EK-LA210-TM-001

LA210

Technical Manual

Prepared by Educational Services
of
Digital Equipment Corporation

First Edition, April 1985

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INTRODUCTION

This technical manual provides operating, programming, installation, and maintenance information about the LA210 Letterprinter.

This manual is for Field Service and Customer Service engineers and other technical personnel involved in maintaining the LA210 Letterprinter. For information on programming and operation, refer to the programmer reference manual and the user guide. (A list of available documents for the printer is in Chapter 1, Table 1-1.)

The manual is divided into the following chapters.

Chapter 1, "Overview," describes the printers physical and functional characteristics. A list of documentation for the printer is included.

Chapter 2, "Installation," describes the environmental conditions to consider before installing the printer. It has procedures for unpacking the printer, installing it, turning it on, and verifying its operation.

Chapter 3, "Operator Information," is a description of the printer's controls, indicators, and self-tests.

Chapter 4, "Programming," covers the basic programming features and data that support the printer application software. For detailed information, see the programmer reference manual.

Chapter 5, "Theory of Operation," discusses the printer's internal operating principles. The chapter covers the primary functional areas of the printer: microprocessor/control system, input/output (I/O) communication system, printing process, paper advance process, and power supply. Each area is explained in terms of hardware and firmware.

Chapter 6, "Options," provides a functional description of the major printer options, along with installation, testing, and reference information.

Chapter 7, "Troubleshooting," is a fault isolation guide. It has tables that list possible failures and procedures for determining the faulty area. Basic (operator-oriented) and functional tests provide check-out procedures and in-depth troubleshooting.

Chapter 8, "Mechanical Servicing," has procedures for removing, replacing, and adjusting field replaceable units (FRUs).

Appendix A, "Base Models," lists the basic printer configurations.

Appendix B, "Interfaces," describes the printer's interface lines and their specifications.

Appendix C, "Options and Accessories," lists the printer options accessories, supplies, and spares.

Appendix D, "Specifications," lists the specifications for the printer.

CHAPTER 1
OVERVIEW

1.1 GENERAL

The LA21Ø Letterprinter is a dot matrix, receive-only (RO) printer that fits on a desktop. You can use this compact microprocessor-controlled printer with personal computer systems, office workstations, and small business computer systems.

This chapter provides physical and functional descriptions of the printer.

1.2 PHYSICAL DESCRIPTION

The printer has two main mechanical assemblies and two main electronic assemblies. The mechanical assemblies are the printer mechanism and the printhead. The electronic assemblies are the control/logic module and power supply.

1.3 FUNCTIONAL DESCRIPTION

Figure 1-1 shows two ways of connecting the printer to a computer. The printer processes data characters according to standards from the American National Standards Institute (ANSI). Depending on system variations, the printer operates in 7-bit and 8-bit modes.

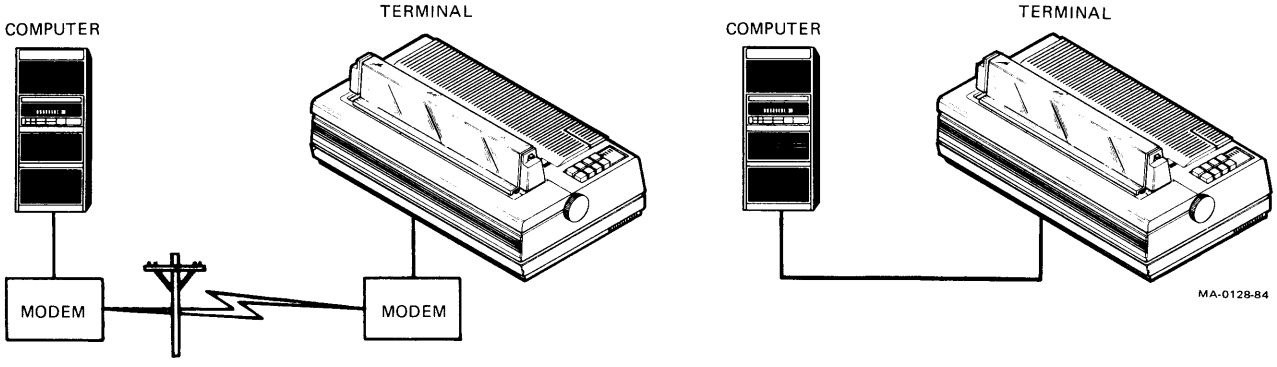

Figure 1-1 Connecting Printer to Computer

1.3.1 Control System

The printer's internal control system supervises data input/output (I/O), character generation and printing, and form control. This control system is built around an 8Ø85A microprocessor supported by 24 Kbytes (8 Kbytes plus 16 Kbytes) of control read only memory (ROM) and 2 Kbytes of random access memory (RAM). Up to five plug-in font ROMs (8 Kbytes each) store the dot pattern sets (DPSs) used for selecting style (fonts) and/or function (character sets). The printer has three internal font slots and two external slots in a font assembly. You can use escape sequences to select fonts from the host computer or you can select fonts manually by using the operator control panel.

The 8Ø85A uses an internal microprocessor control bus to monitor and control the communication module, or USART (Universal Synchronous-Asynchronous Receiver/Transmitter), the DC3Ø5 printer controller, and the control panel. Figure 1-2 is a simplified block diagram of the printer.

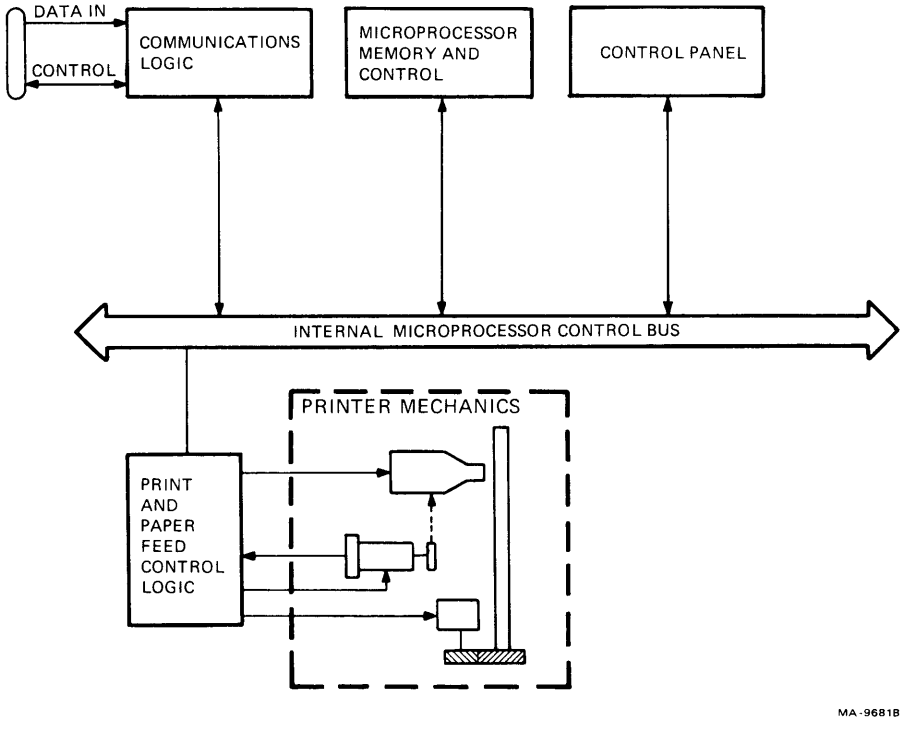

Figure 1-2 Simplified Block Diagram

The LA210 Letterprinter operates at medium speed in asynchronous, full-duplex mode. The printers interface conforms to the electrical requirements of EIA standards RS232-C and CCITT V.24. The printer supports baud rates of 50 to 9600. You can use different rates for sending and receiving.

The printer has electrically alterable read only memory (EAROM) that allows parameters and answerback messages to be stored permanently even after the power is off. You can overwrite this memory area to store new parameters.

1.3.2 Printing Process

The printer's standard character set is the USASCII (American Standard Code for Information Interchange) character set, which has 96 upper- and lowercase characters (Figure 1-3). In addition to English, the printer can print in several European languages and in graphic mode.

Characters are printed by a 9-wire, solenoid-operated printhead. The printhead moves horizontally along the print line and fires groups of discrete wires at each printing position, forming 7 X 9 (W X H) dot matrix characters. You can select multiple font draft and letter quality printing. Draft mode uses the basic 7 X 9 matrix. Letter mode uses either the standard 33 X 18 or optional 33 X 9, depending on the DPS (font) installed. Graphic mode prints a single vertical column of six dots (six printhead wires) for each character received.

The ribbon comes in a disposable cartridge that mounts on the carriage assembly and surrounds the printhead. The ribbon is easy to remove and replace.

The printhead mounts on the carriage assembly. A timing belt connects the carriage assembly to a servo drive motor. The reversible dc servo motor drives the carriage with the printhead and the ribbon cartridge. The ribbon advances when the carriage moves. The control logic module tracks the printhead position by means of feedback pulses sent from an encoder on the servo motor.

The paper feed mechanism moves the paper up or down. When the tractor feed is used, the printer only advances paper, except to use the superscript/subscript function. The printer reverses paper 1/12 inch when superscripting. A dc stepper motor directly drives the paper feed mechanism.

BITS B8 B7 B6 B5 / B4 B3 B2 B1	ROW	COLUMN 0 (0 0 0 0)		COLUMN 1 (0 0 0 1)		COLUMN 2 (0 0 1 0)		COLUMN 3 (0 0 1 1)		COLUMN 4 (0 1 0 0)		COLUMN 5 (0 1 0 1)		COLUMN 6 (0 1 1 0)		COLUMN 7 (0 1 1 1)	
0 0 0 0	0	NUL	0 0 0		20 16 10	SP	40 32 20	0	60 48 30	@	100 64 40	P	120 80 50	`	140 96 60	p	160 112 70
0 0 0 1	1		1 1 1	DC1 (XON)	21 17 11	!	41 33 21	1	61 49 31	A	101 65 41	Q	121 81 51	a	141 97 61	q	161 113 71
0 0 1 0	2		2 2 2		22 18 12	"	42 34 22	2	62 50 32	B	102 66 42	R	122 82 52	b	142 98 62	r	162 114 72
0 0 1 1	3		3 3 3	DC3 (XOFF)	23 19 13	#	43 35 23	3	63 51 33	C	103 67 43	S	123 83 53	c	143 99 63	s	163 115 73
0 1 0 0	4	EOT	4 4 4		24 20 14	$	44 36 24	4	64 52 34	D	104 68 44	T	124 84 54	d	144 100 64	t	164 116 74
0 1 0 1	5	ENQ	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	BEL	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	[	133 91 5B	k	153 107 6B	{	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	\	134 92 5C	l	154 108 6C	|	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	]	135 93 5D	m	155 109 6D	}	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	~	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
		ASCII CONTROL SET				ASCII GRAPHIC CHARACTER SET											

KEY

ASCII CHARACTER		
ESC	1/11	COLUMN/ROW
	33	OCTAL
	27	DECIMAL
	1B	HEX

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Figure 1-3 Standard Character Set (Sheet 1 of 2)

1 0 0 0	1 0 0 1	1 0 1 0	1 0 1 1	1 1 0 0	1 1 0 1	1 1 1 0	1 1 1 1
8	**9**	**10**	**11**	**12**	**13**	**14**	**15**
200 128 80	220 144 90 **DCS**	240 160 A0	260 176 B0 °	300 192 C0 À	320 208 D0	340 224 E0 à	360 240 F0
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 Œ	347 231 E7 ç	367 247 F7 œ
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	316 206 CE Î	336 222 DE	356 238 EE î	376 254 FE
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
ADDITIONAL CONTROL SET		**DEC SUPPLEMENTAL GRAPHIC SET**					

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Figure 1-3 Standard Character Set (Sheet 2 of 2)

1.4 RELATED DOCUMENTS

Table 1-1 lists the documents that support the LA210 Letterprinter.

Table 1-1 Related Documents

Title	Document Number	Description
LA210 Letterprinter User Documentation Package	EK-LA210-UP	User documentation package. Includes user guide, installation manual, programmer reference manual, and operator/programmer reference card and guide.
Installing the LA210 Letterprinter	EK-LA210-IN	Installation, checkout, and set-up information.
LA210 Letterprinter User Guide	EK-LA210-UG	Operating, user maintenance, and checkout information for the printer.
LA210 Letterprinter Programmer Reference Manual	EK-LA210-RM	Information on programming features of the printer (communication, character processing, escape and control sequences, ANSI control strings) for writing printer application software.
LA210 Letterprinter Operator and Programmer Reference Guide	EK-LA210-RC	A foldout card summarizing operator and programming information.
LA210 Letterprinter Emulation Mode Reference Guide	EK-LA210-RG	A foldout card summarizing programming information for using mode emulation.
LA210 Pocket Service Guide	EK-LA210-PS	Troubleshooting, general maintenance, and mechanical servicing information.

Table 1-1 Related Documents (Cont)

Title	Document Number	Description
LA210 Technical Manual	EK-LA210-TM	Summary of installation, operating, and programming with details on troubleshooting and mechanical servicing; includes specifications and other reference data.
LA210 Illustrated Parts Breakdown	EK-LA210-IP	Exploded views and parts lists.
LA210 Field Maintenance Print Set	MP-02007-01	Engineering drawings and parts lists.
LA10X-EP Parallel Interface Option User Guide	EK-L10EP-UG	Installation, functional, checkout, and set-up information for LA10X-EP option.
LA21X-BT Bidirectional Tractor Option Installation Guide		Installation, checkout, and set-up information for bidirectional tractor.
LA21X-SF/SH Cut Sheet Feeder User Guide		Installation, operating, checkout, and maintenance information for sheet feeder option.

NOTE

Installation guides are provided for plug-in ROM options. The ROM options are listed in Appendix C, Paragraph C.1. Refer to the option part number to determine the number of its installation guide.

CHAPTER 2
INSTALLATION

2.1 GENERAL

This chapter has information on inspecting, installing, and powering up the printer. Before you connect the printer to the system, do the procedures in Chapter 3 (Paragraph 3.5) to make sure it is not damaged and is operating correctly.

2.2 SITE CONSIDERATIONS

Install the printer in an area free from excessive dust, dirt, corrosive fumes, and vapors. The following is a list of environmental and power requirements for the printer.

Weight	11.3 kg (25 lb)
Electrical requirements	
Input voltage	90 to 128 Vac 47 to 63 Hz or 180 to 256 Vac 47 to 63 Hz
Power receptacle	Nonswitched, 3-prong, grounded receptacle
Operating requirements	
Temperature	10° to 40°C (50° to 104°F)
Relative humidity	10% to 90%

Appendix D has a complete list of specifications. Also see Figure 2-1, which shows the dimensions of the printer.

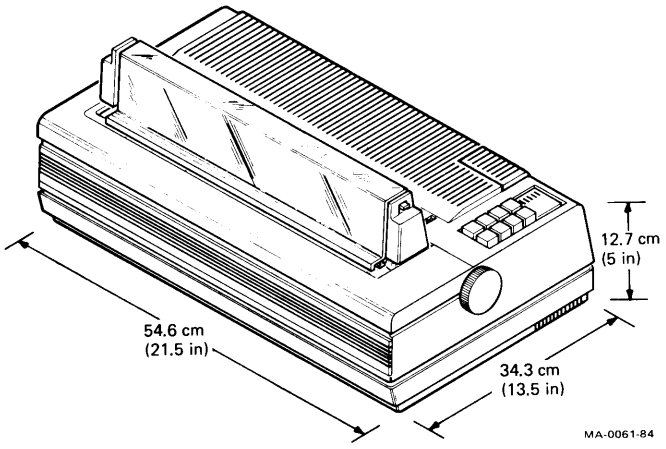

Figure 2-1 Printer Dimensions

2.3 UNPACKING AND INSPECTING THE PRINTER

Unpack and inspect the printer as follows. You will need a sharp tool.

1. Use a sharp tool to open the top of the shipping carton.

2. Lift the printer up and out of the carton. Place the printer on a flat, clean surface.

3. Remove the shock absorbing material and packing from around the printer.

4. Remove the tractor assembly, documentation package, power cord, paper, ribbon, and loopback connector.

5. Carefully inspect the printer for damage. Check for lost or missing items. Report any damage or missing items to the local carrier and your local Digital sales representative.

6. Remove the access cover, cardboard retainer, and the tie wrap which holds the printhead (Figure 2-2). Replace the access cover.

7. Use a clean, soft, lint-free cloth to clean the outer surfaces if they are dirty.

NOTE

Save the cardboard retainer and shock absorbing material to repack the printer.

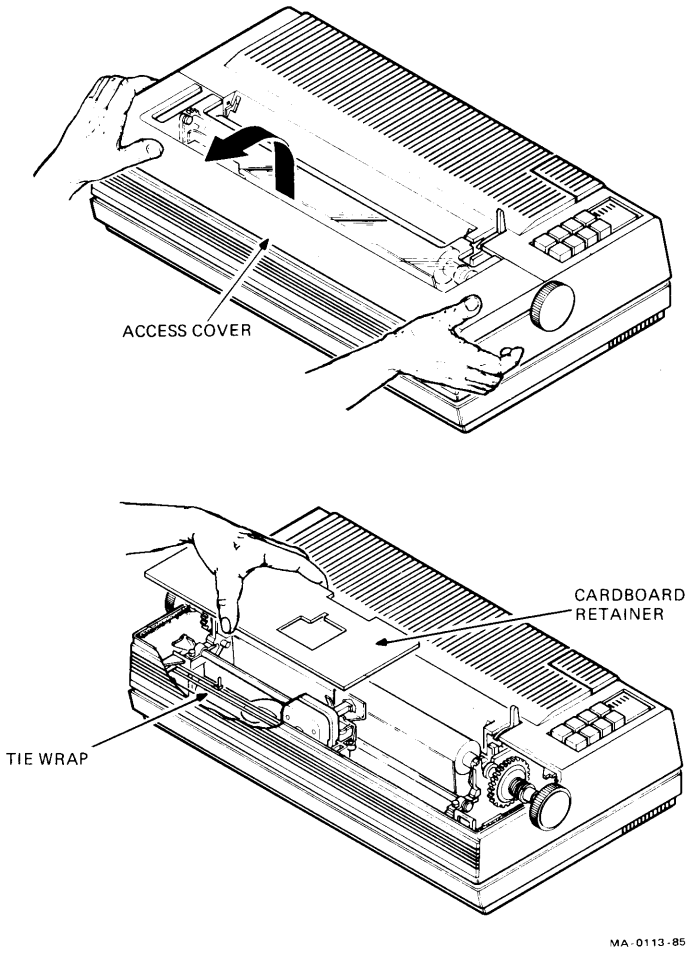

Figure 2-2 Removing the Packing Material

2.4 REPACKING THE PRINTER

Repack the printer for shipment as follows.

1. Remove the ribbon cartridge, paper, and all cables.
2. Remove the access cover and secure the printhead with a tie strap and cardboard retainer to prevent movement while in transit. Replace the access cover.
3. Repack the printer with the shock absorbing material.
4. Seal the shipping carton with reinforced tape.

2.5 INSTALLING THE PRINTER

Perform the procedures to install the printer as follows.

2.5.1 Cabling

Connect the cables as follows.

1. Remove the printer top cover to access the voltage selector switch (Paragraph 8.3). The switch is on the top of the power supply (Figure 2-3). Make sure that the voltage switch setting matches the input voltage (115 V for U.S.).

   CAUTION

   Never use a pencil to change the voltage. Lead particles can disturb printer operation. Always use a small, slotted screwdriver or a ballpoint pen.

2. Attach either end of the communication cable to the rear of the printer. The cable may be either an EIA BC22D or a BCC04 PC cable. If the parallel interface adapter is installed, you must attach a DEC communication cable (part number 70-21511) for DEC parallel applications. For IBM/Epson parallel applications, attach an IBM/TI/Centronics cable (vendor part number R0097). For more information on the parallel interface adapter, see the LA10X-EP External Parallel Interface Adapter User Guide (EK-L10EP-UG).

2.5.2 Power-Up

Perform the following procedure to power-up the printer.

1. Turn off the power switch on the rear of the printer.
2. Plug the ac power cord into the printer and into the wall socket.
3. Turn on the power switch.

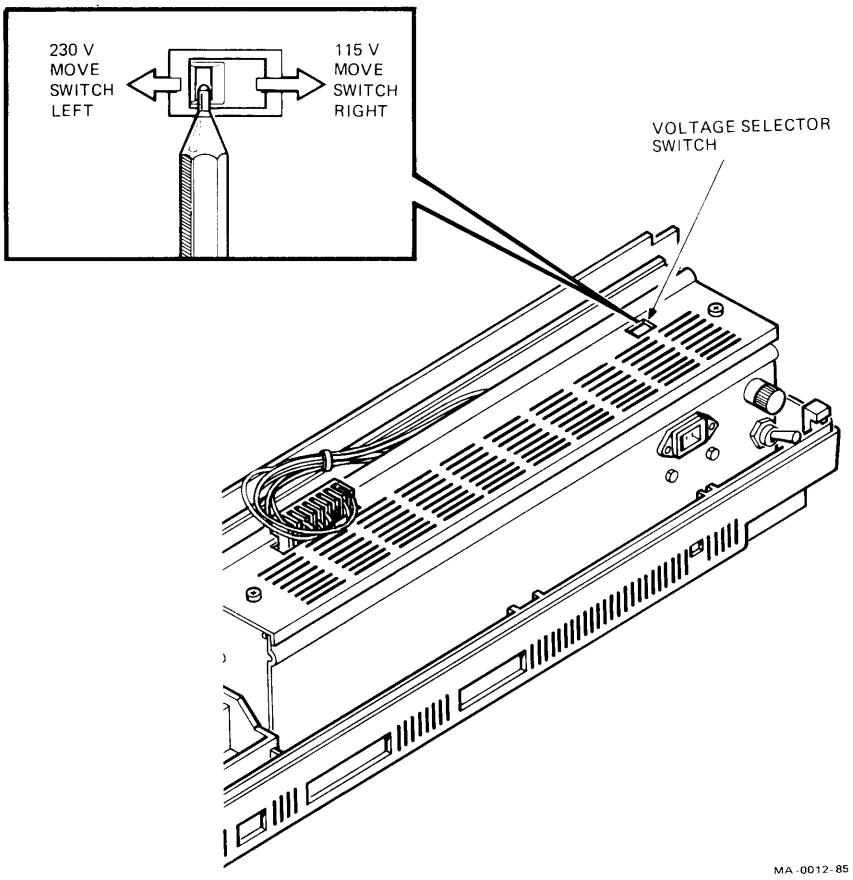

Figure 2-3 Voltage Selector Switch

2.5.3 Ribbon Cartridge

Install the ribbon cartridge as follows. You do not have to turn the power off.

> CAUTION
> Digital recommends the LA1ØR ribbon cartridge for replacement. Using other ribbon cartridges may damage the printhead and void the warranty.

1. Remove the access cover. Remove and discard the old ribbon cartridge.

2. Move the printhead adjustment lever to the right (Figure 2-4).

3. Turn the ribbon adjust knob on the new ribbon cartridge clockwise to tighten the ribbon (Figure 2-5).

4. Line up the snap buttons on the new ribbon cartridge with the mounting holes in the carriage assembly (Figure 2-6).

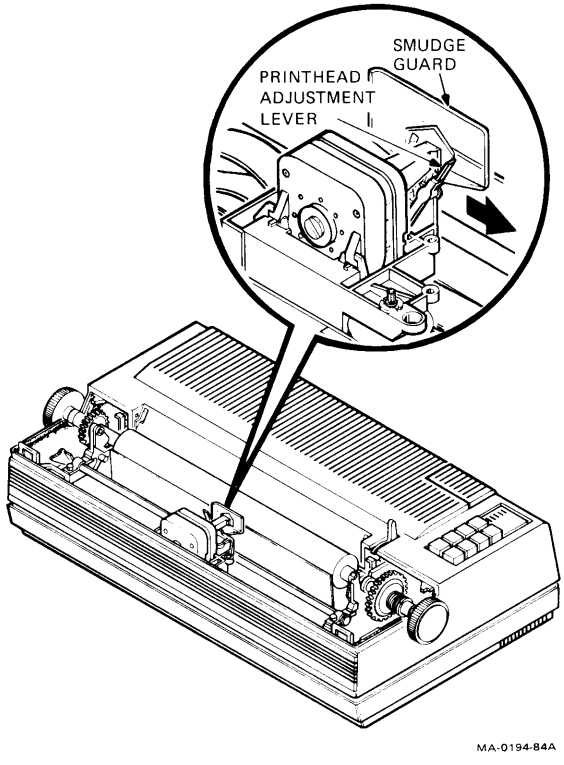

Figure 2-4 Printhead Adjustment Lever

5. Slowly press the new ribbon cartridge onto the carriage assembly while turning the ribbon adjust knob. Make sure the slot in the ribbon cartridge engages the ribbon advancing mechanism and that the ribbon fits between the printhead and smudge guard.

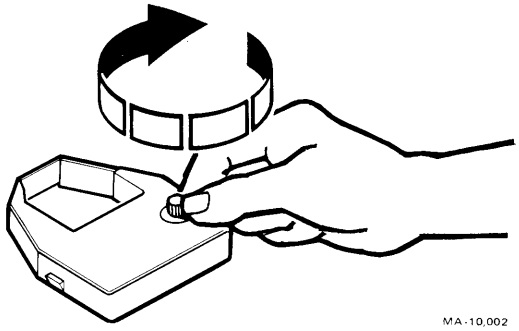

Figure 2-5 Ribbon Cartridge

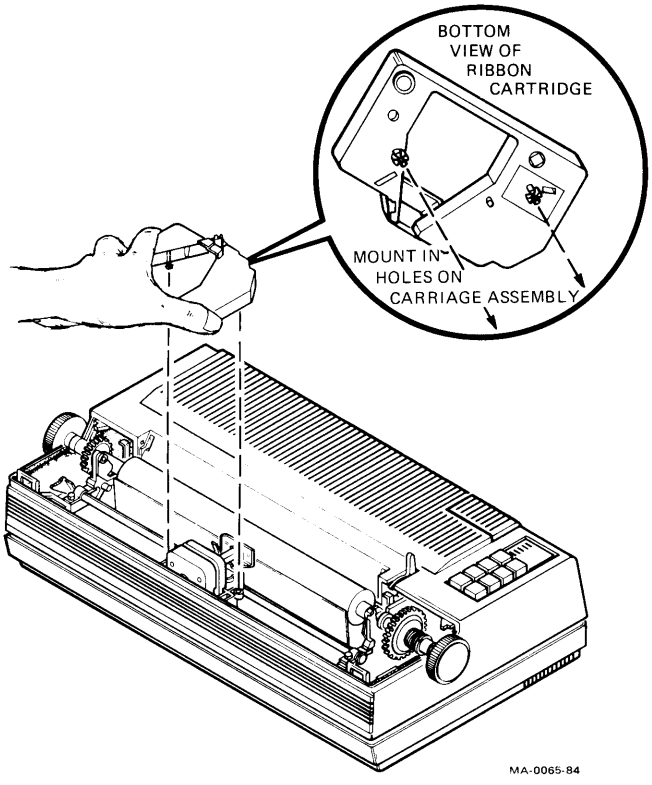

Figure 2-6 Ribbon Cartridge Installation

6. Move the printhead side to side two or three times while watching the ribbon adjust knob. If the ribbon adjust knob turns clockwise when the printhead moves, then the ribbon is advancing correctly.

7. Adjust the printhead (Paragraph 2.6).

8. Replace the access cover.

2.5.4 Installing Tractor Assembly

1. Pull the paper release lever toward you (Figure 2-7).

2. Hold the tractor assembly with both hands and press down on the tractor release levers (Figure 2-7).

3. Align the tractor assembly with the slots in the top of the printer. Then lower the assembly into place.

4. Release the tractor release levers.

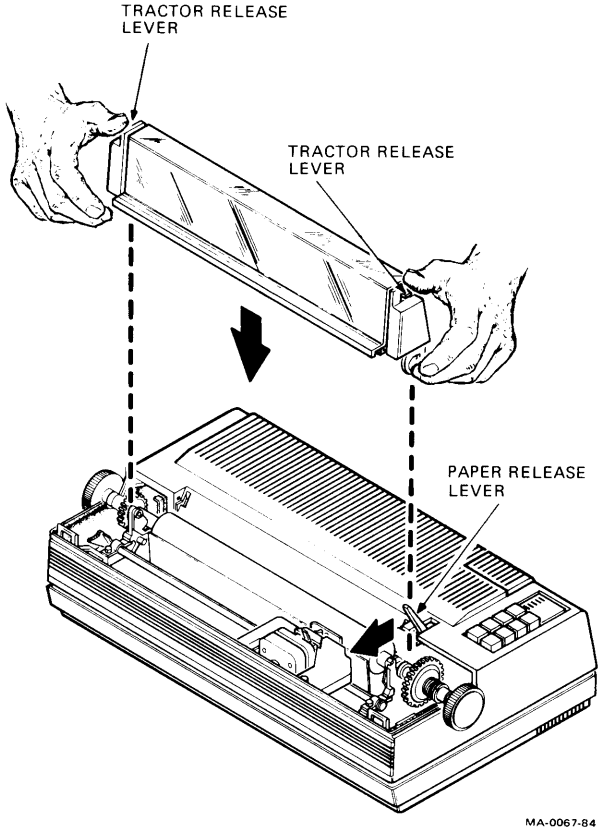

Figure 2-7 Tractor Assembly

2.5.5 Loading Paper

The printer accepts tractor feed paper from 3 to 14 7/8 inches in width. Digital recommends using the printer stand option for the most effective paper feed operation.

Observe the following suggestions when using tractor feed paper.

Do not use stapled forms.

Use multipart forms with no more than four parts and one card. The card must be on the back.

Dot or line glue margins are acceptable (one margin only).

Do not use first-surface impact paper.

Do not use split forms (different number of sheets on each side of form).

Follow these steps to load the paper.

1. Remove the access cover by pulling up and out.

2. Set the paper-out switch to the disabled (forward) position (Figure 2-8).

CAUTION

Make sure the paper-out switch is disabled before you feed or remove paper through the bottom slot in the printer. Otherwise, the switch may be damaged.

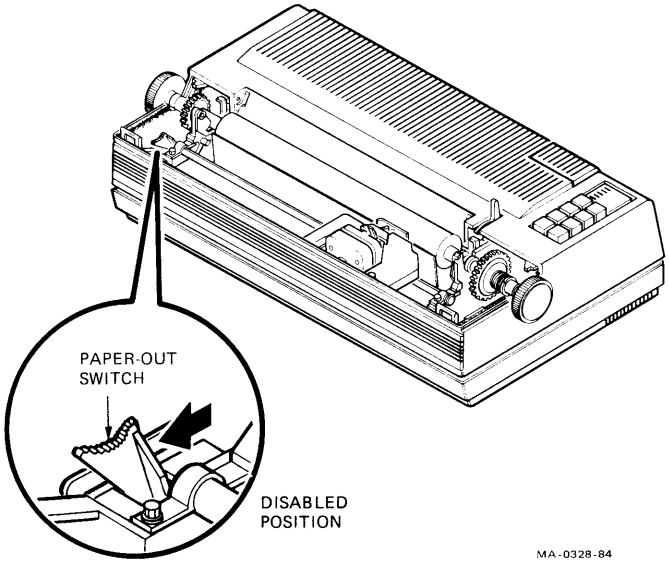

Figure 2-8 Paper-Out Switch in Disabled Position

3. Open the window (Figure 2-9).

4. Open the paper clamps (Figure 2-10).

5. You may have to adjust the right tractor to the paper width. To loosen the right tractor adjustment lever, pull it toward the front of the printer (Figure 2-11).

6. Move the tractor to the position that corresponds to paper width. Do not tighten the tractor adjustment lever yet.

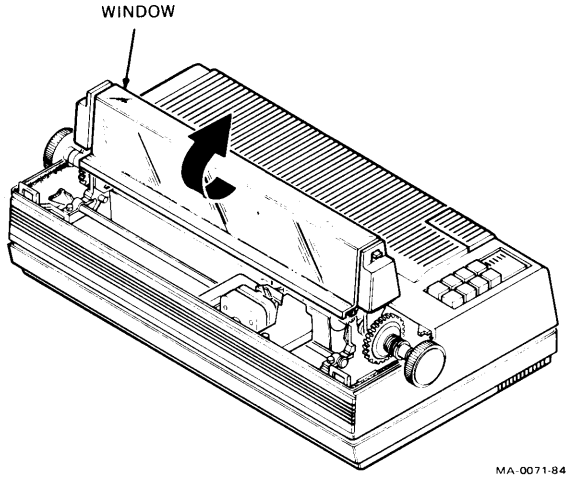

Figure 2-9 Tractor Assembly Window

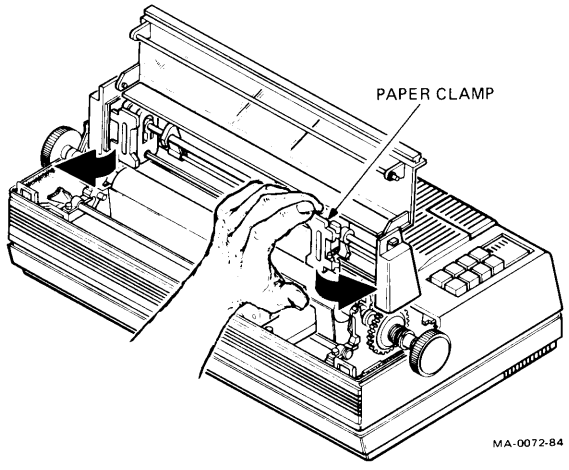

Figure 2-10 Paper Clamp

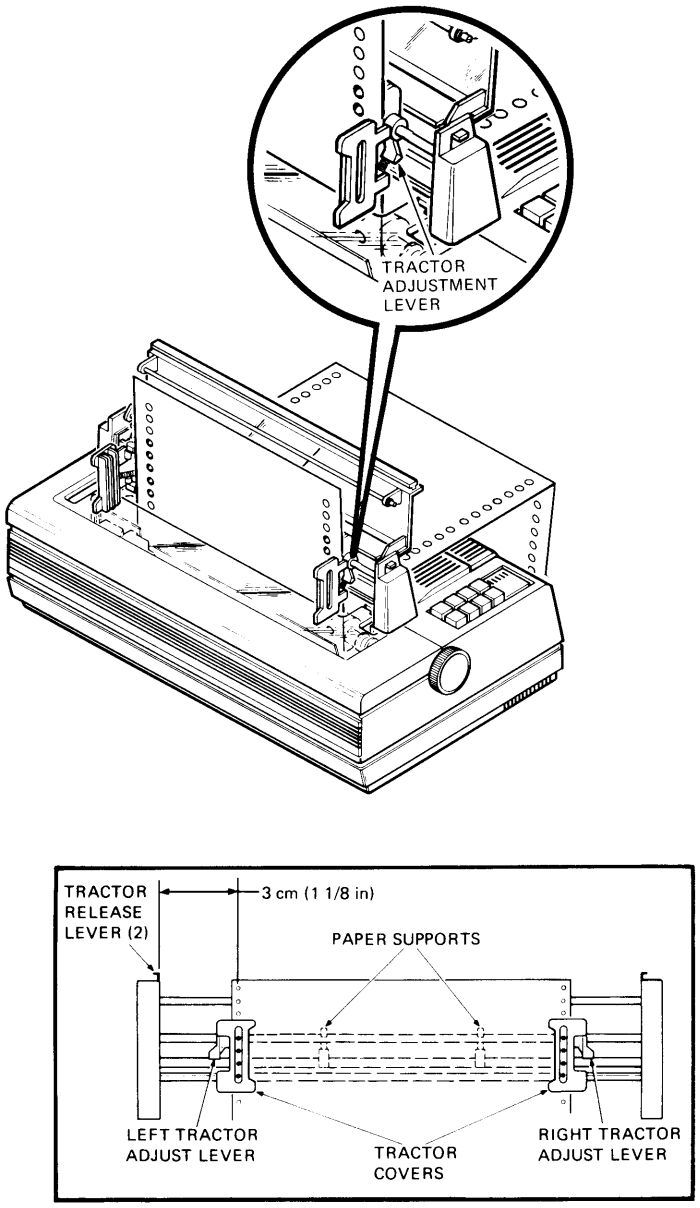

Figure 2-11 Tractor Adjustments

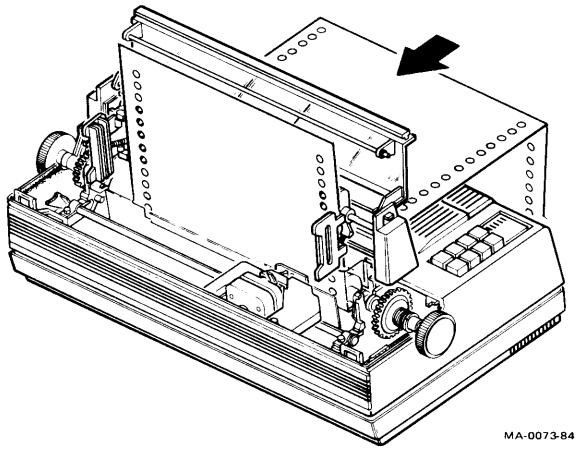

Figure 2-12 Loading Paper (Printer on Table)

7. There are two ways to feed paper, depending on whether or not the printer is on a stand. Digital recommends using a stand. However, if a stand is not available, you may feed paper from the back of the printer (under the back of the tractor assembly, around the platen and up onto the tractors). (See Figure 2-12.)

NOTE

Feed only single-part paper through the back of the printer.

Make sure the paper-out switch (Figure 2-8) is disabled before you feed paper from the back. If not, the power/fault indicator turns on and the printer will not feed paper.

If the printer is on a stand, then you may feed either single-part or multipart paper through the slot in the bottom of the printer and onto the tractors (Figure 2-13).

NOTE

You can enable the paper-out function when paper is feeding from the bottom. First load the paper. Then return the paper-out switch to the enabled position.

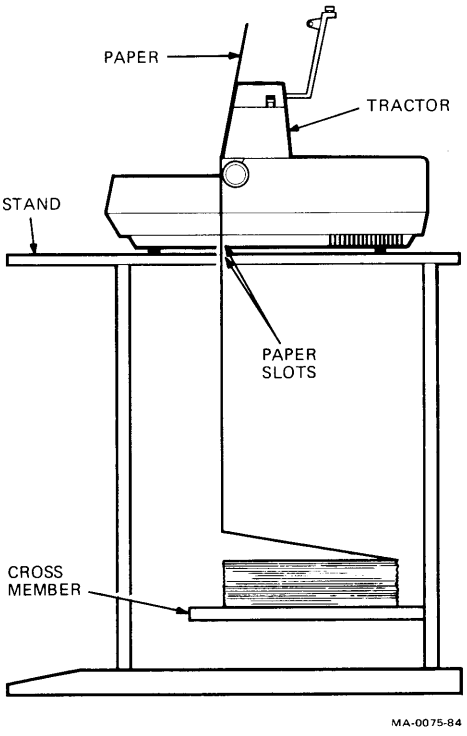

Figure 2-13 Loading Paper (Printer on Stand)

8. Place the paper's left margin holes over the left tractor's feed pins. Close the tractor clamp.

NOTE

Do not move the left tractor unless necessary. If you move the left tractor, reset the margins to the default settings with the page width alignment sequence. See LA21Ø Letterprinter Programmer Reference Manual (EK-LP21Ø-RM).

9. Place the right margin holes over the right tractor's feed pins. Close the tractor clamp.

1Ø. Tighten the right tractor adjustment lever to secure the tractor.

CAUTION

Do not stretch the paper too tight. If the paper pulls against the tractor pins or is loose in the center, readjust the right tractor.

11. Position each paper support at one third of the distance between the tractors (Figure 2-11).

12. Make sure the paper stack is centered directly under the tractors.

13. Close the window.

14. If you are feeding paper from the bottom, you can enable the paper-out switch now.

15. Replace the access cover by sliding it in and down.

2.6 PRINTHEAD ADJUSTMENT

Adjust the printhead as follows.

1. Make sure the power switch is off.

2. Remove the access cover and open the window.

3. Move the printhead adjustment lever all the way to the right (Figure 2-4).

4. Remove the gap setting guide from the ribbon adjust knob.

5. Slide the narrow end of the gap setting guide between the printhead and the paper.

6. Move the printhead adjustment lever to the left until the gap setting guide can slide (with slight resistance) between the printhead and the paper (Figure 2-14). Your printhead is now adjusted correctly.

7. Reinstall the access cover and close the window.

8. If necessary, repeat steps 3 through 6 until the printed characters are clear and sharp.

NOTE

If the form ripples or is pulled by the printhead, the printhead is not adjusted correctly. Repeat steps 2 through 5.

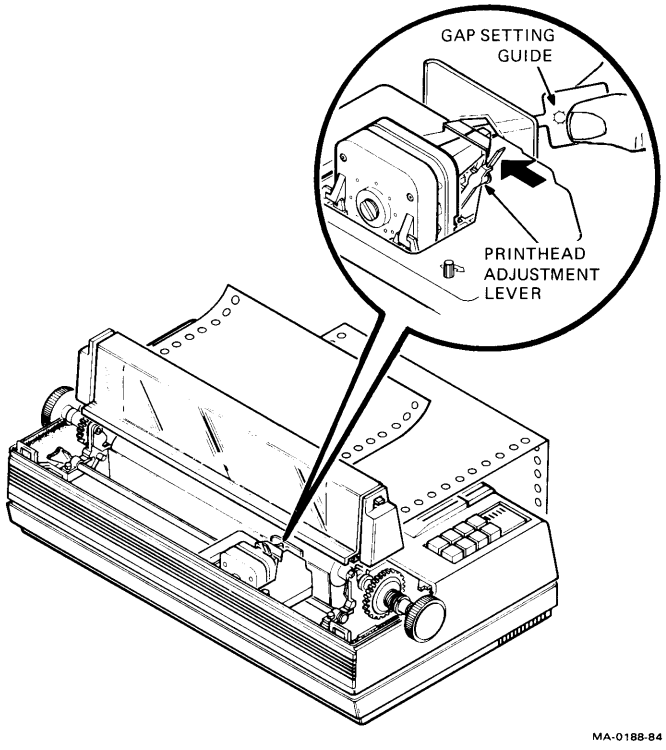

Figure 2-14 Printhead Adjustment