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M-520119
ISSUE 4

MICROLINE 83A STANDARD DOT-IMPACT MATRIX LINE PRINTER

Maintenance Manual

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APPENDICES

1. INTRODUCTION

This maintenance manual is prepared for the maintenance personnel in the field, describing the MICROLINE 82A (referred to as ML 82A hereafter) as to its specifications, operating theory, and maintenance and troubleshooting procedures.

1.1 General

The ML 82A is a desk top, serial dot-impact matrix, receive only printer. The design is particularly suited to personal computer applications.

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

The main features are as follows:

(1) High-speed printing with 120 characters/second

(2) DESCENDER character printing possible

(3) High printing quality by subdividing space motor

(4) High throughput by bidirectional printing and shortest-distance printing

(5) Equipped with FF, VT, TOF functions

(6) Low noise

(7) Small in size, light in weight

(8) Low power consumption

(9) Simple design

(10) Graphic, reduced, and enlarged characters printable.

1.2.3 Block Diagram

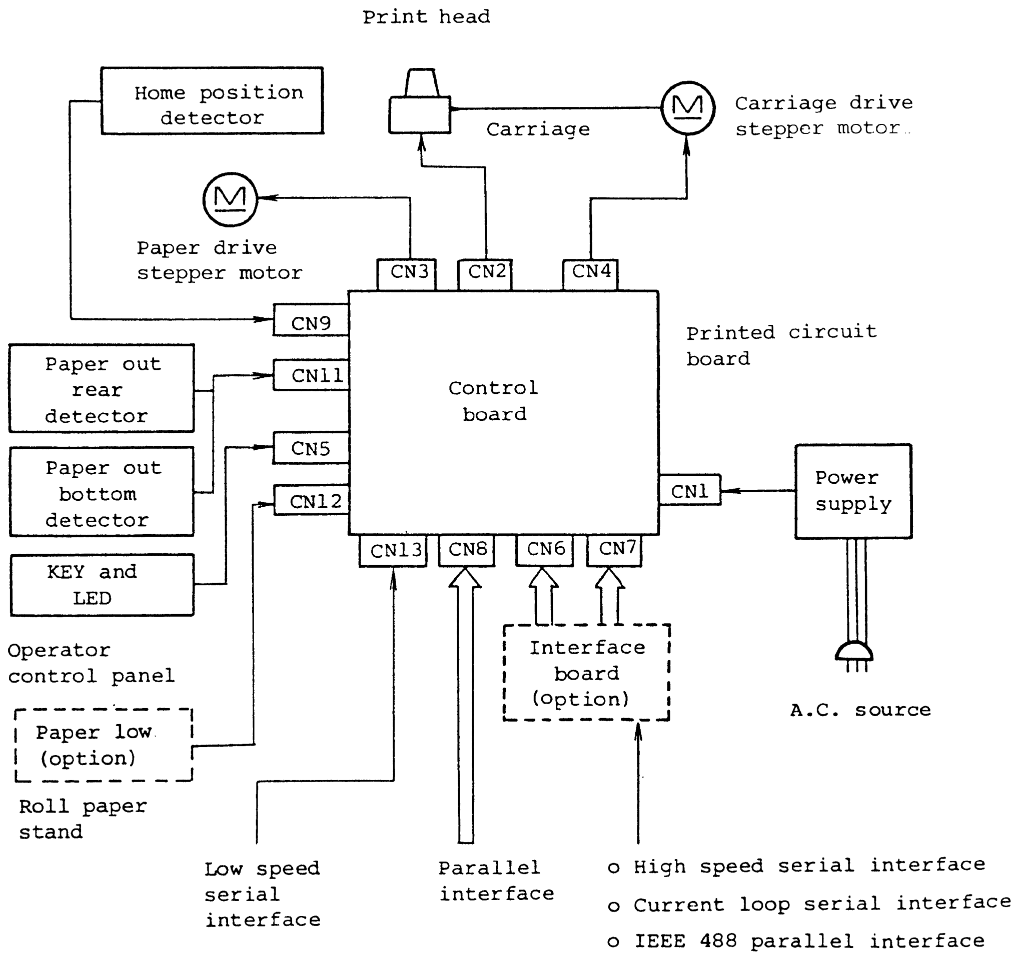


Fig. 1-4 Block Diagram

Option: Any character set is possible by replacing ROM for character generator at the place of use.

Character sets are shown in Appendix B.

(9) Character-to-character space — Changeable by function code (See paragraphs. 4.7 and 4.8)

5 CPI: 5.08 mm (0.200")

8.3 CPI: 3.05 mm (0.120")

10 CPI: 2.54 mm (0.100")

16.5 CPI: 1.52 mm (0.060")

(10) Maximum number of characters per line: Changeable by function code as shown in Table 2-2. (See paragraph 4.10)

Table 2-2

Mode	5 CPI	8.3 CPI	10 CPI	16.5 CPI
Long line mode	40 characters	66 characters	80 characters	132 characters
Short line mode	32 characters	53 characters	64 characters	106 characters

(11) Line space — Changeable by function code (See par. 4.9)

6 LPI: 4.23 mm (0.167")

8 LPI: 3.175 mm (0.125")

(12) Line change time

6 LPI: 115 ms

8 LPI: 95 ms

(13) Line change speed: 2 inch/second (in case of VT, FF)

(14) Paper feed control:

(a) With TOF (Top-of-Form) function

(b) With VT (Vertical Tabulation) function

(15) Paper feed direction: Rear paper feed and bottom paper feed (Rear paper feed only for friction feed)

(16) Paper feed system:

(a) Friction feed system:

(b) Fixed pin platen feed system: Platen for paper width of 241.3 mm (9.5")
Paper cutting with the paper-tear-off bar possible

(c) Tractor feed system: By mounting optional tractor unit, paper 76.2 mm (3.0") to 241.3 mm (9.5") wide can be loaded.

Dielectric strength: No damage is caused when the following voltage is impressed between the a.c. input line and the frame for one minute:

a) 115 V input type: 1,000 V a.c. (50/60 Hz)

b) 220/240 V input type: 1,500 V a.c. (50 Hz)

(26) Ambient temperature and relative humidity

	During operation	During non-operation	During storage
Temperature	5°C to 40°C	-10°C to 43°C	-40°C to 70°C
Humidity	20 to 90% RH	5 to 95% RH	5 to 95% RH

Note: 1) The equipment must be packaged during storage.

2) Packages must be kept free of dew.

(27) Vibration

During operation: Less than 0.3 G (10 Hz)

(28) Shock

During non-operation: Less than 3 G

(29) Noise 65 dB on the average as measured 1 meter from front of printer and 1 meter above the floor, when the printer is operating on a table 64 cm high. (This applies where characters are continuously printed with the printing test pattern in the printer, and average noise level measured by A-range FAST, at 10 CPI, 6 LPI. Graphics not included.)

2.2 Media Specifications

(1) Roll paper

Outside diameter: 128 mm maximum

Paper width: 208 mm to 216 mm

Core inside diameter: 25 mm

Ream: 45 to 55 kg (52 to 64 g/m^2)

Multiple-part paper cannot be used.

A printing format is shown in Appendix H-1.

(2) Single sheet

Standard paper size is A4 (210 mm wide, 297 mm long), but paper up to 215.9 mm (8.5") wide can be used.

Ream: 45 to 55 kg (52 to 64 g/m^2)

Multiple-part paper cannot be used.

(8) Ribbon life: 1.5 million to 2.0 million characters

The diagram number for the genuine OKI ribbon is 4LP-1322-5 (black).

2.4 Interface Specifications

The interface section of the printer can be used divided as shown below.

(1) Standard

(a) Parallel interface (Centronics-compatible interface)

(b) Low speed (L.S.) serial interface

(Based on RS-232-C; 1,200 BPS or less, OKI SIMPLEX BUSY protocol)

(a) or (b) can be selected with DIP switch (SW8) on the front operating panel circuit board. (See Table 4-5.)

(2) Options

(a) High-speed (H.S.) RS-232-C serial interface

(b) High-speed (H.S.) RS-232-C + current loop serial interface

(c) IEEE 488 parallel interface

2.4.1 Parallel Interface

(1) Connectors

Printer end: 36-pin receptacle, equivalent to 57-40360-12-D56 (Amphenol or Daiichi Electronics)

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

The arrangement of connector pins is as shown in Fig. 2-1.

(2) Cable

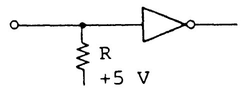
Use a cable less than 5 meters in overall length. (A shielded cable composed of twisted paired wires is recommended for noise prevention.)

(3) Parallel interface signal

Pin No.	Signal	Direction	Description
1	$\overline{\text{DATA STROBE}}$	To printer	Samples data from input device. Sampling effective at low level.
2	DATA BIT 1	To printer	
3	DATA BIT 2	To printer	
4	DATA BIT 3	To printer	

(5) Parallel interface circuits

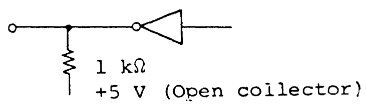
(a) Receiver



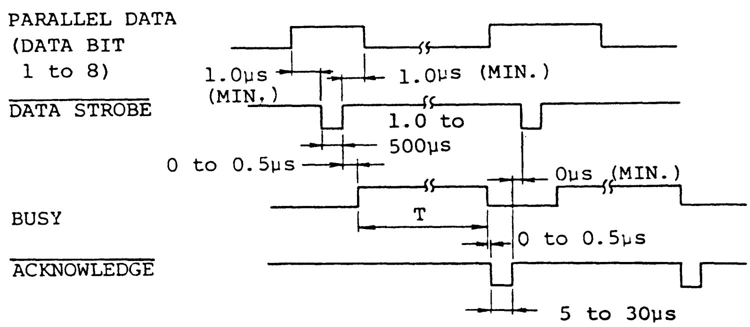
R = 1 kΩ (data lines, $\overline{\text{I-PRIME}}$)

R = 470Ω (DATA STROBE line)

(b) Driver



(6) Parallel interface timing chart



Note: T Minimum: 150μs
Maximum: Printing, carriage return, and line spacing time

2.4.2 Low-speed (L.S.) Serial Interface

The L.S. serial interface can be connected to a start-stop synchronized serial circuit.

Refer to paragraph 5.2.4. (2) for precautions regarding the operation of the L.S. serial interface.

The specifications of the L.S. serial interface are as shown below.

(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)

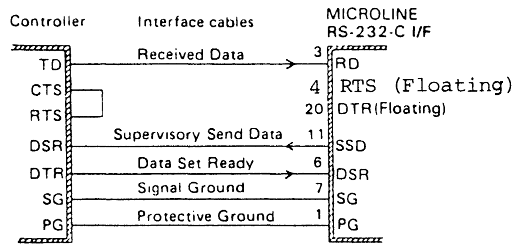
The arrangement of connector pins is as shown in Fig. 2-2.

4) Connection of L.S. serial interface

Handling of SSD signal with L.S. RS-232-C interface differs depending on types of interface on the controller end. Handle the SSD signals as follows:

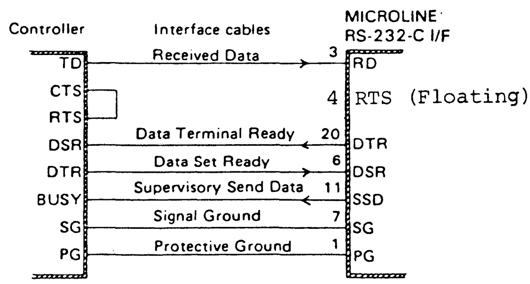
a) When controller does not have BUSY signal input:

Note: When handling SSD signal under this mode, set SW1 of SSD signal polarity on LEPV- circuit board at ON.



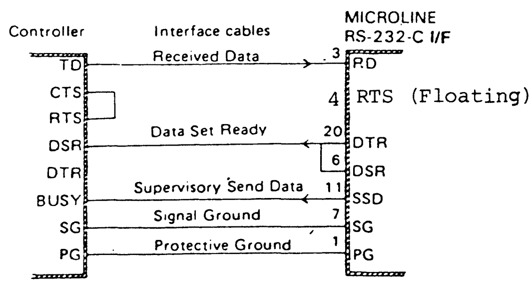
b) When controller has BUSY signal input:

Note: When handling SSD signal under this mode, set the SW1 of SSD signal polarity setting on LEPV-circuit board according to the polarity of BUSY signal on controller end. When this is ignored, characters will be missed, and normal receiving becomes impossible.



c) Handling of unused signals

i) When DTR signal is not used, make DTR signal floating:



(6) Polarity of SSD signal

Selectable with the DIP switch SW1 on the control circuit board (LEPV-). (See Table 4-7.)

(7) Transmitting speed setting

Any of the transmitting speeds can be selected with DIP switches SW2 to SW4. (See Table 4-7.)

(8) Synchronization and data composition

(a) Start-stop synchronous system (ASYNCHRONOUS)

(b) Start bit length: 1 bit

(c) Stop bit length: 1 bit or 2 bits

(d) Code unit number: 8 bits or 7 bits

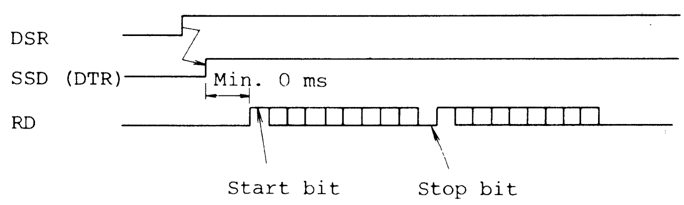
Selected by the DIP switch SW5 on the operating panel (See Table 4-5.)

(e) Parity bit: Existent or non-existent

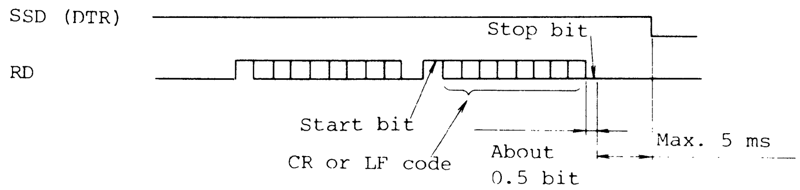
For parity bit setting, use the DIP switch SW6 on the control circuit board. (See Table 4-7.)

(9) L.S. serial interface timing chart

(a) Receive start timing chart



(b) Timing chart where the printer buffer is full



Note: 1) The above diagram applies when DIP switch SW1, shown in Table 4-7, is ON. If SW1 is OFF, the SSD signal has the opposite polarity.

2) A general formula showing the time of stopping the data transmission after sending the SSD signal from the printer end is shown below:

$$T = \frac{3,000\ (A + P + 2)}{B} + \frac{500}{B} - 5$$

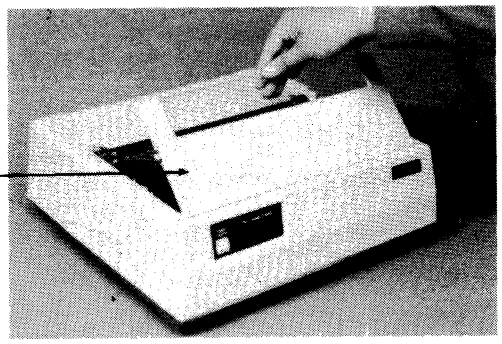
3. INSTALLATION PROCEDURE

3.1 Installation Procedure for Printer Operation

(1) Check the equipment for damage.

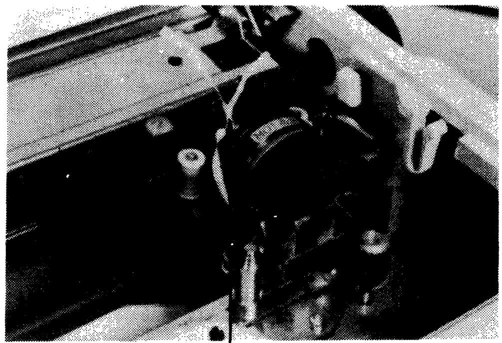
(2) Remove the access cover by holding center of cover and pulling upward.

Access cover



(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 Figs. 3-1 and 3-2.) The a.c. power switch must be in the OFF position. Cover the unused connector with the blank plate.



Fastener

NOTE

When the printer is shipped, the parallel interface is set. When used with low-speed serial interface, set the DIP switch SW8 on the front panel to ON. (Refer to Table 4-5.)

(5) Install ribbon. Refer to paragraph 3.6 for detailed instructions.

(6) Insert the paper and set to the first printing position. Refer to paragraph 3.7 for detailed instructions. When using sprocket paper, skip 16.5 mm (4 lines at 6 LPI) on each side of the perforated line.

(7) Set the FORM LENGTH rotary switch located on the front panel to the desired length. (Refer to paragraph 3.3.1)

(8) Turn the a.c. power switch to the OFF position and connect the a.c. input plug to an a.c. receptacle.

(9) Turn the a.c. power switch to the ON position and verify that the POWER and SEL LEDS illuminates.

CAUTION

1) Set the power source voltage select switch according to the power used (for 200 V type only) Refer to paragraph 4.17.4.

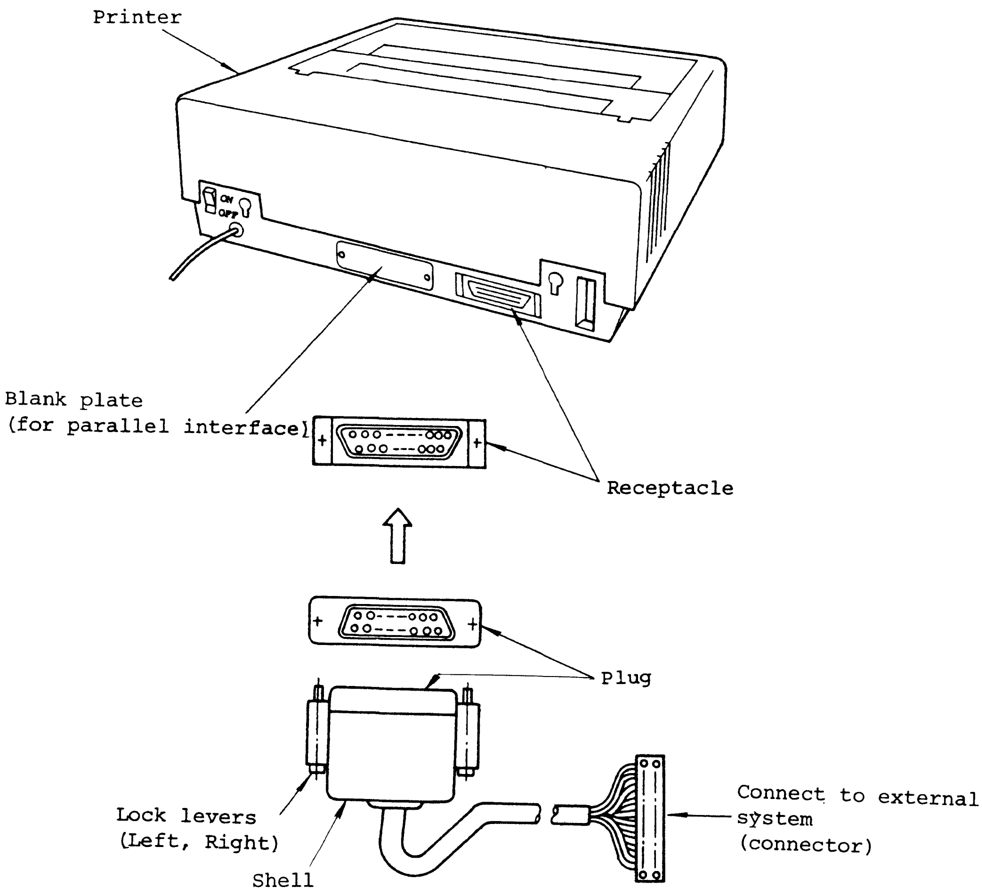


Fig. 3-2 Low Speed Serial Interface Connection Diagram

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.

Table 3-1 Operating Switches and LEDs

Name	Type	Location	Description
A.C. power	Alternate switch	Back panel	Switching a.c. 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.
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 condi tion, it will change to deselect.
SEL (Select)	LED (red)	Front panel	When the LED lights it indicates select condition, i.e. the printer is ready to receive data. 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.
FORM FEED	Momentary switch	Front panel	Valid in deselect condition. When this switch is depressed, paper is fed to the next top-of-form position.

Table 3-2 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	8 inches	48 lines	64 lines
7	11 inches	66 lines	88 lines
8	12 inches	72 lines	96 lines
9	14 inches	84 lines	112 lines

3.3.2 Page Length Feed

(1) If the printer is in the SELECT (on-line) state, depress the SEL switch to set the printer to the DESELECT (off-line) state. The SEL (on-line) LED goes off.

(2) Push the FORM FEED switch. The paper is then fed by the previously selected FORM LENGTH.

(3) Depress the SEL switch again to set the printer to the SELECT (on-line) state. The SEL (on-line) LED lights.

3.3.3 Line Feed

(1) If the printer is in the SELECT (on-line) state, depress the SEL switch to set the printer to the DESELECT (off-line) state. The SEL (on-line) LED goes off.

(2) Push the LINE FEED switch. The paper is then fed line-by-line.

(3) Depress the SEL switch again to set the printer to the SELECT (on-line) state. The SEL (on-line) LED lights.

3.3.4 Character Test-Pattern Printing

(1) Disconnect the interface cord.

(2) Depress the a.c. power switch to OFF.

(3) Depress the LINE FEED switch and hold.

(4) Depress the a.c. power switch to ON.

(5) Release the LINE FEED switch about 2 seconds later.

A continuous test pattern will be printed (see Appendix C). The printer automatically stops after printing the test pattern.

3.5 Roll Paper Stand Mounting

(1) Push the a.c. power switch to OFF.

(2) Insert the roll paper stand's hooks into the hook catch holes on the back of the printer, and push them down to lock the roll paper stand to the printer.

(3) Insert the plug on the left side of the roll paper stand into the receptacle in the left part of the back of the printer (for detecting paper low). The roll paper stand is now installed.

3.5.1 Roll Paper Stand Removal

Reverse the above procedure

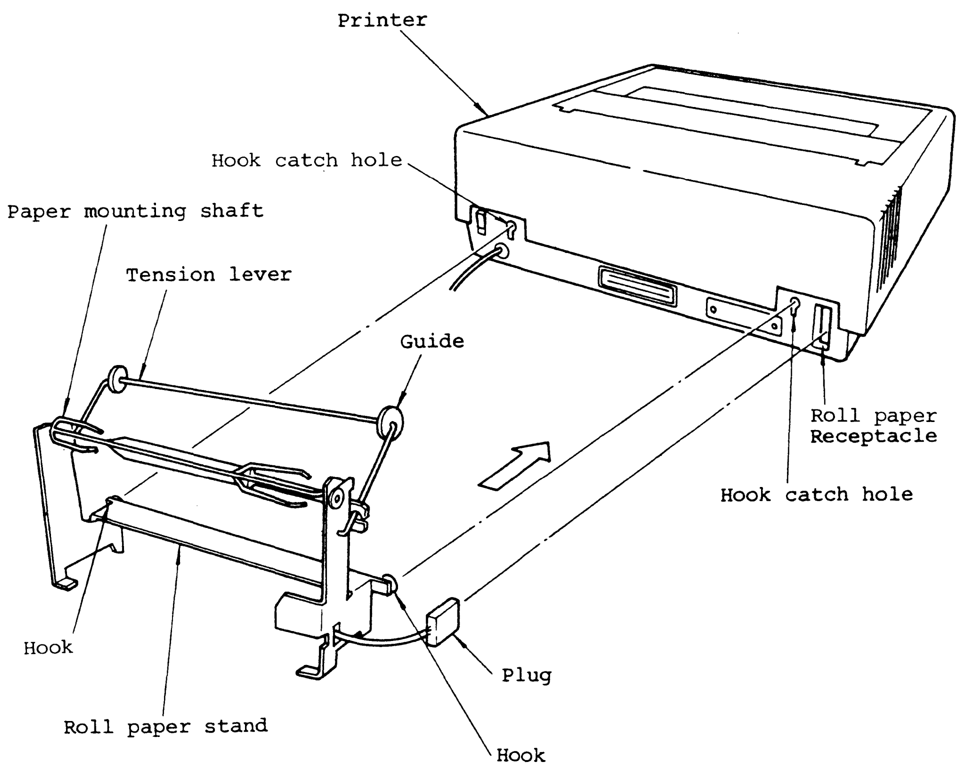


Fig. 3-5 Roll Paper Stand Mounting Method

(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 is not 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.

(9) Replace the access cover.

NOTE

1) Be careful not to deform the ribbon protector when loading the ribbon.

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

3.7 Paper Loading Procedure

Components related to paper loading are shown in Fig. 3-7.

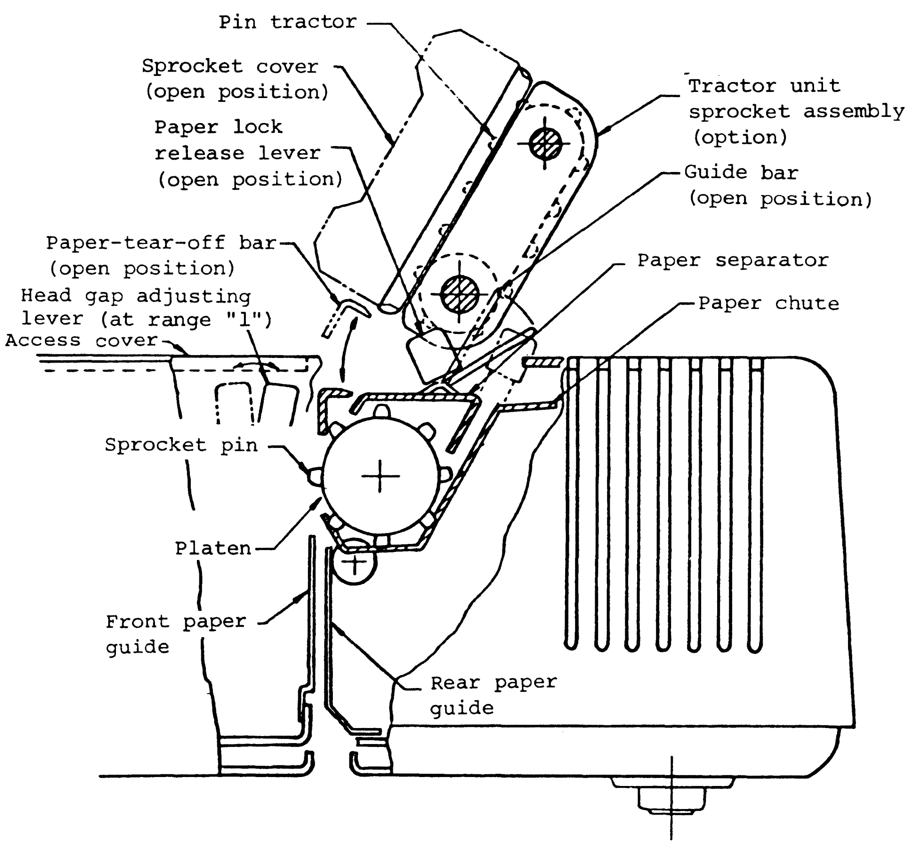
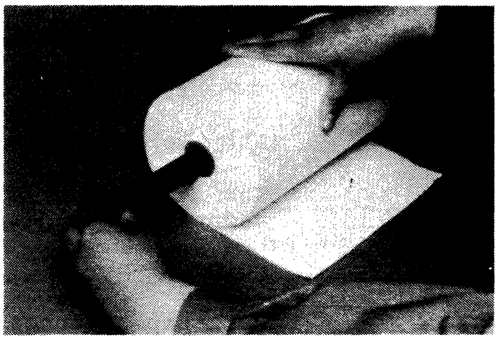


Fig. 3-7 Sprocket Paper Loading Method

3.7.2 Roll Paper Loading

(1) Remove access cover.

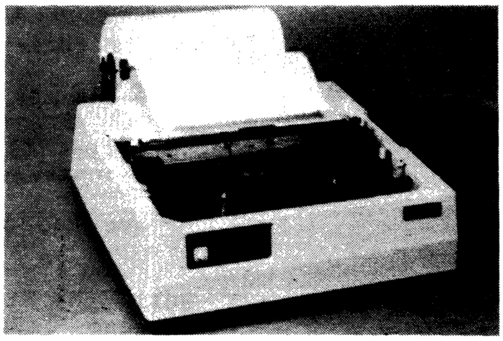
(2) Insert paper mounting shaft into the roll paper tube. Ensure the paper is facing toward you.



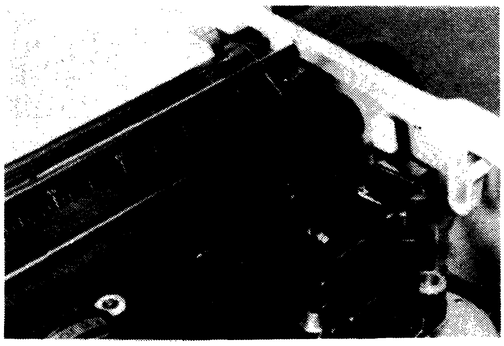
(3) Set the roll paper on the paper stand.

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

(5) Lift the paper-tear-off bar.



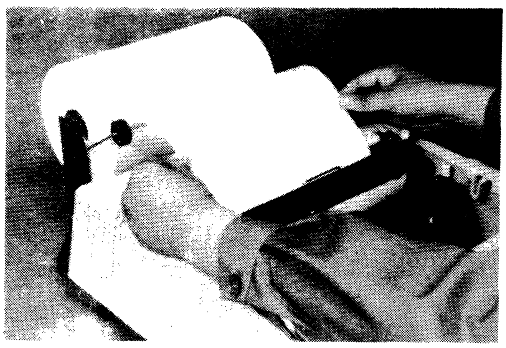
(6) Set the head gap adjusting lever to the first position.



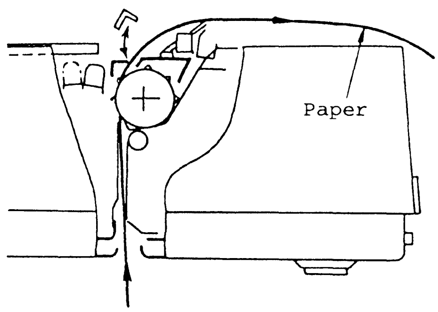
(7) Insert the paper between the paper chute and paper separator and appears the paper in front of the platen.

(8) Tuck the paper under the paper-tear-off bar and over the guide bar and lower the paper-tear-off bar.

Allign the paper.



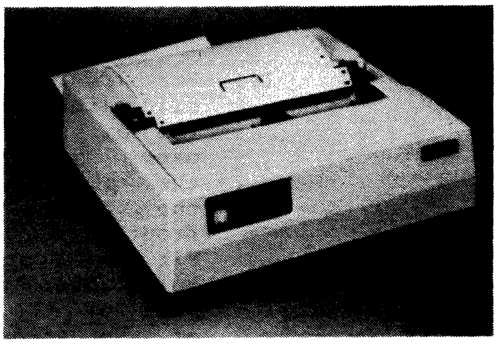
(5) For bottom paper feed, slide the paper up from the bottom frame hole, between the front paper guide and the rear paper guide, and fit the paper sprocket holes over the sprocket pins on either side of the platen.



(6) Lower the paper-tear-off bar.

(7) Leave the paper lock release lever in the open position.

(8) Turn the paper to the first printing line. Lightly pull the paper backwards to remove slack.



(9) Set the head gap adjusting lever to either position 1 or 2, depending on the kind and the number of papers. (See Table 3-3.)

Table 3-3 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	2
2. Front side (Gap between the platen and printing head is wide)	Pressure-sensitive or carbon-lined	4
	Interleaf paper	3, 4

(10) Replace access covers.

NOTE When using sprocket paper, keep the paper lock release lever at the open position.

3.7.4 Sprocket loading paper with installed tractor unit

(Remove the roll paper stand before using sprocket paper)

(See Fig. 3-8 for proper carton positioning.)

Sprocket paper with the width of 3 to 9.5 inches is loaded as follows when the tractor unit is installed:

(1) Remove the access cover.

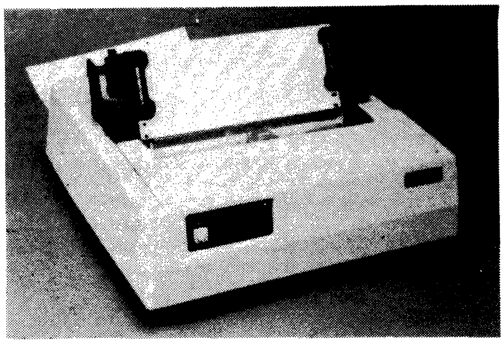
(6) Close the sprocket cover.

(7) Open the sprocket lock lever. Align the edges of the paper.

(8) Close the sprocket lock lever.

(9) Lower the paper-tear-off bar.

(10) Turn the platen knob to adjust the paper to the first line. Lightly pull the paper backwards to remove slack.



(11) Set the head gap adjusting lever to either position 1 or 2, depending on the kind and the number of papers (See Table 3-3.).

(12) Replace access cover.

Fig. 3-8 details the positioning of the sprocket paper carton for rear paper feed and for bottom paper feed.

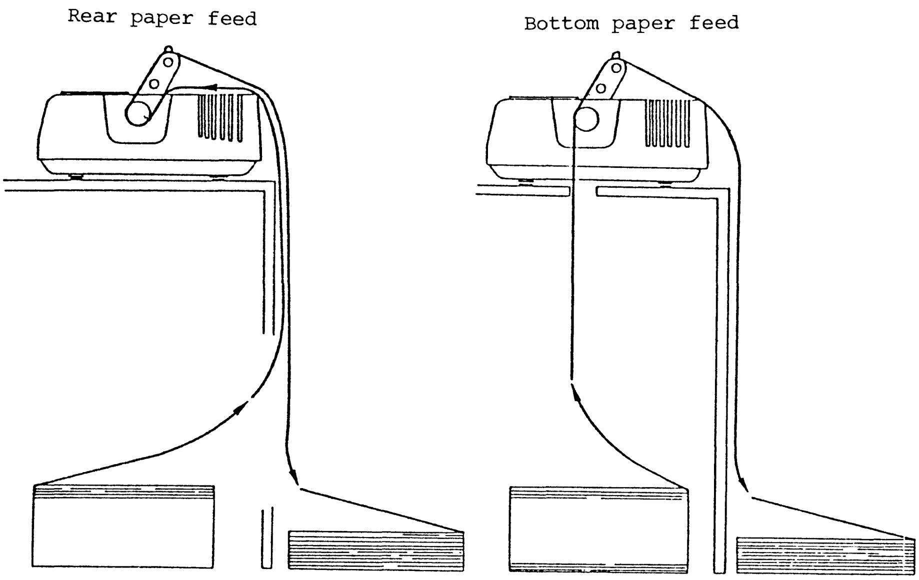


Fig. 3-8 Sprocket Paper Positioning

3.8 Operational Precautions

(1) Ensure that a.c. power supply is in the OFF position before inserting a.c. plug into receptacle. Insert a.c. plug correctly.

(2) Ensure that a.c. power supply switch is in the OFF position before inserting interface connectors.

(3) Never print without paper.

(4) Never print without ribbon. Never use extremely worn-out ribbon.

(5) Remove the inked 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 forward.

(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.

(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.

Character and graphic allocations are as shown in Table 4-2. The optional character set can be selected by replacing the standard character generator with a character generator containing the desired characters.

Table 4-2

Kind	8 bits		7 bits	
	b8 = 0	b8 = 1	SI side	SO side
Standard (US ASCII to TRS-80)	Alphanumeric, symbols, lower case	Graphic	Alphanumeric, symbols, lower case	Graphic
Option	Characters (94) *	Characters (94)	Characters (94)	Characters (94)

* SP and DEL not included

4.3 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 SW6 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 (except where graphic code is included, in which case the paper is moved up one line).

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

DIP SW6 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 number are received: Vertical tab operation

4.5.1 Vertical Tab Setting

The paper is fed to the tab position for the selected channel number according to the format loaded as mentioned in 4.5.2 as VT and channel number codes are recieved.

The channel numbers range from 1 to 12; the corresponding codes are as shown in Table 4-3.

Table 4-3

Channel No.	Code	Channel No.	Code
1	1	7	7
2	2	8	8
3	3	9	9
4	4	10	:
5	5	11	;
6	6	12	<

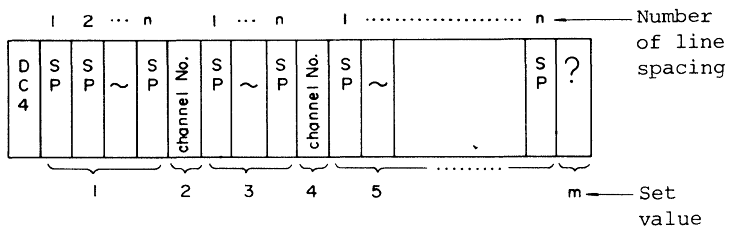
NOTE

1) If no format is loaded, or if the input channel number code is not listed in Table 4-3, it is ignored.

2) If a channel number not stored in the memory is selected, it is ignored.

4.5.2 Format Loading Method

After switching the power on, input data in the format shown below, and set the tab.



DC4 is the start code, and ? is the end code.

Input as many SP codes as required for the desired number of lines up to the tab positions, and select channel numbers for the tab positions. Because of the RAM capacity, the set value "m" must be 54 or less, and the number of line spacing "n" must be 128 or less.

(2) Selection 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 O.

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

4.6.2 Top-of-Form (TOF) Position Setting

The first printing line can be set by depressing the TOF SET switch 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 is counted by the number of line spaces 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.

4.7 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 (Normal characters)

(2) GS: 16.5 CPI (Reduced characters)

Character pitch is changed by the function codes after a line, not halfway in a line.

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

4.11 Select, Deselect Function

When SEL LED is off, depressing of SEL switch or receipt of DC1 code makes the SEL LED illuminate, and the printer is set in select condition. Subsequent input data for the line are printed.

When SEL LED is on, depressing of SEL switch or receipt of DC3 code makes the SEL LED turned off, and the printer is set in deselect (off-line) condition, and ignores input code other than DC1 code.

If the SEL switch is depressed or the DC3 code is received while the printer is printing out input data in a line, the printer becomes deselected (off-line) after inputting and printing the data to the end of that line.

NOTE

The printer is set in select (ready for receiving) condition when power is supplied.

4.12 Buffer Clear Function

When the CAN code is received, the data before CAN code of the line being received is cleared.

The function code is executed, but enlarged character printing is released, and the 7-bit shift is changed to the SI side.

4.13 DEL Code

The DEL code is either ignored or accepted for printing the mark DEL as selected with DIP switch SW7, as shown in Table 4-5. In case of the character sets TRS-80, the space for the DEL mark is left blank.

4.14 Paper-End Function

A microswitch detects the paper out when it is about 50 mm (2") from the printing position, in case of rear paper feed. In case of bottom paper feed, paper out is detected at about 25 mm (1") from the printing position.

Due to input speed differences, etc., 3 to 5 lines can be printed after paper-end detection. After printing, a paper-end signal is sent to the interface, the PAPER LED lights, and the printer stops.

NOTE

When the optional roll paper stand is mounted, the paper low detection process and subsequent operations are the same as described above.

4.15 Initial Reset Condition

The printer is set to the following initial conditons when the power is switched on, or as the $\overline{\text{I-PRIME}}$ signal is received from the parallel interface:

(1) Printing pitch: 10 CPI

(2) Line space pitch: 6 LPI

Table 4-5 DIP Switches on Operation Panel Circuit Board

DIP Switch	ON	OFF
SW1 SW2 SW3 SW4	Character set See Table 4-6	
SW5	7 bits	8 bits
SW6	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.
SW7	As DEL code is received, printer prints ■.	Printer ignores DEL code.
SW8	Low-speed serial interface effective.	Parallel interface effective.

Table 4-6 Table of Character Sets

No.	DIP Switch				Kind
	SW1	SW2	SW3	SW4	
1					US ASCII
2	ON				Unused
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	NETHERLANDISH
10	ON			ON	ITALIAN
11		ON		ON	TRS-80
12	ON	ON		ON	Unused
13			ON	ON	Unused
14	ON		ON	ON	Unused
15		ON	ON	ON	Unused
16	ON	ON	ON	ON	Option

Note: ON means that SW is in the ON position.

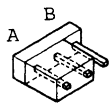
4.17.2 Jumper Plugs

Table 4-9

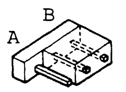
Plug \ Direction	Side A	Side B	Use
SP1	DTR signal is for space (ON) under select (ready for receiving) condition	DTR signal is for space (ON) after power on.	L.S. serial interface
SP2	Bit 8 supplied by external controller	Supplies grounding to DATA BIT-8	Parallel interface

Note: Selection of A or B side can be performed as follows:

side A



side B



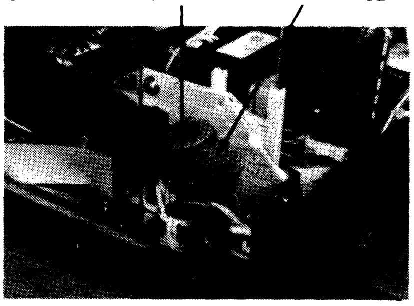
4.17.3 Breaker

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.

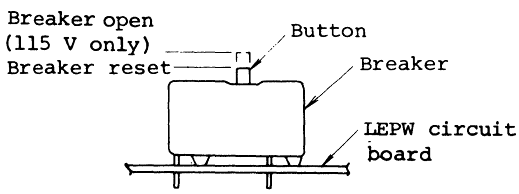
When the breaker trips, all operations of the printer halts. Check the causes and take appropriate measures, then, push the button and reset the breaker.

Power source voltage select switch

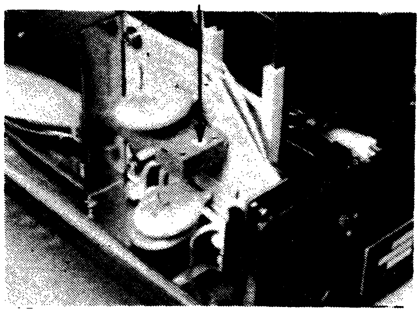
Breaker



(200 V Type)



Breaker



(For 115 V)

Fig. 4-4 Breaker, Power Source Voltage Selector Switch

5. THEORY OF OPERATION

5.1 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

5.1.1 Mechanism and Operation of Print Head

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 CN2.

The print head consists of the following (See Fig. 5-1):

(a) Wire guide

(b) Yoke

(c) Armature assembly

(d) Spacer

(e) Magnet assembly

(f) Thermistor

(1) Print head operation (See Fig. 5-1.)

When not operating, the armature is attracted by the permanent magnet, and an armature spring fixing the armature is bending by thickness of a spacer. Therefore, the print wire which is fixed to the armature is held retracted within the wire guide. When a character to be printed (Appendix B) is detected by the control circuit, a current flows to the coil which corresponds to that print wire. When the coil is energized, the magnetic flux generated by the permanent magnet between the armature and pole is nullified, and an attraction is disappeared. As a result, the print wire is driven toward the platen by force of the armature spring. The print wire fixed on the armature ejects from the tip of the wire guide to hit EP15 paper and the platen surface through an inked ribbon. Thus a dot is printed on the paper.

After printing the character, 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 exceeds a specific temperature, the control circuit detects that signal, and switches the spacing from bidirectional to unidirectional printing until the coil temperature falls below that temperature. At the same time, printing is stopped for 0.7 second (1.4 seconds for Graphics) every time after printing one line.

5.1.2 Space Mechanism and Operation

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 the following:

(a) Stepper motor with synchro belt pulley

(b) Synchro belt

(c) Two carriage shafts

(d) Carriage

(e) Home sensor

(f) Home sensor plate

(1) Spacing operation (See Fig. 5-2.)

The carriage with the print head mounted on it moves parallel to the platen along the upper and lower carriage shafts, and one end of the carriage frame is fixed 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).

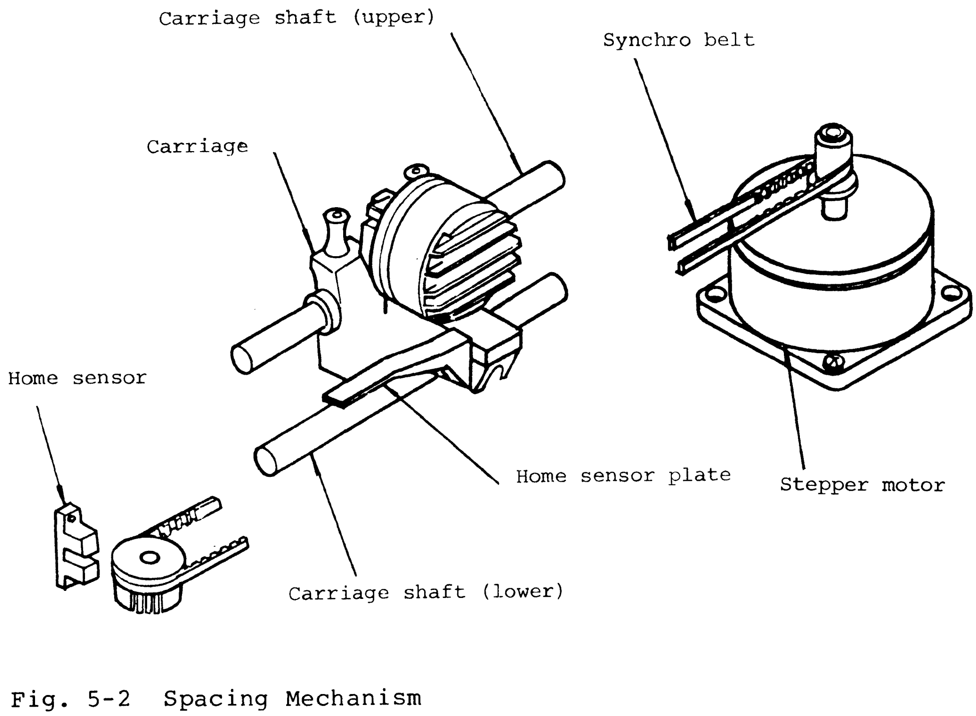
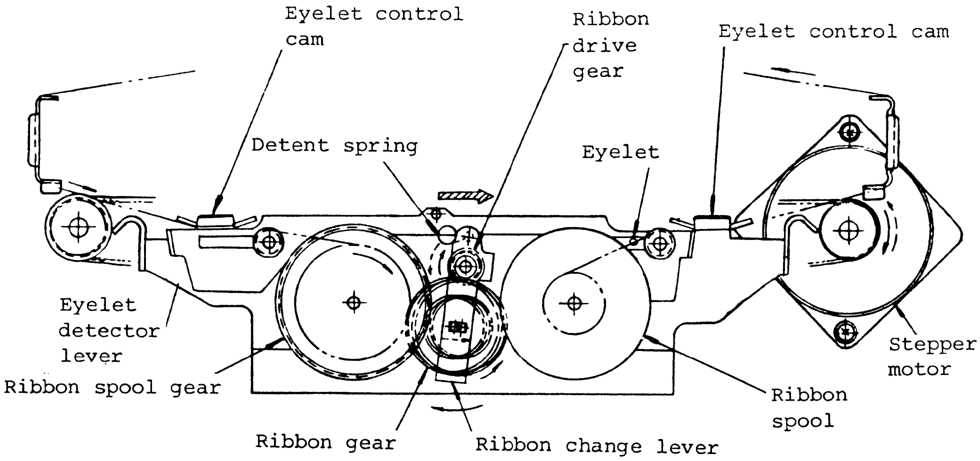


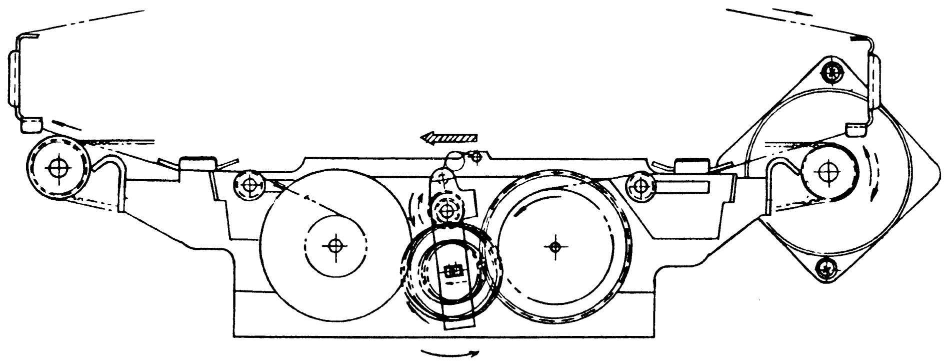
Fig. 5-2 Spacing Mechanism

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 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-mentioned process is repeated to feed the ribbon.



(1) Ribbon Feed to Left



(2) Ribbon Feed to Right

Fig. 5-3 Ribbon Feed Mechanism

5.1.5 Paper Lock Release Mechanism (See Fig. 5-5.)

When the paper lock release lever is moved forward (open position), the roller support shaft turns counterclockwise, and a gap is made between the pressure 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 pressure rollers are pushed against the platen by the feed roller spring, so paper can be fed.

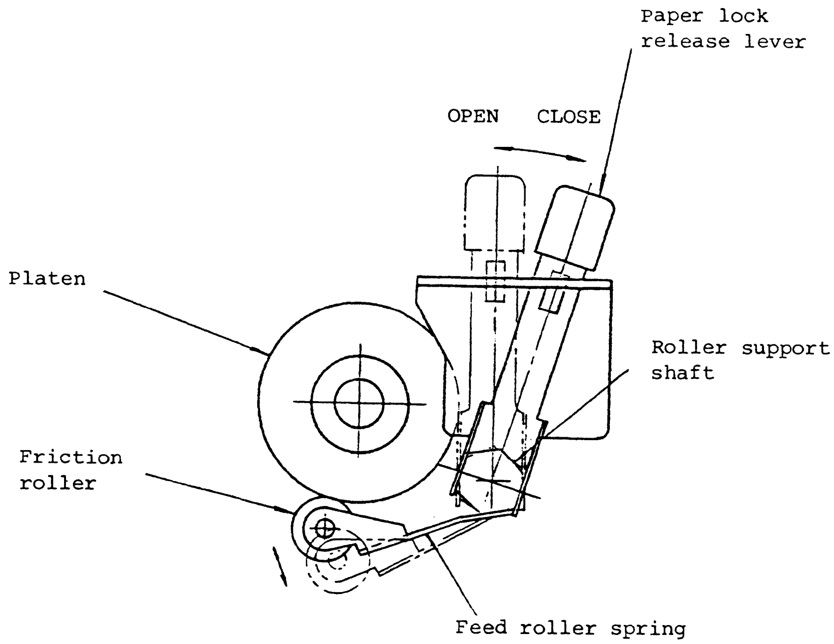


Fig. 5-5 Paper Lock Release Mechanism

5.1.7 Head Gap Adjusting Mechanism (See Fig. 5-7.)

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

The eccentric collars are fitted into the side frame holes and the upper carriage shaft is fixed via eccentric-locking botts. The head gap adjusting lever is fixed to the upper carriage shaft and can be locked in either of the two grooves of the head gap adjusting bracket.

As seen in Fig. 5-7, when the eccentric collar is turned clockwise, the upper carriage shaft comes closer to the platen, due to the eccentrics. When turned counterclockwise, it moves away from the platen.

When the eccentrics are adjusted to the proper head gap, the eccentric-locking bolts are tightened to maintain the gap.

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

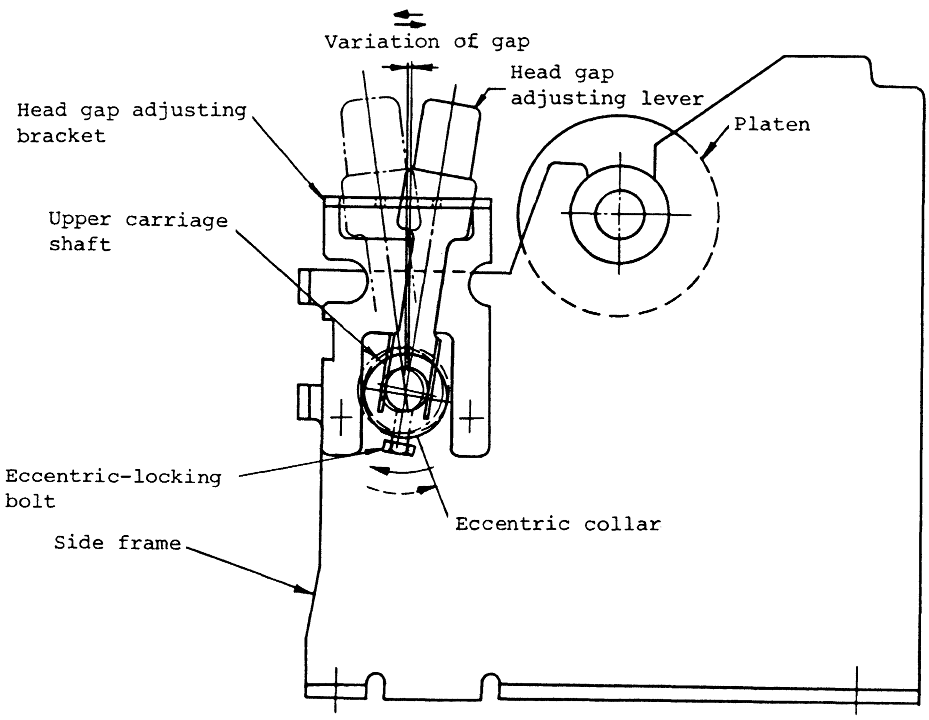


Fig. 5-7 Head Gap Adjusting Mechanism

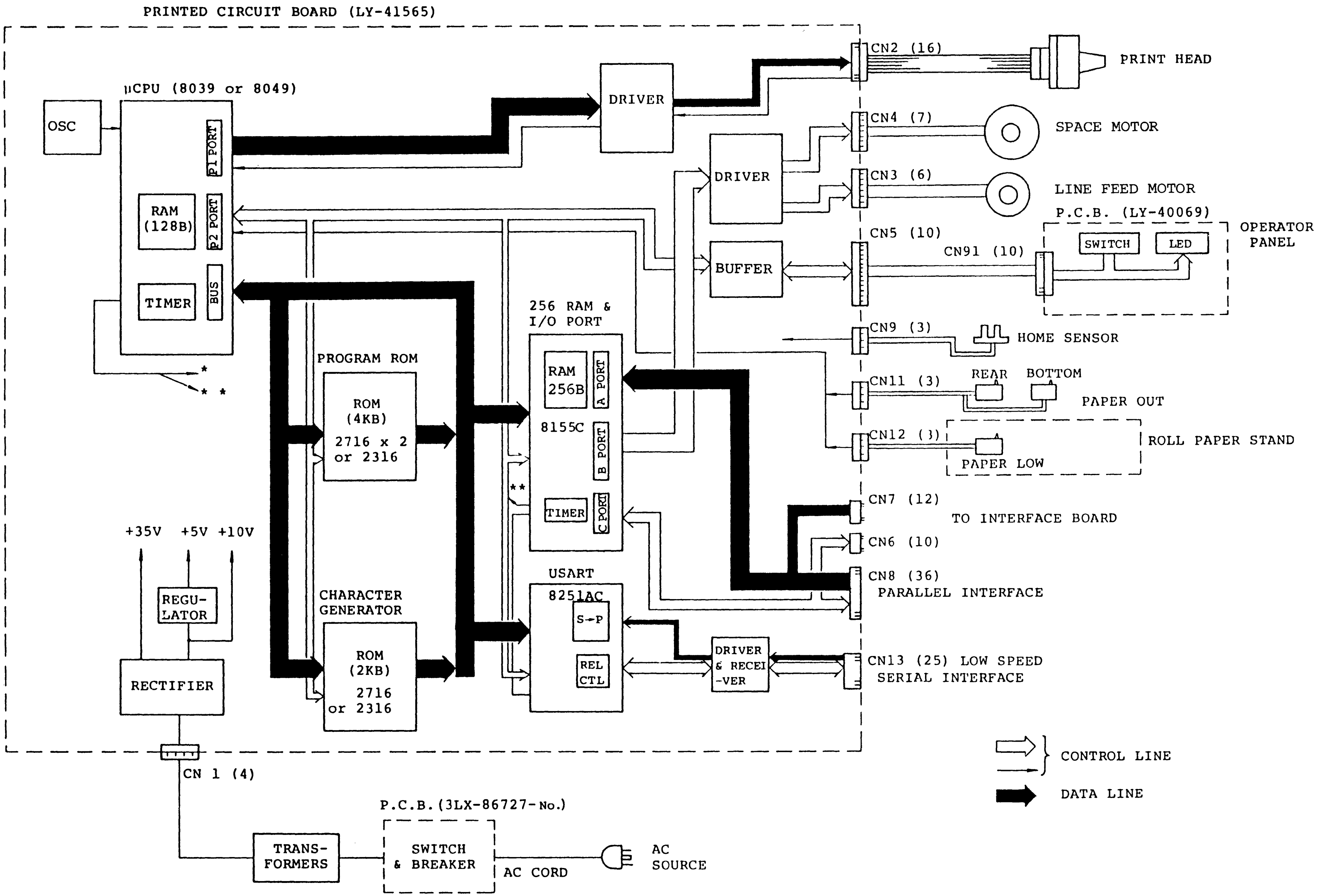


Fig. 5-8 Block Diagram

(a) LF code received

(b) CR code received

(c) VT channel number code received

(d) VT code of ESC. VT. X1. X2 received

(e) F code of ESC. F. X1. X2 received

(f) 5 code of ESC. 5 received

(g) FF code received

(h) Printing code for the maximum number of characters per line plus single character received

(i) DC3 code received

(j) DC4 code received

The SSD signal switches to the unable-to-receive status within 5 ms after receiving any of the codes (a) through (j) shown above.

Even if the printer is not ready for receiving, three characters (including function codes) of the data transmitted from the terminal can be received.

If the terminal sends data for the fourth and subsequent characters without stopping at the third character, only the first, second, and last characters will be valid, and all the characters between them invalid.

NOTE

1) If the deselect status or paper end is reached when the printer is standing by without receiving codes, the SSD signal indicates the unable-to-receive status.

2) Neither parity check nor framing check will be made.

3) Data will be lost if an overflow error occurs.

4) No data receiving interface buffer is provided.

5.2.5 Printing Operation (See Timing Chart (2), Fig. 5-10.)

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 one and a half character positions left of the first character position by a holding voltage of +10 V applied to it via R8 , R12 and D25.

After completion of data input, a "0" output is sent out of Q2's PB2 output $\overline{\text{SPPM OVD}}$ to energize transistor TR21, which applies a +35 V to the space motor to drive the motor with a powerful torque. At the same time, pulse signals are applied to Q2's PB0 and PB1 to drive the stepper motor.

The motor is a 4-phase stepper motor, whose one step angle is 1.8°. When the motor advances by 12 steps, the carriage moves by 2.54 mm (at 10 CPI) to make a space for one character.

A two-phase exciting system is employed. A phase signal drives transistors Tr13, Tr14, Tr19, Tr20 to drive the motor. Zener diodes D23, D24 suppress the counter voltage generated by the motor.

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

A head drive trigger pulse is sent from PB3 of Q2 to cause the comparator of Q21 to generate an enable pulse. This pulse energizes both TR3, TR24, and TR27 to apply a voltage to the head. At this time, pulses are sent out of P10 to P16, P25, P26 of Q1 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 for by changing the magnet ON time according to the variations of the +35 V source voltage. This compensation is done by R19 which is connected to comparator Q21, and +35 V circuit. One of the head coils is connected in common to the collector of TR3 or TR27. 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 R9, D10 to energize thyristor TR1, 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 sent to comparator Q21, from which a signal is sent to the CPU to automatically limit the printing duty cycle.

5.2.6 Carriage Return and Line Feed Operation (See Timing Chart (2), Fig. 5-10.)

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

Phase signals for reversing the space motor are sent from PB0 and PB1 of Q2, and signals for driving the line-feed motor from PB4 and PB5.

The line-feed motor is a 4-phase stepper motor, whose one step angle is 7.5°. 24 steps of it feed the paper by 4.23 mm (at 6 LPI), or 18 steps of it feed the paper by 3.18 mm (at 8 LPI).

If no line spacing takes place, a +10 V is applied through R10 and D35 to provide a holding voltage.

When line spacing, a "0" is sent from the PB6 output ($\overline{\text{LF PM OVD}}$) of Q2 to energize transistor TR22 so that a +35 V is applied to the line feed motor to drive it with a powerful torque.

Return operation is similar to the operation of the space motor in printing operation. (See par. 5.2.5.)

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

5.2.7 Paper End and SEL Switch Operation

Paper end is detected by the operation of paper low detection microswitch in the roll paper stand, or of the paper out detection microswitch behind the platen.

Three lines of data can be received after detecting paper end. After the data input, a paper end signal is sent to the interface, turns off the SEL LED and select the DESELECT (off-line) status so that data will no longer be received. After printing the input data, the PAPER LED lights to indicate that the paper has run out. If the SEL switch is pushed when the SEL LED is lit to indicate that the printer is ready to receive, the input data received up to the point of pushing the SEL switch will be printed out, and then the SEL LED goes out to bring the printer back to the DESELECT (off-line) status.

5.2.8 Graphic Printing Operation

As shown in paragraph 4.4

5.2.9 Power Supply

The d.c. voltage required for operation is obtained from an a.c. input.

The a.c. input to the printer through the a.c. plug runs through the a.c. power switch and circuit breaker to the primary winding of the power transformer.

The secondary winding of the transformer generates outputs of 9 V and 28 V.

A positive voltage of +10 V is generated from the 9 V a.c. through D5 thru D8, and smoothing capacitors C4 and C5. The +10 V is regulated to +5 V , and supplied to the IC's.

6. MAINTENANCE

6.1 Maintenance Precautions

Pay attention to the following when servicing the printer.

(1) Exercise care to keep the gears and belts absolutely free of dust and paper waste.

(2) Be sure to disconnect the a.c. plug before pulling out the connectors or reinserting them.

(3) Do not unnecessarily disassemble, reassemble, or readjust the printer as long as the printer is in good operating condition. Particularly, do not 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. Check the power voltage select switch that it is at the specified voltage. (See paragraph 4.17.4.)

(5) Never print without paper and ribbon properly loaded.

(6) During maintenance or printer operation, neither place anything on the cover nor lean on the printer.

(7) Do not leave parts or screws which have been used during maintenance inside the printer.

(8) Do not wear gloves which will easily generate static, when handling the printed circuit board. Since ICs for the micro-CPU, ROM, etc. are liable to be damaged by static, exercise care not to unnecessarily touch the leads and windows of ROM.

(9) Do not directly place the printed circuit board on the printer or the floor.

(10) When disassembling or reassembling, carefully check the wires and cords for damage, and make sure that they are not strained. (See Fig. 8-1.)

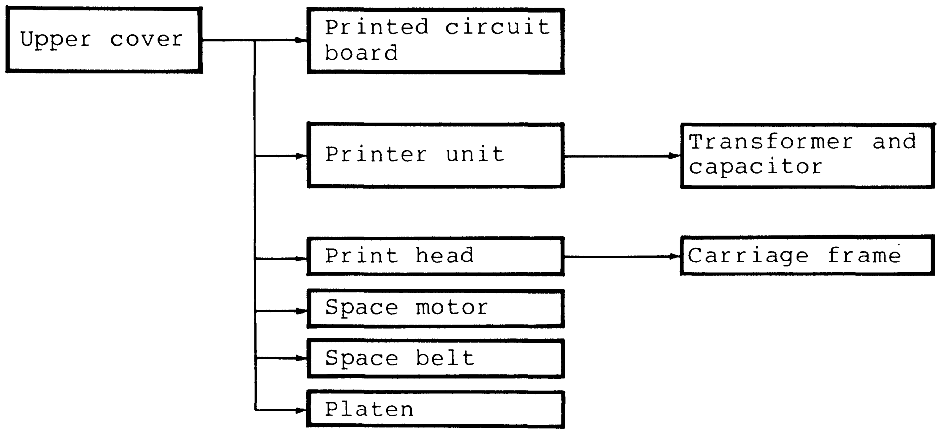
6.2 Cleaning

Clean the inside of the printer at scheduled cycles as mentioned below.

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

6.4.1 Disassembly Route Chart

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



6.4.2 General Precautions

(1) Before disassembly or reassembly, push the a.c. power switch off and pull out the power cord from the a.c. outlet.

(2) Determine the range of disassembly as suitable to the intended purpose. Do not disassemble more than necessary.

(3) Before proceeding with disassembly, check each unit for deterioration, interconnection, and clearances, and record data.

(4) Use the specified maintenance tools only.

(5) Place the removed units in the correct order.

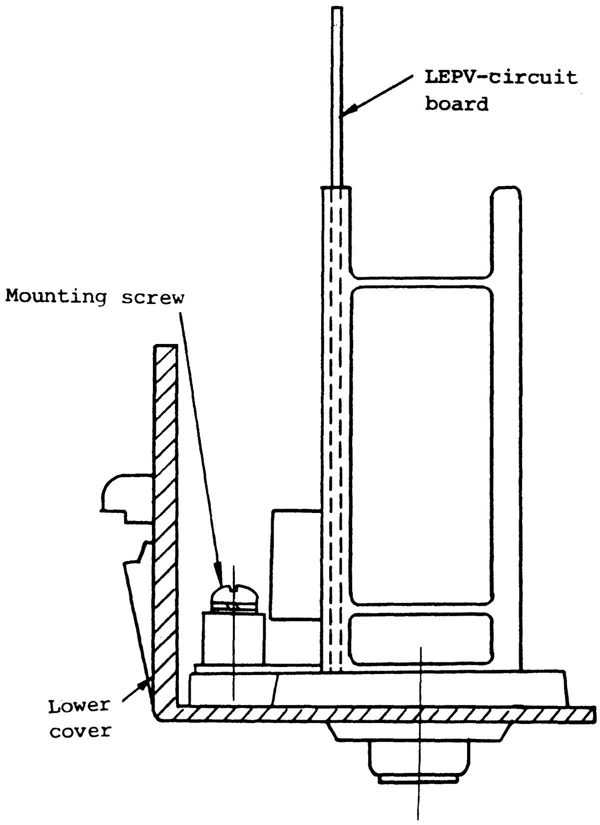
(6) The screws, nuts, collars, etc. which may be easily lost should be temporarily tightened in their original places.

(7) Do not induce artificial troubles by irrationally removing in the wrong order, or cutting the wires.

6.4.3 Non-Disassembly Points

Do not disassemble the print head.

(2) LEPV circuit board (See Figs. 8-1 and 8-13.)

Item	Description	Tool
Disassembly	(1) Remove upper cover. (See 6.4.4 (1).) (2) Pull out connectors from LEPV (2/2) circuit board. (See Fig. 8-1.) (3) Remove LEPV circuit board mounting screw (Fig. 8-13-17), and raise LEPV circuit board (Fig. 8-13) enough to disconnect remaining connectors. (4) Pull out remaining connectors from LEPV circuit board. Note: When exchanging a ROM packaged on the LEPV printed circuit board, refer to Fig. 8-13 "ROM Discrimination Method" and make sure not to mix the part No. and packaging location.	6-200 screw-driver
Reassembly	Reverse the disassembly procedure.	
Sketch		

(4) Power supply assembly (See Figs. 8-8, 8-11 and 8-12.)

Item	Description	Tool
Disassembly	(1) Remove upper cover. (See 6.4.4 (1).) (2) Remove LEPV circuit board. (See 6.4.4 (2).) (3) Remove LEPW circuit board mounting screws (Fig. 8-8-24), and remove a.c. cord leads from seesaw switch (Fig. 8-12). (4) Remove connecting cords of transformer (Figs. 8-11-2, -3) from cord clamp (Fig. 8-8-9). (6) Remove transformer mounting screws (Fig. 8-8-27) and transformer.	No.2-200 Philips screwdriver Soldering iron
Reassembly	Reverse the disassembly procedure. Note: See Fig. 8-1 for routes of connecting cords.	

(6) Carriage frame (See Figs. 8-2 and 8-7.)

Item	Description	Tool
Disassembly	(1) Remove upper cover. (See 6.4.4(1).) (2) Remove print head. (See 6.4.4 (5).) (3) Remove belt clamp screw (Fig. 8-7-6),and belt clamp (Fig. 8-7-2). (4) Remove adjusting lever mounting screw (Fig. 8-2-22) and remove the adjusting lever (Fig. 8-2-7). (5) Loosen the eccentric collar mounting screw (Fig. 8-2-24) on both side of the carriage shaft upper part, and remove the eccentric collar (Fig. 8-2-9). (6) Pull out the carriage shaft upper part (Fig. 8-2-5) from the right and left side frames. (7) Remove head connecting cord connector screw (Fig. 8-7-6) from carriage frame, and head connecting cord (Fig. 8-1-7) from carriage frame. (8) Lift carriage frame up, and remove it from lower carriage shaft.	 No.2-200 Philips screw-driver 5.5 mm wrench
Reassembly	Reverse the disassembly procedure.	
Adjustment	(1) Adjust gap between platen and print head as mentioned in 6.5-2.1.	

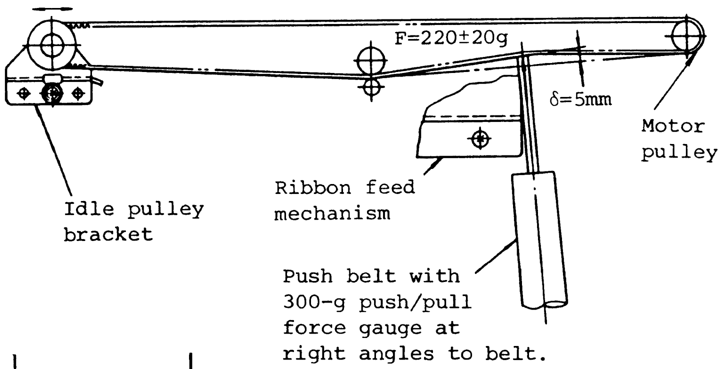
(8) Space belt (See Figs. 8-3 and 8-6.)

Item	Description	Tool
Disassembly	(1) Remove the upper cover. (See 6.4.4 (1).) (2) Loosen the idle pulley bracket screw (Fig. 8-3-54), move the idle pulley bracket (Fig. 8-3-9) to right to loosen space belt (Fig. 8-6-10). (3) Remove the belt clamp screw (Fig. 8-7-6), and belt clamp (Fig. 8-7-2). (4) Remove the E-snap (Fig. 8-6-22) from one of the ribbon spool gears,and remove the ribbon spool gear (Fig. 8-6-7). Note: Be careful not to lose plastic washer (Fig. 8-6-16). (5) Remove the detent spring (Fig. 8-6-9) (6) Remove the other E-snap (Fig. 8-6-22) and then the ribbon change lever (Fig. 8-6-2) and the ribbon drive gear (Fig. 8-6-6). (7) Remove the space belt.	 No.200 Philips screw-driver No.1 round pinchers
Reassembly	Reverse the disassembly procedure. Note: When reassembling the ribbon drive gear, engage its pulley teeth with space belt teeth accurately beforehand.	
Adjustment	(1) Space belt tension See 6.5-1.1	

6.5 Adjustment Procedures for Various Parts

Table 6-3 Adjustment Procedures

<table>
<tr><th>No.</th><th>Item</th><th>Standard</th><th>Description</th><th>Tool</th></tr>
<tr><td>1.1</td><td>Spacing belt tension</td><td>F=220±20 g at δ = 5 mm</td><td>Adjust by moving idle pulley bracket. Carriage unit should be at home position



Note: After making this adjustment, take a print sample (all "H"'s preferred if a terminal is available) and check for uniform character width. Re-adjust belt tension, as required, to get uniform character width.</td><td>300-g push/pull force gauge

No.2-200 Philips screwdriver</td></tr>
<tr><td>1.2</td><td>Detector lever position</td><td></td><td>Mount the detector lever as it comes to the position shown below, when power is on, or the carriage is returned manually.

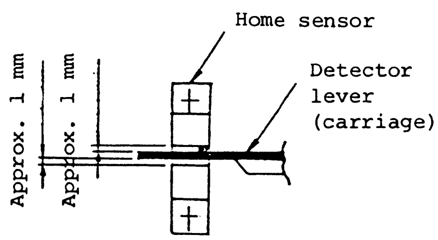

</td><td></td></tr>
</table>

Table 6-3 (con.)

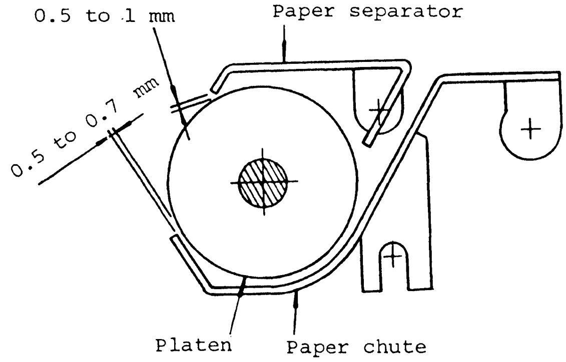
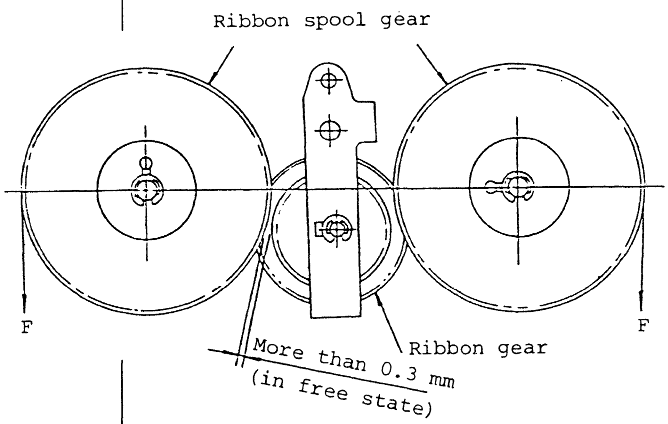
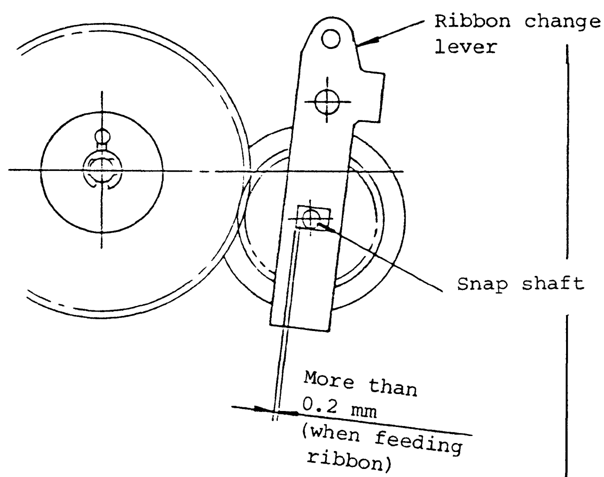
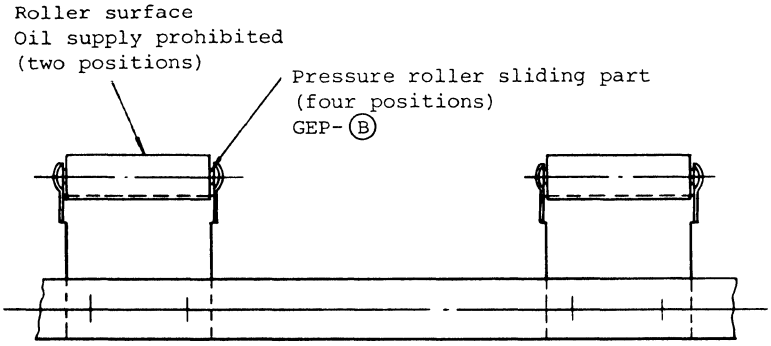
No.	Item	Standard	Description	Tool
3.1	Gap between platen and paper chute	0.5 to 0.7 mm		Thickness gauges No. 2-200 Philips screwdriver
3.2	Gap between platen and paper separator	0.5 to 1 mm		
4.1	Ribbon spool gear friction tension	F= 25±5g	Confirm this on both the right and left spool gears. 	
4.2	Gap between ribbon spool gear and ribbon gear	More than 0.3 mm in free state	Confirm this on both the right and left spool gears. 	
4.3	Gap between ribbon change lever and shaft	More than 0.2 mm when feeding ribbon		

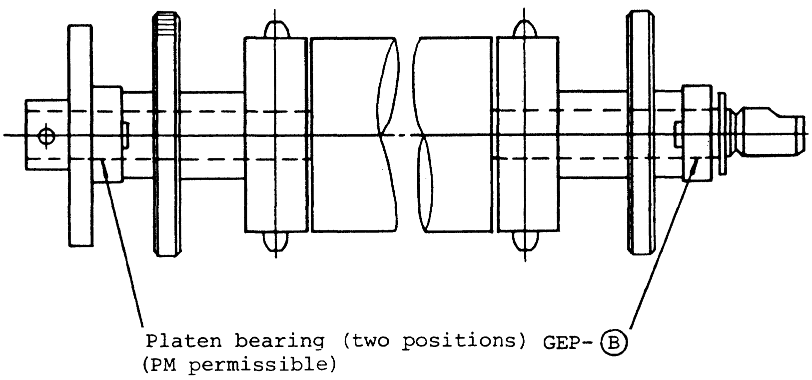
Table 6-4 (con.)

No.	Part	Reason	Remarks
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 feed mechanism friction felt	Prevention of inferior friction	

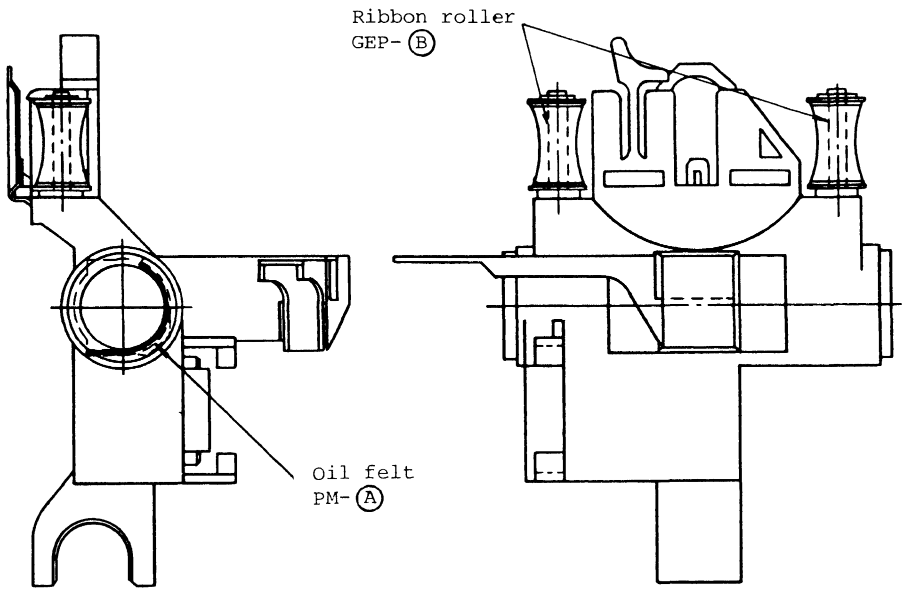
(3) Pressure roller



(4) Platen bearing



(7) Carriage assembly



(8) Tractor assembly

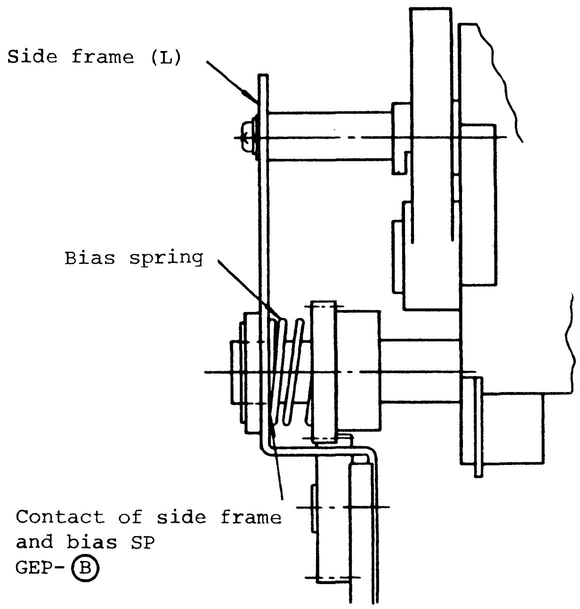


Table 6-6 Maintenance Parts List (1/4)

Ref. No.	Part No.	Nomenclature	Original quantity	Recom-mended quantity	Rank	Compati-bility
Fig. 8-2-1	3LR-190990-7	Print head assembly	1	18	A	83A
Fig. 8-2-4	4LR-191870	Carriage assembly	1	5	B	83A
Fig. 8-7-3	5LR-191873	Ribbon protector	1	10	B	83A
Fig. 8-3-32	4LR-132233	Platen knob	1	10	B	82 83 83A
Fig. 8-3-6	3LR-129900-3	Platen assembly	1	5	B	82
Fig. 8-3-9	4LR-193441-2	Idle pulley bracket	1	2	B	
Fig. 8-3-15	5LR-132475	Idle gear (LF)	1	5	B	83 83A
Fig. 8-3-19	5LR-129804	Guide bar	1	5	B	82
Fig. 8-3-24	4LR-191854	Space motor (pres-sure-fitted)	1	36	A	83A
Fig. 8-3-25	5LR-132473-2	LF motor	1	10	A	83A
Fig. 8-3-26	4LR-129847-3	Photo interrupter assembly	1	13	B	83 83A
Fig. 8-3-27	4LR-129907	Paper out assembly	1	5	B	83 83A
Fig. 8-6-2	5LR-129825	Ribbon change lever (clinched)	1	2	B	80 82 83 83A
Fig. 8-6-3	4LR-129827	Ribbon gear	1	19	B	80 82 83 83A
Fig. 8-6-4	5LR-193461	Snap shaft	1	5	B	83A
Fig. 8-6-5	5LR-129876	Friction spring	1	19	B	80 82 83 83A
Fig. 8-6-6	4LR-191858	Ribbon drive gear	1	5	B	83A
Fig. 8-6-7	4LR-129837	Ribbon spool gear	2	20	B	80 82 83 83A
Fig. 8-6-8	5LR-129840	Compression spring	2	16	B	80 82
Fig. 8-6-9	5LR-129841	Detent spring	1	5	B	80 82 83 83A
Fig. 8-6-10	4LP-1420-6	Synchro belt	1	18	B	
Fig. 8-6-11	5LR-191859	Pressure roller	1	5	B	83A
Fig. 8-6-12	5LR-129842	Friction felt	2	18	B	80 82 83 83A
Fig. 8-6-13	5LR-129843	Special washer	2	18	B	80 82 83 83A
Fig. 8-6-16	5LR-132516	Plastic washer	2	18	B	80 82 83 83A
Fig. 8-7-2	4LR-191857	Bolt clamp	1	10	B	82 83 83A
Fig. 8-8-1	1LM-59707	Upper cover	1	5	B	82
Fig. 8-8-3	2LM-60126	Access cover	1	5	B	
Fig. 8-8-10	5LM-61519	Grounding board	2	3	B	83A
Fig. 8-8-12	5LP-6463-C-6	Cord bushing	1	3	B	80 82
Fig. 8-8-13	4LP-6726-2	Quite-tight	4	5	B	80 82 83 83A
Fig. 8-8-14	5LP-1488	Rubber foot	4	5	A	80 82 83 83A
*Fig. 8-14-11	FMX-35100-2	Sprocket assembly (R)	1	5	B	80 82 83 83A

Note: The parts marked with an asterisk are those for the variable tractor unit (option).

Table 6-6 Maintenance Parts List (3/4)

Ref. No.	Part No.	Nomenclature	Original quantity	Recom-mended quantity	Rank	Compati-bility
Fig. 8-9-3	LY-40069 assembly	LEPF circuit board	1	5	B	82 83 83A
Fig. 8-10	4LP-44373	SEL103R light emit-ting diode	3	15	B	82 83 83A
Fig. 8-10	3LK-50700-2	Key switch	4	20	B	82 83 83A
Fig. 8-10-4	4L-1370-49-A2	Nameplate [TOF SET]	1	5	B	82 83 83A
Fig. 8-10-5	4L-1370-50-A2	Nameplate [SEL]	1	5	B	82 83 83A
Fig. 8-10-6	4L-1370-51-A2	Nameplate [FORM FEED]	1	5	B	82 83 83A
Fig. 8-10-7	4L-1370-52-A2	Nameplate [LINE FEED]	1	5	B	82 83 83A

Table 6-6 Maintenance Parts List (4/4) (for 220/240 V)

Ref. No.	Part No.	Nomenclature	Original quantity	Recom-mended quantity	Rank	Compati-bility
Fig. 8-10-2	4LP-3424	SRQV 101A rotary switch	1	5	B	82 83 83A
Fig. 8-11-1	3LX-86727-2	LEPW circuit board assembly (220V) (240V)	1	5	B	
Fig. 8-12	4LP-8555	0.01 μF capacitor (220V) (240V)	2	10	B	83A
Fig. 8-12	4LP-3621-1	See-saw switch (220V) (240V)	1	5	B	80 82 83 83A
Fig. 8-12-2	4LP-6740-80	Circuit breaker (220V) (240V)	1	5	B	82 83 83A
Fig. 8-12	4LP-3622	Slide switch (220V) (240V)	1	5	B	80 82 83 83A
Fig. 8-1-6	3LP-37256-3	Operation panel con-nection cord	1	5	B	83A
Fig. 8-11	3LP-37378-3	Transformer connection cord (for 220V, 240V)	1	5	B	82 83A
Fig. 8-11-2	4LP-45191-127	Transformer	1	3	B	83A
Fig. 8-11-3	4LP-45191-128	Transformer	1	3	B	83A
Fig. 8-13	LYH-10352	EPROM, character generator (Q4)	1	20	B	83A
Fig. 8-13	4LP-11740-02-001	MASK ROM, program ROM (Q6)	1	10	B	
Fig. 8-1-7	4LP-37587-1	Head connection cord (blue, black)	1	5	B	83A
Fig. 8-1-3	LY-41565-3	LEPV-3 circuit board	1	10	A	

Note: Refer to Fig. 8-13 "ROM Discrimination Method" and make sure not to mix the part No. and packaging location.

Item (1)

Printer does not operate at all when power is switched on.

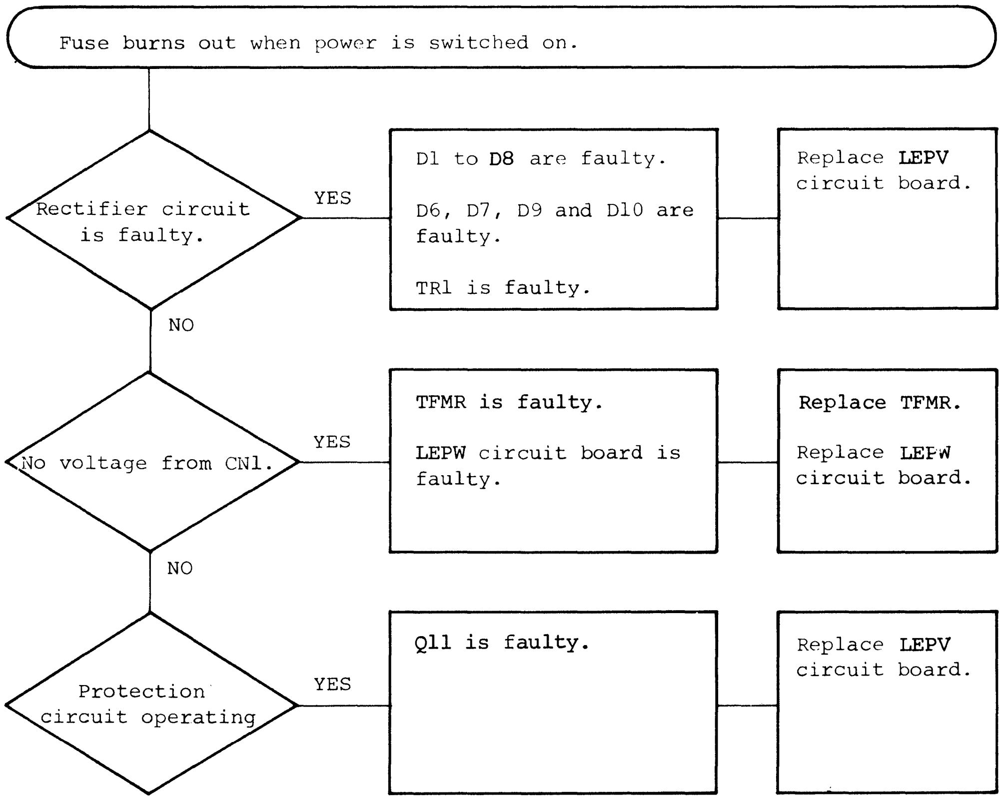
POWER LED does not light.	YES	Check power circuit board breaker. Check LEPV circuit board fuse F1. Check contact of connectors CN1 and CN5.	Push breaker down. Insert connectors CN1, CN5. Replace fuse. Replace LEPW circuit board.
NO ↓ Head carriage does not lock.	YES	Check +35 V voltage. Space motor drive is faulty. Check contact of CN4 connector.	Replace LEPV circuit board. Check insertion of CN4 contacts.
NO ↓ Microcomputer does not operate.	YES	Check XTAL oscillation. Q1 (8039 or 8049), Q2 (8155) faulty.	Replace LEPV circuit board.
NO ↓ RESET remains on.	YES	Q21 is faulty.	Replace LEPV circuit board.

Item (2)

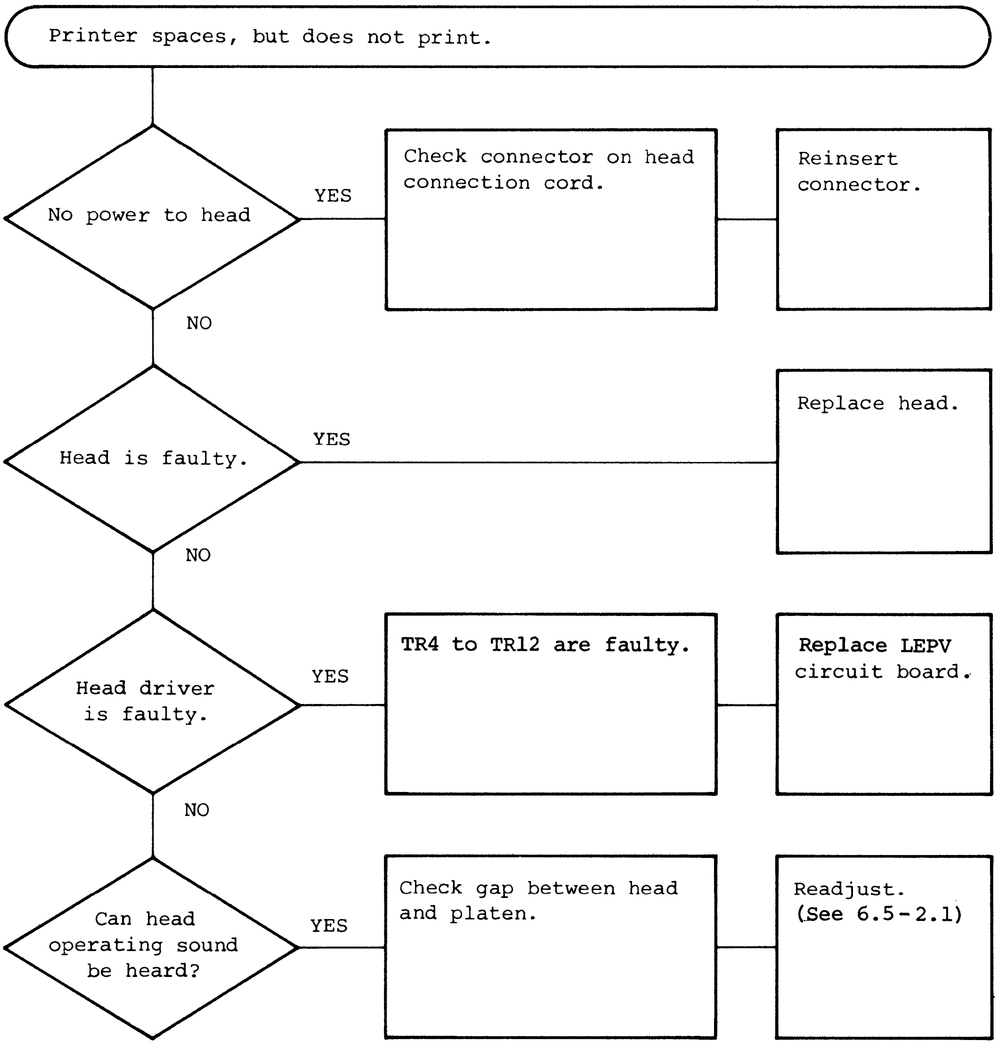
Carriage keeps running to right or left when power is switched on.

Home sensor is faulty.	YES	Check contact of connector CN9.	Replace home sensor. Insert connector of CN9.
NO ↓ Microcomputer operates improperly.	YES	Check oscillation of XTAL: Q1 (8039 or 8049) and Q2 (8155) are faulty.	Replace LEPV CIRCUIT board.

Item (4)

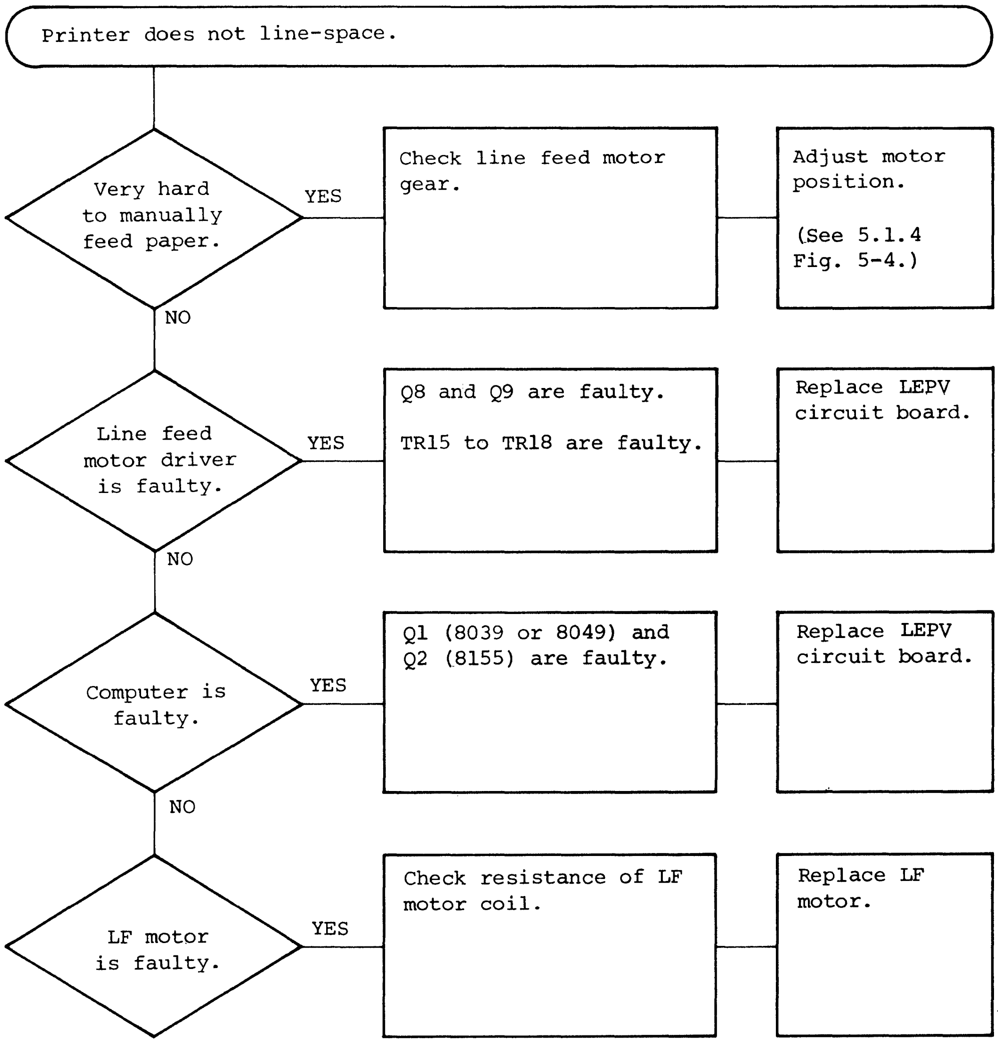

Fuse burns out when power is switched on.
Rectifier circuit is faulty.
YES
D1 to D8 are faulty.
D6, D7, D9 and D10 are faulty.
TR1 is faulty.
Replace LEPV circuit board.
NO
No voltage from CN1.
YES
TFMR is faulty.
LEPW circuit board is faulty.
Replace TFMR.
Replace LEPW circuit board.
NO
Protection circuit operating
YES
Q11 is faulty.
Replace LEPV circuit board.

Item (6)

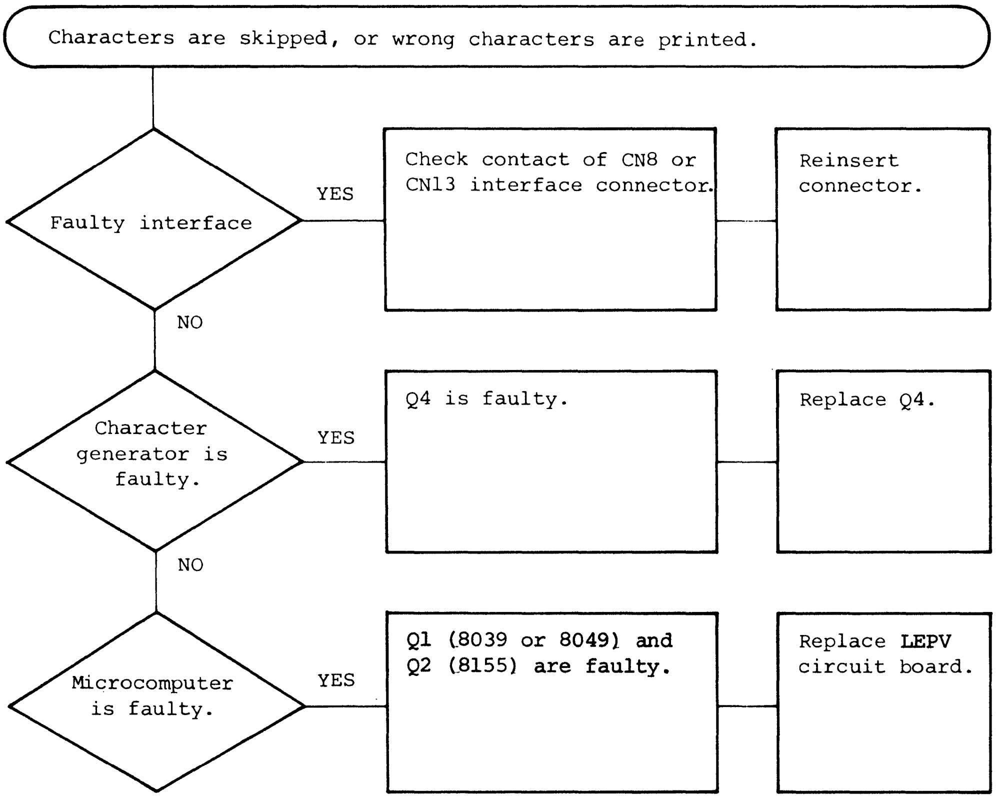


Printer spaces, but does not print.
No power to head
YES
Check connector on head connection cord.
Reinsert connector.
NO
Head is faulty.
YES
Replace head.
NO
Head driver is faulty.
YES
TR4 to TR12 are faulty.
Replace LEPV circuit board.
NO
Can head operating sound be heard?
YES
Check gap between head and platen.
Readjust. (See 6.5-2.1)

Item (9)


Printer does not line-space.
Very hard to manually feed paper.
YES
Check line feed motor gear.
Adjust motor position.
(See 5.1.4 Fig. 5-4.)
NO
Line feed motor driver is faulty.
YES
Q8 and Q9 are faulty.
TR15 to TR18 are faulty.
Replace LEPV circuit board.
NO
Computer is faulty.
YES
Q1 (8039 or 8049) and Q2 (8155) are faulty.
Replace LEPV circuit board.
NO
LF motor is faulty.
YES
Check resistance of LF motor coil.
Replace LF motor.

Item (11)


Characters are skipped, or wrong characters are printed.
Faulty interface
YES
Check contact of CN8 or CN13 interface connector.
Reinsert connector.
NO
Character generator is faulty.
YES
Q4 is faulty.
Replace Q4.
NO
Microcomputer is faulty.
YES
Q1 (8039 or 8049) and Q2 (8155) are faulty.
Replace LEPV circuit board.

Item (14)

LEPV circuit board fuse burns out.

- Rectifier circuit faulty. — YES → D5 to D8 are faulty. / FS7805 is faulty. → Replace LEPV circuit board.

Item (15)

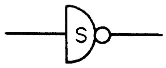
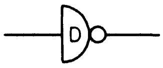
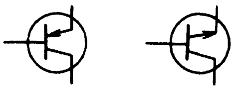
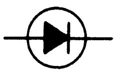
Operating panel's switches don't work.

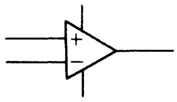
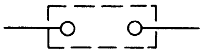
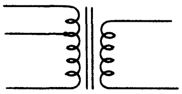
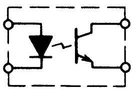
- SEL switch does not work. SEL LED does not light. — YES → Check contact of CN91, CN10, CN5. / Q92, and Q93 are faulty. / SW92 is faulty. → Insert connectors. / Replace LEPF circuit board. / Replace LEPV circuit board.
- NO
- LINE/FORM FEED switch does not work. — YES → Q92, Q93 are faulty. / SW93, and SW94 are faulty. → See Item (9) / Replace LEPF circuit board.
- NO
- TOF SET switch does not work. — YES → Q92, and Q93 are faulty. / SW91 is faulty. → Replace LEPF circuit board.
- NO
- Rotary switch does not work. — YES → Q92, and Q93 are faulty. / SW95 is faulty. → Replace LEPF circuit board.

7. CIRCUIT DIAGRAMS

This chapter describes the circuit diagrams of the MICROLINE 82A in the following order:

Fig. 7-1 Table of Symbols

Symbol	Mark	Description
	Q	SN 7405 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
	Q	339 Comparator
	BK	Breaker
	THERMI- STOR	Thermistor
	SG	Signal ground
	TF	Transformer
		Home position detector
	F	Fuse

1.2 Components

1.2.1 Standard Printer Components

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

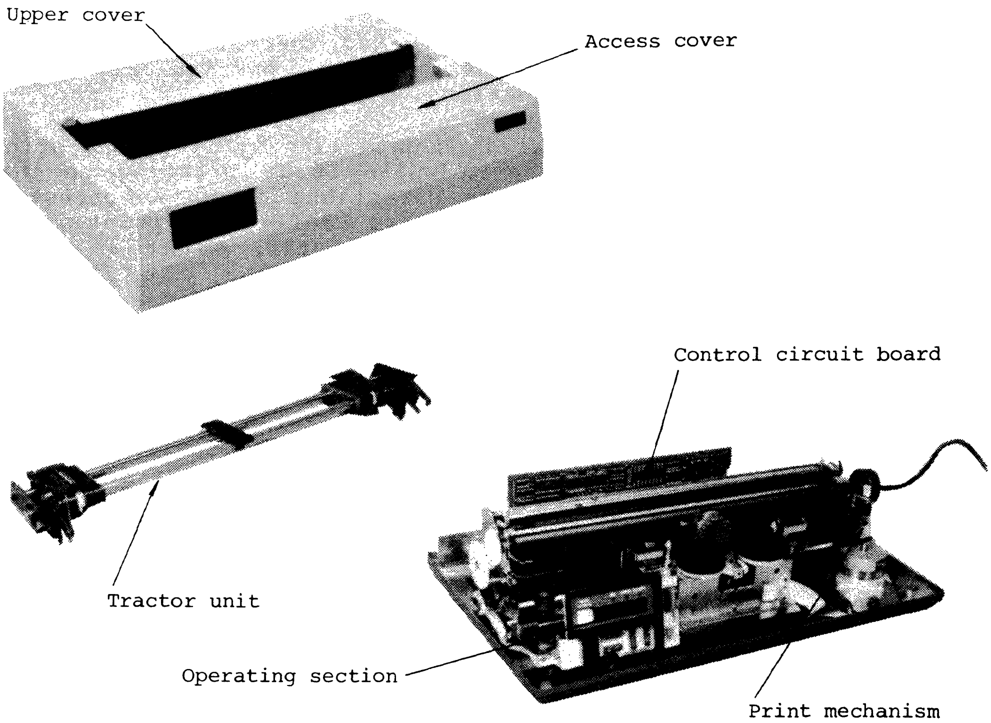


Fig. 1-1 Standard Components

1.2.2 Optional Printer Components

The optional printer components are:

(1) High-speed (H.S.) RS-232-C serial interface board

(2) High-speed (H.S.) RS-232-C + current loop serial interface board

(3) IEEE 488 parallel interface board

2. SPECIFICATIONS

2.1 Print Specifications

(1) Print system: Dot-impact matrix

(2) Printing direction: Bidirectional

(3) Printing speed: 120 characters/second (10 CPI or 16.5 CPI)
60 characters/second (5 CPI, 8.3 CPI)

(4) Line printing speed: As shown in Table 2-1

Table 2-1 Unit: Lines/minute

No. of characters per line	5 CPI	8.3 CPI	10 CPI	16.5 CPI
136	-	-	46	46 (Note 1)
80	-	38	71	69
40	71	69	117	111
20	117	111	173	162

Note: 1) No. of characters per line applies to printing of 132 characters.

2) Graphic printing speed is about one fourth of the above figures

(5) Kinds of printing

Alphanumeric characters and symbols: 94 (Lower-case English letters are included. SP, DEL not included.)

Note: "g", "j", "p", "q", "y", ",", ";", and "_" are printed as DESCENDER characters shifted down by 2 dots for the 6 LPI mode. For the 8 LPI mode, however, these characters are printed as DESCENDER characters shifted down by 1 dot for other than the USA model, "ç" (French) is also dealt with as a discender character.

Graphic: 64

Dot matrix patterns are shown in Appendix E.

(6) Character composition

Basic matrix: 9 (hor.) x 9 (ver.) dots

Characters: 9 x 7 dots

Graphic: 6 x 12 dots (at 6 LPI)
6 x 9 dots (at 8 LPI)

(7) Character size

Characters: As shown in Appendix F.

Graphic: As shown in Appendix G.

(8) Character set

		(c) Fixed pin platen feed system: (option at plant) Paper can be cut by using the paper-tear-off bar (option at plant)
(17)	Column indicator:	2.54 mm (0.10") scale indicator.
(18)	Paper out:	Rear paper feed: Detects the absence of paper about 50 mm (2.0") from the present printing line. Bottom paper feed: Detects the absence of paper about 25 mm (1") from the present printing line.
(19)	Paper-tear-off bar: (option at plant)	Paper can be cut about 23.28 mm (0.916") above printing position. This bar can be mounted when the fixed pin platen is used.
(20)	Appearance	(As shown in Appendix A)
	Outside dimensions:	512 mm (20.15") (W) x 328 mm (12.91") (D) x 133 mm (5.24") (H) (Not including the platen knob, or tractor unit)
	Weight	
	Printer proper:	Approx. 14 kg
	Tractor unit:	Approx. 0.7 kg
(21)	Input power:	Single-phase a.c. a) 115 V $\pm$ 10%, 50/60 Hz $\pm$ 2% b) 220 or 240 V $\pm$ 10%, 50/60 Hz $\pm$ 2%

NOTE

Specify either a) or b) in your order. 220 or 240 V can be selected with internal switch. (Refer to paragraph 4.17.4)

(22)	Power consumption:	Approx. 90 VA maximum during operation; approx. 45 VA when not printing
(23)	Power cord:	Approx. 2.3 m (7.7 ft) long (Plugs and cords meeting UL, CSA, and European standards are available.)
(24)	Insulation	
	Insulation resistance:	5 MΩ or more when measuring between a.c. input and the frame by a 500 V d.c. megger
	Dielectric strength:	No damage is caused when the following voltage is impressed between the a.c. input line and the frame for one minute: a) 115 V input type: 1,000 V a.c. (50/60 Hz)

Type	Ream	Copy number	Remarks
Carbon-line paper	30 to 34 kg (35 to 40 g/m^2)	Up to 4 copies including original	Up to 3 copies when using fixed-pin platen feed system (option at plant)
Pressure-sensitive paper			
Interleaf paper	45 kg (52 g/m^2)	Up to 3 copies including original	
	30 kg (35 g/m^2)	Up to 4 copies including original	When tractor unit is used.

Note: Paper thickness must be 0.28 mm (0.011") or less.

A printing format is shown in Appendix H-1.

NOTE

Two kinds of paper cannot be used simultaneously.

2.3 Ribbon Specifications

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

(1) Spool: 2-inch standard spool (Underwood type)

(2) Ribbon length: 11.5 m (12.5 yd) maximum

(3) Ribbon width: 12.7 mm (0.5")

(4) Ribbon thickness: 0.1 mm (0.004") maximum
Nylon (40 denier x 40 denier)

(5) Color (ink): Single color (black)

(6) Eyelet: With reversing eyelets
(Thickness: 2.4 ± 0.3 mm,
Diameter: 7.8 mm)

(7) Ink viscosity: Low viscosity
(About 500 ± 100 cp at 25°C (77°F))

(8) Ribbon life: 1.5 million to 2.0 million characters

The diagram number for the genuine OKI ribbon is 4LP-1322-5 (black).

2.4 Interface Specifications

The interface section of the printer can be used divided as shown below.

Pin No.	Signal	Direction	Description
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 printer is ready for receiving data.
14, 16 33	0 V	-	Signal ground
17	CHASSIS GROUND	-	Frame ground
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 0.5 ms.
32	$\overline{\text{FAULT}}$	From printer	This signal goes from high to low level when paper runs out.
15, 34 35, 36	-	-	Unused

Note: Pin arrangement

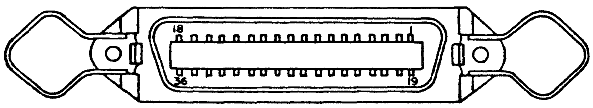


Fig. 2-1 Connector Pin Arrangement

(4) Parallel interface levels

Low level: 0.0 to +0.8 V

High level: +2.4 to +5.0 V

Pin No.	Signal	Direction	Description
1	Protective Ground (PG)	-	Connected to printer frame (Frame ground)
3	Received Data (RD)	To printer	Printer received data signal
4	RTS	From printer	Fixed at mark
*6	Data Set Ready (DSR)	To printer	Signal notifying printer when spacing that data is ready to be transmitted.
7	Signal Ground (SG)	-	Signal ground
11	Supervisory Send Data (SSD)	From printer	Signals (equivalent to $\overline{\text{BUSY}}$) indicating that printer is ready for operation and receiving data. (Refer to Table 4-7.)
20	Data Terminal Ready (DTR)	From Printer	(1) ON when power is supplied. (2) ON when the device is in select (ready for receiving). Switching of (1) and (2) can be made by jumper plug. (Note 2)
2, 5, 8 to 10, 12 to 19, 21 to 25			Unused

Note: 1) The printer output signals of DTR and SSD are unconditionally at high level (ready for receiving) for about 1 second after power is switched on and about 12 seconds after power is switched off, but are invalid for these durations.

2) DTR switching (LEPV-circuit board)

SP1	A side	ON under select condition
	B side	ON when power is supplied

3) Pin arrangement

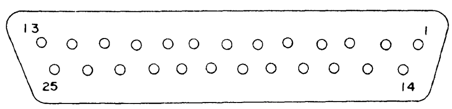


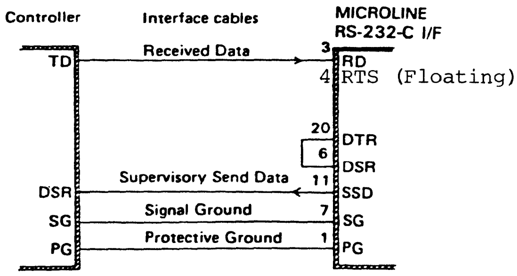
Fig. 2-2 Connector Pin Arrangement (25 pins)

*4) This printer does not monitor the DSR signal.

5) Connection of L.S. serial interface

Handling of SSD signal with L.S. RS-232-C interface differs depending on types of interface on the controller end. Handle the SSD signals as follows:

ii) When DSR signal is not used, connect DSR and DTR signals in the connector.



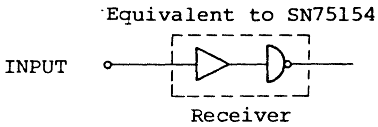
(4) L.S. serial interface levels

Mark (low level) = OFF = LOGIC "1": -25 to -3 V

Space (high level) = ON = LOGIC "0": +25 to +3 V

(5) L.S. serial interface circuit

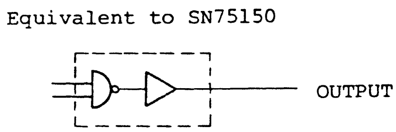
(a) Receiving circuit

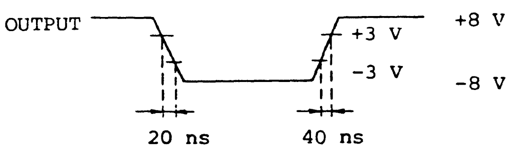


Notes 1) Maximum input voltage is $\pm$25 V

2) If input end power is OFF, the output of receiver becomes high (+2.4 V or more) at TTL level.

(b) Sending circuit





The above values apply for a drive source voltage of 12 V, and a 7 kΩ, 15 pF load.

where,

T: Time (ms) before stopping data, after sending SSD signal

B: Tramsmitting speed (BPS)

A: Code unit number (8 bits or 7 bits)

P: Parity bit (existent = 1, non-existent = 0)

2) Set the DIP switches for function selections according to paragraph 4.17.

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

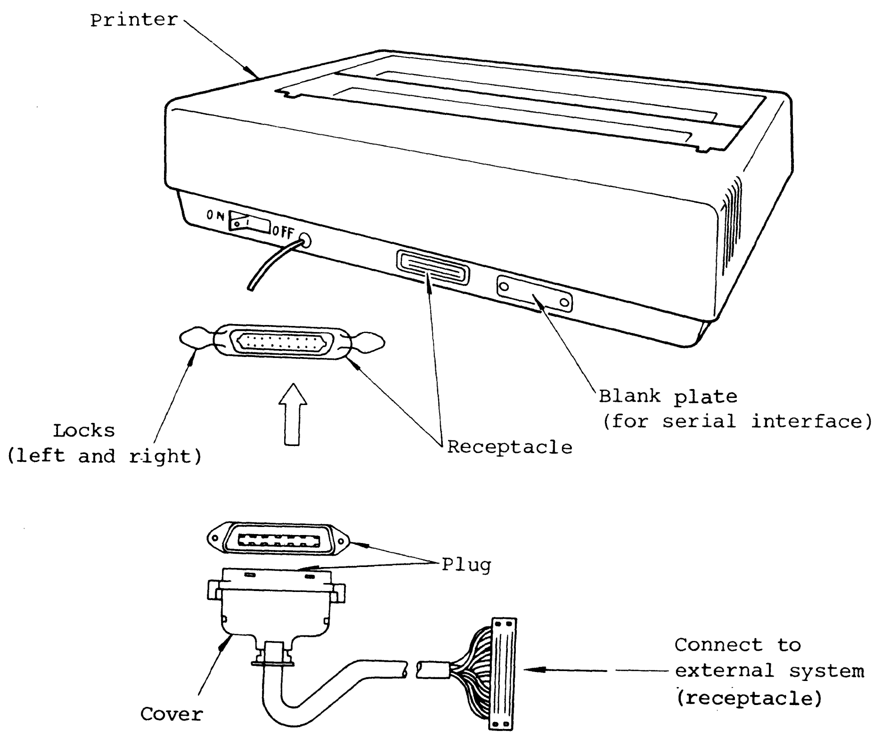


Fig. 3-1 Parallel Interface Connection Diagram

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.

3.2 Functions of Operating Controls and LEDs

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

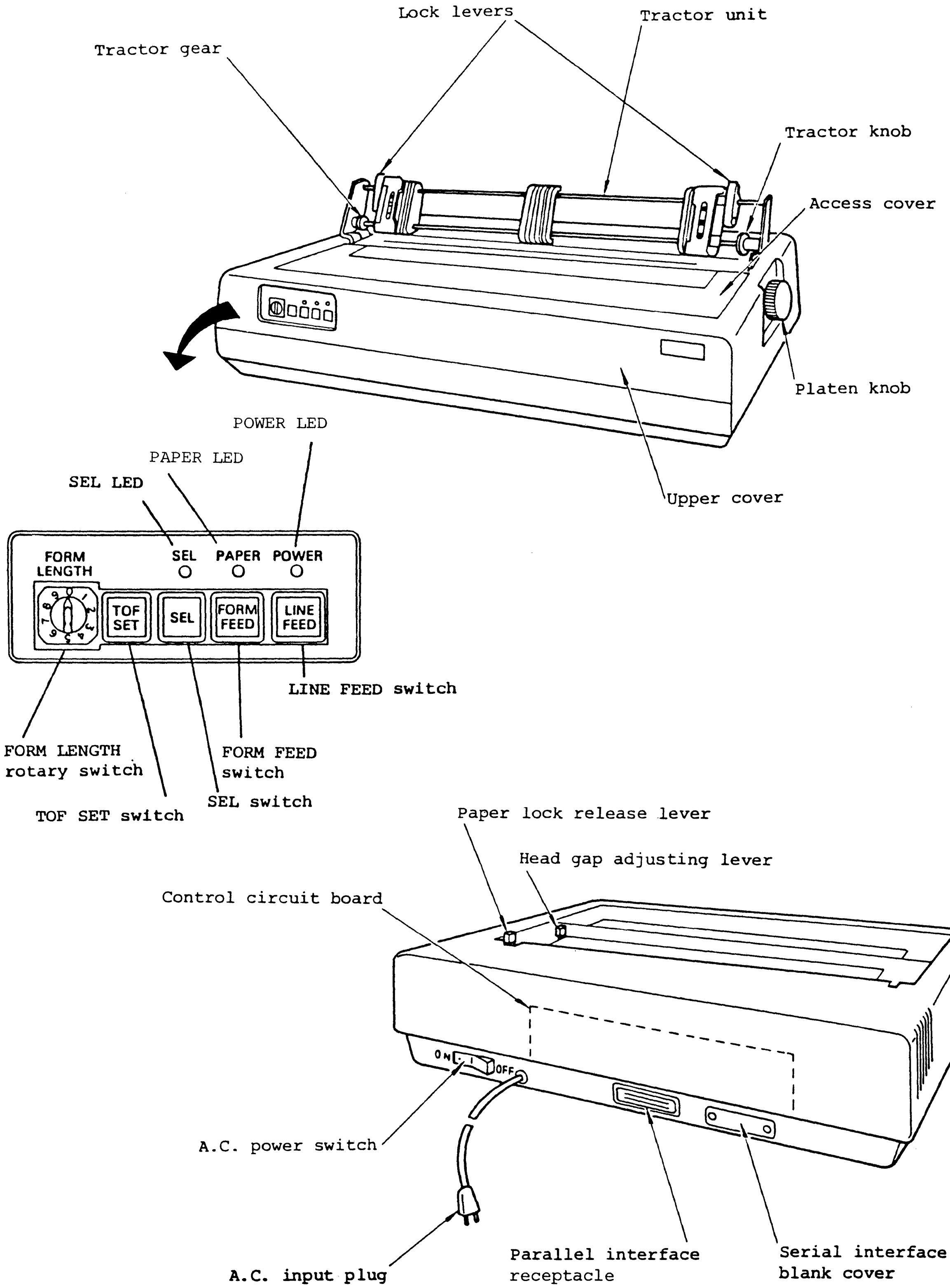


Fig. 3-3 Operating Controls, LEDs and Others

Table 3-1 (con.)

Name	Type	Location	Description
LINE FEED	Momentary switch	Front panel	Valid in deselect condition. When this switch is depressed, paper is fed one line upward. The LINE FEED switch is also used to start character 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 forward, paper is free.
Head gap adjusting lever		Top of printer at right (front side)	Select printing pressure according to paper type and thickness.
Platen knob		Right side of printer	Turned for manually feeding paper up or down.

3.3 Operating Procedures

3.3.1 Setting Page Length

(1) When the a.c. 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 a.c. 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) Adjust the paper to the first line,

(d) Push the TOF SET switch,

(e) Push the SEL switch again to light the LED so the desired page length will be set.

The desired page length is now set.

NOTE

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

3.4 Tractor Unit Mounting (See Fig. 3-4)

(1) Remove the access cover.

(2) Pull the printer's paper lock release lever to the open position.

(3) Slip the left and right tractor side plates rear clamp levers onto the paper tear-off bar shaft.

(4) Pull the tractor unit toward you and slip the forward clamp levers onto the shaft of the platen bearing. Push down and snap in place.

3.4.1 Tractor Unit Removal

Reverse the above procedure.

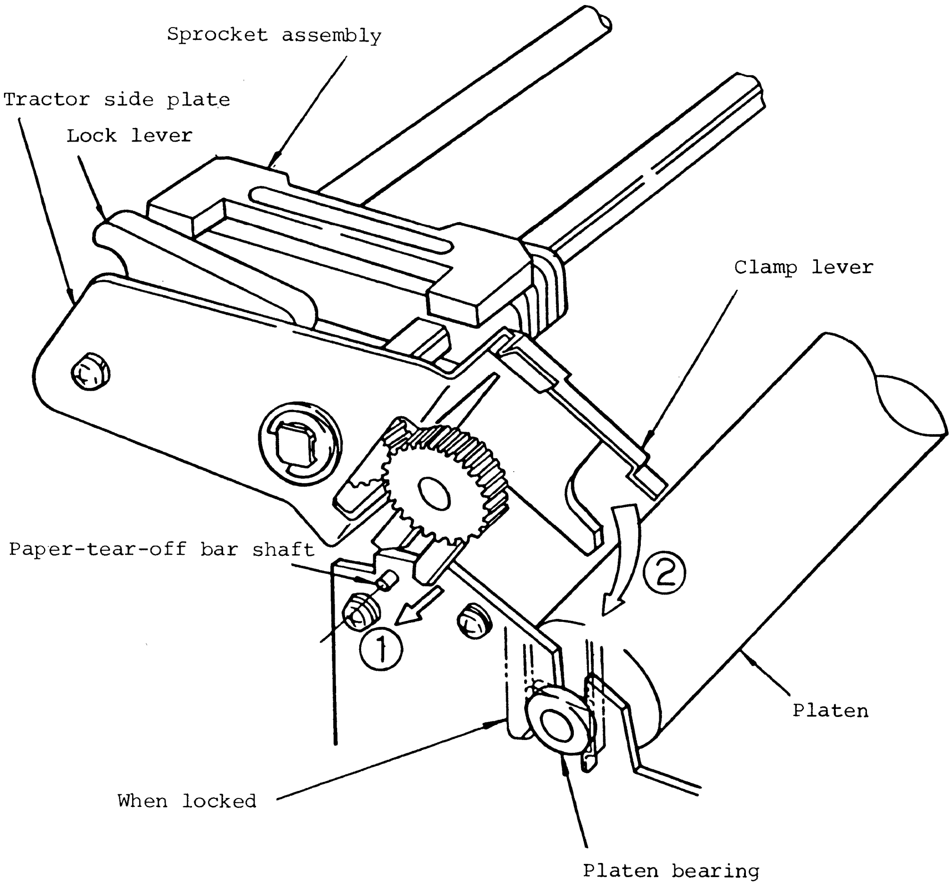


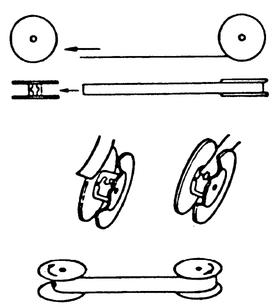
Fig. 3-4 Tractor Unit Mounting Method

3.5 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.



(8) Check all the items from (1) to (7) above, to prevent faulty loading.

(9) Replace the access cover.

NOTE

1) Be careful not to deform the ribbon protector when loading the ribbon.

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

3.6 Paper Loading Procedure

Components related to paper loading are shown in Fig. 3.6.

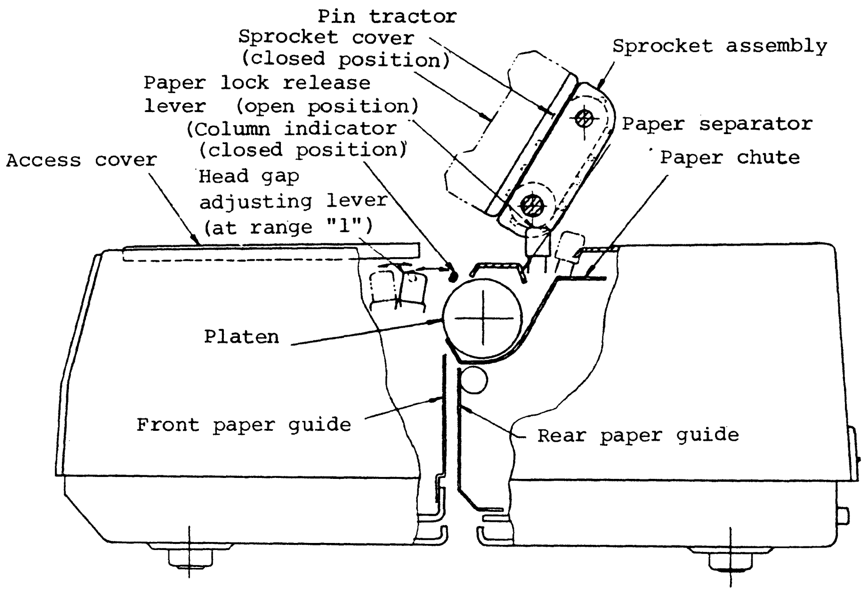


Fig. 3-6 Paper Loading Method

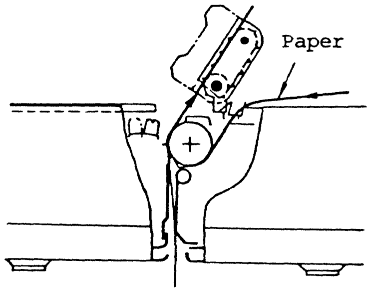
3.6.1 Single-Sheet Paper Loading

(1) Remove the tractor unit.

(2) Remove the access cover.

the paper separator. Turn the platen knob until the paper appears in front of the platen. Fit the paper sprocket holes and the sprocket of the tractor.

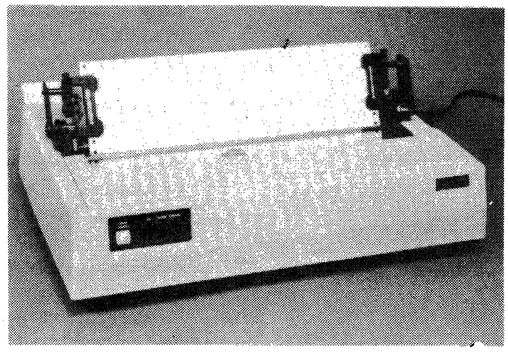
(5) For bottom paper feed, slide the paper up from the bottom frame hole, between the front paper guide and the rear paper guide and fit the paper sprocket holes and the sprocket on the tractor.



(6) Close the sprocket cover.

(7) Open the sprocket lock lever.

Align the edges of the paper.



(8) Close the sprocket lock lever.

(9) Replace the column indicator.

(10) Turn the platen knob to adjust the paper to the first line. Lightly pull the paper backwards to remove slack.

(11) Set the head gap adjusting lever to either position 1 or 2, depending on the kind and the number of papers. (See Table 3-3.)

Table 3-3 Head Gap Adjusting Lever Positions

Head gap adjusting lever position	Type of paper	No. of sheets
1. Platen side (Gap between the platen and print head is narrow)	Single sheet	1
	Pressure-sensitive or carbon-lined paper	2, 3
	Interleaf	2

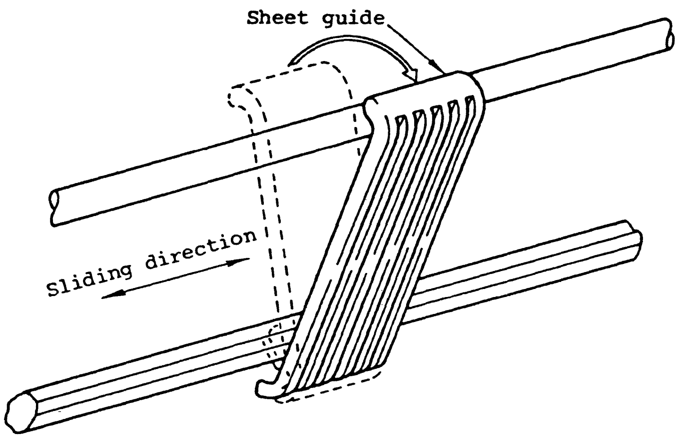
3) When using the tractor unit, keep the paper lock release lever in the front (open) position.

4) The tractor unit can be mounted after loading the paper in place, and feeding it up 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.

   Removed sheet guide should be stored with care not to lose it.

   When using the sheet guide, slide it to the center position between the right and left sheet feeders.



6) When using the tractor unit, keep the paper lock release lever in the front (open) position.

4. FUNCTIONS

4.1 Function Codes

This printer is controlled by the function codes shown in Table 4-1.

Table 4-1 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 format (TOF: top-of-form)
VT Channel No.	11 49 to 60	0B 31 to 3C	Feeds paper to tab position of same channel number as set in VFU.
DC1	17	11	Sets the printer in select (on-line) condition.
DC3	19	13	Releases the printer from select condition, and sets it in deselect (off-line) condition.
DC4	20	14	Loads tab position in VFU.
RS	30	1E	Designates 10 CPI.
GS	29	1D	Designates 16.5 CPI.
US	31	1F	Designates wider characters.
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.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 for page length.
ESC.5	27.53	1B.35	Sets TOF (first line of printing).
ESC.6	27.54	1B.36	Designates 6 LPI.
ESC.8	27.56	1B.38	Designates 8 LPI.
ESC.A	27.65	1B.41	Designates long line.
ESC.B	27.66	1B.42	Designates short line.
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.

4.2 Character Sets

Any of the 10 kinds of character sets shown in Table 4-6 can be selected by combination of the DIP switches SW1 through SW4 on the operating panel circuit board.

(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 132 or less (16.5 CPI). See Table 4-4 for the number of characters per line.

3) If the number of data characters is more than can be printed in a line, that is 137 (10 CPI) or more, or 133 (16.5 CPI) or more, the excess characters are automatically carried over to the next line.

4) Only item (4) differs in cases where a graphic code is included in the input data.

4.4 Graphic Printing

As shown in Fig. 4-1, a block is formed of character and line pitches, and divided into 6 minimum units. These units are combined to form graphic figures. Input code bits b1 to b6 are allocated to each of the 6 divided units. If any of these bits is "1", the units are printed.

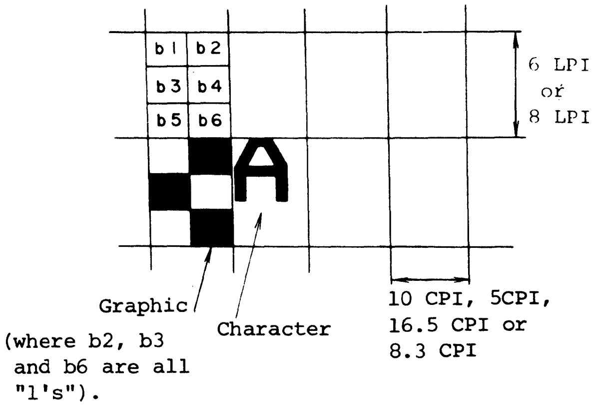


Fig. 4-1 Graphic Printing

The number of dots in each units is as shown in Appendix G.

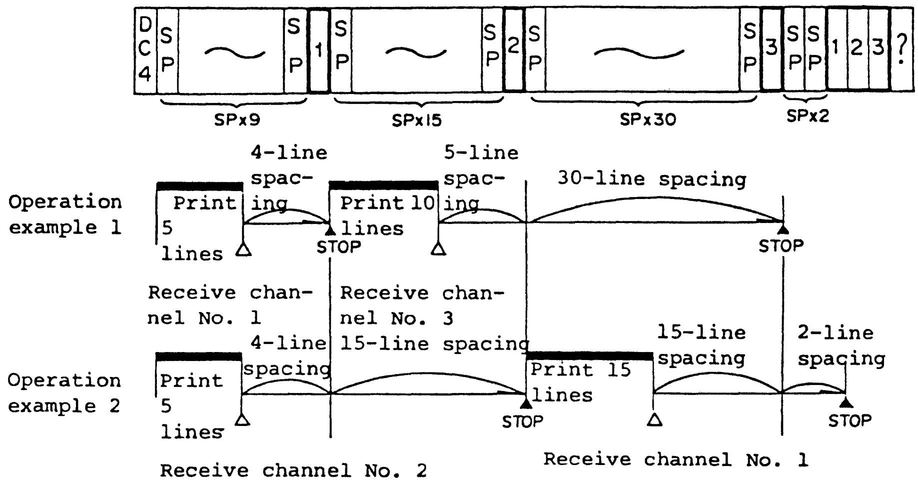
In graphic printing, the number of vertical dots is 12 (6 LPI) or 9 (8 LPI) so that the line is changed twice to print the upper half and the lower half.

Mixed printing of graphic figures and characters is also possible.

4.5 Vertical Tab Function

This printer has an electronic VFU (vertical format unit), and 12 different formats are stored in the memory. (cleared by power OFF.)

[Example]



(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.

4.5.3 Direct Skip Function

If any of the followinig 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 skipped. Any number from 0 to 99 can be selected by combination of X1 and X2.

4.6 Top-of-Form (TOF)

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 4.6.1 and 4.6.2, rapidly feeds the paper up to the top-of-form of the next format.

4.6.1 Format Length Setting

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

(1) Selection with the rotary switch

Any of the 10 format lengths shown in Table 3-2 can be selected.

4.8 Enlarged Character Printing Function

Double-width characters (or graphic symbols) are printed when the following function code is received:

US: Double-width character printing start code

5 CPI (from 10 CPI)
8.3 CPI (from 16.5 CPI)

Enlarged character printing can be stopped by an RS (for 10 CPI) or GS (for 16.5 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, that line will be 16.5 CPI and the enlarged part of it will be 8.3 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 the release code is applied.

4.9 Line Space Change

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

(1) ESC, 6: 6 LPI (0.167")

(2) ESC, 8: 8 LPI (0.125")

NOTE

DESCENDER characters are not printed by 8 LPI.

4.10 Characters-Per-Line Change

The number of characters per line can be changed by applying the following control codes:

Table 4-4

Mode \ CPI	Input code	5 CPI	8.3 CPI	10 CPI	16.5 CPI
Long line	ESC.A	68 characters	66 characters	136 characters	*224 characters 132 characters
Short line	ESC.B	40 characters	66 characters	80 characters	132 characters

Note: * for U.S.A.

A long line is from the first to the 136th character on the column indicator; and a short line from the 1st to the 80th character. Change from a long line to a short line or vice versa is made line by line.

(5) Select/deselect: Select (ready for receiving)

Note: Not at paper-out.

(6) Page length: Set at the position designated by rotary switch

4.16 Communication Function Selection

The following functions of low speed (L.S.) serial interface can be selected.

4.16.1 SSD Signal Polarity Switching

SSD signal polarity can be switched to the mark (low-level) signal or space (high-level) signal with DIP switch SW1, as shown in Table 4-7.

4.16.2 Transmitting Speed Setting

Transmitting speeds of 110 BPS to 1200 BPS shown in Table 4-8 can be selected with DIP switches SW2 to SW4.

4.16.3 DTR Signal Switching

DTR signals can be switched by a jumper plug (SPI) according to the purpose of use, as follows: (Refer to Table 4-9.)

(1) ON at the time of power on.

(2) ON at the time of select (ready for receiving)

4.16.4 Code Bit Switching

By the DIP switch SW5, in Table 4-5, 8 or 7 bits can be selected.

4.16.5 Parity Bit Selection

By the DIP switch SW6 in Table 4-7, existence or non-existence of parity bit can be selected.

4.17 Functions of Switches, Buttons, and Others

Remove the upper cover for operation of these switches and buttons.

4.17.1 DIP Switches

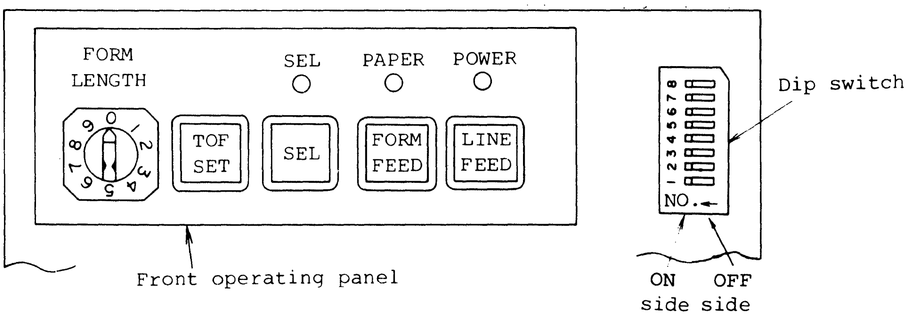


Fig. 4-2 DIP switches on Operation Panel Circuit Board

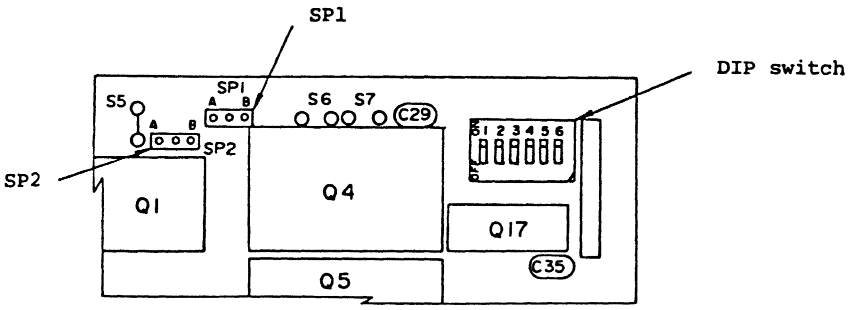


Fig. 4-3 DIP Switches and Jumper Plugs on Control Circuit Board

Table 4-7 DIP Switches (for L.S. serial interface) on Control Circuit Board

Switch	ON	OFF
SW1	SSD polarity (Space when ready, mark when busy).	SSD polarity (Mark when ready, space when busy).
SW2 SW3 SW4	Transmitting speed setting See Table 4-8	
SW5	Unused	Unused
SW6	Parity	No parity

Table 4-8 Transmitting Speed Switching

DIP Switch			Transmitting Speed
SW2	SW3	SW4	BPS
			110
ON			150
	ON		200
ON	ON		300
		ON	600
ON		ON	1200

Note: ON means that SW is in the ON position.

4.17.4 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 Figs. 4-4 and 4-5).

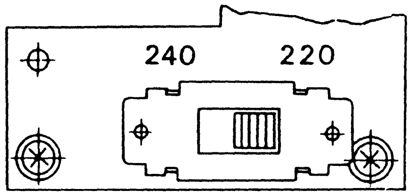
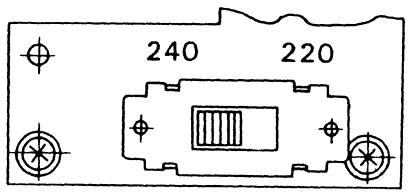
Type	Power source voltage select switch position	A.C. input voltage
200 V type		220 V
		230 V or 240 V

Fig. 4-5

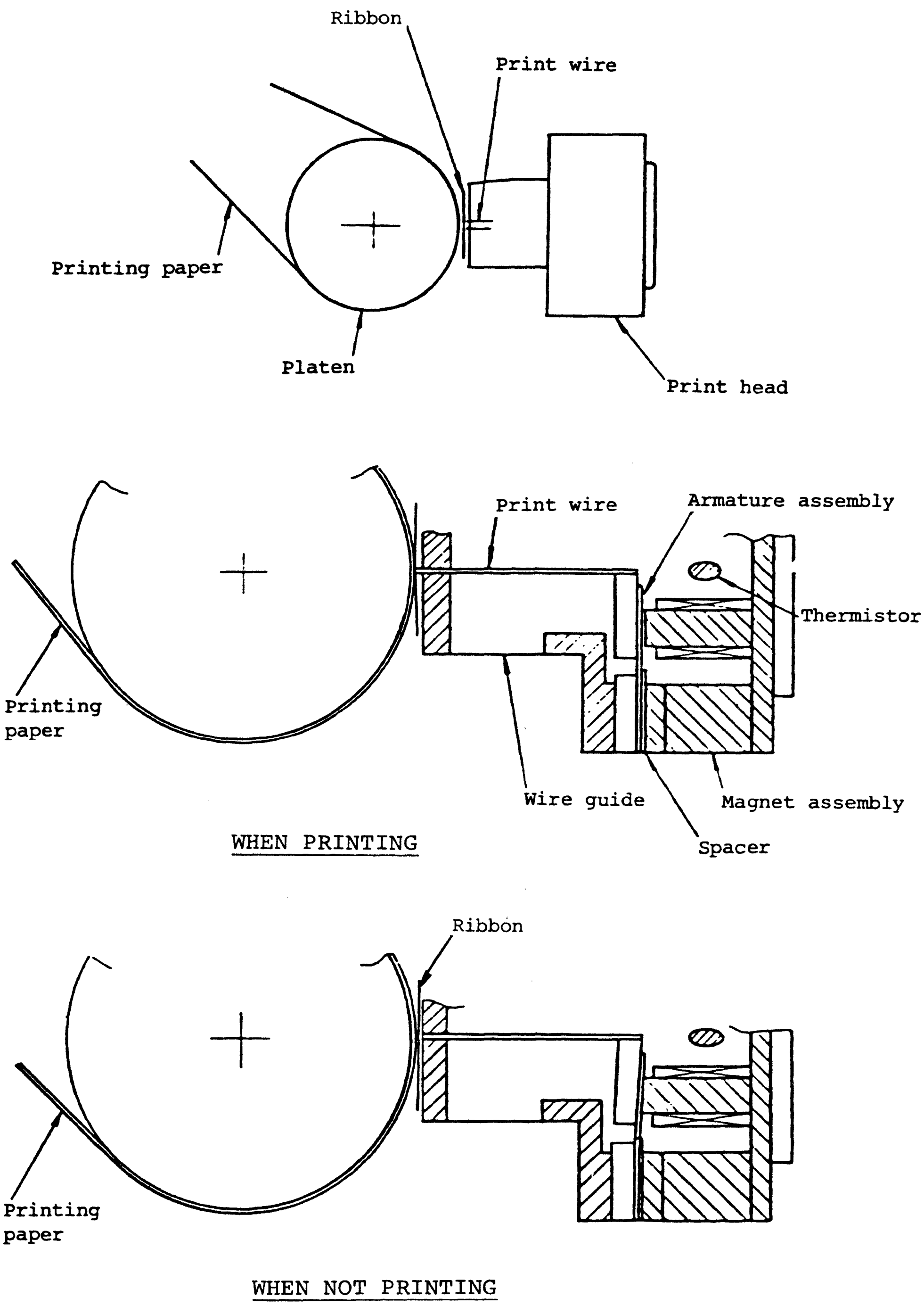


Fig. 5-1 Printing Mechanism

(2) 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 right to left until the home sensor plate enters the opening in the home sensor.

The home sensor consists of an LED photodiode pair. When the home sensor plate enters the sensor, the light is interrupted and a signal is generated to stop the motor. When the stepper motor stops, the carriage stays at the start position until the next print line is ready to be printed.

5.1.3 Ribbon Feed Mechanism and Operation

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

The ribbon feed mechanism consists of the following:

(a) Ribbon drive gear

(b) Ribbon gear

(c) Ribbon spool gear

(d) Ribbon change lever

(e) Eyelet detector lever

(f) Ribbon bracket

(1) Ribbon feed operation (See Figs. 5-3-(1), 5-3-(2).)

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 drive 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 the ribbon reverse arm to shift the ribbon reverse arm from left to right.

When the ribbon reverse arm 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 and is disengaged as previously described.

When the stepper motor is driven counterclockwise, the carriage moves from right to left by 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.

5.1.4 Paper Feed Mechanism and Operation

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 the following:

(a) Pulse motor with gear

(b) Reduction gear

(c) Platen

(d) Tractor unit

(1) Paper feed operation (See Fig. 5-4.)

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) (6 LPI) when the stepper motor advances 24 steps (180°).

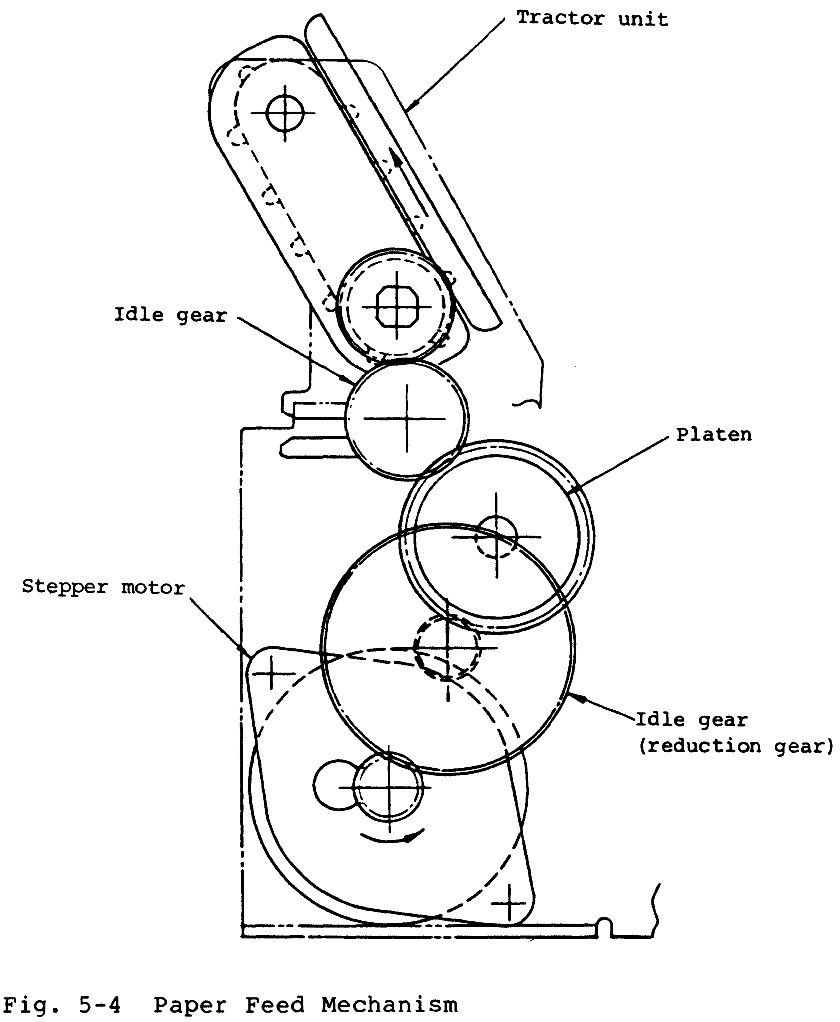


Fig. 5-4 Paper Feed Mechanism

5.1.6 Paper Out Detecting Mechanism (See Fig. 5-6.)

(1) In case of rear paper feed

When the paper is being inserted, the paper prevents the actuator of the microswitch from falling into the groove of the paper separator, and the microswitch is under OFF condition (microswitch is not pushed). When the paper is out, the actuator falls into the groove of the paper separator, and the microswitch becomes ON (microswitch is pushed), to detect paper out.

With the rear paper feed, paper out is detected with the remaining paper length of 50.8 mm (2").

(2) In case of bottom paper feed

When the paper is being inserted, the paper prevents the actuator of the microswitch from falling into the hole of the front paper guide, and the microswitch is under OFF condition (microswitch is not pushed). When the paper is out, the actuator falls into the hole of the front paper guide, and the microswitch becomes ON (microswitch is pushed), to detect paper out.

With the bottom paper feed, paper out is detected with the remaining paper length of 25.4 mm (1").

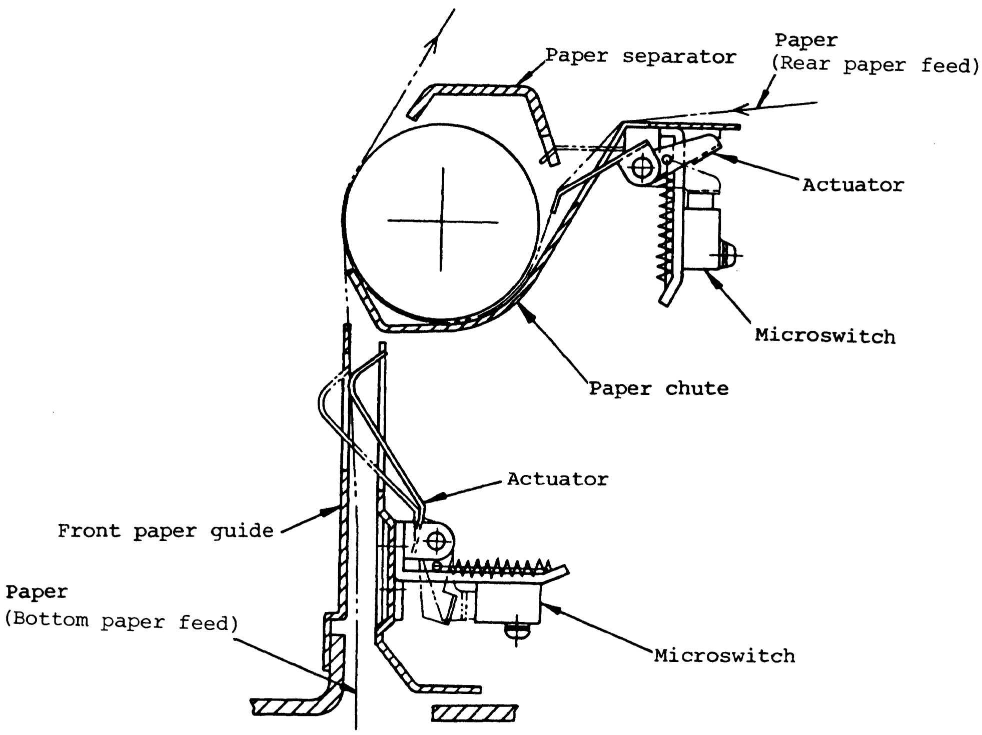


Fig. 5-6 Paper Out Detecting Mechanism

5.2 Operation of the Control Section

5.2.1 General

A block diagram of the printer is shown in Fig. 5-8.

The control section consists of a single printed circuit board, and controls the mechanical section. The microcomputer (micro CPU) handles all control operations. Other basic components include a 256 RAM with an I/O port serving as an input data buffer; serial interface control; ROM which stores character patterns; and another ROM which stores information as a converter for selecting various kinds of characters.

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.

5.2.2 Outline of Control Circuit

The printer operates under control of the microcomputer. As shown in the circuit diagrams in Chapter 7, Q1 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 Q5 (4 k, MASKROM) or Q5 and Q6 (2 k, EPROMs), and are executed after resetting subsequent to switching power on. A 128-byte RAM is used as a register, and the timer is used for internal control. A 9 MHz oscillator (OSC) is connected to XTAL1 and XTAL2, generating the basic clock. The CPU cycle time is about 1.6 s.

The control circuit has an 8-bit bus line, 16 I/O ports, and 3 terminals as I/O means. The bus line is connected to Q18, Q19, Q4, Q5, Q6, Q2, and Q3, and addresses are designated by Q18 and Q19. T1 and $\overline{\text{INT}}$ signify inputs. T0 sends a 3-MHz pulse to other IC's, which use the pulse as a clock.

Q2 is the 256-byte RAM with an internal time and 22 I/O ports. The I/O port is used as a control line for interface signal input/output, and space and line-feed pulse motors. Q4 is the 2 k-byte character generator ROM. Addresses are assigned by A0 thru A10, and signals corresponding to characters are output from O0 to O7. This output is received by the CPU, and sent to its P10 to P17, P25, P26, from which it is fed through the open collector inverters Q7 and Q8 to drive the Darlington transistors TR4 through TR12, and cause the head to print. Q18 and Q19 are 4-bit latches, used for designating addresses to Q4, Q5, and Q6. Q3 is a serial interface IC, which converts serial data into parallel signals, and also generates control signals for the RS-232-C interface.

5.2.3 Initial Operation (See Timing Chart (1), Fig. 5-9.)

When the equipment is switched on, the circuitry is cleared, and the carriage is returned to the home position (Refer to 4.15). When the a.c. power switch is pushed on, a reset signal is generated by C23 which is connected to Q1 (micro CPU). As a result, Q1 inputs $\overline{\text{RESET}}$ to clear the inside. After the clearing, the program runs to move the carriage back to the home position. If the carriage is already at the home position, the carriage moves from the home position once and then returns to the home position. The interface busy signal remains "1" during initialization, and no data will be accepted. After initialization, the busy signal turns to be "0" to enable the printer ready for receiving data.

Transistor TR26 delays the switching on of bias current to the drive circuit and advances its switching off to prevent erratic operation at power switch-on and switch-off.

5.2.4 Data Input Operation (See Timing Chart (1), Fig. 5-9.)

(1) Parallel interface

8-bit parallel data (data bit 1 to bit 8) is input to the I/O port of Q2 (PA0 to PA7). If a $\overline{\text{STROBE}}$ signal is sent out from the host equipment when the BUSY signal is "0", the parallel data is set to the internal latch of Q2 at the rising part of the $\overline{\text{STROBE}}$ signal.

After the data latching, the BUSY signal is turned to "1" and the micro CPU processes it. First, it judges the input data, and writes it into RAM Q2 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 processing the data, the BUSY signal is turned to "0", and a pulse is applied to terminal $\overline{\text{ACKNOWLEDGE}}$.

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

(2) Low-speed serial interface

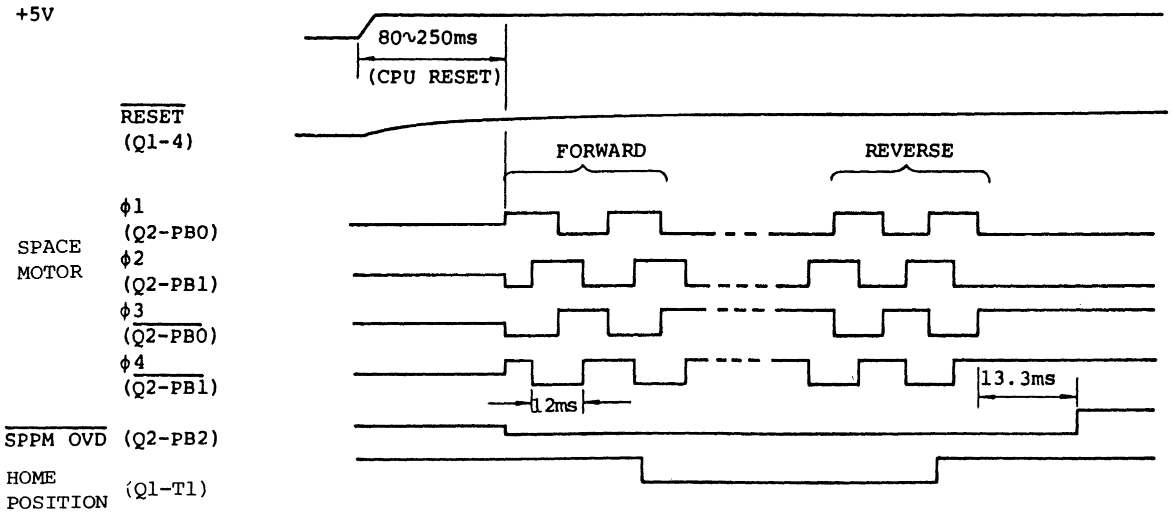
Input serial data to Q3 RXD (RD) is converted into parallel data in IC Q3. The inside status of Q3 is sensed by the CPU to recognize reception of one character. This data is set into RAM Q2 via the CPU. Then printing and various functional operations take place as mentioned in Section 4.

The L.S. serial interface of the printer has no built-in data receiving interface buffer so that transmission from the terminal must be immediately stopped by detecting the unable-to-receive status (equivalent to BUSY) from the SSD signal sent from the printer.

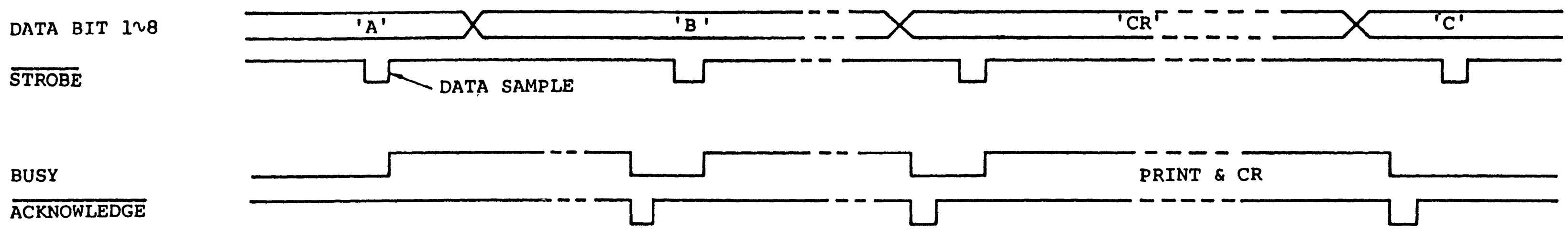
The printer becomes unable to receive under the following conditions.

The printer indicates an unable-to-receive status when, during receiving, the SEL switch is depressed, a paper-end condition is reached, or the print buffer becomes full, and further receives any of the following codes from (a) to (j):

1. Initial operation



2. Data input (parallel interface)



Note: Voltage level

Fig. 5-9 Timing Chart (1)

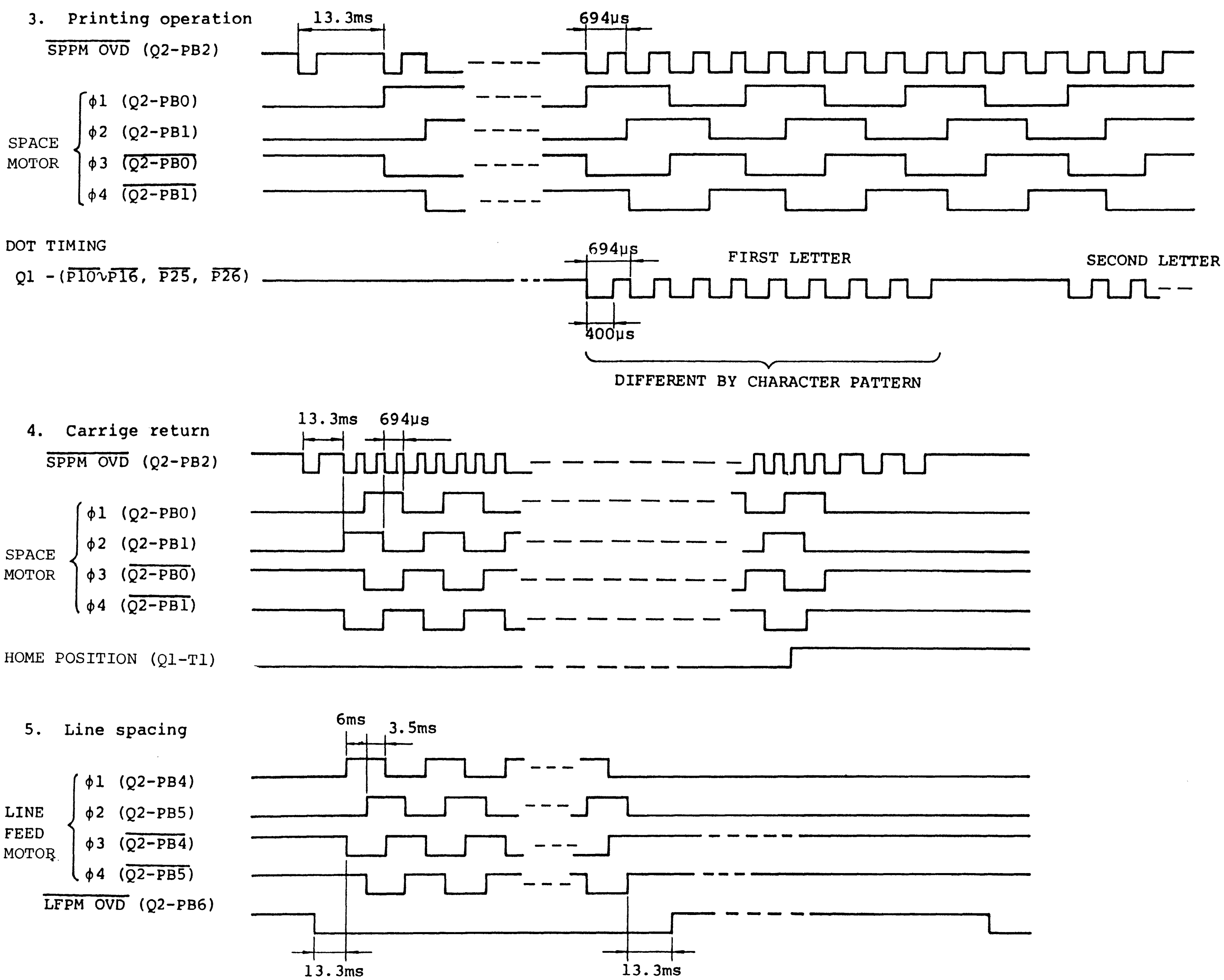
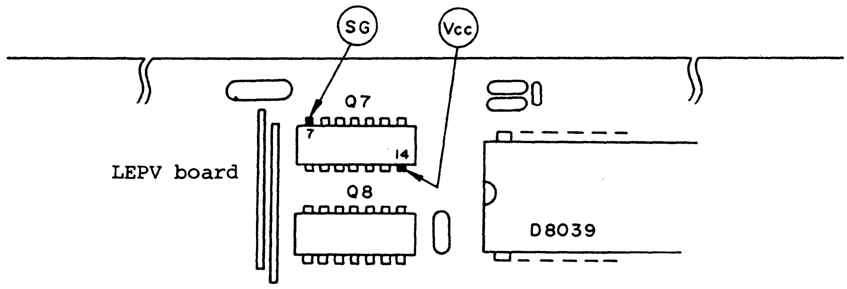
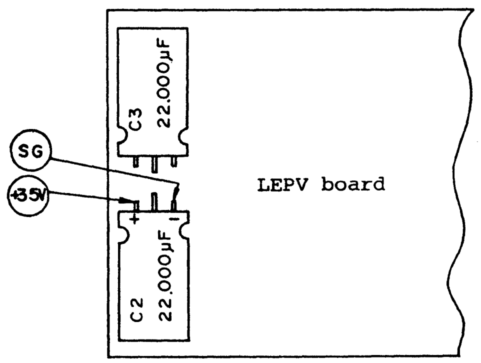


Fig. 5-10 Timing Chart (2)

The +5 V can be checked between pin 7 (SG) and pin 14 (VCC) of IC Q7. It must be made sure that the voltage between these pins is within the range of 4.75 to 5.25 V.



A nonregulated d.c. voltage of 35 V is generated from the transformer secondary output 28 V a.c. through full-wave rectifier consisting of D1 thru D4, and parallel smoothing capacitors C2 and C3 (each 22000µF). This d.c. voltage is used to drive the paper feed motor, print head space motor, and print head magnet. When there is no printing operation, it can be checked that the voltage between both terminals of capacitor C2 is within the range of 35 to 46 V d.c. (for rated input voltage +10%). During printing operation, it can be checked that the voltage becomes 26 to 36 V d.c. as affected by change in the load (for rated input voltage ±10%).



The circuit is so designed that the rated currents may flow through the motors and magnet even if the 35 V fluctuates due to input voltage fluctuation and load fluctuation.

5.2.10 Power Transformer

If the power transformer temperature abnormally rises, the built-in temperature fuse will blow out in order to prevent burn-off of the transformer.

Example of circuit diagram (in the case of 4LP-45191-128)

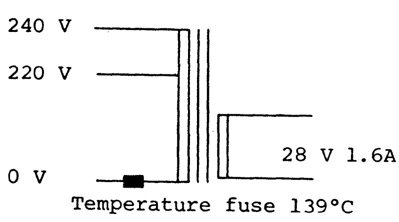


Table 6-1 Cleaning Point

Cleaning point	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.

NOTE

1) Push the a.c. power switch off before cleaning.

2) Be careful not to let ribbon and paper fragments remain inside.

6.3 Maintenance Tools

The following tools shown in Table 6-2 are necessary for replacing the parts for the printed circuit board, mechanism, etc. in the field.

Table 6-2 Maintenance Tools

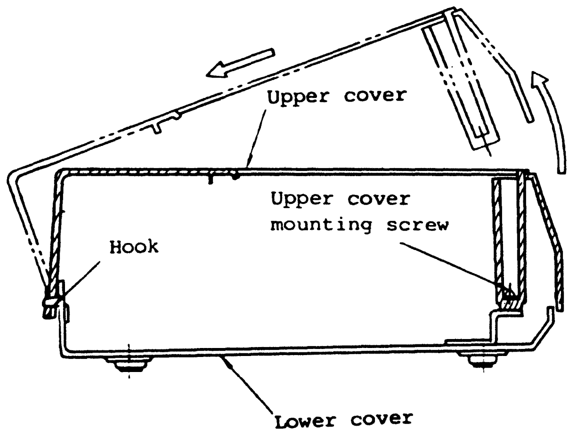
No.	Tool	Q'ty	Location	Remarks
1	No. 1-100 Philips screwdriver	1	Screws 2 to 2.6 mm	
2	No. 2-200 Philips screwdriver	1	Screws 3 to 5 mm	
3	6-200 screwdriver	1	Screws 4 mm	
4	No. 5-H nippers	1		
5	No. 1 round pinchers	1		
6	5.5 mm wrench	1		
7	11 mm wrench	1		
8	Thickness gauge set	1 set		
9	50 g force gauge	1		
10	300 g push/pull force gauge	1		
11	Soldering iron (30 W)	1		
12	Volt/Ohmmeter	1		
13	Oscilloscope	1		

6.4 Disassembly, Reassembly

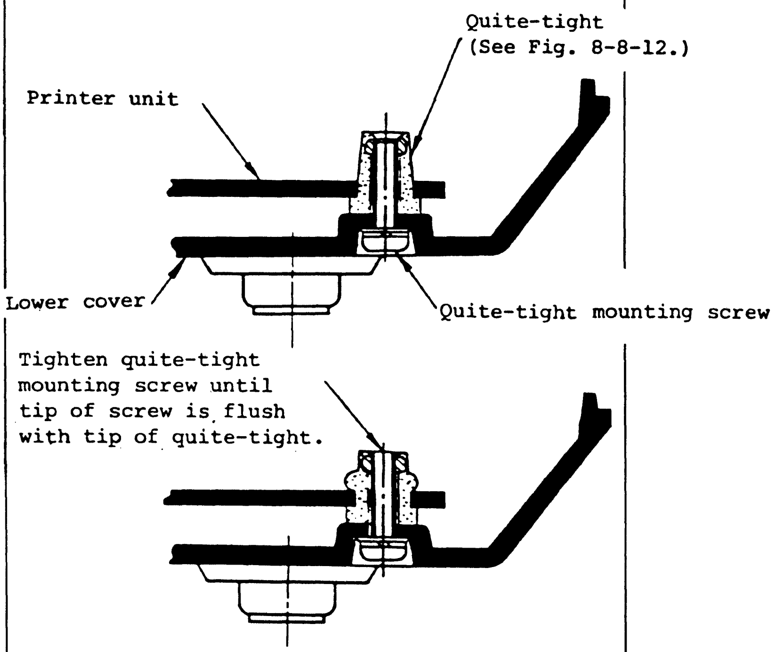
The disassembly and replacement procedures are explained below according to the disassembly route chart in reference to the table of component parts shown in Chapter 8.

6.4.4 Disassembling and Reassembling Parts

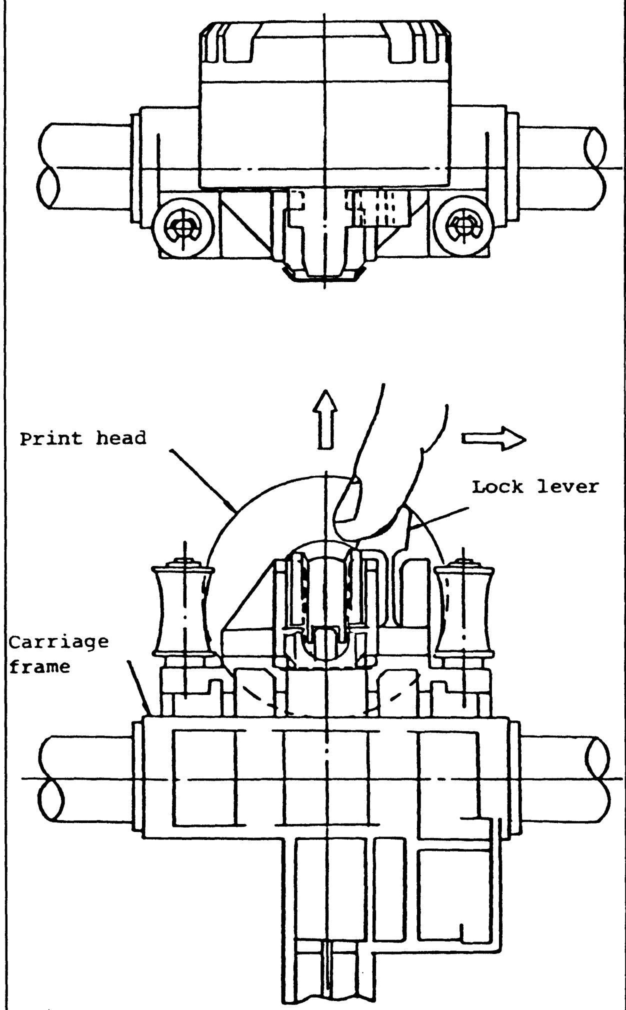
(1) Upper cover (See Figs. 8-1 and 8-8.)

Item	Description	Tool
Disassembly	(1) Disconnect interface connector. (2) Remove tractor unit. (See paragraph 3.4) (3) Raise and remove access cover (Fig. 8-8-3). (4) Remove platen knob (Fig. 8-3-28). (5) Remove two mounting screws (Fig. 8-8-30) from inside of front part of upper cover. (6) Raise front end of upper cover (Fig. 8-8-1), then push it rearward to remove it from lower cover.	No.2-200 Philips screw-driver
Reassembly	Reverse the disassembly procedure.	
Sketch		

(3) Printer unit (See Figs. 8-1 and 8-2.)

Item	Description	Tool
Disassembly	(1) Remove upper cover. (See 6.4.4 (1).) (2) Remove LEPV circuit board. (See 6.4.4 (2).) (3) Remove all connecting cords of printer unit (Fig. 8-1-2) from cord clamp (Fig. 8-8-8). (See Fig. 8-1.) (4) Remove quite-tight mounting screws (Fig. 8-8-29). (5) Raise the printer unit and remove from the quite-tight.	No.2-200 Philips screw-driver
Reassembly	Reverse the disassembly procedure. Note: 1) Tighten stud until tip of screw is flush with tip of quite-tight. (Tightening torque: 4 to 5 kg.cm) 2) See Fig. 8-1 for routes of connecting cords.	
Sketch		

(5) Print head (See Figs. 8-1 and 8-2.)

Item	Description	Tool
Disassembly	(1) Raise and remove the access cover. (2) Disconnect the print head (Fig. 8-2-1) connector from the flat cable connector which is attached to the carriage. (3) While holding the print head with the right hand, lift it straight up, with the lock lever released with the left hand.	
Reassembly	Install the print head, reversing the above procedure. Note: Twist the print head wire leads one turn, clockwise, before inserting the connector.	
Sketch		

(7) Space motor (See Fig. 8-3.)

Item	Description	Tool
Disassembly	(1) Remove upper cover. (See 6.4.4 (1).)	
	(2) Remove LEPV circuit board. (See 6.4.4 (2).)	
	(3) Remove space motor connecting cord from cord clamp (Fig. 8-8-8).	
	(4) Cut tie-wraps securing the space motor connection cord.	No.5 H nippers
	(5) Remove the space belt (Fig. 8-6-10) from the space motor (Fig. 8-3-9) pulley.	
	(6) Remove the space motor mounting screw (Fig 8-3-57), and then the space motor.	No.2-200 Philips screw-driver
Reassembly	Reassemble, reversing above procedures.	
Adjustment	(1) Space belt tension. See 6.5-1.1	

(9) Platen (See Figs. 8-3 and 8-4.)

Item	Description	Tool
Disassembly	(1) Remove the upper cover. (See 6.4.4 (1).) (2) Turn forward (open position) the column indicator (Fig. 8-3-17) (3) Remove the paper separator screw (Fig. 8-3-52), and then the paper separator (Fig. 8-3-7). (4) Remove E-shaped snap (Fig. 8-4-5), and then wave washer (Fig. 8-4-2) and right platen bearing (Fig. 8-4-3) by pulling them sidewise. (5) Pull the side plate bearings horizontally (Fig. 8-4-3) until their projections come off side plates, turn 90°, and remove platen by lifting it.	 No.2-200 Philips screw-driver
Reassembly	Reverse the disassembly procedure.	
Adjustment	Clearance between the paper separator and the platen See 6.5-3.2	

Table 6-3 (con.)

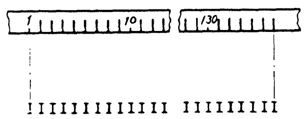
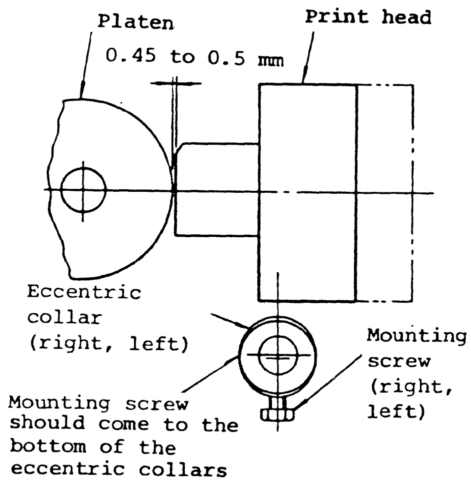
No.	Item	Standard	Description	Tool
1.3	Printing position	Run-out of character center against the column indicator scale should be $\pm$0.5 mm or less.	Fully print the printing column number to check character center run-out agaist the full range of the column indicator scale.  Check point: When out of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

Table 6-3 (con.)

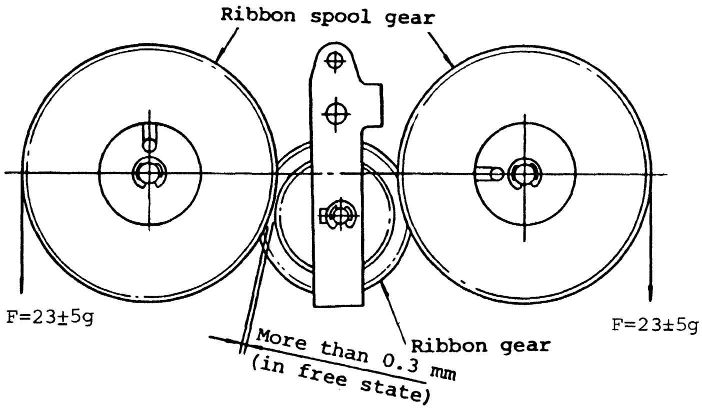
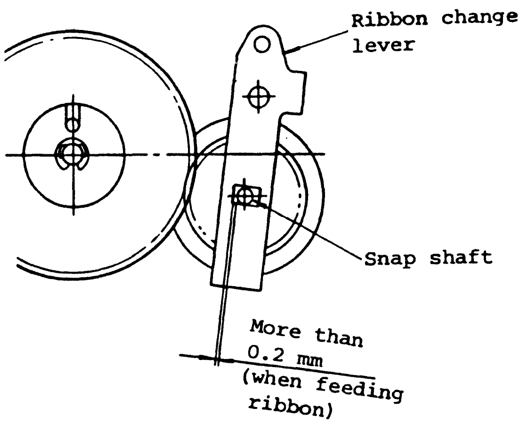
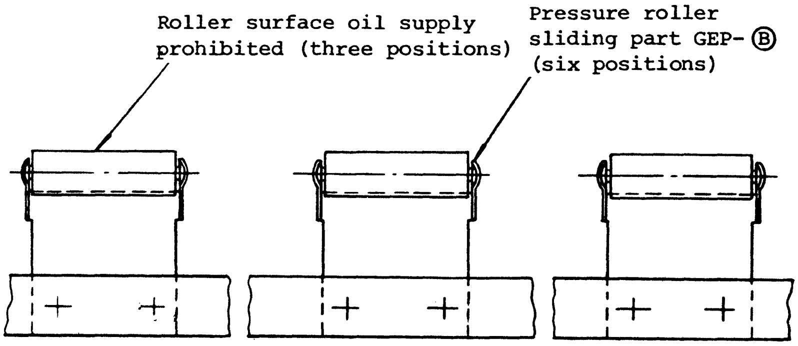
No.	Item	Standard	Description	Tool
4.1	Ribbon spool gear friction tension	F= 23±5g	Confirm this on both the right and left spool gears.  	50 g push/ pull force gauge
4.2	Gap between ribbon spool gear and ribbon gear	More than 0.3 mm in free state	Confirm this on both the right and left spool gears.  	
4.3	Gap between ribbon change lever and shaft	More than 0.2 mm when feed-ing ribbon		

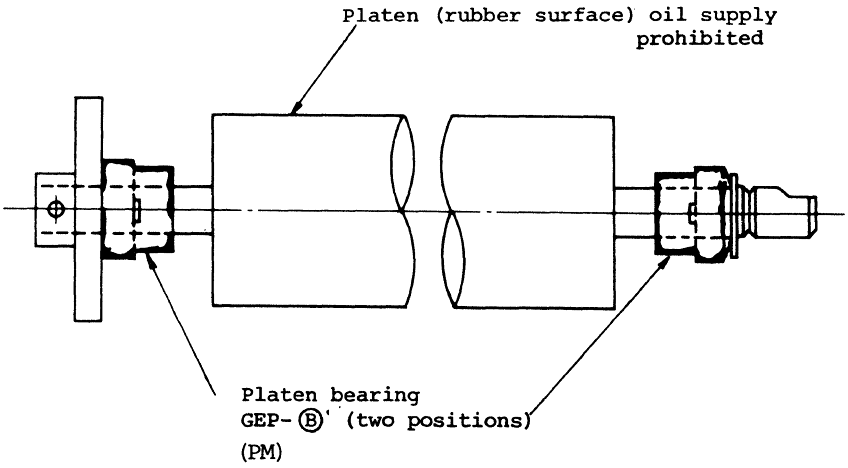
Table 6-4 (con.)

No.	Part	Reason	Remarks
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 feed mechanism friction felt	Prevention of inferior friction	

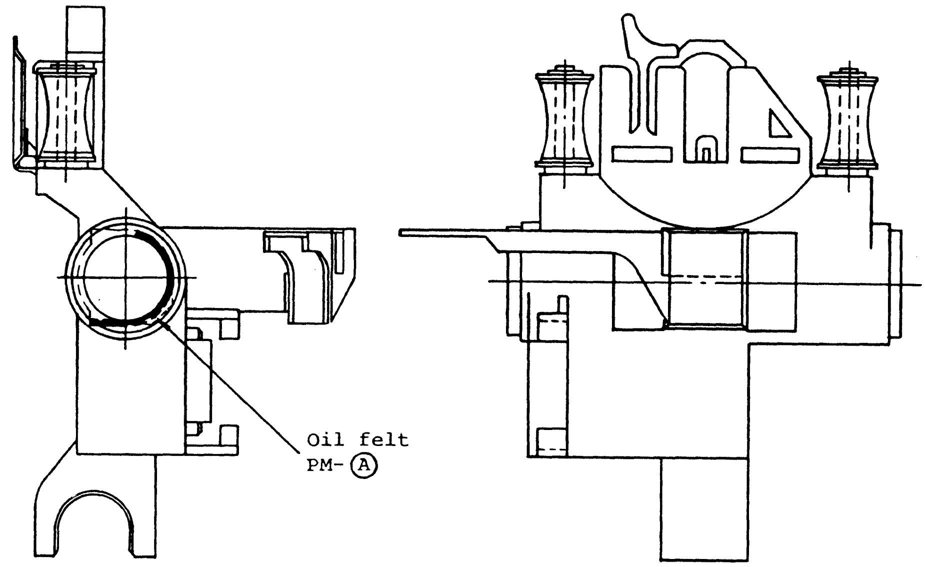
(3) Pressure roller



(4) Platen bearing



(6) Carriage assembly



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

(7) Tractor assembly

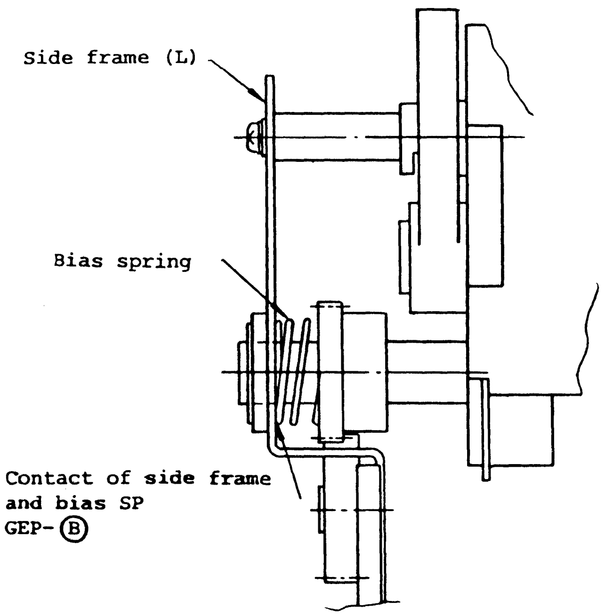


Table 6-6 Maintenance Parts List (1/4)

Ref. No.	Part No.	Nomenclature	Original quantity	Recom-mended quantity	Rank	Compati-bility
Fig. 8-2-1	3LR-190990-7	Print head assembly	1	18	A	82A
Fig. 8-2-4	4LR-191870	Carriage assembly	1	5	B	82A
Fig. 8-7-3	5LR-191873	Ribbon protector	1	10	B	82A
Fig. 8-3-28	4LR-132233	Platen knob	1	10	B	82 82A 83
Fig. 8-3-25	3LR-129900-4	Platen assembly	1	5	B	83
Fig. 8-3-16	4LR-132488-2	Idle pulley bracket (clinched)	1	2	B	
Fig. 8-3-10	5LR-132475	LF idle gear	1	5	B	82A 83
Fig. 8-3-9	4LR-191854	Space motor (pres-sure-fitted)	1	12	A	82A
Fig. 8-3-8	5LR-132473-2	LF motor (Pressure-fitted)	1	10	A	82A
Fig. 8-3-27	4LR-129847-3	Photo interrupter assembly	1	13	B	82A 83
Fig. 8-3-26	4LR-129907	Paper out assembly	1	5	B	82A 83
Fig. 8-6-2	5LR-129825	Ribbon change lever (clinched)	1	2	B	80 82 82A 83
Fig. 8-6-3	4LR-129827	Ribbon gear	1	19	B	80 82 82A 83
Fig. 8-6-4	5LR-193461	Snap shaft	1	5	B	82A
Fig. 8-6-5	5LR-129876	Friction spring	1	19	B	80 82 82A 83
Fig. 8-6-6	4LR-191858	Ribbon drive gear	1	5	B	82A
Fig. 8-6-7	4LR-129837	Ribbon spool gear	2	20	B	80 82 82A 83
Fig. 8-6-8	5LR-129840	Compression spring	2	10	B	82A
Fig. 8-6-9	5LR-129841	Detent spring	1	5	B	80 82 82A 83
Fig. 8-6-10	4LP-1420-5	Synchro belt	1	18	B	
Fig. 8-6-11	5LR-191859	Pressure roller	1	5	B	82A
Fig. 8-6-12	5LR-129842	Friction felt	2	18	B	80 82 82A 83
Fig. 8-6-13	5LR-129843	Special washer	2	18	B	80 82 82A 83
Fig. 8-6-16	5LR-132516	Plastic washer	2	18	B	80 82 82A 83
Fig. 8-8-1	1LM-60106	Upper cover	1	5	B	83
Fig. 8-8-3	2LM-60112	Access cover	1	5	B	83
Fig. 8-8-9	5LM-61519	Ground board	2	3	B	82, 82A, 83
Fig. 8-8-11	5LP-6463-C-5	Cord bushing	1	3	B	83
Fig. 8-8-12	4LP-6726-2	Quite-tight	6	5	B	80 82 82A 83
Fig. 8-8-13	5LP-1416 (1st Edition) 5LP-1488 (2nd Edition)	Rubber foot	4	5	B	82A

Note: The parts marked with an asterisk are those for the tractor unit.

Table 6-6 Maintenance Parts List (3/4) (For 115 V)

Ref. No.	Part No.	Nomenclature	Original quantity	Recommended quantity	Rank	Compatibility
*Fig. 8-14-11	5LR-123467	Sheet guide	1	5	B	83
*Fig. 8-14-31	(+) D3-5-23D	Bind screw	2	5	B	
*Fig. 8-14-32	(+) P(SW+2W) 3-8-23D	Small pan-head screw	2	5	B	
Fig. 8-3-42	5KX-9057	E-snap ring (2)	8	30	B	
Fig. 8-3-41	5KH-12050	E-snap ring (3)	6	30	B	
Fig. 8-4-5	5KX-9059	E-snap ring (6)	1	10	B	
*Fig. 8-14-21	5KD-50242	E-snap ring (8)	4	30	B	
Fig. 8-1-8	4LP-6401-bl	Tie wrap	16	80	A	
Fig. 8-13	D4LP-9409-1	U05B diode	10	40	B	82 82A 83
Fig. 8-13	D4LP-44156-16	AU01-20 zener diode	2	10	B	82 82A 83
Fig. 8-13	4LP-44385	2SD986(1) transistor	17	75	B	82 82A 83
Fig. 8-13	4LP-44251	2SB727 transistor	4	20	B	82 82A 83
Fig. 8-13	4LP-44492-1-B	CSM3B1A30	1	5	B	82A
Fig. 8-13	4LP-8475-B-21	MGC 2.5A fuse	1	20	A	82A
Fig. 8-13	I4LP-11400 -00-248	μCPU 8049-248	1	10	B	82A
Fig. 8-13	I4LP-11368-06	μPD 8155C	1	10	B	80 82 82A 83
Fig. 8-13	I4LP-11369-06	μPD 8251AC	1	5	B	82A
Fig. 8-13	4LP-11830-40	Regulator FS7805	1	10	B	80 82 82A 83
Fig. 8-9-3	LY-40069	LEPF circuit board	1	5	B	82 82A 83
Fig. 8-10	4LP-44373	SEL103R light emitting diode	3	15	B	82 82A 83
Fig. 8-10	3LK-50700-2	Key switch	4	20	B	82 82A 83
Fig. 8-10-4	4L-1370-49-A2	Nameplate [TOF SET]	1	5	B	82 82A 83
Fig. 8-10-5	4L-1370-50-A2	Nameplate [SEL]	1	5	B	82 82A 83
Fig. 8-10-6	4L-1370-51-A2	Nameplate [FORM FEED]	1	5	B	82 82A 83
Fig. 8-10-7	4L-1370-52-A2	Nameplate [LINE FEED]	1	5	B	82 82A 83
Fig. 8-10-2	4LP-3424	SRQV101A rotary switch	1	5	B	82 82A 83
Fig. 8-11-1	3LX-86727-3	LEPW circuit board assembly(for 115V)	1	5	B	
Fig. 8-12	4LP-8604-10	0.01μF capacitor	4	5	B	82A
Fig. 8-12	4LP-3621-2	See-saw switch (for 115V)	1	5	B	80 82 82A 83
Fig. 8-12-2	4LP-6740-160	Circuit breaker (for 115V)	1	5	B	82 82 82A 83

Note: The parts marked with an asterisk are those for tractor unit.

Table 6-6 Maintenance Parts List (3/4) (For 220/240 V)

Ref. No.	Part No.	Nomenclature	Original quantity	Recom- mended quantity	Rank	Compati- bility
*Fig. 8-14-11	5LR-123467	Sheet guide	1	5	B	83
*Fig. 8-14-31	⊕ D3-5-23D	Bind screw	2	5	B	
*Fig. 8-14-32	⊕ P(SW+2W) 3-8-23D	Small pan-head screw	2	5	B	
Fig. 8-3-42	5KX-9057	E-snap ring (2)	8	30	B	
Fig. 8-3-41	5KH-12050	E-snap ring (3)	6	30	B	
Fig. 8-4-5	5KX-9059	E-snap ring (6)	1	10	B	
*Fig. 8-14-21	5KD-50242	E-snap ring (8)	4	30	B	
Fig. 8-1-8	4LP-6401-bl	Tie-wrap	16	80	A	
Fig. 8-13	D4LP-9409-1	U05B diode	10	40	B	82 82A 83
Fig. 8-13	D4LP-44156-16	AU01-20 zener diode	2	10	B	82 82A 83
Fig. 8-13	4LP-44385	2SD986(1) transistor	17	75	B	82 82A 83
Fig. 8-13	4LP-44251	2SB727 transistor	4	20	B	82 82A 83
Fig. 8-13	4LP-44492-1-B	Thyristor CSM3B1A30	1	5	B	82A
Fig. 8-13	4LP-8475-B-21	MGC 2.5A fuse	1	20	A	82A
Fig. 8-13	I4LP-11400-00 -248	μCPU 8049-248	1	10	B	82A
Fig. 8-13	I4LP-11368-06	μPD 8155C	1	10	B	80 82 82A 83
Fig. 8-13	I4LP-11369-06	μPD 8251AC	1	5	B	82A
Fig. 8-13	4LP-11830-40	Regulator FS7805	1	10	B	80 82 82A 83
Fig. 8-9-3	LY-40069	LEPF circuit board	1	5	B	82 82A 83
Fig. 8-10	4LP-44373	SEL103R light emitting diode	3	15	B	82 82A 83
Fig. 8-10	3LK-50700-2	Key switch	4	20	B	82 82A 83
Fig. 8-10-4	4L-1370-49-A2	Nameplate [TOF SET]	1	5	B	82 82A 83
Fig. 8-10-5	4L-1370-50-A2	Nameplate [SEL]	1	5	B	82 82A 83
Fig. 8-10-6	4L-1370-51-A2	Nameplate [FORM FEED]	1	5	B	82 82A 83
Fig. 8-10-7	4L-1370-52-A2	Nameplate [LINE FEED]	1	5	B	82 82A 83
Fig. 8-10-2	4LP-3424	SRQV 101A rotary switch	1	5	B	82 82A 83
Fig. 8-11-1	3LX-86727-4	LEPW circuit board assembly (for 220V, 240V)	1	5	B	
Fig. 8-12	4LP-8555	0.01μF capacitor	2	5	B	82A
Fig. 8-12	4LP-3621-1	See-saw switch (for 220V, 240V)	1	5	B	80 82 82A 83
Fig. 8-12-2	4LP-6740-80	Circuit breaker (for 220V, 240V)	1	5	B	82 82A 83
Fig. 8-12	4LP-3622	Sliding switch (for 220V, 240V)	1	5	B	80 82 82A 83

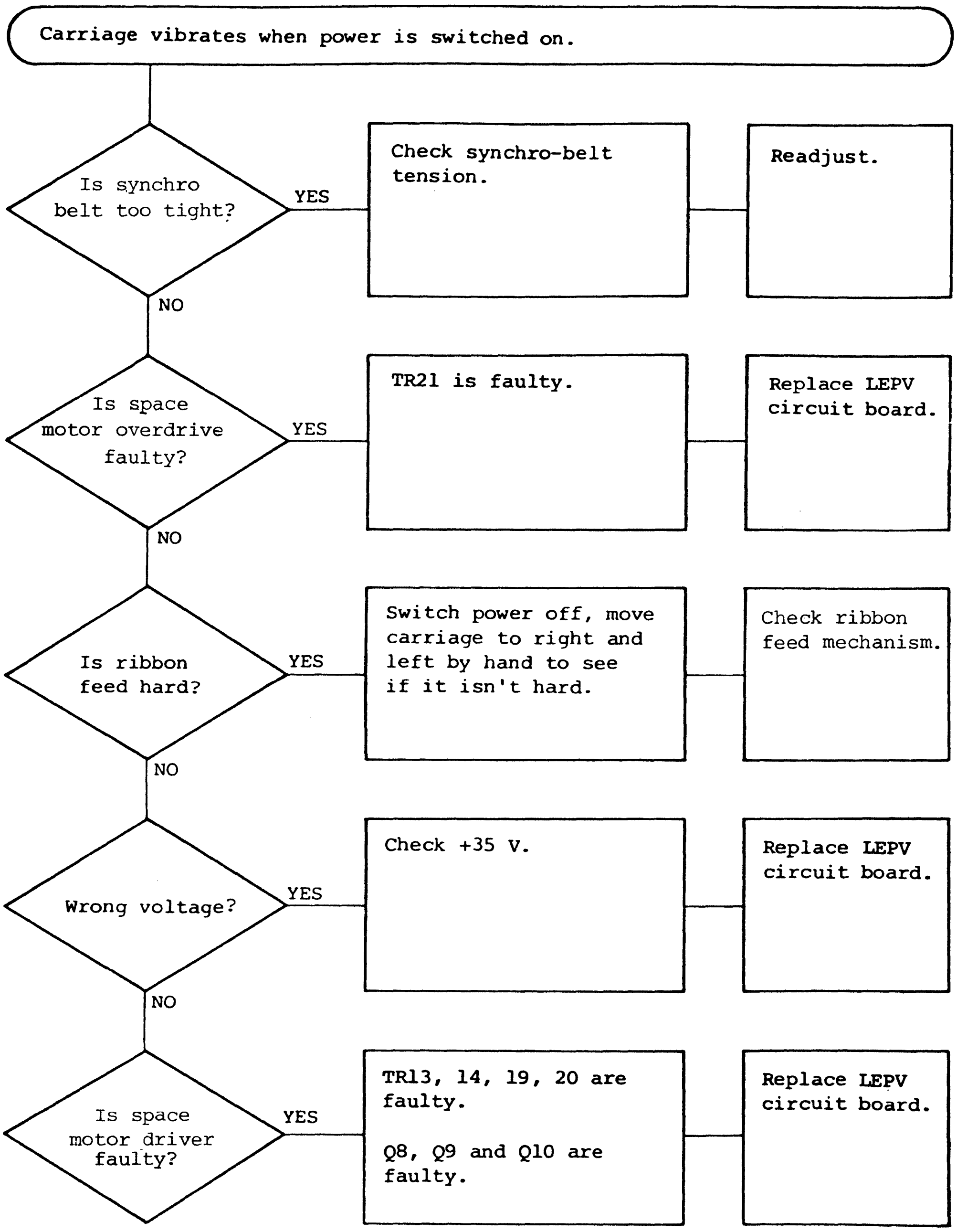
Note: The parts marked with an asterisk are those for tractor unit.

6.8 Troubleshooting Flow Charts

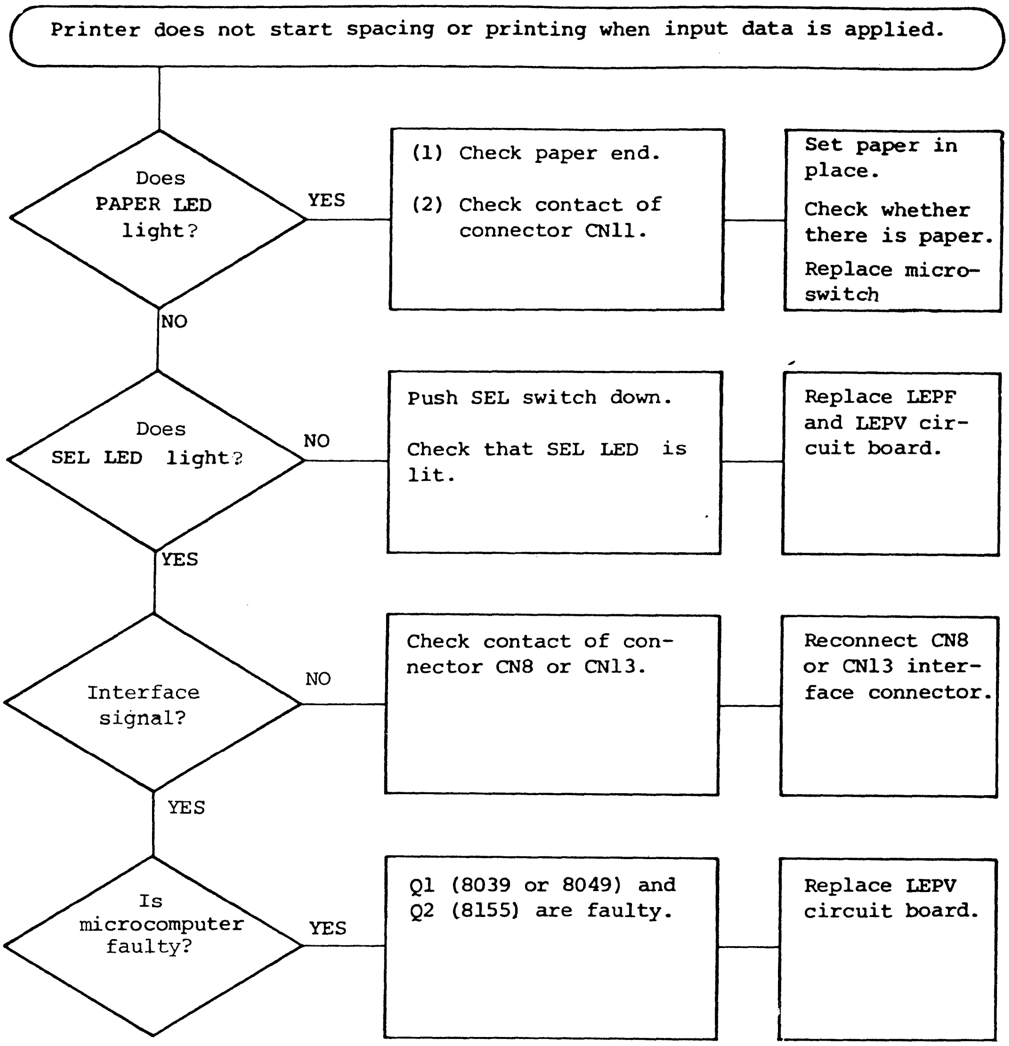
These flow charts are provided for remedying troubles which might develop for the user, and should be referred to after confirming what the trouble is.

Trouble: Classification	Trouble: Description		Item
Operation trouble at power-up	Print head does not come to home position.	Does not move at all.	(1)
		Moves to right or left, but does not stop.	(2)
		Vibrates.	(3)
	Breaker opens.		(4)
Operation trouble after power-up	Neither spacing nor printing operation takes place 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)
	No line spacing		(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 burns out.		(14)
	Operating panel's switches do not work.		(15)
	Print is not dark enough.		(16)

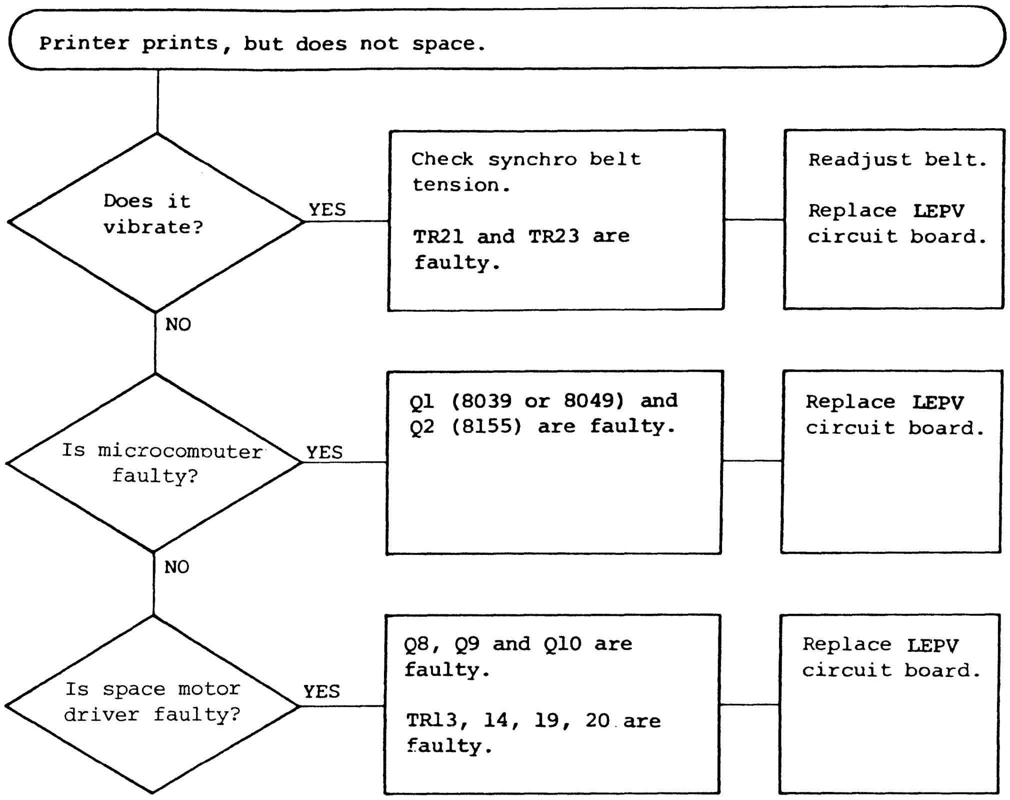
Item (3)


Carriage vibrates when power is switched on.
Is synchro belt too tight?
YES
Check synchro-belt tension.
Readjust.
NO
Is space motor overdrive faulty?
YES
TR21 is faulty.
Replace LEPV circuit board.
NO
Is ribbon feed hard?
YES
Switch power off, move carriage to right and left by hand to see if it isn't hard.
Check ribbon feed mechanism.
NO
Wrong voltage?
YES
Check +35 V.
Replace LEPV circuit board.
NO
Is space motor driver faulty?
YES
TR13, 14, 19, 20 are faulty.
Q8, Q9 and Q10 are faulty.
Replace LEPV circuit board.

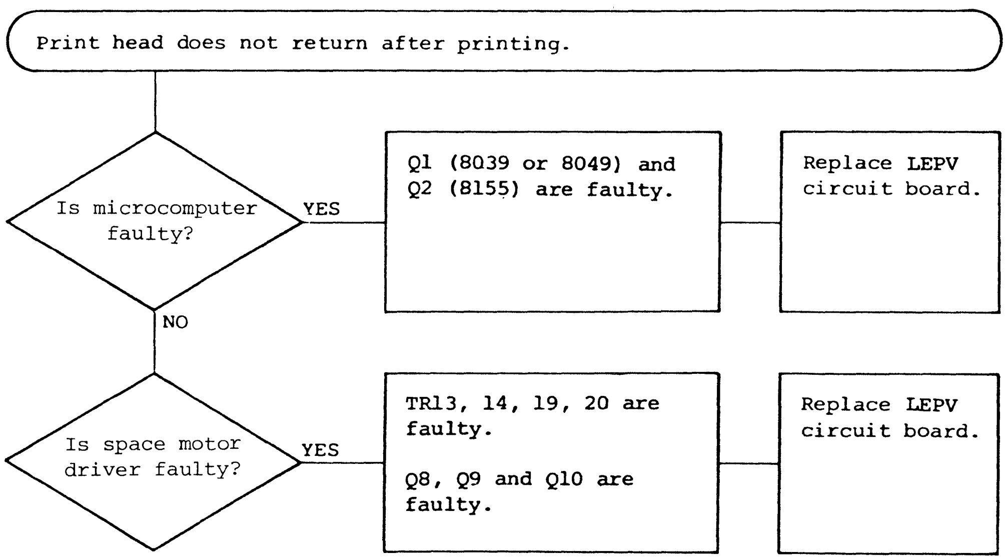
Item (5)


Printer does not start spacing or printing when input data is applied.
Does PAPER LED light?
YES
(1) Check paper end.
(2) Check contact of connector CN11.
Set paper in place.
Check whether there is paper.
Replace micro-switch
NO
Does SEL LED light?
NO
Push SEL switch down.
Check that SEL LED is lit.
Replace LEPF and LEPV circuit board.
YES
Interface signal?
NO
Check contact of connector CN8 or CN13.
Reconnect CN8 or CN13 interface connector.
YES
Is microcomputer faulty?
YES
Q1 (8039 or 8049) and Q2 (8155) are faulty.
Replace LEPV circuit board.

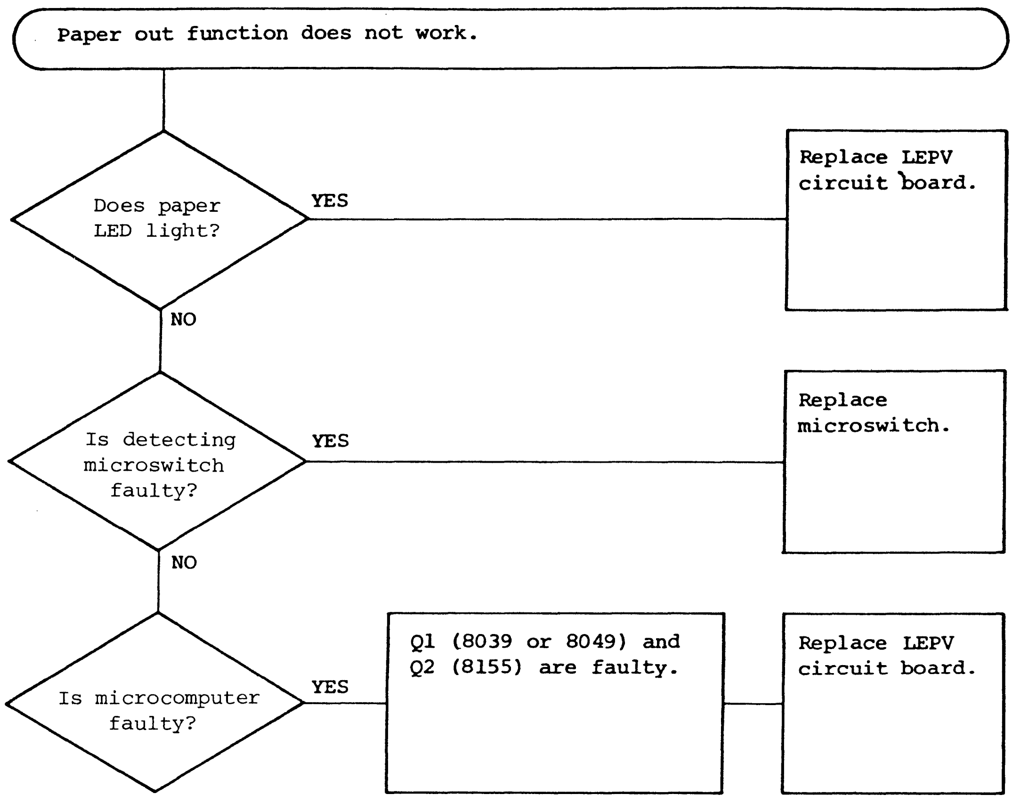
Item (7)


Printer prints, but does not space.
Does it vibrate?
YES
Check synchro belt tension.
TR21 and TR23 are faulty.
Readjust belt.
Replace LEPV circuit board.
NO
Is microcomputer faulty?
YES
Q1 (8039 or 8049) and Q2 (8155) are faulty.
Replace LEPV circuit board.
NO
Is space motor driver faulty?
YES
Q8, Q9 and Q10 are faulty.
TR13, 14, 19, 20 are faulty.
Replace LEPV circuit board.

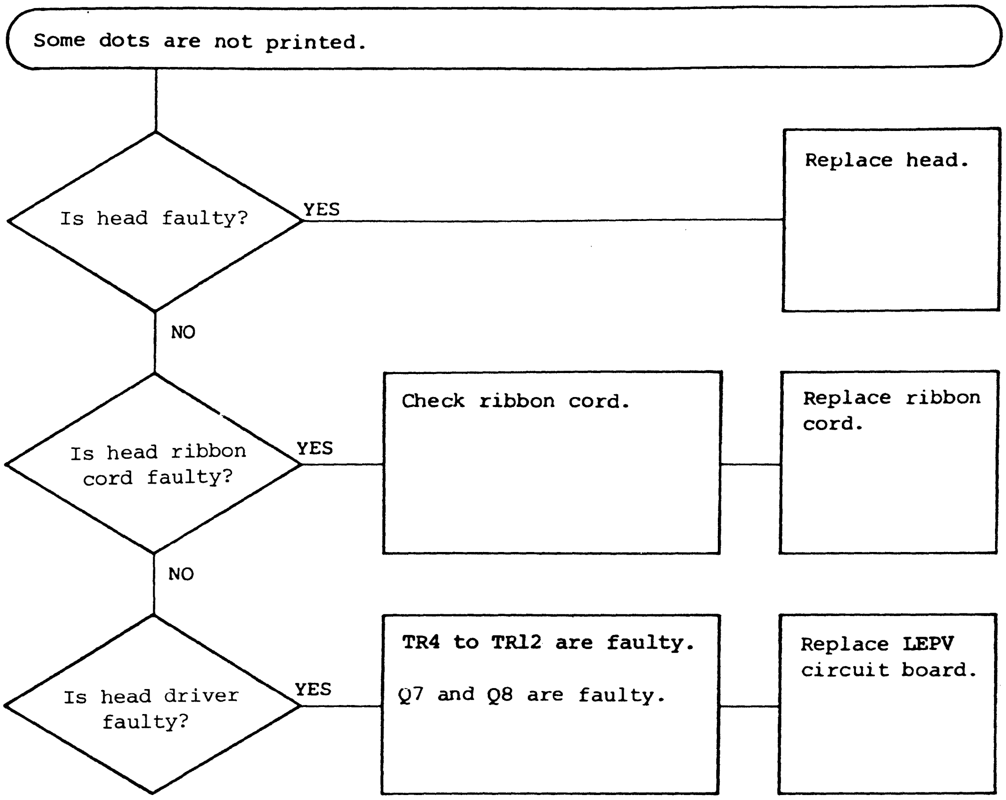
Item (8)


Print head does not return after printing.
Is microcomputer faulty?
YES
Q1 (8039 or 8049) and Q2 (8155) are faulty.
Replace LEPV circuit board.
NO
Is space motor driver faulty?
YES
TR13, 14, 19, 20 are faulty.
Q8, Q9 and Q10 are faulty.
Replace LEPV circuit board.

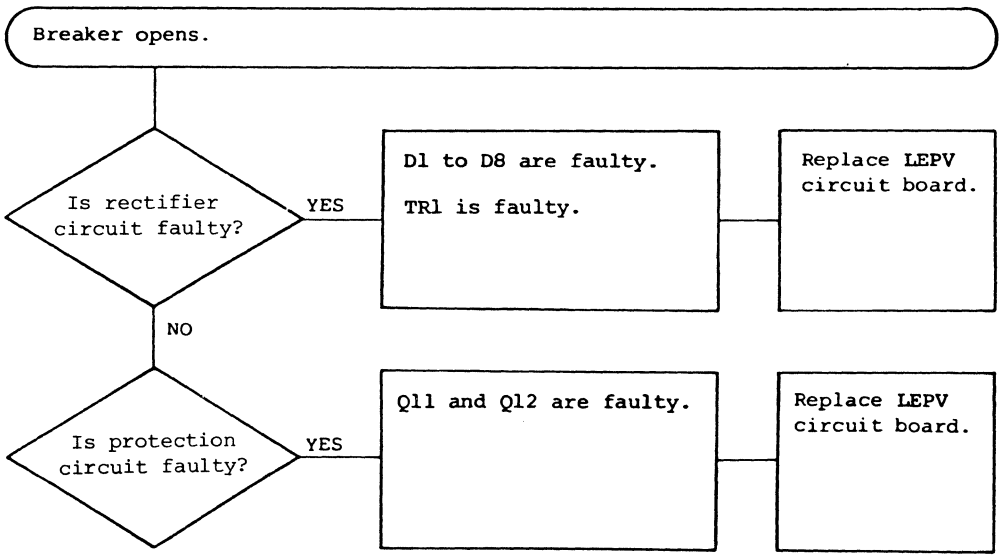
Item (10)


Paper out function does not work.
Does paper LED light?
YES
Replace LEPV circuit board.
NO
Is detecting microswitch faulty?
YES
Replace microswitch.
NO
Is microcomputer faulty?
YES
Q1 (8039 or 8049) and Q2 (8155) are faulty.
Replace LEPV circuit board.

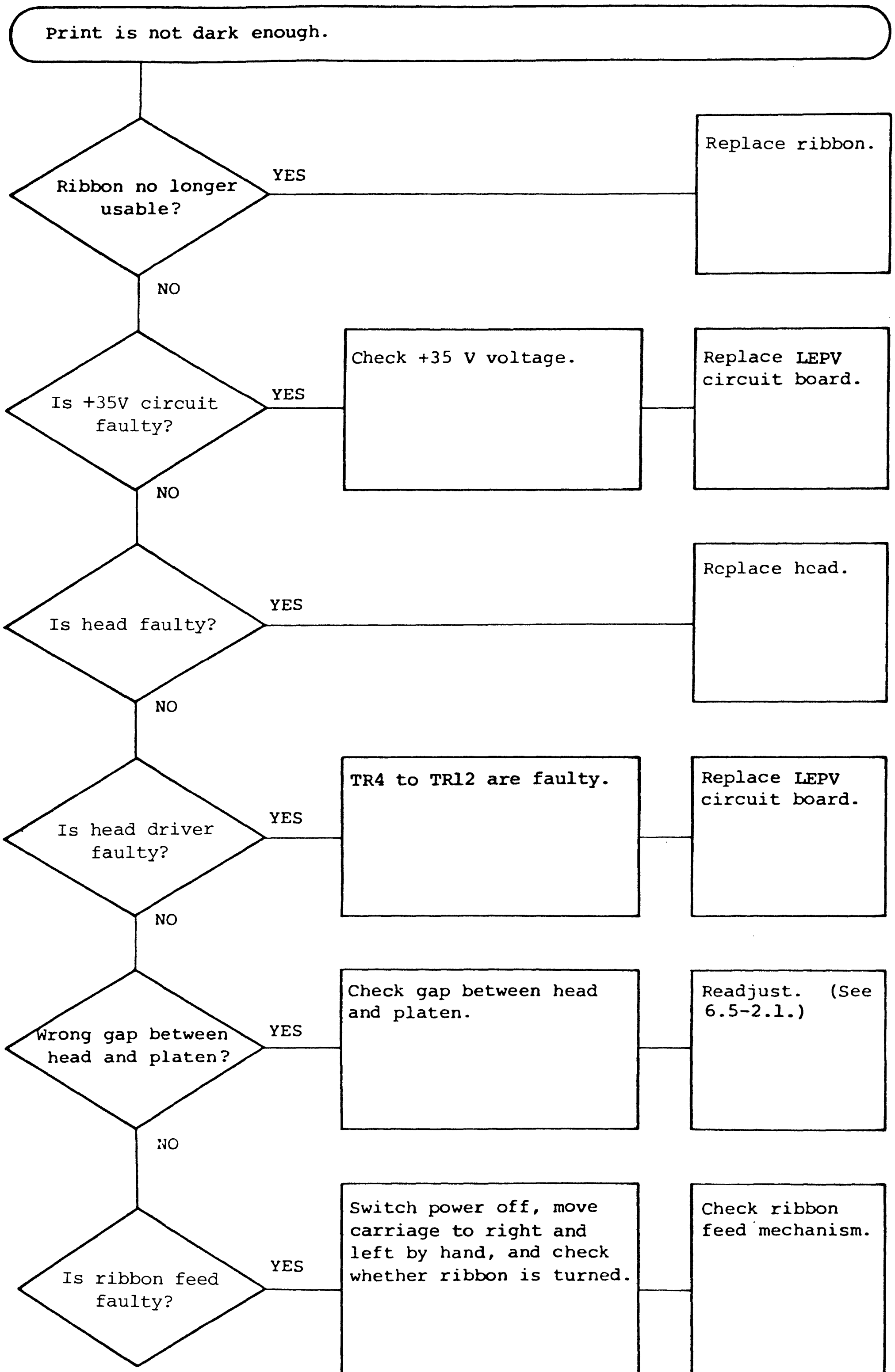
Item (12)

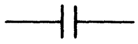
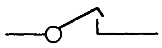
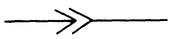
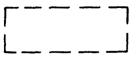
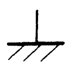
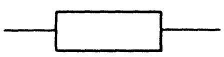
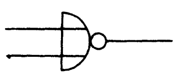
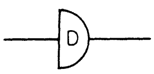


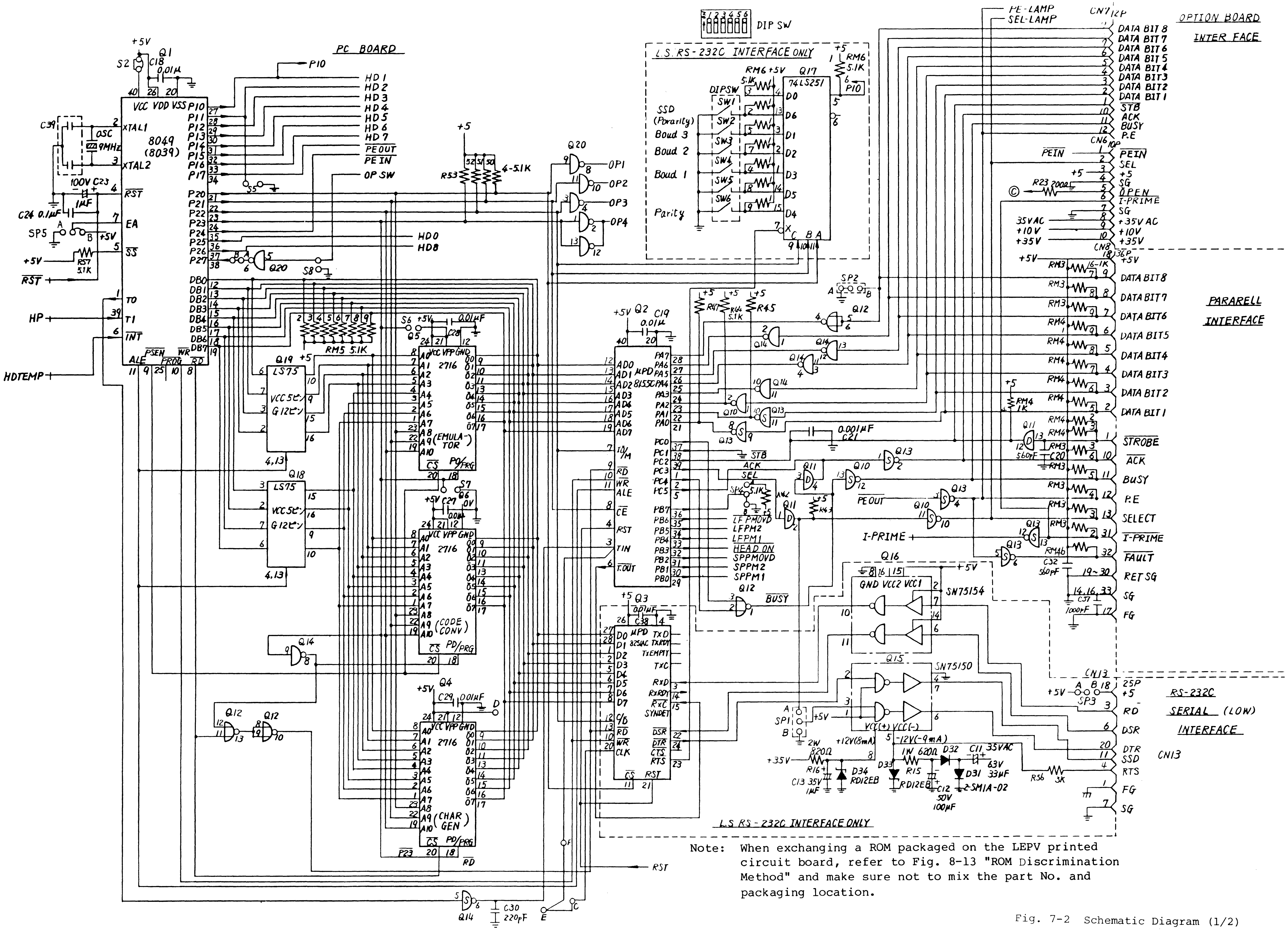
Item (13)



Item (16)

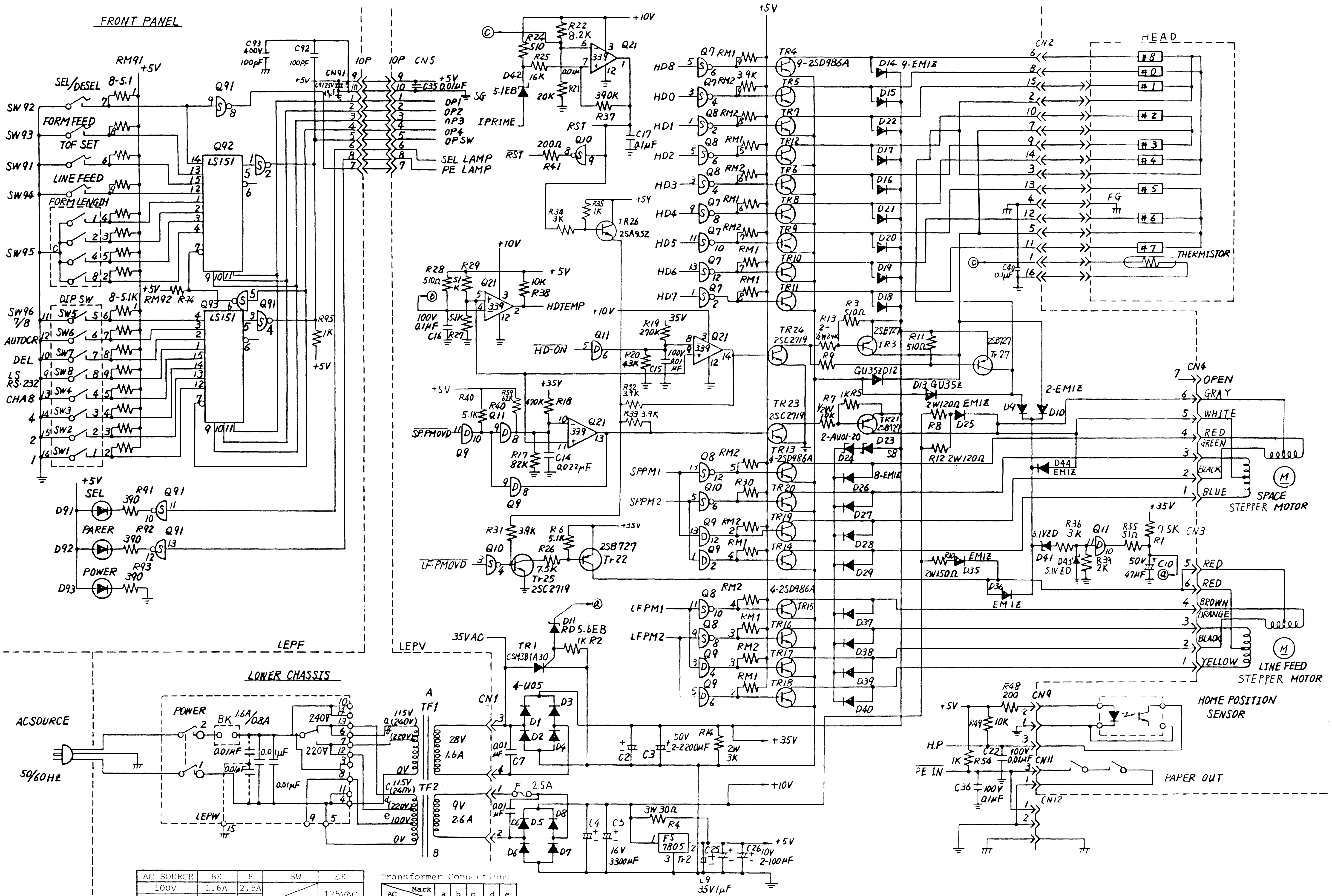

Print is not dark enough.
Ribbon no longer usable?
YES
Replace ribbon.
NO
Is +35V circuit faulty?
YES
Check +35 V voltage.
Replace LEPV circuit board.
NO
Is head faulty?
YES
Replace head.
NO
Is head driver faulty?
YES
TR4 to TR12 are faulty.
Replace LEPV circuit board.
NO
Wrong gap between head and platen?
YES
Check gap between head and platen.
Readjust. (See 6.5-2.1.)
NO
Is ribbon feed faulty?
YES
Switch power off, move carriage to right and left by hand, and check whether ribbon is turned.
Check ribbon feed mechanism.

Symbol	Mark	Description
	C	Capacitor
	C	Electrolytic capacitor
	R	Resistor
	SW	Switch
	S	Shortcircuit line or plug
	CN	Connector (terminal)
 (Reference)		Means a single part.
	FG	Frame ground
		Dot head (element)
	Q	SN7402 2NOR gate
	Q	SN7407 buffer (open collector)



Note: When exchanging a ROM packaged on the LEPV printed circuit board, refer to Fig. 8-13 "ROM Discrimination Method" and make sure not to mix the part No. and packaging location.

Fig. 7-2 Schematic Diagram (1/2)



AC SOURCE	BK	F	SW	SK
100V	1.6A	2.5A		125VAC
115V	1.6A	2.5A		
220V	0.8A	2.5A	mounted	250VAC
240V	0.8A	2.5A		

Transformer Connections

AC \ Mark	a	b	c	d	e
115 V	3	7	10	8	-

Circuit diagram uses 220V/240V

Fig. 7-2 Schematic Diagram (2/2)

8. TABLE OF COMPONENT PARTS (FOR U.S.A.)

This chapter describes the main component parts of the MICRO-LINE 83A in the order of the following schematic diagrams.

- Fig. 8-1 General Assembly Diagram (LY-43207-2)
  - Fig. 8-2 Printer Unit (1LR-1321-1)
    - Fig. 8-3 Base Unit (1LR-193470-3)
      - Fig. 8-4 Platen Assembly (3LR-129900-4)
      - Fig. 8-5 Paper Out Assembly (4LR-129907)
    - Fig. 8-6 Ribbon Drive Assembly (3LR-193456-3)
    - Fig. 8-7 Carriage Assembly (4LR-191870)
  - Fig. 8-8 Cover Unit (1LM-61517-2)
    - Fig. 8-9 Operation Panel Assembly (4LM-59688)
      - Fig. 8-10 LEPF Circuit Board (LY-40069)
    - Fig. 8-11 Power Source Assembly (2LR-104073-5)
      - Fig. 8-12 LEPW Circuit Board (3LX-86727-3)
  - Fig. 8-13 LEPV Circuit Board (LY-41565-8)
    - * Character generator (Q4, EP ROM) (LYH-10254)
    - * Program ROM (Q5, EP ROM) (LYH-10491)
    - * Program ROM (Q6, EP ROM) (LYH-10492)
  - Decorative nameplate
  - Machine nameplate
  - Operation panel connecting cord
  - Fig. 8-14 Tractor Unit (LY-39702)
    - Fig. 8-15 Sprocket Assembly (R) (FMX-35100-2)
    - Fig. 8-16 Sprocket Assembly (L) (FMX-35150-2)

NOTE

1) The parts marked with * are not included in the table of component parts. Any of them may be ordered by specifying parts numbers. (Refer to pages 87 and 89.)

2) The meanings of the entries in the columns "compatibility" of the table of component parts are as follows:

Entry	Meaning
80	Part common to MICROLINE 80
82	Part common to MICROLINE 82
82A	Part common to MICROLINE 82A
83	Part common to MICROLINE 83

8. TABLE OF COMPONENT PARTS (FOR THE AREA OTHER THAN U.S.A.)

This chapter describes the main component parts of the MICROLINE 83A in the order of the following schematic diagrams.

- Fig. 8-1 General Assembly Diagram (LY-43207-3)
  - Fig. 8-2 Printer Unit (1LR-1321-1)
    - Fig. 8-3 Base Unit (1LR-193470-3)
      - Fig. 8-4 Platen Assembly (3LR-129900-4)
      - Fig. 8-5 Paper Out Assembly (4LR-129907)
    - Fig. 8-6 Ribbon Drive Assembly (3LR-193456-3)
    - Fig. 8-7 Carriage Assembly (4LR-191870)
  - Fig. 8-8 Cover Unit (1LM-61517-3)
    - Fig. 8-9 Operation Panel Assembly (4LM-59688)
      - Fig. 8-10 LEPF Circuit Board (LY-40069)
    - Fig. 8-11 Power Source Assembly (2LR-104073-6)
      - Fig. 8-12 LEPW Circuit Board (3LX-86727-4)
  - Fig. 8-13 LEPV Circuit Board (LY-41565-5)
    - * Character generator (Q4, EP ROM) (LYH-10352)
    - * Program ROM (Q6, MASK ROM) (4LP-11740-02-002)
  - Decorative nameplate
  - Machine nameplate
  - Operation panel connecting cord
  - Fig. 8-14 Tractor Unit (LY-39702)
    - Fig. 8-15 Sprocket Assembly (R) (FMX-35100-2)
    - Fig. 8-16 Sprocket Assembly (L) (FMX-35150-2)

NOTE

1) The parts marked with * are not included in the table of component parts. Any of them may be ordered by specifying parts numbers. (Refer to pages 87 and 89.)

2) The meanings of the entries in the columns "compatibility" of the table of component parts are as follows;

Entry	Meaning
80	Part common to MICROLINE 80
82	Part common to MICROLINE 82
82A	Part common to MICROLINE 82A
83	Part common to MICROLINE 83

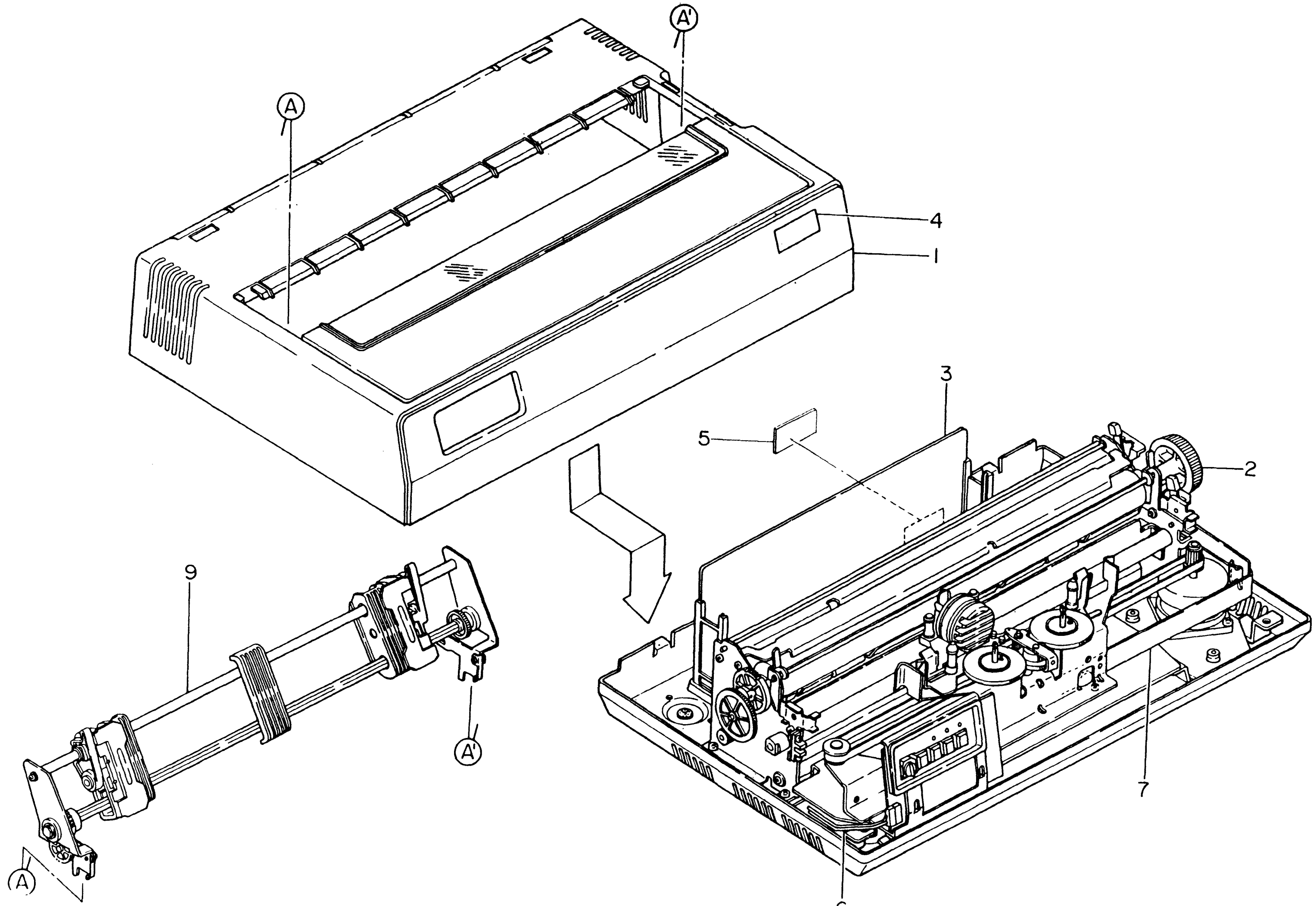


Fig. 8-1 General Assembly Diagram (LY-43207-2, -3) (1/2)

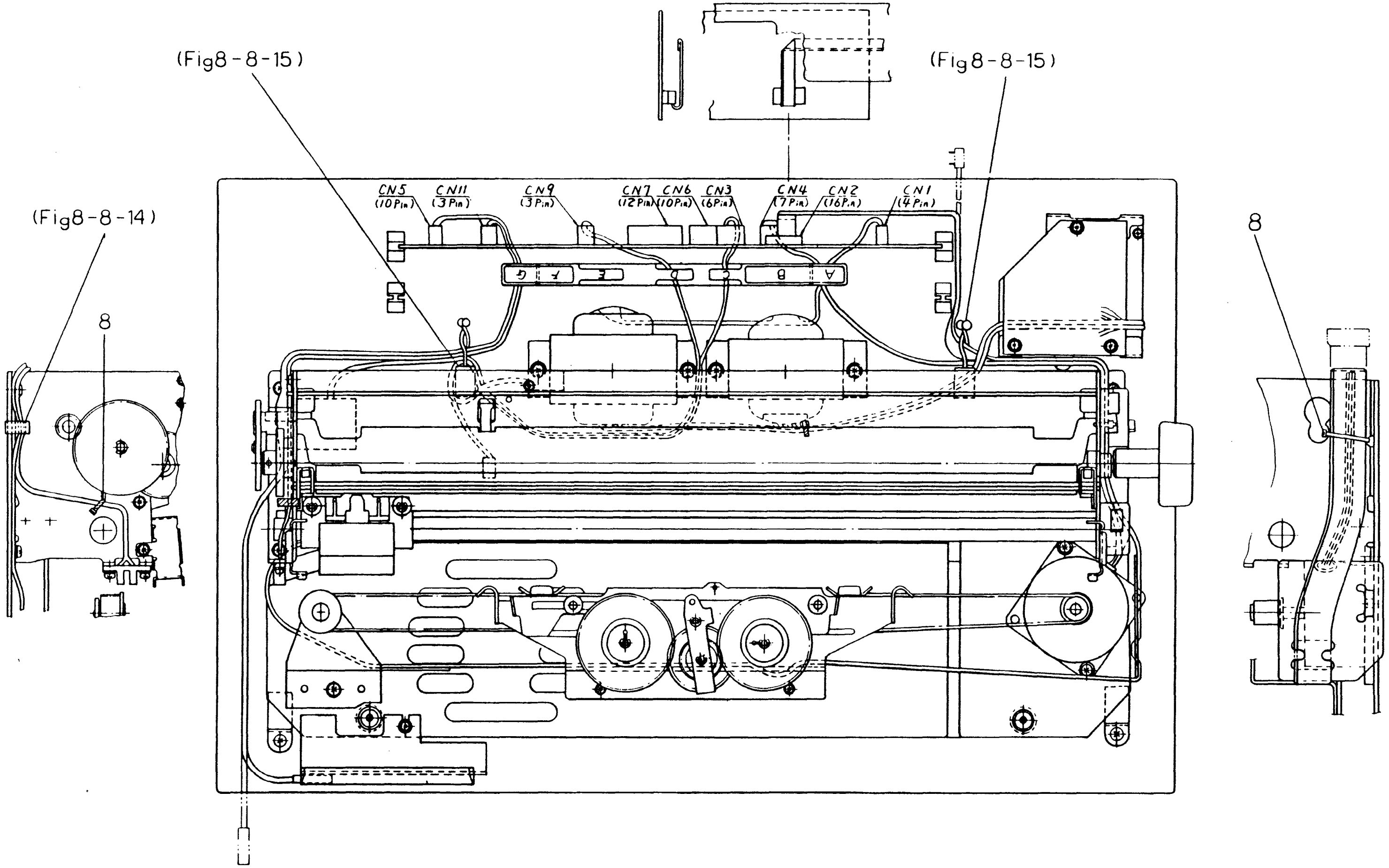


Fig. 8-1 General Assembly Diagram (LY-43207-2, -3) (2/2)

Fig. 8-1 General Assembly Diagram (LY-43207-7) (for 115 V)

Item No.	Part No.	Description	Q'ty	Remarks	Compatibility
1	1LM-61517-2	Cover unit	1		
2	1LR-1321-1	Printer unit	1		
3	LY-41565-8	LEPV circuit board	1		82A
4	4L-1738-2	Decorative nameplate	1		
5	4L-1568-2	Machine nameplate	1		
6	3LP-37256-3	Operation panel connection cord	1		82A
7	4LP-37587-2	Head connection cord	1		82A
8	4LP-6401-bl	Tie-wrap	2		82 82A 83
9	LY-39702	Tractor unit	1		83
10	4L-1557	Caution for carriage tie down	1	Components for packing	82A 83
11	4LP-1457-6	Fastener (ℓ = 250 mm, yellow)	1	Components for packing	82A 83

Fig. 8-1 General Assembly Diagram (LY-43207-8) (for 220/240V)

Item No.	Part No.	Description	Q'ty	Remarks	Compatibility
1	1LM-61517-3	Cover unit	1		
2	1LR-1321-1	Printer unit	1		
3	LY-41565-5	LEPV circuit board	1		82A
4	4L-1566-2	Decorative nameplate	1		
5	4L-1569-2	Machine nameplate	1		
6	3LP-37256-3	Operation panel connection cord	1		82A
7	4LP-37587-2	Head connection cord	1		82A
8	4LP-6401-bl	Tie-wrap	2		82 82A 83
9	LY-39702	Tractor unit	1		83
10	4L-1557	Caution for carriage tie down	1	Components for packing	82A 83
11	4LP-1457-6	Fastener (ℓ = 250 mm, yellow)	1		82A 83

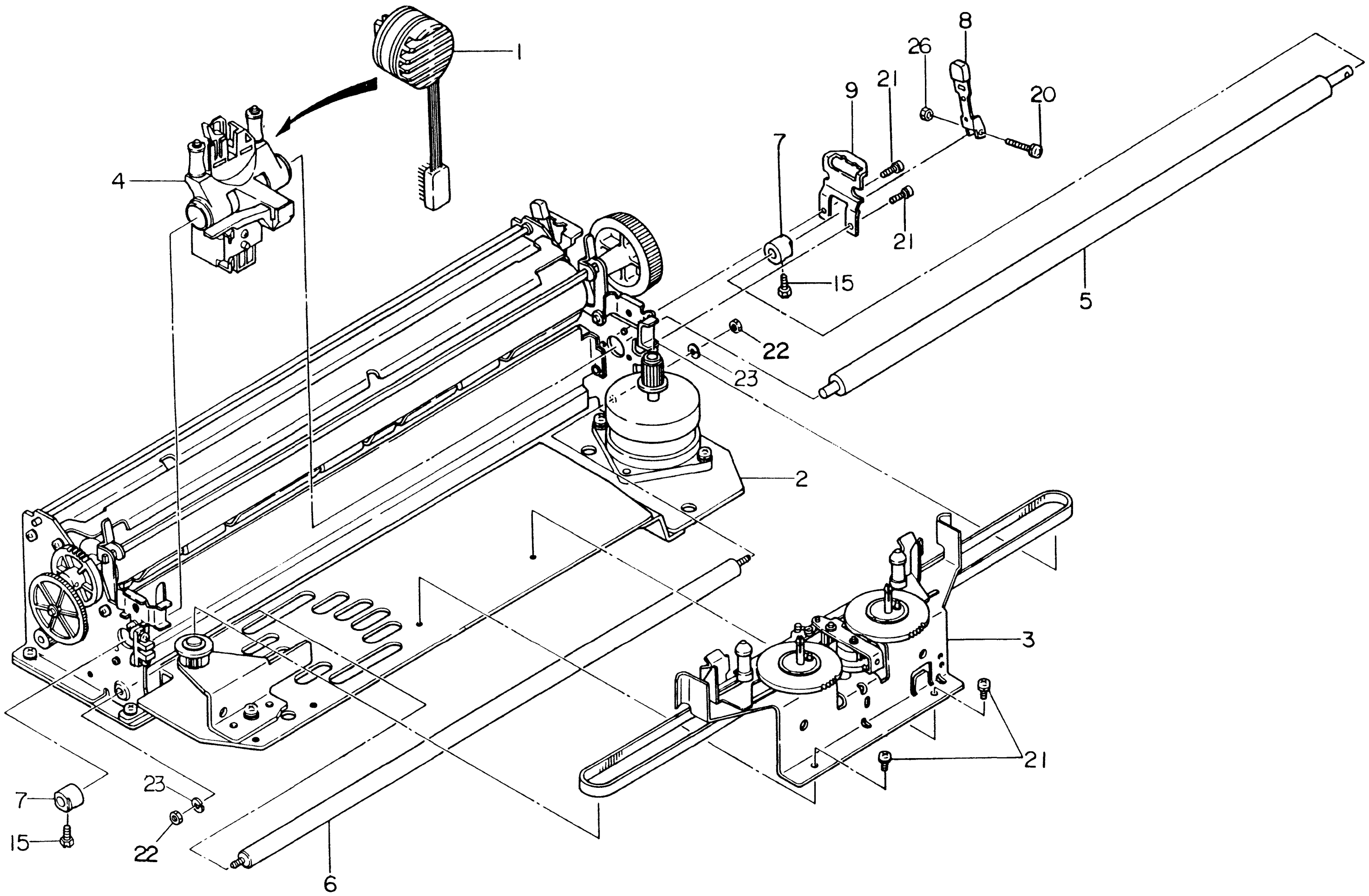


Fig. 8-2 Printer Unit (1LR-1321-1)

Fig. 8-2 Printer Unit (1LR-1321-1)

Item No.	Part No.	Description	Q'ty	Remarks	Compatibility
1	3LR-190990-7	Print head assembly	1		82A
2	1LR-193470-3	Base unit	1		
3	3LR-193456-3	Ribbon feed mechanism	1		
4	4LR-191870	Carriage assembly	1		82A
5	5LR-132450	Carriage shaft (U)	1		83
6	5LR-193455-1	Carriage shaft (L)	1		
7	5LR-132451	Eccentric collar	2		82A 83
8	5LR-132115	Adjusting lever (adhered)	1		82A 83
9	5LR-132452	Adjusting bracket	1		82A 83
15	(-)B_3-6-HH	Bolt	2		
20	⊕ P(SW)3 -14-HH	Small pan-head screw	1		
21	⊕ P(SW)3-6-HH	Small pan-head screw	4		
22	3N4 - HH	Lock nut	2		
23	SW_4 - HHC	Spring washer	2		
26	$2N_3$-HH	Nut	1		

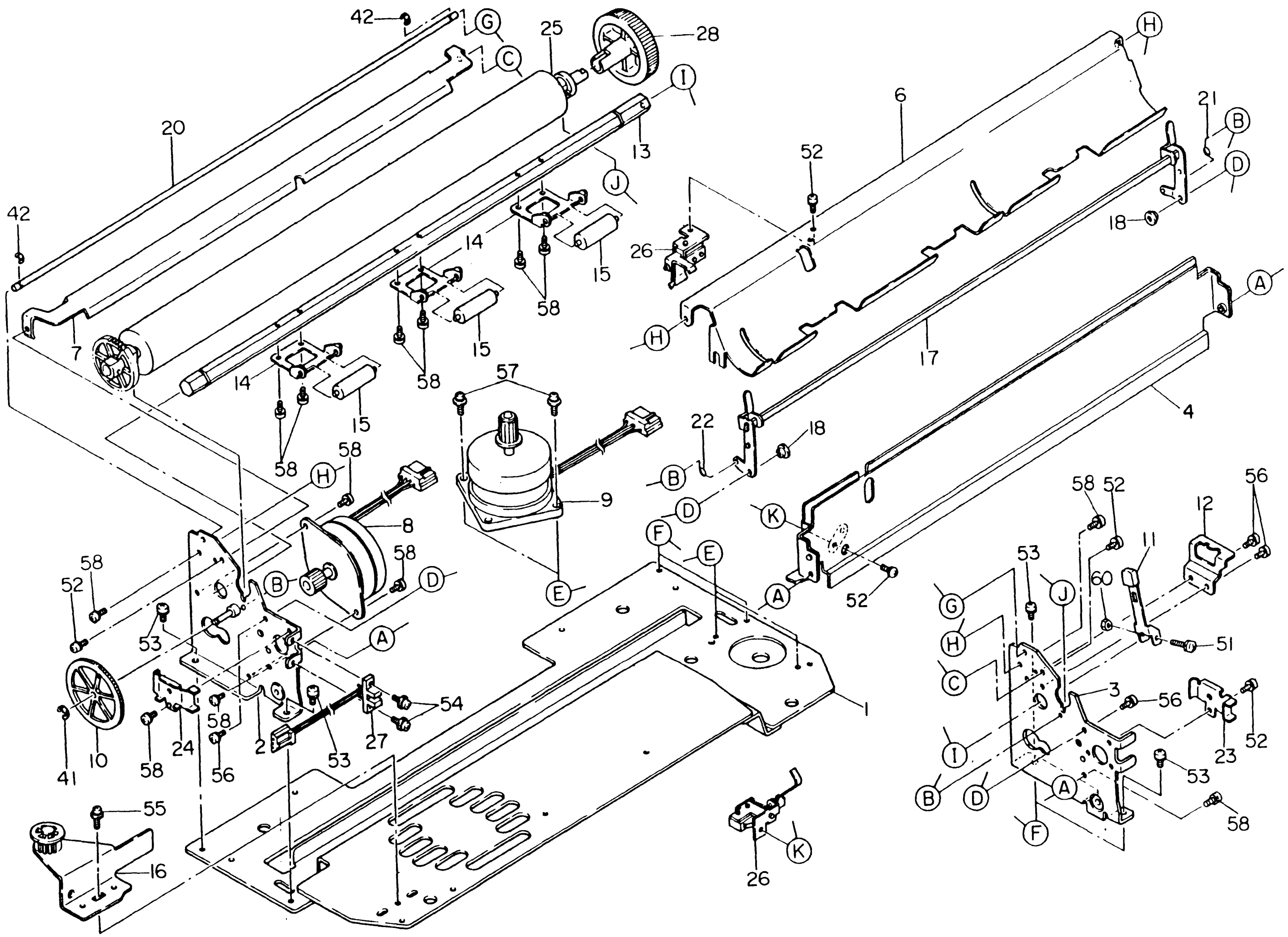


Fig. 8-3 Base Unit (1LR-193470-3)

Fig. 8-3 Base Unit (1LR-193470-3) (1/2)

Item No.	Part No.	Description	Q'ty	Remarks	Compatibility
1	1LR-132461	Base-frame weld	1		83
2	4LR-193450	Side frame (L) clinched	1		82A
3	3LR-193452	Side frame (R)	1		82A
4	4LR-193462-4	Paper guide (welded)	1		
6	3LR-132467	Paper chute	1		83
7	4LR-132468	Paper separator	1		83
8	5LR-132473-2	LF motor (pressure-inserted)	1		82A
9	4LR-191854-1	Space motor (pressure-inserted)	1		82A
10	5LR-132475	LF idle gear	1		82A 83
11	5LR-132480	Paper lock release lever (adhered)	1		82A 83
12	5LR-132482	Paper lock release lever bracket	1		82A 83
13	4LR-132483	Roller support shaft	1		83
14	4LR-132484	Feed roller spring	3		82A 83
15	5LR-132485	Friction roller	3		82A 83
16	4LR-132488-2	Idle pulley bracket	1		
17	5LR-132490	Column indicator assembly	1		83
18	5LR-132494	Shoulder nut	2		83
20	5LR-129808-2	Paper-tear-off bar shaft	1		83
21	5LR-129806-1	Detent spring (R)	1		82 82A 83
22	5LR-129806-2	Detent spring (L)	1		82 82A 83
23	5LR-132222	Ribbon guide (R)	1		82 82A 83
24	5LR-132229	Ribbon guide (L)	1		82 82A 83
25	3LR-129900-4	Platen assembly	1		83
26	4LR-129907	Paper out assembly	1		82A 83
27	4LR-129847-3	Home sensor assembly	1		82A 83
28	4LR-132233	Platen knob	1		80 82 82A 83

Fig. 8-3 Base Unit (1LR-193470-3) (2/2)

Item No.	Part No.	Description	Q'ty	Remarks	Compati-bility
41	5KH-12050	E-snap ring (E3)	1		
42	5KX-9057	E-snap ring (E3)	2		
51	⊕ P(SW)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		

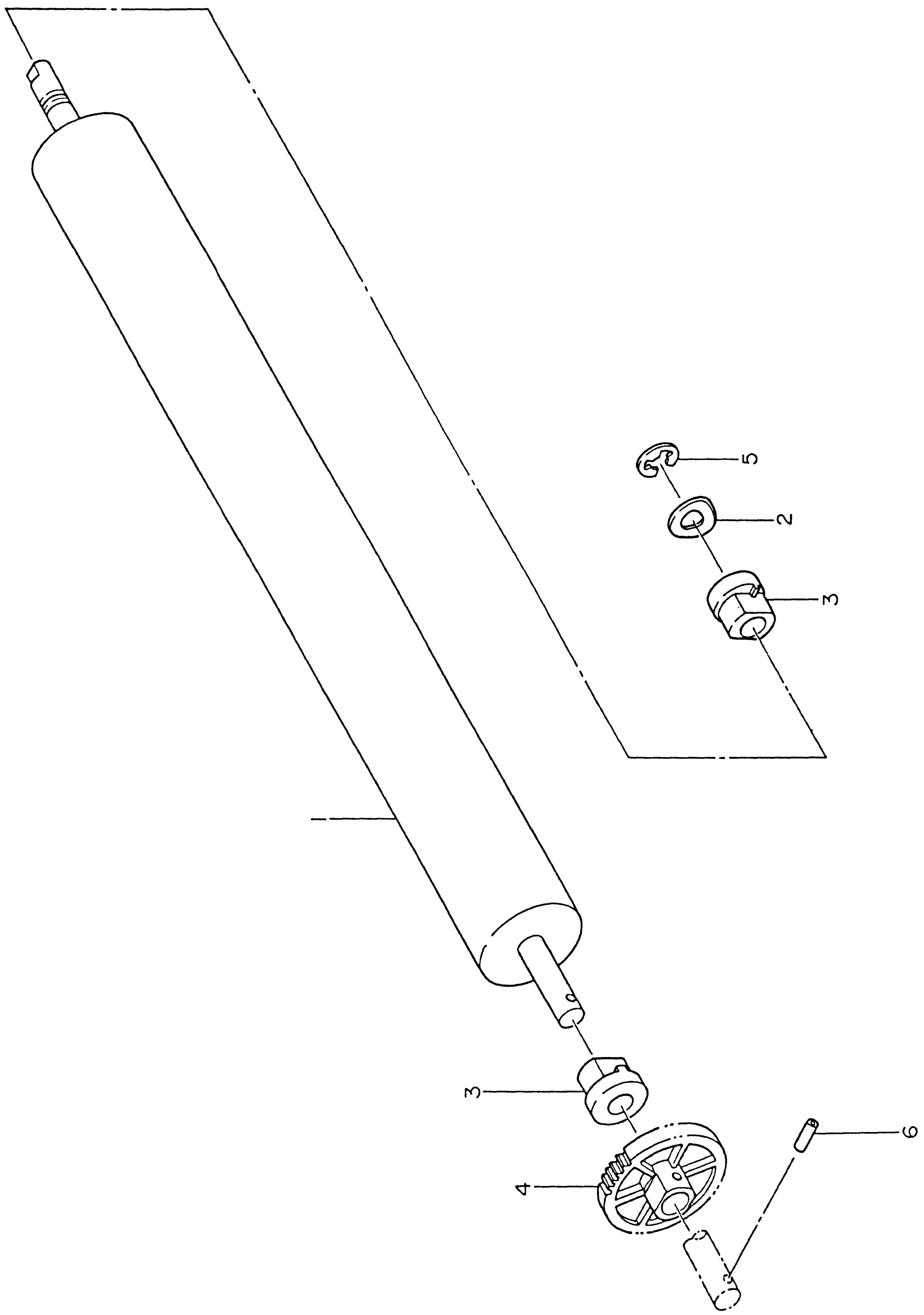


Fig. 8-4 Platen Assembly (3LR-129900-4)

Fig. 8-4 Platen Assembly (3LR-129900-4)

Item No.	Part No.	Description	Q'ty	Remarks	Compatibility
1	4LR-129898-2	Plain platen	1	Plain 16 inches	83
2	5LR-129906	Wave washer	1		80 82 82A 83
3	4LR-129855	Platen bearing	2		80 82 82A 83
4	4LR-129859	Platen gear	1		80 82 82A 83
5	5KX-9059	E-snap ring (E6)	1		
6	SPP_3-12-SUS	Spring pin	1		

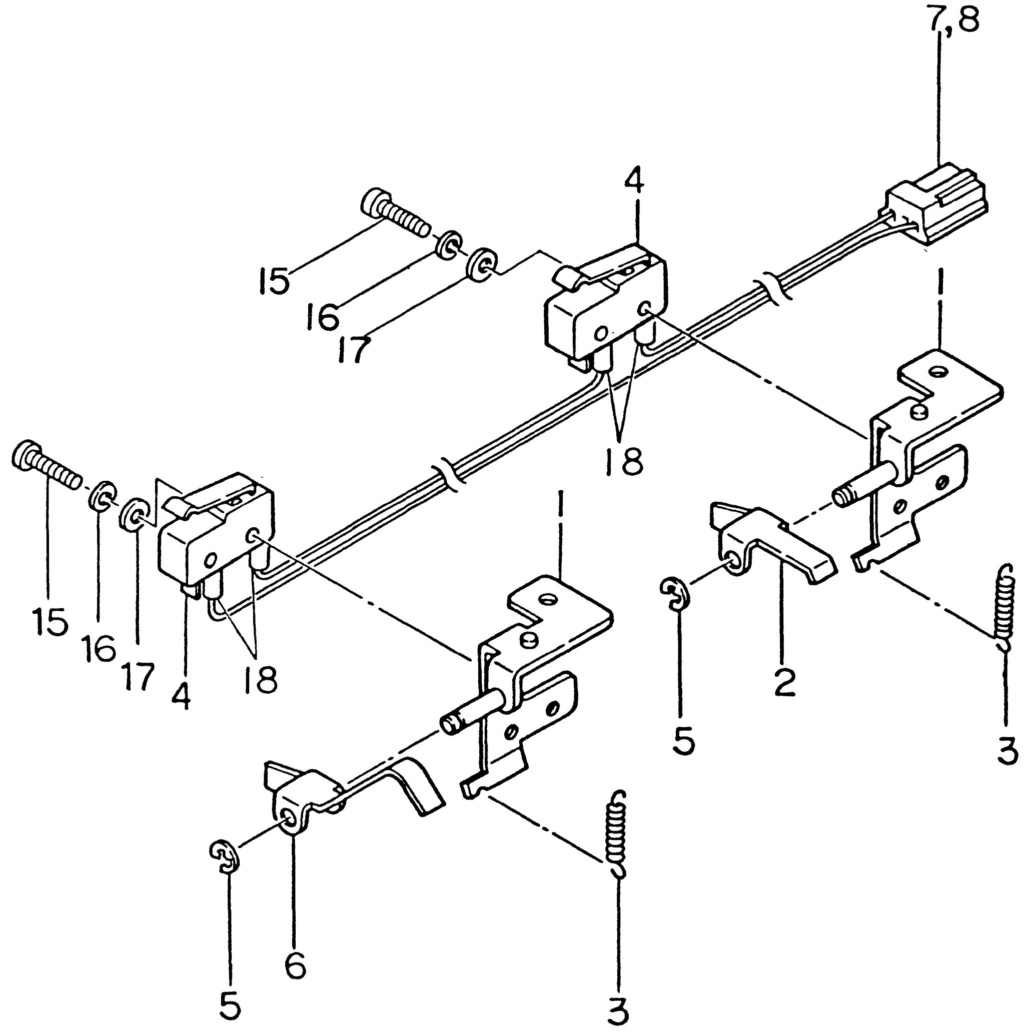


Fig. 8-5 Paper Out Assembly (4LR-129907)

Fig. 8-5 Paper Out Assembly (4LR-129907)

Item No.	Part No.	Description	Q'ty	Remarks	Compatibility
1	5LR-129863	Microswitch bracket (clinched)	2		80 82 82A 83
2	5LR-129870	Microswitch actuator	1		80 82 82A 83
3	5LR-129844	Spring	2		80 82 82A 83
4	4LP-3378-4	Microswitch	2		80 82 82A 83
5	5KX-9057	E-snap ring	2		
6	5LR-132496	Paper out lever	1		82A 83
7	J4LP-5525-3	3P receptacle housing	1		80 82 82A 83
8	J4LP-5526	Receptacle contact	2		
	LY-4658-3 (black)	17/0.16 heat resisting PVC wire	1	ℓ = 270mm	
	LY-4658-3 (blue)	17/0.16 heat resisting PVC wire	1	ℓ = 270mm	
	LY-4658-3 (blue)	17/0.16 heat resisting PVC wire	1	ℓ = 200mm	
15	⊕ P2.3-10-HH	Small pan-head screw	2		
16	SW2.3-HHC	Spring washer	2		
17	W2.3-HH	Washer	2		
18		Insulation SUMI-tube F	4	ø3 x 0.25 x 10	

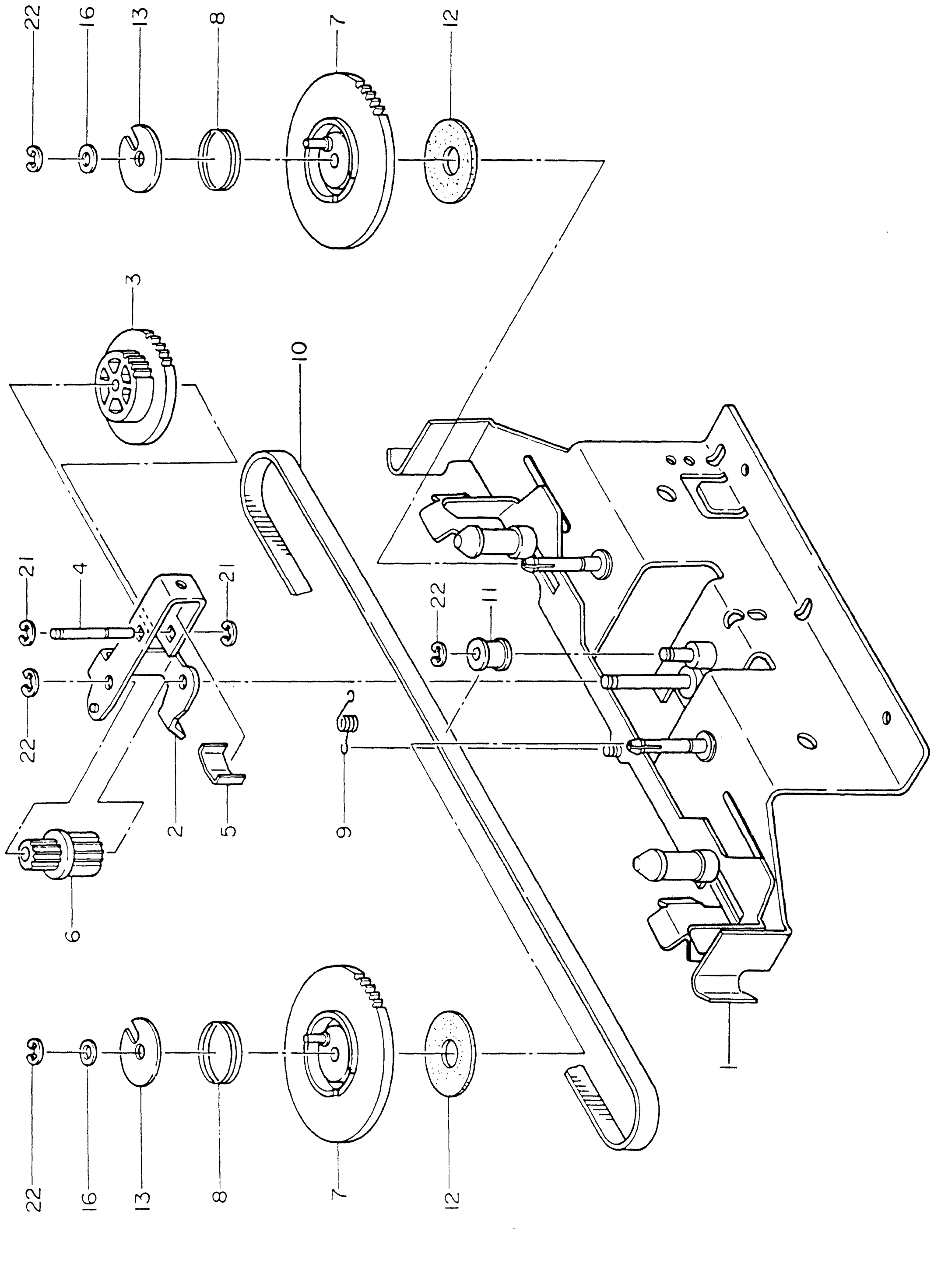


Fig. 8-6 Ribbon Feed Mechanism (3LR-193456-3)

Fig. 8-6 Ribbon Feed Mechanism (3LR-193456-3)

Item No.	Part No.	Description	Q'ty	Remarks	Compatibility
1	3LR-193457	Ribbon bracket (clinched)	1		80 82A
2	5LR-129825	Ribbon change lever (clinched)	1		80 82 82A 83
3	4LR-129827	Ribbon gear	1		80 82 82A 83
4	5LR-193461	Snap shaft	1		80 82A
5	5LR-129876	Friction spring	1		80 82 82A 83
6	4LR-191858	Ribbon drive gear	1		82A
7	4LR-129837	Ribbon spool gear	2		80 82 82A 83
8	5LR-129840	Compression spring	2		83
9	5LR-129841	Detent spring	1		80 82 82A 83
10	4LP-1420-5	Synchro belt	1		
11	5LR-191859	Pressure roller	1		82A
12	5LR-129842	Friction felt	2		80 82 82A 83
13	5LR-129843	Special washer	2		80 82 82A 83
16	5LR-132516	Plastic washer	2		80 82 82A 83
21	5KX-9057	E-snap ring (E_2)	2		
22	5KH-12050	E-snap ring (E_3)	4		

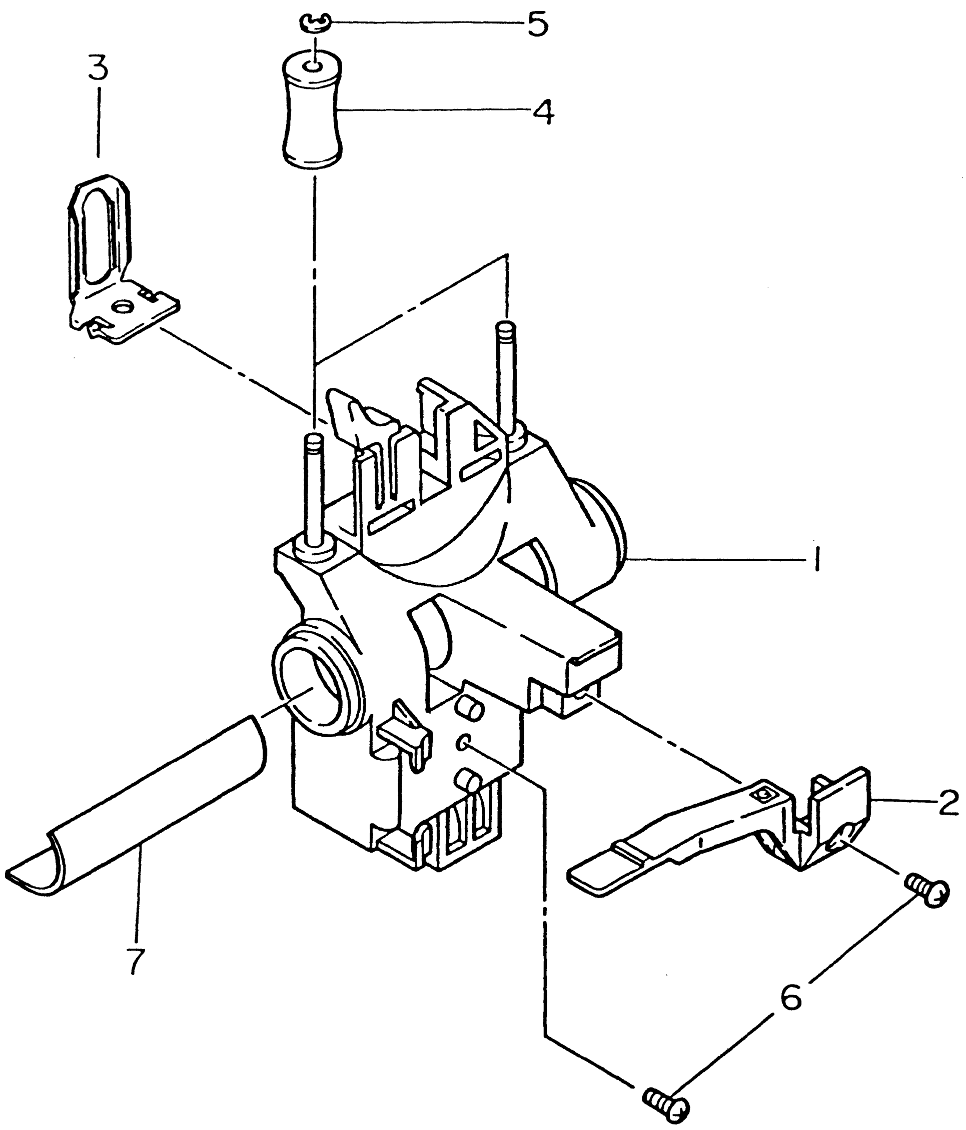


Fig. 8-7 Carriage Assembly (4LR-191870)

Fig. 8-7 Carriage Assembly (4LR-191870)

Item No.	Part No.	Description	Q'ty	Remarks	Compatibility
1	4LR-191871	Carriage frame (pressure-inserted)	1		82A
2	5LR-191857	Belt clamp	1		82A
3	5LR-191873	Ribbon protector	1		82A
4	5LD-83139	Ribbon roller	2		82A 83
5	5KX-9057	E-snap ring (E2)	2		82A
6	⊕ T2P3-10-HH	Tapping screw	2		
7	5LR-191874	Oil felt	1		82A

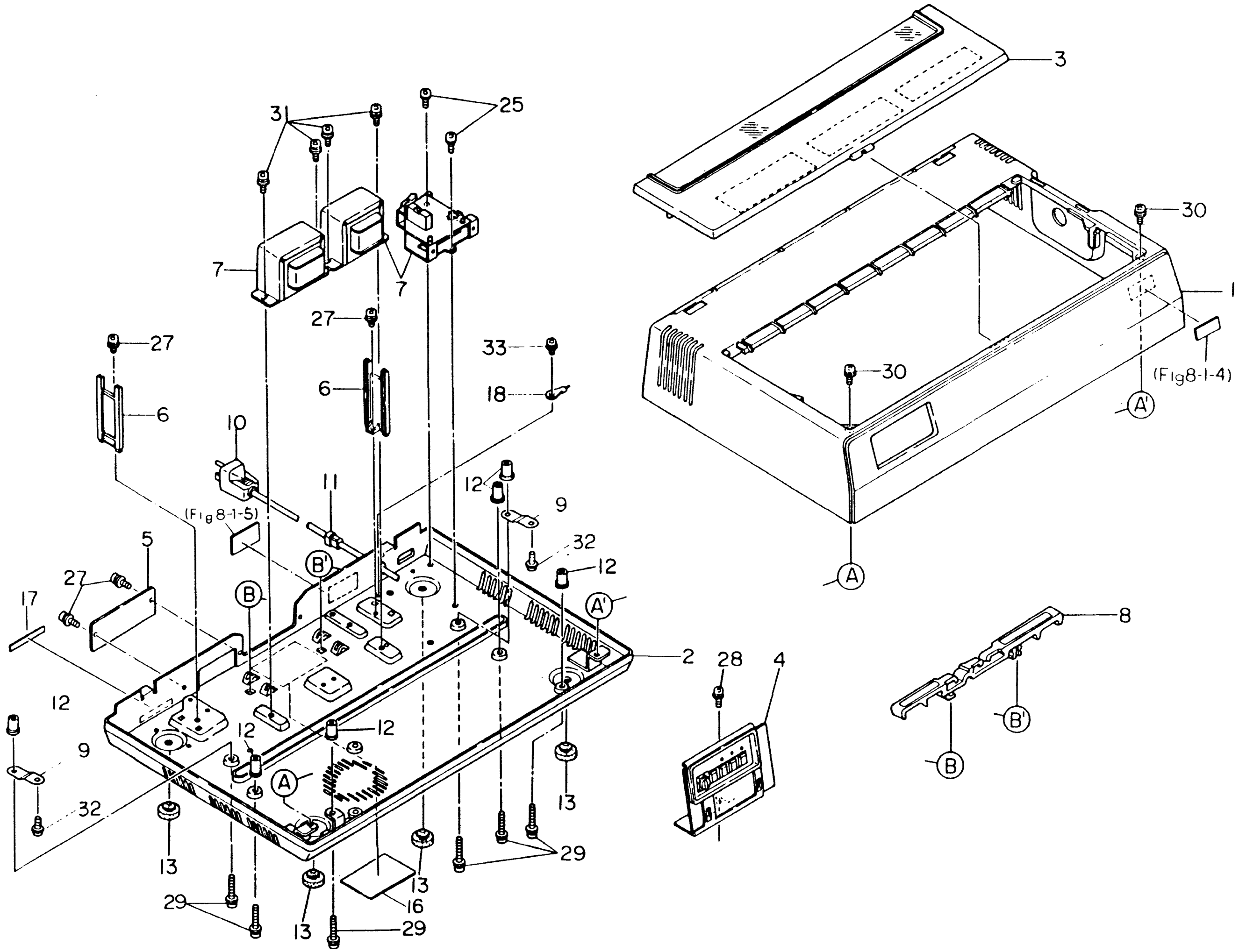


Fig. 8-8 Cover Unit (1LM-61517-2) (for 115 V)

Fig. 8-8 Cover Unit (1LM-61517-2) (for 115 V)

Item No.	Part No.	Description	Q'ty	Remarks	Compatibility
1	1LM-60106	Upper cover	1		83
2	1LM-60104	Lower cover	1		83
3	2LM-60112	Access cover	1		83
4	4LM-59688	Operation panel assembly	1		82 82A 83
5	5LM-59696	Blank plate	1		82 82A 83
6	4LM-60115	Circuit board support	2		82 82A 83
7	2LR-104073-5	Power source assembly	1		
8	3LM-60116	Cord clamp	1		82 82A 83
9	5LM-61519	Ground board	2		82 82A
10	3LP-38462	3-pin AC cord	1		80 82 82A 83
11	5LP-6463-C-5	Cord bushing	1		83
12	4LP-6726-2	Quite-tight	6		80 82 82A 83
13	5LP-1488	Rubber foot	4		80 82 82A 83
14	5LP-1492	Cord clamp	1		80 82 82A 83
15	4LP-1489	Cord clamp	2		
16	4L-1604	FCC nameplate	1		
17	4L-1442	UL listing mark	1		80 82 82A 83
18	5LP-6342-2	Crimp terminal	1		
25	⊕ P(SW)3-5-HH	Small pan-head screw	2		
27	⊕ P(SW+W) 3-8-HH	Small pan-head screw	4		
28	⊕ P(SW+2W) 3-6-HH	Small pan-head screw	1		
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		
33	⊕ P(SW+2W) 4-6-HH	Small pan-head screw	1		

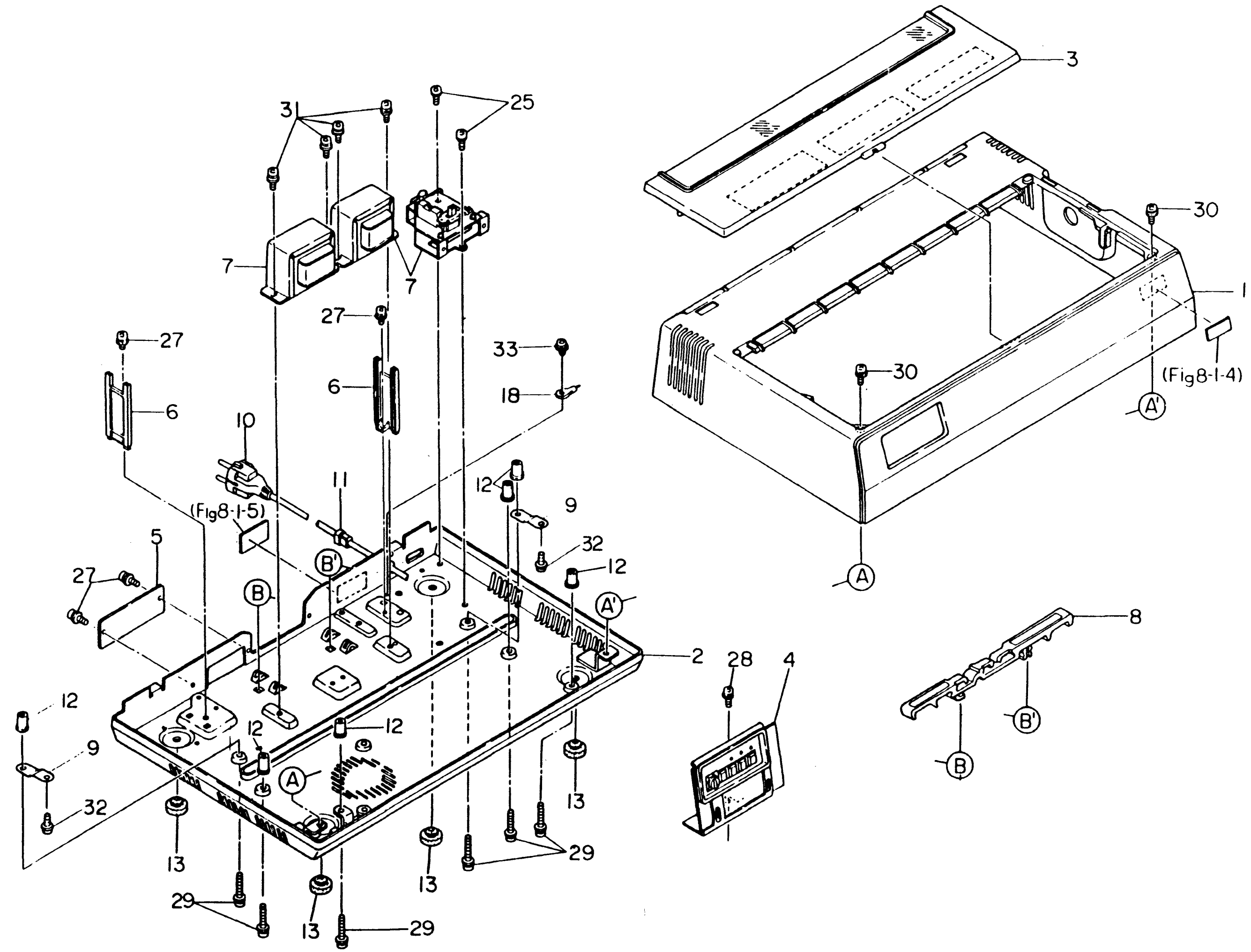


Fig. 8-8 Cover Unit (1LM-61517-3) (for 220/240 V)

Fig. 8-8 Cover Unit (1LM-61517-3) (for 220/240 V)

Item No.	Part No.	Description	Q'ty	Remarks	Compati-bility
1	1LM-60106	Upper cover	1		83
2	1LM-60104	Lower cover	1		83
3	2LM-60112	Access cover	1		83
4	4LM-59688	Operation panel assembly	1		82 82A 83
5	5LM-59696	Blank plate	1		82 82A 83
6	4LM-60115	Circuit board support	2		82 82A 83
7	2LR-104073-6	Power source assembly	1		
8	3LM-60116	Cord clamp	1		82 82A 83
9	5LM-61519	Ground board	2		80 83
10	3LP-38463	3-pin AC cord	1		80 82 82A 83
11	5LP-6463-C-5	Cord bushing	1		83
12	4LP-6726-2	Quite-tight	6		80 82 82A 83
13	5LP-1488	Rubber foot	4		80 82 82A 83
14	5LP-1492	Cord clamp	1		
15	5LP-1489	Cord clamp	2		
18	5LP-6364	Crimp terminal	1		
25	⊕ P(SW)3-5-HH	Small pan-head screw	2		
27	⊕ P(SW+W) 3-8-HH	Small pan-head screw	4		
28	⊕ P(SW+2W) 3-6-HH	Small pan-head screw	1		
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		
33	⊕ P(SW+2W) 4-6-HH	Small pan-head screw	1		

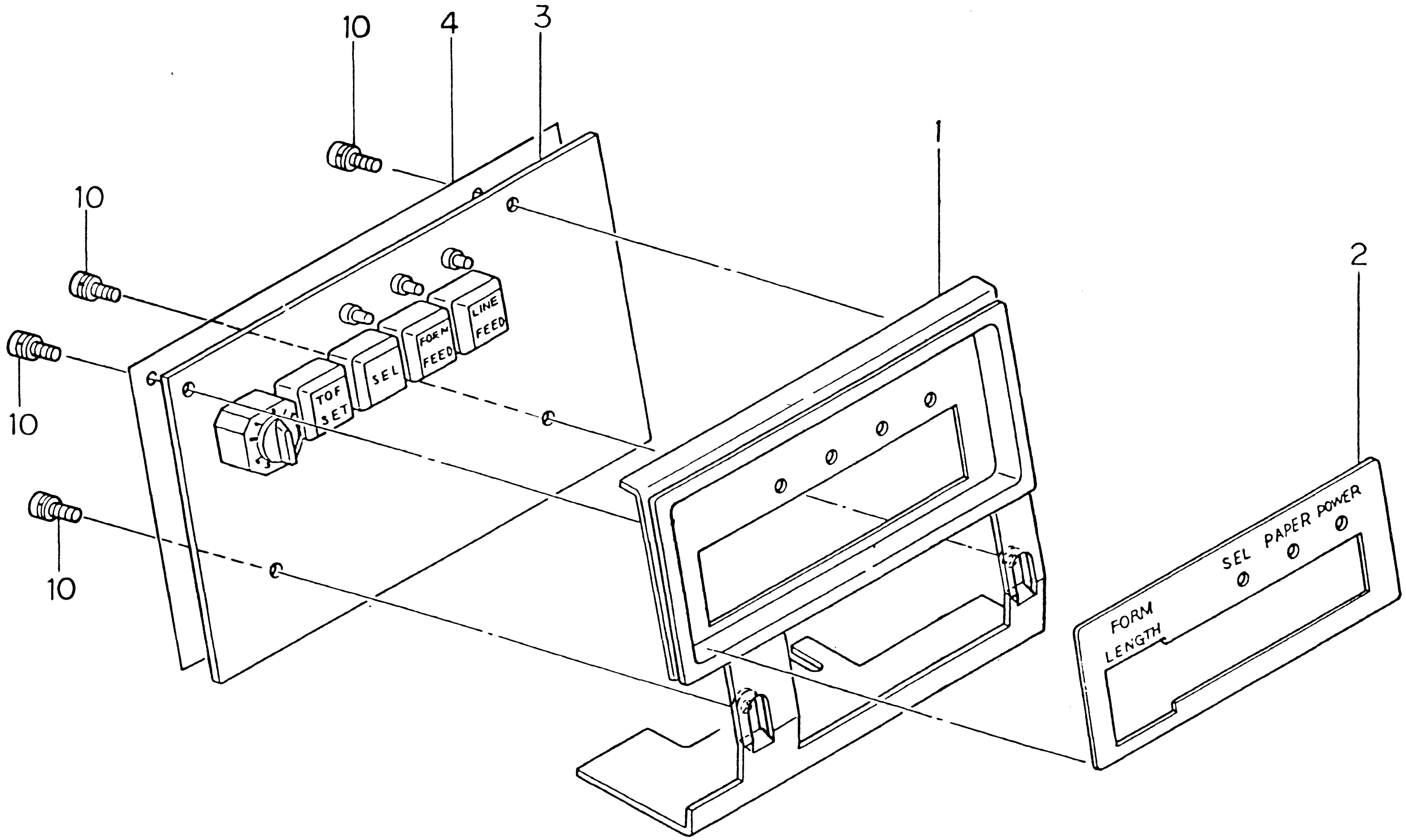


Fig. 8-9 Operation Panel Assembly (4LM-59688)

Fig. 8-9 Operation Panel Assembly (4LM-59688)

Item No.	Part No.	Description	Q'ty	Remarks	Compatibility
1	4LM-59689	Circuit board bracket (welded)	1		82 82A 83
2	5LM-59693	Display panel	1		82 82A 83
3	LY-40069	LEPF circuit board	1		82 82A 83
4	4LR-191908	Insulator	1		82 82A 83
10	⊕ P(SW+W) 3-6-HH	Small pan-head screw	4		

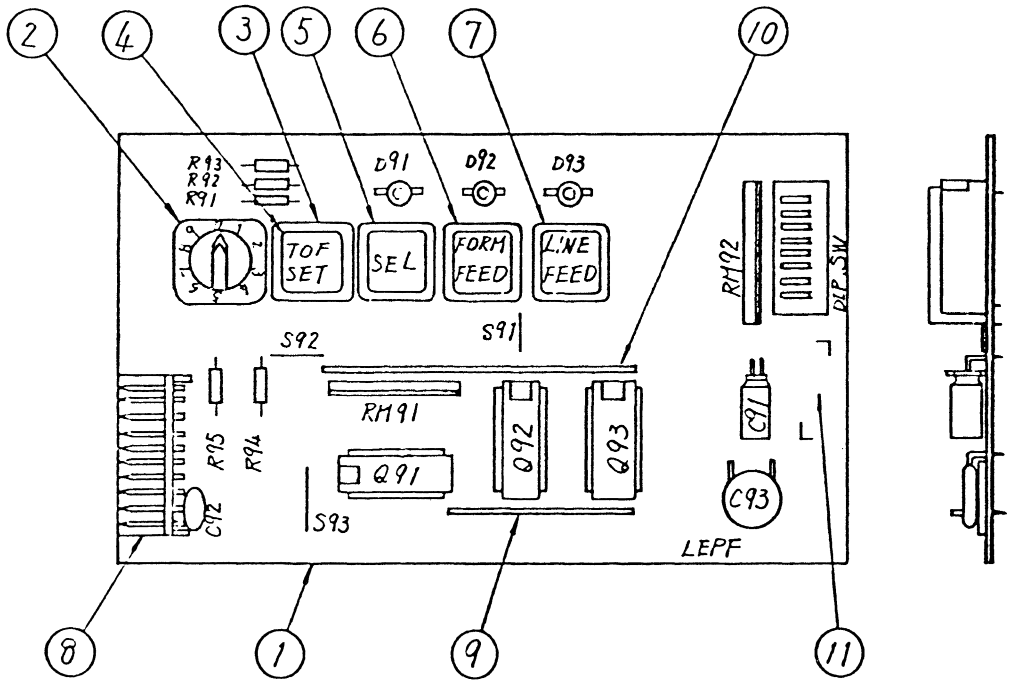


Fig. 8-10 LEPF Circuit Board Assembly (LY-40069)

Fig. 8-10 LEPF Circuit Board Assembly (LY-40069)

Item No.	Part No.	Description	Q'ty	Remarks	Compatibility
1	3LP-16707	LEPF circuit board	1		82 82A 83
D91 to D93	4LP-44373	SEL103R light emitting diode	3		82 82A 83
R91 to R93	R4LP-8446-391	Simple insulated resistor 1/4W 390Ω	3		82 82A 83
R94	R4LP-8446-512	Simple insulated resistor 1/4W 5.1kΩ	1		82 82A 83
R95	R4LP-8446-102	Simple insulated resistor 1/4W 1kΩ	1		82 82A 83
RM1, RM2	R4LP-8396-512	8-element module resistor 1/4W 5.1kΩ	2		82 82A 83
C91	C4LP-8519-12	Aluminum electrolytic capacitor 25V 47μF	1		82 82A 83
Q92, Q93	I4LP-11178-41	SN75LS151	2		82 82A 83
Q91	I4LP-11136-40	SN74LS05	1		82 82A 83
DIP SW	4LP-3425-8	DIP switch 8-pin	1		82 82A 83
2	4LP-3424	Rotary switch (SROV 101A)	1		82 82A 83
3	3LK-50700-2	Key switch	4		82 82A 83
4	4L-1370-49-A2	Nameplate "TOF SET"	1		82 82A 83
5	4L-1370-50-A2	Nameplate "SEL"	1		82 82A 83
6	4L-1370-51-A2	Nameplate "FORM FEED"	1		82 82A 83
7	4L-1370-52-A2	Nameplate "LINE FEED"	1		82 82A 83
8	J4LP-5524-10	AMP EI connector 10-pin (male)	1		82 82A 83
9	3LH-31313-12	Power source bar	1		82 82A 83
10	3LH-31313-68	Power source bar	1		82 82A 83
S91 to S93	4KH-31017-8	⊔-shaped short circuit wire	3		82 82A 83
11	4L-1481	Number indication attaching nameplate	1		82 82A 83
C92	C4LP-8452-101	Ceramic capacitor 100pF	1		82 82A 83
C93	C4LP-8571	V-4SL capacitor 100pF	1		82 82A 83

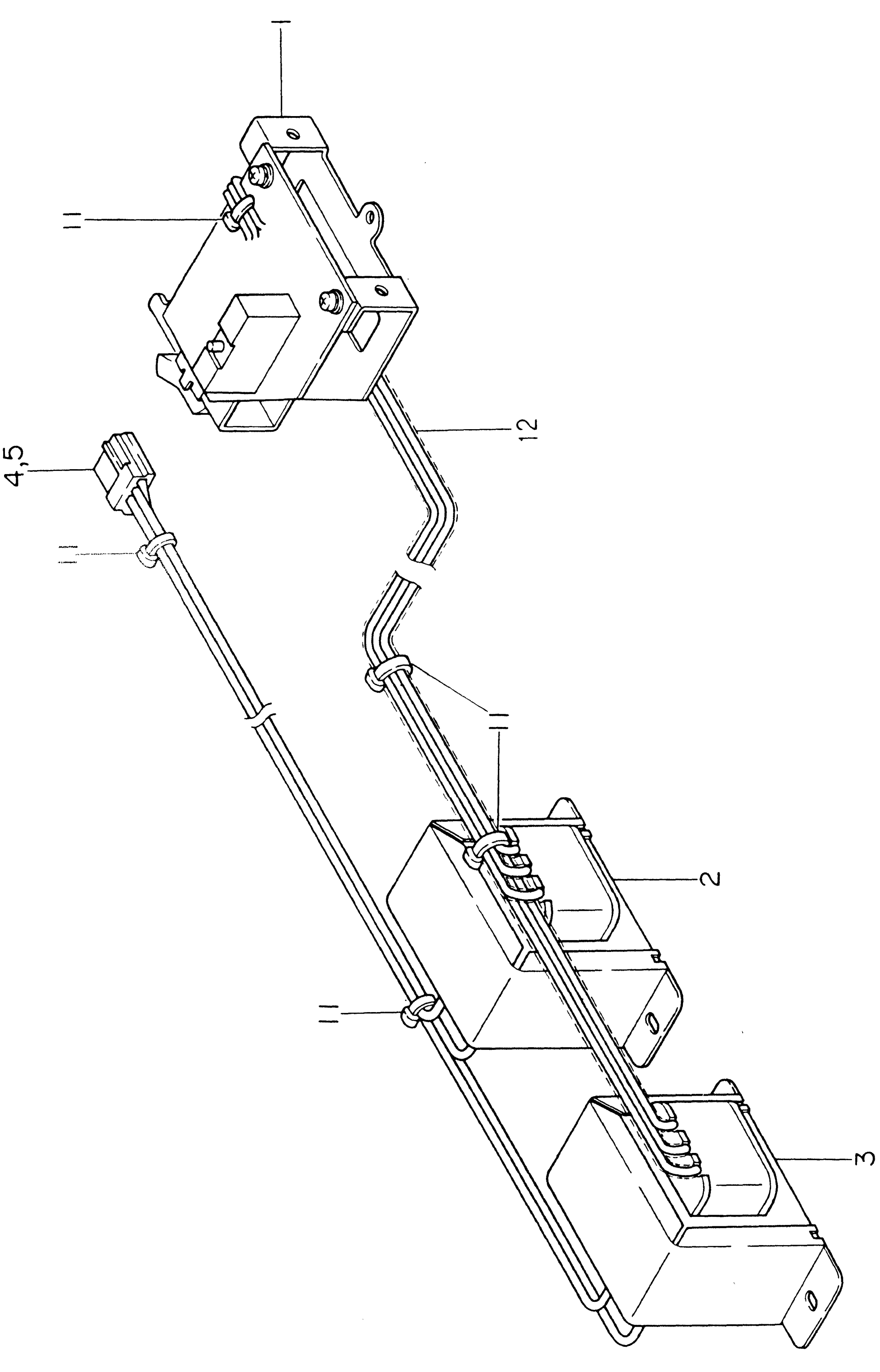


Fig. 8-11 Power Source Assembly (2LR-104073-5) (for 115 V)

Fig. 8-11 Power Source Assembly (2LR-104073-5) (for 115 V)

Item No.	Part No.	Description	Q'ty	Remarks	Compatibility
1	3LX-86727-3	LEPW 3 circuit board	1		
2	4LP-45191-125	Transformer	1		82A
3	4LP-45191-126	Transformer	1		82A
4	J4LP-5525-4	EI connector	1		82 82A 83
5	J4LP-5526	Contact	4		82 82A 83
11	4LP-6401-bl	Tie-wrap	5		82 82A 83
12		Silicon flexible tube	1	∅3 x 2100 mm class A	82A

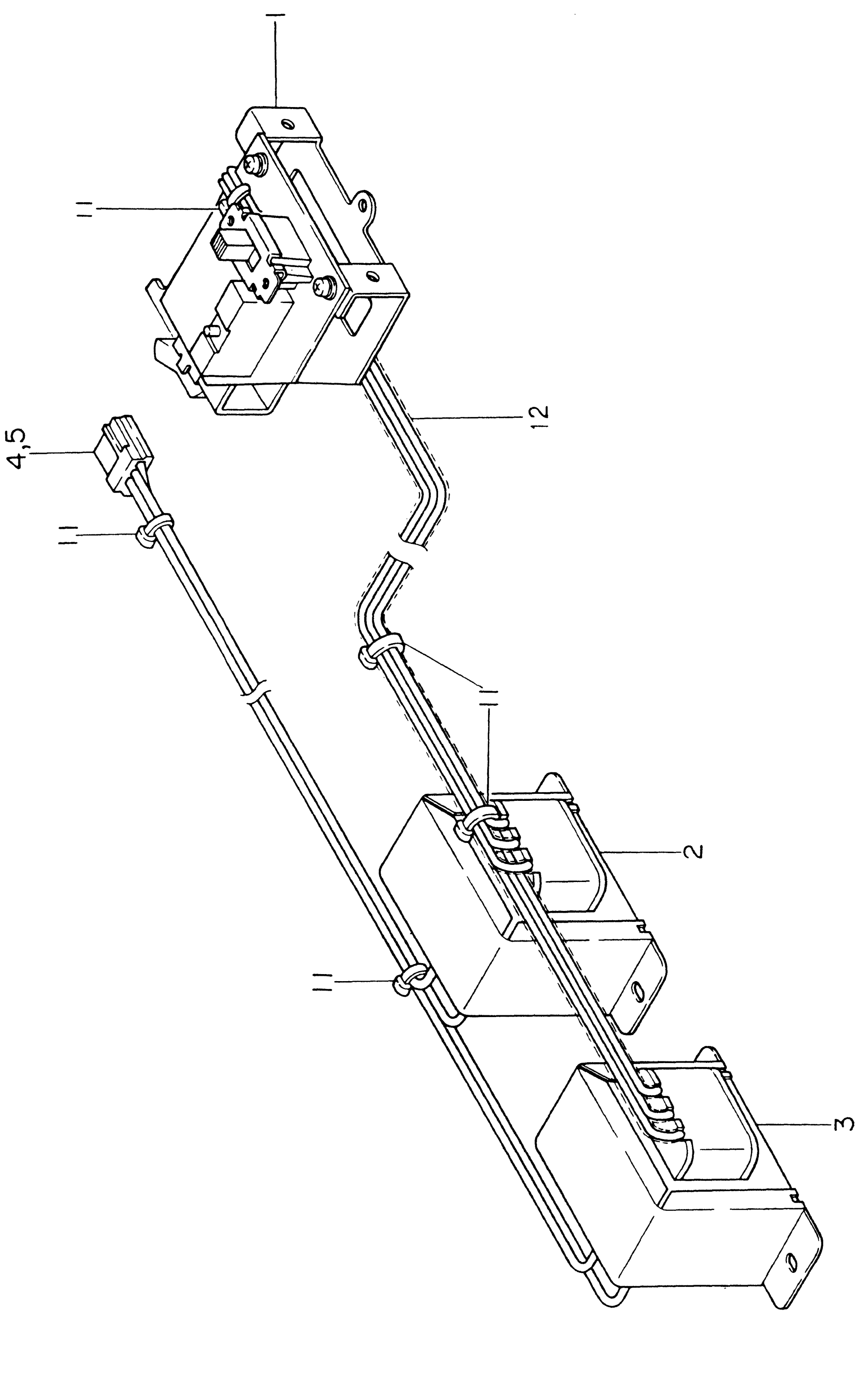
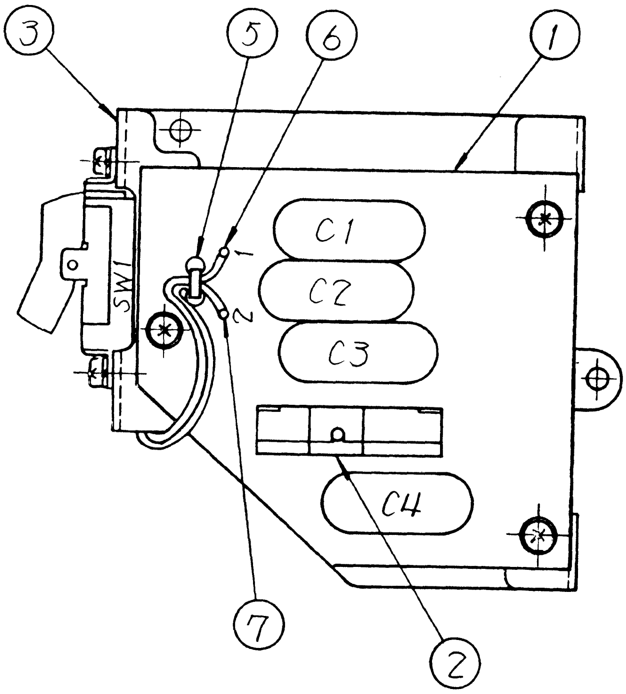


Fig. 8-11 Power Source Assembly (2LR-104073-6) (for 220/240 V)

Fig. 8-11 Power Source Assembly (2LR-104073-6) (for 220/240 V)

Item No.	Part No.	Description	Q'ty	Remarks	Compatibility
1	3LX-86727-4	LEPW 4 circuit board assembly	1		
2	4LP-45191-127	Transformer	1		82A
3	4LP-45191-128	Transformer	1		82A
4	J4LP-5525-4	EI connector	1		82 82A 83
5	J4LP-5526	Contact	4		82 82A 83
11	4LP-6401-b1	Tie-wrap	5		82 82A 83
12		Silicon flexible tube	1	ø3 x 2100 mm class A	82A



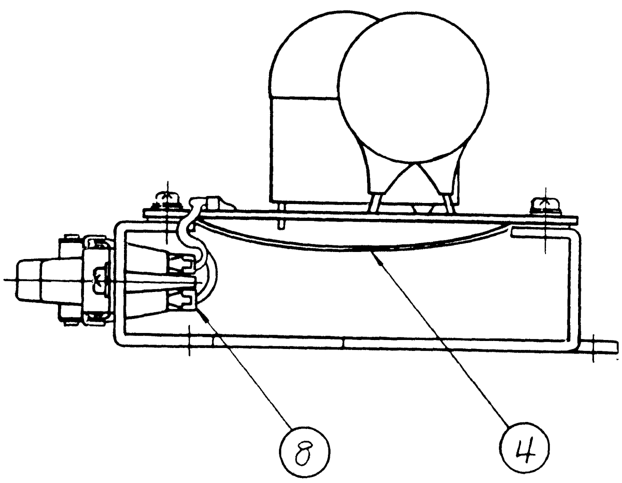
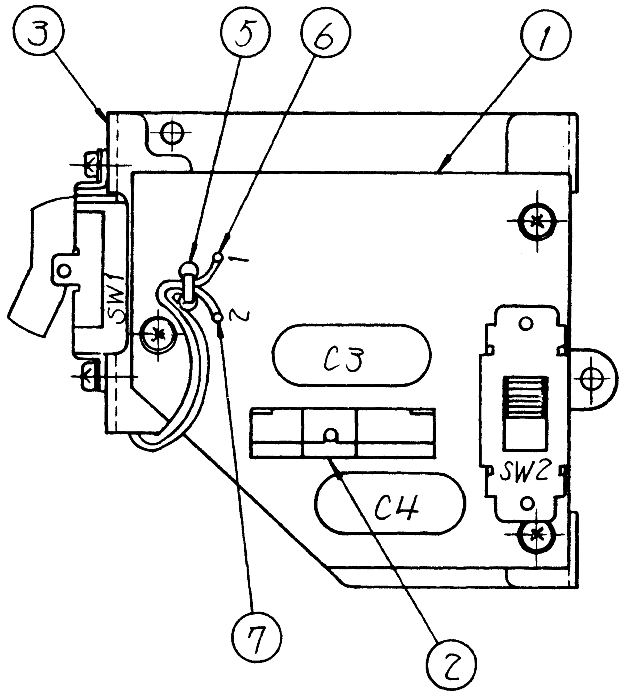


Fig. 8-12 LEPW-3 Circuit Board Assembly (3LX-86727-3) (for 115 V)

Fig. 8-12 LEPW-3 Circuit Board Assembly (3LX-86727-3) (for 115 V)

Item No.	Part No.	Description	Q'ty	Remarks	Compatibility
1	3LP-16727	LEPW circuit board	1		82A
SW1	4LP-3621-2	See-saw switch	1		80 82 82A 83
2	4LP-6740-160	Circuit breaker	1		82 82A 83
C1, C2, C3, C4	C4LP-8604-10	Ceramic capacitor	4		82A
3	4LM-60121	Power source circuit board bracket	1		83
4	4LR-191891	Insulator	1		82A
5	4LP-6401-bl	Tie-wrap	1		
6	LY-4658-3 'White'	Wires	1	ℓ = 100mm	
7	LY-4658-3 'Black'	Wires	1	ℓ = 100mm	
8		Insulation SUMI-tube F	2	ϕ3 x 10	
9	⊕ P(SW)3-5-HH	Small pan-head screw	2		
10	⊕ P(SW+2W)3-5-HH	Small pan-head screw	3		



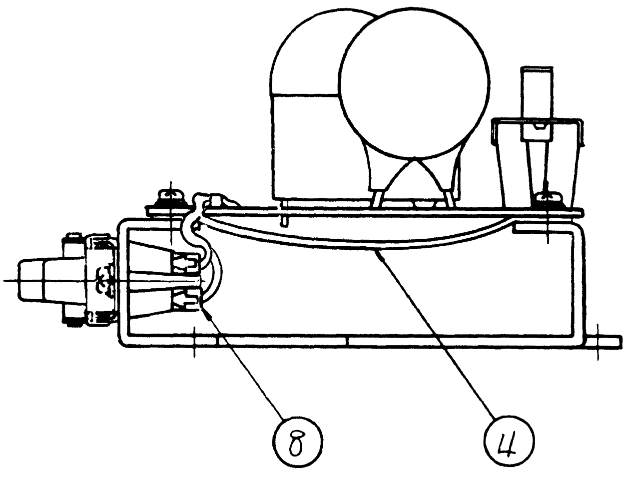
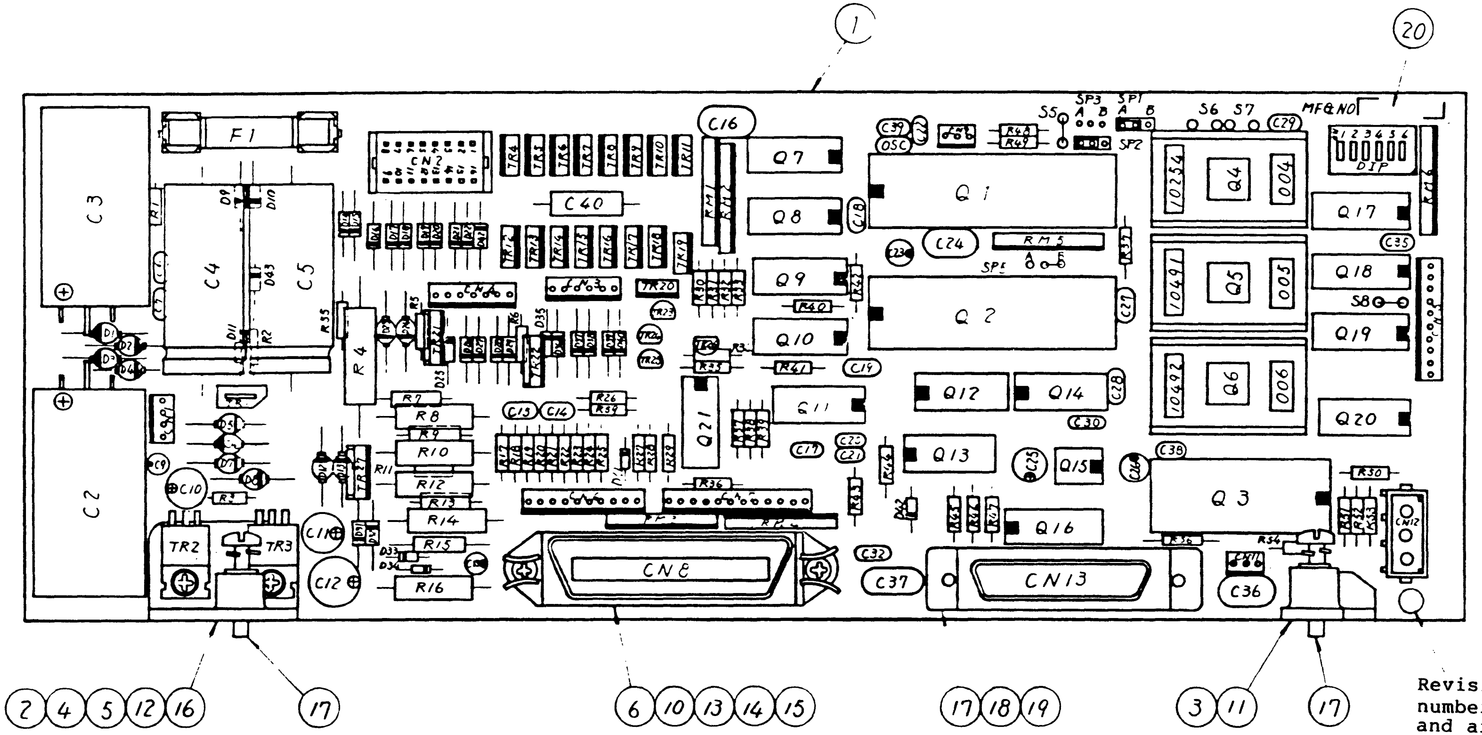


Fig. 8-12 LEPW-4 Circuit Board Assembly (3LX-86727-4)
(for 220/240 V)

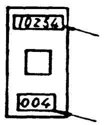
Fig. 8-12 LEPW-4 Circuit Board Assembly (3LX-86727-4) (for 220/240 V)

Item No.	Part No.	Description	Q'ty	Remarks	Compati-bility
1	3LP-16727	LEPW circuit board	1		82A
SW1	4LP-3621-1	See-saw switch	1		80 82 82A 83
SW2	4LP-3622	Slide switch	1		80 82 82A 83
2	4LP-6740-80	Circuit breaker	1		82 82A 83
C3, C4	C4LP-8555	Ceramic capacitor	2		82A
3	4LM-60121	Power source circuit board bracket	1		83
4	4LR-191891	Insulator	1		82A
5	4LP-6401-bl	Tie-wrap	1		
6	LY-4658-3 'White'	Wires	1	ℓ = 100mm	
7	LY-4658-3 'Black'	Wires	1	ℓ = 100mm	
8		Insulation SUMI-tube	2	ø3 x 10	
9	⊕P(SW)3-5-HH	Small pan-head screw	2		
10	⊕P(SW+2W)3-5-HH	Small pan-head screw	3		



Revision number 11 and after

Example of ROM Discrimination



Part No. name plate (White background)

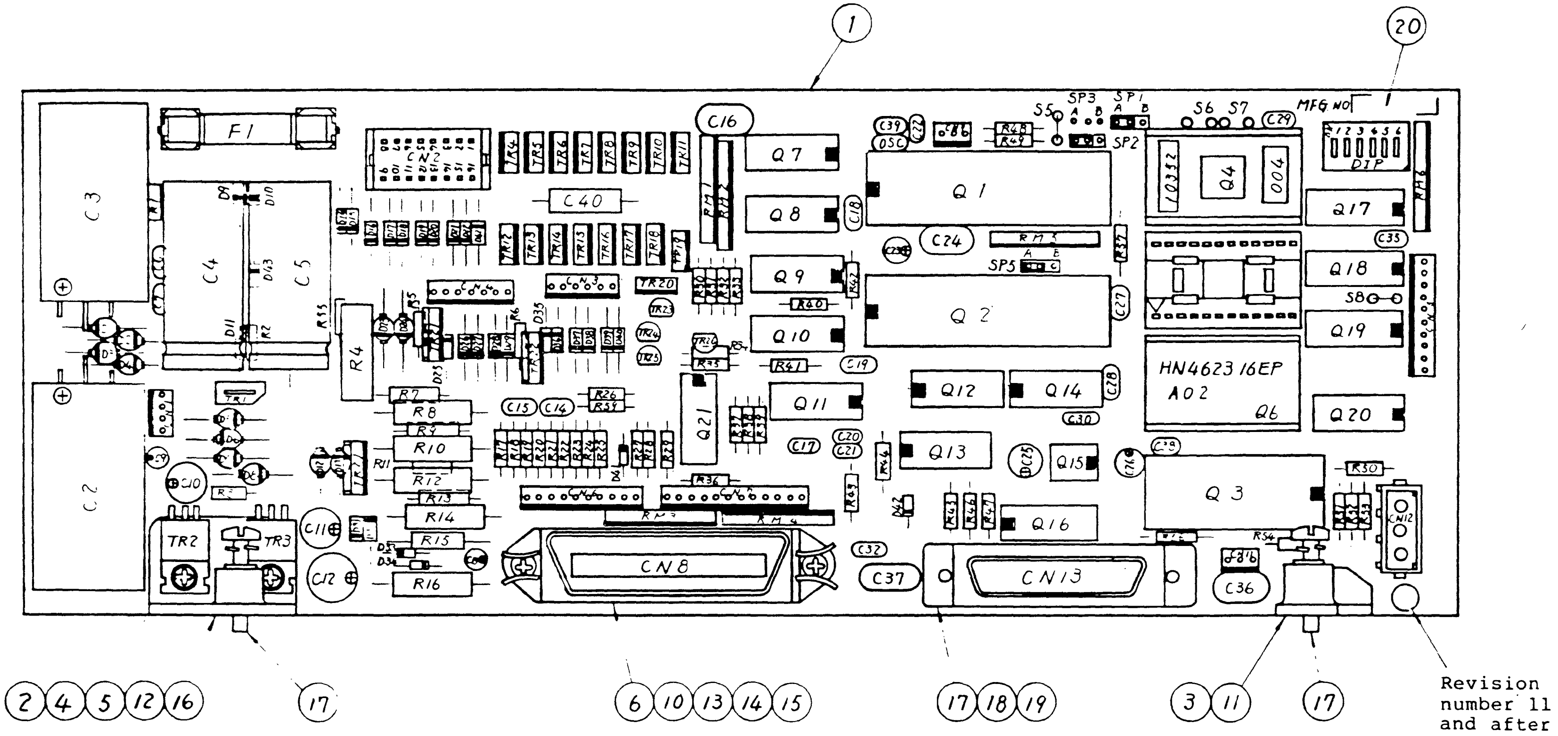
Packaging location name plate (Transparent background)

Note: ROM Discrimination Method

Discriminate the part Nos. and packaging locations of the ROMs packaged on this printed circuit board. Be particularly careful not to mix the part Nos. as the same Nos. are used for ML82A and ML83A in packaging locations only.

Part No.	Name plate indication	10254	10491	10492
	Indication in component table	LYH-10254	LYH-10491	LYH-10492
Packaging location	Name plate indication	004	005	006
	Indication in component table	Q4	Q5	Q6

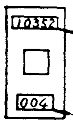
Fig. 8-13 LEPV-8 Circuit Board Assembly (LY-41565-8) (for 115 V)



Note: ROM Discrimination Method

Discriminate the part Nos. and packaging locations of the ROMs packaged on this printed circuit board. Be particularly careful not to mix the part Nos. as the same Nos. are used for ML82A and ML83A in packaging locations only.

Example of ROM Discrimination



Part No. name plate (White background)

Packaging location name plate (Transparent background)

Part No.	Name plate indication	10352		HN462316EP A02
	Indication in component table	LYH-10352		4LP-11740 -2-002
Packaging location	Name plate indication	004		
	Indication in component table	Q4		Q6

Fig. 8-13 LEPV-5 Circuit Board Assembly (LY-41565-5) (for 220/240 V)

Fig. 8-13 LEPV-8, -5 Circuit Board Assembly (LY-41565-8, 5) (1/6)

Item No.	Part No.	Description	Q'ty	Remarks	Compatibility
1	2LP-16726	LEPV circuit board	1		82A
D9,D10,D14 to D22, D25 to D29,D31,D32, D35 to D40, D44	D4LP-44416-1	EM-1Z diode	25		82A
D1 to D8	D4LP-9409-1	U05B diode	8		82 82A 83
D12, D13	D4LP-44253	GU-3SZ diode	2		82A
D23, D24	D4LP-44156-16	AU01-20 zener diode	2		82 82A 83
D41 to D43	D4LP-44171-8	RD5.1EB zener diode	3		80 82 82A 83
D33, D34	D4LP-44171-17	RD12EB zener diode	2		82 82A 83
D11	D4LP-44171-9	RD5.6EB zener diode	1		82A
R22	R4LP-8446-822	Simple insulated resister 1/4W 8.2kΩ	1		82A
R1, R26	R4LP-8446-752	Simple insulated resistor 1/4W 7.5kΩ	2		82 82A 83
R23,R41,R48	R4LP-8446-201	Simple insulated resistor 1/4W 200Ω	3		80 82 82A 83
R34, R36, R56	R4LP-8446-302	Simple insulated resistor 1/4W 3kΩ	3		82 82A 83
R30 to R33	R4LP-8446-392	Simple insulated resistor 1/4W 3.9kΩ	4		82 82A 83
R3,R11,R24,R28	R4LP-8446-511	Simple insulated resistor 1/4W 51Ω	4		82 82A 83
R6,R27,R29,R40 R42 to R45,R47 R50 to R53,R57	R4LP-8446-512	Simple insulated resistor 1/4W 5.1kΩ	14		80 82 82A 83
R2,R5,R35,R46, R54	R4LP-8446-102	Simple insulated resistor 1/4W 1kΩ	5		80 82 82A 83
R55	R4LP-8446-510	Simple insulated resistor 1/4W 51Ω	1		80 82A
R38, R49	R4LP-8446-103	Simple insulated resistor 1/4W 10kΩ	2		80 82 82A 83
R19	R4LP-8446-274	Simple insulated resistor 1/4W 270kΩ	1		82A 83
R20	R4LP-8446-433	Simple insulated resistor 1/4W 43kΩ	1		82A 83
R39	R4LP-8446-202	Simple insulated resistor 1/4W 2kΩ	1		80 82A
R7	R4LP-8447-103	NAS B type 1/2W 10kΩ	1		82 82A 83
R9, R13	R4LP-8447-242	NAS B type 1/2W 2.4kΩ	2		82 82A 83

Fig. 8-13 LEPV-8, -5 Circuit Board Assembly (LY-41565-8, 5) (2/6)

Item No.	Part No.	Description	Q'ty	Remarks	Compati-bility
R15	R4LP-8318-621	Metal film resistor 1W 620Ω	1		82 82A 83
R10	R4LP-8224-151	Metal film resistor 2W 150Ω	1		82 82A 83
R16	R4LP-8224-821	Metal film resistor 2W 820Ω	1		82 82A 83
R14	R4LP-8224-302	Metal film resistor 2W 3kΩ	1		82 82A 83
R8, R12	R4LP-8224-121	Metal film resistor 2W 120Ω	2		82A
R4	R4LP-8225-300	Metal film resistor 2W 3W 30Ω	1		82 82A 83
RM3, RM4	R4LP-8396-102	8-element module resistor 1kΩ	2		80 82 82A 83
RM1, RM2	R4LP-8396-392	8-element module resistor 3.9kΩ	2		82 82A 83
RM5, RM6	R4LP-8396-512	8-element module resistor 5.1kΩ	2		80 82 82A 83
OSC	4LP-12127-3	Ceramic oscillator 9.0MHz	1		82A 83
C39		Capacitor for oscil-lator		Attachment for 4LP-12127-3	82A 83
C16,C24,C36	4LP-8449-104	100V 0.1μF Polyester film capacitor	3		80 82 82A 83
C6,C7,C15, C17 to C19,C27 to C29,C35,C38	4LP-8449-103	100V 0.01μF Polyester film capacitor	11		82 82A 83
C21, C22	4LP-8449-102	100V 0.001μF Polyes-ter film capacitor	2		82 83- 33
C20, C32	4LP-8611-561	560pF ceramic capacitor	2		82A
C37	C4LP-8469-102	1000pF ceramic capacitor	1		82A
C30	4LP-8611-221	220pF ceramic capacitor	1		82A
C23	C4LP-8519-40	04 type aluminum electrolytic capaci-tor 100V 1μF	1		82 82A 83
C25, C26	C4LP-8519-1	04 type aluminum electrolytic capaci-tor 10V 100μF	2		82 82A 83

Fig. 8-13 LEPV-8, -5 Circuit Board Assembly (LY-41565-8, 5) (3/6)

Item No.	Part No.	Description	Q'ty	Remarks	Compatibility
C11	C4LP-8519-31	04 type aluminum electrolytic capacitor 63V 33μF	1		82 82A 83
C12	C4LP-8519-26	04 type aluminum electrolytic capacitor 50V 100μF	1		82 82A 83
C10	C4LP-8519-25	04 type aluminum electrolytic capacitor 50V 47μF	1		82A
C2, C3	C4LP-8520-23	04 type aluminum electrolytic capacitor 50V 2200μF	2		82 82A 83
C4, C5	C4LP-8550-27	02 type aluminum electrolytic capacitor 16V 3300μF	2		82 82A 83
C14	C4LP-8449-223	100V 0.022μF Polyester film capacitor	1		82A
C13, C9	C4LP-8470-7	Tantalum electrolytic capacitor 35V 1μF	2		80 82 82A 83
C40	C4LP-8383-2	0.1μF metalized polyester film capacitor	1		82A
Q1	I4LP-11400-00-248	μCPU 8049-248	1		82A
Q2	I4LP-11368-06	μPD 8155C	1		80 82 82A 83
Q3	I4LP-11369-06	μPD 8251AC	1		82A
Q12	I4LP-11117-40	SN74LS02	1		82 82A 83
Q14	I4LP-11131-40	SN74LS04	1		82 82A 83
Q7,Q8,Q10	I4LP-11136-40	SN74LS05	3		80 82 82A 83
Q9,Q11	I4LP-11146-00	SN7407	2		82A 83
Q18, Q19	I4LP-11124-40	SN74LS75	2		82 82A 83
Q17	I4LP-11288-40	SN74LS251	1		82 82A 83
Q13	I4LP-11145-01	SN7406	1		82 82A 83
Q15	I4LP-11220-00	SN75150P	1		82 82A 83
Q16	I4LP-11172-00	SN75154N	1		82 82A 83
Q20	I4LP-12469	MSM4069	1		82A
Q21	I4LP-11836-00	μPC339C	1		82 82A 83
Q4, Q5, Q6	4LP-5573-24	24-pin IC socket	3		80 82 82A 83
TR4 to TR12	4LP-44385-2	Transistor 2SD986	9		82A
TR13 to TR20	4LP-44385	Transistor 2SD986(1)	8		82 82A 83
TR23 to TR25	4LP-44335	Transistor 2SC2719	3		80 82 82A 83

Fig. 8-13 LEPV-8, -5 Circuit Board Assembly (LY-41565-8, 5) (4/6)

Item No.	Part No.	Description	Q'ty	Remarks	Compati-bility
TR26	4LP-44331	Transistor 2SA952	1		80 82 82A 83
TR3,TR21,TR22, TR27	4LP-44251	Transistor 2SB727	4		82 82A 83
TR1	4LP-44492-1-B	Thyristor CSM3B1A30	1		82A
TR2	4LP-11830-40	Regulator FS7805	1		82A
DIP	4LP-3425-6	DIP switch (6-pin)	1		82 82A 83
SP1, SP2	4LP-5591	Short circuit plug Z128	2		80 82 82A 83
SP1, SP2	4LP-5592-3	Plug Z149-3P	2		80 82 82A 83
CN8	4LP-5663	DIP type 36 plug connector	1		80 82 82A 83
CN13	J3LP-2989-25	25-pin housing DBC25SF0	1		82 82A 83
	4LP-5715	Pin contact 030-50-663	8		82 82A 83
CN9, CN11	4LP-5523-3	AMPEI connector 3-pin	2		80 82 82A 83
CN1	4LP-5523-4	AMPEI connector 4-pin	1		80 82 82A 83
CN3	4LP-5523-6	AMPEI connector 6-pin	1		80 82 82A 83
CN4	4LP-5523-7	AMPEI connector 7-pin	1		82A
CN5, CN6	4LP-5523-10	AMPEI connector 10-pin	2		82 82A 83
CN7	4LP-5523-12	AMPEI connector 12-pin	1		82 82A 83
CN12	4LP-2887-1	3-pin nylon connector	1		80 82 82A
CN2	4LP-9490-B-03	IC socket (16-pin)	1		82 82A 83
CN2	4LP-5551	Connector locker	1		82 82A 83
F1	4LP-8475-B-21	MGC 2.5A fuse	1		82A
F1, F1	5L-90188	Fuse holder	2		80 82 82A 83
2	5LR-193468	Heat sink (for transistor)	1		82A
3	5LR-193469	Circuit board fixing metal	1		82A
S5, S8	5KH-31036-50	U-shaped short circuit wire	2		82A
4	4LP-44106-3	SERCON	2		80 82 82A 83
5	4LP-4967-8	Insulating bush	2		80 82 82A 83

Fig. 8-13 LEPV-8, -5 Circuit Board Assembly (LY-41565-8, 5) (5/6)

Item No.	Part No.	Description	Q'ty	Remarks	Compati-bility
6	4LB-102200-6B	Collar	2		80 82 82A 83
7	4LB-102200-12B	Collar	2		82 82A 83
8	5LP-5683-3	Connector holder	2		82A
9	⊕P(SW+W) 2.6-16-HH	Small pan-head screw	2		
10	⊕P3-12-HH	Small pan-head screw	2		
11	⊕P(SW+W)3-6-HH	Small pan-head screw	2		
12	⊕P(SW+W) 2.6-10-HH	Small pan-head screw	2		
13	W3-HH	Washer	2		
14	SW3-HHC	Spring washer	2		
15	3N3-HH	Lock nut	2		
16	3N2.6-HH	Lock nut	2		
17	5LP-6890	Set screw	2		82 82A 83
20	4L-1481	Number indication attaching nameplate	1		82 82A 83
R25	4LP-8446-163	Simple insulated resistor 1/4W 16kΩ	1		82A
R37	4LP-8446-394	Simple insulated resistor 1/4W 390kΩ	1		82A
R18	4LP-8446-474	Simple insulated resistor 1/4W 470kΩ	1		82A
R17	4LP-8446-823	Simple insulated resistor 1/4W 82kΩ	1		82A
R21	4LP-8446-203	Simple insulated resistor 1/4W 20kΩ	1		82A
R59	4LP-8446-623	Simple insulated resistor 1/4W 62kΩ	1		82A

Fig. 8-13 LEPV-8, -5 Circuit Board Assembly (LY-41565-8, 5) (6/6)

Item No.	Part No.	Description	Q'ty	Remarks	Compatibility
Q4	LYH-10254	EPROM character generator	1	To be ordered separately. (For U.S.A.)	82A
Q5	LYH-10491	EPROM, program ROM	1		
Q6	LYH-10492	EPROM, program ROM	1		
SP5	5KH-31036-25	U-shaped short circuit wire	1		
Q4	LYH-10352	EPROM, character generator	1	To be ordered separately. (For the area other than U.S.A.).	82A
Q6	4LP-11740-02-002	EPROM, program ROM	1		
SP5	4LP-5591	Jumper plug Z 128	1		
SP5	4LP-5592-3	Terminal Z149 3P	1		

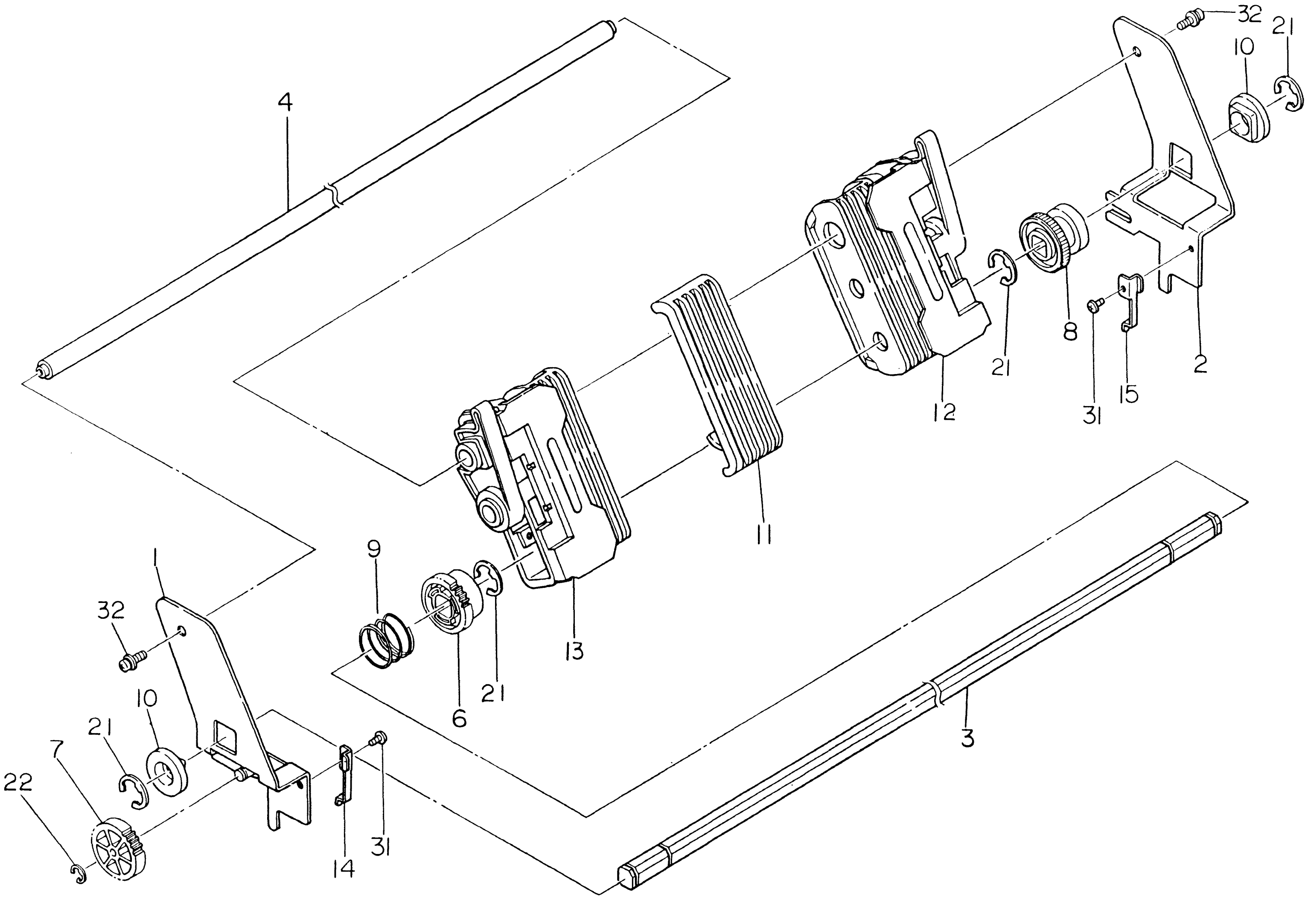


Fig. 8-14 Tractor Unit (LY-39702)

Fig. 8-14 Tractor Unit (LY-39702)

Item No.	Part No.	Description	Q'ty	Remarks	Compatibility
1	5LR-129881	Side plate (L)	1		80 82 82A 83
2	4LR-129884	Side plate (R)	1		80 82 82A 83
3	5LR-129885-2	Tractor drive shaft	1		83
4	5LR-129886-2	Tractor shaft	1		83
6	4LR-129889	Tractor gear	1		80 82 82A 83
7	4LR-129890	Idle gear	1		80 82 82A 83
8	4LR-129891	Knob	1		80 82 82A 83
9	5LR-129895	Bias spring	1		80 82 82A 83
10	5LR-123498	Bushing	2		80 82 82A 83
11	5LR-123467	Sheet guide	1		83
12	FMX-35100-2	Sprocket assembly (R)	1		80 82 82A 83
13	FMX-35150-2	Sprocket assembly (L)	1		80 82 82A 83
14	5LP-194059	Clamp lever (L)	1		80 82A
15	5LR-194060	Clamp lever (R)	1		80 82A
21	5KD-50242	E-snapring	4		
22	5KH-12050	E-snapring	1		
31	⊕ D3-5-23D	Bind screw	2		
32	⊕ P(SW+2W) 3-8-23D	Small pan-head screw	2		

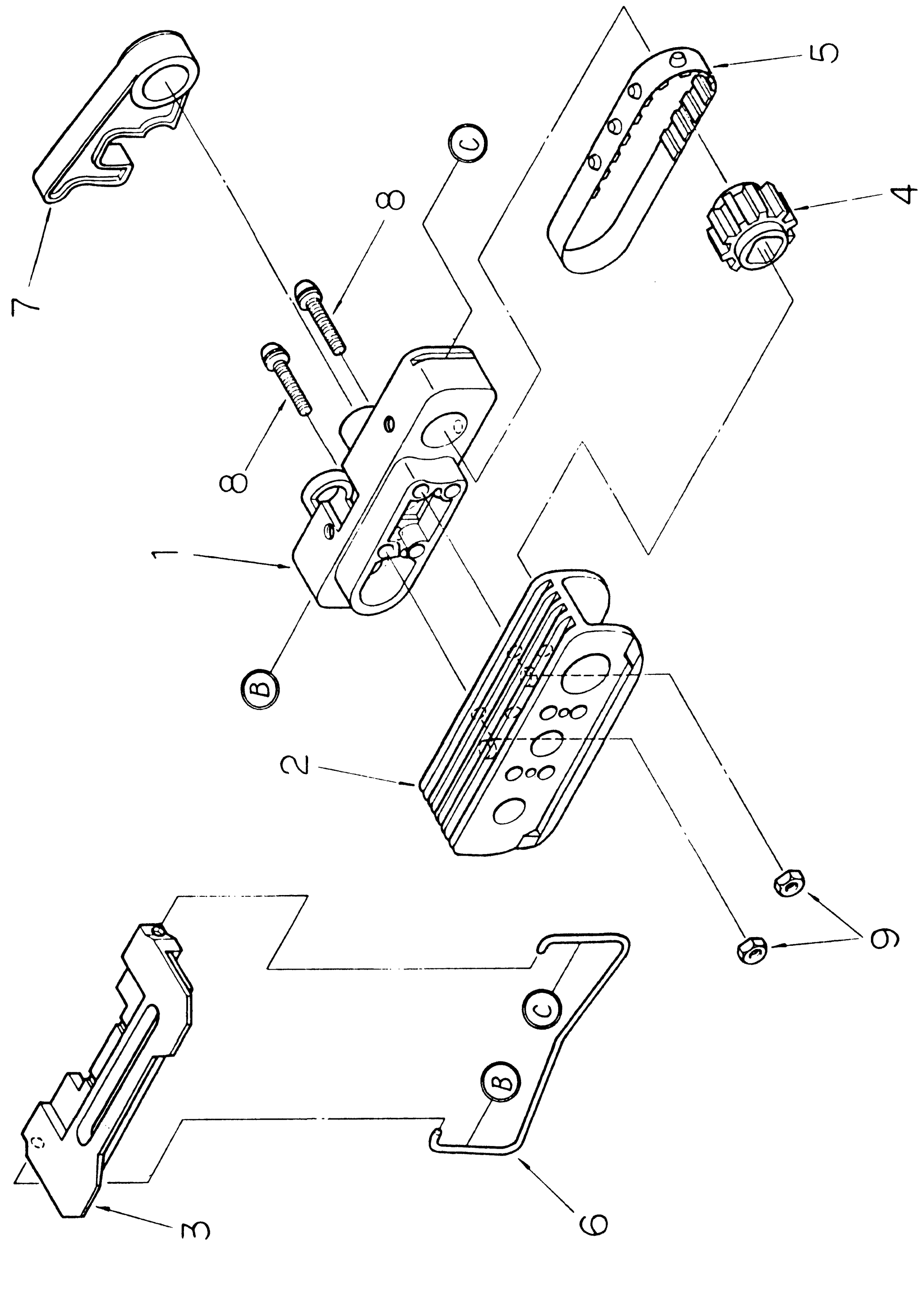


Fig. 8-15 Sprocket Assembly (R) (FMX-35100-2)

Fig. 8-15 Sprocket Assembly (R) (FMX-35100-2)

Item No.	Part No.	Description	Q'ty	Remarks	Compatibility
1	4LR-123484	Sprocket frame (A)	1		80 82 82A 83
2	4LR-123485	Sprocket frame (B)	1		80 82 82A 83
3	5LR-123446	Sprocket cover	1		80 82 82A 83
4	5LR-129894	Sprocket wheel	1		80 82 82A 83
5	4LR-123487	Pin tractor (mold)	1		80 82 82A 83
6	5LR-123453	Pivot spring	1		80 82 82A 83
7	5LR-123458	Lock lever	1		80 82 82A 83
8	⊕ P(SW+W) 3-16-HH	Small pan-head screw	2		
9	$2N_3$-HH	Nut	2		

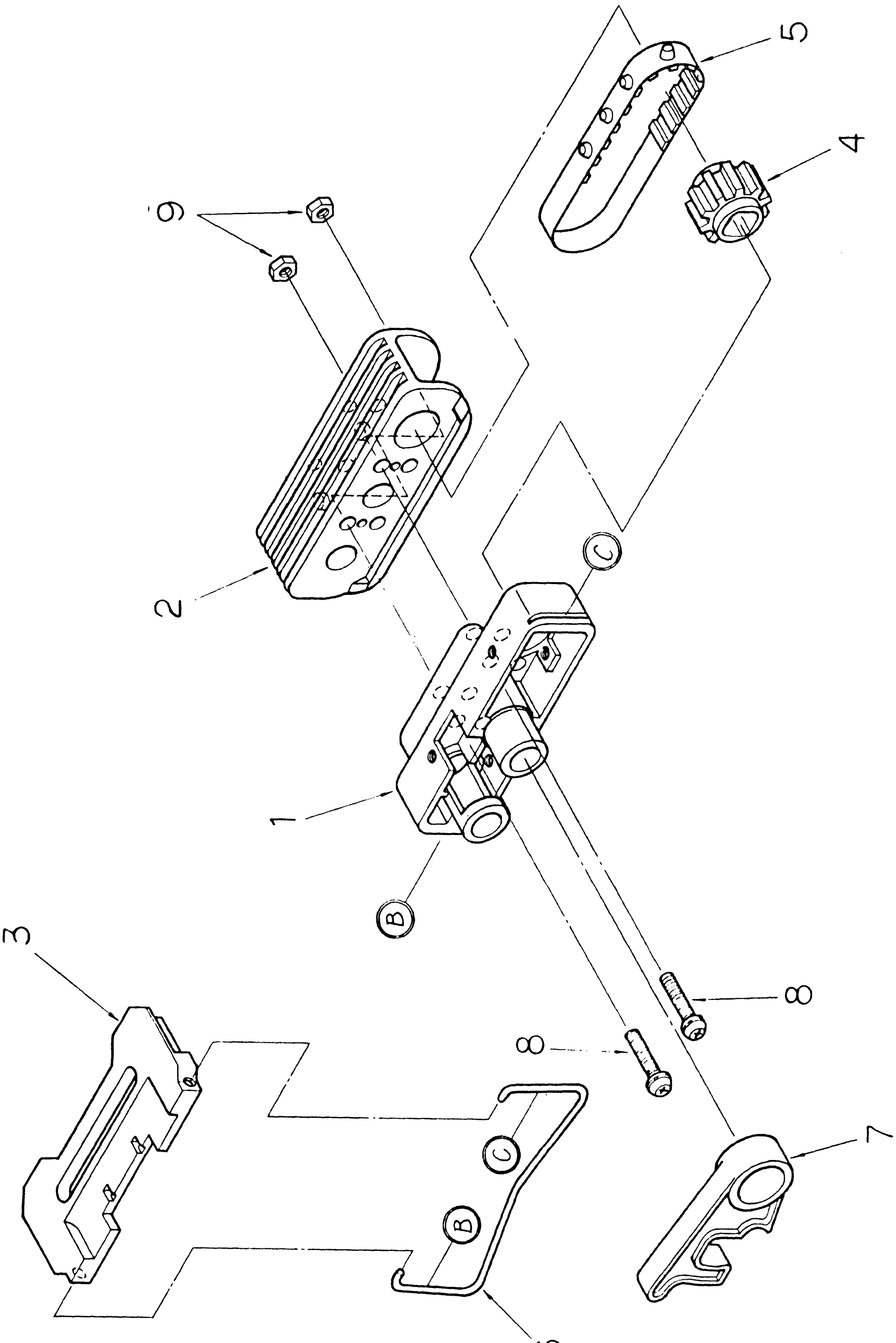


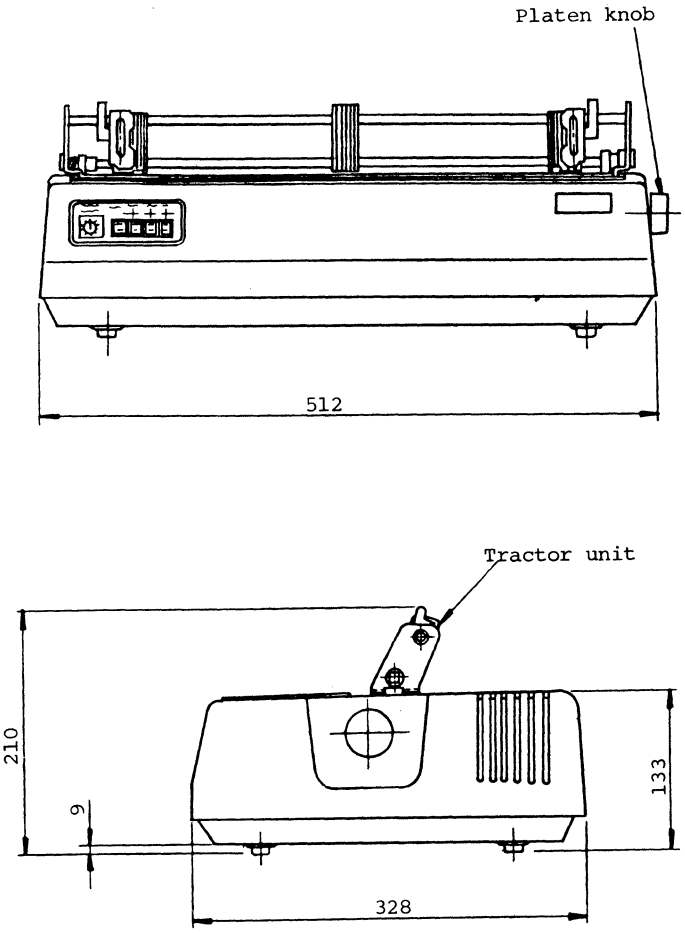
Fig. 8-16 Sprocket Assembly (L) (FMX-35150-2)

Fig. 8-16 Sprocket Assembly (L) (FMX-35150-2)

Item No.	Part No.	Description	Q'ty	Remarks	Compatibility
1	4LR-123484	Sprocket frame (A)	1		80 82 82A 83
2	4LR-123485	Sprocket frame (B)	1		80 82 82A 83
3	5LR-123446	Sprocket cover	1		80 82 82A 83
4	5LR-129894	Sprocket wheel	1		80 82 82A 83
5	4LR-123487	Pin tractor (mold)	1		80 82 82A 83
6	5LR-123453	Pivot spring	1		80 82 82A 83
7	5LR-123458	Lock lever	1		80 82 82A 83
8	⊕ P(SW+W) 3-16-HH	Small pan-head screw	2		
9	$2N_3$-HH	Nut	2		

APPENDICES

Appendix A External Dimensions



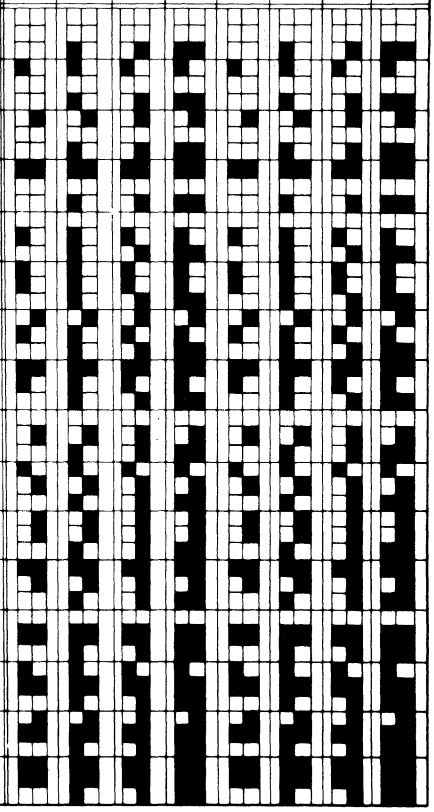
Unit: mm

Fig. A-1 External View

Appendix B Character Set

	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	0	1	1
	b5	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1
b4 b3 b2 b1	R \ C	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0 0 0 0	0			SP	%/0	②	P	⑦	p								
0 0 0 1	1		DC1	!	1	A	Q	a	q								
0 0 1 0	2			"	2	B	R	b	r								
0 0 1 1	3		DC3	①	3	C	S	c	s								
0 1 0 0	4		DC4	$	4	D	T	d	t								
0 1 0 1	5			%	5	E	U	e	u								
0 1 1 0	6			&	6	F	V	f	v								
0 1 1 1	7			'	7	G	W	g	w								
1 0 0 0	8		CAN	(	8	H	X	h	x								
1 0 0 1	9			)	9	I	Y	i	y								
1 0 1 0	A	LF		*	:	J	Z	j	z								
1 0 1 1	B	VT	ESC	+	;	K	③	k	⑧								
1 1 0 0	C	FF		,	<	L	④	l	⑨								
1 1 0 1	D	CR	GS	−	=	M	⑤	m	⑩								
1 1 1 0	E		RS	.	>	N	⑥	n	⑪								
1 1 1 1	F		US	/	?	O	_	o	DEL								

b8 = 0 (columns 0–7); b8 = 1 (columns 8–F)



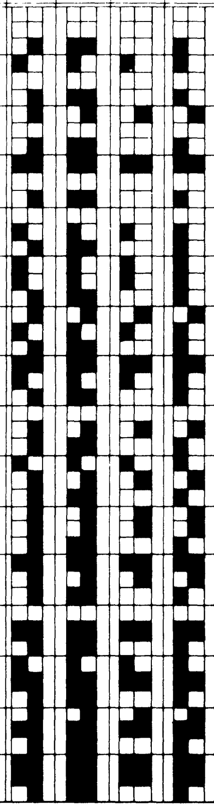
Note: 1) Standard character generator is used.
2) For TRS-80, even when the input code of "DEL" is input, it is processed as a space when printing.
3) Letter face of figure zero is "0̸" for U.S.A., and "0" for the other districts.

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	ê
SWEDISH		É	Ä	Ö	Å	Ü	é	ä	ö	å	ü
DANISH			Æ	Ø	Å	Ü		æ	ø	å	ü
NORWEGIAN			Æ	Ø	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)

Fig. B-1 Character Set (8 Units)

		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	0	1	1
	b5	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1
b4 b3 b2 b1	R \ C	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0 0 0 0	0			SP	0	②	P	⑦	p								
0 0 0 1	1		DC1	!	1	A	Q	a	q		DC1						
0 0 1 0	2			"	2	B	R	b	r								
0 0 1 1	3		DC3	①	3	C	S	c	s		DC3						
0 1 0 0	4		DC4	$	4	D	T	d	t		DC4						
0 1 0 1	5			%	5	E	U	e	u								
0 1 1 0	6			&	6	F	V	f	v								
0 1 1 1	7			'	7	G	W	g	w								
1 0 0 0	8		CAN	(	8	H	X	h	x		CAN						
1 0 0 1	9			)	9	I	Y	i	y								
1 0 1 0	A	LF		*	:	J	Z	j	z	LF							
1 0 1 1	B	VT	ESC	+	;	K	③	k	⑧	VT	ESC						
1 1 0 0	C	FF		,	<	L	④	l	⑨	FF							
1 1 0 1	D	CR	GS	−	=	M	⑤	m	⑩	CR	GS						
1 1 1 0	E	SO	RS		>	N	⑥	n	⑪	SO	RS						
1 1 1 1	F	SI	US	/	?	O	_	o	DEL	SI	US						



Note: 1) Standard character generator is used.
2) For TRS-80, even when the input code of "DEL" is input, it is processed as a space when printing.
3) Letter face of figure zero is "0" for U.S.A., and "0" for the other districts.

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	ê
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)

Fig. B-2 Character Set (European/American 7 bits)

		b8 = 0								b8 = 1							
	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	0	1	1
	b5	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1
b4 b3 b2 b1	R \ C	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0 0 0 0	0			SP								SP					
0 0 0 1	1		DC1								DC1						
0 0 1 0	2																
0 0 1 1	3		DC3								DC3						
0 1 0 0	4		DC4								DC4						
0 1 0 1	5																
0 1 1 0	6																
0 1 1 1	7					Characters								Characters			
1 0 0 0	8		CAN								CAN						
1 0 0 1	9																
1 0 1 0	A	LF								LF							
1 0 1 1	B	VT	ESC							VT	ESC						
1 1 0 0	C	FF								FF							
1 1 0 1	D	CR	GS							CR	GS						
1 1 1 0	E		RS								RS						
1 1 1 1	F		US						DEL		US						DEL

Note: Non-standard character generator is used.

Fig. B-3 Character Set (Optional type 8 bits)

		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	0	1	1
	b5	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1
b4 b3 b2 b1	R \ C	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0 0 0 0	0			SP								SP					
0 0 0 1	1		DC1								DC1						
0 0 1 0	2																
0 0 1 1	3		DC3								DC3						
0 1 0 0	4		DC4								DC4						
0 1 0 1	5																
0 1 1 0	6																
0 1 1 1	7					Characters								Characters			
1 0 0 0	8		CAN								CAN						
1 0 0 1	9																
1 0 1 0	A	LF								LF							
1 0 1 1	B	VT	ESC							VT	ESC						
1 1 0 0	C	FF								FF							
1 1 0 1	D	CR	GS							CR	GS						
1 1 1 0	E	SO	RS							SO	RS						
1 1 1 1	F	SI	US						DEL	SI	US						DEL

Note: Non-standard character generator is used.

Fig. B-4 Character Set (Optional type 7 bits)

Appendix C Local Test Pattern

```
 !"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~▮ !"#$%&'()*+,-./0123456789:;<=>?@ABCDEFG
!"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~▮ !"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGH
"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~▮ !"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHI
#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~▮ !"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJ
$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~▮ !"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJK
%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~▮ !"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKL
&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~▮ !"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLM
'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~▮ !"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMN
()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~▮ !"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNO
)*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~▮ !"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOP
*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~▮ !"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQ
+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~▮ !"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQR
,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~▮ !"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRS
-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~▮ !"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRST
./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~▮ !"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTU
/0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~▮ !"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUV
```

TEST END

Note: 1) This pattern does not concern the character font.

2) This pattern is one made by the printers for U.S.A. The printers for Europe provide different patterns for some characters; see Appendix E for the detailed difference in dot patterns.

Fig. C-1 Local Test Pattern

Appendix D Character Example

```
**********     print example     **********

..... 6 lpi .....

< 10 cpi >
 !"#$%&'()*+,-./Ø123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~▮

< 16.5 cpi >
 !"#$%&'()*+,-./Ø123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~▮

< 5 cpi >
 !"#$%&'()*+,-./Ø123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abc
defghijklmnopqrstuvwxyz{|}~▮

< 8.3 cpi >
 !"#$%&'()*+,-./Ø123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`a
bcdefghijklmnopqrstuvwxyz{|}~▮

..... 8 lpi .....

< 10 cpi >
 !"#$%&'()*+,-./Ø123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~▮

< 16.5 cpi >
 !"#$%&'()*+,-./Ø123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~▮

< 5 cpi >
 !"#$%&'()*+,-./Ø123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abc
defghijklmnopqrstuvwxyz{|}~▮

< 8.3 cpi >
 !"#$%&'()*+,-./Ø123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`a
bcdefghijklmnopqrstuvwxyz{|}~▮
```

Note: 1) This pattern does not concern the character font.

2) This pattern is one made by the printers for U.S.A. The printers for Europe provide different patterns for some characters; see Appendix E for the detailed difference in dot patterns.

Fig. D-1 Character Examples (A)

<US ASCII>

!"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~█

<BRITISH>

!"£$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~█

<GERMAN>

!"#$%&'()*+,-./0123456789:;<=>?§ABCDEFGHIJKLMNOPQRSTUVWXYZÄÖÜ^_`abcdefghijklmnopqrstuvwxyzäöüß█

<FRENCH>

!"£$%&'()*+,-./0123456789:;<=>?àABCDEFGHIJKLMNOPQRSTUVWXYZ°ç§^_`abcdefghijklmnopqrstuvwxyzéùèê█

<SWEDISH>

!"#$%&'()*+,-./0123456789:;<=>?ÉABCDEFGHIJKLMNOPQRSTUVWXYZÄÖÅÜ_éabcdefghijklmnopqrstuvwxyzäöåü█

<DANISH>

!"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZÆØÅÜ_`abcdefghijklmnopqrstuvwxyzæøåü█

<NORWEGIAN>

!"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZÆØÅ^_°abcdefghijklmnopqrstuvwxyzæøå~█

<NETHERLANDISH>

!"£$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[Ĳ]^_`abcdefghijklmnopqrstuvwxyz{ĳ}~█

<ITALIAN>

!"£$%&'()*+,-./0123456789:;<=>?§ABCDEFGHIJKLMNOPQRSTUVWXYZ°çé^_ùabcdefghijklmnopqrstuvwxyzàòèì█

<TRS-80>

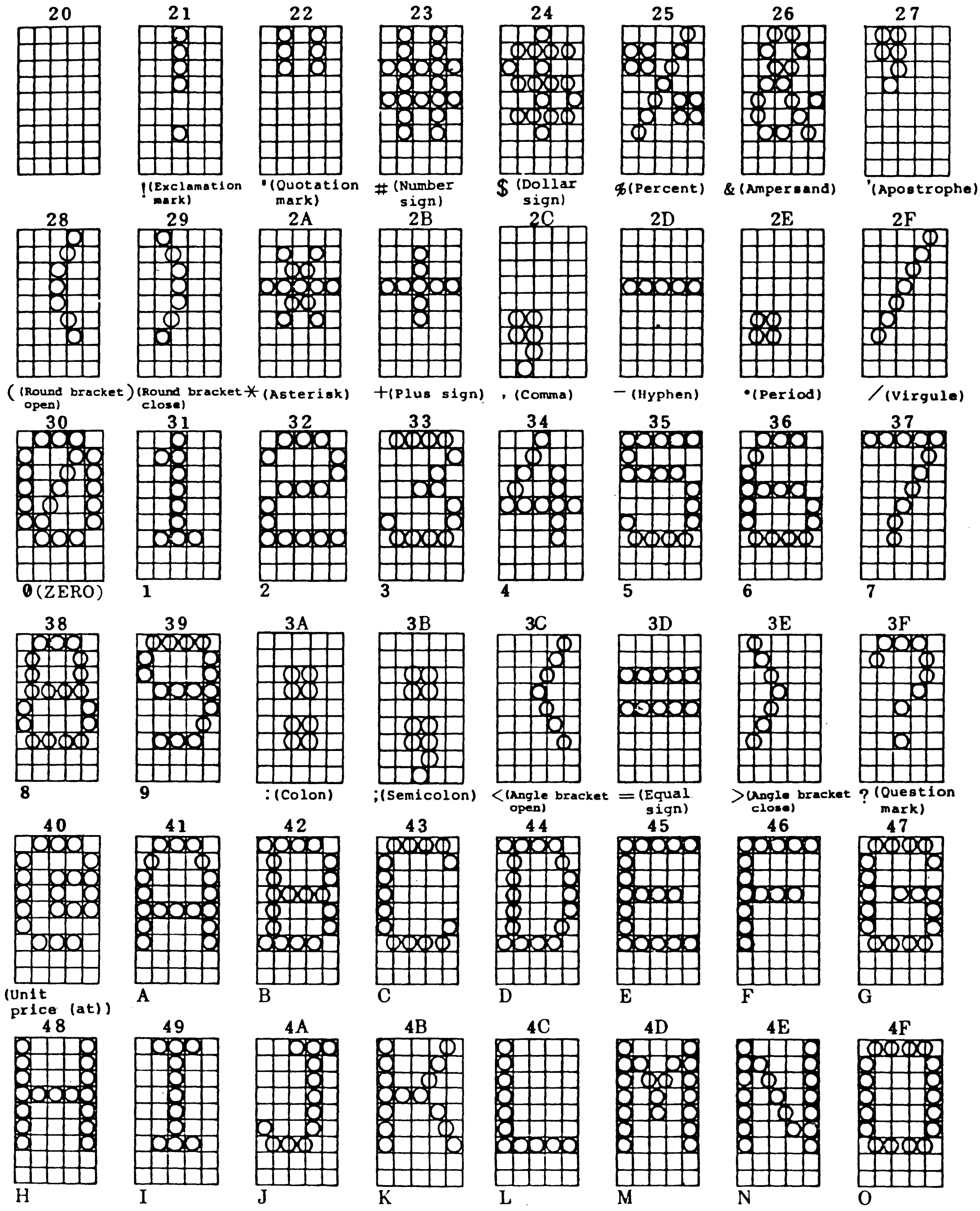
!"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ↑↓←→_`abcdefghijklmnopqrstuvwxyz{|}¯

Note: 1) This pattern does not concern the character font.

2) This pattern is one made by the printers for U.S.A. The printers for Europe provide different patterns for some characters; see Appendix E for the detailed difference in dot patterns.

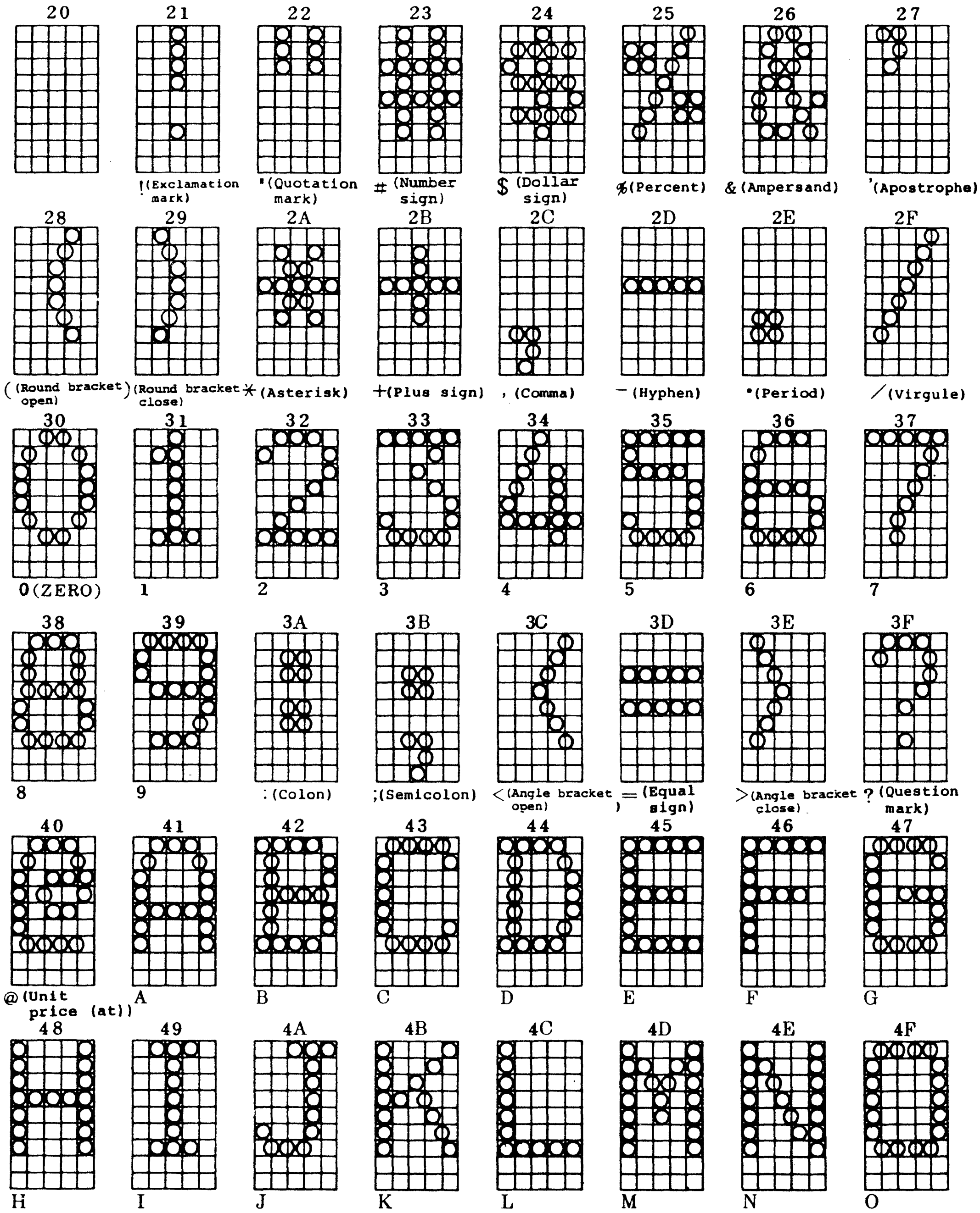
Fig. D-2 Character Examples (B)

Appendix E Dot Pattern



Note: Numbers given above are expressed in hexadecimal.

Fig. E-1 (1/3) ML 83A Dot Pattern (For U.S.A.)



Note: Numbers given above are expressed in hexadecimal.

Fig. E-1 (1/3) ML 83A Dot Pattern
(For the Area Other Than U.S.A.)

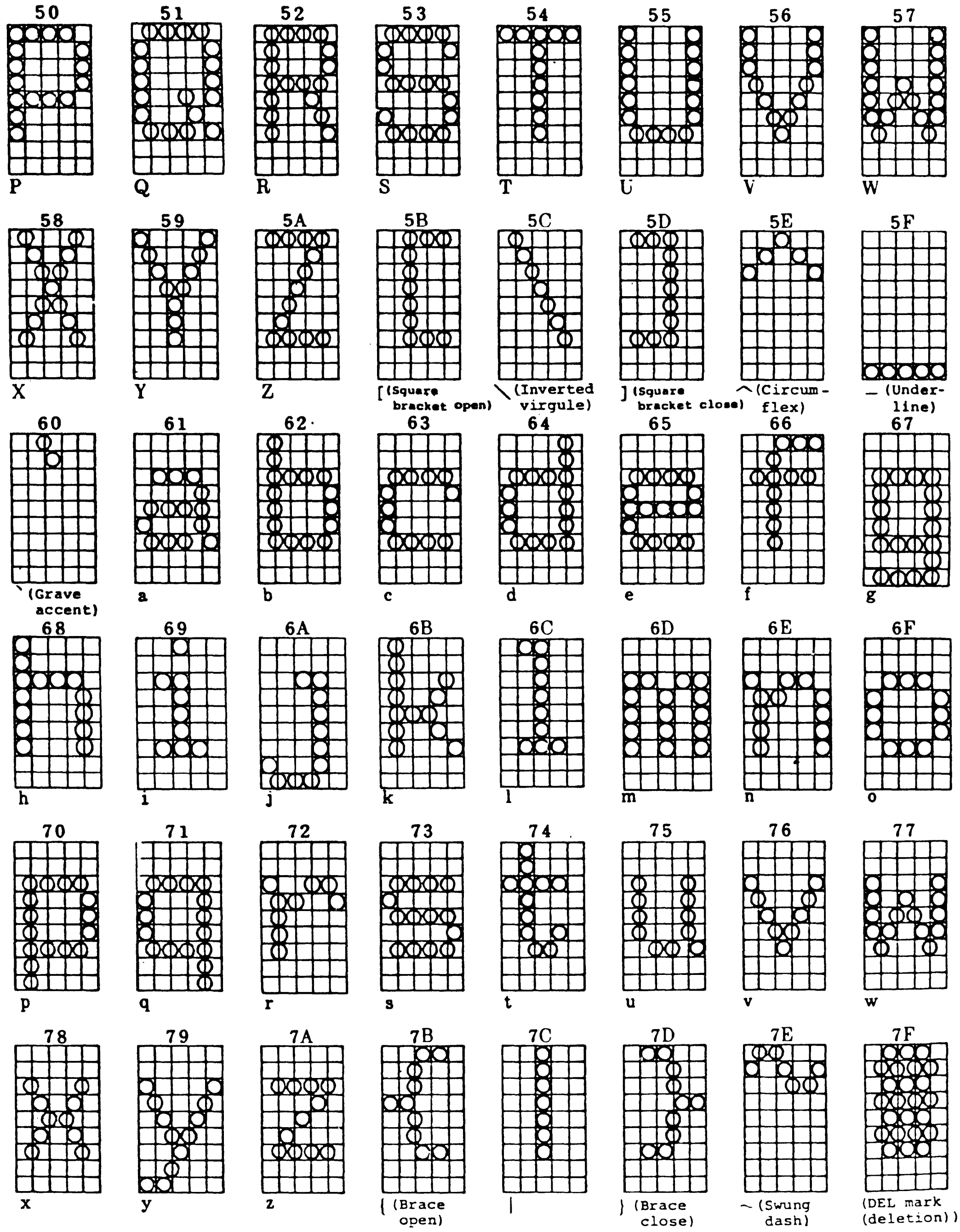


Fig. E-1 (2/3) ML 83A Dot Pattern (For U.S.A.)

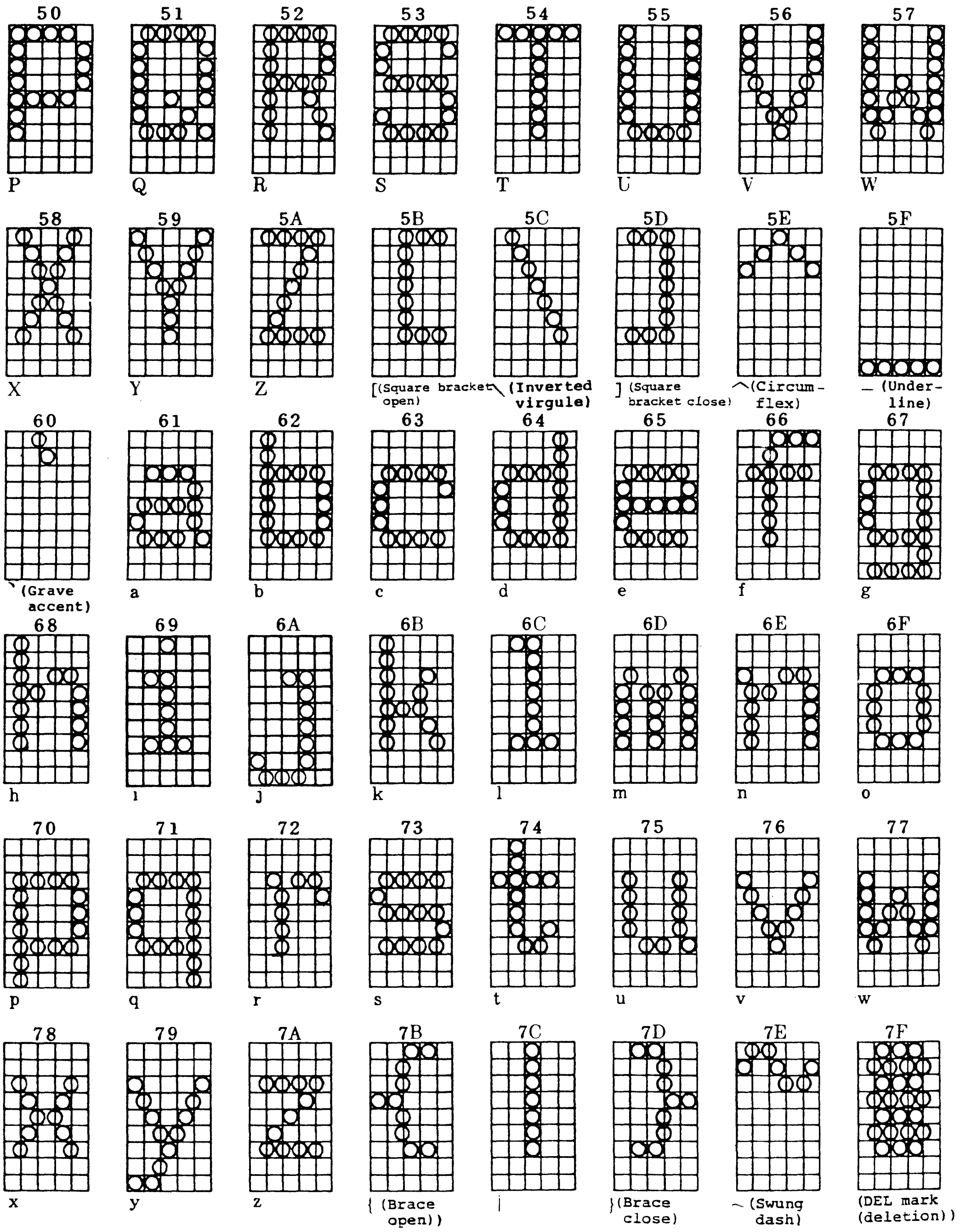
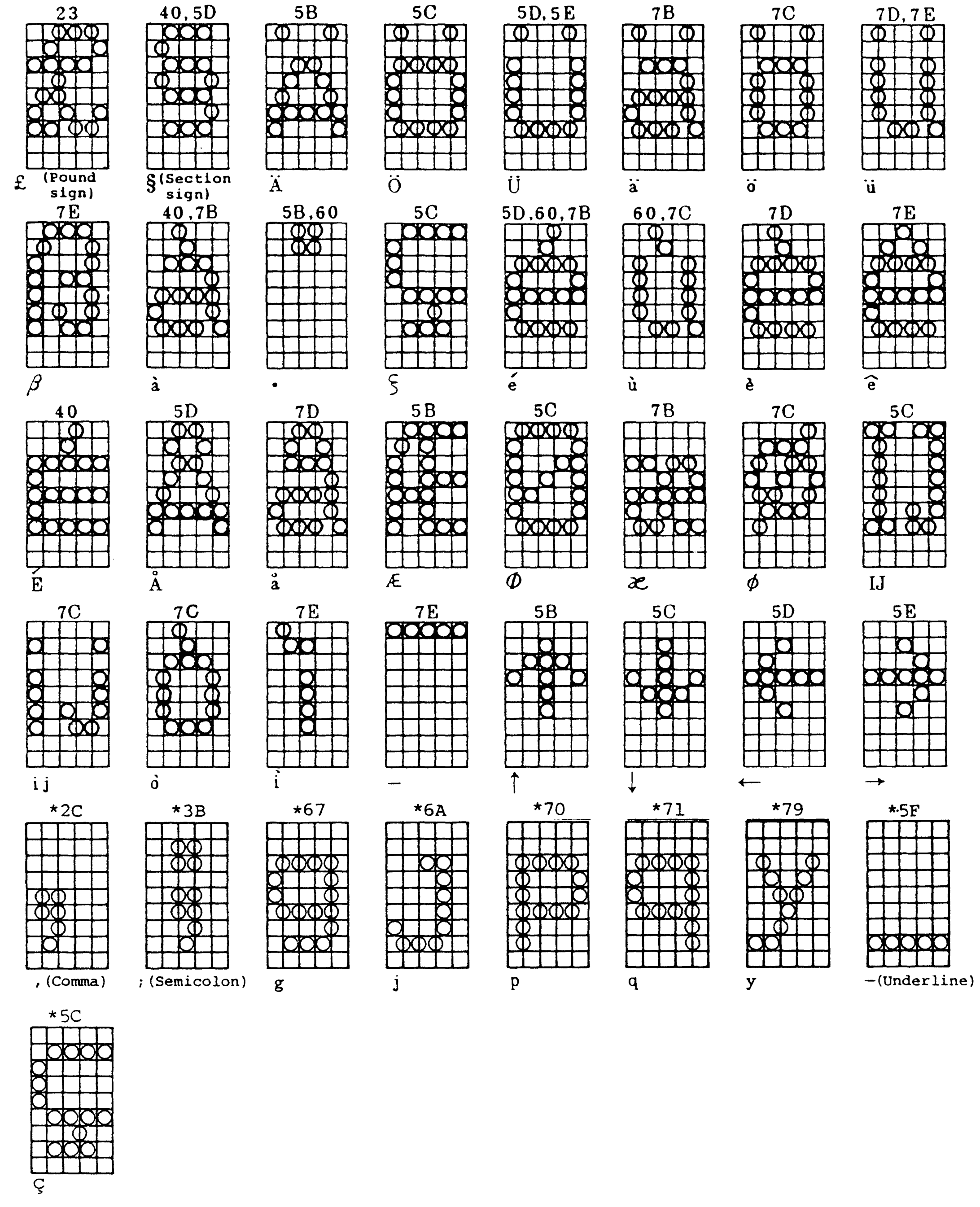


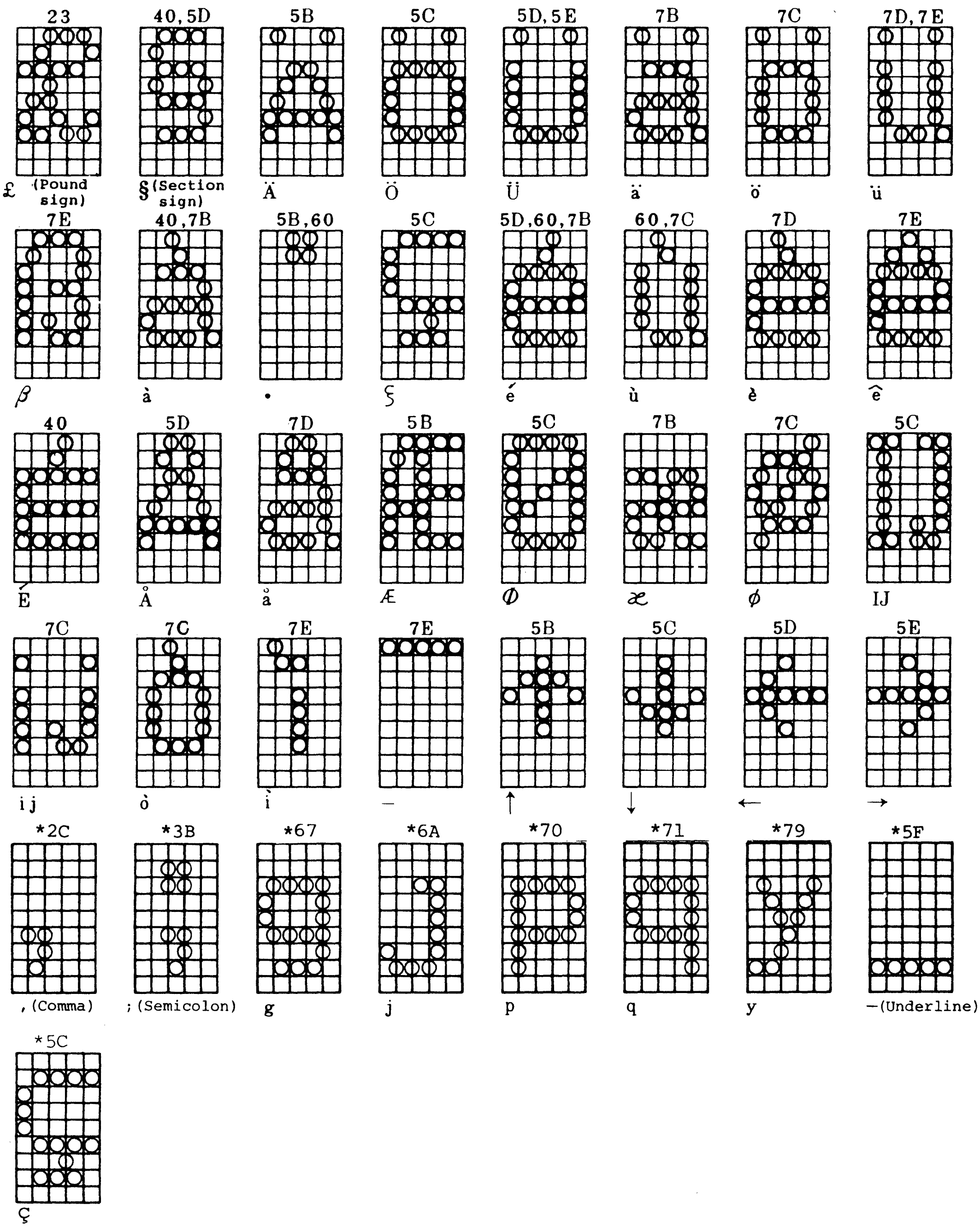
Fig. E-1 (2/3) ML 83A Dot Pattern
(For the Area Other Than U.S.A.)



Note: 1) Numbers given above are expressed in hexadecimal.

2) From *2C to *5F are the 1 dot descender characters.

Fig. E-1 (3/3) ML83A Dot Pattern (For U.S.A.)



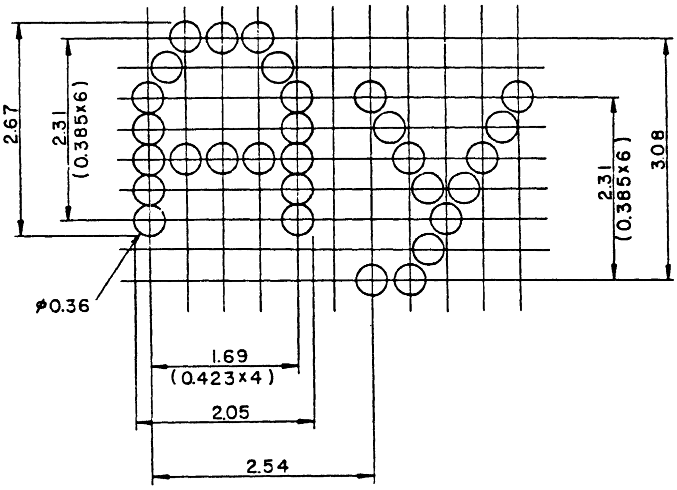
Note: 1) Numbers given above are expressed in hexadecimal.

2) From *2C to *5F are the 1 dot ascender characters.

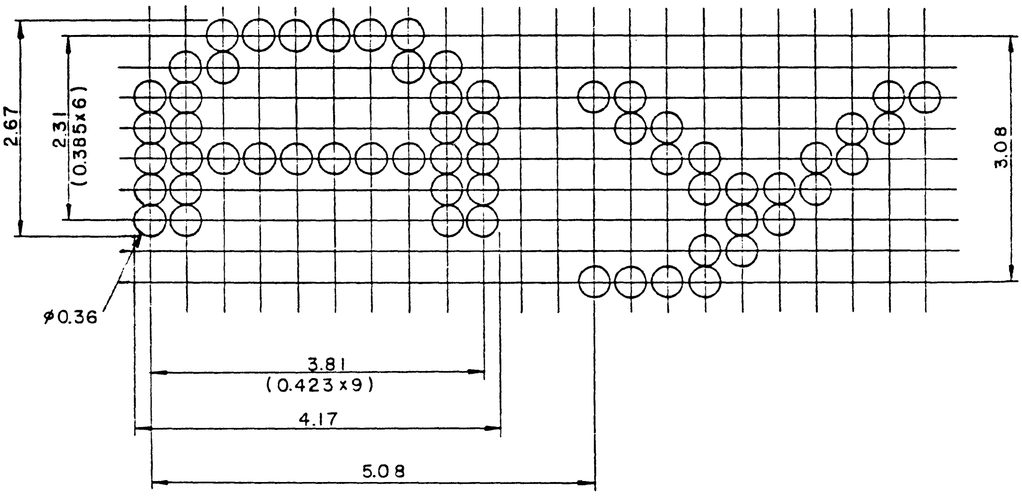
Fig. E-1 (3/3) ML83A Dot Pattern
(For the Area Other Than U.S.A.)

Appendix F Character Dot Dimensions

(1) 10 CPI (9 x 7 dot)



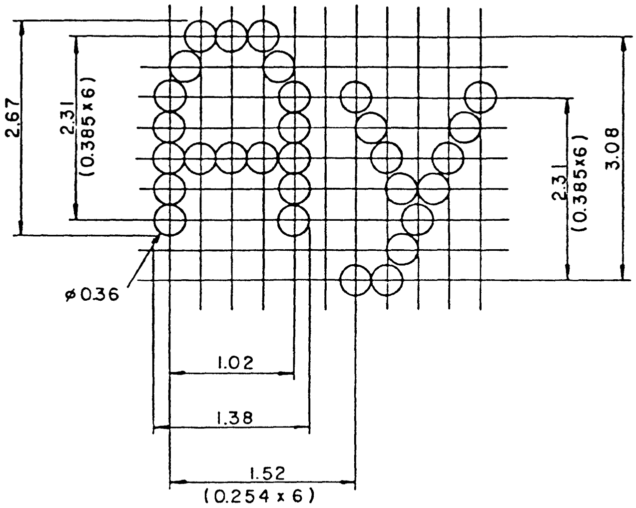
(2) 5 CPI (10 x 7 dot)



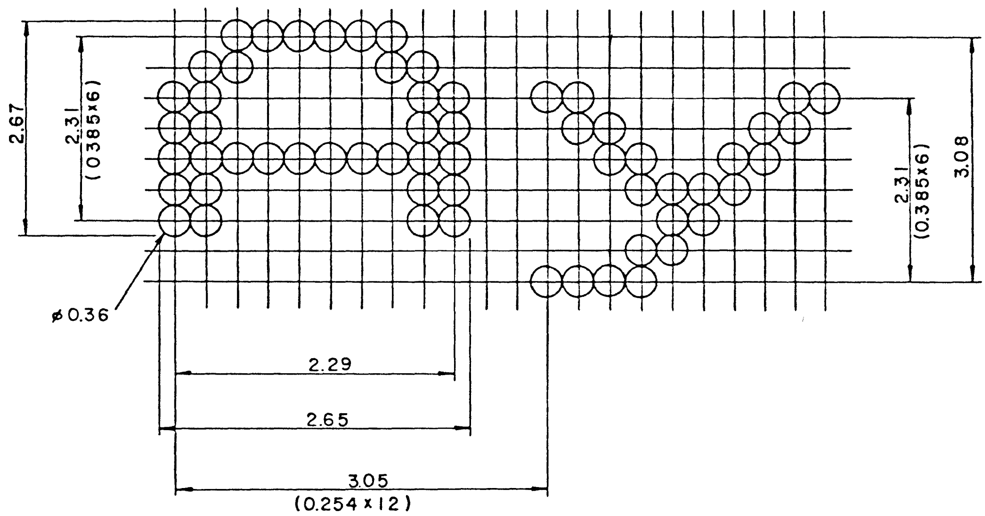
Unit: mm

Fig. F-1 Character Dot Dimensions

(3) 16.5 CPI (9 x 7 dot)



(4) 8.3 CPI (10 x 7 dot)

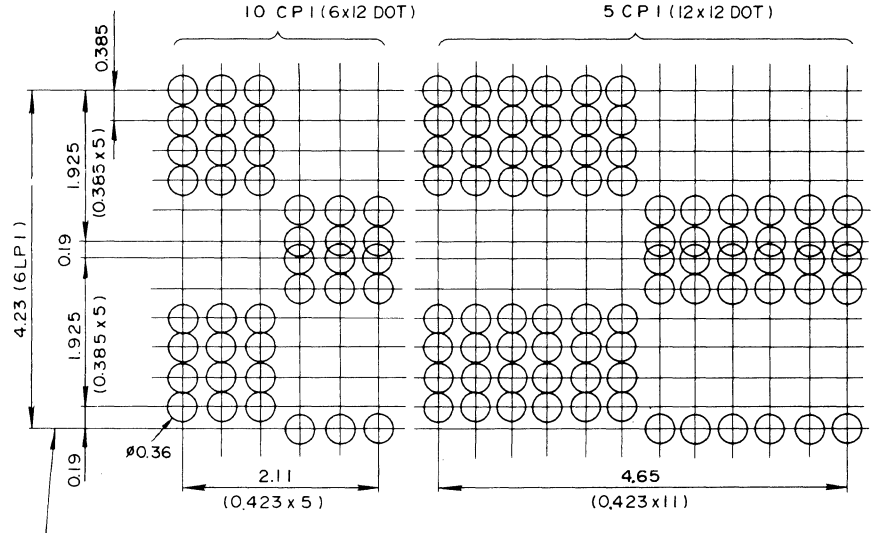


Unit: mm

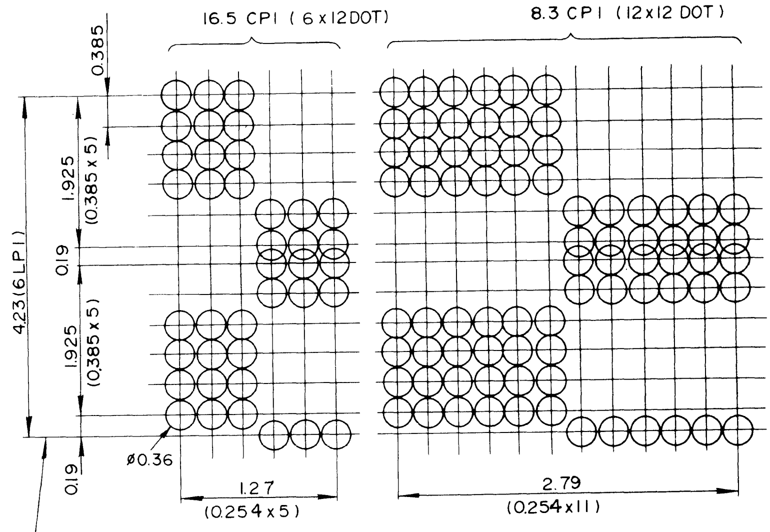
Fig. F-2 Character Dot Dimensions

Appendix G Graphic Dot Dimensions

(1) 6LPI line change



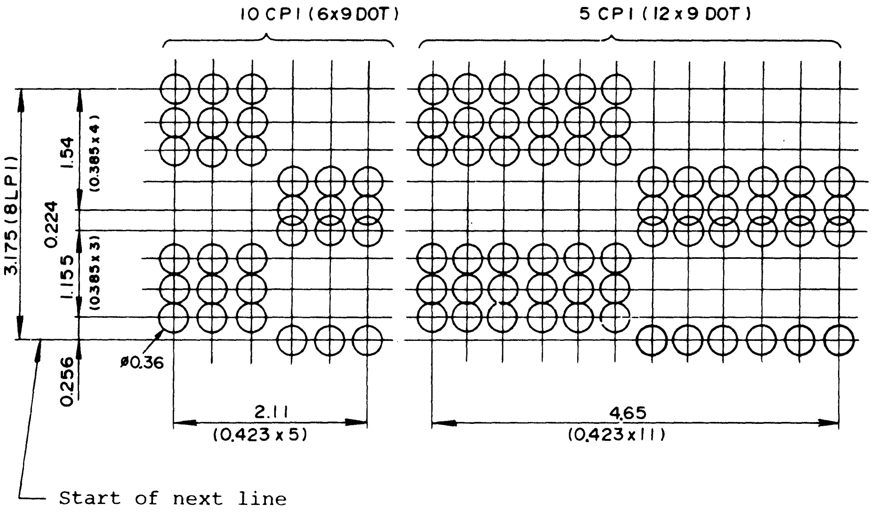
Start of next line



Start of next line

Fig. G-1 Graphic Dot Dimensions

(2) 8 LPI line change



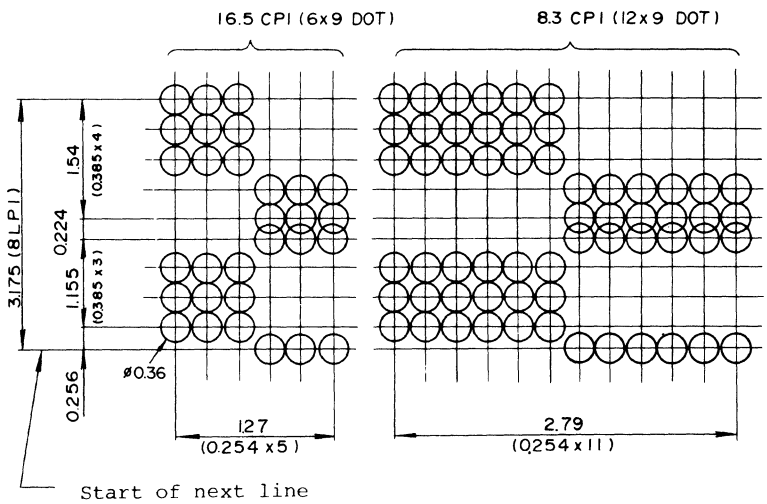
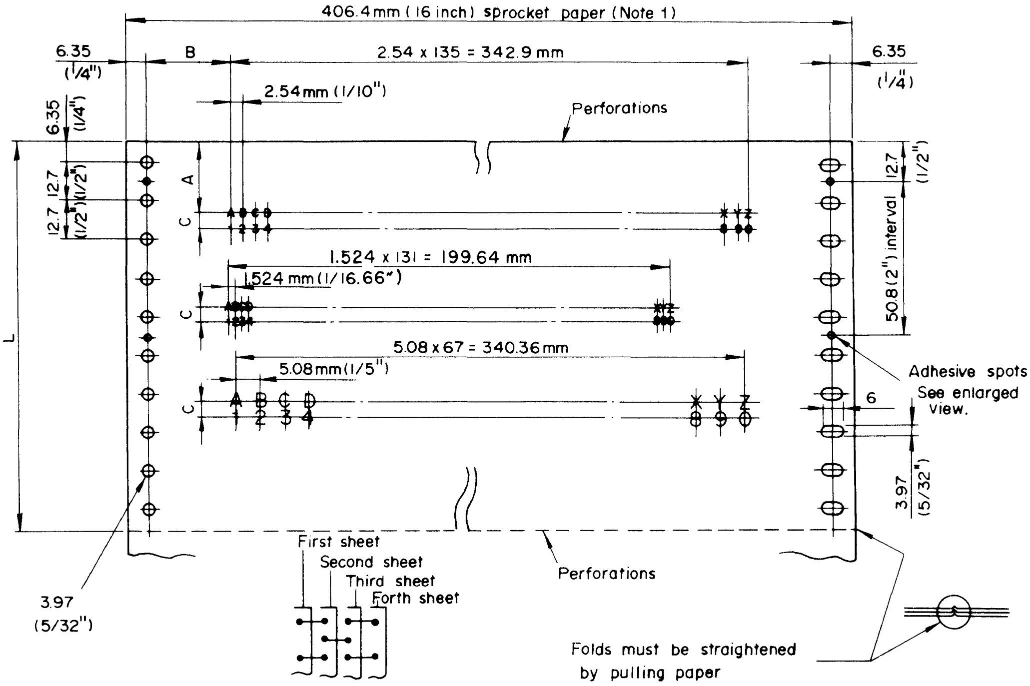


Fig. G-2 Graphic Dot Dimensions

Appendix H Printing Format



Enlarged view of adhesive spots

Unit: mm

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

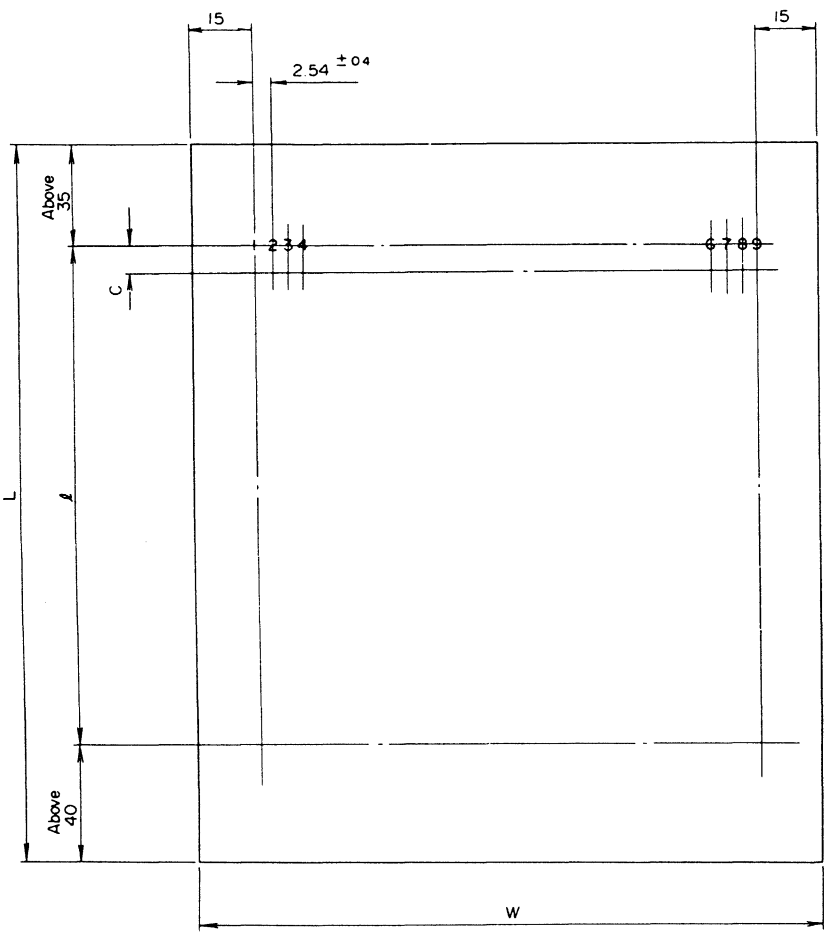
   b) Multiple-part paper
      - Carbon-lined paper and pressure-sensitive paper with ream of 30 to 34 kg (35 to 40 g/m^2) can be used for up to 4 sheets, including the original. With fixedpin platen, up to 3 sheets can be used.
      - Interleaf paper less than 45 kg (52 g/m^2) per ream can be used for up to 3 sheets, including the original.
      - Interleaf paper with ream of 30 kg (35 g/m^2) 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 is 0.28 mm or less.

7) Right margin sprocket holes may be horizontally oval.

Fig. H-1 Printing Format (Sprocket Paper)



Unit: mm

Note:

1) Standard paper size: A4 (210 x 297 mm)

2) Paper width: 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/m^2)

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.

Fig. H-2 Printing Format (Single Sheet)

SINCE 1881

SINCE 1881

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Printed in United States November 1982, GRADAT 822482