OKI

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ISSUE 3

MICROLINE 80 MATRIX PRINTER

Maintenance Manual

M-520059
ISSUE 3C

MICROLINE 80 MATRIX PRINTER

Maintenance Manual

CONTENTS

The contents of this manual are subject to change without notice.

1. INTRODUCTION

This maintenance manual is prepared for the maintenance personnel in the field, describing the Microline 80 as to its specifications, operating theory, and maintenance and inspection procedures.

The manual consists of the following chapters.

1. Introduction
2. Specifications
3. Installation and Operation Procedures
4. Theory of Operation
5. Maintenance
6. Circuit Diagrams
7. Table of Component Parts

1.1 General

The Microline 80 is a desk top, serial impact dot matrix, receive only printer. The design is particularly suited to personal computer applications. The Microline 80 utilizes an ultramini 7-wire print head and microprocessor controlled circuitry.

The Microline 80 will accept standard paper rolls, fan-fold forms, or standard typewriter paper. Up to 3-part forms may be used.

The Microline 80 accepts ASCII code (or JIS code or Alphabet 1 code or Alphabet 2 code), which is stored in a line buffer. Printing is accomplished while moving the 7-wire print head from left to right, the carriage is then returned and paper is fed one line (via hardware or software line feed).

The number of characters per line is selectable by program coding.

Some advantages of the Microline 80 are:

- Compact
- Lightweight
- Quiet
- Low power requirements
- Minimum maintenance
- Graphics capability
- Expanded character capability

1.2 Construction

(1) Standard construction

Standard construction consists of the printer and paper roll stand. The printer contains a print mechanism, electronics, and cabinet. The cabinet is a three piece assembly consisting of an aluminum base, plastic cover, and a clear lid.

The print mechanism has a fixed sprocket platen with pins spaced 9 inches apart or 9.5 inches apart. A block diagram of the printer is shown in Fig. 1-1.

(2) Optional construction

The variable tractor unit can be installed on the printer in the field.

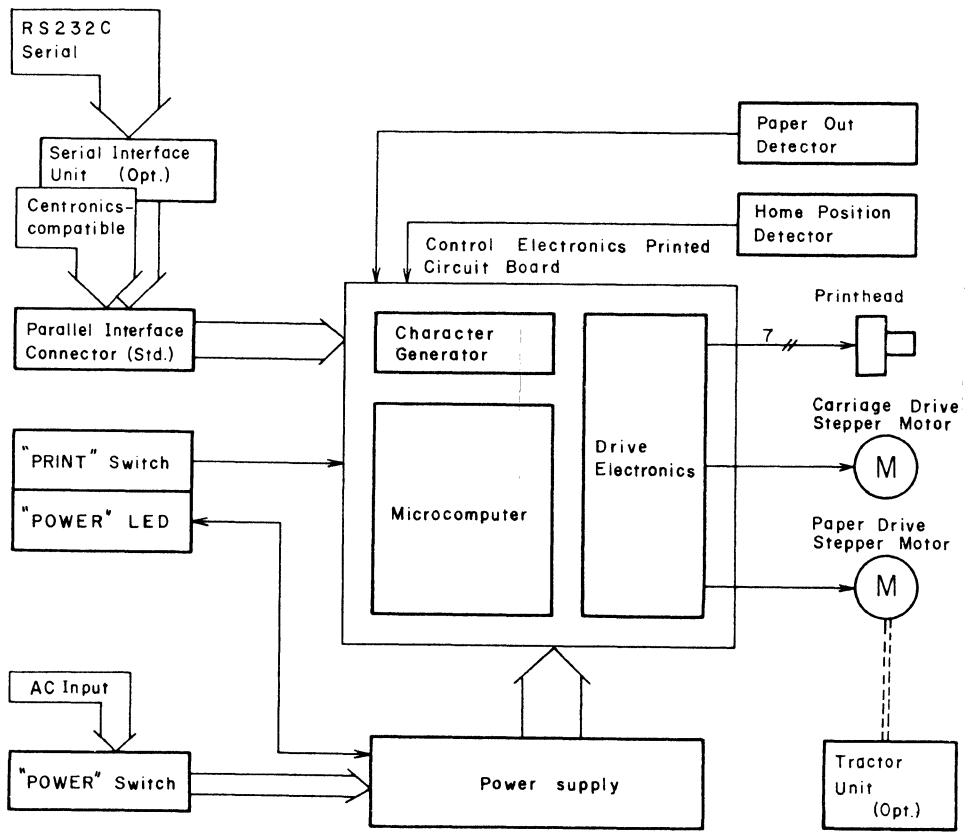


Fig. 1-1 Block Diagram

2. SPECIFICATIONS

2.1 General

This chapter provides the specifications of the Microline 80 as follows:

2.2 Printer Specifications

2.3 Interface Specifications

2.2 Printer Specifications

The specifications of the printer are shown in Table 2-1.

Table 2-1

Item	Description
Printing system	Impact dot matrix system
Printing speed	80 characters/sec (10 characters/inch or 16.5 characters/inch) 40 characters/sec (5 characters/inch)
Data input system	Parallel system (8 bits)
Data input code	ASCII or JIS (Japanese Industrial Standard) (See Table 2-2.), or various languages (optional)
Character composition	Characters: 9 x 7 dots Graphic: 6 x 12 dots
Character-to-character spacing	1/5 inch 1/10 inch 1/16.5 inch Selectable
Maximum number of characters per line	(1) 80 characters per line (10 characters per inch) 40 characters per line (5 characters per inch) 132 characters per line (16.5 characters per inch) (2) 64 characters per line (10 characters per inch) 32 characters per line (5 characters per inch) 105 characters per line (16.5 characters per inch) (1) or (2) selectable as desired.
Line spacing	1/6 inch 1/8 inch Selectable
Kinds of characters (See Table 2-2.)	Alphanumeric characters and symbols: 64 Lower-case English letters and symbols: 31 Kana and symbols: 64 Graphic: 64

Item	Description
Paper feed	Friction feed, and fixed sprocket feed with pins spaced 9 inches apart; Optional pin tractor unit with pins spaced 2.5 to 9 inches apart is also available.
Paper cut knife	Cuts paper 11/12 inch from printed position. (Unusable if pin tractor unit is installed)
Column indicator	Indicator with 1/10-inch scale provided
Paper empty	Paper empty is detected at a point 2 inches from printed position, followed by printing stoppage.
Paper near end	Only when roll paper is used, paper near end is detected as roll diameter decreases to 40 mm, and printing is stopped.
Paper	Paper width Roll paper: 208 to 216 mm Sprocket paper: 9.5 inches (When pin tractor unit is used, paper 3 to 9.5 inches wide may be used.) Paper thickness No. copies necessary: Paper of 45 to 55 kg Copies necessary: Interleaf paper, carbon-lined paper, no-carbon paper of less than 45 kg; up to 3 copies, including original; overall thickness less than 0.28 mm Note: How to set sheets of copying paper squarely: Use adhesive spots or paper staples at both sides. When using adhesive spots, be sure of uniformity and no serious wrinkles. (Sprocket paper)
Inked ribbon	Genuine OKI inked ribbons are recommended. In case of using other inked ribbons, the following specifications must be satisfied. Spool: 2-inch standard spool (Underwood type) Ribbon length: 11.5 m maximum Ribbon width: 1/2 inch Ribbon thickness: 0.1 mm maximum Cloth: Nylon (40 x 40 denier) Color of ink: Single color Eyelets: With reversing eyelets (More than 1 mm thick) Ink viscosity: Low viscosity (500CP at 25°C)

Table 2-1 (Cont.)

Item	Description			
Functions	Symbol	Control Code		Function
		Decimal	Hexa-decimal	
	CR	13	OD	Starts printing. returns carriage, or returns carriage and moves paper up one line.
	LF	10	OA	Starts printing, returns carriage and moves paper up one line.
	GS	29	1D	Prints 16.5 characters per inch.
	RS	30	1E	Prints 10 characters per inch.
	US	31	1F	Prints 5 characters per inch.
	ESC-6	27.54	1B.36	Paper is moved up at line spacing of 6 lines per inch.
	ESC.8	27.56	1B.38	Paper is moved up at line spacing of 8 lines per inch.
	ESC.A	27.65	1B.41	No. of characters per line is changed to 80.
	ESC.B	27.66	1B.42	No. of characters per line is changed to 64.
Control switches	Power switch (Lock type) Print switch (Lock type)			
Indicator	Power lamp			
Limit switches	Paper empty switch Paper near end switch (when roll paper is used)			
Interface connectors	Plug: AMPHENOL 57-30360 Receptacle: AMPHENOL 57-40360-12 (See Fig. 2-1.) See 2.3 for description of functions.			

Item	Description
Ambient temperature	During operation: 5°C to 40°C During non-operation: -10°C to +43°C During storage: -40°C to +70°C (in packaged condition)
Humidity	During operation: 20% to 90% RH During non-operation: 5% to 95% RH
Vibration	During operation: Less than 0.3 G (10 HZ) During non-operation: Less than 3 G (shock)
Noise	65 dB maximum as measured 1 meter from front of printer during operation (This applies where all the 80 digits of characters are continuously printed on a single sheet of sprocket paper, and maximum noise level measured in the A-range FAST.)
Current	Single-phase a.c. 100 V ±10% or 115 V ±10%, (50/60 Hz); or 220 V ±10%, or 240V ±10% (50/60 Hz), whichever is specified.
Power consumption	During printing: Approx. 80 VA During standby: Approx. 20 VA
Weight and dimensions	Weight: Approx. 6.5 kg (with roll paper holder, but without roll paper) Dimensions: 342 (W) x 245 (D) x 108 (H) mm (without roll paper holder) (See Fig. 2-2).

Pin No.	Signal	Pin No.	Signal
1	$\overline{\text{DATA STROBE}}$	19	OV
2	DATA BIT 1	20	OV
3	DATA BIT 2	21	OV
4	DATA BIT 3	22	OV
5	DATA BIT 4	23	OV
6	DATA BIT 5	24	OV
7	DATA BIT 6	25	OV
8	DATA BIT 7	26	OV
9	DATA BIT 8	27	OV
10	$\overline{\text{ACKNOWLEDGE}}$	28	OV
11	BUSY	29	OV
12	PAPER END	30	OV
13	SELECT	31	$\overline{\text{INPUT PRIME}}$
14	OV	32	$\overline{\text{FAULT}}$
15	Blank	33	OV
16	OV	34	10 V d.c.
17	CHASSIS GROUND	35	Blank
18	+5 V	36	23 V a.c.

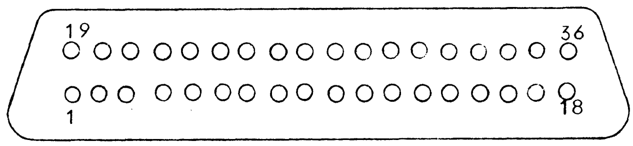


Fig. 2-1 Connector Connection Diagram

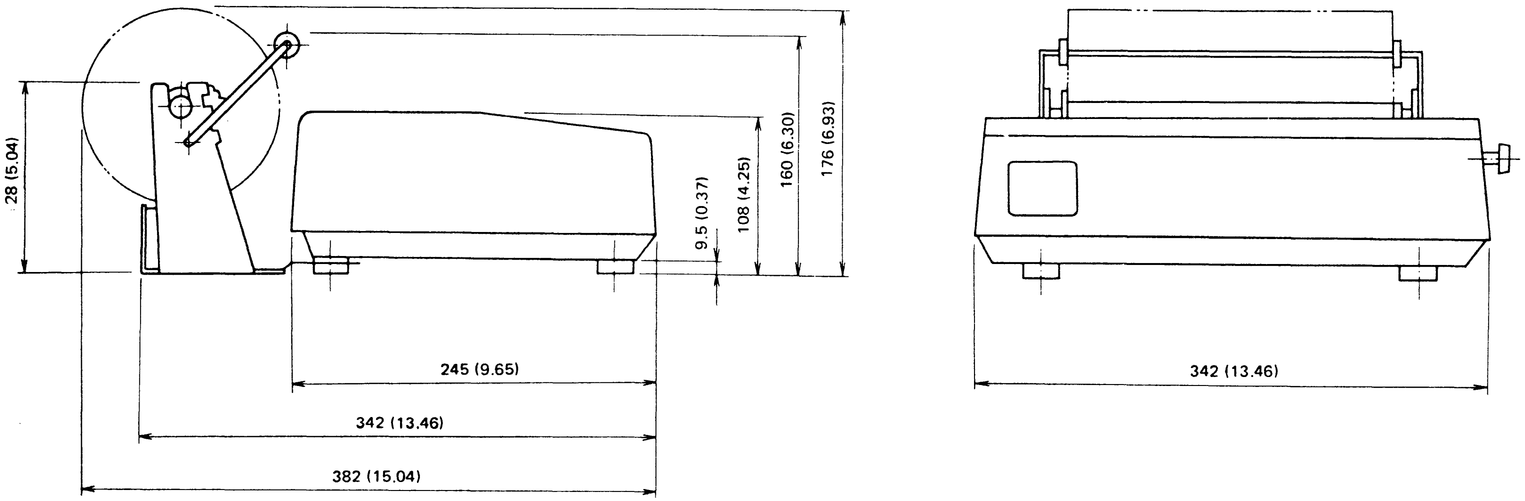
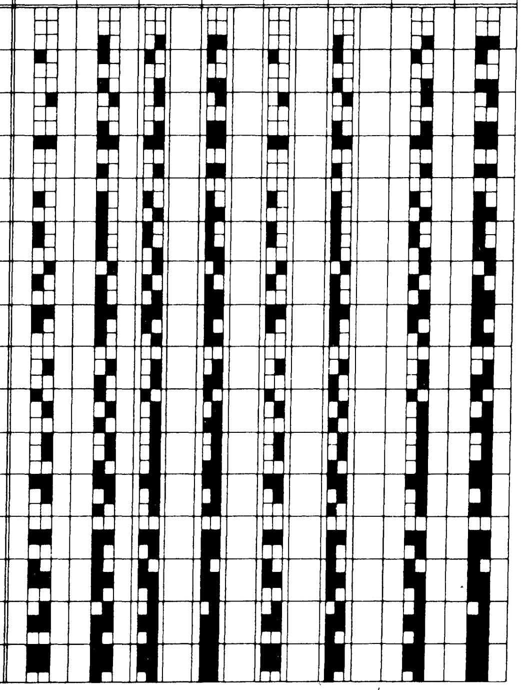


Fig. 2-2 External View In mm (In inches)

Table 2-2 Code Table

b8 b7 b6 b5		0000	0001	0010	0011	0100	0101	0110	0111	1000	1001	1010	1011	1100	1101	1110	1111
b4 b3 b2 b1	R \ C	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0000	0			SP	Ø	@	P	`	p								
0001	1			!	1	(65) A	Q	a	q								
0010	2			"	2	(66) B	R	b	r								
0011	3			#	3	C	S	c	s								
0100	4			$	4	D	T	d	t								
0101	5			%	5	E	U	e	u								
0110	6			&	(54) 6	F	V	f	v								
0111	7			'	7	G	W	g	w								
1000	8			(	(56) 8	H	X	h	x								
1001	9			)	9	I	Y	i	y								
1010	A	(10) LF		*	:	J	Z	j	z								
1011	B		(27) ESC	+	;	K	↑	k	{								
1100	C			,	<	L	↓	l	|								
1101	D	(13) CR	(29) GS	—	=	M	←	m	}								
1110	E		(30) RS	.	>	N	→	n	—								
1111	F		(31) US	/	?	O	—	o									



Note: 1) Figures in parentheses are decimals.

2) C=0, C=1 columns: Other functions than listed below are disregarded.

C/R=7/F: Space only

Shift S1 to Side A, and S3 to Side A (left column) (ASC11)

Shift S1 to Side A, and S3 to Side B (right column) (JIS)

See 5.8.2.

Function

LF:	Print and Line Feed
CR:	Print and Carriage Return
GS:	16.5 C/I Print
RS:	10 C/I Print
US:	5 C/I Print
ESC 6:	6 L/I Line Feed
ESC 8:	8 L/I Line Feed
ESC A:	Long Line Length
ESC B:	Short Line Length

Graphic DOMAIN (Bit allocation)

b1	b2
b3	b4
b5	b6

Special Symbols

Symbol	C/R	Description
"	2/2	Quotation mark
'	2/7	Apostrophe
,	2/C	Comma
-	2/D	Negative, hyphen
.	2/E	Period
_	5/F	Underline
`	6/0	Accent grave
‾	7/E	Overline
o	A/1	Period
,	A/4	Comma
.	A/5	Center point
-	B/0	Long sound
"	D/E	Voiced sound mark
.	D/F	Semi-voiced sound mark

2.3 Interface Specifications

2.3.1 Connection to Input Connectors

Applicable connectors

Printer end: AMPHENOL 57-40360-12

Cable end: AMPHENOL 57-30360

Or AMP 552274-1 (Plug)

AMP 552073-1 (Cover)

2.3.2 Kinds of Signals

The printer's input and output signals are shown in Table 2-3.

Table 2-3

Signal	Pin No.	Source	Description
$\overline{\text{DATA STROBE}}$	1	Input device	Samples data from input device.
DATA BIT 1	2	Input device	Indicates input data.
DATA BIT 2	3	Input device	Indicates "1" at high leve.
DATA BIT 3	4	Input device	"0" at low level.
DATA BIT 4	5	Input device	
DATA BIT 5	6	Input device	
DATA BIT 6	7	Input device	
DATA BIT 7	8	Input device	
DATA BIT 8	9	Input device	
$\overline{\text{ACKNOWLEDGE}}$	10	Printer	Indicates character input completion, or function operation end.
BUSY	11	Printer	Indicates data cannot be received.
PAPER END	12	Printer	Indicates paper has run out, or print switch is at OFF.
SELECT	13	Printer	This signal goes high when PRINT switch is at ON.
0 V	14, 16, 33	Printer	Signal ground
CHASSIS GROUND	17	Printer	Frame ground
+5 V	18	Printer	+5 V supply (max. 50 mA)
0 V	19 to 30		Twisted pair return

Signal	Pin No.	Source	Description
$\overline{\text{INPUT PRIME}}$	31	Input device	Controller is initialized when this signal goes low. (Pulse width: More than 0.5 ms)
$\overline{\text{FAULT}}$	32	Printer	When paper comes to its end, this signal goes low.
+10 V	34	Printer	Max. 0.15 A is on the pin.
+23 V AC	36	Printer	23 V half sine wave (max. 0.05 A) power is on the pin.

Pin No.	Signal	Pin No.	Signal
1	$\overline{\text{DATA STROBE}}$	19	GND
2	DATA BIT 1	20	GND
3	DATA BIT 2	21	GND
4	DATA BIT 3	22	GND
5	DATA BIT 4	23	GND
6	DATA BIT 5	24	GND
7	DATA BIT 6	25	GND
8	DATA BIT 7	26	GND
9	DATA BIT 8	27	GND
10	$\overline{\text{ACKNOWLEDGE}}$	28	GND
11	BUSY	29	GND
12	PAPER OUT OR LOW	30	GND
13	SELECT	31	$\overline{\text{INPUT PRIME}}$
14	GND	32	$\overline{\text{FAULT}}$
15	BLANK	33	GND
16	GND	34	10 V d.c.
17	CHASSIS GROUND	35	N.C.
18	+5 V	36	23 V a.c.

CN6 I/O Connector (Rear view)

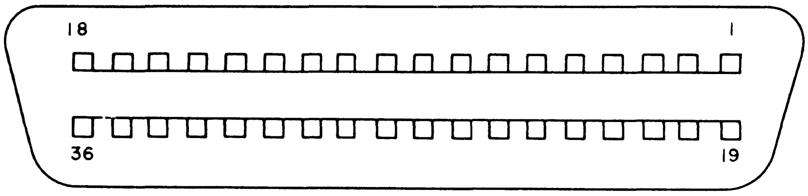


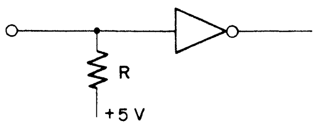
Fig. 2-3 Parallel Connector

2.3.3 Interface Levels

Low: 0.0 to 0.8 V
High: +2.4 to 5.0 V

2.3.4 Interface Circuits

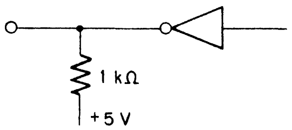
(1) RECEIVER



R = 1 kΩ (Data lines , $\overline{\text{INPUT PRIME}}$)

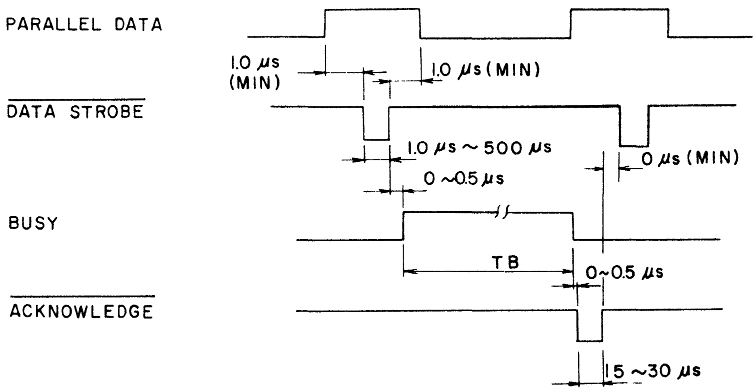
R = 470Ω (Data strobe line)

(2) DRIVER



(Open collector)

2.3.5 Interface Time Chart



Note: Tb: Character code: 300 to 500 µS
CR code: Printing and CR/LF
LF code: Printing and CR/LF

3. INSTALLATION AND OPERATION PROCEDURES

3.1 General

This chapter explains the process from installation to operation start in the following sections.

3.2 Preparations for Printer Operation

3.3 Paper Loading Procedure

3.4 Inked Ribbon Loading Procedure

3.5 External Operating Switches and Knobs

3.6 Print Control Procedure

3.7 Handling Precautions

3.2 Preparations for Printer Operation

(1) In case of using roll paper, place the paper roll holder as shown in Fig. 3-1.

1) Insert the rear feet of the printer in the holes of the paper roll holder.

2) Plug the holder's connector plug into the receptacle on the right rear of the printer.

NOTE:
Do not use the paper roll holder when not using roll paper.

(2) In case of using the variable tractor unit, install the tractor unit. (See Fig. 3-2.)

1) On the R.H. Side of the platen is the paper lock release lever, tilt the lever forward (Released position).

2) Hold the tractor side plates with both hands and insert the rear grooves of the tractor side plates onto the knife shaft of the printer mechanism.

3) Pivot the tractor unit on the knife shaft so the lock levers are above the printer's platen bearings.

Carefully push the tractor side plates down simultaneously, (assure that drive teeth align) until the lock levers lock onto the platen bearings.

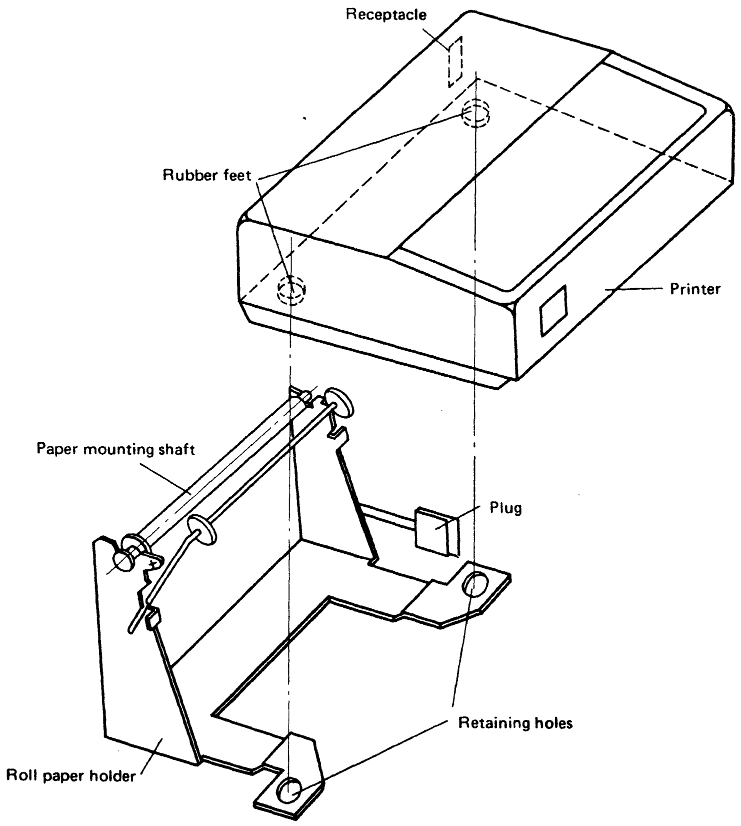


Fig. 3-1 Roll Paper Holder Installation

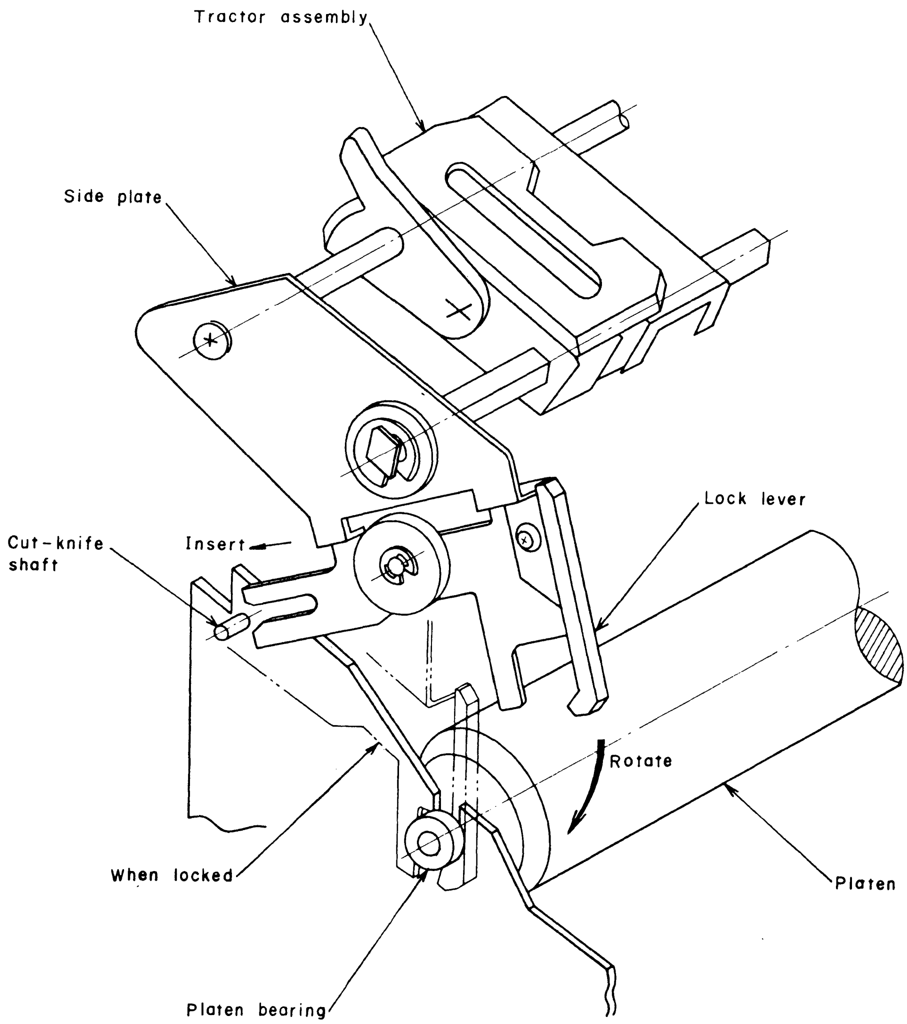


Fig. 3-2 Tractor Unit Installation

(3) Ensure the power switch is off, and connect the a.c. cord into the outlet.

(4) Connect the interface cable to the printer (See Fig. 3-3)

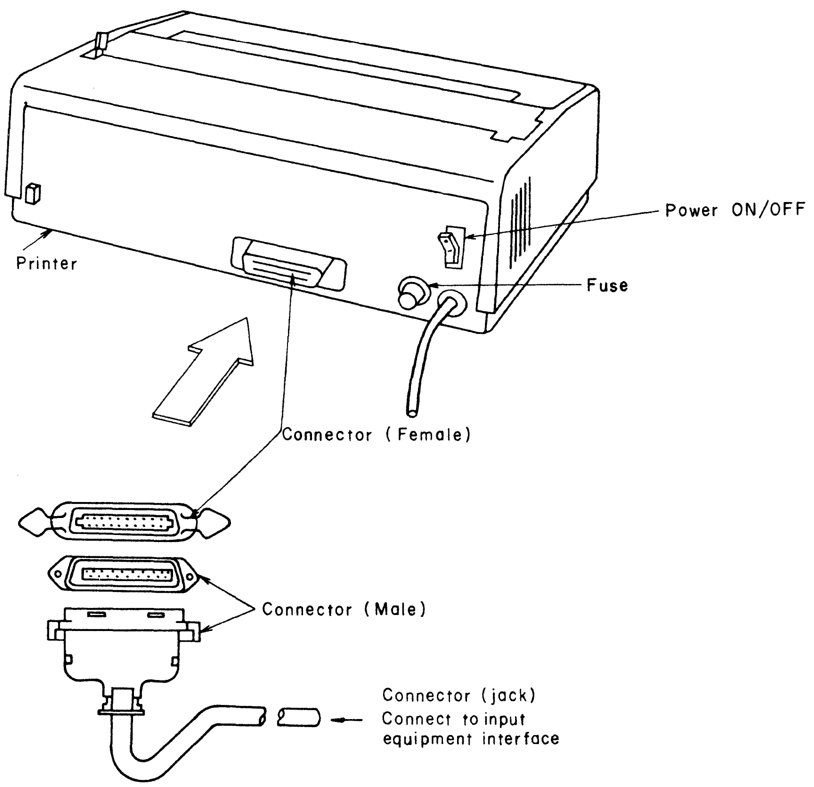


Fig. 3-3 Connecting Printer to Input Equipment Interface

(5) Install the ribbon (See Section 3.8)

(6) Install paper (See Section 3.3)

(7) Turn the printer power on, and verify the power indicator is ON.

(8) Turn on the PRINT switch on the front of the printer. The printer is now ready to receive data.

NOTE

If S2 is turned "ON" on the logic board, the printer will execute self test when powered up. When executing self-test, it is not necessary to connect the interface cable.
See Section 8 for details.

3.3 Paper Loading Procedure

3.3.1 To load paper roll, see Figs. 3-4 and 3-5 and proceed as follows:

(1) Turn off the printer power and remove the top plastic cover (lift straight up).

(2) Insert the paper roll (up to 128 mm in diameter, and up to 216 mm in width) on the paper mounting shaft until the paper edge touches the flange.

(3) Mount the paper roll on the paper holder.

(4) Tilt the paper lock release lever forward (released position).

(5) Locate the paper guide wire and the cut-knife in the open position.

(6) Thread the paper between the paper chute and separator, and under the platen.

(7) Align the paper edges and locate the paper at the center of the platen. Tilt the lock release lever rearward (locked position).

(8) Locate the guides of the paper holder approximately 0.5 to 1.0 mm (.020 to .039 inch) from the paper edges.

(9) Relocate the paper cut-knife and paperguide wire. Replace the printer lid.

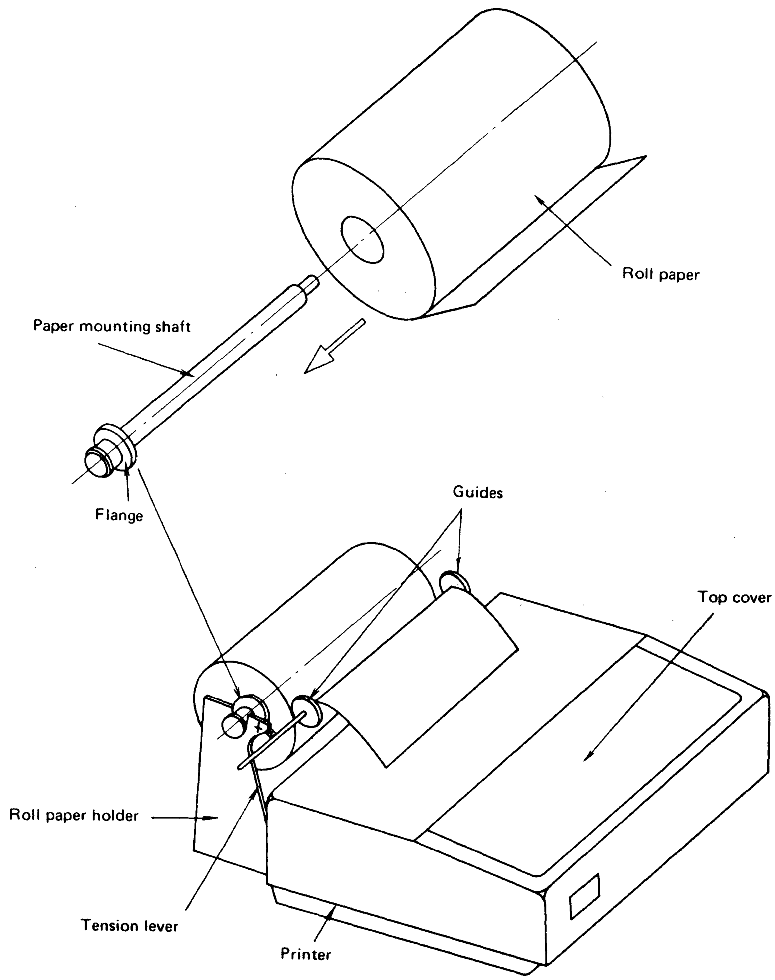


Fig. 3-4 Roll Paper Loading Method

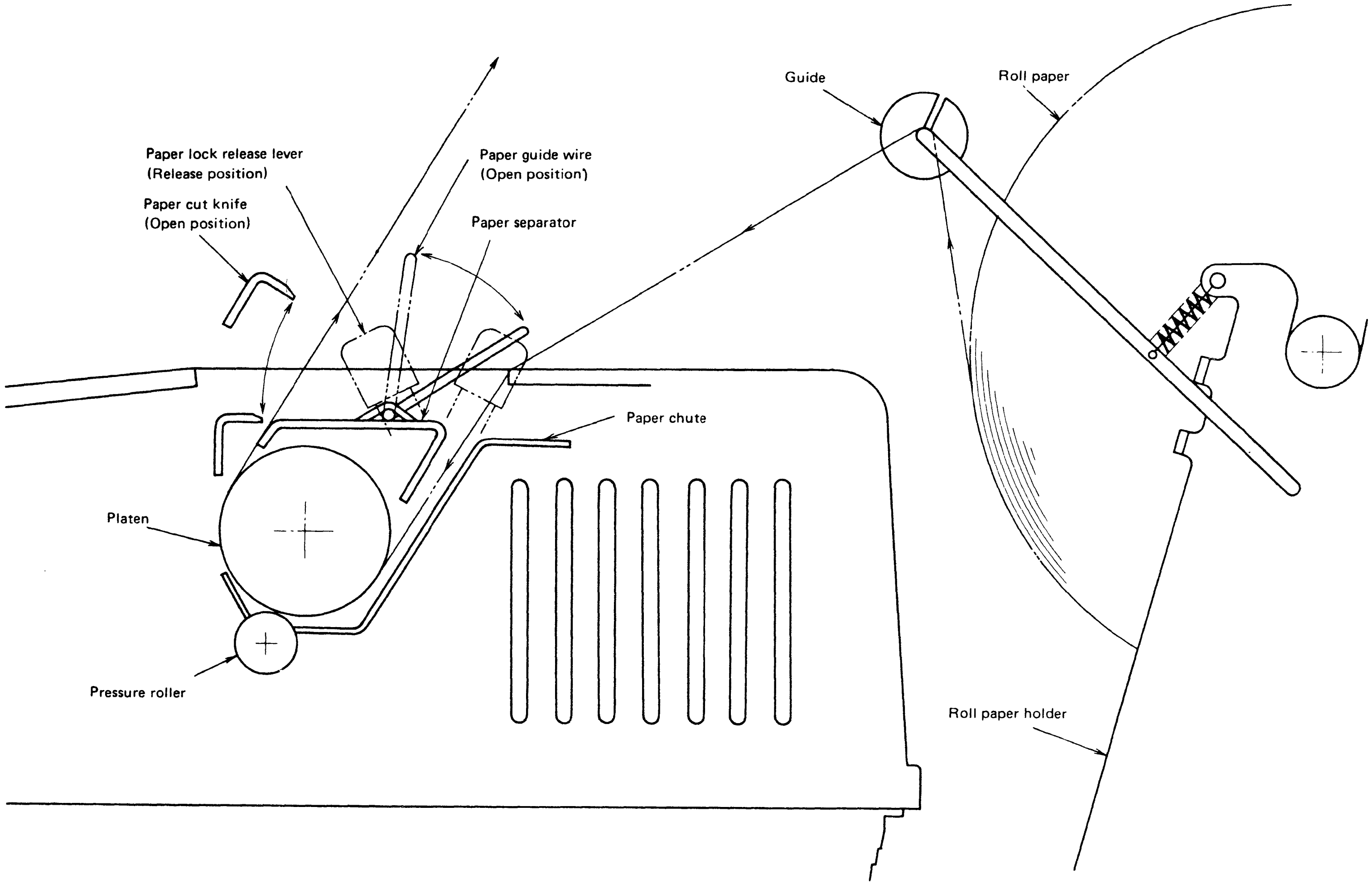


Fig. 3-5 Roll Paper Loading Method

3.3.2 Fixed Sprocket Paper Loading Procedure (See Fig. 3-6)

(1) Turn off the printer power and remove the top plastic cover.

(2) Tilt the paper lock release lever forward (released).

(3) Open the paper guide wire and the paper cut knife.

(4) Thread the paper through the paper chute and separate, and align the sprocket holes of the paper to the sprocket pins.

(5) Feed the paper by turning the knobs of the platen.

(6) Close the paper cut-knife and paperguide wire. Replace the top plastic cover. (Leave the paper lock release lever forward).

NOTE

1) When using fixed sprocket paper, keep the paper lock release lever in the release (forward) position.

2) When using fixed sprocket paper, remove the roll paper holder.

3.3.3 Fixed Sprocket Paper Loading Procedure (in case of using variable tractor unit) (See Fig. 3-7.)

(1) Turn off the printer power.

(2) Lift and remove the top plastic cover. (Pulling evenly on both sides).

(3) Tilt the paper lock release lever forward (release position).

(4) Place the paper guide wire, and the paper cut-knife in the open position.

(5) Open the sheet feeder cover.

(6) Thread the paper between the paper chute and the paper separator, and locate the sprocket holes of the paper onto the tractor pins.

(7) Close the sheet feeder cover.

(8) Relocate the paper cut-knife, the paper guide wire, and the top cover to their original positions.

(9) Turn the platen knob to align the first line. That is, feed the paper up a little more than necessary, and then turn the knob back to run the paper backward until it is aligned. Then, pull the paper back to eliminate slackness.

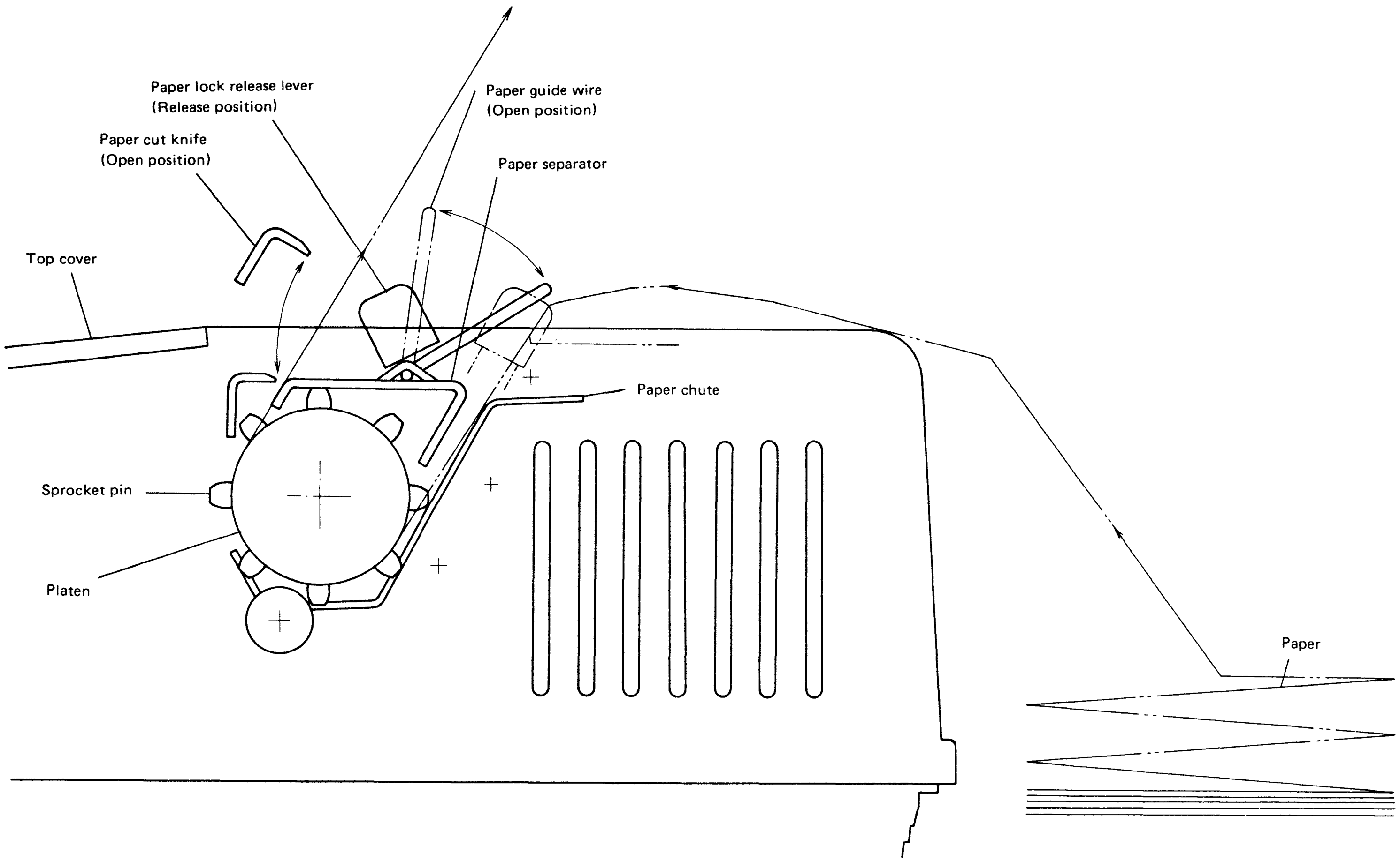


Fig. 3-6 Fixed Sprocket Paper Loading Method

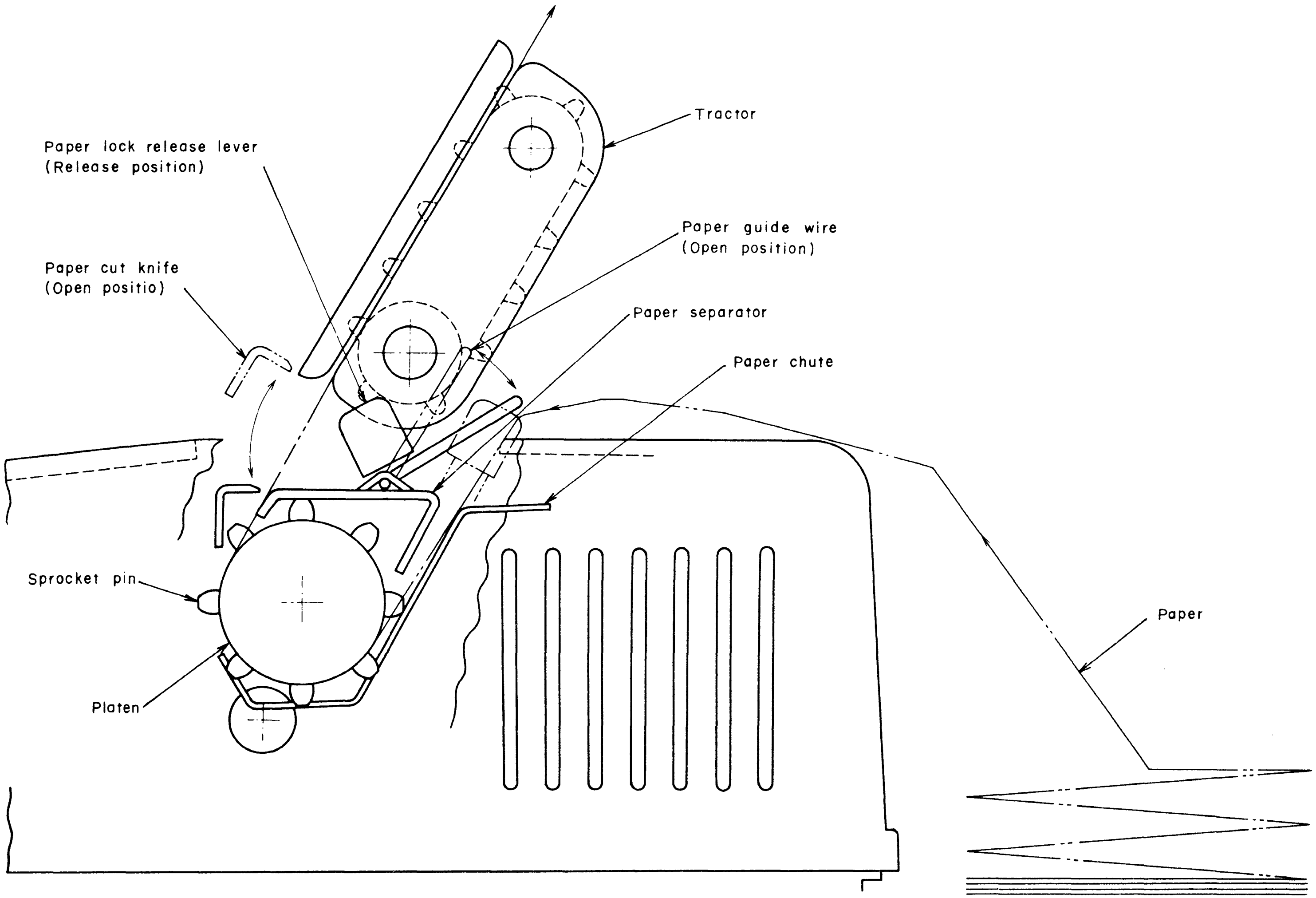


Fig. 3-7 Fixed Sprocket Paper Loading Method

NOTE

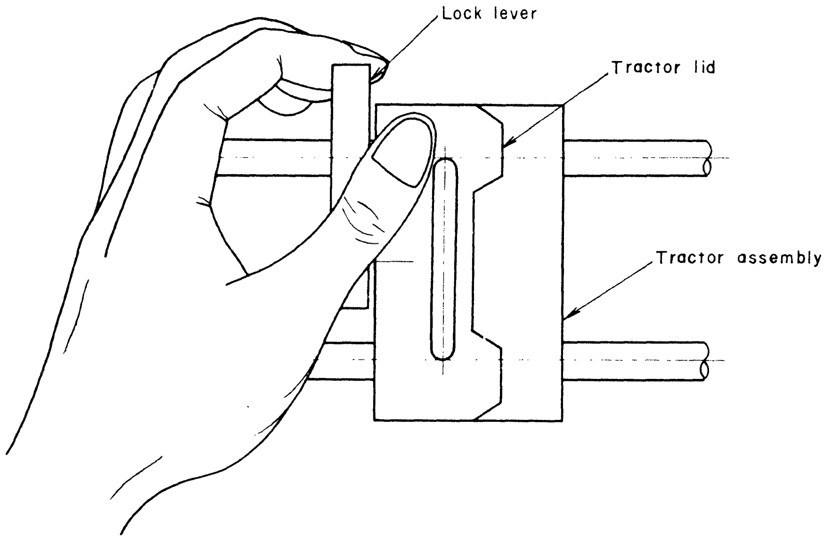
1) If the paper set with both the fixed sprocket pins and sheet feeder pins is loose between the platen and the sheet feeder, push the tractor gear leftward with your finger to disengage the idle gear from the tractor gear, and then turn the tractor knob in the paper feeding direction until the paper is no longer loose.

2) When using the variable tractor, keep the paper lock release lever in the release (forward) position.

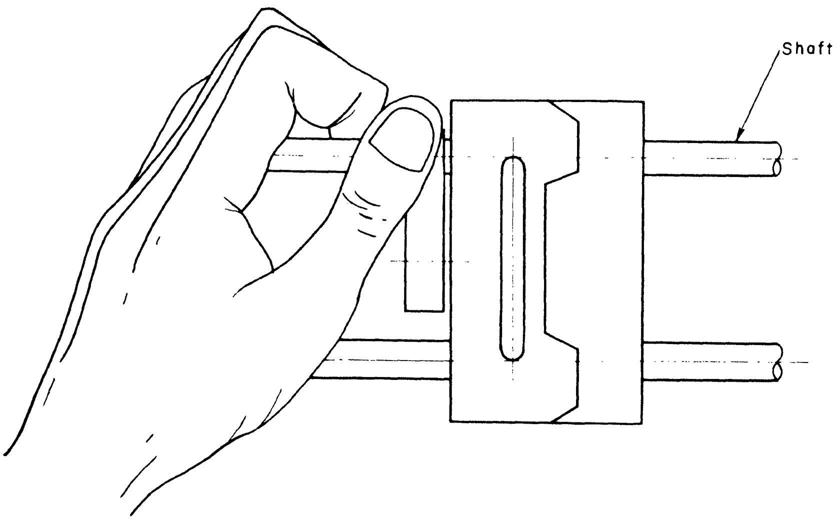
3) When using fixed sprocket paper, remove the roll paper holder.

3.3.4 Tractor Width Adjustment

(1) Unlock the tractor lock lever using index finger, putting your thumb on the tractor lid.



(2) Push the lock lever with your thumb to lock the tractor, while supporting the shaft with your other fingers.



3.4 Inked Ribbon Loading Procedure (See Fig. 3-8.)

(1) Turn off the printer power and remove the plastic cabinet lid.

(2) Remove the used ribbon.

(3) Loosen the end of a new ribbon.
Attach the end of the ribbon on the empty spool. Wind a few turns on the spool.

(4) Mount one ribbon spool on the spool shaft, and verify the winding direction is correct. Insure the ribbon drive pin is in the spool hole.

(5) Pass the ribbon as mentioned below.

Ribbon spool ⟶ ribbon guide post ⟶ between eyelet control cam and eyelet detector lever ⟶ ribbon guide ⟶ between print head and ribbon protector ⟶ ribbon guide ⟶ between eyelet control cam and eyelet detector lever ⟶ ribbon guide post

(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.

(7) After the ribbon has been set in place, check it that it isn't loose. If the ribbon is loose, turn one of the ribbon spools by hand until it is no longer loose.

NOTE

1) Assure the ribbon change eyelet is on the spool side of the eyelet detector lever.

2) Be careful not to misshape the ribbon protector when placing the ribbon.

3) Never twist the ribbon.

4) Be sure to check the ribbon before operating the printer to see that it has been properly set in place.

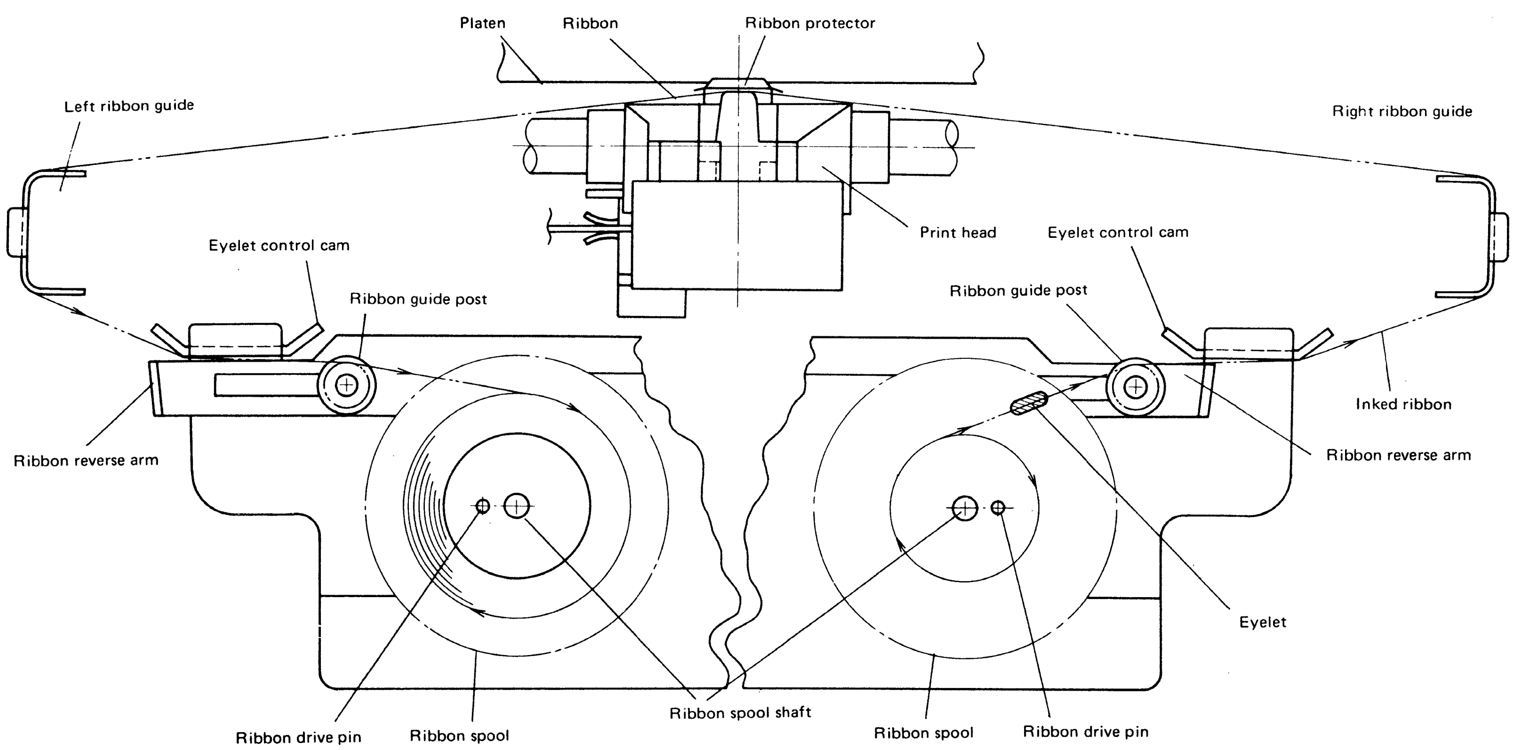


Fig. 3-8 Inked Ribbon Loading Method

3.5 External Operating Switches and Knobs (See Fig. 3-9)

The switches, knobs and lamps required for printer operation are shown in Table 3-1.

Table 3-1

Name	Location	Description
POWER switch	Left side of rear panel	Switches power on and off.
POWER lamp	Front control panel	Lights red to indicate that power is ON.
PRINT switch	Front control panel	Printer is ready for receiving data when this switch is in the ON position, but becomes busy and unable to receive data when it is in the OFF position.
Paper lock release lever	Right side of top of printer	When this lever is pushed backward, paper is pushed against platen. When the lever is shifted forward, paper is free from platen. Keep the lever in lock (rear) position when using roll paper, or in release (forward) position when using sprocket paper.
Platen knobs	Right side of printer	Turned for manually feeding paper up or down.
Tractor knob	Variable tractor unit	Turned for manually feeding paper
Tractor element lock lever	Variable tractor unit	Pin tractor is locked when pushed backward.
Tractor gear	Variable tractor unit	When simultaneously using the fixed-pin platen and variable tractor unit, disengage the gear to remove any paper slackness.

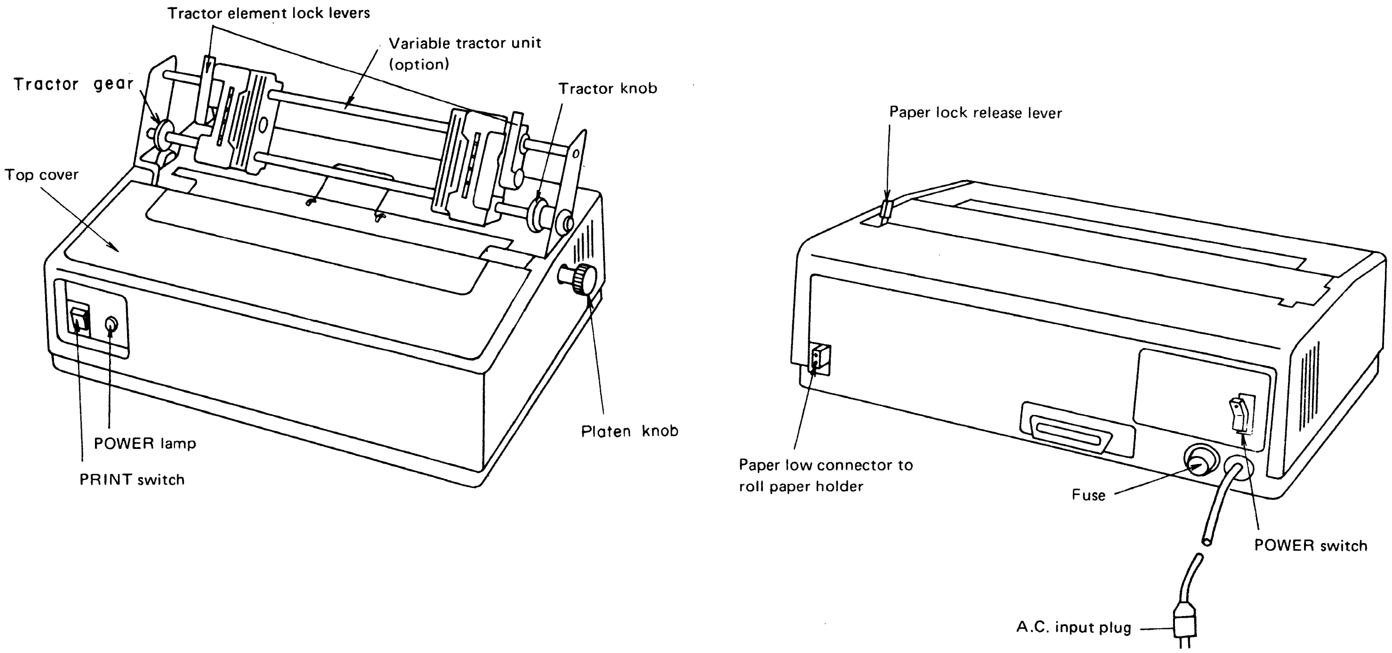


Fig. 3-9 Operation Switch, Lamp, Knob

3.6 Print Control Procedure

The printer can be controlled by using the following function codes.

Table 3-2

Symbol	Control Code		Description
	Decimal	Hexadecimal	
CR	13	OD	Starts printing, returns carriage, or moves paper up one line and returns carriage.
LF	10	OA	Starts printing, moves paper up one line, and returns carriage.
GS	29	1D	Prints 16.5 characters per inch.
RS	30	1E	Prints 10 characters per inch.
US	31	1F	Prints 5 characters per inch.
ESC.6	27.54	1B.36	Paper is moved up at line spacing of 6 lines per inch.
ESC.8	27.56	1B.38	Paper is moved up at line spacing of 8 lines per inch.
ESC.A	27.65	1B.41	Number of characters per line is changed to 80.
ESC.B	27.66	1B.42	Number of characters per line is changed to 64.

NOTE

1) Immediately after the printer is switched on, it is ready to print 10 characters per inch, 6 lines per inch, and 80 characters per line.

2) ESC.6, ESC.8, ESC.A and ESC.B must be two continuous symbols.

3) Once a specific number of characters per inch, a specific number of lines per inch, and a specific number of characters per line are selected, they will remain so until the next changeover code input is applied.

3.6.1 Printing, Carriage Return, and Line Feed

The following operations take place when data, CR and LF code inputs are applied.

1) CR only: No operation

2) LF only: Line feed only

3) Data + CR:

After printing, returns carriages and moves paper up one line (where internal short plug S4 is on Side B).

After printing, returns carriage (where internal short plug S4 is on Side A.) For the short plugs, see 5.8.2.

{In cases where data consists of 79 characters (10 characters per inch), 39 characters (5 characters per inch), 131 characters (16.5 characters per inch) or less in character code or graphic code}

4) Data: 80 characters (10 characters per inch)
   Data: 40 characters (5 characters per inch)
   Data: 132 characters (16.5 character per inch)
   } Same as data + CR

5) Data + LF: After printing, returns carriage and moves paper up one line.

3.6.2 Changing Print Pitch (No. of characters per inch)

Code symbols GS, RS and US are used for this purpose. Print pitch is changed from the line which has a changeover code symbol, but not in the middle of a line. If a line has two or more changeover code symbols, the last one is valid.

Care must be taken to lose data by selecting the print pitch of 5 characters per inch after inputting more than 40 characters in a line, or selecting the print pitch of 10 characters per inch after inputting more than 80 characters in a line.

3.6.3 Changing Line Spacing

Two continuous code symbols are used for this purpose.

ESC and 6 for 6 lines per inch

ESC and 8 for 8 lines per inch

3.6.4 Changing the Number of Characters per Line

The long line mode and short line mode are available. The number of characters per line in each of these modes is as shown below.

Print pitch	Long line	Short line
5 characters per inch	40 characters	32 characters
10 characters per inch	80 characters	64 characters
16.5 characters per inch	132 characters	105 characters

Changeover is made by using two continuous code symbols.

ESC and A for the long line.

ESC and B for the short line.

3.6.5 Printing Lower-case English Letters

Lower-case English letters can be printed by using the codes shown in Table 2-2.

3.6.6 Graphic Printing

The printer can print graphic figures when a graphic code input is applied to it. Decimal codes of 128 to 255 are allocated to graphic printing as shown in Table 2-2.

However, the printer with kana printing function uses decimal codes of 128 to 159 and 224 to 255. Graphic codes are allocated to each domain divided by character and line pitches. One domain is divided into two parts horizontally, and three parts vertically into a total of six units, and either black or white is selected for each of the six units according to the codes.

3.6.7 Kana Printing

The printer can print kana characters when it is used in Japan. Part of the graphic codes (160 to 223) are allocated to kana printing as shown in Table 2-2.

3.6.8 Alphabet Printing

The alphabet can be printed by replacing the character generator on the printed circuit board. The alphabetic character generator has two systems of characters, either of which can be selected with the short plug S3. For the selecting method, see 5.8.2.

3.7 Handling Precautions

(1) Be sure to correctly insert the a.c. plug into an electrical outlet.

(2) Neither lean on the printer nor place anything on the printer. If anything is accidentally dropped into the printer, immediately push the POWER switch OFF, and carefully remove it from the printer.

(3) Be sure to switch the power off before setting paper or replacing the inked ribbon. The print head is hot immediately after hours of operation so be careful not to touch it directly with your hand.

(4) Do not expose the printer to excessively high or low temperature, temperature variations, dust, and shock.

(5) When cleaning the printer surfaces, use a soft, dry cloth. Do not use detergents, cleanser, or the like.

(6) Never use fuses of other than the specified amperage.

(7) If the printer stops printing, check if the printer has run out of paper, or if the paper is near its end, or if the PRINT switch is in the OFF position.

(8) Never let the printer print without paper.

4. THEORY OF OPERATION

4.1 General

This chapter describes the theory of operation of the mechanical and electronic sections of the Microline 80 as follows. See Chapter 6 for the circuit diagrams.

4.2 Operation of the Mechanical Section

4.3 Operation of the Control Section

4.2 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

4.2.1 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 CN5.

The print head consists of the following (See Fig. 4-1):

(a) Wire guide

(b) Yoke

(c) Armature assembly

(d) Spacer

(e) Magnet assembly

(1) Print head operation (See Fig. 4-1)

When not operating, the armature is attracted by the permanent magnet. Therefore, the print wire which is fixed to the armature is held retracted within the wire guide. When a character to be printed 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. As a result, the print wire is driven toward the platen by force of the armature spring. 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.

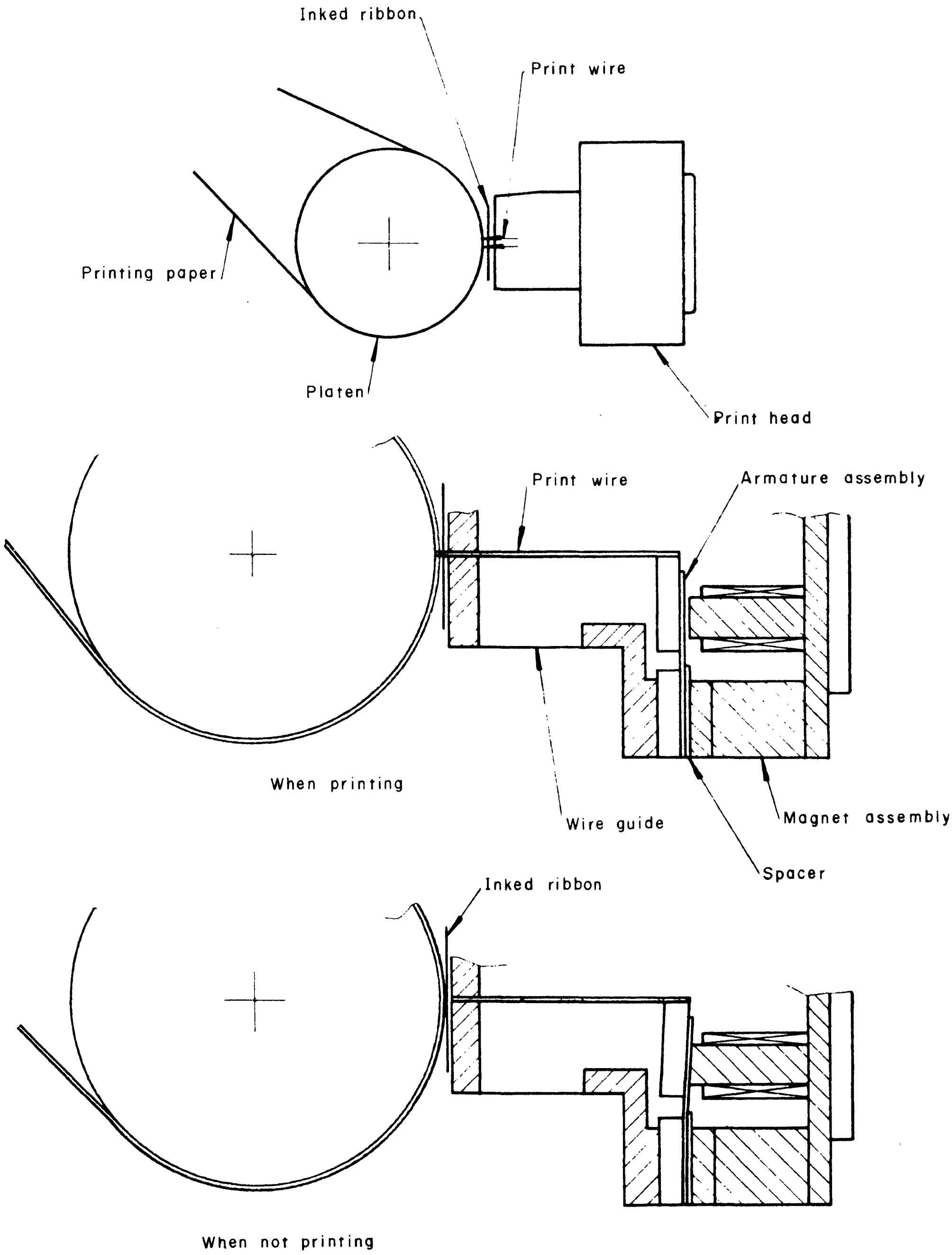


Fig. 4-1 Printing Mechanism

4.2.2 Space Mechanism and Operation

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

The space mechanism is composed of the following.

(a) Pulse motor with synchro belt pulley

(b) Synchro belt

(c) Two guide shafts

(d) Carriage

(e) Home sensor

(f) Home sensor plate

(1) Spacing operation (See Fig. 4-2.)

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

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

The spacing mechanism is so designed that, when the pulse motor turns 2 steps (15°), the carriage moves 2.54 mm (1/10 inch).

(2) Carriage return operation

When the carriage return (CR) code is received, the pulse 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 a 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 pulse motor stops, the carriage stays at the start position until the next print line is ready to be printed.

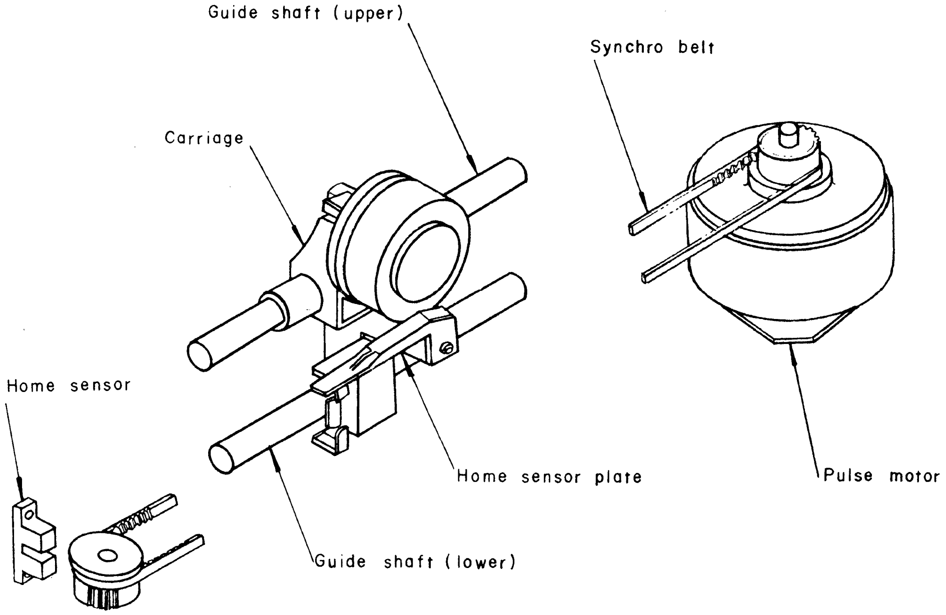


Fig. 4-2 Spacing Mechanism

4.2.3 Ribbon Feed Mechanism and Operation

The pulse 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 Fig. 4-3-(1), -(2).)

If the pulse 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 pulse 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 pulse 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 pulse motor is driven counterclockwise (the carriage moved from right to left) by the CR signal then, the ribbon ge engages the right ribbon spool gear to turn the right ribbon spool counterclockwise and thus feed the ribbon to the right.

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

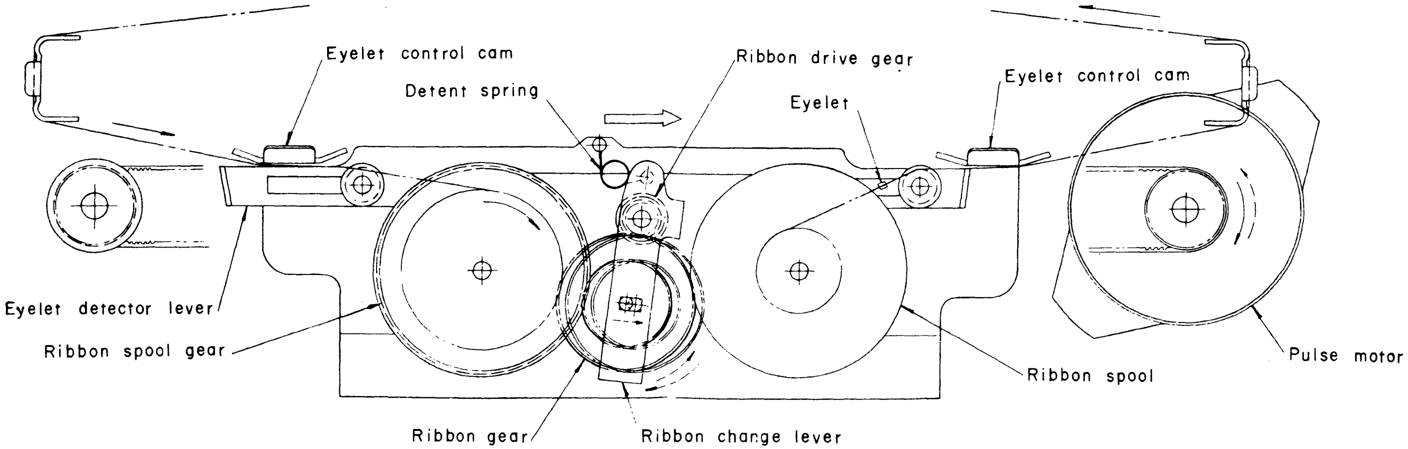


Fig. 4-3-(1) Ribbon Feed to Left

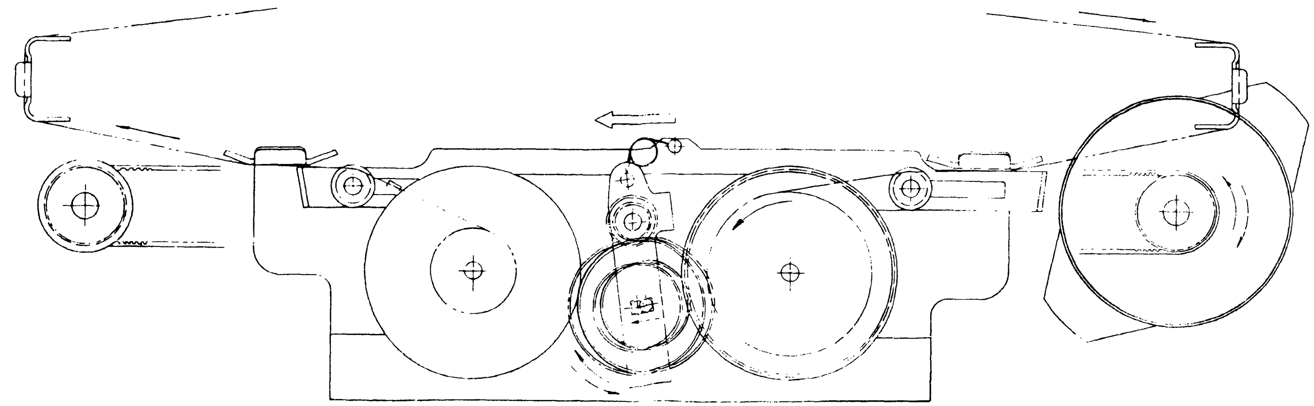


Fig. 4-3-(2) Ribbon Feed to Right

4.2.4 Paper Feed Mechanism and Operation

The printing paper is moved up to the next line as the pulse motor runs to mesh the gears and rotate the fixed pin platen and sprocket tractor (option).

The paper feed mechanism consists of the following:

(a) Pulse motor with gear

(b) Reduction gear

(c) Platen with fixed sprocket and friction roller

(d) Tractor feed unit

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

The paper feed pulse 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 feed unit (option) via the transmission gear.

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

4.2.5 Paper Lock Release Mechanism (See Fig. 4-5.)

When the paper lock release lever is moved forward, the paper chute is turned by the curved release shaft to allow clearance between the pressure rollers and the platen, thereby allowing insertion of paper. When the paper lock release lever is moved back, the pressure rollers are pushed against the platen by the pressure roller springs so paper can be fed.

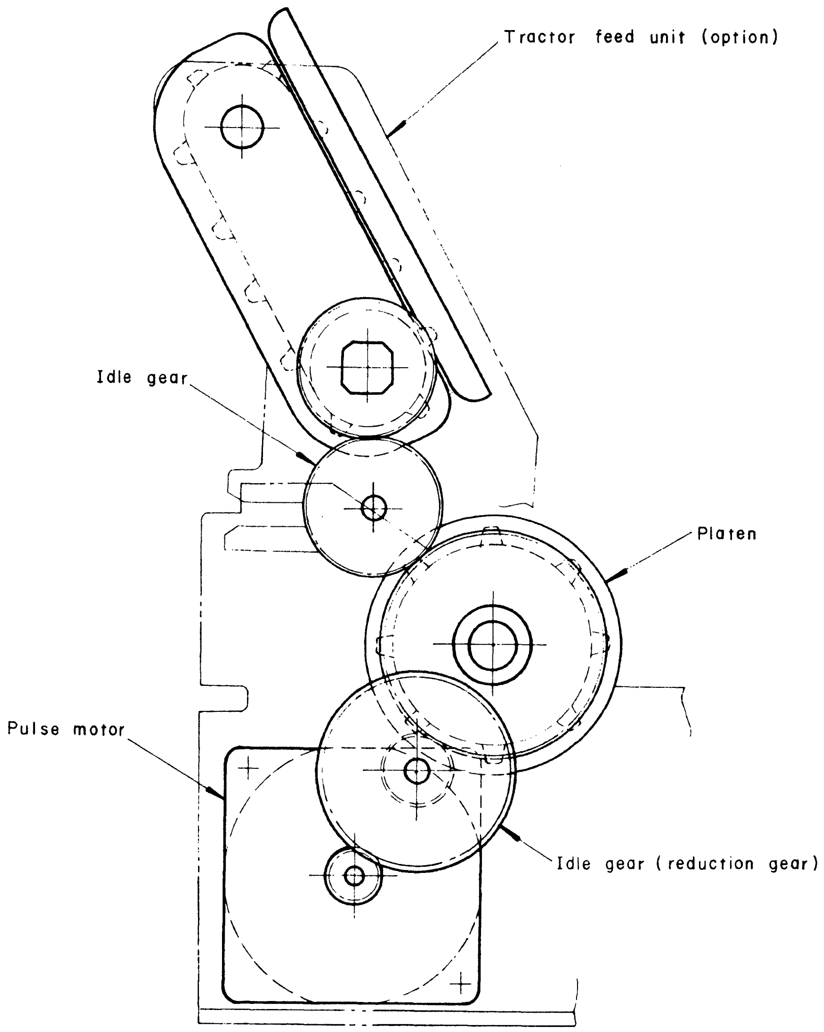


Fig. 4-4 Paper Feed Mechanism

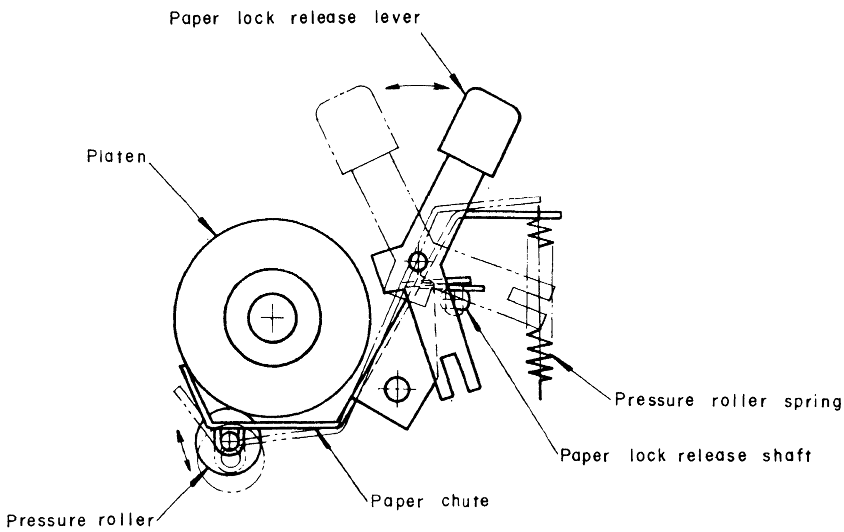


Fig. 4-5 Paper Lock Release Mechanism

4.2.6 Paper End Detecting Mechanism (See Fig. 4-6.)

When paper is loaded, the paper prevents the microswitch actuator from dropping into the paper separator groove so the microswitch remains off. When paper runs out, the actuator drops into the paper separator groove to close the microswitch to detect the absence of paper.

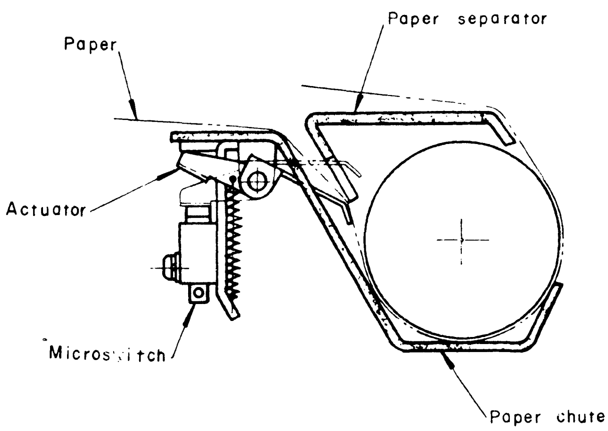


Fig. 4-6 Paper End Detecting Mechanism

4.3 Operation of the Control Section

As for the parts location number such as Q mentioned in this chapter, See Fig. 6-2-(1) schematic diagram (LEPS circuit board) or Fig. 6-2-(2) schematic diagram (LEPU circuit board).

4.3.1 General

A block diagram of the printer is shown in Fig. 4-7.

The control section consists of a single printed circuit board, and controls the mechanical section. It employs a microcomputer for controlling the mechanical section, and has a 256 RAM with an I/O port serving as input data buffer, and a character generator which memorized character patterns.

Input data from the interface is first written into the RAM, where it is stored. When data for one line has been inputted, the printer starts printing. First, the space pulse motor runs to move the carriage. Pulses are applied to the print head to print characters.

When one line has been printed, the space pulse motor runs backward to return the carriage to the home position.

At the same time, the line feed pulse motor is driven to move the paper up one line.

This completes one cycle, and the printer waits for the next data input.

4.3.2 Outline of Control Circuit

The printer operates under control of the microcomputer, Q2. As shown in the circuit diagram in Chapter 6, Q2 is the 8-bit 1-chip microcomputer, which has a 1 k-byte ROM, 64-byte RAM and 8-bit timer. A control program is stored in the inside ROM, and runs when the printer is powered on. Q2's 64-byte RAM is used as register, and the timer is used for internal control.

A 3.58 MHz oscillator (OSC) is connected to XTL1 and XTL2, generating the basic clock. The μCPU cycle time is about 4.2 μs.

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 Q1 for sending and receiving data and instructions.

The I/O ports are connected to Q3 to address the character generator. T0, T1 and $\overline{\text{INT}}$ are used as control inputs.

Q1 is the 256-byte I/O RAM with 22 I/O ports. (The internal timer is not used). The I/O ports are used for interface signals, and as control lines to the step motors.

Q3 is the 2 k-byte character generator PROM. Addresses are assigned via the μCPU by A0 thru A10, and signals corresponding to characters are output from $\overline{\text{O0}}$ to $\overline{\text{O7}}$, which drive the darlington transistor array Q11, Q10 (or Tr7 to Tr13) through inverters Q4 and Q6.

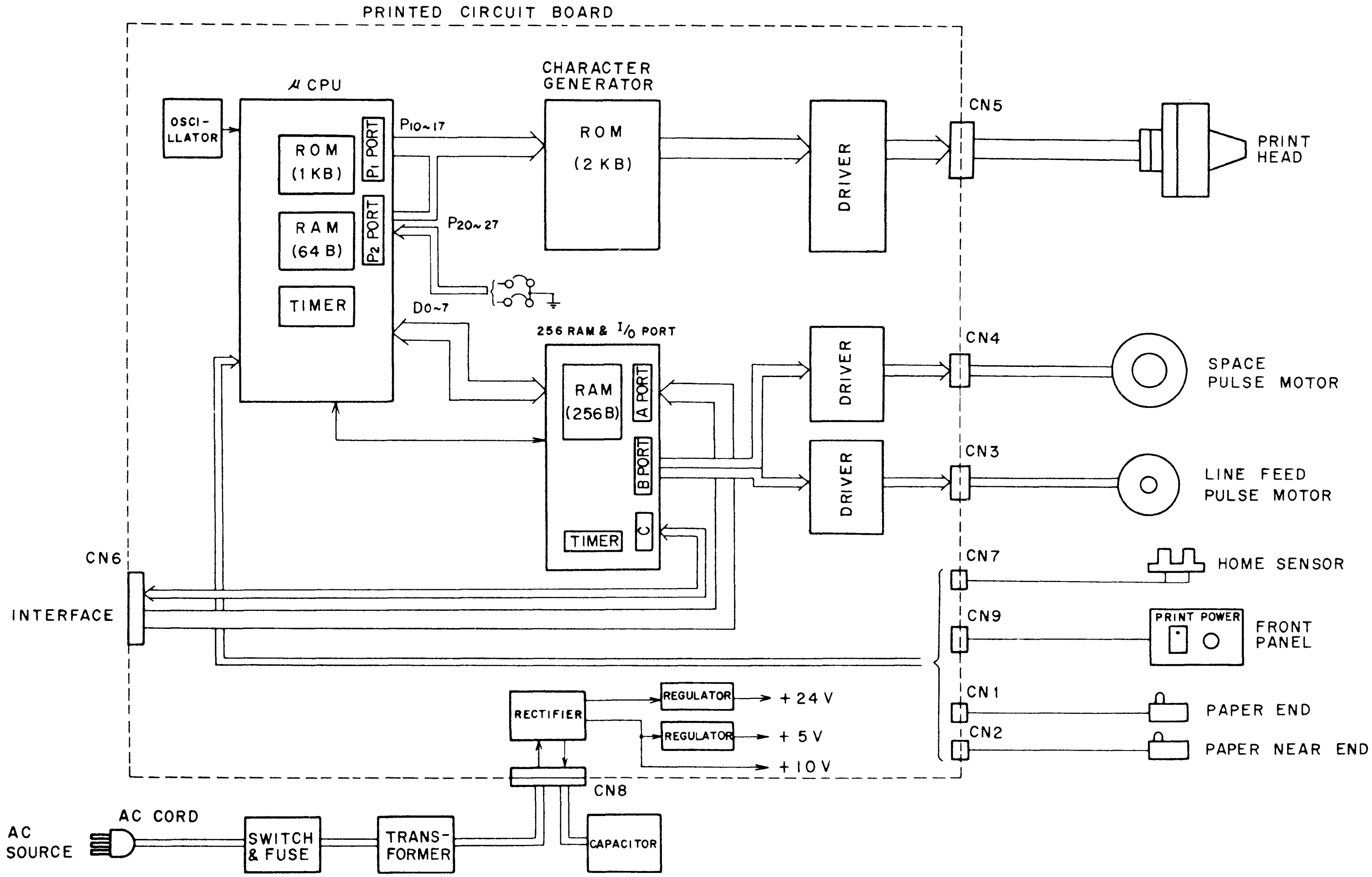


Fig. 4-7 Block Diagram

4.3.3 Initial Operation (See Time Chart (1), Fig. 4-8.)

When the Power switch is turned ON, C3, which is connected to Q2, generates a RESET signal, which clears the processor. After RESET goes HI (40 - 80 μs), the program starts and returns the carriage to the home position. If the carriage is already home, it is moved out of the home position then returns. During initial operation, BUSY (at CN6-11) is HI ("1") and data is not accepted. When initialization is complete, BUSY goes LO to make the printer ready.

To prevent eroneous operation during power ON/OFF, transistor TR2 delays the bias current to the drive circuits, and turns it off in advance.

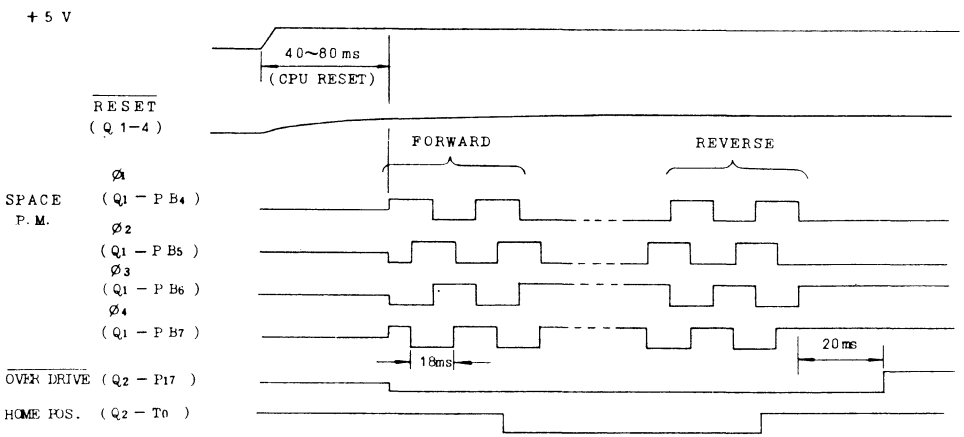
4.3.4 Data Input (See Time Chart (1), Fig. 4-8.)

8-bit parallel data is input to PA0-PA7 of Q1. Data is latched into Q1 on the rising edge of $\overline{\text{STROBE}}$, an interface signal provided by the host controller at CN6-1 and connected to Q1-39 (PC2).

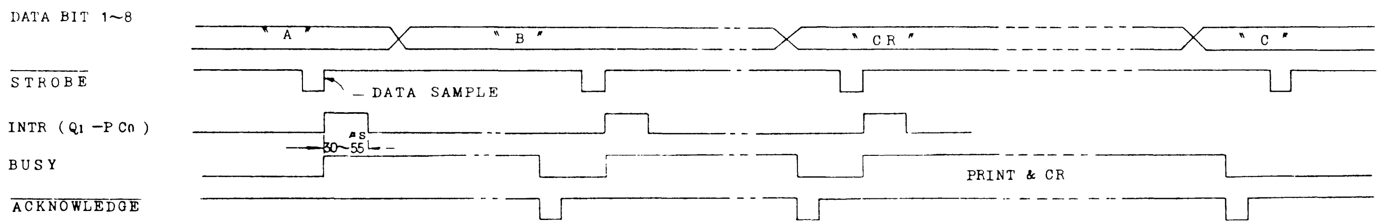
When the input buffer of Q1 is full (one character received) it raises Q1-37 (PC0) which is the interrupt line to Q2. This HI develops a LO at Q5-8, which causes BUSY to go HI at Q7-8. $\overline{\text{INT}}$ at Q2-6 caused the μCPU to read the character received, which is on the μCPU data lines DB0-DB7.

The μCPU decodes the character. If this is a data character, it is returned to Q1's RAM and stored in the line buffer. If the character is a CR or LF, a print operation or feed operation is initiated. After the character is processed, the $\overline{\text{ACKNOWLEDGE}}$ pulse is sent to the interface via Q1-1 (PC3). Also, BUSY is dropped to allow the next character to be strobed in. This process is repeated until the Line Buffer is full or CR LF is received.

1 Initial operation



2 Data input



Note: Voltage level

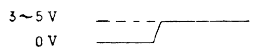


Fig. 4-8 Time Chart (1)

4.3.5 Printing Operation (See Time Chart (2), Fig. 4-9.)

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

The carriage stays one character left of the first character, and the space pulse motor is relatively loosely locked by the voltage of +10 V applied to it via R24 and D2.

After completion of data input, a "1" output is sent out of Q2's P17 output (SPACE PM OVER DRIVE) to energize transistor TR1, which applies a +24 V to the space pulse motor to drive the pulse motor with a powerful torque. At the same time, pulse signals are applied to Q1's PB4 to PB7 to drive the step motor.

The pulse motor is a 4-phase step motor. It is arranged internally so it has 48 magnetic "detent" steps. Each step is equivalent to 7.5°. Two phases at a time are energized, the sequence of the phases determines direction; i.e., forward is Ø1, Ø2 followed by Ø2, Ø3, then Ø3, Ø4, etc. Two steps (15°) are needed to advance the print head one character position (1/10 inch). Zener diode ZD2 suppresses any CEMF voltage generated by the motor.

When the print head reaches column one of the first character position, printing begins. This is accomplished by the μCPU addressing the character generator, Q3, via output ports P10 - P16. A LO output = "1". The column is assigned by P20-P22. P23 is data bit 8, which is the graphics bit.

Q3 outputs dot data from $\overline{O0}$ - $\overline{O6}$, pins 9-16. Pin 17 is feed back to Q2-37 to inform the μCPU to advance the column address. A LO output from Q3 enables the print wire. Pin 9 is print wire #1, etc. This data is passed to the print head via Q6, RM3, Q10 (or Tr7 to Tr9), Q11 (or Tr10 to Tr13), and diode pack D12. The outputs from Q3 are from 600 to 700 μs duration.

Counter voltage generated by the print head is absorbed by ZD1. D3 and D12 monitor the load of the print head. An overload will charge C-19 (or C-8) via ZD4 and Q10-6 (or Q8-7). This action, via point "f" is monitored by TR3 in the power supply, and will cut off the 24 V d.c. line if a fault occurs, thus protecting the print head.

The pulse motor will advance and character columns will print until the print buffer is exhausted. Note the pulse motor will be held in position when not advancing, by 10 V d.c. applied to CN4-5 and 6 via D2 and R24.

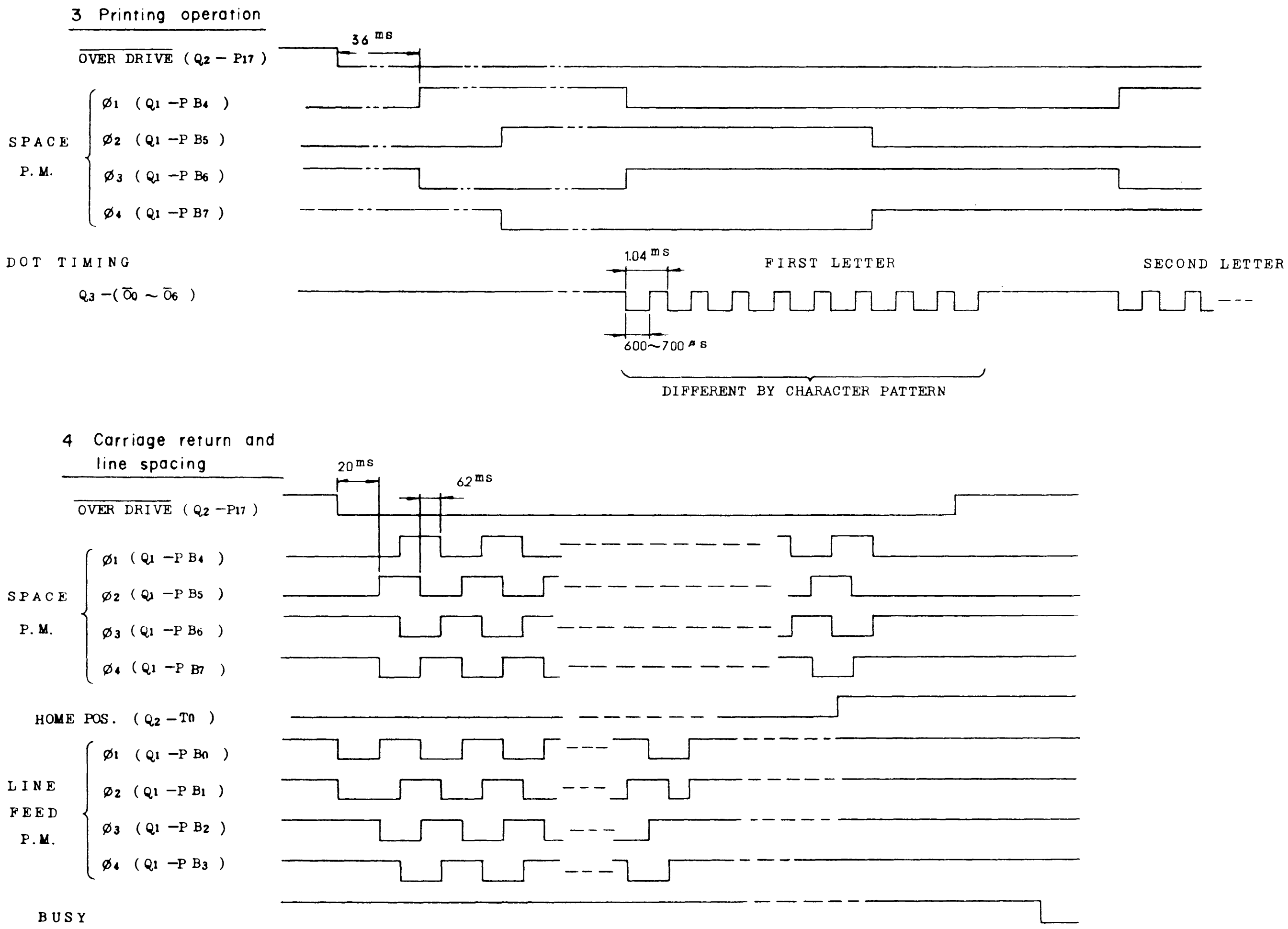


Fig. 4-9 Time Chart (2)

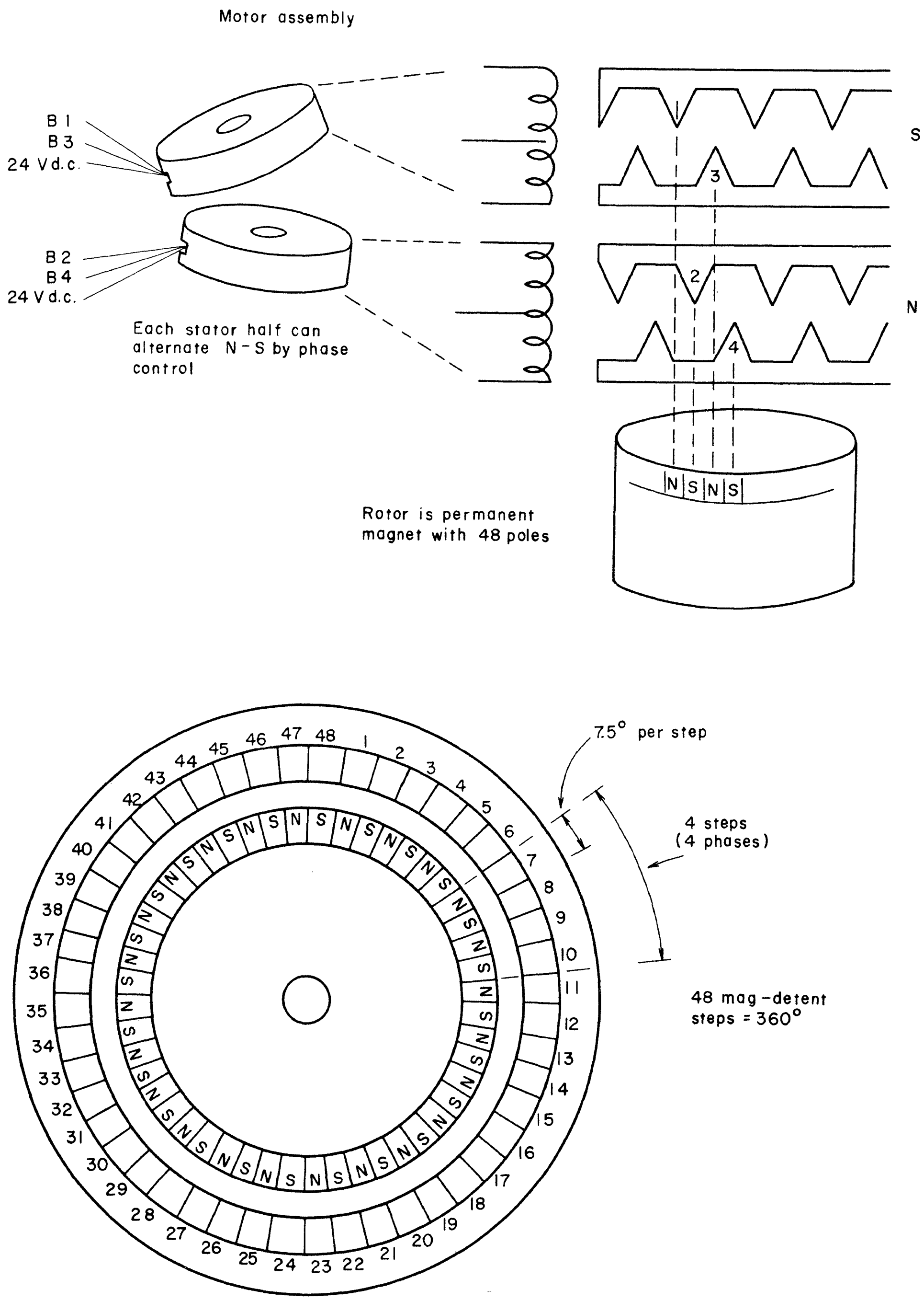


Fig. 4-10 Step Motor

4.3.6 Carriage Return and Line Feed Operation (See Time Chart (2), Fig. 4-9.)

After one line has been printed, the I/O RAM reverses the sequence of phase pulses from PB4 - PB7. This moves the carriage in reverse At the same time outputs PB0 to PB3 are enabled to the line feed pulse motor. These pulses (LO-TRU) are applied to Q4, Q5, RM2, and Q9 (or Q8) to the line feed pulse motor. This motor has 24 V d.c. applied at all times via connector CN3-5 and 6. The line feed puls motor advances one line (24 steps if 6 LPI, or 18 steps if 8 LPI). The line feed pulse motor is similar in operation as the space puls motor, however, only a forward direction is used.

The space pulse motor continues in reverse, until HOME is detected. When this happens, the photo - LED cell applies a HI, via CN7-3, to interrupt the μCPU at Q2-1 (TO). This causes a branch in the μCPU program to the routine which will clear BUSY and output $\overline{\text{ACK}}$ to the interface. The printer is ready for the next data input.

4.3.7 Paper End and Print Switch Operation

A paper out condition is sensed by the paper roll holder via connector CN2, or by the paper out switch on the unit, via CN1. Either switch, when paper runs out, will apply a LO to Q5-13. This produces $\overline{\text{FLT}}$ (LO) to the interface CN6-32. Also Q5-12 goes HI, this signal is PE (Paper End) on CN6-12.

When the PRINT SWITCH is "ON", a HI is felt on Q7-4, through R14, which is connected to +5 V d.c. Q7-5 monitors the paper out condition, and will be HI if paper is not out. Q7-6 will go LO when Print Switch is on, HI if the Print Switch is off, or paper out occurs. This HI signal is applied to the μCPU pin 39 (T1), to inform the μCPU of a fault condition. The μCPU will direct Q1 to output a BUSY signal after completing one line of print, therefore disabling input data until the fault condition is cleared.

4.3.8 Graphic Printing Operation

As shown in Fig. 4-11, a domain is divided into 6 minimum units by character and line spacing pitches, and these units are combined to form a graphic character.

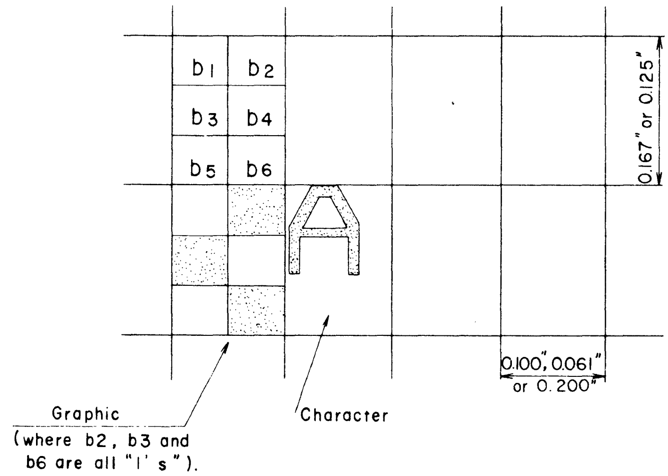


Fig. 4-11 Graphic Printing

To each of the 6 units is allocated bits b1 to b6 of input code (See Table 2-2.). When any of these bits is "1", that unit is printed.

In graphic printing, the number of vertical dots is 12 or 9 so line spacing takes place twice to print the upper half and the lower half.

4.3.9 Power Supply

(1) A.C. VOLTAGE

A.C. voltage is applied via SW1 POWER ON switch, through fuse F2, and arc suppressor SK. Note that SW5 switch will select minimum or maximum a.c. voltage ranges across the transformer's primary winding. Select the range which is closest to your a.c. input. The transformer passes 23 V a.c. and 9 V a.c. to the PCB via CN8.

(2) D.C. REGULATION

23 V a.c. is input to R17 and can be utilized on the I/O connector pin 36 if needed. Remove R17 if this voltage is not required. 23 V a.c. is also passed through rectifier D11, TR4, TR5 and filtered by C29 and C28 (or C10) to +24 V d.c., which is applied to the pulse motors and print head. The 9 V a.c. input is used to develop +10 V d.c. and +5 V d.c. The +10 V d.c. line is connected via jumper S6 to the interface pin 34. Remove S6 if this voltage is not required. +10 V d.c. is developed by D9 and D10, and applied to regulator TR6 which outputs +5 V d.c., which is utilized throughout the logic. 5 V d.c. is also used to power the POWER ON LED on the front of the unit to indicate the Microline 80 has been switched on.

5. MAINTENANCE

5.1 General

This chapter provides the data necessary for the maintenance of the Microline 80 in the following sections.

5.2 Maintenance Precautions

5.3 Periodic Inspection

5.4 Maintenance Tool List

5.5 Disassembly, Replacement and Adjustment Procedures

5.6 Maintenance Parts List

5.7 Troubleshooting Flow Charts

5.8 Voltage Select Switch, Short Plugs and Jumper Wires

5.2 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 wrong with it prior to switching it on.

Check the voltage select switch that it is at the specified voltage.

(5) Never print without paper and ribbon set in place.

(6) The printing paper must be loaded correctly through the printer.

(7) The ribbon must be free of looseness and twist.

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

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

(10) 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.

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

5.3 Cleaning

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

Cleaning interval: 6 months or 300 hours of operation, whichever comes sooner

Cleaning time: Approx. 10 minutes

Tool: Dry cloth (gauze or other dry cloth)

5.3.1 Cleaning Points

Table 5-1

Cleaning Point	Description
Inked ribbon passage	Clean the inked ribbon passage of dust, ribbon lint, etc.
Paper passage	Clean the paper passage and the parts around it of paper lint, etc.

5.4 Maintenance Tool List

The following tools are necessary for replacing the parts for the printed circuit board, units, etc. in the field.

5.4.1 Maintenance Tools

Table 5-2

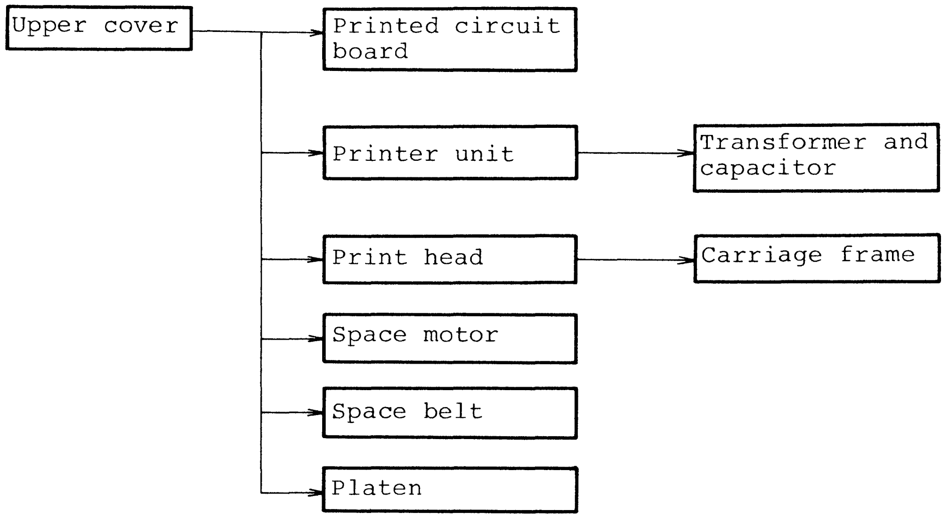
No.	Tool	Q'ty	Location	Remarks
1	No. 1-100 Philips screwdriver	1	Screws 2 to 2.6 mm	
2	No. 2-200 Philips screwdriver	1	Screws 3 to 5 mm	
3	No. 5-H nippers	1		
4	No. 1 round pinchers	1		
5	Thickness gauge	1		
6	50-g pressure gauge	1		
7	300-g stick pressure gauge	1		
8	Soldering iron (30 W)	1		
9	Tester	1		
10	Stop ring pliers	1		

5.5 Disassembly, Replacement and Adjusting Procedures

The disassembly, replacement and adjusting procedures are explained below according to the disassembly route chart in reference to the table of component parts shown in Chapter 7.

5.5.1 Disassembly Route Chart

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



5.5.2 General Precautions

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

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

(3) Use the specified maintenance tools only.

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

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

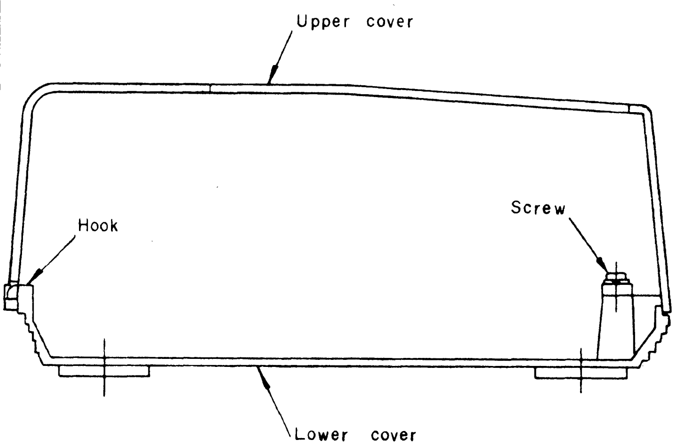
(6) Do not induce artificial troubles by irrationally removing in the wrong order, or cutting the wires.

5.5.3 Non-Disassembly Points

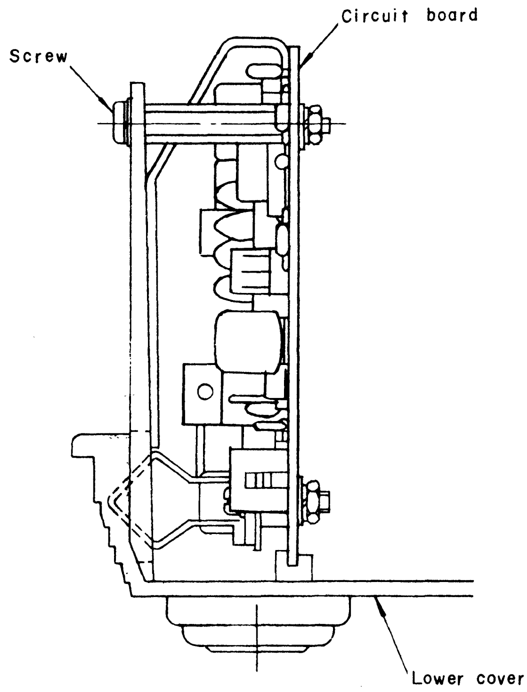
Do not disassemble the inside of the print head.

5.5.4 Disassembly, Reassembly and Adjusting Procedures for Individual Parts

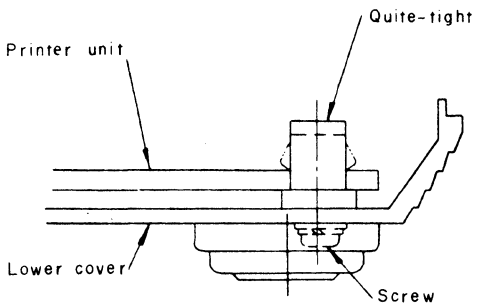
(1) Upper cover (See Fig. 7-8.)

Item	Description	Tool
Dis- assembly	1 Remove a platen knob (Fig. 7-2-11). 2 Remove top cover (Fig. 7-8) by lifting it straight up. 3 Loosen switch assembly screw (Fig. 7-8-23), and move switch assembly (Fig. 7-8-1) backward. 4 Remove two screws (Fig. 7-8-25) from inside of front part of upper cover. 5 Disengage upper cover (Fig. 7-8-3) from lower cover hook, and remove it by lifting.	No. 2-200 Philips screwdriver No. 2-200 Philips screwdriver
Reas- sembly	Reverse the above procedure to reassemble. Note: Install switch assembly by pushing forward so that there will be no clearance with upper cover.	
Sketch		

(2) Circuit board (See Figs. 7-7, 7-8, 7-11.)

Item	Description	Tool
Dis-assembly	1. Remove the upper cover. (See 5.5.4 (1).) 2. Pull out paper near end connector (CN2) and interface connector (CN6) from circuit board. 3. Pull out print head (Fig. 7-2-1) connector. 4. Remove flat cable connector screw from carriage frame (Fig. 7-7-1), and take connector out from carriage frame. 5. Cut tie-wrap which fastens flat cable. 6. Remove the two screws securing the circuit board (Fig. 7-8-23), and raise the circuit board straight up (Fig. 7-11). 7. Disconnect all connectors from the circuit board.	No. 2-200 Philips screwdriver No. 2-200 Philips screwdriver
Re-assembly	Reassemble by reversing above order. Note: Do not insert wiring between heat sink of circuit-board and rear panel of lower cover.	
Sketch		

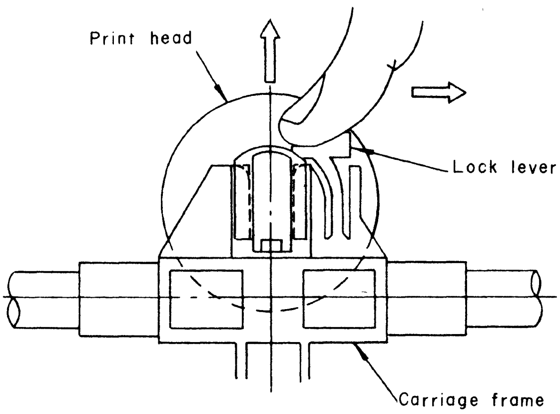
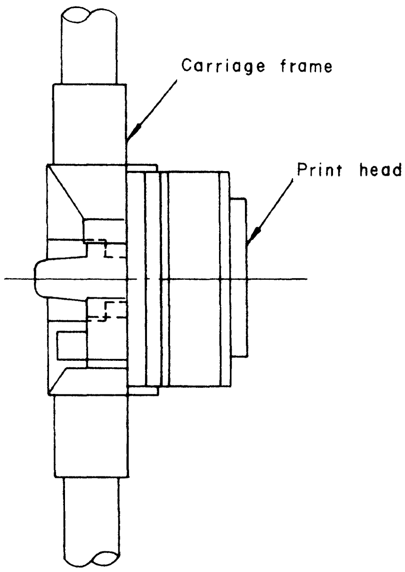
(3) Printer Unit (See Figs. 7-2, 7-8.)

Item	Description	Tool
Dis-assembly	1 Remove upper cover. (See 5.5.4 (1).)	No. 2-200 Philips screwdriver
	2 Pull out print head connector.	
	3 Remove flat cable connector screw from carriage frame, and take connector out from carriage frame.	No. 2-200 Philips screwdriver
	4 Cut tie-wrap which fastens flat cable.	No. 5H nippers
	5 Loosen Quite-tight screw (Fig. 7-8-26) which fastens printer unit (Fig. 7-2) until Quite-tight (Fig. 7-8-10) no longer has swell.	No. 2-200 Philips screwdriver
	6 Remove circuit board screw (Fig. 7-8-23), raise circuit board, and pull out all connectors which connect circuit board to printer unit.	No. 2-200 Philips screwdriver
	7 Hold right and left side plates of printer unit, lift printer unit and remove it from Quite-tight	
Re-assembly	Reassemble by reversing above order. Note: 1) Tighten printer unit Quite-tight screw at a tightening torque of 4 to 5 kg.cm. 2) When connecting the flat cable fix it when it is flush with the end face of the base frame, provided that the carriage is at the left end.	
Sketch		

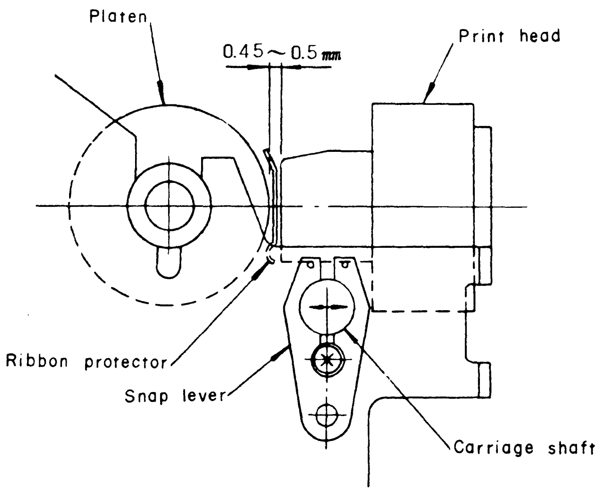
(4) Transformer and Capacitor (See Fig. 7-8.)

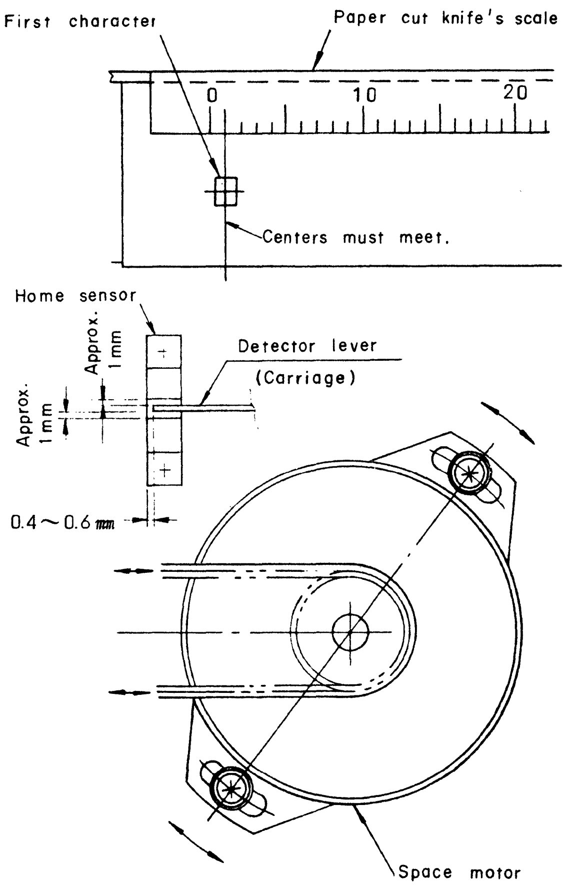
Item	Description	Tool
Dis-assembly	① Remove the upper cover. (Fig. 5.5.4 (1).)	No. 2-200 Philips screwdriver
	② Remove the printer unit. (See 5.5.4 (3).)	No. 2-200 Philips screwdriver
	③ Remove transformer lead from fuse holder (Fig. 7-8-9) terminal.	
	④ Remove transformer screw (Fig. 7-8-24) and capacitor screw (fig. 7-8-25), and remove transformer (Fig. 7-8-8) and capacitor (Fig. 7-8-20, Fig. 7-8-21).	Soldering iron
	⑤ Remove circuit board screw, lift circuit board, and pull out trans-former connector (CN8).	No. 2-200 Philips screwdriver
Re-assembly	Reverse the disassembly procedure.	

(5) Print head (See Fig. 7-2.)

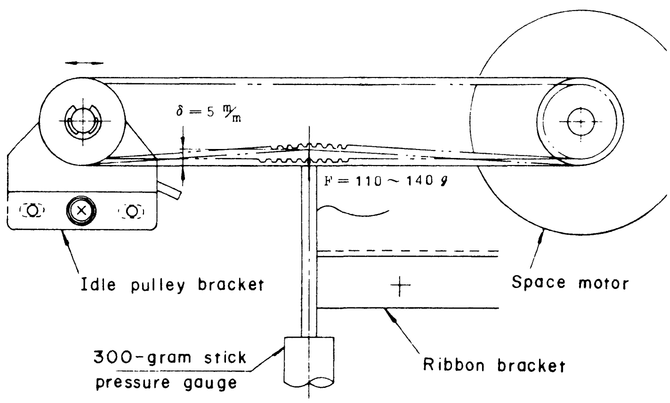
Item	Description	Tool
Dis-assembly	① Remove the top cover by pulling it straight up. ② Disconnect the print head (Fig. 7-2-1) connector from the carriage. ③ Refer to figure. While holding the print head lock lever to the left, lift the print head straight up.	
Re-assembly	Install the print head, reversing the above procedure. Note: Insert the connector lead into the connector by twisting it clockwise by one turn.	
Sketch	 	

(6) Carriage frame (See Figs. 7-2, 7-7.)

Item	Description	Tool
Dis-assembly	① Remove upper cover. (See 5.5.4 (1).)	No. 2-200 Philips screwdriver
	② Remove print head. (See 5.5.4 (5).) Position carriage assembly to left side.	
	③ Remove belt clamp screw (Fig. 7-7-4), and belt clamp (Fig. 7-7-2).	No. 2-200 Philips screwdriver
	④ Remove right and left snap lever screws (Fig. 7-2-10) which fasten upper carriage shaft (Fig. 7-2-5).	No. 2-200 Philips screwdriver
	⑤ Remove one snap lever (Fig. 7-2-6), and pull carriage shaft from right and left side plates.	Stop ring pliers
	⑥ Remove flat cable connector screw from carriage frame, and remove connector from carriage frame.	No. 2-200 Philips screwdriver
	⑦ Lift carriage frame up, and remove it from lower carriage shaft.	
Re-assembly	Reverse the disassembly procedure.	
Adjust-ment	① Gap between platen and print head 	

Item	Description	Tool
	Move carriage shaft forward or back until gap between platen and print head is somewhere between 0.45 and 0.5 mm at right and left ends, and then retighten snap lever screw.	Thickness gauge No. 2-200 Philips screwdriver
	(2) First character printing position. 	
	Make an adjustment by repositioning the space motor one way or the other so that, when the power is on, the carriage returns and stops at the position shown above. If this method is not effective, change the engagement of the synchro-belt and pulley by one tooth or two.	No. 2-200 Philips screwdriver

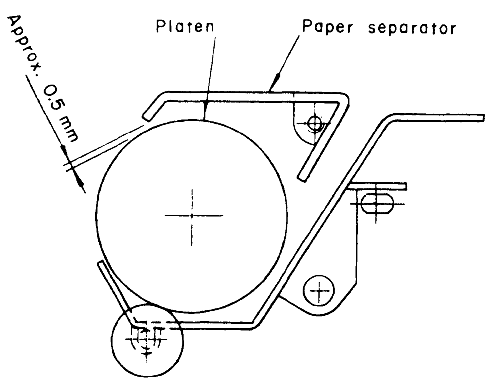
(7) Space motor (See Figs. 7-3 and 7-6.)

Item	Description	Tool
Dis-assembly	① Remove upper cover. (See 5.5.4 (1).)	No. 2-200 Philips screwdriver
	② Remove the circuit board mounting screw, raise the circuit board, and disconnect the space motor connector (CN4).	No. 2-200 Philips screwdriver
	③ Cut tie-wraps securing the space motor connection cord.	No. 5 H nippers
	④ Remove the space belt (Fig. 7-6-12) from the space motor (Fig. 7-3-2) pulley.	
	⑤ Remove the space motor mounting screw (Fig. 7-3-31), and then the space motor.	No. 2-200 Philips screwdriver
Reas-sembly	Reassemble, reversing above procedures.	
Adjust-ment	① Space belt tension  	
	Adjust space belt tension by moving idle pulley bracket to right or left so that tension is between 110 and 140 g when space belt is depressed 5 mm at the point shown above.	No. 2-200 Philips screwdriver 300-g stick pressure gauge
	② First character printing position See 5.5.4 (6), Adjustment ②	

(8) Space belt (See Figs. 7-3, 7-6 and 7-7.)

Item	Description	Tool
Dis-assembly	1 Remove the upper cover. (See 5.5.4 (1).)	No. 2-200 Philips screwdriver
	2 Loosen the idle pulley bracket screw (Fig. 7-3-34), move the idle pulley bracket to right to loosen space belt (Fig. 7-6-12).	No. 2-200 Philips screwdriver
	3 Remove the belt clamp screw (Fig. 7-7-4), and belt clamp (Fig. 7-7-2).	No. 2-200 Philips screwdriver
	4 Remove the E-snap (Fig. 7-6-15) from one of the ribbon spool gears, and remove the ribbon spool gear (Fig. 7-6-7).	No. 1 round pinchers
	5 Remove the detent spring (Fig. 7-6-9).	No. 1 round pinchers
	6 Remove the other E-snap (Fig. 7-6-15), and then the ribbon change lever (Fig. 7-6-2) and the ribbon drive gear (Fig. 7-6-6).	No. 1 round pinchers
	7 Remove the space belt.	
Reas-sembly	Reverse the disassembly procedure. Note: When reassembling the ribbon drive gear, engage its pulley teeth with space belt teeth accurately beforehand.	
Adjust-ment	1 Space belt tension See 5.5.4 (7), Adjustment 1	
	2 First character See 5.5.4 (6), Adjustment 2	

(9) Platen (See Figs. 7-3 and 7-4.)

Item	Description	Tool
Dis-assembly	① Remove the upper cover. (See 5.5.4 (1).)	No. 2-200 Philips screwdriver
	② Remove the detent spring (Fig 7-3-20).	No. 1 round pinchers
	③ Remove one of the E-snaps (Fig. 7-3-28), pull the cut knife lever shaft (Fig. 7-3-21) from the side plate, and remove the paper cut knife (Fig. 7-3-17). Note: Be careful not to lose the collar (Fig. 7-3-27) located between right and left side plates and paper cut knife.	No. 1 round pinchers
	④ Remove the paper separator screw (Fig. 7-3-33), and then the paper separator (Fig. 7-3-16).	No. 2-200 Philips screwdriver
	⑤ Remove the E-snap (Fig. 7-3-31), and then the idle gear (Fig. 7-3-8).	No. 1 round pinchers
	⑥ Pull the right and left plate bearings horizontally (Fig. 7-4-2) until their projections come off side plates, turn 90°, and remove platen by lifting it.	
Reas-sembly	Reverse the disassembly procedure.	
Adjust-ment	Clearance between the paper separator and the platen  Install the paper separator and the platen after securing a clearance of about 0.5 mm between them.	Thickness gauge

5.6 Maintenance Parts List

Table 5-3 shows the maintenance parts for every 1,000 units purchased that are considered convenient for maintenance purposes by the OEM.

5.6.1 Parts Ordering Procedure

(1) Find desired parts (Drawing Nos.) from the table of component parts in Chapter 7, and confirm them.

(2) Specify the drawing numbers and names of the parts required.

(3) Each part has its own number for easy interchageability. (If the part number is the same, the part is the same.)

5.6.2 How to See the List

(1) Ref. No.: Reference number in the table of component parts in Chapter 7.

(2) Rank: A -- Must be kept on hand.

B -- Recommended to be kept on hand.

(3) Recommended quantity: Quantity considered necessary after one year of operating 1,000 units purchased.

Table 5-3 Maintenance Parts List

Ref No.	Part No.	Nomenclature	Original quantity	Recom- mended quantity	Rank
Fig.7-2-1	3LR-121900	Print head assembly	1	36	A
Fig.7-3-2	4LR-129845	Space motor (pressure-fitted)	1	36	A
Fig.7-3-4	4LR-129779	Idle pulley	1	21	B
Fig.7-3-7	4LR-129846	LF motor (pressure-fitted)	1	6	A
Fig.7-3-8	4LR-129787	Idle gear	1	5	B
Fig.7-3-10	3LR-129900-3	Platen assembly	1	5	B
Fig.7-3-11	4LR-129848	Paper end unit	1	5	B
Fig.7-3-15	5LR-129801	Pressure roller	1	5	B
Fig.7-3-22	4LR-129847	Photo interrupter assembly	1	27	B
Fig.7-6-3	4LR-129827	Ribbon gear	1	18	B
Fig.7-6-6	4LR-129833	Ribbon drive gear	1	18	B
Fig.7-6-7	4LR-129837	Ribbon spool gear	2	10	B
Fig.7-6-12	4LP-1313-101	Mini-pitch belt	1	36	B
Fig.7-6-13	FMX-20517	Pressure roller	1	18	B
Fig.7-7-1	3LR-129866	Carriage frame	1	36	B
Fig.7-7-3	5LR-121926	Ribbon protector	1	36	B
Fig.7-8-18	4LP-3621-2	Flip-flop switch	1	5	B
Fig.7-9-2	4LP-3349	Paddle locker switch	1	5	B
Fig.7-9-3	4LP-44293	LED (with holder)	1	5	B
Fig.7-10-8	4LR-129849	Microswitch assembly	1	5	B
** Fig.7-11	2LX-86686-1 (LY-38835-3)	LEPS Circuit board (LEPU Circuit board)	1	10	A
Fig.7-11-F1	4LP-8475-B-28	1.75 A fusee	1	20	A
*** Fig.7-8-17	4LP-6735-10 (4LP-8475-B-28)	0.8 A fuse (1.75 A fuse)	1	40	A
Fig.7-11-Q1	I4LP-11368-03	μPD8155	1	9	B
Fig.7-11-Q2	I4LP-11387-6	μPD8048C mask CPU	1	14	B
Fig.7-11-Q3	I4LP-11388	NH46231 6EP mask ROM	1	9	B
** Fig.7-11-Q8. Q10.Q11	4LP-44329	Transister array ULN 20648	3	25	B
Fig. 7-11-Tr7~Tr17	(Q4LP-44288)	(2SC 2324 k Transister)	(11)	(66)	
** Fig.7-11-Q9 (Fig.7-11-Q8)	ULN2003A	Transistor array	1	6	B
Fig.7-11-TR1	Q4LP-44232	2SB712 transistor	1	6	B
Fig.7-11-TR6	Q4LP-11830-49	FS7805 IC regulator	1	9	B
Fig.7-11-D10	4LP-44327	Bridge diode MI-151	1	6	B
Fig.7-11-D9,D11	4LP-44328	Bridge diode MI-151R	2	11	B
Fig.7-11-ZD2	AU01-15	Zener diode	1	6	B
Fig.7-11-ZD3	AU01-07	Zener diode	1	6	B

Ref No.	Part No.	Nomenclature	Original quantity	Recom-mended quantity	Rank
Fig.7-12-TR4, TR5	4LP-9403-2-C	Thyristor SCM2A2	2	6	B
Fig.7-12-7	5LR-129890	Idle gear	1	5	B
Fig.7-2-11	4LR-132233	Platen knob	1	5	B
* Fig.7-12-9	5LR-123498	Bushing	2	10	B
* Fig.7-12-10	FMX-35100-2	Sheet feeder assembly (R)	1	5	B
* Fig.7-12-11	FMX-35150-2	Sheet feeder assembly (L)	1	5	B
Fig.7-328	5KX-9057	E-snap ring (E2)	5	25	B
Fig.7-3-31	5KH-12050	E-snap ring (E3)	6	30	B
Fig.7-3-29	5KX-9087	E-snap ring (E4)	2	10	B
Fig.7-3-30	5KX-70515	E-snap ring (E5)	1	5	B
* Fig.7-12-12	5KD-50242	E-snap ring (E8)	1	20	B
* Fig.7-12-14	⊕ P(SW+W) 3-6-23D	Small pan-head screw	2	10	B
* Fig.7-12-15	⊕ P(SW+2W) 3-8-23D	Small pan-head screw	2	10	B
* Fig.7-12-5	5LR-129887	Clamp lever	2	10	B
* Fig.7-12-5	5LR-129889	Tractor gear	1	5	B

Note: 1) The parts marked with an asterisk are those for the variable tractor unit (option).

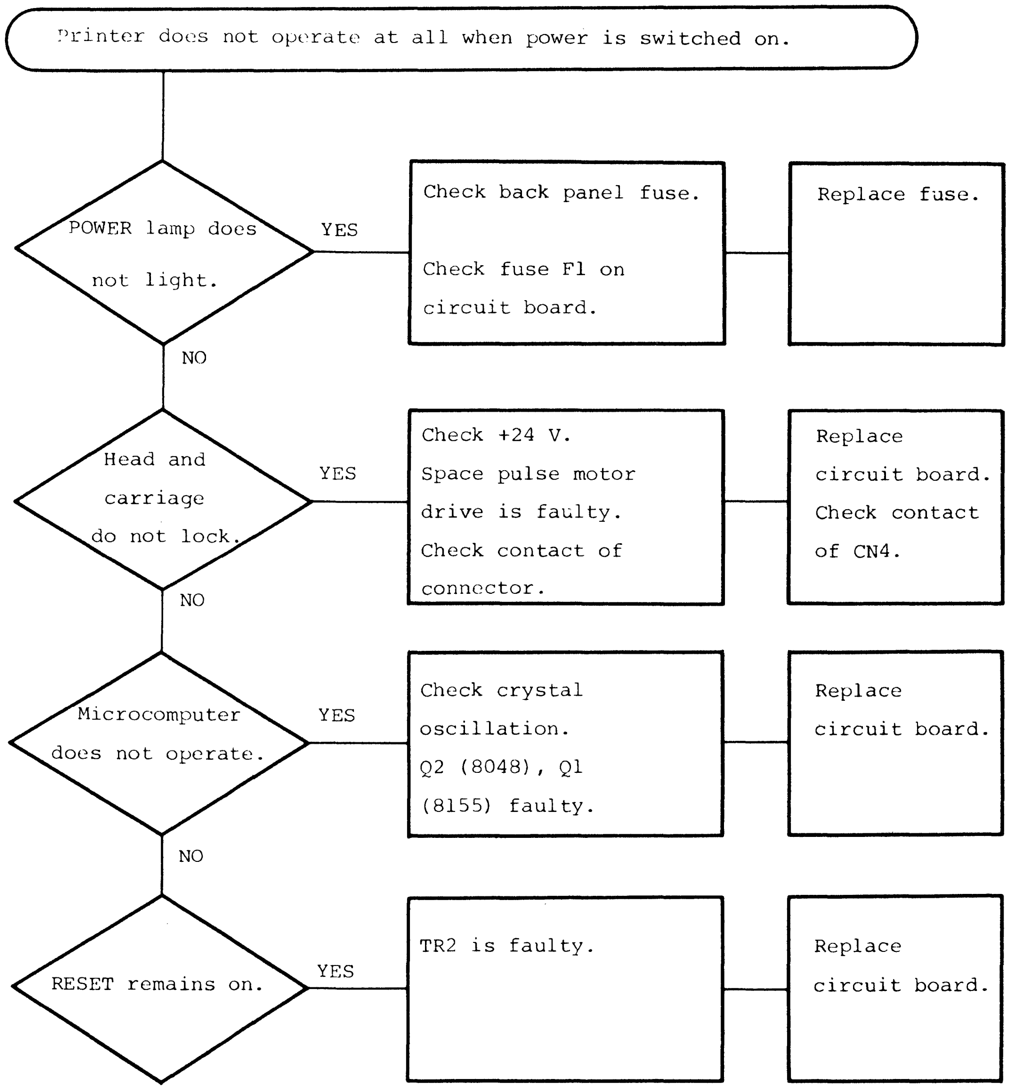
2) The symbols in parentheses marked ** are parts for the LEPU circuit board.

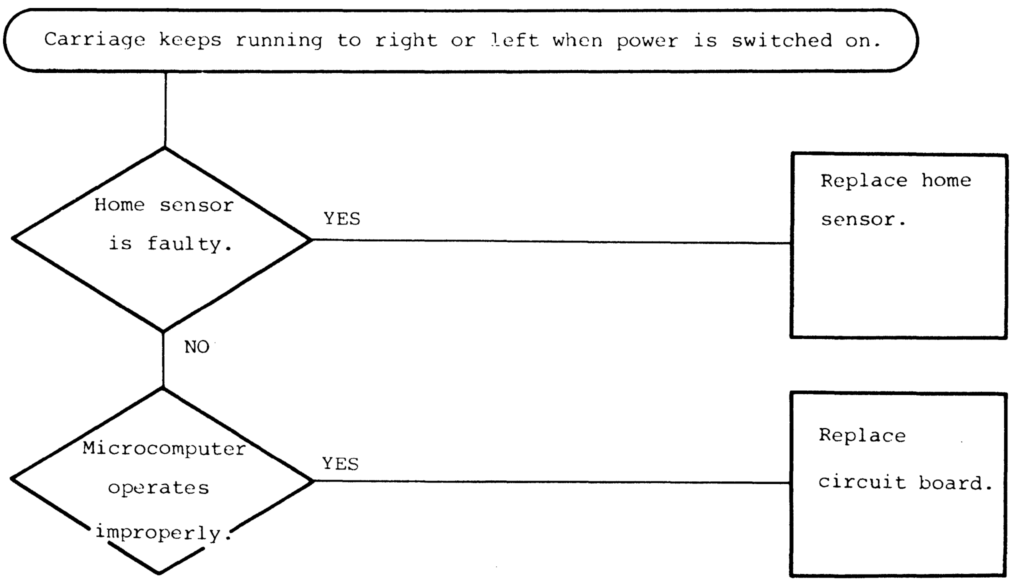
3) The symbols in parentheses marked *** are parts to be used where the input voltage is 100/115 V A.C.

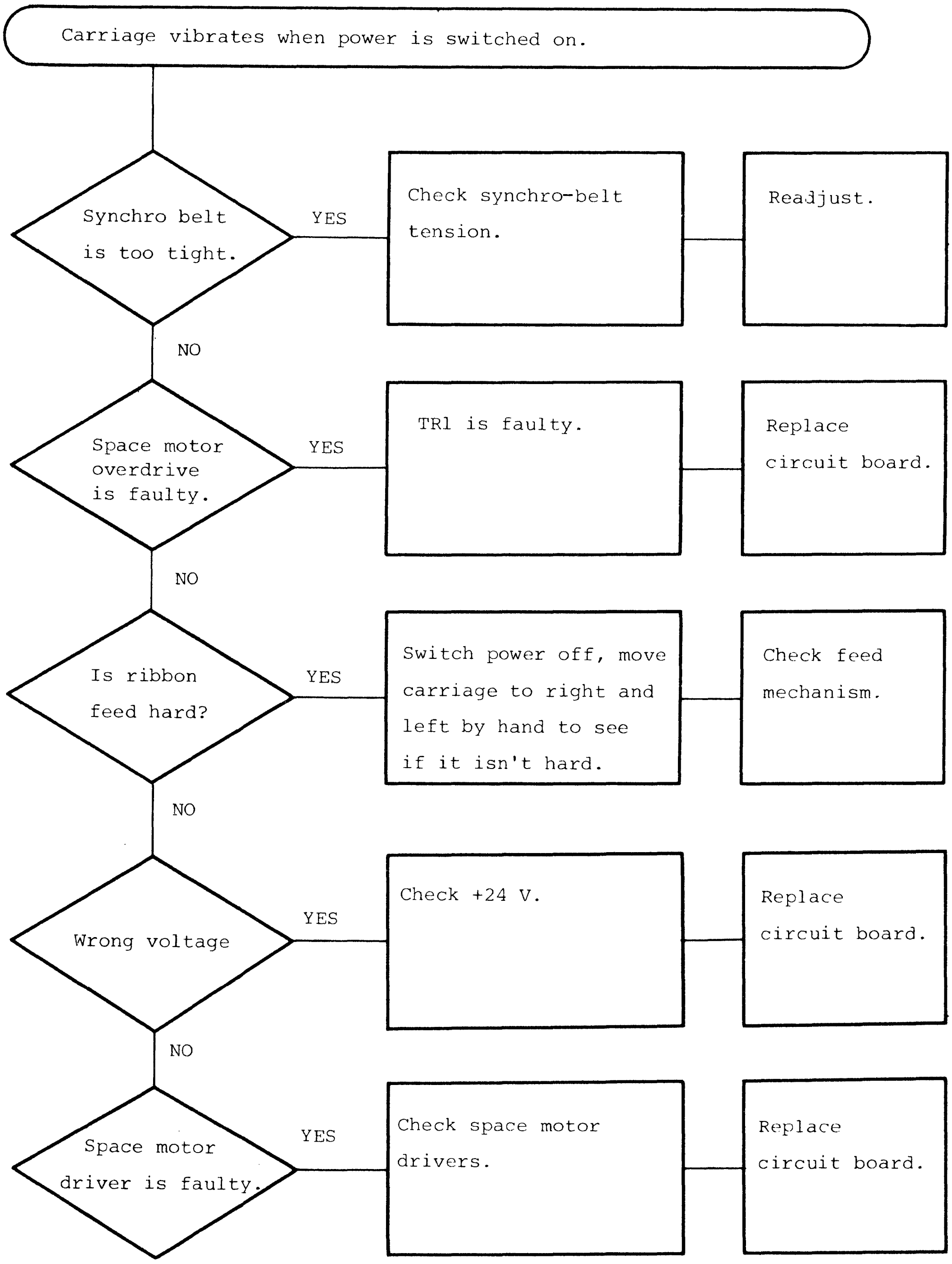
5.7 Troubleshooting Flow Charts

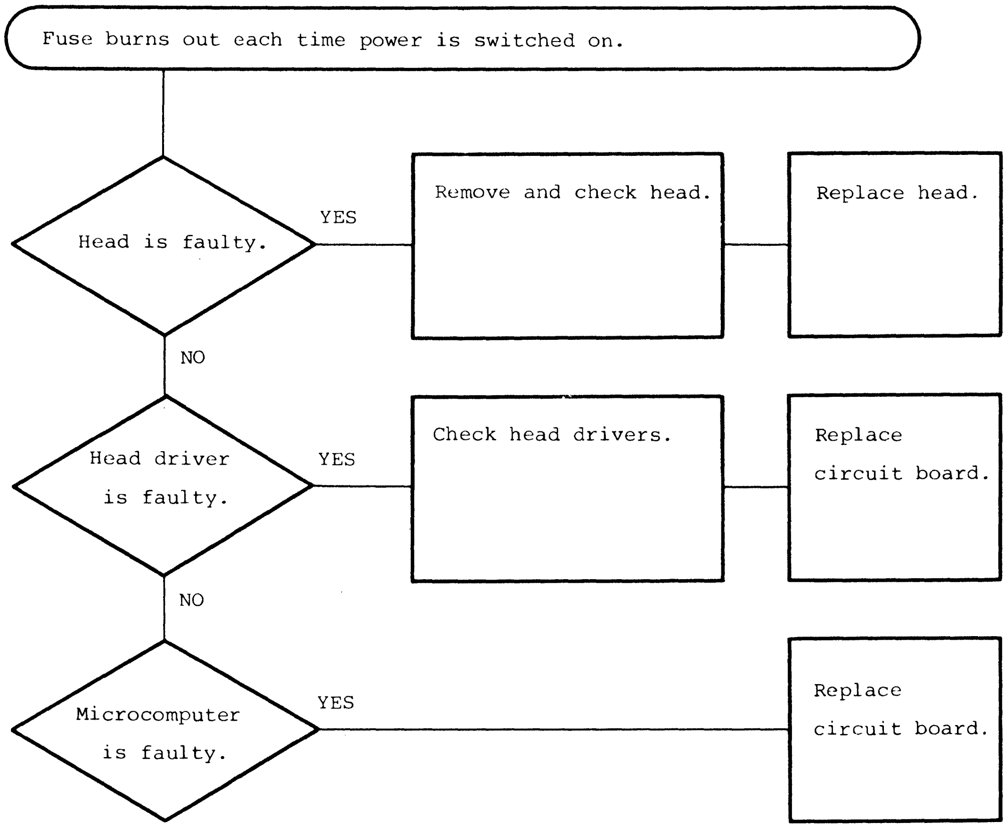
These flow charts are provided for remedying troubles which might develop at the user's, and should be referred to after confirming what and how the trouble is.

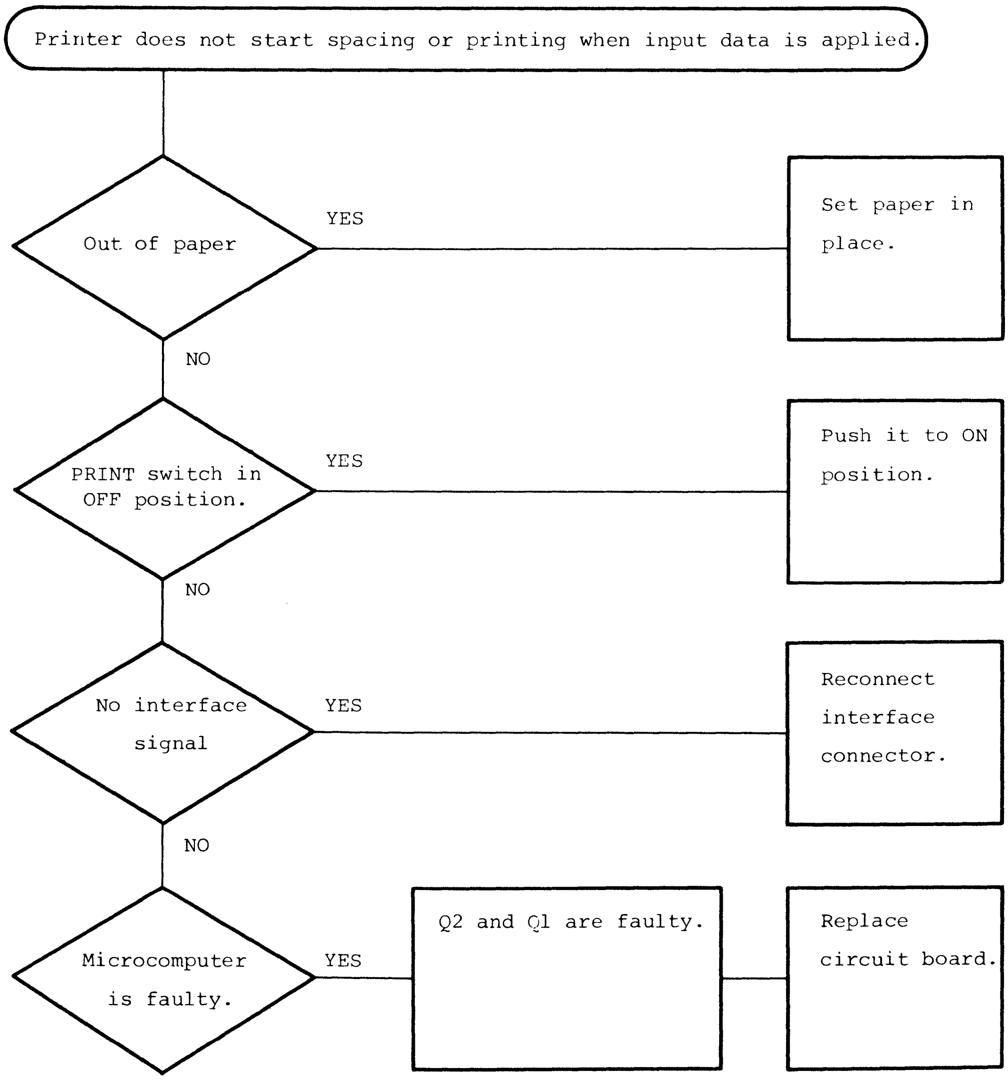
Operation trouble at switching on	Print head does not come to home position.	Does not move at all.
		Moves to right or left, but does not stop.
		Vibrates.
	Fuse burns out.	
Operation trouble after switching on	Neither spacing nor printing operation takes place when input data is applied.	
	Spaces but does not print.	
	Prints but does not space.	
	Print head does not return to home position after printing.	
	No line spacing	
	Neither paper end nor paper near end function works.	
	Characters are skipped, or wrong characters are printed.	
	Some dots are not printed.	
	Fuse burns out after some length of operation.	

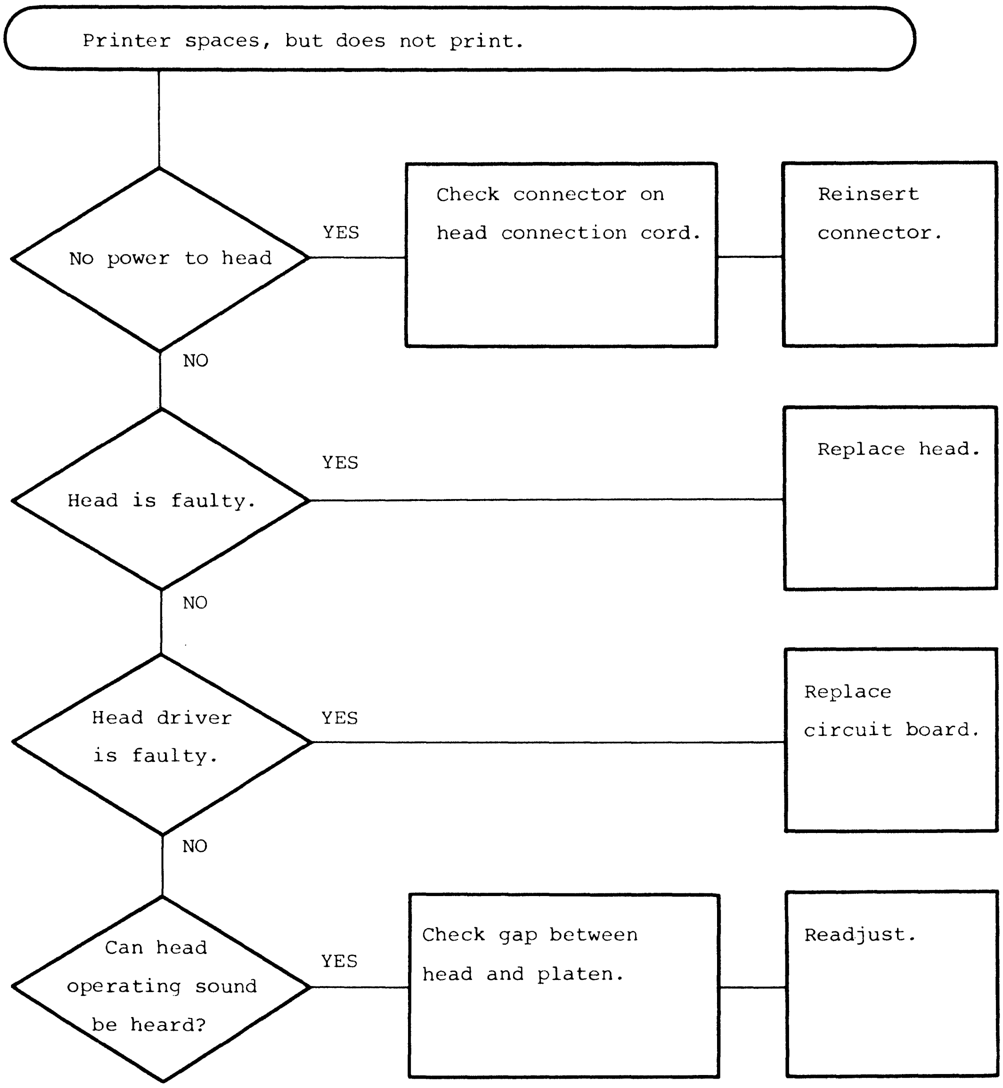

Printer does not operate at all when power is switched on.
POWER lamp does not light.
YES
Check back panel fuse.
Check fuse F1 on circuit board.
Replace fuse.
NO
Head and carriage do not lock.
YES
Check +24 V.
Space pulse motor drive is faulty.
Check contact of connector.
Replace circuit board.
Check contact of CN4.
NO
Microcomputer does not operate.
YES
Check crystal oscillation.
Q2 (8048), Q1 (8155) faulty.
Replace circuit board.
NO
RESET remains on.
YES
TR2 is faulty.
Replace circuit board.

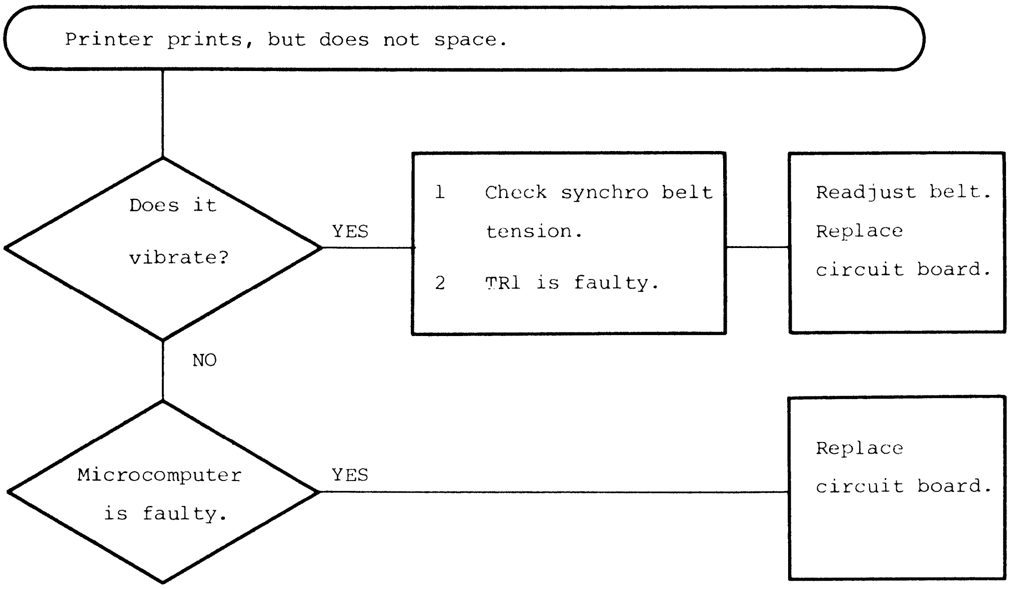

Carriage keeps running to right or left when power is switched on.
Home sensor is faulty.
YES
Replace home sensor.
NO
Microcomputer operates improperly.
YES
Replace circuit board.

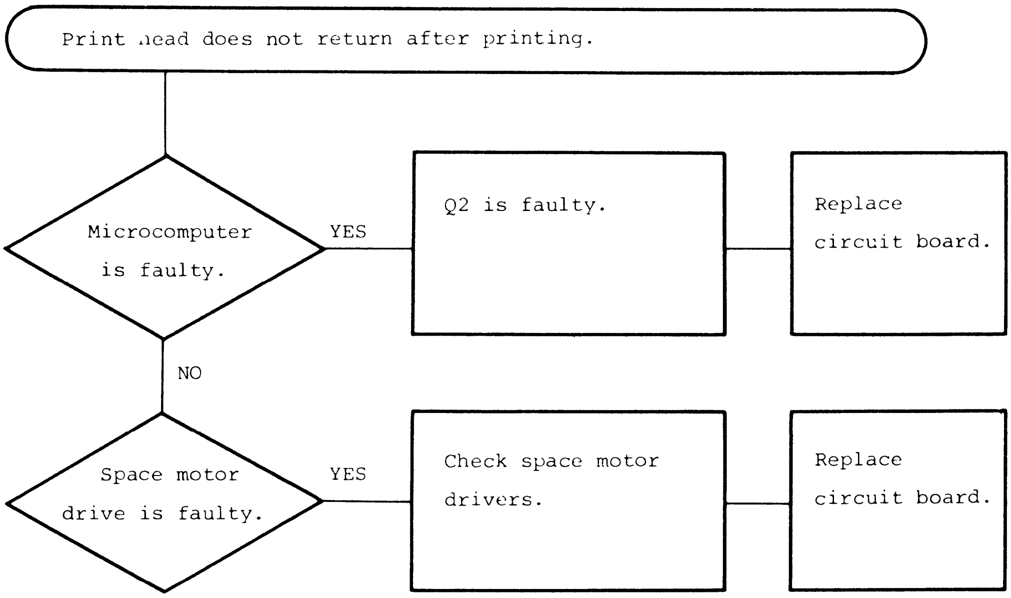

Carriage vibrates when power is switched on.
Synchro belt is too tight.
YES
Check synchro-belt tension.
Readjust.
NO
Space motor overdrive is faulty.
YES
TR1 is faulty.
Replace circuit board.
NO
Is ribbon feed hard?
YES
Switch power off, move carriage to right and left by hand to see if it isn't hard.
Check feed mechanism.
NO
Wrong voltage
YES
Check +24 V.
Replace circuit board.
NO
Space motor driver is faulty.
YES
Check space motor drivers.
Replace circuit board.

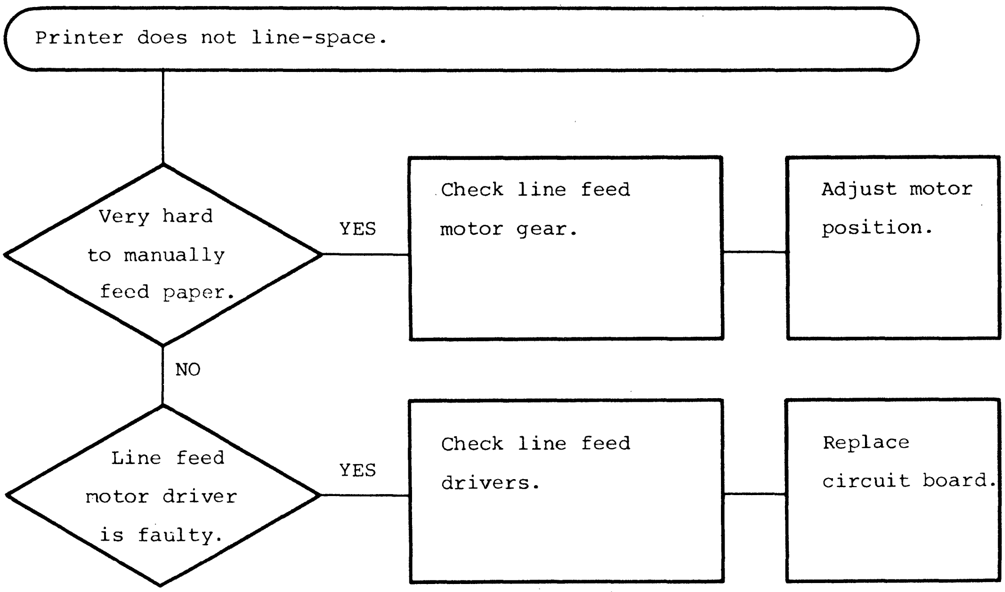

Fuse burns out each time power is switched on.
Head is faulty.
YES
Remove and check head.
Replace head.
NO
Head driver is faulty.
YES
Check head drivers.
Replace circuit board.
NO
Microcomputer is faulty.
YES
Replace circuit board.

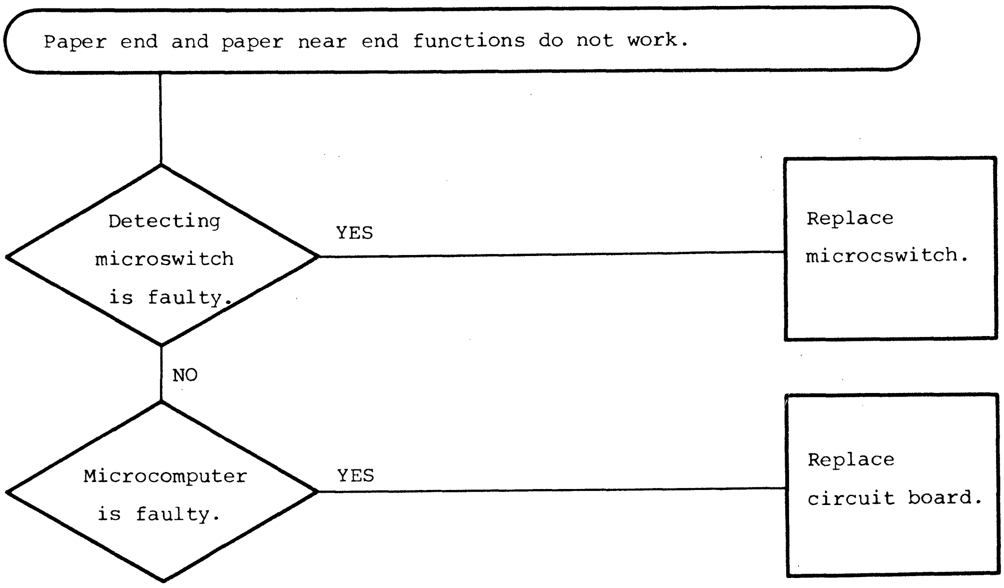

Printer does not start spacing or printing when input data is applied.
Out of paper
YES
Set paper in place.
NO
PRINT switch in OFF position.
YES
Push it to ON position.
NO
No interface signal
YES
Reconnect interface connector.
NO
Microcomputer is faulty.
YES
Q2 and Q1 are faulty.
Replace circuit board.

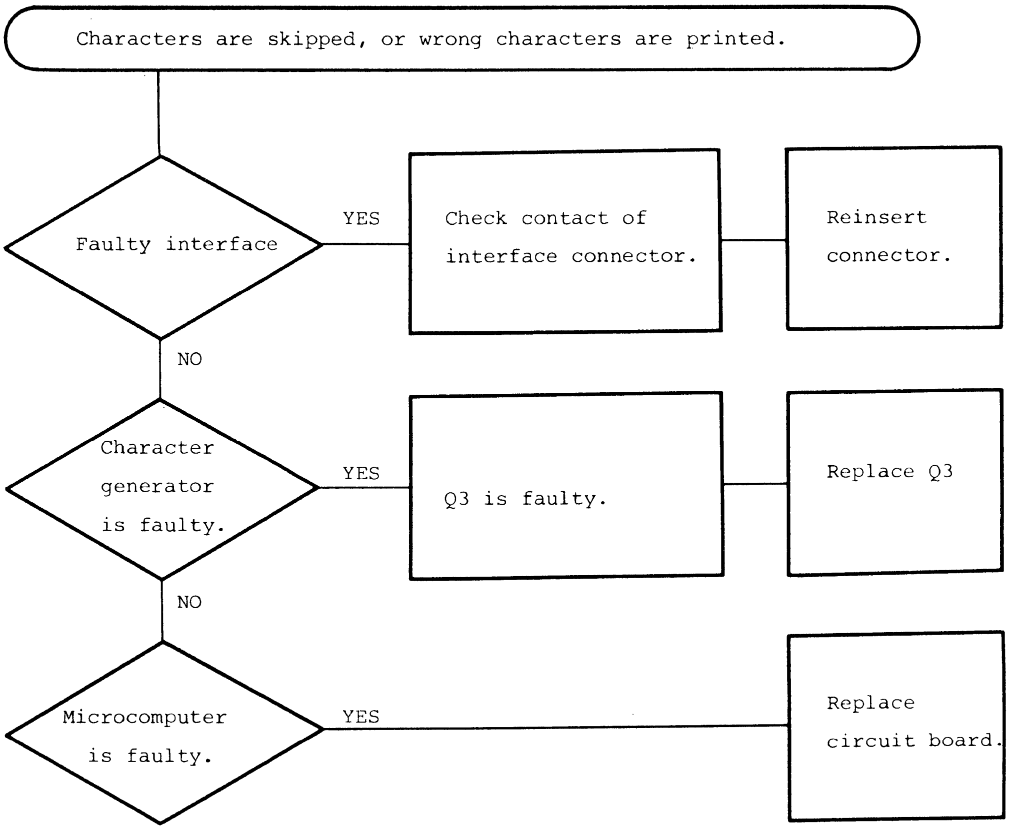

Printer spaces, but does not print.
No power to head
YES
Check connector on head connection cord.
Reinsert connector.
NO
Head is faulty.
YES
Replace head.
NO
Head driver is faulty.
YES
Replace circuit board.
NO
Can head operating sound be heard?
YES
Check gap between head and platen.
Readjust.

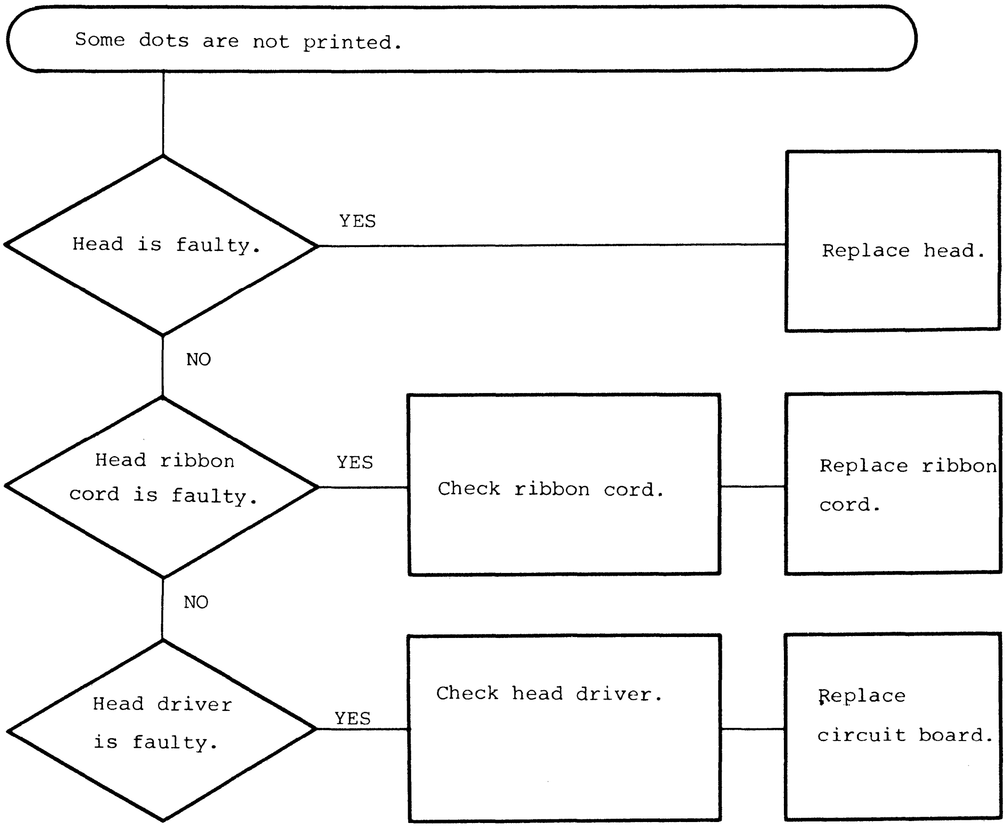

Printer prints, but does not space.
Does it vibrate?
YES
1 Check synchro belt tension.
2 TR1 is faulty.
Readjust belt.
Replace circuit board.
NO
Microcomputer is faulty.
YES
Replace circuit board.

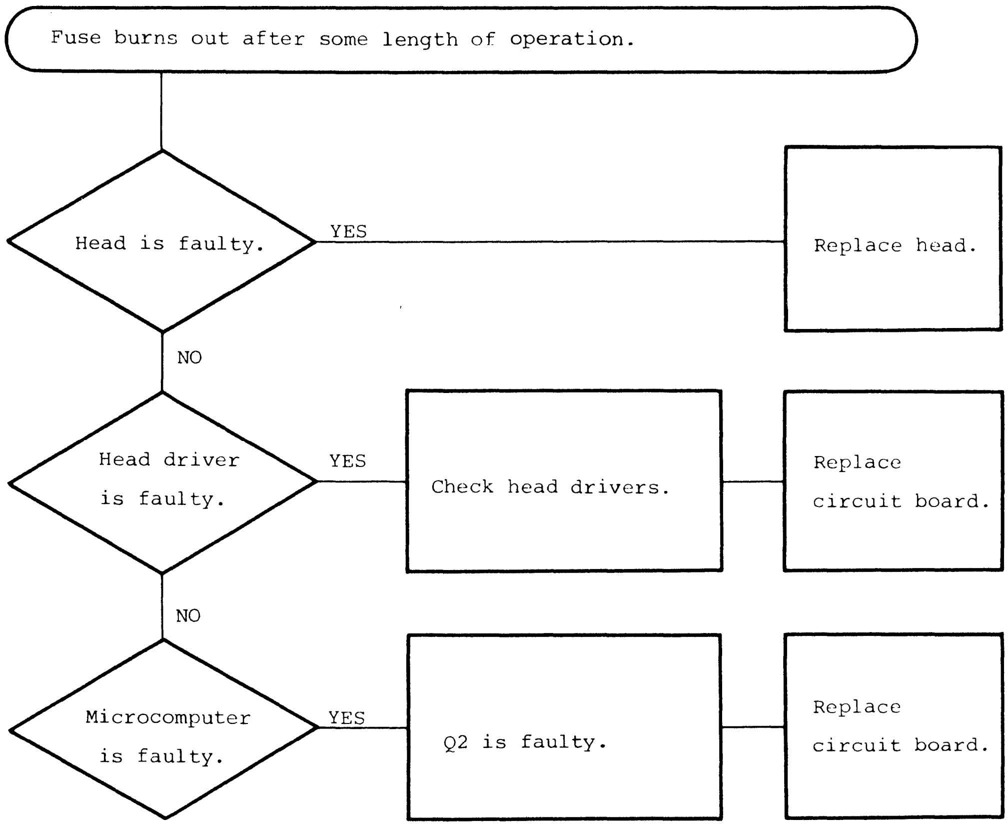

Print head does not return after printing.
Microcomputer is faulty.
YES
Q2 is faulty.
Replace circuit board.
NO
Space motor drive is faulty.
YES
Check space motor drivers.
Replace circuit board.


Printer does not line-space.
Very hard to manually feed paper.
YES
Check line feed motor gear.
Adjust motor position.
NO
Line feed motor driver is faulty.
YES
Check line feed drivers.
Replace circuit board.


Paper end and paper near end functions do not work.
Detecting microswitch is faulty.
YES
Replace microcswitch.
NO
Microcomputer is faulty.
YES
Replace circuit board.


Characters are skipped, or wrong characters are printed.
Faulty interface
YES
Check contact of interface connector.
Reinsert connector.
NO
Character generator is faulty.
YES
Q3 is faulty.
Replace Q3
NO
Microcomputer is faulty.
YES
Replace circuit board.


Some dots are not printed.
Head is faulty.
YES
Replace head.
NO
Head ribbon cord is faulty.
YES
Check ribbon cord.
Replace ribbon cord.
NO
Head driver is faulty.
YES
Check head driver.
Replace circuit board.


Fuse burns out after some length of operation.
Head is faulty.
YES
Replace head.
NO
Head driver is faulty.
YES
Check head drivers.
Replace circuit board.
NO
Microcomputer is faulty.
YES
Q2 is faulty.
Replace circuit board.

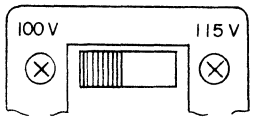
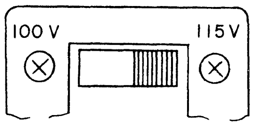
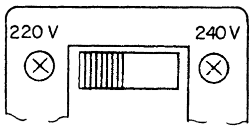
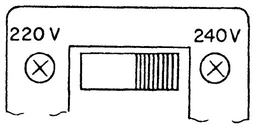
5.8 Voltage Select Switch, Short Plugs and Jumper Wires

The following are provided inside the equipment for selecting various functions and for local tests.

5.8.1 Voltage Select Switch

Set the voltage select switch as shown in the table below as suitable to the a.c. input voltage.

Remove the upper cover, and there is a slide switch under the platen on the printer. Set this switch as appropriate.

	Voltage select switch	A.C. input voltage
100 V equip-ment		100 V
		115 V 120 V
200 V equip-ment		220 V
		230 V

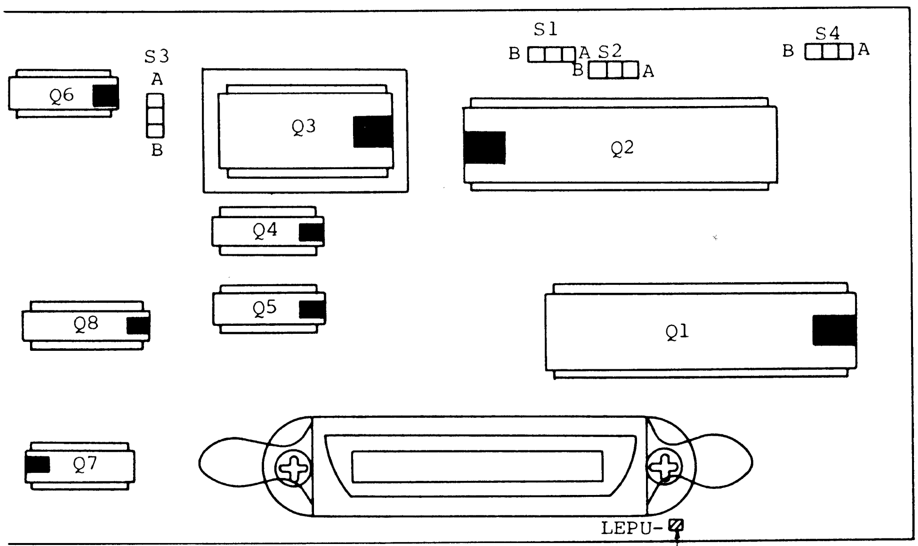
5.8.2 Jumper Plugs (Short Plugs)

Various functions can be selected with jumper plugs on the printed circuit board. Insert plugs S1 to S4, printed white on the printed circuit board, on Side A or B.

[Example]

S2 on Side A　　　　　　S2 on Side B

This drawing describes the functions of jumper plugs on the MICROLINE 80 printed circuit board.



Refer to Note 2).

Jumper Plug Table

Plug No.	Position of jumper plug	
	Side A	Side B
S1	Character code ASCII	Character code JIS
S2	ON LINE	OFF LINE (Local test on)
S3	Fixed on Side A	
S4	NOT AUTO LF	AUTO LF

Note: 1) NOT AUTO LF: On receipt of 80-character data, prints but does not paper feed a line.

AUTO LF: On receipt of 80-character data, prints and paper feeds a line.

2) If the numeral "3" is engraved immediately after the name "LEPU", the character code JIS applies to side A and character code ASCII to side B.

3) All jumper plugs are positioned on side A when shipped from the factory. Adjust their locations according to requirements by using the jumper plug table.

S	Inserting Side	Function
S2	A	On line: For applying inputs from interface line
	B	Local test: When PRINT switch is pushed to ON position with S2 at this position, printer prints all characters continuously. Set PRINT switch to OFF to stop printer. Caution 1. Avoid continuous printing for a long time because it will raise temperature and shorten life. 2. Keep interface cord unplugged.
S4	A	Automatic line spacing function cut out: If CR code is received, or if more than 80 characters are received, printer prints and then only returns carriage. Paper is moved up one line only when LF code is received.
	B	Automatic line spacing function: If CR code is received, or if more than 80 characters are received, printer prints and then automatically returns carriage and moves paper up one line.

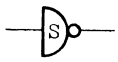
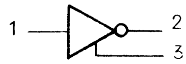
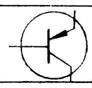
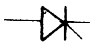
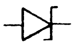
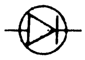
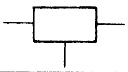
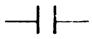
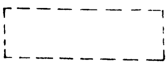
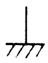
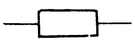
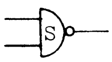
5.8.3 Switching Jumpers

Jumper	Connection	Disconnection
S6	A voltage of about 10 V is applied to Pin 34 of interface.	The voltage mentioned at left is cut out.
R17 (51Ω)	A half-wave rectified voltage of about 23 V is applied to Pin 36 of interface.	The voltage mentioned at left is cut out.

6 CIRCUIT DIAGRAMS

This chapter describes the circuit diagrams of the Microline 80. There are two types of circuit board, one is LEPU and the other is LEPS. These two circuit boards have completely the same functions and compatibility. The major difference between them is that head and carriage pulse motor drivers of LEPU are transistors, while the ones of LEPS are monolithic ICS. The newly ordered circuit board should be LEPU circuit board.

Fig. 6-1 Table of Symbols

Symbol	Mark	Description
	Q	SN 7405 inverter (Open collector)
		Darlington transistor (1: base; 2: collector; 3: emitter)
	OSC	Ceramic oscillator
	TR	Transistor
	TR	Thyristor
	D	Diode
	ZD	Zener diode
		Light emitting diode
	TR	Regulator
	C	Capacitor
	C	Electrolytic capacitor
	R	Resistor
	SW	Switch
	S	Shortcircuit line or plug
	CN	Connector (terminal)
 Reference		Means a single part.
		FG ground
		Dot head (element)
	Q	SN7403 2 NAND gate (open collector

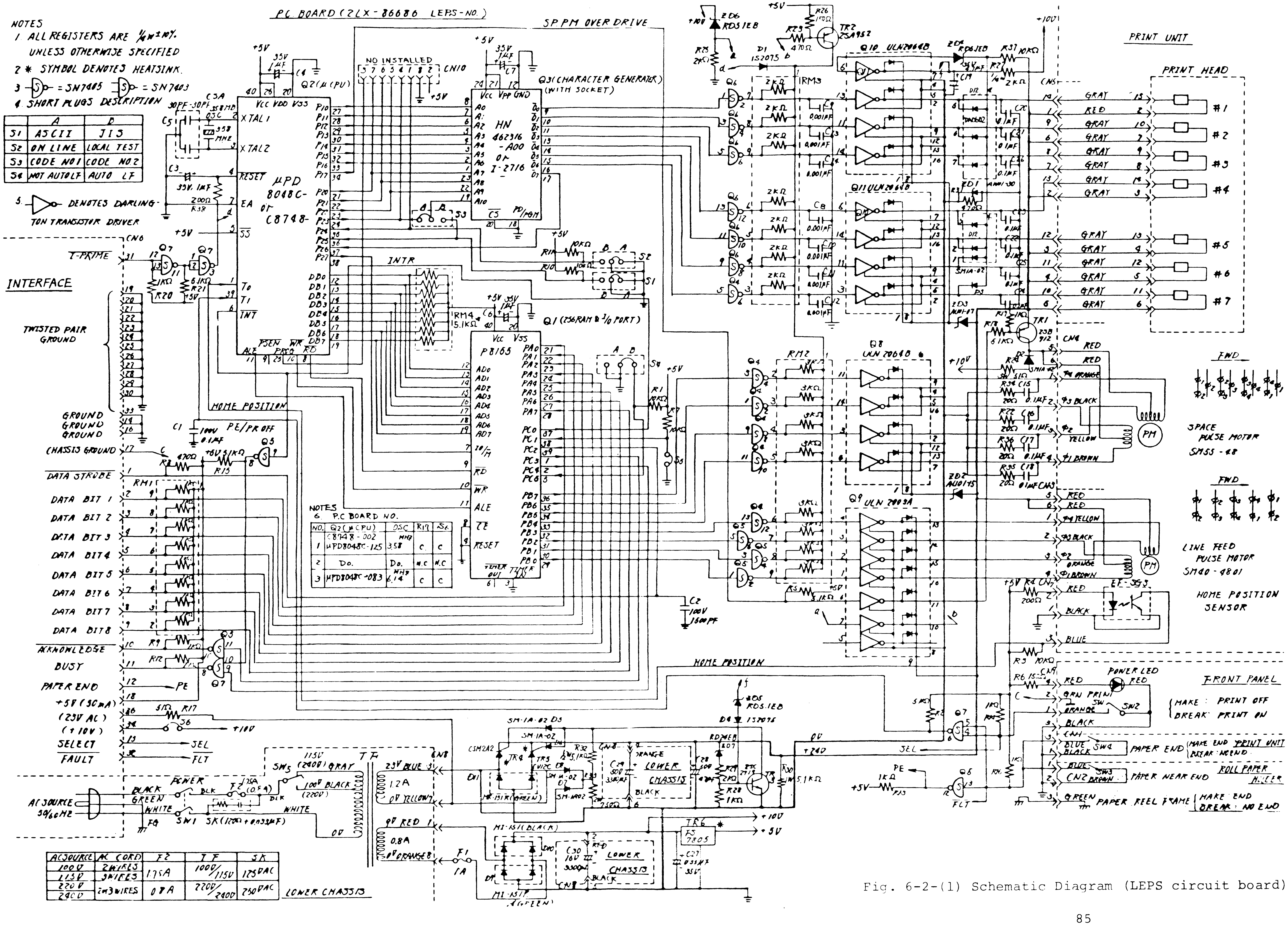


Fig. 6-2-(1) Schematic Diagram (LEPS circuit board)

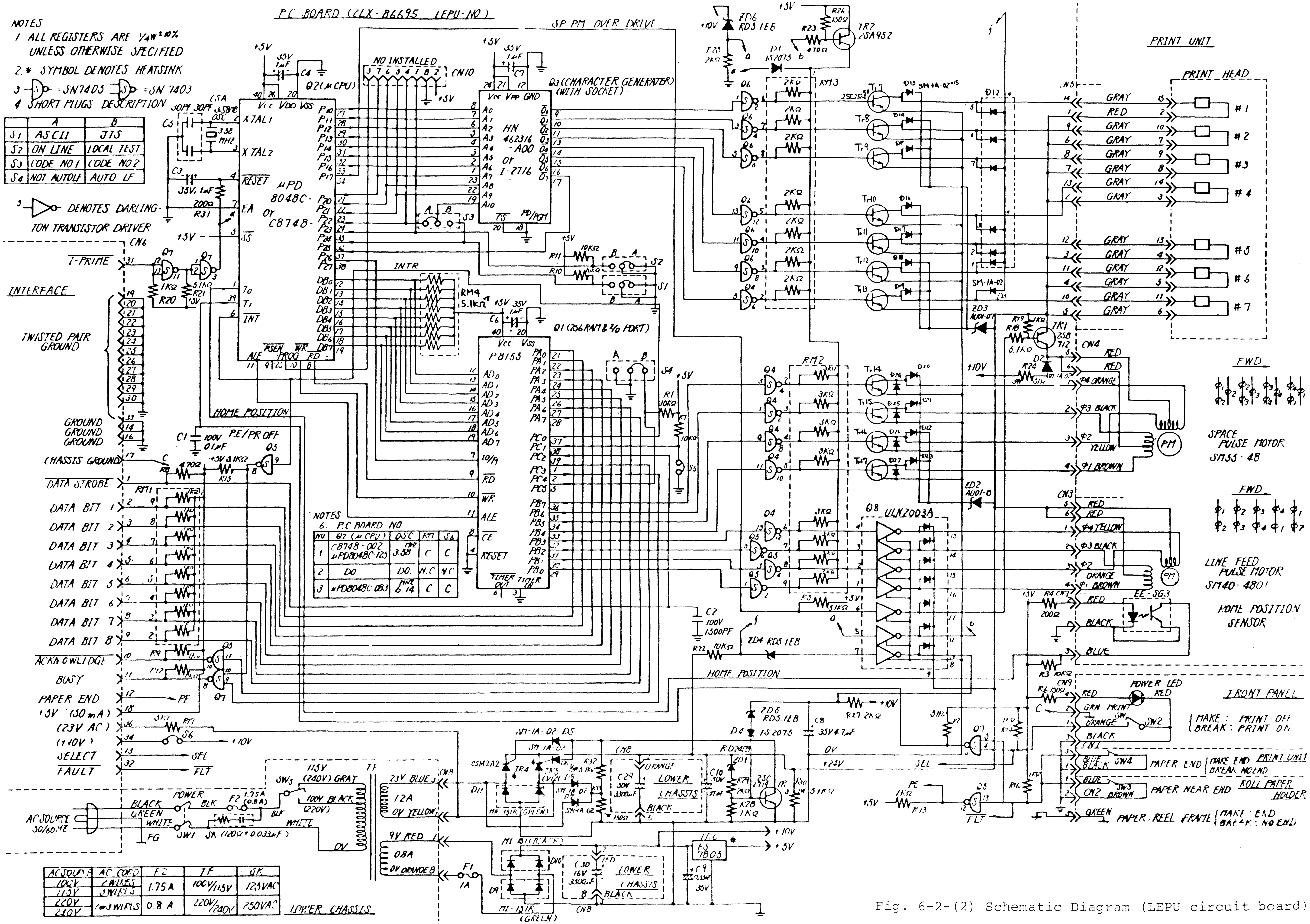


Fig. 6-2-(2) Schematic Diagram (LEPU circuit board)

7 TABLE OF COMPONENT PARTS

This chapter describes the main component parts of the Microline 80 in the order of the following schematic diagrams.

- Fig. 7-1 General Assembly Diagram (LY-43204-3 (for 100/115 V A.C.))
  (LY-43204-4 (for 220/240 V A.C.))
  - Fig. 7-2 Printer Unit (2LR-1322-2)
    - Fig. 7-3 Base Unit (2LR-193480-2)
      - Fig. 7-4 Platen Assembly (3LR-129900-3)
      - Fig. 7-5 Paper End Unit (4LR-129848-2
    - Fig. 7-6 Ribbon Assembly (3LR-193456-1)
    - Fig. 7-7 Carriage Assembly (5LR-129865)
  - Fig. 7-8 Cover Unit (1LM-61520-3 (for 100/115 V A.C.))
    (1LM-61520-4 (for 220/240 V A.C.))
    - Fig. 7-9 Switch Assembly (4LM-58646)
  - Fig. 7-10 Roll Paper Support Assembly (2LM-58648)
  - Fig. 7-11 LEPU Circuit Board (2LX-86695-1)
- Fig. 7-12 Tractor Assembly (2LR-129880)
  - Fig. 7-13 Sheet Feeder Assembly (R) (FMX-35100-2)
  - Fig. 7-14 Sheet Feeder Assembly (L) (FMX-35150-2)

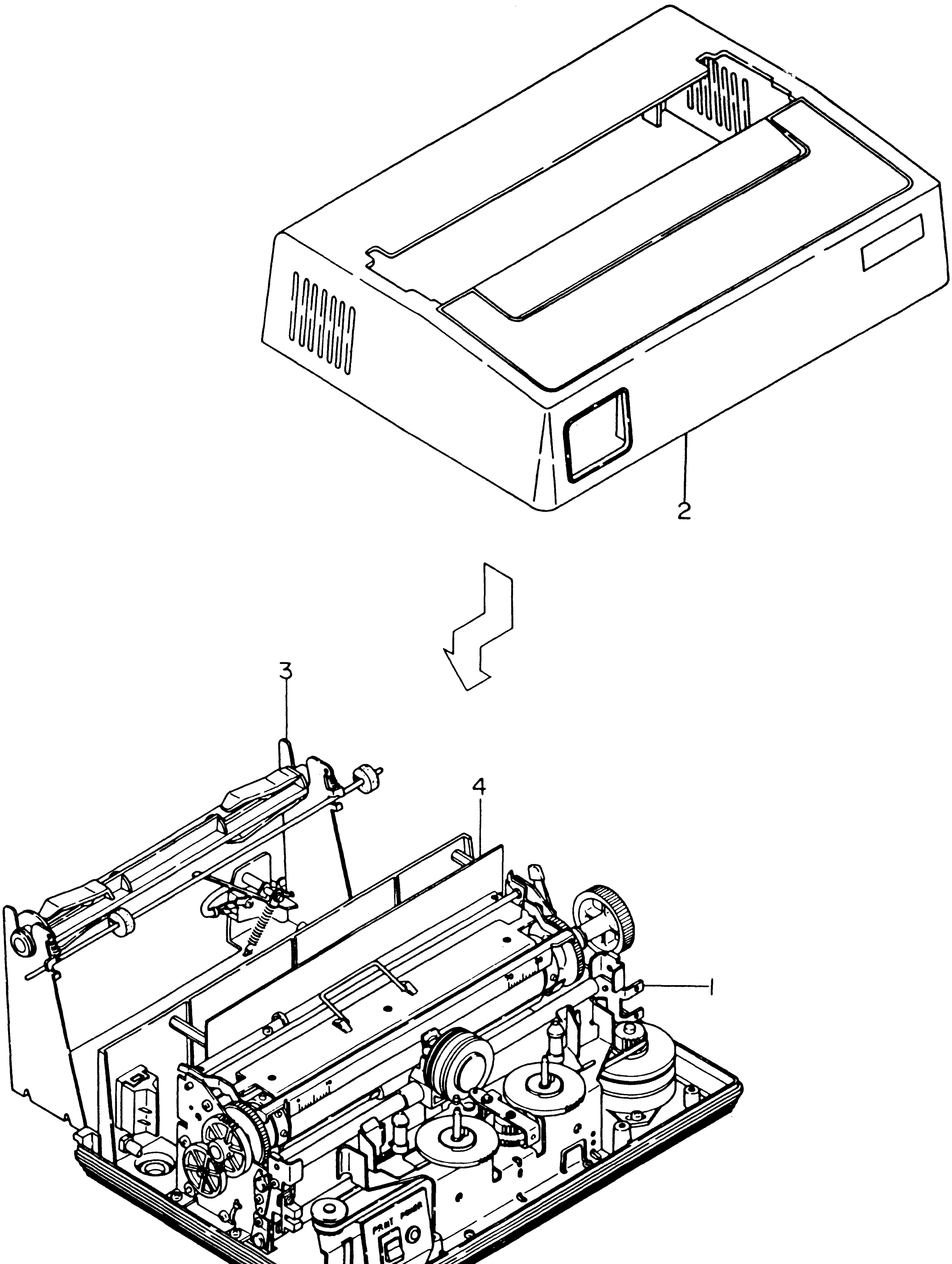
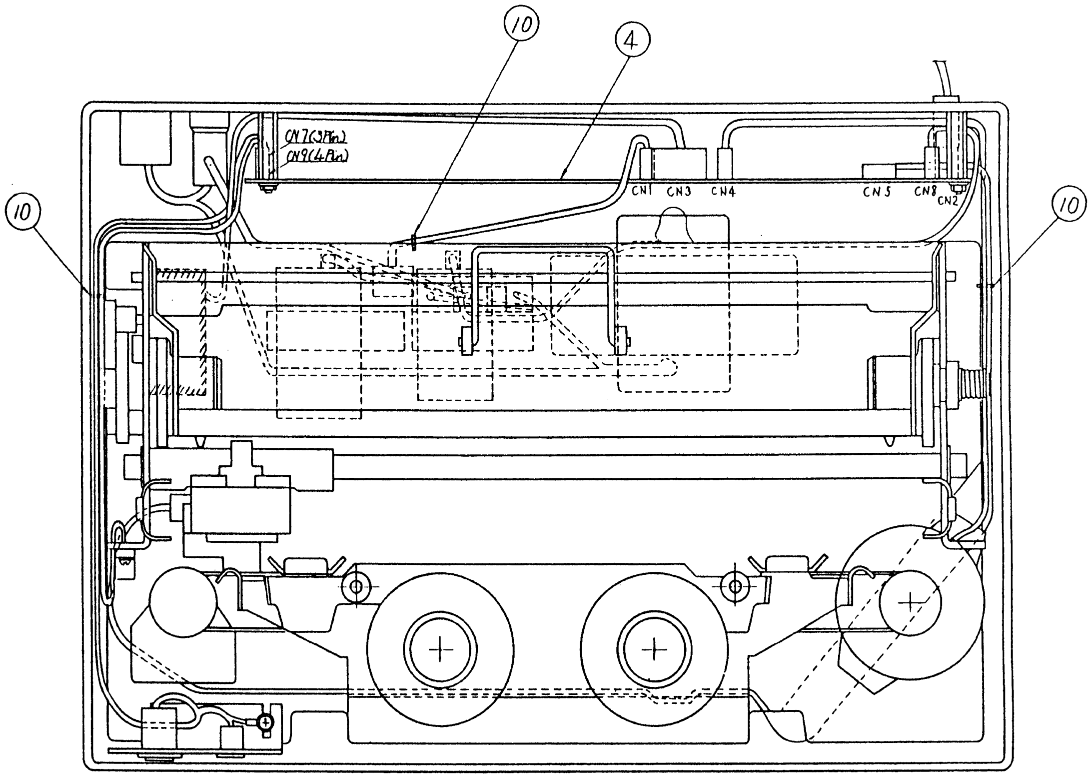


Fig. 7-1 General Assembly Diagram (LY-43204-3, 4) (1/2)



Note: Cord connecting points are as follows:

CN1 Sheet end microswitch
CN2 Roll paper support assembly
CN3 Line feed motor
CN4 Space motor
CN5 Print head
CN7 Home sensor
CN8 Transformer
CN9 Control panel

Fig. 7-1 General Assembly Diagram (LY-43204-3, 4) (2/2)

Fig. 7-1 General Assembly Diagram (LY-43204-3, 4)

No.	Part No.	Nomenclature	Quantity	Remarks
1	2LR-1322-2	Printer unit	1	
* 2	1LM-61520-4 (1LM-61520-3)	Cover unit	1	
3	2LM-58648	Roll paper support assembly	1	
4	2LX-86695-1	LEPU circuit board	1	
10	4LP-6401-b1	Tie-wrap	3	

* The symbols in parentheses apply to cases where the input voltage is 100/115 V A.C.

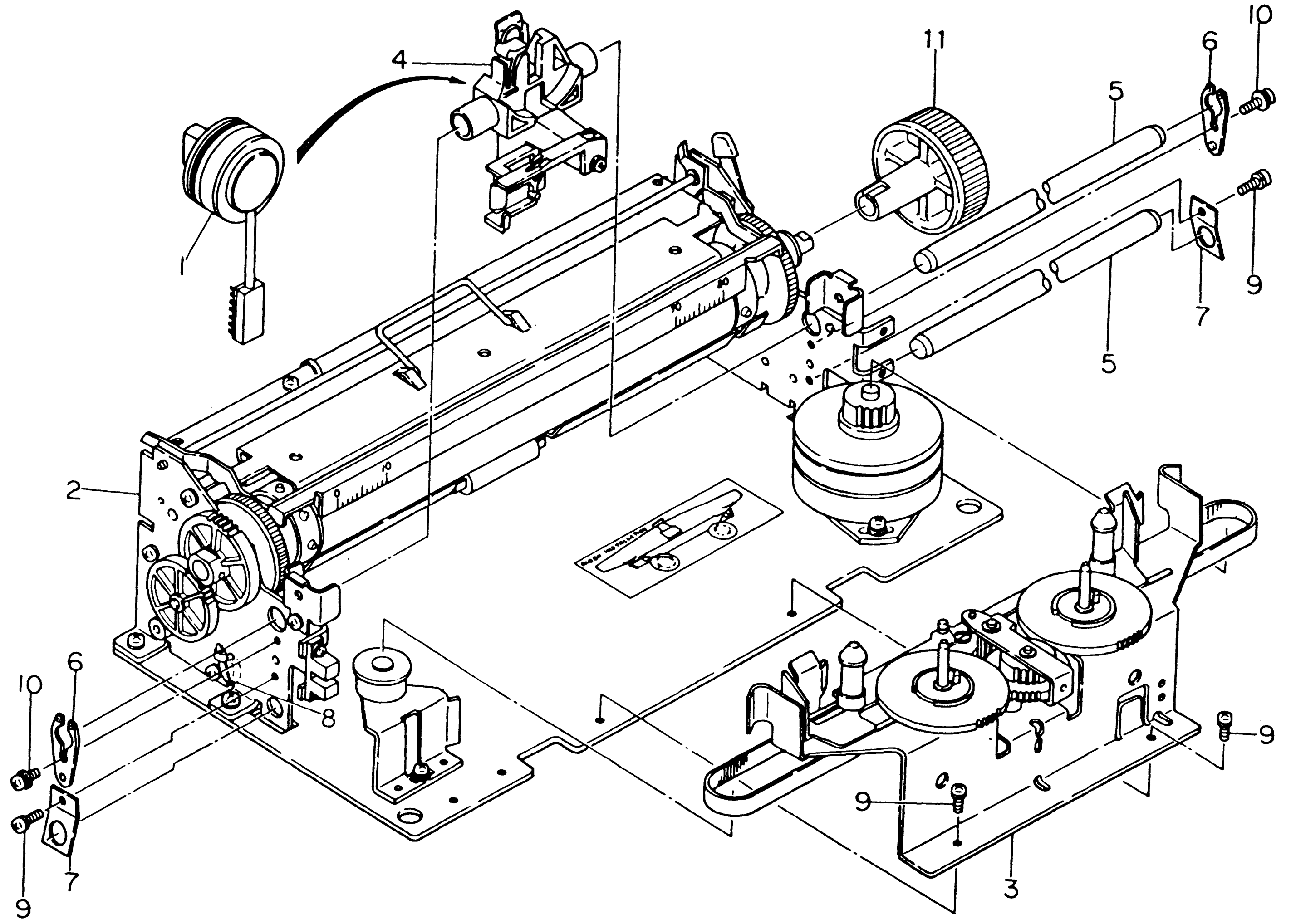


Fig. 7-2 Printer Unit (2LR-1322-2)

Fig. 7-2 Printer Unit (2LR-1322-2)

No.	Part No.	Nomenclature	Quantity	Remarks
1	3LR-121900-1	Print head assembly	1	
2	2LR-193480-2	Base unit	1	
3	3LR-193456-1	Ribbon assembly	1	
4	5LR-129865	Carriage assembly	1	
5	5LR-129791	Carriage shaft	2	
6	5LR-129792	Snap lever	2	
7	5LR-129793	Lock plate	2	
8	4LP-6401-B1	Tie-wrap	2	
9	⊕P(SW)3-6-HH	Small pan-head screw	4	
10	⊕P(SW + 2W) 3-6-HH	Small pan-head screw	2	
11	4LR-132233	Platen knob	1	

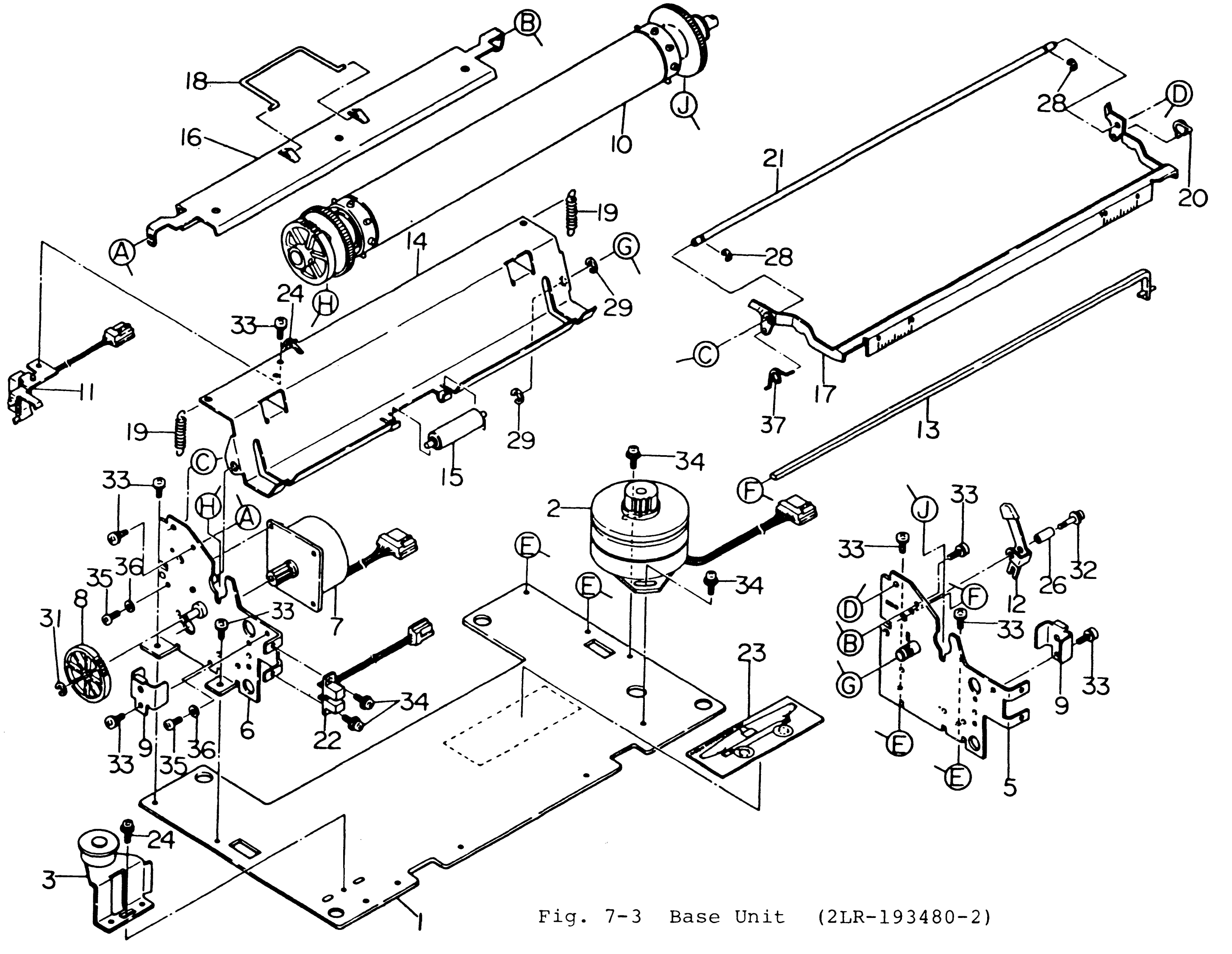


Fig. 7-3 Base Unit (2LR-193480-2)

Fig. 7-3 Base Unit (2LR-193480-2)

No.	Part No.	Nomenclature	Quantity	Remarks
1	3LR-129771	Base plate	1	
2	4LR-129845	Space motor (pressure-fitted)	1	
3	5LR-193441-1	Idle pulley bracket (clinched)	1	
5	4LR-129798	Side plate (clinched) R	1	
6	4LR-129783	Side plate (welded) L	1	
7	4LR-129846	LF motor (pressure-fitted)	1	
8	4LR-129787	Idle gear	1	
9	5LR-129790	Ribbon guide	2	
10	3LR-129900-3	Platen assembly	1	
11	4LR-129848-2	Paper end unit	1	
12	5LR-129909	Release lever (welded)	1	
13	5LR-129796	Release shaft (pressure-inserted)	1	
14	3LR-129800-2	Paper chute	1	
15	5LR-129801	Pressure roller	1	
16	4LR-129802	Paper separator	1	
17	4LR-193443	Paper cut knife	1	
18	5LR-129804	Disturb wire	1	
19	5LR-129805	Pressure roller spring	2	
20	5LR-129806-1	Detent spring (R)	1	
21	5LR-129808-1	Cut knife lever shaft	1	
22	4LR-129847-1	Photo interrupter assembly	1	
23	5LR-129799	Ribbon set diagram	1	
24	4LP-6401-B1	Tie-wrap	1	
26	5KD-42304-8	Collar	1	
28	5KX-9057	E-snap ring	2	
29	5KX-9087	E-snap ring	2	
31	5KH-12050	E-snap ring	1	
32	⊕ P (SW + 2W) 3-14-HH	Small pan-head screw	1	
33	⊕ P (SW) 3-6-HH	Small pan-head screw	9	
34	⊕ P (SW + 2W) 3-6-HH	Small pan-head screw	5	
35	⊕ P 2.6-6-HH	Small pan-head screw	2	
36	SW2.6-HHC	Spring washer	2	
37	5LR-129806-2	Detent spring (L)	1	

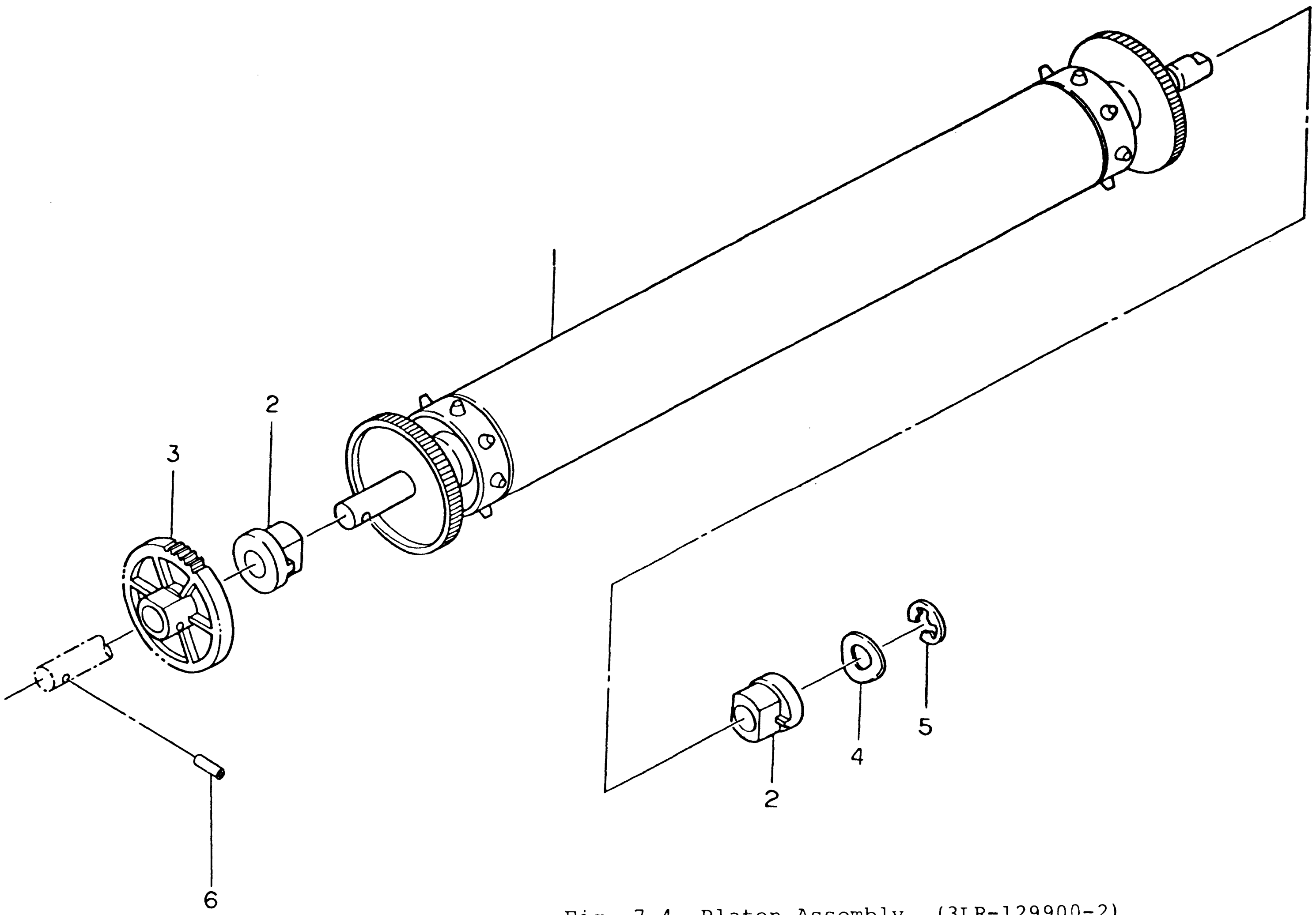


Fig. 7-4 Platen Assembly (3LR-129900-2)

Fig. 7-4 Platen Assembly (3LR-129900-2)

No.	Part No.	Nomenclature	Quantity	Remarks
1	4LR-129904-2	Platen (pressure-fitted)	1	
2	4LR-129855	Platen bearing	2	
3	4LR-129859	Platen gear	1	
4	5LR-129906	Wave washer	1	
5	5KX-9059	E-snap ring	2	
6	SPP_3-12-SUS	Spring pin	1	

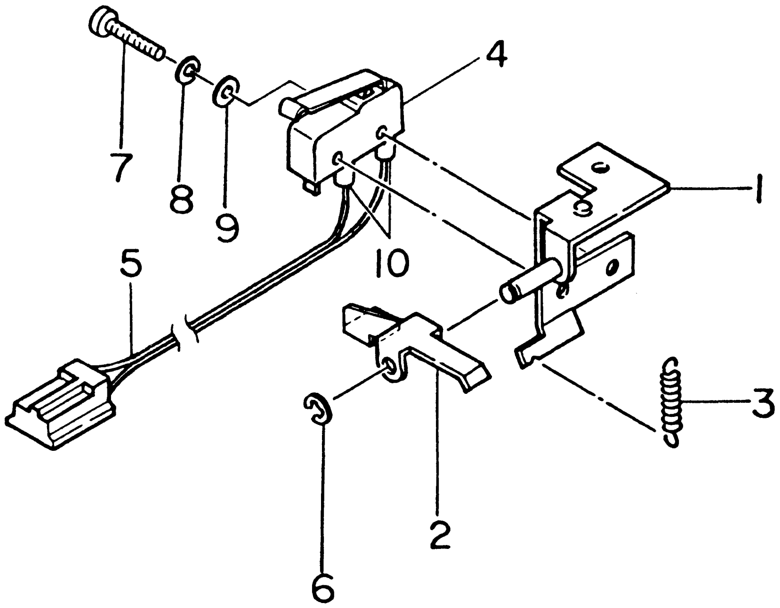


Fig. 7-5 Paper End Unit (4LR-129848-2)

Fig. 7-5 Paper End Unit (4LR-129848-2)

No.	Part No.	Nomenclature	Quantity	Remarks
1	5LR-129863	Microswitch bracket (clinched)	1	
2	5LR-129870	Microswitch actuator	1	
3	5LR-129844	Spring	1	
4	4LP-3378-4	Microswitch	1	
5	4LP-36486-2	Connection cord	1	
6	5KX-9057	E-snap ring	1	
7	⊕ P2.3-10-HH	Small pan-head screw	1	
8	SW2.3-HHC	Spring washer	1	
9	W2.3-HH	Washer	1	
10		Insulation SUMI-tube F	3	ϕ3x0.25x10

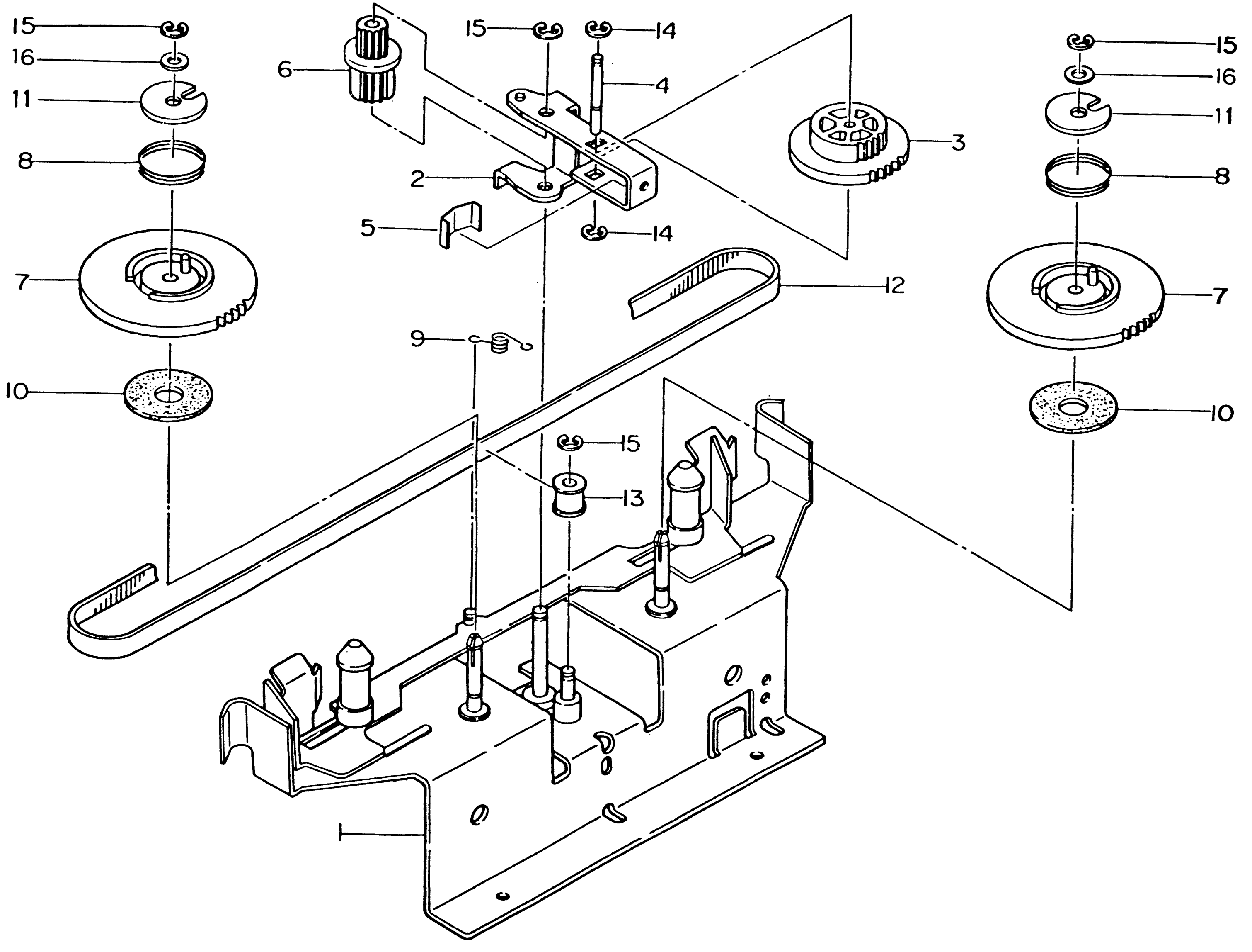


Fig. 7-6 Ribbon Assembly (3LR-193456-1)

Fig. 7-6 Ribbon Assembly (3LR-193456-1)

No.	Part No.	Nomenclature	Quantity	Remarks
1	3LR-193457	Ribbon bracket (clinched) A	1	
2	5LR-129825	Ribbon change lever (clinched)	1	
3	4LR-129827	Ribbon gear	1	
4	5LR-193461	Snap shaft	1	
5	5LR-129876	Friction spring	1	
6	4LR-129833	Ribbon drive gear	1	
7	4LR-129837	Ribbon spool gear	2	
8	5LR-129840	Friction spring	2	
9	5LR-129841	Detent spring	1	
10	5LR-129842	Friction felt	2	
11	5LR-129843	Special washer	2	
12	4LP-1313-101	Minipitch belt	1	
13	FMX-20517	Pressure roller	1	
14	5KX-9057	E-snap ring	2	
15	5KH-12050	E-snap ring	4	
16	5LR-132516	Plastic washer	2	

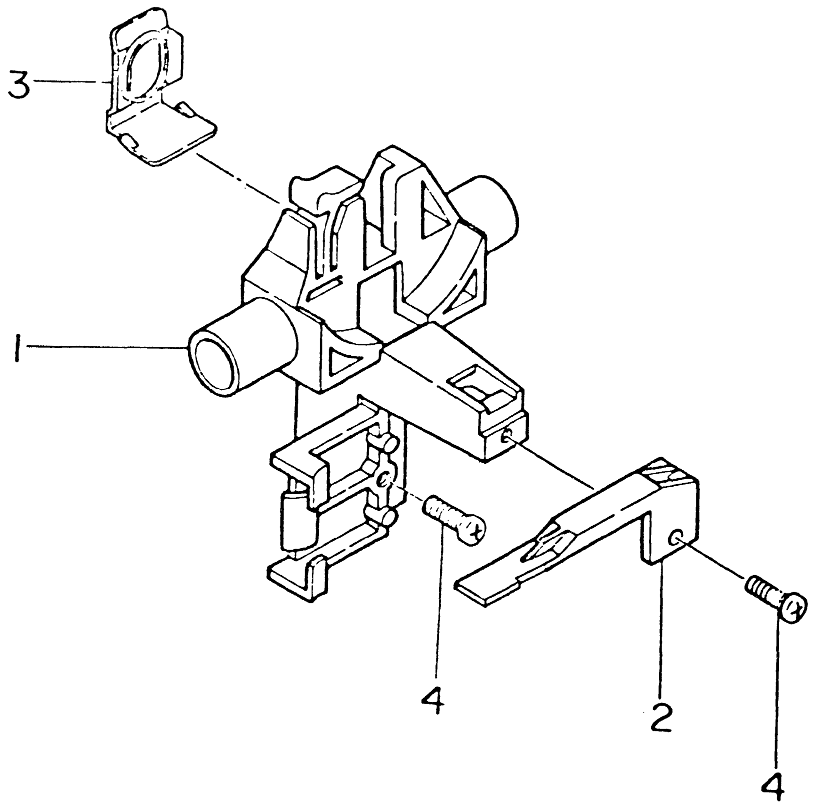


Fig. 7-7 Carriage Assembly (5LR-129865)

Fig. 7-7 Carriage Assembly (5LR-129865)

No.	Part No.	Nomenclature	Quantity	Remarks
1	3LR-129866	Carriage frame	1	
2	4LR-129873	Belt clamp	1	
3	5LR-121926	Ribbon protector	1	
4	⊕ T_2P_3-8-HH	Tapping screw	2	

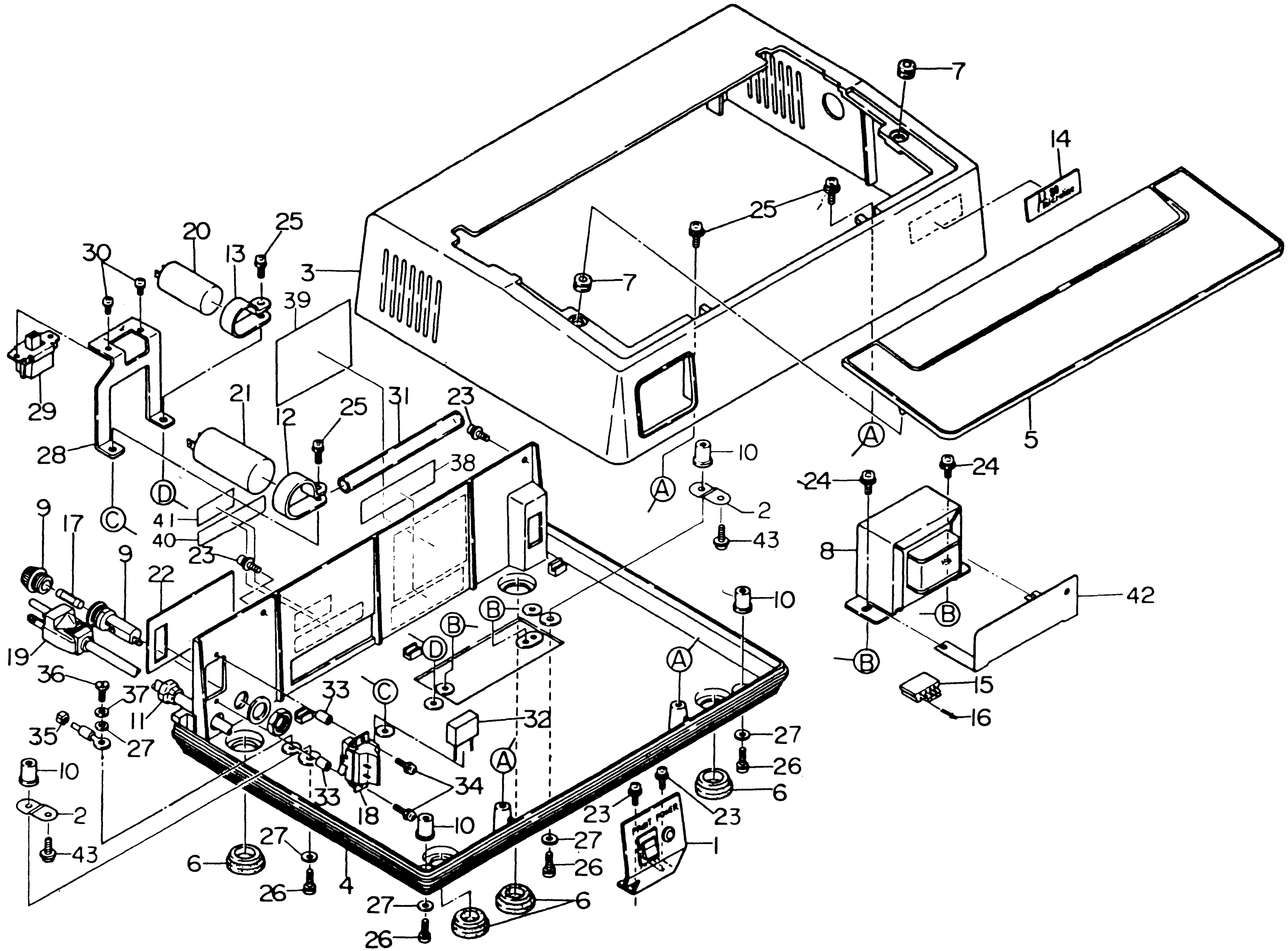


Fig. 7-8 Cover Unit (1LM-61520-3) (for 100/115 V AC)

Fig. 7-8 Cover Unit (1LM-61520-3) (1/2) (for 100/115 V AC)

No.	Part No.	Nomenclature	Quantity	Remarks
1	4LM-58646	Switch assembly	1	
2	5LM-61519	Ground plate	2	
3	1LM-58666-3	Upper cover	1	
4	1LM-58667-2	Lower cover	1	
5	4LM-58658	Top cover	1	
6	5LP-1416	Rubber foot	4	
7	5LM-59675	Bushing	2	
8	4LP-45191-103	Transformer	1	
9	F4LP-6576	Fuse holder	1	
10	4LP-6726-2	Quite-tight	4	
11	5LP-6463-C-6	Strain relief bushing	1	
12	4LP-6342-16	Wire bundle holder	1	
13	4LP-6342-13	Wire bundle holder	1	
14	4L-1394	Nameplate	1	
15	J4LP-5525-8	Receptacle housing	1	
16	J4LP-5526	Receptacle contact	8	
17	F4LP-8475-B-28	Fuse (1.75 A)	1	
18	4LP-3621-2	Flip-flop switch	1	
19	4LP-36467	a.c. input cord	1	
20	C4KP-8212-17-N	Electrolytic capacitor 16 V 2200μF	1	
21	C4KP-8212-20-N	Electrolytic capacitor 50 V 3300μF	1	
22	4L-1378	Main nameplate	1	
23	⊕ P (SW + 2W) 3-7-HH	Small pan-head screw	4	
24	⊕ P (SW + 2W) 4-8-HH	Small pan-head screw	2	
25	⊕ P (SW + 2W) 4-12-HH	Small pan-head screw	4	
26	⊕ P (SW) 4-18-HH	Small pan-head screw	4	
27	2W4-HH	Washer	5	
28	4LM-58680-1	Switch bracket	1	
29	4LP-3623	Slide switch	1	
30	⊕ P (SW) 3-5-HH	Small pan-head screw	2	
31		Insulation SUMI tube-F	1	ø10 x 100
32	4LP-8537	Spark killer 2 CA 120033 (Spark killer AV 120033)	1	
33	5LR-53264-3	Collar	2	
34	⊕ P (SW + 2W) 3-12-HH	Small pan-head screw	2	

Fig. 7-8 Cover Unit (1LM-61520-3) (2/2) (for 100/115 V AC)

No.	Part No.	Nomenclature	Quantity	Remarks
35	5LP-6765	Mark band "G"	1	
36	(-)B4-8-HH	Hexagon bolt	1	
37	SW4-HHC	Spring washer	1	
38	5L-1431	Caution plate	1	
39	4L-1535	FCC nameplate	1	
40	5L-1442	UL listing plate	1	
41	5L-1586	GSA marking plate	1	
42	4LM-60997	Barrier	1	
43	⊕ P(W)3-5-HH	Small pan-head screw	2	

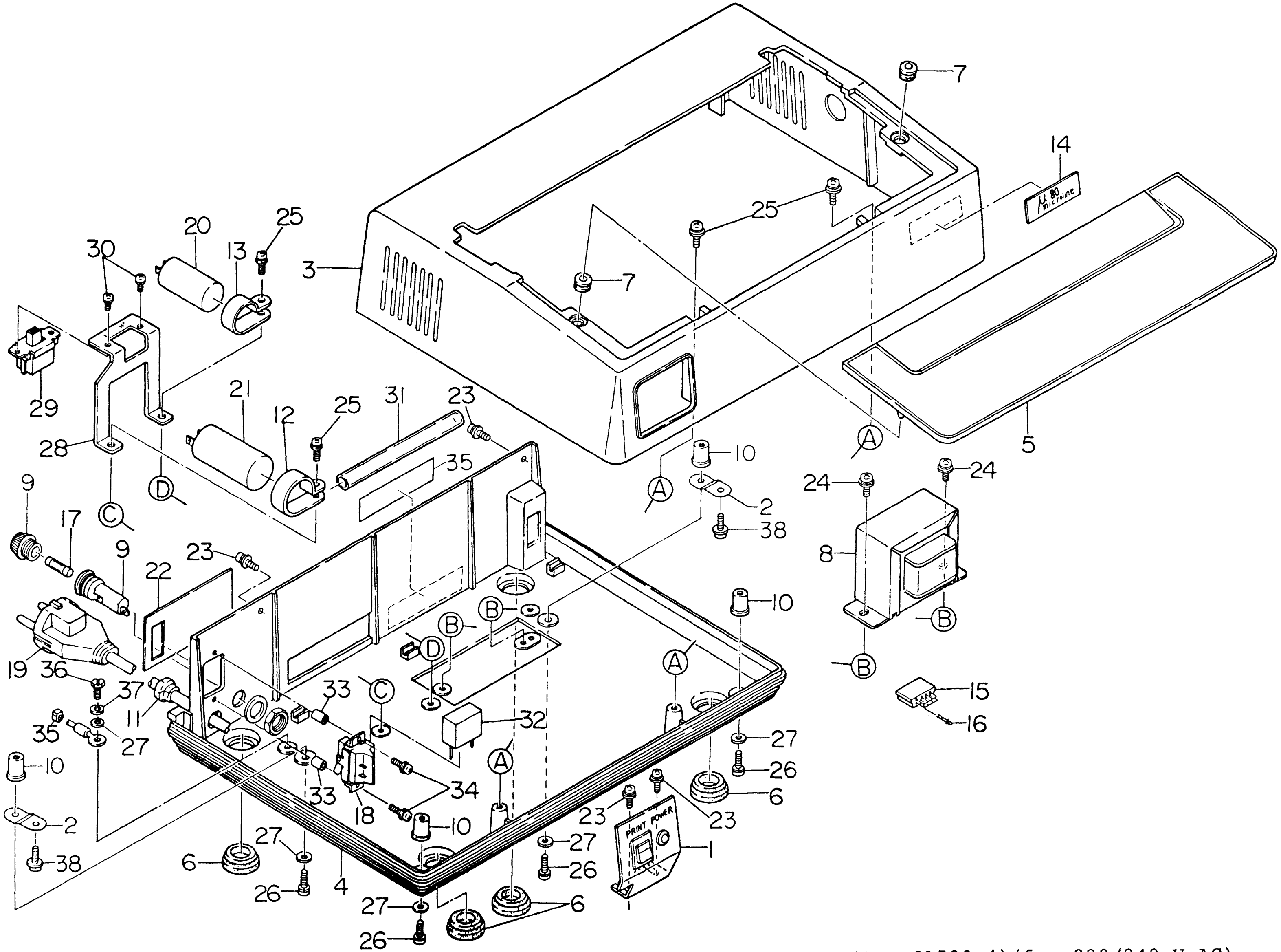


Fig. 7-8 Cover Unit (1LM-61520-4)(for 220/240 V AC)

Fig. 7-8 Cover Unit (1LM-61520-4) (1/2) (for 220/240 V AC)

No.	Part No.	Nomenclature	Quantity	Remarks
1	4LM-58646	Switch assembly	1	
2	5LM-61519	Ground plate	2	
3	1LM-58666-3	Upper cover	1	
4	1LM-58667-2	Lower cover	1	
5	4LM-58658	Top cover	1	
6	5LP-1416	Rubber foot	4	
7	5LM-59675	Bushing	2	
8	4LP-45191-103	Transformer	1	
9	F4LP-6576	Fuse holder	1	
10	4LP-6726-2	Quite-tight	4	
11	5LP-6463-C-6	Strain relief bushing	1	
12	4LP-6342-16	Wire bundle holder	1	
13	4LP-6342-13	Wire bundle holder	1	
14	4L-1394	Nameplate	1	
15	J4LP-5525-8	Receptacle housing	1	
16	J4LP-5526	Receptacle contact	8	
17	F4LP-8475-B-28	Fuse (1.75 A)	1	
18	4LP-3621-2	Flip-flop switch	1	
19	4LP-36467	a.c. input cord	1	
20	C4KP-8212-17-N	Electrolytic capacitor 16 V 2200μF	1	
21	C4KP-8212-20-N	Electrolytic capacitor 50 V 3300μF	1	
22	4L-1378	Main nameplate	1	
23	⊕ P (SW + 2W) 3-7-HH	Small pan-head screw	4	
24	⊕ P (SW + 2W) 4-8-HH	Small pan-head screw	2	
25	⊕ P (SW + 2W) 4-12-HH	Small pan-head screw	4	
26	⊕ P (SW) 4-18-HH	Small pan-head screw	4	
27	2W4-HH	Washer	5	
28	4LM-58680-1	Switch bracket	1	
29	4LP-3623	Slide switch	1	
30	⊕ P (SW) 3-5-HH	Small pan-head screw	2	
31		Insulation SUMI tube-F	1	ø10 x 100
32	4LP-8537	Spark killer 2 CA 120033 (Spark killer AV 120033)	1	
33	5LR-53264-3	Collar	2	
34	⊕ P (SW + 2W) 3-12-HH	Small pan-head screw	2	

Fig. 7-8 Cover Unit (1LM-61520-4) (2/2) (for 220/240 V AC)

No.	Part No.	Nomenclature	Quantity	Remarks
35	5L-1431	Mark band "G"	1	
36	(-)B4-8-HH	Hexagon bolt	1	
37	SW4-HHC	Spring washer	1	
38	⊕ P(W)3-5-HH	Small pan-head screw	2	

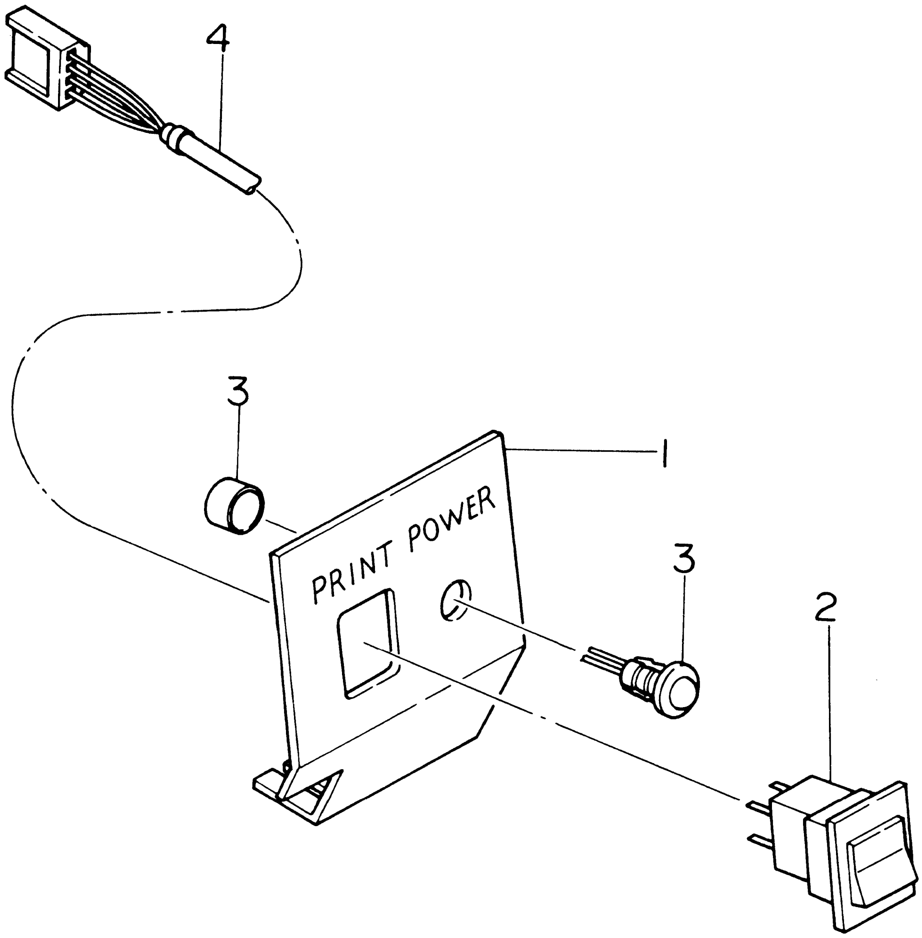


Fig. 7-9 Switch Assembly (5LM-58646)

Fig. 7-9 Switch Assembly (5LM-58646)

No.	Part No.	Nomenclature	Quantity	Remarks
1	4LM-58647	Switch bracket	1	
2	4LP-3349	Paddle locker switch	1	
3	4LP-44293	LED (with holder)	1	
4	4LP-36412	Connection cord	1	

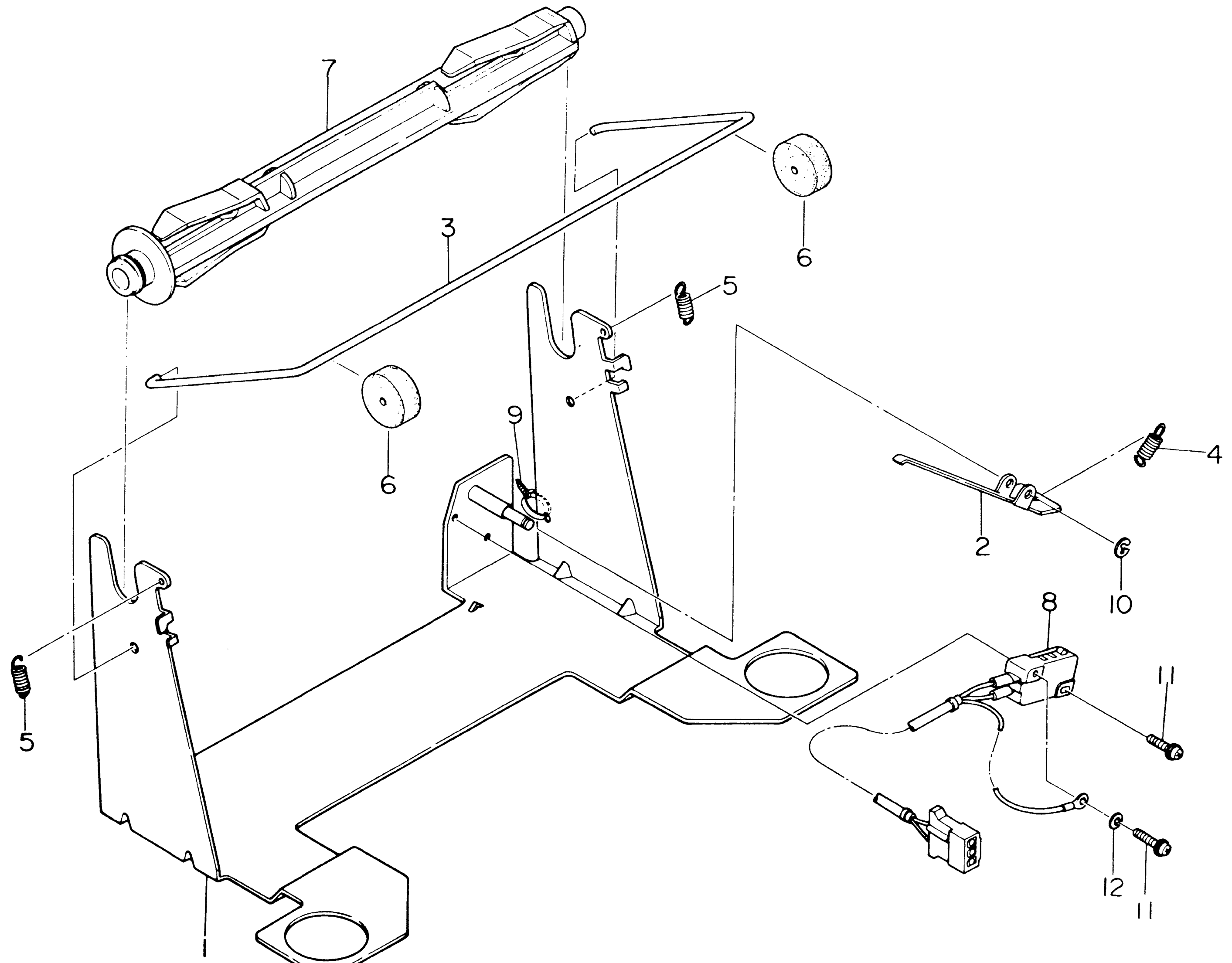


Fig. 7-10 Roll Paper Support Assembly (2LM-58648)

Fig. 7-10 Roll Paper Support Assembly (2LM-58648)

No.	Part No.	Nomenclature	Quantity	Remarks
1	3LM-58651	Roll paper support	1	
2	5LM-58650	Sheet end lever	1	
3	5LM-58652	Tension lever	1	
4	5LM-58653	Alarm lever spring	1	
5	5LM-58654	Tension lever spring	2	
6	5LM-58656	Flange	2	
7	3LR-190075	Paper shaft	1	
8	4LR-129849	Microswitch assembly	1	
9	4LP-6401-B1	Tie-wrap	1	
10	5KX-9057	E-snap ring	1	
11	⊕ P (SW + W) 2.6-14-HH	Small pan-head screw	2	
12	2W-2.6-HH	Washer	1	

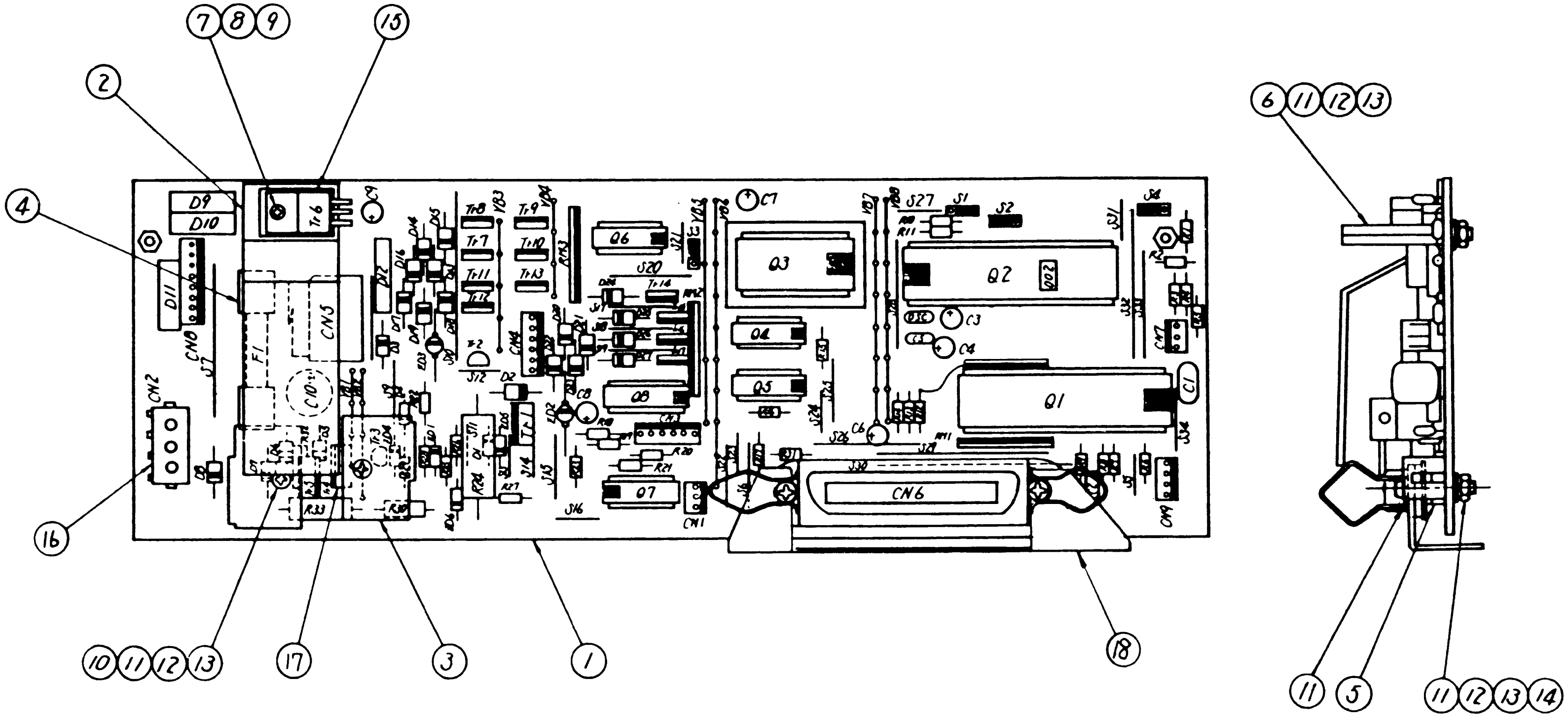


Fig. 7-11 LEPU Circuit Board (2LX-86695)

Fig. 7-11 LEPU Circuit Board (2LX-86695) (1/3)

Symbol	Name, Rating	Rating No.	Q'ty	Remarks
①	LEPU circuit board	2LP-16695	1	
D1, D4	1S2075 diode	D4LP-9300	2	
D2, D3, D5-D8, D13-D27	SM-1A-02 diode	D4LP-9471-1	21	
ZD3	AU01-07 zener diode	D4LP-44156-6	1	
ZD2	AU01-15 zener diode	D4LP-44156-13	1	
ZD1	RD24EB zener diode	D4LP-44171-24	1	
ZD4, ZD6, ZD5	RD5.1EB zener diode	D4LP-44171-8	3	
D10	MI-151 diode bridge	D4LP-44327	1	
D9, D11	MI-151R diode bridge	D4LP-44328	2	
D12	DA-0602 diode array	DA-0602	1	
R8, R23	Simple insulated resistor 1/4W, 470 Ω	R4LP-8446-471	2	
R4, R31	" 1/4W, 200 Ω	R4LP-8446-201	2	
R1, 3, 7, 10, 11, 22	" 1/4W, 10 kΩ	R4LP-8446-103	6	
R6, R26	" 1/4W, 150 Ω	R4LP-8446-151	2	
R12, 13, 14, 16, 19, 20, 28, 9	" 1/4W, 1 kΩ	R4LP-8446-102	8	
R2, 5, 15, 18, 21	" 1/4W, 5.1 kΩ	R4LP-8446-512	5	
R25, 29, 27	" 1/4W, 2 kΩ	R4LP-8446-202	3	
R17	" 1/4W, 51Ω	R4LP-8446-510	1	
R32	NAS 1/2B type 1/2W, 5.1 kΩ	R4LP-8447-512	1	
R30	Metal film resistor 1W, 5.1 kΩ	R4LP-8318-512	1	
R24	" 3W, 51 Ω	R4LP-8225-510	1	
R33	" 2W, 750 Ω	R4LP-8224-751	1	
RM1	8-element module resistor 1 kΩ	R4LP-8396-102	1	
RM2	" 3 kΩ	R4LP-8396-302	1	
RM3	" 2 kΩ	R4LP-8396-202	1	
C3, 4, 6, 7, 9	SSR 35-1 tantalum capacitor 35 V/1μF	C4LP-8545-1	5	
C8	35 V/4.7μF electrolytic capacitor	C4LP-8382-32	1	
C10	50 V/47μF electrolytic capacitor	C4LP-8382-48	1	

Fig. 7-11 LEPU Circuit Board (2LX-86695) (2/3))

Symbol	Name, Rating	Rating No.	Q'ty	Remarks
C1	100 V/0.1μF polyester film capacitor	C4LP-8449-104	1	
C2	100 V/0.0015μF	C4LP-8449-152	1	
Q7	SN7403	I4LP-11155-00	1	
Q4, 5, 6	SN 7405	I4LP-11136-00	3	
Q1	μPD8155C	4LP-11368-06	1	
Q3	24-pin IC socket	4LP-9490-D-01	1	
Q8	Transistor array	ULN-2003A	1	
S1-S4	Short circuit plug Z128	4LP-5591	4	
S1-S4	Terminal Z14903P	4LP-5592-3	4	
S9, S14, S15, S21, S23, S24, S27, S31	]-shaped short circuit wire	4KH-31017-10	10	
S6, S9, S14, S15, S17-S19, S22, S25, S34	"	4KH-31017-15	10	
S8, S20	"	4KH-31017-20	2	
S26, S28, S33	"	4KH-31017-25	3	
S7, S32	"	4KH-31017-35	2	
S10, S29	"	4KH-31017-40	2	
S30	"	4KH-31017-45	1	
Tr7-Tr17	2SC 2324 K transistor	Q4LP-44288	11	
Tr3	2SC 2719 "	Q4LP-44335	1	
Tr2	2SA 952 "	Q4LP-44331	1	
Tr1	2SB 712 "	Q4LP-44232	1	
Tr4, 5	CSM2A2 thyristor	4LP-9403-2-C	2	
Tr6	FS7805 + 5 V IC regulator	I4LP-11830-49	1	
②	Heat sink (for regulator)	5LR-104060	1	
CN1, 7	AMPEI connector, 3-pin	4LP-5523-3	2	
CN9	" 4-pin	4LP-5523-4	1	
CN3, 4	" 6-pin	4LP-5523-6	2	
CN8	" 8-pin	4LP-5523-8	1	
③	Heat sink (for thyristor)	5LR-104058	2	
④	Fuse holder	5L-90188	2	
F1	MGC1 1.75 A fuse	LP-8475-B-28	1	
⑤	Collar	5LM-58720-1	2	
VB6	Power source bar	3LH-31313-6	1	
VB2, VB3	Power source bar	3LH-31313-12	2	
VB1, VB4	"	3LH-31313-66	2	
VB7, VB8	"	3LH-31313-68	2	
VB5	"	3LH-31313-70	1	
⑥	Stud	5LM-58660-2	2	
CN5	Connection cord	4LP-36466-2	1	
CN2	3-pin nylon connector	4LP-2887-1	1	

Fig. 7-11 LEPU Circuit Board (2LX-86695) (3/3)

Symbol	Name, Rating	Rating No.	Q'ty	Remarks
CN6	36-pin connector	4LP-5663	1	
7	Insulation bush	4LP-4967-8	1	
17	Empire tube	ø1 x 5	2	
OSC, C5	Ceramic oscillator 3.58 MHz and capacitor	4LP-12127-2	1	
8	Washer, spring Small pan-head screw	⊕ P(SW+W) 2.6-10-HH	1	
9	Lock nut	1N2.6-HH	1	
10	Small pan-head screw	⊕ P3-6-HH	2	
11	Washer	W3-HH	8	
12	Spring washer	SW3-HH	6	
13	Lock nut	1N3-HH	6	
14	Small pan-head screw	⊕ P3-14-HH	2	
15	SERCON insulator	4LP-44106-3	1	
16	Eyelet	KP-1020-2	3	
Q2	µCPU	4LP-11387-2	1	
Q3	Character generator	4LP-11388	1	
RM4	8-element module resistor 5.1 kΩ	4LP-8396-512	1	
18	Reinforcing plate	4LR-129908	1	

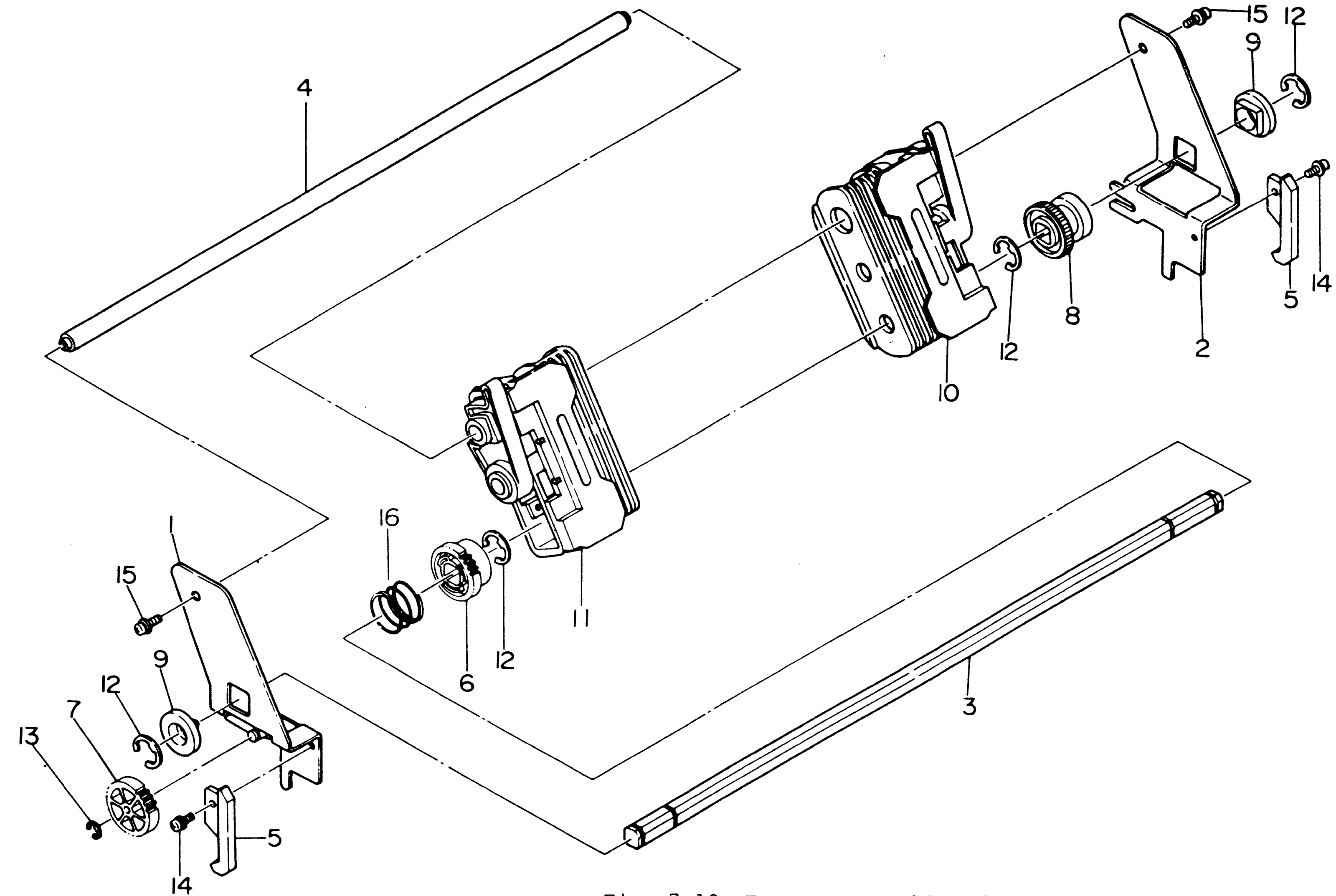


Fig. 7-12 Tractor Assembly (2LR-129880)

Fig. 7-12 Tractor Assembly (2LR-129880)

No.	Part No.	Nomenclature	Quantity	Remarks
1	5LR-129881	Side plate (L)	1	
2	4LR-129884	Side plate (R)	1	
3	5LR-129885	Tractor drive shaft	1	
4	5LR-129886	Tractor shaft	1	
5	5LR-129887	Clamp lever	2	
6	4LR-129889	Tractor gear	1	
7	5LR-129890	Idle gear	1	
8	5LR-129891	Knob	1	
9	5LR-123498	Bushing	2	
10	FMX-35100-2	Sheet feeder assembly (R)	1	
11	FMX-35150-2	Sheet feeder assembly (L)	1	
12	5KD-50242	E-snap ring	4	
13	5KH-21050	E-snap ring	1	
14	⊕ P(SW+W)3-6-23D	Small pan-head screw	2	
15	⊕ P(SW+2W)3-8-23D	Small pan-head screw	2	
16	5LR-129895	Bias spring	1	

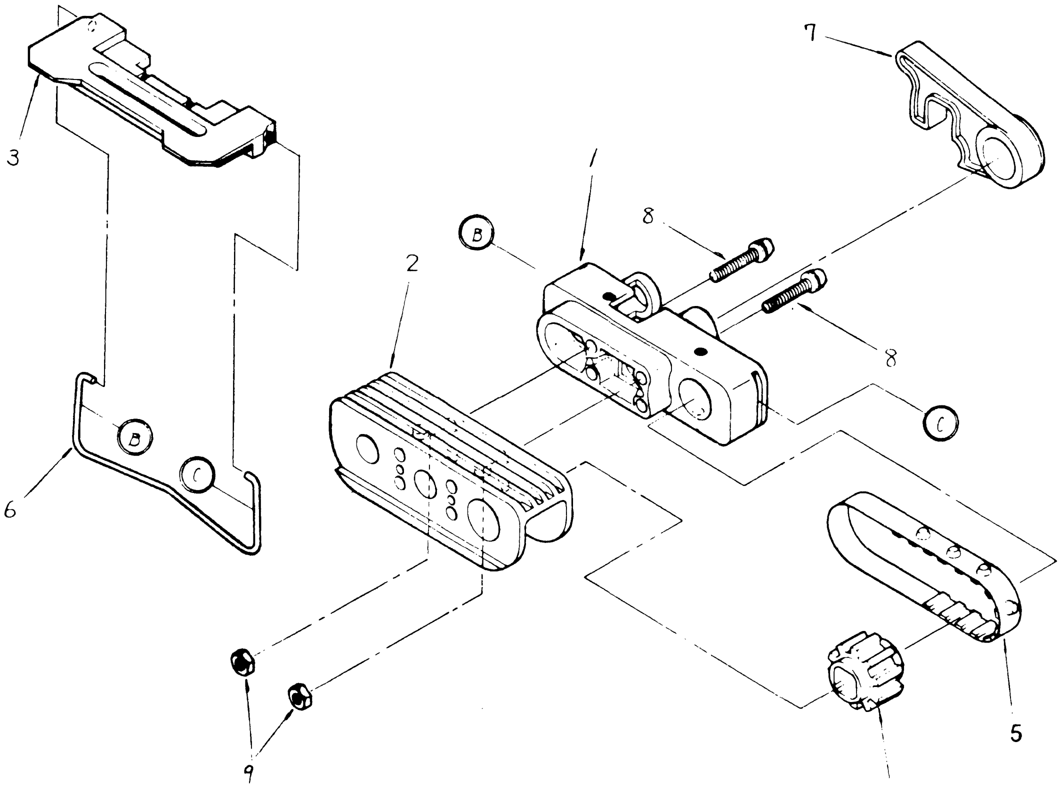


Fig. 7-13 Sheet Feeder Assembly (R) (FMX-35100-2)

Fig. 7-13 Sheet Feeder Assembly (R) (FMX-35100-2)

No.	Part No.	Nomenclature	Quantity	Remarks
1	4LR-123484	Sheet feeder frame (A)	1	
2	4LR-123485	Sheet feeder frame (B)	1	
3	5LR-123446	Sheet feeder cover	1	
4	5LR-129894	Sheet feeder wheel	1	
5	4LR-123487	Pin tractor (mold)	1	
6	5LR-123453	Pivot spring	1	
7	5LR-123458	Lock lever	1	
8	⊕ P(SW+W)3-16-HH	Small pan-head screw	2	
9	N3-HH	Nut	2	

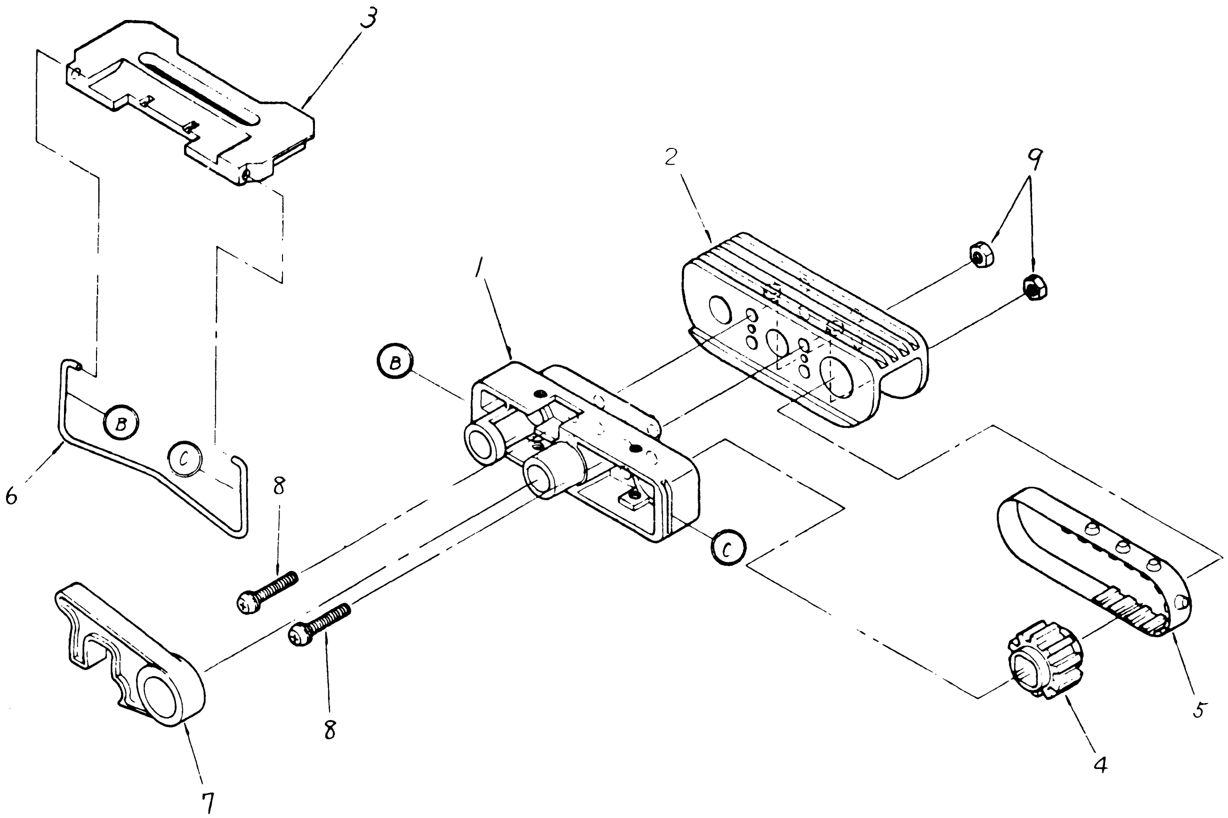


Fig. 7-14 Sheet Feeder Assembly (L) (FMX-35150-2)

Fig. 7-14 Sheet Feeder Assembly (L) (FMX-35150-2)

No.	Part No.	Nomenclature	Quantity	Remarks
1	4LR-123484	Sheet feeder frame (A)	1	
2	4LR-123485	Sheet feeder frame (B)	1	
3	5LR-123446	Sheet feeder cover	1	
4	5LR-129894	Sheet feeder wheel	1	
5	4LR-123487	Pin tractor (mold)	1	
6	5LR-123453	Pivot spring	1	
7	5LR-123458	Lock lever	1	
8	⊕ P(SW+W)3-16-HH	Small pan-head screw	2	
9	N3-HH	Nut	2	

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