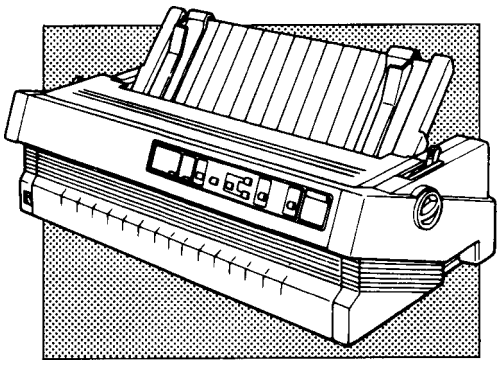
EPSON

EPSON TERMINAL PRINTER

SQ - 870/1170



SERVICE MANUAL

4001225
REV.-A

NOTICE

PRECAUTIONS

Precautionary notations throughout the text are categorized relative to 1) personal injury, and 2) damage to equipment:

DANGER Signals a precaution which, if ignored, could result in serious or fatal personal injury. Great caution should be exercised in performing procedures preceded by a DANGER headings.

WARNING Signals a precaution which, if ignored, could result in damage to equipment.

The precautionary measures itemized below should always be observed when performing repair/maintenance procedures.

DANGER

1. ALWAYS DISCONNECT THE PRODUCT FROM BOTH THE POWER SOURCE AND THE HOST COMPUTER BEFORE PERFORMING ANY MAINTENANCE OR REPAIR PROCEDURE.
2. NO WORK SHOULD BE PERFORMED ON THE UNIT BY PERSONS UNFAMILIAR WITH BASIC SAFETY MEASURES AS DICTATED FOR ALL ELECTRONICS TECHNICIANS IN THEIR LINE OF WORK.
3. WHEN PERFORMING TESTING AS DICTATED WITHIN THIS MANUAL, DO NOT CONNECT THE UNIT TO A POWER SOURCE UNTIL INSTRUCTED TO DO SO. WHEN THE POWER SUPPLY CABLE MUST BE CONNECTED, USE EXTREME CAUTION IN WORKING ON POWER SUPPLY AND OTHER ELECTRONIC COMPONENTS.

WARNING

1. REPAIRS ON EPSON PRODUCT SHOULD BE PERFORMED ONLY BY AN EPSON CERTIFIED REPAIR TECHNICIAN.
2. MAKE CERTAIN THAT THE SOURCE VOLTAGE IS THE SAME AS THE RATED VOLTAGE, LISTED ON THE SERIAL NUMBER/RATING PLATE. IF THE EPSON PRODUCT HAS A PRIMARY-AC RATING DIFFERENT FROM THE AVAILABLE POWER SOURCE, DO NOT CONNECT IT TO THE POWER SOURCE.
3. ALWAYS VERIFY THAT THE EPSON PRODUCT HAS BEEN DISCONNECTED FROM THE POWER SOURCE BEFORE REMOVING OR REPLACING PRINTED CIRCUIT BOARDS AND/OR INDIVIDUAL CHIPS.
4. IN ORDER TO PROTECT SENSITIVE μP CHIPS AND CIRCUITRY, USE STATIC DISCHARGE EQUIPMENT, SUCH AS ANTI-STATIC WRIST STRAPS, WHEN ACCESSING INTERNAL COMPONENTS.
5. REPLACE MALFUNCTIONING COMPONENTS ONLY WITH THOSE COMPONENTS RECOMMENDED BY THE MANUFACTURER; INTRODUCTION OF SECOND-SOURCE ICS OR OTHER NONAPPROVED COMPONENTS MAY DAMAGE THE PRODUCT AND VOID ANY APPLICABLE EPSON WARRANTY.

PREFACE

This manual describes functions, theory of electrical and mechanical operations, maintenance, and repair of the SQ-870/1 170.
The instructions and procedures included herein are intended for the experienced repair technician, and attention should be given to the precautions on the preceding page. The chapters are organized as follows:

Chapter 1 - Provides a general product overview, lists specifications, and illustrates the main components of the printer.

Chapter 2 - Describes the theory of printer operation.

Chapter 3 - Includes a step-by-step guide for product disassembly and assembly.

Chapter 4 - Includes a step-by-step guide for adjustment.

Chapter 5 - Provides Epson-approved techniques for troubleshooting.

Chapter 6 - Describes preventive maintenance techniques.

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

REVISION SHEET

REVISON	DATE ISSUED	CHANGE DOCUMENT
A	Feb. 21, 1992	1st issue

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CHAPTER 1
GENERAL DESCRIPTION

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1.1 FEATURES

The SQ-870/1170 is a high speed 48-nozzle ink jet printer which provides advanced paper handling that is upper compatible with the TSQ-4800. The printer's main features are as follows:

- Use of ESC/P 2 control codes
  Ability to print multi-point fonts
  Ability to receive and print raster graphic images
  Compatibility with the LQ/SQ series available on the market
- Printing speeds:
  660 cps (draft, 12 cpi)
  550 cps (draft, 10 cpi)
  240 cps (LQ, 12 cpi)
  200 cps (LQ, 10 cpi)
- Optional interface card
- Clear, easy-to-read printing with standard EPSON fonts
- Multiple fonts resident in the printer
  2 scalable fonts (Roman, Saris Serif)
  8 LQ bit-map fonts (Roman, Saris Serif, Courier, Prestige, Script, Script C, Orator, Orator-S)
  1 draft bit-map font
- Control panel switch selection of fonts, pitch, and cut-sheet feeder (CSF) bin
- Optional tractor unit that can make up push-pull tractor
- Easy handling of cut sheets with the optional cut-sheet feeder
- Continuous Paper
  Two ways to insert continuous paper (front/rear path)
  Backout & loading
  Continuous paper can be used without removing CSF
  Standard tractor unit can be attached in two positions (front/rear)
- Cut Sheet
  Two ways to insert cut sheets (front/top)
  Auto loading

The SQ-870/1170 is equipped with the standard EPSON 8-bit parallel interface and various interface options ensure compatibility with a wide variety of computers. Table 1-1 lists the interface options, Table 1-2 lists the optional units available for the SQ-870/1170, and Figure 1-1 shows an exterior view of the SQ-870/1170.

Table 1-1. Interface Options

Model	Descriptions
C82305	Serial interface card (inch screw)
C82306	Serial interface card (mini screw)
C82307	32KB serial interface card (inch screw)
C82308	32KB serial interface card (mini screw)
C82310	32KB parallel interface card
C82313	32KB IEEE-488 interface card

NOTE: Refer to the "Optional Interface Technical Manual" for details.

Table 1-2. Optional Units

Model	Descriptions
C80647	Single-bin cut-sheet feeder (80 columns)
C80648	Single-bin cut-sheet feeder (136 columns)
C80637	Second bin hopper (80 columns)
C80640	Second bin hopper (136 columns)
C80023	Tractor unit (80 columns)
C80024	Tractor unit (136 columns)
SO2OO1O	Ink cartridge

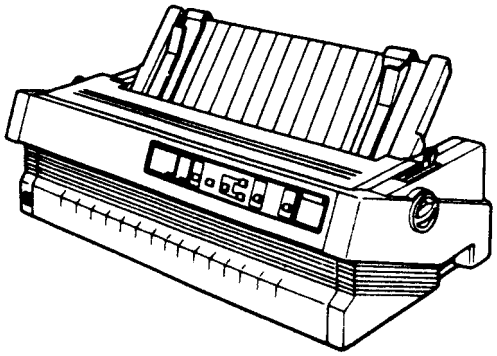


Figure 1-1. Exterior View of the S(2-870/1 170

1.2 SPECIFICATIONS

This section provides specifications for the SQ-870/1 170 printer.

1.2.1 Hardware Specifications

Printing method	On-demand type ink jet system
Nozzle configuration	48 nozzles (48 X 1 diagonal)

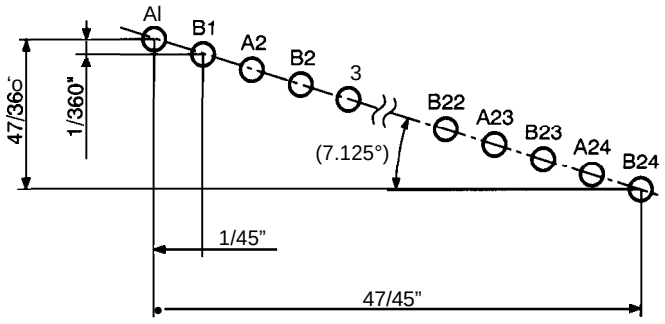


Figure 1-2. Nozzle Configuration

Feeding methods	Friction feed (front/top) Push tractor feed (front/rear) Push-pull tractor feed (with optional tractor) (front/rear)

NOTE: Do not perform pull tractor feed.

Line spacing	1/6 inch, 1/8, or programmable in units of 1/180 or 1/360 inch	
Paper insertion	Friction feed — Front or top side	
	Tractor feed — Front or rear side	
Paper-feed speed	Friction without CSF	45 msec (1/6-inch feed)
		4.5 inches per second (ips) (continuous)
	Friction with CSF	49 msec (1/6-inch feed)
		4.0 ips (continuous)
	Tractor	45 msec (1/6-inch feed)
		4.5 ips (continuous)

NOTE: Following are the precautions for handling paper.

1 Friction feed (release lever in FRICTION POSITION).

- The paper must be loaded from the front or top entrance.
- Do not use continuous paper.
- Do not perform any reverse paper feeds within the top 8.5 mm (.34 in.) or bottom 22 mm (.87 in.) area.
- Do not perform reverse feeds greater than 1/6 inch after a paper end has been detected.

2 Push tractor feed (release lever in REAR PUSH POSITION or FRONT PUSH POSITION).

- The paper must be loaded from the front or rear entrance.
- Release the friction-feed mechanism.
- Do not perform reverse feeds greater than 1/6 inch.
- Since accuracy of paper feed cannot be assured after the paper end has been detected, do not perform reverse feeding after the detection of a paper end.

3. Push-pull tractor feed (release lever in REAR PUSH POSITION or FRONT PUSH POSITION).

- The paper must be loaded from the front or rear entrance.
- Release the friction-feed mechanism.
- Attach the pull tractor unit.
- Ensure that there is no slack in the paper between the platen and the pull tractor.
- Precisely adjust the horizontal position of the pull tractor and push tractor.
- Paper for multiple copies must be spot pasted on both side of the perforation between the tractor holes.
- Do not perform reverse feeds greater than 1/6 inch.
- Do not perform a reverse feed after the paper end has been detected.

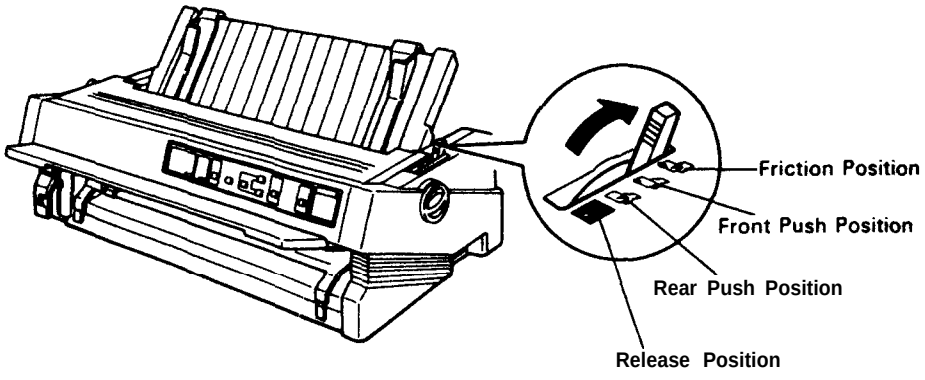


Figure 1-3. Release Lever Positions

Paper specifications See tables 1-3, 1-4, 1-5, and 1-6

Table 1-3. Specifications for Cut Sheets

Width	182 mrn to 257 mm (7.2 in. to 10.1 in.) (80 columns) 182 mm to 420 mm (7.2 in. to 16.5 in.) (136 columns)
Length	182 mm to 364 mm (7.2 in. to 14.3 in.)
Thickness	0.065 mm to 0.10 mm (0.0025 in. to 0.0039 in.)
Weight	14 lb to 22 lb (52.3 g/m² to 82 g/m²)
Quality	Standard paper (photocopier paper, etc.)

Table 1-4. Specifications for Continuous Papers

Width	101 mm to 254 mm (4.0 in. to 10.0 in.) (80 columns) 101 mm to 406 mm (4.0 in. to 16.0 in.) (136 columns]
Quality	Stan dard paper
Thickness	0.065 mm to 0.10 mm (0.0025 in. to 0.0039 in.)
Weight	14 lb to 22 lb (52.3 g/m² to 82 g/m²)

Table 1-5. Envelopes

Size	No. 6 166 mm X 92 mm (6.5 in. X 3.625 in.)
	No. 10240 mm X 104 mm (9.5 in. X 4.125 in.)
Thickness	0.16 mm to 0.52 mm (0.0063 in. to 0.0197 in.)
	Differences in thickness within the printing area must be less than 0.25 mm (0.0098 in.)
Weight	12 lb to 24 lb (45 g/m² to 91 g/m²)
Quality	Bond paper, standard paper, airmail

NOTES:
- Printing on envelopes is available only at normal temperatures and only using top insertion.
- Keep the longer side of the envelope horizontal during insertion.
- Place the left edge of a No. 6 envelope at the sheet guide setting mark.

Table 1-6. Labels Specifications

Label size	2.5 in. X 0.94 in.
	4.0 in. X 0.94 in.
	4.0 in. X 1.44 in.
Copies	These three kinds of labels are recommended.
Thickness	0.22 mm (0.0079 in.) maximum

NOTES:
- Printing on labels is available only at normal temperatures.
- Labels must be of the continuous type.
- Examples of labels AVERY CONTINUOUS FORM LABELS
  AVERY MINI-LINE LABELS

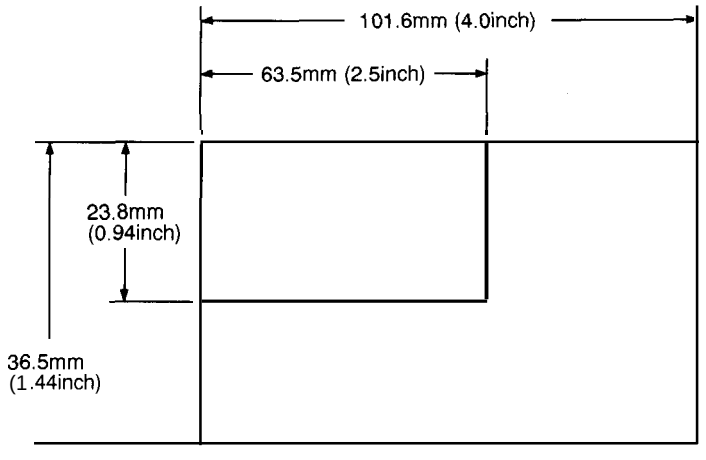
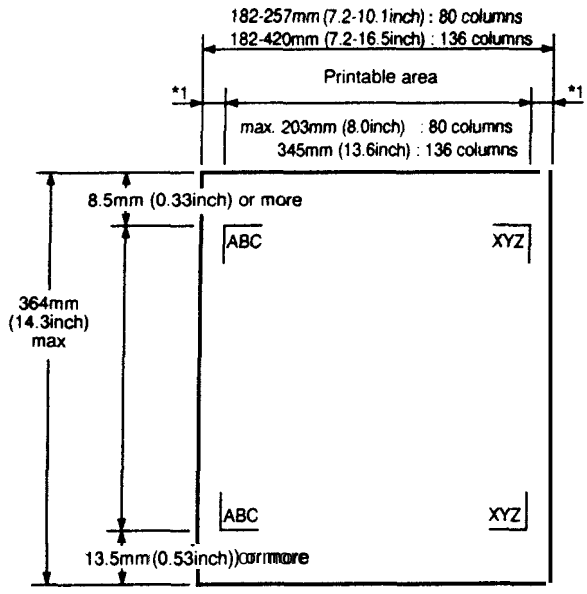


Figure 1-4 Label Size

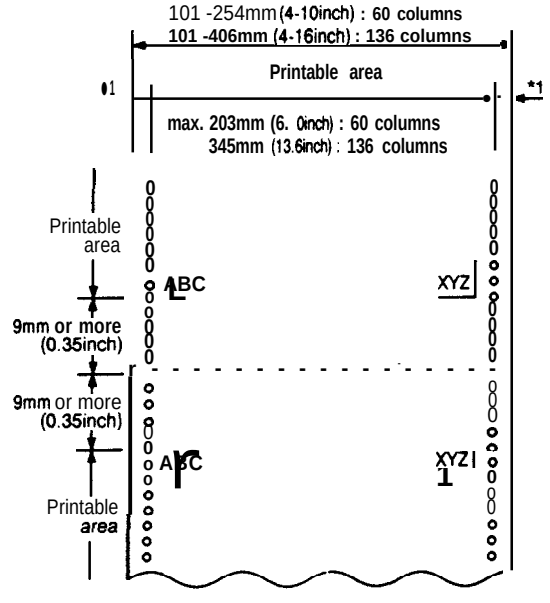
Printable area **See figures 1-5 and 1-6**



● 1: 80 columns: 3.0 mm (0.12 in.) or more when the width of paper is less than 229 mm (9 in.).
13 mm (0.51 in.) or more when the width of paper is 257 mm (10.1 in.).
136 columns: 3.0 mm (O. 12 in.) or more when the width of paper is less than 364 mm (1 4.3 in.)
25 mm (0.98 in.) or more when the width of paper is 420 mm (16.5 in.).

NOTE: The paper feed accuracy can not be assured within the following area.
Front insertion: 47 mm (1 .85 in.) from the bottom edge of paper.
Rear insertion: 26 mm (1 .02 in.) from the bottom edge of paper.

Figure 1-5. Printable Area for Cut Sheets



● 1: 80 columns: 13 mm (0.51 in.) or more when the 101 mm (4.0 in.) to 241 mm (9.5 in.) width paper is used.
26 mm (1 .02 in.) or more when the 254 mm (1 O in.) width paper is used.
136 columns: 13 mm (0.51 in.) or more when the "101 mm (4.0 in.) to 377.8 mm (1 4.87 in.) width paper is used.
15 mm (0.59 in.) or more when the 381 mm (15 in.) to 406 mm (16 in.) width paper is used.

Figure 1-6. Printable Area for Continuous Papers

Ink cartridge	**Type:**	**Exclusive ink cartridge**
	Color:	**Black**
	Ink capacity:	**105 to 115 cc**
	Print capacity (depending on the cleaning operation):	
	Draft:	**6 million characters**
	Letter Quality:	**3 million characters**
	Ink life:	**2 years from production date**
	Storage temperature:	
		–30 to 40 degrees C (–22 to 104 degrees F) -Storage (within a month at 40 degrees C (104 degrees F))
		–30 to 60 degrees C (–22 to 140 degrees F) -Transit (within a month at 40 degrees C (104 degrees F)) (within 120 hours at 60 degrees C (140 degrees F))
	Dimension of cartridge:	
		24.8 mm (W) X 138 mm (D) X 99.3 mm (H) (0.98 inch X 5.43 inch X 3.91 inch)

NOTES:

- **Ink will be frozen under –7 degrees C (19 degrees F) environment, however it will be usable after placing it at room temperature. (It will take approx2.5 hours until melting at 25 degrees C (77 degrees F).)**
- **Do not use the ink cartridge which has been stored longer than the ink life.**

Reliability	**Mean cycles between failures (MCBF)**	**5 million lines (excluding printhead)**
	Mean time between failures (MTBF)	**4000 power on hours (POH) (25% duty)(SQ-870)**
		6000 power on hours (POH)(25% duty)(SQ-1 170)
Life of printhead	**4000 million dots/nozzle**	
Safety approvals	**Safety standards**	**UL1 950 with D3 (U. Aversion)**
		CSA22.2#220
		EN 60950 (TUV) (European version)
	Radio frequency interference (RFI)	**FCC class B (U. Aversion)**
		VDE0871 (self-certification) (European version)

Electrical specifications	**120 V version**	**Rated voltage**	**120 VAC**
		Input voltage range	**103.5 to 132 VAC**
		Rated frequency range	**50 to 60 Hz**
		Input frequency range	**49.5 to 60.5 Hz**
		Rated current	**0.6 A**
		Power consumption	**Approx. 30 W (SQ-870)**
			Approx. 30 W (SQ-1 170)
			(during a self-test in draft mode, 10 cpi)
		Insulation resistance	**10 Megohms minimum (at 500 VDC between AC line and chassis).**

		Dielectric strength	1000 VACrms 1 minute or 1200 VACrms 1 second (between AC line and chassis)
	220/240 version	Rated voltage	220 to 240 VAC
		Input voltage range	198 to 264 VAC
		Rated frequency range	50 to 60 Hz
		Input frequency range	49.5 to 60.5 Hz
		Rated current	0.4 A
		Power consumption	Approx. 30 W (SQ-870) Approx. 30 W (SQ-1 170) (during a self-test in draft mode, 10 cpi)
		Insulation resistance	10 Megohms minimum (at 500 VDC between AC line and chassis).
		Dielectric Strength	1250 VACrms 1 minute or 1500 VACrms 1 second (between AC line and chassis)
Environmental conditions	Temperature	10 to 35 degrees C (50 to 95 degrees F) – operating –30 to 60 degrees C (–22 to 140 degrees F) -in shipment container	
	Humidity	20 to 80 % RH - operating 5 to 85 % RH - storage	

NOTE: Figure 1-5 shows the operating environment.

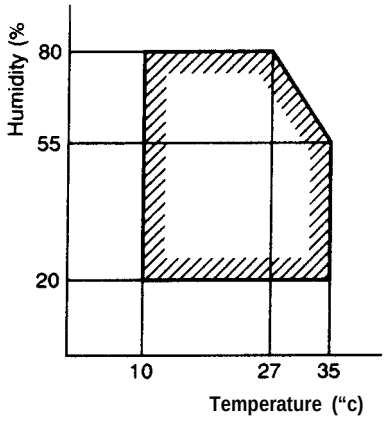


Figure 1-7. Printer Operating Environment

	Resistance to shock	1 G, within 1 ms - operating 2 G, within 1 ms - storage
	Resistance to vibration	0.25 G, 55 Hz, max - operating 0.50 G, 55 Hz, max - storage
Physical specifications	Weight	9.5 Kg, approx. (2 1.0 pounds, approx.)(SQ-870) 12.2 Kg, approx. (27.0 pounds, approx.)(SQ-1 170)
	Dimensions	462 mm (width) X 325 mm (depth) X 205 mm (height) 18.2 in(width) X 12.8 in(depth) X 8.1 in(height)(SQ-870) 657 mm (width) X 325 mm (depth) X 205 mm (height) 25.9 in(width) X 12.8 in(depth) X 8.1 in(height)(SQ-1 170)

1.2.2 Firmware Specifications

Control code	ESC/P™ level 2 (EPSON standard code for printers)
Printing direction	Bi-directional with logic seeking (text printing)
	Uni-directional (bit-image printing)
Input data buffer	16KB (Standard)
	128KB (factory option)
Character code	8 bits
Character tables	Italic character table, PC 437, PC 850, PC 860, PC 863, PC 865 (PC indicates character table for personal computer)
	Fonts and pitches
Bit-map fonts	See table 1-7
Scalable fonts	EPSON Roman 8 pt to 32 pt
	EPSON Saris-serif 8 pt to 32 pt

Table 1-7. Built in Bit-map Fonts

	Family No.	10 CPI	12 CPI	15 CPI	Proportional
EPSON Roman	o	0	0	0	0
EPSON Saris-serif	1	0	0	0	0
EPSON Courier	2	0	0	0	•
EPSON Prestige	3	0	0	0	•
EPSON Script	4	0	0	0	•
EPSON Script-C	9	0	0	0	·
EPSON Orator	7	0	·	x	·
EPSON Orator-S	8	0	*	x	•
EPSON DRAFT	..-	0	0	0	xx

0-- Resident

' -- Desired pitch is made by software using selected font

x -- print Roman 15 CPI

xx -- Print LQ proportional font selected by ESC k

Printing modes — Selection and mixture of the following modes are allowed, excluding 15 cpi condensed mode:

- O Print quality (draft/letter quality)
- O Character pitch (1 O, 12, 15, or proportional)
- O Condensed
- O Double-width
- O Double-height
- O Emphasized
- O Double-strike
- O Italic
- O Underlined
- O Double-underlined
- O Overscore
- O Strike-through
- O Outline
- O Shadow

Printing speed	See Tables 1-8 and 1-9.
Printing columns	See Table 1-8.
Character matrix	See Table 1-10.
Character size	See Table 1-10.

Table 1-8. Printing (Text Mode)

Print Pitch	Con-densed	Empha-sized	Double width	Printable Columns		Character Pitch (cpi)	Printing Speed (cps)	
				80 col.	136 col.		Draft	LQ
10	0	0	0	80	136	10	550	200
	0	0	1	40	68	5	275	100
	0	1	0	80	136	10	400	200
	0	1	1	40	68	5	200	100
	1	x	o	137	233	17.1	684	342
	1	x	1	68	116	8.5	342	171
12	0	0	0	96	163	12	660	240
	0	0	1	48	81	6	330	120
	0	1	0	96	163	12	480	240
	0	1	1	48	81	6	240	120
	1	x	o	160	272	20	800	400
	1	x	1	80	136	10	400	200
15	0	0	0	120	204	15	825	300
	0	0	1	60	102	7.5	412	150
	0	1	0	120	204	15	600	300
	0	1	1	60	102	7.5	300	150
	1	x	x	Cannot be condensed				

CPI: characters per inch
CPS: characters per second
LQ: letter quality

Table 1-9. Printing (Bit Image Mode)

Pins	m	Dot Density (DPI)	Adjacent Dot Printing	256 X n2 + nl		Printing Speed (IPS)
				80 Columns	136 Columns	
8	0	60	Yes	480	816	55
	1	120	Yes	960	1632	20
	2	120	No	960	1632	20
	3	240	No	1920	3264	20
	4	80	Yes	640	1088	20
	6	90	Yes	720	1224	55
24	32	6 0	Yes	480	816	55
	33	120	Yes	960	1632	20
	38	90	Yes	720	1224	55
	39	180	Yes	1440	2448	20
	40	360	No	2880	4896	20
48	71	180	Yes	1440	2448	20
	72	360	No	2880	4896	20
	73	360	Yes	2880	4896	20

DPI: dots per inch

IPS: inches per second

Table 1-10. Character Matrix and Character Size

Printing Mode	Face Matrix	HOD	Character Size	Unit ESC sp
Draft, 10 pitch	15 x 44	180	2.1 x 3.1	120
Draft, 12 pitch	13 x 44	180	1.8 x 3.1	120
Draft, 15 pitch	11 X 32	180	1.6 X 2.3	120
Draft, 17 pitch	15 x 44	360	1.1 x 3.1	120
Draft, 20 pitch	13 x 44	360	0.9 x 3.1	120
LQ, 10 pitch	31 x 22	360	2.2 x 3.1	180
LQ, 12 pitch	27 X 22	360	1.9 x 3.1	180
LQ, 15 pitch	22 X 16	360	1.6 X 2.3	180
LQ, 17 pitch	16 X 44	360	1.1 x 3.1	180
LQ, 20 pitch	14 x 44	360	1.0 x 3.1	180
LQ, proportional	Max. 37 X 44 Min. 18 X 44	360 360	2.6 X 3.1 1.0 x 3.1	180
LQ, proportional, super/subscript	Max. 28 X 32 Min. 12 X 32	360 360	1.8 X 2.3 0.7 X 2.3	180

NOTES:
- HDD is horizontal dot density in dots per inch.
- Face matrix and character size indicate the maximum size of a character. This value is dependent on paper, etc.
- Unit ESC sp (which also can be sent as unit, followed by the character string CHR$(&h20)), indicates the minimum length to be added to the right of the character specified in the ESC SP control code.

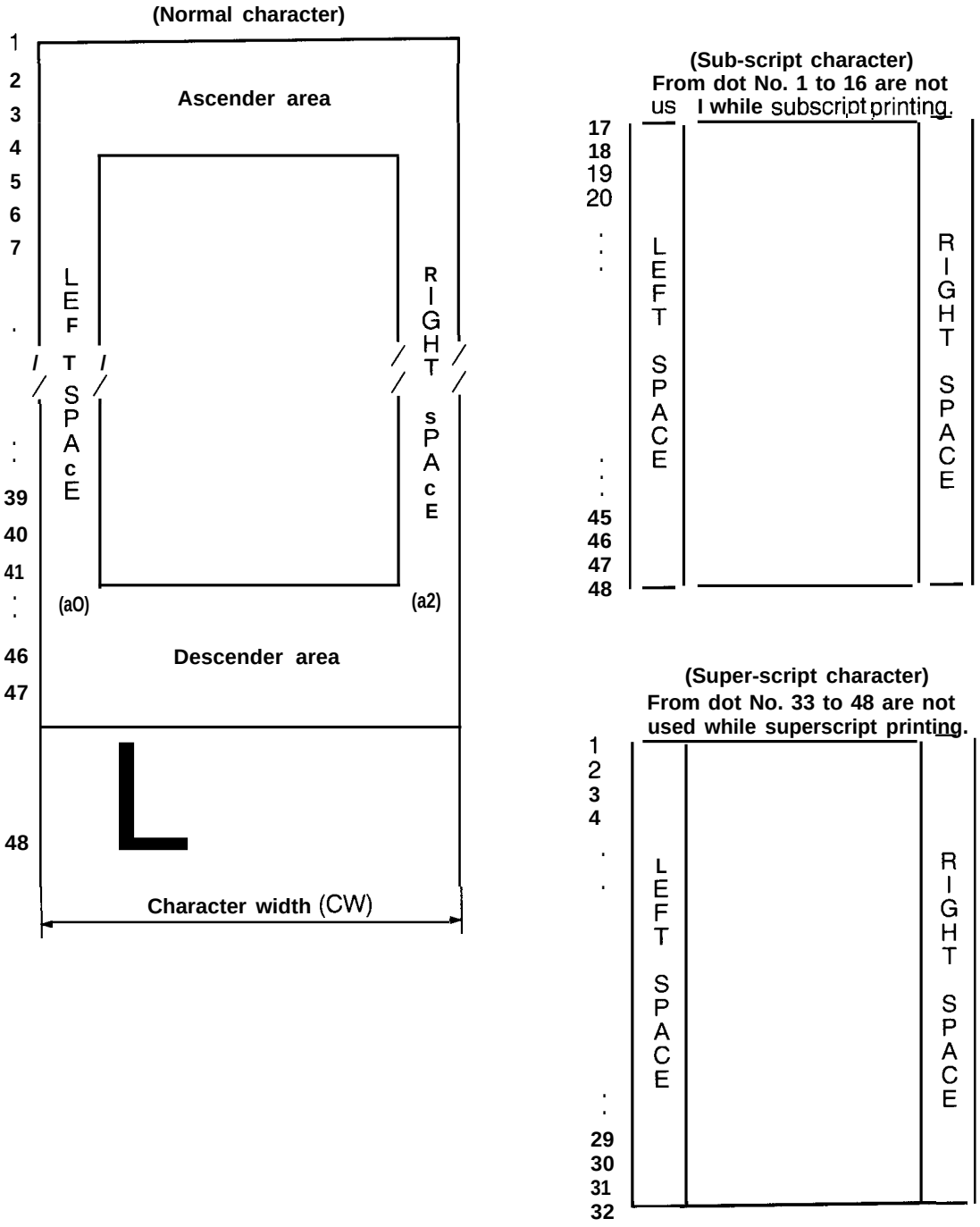


Figure 1-8. Character Matrix

1.3 INTERFACE OVERVIEW

The printer has a parallel interface with the specifications described below.

1.3.1 Parallel Interface

Specifications for the 8-bit parallel interface are as follows:

Data format	8-bit parallel
Synchronization	$\overline{\text{STROBE}}$ signal
Handshaking	BUSY and $\overline{\text{ACKNLG}}$ signal
Signal level	TTL-compatible
Adaptable connector	57-30360 (Amphenol) or equivalent
Data transmission timing	See Figure 1-9.

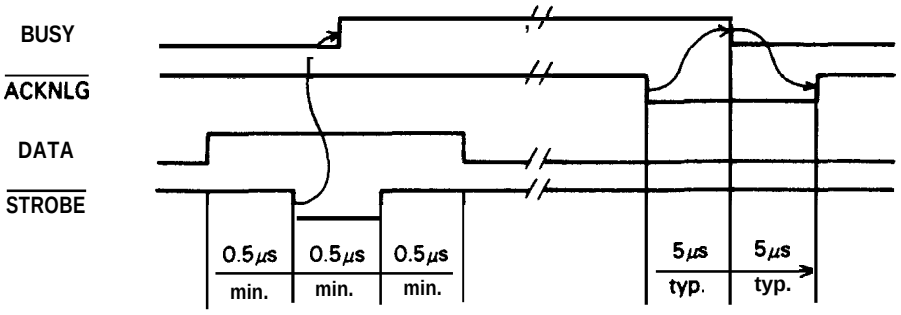


Figure 1-9. Data Transmission Timing

Table 1-11 shows the connector pin assignments and signal functions of the 8-bit parallel interface.

Table 1-11. Connector Pin Assignments and Signal Functions

Pin No.	Signal Name	Return Pin No.	Dir.	Functional Description
1	$\overline{\text{STROBE}}$	19	IN	$\overline{\text{STROBE}}$ pulse to read the input data. Pulse width must be more than 0.5μs. Input data is latched at falling edge of this signal.
2	DATA 1	20	IN	Parallel input data to the printer.
3	DATA 2	21	IN	HIGH level means " 1".
4	DATA 3	22	IN	LOW level means "O".
5	DATA 4	23	IN	
6	DATA 5	24	IN	
7	DATA 6	25	IN	
8	DATA 7	26	IN	
9	DATA 8	27	IN	
10	$\overline{\text{ACKNLG}}$	28	OUT	This pulse indicates data has been received and the printer is ready to accept more data. Pulse width is approximately 11μs.
11	BUSY	29	OUT	HIGH indicates the printer cannot accept more data.
12	PE	30	OUT	HIGH indicates paper out. This signal is effective only when the $\overline{\text{ERROR}}$ signal is LOW,
13	SLCT		OUT	Always HIGH output (Pulled up to +5V through a 3.3K ohm resistor.)

Table 1-11. Connector Pin Assignments and Signal Functions (Cont.)

Pin No.	Signal Name	Return Pin No.	Dir.	Functional Description
14	$\overline{\text{AUTOFEED-XT}}$	--	IN	If LOW when the printer is initialized, the printer automatically performs a line feed upon input of the CR code (Auto LF).
15				Not used.
16	GND		--	Ground for twisted-pair grounding.
17	Chassis GND	··	--	Chassis ground level of printer.
18				Not used.
19 to 30	GND			Ground for twisted-pair grounding.
31	INIT	16	IN	Pulse (width: 50μs, min., active LOW) input for printer initialization.
32	$\overline{\text{ERROR}}$		OUT	LOW indicates an error has occurred in the printer.
33	GND	--	··	Ground for twisted-pair grounding.
34				Not used.
35			OUT	Always HIGH. (Pulled up to +5V through 3.3K ohm resistor.)
36	$\overline{\text{SLCT-IN}}$	--	IN	If LOW when the printer is initialized, DC 1/DC3 control is disabled.

NOTES:
1. "Dir." indicates the direction of the signal flow as viewed from the printer.
2. "Return Pin No." denotes a twisted-pair return line.
3. The cable used must be shielded to prevent noise.
4. All interface conditions are based on TTL levels. Both the rise and fall times of all signals must be less than 0.2μs.
5. The $\overline{\text{AUTOFEED-XT}}$ signal can be set to LOW by DIP switch 2-4.
6. The $\overline{\text{SELECT-IN}}$ signal can be set to LOW by jumper 1.
7. Printing tests, including those of the interface circuits, can be performed without using external equipment by setting DATA 1 -DATA 8 pins to the $\overline{\text{STROBE}}$ signal.

1.4 CONTROL PANEL

On the control panel are: 10 non-lock type buttons, and 24 indicators.

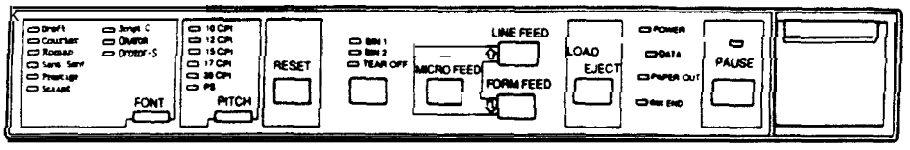


Figure 1-10. Control Panel

BUTTONS

(1) PAUSE Button

This button controls printer action. Pressing the button toggles the printer between PAUSE condition (no printing, no paper feeding, or no data acception) and RUNNING.

(2) FORM FEED Button

Advances the paper to the next top of from position. This switch is also used for the micro feed function.

(3) LINE FEED Button

Advances the paper by one line (1/6 inch)By pressing this switch more than 0.5 second, the paper is fed continuously until releasing this switch. This switch is also used for the micro feed function.

(4) LOAD/EJECT Button

Pushing this switch loads the paper when paper-out condition is detectedAnd ejects the paper when out of paper condition is not detected as in the Forms Override function.

(5) TEAR-OFF/BIN l/BIN 2 Button

In tractor-feed mode, pressing this button advances continuous paper to the tear-off position, and the TEAR-OFF indicator is litIn friction-feed mode, pressing this button toggles between bin 1 and bin 2, and the selected BIN indicator is lit.

(6) MICRO FEED Button

Selects or cancels the micro feed function. When this function is enabled, the MICRO FEED indicator is lit. In the micro feed mode, the LINE FEED button is used to feed the paper forward, and the FORM FEED button is used to feed the paper backward.

Paper feed performed by this micro feed function does not affect the page position control. And this function is also used to adjust the paper loading position and to adjust the continuous paper to meet the tear off edge.

(7) FONT Button

Pressing this button selects a font, and pressing it continuously selects the following ones in sequence. The FONT LED indicates the currently selected font.

(8) PITCH Button

Pushing this switch once selects the character pitch. And holding this button down selects the following ones in sequence. PITCH indicators indicate the currently selected character pitch.

(9) RESET Button

Holding this button down more than 0.45 second, the input data buffer is cleared and the printer initialized by software as ESC @.

(10) CLEANING Button

Holding this button down more than 0.5 second, the print head cleaning is performed. This button is only effective in the PAUSE condition. The CLEANING button is located inside the DIP switch cover.

INDICATORS

(1) POWER (green)

Lit when the printer's power switch is on, and AC power is supplied.

(2) PAUSE (orange)

Lit when the printer is in PAUSE mode (no printing, no paper feed, or no data accepting).

(3) DATA (orange)

Lit when the printer has received data from the host machine.

(4) PAPER-OUT (red)

Lit when the paper-out detector detects no paper. Refer to Section 1.6.3, Paper-out Detection and Forms Override Function.

(5) INK END (red)

Lit when the printer detects the ink empty condition.

(6) MICRO FEED (orange)

Lit when the micro feed function is enabled.

(7) TEAR-OFF (orange)

Lit when the sheet is advanced to the tear-off position.

(8) BIN 1 (green)

Lit when bin 1 is selected.

(9) BIN 2 (green)

Lit when bin 2 is selected.

(1 O) FONT (green) --Draft, Courier, Roman, Saris Serif, Prestige, Script, Script C, Orator, Orator-S

These indicators show the currently selected font.

(1 1) PITCH (green) --10 CPI, 12 CPI, 15 CPI, 17 CPI, 20 CPI, PS

These indicators show the currently selected pitch.

1.5 DIP SWITCHES AND JUMPER SETTING

This section describes the DIP switch selections and jumper setting for the SQ-870/1 170 printer.

1.5.1 DIP Switch Settings

The two DIP switch banks for the printer, located on the control panel, are used to set various print conditions as shown in tables 1-12 through 1-15. (Note that the status of the DIP switches is read only at power on or upon receipt of the INIT signal.)

Table 1-12. Settings for DIP Switch 1 (SW1)

No.	Description	ON	OFF	Factory Setting
1 2 3	International character set and PC selection	See Table 1-14		ON ON ON
4	Character table selection	Graphic	Italic	OFF
5	Graphic print direction	Unidir.	Bidir.	OFF
6	Not Used			OFF
7				OFF
8				OFF

Table 1-13. Settings for DIP Switch 2 (SW2)

No.	Description	ON	OFF	Factory Setting
1 2	Page length of continuous paper	See Table 1-15		OFF OFF
3	1 inch skip for continuous paper	ON	OFF	OFF
4	Auto LF	ON	OFF	OFF

Table 1-14. international Character Set Selection

1-1	1-2	1-3	Country	PC
ON	ON	ON	Us.	437
ON	ON	OFF	France	850
ON	OFF	ON	Germany	860
ON	OFF	OFF	U.K.	863
OFF	ON	ON	Denmark 1	865
OFF	ON	OFF	Sweden	(437)
OFF	OFF	ON	Italy	(437)
OFF	OFF	OFF	Spain 1	(437)

When SW 1-4 is ON,
If italic table was selected by
ESC t O, country setting becomes U.S.

When SW 1-4 is OFF,
if graphic table was selected by
ESC t 1, PC becomes 437.

Table 1-15. Page Length

2-1	2-2	Page Length
OFF	OFF	11 inches
ON	OFF	12 inches
OFF	ON	8.5 inches
ON	ON	70/6 inches

1.5.2 Jumper Setting

If Jumper 1 is connected to GND, the $\overline{\text{SLCT-IN}}$ signal is fixed to LOW and DC 1/DC3 control is ignored.

1.6 OPERATING INSTRUCTIONS

This section describes the self-test and hexadecimal dump functions as well as the error states, printer initialization, and buzzer operation.

1.6.1 Self-Test

To run the self-test using draft mode, turn the printer on while pressing the LINE FEED button. To run the self-test using the letter quality (LO) mode, turn the printer on while pressing the FORM FEED button. You can stop or start self-test printing by pressing the PAUSE button. When you are satisfied with the self-test, stop the printing by pressing the PAUSE button and turn the printer off.

The firmware revision number is printed on the first line of the self-test, followed by the current DIP switch settings.

1.6.2 Hexadecimal Dump Function

To put the printer in hexdump mode, power it on while pressing both the LINE FEED and FORM FEED buttons.
In hexdump mode, the printer prints out the hexadecimal representation of the input data, along with the corresponding ASCII characters. This function is useful for checking the data the printer has received from the host.
If input data is a control code rather than a character code, a period (.) is printed in the ASCII column.

1.6.3 Paper-out Detection and Forms Override Function

When the paper-out detector detects a paper-out condition, the printer enters the PAUSE mode with the following status.

- PAPER OUT indicator lit
- BUSY signal becomes HIGH
- $\overline{\text{ERROR}}$ signal becomes LOW
- PE signal becomes HIGH

In the PAUSE mode, you can perform the "Forms Override" function by pressing the PAUSE button, or continue the printing operation by pressing the PAUSE button after loading new paper.
In the forms override function, the printer ignores the paper-out condition temporarily and prints additional lines beyond the bottom line specified for the page. Once the "Forms Override" function is performed, the paper-out detection will not be enabled until paper is loaded.

1.6.4 Error Conditions

If the following conditions are detected, the printer recognizes them as errors and enters the error mode.

● Paper-out

Paper-out is detected after performing paper loading operation.

. Ink end

Ink end condition is detected. Perform 200 lines of printing or remove the ink cartridge.

● **Cover open**

The printer lid is opened.

● **Fatal errors**

In the following cases, the printer recognizes them as fatal errors and enters the fatal error mode. The fatal error condition cannot be recovered until turning the power off.

- **Carriage does not move correctly**
- **Control circuit cannot work correctly**

When the error condition is detected, the printer automatically enters 'PAUSE' mode and outputs appropriate interface signal.
When parallel interface is selected, the following interface signals are outputted to indicate the error and to stop data transmission.

- **BUSY signal becomes HIGH**
- **$\overline{\text{ERROR}}$ signal becomes LOW**
- **Output no $\overline{\text{ACKNLG}}$ pulse**
- **PE signal becomes HIGH (only paper out error)**

1.6.5 Buzzer Operation

The buzzer sounds under the following conditions:

- **A paper-out error is detected (beeps 3 times for 0.1 second respectively, with 0.1 second intervals).**
- **Ink end error is detected (beeps 5 times for 0.1 second respectively, with 0.1 second intervals).**
- **Cover open error is detected (beeps 5 times for 0.1 second respectively, with 0.1 second intervals).**
- **Fatal error is detected (beeps 5 times for 0.5 second respectively, with 0.5 second intervals).**
- **When panel setting is accepted (beeps 1 time for 0.1 second).**

1.6.6 Printer Initialization

There are three initialization methods: hardware initialization, software initialization, and panel initialization.

(1) Hardware initialization

This type of initialization takes place when the printer power button is turned on with the AC power cord plugged in or when the INIT signal is received.

When the printer is initialized, it performs the following actions:

(a) Initialize printer mechanism.
(b) Clears input data buffer.
(c) Clears downloaded character set.
(d) Clears print buffer.
(e) Returns printer settings to their default values.

(2) Software initialization

Input of the ESC@ command also initialize the printer. Printer initialization by ESC@ code does not perform functions (d) or(e) above. The settings changed by the last SelecType operation are maintained.

(3) Panel initialization

This printer can be initialized by pressing the RESET button on the front panel. When the printer is initialized in this method, the functions (b), (d) and (e) above are not performed. The settings changed by the last SelecType operation are maintained.

1.6.7 Default Values

When the printer is initialized, the following default values are set:

Page position	The current paper position becomes the top-of-form position
Left and right margins	Released
Line spacing	1/6 inch
Vertical tabs	Cleared
Horizontal tabs	Every 8 characters (relative)
Family number of type style	Last font selected from the panel
Download characters	Kept - software initialization Cleared - hardware initialization
Character spacing	Last pitch selected from the panel
Printing effects	Cleared
Printer condition	Not PAUSE

1.6.8 Sheet Loading and Sheet Ejection

The release lever has a disengage capability of tractor unit drive mechanism. Therefore, this printer provides some improved paper handling in combination with the release *lever.*

(a) Automatic cut sheet loading without cut sheet feeder

Change the release lever to friction feed position and put a cut sheet with the paper guide (rear or front insertion).

A few seconds laster, the cut sheet is automatically loaded to the top-of-form position.

(b) Automatic cut sheet loading & ejection with cut sheet feeder

Change the release lever to the friction feed position and the put cut sheets into the hopper of the cut sheet feeder.

Pushing LOAD/EJECT button loads a sheet to the top-of-form positionIf paper out is detected before printing starts, a sheet is automatically loaded to the top-of-form position.

(c) Continuous paper loading & ejection (back-out)

Change the release lever to the rear push position *or* front push position, and set the continuous paper into the tractor unit. Pushing LOAD/EJECT button loads the paper automatically to the top-of-form position. If paper out is detected before printing starts, the paper is automatically loaded to the top-of-form position.

if LOAD/EJECT button is pushed when continuous paper is loaded, the paper is ejected backward to the push tractor unit.

When the paper is at the top-of-form position, the loading position is adjustable by using the 'MICRO FEED' function. In the 'MICRO FEED' function, pushing the LINE FEED button pushes the paper forward, and pushing the FORM FEED button pulls the paper backward.
The adjusted loading position is stored into the memory and remains to be effective until the power is turned off. But the adjusted loading position of the continuous paper is memorized into nonvolatile RAM, so it remains effective even if the power is turned off.

1.6.9 Tear-off Function

By pressing the TEAR OFF button when the tractor feed is selected, the paper is advanced to the tear off position and 'TEAR OFF' indicator is lit.
In this condition (tear off condition), the tear off position is adjustable by using the 'MICRO FEED' functionIn the 'MICRO FEED' function, pushing the LINE FEED button pushes the paper forward, and pushing the FORM FEED button pulls the paper backward.
The adjusted position is memorized into the nonvolatile RAM and remains effective even if the power is turned off.

If necessary to cancel this function, press the TEAR OFF button again or press the PAUSE button or send subsequent data to the printer. Then the paper is fed back to the top-of-form position.

1.6.10 Adjust Lever Operation

The adjust lever must be set to the proper position according to the type of paper used.

Table 1-16. Lever Positions

Lever Position	Paper Type
Front side	Envelope Label
Rear side	Cut sheet I Continuous paper

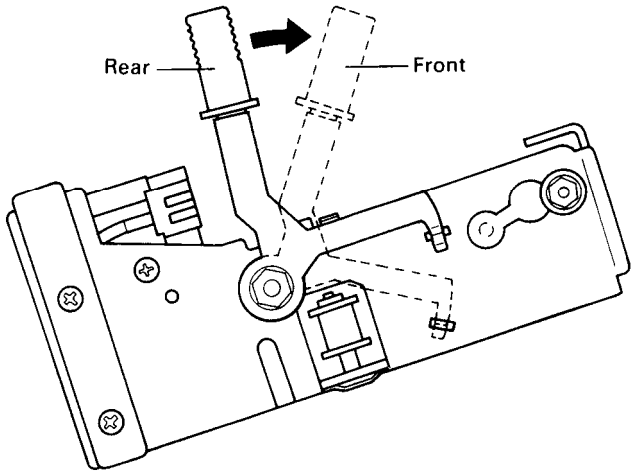


Figure 1-11 Lever Positions

1.6.11 Printhead Protection

To keep the print quality, several kinds of printhead cleaning functions are performed automatically.

(1) Power on cleaning
Performed at power on when '(4) Cleaning' as defined below is not required. It takes about several seconds.

(2) Capping
In the following cases the printhead is capped. It takes about a second.

- Printing is stopped about 3 seconds.
- Entering the PAUSE condition.

(3) Refresh nozzles
Performed about every 15 seconds during printing. It takes less than a second.

(4) Cleaning
In the following cases the printhead cleaning is performed and it takes about 20 seconds.

- Turning the power on when the printhead has not been capped.
- Turning the power on more than 7 days after the last cleaning.
- Pressing the CLEANING button.

1.6.12 Ink Charge

Install the ink cartridge to the printer and turn the printer power on while pressing the CLEANING switch down. The 'Ink Charge' function is started. It takes about 3 minutes to complete this functionIt is needed only at the first time the new printer is used.

1.6.13 Ink End Detection

If ink end sensor detects ink end condition, 'INK END' indicator blinks performing 200 lines of printing, and the printer enters the ink end condition. ('INK END' indicator is lit.)
If ink cartridge is removed, 'INK END' indicator is lit and the printer enters the ink end condition immediately.

1.6.14 Cover Open Detection

Cover open detector is installed to stop the printing whenever the printer cover is opened. If cover open is detected, the printer enters the cover open error condition.

CAUTION:
Don't open the printer cover while printing.

1.7 MAIN COMPONENTS

The main components of the SQ-870/1 170 printer are designed for easy removal and replacement to facilitate maintenance and repair of the printer. The main components are:

1) **C076 MAIN board: the main control board; the CPU on this board controls all main functions.**
2) **Control panel unit**
3) **C076 PSB/PSE board: the power supply board.**
4) **M-47 10/4760: the printer mechanism.**

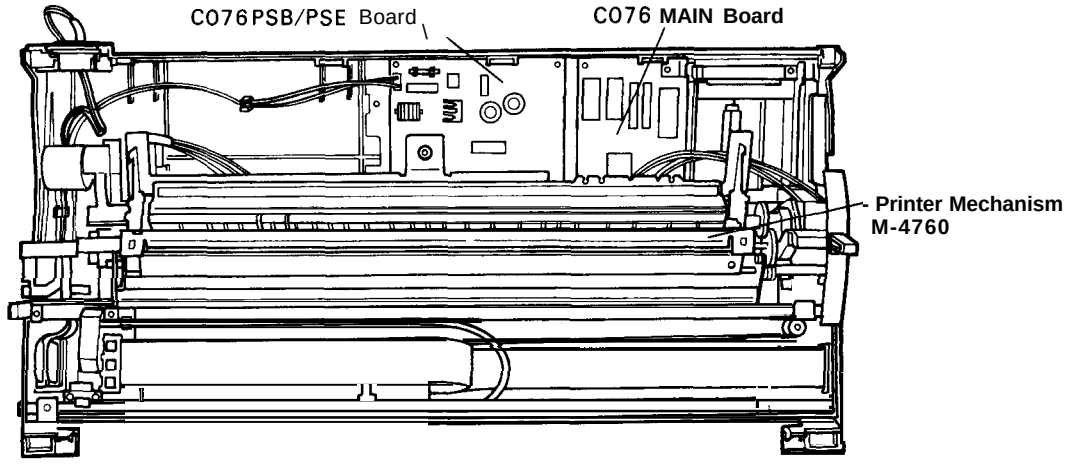


Figure 1-12. SQ-1 170 Component Layout

1.7.1 C076 MAIN Board (Main Control Circuit Board)

The C076 MAIN board is the main board in the printer, and contains a logic circuit and printer mechanism driver circuit.

The μPD70325 (location: IC5) is used, and the following memories and gate arrays are assigned in the 1 M byte memory space.

- **Memories**

5 12K\l M bits program ROM	:Ic14
1 M bits PS-RAM	:IC 19/22/23
8M/4M/2M/1 M bits mask ROM (C.G)	:IC3/4/24

- **Gate Arrays**

Memory management unit (E05A65)	:Ic12
Motor control unit (E05A48)	:IC10

- **Driver**

CR motor (DC motor) driver (SLA4391)	:Ic17
PM motor (DC motor) driver (SDH03)	:IC16
PF motor (Stepping motor) driver (STK67 12B)	:IC 11
Printhead driver (μPD 16322)	:IC8/9

- **Others**

EEPROM	:IC2
Reset IC (MB3771)	:IC21
Reset IC(PST529C)	:IC7
Switching Regulator (TL494)	:IC20
Lithium battery	:BAT 1

A lithium battery in the battery circuit backs up the head cleaning timer while the printer power is off.

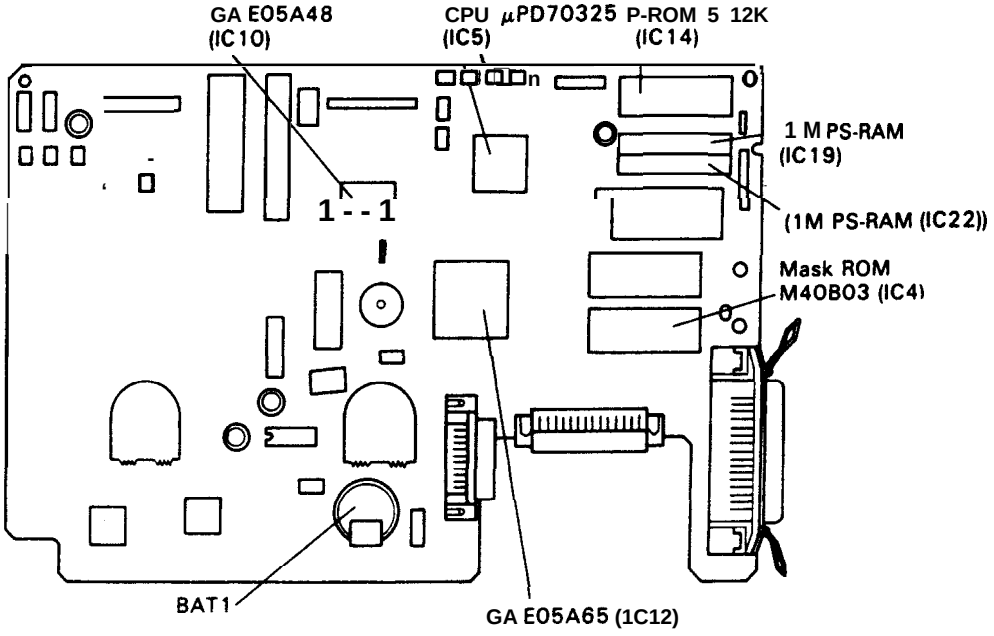


Figure 1-13. C076 MAIN Board

1.7.2 Control Panel

The Control Panel is, which includes the indicator LEDs, switches, and DIP switches.

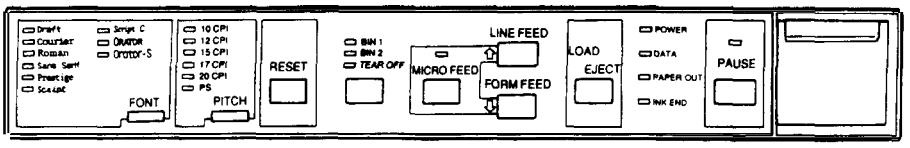


Figure 1-14. Control Panel

1.7.3 C076PSB/PSE Board (Power Supply Circuit Board)

The power supply unit consists of a switching regulator circuit, which converts the AC line voltage to the DC voltages (for example, + 35V and + 5V) used by the printer. The C076PSB board is 120V input type, and the C076PSE board is 220/240V input type.

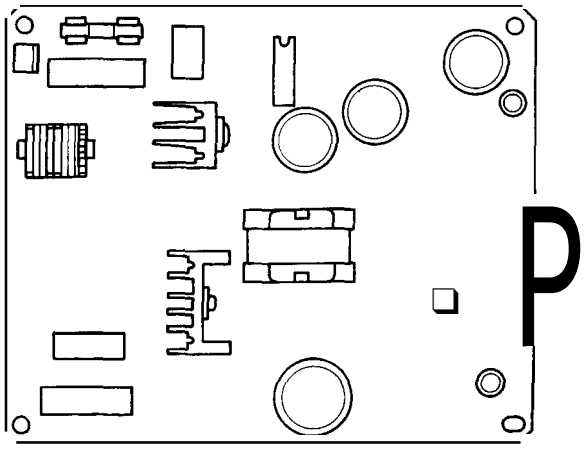


Figure 1-15. C076PSB/PSE Board

1.7.4 Printer Mechanism (M-4710/4760)

The M-47 10/4760 printer mechanism was developed specifically for SQ-870/1 170 printer. Included the components are a carriage motor, carriage mechanism, paper-feed motor, paper-feed mechanism, TE motor, top edge holding mechanism, pump motor, pump mechanism, printhead, and sensors. This printer mechanism allows three ways of paper insertion.

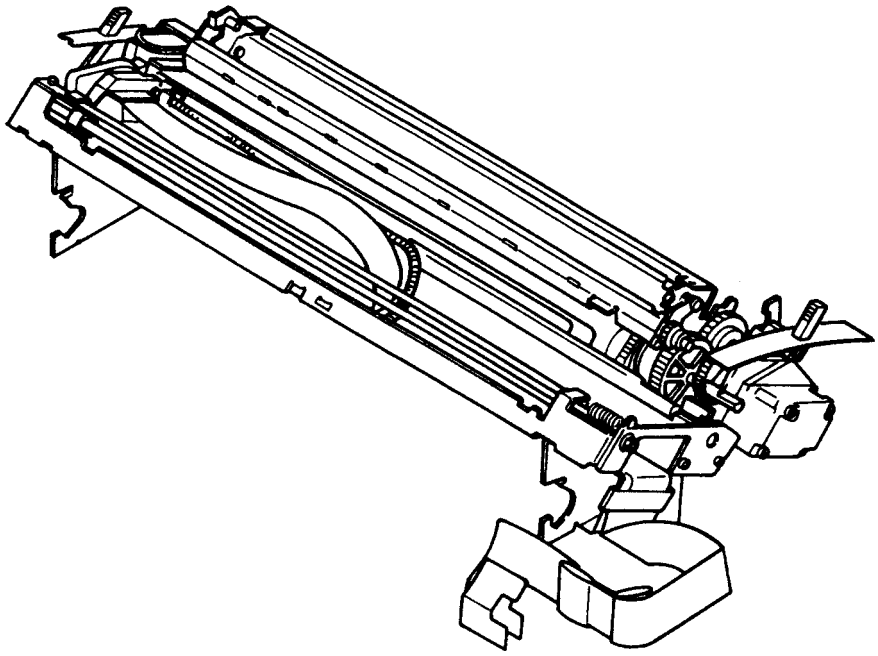


Figure 1-16. Model-4710/4760 Printer Mechanism

1.7.5 Housing

The LQ-870/1 170 housing consists of the upper, lower, and front cases. The front case houses the control panel.

The lower case contains the printer mechanism, the main control circuit board, and power supply circuit board.

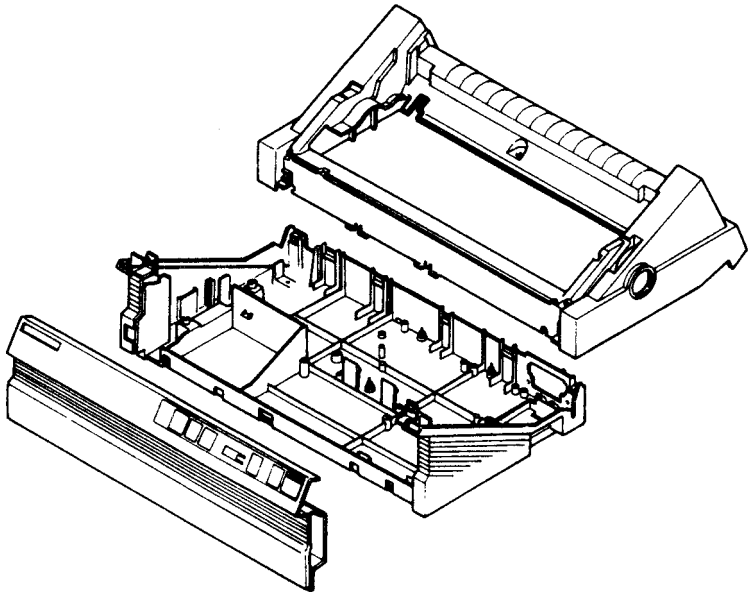


Figure 1-17. Housing

CHAPTER 2
OPERATION PRINCIPLES

LIST OF FIGURES

LIST OF TABLES

2.1 OPERATING PRINCIPLES OF PRINTER MECHANISM

This section describes functions and operations of the printer mechanism - Model-47 10/4760.

Model-47 **10/4760 is a serial type printer mechanism with a 48-nozzle** printhead.
This printer mechanism consists of the printhead **unit, paper feed unit, ink mechanism, and sensors. Figure 2-1 shows the block diagram of the printer mechanism – Model-47 10/4760.**

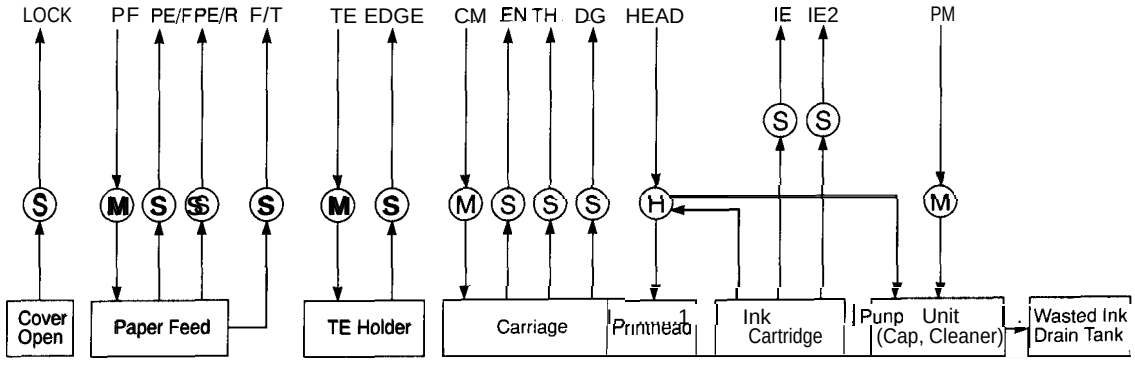


Figure 2-1. Block Diagram of Printer Mechanism - Model-471 0/4760

2.1.1 Printhead Mechanism

The printhead of this printer employs the on-demand method, where part of the ink stored in the reservoir within the printhead is supplied into the nozzle each time ink in the nozzle chamber is injected. Figure 2-2 shows the internal structure of the printhead. The functions of the major components are explained below.

● **Head damper**

When the carriage moves, the ink tube also moves, which results in the change of pressure within the tube. The head damper is used to absorb this change of pressure and prevent the ink from rushing into the reservoir.

● **Reservoir**

The ink supplied into the printhead is once stored in the reservoir.

● **Nozzle**

The ink stored in the reservoir is injected through nozzles. The structure of a nozzle is shown in Figure 2-3.

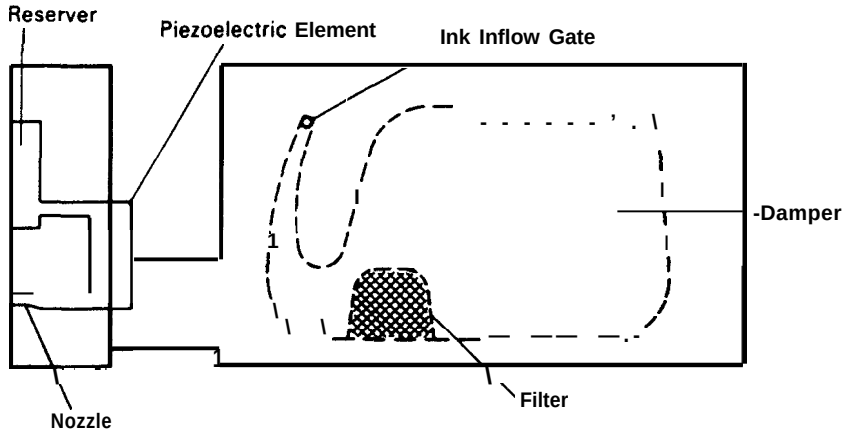


Figure 2-2. Internal Structure of Printhead

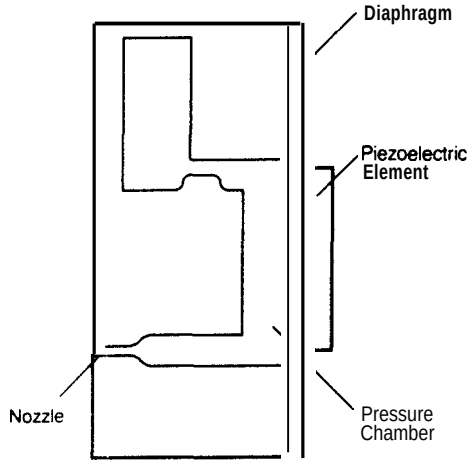


Figure 2-3. Structure of a Nozzle

< Printing >

This section describes how ink is injected through the nozzles.

(1) Normal condition ---Piezoelectric Element is electrically charged and bent inward.

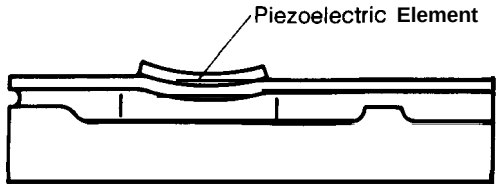


Figure 2-4. Printing Principle (1)

(2) Charging operation --When the electric charge of the piezoelectric element is gradually discharged, the element is bent outward to let ink into the pressure chamber.

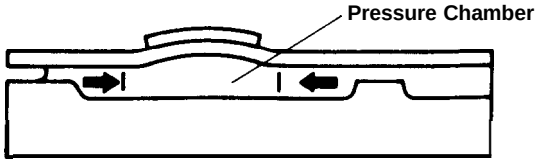


Figure 2-5. Printing Principles (2)

(3) Injecting operation --The ink in the pressure chamber is injected when the piezoelectric element is quickly charged and bent inward.

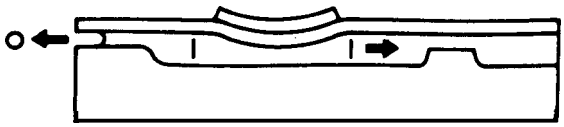


Figure 2-6. Printing Principles (3)

When charging ink or cleaning the printhead, the ink in the pressure chamber is vacuumed out by the pump. When printing, on the other hand, the ink is simultaneously injected and supplied according to the change of volume of the pressure chamber.

This printer is provided with the function to change the printhead drive voltage corresponding to the ink temperature, because the viscosity of the ink is subject to change depending on the ink temperature. A thermistor is attached on the carriage to detect the ink temperature. When the ink temperature is low (i.e. the viscosity is high), the printhead drive voltage is increased, or vice versa.
The temperature signal is fed back to the printhead drive voltage control circuit to adjust the voltage to a proper level.

2.1.2 Carriage Mechanism

The timing belt attached to the base of the carriage is driven by the carriage motor and the pulley. This makes the carriage (printhead) move along the guide shafts.

A scale made of polyester (DETECTION, PLATE, PTS) is provided along the motion range of the carriage. The optical linear encoders mounted on the carriage scan this scale and output one pulse of signal each time the carriage moves 1/1 20 inch. The signal consists of Phase-A and Phase-B, which are 90 degrees different from each other. Therefore, the controller can recognize the moving direction of the carriage by detecting this difference. The controller can also recognize the carriage speed from the signals sent from the encoders.These signals are also used to adjust print timing.

This printer is not provided with a home position sensor. Instead, the carriage is designed to hit the left stroke end each time the printer is initialized. At this time, the controller resets the carriage position counter to "O" and then counts up/down pulse signals sent from the encoder to determine the carriage position.

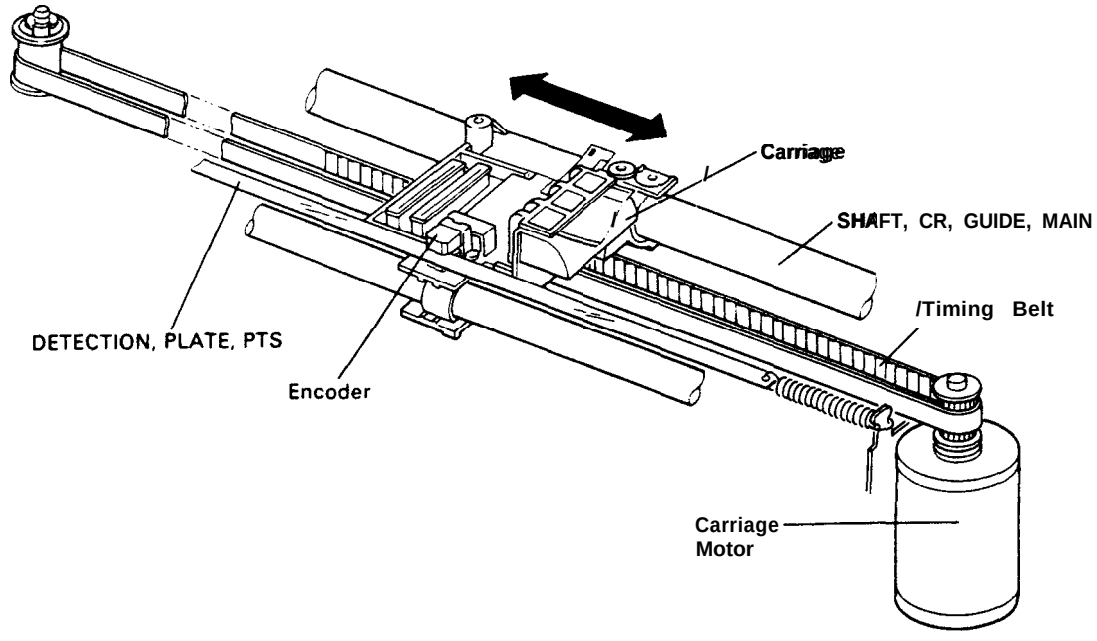


Figure 2-7. Carriage Mechanism

< **Adjustment of Platen Gap** >

The platen gap must be adjusted with the head adjust lever (LEVER, GAP, ADJUST) depending on the thickness of paper. When the head adjust lever is operated, it turns the carriage guide shaft (SHAFT, CR, GUIDE, MAIN) and makes the carriage closer/farther to/from the platen. (The shaft has an eccentric cross section.)

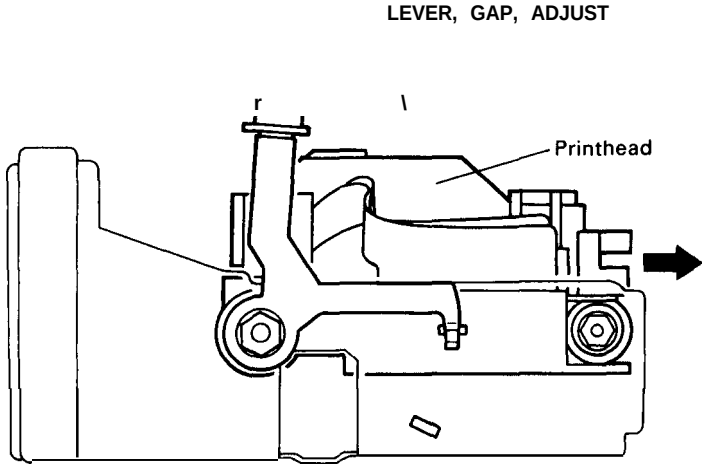


Figure 2-8. Adjustment of Platen Gap

2.1.3 Paper Feed Mechanism

The paper feeding method for this printer is divided into the friction feed method and the tractor feed method. The tractor feed method is further divided into the push tractor method and the push/pull tractor method. (This printer is provided with a standard tractor which performs "'push-type" feeding. In order to perform "push/pull-type" feeding, you must attach an optional tractor.)
Also, this printer is provided with three different paper insertion. The most appropriate paper insertion is to be selected depending on the type of paper or feeding mode.
The following table lists each paper feeding method in relation to the paper path.

Table 2-1. Paper Feeding Method and Paper Entrance

	Paper Insertion (Paper Path)		
Paper Advance Method	Top Entrance	Rear Entrance	Front Entrance
Friction Feed	OK	No	OK
Push tractor Feed	No	OK	OK
Push-pull Tractor Feed	No	OK	OK

NOTE: Pull Tractor Method cannot be used alone on this printer.

2.1.3.1 Paper Feeding Mechanism

The details of each paper feed method is described below.

Friction Feed Method

The cut sheet paper is held by the platen, paper feed rollers, and paper tension roller. When the paper feed motor (STEPPING MOTOR, PF) is driven, the gears connected to the motor are rotated in the direction of the black arrows and rotate the platen and paper tension roller. The paper held between the platen and paper feed rollers is thus driven in the direction of the white arrows by means of friction feed. You can release the paper by setting the release lever to Full Release position. (The paper feed rollers are pressed against the platen by the springs.)
Figure 2-9. shows the friction feed method from the top paper entrance.

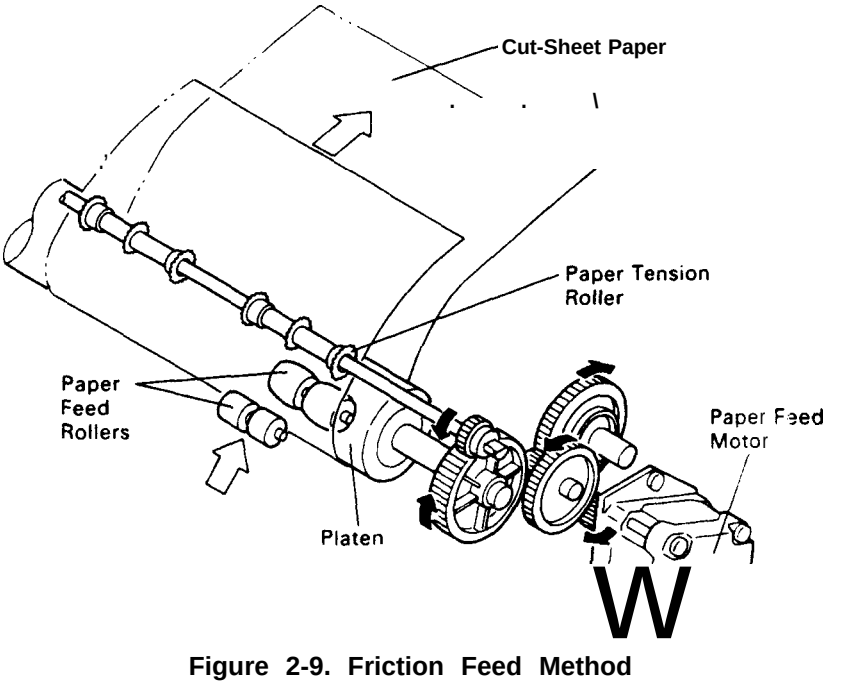


Figure 2-9. Friction Feed Method

Push Tractor Method

In this method, continuous paper is engaged to the tractor by mating the holes of paper to the pins of tractor. When the paper feed motor (STEPPING MOTOR, PF) is driven, the gears connected to the motor are rotated in the direction of the black arrows and rotate the platen, paper tension roller, and push tractor. The paper is thus driven in the direction of the white arrow as pushed by the push tractor pins and pulled by the paper tension roller.

In this method, the release lever must be set to Push Tractor position, where the paper feed rollers are set free from the platen.

Figure 2-10 shows the push tractor method from the rear entrance and the front entrance.

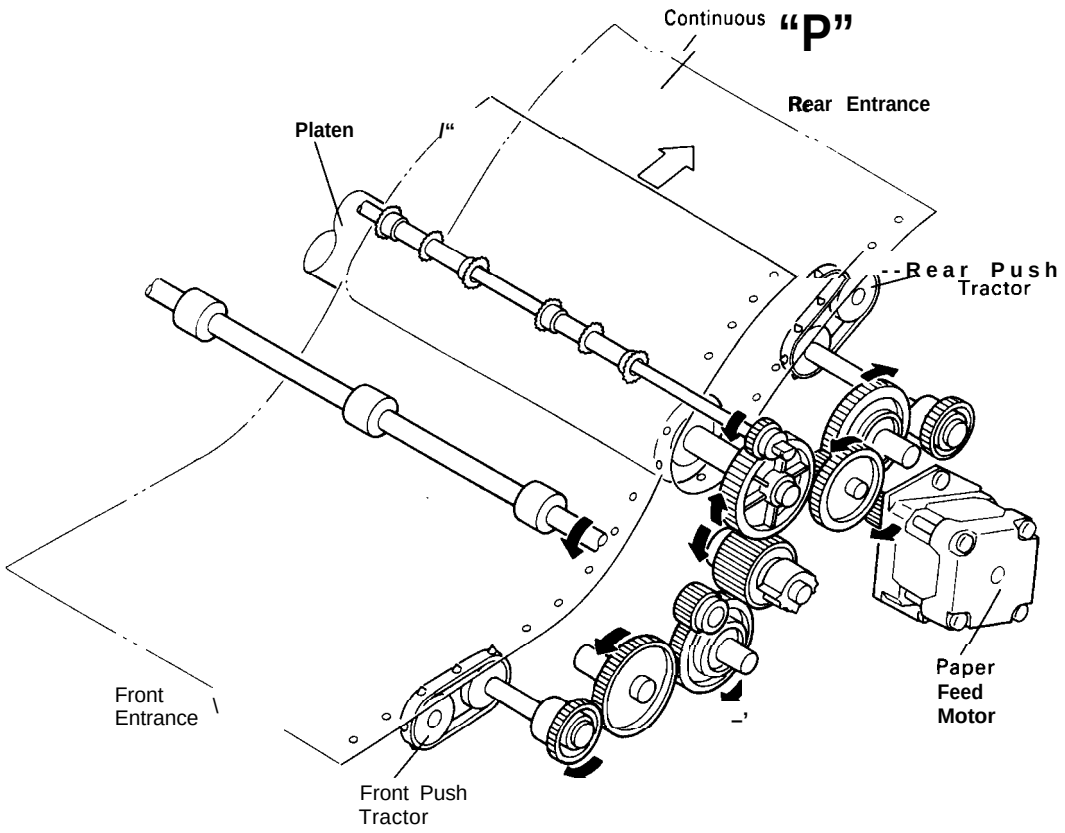


Figure 2-10. Push Tractor Operation

Push-Pull Tractor Method

This method is a combination of the above-mentioned push tractor method and the pull tractor method. The push tractor pushes the paper toward the printhead, while the pull tractor pulls the paper from the printhead. This provides more accuracy in paper feeding operation.

Figure 2-11 shows the push-pull tractor method from the rear feeding slot.

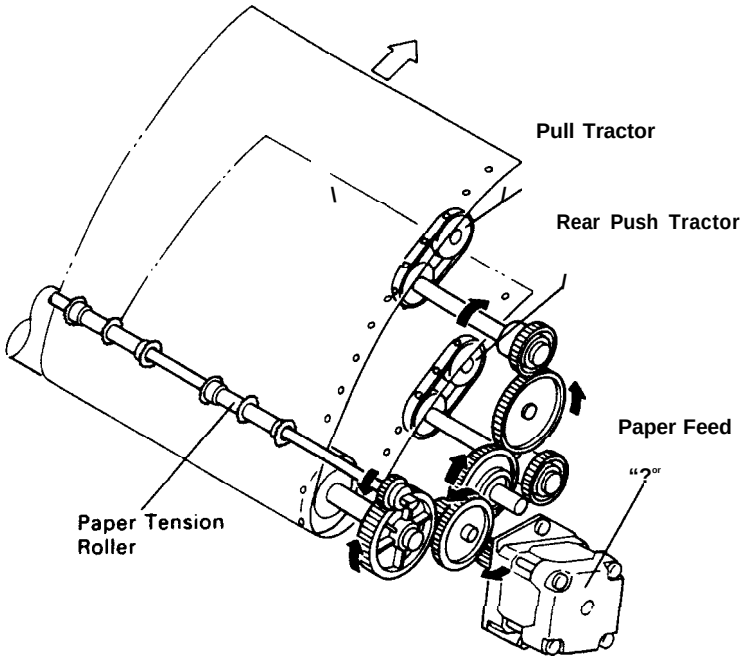


Figure 2-11. Push-Pull Tractor Method

2.1.3.2 Release Lever Operation

The friction feed method and the tractor feed method can be switched to each other with the release lever (LEVER, RELEASE, MAIN). When the release lever is set to the Friction Feed position, the paper feed rollers are made to contact the platen. When the lever is set to the Tractor position, on the other hand, the paper feed rollers are set free from the platen. The position of the release lever is detected by the Release Sensor (CONNECTOR SWITCH).

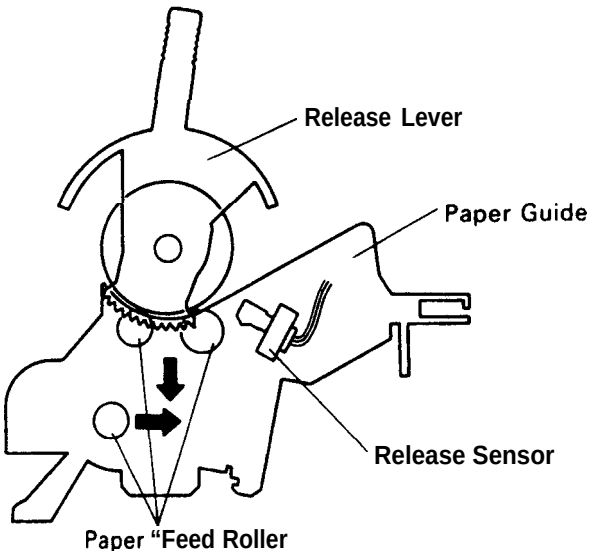


Figure 2-12. Moving the Release Lever

When the release lever is shifted as described above, the arrangement of the gears is changed accordingly to enable various types of paper feeding operation (such as front push tractor feeding or rear push tractor feeding) or to disable either.
Therefore, you can set continuous paper to each push tractor (front and rear) and switch between the two only by shifting the lever.

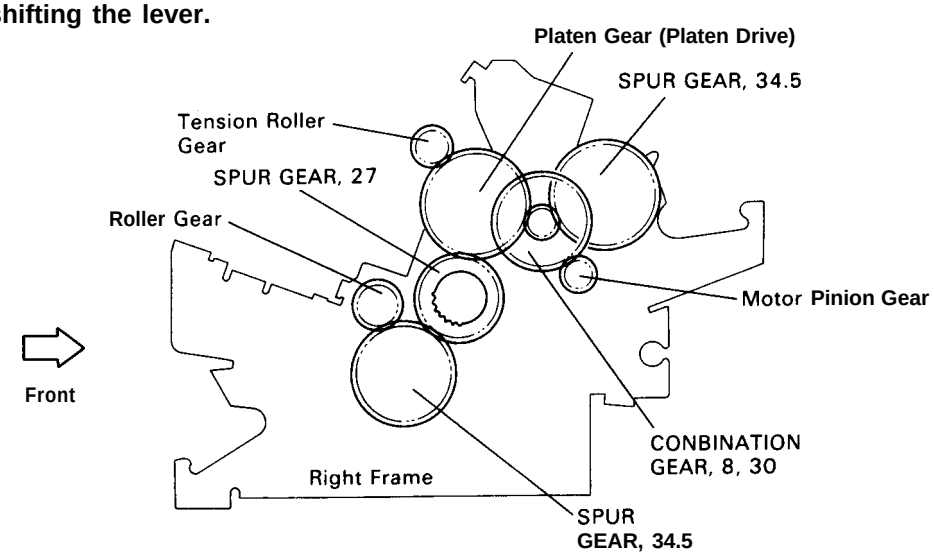


Figure 2-13. Arrangement of Gears in Friction Feed (or Full Release)

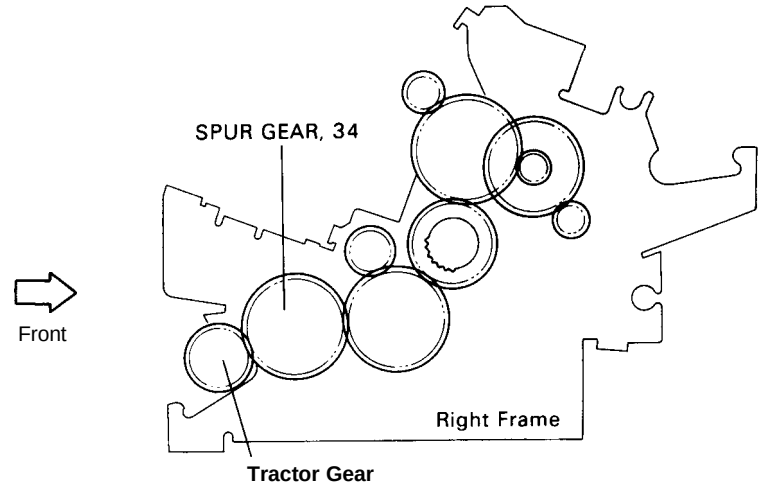


Figure 2-14. Arrangement of Gears in Front Push Tractor Feed

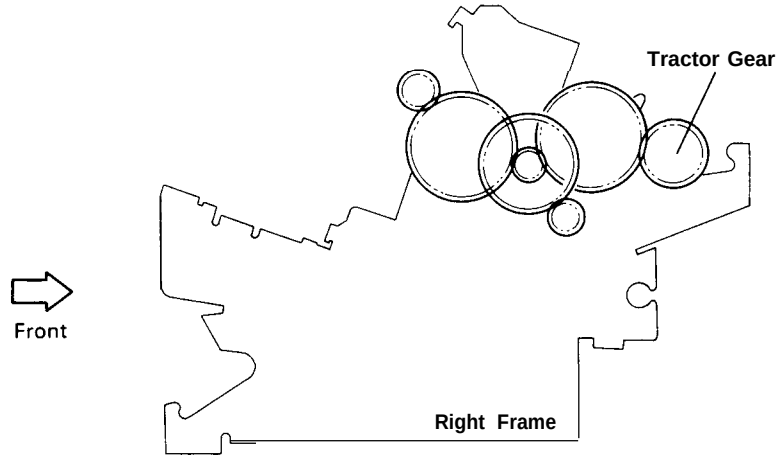


Figure 2-15. Arrangement of Gears in Rear Push Tractor Feed

2.1.3.3 Paper Insertion entrance

The following few pages describe the paper feeding method in relation to the paper feeding insertion.

Top Entrance

The top entrance is used in the friction feed method. The paper inserted through this entrance is detected by the rear PE sensor (DETECTOR ASSY., REAR).

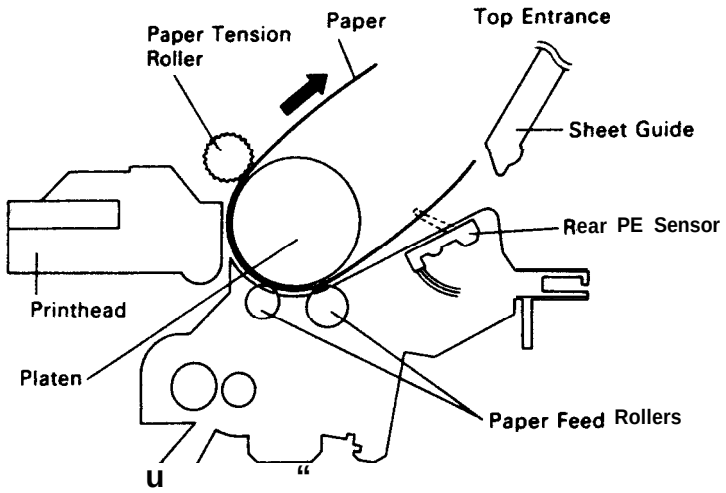


Figure 2-16. Top Entrance - Friction Feed Method

Rear Entrance

The rear entrance is used in the tractor feed method (Push tractor method or Push-pull tractor method). The paper inserted through this entrance is detected by the rear PE sensor (DETECTOR ASSY., REAR).

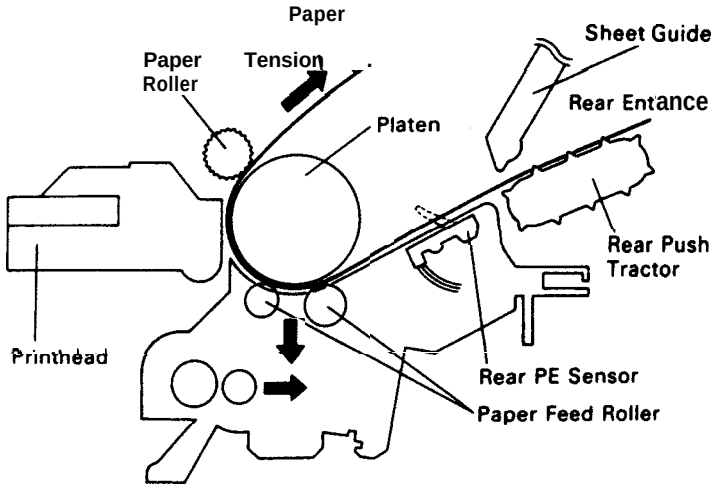


Figure 2-17. Rear Entrance - Push Tractor Method

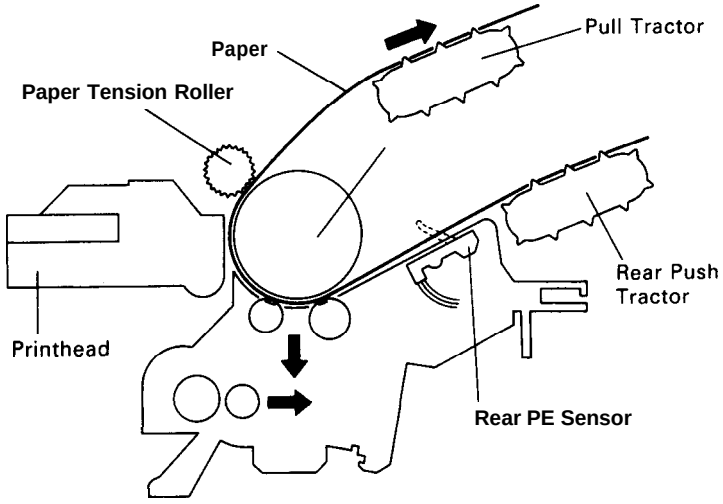


Figure 2-18. Rear Entrance - Push-Pull Tractor Method

Front Entrance

The front entrance is used in the friction feed method or the tractor feed method (Push tractor method or Push-pull tractor method). The paper inserted through this entrance is detected by the front PE sensor (DETECTOR, PE, FRONT).

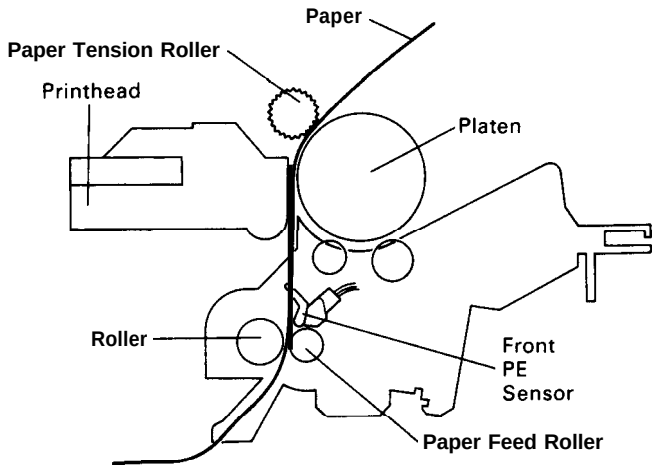


Figure 2-19. Front Entrance - Friction Feed Method

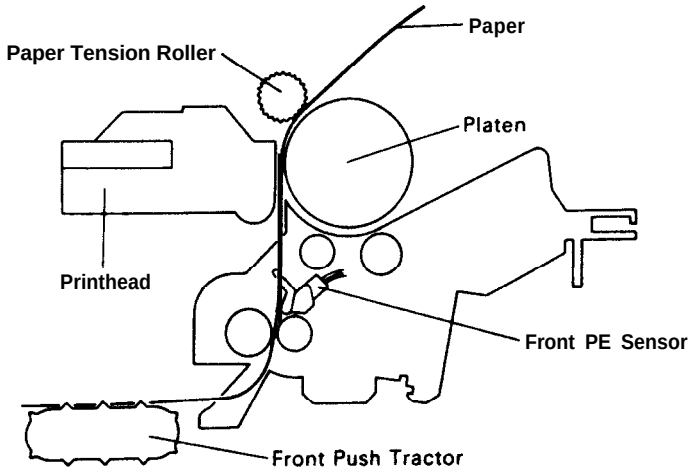


Figure 2-20. Front Entrance - Push Tractor Method

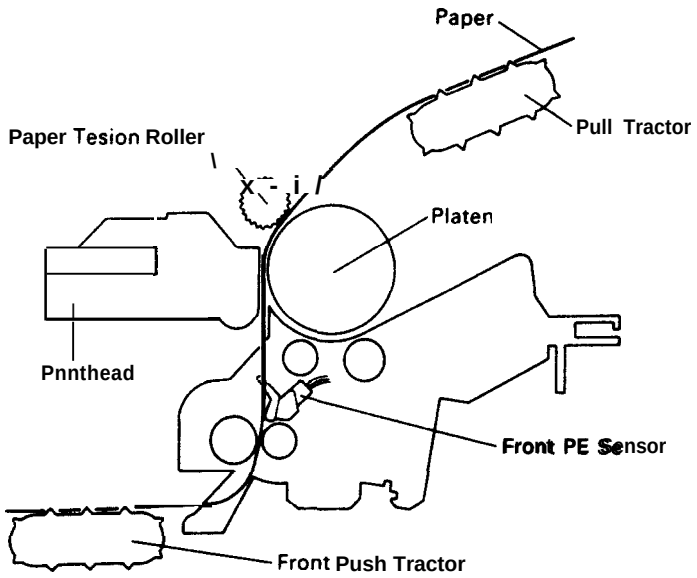


Figure 2-21. Front Entrance - Push-Pull Tractor Method

2.1.3.4 Top Edge Holder Mechanism Operation

This mechanism is provided to minimize unprintable area at the top edge of paper. The top edge of paper fed around the platen is held by the top edge holder plate until the top edge is delivered to the position where the paper tension roller comes down to hold the paper.

In detail, the top edge holder plate catches the top edge of the paper when the paper is initially fed around the platen, and then rotates along with the platen while holding the paper. When the top edge of paper reaches the position where the paper tension roller comes down to hold the paper, the top edge holder plate is enclosed behind the eject guide plate.

The TE (Top Edge) sensor is used to detect whether or not the top edge of paper is at the position to be held by the holder plate. It consists of a photo sensor which emits light toward the paper and detects the reflected light.

The top edge holder plate is driven by the TE motor (a stepping motor) (STEPPING MOTOR, TOP EDGE HOLDER).

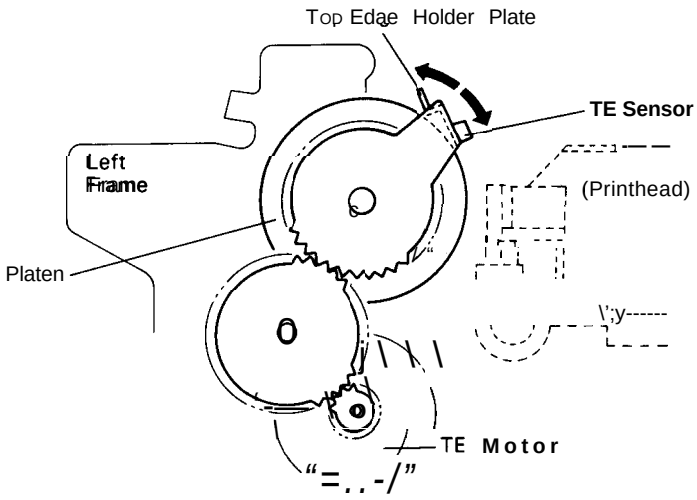


Figure 2-22. Top Edge Holder Mechanism

2.1.4 Ink Mechanism

The ink mechanism consists of the following parts.

- **Ink cartridge (Ink cartridge holder, Ink end sensor, Ink cartridge sensor)**
- **Pump unit**
- **Pump mechanism (Pump motor)**
- **Cap mechanism**
- **Printhead cleaning mechanism (Cleaner blade, Rubbing blade)**
- **Carriage lock mechanism**
- **Wasted ink drain tank**

Figure 2-23 shows the system outline of the ink mechanism.

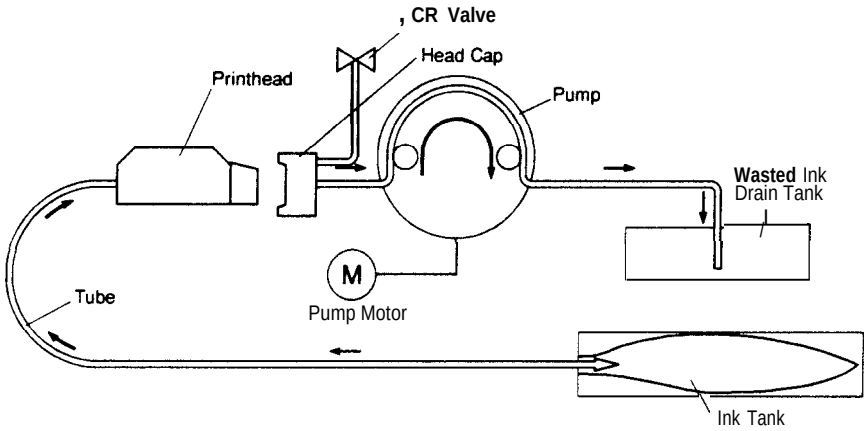


Figure 2-23. Outline Ink Mechanism System

2.1.4.1 Pump Motor

The pump motor drives the pump, cleaner blade, rubbing blade, and carriage lock lever (set/reset) through several gears.

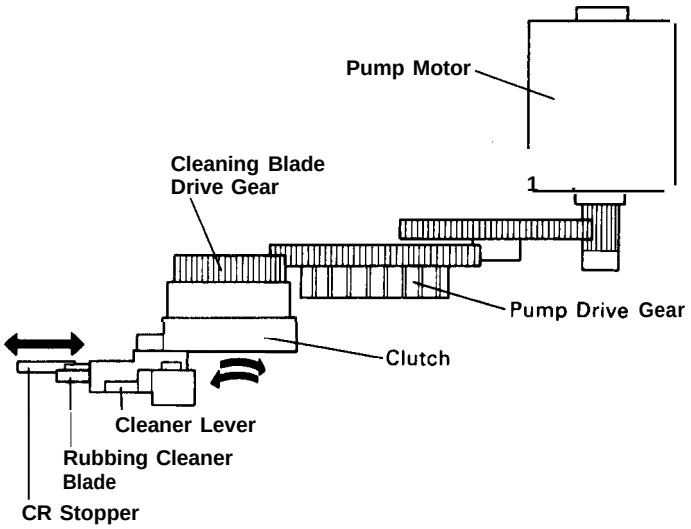


Figure 2-24. Pump Motor

Table 2-2. Rotational Direction and Operation of Each Part

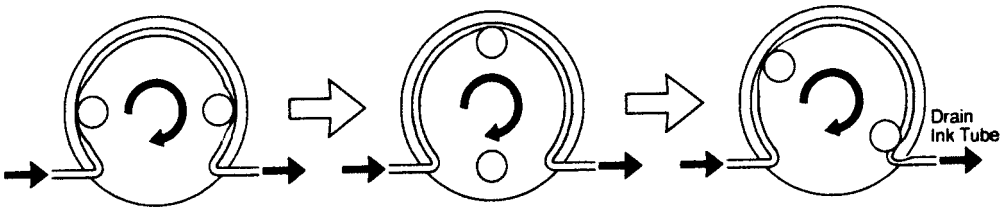
Rotational Direction	Operation of Each Part
C c w	Resets the carriage lock. Pumps ink into the wasted ink drain tank. Reset the cleaner blade. Resets the rubbing blade.
CW	Sets the carriage lock. Resets the pump. Sets the cleaner blade. Sets the rubbing blade.

2.1.4.2 Pump Mechanism

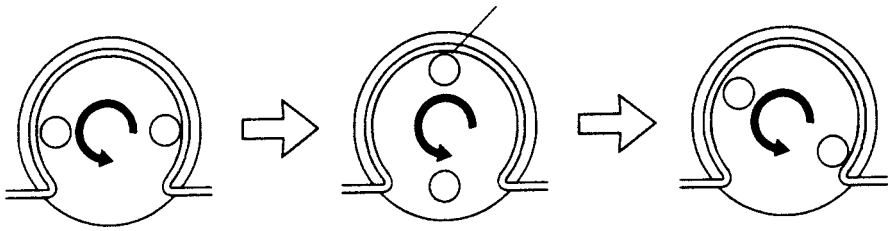
The pump draws ink from the nozzles of the printhead and sends it to the wasted ink drain tank. This operation is performed to eliminate dust/bubbles within the nozzles.

Figure 2-25 illustrates the operation of the pump. When the pump motor rotates CCW, the pulley pumps in the wheel pump unit rotate in the direction of the arrow while compressing the ink tube. This makes the ink in the tube move toward the used ink pack.

When the pump motor rotates CW, the pulley pumps are shifted inward and detached from the ink tube.



Pumping (Pump motor:CCW)



No Pumping (Pump motor:CW)

Pumping (CCW)

No Pumping (CW)

Figure 2-25. Pump Movement

2.1.4.3 Cap Mechanism

This mechanism is provided to prevent the nozzles from drying or forming bubbles while they are not used. In this mode, when the pump is driven with the cap closely contacted to the nozzles, the internal pressure of the capped section becomes lower than that of the printhead section. This causes the ink in the printhead to flow toward the pump through the cap.

The capping is automatically performed when the carriage hits the left stroke end. At this time, the cap covers the printhead nozzles while the slider valve closes the air inlet.

When the carriage moves right ward in this condition, the slider valve is released from the air inlet and allows the air to enter the capped section, so that the cap can be easily separated from the printhead.

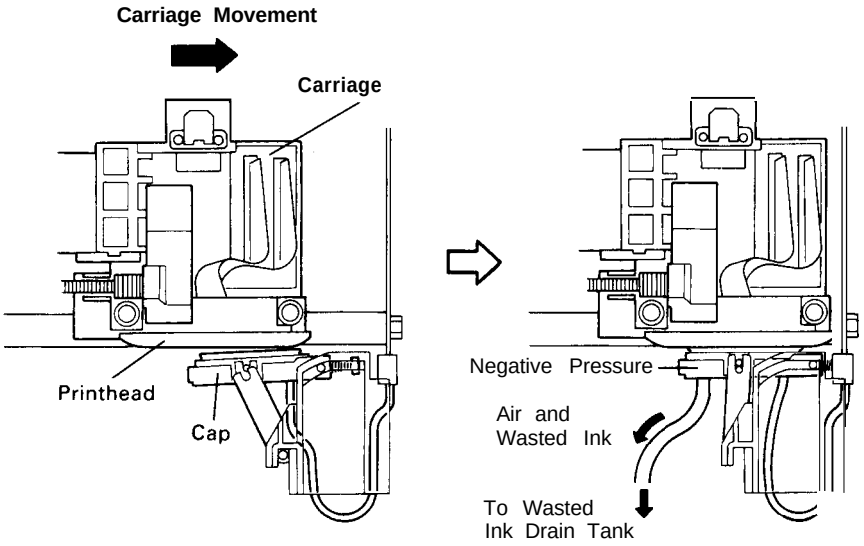


Figure 2-26. Cap Movement

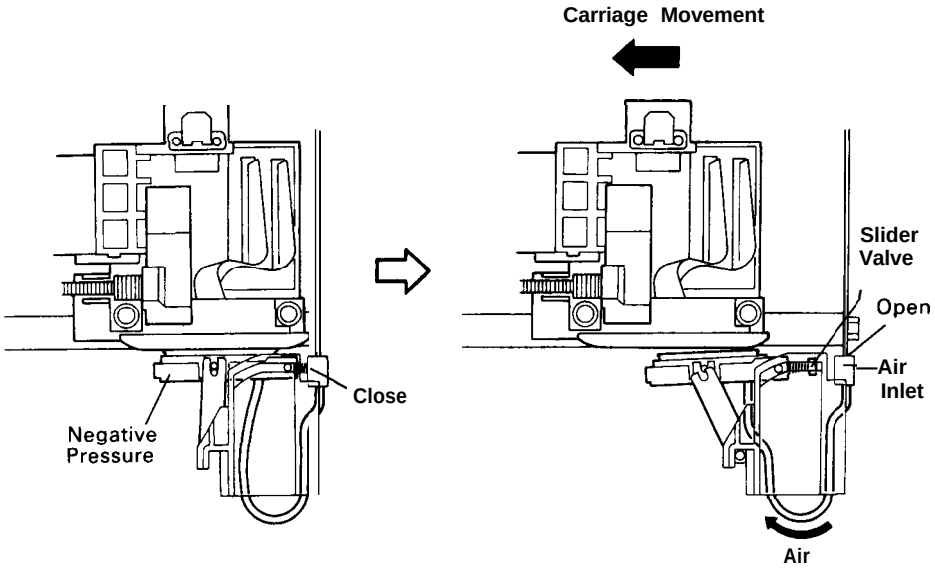


Figure 2-27. Air Inlet Operation

2.1.4.4 Cleaning Mechanism and Carriage Lock Mechanism

The cleaning operation consists of rubbing operation and cleaner blade operation. (The rubbing operation is performed to remove head preserving liquid, ink, or dust which is heavily adhered to the surface of the printhead, while the cleaner blade operation is performed to remove ink or dust lightly stuck to the surface of the printhead.)

In the rubbing operation, the ink, etc. adhered to the nozzles is rubbed off when the carriage is repeatedly rubbed against the pad set in the carriage path.

In the cleaner blade operation, the ink, etc. stuck to the nozzles is scraped off when the carriage is repeatedly passed along the blade set in the carriage path.

The rubbing pad and the cleaner blade are united into a single part. When the carriage moves from left to right, the cleaner blade operation is performed. Or when the carriage moves from right to left, the rubbing operation is performed.

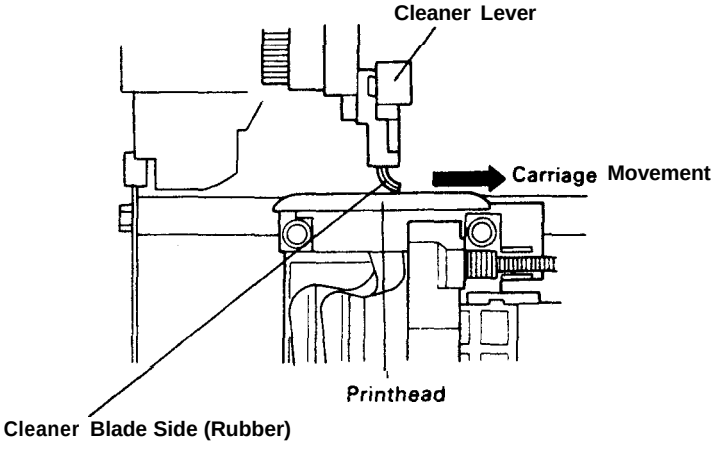


Figure 2-28. Cleaner Blade Operation

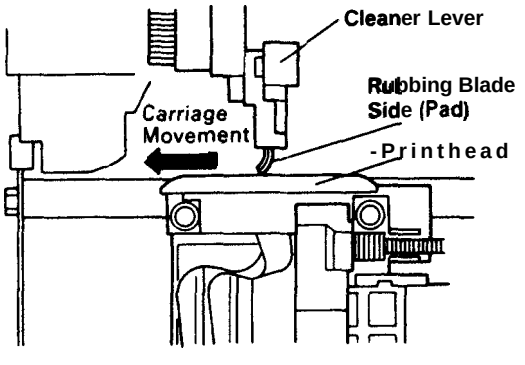


Figure 2-29. Rubbing Block Operation

The pad and blade is attached to the cleaner lever. When the pump motor rotates clockwise, the spur gear (20) is rotated and thus sets the lever forward. When the pump motor rotates counter-clockwise, the cleaner lever is reset.
The spur gear will be disengaged from the cleaner lever as soon as the lever is either set or reset.

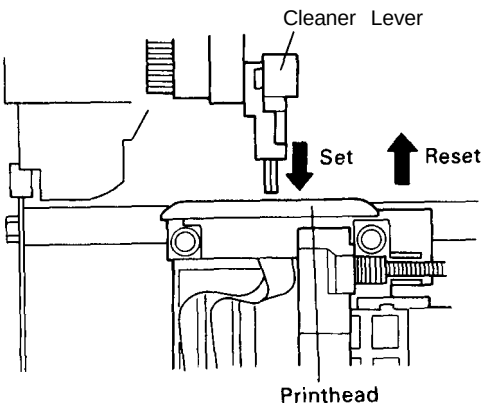


Figure 2-30. Set/Reset of Cleaner Lever

The cleaner lever is also used as a carriage lock lever. When the printhead is locked in the capped state, this lever functions as a printhead holder and prevents the cap from coming off in a shock.

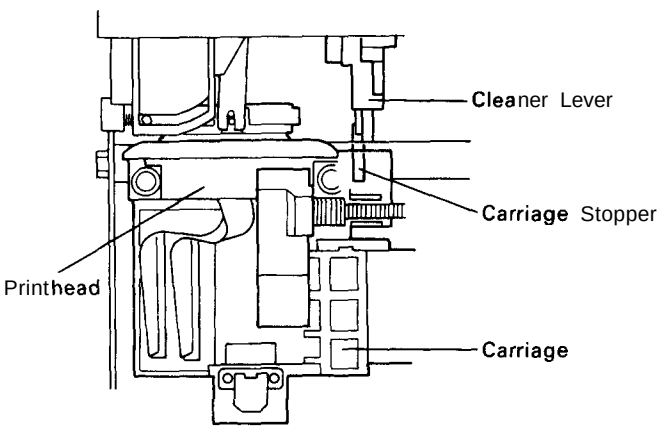


Figure 2-31. Carriage Lock

2.1.4.5 ink Cartridge and Ink End Sensor Mechanism

The structure of the ink cartridge is shown in Figure 2-32.

The ink cartridge contains an ink pack and an ink end detection plate. The detection plate gradually sticks out as the ink inside the cartridge runs short. The ink end sensor (DETECTOR ASSY., INK) is designed to detect this plate.

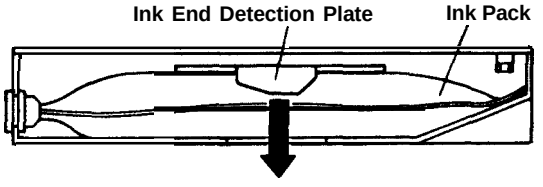


Figure 2-32. Internal Structure of Ink Cartridge

Figure 2-33 shows the structure of the ink cartridge holder.

When the ink cartridge is installed, the ink supply needle breaks the ink pack so that the ink inside the pack is supplied. There are two micro switches within the ink cartridge holder - Ink End Sensor (DETECTOR ASSY., INK) and Ink Cartridge Sensor (HOLDER ASSY., INK CARTRIDGE). The ink end sensor detects the ink end detection plate, while the ink cartridge sensor detects the ink cartridge.

When an ink end condition is detected, the status will not be recognized until another 200 lines are printed. When absence of ink cartridge is detected, however, the ink end signal will be immediately activated with the cartridge signal.

Table 2-3. Ink End/Ink Cartridge Signal

Status	IE Sensor	IC Sensor	IE Signal	IC Signal
Ink Cartridge Exist/Ink Exist	Close	Close	LOW	LOW
Ink Cartridge Exist/Ink Not Exist	Open	Close	HIGH	LOW
Ink Cartridge Not Exist	Open	Open	HIGH	HIGH

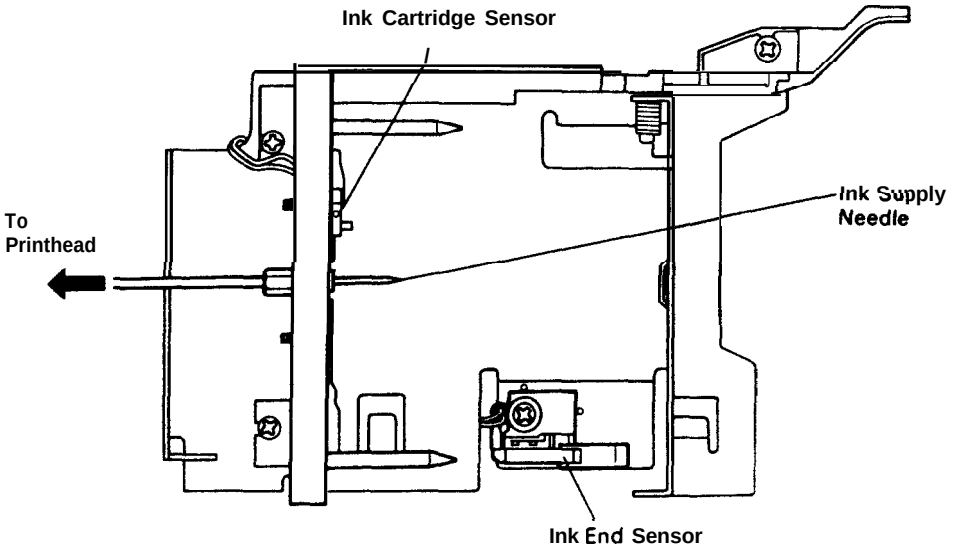


Figure 2-33. Structure of Ink Cartridge Holder

2.1.4.6 Wasted Ink Drain Tank

Used ink is collected into the wasted ink drain tank. The wasted ink drain tank has the absorber to collect used ink through the tube, and the opening which lets out the vapor from ink. This tank is provided with a sufficient capacity to collect the waste ink that is used during the whole printer life.

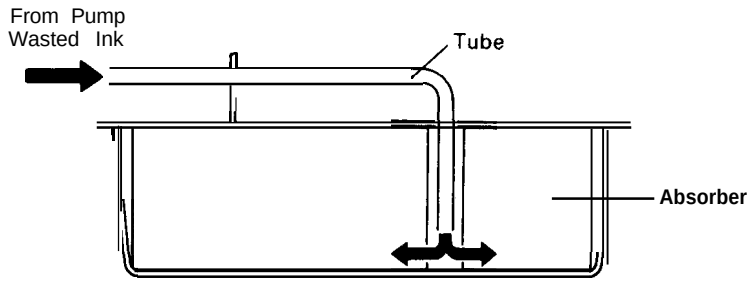


Figure 2-34. Structure of Wasted Ink Drain Tank

2.1.4.7 Operational Sequence of Ink Mechanism

Ink Mechanism comprises of various steps of operation.

The following are some of the basic steps of operation.

● **Ink flushing operation**

In this operation, the printhead is moved to the position where the cap covers the nozzles (the refresh position) and then ink is injected from all the nozzles toward the cap.

● **Negative pressure release operation**

This operation is performed to change of inside the cap air pressure from negative pressure to normal pressure.

In this operation, the carriage is moved to the negative pressure release position, where the printhead is closely contacted against the cap with the air valve opened. (The negative pressure inside the cap is thus released.) Then the pump operates for 5 seconds to make the ink inside the cap flow toward the wasted ink drain tank.

● **Cleaner blade operation-1**

This operation is performed to remove dust, etc. from the printhead. Refer to 2.1.4.4 for the details.

● **Cleaner blade operation-2**

This operation is performed to remove dust, etc. from the printhead following the ink charge operation. It consists of the cleaner blade operation- and 3000-pulse ink flushing operation that follows.

● **Cleaner blade operation-3**

This operation is performed to remove ink mist from the printhead. It consists of the l-second ink discharge operation and the cleaning blade operation- that follows.

● **Rubbing operation**

This operation is performed to remove head preserving liquid, ink, or dust which is heavily adhered to the surface of the printhead. Refer to 2.1.4.4 for the details.

The above operations are performed when the carriage is located at the position indicated below.

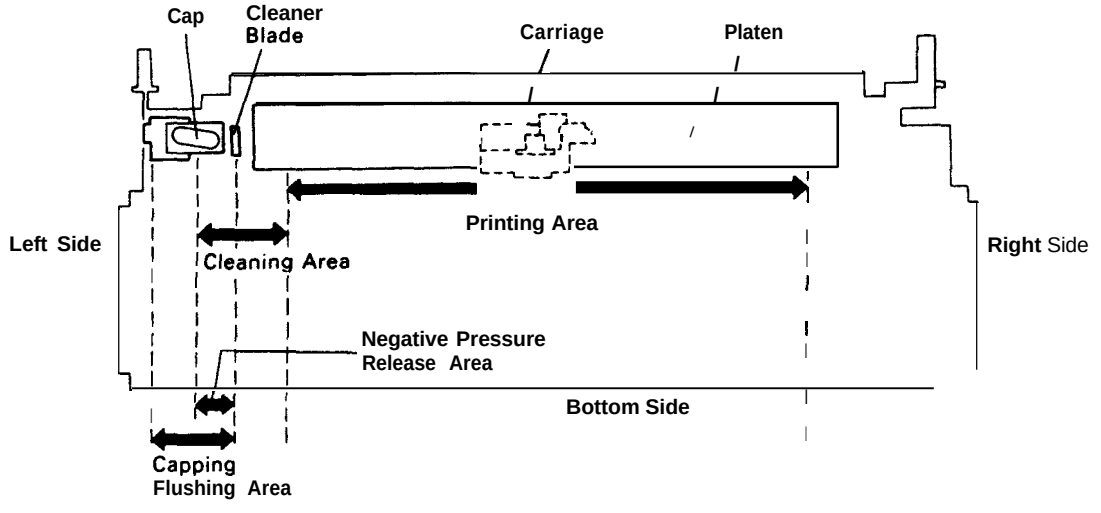


Figure 2-35. Operational Sequence of ink Mechanism and Carriage Position

The basic steps of operation described above are combined in many ways to meet various conditions of the printer as described below.

(1) Power ON operation

At time of power on, four different ways of operation are possible depending on the carriage position and timer value.
They are described in a), b), c), d) below. The timer will be reset in the following cases; the CL1 or CL2 operation (described below) is performed, the initial charge operation (refer to this section) is performed, or the timer indicates "7" days or more when the power is turned on.

a) Carriage Position: Home position
● Timer Value: Less than 7/days/Less than 24 hours after last printing
The negative pressure release operation and 100-pulse flushing operation will be performed without performing the cleaning operation. The purpose of this operation is to prevent ink in the printhead nozzles from drying up by keeping the inside of the cap moistened. After this operation, the printhead will be capped again.

b) Carriage Position: Home position
● Timer Value: Less than 7 days/More than 24 hours after last printing
The negative pressure release operation, and 2600-pulse flushing operation, 0.5 second waite, and 2600-pulse flushing will be performed without performing the cleaning operation. After this operation, the printhead will be capped again.

c) Carriage Position: Home position
● Timer Value: More than 7 days
The pump performs the ink charge operation for 4 seconds to replace the ink in the tube. This operation is followed by the negative pressure release operation, cleaner blade operation-2, and capping.
This operation is necessary because the ink kept inside the tube for more than 7 days is subject to deterioration.

d) Carriage Position: Other than Home position
● Timer Value: Not relevant
The carriage will be moved to the home position followed by the cleaner blade operation-1. Then the pump performs the ink charge operation for 2 seconds, followed by the ink discharge operation, cleaner blade operation-2, and capping.

(2) Cleaning operation

This operation is performed to correct abnormalities such as injection failure (which results in missing dots or deformed characters). This operation is enabled when the cleaning switch is pressed during the pause mode. Three modes of operation are used depending on the number of lines printed since the last cleaning operation.

a) CL1 (Normal cleaning)
This operation consists of the cleaner blade operation-1, negative pressure release operation, and cleaner blade operation-2.

b) CL2 (Intensive cleaning)
This operation is performed when the cleaning switch is pressed before 200 lines are printed after the last cleaning operation. In other words, the intensive cleaning is performed when the normal cleaning fails to correct abnormalities.
This operation consists of the rubbing operation, ink charge operation for 7 seconds, negative pressure release operation, and cleaner blade operation-2.

c) CL3 (False cleaning)
The false cleaning will be performed when the user presses the cleaning switch 6 times or more before 500 lines are printed after power on. This prevents the user from consuming an excessive a mount of ink in performing the cleaning operation for too many times.
This operation consists of the cleaner blade operation-1, ink charge operation for 2 seconds with the slider valve released, negative pressure release operation, and cleaner blade operation-2.

(3) Refreshing operation

This operation is performed to prevent the ink in the nozzles from getting sticky.
Two modes of operation are provided as follows.

a) Refreshing operation-1
This operation is performed every 15 seconds in the continuous printing mode. The carriage is moved to the flushing position and then 10-pulse ink flushing operation will be performed.

b) Refreshing operation-2
This operation is performed after every 100 times of refreshing operation-1. It is followed by the cleaner blade operation-3.

(4) Waiting operation

This operation is performed when more than 3 seconds has passed after the last character is printed. This operation consists of 2800-pulse ink flushing operation (or less, depending on the number of cleaning operations performed so far), cleaner blade operation-3 (performed in some cases, also depending on the number of cleaning operations performed so far), and capping.

(5) Initial charge operation

This operation is performed to replace the head preserving liquid with ink. It is performed when the user operates the initial charge operation.
Three different modes of operation are used depending on the printer conditions.

a) Initial charge operation-1

This operation is performed when the printhead is not capped at the time the user operates the initial charge operation. It consists of the cleaner blade operation-1, ink charge operation for 60 seconds, negative pressure release operation, rubbing operation for 5 times, ink charge operation for 5 seconds, and negative pressure release operation. Then a series of rubbing operation (5 times), ink charge operation (5 seconds), and negative pressure release operation will be repeated 3 times, followed by the ink charge operation for 5 seconds, negative pressure release operation, and cleaner blade operation-2.

b) Initial charge operation-2

This operation is performed when the printhead is capped at the time the user operates the initial charge operation.

It consists of the ink charge operation for 60 seconds, negative pressure release operation, rubbing operation for 5 times, ink charge operation for 5 seconds, and negative pressure release operation. Then a series of rubbing operation (5 times), ink charge operation (5 seconds), and negative pressure release operation will be repeated 3 times, followed by the ink charge operation for 5 seconds, negative pressure release operation, and cleaner blade operation-2.

c) False initial charge operation

This operation is performed if one of the following conditions occurs when the user operates the initial charge operation.

- **The initial charge operation has been performed 6 times or more.**
- **The initial charge operation has been performed immediately after the previous one.**
- **The initial charge operation has been performed 4 times or more in one day.**

This operation prevents the user from consuming an excessive amount of ink in performing the initial charge operation for too many times.

This operation consists of the ink charge operation for 60 seconds with the slider valve released, pause for 10 seconds, ink charge operation for 5 seconds with the slider valve released, and the negative pressure release operation. A series of the above operations are repeated 3 times, followed by the ink charge operation for 5 seconds with the slider valve released, negative pressure release operation, and cleaner blade operation-2.

(6) Wasted ink drain tank replacement operation

In normal use condition, this tank has a sufficient capacity to collect all the ink to be wasted during the whole printer life. However, if an unexpectedly large amount of ink is wasted in excessive cleaning operations or power on operations, the tank may be fulfilled. In this case, the wasted ink drain tank replacement message will be displayed to urge the user to replace the tank. (The tank will be actually replaced by a service personnel as required by the user.)

The tank overflow condition is estimated in the following method; The total time spent for negative pressure release operation is stored in terms of "points"in the non-volatile memory (EEPROM) on the Main Board. If the time exceeds the predetermined value (4 1000 points), the replacement message is displayed. The time spent for ink discharge operation is converted to "point' 'values at the following ratio.

2 seconds: 10 points
4 seconds: 23 points
5 seconds: 30 points
7 seconds: 40 points
60 seconds: 400 points

2.1.5 Case Open Interlock Switch

The carriage of this printer moves at a high speed, and the printhead is supplied with a high DC voltage. To protect the user from the fast moving carriage and high voltage, the interlock switch is installed on this printer. When the printer cover is opened during the printing operation, the interlock switch is activated and mechanically cuts off the printhead drive voltage to reduce the torque of the carriage motor by inserting the interlock resistor in series into the carriage motor drive circuit.

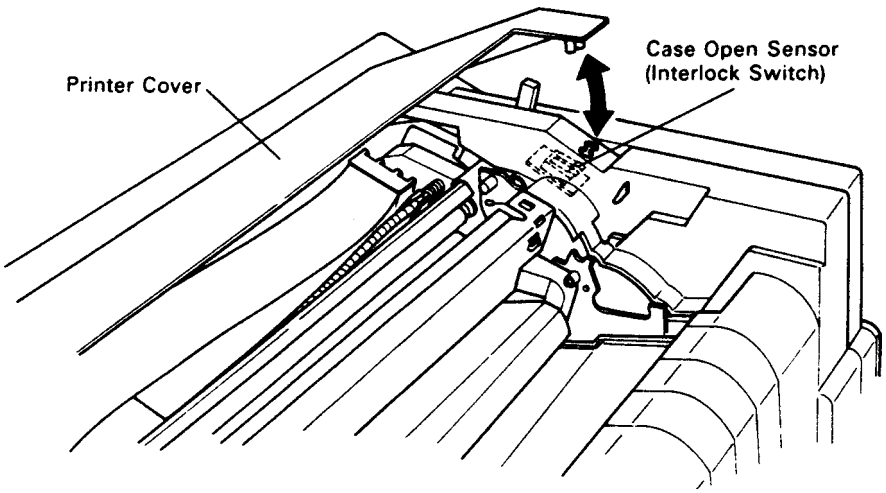


Figure 2-36. Interlock Switch

2.2 OPERATING PRINCIPLES OF POWER SUPPLY CIRCUITRY

The power supply circuitry of this printer is provided with either C076PSB board (120V) or C076PSE board (220/240 V). Both boards operate in the same way although the elements in the primary circuit are partly different.

The power supply unit supplies DC voltage which is used for controlling the printer of driving the printer mechanism.

Table 2-4 shows the ratings of the power supply board.

Table 2-4. Ratings of Power Supply Board

Board Name	Input Voltage (ACV)	Fuse (F I) Rating
C076PSB	103.5-132	2.5 A/ 125 V
C076PSE	198-264	1.25 A/ 250 V

2.2.1 Voltage Allocation

The DC voltage generated by the power supply circuitry is allocated to each circuit or mechanism depending on their voltage level. The details are described in Table 2-5.

Table 2-5. Voltage Allocation

Voltage	Application
+35 VDC	Carriage motor drive Paper feed motor drive Top edge motor drive Pump motor drive Printhead drive voltage (VH) generation
+5 VDC	C076 MAIN board logic circuit Sensors Control panel LED Top edge motor holding

2.2.2 Operating Principles of Power Supply Circuitry

Figure 2-37 shows the block diagram of the power supply circuitry.

The AC power supplied from the external source is first sent to the filter circuit, where higher harmonic is cut. The AC voltage is then rectified and smoothed into the DC voltage. This DC voltage is sent to the switching circuit and then to the smoothing circuit of the secondary circuitry, and thus dropped to +35 VDC voltage. This +35 VDC voltage is fed back to the switching circuit by the + 35V line voltage detection circuit and thus stabilized.

The +35VDC voltage is also sent to the +5VDC power supply circuit and thus dropped to stable +5 VDC voltage.

This circuitry is provided with four types of protection circuits as described below.

1) + 5 VDC line over voltage/current protection circuit

When the current flowing on the + 5 VDC line increases, the over current protection circuit cuts the current. When the voltage of the + 5VDC line exceeds a certain value (+ 7V), the switching circuit is turned off to stop the generation of +35 VDC voltage. The over current protection circuit is included in the over voltage protection circuit.

2) **+35 VDC over voltage protection circuit**
When the voltage of the +35 VDC line exceeds a certain value (+36V), the switching circuit is turned off to stop the generation of +35 VDC voltage.

3) **+35VDC under voltage protection circuit**
When the voltage of the +35VDC line goes lower than a certain value, the switching circuit is turned off to stop the generation of +35 VDC voltage.

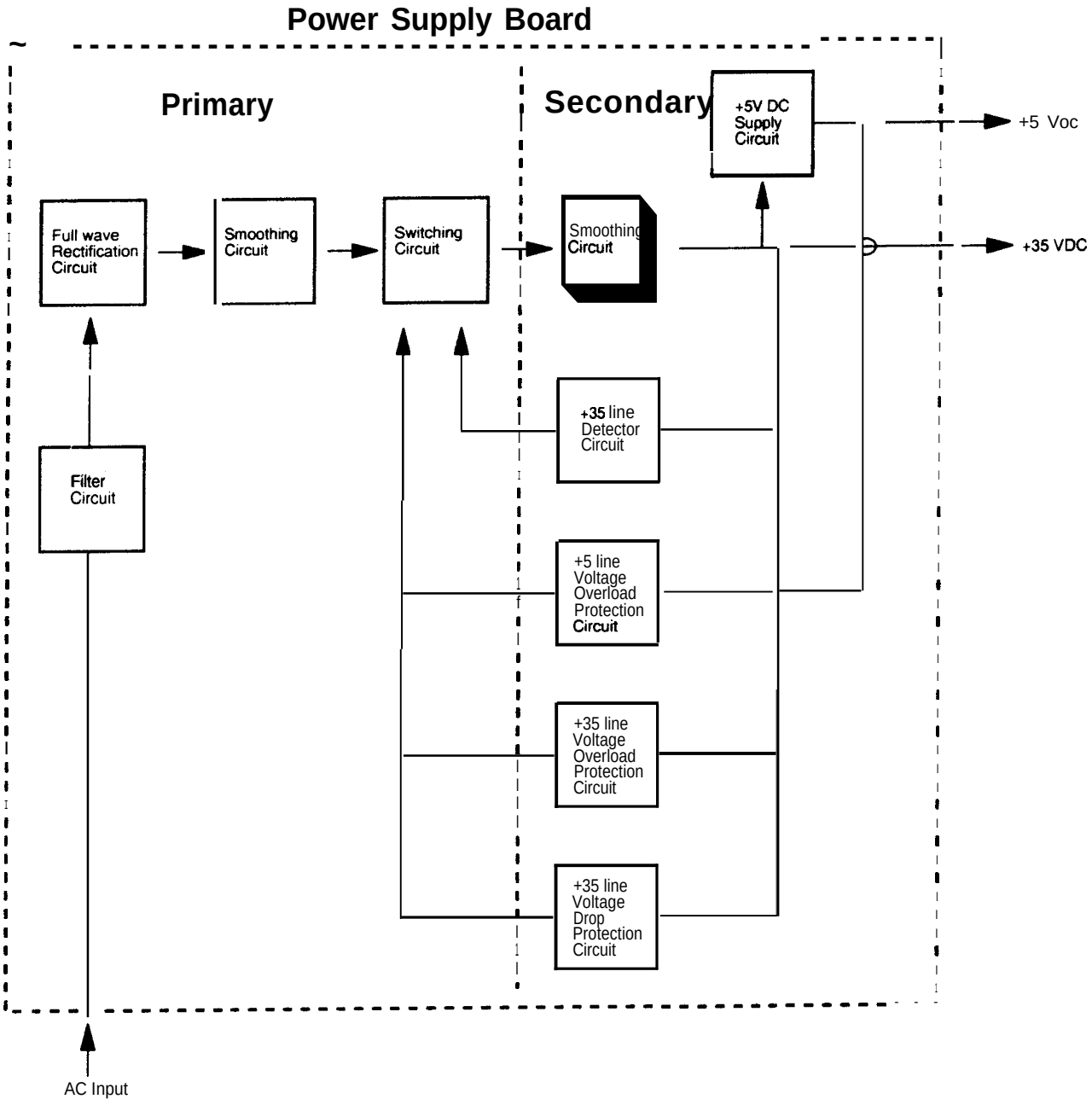


Figure 2-37. Power Supply Circuit Block Diagram

2.3 OPERATING PRINCIPLES OF CONTROL CIRCUITRY

This section describes the operating principles of the control circuitry of this printer - C076 MAIN board.

2.3.1 Control Circuitry Overview

The C076 MAIN board is provided with μPD70325 (V25 +) (9.5 MHz) – a 16-bit one-chip microprocessor, E05A65 - a gate array with memory management function, and E05A48 – a gate array to control DC motors. Figure 2-38 shows the control circuitry block diagram.

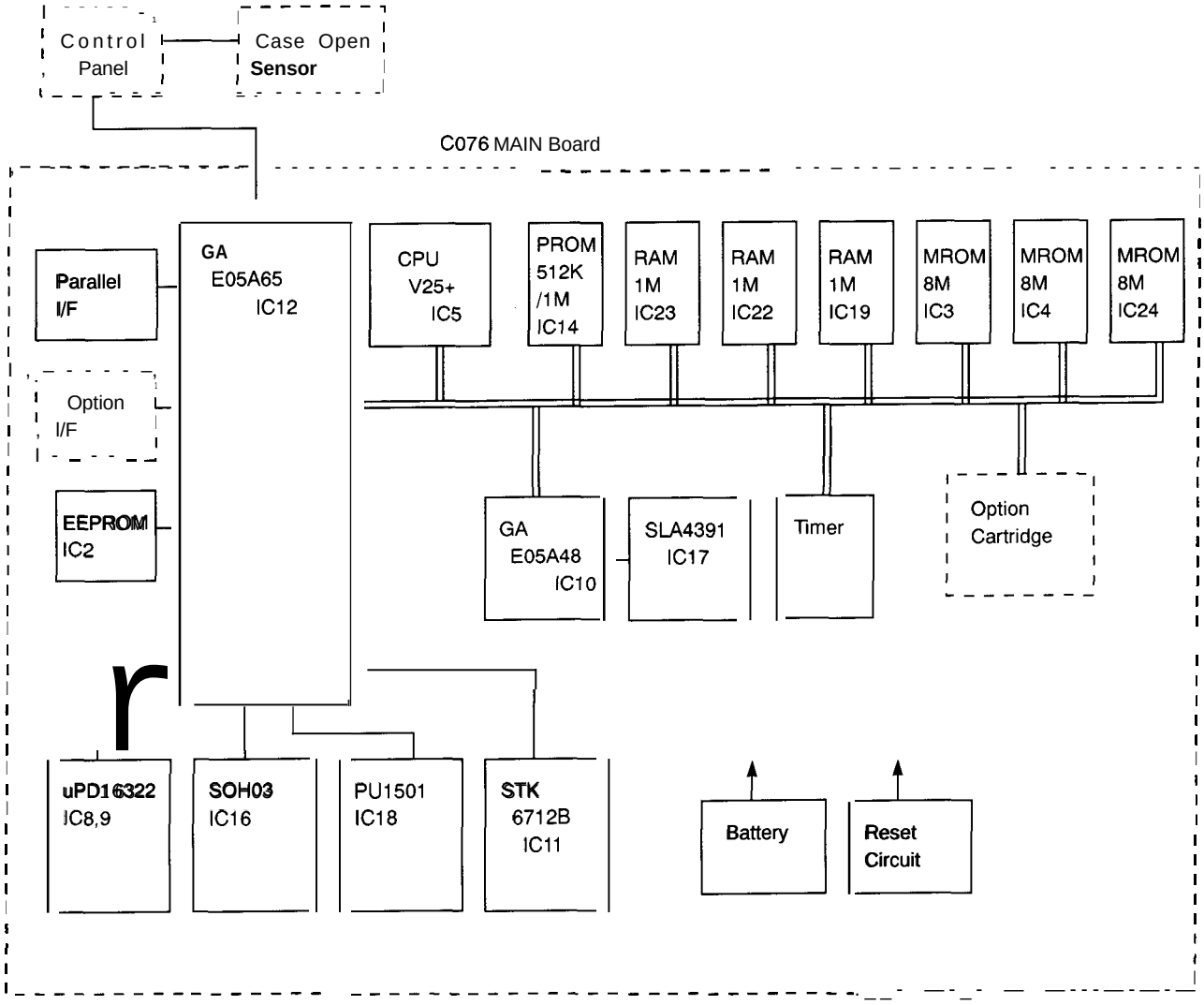


Figure 2-38. Control Circuitry Block Diagram

Table 2-6 lists the functions of major elements on the C076 MAIN board.

Table 2-6. Major Elements on C076 MAIN Board and Their Functions

Element	Location	Function
μPD70325 (V25+)	IC5	The CPU of this board. It receives data from the host and stores (V25+) it in the input buffer in PS-RAM by interrupting. The stored data is then converted to image data and stored in the image buffer in PS-RAM. The image data is then transmitted to the gate array, where the image data is converted to the serial data. This processor also controls each printer mechanism and the control panel, and receives signals from each sensor.
E05A65	IC12	This gate array executes the following functions. . Memory management •I/O Port •Printhead control . EEPROM control . Parallel interface •Control panel control
E05A48	IC10	This gate array controls the carriage motor (DC motor) by detecting the motor speed and carriage position.
SLA4391	IC17	This IC drives the carriage motor (DC motor).
STK67 12B	IC11	This IC drives the PF motor (Stepping motor).
SOHO3	ICI 6	This IC drives the pump motor (DC motor).
μPD 16322	IC8,9	These are head drivers. The head data is received in serial mode.
M40B03	IC4	These ICs (Mask-ROM) are character generators. The font data is stored in these ROMs.
1 M PS-RAM	IC19 (IC22)	This RAM is used to store CPU's working memory, input data, and image data.

2.3.2 Reset Circuit

When the power in turned on, the reset IC(MB3771), which monitors the + 5 VDC line, keeps outputting $\overline{\text{RESET}}$ signals until +5 VDC is stable. This controller can also reset itself by setting $\overline{\text{RSTRG}}$ signal(160 pin of E05A65 gate array) to LOW. The block diagram of this circuit is shown in Figure 2-39.

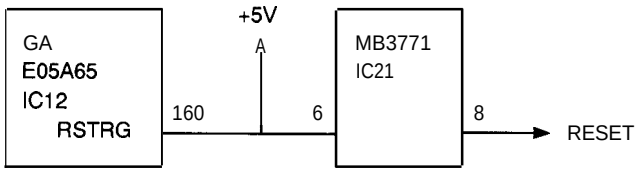


Figure 2-39. Reset Circuit Block Diagram

2.3.3 Detection Circuit

This printer is provided with 1 sensors, but only 7 sensors are described in this section. They are Ink Cartridge Sensor, Ink End Sensor, Platen Gap Sensor, Friction/Tractor Select Sensor, Top Edge Sensor, Paper End Sensor (Front), and Paper End Sensor (Rear). The signals from these sensors are directly inputted to the CPU port.

For the other sensors, refer to each circuit as follows.

- **Ink temperature detector (Thermistor) ---Head drive circuit**
- **+ 35VDC under voltage detection circuit---EEPROM control circuit**
- **Case open sensor (interlock switch) ---Head drive circuit /Carriage motor drive circuit**
- **Encoder ---Carriage motor drive circuit**

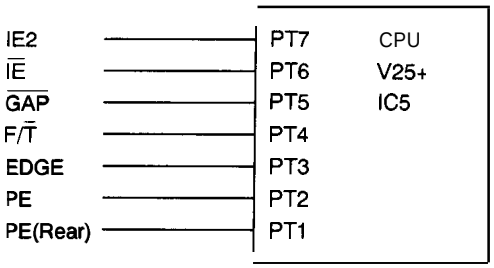


Figure 3-40. Detection Circuit Block Diagram

2.3.4 Paper Feed Motor Drive Circuit

A stepping motor is used in the paper feed motor drive circuit of this printer.
The motor is driven by 2-2 phase excitation and constant-current arrangement. For a single pulse, paper is fed 1/360 inch (minimum value). The acceleration/deceleration control is not applied to the paper feed rate less than 3 steps.
The feeding speed is varied depending on the type of paper, etc.
The constant-current drive circuit is made by STK67 126, which detects the current flowing in the coil of the stepping motor, and keeps the current constant by cutting the current that exceeds a certain value. This value can be set at user's option through the external circuit. The value set by the external circuit is inputted through the port on E05A65 and outputted to STK67 126 in 4 steps. (The motor retaining mode is also included.)
The phase of the paper feed motor is also switched through E05A65.

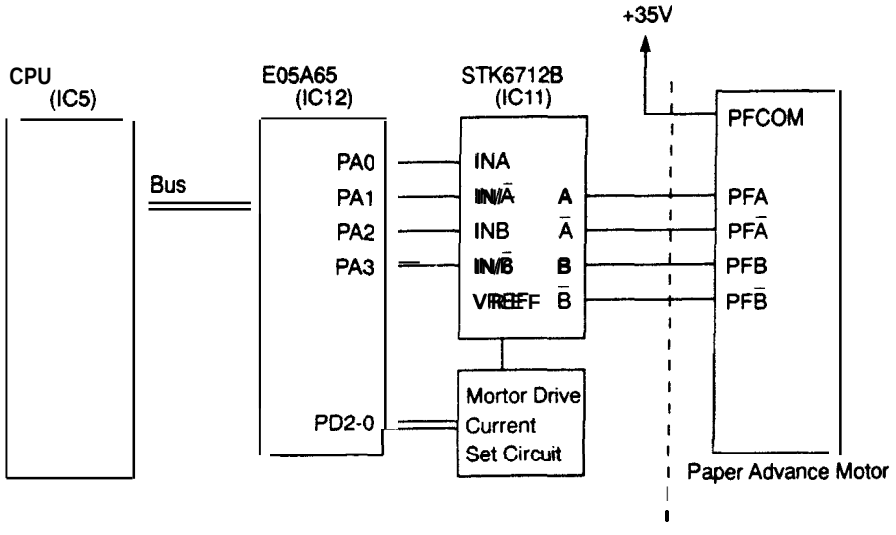


Figure 2-41. Paper Feed Motor Drive Circuit

2.3.5 Carriage Motor Drive Circuit

This printer uses a DC motor for the carriage drive. To drive the DC motor at a constant speed, the gate array E05A48 monitors the encoder signals and then supplies proper voltage to the motor by turning the motor power on/off. The gate array can recognize rotational direction of the motor (i.e. moving direction of the carriage) because there are two encoders attached on the carriage with 90-degree phase difference. The gate array can thus recognize current position of the carriage with reference to the home position. In detail, the position counter in the gate array is reset every time the carriage hits the left frame, and the counter counts up as the carriage moves rightward. (Home position sensor is not used.) The IC 17 (SLA4391) is a DC motor driver. This printer is provided with a case open sensor (interlock switch). When the printer cover is opened during printing operation, the printer immediately stops printing and moves the carriage to the capping position to cap the printhead. Also, when the interlock switch is activated, the interlock resistor is inserted in series into the carriage motor drive circuit to decrease the motor torque. The purpose of this function is to protect users from possible injury they may suffer when they open the case and touches the carriage as the carriage is moving toward the capping position.

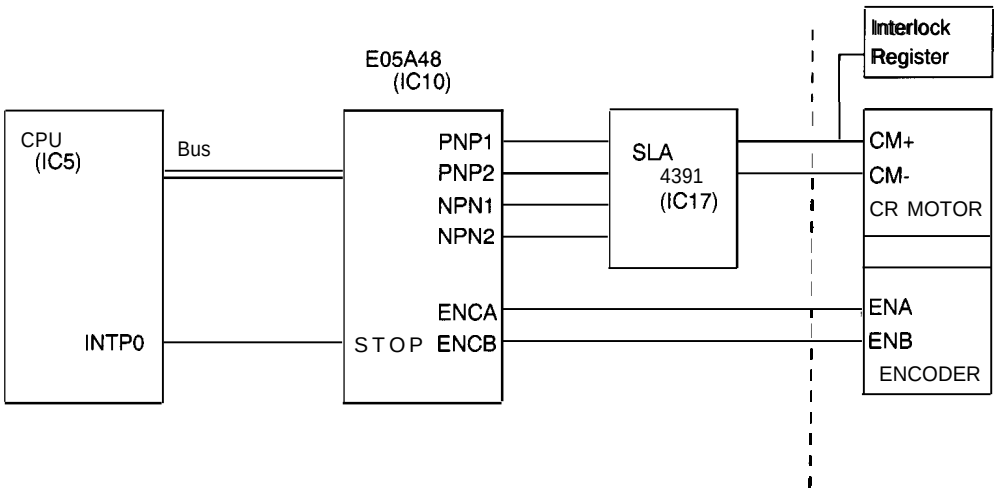


Figure 2-42. Carriage Motor Drive Circuit

This printer has four different carriage speeds as listed below.

Table 2-7. Carriage Motor Drive Modes

Mode No.	Carriage Speed	Dot Density
o	6.60 KHz	180 DPI
1	4.80 KHz	360 DPI
2	2.40 Khz	360 DPI
	0.48 KHz	●1

*1: This speed is used only in Home Position Seek operation.

2.3.6 Printhead Drive Circuit

Figure 2-43 shows the printhead drive circuit.

The print data developed by CPU is transferred to the head control gate array - E05A65 (ICI 2) via data bus. The data for 48 nozzles stored in E05A65 is serially transmitted from HDDAT port to the head driver - μPD 1632 (IC8,9). HDCLK is a clock for this serial transmission. The E05A65 transmits HDSTB signal as soon as the data transmission for 48 nozzles is completed.

The head is controlled by CHG and DSCHG pulses.

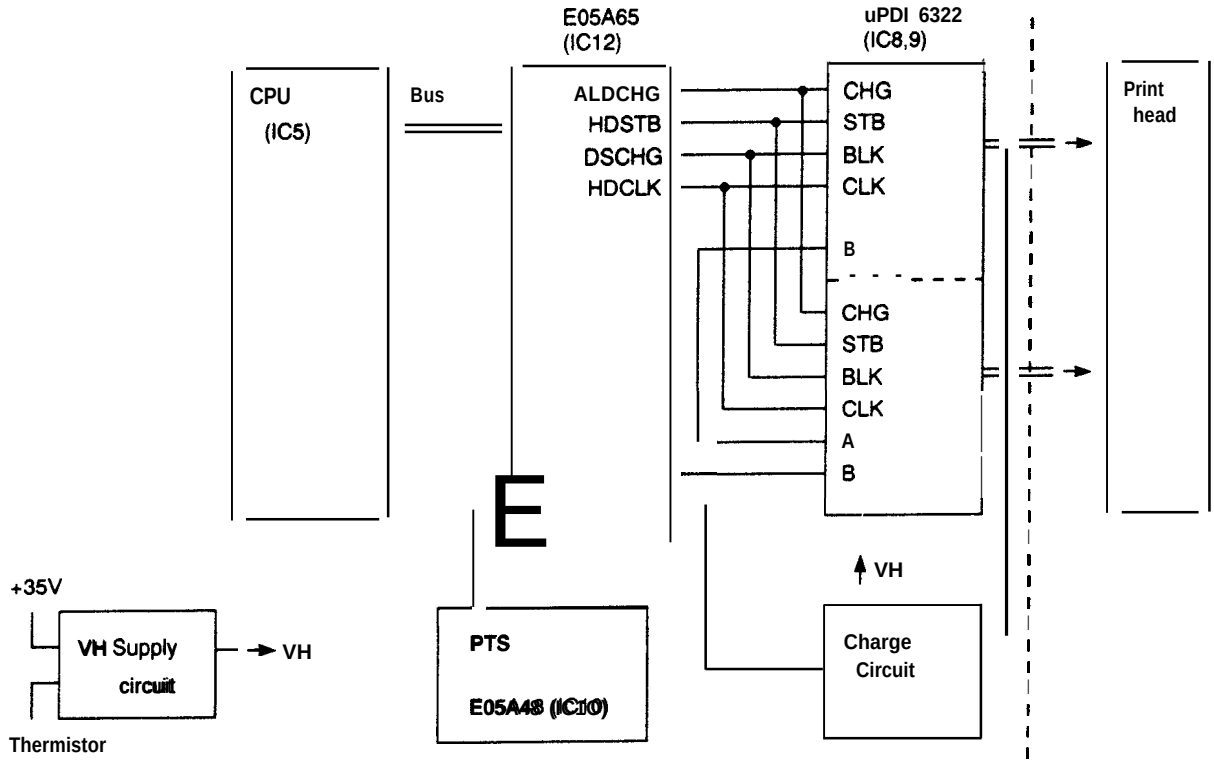


Figure 2-43. Printhead Drive Circuit

The printhead drive circuit can be divided into two circuits: Charge/discharge circuit and Printhead voltage supply circuit.

(1) Charge/discharge circuit

Figure 2-44 shows the charge/discharge circuit,

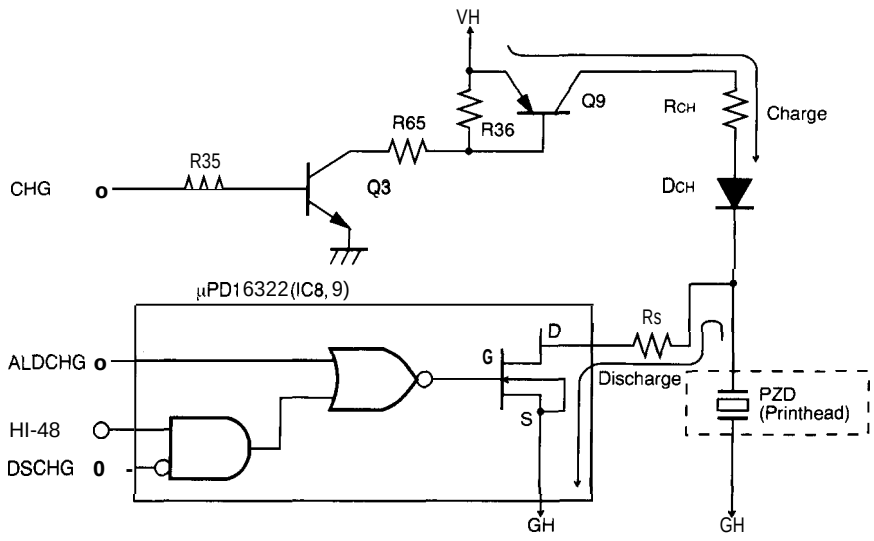


Figure 2-44. Charge/Discharge Circuit

< Charge pulse >

When the gate array (E05A65) outputs HIGH pulse from CHG port, the transistors (Q3,9) go ON and thus the Vh voltage charges the piezoelectric elements (PZD) through the diode (DCH) and resistor (RCH). Figure 2-45 shows the head condition at this time.

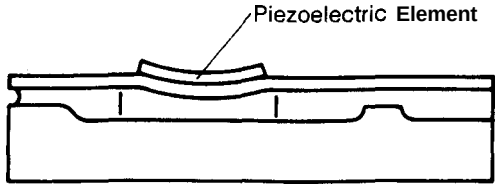


Figure 2-45. Head Charge Condition

< Discharge pulse >

The data for 48 nozzles stored in the gate array (E05A65) is serially transmitted from HDDAT port to the printhead drive IC (μPD 16322). Following this, the discharge pulse is transmitted from E05A65 to μPD 16322. The μPD 16322 then discharges PZD according to the print data to cause the nozzles to inject ink. (PZD is always charged by Vh.)

For cleaning operation, the E05A65 sends ALDSCHG signal to μPD 16322, which automatically discharges ail the piezoelectric elements to cause all the nozzles to inject ink.

Figure 2-46 shows the nozzle in discharge condition.

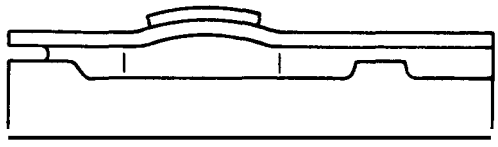


Figure 2-46. Head Discharge Condition

Figure 2-47 shows the timing for discharge/charge pulse.

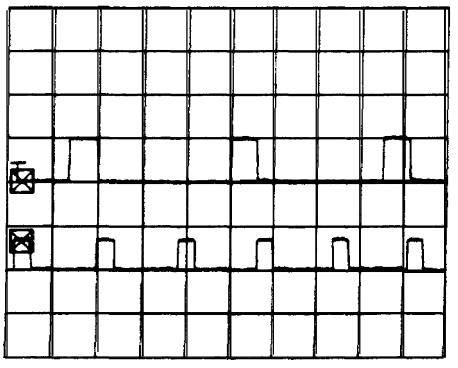


Figure 247. Timing for Discharge/Charge Pulse

(2) Printhead Voltage Supply Circuit

The viscosity of ink is subject to change due to the temperature. If the viscosity is too high, ink injection becomes difficult. To eliminate this difficulty, the head drive voltage (Vh: the +35 VDC voltage boosted to 83 -123.7 VDC in this circuit) is controlled based on the ink temperature detected by the thermistor. That is, the temperature is fed back to the voltage supply circuit and controlled by TL494.

Since each printhead produced shows slightly different characteristics, this difference must be neutralized by adjusting the head drive voltage. For this purpose, several zener diodes (used for detecting output voltage) and a DIC jumper are provided. When the printhead or the MAIN board is replaced, adjust the DIC jumper to connect the zener diodes in proper arrangement.

For safety, this circuit is automatically disconnected when a case open condition is detected.

2.3.7 Pump Motor Drive Circuit

Figure 2-48 shows the block diagram of the pump motor drive circuit.

A DC motor is used to drive the pump. The drive circuit is controlled by the collector-follower bridge - SOH03(IC 16).

The rotational direction of the motor is controlled through the ports on E05A65. If PMCW signal is transmitted from PC0, the motor rotates CW. If PMCCW signal is transmitted from PC 1, the motor rotates Ccw.

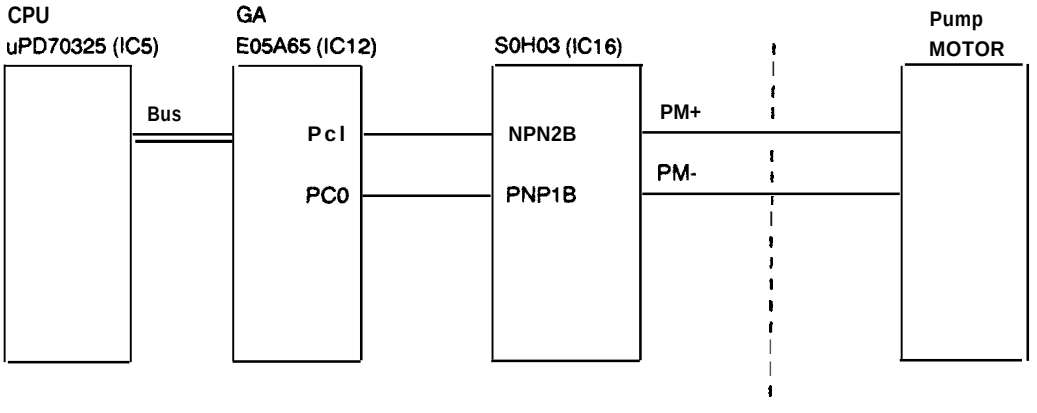


Figure 248. Block Diagram of Pump Motor Drive Circuit

2.3.8 TE Motor Drive Circuit

A stepping motor is used to drive the TE motor. The phase data for the stepping motor is transmitted from the port on E05A65 to the driver - PU 1501, and controls the stepping motor by constant-voltage method. The TE motor is supplied with + 5 VDC in hold mode, and +35 VDC in drive mode. This switching is controlled through the port PD3 on E05A65.

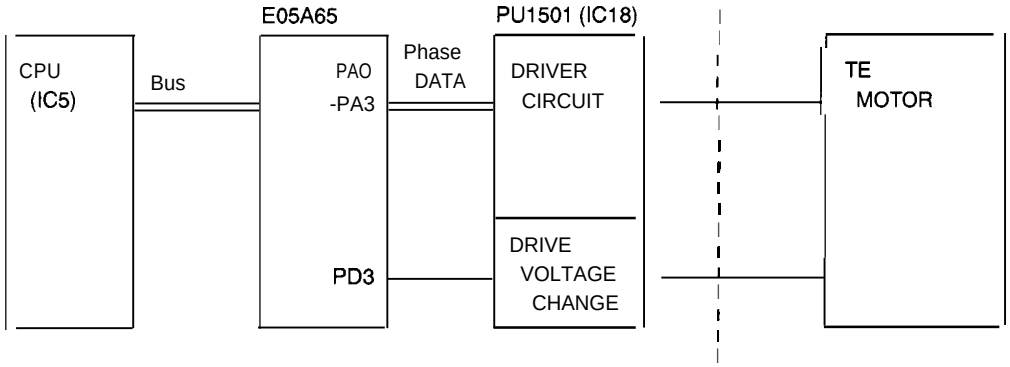


Figure 2-49. Block Diagram of TE Motor Drive Circuit

2.3.9 Timer Circuit and Backup Circuit

Figure 2-50 shows the block diagram of the timer circuit and the backup circuit.
The timer circuit (TC8521 AM on CPU bus) outputs the time data used for the pump unit sequence control. The operation of this circuit is independent of the main power ON/OFF state. The backup circuit is used to back up the timer circuit in the main power OFF state. Since this circuit monitors the + 5 VDC line, it supplies + 5 VDC as soon as the main power is turned on. When the + 5 VDC line indicates + 3.3 VDC or less, the power is supplied from the lithium battery.

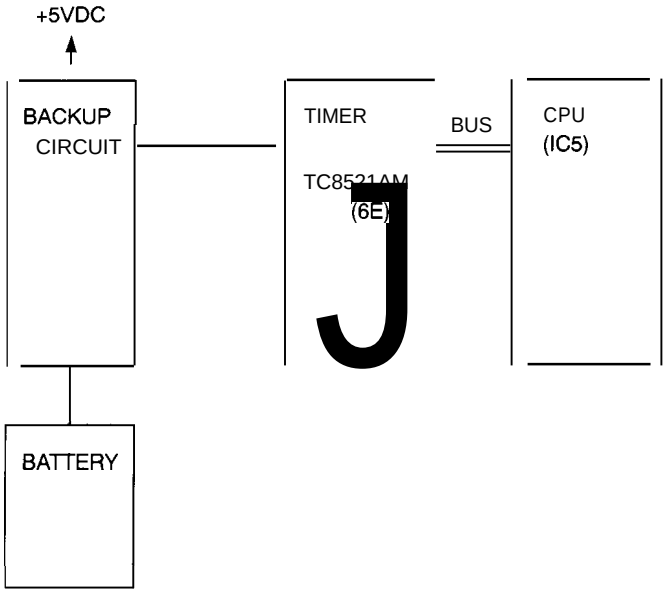


Figure 2-50. Block Diagram of Timer Circuit/Backup Circuit

2.3.10 EEPROM Control Circuit

This printer is provided with an EEPROM to store the data such as panel settings, paper position data (Paper cut position/Current printed line), wasted ink drain tank replacement counter, etc. when the main power is OFF. When the main power is ON, the data is stored in the RAM. But the data in the RAM will be erased as soon as the main power is turned off. To maintain the data, this printer monitors +35 VDC line through PST529C (IC7) and, *as soon* as the voltage goes lower than +25 VDC (approx.), transfers the data from the RAM to the EEPROM.

The data in EEPROM is read/written by/to E05A65 in serial mode.

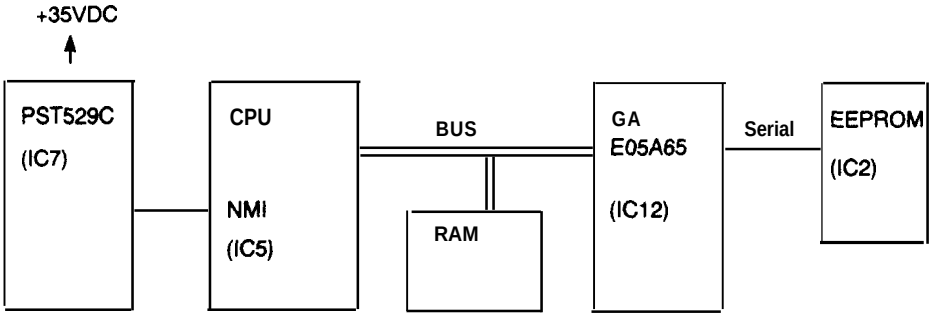


Figure 2-51. **EEPROM** Control Circuit

CHAPTER 3
DISASSEMBLY AND ASSEMBLY

LIST OF FIGURES

LIST OF TABLES

3.1 OVERVIEW

This section describes the various points to note when disassembling, assembling and transporting the printer.

3.1.1 Precautions for Disassembling the Printer

Follow the precautions below when disassembling the printer.

WARNING

- **Disconnect the power cable before disassembling/assembling/adjusting the printer.**
- **Wear glasses to protect your eyes against ink. If your eyes or any injured part of body get ink, wash it away with fresh water and see the doctor immediately.**
- **A lithium battery is installed on the main board of the printer. Be sure to observe the following instructions in servicing the printer or in storing the service parts.**
  - **a. Keep the battery away from any metal or other batteries so that the electrodes of opposite polarity may not contact each other. Otherwise, the battery may burn or lode from the tremendous heat generated inside.**
  - **b. Do not heat the battery. Do not put it in fire.**
  - **c. Do not solder on any part of the battery except terminals.**
    (Doing so may result in leakage, burning, or explosion. The leakage may affect other devices mounted close to the battery.)
  - **d. Do not charge the battery. (An explosive gas may be generated inside, and causes burning or explosion.)**
  - **e. Do not disassemble nor distort the battery. (The gas inside the battery may hurt your throat. Leakage, burning, or explosion may also result.)**
  - **f. Do not mount the battery in the wrong direction. (It may result in burning or explosion.)**

CAUTION

- **When repairing the printer, be sure to empty the ink inside the ink cartridge or used ink pack in order to protect yourself against ink or to keep the printer clean.**
- **Inform users on every occasion of the appropriate ways to transport the printer.**
- **Use only recommended tools. We do not compensate for the damage of the printer resulted from using improper tools.**
- **Apply lubricants\adhesives as specified. (See Chapter 6.)**
- **Make adjustments as specified. (See Chapter 4.)**
- **Never fail to read the details of precautions described below.**

‘ANGER

Danger of explosion if battery is incorrectly replaced. Replace only with same or equivalent type recommended by SEIKO EPSON Co.. Discard used batteries according to government’s safety instruction.

Since this printer employs the ink mechanism, it requires special handling as follows.

(1) Ink handling before/after repair

The ink path of the ink-jet printer is filled with ink for the whole operating period. Because of this, it is necessary to take the following steps before/after repair.

Table 3-1. Ink Handling Steps

Condition	Trouble expected	Countermeasures
When replacing printer mechanism, head, or pump.	Ink leakage	Cap the printhead. Discharge all the ink.
When returning the printer to the user.	Ink leakage (caused by shock or vibration)	Cap the printhead.
	Clogging of nozzles (caused by long left ink)	Fill preservation liquid. Cap the printhead.

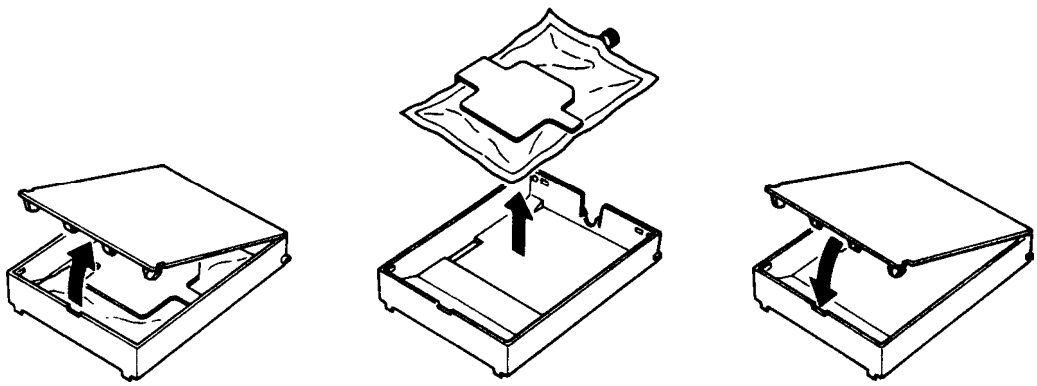
NOTE: The "long left ink'" refers to any ink expected to be left unused for more than a week due to transportation or storage. If you are sure the user is going to use the printer within a week, you can deliver the printer with ink charged.

< Ink discharge operation>

You can discharge all the ink in the mechanism by performing the cleaning operation for about 10 times with the false ink cartridge set in the ink cartridge holder. (In this operation, you have to turn off the printer power after every 2nd cleaning step, because pressing the cleaning button for the 2nd time only results in a false cleaning step if the power remains on. This mechanism is provided to prevent excessive ink consumption.)

Note that excessively frequent ink discharge operation shortens the life of wasted ink drain tank.

NOTE: You must prepare the "false ink cartridge" for yourself. You can easily change over an ink cartridge as shown below.



(1) Open the ink cartridge case. (2) Take out the ink pack. (3) Close the case.

Figure 3-1. How to Make a False Ink Cartridge

< Filling preservation liquid>

If it seems to take more than a week before the user receives the printer, fill the printhead with preservation liquid. You can fill the liquid in the following procedure:

[Step 1] Set the false ink cartridge on the ink cartridge holder.

[Step 2] Insert the preservation liquid charge identity ROM module (TRANSPORTATION LIQUID FILL UP PROGRAM CARTRIDGE #F588) into the ROM cartridge slot.

[Steo 3] Power ON. The BIN 1 LED on control panel brink, and printer discharge ink for printer mechanism ink path.

[Step 4] When the MICRO FEED LED blink, change the false ink cartridge to the preservation liquid cartridge (TRANSPORTATION LIQUID CARTRIDGE #F587) on the ink cartridge holder.

[Step 5] Push the FORM FEED switch. The BIN 2 LED brink, and printer charge preservation liquid to printhead.

[Step 6] When the MICRO FEED LED blink, change the preservation liquid cartridge to false ink cartridge.

[Step 7] Push the FORM FEED switch. The TEAR OFF LED blink.

[Step 8] When the MICRO FEED LED blink, push the FORM FEED switch.

[Step 9] When all LEDs on the control panel, power off.

< Ink charge (initial charge)>

"Ink charge" refers to filling the ink path with ink. You can execute the ink charge by turning on the power while holding down the cleaning switch. The PAUSE button blinks during the operation, which takes 3 or 4 minutes. This operation can only be performed up to 6 times so that ink consumption may be minimized. Any "ink charge" operations that follow will result in "false ink charge" operation.

< Head capping and carriage moving>

When returning the printer to the user, make sure the head is capped. Failing to do so may result in nozzle clogging or ink leakage.

Also, you must lock the carriage with the cleaning lever after capping the head. When moving the carriage with your hands, turn the SPUR GEAR (20) with your fingers to make the lever draw back. If you want to cap the head manually, you must lock the carriage with the cleaning lever in a different manner. That is, turn the spur gear with your fingers to make the lever stick out.

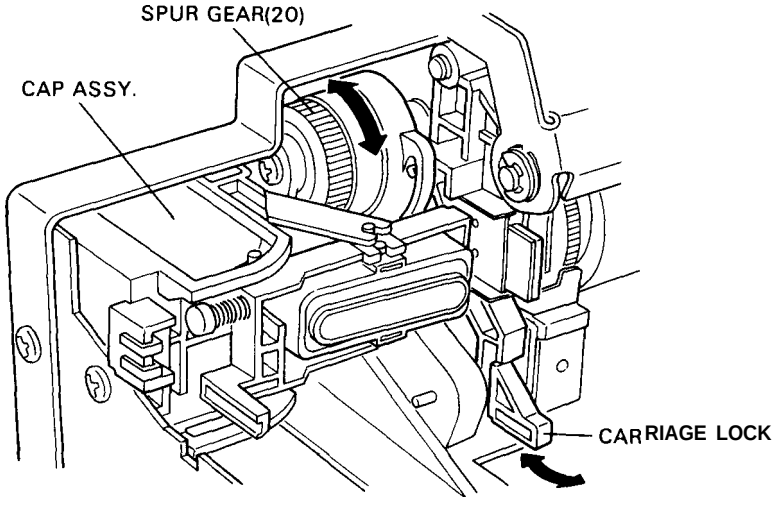


Figure 3-2. Releasing Carriage Lock

(2) Wasted Ink Drain Tank

This printer is provided with the wasted ink drain tank, which is designed to have a sufficient capacity to collect the waste ink that is used during the whole printer life. However, it must be replaced in the following conditions.

- **The "OVERFLOW" message is displayed. (All the LEDs on the panel turn blinking and no print data will be accepted.)**
- **The value of "Wasted Ink Drain Tank Replacement Counter" exceeds the following value;[5,000 X number of years the printer is used]. The value will be printed out under the name of ROM version, if you perform "Self test". (e.g. The printer used for 2 years indicates the value "10,000".)**
- **If the counter value cannot be printed out due to malfunction of the printer, weigh the tank and replace it if it exceeds 240g.**

If you have replaced the tank, reset the counter in the following procedure: (1) Turn the power on while holding down RESET and MICRO FEED switches. (2) Press LF switch. (3) Press FF switch. (4) The printer sounds the buzzer 3 times after resetting the counter. (4) The PAUSE lamp blinks. Following the procedure described above, be sure to adjust PRINTING POSITION setting which has also been reset.

(3) Transportation

Make sure the following preparations are properly made before delivering the printer.

- **Capping**
- **Removing ink cartridge**
- **Setting shockproof attachments**
- **Packaging**

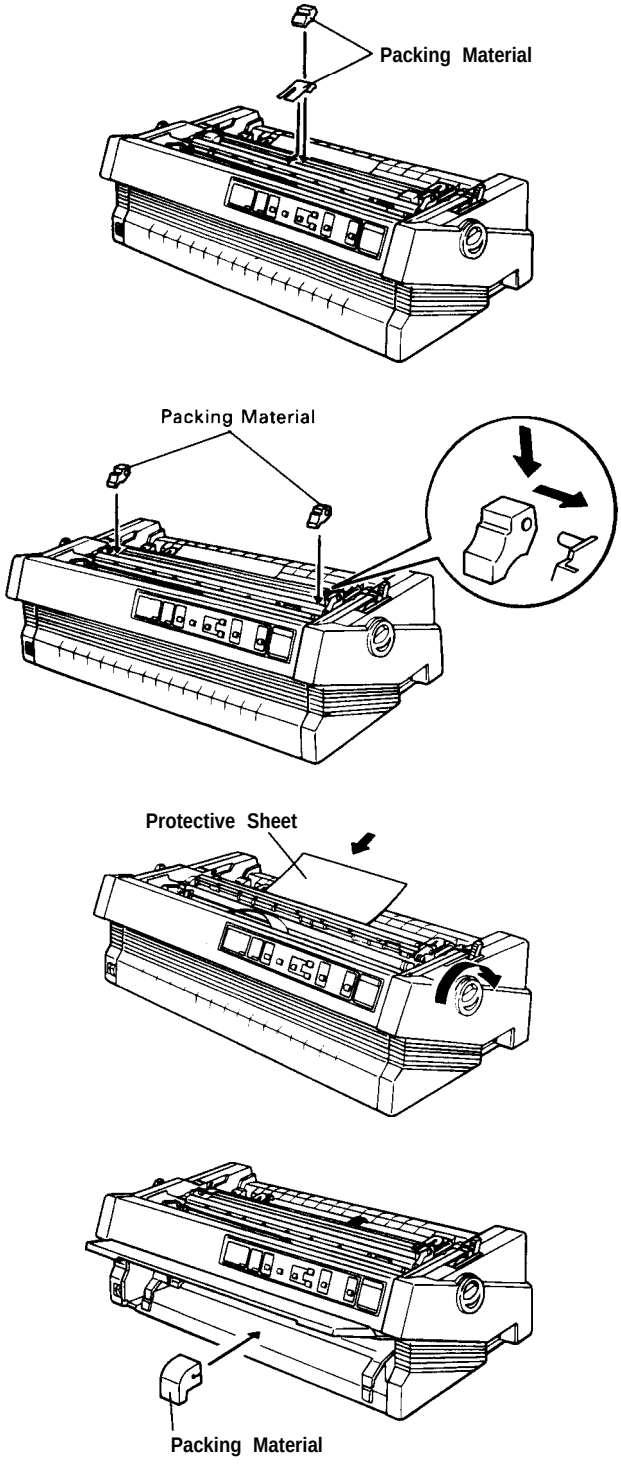


Figure 3-3. Setting Shockproof Attachments

The procedures (1) (2) (3) described above are listed in Table 3-2. (Also refer to Table 3-7)

Table 3-2. Service Process

	Procedure	Description	Cartridge used	Remarks
1	Capping	Cap the head	None	Power on/off or manually
2	Ink discharge	Remove all the ink in the ink path	False ink cartridge	Perform cleaning about 10 times
3	Repair			
4	Self test	Check	Ink cartridge	Test Print
5	On-line test	Check	Ink cartridge	On-line Print
6	Filling preservation liquid	Fill the ink path with the liquid	Preservation liquid cartridge	Refer to Page 3-3
7	Capping	Cap the head		Power on/off
8	Packaging	Set shockproof attachments		

(4) Maintenance

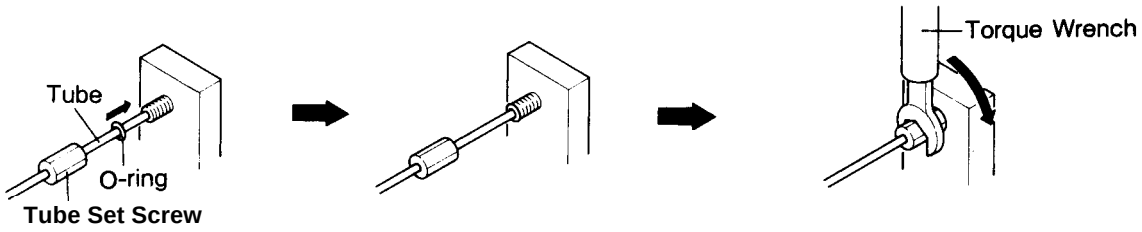
Perform lubricating, adhering, and cleaning according to Chapter 6 "Maintenance" after disassembling/assembling and/or adjustment.

(5) Adjustment

Make adjustment according to Chapter 4 "Adjustment" after disassembling/assembling and/or replacement.

3.1.2 Tools

Table 3-3 and 3-4 list the recommended tools and instruments used for disassembling/assembling, adjusting, or measuring purposes. Be sure to use a proper tool for each step or operation, especially when servicing the ink tube in the pump unit. As shown in Figure 3-4, you must use a specified torque wrench to tighten the tube set screw. If tightened to an excessive degree, the O-ring may break or crack to cause ink leakage. Also make sure the tube is inserted to the end before tightening the tube set screw.



1. Insert the tube fully. 2. Set the O-ring. 3. Tighten the tube set screw.

Figure 3-4. Fastening Tube Set Screw

Table 3-3. Tools

Tool	Availability	Part No.
Round-nose pliers	o	B740400 100
Nippers	o	B740500 100
Tweezers	o	B74 1000100
Soldering iron	o	B740200 100
E-ring holder #2.5	o	B740800400
E-ring holder #3	o	B740800500
E-ring holder #4	o	B740800600
E-ring holder #6	o	B740800800
Phillips screwdriver No. 2	0	B743800200
Normal screwdriver	o	B743000 100
Box driver (7 mm across)	o	B74 1700200
Tension gauge (3,000 g)	o	B747700200
Torque wrench (6mm X 1 Kg) #E589	E	B765 106901
Transportation liquid cartridge #F587	E	S02001 9
Transportation liquid fill up program cartridge #F588	E	C820 180
Thickness gauge (1 .00 mm) #F590	E	1011019
Dummy register #F591	E	1011020
Dial gauge #F603	o	1011974
Dial gauge base	E	1011018

Note: o = market purchase, E = exclusive tool of EPSON

Table 3-4. Instruments

Designation	Specification
Oscilloscope	20 MHz
Multi meter	

< Screw designation>

Ail small parts, such as screws and washers, are indicated by abbreviations.

Table 3-5. Abbreviations List of Small Parts

Abbreviation	Part Name
C.P.S. Screw	Cross-recessed Pan-head S-tight screw
C.B. B. Screw	Cross-recessed Bind-head B-tight screw
C.C.U. Screw	Cross-recessed Cup-head Uska screw
C. B. S-tite Screw	Cross-recessed Bind-head S-tight screw
C.B. Screw	Cross-recessed Bind-head screw
C. P. B-tite Screw	Cross-recessed Pan-head B-tight screw
C.B.S. Screw	Cross-recessed Bind-head S-tight screw
C.B.P. Screw	Cross-recessed with Plain washer screw
C.C. Screw	Cross-recessed Cup-head screw
C. P. S. (P) Screw	Cross-recessed Pan-head S-tight with Plain washer screw

Table 3-6. Form and Abbreviated Part Name of Screw

Heed		Body	Washer (assembled)
Top	Side		
1.Cross—recessed head	1.Bind	1.Normal	1.Plain washer
2.Slotted head	(with Notch)	2. S-tight	2.Outside toothed lock washer
	2.Pan	3. B-tight	
	3.Cup	4. Tapping	3.Spring washer
	4. Truss		

3.1.3 Service Check List

After servicing, be sure to check the printer for any abnormality using the following list.

Table 3-7. Service Check List

Category	Component	Item to Check	Is Check Required?
Printer features	Printhead	Nozzle clogging	❑ Checked, ❑ Not necessary
	Carriage Mechanism	Does the carriage move smoothly? ❑ Movement noisy, ❑ Mechanism dirty, 13 Mechanism oily	❑ IChecked, ❑ Not necessary
		Is the carriage motor running at the correct temperature and not overheating?	❑ Checked, ❑ INot necessary
	paper advance mechanism	Is the paper advancing smoothly? ❑ Movement noisy, ❑ iMechanism dirty, ❑ IMechanism oily	❑ IChecked, ❑ Not necessary
		Is the paper advance motor running at the correct temperature and not overheating?	☐Checked, ❑ Not necessary
	Paper path	Is the type of paper in the printer feeding smoothly?	❑ IChecked, ❑ INot necessary
		Is the tractor feeding the paper correctly?	❑ IChecked, ❑ INot necessary
		Is the paper path clear of all obstructions?	☐Checked, ❑ INot necessary
	Wasted Ink Drain Tank	Is the tank full?	☐Checked, ❑ INot necessary
	Self-test	Was the self-print test successful?	❑ Checked, ❑ Not necessary
	On-line test	Was the on-line test successful?	13 Checked, ❑ INot necessary
Adjustment	Printhead	Are the platen gap and the platen parallelism adjusted correctly?	☐Checked, ❑ Not necessary
	Printing	Are the bi-directional print position and head slant adjusted correctly?	☐Checked, ❑ iNot necessary
	Circuit board	Is the printhead drive voltage adjusted correctly?	☐Checked, 13 Not necessary
System upgrade	ROM version	The ROM version is XXXX.	13 Checked, ❑ Not necessary
Shipment		Has the ink cartridge been removed?	❑ IChecked, ❑ INot necessary
		Has the preservation liquid been filled?	☐Checked, ❑ Not necessary
		Have all relevant parts been included in the shipment?	☐Checked, ☐Not necessary

3.2 DISASSEMBLY AND ASSEMBLY

This chapter describes procedures for disassembling main components of this printer. Unless otherwise specified, the disassembled unit or components can be reassembled simply by performing the disassembly procedure in the inverted sequence. The assembly procedure is, therefore, omitted in this manual. Cautions for the assembly procedures are shown as "ASSEMBLY POINTS". Adjustments required after assembling are shown as "REQUIRED ADJUSTMENT ITEMS".

WARNING

- **Be sure to read section 3.1 and follow instructions** when attempting to disassemble the unit.
- **Before disassembly, remove shockproof attachments** used for transportation.
- **Before disassembly, remove paper and ink cartridge.**

This section consists of the following seven paragraphs.
(1) Housing Removal (2) Printhead Replacement (3) Wasted Ink Drain Tank Replacement (4) Printer Mechanism Removal (5) Circuit Board Removal (6) Ink Cartridge Holder Removal (7) Printer Mechanism Disassembly Refer to the exploded view of the printer in the APPENDIX for reference.

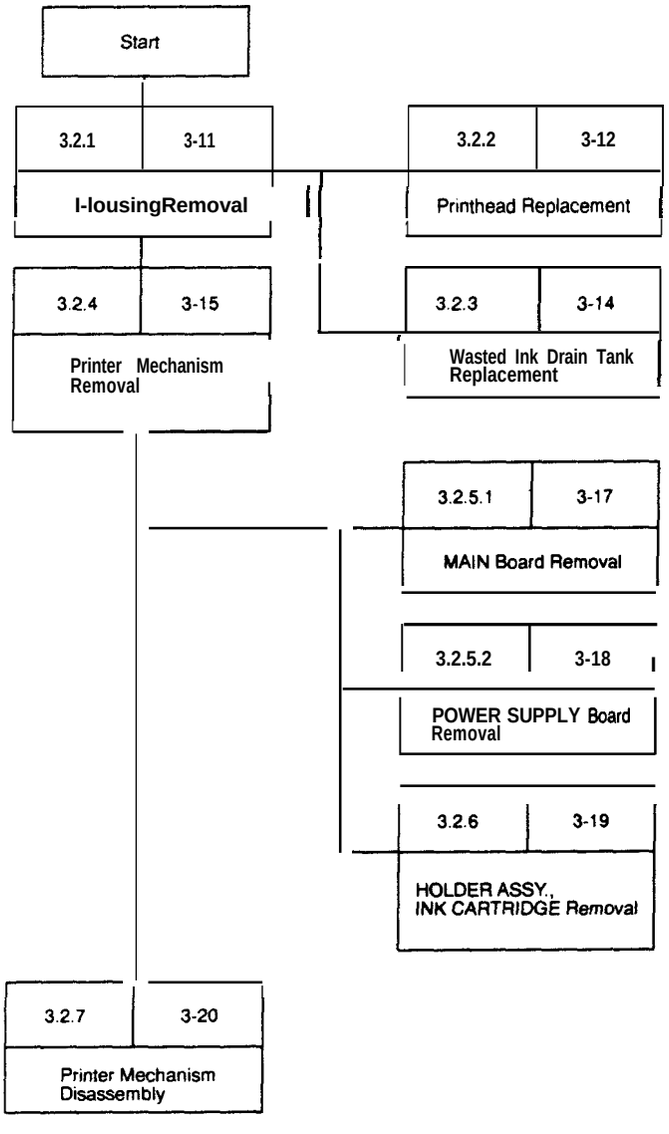


Figure 3-5. Removal/Disassembly Flow Chart

3.2.1 Housing Removal

This paragraph describes the procedures for removing the HOUSINGS, FRONT and UPPER.

[Step 1] Remove the SHEET GUIDE ASSY., REAR, the COVER, PRINTER, the COVER, FRONT, the SHEET GUIDE ASSY., FRONT, the tractor, and the knob.

[Step 2] Unscrew C.B. B. screw (M3 X 12) attaching COVER, GEAR to the HOUSING, UPPER, to remove the COVER, GEAR.

[Step 3] Unscrew C.B. screw (M4 X 16) attaching the HOUSING, UPPER and C.B.B. screw (M3 X 12) attaching the HOUSING, FRONT to the HOUSING, UPPER.

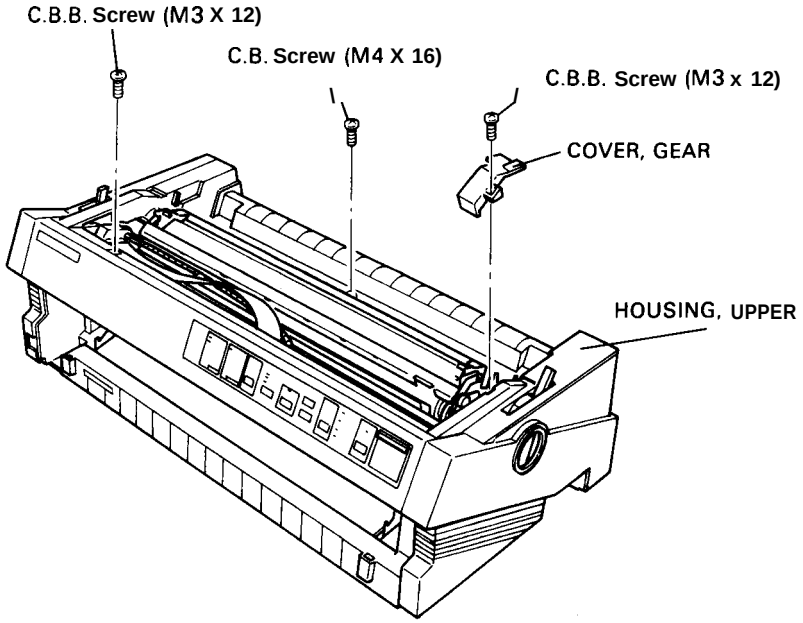


Figure 3-6. Housing Removal (1)

[Step 4] Remove 3 pawls attaching the HOUSING, FRONT to the HOUSING, UPPER. (80-column printer: 2 pawls)

[Step 5] Pull the HOUSING, FRONT toward you, and disconnect 2 connectors on the control panel to remove the HOUSING, FRONT.

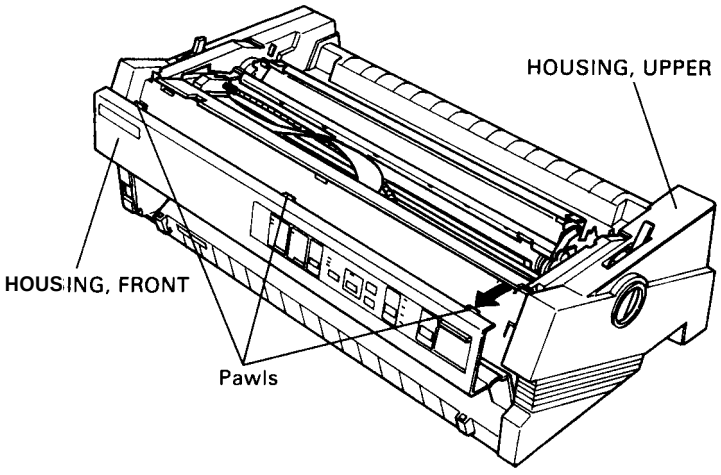


Figure 3-7. Housing Removal (2)

[Step 6] Disconnect the connector that connects the interlock switch to the resistor at the rear of the printer mechanism.

[Step 7] Raise the front side of the HOUSING, UPPER with the rear side held.

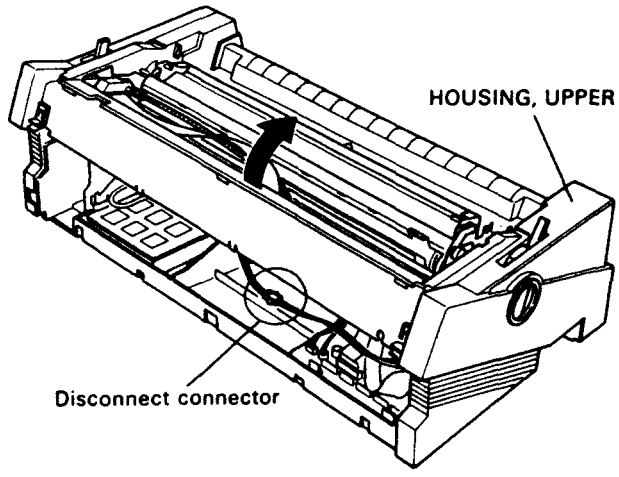


Figure 3-8. Housing Removal (3)

3.2.2 Printhead Replacement

This section describes the procedures for disassembly and assembly of the printhead.

[Step 1] Discharge ink. (Refer to section 3.1. 1.)

[Step 2] Remove the housing. (Refer to section 3.2. 1.)

[Step 3] Remove C.B.S. screw (M3 X 8) fastening the PRESSING PLATE, COVER SPRING, LOWER to remove the PRESSING PLATE, COVER SPRING, LOWER.

[Step 4] Release the carriage lock. (Refer to section 3.1. 1.)

[Step 5] Disconnect FPC of the printhead from 2 connectors on the carriage.

[Step 6] Remove 2 screws (CUP screw (M3 X 8)) attaching the printhead to the carriage.

[Step 7] Loosen the TUBE SET SCREW attaching the TUBE, SUPPLY, INK to the printhead to remove the TUBE, SUPPLY, INK from the printhead.

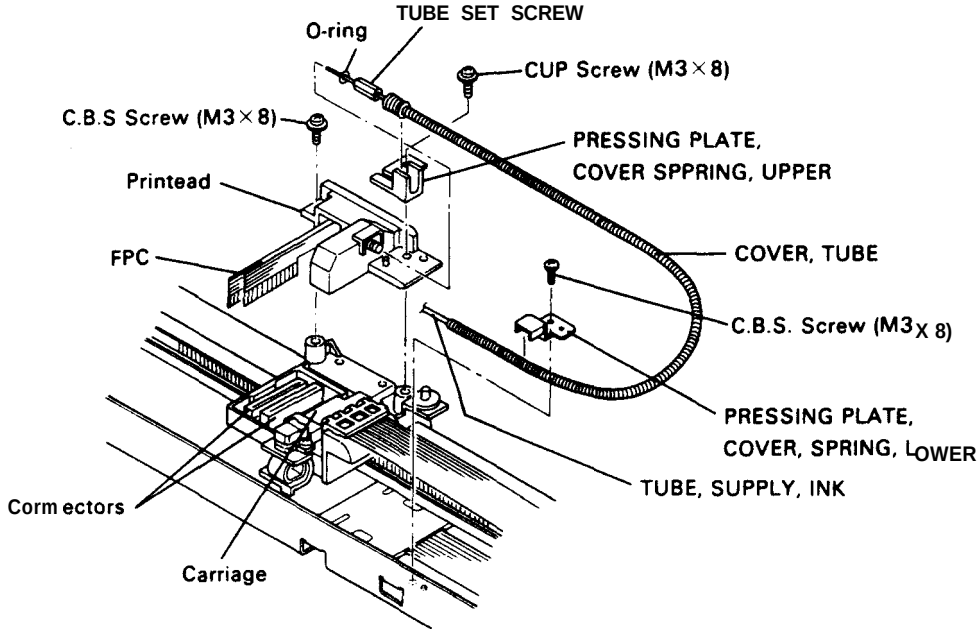


Figure 3-9. Printer Head Replacement

ASSEMBLY POINTS

When assemble the printhead, follow the procedures shown below.

[Step 1] Verify that the PIN, ADJUST on the carriage is set in the direction as shown in the Figure below.

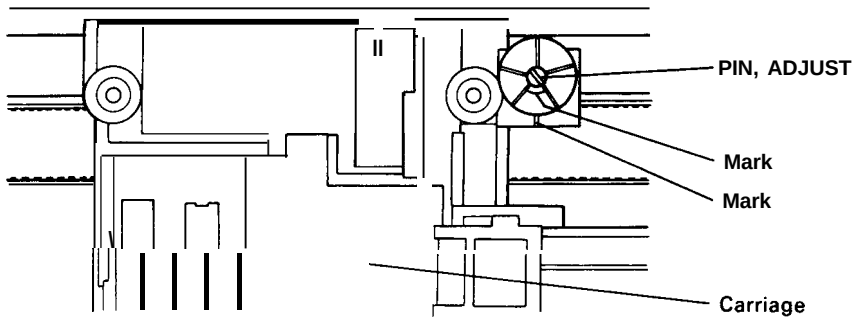


Figure 3-10. Setting PIN, ADJUST Direction

[Step 2] Engage the tube set screw and O-ring onto the TUBE, SUPPLY, INK.

[Step 3] Connect the TUBE, SUPPLY, INK to the printhead and tighten the TUBE SET SCREW with a tightening torque of 1 kg (Refer to section 3. 1.2.).

[Step 4] Mount the printhead on the carriage and fasten the printhead with 2 screws (CP (P) (M3X 8)) (See Figure 3-9.)

[Step 5] Attach the cover, TUBE to the frame, FRONT with the screw (CUP screw (M3 X 8)) and the PRESSING PLATE, COVER SPRING, UPPER.

[Step 6] Loosen the screw (CUP screw (M3 X 8)) which fasten the printhead along with the PRESSING PLATE, COVER SPRING, UPPER and then adjust the PRESSING PLATE, COVER SPRING UPPER until it is parallel to the COVER, TUBE.

[Step 7] Verify that the COVER, TUBE does not interfere with the FPC by manually moving the carriage left and right.

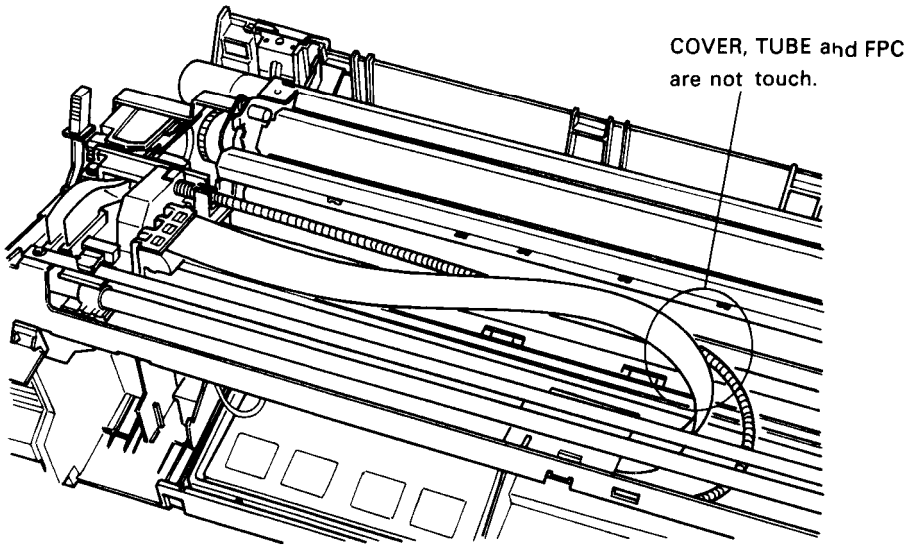


Figure 3-11. Setting PRESSING PLATE, COVER SPRING, UPPER

REQUIRED ADJUSTMENT ITEMS

If you have disassembled/assembled the printhead, make the following adjustment after repair.

- Printhead slant adjustment (Refer to section 4.5. 1.)

If you have replaced the printhead, make the following adjustment in the specified sequence,

(1) Platen gap adjustment (Refer to section 4.2.)
(2) Printhead drive voltage adjustment (Refer to section 4.4.)

3.2.3 Wasted Ink Drain Tank Replacement (TANK, INK EJECT)

This section describes how to replace the wasted ink drain tank.

[Step 1] Remove the housing. (Refer to section 3.2. 1.)
[Step 2] Separate the pump tube from the wasted ink drain tank (TANK INK, EJECT).

ASSEMBLY POINTS

- Be sure to apply the pump tube through the retaining hole before attaching the pump tube.
- Be sure to set the wasted ink drain tank (TANK, INK EJECT) in the correct direction onto th HOUSING, LOWER.
- If you have replaced the tank, reset the ink tank replacement counter according to 3.1.1. Following this, be sure to adjust PRINT POSITION setting (Refer to section 4.5.2.) which has als been reset.

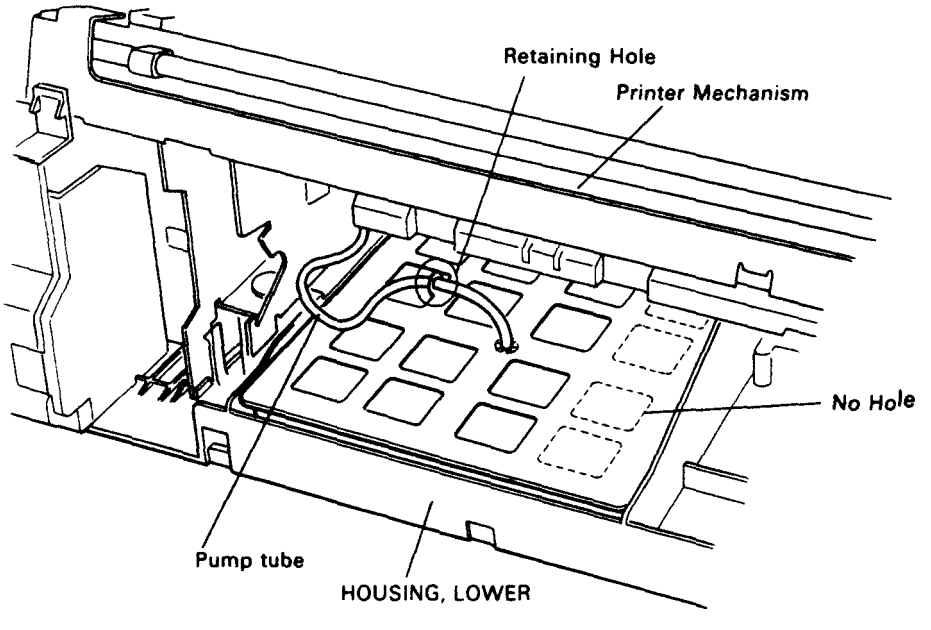


Figure 3-12. Attaching Wasted Ink Drain Tank

3.2.4 Printer Mechanism Removal

This section describes how to remove the printer mechanism.

WARNING

When working with the printer mechanism, take sufficient care in handling the ink.
Carefully read the precautions in 3.1.1 before beginning the work.

CAUTION

Discharge ink from the printer before removing the printer mechanism.

[Step 1] Remove the housing. (Refer to section 3.2. 1.)

[Step 2] Discharge the ink in the ink path of the printer mechanism. (Refer to section 3.1. 1.)

[Step 3] Unscrew 3 C.C.U. screws (M3 X 8) and 1 C.B.B. screw (M3 X 12) to remove the SHIELD PLATE, I/F.

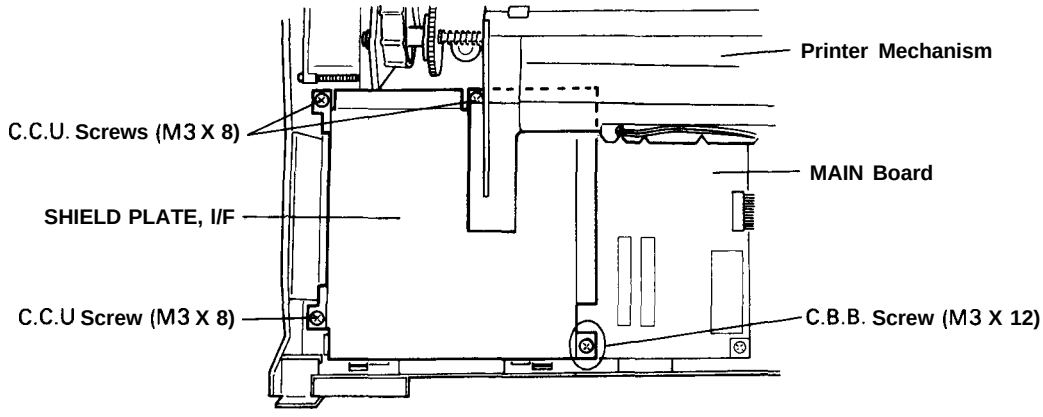


Figure 3-13. Removing SHIELD PLATE, I/F

[Step 4] Separate the pump tube from the wasted ink drain tank.

[Step 5] Remove the TUBE, SUPPLY, INK from the ink cartridge holder by removing the TUBE SET SCREW that fastens the TUBE, SUPPLY, INK to the cartridge holder.

[Step 6] Remove the cords (connected to the DETECTOR ASSY., INK CARTRIDGE and the DETECTOR ASSY., INK) from the rear side of the printer mechanism.

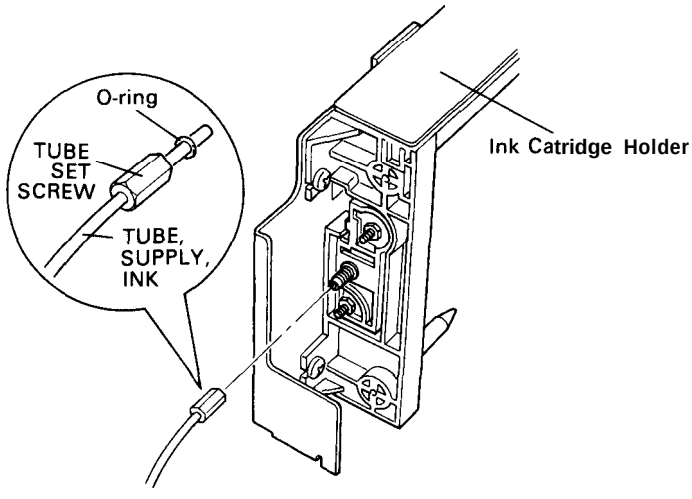


Figure 3-14. TUBE, SUPPLY, INK Removal

[Step 7] Disconnect the following connectors, which connect the printer mechanism to the MAIN board; CN 13 (Blue/6 pins), CN 14 (White/6 pins), CN 12 (White/2 pins), CN15 (White/2 pins), CN 18 (FPC/26 pins), CN 17 (FPC/36 pins), CN 11 (White/3 pins), CN 10 (Blue/3 pins), CN9 (Yellow/2 pins), CN8 (White/2 pins).

[Step8] Remove the 4 screws (PRINTER MECHANISM MOUNTING SCREW) fastening the printer mechanism to the HOUSING, LOWER.

CAUTION

When loosening the screws that fasten the printer mechanism, take sufficient care not to damage the FPC.

[Step 9] Remove the printer mechanism.

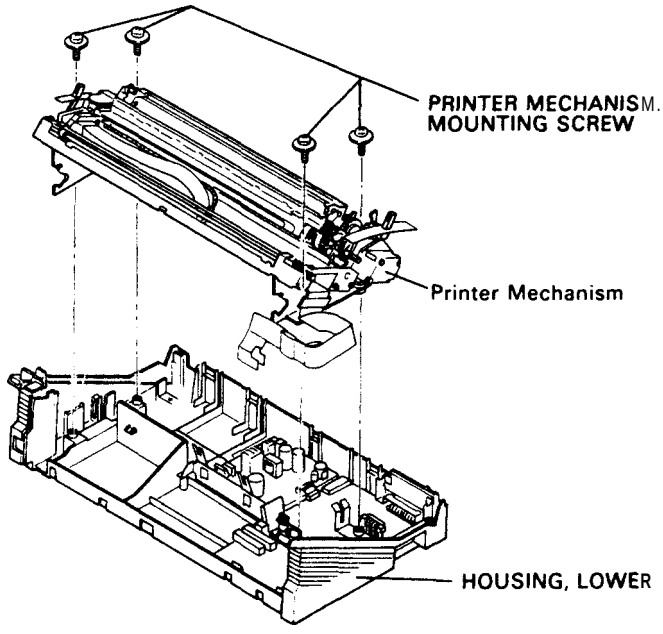


Figure 3-15. Printer Mechanism Removal

ASSEMBLY POINTS

Be sure to mate the connectors with each correct partner referring to the Table below.

Table 3-8. Connector Connection

Printer Mechanism Side	MAIN Board Side
Release detector (White: 2 Pin)	CN8 (White)
PE sensor (Front) (Yellow: 2 Pin)	CN9 (Yellow)
TE sensor (Blue: 3 Pin)	CN 10 (Blue)
PE sensor (Rear) (White: 3 Pin)	CN 11 (White)
Pump motor (White: 2 Pin)	CN 12 (White)
TE motor (Blue: 6 Pin)	CN 13 (Blue)
PF motor (White: 6 Pin)	CN 14 (White)
CR motor (White: 2 Pin)	CN 15 (White)

- Refer to "ASSEMBLY POINTS" in 3.2.3 when inserting the pump tube into the wasted ink drain tank.

REQUIRED ADJUSTMENT ITEMS

If you have replaced the printer mechanism, make the following adjustment in the specified sequence.
(1) Printhead drive voltage adjustment (Refer to section 4.4.)
(2) Print position adjustment (Refer to section 4.5.2.)

3.2.5 Circuit Board Removal

This section describes how to remove the MAIN board and the POWER SUPPLY board.

3.2.5.1 MAIN Board Removal

WARNING

When working with the MAIN board, take sufficient care in handling the battery. Carefully read the precautions in 3.1.1 before beginning the work.

CAUTION

- **To minimize damage to connectors, pull the female connector slowly while holding down the MAIN board.**
- **CN 17 and CN 18 are connected to FPC, which are different from ordinary connectors. Take special care in handling these connectors.**

[Step 1] Remove the housing. (Refer to section 3.2. 1.)

[Step 2] Remove the printer mechanism. (Refer to section 3.2.4.)

[Step 3] Unscrew CCU Screw (M3 X 8) which fastens the GROUNDING PLATE, RIGHT to the HOUSING, LOWER, and remove the GROUNDING PLATE, RIGHT and the COVER, MAIN BOARD.

[Step 4] Unscrew the 2 screws (C. B. S-TITE screw (M3 X 12)) which fasten the COVER, CONNECTOR, UPPER to the HOUSING, LOWER, and remove the COVER, CONNECTOR, UPPER.

[Step 5] Disconnect the following connectors on the MAIN board: CN 19, CN5, CN6, CN4

[Step 6] Unscrew the 4 screws (C. B.B. screw (M3 X 12) X 3 and C.C. U. screw (M3 X 8) X 1)) which fasten the MAIN board to the HOUSING, LOWER, and remove the MAIN board.

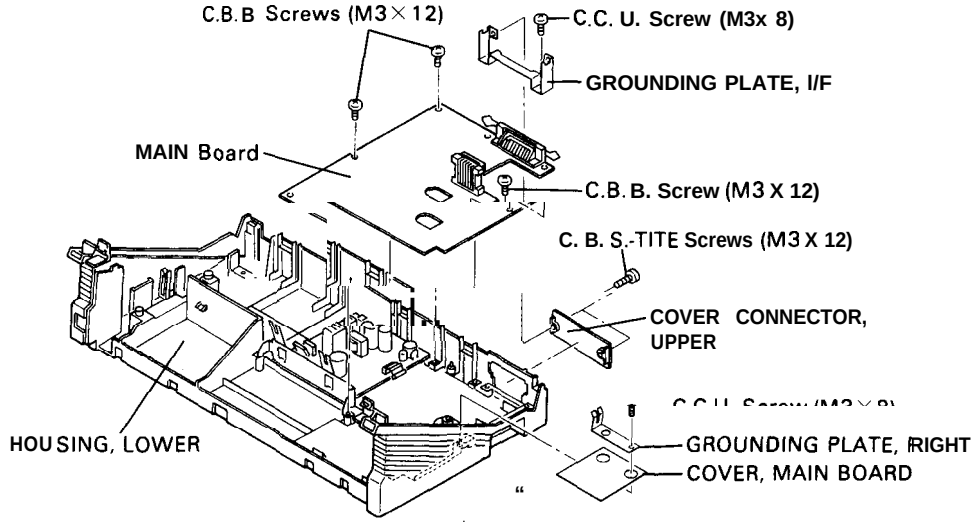


Figure 3-16. MAIN Board Removal

ASSEMBLY POINTS

- If you have replaced the MAIN board, take the weight of the wasted ink drain ink tank and replace it if the weight exceeds 240g.
- If you have replaced the MAIN board, reset the wasted ink tank replacement counter before making the following adjustments.

REQUIRED ADJUSTMENT ITEMS

If you have replaced the printer mechanism, make the following adjustment in the specified sequence.
(1) Printhead drive voltage adjustment (Refer to section 4.4.)
(2) Print position adjustment (Refer to section 4.5.2.)

3.2.5.2 POWER SUPPLY Board Removal

[Step 1] Remove the housing. (Refer to section 3.2. 1.)
[Step 2] Remove the printer mechanism. (Refer to section 3.2.4.)
[Step 3] Disconnect the connector CN4 on MAIN board.
[Step 4] Unscrew the 3 screws (C.B. B. screw (M3 × 12) X 2 and C.C.U. screw (M3 X 8) X 1)) which fasten the POWER SUPPLY board to the HOUSING, LOWER, and remove the POWER SUPPLY board.

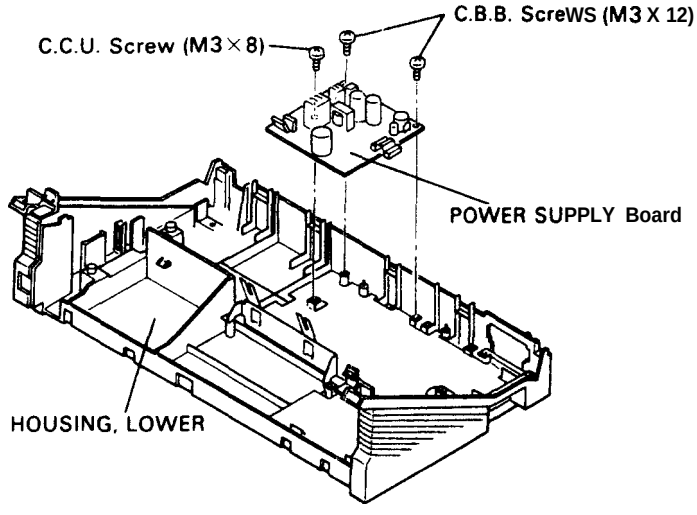


Figure 3-17. POWER SUPPLY Board Removal

3.2.6 HOLDER ASSY., INK CARTRIDGE Removal

[Step 1] Remove the housing. (Refer to section 3.2.1.)

[Step2] Remove the printer mechanism. (Refer to section 3.2.4)

[Step 3] Unscrew C.B.B. screw (M3× 12) which fastens the HOLDER ASSY., INK CARTRIDGE to the HOUSING, LOWER to remove the HOLDER ASSY., INK CARTRIDGE together with the TORSION SPRING, 3490 and the COVER, HOLDER, INK CARTRIDGE.

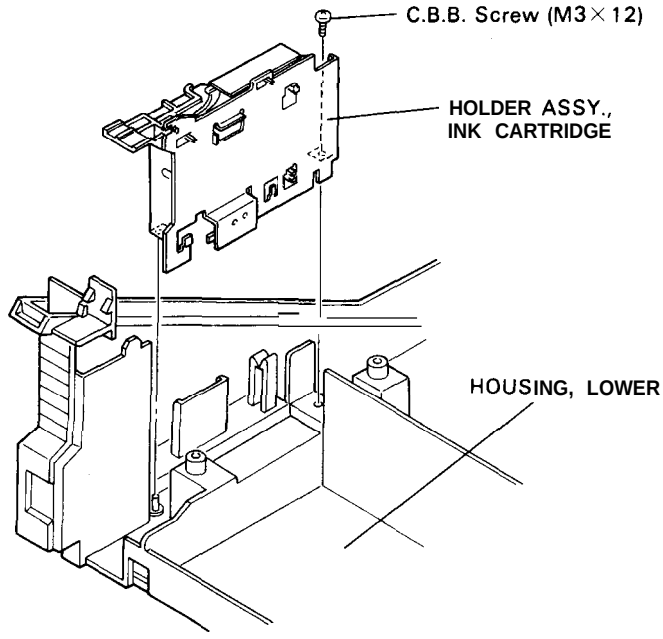


Figure 3-18. HOLDER ASSY., INK CARTRIDGE Removal

ASSEMBLY POINTS

Before attaching the HOLDER ASSY., INK CARTRIDGE to the HOUSING, LOWER, assemble the TORSION SPRING, 3490 and the COVER, HOLDER, INK CARTRIDGE onto the HOLDER ASSY., INK CARTRIDGE.

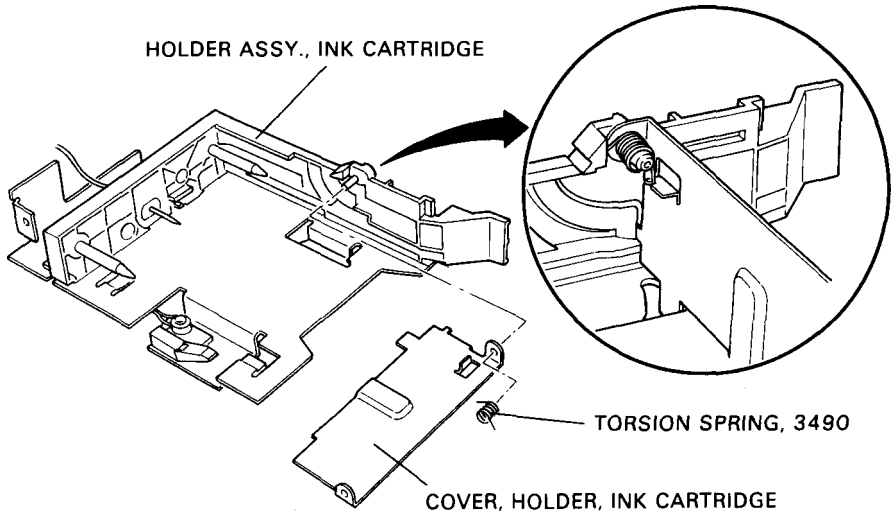


Figure 3-19. Assembling TORSION SPRING, 3490 and COVER, HOLDER, INK CARTRIDGE

3.2.7 Printer Mechanism Disassembly

This section describes how to disassemble the printer mechanism.

WARNING

When working with the printer mechanism, take sufficient care in handling the ink. Carefully read the precautions in 3.1.1 before beginning the work.

3.2.7.1 Disassembly of PAPER HOLDING ASSY.

[Step 1] Remove the housing. (Refer to section 3.2.1.)

[Step 2] Remove the TORSION SPRING, 6750 (LEFT) from the hook on the left frame.

[Step 3] Remove the TORSION SPRING, 6750 (RIGHT) from the hook on the right frame.

[Step 4] Remove the TORSION SPRING, 6750 (LEFT) from the left hook of the PAPER HOLDING ASSY..

[Step 5] Remove the TORSION SPRING, 6750 (RIGHT) from the right hook of the PAPER HOLDING ASSY..

[Step 6] Remove the two E-rings (4)thatfasten the PAPER HOLDING ASSY., and then remove the PAPER HOLDING ASSY..

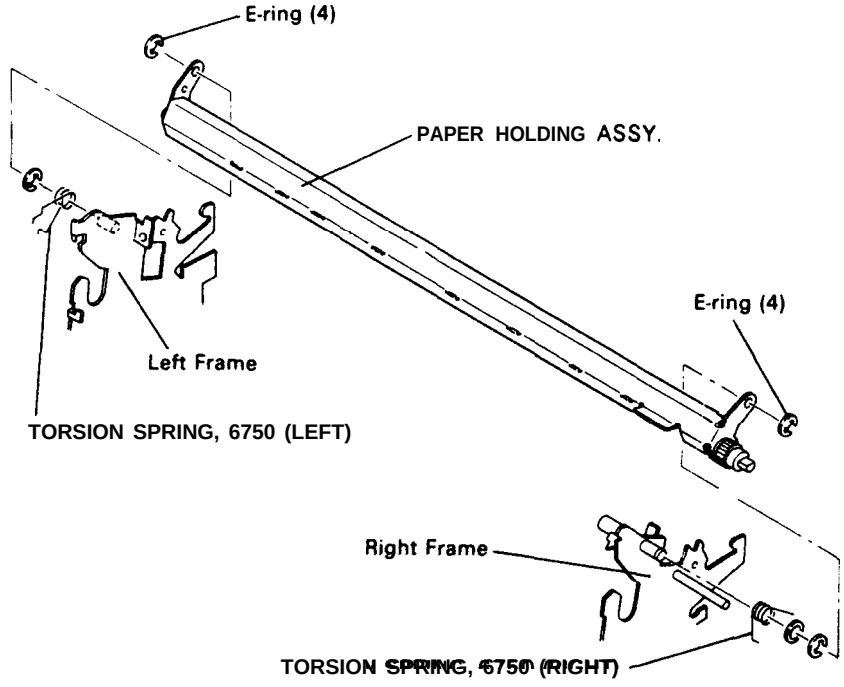


Figure 3-20. Disassembly of PAPER HOLDING ASSY.

3.2.7.2 Disassembly of CAP ASSY.

[Step 1] Remove the housing. (Refer to section 3.2. 1.)

[Step2] Remove the printer mechanism. (Refer to section 3.2.4.)

[Step 3] Unscrew the 3 screws (C.B.S. screw (M3x8)) which fasten the FRAME, STRENGTHEN LEFT, and remove the FRAME, STRENGTHEN RIGHT.

[Step 4] Unscrew C.B.B. screw (M3x8) which fastens the CAP ASSY. to the FRAME, FRONT, and remove the CAP ASSY..

[Step 5] Separate the tube of the PUMP ASSY. from the CAP ASSY..

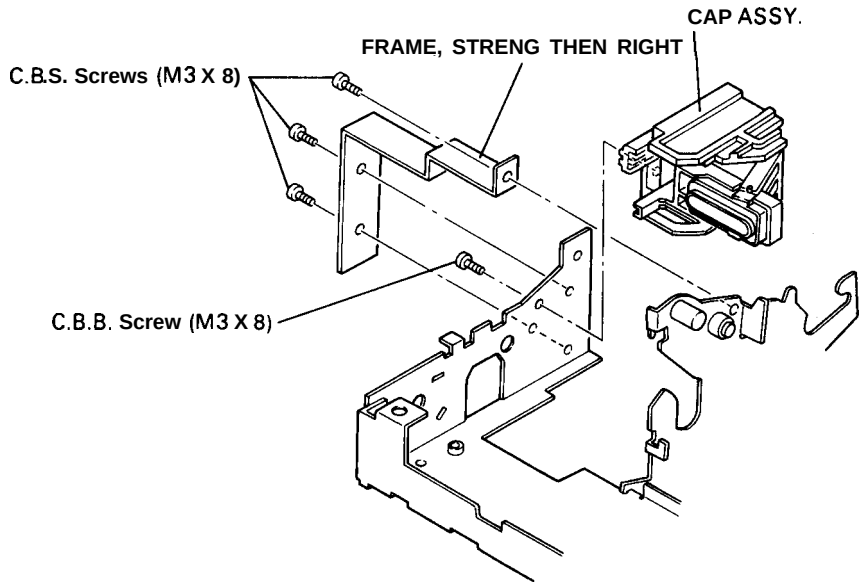


Figure 3-21. Disassembly of CAP ASSY.

3.2.7.3 Disassembly of PUMP ASSY. and CLEANER ASSY.

[Step 1] Remove the housing. (Refer to section 3.2. 1.)

[Step 2] Remove the printer mechanism. (Refer to section 3.2.4.)

[Step 3] Remove the CAP ASSY.. (Refer to section 3.2.7.2.)

[Step 4] Remove the TUBE, SUPPLY, INK, from the PUMP ASSY..

[Step 5] Unscrew two screws (C.B.S. screw (M3 × 8)) which fasten the PUMP ASSY. to the frame, and remove the PUMP ASSY..

[Step 6] Separate the CLEANER ASSY. from the frame.

CAUTION

Never touch the rubber section of the CLEANER ASSY..

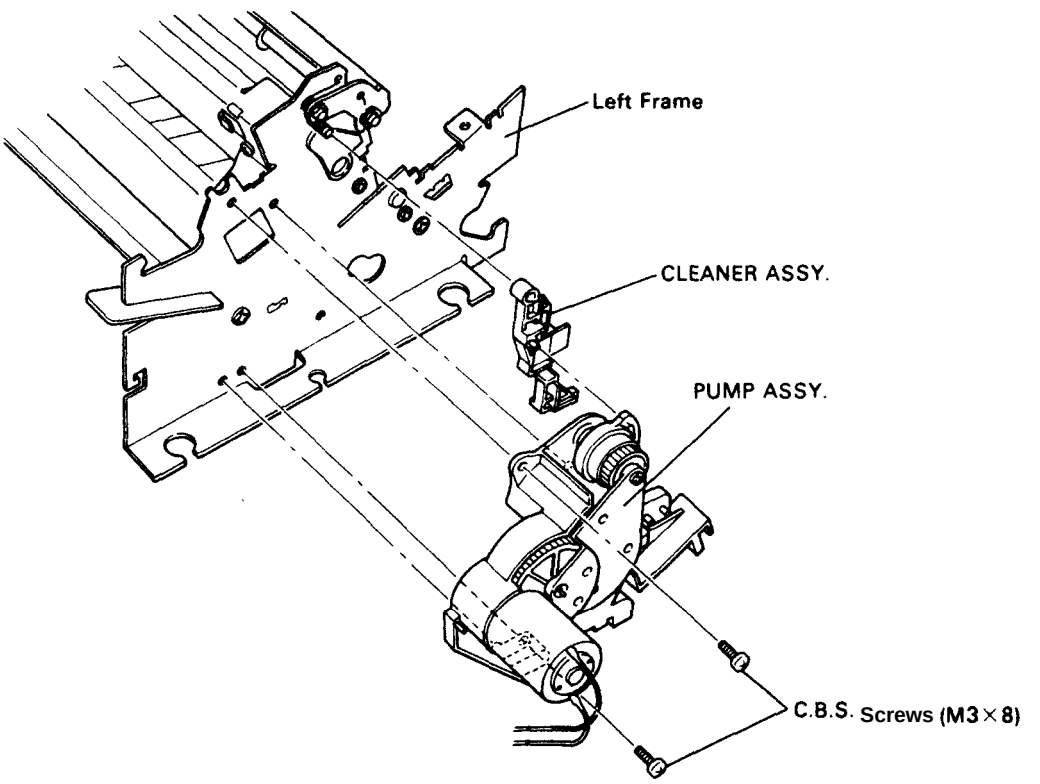


Figure 3-22. Disassembly of PUMP ASSY. and CLEANER ASSY.

3.2.7.4 FRAME, FRONT Removal

[Step 1] Remove the housing. (Refer to section 3.2. 1.)

[Step 2] Remove the printer mechanism. (Refer to section 3.2.4)

[Step3] Remove the CAP ASSY.. (Referto section 3.2.7.2.)

[Step 4] Remove the TUBE, SUPPLY, INK from the hook on the PUMP ASSY..

[Step 5] Remove the harness of the platen gap sensor from the clamp in the rear of the printer mechanism.

[Step 6] Unscrew C.B.S. screw (M3 X 8) which fastens the resistor to the rear of the printer, and remove the resistor.

[Step 7] Unscrew C.B.S. screw (M3 X 8) which fastens the FRAME, STRENGTHEN, RIGHT to the FRAME, FRONT.

[Step 8] Carefully peel off FPC from the FRAME, FRONT. (FPC is adhered to the FRAME, FRONT with adhesive double coated tape.)

[Step 9] Unscrew two screws (C. B.S. screw (M3 X 8)) which fastens the FRAME, FRONT to the printer mechanism, and remove the FRAME, FRONT.

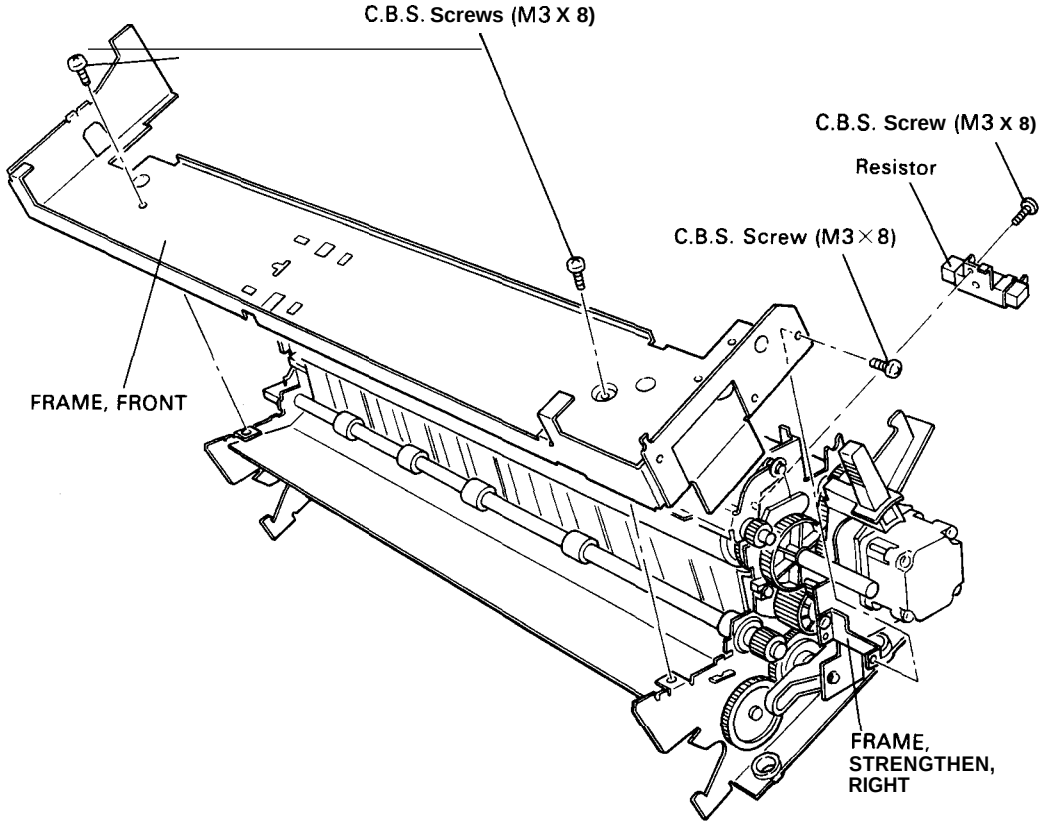


Figure 3-23. FRAME, FRONT Removal

3.2.7.5 Carriage Motor (DC MOTOR, CR) Removal

[Step 1] Remove the housing. (Refer to section 3.2.1.)

[Step 2] Remove the printer mechanism. (Refer to section 3.2.4.)

[Step 3] Remove the CAP ASSY.. (Refer to section 3.2.7.2.)

[Step 4] Remove the FRAME, FRONT. (Refer to section 3.2.7.4.)

[Step 5] Unscrew the 3 screws (C.B.S. screw (M3 X 8)) which fasten the MOUNTING PLATE ASSY., PULLEY, DRIVEN to the FRAME, FRONT, and remove the timing belt from the pulley.

[Step 6] Unscrew the 4 screws (C.C. screw (M3 X 12) X 3 and C.B.S. screw (M3 X 8) X 1) which fasten the carriage motor (DC MOTOR, CR) and the MOUNTING PLATE, MOTOR, CR, to the FRAME, FRONT and remove the carriage motor together with the MOUNTING PLATE, MOTOR, CR.

[Step 7] Unscrew the 2 screws (CUP screw (M3 X 5)) which fasten the carriage motor to the MOUNTING, PLATE, MOTOR, CR and remove the carriage motor from the MOUNTING, PLATE, MOTOR,CR.

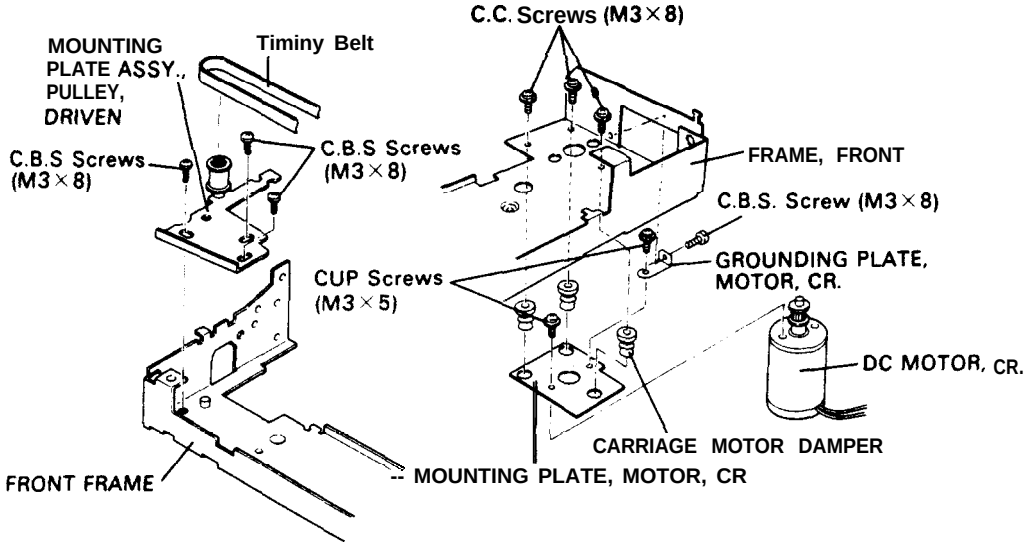


Figure 3-24. Carriage Motor (DC MOTOR, CR) Removal

ASSEMBLY POINTS

When attaching the carriage motor to the MOUNTING PLATE, MOTOR CR be sure to set the motor in the correct attitude. Note the direction of the cord shown in Figure 3-24.

REQUIRED ADJUSTMENT ITEMS

If you have replaced the carriage motor, make the following adjustment.

- Timing belt tension adjustment (Refer to section 4.3.)

3.2.7.6 Disassembly of Carriage

[Step 1] Remove the housing. (Refer to section 3.2. 1.)

[Step 2] Remove the printer mechanism. (Refer to section 3.2.4.)

[Step 3] Remove the printhead. (Refer to section 3.2.2.)

[Step 4] Remove the CAP ASSY.. (Refer to section 3.2.7.2.)

[Step 5] Remove the FRAME, FRONT. (Refer to section 3.2.7.4.)

[Step 6] Remove the HOLDER, CABLE, PRINT HEAD which fastens FPC to the FRAME, FRONT, and release one end of the FPC.

[Step 7] Unscrew the 3 screws (C.B.S. screw (M3 X 8)) which fasten the MOUNTING PLATE ASSY., PULLEY DRIVEN to the FRAME, FRONT, and remove the timing belt from the MOUNTING PLATE ASSY., PULLEY DRIVEN and pulley of CR motor.

[Step 8] Remove the 3 FLANGE NUT (M4) which fasten the SHAFT, CR, GUIDE, MAIN and SHAFT, CR, GUIDE, SUB to the FRAME, FRONT, and then remove the carriage together with the SHAFT, CR, GUIDE, MAIN and SHAFT, CR, GUIDE, SUB.

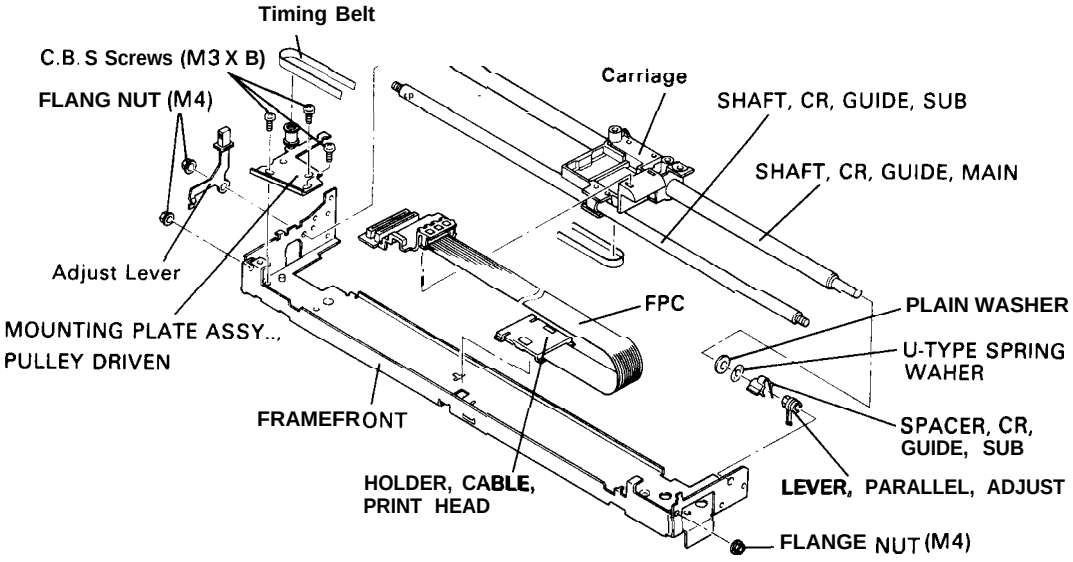


Figure 3-25. Disassembly of Carriage (1)

[Step 9] Remove the 2 screws (C.C. screw (M2.5 X6)) which fasten the encoder to the carriage.

[Step 10] Remove the CABLE ASSY., HEAD from the carriage.

[Step 1 1] Remove the timing belt from the carriage.

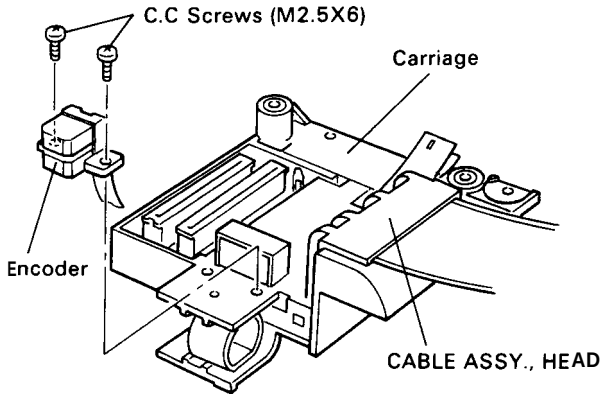


Figure 3-26. Disassembly of Carriage (2)

ASSEMBLY POINTS

When engaging the timing belt to the carriage, make sure that 3 grooves can be seen at the end of the belt as shown in Figure 3-27.

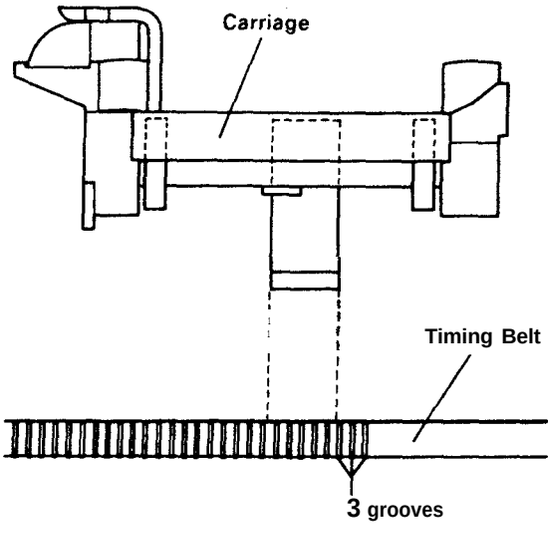


Figure 3-27. Engaging Timing Belt

REQUIRED ADJUSTMENT ITEMS

If you have reassembled the carriage, make the following adjustment in the specified sequence.

(1) Timing belt tension adjustment (Refer to section 4.3.)
(2) Platen gap adjustment (Refer to section 4. 1.)
(3) Platen gap adjustment (Refer to section 4.2.)
(4) Printhead slant adjustment (Refer to section 4.5.1)
(5) Print position adjustment (Refer to section 4.5.2)

3.2.7.7 STEPPING MOTOR, PF Removal

[Step 1] Remove the housing. (Refer to section 3.2. 1.)

[Step2] Remove the printer mechanism. (Refer to section 3.2.3)

[Step 3] Unscrew the CUP screw (M3×8) and the C.B.S. screw (M3×8) which fasten the STEPPING MOTOR, PF to the FRAME, SUB, RIGHT, and remove the STEPPING MOTOR, PF.

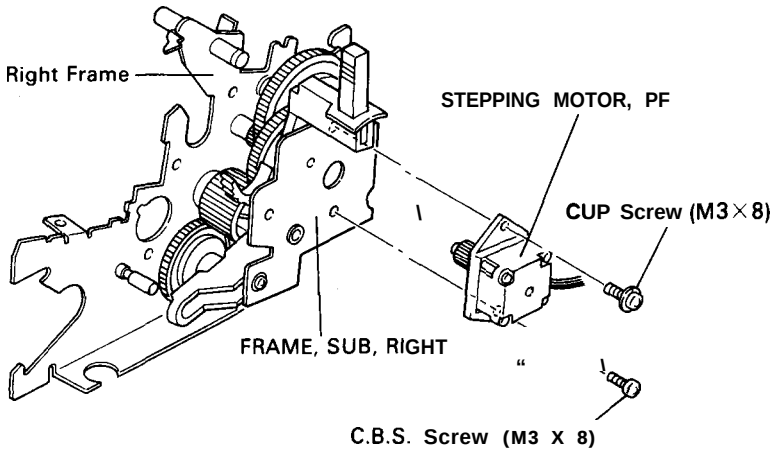


Figure 3-28. STEPPING MOTOR, PF Removal

3.2.7.8 STEPPING MOTOR, TOP EDGE HOLDER Removal

[Step 1] Remove the housing. (Refer to section 3.2.1.)

[Step 2] Remove the printer mechanism. (Refer to section 3.2.4.)

[Step 3] Unscrew the 2 screws (C.B.S. screw (M3×8)) which fasten the STEPPING MOTOR, TOP EDGE to the right frame and remove the STEPPING MOTOR, TOP EDGE HOLDER.

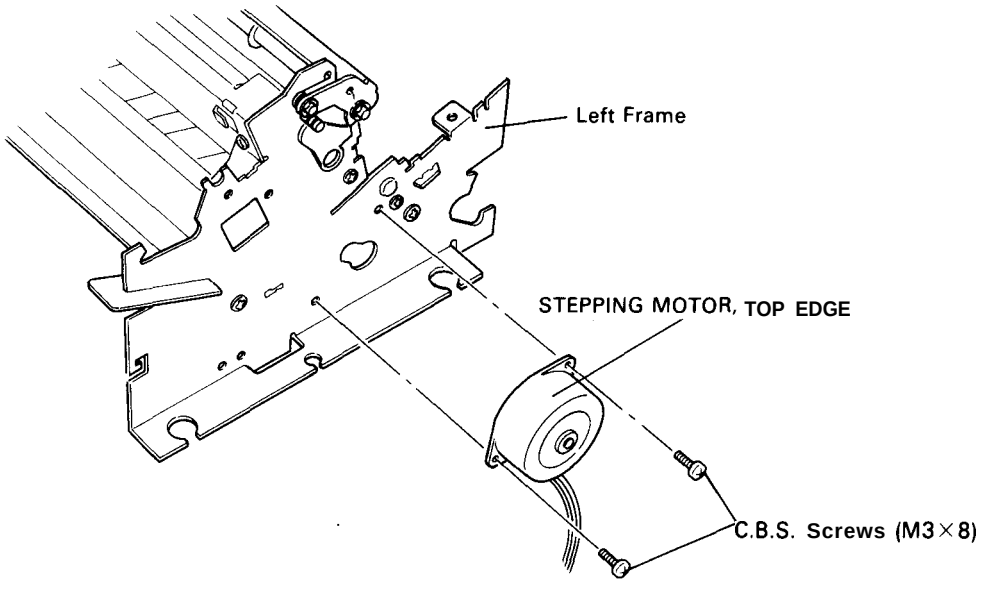


Figure 3-29. STEPPING MOTOR, TOP EDGE HOLDER Removal

3.2.7.9 Disassembly of PLATEN ASSY.

[Step 1] Remove the housing. (Refer to section 3.2.1.)

[Step 2] Remove the printer mechanism. (Refer to section 3.2.4.)

[Step 3] Remove the CAP ASSY.. (Refer to section 3.2.7.2.)

[Step 4] Remove the FRAME, FRONT. (Refer to section 3.2.7.4.)

[Step 5] Remove the PAPER HOLDING ASSY.. (Refer to section 3.2.7.1.)

[Step 6] Unscrew the 2 screws (C. B. S. screw (M3×8)) which fasten the COVER, PLATEN to the frame, LEFT/RIGHT, and remove the COVER, PLATEN.

[Step 7] Remove the E-ring (3) which fixes the GUIDE, PAPER EJECT to the left frame and remove the GUIDE, PAPER EJECT.

[Step 8] Unscrew the 2 screws (C.B.B. screw (M3×6)) which fasten the PAPER GUIDE ASSY., SUPPORT to the frame, LEFT/RIGHT, and remove the PAPER ASSY., SUPPORT.

[Step 9] Remove the PUMP ASSY. and the CLEANER ASSY.. (Refer to section 3.2.7.3.)

[Step 10] Unscrew C.B. screw (M2×4) which fastens the SENSOR SUB ASSY., PW to the TOP EDGE HOLDER., and remove the SENSOR SUB ASSY., PW while separating the FPC (connected to the sensor) from the adhesive double coated tape.

[Step 11] Hook off the GROUNDING SPRING.

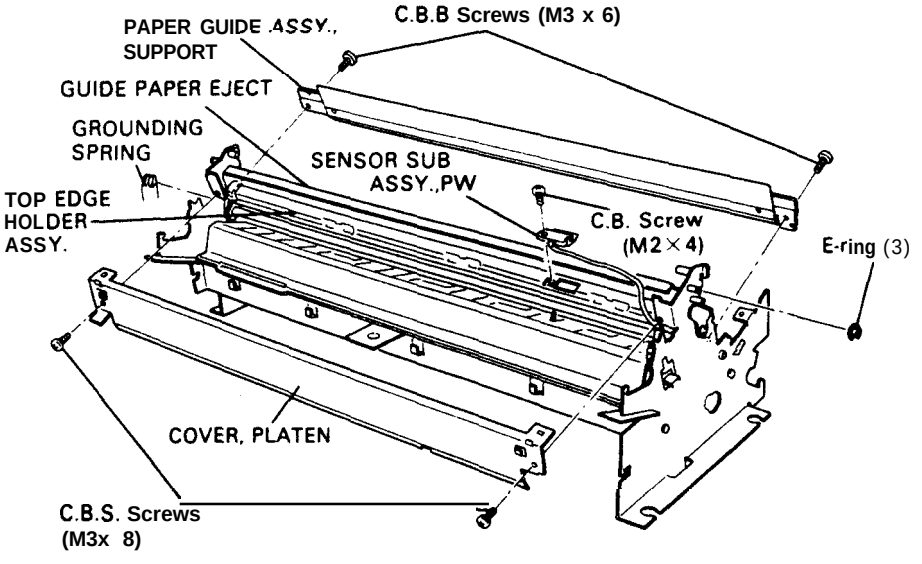


Figure 3-30. Disassembly of PLATEN ASSY. (1)

[Step 12] Rotate the HOLDER, PLATEN, RIGHT and HOLDER, PLATEN, LEFT which fasten the PLATEN ASSY. to the frame, LEFT/RIGHT, and remove the PLATEN ASSY..

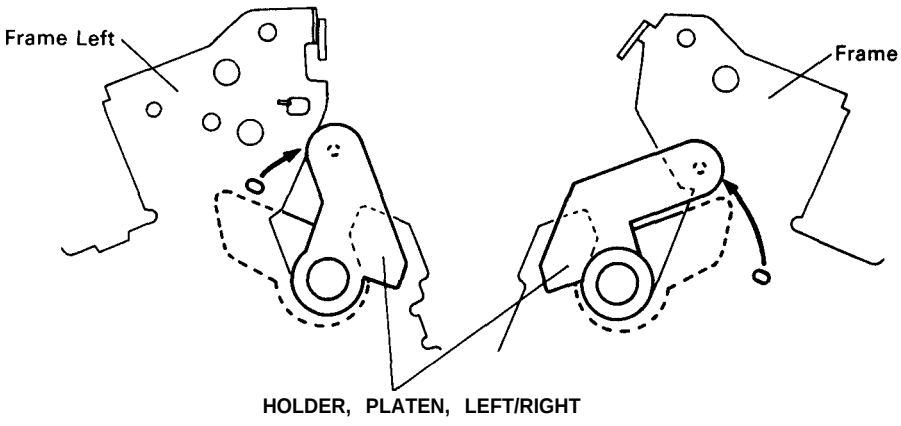


Figure 3-31. Disassembly of PLATEN ASSY. (2)

ASSEMBLY POINTS

- When assembling the GUIDE, PAPER EJECT be sure to hook the TORSION SPRING 700 to the GUIDE PAPER EJECT.
- When attaching the SENSOR SUB ASSY., PW make sure the adhesive double coated tape is completely covered by FPC.
- Before setting the platen, set up the other parts as shown in the figure below.
- Take the alignment of the HOLDER, PLATEN, RIGHT and HOLDER, PLATEN, LEFT.

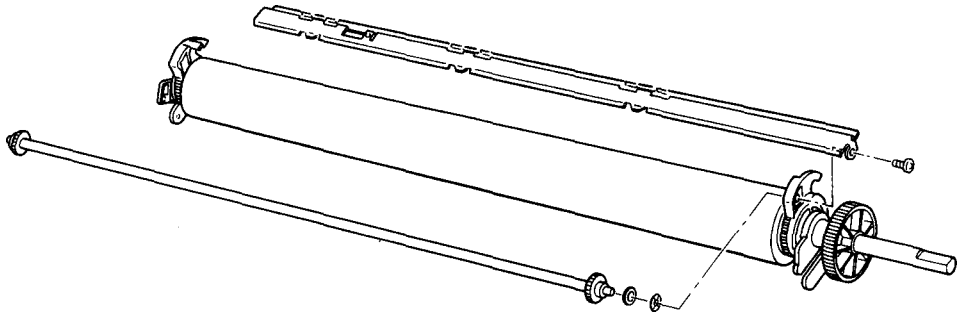


Figure 3-32. Aligning HOLDER, PLATEN

REQUIRED ADJUSTMENT ITEMS

If you have reassembled the carriage, make the following adjustment in the specified sequence.

(1) Timing belt tension adjustment (Refer to section 4.3.)

(2) Platen gap adjustment (Refer to section 4. 1.)

(3) Platen gap adjustment (Refer to section 4.2.)

(4) Printhead slant adjustment (Refer to section 4.5.1)

(5) Print position adjustment (Refer to section 4.5.2)

3.2.7.10 Disassembly of PAPER GUIDE

IStepl] Remove thehousing. (Refer to section 3.2.1.)

[Step2] Remove the printer mechanism. (Refer to section 3.2.4)

[Step 3] Remove the CAP ASSY.. (Refer to section 3.2.7.2)

[Step 4] Remove the FRAME, FRONT. (Refer to section 3.2.7.4)

[Step 5] Remove the PAPER HOLDING ASSY.. (Refer to section 3.2.7.1.)

[Step6] Remove the PLATEN ASSY.. (Refer to section 3.2,7.9)

[Step 7] Remove the STEPPING MOTOR, TOP EDGE HOLDER. (Referto section 3.2.7.8)

[Step 8] Unscrew the 3 screws (C.B.S. screw (M3×8) ×2 and C.B.S. screw (M2.5×6) ×1)) which fasten the FRAME ASSY., LEFT, and remove the FRAME ASSY., LEFT.

[Step 9] Remove the ROLLER, ASSY., DRIVE.

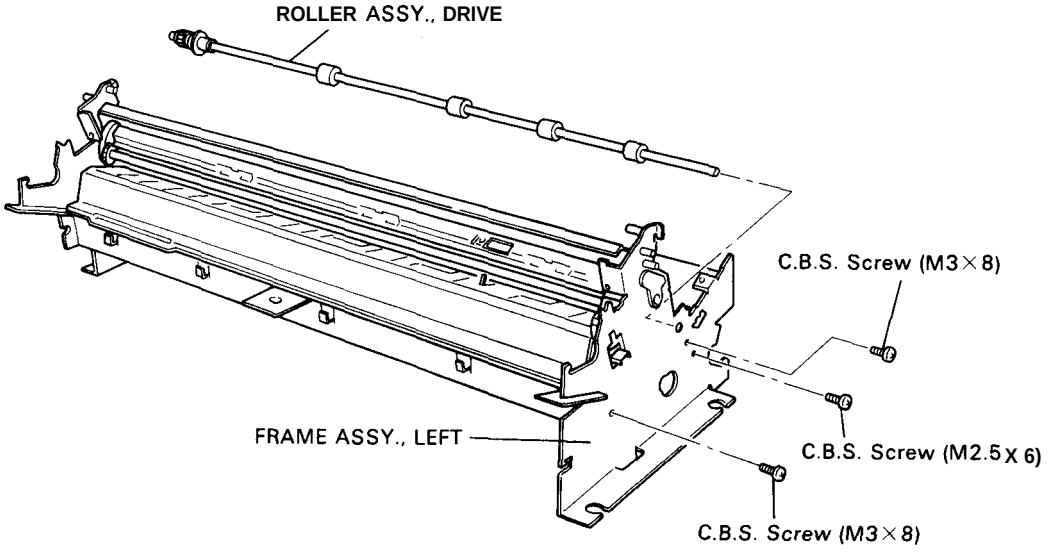


Figure 3-33. Disassembly of PAPER GUIDE (1)

[Step 10] Unscrew the 3 screws (C. B.S. screw (M3×8) X2 and C.B.S. screw (M2.5×6) X 1)) which fasten the FRAME ASSY., RIGHT, and remove the FRAME ASSY., RIGHT.

[Step 1 1] Slide the PAPER GUIDE toward the left and remove the PAPER GUIDE.

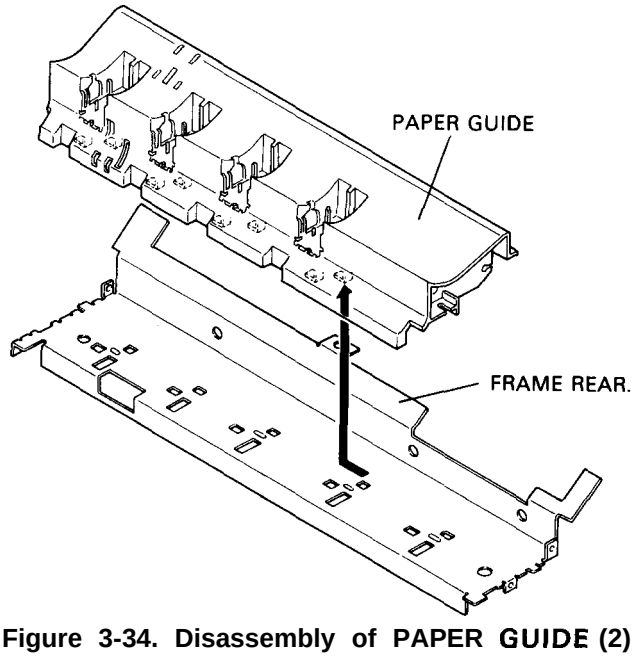


Figure 3-34. Disassembly of PAPER GUIDE (2)

ASSEMBLY POINTS

When attaching the FRAME ASSY., RIGHT to the PAPER GUIDE, make sure the SHAFT, RELEASE of the PAPER GUIDE, RIGHT is set in the proper direction as shown below.

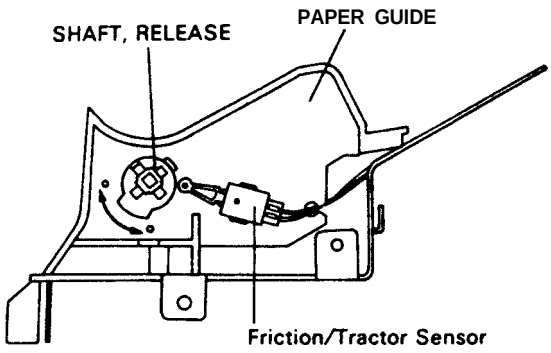


Figure 3-35. Direction of SHAFT, RELEASE

REQUIRED ADJUSTMENT ITEMS

If you have reassembled the carriage, make the following adjustment in the specified sequence.

(1) Timing belt tension adjustment (Refer to section 4.3.)
(2) Platen gap adjustment (Refer to section 4.1.)
(3) Platen gap adjustment (Refer to section 4.2.)
(4) Printhead slant adjustment (Refer to section 4.5.1)
(5) Print position adjustment (Refer to section 4.5.2)

3.2.7.11 Disassembly of FRAME ASSY., RIGHT

[Step 1] Remove the housing. (Refer to section 3.2. 1.)

[Step 2] Remove the printer mechanism. (Refer to section 3.2.4.)

[Step 3] Remove the CAP ASSY.. (Refer to section 3.2.7.2.)

[Step 4] Remove the FRAME, FRONT. (Refer to section 3.2.7.4.)

[Step 5] Remove the STEPPING MOTOR, PF. (Refer to section 3.2.7.7.)

[Step 6] Remove the PAPER HOLDING ASSY.. (Refer to section 3.2.7. 1.)

[Step 7] Remove the PLATEN ASSY.. (Refer to section 3.2.7.9.)

[Step 8] Unscrew C.C. screw (M3 X 8) which fastens the FRAME, SUB, RIGHT, and remove the FRAME, SUB, RIGHT.

[Step 9] Remove the release lever from the FRAME ASSY., RIGHT.

[Step 10] Remove the INTERMITTENT GEAR and the SPUR GEAR (27) from the FRAME ASSY., RIGHT.

[Step 1 1] Remove the COMBINATION GEAR (8, 30) from the shaft (C) on the FRAME ASSY., RIGHT.

[Step 12] Remove the COMPRESSION SPRING (200), the PLAIN WASHER (10.3 X 0.5 X 18.7), and the SPUR GEAR (34.5) from the shaft (B) on the FRAME ASSY., RIGHT.

[Step 13] Remove the COMPRESSION SPRING (200), the PLAIN WASHER (8 X 0.5 X 15), and the SPUR GEAR (34.5) from the shaft (A) on the FRAME ASSY., RIGHT.

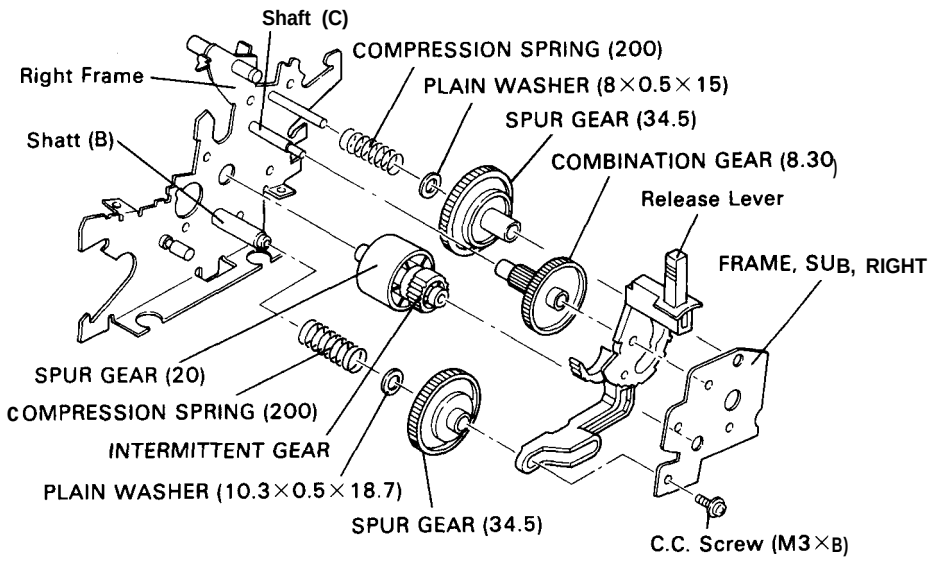


Figure 3-36. Disassembly of Frame Assembly, RIGHT

ASSEMBLY POINTS

When attaching the release lever to the FRAME ASSY., RIGHT, make sure that all the teeth of the gap gear are fully engaged with the teeth of the release lever.

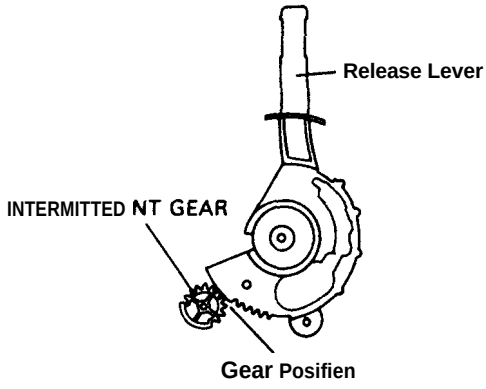


Figure 3-37. Setting Release Lever

REQUIRED ADJUSTMENT ITEMS

If you have reassembled the carriage, make the following adjustment in the specified sequence.

(1) Timing belt tension adjustment (Refer to section 4.3.)
(2) Platen gap adjustment (Refer to section 4. 1.)
(3) Platen gap adjustment (Refer to section 4.2.)
(4) Printhead slant adjustment (Refer to section 4.5.1)
(5) Print position adjustment (Refer to section 4.5.2)

3.2.7.12 Disassembly of TRACTOR ASSY.

[Step 1] Remove the TRACTOR GEARS (left/right) attached on the SHAFT, TR, DRIVE, and remove the FRAME, TR, (left/right).

[Step 2] Remove the E-rings (6) attached on the SHAFT, TR, DRIVE, and remove the tractors (left/right).

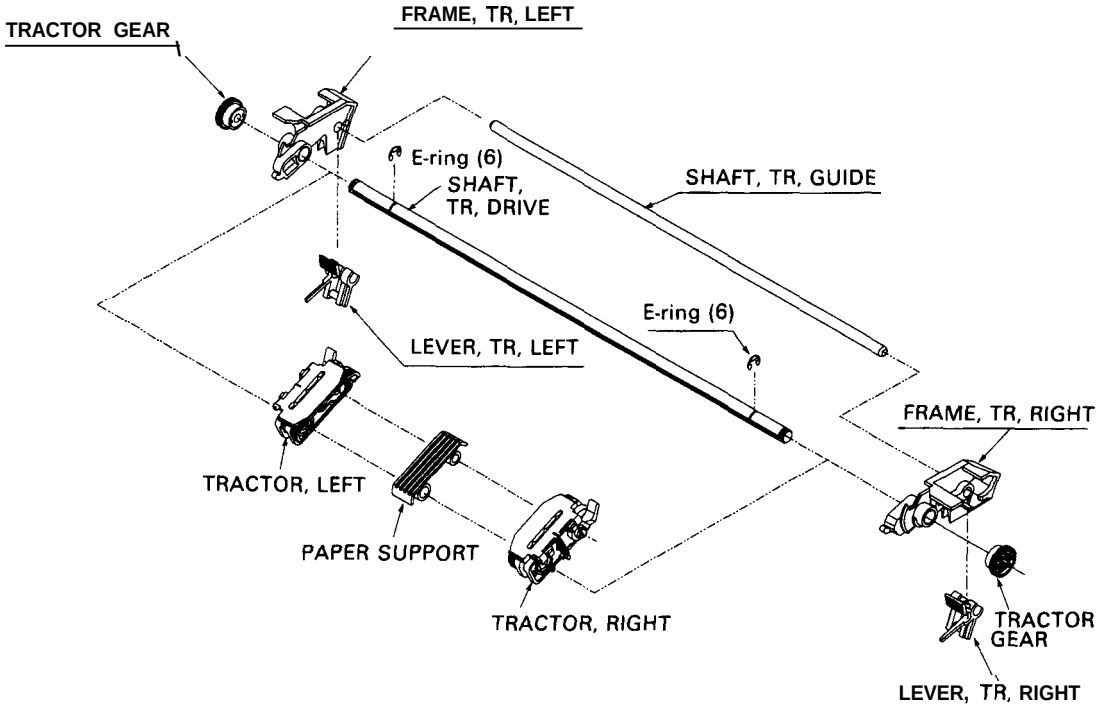


Figure 3-38. Disassembly of Tractor Assembly

ASSEMBLY POINTS

When attaching the tractor to the SHAFT, TR, DRIVE, make sure that the reference marks meet each other as shown in the figure below.

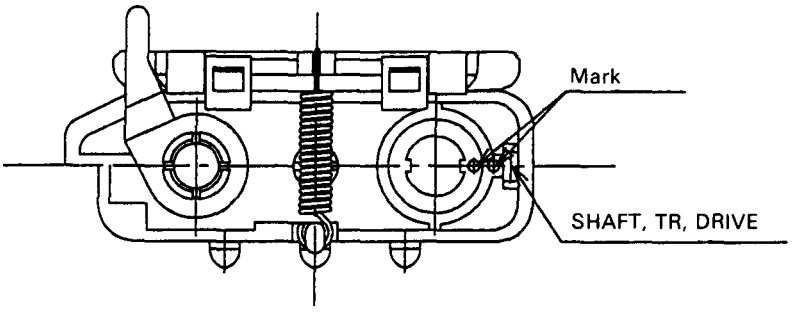


Figure 3-39. Tractor Set Position

CHAPTER 4
ADJUSTMENTS

LIST OF FIGURES

LIST OF TABLES

This chapter describes the various adjustments you should make after you disassemble or replace any parts or components that require adjustment. Needless to say, you should also make adjustment in any case if the printer does not function properly or print quality is not good enough.
Other conditions that require adjustment are described in this chapter.

WARNING

Disconnect the power supply cable from the printer whenever you work with the printer. (Unless otherwise specified)

4.1 PLATEN GAP PARALLELISM ADJUSTMENT

This adjustment is to make the distance between the platen and the printhead (platen gap) uniform at column 1 and column 136 (column 80 in case of 80-column printer). Since it has already been adjusted in the assembling line before shipment, you need not adjust it. But if you have changed the setting of LEVER, PARALLEL, ADJUST when repairing this printer, you should make this adjustment.

[Step 1] Remove the printhead. (Refer to section 3.2.2.)
[Step 2] Install the dial gauge base to the carriage.
[Step 3] Set the dial gauge to the dial gauge base (# F590), and touch the probe to the platen so that the long needle indicates 15-20 divisions on the scale. Then fix the dial gauge (# E603) to the dial gauge base with a hexagonal screw.

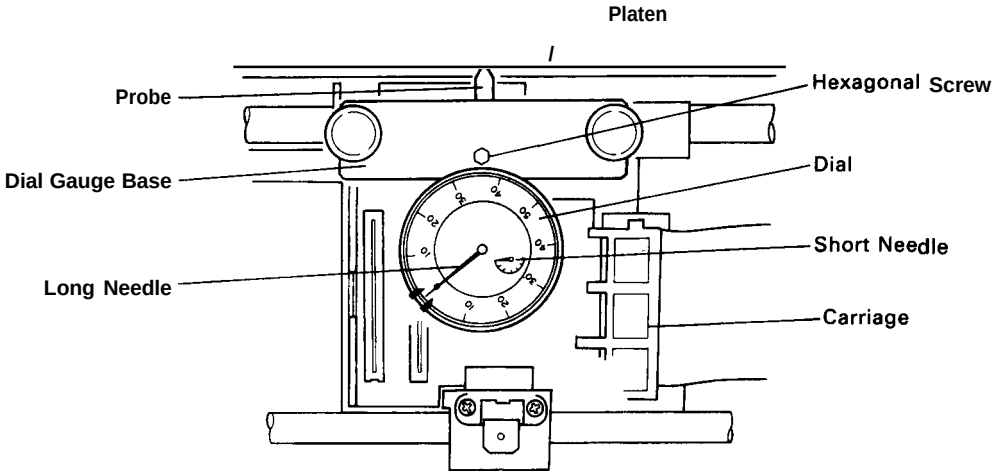


Figure 4-1. Setting of Dial Gauge

[Step 4] Adjust the LEVER, PARALLEL, ADJUST so that the long needle of the dial gauge indicates a constant value at any point on the platen with an allowance of 3 divisions (0.03 mm) when you move the carriage to the left and right.

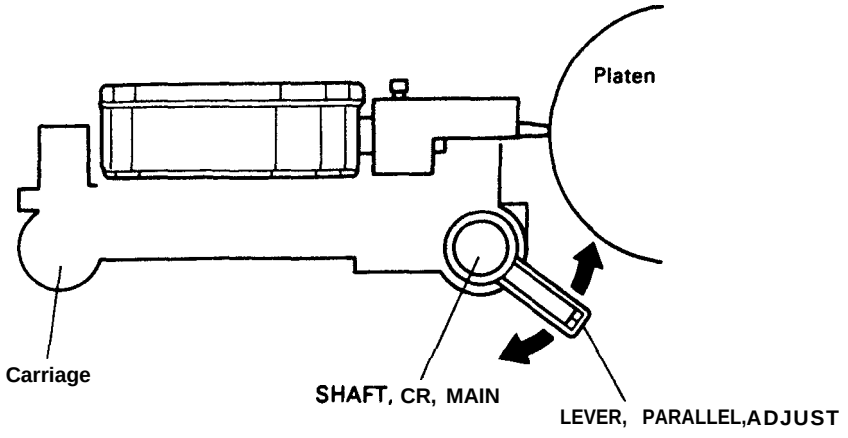


Figure 4-2. Platen Gap Parallelism Adjustment

[Step 5] Remove the dial gauge and the dial gauge base.
[Step 6] Install the printhead to the carriage. (Refer to section 3.2.2.)

NOTE: Be sure to adjust the platen gap (Refer to section 4.2) after this adjustment.

4.2 PLATEN GAP ADJUSTMENT

This adjustment is to make the distance between the platen and the printhead 1.00±0.05mm. If this adjustment is not performed properly, print quality will be degraded. This adjustment is required when you loosened the flange of the shaft, CR, MAIN or replaced the printhead.

CAUTION

When making this adjustment, do not allow the clearance gauge to touch the nozzles of the head. They are quite fragile.

[Step 1] Slightly loosen the FLANGE NUT (M4) of the SHAFT, CR, MAIN, and check the installation direction of the SHAFT, CR, MAIN.

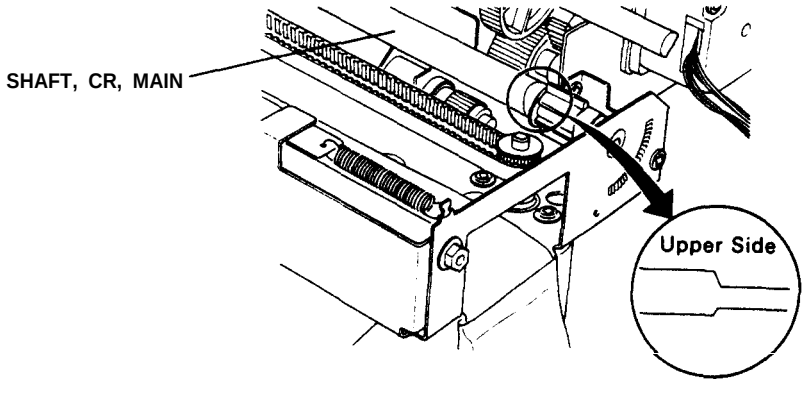


Figure 4-3. SHAFT, CR, MAIN Installation Direction

[Step2] Insert the thickness gauge (exclusively made by EPSON) between the platen and the printhead, and rotate the SHAFT, CR, MAIN so that the head is pressed lightly against the head. When rotating the SHAFT, CR, MAIN, you can make use of the notch at the right side of the shaft.

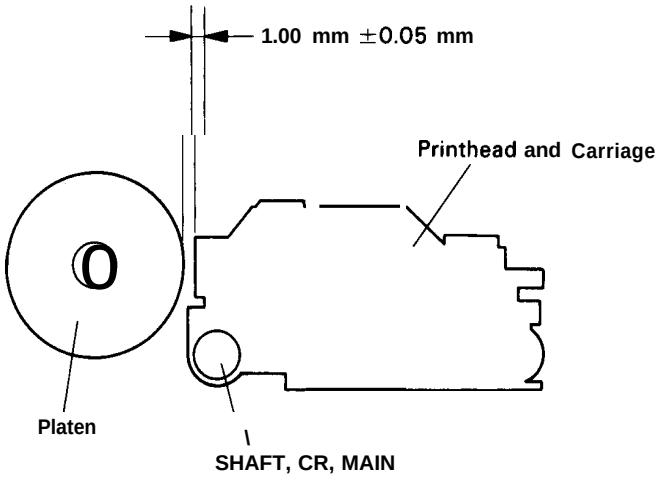


Figure 4-4. Platen Gap Adjustment

[Step 3] Set the adjust lever to the normal paper printing position and tighten the FLANGE NUT (M4).

[Step 4] Pull out the thickness gauge. If the thickness gauge does not come off easily, loosen the FLANGE NUT (M4) again and go back to Step 2.

[Step 5] Apply Neji-lock to the FLANGE NUT (M4).

NOTE: Be sure to perform printhead slant adjustment (Refer to section 4.5.1) after the platen gap adjustment.

4.3 TIMING BELT TENSION ADJUSTMENT

This adjustment is to change the tension of the timing belt to a proper level. If this adjustment is not performed properly, bi-directional printing settings will be interfered.
This adjustment is required when you loosened the timing belt for disassembling or assembling the printer or when the bi-directional print position cannot be aligned.

[Step 1] Center the carriage.
[Step 2] Loosen the 3 screws (C.B.S. screw (M3×8)) attaching the MOUNTING PLATE ASSY., PULLEY, DRIVEN to the frame.
[Step 3] Engage the tensiOn gauge to the hook of the MOUNTING PLATE ASSY., PULLEY, DRIVEN and adjust the belt tension. Tension value: 1,500 ±100g

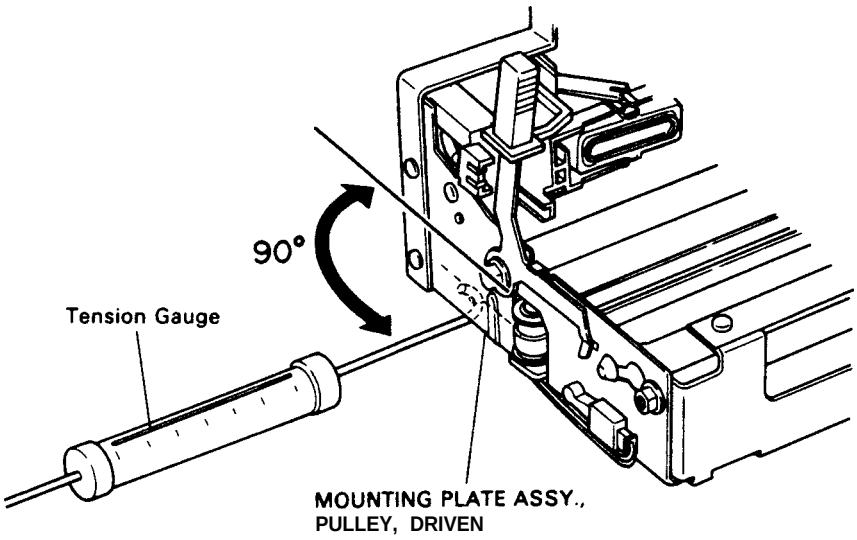


Figure 4-5. Timing Belt Tension Adjustment

4.4 PRINTHEAD DRIVE VOLTAGE ADJUSTMENT

Printhead drive voltage of each printhead should be adjusted individually, because all printheads are not exactly of the same characteristics.

If it is not adjusted properly, print quality will be degraded. This adjustment is required when the printhead or the printer mechanism is replaced. It is also required when the MAIN board is replaced. The voltage for each printhead is determined by measuring the characteristics of each printhead during the production line. You can realize this voltage by setting the jumper located on the MAIN board.

[Step 1] Remove the printer mechanism. (Refer to section 3.2.4.)

[Step 2] Check the printhead drive voltage in one of the following ways.

(1) When only the MAIN board is replaced:
Remove the printhead from the carriage and check the head drive voltage printed at the bottom, and then put it back onto the carriage.

(2) When the printhead is replaced:
Check the head drive voltage printed at the bottom of the printhead.

(3) When the printer mechanism is replaced:
Check the head drive voltage printed on the notice sheet on the spare printer mechanism. (See Figure below.)

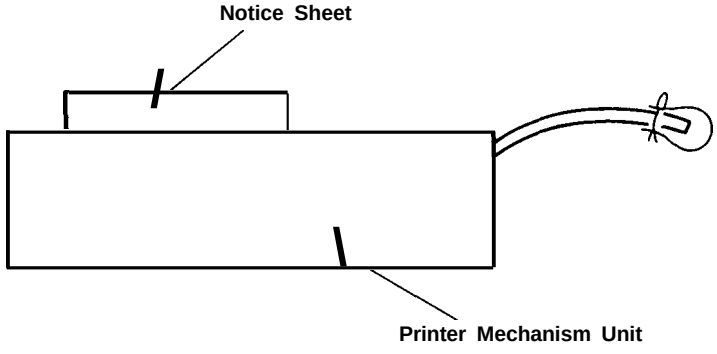


Figure 4-6. Notice Sheet on Spare Printer Mechanism

[Step 3] Confirm the jumper settings (Jumper 5 and 6) referring to Table 4-1.

Table 4-1. Head Drive Voltage and Jumper Setting

Head Drive Voltage (V)	Jumper 5 Setting	Jumper 6 Setting
122.2- 123.7	A	x
120.7- 122.1		Y
118.8- 120.6		z
117.1 - 118.7	B	x
115.5- 117.0		Y
113.8- 115.4		z
112.4- 113.7	c	x
110.8- 112.3		Y
108.8- 110.7		z
106.8- 108.7	D	x
105.3- 106.7		Y
103.7- 105.2		z
102.0- 103.6	E	x
100.4- 101.9		Y
)8.5 - 100.3		z
)7.0 -98.4	F	x
)5.2 -96.9		Y
)3.6 - 95.1		z
)2.0 - 93.5	G	x
)0.4 - 91.9		Y
18.5 -90.3		z
6.8- 88.4	H	x
5.0- 86.7		Y
3.0 -84.9		z

[Step4] When only the MAIN board is replaced:

Set the jumpers (5 and 6) on the MAIN board according to the settings confirmed in Step 3, and install the main board to HOUSING, LOWER.

When either the printhead or the printer mechanism is replaced:

Set the jumpers (5 and 6) on the MAIN board according to the settings confirmed in Step 3.

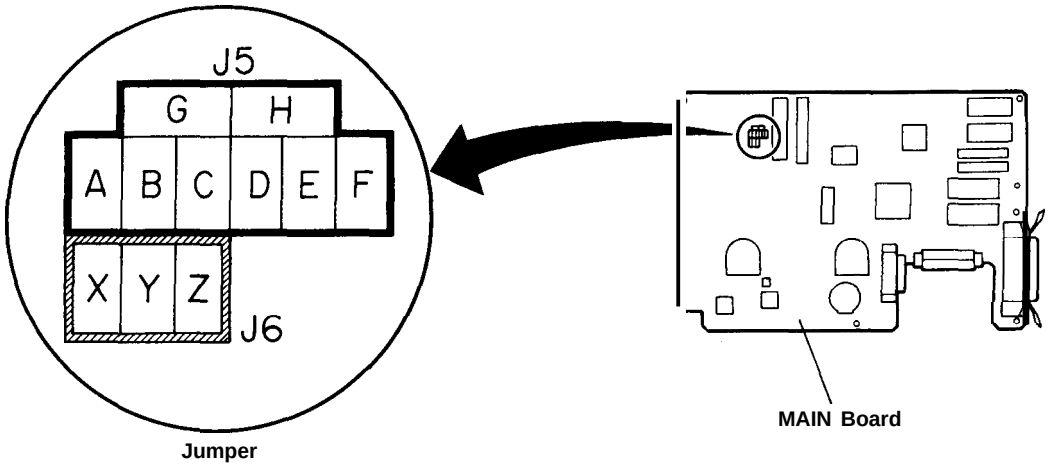


Figure 4-7. Jumper Setting

[Step5] Connect a dummy resistor (20. 0Kohm±1 %) (#F59 1) to connector CN 16 on the MAIN board.

[Step6] Set the digital multi-meter to the test terminal TP3(+) and TP4(−) on the MAIN board.

[Step7] Connect the control panel to CN 19 and short-circuit the pin no. 1 and no.3 of the connector CN2 on the control panel. (Refer to section 5.1 for the details.)

[Step 8] Turn on the power.

[Step 9] Adjust the volume VR2 on the MAIN board until the digital multi-meter indicates the specified voltage with an allowance of ±0.5V.

[Step 10] Turn off the power.

[Step 11] Stop short-circuiting CN2 on the control panel, and remove the control panel from the MAIN board.

[Step 12] Remove the dummy resistor and the multi-meter from the MAIN board.

[Step 13] Install the printer mechanism.

4.5 PRINT ADJUSTMENT

The print adjustment can be divided into the printhead inclination adjustment and print position adjustment. These adjustments can be performed by running the special program on the personal computer (EPSON PC/EQUITY or 100% IBM PC compatible machine) connected to the printer.

4.5.1 Printhead Slant Adjustment

If the printhead is not installed at the right angle to the carriage, the characters will not be printed at the right angle.
This adjustment is performed to correct the installation angle of the printhead.
When you reinstall the printhead or when the characters printed are not at the right angle, you should perform this adjustment by turning the PIN, ADJUST on the carriage while checking the output.

CAUTION

When you turn the PIN, ADJUST for inclination adjustment, first loosen the screw on the righthand side to unfasten the printhead, or the PIN, ADJUST may be damaged.

[Step 1] Load 15-inch continuous paper (for 136-column printer) or 10-inch continuous paper (for 80-column printer) to the front push tractor.
[Step 2] Open the upper case and set the control panel so that CASE OPEN will not be detected. (Refer to Section 5.1 for the details.)
[Step 3] Connect the printer to the personal computer and turn on the printer power.
[Step 4] Turn on the power for the personal computer and start the adjustment program (Program name: F30B01 A (GW-BASIC)).
[Step 5] When "CHANGE DATE?" is displayed on the screen, enter N.
[Step 6] When "ADJUST... 1, RESET...2° is displayed, select "ADJUST" by entering " 1".
[Step 7] When "80 COLUMN... 1, 136 COLUMN...2° is displayed, select 80 column or 136 column for your machine.
[Step 8] When "BI-D...1, HEAD TILT...2, END...E" is displayed, select "HEAD TILT" by entering "2".
[Step 9] When "PRINTER No.?" is displayed, enter the applicable printer number and press the return key.
[Step 10] When the check pattern of a vertical line is printed, verify it. If the check pattern looks like (a), press the return key to print the final check pattern and finish the adjustment. If it looks like (b) or (c), continue the following steps.

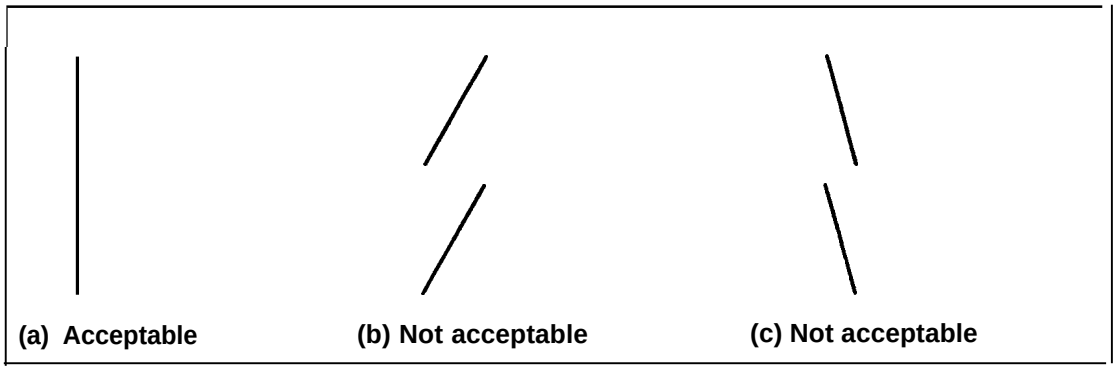


Figure 4-8. Print Check Pattern

[Step 1 1] Center the carriage and loosen the screw (fastening the printhead)on the righthand side. Then, holding the head with the hand, turn the PIN, ADJUST. The PIN, ADJUST can be turned to 5 different positions.

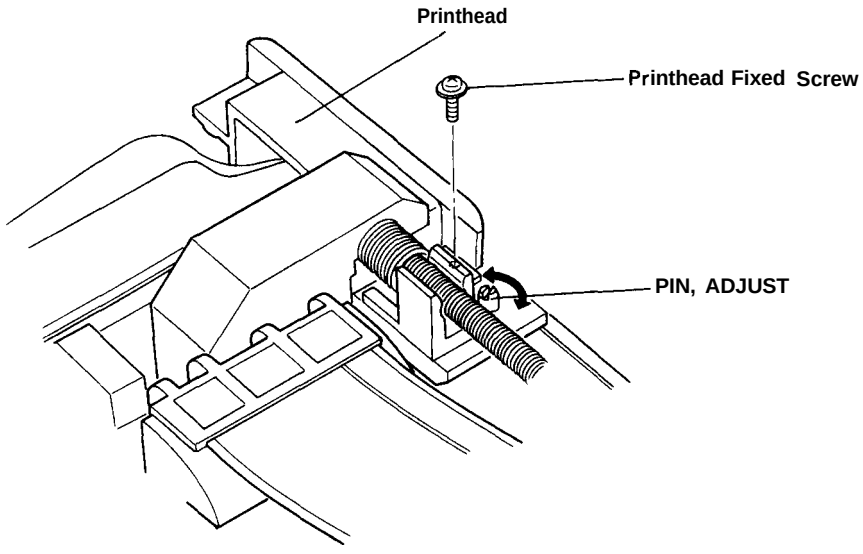


Figure 4-9. Head Inclination Adjustment

[Step 12] Turn the PIN, ADJUST to a proper position and tighten the screw loosened in Step 10.

[Step 13] Press the SPACE key and print the check pattern again. If the check pattern is acceptable, press the return key to print the final check pattern and finish the adjustment. If not acceptable, go back to Step 12.

4.5.2 Print Position Adjustment

This adjustment is performed on the control circuit to compensate the deviation of print position, which may be caused by the different printing speeds due to the parts tolerance of the printer mechanism, and the deviation of print timing between odd-numbered lines and even-numbered lines in bi-directional print. This printer stores the compensation-related data in EEPROM on the MAIN board. You should perform this adjustment in the following conditions.

.The MAIN board is replaced.
• The cartridge replacement counter is cleared, i.e. the contents of EEPROM is cleared.
. The printer mechanism is replaced.
• The timing belt is removed or loosened.
• The bi-directional print position is not aligned.

[Step 1] Load 15-inch continuous paper (for 136-column printer) or 10-inch continuous paper (for 80-column printer) to the rear push tractor.

[Step 2] Connect the printer to the personal computer and turn on the printer power.

[Step 3] Turn on the power for the personal computer and start the adjustment program (Program name: F30B01 A (GW-BASIC)).

[Step 4] When “ACHANGE DATE?” is displayed on the screen, enter N.

[Step 5] When “ADJUST... 1, RESET...2° is displayed, select “ADJUST” by entering “1”.

[Step 6] When "'80 COLUMN...1, 136 COLUMN...2° is displayed, select 80 column or 136 column for your machine.

[Step 7] When "BI-D...1, HEAD TILT...2, END...E" is displayed, select "BI-D" by entering "I'".

[Step 8] When "PRINTER No.?" is displayed, enter the applicable printer number and press the return key.

[Step 9] Print the odd-numbered lines at SPEEDO and even-numbered lines at SPEED1 both in uni-directional print mode. In SPEED 1 mode, the compensation value of "-4" is automatically selected.

NOTE: The compensation value "-4" is a specific value judged from our experience. The plus value means that the print position will be shifted to the right, while the minus value to the left.

[Step 10] If the vertical elements in even-numbered lines and odd-numbered lines are aligned, press the return key and go to Step 11. If they are not aligned, enter another value and press the return key to check the output. Continue this procedure until they are aligned.

[Step 1 1] When the return key is pressed in Step IO, vertical lines are printed at SPEED1 in bi-directional print mode. The compensation value of "5" is automatically selected.

NOTE: The compensation value "5" is a specific value judged from our experience. The plus value means that the print position will be shifted to the right, while the minus value to the left.

[Step 12] If the vertical elements in even-numbered lines and odd-numbered lines are aligned, press the return key and go to Step 13. If they are not aligned, enter another value and press the return key to check the output. Continue this procedure until they are aligned.

[Step 13] When the return key is pressed in Step 12, verticallines are printed at SPEED2 in bi-directional print mode. The compensation value of "7" is automatically selected.

NOTE: The compensation value "7" is a specific value judged from our experience. The plus value means that the print position will be shifted to the right, while the minus value to the left.

[Step 14] If the vertical elements in even-numbered lines and odd-numbered lines are aligned, press the return key and go to Step 15. If they are not aligned, enter another value and press the return key to check the output. Continue this procedure until they are aligned.

[Step 15] When the return key is pressed in Step 14, the printing will be performed at each SPEED and the adjustment is finished.

4.6 VOLUME VR1 ADJUSTMENT ON MAIN BOARD

The volume, VR1 on the MAIN board is used to adjust the reference pulse of the gate array, E05A48, which controls the carriage motor. Since VR 1 has already been adjusted before shipment, additional adjustment is not required.

However, when the gate alley, E05A48 is replaced, adjust VR 1 in the following steps.

[Step 1] Connect the oscilloscope to the 7th pin of the gate array, E05A48.

[Step 2] Turn on the printer power.

[Step 3] Verify that the printhead is capped and that the carriage motor is not rotating.

[Step 4] Turn VR1 until 1 cycle of the continuous waveform in the oscilloscope shows 10* O. O5PS.

CHAPTER 5
TROUBLESHOOTING

LIST OF FIGURES

LIST OF TABLES

5.1 OVERVIEW

The task of troubleshooting is not an easy job, because even a single trouble may exhibit a variety of symptoms.

Figure 5-1 show a flowchart, by which you can easily determine the cause of trouble.

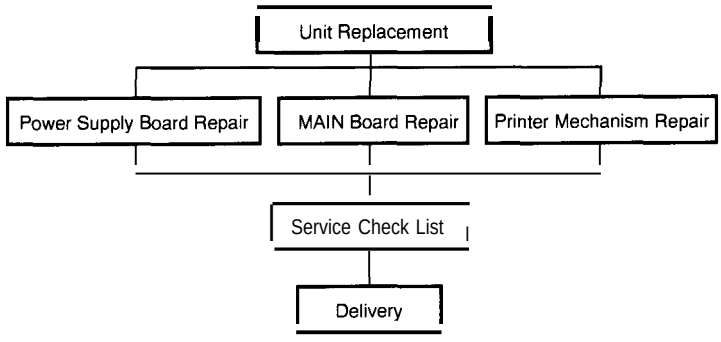


Figure 5-1. Troubleshooting Procedure

Table 5-1 and 5-2 lists the information related to the troubleshooting operation.

Table 5-1. Resistance of Motor Coil

Unit Name	Specifications
Carriage motor	Coil Resistance 7.8ohms± 10% at 20 degrees C
Paper-feed motor	Coil Resistance 19.5ohms ± 7% at 25 degrees C
Top edge holder motor	Coil Resistance 79ohms± 10% at 25 degrees C
Pump motor	Coil Resistance 1 17ohms

Table 5-2. Error Display

Buzzer	LED Status	Error Description
	All LEDs blink	Weasted ink drain tank overflow
5 times of O. l-second beep with O. l-second intervals		Cover open
5 times of 0.5-second beep with 0.5 second intervals		Carriage malfunction
3 times of O. l-second beep with 0.1 -second intervals	PAPER OUT LED lights up	paper empty
3 times of O. l-second beep with O. l-second intervals	INK END LED lights up	Ink end or ink cartridge empty

In order to check the *waveforms* of the MAIN board, you can use the extension cable provided for this printer. You can remove the MAIN board from the lowercase and still check its waveforms by connecting the board to the printer mechanism with these cables.
The following table shows extension cables and connecting points.

Table 5-3. Extension Cables

Connector on MAIN Board	Connecting Point on Printer Mechanism	Extension Cable	Part No.
CN5	Ink cartridge sensor	#F578	1011025
CN6	Ink-and sensor	#F578	1011025
CN7	PG sensor	#F578	1011025
CN8	Release/Tractor sensor	#F578	1011025
CN 10	Top edge sensor	#F579	1011024
CN9	Paper-end sensor (front)	#F578	1011025
CN11	Paper-end sensor (rear)	#F579	1011024
CN 18	Printhead	#F574, and #F575	1011027
CN 17	Printhead	## F576, and #F577	1011026
CN 13	TE motor	#F580	1011023
CN 15	, CR motor	#F594	B765 1054101
CN 12	Pump motor	#F578	1011025
CN 14	Paper-feed motor	#F580	1011023

in order to make the printer operate with the case-open sensor removed, you can cut out the male connector from the extension cable #F579 and short-circuit Line 1 and 3, and then insert it to the 3-pin connector on the control panel.
At the same time, cut out the female connector from the extension cable #E594 and short-circuit Line 1 and 2, and then connect it to the connector connected to the resistor coming form the printer mechanism.

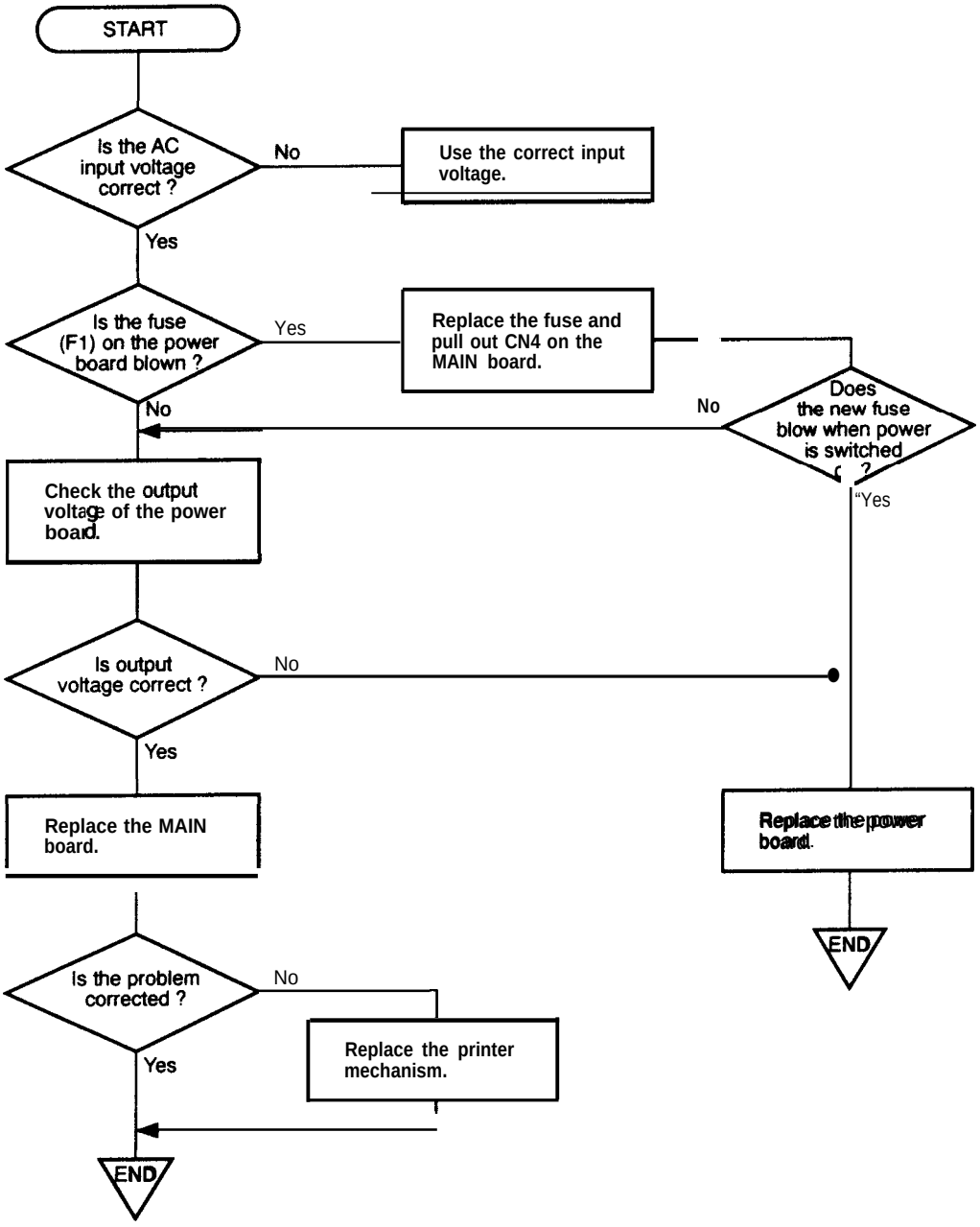
5.2 REPAIR BY UNIT REPLACEMENT

When a problem occurs, you can separate a particular unit that is responsible for the particular problem by referring to the symptoms listed below. Refer to Table 5-4, identify what the problem is, and then perform the checks according to the corresponding flowchart.

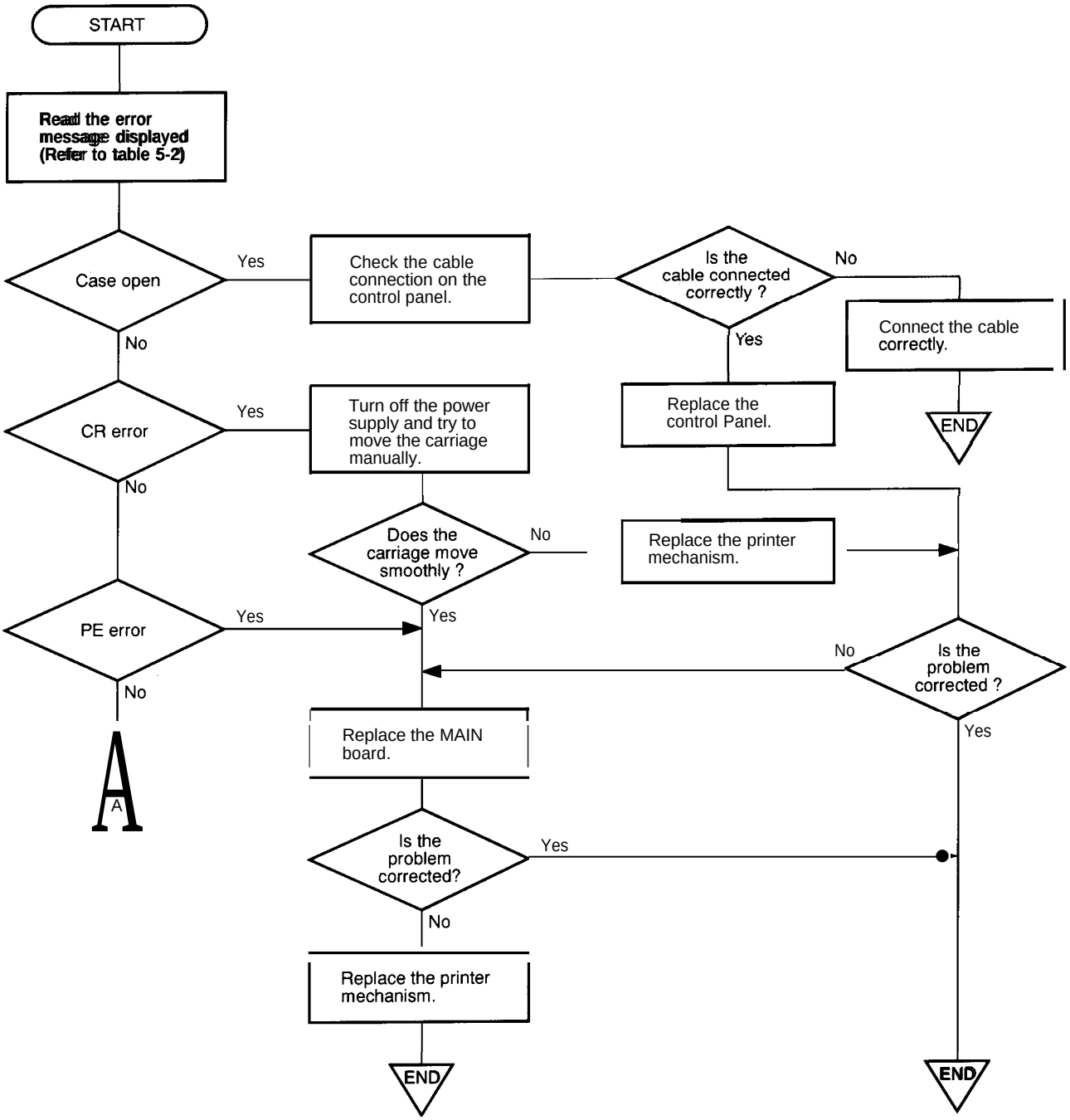
Table 5-4. Symptoms and Reference Pages

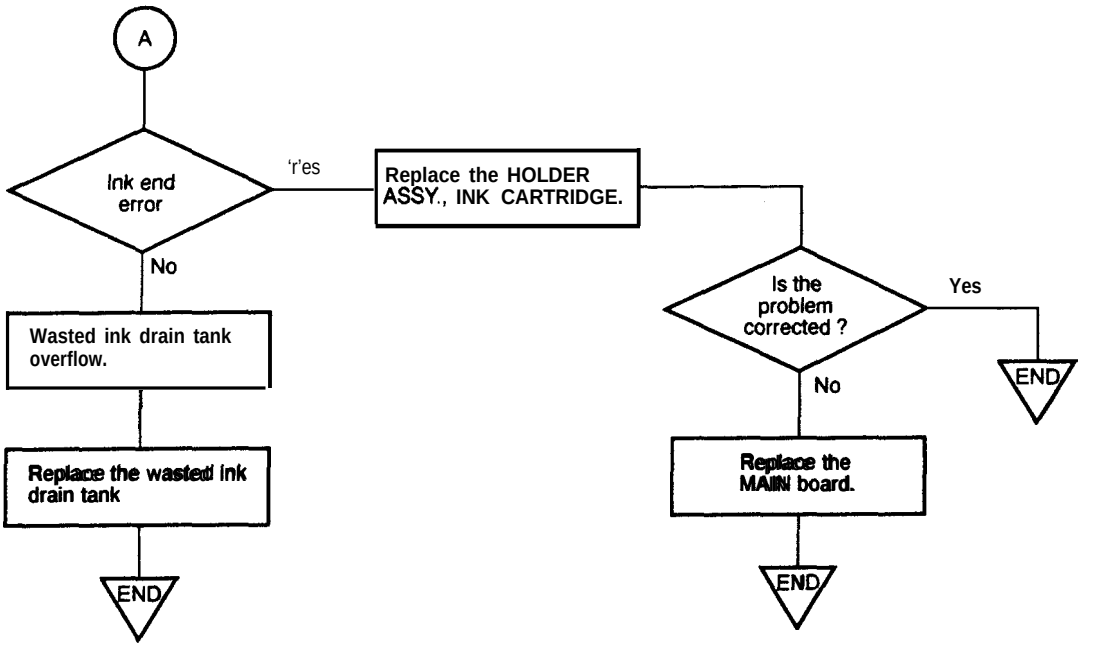
Symptom	Contents	Reference Page
Printer fails to operate at time of power on.	• Control panel LEDs do not light up. . Carriage and pump do not operate.	5-4
Error is detected.	o Error is indicated by LED or buzzer.	5-5
Print failure occurs during self test.	• Printing is not performed. • Faulty printing - some of the dots are not printed. • Bad print quality (density, etc.)	5-7
Paper is not fed normally.	• No paper is fed. • Feeding is irregular. • Paper jam occurs.	5-8
Control panel does not function normally.	• When “LF” or “FF” switch is pressed in PAUSE mode, no paper is fed. . Each function cannot be controlled through control panel. • PAUSE mode cannnot be selected. o DIP SW cannot be set.	5-9
The printer does not function normally in on-line mode.	. Self-test is executed correctly, however print data from the host computer is not printed correctly. • When printer is operated, an error occurs to the host computer.	5-10

(1) Printer fails to operate at time of power on.

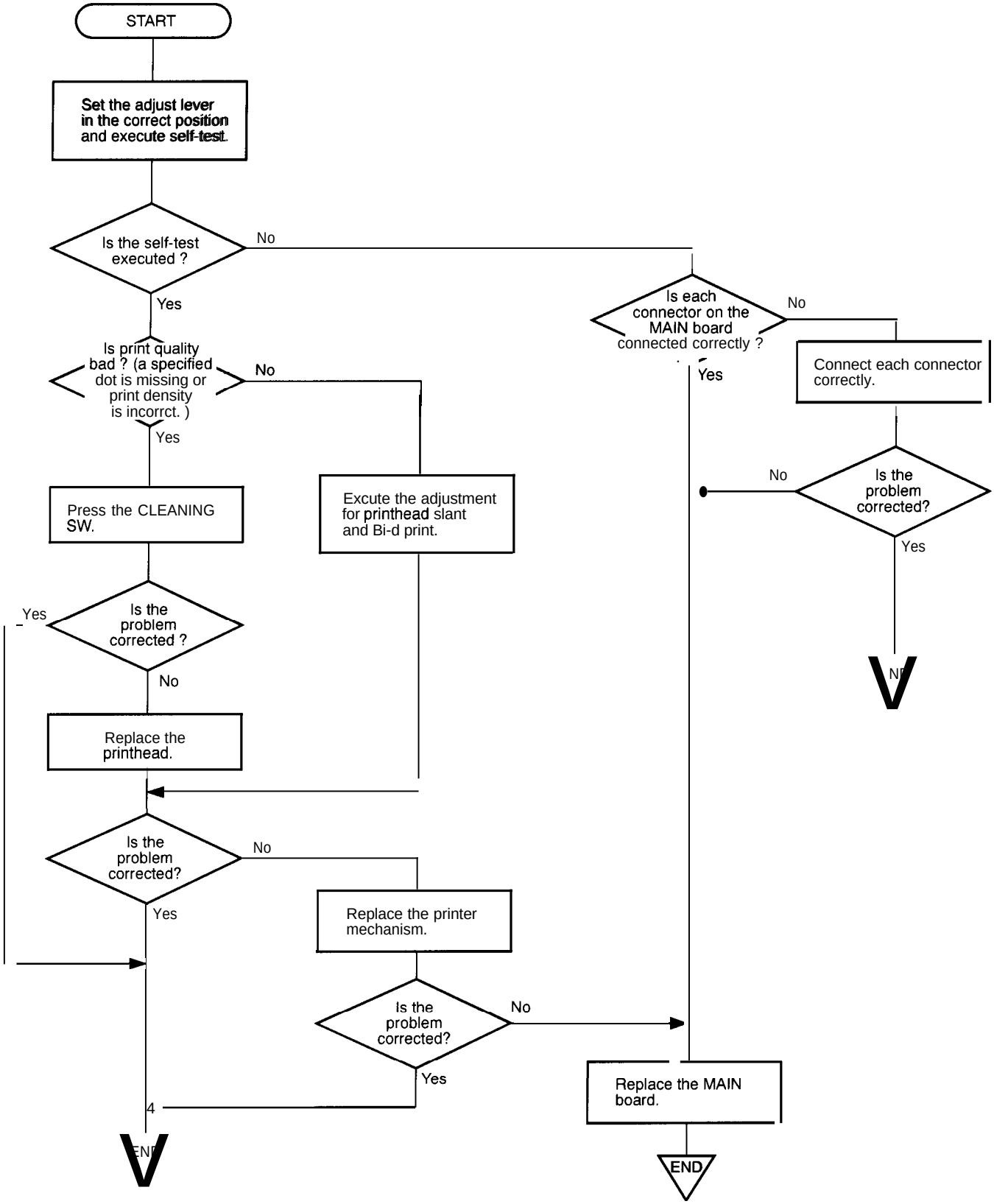


(2) Error is detected.

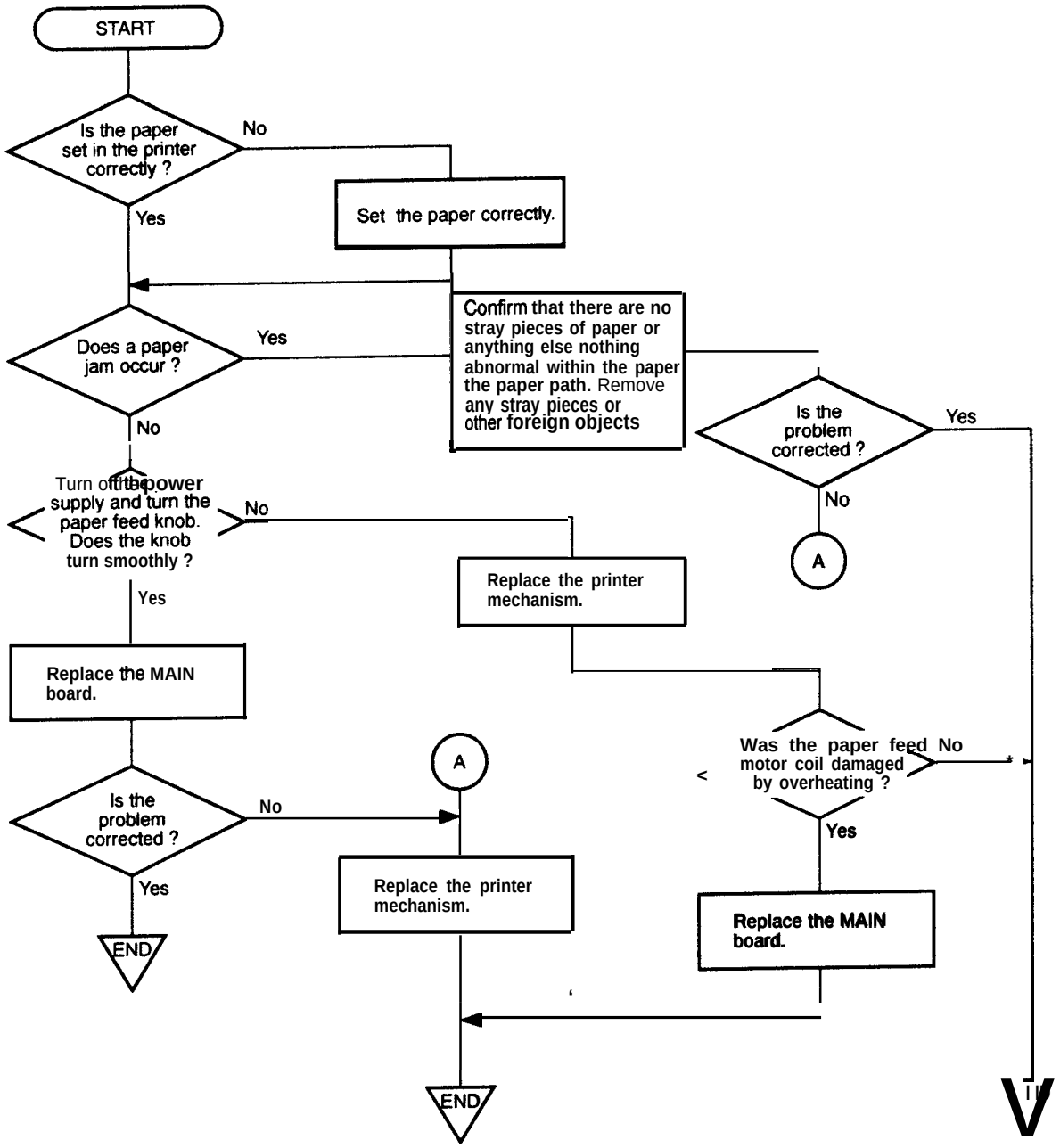



A
Ink end error
'r'es
Replace the HOLDER ASSY., INK CARTRIDGE.
No
Wasted ink drain tank overflow.
Replace the wasted ink drain tank
END
Is the problem corrected ?
Yes
END
No
Replace the MAIN board.
END

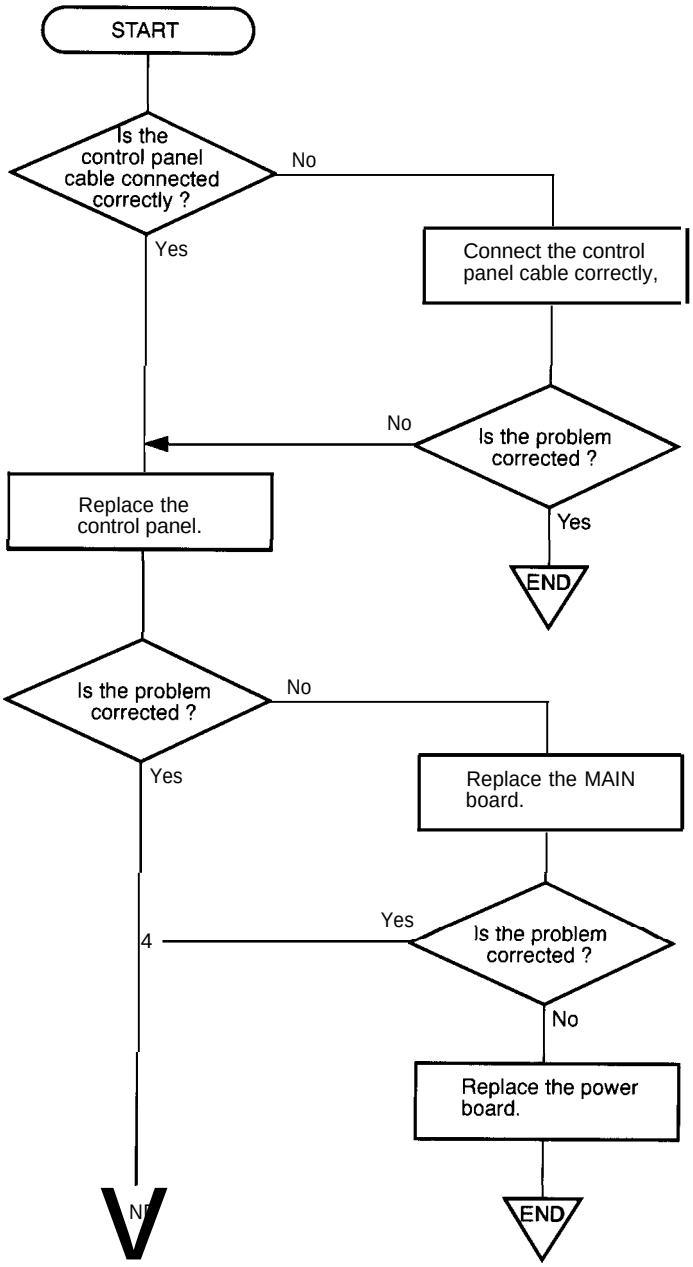
(3) Print failure occurs during self test.



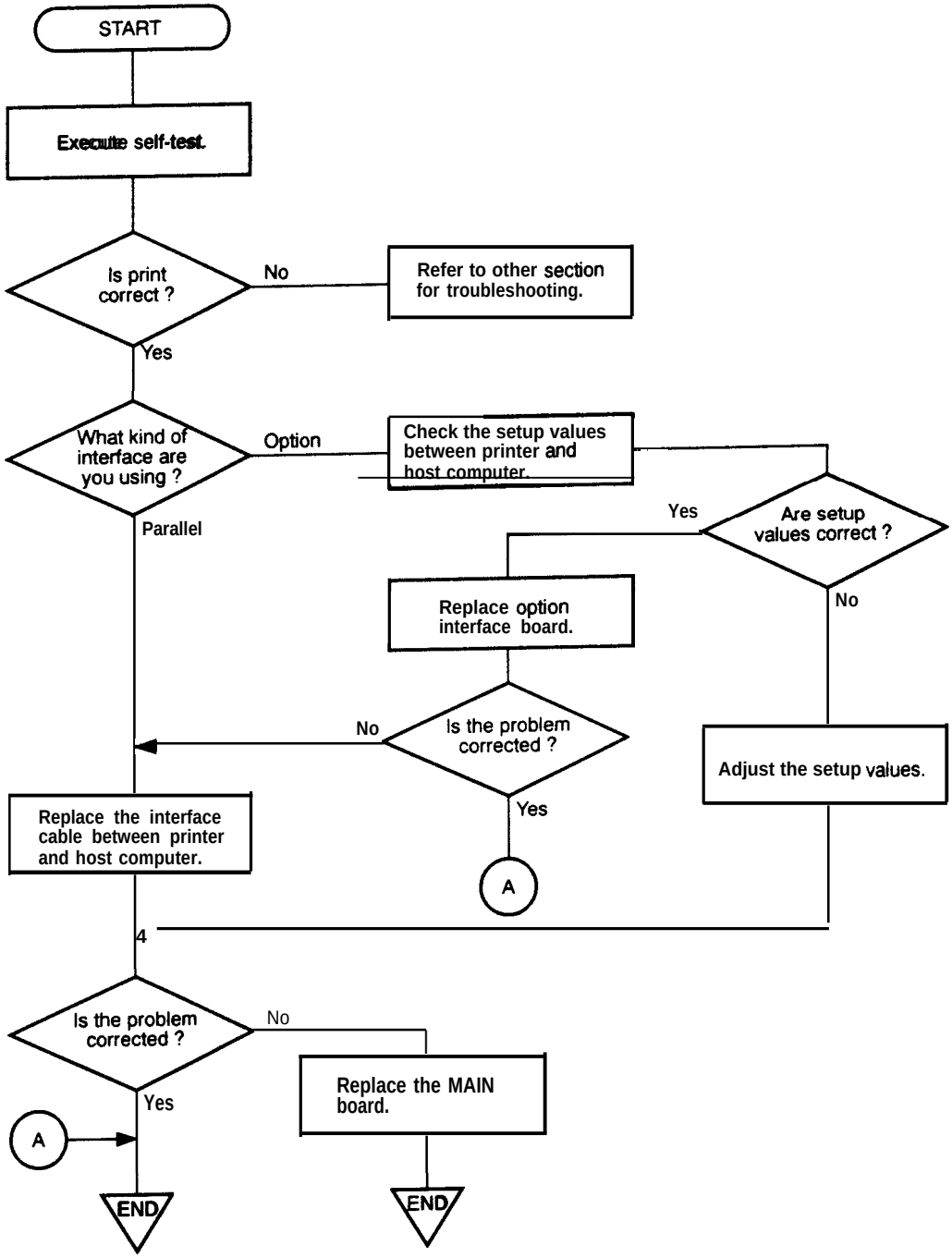
(4) Paper is not fed normally.



(5) Control panel does not function normally.



(6) The printer does not function normally in on-line mode.



5.3 REPAIR OF POWER SUPPLY BOARD

This section describes the problems related to the power supply board. The table below provides various symptoms, likely causes, and checkpoints. The checkpoints refer to waveforms, resistance, and other values to be checked to evaluate the operation of each component. Check these values and take the appropriate action.

Table 5-5. Repair of Power Supply Board

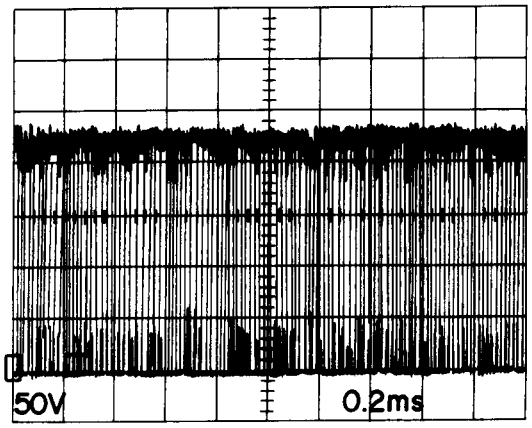
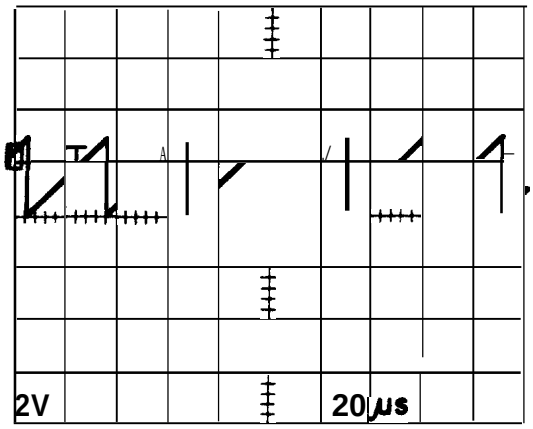
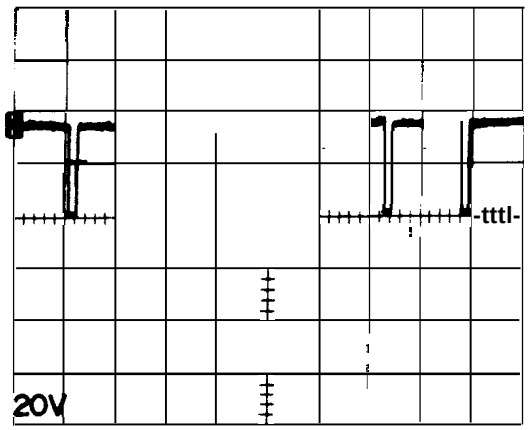
Symptom	Conditon	Cause	Checkpoint	Solution
The printer does not operate at all.	+35V line is dead.	Transformer coils are open.	Check the transformer coils by using a multimeter.	Replace T1.
		FETQ1 is dead.	Check the waveform at the drain of Q1. 	Replace Q1.
	+35V line is abnormal.	Q2, Q3, IC1, PC1 or ZD51 is dead.		Replace Q2, Q3,IC1, PC1 or ZD51.

Table 5-5. Repair of Power Supply Board (Cont.)

Symptom	Conditon	Cause	Checkpoint	Solution
The printer does not op-crate at all.	+5V line is dead.	+35V line is dead.	Check the +35V line.	
		IC51 is dead.	Check the oscillation waveform and switching waveform of IC51.  Oscillation Waveform (IC51, pin 5)  Switching Waveform (IC51, pin 8)	Replace IC51.
		Q51 or Q52 is dead.		Replace Q51 or Q52.

5.4 REPAIR OF MAIN BOARD

This section describes the problems related to the MAIN board. The table below provides various symptoms, likely causes, and checkpoints. The checkpoints refer to waveforms, resistance, and other values to be checked to evaluate the operation of each component. Check these values and take the appropriate action.

Table 5-6. Repair of Main Board

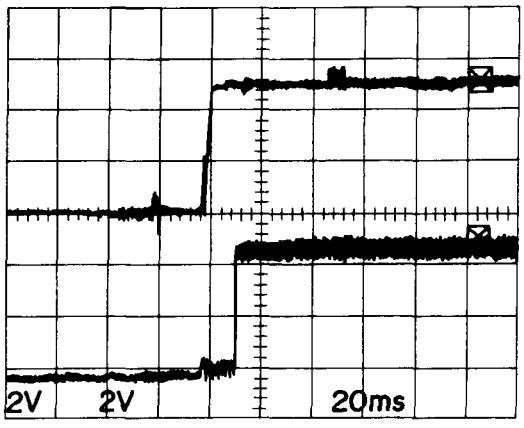
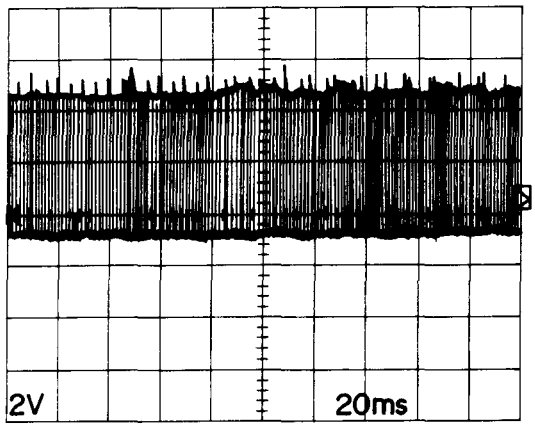
Symptom	Conditon	Cause	Checkpoint	Solution
The printer does not operate at all.	The CPU does not operate.	Reset circuit does not operate.	Check the waveform of the +5V line and that of the $\overline{\text{RESET}}$ signal. 	Replace IC21.
		Under voltage detection circuit is defective.	Check that pin 3 of IC7 is at HIGH level a few moments after the power is turned on.	Replace IC7.
		Selection of control ROM is abnormal.	Check pin 128 of IC12 for a change in the signal HIGH/LOW. 	Replace IC12.

Table 5-6 Repair of Main Board (Cont.)

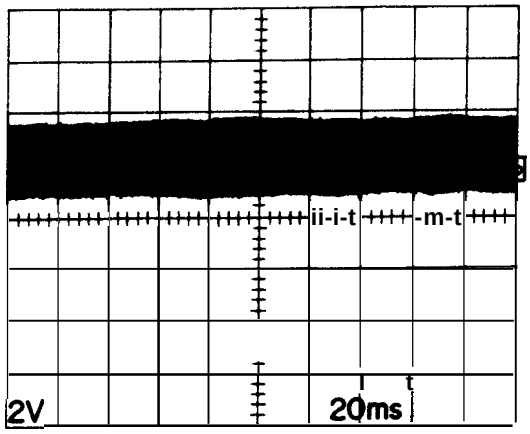
Symptom	Conditon	Cause	Checkpoint	Solution
The printer does not op-crate at ail.	The CPU does not operate.	Either CG or RAM is defective.		Replace CG or RAM.
		CPU is defective.	Check the oscillator signal at either pin 53 or 54 of the CPU. 	If signal is detected, re-place CPU. Otherwise replace CR2.

Table 5-6. Repair of the Main Board (Cont.)

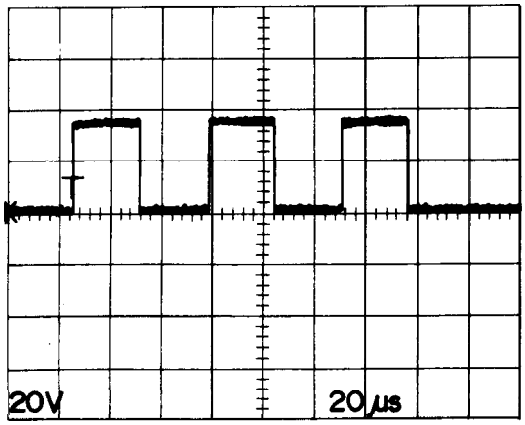
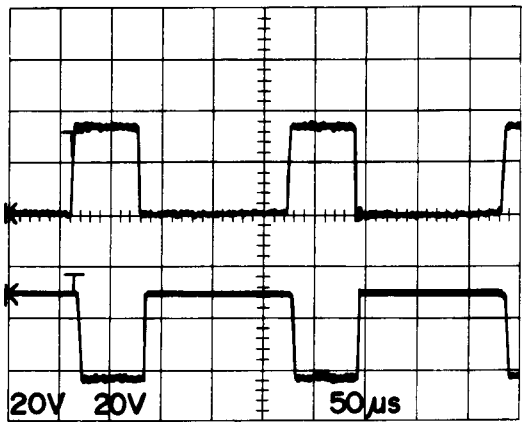
Symptom	Conditon	Cause	Checkpoint	Solution
The carriage does not operate normally.	The carriage does not operate at all.	IC 10 is defective.	Check the oscillator waveform at pins 27, 25, 32 and 31 of IC10. 	Replace Ic 10.
		ICI 7 is defective.	At IC 17, compare the waveform at pin 2 with that at pin 4. 	Replace Ic17.

Table 5-6 Repair of the Main Board (Cont.)

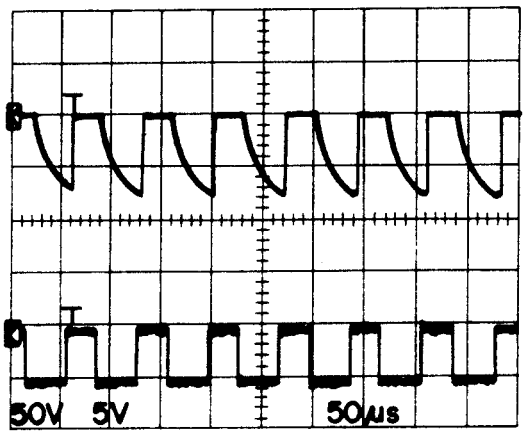
Symptom	Conditon	Cause	Checkpoint	Solution
Self test printing is abnormal.	Self-test is not executed.	The CPU cannot verify the normal voltage.	Check the output voltage of IC20 and the switching waveform of Q8.	Replace IC20 or Q8.
		IC12 is defective.	Check the output signal at pin 33 and pin 30 of IC12. 	Replace IC12.
		IC8 or IC9 is defective.		Replace IC8 or IC9.
Paper is not fed normally.	The paper feed motor does not rotate.	IC12 is defective.	Check the output signal at pin 16, 17, 18, 19 of IC12.	Replace IC12.
		IC11 is defective.	Check the output signal of IC11.	Replace IC4D.
	Feed pitch is abnormal. (Lack of torque)	IC12 is defective.	Check the output signal at pin 165, 166 and 167 of IC12.	Replace IC12.

Table 5-6. Repair of the Main Board (Cont.)

Symptom	Conditon	Cause	Checkpoint	Solution
The top edge holding mechanism does not operate normally.	TE motor **does not rotate at all.**	ICI 2 is **defective.**	Check **the** output signal at pin **21, 22, 23 and 24 of IC 12.**	**Replace Ic12.**
		ICI 8 is defective.	**Check the output signal of IC 18.**	**Replace IC 18.**
The pump does not operate normally	**The pump motor does not rotate at all.**	**IC12 or IC16 is defective.**	**Check the waveform at pin 1 and 2 of ICI 2 and pin 15 and 9 of IC 16.**	**Replace IC12 or 16.**
Abnormal print in online mode.	**Data is not received normally.**	**ICI 2 is defective.**	**Check the input/output signal of IC 12.**	**Replace Ic12.**

5.5 REPAIR OF THE PRINTER MECHANISM

Troubles related to the printer mechanism should be repaired according to the troubleshooting procedures in Table 5-7.

Table 5-7. Repair of Printer Mechanism

Symptom	Condition	Cause	Checkpoint	Solution
The pump motor does not rotate.	The pump motor fails to rotate at time of power on.	Foreign substances are lodged in the gear in the mechanism.	Manually drive the gear train connected to the pump motor to check if the motor rotates.	Remove any foreign substance.
		The pump motor is defective.	Check the coil resistance of the motor.	Replace the pump motor.
Ink is not absorbed or poorly absorbed.	Used ink does not go through the used ink tube during the cleaning operation.	The tube is not properly connected to the cap.	Check that the tube is properly connected to the cap.	Set the tube properly.
		The ink tube is damaged.	Check the ink tube visually.	Replace the tube.
		The cap is defective.	Check for any defective part.	Replace the head cap.
		The pump is defective.	Replace the pump to see if this causes the ink to be absorbed normally.	Replace the pump unit.
		The printhead is defective.	Replace the printhead to see if this causes the ink to be absorbed normally.	Replace the printhead.
The carriage motor does not rotate.	The carriage motor fails to rotate at time of power on.	Foreign substances are lodged in the gear in the mechanism.	Manually drive the timing belt to see if the carriage motor rotates.	Remove any foreign substance.
		The carriage motor is defective.	Measure the coil resistance of the CR motor.	Replace the carriage motor.

Table 5-7. Repair of Printer Mechanism (Cont.)

Symptom	Condition	Cause	Checkpoint	Solution
The carriage does not operate normally at time of power on. (after the carriage has been manually centered prior to power on).	The carrige motor rotates, but the carriage does not move.	The pulley is defective.	Check for broken or worn pulley.	Replace the driven pullely.
		The timing belt is defective.	Check that the timing belt is properly inserted into the bottom of carriage.	Reinsert the timing belt.
			Check the timing belt for any damage.	Replace the timing belt.
	The carriage moves to the left slightly and then stops.	Carriage movement is not smooth.	Check whether the carriage moves smoothly when moved manually.	Clean and lubricate.
			Check tension of the timing belt.	Adjust tension of the timing belt.
	The carriage moves to the left or right end, and then stops.	The encoder is defective.		Replace the encoder.
Printing is not performed.	The carriage moves, but no printing is performed.	The ink end sensor is defective.	Check the ink-end sensor with a tester.	Replace the ink end sensor.
		The head cable is disconnected.	Check the head cable for disconnection.	Replace the cable.
		The printhead is defective.	Replace the printhead to see if the printhead operates normally.	Replace the printhead.
		Ink absorption is poor.	See “Ink is not absorbed” on the previous page.	

Table 5-7. Repair of Printer Mechanism (Cont.)

Symptom	Condition	Cause	Checkpoint	Solution
Abnormal printing.	A particular dot is not printed.	Front of the printhead is not clean.	Perform the cleaning operation.	Clean.
		The head cable is disconnected.	Check the head cable for disconnection.	Replace the cable.
		The printhead is defective.	Replace the printhead.	Replace the printhead.
	A dot is not printed occasionally.	Front of the printhead is not clean.	Check front of the printhead.	Clean.
		The expiration of the ink cartridge.	Check the ink cartridge for expiration.	Replace the ink cartriege.
		Insufficient contact of the head cable.	Check whether the cable is properly plugged into the connector.	Plug the cale into the connector properly.
			Check the cleanliness.	Clean.
		The printhead is defective.	Replace the printhead to see if this causes printing to be performed normally.	Replace.
		Ink is poorly absorbed.	Check whether the used ink goes through the used ink tube.	See “Ink is not Absorbed”.
	Printed characters are not aligned.	The platen gap is not adjusted.	Check the platen gap.	Adjust the gap.
		Head inclination is not adjusted.		Adjust the head inclination.
	The intervals between the characters are irregular.	The timing belt is defective.	Check that the timing belt is properly inserted into the bottom of carriage.	Set the timing belt properly.
			Tension of the timing belt is not adjusted.	Adjust the tension.
	Print at the sides is abnormal.	The paper gu de is damaged.	Check the paper guide.	Replace or reset the paper guide.
	Vertical line is not aligned.	Head inclination is not adjusted.	Adjust the head inclination.	Adjust the head inclination.

Table 5-7. Repair of Printer Mechanism (Cont.)

Symptom	Condition	Cause	Checkpoint	Solution
Paper is not fed normally.	Top edge holding mechanism does not function properly.	The TE motor is defective.	Measure the coil resistance of the TE motor.	Replace the TE motor.
	Paper-feeding method cannot be changed.	Release mechanism is defective.	Check the release mechanism.	Replace the defective parts.
	Paper is not fed.	Foreign substance are lodged in the paper path.	Visually check the paper path.	Remove any foreign substance.
		Paper feeding gears are defective.	Visually check the gears.	Replace defective gears.
		The paper-feed motor is defective.	Measure the coil resistance of the PF motor.	Replace the PF motor.

CHAPTER 6
MAINTENANCE

LIST OF FIGURES

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6.1 PREVENTIVE MAINTENANCE

Preventive maintenance includes regular cleaning of the case exterior (using denatured alcohol), as well as occasional vacuuming of the mechanism's interior to remove dust and paper debris. After cleaning the unit, check that it is adequately lubricated (as described in Section 6.2, below). Before returning the printer to the customer, check that the printer operates normally.

WARNING

Do not use thinner, trichloroethylene, or ketone-based solvents on the plastic components of the printer.

6.2 LUBRICATION AND ADHESIVE APPLICATION

Lubrication should be performed when mechanical noise of the printer exceeds a certain level or when disassembly or replacement of the printer is performed.

EPSON recommends that the printer be lubricated at the points as listed in Table 6-2. The two recommended lubricants are EPSON O-5, G-1 4, both of which have been tested extensively and found to comply with the needs of this printer. (Table 6-1 provides details about these lubricants.) Before applying a lubricant, be sure that the surface to be lubricated is clean. Do not apply too much lubricant, as this may dirty or affect the adjacent parts.

Adhesive application is necessary at the point listed in Table 6-3. Figure 6-1 indicates the point at which adhesive must be applied following disassembly or replacement. EPSON recommends Neji lock #2(G) adhesive. Do not let the adhesive overflow to adjacent parts when applying it.

Table 6-1. Lubricants and Adhesive

Type	Name	Quantity	Part No.	Availability
Oil	o-5	40 cc	1010513	E
Grease	G-1 4	40 gm.	B70 1400001	E
Adhesive	Neji lock #2 (G)	1000 gm.	B730200200	E

E: EPSON-exclusive product

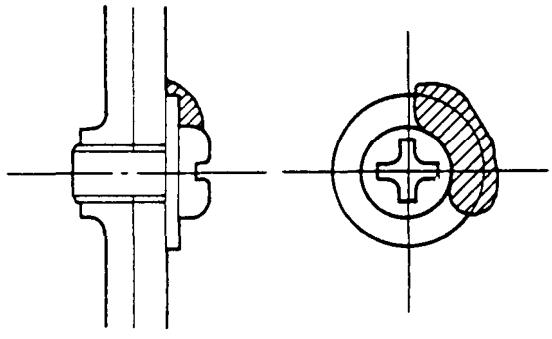


Figure 6-1. How to Apply Adhesive

Table 6-2. **Lubrication Points (Refer to Figure 6-2 to Figure 6-3)**

Ref. No.	Lubrication Points	Lubricant
(1)	Sliding surface of the LEVER, RELEASE, SUB.	G-1 4
(2)	The left shaft of the ROLLER ASSY., DRIVER and the inner side of the FRAME ASSY., LEFT.	G-14
(3)	HOLDER, PLATEN, RIGHT	G-1 4
(4)	HOLDER, PLATEN, LEFT	G-1 4
(5)	Carriage pad and CARRIAGE, SUB	o-5

Table 6-3. Adhesive Application Points (Refer to Figure 6-2 to Figure 6-3.)

Ref. No.	Adhesive Application Point	No. of Points
①	Screw fastening top edge assembly (1/4 of the perimeter)	2
②	Screw fastening SENSOR ASSY., PW (1/4 of the perimeter)	3
③	Timing belt (2 teeth)	1
④	Head fastening screw (right-side only) (1/4 of the perimeter)	1
⑤	LEVER, PARALLEL, ADJUST (1/4 of the perimeter)	1
⑥	FLANGE NUT (M4) of the lever G, ADJUST holder (1/4 of the perimeter)	1

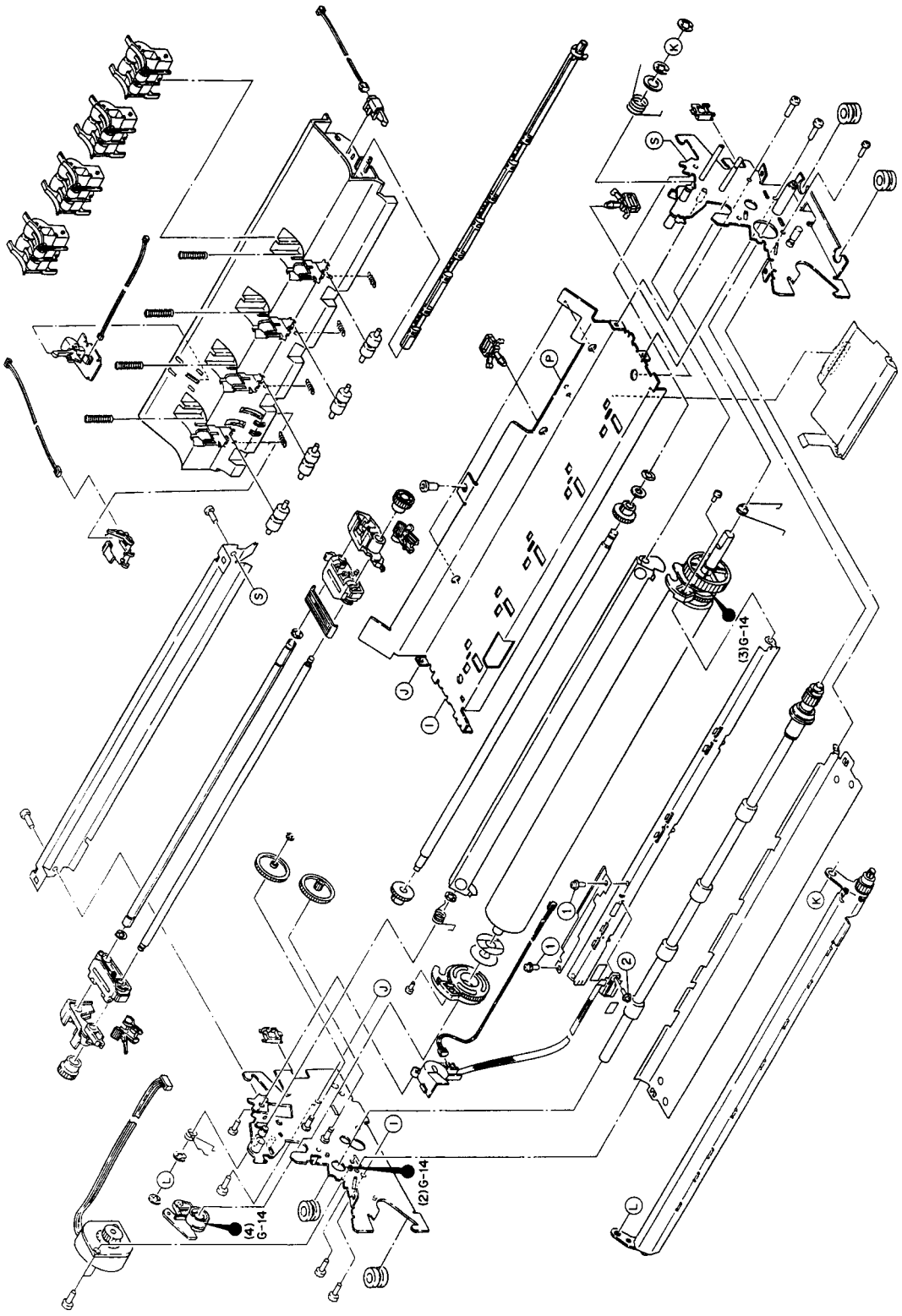


Figure 6-2. **Lubrication Points (1)**

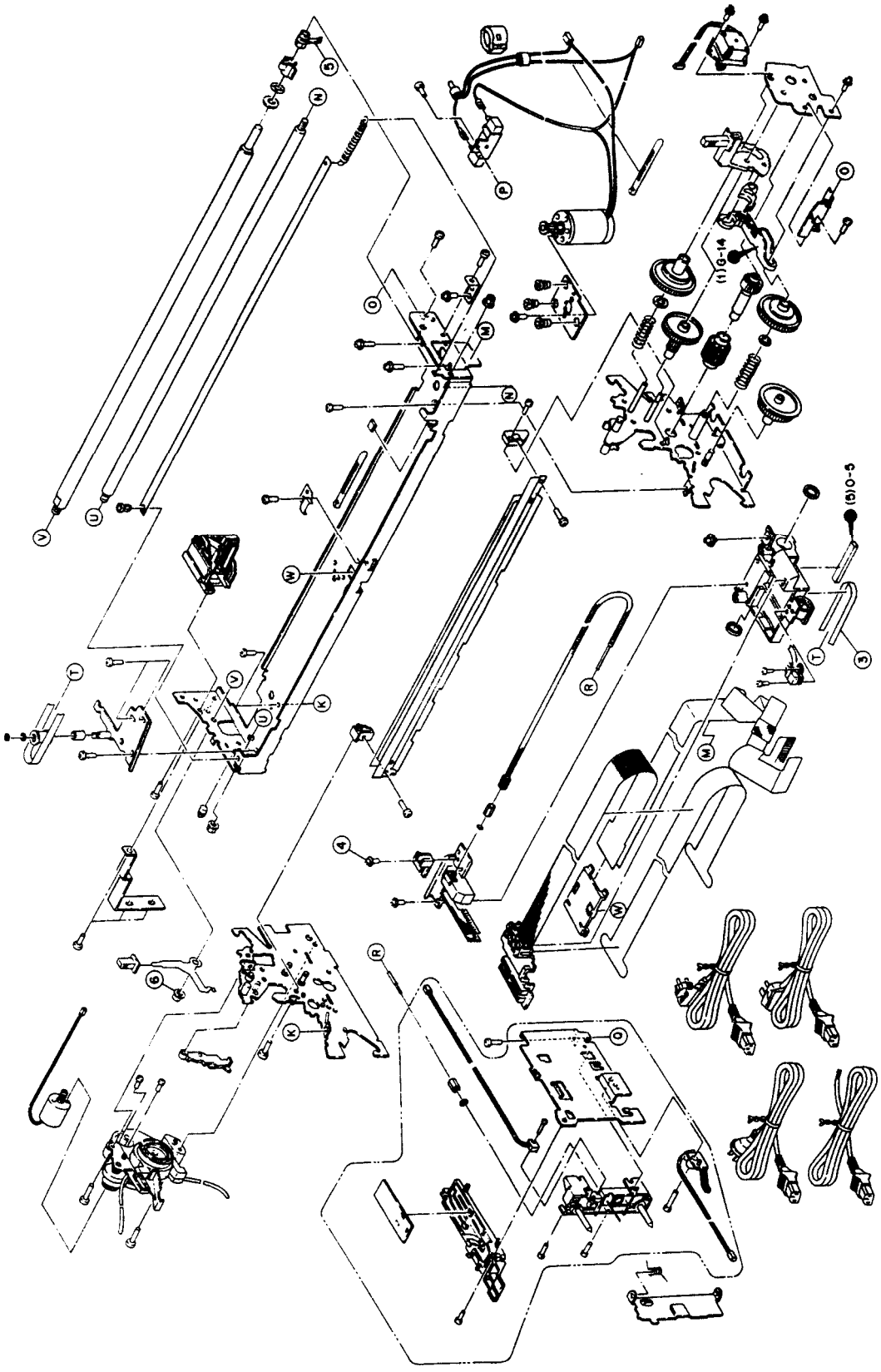


Figure 6-3. **Lubrication Points** (2)

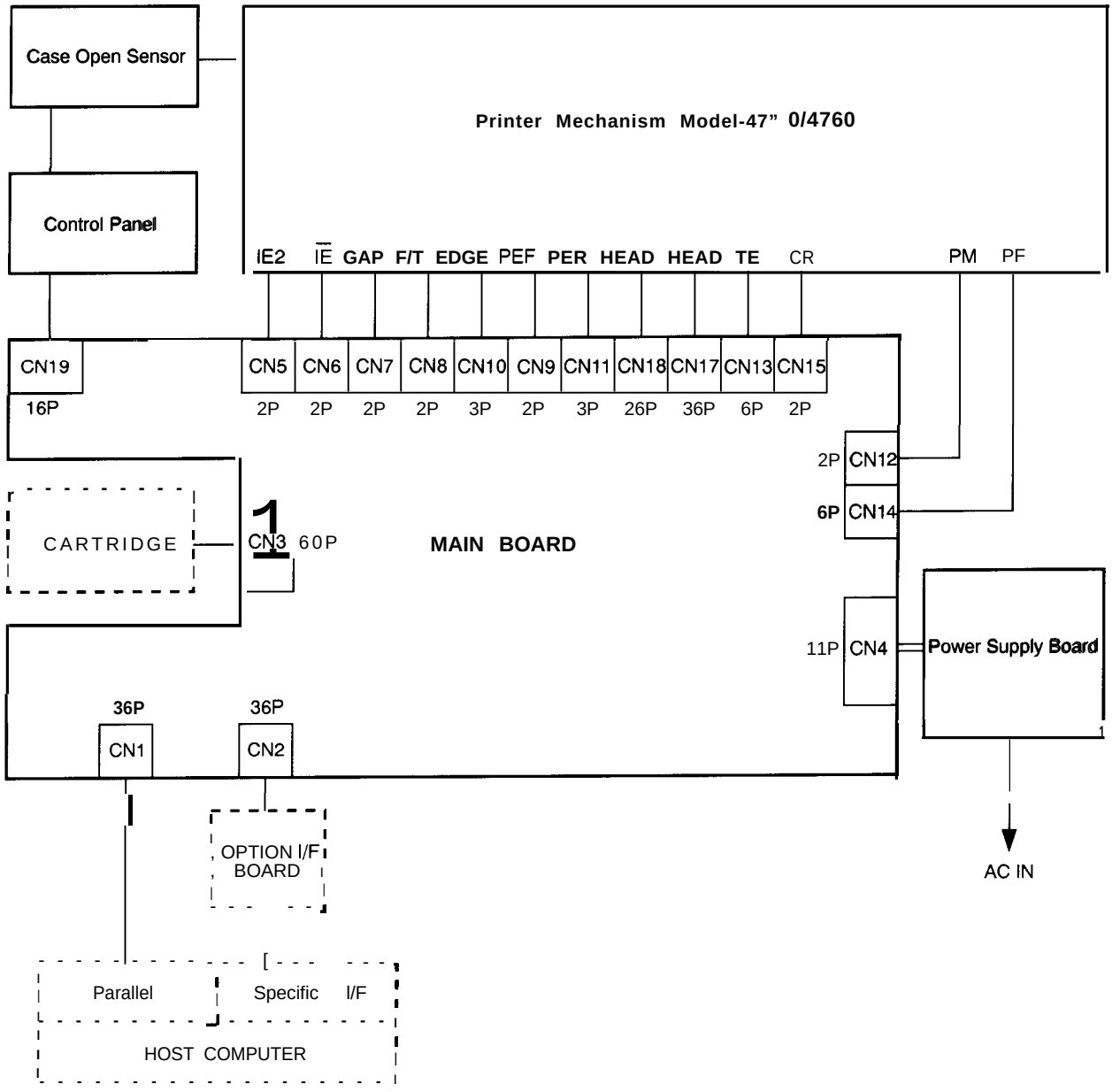
APPENDIX

LIST OF FIGURES

LIST OF TABLES

A.1 CONNECTOR SUMMARY

Figure A-1 illustrates the interconnection of the primary components. Table A-1 summarizes the functions and sizes of the connectors.



IE2:	Ink Cartridge Sensor	IE:	Ink End Sensor
GAP:	Platen Gap	F/T:	Friction/Tractor Sensor
EDGE:	Top Edge Sensor	PEF:	PE Sensor (Front)
PER:	PE Sensor (Rear)	HEAD:	Printhead
TE:	TE Motor	CR:	Carriage Motor
PM:	Pump Motor	PF:	PF Motor

Figure A-1. Cable Connections

Table A-1. Board Connector Summary

Board	Connector	Function	Pins
C076 MAIN board	CN1	Parallel interface	36
	CN2	Optional interface card	36
	CN3	Identity or font module	60
	CN4	DC power input (C076PSB/PSE board)	11
	CN5	Ink cartridge sensor	2
	CN6	Ink end sensor	2
	CN7	PG sensor	2
	CN8	Release sensor	2
	CN9	Paper-end sensor (front)	2
	CN1O	Top edge sensor	3
	CN 11	Paper-end sensor (rear)	3
	CN 12	Pump motor	2
	CN 13	Top edge motor	6
	CN14	Paper feed motor	6
	CN 15	Carriage motor	2
	CN 16	For adjustment	2
	CN 17	Printhead	36
	CN 18	Printhead	26
	CN 19	Control Panel	16
	CN2O	—	2
C076 PSB/PSE board	CN 1	AC power input	2
	CN3	DC power output (C076 MAIN board)	11
Control Panel board	CN 1	C076 MAIN board	16
	CN2	Cover open sensor	3

Table A-2. CN2(C076 MAIN)

No.	I/O	Signal Name	Function
1	-	+5	+5 VDC
2	-	+5	+5 VDC
3	-	+5	+5 VDC
4	-	+5	+5 VDC
5	-	+5	+5 VDC
6	-	+5	+5 VDC
7	0	TXD	Transmit data
8	0	$\overline{\text{READY}}$	Ready to receive data
9	I	RXD	Receive data
10	-	*NC*	*No* connection
11	0	RST	Reset
12	0	INH	Inhibit
13	I	$\overline{\text{CMREQ}}$	Command request
14	I	$\overline{\text{WRRDY}}$	Write ready
15	I	$\overline{\text{RDREQ}}$	Read request
16	0	WR	Write
17	0	RD	Read
18	0	Cs	chip select
19	-	GND	Signal ground
20	-	GND	Signal ground
21	-	GND	Signal ground
22	-	GND	Signal ground
23	-	GND	Signal ground
24	-	GND	Signal ground
25	0	A3	Address bus bit 3
26	0	A2	Address bus bit 2
27	0	A1	Address bus bit 1
28	0	AO	Address bus bit O
29	I/O	D7	Data bus bit 7
30	I/O	D6	Data bus bit 6
31	I/O	D5	Data bus bit 5
32	I/O	D4	Data bus bit 4
33	I/O	D3	Data bus bit 3
34	I/O	D2	Data bus bit 2
35	I/O	D1	Data bus bit 1
36	I/O	DO	Data bus bit O

Table A-3. CN3(C076 MAIN)

No.	I/O	Signal Name	Function
1	-	+5	+5 VDC
2	-	+5	+5 VDC
3	-	+5	+5 VDC
4	I	$\overline{\text{ARE(3}}$	Address request
5	0	CNT	MMIO2
6	0	$\overline{\text{PROG}}$	P-ROM chip select
7	0	RAM	RAM chip select
8	0	CG	CG ROM chip select
9	0	WR	Write strobe
10	0	CGA18	CG address bit 17
11	0	RD	Read strobe
12	0	CGA13	CG address bit 13
13	0	CGA14	CG address bit 14
14	0	RAM 14	RAM address bit 14
15	0	CGA15	CG address bit 15

Table A-3. CN3(C076 MAIN) (Cont.)

No.	I/O	Signal Name	Function
16	0	RAM 15	RAM address bit 15
17	0	CGA16	CG address bit 16
18	0	RAM 16	RAM address bit 16
19	0	CGA17	CG address bit 17
20	0	AO	Address bit O
21	0	A1	Address bit 1
22	0	A2	Address bit 2
23	0	A3	Address bit 3
24	0	A4	Address bit 4
25	0	A5	Address bit 5
26	0	A6	Address bit 6
27	0	A7	Address bit 7
28	0	A8	Address bit 8
29	-	+5	+5 VDC
30	-	+5	+5 VDC
31	-	GND	Signal ground
32	-	GND	Signal ground
33	-	GND	Signal ground
34	0	PROGA16	Program address bit 16
35	0	$\overline{\text{MREQ}}$	Memory request
36	0	PROGA15	Program address bit 15
37	0	PROGA14	Program address bit 14
38	0	CGA22	CG address bit 22
39	0	CGA21	CG address bit 21
40	0	CGA20	CG address bit 20
41	0	CGA19	CG address bit 19
42	0	PROGA13	Program address bit 13
43	0	RAMAI 3	RAM address bit 13
44	0	A9	Address bit 9
45	0	A IO	Address bit 10
46	-	NC	Not connect
47	0	AI 1	Address bit 11
48	-	NC	Not connect
49	0	AI 2	Address bit 12
50	I/O	D7	Data bus bit 7
51	I/O	D6	Data bus bit 6
52	I/O	D5	Data bus bit 5
53	I/O	D4	Data bus bit 4
54	I/O	D3	Data bus bit 3
55	I/O	D2	Data bus bit 2
56	I/O	D1	Data bus bit 1
57	I/O	DO	Data bus bit O
58	-	GND	Signal ground
59	-	GND	Signal ground
60	-	GND	Signal ground

Table A-4. **CN4(C076 MAIN)**

No.	I/O	Signal Name	Function
1	–	+5	+5 VDC
2	–	+5	+5 VDC
3	–	GND	Signal ground
4	–	GND	Signal ground
5	–	GND	Signal ground
6	–	GP	Power ground
7	–	GP	Power ground
8	–	GP	Power ground
9	–	+35	+35 VDC
10	–	+35	+35 VDC
11	–	NC	Not connect

Table A-5. **CN5(C076 MAIN)**

No.	I/O	Signal Name	Function
1	I	IE2	Ink cartridge sensor
2	-	GND	Signal ground

Table A-6. **CN6(C076 MAIN)**

No.	I/O	Signal Name	Function
1	I	$\overline{IE}$	Ink end sensor
2	-	GND	Signal ground

Table A-7. **CN7(C076 MAIN)**

No.	I/O	Signal Name	Function
1	I	$\overline{GAP}$	Platen gap sensor
2	-	GND	Signal ground

Table A-8. **CN8(C076 MAIN)**

No.	I/O	Signal Name	Function
1	I	F/$\overline{T}$	Release sensor
2	–	GND	Signal ground

Table A-9. **CN9(C076 MAIN)**

No.	I/O	Signal Name	Function
1	I	PE	Paper-end sensor (F)
2	-	GND	Signal ground

Table A-10. **CN10(C076 MAIN)**

No.	I/O	Signal Name	Function
1	I	EDGE	Top edge *sensor*
2	-	GND	Signal ground
3	-	LED	+5 VDC

Table A-1 1. **CN11(C076 MAIN)**

No.	I/O	Signal Name	Function
1	–	LED	+5 VDC
2	I	PE	Paper-end sensor (R)
3	-	GND	Signal ground

Table A-12. **CN12(C076 MAIN)**

No.	I/O	Signal Name	Function
1	0	PM+	Pump motor +
2	0	PM-	Pump motor -

Table A-13. **CN13(C076 MAIN)**

No.	I/O	Signal Name	Function
1	0	TEA	TE motor phase A
2	0	TE-A	TE motor phase /A
3	0	TEB	TE motor phase B
4	0	TE-B	TE motor phase /B
5		TECOM	TE motor common
6		TECOM	TE motor common

Table A-14. **CN14(C076 MAIN)**

No.	I/O	Signal Name	Function
1	0	PFA	PF motor phase A
2	0	PF-A	PF motor phase /A
3	0	PFB	PF motor phase B
4	0	PF-B	PF motor phase /B
5	–	PFCOM	PF motor common
6	–	PFCOM	PF motor common

Table A-15. **CN15(C076 MAIN)**

No.	1/0	Signal Name	Function
1	0	CM+	CR motor
2	0	CM-	CR motor

Table A-16. **CN16(C076 MAIN)**

No.	I/O	Signal Name	Function
1	-	GND	GND
2	I	THER	Dummy register

Table A-17. CN17 (C076 MAIN)

No.	I/O	Signal Name	Function
1	0	HD2	Head data 2
2	0	HD4	Head data 4
3	0	HD6	Head data 6
4	0	HD8	Head data 8
5	0	HD 10	Head data 10
6	0	HD 12	Head data 12
7	0	HD 14	Head data 14
8	0	HD 16	Head data 16
9	0	HD 18	Head data 18
10	0	HD20	Head data 20
11	0	HD22	Head data 22
12	0	HD24	Head data 24
13	0	HD26	Head data 26
14	0	HD28	Head data 28
15	0	HD30	Head data 30
16	0	HD32	Head data 32
17	0	HD34	Head data 34
18	0	HD36	Head data 36
19	0	HD38	Head data 38
20	0	HD40	Head data 40
21	0	HD42	Head data 42
22	0	HD44	Head data 44
23	0	HD46	Head data 46
24	0	HD48	Head data 48
25	-	COM	Common
26	-	COM	Common
27	-	GND/T	GND for thermistor
28	I	THER	Thermistor
29	-	SHLD	Shield
30	I	ENB	Encoder phase B
31	-	SHLD	Shield
32	-	+5	+5 VDC
33	-	SHLD	Shield
34	I	ENA	Encoder A
35	-	SHLD	Shield
36	-	GND	GND

Table A-18. CN18(C076 MAIN)

No.	I/O	Signal Name	Function
1	-	COM	Common
2	-	COM	Common
3	0	HD 1	Head data 1
4	0	HD3	Head data 3
5	0	HD5	Head data 5
6	0	HD7	Head data 7
7	0	HD9	Head data 9
8	0	HD 11	Head data 11
9	0	HD 13	Head data 13
10	0	HD 15	Head data 15
11	0	HD 17	Head data 17
12	0	HD 19	Head data 19
13	0	HD21	Head data 21
14	0	HD23	Head data 23
15	0	HD25	Head data 25
16	0	HD27	Head data 27
17	0	HD29	Head data 29
18	0	HD31	Head data 31
19	0	HD33	Head data 33
20	0	HD35	Head data 35
21	0	HD37	Head data 37
22	0	HD39	Head data 39
23	0	HD41	Head data 41
24	0	HD43	Head data 43
25	0	HD45	Head data 45
26	0	HD47	Head data 47

Table A-1 9. CN19(C076 MAIN)

No.	I/O	Signal Name	Function
1	I	PAUSE	PAUSE switch
2	0	TXS	Transmit data
3	I	$\overline{\text{LDLED}}$	LED condition load
4	0	CKS	Serial clock
5	I	$\overline{\text{LDSW}}$	Switch condition load
6	I	RXS	Relived data
7	-	+5	+5 VDC
8	-	+5	+5 VDC
9	-	GND	GND
10	-	GND	GND
11	-	FG	Frame GND
12	I	LOCKB	Case open sensor
13	-	FG	Frame GND
14	-	FG	Frame GND
15	-	FG	Frame GND
16	-	LOCKA	+35 VDC

Table A-20. CN20 (C076 MAIN)

No.	I/O	Signal Name	Function
1	-	RA	Not used
2	-	RB	Not used

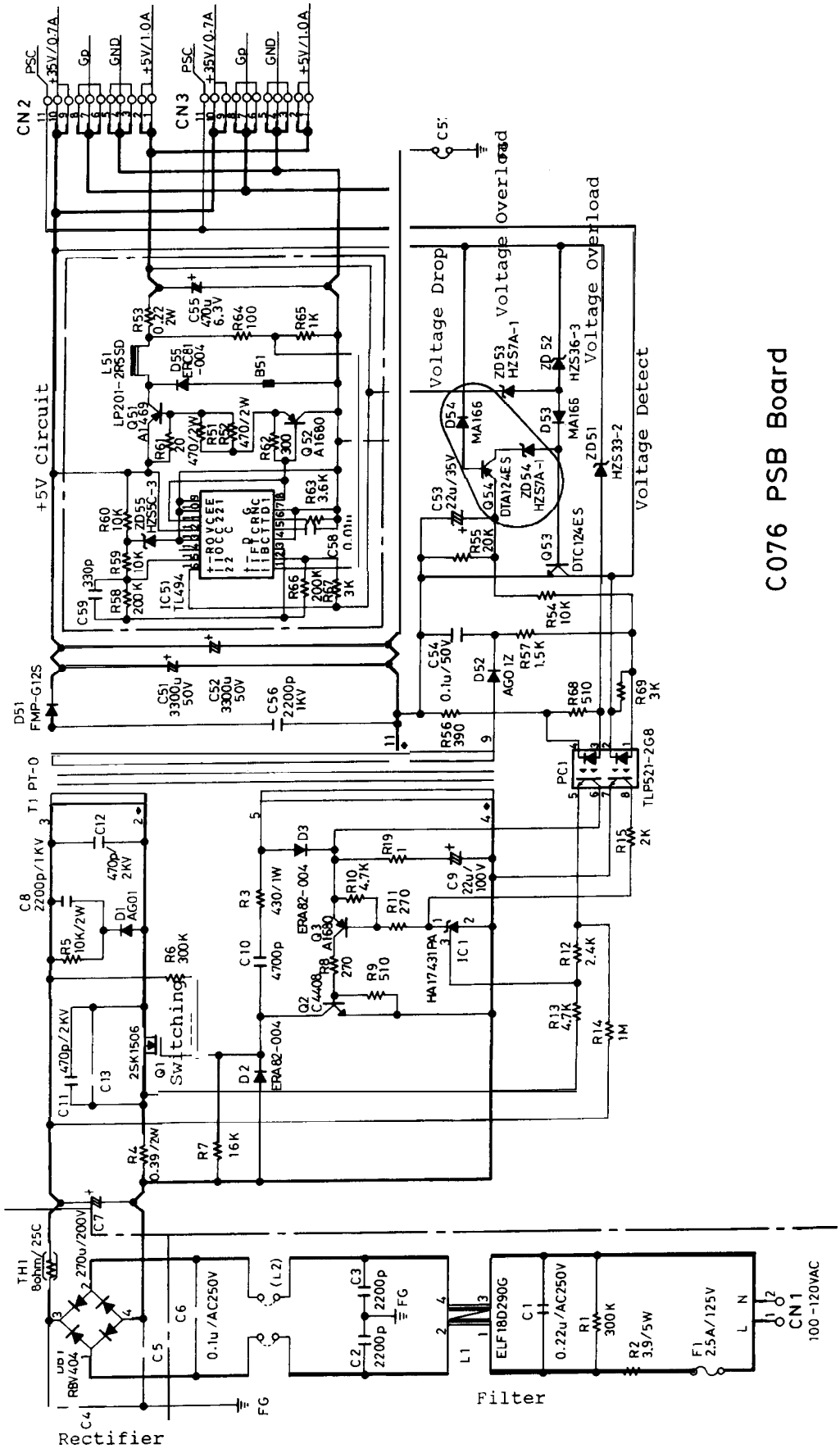


Figure A-4. C076 PSB Board Circuit Diagram (Annotated)

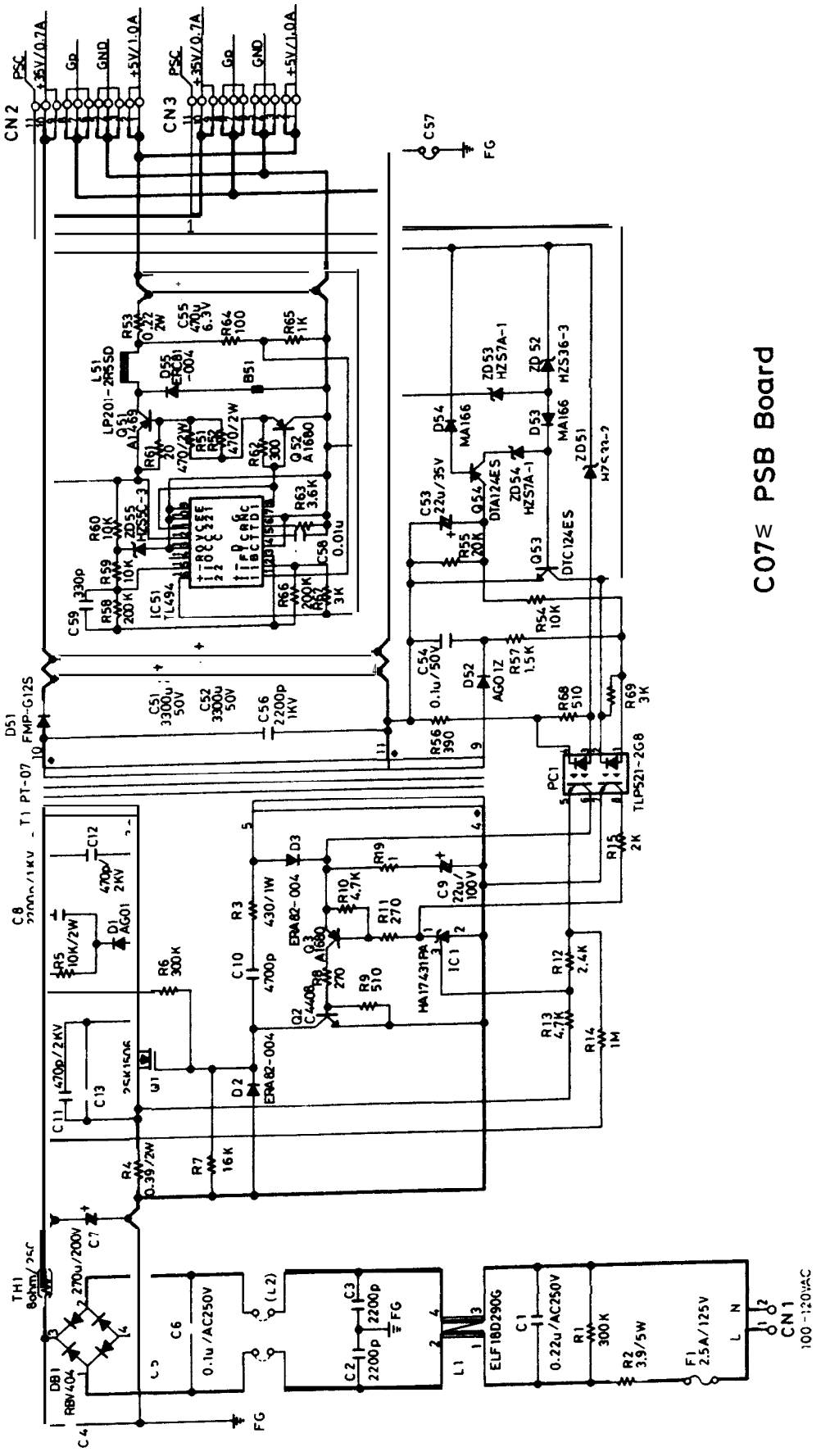


Figure A-5. C076 PSB Board Circuit Diagram

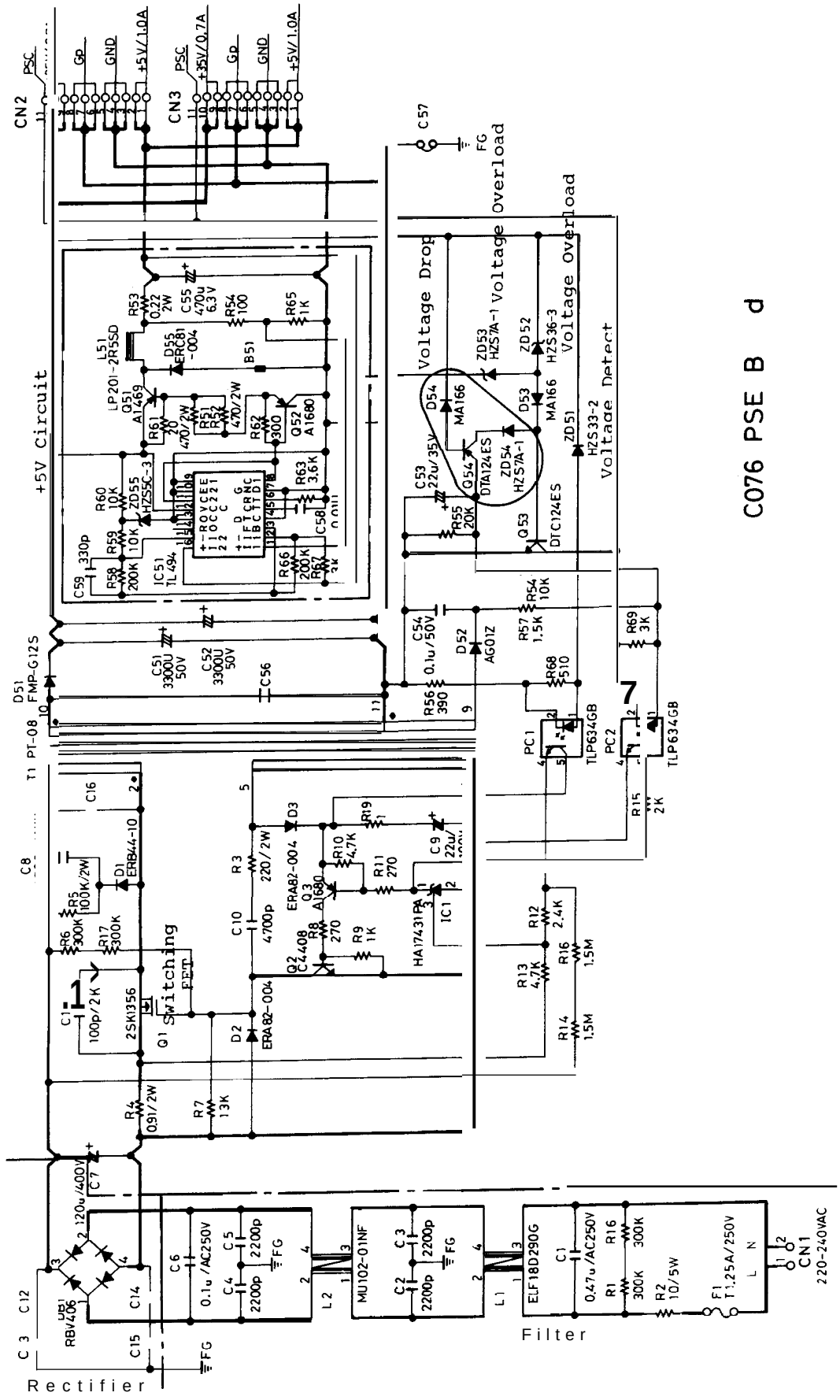


Figure A-6. C076 PSE Board Circuit Diagram (Annotated)

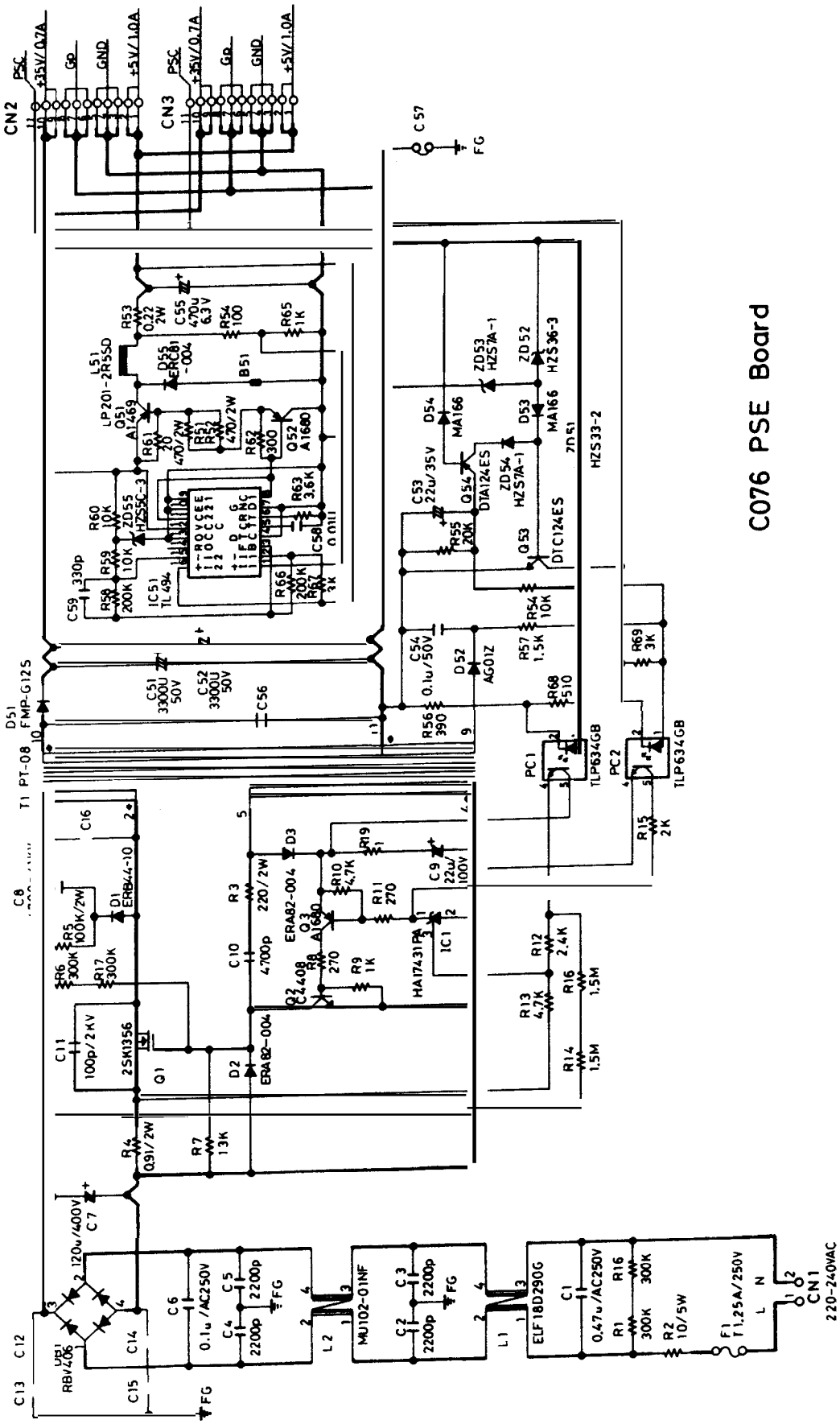


Figure A-7. C076 PSE Boerd Circuit Diagram

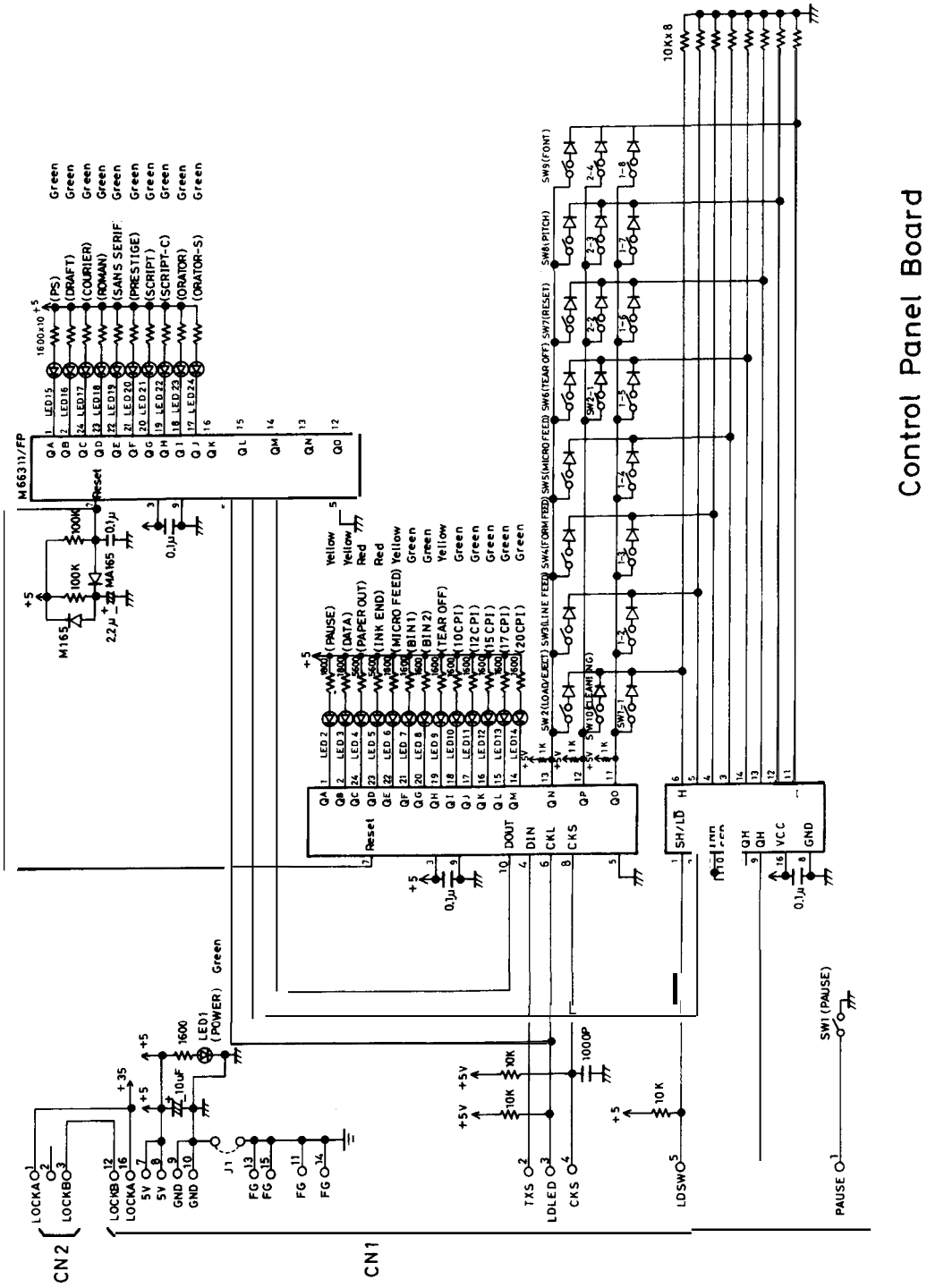


Figure A-8. Control Panel Board Circuit Diagram

A.3 CIRCUIT BOARD COMPONENT LAYOUT

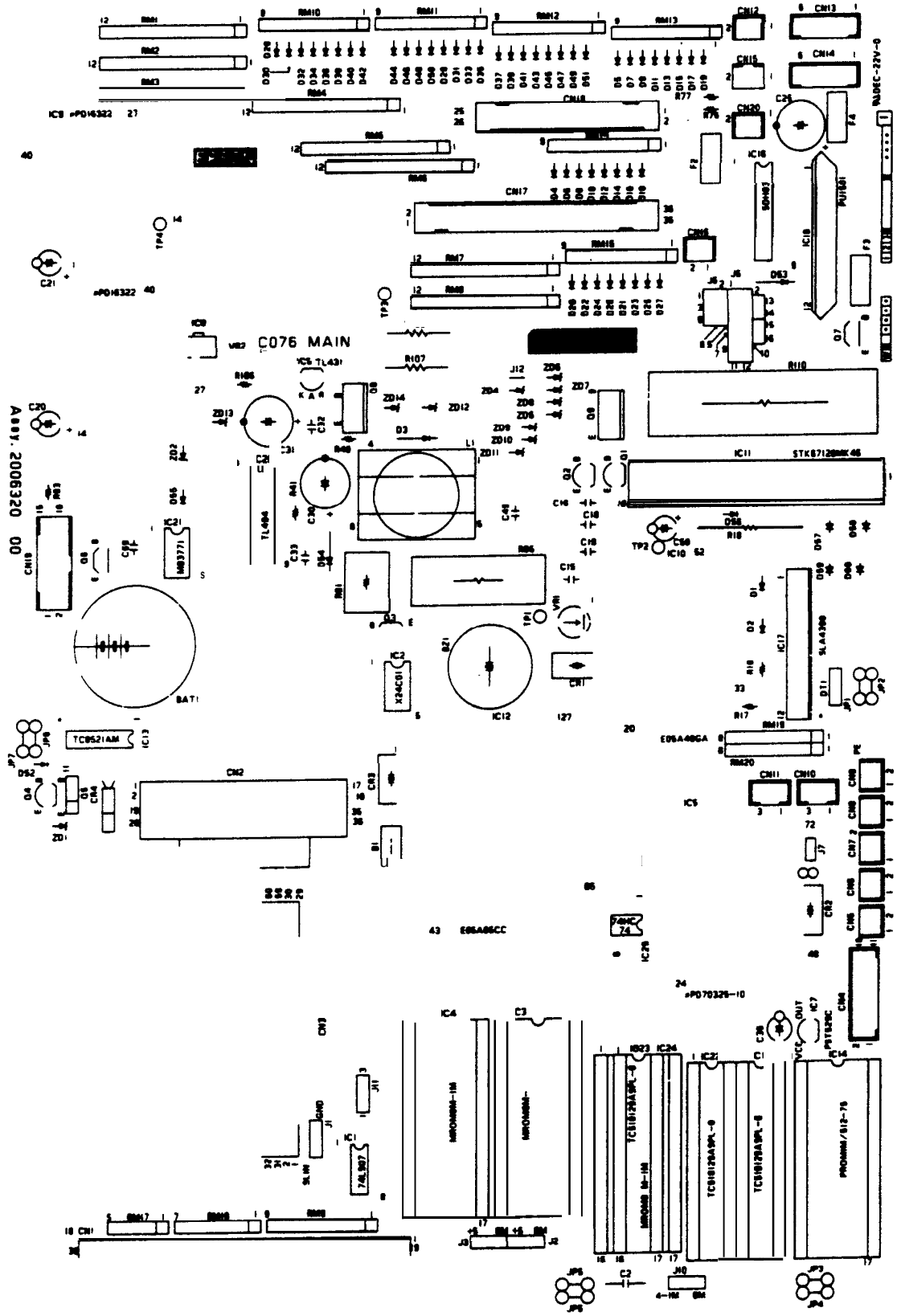


Figure A-9. C076 MAIN Board Component Layout (Surface)

Figure A-10. C076 MAIN Board Component Layout (Back Side)

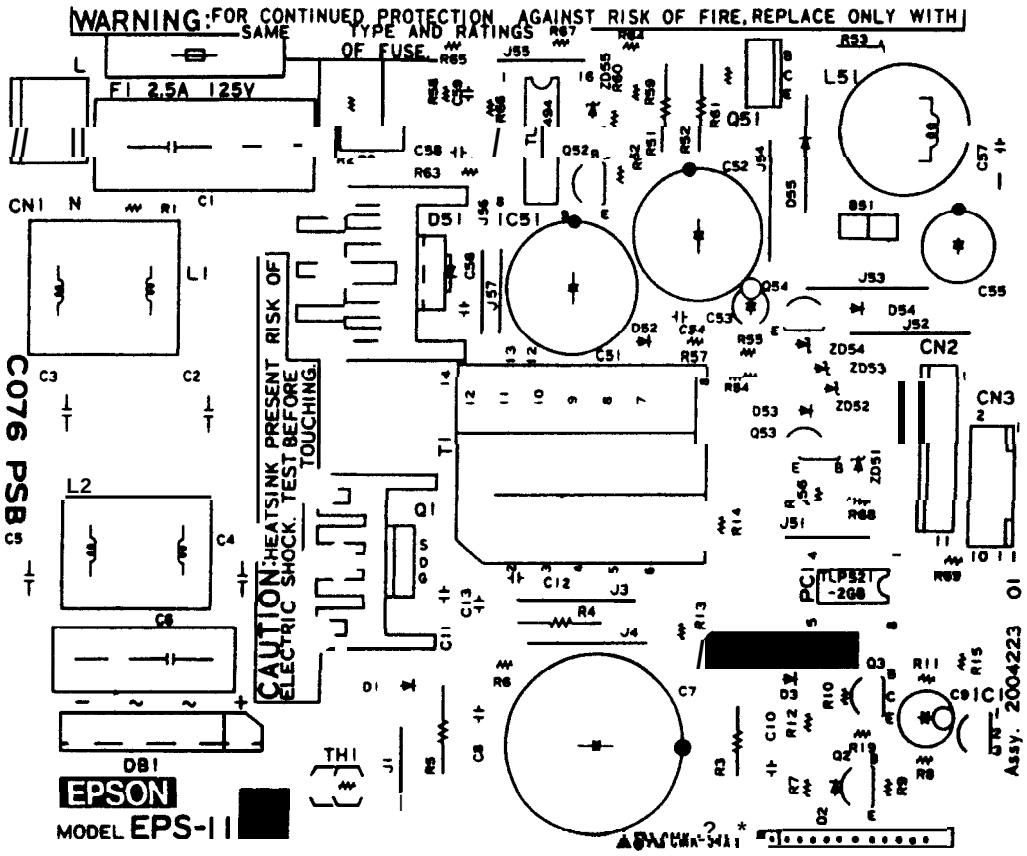


Figure A-1 1. C076 PSB Board Component Layout

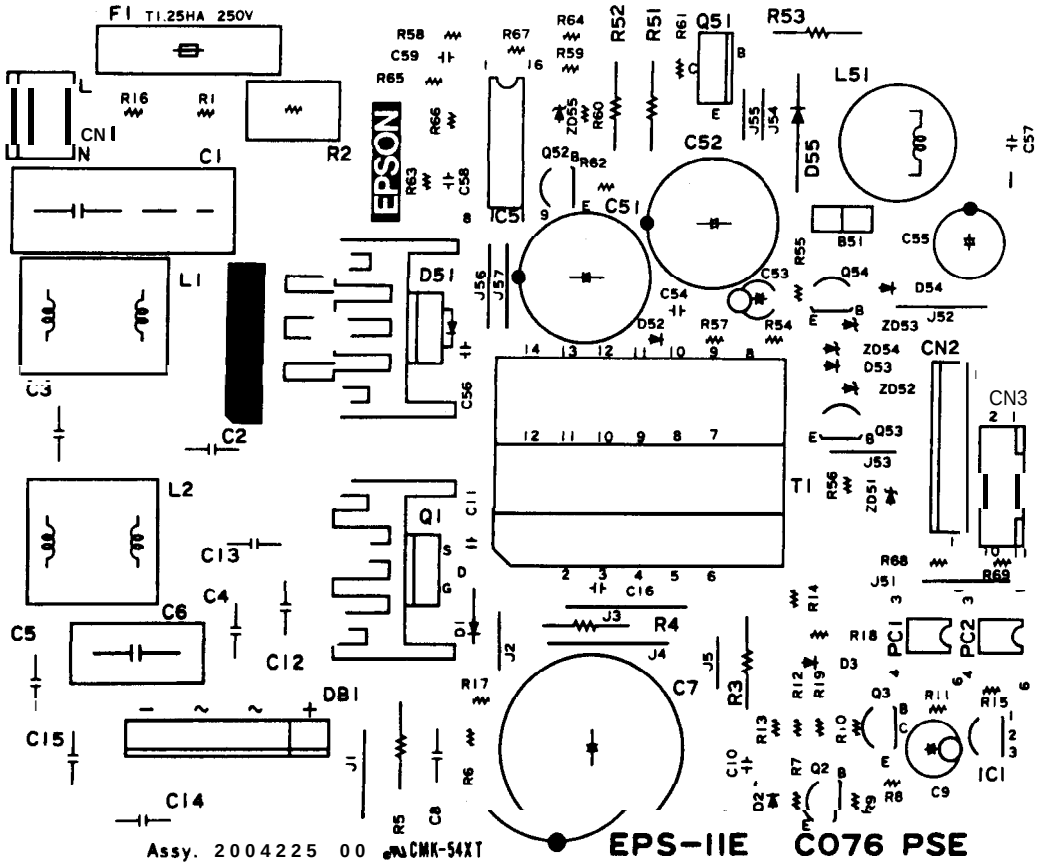


Figure A-1 2. C076 PSE Board Component Layout

Table A-21. Part No. Reference Table

Ref. No.	Description	Ref. No.	Description
100	HOUSING ASSY., LOWER	507	FRAME ASSY., RIGHT
101	SHIELD PLATE	508	MOUNTING PLATE, MOTOR, CR
102	HOUSING, UPPER	509	DC MOTOR, CR
103	HOUSING, FRONT	510	RESISTOR
104	COVER, FRONT	511	HARNESS, TOP EDGE DETECT
105	COVER ASSY., PRINTER	512	CARRIAGE ASSY.
106	SHEET GUIDE ASSY., REAR	513	TIMING BELT
107	SHEET GUIDE, FRONT	514	CABLE ASSY., HEAD
108	EDGE GUIDE, FRONT	515	HOLDER, CABLE, PRINT HEAD
109	KNOB	516	PRINT HEAD
110	HOLDER, POWER SWITCH	517	PLATEN ASSY.
111	COVER, MAIN BOARD	518	TOP EDGE HOLDER ASSY.
112	COVER, INTER LOCK	519	S., TRANSMISSION, T. E. HOLDING
113	COVER, GEAR	520	ROLLER ASSY., PF
114	COVER, CONNECTOR, UPPER	521	HARNESS, PE, FRONT
115	SHIELD PLATE, I/F	522	HARNESS, PE, REAR
116	GROUNDING PLATE, I/F	524	CONNECTOR SWITCH
117	GUIDE, I/F BOARD	525	HARNESS, PF
118	GROUNDING PLATE, LEFT	526	DETECTOR ASSY., REAR
119	GROUNDING PLATE, CENTER	527	ROLLER, PF, DRIVEN, LOWER
120	GROUNDING PLATE, RIGHT	528	COMPRESSION SPRING, 1000
121	LOGO PLATE	529	EXTENSION SPRING, 70
122	C.P.S. SCREW (M3X8)	530	DETECTOR, PE, FRONT
123	C.B.B. SCREW (M3X12)	531	SHAFT, RELEASE
124	P. MECHANISM MOUNTING SCREW	532	PAPER HOLDING, ASSY.
125	C.C.U. SCREW (M3X8)	533	PUMP ASSY.
126	C. B. S-TITE SCREW (M3X12)	534	MOTOR ASSY., PUMP
127	C.B. SCREW (M4X16)	535	C.B. SCREW (M2.6X5)
128	FOOT	536	PLAIN WASHER (8X0.5X1 5)
129	C. P. S.(P.S.) SCREW(M3X8)	538	CLEANER ASSY.
130	MINI CLAMP	539	CAP ASSY.
		540	PAPER GUIDE
200	BOARD ASSY., MAIN	541	POROUS PAD, CR, OIL TANK
		542	SHEET, HOLDER, PLATEN
300	B. ASSY., POWER SUPPLY (120V)	543	GROUND SPRING
330	HARNESS	545	CRAMP CORE
331	HARNESS	553	TUBE, SUPPLY, INK
350	B. ASSY., POWER SUPPLY (220/240V)	554	COVER, TUBE
		555	HOLDER ASSY., INK CARTRIDGE
400	POWER CABLE VD3 1303SA-1 OA	556	HOLDER ASSY., NEEDLE
401	POWER CABLE (BSO030303SA-SR-1 OA)	557	DETECTOR ASSY., INK CARTRIDGE
402	POWER CABLE VD00303SA-10A	558	DETECTOR ASSY., INK
403	POWER CABLE (AS3 1303S1)	559	TUBE SET SCREW
410	POWER CABLE ASSY.	560	O RING
411	POWER CABLE ASSY.	561	FRAME, HOLDER, INK CARTRIDGE
412	HARNESS	562	HOLDING PLATE, HOLDER, INK CAR.
450	CONTROL PANEL	563	SENSOR SUB ASSY., PW
		564	COVER, TOP EDGE DETECT
500	PRINTER MECHANISM M-47 10/4760	565	PWS COVER
501	PULLEY, DRIVEN	566	T. E. HOLDING TRANSMISSION GEAR
502	FRAME, FRONT	567	TOP EDGE HOLDER GEAR
503	FRAME, SUB, RIGHT	568	HOLDER, TOP EDGE HOLDER, LEFT
504	FRAME, STRENGTHEN, RIGHT	569	COVER, TOP EDGE DETECT, REAR
505	FRAME, STRENGTHEN, LEFT	570	TANK, INK EJECT
506	FRAME ASSY., LEFT	571	PAPER GUIDE ASSY., SUPPORT

Table A-21. Part No. Reference Table (Cent)

Ref. No.	Description	Ref. No.	Description
572	HOLDER, P. GUIDE, SUPPORT, LEFT	633	EDGE SADDLE
573	HOLDER, P. GUIDE, SUPPORT, RIGHT	634	CLAMP
574	ROLLER ASSY., DRIVE	635	PLASTIC RIVET
575	M. PLATE ASSY., PULLEY, DRIVEN	636	U-TYPE SPRING WASHER
576	PLAIN WASHER (3.2X0.5X7)	637	C.B. SCREW (M2.5X3)
577	BALL BEARING	638	CUP SCREW (M2X4)
581	STEPPING MOTOR, PF	639	CUP SCREW (M3X5)
582	S. MOTOR, TOP EDGE HOLDER	640	CUP SCREW (M3X8)
585	SHEET, CABLE, HEAD, PROTECTION	641	C.C. SCREW (M3X12)
586	SHEET, INK, STOPPER	642	FLANGE NUT (M4)
587	CARRIAGE MOTOR DAMPER	643	PLAIN WASHER (6 X0.7X I 2)
588	TUBE SET SCREW	644	PLAIN WASHER (10.3X0.5X 18.7)
589	O RING	645	PLAIN WASHER (8. 1 XO.5X22.2
590	SHEET, ADJUST, CAP	646	PLAIN WASHER (3. 1 XO.5X6. 1)
591	CAP, LEVER ADJUST	648	LEAF SPRING
592	LEVER, PARALLEL, ADJUST	649	LEAF SPRING
593	SHEET, ADJUST, CAP	650	RETAINING RING (3)
594	LEVER, GAP, ADJUST	651	RETAINING RING (4)
595	LEVER, RELEASE, MAIN	652	C.B.S. SCREW (M3X8)
596	LEVER, RELEASE, SUB	653	C.B.B. SCREW (M3X6)
597	LEVER, RELEASE, TRANSMISSION	654	C.B. B. SCREW (M3X8)
599	HOLDER, PLATEN, LEFT	655	C.B.B: SCREW (M3XI 2)
600	FRAME, REAR	656	C.B.S. SCREW (M2.5X8)
601	SHAFT, CR, GUIDE, SUB	657	C.B.S. SCREW (M2.5X8)
602	SHAFT, CR, GUIDE, MAIN	658	C. T2.P. SCREW
603	POROUS PAD, CR, OIL	659	RETAINING RING (2.3)
604	PRESSING PLATE, COVER SPRING,V	660	C.P.B. SCREW (M2X1O)
605	COVER, HOLDER, INK CAR.	661	S. C. P.(P4) SCREW (M3X8)
606	POROUS PAD, INK HOLDER	662	C. P.S.(P) SCREW (M3X8)
607	PIN, ADJUST	663	C. B. S-TITE SCREW (M2.5X6)
608	GUIDE, PAPER EJECT	664	C. B. S-TITE SCREW (3X12)
609	GROUNDING PLATE, MOTOR, CR	665	MIRE BAND
610	'RESSING PLATE, COVER SPRING, L.	666	SHEET, NOTICE
611	COVER, PLATEN	700	'RACTOR ASSY.
612	GUIDE, PAPER LOAD	701	'RACTOR, LEFT
613	DETECTION, PLATE, PTS	702	'RACTOR, RIGHT
614	STOPPER, CR, LEFT	703	SHAFT, TR, DRIVE
615	STOPPER, CR, RIGHT	704	SHAFT, TR, GUIDE
616	SPACER, CR, GUIDE, SUB	705	'RAME, TR, LEFT
617	NTERMITTENT GEAR	706	'RAME, TR, RIGHT
618	COMBINATION GEAR 8,30	707	.EVER, TR, LEFT
619	SPUR GEAR, 27	708	.EVER, TR, RIGHT
620	SPUR GEAR, 34.5	709	'APER SUPPORT
621	SPUR, GEAR 34	710	'RACTOR GEAR
622	SPUR GEAR, 34.5	711	RETAINING RING (6)
623	'APER FEEDING REDUCTION GEAR		
624	BASE RUBBER		
625	TORSION SPRING, 3490		
626	COMPRESSION SPRING, 200		
627	EXTENSION SPRING, 328		
628	TORSION SPRING, 6750		
629	TORSION SPRING, 6750		
630	TORSION SPRING, 700		
631	COMPRESSION SPRING		
632	.OCKING WIRE SADDLE		

A.5 CASE OUTLINE DRAWING

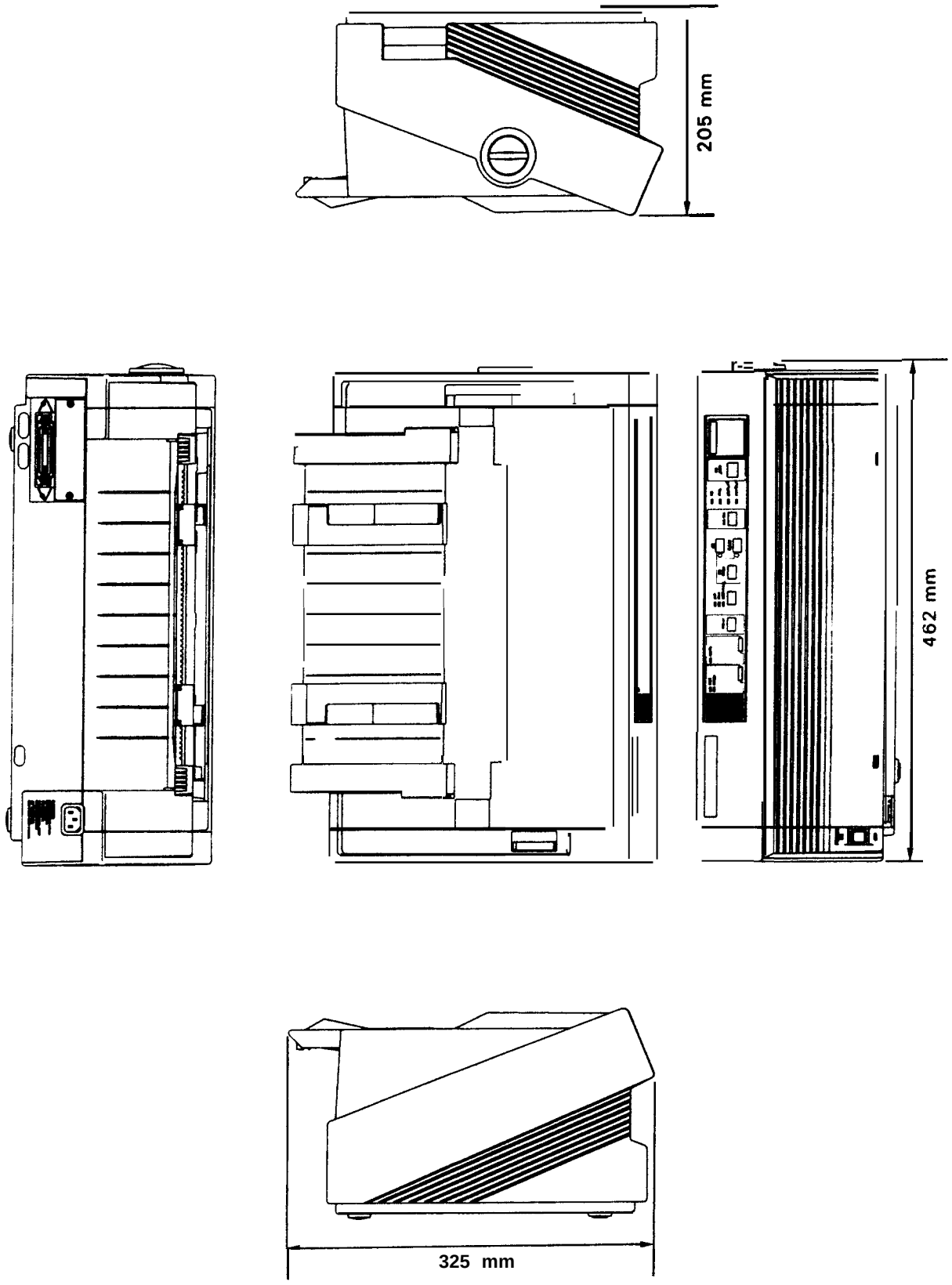


Figure A-19. SQ-870 Case Outline Drawing

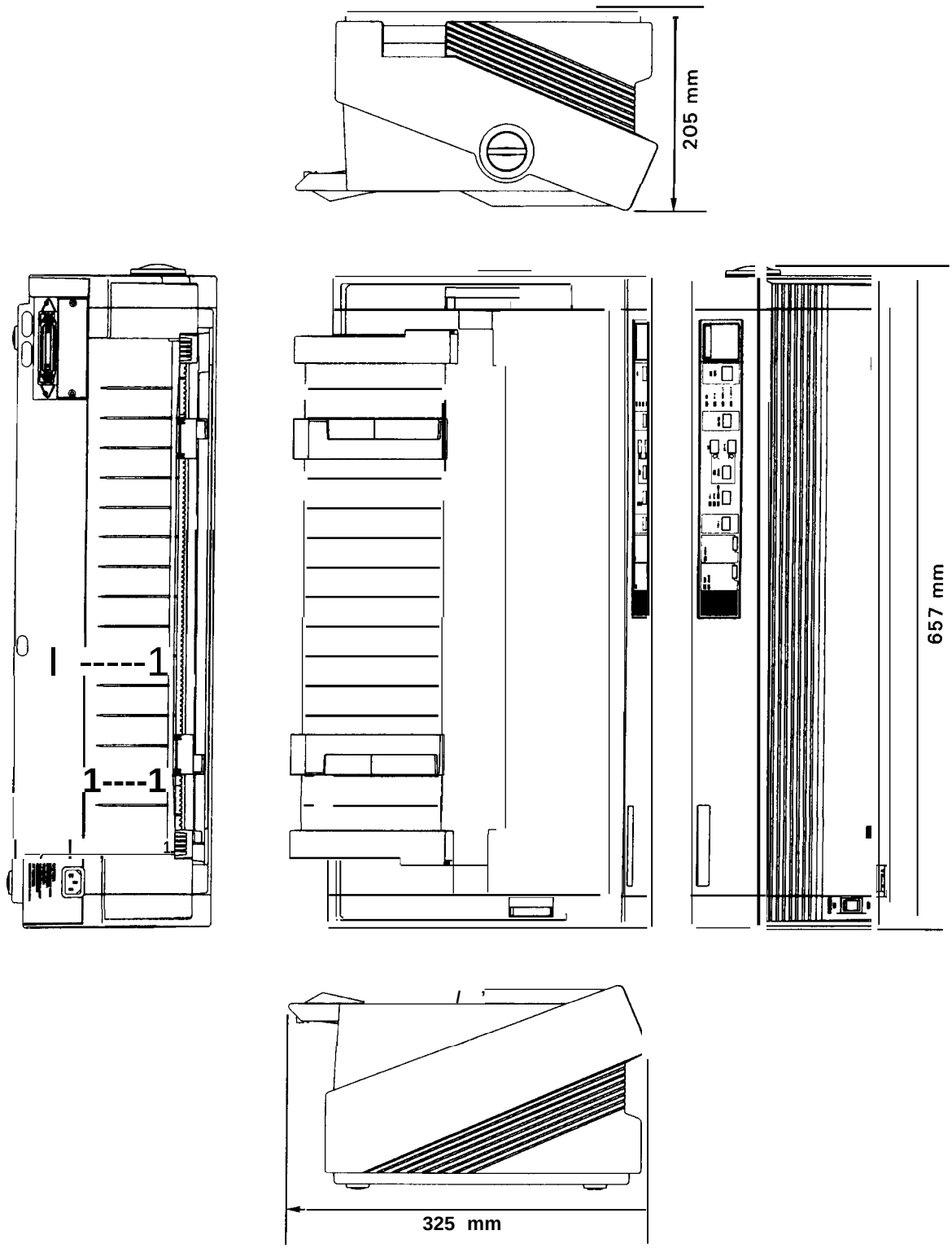


Figure A-20. SQ-1 170 Case Outline Drawing

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