



M-520163
ISSUE 2

**MICROLINE 84
DOT-MATRIX PRINTER
(Standard Model)**

**Maintenance
Manual**



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Preface

PART I User's Manual

PART II Maintenance Manual

PART III Appendixes

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Oki Electric Industry Company, Ltd.
International Division
10-3 Shibaura 4-chome
Minato-ku, Tokyo 108
Japan

Preface

This manual consists of three parts:

- Part I** **User's Manual**, containing all information needed for installation, operation, paper and ribbon loading, and programming of the MICROLINE 84 Dot-Matrix Printer

- Part II** **Maintenance Manual**, containing all additional information needed for maintenance, troubleshooting, and repair of the MICROLINE 84 (maintenance and repair personnel should review Part I before reading Part II).

- Part III** **Appendixes**, containing technical details of printer design and operation.

The MICROLINE 84 is a desk-top, serial dot-impact matrix, receive-only printer. It is particularly suited to personal computer applications.

The printer receives data line-by-line, and prints it out. Data can be received even during printing so that the machine can print in both directions in the shortest distance. The printer employs an extra-small print head, simplified mechanism, and a microcomputer, so it is small in size and light in weight.

The main features of the MICROLINE 84 include:

- (1) High-speed printing at up to 200 characters per second
- (2) Both upper-case and lower-case characters
- (3) High-quality printing using subdividing space motor
- (4) High throughput by bidirectional printing and shortest-distance printing
- (5) FF, VT, and TOF functions provided
- (6) Low noise
- (7) Small size, light weight
- (8) Low power consumption
- (9) Simple design
- (10) Graphics, and reduced or enlarged characters

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PART I User's Manual

WARNING: This equipment complies with the limits for a Class B computing device in accordance with the specifications in Subpart J of Part 15 of FCC Rules which are designed to minimize radio frequency interference in a residential installation. There is no guarantee that radio or television interference will not occur in any particular installation and can be determined by turning the equipment off and on. The user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient the radio or television receiving antenna
- Relocate the computer with respect to the receiver
- Move the computer away from the receiver
- Plug the computer into a different outlet so that computer and receiver are on different branch circuits.

If necessary, the user should consult the dealer or an experienced radio/television technician for additional suggestions. The user may find the following booklet prepared by the Federal Communications Commission helpful:

“How to Identify and Resolve Radio-TV Interference Problems” This booklet is available from the US Government Printing Office, Washington, DC 20402, Stock No. 004-000-00345-4.

1. INTRODUCTION

This manual describes the operation of the MICROLINE 84, designed as a high-performance printer with multiple functions. The MICROLINE 84 can be used with a personal computer.

Before using your MICROLINE 84 printer, read this manual to understand the printer operation.

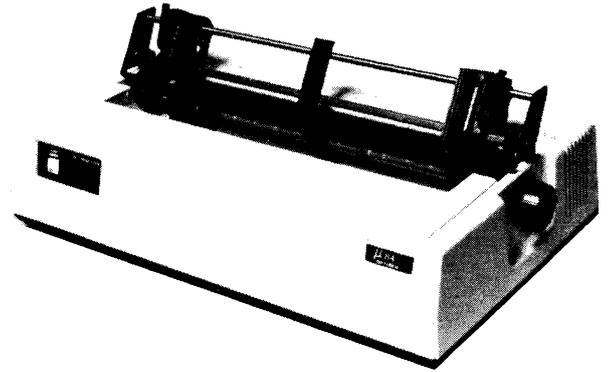


Figure 1-1 External View of Printer

2. CONTENTS

2.1 Packing List

Uncrate the printer and check for damage and/or missing accessories. Included in the carton are:

- (1) MICROLINE 84 printer 1
- (2) User's manual 1
- (3) Ribbon 1
- (4) Empty reel 1
- (5) Fuse (2 A) 1
- (6) Fuse (3 A) 1
- (7) Platen knob 1
- (8) Tractor unit 1



Figure 2-1 Packing List

2.2 Standard Printer Components

The basic printer consists of a print mechanism, control circuit board, operating section, power supply, covers and a tractor unit.

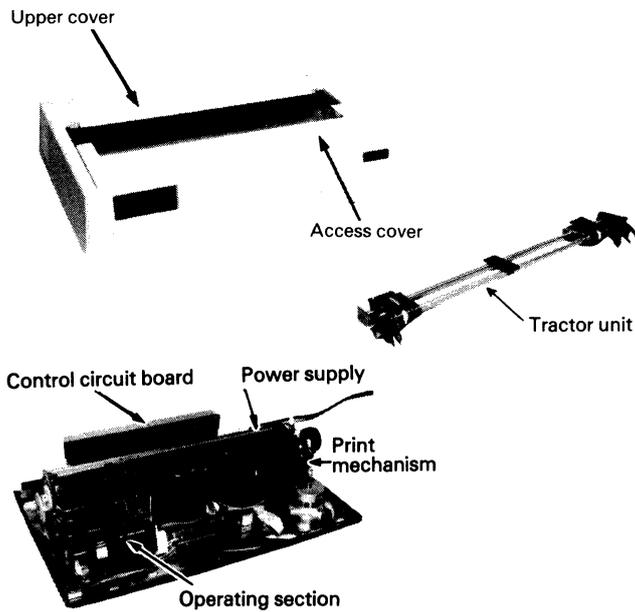


Figure 2-2 Standard Components

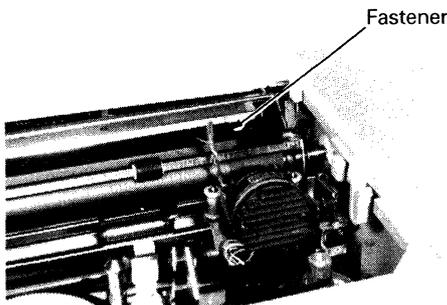
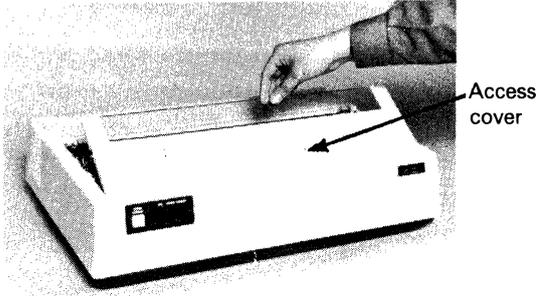
2.3 Optional Printer Components

The optional printer components are:

- (1) High Speed RS-232-C and current loop serial interface board.
- (2) IEEE 488 parallel interface board.
- (3) Cut sheet feeder.

3. INSTALLATION PROCEDURE

- (1) Check the equipment for damage before installing.
- (2) Remove the access cover by holding center of cover and pulling upward.
- (3) Remove fastener used to secure printhead during transportation.



- (4) Connect the interface cable to the back of the printer and to the external data system. (Refer to figures 3-1 and 3-2.) The AC power switch must be in the OFF position. Cover the unused connector with the blank plate.
- (5) Install ribbon. Refer to paragraph 4.4 for detailed instructions.
- (6) Mount the tractor unit as required. (Refer to paragraph 4.3.)
- (7) Insert the paper and set to the first printing position. Refer to paragraph 4.5 for detailed instructions. When using sprocket paper, skip 16.5 mm (4 lines at 6 LPI) on each side of the perforated line.
- (8) Set the FORM LENGTH rotary switch located on the front panel to the desired length.
- (9) Turn the AC power switch to the OFF position and connect the AC input plug to an AC receptacle.
- (10) Turn the AC power switch to the ON position and verify that the POWER SEL LED illuminates.

CAUTION: 1) Set the power source voltage select switch according to the power used for 200 V type only. Refer to figure E-3 in Appendix E.

2) Set the DIP switches for function selections according to Appendix E.

Preparation for data reception from an external source is now complete.

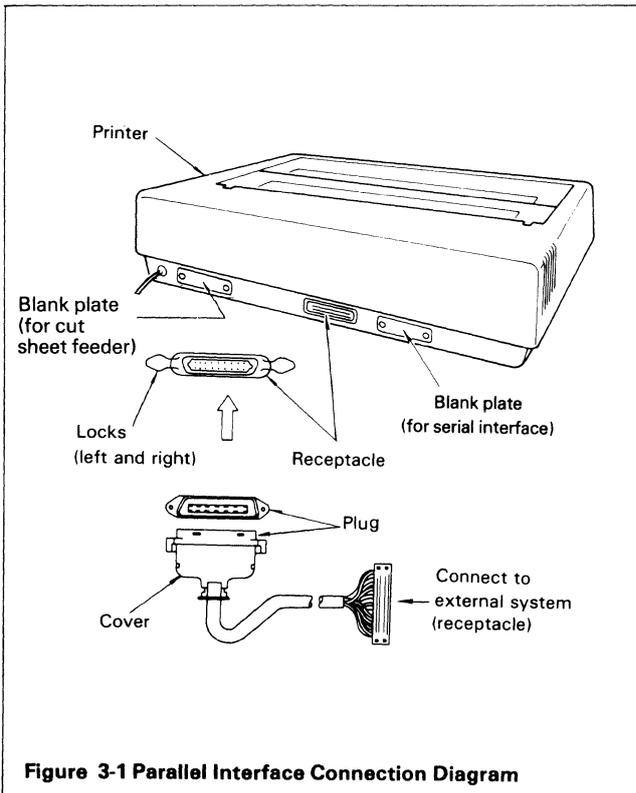


Figure 3-1 Parallel Interface Connection Diagram

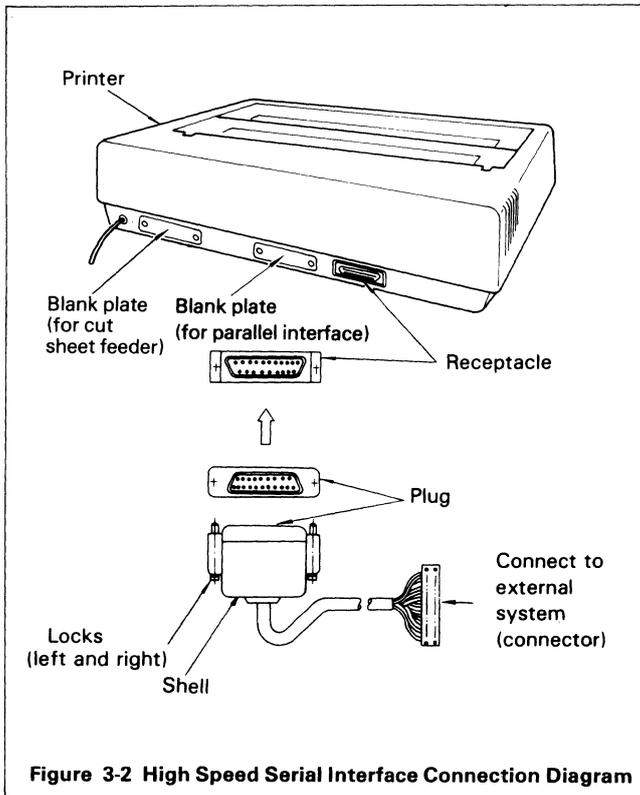
Parallel Interface Connectors and Cable Specifications

- (1) Connectors

Printer end:	36-pin receptacle, equivalent to 57-40360-12-D56 (Amphenol)
Cable end:	36-pin plug, equivalent to 57-30360 (Amphenol)
	Or plug equivalent to 552274-1 (AMP); cover equivalent to 552073-1 (AMP)
- (2) Cable

Use a cable less than 5 meters long. A shielded cable using twisted pair conductors is desirable.
- (3) Connector locks

After engaging the connectors, fasten them with locks.



Serial Interface Connectors and Cable Specifications

(1) Connectors

Printer end: 25-pin receptacle, equivalent to DB-25S (Cannon)

Cable end: 25-pin plug, equivalent to DB-25P (Cannon)

Shell, equivalent to DB-C2-J9 (Cannon)

(2) Cable

Use a cable less than 15 meters long. A shielded cable using twisted pair conductors is desirable.

(3) Connector locks

After engaging the connectors, fasten them with locks.

4. OPERATING PROCEDURES

4.1 Functions of Operating Controls and LEDs

The controls, LEDs and knobs necessary for operating the printer are shown below.

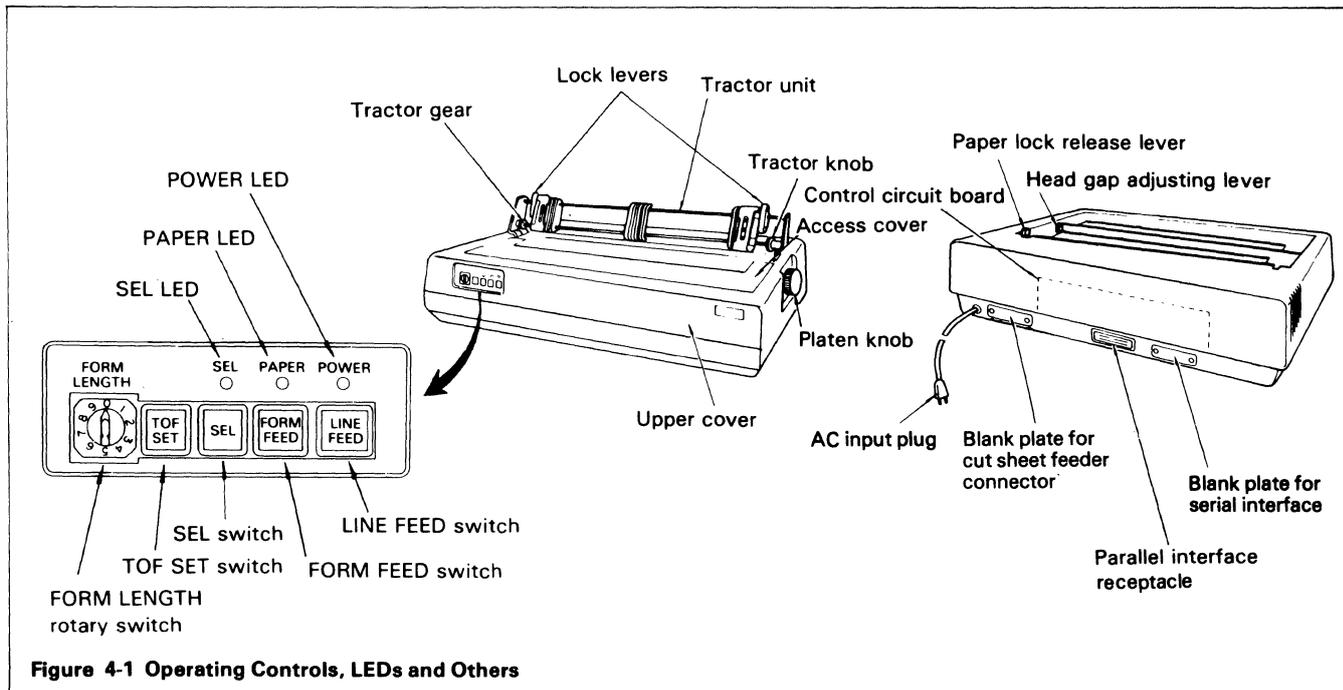


Figure 4-1 Operating Controls, LEDs and Others

Table 4-1 Operating Switches and LEDs

Name	Type	Location	Description
AC power	Alternate switch	Right side	Switching AC power ON and OFF.
POWER	LED (red)	Front panel	Lights when power is switched ON.
PAPER	LED (red)	Front panel	Lights when paper has run out.
FORM LENGTH	Rotary switch	Front panel	Used for selecting page length. (Refer to Table 4-2.)
TOF SET	Momentary switch	Front panel	Valid in deselect (off-line) condition. Paper is set to top-of-form (first printing line) when this switch is depressed. Before depressing switch, paper must be set to desired top-of-form.
SEL (Select)	Momentary switch	Front panel	When this switch is depressed the printer changes from deselect (off-line) to select (on-line) condition to be ready for receiving. If the printer had been in select condition, it will change to deselect. When the printer is changed from deselect condition to select condition by depressing this switch, the printer head returns to its home position.

Name	Type	Location	Description
SEL (Select)	LED (red)	Front panel	When the LED lights it indicates select (on-line) condition. When the light is not lit, it indicates deselect condition. The LED lights when the SEL switch is depressed or when a DC1 code is received or when power is switched ON. When the SEL switch is depressed again or when a DC3 is received or when paper has run out, the light goes out.

Note: When the LINE FEED or FORM FEED switch is depressed during deselect condition, if data still remains in the printer buffer the paper is fed after the data is printed. Data will not be printed, however, if the printer is in paper-end condition.

Table 4-1 (con.)

Name	Type	Location	Description
FORM FEED	Momentary switch	Front panel	Valid in deselect (off-line) condition. When this switch is depressed, paper is fed to the next top-of-form position.
LINE FEED	Momentary switch	Front panel	Valid in deselect (off-line) condition. Every depressing of this switch feeds the paper by one line. This switch is also used to initiate the test pattern printing.
Paper lock release lever		Top of printer at right (further side)	Close when single paper is used; open when using sprocket paper. When the lever is pulled towards front, paper is free.
Head gap adjusting lever		Top of printer at right (front side)	Select printing pressure according to paper type and thickness. (Refer to Table 4-3)
Platen knob		Right side of printer	Turned for manually feeding paper up or down.

4.2 Operating Procedures

4.2.1 Setting page length

- (1) When the AC power switch is OFF;
 - (a) Turn the FORM LENGTH rotary switch to the desired page length,
 - (b) Adjust the first printing line,
 - (c) Push the power switch to the ON position.

The desired page length is now set.
- (2) When the AC power switch is ON;
 - (a) Push the SEL switch to extinguish the LED so the printer will be in deselect (off-line) mode,
 - (b) Turn the FORM LENGTH rotary switch to the desired page length,
 - (c) Set the paper to the first printing position.
 - (d) Push the TOF SET switch to set the desired page length,
 - (e) Push the SEL switch again to light the LED so the printer will be in select (on-line) mode.

The desired page length is now set.

Note: Do not set the FORM LENGTH rotary switch within the numbered positions.

Table 4-2 FORM LENGTH Rotary Switch

Rotary switch position	Form length	6 LPI	8 LPI
0	3 inches	18 lines	24 lines
1	3.5 inches	21 lines	28 lines
2	4 inches	24 lines	32 lines
3	5.5 inches	33 lines	44 lines
4	6 inches	36 lines	48 lines
5	7 inches	42 lines	56 lines
6	For U.S.A.	8.5 inches	51 lines
	For the area other than U.S.A.	8 inches	48 lines
7	11 inches	66 lines	88 lines
8	12 inches	72 lines	96 lines
9	14 inches	84 lines	112 lines

4.2.2 Page length feed

- (1) Deselect the printer by pushing the SEL switch.
- (2) Push the FORM FEED switch. The paper is then fed by the previously selected FORM LENGTH.
- (3) Select the printer by pushing the SEL switch.

4.2.3 Line feed

- (1) Deselect the printer by pushing the SEL switch.
- (2) Push the LINE FEED switch. The paper is then fed line-by-line.
- (3) Select the printer by pushing the SEL switch.

Note: When the FORM FEED or LINE FEED switch is depressed, if data still remains in the printer buffer the paper is fed after the data is printed.

4.2.4 Test-pattern printing

- (1) Depress the AC power switch to OFF.
- (2) Depress the AC power switch to ON, holding the LINE FEED switch depressed.
- (3) Release the LINE FEED switch about 2 seconds later.

A continuous test pattern will be printed. To terminate the test-pattern printing, depress the FORM FEED switch for about 2 seconds.

4.2.5 Selection of test patterns

Two kinds of test pattern can be selected according to the position of the FORM FEED rotary switch:

Any odd-number position: Rolling ASCII pattern

Any even-number position: Rolling ASCII pattern with skipping

The test-pattern printing may be used for diagnosis of printing trouble to see whether the trouble is attributable to the printer itself or to the external system. For this diagnosis, perform test-pattern printing without the interface cable.

4.3 Tractor Unit Mounting (See figure 4-2).

- (1) Remove the access cover.
- (2) Pull the printer's paper lock release lever to the open position.
- (3) Hold the left and right tractor side plates and slip the parallel parts behind the gear onto the paper-tear-off bar shaft.
- (4) Pull the tractor unit toward you and slip the clamp levers onto the shaft of the platen bearing. Push down and snap in place.

To remove the tractor unit, reverse the above procedure.

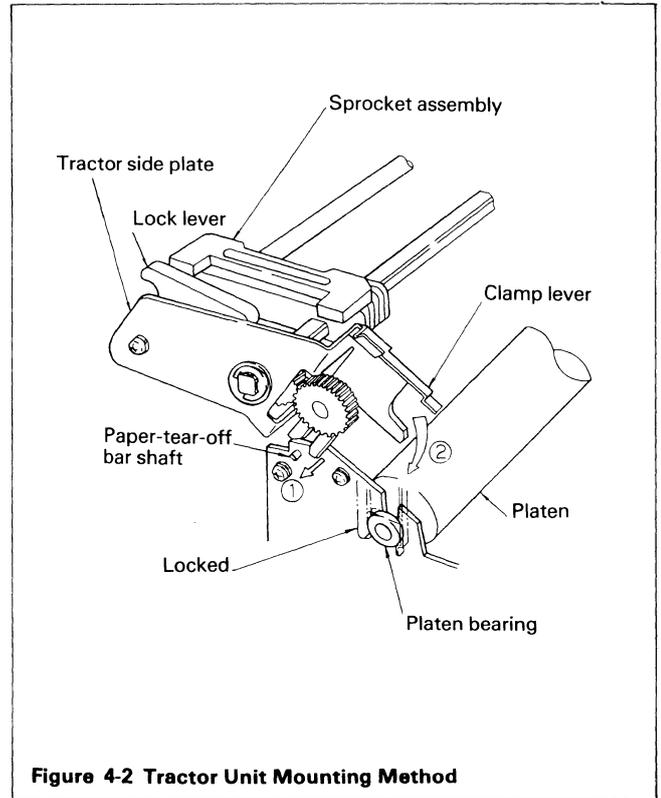
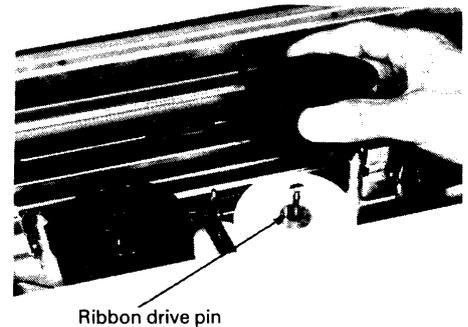
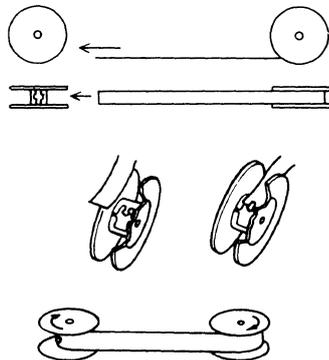


Figure 4-2 Tractor Unit Mounting Method

4.4 Ribbon Loading Procedure

- (1) Remove the access cover.
- (2) Remove the used ribbon and discard.
- (3) Loosen the end of a new ribbon. Attach the end of the ribbon to the hook on the empty spool boss, and wind a few turns on the spool.

- (4) Mount one ribbon spool on the spool shaft. Make sure that the winding direction is as shown in figure 4-3, and that the ribbon drive pin fits into the hole in the ribbon spool.



- (5) Thread the ribbon as shown in figure 4-3.
- (6) Place the other ribbon spool on the spool shaft, making sure that the ribbon drive pin fits into the hole in the ribbon spool (Do not twist the ribbon.)
- (7) After the ribbon has been set in place, check that it isn't loose. If the ribbon is loose, turn one of the ribbon spools by hand until it is no longer loose.
- (8) Check all the items from (1) to (7) above, to prevent faulty loading.

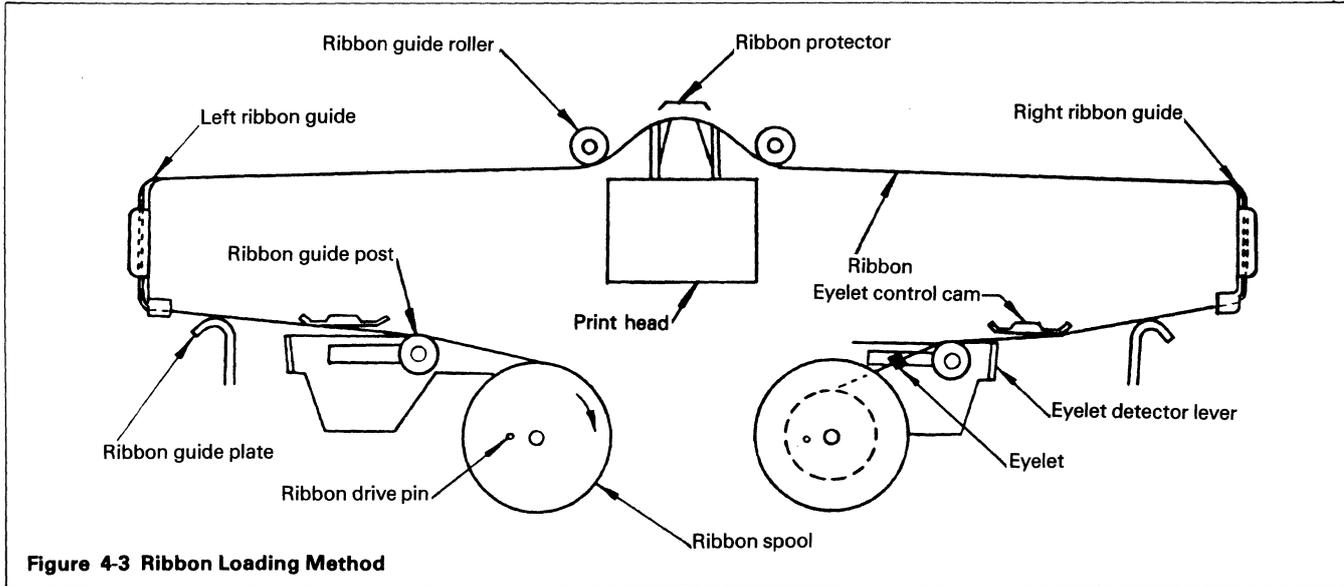


Figure 4-3 Ribbon Loading Method

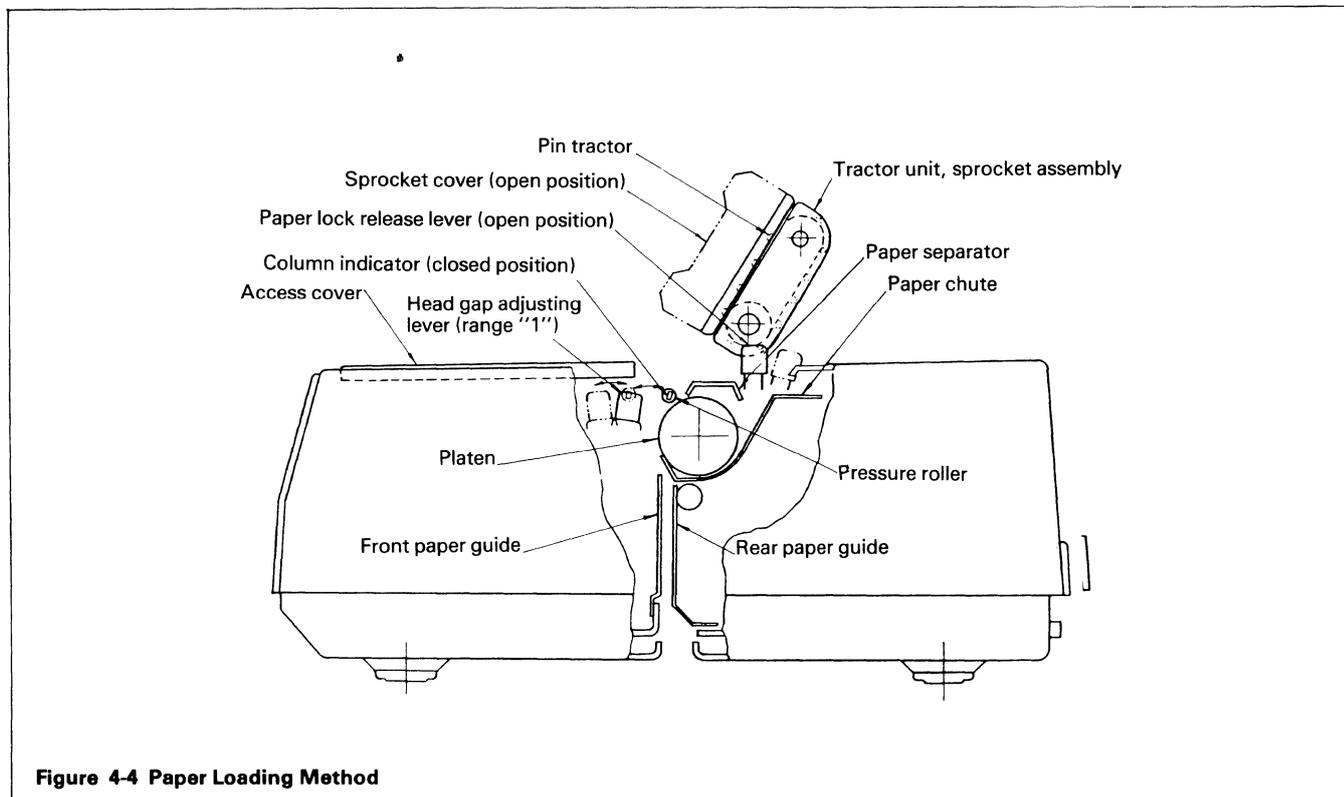
- (9) Replace the access cover.

Note: 1) Be careful not to disturb the ribbon protector when threading the ribbon.

- 2) *Ensure the ribbon change eyelet is on the spool side of the eyelet detector lever. If not, turn the ribbon spool manually to bring it to the spool side.*

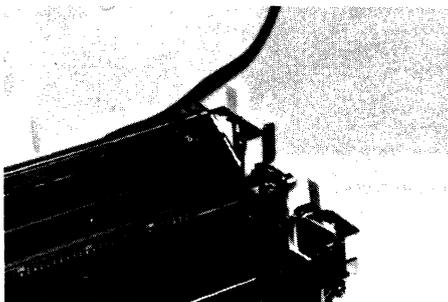
4.5 Paper Loading Procedure

Components related to paper loading are shown in figure 4-4.



4.5.1 Cut-sheet loading

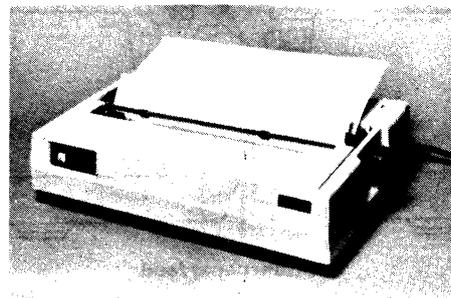
- (1) Remove the tractor unit. (See figure 4-2.)
- (2) Remove the access cover.
- (3) Set the head gap adjusting lever to the first position.



- (4) Pull the paper lock release lever to the open position.



- (5) Lift the column indicator.
- (6) Insert paper between the paper chute and the paper separator until it reaches the front of the platen.
- (7) Tuck the paper under the column indicator and over the guide bar and lower the column indicator. Align the paper.
- (8) Push the paper lock release lever to the closed position.
- (9) Replace access cover.



The cut-sheet paper loading procedure is now complete.

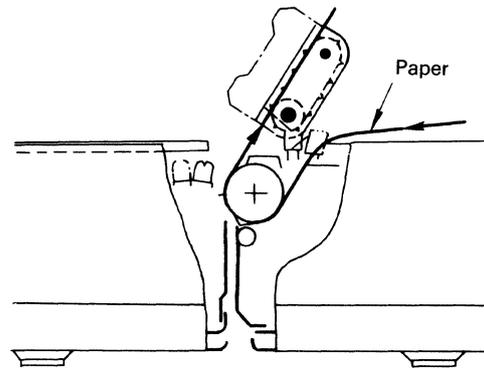
Note: Cut-sheet paper cannot be used if the tractor unit is installed.

4.5.2 Sprocket paper loading with installed tractor unit

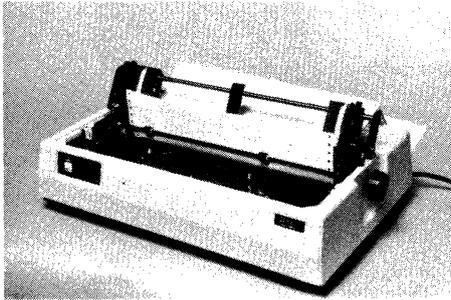
(See figure 4-5 for proper carton positioning.)

Sprocket paper with the width of 3 to 16 inches is loaded as follows when the tractor unit is installed:

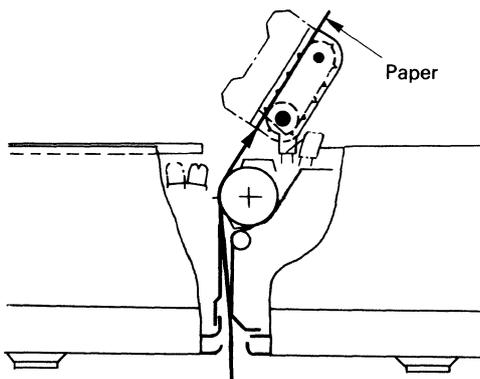
- (1) Remove the access cover.
- (2) Pull the paper lock release lever to the open position and lift the column indicator.
- (3) Open the sprocket covers.
- (4) For rear paper feed, slide the paper between the paper chute and the paper separator. Turn the platen knob until the paper appears in front of the platen. Fit the paper sprocket holes over the sprocket pins of the platen and of the sprocket of the tractor. Should slack occur, push the tractor gear to the left. Keeping the idle gear disengaged, turn the tractor knob in the feed direction. Slack will disappear.



Rear paper feed

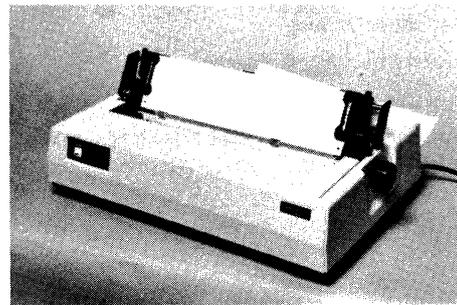


- (5) For bottom paper feed, slide the paper up from the lower cover hole, between the front paper guide and the rear paper guide and fit the paper sprocket holes over the sprocket pins of the platen and of the sprocket on the tractor.

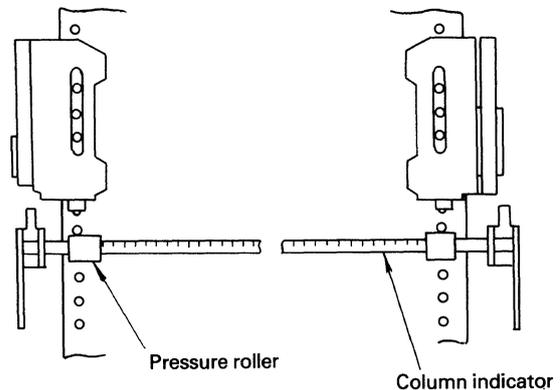


Bottom paper feed

- (6) Close the sprocket covers.
- (7) Open the sprocket lock lever. Align the edges of the paper.
- (8) Close the sprocket lock lever.



- (9) Move the pressure roller of the column indicator to the position of the paper sprocket holes.

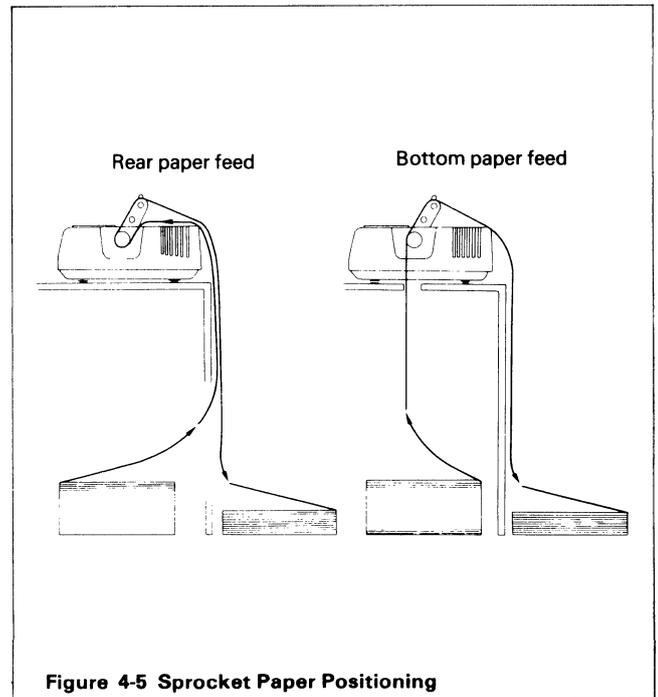


- (10) Lower the column indicator.
- (11) Turn the platen knob to adjust the paper to the first line. Lightly pull the paper forward to remove slack.
- (12) Leave the paper lock release lever in the open position.
- (13) Set the head gap adjusting lever to the recommended position for the type of paper used. (See Table 4-3.)

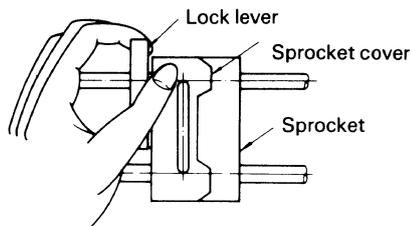
Table 4-3 Head Gap Adjusting Lever Positions

Head gap adjusting lever position	Type of paper	No. of sheets
1 Platen side (Gap between the platen and printing head is narrow.)	One-part paper	1
	Pressure-sensitive or carbon-lined	2, 3
	Interleaf paper	2
2 Front side (Gap between the platen and printing head is wide.)	Pressure-sensitive or carbon-lined	4
	Interleaf paper	3, 4

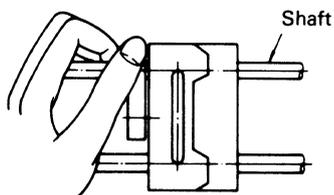
Figure 4-5 details the positioning of the sprocket paper carton for rear paper feed and for bottom paper feed.



Note: 1) When disengaging the sprocket lock lever, put your thumb on the sprocket cover and disengage the lock lever with your index finger.



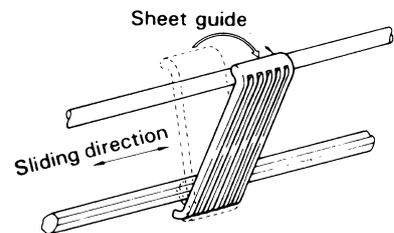
2) When locking the sprocket lock lever, push the lock lever with your thumb while holding the shaft with the other fingers.



3) When using the tractor unit, keep the paper lock release lever set at the front (open) position.

4) It is possible to install the tractor unit by loading the paper in advance, and pulling it from the platen.

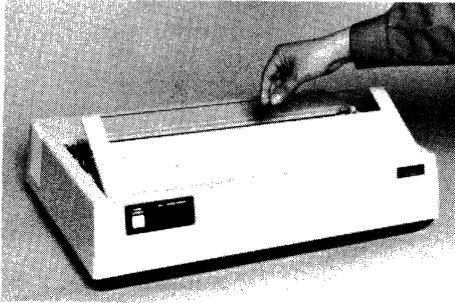
5) When using narrow paper, remove the sheet guide located in the center of the tractor bar by snapping it off the bar.



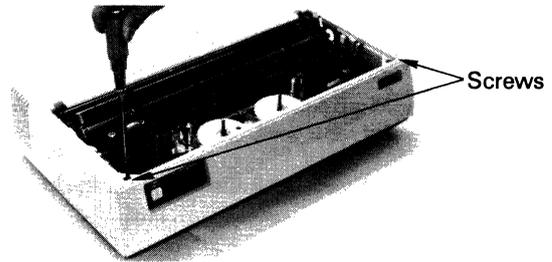
4.6 Upper Cover Removal

Remove the upper cover when operating the DIP switches or changing the fuse.

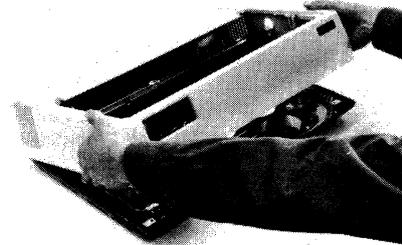
- (1) Turn the AC power switch to OFF and remove the interface connector.
- (2) Remove the tractor unit.
- (3) Remove the access cover.
- (4) Remove the platen knob by pulling.



- (5) Remove the screws on each side of the upper cover.



- (6) Lift the front upper cover, tilt backward, and lift from the lower cover.



4.7 Operational Precautions

- (1) Ensure that AC power supply switch is in the OFF position before inserting AC plug into receptacle. Insert AC plug correctly.
- (2) Ensure that AC power supply switch is in the OFF position before inserting interface connectors.
- (3) Never print without paper.
- (4) Never print without ribbon. Replace ribbon as soon as it shows signs of wear.
- (5) Remove the ribbon spool when transporting the printer.
- (6) If printer is unused or stored for a long period of time, open the paper lock release lever by pulling back.
- (7) Align the platen knob with the detent, push it in, and lock it securely.
- (8) Never use fuses other than those specified.
- (9) The printhead is hot within hours of printing. Do not touch it directly.
- (10) Should printing operation stop, check PAPER LED for paper-out condition. If the print head gets hot, printing is automatically stopped. It restarts automatically when the print head cools down.
- (11) Do not leave the printer on or plugged-in without intentions to use the printer soon.
- (12) Do not expose the printer to excessively high or low temperatures, temperature variations, dust, or shock.
- (13) When cleaning the printer surfaces, use a small amount of diluted cleaning solution. Do not use organic detergents or abrasive cleansers.
- (14) Neither lean on nor place anything in the printer. If something should drop accidentally into the printer, immediately turn the AC power switch to OFF and carefully remove the foreign object from the printer.

5. TROUBLES AND REMEDIES

5.1 Troubles and Responses

Table 5-1 shows the troubles which might occur with this printer, and the responses. Make contact with our service staff if causes cannot be identified.

Table 5-1

No.	Trouble	Supposed cause	Response
1	POWER LED does not light	<ul style="list-style-type: none"> Power input cord is not connected. Breaker switch is OFF. 	<ul style="list-style-type: none"> Connect the AC input cord to receptacle. After turning OFF the AC power switch, reset breaker switch. (Refer to Appendix E-2). If breaker trips repeatedly, refer to dealer.
2	PAPER LED lights	<ul style="list-style-type: none"> No paper, or paper has run out. 	<ul style="list-style-type: none"> Install new paper.

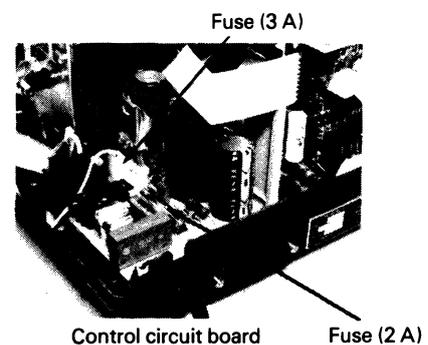
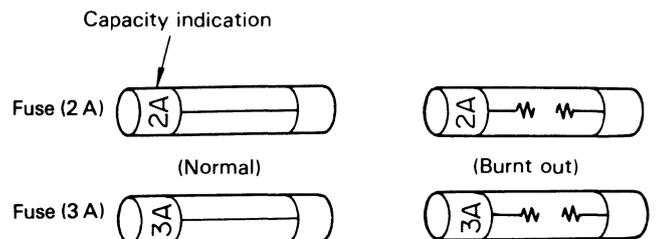
No.	Trouble	Supposed cause	Response
3	No line spacing (paper does not move up)	<ul style="list-style-type: none"> When using cut sheet, paper lock release lever is at open position. When using sprocket paper, the paper feed holes are not fixed to sprocket of platen. 	<ul style="list-style-type: none"> Shift paper lock release lever to closed position (figure 4-1) Install paper correctly. (Refer to paragraph 4.5.2)
4	Paper tears	<ul style="list-style-type: none"> Paper does not meet standard. Paper is not installed correctly. Head gap adjusting lever is not at correct position. 	<ul style="list-style-type: none"> Change to standard paper. Install paper correctly. Set lever correctly. (Refer to paragraph 4.5.2)

Table 5-1 (con.)

No.	Trouble	Supposed cause	Response
5	Ribbon does not make any color	<ul style="list-style-type: none"> Ribbon has been used longer than service life. Trouble on ribbon feed mechanism. Incorrect installation of ribbon. 	<ul style="list-style-type: none"> Change ribbon. Refer to the dealer. Install ribbon correctly (Refer to paragraph 4.4)
6	Printer does not operate	<ul style="list-style-type: none"> Fuse in circuit board is burnt out. 	<ul style="list-style-type: none"> Turn off power, and change fuse. (Refer to paragraph 5.2) When fuse burns out repeatedly, refer to the dealer.

5.2 Fuse Replacement

- Turn AC power switch OFF, and retract the AC input plug.
- Remove the upper cover. (Refer to paragraph 4.6)
- Remove the burnt out fuse from circuit board.



- Insert new fuse to circuit board. Ensure that the replacement fuse is of the same capacity.
- Replace the upper cover.
- Turn AC power switch to ON and insert AC plug in receptacle.

PART II Maintenance Manual

PART II Maintenance Manual

6. THEORY OF OPERATION

6.1 Operation of the Mechanical Section

The mechanical section consists of the following:

- (a) Print head
- (b) Carriage assembly
- (c) Ribbon feed mechanism
- (d) Paper feed mechanism

6.1.1 Mechanism and Operation of Print Head

(1) Description

The print head is a spring-loaded type, utilizing a permanent magnet, and can be easily removed and installed. It is mounted on the carriage which runs parallel to the platen. The print head is electrically connected to the circuit board at connector CN4.

The print head consists of the following (See figure 6-1):

- (a) Wire guide
- (b) Yoke
- (c) Armature assembly
- (d) Spacer
- (e) Magnet assembly
- (f) Thermistor

(2) Print head operation (See figure 6-1.)

When not operating, the armature is attracted by the permanent magnet, and an armature spring holding the armature is bent by the thickness of a spacer. Therefore, the print wire, which is fastened to the armature, is held retracted within the wire guide. When a character to be printed (Appendix H) is detected by the control circuit, a current flows to the coil that corresponds to the particular print wire. When the coil is energized, the magnetic flux generated by the permanent magnet between the armature and pole is nullified and the attraction disappears. As a result, the print wire is driven toward the platen by the force of the armature spring. The print wire fastened to the armature ejects from the tip of the wire guide and strikes the print paper and platen surface through a ribbon. A dot is thus printed on the paper.

After the character is printed, the magnetic flux of the permanent magnet attracts the armature again so the print wire is retracted into the wire guide.

The print head has a built-in thermistor to prevent the coil from overheating and burning in continuous printing in both directions for a long time. If the coil temperature exceeds a certain limit, the control circuit detects the thermistor signal and stops the printing operation after the current printing line is completed. Printing cannot be resumed until the coil cools down.

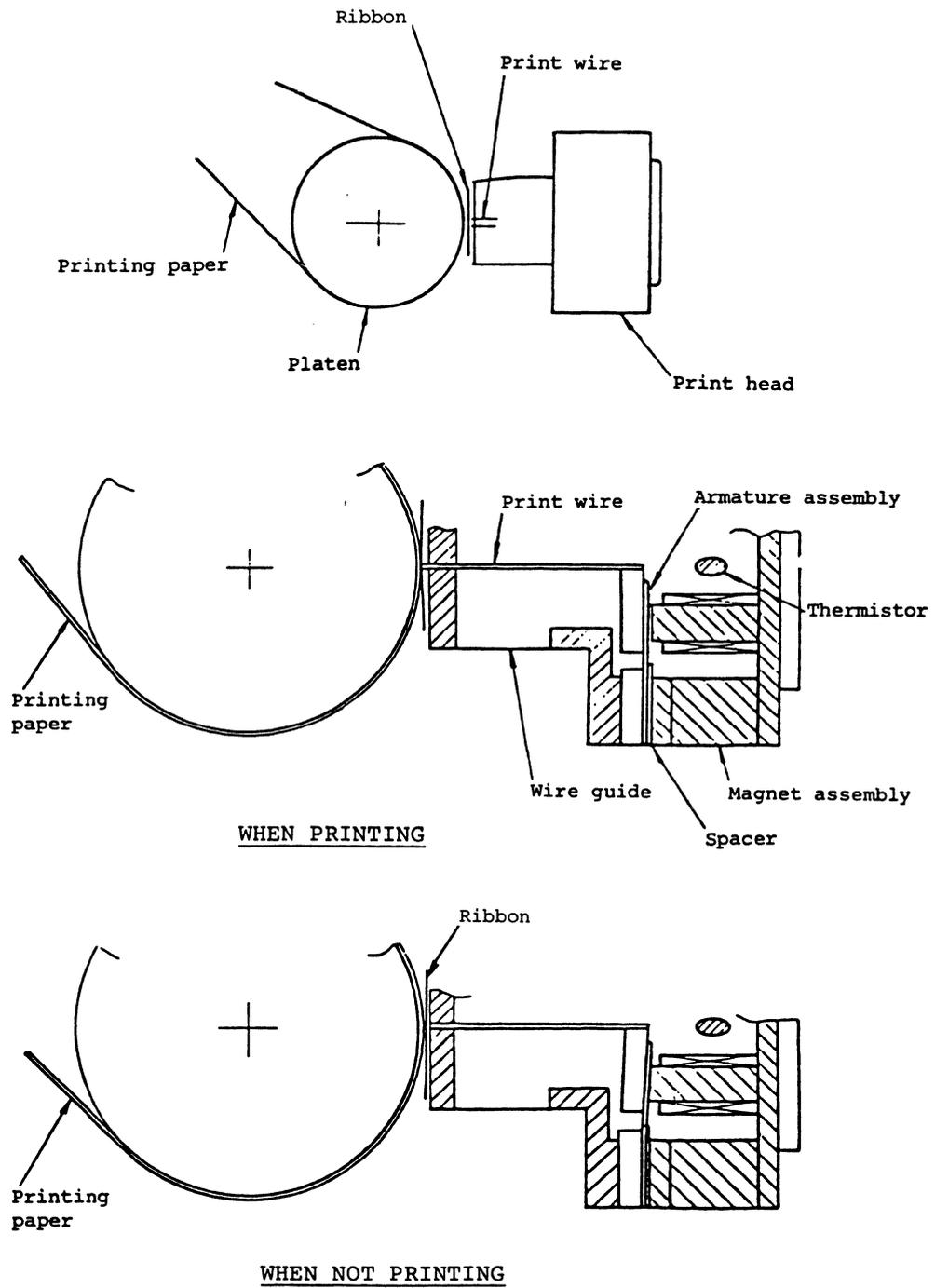


Figure 6-1 Printing Mechanism

6.1.2 Space Mechanism and Operation

(1) Description

Spacing and carriage return are performed by driving the carriage, which is guided by two carriage shafts mounted parallel to the platen, by a stepper motor.

The space mechanism is composed of:

- (a) Stepper motor with synchro belt pulley
- (b) Synchro belt
- (c) Two carriage shafts
- (d) Carriage
- (e) Home sensor
- (f) Home sensor plate

(2) Spacing operation (See figure 6-2.)

The carriage, with the print head mounted on it, moves parallel to the platen along the upper and lower carriage shafts. One end of the carriage frame is attached to the synchro belt.

As the stepper motor turns clockwise, the carriage assembly is driven from left to right.

The spacing mechanism is so designed that when the stepper motor turns 12 steps (21.6°), the carriage moves 2.54 mm (10 CPI).

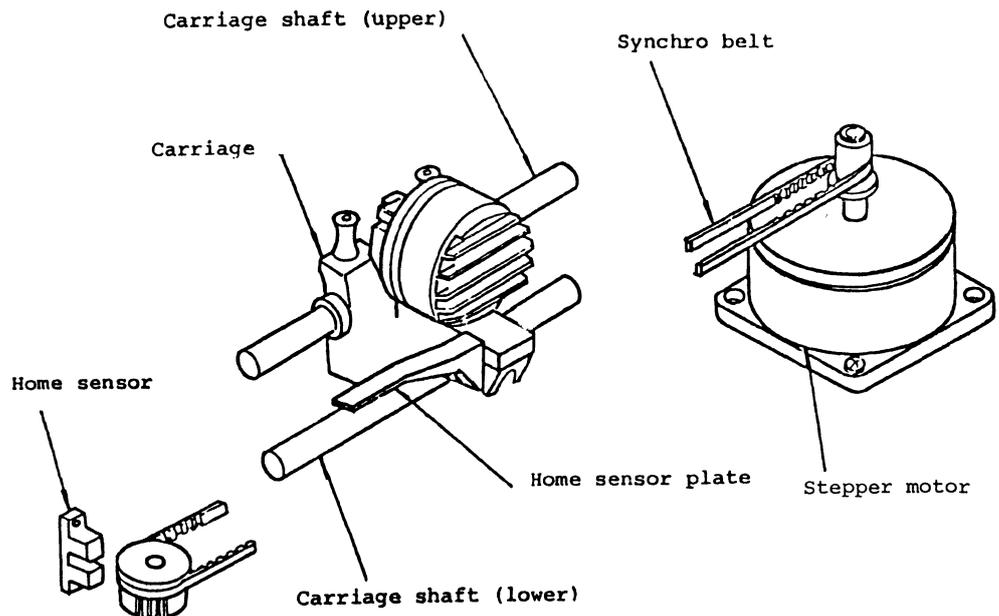


Figure 6-2 Spacing Mechanism



(3) Carriage return operation

When the carriage return (CR) code is received, the stepper motor is driven counterclockwise by the signal from the control circuit.

The carriage moves from the right to the printing position of the first character.

6.1.3 Ribbon Feed Mechanism and Operation

(1) Description

The stepper motor for driving the carriage provides the power to feed the ribbon.

The ribbon feed mechanism consists of:

- (a) Ribbon drive gear
- (b) Ribbon gear
- (c) Ribbon spool gear
- (d) Ribbon change lever
- (e) Eyelet detector lever
- (f) Ribbon bracket

(2) Ribbon feed operation (See figure 6-3.)

If the stepper motor runs clockwise (carriage moves from left to right) when the ribbon change lever is at the left, the ribbon drive gear runs clockwise via the drive belt. The ribbon gear rotates freely about the ribbon drive gear until it engages the left ribbon spool gear to turn the left ribbon spool clockwise, and feed the ribbon to the left.

When the stepper motor turns counterclockwise (carriage moves from right to left) as the CR signal is received, the ribbon gear rotates freely about the ribbon synchro gear, and is disengaged from the ribbon spool via the elongated slot in the change lever, so the ribbon is no longer fed.

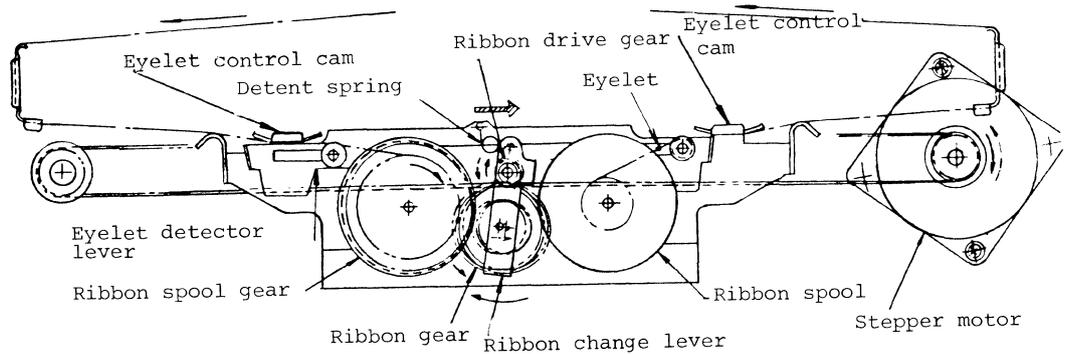
When the ribbon in the right ribbon spool runs short, the ribbon reverse eyelet on the right is caught between the eyelet control cam and eyelet detector lever to shift the eyelet detector lever from left to right.

When the eyelet detector lever shifts, the detent spring causes the ribbon change lever to turn from left to right. When the stepper motor runs clockwise (carriage moves from left to right), the ribbon gear rotates freely about the ribbon drive gear, is disengaged as previously described, and does not feed the ribbon.

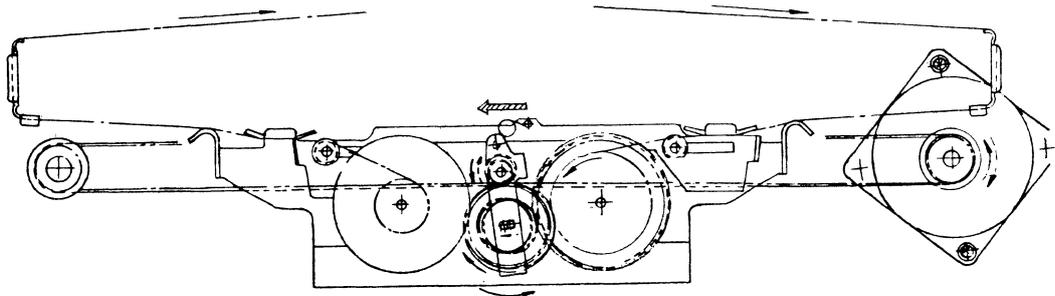
When the stepper motor is driven counterclockwise, the carriage moves from right to left upon the CR signal. The ribbon gear engages the right ribbon spool gear to turn the right ribbon spool counterclockwise and thus feed the ribbon to the right.

When the ribbon in the left ribbon spool runs short, the ribbon reverse eyelet on the left is caught between the eyelet control cam and the eyelet detector lever to move the eyelet detector lever from right to left. When the eyelet detector lever shifts, the detent spring causes the ribbon change lever to turn from right to left.

The above process is repeated to feed the ribbon.



Ribbon Feed to Left



Ribbon Feed to Right

Figure 6-3 Ribbon Feed Mechanism

6.1.4 Paper Feed Mechanism and Operation

(1) Description

The printed paper is moved up to the next line as the stepper motor runs to mesh the gears and rotate the platen and tractor unit.

The paper feed mechanism consists of:

- (a) Stepper motor with gear
- (b) Reduction gear
- (c) Platen
- (d) Tractor unit

(2) Paper feed operation (See figure 6-4.)

The paper feed stepper motor is mounted on the left side frame, and its rotation is transmitted to the platen via the reduction gear. The rotation of the platen is also transferred to the tractor unit via the transmission gear.

The mechanism is so designed that the paper is fed 4.23 mm (1/6 inch) at 6 LPI when the stepper motor advances 24 steps (180°).

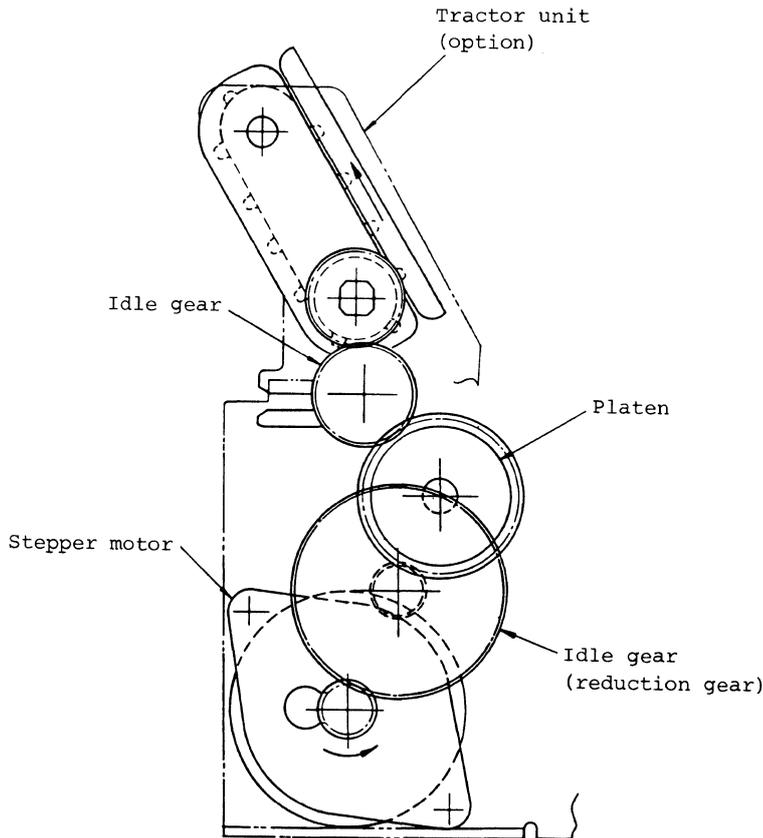


Figure 6-4 Paper Feed Mechanism

6.1.5 Paper Lock Release Mechanism (See figure 6-5.)

When the paper lock release lever is moved forward (open position), the roller support shaft turns counterclockwise, and a gap is made between the friction rollers and platen, allowing insertion of the paper.

When the paper lock release lever is moved backward (closed position), the roller support shaft turns clockwise, and the friction rollers are pushed against the platen by the feed roller spring, so paper can be fed.

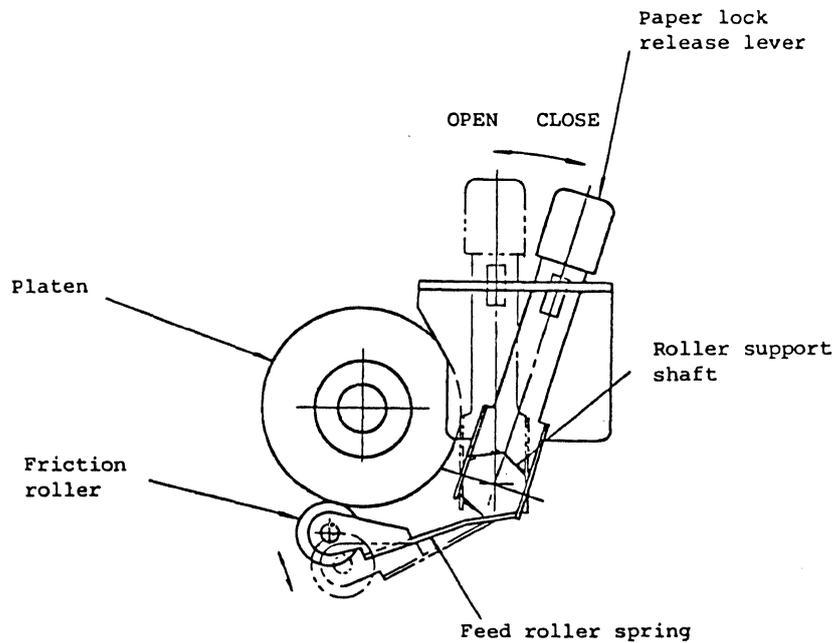


Figure 6-5 Paper Lock Release Mechanism

6.1.6 Paper Out Detecting Mechanism (See figure 6-6.)

(1) Rear paper feed

When paper is present in the printer, the paper prevents the microswitch actuator from falling into the groove of the paper separator, so the microswitch is OFF (not depressed). When the printer runs out of paper, the actuator falls into the groove of the paper separator and the microswitch turns ON (depressed).

With paper fed from the rear, "paper out" is detected when the remaining paper length is 50.8 mm (2 inches).

(2) Bottom paper feed

When paper is present in the printer, the paper prevents the microswitch actuator from falling into the hole in the front paper guide, and the microswitch is OFF (not depressed). When the printer runs out of paper, the actuator falls into the hole in the front paper guide and the microswitch turns ON (depressed).

With paper fed from the bottom, "paper out" is detected when the remaining paper length is 25.4 mm (1 inch).

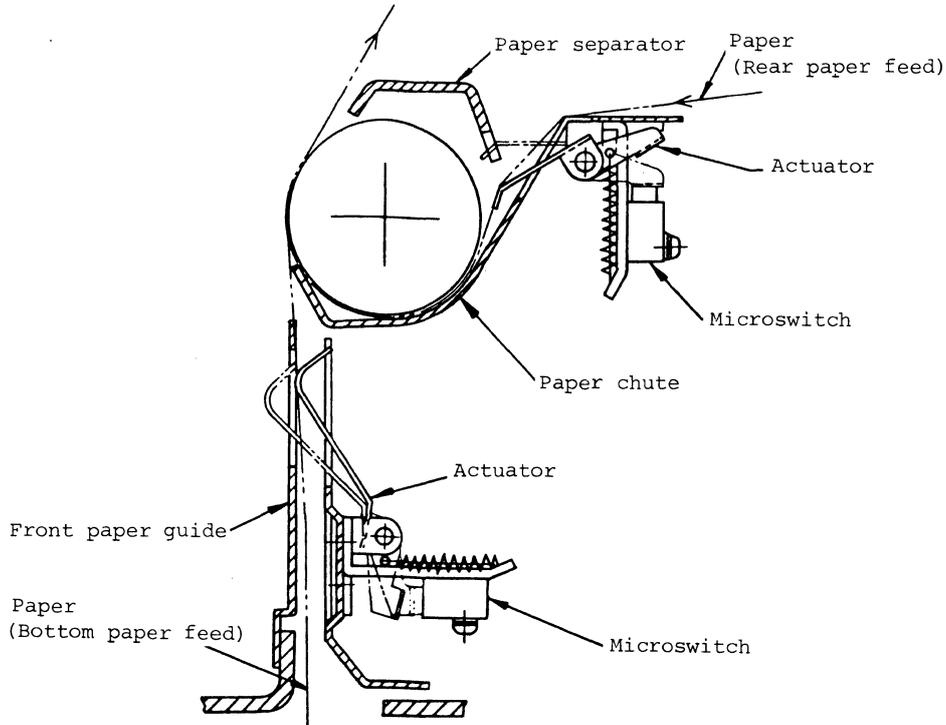


Figure 6-6 Paper Out Detecting Mechanism

6.1.7 Head Gap Adjusting Mechanism (See figure 6-7.)

The head gap adjusting mechanism changes the gap between the platen and print head by turning the eccentric collars attached to both sides of the upper carriage shaft.

The eccentric collars are fitted into side frame holes and the upper carriage shaft is attached by an eccentric locking bolt. The head gap adjusting lever is attached to the upper carriage shaft and can be locked in two grooves in the head gap adjusting bracket.

When the eccentric collar is turned clockwise, as seen in the direction shown in figure 6-7, the upper carriage shaft moves closer to the platen. When the collar is turned counterclockwise, the shaft moves away from the platen. Turning the eccentric collar with the eccentric locking bolt loosened adjusts the gap between the platen and print head at the locked head gap adjusting lever position. The gap is changed by shifting the head gap adjusting lever with the bolt tightened.

Mechanically, shifting of the head gap adjusting lever changes the gap between the platen and printing head by 0.15 mm.

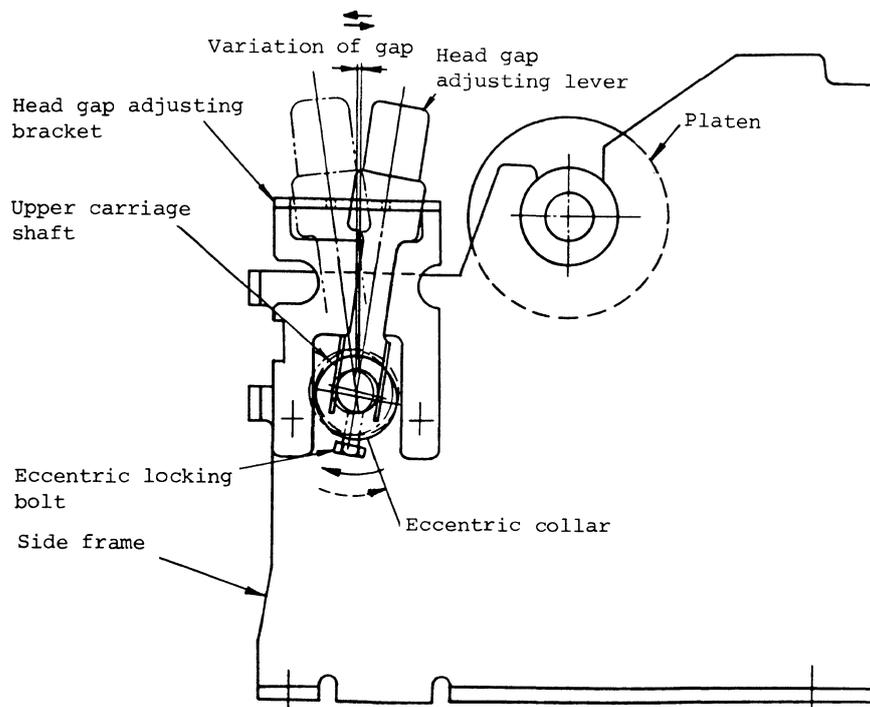


Figure 6-7 Head Gap Adjusting Mechanism



6.2 Operation of the Control Section

6.2.1 General

A block diagram of the printer is shown in figure 6-8.

The control section, consisting of a single printed-circuit board, controls the mechanical section. Two microcomputers (micro CPUs) handle all control operations. Other components include a RAM input buffer and buffer for dot-addressable graphics printing, LSI for interface control, ROM to store character patterns, and ROM to store the program.

Input data from the interface is first written into the RAM, where it is stored. When data for one line has been received, the printer starts printing.

When printing starts, the space motor runs to move the carriage. Pulses are applied to the print head to print characters. When one line of characters has been printed, the line feed motor advances to the next line. When data for the next line is received, the space motor is driven backward to move the carriage and apply pulses to the print head to print characters. Printing goes on through repetition of this cycle. When data is no longer present, the carriage is returned to the home position, and the printer waits to receive more data. The printing system is shortest-distance, bidirectional printing, with short-line seeking capability.

6.2.2 Outline of Control Circuit

The printer operates microcomputer control. As shown in the circuit diagrams in section 8, Q10 is an 8-bit, 1-chip microcomputer (micro CPU), and has a 128-byte RAM and an 8-bit timer. Control programs are stored in an 8-kilobyte ROM, Q19 and Q20 (4-kilobyte EPROMs), and are executed after resetting when power is switched on. A 128-byte RAM is used as a register, and the timer is used for internal control. A 9-MHz oscillator (OSC1) is connected to XTAL1 and XTAL2, generating the basic clock. The CPU cycle time is about 1.6 μ s.

The control circuit has an 8-bit bus line, 16 I/O ports, and three terminals for interfaces. The bus line is connected to Q11, Q12, Q13, Q16, Q17, Q18, Q19, Q20, Q21 and Q22, and addresses are designated by Q13 and Q18. T1 and INT signify inputs. Another microcomputer, Q11, has a 1-kilobyte ROM, 64-byte RAM, and 8-bit timer. A command is executed at approximately 2.5 μ s of cycle time using an oscillator of 6.14 MHz. The space motor and line feed motor connected to the I/O port are driven by a command of the other microcomputer, Q10.

Q12 is a 256-byte RAM with an internal timer and 22 I/O ports. The I/O ports are used as control lines for interface signal input/output. Q21 and Q22 are the 4-kilobyte character generator ROMs. Addresses are assigned by A0 through A11, and signals corresponding to characters are output from O0 to O7. These signals are received by Q10 and output on P10 through P17 to P43 of Q14 from which they are fed through the open collector inverters, Q6 and Q7, to drive Darlington transistors TR17 through TR19, and cause the head to print. Q13 and Q18 are 4-bit latches, used for designating addresses to Q16, Q17, Q19, Q20, and Q21.

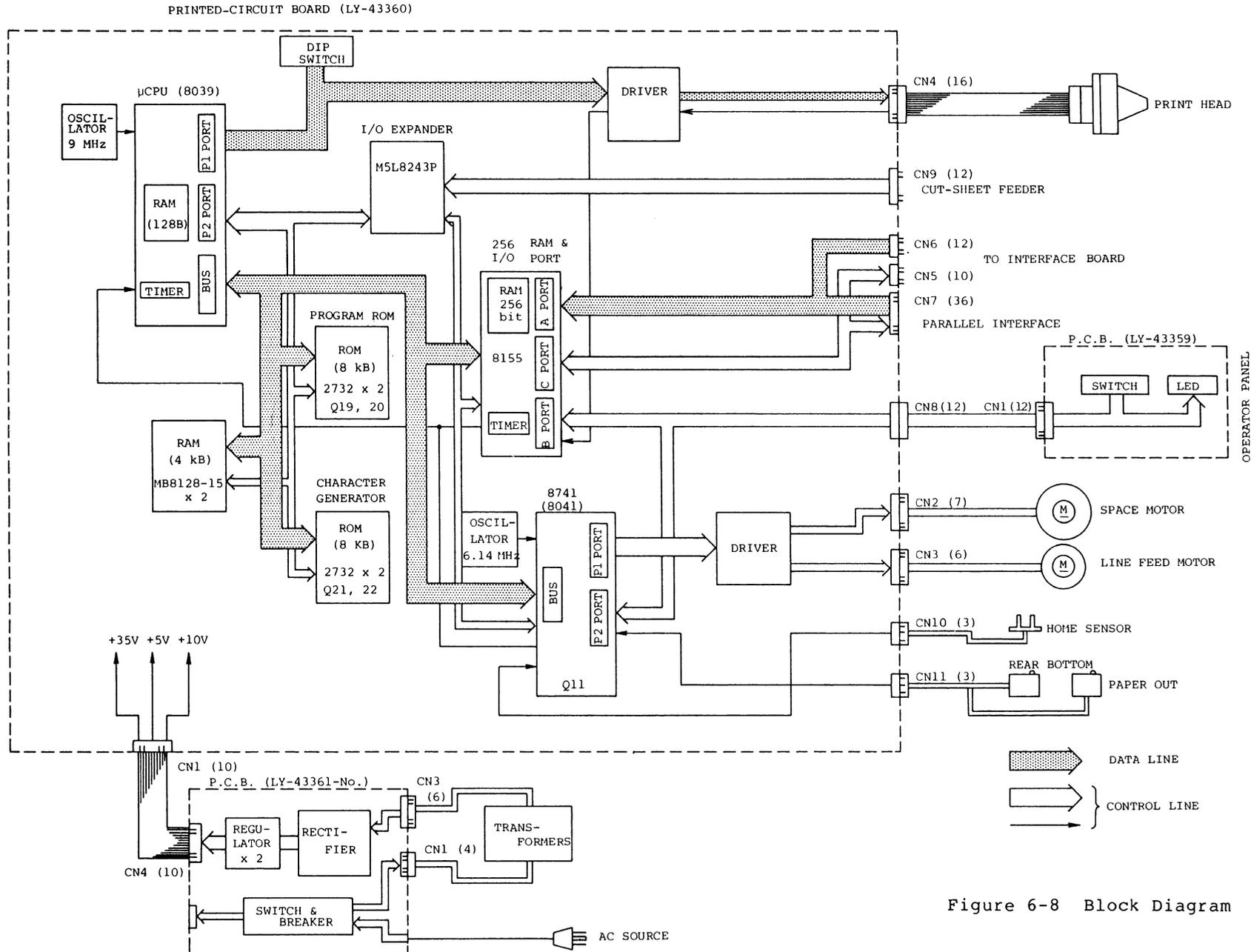


Figure 6-8 Block Diagram





6.2.3 Initial Operation (See Timing Chart (1), figure 6-9.)

When the equipment is switched on, the circuitry is cleared, and the carriage is returned to the home position (refer to Appendix F-20). When the AC power switch is pushed on, a reset signal generated by C12 is connected to Q10 (micro CPU). As a result, Q10 inputs RESET to clear the the controls. After the clearing, the program moves the carriage back to the home position. If the carriage is already at the home position, the carriage moves away from home position once and then returns to the home position. The interface busy signal remains at 1 during initialization, and no data can be accepted. After initialization, the busy signal changes to 0 to enable the printer to receive data.

Transistor TR20 delays the switching on of bias current to the drive circuit and advances its switching off to prevent erratic operation at power switching times.

6.2.4 Data Input Operation (See Timing Chart (1), figure 6-9.)

A parallel interface is used for input; 8-bit parallel data (data bit 1 to bit 8) is input to the I/O ports of Q12 (PA0 to PA7). If a STROBE signal is output from the host equipment when the BUSY signal is 0, the parallel data is set in the internal latch of Q12 at the positive-going edge of the STROBE signal.

After the data latching, the BUSY signal is switched to 1 and the micro CPU processes the data. First, it determines the type of input data and writes the data into RAM Q16, Q17 if it is print data or starts printing if it is the CR or LF code. When one line of data is received, the printer starts printing.

After the data is processed, the BUSY signal is switched to 0 and a pulse is applied to the ACKNOWLEDGE terminal.

If there is an idle receiving buffer, data for the next line can be received even during printing.

6.2.5 Printing Operation (See Timing Chart (2), figure 6-10.)

The space motor drives the carriage at constant speed, and pulses corresponding to character patterns are applied to the print head.

The carriage is held three character positions left of the first character position by a holding voltage of +3 V applied via R1 and D11.

After completion of data input, a 0 output from P13 of Q11 (SPPM OVD) energizes transistor TR15, which applies +35 V to the space motor to drive the motor with a powerful torque. At the same time, pulse signals are applied to P14 through P17 of Q11 to drive the motor.

The motor is a four-phase stepper motor, which has a step angle of 1.8°. When the motor advances 12 steps, the carriage moves 2.54 mm (at 10 CPI) to make space for one character.

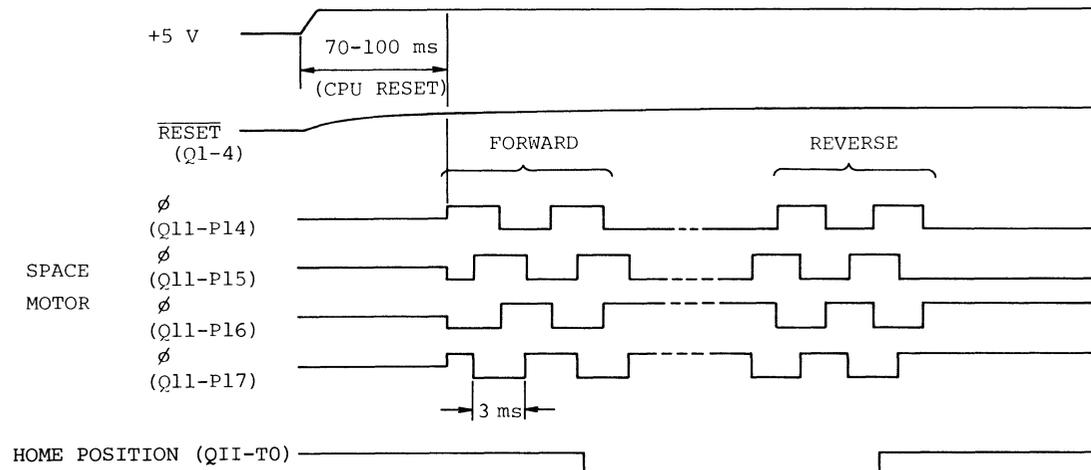
A two-phase exciting system is employed. A phase signal drives transistors TR5, TR6, TR7, and TR8 to drive the stepper motor. Zener diodes D3 to D5 suppress the counter voltage generated by the stepper motor.

The printer starts printing when the carriage reaches the first character position.

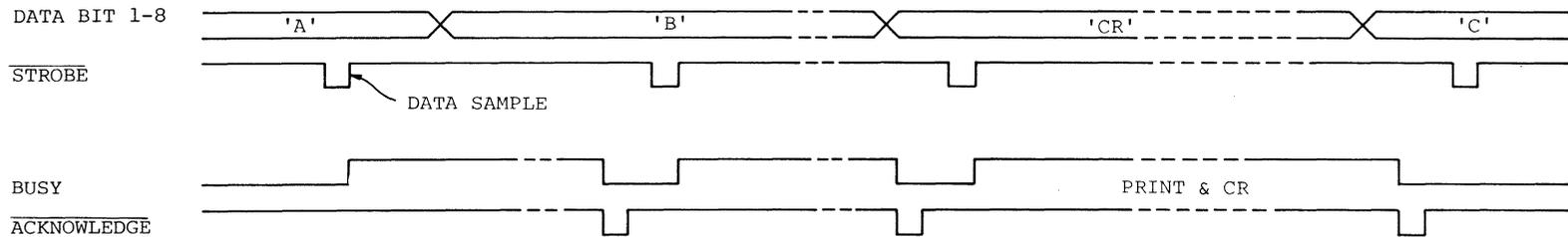
A head drive trigger pulse from P42 of Q14 causes comparator Q1 to generate an enable pulse. This pulse energizes TR3, TR4, and TR14 to apply a voltage to the head. At this time, pulses are output to P10 to P17 of Q10 and P43 of Q14 according to character patterns. This drives the print head magnet through the Darlington transistors. The characteristic variations of the print head due to source voltage variations are compensated by changing the magnet ON time according to the variations of the +35 V source voltage. This compensation is provided by R15, which is connected to comparator Q1 and the +35 V circuit. One of the head coils is connected in common to the collector of TR3 or TR4. Thus a continuation of the ON time beyond the rated length signifies an abnormality. Such a fault is detected by the integrating circuit composed of D29, D30 to energize thyristor TR5, and thus shorts out the +35 V circuit. When the +35 V circuit is shorted, the input breaker opens to prevent damage to the printer.

The print head has a built-in thermistor to protect itself from overheating during excessive printing duty operation. The output of the thermistor is applied to comparator Q1, from which a signal is sent to the CPU to automatically limit the printing duty cycle.

1. Initial operation



2. Data input (parallel interface)

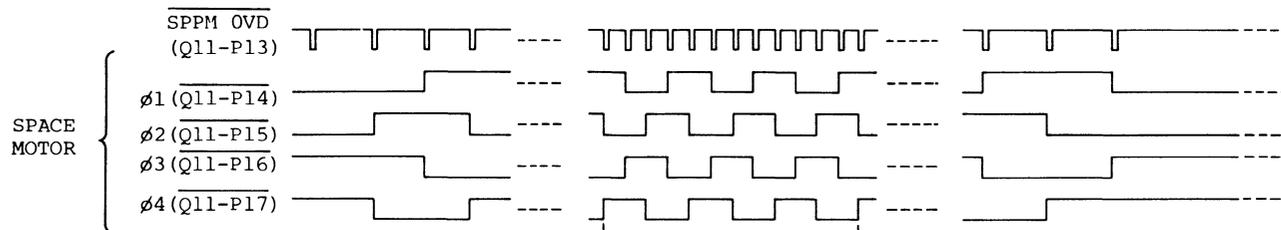


Note: Voltage level $\frac{3-5 \text{ V}}{0 \text{ V}}$

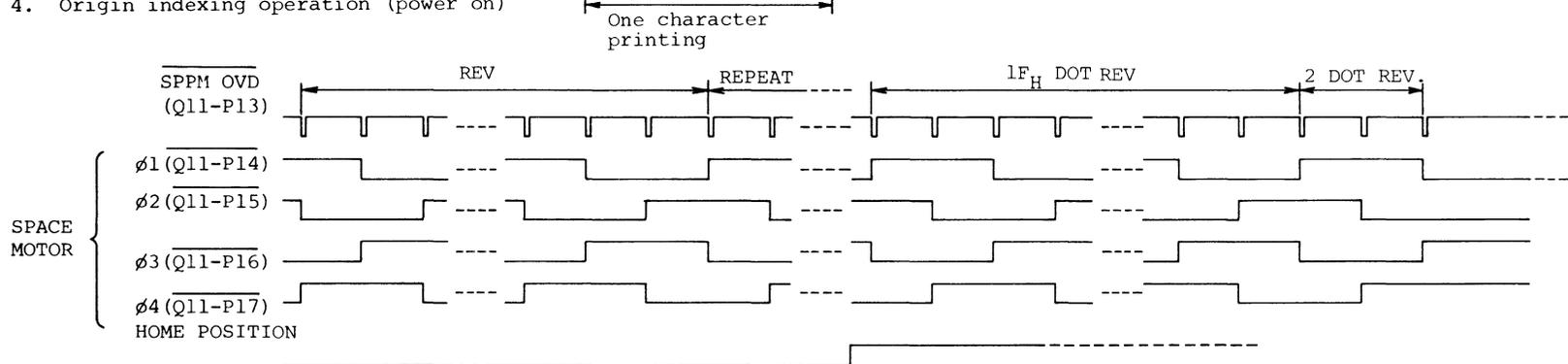
Figure 6-9 Timing Chart (1)



3. Printing operation



4. Origin indexing operation (power on)



5. Line feed operation

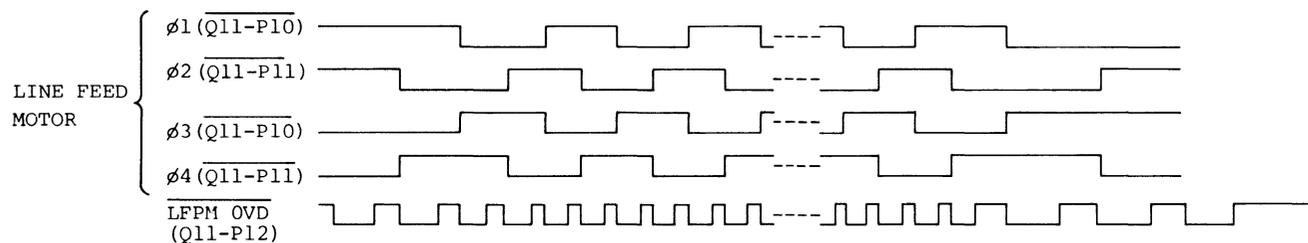


Figure 6-10 Timing Chart (2)





6.2.6 Carriage Return and Line Feed Operation (See Timing Chart (2), figure 6-10.)

After one line of characters is printed, the paper is moved up one line.

Phase signals for reversing the space motor are sent from P14 to P17 of Q11, and signals for driving the line-feed motor, from P10 and P11.

The line-feed motor is a four-phase stepper motor with a step angle of 7.5°, so 24 steps feed the paper 4.23 mm (at 6 LPI) and 18 steps feed the paper 3.18 mm (at 8 LPI).

If no line spacing takes place, +3 V is applied through R11 and D10 as a holding voltage.

During line spacing, a 0 from the P12 output (LF PM OVD) of Q11 energizes transistors TR2 and TR16 so that +35 V is applied to the line feed motor, driving it with a powerful torque.

Return operation is similar to the operation of the space motor in printing operation. (See subsection 6.2.5.)

In returning to the home position, the space motor runs backward to the home position, which is detected by interrupting the light of the homesensor composed of a combination of a light-emitting diode and phototransistor.

6.2.7 Paper Out and SEL Operation

"Paper out" is detected by the paper out detection microswitch in the bottom of the printer or behind the platen.

Three lines of data can be received after detecting "paper out". After data input, a paper out signal applied to the interface turns off the SEL LED and switches to deselect (off-line) status so that data no longer can be received. After the input data is printed, the PAPER LED lights to indicate that the printer has run out of paper. If the SEL switch is depressed when the SEL LED is lit to indicate that the printer is in select (on-line) status, the SEL LED goes out, returning the printer to deselect (off-line) status.

6.2.8 Graphics Printing Operation

Dot-addressable graphics printing starts when the following command and data are received. (The print head consists of nine pins, but the bottom head pins are not used.)

(1) Specifies the line feed pitch.

ESC, %, 9, X1 (X1 = 10 H: 16/144 inch)



7. MAINTENANCE

7.1 Maintenance Precautions

Be careful of the following when servicing the printer:

- (1) Keep the gears and belts absolutely free of dust and paper lint.
- (2) Be sure to disconnect the AC plug before pulling the connectors out or reinserting them.
- (3) Do not unnecessarily disassemble, reassemble, or readjust the printer as long as the printer is in good operating condition. Be especially careful not to carelessly loosen the screws that fasten various parts of the printer.
- (4) After inspection, be sure to check the printer and confirm that nothing is mechanically wrong with it prior to switching it on. Verify that the power source voltage select switch is at the specified voltage. (See paragraph 3, Appendix E.)
- (5) Never print without properly loaded paper and ribbon.
- (6) During maintenance or printer operation, do not place anything on the cover and do not lean on the printer.
- (7) Do not leave parts or screws used during maintenance inside the printer.
- (8) Do not wear gloves that can generate static, when handling the printed-circuit board. ICs for the micro-CPU, RAM, ROM, etc. are easily damaged by static, so exercise care not to touch the leads and ROM windows unnecessarily.
- (9) Do not place the printed-circuit board directly on the printer or the floor.
- (10) During disassembly or reassembly, carefully check the wires and cords for damage, and make sure that they are not strained. (See figure 9-1.)

7.2 Cleaning

Clean the inside of the printer at scheduled times as follows:

Cleaning interval:	6 months or 300 hours of operation, whichever comes first.
Cleaning time:	Approximately 10 minutes.
Tool:	Dry cloth (gauze or other dry cloth).
Cleaning points:	See Table 7-1.

Table 7-1 Cleaning Points

Cleaning points	Description
Ribbon path	Clean the ribbon path of dust, ribbon lint, etc.
Paper path	Clean the paper path and the parts around it of paper lint, etc.
Home sensor	Remove dust and paper lint.

Notes:

- 1) Depress the AC power switch OFF before cleaning.
- 2) Be careful not to let ribbon and paper fragments remain inside.

7.3 Maintenance Tools

The following tools shown in Table 7-2 are necessary for replacing the parts for the printed-circuit board, mechanism, etc. in the field.

Table 7-2 Maintenance Tools

No.	Tool	Qty	Location	Remarks
1	No. 1-100 Phillips screwdriver	1	Screws 2 to 2.6 mm	
2	No. 2-200 Phillips screwdriver	1	Screws 3 to 5 mm	
3	6-200 screwdriver	1	Screws 4 mm	
4	No. 5-H cutters	1		
5	No. 1 round pliers	1		
6	5.5-mm wrench	1		
7	11-mm wrench	1		
8	Thickness gauge set	1 set		
9	50-g force gauge	1		
10	300-g push/pull force gauge	1		
11	Soldering iron (30 W)	1		
12	Volt/Ohmmeter	1		
13	Pliers R-29	1	Code bushing	HEYCO-MADE
14	Oscilloscope	1		

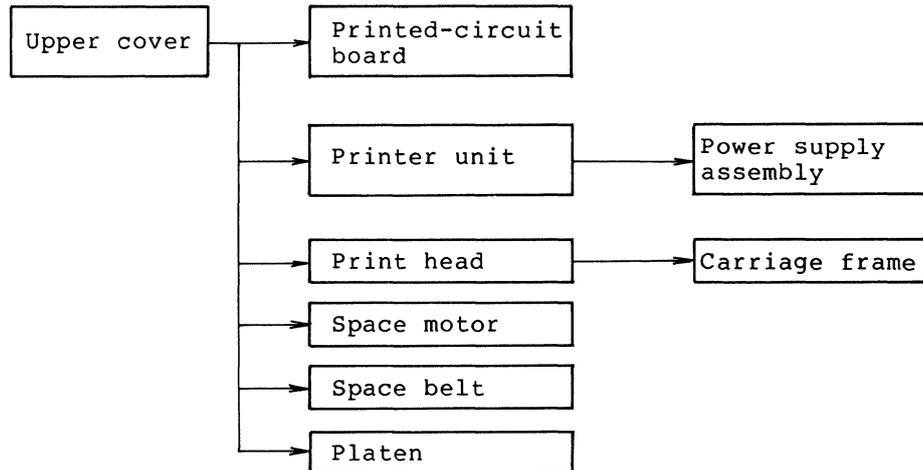


7.4 Disassembly, Reassembly

The disassembly and replacement procedures are explained below according to the disassembly flow chart in reference to the table of component parts shown in section 9.

7.4.1 Disassembly Flow Chart

Disassemble the printer in the following order. (Reassemble in the reverse order.)



7.4.2 General Precautions

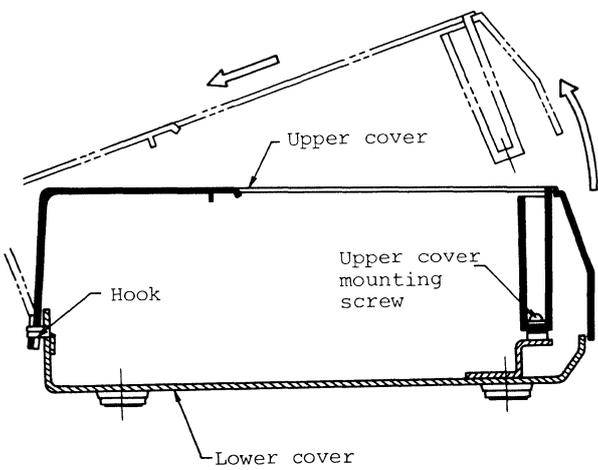
- (1) Before disassembly or reassembly, depress the AC POWER switch off and pull out the power cord from the AC outlet.
- (2) Prior to disassembly, turn the power off and wait for a few minutes.
- (3) Determine the range of disassembly as suitable to the intended purpose. Do not disassemble more than necessary.
- (4) Before proceeding with disassembly, check each unit for deterioration, interconnection, and clearances, and record data.
- (5) Use the specified maintenance tools only.
- (6) Place the removed units in the correct order.
- (7) The screws, nuts, collars, etc. that may be easily lost should be temporarily tightened in their original places.
- (8) Be careful not to induce trouble by removing components in the wrong order or cutting the wires.

7.4.3 Non-Disassembly Points

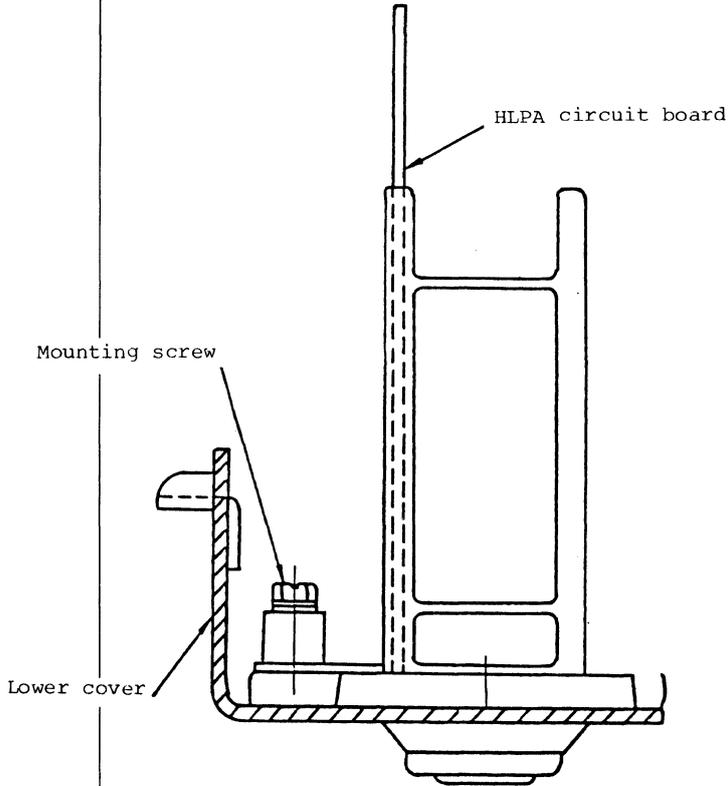
Do not disassemble the print head.

7.4.4 Disassembling and Reassembling Parts

(1) Upper cover (See figures. 9-1 and 9-8.)

Item	Description	Tool
Disassembly	(1) Disconnect interface connector. (2) Remove tractor unit. (See section 4.3) (3) Raise and remove access cover (figure 9-8-3). (4) Remove platen knob (figure 9-3-28). (5) Remove two mounting screws (figure 9-8-30) from inside of front part of upper cover. (6) Raise front end of upper cover (figure 9-8-1), then push it rearward to remove it from lower cover.	No.2-200 Phillips screw- driver
Reassembly	Reverse the disassembly procedure.	
Sketch		

(2) HHPA circuit board (See figures. 9-1 and 9-14.)

Item	Description	Tool
Disassembly	(1) Remove upper cover. (See 7.4.4 (1).) (2) Pull out connectors from HHPA circuit board (figure 9-1 (2/2)). (3) Remove HHPA circuit board mounting screw (figure 9-14-6), and raise HHPA circuit board.	6-200 screwdriver
Reassembly	Reverse the disassembly procedure.	
Sketch		

(3) Printer unit (See figures 9-1 and 9-2.)

Item	Description	Tool
Disassembly	<ol style="list-style-type: none"> (1) Remove upper cover. (See 7.4.4 (1).) (2) Remove HLP A circuit board. (See 7.4.4 (2).) (3) Remove all connecting cords of printer unit (figure 9-1-2) from cord clamp (figure 9-8-8). (See figure 9-1.) (4) Loosen the quite-tight mounting screws (figure 9-8-29) fixing the printer unit until the quite-tight swelling is removed. (5) Lift the printer and remove it from the quite-tight. Move the printer toward you at this time so that it does not touch the power supply assembly (figure 9-8-7). 	No.2-200 Phillips screw-driver
Reassembly	<p>Reverse the disassembly procedure.</p> <p>Notes: 1) Tighten stud until tip of screw is flush with tip of quite-tight. (Tightening torque: 4 to 5 kg.cm)</p> <p>2) See figure 9-1 for routes of connecting cords.</p>	
Sketch	<p style="text-align: center;">Tighten quite-tight mounting screw until tip of screw is flush with tip of quite-tight.</p>	



(4) Power supply and transformer assembly (See figure 9-8.)

Item	Description	Tool
Disassembly	<p>(1) Remove upper cover. (See 7.4.4 (1).)</p> <p>(2) Remove HHPA circuit board. (See 7.4.4 (2).)</p> <p>(3) Remove all connectors from HHPA circuit board (figure 9-1)</p> <p>(4) Remove HHPA circuit board mounting screws (figure 9-8-25), and remove AC cord bushing from the frame (figure 9-8-11).</p> <p>(5) Remove transformer mounting screws (figure 9-8-31) and transformer.</p>	No.2-200 Phillips screw- driver, Pliers R-29
Reassembly	<p>Reverse the disassembly procedure.</p> <p>Note: See figure 9-1 for routes of con- necting cords.</p>	

(5) Print head (See figures 9-1 and 9-2.)

Item	Description	Tool
Disassembly	<p>(1) Raise and remove the access cover.</p> <p>(2) Disconnect the print head (figure 9-2-1) connector from the flat cable connector, which is attached to the carriage.</p> <p>(3) While holding the print head with the right hand, lift it straight up, with the lock lever released, with the left hand.</p>	
Reassembly	<p>Reverse the disassembly procedure.</p> <p>Note: Twist the print head wire leads one turn, clockwise, before inserting the connector.</p>	
Sketch		



(6) Carriage frame (See figures 9-2 and 9-7.)

Item	Description	Tool
Disassembly	<p>(1) Remove upper cover. (See 7.4.4(1).)</p> <p>(2) Remove print head. (See 7.4.4 (5).)</p> <p>(3) Remove belt clamp screw (figure 9-7-6), and belt clamp (figure 9-7-2).</p> <p>(4) Remove adjusting lever mounting screw (figure 9-2-22) and remove the adjusting lever (figure 9-2-8).</p> <p>(5) Loosen the eccentric locking bolts (figure 9-2-15) on both sides of the upper carriage shaft, and remove the eccentric collar (figure 9-2-7).</p> <p>(6) Pull out the upper carriage shaft (figure 9-2-5) from the right and left side frames.</p> <p>(7) Remove head connecting cord con- nector screw (figure 9-7-6) from carriage frame, and head connecting cord (figure 9-1-7) from carriage frame.</p> <p>(8) Lift carriage frame, and remove it from lower carriage shaft.</p>	<p>No.2-200 Phillips screw- driver</p> <p>5.5-mm wrench</p>
Reassembly	Reverse the disassembly procedure.	
Adjustment	Adjust gap between platen and print head as described in Table 7-3, item 2.1.	

(7) Space motor (See figure 9-3 and 9-6.)

Item	Description	Tool
Disassembly	(1) Remove upper cover. (See 7.4.4 (1).) (2) Remove HLP A circuit board. (See 7.4.4 (2).) (3) Remove the cable guide (figure 9-3-30) from the space motor. (4) Remove space motor connecting cord from cord clamp (figure 9-8-8). (5) Cut tie-wraps securing the space motor connection cord. (6) Remove the space belt (figure 9-6-10) from the space motor (figure 9-3-9) pulley. (7) Remove the space motor mounting screw (figure 9-3-57) and the space motor.	 No.5 H cutters No.2-200 Phillips screw-driver
Reassembly	Reverse the disassembly procedures.	
Adjustment	Space belt tension. See Table 7-3, item 1.1.	



(8) Space belt (See figures 9-3 and 9-6.)

Item	Description	Tool
Disassembly	<p>(1) Remove the upper cover. (See 7.4.4 (1).)</p> <p>(2) Loosen the idle pulley bracket screw (figure 9-3-55), move the idle pulley bracket (figure 9-3-16) to right to loosen space belt (figure 9-6-10).</p> <p>(3) Remove the belt clamp screw (figure 9-7-6), and belt clamp (figure 9-7-2).</p> <p>(4) Remove the E-snap (figure 9-6-22) from one of the ribbon spool gears, and remove the ribbon spool gear (figure 9-6-7).</p> <p>Note: Be careful not to lose plastic washer (figure 9-6-16).</p> <p>(5) Remove the detent spring (figure 9-6-9).</p> <p>(6) Remove the other E-snap (figure 9-6-22) and then the ribbon change lever (figure 9-6-2) and the ribbon drive gear (figure 9-6-6).</p> <p>(7) Remove the space belt.</p>	<p>No.2-200 Phillips screw- driver</p> <p>No.1 round pliers</p>
Reassembly	<p>Reverse the disassembly procedure.</p> <p>Note: When reassembling the ribbon drive gear, accurately engage its pulley teeth with space belt teeth beforehand.</p>	
Adjustment	<p>Space belt tension See Table 7-3, item 1.1.</p>	

(9) Platen (See figures 9-3 and 9-4.)

Item	Description	Tool
Disassembly	<ol style="list-style-type: none"> <li data-bbox="695 342 1118 394">(1) Remove the upper cover. (See 7.4.4 (1).) <li data-bbox="695 421 1193 495">(2) Turn forward (open position) the column indicator (figure 9-3-17). <li data-bbox="695 521 1262 595">(3) Remove the paper separator screw (figure 9-3-52), and the paper separator (figure 9-3-7). <li data-bbox="695 645 1278 775">(4) Remove E-shaped snap (figure 9-4-5), and then wave washer (figure 9-4-2) and right platen bearing (figure 9-4-3) by pulling them sidewise. <li data-bbox="695 801 1278 931">(5) Pull the side plate bearings horizontally (figure 9-4-3) until their projections come off side plates, turn 90°, and remove platen by lifting it. 	No.2-200 Phillips screw-driver
Reassembly	Reverse the disassembly procedure.	
Adjustment	Clearance between the paper separator and the platen. See Table 7-3, item 3.2.	

7.5 Adjustment Procedures for Various Parts

Table 7-3 Adjustment Procedures

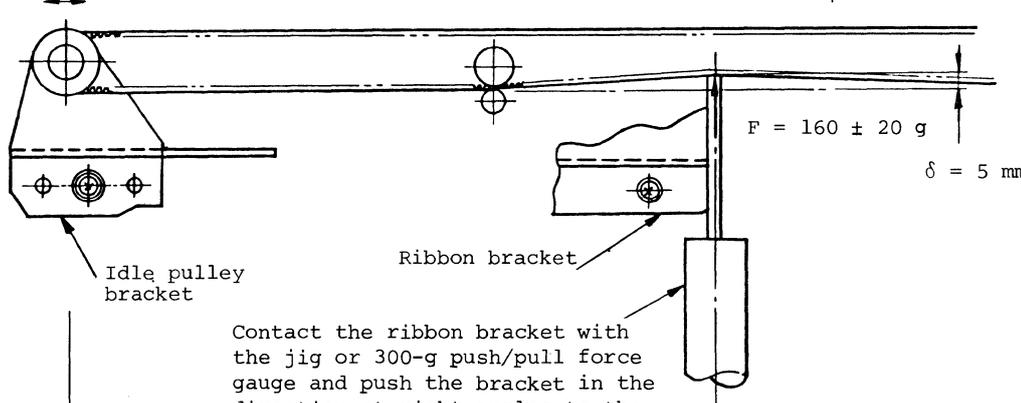
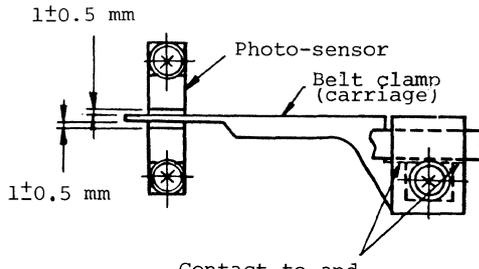
No.	Item	Standard	Description	Tool
1.1	Spacing belt tension	$F = 160 \pm 20$ g at $\delta = 5$ mm	Adjust by moving idle pulley bracket. Note: Carriage unit should be at home position.	300-g push/pull force gauge No.2-200 Phillips screwdriver
 <p>Contact the ribbon bracket with the jig or 300-g push/pull force gauge and push the bracket in the direction at right angles to the belt.</p>				
1.2	Belt clamp position	1 ± 0.5 mm	The belt clamp should be at the position shown below, against the photo-sensor, when power is on, or the carriage is returned manually.	
 <p>Contact to and mount.</p>				
<p>Check point:</p> <p>Verify the belt clamp is within tolerance when contacting to the upper side. If it is out of tolerance, adjust the belt clamp mounting.</p>				

Table 7-3 (con.)

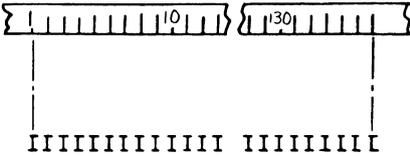
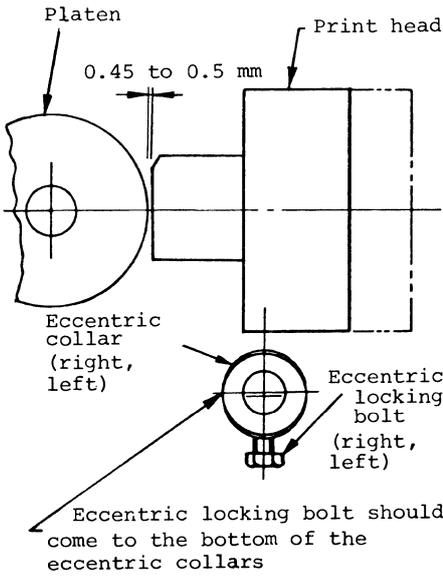
No.	Item	Standard	Description	Tool
1.3	Printing position	Run-out of character center against the column indicator scale should be +0.5 mm or less.	<p>Fully print the printing column number to check character center run-out against the full range of the column indicator scale.</p>  <p>Check point:</p> <p>When out of tolerance, adjust the photo-sensor and space motor mounting.</p>	
2.1	Gap between platen and print head	0.45 to 0.5 mm	<p>Adjust with the right and left eccentric collars mounted on both sides of the carriage shaft on the upper side. Check the standard value at both ends of platen with thickness gauge.</p>  <p>Adjustment:</p> <p>Let the adjust lever position be No. 1.</p> <p>When the platen has loosened, adjust the gap with the paper lock release lever turned to close. After adjustment, turn it to open.</p>	Thickness gauges, 5.5-mm wrench, 11-mm wrench

Table 7-3 (con.)

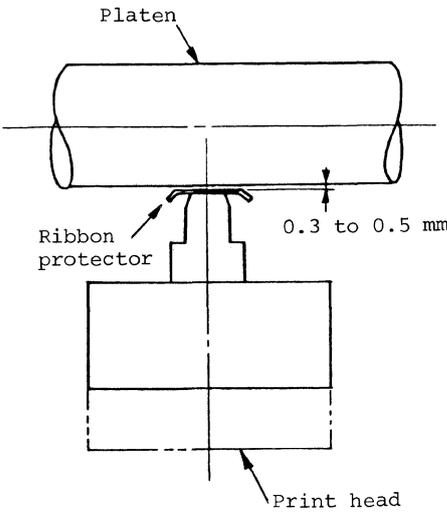
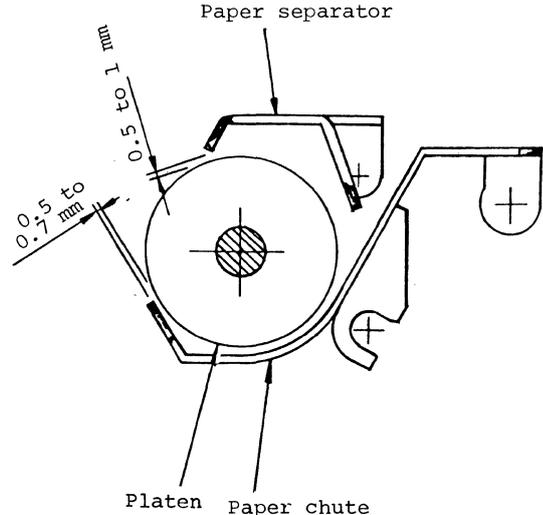
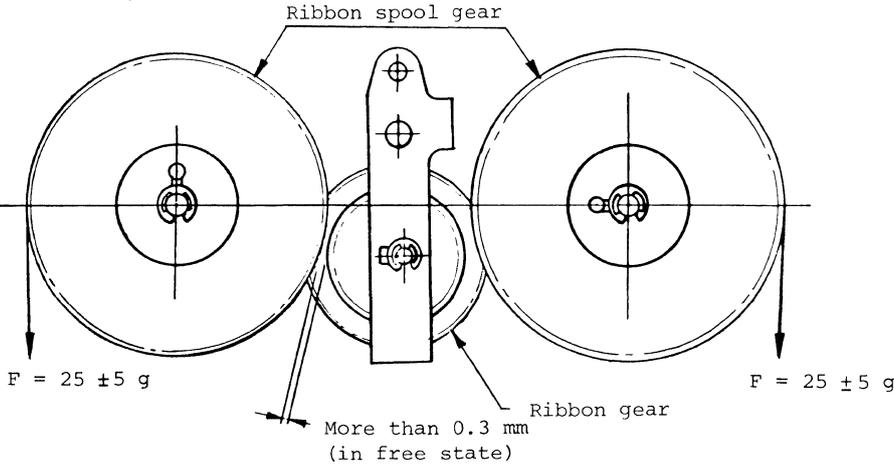
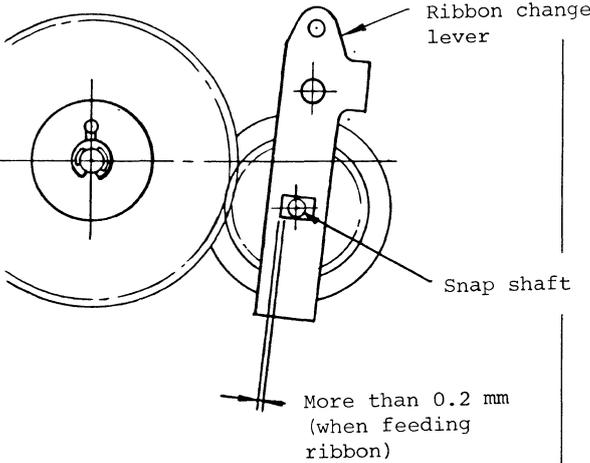
No.	Item	Standard	Description	Tool
2.2	Gap between platen and ribbon protector	0.3 to 0.5 mm	 <p>Platen</p> <p>Ribbon protector</p> <p>0.3 to 0.5 mm</p> <p>Print head</p>	Thickness gauge
3.1	Gap between platen and paper chute	0.5 to 0.7 mm	 <p>Paper separator</p> <p>0.5 to 0.7 mm</p> <p>0.5 to 1 mm</p> <p>Platen</p> <p>Paper chute</p>	Thickness gauges No. 2-200 Phillips screwdriver
3.2	Gap between platen and paper separator position	0.5 to 1 mm		

Table 7-3 (con.)

No.	Item	Standard	Description	Tool
4.1	Ribbon spool gear friction tension	F= 25 \pm 5 g	<p>Confirm this on both the right and left spool gears.</p> 	Thickness gauge
4.2	Gap between ribbon spool gear and ribbon gear	More than 0.3 mm in free state	<p>Confirm this on both the right and left spool gears.</p>	
4.3	Gap between ribbon change lever and shaft	More than 0.2 mm when feeding ribbon		



7.6 Oiling

The purposes of oiling are rust prevention and lubrication. For rust prevention, do not apply oil in a large quantity, but rub the parts with an oily cloth. For lubrication, apply oil of suitable type in a suitable quantity, according to the operation condition of the parts.

Inadequate oil quantity may cause insufficient lubrication or troubles due to splash. When applying oil, remove contaminated old oil and dust before adding new oil. For rust-prevention, do not use oil containing molybdenum disulfide.

7.6.1 Oil Types

- (1) Pan Motor Oil 10W30 (or equivalent) PM
- (2) ALBANIA Grease #2EP (or equivalent) GEP
- (3) Molybdenum disulfide oil (or equivalent)..... ML

7.6.2 Application volume

- Large quantity (A) Let oil felt or other part be thoroughly soaked with oil.
- Medium quantity (B) Three to four drops. A thickness of approximately 0.2 mm in case of grease.
- Small quantity (C) One drop

7.6.3 Oil Application Cycle

ML 84 is maintenance-free, and no oil is necessary during normal operation. Apply oil after disassembly, reassembly, or cleaning.

7.6.4 Parts Where Oil Is Prohibited

Table 7-4

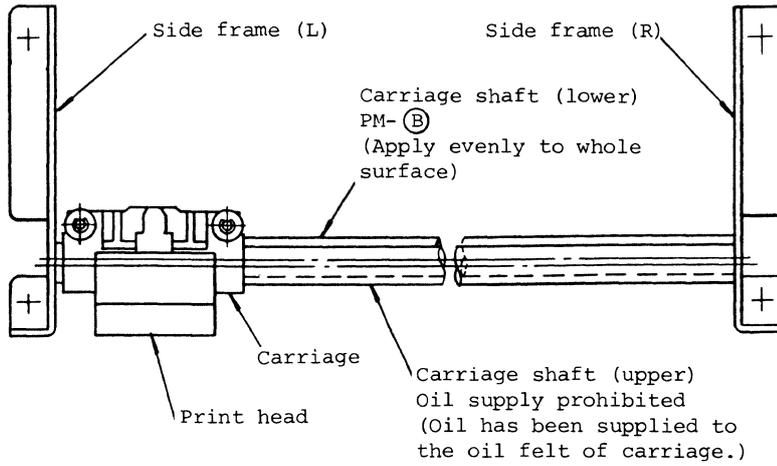
No.	Part	Reason	Remarks
1	Ribbon	Prevention of ink stain of printed characters	
2	Ribbon roller	Prevention of ink stain of printed characters	
3	Microswitch	Prevention of faulty contact	
4	Home sensor	Prevention of dust	
5	Platen (rubber face)	Prevention of stained paper	

Table 7-4 (con.)

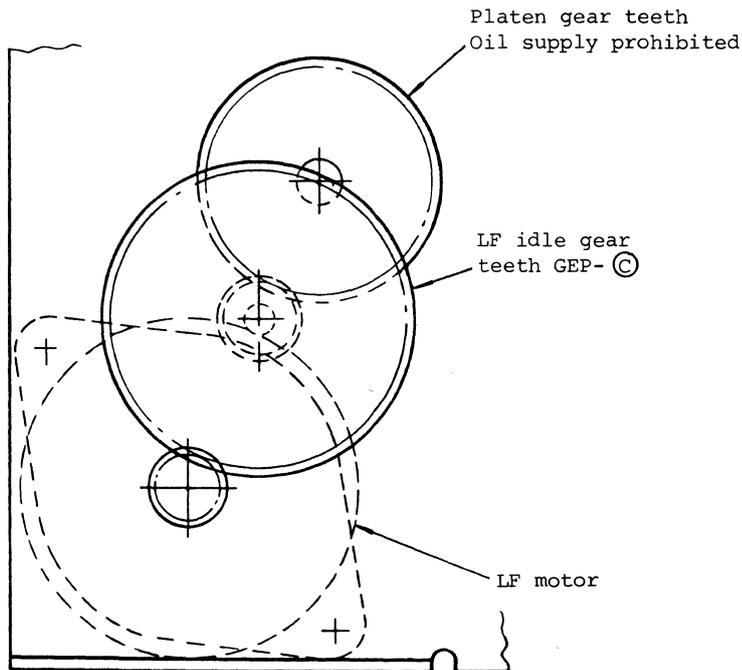
No.	Part	Reason	Remarks
6	Platen pressure roller	Prevention of stained paper	
7	Pin tractor	Prevention of stained paper	
8	Synchro-belt	Prevention of extended belt	
9	Pulley teeth of belt	Prevention of extended belt	
10	Ribbon drive assembly friction felt	Prevention of inferior friction	

7.6.5 Lubrication Points

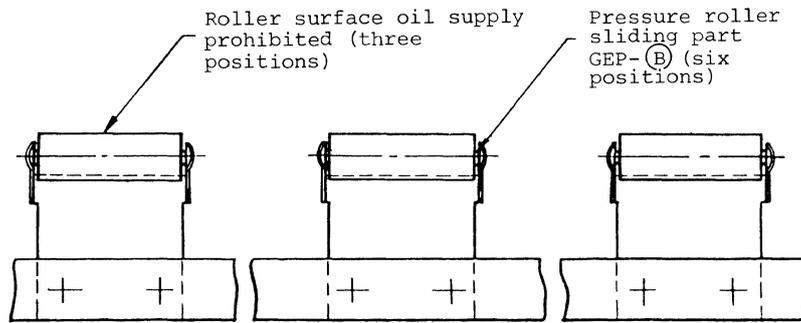
(1) Carriage shaft (lower)



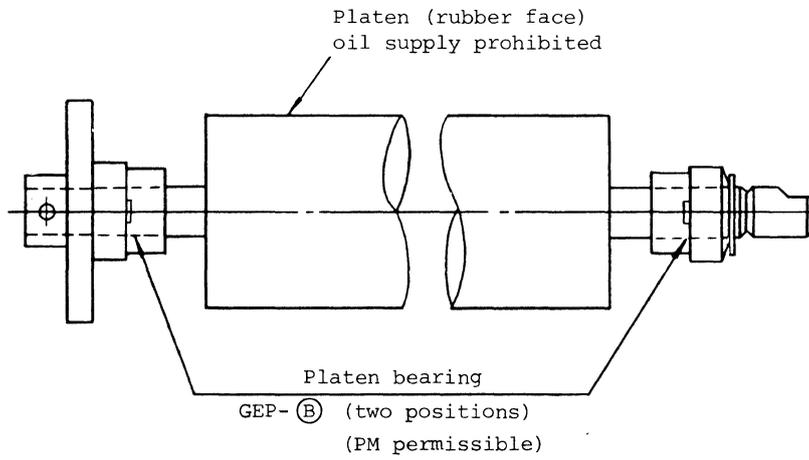
(2) LF idle gear



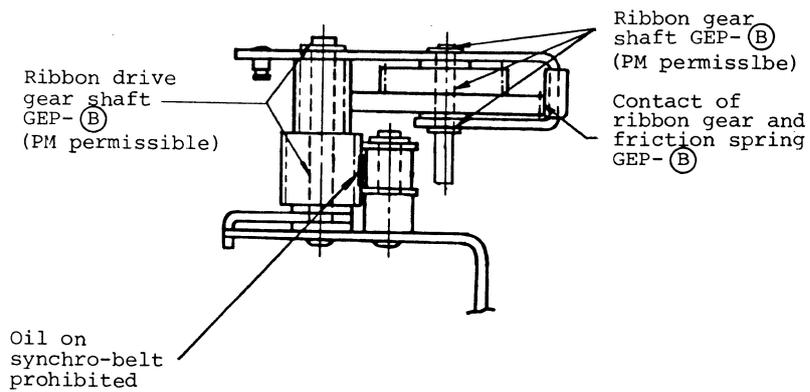
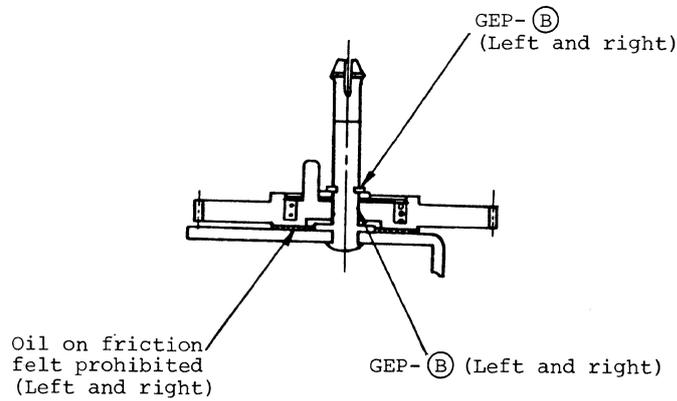
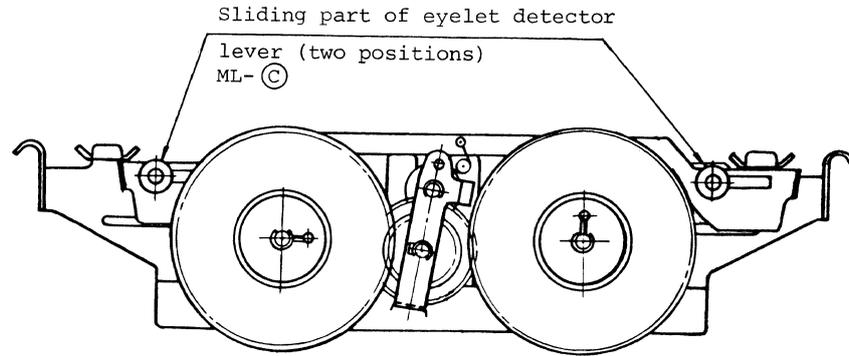
(3) Pressure roller



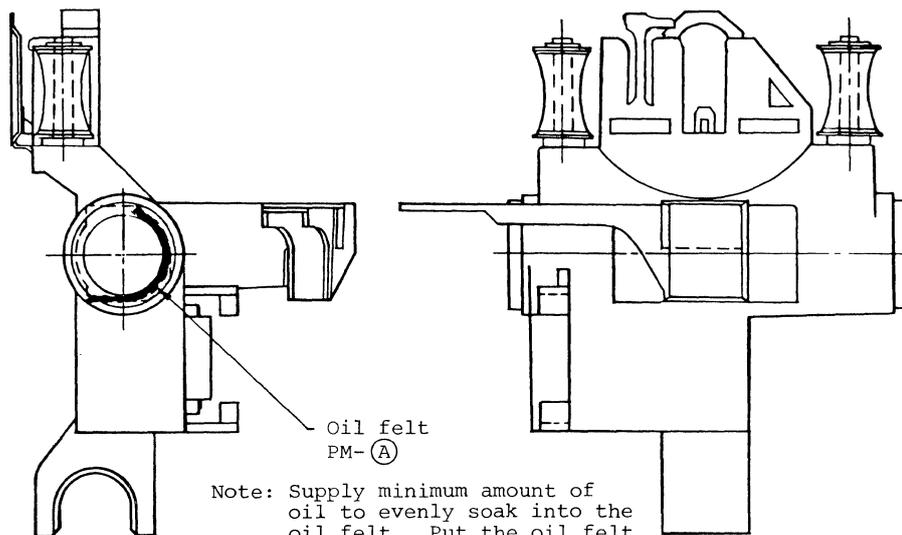
(4) Platen bearing



(5) Ribbon drive assembly

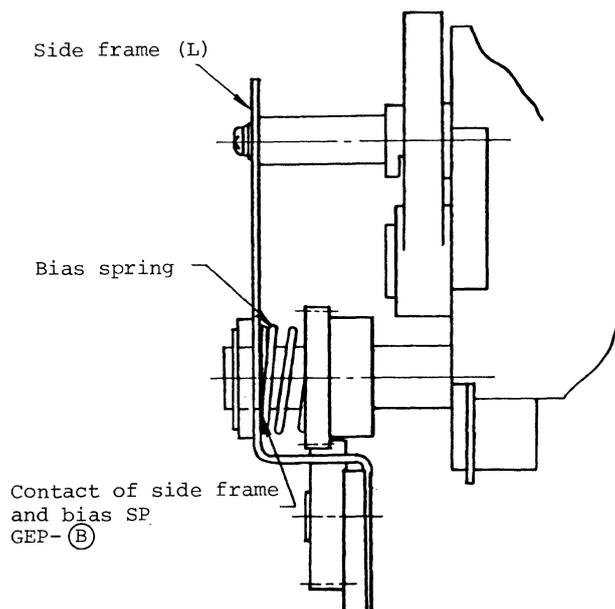


(6) Carriage assembly



Note: Supply minimum amount of oil to evenly soak into the oil felt. Put the oil felt in the oil, let oil thoroughly soak into the felt, leave it on a wire net to remove excessive oil, then mount the felt.

(7) Tractor assembly





7.7 Maintenance Parts List

Table 7-6 shows the maintenance parts (quantities for every 1000 units purchased) that are considered convenient for maintenance purposes by the OEM.

7.7.1 Parts Ordering Procedure

- (1) Find desired parts (part number) from the table of component parts in section 9, and confirm the numbers.
- (2) Specify the part numbers and names of the parts required.
- (3) Each part has its own number for confirmation of interchangeability.
(If the part number is the same, the part is the same.)

7.7.2 How to Use the List

- (1) Ref. No.: Reference number in the table of component parts in section 9.
- (2) Rank: A -- Must be kept on hand.
B -- Recommended to be kept on hand.
- (3) Recommended quantity: Quantity considered necessary after 1 year of operating 1000 purchased units.

Note: "83A" in the column of compatibility indicates this unit is compatible with ML 83A.

Table 7-6 Maintenance Parts List (1/5)

Mechanical components (1/3)

Ref. No.	Part No.	Nomenclature	Original quantity	Recommended quantity	Rank	Compatibility
	(Printer unit)					
Fig. 9-2-1	3LR-190990-10	Print head assembly	1	18	A	
Fig. 9-2-4	4LR-191870-3	Carriage assembly	1	5	B	
Fig. 9-7-3	5LR-191873-2	Ribbon protector	1	10	B	83A
Fig. 9-3-28	4LR-132233	Platen knob	1	10	B	83A
Fig. 9-2-8	5LR-132115	Head gap adjusting lever (welded)	1	5	B	83A
Fig. 9-3-25	3LR-129900-4	Platen assembly	1	5	B	83A
Fig. 9-3-16	4LR-132488-2	Idle pulley bracket (clinched)	1	2	B	83A
Fig. 9-3-10	5LR-132475	LF idle gear	1	5	B	83A
Fig. 9-3-9	4LR-191854-2	Space motor (pressure- fitted)	1	12	A	
Fig. 9-3-8	5LR-132473-3	LF motor (pressure- fitted)	1	10	A	
Fig. 9-3-27	4LR-129847-3	Home sensor assembly	1	13	B	
Fig. 9-3-26	4LR-129907	Paper out assembly	1	5	B	83A
Fig. 9-3-11	5LR-132480	Paper lock release lever (welded)	1	5	B	83A
Fig. 9-6-2	5LR-192194	Ribbon change lever (clinched)	1	2	B	
Fig. 9-6-3	4LR-129827	Ribbon gear	1	19	B	83A
Fig. 9-6-4	5LR-93429-3	Snap shaft	1	5	B	
Fig. 9-6-5	5LR-129876	Friction spring	1	19	B	83A
Fig. 9-6-6	4LR-192197	Ribbon drive gear	1	5	B	
Fig. 9-6-7	4LR-192196	Ribbon spool gear	2	20	B	
Fig. 9-6-8	5LR-191325	Compression spring	2	10	B	
Fig. 9-6-9	5LR-129841	Detent spring	1	5	B	83A
Fig. 9-6-10	4LP-1420-5	Synchro belt	1	18	B	83A
Fig. 9-6-11	5LR-191859	Pressure roller	1	5	B	83A
Fig. 9-6-12	5LR-129842-2	Friction felt	2	18	B	
Fig. 9-6-13	5LR-129843	Special washer	2	18	B	
Fig. 9-6-16	5LR-132516	Plastic washer	2	18	B	83A
Fig. 9-7-2	4LR-191857	Belt clamp	1	10	B	83A
	(Cover unit)					
Fig. 9-8-1	1LM-60106	Upper cover	2	5	B	83A
Fig. 9-8-3	2LM-60112	Access cover	2	5	B	83A
Fig. 9-8-9	5LM-61519	Ground board	4	3	B	83A
Fig. 9-8-11	5LP-6463-C-5	Cord bushing	2	3	B	83A



Table 7-6 Maintenance Parts List (2/5)

Mechanical components (2/3)

Ref. No.	Part No.	Nomenclature	Original quantity	Recommended quantity	Rank	Compatibility
Fig. 9-8-12	4LP-6726-2	Quite-tight	12	5	B	83A
Fig. 9-8-13	5LP-1416 (Tractor unit)	Rubber foot	8	5	B	83A
Fig. 9-15-12	FMX-35100-2	Sprocket assembly (R)	1	5	B	83A
Fig. 9-15-13	FMX-35150-2	Sprocket assembly (L)	1	5	B	83A
Fig. 9-15-5	5LR-129887	Clamp lever	2	18	B	83A
Fig. 9-15-6	4LR-129889	Tractor gear	1	5	B	83A
Fig. 9-15-7	5LR-129890	Idle gear	1	5	B	83A
Fig. 9-15-10	5LR-123498	Bushing	2	9	B	83A
Fig. 9-15-11	5LR-123467	Sheet guide	1	5	B	83A
Fig. 9-15-31	⊕ P(SW+W) 3-6-23D	Small pan-head screw	2	5	B	83A
Fig. 9-15-32	⊕ P(SW+2W) 3-8-23D	Small pan-head screw	2	5	B	83A
Fig. 9-1-9	LY-39702 (Others)	Tractor unit	2	5	B	83A
Fig. 9-3-42	5KX-9057	E-snap ring (2)	8	30	B	
Fig. 9-3-41	5KH-12050	E-snap ring (3)	6	30	B	
Fig. 9-4-5	5KX-9059	E-snap ring (6)	1	10	B	
Fig. 9-15-21	5KD-50242	E-snap ring (8)	4	30	B	
Fig. 9-2-20	⊕ P3-12-HH	Small pan-head screw	1	10	B	
Fig. 9-3-51	⊕ P3-14-HH	Small pan-head screw	1	10	B	
Fig. 9-3-56	⊕ P(SW) 3-5-HH	Small pan-head screw	14	50	B	
Fig. 9-2-21	⊕ P(SW) 3-6-HH	Small pan-head screw	9	150	B	
Fig. 9-3-53	⊕ P(SW) 4-6-HH	Small pan-head screw	4	50	B	
Fig. 9-3-54	⊕ P(SW+W) 3-6-HH	Small pan-head screw	17	50	B	



Table 7-6 Maintenance Parts List (3/5)

Mechanical components (3/3)

Ref. No.	Part No.	Nomenclature	Original quantity	Recommended quantity	Rank	Compatibility
Fig. 9-8-27	⊕ P(SW+W) 3-8-HH	Small pan-head screw	12	10	B	
Fig. 9-8-32	⊕ P(W)3-5-HH	Small pan-head screw	2	10	B	
Fig. 9-8-28	⊕ P(SW+2W) 3-6-HH	Small pan-head screw	4	10	B	
Fig. 9-8-30	⊕ P(SW+W) 4-12-HH	Small pan-head screw	4	10	B	
Fig. 9-3-55	⊕ P(SW+2W) 4-8-HH	Small pan-head screw	9	10	B	
Fig. 9-3-57	⊕ P(SW+2W) 4-10-HH	Small pan-head screw	2	10	B	
Fig. 9-8-29	⊕ P(SW+2W) 4-18-HH	Small pan-head screw	12	50	B	
Fig. 9-7-6	⊕ T ₂ P ₃ - 10-HH	Tapping screw		21	B	
Fig. 9-2-15	(-)B ₃ -6-HH	Bolt	2	10	B	
Fig. 9-8-24	(-)B ₄ -6-HH	Bolt	2	10	B	
Fig. 9-2-25	SW ₃ -HHC	Spring washer	8	50	B	
Fig. 9-2-23	SW ₄ -HHC	Spring washer	6	30	B	
Fig. 9-8-36	2W ₄ -HH	Washer	2	10	B	
Fig. 9-2-26	2N ₃ -HH	Nut	6	10	B	
Fig. 9-2-22	3N ₄ -HH	Nut	2	10	B	



Table 7-6 Maintenance Parts List (4/5) (1/2)
(3rd edition)

Electrical Parts (1/2)

For USA

Ref. No.	Part No.	Nomenclature	Original quantity	Recommended quantity	Rank	Compatibility
Fig. 9-1-3	LY-43360	HLLPA circuit board	1	20	A	
Fig. 9-9-3	LY-43359	HLSW circuit board	1	5	B	
Fig. 9-14	LYH-20099-001	ROM IC (Q20)	1	20	B	
Fig. 9-14	LYH-20099-002	ROM IC (Q19)	1	20	B	
Fig. 9-14	LYH-20099-003	ROM IC (Q21)	1	20	B	
Fig. 9-14	LYH-20099-004	ROM IC (Q22)	1	20	B	
Fig. 9-14	LYH-20099-005	ROM IC (Q11)	1	20	B	
Fig. 9-12	LY-43361-2	HLLPS-2 circuit board	1	5	B	
	LY-43361-3	HLLPS-3 circuit board		1	B	
Fig. 9-1-10	4LP-37202-10	DC power connection cord	1	10	B	
Fig. 9-1-6	3LP-37257-4	Operation panel connection cord	1	5	B	
Fig. 9-1-7	4LP-37587-2	Head connection cord	1	5	B	
Fig. 9-13	2LR-192189-2	Transformer assembly	1	5	B	
	2LR-192189-3	Transformer assembly		1	B	
		(HLLPS circuit board)				
Fig. 9-12	D4LP-9409-2	U05C diode	12	60	B	
Fig. 9-12	D4LP-44386-2	Thyrister CU12	1	5	B	
Fig. 9-12	4LP-11830-49	Regulator FS7805	2	20	B	
Fig. 9-12	4LP-8475-B-20	MGC 2A fuse (for 115 V)	1	20	A	
Fig. 9-12	4LP-8475-B-22	MGC 3A fuse (for 115 V)	1	20	A	
Fig. 9-11-3	4LP-3621-2	Toggle switch (for 115V)	1	5	B	83A
	4LP-3621-1	Toggle switch (for 240V)		1	B	83A
Fig. 9-12	4LP-6740-200	Circuit breaker (for 115V)	1	5	B	
	4LP-6740-100	Circuit breaker (for 240V)		1	B	
	4LP-3622	Slide switch		1	B	
	4LP-6735-13	MF51NM 2A fuse (for 240 V)		1	B	
	4LP-6735-15	MF51NM 3A fuse (for 240 V)		1	B	



Table 7-6 Maintenance Parts List (4/5) (2/2)

(3rd edition)

Electrical Parts (1/2)

For Europe

Ref. No.	Part No.	Nomenclature	Original quantity	Recommended quantity	Rank	Compatibility
Fig. 9-1-3	LY-43360	HLP A circuit board	1	20	A	
Fig. 9-9-3	LY-43359	HLSW circuit board	1	5	B	
Fig. 9-14	LYH-20099-001	ROM IC (Q20)	1	20	B	
Fig. 9-14	LYH-20099-002	ROM IC (Q19)	1	20	B	
Fig. 9-14	LYH-20099-003	ROM IC (Q21)	1	20	B	
Fig. 9-14	LYH-20099-004	ROM IC (Q22)	1	20	B	
Fig. 9-14	LYH-20099-005	ROM IC (Q11)	1	20	B	
Fig. 9-12	LY-43361-3	HLP S-3 circuit board	1	5	B	
Fig. 9-1-10	4LP-37202-10	DC power connection cord	1	10	B	
Fig. 9-1-6	3LP-37257-4	Operation panel connection cord	1	5	B	
Fig. 9-1-7	4LP-37587-2	Head connection cord	1	5	B	
Fig. 9-13	2LR-192189-3	Transformer assembly	1	5	B	
		(HLP S Circuit board)				
Fig. 9-12	D4LP-9409-2	U05C diode	12	30	B	
Fig. 9-12	D4LP-44386-2	Thyrister CU12	1	5	B	
Fig. 9-12	4LP-11830-49	Regulator FS7805	2	20	B	
Fig. 9-12	4LP-6735-13	MF51NM 2A fuse (for 240 V)	1	20	A	
Fig. 9-12	4LP-6735-15	MF51NM 3A fuse (for 240 V)	1	20	A	
Fig. 9-11-3	4LP-3621-1	Toggle switch (for 240V)	1	5	B	83A
Fig. 9-12	4LP-6740-100	Circuit breaker (for 240V)	1	5	B	
Fig. 9-12	4LP-3622	Slide switch	1	5	B	83A



Table 7-6 Maintenance Parts List (5/5)

Electrical Parts (2/2)

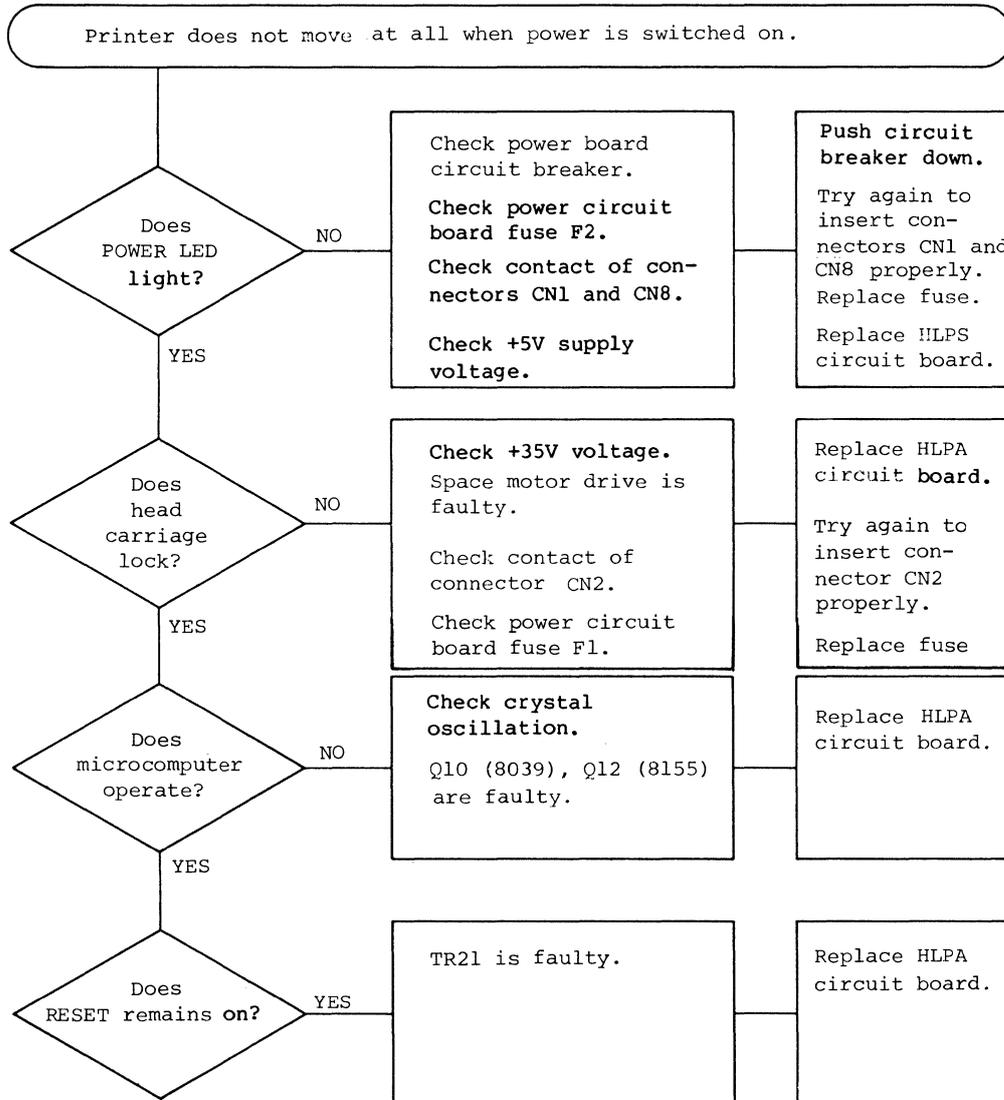
Ref. No.	Part No.	Nomenclature	Original quantity	Recommended quantity	Rank	Compatibility
	(HLPB Circuit board)					
Fig. 9-14	D4LP-9409-2	U05C diode	2	10	B	
Fig. 9-14	D4LP-44156-12	AU01-13 zener diode	1	5	B	
Fig. 9-14	4LP-44385	Transistor 2SD986	4	20	B	83A
Fig. 9-14	4LP-44251	Transistor 2SB-727	3	15	B	83A
Fig. 9-14	4LP-44252	Transistor 2SD-768	4	20	B	
Fig. 9-14	4LP-44401	Transistor 2SB-791	1	5	B	
Fig. 9-14	4LP-44419	Transistor array STA301	3	15	B	
Fig. 9-14	I4LP-11499-06	CPU 8039	1	10	B	83A
Fig. 9-14	I4LP-11368-06	MPD 8155C	1	10	B	83A
Fig. 9-14	I4LP-11714-04	M5L 8243	1	5	B	
Fig. 9-14	I4LP-11699-09	2-kilobyte S RAM MB MB8128-15	2	20	B	
Fig. 9-14	D4LP-9471-1	S1A-02 diode	22	100	B	
Fig. 9-14	D4LP-44117-1	VO9C diode	4	20	B	
Fig. 9-14	D4LP-44156-16	AV01-20 Zener diode	2	10	B	
	(HLSW Circuit board)					
Fig. 9-10	4LP-44373	SEL 103R light-emitting diode	3	15	B	83A
Fig. 9-10	3LK-50700-2	Key switch	4	20	B	83A
Fig. 9-10	4L-1370-49-A2	Nameplate "TOF SET"	1	5	B	83A
Fig. 9-10	4L-1370-50-A2	Nameplate "SEL"	1	5	B	83A
Fig. 9-10	4L-1370-51-A2	Nameplate "FORM FEED"	1	5	B	83A
Fig. 9-10	4L-1370-52-A2	Nameplate "LINE FEED"	1	5	B	83A
Fig. 9-10	4LP-3424	SRQV 101A rotary switch	1	5	B	83A

7.8 Troubleshooting Flow Charts

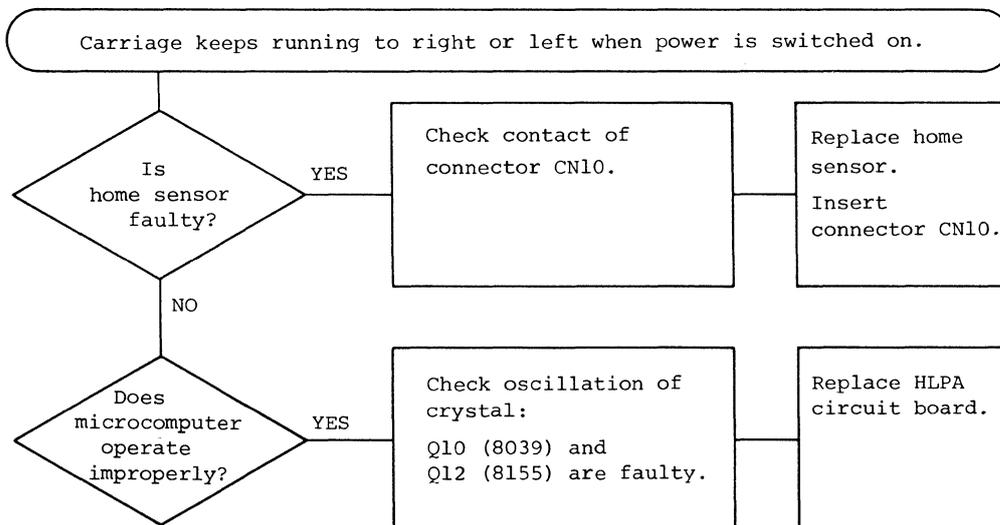
These flow charts are provided for remedying troubles which might develop for the user, and should be referred to after confirming what the trouble is.

Trouble		Item
Classification	Description	
Operation trouble at power-up	Print head does not come to home position.	Does not move at all. (1)
		Keeps running to right or left. (2)
		Vibrates. (3)
	Breaker opens. (4)	
Operation trouble after power-up	Does not start spacing or printing when input data is applied. (5)	
	Spaces but does not print. (6)	
	Prints but does not space. (7)	
	Print head does not return to home position after printing. (8)	
	Does not line-space (9)	
	Paper out function does not work. (10)	
	Characters are skipped, or wrong characters are printed. (11)	
	Some dots are not printed. (12)	
	Breaker opens after a while. (13)	
	Circuit board fuse blows. (14)	
	Operating panel switches do not work. (15)	
	Print is not dark enough. (16)	

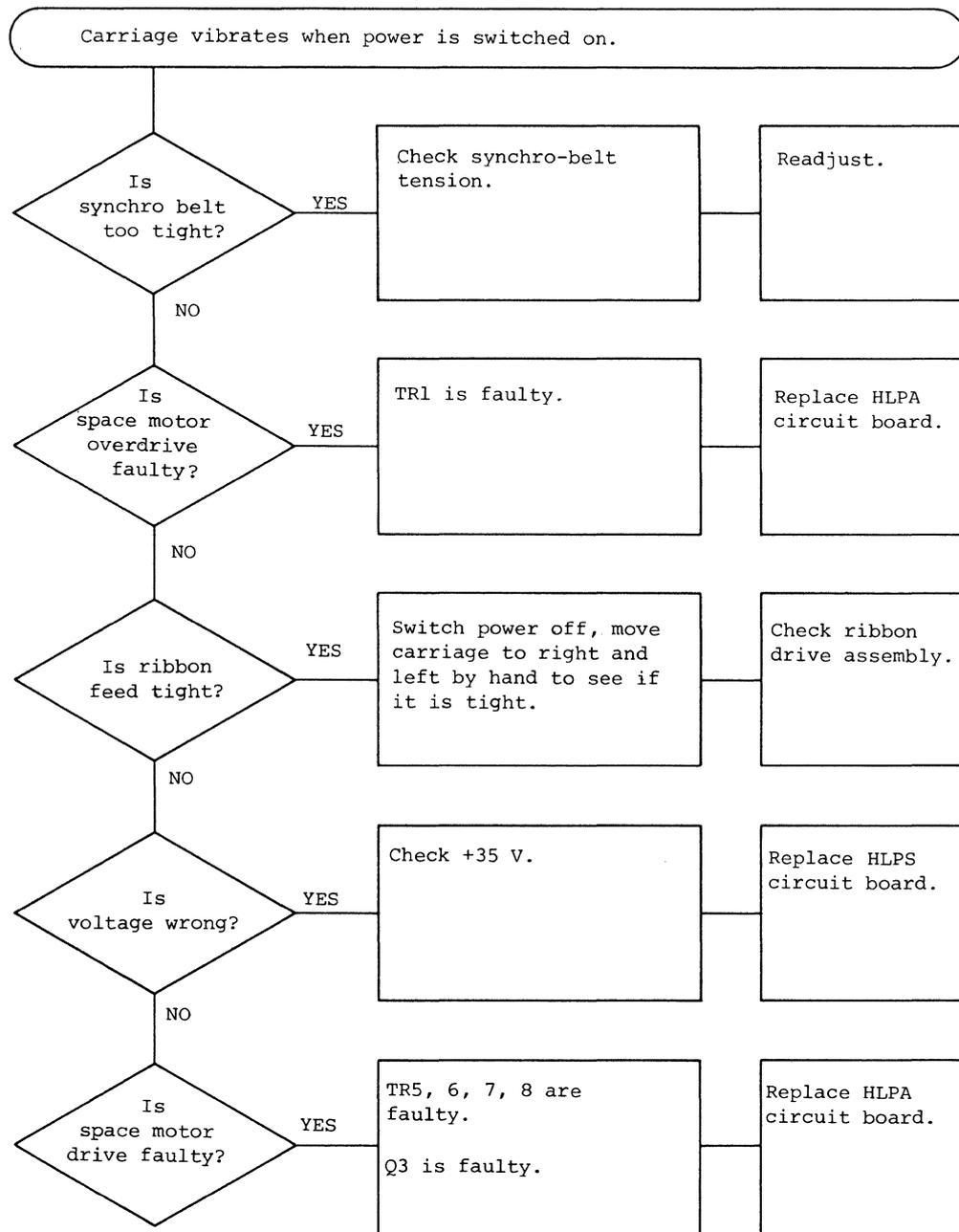
Item (1)



Item (2)

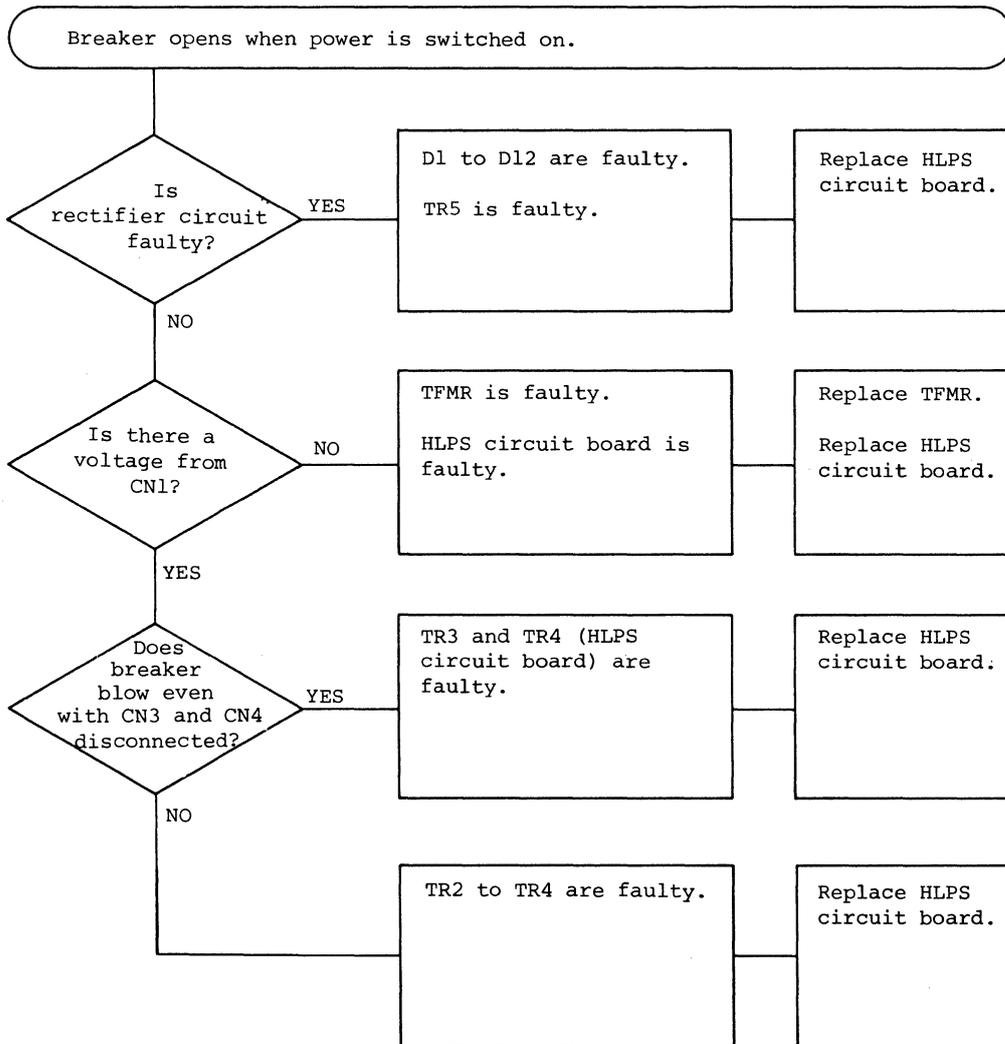


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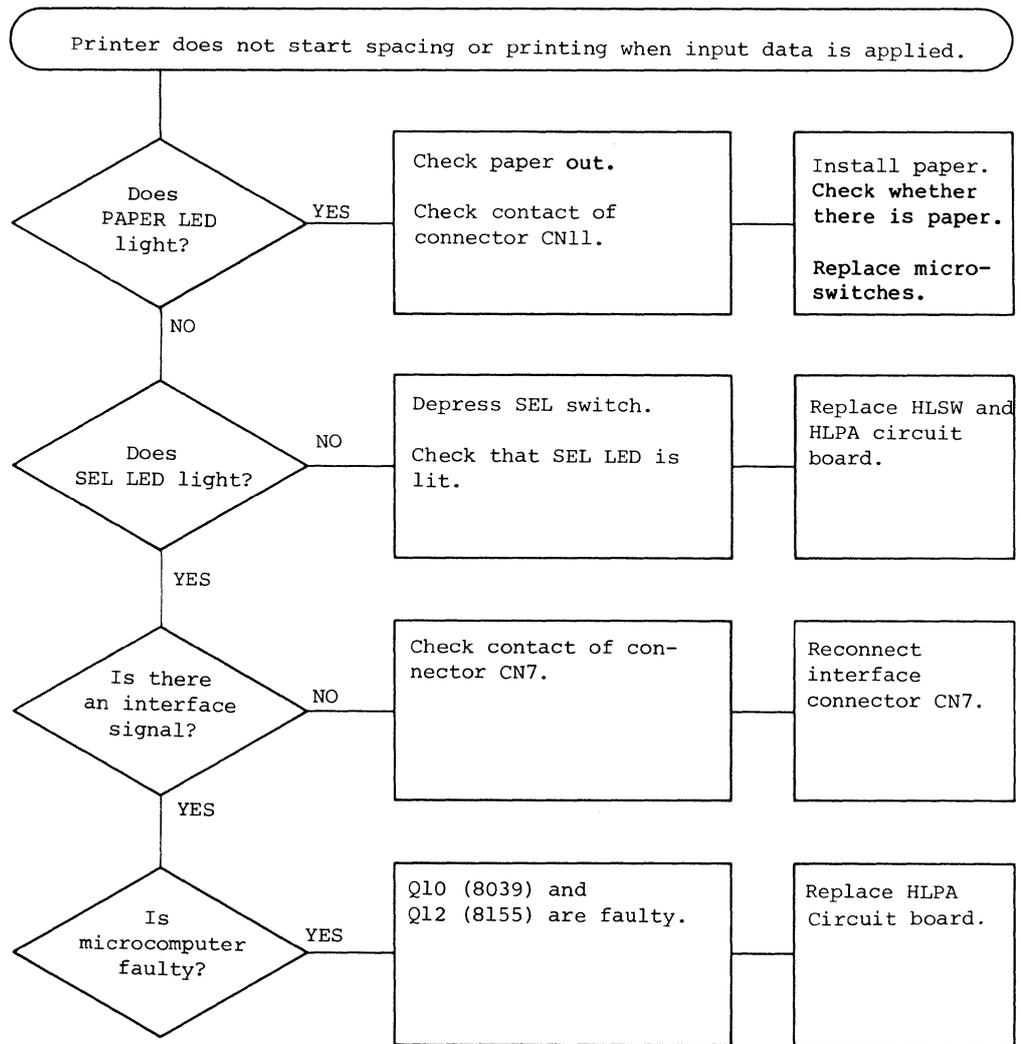




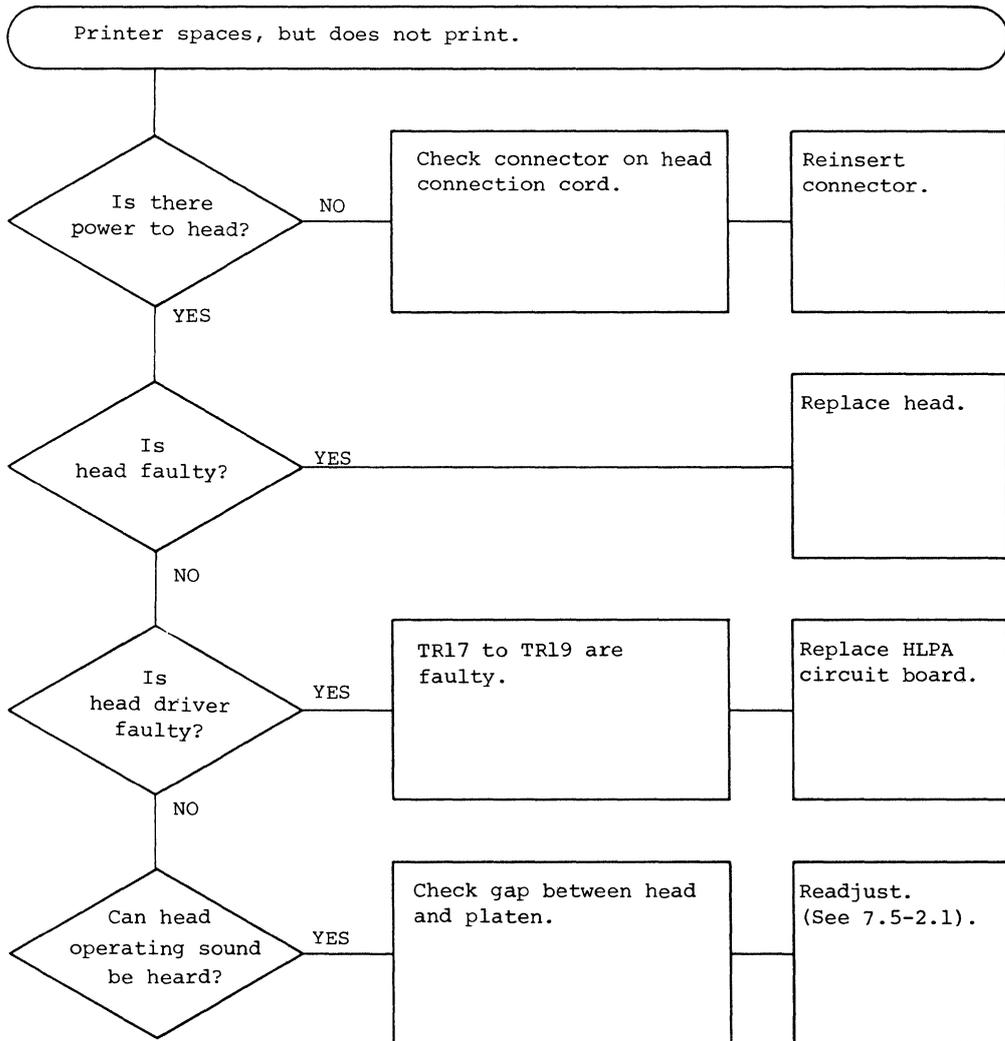
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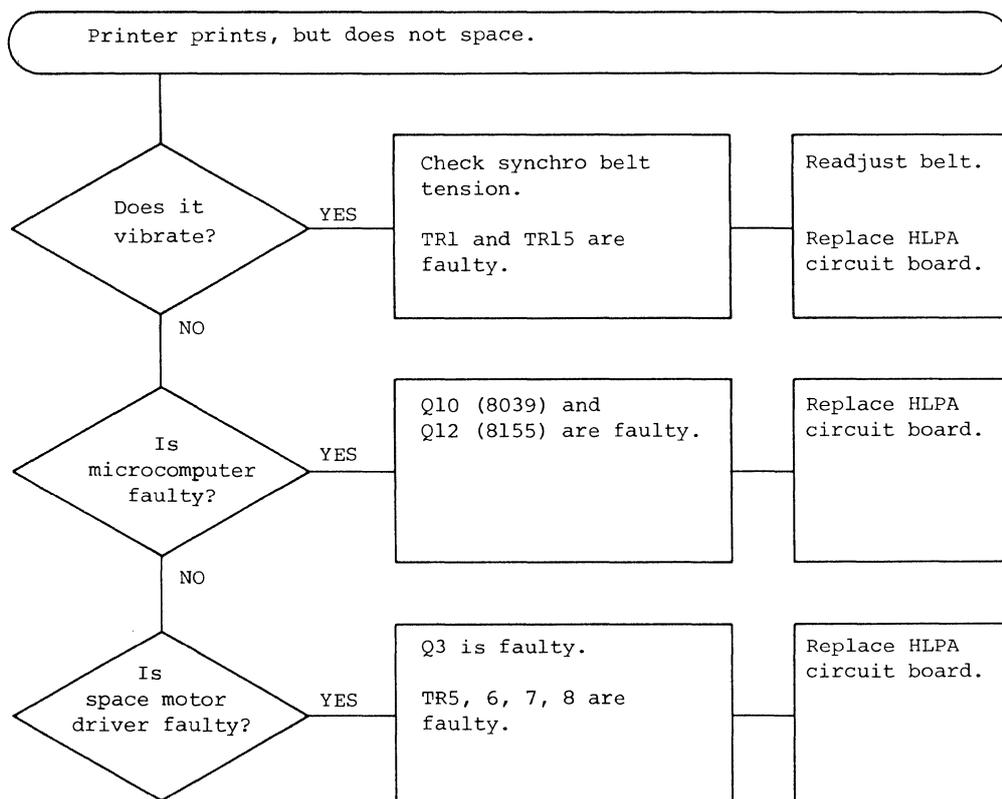
Item (5)



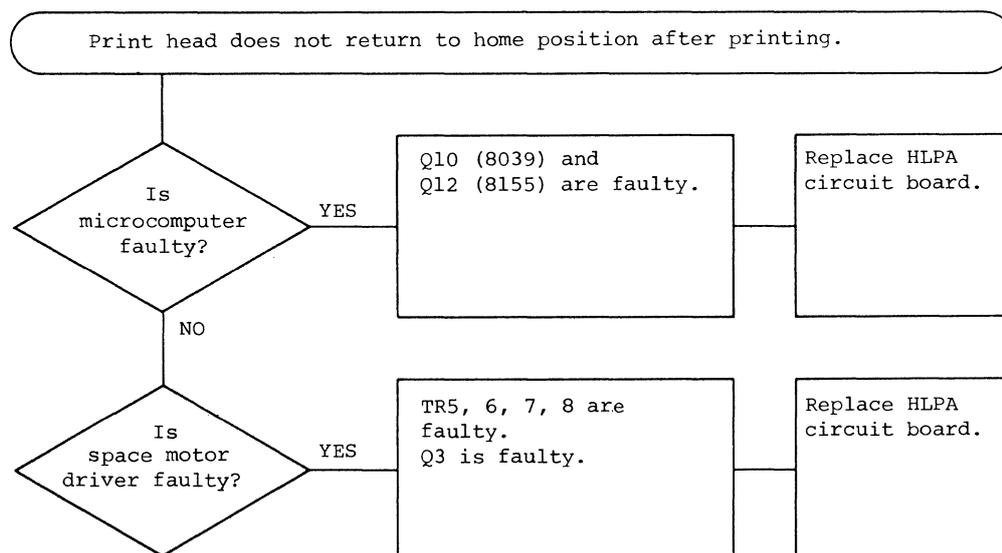
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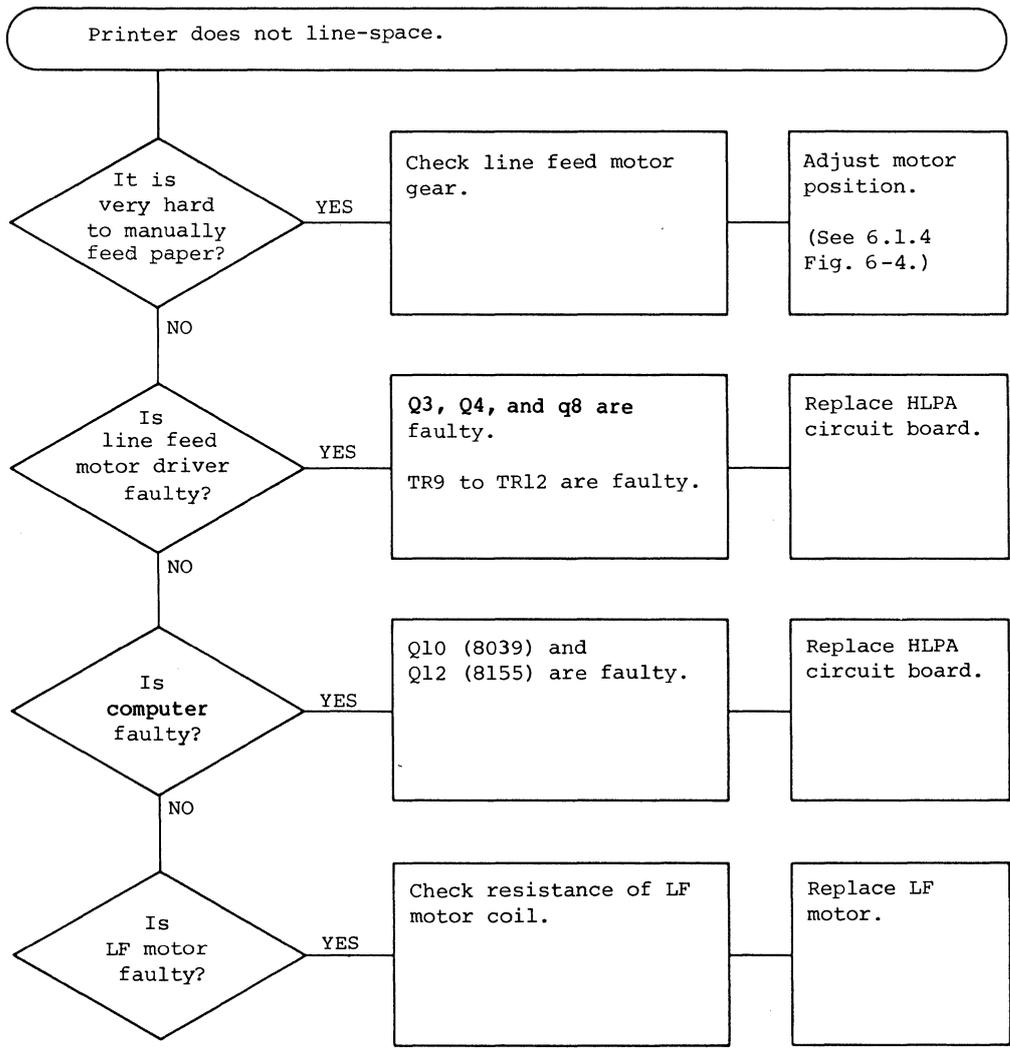
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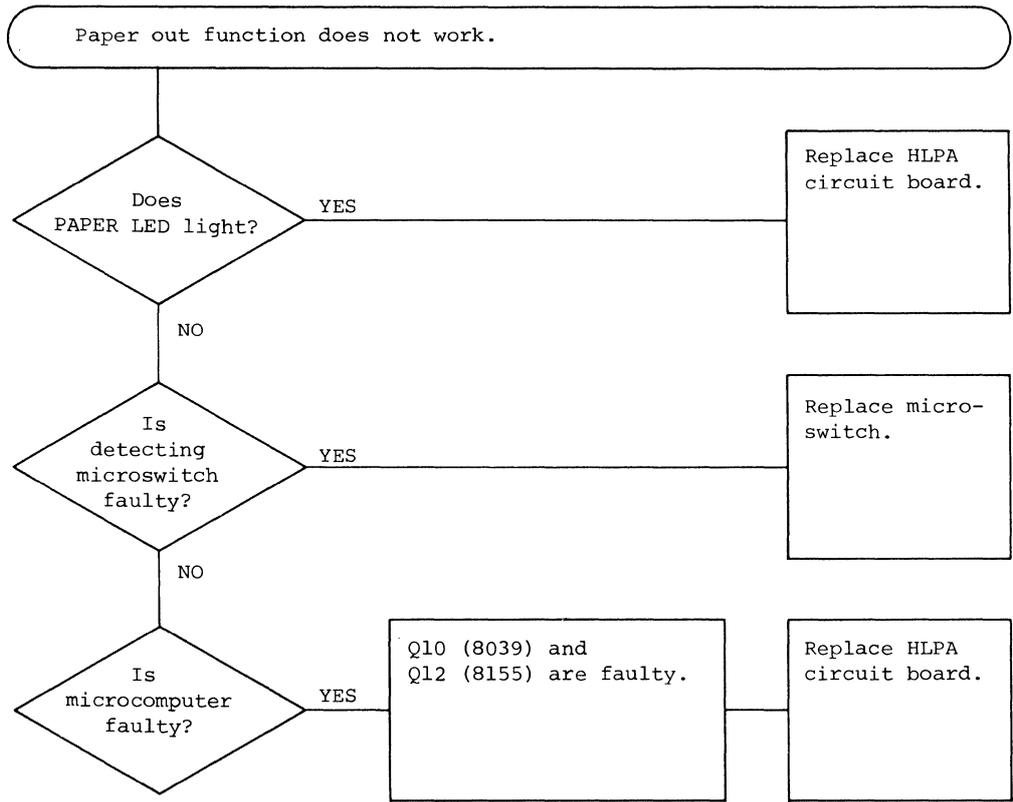
Item (8)



Item (9)

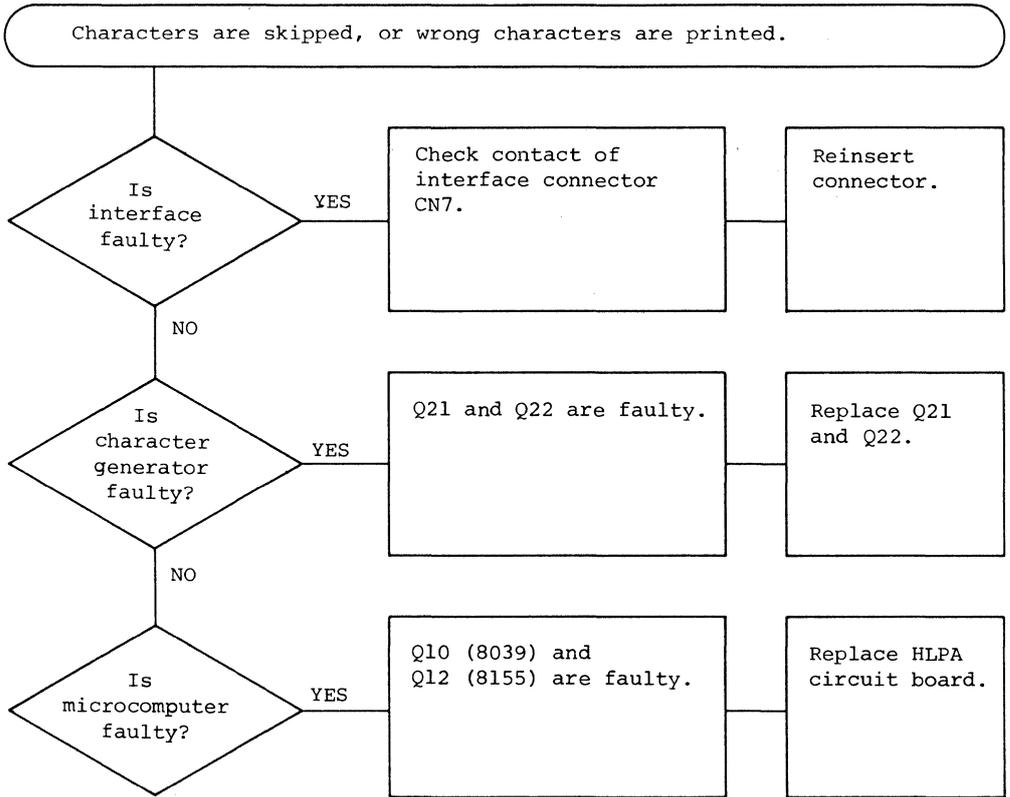


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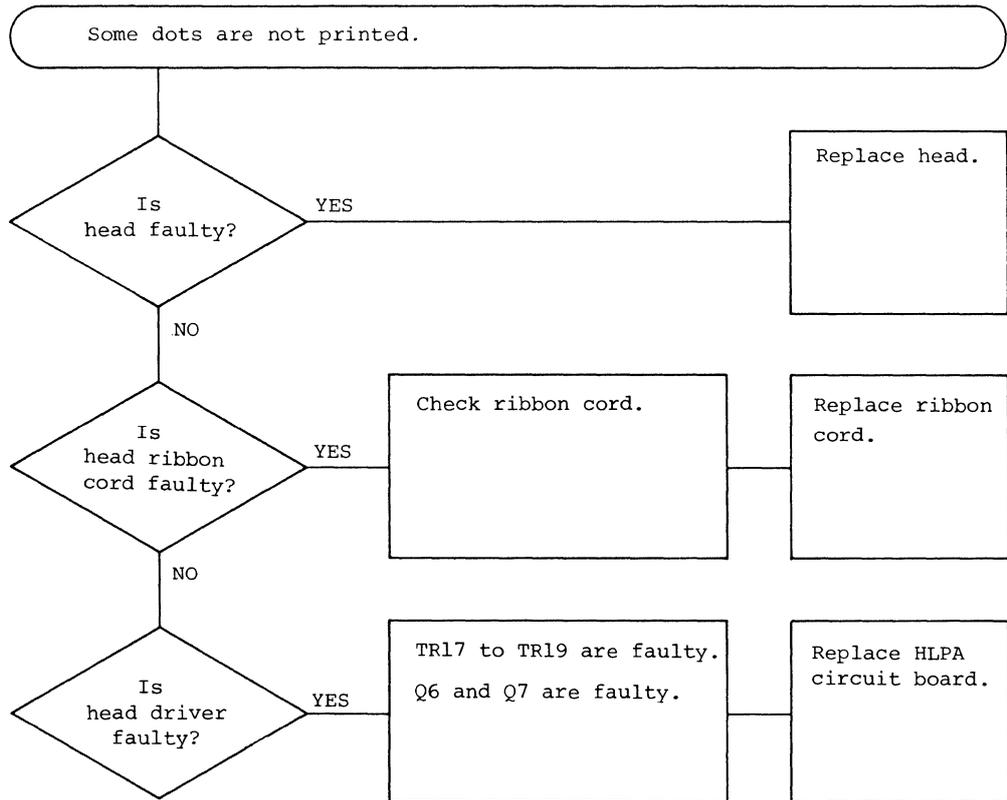




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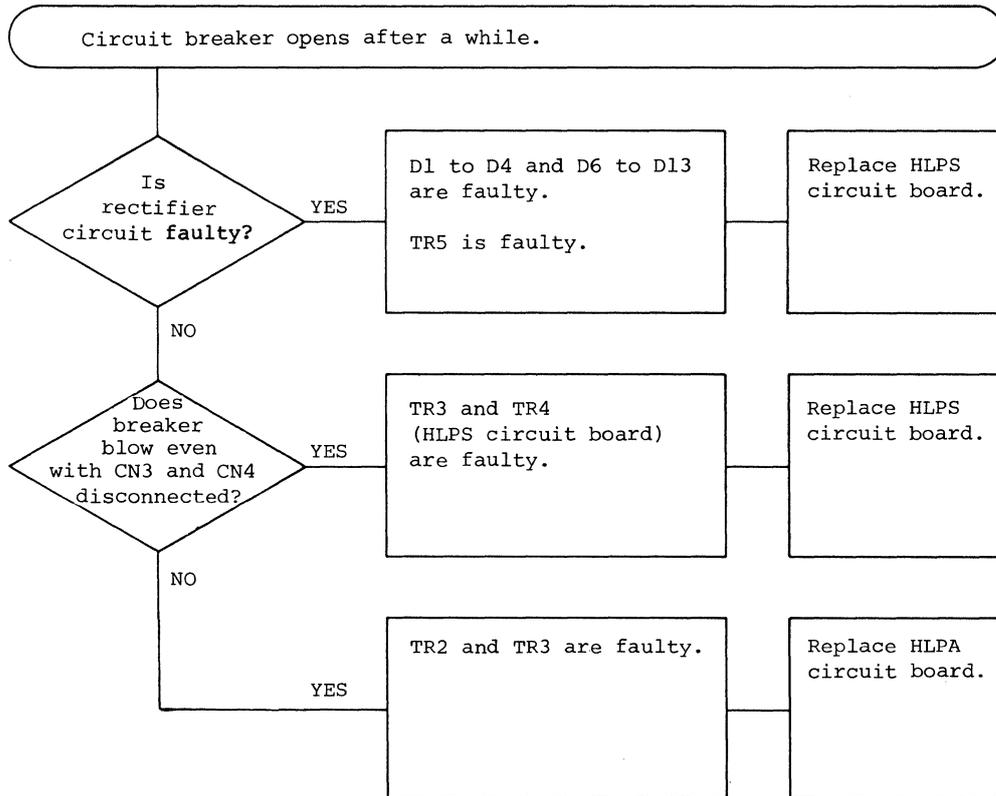


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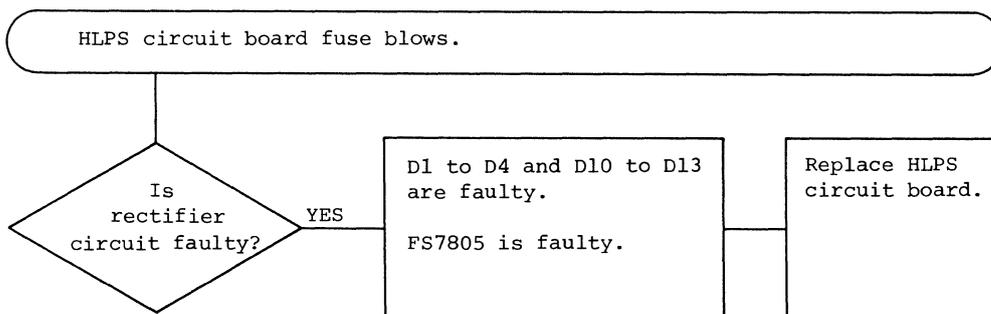




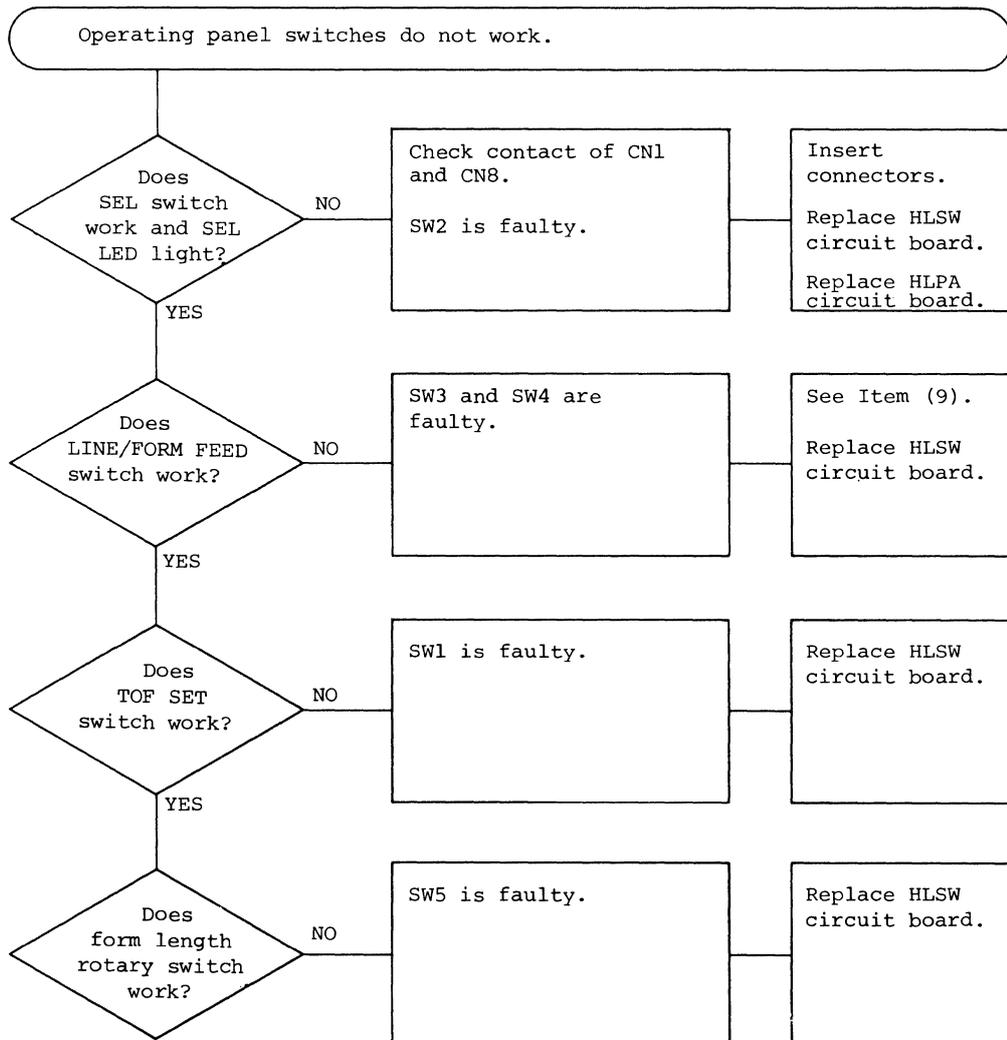
Item (13)



Item (14)

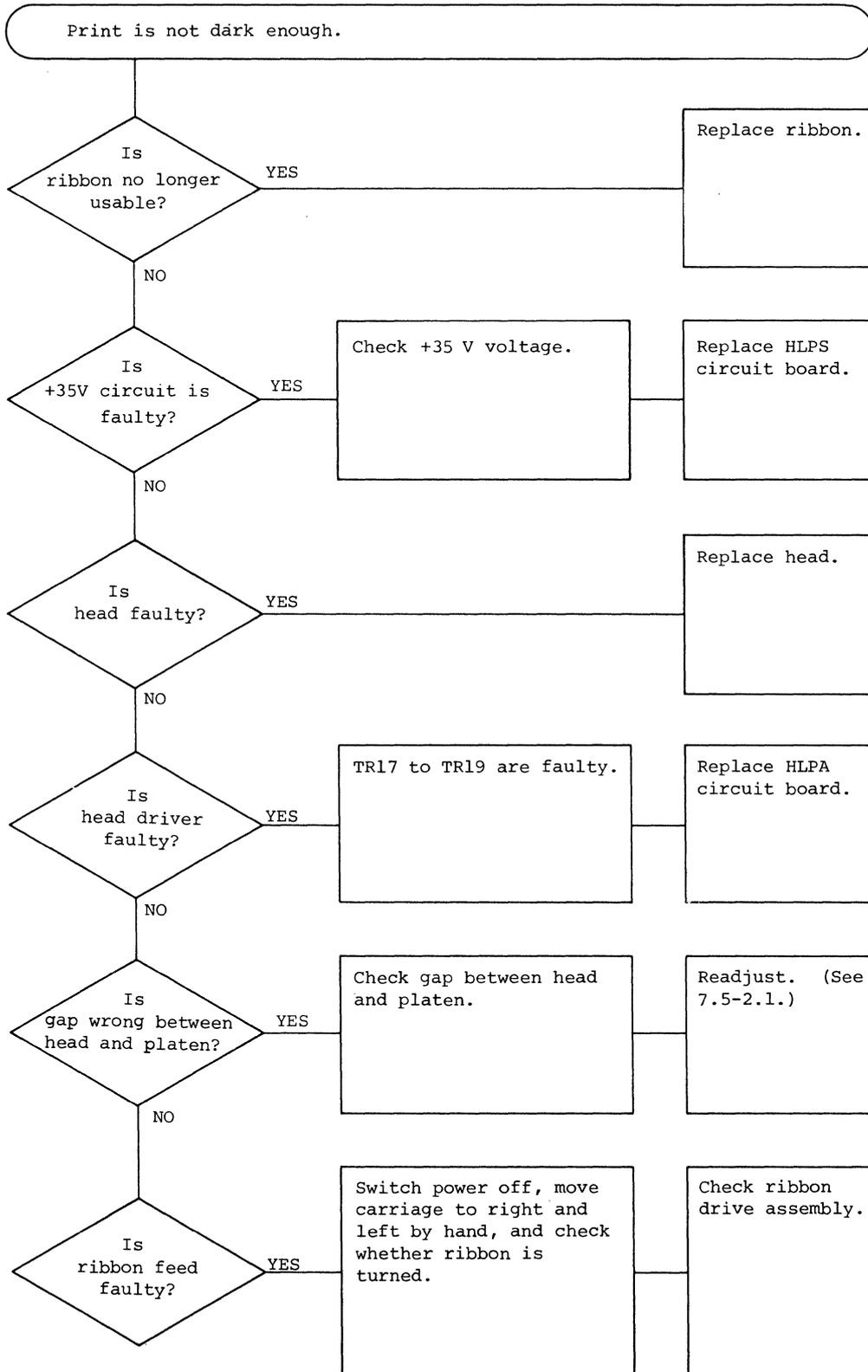


Item (15)





Item (16)



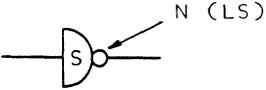
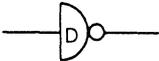
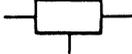
8. CIRCUIT DIAGRAMS

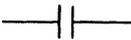
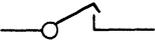
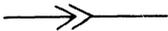
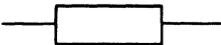
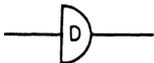
This section provides circuit diagrams of the Microline 84 in the following order:

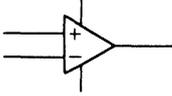
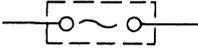
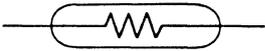
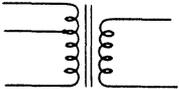
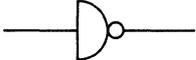
Figure 8-1 Table of Symbols

Figure 8-2 Schematic Diagram

Figure 8-1 Table of Symbols

Symbol	Mark	Description
	Q	SN 7405 N (SN 74 LS05) inverter (open collector)
	Q	SN 7406 inverter (open collector)
	OSC	Ceramic oscillator
	TR	Transistor
	TR	Thyristor
	D	Diode
	D	Zener diode
	D	Light-emitting diode
	TR	Regulator

Symbol	Mark	Description
	C	Capacitor
	C	Electrolytic capacitor
	R	Resistor
	SW	Switch
	S	Jumper wire or plug
	CN	Connector (terminal)
 (Reference)		Means a single part.
	FG	Frame ground
		Dot head (element)
	Q	SN74LS02 2NOR gate
	Q	SN7407 buffer (open collector)

Symbol	Mark	Description
	Q	339 Comparator
	BK	Circuit breaker
	THERMI- STOR	Thermistor
	SG	Signal ground
	TF	Transformer
		Home position detector
	F	Fuse
	Q	SN74LS04 Inverter

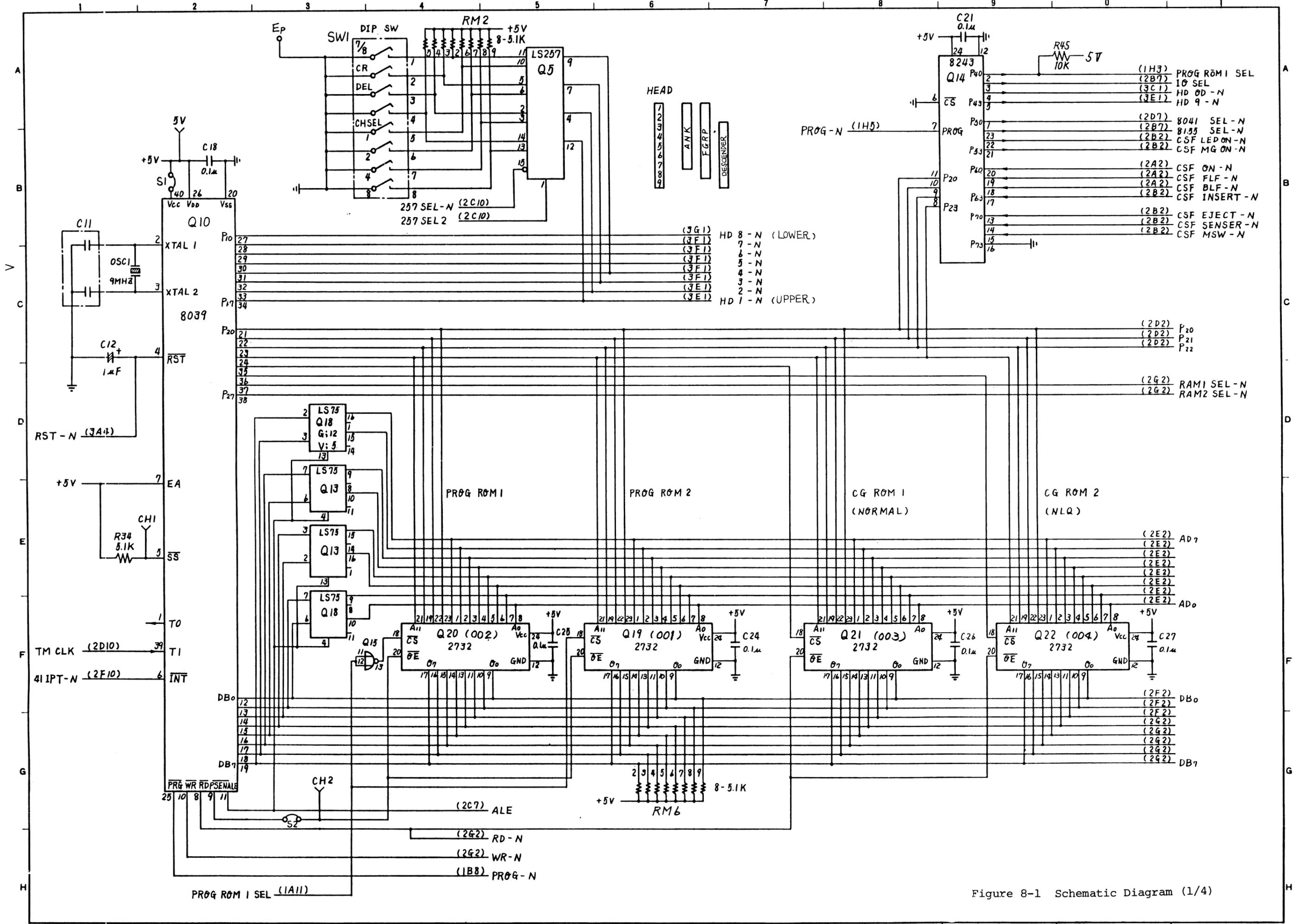


Figure 8-1 Schematic Diagram (1/4)

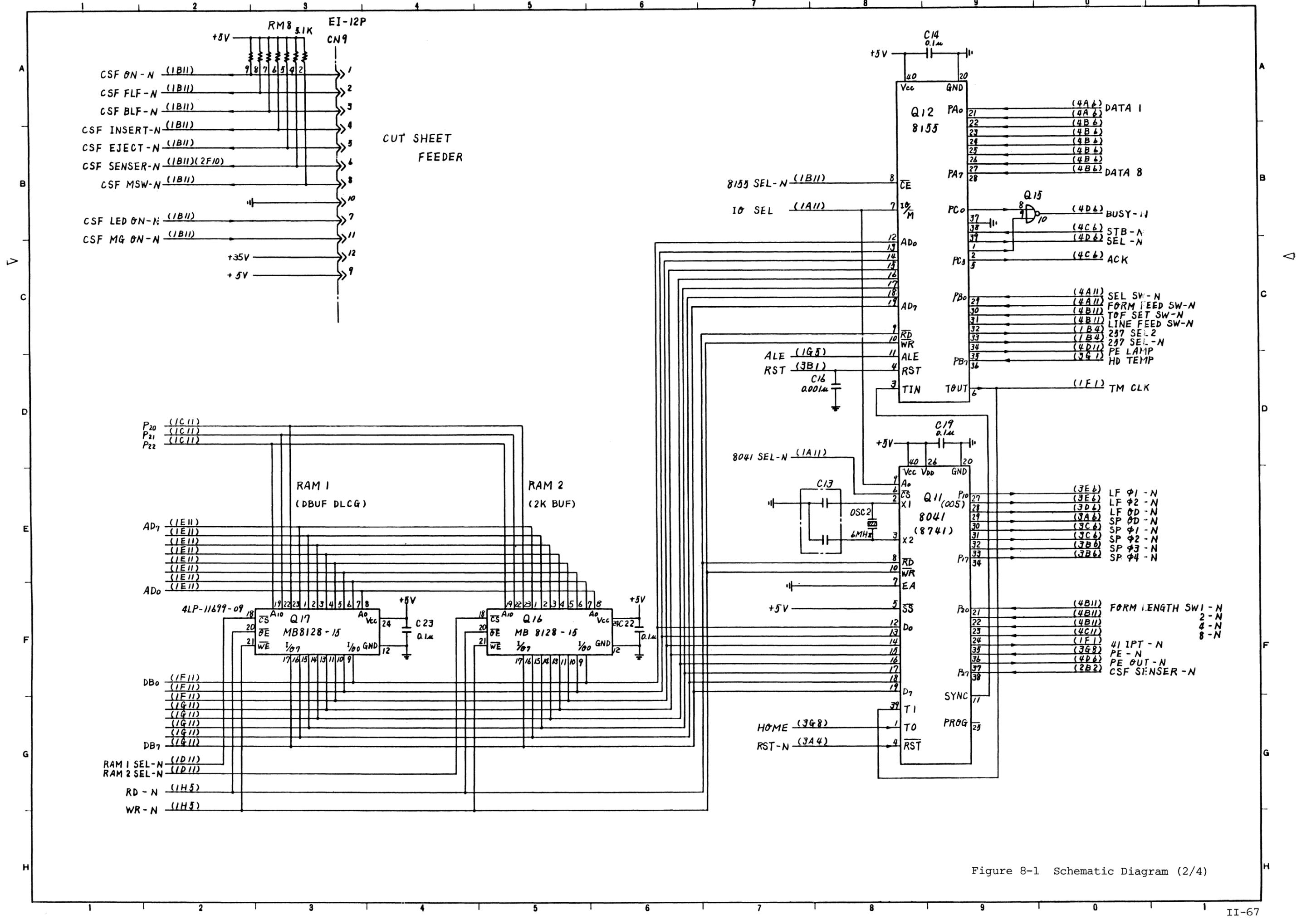


Figure 8-1 Schematic Diagram (2/4)

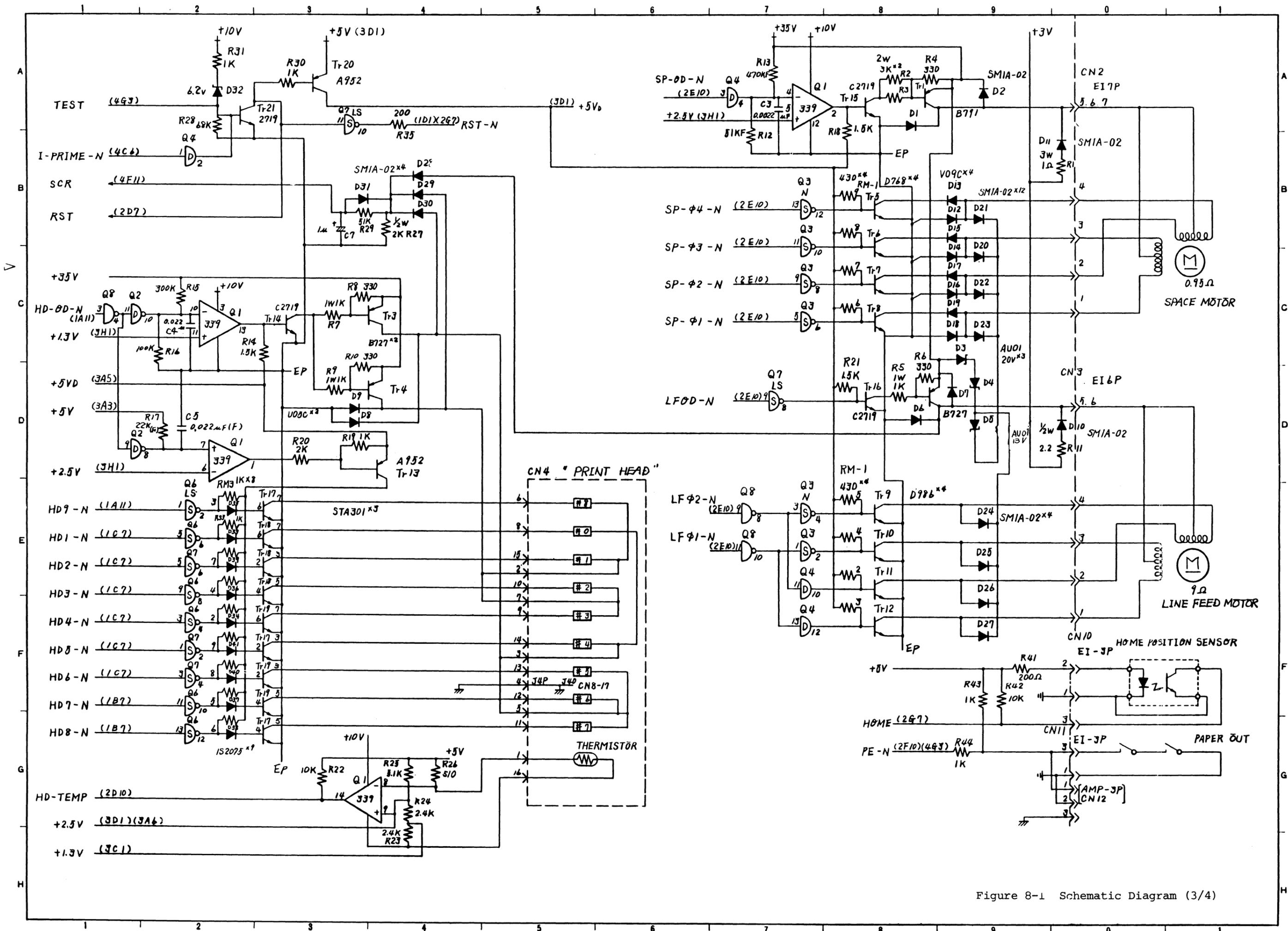


Figure 8-1 Schematic Diagram (3/4)

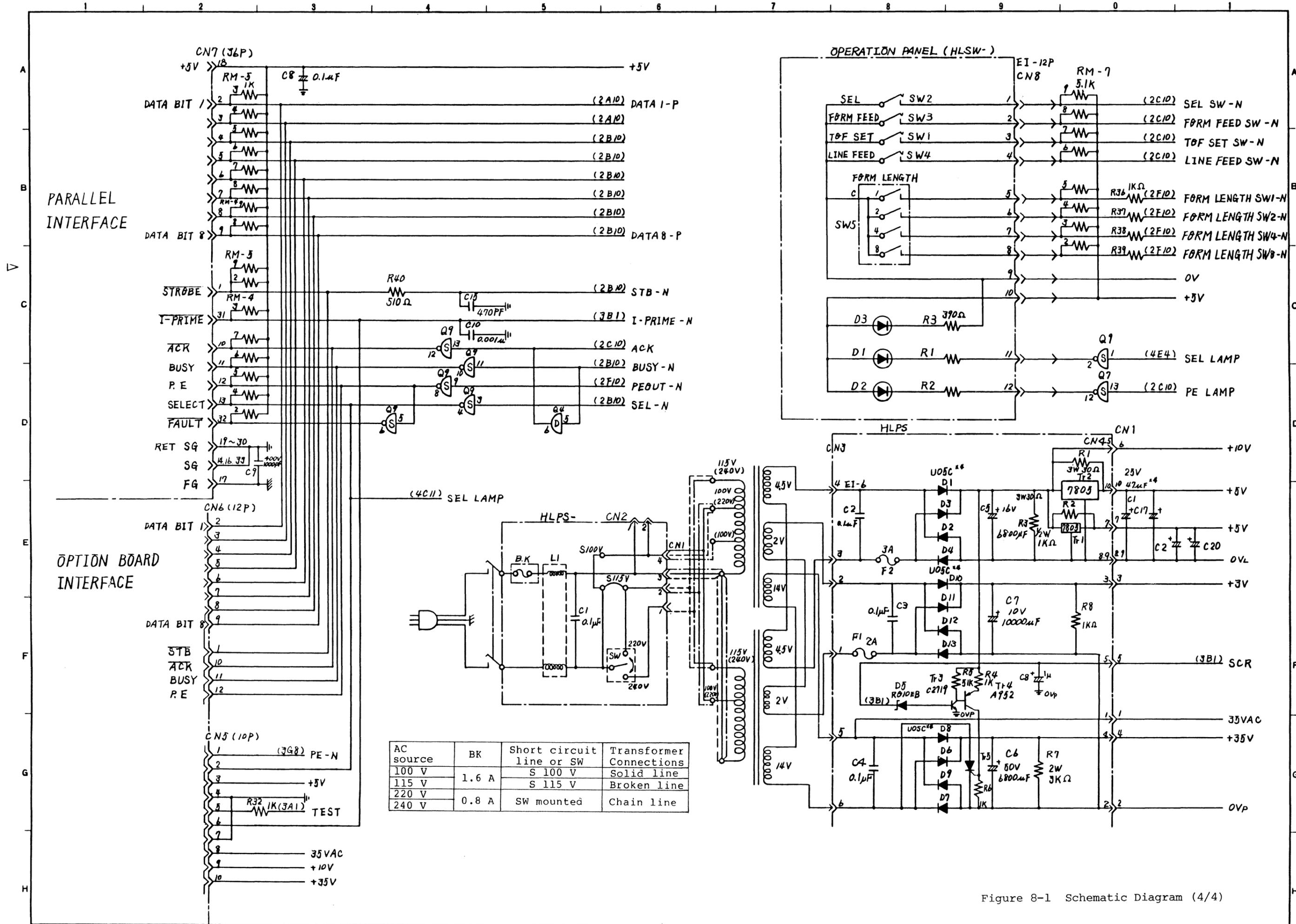


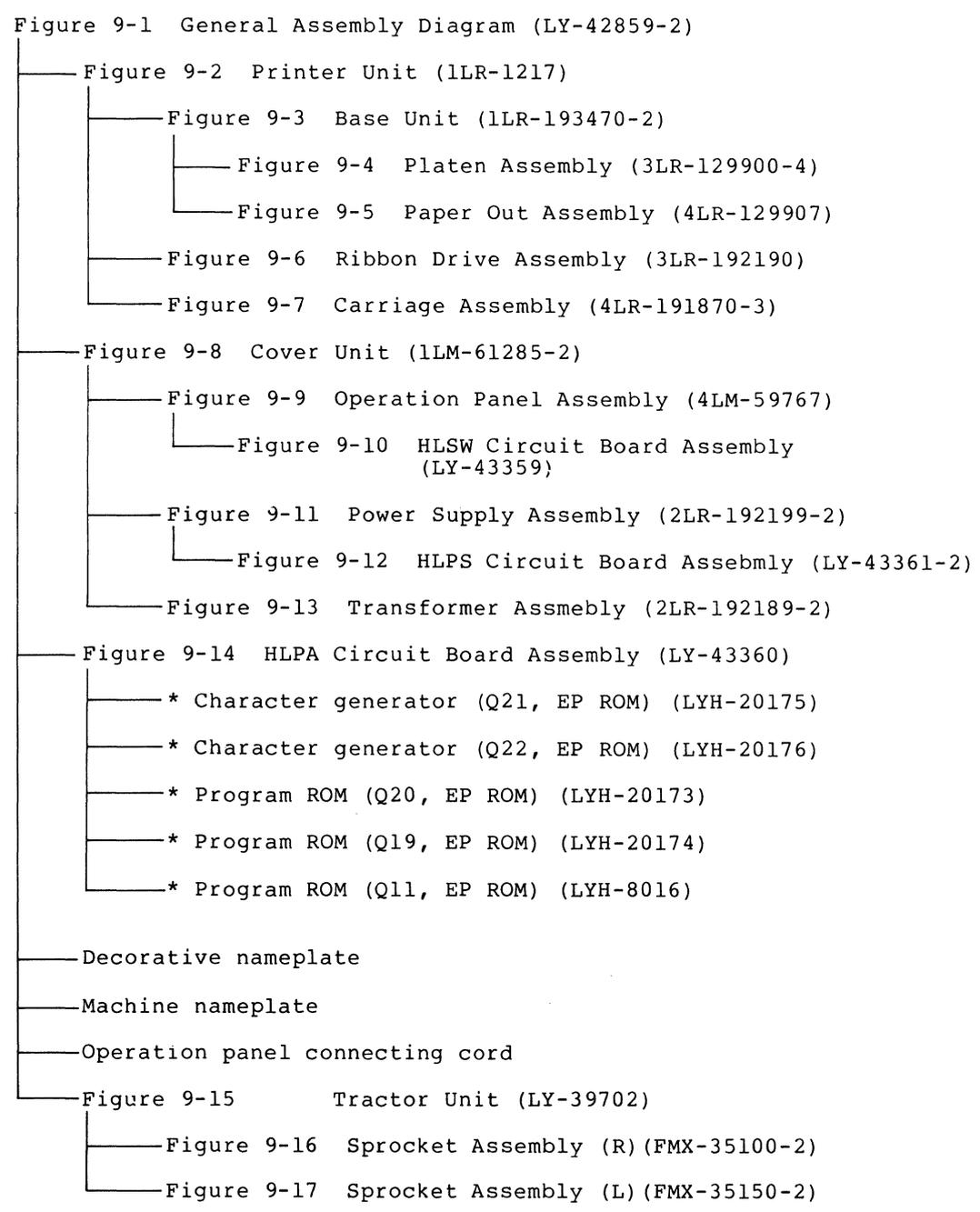
Figure 8-1 Schematic Diagram (4/4)



9. TABLE OF COMPONENT PARTS

(1) For USA

This section lists the main component parts of the MICROLINE 84 in the order of the following schematic diagrams:



Notes:

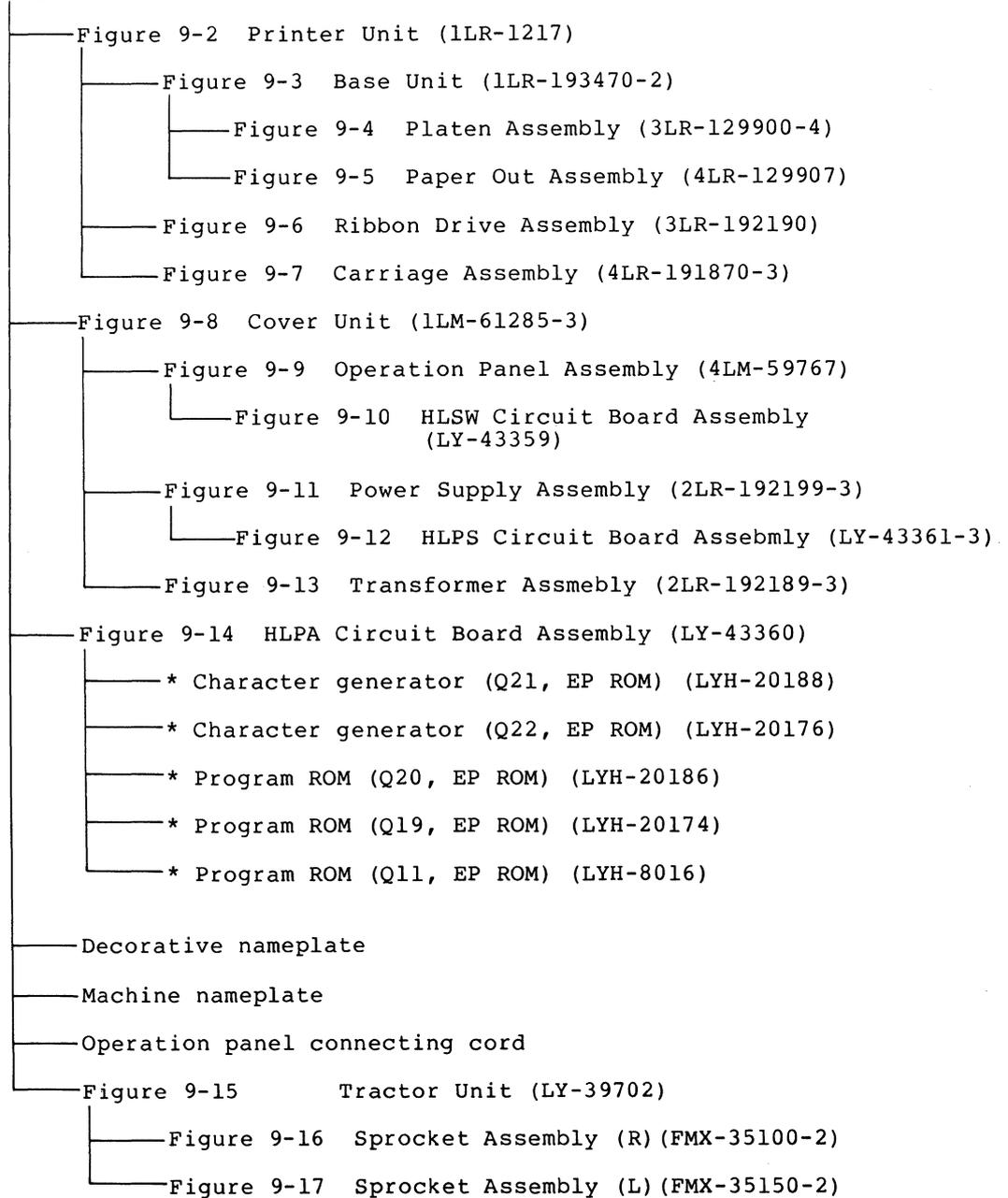
- 1) The parts marked with * are not included in the table of component parts. Any of them may be ordered by specifying parts numbers.
- 2) "83A" in the compatibility column indicates this unit is compatible with ML 83A.



(2) For Europe

This section lists the main component parts of the MICROLINE 84 in the order of the following schematic diagrams:

Figure 9-1 General Assembly Diagram (LY-42859-3)



Notes:

- 1) The parts marked with * are not included in the table of component parts. Any of them may be ordered by specifying parts numbers.
- 2) "83A" in the compatibility column indicates this unit is compatible with ML 83A.

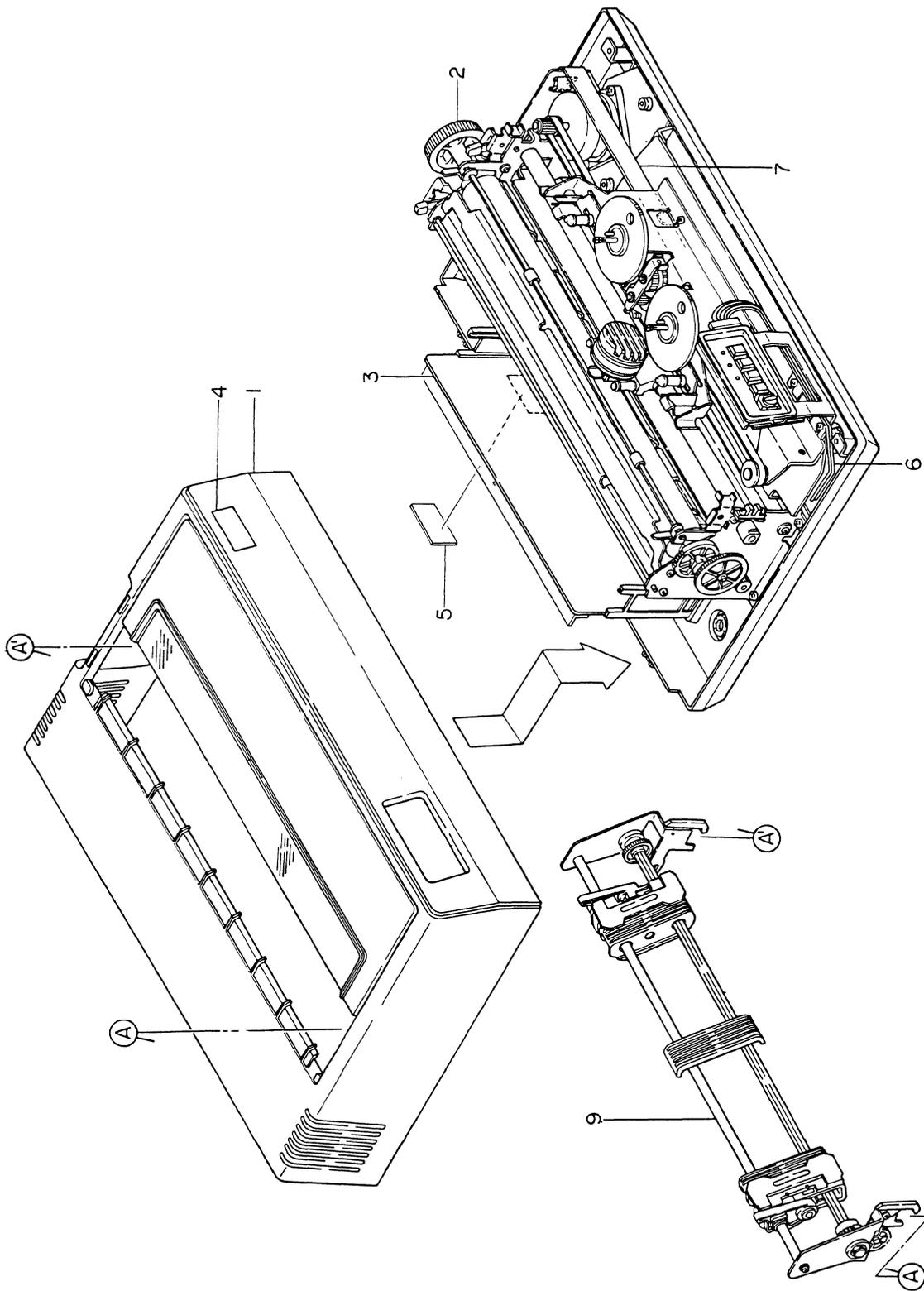


Figure 9-1 General Assembly Diagram (LY-42859-2)

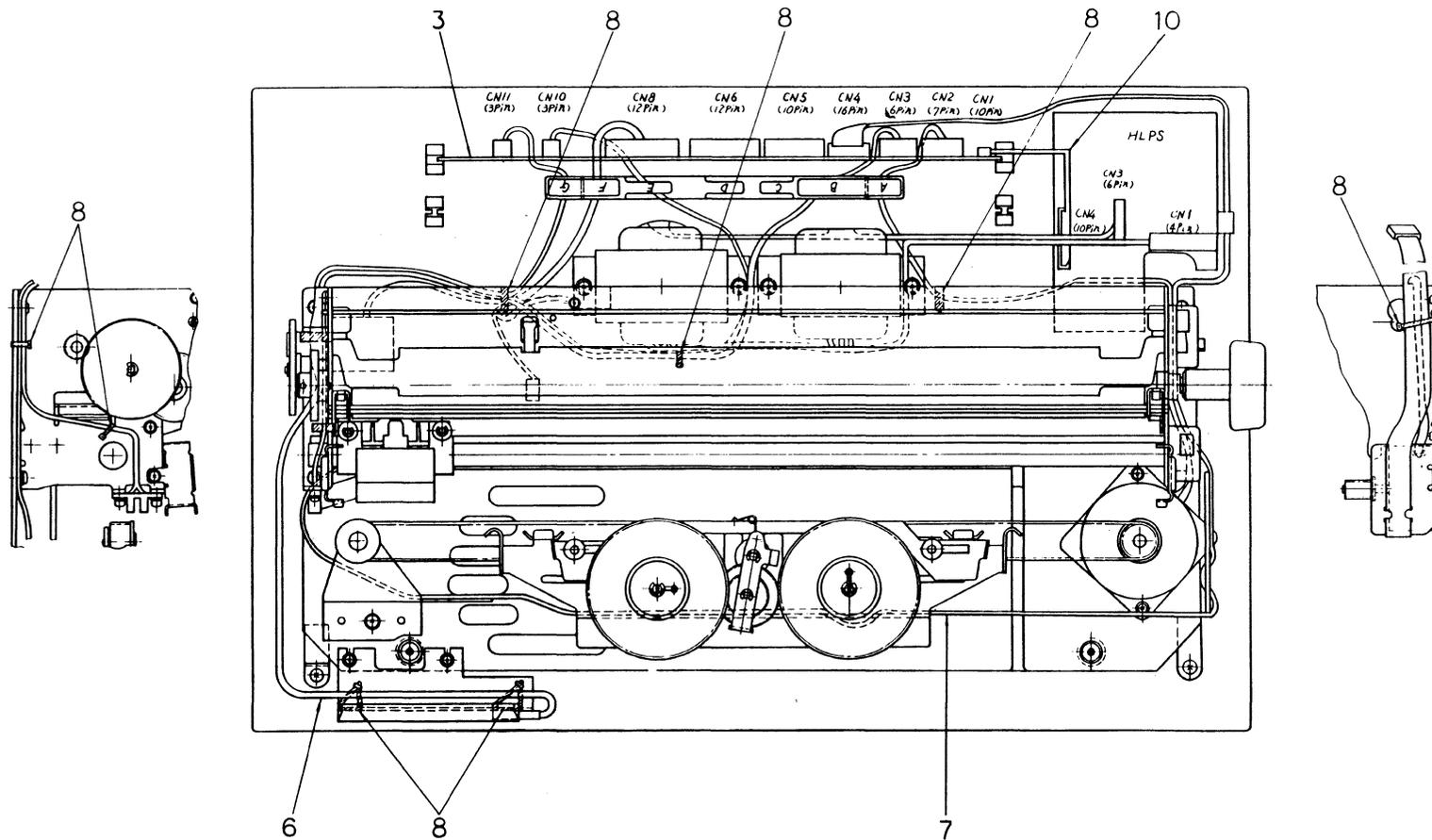


Figure 9-1 General Assembly Diagram (LY-42859-3)





Figure 9-1 General Assembly Diagram (LY-42859-2) (for USA for 115 V)
(3rd edition)

Item No.	Part No.	Description	Qty	Remarks	Compati- bility
1	1LM-61285-2	Cover unit	1		
2	1LR-1217	Printer unit	1		
3	LY-43360	HLP A circuit board	1		
4	4L-1738-3	Decorative nameplate	1		
5	4L-1628	Machine nameplate	1		
6	3LP-37257-4	Operation panel connection cord	1		
7	4LP-37587-2	Head connection cord	1		83A
8	4LP-6401-b1	Tie-wrap	8		83A
9	LY-39702	Tractor unit	1		83A
10	4LP-37202-10	DC power connection cord	1		
11	4L-1557	Caution for carriage tie down	1	} Components } for packing	83A
12	4LP-1457-6	Fastener (250 mm long, yellow)	1		83A



Figure 9-1 General Assembly Diagram (LY-42859-3) (for Europe (for 220/240 V))
(3rd edition)

Item No.	Part No.	Description	Qty	Remarks	Compati- bility
1	1LM-61285-3	Cover unit	1		
2	1LR-1217-1	Printer unit	1		
3	LY-43360	HLEPA circuit board	1		
4	4L-1738-3	Decorative nameplate	1		
5	4L-1629	Machine nameplate	1		
6	3LP-37257-4	Operation panel connection cord	1		
7	4LP-37587-2	Head connection cord	1		83A
8	4LP-6401-b1	Tie-wrap	8		83A
9	LY-39702	Tractor unit	1		83A
10	4LP-37202-10	DC power connection cord	1		
11	4L-1557	Caution for carriage tie down	1	} Components } for packing	83A
12	4LP-1457-6	Fastener (250 mm long, yellow)	1		83A

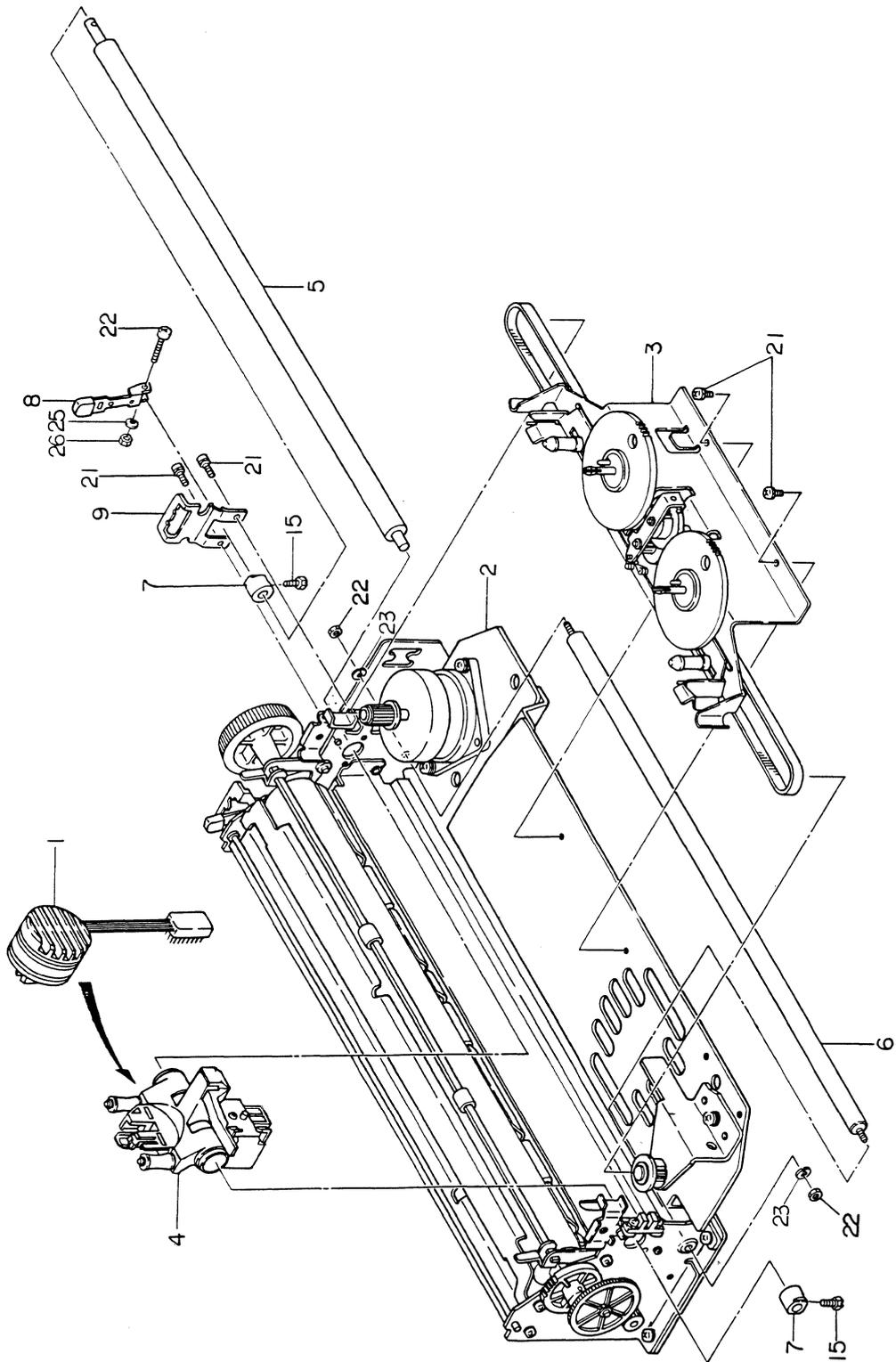


Figure 9-2 Printer Unit (LLR-1217)



Figure 9-2 Printer Unit (1LR-1217)

Item No.	Part No.	Description	Qty	Remarks	Compati- bility
1	3LR-190990-10	Print head assembly	1	With grey grounding wire	
2	1LR-193470-2	Base unit	1		
3	3LR-192190	Ribbon drive assembly	1		
4	4LR-191870-3	Carriage assembly	1		
5	5LR-132450	Carriage shaft (U)	1		83A
6	5LR-193455-1	Carriage shaft (L)	1		83A
7	5LR-132451	Eccentric collar	2		83A
8	5LR-132115	Adjusting lever (welded)	1		83A
9	5LR-132452	Adjusting bracket	1		83A
15	(-)B ₃ -6-HH	Bolt	2		
20	⊕ P ₃ -12-HH	Small pan-head screw	1		
21	⊕ P(SW) 3-6-HH	Small pan-head screw	4		
22	3N ₄ -HH	Locknut	2		
23	SW ₄ -HHC	Spring washer	2		
25	SW ₃ -HHC	Spring washer	1		
26	2N ₃ -HH	Nut	1		

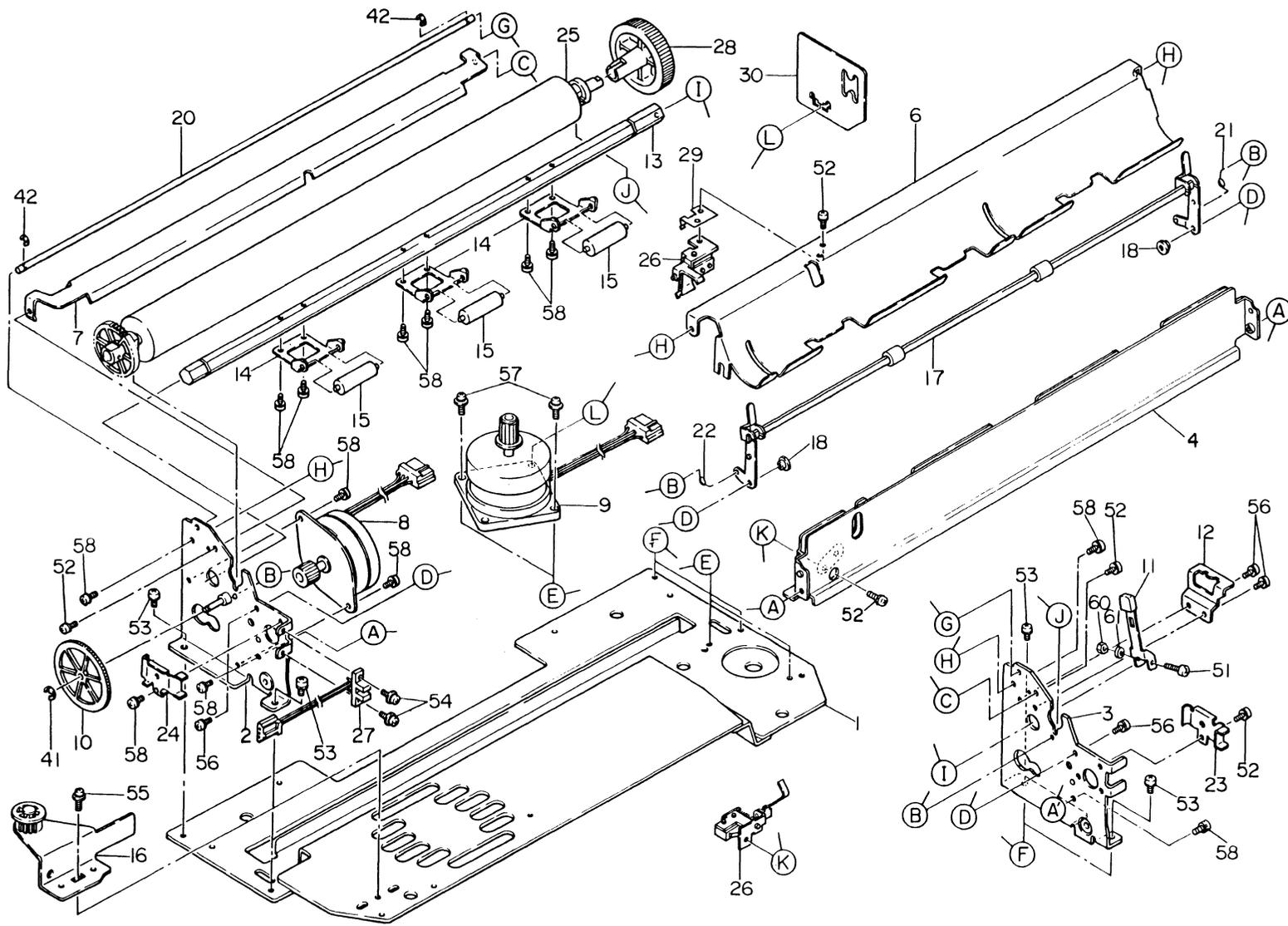


Figure 9-3 Base Unit (1LR-193470-2)





Figure 9-3 Base Unit (1LR-193470-2) (1/2)

Item No.	Part No.	Description	Qty	Remarks	Compati- bility
1	1LR-132461	Base-frame weld	1		83A
2	4LR-193450	Side frame (L) clinched	1		83A
3	3LR-193452	Side frame (R)	1		83A
4	4LR-193462-4	Paper guide (welded)	1		
6	3LR-132467	Paper chute	1		83A
7	4LR-132468	Paper separator	1		83A
8	5LR-132473-3	LF motor (pressure-fitted)	1		
9	4LR-191854-2	Space motor (pressure-fitted)	1		
10	5LR-132475	LF idle gear	1		83A
11	5LR-132480	Paper lock release lever (adhered)	1		83A
12	5LR-132482	Paper lock release lever bracket	1		83A
13	4LR-132483	Roller support shaft	1		83A
14	4LR-132484	Feed roller spring	3		83A
15	5LR-132485	Friction roller	3		83A
16	4LR-132488-2	Idle pulley bracket	1		83A
17	5LR-192206	Column indicator assembly	1		
18	5LR-132494	Shoulder nut	2		83A
20	5LR-129808-2	Paper-tear-off bar shaft	1		83A
21	5LR-192198-1	Detent spring (R)	1		
22	5LR-192198-2	Detent spring (L)	1		
23	5LR-132222	Ribbon guide (R)	1		83A
24	5LR-132229	Ribbon guide (L)	1		83A
25	3LR-129900-4	Platen assembly	1		83A
26	4LR-129907	Paper out assembly	1		83A
27	4LR-129847-3	Home sensor assembly	1		83A
28	4LR-132233	Platen knob	1		83A
29	5LR-194124	Detent spring	1		
30	4LR-191875	Cable guide	1		



Figure 9-3 Base Unit (1LR-193470-2) (2/2)

Item No.	Part No.	Description	Qty	Remarks	Compati- bility
41	5KH-12050	E-snap ring (E3)	1		
42	5KX-9057	E-snap ring (E2)	2		
51	⊕ P ₃ -14-HH	Small pan-head screw	1		
52	⊕ P (SW) 3-6-HH	Small pan-head screw	5		
53	⊕ P (SW) 4-6-HH	Small pan-head screw	4		
54	⊕ P (SW+W) 3-6-HH	Small pan-head screw	2		
55	⊕ P (SW+2W) 4-8-HH	Small pan-head screw	1		
56	⊕ P (SW) 3-5-HH	Small pan-head screw	4		
57	⊕ P (SW+2W) 4-10-HH	Small pan-head screw	2		
58	⊕ P (SW) 3-8-HH	Small pan-head screw	13		
60	2N ₃ -HH	Nut	1		
61	SW ₃ -HHC	Spring washer	1		

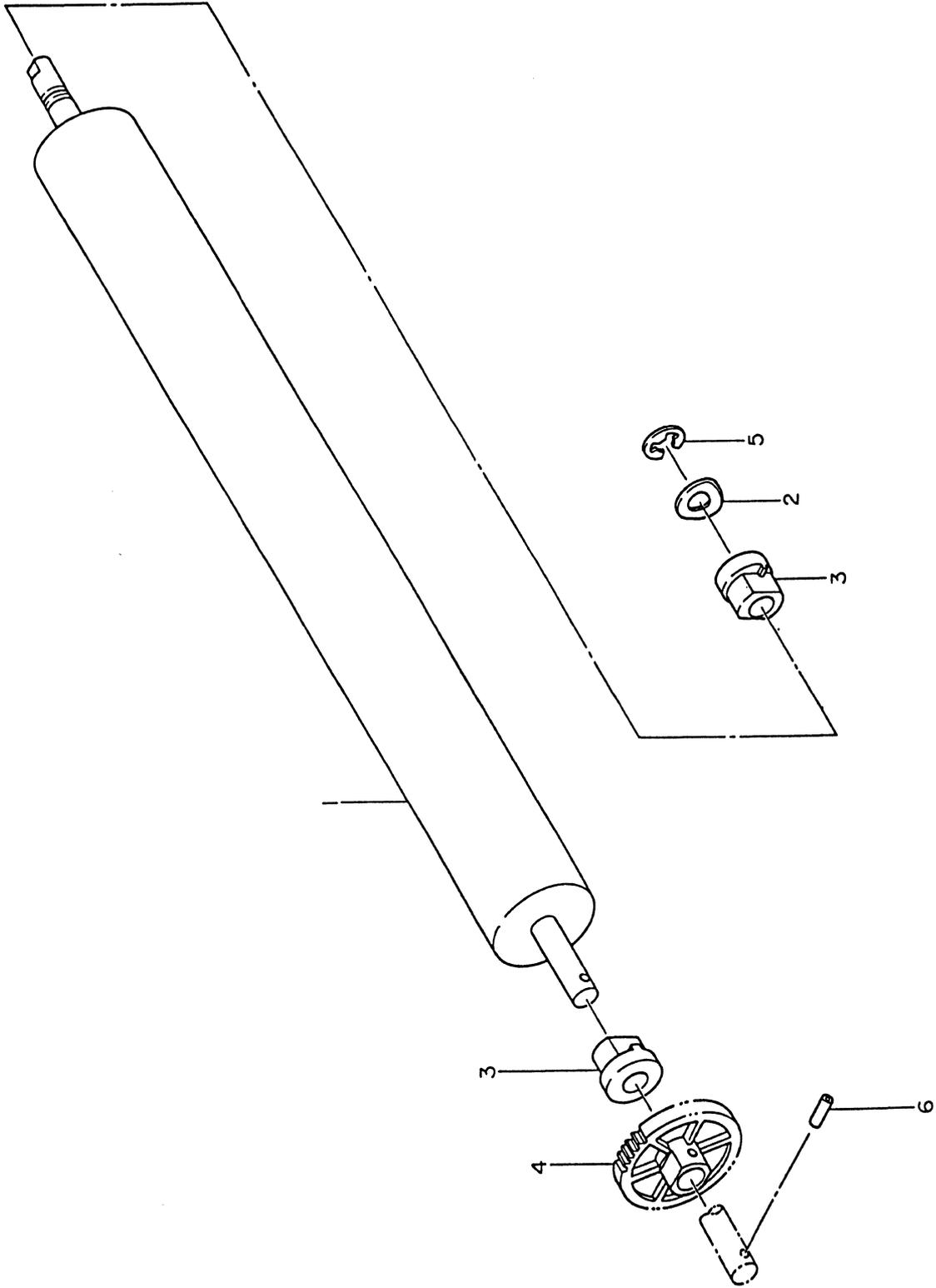


Figure 9-4 Platen Assembly (3LR-129900-4)



Figure 9-4 Platen Assembly (3LR-129900-4)

Item No.	Part No.	Description	Qty	Remarks	Compati- bility
1	4LR-129898-2	Plain platen, 16 inches	1	Plain 16	83A
2	5LR-129906	Wave washer	1	inches	83A
3	4LR-129855	Platen bearing	2		83A
4	4LR-129859	Platen gear	1		83A
5	5KX-9059	E-snap ring (E6)	1		
6	SPP ₃ -12-SUS	Spring pin	1		83A

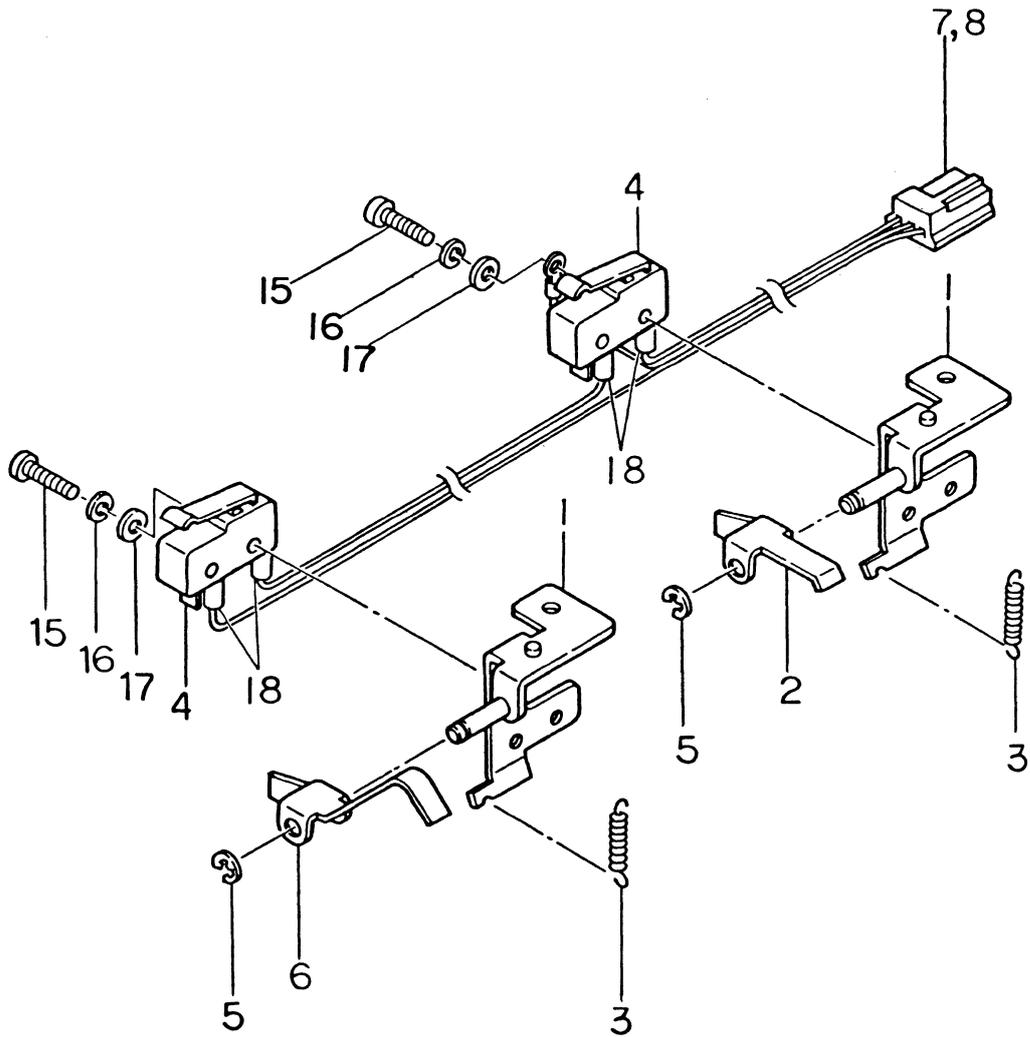


Figure 9-5 Paper Out Assembly (4LR-129907)

Figure 9-5 Paper Out Assembly (4LR-129907)

Item No.	Part No.	Description	Qty	Remarks	Compati- bility
1	5LR-129863	Microswitch bracket (clinched)	2		83A
2	5LR-129870	Microswitch actuator	1		83A
3	5LR-129844	Spring	2		83A
4	4LP-3378-4	Microswitch	2		83A
5	5KX-9057	E-snap ring	2		
6	5LR-132496	Paper out lever	1		83A
7	J4LP-5525-3	3P receptacle housing	1		83A
8	J4LP-5526	Receptacle contact	2		83A
	LY-4658-3 (Black)	17/0.16 heat-resisting PVC wire	1	270 mm long	
	LY-4658-3 (Blue)	17/0.16 heat-resisting PVC wire	1	270 mm long	
	LY-4658-3 (Blue)	17/0.16 heat-resisting PVC wire	1	200 mm long	
15	⊕ P2.3-10-HH	Small pan-head screw	2		
16	SW 2.3-HHC	Spring washer	2		
17	W 2.3-HH	Washer	2		
18		Insulation SUMI-tube F	4	∅3x0.25x10	

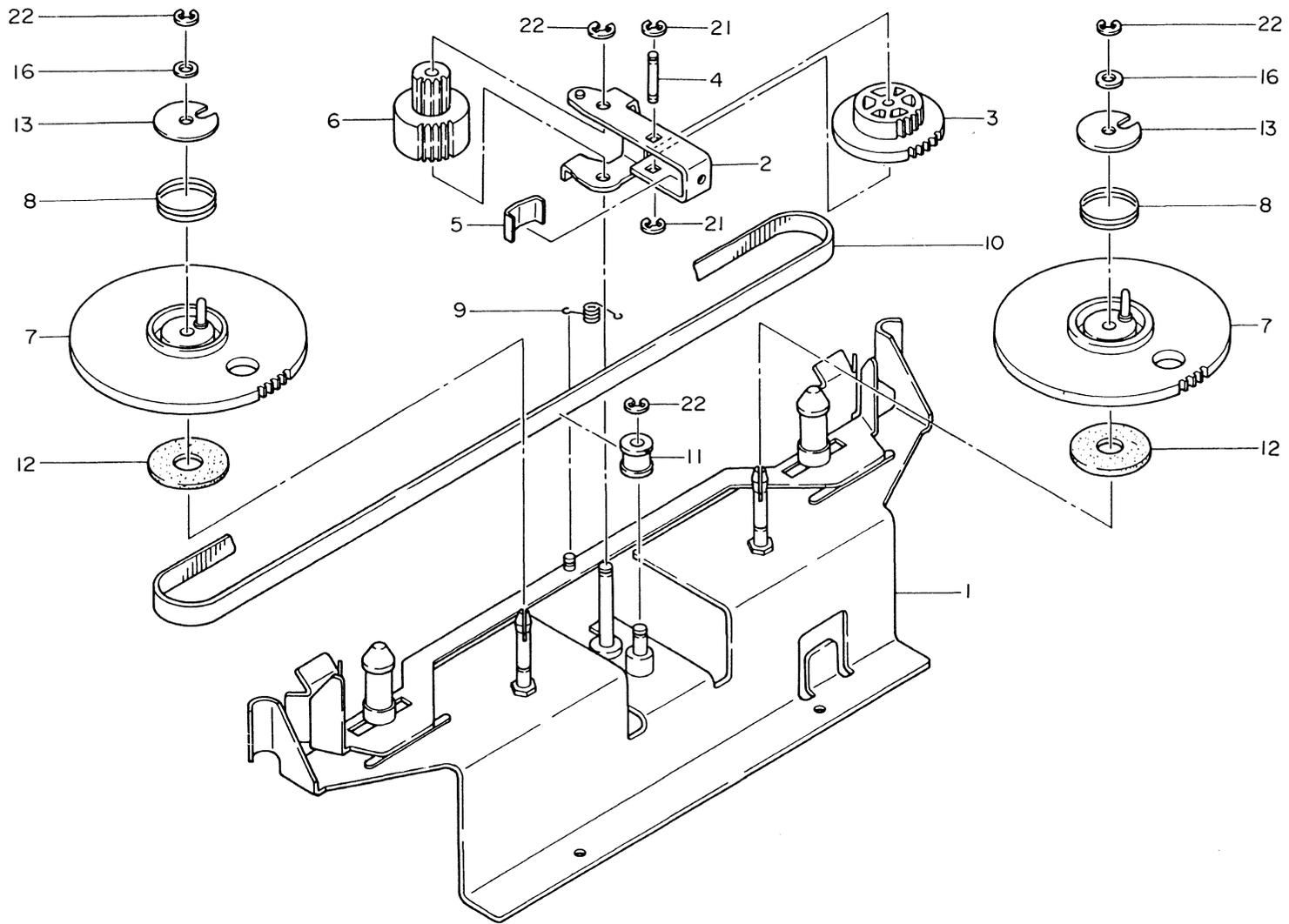


Figure 9-6 Ribbon Drive Assembly (3LR-192190)





Figure 9-6 Ribbon Drive Assembly (3LR-192190)

Item No.	Part No.	Description	Qty	Remarks	Compati- bility
1	3LR-192191	Ribbon bracket (clinched)	1		
2	5LR-192194	Ribbon change lever (clinched)	1		
3	4LR-129827	Ribbon gear	1		83A
4	5LR-93429-3	Snap shaft	1		
5	5LR-129876	Friction spring	1		83A
6	5LR-192197	Ribbon drive gear (pressure fitted)	1		
7	5LR-192196	Ribbon spool gear (clinched)	2		
8	5LR-191325	Compression spring	2		
9	5LR-129841	Detent spring	1		83A
10	4LP-1420-5	Synchro belt	1		83A
11	5LR-191859	Pressure roller	1		83A
12	5LR-129842-2	Friction felt	2		
13	5LR-129843	Special washer	2		83A
16	5LR-132516	Plastic washer	2		83A
21	5KX-9057	E-snap ring (E ₂)	2		
22	5KH-12050	E-snap ring (E ₃)	4		

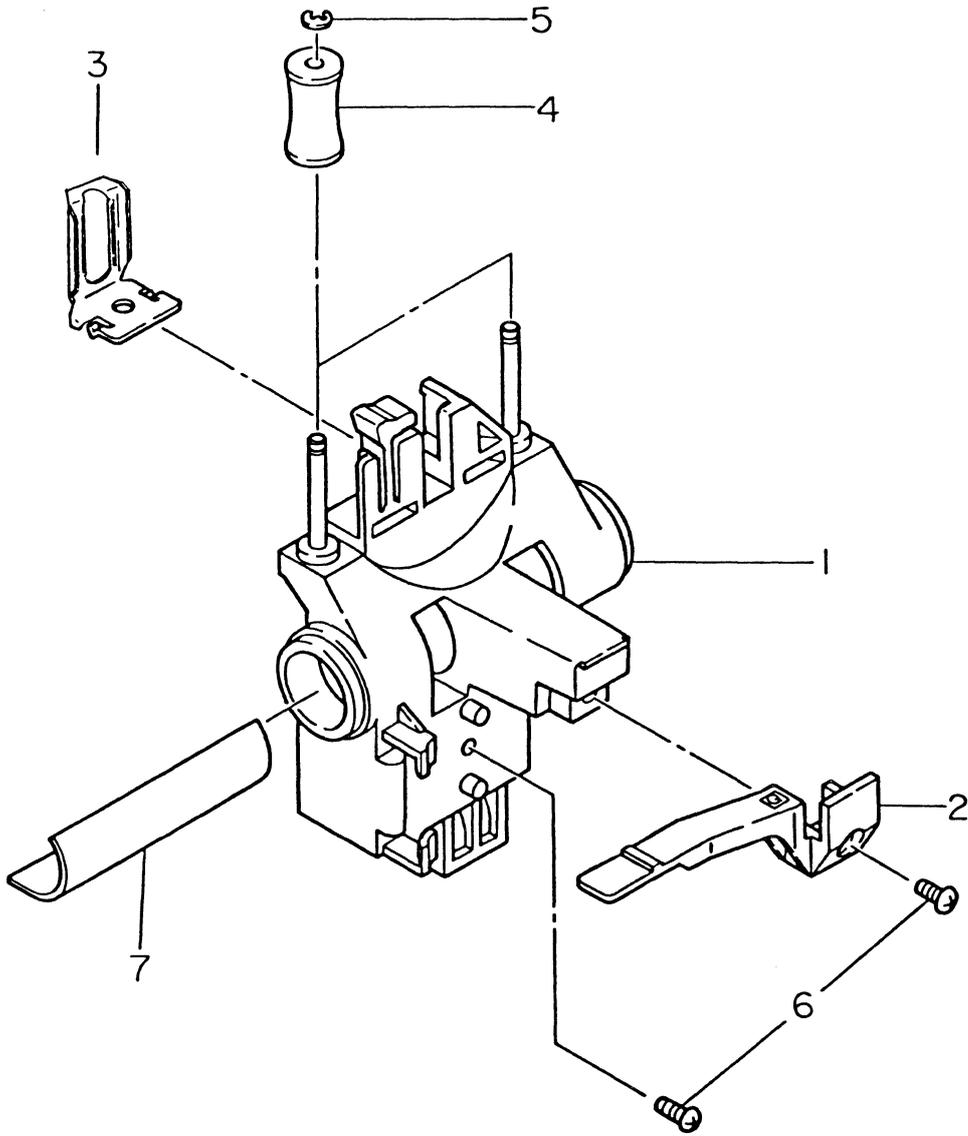


Figure 9-7 Carriage Assembly (4LR-191870-3)

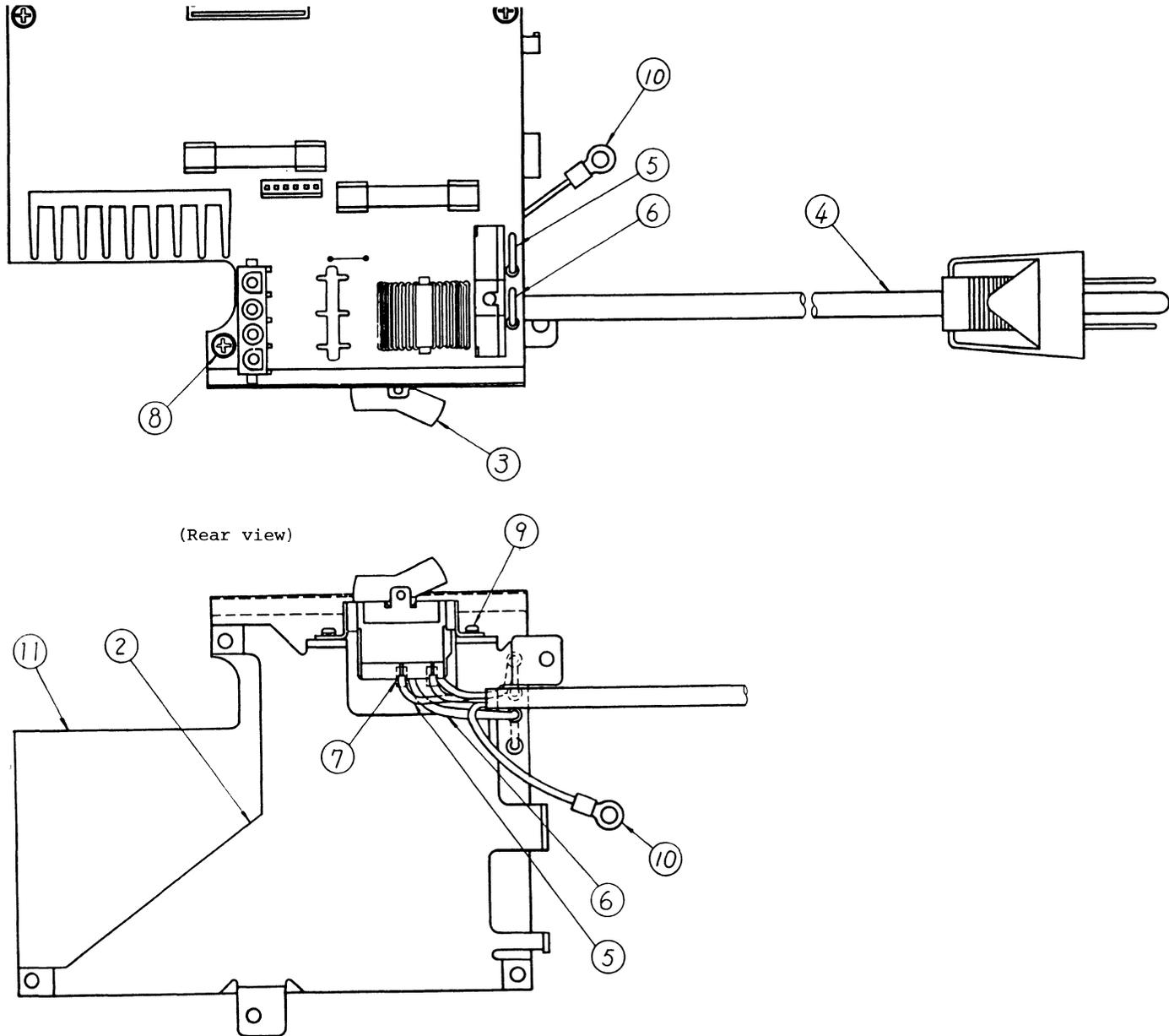


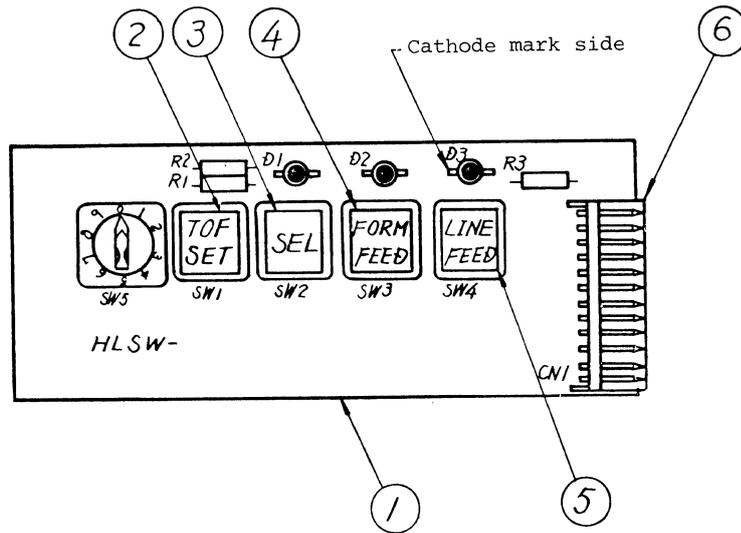
Figure 9-11 Power Supply Assembly (2LR-192199-2) (for USA)





Figure 9-10 HLSW Circuit Board Assembly (LY-43359)

Symbol	Part No.	Description	Qty	Remarks
①	3LP-16742	HLSW circuit board	1	
D1 to D3	D4LP-44373	Light-emitting diode	3	
R1 to R3	R4LP-8446-391	Resistor 1/4 W 390 ohms	3	
SW5	4LP-3424	Rotary switch	1	
SW1 to 4	3LK-50700-2	Key switch	4	
②	4L-1370-49-A2	Nameplate "TOF SET"	1	
③	4L-1370-50-A2	Nameplate "SEL"	1	
④	4L-1370-51-A2	Nameplate "FORM FEED"	1	
⑤	4L-1370-52-A2	Nameplate "LINE FEED"	1	
⑥	J4LP-5524-12	EI-Connector 12P	1	



Note 1) Mount LED (D1 to D3) as shown below.

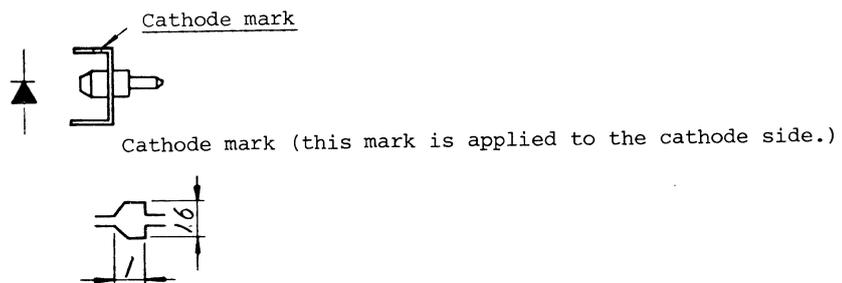


Figure 9-10 HLSW Circuit Board Assembly (LY-43359)



Figure 9-9 Operation Panel Assembly (4LM-59767)

Item No.	Part No.	Description	Qty	Remarks	Compati- bility
1	4LM-59768	Circuit board bracket	1		
2	5LM-59693	Display panel	1		83A
3	LY-43359	HLSW circuit board	1		
4	4LR-194100	Insulator	1		
10	⊕ P(SW+W)3-6-HH	Small pan-head screw	2		

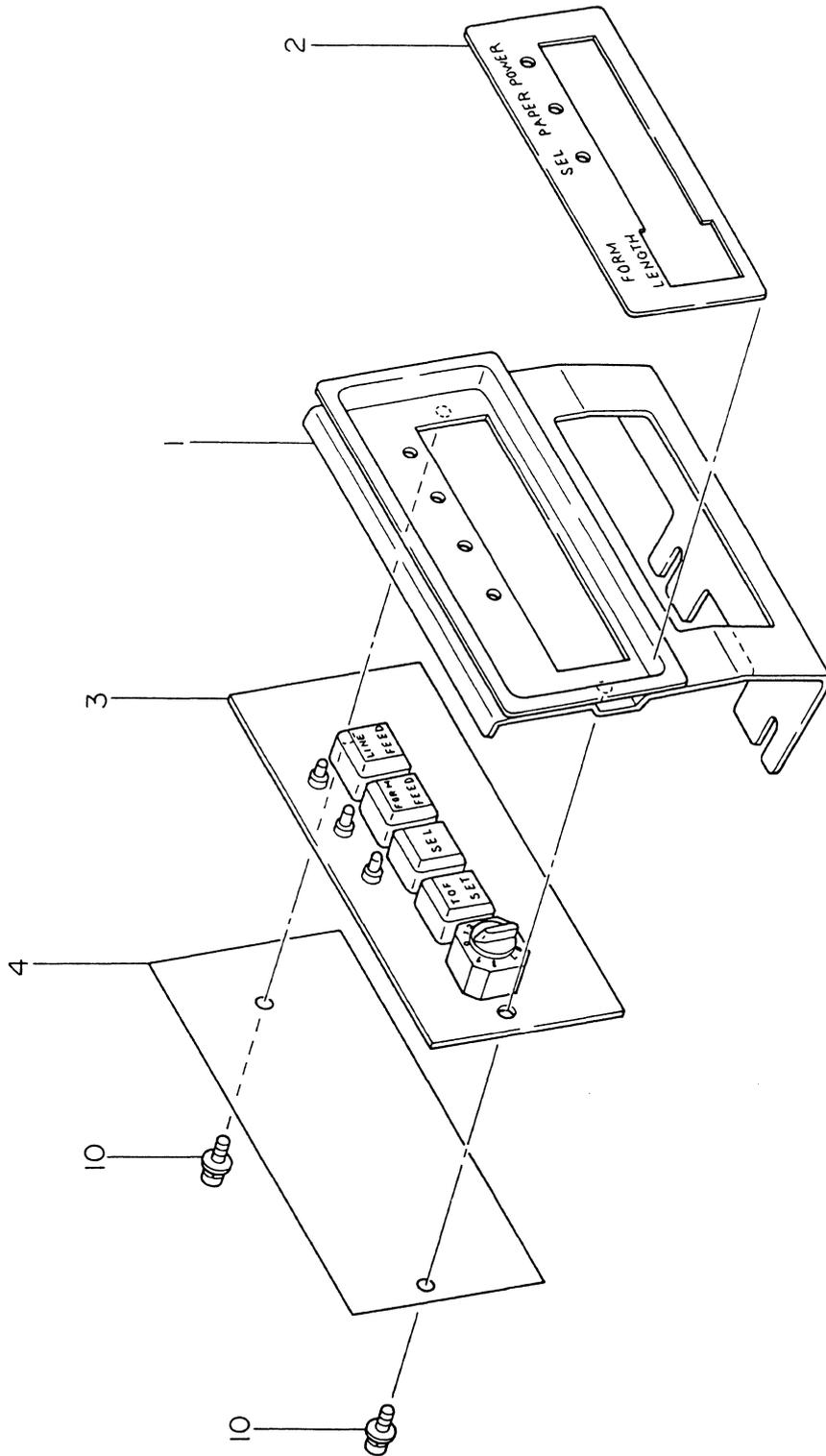


Figure 9-9 Operation Panel Assembly (4LM-59767)



Figure 9-8 Cover Unit (1LM-61285-3) (for Europe (for 220/240 V))
(2nd edition)

Item No.	Part No.	Description	Qty	Remarks	Compati- bility
1	1LM-60106	Upper cover	1		83A
2	1LM-61286	Lower cover	1		
3	2LM-60112	Access cover	1		83A
4	4LM-59767	Operation panel assembly	1		
5	5LM-59696	Blank plate	1		83A
6	4LM-60115	Circuit board support	2		83A
7	2LR-192199-3	Power supply assembly	1		
8	3LM-60116	Cord clamp	1		83A
9	5LM-61519	Ground board	2		83A
11	5LP-6463-C-5	Cord bushing	1		83A
12	4LP-6726-2	Quite-tight	6		83A
13	5LP-1416	Rubber foot	4		83A
15	5LM-61287	Blank plate	1		
18	5L-1667	Switch indicating board	1		
21	2LR-192189-3	Transformer assembly	1		
24	(-) B4-6-HH	Bolt	1		
25	⊕ P (SW) 3-5-HH	Small pan-head screw	3		
27	⊕ P (SW+W) 3-8-HH	Small pan-head screw	6		
28	⊕ P (SW+2W) 3-6-HH	Small pan-head screw	2		
29	⊕ P (SW+2W) 4-18-HH	Small pan-head screw	6		
30	⊕ P (SW+W) 4-12-HH	Small pan-head screw	2		
31	⊕ P (SW+2W) 4-8-HH	Small pan-head screw	4		
32	⊕ P (W) 3-5-HH	Small pan-head screw	2		
34	SW4-HHC	Spring washer	1		
36	2W4-HH	Washer	2		

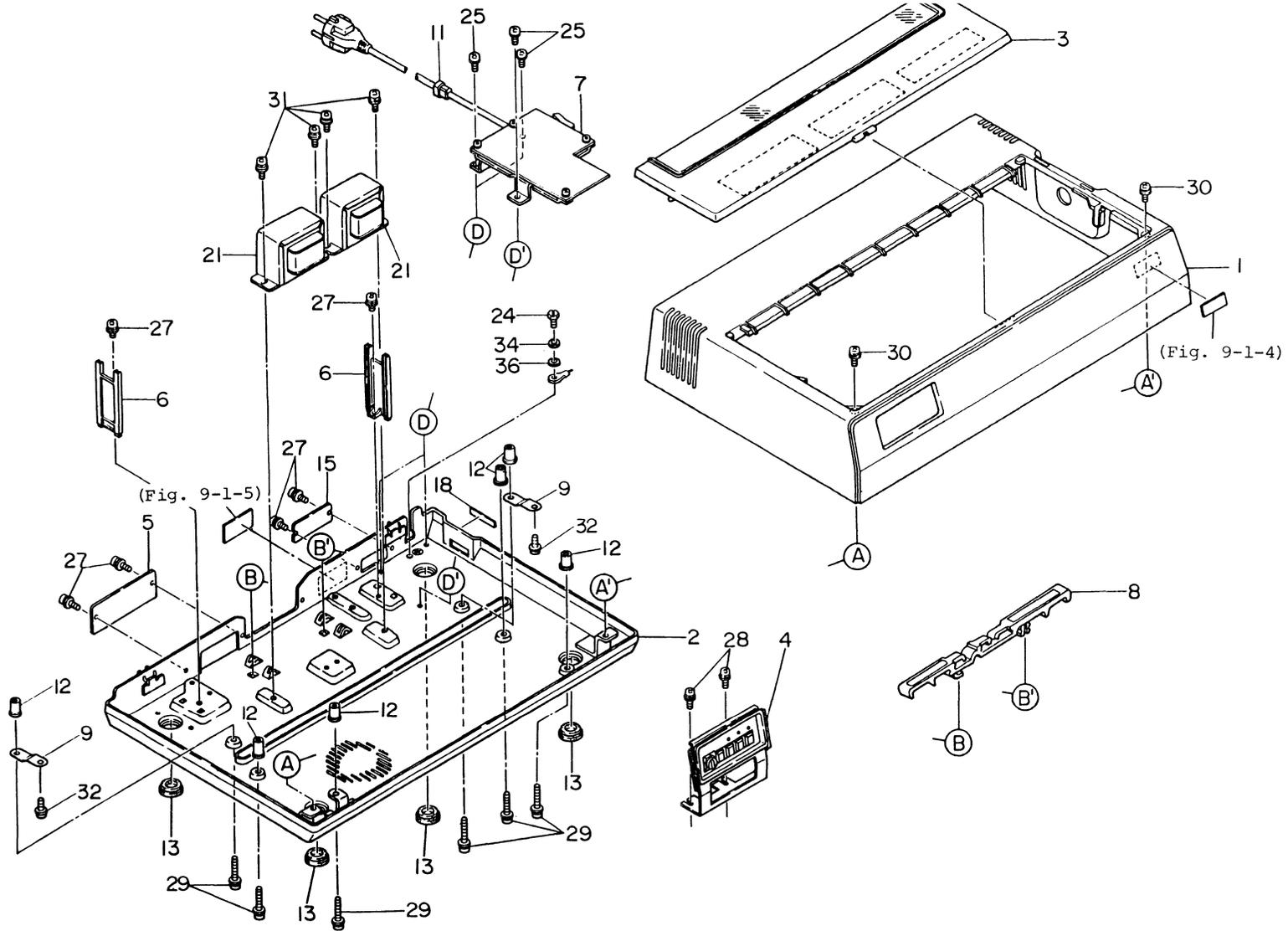


Figure 9-8 Cover Unit (1LM-61285-3) (for Europe) (for 220/240 V)



Figure 9-8 Cover Unit (1LM-61285-2) (for USA (for 115 V))
(2nd edition)

Item No.	Part No.	Description	Qty	Remarks	Compati- bility
1	1LM-60106	Upper cover	1		83A
2	1LM-61286	Lower cover	1		
3	2LM-60112	Access cover	1		83A
4	4LM-59767	Operating panel assembly	1		
5	5LM-59696	Blank plate	1		
6	4LM-60115	Circuit board support	2		83A
7	2LR-192199-2	Power supply assembly	1		
8	3LM-60116	Cord clamp	1		83A
9	5LM-61519	Ground board	2		83A
11	5LP-6463-C-5	Cord bushing	1		83A
12	4LP-6726-2	Quite-tight	6		83A
13	5LP-1416	Rubber foot	4		83A
14	5LP-6765	Mark band	1		83A
15	5LM-61287	Blank plate	1		
18	5L-1667	Switch indicating board	1		
21	2LR-192189-2	Transformer assembly	1		
24	(-)B4-6-HH	Bolt	1		
25	⊕ P(SW)3-5-HH	Small pan-head screw	3		
27	⊕ P(SW+W)3-8-HH	Small pan-head screw	6		
28	⊕ P(SW+2W)3-6-HH	Small pan-head screw	2		
29	⊕ P(SW+2W)4-18-HH	Small pan-head screw	6		
30	⊕ P(SW+W)4-12-HH	Small pan-head screw	2		
31	⊕ P(SW+2W)4-8-HH	Small pan-head screw	4		
32	⊕ P(W)3-5-HH	Small pan-head screw	2		
34	SW4-HHC	Spring washer	1		
36	2W4-HH	Washer	1		

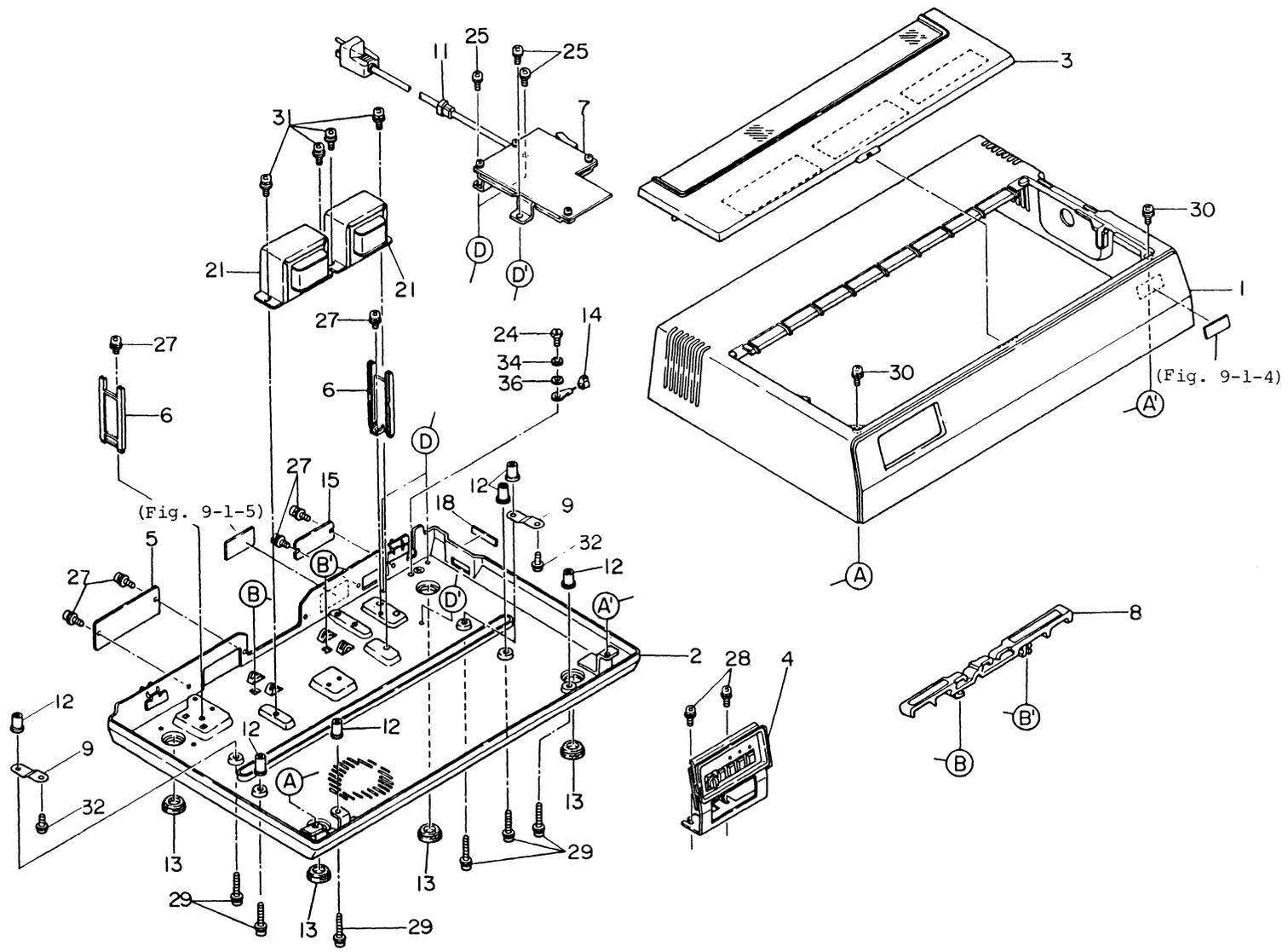


Figure 9-8 Cover Unit (1LM-61285-2) (for USA) (for 115 V)

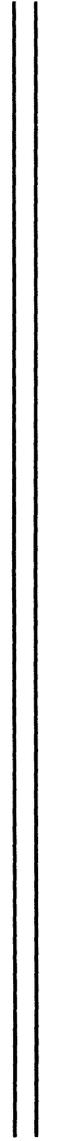




Figure 9-7 Carriage Assembly (4LR-191870-3)

Item No.	Part No.	Description	Qty	Remarks	Compati- bility
1	4LR-191871-3	Carriage frame (pressure-fitted)	1		
2	5LR-191857	Belt clamp	1		83A
3	5LR-191873-2	Ribbon protector	1		83A
4	5LD-83139	Ribbon roller	2		83A
5	5KX-9057	E-snap ring (E2)	2		83A
6	⊕ T2P3-10-HH	Tapping screw	2		83A
7	5LR-191874	Oil felt	1		83A



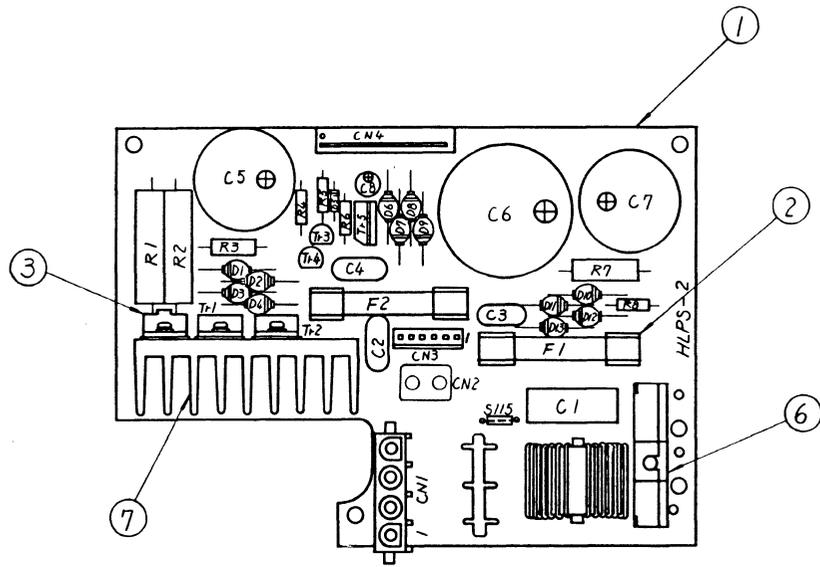
Figure 9-11 Power Supply Assembly (2LR-192199-2) (for USA)

Item No.	Part No.	Description	Qty	Remarks	Compati- bility
①	LY-43361-2	HLPS-2 circuit board	1		
②	3LR-192200	Bracket	1		
③	4LP-3621-2	AC toggle switch	1		
④	3LP-36467	AC code	1		
⑤	LY-4658-3 "white"	17/0.16 heat-resisting PVC wire	1		
⑥	LY-4658-3 "black"	17/0.16 heat-resisting PVC wire	1		
⑦		Insulation SUMI tube F $\phi 3$ x 10	4		
⑧	⊕ P(SW+W) 3-6-HH	Small pan-head screw	4		
⑨	⊕ P(SW) 3-5-HH	Small pan-head screw	2		
⑩	5LP-6364-2	Pressure-welded terminal	1		
⑪	3LR-194101	Insulator	1		

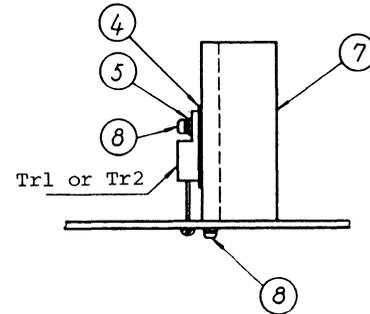


Figure 9-11 Power Supply Assembly (2LR-192199-3) (for Europe)

Item No.	Part No.	Description	Qty	Remarks	Compati- bility
①	LY-43361-3	HGPS-3 circuit board	1		
②	3LR-192200	Bracket	1		
③	4LP-3621-1	AC toggle switch	1		
④	3LP-36564	AC code	1		
⑤	LY-4658-3 "white"	17/0.16 heat-resisting PVC wire	1		
⑥	LY-4658-3 "black"	17/0.16 heat-resisting PVC wire	1		
⑦		Insulation SUMI tube F ϕ 3 x 10	4		
⑧	⊕ P(SW+W) 3-6-HH	Small pan-head screw	4		
⑨	⊕ P(SW) 3-5-HH	Small pan-head screw	2		
⑩	5LP-6364-2	Pressure-welded terminal	1		
⑪	3LR-194101	Insulator	1		



Note 1) Heat sink (7) and regulator FS7805 (TR1, TR2) mounting



Note 2) Diode bracket (3) and resistor (R1, R2) mounting

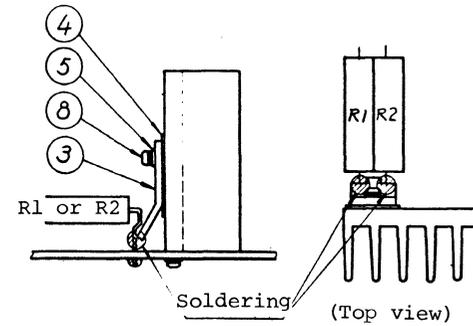


Figure 9-12 HLPS-2 Circuit Board Assembly (LY-43361-2) (for USA)
(2nd edition)



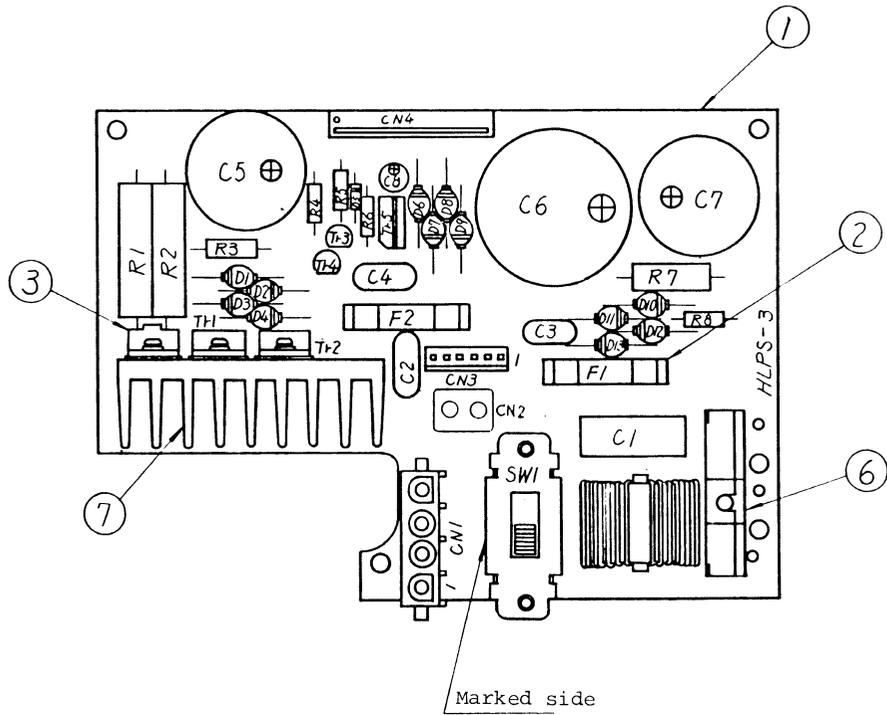
Figure 9-12 HLPS-2 Circuit Board Assembly (LY-43361-2) (for USA) 1/2
(2nd edition)

Symbol	Part No.	Description	Qty	Remarks
1	3LP-16757	HLPS circuit board	1	
D5	D4LP-44171-15	Zener diode RD10EB	1	
D1 to D4, D6 to D13	D4LP-9409-2	Diode U05C	12	
R4, R6, R8	R4LP-8446-102	Resistor 1/4 W 1 kilohm	3	
R5	R4LP-8446-512	Resistor 1/4 W 5.1 kilohms	1	
R3	R4LP-8447-102	Resistor 1/2 W 1 kilohm	1	
R7	R4LP-8224-302	Resistor 2 W 3 kilohms	1	
R1, R2	R4LP-8225-300	Resistor 3 W 30 ohms	2	
C2 to C4	C4LP-8449-104	Film capacitor 100 V 0.1 μ F	3	
C1	C4LP-8593-104	MP capacitor 0.1 μ F	1	
C7	C4LP-8520-3	Electrolytic capacitor 10 V 10,000 μ F	1	
C5	C4LP-8520-7	Electrolytic capacitor 16 V 6800 μ F	1	
C6	C4LP-8520-26	Electrolytic capacitor 50 V 6800 μ F	1	
C8	C4LP-8382-42	Electrolytic capacitor 50 V 1 μ F	1	
Tr4	Q4LP-44331	Transistor 2SA952	1	
Tr3	Q4LP-44335	Transistor 2SC2719	1	
Tr1, Tr2	I4LP-11830-49	Regulator FS7805	2	
Tr5	D4LP-44386-2	Thyristor CU12C11	1	
L1	H4LP-45187-2	SC coil	1	
Tr3	Q4LP-44335	Transistor 2SC2719	1	
CN2	4LP-2886	AMP nylon connector 2P	1	
CN1	4LP-5902-4	AMP socket header 4P	1	
CN3	4LP-5523-6	AMP EI connector 6P	1	
CN4	4LP-5691-10	Circuit connector for brake cable 10P	1	
F1	4LP-6735-13	Fuse 2A	1	
F2	4LP-6735-15	Fuse 3A	1	
②	5L-90186	Fuse holder	4	
③	5LK-51174	Diode bracket	1	
④	4LP-44106-3	SERCON	3	

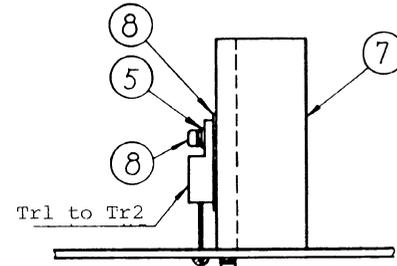


Figure 9-12 HLP5-2 Circuit Board Assembly (LY-43361-2) (for USA) 2/2
(2nd edition)

Symbol	Part No.	Description	Qty	Remarks
⑤	4LP-4967-8	Insulating bush	3	
⑥	4LP-6740-200	Circuit breaker	1	
⑦	4LP-45334	Heat sink	1	
S115V	5KH-31036-50	U-shaped jumper wire	1	
⑧	⊕ P(SW+W) 2.6-6-HH	Small pan-head screw	5	



Note 1) Heat sink ⑦ and regulator FS7805 (Tr1, Tr2) mounting



Note 2) Diode bracket ③ and resistor (R1, R2) mounting

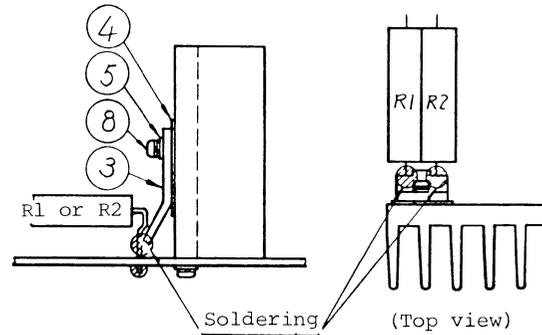


Figure 9-12 HLP3-3 Circuit Board Assembly (LY-43361-3) (for Europe) (2nd edition)



Figure 9-12 HLPS-3 Circuit Board Assembly (LY-43361-3) (for Europe) 1/2
(2nd edition)

Symbol	Part No.	Description	Qty	Remarks
①	3LP-16757	HLPS circuit board	1	
D5	D4LP-44171-15	Zener diode RD10EB	1	
D1 to D4, D6 to D13	D4LP-9409-2	Diode U05C	12	
R4, R6, R8	R4LP-8446-102	Resistor 1/4 W 1 kilohm	3	
R5	R4LP-8446-512	Resistor 1/4 W 5.1 kilohms	1	
R3	R4LP-8447-102	Resistor 1/2 W 1 kilohm	1	
R7	R4LP-8224-302	Resistor 2 W 3 kilohms	1	
R1, R2	R4LP-8225-300	Resistor 3 W 30 ohms	2	
C2 to C4	C4LP-8449-104	Film capacitor 100 V 0.1 μ F	3	
C1	C4LP-8593-104	MP capacitor 0.1 μ F	1	
C7	C4LP-8520-3	Electrolytic capacitor 10 V 10,000 μ F	1	
C5	C4LP-8520-7	Electrolytic capacitor 16 V 6800 μ F	1	
C6	C4LP-8520-26	Electrolytic capacitor 50 V 6800 μ F	1	
C8	C4LP-8382-42	Electrolytic capacitor 50 V 1 μ F	1	
SW1	4LP-3622	AC slide switch	1	
Tr4	Q4LP-44331	Transistor 2SA952	1	
Tr1, Tr2	I4LP-11830-49	Regulator FS7805	2	
Tr5	D4LP-44386-2	Thyristor CU12C11	1	
L1	H4LP-45187-2	SC coil	1	
Tr3	Q4LP-44335	Transistor 2SC2719	1	
CN2	4LP-2886	AMP nylon connector 2P	1	
CN1	4LP-5902-4	AMP socket header 4P	1	
CN3	4LP-5523-6	AMP EI connector 6P	1	
CN4	4LP-5691-10	Circuit connector for brake cable 10P	1	
F1	4LP-6735-13	Fuse 2A	1	
F2	4LP-6735-15	Fuse 3A	1	
②	5L-90186	Fuse holder	4	
③	5LK-51174	Diode bracket	1	
④	4LP-44106-3	SERCON	3	



Figure 9-12 HLPS-3 Circuit Board Assembly (LY-43361-3) (for Europe) 2/2
(2nd edition)

Symbol	Part No.	Description	Qty	Remarks
④	4LP-44106-3	SERCON	3	
⑤	4LP-4967-8	Insulating bushing	3	
⑥	4LP-6740-100	Circuit breaker	1	
⑦	4LP-45334	Heat sink	1	
⑧	⊕ P(SW+W)2.6-6-HH	Small pan-head screw	5	

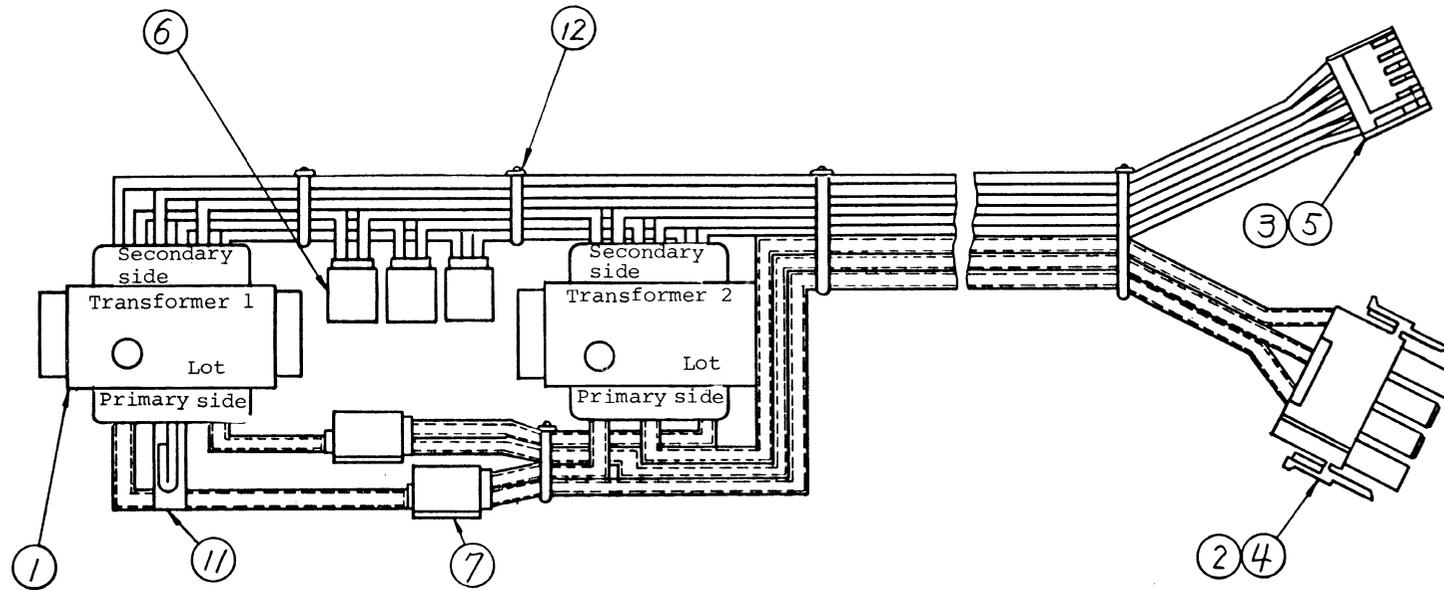


Figure 9-13 Transformer Assembly (2LR-192189-2) (for USA)
(2nd edition)

Figure 9-13 Transformer Assembly (2LR-192189-2) (for USA)
(2nd edition)

Item No.	Part No.	Description	Qty	Remarks	Compati- bility
1	4LP-45191-124	Power supply transformer	2		
2	J4LP-5903-4	AMP maintaining lock connector plug	1		
3	J4LP-5525-6	AMP E1 connector plug	1		
4	J4LP-5811	Contactor (pin)	3		
5	J4LP-5526	Contactor	6		
6	J4LP-5851	U-element connector No. 557	3		
7	J4LP-5852	U-element connector No. 558	2		
11		Insulation SUMI tube F $\phi 5 \times 20$	1		
12	4LP-6401-b ₁	Tie-wrap	5		
		Silicon vanished glass tube $\phi 3 \times 45$	1		
		Silicon vanished glass tube $\phi 3 \times 55$	1		
		Silicon vanished glass tube $\phi 3 \times 60$	1		
		Silicon vanished glass tube $\phi 3 \times 70$	1		
		Silicon vanished glass tube $\phi 3 \times 255$	1		
		Silicon vanished glass tube $\phi 3 \times 295$	2		

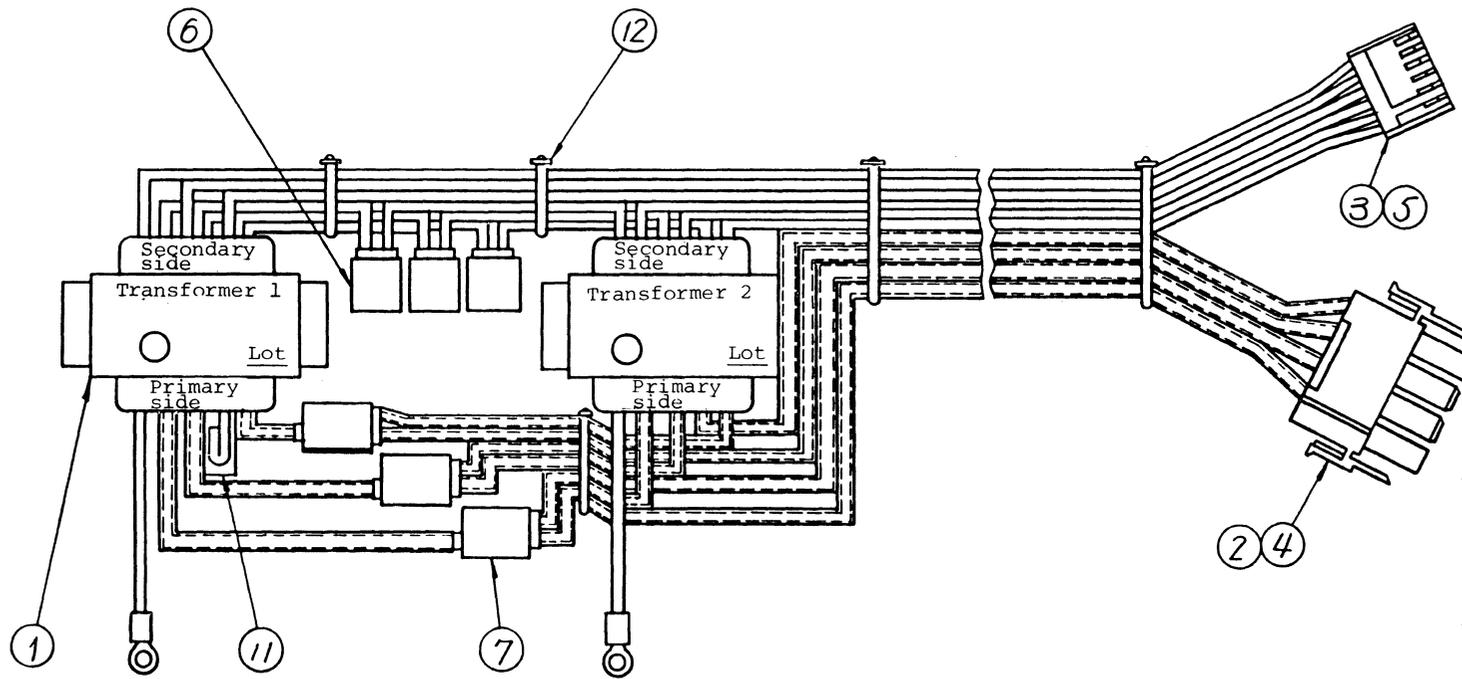


Figure 9-13 Transformer Assembly (2LR-192189-3) (for Europe)
(2nd edition)

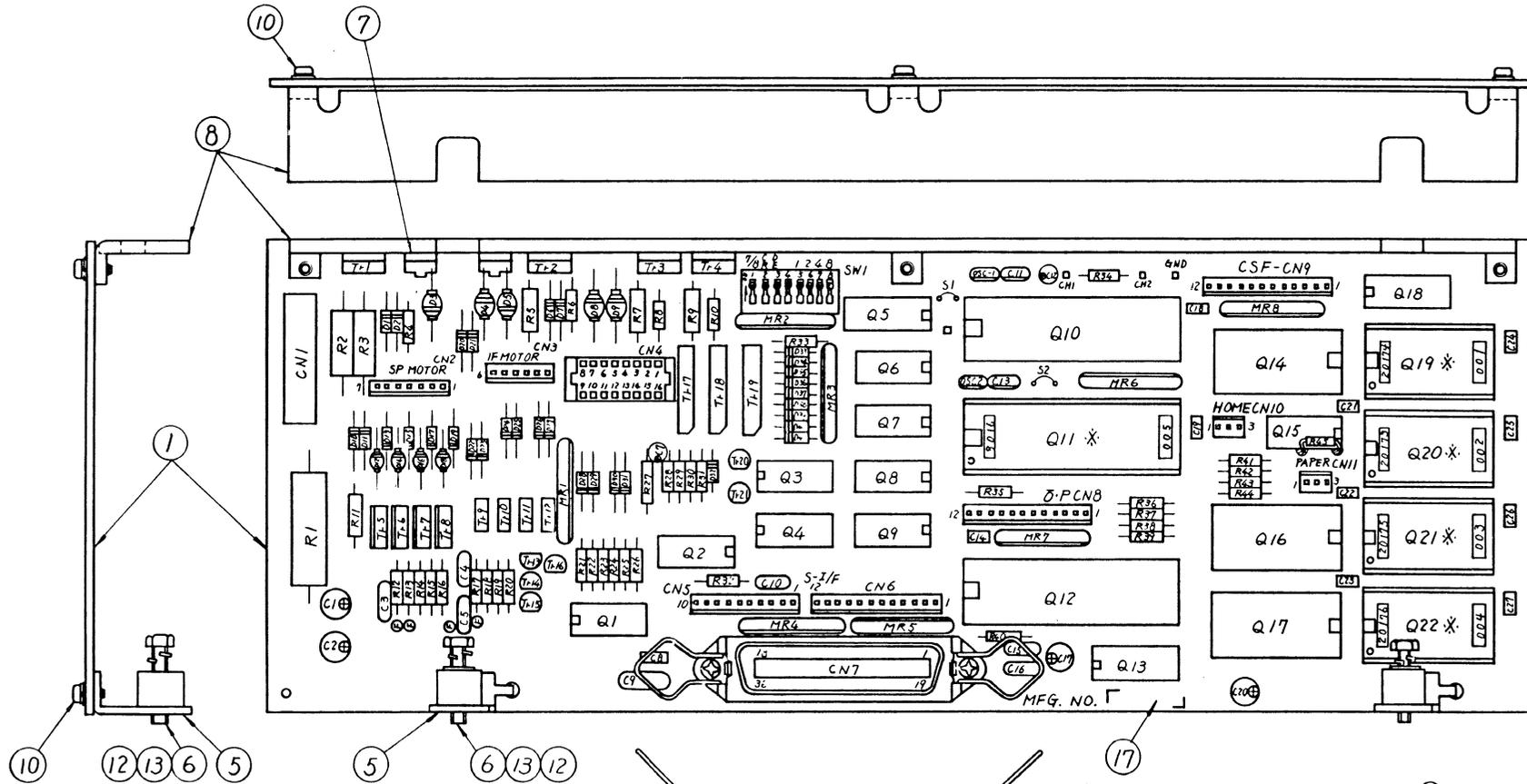


Figure 9-13 Transformer Assembly (2LR-192189-3) (for Europe)

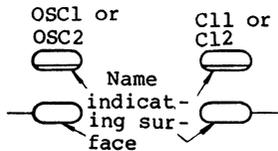
(2nd edition)

Item No.	Part No.	Description	Qty	Remarks	Compatibility
1	4LP-45191-129	Power supply transformer	2		
2	J4LP-5903-4	AMP maintaining lock connector plug	1		
3	J4LP-5525-6	AMP E1 connector plug	1		
4	J4LP-5811	Contactactor (pin)	4		
5	J4LP-5526	Contactactor	6		
6	J4LP-5851	U-element connector No. 557	3		
7	J4LP-5852	U-element connector No. 558	3		
11		Insulation SUMI tube F $\phi 5 \times 20$	1		
12	4LP-6401-b ₁	Tie-wrap	5		
		Silicon vanished glass tube $\phi 3 \times 40$	1		
		Silicon vanished glass tube $\phi 3 \times 50$	2		
		Silicon vanished glass tube $\phi 3 \times 55$	1		
		Silicon vanished glass tube $\phi 3 \times 60$	1		
		Silicon vanished glass tube $\phi 3 \times 70$	1		
		Silicon vanished glass tube $\phi 3 \times 250$	1		
		Silicon vanished glass tube $\phi 3 \times 295$	3		

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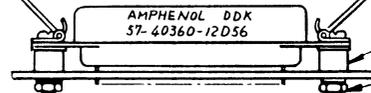


Note 1) Ceramic oscillator (OSC1, OSC2) and capacitor mounting for temperature characteristics support (C11, C13).



Note 4) * mark indicates RCM IC. Note for ROM IC mounting is shown in the table following.

ROM	Mounting position Indication	For U.S.A.		For Europe		Description
		Nameplate	Parts No.	Nameplate	Parts No.	
Q19	001	20174	LYH-20174	20174	LYH-20174	Program ROM (2732)
Q20	002	20173	LYH-20173	20186	LYH-20186	Program ROM (2732)
Q21	003	20175	LYH-20175	20188	LYH-20188	Character generator (2732)
Q22	004	20176	LYH-20176	20176	LYH-20176	Character generator (2732)
Q11	005	8016	LYH-8016	8016	LYH-8016	Program ROM (8741)

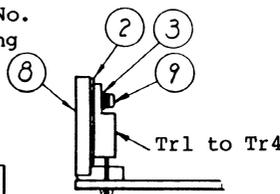


Note 3) Mounting the diode bracket (7) and Zener diodes (D3 to D5) on the transistor mounting board.

Note 2) Mounting transistors (Tr1 to Tr4) to the transistor mounting board (3).

Drawing No. indicating panel

White dot



Mounting position indicating panel

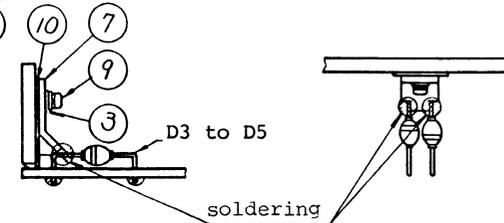


Figure 9-14 HLP A Circuit Board Assembly (LY-43360)



Figure 9-14 HLEPA Circuit Board Assembly (LY-43360) 1/4
(2nd edition)

Symbol	Part No.	Description	Qty	Remarks
1	2LP-97741	HLEPA circuit board	1	
D32	D4LP-44171-10	Zenor diode RD6.2EB	1	
D5	D4LP-44156-12	Zenor diode AU01-13	1	
D3, D4	D4LP-44156-16	Zenor diode AU01-20	2	
D8, D9	D4LP-9409-2	Diode U05C	2	
D1, D2, D6, D7, D10, D11, D13, D15, D17, D19 to D31	D4LP-9471-1	Diode SMLA-02	22	
D33 to D41	D4LP-9300	Diode 1S2075	9	
D12, D14, D16, D18	D4LP-44117-1	Diode V09C	4	
R35, R41	R4LP-8446-201	Resistor 1/4 W 200 ohms	2	
R4, R6, R8, R10	R4LP-8446-331	Resistor 1/4 W 330 ohms	4	
R26, R40	R4LP-8446-511	Resistor 1/4 W 510 ohms	2	
R19, R30, R31 to R33, R36 to R39, R43, R44	R4LP-8446-102	Resistor 1/4 W 1 kilohm	11	
R20	R4LP-8446-202	Resistor 1/4 W 2 kilohms	1	
R23, R24	R4LP-8446-242	Resistor 1/4 W 2.4 kilohms	2	
R14, R18, R21	R4LP-8446-152	Resistor 1/4 W 1.5 kilohms	3	
R25, R34	R4LP-8446-512	Resistor 1/4 W 5.1 kilohms	2	
R22, R42, R45	R4LP-8446-103	Resistor 1/4 W 10 kilohms	3	
R29	R4LP-8446-513	Resistor 1/4 W 51 kilohms	1	
R28	R4LP-8446-683	Resistor 1/4 W 68 kilohms	1	
R16	R4LP-8446-104	Resistor 1/4 W 100 kilohms	1	
R15	R4LP-8446-304	Resistor 1/4 W 300 kilohms	1	
R17	R4LP-8482-223	Resistor 1/4 W 22 kilohms F	1	
R12	R4LP-8482-513	Resistor 1/4 W 51 kilohms F	1	
R13	R4LP-8482-474	Resistor 1/4 W 470 kilohms F	1	
R11	R4LP-8505-2R2	Resistor 1/2 W 2.2 ohms	1	
R27	R4LP-8447-202	Resistor 1/2 W 2 kilohms	1	



Figure 9-14 HLP A Circuit Board Assembly (LY-43360) 2/4
(2nd edition)

Symbol	Part No.	Description	Qty	Remarks
R5, R7, R9	R4LP-8318-102	Resistor 1 W 1 kilohm	3	
R2, R3	R4LP-8224-102	Resistor 2 W 1 kilohm	2	
R1	R4LP-8441-5	Resistor 5 W 1 ohm	1	
MR1	R4LP-8396-431	8-element module 430 ohms	1	
MR3 to MR5	R4LP-8396-102	8-element module 1 kilohm	3	
MR2, MR6 to MR8	R4LP-8396-512	8-element module 5.1 kilohms	4	
C3	C4LP-8449-152	Film capacitor 100 V 0.0015 μ F	1	
C10, C16	C4LP-8449-102	Film capacitor 100 V 0.001 μ F	2	
C4	C4LP-8449-223	Film capacitor 100 V 0.022 μ F	1	
C5	C4LP-8596-223	High-precision film capacitor 50 V 0.022 μ F	1	
C15	C4LP-8452-471	Ceramic capacitor 50 V 470 pF	1	
C9	C4LP-8571	Ceramic capacitor 400 V 100 pF	1	
C7, C12	C4LP-8470-7	Tantalum electrolytic capacitor 35 V 1 μ F	2	
C8, C14, C18, C19, C21 to C27	C4LP-8486	Laminated ceramic capacitor 50 V 0.1 μ F	11	
C1, C2, C17, C20	C4LP-8519-12	Electrolytic capacitor 25 V 47 μ F	4	
OSC2, C13	4LP-12127-1	Ceramic oscillator with capacitor 6.14 MHz	1	
OSC1, C11	4LP-12127-3	Ceramic oscillator with capacitor 9.0 MHz	1	
Q1	I4LP-11836-00	μ PC339C	1	
Q10	I4LP-11499-06	8039	1	
Q12	I4LP-11368-06	8155	1	



Figure 9-14 HLPB Circuit Board Assembly (LY-43360) 3/4
(2nd edition)

Symbol	Part No.	Description	Qty	Remarks
Q16, Q17	I4LP-11699-09	MB8128-15 2-kilobyte S RAM	2	
Q14	I4LP-11714-04	M5L8243 I/O EXPANDER	1	
Q13, Q18	I4LP-11124-40	74LS75	2	
Q15	I4LP-11117-40	74LS02	1	
Q8	I4LP-11131-40	74LS04	1	
Q6, Q7, Q9	I4LP-11136-40	74LS05	3	
Q5	I4LP-11348-40	74LS257	1	
Q3	I4LP-11136-00	7405N	1	
Q2	I4LP-11145-00	7406N	1	
Q4	I4LP-11146-00	7407N	1	
(Q11)	4LP-9490-F-06	40-pin IC socket	1	
(Q19 to Q22)	4LP-9490-D-06	24-pin IC socket	4	
SW1	4LP-3425-8	DIP switch	1	
Tr2 to Tr4	Q4LP-44251	Transistor 2SB727	3	54134401
Tr1	Q4LP-44401	Transistor 2SB791	1	55606601
Tr5 to Tr8	Q4LP-44252	Transistor 2SD768	4	
Tr9 to Tr12	Q4LP-44385	Transistor 2SD986	4	
Tr13 to Tr20	Q4LP-44331	Transistor 2SA952	2	
Tr14 to Tr16, Tr21	Q4LP-44335	Transistor 2SC2719	4	
Tr17 to Tr19	Q4LP-44419	Transistor array STA 301	3	
CN17	4LP-5663	36-plug connector	1	
CN10, CN11	4LP-5523-3	AMP EI connector 3P	2	
CN3	4LP-5523-6	AMP EI connector 6P	1	
CN2	4LP-5523-7	AMP EI connector 7P	1	
CN5	4LP-5523-10	AMP EI connector 10P	1	
CN6, CN8, CN9	4LP-5523-12	AMP EI connector 12P	3	
CN1	4LP-5850-10	Brake cable connector 10P	1	
CN4	4LP-9490-B-03	IC socket (16P)	1	
(CN4)	4LP-5551	Connector locker	1	



Figure 9-14 HLPB Circuit Board Assembly (LY-43360) 4/4
(2nd edition)

Symbol	Part No.	Description	Qty	Remarks
(2)	4LP-44106-3	SERCON	6	
(3)	4LP-4967-8	Insulating bushing	6	
(4)	4LB-102200-6-B	Collar	2	
(5)	5LR-104062	Circuit board mounting metal	2	
(6)	LX-5094-1	Set screw	2	
(7)	5LK-50620	Diode bracket	2	
(8)	3LK-50749	Transistor mounting board	1	
(9)	⊕ P(SW+W) 2.6-8-HH	Small pan-head screw	6	
(10)	⊕ P(SW+W) 3-6-HH	Small pan-head screw	5	
(11)	⊕ P3-12-HH	Small pan-head screw	2	
(12)	SW4-HHC	Spring washer	2	
(13)	W4-HH	Washer	2	
(14)	SW3-HHC	Spring washer	2	
(15)	W3-HH	Washer	2	
(16)	3N3-HH	Locknut	2	
S1, S2	5KH-31036-50	U-shaped jumper wire, 5 mm long	2	
CH1, CH2, GND, 5V	5LR-86639	Check terminal	4	
(17)	4L-1481	Number indication attaching nameplate	1	
*Q19 (001)	LYH-20174	EPROM, program ROM	1	} For USA
*Q20 (002)	LYH-20173	EPROM, program ROM	1	
*Q21 (003)	LYH-20175	EPROM, character generator	1	
*Q22 (004)	LYH-20176	EPROM, character generator	1	
*Q11 (005)	LYH-8016	EPROM, program ROM	1	
*Q19 (001)	LYH-20174	EPROM, program ROM	1	} For Europe
*Q20 (002)	LYH-20186	EPROM, program ROM	1	
*Q21 (003)	LYH-20188	EPROM, character generator	1	
*Q22 (004)	LYH-20176	EPROM, character generator	1	
*Q11 (004)	LYH-8016	EPROM, program ROM	1	

(Note) The items indicated by * are not included in this parts list.
Order them separately.

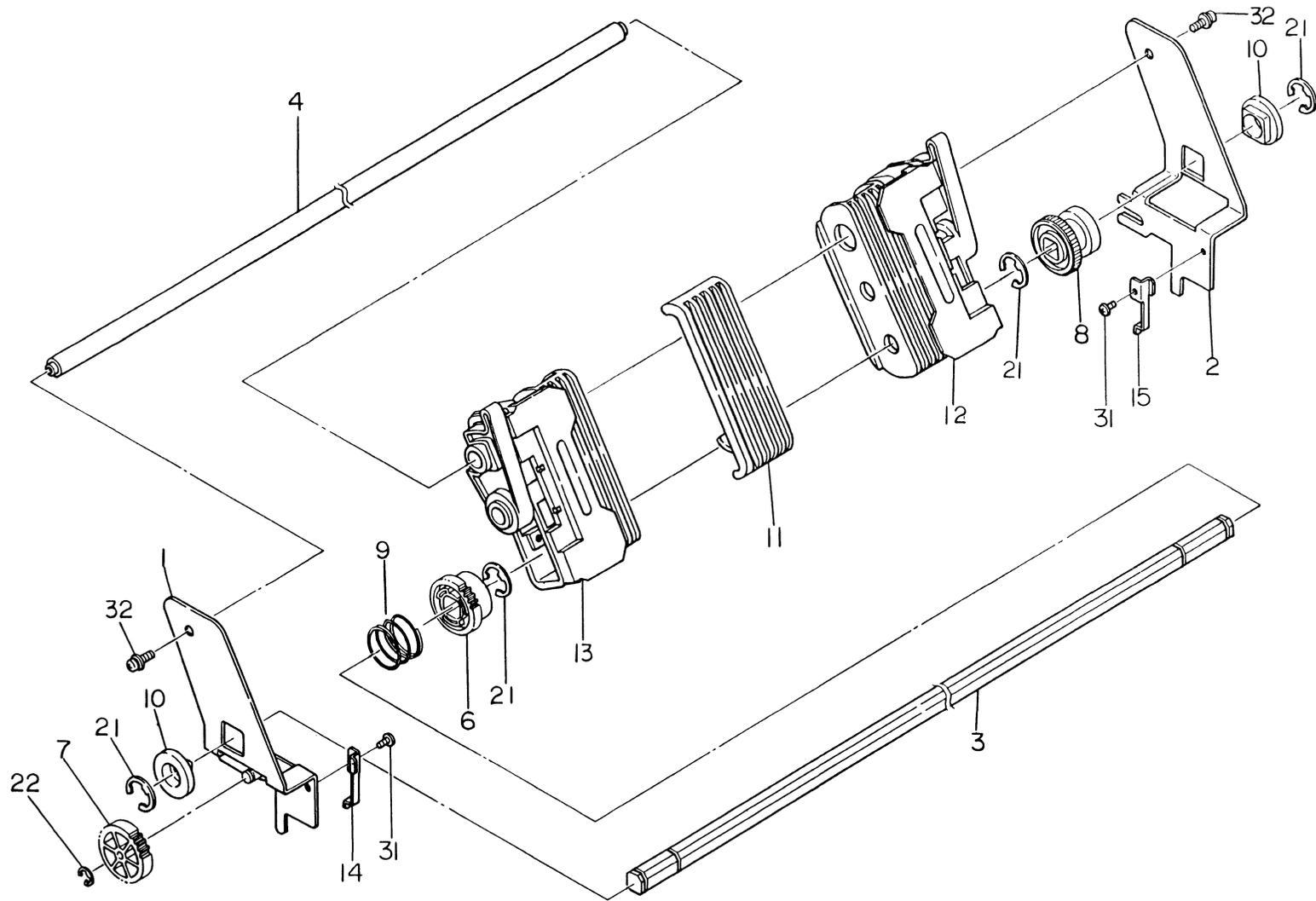


Figure 9-15 Tractor Unit (LY-39702) (2nd edition)



Figure 9-15 Tractor Unit (LY-39702)
(2nd edition)

Item No.	Part No.	Description	Qty	Remarks	Compati- bility
1	5LR-129881	Side plate (L)	1		83A
2	4LR-129884	Side plate (R)	1		83A
3	5LR-129885-2	Tractor shaft	1		83A
4	5LR-129886-2	Tractor shaft	1		83A
6	4LR-129889	Tractor gear	1		83A
7	4LR-129890	Idle gear	1		83A
8	4LR-129891	Knob	1		83A
9	5LR-129895	Bias spring	1		83A
10	5LR-123498	Bushing	2		83A
11	5LR-123467	Sheet guide	1		83A
12	FMX-35100-2	Sprocket assembly (R)	1		83A
13	FMX-35150-2	Sprocket assembly (L)	1		83A
14	5LR-194059	Clamp lever (L)	1		
15	5LR-194060	Clamp lever (R)	1		
21	5KD-50242	E-snap ring	4		
22	5KH-12050	E-snap ring	1		
31	⊕ 3-5-23D	Bind screw	2		
32	⊕ P(SW+2W)3-8-23D	Small pan-head screw	2		

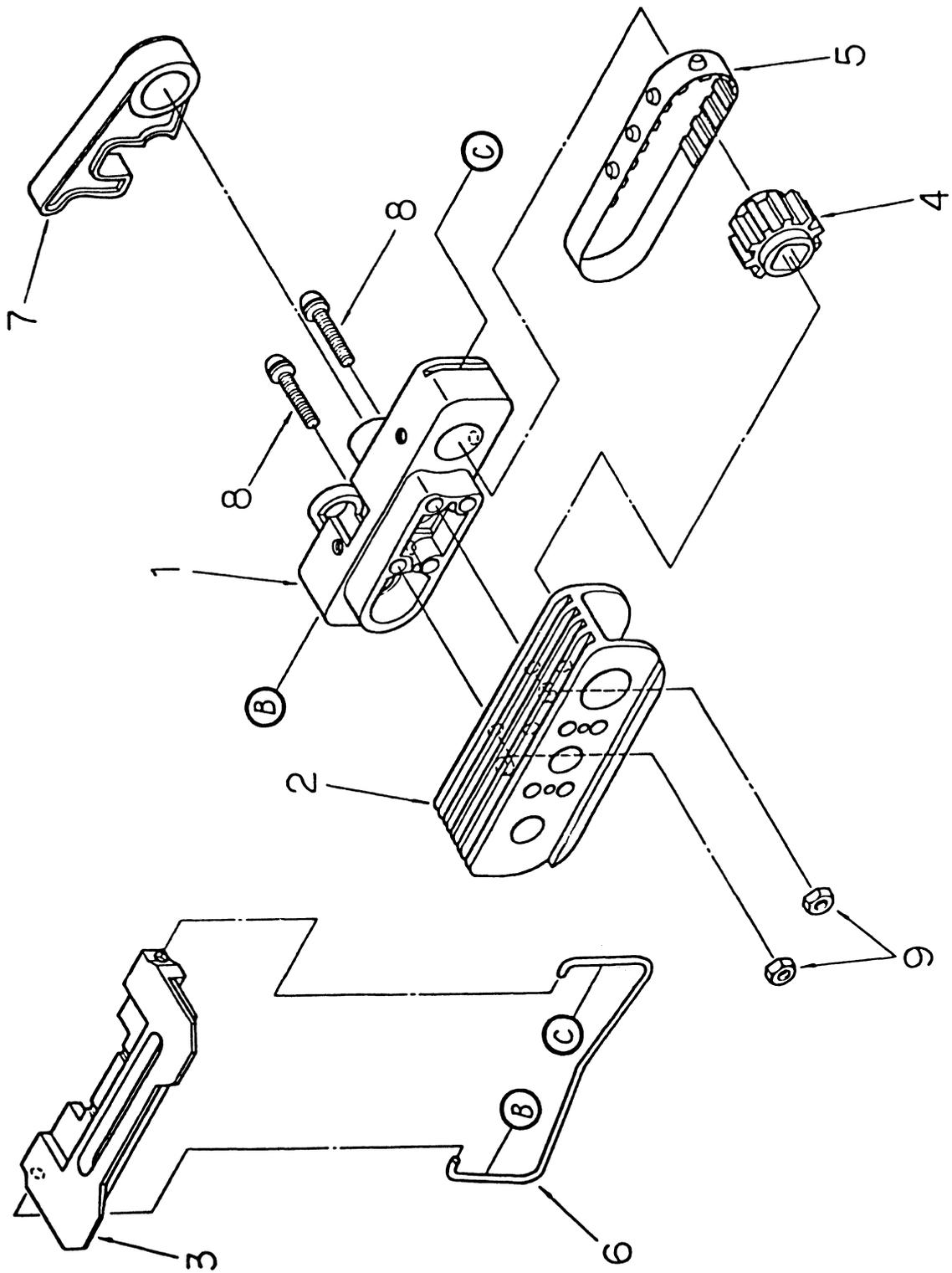


Figure 9-16 Sprocket Assembly (R) (FMX-35100-2)



Figure 9-16 Sprocket Assembly (R) (FMX-35100-2)

Item No.	Part No.	Description	Qty	Remarks	Compati- bility
1	4LR-123484	Sprocket frame (A)	1		83A
2	4LR-123485	Sprocket frame (B)	1		83A
3	5LR-123446	Sprocket cover	1		83A
4	5LR-129894	Sprocket wheel	1		83A
5	4LR-123487	Pin tractor (mold)	1		83A
6	5LR-123453	Pivot spring	1		83A
7	5LR-123458	Lock lever	1		83A
8	⊕ P (SW+W) 3-16-HH	Small pan-head screw	2		
9	2N ₃ -HH	Nut	2		

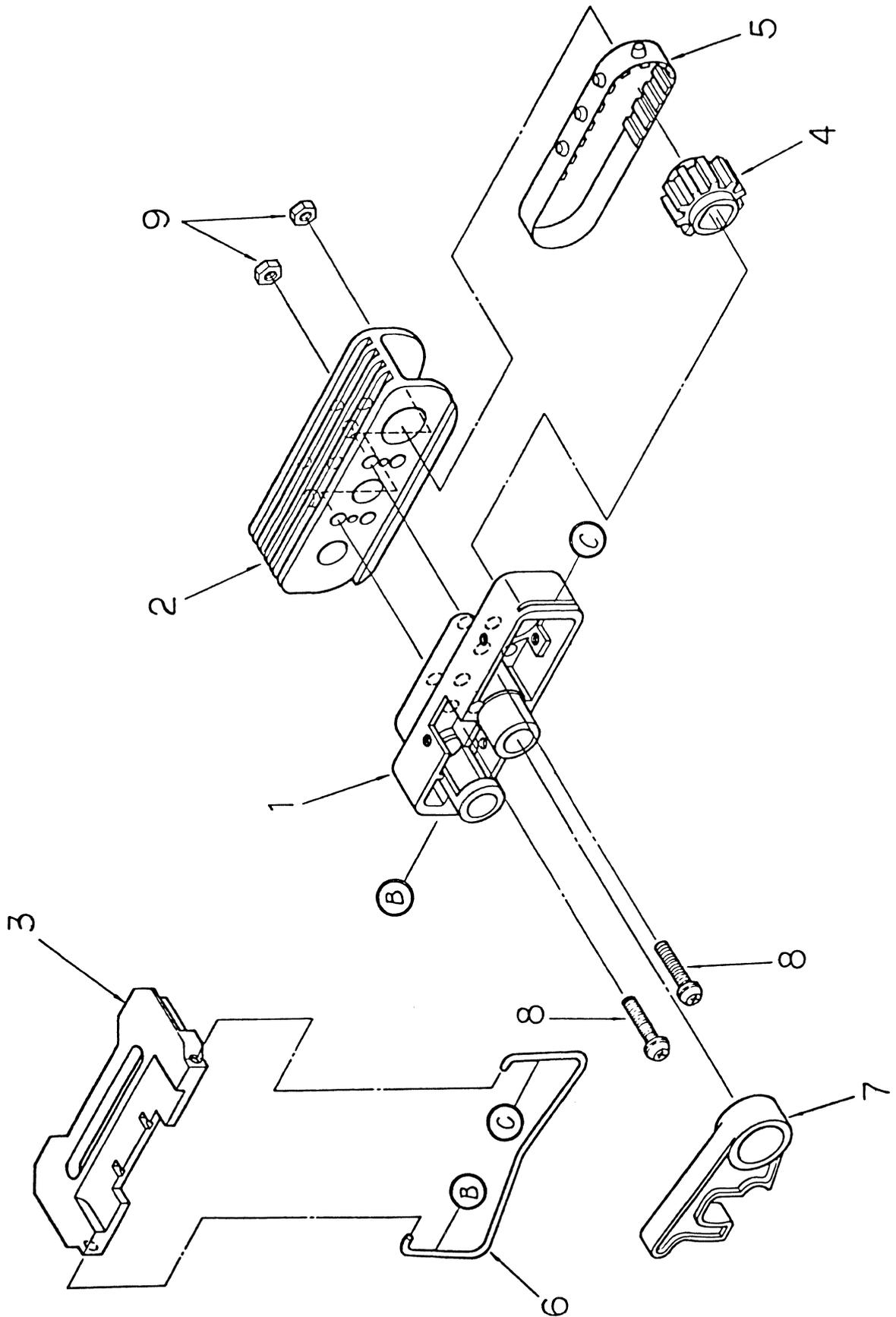


Figure 9-17 Sprocket Assembly (L) (FMX-35150-2)



Figure 9-16 Sprocket Assembly (L) (FMX-35150-2)

Item No.	Part No.	Description	Q'ty	Remarks	Compati- bility
1	4LR-123484	Sprocket frame (A)	1		83A
2	4LR-123485	Sprocket frame (B)	1		83A
3	5LR-123446	Sprocket cover	1		83A
4	5LR-129894	Sprocket wheel	1		83A
5	4LR-123487	Pin tractor (mold)	1		83A
6	5LR-123453	Pivot spring	1		83A
7	5LR-123458	Lock lever	1		83A
8	⊕ P (SW+W) 3-16-HH	Small pan-head screw	2		
9	2N ₃ -HH	Nut	2		

PART III Appendixes

APPENDIX A SPECIFICATIONS

1. General Specifications

- (1) **Print system:** Impact dot matrix
Printing direction: Bidirectional
- (2) **Printing speed:** 200 characters/second (10 CPI, 12 CPI, or 17 CPI)
 100 characters/second, unidirectional 2-pass printing (5 CPI, 6 CPI, or 8.5 CPI)
- (3) **Character composition**
Basic matrix: 9(W) × 9(H) dots
Characters: 9(W) × 7(H) dots
 n(W) × 13(H) dots (n = 8 to 12 CQ MODE)
- (4) **Character-to-character space**
 Changeable by function code
5 CPI: 5.08 mm (0.20 inch)
6 CPI: 4.23 mm (0.16 inch)
8.5 CPI: 2.96 mm (0.11 inch)
10 CPI: 2.54 mm (0.10 inch)
12 CPI: 2.12 mm (0.08 inch)
17 CPI: 1.48 mm (0.05 inch)
- (5) **Maximum number of characters per line**
 Changeable by function code

Character-to-character space	5 CPI	6 CPI	8.5 CPI	10 CPI	12 CPI	17 CPI
Number of characters	68 characters	81 characters	115 characters	136 characters	163 characters	231 characters

Note: For the CQ mode, see Appendix F, paragraph 9.1.

- (6) **Line space**
 Changeable by function code
6 LPI: 4.23 mm (0.166 inch)
8 LPI: 3.175 mm (0.125 inch)
 n/144 inch possible

Note: n is specified as: ESC, %, 9, n3.

- (7) **Kinds of printing:**
Alphanumeric characters and symbols: 63 (SP, and DEL not included)
Lower-case English letters and symbols: 31

Note: "g", "j", "p", "q", "y", ":", ";", "—", and ç are printed as DESCENDER characters shifted down by 2 dots for the 6 LPI mode.

- Special graphic characters** 64

- (8) **Paper feed system**
 (a) Friction feed system
 (b) Tractor feed system
 By mounting tractor unit, paper 76.2 to 406.4 mm (3 to 16 inches) wide can be mounted.
- (9) **Paper feed control**
 (a) With TOF (Top-of-Form) function
 (b) With VT (Vertical Tabulation) function
- (10) **Column indicator:** Column indicator is equipped with 2.54 mm (0.10 inch) scale.
- (11) **Paper out**
Rear paper feed: Detects absence of paper 50 mm (2 inches) from the present printing line.
Bottom paper feed: Detects absence of paper 25.4 mm (1 inch) from the present printing line.

- (12) **Character set**
Standard: US ASCII
 JIS (with graphic)
 BRITISH
 GERMAN
 FRENCH
 SWEDISH
 DANISH
 NORWEGIAN
 NETHERLANDISH
 ITALIAN
 TRS-80
 Equivalent to JIS
 JIS (without graphic)

Note: Character sets can be selected by the DIP switch on the HLPA-circuit board.

Character sets are shown in Appendix H.

(13) Interface specifications

- (a) Standard
 - Parallel interface (Centro-interface)
- (b) Option
 - High speed (H.S.) RS-232-C and current loop serial interface
 - IEEE 488 parallel interface

(14) Media specifications

(a) Cut sheet

Standard paper size is A4 (210 mm wide, 297 mm long), but paper up to 381 mm (15 inches) wide can be used.

Ream: 45 to 55 kg (52 to 64 g/m²)

Multiple-part paper cannot be used.

(b) Sprocket paper

When tractor unit is mounted, sprocket paper ranging from 76.2 mm (3 inches) to 406.4 mm (16 inches) can be used.

One-part paper

Ream: 45 to 55 kg (52 to 64 g/m²)

Multiple-part paper:

Type	Ream	No. of copy sheet	Remarks
Carbon-lined paper	30 to 34 kg (35 to 40 g/m ²)	Up to 4 sheets incl. original	
Pressure-sensitive paper			
Interleaf paper	45 kg (52 g/m ²)	Up to 3 sheets incl. original	
	30 kg (35 g/m ²)	Up to 4 sheets incl. original	When using tractor unit

Note: 1) The paper thickness should be 0.28 mm or less.

2) The parts of multiple-part paper must be stucked at both edges with spot paste or paper staples. The spot pasting must be uniform, and should not cause considerable corrugation.

(15) Ribbon specifications

Genuine OKI ribbons are recommended. Other ribbons must meet the following specifications:

- Spool: 3-inch standard spool (Underwood type)
- Ribbon length: 35 m maximum
- Ribbon width: 12.7 mm (0.5")
- Ribbon thickness: 0.1 mm (0.004") maximum
- Fabric: Nylon (40 denier x 40 denier)
- Color (ink): Single color (black)
- Eyelet: With reversing eyelets (Thickness: 2.4±0.3 mm, diameter: 7.8 mm)
- Ink viscosity: Low viscosity (about 500±100 cps at 25°C)

(16) Ribbon life:

4.5 million to 5.0 million characters

(17) Ribbon diagram number:

When purchasing, specify the OKI genuine ribbon number 4LP-1322-3.

(18) Ambient temperature

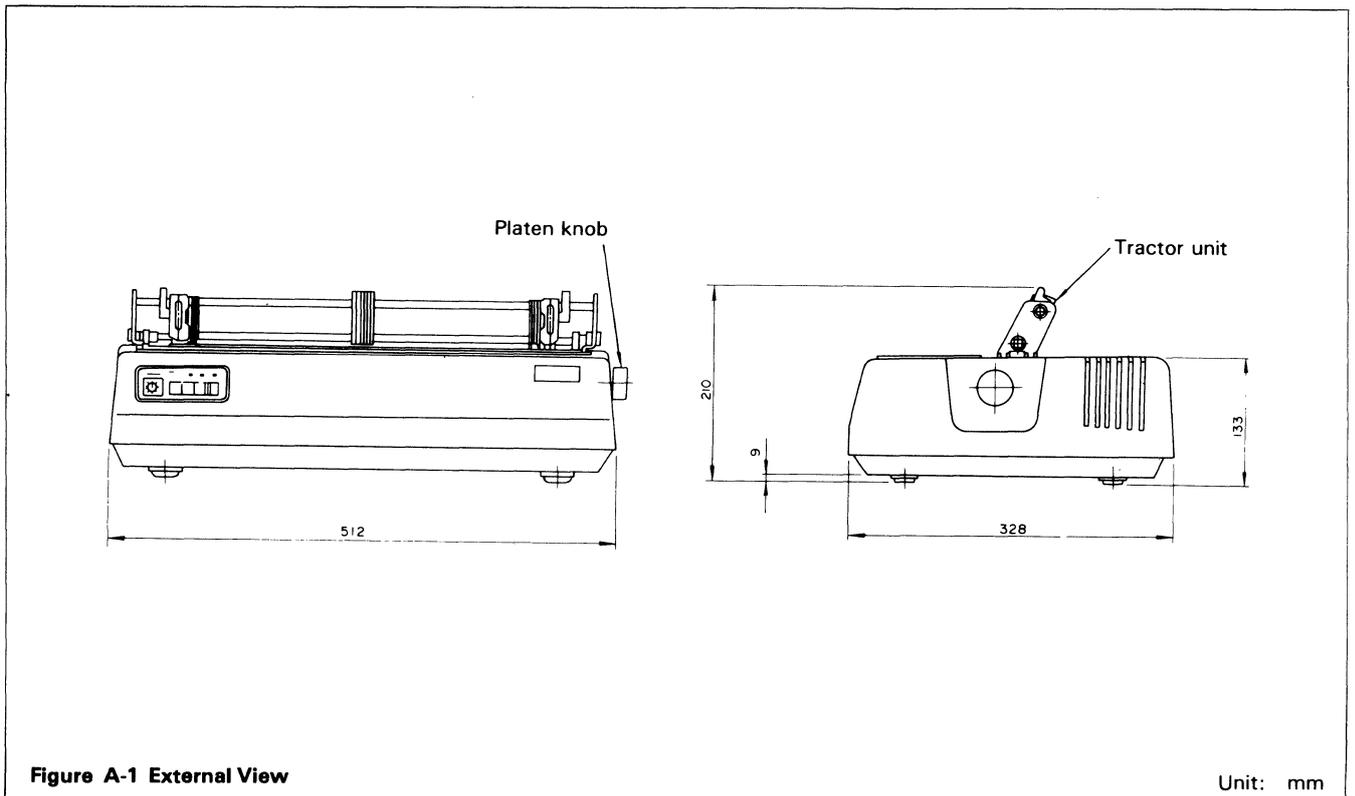
- During operation: 5°C to 40°C
- During non-operation: -10°C to 43°C
- During storage: -40°C to 70°C (when packed)

(19) Relative humidity

- During operation: 20 to 90% RH
- During non-operation: 5 to 95% RH
- During storage: 5 to 95% RH (when packed)

Note: Packages must be kept free of dew.

- (20) Vibration
During operation: Less than 0.3 G (10 Hz)
- (21) Shock
During non-operation: Less than 3 G
- (22) Noise
65 dB on the average as measured 1 m from front of printer and 1 m above the floor, when the printer is operating on a table 64 cm high. This is the average noise measured in the A range FAST when all the characters are continuously printed at 136 columns on each line, using the built-in test pattern (10 CPI, 6 LPI, not including graphics).
- (23) Input power
Single-phase AC.
(a) 115 V \pm 10%, 50/60 Hz \pm 2%
(b) 220 V \pm 10% / 240 V \pm 10%, 50/60 Hz \pm 2%
Note: Specify either (a) or (b) in your order. In case of (b), 220 or 240 V can be selected with internal switch.
- (24) Power consumption
During operation: Approx. 100 VA maximum
When not operating: Approx. 60 VA
- (25) Power cord
Approx. 2.3 m (7.7 ft) long
(Plugs and cords meeting UL, CSA standards are available.)
- (26) Outside dimensions
512 mm (20.15 inches) (W) \times 328 mm (12.91 inches) (D) \times 133 mm (5.24 inches) (H)
(See figure A-1.)
- (27) Weight
Printer proper: Approx. 14 kg
Tractor unit (option): Approx. 0.7 kg



2. Interface Specifications

2.1 Parallel Interface

(1) Connectors

Printer end: 36-pin receptacle, equivalent to 57-40360-12-D56 (Amphenol or Daiichi Electronics)
The arrangement of connector pins is as shown in figure B-1.

Cable end: 36-pin plug, equivalent to 57-30360 (Amphenol or Daiichi Electronics), or plug 552274-1 (Amphenol) or equivalent cover 552073-1 (Amphenol)

(2) Cable

Use a cable less than 5 meters in overall length. (A shielded cable composed of twisted paired wires is recommended for noise prevention)

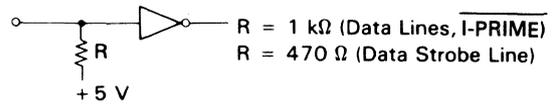
(3) Parallel interface levels

Low level: 0.0 to +0.8 V

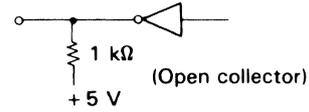
High level: +2.4 to +5.0 V

(4) Parallel interface circuits

(a) Receiver (Equivalent to I8155)



(b) Driver (Equivalent to SN7406)



(5) Parallel interface signal

Refer to Appendix B.

(6) Parallel interface timing chart

Refer to Appendix C.

APPENDIX B INTERFACE SIGNALS

Table B-1 Parallel Interface Signals

Pin No.	Signal	Direction	Description
1	$\overline{\text{DATA STROBE}}$	To printer	Samples input data when changing from low level to high level.
2	DATA BIT 1	To printer	Indicate input data. High level indicates "1" and low level "0".
3	DATA BIT 2		
4	DATA BIT 3		
5	DATA BIT 4		
6	DATA BIT 5		
7	DATA BIT 6		
8	DATA BIT 7		
9	DATA BIT 8		
10	$\overline{\text{ACKNOWLEDGE}}$	From printer	Indicates character input completion, or function operation end at low level.
11	BUSY	From printer	Indicates data cannot be received at high level. Data can be input at low level.
12	PAPER END	From printer	High level indicates paper end.
13	SELECT	From printer	High level indicates the select (on-line) condition.
14, 16, 33	0 V	—	Signal ground
17	CHASSIS GROUND	—	Frame ground

Pin No.	Signal	Direction	Description
18	+ 5 V	From printer	+ 5 V supply (50 mA maximum)
19 to 30	0 V	—	Twisted pair return (For pins 1 to 11)
31	$\overline{\text{INPUT-PRIME}}$	To printer	Controller is initialized at low level. Pulse width more than 5.0 ms.
32	$\overline{\text{FAULT}}$	From printer	From high to low level when paper runs out.
15, 34, 35, 36		—	Unused

Note: Pin arrangement:

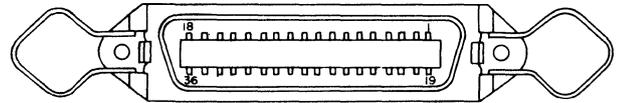
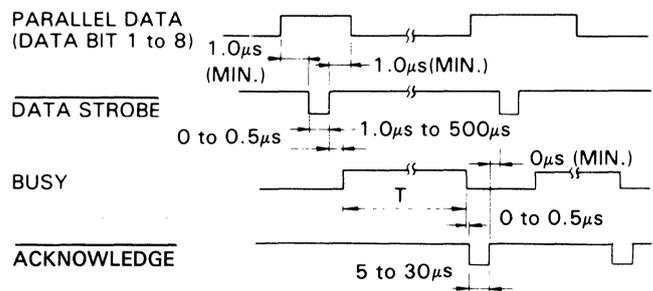


Figure B-1 Connector Pin Arrangement

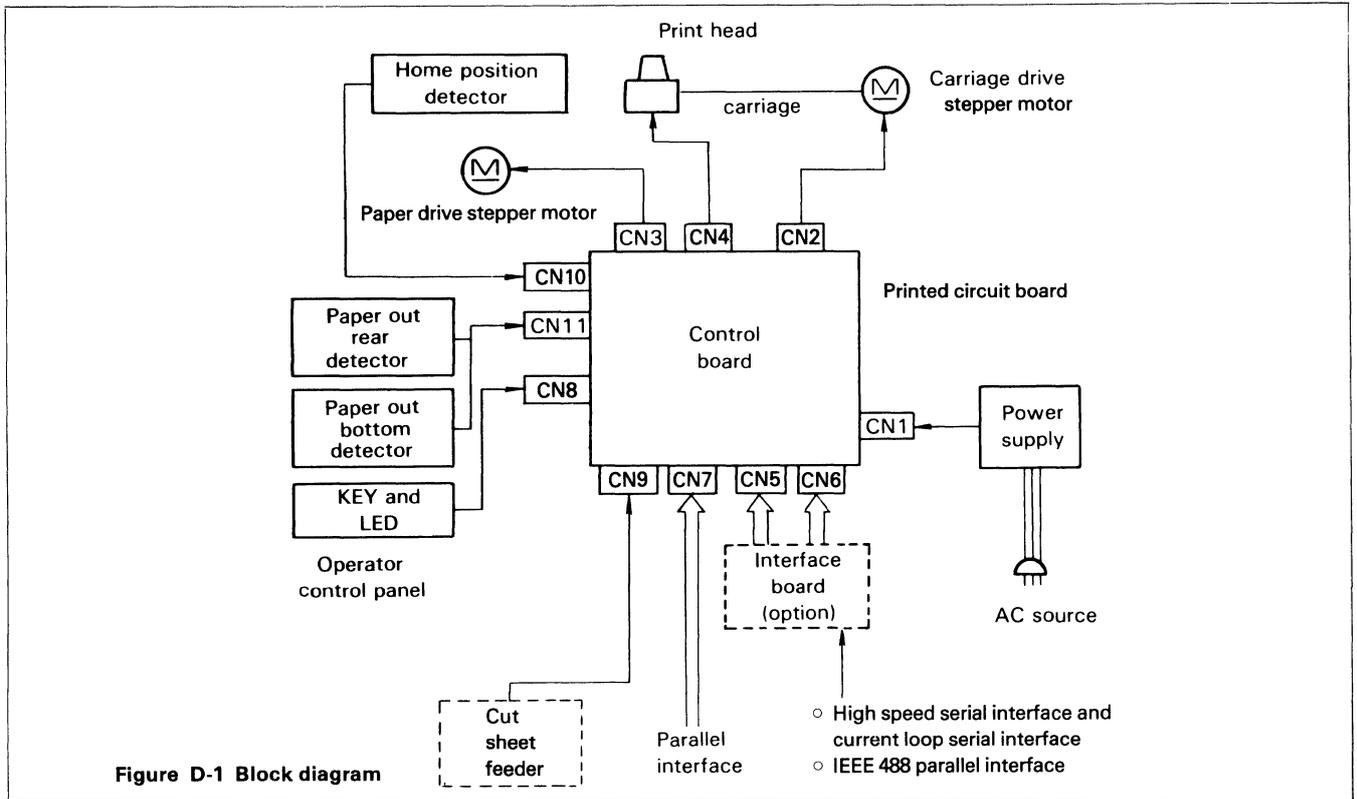
APPENDIX C INTERFACE TIMING CHART

1. Parallel Interface Timing Chart



Note: T Minimum: $150\mu\text{s}$
Maximum: Printing, carriage return and line spacing time

APPENDIX D BLOCK DIAGRAM



APPENDIX E FUNCTIONS OF SWITCHES, BUTTONS, AND OTHERS

Remove the upper cover for operation of these switches and buttons.
(Refer to paragraph 4.6)

1. DIP Switches

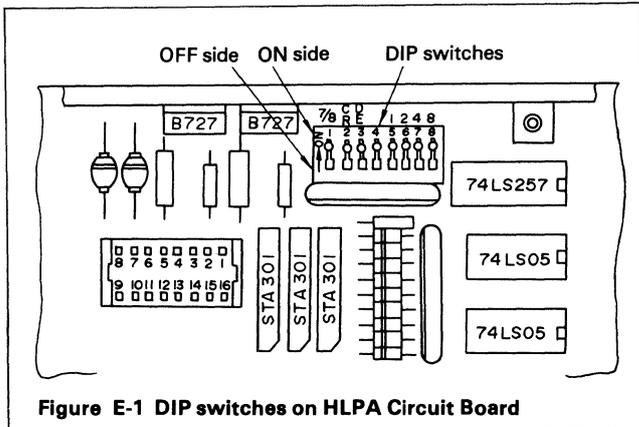


Table E-1 DIP Switches on HPLA Circuit Board

DIP Switch (SW1)		ON	OFF
No.	Silk-screen print		
1	7/8	7 bits	8 bits
2	CR	As CR is received, printer prints, automatically returns carriage, and moves paper up one line.	As CR is received, printer prints, and automatically returns carriage.
3	DE	As DEL code is received, printer prints ■.	Printer ignores DEL code.
4		Unused	
5	1	Character sets Refer to Table E-2	
6	2		
7	4		
8	8		

Functions in the tables below can be selected by setting and combinations of DIP switches on PC board. The DIP switch names and numbers are indicated on PC board by silk-screen print.

Table E-2 Table of Character Sets

No.	DIP switch (SW1)				Kind
	SW 5	SW 6	SW 7	SW 8	
1					US ASCII
2	ON				JIS (with graphic)
3		ON			BRITISH
4	ON	ON			GERMAN
5			ON		FRENCH
6	ON		ON		SWEDISH
7		ON	ON		DANISH
8	ON	ON	ON		NORWEGIAN
9				ON	DUTCH
10	ON			ON	ITALIAN
11		ON		ON	TRS-80
12	ON	ON		ON	Unused
13			ON	ON	Unused
14	ON		ON	ON	Equivalent to JIS
15		ON	ON	ON	JIS (without graphic)
16	ON	ON	ON	ON	Option

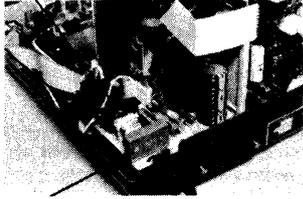
Note: "ON" means that SW is at ON position.

2. Breaker

A built-in breaker is mounted on the power source circuit board on the rear right of the printer, to protect the printer from the input current.

When the breaker opens, all the operation of printer halts. Check the causes and take appropriate measures, then, push the button and reset the breaker.

Power source voltage select switch



Breaker (200 V type)



Breaker (For 115 V)

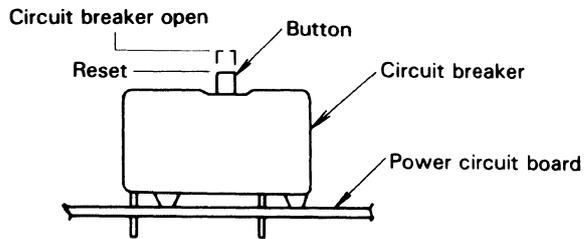


Figure E-2 Breaker and Power Switch

3. Power Source Voltage Select Switch

A sliding switch for power source voltage selection is mounted on the power source circuit board on the rear right of the printer. Set the switch according to a.c. input voltage, as follows: (Refer to figures E-2 and E-3)

Model	Power Source Voltage Select Switch Position	AC input voltage
200 V		220 V
		230 V 240 V

Figure E-3

APPENDIX F DESCRIPTION OF FUNCTIONS

1. Character Sets

Any of the 10 kinds of character sets shown in Table E-2 can be selected by combination of the DIP switch SW1 (5, 6, 7, 8) on the operating panel circuit board.

Character and graphic allocations are as shown in Table F-1. The optional character set can be selected by replacing the standard character generator with a character generator containing the desired characters.

Table F-1

Kind	8 bits		7 bits	
	b ₈ =0	b ₈ =1	SI side	SO side
Standard (US ASCII ~ TRS-80)	Alphanumeric symbols, lower case	Graphic	Alphanumeric symbols, lower case	Graphic
Option	Characters (94)	Characters (94)	Characters (94)	Characters (94)

2. Data Receiving and Printing System

Conditions for printing start, carriage return and line change are as follows:

- (1) CR only is received: Ignored.
- (2) LF only is received: Line spacing only.
- (3) Data and LF are received: The printer prints data, moves the paper up one line, and automatically returns the carriage.
- (4) Data and CR are received: As shown in the table below:

DIP SW1 (2) on operating panel	Operation
ON	After printing data, the printer moves the paper up one line, and returns the carriage automatically.
OFF	After printing data, the printer returns the carriage automatically, but does not move the paper up.

- (5) Data, CR, and LF are received: As shown in the table below:

DIP SW1 (2) on operating panel	Operation
ON	After printing data, the printer returns the carriage automatically, and moves the paper up two lines.
OFF	After printing data, the printer returns the carriage automatically, and moves the paper up one line.

- (6) Data, LF, and CR are received: The printer prints data, moves the paper up one line, and automatically returns the carriage.
- (7) FF only is received: Form feed
- (8) VT and channel numbers are received: Vertical tab operation.
- (9) Data and FF are received: Form feed after printing
- (10) Data, VT, and channel number are received: Vertical tab operation after data printing

- Note:*
- 1) Any code not listed in the character set table is ignored.
 - 2) The number of data characters is 136 or less (10 CPI), or 163 or less (12 CPI), or 231 or less (17 CPI).
 - 3) If the number of data characters is more than can be printed in a line, that is, 137 (10 CPI) or more, 164 (12 CPI) or more, or 232 (17 CPI) or more, the excess characters are automatically carried over to the next line. In the CQ mode, no automatic CR or LF is performed. (See paragraph 9.1.)

(1) Description of operation example 1

After printing 5 lines and receiving channel No. 1, the paper stops after spacing 4 (9-5) lines. Then, after printing 10 lines and receiving channel No. 3, the paper stops after spacing 35 (15-10+30) lines.

(2) Description of operation example 2

After printing 5 lines and receiving channel No. 2, the paper stops after spacing 19 (9-5+15) lines. Then, after printing 15 lines and receiving channel No. 1, the paper stops after spacing 17 (30-15+2) lines.

3.3 Direct skip function

If any of the following function codes is received, the paper will be fed as many lines as the number selected.

ESC, VT, X1, X2

X1 and X2 are digits, 0 through 9, representing the number of lines to be skipped. Any number from 0 to 99 can be selected by combination of X1 and X2.

4. Top of Form (TOF) Function

The top of form function refers to a function by which the printer, upon receiving the FF code after format length and top of form have been set as mentioned in paragraphs 4.1 and 4.2, rapidly feeds the paper up to the top of form of the next format.

4.1 Format length setting

Select a format length (page length) with the rotary switch on the operating panel or by function codes.

4.2 Top of form (TOF) position setting

The first printing line can be set by depressing the TOF SET switch after selection of a format length with the rotary switch mentioned as 4.1 or selecting the codes ESC and 5.

The paper position where the TOF switch is depressed or the specified codes are applied will be the top of form. Format length is also selected at the same time, and remains unchanged until the switch is depressed again or the specified codes are applied. Therefore, format length does not change only by switching the rotary switch.

Note: 1) Immediately after power is switched on, the format length represented by the rotary switch position at that time is selected, and the paper position at that time is the TOF position.

2) If current pitch is changed before a page is finished, the number of lines selected is counted by the number of line space before changing until the top of form position is reached. It is from the next page that the count of lines at the newly selected line space pitch begins.

(1) Selection with the rotary switch

Any of the 10 format lengths shown in Table 4-2 can be selected.

(2) Selection-1 by function codes

A format length can be selected by inputting the following codes from the outside: ESC, F, X1, X2

X1 and X2 are digits, 0 through 9, representing the number of lines per page. Any number from 0 to 99 can be selected by the combination of X1 and X2.

Note: 1) The rotary switch is ineffective if function codes are used for format length selection. The rotary switch is made effective again by applying the function codes ESC, F, O, and 0.

2) Immediately after power is switched on, the format length represented by the rotary switch position at that time is selected.

(3) Selection-2 by function codes

A format length can be selected by inputting the following codes from the outside: ESC, G, X1, X2. Setting is in 0.5 inch graduations.

X1 and X2 are digits, 0 through 9. The number of lines per page is represented by combination of $X1 \times 0.5$ and $X2 \times 0.5$.

Note: The rotary switch is ineffective if function codes are used for format length selection. The rotary switch is made effective again by applying the function codes ESC, G, O, and 0.

5. Character Pitch Selection

The number of characters per inch in a line can be changed by using the following function codes (this applies to both characters and graphics, and character width changes proportionately):

- (1) RS: 10 CPI
- (2) GS: 12 CPI
- (3) FS: 17 CPI

Character pitch is changed by the function codes after a line, not half-way in a line.

If the function codes for character pitch change come continuously in a line, the last function code is valid. (the code is valid from the next line).

6. Enlarged Character Printing Function

Double-width characters are printed when the following function code is received:

US: Double-width character printing start code

- (1) 5 CPI (from 10 CPI)
- (2) 6 CPI (from 12 CPI)
- (3) 8.5 CPI (from 17 CPI)

Enlarged character printing can be stopped by an RS (for 10 CPI), GS (for 12 CPI), or FS (for 17 CPI) code input.

Switching is possible by the unit of character, before the line is finished.

- Note:*
- 1) if 10 CPI is enlarged and released by the code GS (or FS), the next line will be 12 (or 17) CPI and the enlarged part of it will be 6 (or 8.5) CPI.
 - 2) If enlarged character printing exceeds the line length, the last character of the line will automatically be printed in normal size. However, the enlarged mode continues until release code is applied.

7. Line Space Change

Line space is changed when the following continuous codes are received:

- (1) ESC, 6: 6 LPI (0.166 inch line spacing)
- (2) ESC, 8: 8 LPI (0.125 inch line spacing)
- (3) ESC, %, 9, X1: X1/144 inch line spacing

Note: 1) X1 is a binary number between 0 and 127.

2) If X1 is specified as 0, the X1/144-inch line spacing is cancelled and the previous specification (6 LPI or 8 LPI) is applied instead.

8. APA Graphic Function

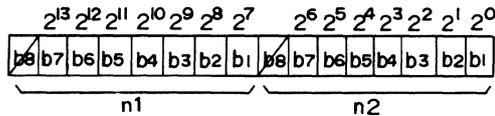
- (1) APA printing with half dots (printing speed 100 CPS)



- (2) APA printing without half dots (printing speed 120 CPS)



Note: 1) N1 and N2 are linked 2-byte binary numbers, and b8 is not used. (In case of 8-unit code system, set 0 to bit 8.) Refer to Table F-3 for maximum value setting.

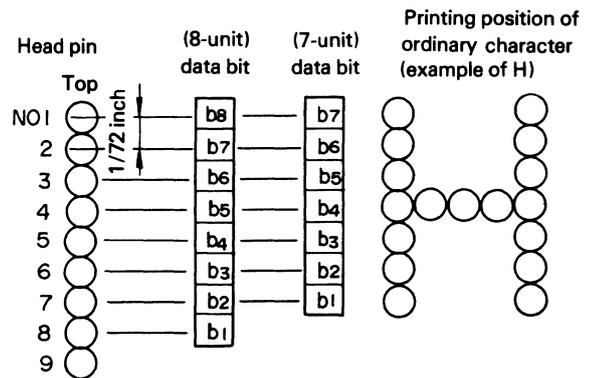


Example: With 546 dot line

	b8	b7	b6	b5	b4	b3	b2	b1	b8	b7	b6	b5	b4	b3	b2	b1
7-unit system	/	0	0	0	0	1	0	0	/	0	1	0	0	0	1	0
8-unit system	0	0	0	0	0	1	0	0	0	0	1	0	0	0	1	0

2) This function is ineffective in the incremental mode.

8.1 Correspondence between print head pin and interface data bit



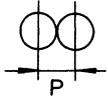
8.2 Horizontal pitch

(1) Specification of ESC % 1



	P
10 CPI	1/120 inch
12 CPI	1/144 inch
17 CPI	1/204 inch

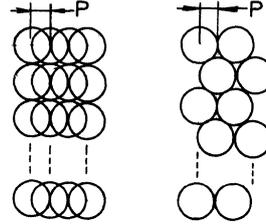
(2) Specification of ESC % 2



	P
10 CPI	1/60 inch
12 CPI	1/72 inch
17 CPI	1/102 inch

8.3 Notes on APA graphic Function

- (1) When APA printing of half dots ESC % 1 is specified, avoid continuous printing at the minimum unit of horizontal pitch because printing density is reduced.



Undesirable printing

Desirable printing

- (2) The maximum printing dot line numbers in the line including APA graphic are as follows.

Table F-3 Character-to-Character Space

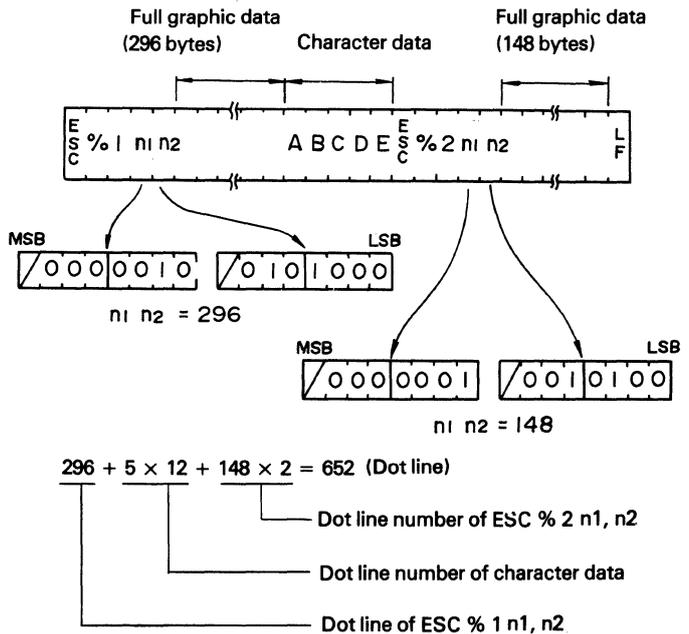
Printing pitch	ESC, % 1	ESC, % 2
10 CPI	1632	816
12 CPI	1956	978
17 CPI	2048	1024

(Dot line)

Computing method of dot line number in the line of mixed printing of ESC % 1, ESC % 2, and character codes.

- Specification of ESC % 1, n1 and n2
Dot line of n1, n2
- Specification of ESC % 2, n1, n2
Dot line of n1, n2 doubled
- Character code: 12 dot lines per character
- Extension character code: 24 dot lines per character

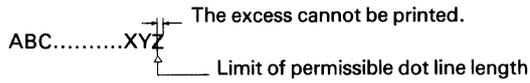
Example of data



Values given in the column for ESC % 1 specification in Table F-3 are applied for the maximum printing dot line number for one line.

For the widths (number of dots) of CQ mode characters, see Appendices I and J.

- (3) Data exceeding the maximum printing dot line number is received and discarded, and the printing operation starts when printing start code (CR, LF ... etc.) is received.



9. Correspondence Quality (CQ) Printing Function

Only in this printing, proportional spacing is carried out.

ESC1 CQ printing is performed for the data after this command.

- Note:*
- 1) In the incremental mode, this function cannot be used.
 - 2) A line is printed by two passes (two-pass printing at a printing speed of 100 CPS).
 - 3) 96 types of data (20H to 7FH) can be used.

9.1 Notes on CQ printing start

- (1) The maximum number of characters per line in the CQ mode is determined by the total widths (number of dots) of the individual characters (see Appendices I and J). This total must not exceed the maximum number of dots per line shown in the ESC%1 column of Table F-3
- (2) Data exceeding the maximum printing dot line number is received and discarded, and the printing operation starts when printing start code (CR, LF, ... etc.) is received.

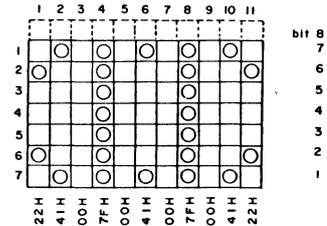
10. Downline Loadable CG Function

ESC % A C "C" is a code in the range of 20H to 5FH.

A one-character pattern is loaded into the downline loadable CG. Designate pseudo 11 × 7 pattern data after the C.

Note: The pattern data is pseudo 11 × 7 data.

Example: The method to load the following pattern for character '2' is as follows:



Loading method:

ESC % A 2 22H 41H 00H 7FH 00H 41H 00H 7FH 00H 41H 22H*

Note: After 22H marked with * is loaded, the downline loadable CG mode is automatically cancelled.

11. Underline Printing Function

ESC C: Designates underline printing for the data after this command.

ESC D: Cancels underline printing for the data after this command.

12. Superscript/Subscript Printing Function

ESC J: Designates superscript printing for the data after this command.

ESC K: Cancels superscript printing for the data after this command.

ESC L: Designates subscript printing for the data after this command.

ESC M: Cancels subscript printing for the data after this command.

- Note:*
- 1) In the incremental mode, this function cannot be used.
 - 2) Superscript printing and subscript printing cannot be designated at a time.
 - 3) Emphasized printing cannot be designated.

13. Emphasized Printing Function

ESC H: Designates emphasized printing for the data after this command (with 1/144 inch line spacing).

ESC I: Cancels emphasized printing for the data after this command.

ESC T: Designates emphasized printing for the data after this command (overlap printing).

- Note:*
- 1) ESC H and ESC T cannot be used at a time on a line.
 - 2) In the incremental mode, this function cannot be used.

14. Incremental Printing Function

ESC O: Designates the incremental mode for the printing after this command.

ESC P: Cancels the incremental mode for the printing after this command.

- Note:*
- 1) The incremental mode cannot be designated or cancelled before a line is finished.
 - 2) This function is not provided for CQ, APA, and emphasized printing.

15. Horizontal Tab

Example of loading: ESC HT n1, n2, ..., nm CR

n1 to nm are three-digit integers, and m is 16 or less.

ESC HT CR: HT memory clear

APPENDIX G FUNCTION CODES

Table G-1 Table of Function Codes

Command	Function code		Description
	Decimal	Hexadecimal	
LF	10	0A	Moves paper up one line.
CR	13	0D	Returns carriage.
FF	12	0C	Feeds paper to the first line of next form (TOF: top-of-form)
VT 31H to 3CH	11 49 to 60	0B 31 to 3C	Feeds paper to tab position of same channel number as set in VFU.
HT	9	09	Take space up to the next HT position
BS	8	08	Take one character backspace. Valid in the incremental mode only.
DC1	17	11	Sets the printer in select (on-line) condition.
DC3	19	13	Releases the printer from select condition, and sets it in de-selected (off-line) condition.
DC4	20	14	Loads tab position in VFU.
RS	30	1E	Designates 10 CPI.
GS	29	1D	Designates 12 CPI.
FS	28	1C	Designates 17 CPI.
US	31	1F	Designates wider characters.

Command	Function Code		Description
	Decimal	Hexadecimal	
SO	14	0E	Shifts out character set in case of 7-bit code.
SI	15	0F	Shifts in character set in case of 7-bit code.
CAN	24	18	Clears buffer. Invalid in the incremental mode.
ESC · 0	27 · 48	1B · 30	Designates the ordinary character generator. The printer turns into this mode when the power is turned on or the I-PRIME signal is received.
ESC · 1	27 · 49	1B · 31	Designates the character generator for CQ.
ESC · 2	27 · 50	1B · 32	Designates the character generator for downline loadable character generator.
ESC · 5	27 · 53	1B · 35	Set TOF (first line of printing).
ESC · 6	27 · 54	1B · 36	Designates 6 LPI.
ESC · 8	27 · 56	1B · 38	Designates 8 LPI.
ESC · C	27 · 67	1B · 43	Attaches an underline to the characters after this command.
ESC · D	27 · 68	1B · 44	Prints the characters after this command without underline.

Table G-1 (con.)

Command	Function code		Description
	Decimal	Hexadecimal	
ESC · F · 0.0 to 9.9	27 · 70 48 · 48 to 57 · 57	1B · 46 30 · 30 to 39 · 39	Designates the number of lines per page length.
ESC · G 0.0 to 9.9	27 · 71 48 · 48 to 57 · 57	1B · 47 30 · 30 to 39 · 39	Designates the length of line spacing per page. The length is N/2 inches.
ESC · H	27 · 72	1B · 48	Designates emphasized printing for the characters after this command (with 1/144 inch line spacing).
ESC · I	27 · 73	1B · 49	Cancels emphasized printing for the characters after this command.
ESC · J	27 · 74	1B · 4A	Designates superscript printing for the characters after this command.
ESC · K	27 · 75	1B · 4B	Cancels superscript printing for the characters after this command.
ESC · L	27 · 76	1B · 4C	Designates subscript printing for the characters after this command.
ESC · M	27 · 77	1B · 4D	Cancels subscript printing for the characters after this command.

Command	Function code		Description
	Decimal	Hexadecimal	
ESC · N n	27 · 78 · 1 to 11	1B · 4E 01 to 0B	Designates the number of character-to-character spaces for dot expansion line. "n" is a binary number of max. 11 (OB _H).
ESC · V	27 · 86	1B · 56	Designates single CSF exhaust.
ESC · S	27 · 83	1B · 53	Designates single CSF inhalation.
ESC · T	27 · 84	1B · 54	Designates emphasized printing for the characters after this command (without 1/144 inch line spacing).
ESC · % · 1 n1 · n2	27 · 37 · 49 n1 · n2	1B · 25 · 31 n1 · n2	Designates start of full graphic printing with half dots. "n1" and "n2" are the numbers of graphic codes.
ESC · % · 2 n1 · n2	27 · 37 · 50 n1 · n2	1B · 25 · 32 n1 · n2	Designates start of full graphic printing without half dots. "n1" and "n2" are the numbers of graphic codes.
ESC · % · 9 n3	27 · 37 · 57 n3	1B · 25 · 39 n3	Designates line spacing of 1/144 inch multiplied by "n3." n3 ≤ 127
ESC · % · A C	27 · 37 · 65 C	1B · 25 · 41 C	Loads a one-character pattern into the downline loadable CG. "C" is a code in the range of ^ 20 to ^ 5F.

Table G-1 (con.)

Command	Function code		Description
	Decimal	Hexadecimal	
ESC · VT · 0.0 to 9.9	27 · 11 48 · 48 to 57 · 57	1B · 0B 30 · 30 to 39 · 39	Directly skips as many as the designated number of lines.
ESC · HT n · CR	27 · 9 n · 13	1B · 09 n · 0D	Sets a tab in the HT memory.
ESC · O	27 · 79	1B · 4F	Designates incremental printing for the characters after this command.
ESC · P	27 · 80	1B · 50	Cancels incremental printing for the characters after this command.

Cautions on printing mode selection:

1. A dot expansion line means on-line data stored as dot patterns in the 2K-byte RAM when the line includes CQ characters or APA printing.
2. Refer to Table F-3 for the number of printable dots of a dot expansion line.
3. A line including CQ characters of full graphic printing (with half dots) is printed only in the forward direction at a printing speed of 100 CPS.

4. A line including full graphic printing (without half dots) is printed only in the forward direction at a printing speed of 120 CPS.
5. If emphasized printing, special graphic character printing, or superscript/subscript printing is designated, the printing direction becomes forward only.
6. If the incremental mode is designated, the printing direction becomes forward only, and emphasized printing, CQ character printing, superscript/subscript printing, and full graphic printing cannot be designated.
7. In superscript/subscript printing, emphasized printing cannot be designated.
8. Superscript/subscript printing designation and underline designation are reset every time the line is changed.
9. In a dot expansion line, horizontal tab cannot be set.
10. If character generator selection is erroneous, designation of printing mode is not guaranteed.

		SI Side							SO Side									
		b7	0	0	0	0	1	1	1	1	0	0	0	0	1	1	1	1
		b6	0	0	1	1	0	0	1	1	0	0	1	1	0	1	1	1
		b5	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1
b4b3b2b1	R C	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F	
0000	0			SP	0	Ⓜ	P	Ⓡ	p			≡	✕	—	┌			
0001	1		DC1	!	1	A	Q	a	q	DC1		⌘	円	—	└			
0010	2			"	2	B	R	b	r			≡	年	—	┌			
0011	3		DC3	Ⓛ	3	C	S	c	s	DC3		≡	月	—	┌			
0100	4		DC4	\$	4	D	T	d	t	DC4		▴	日	—	└			
0101	5			%	5	E	U	e	u			▴	時	—	└			
0110	6			&	6	F	V	f	v			▴	分	—	└			
0111	7			'	7	G	W	g	w			▴	秒	—	└			
1000	8	BS	CAN	(	8	H	X	n	x	BS	CAN	♠	+	—	└		
1001	9	HT		)	9	I	Y	i	y	HT		♥	Y	—	└		
1010	A	LF		*	:	J	Z	j	z	LF		♦	人	—	└			
1011	B	VT	ESC	+	;	K	Ⓛ	k	Ⓢ	VT	ESC	♣	♪	—	└			
1100	C	FF	FS	,	<	L	Ⓛ	l	Ⓣ	FF	FS	●	÷	—	└			
1101	D	CR	GS	—	=	M	Ⓜ	m	Ⓛ	CR	GS	○	+	—	└			
1110	E	SO	RS	.	>	N	Ⓝ	n	Ⓛ	SO	RS	▤	⊞	—	└			
1111	F	SI	US	/	?	O	—	o	DEL	SI	US	▤	SP	+	└			

Note: For TRS-80 even when the input code of "DEL" is input, it is processed as a space when printing.

Language	1	2	3	4	5	6	7	8	9	10	11
US ASCII	#	@	|	\	|			|	|	|	~
BRITISH	£										
GERMAN		§	Ä	Ö	Ü			ä	ö	ü	ß
FRENCH	£	à	•	ç	§			é	ù	è	é
SWEDISH		É	Ä	Ö	Å	Ü	é	ä	ö	å	ü
DANISH			Æ	Φ	Å	Ü		æ	ø	å	ü
NORWEGIAN			Æ	Φ	Å		•	æ	ø	å	
DUTCH	£			IJ						ij	
ITALIAN	£	§	•	ç	é		ù	à	ò	è	ì
TRS-80			|	|	—	—					—

Note: Differences among languages (Same as US ASCII if blank)

Figure H-2 Character Set (Standard 7 Bits)

APPENDIX I PROPORTIONAL CHARACTERS

Table I-1 Table of Proportional Character Codes

Hex code	20	21	22	23	24	25	26	27
Char	SP	!	"	#	\$	%	&	'
Width	12	8	10	12	12	12	12	8
Hex code	28	29	2A	2B	2C	2D	2E	2F
Char	()	*	+	,	-	.	/
Width	8	8	10	10	8	10	8	10
Hex code	30	31	32	33	34	35	36	37
Char	0	1	2	3	4	5	6	7
Width	12	12	12	12	12	12	12	12
Hex code	38	39	3A	3B	3C	3D	3E	3F
Char	8	9	:	;	<	=	>	?
Width	12	12	8	8	10	10	10	10
Hex code	40	41	42	43	44	45	46	47
Char	@	A	B	C	D	E	F	G
Width	12	12	12	11	12	12	12	12
Hex code	48	49	4A	4B	4C	4D	4E	4F
Char	H	I	J	K	L	M	N	O
Width	12	8	12	12	12	12	12	12

Hex code	50	51	52	53	54	55	56	57
Char	P	Q	R	S	T	U	V	W
Width	12	12	12	12	12	12	12	12
Hex code	58	59	5A	5B	5C	5D	5E	5F
Char	X	Y	Z	[\]	^	_
Width	12	12	10	8	10	8	10	12
Hex code	60	61	62	63	64	65	66	67
Char	`	a	b	c	d	e	f	g
Width	8	12	12	12	12	12	10	12
Hex code	68	69	6A	6B	6C	6D	6E	6F
Char	h	i	j	k	l	m	n	o
Width	12	8	8	12	8	12	12	12
Hex code	70	71	72	73	74	75	76	77
Char	p	q	r	s	t	u	v	w
Width	12	12	11	12	11	12	12	12
Hex code	78	79	7A	7B	7C	7D	7E	7F
Char	x	y	z	{	|	}	~	DEL
Width	12	12	10	8	8	8	10	12

Table I-2 Widths (Number of Dots) of Proportional Characters

8 dots							
Char	Hex code	Char	Hex code	Char	Hex code	Char	Hex code
!	21	.	2E	]	5D	|	7B
,	27	:	3A	`	60	|	7C
(	28	;	3B	i	69	|	7D
)	29	|	49	j	6A		
,	2C	|	5B	|	6C		

10 dots						11 dots	
Char	Hex code	Char	Hex code	Char	Hex code	Char	Hex code
"	22	<	3C	\	5C	C	43
*	2A	=	3D	^	5E	r	72
+	2B	>	3E	f	66	t	74
-	2D	?	3F	z	7A		
/	2F	Z	5A	~	7E		

12 dots							
Char	Hex code	Char	Hex code	Char	Hex code	Char	Hex code
SP	20	@	40	Q	51	g	67
#	23	A	41	R	52	h	68
\$	24	B	42	S	53	k	6B
%	25	D	44	T	54	m	6D
&	26	E	45	U	55	n	6E
0	30	F	46	V	56	o	6F
1	31	G	47	W	57	p	70
2	32	H	48	X	58	q	71
3	33	J	4A	Y	59	s	73
4	34	K	4B	-	5F	u	75
5	35	L	4C	a	61	v	76
6	36	M	4D	b	62	w	77
7	37	N	4E	c	63	x	78
8	38	O	4F	d	64	y	79
9	39	P	50	e	65	DEL	7F

APPENDIX J PROPORTIONAL CHARACTERS (VARIOUS LANGUAGES)

**Table J-1 Table of Proportional Character Codes
(Various Languages)**

Hex code		23	40	5B	5C	5D	5E	60	7B	7C	7D	7E
Language												
US ASCII	Char	#	@	[	\	\]	^	{	|	}	~
	Width	12	12	8	10	8	10	8	8	8	8	10
BRITISH	Char	£										
	Width	12										
GERMAN	Char	§	Ä	Ö	Ü			ä	ö	ü	ß	
	Width	10	12	12	12			12	11	12	12	
FRENCH	Char	£	à	.	ç	§		é	ù	è	ê	
	Width	12	12	8	12	10		12	12	12	12	
SWEDISH	Char	É	Ä	Ö	Å	Ü	é	ä	ö	å	ü	
	Width	12	12	12	12	12	12	12	12	11	12	12
DANISH	Char		Æ	Φ	Å	Ü		æ	ø	å	ü	
	Width		12	12	12	12		12	12	12	12	
NORWEGIAN	Char		Æ	Φ	Å		.	æ	ø	å		
	Width		12	12	12		8	12	12	12		
DUTCH	Char	£			IJ					ij		
	Width	12			12					12		
ITALIAN	Char	£	§	.	ç	é		ù	à	ò	è	ì
	Width	12	10	8	12	12		12	12	11	12	8

Table J-1 con.

Hex code		23	40	5B	5C	5D	5E	60	7B	7C	7D	7E
Language												
Equivalent to ASCII	Char			†	‡	—	—					—
	Width			10	10	12	12					12
JIS (with graphic)	Char				¥							—
	Width				12							12
JIS (without graphic)	Char				¥							—
	Width				12							12
Equivalent to JIS	Char			†	‡	—	—					—
	Width			10	10	12	12					12

Note: 1) Same as US ASCII if blank.

2) For the ASCII and JIS models, DEL (hex code: 7F) is processed as SP when printing.

**Table J-2 Widths (Number of Dots) of Proportional Characters
(Various Languages)**

8 dots	10 dots	11 dots	12 dots						
Char	Char	Char	Char						
i	†	‡	¥	É	Æ	£	è	æ	—
.	‡	ö	Ä	é	Φ	—	é	ø	—
	§		Å	Ü	IJ	ä	ù	ij	
			à	Ö	ç	å	ü	ß	

APPENDIX K PRINTING FORMAT

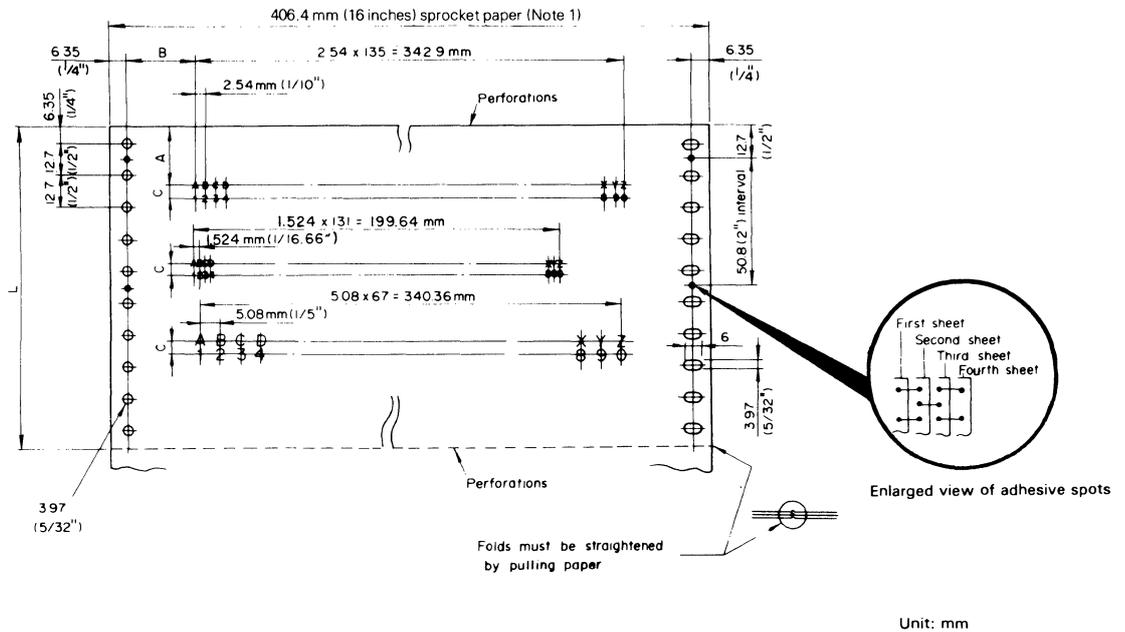


Figure K-1 Printing Format (Sprocket paper)

Note: 1) By mounting the tractor feed unit, sprocket paper ranging from 76.2 mm (3 inches) to 406.4 mm (16 inches) wide can be used.

2) L: Multiple of 25.4 mm (1 inch)

A: Leave 16.9 mm (or 4 line spaces at 6 LPI) blank before and after the perforations to avoid being affected by the perforations.

B: 25.4 mm (1 inch)
12.7 mm (0.5 inch) is also possible for paper 381 mm (15 inches) wide or less.

3) C: Line space of 4.23 mm (6 LPI) and 3.18 mm (8 LPI) can be selected.

4) Ream

a) One-part paper: 45 to 55 kg

b) Multiple-part paper

•Carbon-lined paper and pressure-sensitive paper with ream of 30 to 34 kg (35 to 40 g/m²) can be used for up to 4 sheets, including the original. With fixed pin platen, up to 3 sheets can be used.

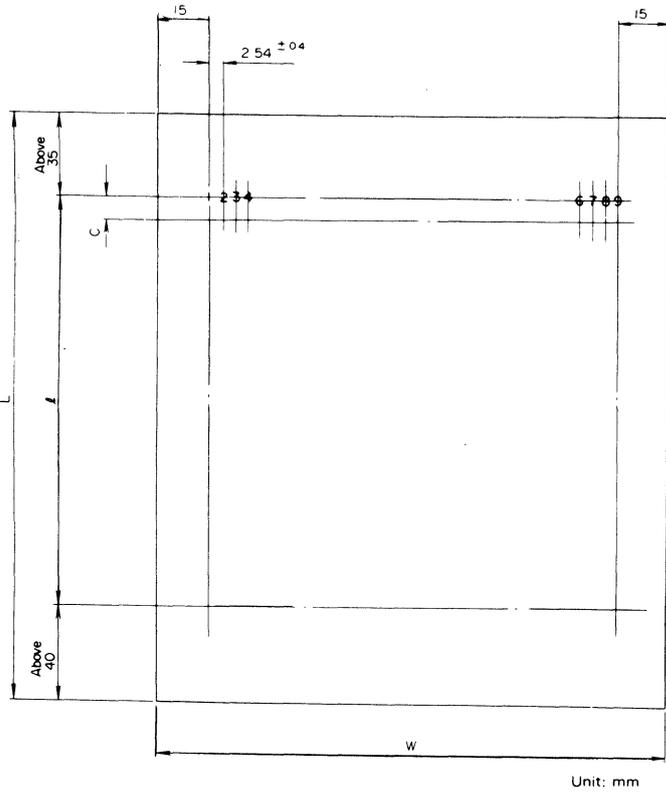
•Interleaf paper less than 45 kg (52 g/m²) per ream can be used for up to 3 sheets, including the original.

•Interleaf paper with ream of 30 kg (35 g/m²) can be used for up to 4 sheets, including the original. This is applicable when the tractor unit is used.

5) When fastening multiple-part paper, use adhesive spots or paper staples along both edges. Make sure that carbon copies are uniformly pasted and free of wrinkles.

6) The thickness of multiple-part paper must be 0.28 mm or less.

7) Right margin sprocket holes may be horizontally oval.



- Note: 1) Standard paper size: A4 (210×297 mm)
 2) Paper width W : From 210 to 381 mm (15 inches)
 3) Paper length L : Less than 300 mm
 4) Ream: 45 to 55 kg (52 to 64 g/m²)
 5) Line space pitch C : 4.23 mm (6 LPI) and 3.18 mm (8 LPI) selectable
 6) Paper must be free of folds and bends.
 7) Multiple-part paper cannot be used.

Figure K-2 Printing Format (Cut sheet)



SINCE 1881



OKI
electric
industry
company, Ltd.

International Divisions:
10-3, Shibaura 4-chome,
Minato-ku, Tokyo 108, Japan
Tel: (03) 454-2111
Telex: J22627
Cable: OKIDENKI TOKYO

**American Sales/
Services Support
Centre:**

Okidata Corporation
111 Gaither Drive
Mt. Laurel, New Jersey
08054, U.S.A.
Tel: 609-235-2600
Telex: (25) 710-897-0792

**European Sales/
Service Support
Centre:**

Oki Electric Europe GmbH:
Emanuel-Leutze str. 8
4000, Düsseldorf 11
West Germany
Tel: (0211) 592031
TLX: 8587218 OKI D

For further information, please contact;