LP11/LS11/LA11
line printer
user's manual

CONTENTS

ILLUSTRATIONS

TABLES

1.1 SCOPE

The LP11/LS11/LA11 Line Printer systems are high-speed printer systems designed to interface with the PDP-11 family of processors to provide impact line printing at speeds up to 1250 lines per minute (speed is dependent on line length).

The LP11 system consists of two major components: a Data Products Corporation line printer (Model 2230, 2310, 2410, or 2470); and an M7930 or M7258 interface unit, referred to as the LP11 controller. The Data Products line printers (Models 2230, 2310, 2410, and 2470) are designated by DEC as LP05, LP01, LP02, and LP04, respectively. These DEC designations are used throughout this guide. Figures 1-1 through 1-4 respectively show the LP01, LP02, LP04, and LP05 line printers.

The LS11 system consists of two components: a Centronics line printer (Model 101, 101A*, 101D, 102A, or 303); and an M7258 interface unit, referred to as the LS11 controller.

The LA11 system also consists of two components: a DEC line printer LA180 (Model LA11-PA, LA11-PB, LA11-PC, or LA11-PD) and an M7258 interface unit, referred to as the LA11 controller.

This manual and the applicable line printer manual must be used together for a complete understanding of the LP11/LS11/LA11 system. The prime subject of this manual is the LP11/LS11/LA11 controller. In addition to providing complete coverage of the controller, this manual includes sections covering system installation, system operating procedures, and programming. The prime subject of the line printer manual is the line printer itself; the manual presents a detailed discussion of the print mechanism including installation, operation, and principles of operation.

Table 1-1 lists other PDP-11 documents that are applicable to the LP11, LS11 and LA11 systems.

*Product Line standard.
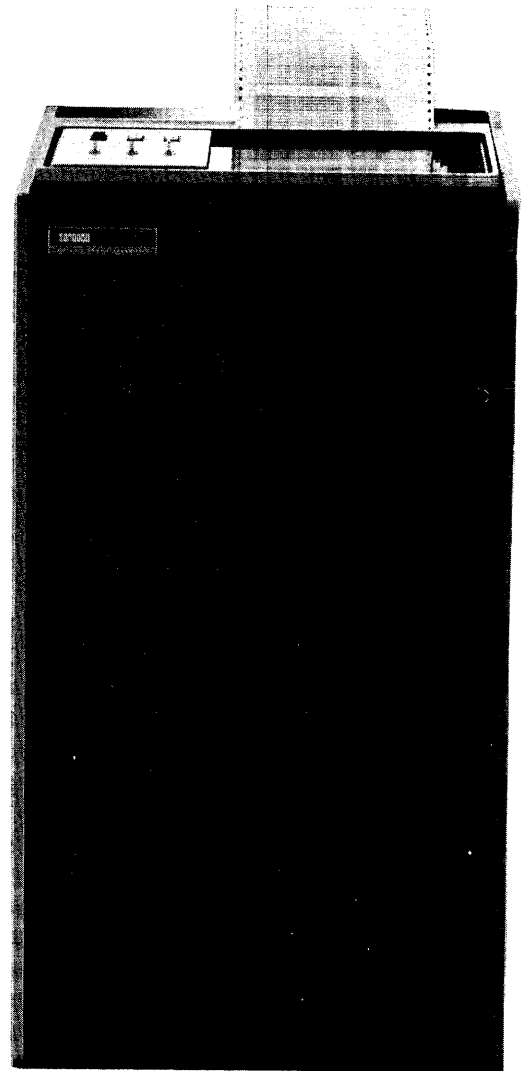
M-0214

Figure 1-1 LP01 Line Printer
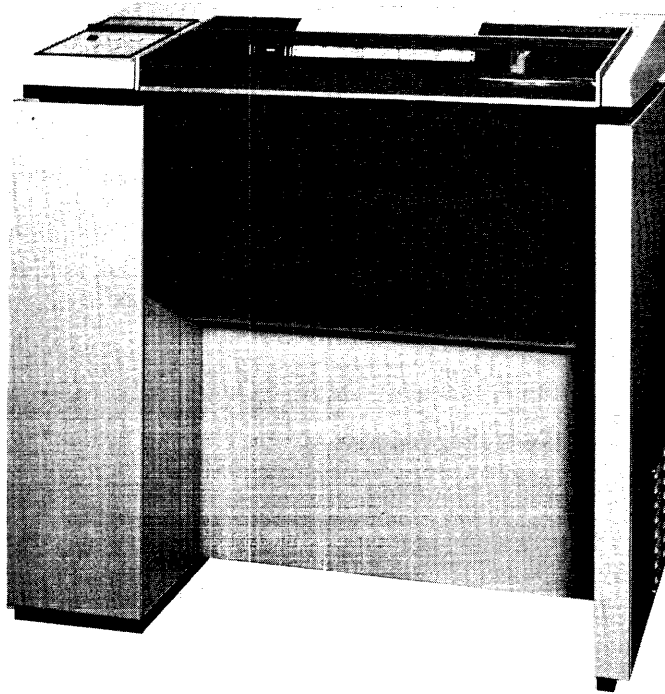
5550-1

Figure 1-2   LP02 Line Printer
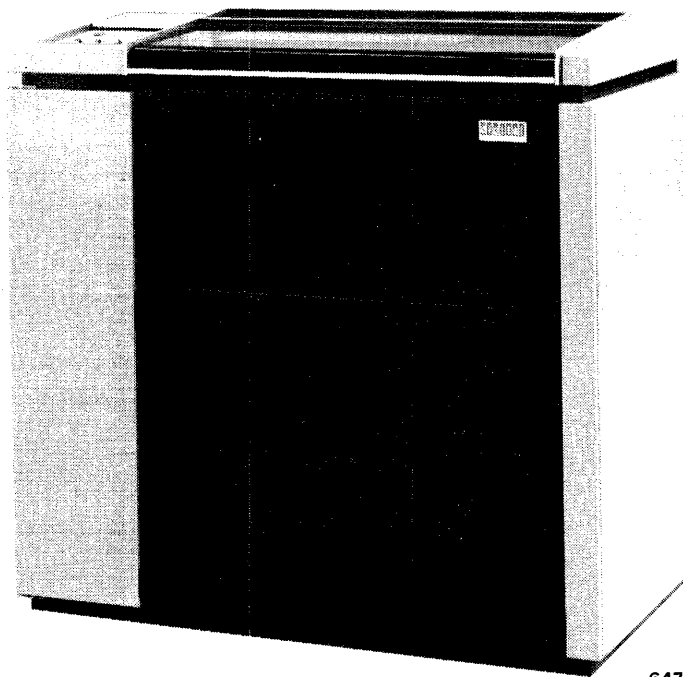
6476-1

Figure 1-3   LP04 Line Printer
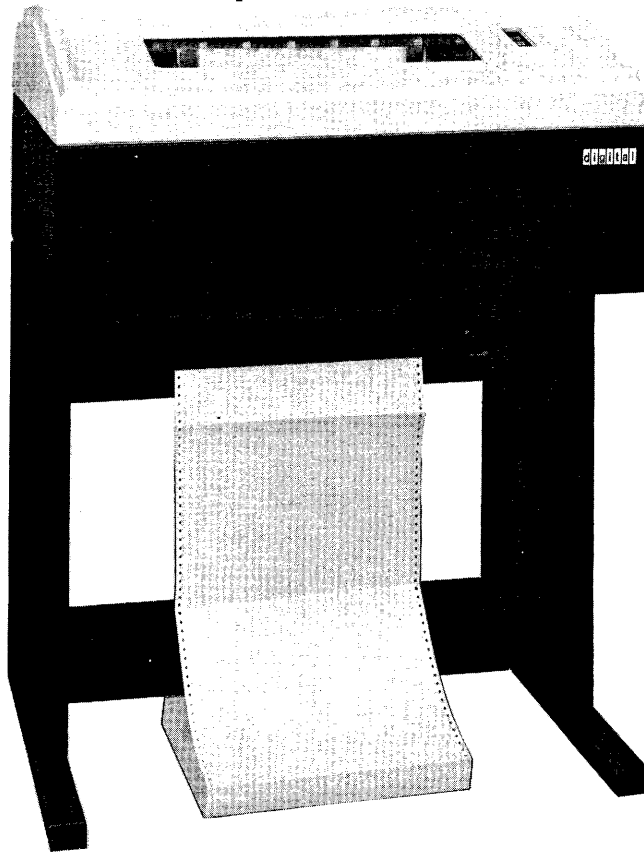
6996-2

Figure 1-4   LP05 Line Printer

1.2   GENERAL DESCRIPTION

1.2.1   LP11

The LP11 Line Printer system is designed to operate on-line with the PDP-11 system and associated peripherals such as paper tape readers, magnetic tape units, card readers, or communications terminals. The line printer is mounted in a free-standing cabinet. The controller, which interfaces the line printer to the Unibus is a single quad module that occupies one of the four slots in the DD11 or one of the two small peripheral controller slots in the KA11, KC11, or other PDP-11 Processor system unit.

When the printer memory is full, a print cycle is initiated and the characters are automatically printed in the first zone (columns 1–20). During the print cycle, the stored characters are scanned and compared in synchronism with the rotating characters on the drum. The printer actuates the appropriate hammer as the desired character approaches the print position. If the comparison indicates an invalid character, that character is erased from the memory.

After the first zone has been printed, the next 20 characters are loaded and printed out on the second zone (columns 21–40) provided no special control character (paper feed, form feed, or carriage return) is recognized by the printer. This process continues until all four zones have been printed. Any time that one of the three control characters is

1-3

Table 1-1
Applicable Documents

Title	Number	Description
Model 2230 Line/Printer, Technical Manual	DPC 234875	Provides a detailed description of the Data Products Model 2230 line printer. Includes installation, operation, principles of operation, maintenance and troubleshooting, and engineering drawings.
Model 2310 Line/Printer, Technical Manual	DPC 214163A	Provides a detailed discussion of the Data Products Model 2310 line printer. Contains similar coverage to the Model 2230 manual.
Model 2410 Line/Printer, Technical Manual	DPC 215656A	Provides a detailed discussion of the Data Products Model 2410 line printer. Contains similar coverage to the Model 2230 manual.
Centronics (Models 101, 101A, 101D, 102, or 303) Printer Technical Manual		Provides a detailed discussion of the specified Centronics line printer.
LA180 DECprinter I User's Manual	EK-LA180-OP-002	Provides the procedures required to operate the LA180 line printer.
LA180 Maintenance Manual	EK-LA180-MM-001	Provides a detailed description of the DECprinter LA180 line printer. Includes installation, operation, theory of operation, troubleshooting, and adjustment procedures.
Model 2470 Line/Printer, Technical Manual	DPC 232434A	Provides a detailed discussion of the Data Products Model 2470 line printer.
Paper-Tape Software Programming Handbook	DEC-11-GGPB-D	Provides a detailed discussion of the PDP-11 software system used to load, dump, edit, assemble, and debug PDP-11 programs; input/output programming; and the floating point and math package.
PDP-11 Processor and System Manuals	*	A series of maintenance and theory manuals that provide a detailed description of the basic PDP-11 System.
PDP-11 Processor Handbook	**	A general handbook that discusses system architecture, addressing modes, the instruction set, programming techniques, and software.
PDP-11 Peripherals Handbook	112-00973-2908	A handbook devoted to a discussion of the various peripherals used with PDP-11 systems. It also provides detailed theory, flow, and logic descriptions of the Unibus and external device logic; methods of interface construction; and examples of typical interfaces.

* Applicable manuals are furnished with the system at time of installation. The document number depends upon the specific PDP-11 family processor.

** Use the processor handbook unique to the actual CPU.

recognized, the current buffer contents are printed and the printer returns to the first zone rather than continuing printing of the remaining zones.

The printer responds only to codes representing the character set and the three control characters. All other codes are ignored.

The line printer is a high-speed printer that produces hard copy output at rates up to 1250 lines per minute. The printer employs an impact type mechanism with a revolving character drum and one hammer per column. Forms making up to six copies can be used when multiple copy printing is desired. The printer is available in three versions: 80 columns with a speed of up to 356 lines per minute for a full line; 132 columns with a speed of up to 245 lines per minute for a full line; 132 columns with a speed of up to 1250 lines per minute for a full line; or 132 columns with a speed of up to 300 lines per minute for a full line. All of the preceding print rates are based on the 64-character drum. The four line printer models can be ordered with either a 64- or 96-character drum. The DEC model designations are listed in Table 1-2.

Table 1-2
Model Designations

Line Printer	Designation	Number of Characters	Power
LP01	LP11-FA	64	115 V, 60 Hz
80 Column	FB	64	230 V, 50 Hz
(DP 2310)	HA	96	115 V, 60 Hz
	HB	96	230 V, 50 Hz
LP02	LP11-JA	64	115 V, 60 Hz
132 Column	JB	64	230 V, 50 Hz
(DP 2410)	KA	96	115 V, 60 Hz
	KB	96	230 V, 50 Hz
LP04	LP11-RA	64	115 V, 60 Hz
132 Column	RB	64	230 V, 50 Hz
(DP 2470)	SA	96	115 V, 60 Hz
	SB	96	230 V, 50 Hz
LP05	LP11-VA	64	115 V, 60 Hz
132 Column	VB	64	230 V, 60 Hz
(DP 2230)	VC	64	115 V, 50 Hz
	VD	64	230 V, 50 Hz
	WA	96	115 V, 60 Hz
	WB	96	230 V, 60 Hz
	WC	96	115 V, 50 Hz
	WD	96	230 V, 50 Hz

A brief description of the four line printer models and both character sets is contained in subsequent paragraphs.

1.2.1.1 LP11-F, H — The LP11-F, H 80-column line printer has a maximum line length of 80 columns and prints at a rate of 356 full lines per minute. If the line length is decreased to 20 columns the maximum printing rate is 1110 lines per minute. These rates are based on a 64-character set. If a 96-character set is used, printing rates decrease because of the larger character drum.

A single 80-character line is composed of four 20-character zones. This permits the 20 hammer drivers to be time-shared by the four zones. The printer contains a 20-character memory that stores the image of one zone. The character string is serially loaded into this memory by means of the line printer data buffer register (LPDB) in the LP11 Controller. Although the bits comprising an individual character are parallel loaded the zone is serially loaded, character by character.

1.2.1.2 LP11-J, K — The LP11-J, K 132-column line printer has a maximum line length of 132 columns and prints at a rate of 245 full lines per minute or 1100 lines per minute, if the line length is decreased to 24 columns. It is essentially the same as the 80-column model, except that the memory holds 24 characters and a line is composed of six zones.

1.2.1.3 LP11-R, S — The LP11-R, S 132-column line printer has a maximum line length of 132 columns and prints at a rate of 1250 full lines per minute when using the 64-character set and 925 full lines per minute when using the 96-character set. The LP11-R, S is distinguished from the two previous versions because it contains one 132-character memory; there are no zones. A print hammer is assigned to each of the 132 print positions. The LP11-R, S will print a line only after one of three control characters is sent to it.

1.2.1.4 LP11-V, W — The LP11-V, W 132-column line printer has a maximum line length of 132 columns and prints at a rate of 300 lines per minute when using the 64-character set, and 240 lines per minute when using the 96-character set. A 132-column memory is contained within the line printer. Printing is accomplished by dividing the 132 columns into odd and even positions and sharing a hammer and associated drive circuit between two positions. The LP11-V, W will print a line only after one of three control characters is sent to it.

1.2.2 LS11

The LS11 is capable of interfacing a family of Centronics line printers to the Unibus, including Models 101, 101A*, 101D, 102A, and 303. These models are medium-speed serial matrix printers. The 101 model uses a 5 X 7 matrix, the 101A uses a 9 X 7 matrix. The 101 and 101A line printers have the following basic characteristics:

    a.   The average printing speed is 132 characters/second, including the return time of the printing head.

    b.   The line printing speeds are 60 lines/minute on full lines and up to 200 lines/minute on short lines.

    c.   The print size is 10 characters/inch horizontally and 6 lines/inch vertically.

The line printer contains a 132-character memory buffer, which is loaded character by character via the LS11 Controller. Once the 132-character memory is full, the Centronics printer automatically prints the 132 characters on a line and then performs an automatic carriage return. There is, however, a carriage return command which is performed for lines containing less than 132 characters as specified by the programmer.

Each character is transferred to the line printer in a parallel 7-bit format. These 7-bit characters are in ASCII code. The Centronics line printer does not print lower case characters. Of the ASCII character set, the line printer uses nine commands. These commands and their functions are listed in Table 4-2. For more detailed printer information, refer to the applicable Centronics technical manual.

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*Product line standard.

The front panel of the line printer unit contains four illuminated switches and one pushbutton switch, as follows:

a. Power On/Power Off Switch — alternate depression of this switch turns the printer on or off.

b. Select Switch — alternate depression of this switch places the printer in the on-line state (able to receive data) or the off-line state.

c. Top of Form — Depressing this switch causes the Vertical Format Reader to seek the Top-of-Form position as indicated by the paper tape.

d. Forms Override — Depressing this switch allows the printer to complete the form being printed, even though a Paper-Empty condition exists (Paper Out indicator is on).

NOTE
This indicator switch must be pressed and held during printing when a Paper-Empty condition exists.

e. Remote Line Feed — Depressing this switch initiates a single line feed.

The front panel also contains a Paper Out indicator, which, when lit, indicates that the paper supply rack is empty.

1.2.3 LA11

The LA11 system operates on-line with a PDP-11 system and its associated peripherals. The line printer is a free-standing, pedestal-type terminal that is capable of printing a maximum of 132 characters per line. To initiate a print cycle, a line terminator character (LF, FF, or CR) is required. The printer contains a 256 × 8 character buffer RAM which stores printable and nonprintable characters. This RAM is loaded character by character through a single character buffer via the LA11 controller under microprogramming control. After each character is stored in memory, a read function is performed to determine whether the line should be terminated, causing the line of stored data to be printed.

Each character is transferred to the printer as a parallel 7-bit plus parity (optional) ASCII code. The printer is a high-speed printer that prints at speeds up to 180 characters per second. It produces a hard copy original, plus up to five duplicate copies on tractor-driven continuous forms, varying in width from 3 to 14-7/8 inches. The average printing speeds are 70 lines per minute on full lines, and 300 lines per minute on short lines. The printer responds only to codes representing the LA180 character set and six command characters. All other codes are ignored. Refer to the applicable LA180 DECprinter manuals for more detailed printer information.

The LA11 is available in four models, as listed in Table 1-3. Each model is a parallel, 180 character per second, printer with a controller.

Table 1-3
Model Designations

Model No.	Operating Power
LA11-PA	115 Vac, 60 Hz
LA11-PB	230 Vac, 60 Hz
LA11-PC	115 Vac, 50 Hz
LA11-PD	230 Vac, 50 Hz

1.2.4 Controller

The LP11/LS11/LA11 controller interfaces the line printer to the PDP-11 Unibus and is under program control. The controller does not store information but synchronizes the data transfer between the bus and the printer. The prime functions of the controller are: indicate to the PDP–11 System the operational status of the line printer; control transfer of data from the PDP-11 System into the printer; and enable the line printer to gain control of the bus and perform an interrupt routine.

1.3 SPECIFICATIONS

Electrical, operating, physical, environmental, and printing characteristics and performance specifications are presented in Tables 1-4, 1-5, 1-6 and 1-7.

Table 1-4
LP11 Line Printer System Specifications

	LP11-F, H	LP11-J, K	LP11-R, S	LP11-V, W
Electrical				
Printer	115 Vac ± 10%, 60 Hz ± 3 Hz 230 Vac ± 10%, 50 Hz ± 3 Hz 330 W	115 Vac ± 10%, 60 Hz ± 3 Hz 230 Vac ± 10%, 50 Hz ± 3 Hz 500 W	115 Vac ± 10%, 60 Hz ± 3 Hz 230 Vac ± 10%, 50 Hz ± 3 Hz 1950 W	115 Vac ± 10%, 50/60 Hz ± 3 Hz 230 Vac ± 10%, 50/60 Hz ± 3 Hz 700 W
Controller	1.5 A (derived from power supply in mounting box where controller is installed)			
Signal Cable	M7930: One 25-ft cable consisting of 11 twisted pairs, supplied with system. M7258: One 25, 50, or 100-ft cable consisting of 18 twisted pairs, supplied with system.			
Printable Characters				
Character Set	64- or 96-character set			
	64-character set: A to Z, 0 to 9, ! " # $ % & ' ( ) * , - . / : ; < = > ? @ [ ] ⊥ \ space			
	96-character set: All of the above plus a to z : ~ `			
Type	Open Gothic print			
Size	Typically 0.095-in. high; 0.065-in. wide			
Code Format	ASCII			
Characters per Line	80	132	132	132
Character Drum Speed				
64-Character Drum	1760 RPM	1760 RPM	1800 RPM	1200 RPM
96-Character Drum	1180 RPM	1180 RPM	1200 RPM	800 RPM
Print Characteristics				
Format	Top-of-form control; single line advance with automatic perforation step-over, and carriage return. Automatic vertical format control is optional.			
Paper-Feed	One pair of pin-feed tractors for 1/2 in. hole center, edge-punched paper.			
Paper Slew Speed	13 in. per second	13 in. per second	35 in. per second	20 in. per second
Print Area	8 in. wide; left justified	13.2 in. wide; left justified	13.2 in. wide; left justified	13.2 in. wide; left justified
Character Spacing (horizontal)	0.1 (±0.005) in. between centers; maximum possible accumulative error for normal spacing is 0.01 in. per 80 or 132-character line.			

Table 1-4 (Cont)
LP11 Line Printer System Specifications

	LP11-F, H	LP11-J, K	LP11-R, S	LP11-V, W
Line Spacing	0.167 (±0.01) in. (6 lines per inch); each character within ±0.1 in. from mean line through character. Also, LP11-R, S and LP11-V, W 0.125 in. (8 lines per inch).			
Line Advance Time	20 ms maximum	20 ms maximum	14 ms maximum	50 ms maximum
Character Synchronization	Variable reluctance pick-off senses drum position.			
Physical Characteristics				
Printer				
Height	46 in. (1.17m)	47 in. (1.19m)	46 in. (1.17m)	45 in. (1.14m)
Width	24 in. (0.6m)	49 in. (1.2m)	48.5 in. (1.2m)	32 in. (0.81m)
Depth	22 in. (0.56m)	26 in. (0.61m)	24.5 in. (0.6m)	22 in. (0.56m)
Weight	220 lb (100kg)	575 lb (260kg)	800 lb (360kg)	330 lb (150kg)
Controller	The LP11 Controller is a small peripheral controller consisting of a single quad module and occupying 1/4 of a DD11 or one of the controller slots in a processor system unit such as the KA11 or 11/05.			
Ribbon Characteristics				
Type	Inked roll			
Width	9 in.	14 in.	14.5 in.	15 in.
Length	30 yards	30 yards	30 yards	20 yards
Thickness	0.003 in.	0.003 in.	0.004 in.	0.004 in.
Paper Characteristics				
Type	Standard fanfold, edge punched, 11 in. between folds			
Width	4 in. to 9-7/8 in.	4 in. to 14-7/8 in.	4 in. to 19-7/8 in.	4 in. to 16-3/4 in.
Weight	15-lb bond minimum (single copy) 12-lb bond with single-sheet carbon for up to six parts (multiple copy)			
Environmental				
Operating Temperature	50° F (10°C) to 110° F (43°C)	50° F (10°C) to 110° F (43°C)	50° F (10°C) to 110° F (43°C)	50° F (10°C) to 90° F (32°C)
Humidity (Non Condensing)	5% to 90% with static eliminator	5% to 90% with static eliminator	10% to 90% with static eliminator	30% to 90%

Table 1-5
Print Rates

	Columns	Print Rate (Lines/Min)
LP11-F, H		
64-Character Drum	1-80	356
	1-60	460
	1-40	650
	1-20	1110
96-Character Drum	1-80	253
	1-60	330
	1-40	478
	1-20	843
LP11-J, K		
64-Character Drum	1-132	245
	1-110	290
	1-88	356
	1-66	460
	1-44	650
	1-22	1110
96-Character Drum	1-132	173
	1-110	205
	1-88	253
	1-66	330
	1-44	478
	1-22	843
LP11-R, S		
64-Character Drum	1-132	1250
96-Character Drum	1-132	925
LP11-V, W		
64-Character Drum	1-132	300
96-Character Drum	1-132	240

Table 1-6
LS11 Specifications

Specification	Description
Options	LS11-A, 115 V, 60 Hz LS11-B, 230 V, 50 Hz
Power Requirement	+5 V at 1.5 A
Line Printer Characteristics (For Models 101 and 101A only)	Print Cycle Speed: 132 characters/second Line Printing Speeds: 60 lines/minute (full lines) 200 lines/minute (short lines) Print Size: 10 characters/inch horizontal 6 characters/inch vertical
Character Format	7-bit ASCII
Character Transfers	Parallel (seven bits of each character transferred in parallel)
Interface Cable	D-IA-7009087-0-0

Table 1-7
LA11 Specifications

Specification	Description

Options
    LA11-PA
    LA11-PB
    LA11-PC
    LA11-PD
	
	115 Vac, 60 Hz
	230 Vac, 60 Hz
	115 Vac, 50 Hz
	230 Vac, 50 Hz

Printer	90 − 132 Vac or 180 − 264 Vac 50 or 60 Hz ± 1 Hz 400 W max. (printing) 200 W max. (idle)
Controller	+5 V at 1.5 A
Interface cable	BC11S, one 25, 50, or 100 ft cable supplied with system
Printable characters	95 upper and lower case character set (7 X 7 dot matrix)
Code format	ASCII
Nonprintable character	Six commands
No. of characters per line	132 max.
Type of character transfer	Parallel (7 bit plus parity)

Line printer characteristics	Print cycle speed:
	    Up to 180 characters per second
	Line printing speeds:
	    70 lines per minute on full line
	    300 lines per minute on short lines
	Print Size:
	    10 characters per inch horizontal
	    6 lines per inch vertical

CHAPTER 2
INSTALLATION

2.1 INTRODUCTION

The information in this chapter serves as a guide for the installation of the line printer system and is provided primarily for installation planning.

CAUTION
Although specific installation procedures are included for planning purposes, it is recommended that the equipment be installed by DEC field service personnel.
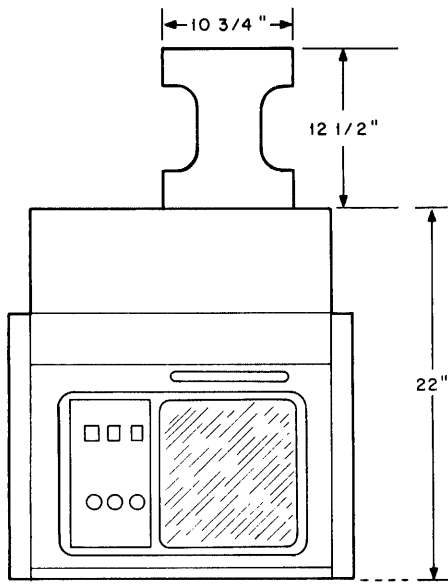
2.2 SPACE REQUIREMENTS

Figures 2-1 through 2-4 are installation drawings of respectively, the LP11-F, H, LP11-J, K, LP11-R, S, and LP11-V, W showing the physical size and shape of each system. System dimensions are included on the drawing.

In planning the installation facility to accommodate the printer, additional space should be allowed for operating and maintenance personnel.

2.3 UNPACKING THE LINE PRINTER

Before removing the system from its shipping container, place the line printer as close as possible to its final installation position. Unpack the equipment as follows:

1. Remove outer shipping carton.

2. Remove any protective packing material surrounding the line printer and cut any straps securing the line printer to the shipping pallet.

3. Unbolt the printer from the shipping pallet.

4. Remove the printer from the shipping pallet and carefully place it in the desired location.

5. Install the four rubber leveling feet on the base of the printer. Adjust feet so that printer is level.

6. Unpack the controller module, the printer cable, the LP11 diagnostic tape, and the MAINDEC-11-D2CA or MAINDEC-11-DZLAEA writeup.

7. Install the page guide to the top of the printer cabinet by using the hardware supplied with the guide, and place the paper hopper in place.

8. Check all packing material before discarding to ensure that no components or hardware are accidentally discarded.

TOP VIEW
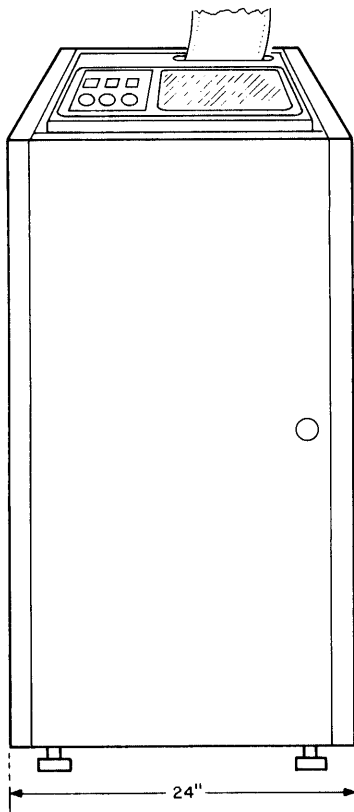
FRONT VIEW
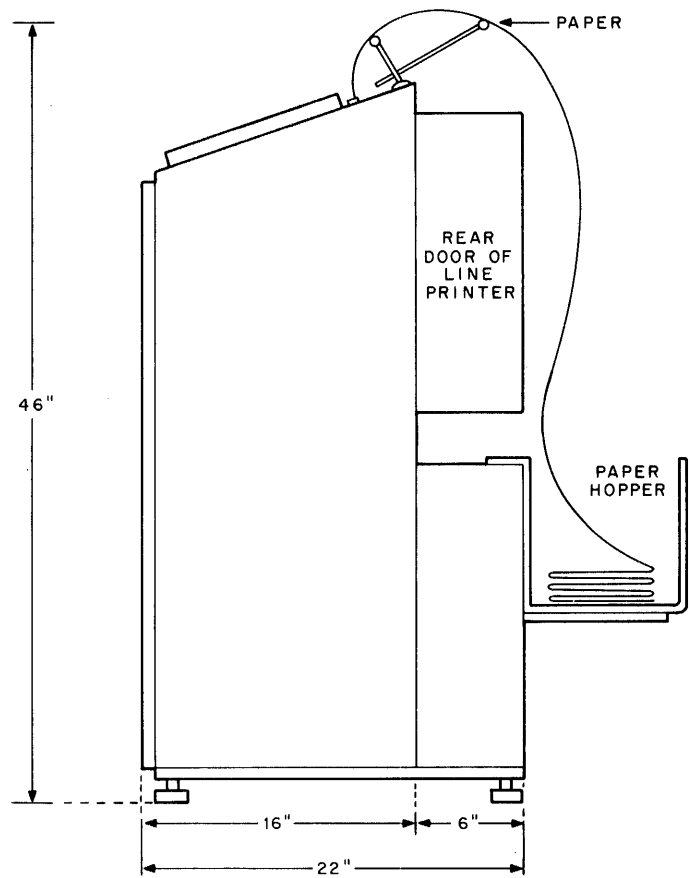
SIDE VIEW

11-0283

Figure 2-1   LP11-F, H Line Printer Installation Diagram

PRINTER WINDOW
OPENS APPROX. 105°

LEFT SIDE ACCESS
DOOR OPENS APPROX. 105°

12.0 IN.

43.0 IN.

46.0 IN.

22.5
IN.

DRUM GATE A2A1
OPENS 90°

23.0 IN.

DRUM GATE CLEARANCE
DOOR OPENS APPROX. 70°

24.5 IN.

10.0 IN.

48.5 IN.
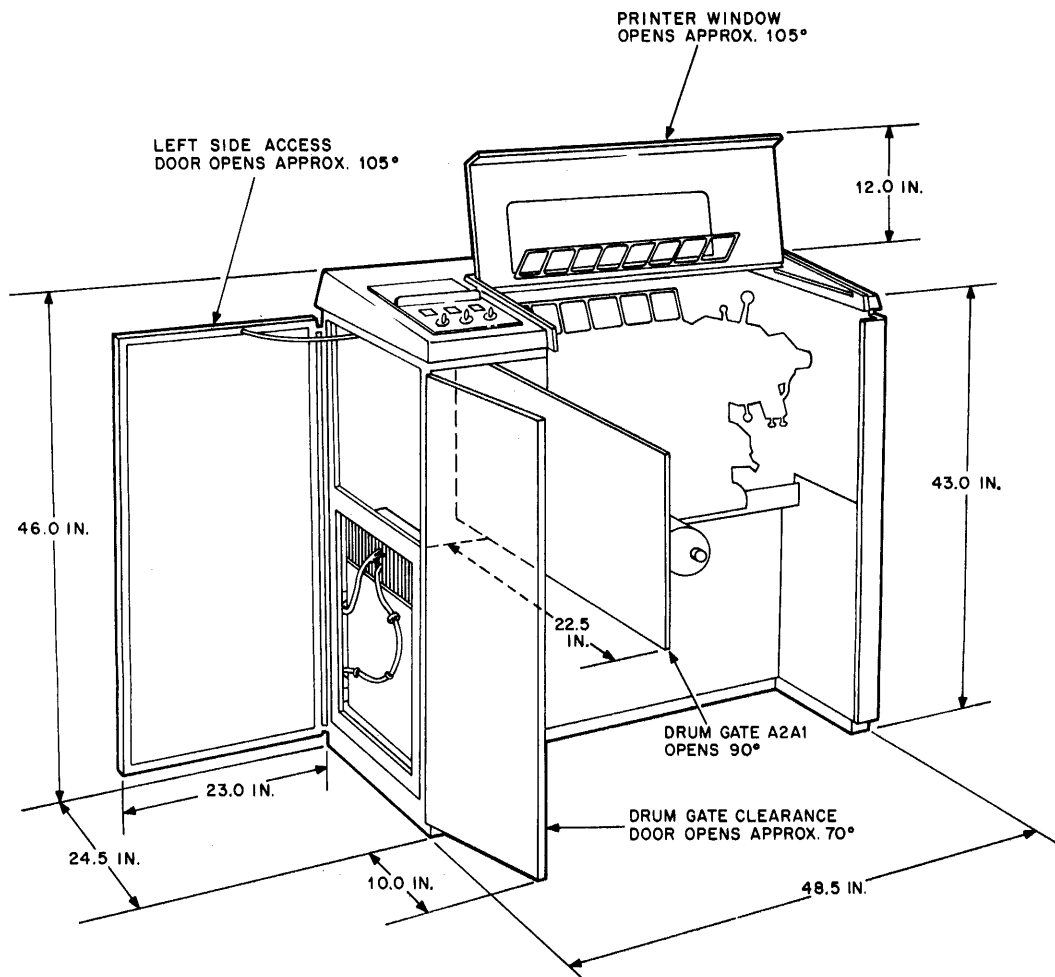
08-0672

Figure 2-2   LP11-J, K Line Printer Installation Diagram

2-3

PRINTER WINDOW,
OPEN 135°

ELECTRONIC GATE
ACCESS DOOR,
OPEN 105°

12.0"

22.25"

44.0"

46.0"

DRUM GATE
OPEN 90°

24.0"

17.0"

24.5"

DRUM GATE
CLEARANCE DOOR
OPEN 90°

11.5"

48.5"
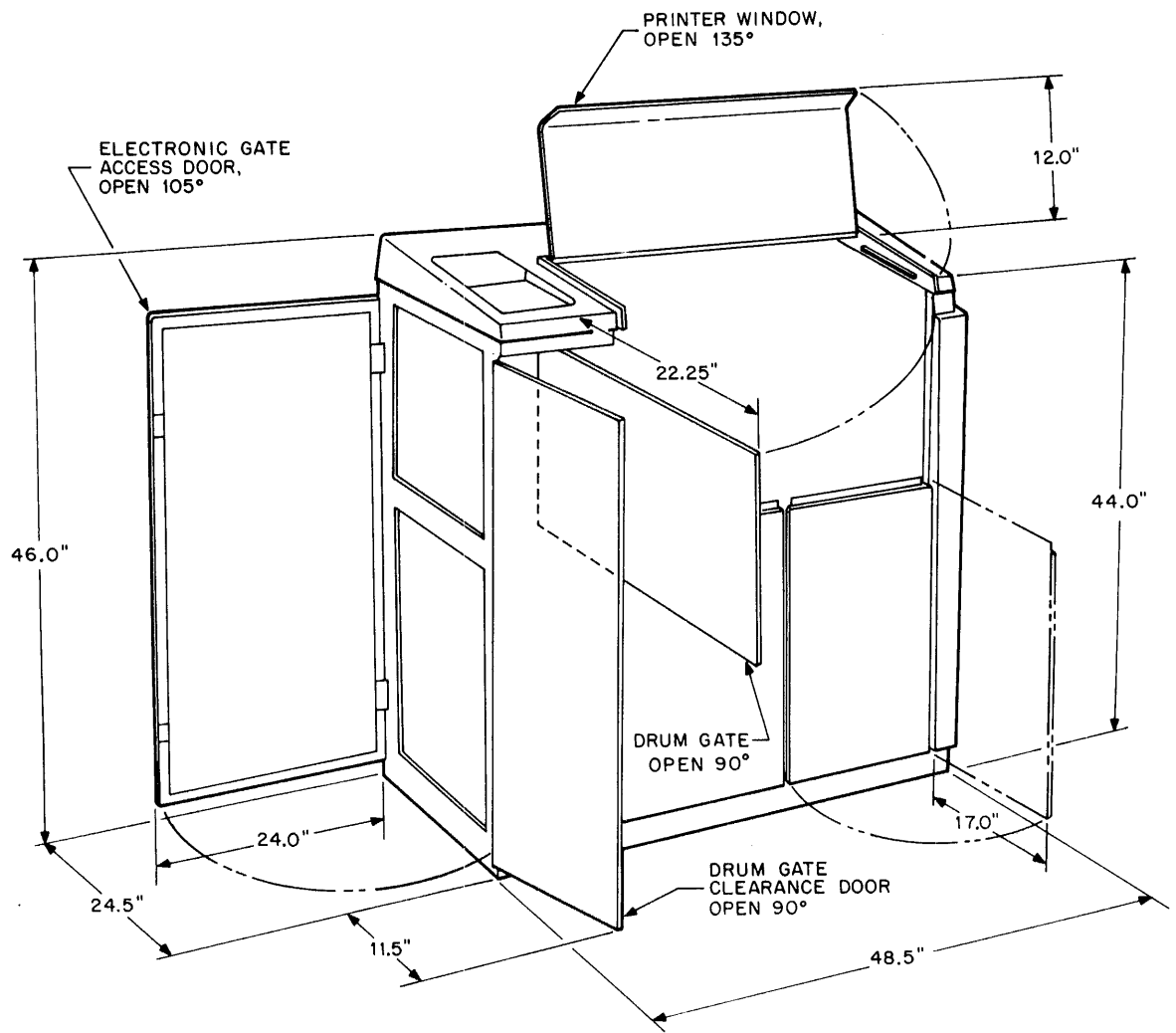
11-1575

Figure 2-3   LP11-R, S Line Printer Installation Diagram
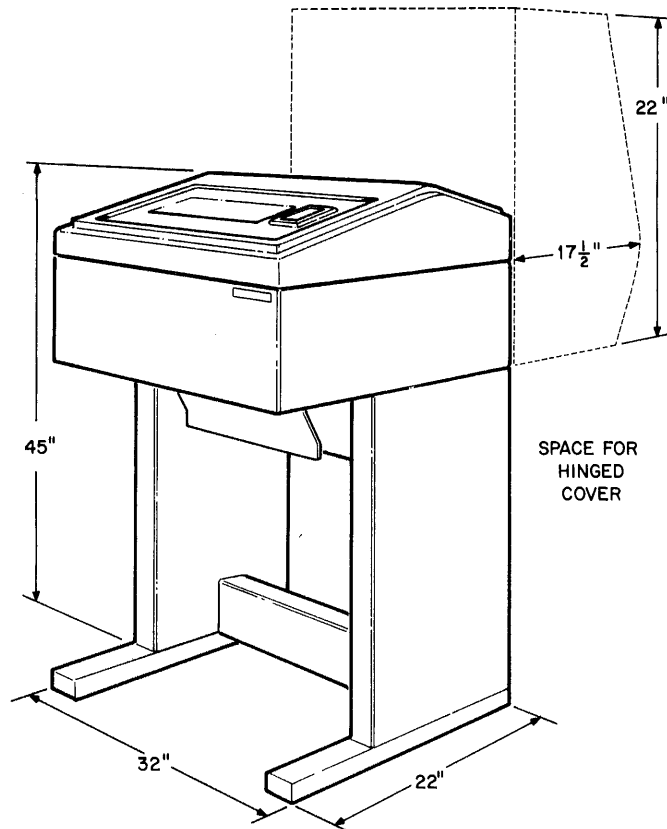
11-2462

Figure 2-4 LP11-V, W Line Printer Installation Diagram

2.4 INSPECTION

After removing the equipment, inspect all components according to the following procedure. Report any damage to the local DEC field office.

1. Inspect external surfaces of the cabinets and related equipment for obvious damage to the surface, bezel, switches, lights, etc.

2. Open both front and rear cabinet doors and inspect for internal damage; loose mounting hardware; loose or broken modules; loose nuts, bolts, and screws; etc.

3. Inspect power supply for proper seating of fuses and power connectors.

4. Check controller module for any signs of damage.

5. Check the equipment received against the packing list to be certain that all equipment has been received.

2.5 INSTALLATION PROCEDURES

The following paragraphs describe the required procedures for installing the line printer system. Installation procedures include: primary ac power cable, controller, and signal cable.

2.5.1 Primary AC Power Cable

The three-wire primary ac power cable connects the printer power supply to the source power at the installation site. The printer has a self-contained power supply. One end of the power cable is connected to a transformer within this power supply. This connection is made at the factory to ensure that the desired operating frequency (either 50 Hz or 60 Hz) is available. The other end of the cable is connected to the source power receptacle at the installation site. Table 2-1 lists the color coding for each wire; Figure 2-5 shows the wiring schematic.

WARNING

Do not attempt to connect power cable to source power without first referring to the wiring table and schematic and ensuring that the required checkout procedures (Paragraph 2.6) have been performed.

* A Voltage Between White Wire And Frame Indicates That The Receptacle Is On A Line Which Is A Considerable Distance From The Service Entrance (The Watt-Hour Meter And Fuse Box) And Is Carrying Significant Current. This Voltage Should Not Exceed 5% Of The Nominal Line Voltage.
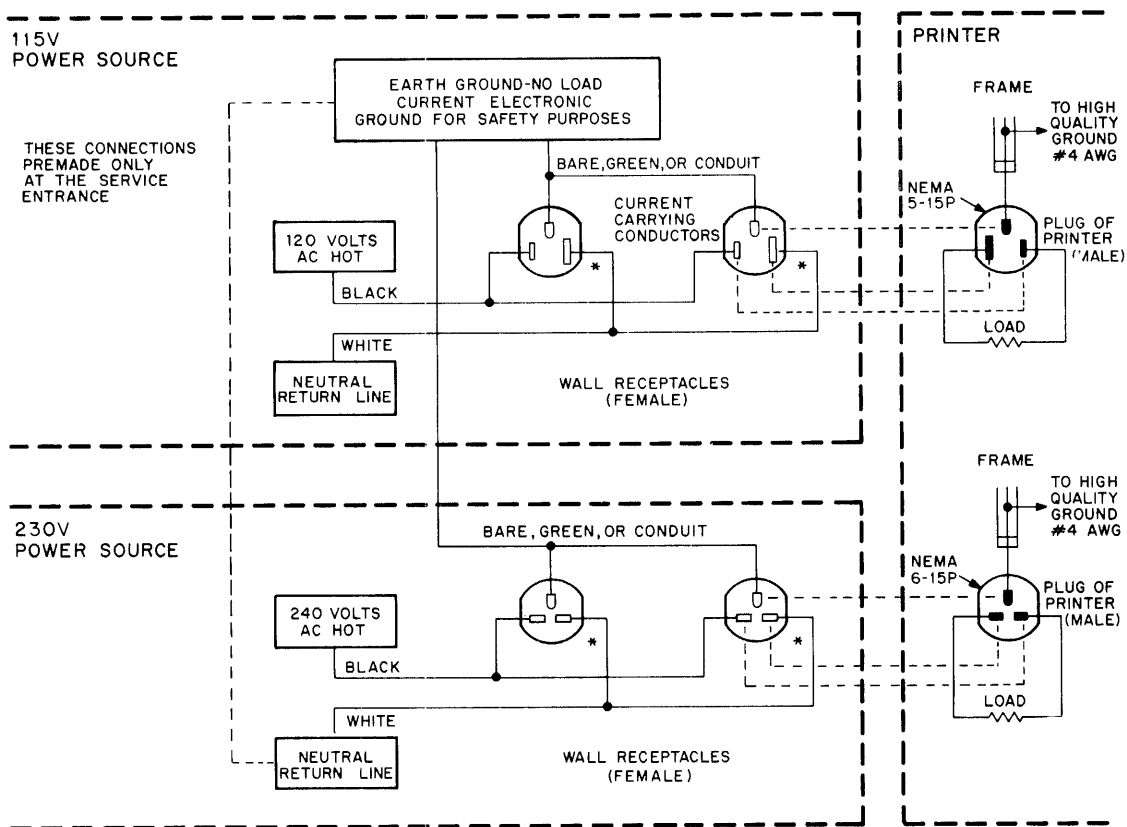
II 0285

Figure 2-5 Power Wiring Schematic

Table 2-1
Power Cable Line Identification

Wire Color	Line	Terminal Nomenclature	Plug
Green	Frame ground	Frame ground	W
White or light grey	Line 2	Neutral or line 2	X
Black	Line 1	Line 1	Y

WARNING

1. The green wire is the cabinet frame ground and does not carry load current but must be connected for safety reasons. This wire must be securely connected from the printer cabinet to the grounding point on the primary power source.

2. The white (or light grey) wire must never be used for grounding the printer cabinet. This wire is the neutral, common, ac return, or cold lead.

2.5.2 Controller

Before installing the M7930 or M7258 controller in the DD11 or in a processor, make sure that the proper priority jumper plug (level 2) is mounted on the controller. If installing an M7258 module, arrange the module jumpers as directed by Table 2-2. Install the controller as follows:

1. Determine proper mounting slot for controller.

2. Remove G727 Grant Continuity Module from area D of the appropriate slot.

3. Install the M7930 or M7258 controller module into the mounting slot.

2.5.3 Signal Cable

The printer signal cable interconnects the line printer and the controller. The installation procedure is as follows:

1. Pass the end of the signal cable that is terminated with a Berg Connector through the cable slot in the back of the BA11 Mounting Box.

2. Plug the Berg Connector into the printer plug on the M7930 or M7258 Module in such a way that the printed lettering on the Berg side is visible as shown in Figure 2-6.

CAUTION
Route the cable so that it does not bind or interfere with other cables or modules.

3. Tighten the cable clamp on the rear of the mounting box.

4. Plug the mating connector into the rear of the line printer. Tighten holding screws thumb tight.

CAUTION
Do not overtighten by using a screwdriver.

UPPER ROW OF PINS

B D F J L N R T V X Z BB DD FF JJ LL NN RR TT VV

A C E H K M P S U W Y AA CC EE HH KK MM PP SS UU

LOWER ROW OF PINS

VV
UU

BERG

B
A
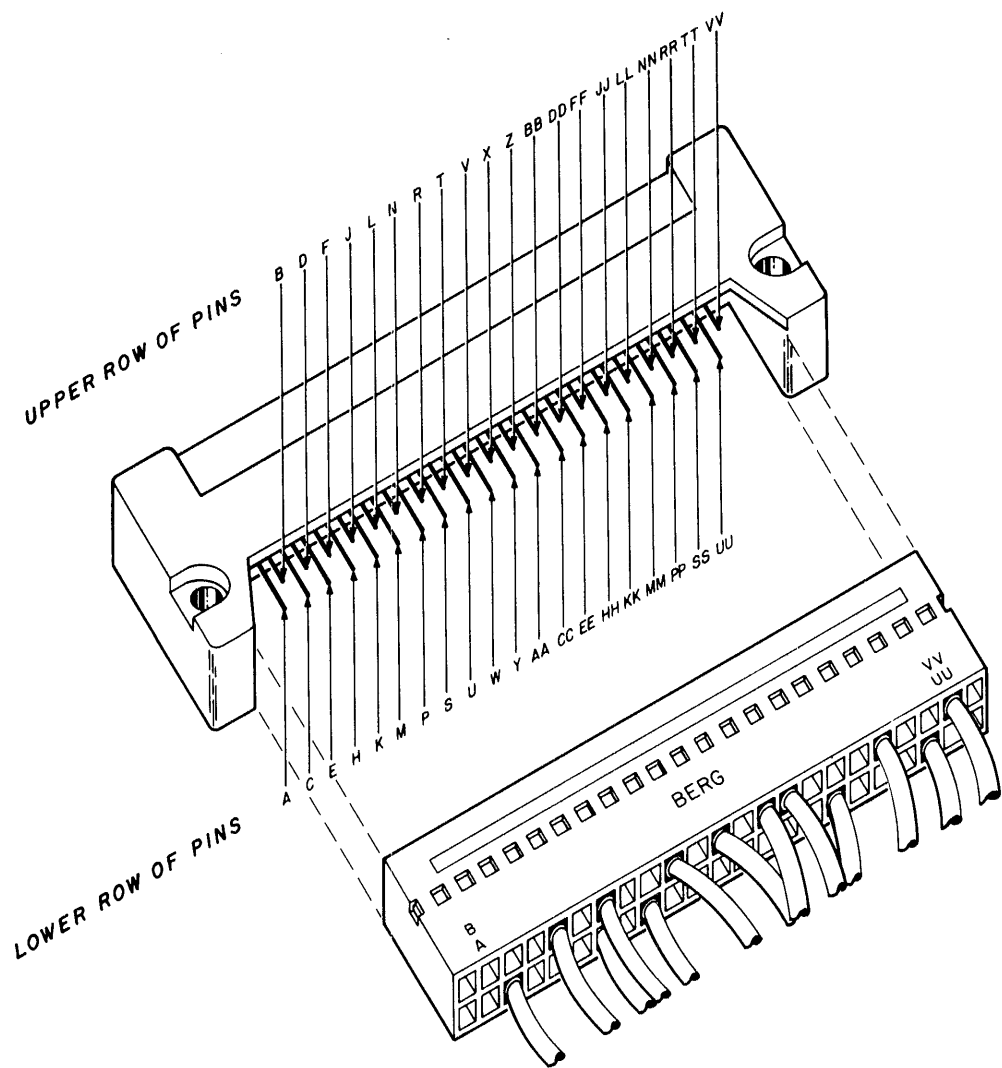
11-1650

Figure 2-6   Berg Connector

Table 2-2
M7258 Selectable Jumpers

Jumpers	Function
V2 − V8	Select the vector address for the service routine. Typically address 200 is used, which is configured by removing all V jumpers except V7.
A3 − A12	Select the device address to which the line printer will respond. Typically an address from 777514 − 777517 is used. Address 777514 is selected when jumpers A7, A5 and A4 are in, and other A jumpers are removed.
J1 − J14 and W5	Configure the logic circuits for LS11, LP11 or LA11 use. The configurations are as follows:

Jumper	LS11	LP11	LA11
J1	OUT	OUT	IN
J2	IN	IN	OUT
J3	IN	IN	IN
J4	OUT	OUT	OUT
J5	IN	IN	IN
J6	IN	IN	IN
J7	OUT	OUT	OUT
J8	OUT	IN	OUT
J9	IN	OUT	IN
J10	OUT	OUT	OUT
J11	IN	IN	IN
J12	OUT	OUT	OUT
J13	OUT	OUT	OUT
J14	IN	IN	IN
W5	OUT	OUT	OUT

Jumpers	Function
N1	Controls sampling of the NPR line. In certain system configurations, the NPR line can be sampled and interrupt requests prevented until all NPRs have been honored, thus improving NPR latency. Removal of the N1 jumper disables the NPR sampling circuit.

2.6 AC POWER CHECKOUT PROCEDURES FOR PRINTERS

After the line printer system has been unpacked and installed at the site, perform the following checkout procedure before connecting the printer power cable to the power source. The power source may be either the receptacle in the PDP-11 system cabinet or a separate wall outlet. If the cabinet is used as the power source, then the PDP-11 system and line printer system can both be shut down at the same time.

WARNING
Under no circumstances should the customer apply power to
the line printer unless a DEC field service engineer is present
during installation and checkout.

Prior to performing the following procedure, ensure that the power cable is connected in accordance with the schematic shown in Figure 2-5.

1. Measure the ac source voltage to ensure that the proper voltage is present. Check measured voltage against nameplate rating on line printer power supply.

2. Measure the voltage potential between the ac return line and the frame ground line to ensure that no potential exists between earth ground (cold water pipe) and the line printer ground.

3. Measure the potential between earth ground of the power source and the line printer frame. It should be 0V with the processor on.

4. Set installation source power circuit breaker to the ON position.

5. Plug line printer primary power cable into the power source receptacle.

6. Set main ac power circuit breaker on line printer maintenance panel to ON position. Observe that the red POWER indicator on the line printer control panel illuminates indicating that primary ac power is applied to the printer.

2.7 SYSTEM CHECKOUT PROCEDURE

Perform a checkout of the system as follows:

1. Load paper and ribbon into the printer if necessary. (Refer to Paragraph 3.3 in this manual and the *Data Products Manual.*)

2. Perform the operational tests described in Paragraph 3.4 of this manual.

CHAPTER 3
OPERATION

3.1 INTRODUCTION

This chapter provides the information necessary for normal operation of the Line Printer System and is divided into three major parts: controls and indicators, paper installation, and operational tests. Additional operating procedures such as ribbon replacement, calibration, and mechanical adjustments, are covered in the appropriate printer manual.

3.2 CONTROLS AND INDICATORS

The controls and indicators used to operate the Line Printer System are listed in Tables 3-1 through 3-6 and Figures 3-1, 3-2, 3-3 and 3-4. The items covered in each table are listed below:

Table 3-1	Control Panel for LP11	The control panel is located at the top of the LP11 Line Printer cabinet, to the left of the window. This panel contains the controls used for normal on-line/off-line operation of the printer.
Table 3-2	Maintenance Panel for LP11	For the LP01, this panel is located behind the front cabinet door, beneath the control panel, and is not accessible unless the door is open. The controls on this panel are used for initial setup of the system and for maintenance purposes. The maintenance panel for the LP02 and LP04 models is located on top of the printer cabinet, directly above the control panel, and is accessible by simply lifting the access cover.
Table 3-3	Adjustment Controls (LP01 Model)	The location of each of these controls is listed in the table. These controls are used for: loading and aligning paper; adjusting paper width and tension; setting hammer bank for multiple copy paper; and opening or closing the drum gate.
Table 3-4	Adjustment Controls (LP02 model)	Location of these controls is listed in the table.
Table 3-5	Adjustment Controls (LP04 model)	Location of these controls is listed in the table.
Table 3-6	Adjustment Controls (LP05 model)	Location of these controls is listed in the table.

3.3 PAPER INSTALLATION

Procedures for loading paper in the line printer are given in Paragraph 3.3.1 (LP01 model), Paragraph 3.3.2 (LP02 model), Paragraph 3.3.3 (LP04 model), and Paragraph 3.3.4 (LP05 model). In each case, it is assumed that the line printer has been properly installed and appropriate cables connected.

Table 3-1
Controls and Indicators (Control Panel) for LP11

Control or Indicator	Type	Function
POWER indicator	single light (red)	When lit, indicates that primary ac power is applied to the printer by means of the main ac power switch on the maintenance panel.
READY indicator	single light (white)	When lit, indicates that printer power is up, all interlocks are satisfied, paper is loaded, and the printer is ready for use in either on-line or off-line mode. This indicator does not light if any of the following conditions exist: DRUM GATE lit; PAPER FAULT lit; PRINT INHIBIT lit; POWER not lit; +5V or VCL supplies not operating properly, or MASTER CLEAR switch is active.
ON LINE indicator	single light (white)	When lit, normally indicates that printer is in on-line mode of operation (as determined by ON LINE/OFF LINE switch) and PRINT INHIBIT switch is off.
ON LINE/OFF LINE switch	3-position toggle, spring-loaded to center position	Selects printer mode of operation. ON LINE (up) position – disables TOP OF FORM and PAPER STEP switches; lights ON LINE indicator provided PRINT INHIBIT switch is off. OFF LINE (down) position – permits printer to be operated locally; enables TOP OF FORM and PAPER STEP switches.
TOP OF FORM switch	2-position toggle, spring-loaded to off (down) position	When activated, moves new sheet into print position by advancing tractors to top-of-form position. This switch can only be used in off-line mode. It is disabled during on-line mode.
PAPER STEP switch	2-position toggle, spring-loaded to off (down) position	When activated, advances paper one line. This switch is disabled during on-line mode of operation.

Table 3-2
Controls and Indicators (Maintenance Panel) for LP11

Control or Indicator	Type	Function
Main ac power switch	2-position circuit breaker	Controls application of primary ac power to the line printer.
DRUM GATE indicator	single light (red)	When lit, indicates that the drum gate is not properly locked in place.
PAPER FAULT indicator	single light (red)	When lit, indicates that no paper is in printer or that paper is torn.
PRINT INHIBIT indicator	single light (red)	When lit, indicates that PRINT INHIBIT switch is on.
PRINT INHIBIT switch	2-position toggle	When in up (on) position, prevents printer from printing. For normal operation, this switch must be off (down position). Used to disable print hammers for maintenance. All other functions should operate properly. Disabling is accomplished by placing PRINT INHIBIT switch in the up position, then placing LP11 ON LINE/OFF LINE switch to ON LINE position. The printer will run as normal but the hammers are deactivated. Note that both the READY and ON LINE indicators are *not* lit during this operation.
MASTER CLEAR switch	2-position toggle; spring-loaded to down (off) position	When lifted to on (up) position, resets printer logic and extinguishes READY and ON LINE indicators on the control panel.

Table 3-3
Adjustment Controls (LP01 Model)

Control	Location	Function
Drum gate latch	Gearshift type knob near right-hand side of maintenance panel.	Unlocks drum gate which can then be swung open for access to components on back.
Tractor paper width adjustment	Set screw at far right of tractor pressure plate behind drum gate.	Adjusts right tractor for various paper widths; left tractor is factory adjusted.
Tractor horizontal tension adjustment	Next to left side of tractor paper width adjustment.	Adjusts horizontal tension of paper.
COPIES CONTROL lever	Extreme upper right-hand corner of cabinet just above drum gate hinge.	Adjusts the distance between hammer bank and character drum for different numbers of printed copies. Settings are: 1-2, 3-4, and 5-6.
Paper vertical adjustment control	Knob at upper left of cabinet, directly above right-hand side of maintenance panel.	Adjusts vertical alignment of printing so that it prints on lined paper. Can be adjusted to plus or minus one line and may be adjusted while the printer is in operation.
Top-of-form indicators	Red arrows, visible when drum gate is swung open; one on each side of paper directly below tractor pressure plates.	Aligns paper during loading.

Table 3-4
Adjustment Controls (LP02 Model)

Control	Location	Function
Drum gate latch	Gearshift type knob at right-hand side of drum gate, behind panel.	Unlocks drum gate which can then be swung open for access to components on back.
Tractor paper width adjustment (right and left)	Levers at far edges of tractor pressure plate behind drum gate.	Adjusts tractors for various paper widths. Left tractor can be moved three inches outward from column 1; right tractor can be moved 4-1/2 inches outward from column 132.
Tractor horizontal tension adjustment	Next to left side of right tractor paper width adjustment.	Adjusts horizontal tension of the paper.
COPIES CONTROL lever	Extreme upper right-hand corner of drum gate just to the left of and below the VERTICAL PAPER POSITION knob.	Adjusts the distance between hammer bank and character drum for different number of printed copies.
VERTICAL PAPER POSITION knob	Extreme upper right-hand corner of drum gate just above drum gate hinge and to the left of the drum gate latch.	Adjusts vertical alignment of printing so that it prints on lined paper. Can be adjusted to plus or minus one line and may be adjusted while the printer is in operation.
Top-of-form indicators	Red arrows, visible when drum gate is swung open; one on each side of paper directly below tractor pressure plates.	Aligns paper during loading.

Table 3-5
Adjustment Controls (LP04 Model)

Control	Location	Function
Drum gate latch	Gearshift-type knob at right-hand side of drum gate, behind panel.	Unlocks drum gate which can then be swung open for access to components on back.
Tractor paper width adjustment	Two sets, one above and one below the print station.	Adjusts tractors for various paper widths. Left tractors are adjustable indented 1/2-inch increments. Right tractors are continuously adjustable.
Tractor horizontal tension adjustment	Next to left side of right tractors.	Thumbwheel used to adjust horizontal tension of the paper.
COPIES CONTROL lever	Extreme upper right-hand corner of drum gate just to the left of and below the VERTICAL PAPER POSITION knob.	Adjusts the distance between hammer bank and character drum for different number of printed copies.
VERTICAL PAPER POSITION knob	Extreme upper right-hand corner of drum gate just above drum gate hinge and to the left of the drum gate latch.	Adjusts vertical alignment of printing so that it prints on lined paper. Can be adjusted to plus or minus one line and may be adjusted while the printer is in operation.
RUN/ADJUST lever	Located to the right of the VERTICAL PAPER POSITION knob.	Enables free movement of paper feed drive tractors.
Paper drive knob	Located to the right of the bottom left tractors.	Rotates paper drive mechanism.
Scale alignment assembly	Located between top and bottom tractors.	Allows easy forms alignment
Phase control vernier	Operator's panel	Synchronizes hammer motion with drum position to maintain uniform printing density.
Penetration control vernier	Operator's panel	Allows the user to change the print density.

Table 3-6
Adjustment Controls (LP05 Model)

Control or Indicator	Location	Function
POWER ON indicator	Control panel	Indicates all dc voltages are within their tolerances and the initial power up delay (approximately 4 seconds) is over.
ALARM CLEAR switch/indicator	Control panel	a. Indicates a fault condition exists. If the specific fault condition has an associated indicator, that indicator will be lit in conjunction with the ALARM indicator. b. The ALARM indicator also lights when the PRINT INHIBIT switch is on, and the READY indicator is lit. Pressing the switch/indicator master clears printer logic.
READY indicator	Control panel	Indicates that all interlocks are satisfied, there is no fault condition, and the printer is ready to be put into the on-line mode.
ON/OFF LINE switch/indicator	Control panel	Indicates that the printer is in either the on-line or off-line mode. The indicator lights when the printer is in the on-line mode and under control of the user system. Pressing the switch/indicator alternately places the printer on-line and off-line. At initial power turn-on, the indicator will be out (off-line mode).
TOP OF FORM switch	Control panel	Advances paper to top of next form (page). Switch is disabled when printer is in the on-line mode.
PAPER STEP switch	Control panel	Advances paper to the next line. Switch is disabled when the printer is in the on-line mode.
Power circuit breaker	Front of printer below print station	When on, applies primary ac power to the printer.
FORMS RESET switch	Front of control panel with printer cover up	When on, allows manual override of the paper feed servo system so that paper may be positioned while power is on. (Refer to paper advance adjustment control coarse and fine for direct application of this switch.)
6 LPI/8 LPI switch	Front of control panel with printer cover up	Selects either 6 or 8 lines per inch spacing.

Table 3-6 (Cont)
Adjustment Controls (LP05 Model)

Control or Indicator	Location	Function
Print inhibit switch	On logic board	Inhibits print hammer circuits for test purposes.
Paper width adjustment control	On printer mechanism	Aligns paper edge punched holes, with tractors.
Phasing control	Top of logic board enclosure	An operator adjustment that varies ink density at top and bottom of a character. Adjustment should be made by factory trained personnel only.
Paper advance adjustment (coarse)	End of platen assembly	This adjustment will vertically position the paper at predetermined increments. In order to make a course adjustment, the FORMS RESET switch must be in the down position to prevent a format error from occurring.
Paper advance adjustment (fine)	End of platen assembly	This adjustment provides a fine vertical positioning of the paper, between the limits of the predetermined increment range of the coarse paper advance adjustment control. The adjustment knob moves the mounting bracket of the photo cell for the paper feed phase encoder. This movement positions the line strobe pulse so that it occurs at the desired position on the paper. In order to make a fine adjustment, the FORMS RESET switch must be in the up position.
Paper horizontal adjustment control	End of platen assembly	Provides a fine horizontal paper adjustment by moving tractors in a horizontal direction.
Forms thickness adjustment	Below end of platen assembly	Adjusts spacing between parts through which paper moves during printing to compensate for paper thickness.
HAMMER fault indicator	Control panel	Indicates that hammer current is flowing when a hammer should not be firing, or when a hammer is not firing when addressed. The occurrence of a hammer fault will cause the printer to go off-line upon completion of the printing operation in progress. The ALARM indicator lights in conjunction with the HAMMER fault indicator.

Table 3-6 (Cont)
Adjustment Controls (LP05 Model)

Control or Indicator	Location	Function
FORMAT fault indicator	Control panel	Indicates that line strobes generated in the printer logic are not comparing with strobes generated by the line count track (6 or 8) on the line feed encoder disk. Line count strobes from the phase encoder disk occur at five line intervals. The occurrence of a format fault will cause the printer to go off-line upon completion of the printing operation in progress. The FORMAT fault indicator lights in conjunction with the ALARM indicator. It is cleared by actuating the FORMS RESET switch.
RIBBON fault indicator	Control panel	Indicates: a. Ribbon direction has failed to reverse at the end of a spool. b. Ribbon motor is open or shorted. c. A ribbon snag has developed. The occurrence of a ribbon fault will cause the printer to go off-line upon completion of the printing operation in progress. This indicator will light in conjunction with the ALARM indicator.
GATE fault indicator	Control panel	Indicates that drum gate is unlatched. Assuming power is on, the opening of the drum gate will cause the printer logic to be master cleared.
PAPER fault indicator	Control panel	Indicates a torn paper or an out-of-paper condition. The occurrence of a paper fault will cause the printer to go off-line upon completion of the printing operation in progress. This indicator will light in conjunction with the ALARM indicator. Paper fault is cleared when the printer is master cleared.
TAPE fault indicator (optional)	Control panel	Indicates a parity error in the VFU memory or a tape channel command for which no hole has been punched. The occurrence of a tape fault will cause the printer to go off-line upon completion of the printing operation in progress. This indicator will light in conjunction with the ALARM indicator.

Table 3-6 (Cont)
Adjustment Controls (LP05 Model)

Control or Indicator	Location	Function
V-DEL fault (POWER ON indicator)	Logic circuitry	Indicates a power supply fault. When signal V-DEL is active, this indicates that the 5 Vdc or 12 Vdc supply has dropped. During initial turn-on, V-DEL is active for approximately 4 seconds while power is coming up. Once power is up, V-DEL goes inactive and the POWER ON indicator lights. If V-DEL becomes active during the printing operation, the printing operation in progress will not be completed and the POWER ON indicator will extinguish.
PAPER RUNAWAY fault (ALARM indicator)	Logic circuitry	This fault will cause an orderly suspension of printing operations if, after initiating paper movement, paper has not stopped moving after a predetermined time. This fault is normally activated when 3 or 4 forms have been slewed during low speed operation, or 8 or 9 forms have been slewed during high speed operation. The amount of forms slewed corresponds to approximately 6 seconds of slew. A paper runaway fault will also be acknowledged if, during operation, the paper feed mechanics become jammed. A paper runaway fault condition will cause the printer to go off-line and the ALARM indicator to light.
DRUM SPEED fault (ALARM indicator)	Logic circuitry	This fault will place the printer off-line when the drum is not revolving at its predetermined speed. The ALARM indicator will light when a drum speed fault is detected.

HAMMER
FORMAT
RIBBON
GATE
PAPER
TAPE

POWER ON

ALARM
CLEAR

READY

ON/OFF LINE

PAPER STEP

TOP OF FORM
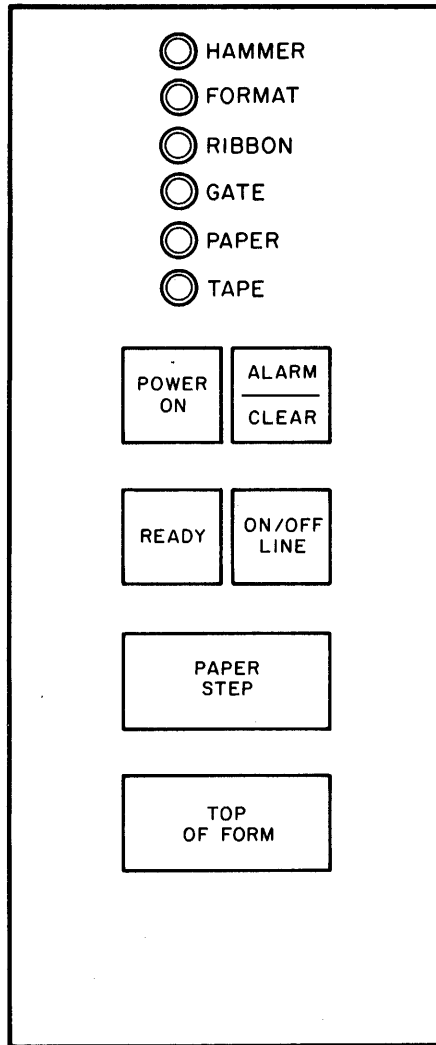
11-2460

Figure 3-1 LP05 Control Panel

Power ON and Power OFF Switch:

Alternate depression of switch will turn Printer
on and off. When in ON position (power applied)
the indicator will be illuminated.

Select Switch:

Alternate depression of switch will place the
Printer in ready-position to receive data. When
selected the indicator will be illuminated.

Top of Form Switch:

Depression of this switch will cause Vertical
Format Reader to seek Top of Form position
as indicated by the paper tape.

Forms Override Switch:

When paper empty exists (Paper Out Indicator
goes ON) the Forms Override switch may be
depressed allowing the Printer to complete the
existing form being printed.
        Note: This switch must be pressed and
                held during Print Operation.

Hardware Alarm:

Indicates that the print head has traveled to
either right or left extreme (moving beyond
the Limit Switch).

Paper Out:

Indicates no more paper in Paper Supply Rack.

Remote Line Feed:

A single line feed occurs each time
the switch is pressed.

Figure 3-2   Operator Panel for Centronics 101A
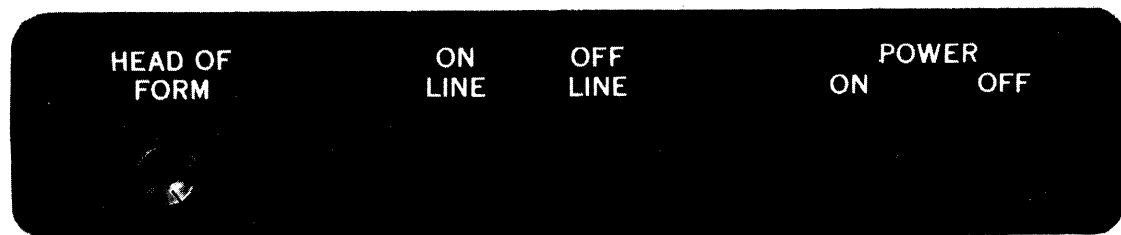
POWER ON/OFF Switch

The POWER switch controls power application to the LA180.

ON LINE/OFF LINE Switch

The ON LINE/OFF LINE switch enables the operator to place the LA180 off-line or on-line with an operating system. When off-line, the HEAD OF FORM switch is activated.

HEAD OF FORM Pushbutton

The HEAD OF FORM pushbutton, when pressed, causes the line printer paper to advance to the top of the form, as determined by the SET VFU and LENGTH OF FORM switches. The HEAD OF FORM pushbutton is only active OFF LINE.

Figure 3-3   Front Panel LA180 Operator Controls
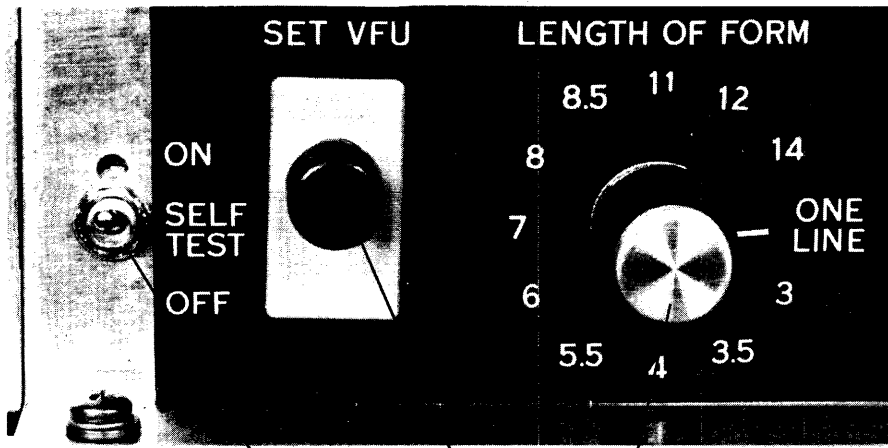
7595-10

LENGTH OF FORM Switch

The LENGTH OF FORM switch is set to the number corresponding to the form length in inches. To set the form length to 11 inches, set the switch to 11. (The new switch setting is delayed until one form passes through the LA180 at the old switch setting. Pressing SET VFU eliminates the one form delay.)

SET VFU Pushbutton

The LENGTH OF FORM switch enables the LA180 to determine the length of the forms; however, the LA180 does not know where the form begins. Pressing SET VFU establishes the starting point on the form.

SELF TEST SWITCH

In the on-line mode, setting the SELF TEST switch to ON causes the LA180 to print out all the ASCII characters.

NOTE

When performing a self-test, 14-7/8-inch (132-column) paper must be used.

Figure 3-4   Internal LA180 Operator Controls

3.3.1 Loading Model LP01

The following procedure is to be used when loading paper into the 80-column LP01 model line printer. More detailed instructions including illustrations, are given in Section 3 of the *Data Products, Model 2310, Line/Printer Manual.*

1. Open front door of cabinet to gain access to maintenance panel and turn main ac power switch on. Verify that control panel POWER and PAPER FAULT indicators both light.

2. Open the drum gate by moving the drum gate latch knob to the left and up. Swing drum gate open. Verify that DRUM GATE indicator lights.

3. Lift control panel TOP OF FORM switch and release to move tractors to correct loading position.

4. Adjust the COPIES CONTROL lever to the proper number for the number of copies to be made. For example, set to 1-2 for single forms; set to 5-6 for 6-part forms.

5. Open spring-loaded pressure plates on both tractors.

6. Place paper on tractor pins.

7. If required, adjust right-hand tractor paper width adjustment for proper paper width. This is accomplished by loosening the set screw. Make certain that the right-hand tractor is tightened in place after it is adjusted.

8. Adjust paper so that a perforation is pointed to by the two red arrows (top-of-form indicators). Paper should lie smoothly between tractors without wrinkling or tearing the feed holes.

9. Close spring-loaded pressure plates on both tractors.

10. Close drum gate and lock into position with drum gate latch. After approximately 10 seconds, the control panel READY indicator should light. If it does not, check to see if any error is indicated. An error is indicated if one of the following lights is on: DRUM GATE, PAPER FAULT, or PRINT INHIBIT.

11. Lift TOP OF FORM switch several times to ensure paper is feeding properly.

12. Set system to on-line mode by lifting ON LINE/OFF LINE switch and verifying that ON LINE indicator lights. At this point, printed matter can be aligned with the paper lines by rotating the paper vertical adjustment knob.

3.3.2 Loading Model LP02

The following procedure is to be used when loading paper into the 132-column LP02 model line printer. More detailed instructions, including illustrations, are given in Section 3 of the *Data Products, Model 2410, Line/Printer Manual.*

1. Verify that circuit breaker CB1 is ON (lift maintenance panel access cover to check), and that the POWER and PAPER FAULT indicators are lit.

2. Lift and latch printer window; unlatch and open drum gate and ensure that DRUM GATE indicator lights.

3. Lift control panel TOP OF FORM switch and release to move tractors to correct loading position.

4. Set the COPIES CONTROL lever to the number of copies desired.

5. Open the spring-loaded pressure plates on both tractors.

6. Place paper on tractor pins. If paper width adjustment is required, loosen paper width adjustment levers, set tractors to correct paper width, and tighten levers.

7. Adjust paper so that a perforation is pointed to by the two arrows (top-of-form indicators). Paper should lie smoothly between tractors without wrinkling or tearing the feed holes.

8. Close pressure plates on both tractors.

9. Close and latch drum gate; verify that both PAPER FAULT and DRUM GATE indicators go off.

10. Unlatch and close printer window.

11. Wait for READY indicator to light (approximately 10 seconds after drum gate is closed).

12. Ensure PRINT INHIBIT switch is down and PRINT INHIBIT indicator is off.

13. Set ON LINE/OFF LINE switch to ON LINE position and release. Verify that ON LINE indicator lights.

14. Observe printer operation and adjust as necessary. If lined paper is used, the characters being printed can be set to appear directly on the print line by adjusting the VERTICAL PAPER POSITION control.

3.3.3 Loading Model LP04

The following procedure is to be used when loading paper into the LP04 line printer. More detailed instructions, including illustrations, are given in Section 3 of the *Data Products Model 2470 Line/Printer Technical Manual.*

1. Verify that POWER and PAPER FAULT indicators both light.

2. Lift printer window and unlatch and open drum gate.

3. Press and release TOP OF FORM switch on control panel.

4. Set COPIES CONTROL lever to the number of copies desired.

5. Position upper and lower *left* tractors in proper detent so that vertical alignment is achieved.

6. Rotate horizontal tension thumbwheels completely clockwise on both upper and lower *right* tractors.

7. Unlock upper and lower tractor locks on right tractors and move to extreme right.

8. Open all tractor pressure plates.

9. Install left edge of paper in upper left tractor and close its pressure plate.

10. Slide upper right tractor to position of form feed holes to allow alignment of tractor feed pins with form feed holes. Lock upper right tractor and close tractor pressure plate.

11. Install paper in lower left tractor and close pressure plate.

12. Slide lower right tractor to position and lock. Close right pressure plate.

13. Adjust VERTICAL PAPER POSITION knob until proper vertical paper tension is achieved.

14. Adjust horizontal tension thumbwheels or both *right* tractors until proper horizontal paper tension is achieved.

15. Move RUN/ADJUST lever to ADJUST position and rotate paper drive mechanism by use of the PAPER DRIVE knob until top-of-form is aligned to position.

16. Move RUN/ADJUST lever to RUN position.

17. Close and latch drum gate; close printer window.

18. Press top-of-form switch several times to ensure that paper is feeding correctly.

3.3.4 Loading Model LP05

The following procedure is to be used when loading paper into the LP05 line printer. More detailed instructions including illustrations are given in Section 4 of the *Data Products Model 2230 Line/Printer Technical Manual.*

1. Lift printer cover.

2. Pull drum gate latch forward.

3. Swing drum gate fully open.

4. Set the power circuit breaker to on and press and release the TOP OF FORM switch on the control panel. The tractors should automatically advance to the top-of-form position.

5. Open the spring-loaded pressure plates.

6. Place the paper in the tractors and close the pressure plates.

7. Loosen both of the paper width adjustment guides and move both of the tractors laterally to adjust the correct paper width. Tighten the paper width adjustment guides.

8. Align the perforations in the paper with the top-of-form index line by setting the FORMS RESET switch to the down position and rotating the tractor shaft by using the coarse paper advance adjustment knob. Then set the FORMS RESET switch to the up position.

9. Adjust the horizontal position of the paper by using the horizontal paper positioning knob. Use the horizontal indentation index marks as a guide.

10. Close and latch the drum gate.

11. Close the printer cover.

12. Use the fine paper advance adjustment knob to correct any small misalignment in the print-out during operation.

3.3.5 Loading the Model LA180 Line Printer

The following procedure is to be used when loading paper into the LA180 line printer. More detailed instructions including illustrations are given in the LA180 Maintenance Manual, Chapter 3, Paragraphs 3.3 through 3.5.

1. Set the POWER switch to OFF.

2. Lift the cover.

3. Place the tractor-feed paper on the floor between the legs of the LA180. (The term tractor-feed refers to the holes on either side of the paper.)

NOTE
Ensure that the leading edge of the forms is directly below and parallel to the feed slot.

4. Open the left tractor cover so that the tractor pins are exposed.

5. Move the carriage adjustment lever to the highest number (toward operator).

6. Feed the paper through the load channel under the terminal and align the left paper margin holes over the left tractor pins.

7. Close the left tractor cover.

8. Loosen the tractor adjustment knob on the right tractor about 1/2 turn.

9. Open the right tractor cover and slide the tractor to a position where the holes on the right paper margin align directly over the tractor pins.

10. Close the tractor cover.

NOTE
Ensure that the paper does not pull against the tractor pins or bow in the middle.

11. Tighten the tractor adjustment.

12. Set the LENGTH OF FORM switch to the number corresponding to the form length and proceed to the impression adjustment.

IMPRESSION ADJUSTMENT

NOTE
The carriage adjustment lever is normally set forward (to notch number 1) for single thickness paper. The following procedure is applicable only to multipart forms.

1. Set the POWER switch to OFF.

2. Set the carriage adjustment lever to the number corresponding to the number of parts in the form.

3. Turn the paper advance knob counterclockwise while moving the carriage adjustment lever forward one notch at a time until the paper smudges; then move the lever back one notch at a time until the paper no longer smudges.

4. Set the POWER switch to ON and resume operation.

NOTE
If the impression is unsatisfactory due to a worn ribbon, perform the ribbon installation procedure. A worn ribbon is indicated when the first copy in a multipart copy is poor but the remaining copies are good.

3.4 OPERATIONAL TESTS

Operational tests of the LP11 Line Printer system can be run by loading the MAINDEC-11-DZLPA program (use MAINDEC-11-DZLPK for the LP05) and running the diagnostic. Operational tests of the LS11 Line Printer system can be run using the MAINDEC-11-DZLSA-A diagnostic program. Operational tests of the LA11 Line Printer system can be run using the MAINDEC-11-DZLAEA diagnostic program. These programs test all operational characteristics of the printer including timing of paper movement and print rates. If any problems occur, refer to maintenance and troubleshooting in the appropriate line printer manual.

<div align="right">

CHAPTER 4
PROGRAMMING

</div>

4.1 GENERAL

4.1.1 LP11

Characters are serially loaded into the line printer one character at a time under program control. The characters are loaded into the printer memory by means of the line printer data buffer (LPDB) in the LP11 Controller. When the printer memory becomes full (20 characters for LP01 model and 24 characters for LP02 model) the characters are automatically printed out. In the LP04 and LP05 models, the characters in the buffer are printed out only when one of three special non-printing characters is recognized. This process continues until the full 80 columns (or 132 columns) have been printed, or until one of three special non-printing characters is recognized. These special characters are described in Table 4-1.

<div align="center">

Table 4-1
LP11 Non-Printing Characters

</div>

Mnemonic	Octal Code	Name	Function
CR	015	Carriage Return	Causes the currently stored characters to be printed; then resets column counter to 1 (next printing character loaded is printed in column 1). Does not advance paper.
PF	012	Paper Feed	Causes the currently stored characters to be printed; then resets column counter to 1 and advances paper one line.
FF	014	Form Feed	Functions the same as PF above except paper is advanced to top of next page.

Note: In all cases of paper advance (PF and FF), the printer automatically skips the last line on the page and spaces two lines at the top of the next page.

4.1.2 LS11

ASCII-coded characters are loaded into the line printer one character at a time. The characters are loaded into the printer memory from the LS11 programmable data buffer register. When the printer memory is full (132 characters), the characters are automatically printed out. Special nonprinting characters serve as line printer commands and direct line printer functions as shown in Table 4-2.

Table 4-2
LS11 Line Printer Commands and Functions

Octal ASCII Code	Character	Name	Function
007	BEL	Bell	Generates a 2-second audible tone from the speaker in the line printer unit.
012	LF	Line Feed	Performs a print cycle and a carriage return, and then advances the paper one line.
013	VT	Vertical Tab	Advances the line printer paper to the next hole position in Channel 2 of the line printer tape reader. Does not perform a carriage return or a print cycle.
014	FF	Form Feed	Performs a print cycle and a carriage return, then advances the paper to the next hole position in Channel 1 of the tape reader.
015	CR	Carriage Return	Causes all characters in the line printer character memory to be printed. There is no automatic line feed.
016	ELONG	Elongated Character	Doubles the size of horizontal printing axis, thus lowering the line capacity from 132 to 66 characters/line. This command code may be sent to the printer anywhere in a line, but, once sent, causes the entire line to be printed in the elongated format. The command must be given for each line to be elongated. If the character memory contains more than 66 characters when this command is in the line, then the 67th and all following characters are lost.
021	SEL	Select	Allows the program to place the printer on-line without having to depress the Select switch.
023	DSEL	Deselect	Allows the program to place the printer off-line without having to depress the Select switch.
177	DEL	Delete	Used to prime the Centronics line printer by destroying all characters in the character memory and performing a carriage return. There is no line feed, and printing does not occur.

4.1.3 LA11

Seven-bit ASCII coded characters plus parity (optional) from the LA11 are processed through a Single Character Buffer (SCB) in the line printer. This SCB loads the Character Buffer RAM under program control with a line of data. After each character is stored in memory, a read function is performed to determine whether the line should be terminated (LF, FF, or CR will terminate the input functions), causing the line of stored data to be printed. The Character Buffer RAM is capable of storing 132 printable characters plus nonprintable characters such as the commands listed in Table 4-3.

Table 4-3
LA11 Line Printer Commands and Functions

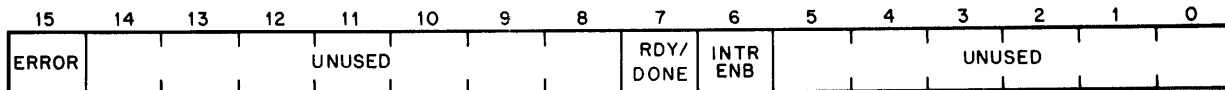| Octal ASCII Code	Character	Name	Function
007	BEL	Bell	Activate alarm bell
010	BS	Backspace	Backspace one position
012	LF	Line Feed	Performs a print cycle and a carriage return and then advances the paper one line
014	FF	Form Feed	Performs a print cycle and a carriage return and then advances the paper to the first printable line at the top of the next form.
015	CR	Carriage Return	Causes all characters in the LA180 memory to be printed and performs a carriage return.
177	DEL	Delete	Clears memory of all data.

4.2 DEVICE REGISTERS

All software control of the Line Printer controller is performed by means of two device registers. These registers have been assigned bus addresses and can be read or loaded by any PDP-11 instruction that refers to their address. The device registers and associated addresses are listed in Table 4-4.

Table 4-4
Standard Device Register Assignments

Register	Mnemonic	Address
Line Printer Control and Status Register	LPCS	777514
Line Printer Data Buffer Register	LPDB	777516

Figures 4-1 and 4-2 show the bit assignments within the two device registers. Loading *read only* bits has no effect on the bit position. Loading *unused* bits results in data being lost in the corresponding bit position.

11-0329

Figure 4-1   Line Printer Status Register Bit Assignments

Bit	Name	Meaning and Operation
15	ERROR	Asserted (1) whenever an error condition exists in the line printer. Error conditions are listed below.

LP11 Errors:

a.	power off	e.	PRINT INHIBIT switch off
b.	no paper	f.	printer off-line
c.	printer drum gate open	g.	torn paper
d.	over-temperature alarm		

LS11 Errors:

a.	paper empty	c.	light detection
b.	hardware alarm	d.	select

LA11 Errors:
a.   fault (paper fault)
b.   on-line switch (in off position)

Reset only by manual correction of error condition. Read only.

Bit	Name	Meaning and Operation
14–08	Unused	
07	READY (LP11)	Asserted (1) whenever printer is ready for next character to be loaded. Indicates that previous function is either complete or has been started and continued to a point where the printer can accept the next command. This bit, which must be on-line, is set by the printer; if the M7258 controller is being used, READY can be set by INIT. Read only.

4-4

Bit	Name	Meaning and Operation
07 (Cont)	DONE (LS11/LA11)	Asserted (1) when the line printer is ready to accept another character. DONE is set by INIT and cleared by loading the LSDB. If Interrupt Enable is also set, the LS11 starts an interrupt sequence.
06	INTR ENB	Set or cleared under program control. Cleared by INIT (initialize) signal on Unibus. (INIT caused by programmed RESET instruction, console START function, or a power up or power down condition.) When set, an interrupt is requested when READY or ERROR becomes a 1.
05–00	Unused	

15	7 6	0
UNUSED		DATA
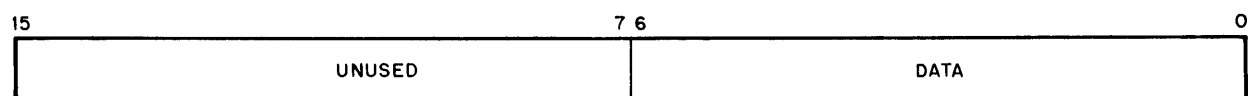
11-0330

Figure 4-2   Line Printer Data Buffer Register Bit Assignments

Bit	Name	Meaning and Operation
15–07	Unused	If these bits are loaded, data is lost in these bits.
06–00	DATA	7-bit ASCII character buffer. Characters are transferred to the line printer by loading this buffer. Can be loaded from the bus. Load only. Data in this buffer cannot be read. Always reads as all 0s.

4.3 INTERRUPTS

When the interrupt is enabled (INTR ENB set) and either the READY or ERROR bit is set, an interrupt request is generated. When the interrupt is granted, it normally uses the vector block at location 200. The normal priority level is BR4. However, both the vector block and this level may be changed by using a different priority jumper plug in the M7930 or M7258 controller module.

4.4 ADDRESSES

Addresses 777510 and 777512 are unused for the LS11/LA11 (and the LP11 if using the M7258) and will not respond when addressed (NO SSYN). The controller will respond to 777514 (LSCS) and 777516 (LSDB). If the LP11 is using the M7930, the controller will respond to 777510 – 777517.

The Unibus address contains 18 bits [A(17:00)], offering the capability of addressing 256K memory locations, each of which is an 8-bit byte. The basic PDP-11 processors provide program control for only 16 bits of address information, which address a maximum of 64K bytes or 32K words. The address word length and bus width in these processors are 16 bits (2 bytes). A word operation accesses two locations at once. The Unibus word address contains the even-numbered location only, and the next higher odd location is selected also to provide a 16-bit word. A byte operation accesses an odd or even location to select an 8-bit byte.

When a PDP-11 processor with a maximum limit of 64K memory locations is used, bits A17 and A16 are forced to 1s if bits A(15:13) are all 1s when the processor is master. With bits A(17:13) all 1s, the last 8K locations are relocated to become the highest locations accessible by the bus. All device addresses and internal processor locations are assigned in these 8K locations. The assigned addresses for the LS11/LP11/LA11 controller registers are in these locations.

4.5 TIMING CONSIDERATIONS

The Data Products line printer contains a 20-character buffer (22-character buffer in the 132-column model) that is loaded by means of the LPDB register in the LP11 Controller. Data may be transferred at a rate of approximately 500 kHz until the printer buffer is full. Each time a character is loaded, the READY bit is cleared for approximately 1 μs. When the buffer is full, the READY flag remains cleared until the buffer contents have been printed. If a non-printing command character (CR, PF, or FF) is detected, the print operation is started and the remainder of the buffer is automatically filled with spaces. The time required to print the contents of the buffer depends on the position of the print drum. The nominal time is 34 ms. The paper advance time for a single line feed is a maximum 20 ms for the LP01 and LP02, 14 ms for the LP04, and 50 ms for the LP05.

Since printing begins after a PF or FF command, the READY bit remains cleared for approximately 34 ms. The READY bit is again set as soon as the buffer is available, even though the actual paper movement is not completed. If the buffer is full and another PF command is given, the READY bit remains cleared for approximately 54 ms (20 ms for advancing paper plus 34 ms for printing) for the LP01 and LP02, 48 ms (14 ms for advancing paper plus 34 ms for printing) for the LP04, or 84 ms (50 ms for advancing paper plus 34 ms for printing) for the LP05.

These timing considerations should be taken into account when programming the LP11 Line Printer System to ensure maximum printing speed and minimum program overhead.

Standard Teletype[®] output routines may be used with the line printer, but they do not yield maximum printing rates because of CR-PF pairs. The CR command is not needed on the LP11 Line Printer because the PF also resets the column pointer to 0. The CR-PF command pair does not cause any functional problems; however, the printer must take the time required to scan and *print* the empty buffer when it recognizes the PF command. This is an unnecessary step because the CR command has previously caused the buffer contents to be printed.

NOTE
If no PF or FF commands are issued after a full row of characters are printed, additional characters will overprint on the same line.

4.6 LS11 vs LP11 PROGRAMMING CONSIDERATIONS
Because the LS11 and the LP11 occupy the same register address locations, vector address location, and priority level, it is advantageous that they both utilize the same software. The significant differences between the LS11/LA11 and the LP11 are in the respective character commands. The software-related differences are listed in Table 4-5.

Both the LP11 and the LS11 will print when their buffers are full, but the buffer sizes are 20 and 132 characters, respectively. However, the LA11 initiates its print cycle when it sees a line terminator (LF, FF or CR).

Common drivers for the LS11, the LP11 and the LA11 can be written, provided the following differences are noted:

    a.   No DEL (177_8) or ELONG (016_8) codes can be issued.

    b.   The VT (013_8) feature cannot be used.

[®]Teletype is a registered trademark of Teletype Corporation.

Table 4-5
LS11, LP11 and LA11 Commands

Command	LS11	LP11	LA11
007_8	BELL (A 2-second audible tone)	Prints a space	*BEL — Bell 1. Activate alarm bell
010_8			BS — Backspace 1. Backspace one position
012_8	LF — Line Feed 1. Print cycle 2. Carriage return 3. Advances paper one line	PF — Paper Feed 1. Print cycle 2. Carriage return 3. Advances paper one line	LF — Line Feed 1. Print cycle 2. Carriage return 3. Advances paper one line
013_8	VT — Vertical Tab 1. Advances paper to the next hole position in Channel 2	VT — Vertical Tab 1. Prints a space	
014_8	FF — Form Feed 1. Print cycle 2. Carriage return 3. Advances paper to the next hole position in Channel 1	FF — Form Feed 1. Print cycle 2. Carriage return 3. Advances paper to the third line of the next form	FF — Form Feed 1. Print cycle 2. Carriage return 3. Advances paper to the first line of next form
015_8	CR — Carriage Return 1. Print cycle 2. Carriage return 3. No line feed	CR — Carriage Return 1. Print cycle 2. Carriage return 3. No line feed	CR — Carriage Return 1. Causes all characters in LA180 memory to be printed 2. Carriage return
016_8	ELONG — Elongated Character 1. Doubles the horizontal printing axis	ELONG — Elongated Character 1. Prints a space	
021_8	SEL — Select 1. Allows the software to put the printer on-line	SEL — Select 1. Prints a space	
023_8	DSEL — Deselect 1. Allows the software to put the printer off-line	DSEL — Deselect 1. Prints a space	
177_8	DEL — Delete 1. Destroys all characters in 2. Carriage return 3. No line feed 4. No printing	DEL — Delete 1. Prints a space	DEL — Delete 1. Clears memory of all data

*The LA180 produces three different audible alarm signals:

1. Continuous tone — indicates a carriage jam or failure.
2. Repetitive beeping — indicates an out of paper condition or a series of bell codes.
3. Single Beep — indicates a bell code.

4-7

c. All letters must be upper case for LP11 and LS11. The LA11 can be either upper or lower case letters.

d. The Centronics tape for a FF must slew the proper number of lines.

e. An 80-character line must be used if a 132-character LP11 is not available.

f. No SEL (021_8) or DSEL (023_8) codes can be issued.

4.7 PROGRAM EXAMPLES

The following two examples represent typical programs used to control the line printer by means of an interrupt service routine.

The first routine requires 18 words and approximately 440 μs to load 20 characters. This represents a 1.06 percent overhead to the system when printing all 80 columns at the maximum output rate. (These figures are based on using an LP01 line printer with a PDP-11/20 processor. The figures for an LP04 used with a PDP-11/45 processor are 1.5 ms to load 132 characters. This represents a 4.4 percent overhead when printing all 132 columns at the maximum output rate.) This routine may be speeded up by saving and restoring R1, R2, and R3 and loading these registers with the LPCS, LPDB, and BUFEND values. If this is done, the routine requires approximately 380 μs and represents 0.91 percent system overhead for the PDP-11/20 and an LP01. Program storage is 26 words in this case.

a. **Interrupt Service Routine (Example 1)**

	177514				LPCS=177514			;CONTROL AND STATUS ;REGISTER
	177516				LPDB=177516			;DATA BUFFER REGISTER
	000007				SP=%7			
	000200				.=200			;ORIGIN FOR LPT VECTOR
000200	002000				.WORD	LPSERV		;VECTOR TO SERVICE ;ROUTINE
000202	000200				.WORD	200		;SERVICE AT PRIORITY ;LEVEL 4
	001000				.=1000			
001000	001000				.			
001002	052767	000100	176504	MAIN:	BIS	#100,	LPCS	;ENABLE INTERRUPT
001010	001010				.			
001012	001012				.			
	002000				.=2000			
002000	005767	175510		LPSERV:	TST	LPCS		;CHECK FOR ERROR
002004	100417				BMI	ERROR		
002006	010047				MOV	%0,	–(SP)	;SAVE R0
002010	016700	000030			MOV	BUFADR,	%0	;GET BUFFER POINTER
002014	112067	175476		LOAD:	MOVB	(%0) +,	LPDB	;LOAD PRINTER BUFFER
002020	020067	000020			CMP	%0,	BUFEND	;END OF DATA?
002024	101007				BHI	PRCOMP		;YES, GO TO PRINT ;COMPLETE
002026	105767	175462			TSTB	LPCS		;NO, CHECK READY
002032	100770				BMI	LOAD		;NOT FULL, GET ANOTHER ;CHARACTER
002034	010067	000004		EXIT:	MOV	%0,	BUFADR	;SAVE BUFFER POINTER
002040	012700				MOV	(SP) +,	%0	;RESTORE R0
002042	000002				RTI			;BACK TO MAIN PROGRAM
				BUFADR:				;BUFFER DATA POINTER
				BUFEND:				;BUFFER END ADDRESS
				ERROR:				;START OF ERROR ;ROUTINE
				PRCOMP:				;START OF ROUTINE FOR ;PRINTER COMPLETE
	000001				.END			

BUFADR	002044
BUFEND	002044
ERROR	002044
EXIT	002034
LOAD	002014
LPCS	177514
LPDB	177516

```
                                    LPSERV      002000
                                    MAIN        001002
                                    PRCOMP      002044
                                    SP          000007R
```

ERRORS DETECTED: 0
RUN-TIME: 0 SECONDS
4K CORE USED

b.   **Interrupt Service Subroutine (Example 2)**

```
                 ;REGISTERS
        000000   R0      =      %0
        000001   R1      =      %1
        000002   R2      =      %2
        000003   R3      =      %3
        000004   R4      =      %4
        000005   R5      =      %5
        000006   SP      =      %6
        000007   PC      =      %7
                 ;INTERRUPT DRIVEN LINE-PRINTER SUBROUTINE
                 ;
                 ;CALL:   MOV    #PARAM,R0    ;ADDRESS OF PARAMETER BLOCK
                 ;        JSR    PC,LPTIO     ;CALL LPT DRIVER
                 ;        .WORD  INIERH       ;INITIALIZATION ERROR ADDRESS
                 ;        . . .               ;NORMAL RETURN – I/O IN PROGRESS

                 ;        . . .

                 ;
                 ;THE PARAMETERS ARE:
                 ;PARAM:  .WORD  LPCOUNT      ;POSITIVE BYTE COUNT
                 ;        .WORD  LPBUF        ;DATA BUFFER ADDRESS
                 ;        .WORD  LPRET        ;SUBROUTINE ADDRESSES:
                 ;                            ;   LPRET FOR ON-LINE ERRORS
                 ;                            ;   LPRET+2 FOR NORMAL I/O COMPL
                 ;
                 ;LINE PRINTER DEVICE REGISTERS:
                 ;
        177514   LPCS    =      177514       ;CONTROL AND STATUS
        177516   LPDB    =      177516       ;DATA BUFFER
                 ;
                 ;INITIALIZE OPERATION
                 ;
000000  005767   LPTIO:  TST    LPCS         ;LINE PRINTER OK?
        177510
000004  100001           BPL    .+4          ;YES
000006  013607           MOV    @(SP)+,PC    ;NO – POP INITIALIZATION ERROR A
000010  062716           ADD    #2,(SP)      ;SKIP OVER ERROR ADDRESS
        000002
```

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000014	010067		MOV	R0, LPTPAR	;SAVE PARAMETER ADDRESS
	000010				
000020	012767		MOV	#100, LPCS	;ENABLE INTERRUPT, AND THEN INT
	000100				
	177466				
000026	000207		RTS	PC	;RETURN
000030	000000	LPTPAR:	.WORD	0	;ADDRESS OF PARAMETERS
		;			
		;SERVICE INTERRUPTS			
		;			
000032	010046	LPTINT:	MOV	R0, -(SP)	;SAVE R0, R1, R2 ON STACK
000034	010146		MOV	R1, -(SP)	
000036	010246		MOV	R2, -(SP)	
000040	016700		MOV	LPTPAR,R0	;POINTS TO PARAMETER BLOCK
	177764				
000044	012701		MOV	#LPCS,R1	;POINTS TO STATUS REGISTER
	177514				
000050	012702		MOV	#LPDB,R2	;POINTS TO DATA REGISTER
	177516				
000054	005711		TST	(R1)	;ANY ERRORS?
000056	100003		BPL	.+10	;NO
000060	004770		JSR	PC,@4(R0)	;YES – GO TO ERROR SUBROUTINE
	000004				
000064	000411		BR	LPTIN3	;CLEAN UP STACK AND EXIT
000066	005720		TST	(R0)+	;MAKE R0 POINT TO BUFFER ADDRESS
000070	005740	LPTIN1:	TST	-(R0)	;TEST BYTE COUNT
000072	001412		BEQ	LPTIN2	;YES – DONE
000074	005320		DEC	(R0)+	;DECREMENT COUNT
000076	117012		MOVB	@(R0),(R2)	;MOVE CHARACTER TO LPDB
	000000				
000102	005210		INC	(R0)	;UPDATE BUFFER POINTER
000104	105711		TSTB	(R1)	;IS PRINTER READY?
000106	100770		BMI	LPTIN1	;YES – MOVE IN ANOTHER CHARACTER
000110	012602	LPTIN3:	MOV	(SP)+, R2	;RESTORE R2, R1, R0
000112	012601		MOV	(SP)+, R1	
000114	012600		MOV	(SP)+, R0	
000116	000002		RTI		;RETURN
000120	005011	LPTIN2:	CLR	(R1)	;DISABLE THE INTERRUPT
000122	016001		MOV	4(R0), R1	;TRANSFER COMPLETE – SET UP CALL
	000004				
000126	062701		ADD	#2, R1	;TO COMPLETION ROUTINE
	000002				
000132	004711		JSR	PC,(R1)	;NOW CALL IT
000134	000765		BR	LPTIN3	;CLEAN UP STACK AND EXIT
	000200		.=200		;ORIGIN FOR LPT VECTOR
000200	000032		.WORD	LPTINT	;INTERRUPT HANDLER
000202	000200		.WORD	200	;PRIORITY 4

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```
        000001                  .END


LPCS    =  177514        LPDB    =  177516      LPTINT    000032      LPTIN1      000070
LPTIN2     000120        LPTIN3     000110      LPTIO     000000      LPTPAR      000030
PC      =%000007        R0      =%000000       R1      =%000001      R2        =%000002
R3      =%000003        R4      =%000004       R5      =%000005      SP        =%000006
           =  000204
```

Reader's Comments

LP11/LS11/LA11
LINE PRINTER USER'S MANUAL
EK-LP11S-OP-001

Your comments and suggestions will help us in our continuous effort to improve the quality and usefulness of our publications.

What is your general reaction to this manual? In your judgment is it complete, accurate, well organized, well written, etc.? Is it easy to use? _____

_____

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_____

What features are most useful? _____

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What faults do you find with the manual? _____

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Does this manual satisfy the need you think it was intended to satisfy? _____

Does it satisfy *your* needs? _____ Why? _____

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_____

Would you please indicate any factual errors you have found. _____

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_____

_____

Please describe your position. _____

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Street _____ Department _____

City _____ State _____ Zip or Country _____

CUT OUT ON DOTTED LINE

— — — — — — — — — — — — Fold Here — — — — — — — — — — — — —

— — — — — — — — Do Not Tear - Fold Here and Staple — — — — — — — — —