EK-OLP27-UG-002

LP27 Line Printer

User's Guide

Prepared by Computer Special Systems
of
Digital Equipment Corporation

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WARNING

This equipment generates, uses, and may emit radio frequency energy. The equipment has been type-tested and found to comply with the limits for a Class A computing device pursuant to Subpart J of Part 15 of FCC Rules, which are designed to provide reasonable protection against such radio frequency interference when operated in a commercial environment. Opeation of this equipment in a residential area may cause interference, in which case the user, at his own expense, may be required to correct the interference.

Interference can be resolved by turning the equipment on and off. Further correction, if required, can be made by one or more of the following measures.

- Reorient the receiving antenna.
- Move or relocate the printer away from the receiver.
- Plug the receiver into a different outlet so that printer and receiver are on different branch circuits.

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PREFACE

This manual provides the information necessary to install and operate the LP27 Line Printer on several VAX-11 and DECsystem-10/-20 processors with standard interfaces and cable configurations. It is assumed that the installer/operator is unfamiliar with the printer but has previous knowledge and/or experience with the host processor system.

Chapters 1, 2, and 3 contain the following information.

CHAPTER 1 -- Description of the LP27 printer, including functions and specifications.

CHAPTER 2 -- Installation with emphasis on site preparation, unpacking, inspection, interconnect, self-testing, and system diagnostic testing.

CHAPTER 3 -- Description of the operation (including controls and indicators), ribbon changing, band replacement, and paper selection.

CHAPTER 1
INTRODUCTION

1.1 OVERVIEW

The LP27 Line Printer (hereinafter referred to as "printer") is a general-purpose, 132-column, impact line printer that uses a continuous steel band font carrier (see Figures 1-1 and 1-2). It prints reliably at 1250 or 800 lines per minute using 64 and 96 character bands, respectively. The printer electronics contains a microprocessor that controls the electrical, mechanical, and electronic functions, and also provides diagnostic testing to detect and indicate malfunctions. In addition, the printer provides operator enabled self-tests with digital status display.

The printer uses a variety of digital, analog, and electromechanical components to accomplish the following tasks.

1. Accept user data from a DIGITAL processor.
2. Process the data for a line of print.
3. Print the data.
4. Move the paper according to a programmed format.

There are two printer versions: short lines version and long lines version. The short lines version can be up to 50 feet from the host processor, while the long lines version can be up to 1000 feet from the host processor.

1.2 FUNCTIONAL DESCRIPTION

The printer consists of the following seven major subsystems (see Figure 1-3).

1. Processing and control
2. Character band drive
3. Paper feed
4. Interface
5. Hammer driver
6. Timing and status
7. Ribbon drive

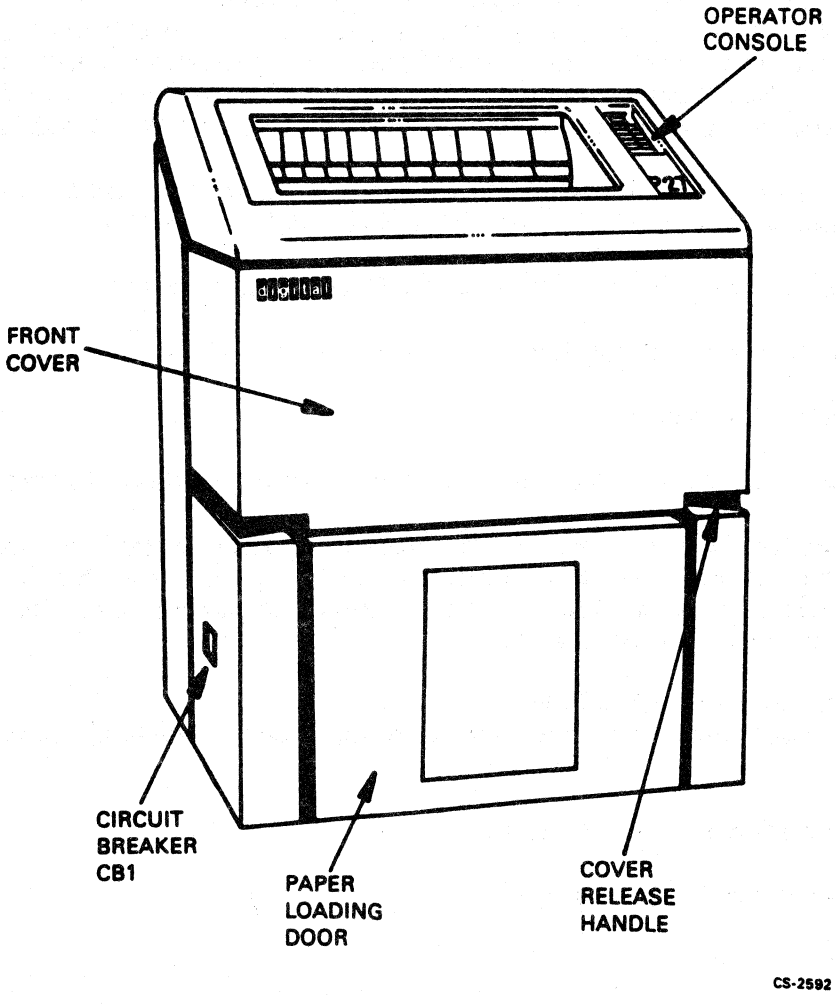


Figure 1-1 LP27 Line Printer, Front View

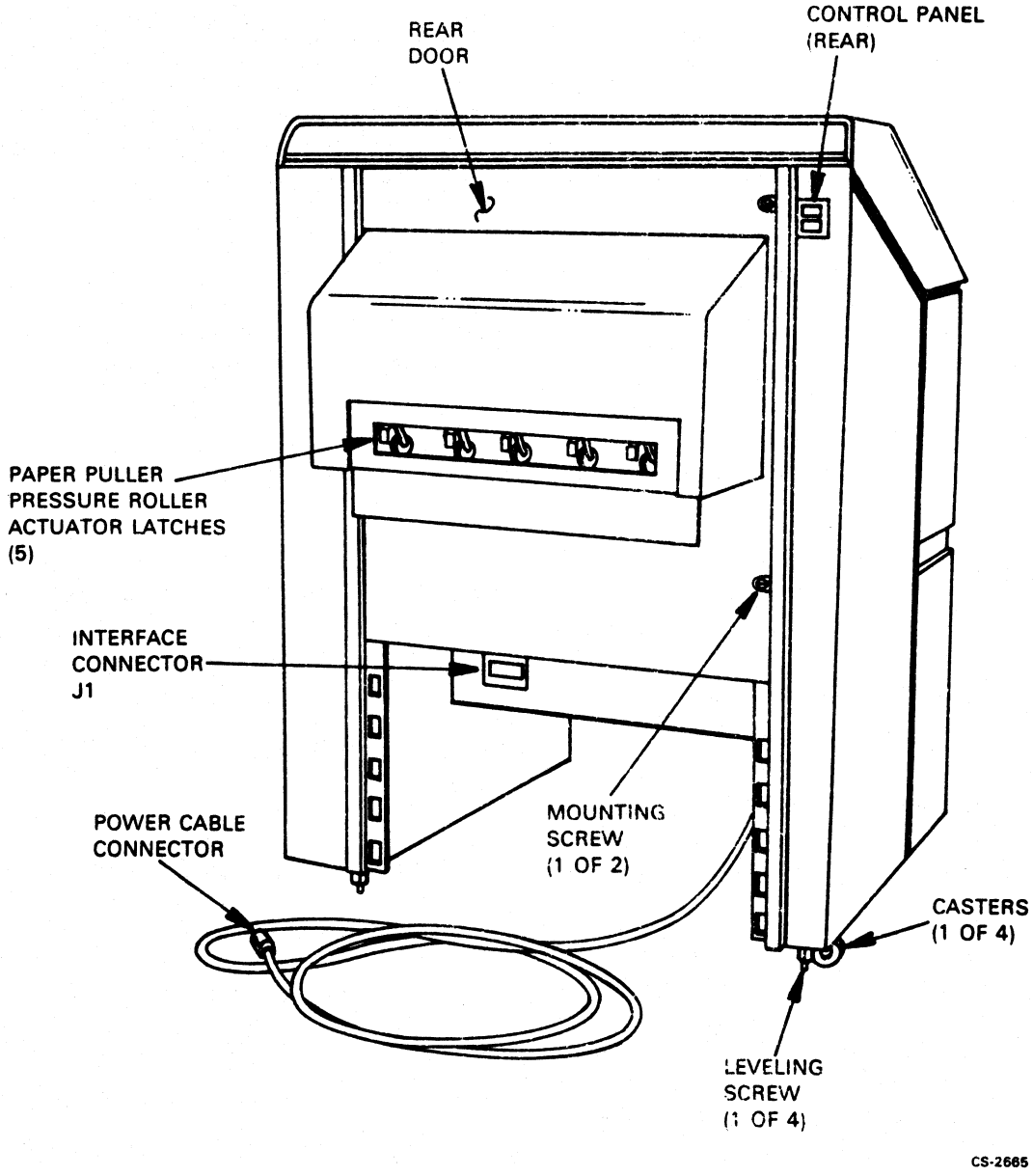


Figure 1-2 LP27 Line Printer, Rear View

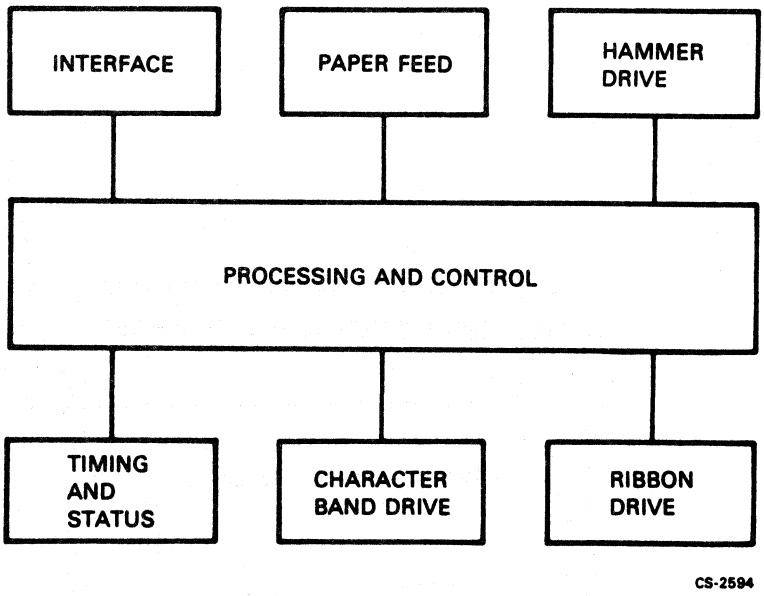


Figure 1-3 Printer System Block Diagram

1.2.1 Processing and Control

The information processing and control function is provided by a bit slice microprocessor and is designed to provide speed, reliability, and flexibility. This microprocessor performs the following functions.

1. Contains the master (or system) program
2. Controls and stores data
3. Identifies character band position and band type
4. Decodes control characters into printer system commands
5. Generates all enabling signals used in printer operation
6. Performs all housekeeping routines within the printer

1.2.2 Character Band Drive

This section of the printer contains the necessary mechanics and electrical and electronic circuitry necessary to perform the following functions.

1. Sense and synchronize the band markings with the system clock so that the proper character will be selected at the desired column position.
2. Provide the logic and drive signals to operate the band drive servo, band position servo, and ribbon drive system.

1.2.3 Paper Feed

The paper feed subsystem consists of the mechanical and electrical components necessary to position and move the paper either under system control or from the operator's panel. The following are the major components of this subsystem.

1. Paper Feed Motors - Four permanent magnet motors drive the paper tractors to advance the paper.

2. Tractors - Four tractors (two above the print area and two below) hold and move the paper. The tractors can be adjusted in both the horizontal and vertical directions to compensate for variations in paper hole spacing.

3. Paper Feed Driver Module - This microprocessor-based module accepts information from the processing and control module and calculates the position data necessary to control the paper feed motors.

4. Paper Motion/Low Detectors - The paper motion detector is located in the upper left tractor assembly. Failure to sense paper motion is interpreted as a fault condition and causes the printer to go off-line. The paper low sensor is located in the lower right tractor assembly. Detection of a paper low condition allows printing to the bottom of the form with the status code Ø1 displayed. In addition, the paper low solenoid operates, raising the cover to alert the operator.

5. Paper Puller - The paper puller runs continously when the printer's POWER switch is turned ON. It prevents paper bounce and provides the correct amount of paper tension for smooth paper slew operation.

1.2.4 Interface

The interface section accepts command and print information from the host processor and distributes the data to the appropriate storage areas within the printer. Similarly, the status of the printer (for example, ready for data) is transmitted back to the host. The signal path from this section to the host is provided by the interface connector located at the rear of the printer.

1.2.5 Hammer Driver

The hammer driver section of the printer accepts control information and actuates the appropriate print hammer when the proper character on the band is aligned with the desired column. There are 132 hammers, one for each column. The hammers are contained on small, replaceable assemblies. Each assembly houses four individual coil and hammer units. Hammer verify circuitry and hammer protect circuitry are used to check on a hammer's failure to fire or a hammer firing when not selected.

1.2.6 Timing and Status

This section of the printer performs the following functions.

1. Synchronizes the band with the printer processor
2. Monitors the power supplies and interlocks
3. Generates the "power on" reset
4. Routes the operator control panel outputs within the printer or to the host system
5. Adjusts the hammer firing time
6. Controls the band speed by timing it with the system clock
7. Monitors voltage faults
8. Routes paper low and paper motion signals
9. Generates hammer pulse reset, hammer trigger, index, ident, and band position counter signals.

1.2.7 Ribbon Drive

The print ribbon is mounted on the band gate assembly and travels vertically between the print band and the paper. It is driven alternately in the forward and reverse directions by two motors, one on each ribbon core. End-of-ribbon travel reversal is accomplished by foil reversing tabs mounted on the ribbon that contact sensing bars on the band gate. The ribbon moves when printing begins, and it stops when printing has ceased. A ribbon deskew mechanism keeps the ribbon horizontally aligned as it winds from one spool to another.

1.3 PRINTER SPECIFICATIONS

Table 1-1 summarizes the printer specifications.

Table 1-1 Specification Summary

Item	Specification	Remarks
Power Supply:		
Input Voltage	100, 120, 127, 220, 230, 240 Vac (+10%, -15%)	
Frequency	47 to 63 Hz	

Table 1-1 Specification Summary (Cont)

Item	Specification	Remarks
Power Requirements	1100 W maximum	Not frequency sensitive. Specific selection of voltage is made by jumper connections on the power supply assembly.
Temperature:		
Operating	10°C to 38°C (50°F to 100°F)	
Storage	-10°C to 50°C (14°F to 122°F)	
Transit	-40°C to 71°C (-40°F to 160°F)	
Humidity:		
Operating	20% to 80% relative humidity	Humidity (noncondensing).
Storage	10% to 90% relative humidity	10% per hour rate of change.
Transit	95% maximum relative humidity	10% per hour rate of change.
Printer Dimensions:		
Weight	257.2 kg (567.0 lb)	
Weight (shipping)	290.0 kg (640.0 lb)	
Height	1240 mm (49 in) 1981 mm (78 in)	Cover closed. Cover open.
Width	889 mm (35 in)	
Depth	965 mm (38 in) 750 mm (29.5 in)	With paper puller. Without paper puller.
Print Speed:		
Character Set	64 96	

Table 1-1 Specification Summary (Cont)

Item	Specification	Remarks
Speed	1250 800	
Printable Columns	132 maximum	
Character Spacing (Horizontal)	10 characters/25.4 mm (1.0 in)	
Line Spacing (Vertical)	6 or 8 lines/25.4 mm (1.0 in)	
Print Method	Impact, ribbon transfer	
Hammer Bank	Mark V hammers, upper and lower hammer banks, each containing 66 Mark V hammers (16 four-hammer modules and 1 two-hammer module each).	
Paper Feed Rate:		
Step	14 ms maximum	Single line advance.
Slew	1270 mm (50 in)/s	Follows the receipt of a control character that causes two or more lines to be slewed.
Format Control	LF, FF, CR, 279.4 mm (11.0 in) Standard form length	

1.4 PRINTER OPTIONS

Table 1-2 describes the eight LP27 printer options that run on the VAX-11, PDP-11, and DECSYSTEM-10/20 processors.

Table 1-2 LP27 Printer Options

DIGITAL Model No	Standard Feature	Used With
LP27-UA	64 and 96 character American bands (minimum: 1200/800 lpm), M7258 controller, 30.00 ft (9.14 m) cable, 120 v.	VAX-11 processor PDP-11 processor
LP27-UB	64 and 96 character American bands (minimum: 1200/800 lpm), M7258 controller, 30.00 ft (9.14 m) cable, 240 V.	VAX-11 processor PDP-11 processor
LP27-VA	64 and 96 character American bands (minimum: 1200/800 lpm), no controller, 30.00 ft (9.14 m) cable, 120 V. DMF32 controller required.	VAX-11 processor
LP27-VB	64 and 96 character American bands (minimum: 1200/800 lpm), no controller, 30.00 ft (9.14 m) cable, 240 V. DMF32 controller required.	VAX-11 processor
LP27-2A	64 and 96 character American bands (minimum: 1200/800 lpm), long line interface, DAVFU, LP20 controller 100.00 ft (30.48 m) cable, 120 V.	DECsystem-10/-20 processor
LP27-2B	64 and 96 character American bands (minimum: 1200/800 lpm), long line interface, DAVFU, LP20 controller, 100.00 ft (30.48 m) cable, 240 V.	DECsystem-10/-20 processor
LP27-DA	64 and 96 character American bands (minimum: 1200/800 lpm), long line interface, M7258/ LLD11-CA controller, 1000 (max) ft (304.8 m) cable, 120 V.	VAX-11 processor PDP-11 processor
LP27-DB	64 and 96 charater American bands (minimum: 1200/800 lpm), long line interface, M7258/ LLD11-CA controller, 1000 (max) ft (304.8 m) cable, 240 V.	VAX-11 processor PDP-11 processor

1.5 APPLICABLE DOCUMENTS

This manual and the complement of DIGITAL documents listed below provides the user/technician with the level of technical information desired.

Title	Document No.
LP27 Line Printer Technical Manual	EK-ØLP27-TM
LLD11 Long Line Driver Option Description	YK-C116C-ØØ
LP27 Line Printer User's Guide	EK-ØLP27-UG
LP2Ø Line Printer System Manual	EK-LP2Ø-TM
LP27 Line Printer Pocket Service Guide	EK-ØLP27-PS

CHAPTER 2
INSTALLATION

This chapter describes the installation of the LP27 Line Printer. A separate section is devoted to each of the following.

1. Site preparation
2. Transporting the printer
3. Unpacking the printer
4. Leveling the printer
5. Inspection
6. Printer power connections
7. Interconnect
8. Self-test
9. Diagnostics test

NOTE
Before unpacking the cartons, inspect for signs of shipping damage. If the shipment has been damaged, call the salesperson through whom the equipment was purchased.

2.1 SITE PREPARATION

The LP27 printer requires a 94.0 cm (37.0 in) wide by 96.5 cm (38.0 in) deep area of floor space that is capable of supporting, as a minimum, 290.0 kg (640.0 lb).

Beyond this mounting space, the LP27 printer also requires room for access to the cabinet, the power receptacle, and an adequate flow of cool air. Figures 2-1 and 2-2 illustrate the space requirements for the printer.

NOTE
Care should be taken to ensure that the power switch is in an accessible place.

2.1.1 Long Line Connector Kit Assembly

If the customer has purchased the LP27-DA/DB, he/she is responsible for preparing the long line cable. The following instructions for assembling the long line connector kit (split-ring ferrule) are provided below and in Figure 2-3. The customer is responsible for detaching or attaching any connector to the long line cable. The instructions are provided here as a service, but assembling the long line cable is not part of the normal installation of the printer.

1. Cut the cable to the desired length and slide ferrule onto cable.

2. Strip the cable jacket 3.81 cm (1.5 in) from the end of the conductors and remove plastic cover and foil.

3. Fold braid back over cable without splitting or slicing the braid. If using foil cable, fold drain wire back over the cable.

4. Trim excess braid or drain wire to approximately 1.52 cm (Ø.6 in) from the end of the cable jacket.

5. Slide ferrule under the braid to the end of the cable jacket. If using drain wire, wrap the drain wire around ferrule, ensuring that the drain wire is NOT left in slotted openings of the ferrule.

6. Terminate conductors with contacts.

7. Insert contacts into rear of the connector (see Table 2-1).

8. Position one half of the cable clamp on the cable and connector. Ensure that the flange of the connector is behind flange gripper of the clamp, and ferrule is positioned in strain-relief grooves of the clamp (see Figure 2-3).

9. Position second half of the cable clamp on top of the cable and secure with attaching hardware.

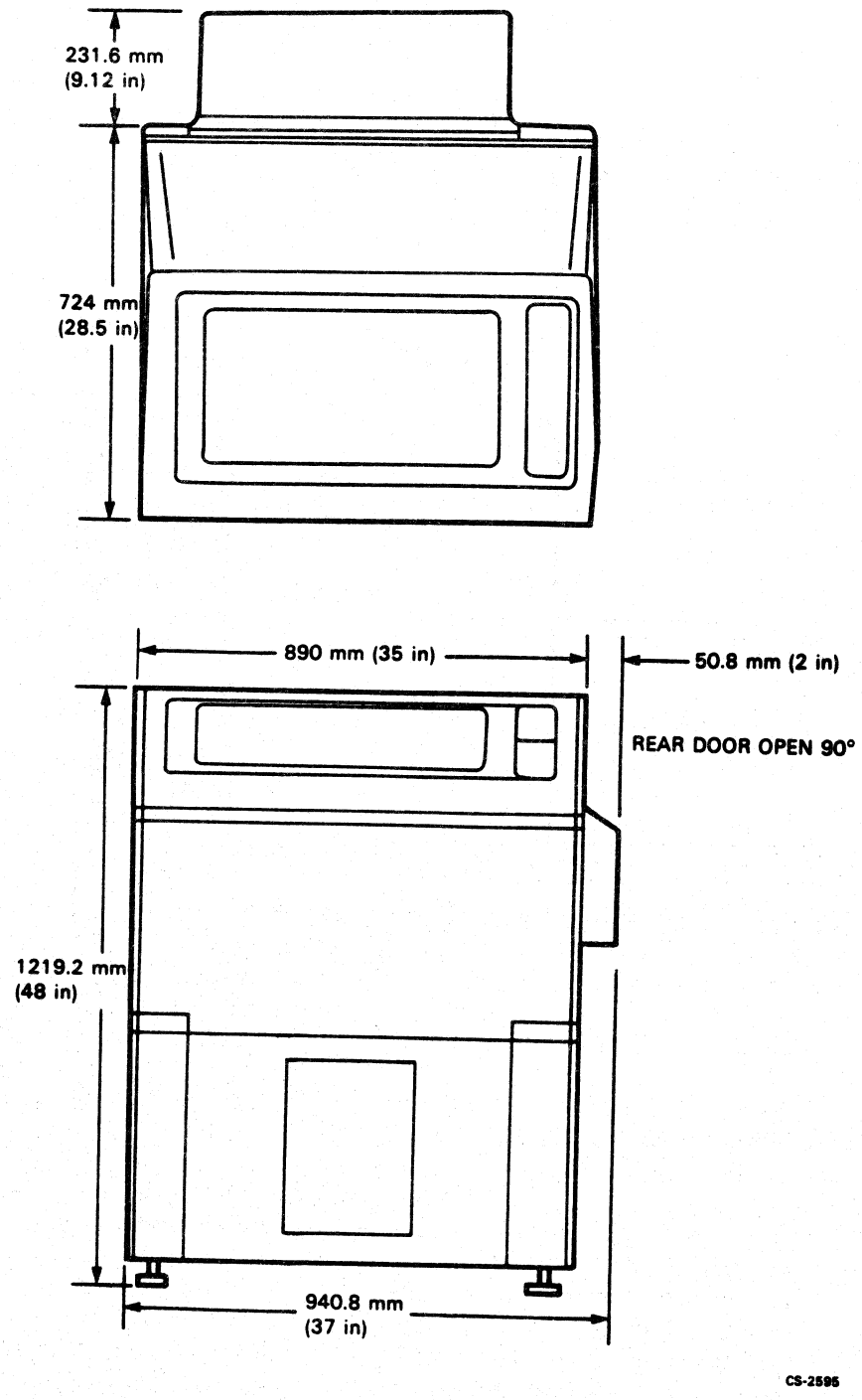


Figure 2-1 LP27 Line Printer Clearance Dimensions

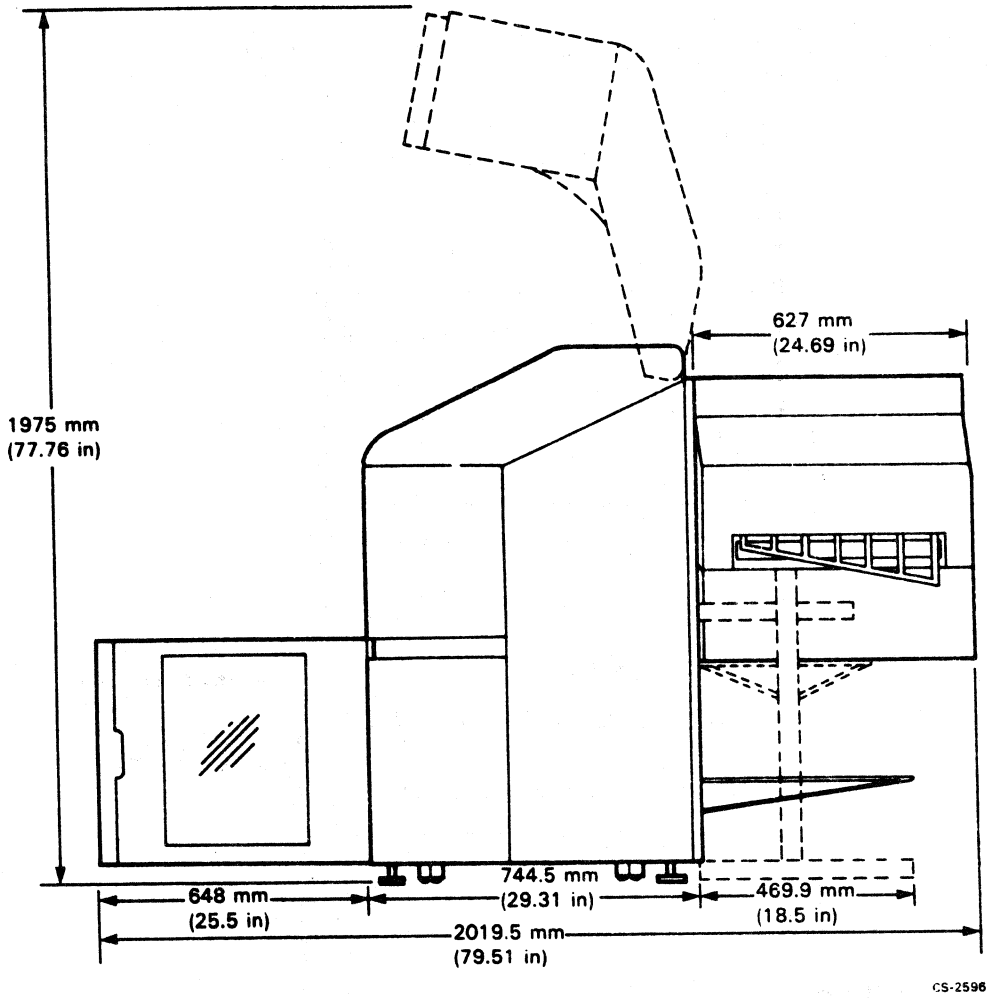


Figure 2-2 LP27 Line Printer Access Requirements

2.2 TRANSPORTING THE PRINTER

CAUTION

The printer and its shipping container weigh 290.0 kg (640.0 lb). Use a forklift to transport the printer from the receiving area to the installation site. Do not lift the pallet with a forklift without making sure that the printer is securely attached to the pallet. Never extend the forklift directly under the printer.

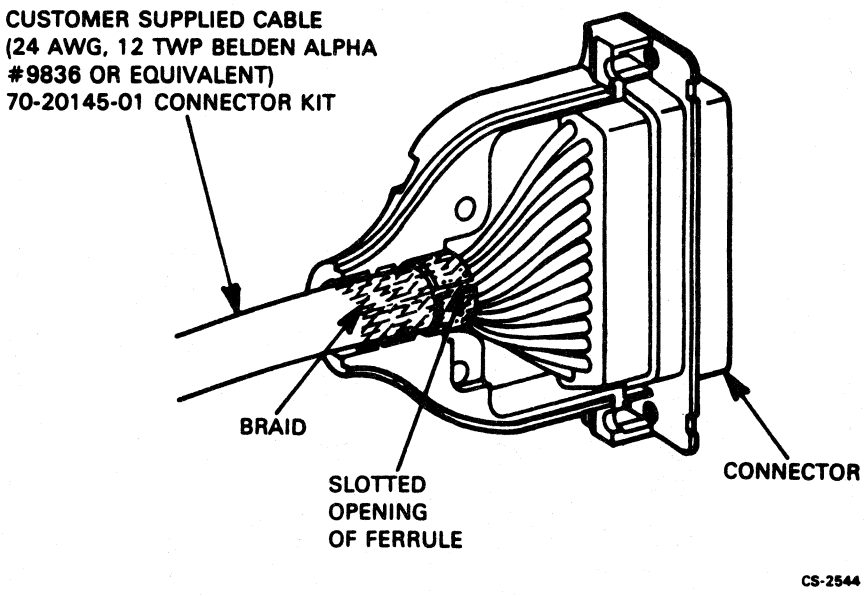


Figure 2-3 Long Line Connector Kit Assembly

Table 2-1 LP27-DA, -DB Connector Pin Assignments*

Interface Signal Name	BN27A-03 40-Pin Ribbon Conn (M5973)	BN27A-03 37-Pin D-Conn (Line)	BN27B-16 37-Pin D-Conn (Line)	BN27B-16 50-Pin D-Conn (Printer)	Printer Signal Name
+ Data 1	JJ	26	26	19	Data Bit 1
- Data 1	HH	30	30	3	RTN 1
+ Data 2	LL	20	20	20	Data Bit 2
- Data 2	KK	34	34	4	RTN 2
+ Data 3	BB	22	22	1	Data Bit 3
- Data 3	AA	28	28	2	RTN 3
+ Data 4	FF	1	1	41	Data Bit 4
- Data 4	EE	33	33	40	RTN 4
+ Data 5	TT	24	24	34	Data Bit 5
- Data 5	SS	35	35	18	RTN 5
+ Data 6	RR	23	23	43	Data Bit 6
- Data 6	PP	4	4	42	RTN 6
+ Data 7	DD	5	5	36	Data Bit 7
- Data 7	CC	25	25	35	RTN 7
Not	D	6	6	30	Not
Used	C	27	27	14	Used
+ Strobe	VV	8	8	38	Data Strobe
- Strobe	UU	29	29	37	RTN Strobe
Not	U	14	14	46	Not
Used	V	36	36	45	Used
+ Fault	R	12	12	21	On Line
- Fault	P	32	32	5	RTN O.L.
+ Demand	X	18	18	23	Demand
- Demand	W	37	37	7	RTN DEM

*All cables are 24 AWG, 12 TWP, Belden™ Alpha #9836 or equivalent.

Belden™ is a trademark of Belden Corporation.

2.3 UNPACKING THE PRINTER

1. Inspect the shock-watch label on the outside of the shipping container. If the label has changed color from yellow to red, the package and/or printer may have been damaged during shipment.

2. Cut the plastic straps securing the shipping container to the pallet.

3. Remove the container, lifting it straight up to clear the top of the printer.

4. Remove the plastic shroud.

5. Remove the straps and cargo wrap.

6. Remove the air cap (polyethylene foam).

7. Cut the straps securing the two unloading ramps to the pallet. Remove the ramps and temporarily place them to one side (refer to Figure 2-4).

8. Unbolt the four leveling screw clamps securing the printer to the pallet and remove them (refer to Figure 2-4).

9. Raise the printer off its support brackets by turning the corner leveling screws clockwise, down and out from the printer base (refer to Chapter 1, Figure 1-2).

10. Remove the six bolts fixing the support brackets to the pallet. Twist and slide the brackets out from under the printer (refer to Figure 2-4).

11. Lower the printer onto its casters by turning the four corner leveling screws counterclockwise, up and into the printer base.

12. Find the four ramp attachment holes on the pallet's edge. Set up the unloading ramps from floor to pallet so that the ramp's four metal brackets lie adjacent to the four ramp attachment holes. Use the four bolts removed from the leveling screw clamps and position the ramps in place by putting one bolt in each hole, and tighten securely (refer to Figure 2-4).

13. With someone standing on the opposite side of the pallet to guard against tipping, carefully roll the printer off the pallet and down the ramps.

NOTE

Care should be taken to ensure that the power cord will not interfere with the movement of the printer off the pallet.

14. Store the shipping pallet, ramps, hardware, and all packaging materials for possible future use in repacking.

2.4 LEVELING THE PRINTER

The printer is leveled at its operating site as follows.

1. Adjust the leveling screws (located at each corner) until the printer stands both firm and even. Each leveling screw must be extended until the entire printer is supported on the leveling screws rather than on the casters.

2. Tighten each leveling screw locknut against the printer frame.

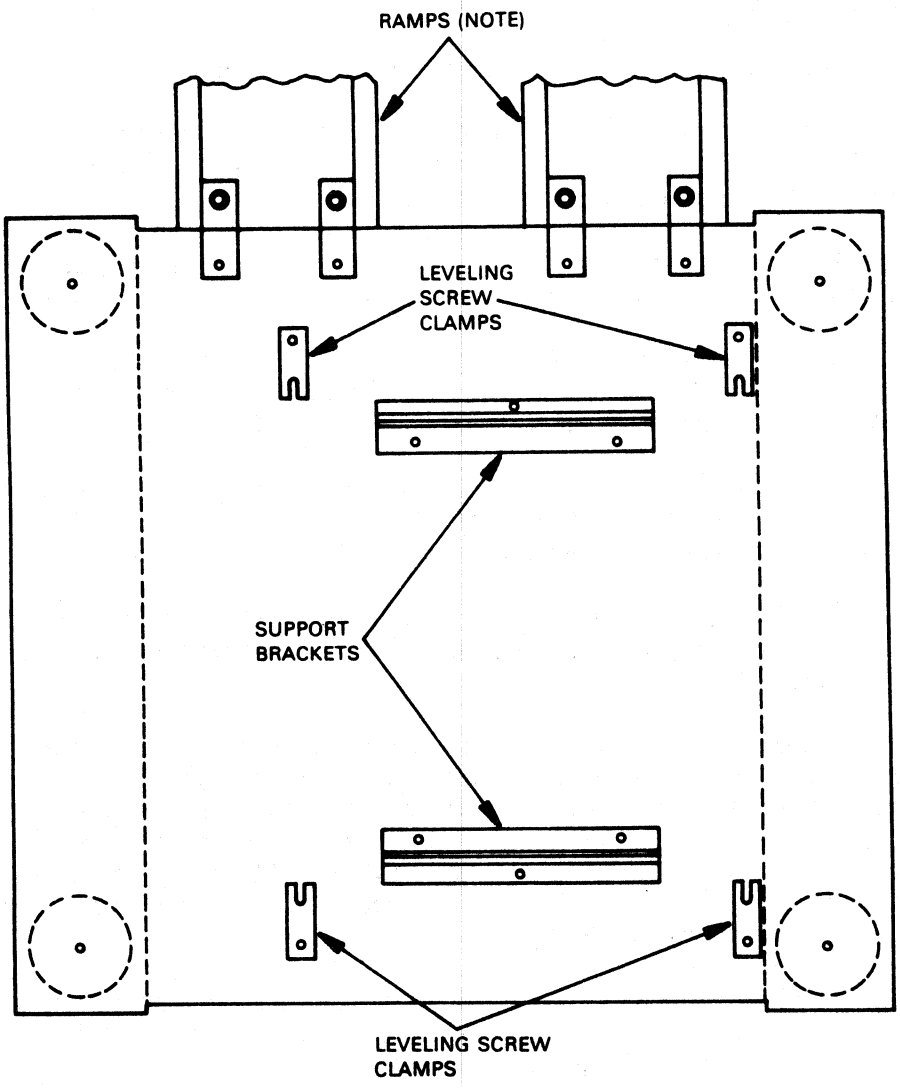


Figure 2-4 Ramps and Shipping Pallet

2.5 INSPECTION

CAUTION

This on-receipt inspection must be performed before applying power to the printer.

NOTE

If the printer does not meet inspection requirements, contact the shipper, the customer, and service personnel as required.

1. Verify that the printer POWER switch is in the OFF position.

2. Lift the printer front cover. Verify that there are no obstructions.

3. Inspect the printer for any damage, loose mechanical or electrical connections, or broken wires.

4. Inspect the power input cable connector and interface connector for bent or damaged pins.

5. Rotate the FORMS ADJUSTMENT knob (refer to Figure 2-11, page 2-21) in its two positions; first for right tractors only, then for right and left tractors together. Verify that the tractors move freely.

6. Operate the band gate latch handle (refer to Figure 2-10, page 2-20), and verify that the band gate swings open smoothly.

7. Verify that the main power circuit breaker (refer to Chapter 1, Figure 1-1) mechanically locks in both the ON and OFF positions.

8. Verify that the 6/8 LPI (lines per inch) switch and 80/FULL switches lock in each of two positions (refer to Figure 2-9, page 2-19).

9. Move the SELF TEST switch from the center to the up and down positions, and verify that it mechanically locks in each position (refer to Figure 2-9, page 2-19).

10. Leave the main power circuit breaker set to OFF and the 6/8 LPI switch set to 6 LPI.

2.5.1 Setting the DAVFU Switch

Verify that the Direct Access Vertical Form Unit (DAVFU) is set correctly. (All LP27 printers have a DAVFU.) This unit is supported on DECsystem-10/20 systems, but is not supported on VAX-11 and PDP-11 systems. During printer installation a switch on the

Long Line Interface PCB must be set ON for VAX-11 and PDP-11 systems. The necessary procedure follows.

1. Open the rear door of the printer.
2. Set switch 8-1 on the Long Line Interface PCB to ON.
3. Refer to Figure 2-5 for the location of the PCB and the switch.
4. Close the printer rear door.

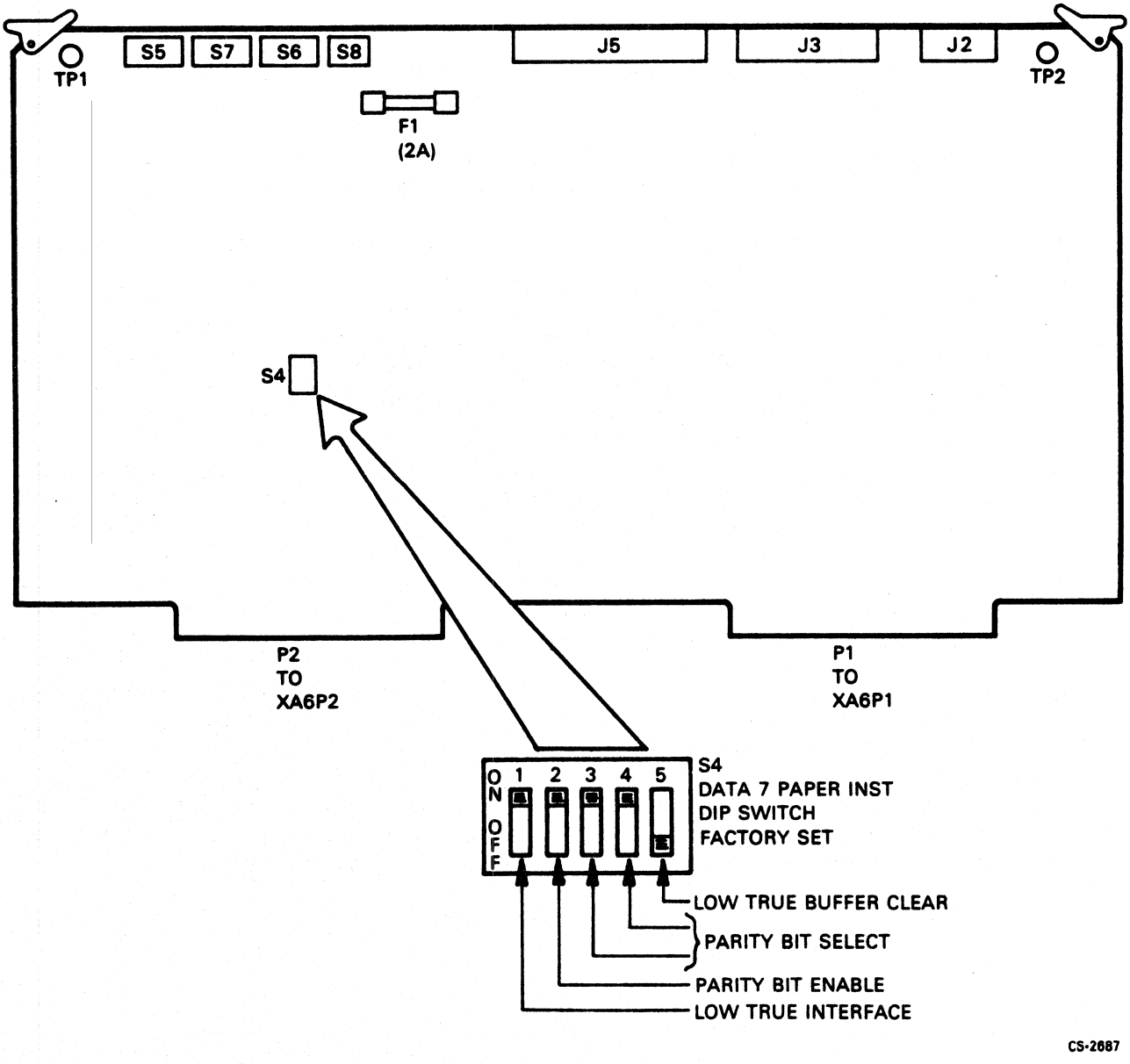


Figure 2-5 Long Line Interface PCB

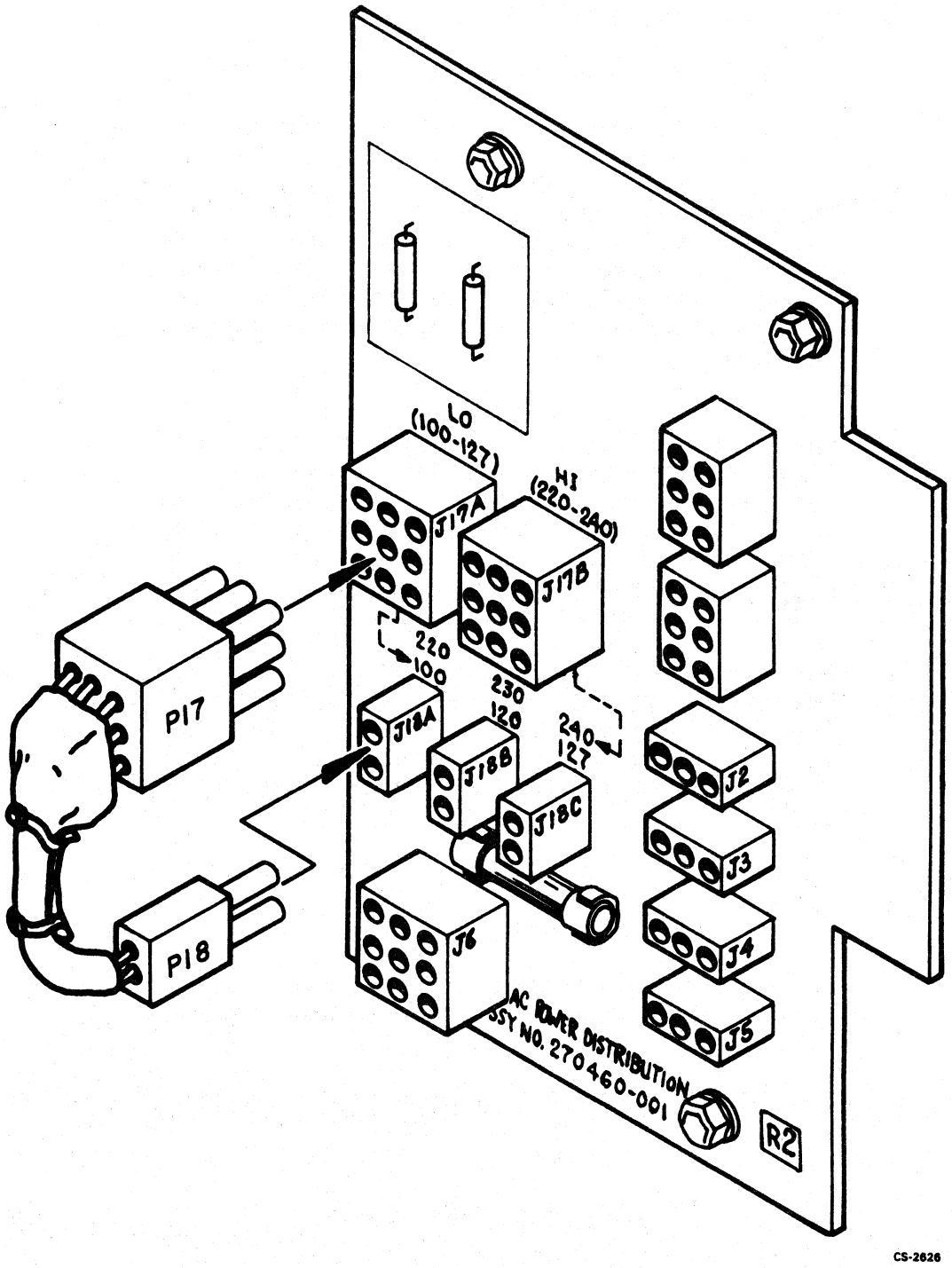


Figure 2-6 Printer Power Supply

2.6 PRINTER POWER CONNECTION

The printer has been provided with a 4.6 m (15.1 ft) ac power cord and a standard three-prong plug for connection to the ac power outlet at the operating site. The printers have been set at the factory for the following voltages.

LP27-UA, -VA, -2A, -DA	120 Vac
LP27-UB, -VB, -2B, -DB	240 Vac

CAUTION

Ensure that the specific input power configuration selected corresponds to available power at the operating site. Severe damage will occur if the printer is operated with incorrect power supply voltage.

NOTE

The printer power supply is not frequency-sensitive. It is configured to operate in the frequency range from 47 to 63 Hz and with nominal inputs of 100, 120, or 127 Vac +10%, -15% in the low voltage range, or 220, 230, or 240 Vac +10%, -15% in the high voltage range.

One of these operating voltages is selected by proper connection of P17 and P18 on the power supply board. For the low voltage range, connect P17 into J17A. Connect P18 into one of the following.

100 Vac	J18A
120 Vac	J18B
127 Vac	J18C

For the high voltage range, connect P17 into J17B. Connect P18 into one of the following.

220 Vac	J18A
230 Vac	J18B
240 Vac	J18C

Reference Figure 2-6

2.6.1 Power Receptacles and Plugs

The type of receptacles and plugs used depends on the requirements of the country in which the system is installed.

2.6.2 Requirements for Special Plugs

All plugs and receptacles for Class I equipment must be the grounding type. Non-grounding types are not permitted for Class I equipment. Because standards vary among countries, selection of configurations is more difficult and no single configuration will be universally accepted.

For the most part, configurations of plugs and receptacles are generally categorized into four types: European, Australian, United Kingdom, and American.

Table 2-2 lists the countries that use each of the four types.

Table 2-2 Countries that Use Each Power Receptacle/Plug Category

European	United Kingdom	American	Australian
Austria	Bangladesh	Bahamas	Australia
Belgium	Barbados	Bermuda	Fiji
Bulgaria	Burma	Bolivia	Guinea
Central Africa	Cyprus	Brazil	New Zealand
Chile	Ghana	Canada	Toriga
Czechoslovakia	Gibraltar	Columbia	
Denmark*	Guyana	Costa Rica	
Finland	Hong Kong	Dominican Republic	
France	India	Guatemala	
Germany	Ireland	Haiti	
Greece	Kenya	Honduras	
Hungary	Lebanon	Japan	
Iceland	Malaysia	Korea Republic	
Iran	New Zealand	Mexico	
Luxembourg	Nigeria	Nicaragua	
Morocco	Pakistan	Okinawa	
Netherlands	Rhodesia	Panama	
Niger	Singapore	Philippines	
Norway*	South Africa	Puerto Rico	
Poland	Swaziland	Taiwan	
Portugal	Tanzania	Thailand	
Romania	Uganda	Venezuela	
Spain*	United Kingdom	United States	
Sweden			
Switzerland*			
Syria			
Tunisia			
Turkey			
Uruguay			
U.S.S.R.			
Yugoslavia			
Italy*			

*Mixed types, but European is predominate.

2.6.3 Common Configurations

Figure 2-7 shows configurations of the most commonly used receptacles and plugs, with NEMA designations and with the DEC part number where applicable.

Figure 2-8 shows wiring diagrams for receptacles.

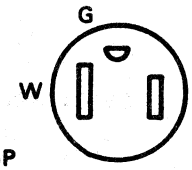
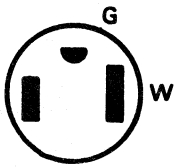
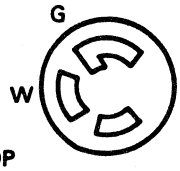
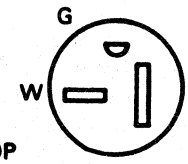
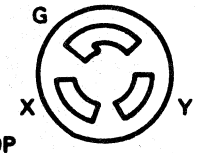
2.6.4 Procedure for Connecting ac Power Cord to Power Sources in Foreign Countries

In the event that the standard three-prong plug is not suitable for connection to the ac power source of a foreign country, the following procedure must be performed prior to printer power-up.

Step No	Procedure
1	Cut off the existing three-prong plug from the main ac power cord on the printer.
2	If a suitable plug is available, connect the plug to the cable in accordance with area and local electrical codes. Proceed to printer power-up. Reference Table 2-3 for proper wire color code connections.
3	If a suitable plug is not available, the printer power cable must be permanently wired to an electrical box according to area and local electrical codes. Proceed to printer power-up. Reference Table 2-3 for proper wire color code connections.

Table 2-3 Power Cord Connections

A.	Brown	Phase conductor on "Hot" lead.
B.	Blue	Neutral lead.
C.	Green/yellow	Protective earth ground only.

SOURCE	PLUG	RECEPTACLE	RECEPTACLE WIRING
120 V 15 A	 NEMA 5-15P DEC 90-08938	 NEMA 5-15R DEC 12-05361	SEE FIGURE 2-8A ILLUSTRATION 1
120 V 30 V	 NEMA L5-30P DEC 12-11193	 NEMA L5-30R DEC 12-11194	SEE FIGURE 2-8A ILLUSTRATION 1
120 V 20 A	 NEMA 5-20P NO DEC PART NUMBER	 NEMA 5-20R DEC 12-12265	SEE FIGURE 2-8A ILLUSTRATION 1
240 V 20 A	 NEMA L6-20P DEC 12-11192	 NEMA L6-20R DEC 12-11191	SEE FIGURE 2-8A ILLUSTRATIONS 2 OR 3

NOTES:

1. ALL PLUGS AND RECEPTACLES ARE SHOWN MATING FACE VIEW.
2. TERMINALS MARKED G ARE SAFETY GROUND TERMINALS (GREEN/YELLOW WIRE).
3. TERMINALS MARKED W ARE NEUTRAL TERMINALS.
4. CEE 7 TYPE. PART OF POWER CORD DEC PART NO. 17-00066.

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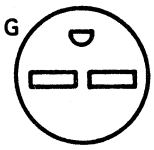
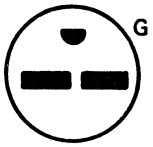
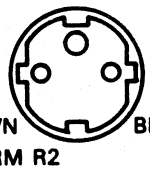
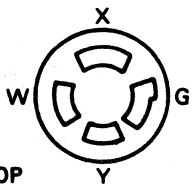
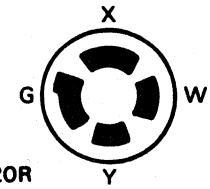
Figure 2-7 Single-Phase Plugs and Receptacles (Sheet 1 of 2)

SOURCE	PLUG	RECEPTACLE	RECEPTACLE WIRING
240 V 15 A	 NEMA 6-15P DEC 90-08853	 NEMA 6-15R DEC 12-11204	SEE FIGURE 2-8A ILLUSTRATION 2 OR 3
240 V 16 A NOTE 4	SOCKET G  DIN 49441 FORM R2 NO DEC PART NUMBER	NO DEC PART NUMBER	
240 V 20 A	 DEC 12-14379-03	 DEC 12-12378-03	SEE FIGURE 2-8A ILLUSTRATION 3
120/240 V 20 A	 NEMA L14-20P DEC 12-11045	 NEMA L14-20R DEC 12-11046	SEE FIGURE 2-8B ILLUSTRATION 1

NOTES:

1. ALL PLUGS AND RECEPTACLES ARE SHOWN MATING FACE VIEW.
2. TERMINALS MARKED G ARE SAFETY GROUND TERMINALS (GREEN/YELLOW WIRE).
3. TERMINALS MARKED W ARE NEUTRAL TERMINALS.
4. CEE 7 TYPE. PART OF POWER CORD DEC PART NO. 17-00066.

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Figure 2-7 Single-Phase Plugs and Receptacles (Sheet 2 of 2)

Illustration 1

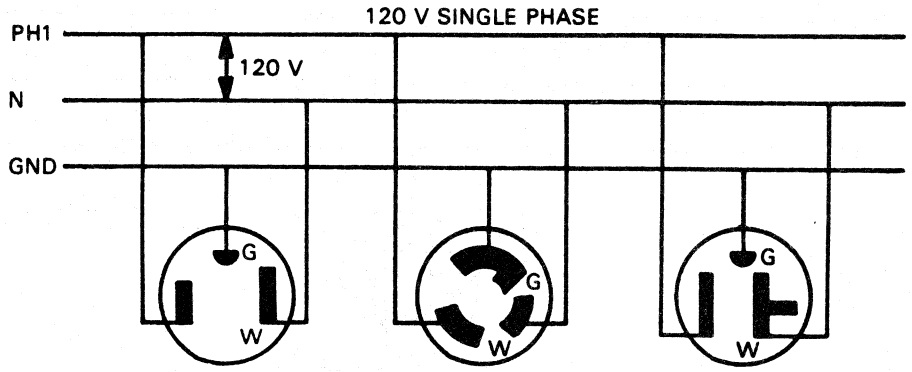


Illustration 2

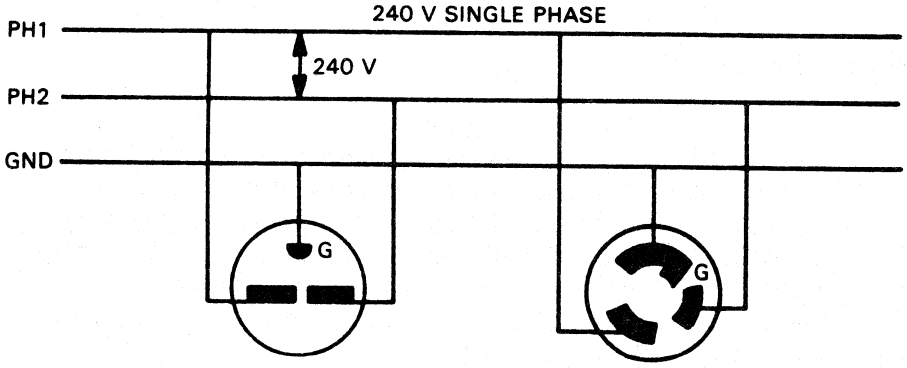


Illustration 3

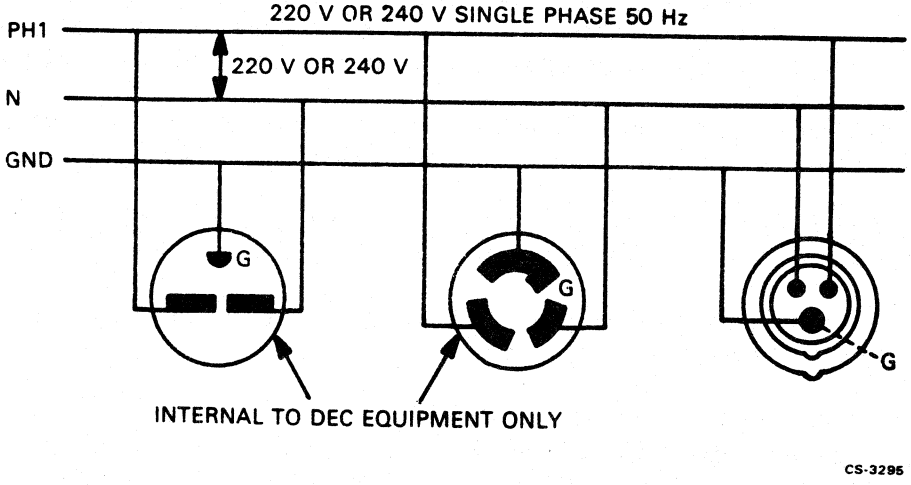


Figure 2-8A Single-Phase Wiring Diagrams

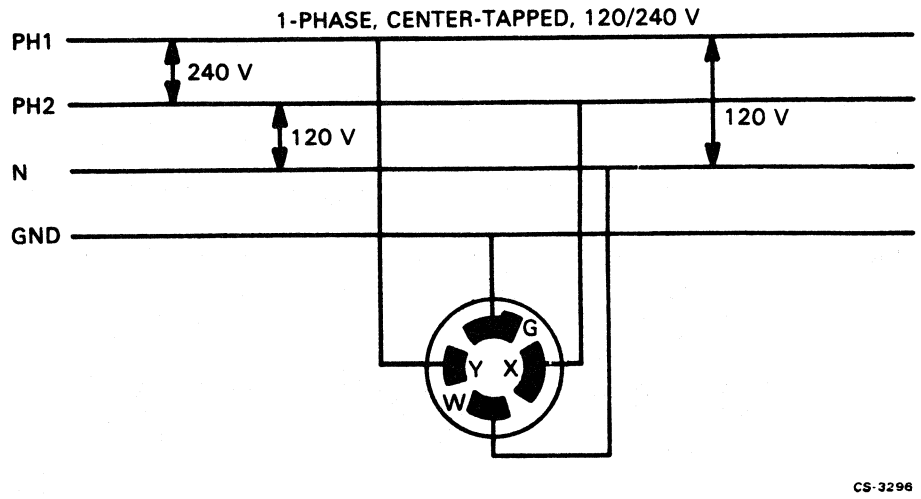


Figure 2-8B Single-Phase Wiring Diagrams

2.7 PRINTER POWER-UP

NOTE

The printer power-up procedure assumes that the ribbon and character band are properly installed, and all printer doors and latches are closed. If the ribbon or the band are not installed, refer to Chapter 3 of the LP27 Line Printer User's Guide.

Step No	Procedure
1	With the printer circuit breaker in the OFF (down) position, unwind the power cable and plug it into the proper receptacle. Then turn the printer circuit breaker to the ON (up) position (refer to Chapter 1, Figure 1-1).
2	Ensure that the POWER ON indicator on the operator control panel is illuminated (refer to Figure 2-9).
3	Unlatch and raise the printer cover to its fully open position (refer to Chapter 1, Figure 1-1).
4	Open the band gate latch and swing the band gate fully open (see Figure 2-10).

WARNING

The character band may still be rotating. Keep clear until the character band stops.

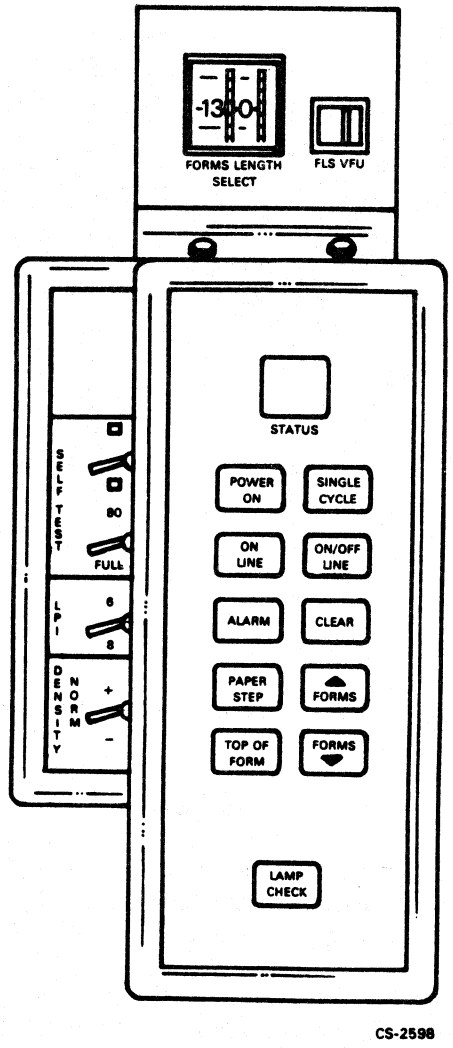


Figure 2-9 LP27 Operator Control Panel

Step No	Procedure
5	Turn the FORMS ADJUSTMENT control knob in the counter-clockwise direction until both upper and lower left side tractors have reached their limit against the stops (see Figure 2-11).
6	Pull up and turn the FORMS ADJUSTMENT control knob in a clockwise direction until both upper and lower right side tractors have reached their limit against the stops (see Figure 2-11).
7	Open both the upper and lower tractor covers (see Figure 2-11).

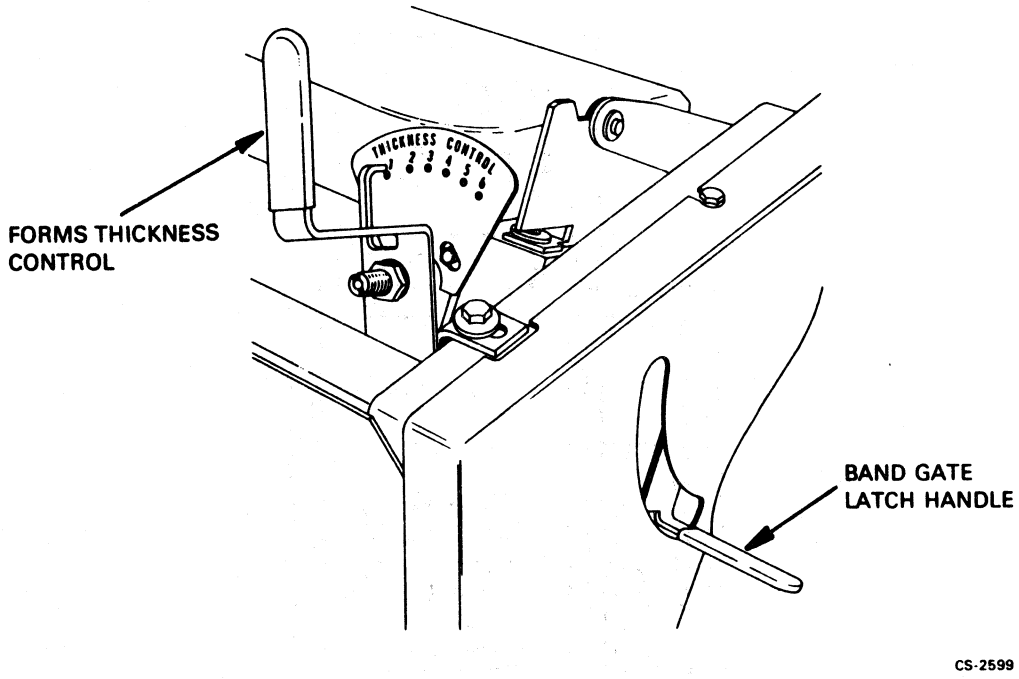


Figure 2-10 Band Gate Assembly

Step No	Procedure
8	Open paper loading door and install box of line printer paper. Center box of paper in its storage area (refer to Chapter 1, Figure 1-1).
9	Load paper by sliding the first sheet part way through the paper feed exit assembly (see Figure 2-11).
10	Align the form feed holes in the paper over the upper left-hand sprocket pins.
11	Close the upper left-hand tractor cover.
12	Pull up and turn the FORMS ADJUSTMENT control knob to align the right-hand sprocket pins to the form feed holes in the paper (see Figure 2-11).
13	Close the upper right-hand tractor cover.
14	Close both lower sprocket covers.
15	Turn the paper tension control knob to align the lower tractor feed pins to the form feed holes (see Figure 2-11).
16	Press the TOP OF FORM switch on the operator control panel (refer to Figure 2-9) to set the electronics to the Top of Form condition.

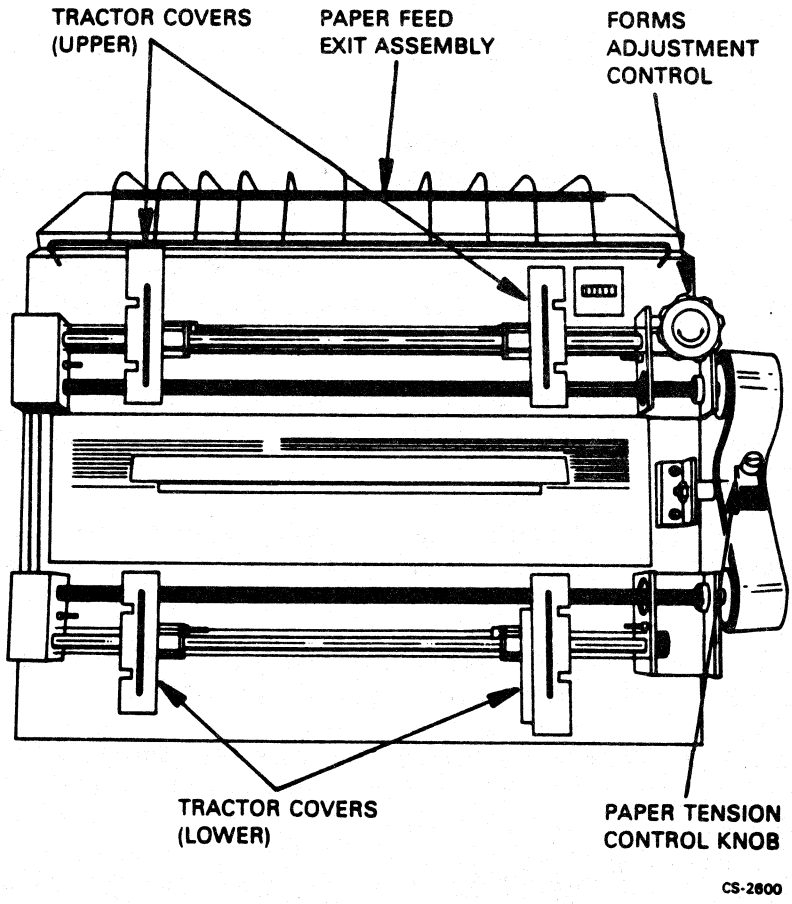


Figure 2-11 Paper Feed Assembly

Step No	Procedure
17	Press the appropriate FORMS switch to physically position the paper to the desired starting point (refer to Figure 2-9).
18	Close and latch the band gate.
19	Set the FLS/VFU switch to FLS (refer to Figure 2-9).
2Ø	Set the FORMS LENGTH SELECT thumbwheels to the desired forms length.
21	Select either the 6 or 8 LPI setting using the 6/8 LPI switch.

NOTE
TOP OF FORM must be reset when 6/8 LPI setting is changed.

Step No	Procedure
22	Set the SELF TEST switch in the down or sliding pattern position.
23	Set the FORMS THICKNESS CONTROL lever to the correct setting for the number of forms being printed (see Figure 2-12).
24	Momentarily press the TOP OF FORM switch (the form should slew to the top paper position of the next form with no tearing or wrinkling).
25	Press the ON/OFF LINE switch to start the print cycle (the ON LINE indicator must also illuminate at this time).
26	Allow a sufficient number of lines to be printed to determine vertical and horizontal registration. Note that each character on the band is printed.
27	Press the ON/OFF LINE switch to halt the print cycle (the ON LINE indicator should go off).
28	Check the forms printed to ensure that all letters and symbols are legible and that all columns have been printed.
29	Set the SELF TEST switch to the up or fixed character pattern.
30	Press the ON/OFF LINE switch to start the print cycle.
31	Set the DENSITY control to the lowest setting that allows the best print quality for the thickness of forms being printed (refer to Figure 2-9, page 2-19).
32	Press the ON/OFF LINE switch to halt the print cycle.
33	Set the SELF TEST switch to the center (or OFF) position.
34	Close and latch the printer cover.

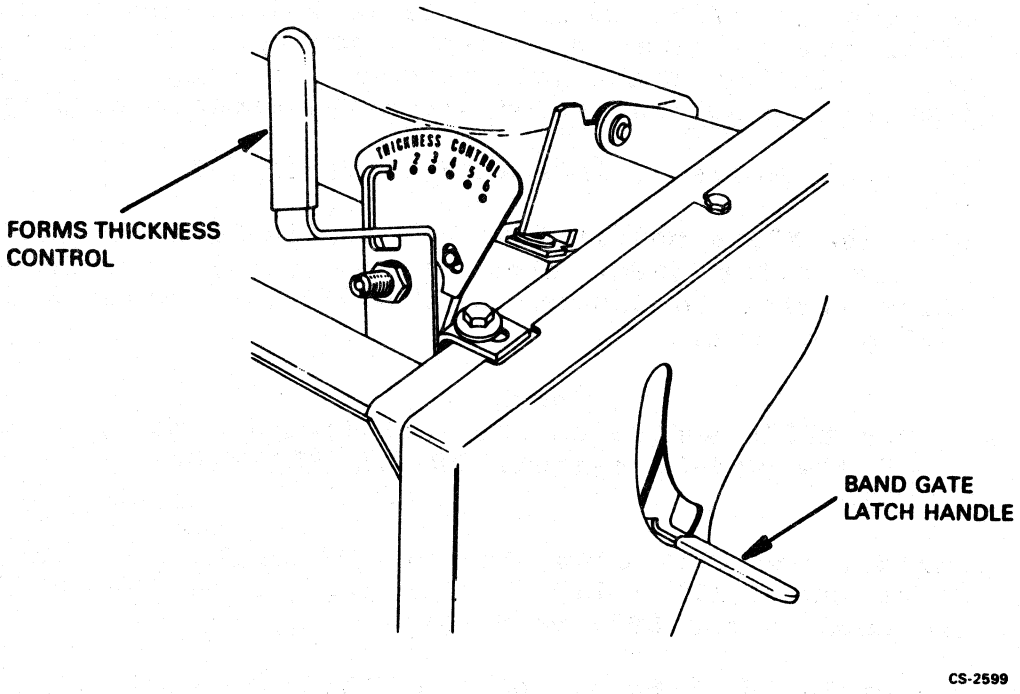


Figure 2-12 Forms Thickness and Band Gate Latch

2.8 INTERCONNECT TO VAX-11 SYSTEMS

The LP27 Line Printer can be connected and used with all of the VAX-11 processors. The procedure for connecting the printer to the processor depends on the type of cable, the controller, and the printer option being used. The installer should use the instructions that go with his/her version of the printer, and should make use of the supplied print set, and refer to the appropriate VAX-11 manual for any of the technical details.

2.8.1 VAX-11/730, -11/750, and -11/780, LP27-UA/UB, M7258 Controller and 70-16560 Cable

This is a short lines version of the printer which can operate up to 50 ft from the host processor. To install this version, use the following procedure.

Step No	Procedure
1	Power down the VAX-11 system.
2	Open the VAX-11 system cabinet doors and drawers as necessary to install the M7258 printer controller module.

NOTE

The jumpers on the M7258 module are special "0" ohm resistors.

Step No	Procedure
3	Compare the M7258 module to Table 2-4 to ensure that the M7258 jumpers are installed properly. If the jumpers are installed properly, proceed to step 5. If the jumpers are not installed properly, proceed to step 4.
4	Install jumpers as indicated in Table 2-4.
5	Plug the M7258 module into any available small peripheral controller (SPC) slot of the VAX-11 system UNIBUS slots (refer to drawing D-CS-M7258-0-1 included in the LP27 print set).

NOTE

The M7258 module can be installed in any of the VAX-11 system, UNIBUS SPC slots C-F.

6	Install the flat connector end of cable into connector J1 on the M7258 module (refer to drawing D-UA-M7258-0-0 included in the LP27 print set).
7	Run cable 70-16560 out of the VAX-11 system.
8	Close all VAX-11 system cabinet drawers and doors.
9	Connect the other end of cable 70-16560 to J1, the interface connector located at the rear of the printer (refer to Chapter 1, Figure 1-2).
10	Power up the VAX-11 system.

Table 2-4 M7258 Jumper Configuration for VAX-11

Address*	Vector*
LPA0 = 777514	200
LPB0 = 764004	170
LPC0 = 764014	174
etc.	

Jumper Configuration			
J1	IN	W5	OUT
J2	OUT	W1-W4, W6-W9	IN
J3	IN	N1	IN
J4	OUT	W11-W15	IN
J5	IN	W10	OUT
J6	IN	W16	IN
J7	OUT	W17	IN
J8	OUT		
J9	IN		
J10	OUT		
J11	IN		
J12	OUT		
J13	OUT		
J14	IN		

*Address bits are jumpered for a "0". Vector bits are jumpered for a "1". Refer to drawing D-UA-M7258 for locations of address and vector jumpers (see Figure 2-13).

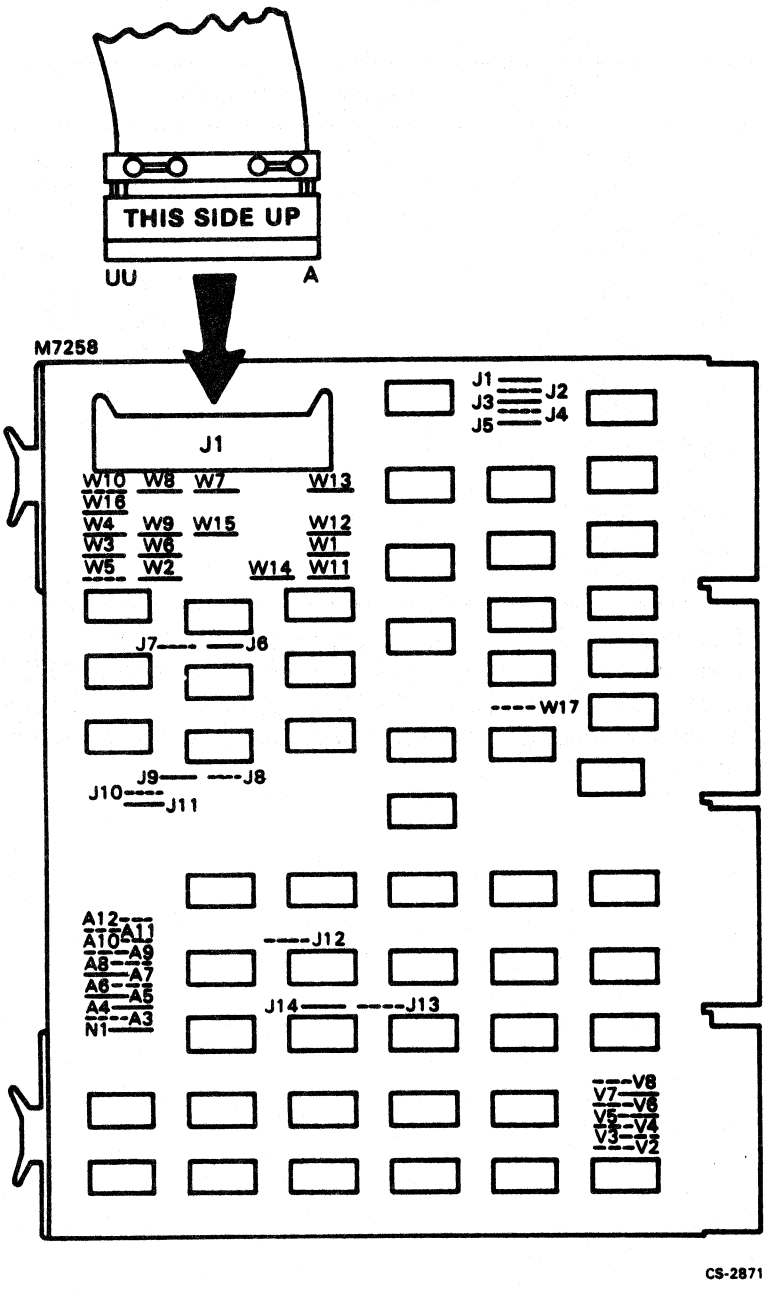


Figure 2-13 M7258 Printer Controller Module

2.8.2 VAX-11/730, -11/750, and -11/780, LP27-UA/UB, M7258 Controller and BC27A-XX Cable

This is a short lines version of the printer which can operate up to 50 ft from the host processor. To install this version, follow the procedure below.

Step No	Procedure
1	Power down the VAX-11 system.
2	Open the VAX-11 system UNIBUS cabinet doors and drawers as necessary to install the M7258 printer controller module.
3	Compare the M7258 module to Table 2-4 to ensure that the M7258 jumpers are installed properly. If the jumpers are installed properly, proceed to step 5. If the jumpers are <u>not</u> installed properly, proceed to step 4.
	NOTE **The jumpers on the M7258 module are special "0" ohm resistors.**
4	Install jumpers as indicated in Table 2-4.
5	Plug the M7258 module into any available SPC slot of the VAX-11 system UNIBUS slots (refer to drawing D-CS-M7258-0-1 included in the LP27 print set).
	NOTE **The M7258 module can be installed in any of the VAX-11 systems, UNIBUS SPC slots C-F.**
6	Install the flat connector end of cable BC05L-10 into connector J1 on the M7258 module (refer to Table 2-1). Attach the other end of the cable into the bulkhead connector assembly (70-20377-00).
7	Attach the connector assembly to the standard bulkhead panel (if available). If a standard bulkhead panel is not available, attach the bulkhead connector assembly to one of the vertical mounting rails of the cabinet by means of the auxiliary mounting bracket (74-27292-01).
8	Connect line printer cable BC27A-XX to the outside of the bulkhead connector.
9	Connect the other end of cable BC27A-XX to J1, the interface connector located on the line printer (refer to Chapter 1, Figure 1-2).
10	Power up the VAX-11 system.

2.8.3 VAX-11/730, -11/750, and -11/780, LP27-VA/VB, DMF32 Controller and BC27A-XX Cable

This is a short lines version of the printer which can operate up to 50 ft from the host processor. To install this version, follow the procedure below.

Step No	Procedure
1	Power down the VAX-11 system.
2	Open the VAX-11 UNIBUS cabinet rear doors.
3	Connect cable BC27A-XX to connector marked "LP32 or Parallel Out" on the DMF32 distribution panel.
4	Run cable BC27A-XX out of the VAX-11 system.
5	Close the VAX-11 UNIBUS cabinet rear doors.
6	Connect the other end of cable BC27A-XX to J1, the interface connector located at the rear of the printer (refer to Chapter 1, Figure 1-2).
7	Power up the VAX-11 system.

2.8.4 VAX-11/730, -11/750, and -11/780, LP27-DA/DB, M7258/M5973 Controller and Long Line Cable

The LP27-DA/DB is a long line version of the LP27 that permits operation up to 1000 ft from the computer by using differential drivers and receivers in the printer and in the computer backplane.

The differential driver/receiver board in the computer backplane is a single-height board (M5973) and is installed in the same SPC slot as the line printer controller (M7258) by way of a 5.08 cm (2 in) ribbon cable.

A long line interface board resident in the LP27-DA/DB contains the differential drivers and receivers that communicate with the M5973.

These printers are fitted with a DAVFU which is internally disabled and is not supported by this option.

The LP27-DA, -DB consists of the following:

- An LP27-BA, -BB printer -- U.S./U.K. 64/96-character band with U.S. PROM set and long-line interface.
- An M7258 controller.
- An LLD11-CA long-line kit consisting of:

-- A long-line driver (M5973),
-- Cables (2K-EC0MA-00, BN27A-03, BN27B-16),
-- A filter panel (70-19474-02), and
-- A connector kit (70-20145-01) for customer long-line cable.

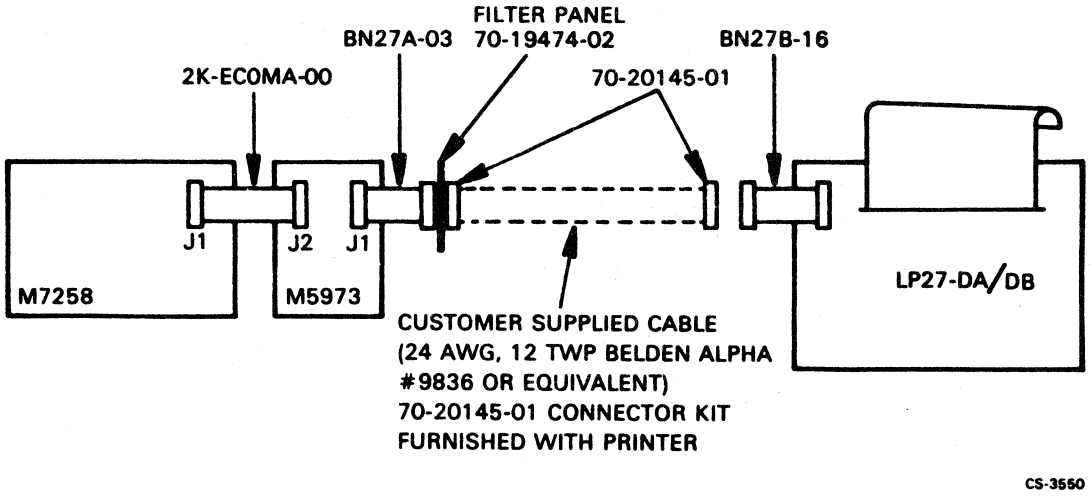
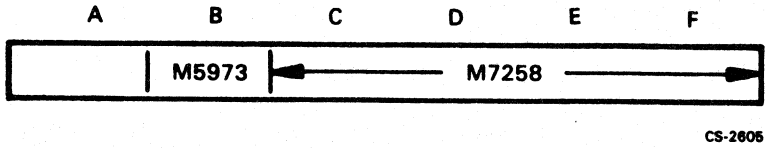


Figure 2-14 LP27-DA, -DB System Configuration

The M7258 plugs into any VAX-11 system UNIBUS SPC Slots C-F, and the M5973 plugs into Slot B.

NOTE
"UNIBUS IN" and "UNIBUS OUT" slots cannot be used.

DD11 Configuration:



The two modules are linked with cable 2K-EC0MA-00.

Cable BN27A-03 is connected to the M5973 and to the 70-19474-02 filter panel. The filter panel is installed in the system I/O distribution panel. If an appropriate panel opening is not available, attach the filter panel to one of the system cabinet rear vertical mounting rails using the bracket supplied. Cable BN27B-16 is connected to the printer and the 70-19474-02 filter panel. If a long-line customer-supplied cable is used, the

customer is responsible for assembling the cable using the 70-20145-01 connector kit to connect one end to the filter panel and the other end to the BN27B-16 cable (as shown in Figure 2-14). Pin assignments for each are shown in Table 2-1.

2.8.5 Installing the LP27-DA/DB on the VAX-11 System

Verify that the switch settings for the M5973 are correct. These switch settings are listed below. Also refer to Figure 2-15.

Switch	Signal	State
E2 - S1	Fault	ON
S2	Select	OFF
S3	Not Used	OFF
S4	P.Paper	ON
S5	+ Select	OFF
S6	+ P.Paper	OFF
S7	- Select	OFF
S8	- P.Paper	OFF

Next, perform the following.

Step No	Procedure
1	Power down the VAX-11 system.
2	Open the VAX-11 system UNIBUS cabinet doors and drawers as necessary to install the M7258/M5973 printer controller module.
3	Compare the M7258/M5973 module to Table 2-4, page 2-25 to ensure that the M7258 jumpers are installed properly. If the jumpers are installed properly, proceed to step 5. If the jumpers are <u>not</u> installed properly, proceed to step 4.
	NOTE **The jumpers on the M7258 module are special "0" ohm resistors.**
4	Install jumpers as indicated in Table 2-4.
5	Connect the 2K-EC0MA-00 5.08 cm (2 in) ribbon cable from the J1 connector, on the M7258 line printer interface (quad module), to the J2 connector, on the M5973 differential driver/receiver board (single height module). Ensure that the label marked "THIS SIDE UP" can be read when looking at the component side of the PC boards.
6	Install the M7258 in Slot C through F in the DD11 and the M5973 in the adjacent Slot B. There should be no twists in the ribbon cable when both boards are installed.

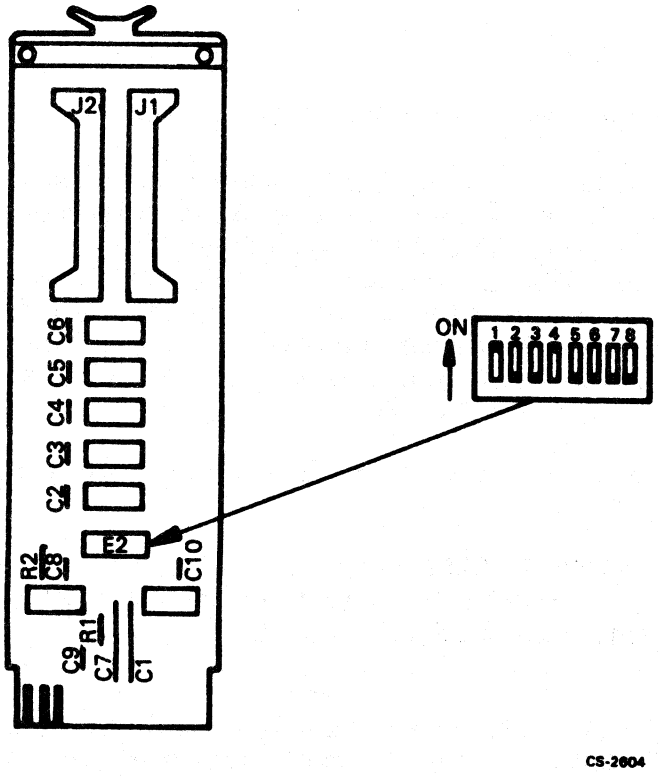


Figure 2-15 Switch Configuration M5973

Step No	Procedure
7	Install the flat 40-pin connector end of the BN27A-03 cable to the J1 connector on the M5973 module and the "D" subminiature end of this cable to the filter panel. Connect the BN27B-16 cable to the printer 50-pin "D" subminiature end and the 37 "D" subminiature end to the other side of the filter panel.
8	Place the printer as close as possible to the VAX-11 system.
9	Power up the VAX-11 system.
10	Power up the printer.
11	Run the standard VAX-11 diagnostic test given in Section 2.9.

Step No	Procedure
12	Remote Test

a. Power down the VAX-11 system.

b. Install the flat 40-pin connector end of the BN27A-03 cable to the J1 connector on the M5973 module and the "D" subminiature end of this cable to the filter panel. Connect the customer-supplied cable to the other side of the filter panel. The BN27B-16 cable connects the other end of the customer-supplied cable to the connector on the rear of the LP27-DA, -DB.

c. Power up the VAX-11 system and perform steps 10 and 11.

2.9 VAX-11 DIAGNOSTIC TEST

The printer is now ready for test using the standard VAX-11 diagnostic EVAAA (revision 5.3 or later).

NOTE

If the customer has an earlier version of EVAAA, use "LP06" instead of "LP27" in the instructions below.

1. Gain access to the printer subsystem by stopping the print queue and setting the printer to "no spool" status (may require System Manager privileges).

```
$STOP/QUE/NEXT LPA0:
$DEL/QUE LPA0:
$SET/DEV/NOSPOOL LPA0:
$SET DEF [SYS$MAINTENANCE] (if not there already)
```

2. M7258 Controller (with or without M5973)

Run DIAGNOSTIC SUPERVISOR and attach channel, interface, and printer. Select the printer and run diagnostic. If using a VAX-11/780, run ESSAA; if using a VAX-11/750, run ECSAA; if using a VAX-11/730, run ENSAA. The following is an example if the printer is interfaced to a VAX-11/780.

```
$RUN ESSAA
(Announcement "DIAGNOSTIC SUPERVISOR".....etc.)
DS> ATTACH DW780 HUB DW0 3 4*
DS> ATTACH LP11 DW0 LPA 777514 200 4  (first line printer
DS> ATTACH LP27 LPA LPA0               on system)
DS> SEL LPA0
DS> RUN EVAAA
```

*or: DW750 HUB DW0 (for VAX-11/750 if applicable).
DW730 HUB DW0 (for VAX-11/730 if applicable).

DMF32 Controller

Run DIAGNOSTIC SUPERVISOR and attach channel, interface, and printer. Select the printer and run diagnostic. If using a VAX-11/780, run ESSAA; if using a VAX-11/750, run ECSAA; if using a VAX-11/730, run ENSAA. The following is an example if the printer is interfaced to a VAX-11/780.

```
$RUN ESSAA
(Announcement "DIAGNOSTIC SUPERVISOR".....etc.)
DS> ATTACH DW780 HUB DW0 3 4*
DS> ATTACH DMF32P DWO LCA 760400 320 5
DS> ATTACH LP27 LCA LCA0
DS> SEL LCA0
DS> RUN EVAAA
```

(Announcement of diagnostic title; types printer characteristic ["MECHFORM"] and then printer produces eight pages of various patterns. Console then gives "end of pass" message.)

3. When testing is completed satisfactorily, return printer to normal system operation as below. If a DMF32 is installed, use LCA0 in place of LPA0.

```
DS> EXIT
$SET PRINTER /LOWER LPA0:  (to print lower/upper case)
$SET DEV/SPOOL      LPA0:
$ASSIGN/SYSTEM LPA0 SYS$PRINT
$INIT/QUE/FLAG LPA0:
$START/QUE LPA0:
$
```

The above procedure applies to ESSAA-6.8 and EVAAA-5.3.

*or: DW750 HUB DW0 (for VAX-11/750 if applicable).
DW730 HUB DW0 (for VAX-11/730 if applicable).

2.10 INTERCONNECT FOR PDP-11 UNIBUS DEVICE

The LP27 can be connected and used with any of the PDP-11 processors (except LSI-11s). The installer should make use of the supplied print set and refer to the appropriate system manual for technical details.

2.10.1 LP27-UA/UB, M7258 and 70-16560-30 Cable

This is a short lines version of the printer which can operate up to 50 ft from the host processor. To install this version, use the following procedure.

Step No	Procedure
1	Power down the PDP-11 system.
2	Open the PDP-11 system cabinet doors and drawers as necessary to install the M7258 printer controller module.

NOTE
The jumpers on the M7258 module are special "Ø" ohm resistors.

3	Compare the M7258 module to Table 2-5 to ensure that the M7258 jumpers are installed properly. If the jumpers are installed properly, proceed to step 5. If the jumpers are not installed properly, proceed to step 4.
4	Install jumpers as indicated in Table 2-5.
5	Plug the M7258 module into any available SPC slot of the PDP-11 system UNIBUS slots (refer to drawing D-CS-M7258-Ø-1 included in the LP27 print set).

NOTE
The M7258 module can be installed in any of the PDP-11 system, UNIBUS SPC slots C-F.

6	Install the flat connector end of the cable into connector J1 on the M7258 module (refer to drawing D-UA-M7258-Ø-Ø included in the LP27 print set).
7	Run cable 7Ø-16560-3Ø out of the PDP-11 system.
8	Close all PDP-11 system cabinet drawers and doors.
9	Connect the other end of cable 7Ø-16560-3Ø to J1, the interface connector located at the rear of the printer (refer to Chapter 1, Figure 1-2).
1Ø	Power up the PDP-11 system.

Table 2-5 M7258 Jumper Configuration for PDP-11

Address*	Vector*
LPA0 = 777514	200
LPB0 = 764004	170
LPC0 = 764014	174
etc.	

Jumper Configuration			
J1	IN	W5	OUT
J2	OUT	W1-W4, W6-W9	IN
J3	IN	N1	IN
J4	OUT	W11-W15	IN
J5	IN	W10	OUT
J6	IN	W16	IN
J7	OUT	W17	IN
J8	OUT		
J9	IN		
J10	OUT		
J11	IN		
J12	OUT		
J13	OUT		
J14	IN		

*Address bits are jumpered for a "0". Vector bits are jumpered for a "1". Refer to drawing D-UA-M7258 for locations of address and vector jumpers (see Figure 2-11).

2.10.2 LP27-UA/UB, M7258 and BC27A-XX Cable

This is a short lines version of the printer which can operate up to 50 ft from the host processor. To install this version, follow the procedure below.

Step No	Procedure
1	Power down the PDP-11 system.
2	Open the PDP-11 system cabinet doors as necessary to install the M7258 printer controller module.
3	Visually inspect the M7258 module for damage.

NOTE

The jumpers on the M7258 module, referred to in step 4, are special "0" ohm resistors.

4	Compare jumpers on M7258 module to Table 2-5.

Step No	Procedure
5	Ensure that all jumpers are installed before proceeding as indicated in Table 2-5. If jumpers are not installed or are missing, soldering may be required.
6	Plug the M7258 module into the appropriate UNIBUS slot of the PDP-11 system backplane. Refer to the appropriate PDP-11 technical manual and the LP27 print set for additional details.
7	Install the flat connector end of cable BC05L-10 into connector J1 on the M7258 module. Attach the other end of the cable into the bulkhead connector assembly (70-20397-00).
8	Attach the connector assembly to the standard cable distribution panel (if available). If a standard bulkhead panel is not available, attach the bulkhead connector assembly to one of the vertical mounting rails of the cabinet by means of the auxiliary mounting bracket (74-27292-01).
9	Connect the line printer cable BC27A-30 to the outside of the bulkhead connector.
10	If the PDP-11 system has a cable holddown bar, use a screwdriver to remove the bar, and proceed to step 11. If the PDP-11 system does not have a holddown bar, proceed to step 13.
11	Run cable BC05L-10 (just attached to M7258 module) so that it correctly fits under the cable holddown bar. Refer to the appropriate PDP-11 technical manual for additional details.
12	Use a screwdriver to replace the cable holddown bar.
13	Connect the other end of cable BC27A-30 to interface connector J1 located on the LP27.
14	Place the printer as close as possible to the PDP-11 system.
15	Power up the PDP-11 system.
16	Power up the printer.
17	Run the standard PDP-11 diagnostic test CZLPL D* given in Section 2.11.

*Rev. E or later.

2.10.3 LP27-DA/DB, M7258/5973 Controller and Long Line Cable

The LP27-DA/DB is a long line version of the LP27 that permits operation up to 1000 ft from the computer by using differential drivers and receivers in the printer and in the computer backplane.

The differential driver/receiver board in the computer backplane is a single-height board (M5973) and is installed in the same SPC slot as the line printer controller (M7258) by way of a 5.08 cm (2 in) ribbon cable.

A long line interface board resident in the LP27-DA/DB contains the differential drivers and receivers that communicate with the M5973.

These printers are fitted with a DAVFU which is internally disabled and is not supported by this option.

The LP27-DA, -DB consists of the following:

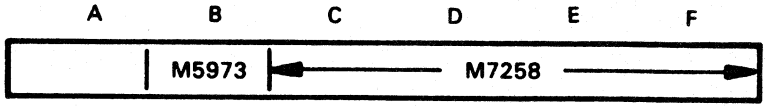
- An LP27-BA, -BB printer -- U.S./U.K. 64/96-character band with U.S. PROM set and long-line interface.
- An M7258 controller.
- An LLD11-CA long-line kit consisting of:
  - -- A long-line driver (M5973),
  - -- Cables (2K-EC0MA-00, BN27A-03, BN27B-16),
  - -- A filter panel (70-19474), and
  - -- A connector kit (70-20145-01) for customer long-line cable.

The M7258 plugs into any PDP-11 system UNIBUS SPC Slots C-F, and the M5973 plugs into Slot B.

NOTE

"UNIBUS IN" and "UNIBUS OUT" slots cannot be used.

DD11 Configuration:



CS-2605

The two modules are linked with cable 2K-EC0MA-00.

The cable BN27A-Ø3 is connected to the M5973 and to the 7Ø-19474-Ø2 filter panel. The filter panel is installed in the system I/O distribution panel. If an appropriate panel opening is not available, attach the filter panel to one of the system cabinet rear vertical mounting rails using the bracket supplied. Cable BN27B-16 is connected to the printer and the 7Ø-19474-Ø2 filter panel. If a long-line customer-supplied cable is used, the customer is responsible for assembling the cable using the 7Ø-2Ø145-Ø1 connector kit to connect one end to the filter panel and the other end to the BN27B-16 cable (as shown in Figure 2-14, page 2-29). Pin assignments for each are shown in Table 2-1.

2.1Ø.4 Installing the LP27-DA/DB on the PDP-11 System

Verify that the switch settings for the M5973 are correct. These switch settings are listed below. Also, refer to Figure 2-15, page 2-31.

Switch	Signal	State
E2 - S1	Fault	ON
S2	Select	OFF
S3	Not Used	OFF
S4	P.Paper	ON
S5	+ Select	OFF
S6	+ P.Paper	OFF
S7	- Select	OFF
S8	- P.Paper	OFF

Next, perform the following.

Step No	Procedure
1	Power down the PDP-11 system.
2	Open the PDP-11 system cabinet doors as necessary to install the M7258/M5973 printer controller module.
3	Visually inspect the M7258 modules for damage.

NOTE

The jumpers on the M7258/M5973 module, referred to in step 4, are special "Ø" ohm resistors.

4	Compare jumpers on M7258 module to Table 2-5, page 2-35.
5	Ensure that all jumpers are installed before proceeding as indicated in Table 2-5. If jumpers are not installed or are missing, soldering may be required.
6	Connect the 2K-ECØMA-ØØ 5.Ø8 cm (2 in) ribbon cable from the J1 connector, on the M7258 line printer interface (quad module), to the J2 connector, on the M5973 differential driver/receiver board (single height module).

Step No	Procedure
	Ensure that the label marked "THIS SIDE UP" can be read when looking at the component side of the PC boards.
7	Install the M7258 in Slot C through F in the DD11 and the M5973 in the adjacent Slot B. There should be no twists in the ribbon cable when both boards are installed.
8	Install the flat 40-pin connector end of the BN27A-03 cable to the J1 connector on the M5973 module and the "D" subminiature end of this cable to the filter panel. Connect the BN27B-16 cable to the printer 50-pin "D" subminiature end and the 37 "D" subminiature end to the other side of the filter panel.
9	Place the printer as close as possible to the PDP-11 system.
10	Power up the PDP-11 system.
11	Power up the printer.
12	Run the standard PDP-11 diagnostic test CZLPL D* given in Section 2.11.
13	Remote Test
	a. Power down the PDP-11 system.
	b. Install the flat 40-pin connector end of the BN27A-03 cable to the J1 connector on the M5973 module and the "D" subminiature end of this cable to the filter panel. Connect the customer-supplied cable to the other side of the filter panel. The BN27B-16 cable connects the other end of the customer-supplied cable to the connector on the rear of the LP27-DA, -DB.
	c. Power up the PDP-11 system.
	d. Power up the printer.
	e. Run the standard PDP-11 diagnostic test CZLPL D* given in Section 2.11.

2.11 PDP-11 DIAGNOSTIC TEST

The following procedure is used to check out the LP27 printer. Review Sections 2.11.1 through 2.11.6 before proceeding.

*Rev. E or later.

1. Power up the printer and system.

2. Verify that the printer has ribbon and paper and that no fault conditions exist, and the ON LINE indicator is lit.

3. Place the printer ON LINE. Verify that the ON LINE indicator lights.

4. Load the diagnostic routine CZLPL D*.

   a. This diagnostic is written for use with the diagnostic supervisor. For a complete description of the runtime services, refer to the XXDP+ User's Manual.†

   b. The diagnostic is used in a variety of operating systems to fulfill different requirements. The diagnostic is loaded using XXDP+.

   c. The diagnostic is also used in a manufacturing environment where APT/ACT/SLIDE station must be equipped with the appropriate interface and a host processor with the necessary software.

      If a clock is not installed in the system, then the operator must use manual mode to time the printer interval and calculate the printing speed.

5. Set the legal switches according to Section 2.11.3.

6. Run the diagnostic for five error-free passes (test mode). If an error persists, consult the system troubleshooting guide in the LP27 Line Printer Technical Manual or the LP27 Line Printer Pocket Service Guide, or contact the service personnel.

2.11.1 Test Descriptions

The individual tests are identified as follows.

- Test 1 -- INTERFACE LOGIC
- Test 2 -- READY LINE INTERLOCKS
- Test 3 -- FORMS LENGTH SELECTION
- Test 4 -- PRINTING SPEED
- Test 5 -- DATA TRANSFER PATHS
- Test 6 -- PRINTABLE CHARACTERS
- Test 7 -- NON-PRINTABLE CHARACTERS
- Test 8 -- BAND PATTERN
- Test 9 -- SPURIOUS HAMMER FIRING
- Test 10 -- PRINT CONTROL
- Test 11 -- MULTIPLE LINE ADVANCE
- Test 12 -- CHARACTER ALIGNMENT

†Available on microfiche at most DIGITAL Field Service centers.

2.11.2 Commands

There are eleven legal commands for the diagnostic supervisor. This section lists the commands and gives a brief description of each. Additional details are found in the XXDP+ User's Manual.

Command	Effect
START	Start the diagnostic from an initial state.
RESTART	Start the diagnostic without initializing.
CONTINUE	Continue at test that was interrupted (after-C).
PROCEED	Continue from an error halt.
EXIT	Return to XXDP+ monitor (XXDP+ operation only).
ADD	Activate a unit for testing (all units are considered to be active at start time).
ORCP	Deactivate a unit.
PRINT	Print statistical information (if implemented by the diagnostic - refer to Section 4.Ø of the XXDP+ User's Manual).
DISPLAY	Type a list of all device information.
FLAGS	Type the state of all flags (Section 2.3 of the XXDP+ User's Manual).
ZFLAGS	Clear all flags (Section 2.3 of the XXDP+ User's Manual).

A command is recognized by the first three characters; therefore, you may for example, type "STA" instead of "START".

2.11.3 Setting Legal Switches

There are several programming switches that are used to modify the supervisor operation. These switches are appended to the legal commands. The switch labels are defined in Table 2-6. Table 2-7 specifies which switches can be used by each command.

NOTE
In the switch descriptions, a decimal number is designated by "DDDDD".

Table 2-6 Programming Switches

Switch	Definition
/TESTS:LIST	Executes only those tests specified in the list. (List is a string of test numbers. For example: /Tests: 1: 5: 7-10. This list will cause tests 1, 5, 7, 8, 9, 10 to be run. All other tests will not be run.)
/PASS:DDDDD	Executes DDDDD passes (DDDDD = 1 to 64000).
/FLAGS:FLGS	Sets a number of specified flags. Flags are described in Section 2.11.4.
/EOP:DDDDD	Reports end of pass message after every DDDDD pass only. (DDDDD = 1 to 64000.)
/UNITS:LIST	TEST/ADD/DROP only those units specified in the list. List example: ?UNITS:0:5:10-12 use units 0, 5, 10, 11, 12 (unit number = 0-63).

Table 2-7 Switch/Command Usage

Command	Switch				
	TESTS	PASS	FLAGS	EOP	UNITS
START	X	X	X	X	X
RESTART	X	X	X	X	X
CONTINUE		X	X	X	
PROCEED			X		
DROP					X
ADD					X
PRINT					
DISPLAY					X
FLAGS					
ZFLAGS					
EXIT					

An example of switch usage is:

START/TESTS: 1-5/PASS: 100/EOP:100

The results of this command are as follows.

1. Tests 1 through 5 are executed.

2. All units are tested 100 times.

3. The messages (END OF PASSnnnnn) are printed after each 100 passes.

NOTE
A switch is recognized by the first three characters.

For example:

Type "/TES: 1-5"; therefore, it is not necessary to type "TESTS:1-5".

2.11.4 FLAGS Usage

FLAGS are used to set up certain operational parameters such as looping on error. All FLAGS are cleared at startup and remain cleared until explicitly set using the FLAGS switch. FLAGS are also cleared after a start command unless set using the FLAG switch. The ZFLAGS command may also be used to clear all FLAGS. With the exception of the start and ZFLAGS commands, no commands affect the state of the FLAGS. They remain set or cleared as specified by the last FLAG switch. See the following list.

Flag	Effect
HOE	Halt on Error - Control is Returned to Runtime Services Command Mode
LOE	Loop on Error
IER*	Inhibit All Error Reports
IRR*	Inhibit All Error Reports Except First Level (first level contains error type, number PC, test, and unit)
IXR*	Inhibit Extended Error Reports (those called by Printx macro's)
PRI	Direct Messages to Line Printer
PNT	Print Test Number as Test Executes
BOE	"BELL" On Error
UAM	Unattended Mode (no manual intervention)
ISR	Inhibit Statistical Reports (does not apply to diagnostics that do not support statistical reporting)
IDR	Inhibit Program Dropping of Units
ADR	Execute Autodrop Code
LOT	Loop On Test

Flag	Effect
EVL	Execute Evaluation (on diagnostics that have evaluation support)

You may specify more than one FLAG with the FLAG switch. For example: to cause the program to loop on error, inhibit error reports, and type a "BELL" on error, you may use the string shown in the example below. For additional information on the use of FLAGS, refer to the XXDP+ User's Manual.

Example: /FLAGS:LOE:IER:BOE

2.11.5 Hardware Considerations

When a diagnostic is started, the runtime services prompt the user for hardware information by typing:

```
"CHANGE HW (L)?"
L = logical
```

Respond with "Y" after a start command unless the hardware information is "PRELOADED" using the setup utility described in Chapter 6 of the XXDP+ User's Manual.

When responding with "Y", the runtime services prompt the user by asking for the number of units. The user is then asked the following questions for each unit. (O) requires an octal response; and (L) requires a logical response such as "Y" or "N".

For example:

If only one printer is to be tested; type in (1) CR.

```
UNITS (O)? 1

LP11 Address: (O) (177514)?
Interrupt Vector: (O) (200)?
```

The user is now asked to enter the printer type?

User enters 1.

The user is asked to enter the type of character band?

96 Character Band (L)?

Respond with "Y" or "N" acccording to which band is installed.

2.11.6 Software Considerations

Once the hardware information described in Section 2.13 of the XXDP+ User's Manual is entered, or after a RESTART or CONTINUE command, the runtime services prompt the user for software parameters. These parameters govern some specific operation modes.

For example:

"CHANGE SW (L)?" respond with "Y" or "N".

"Y" is used to change parameters. The software questions and the default values are described below.

Run Manual Intervention Tests (N)?

Default is no (N)?
Perform manual print speed measurement (N)?
Default is automatic.
Desired time interval for print speed.
Calculation (60)?
Default is 60 seconds.

2.12 INTERCONNECT FOR DECSYSTEMS-10/20

This section contains the installation procedure for the LP27-2A/-2B with the LP20 line printer controller on the DECSYSTEMS-10/20.

2.12.1 Unpacking the LP20 Controller

1. Remove the LP20 controller from its shipping carton.

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

2.12.2 Inspection

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

1. Check the equipment received against the shipping checklist (A-PL-LP20-0-SL) to be certain that all equipment has been received.

2. Inspect the LP20 controller modules for any signs of damage.

3. Inspect the LP20 wired assembly (7011427) for bent pins and verify that there is no short circuit between +5 V and ground by measuring with an ohmmeter between pins C02A2 and C02C2.

4. Inspect the line printer according to the detailed procedures in the appropriate line printer manual.

2.12.3 Installing the LP20 Controller

2.12.3.1 Module Configuration --

1. Device and Vector Addresses - One or two LP20 controllers may be installed in the peripheral cabinet. When a system has one controller and one line printer, its base address

(device address) will be 775400 and its corresponding vector address will be 754. However, when the system has two controllers and two line printers, the base address and vector address are assigned as follows.

Unit No 1	Base address	775400
	Vector address	754
Unit No 2	Base address	775420
	Vector address	750

Refer to drawings D-CS-M8586-0-LPC1 and D-CS-M8586-0-LPC4 in the LP20 print set for correct configuration information for the M8586 module.

2. Priority Level - The bus request/grant priority plug installed at the factory selects priority level BR4/BG4. Details of these jumper connections are provided in Chapter 5 of the LP20 Line Printer System Manual.

3. Direct Access VFU - All line printers except LP10-J, -K (LP20-F, -A) have a direct access vertical format unit (DAVFU). LP10 line printers have a paper tape (optical) vertical format unit. Refer to drawings D-CS-M8587-0-LPD0 and D-CS-M8571-0-LPD0 for correct jumper or dip switch configuration for the printer in use.

4. Line Printer Parity - Refer to drawings D-CS-M8587-0-LPD0 and D-CS-M8571-0-LPD0 for correct jumper or dip switch configuration based on the model of line printer in use.

2.12.3.2 Installing a Single LP20 Controller -- When the appropriate jumper wires on the modules have been removed, the next step is to install the controller. Refer to Figure 3-9 and proceed as follows for a typical installation.

NOTE

Refer to the LP20 Field Maintenance Print Set (MP00006) for cable drawings, circuit schematics, and a drawing of the wired assembly.

1. Determine the proper mounting position for the LP20 wired assembly (7011427).

2. Install the wired assembly and harness support in the mounting drawer. Before tightening the cap screws completely, insert a hex-height module into the wired assembly to check card guide alignment.

3. With a hex-height module in place, tighten the two cap screws securely and remove the hex-height module.

NOTE

Skip steps 4 and 5 if power harness 70-12475 is supplied.

4. Wrap the following unused Faston™ tabs of the power harness (70-09563) with tape.

   Line clock (brown wire)
   +15 V (grey wire)
   -15 V (blue wire)

5. Tie back the loose wires as shown in Figure 3-9 (Sheet 2 of 2). Then lace the entire power harness to the harness support.

6. Make the six electrical connections between the power harness and the wired assembly as shown in Figure 3-9 (Sheet 2 of 2).

7. Make electrical connections between the power harness and the mounting drawer of the system cabinet by plugging the two Mate-N-Lok™ connector plugs into available connector receptacles.

8. Install the UNIBUS cable assemblies according to Figure 3-9. If this LP20 is the last device on the UNIBUS slot, an M930 UNIBUS terminator module, instead of the UNIBUS cable assembly, must be installed in slots A04 and B04.

9. Without modules installed, power up the system and measure +5.0 V +5% between either red wire (+5 V) and either black wire (ground) of the power harness at the Mate-N-Lok™ connector.

10. Power down the system and install the three LP20 modules according to Figure 2-16.

11. Connect the BC06R-10 cable to the Berg™ connector on the M8587 module with the wire (rib) side toward the module and the red line on the cable away from the handle.

12. Connect the other end of the BC06R-10 cable to the center slot of the receptacle housing assembly (7009861) with the red line on the cable toward the locking cam indentation as shown in Figure 2-16.

13. Connect the LP20 round cable to the receptacle housing assembly and connect the other end of the LP20 round cable to the line printer interface connector J1.

Faston™ and Mate-N-Lok™ are trademarks of AMP, Inc.
Berg™ is a trademark of Berg Electronics.

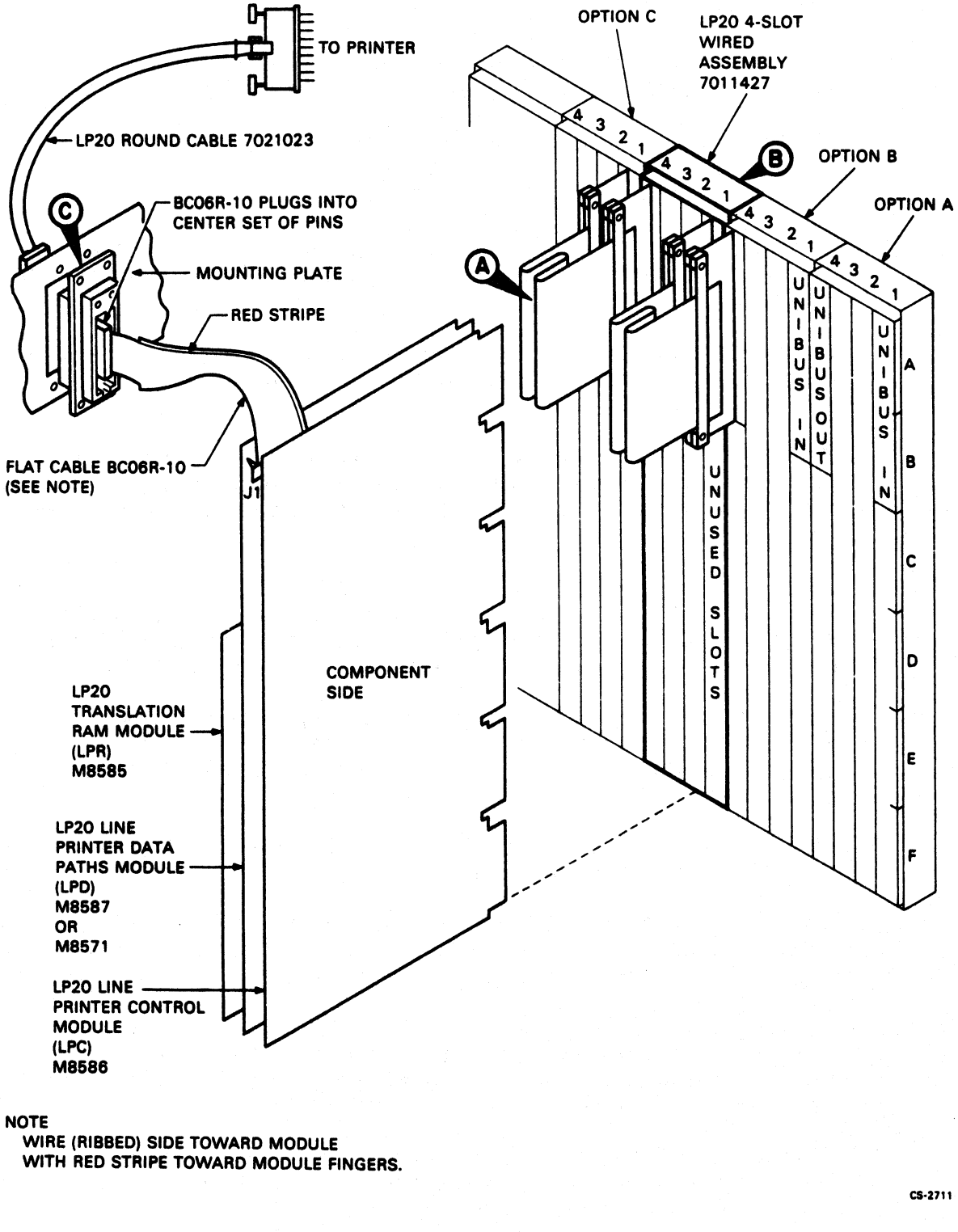


Figure 2-16 Typical LP20 Controller Assembly Mounting (Sheet 1 of 2)

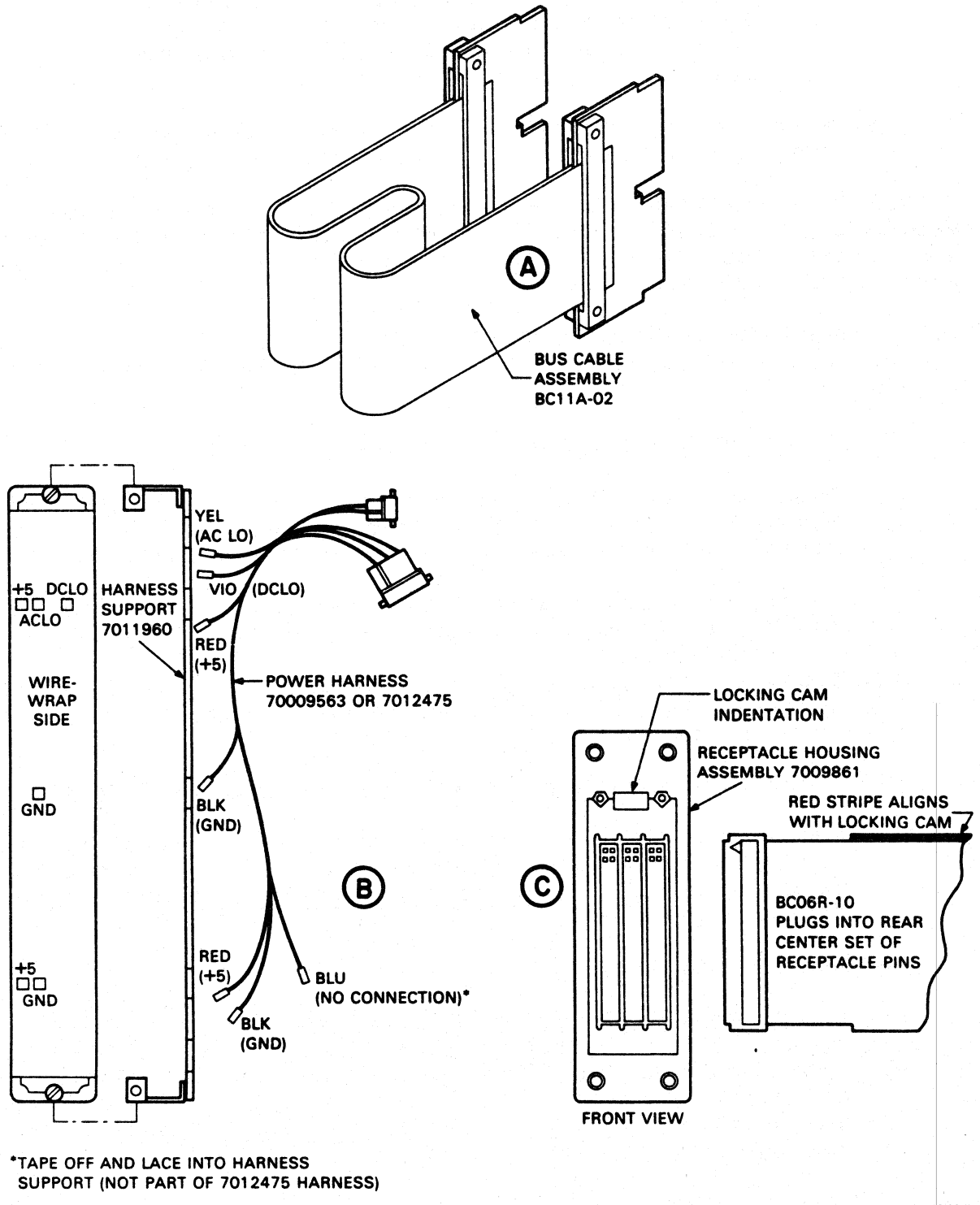


Figure 2-16 Typical LP20 Controller Assembly Mounting (Sheet 2 of 2)

CAUTION

Route cables so that they do not bind or interface with other cables or modules. Do not overtighten the printer connector.

14. With modules and cables installed, power up the system and again measure +5.0 V ±5% as described in step 9.

2.12.3.3 Installing Two LP20 Controllers -- Installation of the second LP20 controller is the same as that for the first controller, except for the configuration of address and vector jumpers. Refer to Section 2.12.3.1.

2.13 DECSYSTEM DIAGNOSTIC TEST

The procedure below is used for the printer models LP27-2A/-2B (LL version).

1. Power up the printer and system.

2. Read in the LP20 line printer diagnostic MD-10-DXLPB.* Refer to listing of DXLPB for operational assistance and console switches used in debugging the controller.

3. Verify that the printer has ribbon and paper and that no fault conditions exist, and the ON LINE indicator is lit.

4. Place the printer ON LINE. Verify that ON LINE indicator lights. Run the following tests as specified in steps 5 through 16.

5. Start the diagnostic at address 200 (switch 0 down).

6. Run diagnostic for five error-free passes (test mode). If one error persists, consult the system troubleshooting guide in the LP27 Line Printer Technical Manual or consult service personnel.

7. Halt the processor.

8. Start the diagnostic at address 200 (switch 0 up).

9. Run diagnostic for five error-free passes (printing). If an error persists, consult the system troubleshooting guide in the LP27 Line Printer Technical Manual or consult service personnel.

10. Halt the processor.

11. Verify that the line printer output is correct.

* For DECSYSTEM 2020 use MD-10-DSLPA.

12. Run manual intervention printer tests via interlocks. Refer to Chapter 3 of the LP27 Line Printer User's Guide for details.

13. Start the diagnostic at address 210.

14. Follow instructions on the terminal.

15. Run the diagnostic for one pass.

16. Halt the processor.

CHAPTER 3
OPERATION

This chapter contains information on printer controls and indicators, interlocks, operating procedures, ribbon changing, band replacement, and paper selection.

3.1 CONTROLS AND INDICATORS

Table 3-1 lists the printer controls and indicators (see Figures 3-1, 3-2, and 3-3 for locations).

Table 3-1 Controls and Indicators

Controls and Indicators	Function
POWER Switch	Allows primary ac power to be applied to the printer. Indicates ON/1 or OFF/Ø.
POWER ON Indicator	Illuminates when power is ON.
ON LINE Indicator	Illuminates when printer is ready and on-line or in self-test mode.
ALARM Indicator	Illuminates when any fault or not ready condition occurs.
LAMP CHECK Switch	Actuation of this lights all control panel indicators to verify their operation.
CLEAR Switch	When actuated, clears the ALARM indicator and printer logic, leaving the VFU buffer and paper position control intact.
ON/OFF LINE Switch (Front and Rear Panel)	When actuated and the printer is ready, places the printer in an on-line condition, illuminating the ON LINE indicator. If a self-test mode is selected, actuation of the ON/OFF LINE switch alternately starts and stops self-test, illuminating the ON LINE indicator when in the self-test mode.
SINGLE CYCLE Switch	When actuated, prints one line of data.

Table 3-1 Controls and Indicators (Cont)

Controls and Indicators	Function
TOP OF FORM Switch (Front and Rear Control Panel)	When actuated, this momentary switch advances paper to the next top of form position. This switch is disabled when the printer is on-line, in the self-test mode, or during a VFU load operation.
PAPER STEP Switch	When actuated, this momentary switch advances paper one line. This switch is disabled when the printer is on-line, in the self-test mode, or during a VFU load operation.
△ FORMS	When actuated, this momentary switch moves the form upward 0.035 cm (0.014 in) to aid in positioning it relative to the line of print. If this switch is pressed for more than 1 s, the form will advance continuously at approximately 3.55 cm (1.40 in).
FORMS ▽	When actuated, this momentary switch moves the form downward 0.035 cm (0.014 in) to aid in positioning it relative to the line of print. If this switch is pressed for more than 1 s, the form will advance continuously at approximately 3.55 cm (1.40 in).
STATUS Indicator	This digital readout indicates which printer function was being performed or which fault had occurred when the printer halted.
SELF TEST Switch	A three-position switch that allows exercising of the self-test function. Pressing the ON/OFF LINE switch with the SELF TEST switch in the up or down position places the printer in the self-test mode. With the switch in the down position, pressing the ON/OFF LINE switch will cause the printing of a sliding pattern. Placing the switch in the up

Table 3-1 Controls and Indicators (Cont)

Controls and Indicators	Function
SELF TEST Switch (Cont)	position will cause the printing of a fixed character pattern. After printing in the self-test mode in either the sliding or fixed pattern position, the switch may be moved to its center position. The printer will remain in the self-test mode, printing full lines of each character and changing the characters for each line printed, reproducing the entire character set. To exit the self-test mode of operation, the ON/OFF LINE switch is pressed with the SELF TEST switch in its center position.
6/8 LPI	Allows selection of either 6 or 8 lines/in spacing. TOP OF FORM switch must be reset after changing the 6/8 LPI setting.
DENSITY	A three-position control that allows the hammer energy level to be adjusted for maximum print and ribbon life. Used to compensate for differences in ribbon inking to maintain uniform print density.
80/FULL	When switch is set to 80, each line of print will terminate at 80 characters. In the FULL position, a 132-character line will be printed. This switch is operable only while in the self-test mode of operation.
FLS/VFU	A two-position switch that selects either the forms length switch or the VFU mode for forms control. In the VFU mode, the VFU memory is loaded directly from the user system (DAVFU). (DAVFU not supported on LP27-AA/-AB, DA/-DB).
FORMS LENGTH SELECT Switch	Two thumbwheel switches select the desired length of the forms to be printed.

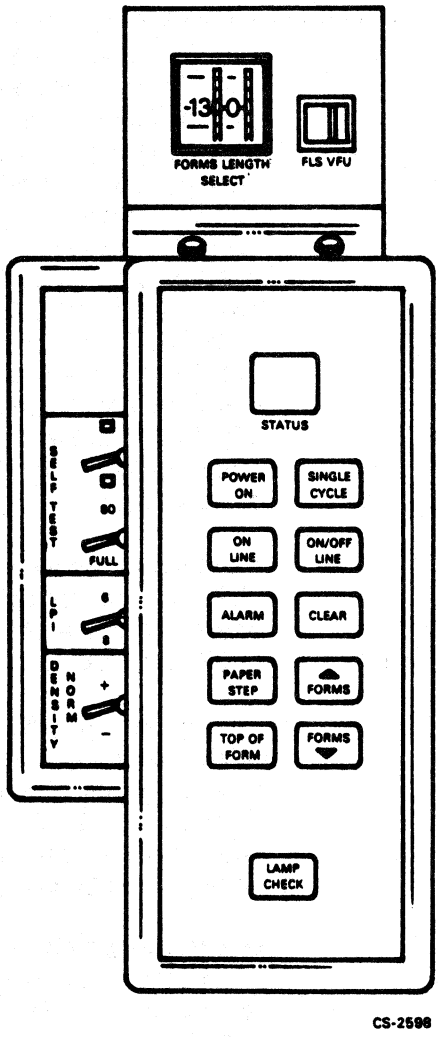


Figure 3-1 Control Panel

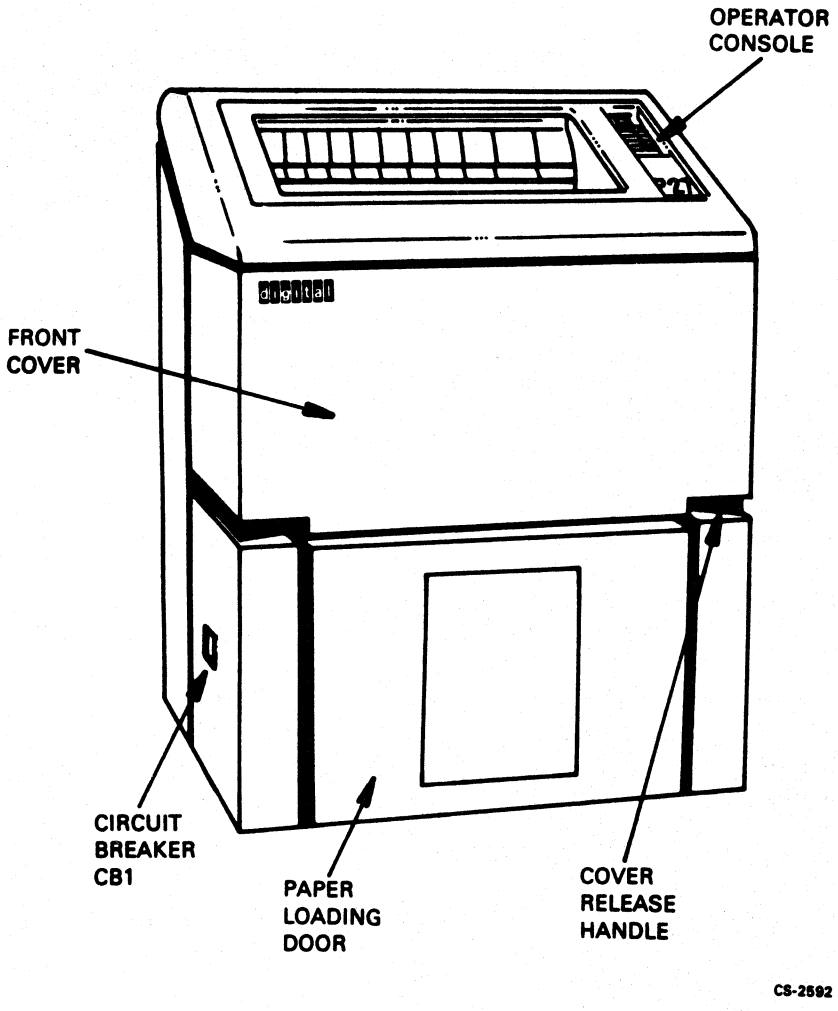


Figure 3-2 Printer, Front View

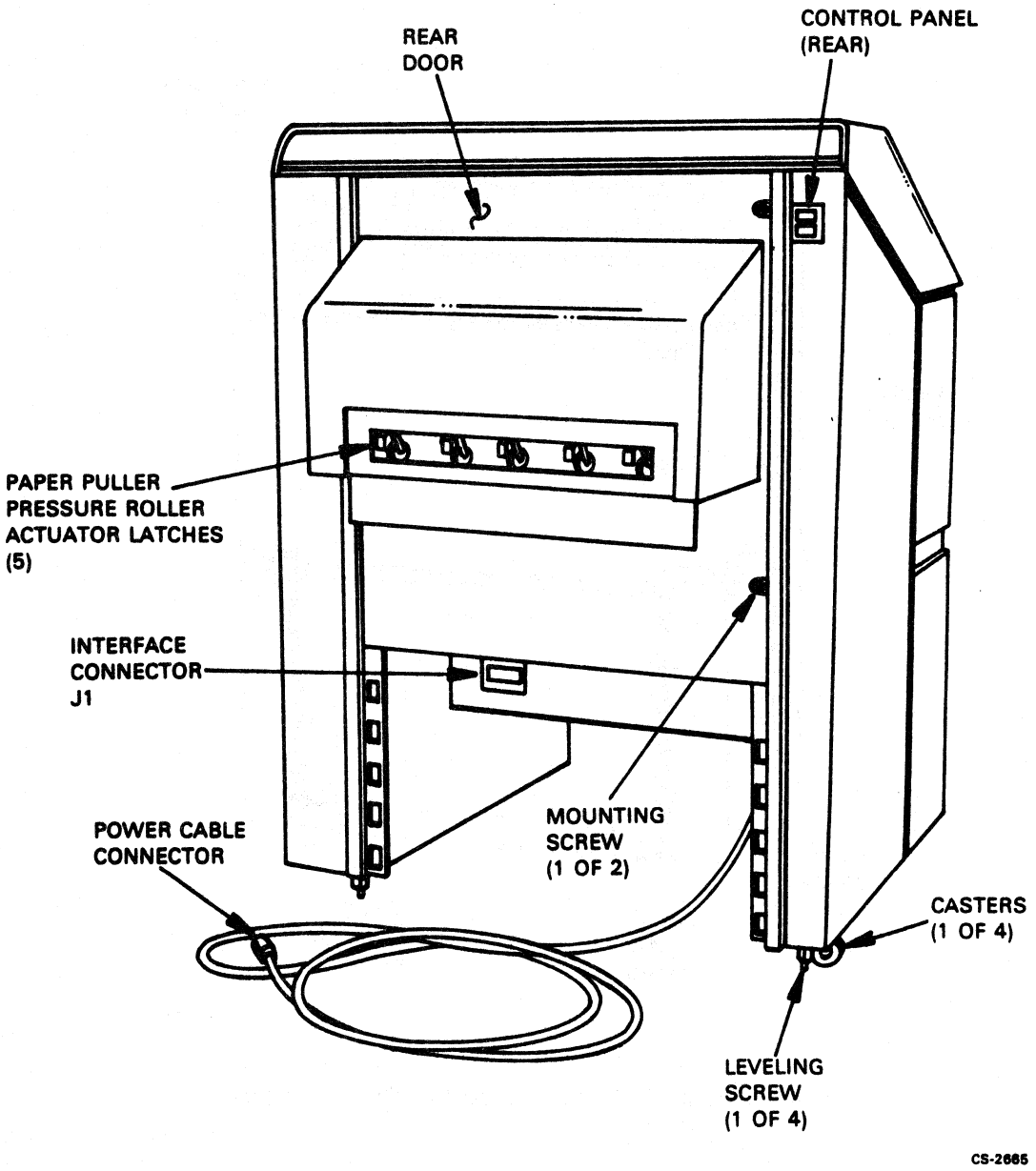


Figure 3-3 Printer, Rear View

3.2 PRINTER INTERLOCKS

Table 3-2 lists the printer interlocks.

Table 3-2 Printer Interlocks

Interlock	Function
Band Gate Open	Senses when the band gate is not properly latched. A status indication of Ø4 is displayed.
Paper Low	Detects the end of the last form. A status indication of Ø1 is displayed.
Band Interlock	Senses that the band release handle is not properly latched or the band cover is not closed. A status indication of Ø3 is displayed.
Paper Motion	Senses paper movement through the sprockets. Detection of a loss of paper will cause a status indication of Ø2 to be displayed.

3.3 OPERATING PROCEDURES

3.3.1 Ribbon Installation/Removal

3.3.1.1 Ribbon Installation --

Step No	Procedure
1	Place the printer off-line.
2	Release the cover latch and raise the printer cover to its fully open position (see Figure 3-2).

WARNING
Rotating parts. Keep clear until character band stops.

3	Open the band gate latch and swing the band gate fully open (see Figure 3-4).
4	Raise the ribbon mask assembly to its fully open position (see Figure 3-5).

NOTE
Use plastic gloves, supplied with ribbon, when installing ribbon.

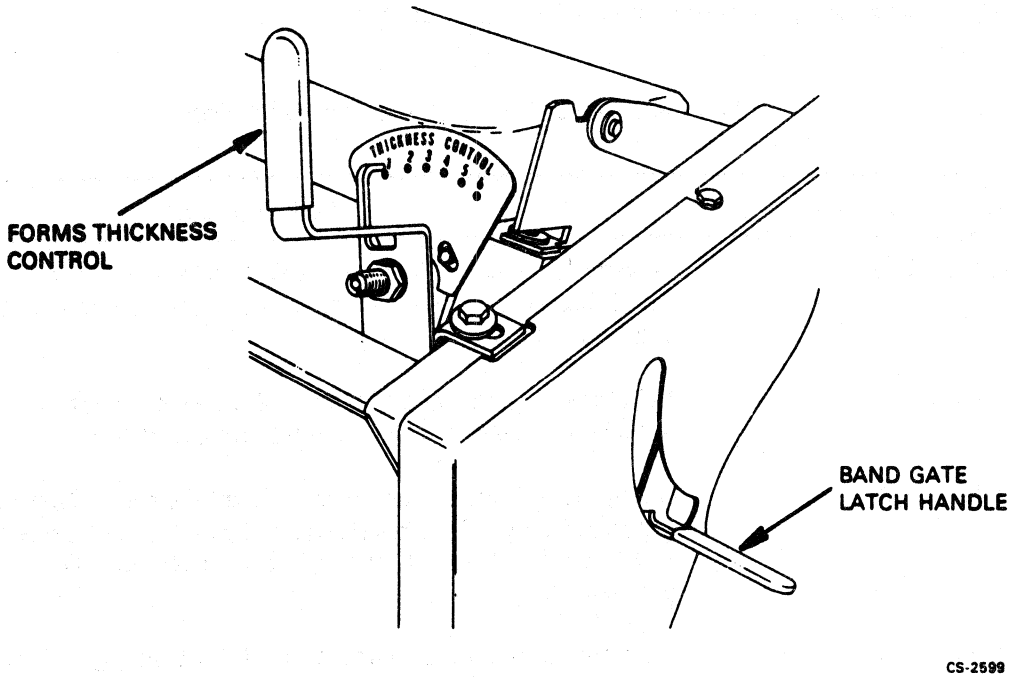


Figure 3-4 Band Gate Latch

Step No	Procedure
5	Hold the ribbon cores together and remove from the box.
6	Place the fully wound ribbon core against the spring-loaded upper ribbon holder assembly. Ensure that the ribbon unwraps from the top of the core (see Figure 3-6).
7	Push against the ribbon holder assembly and place the opposite ribbon core end onto the ribbon drive assembly. Ensure that the ribbon guide pin slips into the slot on the core end (see Figure 3-6).
8	Unwind the fully wound ribbon core enough to bring the ribbon to the lower ribbon holder assembly (see Figure 3-7).
9	Place the ribbon core against the lower spring-loaded ribbon holder assembly.
1Ø	Push against the ribbon holder assembly and place the opposite ribbon core end onto the ribbon drive assembly, ensuring that the ribbon guide pin slips into the slot on the core end.

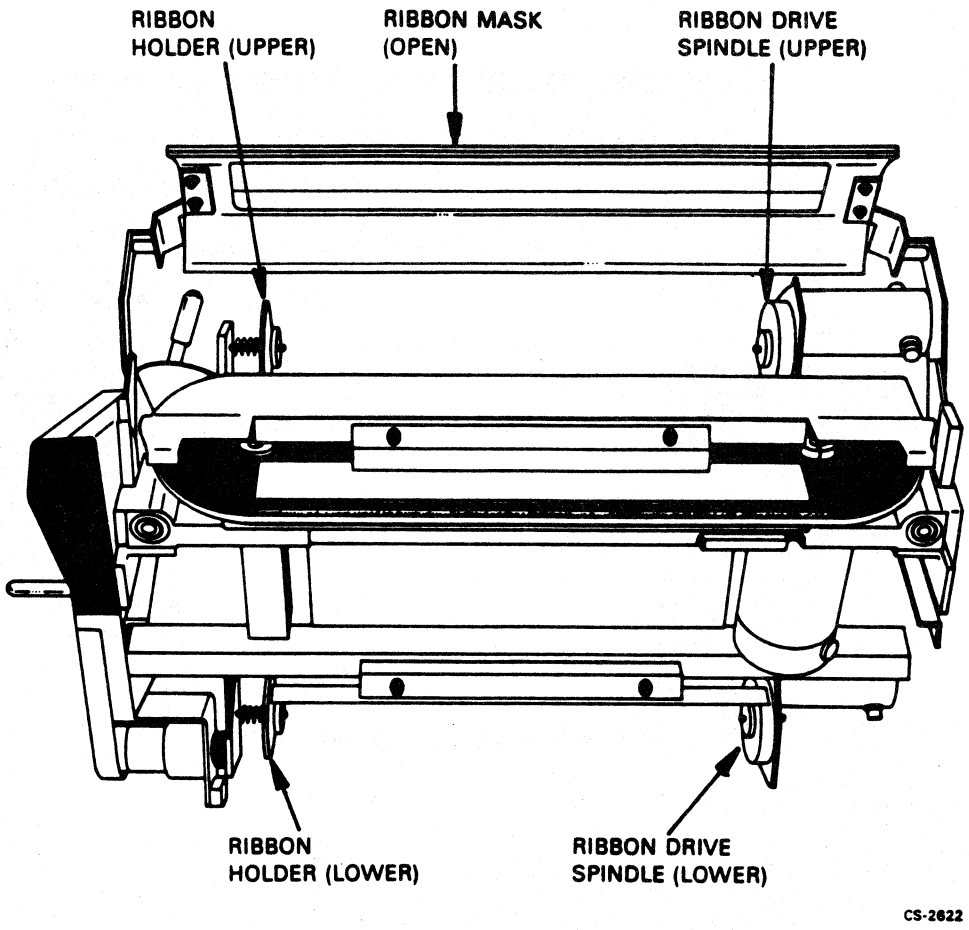


Figure 3-5 Ribbon Mask Assembly, Opened

Step No	Procedure
11	Close the ribbon mask assembly.
12	Close and latch the band gate.
13	Close and latch the printer cover.

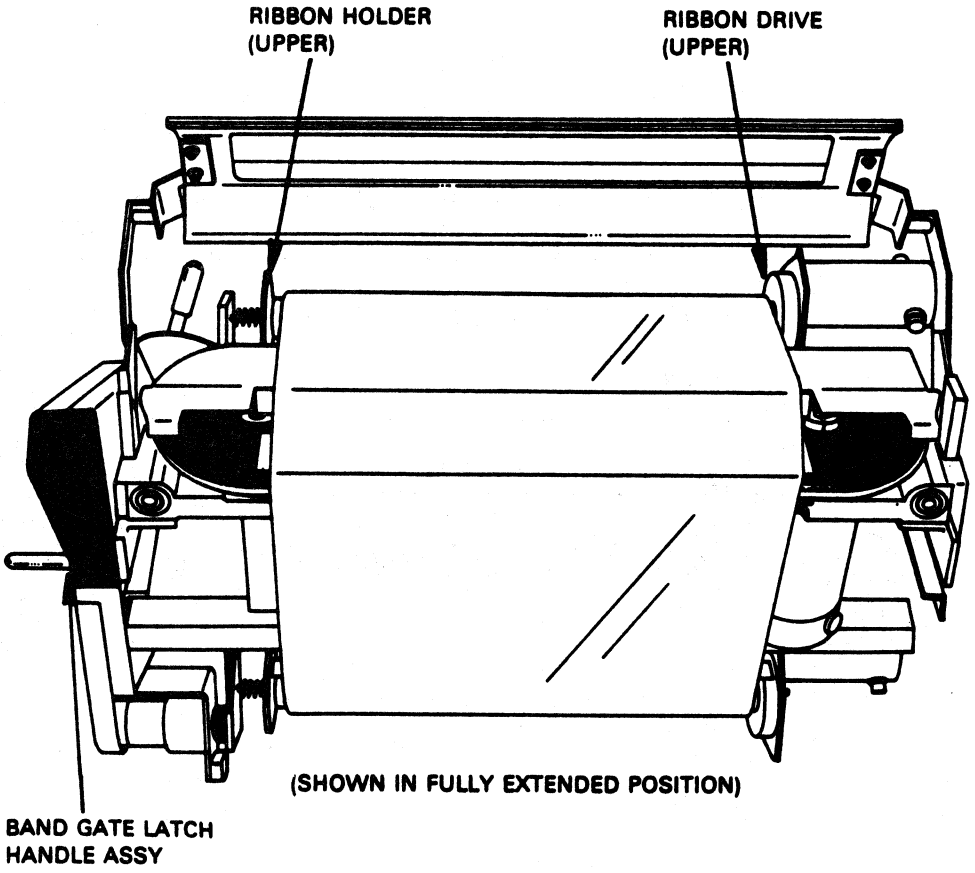


Figure 3-6 Ribbon Placement

3.3.1.2 Ribbon Removal --

Step No	Procedure
1	Place the printer off-line.
2	Release the cover latch and raise the printer cover to its fully open position (see Figure 3-2).
	WARNING **Rotating parts. Keep clear until character band stops.**
3	Open the band gate latch and swing the band gate fully open.
4	Raise the ribbon mask assembly to its fully open position.

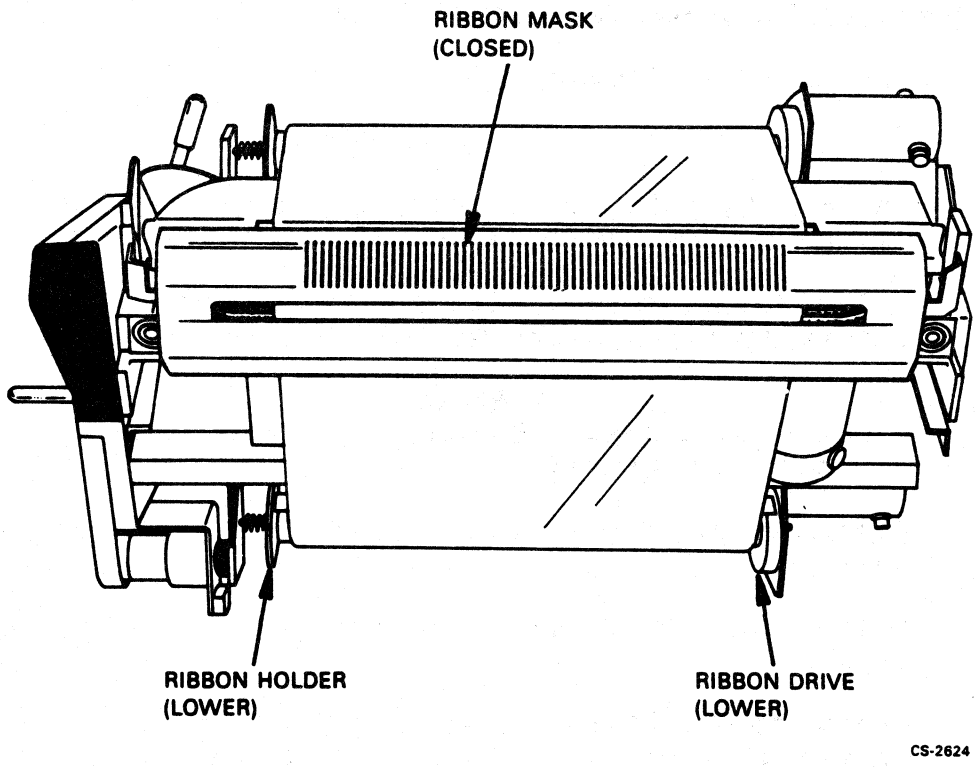


Figure 3-7 Ribbon Mask Assembly, Closed

Step No	Procedure
	NOTE **Use plastic gloves when removing the ribbon.**
5	Grasp the ribbon cores and push toward the spring-loaded end until the ribbon holder springs are fully compressed.
6	Remove ribbon by pulling the opposite ribbon core ends free of the ribbon drive assembly and away from the band gate.

3.3.2 Character Band Removal/Installation

3.3.2.1 Character Band Removal --

Step No	Procedure
1	Ensure that the printer is off-line, and set the POWER switch to the OFF/Ø position.
2	Release the cover latch and raise the printer cover to its fully open position (see Figure 3-2).
	WARNING **Rotating parts. Keep clear until character band stops.**
3	Open the band gate latch and swing the band gate fully open.
4	Raise the ribbon mask assembly to its fully open position.
5	Grasp the ribbon cores and push toward the spring-loaded holder end until the ribbon holder spring assemblies are fully compressed.
6	Remove the ribbon by pulling the opposite ribbon core ends free of the ribbon drive assembly and away from the band gate.
7	Lift open the band cover.
8	Remove band tension by positioning the band release handle upward (see Figure 3-8).
	CAUTION **Do not bend the character band to a radius less than that of the band pulleys when removing or during storage.**
9	While holding the band with the left hand, carefully lift the band from the right band pulley.
1Ø	Squeeze the band together at the center, carefully lifting it off the left band pulley, and remove it from the printer.
11	To install new band, proceed to Section 3.3.2.2, step 6.

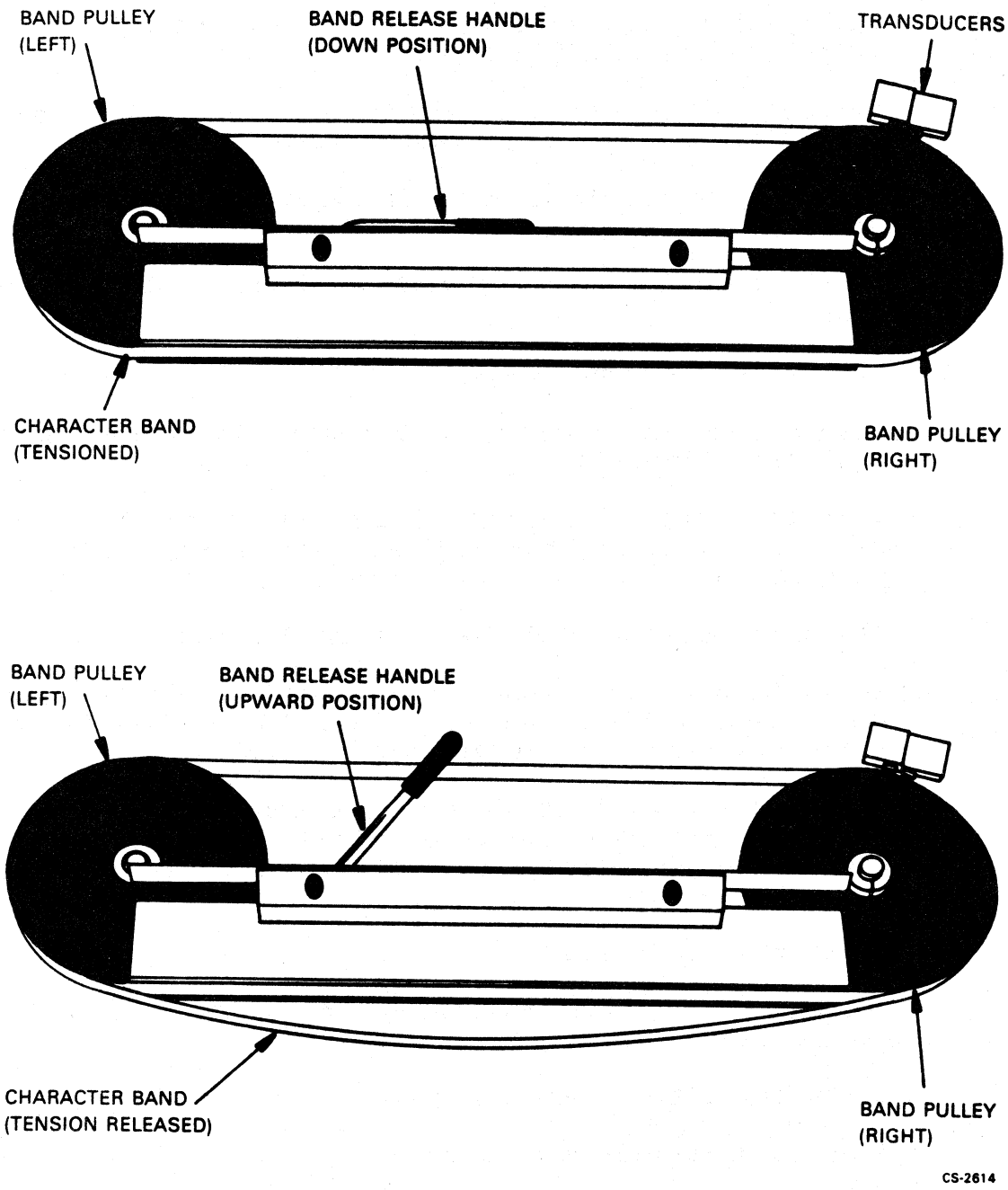


Figure 3-8 Band Gate Assembly

3.3.2.2 Character Band Installation --

Step No	Procedure
1	Ensure that the printer is off-line, and set the POWER switch to the OFF/Ø position.
2	Release the cover latch and raise the printer cover to its fully open position (see Figure 3-2).
3	Open the band gate latch and swing the band gate fully open.
4	Raise the ribbon mask assembly to its fully open position.
5	Lift open the band cover.
6	Ensure that the band release handle is in the up position (see Figure 3-8).
7	With the print characters facing up, place the band in position, allowing the band to rest on top of the right band pulley.
8	Place the band around the left band pulley.
9	While holding the band in position, slide it over the right band pulley, ensuring that is is positioned between the band transducers and the pulley.
1Ø	Position the band flush with the top edge of both band pulleys, then move the band release handle down to tension the band. Manually rotate the pulleys a few turns to seat the band.
11	Close the band cover.
12	Install the ribbon following the ribbon installation procedure.
13	Close the ribbon mask assembly.
14	Close and latch the band gate.
15	Close and latch the printer cover.

NOTE

When the printer is powered up, the character band will position itself properly.

3.3.3 Paper Loading

This procedure assumes that the ribbon and character band are properly installed.

Step No	Procedure
1	Place the POWER switch (located on the left-hand side of printer) to ON/1 (see Figure 3-9).
2	Ensure that the POWER ON indicator is illuminated (see Figure 3-1).
3	With the printer powered up, press the TOP OF FORM switch on the operator control panel (see Figure 3-1).
4	Unlatch and raise the printer cover to its fully open position.

WARNING

Rotating parts. Keep clear until character band stops.

5	Open the band gate latch and swing the band gate fully open (see Figure 3-4).
6	Open all upper and lower tractor covers (see Figure 3-10).
7	Slide paper part of the way through the paper feed exit assembly and align the form feed holes over the upper left-hand sprocket pins. Close the tractor cover (see Figure 3-10).
8	Pull up and turn the FORMS ADJUSTMENT control knob to align the right-hand sprocket pins to the form feed holes. Close the upper right-hand sprocket cover (see Figure 3-10).
9	Turn the paper tension control knob to align the lower tractor feed pins to the form feed holes. Close both lower sprocket covers. If the upper and lower tractors do not align, perform the vertical tractor alignment procedure (refer to Section 3.3.6).

NOTE

Over-tension of the paper feed sprockets is indicated by elongation of the form feed holes.

10	Turn the FORMS ADJUSTMENT control knob to align the form in the correct lateral position for printing (see Figure 3-10).

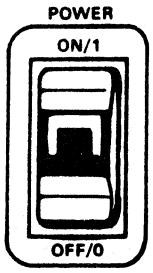


Figure 3-9 Power Switch

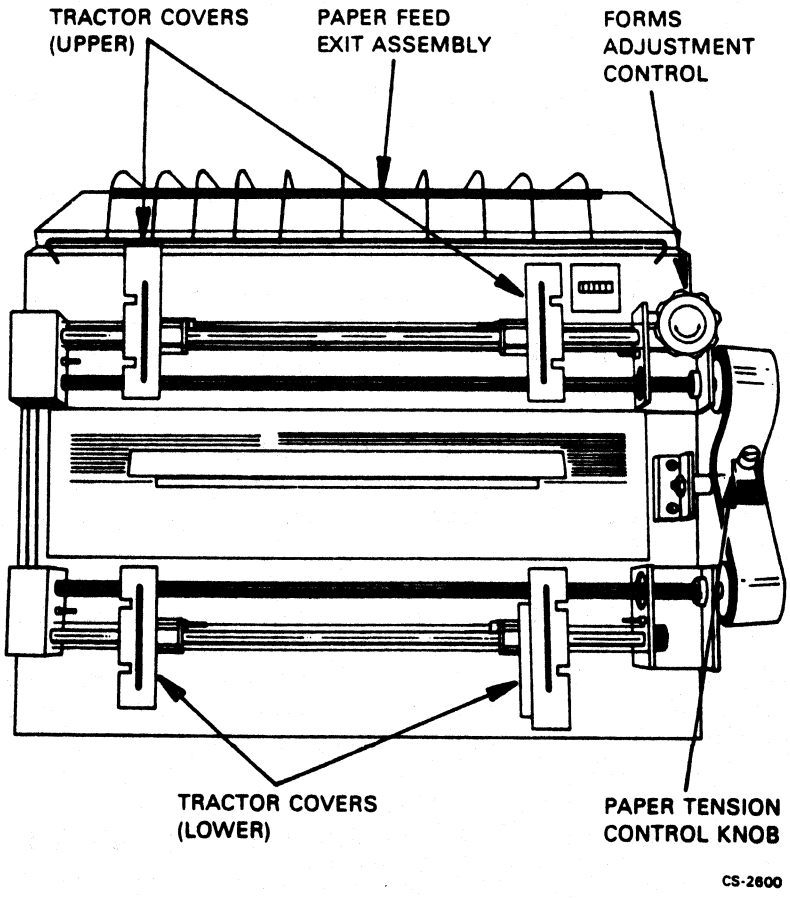


Figure 3-10 Paper Loading

Step No	Procedure
11	Press the FORMS switches on the operator control panel to align the top of form to the correct position (see Figure 3-1).
12	Close and latch the band gate.
13	Ensure that the FLS/VFU switch is set to the desired position.
14	If the FLS feature is to be used, ensure that the FORMS LENGTH SELECT thumbwheels are set to the appropriate forms length (see Figure 3-1).

NOTE
The FORMS LENGTH SELECT switch must be evenly divisible by the selected number of lines per inch. Refer to 6/8 LPI description in Table 3-1.

15	Press the TOP OF FORM switch. Align the form as shown in the paper loading procedure (refer to Section 3.3.3).
16	Press the ON/OFF LINE switch and verify that the ON LINE indicator is illuminated. Allow the indicator to remain lit if the on-line mode is required (see Figure 3-1).
17	Close and latch the printer cover.

3.3.4 Power-Up/Restart

The power-up/restart procedure assumes that the printer is properly loaded with paper, the ribbon and character band are properly installed, the SELF TEST switch is in its center position, and all printer doors and latches are closed.

Step No	Procedure
1	Place the POWER switch, located on the exterior left-hand side of the printer, to ON/1 (see Figure 3-9).
2	Ensure that the POWER ON indicator is illuminated (see Figure 3-1).
3	Press the ON/OFF LINE switch and verify that the ON LINE indicator is illuminated. Allow the indicator to remain lit if the on-line mode is required (see Figure 3-1).

3.3.5 Power Down

If the ON LINE indicator is illuminated, press the ON/OFF LINE switch. If the indicator remains lit, this indicates that unprinted data remains in the printer memory. If it is desired to disregard this data and continue the power-down procedure, place the POWER switch to OFF/Ø and ensure that the POWER ON indicator is extinguished (see Figure 3-1).

CAUTION

Turning off the power will result in loss of top of form orientation. The top of the form will be re-established in the next power on procedure.

3.3.6 Tractor Vertical Alignment Procedure

This procedure checks the vertical alignment of the upper and lower tractors on the left and right sides.

Step No	Procedure
1	Place the printer off-line.
2	Unlatch and raise the printer cover door to its fully open position (see Figure 3-2).
	WARNING **Rotating parts. Keep clear until character band stops.**
3	Open the character band gate latch and swing the band gate fully open (see Figure 3-1Ø).
4	Turn the FORMS ADJUSTMENT control knob counterclockwise until both upper and lower left side tractors have reached their limit against the stops. The left upper and lower tractors should now be aligned vertically (see Figure 3-11).
5	Pull up and turn the FORMS ADJUSTMENT control knob clockwise until both upper and lower right side tractors have reached their limit against the stops. The right upper and lower tractors should now be aligned vertically (see Figure 3-11).
6	If either of the vertical tractors are out of alignment, call the service personnel.

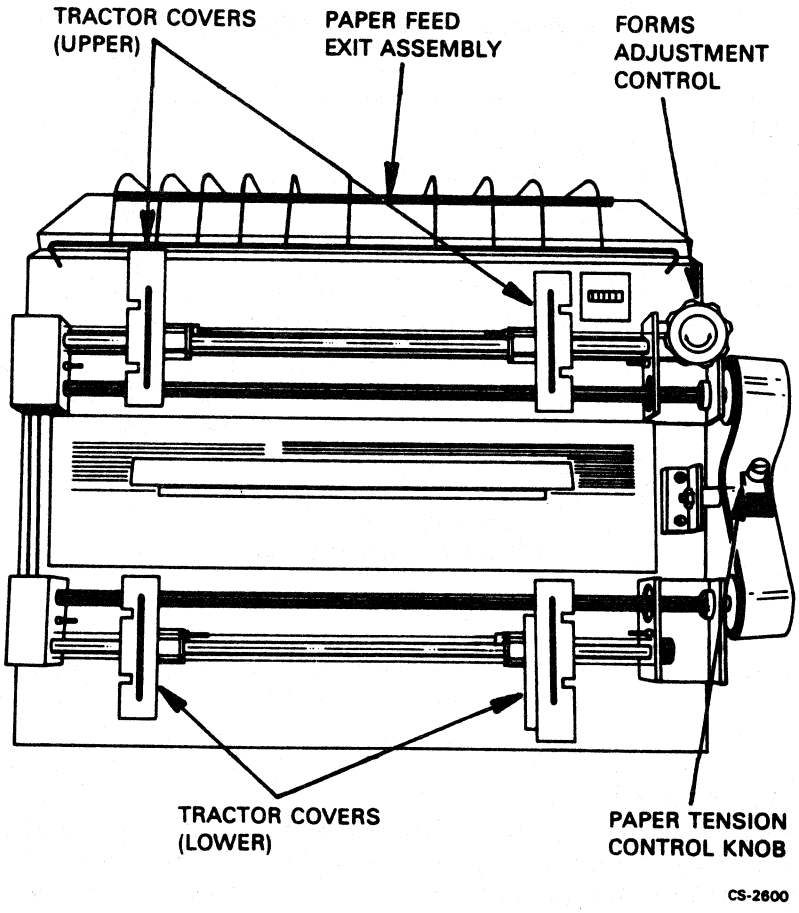


Figure 3-11 Vertical Tractor Alignment

3.3.7 Paper Puller Operation

Push in the required number of pressure roller actuator latches to engage the pressure rollers with the drive rollers. Engage the minimum number of pressure rollers necessary to provide uniform pull to keep paper bounce at a minimum above the upper paper feed tractors, and to provide the required amount of drive for smooth paper slew operation (see Figure 3-12).

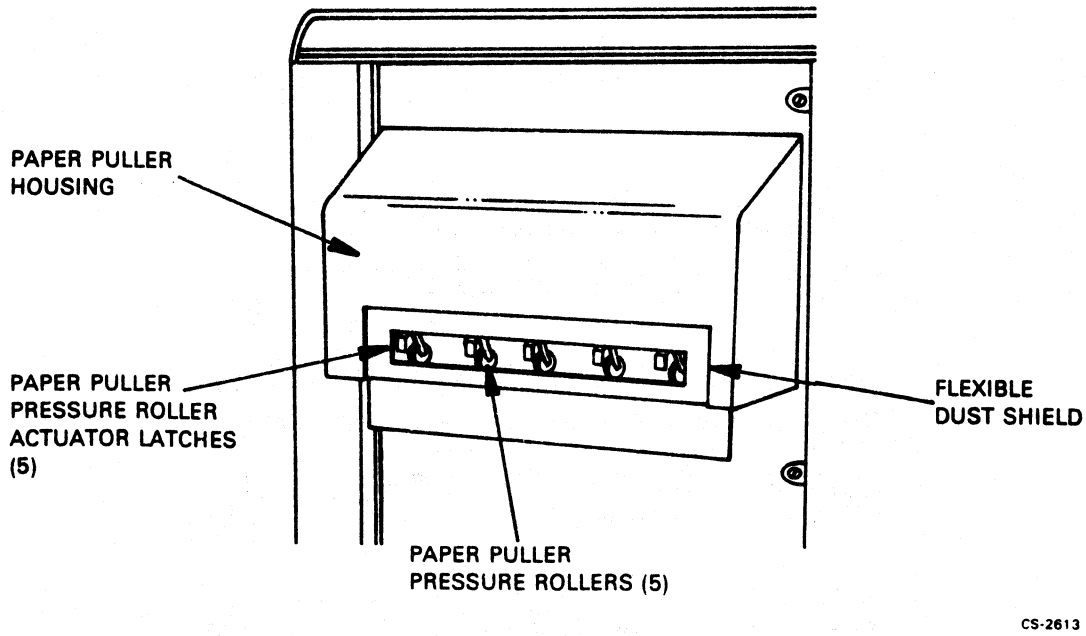


Figure 3-12 Paper Puller Actuator Latches and Pressure Rollers

3.3.8 Registration Check

This procedure assumes that the printer is powered up, off-line, and properly loaded with paper, ribbon, and character band, and that all interlocks are closed.

Step No	Procedure
1	Unlatch and raise the printer cover (see Figure 3-2) and select either the 6 or 8 LPI setting, as desired. TOP OF FORM switch must be reset when 6/8 LPI setting is changed (see Figure 3-1).
2	Place the SELF TEST switches in the fixed character (up) position and FULL setting (see Figure 3-1).
3	Set the FORMS THICKNESS CONTROL lever to the correct setting for the number of forms being printed (see Figure 3-13).
4	Momentarily press the TOP OF FORM switch. The form should slew to the top paper position of the next form with no tearing or wrinkling.
5	Press the ON/OFF LINE switch to start the print cycle. Allow a sufficient number of lines to be printed to determine vertical and horizontal character registration (see Figure 3-1).

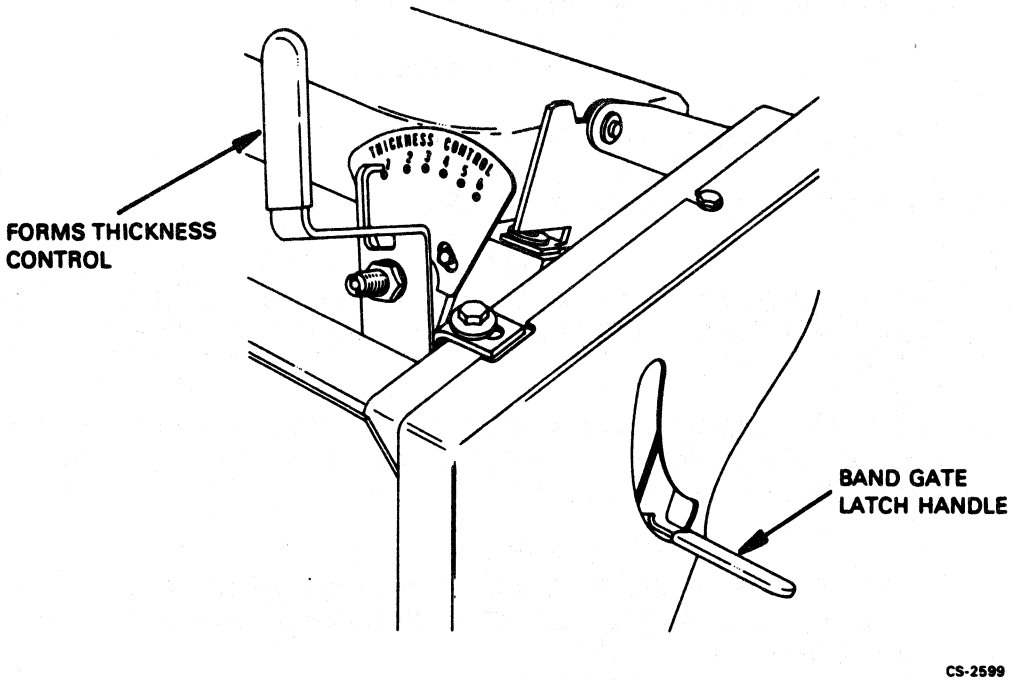


Figure 3-13 Copies Control Lever

Step No	Procedure
6	Press the ON/OFF LINE switch to halt the print cycle. Ensure that all letters and symbols are legible and that all columns have been printed.
7	While printing in self-test mode, set the DENSITY control to the lowest setting that allows the best print quality for the number of forms being printed (see Figure 3-1).
8	Press the ON/OFF LINE switch to halt the print cycle.
9	Set the SELF TEST switch to its center or OFF position (see Figure 3-1).
10	Close and latch the printer cover.

3.3.9 Forms Length Select Switch

Step No	Procedure
1	Place the printer off-line.
2	Unlatch and raise the printer cover.

NOTE
If a new form size is to be used, refer to the paper loading procedures in Section 3.3.3.

3	Set the FLS/VFU switch to the FLS position, then set the FORMS LENGTH SELECT thumbwheels to the desired legal forms length.

NOTE
The FORMS LENGTH SELECT switch must be evenly divisible by the selected number of lines per inch.

A status indication of Ø8 indicates an illegal combination setting of the FLS and 6/8 LPI switches.

4	Momentarily press the TOP OF FORM switch. The form should slew to the top position of the next form.
5	Close and latch the printer cover.

3.4 STATUS INDICATORS

The printer has a diagnostic status indicator located on the operator control panel. It displays a status code that depicts the operation being performed or the fault that has forced the printer off-line. Table 3-3 lists the status display codes, corrective actions, and possible means of clearing the printer after corrective action has been taken.

Table 3-3 Status Indicators

Status Display	Definition	Corrective Action	Cleared By	
Ø1	Out of paper	Install paper		2
Ø2	Paper motion fault	Clear paper jam	1	2
Ø3	Band cover not locked	Close band cover	1	2
Ø4	Band gate not closed	Close band gate	1	2
Ø5	Undefined band loaded	Replace with valid band or PROM	1	2
Ø6	Ribbon fault	Check for ribbon jam	1	2
Ø7	Hammer verify fault	If error persists, call service personnel		1
Ø8	Undefined forms length selected	Set 6/8 LPI switch or FLS switch	1	2
Ø9	Not applicable			
1Ø	VFU memory not loaded	Reload VFU memory; master clearing will allow operation without VFU		1
11	Not applicable			
12	No top of form	Reload DAVFU	1	2
13	Not applicable			
14	Channel not found	Reload DAVFU	1	2
15	Not applicable			
16	Single step mode	Single step to bottom of form and/or install paper	1	2
17	Loss of sync in print	Clear. Check last line of print for incorrect data. If error persists, call service personnel		1

1 = Press ALARM/CLEAR switch.

2 = Correct fault.

Table 3-3 Status Indicators (Cont)

Status Display	Definition	Corrective Action	Cleared By
18	VFU not selected	VFU/FLS switch incorrectly set. Set in proper position	1
19	Improper throat or density setting for flight time	Set copies control for single part paper and density control at center position	1
20	Hung with unprintable data	Data error*	1
21	Print inhibit	Internal print inhibit switch set incorrectly. Call service personnel	3
22	Interlock cable error	Call service personnel	3
23	I/O parity error, data load	Have user send a BUFFER CLEAR signal. Validate data	1
25	Format code not recognized	Transmit correct format code. Validate VFU data	1
26	DAVFU stop code	Data error†	1
27	DAVFU image too long	Data error†	1

1 = Press ALARM/CLEAR switch.

3 = Shut down and power up. If error persists, call service personnel.

* Data error corresponds to a printer system malfunction. If the ALARM/CLEAR switch does not correct the problem, service personnel should be called.

† Data error corresponds to a user system malfunction. If the ALARM/CLEAR switch does not correct the problem, service personnel should be called.

Table 3-3 Status Indicators (Cont)

Status Display	Definition	Corrective Action	Cleared By
29	I/O parity error, DAVFU load	Validate input data	1
31	Missing index	Call service personnel	1
32	Missing HPRES	Call service personnel	1
33	Paper feed command error	Call service personnel	1
34	Band position fault	Clear. If error persists, call service personnel	1
35	Band ID = Ø	Clear. If error persists, call service personnel	1
36	+5 V fault	Call service personnel	3
37	+14 V fault	Call service personnel	3
38	-14 V fault	Call service personnel	3
39	+5Ø V fault	Call service personnel	3
4Ø	Band speed fault	Clear. If error persists, call service personnel	1
41	Paper drive system fault	Call service personnel	3
42	Hammer protect fault	Call service personnel	3
46	VCL fault	Call service personnel	3
49	Band current fault	Call service personnel	3

1 = Press ALARM/CLEAR switch.

3 = Shut down and power up. If error persists, call service personnel.

Table 3-3 Status Indicators (Cont)

Status Display	Definition	Corrective Action	Cleared By
51	Position band	Normal indication during 15 s band position routine.‡	
52	Print routine - waiting for HPRESET	Call service personnel	3
53	Waiting for paper motion completion	Call service personnel	2
54	Print routine - waiting for hammer trigger	Call service personnel	2
55	Print routine - loss of sync	Call service personnel	2
56	Band ID routing	Normal indication‡	
58	TOP OF FORM switch pressed	Normal indication‡	
59	PAPER STEP switch pressed	Normal indication‡	
60	FORMS ADJUST switch pressed	Normal indication‡	
62	ON/OFF LINE switch pressed	Normal indication‡	
63	Not applicable		
64	6/8 LPI switch not initialized	Initialize switch.	
65	VFU/FLS switch setting not initialized	Initialize VFU/FLS switch	

2 = Correct fault.

3 = Shut down and power up. If error persists, call service personnel.

‡ If normal print operation halts and one of these status codes is displayed, power the printer down and then up. If the condition still exists, call service personnel.

Table 3-3 Status Indicators (Cont)

Status Display	Definition	Corrective Action	Cleared By
66	Self-test mode - print inhibit	Call service personnel	3
67	Self-test mode	Place SELF TEST switch to OFF (center position)	3
68	DAVFU load routine	Normal indication†	
69	Forms length setting not initialized	Initialize FORMS LENGTH SELECT switch	2
75	On-line - buffer clear active	Call service personnel	3
76	On-line mode - print inhibit	Call service personnel	3
77	On-line mode	Normal indication.	
78	On-line - data in buffer	Call service personnel	2
88	Off-line - ready	Press ON/OFF LINE switch	
90	RAM test - memory 0	Call service personnel	3
91	RAM test - memory 1	Call service personnel	3
92	RAM test - memory 2	Call service personnel	3
93	RAM test - memory 3	Call service personnel	3
94	Illegal RAM test	Call service personnel	3
95	Hammer verify memory test	Call service personnel	3
P	Power reset	Call service personnel	3

2 = Correct fault.

3 = Shut down and power up. If error persists, call service personnel.

† If normal print operation halts and one of these status codes is displayed, power the printer down and then up. If the condition still exists, call service personnel.

Table 3-3 Status Indicators (Cont)

Status Display	Definition	Corrective Action	Cleared By
CP	Clock fault	Call service personnel Whenever a clock fault occurs, a power reset is generated. Therefore, a "P" will also be displayed	3
H	Temperature fault	Call service personnel	3

3 = Shut down and power up. If error persists, call service personnel.

3.5 CARE AND MAINTENANCE

The recommended cleaning solution for all subassemblies is 91% isopropyl alcohol.

WARNING

Isopropyl alcohol is a combustible liquid and must be kept away from heat and open flame.

Rotating parts. Keep clear until character band stops.

CAUTION

DO NOT use trichloroethylene, methylethylketone, or acetone.

1. Place the power switch to the OFF position.
2. Remove the ribbon (refer to the ribbon removal procedures in Section 3.3.1.2).
3. Remove the character band (refer to the character band removal procedures in Section 3.3.2.1). Place the character band in a shallow pan.

CAUTION

Do not bend the character band to a radius less than that of the band pulleys when removing or during storage.

4. Vacuum the printer interior.

5. Place the cleaning solution in a bottle with a spray nozzle and saturate the character band. Using a small, stiff bristled brush, clean the typefaces thoroughly, adding more solution as required. Clean both sides of the entire character band and allow to drip dry.

6. To clean the band area, moisten a soft cloth with the cleaning solution and clean both band pulleys, the ribbon mask, the platen (the area facing the hammers), and along the path travelled by the character band and the ribbon.

7. Replace the character band following the installation procedures in Section 3.3.2.2; replace the ribbon following the procedures in Section 3.3.1.1.

3.6 PAPER SELECTION GUIDE

The following is presented as a guide for selecting forms to be used in the printer. Forms meeting these specifications should produce satisfactory printing results. However, it is ultimately the responsibility of the user to ensure that the forms provide satisfactory printing and do not degrade printer performance. Table 3-4 lists the paper requirements and additional paper specifications.

NOTE

Forms should be tested under the user's operating conditions to verify proper paper handling and printout legibility. Forms other than listed herein may be used to fulfill the operating requirements, provided they do not increase the maintenance requirements of the printer.

Table 3-4 Paper Selection Guide

Item	Specification
Type	Standard fan-folded, edge-punched
Dimensions	
Width	88.90 to 476.00 mm (3.50 to 18.75 in) overall
Length	A minimum forms length of 7.62 cm (3.00 in) and a maximum of 35.56 cm (14.00 in) can be accommodated
	A printer using the direct access vertical format unit may accommodate forms up to a maximum of 45.40 cm (17-7/8 in) when operating at 6 lines/in

Table 3-4 Paper Selection Guide (Cont)

Item	Specification
Weight*	A maximum forms thickness of up to 0.50 mm (0.02 in) can be accommodated
Single Copy	56 gsm bond (15 lb) minimum. 68 to 75 gsm bond (18 to 20 lb) recommended
Multicopy	Typically 45 gsm bond (12 lb) paper with 14 to 19 gsm (6 to 8 lb) single-shot carbon for up to six parts
Card Stock	56 to 470 gsm (15 to 125 lb)
Environmental	Recommended operating and storage of forms for best printing
	Temperature of 16°C (60°F) and a relative humidity of 40% to 60%
Punching	The forms should have sprocket feed holes in the left- and right-hand margins. Holes should be 0.396 ± 0.010 cm (5/32 ± 0.004 in) in diameter. The top hole centers should be located 0.64 ± 0.08 cm (1/4 ± 1/32 in) from the top horizontal tearline perforation (applicable when the forms length is evenly divisible by 1.27 cm [1/2 in]). Hole centers should be 0.64 ± 0.04 cm (1/4 ± 1/64 in) from the edge of the forms. The horizontal center-to-center distance between holes should be within 0.04 cm (1/64 in) of nominal; for example, 21.59 cm (8.50 in) form; center-to-center hole spacing should be 1/2 ± 0.4 cm. The forms used should enter and leave the sprocket pins without tearing.
	Holes punched in carbons should not be less than the actual size of the holes punched in the forms and not greater than 0.846 cm (7/21 in) in diameter. Holes in carbons and forms should be centered with corresponding holes in all parts. Holes should be punched cleanly so that no disks remain in either the forms or carbons.

* Paper weights are based on bond = 17 in x 22 in x 500 sheets; or carbon = 20 in x 90 in x 500 sheets (gsm = grams per square meter).

Table 3-4 Paper Selection Guide (Cont)

Item	Specification
Perforations	The horizontal tearline perforations should be accurately located at a 90 degree angle to the centerline of the form feed holes. The perforations should be cut through both forms and carbons. The cut and uncut portions of the forms should have dimensions satisfactory for the intended use, but should not catch in normal handling or feeding through the printer.
Fastening	Forms and carbons should be secured together by a method that prevents any sheet or carbon from shifting position, relative to the other sheets. Print quality is adversely affected by a loosely fastened form. Fastening on both margins is recommended. The fastening medium must not impair the printing alignment or feeding of forms. Metallic, hard-finished fasteners, or any fastening medium that can cause damage to the printer, should not be used. If only one side of the form is fastened, it must be the right side.
Fastening (Cont)	Recommended types of fastening are crimping, hook lock, stan lock, and fugitive and flexible gluing. The fastening technique used must not cause wrinkling, creases, or tears that would restrict form feeding through the printer.

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