

DOT MATRIX PRINTER
NX-1020
LC-200
TECHNICAL MANUAL
[SIXTH EDITION]

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INTRODUCTION

This manual describes dot matrix printers as shown below.

It is intended for use as a reference for periodic inspections and maintenance procedures.

This manual is prepared for use at a technical level and not for the general user.

Model	Destination
NX-1020 RAINBOW	For American market
NX-1020 COLOUR	For Asian market
LC-200	For European market
LC-200 COLOUR	For Pacific market

- This manual is divided into the following sections:

Chapter 1	General Specifications
Chapter 2	Theory of Operation
Chapter 3	Adjustments
Chapter 4	Parts Replacement
Chapter 5	Maintenance and Lubrication
Chapter 6	Troubleshooting
Chapter 7	Parts List

- First edition : Jun. 1990
- Second edition : Jan. 1991 Add the new model (NX-1020 COLOUR and LC-200 COLOUR)
- Third edition : May 1991 Add the new printer mechanism (Ver. 2)
- Fourth edition : Jul. 1993
- Fifth edition : Sep. 1995
- Sixth edition : Apr. 1996

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CHAPTER 1

GENERAL SPECIFICATIONS

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1. General Specifications

Print system	Serial Impact Dot-matrix
Printing speed High-Speed Draft Draft NLQ	Pica Elite 200cps 225cps 150cps 180cps 37.5cps 45cps
Print direction	Bidirectional, logic-seeking Unidirectional, logic-seeking (selectable)
Print head	9pins Life: 100 million characters
Line spacing	1/6, 1/8, n/72, n/216 inches
Paper feed	Friction and push/pull tractor
Paper feed speed	2.9 inches/second max.
Character set ASCII International IBM special IBM block graphic IBM code page Download	96 16 set(*) 111 50 6 set(**) 255

* USA, France, Germany, England, Denmark I, Sweden, Italy, Spain I, Japan, Norway, Denmark II, Spain II, Latin America, Korea, Irish, Legal

** #437 (USA), #850 (Multi-Lingual), #860 (Portuguese), #861 (Icelandic), #863 (Canadian French), #865 (Nordic)

Number of columns Pica Elite Condensed pica Condensed elite Proportional	CPI 10 12 17.1 20	Columns 80 96 137 160 Variable
Character dot matrix	9 × 11 18 × 23	(Draft) (NLQ)
Bit image dot-matrix Normal Double High-speed double* Quadruple CRT I CRT II Plotter Double-plotter	DPI 60 120 120 240 80 90 72 144	(8 or 9) × 480 (8 or 9) × 960 (8 or 9) × 960 (8 or 9) × 1920 (8 or 9) × 640 (8 or 9) × 720 (8 or 9) × 576 (8 or 9) × 1152

* It is impossible to print adjacent dots in the modes marked with an asterisk(*).

Paper width Cut sheet Fanfold (continuous)	4" ~ 11.7" 4" ~ 10"
Copies	Original + 3 copies (Max.)

GENERAL SPECIFICATIONS

Maximum buffer size Without Download With Download	16KB 1 line
Emulations	Epson mode IBM proprinter mode
Interface	Standard: Centronics parallel Option: RS-232C serial
Ribbon type	On-carriage, dedicated Monochrome (Black only) Color (Black, magenta, cyan, violet, yellow, orange, green)
Ribbon life	Monochrome 3 million characters (draft pica) Color 1 million characters (draft pica)
Dimensions	440(w) × 334(d) × 135(h) mm (excluding platen knob) 17.3(w) × 13.1(d) × 5.3(h) in
Weight	6.3kg (13.9lb)
Power supply	120VAC, 220VAC, 240VAC (varies according to the country of purchase)
Options	Automatic sheet feeder (SF-10DN) Serial-Parallel converter (SPC-8K) Roll paper holder (RH-10Z)

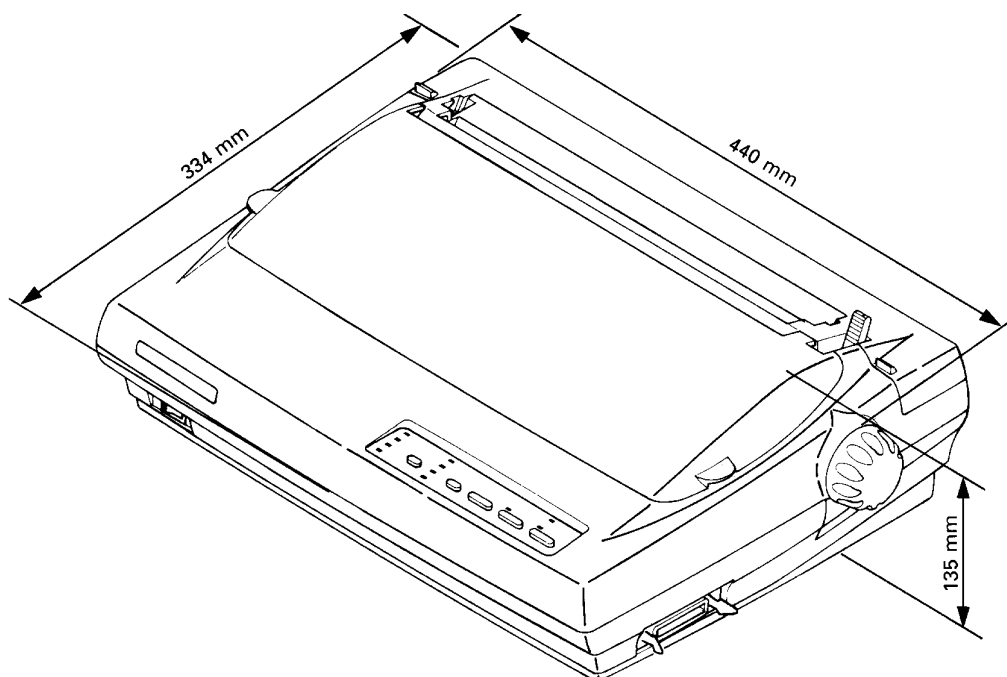


Fig. 1-1 External dimensions

2. External Appearance and Composition

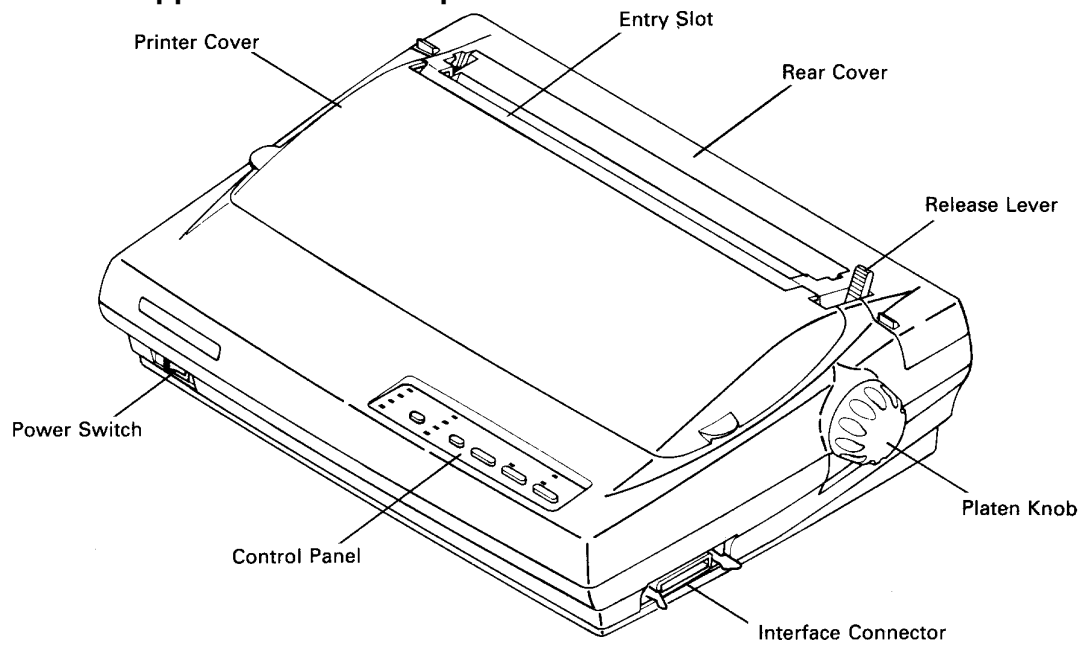


Fig. 1-2 Front View of the Printer

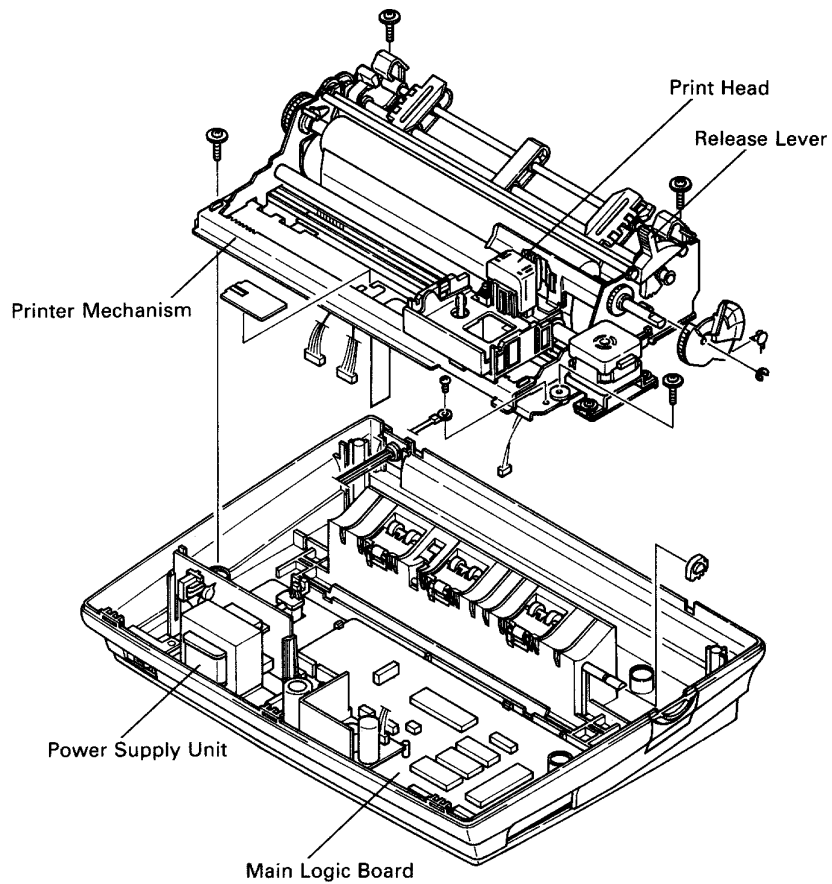


Fig. 1-3 Diagram of Internal Composition

GENERAL SPECIFICATIONS

3. EDS Mode Settings

The EDS (Electronic DIP Switch) mode has 16 kinds of functions you can set as the power-on default. To enter the EDS mode, turn the printer on while simultaneously holding the **SET/EJECT PARK**, **PAPER FEED**, and **ON LINE** buttons. In EDS mode, the indicators and the buttons on the control panel are used as shown below in Figure 1-4.

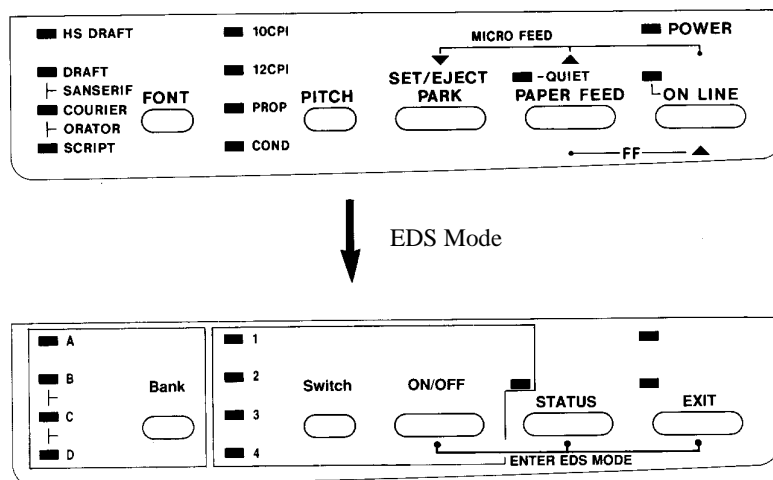


Fig. 1-4 Button and indicator functions in the EDS mode

Number	Function	ON	OFF
A-1	Emulation	STANDARD	IBM
A-2	RAM Usage	Input Buffer	Download
A-3	Auto-LF	Disabled	Enabled
A-4	ASF Setting	Disabled	Enabled
B-1	Multi-part mode	Disabled	Enabled
B-2	Paper-out Detector	Enabled	Disabled
B-3	Tear off	Disabled	Enabled
B-4	Strobe Timing ^{*1}	Normal	Reverse
C-1	Print Mode	(See next page)	
C-2			
C-3	Page Length	(See next page)	
C-4			
D-1	Character Table (Standard mode) (IBM mode)	Graphics Set #2	Italics Set #1
D-2	IBM Code page or International Character Set	(See next page)	
D-3			
D-4			

*1 See figure 1-5.

GENERAL SPECIFICATIONS

Print Mode	C-1	C-2
10 CPI DRAFT	ON	ON
10 CPI HS DRAFT	ON	OFF
17 CPI DRAFT	OFF	ON
10 CPI COURIER	OFF	OFF

Page Length	C-3	C-4
11 inches	ON	ON
A4 sized paper	ON	OFF
8 inches	OFF	ON
12 inches	OFF	OFF

In the standard Italic character set

Country	D-2	D-3	D-4	Country	D-2	D-3	D-4
U.S.A.	ON	ON	ON	Denmark I	ON	ON	OFF
France	OFF	ON	ON	Sweden	OFF	ON	OFF
Germany	ON	OFF	ON	Italy	ON	OFF	OFF
England	OFF	OFF	ON	Spain I	OFF	OFF	OFF

Except in the Standard Italic character set

IBM Code Page	D-2	D-3	D-4	IBM Code Page	D-2	D-3	D-4
#437 U.S.A.	ON	ON	ON	#863 Canadian French	ON	ON	OFF
#850 Multi-lingual	OFF	ON	ON	#865 Nordic	OFF	ON	OFF
#860 Portuguese	ON	OFF	ON	Option 1	ON	OFF	OFF
#861 Icelandic	OFF	OFF	ON	Option 2	OFF	OFF	OFF

GENERAL SPECIFICATIONS

4. Parallel Interface

4-1. General Specifications

Item	Specifications
Synchronization System	Via externally supplied $\overline{\text{STROBE}}$ pulse
I/F Protocol	By $\overline{\text{ACK}}$ and BUSY signals
Logic Level	Compatible with TTL level

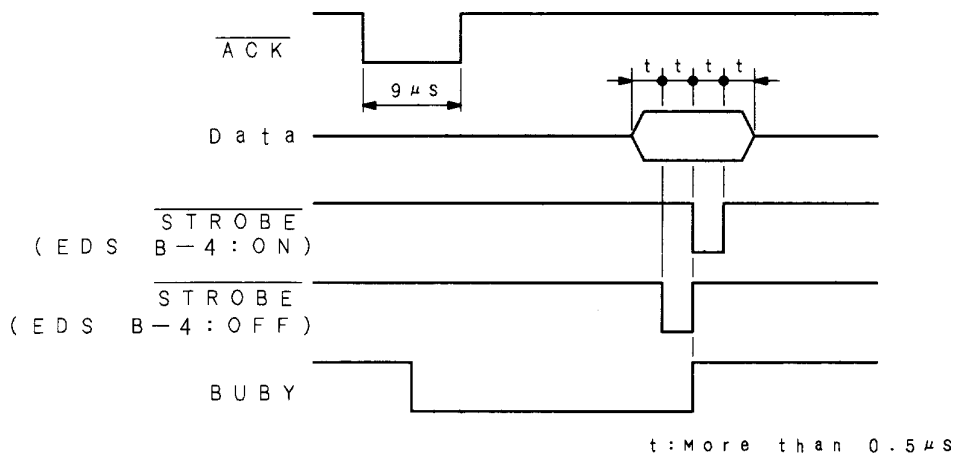


Fig. 1-5 Timing Charts of Parallel Interface

4-2. Connector Signals

Pin No.	Signal Name	Function Description
1	$\overline{\text{STROBE}}$	Goes from high to low (for $\geq 0.5\ \mu\text{s}$) when active
2	DATA1	High when active
3	DATA2	High when active
4	DATA3	High when active
5	DATA4	High when active
6	DATA5	High when active
7	DATA6	High when active
8	DATA7	High when active
9	DATA8	High when active
10	$\overline{\text{ACK}}$	$9\ \mu\text{s}$ low pulse acknowledges receipt of data
11	BUSY	Low when printer ready to receive data.
12	PAPER	High when paper out. Can be disabled with EDS setting.
13	SELECT	High when printer is on-line
14,15	NC	
16	SIGNAL GND	Signal ground
17	CHASSIS GND	Chassis ground (isolated from signal ground)
18	+5V	+5V DC output from printer
19 ~ 30	GND	Twisted pair ground return
31	$\overline{\text{RESET}}$	When this input signal is low, printer is reset
32	$\overline{\text{ERROR}}$	Outputs low when printer cannot continue, due to an error
33	EXT GND	External ground
34,35	NC	
36	$\overline{\text{SELECT IN}}$	Always high

5. Serial Interface (option)

When using the serial interface, the optional Serial-Parallel Converter must be connected with the printer.

5-1. Genereal Specifications

Item	Specifications
Interface	RS-232C level
Synchronization System	Asynchronous
Baud rate	150 - 19,200 bit per second (BPS) [selectable] 150, 300, 600, 1200, 2400, 4800, 9600, 19200 BPS
Word length Start bit: Data bit: Parity bit: Stop bit:	1 bit 7 or 8 bits (selectable) Odd, Even or None (selectable) More then 1 bit length
Signal polarity Mark: Space:	Logic "1" (-3V to -15V) Logic "0" (+3V to +15V)
Handshaking	DTR XON/XOFF ETX/ACK
Data buffer	8KB (standard)

5-2. Connector Signals and Functional Descriptions

Pin No.	Signal name	Direction	Function
1	GND	—	Printer's chassis ground.
2	TXD	OUT	This pin carries data from the printer.
3	RXD	IN	This pin carries data to the printer.
4	RTS	OUT	Always space.
5	CTS	—	This pin is space when the computer is ready to send data. This printer does not check this pin.
6	NC		Unused.
7	GND	—	Signal ground.
8 ~ 10	NC		Unused.
11	RCH	OUT	This printer turns this pin space when it is ready to receive data. This line carries the same signal as pin 20.
12 ~ 19	NC		Unused.
20	DTR	OUT	The printer turns this pin space when it is ready to receive data.
21 ~ 25	NC		Unused.

GENERAL SPECIFICATIONS

5-3. DIP Switch Settings

Switch	ON	OFF
1	8 data bits	7 data bits
2	No parity	Parity checked
3	Handshaking protocols – see table below	
4		
5	Odd parity	Even parity
6	Data transfer rate – see table below	
7		
8		

All switches are set ON when the printer leaves the factory.

Protocol	Switch 3	Switch 4
DTR mode	ON	ON
XON/XOFF mode	ON	OFF
ETX/ACK mode	OFF	ON

Baud rate	Switch 6	Switch 7	Switch 8
150	OFF	OFF	OFF
300	OFF	OFF	ON
600	OFF	ON	OFF
1200	OFF	ON	ON
2400	ON	OFF	OFF
4800	ON	OFF	ON
9600	ON	ON	OFF
19200	ON	ON	ON

6. EE-PROM Mode

6-1. Outline

The settings described below can be changed if data is written to the EE-PROM on the main logic board.
The mode for writing to the EE-PROM is designed for use by maintenance workers, not for use by the general user.
In addition, this mode is subject to change without prior notice.

- EDS (Electric DIP Switch) settings
- Misalignment correction
- Top margin in auto-loading
- Allowable distance of paper out detector

1. Setting method

There are the following two methods to set the EE-PROM mode

- Power the printer ON while **ON LINE** and **PAPER FEED** switches are held pressed.
- If the printer has already been powered ON, send <ESC> (09)_H command.

2. Canceling method

There are the following two methods to cancel this mode.

- Power the printer OFF.
- Initialize the printer by sending <ESC> “@” command.

6-2. Explanation of Special Control Codes

The control codes shown below are provided for use in writing to the EE-PROM.

- <ESC> @ : The printer exits from EE-PROM mode and is initialized.
- <ESC> M @ : All data in the EE-PROM are changed to factory settings.
After the buffer is cleared, the buzzer sounds.
If the printer is powered off before the buzzer sounds, all data in the buffer is not cleared.
Since the data values are regarded as illegal ones, the operation in this case is not guaranteed.
- <ESC> M W n :

	Function	Address	Capacity
<ESC> M W 0 <data>	Store data into whole area of EE-PROM.	00H - 7FH	128 bytes
<ESC> M W 1 n m	Store data (m) into the address (n).	nH	1 byte
<ESC> M W 2 <data>	Store auto-start software data into EE-PROM.		

- The data (m) following the above commands are stored in the specified address in order (n).
- When the data to be stored exceeds specified capacity, the subsequent data are ignored.
- Data are stored in EE-PROM according to memory map.
- After all data are stored, a beep indicates the finish of storage.
- If the printer is powered off during data storage, the data which have already been stored are valid but the subsequent operation is not guaranteed.

- <ESC> M R : Print all data in EE-PROM in hex dump.

An example of the use of this control code is described in section 6-4. The corresponding EE-PROM addresses may be found in the EE-PROM memory map in section 6-3.

GENERAL SPECIFICATIONS

6-3. EE-PROM Map

Address	Function	Data(H)	Factory data		
00H	EDS setting		Lower 00		
	Bit	Function		0	1
	b7	Emulation		Standard	IBM
	b6	RAM Usage		Input Buffer	Download
	b5	Auto-LF		Disabled	Enabled
	b4	ASF Setting		Disabled	Enabled
	b3	Multi-part Mode		Disabled	Enabled
	b2	Paper-out		Enabled	Disabled
	b1	Tear off		Disabled	Enabled
	b0	Strobe Timing		Normal	Reverse
01H	EDS setting		Upper 00		
	b7	b6		Print Mode	
	0	0		10 CPI DRAFT	
	0	1		10 CPI HS DRAFT	
	1	0		17 CPI DRAFT	
	1	1		10 CPI COURIER	
	b5	b4		Page Length	
	0	0		11 inches	
	0	1		A4 sized page	
	1	0		8 inches	
	1	1		12 inches	
	b3 bit Character Table				
	0:Graphics (Standard Mode)				
	Set #2 (IBM Mode)				
	1:Italics (Standard Mode)				
	Set #1 (IBM Mode)				
	In the Standard Italic character set				
	b2	b1		b0	Country
	0	0		0	U.S.A.
	1	0		0	France
	0	1		0	Germany
	1	1		0	England
	0	0		1	Denmark I
	1	0		1	Sweden
	0	1		1	Italy
	1	1		1	Spain I

GENERAL SPECIFICATIONS

Address	Function	Data(H)	Factory data																																				
01H	Except in the Standard Italic character set <table border="1"> <tr> <th>b2</th><th>b1</th><th>b0</th><th>IBM Code Page</th></tr> <tr><td>0</td><td>0</td><td>0</td><td>#437 U.S.A.</td></tr> <tr><td>1</td><td>0</td><td>0</td><td>#850 Multi-lingual</td></tr> <tr><td>0</td><td>1</td><td>0</td><td>#860 Portuguese</td></tr> <tr><td>1</td><td>1</td><td>0</td><td>#861 Icelandic</td></tr> <tr><td>0</td><td>0</td><td>1</td><td>#863 Canadian French</td></tr> <tr><td>1</td><td>0</td><td>1</td><td>#865 Nordic</td></tr> <tr><td>0</td><td>1</td><td>1</td><td>Option 1</td></tr> <tr><td>1</td><td>1</td><td>1</td><td>Option 2</td></tr> </table>	b2	b1	b0	IBM Code Page	0	0	0	#437 U.S.A.	1	0	0	#850 Multi-lingual	0	1	0	#860 Portuguese	1	1	0	#861 Icelandic	0	0	1	#863 Canadian French	1	0	1	#865 Nordic	0	1	1	Option 1	1	1	1	Option 2	Upper	00
b2	b1	b0	IBM Code Page																																				
0	0	0	#437 U.S.A.																																				
1	0	0	#850 Multi-lingual																																				
0	1	0	#860 Portuguese																																				
1	1	0	#861 Icelandic																																				
0	0	1	#863 Canadian French																																				
1	0	1	#865 Nordic																																				
0	1	1	Option 1																																				
1	1	1	Option 2																																				
02H,03H	Area for IBM initial Condition	Lower,Upper	01,00																																				
04H,05H	Empty area	Lower,Upper	00,00																																				
06H,07H	Misalignment correction (1/360" pitch): Standard mode Pica/Elite	Lower,Upper	03,90																																				
08H,09H	Misalignment correction (1/360" pitch): Standard mode Condensed	Lower,Upper	04,E0																																				
0AH,0BH	Misalignment correction (1/360" pitch): Standard mode NLQ	Lower,Upper	06,80																																				
0CH,0DH	Misalignment correction (1/360" pitch): Standard mode Emphasized	Lower,Upper	06,D0																																				
0EH,0FH	Misalignment correction (1/360" pitch): Standard mode 20 CPI	Lower,Upper	06,A0																																				
10H,11H	Misalignment correction (1/360" pitch): Standard mode HS-Draft(Pica)	Lower,Upper	03,72																																				
12H,13H	Misalignment correction (1/360" pitch): Standard mode Forward	Lower,Upper	00,00																																				
14H,15H	Misalignment correction (1/360" pitch): Multi-part mode Pica/Elite	Lower,Upper	04,B0																																				
16H,17H	Misalignment correction (1/360" pitch): Multi-part mode Condensed	Lower,Upper	05,E0																																				
18H,19H	Misalignment correction (1/360" pitch): Multi-part mode NLQ	Lower,Upper	06,E0																																				
1AH,1BH	Misalignment correction (1/360" pitch): Multi-part mode Emphasized	Lower,Upper	08,E0																																				
1CH,1DH	Misalignment correction (1/360" pitch): Multi-part mode 20 CPI	Lower,Upper	06,C0																																				
1EH,1FH	Misalignment correction (1/360" pitch): Multi-part mode HS-Draft(Pica)	Lower,Upper	03,B0																																				
20H,21H	Misalignment correction (1/360" pitch): Multi-part mode Forward	Lower,Upper	00,00																																				
22H	Bidirectional test/adjustment mode (+/-8 steps) Current -8 : -8/360 inch correction Current -7 : -7/360 inch correction Current -6 : -6/360 inch correction Current -5 : -5/360 inch correction Current -4 : -4/360 inch correction Current -3 : -3/360 inch correction Current -2 : -2/360 inch correction Current -1 : -1/360 inch correction Current 0 : No correction Current +1 : +1/360 inch correction Current +2 : +2/360 inch correction Current +3 : +3/360 inch correction Current +4 : +4/360 inch correction Current +5 : +5/360 inch correction Current +6 : +6/360 inch correction Current +7 : +7/360 inch correction Current +8 : +8/360 inch correction	11 10 0F 0E 0D 0C 0B 0A 09 08 07 06 05 04 03 02 01	09																																				

GENERAL SPECIFICATIONS

Address	Function	Data(H)	Factory data
23H	Empty area		00
24H 25H	Top margin in auto-loading : Standard mode Friction (Paper feed at a pitch of 1/432 of an inch)	Lower Upper	CC 02
26H 27H	Top margin in auto-loading : Standard mode Tractor (Paper feed at a pitch of 1/432 of an inch)	Lower Upper	CC 02
28H 29H	Top margin in auto-loading : Standard mode ASF (Paper feed at a pitch of 1/432 of an inch)	Lower Upper	CC 02
2AH 2BH	Top margin in auto-loading : IBM mode Friction (Paper feed at a pitch of 1/432 of an inch)	Lower Upper	CC 02
2CH 2DH	Top margin in auto-loading : IBM mode Tractor (Paper feed at a pitch of 1/432 of an inch)	Lower Upper	CC 02
2EH 2FH	Top margin in auto-loading : IBM mode ASF (Paper feed at a pitch of 1/432 of an inch)	Lower Upper	CC 02
30H,31H	Misalignment correction : Standard mode HS-Draft(Elite)	Lower,Upper	03,60
32H,33H	Misalignment correction : Multi-part mode HS-Draft(Elite)	Lower,Upper	03,90
34H,35H	Empty area	Lower,Upper	00,00
36H 37H	Allowable distance (steps) between point of paper out detector and its detection :Standard mode / push tractor (Paper feed at a pitch of 1/432 of an inch)	Lower Upper	E8 01
38H 39H	Allowable distance (steps) between point of paper out detector and its detection :Standard mode / pull tractor (Paper feed at a pitch of 1/432 of an inch)	Lower Upper	E8 01
3AH 3BH	Allowable distance (steps) between point of paper out detector and its detection :IBM mode / push tractor (Paper feed at a pitch of 1/432 of an inch)	Lower Upper	E8 01
3CH 3DH	Allowable distance (steps) between point of paper out detector and its detection :IBM mode / pull tractor (Paper feed at a pitch of 1/432 of an inch)	Lower Upper	E8 01
3EH,3FH	Empty area	Lower,Upper	00,00
40H,41H	Empty area	Lower,Upper	00,00
42H,43H	Stored control panel information : Standard mode	Lower,Upper	00,00
44H,45H	Stored control panel information : IBM mode	Lower,Upper	00,00
46H to 61H	AUTOSTART software area : Standard mode (28 bytes)		ALL 00
62H to 7DH	AUTOSTART software area : IBM mode (28 bytes)		ALL 00
7EH,7FH	EE-PROM Reset Marker	Lower,Upper	4E,**

CHAPTER 2

THEORY OF OPERATION

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1. Block Diagram

The block diagram of this printer is shown in Fig. 2-1.

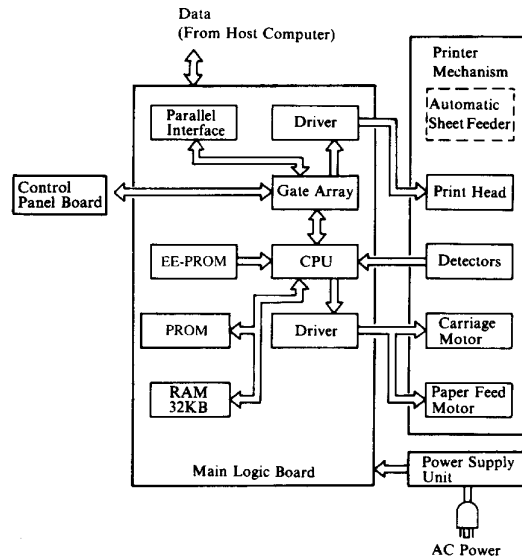


Fig. 2-1 Block Diagram

(1) Main Logic Board

This board receives data from the host computer and stores it in the RAM in the order of arrival. The CPU on this board reads the data from the RAM, and edits it according to the program stored in the ROM.

When the editing is completed, various drive signals from the CPU are sent to the printer mechanism to perform printing.

<Explanation>

1 CPU M50734SP

- Controls this printer.

2 PROM

- Contains the program which executes control of the printer.

3 EE-PROM BR93C46 46 × 16 bits

- Contains the data (EDS data and so on) in the memory switch.

4 RAM 32K-bytes

- Used as stack area, work area and data buffer of the CPU.

5 Parallel interface

6 Gate array (custom IC)

- Inputs or outputs several signals.

7 Driver

- The data edited by the CPU and gate array are sent to the printer mechanism after conversion to the signal for the print head drive, carriage motor drive and paper feed motor drive respectively.

(2) Control Panel Board

This panel circuit is for manual operation of the printer.

(3) Printer Mechanism

The printer mechanism consists of a print head, carriage motor, paper feed motor and detectors.

(4) Power Supply Unit

AC power is converted to 25VDC and 5VDC.

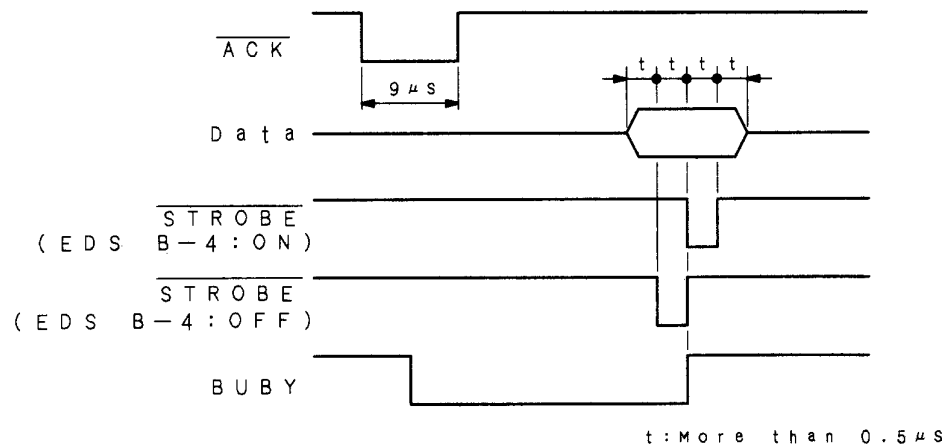


Fig. 2-3 Timing Chart of Parallel Interface

2-1-2. Serial Interface (option)

When the serial interface is used, an optional Serial-Parallel Converter is required to be installed. The converter will change the voltage level (RS-232C <-----> TTL) and the data transfer method (Serial <-----> parallel).

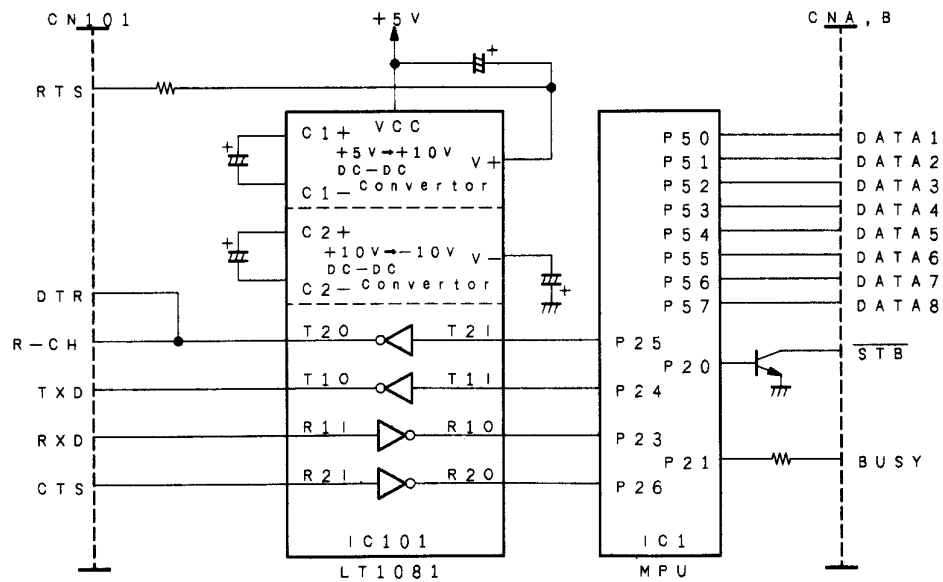


Fig. 2-4 Serial Interface (in the Serial-Parallel Converter)

THEORY OF OPERATION

The IC101 is a dual RS-232C driver/receiver which includes a capacitive voltage generator to supply RS-232C voltage levels from a single 5V supply.

Data from the host computer is sent from RXD via IC101 and is input to the MPU. Serial data input to the MPU is converted into parallel data, and output to the main logic board. Conversely, parallel data received by the MPU is converted there into serial data, and output to the TXD terminal via IC101.

The CTS terminal is hardware-connected, not software- connected. (This signal is not checked.)

This printer employs 3 different transfer methods, which can be selected using the dip switches. (Refer to Chapter 1, 5-3 Setting Dip Switches)

(1) DTR method

The DTR signal is considered a BUSY signal at the handshake, and when the data buffer capacity is 256 bytes or less, the DTR signal is given a marked status, meaning it cannot receive data. When the capacity of the data buffer increases to 512 bytes or more during printing, the DTR signal is given a space status, which indicates that it can receive data.

(2) XON/XOFF method

When a handshake is carried out with the host computer, the XON/XOFF method makes use of ASCII codes (DC1 and DC3). (DC1 and DC3 are called XON and XOFF, respectively.) When the printer buffer is full, DC3 (ASCII code 19) is output to the TXD terminal, and the computer receives a request to stop data transfer. The printer outputs DC3 until it (the computer) stops data transfer. During printing, when the buffer full status is cancelled and data can be received, DC1 (ASCII code 17) is output to the TXD terminal. When DC1 is output from the printer, the computer follows the data format, and begins data transfer. Data transfer will continue until DC3 is output again.

(3) ETX/ACK method

The data block is configured as shown below, but the initial STX code is not necessary. When an STX code is sent from the host computer, that 1 byte is ignored. When the ETX code is received, that 1 byte is not regarded as data, an ACK or NACK code is sent to the TXD terminal, and the host computer is informed that data reception has been completed.

Data block form:

STX	DATA (8 KB or less)	ETX
-----	---------------------	-----

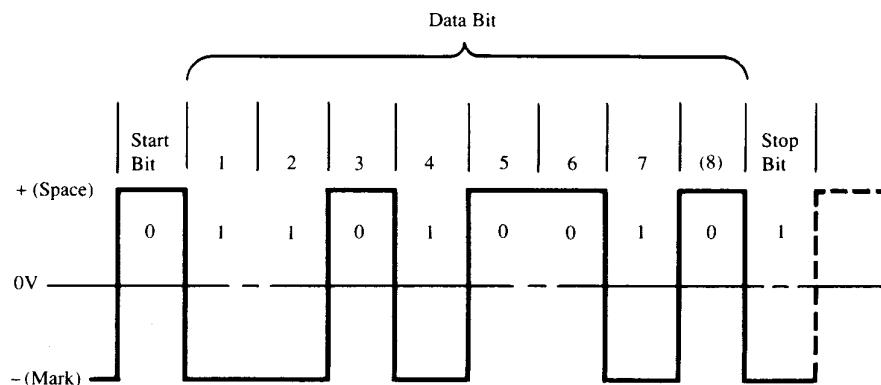
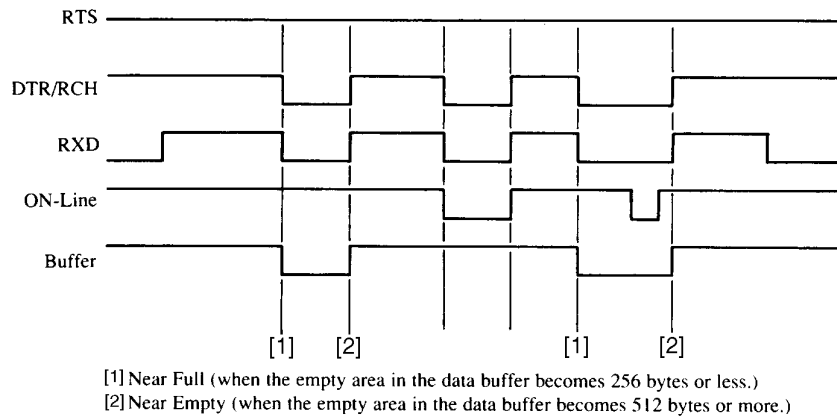
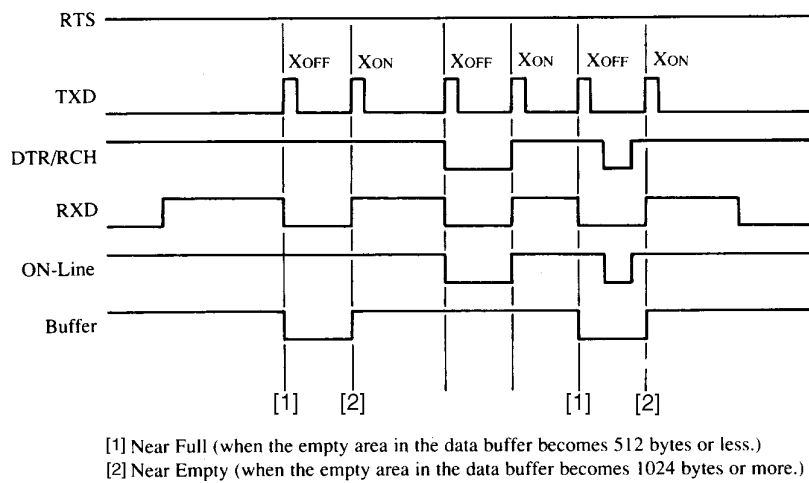


Fig. 2-5 Data Format

(1) DTR method



(2) XON/XOFF method



(3) ETX/ACK method

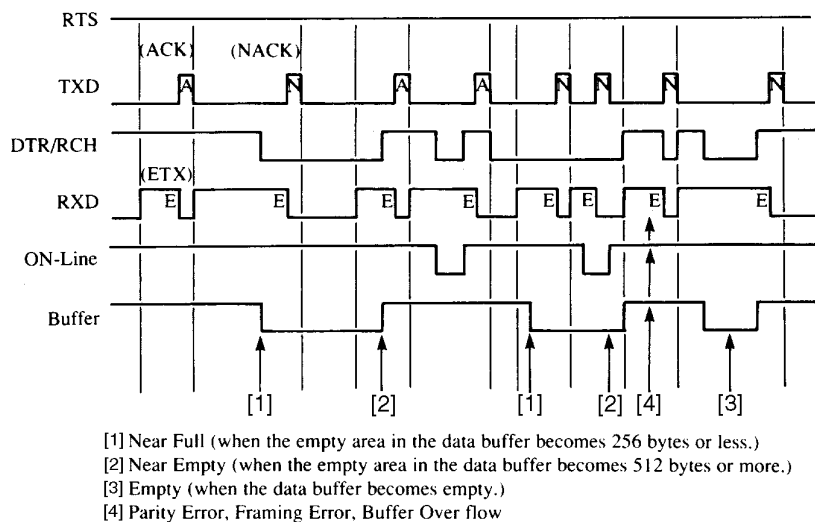


Fig. 2-6 Data Input Timing Chart with Serial Interface

THEORY OF OPERATION

2-2. General Flow Chart

A general flow chart of editing and printing operations is presented in Fig. 2-7.

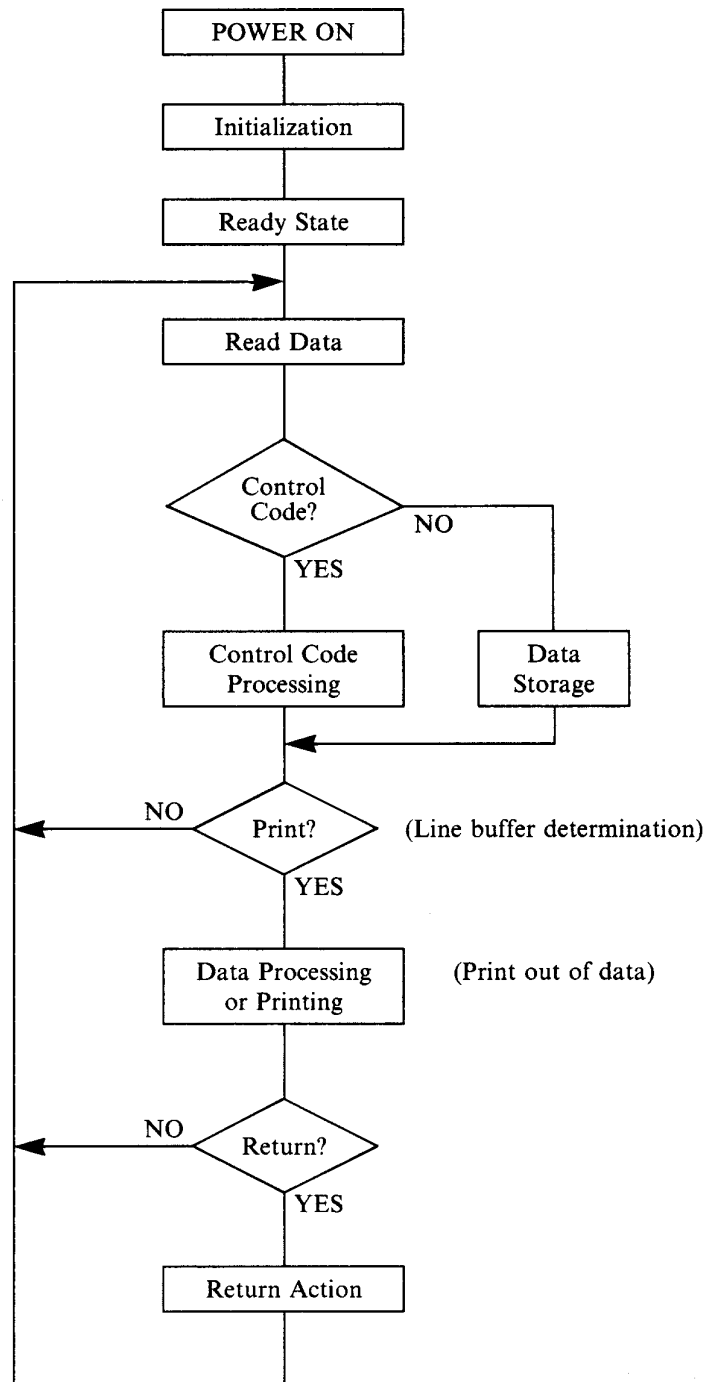


Fig. 2-7 General Flow Chart of Editing and Printing

2-2-1. Editing

Data stored in the RAM is read out sequentially by the CPU and then edited according to a function code that has been specified in advance.

This editing takes places until the CR or CR + LF code appears or the line buffer becomes full.

2-2-2. Print Head Driving Circuit

Edited print data is output to terminals ($\bar{Q}0 \sim \bar{Q}7$) in the gate array through the CPU data bus, as regulated by the issue timing of a \bar{WR} signal. However, as for pin 9 (HD9) of the print head, the data is output to the terminal Q7 upon issue of the next \bar{WR} signal. When all the data is received for printing, an energized time control signal is output from port P04 of the CPU. This allows the print data to be output to HD-1 ~ 9 of the gate array. When the print data is HIGH, the transistor TR19 will be turned ON for 327 μ S, energizing the print head solenoid to drive the print head.

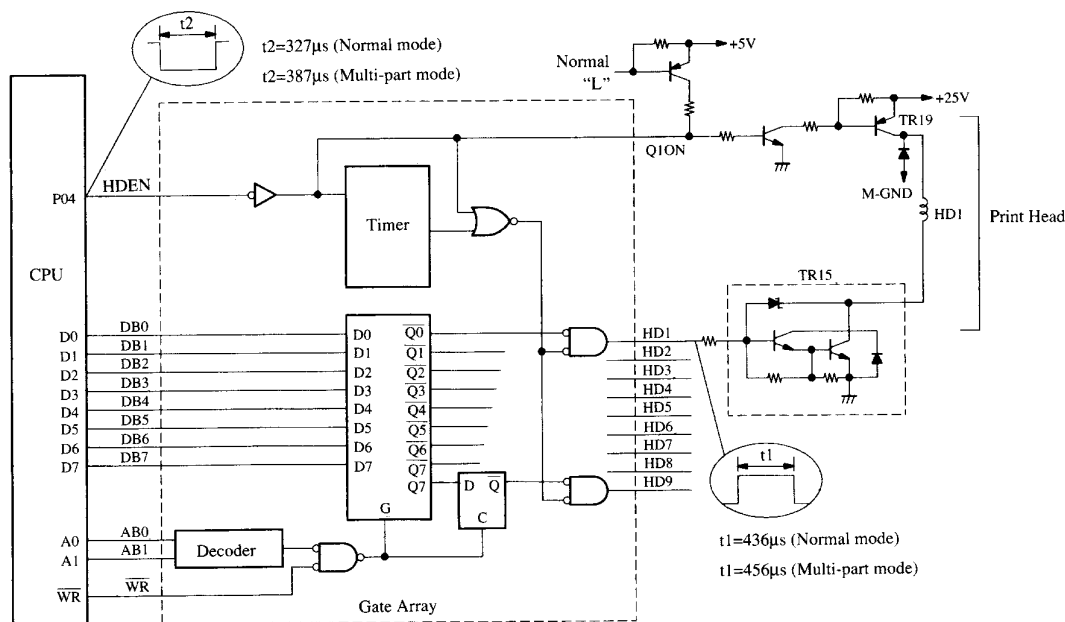


Fig. 2-8 Print Head Driving Circuit

2-2-3. Print Head Temperature Detection Circuit

The print head temperature detection circuit protects against damage when the print head heats up abnormally.

Fig. 2-9 shows this circuit.

The print head has a thermistor to show the temperature of the head solenoids. This thermistor is an element that converts temperature into voltage. Its output voltage is input to an analog pin of the CPU. The CPU compares this input voltage against its reference voltage V_{REF} to find out the temperature of the head solenoids and carries out the following operations depending on the temperature.

- (1) $T \leq 115^\circ\text{C}$
 - Normal print operations
- (2) $115^\circ\text{C} < T < 125^\circ\text{C}$
 - Interval printing; The print head stays for approximately 0.5 second whenever it finishes 1-line. When the temperature falls below 115°C , normal printing is resumed.
- (3) $125^\circ\text{C} \leq T$
 - The line being printed is completed, then printing stops. When the thermistor's temperature falls below 125°C , interval printing is resumed.

2-2-5. Carriage Motor Speed Control

Since the carriage motor is a stepping motor, the carriage can be stopped at a desired position by controlling acceleration and deceleration. The carriage can also move backward.

The rotational speed of the carriage motor is set by the number of pulses per time unit. The character pitch (horizontal character size) in each print mode is determined by changing this rotational speed (or carriage transfer speed).

- (1) At start-up of the motor:
The number of pulses input to the motor increase in steps, reaching a certain frequency.
- (2) To stop the motor:
The number of pulses input to the motor decreases in steps, in order to gradually bring the motor to a halt.
- (3) When printing is carried out:
Pulses of a uniform pulse width are supplied for printing.

2-2-6. Paper Feed Motor Driving Circuit

Again, a stepping motor is employed as the paper feed motor, which turns a certain angle only when a drive pulse is received. This 4-phase stepping motor is controlled by the phase 1-2 excitation method. The following shows the paper feed motor drive circuit and the control signal generated by the phase 1-2 excitation method.

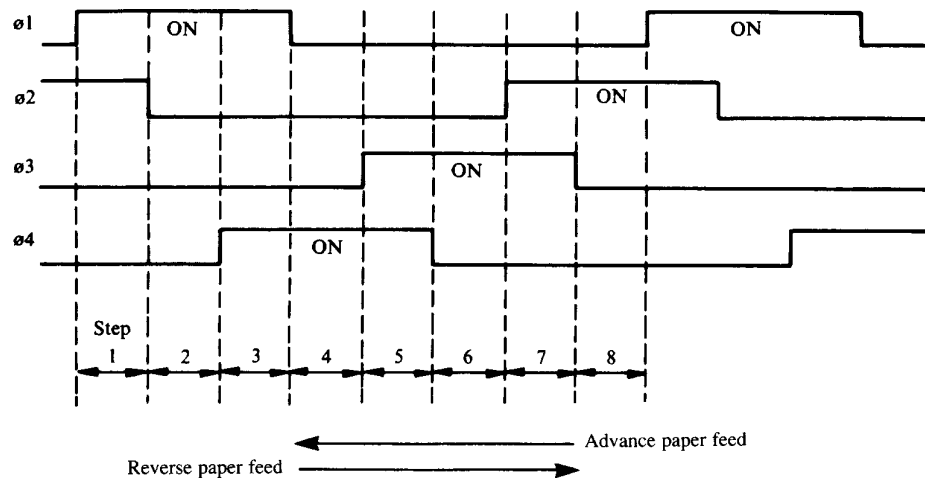


Fig. 2-12 Paper Feed Motor Driving Circuit

THEORY OF OPERATION

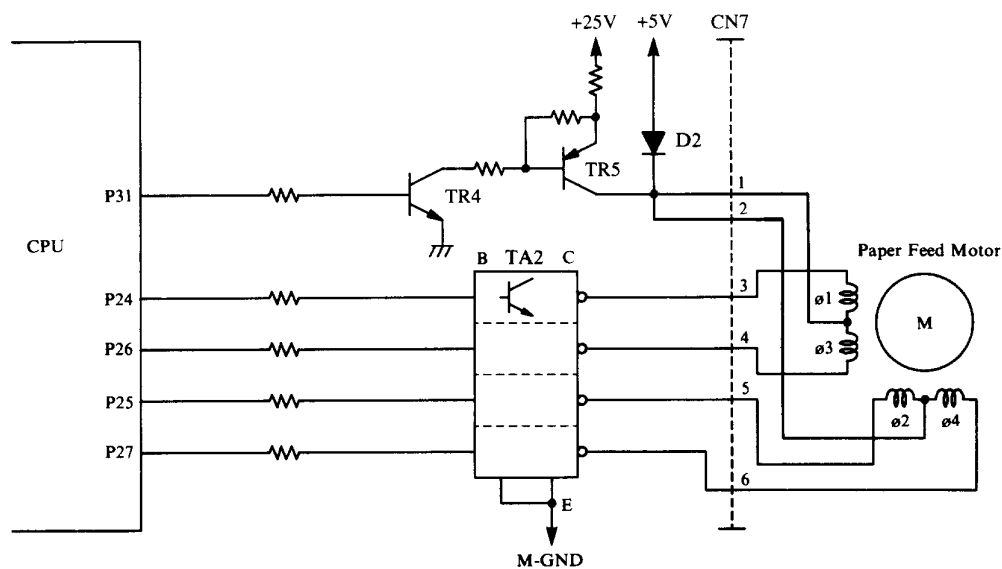


Fig. 2-13 Paper Feed Motor Driving Signals

The utilization of voltage applied to the paper feed motor is described as follows.

Mode	Voltage	Application
Operation	+25VDC	Motor Drive
Standby:	+5VDC	Holding Bias

Voltage to the paper feed motor is changed by setting CPU port P31 to LOW or HIGH and by turning transistors TR4 and TR5 ON or OFF.

When TR5 is turned on, +25V is applied to the paper feed motor.

When TR5 is turned off, +5V is supplied to the motor via diode D2.

2-3. Reset Circuit

The RESET signal initializes the circuit elements and prevents operation errors when the power is turned on.

The RESET signal is output for approx. 34ms. when the power is turned on, or while the RESET (INPUT-PRIME) signal is being output from the host computer.

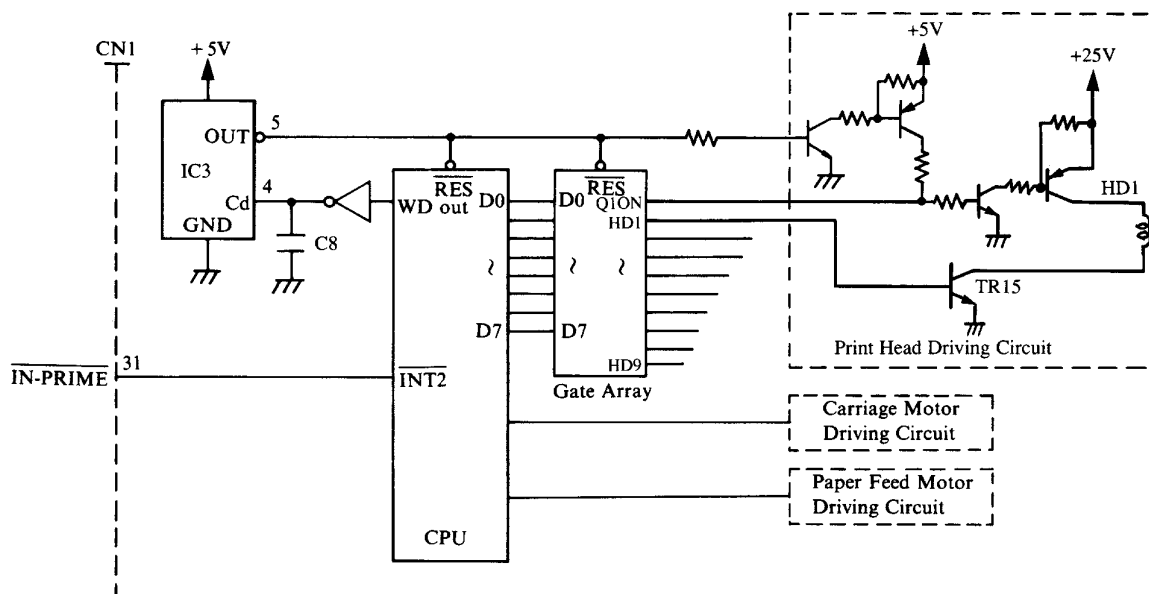


Fig. 2-14 Reset Circuit and Protection Circuit.

- Power On Reset

- 1 When the power is turned on, the RESET signal is output to Pin 5 of IC3 (M51953BL) for approx. 34 msec. This time length is determined by external capacitor C8 (0.1μF), and it can be calculated by the following formula.

$$T = 0.34 \times C8 \text{ (pF)} \mu\text{sec.}$$

- 2 This LOW signal triggers RESET command to the CPU and the RESET terminal ($\overline{\text{RES}}$) of the gate array.

- 3 Resetting the CPU and the gate array will ignore all the drive signals for the carriage motor, the paper feed motor and the print head, preventing operation errors at power ON.

- Reset by Input Prime Signal from Host Computer

- 1 The input prime signal from the host computer is output to pin 31 of the connector CN1.
- 2 This output signal will set the terminal $\overline{\text{INIT 2}}$ of the CPU to LOW, executing interruption. Then, the CPU will be initialized.

THEORY OF OPERATION

2-4. Reset by +5V Line Voltage Detection

A voltage-detecting IC (IC3 in Fig. 2-14) detects momentary drops in voltage or unstable voltage supply (due to power failures, etc.) on the +5V line. If the voltage on the +5V line falls below 4.25V, the RESET signal appears at the output terminal of the voltage-detecting IC.

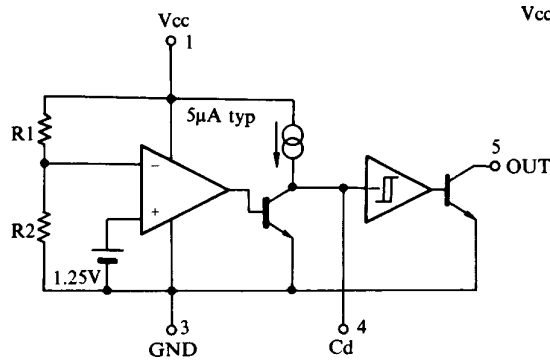


Fig. 2-15 Equivalent Circuit of Voltage-Detecting IC

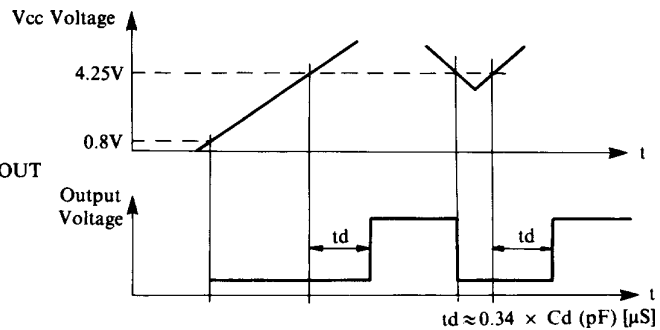


Fig. 2-16 Operational Timing Chart

2-5. Protection Circuit

This printer is provided with a protection circuit which shuts off the print head and motor driving circuits in the event of a CPU malfunction. (Refer to Fig.2-14)

The CPU normally outputs a LOW level signal from the terminal (WD OUT). However, if the CPU malfunctions, it can not output this signal.

When the LOW level signal is not output from the CPU, the input terminal (Cd) of the voltage-detecting IC goes to LOW and the RESET signal is output from the output terminal (OUT) of the voltage-detecting IC. By this signal, the CPU and the gate array are reset; and the print head, the carriage motor and paper feed motor driving signals are ignored, protecting the printer from the CPU runaway.

3. Power Supply Unit

Fig. 2-17 shows the power supply unit.

The AC power is stepped down to Vs1 and Vs2 by the power transformer. The Vs1 power is full-wave rectified by the DB1 rectifier stack and smoothed by electrolytic capacitor C4. The smoothed DC power is converted into the stable 25VDC power by the chopper circuit, whose main component is IC1. The Vs2 power is full-wave rectified by the DB2 rectifier stack and smoothed by the electrolytic capacitor C10. Part of this smoothed Vs2 output is converted into the stable 5VDC power by fixed voltage IC2.

	Voltage Range	Circuit Type	Use
Vs1	About 30VAC		To 25VDC
Vs2	About 9VAC		To 5VDC
25VDC	+25V±5%	Chopper	For print head, carriage motor, paper feed motor
5VDC	+5V±2.5%	Dropper	For IC 5V power, motor holding bias

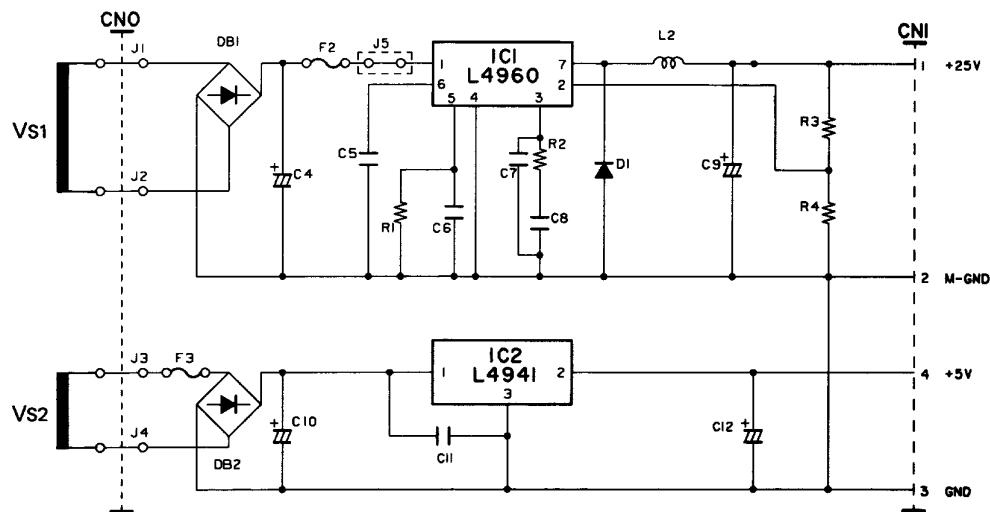


Fig. 2-17 Power Supply Board

THEORY OF OPERATION

We will explain the chopper circuit in terms of Fig. 2-18, a simplified version of Fig. 2-17. IC1 is a pulse-width control switching regulator. It has a reference voltage section, oscillation section, pulse-width control section, and power transistors. Fig. 2-19 shows an equivalent circuit for IC1.

The chopper circuit switches the power transistors in IC1 on and off to divide input voltage V_{IN} into pulses and smoothes those pulses with choke coil L2 and capacitor C9 to obtain the desired output voltage V_{OUT} .

Since the pulse width control section determines the ratio of the time that the power transistors are on and off by comparing the output voltage with the reference voltage, the output voltage can be held steady.

In other words, if the output voltage falls below the reference voltage, the pulse width controller extends the time that the power transistors are on, thus raising the output voltage. The output voltage V_{OUT} can be expressed with the following equation.

$$V_{OUT} = V_{IN} \cdot \frac{T_{ON}}{T_{ON} + T_{OFF}} = V_{IN} \cdot \frac{T_{ON}}{T}$$

T_{ON} : Duration the power transistors are on

T_{OFF} : Duration the power transistors are off

T : $T_{ON} + T_{OFF}$ (constant)

Diode D1 forms a pathway through which the energy accumulated on choke coil L2 while the power transistor are on is discharged while the power transistors are off.

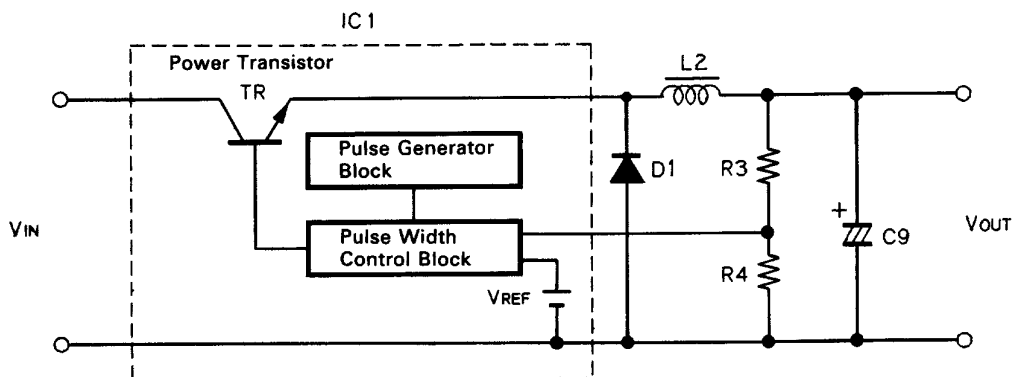


Fig. 2-18 Chopper Circuit

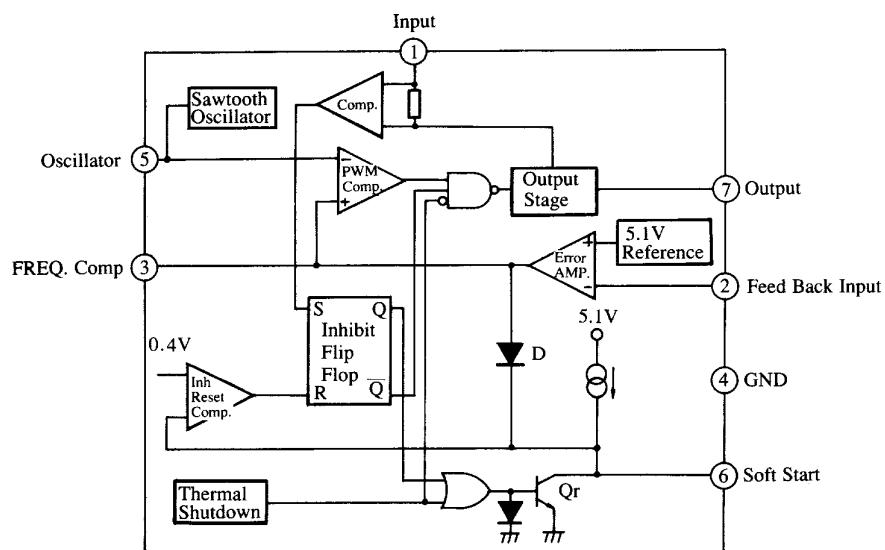


Fig. 2-19 Equivalent Circuit for Voltage Regulator IC1

4. Mechanism

4-1. Print Head Mechanism

The print head consists of 9 needle wires and 9 print solenoids. The following explains how each needle wire operates during printing.

- (1) When the print solenoid is energized, the clapper is attracted by the iron core and the needle wire is driven toward the platen.
- (2) This needle wire hits the platen via the ink ribbon and paper. A single dot is printed on the paper.
- (3) When the print solenoid is de-energized, the needle wire is returned to its original position by rebound energy and spring and clapper holder (leaf spring) force.

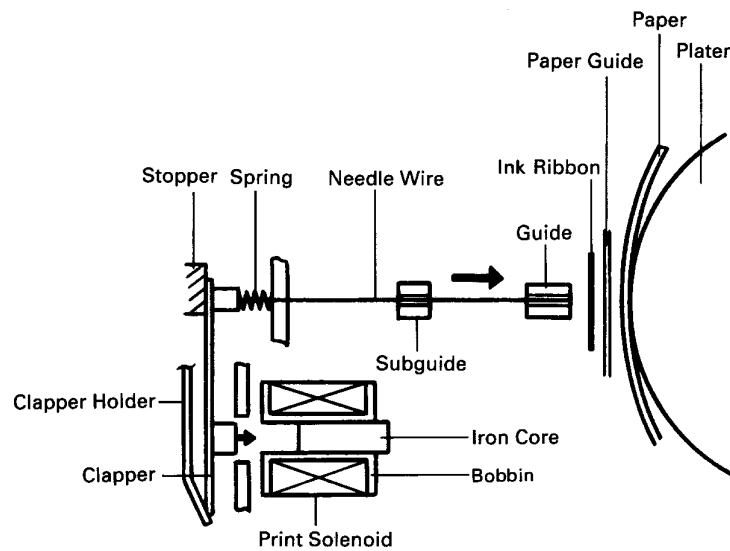


Fig. 2-20 Outline of Print Head Mechanism

4-2. Print Head Carrying Mechanism

The print head carrying mechanism consists mainly of a carriage, timing belt, carriage motor, and home position detector.

- (1) Carriage
The carriage is supported horizontally by means of the carriage stay and rear angle, and it moves from side to side with the print head mounted above it. A timing belt is clamped to the base of the carriage and a shield plate is mounted at the base for home position detection.
- (2) Timing Belt
The timing belt is suspended between the timing pulley of the carriage motor and the timing pulley of the tension lever, and it maintains a constant tension.
The timing belt is also clamped to the base of the carriage so that it can move the carriage accurately with driving force from the carriage motor.
- (3) Carriage Motor
The carriage motor is a HB (Hybrid) type, four-phase and 192-pole pulse motor, which is driven by pulse signals from the control circuit. The rotational rate depends on the number of pulses per unit time. By varying this rotational rate (that is, the carriage carrying rate), the size of the horizontal letters can be changed in each print mode.

THEORY OF OPERATION

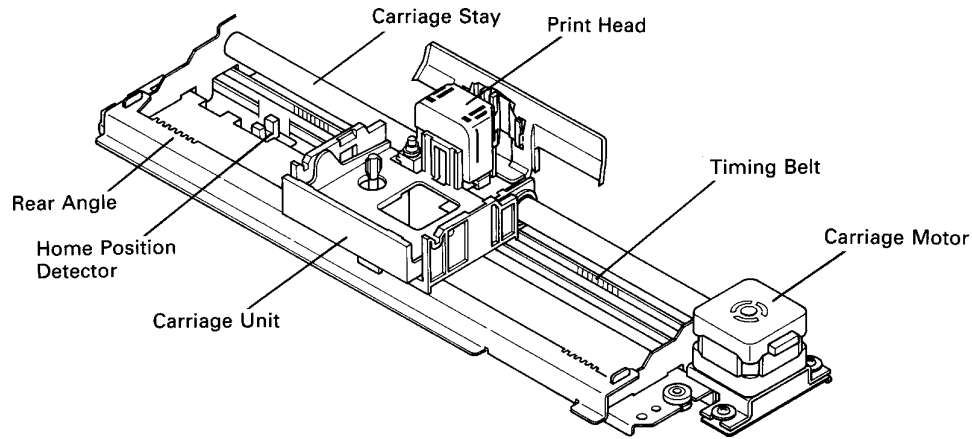


Fig. 2-21 Print Head Carrying Mechanism

4-3. Ink Ribbon Feed Mechanism

The ink ribbon feed mechanism is linked to the print head carrying mechanism described previously so that the ink ribbon is wound up automatically while the carriage moves left or right.

The ribbon feed mechanism is driven by torque from the carriage motor, and carriage movement allows the gear B to rotate.

This rotation is conveyed sequentially to the gears that work to wind the ribbon. The carriage is equipped with a ribbon feed fin A'ssy so that the direction of RF fin rotation remains constant regardless of the direction of the gear B rotation.

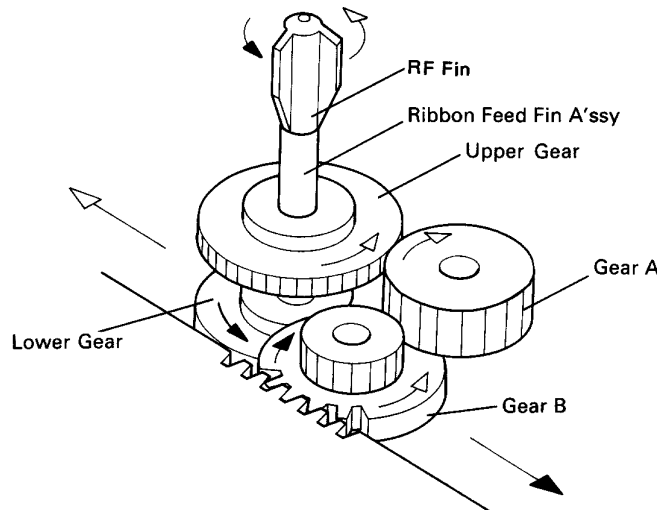


Fig. 2-22 Ribbon Feed Mechanism

4-4. Paper Feed Mechanism

The paper feed motor is a PM (Permanent Magnet) type, four-phase and 48-pole pulse motor. Minimum paper feed is set at 1/432 inch.

There are two ways of feeding paper available with this printer: Friction method and Tractor method. You can select one of the two methods, using the release lever.

Position of release lever	[1]	[1]	[2]	[2]
Position of tractor	[A] (Down)	[B] (Up)	[A] (Down)	[B] (Up)
Tractor gear and tractor clutch	Not linked	Linked	Linked	Linked
Holder roller position	Up	Up	Down	Down
Direction of rotation of tractor gear	CW	CCW	CW	CCW
Release lever position detector	Open	Open	Closed	Closed
Tractor position detector	Closed	Open	Closed	Open
Paper feed method	Friction	(Error)	Push tractor	Pull tractor

(1) Friction Method

Friction method is selected when the release lever is position [1]. With this method, paper is pressed between the platen roller and the holder roller therefore, paper is fed as the rollers turn.

As the paper feed motor is driven, the motor gear, through the idler gear, turns the platen gear in the paper feeding direction. However, since the tractor gear and the tractor clutch are not linked at this time, the tractor unit will not be driven.

(2) Tractor Method

Tractor method is selected when the release lever is position [2]. Paper feeding is facilitated by rotation of the sprocket pin of the tractor unit. When the tractor method is selected, the tractor gear is linked to the tractor clutch, enabling the drive force generated by the paper feed motor to be transferred to the tractor unit via the idler gear and the platen gear.

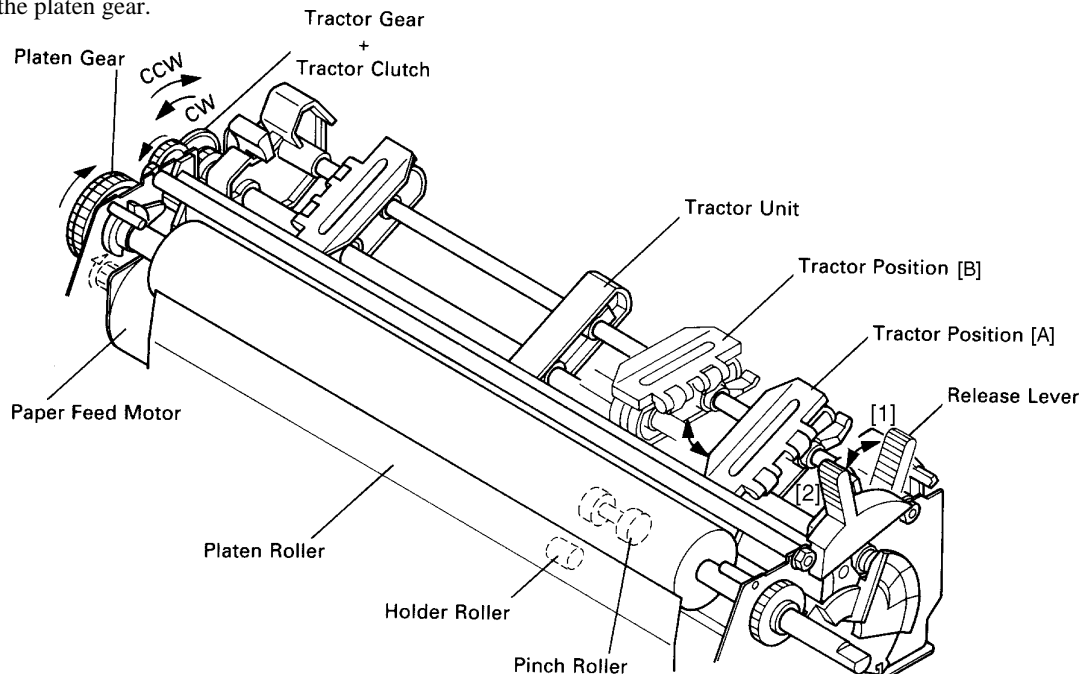


Fig. 2-23 Paper Feed Mechanism

THEORY OF OPERATION

4-5. Detectors

(1) Home Position Detector

A photo-interrupter is used in the home position detector, which is set at the left side of the frame unit. ON/OFF signals are generated according to the position of the shield plate mounted at the base of the carriage, and the printing position is determined by these signals.

(2) Paper End Detector

A paper end detector is located at the paper insertion slit. When paper is present, the photo transistor with the reflecting type photo sensor goes on. As soon as paper runs out, this transistor goes off, outputting a paper empty signal.

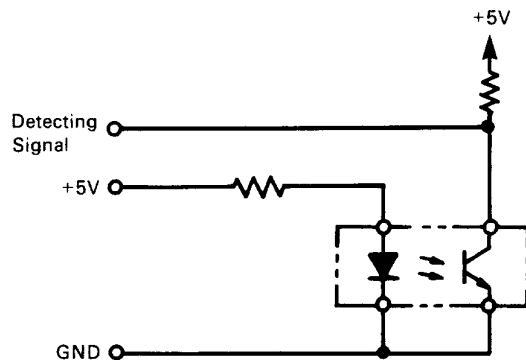


Fig. 2-24 Home Position Detector

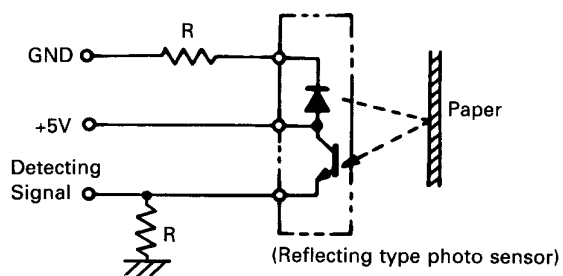


Fig. 2-25 Paper End Detector

(3) Tractor Position Detector

The leaf switch is open when the tractor is used in pull-tractor mode, and it is closed when the tractor is used in push-tractor mode.

(4) Release Lever Position Detector

The leaf switch is open when the release lever is in the friction position, and is closed in the tractor position.

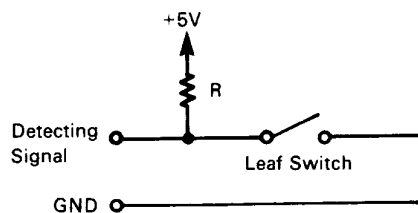


Fig. 2-26 Tractor Position Detector

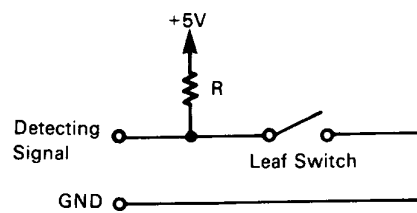


Fig. 2-27 Release Lever Position Detector

CHAPTER 3 ADJUSTMENTS

This printer has undergone various adjustments so that it will achieve standard performance.
In this chapter, a brief explanation is given of the methods of adjustments.
Follow the instruction when making maintenance inspections or when replacing parts to correct malfunctions.

1. Gap Adjustment Between Print Head and Platen	39
1-1. Measuring Gap Between Print Head and Platen	39
1-2. Adjusting Gap Between Print Head and Platen	39
2. Adjustment of Timing Belt Tension	40

1. Gap Adjustment Between Print Head and Platen

1-1. Measuring Gap Between Print Head and Platen

- (1) Remove the upper case unit according to procedures described in Chapter 4.
- (2) Set the index lever [1] at step two.
- (3) Remove the ribbon guide [2].
- (4) Insert a thickness gauge [3] between the print head [4] and the platen [5], and measure the gap.
- (5) This measurement must be carried out at the center [C].
- (6) The standard gap value is 0.30 to 0.40 mm.
- (7) If the gap does not lie within this range, adjust it by following the procedure in item 1-2.

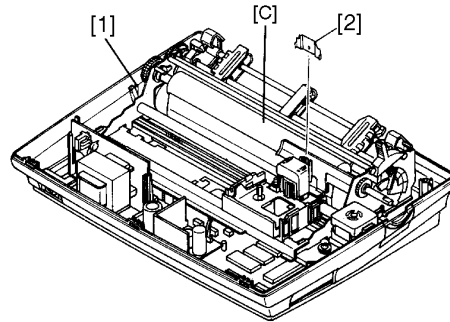


Fig. 3-1 Gap Adjustment

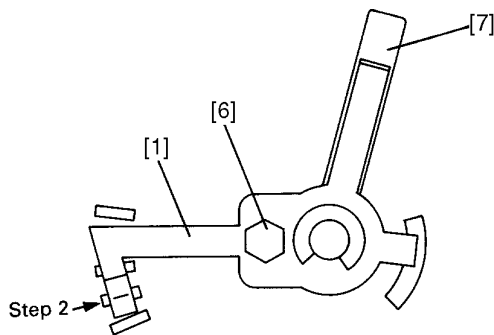


Fig. 3-2 Position of Adjustment Lever

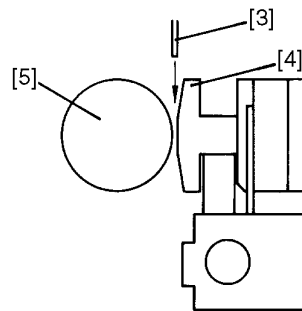


Fig. 3-3 Gap Measurement

1-2. Adjusting Gap Between Print Head and Platen

If the gap does not lie within the standard range, adjust it by carrying out the following procedures.

- (1) Remove the printer mechanism according to the procedures described in Chapter 4.
- (2) Unfasten the screw [6] securing the adjustment lever [7] and the index lever [1].
- (3) Holding the index lever [1] at the position shown in Fig. 3-2, shift the adjustment lever [7] for gap adjustment.
When the shaft is lowered to the platen side, the gap is reduced, and when lowered to the opposite side, the gap is expanded.
- (4) After adjusting, tighten the screw [6].

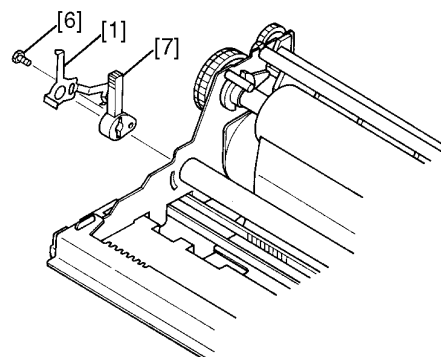


Fig. 3-4 Gap Adjustment

ADJUSTMENTS

2. Adjustment of Timing Belt Tension

The timing belt tension should be set at from 15g to 19g.

(The belt tension must be measured with the designated tension gauge [1].)

After the belt has been used for a long time, however, it may be difficult to maintain prescribed tension because of belt deterioration or wear. In these cases, make adjustments by following the procedures listed below.

- (1) Remove the upper case unit according to the procedures described in Chapter 4.
- (2) Move the carriage unit [2] right and left two or three times in order to familiarize yourself with the timing belt [3].
- (3) Set the index lever [4] at step 2 as shown in Fig. 3-2.
- (4) Move the carriage unit [2] to the right end.
- (5) Set the arm [5] of the tension gauge [1] 142mm apart from the frame L.
- (6) Move the tension gauge [1] in the direction of the platen [6] until it stops. Then place the arm [5] of the tension gauge on the timing belt [3].
- (7) Loosen the screw [7].
- (8) Insert a flat-blade screwdriver into the square hole of the tension arm [8] and adjust the belt tension by moving the tension arm [8] left or right.
- (9) When the belt has been adjusted to the prescribed tension, tighten the setting screw [7].
- (10) If the belt cannot be adjusted to the prescribed tension, replace it with a new timing belt [3].

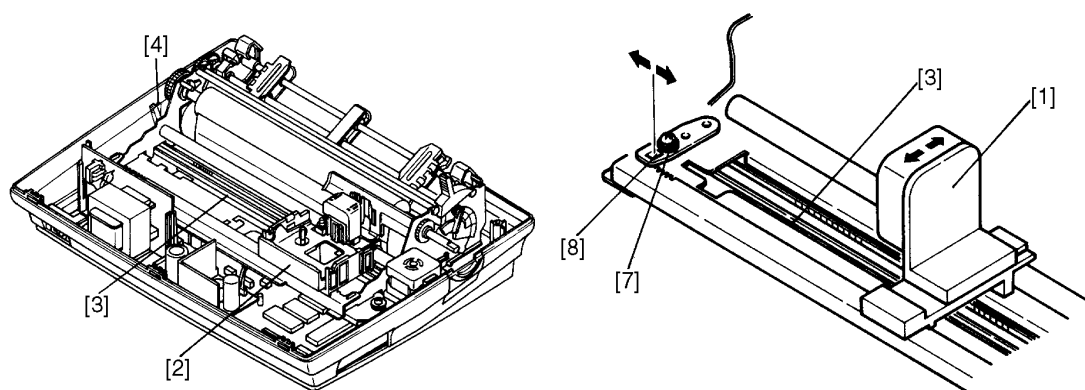


Fig. 3-5 Adjustment of Timing Belt Tension

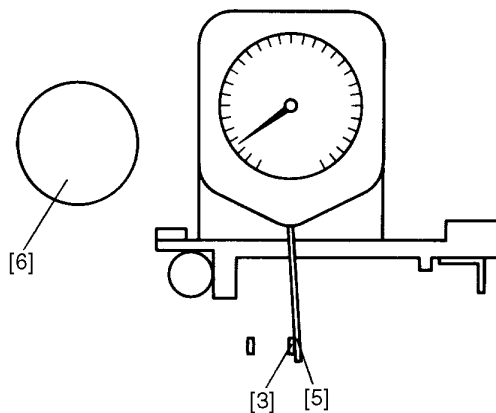


Fig. 3-6 Tension Measurement

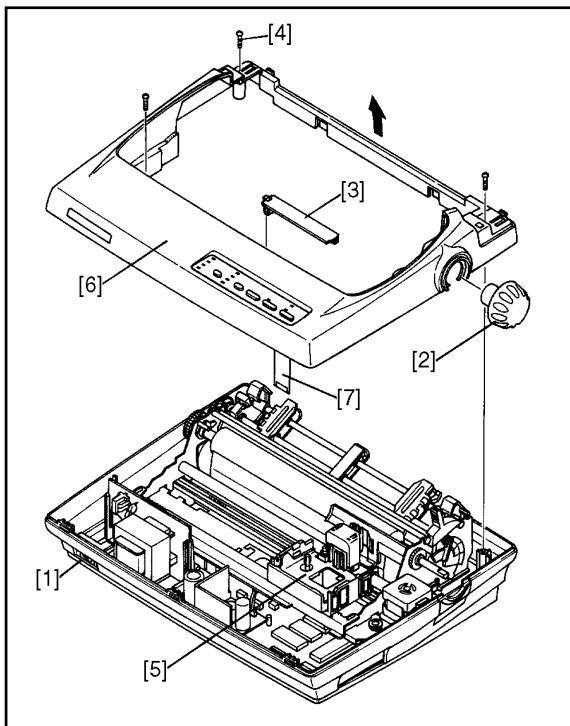
CHAPTER 4

PARTS REPLACEMENT

This chapter explains disassembly and reassembly of the printer. Note the following precautions during disassembly and reassembly.

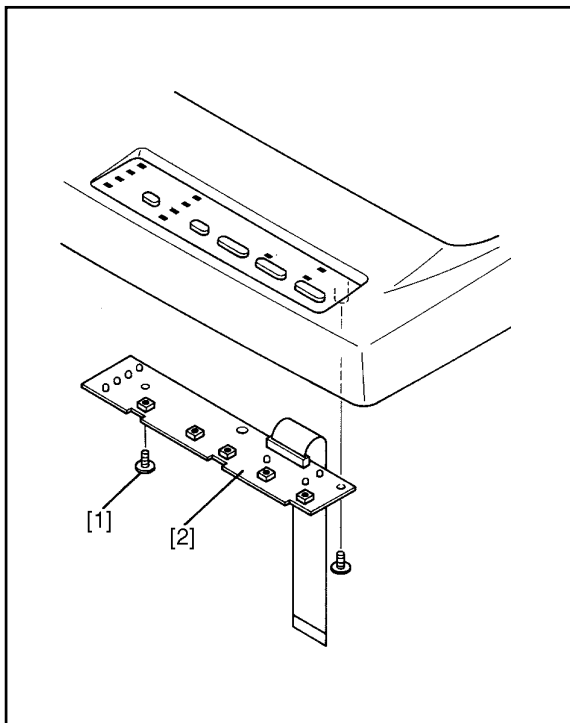
1. Disconnect the printer from the wall outlet before servicing it.
2. Assembly is the reverse of disassembly unless otherwise specified.
3. After reassembly, coat the screw heads with locking sealant.
4. Lubrication information is not provided in this chapter. Refer to item 2 in Chapter 5.

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8. Carriage Motor Unit	46
9. Platen Unit	47
10. Tractor Unit	47
11. Paper Feed Motor Unit	48



1. Upper Case Unit

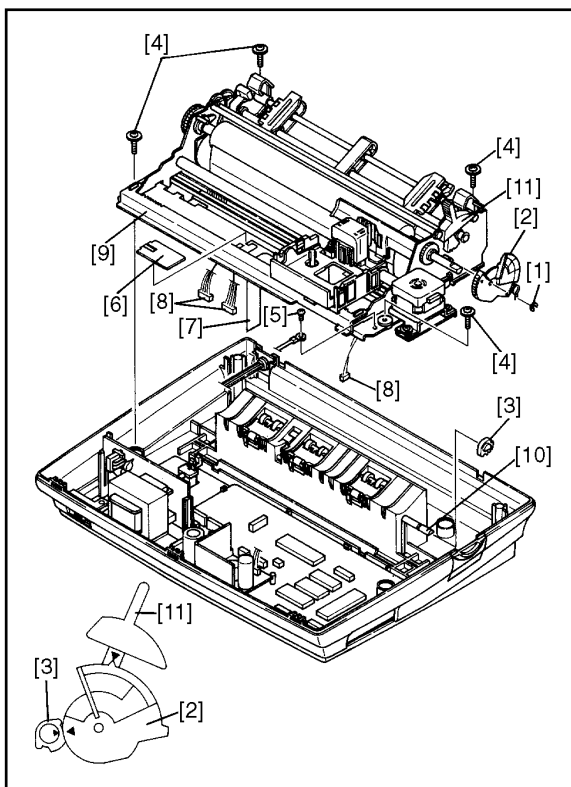
- (1) Turn off the power switch [1] .
- (2) Remove
 - Printer cover
 - Rear cover
 - Platen knob [2]
 - ROM cover [3]
 - Three screws [4]
- (3) Move the carriage unit [5] over to the right so that it aligns with the cut-out of the upper case unit [6].
- (4) Remove
 - Upper case unit [6]
Lean the upper case unit [6] forward for removal.
 - Cable [7] of control panel board.



2. Control Panel Board

- (1) Remove
 - Upper case unit according to the procedure described in item 1.
 - Two tapping screws [1]
 - Control panel board unit [2]

PARTS REPLACEMENT



3. Printer Mechanism

(1) Remove

- Upper case unit according to the procedure described in item 1.
- Stop ring [1]
- Release cam [2]
- Release gear [3]
- Four screws [4]
- Screws [5]
- Connector cover [6]

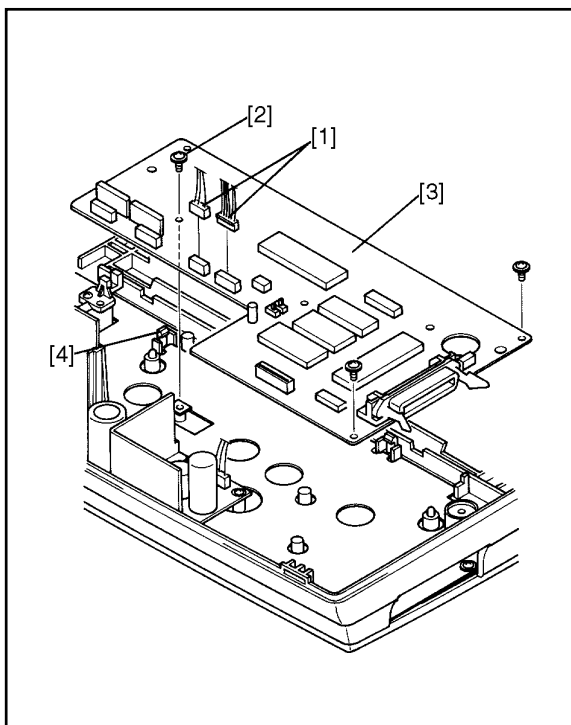
Holding up the tab of the connector cover, slide the connector cover to the right for removal.

- Head cable [7]
- Three connectors [8]
- Printer mechanism [9]

Lean the printer mechanism [9] to prevent interference with the release shaft [10].

Caution in assembly:

Of the two Δ marks on the release cam [2], one must align with the same mark on the release gear [3], and the other must align with the same mark on the release lever [11].

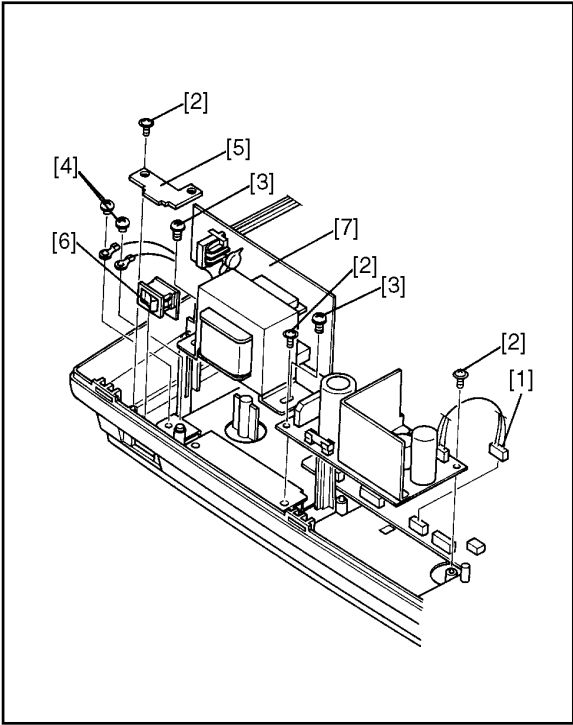


4. Main Logic Board

(1) Remove

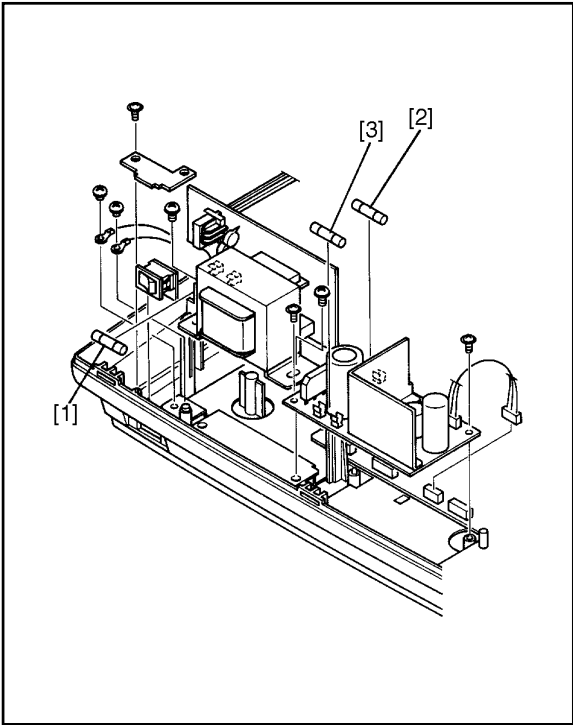
- Printer mechanism according to the procedure described in item 3.
- Two connectors [1]
- Three tapping screws [2]
- Main logic board [3]

Undo the four hooks [4] fastening the main logic board.



5. Power Supply Unit

- (1) Remove
- Upper case unit according to the procedure described in item 1.
 - Connector [1]
 - Three tapping screws [2]
 - Two screws [3]
 - Two screws [4]
 - Power switch holder [5]
 - Power switch [6]
 - Power supply unit [7]



6. Fuses

- (1) Remove
- Power supply unit according to the procedure described in item 5.
- (2) Inspect
- Fuse F1 [1]
 - Fuse F2 [2]
 - Fuse F3 [3]

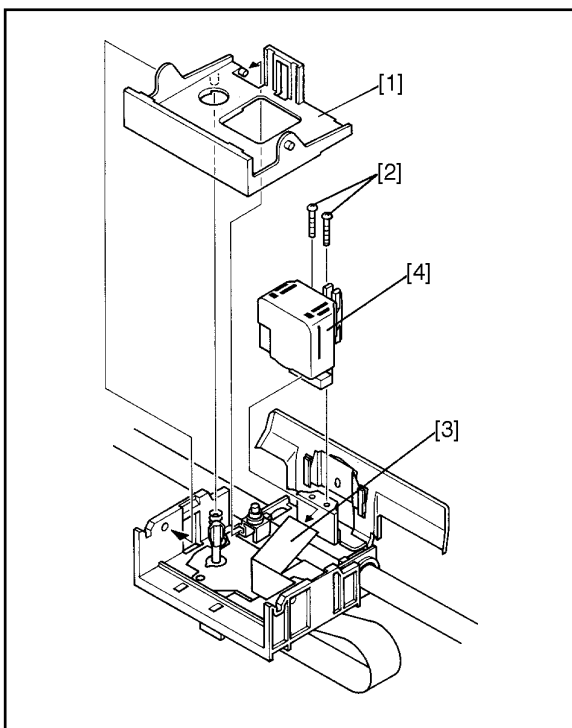
Defective → Replace fuse as follows:

AC Voltage	F1
120V	5TT1A
220V/240V	630mA

Destination	F2,F3
For US, UK, AS	5TT3A
For EC, WG, HK	EAK3.15A

New fuse blown → Inspect circuit

PARTS REPLACEMENT



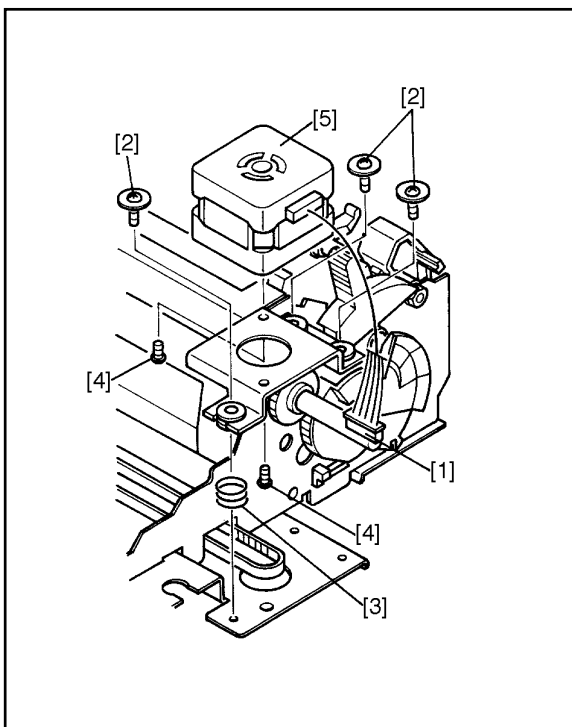
7. Print Head

- (1) Remove
- Printer Cover
 - Ink ribbon cartridge
 - Color ribbon holder [1]
 - Two tapping screws [2]
 - Head cable [3]
 - Print head [4]

WARNING

The print head gets hot after printing. Do not touch it until it get cool.

- (2) Adjust
- Gap between print head and platen
Refer to item 1 of Chapter 3.

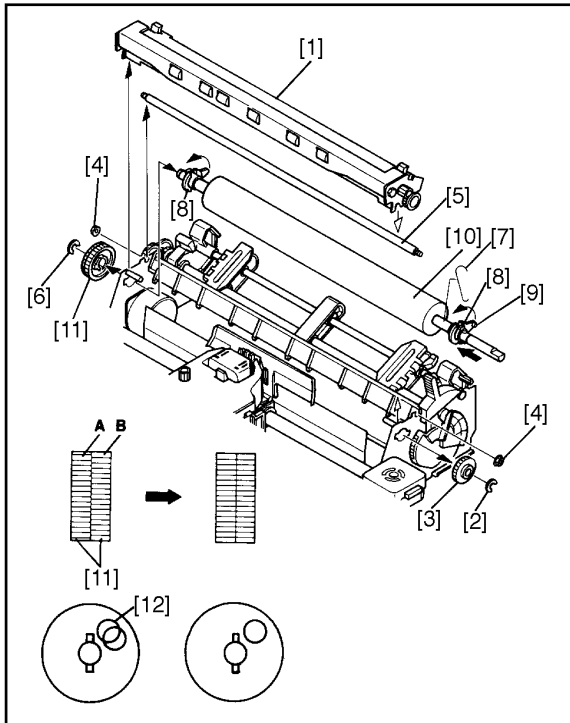


8. Carriage Motor Unit

- (1) Remove
- Upper case unit according to the procedure described in item 1.
 - Connector CN6 [1]
 - Three screws [2]
 - Spring [3]
 - Two screws [4]
 - Carriage motor unit [5]

Note:

The color of the connector [1] on the carriage motor unit [5] has been changed from white to red; however the motor itself has not been changed.



9. Platen Unit

(1) Remove

- Upper case unit according to the procedure described in item 1.
- Paper feed roller unit [1]
- Stop ring [2]
- Gear [3]
- Two nuts [4]
- Tractor stay [5]
- Stop ring [6]
- Ground contact spring [7]
- Two platen holders [8]

Holding up the tab [9] of the platen holder [8], turn the platen holder for removal from the frame.

- Platen unit [10]

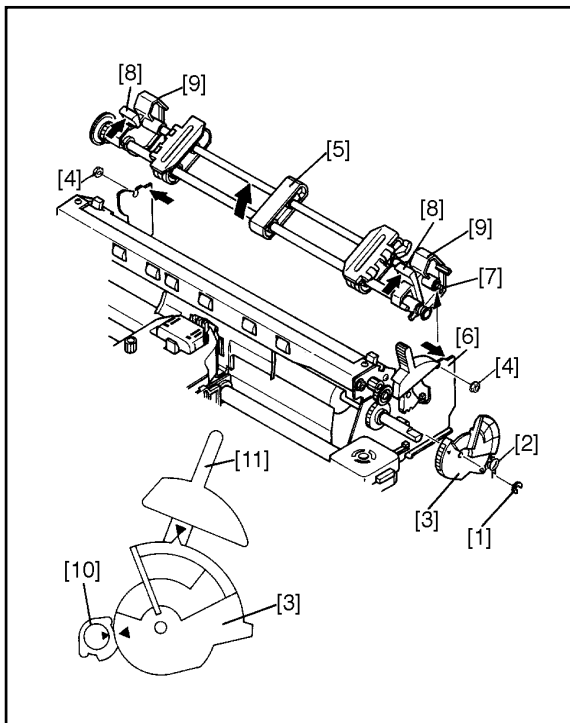
Slide the platen unit [10] to the right until the shaft comes off from the platen gear assembly [11] and then lift the platen unit.

Caution in assembly:

When the platen gear assembly [11] meshes with the idler gear, align the teeth of gear A and gear B (be sure to align the holes [12] in the two gears).

(2) Adjust

- Gap between print head and platen
- Refer to item 1 of Chapter 3.



10. Tractor Unit

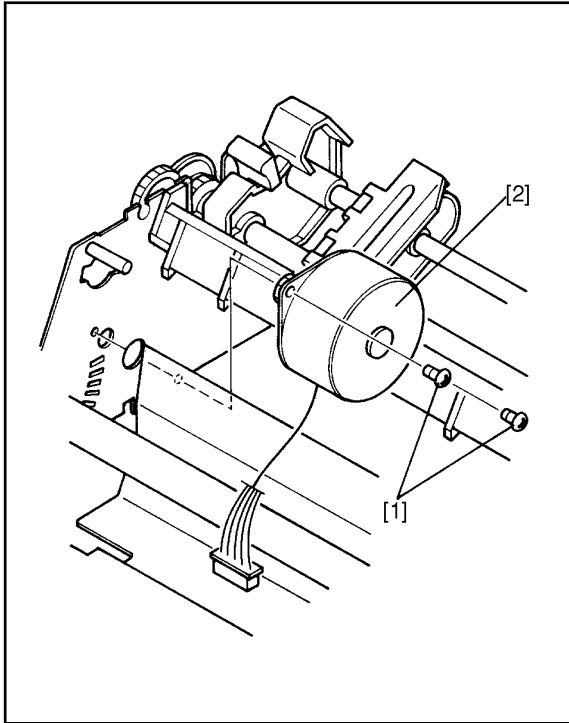
(1) Remove

- Upper case unit according to the procedure described in item 1.
- Stop ring [1]
- Release lever spring [2]
- Release cam [3]
- Two nuts [4]
- Tractor unit [5]

With the frames [6] open and the tractor stay [7] released, pinch the two levers [8] and turn the two tractor sub-units [9].

Caution in assembly:

Of the two Δ marks on the release cam [3], one must align with the same mark on the release gear [10], and the other must align with the same mark on the release lever [11].



11. Paper Feed Motor Unit

- (1) Remove
- Platen unit according to the procedure described in item 9.
 - Two screws [1]
 - Paper feed motor unit [2]

CHAPTER 5

MAINTENANCE AND LUBRICATION

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1. Maintenance

In order to maintain the optimum performance of this printer and to prevent trouble, maintenance must be carried out according to the following items.

1-1. Cleaning

(1) Removal of dirt

Wipe off dirt with a soft cloth soaked in alcohol or benzine.

*Note: Do not use thinner, trichlene or ketone solvents because they may damage plastic parts. Also during cleaning, be careful not to moisten or damage electronic parts, wiring, or mechanical parts.

(2) Removal of dust, pile, etc.

Vacuum cleaning (with an electric cleaner) is preferred. Remove all dust, etc., inside the printer.

*Note: After cleaning, check the oil level. If it is not adequate due to cleaning, replenish it.

1-2. Checks

Checks must be carried out at two levels: a “daily check” which the operator can easily carry out during operation, and a “periodic check” which an expert should carry out.

(1) Daily check

When the printer is used on a daily basis, check that the printer is used properly. Make sure that the printer is operating under the best conditions.

- Is any paper stuck in the paper box or printer case?
- Is the cartridge ribbon set at the right position?
- Is there any foreign matter inside the printer? (Remove if any.)
- Is the print head getting excessively dirty?

(2) Periodic check

After 6 months or printing 1 million lines, the periodic check and lubrication must be carried out.

- Check for deformation of springs.
- Check the gap between the platen and the print head.
- Remove dust, dirt, etc., around the detectors.

MAINTENANCE AND LUBRICATION

2. Lubrication

Lubrication is very important to maintain optimum performance and to prevent trouble.

2-1. Lubricant

The type of lubricant greatly affects the performance and durability of the printer, especially in a low temperature environment. We recommend use of the grease and lubrication oils listed below for this printer.

Type of oil	Product name	Maker
Grease	FLOIL GB-TS-0	Kanto Chemicals Co., LTD.
	KF96 (1000 cs)	Shinetsu Chemical Industry
Lubricant	Mobil 1	Mobil oil

2-2. Lubricating Method

When lubrication is carried out in assembly and disassembly, wash parts well to remove dust and dirt before lubrication. Lubrication must be carried out regularly once every 6 months or after 1 million lines have been printed. Lubrication is necessary irrespective of the regular lubrication whenever lubricant becomes deficient after cleaning or whenever parts have been disassembled or replaced.

2-3. Lubricated Areas

NO.	Lubricating Point	Grease/Oil
[1]	Rubbing surface of TM pulley B and pulley shaft	GB-TS-0
[2]	Rubbing surface of pulley cap and stop ring	GB-TS-0
[3]	Rubbing surface of gear 58 × 0.5 and gear shaft	GB-TS-0
[5]	Rubbing surface of lift cam and shaft	KF96
[6]	Rubbing surface of gear B and shaft	GB-TS-0
[7]	Rubbing surface of gear A and shaft	GB-TS-0
[8]	Rubbing surface of ribbon change lever and carriage	KF96
[9]	Rubbing surface of lift lever and shaft	KF96
[10]	Rubbing surface of lift lever and carriage	KF96
[11]	Rubbing surface of lift lever and lift cam	KF96
[12]	Rubbing surface of ribbon change lever and lift cam	KF96
[13]	Rubbing surface of gear cover and three gears	GB-TS-0
[14]	Rubbing surface of adjusting lever and frame	GB-TS-0
[15]	Rubbing surface of bushing and carriage stay	Mobil 1
[16]	Rubbing surface of tractor frame assy and shaft	GB-TS-0
[17]	Rubbing surface of idler gear 16 × 72 × 0.5 and shaft	GB-TS-0
[18]	Rubbing surface of idler gear 36 × 0.5 and shaft	GB-TS-0
[19]	Rubbing surface of color ribbon holder and carriage	GB-TS-0
[20]	Rubbing surface of PF idler gear 28 × 0.5 and shaft	GB-TS-0
[21]	Rubbing surface of PF clamp lever and shaft	GB-TS-0
[22]	Rubbing surface of roller holder and lower case	GB-TS-0

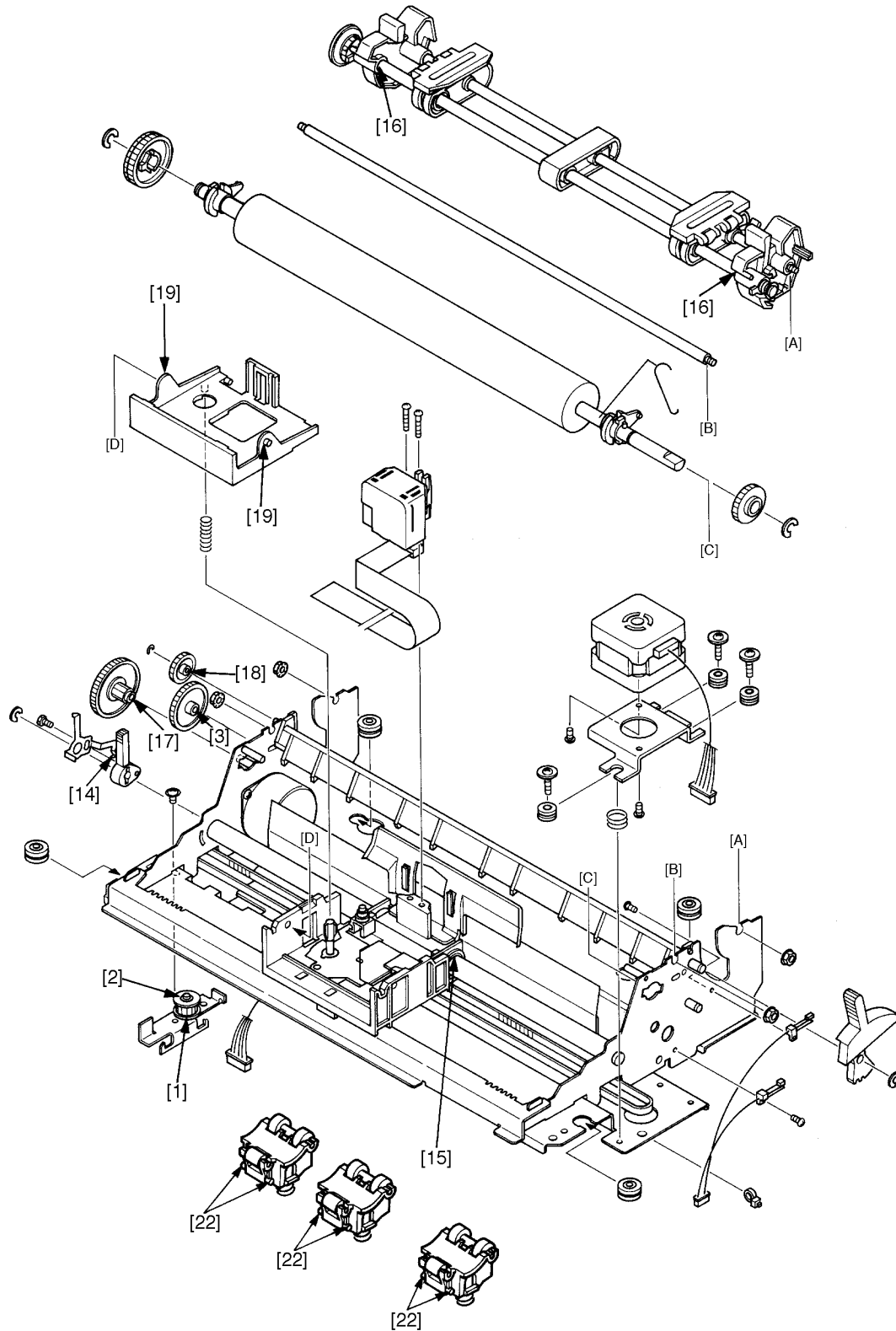


Fig. 5-1 Lubricated Areas 1

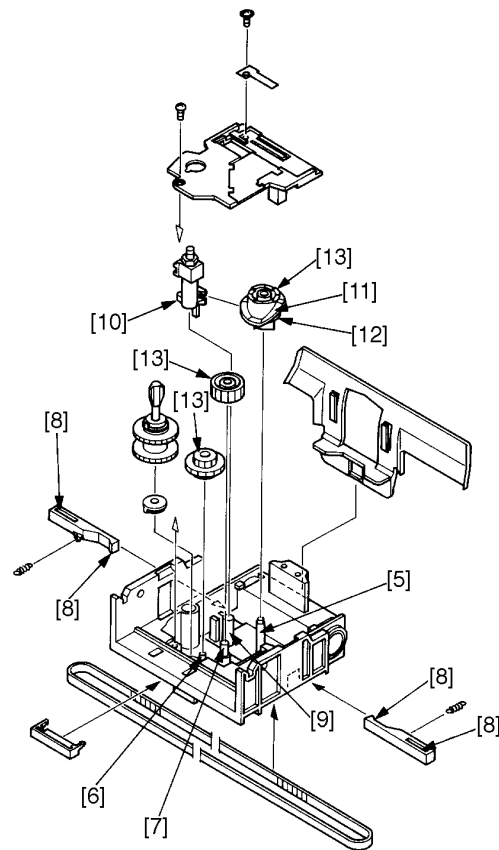


Fig. 5-2 Lubricated Areas 2

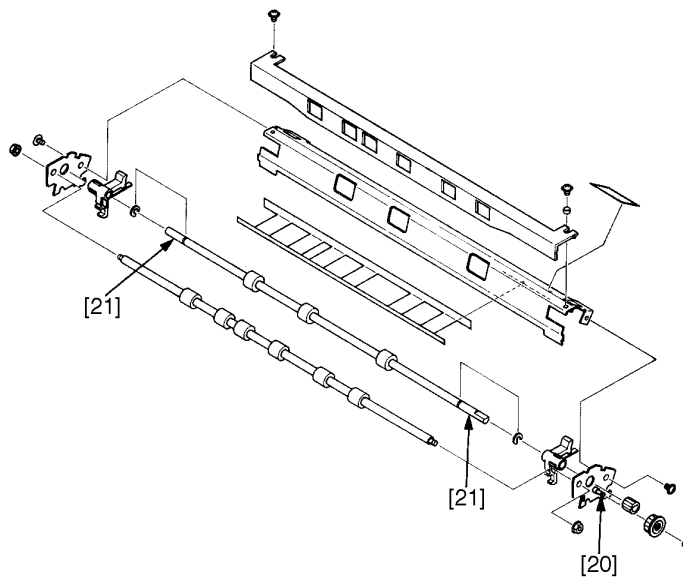


Fig. 5-3 Lubricated Areas 3

CHAPTER 6

TROUBLESHOOTING

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1. Troubleshooting Procedures

Troubleshooting is never easy because various problems arise depending upon the particular location of the breakdown. The following procedures should be taken in making repairs.

- (1) The first method is to make repairs through unit replacements. The two display codes appearing in the flow chart are defined as follows: 1) indicates main logic board replacement; and 2) indicates printer mechanism replacement, to be carried out if the problem has not been corrected.

1)	Main Logic Board Replacement
2)	Printer Mechanism Replacement

Check again at this time whether the replaced unit is malfunctioning. (This is done to rule out trouble caused by improper contact of connectors.)

Replaceable units consist of the following:

- Power supply unit
- Main logic board
- Printer mechanism
- Control panel board

In replacing these units, always refer to the unit replacement priority chart.

- (2) The second method is to make repairs by parts replacement to replace defective elements inside a particular unit.

(Note 1) Before starting to repair, be sure to check visually the contact of the connector and the mounting of the IC in the IC socket.

(Note 2) Always turn off power source and remove power plug before replacing any units or parts.

(Note 3) All check items shown in the flow chart must be checked. Otherwise, newly mounted parts or units may become damaged.

(Note 4) If, in the process of making repairs, there is any confusion about proper procedures, restart the job from the beginning.

(Note 5) Be careful to avoid injury from static electricity when handling ICs and main logic board.

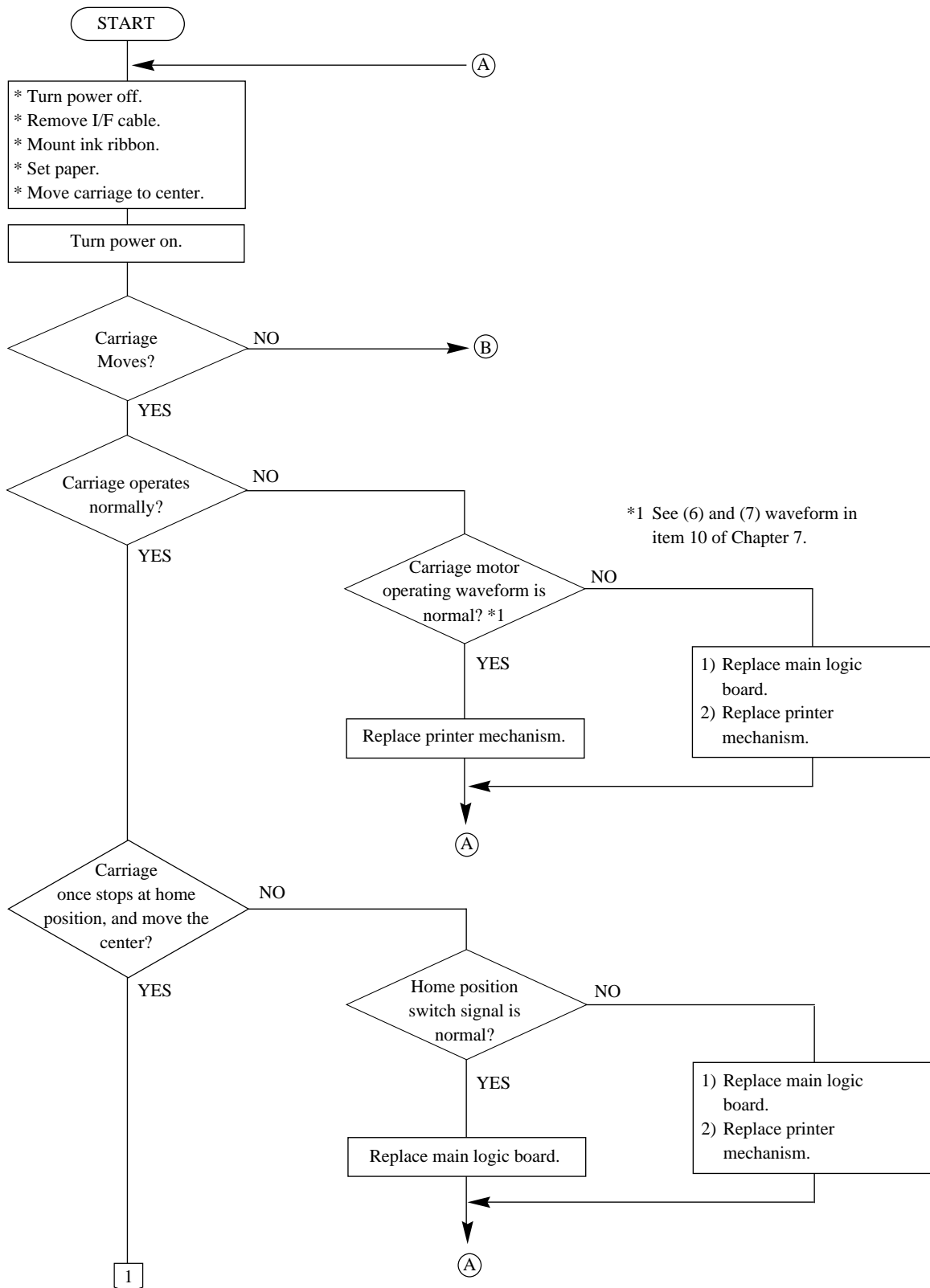
TROUBLESHOOTING

2. Unit Replacement Priority Chart

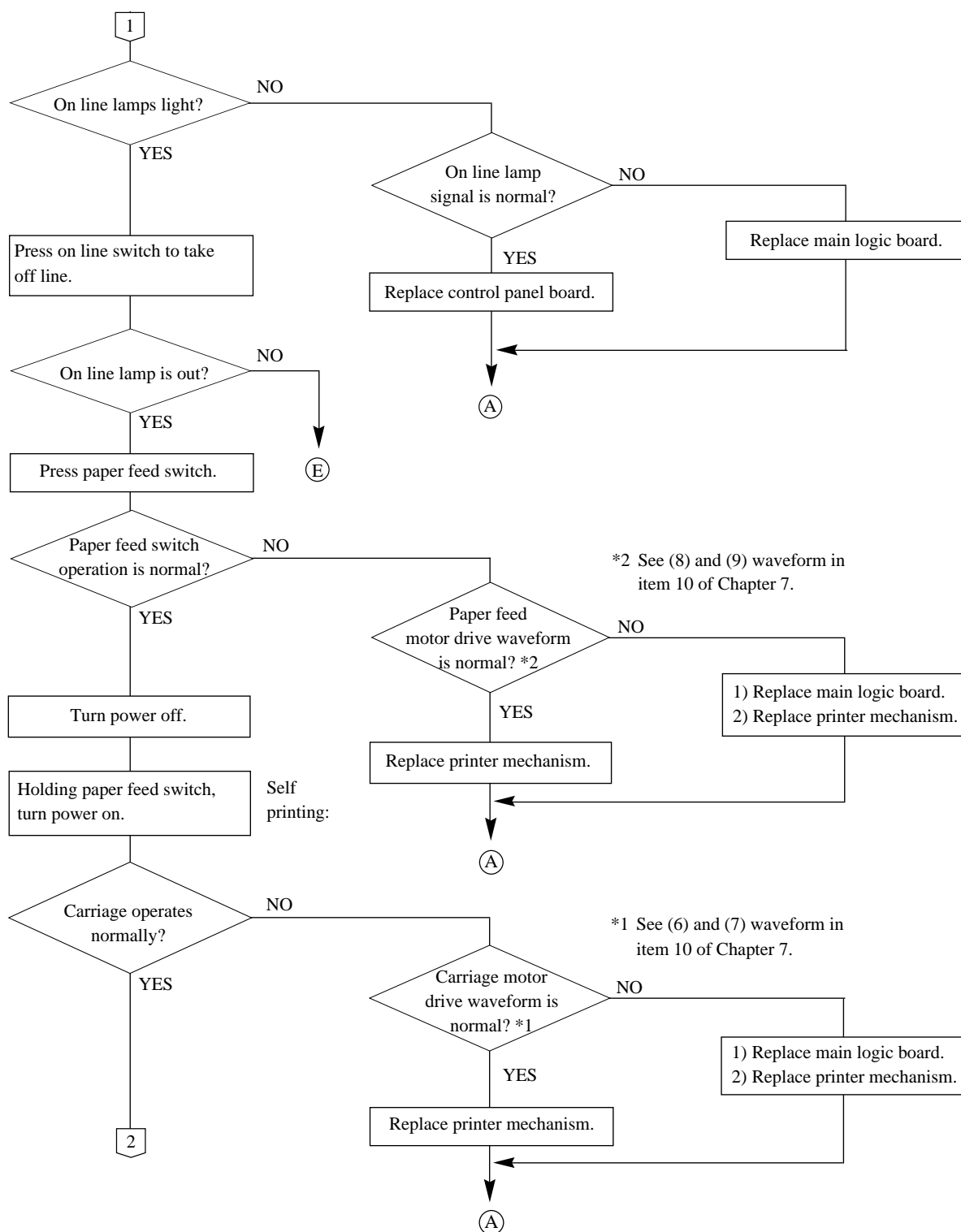
Category	Problem Details	Unit Exchange Sequence				Remarks
		Power supply unit	Main logic board	Printer mechanism	Control panel board	
Operation related	Specific display lamp only will not glow		2		1	
	Specific switch only cannot be input		2		1	
	Buzzer does not sound (sound volume inadequate)		1	2		
Motor related	Strange sounds during operation		1	2		
	No motor holding power (power very weak)	2	1			
Print head related	Dots skipped		2	1		
	Print is too light		2	1		Replace ink ribbon
	Ink ribbon entanglement (wire sticks out)		2	1		
Detector related	Absence of paper not detected		2	1		
	Lever position not detected		1	2		
Interface related and others	Incorrect printing		1			Check I/F cable
	Ink ribbon not forwarded			1		
	No operation at DIP switch setting		1	2		EDS mode
	Faulty operation when power is turned on/off		1			
	Abnormal motor operating speed (slow)		1	2		
	Fuse blown during operation	3	1	2		
Error indication	Error detection of head temperature		2	1		“ON LINE” lamp blink
	CR Home position error		2	1		“POWER” and “QUIET” lamp blink
	CR motor error		2	1		“POWER” lamp blink
	RAM check error		1			“QUIET” lamp blink
	EE-PROM check error		1			“QUIET” and “ON LINE” lamp blink
	Color ribbon error		2	1		“POWER”, “ON LINE” and “QUIET” lamps blink

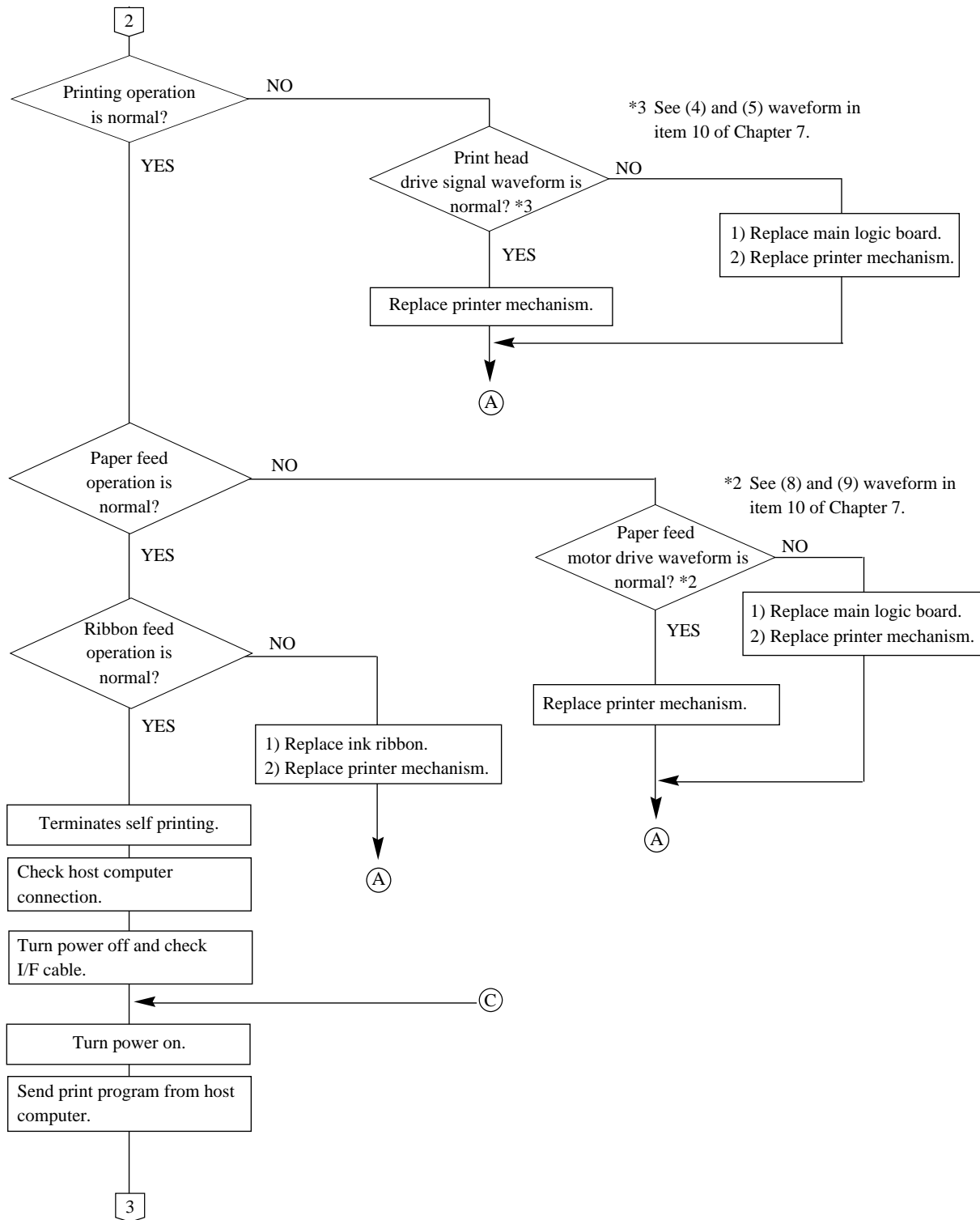
Note: The figures 1, 2 and 3 mean the priority of replacement.

3. Repair by Unit Replacement

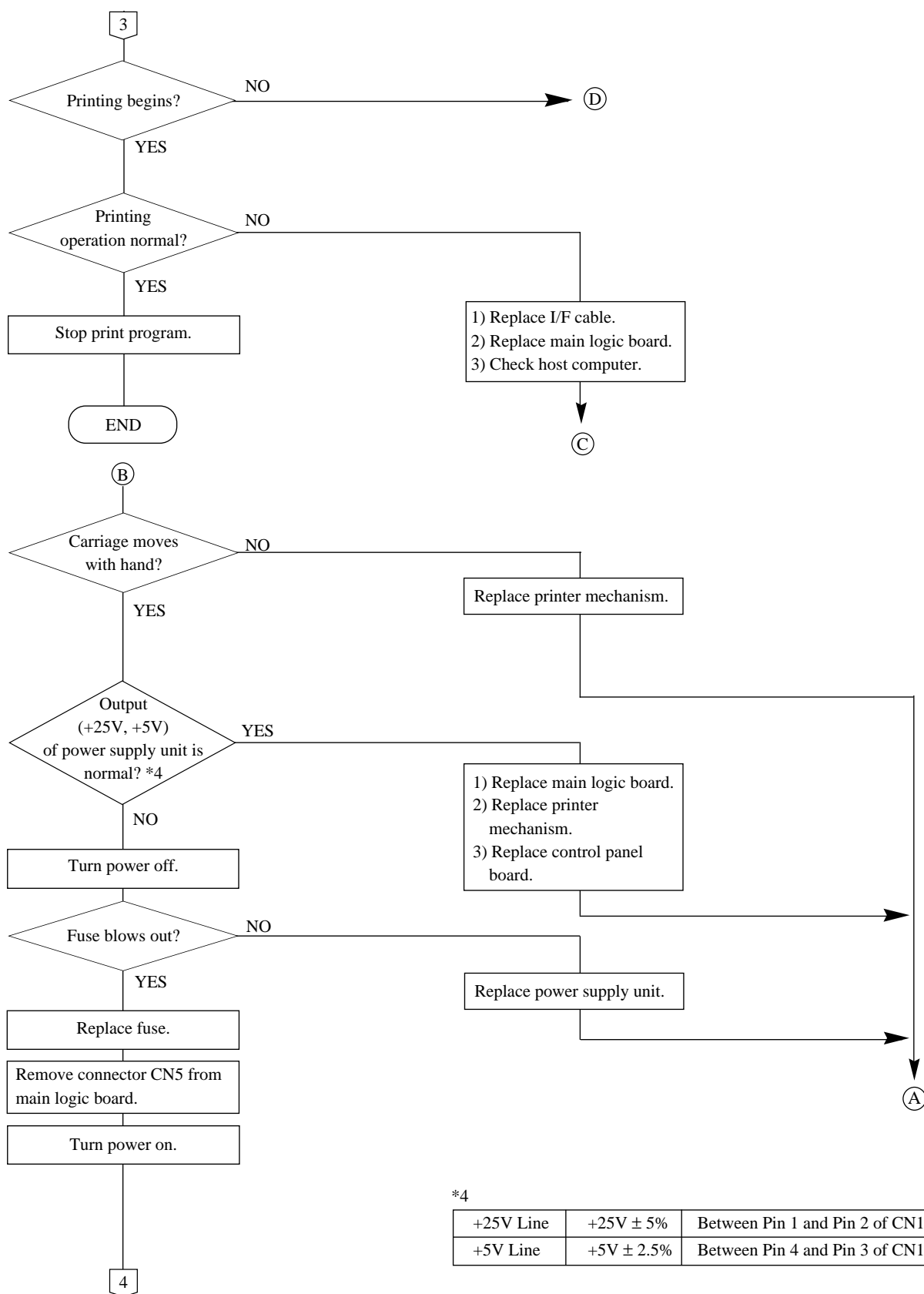


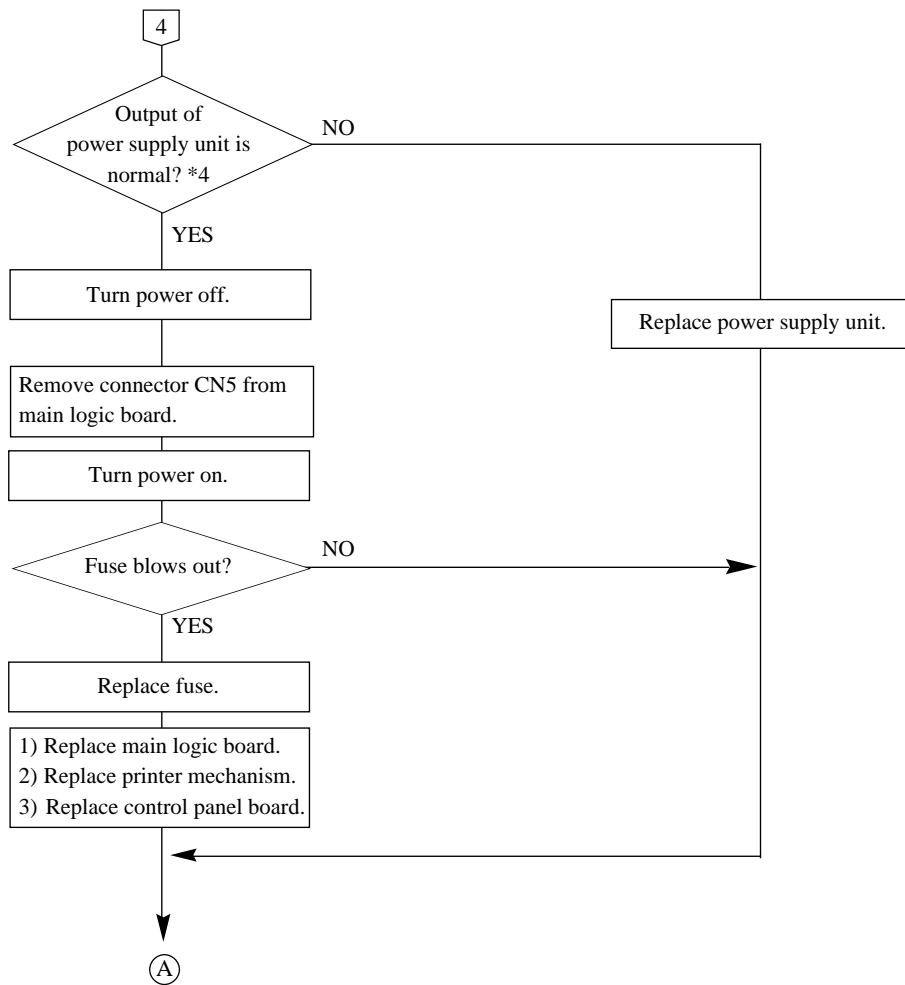
TROUBLESHOOTING





TROUBLESHOOTING

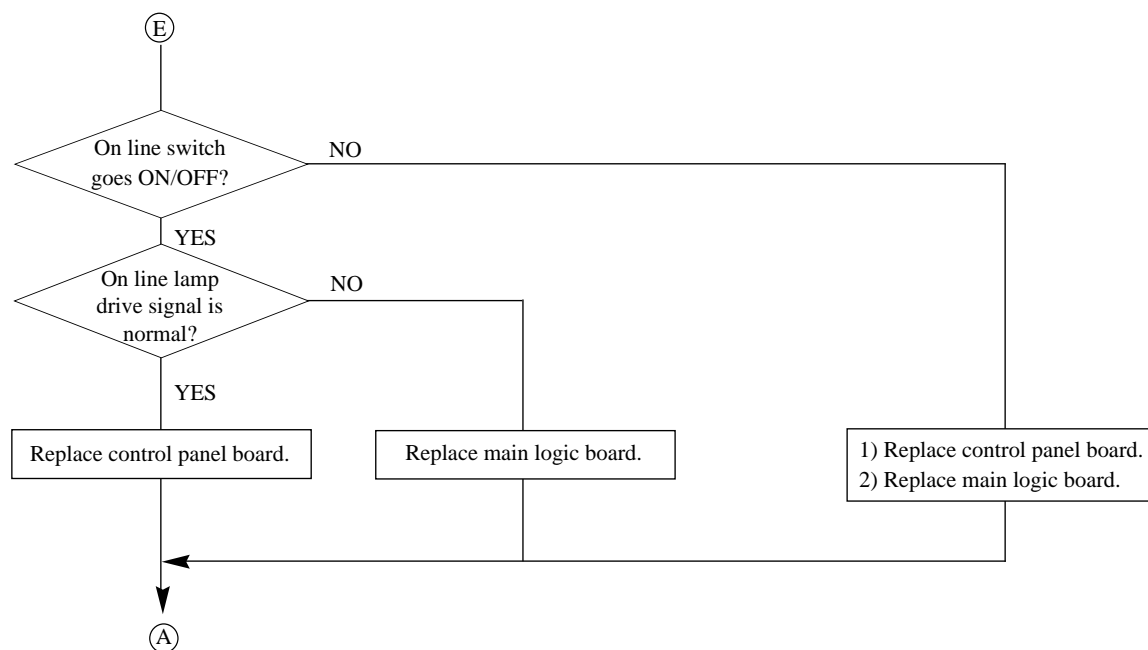
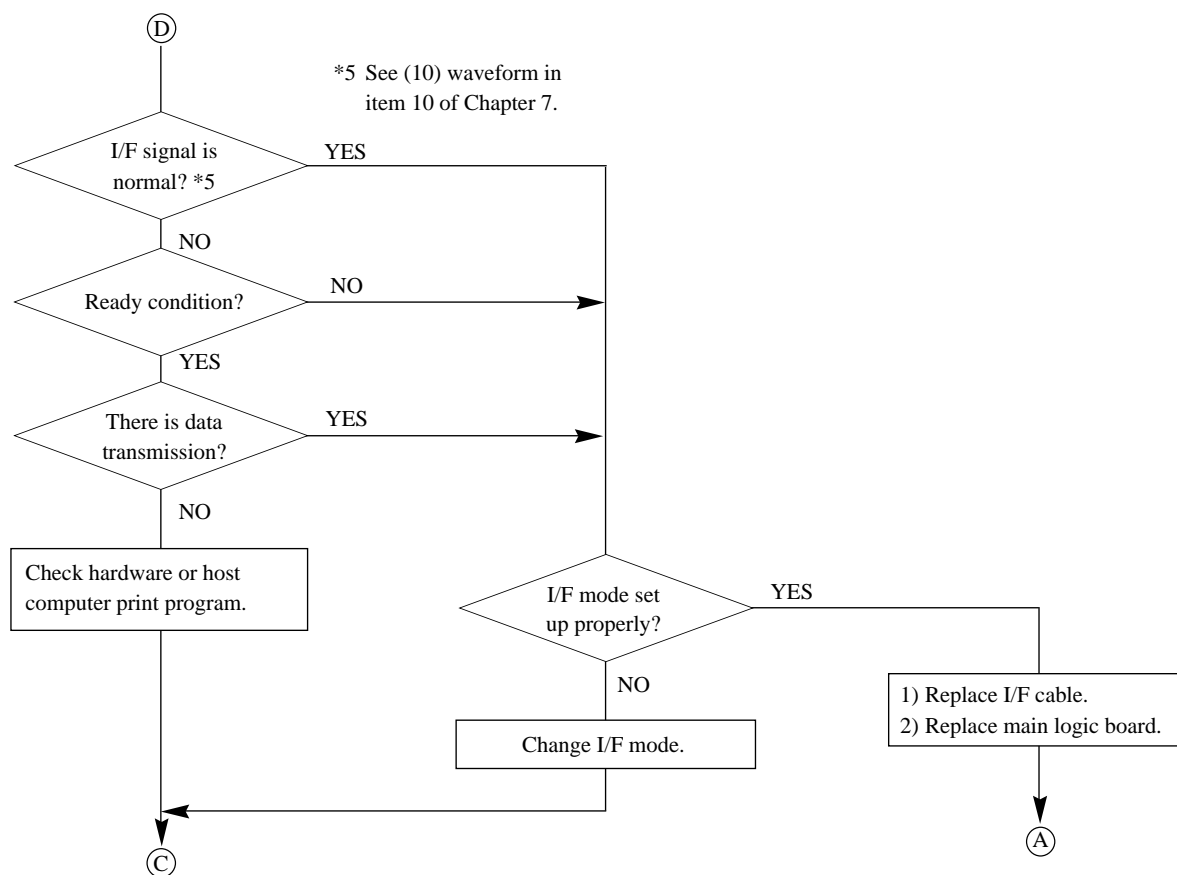




*4

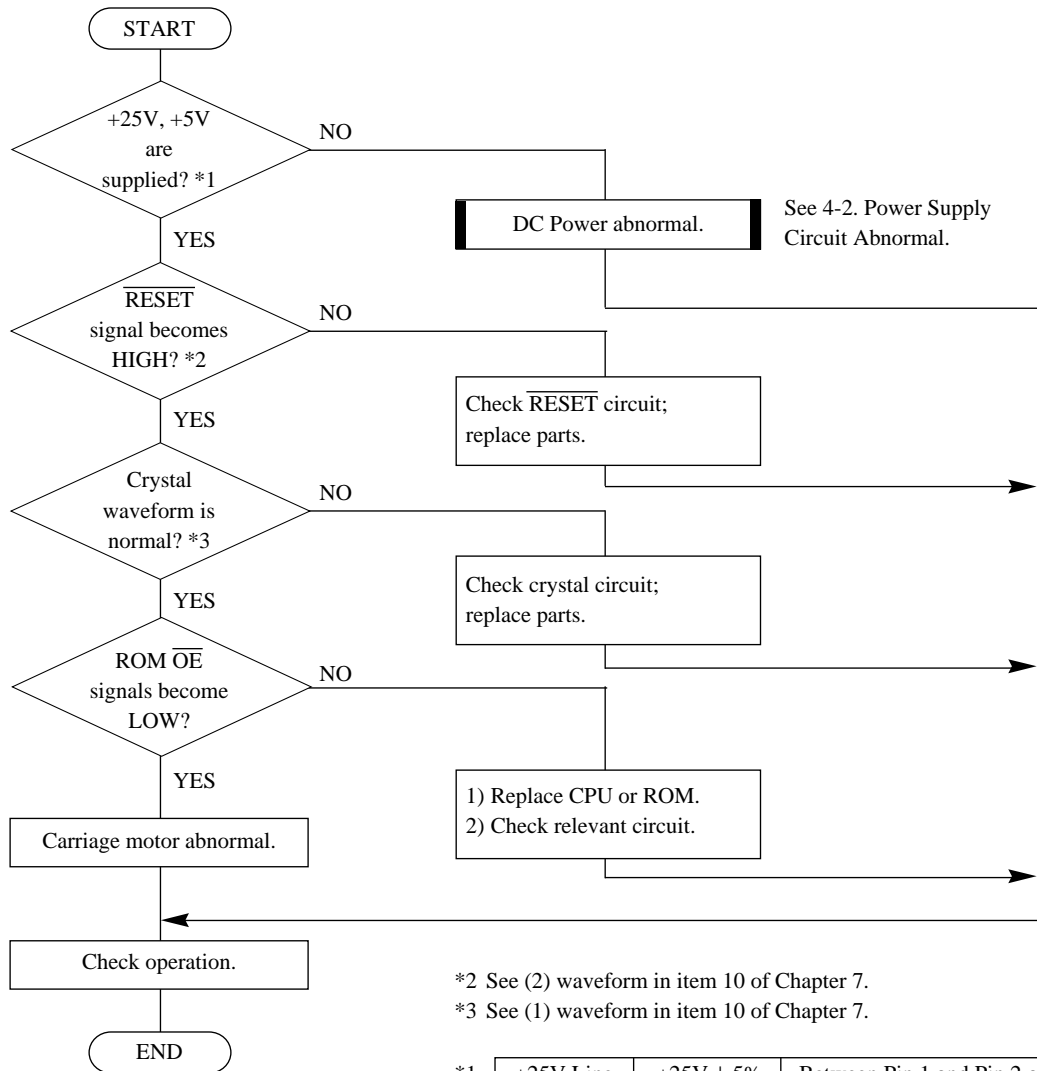
+25V Line	+25V \pm 5%	Between Pin 1 and Pin 2 of CN1
+5V Line	+5V \pm 2.5%	Between Pin 4 and Pin 3 of CN1

TROUBLESHOOTING



4. Repair by Parts Replacement

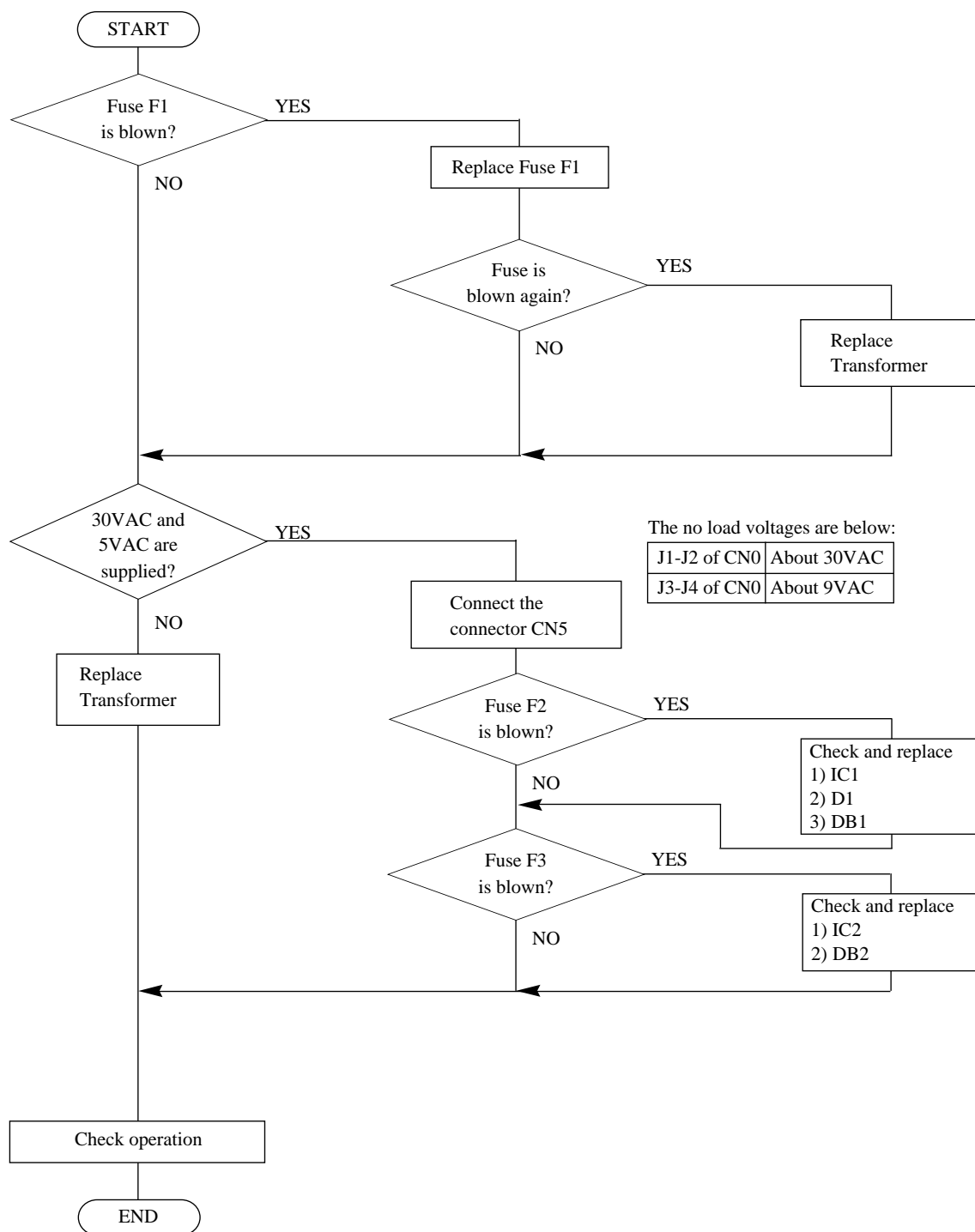
4-1. Does not Operate at All with Power on



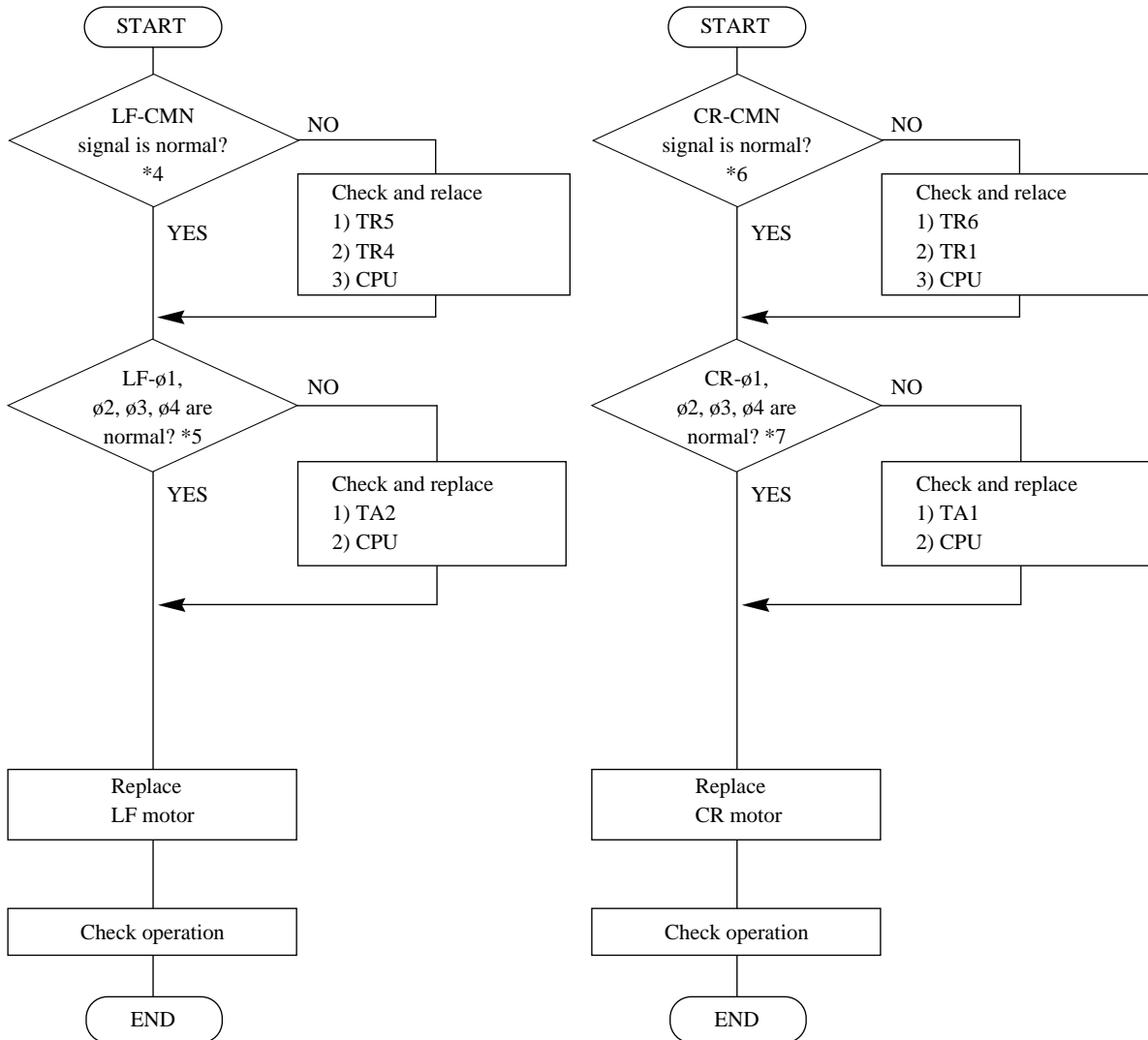
TROUBLESHOOTING

4-2. Power Supply Circuit Abnormal

(1) Remove connector CN5 from the main logic board.



4-3. Defective Motor Operation



*4 See (8) waveform in item 10 of Chapter 7.

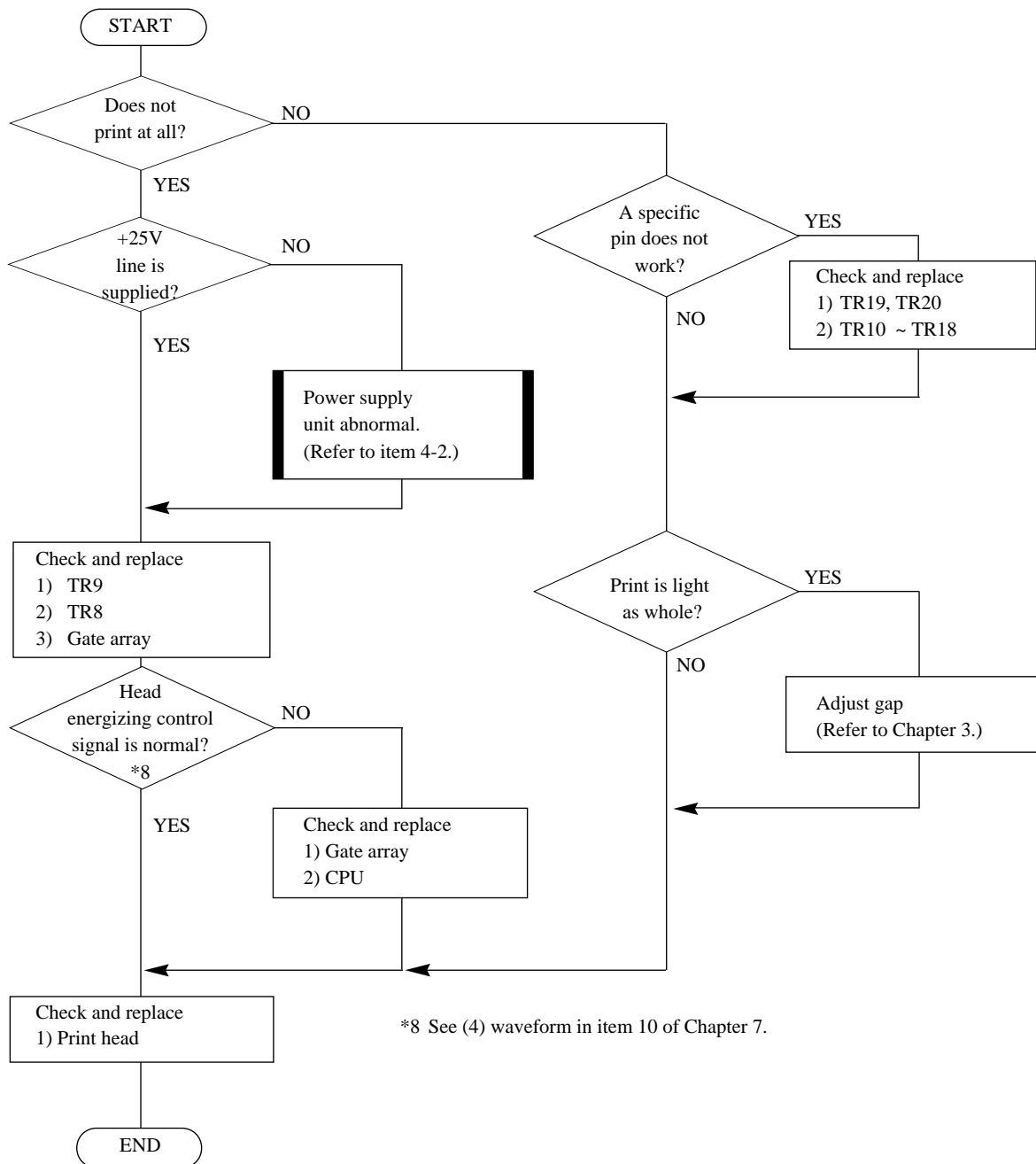
*5 See (9) waveform in item 10 of Chapter 7.

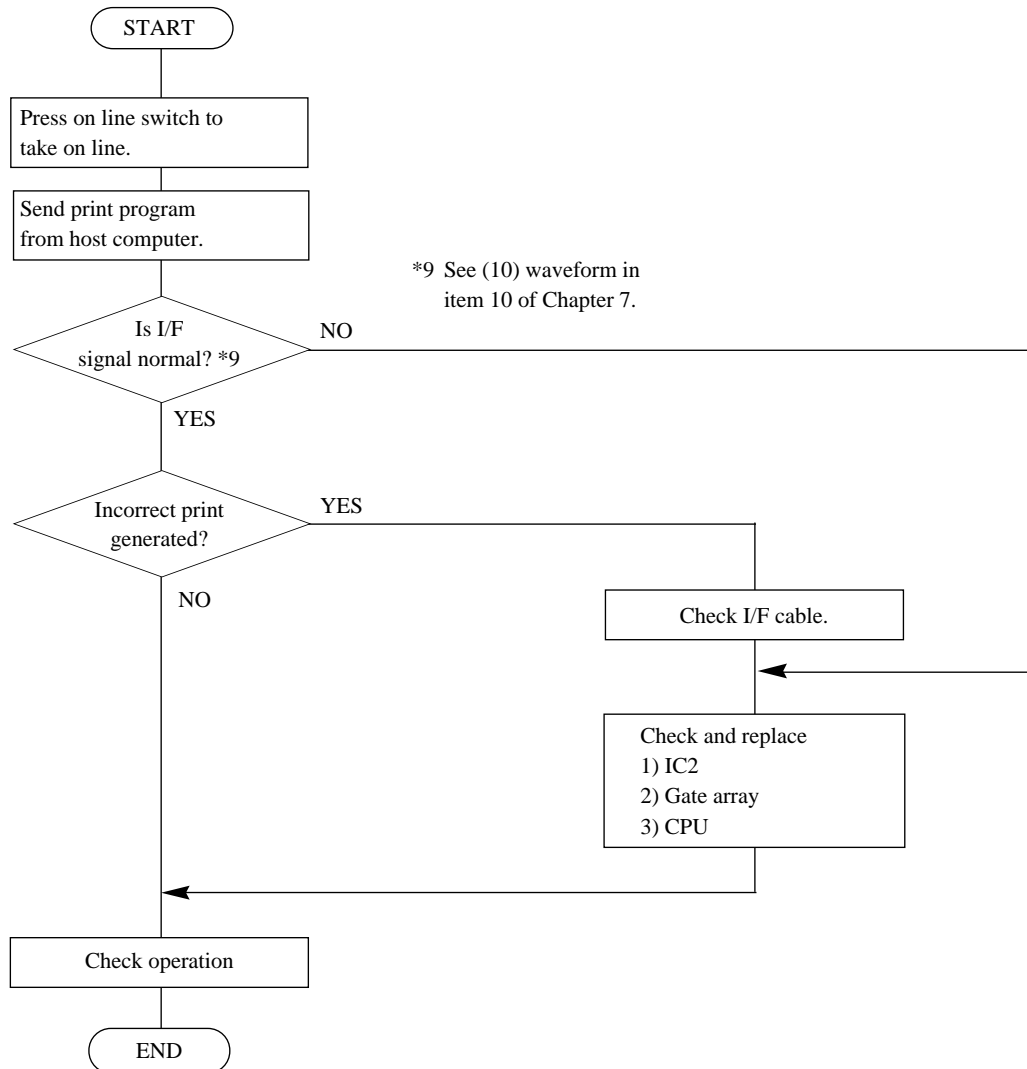
*6 See (6) waveform in item 10 of Chapter 7.

*7 See (7) waveform in item 10 of Chapter 7.

TROUBLESHOOTING

4-4. Defective Print Head Operation



4-5. Defective Interface Operation

CHAPTER 7

PARTS LIST

HOW TO USE PARTS LIST

- (1) DRWG. NO.
This column shows the drawing number of the illustration.
- (2) REVISED EDITION MARK
This column shows a revision number.
Parts that have been added in the revised edition are indicated with “#”.
Parts that have been abolished in the revised edition are indicated with “*”. For example,
#1 : First edition → Second edition #2 : Second edition → Third edition #3 : Third edition → Fourth edition
*1 : First edition → Second edition *2 : Second edition → Third edition *3 : Third edition → Fourth edition
- (3) PARTS NO.
Parts numbers must be notified when ordering replacement parts.
- (4) PARTS NAME
Parts names must be notified when ordering replacement parts.
- (5) Q'TY
This column shows the number of the part used as indicated in the figure.
- (6) REMARKS
When there are differences in the specifications of the fuse, destinations, etc., the differences are described in words or indicated by two letters.
US ... U.S.A. EC ... EC UK ... United Kingdom
AS ... Australia HK ... Hong Kong WG ... Germany
The seal number of ROM is described in this column. The “*” mark of seal number is a variable representing on the software version.
- (7) RANK
Parts marked “S” are service parts. Service parts are recommended to be in stock for maintenance.

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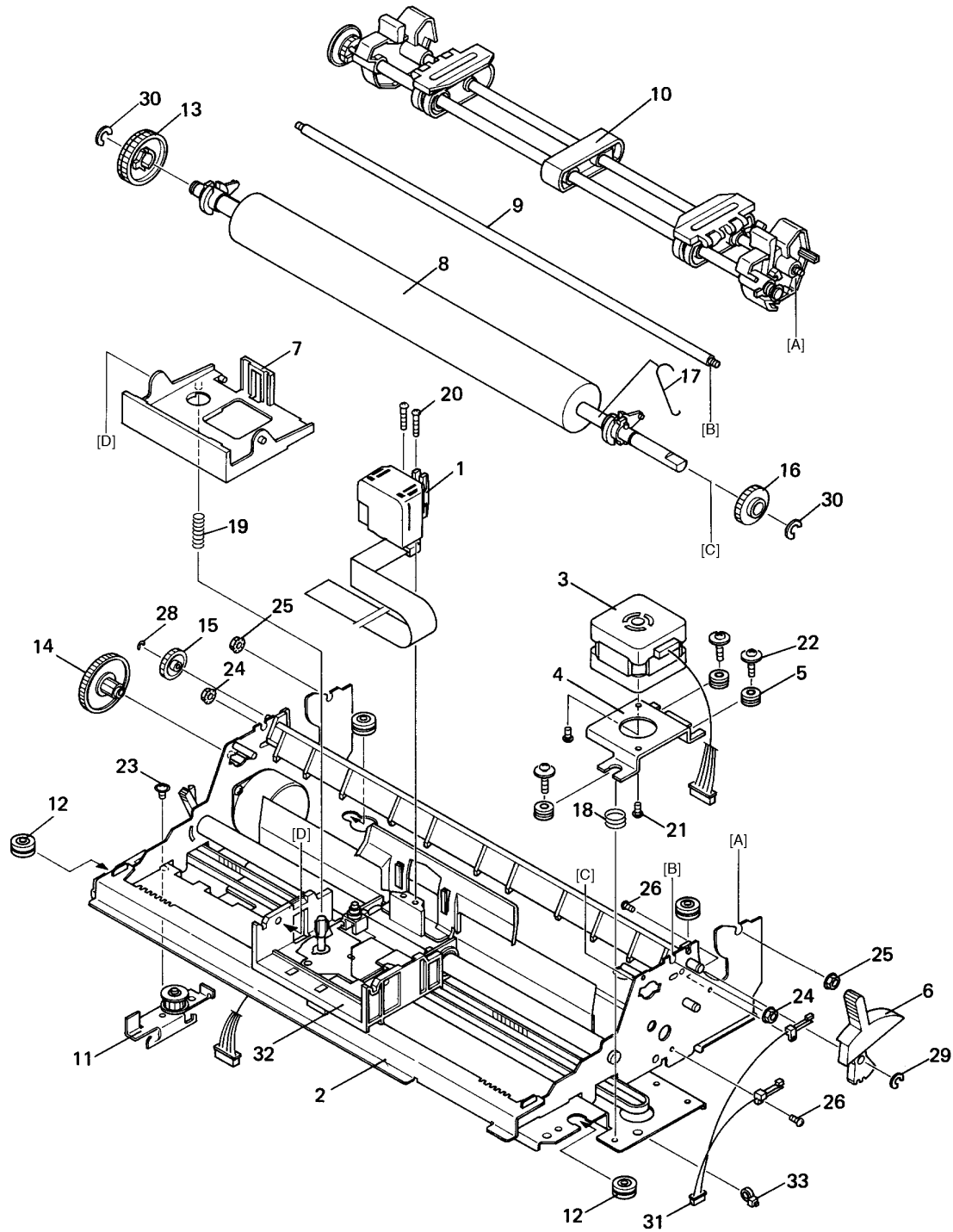
Printer Assembly

DRWG.NO.	REV.	PARTS NO.	PARTS NAME	Q'TY	REMARKS	RANK
2	#2	87801021	LOWER CASE UNIT ZX-10CLII	1	VER.2:US,UK,AS,HK	S
	#2	87801101	LOWER CASE UNIT LC-200 EC	1	VER.2:EC,WG	S
3		87802020	MAIN LOGIC BOARD UNIT ZX-10CL	1	VER.1:US,EC,UK,AS,WG	S
	#1	87802070	MAIN LOGIC BD UNIT ZX-10CL HK	1	VER.1:HK	S
	#2	87802021	MAIN LOGIC BD UNIT ZX-10CLII	1	VER.2:US,EC,UK,AS,WG	S
	#2	87802071	MAIN LOGIC BD UNIT ZX-10CLIIHK	1	VER.2:HK	S
4		87803020	POWER SUPPLY UNIT ZX-10CL US	1	FOR US	S
		87803050	POWER SUPPLY UNIT ZX-10CL EC	1	FOR EC,WG	S
		87803060	POWER SUPPLY UNIT ZX-10CL UK	1	FOR UK	S
	#1	87803190	POWER SUPPLY UNIT ZX-10CL HK	1	FOR HK	S
	#1	87803280	POWER SUPPLY UNIT ZX-10CL AS	1	FOR AS	S
5		87800020	UPPER CASE UNIT NX-1020CL US	1	FOR US	S
		87800040	UPPER CASE UNIT LC-200 EC	1	FOR EC,UK,WG	S
	#1	87800100	UPPER CASE UNIT NX-1020CL HK	1	FOR HK	S
	#1	87800150	UPPER CASE UNIT LC-200CL AS	1	FOR AS	S
6		83911580	ROM COVER ZX-10CL	1		S
7		83023870	PRINTER COVER ZX-10CL	1		S
8		83023880	REAR COVER ZX-10CL	1		S
9	*3	87806021	PAPER GUIDE UNIT ZX-10CL	1		S
	#3	87806023	PAPER GUIDE UNIT ZX-10CL	1		S
10	*1	87034010	PAPER FEED ROLLER UNIT 941	1		S
	#1	87034011	PAPER FEED ROLLER UNIT 941	1		S
11		83902730	PLATEN KNOB ZX-10CL	1		S
12	*5	80981780	INK RIBBON CARTRIDGE UPC ZX9	1	MONO :FOR US	S
	#5	80981970	INK RIBBON CARTRIDGE UPC ZX9	1	MONO :FOR US	S
		80981790	INK RIBBON CARTRIDGE JAN ZX9	1	MONO :EXCEPT FOR US	S
13	*5	80981800	INK RIBBON CARTRIDGE UPC ZX9CL	1	COLOR :FOR US	S
	#5	80981990	INK RIBBON CARTRIDGE UPC ZX9CL	1	COLOR :FOR US	S
		80981810	INK RIBBON CARTRIDGE JAN ZX9CL	1	COLOR :EXCEPT FOR US	S
14		83911570	RELEASE SHAFT COVER ZX-10CL	1		S
15	*3	83290081	RELEASE CAM 941	1		S
	#3	83290082	RELEASE CAM 941	1		S
16		83101230	RELEASE GEAR 941	1		S
17		83911560	POWER SWITCH HOLDER ZX-10CL	1		S
18		83910841	CABLE HOLDER 941	1		S
19		82901470	RIBBON HOLDER 941	1		S
20	*1	80530800	RELEASE LEVER SPRING 941	1		S
	*3	80530802	RELEASE LEVER SPRING 941	1		S
	#3	80530800	RELEASE LEVER SPRING 941	1		S
21		04020016	STOP RING SE4.0	1		S
22		01903060	SCREW TAT 3-8 PT-FL	6		S
23		01704103	SCREW TRHT 4-10-C	2	FOR US	S
		01914007	SCREW TR 4-8 WB	2	FOR EC,UK,HK,AS,WG	S
24		01914030	SCREW TAT 4-15 PT	3		S
25	*3	01914039	SCREW TAT 4-8 WS	1		S
	#3	01914034	SCREW TAT 4-8 CT-WF	1		S
26		01914036	SCREW TR 4-5 WS	2	FOR US,EC,UK,AS,WG	S
	#1	01914036	SCREW TR 4-5 WS	1	FOR HK	S
27		01914038	SCREW TAT 4-20 PWF	4		S
28		89595010	S-P CONVERTER SPC-8K UPC	1	OPTION:FOR US	
		89595020	S-P CONVERTER SPC-8K JAN	1	OPTION:EXCEPT FOR US	
-		89590193	ASF SF-10DN US	1	OPTION:FOR US	
		89590191	ASF SF-10DN WG	1	OPTION:FOR EC	
		89590190	ASF SF-10DN UK	1	OPTION:FOR UK	
	#1	89590195	ASF SF-10DN AS	1	OPTION:FOR AS	
	#1	89590196	ASF SF-10DN HK	1	OPTION:FOR HK	

DRWG.NO.	REV.	PARTS NO.	PARTS NAME	Q'TY	REMARKS	RANK
	#1	89590191	ASF SF-10DN WG	1	OPTION:FOR WG	
		89591020	ROLL PAPER HOLDER RH-10Z UPC	1	OPTION:FOR US	
		89591030	ROLL PAPER HOLDER RH-10Z JAN	1	OPTION:EXCEPT FOR US	

2. Printer Mechanism

2-1. Disassembly Drawing



2-2. Parts List

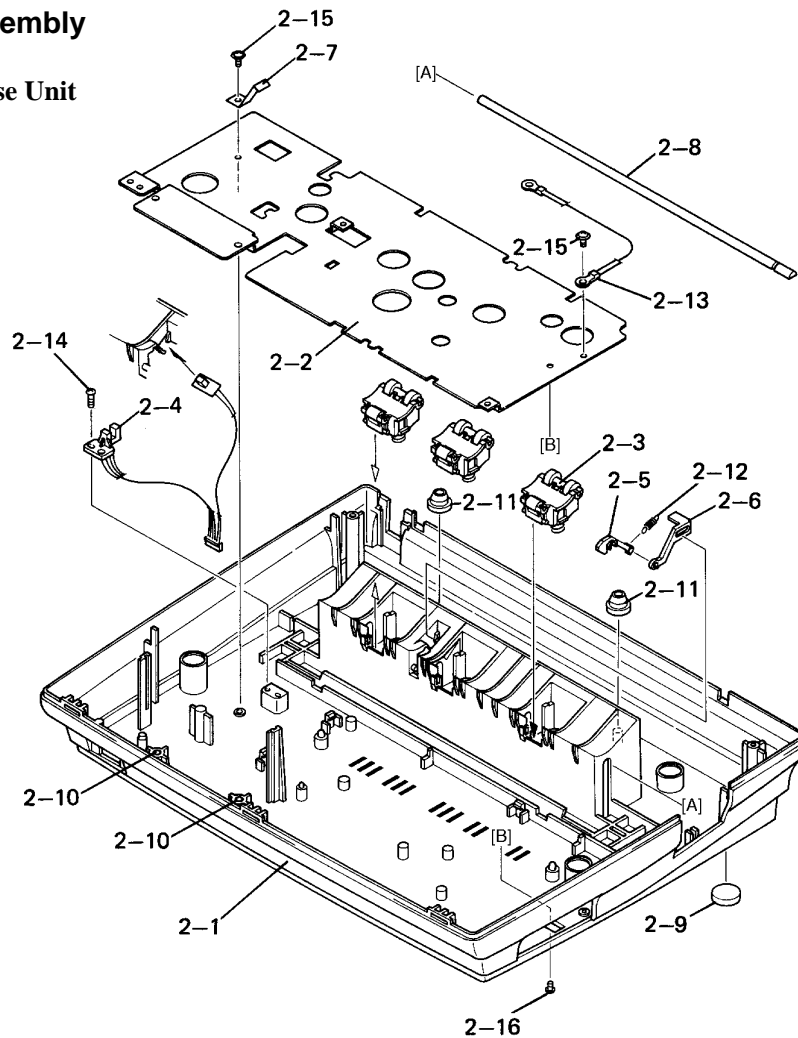
Printer Mechanism

DRWG.NO.	REV.	PARTS NO.	PARTS NAME	Q'TY	REMARKS	RANK
1		89133010	PRINT HEAD DP9401B	1		S
2		87030010	FRAME UNIT 941	1	VER.1:INC.26,31,32	
	#2	87030011	FRAME UNIT 941	1	VER.2:INC.26,31,32	
3		87031310	CARRIAGE MOTOR ASSY 941	1		S
4		82091260	MOTOR HOLDER 941	1		
5		87031320	RUBBER BUSHING A ASSY 941	3		
6	*4	83400780	RELEASE LEVER 941	1		S
	#4	83400782	RELEASE LEVER 941	1		S
7		83902630	COLOR RIBBON HOLDER 941CL	1		S
8		87033010	PLATEN UNIT 941	1		S
9		81370720	TRACTOR STAY 941	1		
10		87036010	TRACTOR UNIT 941	1		S
11		87037010	TENSION LEVER UNIT 941	1		
12	#1	87031030	RUBBER BUSHING B UNIT 941	4		
13		87063340	PLATEN GEAR ASSY 891B	1		S
14		83100520	IDLER GEAR 16X72X0.5	1		S
15		83100740	IDLER GEAR 36X0.5 905	1		
16		83101260	GEAR 48X0.5 941	1		
17	*1	80530811	GROUND CONTACT SPRING 941	1		
	#1	80530812	GROUND CONTACT SPRING 941	1		
18	*1	80520710	SPRING C120-040-0049	1		S
	#1	80520711	SPRING C120-040-0049	1		S
19		80520810	SPRING C065-040-0296	1		S
20		01902612	SCREW TAT 2.6-16 PT	2		S
21		00830604	SCREW TR 3-6	2		S
22		01903079	SCREW TAT 3-12 CT-WF	3		S
23	*1	01903073	SCREW TR 3-6 FL SPECIAL	1		S
	#1	01903018	SCREW TR 3-6 WS/WF	1		S
24	*3	02040403	TOOTHED NUT NHK4	2		S
	#3	02020401	HEXAGON NUT NH4-2	2		S
25	*1	02040401	SPRING LOCK NUT NHS4	2		S
	#1	02040406	FLANGED NUT NHW4	2		S
26		00926603	SCREW TAT 2.6-6 CT	2		S
27	*1	02204001	PLAIN WASHER WF4X9X0.8	2		S
28		04020010	STOP RING SE2.0	1		S
29		04020016	STOP RING SE4.0	1		S
30	*1	04020014	STOP RING SE6.0	2		S
	#1	04020022	STOP RING SE6.0-SUS	2		S
31		87030340	LEVER SWITCH UNIT 941	1		
32		87030310	CARRIAGE UNIT 941	1		
33		04991204	FASTENER T18S	1		S
-	#1	80993560	SHEET D ZX-10CL	1		

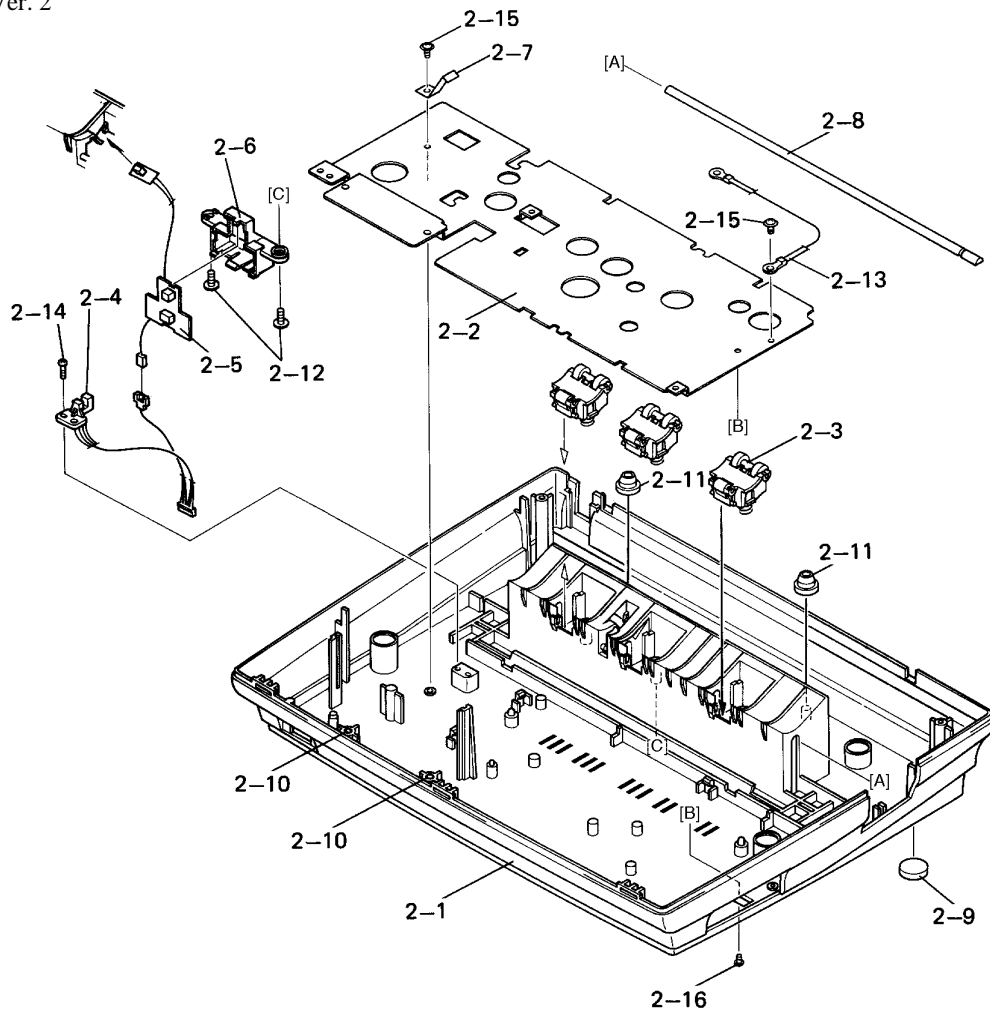
3. Sub-Assembly

3-1. Lower Case Unit

A. Ver. 1

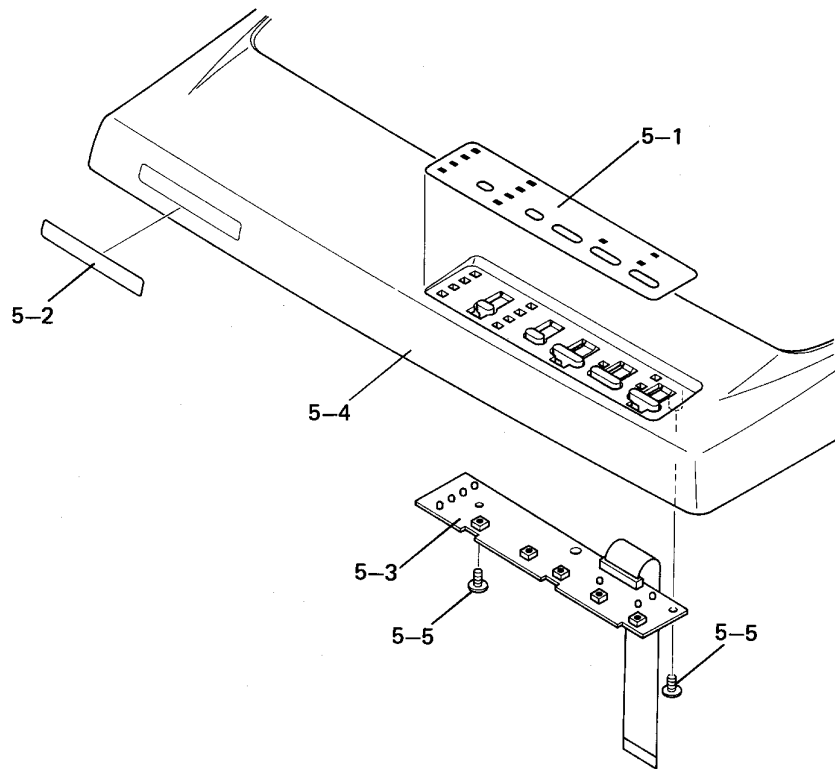


DRWG.NO.	REV.	PARTS NO.	PARTS NAME	Q'TY	REMARKS	RANK
2-1		83023860	LOWER CASE ZX-10CL	1		
2-2		82011040	LOWER CASE CHASSIS ZX-10CL	1		
2-3	*3	87801340	ROLLER HOLDER ASSY ZX-10CL	3		S
	#3	87067180	ROLLER HOLDER UNIT 935	3		S
2-4		87801310	DETECTOR UNIT ASSY ZX-10CL	1		S
2-5		83400740	PE DETECTOR LEVER 941	1		S
2-6	*1	83400750	PE SCREEN LEVER 941	1		S
	#1	83400751	PE SCREEN LEVER 941	1		S
2-7		82501130	GROUND SPRING ZX-10CL	1		
2-8		81360680	RELEASE SHAFT 941	1		
2-9		80991610	RUBBER FOOT NB24-10	4		
2-10		80290040	HEAT PRESSURE HOLDER M4-6	2		
2-11		80290020	LOCATING BUSHING NL	2		
2-12	*1	80510940	SPRING E040-023-0128	1		S
	#1	80510700	SPRING E030-014-0088	1		S
2-13		80924180	MESHED GROUND WIRE 100T	1		
2-14		01903058	SCREW TAT 3-10 PT	1		S
2-15		01903060	SCREW TAT 3-8 PT-FL	2		S
2-16	*3	01903064	SCREW TAT 3-5 CT	1		S
	#3	01903094	SCREW TAT 3-5 DT	1		S
-	#1	80993530	SHEET A ZX-10CL	1		
	#1	80086480	CAUTION SEAL LC-10II SC	1	FOR EC,WG	



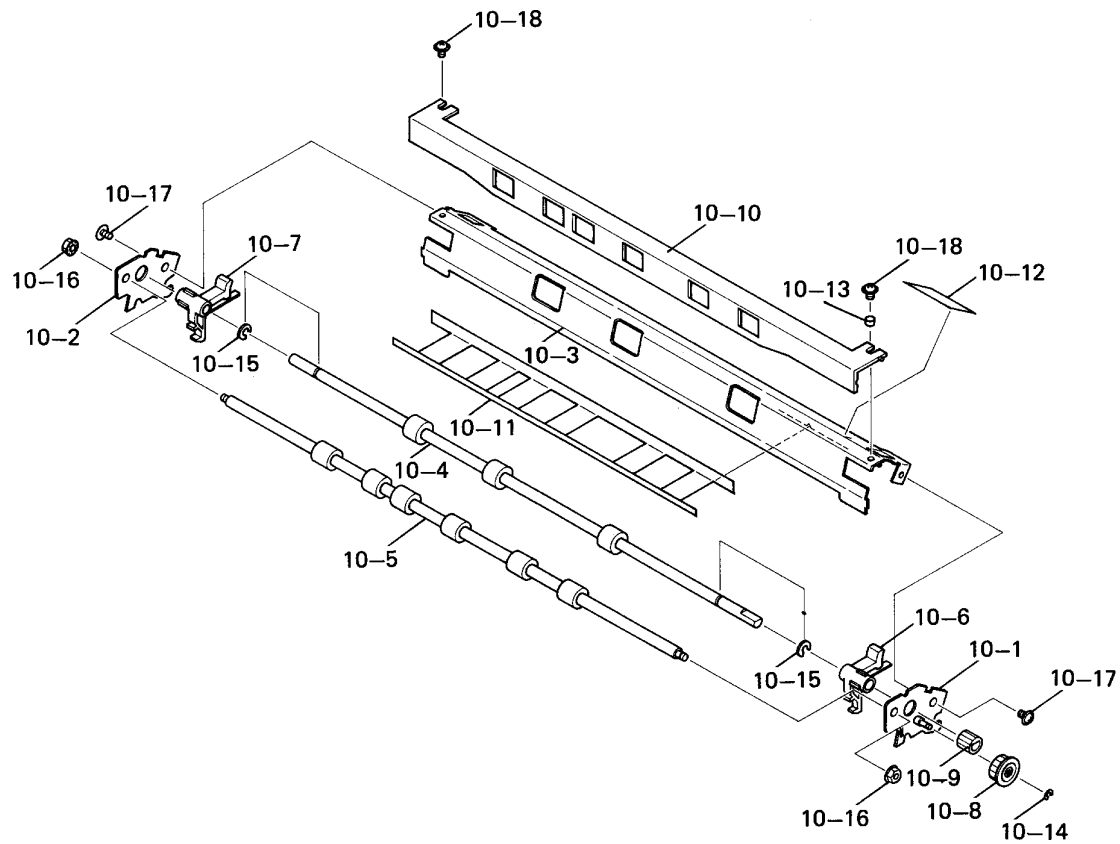
DRWG. NO.	REV.	PARTS NO.	PARTS NAME	Q'TY	REMARKS	RANK
2-1	#2	83023862	LOWER CASE ZX-10CL	1		
2-2		82011040	LOWER CASE CHASSIS ZX-10CL	1		
2-3	*3	87801340	ROLLER HOLDER ASSY ZX-10CL	3		S
	#3	87067180	ROLLER HOLDER UNIT 935	3		S
2-4	#2	87801311	DETECTOR UNIT ASSY ZX-10CLII	1		S
2-5	#2	87801350	PE DETECTOR UNIT ASSY ZX-10CL	1		S
2-6	#2	83903470	DETECTOR BOARD HOLDER ZX-10CL	1		S
2-7		82501130	GROUND SPRING ZX-10CL	1		
2-8		81360680	RELEASE SHAFT 941	1		
2-9		80991610	RUBBER FOOT NB24-10	4		
2-10		80290040	HEAT PRESSURE HOLDER M4-6	2		
2-11		80290020	LOCATING BUSHING NL	2		
2-12		01914035	SCREW TAT 4-10 PT-FL	2		S
2-13		80924180	MESHED GROUND WIRE 100T	1		
2-14		01903058	SCREW TAT 3-10 PT	1		S
2-15		01903060	SCREW TAT 3-8 PT-FL	2		S
2-16	*3	01903064	SCREW TAT 3-5 CT	1		S
	#3	01903094	SCREW TAT 3-5 DT	1		S
-		80993530	SHEET A ZX-10CL	1		
		80086480	CAUTION SEAL LC-10II SC	1	FOR EC,WG	

3-2. Upper Case Unit



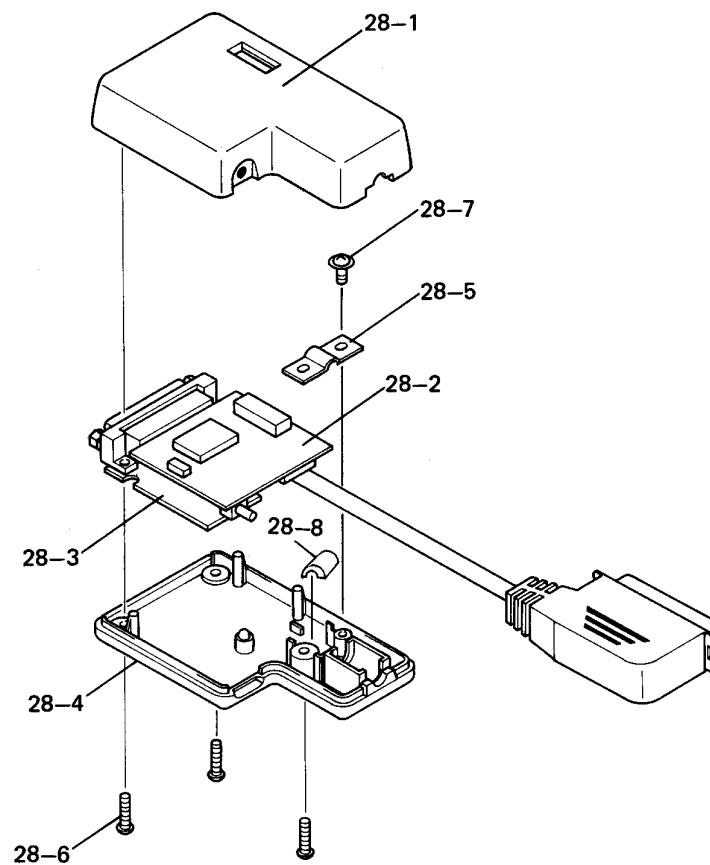
DRWG.NO.	REV.	PARTS NO.	PARTS NAME	Q'TY	REMARKS	RANK
5-1		80086640	OPERATION SHEET ZX-10CL	1		S
5-2		80082880	BRAND PLATE NX-1020CL US	1	FOR US	S
		80083150	BRAND PLATE LC-200 EC	1	FOR EC,UK,WG	S
	#1	80083450	BRAND PLATE NX-1020CL HK	1	FOR HK	S
	#1	80083590	BRAND PLATE LC-200CL AS	1	FOR AS	S
5-3		87800310	CONTROL PANEL BD UNIT ZX-10CL	1		S
5-4		83023850	UPPER CASE ZX-10CL	1		
5-5		01903060	SCREW TAT 3-8 PT-FL	2		S
-	#1	80993540	SHEET B ZX-10CL	1		
	#1	80993550	SHEET C ZX-10CL	1		

3-3. Paper Feed Roller Unit



DRWG.NO.	REV.	PARTS NO.	PARTS NAME	Q'TY	REMARKS	RANK
10-1	#1	87034310	PF ROLLER FRAME ASSY 941	1		
10-2	#1	82000890	PAPER FEED ROLLER FRAME 941	1		
10-3	#1	82040421	PF ROLLER GUIDE 941	1		
10-4	#1	80201150	PAPER FEED ROLLER 941	1		
10-5	#1	87034320	PF HOLDER ROLLER SHAFT ASSY941	1		
10-6	#1	83400710	PF CLAMP LEVER R 941	1		
10-7	#1	83400720	PF CLAMP LEVER L 941	1		
10-8	#1	83101300	PF IDLER GEAR 28X0.5 941	1		
10-9	#1	83101310	PF ROLLER GEAR 19X0.5 941	1		
10-10	#1	83911530	TOP GUIDE 941	1		
10-11	#1	80993401	PAPER FEED SUB-GUIDE 941	1		
10-12	#1	80086710	ROLLER UNIT SEAL 941	1		
10-13	#1	81210380	BUSHING 3X4X2.3 941	1		
10-14	#1	04020010	STOP RING SE2.0	1		
10-15	#1	04020016	STOP RING SE4.0	2		
10-16	#1	02040405	TOOTHED NUT NHK4.0	2		
10-17	#1	01903077	SCREW TAT 3-5 CT-FL	2		
10-18	#1	01903080	SCREW TAT 3-6	2		

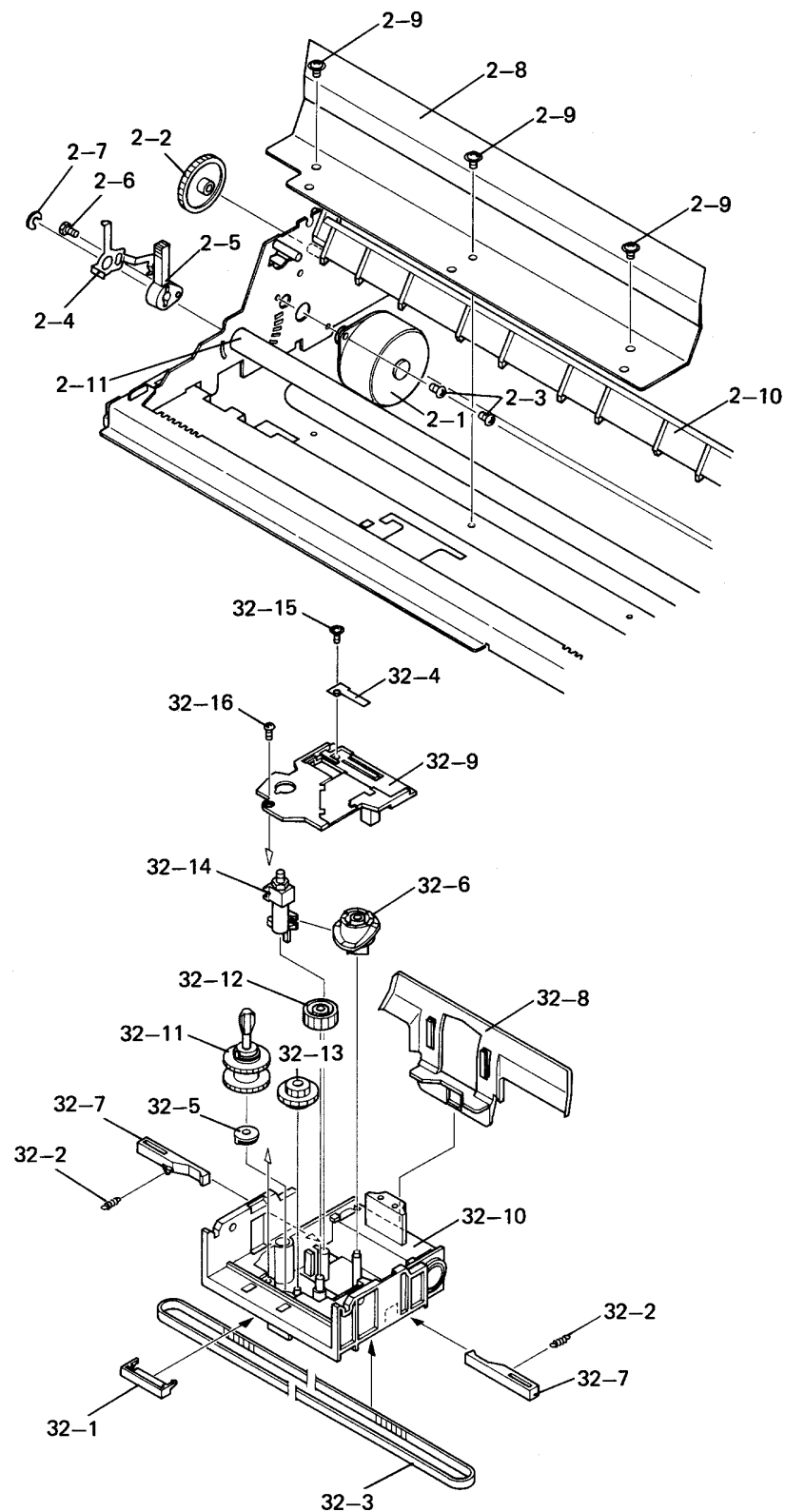
3-4. Serial-Parallel Converter (Option)



DRWG.NO.	REV.	PARTS NO.	PARTS NAME	Q'TY	REMARKS	RANK
28-1		83024060	UPPER CASE SPC-8K	1		
28-2		87590010	CPU BOARD UNIT SPC-8K	1		
28-3		87590020	IF BOARD UNIT SPC-8K	1		
28-4		87591020	LOWER CASE UNIT SPC-8K	1		
28-5		82901600	CORD HOLDER SPC-8K	1		
28-6		01903047	SCREW TAT 3-12 PT-FL	3		
28-7		01903060	SCREW TAT 3-8 PT-FL	1		
28-8	#2	82902150	CORD HOLDER PLATE SPC-8K	1		
-		09990716	FERRITE CORE HF70RU12X5	2		

3-5. Frame Unit

3-5-1. Disassembly Drawing

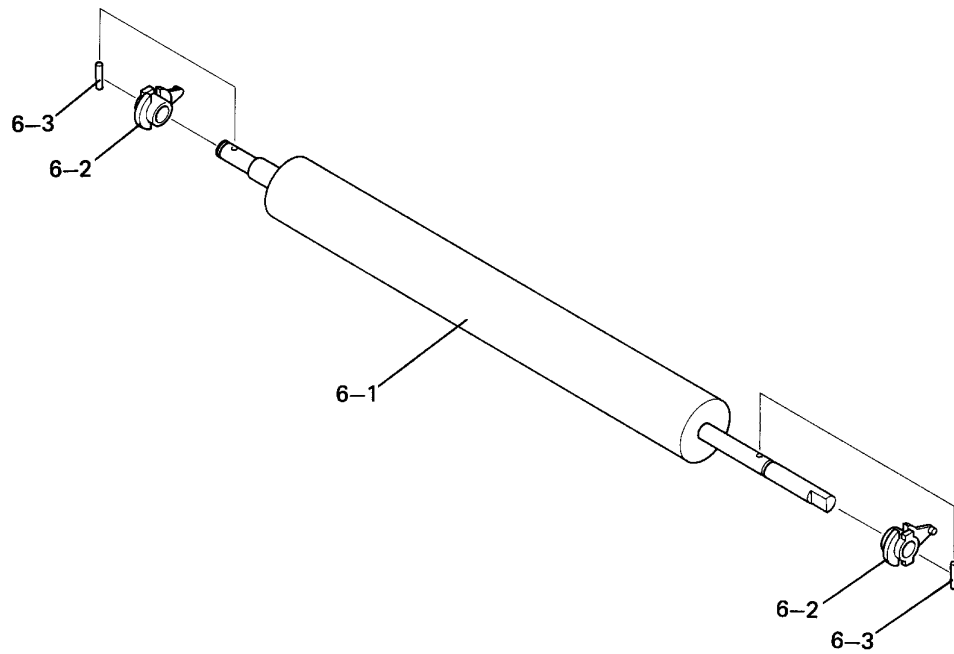


3-5-2. Parts List

Frame Unit

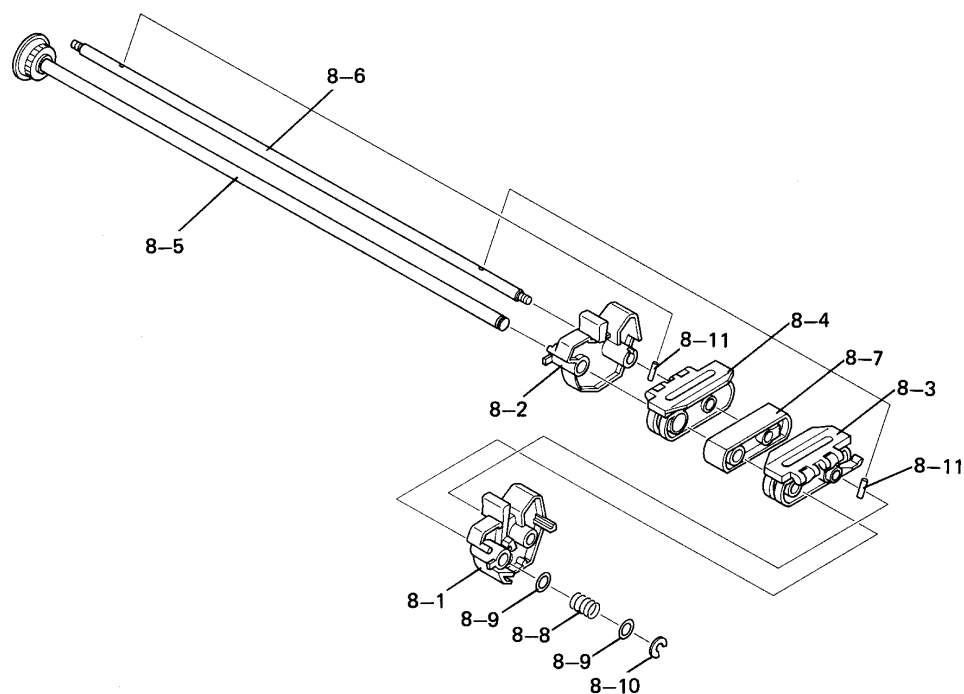
DRWG.NO.	REV.	PARTS NO.	PARTS NAME	Q'TY	REMARKS	RANK
2-1		87030660	PAPER FEED MOTOR ASSY 941	1		S
2-2		83101250	GEAR 58X0.5 941	1		S
2-3		01903064	SCREW TAT 3-5 CT	2		
2-4		82401200	INDEX LEVER 941	1		
2-5		83400730	ADJUSTING LEVER 941	1		
2-6		01903075	SCREW TBT 3-6 PT	1		S
2-7		04020016	STOP RING SE4.0	1		S
2-8		87030360	BOTTOM GUIDE UNIT 941	1	FOR VER.1	
	#2	87030361	BOTTOM GUIDE UNIT 941	1	FOR VER.2	
2-9	*1	01903077	SCREW TAT 3-5 CT-FL	3		S
	#1	01903064	SCREW TAT 3-5 CT	3		S
2-10		83902590	PAPER GUIDE 941	1		
2-11		87030350	CARRIAGE STAY UNIT 941	1		
32-1	*5	80203010	REAR SLIDER 921	1		S
	#5	80203011	REAR SLIDER 921	1		S
32-2	*1	80510950	SPRING E032-026-0116	2		S
	#1	80510951	SPRING E032-026-0116	2		S
32-3		80902150	TIMING BELT HTD102 389X4.8	1		
32-4		82501120	CLUTCH SPRING 941CL	1		
32-5		83200860	BUSHING F4X10X3.5 941	1		S
32-6		83290070	LIFT CAM 941CL	1		S
32-7		83400760	RIBBON CHANGE LEVER 941CL	2		S
32-8		83902620	CARD HOLDER 941	1		S
32-9		83911520	GEAR COVER 941	1		
32-10		87030610	CARRIAGE ASSY 941	1		
32-11		87030620	RIBBON FEED FIN ASSY 941	1		S
32-12		87030630	GEAR A ASSY 941	1		S
32-13		87030640	GEAR B ASSY 941	1		S
32-14	*3	87030680	LIFT LEVER ASSY 941	1		S
	#3	87030681	LIFT LEVER ASSY 941	1		S
32-15		01902024	SCREW TAT 2-6	1		S
32-16		01902608	SCREW TAT 2.6-6	1		S

3-6. Platen Unit

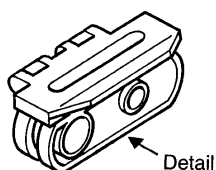


DRWG. NO.	REV.	PARTS NO.	PARTS NAME	Q'TY	REMARKS	RANK
6-1		80202150	PLATEN 941	1		
6-2	*3	83902580	PLATEN HOLDER 941	2		
	#3	83902581	PLATEN HOLDER 941	2		
6-3		04012503	ROLL PIN SP2.5X14	2		

3-7. Tractor Unit



DRWG.NO.	REV.	PARTS NO.	PARTS NAME	Q'TY	REMARKS	RANK
8-1		87036330	TRACTOR FRAME R ASSY 941	1		S
8-2		87036320	TRACTOR FRAME L ASSY 941	1		S
8-3	*4	80906051	TRACTOR SUB-UNIT R 941	1	NOTE1	S
	#4	87036350	TRACTOR R ASSY 941	1	NOTE1	S
	*3	80906150	TRACTOR SUB-UNIT R TS 941	1	NOTE1: NOT STOCKED	N
8-4	*4	80906061	TRACTOR SUB-UNIT L 941	1	NOTE1	S
	#4	87036360	TRACTOR L ASSY 941	1	NOTE1	S
	*3	80906160	TRACTOR SUB-UNIT L TS 941	1	NOTE1: NOT STOCKED	N
8-5		87036310	TRACTOR SHAFT ASSY 941	1		
8-6	*5	81370770	TRACTOR STAY B 941	1		
	#5	81370771	TRACTOR STAY B 941	1		
8-7	*4	83911060	SHEET GUIDE 905	1		
	#4	83911061	SHEET GUIDE 905	1		
8-8	*4	80520350	SPRING C090-070-0130	1		S
	#4	80520351	SPRING C090-070-0130	1		S
8-9		02307050	POLY-SLIDER WP7X0.5	2		S
8-10		04020017	STOP RING SE5.0	1		
8-11		04012002	ROLL PIN SP2.0X10	2		



Original type
80906051
80906061
87036350
87036360

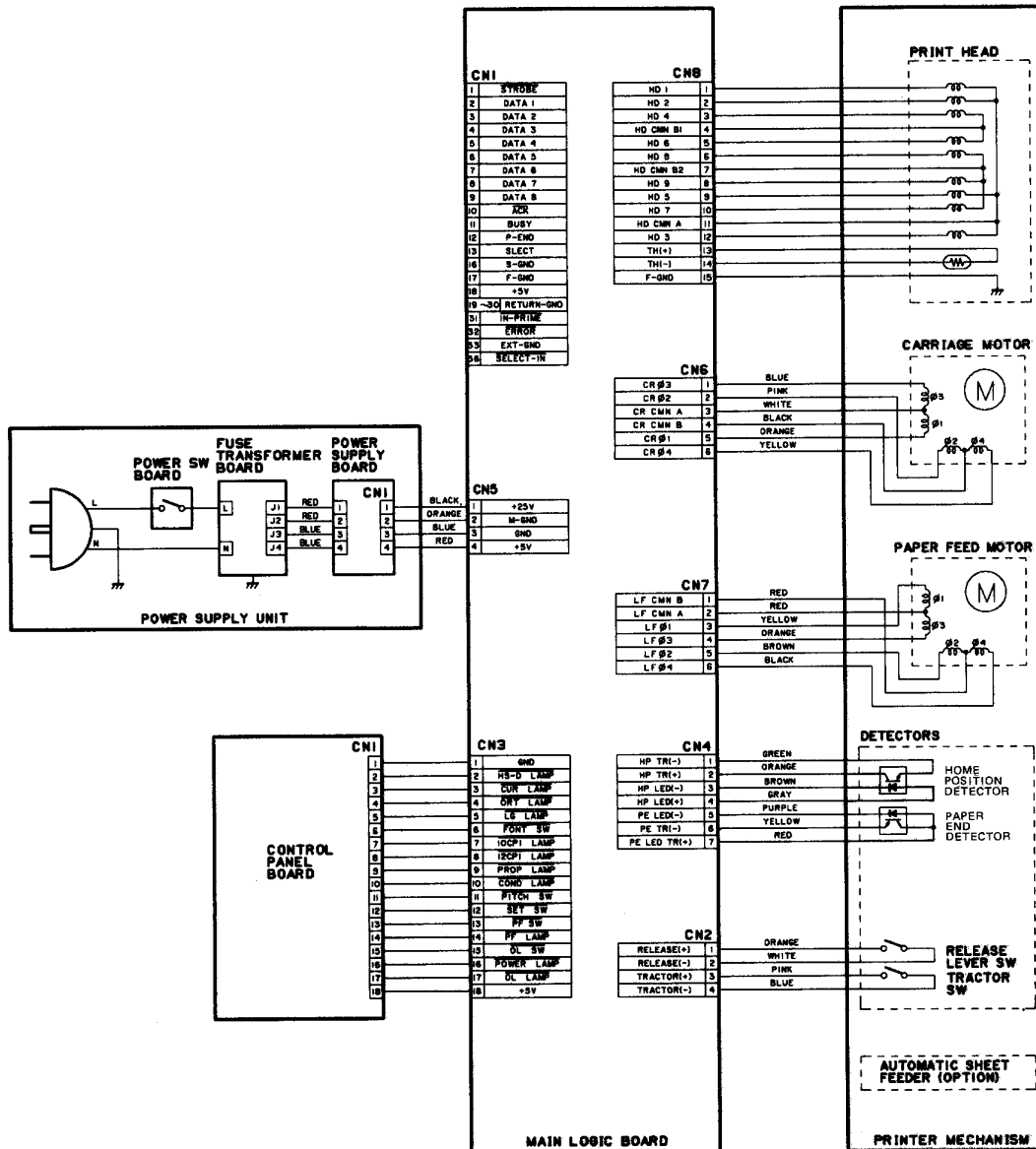


TS type
80906150
80906160

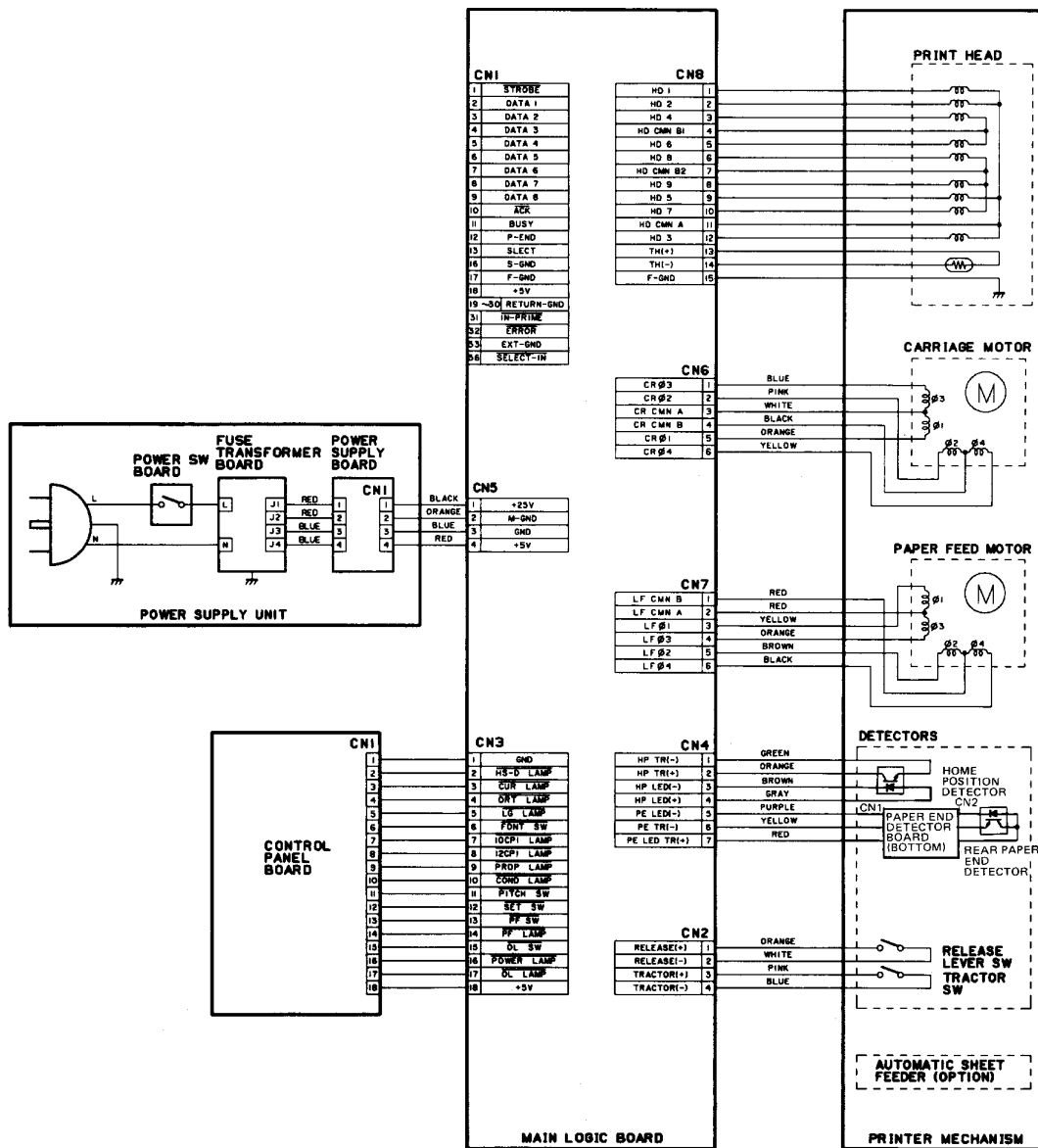
NOTE 1: The tractor sub-units R and L come in an Original Type and a TS Type. The sub-units of one tractor must be of one and the same type. Because the TS Type is not available as a replacement part, it has to be replaced with an Original Type sub-unit. Therefore, the R and L, side of the TS Type must always be replaced at the same time.

4. Wiring Scheme of the Printer

4-1. Ver. 1

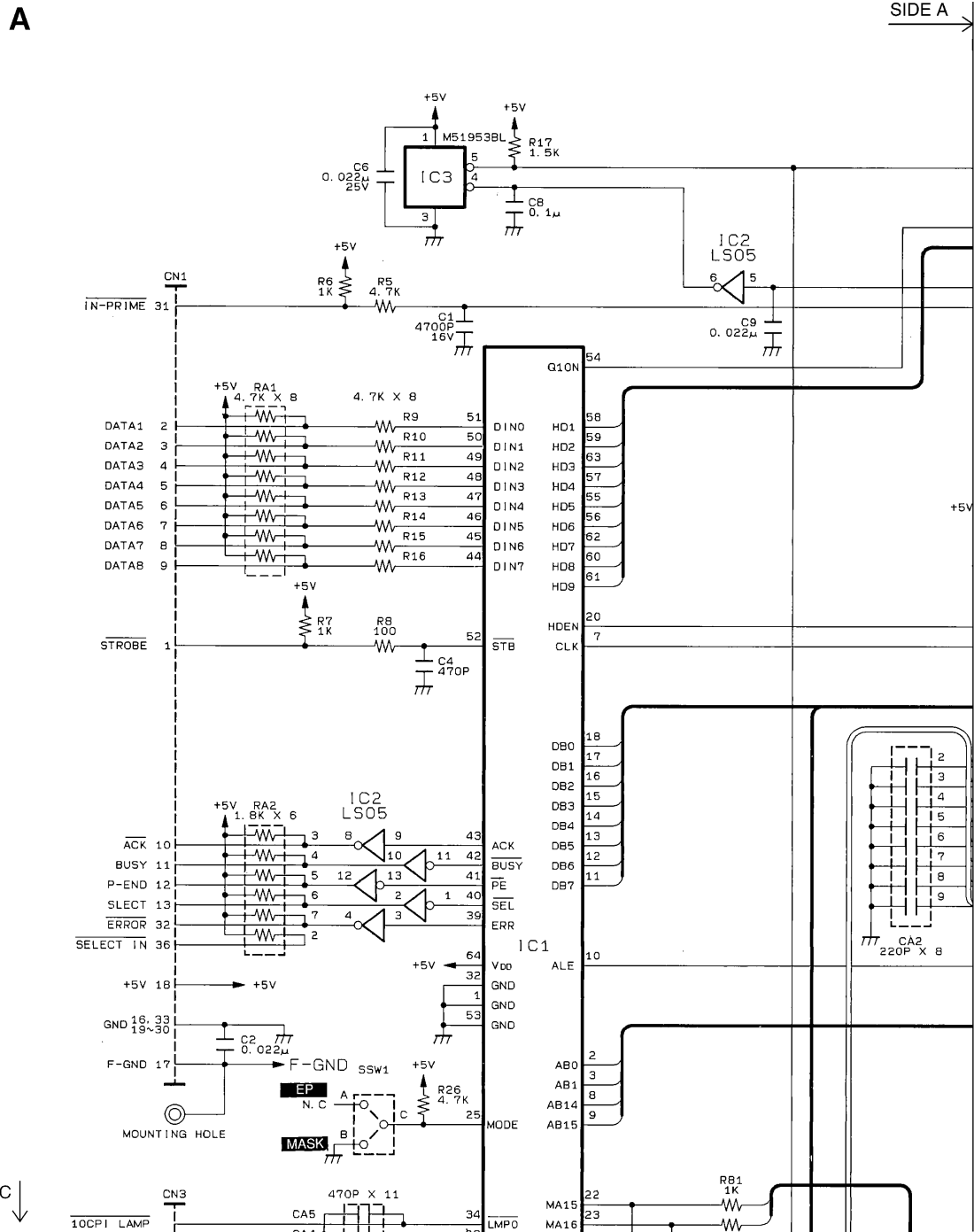


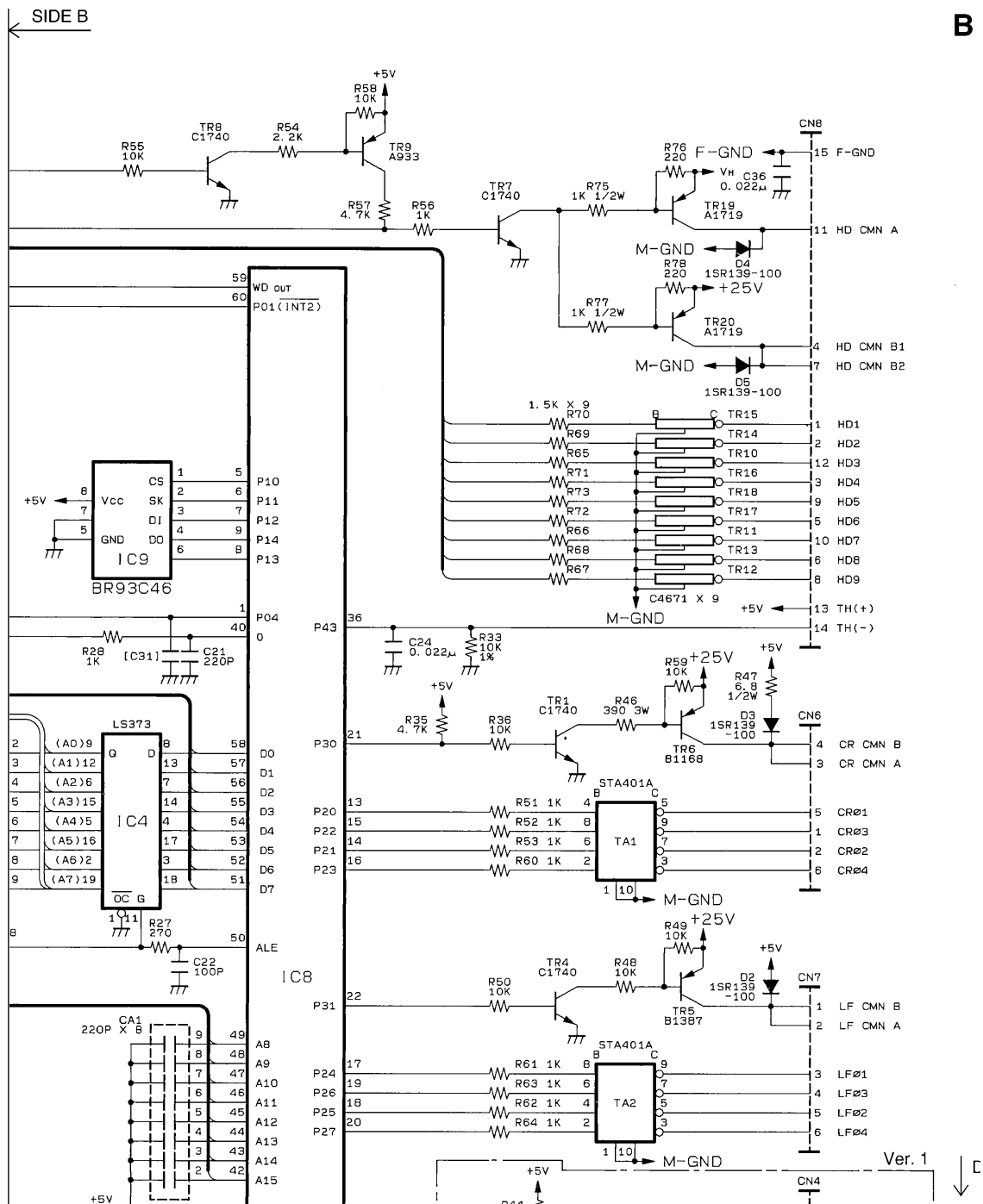
4-2. Ver. 2

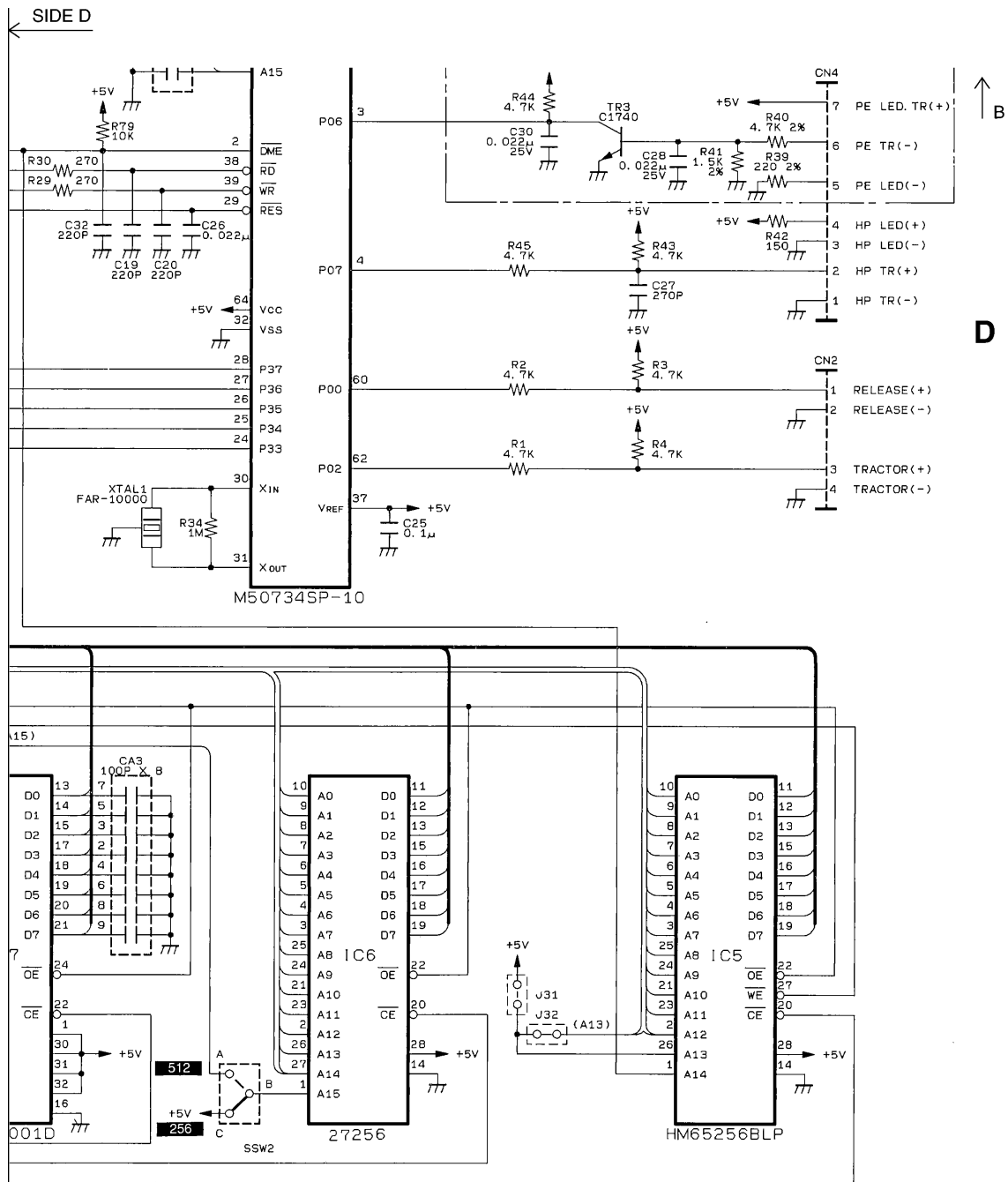


5. Main Logic Board

5-1. Circuit Diagram

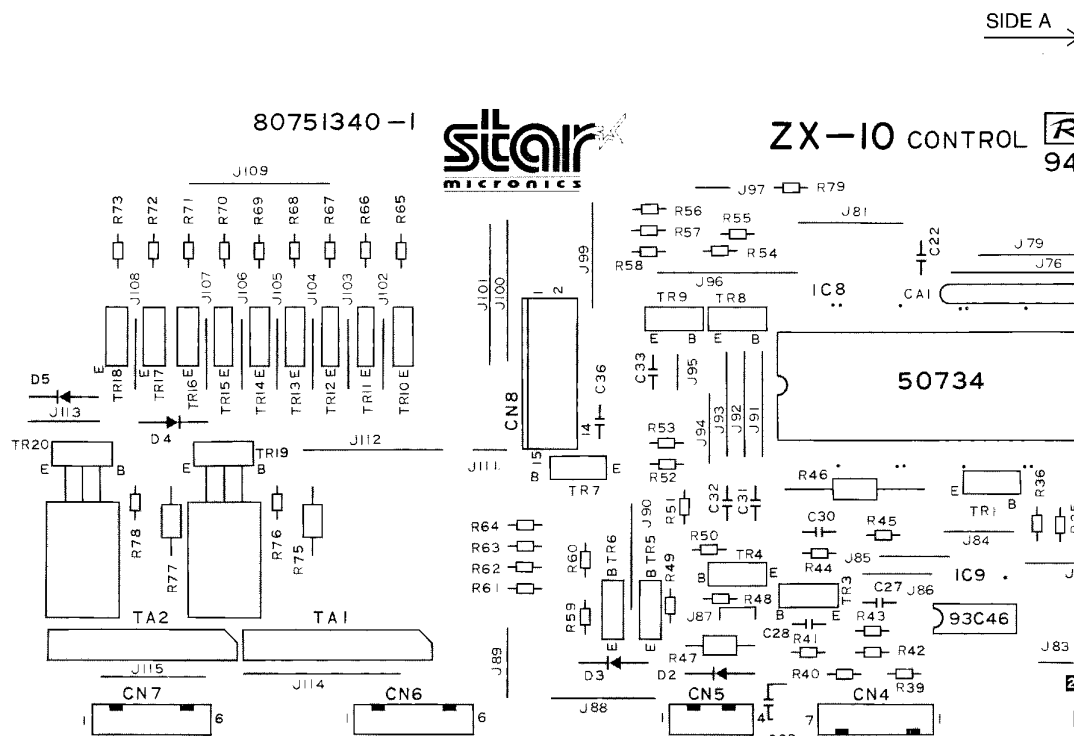




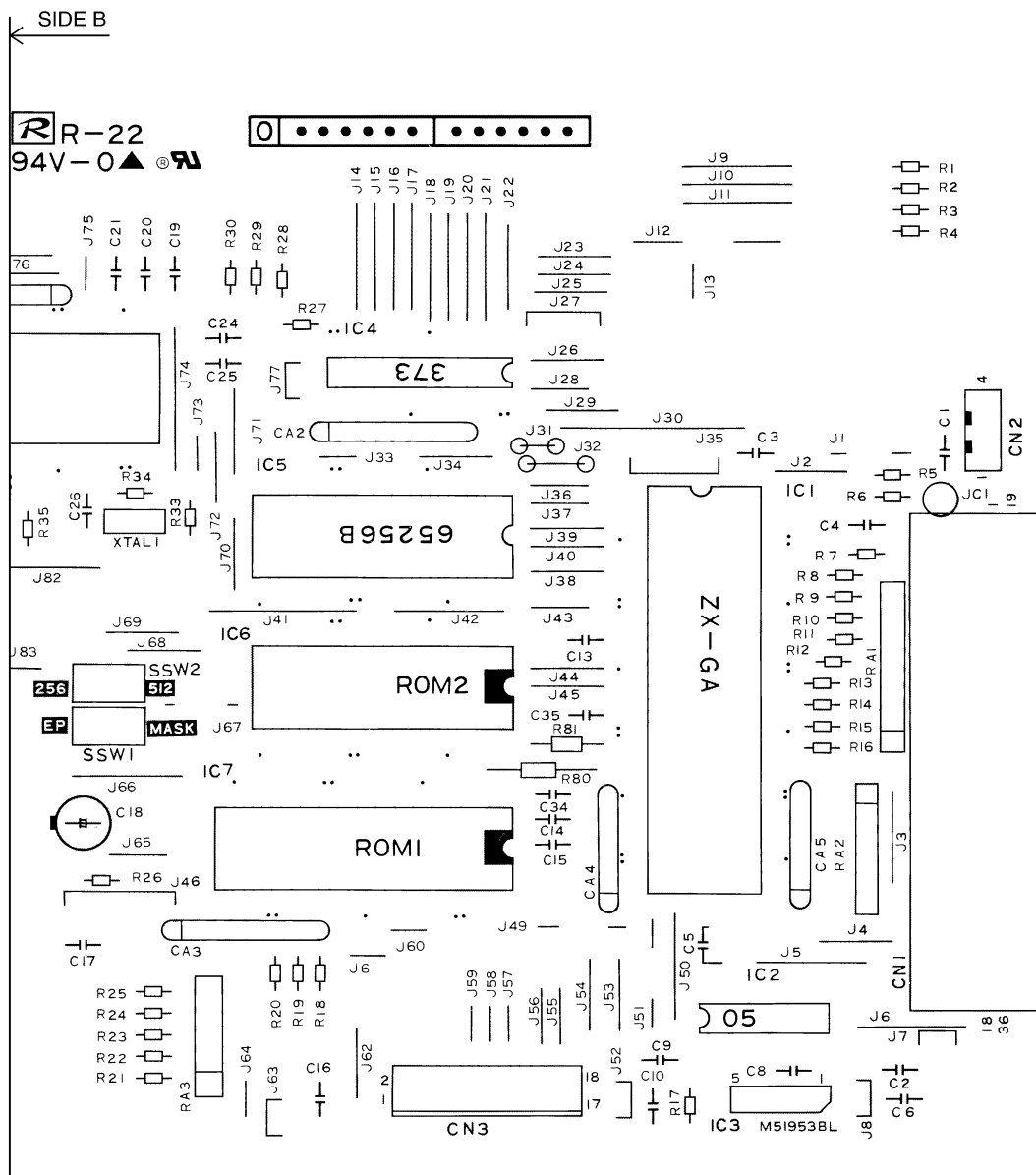


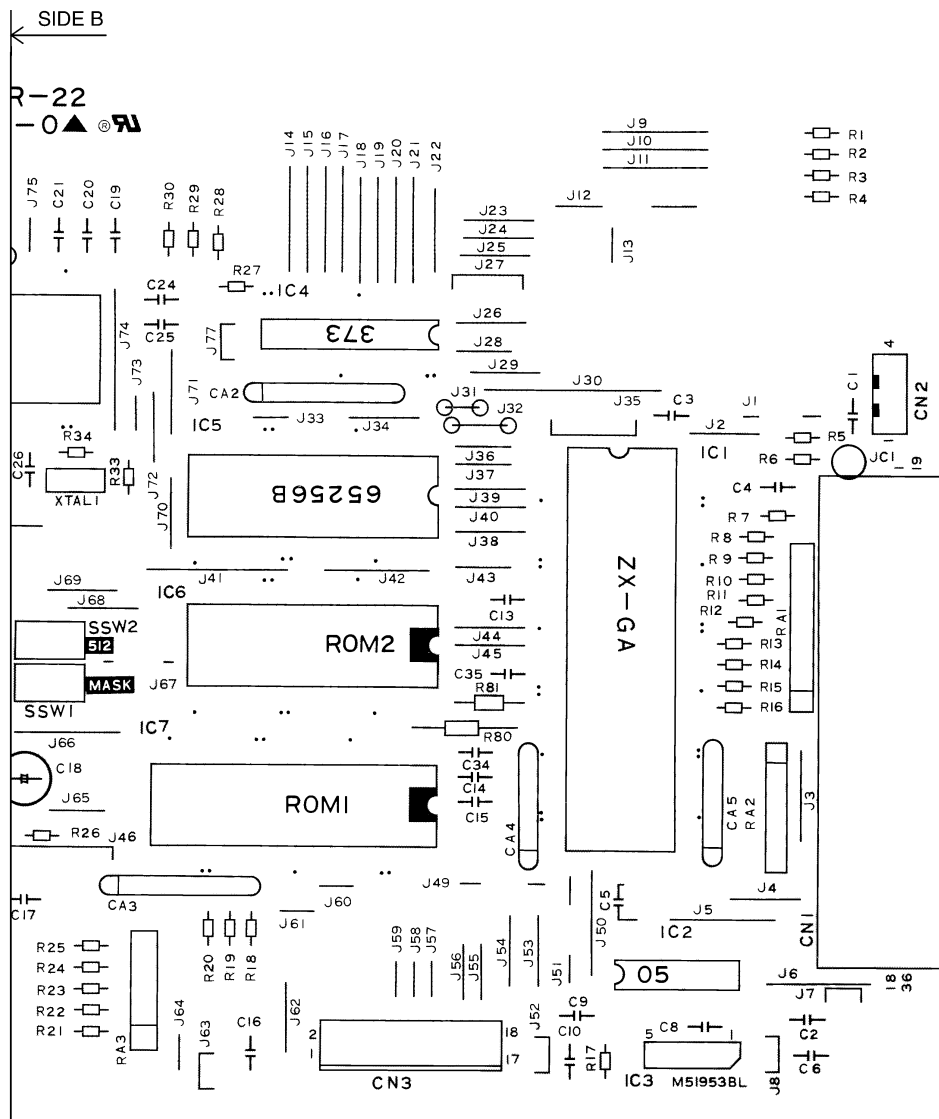
and no indication of wattage means 1/6W, 1/8W respectively.
 , and no indication of voltage means 50V.
 board.

5-2. Component Layout



[OLD BOARD]





5-3. Parts List

Main Logic Board

DRWG.NO.	REV.	PARTS NO.	PARTS NAME	Q'TY	REMARKS	RANK
IC1		08240026	GATE ARRAY D65006CW-ZX	1		S
IC2		08210017	TTL IC 74LS05	1		S
IC3		08200109	IC-RESET M51953BL	1		S
IC4		08210038	TTL IC 74LS373	1		
IC5		08221007	PSRAM HM65256BLP-100NS	1		S
IC6					NOT MOUNTED :NOTE 1	
		08222026	EPROM 27256-150NS	1	ZX.**.** :NOTE 1	S
					NOT MOUNTED :NOTE 1	
IC7	*1	08222017	EPROM D27C1001D-150NS	1	ZX.** :NOTE 1	S
	*1	08223070	MASKED ROM 1.0 ZX-10CL	1	:NOTE 1	S
	#1	08223071	MASKED ROM 2.0 ZX-10CL	1	:NOTE 1	S
	#1	08223072	MASKED ROM 3.0 ZX-10CL	1	:NOTE 1	S
	#3	08223073	MASKED ROM 4.0 ZX-10CL	1	:NOTE 1	S
IC8		08250001	CPU M50734SP-10	1		S
IC9	*2	08222022	EEPROM BR93C46	1		S
	#2	08222047	EEPROM KM93C46	1		S
TR1		07227853	TRANSISTOR 2SC1740SE	1		
TR2					NOT USED	
TR3		07227853	TRANSISTOR 2SC1740SE	1	FOR VER.1	
	#2				VER.2:NOT MOUNTED	
TR4		07227853	TRANSISTOR 2SC1740SE	1		
TR5		07113871	TRANSISTOR 2SB1387TZ	1		S
TR6	*4	07111682	TRANSISTOR 2SB1168	1		S
	#4	07018271	TRANSISTOR 2SA1827	1		S
TR7-8		07227853	TRANSISTOR 2SC1740SE	2		
TR9		07011752	TRANSISTOR 2SA1266*	1		
TR10-18		07246711	TRANSISTOR 2SC4671	9		S
TR19-20		07017191	TRANSISTOR 2SA1719	2		S
TA1-2		07650031	TRANSISTOR ARRAY STA401A	2		S
D1					NOT USED	
D2-5		08000044	DIODE 1SR139-100AT	4		
R1-5		06054725	RD RESISTOR 4.7 K-OHM 1/6W	5		
R6-7		06051025	RD RESISTOR 1 K-OHM 1/6W	2		
R8		06051014	RD RESISTOR 100 OHM 1/6W	1		
R9-16		06054725	RD RESISTOR 4.7 K-OHM 1/6W	8		
R17		06051525	RD RESISTOR 1.5 K-OHM 1/6W	1		
R18-19		06052714	RD RESISTOR 270 OHM 1/6W	2		
R20		06054714	RD RESISTOR 470 OHM 1/6W	1		
R21-26		06054725	RD RESISTOR 4.7 K-OHM 1/6W	6		
R27		06052714	RD RESISTOR 270 OHM 1/6W	1		
R28		06051025	RD RESISTOR 1 K-OHM 1/6W	1		
R29-30		06052714	RD RESISTOR 270 OHM 1/6W	2		
R31-32					NOT USED	
R33		06251034	RN RESISTOR 10 K-OHM 1/6W	1		
R34		06051051	RD RESISTOR 1 M-OHM 1/6W	1		
R35		06054725	RD RESISTOR 4.7 K-OHM 1/6W	1		
R36		06051034	RD RESISTOR 10 K-OHM 1/6W	1		
R37-38					NOT USED	
R39		06052214	RD RESISTOR 220 OHM 1/6W	1	FOR VER.1	
	#2	93930006	JUMPER WIRE STP122	1	FOR VER.2	
R40		06054724	RD RESISTOR 4.7 K-OHM 1/6W 2%	1	FOR VER.1	
	#2	93930006	JUMPER WIRE STP122	1	FOR VER.2	
R41		06051524	RD RESISTOR 1.5 K-OHM 1/6W 2%	1	FOR VER.1	
	#2	06051034	RD RESISTOR 10 K-OHM 1/6W	1	FOR VER.2	
R42		06051514	RD RESISTOR 150 OHM 1/6W	1		
R43		06054734	RD RESISTOR 47 K-OHM 1/6W	1		

Main Logic Board

DRWG.NO.	REV.	PARTS NO.	PARTS NAME	Q'TY	REMARKS	RANK
R44		06054725	RD RESISTOR 4.7 K-OHM 1/6W	1		
	#2				VER.2:NOT MOUNTED	
R45		06054725	RD RESISTOR 4.7 K-OHM 1/6W	1		
R46		06233911	RN RESISTOR 390 OHM 3W	1		
R47		06020684	RD RESISTOR 6.8 OHM 1/2W	1		
R48-50		06051034	RD RESISTOR 10 K-OHM 1/6W	3		
R51-53		06051025	RD RESISTOR 1 K-OHM 1/6W	3		
R54		06052224	RD RESISTOR 2.2 K-OHM 1/6W	1		
R55		06051034	RD RESISTOR 10 K-OHM 1/6W	1		
R56		06051025	RD RESISTOR 1 K-OHM 1/6W	1		
R57		06054725	RD RESISTOR 4.7 K-OHM 1/6W	1		
R58-59		06051034	RD RESISTOR 10 K-OHM 1/6W	2		
R60-64		06051025	RD RESISTOR 1 K-OHM 1/6W	5		
R65-73		06051525	RD RESISTOR 1.5 K-OHM 1/6W	9		
R74					NOT MOUNTED	
R75		06021024	RD RESISTOR 1 K-OHM 1/2W	1		
R76		06052211	RD RESISTOR 220 OHM 1/6W	1		
R77		06021024	RD RESISTOR 1 K-OHM 1/2W	1		
R78		06052211	RD RESISTOR 220 OHM 1/6W	1		
R79		06051034	RD RESISTOR 10 K-OHM 1/6W	1		
R80		06041027	RD RESISTOR 1 K-OHM 1/4W	1		
R81		06041025	RD RESISTOR 1 K-OHM 1/4W	1		
R82	#2	06052226	RD RESISTOR 2.2 K-OHM 1/6W (W)	1	FOR VER.2 ONLY	
R83	#2	06051026	RD RESISTOR 1 K-OHM 1/6W (W)	1	FOR VER.2 ONLY	
RA1		06584729	RESIS. ARRAY 4.7K-OHM 1/8W 8EL	1		
RA2		06581824	RESIS. ARRAY 1.8K-OHM 1/8W 6EL	1		
RA3		06594721	RESIS. ARRAY 4.7K-OHM 1/8W 5EL	1		
C1		05524724	CAPACITOR 4700PF 16V	1		
C2	#1				NOT MOUNTED :FOR HK	
		05252232	FILM CAPA. 0.022UF 50V	1	EXCEPT FOR HK	
C3		05152234	CERA. CAPA. 0.022UF 50V	1		
C4		05154714	CERA. CAPA. 470PF 50V	1		
C5-6		05532234	CAPACITOR 0.022UF 25V	2		
C7					NOT USED	
C8		05551044	CAPACITOR 0.1UF 50V	1		
C9-10		05152234	CERA. CAPA. 0.022UF 50V	2		
C11-12					NOT USED	
C13-15		05154714	CERA. CAPA. 470PF 50V	3		
C16-17		05152234	CERA. CAPA. 0.022UF 50V	2		
C18		05024764	CHEM. CAPA. 47UF 16V	1		
C19-21		05552214	CAPACITOR 220PF 50V	3		
C22		05551014	CAPACITOR 100PF 50V	1		
C23					NOT USED	
C24		05532234	CAPACITOR 0.022UF 25V	1		
C25		05551044	CAPACITOR 0.1UF 50V	1		
C26		05152234	CERA. CAPA. 0.022UF 50V	1		
C27		05154714	CERA. CAPA. 470PF 50V	1		
C28		05532234	CAPACITOR 0.022UF 25V	1	FOR VER.1	
	#2				VER.2:NOT MOUNTED	
C29		05152234	CERA. CAPA. 0.022UF 50V	1		
C30		05532234	CAPACITOR 0.022UF 25V	1		
C31					NOT MOUNTED	
C32	#1				NOT MOUNTED :FOR HK	
		05552214	CAPACITOR 220PF 50V	1	EXCEPT FOR HK	
C33		05152234	CERA. CAPA. 0.022UF 50V	1		
C34-35		05154714	CERA. CAPA. 470PF 50V	2		

Main Logic Board

DRWG.NO.	REV.	PARTS NO.	PARTS NAME	Q'TY	REMARKS	RANK
C36		05152234	CERA. CAPA. 0.022UF 50V	1		
CA1-2		05652212	CAPA. ARRAY 220PF 50V 8EL	2		
CA3		05651012	CAPA. ARRAY 100PF 50V 8EL	1		
CA4-5		05654712	CAPA. ARRAY 470PF 50V 6EL	2		
SSW1-2	*2	09000042	SLIDE SWITCH SS-12D00	2		
	#2	09000048	SLIDE SWITCH ESD-14345	2		
XTAL1		09250035	CERA. OSCILLATOR CST10.0MT	1		
CN1		09100457	CONNECTOR 57L-40360-770B-D29	1		
CN2	*1	09100342	CONNECTOR 53014-0410	1		
	*4	09100476	CONNECTOR 53014-0470	1		
	#4	09100342	CONNECTOR 53014-0410	1		
CN3		09100416	CONNECTOR HLEM18S-2	1		
CN4		09100370	CONNECTOR 53014-0710	1		
		09100475	CONNECTOR 53014-0770	1		
CN5		09100317	CONNECTOR 5483-04A	1		
CN6		09100267	CONNECTOR 5483-06A	1	FOR VER.1:(WHITE)	
		09100267	CONNECTOR 5483-06A	1	FOR VER.2:(WHITE)	
	#3	09100278	CONNECTOR 5483-06A-RED	1	FOR VER.2:(RED)	
CN7		09100278	CONNECTOR 5483-06A-RED	1	FOR VER.1:(RED)	
		09100278	CONNECTOR 5483-06A-RED	1	FOR VER.2:(RED)	
	#3	09100404	CONNECTOR 5483-06A-BLK	1	FOR VER.2:(BLACK)	
CN8		09100384	CONNECTOR HLEM15S-2	1		
J1-30		93930006	JUMPER WIRE STP122	30		
J31					NOT MOUNTED	
J32-46		93930006	JUMPER WIRE STP122	15		
J47-48					NOT USED	
J49-77		93930006	JUMPER WIRE STP122	29		
J78					NOT USED	
J79		93930006	JUMPER WIRE STP122	1		
J80					NOT USED	
J81-97		93930006	JUMPER WIRE STP122	17		
J98					NOT USED	
J99-109		93930006	JUMPER WIRE STP122	11		
J110					NOT USED	
J111-115		93930006	JUMPER WIRE STP122	5		
JC1		80700250	WIRE 18UL1007BLK055T	1		
-		09110024	IC SOCKET ICS-28-2T	1		
		09110077	IC SOCKET ICS-32-2T	1		
	*4	80086510	BOARD ID SEAL HK	1	FOR HK ONLY	
		80087180	BOARD ID SEAL VERII	1	FOR VER.2 :OLD BOARD	

NOTE 1

(1)	Slide Switch SSW 1	IC6	IC7
	MASK (B - C)	Program data is invalid	Program data is valid
	EP (A - C)	Program data is valid	Program data is invalid

(2)	Slide Switch SSW 2	IC6
	256 (C - B)	256Kbit
	512 (A - B)	512Kbit

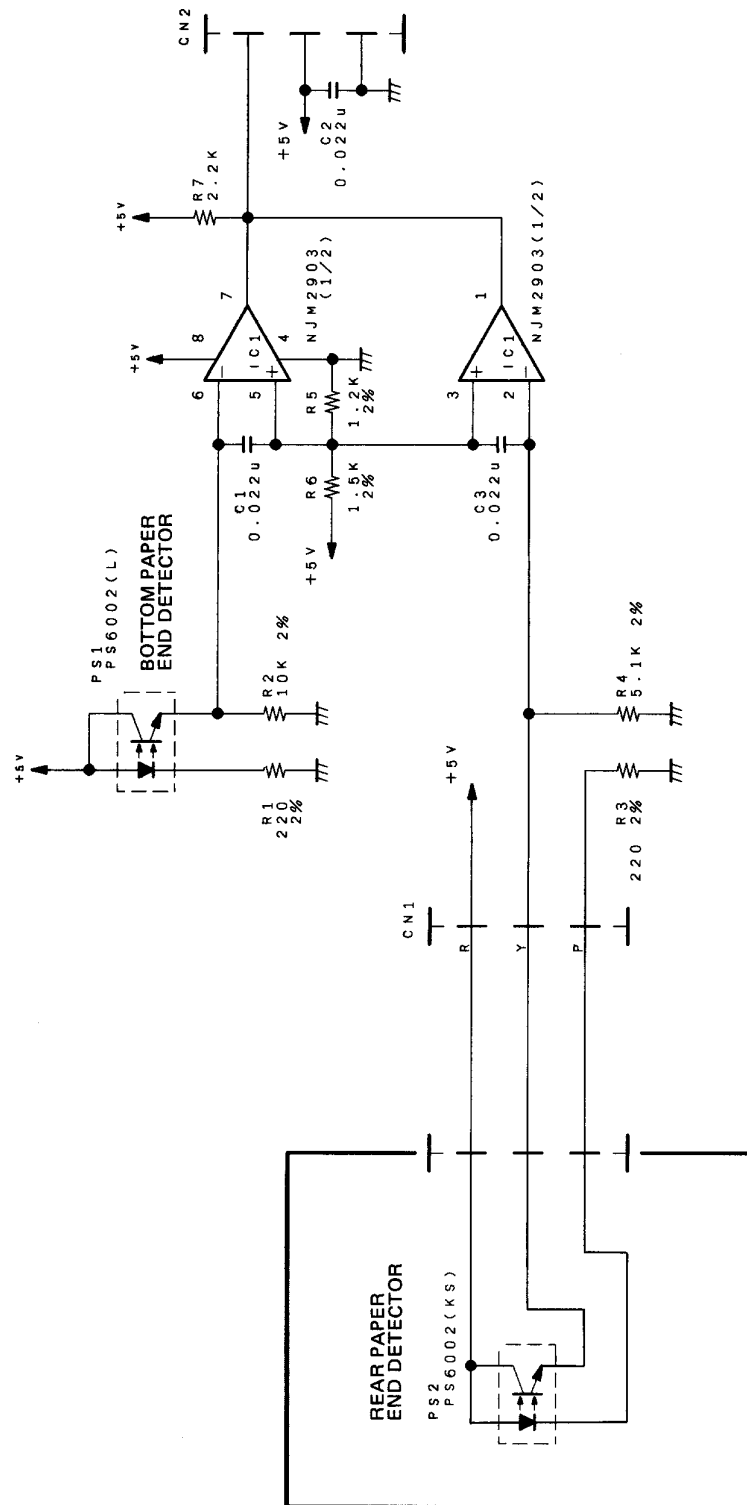
(3) As of Jul, 1993 the ROM version and slide switch settings are as follows.

IC7 Masked ROM	IC6 EP ROM	Slide Switch	
		SSW 1	SSW2
ROM 2.0	2.2	EP	256
ROM 3.0	3.2	EP	256
ROM 4.0	Not Mounted	MASK	256

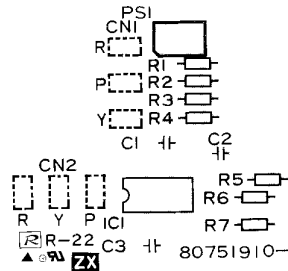
If a ROM other than those described above is mounted on IC6 or IC7, the performance of the printer may differ from that described in this manual.

6. Paper End Detector Board

6-1. Circuit Diagram



6-2. Component Layout

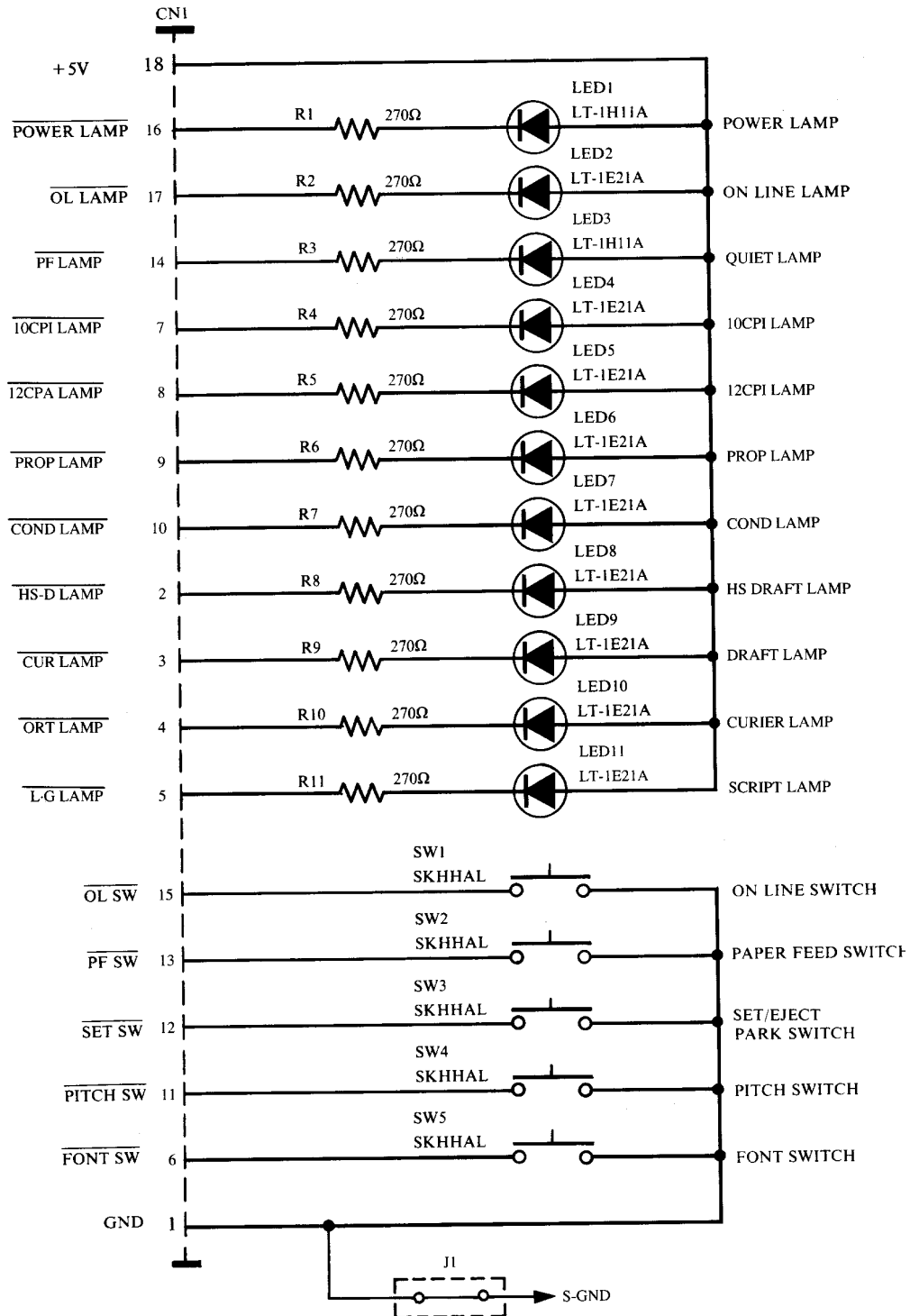


6-3. Parts List

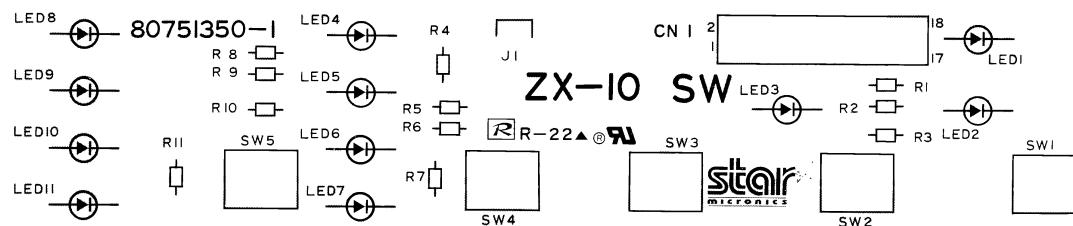
DRWG.NO.	REV.	PARTS NO.	PARTS NAME	Q'TY	REMARKS	RANK
IC1	*3	08200053	IC-LIN NJM2903D	1		
	#3	08200091	IC-LIN NJM2903D	1		
R1		06052214	RD RESISTOR 220 OHM 1/6W	1		
R2		06051035	RD RESISTOR 10 K-OHM 1/6W 2%	1		
R3		06052214	RD RESISTOR 220 OHM 1/6W	1		
R4		06055124	RD RESISTOR 5.1 K-OHM 1/6W 2%	1		
R5		06051225	RD RESISTOR 1.2 K-OHM 1/6W 2%	1		
R6		06051524	RD RESISTOR 1.5 K-OHM 1/6W 2%	1		
R7		06052224	RD RESISTOR 2.2 K-OHM 1/6W	1		
C1-3		05532234	CAPACITOR 0.022UF 25V	3		
PS1	*3	08300105	PHOTO-INTERRUPTER PS6002-L	1		
	#3	08300108	PHOTO-INTERRUPTER PS6002A-SS	1		
PS2		08300082	PHOTO-INTERRUPTER PS6002A-KS	1		
-		80701360	WIRE 28UL1007RED100	1		
		80701370	WIRE 28UL1007YEL100	1		
		80701380	WIRE 28UL1007PUP100	1		
		80703640	CABLE UNIT 3X170C	941	1	

7. Control Panel Board

7-1. Circuit Diagram



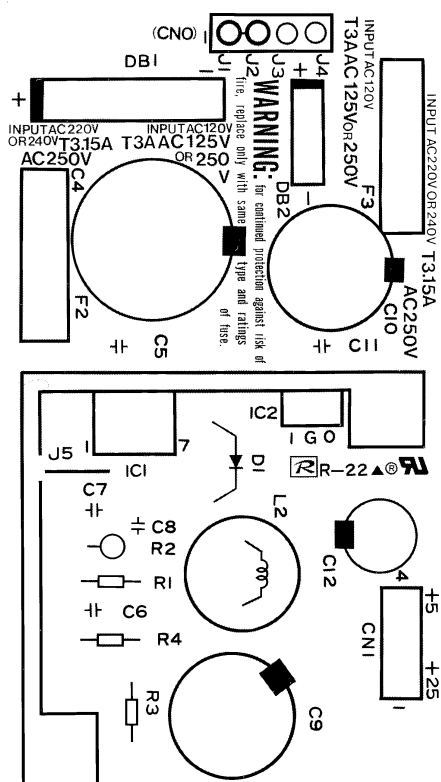
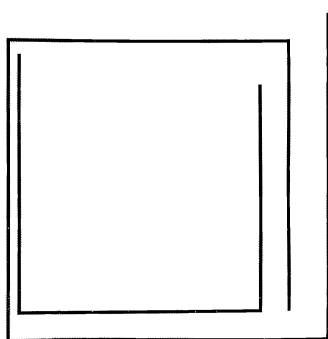
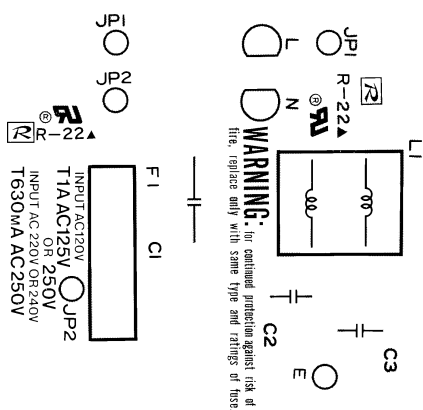
7-2. Component Layout



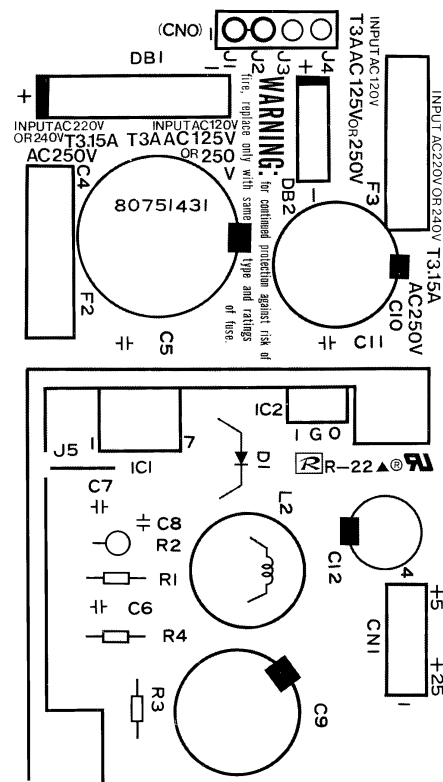
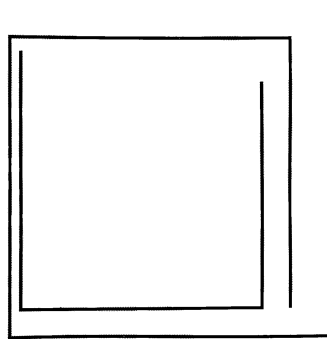
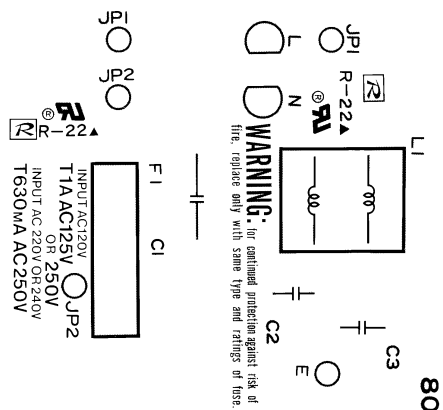
7-3. Parts List

DRWG.NO.	REV.	PARTS NO.	PARTS NAME	Q'TY	REMARKS	RANK
R1-11		06052714	RD RESISTOR 270 OHM 1/6W	11		
LED1		08300055	LED LT-1H11A	1		
LED2		08300058	LED LT-1E21A	1		
LED3		08300055	LED LT-1H11A	1		
LED4-11		08300058	LED LT-1E21A	8		
SW1-5		09010043	PUSH SWITCH SKHHAL=S	5		
CN1		09100456	CONNECTOR 5062-18	1		
J1		93930006	JUMPER WIRE STP122	1		
-		80703040	CABLE UNIT 18X170 ZX-10CL	1		

8-2. Component Layout



Old Board



New Board

8-3. Parts List

Power Supply Unit

DRWG.NO.	REV.	PARTS NO.	PARTS NAME	Q'TY	REMARKS	RANK
IC1		08202008	IC-REG L4960	1		S
IC2		08202013	IC-REG L4941	1		S
D1		08030016	SCHOTTKY DIODE ERB84-009	1		S
R1		06041035	RD RESISTOR 10 K-OHM 1/4W	1		
R2		06041034	RD RESISTOR 10 K-OHM 1/4W	1		
R3		06242034	RN RESISTOR 20 K-OHM 1/4W 1%	1		
R4		06245124	RN RESISTOR 5110 OHM 1/4W	1		
C1	*4	05291044	FILM CAPA. 0.1UF 250V	1		
	#4	05291045	FILM CAPA. 0.1UF 275V	1		
C2-3	#1				NOT MOUNTED :FOR HK	
		05192224	CERA. CAPA. 2200PF 400V	2	EXCEPT FOR HK	
C4		05054782	CHEM. CAPA. 4700UF 50V	1		
C5		05155614	CERA. CAPA. 560PF 50V	1		
C6		05252224	FILM CAPA. 2200PF 50V	1		
C7		05154714	CERA. CAPA. 470PF 50V	1		
C8		05251044	FILM CAPA. 0.1UF 50V	1		
C9		05043385	CHEM. CAPA. 3300UF 35V	1		
C10		05024781	CHEM. CAPA. 4700UF 16V	1		
C11		05152234	CERA. CAPA. 0.022UF 50V	1		
C12		05022271	CHEM. CAPA. 220UF 16V	1		
DB1	*5	08990220	DIODE STACK D3SB10	1		S
	#5	08990227	DIODE STACK D3SB20	1		S
DB2		08990221	DIODE STACK 1B4B41	1		S
T1	*3	09240680	TRANSFORMER 120V ZX-10CL-TB US	1	FOR US	
	#3	09240681	TRANSFORMER 120V ZX-10CL-TB US	1	FOR US	
		09240690	TRANSFORMER 220V ZX-10CL-P EC	1	FOR EC,HK,WG	
		09240700	TRANSFORMER 240V ZX-10CL-P UK	1	FOR UK,AS	
L1		09251106	LINE FILTER SU10V-05050	1		
L2		09251023	CHOKE COIL SK15BS045-300	1		
F1		09990058	FUSE 5TT1A 250V	1	FOR US	S
		09990021	FUSE EAWK630MA 250V	1	FOR EC,UK,HK,AS,WG	S
F2-3		09990054	FUSE 5TT3A 125V	2	FOR US,UK,AS	S
		09990050	FUSE EAK3.15A 250V	2	FOR EC,HK,WG	S
-	*4	09110098	CORD SET US-PN ZX-10CL	1	FOR US	
	#4	09110144	CORD SET US-PN HA-10	1		
	*4	09110099	CORD SET EC-PN ZX-10CL	1	FOR EC,WG	
	*5	09110099	CORD SET EC-PN ZX-10CL	1	FOR WG	
	#5	09110143	CORD SET EC-PN HA-10	1	FOR WG	
	#4	09110143	CORD SET EC-PN HA-10	1	FOR EC	
		09110067	CORD SET UK-PN LC	1	FOR UK	
	*3	09110067	CORD SET UK-PN LC	1	FOR HK	
	#3	09110136	CORD SET HK-PN QBA	1	FOR HK	
	#1	09110068	CORD SET AS-PN LC	1	FOR AS	
		09030019	SEESAW SWITCH T-881SBSS-A1	1		
	*3	04033002	SCREW RIVET 1712-3007	2	FOR IC1,2 :NOTE1	
	#3	01903035	SCREW TR 3-10 FL	1	FOR IC1,2	
	#3	82090350	TRANSISTOR HOLDER PLATE R-10	1	FOR IC1,2	
		04033202	RIVET 1801-0408	2	FOR RADIATION PLATE	
		04991204	FASTENER T18S	3	FOR US,EC,AS,WG	
		04991204	FASTENER T18S	2	FOR UK,HK	
		04991219	CORD BUSHING SR-4N-4	1	FOR US	
		04991220	CORD BUSHING SR-5N-4	1	FOR EC,UK,HK,AS,WG	
		09990023	FUSE HOLDER UF-0033	6		
	*4	80701060	WIRE 20UL1015BLK105T	2		
	#4	80770040	CABLE UNIT 01X105T (D)			
	*4	80702240	CABLE UNIT 4X60	1		

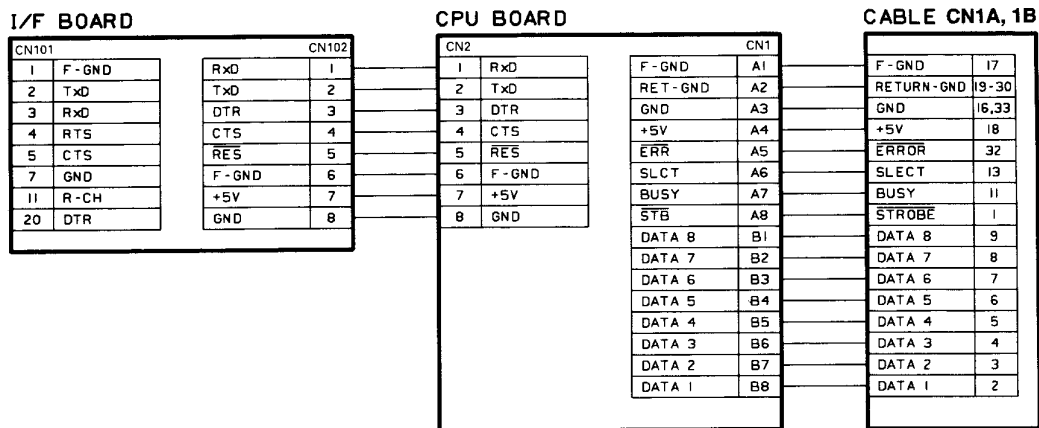
Power Supply Unit

DRWG.NO.	REV.	PARTS NO.	PARTS NAME	Q'TY	REMARKS	RANK
	#4	87770050	CABLE UNIT 04X060 (D)	1		
	*4	80703120	CABLE UNIT 4X60 ZX-10CL	1		
	#4	87770030	CABLE UNIT 04X060 A (D)	1		
	*4	80924691	WIRE 18UL1015G/Y100TT	1		
	#4	87770060	CABLE UNIT 01X100TT A (D)	1		
		80993350	INSULATION SHEET ZX-10CL	1		
	*5	82020440	POWER CORD COVER ZL-10	1		
	#5	82020441	POWER CORD COVER ZL-10	1		
		82911110	RADIATION PLATE ZX-10CL	1		
		93930006	JUMPER WIRE STP122	6		

NOTE1: This screw is retightened with a 1/16" hexagon screw driver.

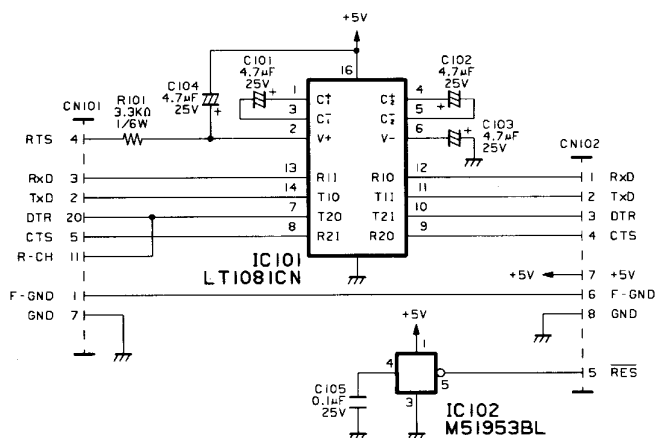
9. Serial-Parallel Converter Board (Option)

9-1. Wiring Scheme

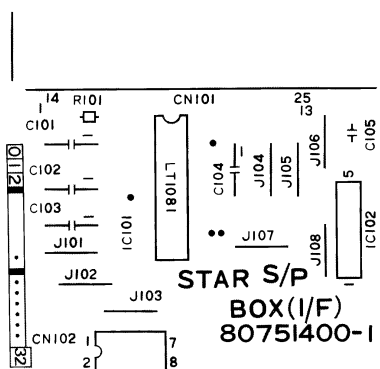


9-2. I/F Board

9-2-1. Circuit Diagram



9-2-2. Component Layout



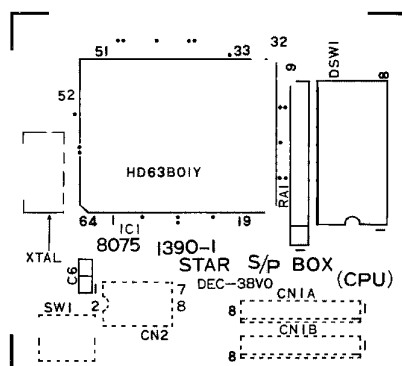
9-2-3. Parts List

DRWG.NO.	REV.	PARTS NO.	PARTS NAME	Q'TY	REMARKS	RANK
IC101		08200125	IC-I/F LT1081CN	1		
IC102		08200109	IC-RESET M51953BL	1		
R101		06053324	RD RESISTOR 3.3 K-OHM 1/6W	1		
C101-104		05034758	CHEM. CAPA. 4.7UF 25V	4		
C105		05551044	CAPACITOR 0.1UF 50V	1		
CN101		09100461	CONNECTOR DBLC-J25SAF-23L8	1		
CN102		09100462	CONNECTOR 5532-08A	1		
J101-108		93930006	JUMPER WIRE STP122	8	P=10mm	

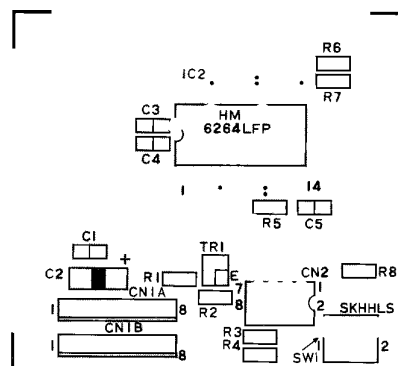
9-3-1. Circuit Diagram



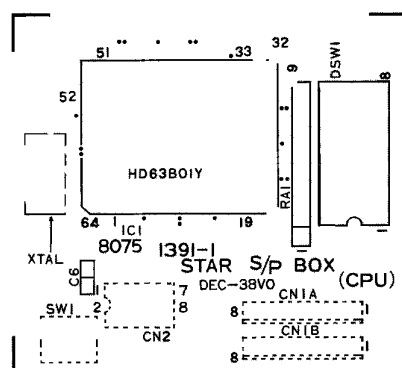
9-3-2. Component Layout



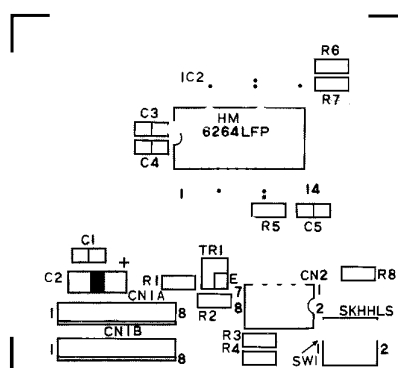
Old board [Parts side]



Old board [Solder side]



New board [Parts side]



New board [Solder side]

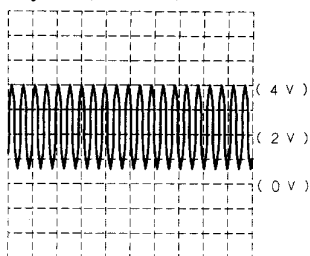
9-3-3. Parts List

CPU Board

DRWG.NO.	REV.	PARTS NO.	PARTS NAME	Q'TY	REMARKS	RANK
IC1		08250011	MASKED CPU HD63B01YF-IF	1		
IC2		08221021	SRAM HM6264LFP-100NS	1		
TR1		07603007	DIGITAL TRANSISTOR RTIN434C-T	1		
R1		06754721	CHIP RESISTOR 4.7 K-OHM 1/10W	1		
R2-4		06751021	CHIP RESISTOR 1 K-OHM 1/10W	3		
R5		06754721	CHIP RESISTOR 4.7 K-OHM 1/10W	1		
R6-7		06783313	CHIP RESISTOR 330 OHM 1/8W	2		
R8		06754721	CHIP RESISTOR 4.7 K-OHM 1/10W	1		
RA1		06564721	RESIS. ARRAY 4.7K-OHM 1/16W8EL	1		
C1		05731042	CERA. CAPA. CHIP 0.1UF 25V	1		
C2		05514751	TANTALUM CAPA. CHIP 4.7UF 10V	1		
C3		05731042	CERA. CAPA. CHIP 0.1UF 25V	1		
C4					NOT USED	
C5-6		05751025	CERA. CAPA. CHIP 1000PF 50V	2		
XTAL1		09250039	CERA. OSCILLATOR EF0-W4914B5	1		
DSW1		09090018	DIP SWITCH KSD08	1		
SW1		09010047	PUSH SWITCH SKHLS0001	1		
CN1A-1B		80706070	INTERFACE CABLE SPC-8K	1		
CN2		09100463	CONNECTOR 5533-08CPB	1		

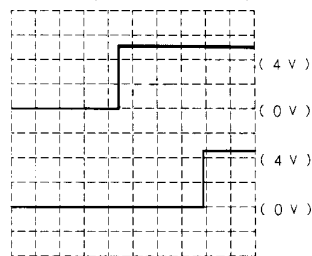
10. Waveform with Oscilloscope

(1) Crystal (10 MHz)



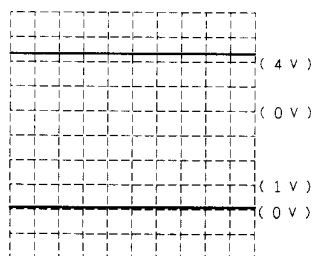
Crystal Pin 30 of IC8
Time/Div : 0.2 μ s
Volt/Div : 1V

(2) $\overline{\text{RESET}}$ (Power on reset)



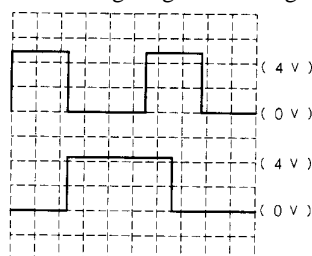
Upper : RESET input Pin 4 of IC3
Lower : RESET output Pin 5 of IC3
Time/Div : 10 ms
Volt/Div : 2V

(3) Protection Circuit



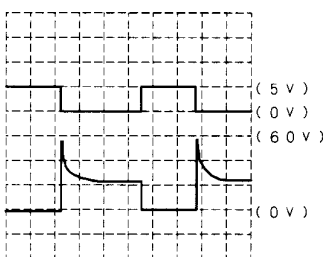
Upper : $\overline{\text{RESET}}$ Pin 5 of IC3
Lower : WD OUT Pin 59 of IC8
Time/Div : 5 ms
Volt/Div : Upper 2V
Lower 1V

(4) Head Energizing Control Signal



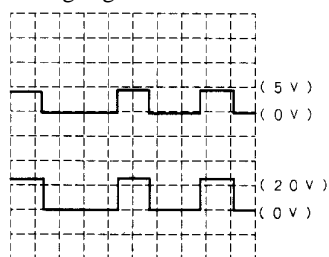
Upper : HD-EN Pin 20 of IC1
Lower : HD1 Data Pin 58 of IC1
Time/Div : 0.1 ms
Volt/Div : 2V

(5) Print Head Control Signal and Waveform



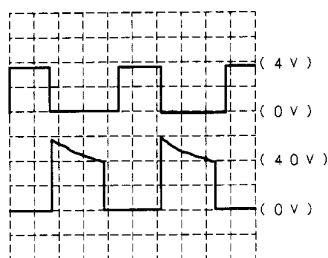
Upper : HD1 Data Pin 58 of IC1
Lower : HD1 Pin 1 of CN8
Time/Div : 0.2 ms
Volt/Div : Upper 5V
Lower 20V

(6) Carriage Motor Common Control Signal and Diving Signal



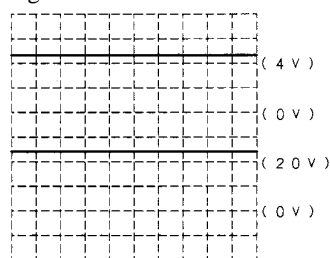
Upper : CR-CMN Control Signal Pin 21 of IC8
Lower : CR-CMN Driving Signal Pin 3 of CN6
Time/Div : 0.5 ms
Volt/Div : Upper 5V
Lower 20V

(7) Carriage Motor Control Signal and Driving Signal



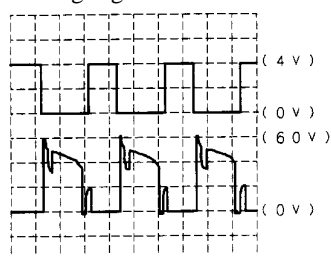
Upper : Carriage-ø1 Control Signal Pin 13 of IC8
 Lower : Carriage-ø1 Driving Signal Pin 5 of CN6
 Time/Div : 0.5 ms
 Volt/Div : Upper 2V
 Lower 20V

(8) Paper Feed Motor Common Control Signal and Driving Signal



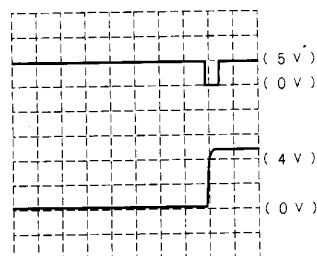
Upper : LF-CMN Control Signal Pin 22 of IC8
 Lower : LF-CMN Driving Signal Pin 1 of CN7
 Time/Div : 20 ms
 Volt/Div : Upper 2V
 Lower 10V

(9) Paper Feed Motor Control Signal and Driving Signal



Upper : LF-ø1 Control Signal Pin 17 of IC8
 Lower : LF-ø1 Driving Signal Pin 3 of CN7
 Time/Div : 50 ms
 Volt/Div : Upper 2V
 Lower 20V

(10) Parallel Interface



Upper : \overline{STB} Pin 1 of CN1
 Lower : BUSY Pin 11 of CN1
 Time/Div : 50 ms
 Volt/Div : Upper 5V
 Lower 2V

**HEAD QUARTERS****STAR MICRONICS CO., LTD. JAPAN**

536 Nanatsushinya, Shimizu,
Shizuoka, 424, Japan

Tel: 0543-47-0113
Telefax: 0543-48-5013

OVERSEAS SUBSIDIARY COMPANIES**STAR MICRONICS AMERICA INC.**

70-D Ethel Road West.
Piscataway, NJ 08854-5950, U.S.A
Tel: 908-572-5550
Telefax: 908-572-5693

STAR MICRONICS DEUTSCHLAND GMBH

Westerbachstraße 59 P.O.Box 940330
D-60489 Frankfurt/Main 90
F.R.of Germany
Tel: 069-789990
Telefax: 069-781006
Telex: 417 5825 STAR D

STAR MICRONICS U.K.LTD.

Star House, Peregrine Business
Park, Gomm Road, High Wycombe
Bucks, HP13 7DL U.K.
Tel: 01494-471111
Telefax: 01494-473333

STAR MICRONICS PTY. LTD.

Unit A/107-115 Asquith Street,
Silverwater, NSW 2141
Australia
Tel: 02-748-4300
Telefax: 02-748-3527

STAR MICRONICS ASIA LTD.

18/F., Tower II, Enterprise Square
9 Sheung Yuet Road, Kowloon Bay
Hong Kong
Tel: 2796-2727
Telefax: 2799-9344

STAR MICRONICS (N.Z.) LTD.

64 Lunn Ave. Mount Wellington
P.O. Box 6255, Wellesley St.,
Auckland, New Zealand.
Tel: 570-1450
Telefax: 570-1448

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