EK-LA120-TM-001

LA120
TECHNICAL MANUAL

digital equipment corporation • maynard, massachusetts

First Edition, January 1980

Printed in U.S.A.

This document was set on DIGITAL's DECset-8000 computerized typesetting system.

CONTENTS

CONTENTS (Cont)

CONTENTS (Cont)

CONTENTS (Cont)

CONTENTS (Cont)

CONTENTS (Cont)

CONTENTS (Cont)

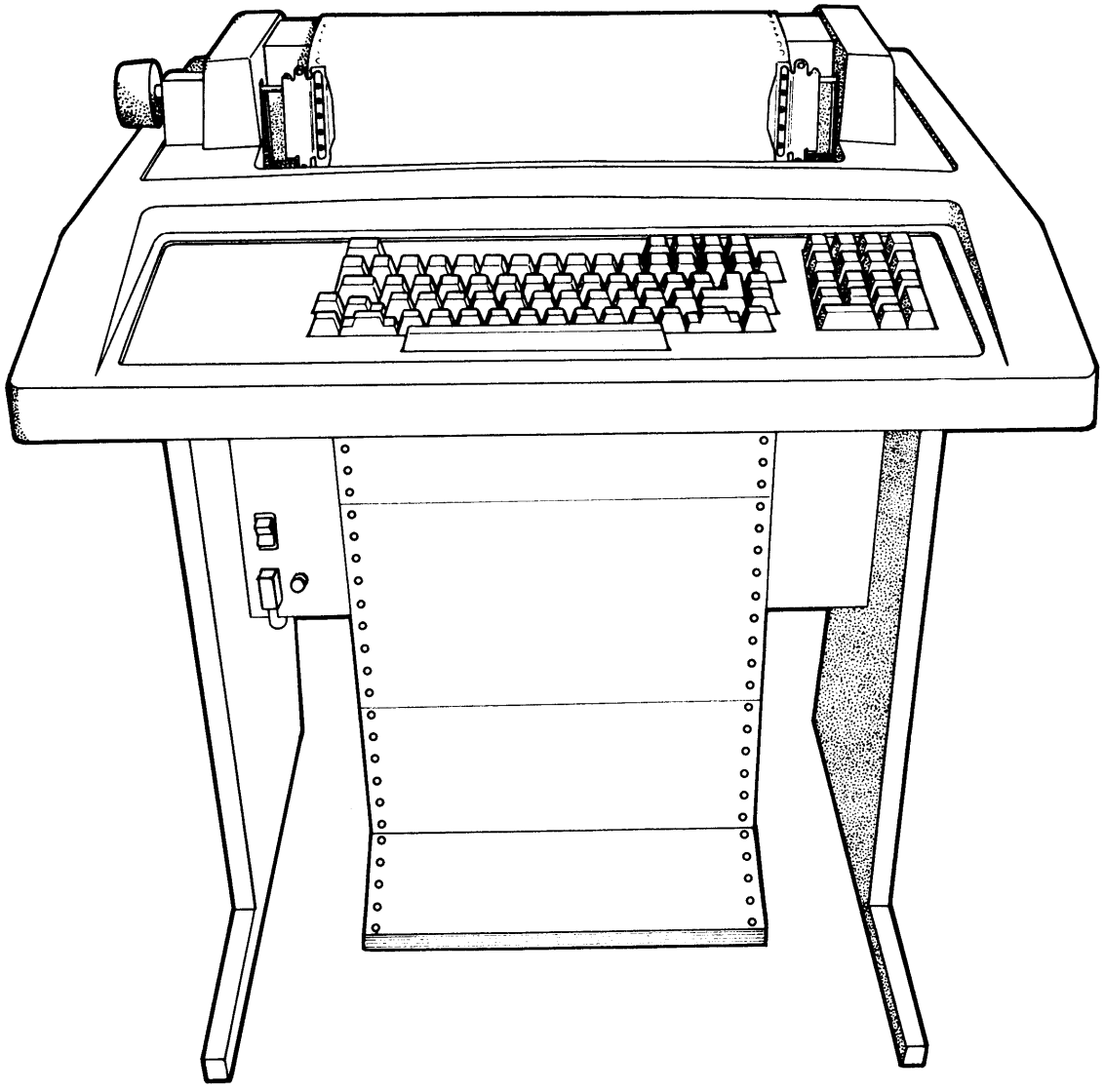
FIGURES

FIGURES (Cont)

FIGURES (Cont)

TABLES

TABLES (Cont)



LA120 DECwriter III

CHAPTER 1
OPERATORS INFORMATION

1.1 INTRODUCTION

The LA120 DECwriter III terminal is basically a typewriter, with a wide range of features, that communicates with a computer.

The LA120 is easily integrated into most systems. It is compatible with both EIA and ANSI standards. Besides the many standard features built into the basic LA120 DECwriter III, there are a number of options and accessories that may be added to the terminal to make it useful in an even wider range of applications.

Operator information contained in Chapter 1 is for the general user or user already familiar with the features of a terminal.

It contains the following information:

- Description of operator's console
- Description of alarm indicators
- Operator Testing and troubleshooting.

Operator information is summarized on the LA120 Operator Reference Card (Appendix A). Table 1-1 is a list of related LA120 documents.

Table 1-1 Related Documentation

Title	Document Number
LA120 User Guide	EK-LA120-UG*
LA120 Pocket Service Guide	EK-LA120-SV*
LA120 DECwriter III Illustrated Parts Breakdown	EK-LA120-IP**

*Available on hard copy only.
**Available on hard copy and microfiche.

For information on microfiche libraries, contact:
Digital Equipment Corporation
Micropublishing Group
12 Crosby Drive
Bedford, MA 01730

Hardcopy documents can be ordered from:
Digital Equipment Corporation
444 Whitney Street
Northboro, MA 01532
Attention: Communication Services (NR2/M15)
Customer Services Section

1.2 OPERATOR'S CONSOLE (Figure 1-1)

The LA120 operator's console contains an office typewriter-style keyboard. The keyboard contains a four-digit numeric display and seven indicators. There is provision for an optional, field installable numeric keypad.

To better understand the LA120 keyboard, think of the LA120 as two things. First, it is an input device to a computer; that is, pressing a key sends information (a code) to a computer. Second, it is a printer; information is sent from the computer to the printing portion of the LA120. However, you can set up your system to send information from the keyboard to the printer and computer at the same time. Figure 1-2 illustrates a basic system using an LA120.

1.2.1 Lights

The console indicator lights are listed in Table 1-2.

Table 1-2 LA120 Console Indicators

Indicator Light	Meaning
ON LINE	The LA120 is on-line. Data is transmitted and received only while on-line.
LOCAL	The LA120 is in local mode. In local, LA120 operates as a typewriter and does not transmit or receive data.
ALT CHAR SET	An optional alternate character set such as APL is in use.
CTS	Transmission of data is enabled (clear to send).
DSR	The modem is in data mode (data set ready).
SET-UP	Flashes to indicate that LA120 is in SET-UP mode.
PAPER OUT	Flashes to indicate that printer is not ready due to any of the following conditions. • Paper out • Cover open • Print head jam
NUMERIC DISPLAY	The numeric display indicates the next column number during normal operation. In SET-UP mode the numeric display may also indicate line number, baud rate, form length, etc.

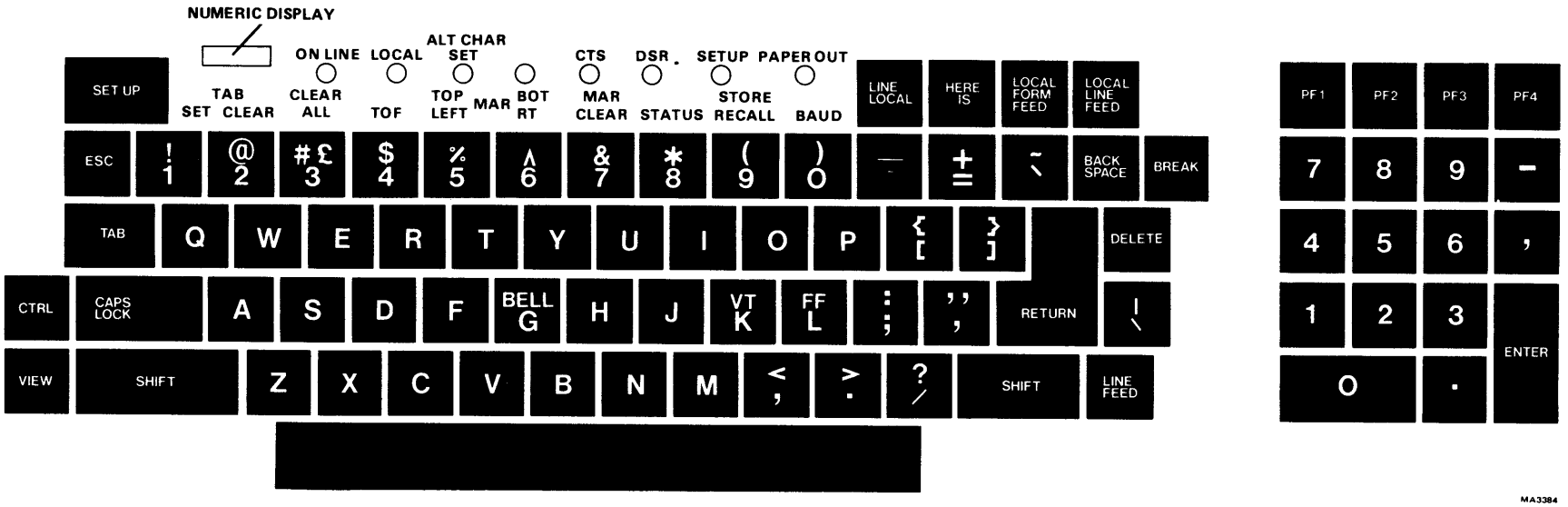


Figure 1-1 Operator's Console

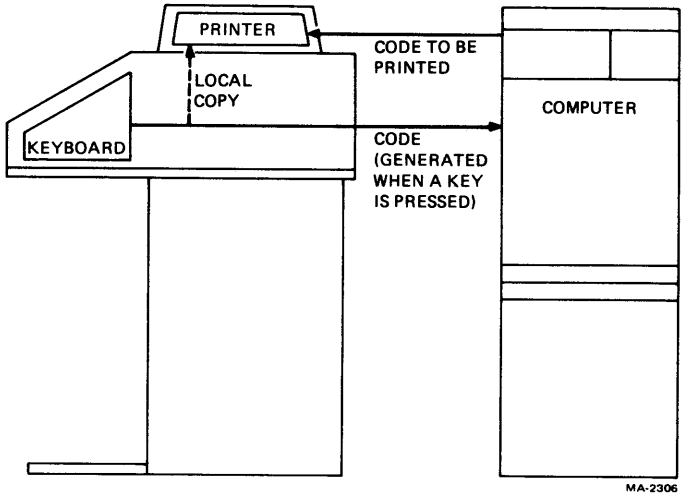


Figure 1-2 Basic System Using LA120

1.2.2 Local Control Keys

The console local control keys and their functions are listed in Table 1-3.

Table 1-3 LA120 Console Local Control Keys

Key	Function
LINE/LOCAL	Switches the LA120 from line to local and vice versa as indicated by ON LINE and LOCAL lights.
HERE IS	Transmits answerback message. This key is not active in SET-UP mode.
LOCAL FORM FEED	Performs a form feed without transmitting a code to the host computer.
LOCAL LINE FEED	Advances paper one line at a time without transmitting a code to host computer.

1.2.3 SET-UP Keys

When in SET-UP mode, most keys on the console keyboard perform a SET-UP command function. SET-UP command functions for the top row of keys are discussed briefly in Table 1-4.

Table 1-4 LA120 Console Set-Up Keys

Key	Label	Function
SET-UP	–	Places LA120 in SET-UP mode where LA120 features can be examined or changed. In SET-UP mode, the numeric display indicates line number, baud rate, or form length, etc.
! 1	SET TAB	Sets a horizontal tab stop at the current column. When used with SHIFT, sets a vertical tab stop at current line.
^ 6	BOT/RT MAR	Sets right margin at current column. When used with SHIFT, sets bottom margin at current line.
@ 2	CLEAR TAB	Clears horizontal tab stop at current column. When used with SHIFT, clears vertical tab stop at current line.
#£ 3	CLEAR ALL	Clears all horizontal and vertical tab stops.
$ 4	TOF	Shifted or unshifted designates current paper position as top of form. If top of form is not the same as the top margin, paper will move to the top margin (first printable line).
& 7	MAR CLEAR	Clears left and right margins. When used with SHIFT, clears top and bottom margins. Left or top margin becomes]. Right or bottom margin becomes maximum allowable in the current characters per inch (pitch) or form length.

Table 1-4 LA120 Console Set-Up Keys (Cont)

Key	Label	Function
* 8	STATUS	Prints a status message containing currently selected values of SET-UP features.
(9	STORE/RECALL	Recalls stored SET-UP parameters. When used with SHIFT, stores the current SET-UP parameters.
% 5	TOP/LEFT MAR	Sets left margin at current column. When used with SHIFT, sets top margin at current line.
) 0	BAUD	Selects receive and transmit baud rates. When used with SHIFT, selects split transmit baud rates.

1.2.4 Control Character Keys

The console control character keys and their functions are listed in Table 1-5.

Table 1-5 LA120 Console Control Character Keys

Key	Function
ESC	Generates code for escape (Chapter 3).
TAB	Generates code for horizontal tab.
SPACE BAR	Generates code for space.
BACK SPACE	Generates code for backspace.
DELETE	Generates code for delete.
RETURN	Generates code for carriage return or the codes for a carriage return and line feed sequence (in auto line feed mode). In half duplex, the RETURN key can also generate a turnaround character in addition to its normal code or codes. The turnaround character tells the computer that it is the computer's turn to send data.
LINE FEED	Generates code for line feed.
CTRL	When held down, modifies function or codes generated by other keys.
BELL G	Hold CTRL down and press G to generate code for the bell. G is also used in SET-UP mode to change bell volume.
VT K	Hold CTRL down and press K to generate code for vertical tab. K is also used in SET-UP mode to turn keyclick on or off.
FF L	Hold CTRL down and press L to generate code for form feed. L is also used in SET-UP mode to select auto line feed.

1.2.5 Other Keys

Other miscellaneous console keys and their functions are listed in Table 1-6.

Table 1-6 LA120 Console Miscellaneous Keys

Key	Function
SHIFT	Functions the same as the shift key on a typewriter. When in SET-UP mode, SHIFT can also be used with other keys to select LA120 features.
CAPS LOCK	Causes alphabetic keys to transmit shift (uppercase characters) codes, regardless of the position of the SHIFT key. CAPS LOCK does not affect numeric or other keys.
BREAK	Causes LA120 to transmit a short break signal (233 ms). When used with SHIFT, causes LA120 to transmit a long break disconnect signal (3.5 seconds).
VIEW	Allows operator to view last character printed.

1.2.6 Optional Numeric Keypad

The numeric keypad allows numbers to be entered in adding machine fashion. Each number key, minus key, and comma key, normally generate the same codes as the corresponding unshifted keys on the main keyboard. The SHIFT key does not affect the numeric keypad.

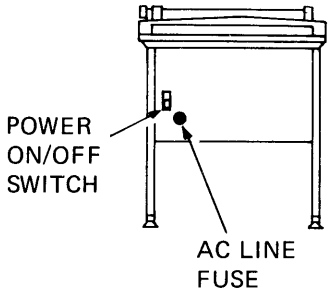
In the alternate keypad mode, the keys generate escape sequences that may have special meanings (Chapter 3). The PF1, PF2, PF3, and PF4 keys generate escape sequences that may have special meanings (Chapter 3). The ENTER key normally corresponds to the RETURN key. In alternate keypad mode, ENTER generates an escape sequence that may have a special meaning (Chapter 3).

1.2.7 Power ON/OFF Switch and Voltage Selector Switch

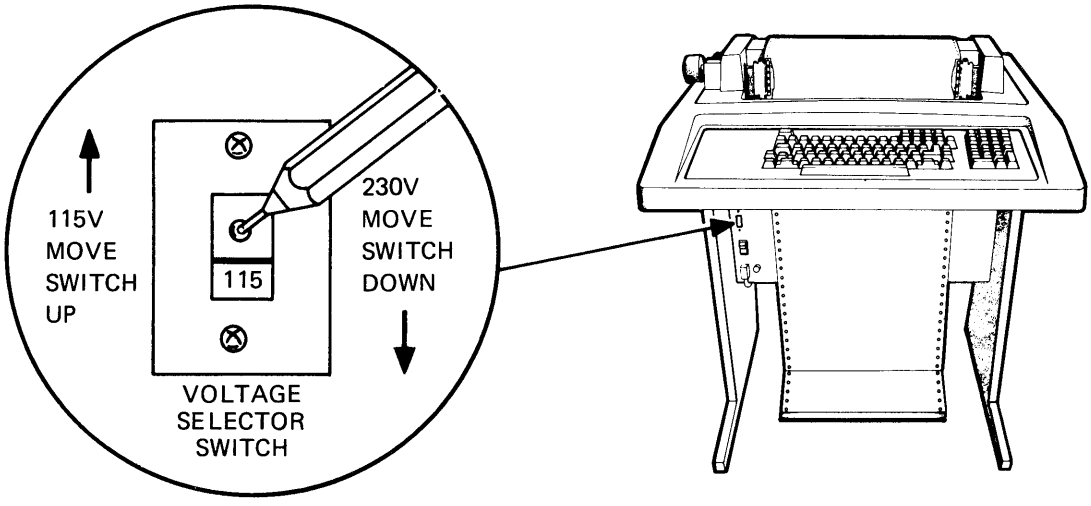
The power switch controls power application to the LA120. The switch is located on the LA120 lower front panel (Figure 1-3a). Terminals currently being manufactured also contain a voltage selector switch. The voltage selector switch is located above the power ON/OFF switch. Place the tip of a pen into the selector switch indentation and select the appropriate voltage, as shown in Figure 1-3b.

CAUTION

Failure to set the switch to 230 V when plugging the LA120 into a 180–256 V power source will damage the power supply.



a. Power ON/OFF Switch



b. Voltage Selector Switch
(Newer Terminals Only)

MA-4506

Figure 1-3 Location of Power ON/OFF Switch and Voltage Selector Switch

1.2.8 Cover Interlock Switch

This switch is a safety feature that prevents operation of the LA120 when the cover is open. The location of the switch is shown in Figure 1-4.

1.2.9 Paper Adjust Knob (Figure 1-5)

The paper adjust knob advances the paper 1/12 of an inch at a time. Pressing in and turning the paper adjust knob enables the paper to be rolled freely in either direction and allows precise vertical forms positioning.

NOTE

This knob should only be used when setting up the form. To advance paper, use LOCAL LINE FEED or LOCAL FORM FEED.

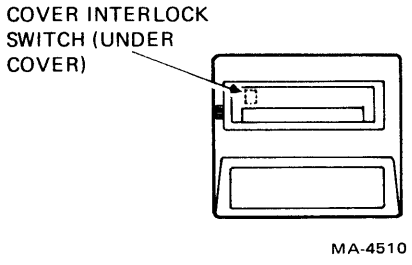


Figure 1-4 Location of Cover Interlock Switch

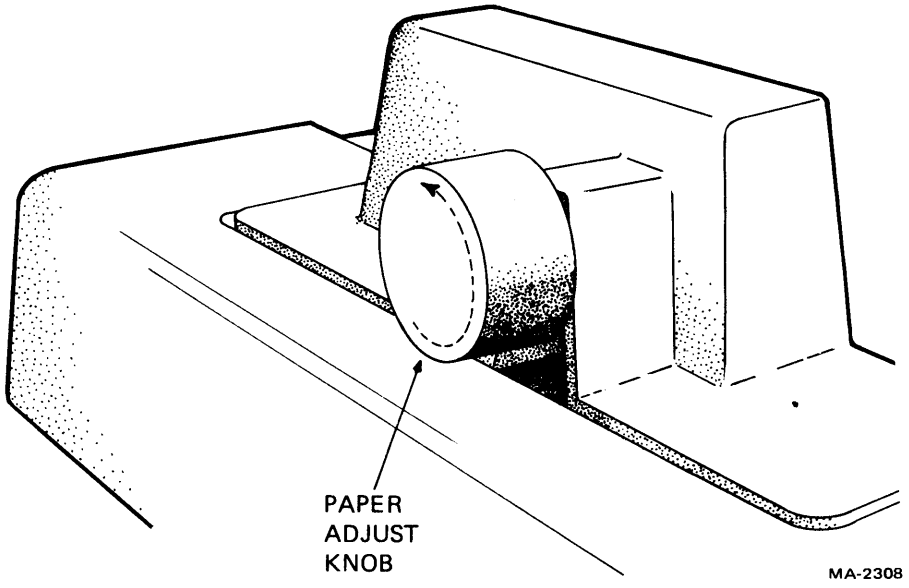


Figure 1-5 Paper Adjust Knob

1.2.10 Tractor Adjust Knobs (Figure 1-6)
The tractor adjust knobs allow fine horizontal adjustment of forms.

1.2.11 Carriage Adjustment Lever (Figure 1-7)
The carriage adjustment lever controls the print head gap for single or multipart forms.

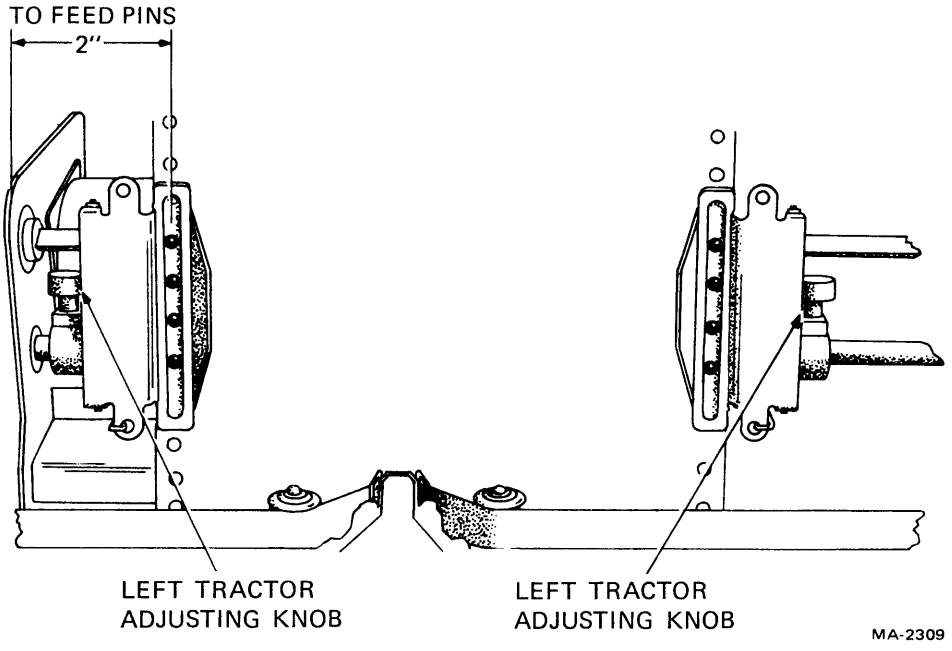


Figure 1-6 Tractor Adjust Knobs

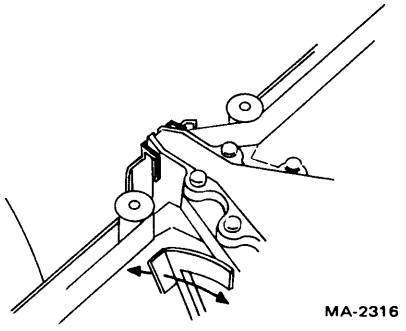


Figure 1-7 Carriage Adjustment Lever

1.3 ALARM INDICATORS

The LA120 produces several different alarm and bell signals. The operator should become familiar with these signals to determine the correct response. Table 1-7 lists the various types of alarms, the causes, and the corrective action that should be taken.

Table 1-7 Alarm Indicators

Indicator	Cause	Action/Comments
Bell and Flashing PAPER OUT	Paper out	Load paper. Printer will resume normal operation after paper is loaded and cover is closed. **NOTE** **When out of paper, bell will turn off after 5 seconds. If PAPER OUT light continues to falsh after cover is closed, paper fault still exists.**
	Head Jam	Open top cover and clear obstruction causing head jam (see Operator Troubleshooting, Table 1-9). Reload paper by aligning perforation with print head line indicator. Close cover.
	Cover open	(Flashing light only.) Close cover.
Bell only (Low Pitch Bell Tones)	Keyboard buffer overflow	Typing faster than the communication line can handle will cause a buffer overflow. This condition is indicated by a bell tone each time a key is pressed. Under these conditions, data will *not* be lost.
	Input buffer overflow	Inputs to LA120 faster than 1200 baud (without XON/XOFF or its equivalent) can cause a buffer overflow. This condition is indicated by a bell tone, a special symbol printout, and loss of data.
Bell only (High Pitch Bell Tones)	Approaching right margin	One bell tone occurs when print head moves to within 10 characters of right margin.
	Bell character	Each bell character code received causes a bell tone.
	Invalid SET-UP command	One bell tone occurs for each invalid SET-UP command.
	Incorrect entry of answerback message	Attempting to enter more than a 30 character answerback message will cause a bell tone.

1.4 OPERATOR TESTING AND TROUBLESHOOTING

The LA120 automatically runs several internal tests and displays the error test results in the numeric display. Table 1-8 lists the error test results, the cause, and the required corrective action.

Table 1-8 LA120 Internal Tests

Test Result	Cause	Corrective Action
0 (flashing)	Error at ROM address 0	Call for service
1 (flashing)	Error at ROM address 2048	Call for service
2 (flashing)	Error at ROM address 4096	Call for service
3 (flashing)	Error at ROM address 6144	Call for service
4 (flashing)	Error at ROM address 8192	Call for service
5 (flashing)	Error at ROM address 10240	Call for service
6 (flashing)	Reserved for future options	-
7 (flashing)	RAM diagnostic failure	Call for service
8 (flashing)	Microprocessor failure	See Note 1
9 (flashing)	Nonvolatile memory failure	See Note 2
8888 (constant)	Cover open	Close cover
	Out of paper	Reload paper

NOTES

1. **Turn LA120 off, then back on. If an error indication reappears, record indiction and call for service.**

2. **If the original problem was a flashing 9, check stored SET-UP feature to ensure that it has not been affected. The self-test is an additional test (Paragraph 2.1.3) that can be initiated by the operator. The test will help determine if the problem is in the printer or in some other portion of the communication system.**

3. **If you are unable to turn the printer on or if the printer appears to be faulty, refer to the operator's troubleshooting table (Table 1-9). This table describes those things an operator can check prior to requesting service.**

Table 1-9 Operator Troubleshooting

Symptom	Possible Cause and Corrective Action
LA120 does not turn on when printer power switch is set to ON.	AC power cord is not plugged into wall outlet or front of printer. Plug in cord. Power is not coming from wall outlet. Check outlet with a known working electrical device (such as a lamp). If no power, call maintenance personnel. AC line fuse blown; turn printer off and replace fuse (Figure 1-3).

Table 1-9 Operator Troubleshooting (Cont)

Symptom	Possible Cause and Corrective Action
Characters do not print	Printer out of paper; load paper. (See *LA120 User Guide* for paper loading.) Printer cover open or ajar. Close cover. Print head too far from paper; readjust carriage adjustment lever. (See Paragraph 1.2.11 for adjustment.) Data set unplugged; plug it in. Incorrect communication setup.
Light print	Print head too far from paper; readjust carriage adjustment lever. Ribbon out of ink; turn ribbon over or replace ribbon. (See *LA120 User Guide* for ribbon replacement.) **NOTE** **Turn ribbon over after 5 to 6 hours of continuous printing. Ribbon can be turned over only once; then it must be replaced.**
Paper does not advance	Paper not loaded properly; check that tractor covers are closed and feed holes are aligned properly. Feed holes torn; reload paper. If paper falls against tractor pins or bows in the middle, readjust right tractor.
Paper tearing on multipart forms	Print head exerting too much pressure on paper; readjust carriage adjustment lever. Tractor incorrectly adjusted. If paper pulls against tractor pins or bows in the middle, readjust right tractor. Paper not straight in printer; realign paper.
Print head jam or print head does not move	Paper or print head jam; clear jam and perform reloading paper/form procedure. (See *LA120 User Guide*.)
No keyboard or printer	Printer cover open or ajar when printer is turned on (normally indicated by flashing 8888 and PAPER OUT light); close the cover.
Garbled or double characters.	Incorrect communication setup. Ensure that communication setup is compatible with the equipment at the other end of the line.

CHAPTER 2
INSTALLATION, INTERFACE, AND SPECIFICATIONS

2.1 INSTALLATION AND CONFIGURATION

This section contains step-by-step procedures for unpacking, cabling, and unit checkout to ensure that the unit was not damaged during shipment and that the unit is operating properly prior to connection to the communication system.

The LA120 should be installed in an area that is free of excessive dust, dirt, corrosive fumes, and vapors. To ensure that the unit has proper ventilation and cooling, ventilation openings on the side of the cabinet should not be obstructed.

A minimum 4-inch clearance between units must be maintained at all times. Figure 2-1 illustrates site considerations.

NOTE

Site plans are not supplied by Digital Equipment Corporation.

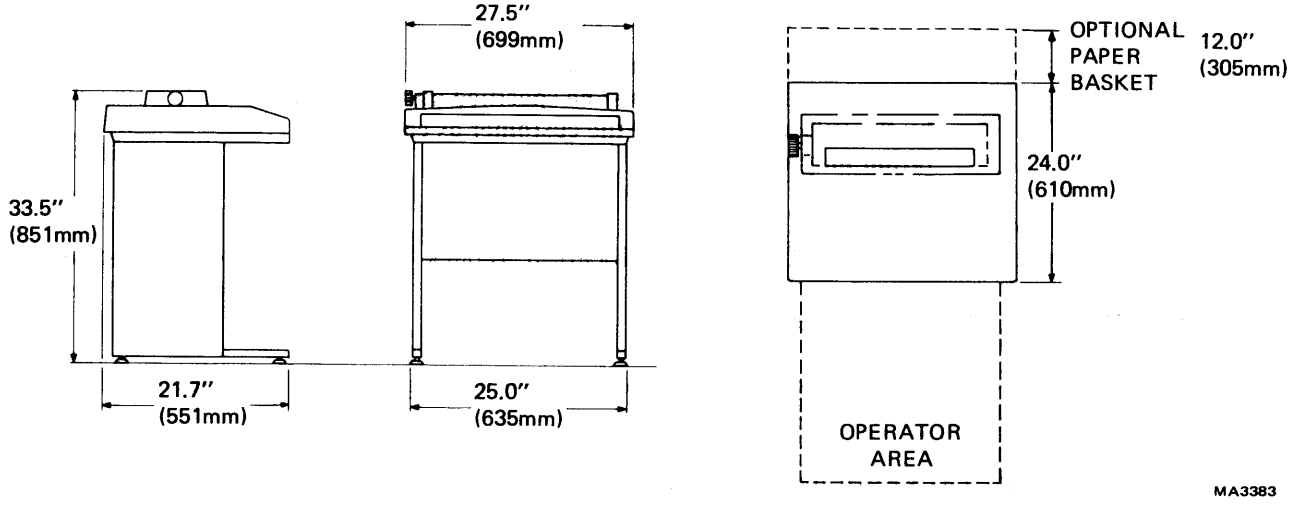


Figure 2-1 LA120 Site Considerations

2.1.1 Unpacking and Inspection

1. Cut nylon retaining straps from around the shipping carton and discard them.
2. Remove outer cardboard shipping container.
3. Remove all shock-absorbing material and packing from around the LA120 (Figure 2-2).
4. Loosen and remove hex-head bolts that secure wood leg brace to skid assembly. Remove microfoam around each leg of the LA120.
5. Carefully inspect LA120 cabinet and carriage assembly for possible shipping damage. Inspect and check enclosed packing list for lost or missing items. Report any damaged or missing items to the local DIGITAL Field Service or Sales Office and local carrier.
6. Remove printer from wooden shipping skid and place it in desired location.
7. Install and adjust leveling feet on LA120 legs.
8. Lift LA120 top cover assembly. Clip and remove nylon cable tie securing print head assembly (Figure 2-3).
9. If necessary, wipe all outer surfaces with a clean, soft, lint-free cloth.
10. Connect EIA interface cable to user's equipment.
11. The LA120 SET-UP label is enclosed in the package with the user guide. Fasten label to area shown in Figure 2-4.

NOTE

To install 20 mA option, refer to Chapter 8. Interface logic connections must be specified and provided by the system supplier or the customer as each installation may differ.

2.1.2 Packing Procedures

If it is necessary to ship your LA120 to another location, repack it per the following procedure.

1. Remove ribbon and paper.
2. Use a nylon cable tie to secure print head assembly (Figure 2-3). This prevents movement during transit.
3. Pack LA120 as shown in Figure 2-2.

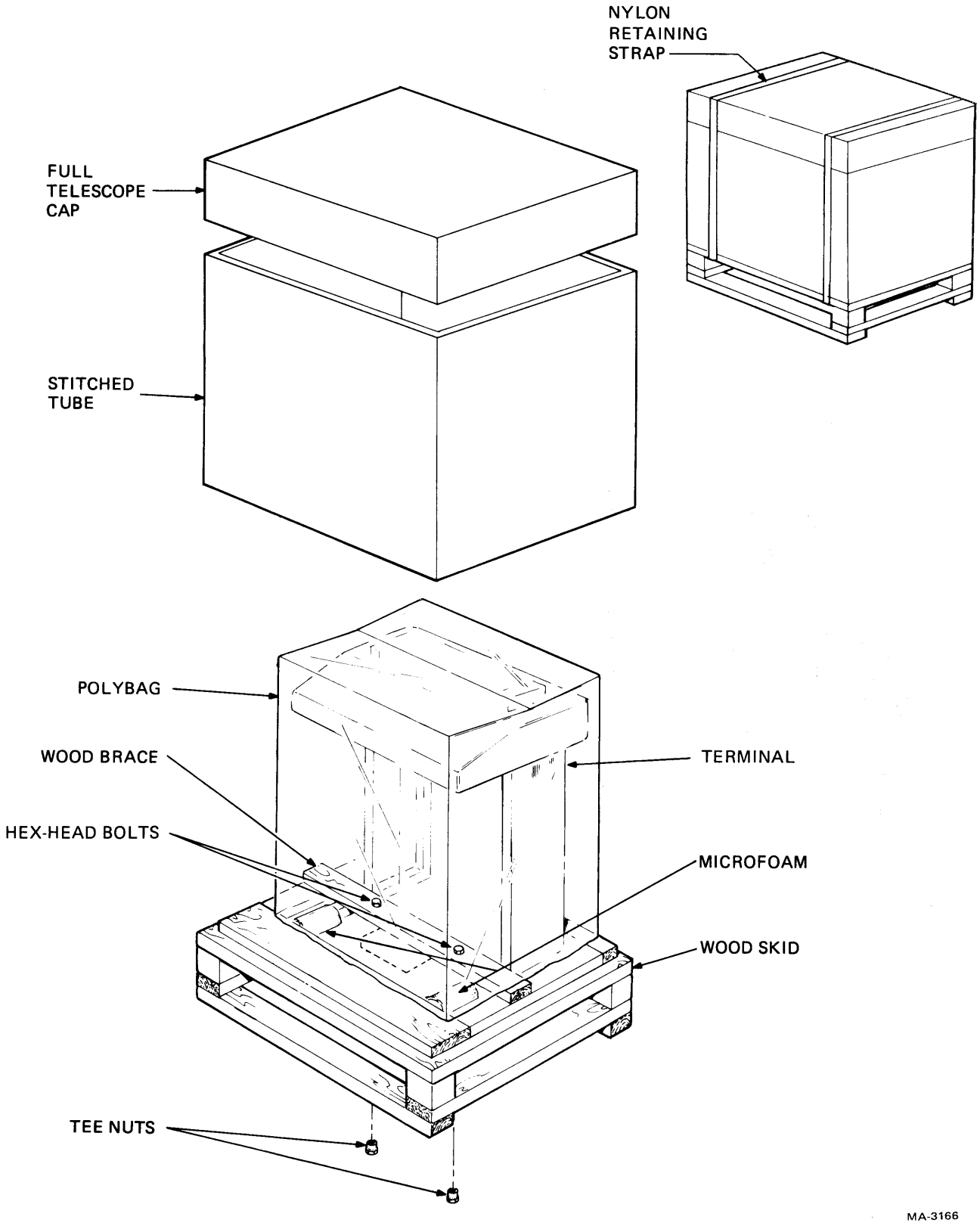


Figure 2-2 Unpacking/Packing

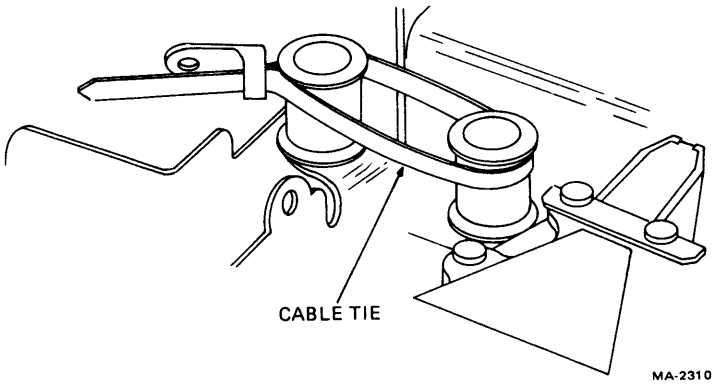


Figure 2-3 Location of Nylon Cable Tie

REC	Receive baud rate		
XMT	Transmit baud rate		
A	Auto-answerback	0=Off	1=On
B	Buffer control	0=Small	1=Large
C	Printer char. set	1=US	2=GB
D	Auto-disconnect	0=Off	1=On
E	Local echo	0=Off	1=On
F	Form length	Lines per form	
G	Bell volume	0=low	1=High
H	Horizontal pitch	Char. per Inch	
J	Auto-newline	0=Off	1=On
K	Key click	0=Off	1=On
L	Auto-linefeed	0=Off	1=On
M	Modem/protocol		
N	Keyboard char. set	1=US	2=GB
O	Alt. char. set	0=Off	1=On
P	Parity/data bits		
Q	HDX initial state	0=XMT	1=REC
R	Auto-repeat	0=Off	1=On
S	Secondary channel	0=No	1=Yes
U	Break enable	0=No	1=Yes
V	Vertical pitch	Lines per Inch	
W	Printer NL char.	1=None	2=LF 3=CR
X	XON/XOFF	0=No	1=Yes
Y	Alt keypad mode	0=No	1=Yes
Z	Auto-view	0=Off	1=On
I	Initialize to factory settings		
T	Self test: Type a character to stop		

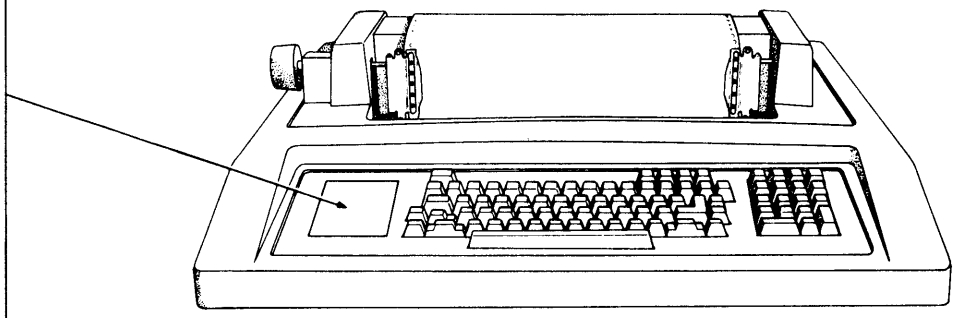


Figure 2-4 Location of LA120
SET-UP Label

2.1.3 Checkout Procedure

The checkout procedure consists of running the self-test exercise. Two self-tests are provided. One prints out characters within the currently selected margins; the other causes the LA120 to go through the same motions as the printing test, but without printing. Use the nonprinting self-test if your printer is loaded with valuable forms such as checks or tickets.

To perform the checkout, proceed as follows.

1. Install ribbon and paper. (Refer to *LA120 User Guide* for ribbon and paper installation procedure.)

2. The LA120 terminal may have a voltage selector switch located above the power ON/OFF switch. If so, place the tip of a pen into the selector switch indentation and select the appropriate voltage (Figure 1-3b).

> **CAUTION**
> **Failure to set the switch to 230 V when plugging the LA120 into a 180–256 V power source will damage the power supply.**

3. Connect LA120 line cord to correct wall receptacle.

> **CAUTION**
> **Before connecting LA120 to a power source, ensure that power switch is OFF and line voltage and frequency are compatible with machine power requirements.**

4. Set power switch to ON. Print head automatically positions itself to the left margin.

5. Enter SET-UP mode. SET-UP light flashes to indicate you are in SET-UP mode.

6. Press T to initiate a printing self-test. LA120 prints out self-test pattern (Figure 2-5).

> **NOTE**
> **To run a nonprinting self-test, do not press T. Instead, press and hold SHIFT and press ?. The LA120 will perform a nonprinting self-test.**

7. To stop test, exit SET-UP mode or press any character. Self-test terminates.

8. Exit SET-UP mode. SET-UP light stops flashing.

MA-4695

Figure 2-5 Self-Test Printout

2.1.4 Answerback Jumper

To obtain a permanent answerback message that cannot be changed by the operator, remove the jumper shown in Figure 2-6.

NOTE

The answerback message must be stored in permanent memory prior to removing the jumper. When the jumper is removed, the answerback message cannot be altered or erased.

To remove the jumper, proceed as follows.

1. Store answerback message, if required.
2. Verify answerback message.
3. Turn power off.
4. Remove jumper.
5. Turn power on.

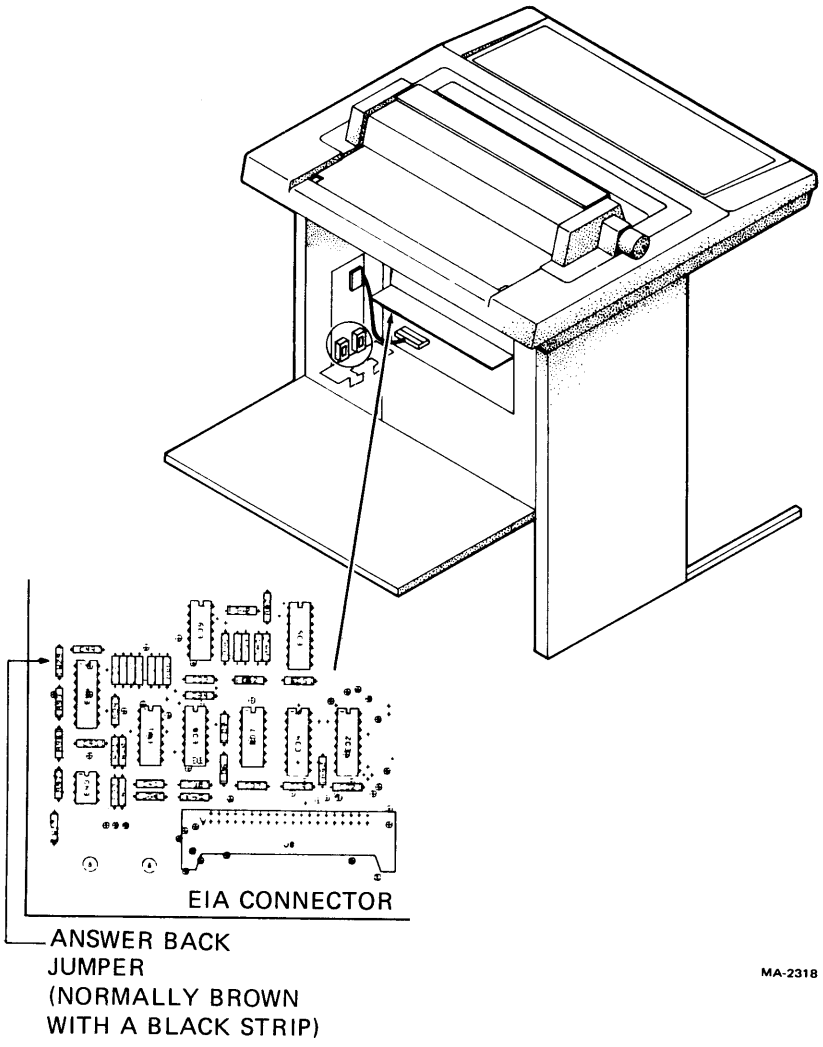


Figure 2-6 Location of Answerback Jumper

2.2 INTERFACE INFORMATION

The LA120 interfaces with EIA devices using an optional modem cable. The interface is compatible with Bell 103, 212A, and 202 modems and meets EIA specification RS232-C requirements. The interface conforms to CCITT recommendation V.2.4.

2.2.1 Interface Signals

Table 2-1 summarizes EIA interface signals. The following paragraphs describe interface signals.

2.2.1.1 Protective Ground – This conductor is connected to the LA120 chassis. It is further connected to external grounds through the third wire of the power cord.

2.2.1.2 Transmitted Data (TDX) – The direction of TDX is from the LA120. Signals on this circuit represent serially encoded characters generated by the LA120.

2.2.1.3 Received Data (RDX) – The direction of RDX is to the LA120. Signals on this circuit represent serially encoded characters generated by the user's equipment.

Table 2-1 Summary of LA120 EIA Interface Signals

Pin	Source	Name	Function	Circuit CCITT/EIA
1	–	–	Protective ground	101/AA
2	LA120	TXD	Transmitted data	103/BA
3	User	RXD	Received data	104/BB
4	LA120	RTS	Request to send	105/CA
5	User	CTS	Clear to send	106/CB
6	User	DSR	Data set ready	107/CC
7	–	–	Signal ground	102/AB
8	User	RLSD	Carrier detect	109/CF
9	–	–	–	–
10	–	–	–	–
11*	LA120	SRTS	Sec. req. to send	120/SCA
12†	User	SPDI	Speed indicator (FDX)	112/CI
	User	SRLSD	Sec. carrier det. (HDX)	122/SCF
13	–	–	–	–
14	–	–	–	–
15	–	–	–	–
16	–	–	–	–
17	–	–	–	–
18	–	–	–	–
19*	LA120	SRTS	Sec. req. to send	120/SCA
20	LA120	DTR	Data term. ready	108.2/CD
21	–	–	–	–
22	User	RI	Ring indicator	125/CE
23*	LA120	SPDS	Speed select (FDX)	111/CH
24	–	–	–	–
25	–	–	–	–

* Pins 11, 19, and 23 are driven by a common circuit whose function is determined by the modem and secondary channel SET-UP commands.

† Pin 12 is SPDI for full-duplex operation. For half-duplex operation, pin 12 is SRLSD.

2.2.1.4 Request To Send (RTS) – The direction of RTS is from the LA120. The on condition of RTS means that the LA120 intends to transmit data. After turning this circuit on, the LA120 waits for a clear to send (transmit enable) condition before starting transmission.

2.2.1.5 Clear To Send (CTS) – The direction of CTS is to the LA120. Although the LA120 physically receives this signal, it is not used for any purpose. Depending on the modem control protocol in use, either RLSD, SRLSD, or a timeout after asserting RTS is used to provide a clear to send (transmit enable) condition.

2.2.1.6 Data Set Ready (DSR) – The direction of DSR is to the LA120. The on condition of DSR indicates that the user's equipment is capable of transmitting and receiving data signals. The off condition of DSR causes the LA120 to ignore all other interface inputs except ring indicator (RI). In full duplex without EIA control, this circuit is assumed to always be in the on condition.

2.2.1.7 Signal Ground – This circuit establishes the common ground reference potential for all interface circuits except protective ground. The circuit is permanently connected to the protective ground circuit.

2.2.1.8 Carrier Detect (RLSD) – The direction of RLSD is to the LA120. The on condition of RLSD indicates that data transmission from the user's equipment to the LA120 is enabled. In full duplex without EIA control, this circuit is assumed to always be in the on condition.

2.2.1.9 Secondary Request To Send (SRTS) – The direction of SRTS is from the LA120. In certain half-duplex modes, the on condition of SRTS indicates that the LA120 is capable of successfully processing the received data from the user's equipment. In restraint mode, the off condition of SRTS indicates that the user's equipment should temporarily suspend the transmission of data. When SRTS goes on, transmission may be resumed.

2.2.1.10 Speed Indicator (SPDI) (Full Duplex Only) – The direction of SPDI is to the LA120. The on condition of SPDI indicates that the baud rate is 1200, regardless of the rate selected by the operator. The off condition indicates that the operator-selected baud rate is being used.

2.2.1.11 Secondary Carrier Detect (SRLSD) (Half Duplex Only) – The direction of SRLSD is to the LA120. The on condition of SRLSD indicates that the user's equipment is capable of successfully processing the transmitted data from the LA120.

2.2.1.12 Data Terminal Ready (DTR) – The direction of DTR is from the LA120. The on condition of DTR indicates that the LA120 is capable of transmitting and receiving data signals. The off condition of DTR may cause the user's equipment to set the DSR (data set ready) to the off condition. When DTR is off, the LA120 ignores all interface inputs except ring indicator (RI).

2.2.1.13 Ring Indicator (RI) – The direction of RI is to the LA120. If data terminal ready (DTR) is off, then the on condition of RI causes DTR to turn on. DTR remains on until data set ready (DSR) turns on or 30 seconds elapses, whichever occurs first. Then DTR turns off. If DTR is on, the on condition of RI causes a 30-second timeout. If no data is received in 30 seconds, DTR is pulsed low for 233 ms ± 10 percent.

2.2.1.14 Speed Select (SPDS) (Full Duplex Only) – The direction of SPDS is from the LA120. If the operator-selected baud rate is 600 or higher, the LA120 asserts an on condition of SPDS; otherwise, the LA120 holds this circuit in the off condition.

2.2.2 EIA Interface Cables

BC22A and BC22B interface cables are described in the following paragraphs.

2.2.2.1 BC22A-10, -25 – BC22A interface cables come in 10 and 25 foot lengths for hookup between LA120 and computer.* Each end is terminated with a female molded connector. The cable is shielded, contains six conductors, and is wired in a null modem configuration.

2.2.2.2 BC22B-10, -25 – BC22B interface cables come in 10 and 25 foot lengths for hookup between LA120 and modem.† They can also be used for cable extension. Connectors are molded with a male connector at one end and a female at the other end. Cable is shielded and has 14 conductors.

2.2.3 Impedance of Terminator

The terminating impedance of the receiving end of the interface circuits has a dc resistance of not less than 3000 ohms or more than 7000 ohms. When the interface plug is disconnected, interface voltage on the terminator circuits is –2 V to +2 V.

2.2.4 Rise and Fall Times

The circuitry that receives signals from an interface circuit depends only on signal voltage and conforms to RS232-C rise time and fall time. For control interface circuits, the time required for the signal to pass through the transition region (–3 V to +3 V) during a change in state does not exceed 1 μs. For the transmitted data circuit, the rise time and fall time do not exceed 16.7 μs through the 6 V range (–3 V to +3 V).

2.2.5 Open Circuit Voltages

The open circuit driver voltage for signal ground on any interface circuit does not exceed –12 V to +12 V. The terminator on an interface circuit is designed to withstand any input signal within a –25 V to +25 V range. When the terminating impedance is in the proper range (3000 to 7000 ohms) and the terminator open circuit voltage is zero, the potential at the point of interface is not less than –5 V to +5 V or more than –12 V to +12 V. An open circuit or applied voltage more negative than +0.6 V will be interpreted the same as a legitimate negative voltage (–3 V to –25 V).

2.3 LA120 SPECIFICATIONS

The LA120 specifications include data on the printer, keyboard, communications, physical aspects, and paper. The data in each of these categories is given in Tables 2-2 through 2-6.

Table 2-2 Printer Specifications

Item	Specification
Printing technique	Impact dot matrix, smart bidirectional
Print matrix (width by height)	7 × 7
Maximum print speed	180 char/s
Horizontal slew speed	60 in/s
Single line feed time	33 ms
Vertical slew speed	7.5 in/s

*For longer lengths, use BC03M instead of BC22A. Specify desired length.

†For longer lengths or full 25 connectors, use BC05D instead of BC22B. Specify desired length.

Table 2-2 Printer Specifications (Cont)

Item	Specification
Paper feed	Pin-feed, tractor drive
Paper type	Fanfold, up to six parts (Table 2-6)
Forms length	1 to 168 lines
Vertical pitch (lines per inch)	2, 3, 4, 6, 8, 12
Horizontal pitch (characters per inch)	
180 char/s	10, 12, 13.2, 16.5
90 char/s	5, 6, 6.6, 8.25
Maximum line length (varies with horizontal pitch)	
5 char/in	66 columns
6 char/in	79 columns
6.6 char/in	87 columns
8 char/in	108 columns
10 char/in	132 columns
12 char/in	158 columns
13.2 char/in	174 columns
16.5 char/in	217 columns
Margins	Left, right, top, bottom
Tabs	217 horizontal, 168 vertical, from keyboard or line
Forms storage	True non-volatile memory (no batteries)
Positioning commands	Horizontal and vertical, absolute and relative
Character set	ASCII upper/lowercase set
National character sets	
Standard	United States Great Britain
Optional	Finland Sweden Norway Denmark Germany France
APL character set	Optional

Table 2-2 Printer Specifications (Cont)

Item	Specification
Other printer features	• Paper out and cover open interlocks • Manual and automatic last character view • Selectable auto new line • Self-test • Status message • Four-digit numeric display used as column counter and to set parameters • Factory stored form setup (10 char/in, 6 lines/in, 66 lines/form; tab stops every eight columns, etc.)

Table 2-3 Keyboard Specifications

Item	Specification
Keyboard	Typewriter style with multikey rollover
Selectable auto line feed	Standard
Optional numeric keypad	18 keys including 4 function keys
Feature selection	Keyboard entry to non-volatile memory
Other keyboard features	• Local form feed key • Local line feed key • Auto repeat on all alphanumeric keys • Selectable keyclick

Table 2-4 Communications Specifications

Item	Specification
Data transfer	Serial, asynchronous
Baud rates (bits/s)	50, 75, 110, 134, 134.5, 150, 300, 600, 1200, 1800, 2400, 4800, 7200, 9600
Split speeds (bits/s)	• 600 or 1200 receive, with 75 or 150 transmit • 2400 or 4800 receive, with 300 or 600 transmit
Parity	Odd, even, or none (8th bit mark or space transmitted, or data bits only)
Input buffer	1024 characters standard 4096 characters optional
Interface	Full EIA standard (includes auto answer/disconnect) 20 mA optional
Character codes	7-bit ASCII plus ANSI-compatible escape sequences
Modem control protocols	
Full Duplex	Selectable XON/XOFF or restraint signal data synchronization
Half Duplex	Coded control with or without reverse channel
Half Duplex	• Reverse channel • Supervisory • Line control
Answerback	Up to 30 characters

Table 2-5 Physical Specifications

Item	Specification
Dimensions	
Width	69.9 cm (27.5 in)
Height	85.1 cm (33.5 in)
Depth	61.0 cm (24.0 in)
Weight	
Uncrated	46.4 kg (102 lb)
Crated	63.7 kg (140 lb)
Power	
Voltage	87 to 128 V/180 to 256 V*
Frequency	60/50* Hz ± 1 Hz
Input current	4.2 A max at 115 V
Heat dissipation	
Printing	440 W maximum
Temperature	
Operating	10° to 40° C (50° to 104° F)
Non-operating	–40° to 66° C (–40° to 151° F)
Relative Humidity	
Operating	10 to 90 percent wtih a maximum wet bulb temperature of 28° C (82° F) and a minimum dewpoint of 2° C (36° F), noncondensing
Non-operating	5 to 95 percent, noncondensing

* With voltage selector switch. See Paragraph 2.1.3, Step 2.

Table 2-6 Paper Specifications

Item	Specification
General	Continuous, fanfold, pin-feed forms
Width	7.6 to 37.8 cm (3 to 14-7/8 in)
Hole spacing	12.7 mm ± 0.25 mm (0.500 in ± 0.010 in) nonaccumulative over 5 cm (2 in)
Hole diameter	3.81 to 4.06 mm (0.150 to 0.160 in)
Forms thickness	
Single part	15 lb paper minimum 0.25 mm (0.010 in) card stock max
Multipart	Up to 6 parts (see Notes) 0.50 mm (0.020 in) max

NOTES

1. Multipart forms may have only one card part. The card part must be the last part.

2. Multipart carbonless forms up to six parts may be used. Ribbon must be used on top copy. First-surface impact paper is not recommended.

3. Multipart forms with 3- or 4-prong margin crimps on both margins are recommended. Stapled forms are not recommended and may damage tractors and other areas of machine. Dot or line glue margins are acceptable if line is on one margin only. Line glue on both margins prevents air from escaping and results in poor impressions.

4. Split forms with each side containing a different thickness or number of sheets are not recommended.