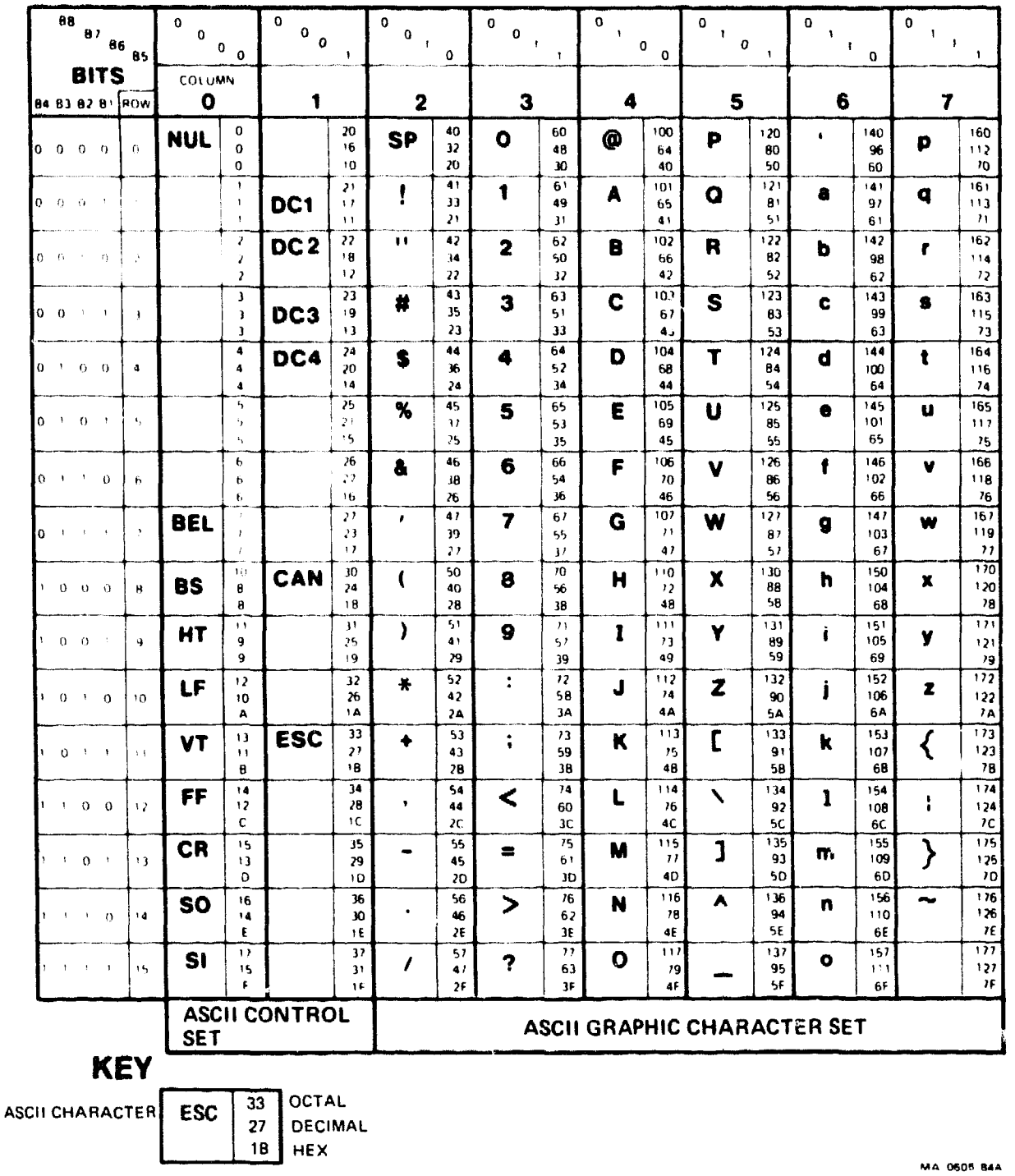
In emulation mode, all escape sequences and control characters are compatible with software written for the IBM Proprinter. The character sets used by the LN03 PLUS are compatible with the character sets used by the IBM Proprinter.

5.3 CHARACTER SETS

This section describes the character sets the LN03 PLUS uses in IBM Proprinter emulation mode. In emulation mode, LN03 PLUS printer has access to the three character sets available to the IBM Proprinter: character sets A,B, and All Characters. You select these character sets through your software package or by using the escape sequence described in Chapter 7, IBM Proprinter Emulation Escape Sequences.

5.3.1 Character Set Charts

Figures 5-1 through 5-3 show character sets A, B, and All Characters respectively.



BITS b8 b7 b6 b5 / b4 b3 b2 b1	ROW	COLUMN 0	1	2	3	4	5	6	7
0 0 0 0	0	NUL		SP	0	@	P	`	p
0 0 0 1	1		DC1	!	1	A	Q	a	q
0 0 1 0	2		DC2	"	2	B	R	b	r
0 0 1 1	3		DC3	#	3	C	S	c	s
0 1 0 0	4		DC4	$	4	D	T	d	t
0 1 0 1	5			%	5	E	U	e	u
0 1 1 0	6			&	6	F	V	f	v
0 1 1 1	7	BEL		'	7	G	W	g	w
1 0 0 0	8	BS	CAN	(	8	H	X	h	x
1 0 0 1	9	HT		)	9	I	Y	i	y
1 0 1 0	10	LF		*	:	J	Z	j	z
1 0 1 1	11	VT	ESC	+	;	K	[	k	{
1 1 0 0	12	FF		,	<	L	\	l	|
1 1 0 1	13	CR		-	=	M	]	m	}
1 1 1 0	14	SO		.	>	N	^	n	~
1 1 1 1	15	SI		/	?	O	_	o	

	Octal	Decimal	Hex
Col 0	000	0	00
Col 1	020	16	10
Col 2	040	32	20
Col 3	060	48	30
Col 4	100	64	40
Col 5	120	80	50
Col 6	140	96	60
Col 7	160	112	70
Row 0	000	0	00
Row 1	001	1	01
Row 2	002	2	02
Row 3	003	3	03
Row 4	004	4	04
Row 5	005	5	05
Row 6	006	6	06
Row 7	007	7	07
Row 8	010	8	08
Row 9	011	9	09
Row 10	012	10	0A
Row 11	013	11	0B
Row 12	014	12	0C
Row 13	015	13	0D
Row 14	016	14	0E
Row 15	017	15	0F

ASCII CONTROL SET

ASCII GRAPHIC CHARACTER SET

KEY

ASCII CHARACTER: ESC — 33 OCTAL, 27 DECIMAL, 1B HEX

MA 0505 84A

Figure 5-1 IBM Graphic Character Set A (GL) (Sheet 1 of 2)

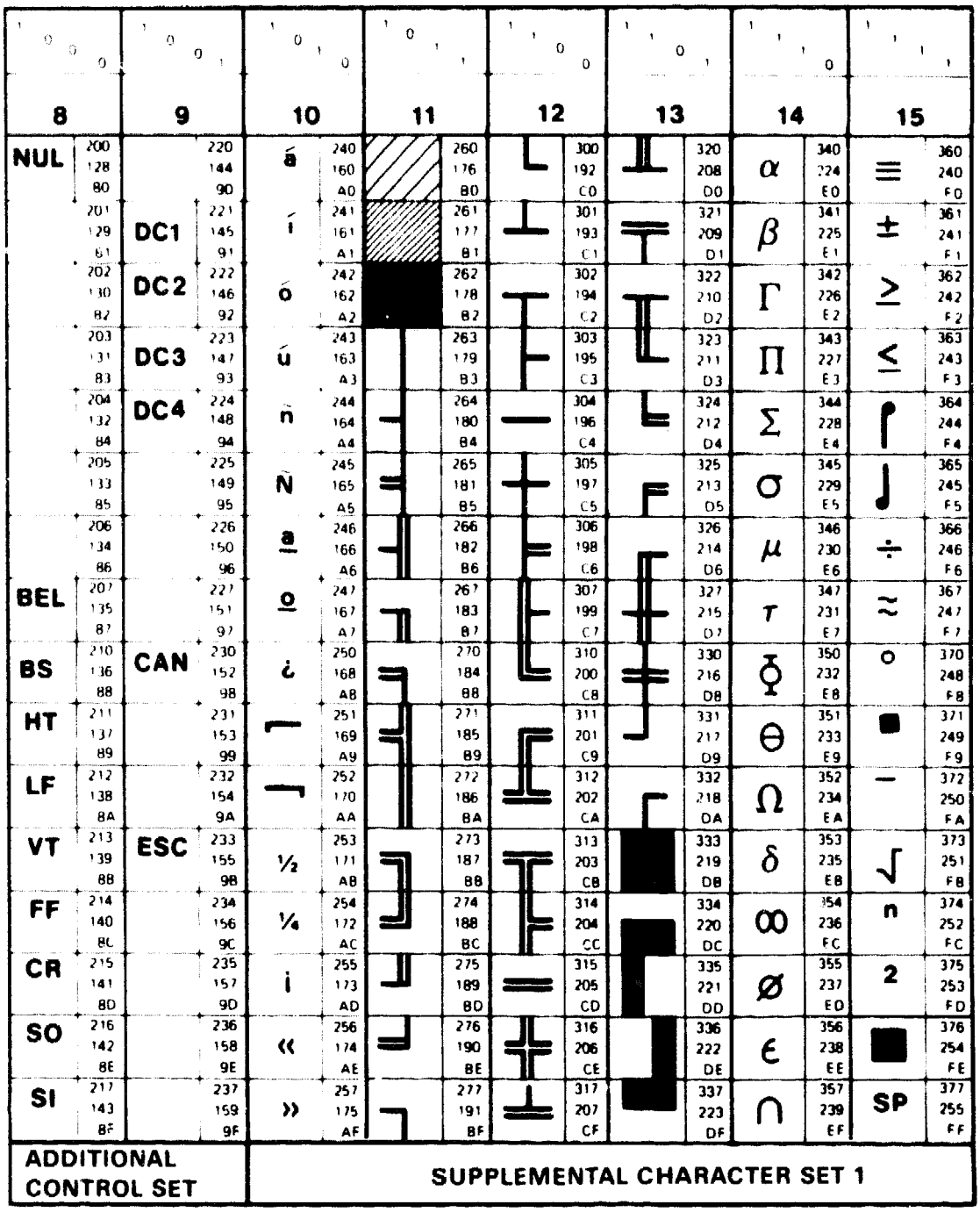


Figure 5-1 IBM Graphic Character Set A (GL) (Sheet 2 of 2)

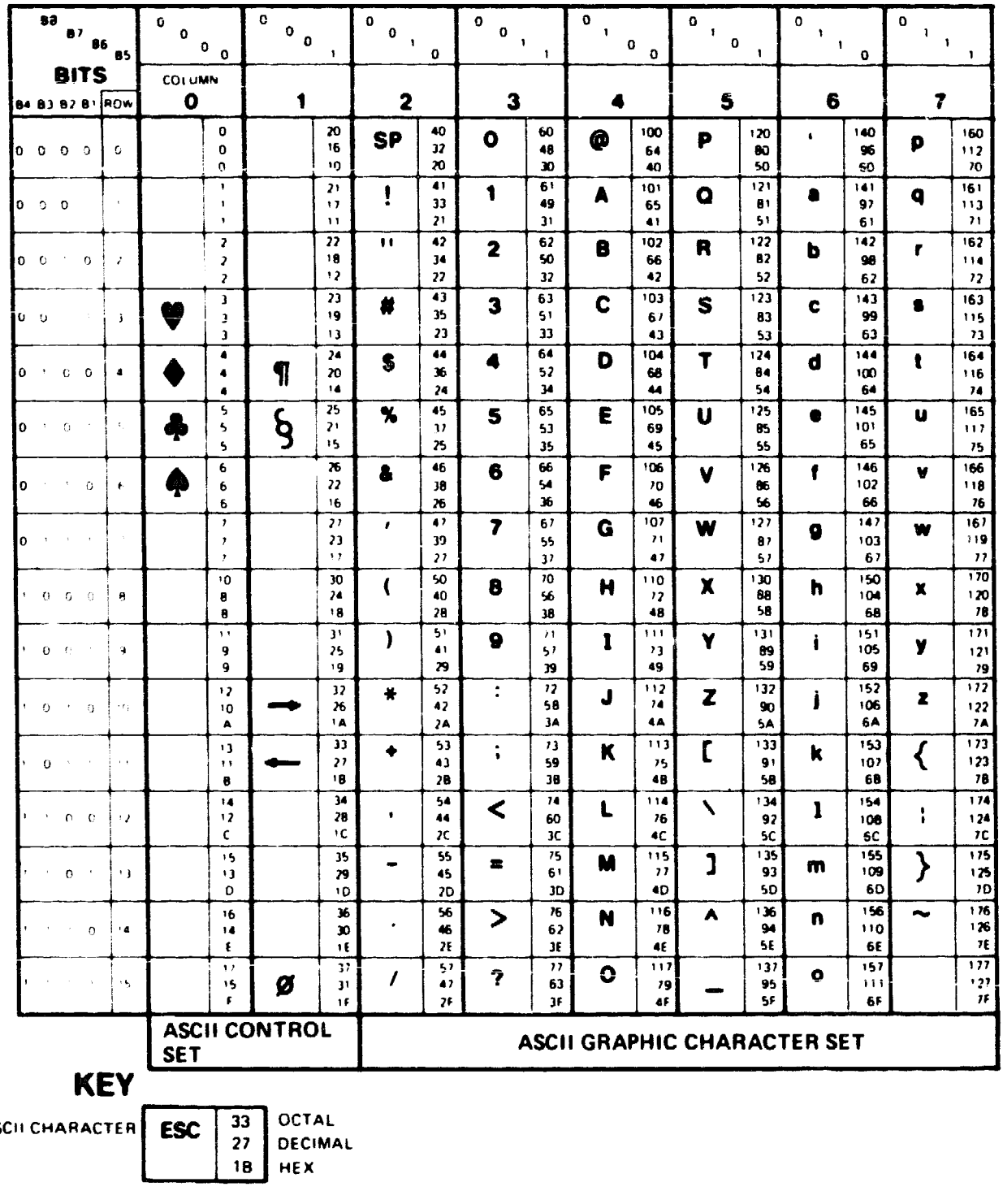
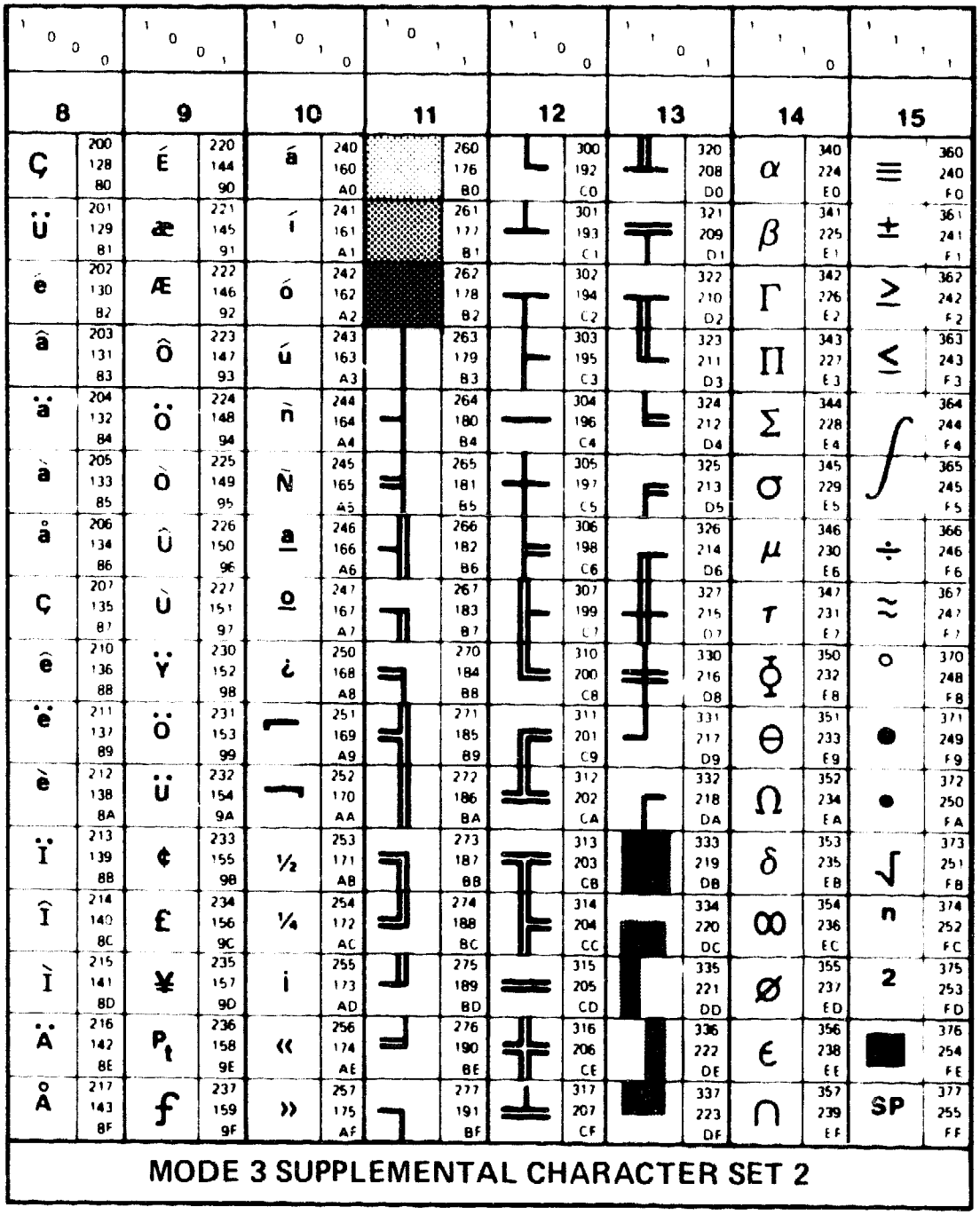


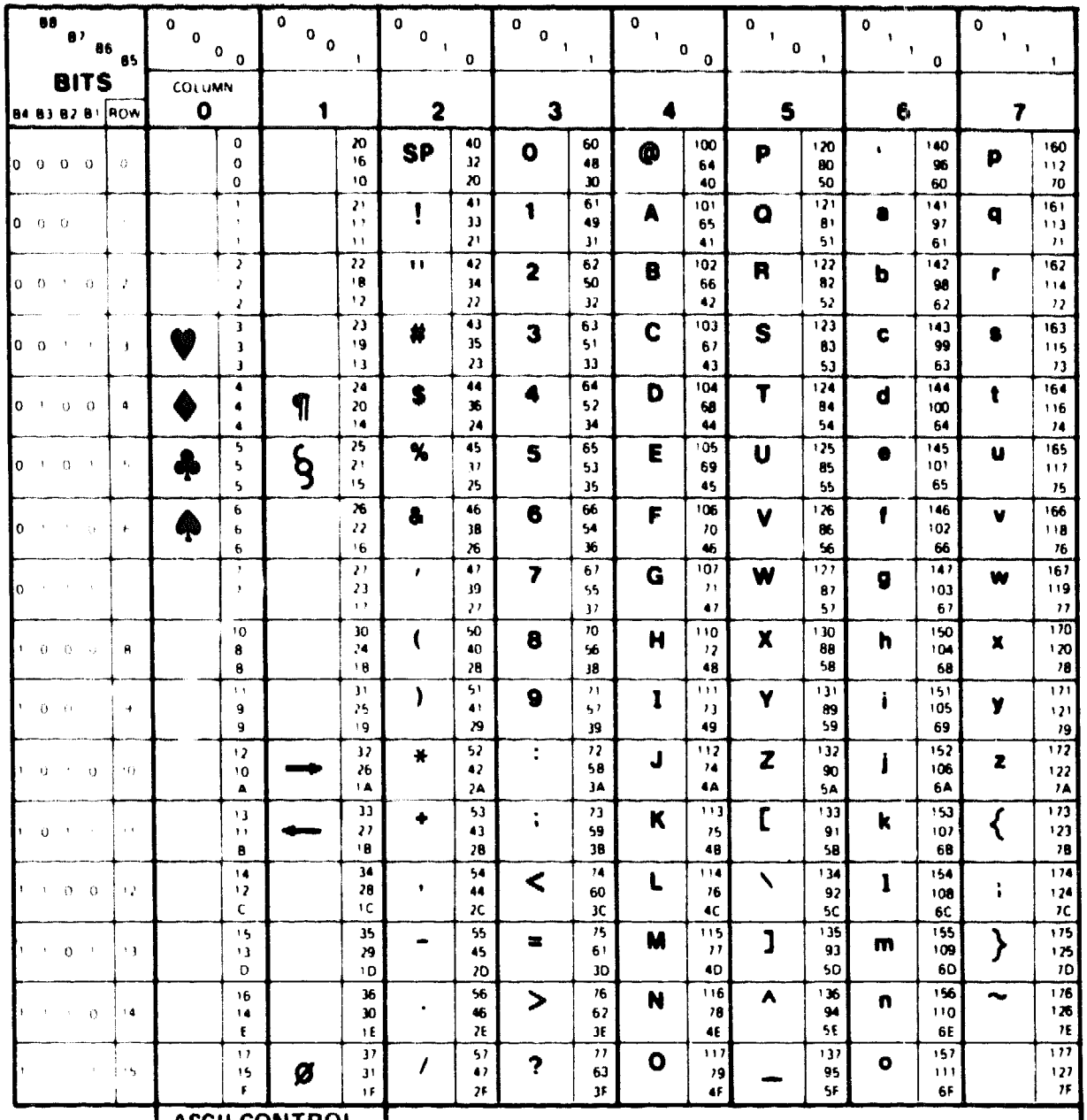
Figure 5-2 IBM Graphic Character Set B (GL) (Sheet 1 of 2)



8		9		10		11		12		13		14		15	
Ç	200 128 80	É	220 144 90	á	240 160 A0		260 176 B0		300 192 C0		320 208 D0	α	340 224 E0	≡	360 240 F0
ü	201 129 81	æ	221 145 91	í	241 161 A1		261 177 B1		301 193 C1		321 209 D1	β	341 225 E1	±	361 241 F1
é	202 130 82	Æ	222 146 92	ó	242 162 A2		262 178 B2		302 194 C2		322 210 D2	Γ	342 226 E2	≥	362 242 F2
â	203 131 83	Ô	223 147 93	ú	243 163 A3		263 179 B3		303 195 C3		323 211 D3	Π	343 227 E3	≤	363 243 F3
ä	204 132 84	ö	224 148 94	ñ	244 164 A4		264 180 B4		304 196 C4		324 212 D4	Σ	344 228 E4	⌠	364 244 F4
à	205 133 85	Ò	225 149 95	Ñ	245 165 A5		265 181 B5		305 197 C5		325 213 D5	σ	345 229 E5	⌡	365 245 F5
å	206 134 86	Û	226 150 96	ª	246 166 A6		266 182 B6		306 198 C6		326 214 D6	μ	346 230 E6	÷	366 246 F6
ç	207 135 87	ù	227 151 97	º	247 167 A7		267 183 B7		307 199 C7		327 215 D7	τ	347 231 E7	≈	367 247 F7
ê	210 136 88	ÿ	230 152 98	¿	250 168 A8		270 184 B8		310 200 C8		330 216 D8	Φ	350 232 E8	°	370 248 F8
ë	211 137 89	Ö	231 153 99	⌐	251 169 A9		271 185 B9		311 201 C9		331 217 D9	Θ	351 233 E9	∙	371 249 F9
è	212 138 8A	Ü	232 154 9A	¬	252 170 AA		272 186 BA		312 202 CA		332 218 DA	Ω	352 234 EA	·	372 250 FA
ï	213 139 8B	¢	233 155 9B	½	253 171 AB		273 187 BB		313 203 CB		333 219 DB	δ	353 235 EB	√	373 251 FB
î	214 140 8C	£	234 156 9C	¼	254 172 AC		274 188 BC		314 204 CC		334 220 DC	∞	354 236 EC	n	374 252 FC
ì	215 141 8D	¥	235 157 9D	¡	255 173 AD		275 189 BD		315 205 CD		335 221 DD	∅	355 237 ED	2	375 253 FD
Ä	216 142 8E	₧	236 158 9E	«	256 174 AE		276 190 BE		316 206 CE		336 222 DE	∈	356 238 EE	■	376 254 FE
Å	217 143 8F	ƒ	237 159 9F	»	257 175 AF		277 191 BF		317 207 CF		337 223 DF	∩	357 239 EF	SP	377 255 FF

MODE 3 SUPPLEMENTAL CHARACTER SET 2

Figure 5-2 IBM Graphic Character Set B (GL) (Sheet 2 of 2)



B8 B7 B6 B5 / BITS B4 B3 B2 B1	ROW	COLUMN 0		1		2		3		4		5		6		7	
0 0 0 0	0		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		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		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		10 8 8		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		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		12 10 A	→	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		13 11 B	←	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		14 12 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		15 13 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		16 14 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		17 15 F	Ø	37 31 1F	/	57 47 2F	?	77 63 3F	O	117 79 4F	_	137 95 5F	o	157 111 6F		177 127 7F

ASCII CONTROL SET

ASCII GRAPHIC CHARACTER SET

KEY

ASCII CHARACTER **ESC** 33 OCTAL, 27 DECIMAL, 1B HEX

MA 0607 84A

Figure 5-3 IBM All Character Set (GL) (Sheet 1 of 2)

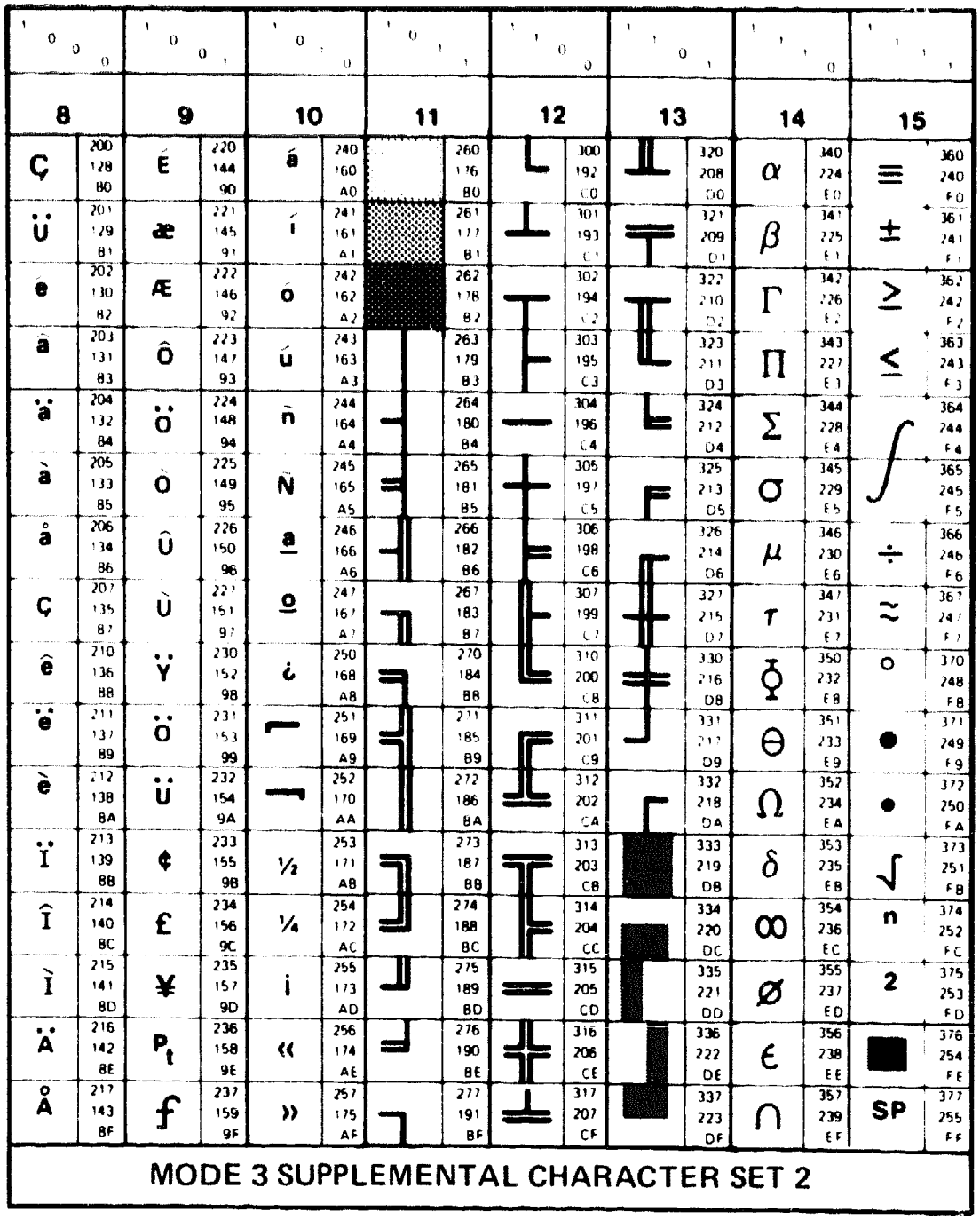
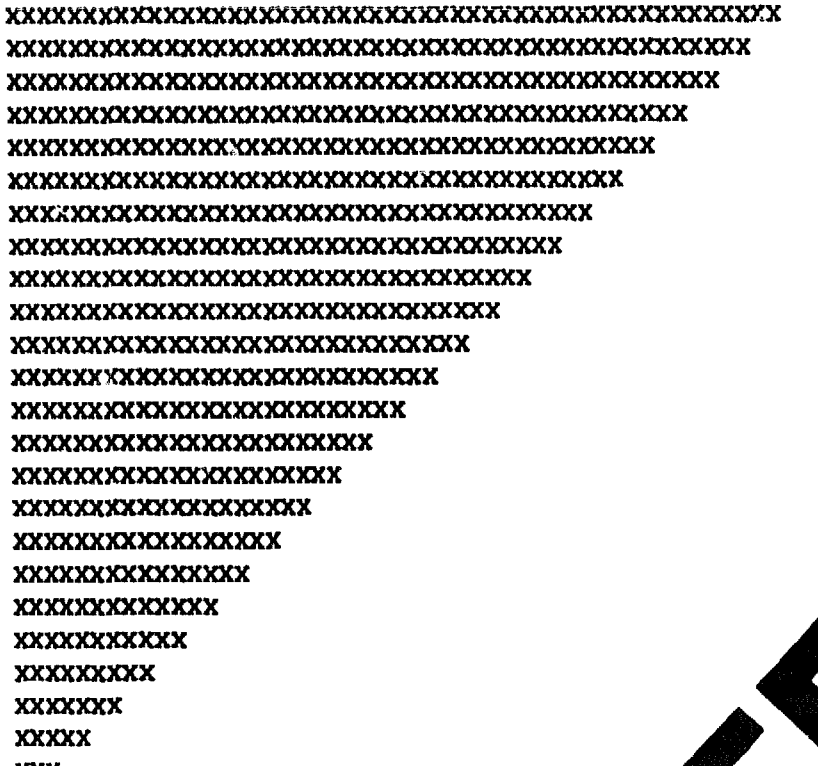
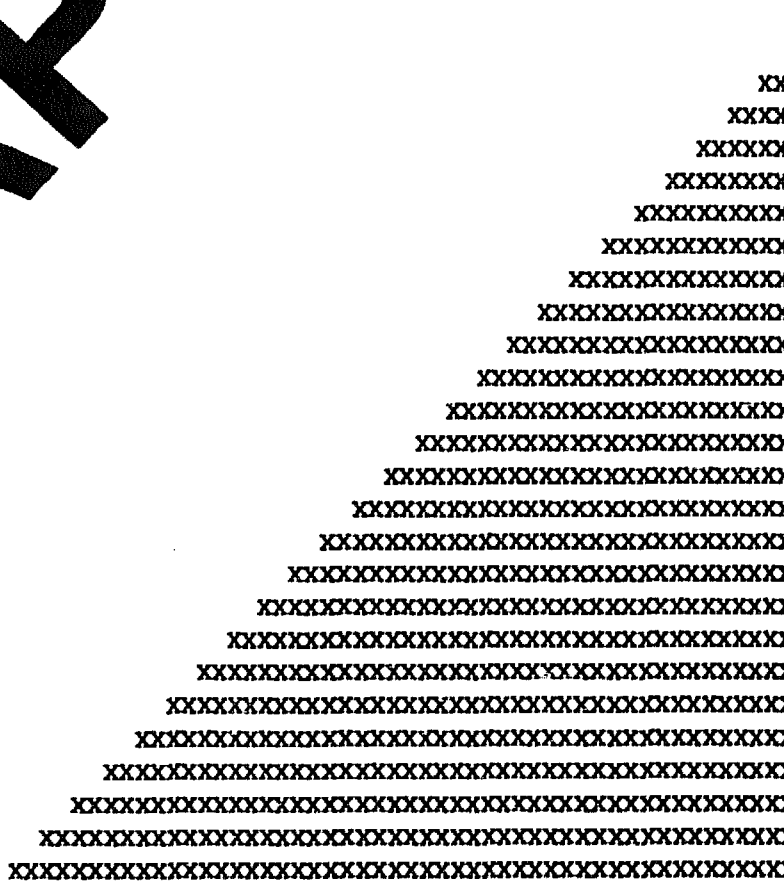


Figure 5-3 IBM All Character Set (GL) (Sheet 2 of 2)



CHAPTER 6



CHAPTER 6
IBM EMULATION MODE CONTROL CHARACTERS

6.1 GENERAL

This chapter summarizes the control characters used in emulation mode.

In emulation mode, the LN03 PLUS has three character sets available for selection: A, B, and All Characters. The three character sets are identical, except for the interpretation of C0 (HEX character codes 00 through 1F) and C1 (HEX character codes 80 through 9F).

Table 6-1 shows which Control character sets in C0 and C1 are active.

NOTE: Control characters are not printed when they are received by the printer. Control characters send instructions to the printer about text processing or cause the printer to perform a specific action, such as adding a form feed or a carriage return.

Table 6-2 is a summary of all C0 and C1 control characters used by the printer in "Other" mode.

Table 6-1 Active Control Characters

Control Character Set	Character Set A	Character Set B	Character Set All Character
C0 (00H to 1FH)	Controls	Some printables	Printables
GL (20H to 7FH)	Printables	Printables	Printables
C1 (80H to 9FH)	Controls	Printables	Printables
GR (A0H to FFH)	Printables	Printables	Printables

NOTES:

1. The set of controls in C0 of Character Set A is identical to that in C1 of Character Set A, except that 80H is ignored, instead of being interpreted as NUL. The same set of controls is used in C0 of Character Set B, except that some printables are added to unused character code spaces.

2. The set of printables used in both GL and GR is the same for all three character sets.

Table 6-2 Summary of Control Characters

Name	Mnemonic	Location	Function in Text Mode
Null	NUL	0/0	Used with ESC B and ESC D as a list terminator and with other escape sequences to select options. Otherwise it is ignored.
Bell	BEL	0/7	LN03 PLUS ignores this code since it has no bell.
Backspace	BS	0/8	Decrements active position by the width of the current pitch. Error handling: if the active position is already at the left margin, BS is ignored.
Horizontal Tab	HT	0/9	Tabs to the next horizontal space. At power up tabs are set at every 8 columns, beginning at column 9 and ending at column 73. Error handling: If the next tab stop is beyond the right side, HT is ignored. If current position is beyond the last tab stop, HT is ignored.
Line Feed	LF	0/10	Advances the active position one line and empties the buffer. This control code cancels the double-width printing if enabled by SO. A carriage return will never occur. Error handling: If the new vertical position is beyond the bottom margin or the bottom of the form, the next printable character will force a form feed.

Table 6-2 Summary of Control Characters (Cont)

Name	Mnemonic	Location	Function in Text Mode
Vertical Tab	VT	6/11	Advances the active position to the next vertical tab stop and causes a carriage return. Error Handling: If no tabs are set, VT acts as a line feed. If the next VT exceeds the form length minus the bottom margin, a line feed is executed. VT cancels double-width printing if enabled by SO. *NOTE: Vertical tabs are scaled with changes in vertical pitch.*
Form Feed	FF	0/12	Advances to the next top of form and performs a carriage return. The default form length is 11 inches. FF cancels double-width printing if enabled by SO. Error handling: If there is no paper in the printer, the "paper out" indicator blinks and the printer waits for paper. As soon as paper is loaded, the page is printed and the form ejected.
Carriage Return	CR	0/13	Terminates the line and returns active position to the left margin. No line feed occurs unless auto line feed is enabled by ESC 5. This control code cancels double-width printing if enabled by SO.
Shift Out	SO	0/14	Selects double-width print mode. A carriage return, line feed, form feed, vertical tab, cancel, ESC W 0 or DC4 cancels this print mode.

Table 6-2 Summary of Control Characters (Cont)

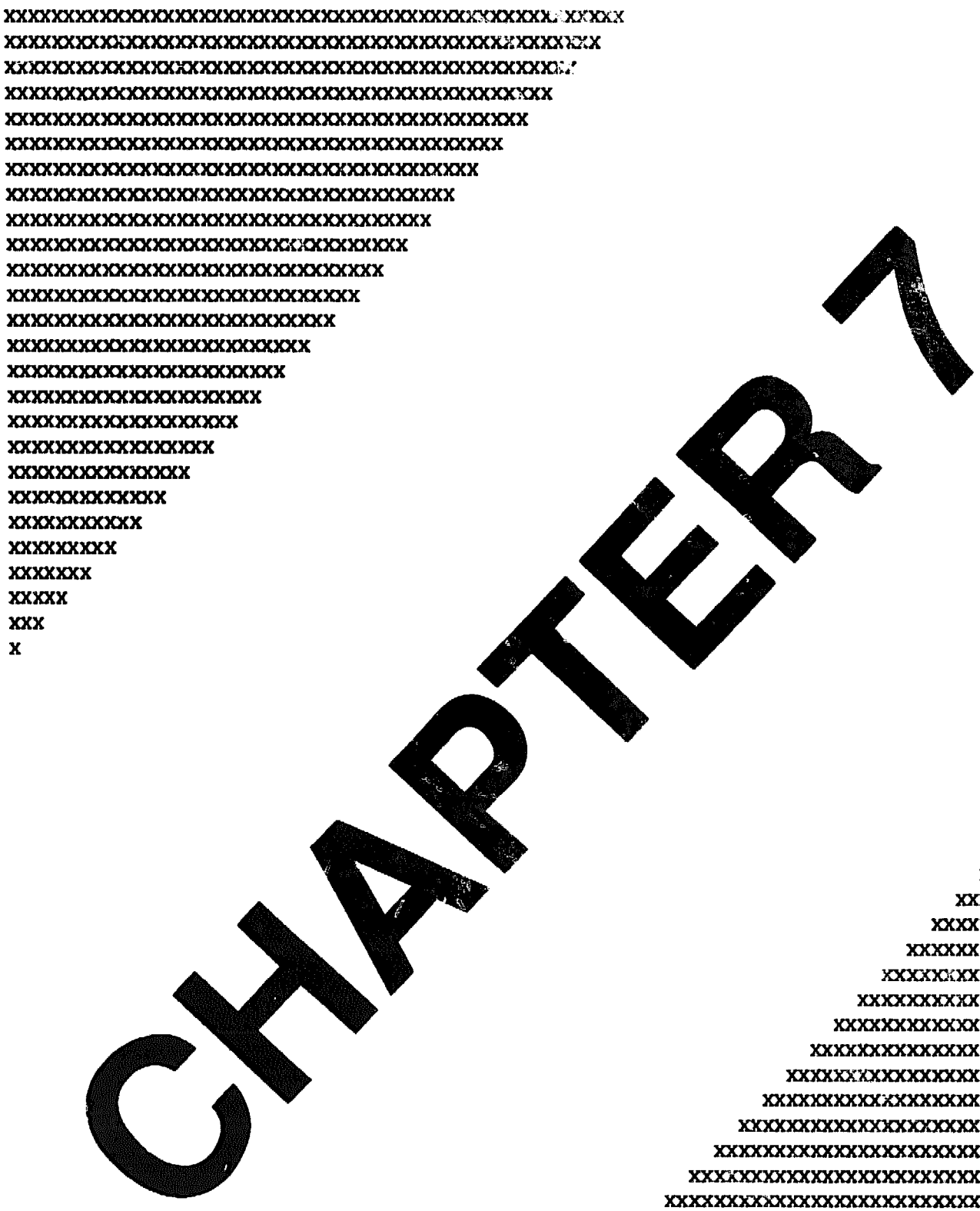
Name	Mnemonic	Location	Function in Text Mode
			SO changes the horizontal pitch in the following way: from 10 cpi to 5 cpi. from 12 cpi to 6 cpi. from 17.1 cpi to 8.55 cpi. Error handling: Characters are allowed to print "off grid." This means that mixed width characters on adjacent lines may not "line up" vertically.
Shift In	SI	0/15	Selects compressed character mode. The DC2 code cancels the compressed printing mode. Changes are as follows: from 10 cpi to 17.1 cpi from 5 cpi to 8.55 cpi If at 6 cpi, 8.55 cpi, 12 cpi, or 17.1 cpi, the sequence is ignored. Error handling: Characters are allowed to print "off grid." This means that mixed width characters on adjacent lines may not "line up" vertically.
Device Control 1	DC1	1/1	Selects printer to accept data. The printer is selected by default. Only use this code if the printer has been deselected by using ESC Q ETX. When the printer is deselected, it ignores all incoming data except the DC1 code.

Table 6-2 Summary of Control Characters (Cont)

Name	Mnemonic	Location	Function in Text Mode
Device Control 2	DC2	1/2	Terminates printing in compressed mode or 12 cpi mode and sets the printer to 10 cpi (5 cpi if double-width). DC2 changes the horizontal pitch as follows: from 17.1 cpi to 10 cpi from 8.55 cpi to 5 cpi from 12 cpi to 10 cpi from 6 cpi to 5 cpi If at 10 cpi or 5 cpi, the sequence is ignored.
Device Control 3	DC3	1/3	Ignored.
Device Control 4	DC4	1/4	Terminate printing in double-width mode, if set by SO, and returns to the corresponding single-width character spacing. DC4 changes the horizontal pitch as follows: from 5 cpi to 10 cpi from 6 cpi to 12 cpi from 8.55 cpi to 17.1 cpi Error handling: Characters are allowed to print "off grid;" mixed width characters on adjacent lines may not "line up" vertically. If double-width was not selected with SO, this code is ignored.

Table 6-2 Summary of Control Characters (Cont)

Name	Mnemonic	Location	Function in Text Mode
Cancel	CAN	1/8	Clears the last unterminated line buffer, leaving the current print position unchanged. Double-width printing is cancelled if set with SO, but remains active if set with ESC W. All other printing modes remain in effect.
Escape	ESC	1/9	Initiates all escape sequences. (See Chapter 7.)
Delete	DEL	7/15	The function of the DEL character depends on its position in a line as outlined below: 1. When the DEL character is placed immediately after ESC, the sequence is aborted and all subsequent printable characters are printed out. 2. When the DEL character is placed in a parameter position, it is treated as the number 127 (Hex 7F). The sequence is executed as if DEL were any other numerical parameter. 3. Any placement of a DEL character outside of escape sequences is ignored.
Space	SP	2/0	Increments the active column. No character is printed.


CHAPTER 7

CHAPTER 7
IBM PROPRINTER EMULATION ESCAPE SEQUENCES

7.1 GENERAL

This chapter describes the escape sequences used by the LN03 PLUS when it is in IBM Proprinter emulation mode. These sequences are grouped by function.

- Terminal Management
- Vertical Form Handling
- Horizontal Form Handling
- Alternate Character Set Mapping
- Printing Modes
- Printing Mode rules and exceptions
- Graphic Mode
- Downloading characters
- Escape sequences not used by the LN03 PLUS in IBM Proprinter Emulation mode

NOTE: Escape sequences send instructions to the printer, but are not printed.

7.1.1 Escape Sequence Processing

In this manual, IBM mode parameters are shown by their decimal representation. This differs from other Digital documentation which usually shows the ASCII equivalent of parameter values.

7.1.2 Error Handling

In some escape sequence explanations there is a separate paragraph that describes how the ISO/PC cartridge handles errors. The paragraph also lists any default settings. This information is included for clarity and completeness. However, software should not depend on error conditions for normal operation because this will limit software to printers that have the same error handling algorithms.

7.2 TERMINAL MANAGEMENT

You can control the printer status and the printer selection from the host computer by using the following escape sequences.

7.2.1 Reset to Initial State (RIS)

ESC	c
1/11	6/3

This sequence resets the printer to DEC mode with DEC power-up settings (except for communications settings). The printer ejects the page if printing has occurred on this page. Fonts that were previously downloaded are not affected in DEC mode.

NOTE: The printer is always set to DEC mode after receiving this sequence, regardless of the power-up setting you select with the button on the ISO/PC cartridge.

7.2.2 Soft Terminal Reset

ESC	[	!	p
1/11	5/11	2/1	7/0

This sequence acts exactly like RIS in Paragraph 7.2.1. It is recommended that software use this sequence, rather than RIS, since RIS can cause problems when printing through the printer port on some older video terminals.

7.2.3 IBM Terminal Reset

ESC	@
1/11	4/0

This sequence resets the IBM Proprinter emulation to its default power-up state without returning to DEC mode and without changing the current communication settings. The printer always remains in IBM Proprinter emulation mode when it receives this sequence. The printer ejects the page if printing has occurred on this page. This sequence is not recognized when the printer is in DEC mode.

7.2.4 Deselect Printer

ESC	Q	3
1/11	5/1	0/3

This sequence composes the contents of the line buffer, then deselects the printer. The printer ignores any data received after this sequence until the DC1 control character is received.

7.3 VERTICAL FORM HANDLING

There are five ways to control the vertical form. You can control the length of the form, the size of the vertical pitch, the position of the bottom margin, the position of the vertical tab stops, and the state of automatic line feed.

1. Length of form – If a form length larger than the size of the paper in the printer is requested, the form length will be set to the maximum. If a form length shorter than the size of the paper is requested, the small form will be top-justified on the paper. A form feed control character always advances the paper to the top of the next form.

2. Vertical Pitch – Vertical pitch is the distance between lines and is measured in number of lines per inch. Vertical pitch is not the height of printed characters.

3. Bottom Margin – The bottom margin is set in terms of the number of lines from the bottom of the form. You must know the current vertical pitch to set a new bottom margin.

   For example: To set a bottom margin 1 inch from the bottom of the form, using a vertical pitch of 6 lines per inch, you would set Pn equal to 6 in the set bottom margin sequence. To set the same bottom margin using a vertical pitch of 8 lines per inch, you would set Pn equal to 8. Pn refers to the number of lines from the bottom of the page to place the bottom margin.

4. Vertical Tab Stops - Vertical tab stops are set to corresponding line numbers. Vertical tab stops do not correspond to absolute physical locations on the page, but to line numbers whose physical locations from top of form will change with changes in vertical pitch.

5. A form feed control character ejects the page and puts the current position at the left hand top corner of the next page.

The following escape sequences control the vertical forms.

7.3.1 Set Vertical Pitch (ER8LI)

ESC	**0**
1/11	3/0

Sets vertical pitch to 8 lines per inch (225/28.1 inch).

7.3.2 Set Vertical Pitch (ER10LI)

ESC	**1**
1/11	3/1

Sets vertical pitch to 10.3 lines per inch (75/7 inch).

7.3.3 Set Vertical Pitch (ERNLI12)

ESC	2
1/11	3/2

Sets vertical pitch to the setting specified in a previous ESC A sequence.

Error handling: If no vertical pitch is selected using the ESC A sequence, the default setting selected is 6 lines per inch.

7.3.4 Select Vertical Pitch (ERNLI1)

ESC	A	Pn
1/11	4/1	***

Selects vertical pitch of 75/Pn lines per inch. The vertical pitch is set when the printer receives an ESC 2 sequence.

Error Handling: If Pn = 0, the printer retains the previous ESC A setting. Maximum Pn = 225. If Pn is greater than 225, the sequence is ignored, and the current vertical pitch remains active.

7.3.5 Set Vertical Pitch (ERNLI3)

ESC	3	Pn
1/1	3/3	***

Sets vertical pitch to 225/Pn lines per inch.

NOTE: This sequence is most often used to print adjacent lines of graphics. Although the LN03 cannot print at exactly 1/225" vertical resolution, it dynamically adjusts to compensate for any error. The algorithm used is compatible with that used by the IBM Proprinter.

7.3.6 Variable Line Feed (ERNLI4)

ESC	J	Pn
1/11	4/10	***

Performs one line feed at a vertical pitch of 225/Pn lines per inch. This sequence allows printing into the bottom margin. This sequence does not affect previously set vertical pitch.

Error handling: If Pn = 0 or if Pn is greater than 225, the sequence is ignored. See NOTE, Paragraph 7.3.5, Set Vertical Pitch (ERNLI3).

7.3.7 Set Form Length in Lines (ERSFL)

ESC	C	Pn
1/11	4/3	***

This sequence performs four functions: 1) sets the form length to the number of lines requested. The printable area equals the number of inches that equal Pn times the current pitch; 2) sets top of form; 3) clears the bottom margin; 4) performs a form feed if the current active position is not at top of page.

Error handling: If Pn times the current pitch is greater than the length of the paper, form length is set to the paper size currently in the printer. Paper size is defined as the actual printable area on a sheet. The printable area is 1/4 inch in from the edges of the paper.

7.3.8 Set Form Length (ERSFLI)

ESC	C	NUL	Pn
1/11	4/3	0/0	***

Sets form length to Pn inches, sets top of form, and clears bottom margin.

Error handling: A form feed is done if the current active position is not at the top of the page.

If Pn is greater than the length of the paper, form length is set to the paper size currently in the printer. Paper size is defined as the actual printable area on a sheet. The printable area is 1/4 inch in from the edges of the paper.

The page length can be set smaller than the current vertical pitch. In this case, either a line feed or a form feed will advance to the next top-of-form.

7.3.9 Set Bottom Margin (ERSBM)

ESC	N	Pn
1/11	4/14	***

Sets bottom margin to Pn lines above the bottom of the form.

Note: The bottom margin is reset to 0 when you change the form length using ESC C or ESC C 0.

Error handling: If Pn is greater than 225, the sequence is ignored. If Pn is greater than the form length, printing is allowed only on the top line of the page. All positioning commmands (except ESC J) result in a page eject.

7.3.10 Clear Bottom Margin (ERCBM)

ESC	O
1/11	4/15

Sets bottom margin equal to form length.

7.3.11 Set Vertical Tabs

ESC	B	Pn1	Pn2	Pn	NUL
1/11	4/2	***	***	***	0/0

This sequence sets vertical tab stops at Pn1, Pn2 and other designated stops. Use of this sequence cancels any previously set tabs. Vertical tabs are scaled with changes in vertical pitch.

Pn is a character representing the line number of desired tab stops. For example, character 1/2 sets a tab at line 18.

Error handling: If more than 64 tabs are specified, the first 64 will be set. Tab positions must be specified in ascending order, any descending values are ignored. The tab character acts as a line feed if this sequence is sent without parameters.

7.3.12 Enable Automatic Line Feed

ESC	5	Pn
1/11	3/5	***

This sequence causes a line feed to occur whenever the printer receives a carriage return (CR control code).

Pn = any odd parameter.

7.3.13 Disable Automatic Line Feed

ESC	5	Pn
1/11	3/5	***

This sequence cancels automatic line feed. When the printer receives a carriage return (CR control character) it will not automatically do a line feed.

Pn = any even parameter.

7.4 HORIZONTAL FORM HANDLING

This section describes how to select single- or double-width printing, how to use an escape sequence to perform a carriage return, how to set horizontal tabs, and how to select 12 cpi horizontal pitch.

7.4.1 Print Width and Carriage Return

Double-width printing doubles the width of the current character setting. For example, if the current character pitch setting is compressed, the double-width print command doubles the width of the compressed characters. While the printer is printing you can send an escape sequence that sets double- or single-width characters. You can send these escape sequences in compressed or standard printing; this means that there are six different combinations of horizontal pitch.

7.4.1.1 Set Double-Width Characters (EREDW)

ESC	W	Pn
1/11	5/7	***

Sets double-width characters for current and following lines. If double-width is set using this sequence, use ESC W 0 to reset to single width.

Pn = any odd parameter

7.4.1.2 Set Single-Width Characters (ERDDW)

ESC	W	Pn
1/11	5/7	0/0

Sets single-width characters for current and following lines.

Pn = any even parameter

7.4.1.3 Carriage Return (PCR1)

ESC	<
1/11	3/12

This sequence performs a carriage return exactly like CR.

7.4.2 Horizontal Tabs

Horizontal tabs are set corresponding to column numbers. The width of each column depends on the current character width. They are scaled with changes in horizontal pitch (10, 12 or 17.1). Double width pitches (5, 6, and 8.55) are considered as attributes, not pitches. This means that tabs are always scaled to the corresponding single-width column when double-width printing is in effect.

The LN03 PLUS printer has 28 possible horizontal tab stops. You can specify up to 28 tabs in one escape sequence. The following escape sequences modify horizontal tabs.

7.4.2.1 Set Horizontal Tabs (ERSHT)

ESC	D	Pn1	Pn2	Pn	NUL
1/11	4/41	***	***	***	0/0

This sequence cancels all previously set horizontal tabs and sets horizontal tab stops at Pn1, Pn2, and other designated stops. Horizontal tabs are scaled with changes in horizontal pitch (except double-width). Pn is a character representing the column number of the desired tab stop. For example, character DC2 (1/2) sets a tab at column 18.

Error handling: Tab positions must be specified in ascending order; any descending character is ignored. A maximum of 28 tab stops is allowed. All tab stops over the maximum are ignored. If parameters to the sequence are missing, a tab position is set at every column.

NOTE: ESC D NUL
1/11 4/41 0/0 cancels all previous tab settings.

7.4.2.2 Set All Horizontal Tabs to Default

ESC	R
1/11	5/2

This sequence sets a horizontal tab stop every eight columns beginning with column 9. It also clears all vertical tab stops.

7.4.3 Set Horizontal Spacing to 12 CPI

ESC	:
1/11	3/10

Sets the printer to 12 cpi if single-width, or 6 cpi if double-width is selected.

7.5 ALTERNATE CHARACTER SET MAPPING

The following escape sequences let you select alternate character sets. You can find these character sets in Figures 3-1 through 3-3.

7.5.1 Select Set A (ERC01)

ESC	7
1/11	3/7

Selects character set A.

NOTE: This is the default setting when you enter emulation mode).

7.5.2 Select Set B (ERC02)

ESC	6
1/11	3/6

Selects character set B.

7.5.3 Select All Characters Set

ESC	\	n1	n2
1/11	5/12	***	***

This sequence selects the All Characters set as the active character set. This set has no control characters. Instead, it contains extra printable characters in some locations where control characters appear in sets A and B.

n1 and n2 represent the number of characters to be printed from the All Characters Set.

n1 represents values from 0 - 255 (Low byte)
n2 represents values equal to (n2 × 256) (High byte)
Total characters = n1 + (n2 × 256)

The character set that was active before the sequence was initiated becomes active again after the printer receives the number of characters specified by n1 and n2.

Error handling: The printer prints a space for any undefined character location it receives.

7.5.4 Print Single Character from All Characters Set

ESC	^
1/11	5/14

This sequence allows the next single character to be accessed and printed from the All Characters Set.

Error handling: The printer prints a space for any undefined character location it receives.

7.6 PRINTING MODES

This section describes the various printing modes and text enhancements that the LN03 PLUS can perform in IBM Proprinter emulation mode. The following escape sequences control the printing features.

7.6.1 Enable Shadow Bold (EREBD)

ESC	E
1/11	4/5

Sets shadow bold printing for all characters that follow.

7.6.2 Disable Shadow Bold (ERDBD)

ESC	F
1/11	4/6

Turns off shadow bold printing for all characters that follow.

7.6.3 Set LQ (EREHR)

ESC	G
1/11	4/7

Enters Letter Quality printing mode.

NOTE: The LN03 PLUS prints Letter Quality text by using shadow bolding.

7.6.4 Set Draft (ERDHR)

ESC	H
1/11	4/8

Enters Draft mode (no shadow bolding unless bold set by ESC E).

7.6.5 Select Printing Modes

ESC	I	n
1/11	4/9	***

Use this sequence to select the print mode you want to use. The parameter selection is as follows:

The parameter "n" is stripped of the low order bit, then divided by 8. If the remainder is:

Remainder	Printing mode
0	select Draft 1
2	select shadow bold
4	select downloaded set
8	select bold downloaded set

Error handling: If you request downloaded printed for a character that has not been downloaded, the printer prints a space.

7.6.6 Set Underline (EREUL)

ESC	-	Pn
1/11	2/13	***

Underlines all following characters, including spaces, but does not underline horizontal tabs.

Pn = all odd parameters

7.6.7 Reset Underline (ERDUL)

ESC	-	Pn
1/11	2/13	***

Turns off underlining.

Pn = all even parameters

7.6.8 Set Overscore

ESC	_	Pn
1/11	5/15	***

Overscores all following characters. Full height line drawing characters (12 pt) are not overscored.

Pn = all odd parameters

NOTE: Underline and overscore cannot be distinguished if one line is underlined and the next line is overscored.

7.6.9 Reset Overscore

ESC	_	Pn
1/11	5/15	***

Turns off underscore.

Pn = all even parameters

7.6.10 Superscript and Subscript

The superscript and subscript both print half-size (5 pt) characters. Subscript prints in the upper half of the character cell to allow printing of exponential expressions and footnotes. The subscript prints in the lower half of a character cell to allow printing of mathematical equations and scientific expressions. Superscripts and subscripts are available in all modes and pitches.

7.6.10.1 Enable Superscript (ERESCR)

ESC	S	Pn
1/11	5/3	***

Prints all following characters in superscript mode.

Pn = all even parameters

7.6.10.2 Enable Subscript (ERDSCR)

ESC	S	Pn
1/11	5/3	***

Prints all following characters in subscript mode.

Pn = all odd parameters.

7.6.10.3 Reset Script (ERDSCR)

ESC	T
1/11	5/4

Resets script setting to no script.

7.7 PRINTING MODE RULES AND EXCEPTIONS

Printing modes can be combined to produce the necessary output. The following are exceptions or clarifications to printing code combinations:

1. If both the 12 cpi and the compressed modes are active, set pitch to 12 cpi only. Setting the printer to 12 cpi pitch cancels the compressed mode.

2. Double-width printing is in effect for all pitches (10, 12, compressed), font styles (draft, bold), and their superscripts and subscripts.

7.8 GRAPHIC MODE

The host computer sends graphic data to the printer as a string of 8-bit characters. An escape sequence before these characters defines how many characters follow.

You can select the graphic mode with the escape sequences described below. After executing the escape sequence, the printer returns to text mode. The number of graphic bytes to print must equal the number specified. If the actual number of bytes differs from the number specified, the printer may (1) interpret text characters as graphic data, or (2) interpret graphic data as text.

7.8.1 Escape K (480 Bit-Image Graphic Mode)

This sequence changes printing from the text mode to the bit-image graphic mode at 60 dots per inch (dpi) resolution. At every horizontal position, each byte can print up to 8 vertical dots. The most significant bit (MSB) addresses the top dot, while the least significant bit (LSB) addresses the bottom dot. Bit-image data may be mixed with text data on the same line.

ESC	K	Pn1	Pn2	v1	v2 ... vk
1/11	4/2	***	***	***	*** ***

Pn1 and Pn2 are data bytes which specify the number of bit image data bytes to be transferred. v1 through vk are the bytes of the bit-image data. The number of bit-image data bytes (k) is equal to Pn1 + (256 × Pn2) but cannot exceed 480 bytes.

Pn1 represents values from 0 - 255.
Pn2 represents values (0 or 1) × 256.

If the specified number of bytes exceeds the maximum number of printable bytes in a certain graphic mode, the excess graphic data is not printed. These characters, however, shall be counted in order to properly exit the graphic mode.

Example: If 500 bytes are specified in 480 bit image graphic mode, the first 480 bytes will be printed and the remaining 20 bytes will be ignored before exiting the graphic mode.

7.8.2 Escape L (960 Bit-Image Graphic Mode)

ESC	L	Pn1	Pn2	v1	v2	...	vk
1/11	4/3	***	***	***	***		***

This sequence changes printing from the text mode to the bit-image graphic mode at a 120 dpi resolution. Data input is the same as for ESC K command. The number of bytes of bit-image data (k) is equal to Pn1 + (256 × Pn2) but cannot exceed 960.

7.8.3 Escape Y (960 Bit-Image Graphic Mode - Normal Speed)

This sequence allows printing at the same speed as the 480 bit-image graphic mode.

ESC	Y	Pn1	Pn2	v1	v2	...	vk
1/11	5/9	***	***	***	***		***

This sequence changes printing from the text mode to the bit-image graphic mode at a 120 dpi resolution. Data input is the same as for ESC K command. The number of bytes of bit-image data (k) is equal to PN1 + (256 × Pn2) but cannot exceed 960.

The firmware treats this mode in an identical fashion to the other 960 bit-image graphic mode.

7.8.4 Escape Z (1920 Bit-Image Graphic Mode)

This sequence changes printing from the text mode to bit-image graphic mode at 240 dpi resolution. Data input is the same as for ESC K command. The number of bytes of bit-image data (k) is equal to Pn1 + (256 × Pn2) but cannot exceed 1920.

ESC	Z	Pn1	Pn2	v1	v2	...	vk
1/11	5/10	***	***	***	***		***

7.9 DOWNLINE-LOAD CHARACTER IMAGE TO MEMORY

You can use this sequence to initiate character downline-loading. The sequence is self-terminating; it exits after a specified number of characters have been received. You can define a maximum of 94 downline-load characters.

Both draft and NLQ downline-load fonts are created from an 11-byte pattern. The character(s) need only be downline-loaded once. If the NLQ downline-load font is selected (<ESC> I 6), a bolding algorithm will be applied to the downline-load front data. If the draft downline-load font is selected (<ESC> I 4), the downline-loaded font data will be translated directly.

The downline-load sequence format is as follows:

ESC	=	**Pn1**	**Pn2**	**DC4**	**Pn3**
1/11	3/13	***	***	1/4	***

To figure out how many bytes you will need to downline-load the font data, you have to find the numeric parameters for the downline-load sequence. The numeric parameters Pn1 and Pn2 specify the number of informational bytes that will follow, where Pn1 = 0 to 255 and PN2 = (Pn2 × 256) and Pn2 can be equal to 0 or a greater integer.

In data string, each downline-loaded character contains 11 font data bytes preceded by two attribute bytes. Two additional bytes, DC4 and Pn3, precede all character data.

Therefore you can calculate the total number of bytes as follows:

1. Number of character bytes = 2 + (number of characters × 13)

2. The total number of bytes is encoded with Pn1 and Pn2 as
   Total bytes = Pn1 + (Pn2 × 256).

If number of character bytes is 255 or less, Pn1 parameter is used and Pn2 = 0. If Pn1 is greater than 255, Pn2 is equal or greater than 1 and both Pn1 and Pn2 are used.

Example:

If you want to downline-load ten characters, you will need the following number of bytes:

Character bytes = 2 + (10 × 13) = 132 (bytes)

Total Number of bytes = 132 + (0 × 256) = 132 (bytes)

The Pn3 parameter specifies the character address of the first downline-loaded character. If more than one character is downline-loaded, incremental address locations are filled. Characters may only be downline-loaded into address positions 2/1 to 7/14 (ASCII 7-bit printables). If an illegal address is reached at some point during the sequence, the downline load sequence is terminated. Font data received before the illegal address was reached will be saved.

Character data following the sequence set-up is of the following form.

Attribute			**Character**		
Pn4	**NUL**	**v1**	**v2**	**...**	**v11**
***	0/0	***	***		***

Each character is preceded by the Pn4 parameter and NUL. Attribute is set by Pn4 as follows.

Pn4 = 0 (0/0) character is ascending (uses top 8 wires of printhead)

Pn4 = 128 (3/1) character is descending (uses bottom 8 wires)

Bytes v1 through v11 are bit-map font data. They address the printhead pins the same way as the four graphic modes. Each of the 11 bytes constitutes 1/12 of the horizontal character cell.

When the downline-load font is selected, only those printable characters which were downline-loaded are addressable. All control codes corresponding to the current character set remain active. (If the Character Set A is the active set, all C0 and C1 control codes remain in effect.) Any other undefined printable addresses, including ALL 8-bit printable addresses, perform a space <SP> function.

Additional downline-load sequences may overwrite current downline-load data. Any current downline-load data at addresses which are not redefined remain in the downline-load buffer.

The entire downline-load data buffer is cleared with the following sequence:

ESC	=	**NUL**	**NUL**
1/11	3/13	0/0	0/0

NOTE: Some device drivers may not permit treansmission of the NUL code 0/0.

7.10 ESCAPE SEQUENCES NOT USED BY THE LN03 PLUS IN IBM PROPRINTER EMULATION MODE

Some escape sequences used by the IBM Proprinter are ignored by the LN03 PLUS because of the differences in the way the printers work. These ignored escape sequences include the following.

7.10.1 Paper Fault Handling

Paper fault escape sequences used by the IBM Proprinter are ignored by the LN03 PLUS because the printer has a single sheet feeder. When the LN03 PLUS is out of paper, an indicator lights on the LN03 indicator panel.

The following escape sequences for paper faults are ignored by the LN03 PLUS.

Disable paper out

ESC	**8**
1/11	3/8

Enable paper out

ESC	**9**
1/11	3/9

7.10.2 Unidirectional/Bidirectional Printing Control

Since the LN03 PLUS is a laser printer, it does not respond to escape sequences which affect printing control in the IBM Proprinter.

The following printing control sequences are ignored by the LN03 PLUS:

Set Bidirectional Printing (ERDUD)

ESC	**U**	**n**
1/11	5/6	***

Set Unidirectional Printing (EREUD)

ESC	**U**	**n**
1/11	5/6	***

7.10.3 Set Top of Form

ESC	**4**
1/11	

Sets the current paper position as top of form. Because the LN03 PLUS is a page printer, it ignores all requests for top of form. Use the form feed control character to eject the current page and advances to the top of the next page.


APPENDIX

APPENDIX
EXAMPLES OF SOFTWARE PACKAGES SUPPORTED IN "OTHER" MODE

NOTE: Some versions of these packages may run in DEC mode.

LANUGAGE APPLICATIONS
MS-Pascal, which is a trademark of Microsoft Corporation.
MS-Fortran, which is a trademark of Microsoft Corporation.
MS-Cobol, which is a trademark of Microsoft Corporation.
MS-Macro
MS-C Compiler
RM/Cobol, which is a trademark of Ryan-McFarland Corporation.
RM/Fortran, which is a trademark of Ryan-McFarland Corporation.
Turbo Pascal, which is a trademark of Borland International, Inc.
MWC-86, which is a trademark of Mark Williams Company.

WORD PROCESSING APPLICATIONS
MS-Word
MULTIMATE, which is a trademark of MultiMate International, Inc, an ASHTON-TATE company.
Samna Word III, which is a registered trademark of MicroPro International Corporation.
PFS: WRITE, which is a trademark of Software Publishing Corporation.

SPREAD SHEET APPLICATIONS
MULTIPLAN, which is a trademark of Microsoft Corporation.
SuperCalc, which is a registered trademark of Computer Associates International, Inc.
20/20, which is a trademark of Access Technology, Inc.
1-2-3, which is a trademark of Lotus Development Corporation.
Symphony, which is a trademark of Lotus Development Corporation.
MS-Excel

GRAPHICS APPLICATIONS
MS-Chart
MS-Paint
Graphwriter, which is a trademark of Graphic Communications, Inc.

DATA BASE APPLICATIONS
PFS: FILE, which is a trademark of Software Publishing Corporation.
dBase III, which is a trademark of ASHTON-TATE.
R. BASE.4000, which is a registered trademark of Microrim, Inc.
R. BASE.6000

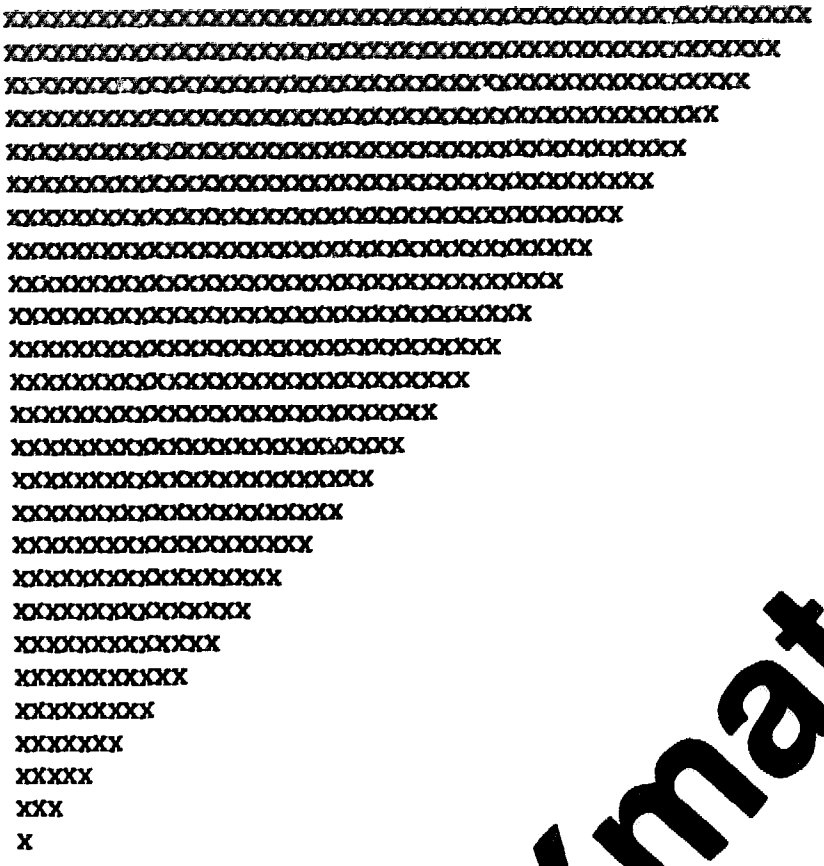
COMMUNICATIONS APPLICATIONS
SmartComm II
CROSSTALK XVI, which is a trademark of MicrosTuf, Inc.

SCHEDULING APPLICATIONS
MS-Project

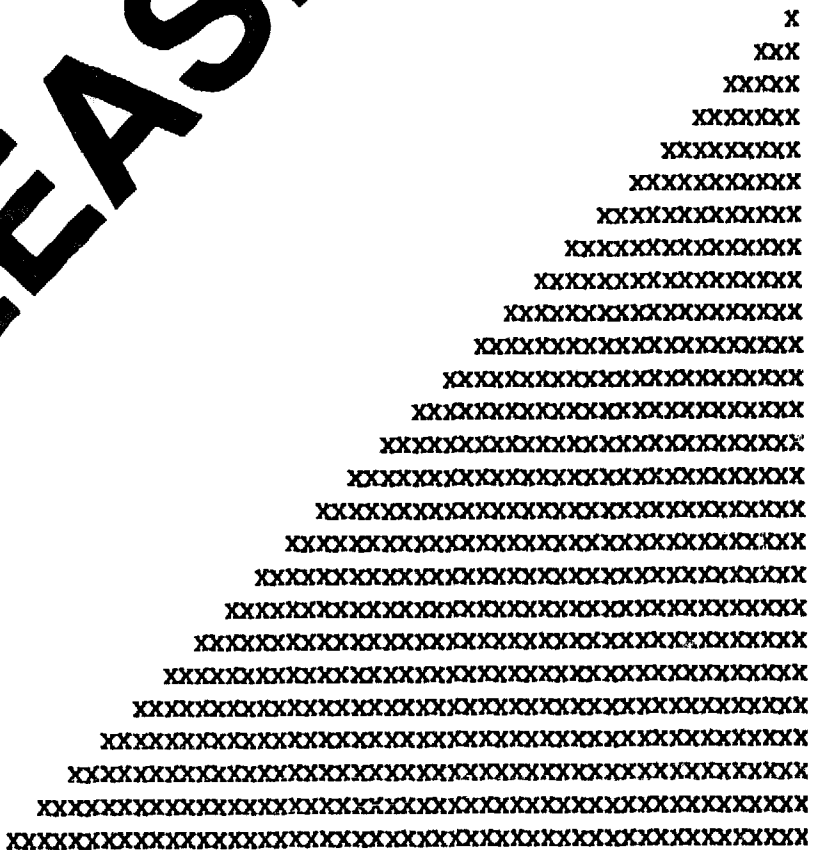
WINDOW ENVIRONMENT
DESQ, which is a trademark of Quarterdeck Office Systems.

TERMINAL EMULATION
SmarTerm 220, which is a trademark of Persoft, Inc.

GAMES
MS-Flight Simulator
BLAST, which is a trademark of Communications Research Group, Inc.



VAXmate RELEASE NOTE



VAXmate System Administration Release Note

Use of the LN03 ISO/PC Cartridge In the Version 1.0 PCSA Environment

You can use the LN03 ISO/PC cartridge in the Version 1.0 PCSA environment in three modes. You should select the mode and drivers to be used according to the types of output to be generated on the printer. The modes are:

- Mode Switching
- DEC Mode
- IBM Proprinter Emulation Mode

These modes and their PCSA support mechanisms are described in the following sections.

Mode Switching Support

If the LN03 PLUS with cartridge will be switched between DEC and Other (industry-standard) mode, use the PCSA support mechanisms described in this section.

VAX/VMS Server

Use the following aliases when printing via a VAX/VMS server:

- LA75_D80 - for DEC 80 column mode printing
- LA75_D132 - for DEC 132 column mode printing
- LA75_S80 - for industry-standard 80 column mode printing
- LA75_S132 - for industry-standard 132 column mode printing

From MS-Windows:

Select the appropriate printer driver from the Windows Control Panel Setup menu, according to the type of output desired:

- Digital LA75DEC driver - for DEC portrait mode printing
- Digital LA75STD driver - for industry-standard portrait and industry-standard graphics landscape mode printing

Use of the LN03 PLUS with the cartridge as an LA75 provides the advantage of automatic switching between DEC and industry standard modes. This is particularly useful when many users will share the printer. Limitations of this mode are:

- DEC landscape mode is not available
- graphics resolution is equal to that of the LA75 (144x72 dpi) rather than that of the LN03 PLUS (300x300 dpi).

It is possible, however, to generate 300x300 dpi resolution DEC mode output when printing from MS-Windows. To do this, you must connect to a VAX/VMS server using the LN03P_DPORT or LN03P_DLAND alias, and select the Digital LN03PLUS driver from the Control Panel.

From MS-DOS:

Use the MS-DOS MODE and GRAPHICS utilities with printer type:

- Digital LA75DEC - for DEC portrait mode printing
- Digital LA75STD - for industry-standard mode printing

DEC Mode Support

If the LN03 PLUS with the cartridge will be used to print in DEC mode only, use the printer as an LN03 PLUS. Before power-up, manually set the cartridge to DEC mode. In addition, use the PCSA support mechanisms described in this section.

WARNING: Any IBM printer commands will cause unpredictable results.

VAX/VMS Server:

Use the following aliases when printing using a VAX/VMS server:

- LA75_D80 - for DEC 80 column mode printing
- LA75_D132 - for DEC 132 column mode printing

From MS-Windows:

Select the Digital LN03PLUS driver from the Control Panel Setup menu.

From MS-DOS:

Use the MS-DOS MODE and GRAPHICS utilities with printer type LN03

Use of the LN03 PLUS with the cartridge as an LN03 PLUS provides DEC landscape mode printing and LN03 PLUS graphics resolution of 300x300 dpi.

IBM Proprinter Emulation

If the LN03 PLUS with the cartridge is to be used in IBM Proprinter emulation mode only, manually set the cartridge to Other mode before power-up, and use the PCSA support mechanisms described in this section.

WARNING: Any DEC printer commands will cause unpredictable results.

VAX/VMS Server:

Use the following aliases when printing using a VAX/VMS server:

- LA75_S80 - for industry-standard 80 column mode printing
- LA75_S132 - for industry-standard 132 column mode printing

From MS-Windows:

Select the Digital LA75STD printer driver from the Windows Control Panel Setup menu for standard portrait and standard graphics landscape mode printing.

From MS-DOS:

Use the MS-DOS MODE and GRAPHICS utilities with printer type:

- LA75STD - for industry-standard mode printing