EPSON

EPSON TERMINAL PRINTER

LQ-570/1070

SERVICE MANUAL

4000566
REV.-B

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 heading.**

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 LQ-570/1070.
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 and lists lubricants and adhesives required to service the equipment.

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

REVISION SHEET

REVISON	DATE ISSUED	CHANGE DOCUMENT
A	June 20, 1991	1st issue
B	Sept. 6, 1991	Added information for the LQ-1 070: l-i, l-ii, 1-1 - 1-8, 1-10, 1-11, 1-24, 1-26 - 1-28 2-i, 2-ii, 2-1 - 2-11, 2-13- 2-15, 2-17, 2-18 3-i, 3-ii, 3-5 - 3-20 4-i, 4-1 - 4-4, 4-6 5-i, 5-1 - 5-5, 5-9, 5-11 - 5-19 6-i, 6-1, 6-4 A-1, A-ii, A-1 - A-1 5, A-17 - A-1 9, A-22, A-23

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CHAPTER 1
GENERAL DESCRIPTION

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1.1 FEATURES

The LQ-570/1 070 are small, light-weight, low-cost, printers with advanced paper handling that is compatible with the LQ-5 10/550/1010. 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: 225 characters per second (cps) (high-speed draft, 10 characters per inch (cpi))
  252 cps (draft, 12 cpi)
  210 cps (draft, 10 cpi)
  84 cps (LQ, 12 cpi)
  64 cps (LQ, 10 cpi)
- Optional interface card
- Clear, easy-to-read printing with standard EPSON fonts
- Multiple fonts resident in the printer
  9 LQ fonts (Roman, Saris Serif, Courier, Prestige, Script, OCR-B, Script C, Orator, Orator-S)
  1 draft font
- Control panel switch selection of fonts, condensed, and cut-sheet feeder (CSF) bin
- Optional tractor unit for push-pull tractor feed
- Flexible handling of continuous paper
  Three ways to insert continuous paper (front/bottom/rear path)
  Auto backout and auto loading (rear insertion)
  Use of continuous paper without removing CSF
  Attachment of standard tractor unit in either of two positions (push/pull)
- Easy handling of cut sheets with the optional cut-sheet feeder
  Two ways to insert cut sheets (front/top)
  Auto loading

The LQ-570/1 070 are equipped with the standard EPSON 8-bit parallel interface. 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 LQ-570/1 070, and Figure 1-1 shows an exterior view of the LQ-570/1 070.

Table 1-1. Interface Options

Model	Description
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

Printing is not possible for the following baud rates : 1800, 200, 134.5, 110, 75 bps.

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

The asterisks (*) in the table above represent the last digit of the part numbers. This digit varies, depending on the country. For instance, in the U.S. the last digit is 1.

Table 1-2. Optional Units

Model	Description
C80637*	Single-bin cut-sheet feeder (80-column)
C80638*	High-capacity cut-sheet feeder (80-column)
C80639*	Singl-bin cut sheet feeder (1 36-column)
C80640*	High capacity cut sheet feeder (1 36-column)
C80019*	Tractor unit (80-column)
C80022*	Tractor unit (1 36-column)
7753	Fabric ribbon cartridge (80-column)
7754	Fabric ribbon cartridge (1 36-column)
7768	Film ribbon cartridge (80-column)
7770	Film ribbon cartridge (1 36-column)

Note: When a part number in the table above is followed by an asterisk ('), the last digit of the number varies, depending on the country. For example, in the U. S., the model number for a single-bin cut-sheet feeder (80-column) is C80673l.
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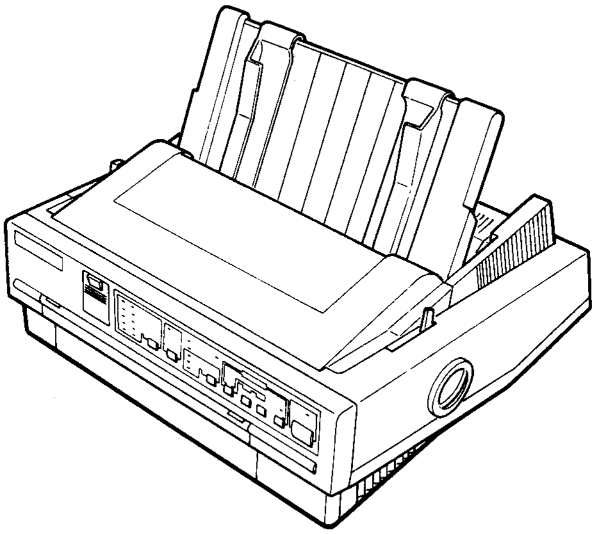

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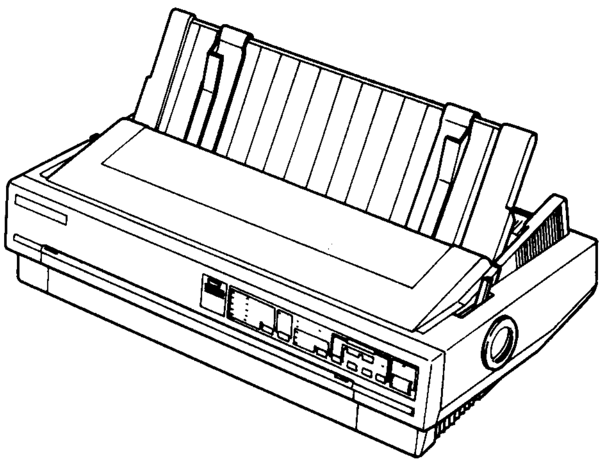

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Figure 1-1. Exterior View of the LQ-570/1070

1.2 SPECIFICATIONS

This section provides specifications for the LQ-570/1070 printer.

1.2.1 Hardware Specifications

Printing method	Serial, impact, dot matrix
Pin configuration	24 wires (12 X 2 staggered, diameter 0.2 mm)

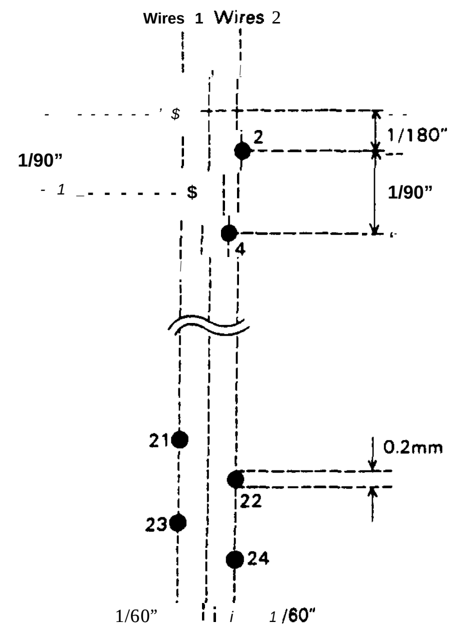


Figure 1-2. Pin Configuration

Feeding methods	Friction feed (front/top)	
	Push tractor feed (rear)	
	Pull tractor feed (front/bottom)	
	Push-pull tractor feed (with optional tractor) (rear)	
Line spacing	1/6 inch, 1/8, or programmable in units of 1/360 inch	
Paper insertion	Friction feed	Front or rear side
	Tractor feed	Front, bottom, or rear side

Paper-feed speed	Friction without CSF	77.6 msec (1/6-inch feed)
		2.2 inches per second (ips) (continuous)
	Friction with CSF	77.6 msec (1/6-inch feed)
		2.2 ips (continuous)
	Tractor	77.6 msec (1/6-inch feed)
		2.2 ips (continuous)

NOTE: The points below provide precautions for handling paper.

1. Friction feed (release lever in FRICTION POSITION).
   - 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.), bottom 22 mm (.87 in.) (top entrance), or bottom 40.2mm (1.6 in.) (front entrance) area.
   - Do not perform reverse feeds greater than 1/6 inch after a paper end has been detected.

- Use the paper tension unit.
- Do not use multi-part cut-sheet forms, except with front insertion.
- Do not perform reverse feeds greater than 1/6 inch when using envelopes.

2. Push tractor feed (release lever in REAR PUSH POSITION).
   - Paper must be loaded from the rear entrance.
   - Release the friction-feed mechanism.
   - Multi-part forms must be spot pasted beyond the perforation between the tractor holes.
   - Paper for multiple copies must be carbonless multi-part paper.
   - Use the paper tension unit.
   - Do not perform reverse feeds greater than 4/15 inch.
   - Since accuracy of paper feed cannot be assured after the paper end has been detected, please do not perform reverse feeds after detection of a paper end.

3. Push-pull tractor feed (release lever in REAR PUSH POSITION).
   - Paper must be loaded from the front, rear, or bottom entrance.
   - Release the friction-feed mechanism.
   - Remove the paper tension unit and 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 sprockets.
   - Paper for multiple copies must be spot pasted beyond the perforation between the tractor holes.
   - Paper for copies must be a carbonless multi-part paper.
   - Do not perform reverse feeds greater than 4/15 inch.
   - Do not perform reverse feeds after the paper end has been detected.

4. Pull tractor feed (release lever in PULL POSITION).
   - Paper must be loaded from the front or rear entrance.
   - Release the friction-feed mechanism.
   - Remove the paper tension unit and attach the pull tractor unit.
   - Insert the paper from either front or bottom.
   - Paper for multiple copies must be spot pasted beyond the perforation between the tractor holes.
   - Paper for copies must be a carbonless multi-part paper.
   - Do not perform reverse feeds.

Paper specifications — See tables 1-3, 1-4, 1-5, 1-6, and 1-7

Table 1-3. Specifications for Cut Sheets (One-Part Paper)

Width	148 mm to 257 (*420) mm (5.8 in. to 10.1 (* 16.5) in.) (top insertion) 182 mm to 257 (*364) mm (7.2 in. to 10.1 (* 16.5) in.) (front insertion)
Length	364 mm (1 4.3 in.), maximum
Thickness	0.065 mm to 0.14 mm (0.0025 in. to 0.0055 in.)
Weight	14 lb. to 24 lb. (52.3 g/m² to 90 g/m²)
Quality	Standard paper (photocopier paper, etc.) Recycled paper (at normal temperatures)

(*136-column)

Table 1-4. Specifications for Cut Sheets (Carbonless Duplicating Paper)

Width	182 mm to 216 ('364) mm (7.2 in. to 8.5 (* 14.3) in.)
Length	257 mm to 297 mm (10.1 in. to 11.7 in.)
Thickness	0.065 mm to 0.14 mm (0.0025 in. to 0.0055 in.) - single sheet
	0.12 mm to 0.32 mm (0.0047 in. to 0.012 in.) - total
Weight	17 lb. to 24 lb. (52.3 g/m^2 to 90 g/m^2) - single sheet
	12 lb. to 15 lb. (40 g/m^2 to 58 g/m^2) - each
Quality	Carbonless duplicating paper
Copies	4 sheets (1 original and 3 copies)

(*136-column

Table 1-5. Specifications for Continuous Paper

Width	101 mm to 254 ("406) mm (4.0 in. to 10.0 (* 16) in.)
Thickness	0.065 mm to 0.10 mm (0.0025 in. to 0.0039 in.) - single sheet
	0.065 mm to 0.32 mm (0.0025 in. to 0.012 in.) -total
Weight	14 lb. to 22 lb. (52.3 g/m^2 to 82 g/m^2) - single sheet
	12 lb. to 15 lb. (40 g/m^2 to 58 g/m^2) - each
Quality	Standard paper or carbonless duplicating paper
	Recycled paper (at normal temperatures)
Copies	4 sheets (1 original and 3 copies)

(*:1 36-column)

Table 1-6. Envelopes

Size	No. 6= 166 mm X 92 mm
	No. 10= 240 mm X 104 mm
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. (40 g/m^2 to 91 g/m^2)
Quality	Bond paper, standard paper, airmail
Copies	Not available

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.

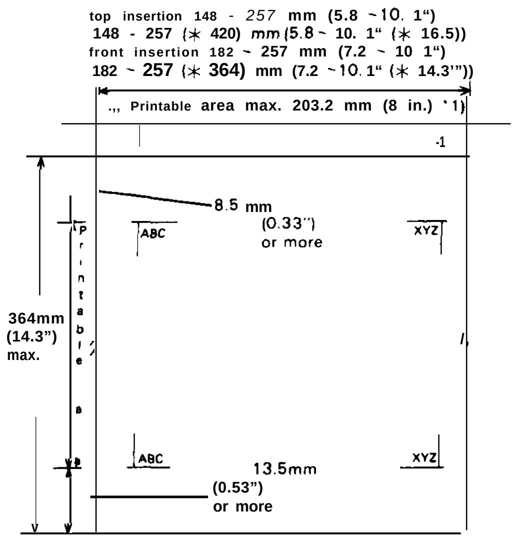
Table 1-7. Label Specifications

Label size	2 1/2 in. X 15/16 in.
	4 in. X 15/16 in. "
	4 in. X 1 7/16 in.
Copies	Not available
Thickness	0.07 mm to 0.09 mm (0.0028 in. to 0.0031 in.) - base paper
	0.16 mm to 0.19 mm (0.0063 in. to 0.0075 in.) -total

NOTES:
- Printing on labels is available only at normal temperatures.
- Labels must be of the fanfold type.
- Labels with pressure sensitive paper must be spot pasted beyond the perforation between the tractor holes. The total thickness must be less than or equal to 0.3 mm (0.01 18 in.). Labels can be printed out only if the temperature is between 5 and 35 degrees C (41 and 95 degrees F) and humidity is between 10 % and 80 % RH.
- Examples of labels AVERY CONTINUOUS FORM LABELS
  AVERY MINI-LINE LABELS
- Labels must be used with the pull tractor (front or bottom).
- Do not perform reverse feeds.

Printable area

See figures 1-3, 1-4, and 1-5



(* 136-column)

(80-column):

*1) 3.0 mm (O. 12 in.) or more when paper width is less than 229 mm (9 in.).

24 mm (0.9 in.)(top insertion)/26 mm (1.0 in.)(front insertion) or more when paper width is 229 mm (9.0 in.) to 257 mm (10.1 in.).

(136-column:)

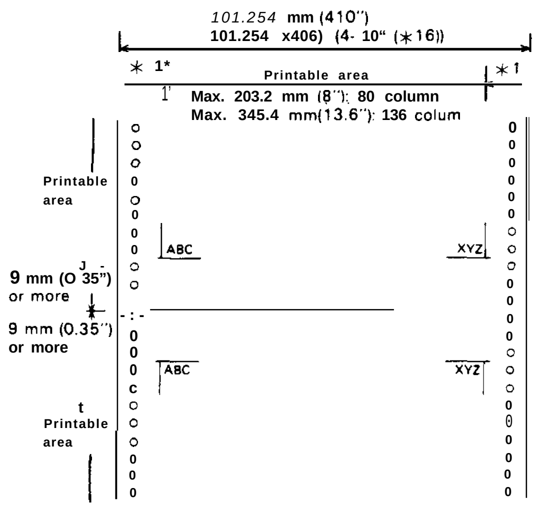
3.0 mm (O. 12 in.) or more when paper width is less than 392 mm (1 5.4 in.). 29 mm (1.14 in.) (top insertion) /31 mm (1.22 in.) (front insertion) or more when paper width is 392 mm (1 5.4 in.) to 420 mm (1 6.4 in.).

- Paper-feed accuracy cannot be assured within 22 mm (0.87 in.) from the bottom edge of paper (top insertion).

  Paper-feed accuracy cannot be assured within 40.2 mm (1 .58 in.) from the bottom edge of paper (front insertion).

  Paper-feed accuracy cannot be assured within 22 mm (0.87 in.) from the top edge of paper.

Figure 1-3. Printable Area for Cut Sheets



(* 136-column)

Figure 1-4. Printable Area for Continuous Sheets

(80-column):

- 1) 13 mm (0.51 in.) or more when a paper width of 101 mm (4 in.) to 241 mm (9.5 in.) is used. 24 mm (0.9 in.)(rear insertion)\ 26 mm (1.0 in.)(front/bottom insertion) or more when a paper width of 254 mm (10 in.) is used.

(1 36-column):

13 mm (0.51 in.) or more when a paper width of 101 mm to 401.3 mm (4 in. to 15.8 in.) is used. 15 mm or more when a paper width of 381 mm to 406 mm (15 in. to 16 in.) is used. 13 mm (rear insertion) (0.5 1 in.) /1 7 mm (front/bottom insertion) (0.67 in.) is used. (136-column).

Ink ribbon	Type #7753 black ribbon cartridge (80-column) #7768 film ribbon cartridge (80-column) #7754 black ribbon cartridge (1 36-column) #7770 film ribbon cartridge (1 36-column) Color Black Life 2 million characters at 48 dots/character (black ribbon) (80-column) 0.2 million characters at 48 dots/character (film ribbon) (136-column) 0.3 million characters at 48 dots/character (film ribbon) Dimensions of ribbon cartridge Fabric Type: (80-column): 293 mm (W) X 34 mm (H) × 72 mm (D) (136-column): 468.3 mm (W) X 34 mm (H) X 72 mm (D) Film Type: (80-column): 293 mm (W) X 34 mm (H) X 72 mm (D) (136-column): 468.5 mm (W) X 34 mm (H) X 72 mm (D)
Reliability	Mean cycles between failures (MCBF) 3 million lines (excluding printhead) Mean time between failures (MTBF) 4000 power on hours (POH) (25% duty)
Life of printhead	200 million strokes (black ribbon) 100 million strokes (film ribbon)
Safety approvals	Safety standards UL1 950 with D3 (U.S. version) CSA22.2#220 EN 60950 (TUV) (European version) Radio frequency interference (RFI) FCC class B (U.S. version) VDE0871 (self-certification) (European version)

Electrical specifications	120 V version	Rated voltage	120 VAC
		Input voltage range	103.5 to 132 VAC
		Rated frequency	50 to 60 Hz
		Input frequency	49.5 to 60.5 Hz
		Rated current	2.0 A
		Power consumption	Approx. 33 W (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 for 1 minute or 1200 VACrms for 1 second (between AC line and chassis)

220 to 240 V version	Rated voltage	220 to 240 VAC
	Input voltage range	198 to 264 VAC
	Rated frequency	50 to 60 Hz
	Input frequency	49.5 to 60.5 Hz
	Rated current	1.0 A
	Power consumption	Approx. 33 W (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 VAC rms 1 minute *or 1500* VAC rms 1 second (between AC line and chassis)

Environmental conditions	Temperature range	5 to 35 degrees C (41 to 95 degrees F) - operating –30 to 60 degrees C (–22 to 140 degrees F) – in shipment container
	Humidity	10 to 80 % RH - operating 5 to 85 % RH – storage
	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 (80-column):

Weight 6.1 kg, approx. (13.5 lbs., approx.)

Dimensions 434 mm (width) X 368 mm (depth) X 151 mm (height)
17.4 in. (width) X 14.7 in. (depth) X 6 in. (height)

(136-column):

Weight 8.4 kg, approx. (1 8.6 lbs., approx.)

Dimension 609 mm (width) X 368 mm (depth) × 151 mm (height)
24.4 in. (width X 14.7 (depth) X 6 in. (height)

1.2.2 Firmware Specifications

Control code	ESC/P™ level ESC/P 2 (EPSON standard code for printers)
Printing direction	Bidirectional with logic seeking
Input data buffer	8KB (when SW 1-7 is OFF) OKB (when SW 1-7 is ON)
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	EPSON Roman	10, 12, 15, proportional
	EPSON Saris Serif	10, 12, 15, proportional
	EPSON Courier	10, 12, 15
	EPSON Prestige	10, 12
	EPSON Script	10, 12
	EPSON Script C	proportional
	OCR-B	10
	EPSON Orator	10
	EPSON Orator-S	10
	EPSON Draft	10, 12, 15
Scalable fonts	EPSON Roman	8 pt to 32 pt
	EPSON Saris Serif	8 pt to 32 pt

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 (10, 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

NOTES: High-speed draft is valid if the printer status is as follows:

- High-speed draft is selected by DIP switch.
- Emphasized character mode is not selected.
- Condensed character mode is not selected.
- Draft is selected.
- No D/L (download) characters are sent to the printer,
- The horizontal dot space of characters is not set.
- No bit image is sent to the printer.
- Super/subscript is not selected.

(The printer switches back into normal mode to print emphasized, condensed, or download characters and bit images.)

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	Condensed	Printable Columns	Character Pitch (cpi)	Printing Speed (cps)		
				Draft	LQ	HSD
10	0	80 (* 136)	10	210	70	225
	1	137 (“233)	17.1	180	120	—
12	0	96 (* 164)	12	252	84	—
	1	160 (*272)	20	210	140	—
15	0	120(”204)	15	315	105	—
	1	Invalid				

(* 136-column)

cpi:	characters per inch
Cps:	characters per second
LQ:	letter quality
HSD:	high-speed draft

Table 1-9. Printing (Bit Image Mode)

Pins	Bit Image Printing Mode	Density (dpi)	Printable Dots	Printing Speed (ips)
8	Single-density	60	480 (*8 16)	21.0
8	Dual-density	120	960 (* 1632)	10.5
8	Double-speed, dual-density	120	960 (“1632)	21.0
8	Quadruple-density	240	1920 (*3264)	10.5
8	CRT graphics	80	640 (“ 1088)	10.5
8	CRT graphics II	90	720 (“1224)	14.0
24	Single-density	60	480 (*8 16)	21.0
24	Dual-density	120	960 (* 1632)	10.5
24	CRT graphics II	90	720 (“224)	14.0
24	Triple-density	180	1440 (“2448)	7.0
24	Hex-density	360	2880 (*4896)	7.0

(* 136-column)

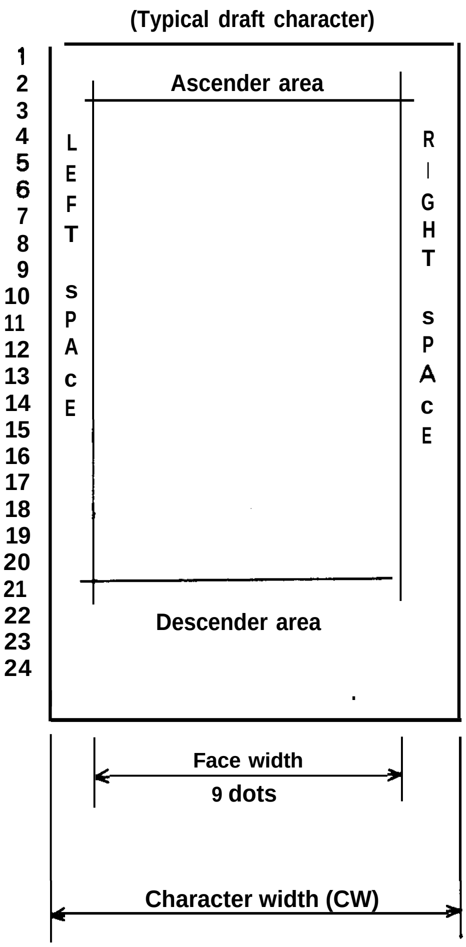
dpi: dots per inch
ips: inches per second

Table 1-10. Character Matrix and Character Size

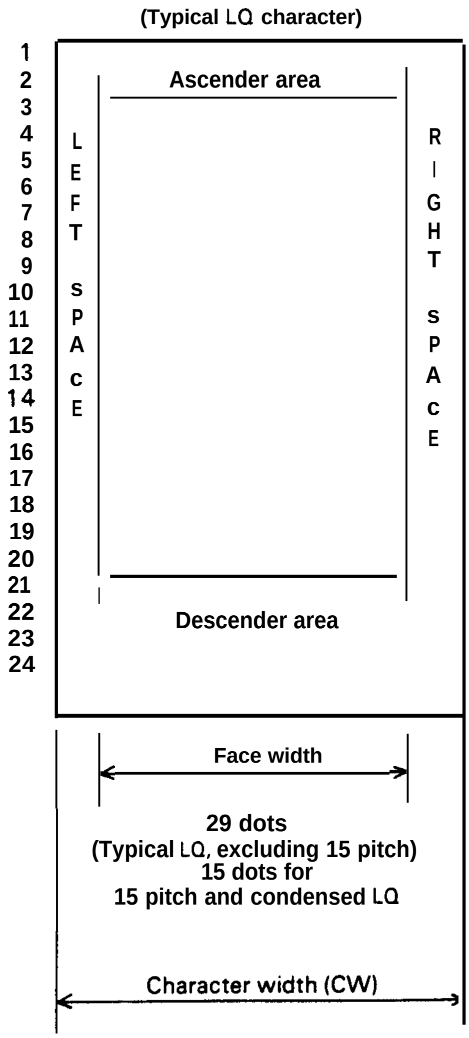
Printing Mode	Face Matrix	HDD	Character Size	Unit ESC sp
High-speed draft, 10 pitch	7 × 22	90	2.0 x 3.1	—
Draft, 10 pitch	9 x 22	120	1.9 x 3.1	120
Draft, 12 pitch	9 x 22	120	1.9 x 3.1	120
Draft, 15 pitch	7 X 16	120	1.0 X 2.3	120
Draft, 10 pitch, condensed	—	240	—	120
Draft, 12 pitch, condensed	—	240	—	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, 10 pitch, condensed	—	360	—	180
LQ, 12 pitch, condensed	—	360	-	180
LQ, proportional	Max. 37 X 22 Min. 18 X 22	360 360	2.6 X 3.1 1.0 x 3.1	180
LQ, proportional, condensed	— —	360 360	— —	180
LQ, proportional, super/subscript	Max. 28 X 16 Min. 12 X 16	360 360	1.8 X 2.3 0.7 X 2.3	180
LQ, proportional, super/subscript, condensed	— —	360 360	— —	180

NOTES: . HDD is horizontal dot density in dots per inch.

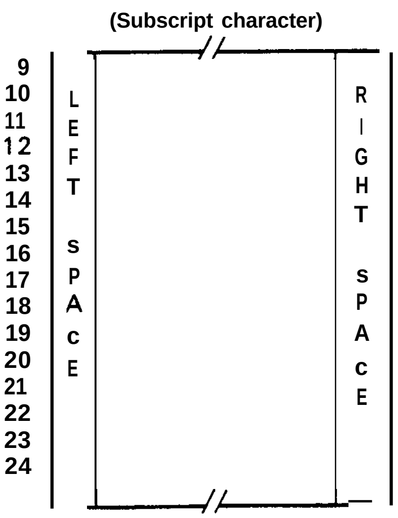
- Face matrix and character size indicate the size of the maximum character. This value is dependent on paper, ribbon, etc.
- Unit ESC sp (which also can be sent as unit, followed by the character string CHR(&h20)), indicates the minimum length to be added to the right of the character specified with the ESC sp control code.
- "-" indicates that the character matrix is reshaped by printer firmware. Character width becomes half of the noncondensed character width.



12 dots (10 CPI) 120 DPI
15 dots (12 CPI) 180 DPI
16 dots (15 CPI) 240 DPI
14 dots (condensed 10 CPI) 240 DPI
12 dots (condensed 12 CPI) 240 DPI



36 dots (10 CPI) 360 DPI
30 dots (12 CPI) 360 DPI
24 dots (15 CPI) 360 DPI
21 dots (condensed 10 CPI) 360 DPI
18 dots (condensed 12 CPI) 360 DPI



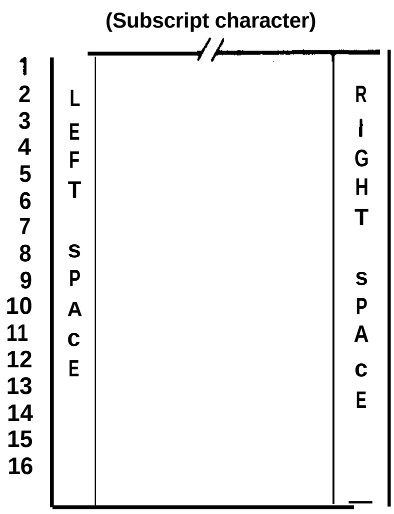


Figure 1-5. Character Matrix

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 1-6.

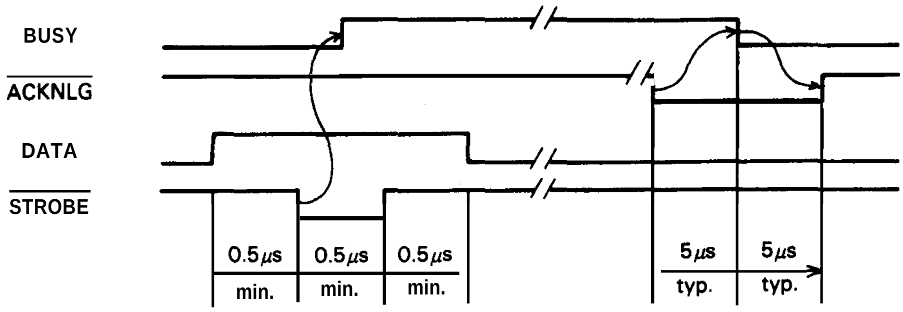


Figure 1-6. Data Transmission Timing

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 3 4 5 6 7 8 9	DATA 1 DATA 2 DATA 3 DATA 4 DATA 5 DATA 6 DATA 7 DATA 8	20 21 22 23 24 25 26 27	IN IN IN IN IN IN IN IN	Parallel input data to the printer. HIGH level means data 1. LOW level means data O.
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 11 μs.
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 +5 V 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	$\overline{\text{AUTO FEED-XT}}$	—	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	I NIT	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	DC1/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 3.
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: a power button (labeled OPERATE), 7 non-lock type buttons, and 19 indicators.

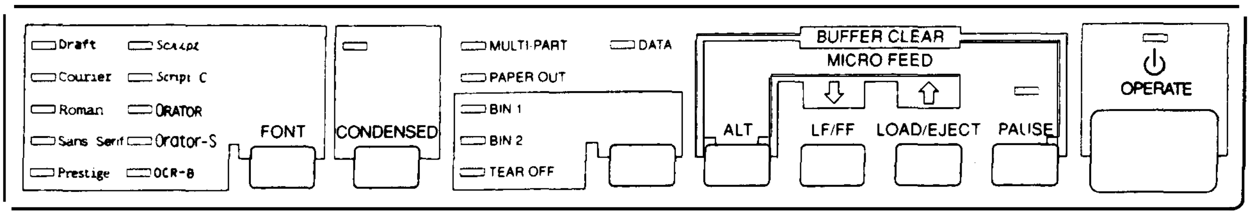


Figure 1-7. Control Panel

BUTTONS

(1) OPERATE Button

This button turns on the power supply to the printer.

(2) PAUSE Button

This button controls printer action. Pressing the button toggles the printer between PAUSE condition (no printing, no paper feeding, and not accepting data) and RUNNING. This button is also used in conjunction with the ALT button as a buffer clear to clear the input buffer and perform software initialization, as if ESC @ had been received.

(3) LINE FEED/FORM FEED Button

Pressing this button performs a line feed, and holding down the button performs a form feed, irrespective of the PAUSE/RUNNING condition. This button is also used in conjunction with the ALT button as the micro reverse feed.

(4) LOAD/EJECT Button

Pressing this button loads or ejects the paper. Refer to Section 1.6.8, Sheet Loading and Sheet Ejection. This button is also used in conjunction with the ALT button as the micro forward feed.

(5) TEAR-OFF/BIN 1/BIN 2 Button

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

(6) ALT Button

This button is used only in combination with another button,

(7) FONT Button

Pressing this button selects a font, and pressing it continuously selects the next one, sequentially. The FONT LED indicates the currently selected font.

(8) CONDENSED Button

Pressing this button toggles the printing mode between normal and condensed, alternatively.

NOTE: Selections of the FONT and CONDENSED buttons are stored as defaults, so that the last FONT and the CONDENSED selection become effective when the printer is initialized.

INDICATORS

(1) OPERATE (green)

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

(2) PAUSE (orange)

Lit when the printer is in PAUSE-mode (no printing, no paper feeding, and not accepting data).

(3) TEAR-OFF (orange)

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

(4) DATA (orange)

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

(5) PAPER-OUT (red)

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

(6) MULTI-PART (green)

Lit when the adjust lever is positioned at the 4th step or higher,

(7) BIN 1 (green)

Lit when bin 1 is selected.

(8) BIN 2 (green)

Lit when bin 2 is selected.

(9) FONT (green) - Draft, Courier, Roman, Saris Serif, Prestige, Script, Script C, Orator, Orator-S, OCR-B

These indicators show the currently selected font.

(10) CONDENSED (green)

Lit when condensed mode is selected.

1.5 DIP SWITCHES AND JUMPER SETTING

This section describes the DIP switch selections and jumper setting for the LQ-570 printer.

1.5.1 *DIP Switch Settings*

The two DIP switch banks for the printer, located on control panel, function 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	High-speed draft	Invalid	Valid	OFF
7	Input buffer	Invalid	Valid	OFF
8	l-inch skip continuous paper	ON	OFF	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	Auto tear-off	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 OFF,
If graphic table was selected by
ESC t 1, PC becomes 437.

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

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 3 is connected to GND, the $\overline{\text{SLCT-IN}}$ signal is fixed to LOW.

1.6 OPERATING INSTRUCTIONS

This section describes the self-test and hexadecimal dump functions and also includes 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 LOAD/EJECT button. To run the self-test using the letter quality (LQ) mode, turn the printer on while pressing the LINE FEED/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.

```
Xxxxxx
Country/PC    SW1-1 1-2 1"3 1-4    High speed draft SW1-6
  U.S.A.        on   on  on  off      Valid            off
  France        on   on  off off      Invalid          on
  Germany       on   off Orl off    Receive buffer     SW1-7
  U.K.          on   off off off      Valid            off
  Denmark       off  on  on  off      Invalid          on
  Sweden        off  on  off oft    1 inch skip        SW1-8
  Italy         off  off on  off      1 rival id       off
  Spain         off  off off off      Valid            on
PC 437          on   on  on                            SW2-1 2-2
                o    I   I                              off   off
```

Figure 1-8. Self-Test Printout

1.6.2 Hexadecimal Dump Function

To put the printer in hex. dump mode, power it on while pressing both the LOAD\ EJECT and LINE FEED/FORM FEED buttons. In hex. dump mode, the printer prints out the hexadecimal representation of the input data, along with the corresponding ASCII characters. This function is valuable for checking the data the printer has received from the host. If input data is a nonprintable character code, a period (.) is printed in the ASCII column.

```
1B 40 LB 52 00 1B 74 01 1B 36 12 1B 50 1B 70 00    .@. R. . t. .6. .P. D.
20 20 54 68 69 73 20 69 73 20 61 6E 20 65 78 61      This is an exa
6D 70 6C 65 20 6F 66 20 61 20 64 61 74 61 20 64    mple of a data d
75 6D 70 20 70 72 69 6E 74 6F 75 74 2E 20 54 68    ump printout. Th
69 73 20 66 65 61 74 75 72 65 20 6D 61 6B 65 73    is feature makes
0.4 20 20 20 20 20 69 74 20 65 61 73 79 20 66 6F   .      it easy fo
```

Figure 1-9. Hexadecimal Dump Function

1.6.3 *Paper-out Detection and Forms Override Function*

When the paper-out detector, attached to the printer mechanism, detects a paper-end, the printer first performs a forms override. If paper loading fails, the BUSY signal goes HIGH, the PAPER OUT indicator is lit, the interface PE signal becomes HIGH, the ERROR signal becomes LOW, and the printer enters the PAUSE condition automatically.

By ignoring the paper out, the printer can print additional lines after the paper out is detected. This function is called the forms override function. After you load new paper and press the PAUSE button, the printer recovers to the RUNNING condition, and printing restarts.

The printer enters the paper-out condition only when a paper-out is detected after the printer performs paper loading.

1.6.4 Error Conditions

If any of the following error conditions are detected, the printer automatically enters PAUSE condition.

- **Home position is not detected at printer mechanism initialization.**
- **Home position is detected during printing.**
- **The PAUSE button is pressed, and the printer enters PAUSE condition.**
- **A paper-out is detected after performing paper loading operation.**

If parallel interface is selected, the following interface signals are output to indicate the error and to stop data transmission:

The BUSY signal becomes HIGH.
The ERROR signal becomes LOW.
No ACKNLG pulse is sent.

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, with 0.1 second intervals).**
- **Abnormal carriage movement is detected (beeps 5 times for 0.5 second, with 0.5 second intervals).**
- **A panel setting is accepted (O. 1 second beep).**

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 (and the AC power cord is plugged in) or when the INIT signal is received.

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

(a) Initializes 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 initializes the printer. Printer initialization by ESC@ code does not perform functions (a), (b), and (c) above. The settings changed by the last SelecType operation are maintained.

(3) Panel initialization

This printer can be initialized by pressing the PAUSE button in combination with the ALT button. When the printer is initialized from the front panel, functions (a) and (c) 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	10 cpi
Printing effects	Cleared, except condensed printing
Condensed printing	Last setting selected from the panel
Printer condition	RUN

1.6.8 Sheet Loading and Sheet Ejection

The release lever can disengage the pull-tractor unit drive mechanism, giving this printer improved paper-handling for functions that utilize the release lever. These functions are described below:

Automatic cut-sheet loading without the cut-sheet feeder

Move the release lever to the friction-feed position, and place the sheet along the paper guide (top or front). A few seconds later, the sheet is automatically loaded to the top-of-form position and the printer enters the RUNNING condition.

Automatic cut-sheet loading and ejection with cut-sheet feeder

Move the release lever to the friction-feed position, and place the sheets into the hopper of the cut-sheet feeder. Pressing the LOAD/EJECT button loads one sheet to the top-of-form position. If a paper-out is detected before printing starts, a sheet will again be loaded automatically to the top-of-form position.

Continuous paper loading and ejection (backout)

Move the release lever to the REAR PUSH position, and insert the paper into the tractor unit. Pressing the LOAD/EJECT button loads the paper automatically to the top-of-form position. If a paper-out is detected before printing starts, the paper will be loaded automatically to the top-of-form position.

If the LOAD/EJECT button is pressed after continuous paper has been loaded, the paper is ejected backward to the push tractor unit. To back out several pages, press the LOAD/EJECT button several times. Each time LOAD/EJECT is pressed, reverse feed is performed for a single page.

When the paper is at the current setting for the top-of-form position, the top-of-form adjustment function is valid for the next loaded position. At this time, the LOAD\ EJECT button advances the paper forward, and the LINE FEED/FORM FEED button moves the paper backward.

The adjusted top-of-form position for continuous paper is saved in EEPROM, but the setting for cut sheet paper is not saved.

1.6.9 Tear-off Function

The below tear-off function is limited under the push tractor mode.

Auto-tear-off

The auto-tear-off function is enabled by DIP switch setting. When this function is enabled and the release lever is in the tractor position, the paper advances to the tear-off position automatically if the input data buffer is empty and the printer is in the RUNNING condition. The TEAR-OFF LED lights to indicate that you can use the LOAD/EJECT and LINE FEED/FORM FEED buttons, in combination with the ALT button, for backward and forward micro feed adjustment.

Using micro feed, adjust the paper to meet the tear-off edge. Once the tear-off position is set, this setting remains valid even after the printer is turned off or initialized. If subsequent data is sent to the printer, the paper returns to the original position automatically and printing starts. If the PAUSE button is pressed while the paper is advanced to the tear-off position, the paper returns to the original position (and the printer enters the PAUSE condition).

Short-tear-off

To access the short-tear-off function, press the TEAR-OFF button. The release lever must be in the tractor position. The paper advances to the tear-off position whether the printer is in PAUSE or RUNNING condition. At this time, the TEAR-OFF LED lights to indicate that you can use the LOAD/EJECT and LINE FEED/FORM FEED buttons, in conjunction with the ALT button, for backward and forward micro feed adjustment. Using micro feed, adjust the paper to meet the tear-off edge. Once the tear-off position is set, this setting remains valid even after the printer is turned off or initialized. If subsequent data is sent to the printer and the printer is in the RUNNING condition, the paper returns to its original position automatically and printing starts. If the TEAR-OFF button is pressed again while the paper is advanced to the tear-off position, paper returns to its original position whether the printer is in PAUSE or RUNNING condition.

1.6.10 LEVER, G, ADJUST Operation

The LEVER ,G, ADJUST must be set to the proper position for the paper thickness. If this lever has been set to the 4th step or higher, printing speed is reduced and the head energy is increased.

Table 1-16. Lever Positions

Lever Position	Paper Thickness
0 (2nd step)	0.06 – 0.12 mm
1 (3rd step)	0.13 – 0.18 mm
2 (4th step)	0.19 – 0.25 mm
3 (5th step)	0.26 – 0.32 mm

NOTE: If printing density becomes lighter, adjust the LEVER, G, ADJUST position one step higher.

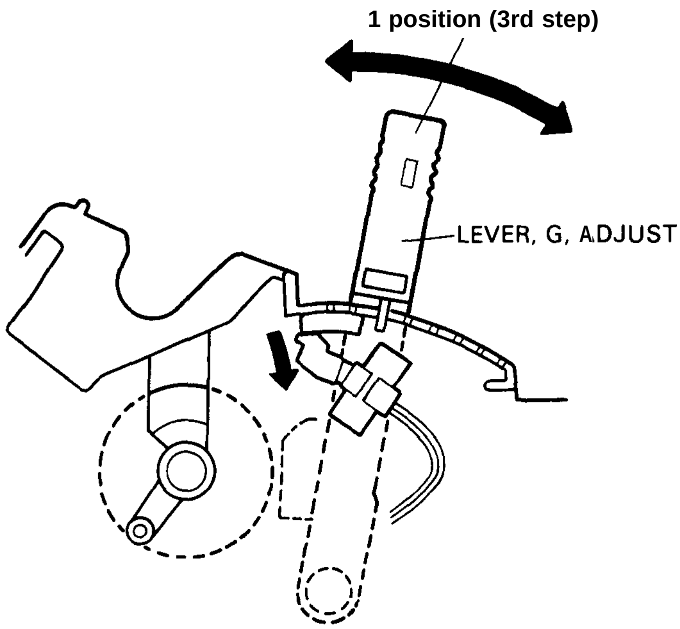


Figure 1-10. Lever Positions

1.6.11 Printer Protection for Heavy-Duty Printing

This printer has a printhead protection function to prevent it from overheating and to protect the printer when the head driver voltage drops. If head temperature exceeds its maximum value, printing stops automatically until the head temperature drops to a certain value before printing resumes. Printing resumes at a lower print speed at first.

However, as the head temperature decreases, print speed increases to normal speed automatically. If the head temperature continues to increase at the lower speed, printing is stopped or resumed as temperature increases or decreases.

If the voltage supplied to the head drive circuit drops below its minimum limit as a result of heavy-duty printing, printing is interrupted immediately. When the power supply voltage recovers to a certain value, the remaining print line is printed at half speed. This protective action occurs when half or more of the wires are activated continuously.

1.7 MAIN COMPONENTS

The main components of the LQ-570/1 070 printers are designed for easy removal and replacement to maintain and repair the printer. The main components are:

1) C062 MAIN board: the main control board; the CPU on this board controls all main functions.
2) C062 PNL board: the control panel board.
3) C062 PSB/PSE board: the power supply board.
4) M-5 E10/5E60: the printer mechanism.

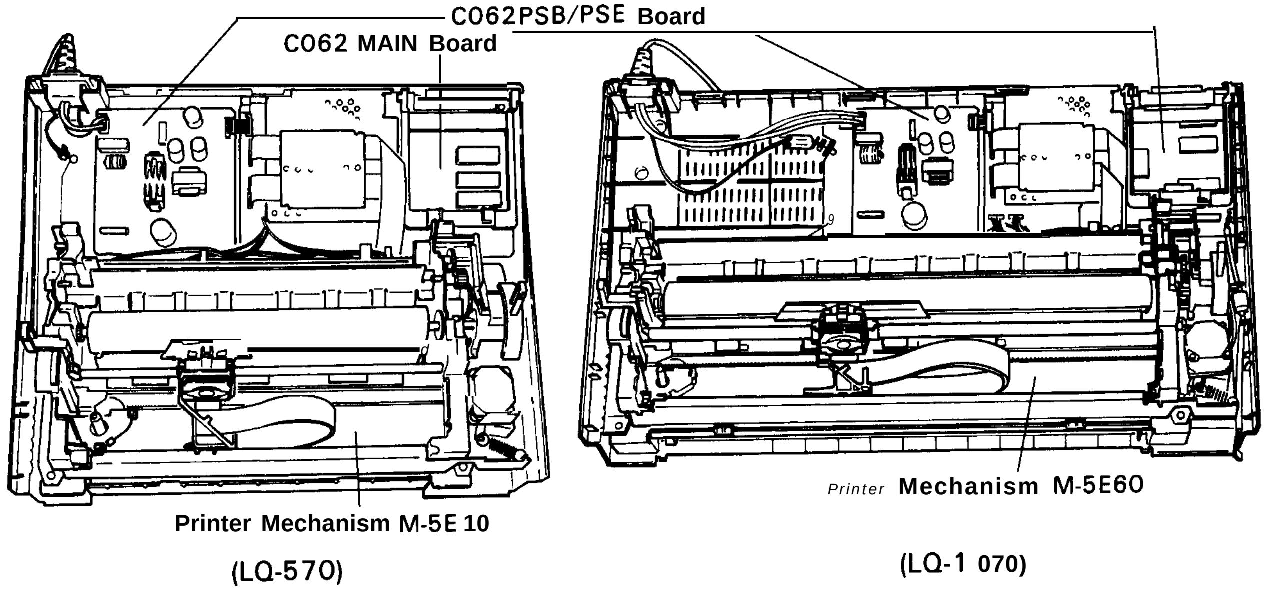


Figure 1-11. LQ-570/1070 Component Layout

1.7.1 C062 MAIN Board (Main Control Circuit Board)

The C062 MAIN Board for the LQ-570 consists of a TMP90C041 N 8-bit CPU, an E05A50 gate array, a PROM (5 12K), a PSRAM (256 K), a mask ROM (character generator, 2M), an EEPROM, and a hybrid IC (STK-6022B). In addition to this, the board for the LQ-1 070 also includes a SRAM (64 K).

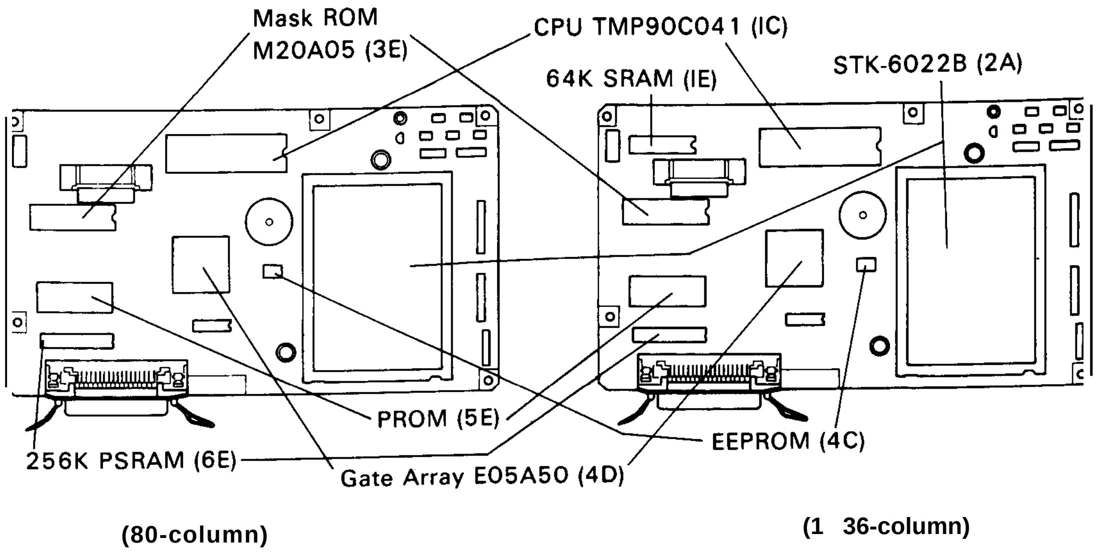


Figure 1-12. C062 MAIN Board (80-column and 136-column)

1.7.2 C062 PNL *Board (Control Panel Circuit Board)*

The C062PNL board is the LQ-570/1070 control panel, which includes the indicator LEDs, switches, I and DIP switches.

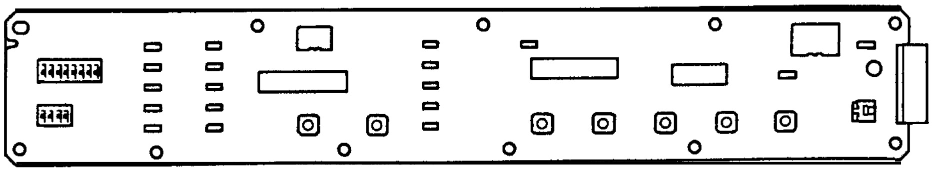


Figure 1-13. C062PNL Board

1.7.3 C062PSB/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 C062PSB board is 120V input type, and the C062PSE board is 220\240V input type.

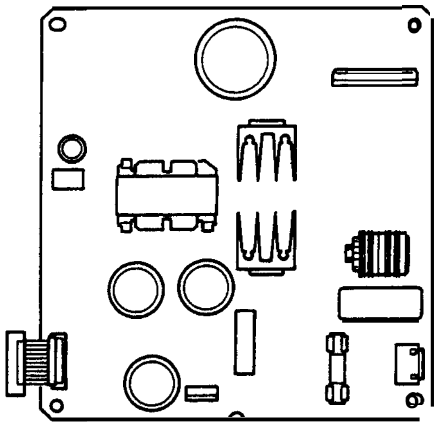
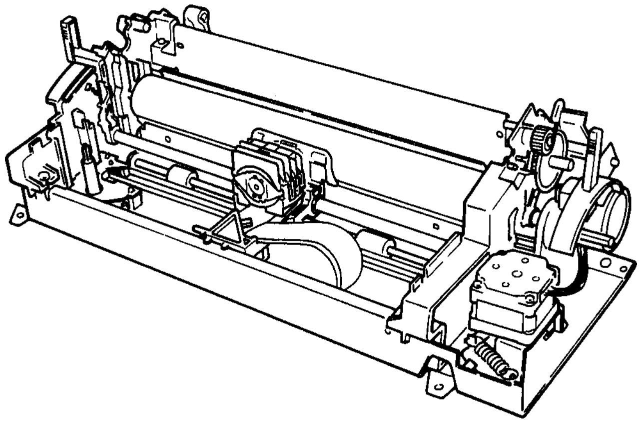


Figure 1-14. C062PSB/PSE Board

1.7.4 Printer Mechanism (M-5 E10/M-5E60)

The M-5E10/M-5E60 printer mechanism was developed specifically for use with LQ-570/1 070 printer. The components include a carriage motor, carriage mechanism, paper-feed motor, paper-feed mechanism, ribbon-feed mechanism, printhead, and sensors. This printer mechanism allows three ways of paper insertion.

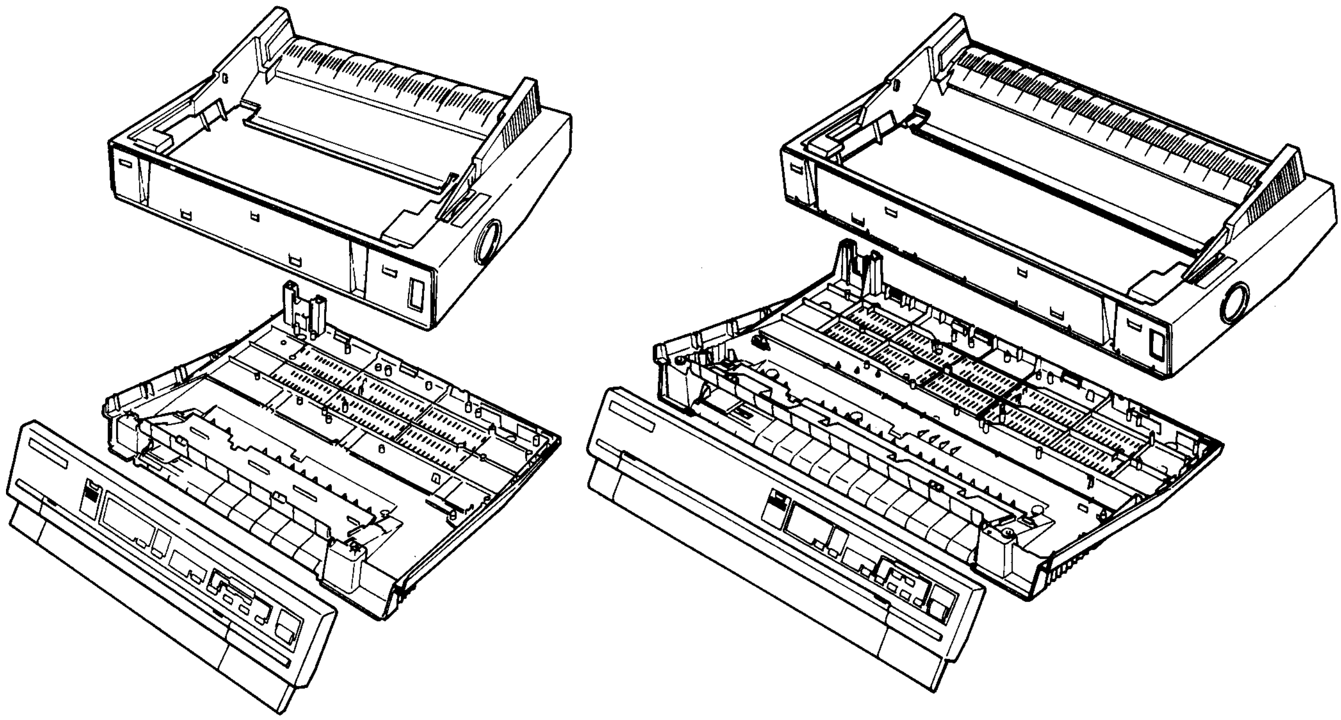


This picture shows an 80-column Printer. The M-5E10 and M-5E60 differ in width only.

Figure 1-15. Model-5E10/5E60 Printer Mechanism

1.7.5 Housing

The LQ-570/1 070 housing consists of the upper, lower, and front cases. The front case houses the control panel board. The lower case contains the printer mechanism, the main control circuit board, and power supply circuit board.



(LQ-570) (LQ-1 070)

Figure 1-16. Housing (LQ-570/LQ-1070)

CHAPTER 2
OPERATION PRINCIPLES

LIST OF FIGURES

CHAPTER 2

LIST OF TABLES

2.1 OVERVIEW OF PRINTER MECHANISM OPERATION

This section describes the PRINTER MECHANISM of the Model-5E10/5E60 printer unit and explains how the printer works. The Model-5E10/5E60 has a PRINTER MECHANISM that features a 24-pin impact dot printhead for serial printing. There are four main parts to the printer mechanism: 1) the printhead mechanism, 2) the carriage movement mechanism, 3) the paper advance mechanism, and 4) the ribbon advance mechanism. Each of these is described below.

2.1.1 Printhead Mechanism

The printhead mechanism consists of the printhead itself, the ink ribbon, and the PLATEN. The printhead contains 24 wires in a zigzag arrangement in two rows of 12. A drive coil is provided for each of these wires to make the wires move in and out of the printhead and print dots independently of each other. The basic way that the wires are driven is described in the four steps below.

1. The control circuit outputs the drive signal to the printhead drive circuit. This changes the printhead drive voltage, and current flows through the corresponding printhead coil. The coil acts as a solenoid and generates a magnetic force.
2. This induced force causes the plate to approach the coil rod and the associated dot wire is rapidly ejected to impact on the platen.
3. The dot wire presses the ink ribbon up against the paper as it hits the platen, and in this way prints a dot on the paper.
4. As soon as the current through the coil is switched off, the force induced in the coil rod stops. The plate then returns to its original position (its position before the coil was energized) through the action of the plate spring. After the dot wire hits the platen, the rebounding force of hitting the platen works together with the wire return spring to pull the wire back to its original position in relation to the plate.

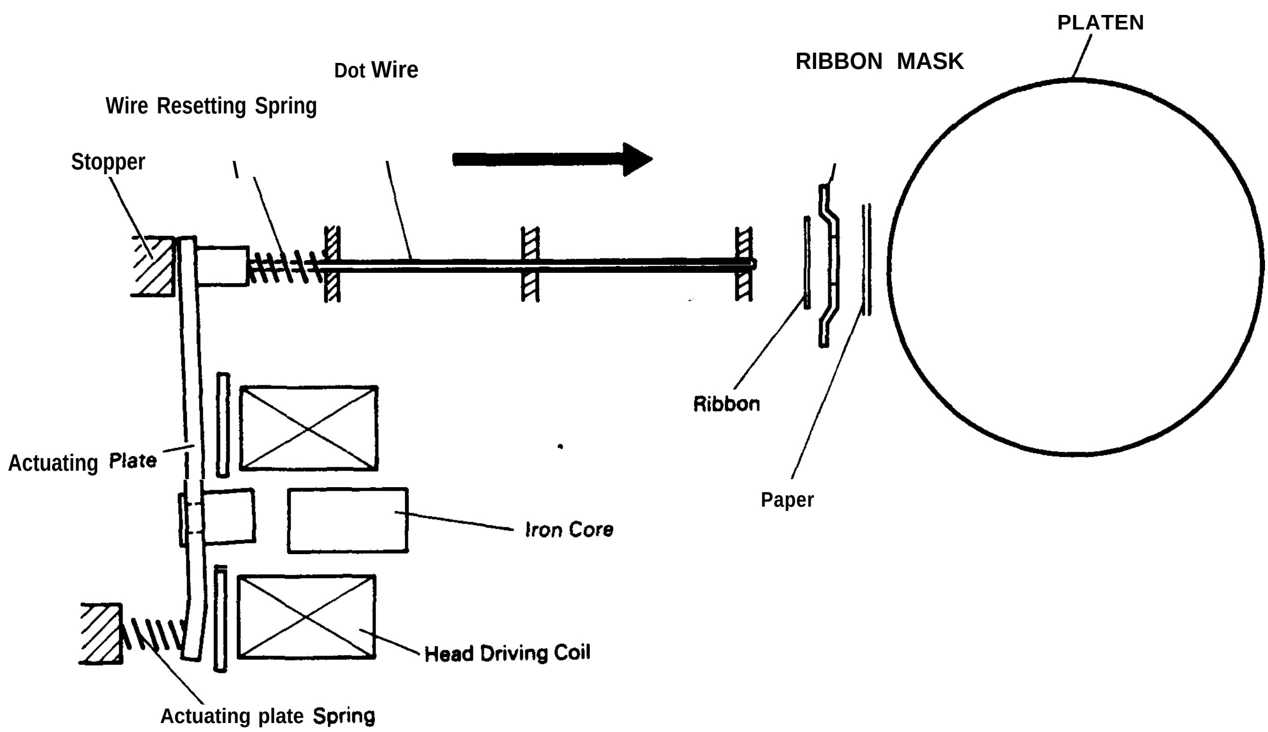


Figure 2-1. How the Printhead Works

Figure 2-1 shows the action of the PRINTER MECHANISM when a single dot is printed. The printhead tends to heat up after a period of continuous printing. To minimize the possibility of the dot wire drive coils overheating within the printhead and any loss of performance, the head is equipped with a thermistor that detects the head temperature. When this thermistor detects changes in the printhead temperature, the voltage signal changes. This signal change is read by the control circuit for feedback control.

2.1.2 Carriage Movement Mechanism

A timing belt is connected to the carriage on the lower side. With the printhead installed, this carriage moves in either direction along the SHAFT, CR, GUIDE. The carriage is driven by the MOTOR, CR a stepping motor that drives the TIMING BELT via the BELT PULLEY. The DETECTOR ASSY., HP DETECTS when the carriage is in the home position.

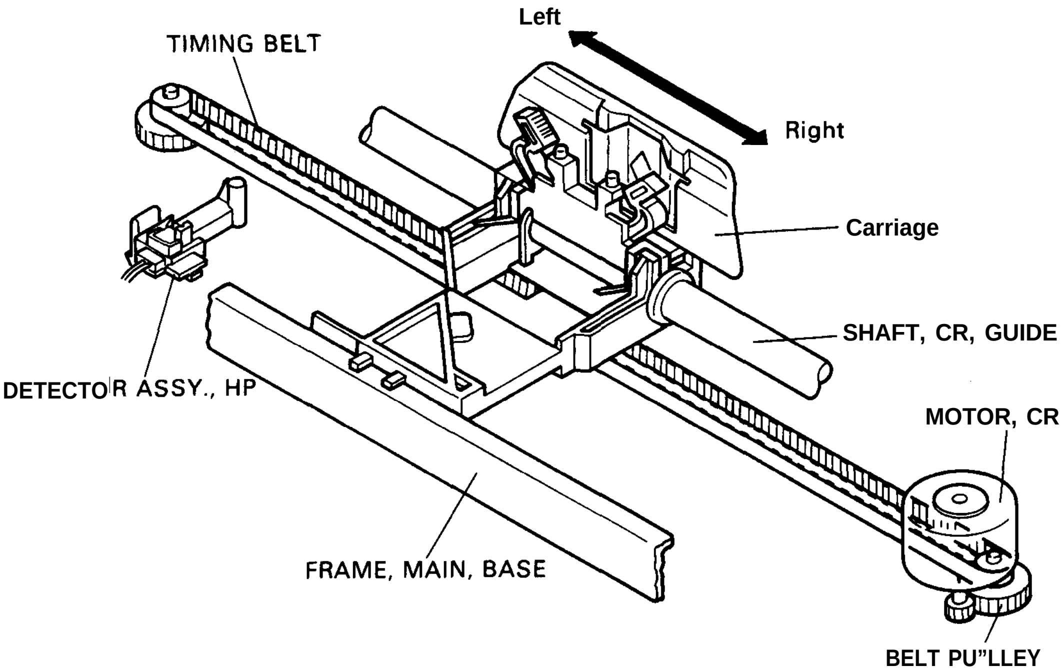


Figure 2-2. Carriage Movement

The paper-thickness LEVER, G, ADJUST allows the printer to use different weights of paper (different thicknesses). The user controls this lever and alters the platen gap on the SHAFT, CR, GUIDE by changing its position. Changing the position of the lever rotates the CHAFT, CR, GUIDE and moves the carriage either toward or away from the PLATEN. Moving the paper-thickness LEVER, G, ADJUST to the fourth position or higher slows down the printing speed to protect the printhead. The PG sensor reads the current position of the paper-thickness LEVER, G, ADJUST.

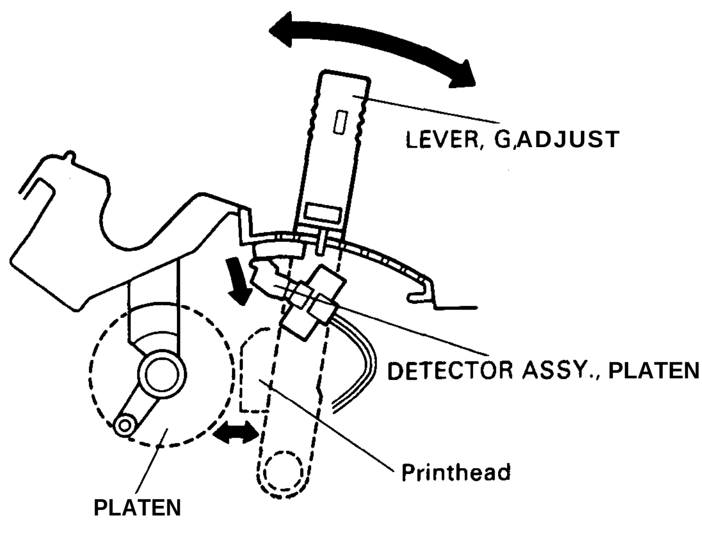


Figure 2-3. Paper-Thickness LEVER, G, ADJUST Movement

2.1.3 Paper Feed Mechanism

Cut sheet paper is advanced by friction feed. Continuous form paper is advanced using a tractor feed mechanism.
There are three ways to advance the paper with tractor feed: using the push tractor, using the pull tractor, and using the push and pull tractors together. Any one of these three tractor configurations can feed paper through the printer. In normal operation, the printer is set up with one tractor, which functions as either a push tractor or pull tractor, depending on where it is attached to the printer body. To use the push-pull tractor feed method, an optional tractor must be attached in addition.

There are also four ways to insert paper into the printer. Different paper paths are used for different types of paper. Table 2-1 lists which paper paths can be used for each of the various paper advance methods.

Table 2-1, Paper Advance Methods and Paper Paths

	Paper Insertion (Paper Paths)			
Paper Advance Method	Rear Entrance	Front Entrance	Bottom Entrance	Top Entrance
Friction Feed	No	OK	No	OK
Push Tractor	OK	No	No	No
Pull Tractor	No	OK	OK	No
Push-pull Tractor Feed	OK	No	No	No

2.1.3.1 Paper Advance Mechanisms

This section describes how the friction feed and tractor feed mechanisms work to advance the paper in the printer.

Friction Feed Method

The paper is held between the platen and paper advance' roller, and between the paper eject roller and paper eject unit cover. The paper-feed pinion gear, turning in the direction of the black arrow, drives the COMBINATION GEAR, 8.5, 30. The COMBINATION GEAR, 8.5, 30 turns the SPUR GEAR, 34, paper-feed rollers, and top ROLLER ASSY., PAPER EJECT. The paper then advances in the direction of the white arrow.

The paper advance roller spring holds the paper against the platen. Setting the LEVER, G, ADJUST to the tractor feed position releases this pressure and frees the paper. Figure 2-4 illustrates friction feed when paper is inserted through the top entrance.

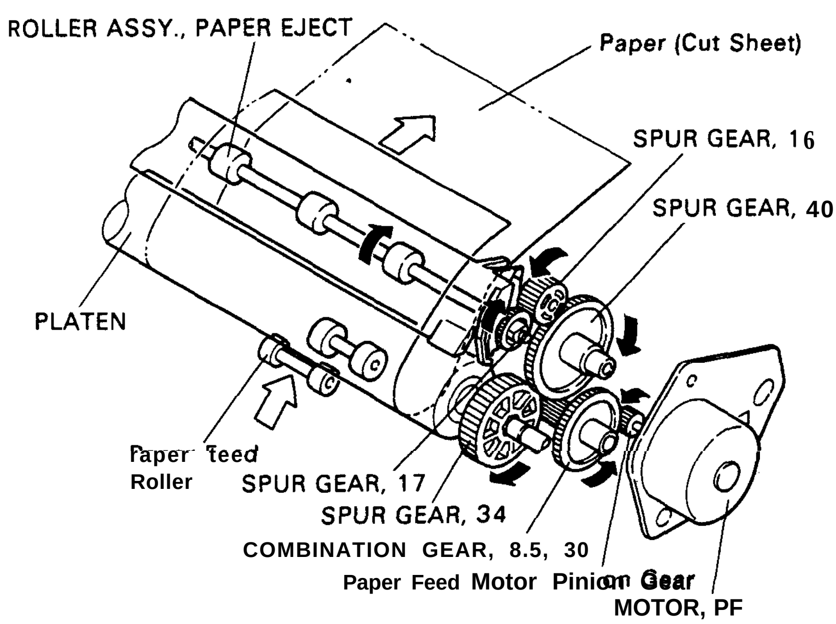


Figure 2-4. Top Path Friction Feed

Push Tractor Method

When **the push tractor is selected, the SPUR GEAR, 16 engages the SPUR GEAR, 17 (Tractor gear) on the TRACTOR ASSY. COMBINATION GEAR, 8.5, 30 is driven by the paper-feed gear, which in turn is driven by the paper-feed motor pinion gear. The paper-feed pinion gear, when turning in the direction of the black arrow, results in pushing the paper through the mechanism.**

During tractor feeding, the LEVER, G, ADJUST is set to the tractor position to disengage the friction drive. This releases the pressure between the paper advance roller and the platen. Figure 2-5 illustrates push tractor operation.

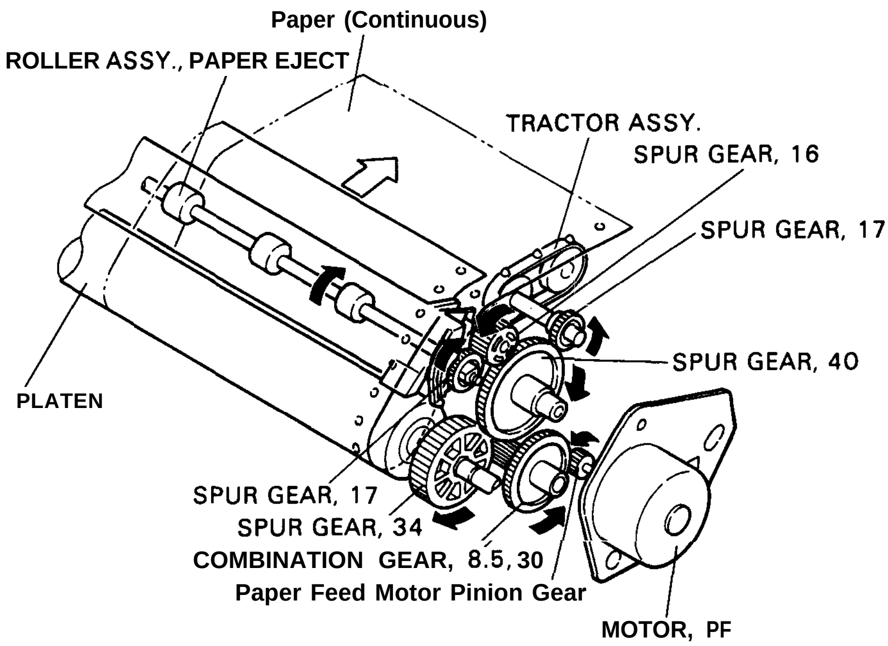


Figure 2-5. Push Tractor Operation

Pull Tractor Method

Using pull tractor feed to advance the paper is basically the same as using push tractor feed. In push tractor feed, the TRACTOR ASSY. (paper advance mechanism) is before the paper entrance. It pushes the paper through the PRINTER MECHANISM. Pull tractor feed, however, has the opPosite arrangement, with the tractor situated after the paper entrance. Since it pulls the paper through the PRINTER MECHANISM, it requires no paper tension unit. Figure 2-6 illustrates pull tractor operation tractor when paper is inserted through the bottom path.

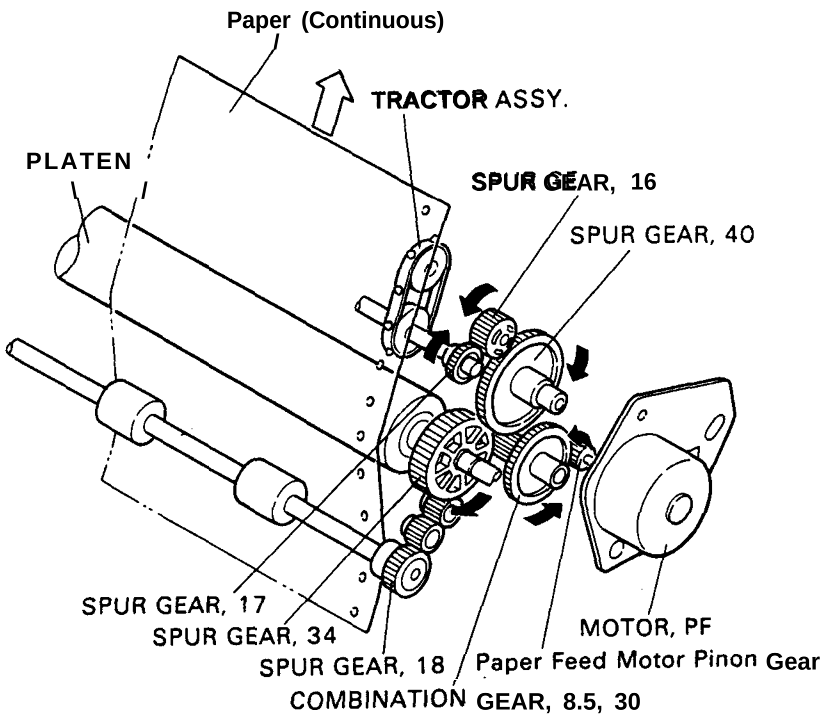


Figure 2-6. Pull Tractor Operation

Push-Pull Tractor Method

This is a combination of the push tractor and pull tractor methods. Two tractors are used, one in f‘rent of and one behind the paper entrance, to advance the paper. They act simultaneously to push and pull the paper through the PRINTER MECHANISM. Figure 2-7 illustrates push-pull tractor operation.

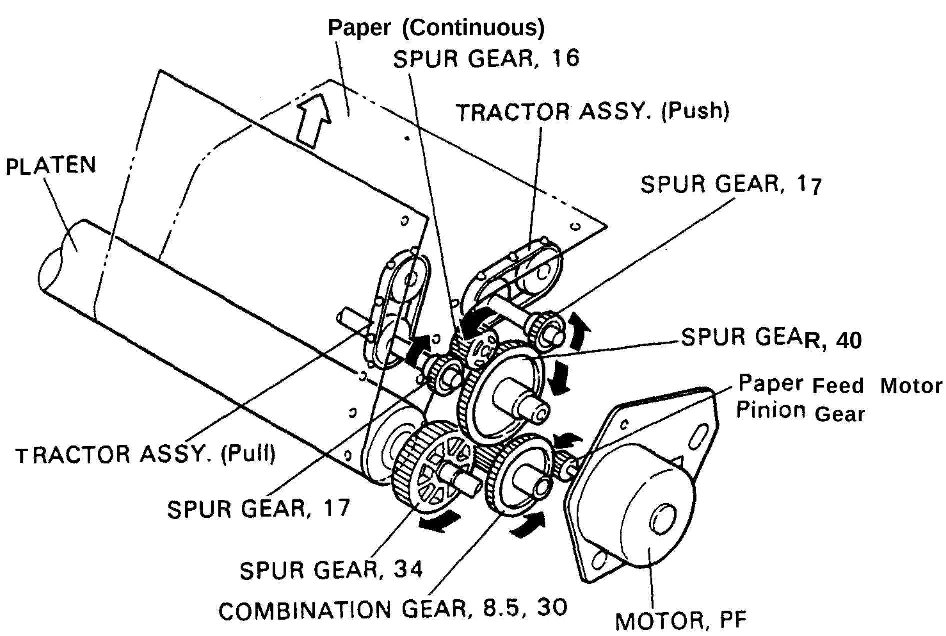


Figure 2-7. Push-Pull Tractor Operation

The LEVER, RELEASE switches between friction feed and tractor feed. Setting the LEVER, RELEASE to the friction feed position presses the paper advance roller against the PLATEN. Setting the release lever to the tractor feed position releases this pressure, so that the paper advance roller separates from the PLATEN. The DETECTOR ASSY., RELEASE senses the current position of the LEVER, RELEASE.

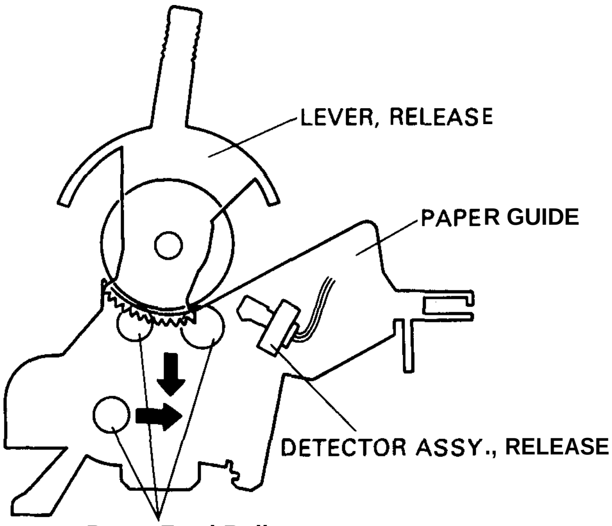


Figure 2-8. LEVER, RELEASE Movement

2.1.3.2 Paper Insertion Entrances

This section describes the different ways to feed paper into the printer.

Top entrance paper insertion

When you feed paper into the printer through the top entrance, the method to advance the paper is friction feed.

There are two paper-out detectors: the front paper-out detector is in front of the PRINTER MECHANISM and the rear paper-out detector is behind the PRINTER MECHANISM. When paper is inserted through the top entrance, the rear detector senses when the paper runs out.

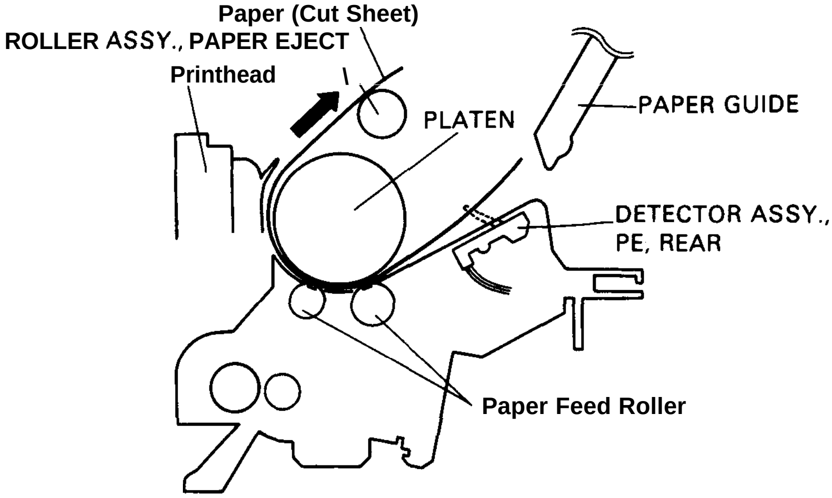


Figure 2-9. Paper Path for Top Entrance Friction Feed

Rear entrance paper insertion

When you feed paper into the printer through the rear entrance, the method to advance the paper can be: the push tractor, or the push-pull tractor. The rear paper-out detector senses when the paper has run out.

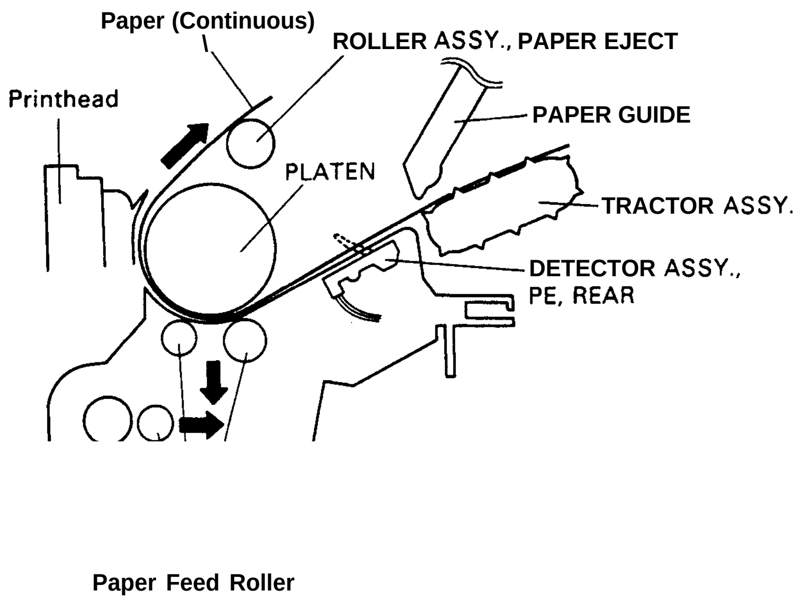


Figure 2-10. Paper Path for Rear Entrance Push Tractor Feed

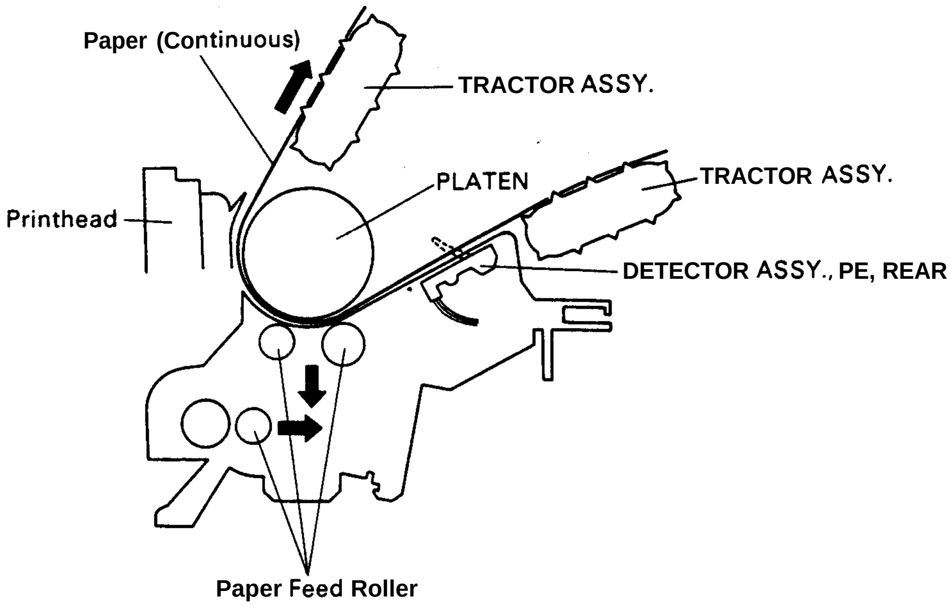


Figure 2-11. Paper Path for Rear Entrance Push-Pull Tractor Feed

Bottom entrance paper insertion

When you feed paper into the printer through the bottom entrance, the pull tractor advances the paper. The front paper-out detector senses when the paper runs out.

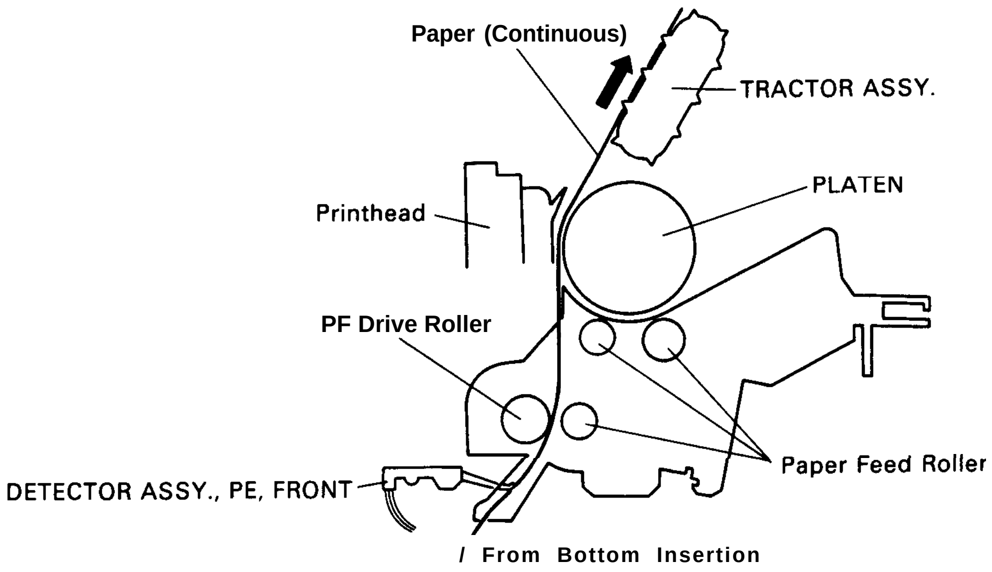


Figure 2-12. Paper Path for Bottom Entrance Pull Tractor Feed

Front entrance paper insertion

When you feed paper into the printer through the front entrance, the paper can be advanced either with friction feed or the pull tractor. The front paper-out detector senses when the paper runs out.

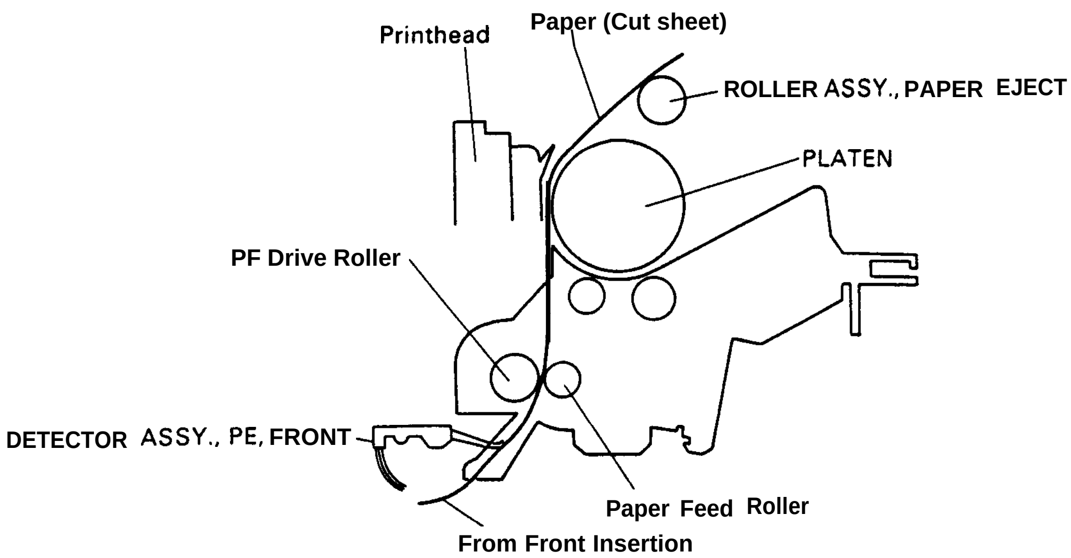


Figure 2-13. Paper Path *for Front Entrance* **Friction Feed**

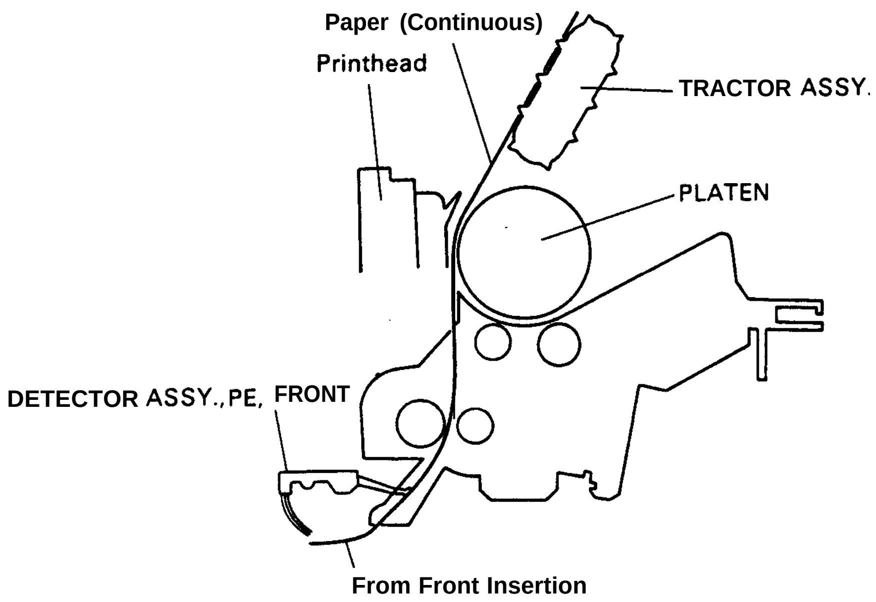


Figure 2-14. Paper Path for Front Entrance Pull Tractor Feed

2.1.4 Ribbon Advance Mechanism

The ribbon drive gear advances the ribbon through a gear linkage. This arrangement of gears makes the ribbon drive gear always rotate in a counterclockwise direction, regardless of the direction the carriage is moving.

Table 2-2. Ribbon Advance Gear Linkage

Direction of Carriage Movement	Gear Linkage
Left to right (arrow ➡)	PULLEY, DRIVEN ➡ Ribbon transmission gear ● COMBINATION GEAR (1) ● COMBINATION GEAR (3) ➡ COMBINATION GEAR (4) ● RATCHET, RD
Right to left (arrow ⇨)	PULLEY, DRIVEN ⇨ Ribbon transmission gear ⇨ COMBINATION GEAR (1) ⇨ COMBINATION GEAR (2) ⇨ RATCHET, RD

The ink ribbon within the cartridge case is an endless ribbon that is held against the ribbon advance roller by the pressure of the ribbon grip roller. The ribbon advance roller, linked to the ribbon drive gear, winds the ink ribbon.

The ribbon brake spring, attached to the exit slot of the cartridge case, prevents slack in the ribbon and keeps the ribbon tension correct, The ribbon mask keeps the paper clean by preventing the ribbon from brushing against the paper.

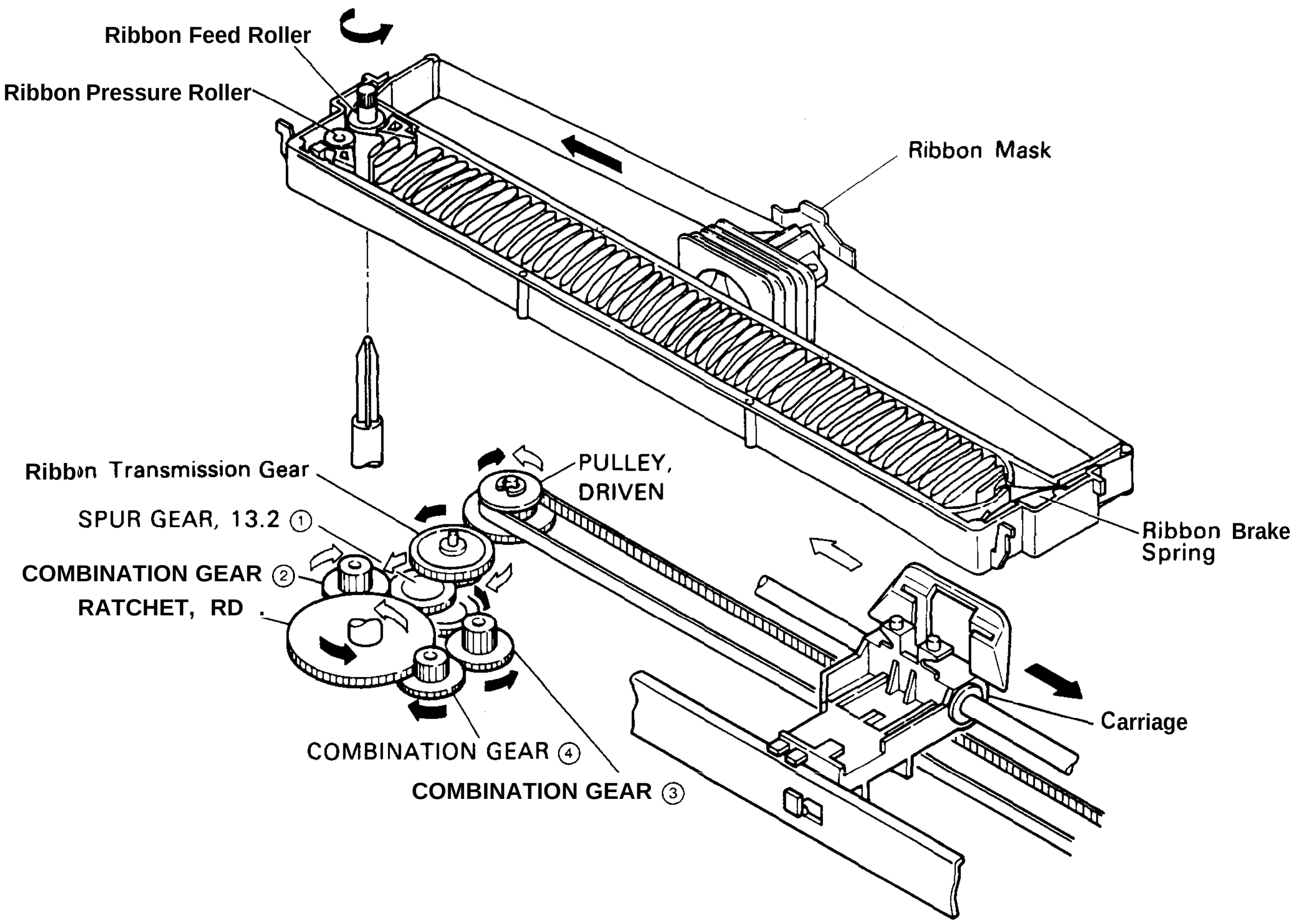


Figure 2-15. *Ribbon Advance Mechanism*

2.2 POWER SUPPLY OPERATION

The printer can be powered by either of two power supply boards: the 120 V C062PSB board or the 220/240 V C062PSE board. The only difference in the way these two boards operate is in the primary circuitry. How they work to supply power to the printer is identical. These power boards output the DC current necessary to drive the printer control circuits and printer drive mechanism. Table 2-3 shows the input voltages and fuse ratings for these boards.

Table 2-3. Power Supply Boards

Board	input Voltage (VAC)	Fuse F1 Rating
C062 PSB	103.5 to 132	2.5A / 125 V
C062 PSE	198 to 264	1.25A / 250 V

2.2.1 Power Supply Overview

The power supply board has two power output lines that supply power to the various control circuits and drive mechanisms. Table 2-4 lists the parts of the printer that run off these two DC output supply voltages.

Table 2-4. Power Supply Output Voltages and Applications

Output Supply Voltage (DC)	Applications
+35 v	MOTOR, CR drive MOTOR, PF drive Printhead drive
+5 v	C062 MAIN board logic circuitry Various sensors Control panel LEDs MOTOR, PF hold

2.2.2 Supply Circuit Operation

Figure 2-16 shows the power supply circuitry in block diagram form. AC power feeds into the printer from the external power source. A filter circuit removes the noise. The AC voltage then undergoes full wave rectification and is smoothed to produce the direct current supply voltage. This voltage is fed through a switching circuit and secondary smoothing circuit to produce the stepped down +35 VDC supply. A +35 V line voltage detector circuit is connected to the switching circuit. This feedback control arrangement ensures that the +35 VDC supply is kept stabilized.

The + 5 VDC supply is achieved by feeding the +35VDC line through the +5VDC power supply circuit. This circuit further steps down the +35 VDC voltage and outputs a stabilized +5 VDC supply.

There are two main features of the power supply circuit. First, the power supply switch is in the secondary circuitry. When this switch is turned off, the switching circuit is de-energized and output of the +35 VDC supply stops. However, since the switch is in the secondary circuitry, while the printer remains plugged into the external AC supply current continues to flow in the primary circuitry, whether the power supply switch is turned off or on. For this reason, before you perform any maintenance work, you must disconnect the printer from the external AC power supply by unplugging it from the power source.

Second, there are four circuits to protect the supply circuitry and avoid danger. The +5 VDC line contains a current overload protection circuit and a voltage overload protection circuit. The current overload protection circuit is part of the + 5 VDC supply circuit. It cuts the + 5 VDC line if the current is too great. The + 5 V voltage overload protection circuit cuts the supply if the voltage reaches or exceeds + 7 VDC. It stops the switching circuit operation, which stops the output of the +35 VDC line.

The +35 VDC line has a voltage overload protection circuit and a voltage drop protection circuit. The +35 V voltage overload protection circuit cuts the supply if the voltage reaches or exceeds +36 VDC. It stops the switching circuit operation, which stops the output of the +35 VDC line. The voltage drop protection circuit protects the printer from such damage as might occur from short circuiting in the secondary circuitry of the +35 VDC line. If a voltage drop is detected, it stops the switching circuit operation, which stops the output of the +35 VDC line.

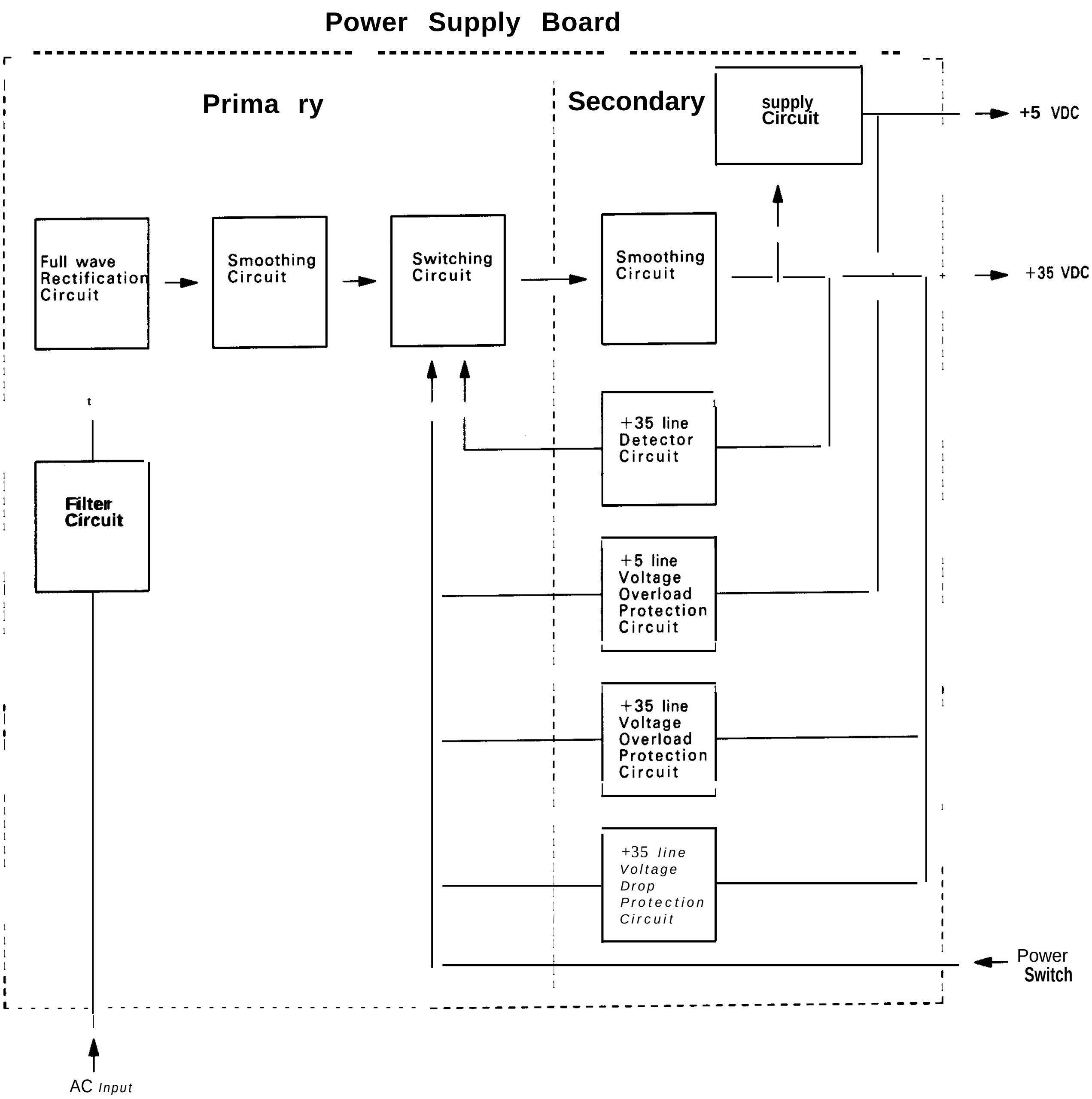


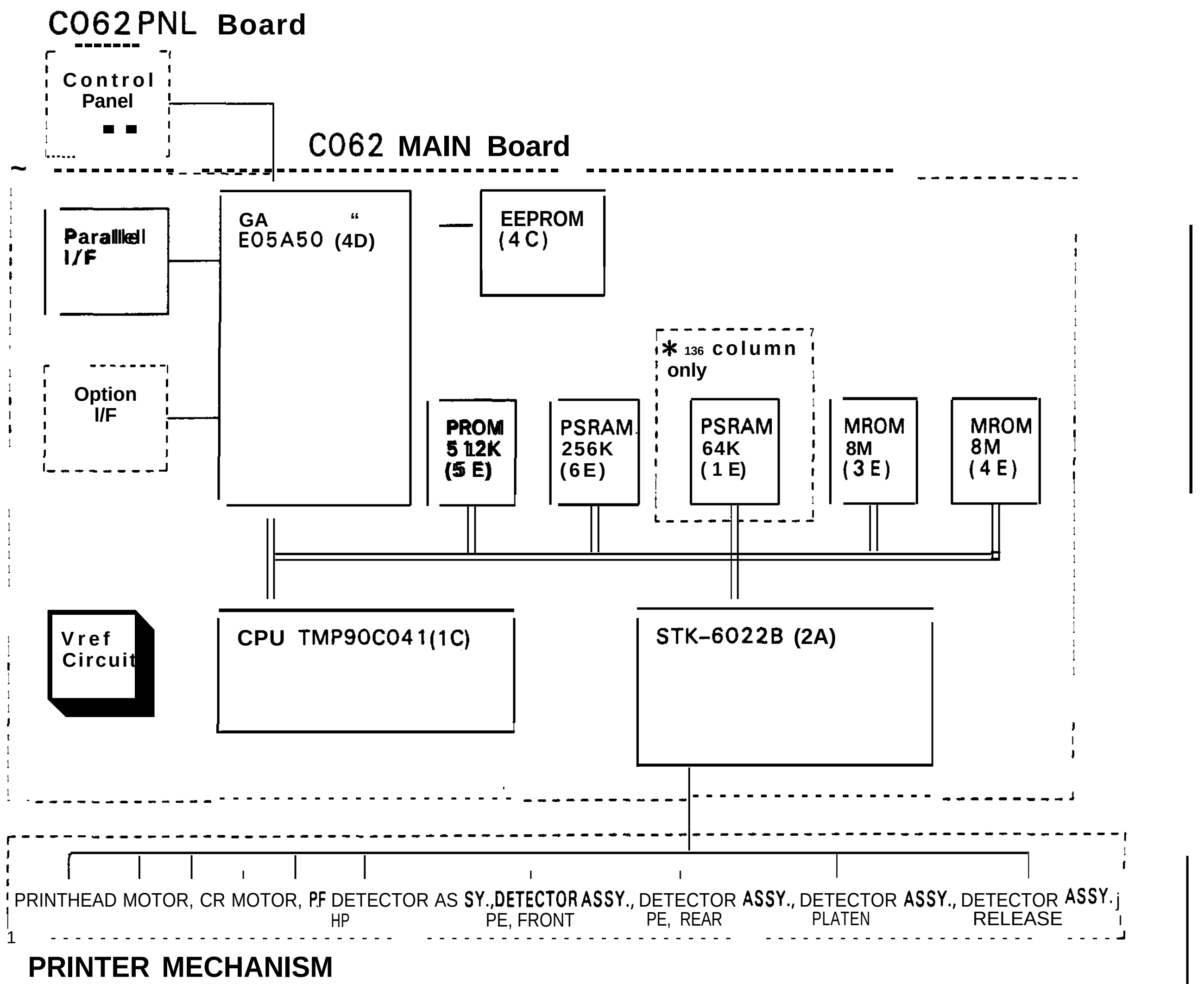
Figure 2-16. Power Supply Circuit **Block Diagram**

2.3 CONTROL CIRCUIT OPERATION

The control circuit consists of two boards: the C062 MAIN board, which acts as the main board, and the C062PNL board, which acts as the control panel board. This section describes how these boards work.

2.3.1 *Control Circuit Operation Overview*

The printer CPU is an 8-bit CPU TMP90C041 running at 10 MHz. It oversees control of all the components of the printer. The E05A50 gate array contains various memory management functions that control the assignment of the memory and I/O areas. Rationalization and simplification of the circuitry is achieved through use of the STK-6022B, which holds all the driver circuits for driving the PRINTER MECHANISM on a single chip. Figure 2-17 shows the control circuits in block diagram form.



GA	**Gate array**	**DETECTOR ASSY., HP**	**Home position sensor**
DETECTOR ASSY., RELEASE	**Platen gap sensor**	**MOTOR, CR**	**Carriage motor**
DETECTOR ASSY., RELEASE	**Release sensor**	**MOTOR, PF**	**Paper advance motor**

DETECTOR ASSY., PE, FRONT Front paper-out detector (positioned in front of the PRINTER MECHANISM)
DETECTOR ASSY., PE, REAR Rear paper-out detector (positioned behind the PRINTER MECHANISM)

Figure 2-17. Control Circuit Block Diagram

Table 2-5 lists the functions of the main components and circuits of the printer. The CPU converts the print data sent from the host computer to image data (the print image). The image data is then loaded to RAM. Each line of data is processed sequentially. The CPU transfers the print data to the printhead drive circuit. The CPU sends the printhead drive pulse to the printhead drive circuit. The length of this pulse corresponds to the printhead drive voltage. The head drive circuit then outputs the head drive signal.

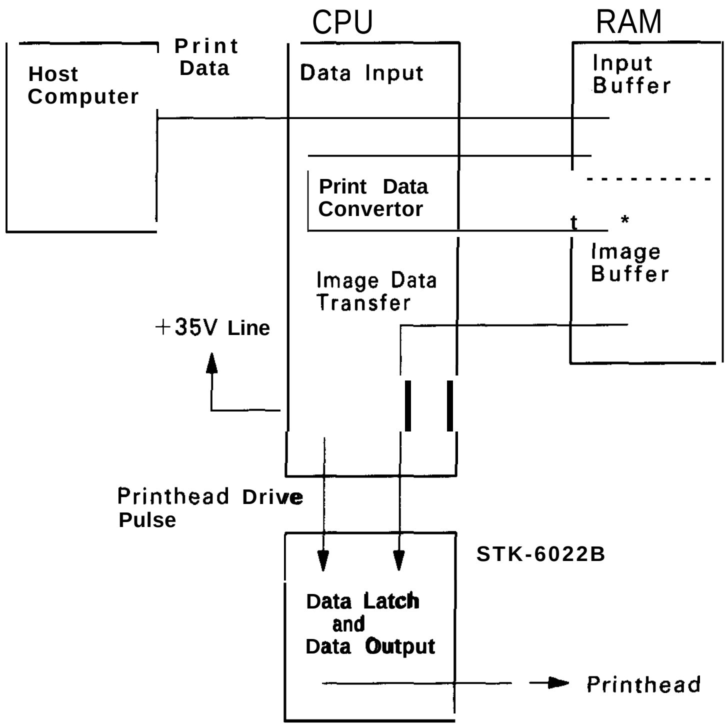


Figure 2-18. Data Flow

Table 2-5. Functions of the Main IC and Circuits

IC or Circuit	Location	Functions
TMP90C041	1C	Receives data from the host computer and loads the data to the input buffer in RAM (under interrupt processing control). Expands the input data held in the buffer to create image data. Loads this image data to the image buffer in RAM. Transfers the image data to the printhead drive circuit. Also controls various parts of the PRINTER MECHANISM, such as the motors.
E05A50	4D	This is a gate array consisting of three components configured on a single chip: Memory Management Unit Handles CPU memory in ROM, RAM, and mask ROM, and assigns addresses for other devices. Parallel Interface (Parallel I/F) Holds the parallel interface functions. Reset Circuit Contains the circuit that generates the $\overline{RESET}$ signal.

Table 2-5. Functions of the Main IC and Circuits (Cont.)

IC or Circuit	Location	Functions
STK-6022B	2A	This is a *single* chip that houses drive circuits for the printhead, MOTOR,CR and MOTOR, PF of the PRINTER MECHANISM. The chip also includes the various sensor input circuits for the PRINTER MECHANISM.
PROM	5E	PROM contains the program that runs the CPU.
RAM	6E 1E	Holds the CPU working area and the various buffers. (1 E is not used for an 80-column device and is not installed.)
MROM (Mask ROM)	3E 4E	Holds the character design (also called the character generator).
EEPROM	4C	EEPROM is an electronically writable and erasable ROM used to hold such information as the TOF position.
Vref Circuit	—	This is a circuit for generating the reference voltage used in the A/D convertor within the CPU.

2.3.2 *Reset* Circuit

Figure 2-19 shows the reset circuit in block diagram form. The reset circuit issues the $\overline{\text{RESET}}$ signal. Each part of the control circuits is initialized when this $\overline{\text{RESET}}$ signal is received. The conditions when the $\overline{\text{RESET}}$ signal is output are described below.

When turning on the power supply

Immediately after the power has been turned on, STK-6022B (2A) outputs the $\overline{\text{VCCON}}$ pulse. E05A50 (4D) receives this pulse and then outputs the $\overline{\text{DISC}}$ pulse. The electrical charge in the condenser within the STK-6022B is then discharged. After this, STK-6022"B outputs the THLD signal, and E05A50 then outputs the $\overline{\text{RESET}}$ signal. After a certain time has elapsed, the charge in the condenser in the STK-6022B builds up again. The THLD signal is canceled and then the $\overline{\text{RESET}}$ signal is canceled.

Resets performed by the CPU itself (CPU self-reset)

The CPU outputs the $\overline{\text{RESET}}$ signal if there is a $\overline{\text{RESET}}$ request for E05A50 and if E05A50 has output the $\overline{\text{DISC}}$ pulse.

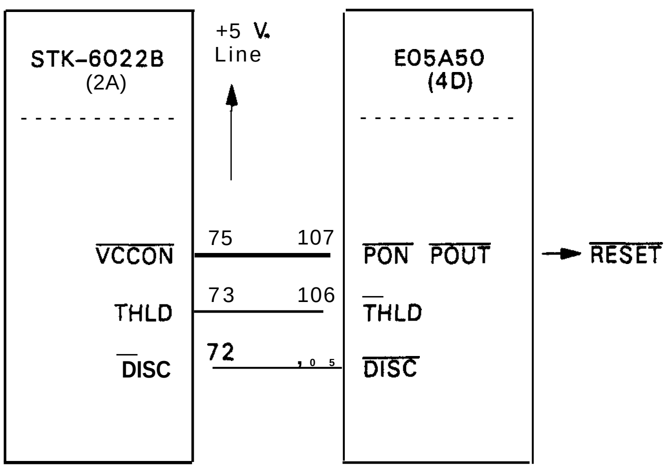


Figure 2-19. Reset Circuit Block Diagram

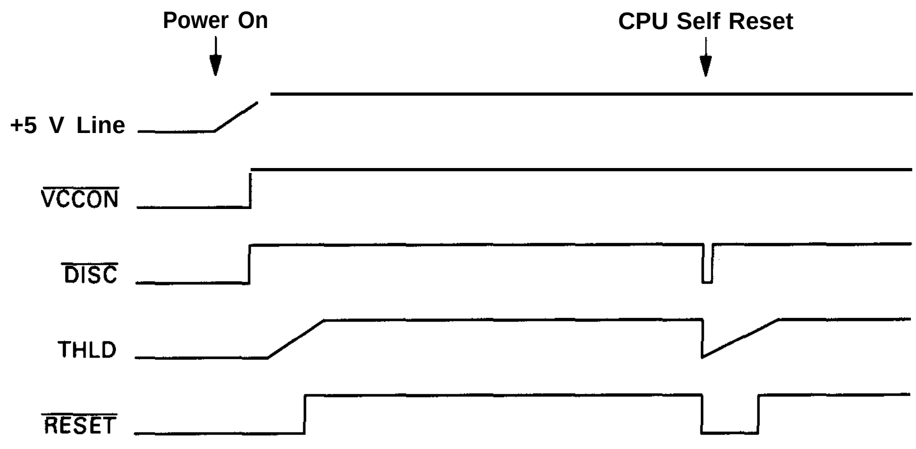


Figure 2-20. RESET Signal Timing

2.3.3 Sensor Circuits

Figure 2-21 shows the sensor circuits in block diagram form. Detection of any excessive printhead temperature causes the TEMP2 signal to be sent directly to the CPU. Other signals, such as the CRHOME signal, pass through the STK-6022B unit before reaching the CPU. Terminals P50 to P55 on the CPU are used for the A/D convertor.

The Vref circuit generates the A\D convertor reference voltage Vref.

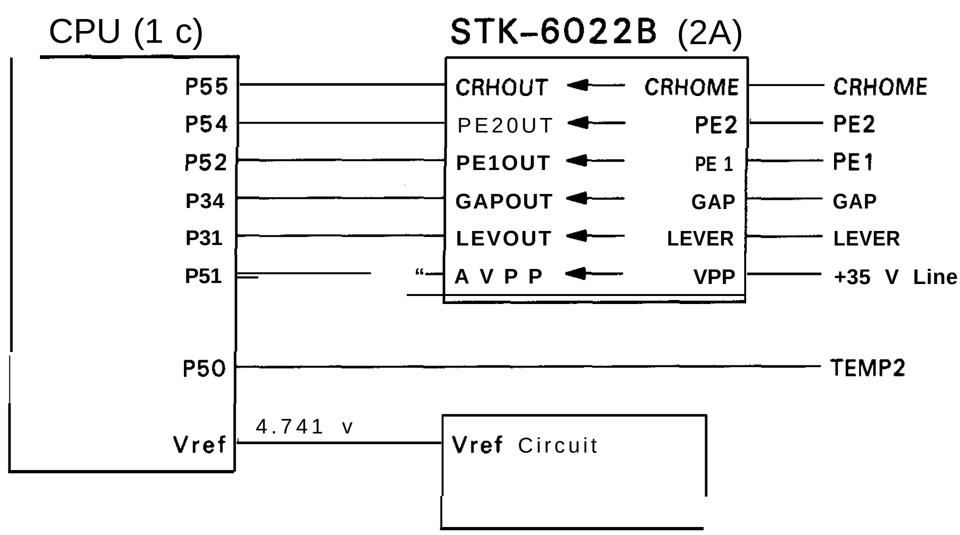


Figure 2-21, **Sensor Circuit Block Diagram**

2.3.4 MOTOR, CR Drive Circuit

Figure 2-22 shows the MOTOR, CR drive circuit. An open-loop, constant-current drive arrangement is used for running the MOTOR, CR. The motor is driven by 2-2 phase excitation and 1-2 phase excitation. 2-2 phase excitation corresponds to two 1-2 phase excitation steps. Thus, for each single step phase change of a 2-2 phase excitation motor, the carriage moves 1/1 20 inch. For each single step phase change of a 1-2 phase excitation motor, the carriage moves 1/240 inch.

The MOTOR, CR drive circuit of the STK-6022B detects the amount of current flowing in the MOTOR, CR coil and regulates this current. The current flowing through the coil varies, depending on the speed of the MOTOR, CR. The amount of current is set by the CPU via the E05A501/O port. Signals are sent to SELR 1 to SELR4 on the STK-6022B. The STK-6022B sets the coil current to correspond to the MOTOR, CR speed.

Ports P60 to P63 on the CPU are used exclusively as control ports for the stepping motor.

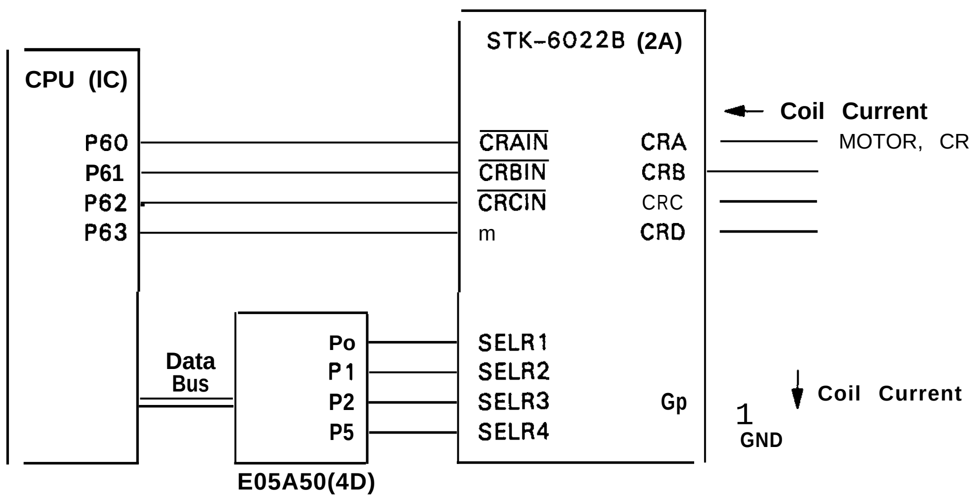


Figure 2-22. MOTOR, CR Drive Circuit

Table 2.6. MOTOR, CR Drive Modes

Drive Mode	Excitation Type	• Drive Frequency Type	Standard Print Character
3.214 X speed	2-2 phase	2700 pps	High Speed Draft
3 X speed	2-2 phase	2520 pps	Draft
2 X speed	2-2 phase	1680 pps	
1.5 X speed	1-2 phase	2520 pps	
4/3 X speed	1-2 phase	2240 pps	
1 X speed	1-2 phase	1680 pps	LQ
2/3 X speed	1-2 phase	1120 pps	
1/2 X speed	1-2 phase	840 pps	

2.3.5 MOTOR, PF Drive Circuit

The printer uses a stepping motor to advance the paper. The minimum amount of paper that can be advanced is 1/360 inch. The motor is a 2-2 phase or 1-2 phase, constant-voltage drive type. P70 to P73 on the CPU are the control ports for the stepping motor. MOTOR, PF phase data is output through these ports. PFA to PFD are turned on and off within the STK-6022B according to this phase data sent from the CPU.

When the MOTOR, PF is running, the voltage supplying the coil of the MOTOR, PF is +35 V. When the MOTOR, PF is not running and is in hold status, the supply voltage to the coil is + 5 V. Switching between these two supply voltages occurs at the PFCOM terminal of the STK-6022B when $\overline{\text{PFENB}}$ is turned on or off.

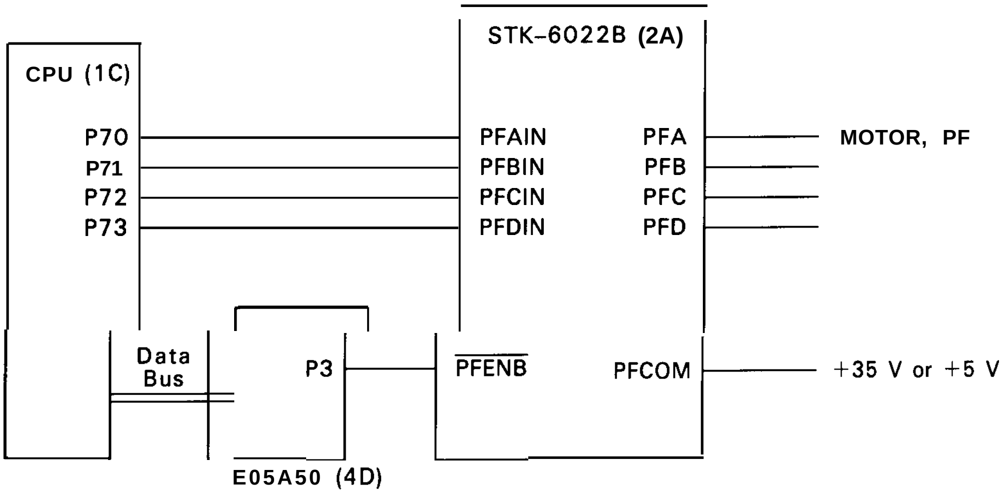


Figure 2-23. MOTOR, PF Drive Circuit

2.3.6 Printhead Drive Circuit

Figure 2-24 shows the printhead drive circuit in block diagram form. The print data already has been expanded to create the image data. The CPU splits up this data three times and transfers this information to the latch circuit within the STK-6022B. The CPU samples the voltage of the +35 V line via the A/D convertor (see Section 2.3.3).

The CPU outputs a pulse via the CPU time output port P83. The length of this pulse corresponds to the voltage of the +35 V line. This pulse becomes the head drive signal. In this way, STK-6022B outputs head drive signals (signals HD 1 to HD24) that relate to voltage levels through the length of the pulses. These signals are output to the head for each of the sections of print data that were created by subdividing the data three times before sending.

By sampling the +35 V line voltage and determining the length of the head drive signal, it is possible to maintain the energy supplied to the head at a constant level. If the voltage of the +35 V line is HIGH, the CPU shortens the output pulse. If the voltage of the +35 V line is LOW, the CPU lengthens the output pulse.

Figure 2-25 shows the timing of-the output of the head drive signal.

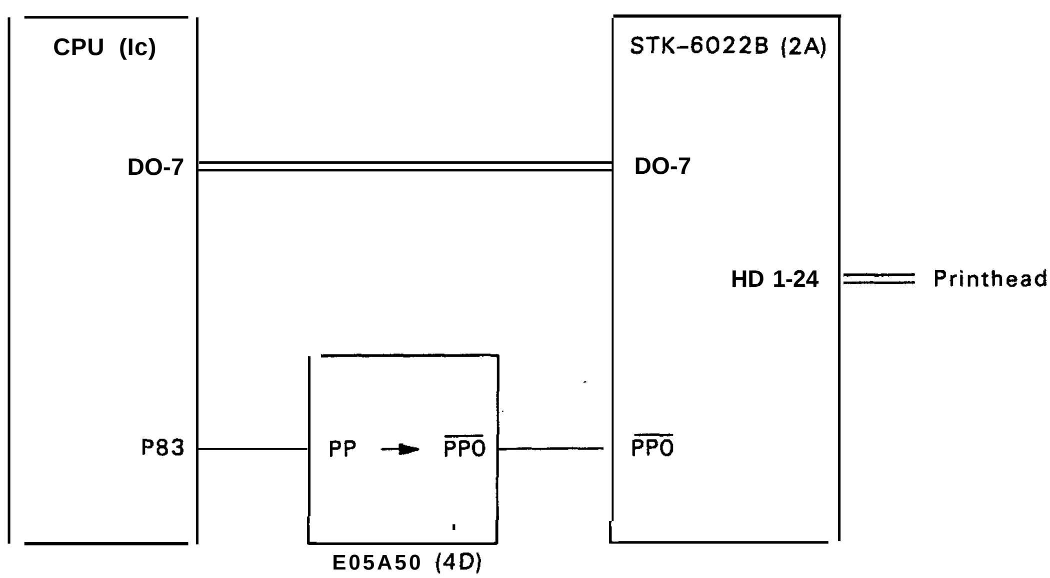


Figure 2-24. Printhead Drive Circuit

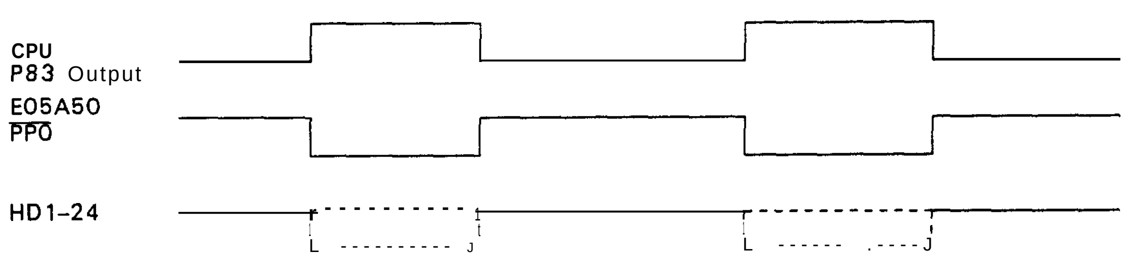


Figure 2-25. Head Drive Signal Output Timing

2.3.6 Printhead Drive Circuit

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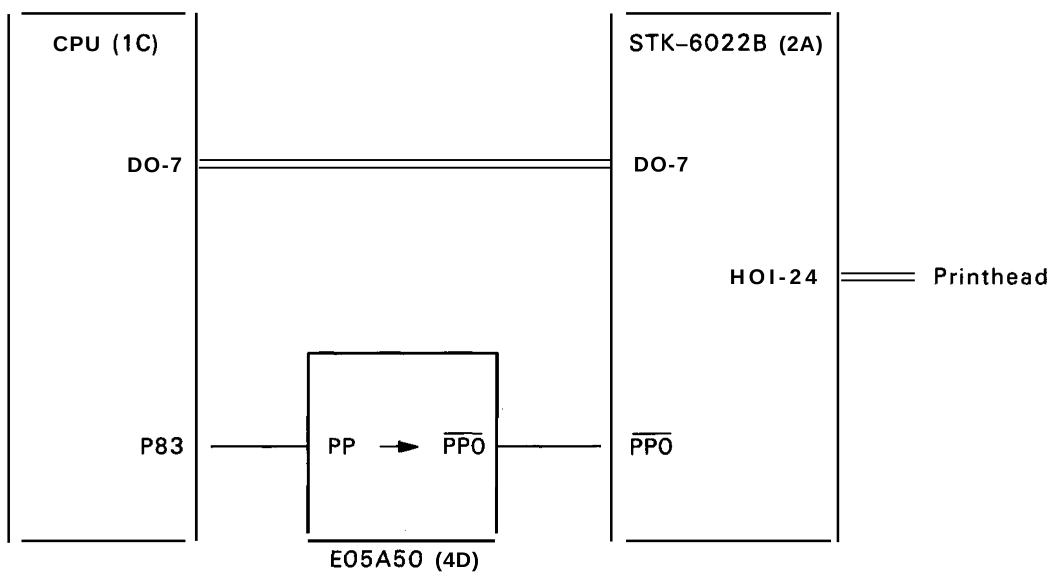


Figure 2-24. **Printhead Drive Circuit**

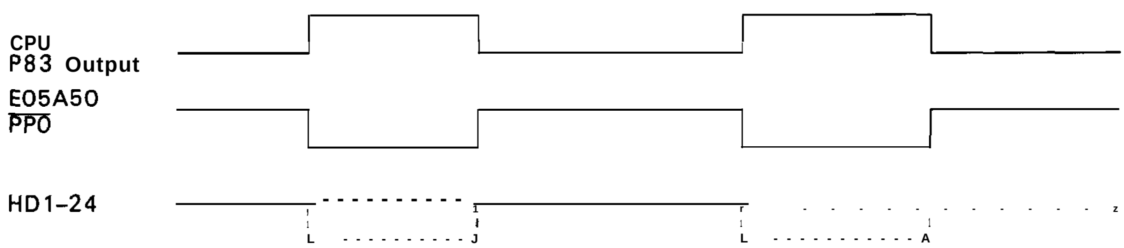


Figure 2-25. Head Drive Signal Output Timing

CHAPTER 3
DISASSEMBLY AND ASSEMBLY

CHAPTER 3

LIST OF FIGURES

LIST OF TABLES

3.1 OVERVIEW

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

3.1.1 Precautions for Disassembling the Printer

Follow the precautions below when disassembling the printer.

WARNING

Before disassembling, assembling, or adjusting the printer, disconnect the power supply cable from the external AC power socket. Failure to do so risks personal injury. The power supply switch for the printer is wired into the secondary circuitry. As a result, the printer still remains live with current flowing even when this switch is off.

CAUTION

To maintain efficient printer operation, use only the recommended tools for maintenance work.
Use only the recommended lubricants and adhesives (see Chapter 6).
Adjust the printer only in the manner described in this manual.

3.1.2 Tools

Tables 3-1 and 3-2 list the various recommended tools that are needed when disassembling, assembling, or adjusting the printer. Use only tools that meet these specifications.

Table 3-1. List of Recommended Tools

Tool	Part No.
Round-nose pliers	B740400 100
Nippers	B740500100
Tweezers	6741000100
Soldering iron	B740200 100
E-ring holder # 2.5	B740800400
E-ring holder # 5	B740800700
E-ring holder # 6	B740800800
Phillips screwdriver No. 2	6743800200
Normal screwdriver	6743000100
Box driver (7 mm across)	B74 1700200
Thickness gauge (0.44 mm)	—
Thickness gauge (0.47 mm)	—

NOTE

All tools are commercially aveilable.

Table 3-2. Equipment Required for Maintenance

Description	Specification
Multimeter	20 MHz
Oscilloscope	

3.1.3 Service Checks After Repair

When printer components are to be sent back to the customer after servicing, first use the checklist shown in Table 3-3 to note the current state of the components. This checklist provides a record to make servicing and shipping more efficient.

Table 3-3. Inspection Checklist for Repaired Printer

Category	Component	Item to Check	Is Check Required?
Printer features	Printhead	Are any wires broken?	❑ Checked, ❑ Not necessary
	•	Are any wires worn out?	❑ Checked, ❑ Not necessary
	Carriage mechanism	Does the carriage move smoothly? ❑ Movement noisy, ❑ Mechanism dirty, ❑ Mechanism oily	❑ Checked, ❑ Not necessary
	•	Is the carriage motor running at the correct temperature and not overheating? ❑ Checked, ❑ Not necessary	❑ Checked, ❑ Not necessary
	Paper advance mechanism	Is the paper advancing smoothly? ❑ Movement noisy, ❑ Mechanism dirty, ❑ Mechanism oily	❑ Checked, ❑ 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?	❑ Checked, ❑ Not necessary
	•	Is the tractor feeding the paper correctly?	❑ Checked, ❑ Not necessary
	•	Is the paper path clear of all obstructions?	❑ Checked, ❑ Not necessary
	•	Is the platen free of damage?	❑ Checked, ❑ Not necessary
	Ribbon mask	Is the ribbon mask free of distortion?	❑ Checked, ❑ Not necessary
	Self-print test	Was the self-print test successful?	❑ Checked, ❑ Not necessary
	On-line test	Was the on-line test successful?	❑ Checked, ❑ Not necessary
Adjustment	Printhead	Is the platen gap adjusted correctly?	❑ Checked, ❑ Not necessary
	Printing	Is the bidirectional print position adjusted correctly?	❑ Checked, ❑ Not necessary
	DIP switch settings	Have DIP switches been reset to their factory shipment settings?	❑ Checked, ❑ Not necessary
System upgrade	ROM version	The ROM version is XXX.	❑ Checked, ❑ Not necessary
Shipment	•	Has the ribbon been removed?	❑ Checked, ❑ Not necessary
		Have all relevant parts been included in the shipment?	❑ Checked, ❑ Not necessary

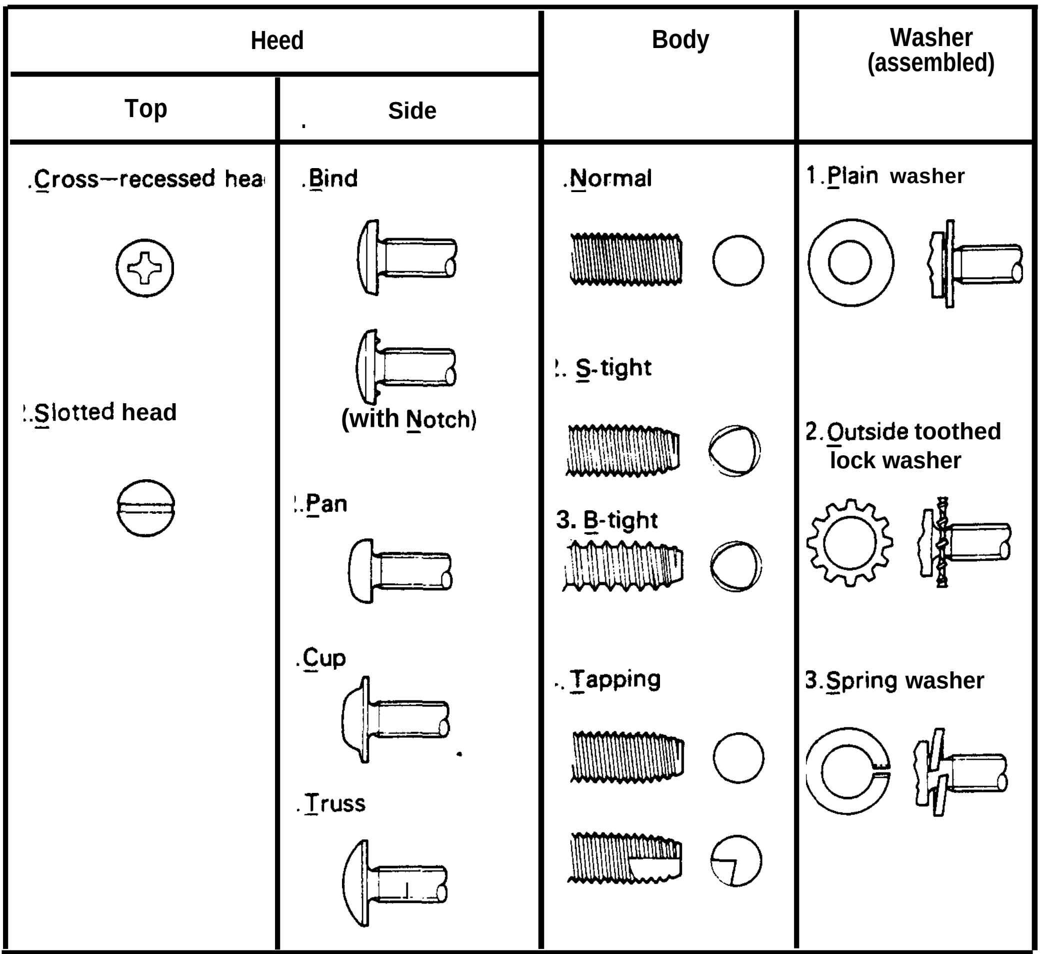
3.1.4 Specifications for Screws

In the following sections, abbreviations are used for small parts, such as screws and washers. Tables 3-4 and 3-5 list these abbreviations.

Table 3-4. Abbreviations Used for Screws

Abbreviation	Part Neme
CBS(C)	Cross-recessed Bind head Cone point S tight screw
CBB(C)	Cross-recessed Bind head Cone point B tight screw
CB	Cross-recessed Bind head screw
CBS(0)	Cross-recessed Bind head S tight with screw with Outside toothed lock washer

Table 3-5. Types of Screws and Abbreviations



3.2 DISASSEMBLY AND ASSEMBLY

This section describes the procedures for disassembling and assembling the main components of the printer. When the procedure for installing a component into the printer is simply the reverse of the procedure for removing the component, no description of how to install the component is given.

Any points of special concern when assembling or adjusting a component part are given after the description of the procedure. It is important to take note of these points.

CAUTION

Before disassembling any part of the printer, note the warnings in Section 3.1.
Before disassembling any part of the printer, remove the paper and the ink ribbon.

Disassembly includes the following five procedures:

1. Removing the printhead
2. Removing the case
3. Removing the electrical circuits
4. Removing the printer mechanism
5. Disassembling the printer mechanism

Diagrams in the appendix show how the components fit together. Refer to them as necessary.

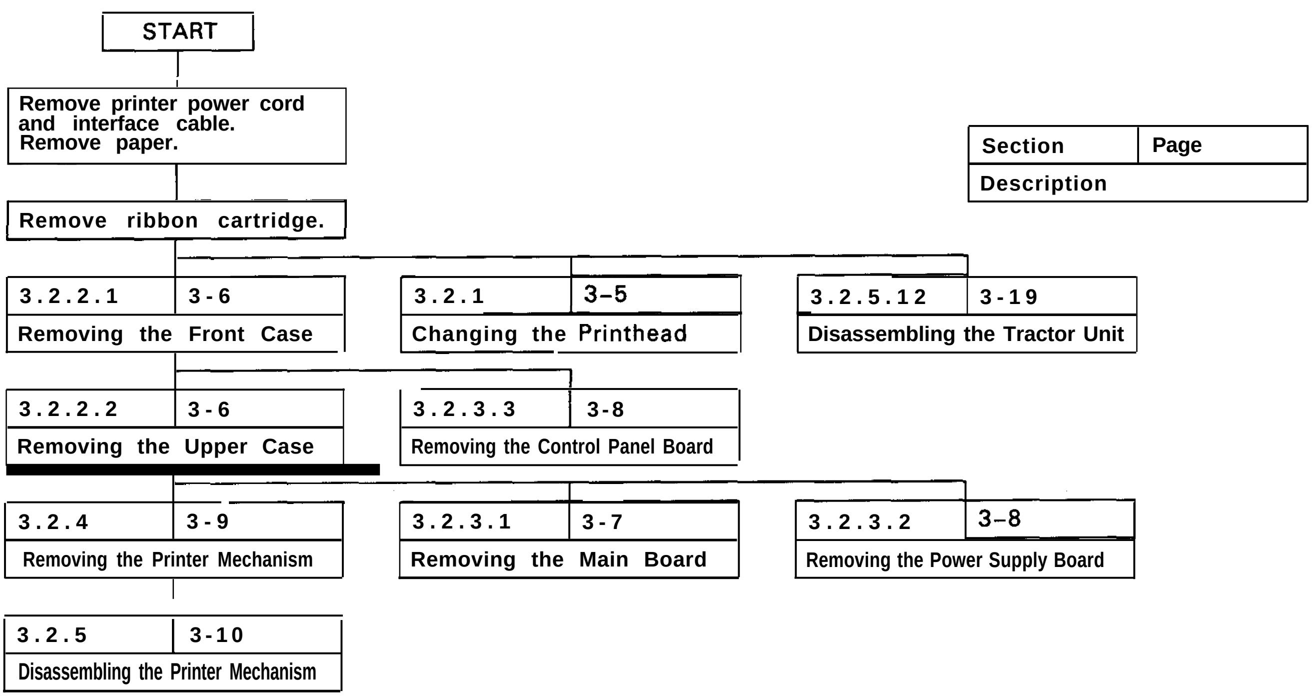
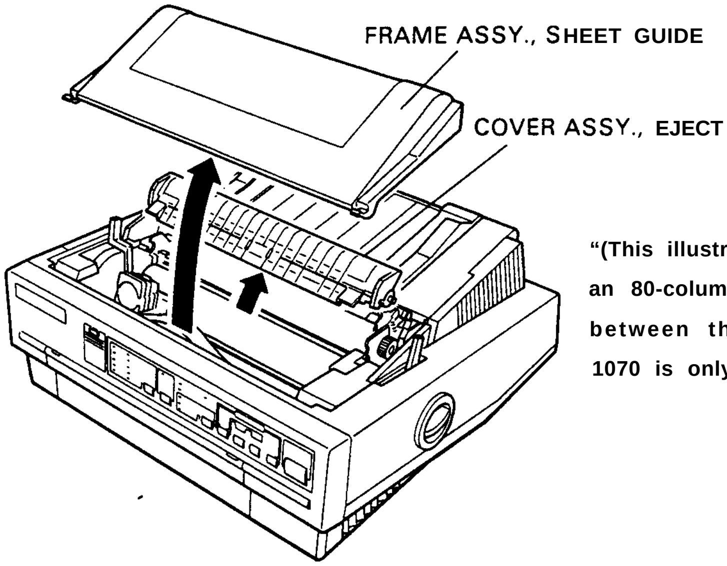


Figure 3-1. Flowchart for Disassembling the Printer

3.2.1 Changing the Printhead

1. Remove the FRAME ASSY., SHEET GUIDE.
2. Remove the COVER ASSY., EJECT.



"(This illustration shows the LQ-570, an 80-column printer. The difference between the LQ-570 and the LQ-1070 is only in carriage width.)

Figure 3-2. Removing the FRAME ASSY., SHEET GUIDE and the COVER ASSY., EJECT

3. Release the two levers that hold the printhead to the carriage. Lift out the printhead.
4. Remove the two FFCS (CABLE, HEAD, FRONT(,REAR)) from the printhead.

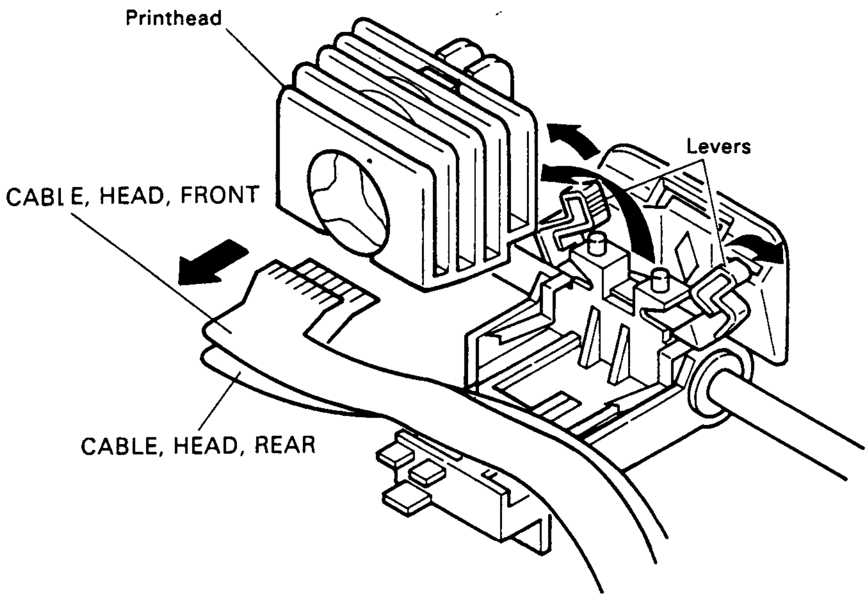


Figure 3-3. Removing the Printhead

3.2.2 Removing the Printer Case

This section describes how to remove the front case and HOUSING ASSY., UPPER.

3.2.2.1 Removing the HOUING, FRONT

1. **Remove the COVER ASSY., PRINTER, FRONT.**
2. **Remove the HOUSING, FRONT.**
3. **Use a screwdriver to release the clips that hold the front case to the HOUSING ASSY., UPPER. Open the HOUSING, FRONT. Remove connector CN 1 on the BOARD ASSY., PANEL (C062 PNL). Remove the HOUSING, FRONT.**

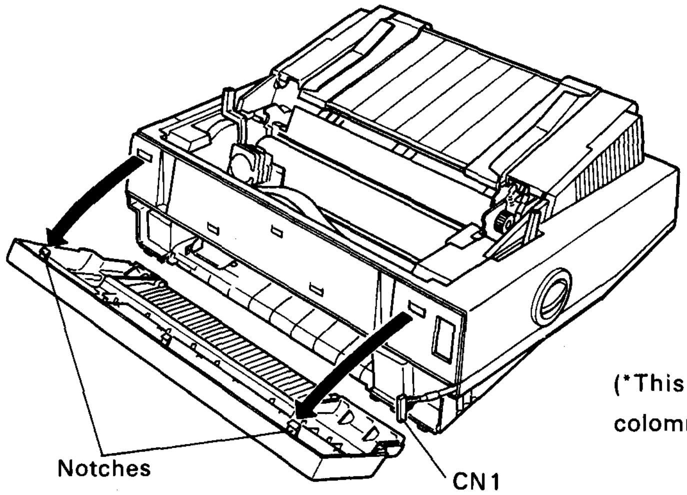


Figure 3-4. Removing the HOUSING, FRONT

3.2.2.2 Removing the HOUSING ASSY., UPPER

1. **Remove the COVER ASSY., PRINTER, FRONT, the COVER ASSY., EJECT, the TRACTOR ASSY, and the KNOB.**
2. **Remove the two CBS(C) (M3 X 10) screws that hold the optional interface card cover. Remove the cover.**

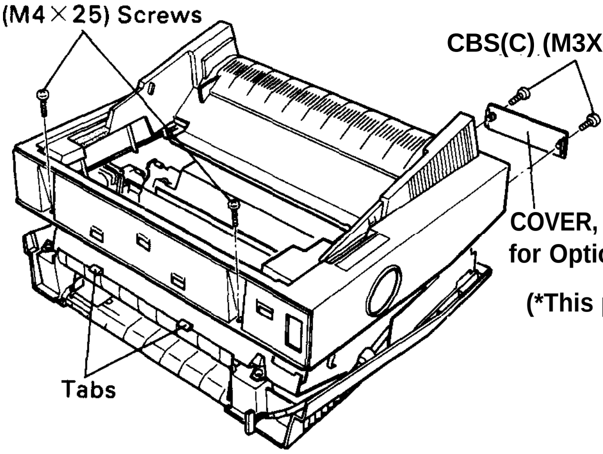


Figure 3-5. Removing the COVER, CONNECTOR, UPPER for the Optional Interface Card

3. **Remove the HOUSING, FRONT (see Section 3.2.2. 1).**
4. **Remove the two CBB(C)(M4 X 25) screws that hold the HOUSING ASSY., UPPER to the HOUSING ASSY., LOWER.**
5. **Depress the two clips that hold the HOUSING ASSY., UPPER to the FRAME ASSY., SHEET GUIDE. Remove the HOUSING ASSY., UPPER.**

3.2.3 Removing the Circuit Boards

This section describes how to remove the BOARD ASSY., MAIN (C062 MAIN board), the BOARD ASSY., POWER SUPPLY (C062PSB/PSE board) and the BOARD ASSY., PANEL (C062 PNL board).

3.2.3.1 Removing the BOARD ASSY., MAIN (C062 MAIN Board)

1. Remove the HOUSING ASSY.,UPPER (see Section 3.2.2.2).
2. Remove the CB (M3 X 6) screws that hold the HOLDING PLATE, FFC to the SHIELD PLATE, MAIN BOARD . Remove the HOLDING PLATE, FFC.
3. Disconnect the FFC (CABLE, HEAD, FRONT (, REAR)) removing the cables for the CN6 and CN7 connectors on the main board.
4. Remove the three CBB (C) (M3 X 10) screws that hold the SHIELD PLATE, MAIN BOARD to the BOARD ASSY., MAIN. Remove the SHIELD PLATE, MAIN BOARD.

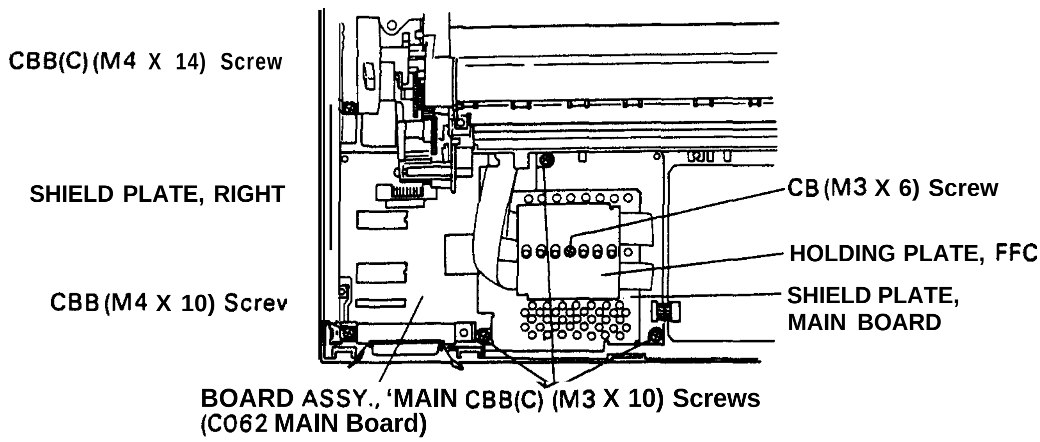


Figure 3-6. Removing the SHIELD PLATE, MAIN BOARD

5. Remove the CBB (M4X 10) screw that holds the SHIELD PLATE, RIGHT to the BOARD ASSY., MAIN. Remove the CBB(C)(M4 X 14) screw that holds it to the HOUSING ASSY., LOWER. Remove the SHIELD PLATE, RIGHT.
6. Remove the cables for the following BOARD ASSY., MAIN connectors: CN3 (brown 12-pin), CN4 (white 5-pin), CN5 (white 6-pin), CN8 (yellow 2-pin), CN9 (black 2-pin), CN 10 (blue 2-pin), CN 11 (white 2-pin), and CN 12 (red 2-pin).
7. Remove the three CBB(C)(M3 X 10) screws and CB (M3 X 8) screws that hold the BOARD ASSY., MAIN to the HOUSING ASSY., LOWER. Remove the BOARD ASSY., MAIN.

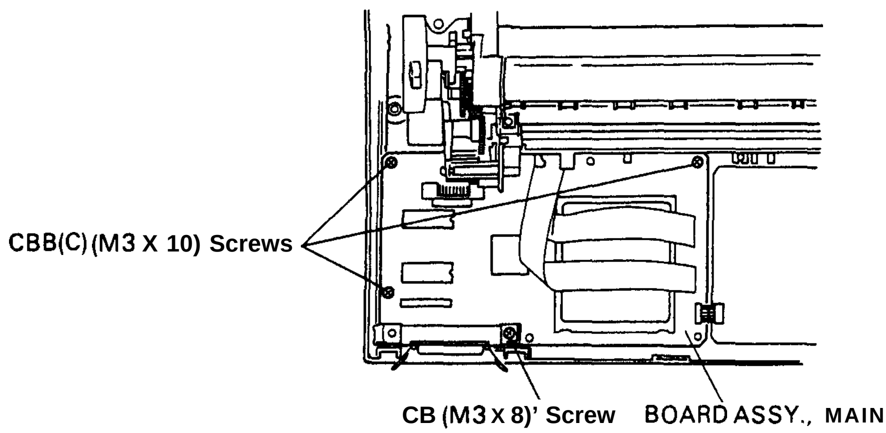


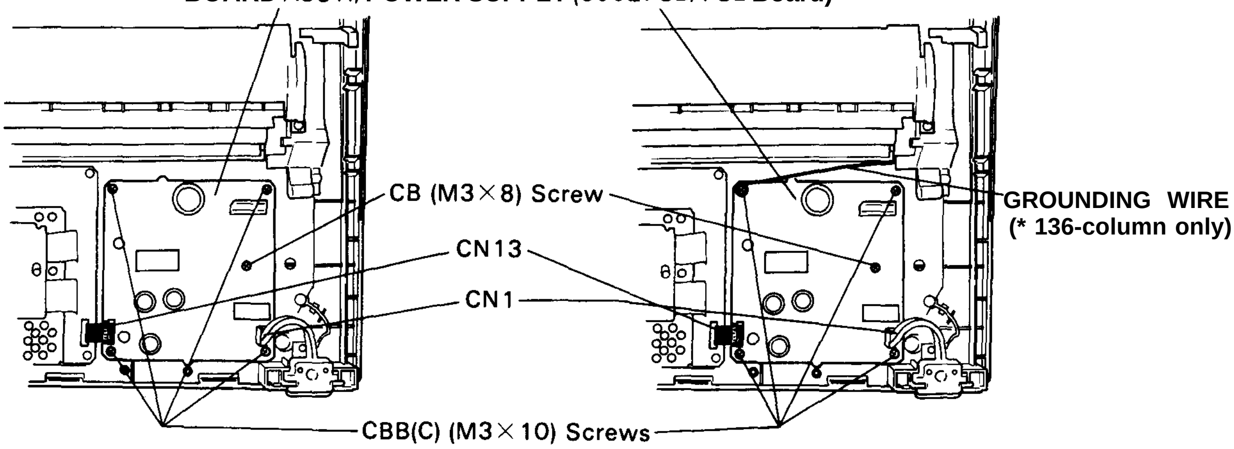
Figure 3-7. Removing the BOARD ASSY., MAIN

Point to Note for Assembly and Adjustment

After replacing the BOARD ASSY., MAIN, you must adjust the bidirectional print position again to ensure bidirectional printing is correctly aligned (see Section 4.2).

3.2.3.2 Removing the BOARD ASSY., POWER SUPPLY (C062 PSB/PSE Board)

1. Remove the HOUSING ASSY., UPPER (see Section 3.2.2.2).
2. Remove the cable for connector CN 13 from the BOARD ASSY., MAIN,
3. Remove the cable for connector CN 1 from the BOARD ASSY., POWER SUPPLY.
4. Remove the four CBB(C) (M3 × 10) screws and the CB (M3 × 8) screws that hold the BOARD ASSY., POWER SUPPLY to the HOUSING ASSY., LOWER. Remove the BOARD ASSY., POWER SUPPLY.



(80-column) (1 36-column)

Figure 3-8. Removing the BOARD ASSY., POWER SUPPLY

3.2.3.3 Removing the BOARD ASSY., PANEL (C062 PNL Board)

1. Remove the HOUSING, FRONT (see Section 3.2.2.1).
2. Remove the 10 CBB(C) (M3 × 10) screws that hold the BOARD ASSY.,PANELto the HOUSING, FRONT. Remove the BOARD ASSY., PANEL.

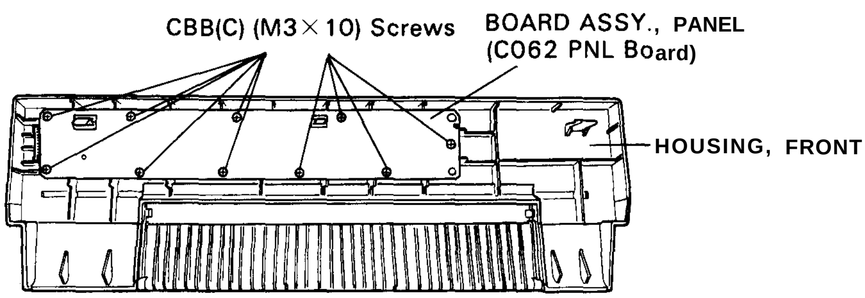
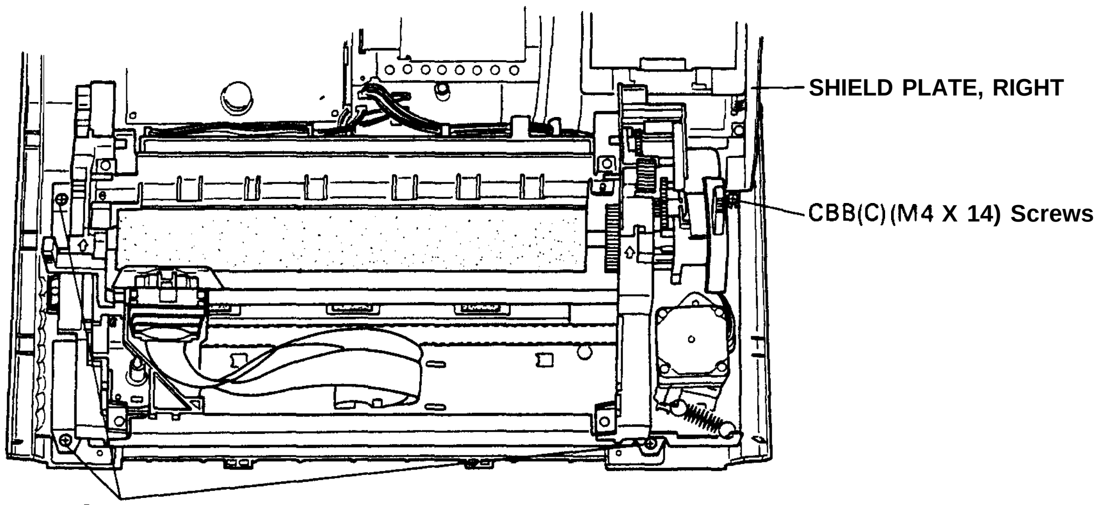


Figure 3-9. Removing the BOARD ASSY., PANEL

3.2.4 Removing the PRINTER MECHANISM

1. Remove the HOUSING ASSY., UPPER (see Section 3.2.2.2).
2. Remove the CB (M3X 6) screws that attach the HOLDING PLATE., FFC to the SHIELD PLATE, MAIN BOARD. Remove the HOLDING PLATE,FFC.
3. Disconnect the 2 FFCs(CABLE, HEAD, FRONT(,REAR))from the CN6 and CN7 connectors on the BORAD ASSY., MAIN. Remove the cables for the following BOARD ASSY., MAIN connectors: CN3 (brown 12-pin), CN4 (white 5-pin), CN5 (white 6-pin), CN8 (yellow 2-pin), CN9 (black 2-pin), CN1O (blue 2-pin), CN 11 (white 2-pin) and CN12 (red 2-pin).
4. Remove the CBB(C)(M4 X 10) screw that holds the SHIELD PLATE., RIGHT to the BOARD ASSY., MAIN (see Figure 3-6). Remove the CBB(C)(M4 × 14) screws that hold it to the HOUSING ASSY., LOWER. Remove the SHIELD PLATE., RIGHT.
5. Remove the three CBB(C)(M4 × 14) screws that hold the PRINTER MECHANISM to the HOUSING ASSY., LOWER. Remove the PRINTER MECHANISM.



('This picture is 80-column.)

Figure 3-10. Removing the PRINTER MECHANISM

Point to Note for. Assembly and Adjustment

After replacing the PRINTER MECHANISM, you must adjust the bidirectional print position to ensure bidirectional printing is correctly aligned (see Section 4.2).

3.2.5 Disassembling the PRINTER MECHANISM

This section describes how to disassemble the main components of the PRINTER MECHANISM.

3.2.5.1 Removing the MOTOR, CR

1. Remove the PRINTER MECHANISM from the HOUSING ASSY., LOWER (see Section 3.2.4).
2. Remove the printer spring (778 gm) from the base frame and the MOTOR, CR frame.
3. Remove the TIMING BELT from the BELT PULLEY.
4. Remove the MOTOR, CR frame from the HOUSING ASSY., LOWER.
5. Remove the two CBS(0) (M3×6) screws that hold the MOTOR, CR to the FRAME ASSY., CR, MOTOR. Remove the MOTOR, CR .

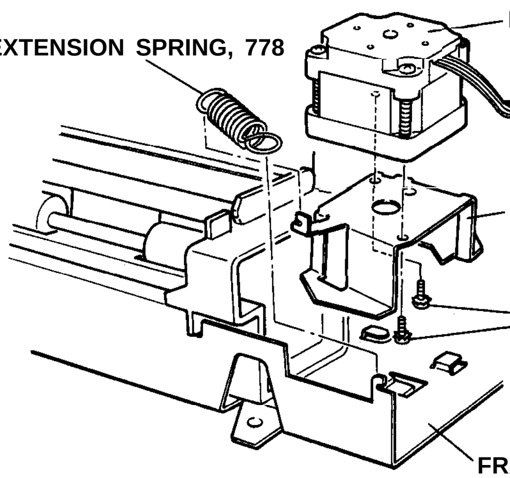


Figure 3-11. Removing the MOTOR, CR

Points to Note for Assembly and Adjustment

See Section 3.2.5.13 for details on arranging and positioning the motor cable.

After removing the MOTOR, CR from the FRAME ASSY., CR, MOTOR, you must adjust the MOTOR, CR backlash (see Section 4.1. 1). You also must adjust the bidirectional print position to ensure bidirectional printing is correctly aligned (see Section 4.2).

3.2.5.2 Removing the MOTOR, PF

1. Remove the PRINTER MECHANISM from the HOUSING ASSY., LOWER(see Section 3.2.4).
2. Remove the COMPRESSION SPRING, 200 that holds the platen shaft.
3. Release the two clips holding the MOTOR, PF to the FRAME, MAIN, RIGHT.
4. Remove the MOTOR, PF from the FRAME, MAIN, RIGHT.

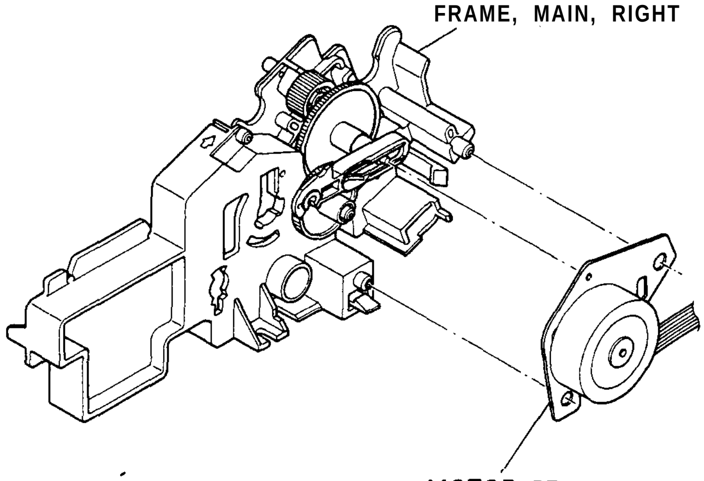


Figure 3-12. Removing the MOTOR, PF

Point to Note for Assembly

See Section 3.2.5.13 for details on arranging and positioning the motor cable.

3.2.5.3 Removing the FFC (CABLE, HEAD, FRONT(,REAR))

1. Remove the printhead (see Section 3.2. 1).
2. Remove the PRINTER MECHANISM from the HOUSING ASSY., LOWER (see Section 3.2.4).
3. Remove the FFC from the clips that hold it along the rear side of the PRINTER MECHANISM. Make sure that the FFC is free.
4. Remove the FFC from clip on the HOLDING PLATE, FFC at the rear of the PRINTER MECHANISM.
5. Remove the four clips that hold the HOLDING PLATE, FFC to the base frame. Remove the FFC together with the HOLDING PLATE, FFC.

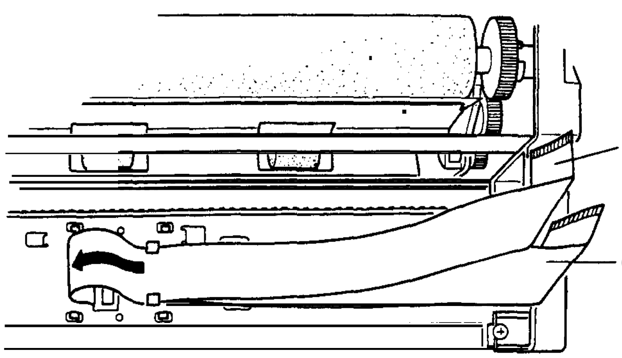


Figure 3-13. Removing the FFC Cable

Point to Note for Assembly

See Section 3.2.5.13 for details on arranging and positioning the FFC.

3.2.5.4 Removing the Carriage

1. Remove the FFC (CABLE, HEAD, FRONT(,REAR)) (see Section 3.2.5.3).
2. Remove the TIMING BELT from the carriage.
3. Use the box driver to rotate and free the adjusting bushing. This bushing holds the SHAFT, CR, GUIDE to the FRAME, MAIN, RIGHT. Remove the bushing.
4. Remove the carriage unit together with the SHAFT, CR, GUIDE by pulling the SHAFT, CR, GUIDE a little to the right.

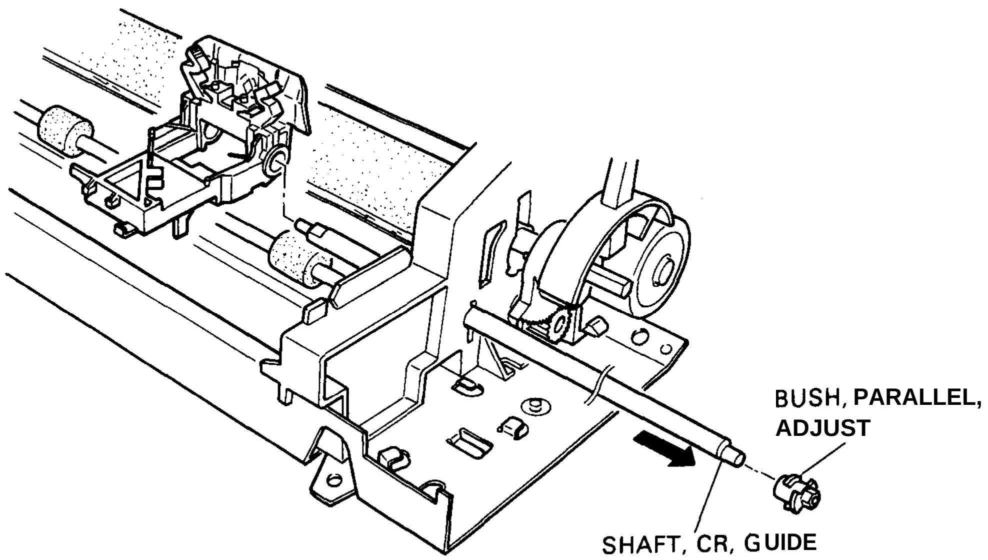


Figure 3-14. Removing the Carriage Unit

Point to Note for Assembly and Adjustment

After removing or rotating the adjusting bushing, you must adjust the platen gap (see Section 4.1 .2).

3.2.5.5 Removing the PLATEN

1. Remove the PRINTER MECHANISM from the HOUSING ASSY., LOWER (see Section 3.2.4).
2. Remove the two CBP(C)(M3 X 10) screws that hold the COVER, PLATEN, LOWER to the left and FRAME, MAIN, RIGHT. Remove the COVER, PLATEN, LOWER.
3. Remove the COMPRESSION SPRING, 200 that holds the platen shaft (see Section 3.2.5.2, step 2).
4. Set the head LEVER, G, ADJUST to the most forward position.
5. Remove the two clips that hold the LEVER, RELEASE to the platen shaft. Remove the LEVER, RELEASE from the platen shaft.
6. Rotate the bushing by using the tweezers that holds the platen to the FRAME, MAIN, LEFT. Remove this BUSHING, 8 with the GROUND SPRING.
7. Rotate the BUSHING, 8 by using the tweezers that holds the platen to the FRAME, MAIN, RIGHT. Remove the PLATEN by lifting it up toward the right.

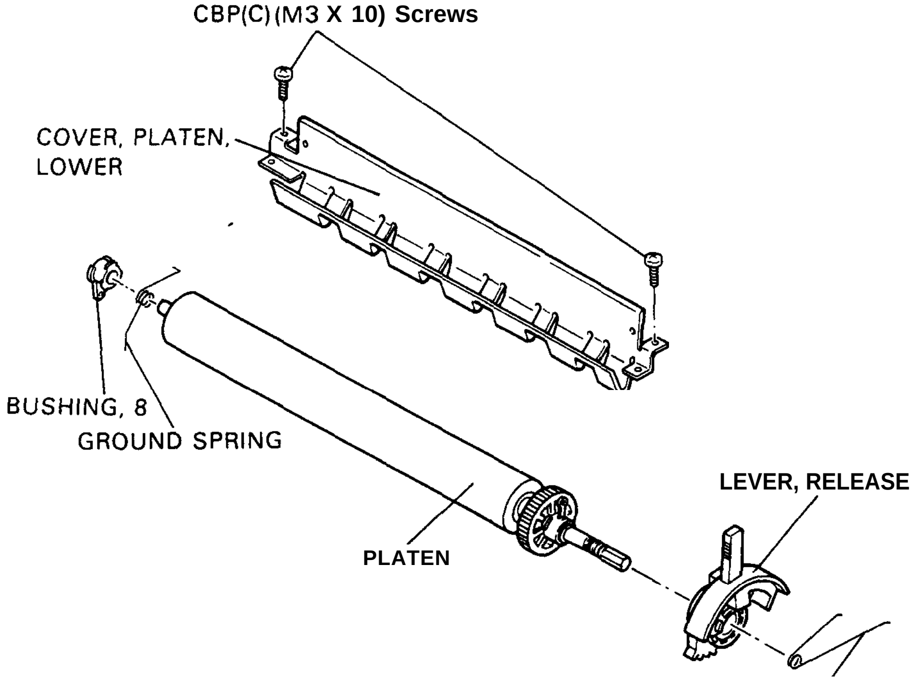


Figure 3-15. Removing the PLATEN

Point to Note for Assembly

When inserting the LEVER, RELEASE onto the platen shaft, mesh the LEVER, RELEASE with the mechanism correctly by positioning it at the mark on the auxiliary release shaft.

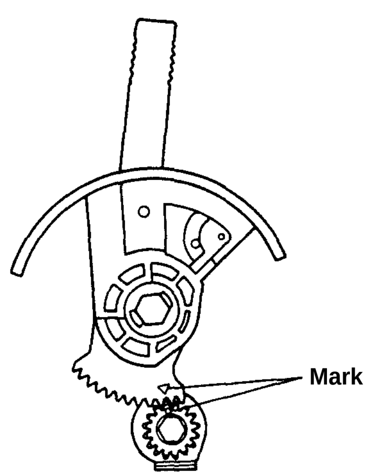


Figure 3-16. LEVER, RELEASE Insertion Positioning

3.2.5.6 Removing and Disassembling the FRAME, MAIN, RIGHT

1. Remove the PRINTER MECHANISM from the HOUSING ASSY., LOWER (see Section 3.2.4).
2. Remove the PLATEN from the PRINTER MECHANISM (see Section 3.2.5.5).
3. Remove the MOTOR, CR from the FRAME, MAIN, BASE (see Section 3.2.5. 1).
4. Remove the two CBS(C)(P) (M3 X 10) screws that hold the FRAME, MAIN, RIGHT to the FRAME, MAIN, BASE. Remove the FRAME, MAIN, RIGHT from the FRAME, MAIN, BASE.
5. Remove the following items from the FRAME, MAIN, RIGHT in the specified order: MOTOR, PF (see Section 3.2.5.2), CAM, CLUTCH, TRACTOR, COMBINATION GEAR, 8.5,30, SPUR GEAR, PLAIN WASHER, COMPRESSION SPRING 200, and SPUR GEAR, 16.

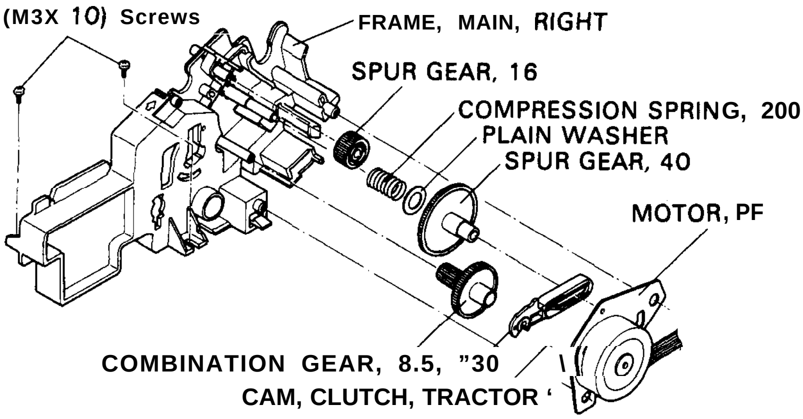


Figure 3-17. Disassembling the FRAME, MAIN, RIGHT

Point to Note for Assembly

When installing the PLAIN WASHER, insert it from the front in the direction indicated by the mark.

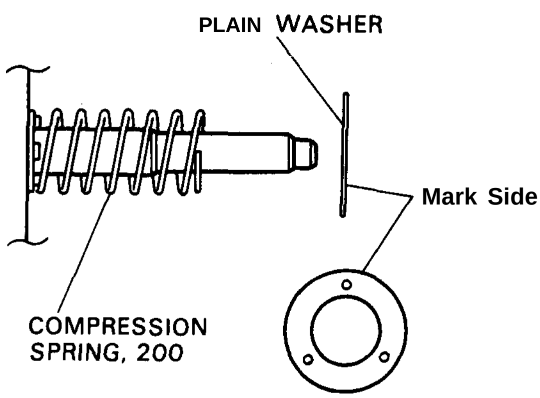
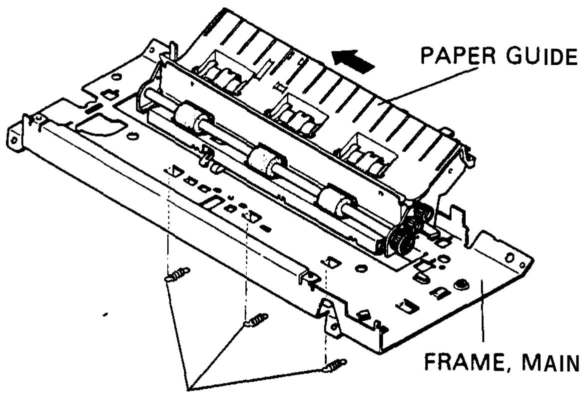


Figure 3-18. Direction for Inserting the PLAIN WASHER

3.2.5.7 Removing and Disassembling the PAPER GUIDE (Including the DETECTOR ASSY., HP)

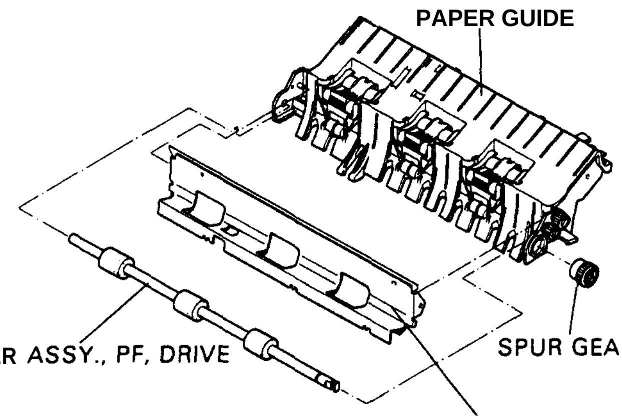
1. **Remove the PRINTER MECHANISM from the HOUSING ASSY., LOWER (see Section 3.2.4).**
2. **Remove the PLATEN from the PRINTER MECHANISM (see Section 3.2.5.5).**
3. **Remove the FRAME, MAIN, RIGHT from the FRAME, MAIN, BASE (see Section 3.2.5.6).**
4. **Remove the three springs (32 gm) from the lower side of the PRINTER MECHANISM . (These springs join the PAPER GUIDE support to the FRAME, MAIN, BASE.)**
5. **While holding open the clips that secure the PAPER GUIDE to the FRAME, MAIN, BASE, slide the PAPER GUIDE to the left. Remove the PAPER GUIDE.**



(" This picture is 80-column)

Figure 3-19. Removing the PAPER GUIDE

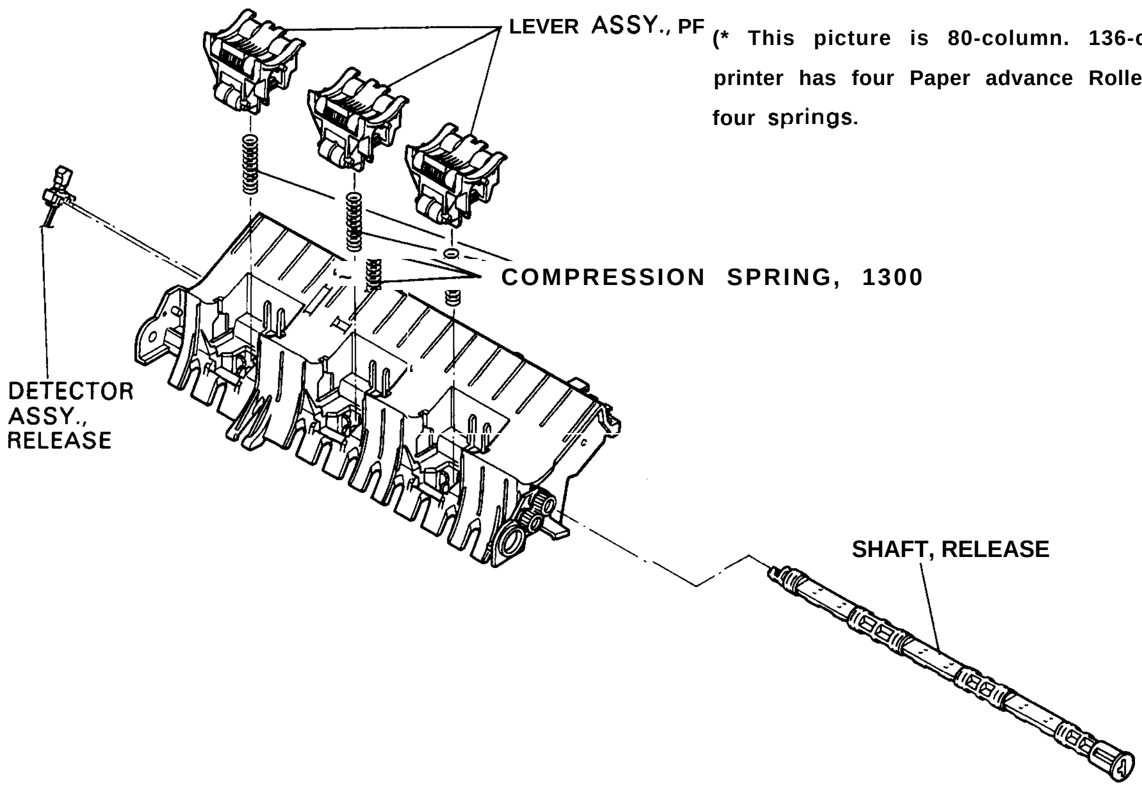
6. **Open the clips that hold the SPUR GEAR, 18 to the ROLLER ASSY., PF, DRIVE. Remove the SPUR GEAR, 18 from the ROLLER ASSY., PF, DRIVE.**
7. **Remove the ROLLER ASSY., PF, DRIVE from the PAPER GUIDE.**
8. **Slide the PAPER GUIDE support to the right. Remove the PAPER GUIDE support from the PAPER GUIDE.**



(" This picture is 80-column)

Figure 3-20. Removing the PAPER GUIDE ASSY., SUPPORT

9. While holding down the three LEVER ASSY., PF, pull out and remove the SHAFT, RELEASE Remove the LEVER ASSY., PF and the COMPRESSION SPRING, 1300 from the PAPER GUIDE.
10. While holding open the clips that secure the DETECTOR ASSY., RELEASE to the PAPER GUIDE, remove the DETECTOR ASSY., RELEASE.



(* This picture is 80-column. 136-column printer has four Paper advance Rollers and four springs.

Figure 3-21. Removing the LEVER ASSY., PF

Point to Note for Assembly

Insert the SHAFT, RELEASE in the PAPER GUIDE in the way shown in the diagram below.

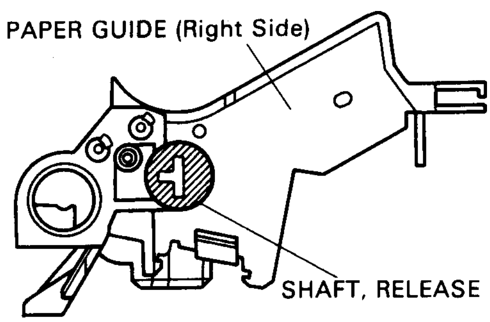


Figure 3-22. How to Insert the SHAFT, RELEASE

3.2.5.8 Removing the DETECTOR ASSY., HP

1. Remove the PRINTER MECHANISM from the HOUSING ASSY., LOWER (see Section 3,2.4).
2, Remove the clips from the rear side of the FRAME, MAIN, BASE that hold the DETECTOR ASSY., HP. Remove the DETECTOR ASSY., HP from the rear of the FRAME, MAIN, BASE.

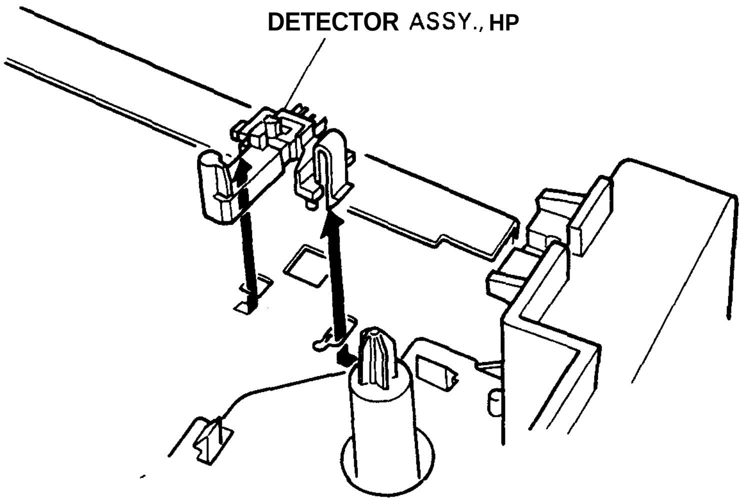


Figure 3-23. Removing the DETECTOR ASSY., HP

3.2.5.9 Removing the DETECTOR ASSY., PE, REAR

1. Remove the PRINTER MECHANISM from the HOUSING ASSY., LOWER (see Section 3.2.4).
2. Remove the two CBP(C) (M3 X 10) screws that hold the COVER, PLATEN, LOWER to the frame. Remove the COVER, PLATEN, LOWER.
3. Remove the clips that hold the DETECTOR ASSY., PE, REAR in the PAPER GUIDE. Remove the DETECTOR ASSY., PE, REAR .

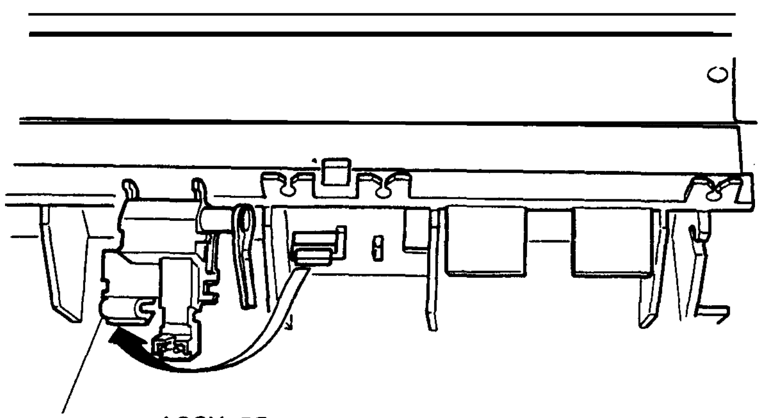


Figure 3-24. Removing the DETECTOR ASSY., PE, REAR

3.2.5.10 Removing the DETECTOR ASSY., PE, FRONT

1. Remove the PRINTER MECHANISM from the HOUSING ASSY., LOWER (see Section 3.2.4).
2. Open the clips that hold the DETECTOR ASSY., PE, FRONT to the FRAME, MAIN, BASE. Remove the DETECTOR ASSY., PE, FRONT.

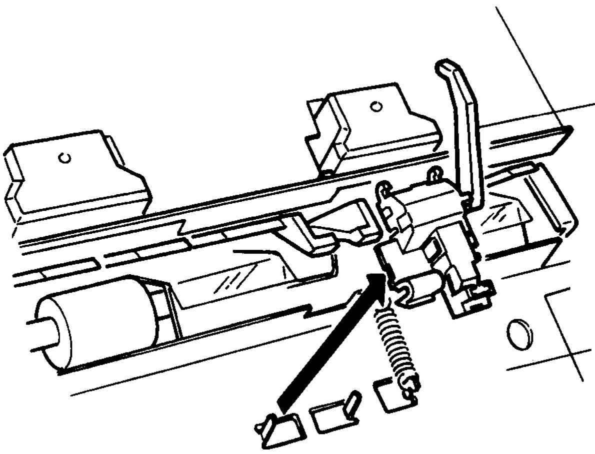


Figure 3-25. Removing the DETECTOR ASSY., PE, FRONT

3.2.5.11 Removing the DETECTOR ASSY., PLATEN

1. Remove the PRINTER MECHANISM from the HOUSING ASSY., LOWER (see Section 3.2.4).
2. Remove the clips that hold DETECTOR ASSY., PLATEN to the FRAME, MAIN, LEFT. Remove the DETECTOR ASSY., PLATEN.

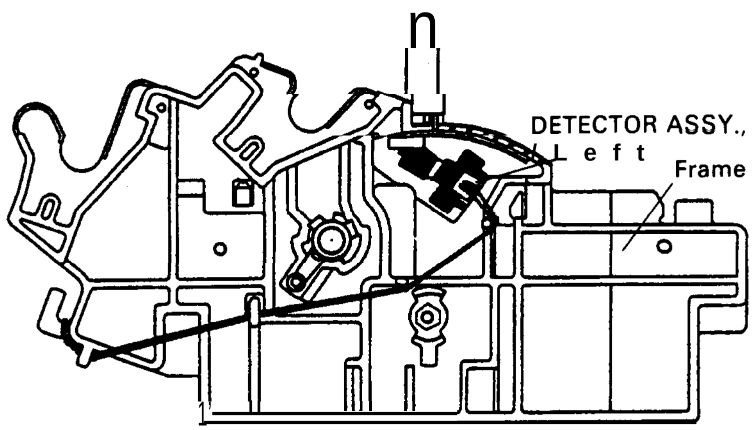


Figure 3-26. Removing the DETECTOR ASSY., PLATEN

3.2.5.12 Disassembling the TRACTOR ASSY.

1. Remove the TRACTOR ASSY. from the printer.
2. Remove the SPUR GEAR, 17 from the SHAFT, TRACTOR.
3. Remove the FRAME, TRACTOR, RIGHT from the SHAFT, TRACTOR and the SHAFT, TRACTOR, GUIDE.
4. Remove RETAINING RING from the SHAFT, TRACTOR.
5. Remove the TRACTOR ASSEMBLY (RIGHT), the PAPER SUPPORT unit, and the TRACTOR ASSEMBLY [LEFT) from the SHAFT, TRACTOR and SHAFT, TRACTOR, GUIDE.

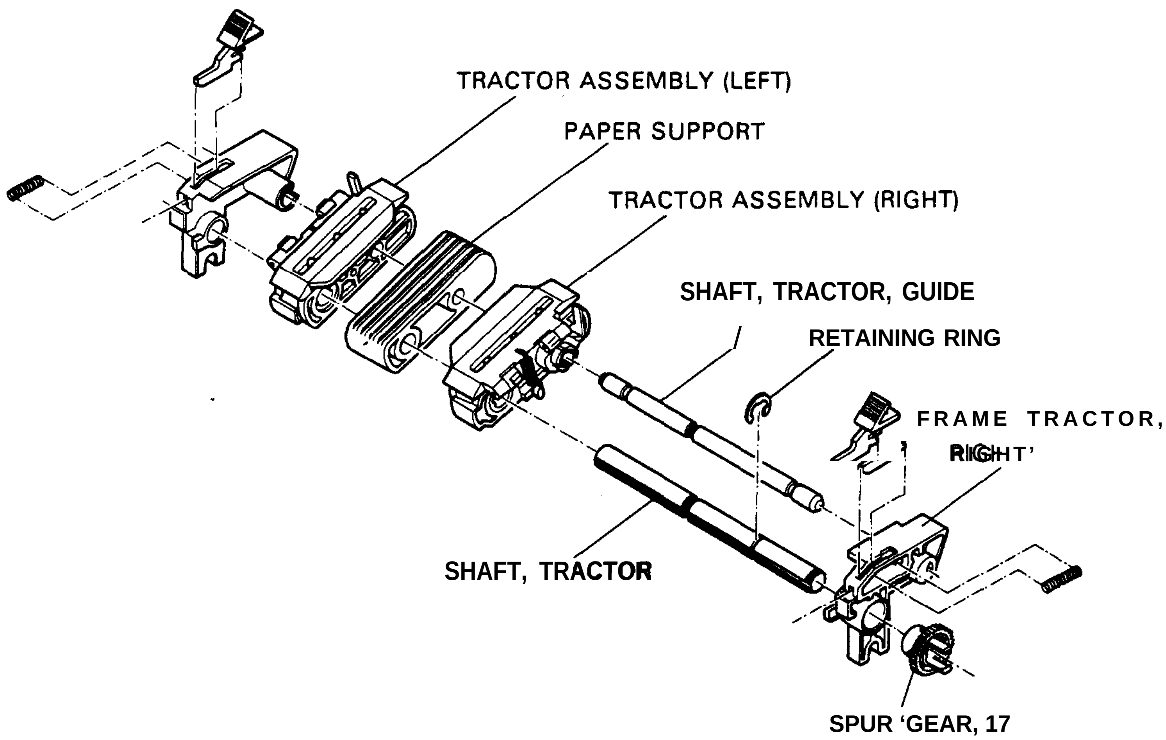
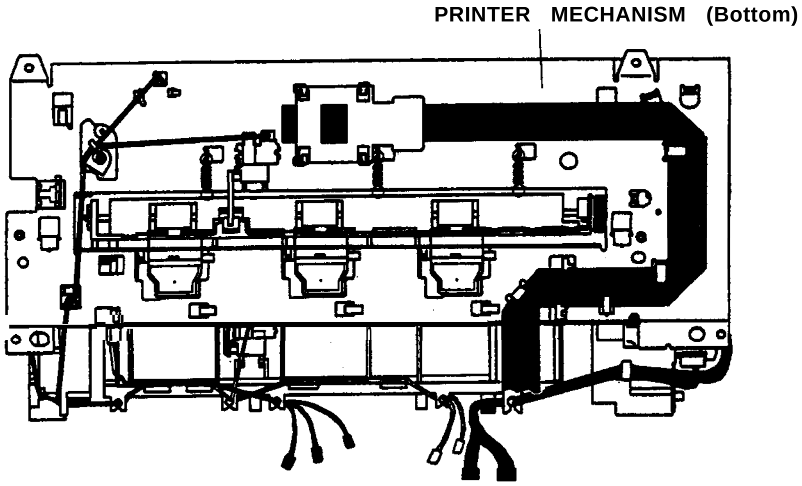


Figure 3-27. Disassembling the TRACTOR ASSY.

3.2.5.13 Arranging the Cables

Figure 3-28 shows how the cables are arranged for the PRINTER MECHANISM. When assembling the printer, make sure that the cables are laid out as shown in this figure.



(*This is an 80-column printer.)

Figure 3-28. Arranging the Cables

CHAPTER 4
ADJUSTMENTS

LIST OF FIGURES

4.1 ADJUSTING THE PRINTER MECHANISM

This section describes the various adjustments you may need to make to the PRINTER MECHANISM.

4.1.1 MOTOR, CR Backlash Adjustment

In the MOTOR, CR backlash adjustment, the pinion gear of the MOTOR, CR is meshed smoothly with the BELT PULLEY cog. If the pinion gear is poorly aligned, printer operation becomes noisy, and the accuracy of character alignment during printing suffers.

1. **Remove the MOTOR, CR, along with the FRAME ASSY., CR, MOTOR, from the PRINTER MECHANISM (see Section 3.2.5.1).**
2. **Loosen the two CBS(0) (M3X 6) screws that hold the MOTOR, CR to the FRAME ASSY., CR, MOTOR.**
3. **Check the alignment of the MOTOR, CR pinion gear with the BELT PULLEY cog. Move the MOTOR, CR until you judge that there is a gap of about 0.05 -0.15 mm between the two. Tighten the two CBS(0) (M3 X 6) screws.**

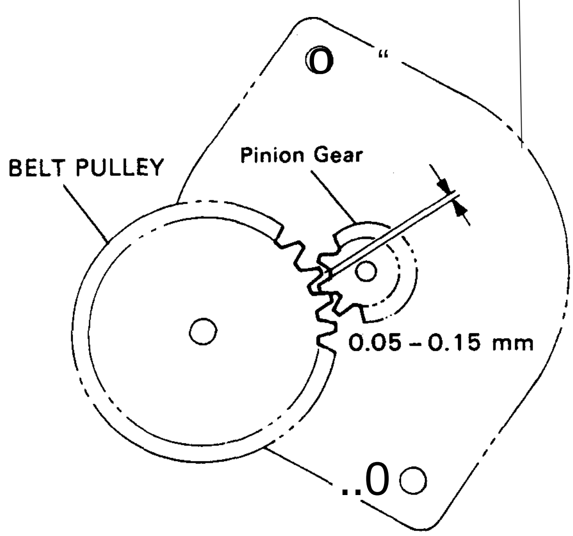


Figure 4-1. MOTOR, CR Backlash Adjustment

4.1.2 Platen Gap Adjustment

If you have rotated or reassembled the SHAFT, CR, GUIDE or the adjusting bushing, or if printing is abnormal, you must adjust the gap between the PLATEN and the printhead.

1. Remove the PRINTER MECHANISM from the HOUSING ASSY., LOWER (see Section 3.2.4).
2. Remove the printhead from the carriage (see Section 3.2. 1).
3. Use tweezers to remove the RIBBON MASK from the carriage.

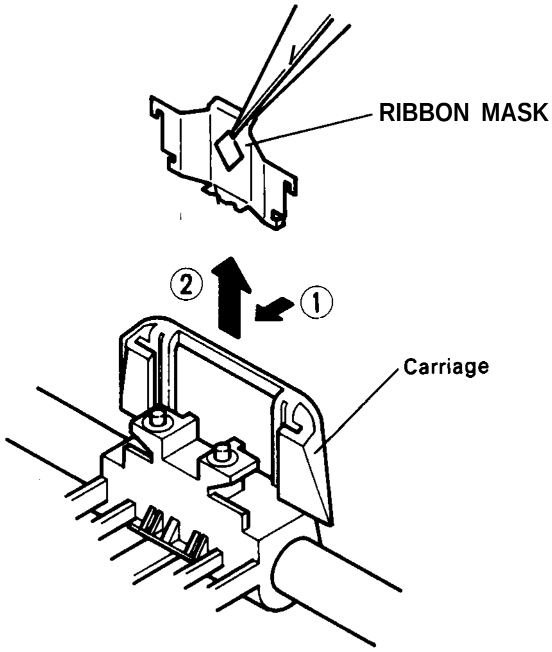


Figure 4-2. Removing the RIBBON MASK

4. Remount the printhead on the carriage.
5. Set the paper-thickness LEVER, G, ADJUST to position O (the second step position).
6. Move the LEVER, RELEASE back to the friction setting.
7. Move the carriage until the edge of the printhead is at the 5th column print position.
8. Use the box driver (7 mm) to rotate the adjusting bushing on the FRAME, MAIN, RIGHT of the PRINTER MECHANISM.

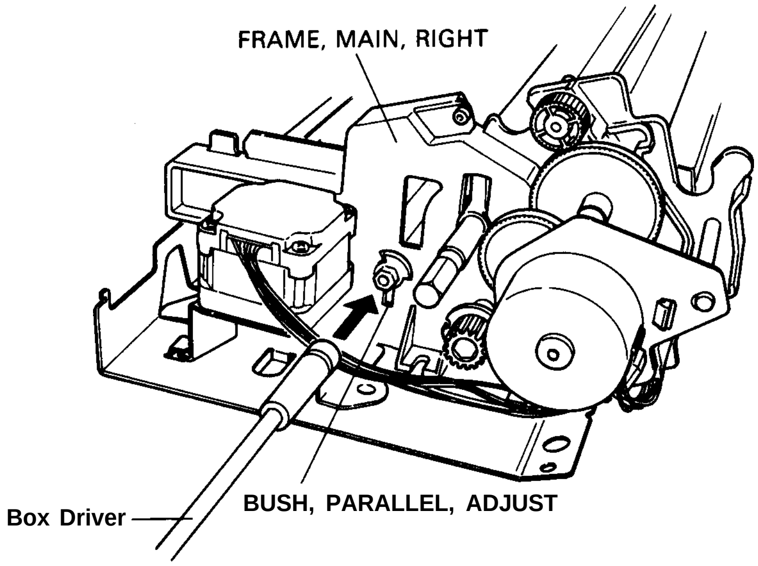


Figure 4-3. The Adjusting Bushing

9. Rotate the adjusting bushing until the platen gap is large enough for a thickness gauge of 0.44 mm thickness but too narrow for one of 0.47 mm thickness.

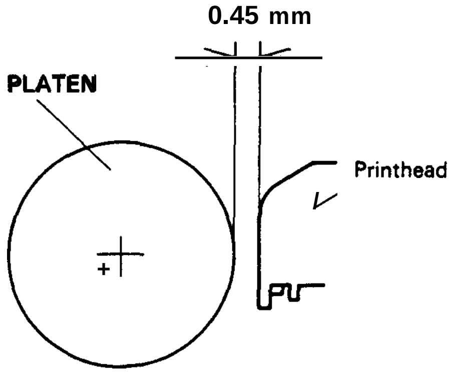


Figure 4-4. Platen Gap

10. Move the carriage until the edge of the printhead is at the 75th column print position.
11. Use the box driver (7 mm) to rotate the adjusting bushing on the FRAME, MAIN, RIGHT of the PRINTER MECHANISM.
12. Rotate the adjusting bushing until the platen gap is large enough for a thickness gauge of 0.44 mm thickness but too narrow for one of 0.47 mm thickness.
13. Move the printhead back again so that the edge of the printhead is at the 5th column print position. Check the platen gap again with the thickness gauge. It should still be large enough for a thickness gauge of 0.44 mm thickness but too narrow for one of 0.47 mm thickness. If this is not the case, go back to step 8.
14. Center the carriage. Check the platen gap again with the thickness gauge. It should still be large enough for a thickness gauge of 0.44 mm thickness but too narrow for one of 0.47 mm thickness. If this is not the case, go back to step 8.
15. Remove the printhead, install the RIBBON MASK and then replace the printhead.

4.2 BIDIRECTIONAL PRINT POSITION ADJUSTMENT

This section describes how to adjust the bidirectional print position to ensure correct printing alignment.

4.2.1 Overview of Bidirectional Print Position Adjustment

This printer prints characters when the carriage is moving in either direction (i.e., from left to right or from right to left).

Adjustment is necessary to ensure that the printing of characters in one direction is properly aligned with the printing of characters in the opposite direction. For example, if the print position is out of alignment, printing of a vertical line shows staggering because of the skew effect.

It is important to readjust the bidirectional print position if anything has been done to the gear arrangement that might affect this printing alignment. By making the timing lag a fraction during printing while the carriage moves from right to the left, it is possible to line up the printing done in this direction so that it will match the printing done in the left to right direction. This procedure to alter the timing is called bidirectional print position adjustment.

The degree of bidirectional printing skew differs, depending on the unique characteristics of each PRINTER MECHANISM. For this reason, there is no standard skew correction value that can be applied to each printer. The unique skew correction value for each printer has to be written to EEPROM on the BOARD ASSY., MAIN (C062 MAIN BOARD).

Whenever the PRINTER MECHANISM, or the BOARD ASSY., MAIN (C062 MAIN BOARD) itself, is changed during sevicing, the bidirectional print position must be readjusted and a new bidirectional skew correction value must be written to EEPROM.

4.2.2 Bidirectional Print Position Adjustment Procedure

Initial operation

Before performing the bidirectional alignment adjustment, complete the initial operation below:

* Position the LEVER, G, ADJUST at position O. * Verify that the DIP switch 1-6 is on).
* Verify that the DIP switch setting for country is U.S. (DIP switches 1-1, 1-2, 1-3 are on).
* Load paper.
* Feed at least 10 lines.
* Turn the printer off.

NOTE: The printer enters unidirectional printing mode automatically from the top of form to the line 10 position on the paper, because this improves paper-feed accuracy. Therefore, you must perform the bidirectional alignment adjustment after 10 lines or more have been fed.

Adjustment operation

The alignment procedure is as follows:

1. Turn the printer power on while pressing the ALT, LF/FF, and LOAD\ EJECT buttons.
2. The printer enters draft mode and prints the reference value and "|" characters for 4 lines.

Are the characters aligned vertically? NO → GO TO STEP 3.
YES → GO TO STEP 4.

3. Referring the odd-numbered lines (Ist and 3rd), adjust the even-numbered lines (2nd and 4th).

   " If the even-numbered lines are shifted to the right:
   → Press the LOAD/EJECT button once while pressing the ALT button. (The reference value increases + 1 and even lines shift to the left.)
   •If the even-numbered lines are shifted to the left:
   → Press the LF/FF button once while pressing the ALT button. (The reference value decreases — 1 and even lines shift to the right.)
4. Press the ALT, LF/FF, and LOAD/EJECT buttons at the same time.
5. The printer enters LQ mode, and the printer prints the reference value and the "|" characters for 4 lines.

   Are the characters aligned vertically? NO → GO TO STEP 6.
   YES → GO TO STEP 7.

6. Referring to the odd-numbered lines (1st and 3rd), adjust the even-numbered lines (2nd and 4th).

   •If the even-numbered lines are shifted to the right:
   → Press the LOAD/EJECT button once while pressing the ALT button. (The reference value increases + 1 and even lines shift to the left.)
   •If the even-numbered lines are shifted to the left:
   → Press the LF/FF button once while pressing the ALT button. (The reference value decreases — 1 and even lines shift to the right.)

7. Turn printer power off.

4.3 CIRCUIT ADJUSTMENT

The BOARD ASSY., MAIN (C062 MAIN BOARD) contains variable resistor VR1, which is used for balancing the circuitry. When any of the following parts are replaced, the circuitry must be balanced again by adjusting this variable resistance:

R14, RI 5, R13, C8, and VR 1

If the circuitry is not correctly balanced in this way, the CPU A\D converter fails to function normally and printer operation is affected.

4.3.1 Adjustment Process

Attach a digital multimeter to the check terminal TP2 (Vref voltage) on the BOARD ASSY., MAIN (C062 MAIN BOARD). Turn on printer power and turn variable resistor VR1 until a reading of 4.741 V is obtained.

CHAPTER 5
TROUBLESHOOTING

LIST OF FIGURES

LIST OF TABLES

CHAPTER 5

5.1 OVERVIEW

Problems in the printer may exhibit a variety of symptoms, which can complicate the task of troubleshooting, unless you follow the procedure shown in the flowchart below.

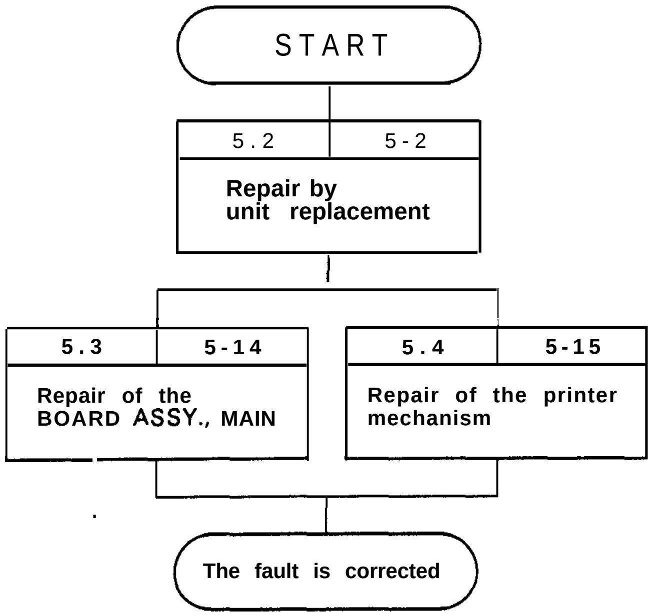


Figure 5-1. Troubleshooting Procedure

The following tables provide troubleshooting information.

Table 5-1. Motor and Printhead Coil Resistance

Part	Specifications
MOTOR, CR	Coil resistance 19.5 ohms +/− 7% at 25 degrees C (77 degrees F)
MOTOR, PF	Coil resistance 79.0 +/− 5 ohms at 25 degrees C (77 degrees F)
Printhead	Coil resistance 45.5 +/− 3.2 ohms 'at 25 degrees C (77 degrees F)

Table 5-2. Error Codes

Error Display	Error	Cause
Buzzer beeps 3 times for 0.1 second, with 0.1-second intervals.	Paper-out error	• Printer is out of paper. • DETECTOR ASSY., PE, FRONT (, REAR)
Buzzer beeps 5 times for 0.5 second, with 0.5-second intervals.	Carriage error	• MOTOR, CR malfunction. • Carriage mechanism malfunction. • MOTOR, CR driver current malfunction.

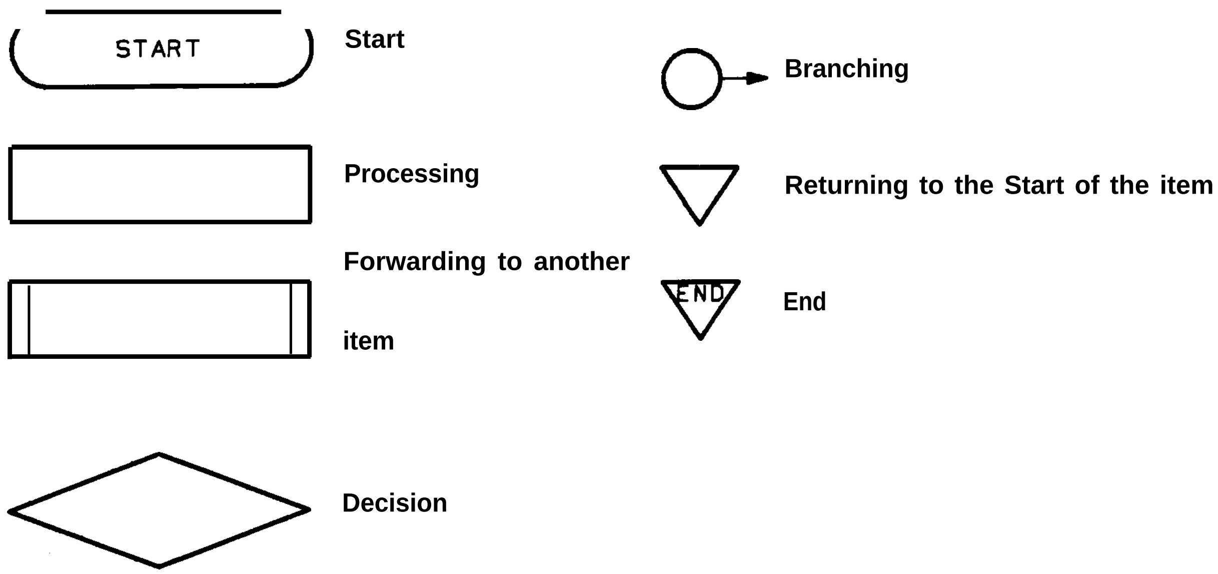
5.2 REPAIR BY UNIT REPLACEMENT

For most problems, it is sufficient for you to determine the difficulty to the unit level. Refer to Table 5-3, identify what the problem is, then perform the checks according to the corresponding flowchart.

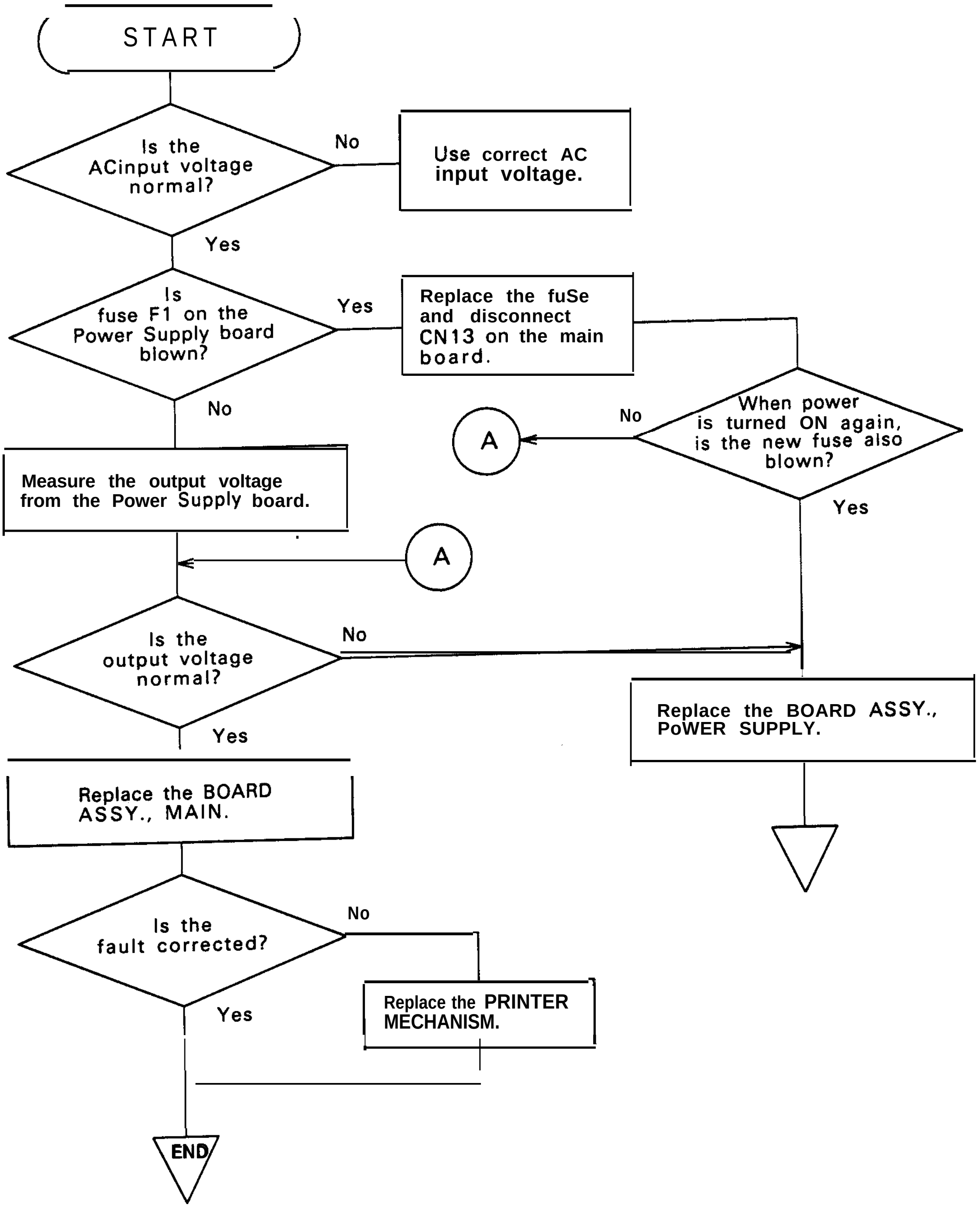
Table 5-3. Symptoms and Reference Pages

Symptom	Problem	See Page
Printer fails to operate when power is on.	• Carriage does not move. • Control panel indicator lamp does not light.	5-3
Carriage operation is abnor-real.	• Carriage moves away from home position at power on. • The carriage returns to the home position correctly, but the printer then fails to enter the READY mode.	5-4
Printing is faulty during self-test, but carriage operation is normal.	• No printing at all. • Faulty printing - some of the dots are not printed.	5-5
Paper feeding is abnormal.	• No paper is fed. • Regular paper feed, but with variations in the separations between lines.	5-9
Control panel operation is abnormal.	• When the LF switch is activated, no paper is fed.	5-12
Printing of data sent by the host computer is faulty.	• Carriage operates normally at power on, and self-test is executed correctly. • Print data from the computer, however, is not printed correctly.	5-13

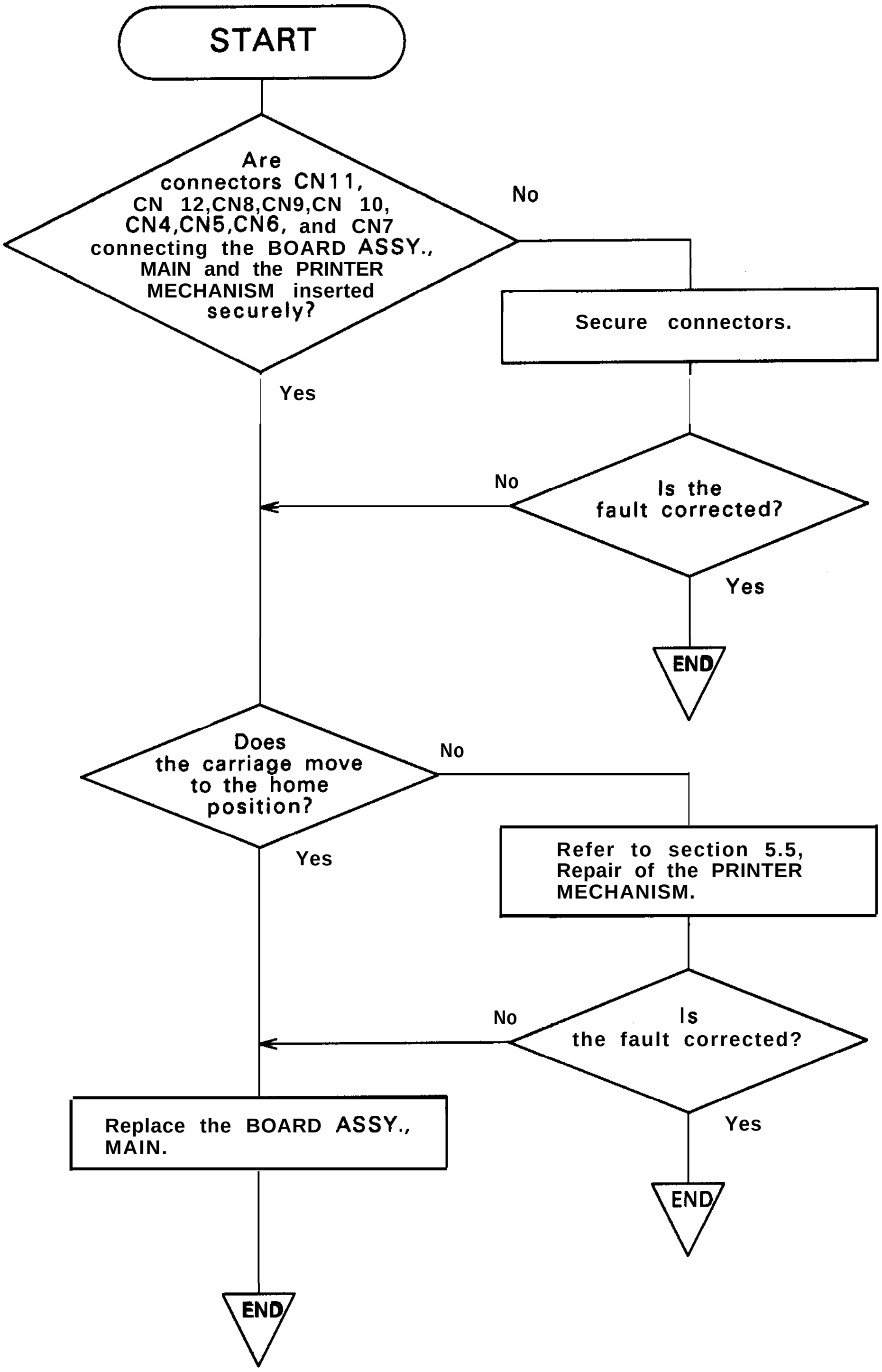
The repair procedure flowcharts are represented using the following symbols:



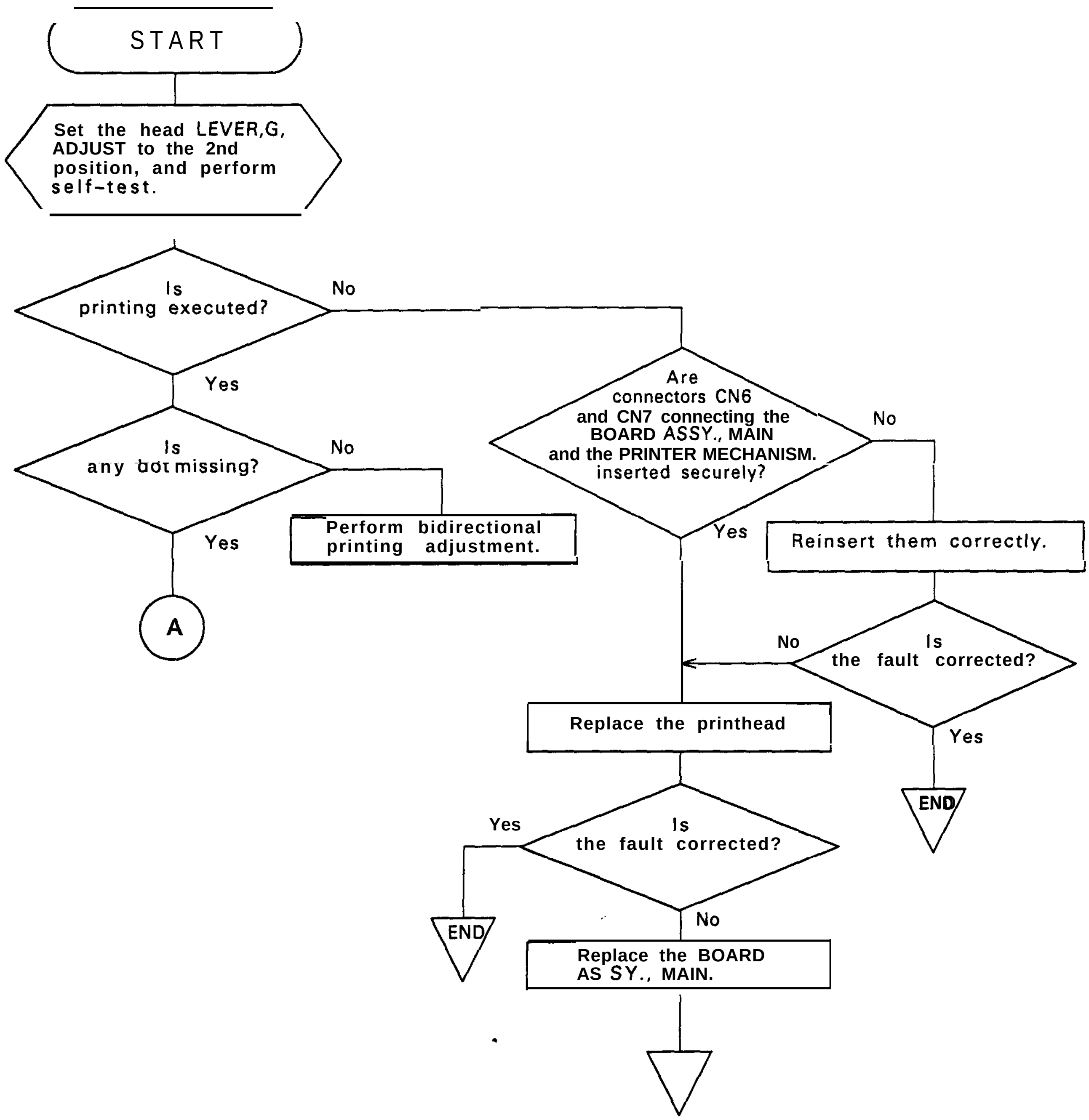
(1) Printer Fails to Operate when Power is On

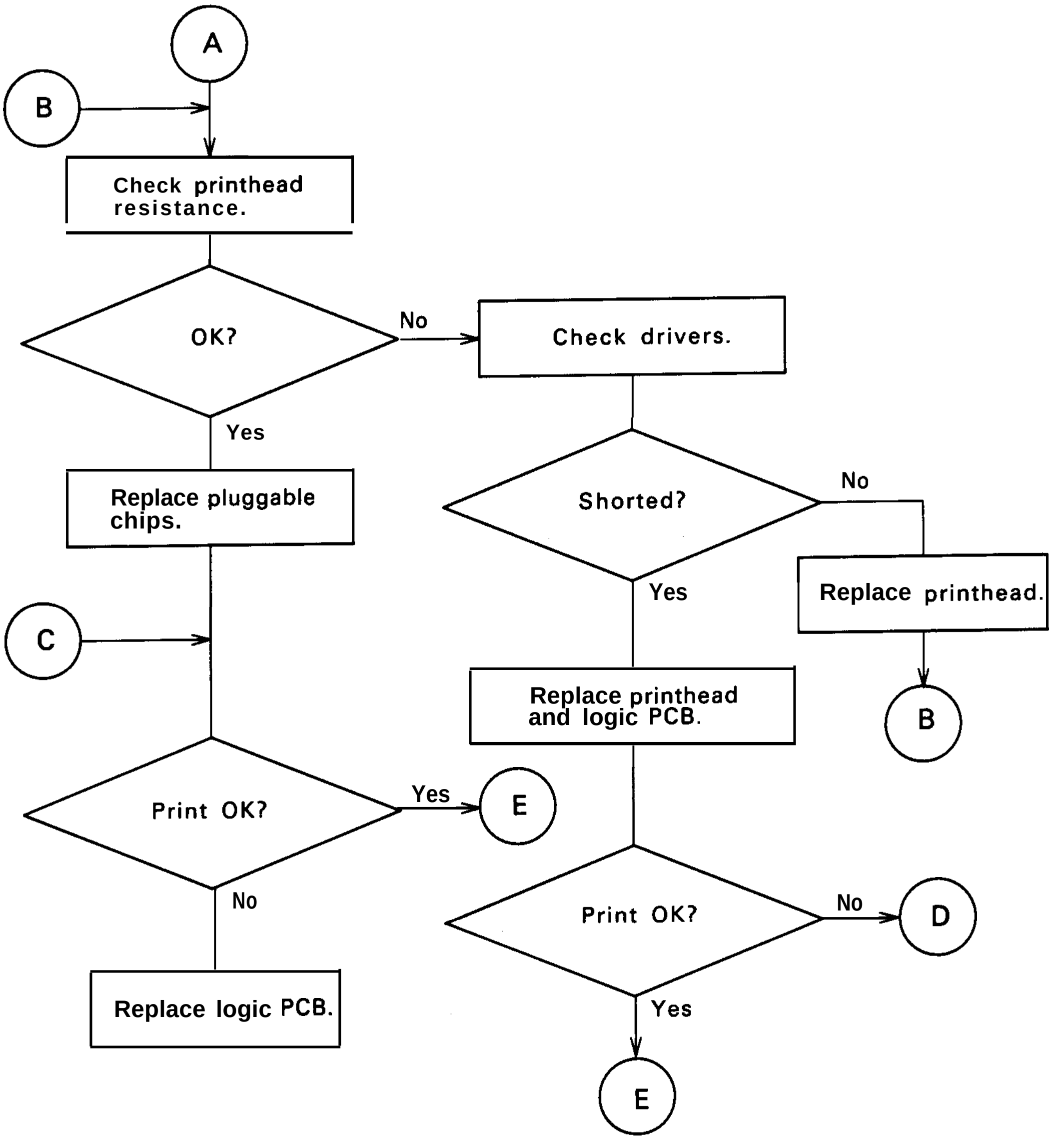


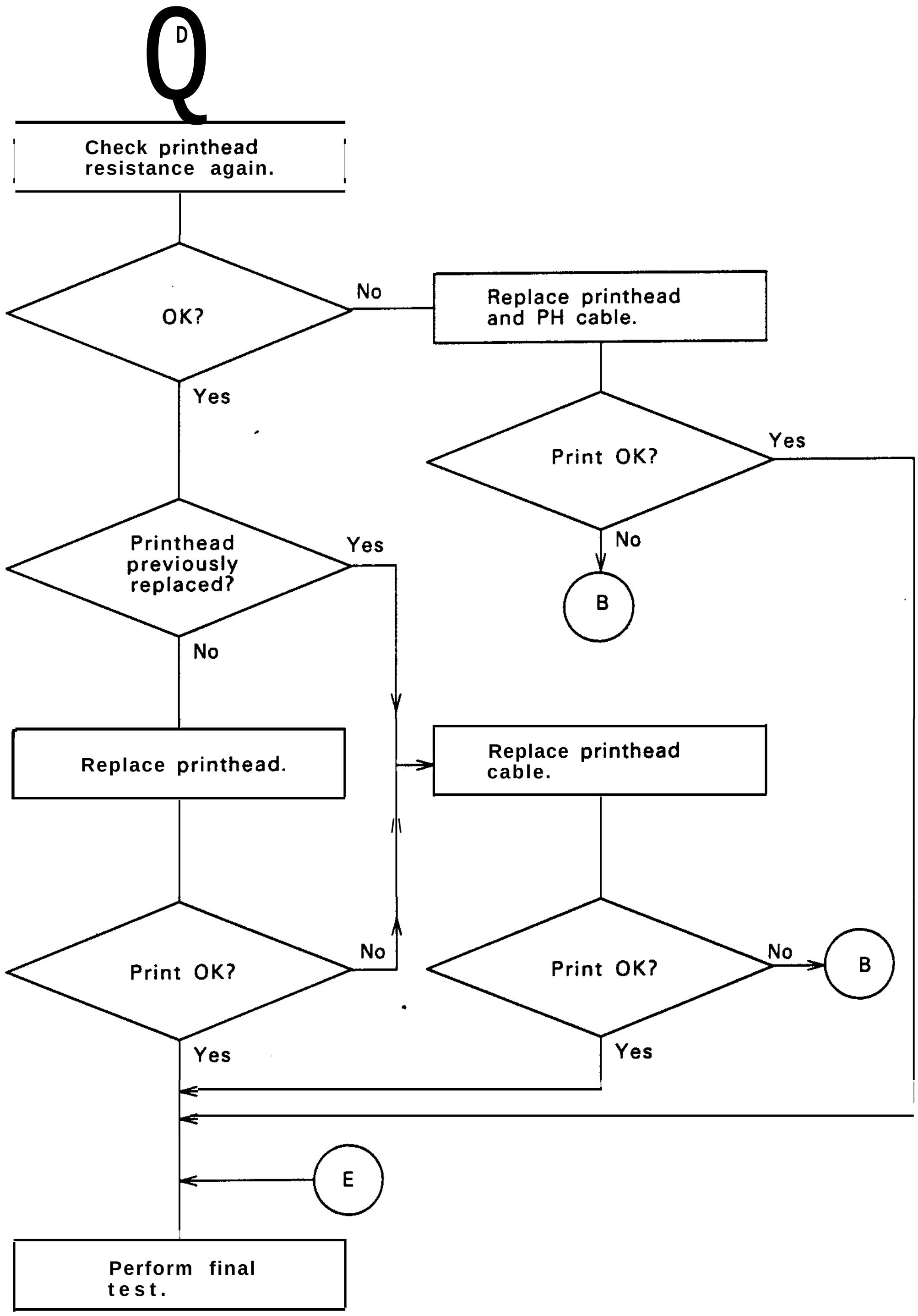
(2) Carriage Operation is Abnormal

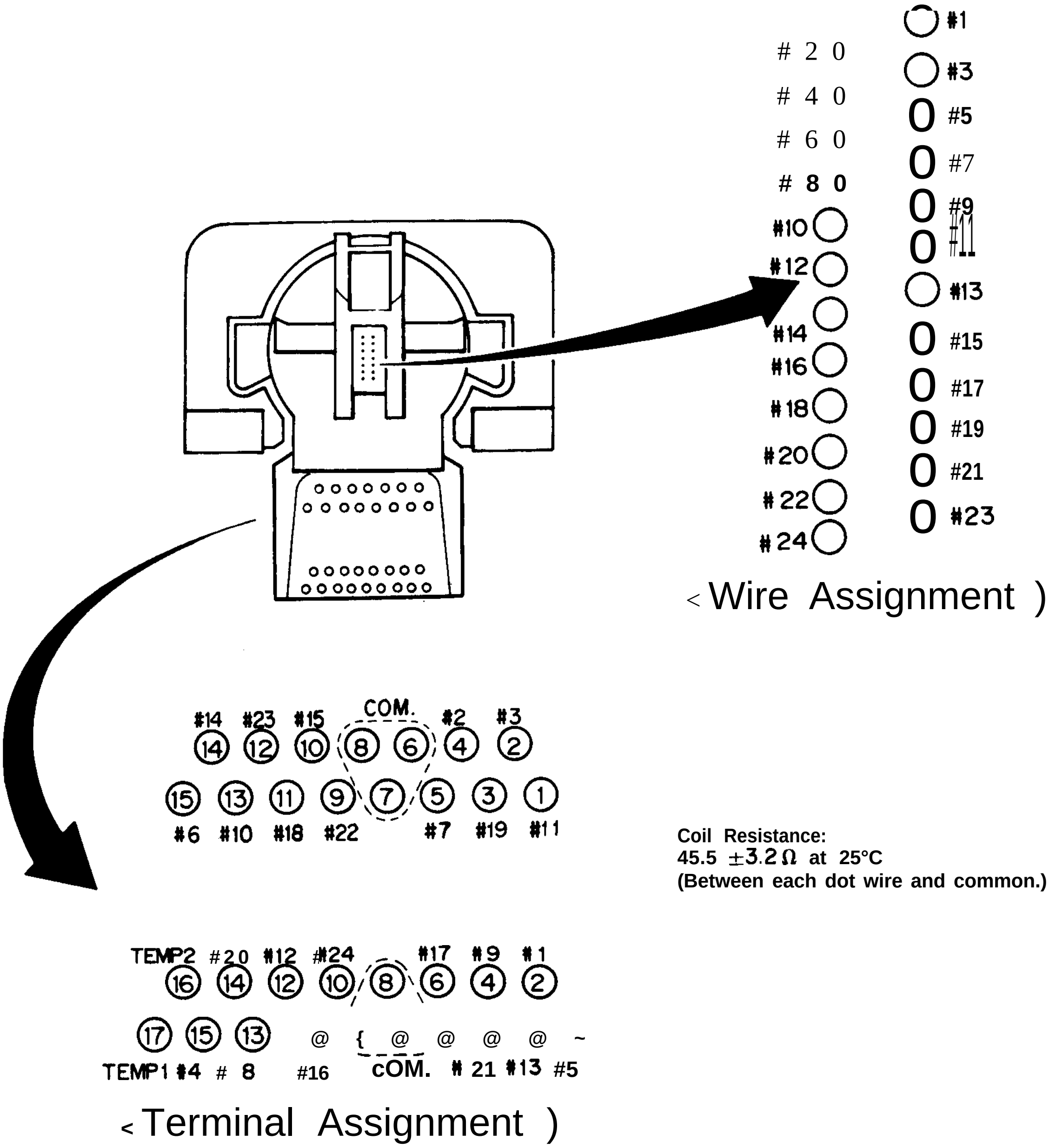


(3) Printing is Faulty During Self-Test, but Carriage Operation is Normal




A
B
Check printhead resistance.
OK?
No
Check drivers.
Yes
Replace pluggable chips.
Shorted?
No
Replace printhead.
Yes
C
Replace printhead and logic PCB.
B
Print OK?
Yes
E
No
Replace logic PCB.
Print OK?
No
D
Yes
E

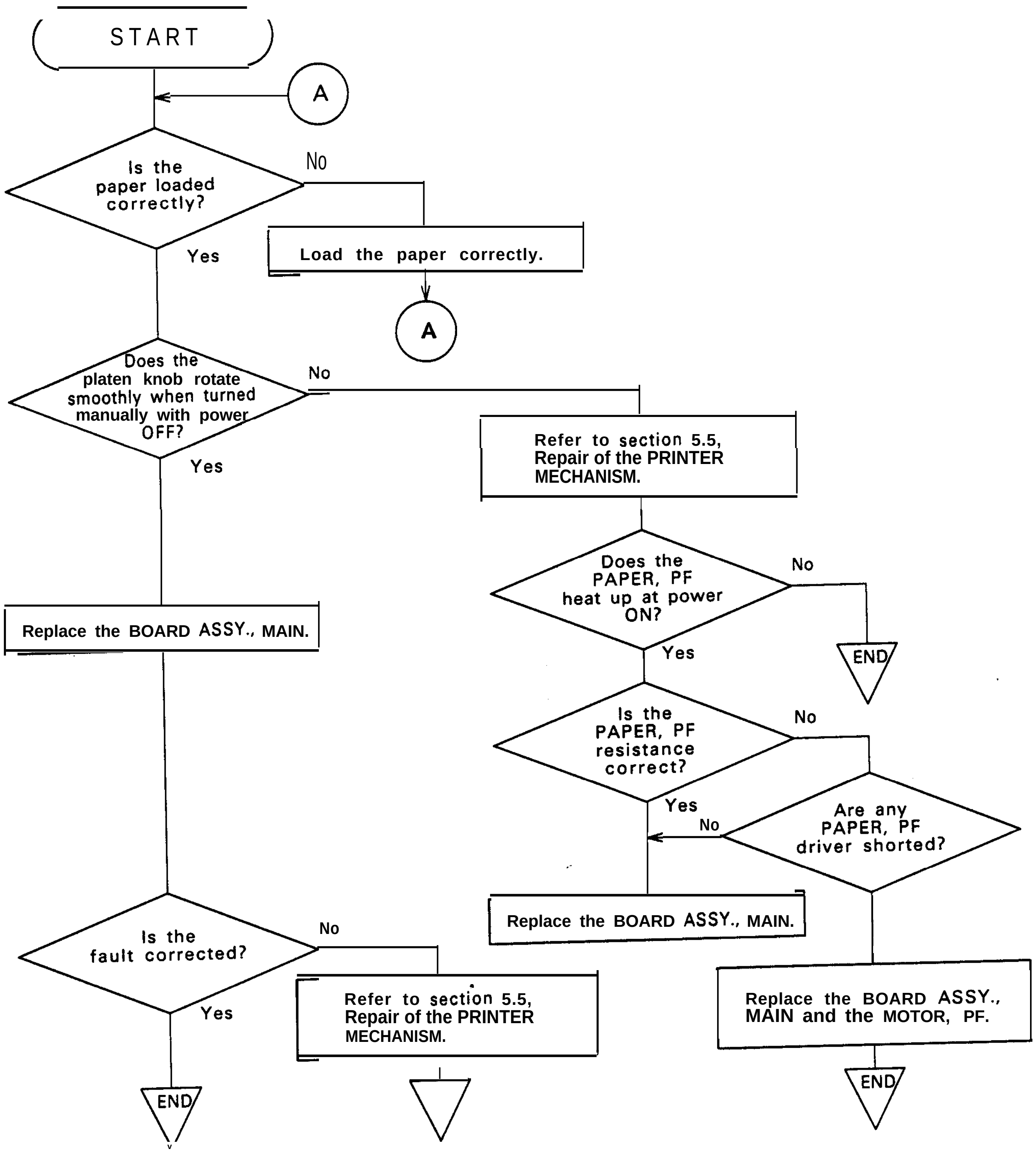

D
Check printhead resistance again.
OK?
No
Replace printhead and PH cable.
Yes
Print OK?
Yes
No
B
Printhead previously replaced?
Yes
No
Replace printhead.
Replace printhead cable.
Print OK?
No
Print OK?
No
B
Yes
Yes
E
Perform final test.

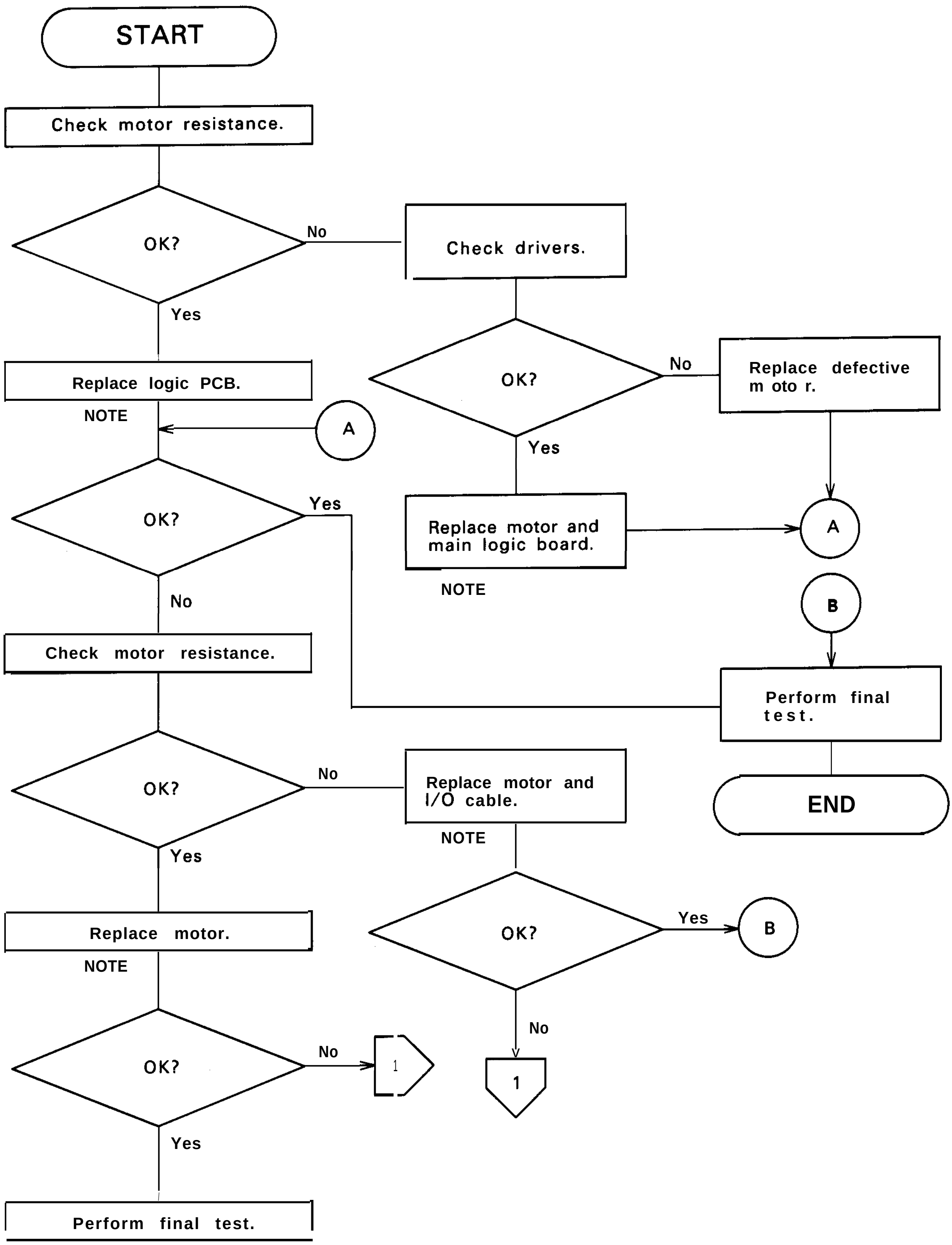


Coil Resistance:
45.5 ±3.2 Ω at 25°C
(Between each dot wire and common.)

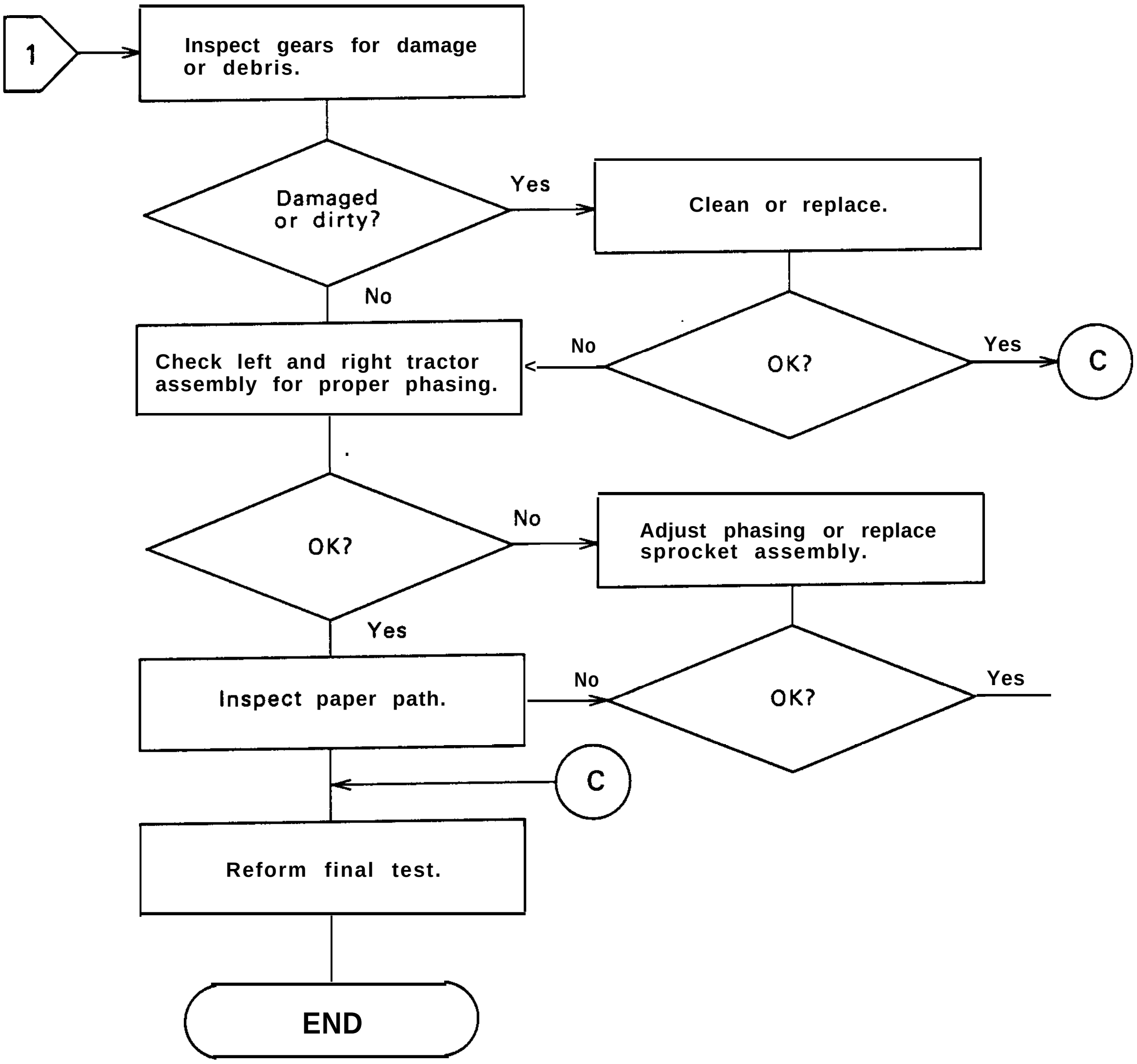
Figure 5-2. Printhead Resistance

(4) Paper Feeding is Abnormal (but Printing is Normal)

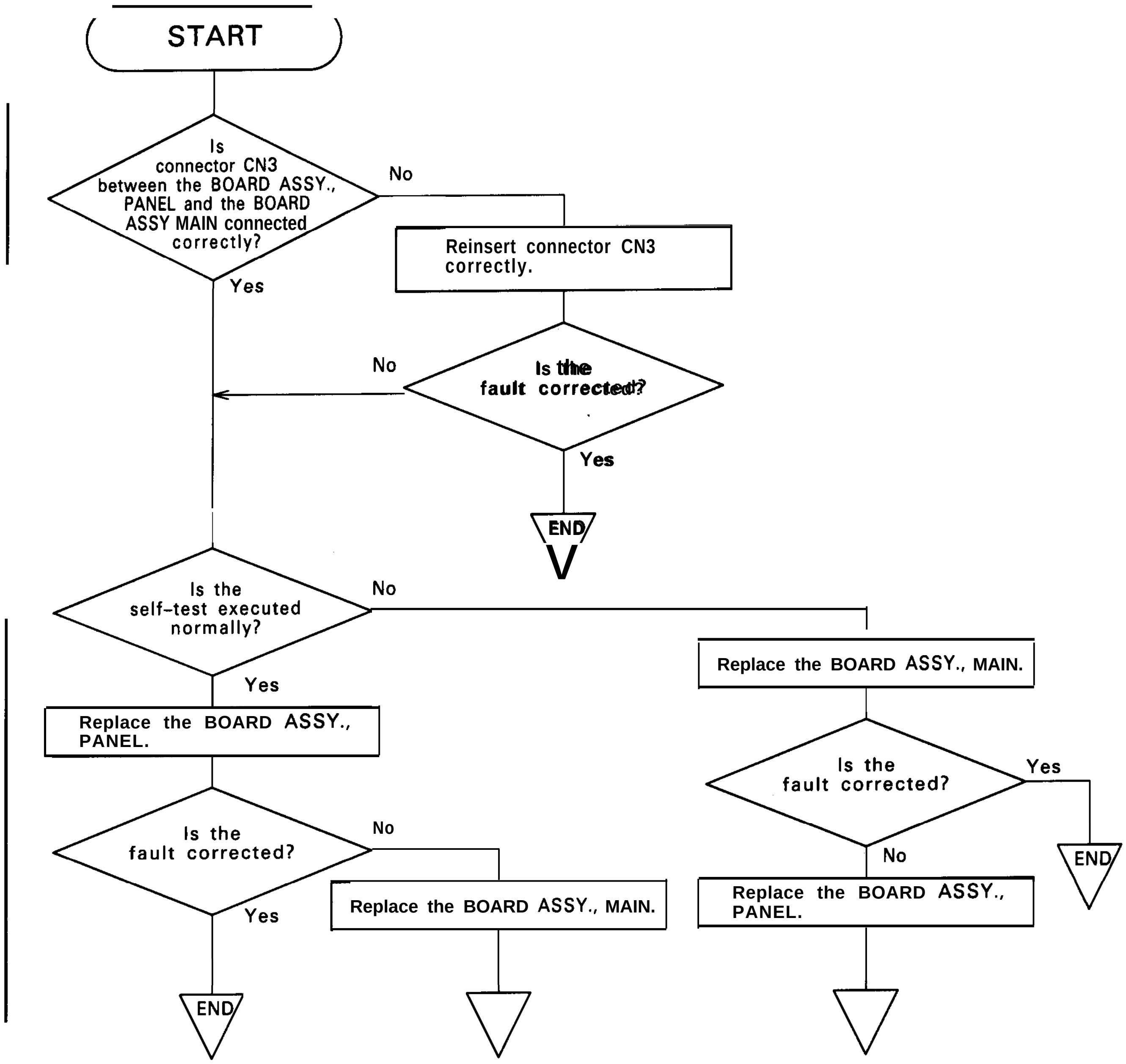




NOTE: Perform bidirectional print alignment adjustment.

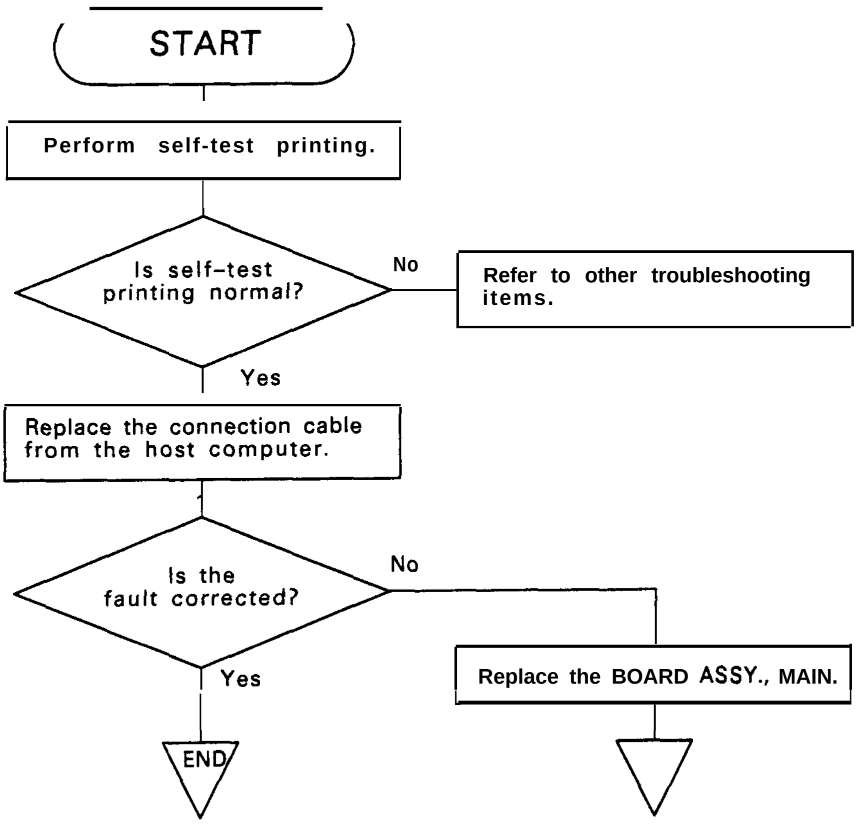

1
Inspect gears for damage or debris.
Damaged or dirty?
Yes
Clean or replace.
No
OK?
No
Yes
C
Check left and right tractor assembly for proper phasing.
OK?
No
Adjust phasing or replace sprocket assembly.
Yes
Inspect paper path.
No
OK?
Yes
C
Reform final test.
END

(5) **Control Panel Operation is Abnormal**



(6) Printing of Data Sent by the Host Computer is Faulty

NOTE: It is assumed here that the host computer is operating normally.



5.3 REPAIR OF THE MAIN BOARD

This section provides instructions for repairing the BOARD ASSY., MAIN when it is defective and describes various symptoms, likely causes, and checkpoints. Checkpoints refer to proper waveforms, resistance values, and other values to be checked to evaluate the operation of any component that might be bad. Check these values and take the appropriate action.

Table 5-4. Repair of a Problem in the BOARD ASSY., MAIN

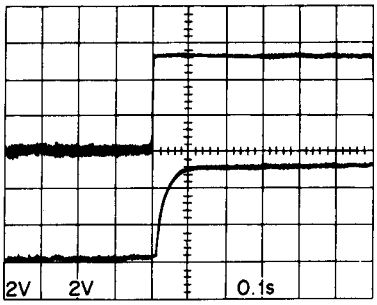
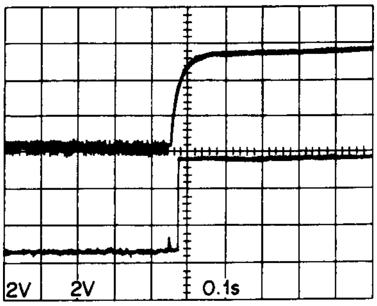
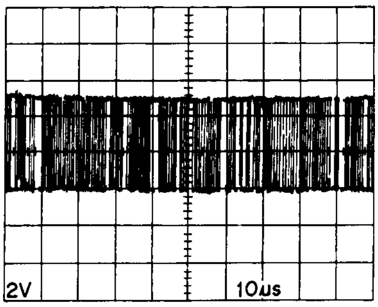
Problem	Symptom	Cause	Checkpoint	Solution
The printer does not operate at all.	The CPU does not operate.	The reset circuit is not operational.	Check the voltage waveforms for the +5V line (IC2A pin 52) and for the THLD signal (IC2A pin 73) when power is on. 	Replace IC2A.
			Check the voltage waveforms for the THLD signal (IC2A pin 73) and for the RESET signal (IC4D pin 4) when power is on. 	Replace IC4D.
			Check pin 21 of ICIC for a HIGH Vx voltage (NM I signal).	Replace IC 1 C.
		Selection of control ROM is abnormal.	Check pin 36 of IC4D for a change in the signal HIGH/LOW. 	Replace IC4D.

Table 5-4. Repair of a Problem in the BOARD ASSY., MAIN (Cont.)

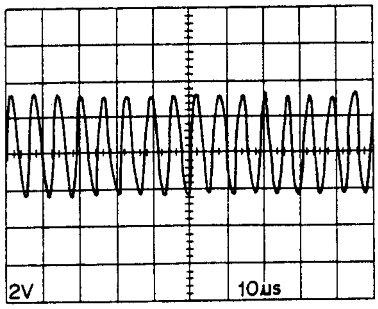
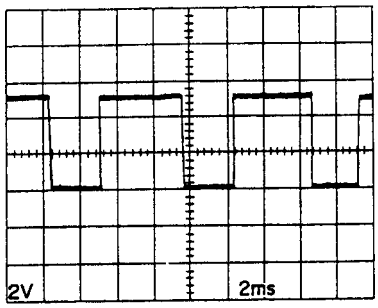
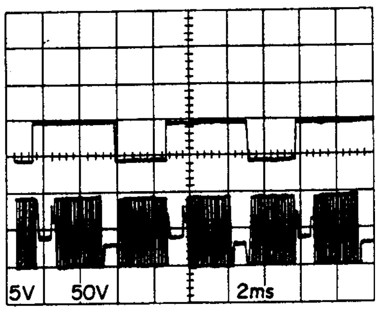
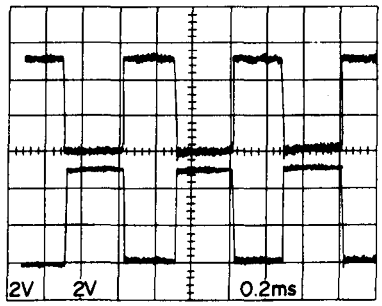
Problem	Symptom	Cause	Checkpoint	Solution
The printer does not operate at all.	The CPU does not operate.	Either ROM or RAM is defective.		Replace IC5E or IC6E.
		The CPU is defective.	Check the oscillator signal at either pin 33 or pin 34 of the CPU. 	If a signal is detected, replace ICI C. Otherwise, replace CR1.
The carriage operates abnormally.	The carriage does not operate at all.	ICI C is defective.	Check the MOTOR, CR phase signal at pins 9, 10, 11, and 12 of IC1C. 	Replace IC1C.
		IC2A is defective.	At IC2A, check the input signal for pin 90 and the output waveform for pin 100. 	Replace IC2A.
	Carriage operation is unstable (lack of torque).	IC2A is defective.		Replace IC2A.

Table 5-4. Repair of a Problem in the BOARD ASSY., MAIN (Cont.)

Problem	Symptom	Cause	Checkpoint	Solution
Self-test printing is abnormal.	Self-test is not executed.	The CPU can't measure the voltage on the +35V line.	Measure the voltage at Vref (pin 1) of IC 1 C. The normal voltage is 4.741 V.	Adjust VR 1.
		IC4D is defective.	At IC4D, check the input signal at pin 101 and the output signal at pin 46. 	Replace IC4D.
	A particular dot is not being printed.	IC2A is defective.		Replace IC2A.
‘a per is not ‘ed normally.	The paper does not feed, or the feed pitch is abnormal.	IC2A is defective.		Replace IC2A.
ʾrinting of da- a from the ıost comput- ɛr is faulty.	Data corruption occurs when the parallel interface is used.	IC4D or IC5D is defective.		Replace IC4D or IC5D.

5.4 REPAIR OF THE PRINTER MECHANISM

For detailed procedures for replacing or adjusting parts, refer to Chapter 3, *Disassembly and Assembly,* and Chapter 4, *Adjustment.* If a problem or symptom recurs following an attempted repair, refer to Table 5-5 to try to find other potential causes.

Table 5-5. Repair of the PRINTER MECHANISM

Problem	Symptom	Cause	Checkpoint	Solution
The MOTOR, CR fails to operate.	The MOTOR, CR completely fails to activate at power on.	Foreign substances are lodged in the gears or elsewhere in the mechanism.	Manually move the TIMING BELT to see if this causes the motor to rotate.	Remove any foreign substances.
		The MOTOR, CR is defective.	Measure the coil resistance of the motor. The resistance should be about 19.5 ohms.	Replace the MOTOR, CR.
The carriage does not operate normally at power on [after the carriage has been manually centered prior to power on).	The MOTOR, CR rotates, but the carriage does not move.	The BELT PULLEY is defective.	Check for broken or worn pulley.	Replace the BELT PULLEY.
		The TIMING BELT is defective.	Check that the TIMING BELT is correctly inserted into the bottom of the carriage.	Reinsert the TIMING BELT.
			Check for a broken timing belt.	Replace the timing belt.
	The carriage moves left slightly, then stops.	Carriage movement is not smooth.	Check whether the carriage moves smoothly when moved manually.	Clean and lubricate. Replace the MOTOR, CR.
	The carriage moves to the left or right end, then stops.	The DETECTOR ASSY., HP is defective.	Use a multimeter to check the DETECTOR ASSY., HP.	Replace the DETECTOR ASSY., HP.
Self-test printing does not execute.	The carriage moves, but no printing is performed.	The printhead FFC (CABLE, HEAD, FRONT (, REAR)) common wires are disconnected.	Check the common wires for the printhead FFC (CABLE, HEAD, FRONT (, REAR)).	Replace the FFC (CABLE, HEAD, FRONT (, REAR)).

Table 5-5. Repair of the PRINTER MECHANISM (Cont.)

Problem	Symptom	Cause	Checkpoint	Solution
Self-test printing is abnormal.	A particular dot fails to print.	The printhead is defective.	Measure the coil resistance of the printhead. The normal value is approximately 45.5 ohms.	Replace the printhead.
			Check whether the dot wire is worn.	Replace the printhead.
	The printing is too light, or the print density is not uniform.	The printhead is defective.	Check whether the tip of the dot wire is worn.	Replace the printhead.
		The platen gap is not properly adjusted.	Set the gap LEVER, G, ADJUST to the second position, and check the gap between the tip of the printhead and the PLATEN. The appropriate value is 0.46 mm.	Adjust the gap. Refer to Section 4.1.2, *Platen Gap Adjustment.*
Paper feeding is abnormal.	Printing is performed, but the paper is not fed, or is not fed uniformly.	Foreign substances are lodged in the paper path.	Perform a visual check of the paper path.	Remove any foreign substance.
		The MOTOR, PF is not driving the gear correctly.	Check that no foreign substance is lodged between the gears, and that the gears are not broken or worn.	. Remove any foreign substance. . Replace the paper-feed reduction gear. • Replace the platen gear.
		The MOTOR, PF is defective.	Measure the coil resistance for the MOTOR, PF. The approximate value should be 79 ohms.	Replace the MOTOR, PF.

Table 5-5. Repair of the PRINTER MECHANISM (Cont.]

Problem	Symptom	Cause	Checkpoint	Solution
The ribbon feed is abnormal.	The ribbon is not fed.	The ribbon cartridge is defective.	Dismount the ribbon cartridge, rotate its knob manually, and check whether the ribbon feeds normally.	Replace the ribbon cartridge.
		Foreign substances are caught in the gears.	Check whether the ribbon driving gear rotates when the carriage is moved manually.	• Remove any foreign substance. • Replace the ribbon-feed mechanism.
	The ribbon feeds properly only when the carriage moves in one direction (i.e., it fails to feed when the carriage moves in the other direction).	The planetary lever is defective.	Move the carriage manually, and check whether the planetary lever turns in reverse and engages the gear.	Replace the ribbon cartridge.
Paper becomes stained.	Ink stains appear on areas where there is pinting.	The RIBBON MASK is not correctly positioned.	Check whether the RIBBON MASK is in the correct position.	Reinstall the RIBBON MASK.
		The platen gap is not adjusted.	Set the gap adjust lever to the second position, and check the gap between the tip of the printhead and the PLATEN. The appropriate value is 0.46 mm.	Adjust the gap. Refer to Section 4.1.2, *Platen Gap Adjustment.*
Printing continues after the paper ends or when no paper is loaded.	Printing continues past the paper end.	The DETECTOR ASSY., PE, FRONT (, REAR)	Check the DETECTOR ASSY., PE, FRONT (, REAR)	Replace the DETECTOR ASSY., PE, FRONT (, REAR)

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, inspect the springs, paper-feed rollers, and basic operation.

CAUTION

Disconnect the printer from the external AC power source before performing maintenance. Do not use thinner, trichloroethylene, or ketone-based solvents on the plastic components of the printer.

6.2 LUBRICATION AND ADHESIVE APPLICATION

EPSON recommends that the printer be lubricated at the points illustrated in Figure 6-2. Table 6-2 lists each point together with its recommended lubricant. The three recommended lubricants are EPSON O-2, G-20, and G-26, all 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 damage related parts.

Adhesive application is necessary at the point described in Table 6-3. Figure 6-1 indicates the point at which adhesive must be applied following disassembly or replacement. EPSON recommends that Neji lock #2 (G) adhesive be applied to the point illustrated. Avoid overflow to adjacent parts.

Table 6-1. Lubricants and Adhesive

Type	Name	Quantity	Availability	Part No.
Oil	o-2	40 cc	E	B7 10200001
Grease	G-20	40 gm	E	B702000001
Grease	G-26	40 gm	E	B702600001
Adhesive	Neji lock #2 (G)	1000 gm	E	B730200200

E: EPSON-exclusive product

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

Ref. No.	Lubrication Points	Lubricant
1	1/4 of the perimeter of the top edge of the gear (8.5 mm, 30 mm)	G-26
2	1/3 of the perimeter of the top edge of the gear (40 mm)	G-26
3	1/3 of the perimeter of the top edge of the platen gear	G-26
4	Portion of carriage that contacts base frame	G-26
5	Oil pad	o-2
6	Portion of platen shaft that contacts ground spring	G-20
7	Gear (40 mm) shaft	G-26
8	Gear (8.5, 30 mm) shaft	G-26
9	Ribbon-feed gear shafts	G-26
10	Gear (1 1.5 mm) shaft	G-26
11	Portion of paper guide that contacts gear (18 mm)	G-26
12	Portion of paper guide that contacts sub paper guide	G-26
13	Portion of release shaft that contacts paper guide	G-26
14	Portion of paper tension roller shaft that contacts paper tension frame	G-26
15	Portion of tractor shaft that contacts tractor frame (left)	G-26
16	Tractor clutch cam	G-26

NOTE: Lubrication must be applied during the reassembly process.

Table 6-3. Adhesive Application Point (Refer to Figure 6-l.)

Adhesive Application Point	No. of Points
Portion where timing belt engages the carriage	1

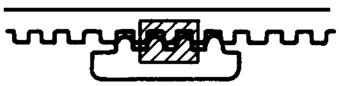


Figure 6-1. Correct Adhesive Application

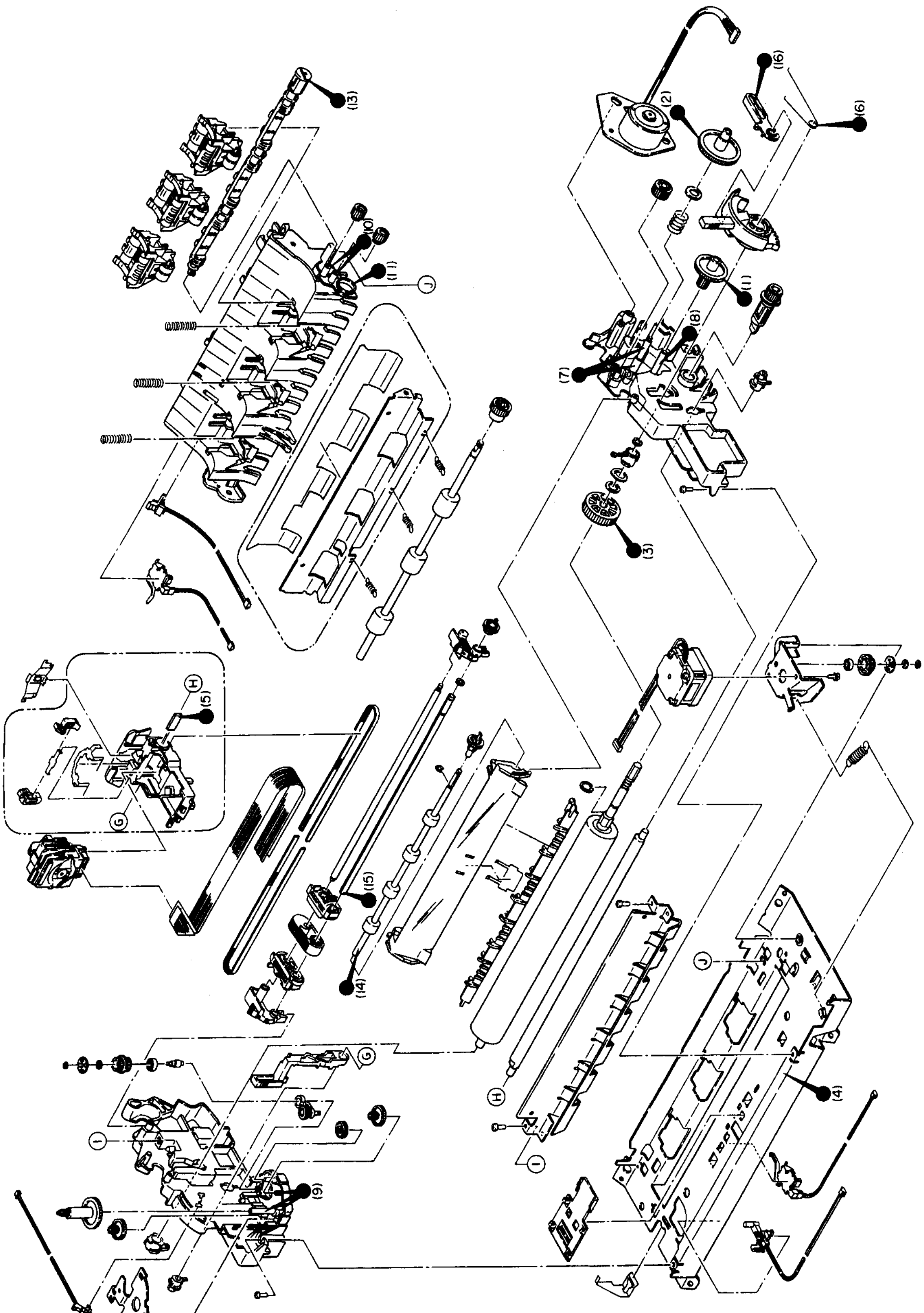


Figure 6-2. LQ-570 Lubrication Points

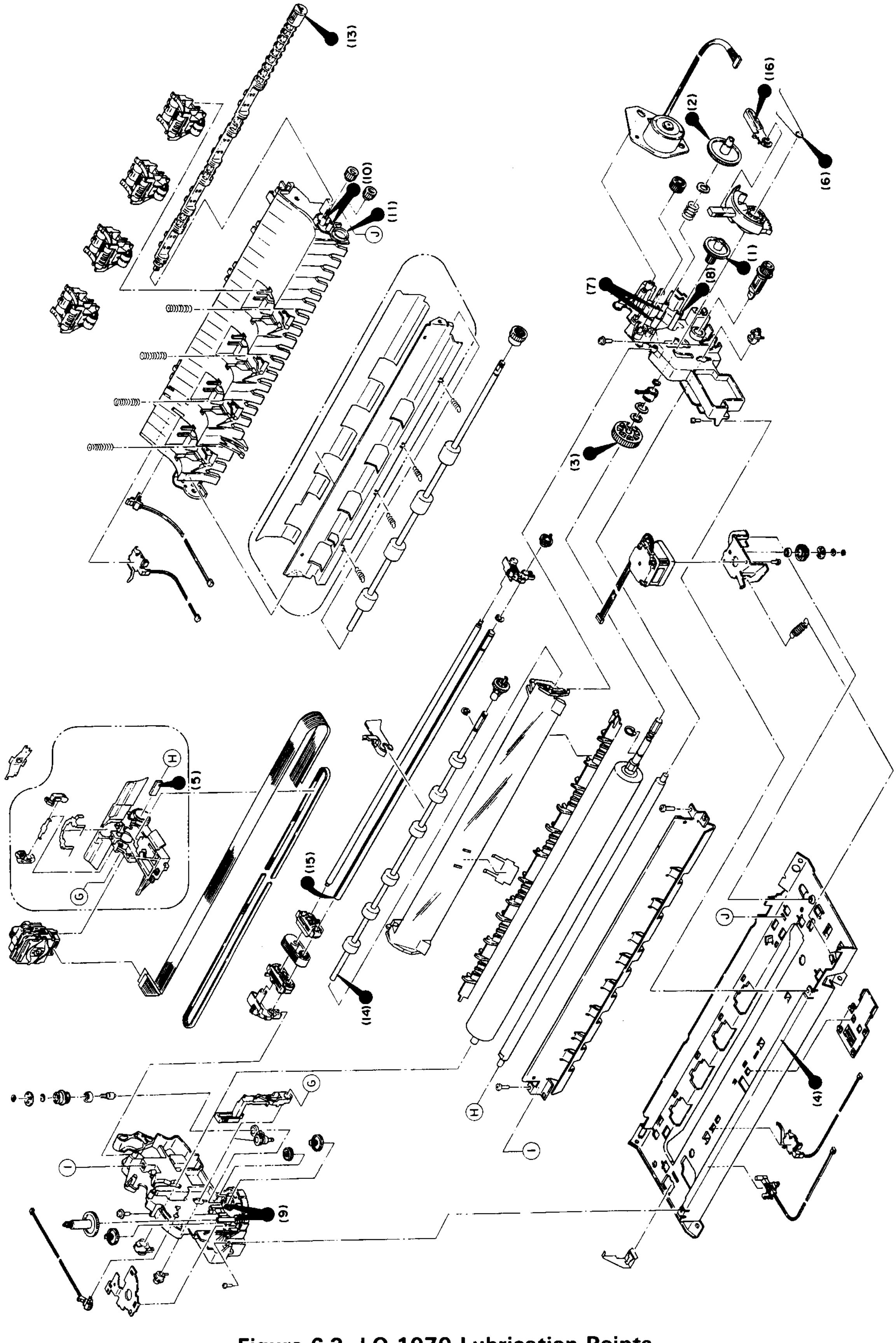


Figure 6-3. LQ-1070 Lubrication Points

APPENDIX

LIST OF FIGURES

APPENDIX

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.

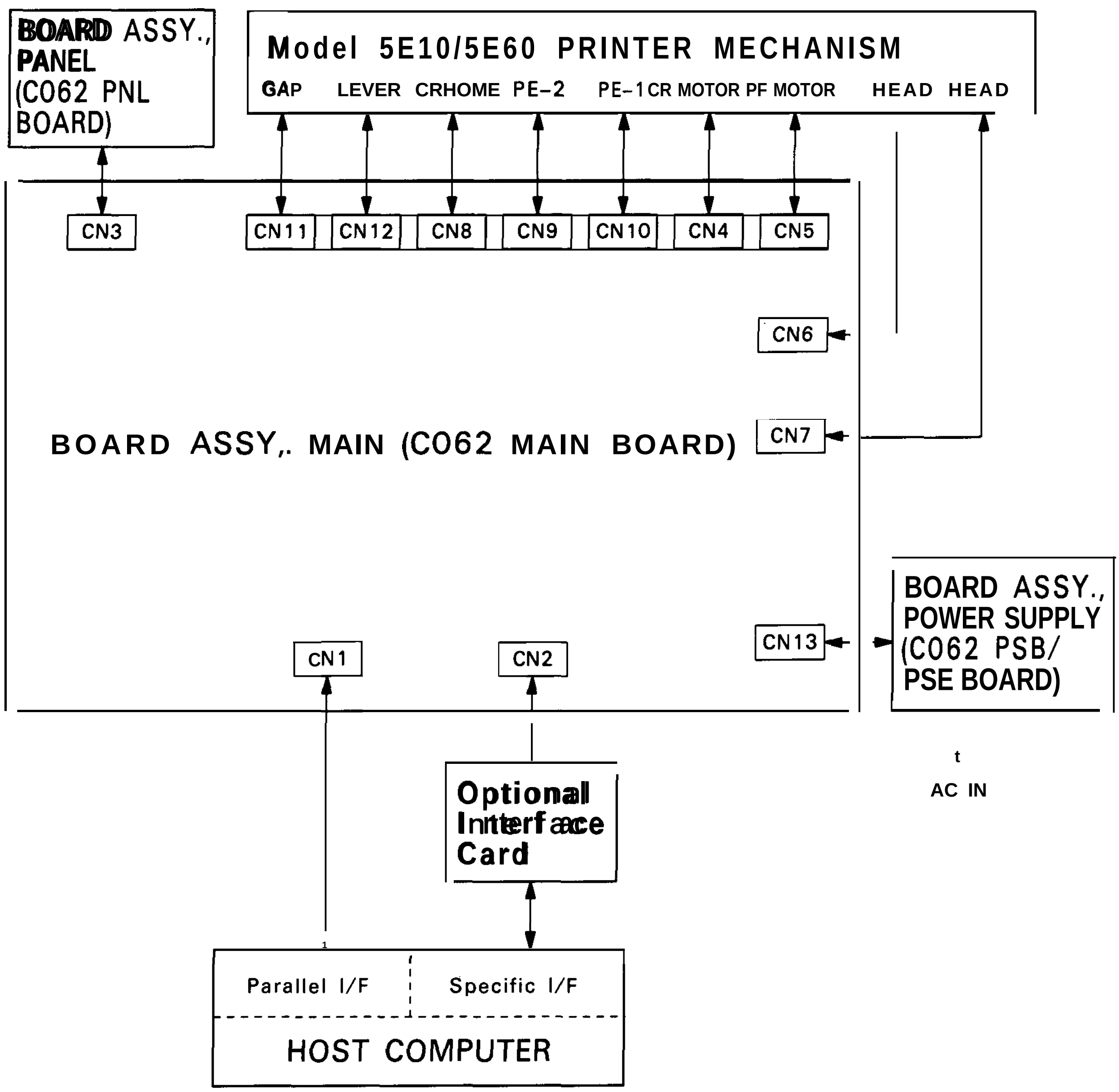


Figure A-1. Cable Connections

Table A-1. Board Connector Summarv

Board	Connector	Function	Pins
BOARD ASSY., MAIN (C062 MAIN BOARD)	CN1	Parallel interface	36
	CN2	Optional interface card	36
	CN3	Control panel	12
	CN4	MOTOR, CR	5
	CN5	MOTOR, PF	5
	CN6	Printhead	17
	CN7	Printhead	15
	CN8	DETECTOR ASSY., HP (HP sensor)	2
	CN9	DETECTOR ASSY.,PE, REAR	2
	CN 10	DETECTOR ASSY.,PE, PRONT	2
	CN 11	DETECTOR ASSY., PLATEN	2
	CN 12	DETECTOR ASSY., RELEASE	2
	CN 13	DC power input BOARD ASSY., (POWER SUPPLY): (C062 PSB/PSE board)	11
BOARD ASSY., POWER SUP-PLY (C062 PSB/PSE BOARD)	CN 1	AC power input	2
	CN2	DC power output (BOARD ASSY., MAIN): (C062 MAIN board)	11
BOARD ASSY., PANEL (C062 PNL BOARD)	CN 1	BOARD ASSY., MAIN (C062 MAIN board)	12

Table A-2. CN2 BOARD ASSY., MAIN (C062 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	/READY	Ready to receive data
9	I	RXD	Receive data
10	-	NC	No connection
11	0	/RST	Reset
12	0	INH	Inhibit
13	I	/CMREQ	Command request
14	I	/WRRDY	Write ready
15	I	/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	A I	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 BOARD ASSY., MAIN (C062 MAIN)

No.	I/O	Signal Name	Function
1	I	/PAUSE	Pause switch
2	-	/READY	Fixed GND
3	0	TXS	Transmit signal (LED)
4	0	/LDLED	LED data latch
5	0	/CKS	Shift clock
6	0	/LDSW	Load switch data
7	I	RXS	Receive data (switch)
8	-	+5	+5 VDC
9	-	GND	Signal ground
10	-	SHLD	Shield ground
11	I	POWER I	Power switch
12	-	POWER2	Fixed GND

Table A4. CN4 BOARD ASSY., MAIN (C062 MAIN)

No.	I/O	Signal Name	Function
1	0	CRA	MOTOR, CR phase A
2	0	CRB	MOTOR, CR phase B
3	0	CRC	MOTOR, CR phase C
4	0	CRD	MOTOR, CR phase D
5	0	CRCOM	MOTOR, CR common

Table A-5. CN5 BOARD ASSY., MAIN (C062 MAIN)

No.	I/O	Signal Nama	Function
1	0	PFA	MOTOR, PF phase A
2	0	PFB	MOTOR, PF phase B
3	0	PFC	MOTOR, PF phase C
4	0	PFD	MOTOR, PF phase D
5	0	PFCOM	MOTOR, PF common
6	0	PFCOM	MOTOR, PF common

Table A-6. CN6 BOARD ASSY., MAIN (C062 MAIN

No.	I/O	Signal Name	Function
1	0	HD5	Head data 5
2	0	HDI	Head data 1
3	0	HD 13	Head data 13
4	0	HD9	Head data 9
5	0	HD21	Head data 21
6	0	HD17	Head data 17
7	-	COM	Common
8	-	COM	Common
9	-	COM	Common
10	0	HD24	Head data 24
11	0	HD16	Head data 16
12	0	HD 12	Head data 12
13	0	HD8	Head data 8
14	0	HD20	Head data 20
15	0	HD4	Head data 4
16	I	TEMP2	Head temperature
17	-	TEMP 1	+VU

Table A-7. CN7 BOARD ASSY., MAIN (C062 MAIN)

No.	I/O	Signal Name	Function
1	0	HD3	Head data 3
2	0	HD 11	Head data 11
3	0	HD2	Head data 2
4	0	HD 19	Head data 19
5	0	HD7	Head data 7
6	-	COM	Common
7	-	COM	Common
8	-	COM	Common
9	0	HD22	Head data 22
10	0	HD 15	Head data 15
11	0	HD 18	Head data 18
12	0	HD23	Head data 23
13	0	HD 10	Head data 10
14	0	HD14	Head data 14
15	0	HD6	Head data 6

Table A-8. CN8 BOARD ASSY., MAIN (C062 MAIN)

No.	I/O	Signal Name	Function
1	I	CRHOME	DETECTOR ASSY.,HP
2	-	GND	Signal ground

Table A-9. CN9 BOARD ASSY., MAIN (C062 MAIN)

No.	I/O	Signal Name	Function
1	I	PE2	DETCTOR ASSY.,PE, REAR
2	-	GND	Signal ground

Table A.1O. CN10 BOARD ASSY., MAIN (C062 MAIN)

No.	I/O	Signal Name	Function
1	I	PE1	DETECTOR ASSY.,PE,FRONT
2	-	GND	Signal ground

Table A-1 1. CN11 BOARD ASSY.,MAIN(C062 MAIN)

No.	I/O	Signal Name	Function
1	I	GAP	DETECTOR ASSY., PLATEN
2	-	GND	Signal ground

Table A-12. CN12 BOARD ASSY., MAIN (C062 MAIN)

No.	I/O	Signal Name	Function
1	I	LEVER	DETECTOR ASSY., RELEASE
2	-	GND	Signal ground

Table A-13. CN13 BOARD ASSY., MAIN (C062 MAIN)

No.	I/O	Signal Name	Function
1	0	Psc	Power switch signal
2	-	+5	+5 VDC
3	-	+5	+5 VDC
4	-	GND	Signal ground
5	-	GND	Signal ground
6	-	GND	Signal ground
7	-	GND	Signal ground
8	-	GND	Signal ground
9	-	+35	+35 VDC
10	-	+35	+35 VDC
11	-	+35	+35 VDC

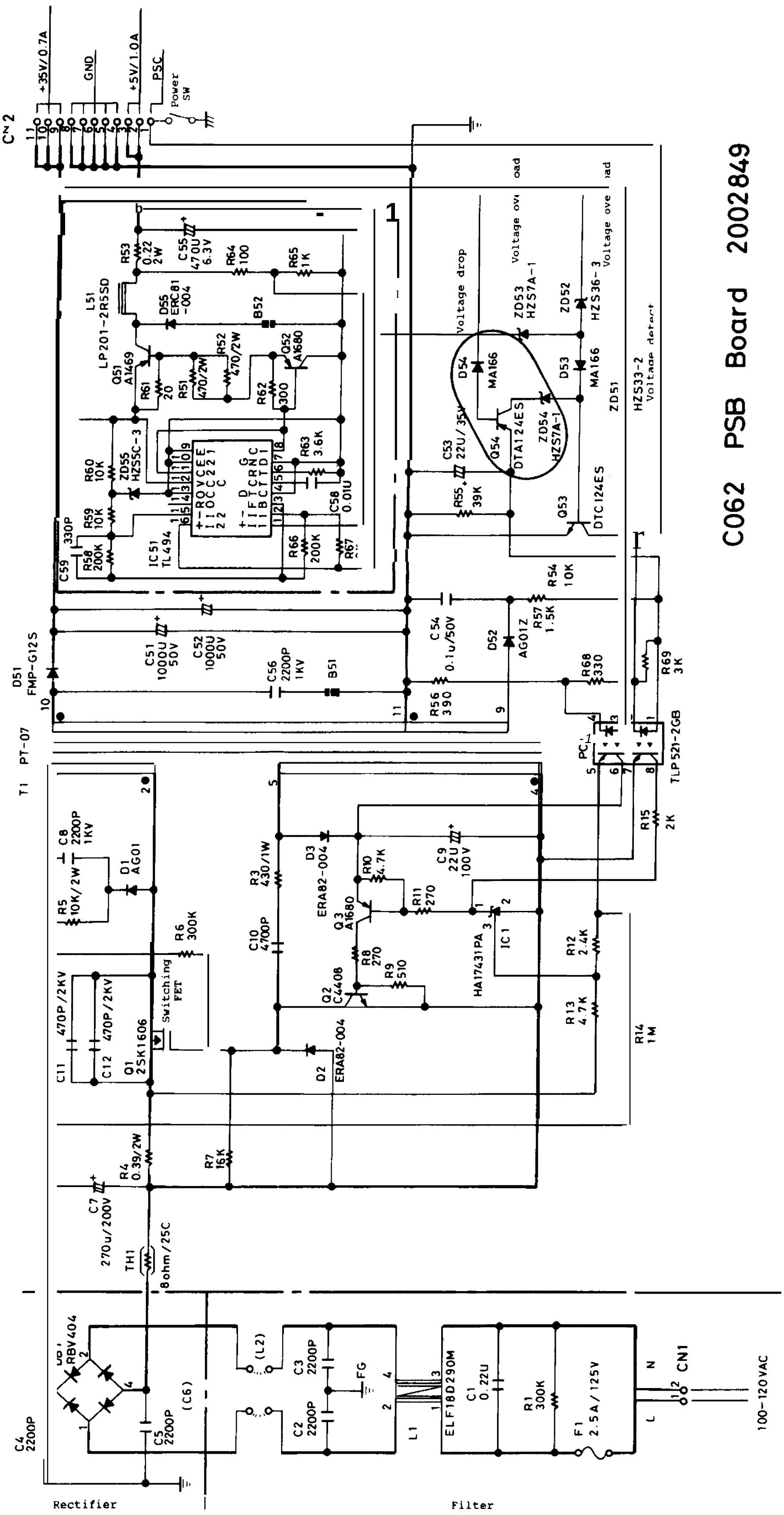


Figure A-4. BOARD ASSY., POWER SUPPLY (C062 PSB BOARD) Circuit Diagram (Annotated)

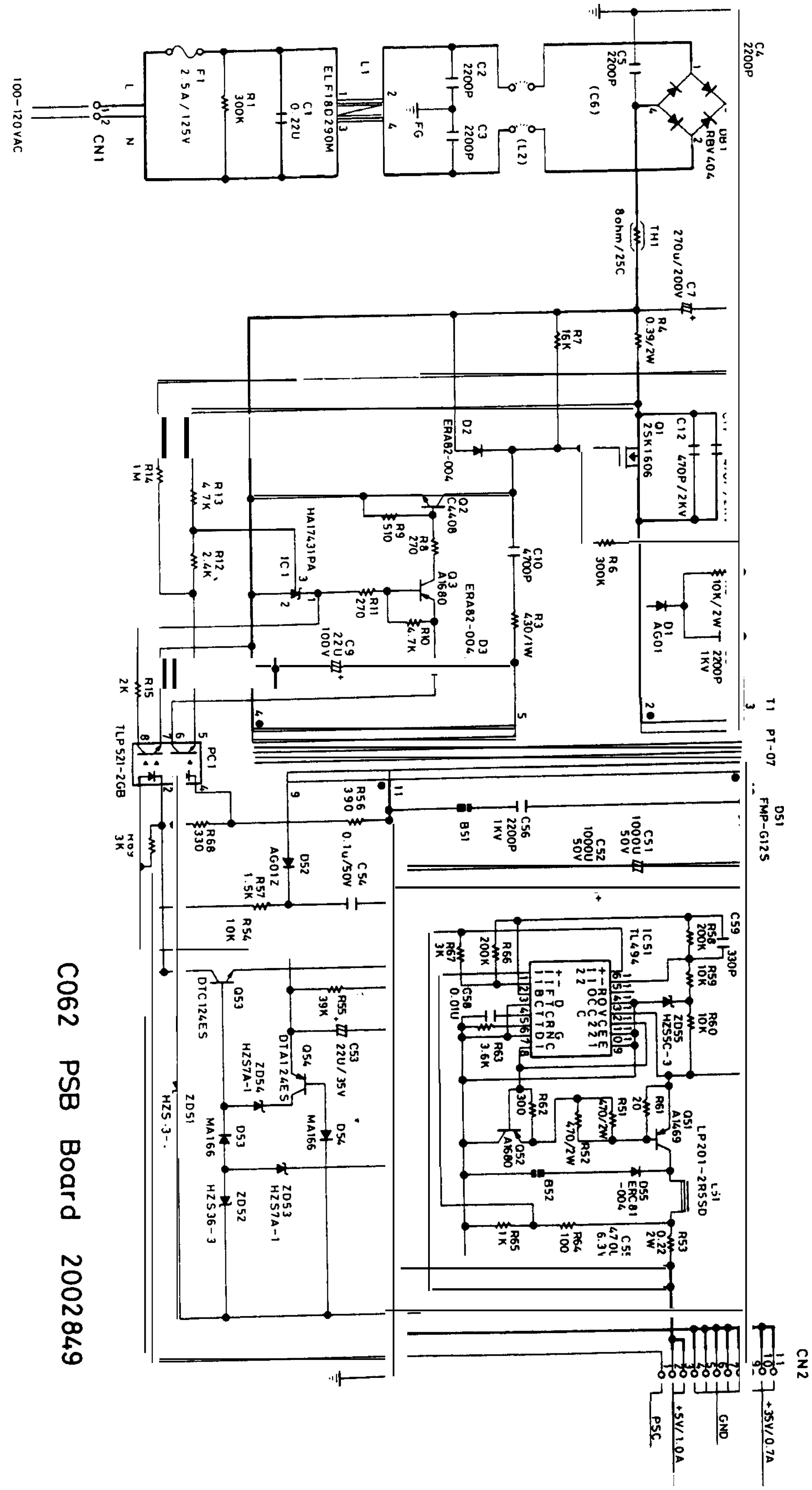


Figure A-5. BOARD ASSY., POWER SUPPLY (C062 PSB Board) Circuit Diagram

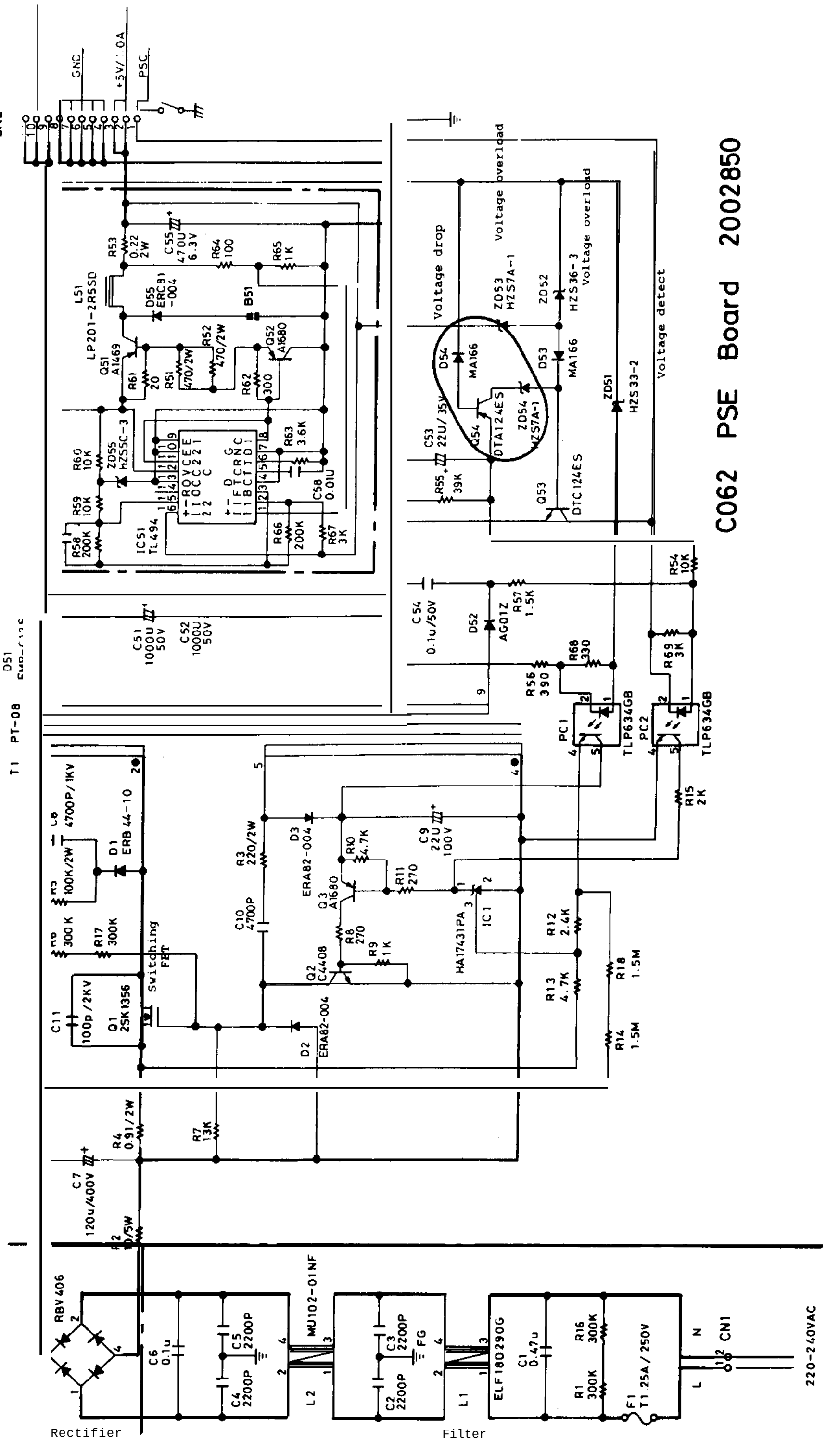


Figure A-6. BOARD ASSY., POWER SUPPLY (C062 PSE BOARD) Circuit Diagram (Annotated) 1

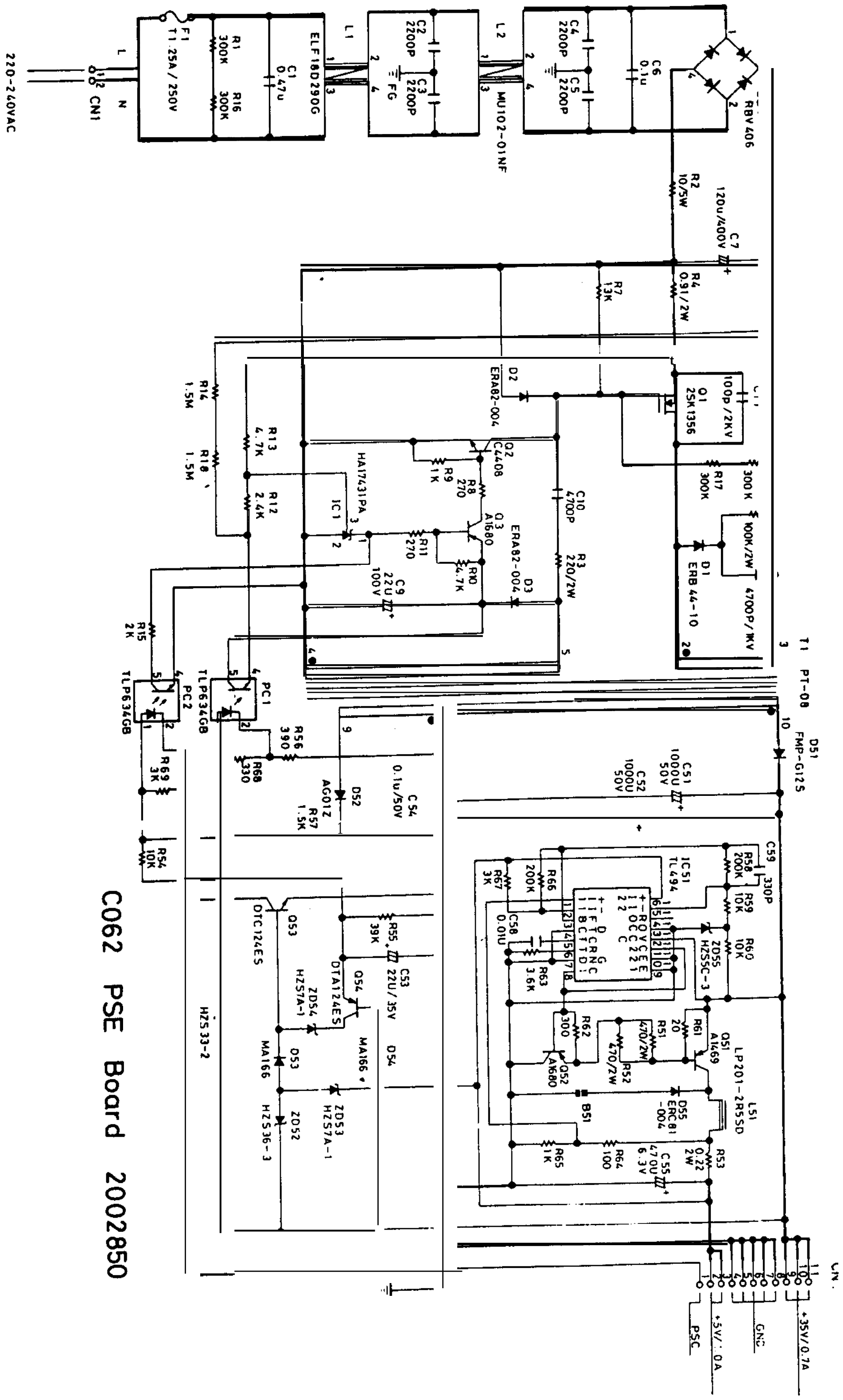
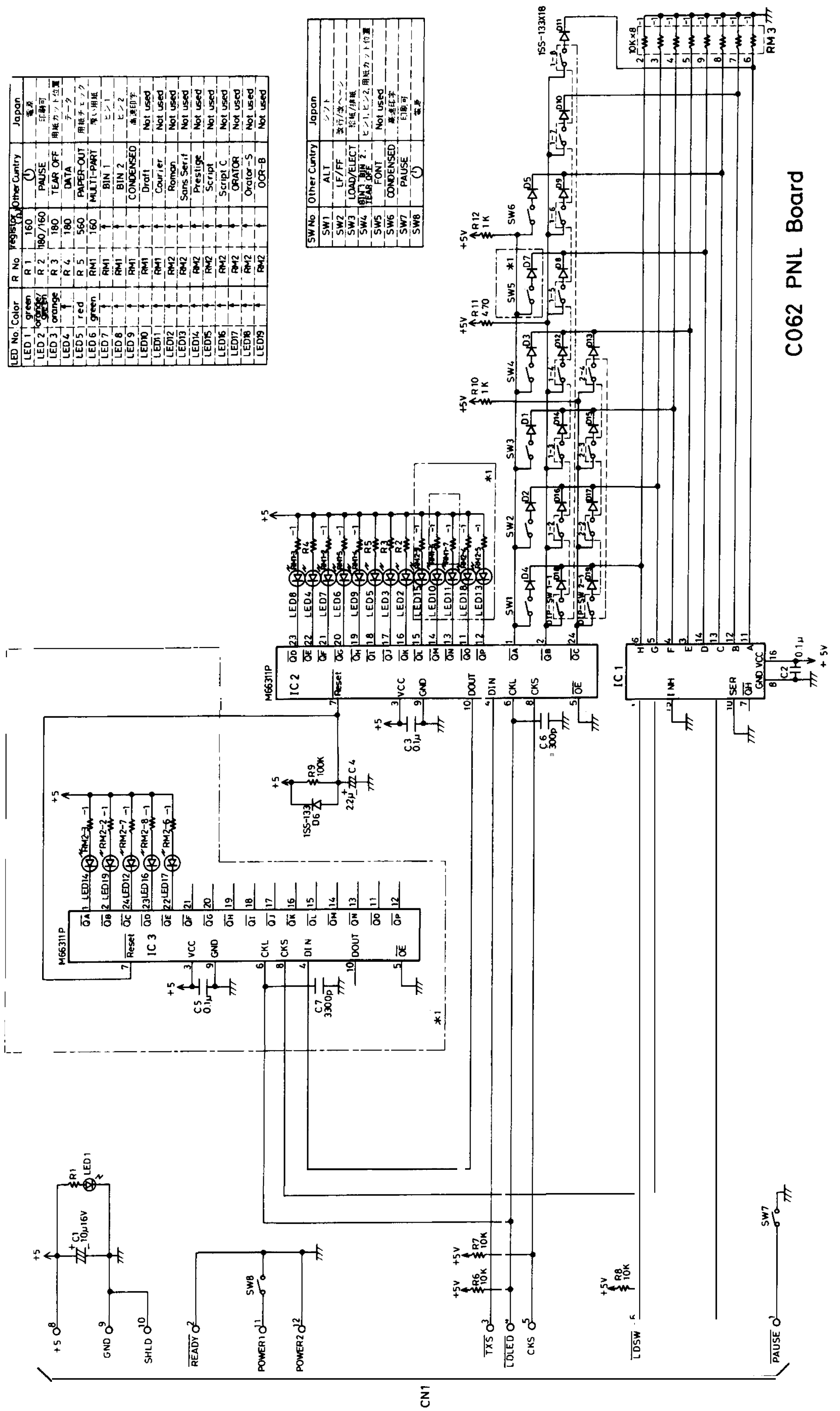


Figure A-7. BOARD ASSY., POWER SUPPLY (C062 PSE Board) Circuit Diagram



LED No.	Color	R No	register (Ω)	Other Cuntry	Japan
LED 1	green	R 1	160	⏻	電源
LED 2	orange/green	R 2	180/160	PAUSE	印刷可
LED 3	orange	R 3	180	TEAR OFF	用紙カット位置
LED 4	↑	R 4	180	DATA	データ
LED 5	red	R 5	560	PAPER-OUT	用紙チェック
LED 6	green	RM1	160	MULTI-PART	厚い用紙
LED 7	↑	RM1	↑	BIN 1	ビン1
LED 8	↑	RM1	↑	BIN 2	ビン2
LED 9	↑	RM1	↑	CONDENSED	高速印字
LED10	↑	RM1	↑	Draft	Not used
LED11	↑	RM1	↑	Courier	Not used
LED12	↑	RM2	↑	Roman	Not used
LED13	↑	RM2	↑	Sans Serif	Not used
LED14	↑	RM2	↑	Prestige	Not used
LED15	↑	RM2	↑	Script	Not used
LED16	↑	RM2	↑	Script C	Not used
LED17	↑	RM2	↑	ORATOR	Not used
LED18	↑	RM2	↑	Orator-S	Not used
LED19	↑	RM2	↑	OCR-B	Not used

SW No.	Other Cuntry	Japan
SW1	ALT	シフト
SW2	LF/FF	改行/改ページ
SW3	LOAD/ELECT	給紙/排紙
SW4	BIN1, BIN 2, TEAR OFF	ビン1, ビン2, 用紙カット位置
SW5	FONT	Not used
SW6	CONDENSED	高速印字
SW7	PAUSE	印刷可
SW8	⏻	電源

Figure A-8. BOARD ASSY., PANEL (C062 PNL BOARD) Circuit Diagram

REV.-B

A-3. CIRCUIT BOARD COMPONENT LAYOUT

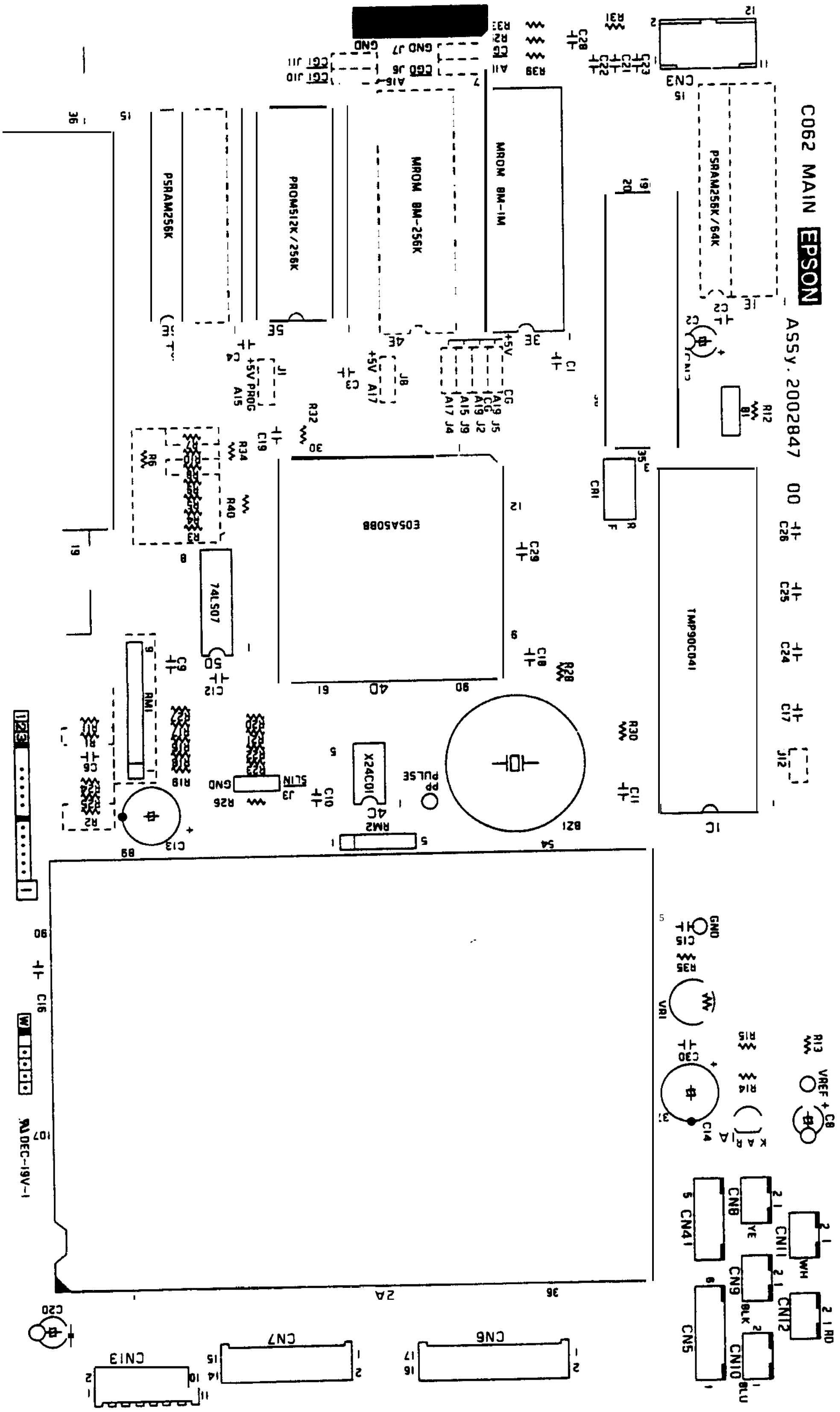


Figure A-9. BOARD ASSY., MAIN (C062 MAIN Board) Component Layout

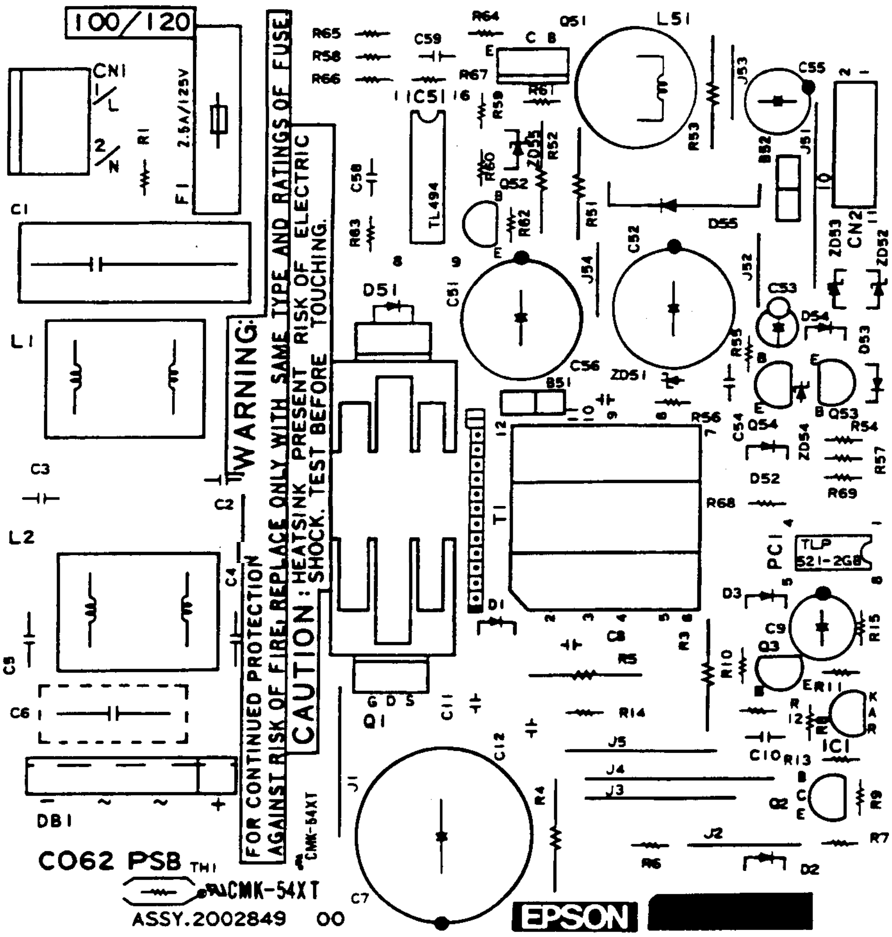


Figure A-10. BOARD ASSY., POWER SUPPLY (C062 PSB BOARD) Component Layout

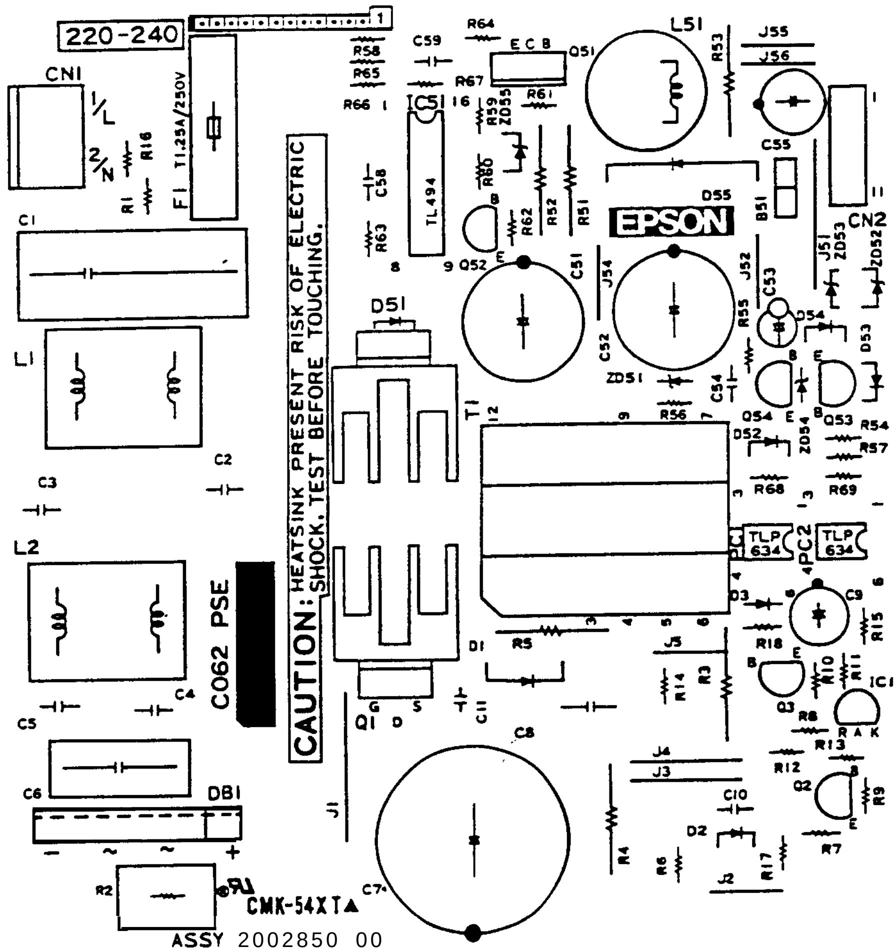


Figure A-1 1. BOARD ASSY., POWER SUPPLY (C062 PSE Board) Component Layout

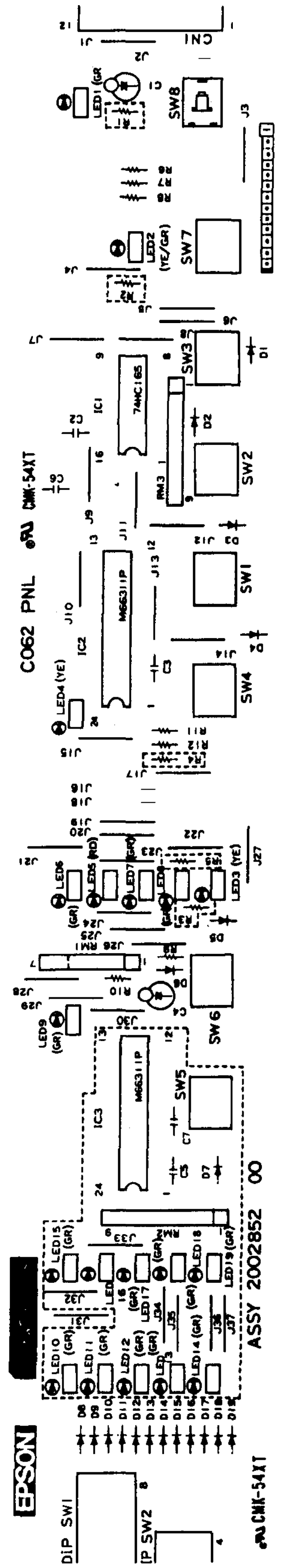


Figure A-1 2. BOARD ASSY., PANEL (C062 PNL BOARD) Component Layout

REV.-A

A.4 EXPLODED DIAGRAM

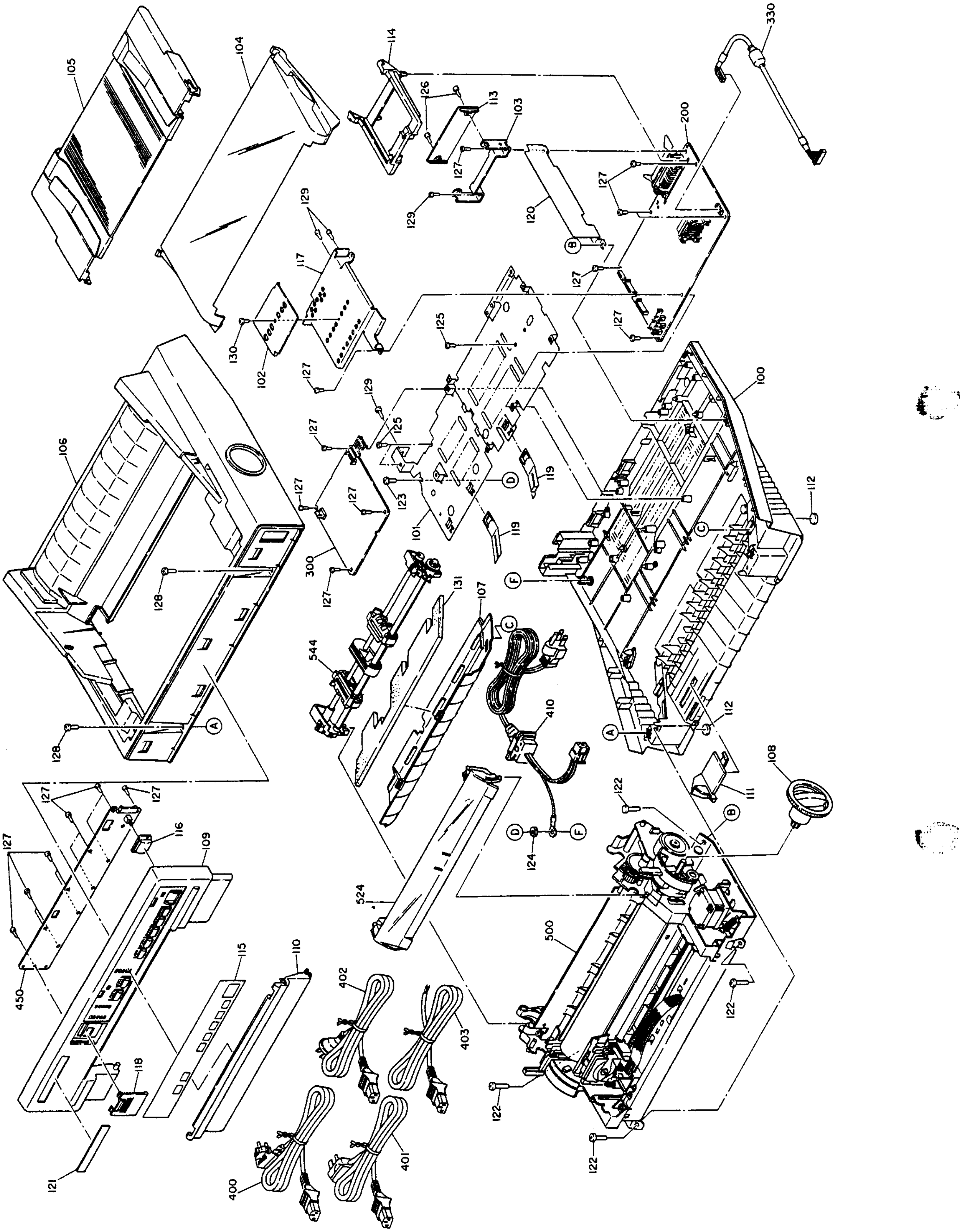


Figure A-1 3. LQ-570 Exploded Diagram

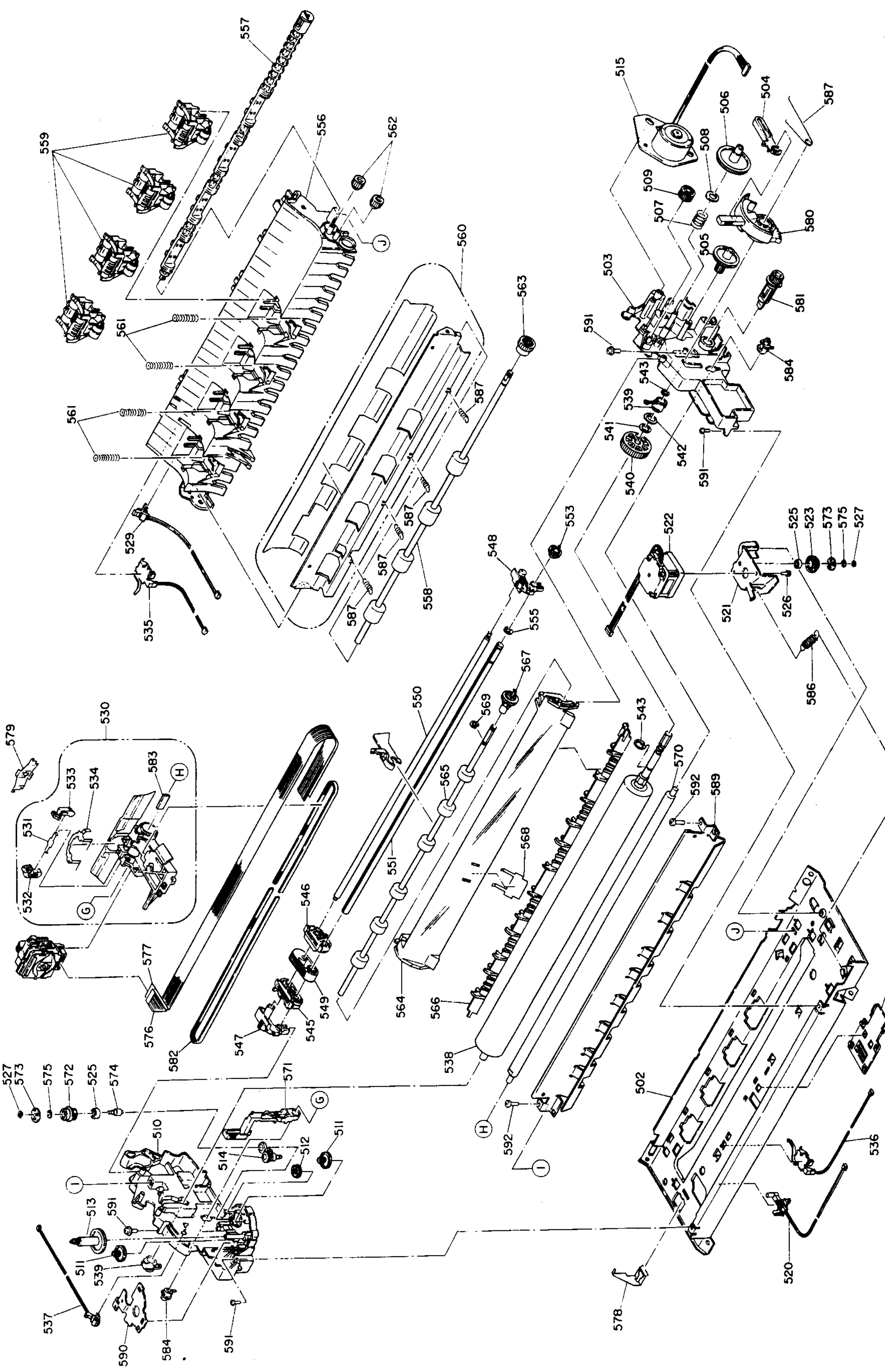


Figure A-16. Model-5E60 Exploded Diagram

Table A-1A Part No. Reference Table

Ref. No.	Description	Ref. No.	Description
100	HOUSING ASSY., LOWER	507	COMPRESSION SPRING, 200
101	SHIELD PLATE, BOTTOM	508	PLAIN WASHER (M5 X 16)
102	HOLDING PLATE, FFC	509	SPUR GEAR, 40
103	GROUNDING PLATE, I/F	510	FRAME, MAIN, LEFT
104	COVER ASSY., PRINTER FRONT	511	COMBINATION GEAR
105	FRAME ASSY., SHEET GUIDE	512	SPUR GEAR, 13.2
106	HOUSING ASSY., UPPER	513	RATCHET, RD
107	PAPER GUIDE, FRONT	514	LEVER ASSY., RIBBON PLANET
108	KNOB	515	MOTOR, PF
109	HOUSING, FRONT	520	DETECTOR, HP
110	COVER, FRONT	521	FRAME ASSY., CR, MOTOR
111	EDGE GUIDE, FRONT	522	MOTOR, CR
112	RUBBER FOOT	523	BELT PULLEY
113	COVER, CONNECTOR, UPPER	524	COVER ASSY., E
114	GUIDE, I/F BOARD	525	BALL BEARING
115	SHEET, PANEL	526	C. B.S.(O) SCREW
116	KEY TOP, POWER SWITCH	527	RETAINING RING TYPE-E(2.3)
117	SHIELD PLATE, MAIN BOARD	529	DETECTOR, RELEASE
118	COVER, DIP SWITCH	530	CARRIAGE ASSY.
119	GROUNDING PLATE ‘	531	HEAD LOCK LEVER SPRING
120	SHIELD PLATE, RIGHT	532	HEAD LOCK LEVER (LEFT)
121	LOGO PLATE	533	HEAD LOCK LEVER (RIGHT)
122	C. B. B-TITE C. SCREW (M4 X 14)	534	GROUNDING PLATE, HEAD
123	C. B.(O) SCREW (M4×8)	535	DETECTOR, PE, REAR
124	HEXAGON NUT (M4)	536	DETECTOR, PE, FRONT
125	C. B. B(C). SCREW(M3×10)	537	DETECTOR, PLATEN
126	C. B. S-TITE C. SCREW (M3×10)	538	PLATEN
127	C. B. B(P). SCREW(M3×12)	539	BUSHING, 8
128	C. B. B(P). SCREW(M4 X 25)	540	SPUR GEAR, 34
129	C. B.A-LAMITITE (M3×6)	541	PLAIN WASHER 8X0.5 X 15
130	C.B. SCREW (M3×6)	542	LEAF SPRING 8.2X0. 15X 15
131	SOUND ABSORBER	543	RETAINING RING TYPE-C
		544	TRACTOR ASSY.
200	BOARD ASSY., MAIN	545	TRACTOR ASSEMBLY (LEFT)
		546	TRACTOR ASSEMBLY (RIGHT)
300	BOARD ASSY., POWER SUPPLY	547	FRAME, TRACTOR, LEFT
301	FUSE	548	FRAME, TRACTOR, RIGHT
302	C.B.S. SCREW (M3×8)	549	PAPER SUPPORT
330	WIRE HERNESS	550	TRACTOR GUIDE SHAFT
		551	SHAFT, TRACTOR
400	POWER CABLE VD3 1303SA-1 OA	552	LEVER, TR, FRAME
401	POWER CABLE (BS3 1303SA-SR)	553	SPUR GEAR, 17
402	POWER CABLE (AS3 1303S1)	554	COMPRESSION SPRING, 150
403	POWER CABLE VDO0303SA-1 OA	555	RETAINING RING TYPE-E(6)
410	POWER CABLE ASSEMBLY	556	PAPER GUIDE
411	POWER CABLE ASSEMBLY	557	SHAFT, RELEASE
412	WIRE HERNESS	558	ROLLER ASSY., PF, DRIVE
450	BOARD ASSY., PANEL	559	LEVER ASSY., PF
		560	PAPER GUIDE ASSY., SUPPORT
500	PRINTER MECHANISM M-5E1O	561	COMPRESSION SPRING, 1300
502	FRAME, MAIN, BASE	562	SPUR GEAR, 11.5
503	FRAME, MAIN, RIGHT	563	SPUR GEAR, 18
504	CAM, CLUTCH, TRACTOR	564	COVER, EJ
505	COMBINATION GEAR, 8.5, 30	565	ROLLER ASSY., EJ
506	SPUR GEAR, 40	566	COVER, PLATEN, UPPER

Table A-14. Part No. Reference Table (Cont.)

Ref. No,	Description	Ref. No,	Description
567	SPUR GEAR, 17		
568	PAPER TENSION SPRING		
569	RETAINING RING TYPE-E(5)		
570	SHAFT, CR, GUIDE		
571	LEVER, G, ADJUST		
572	PULLEY, DRIVEN		
573	BELT PULLEY FLANGE		
574	SHAFT, DRIVEN, PULLEY		
575	PLAIN WASHER 3.2 XO.5 X 7		
576	CABLE, HEAD, FRONT		
577	CABLE, HEAD, REAR		
578	GROUNDING PLATE, CR		
579	RIBBON MASK		
580	LEVER, RELEASE		
581	SHAFT, RELEASE, SUPPORT		
582	TIMING BELT		
583	OIL PAD		
584	BUSH, PARALLEL, ADJUST		
585	HOLDER, HEAD CABLE		
586	EXTENSION SPRING, 778		
587	EXTENSION SPRING, 32		
589	COVER, PLATEN, LOWER		
590	COVER, RD		
591	C. B. S-TITE C.(P2) SCREW (M3 X 10)		
592	C. B. P-TITE C. SCREW (M3x 10)		

A.5 CASE OUTLINE DRAWING

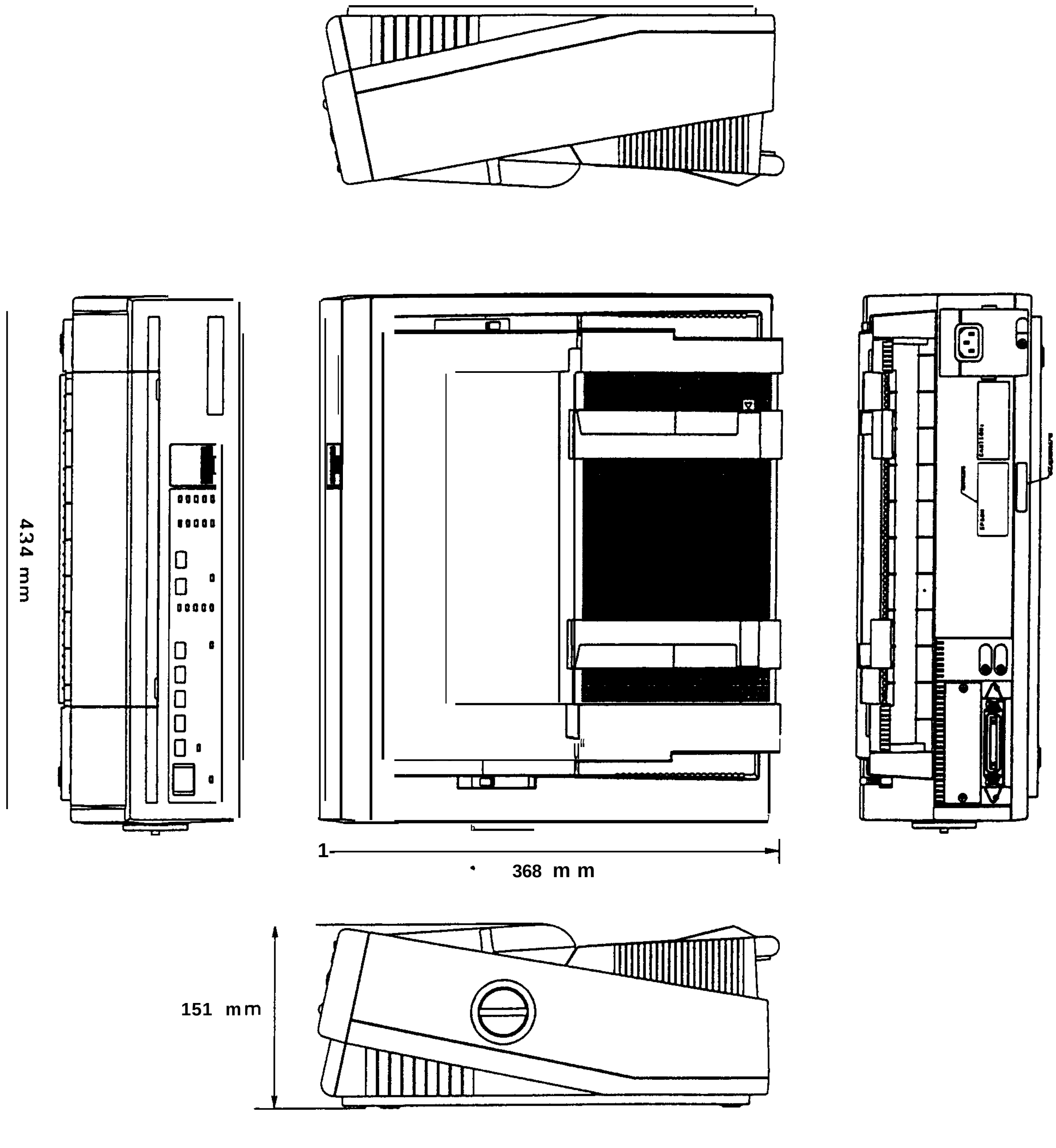


Figure A-1 7. LQ-570 Case Outline Drawing

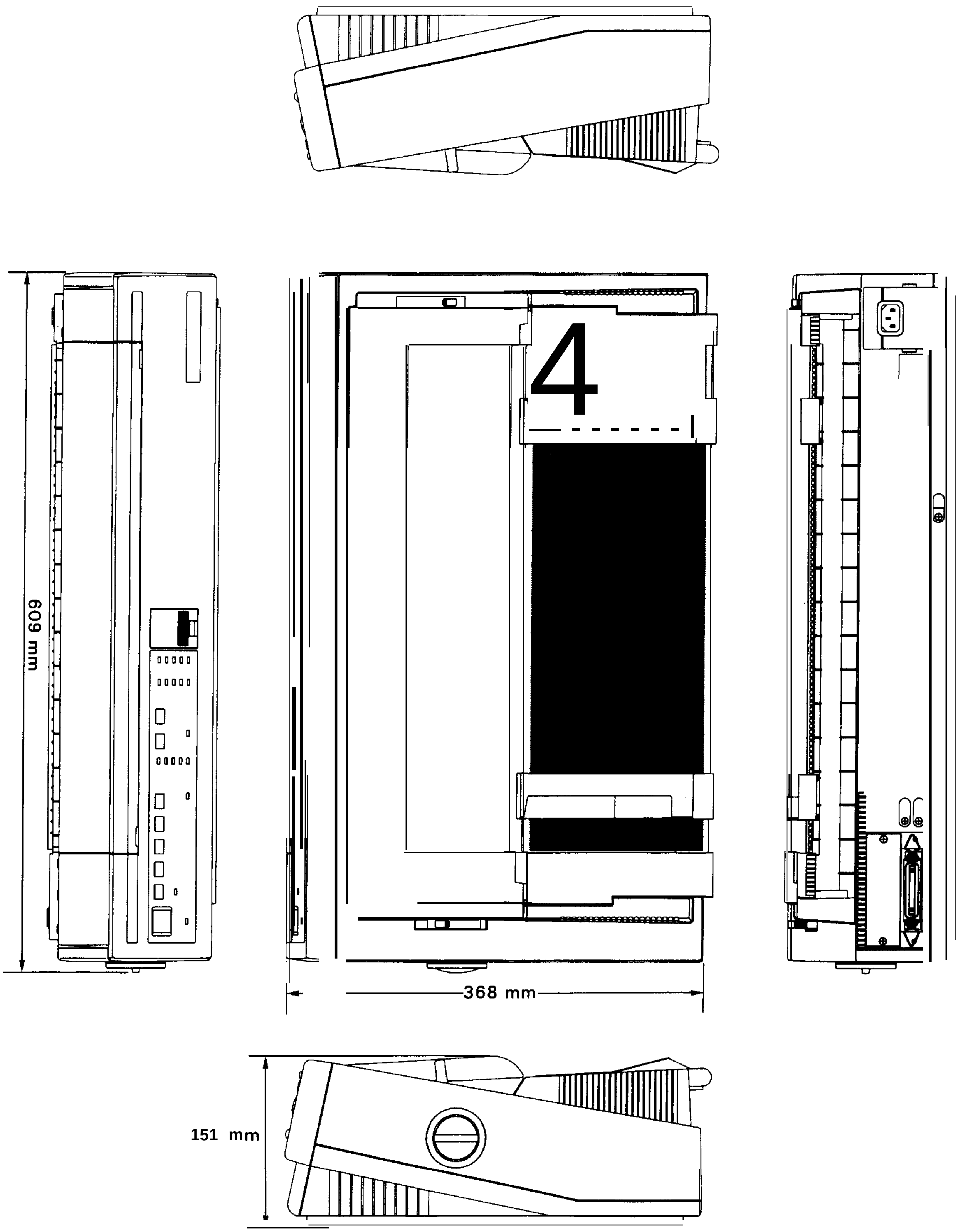


Figure A-1 8. LQ-107O Case Outline Drawing

EPSON

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Addendum

The AP5000 is mechanically and electronically the same as the LQ-570. The AP5500 is mechanically and electronically the same as the LQ-1070.

All the information contained herein is equally applicable to both printers.

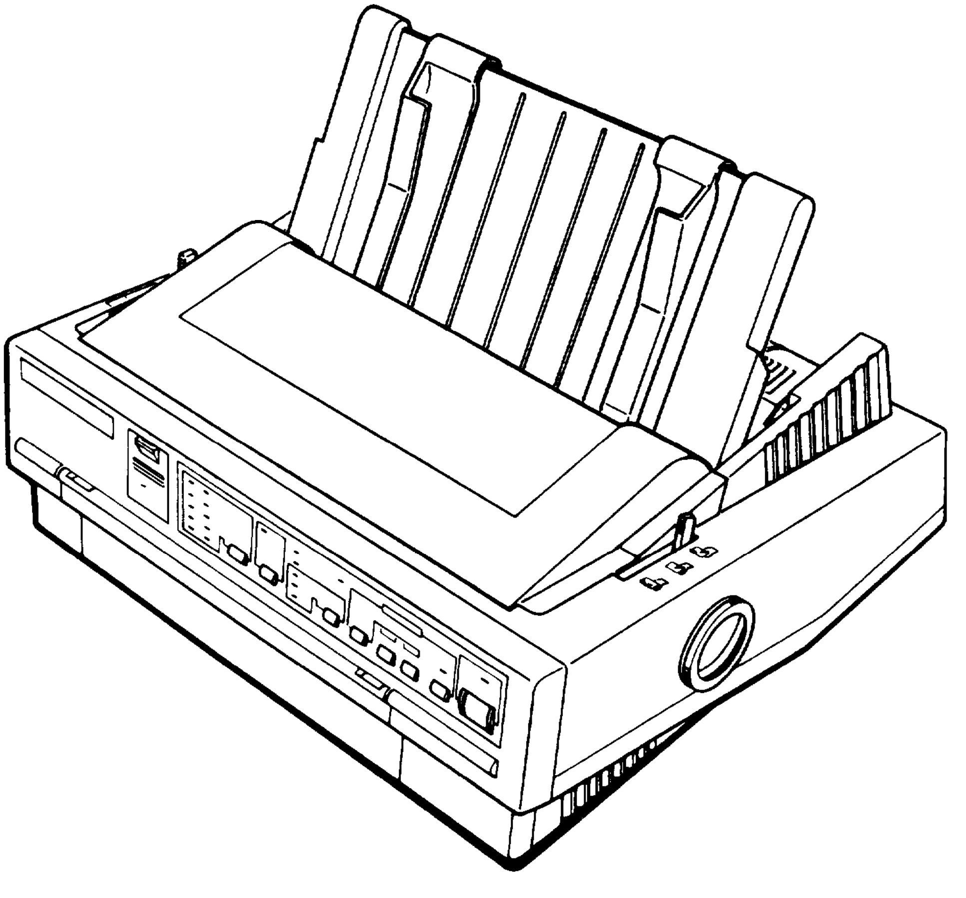
With the exception of a few parts, all parts for the ActionPrinter 5000/5500 are identical to those for the LQ-570/1070. Refer to the parts price list (PL-LQ57AP5) for a list of the unique parts for the Epson ActionPrinter 5000/5500.

EPSON®

Service Manual

LQ-570/1070 ActionPrinter™ 5000/5500

24-PIN DOT MATRIX PRINTERS



EPSON AMERICA, INC.

TM-LQ57AP5

LQ-570/1070

SERVICE MANUAL

EPSON

Printed on Recycled Paper

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 heading.

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 DISCONNECTTHE 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 LQ-570/1070.
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 and lists lubricants and adhesives required to service the equipment.

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

REVISION SHEET

REVISON	DATE ISSUED	CHANGE DOCUMENT
A	June 20, 1991	1st issue
B	July 26, 1991	**Added information for the LQ-1070:** I-i, I-ii, I-l ~ I-8, I-10, I-l 1, I-24, I-26 ~ I-28 2-i, 2-ii, 2-l ~ 2-1 1, 2-13 ~ 2-15, 2-17, 2-18 3-i, 3-ii, 3-5 ~ 3-20 4-i, 4- 1 ~ 4-4, 4-6 5-i, 5-l ~ 5-5, 5-9, 5-1 1 ~ 5-19 6-i, 6-1, 6-4 A-l, A-ii, A-l ~ A-15, A-17 ~ A-19, A-22, A-23

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CHAPTER 1
GENERAL DESCRIPTION

LIST OF FIGURES

LIST OF TABLES

1.1 FEATURES

The LQ-570/1070 are small, light-weight, low-cost, printers with advanced paper handling that is compatible with the LQ-510/550/1010. 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: 225 characters per second (cps) (high-speed draft, 10 characters per inch (cpi))
  252 cps (draft, 12 cpi)
  210 cps (draft, 10 cpi)
  84 cps (LQ, 12 cpi)
  64 cps (LQ, 10 cpi)
- Optional interface card
- Clear, easy-to-read printing with standard EPSON fonts
- Multiple fonts resident in the printer
  9 LQ fonts (Roman, Sans Serif, Courier, Prestige, Script, OCR-B, Script C, Orator, Orator-S)
  1 draft font
- Control panel switch selection of fonts, condensed, and cut-sheet feeder (CSF) bin
- Optional tractor unit for push-pull tractor feed
- Flexible handling of continuous paper
  Three ways to insert continuous paper (front/bottom/rear path)
  Auto backout and auto loading (rear insertion)
  Use of continuous paper without removing CSF
  Attachment of standard tractor unit in either of two positions (push/pull)
- Easy handling of cut sheets with the optional cut-sheet feeder
  Two ways to insert cut sheets (front/top)
  Auto loading

The LQ-570/1070 are equipped with the standard EPSON 8-bit parallel interface. Various interface options ensure compatibility with a wide variety of computers. Table l-l lists the interface options,Table 1-2 lists the optional units available for the LQ-570/1070, and Figure l-l shows an exterior view of the LQ-570/1070.

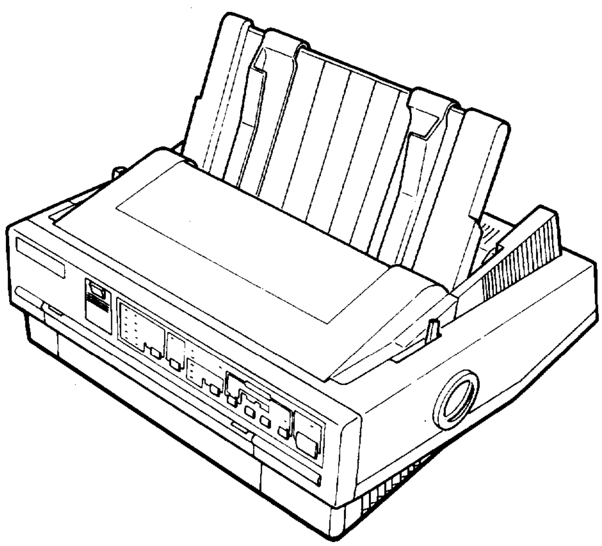
Table l-l. Interface Options

Model	Description
C823051	Serial interface card (inch screw)
C823061	Serial interface card (milli screw)
C823071	32KB serial interface card (inch screw)
C823081	32KB serial interface card (milli screw)
C823101	32KB parallel interface card
C823131	32KB IEEE-488 interface card

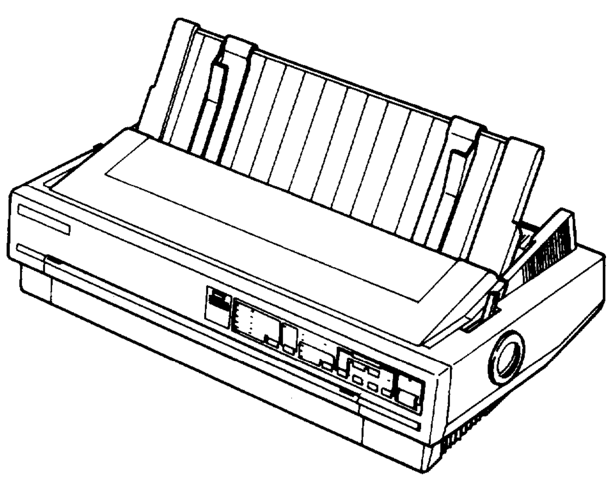
Printing is not possible for the following baud rates : 1800, 200, 134.5, 1 10, 75 bps.
NOTE: Refer to the "Optional Interface Technical Manual" for details.

Table 1-2. Optional Units

Model	Description
c806371	Single-bin cut-sheet feeder (80 column)
C806381	High-capacity cut-sheet feeder (80 column)
C806391	Singl-bin cut sheet feeder (136 column)
C806401	High capacity cut sheet feeder (136 column)
C800191	Tractor unit (80 column)
C800221	Tractor unit (136 column)
7753	Fabric ribbon cartridge (80 column)
7754	Fabric ribbon cartridge (136 column)
7768	Film ribbon cartridge (80 column)
7770	Film ribbon cartridge (136 column)



(LQ-570)



(LQ-1070)

Figure 1-1. Exterior View of the LQ-570/1070

1.2 SPECIFICATIONS

This section provides specifications for the LQ-570/1070 printer.

1.2.1 Hardware Specifications

Printing method	Serial, impact, dot matrix
Pin configuration	24 wires (12 X 2 staggered, diameter 0.2 mm)

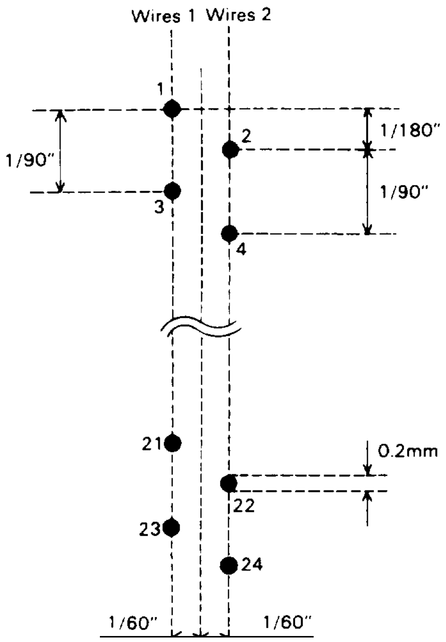


Figure 1-2. Pin Configuration

Feeding methods	Friction feed (front/top)	
	Push tractor feed (rear)	
	Pull tractor feed (front/bottom)	
	Push-pull tractor feed (with optional tractor) (rear)	
Line spacing	1/6 inch, 1/8, or programmable in units of 1/360 inch	
Paper insertion	Friction feed	Front or rear side
	Tractor feed	Front, bottom, or rear side

Paper-feed speed	Friction without CSF	77.6 msec (l/6-inch feed)
		2.2 inches per second (ips) (continuous)
	Friction with CSF	77.6 msec (l/6-inch feed)
		2.2 ips (continuous)
	Tractor	77.6 msec (l/g-inch feed)
		2.2 ips (continuous)

NOTE: The points below provide precautions for handling paper.

1. Friction feed (release lever in FRICTION POSITION).
   - 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.), bottom 22 mm (.87 in.) (top entrance), or bottom 40.2mm (1.6 in.) (front entrance) area.
   - Do not perform reverse feeds greater than 1/6 inch after a paper end has been detected.

- Use the paper tension unit.
- Do not use multi-part cut-sheet forms, except with front insertion.
- **Do not perform reverse feeds greater than 1/6 inch when using envelopes.**

2. Push tractor feed (release lever in REAR PUSH POSITION).
   - Paper must be loaded from the rear entrance.
   - Release the friction-feed mechanism.
   - Multi-part forms must be spot pasted beyond the perforation between the tractor holes.
   - Paper for multiple copies must be carbonless multi-part paper.
   - Use the paper tension unit.
   - Do not perform reverse feeds greater than 4/1 5 inch.
   - Since accuracy of paper feed cannot be assured after the paper end has been detected, please do not perform reverse feeding after detection of a paper end.

3. Push-pull tractor feed (release lever in REAR PUSH POSITION).
   - Paper must be loaded from the front, rear, or bottom entrance.
   - Release the friction-feed mechanism.
   - Remove the paper tension unit and 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 sprockets.
   - Paper for multiple copies must be spot pasted beyond the perforation between the tractor holes.
   - Paper for copies must be a carbonless multi-part paper.
   - Do not perform reverse feeds greater than 4/1 5 inch.
   - **Do** not perform a reverse feed after the paper end has been detected.

4. Pull tractor feed (release lever in PULL POSITION).
   - Paper must be loaded from the front or rear entrance.
   - Release the friction-feed mechanism.
   - Remove the paper tension unit and attach the pull tractor unit.
   - Insert the paper from either front or bottom.
   - Paper for multiple copies must be spot pasted beyond the perforation between the tractor holes.
   - Paper for copies must be a carbonless multi-part paper.
   - Do not perform reverse feeds.

Paper specifications See tables I-3, I-4, 1-5, I-6, and I-7

Table I-3. Specifications for Cut Sheets (One-Part Paper)

Width	148 mm to 257 (“420) mm (5.8 in. to 10.1 (16.5) in.) (top insertion) 182 mm to 257 (*364) mm (7.2 in. to 10.1 (16.5) in.) (front insertion)
Length	364 mm (14.3 in.), maximum
Thickness	0.065 mm to 0.14 mm (0.0025 in. to 0.0055 in.)
Weight	14 lb to 24 lb (52.3 g/m² to 90 g/m²)
Quality	Standard paper (photocopier paper, etc.) Recycled paper (at normal temperatures)

(* 136 column)

Table 1-4. Specifications for Cut Sheets (Carbonless Duplicating Paper)

Width	182 mm to 2 16 ('364) mm (7.2 in. to 8.5 ('I 4.3) in.)
Length	257 mm to 297 mm (10.1 in. to 11.7 in.)
Thickness	0.065 mm to 0.14 mm (0.0025 in. to 0.0055 in.)-single sheet 0.12 mm to 0.32 mm (0.0047 in. to 0.012 in.)- total
Weight	17 lb to 24 lb (52.3 g/m² to 90 g/m²) – single sheet 12 lb to 15 lb (40 g/m² to 58 g/m*) – each
Quality	Carbonless duplicating paper
Copies	4 sheets (1 original and 3 copies)

(*:136 column)

Table 1-5. Specifications for Continuous Paper

Width	101 mm to 254 ('406) mm (4.0 in. to 10.0 ("16) in.)
Thickness	0.065 mm to 0.10 mm (0.0025 in. to 0.0039 in.)-single sheet 0.065 mm to 0.32 mm (0.0025 in. to 0.012 in.) – total
Weight	14 lb to 22 lb (52.3 g/m² to 82 g/m²) – single sheet 12 lb to 15 lb (40 g/m² to 58 g/m*) – each
Quality	Standard paper or carbonless duplicating paper Recycled paper (at normal temperatures)
Copies	4 sheets (1 original and 3 copies)

(*:136 column)

Table l-6. Envelopes

Size	No. 6= 166 mm X 92mm No. 10= 240 mm X 104 mm
Thickness	0.16 mm to 0.52 mm (0.0063 in. to 0.0 197 in.) Differences in thickness within the printing area must be less than 0.25 mm (0.0098 in.)
Weight	12 lb to 24 lb (40 g/m² to 9 1 g/m²)
Quality	Bond paper, standard paper, airmail
Copies	Not available

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.

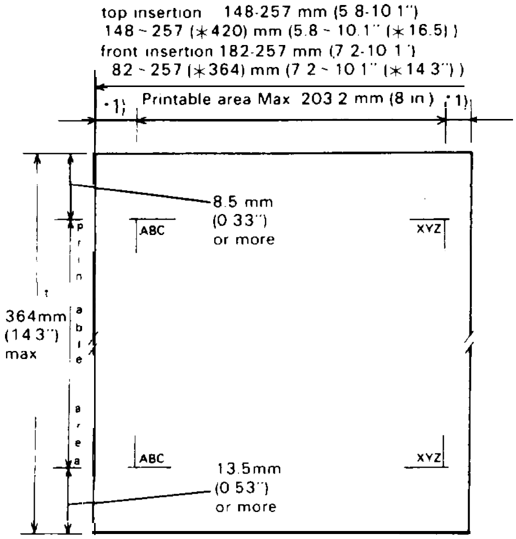
Table 1-7. Label Specifications

Label size	2 1/2 in. X 15/16 in. 4 in. X 15/16 in. 4 in. × 1 7/16 in.
Copies	Not available
Thickness	0.07 mm to 0.09 mm (0.0028 in. to 0.003 1 in.) – base paper 0.16 mm to 0.19 mm (0.0063 in. to 0.0075 in.)- total

NOTES:
- Printing on labels is available only at normal temperatures.
- Labels must be of the fanfold type.
- Labels with pressure sensitive paper must be spot pasted beyond the perforation between the tractor holes. The total thickness must be less than or equal to 0.3 mm (0.01 18 in.). Labels can be printed out only if the temperature is between 5 and 35 degrees C (41 and . 95 degrees F) and humidity is between 10 % and 80 % RH.
- Examples of labels AVERY CONTINUOUS FORM LABELS
  AVERY MINI-LINE LABELS
- Labels must be used with the **pull tractor (front or bottom).**
- **Do not perform reverse feeds.**

Printable area

See figures 1-3, I-4, and I-5



(*: 136 column)

(80 column):

. 1) 3.0 mm (0.12 in.) or more when paper width is less than 229 mm (9 in.).
24 mm (0.9 in.)(top insertion)/26 mm (1 .O in.)(front insertion) or more when paper width is 229 mm (9.0 in.) to 257 mm (10.1 in.).

(136 column:)
3.0 mm (0.12 in.) or more when the width of paper is less than 392 mm (15.4 in.). 29 mm (1.14 in.) (top insertion) /31 mm (1.22 in.) (front insertion) or more when the width of paper is 392 mm (15.4 in.) to 420 mm (16.4 in.).

- Paper-feed accuracy cannot be assured within 22 mm (0.87 in.) from the bottom edge of paper (top insertion)
  Paper-feed accuracy cannot be assured within 40.2 mm (1.58 in.) from the bottom edge of paper (front insertion)
  Paper-feed accuracy cannot be assured within 22 mm (0.87 in.) from the top edge of paper.

Figure 1-3. Printable Area for Cut Sheets

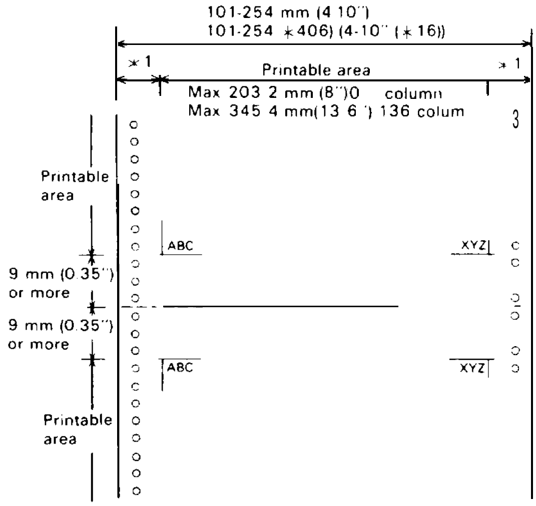


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Figure 1-4. Printable Area for Continuous Sheets

(80 column):

* 1) 13 mm (0.5 1 in.) or more when a paper width of 101 mm (4 in.) to 24 1 mm (9.5 in.) is used. 24 **mm** (0.9 in.)(rear insertion)/ 26 mm (1.0 in.) (front/bottom insertion) or more when a paper width of **254** mm (10 in.) is used.

(136 column):

13 **mm (0.51 in.) or more using a paper width of 101 to 401.3 mm (4 to 15.8 in.).**
15 mm (0.6 in.) or more using a paper width of 381 to 406 mm (15 to 16 in.).
13 mm (0.51 in.) (rear insertion) / 17 mm (0.67 in.) (front/bottom insertion) or more using a paper width Of 406 mm (16 in.)

Ink ribbon	Type #7753 Black ribbon cartridge (80 column) #7768 Film ribbon cartridge (80 column) #7754 Black ribbon cartridge (136 column) #7770 Film ribbon cartridge (136 column)
	Color Black
	Life 2 million characters at 48 dots/character (black ribbon) (80 column) 0.2 million characters at 48 dots/character (film ribbon) (136 column) 0.3 million characters at 48 dots/character (film ribbon)
	Dimensions of ribbon cartridge Fabric Type: (80 column): 293 mm(W) X 34 mm(H) × 72 mm(D) (136 column): 468.3 mm(W) X 34 mm(H) × 72 mm(D) Film Type: (80 column): 293 mm(W) X 34 mm(H) X 72 mm(D) (136 column): 468.5 mm(W) X 34 mm(H) X 72 mm(D)
Reliability	Mean cycles between failures (MCBF) 3 million lines (excluding printhead) Mean time between failures (MTBF) 4000 power on hours (POH) (25% duty)
Life of printhead	200 million strokes (black ribbon) 100 million strokes (film ribbon)
Safety approvals	Safety standards UL1950 with D3 (U.S. version) CSA22.2#220 EN 60950 (TUV) (European version)
	Radio frequency interference (RFI) FCC class B (U.S. version) VDE087 1 (self-certification) (European version)

Electrical specifications — 120 V version

Rated voltage	**120 VAC**
Input voltage range	**103.5** to 132 VAC
Rated frequency	**50 to 60 Hz**
Input frequency	49.5 to 60.5 Hz
Rated current	**2.0** A
Power consumption	Approx. 33 W (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 VAC rms for 1 minute or 1200 VAC rms for 1 second (between AC line and chassis).**

	220 to 240 V version	Rated voltage	220 to 240 VAC
		Input voltage range	198 to 264 VAC
		Rated frequency	50 to 60 Hz
		Input frequency	49.5 to 60.5 Hz
		Rated current	1.0 A
		Power consumption	Approx. 33 W (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 VAC rms 1 minute or 1500 VAC rms 1 second (between AC line and chassis)

Environmental conditions	Temperature	5 to 35 degrees C (41 to 95 degrees F)-operating -30 to 60 degrees C (-22 to 140 degrees F) – in shipment container
	Humidity	10 to 80 % RH -operating 5 to 85 % RH -storage
	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 (80 column):

Weight	6.1 kg, approx. (13.5 pounds, approx.)
Dimensions	434 mm (width) X 368 mm (depth) X 151 mm (height) 17.4 in. (width) X 14.7 in. (depth) X 6 in. (height)

(136 column):

Weight	8.4 kg, approx. (18.6 pounds approx.)
Dimension	609 mm (width) X 368 mm (depth)X 151 mm (height) 24.4 in. (width X 14.7 (depth) X 6 in. (height)

1.2.2 Firmware Specifications

Control code	ESC/P™ level ESC/P 2 (EPSON standard code for printers)
Printing direction	Bidirectional with logic seeking
Input data buffer	8KB (when SW I-7 is OFF) OKB (when SW I-7 is ON)
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	EPSON Roman 10, 12, 15, proportional EPSON Sans Serif 10, 12, 15, proportional EPSON Courier 10, 12, 15 EPSON Prestige 10, 12 EPSON Script 10, 12 EPSON Script C proportional OCR-B 10 EPSON Orator 10 EPSON Orator-S 10 EPSON Draft 10, 12, 15
Scalable fonts	EPSON Roman 8 pt to 32 pt EPSON Sans Serif 8 pt to 32 pt
Printing modes	Selection and mixture of the following modes are allowed, excluding 15 cpi condensed mode: 0 Print quality (draft/letter quality) 0 Character pitch (10, 12, 15, or proportional) 0 Condensed 0 Double-width 0 Double-height 0 Emphasized 0 Double-strike 0 Italic 0 Underlined 0 Double-underlined 0 Overscore 0 Strike-through 0 Outline 0 Shadow

NOTES: High-speed draft is valid if the printer status is as follows:

- High-speed draft is selected by DIP switch.
- Emphasized character mode is not selected.
- Condensed character mode is not selected.
- Draft is selected.
- No D/L (download) characters are sent to the printer.
- The horizontal dot space of characters is not set.
- No bit image is sent to the printer.
- Super/subscript is not selected.

(The printer switches back into normal mode to print emphasized, condensed, or download characters and bit images.)

Printing speed	See tables I-8 and I-9.
Printing columns	See Table 1-8.
Character matrix	See Table I-IO.
Character size	See Table I-10.

Table 1-8. Printing (Text Mode)

Print Pitch	Condensed	Printable Columns	Character Pitch (cpi)	Printing Speed (cps)		
				Draft	LQ	HSD
10	0	80 (*136)	10	210	70	225
	1	137 (*233)	17.1	180	120	—
12	0	96 (*164)	12	252	84	—
	1	160 (*272)	20	210	140	—
15	0	120(*204)	15	315	105	—
	1	Invalid				

(*: 136 column)

cpi: characters per inch
cps: characters per second
LQ: letter quality
HSD: high-speed draft

Table 1-9. Printing (Bit Image Mode)

Pins	Bit Image Printing Mode	Density (dpi)	Printable Dots	Printing Speed (ips)
8	Single-density	60	480(*816)	21.0
8	Dual-density	120	960(*1632)	10.5
8	Double-speed, dual-density	120	960(*1632)	21.0
8	Quadruple-density	240	1920(*3264)	10.5
8	CRT graphics	80	640(*1088)	10.5
8	CRT graphics II	90	720(*1224)	14.0
24	Single-density	60	480(*816)	21.0
24	Dual-density	120	960(*1632)	10.5
24	CRT graphics II	90	720(*224)	14.0
24	Triple-density	180	1440(*2448)	7.0
24	Hex-density	360	2880(*4896)	7.0

(*: 136 column)

dpi: dots per **inch**
ips: inches per second

Table I-10. Character Matrix and Character Size

Printing Mode	Face Matrix	HDD	Character Size	Unit ESC sp
High-speed draft, 10 pitch	7 × 22	90	2.0 × 3.1	—
Draft, 10 pitch	9 × 22	120	1.9 × 3.1	120
Draft, 12 pitch	9 × 22	120	1.9 × 3.1	120
Draft, 15 pitch	7 × 16	120	1.0 × 2.3	120
Draft, 10 pitch, condensed	—	240	—	120
Draft, 12 pitch, condensed	—	240	—	120
LQ, 10 pitch	31 × 22	360	2.2 × 3.1	180
LQ, 12 pitch	27 × 22	360	1.9 × 3.1	180
LQ, 15 pitch	22 × 16	360	1.6 × 2.3	180
LQ, 10 pitch, condensed	—	360	—	180
LQ, 12 pitch, condensed	—	360	—	180
LQ, proportional	Max. 37 × 22 Min. 18 × 22	360 360	2.6 × 3.1 1.0 × 3.1	180
LQ, proportional, condensed	— —	360 360	— —	180
LQ, proportional, super/subscript	Max. 28 × 16 Min. 12 × 16	360 360	1.8 × 2.3 0.7 × 2.3	180
LQ, proportional, super/subscript, condensed	— —	360 360	— —	180

NOTES:
- HDD is horizontal dot density in dots per inch.
- Face matrix and character size indicate the size of the maximum character. This value is dependent on paper, ribbon, 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 with the ESC sp control code.
- "—" indicates that the character matrix is reshaped by printer firmware. Character width becomes half of the noncondensed character width.

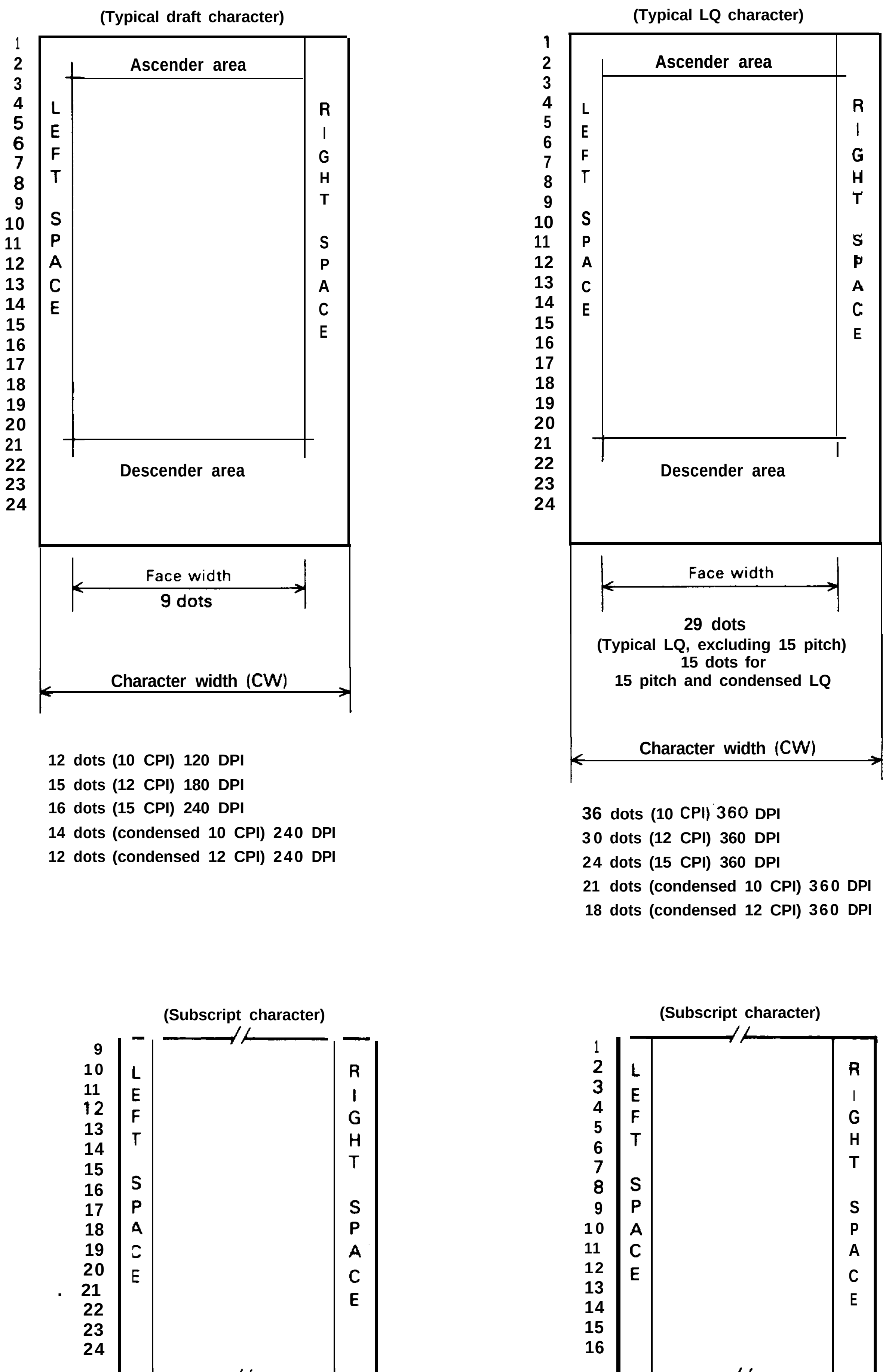


Figure 1-5. Character Matrix

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 l-6.

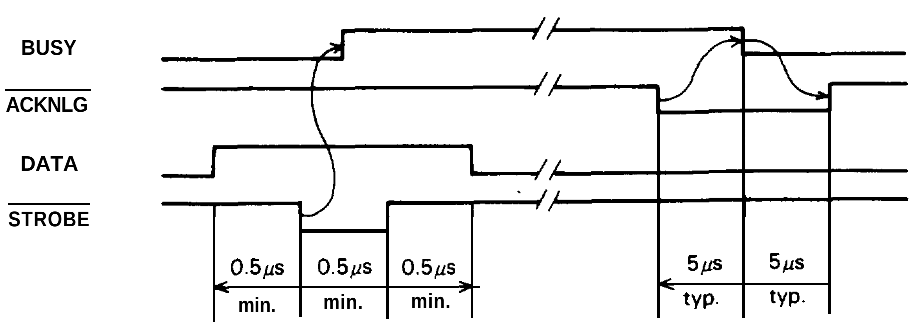


Figure 1-6. Data Transmission Timing

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

Table l-l 1. 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 3 4 5 6 7 8 9	DATA 1 DATA 2 DATA 3 DATA 4 DATA 5 DATA 6 DATA 7 DATA 8	20 21 22 23 24 25 26 27	IN IN IN IN IN IN IN IN	Parallel input data to the printer. HIGH level means data 1. LOW level means data 0.
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 1 1μs.
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 I-I 1. 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	$\overline{\text{INIT}}$	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	DC1/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 3.
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: a power button (labeled OPERATE), 7 non-lock type buttons, and 19 indicators.

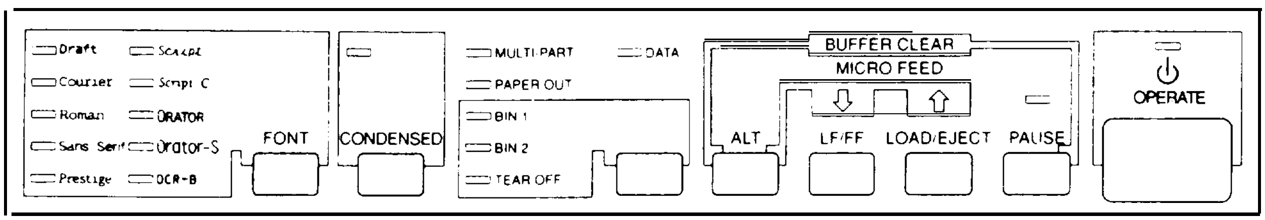


Figure 1-7. Control Panel

BUTTONS

(1) OPERATE Button
This button turns on the power supply to the printer.

(2) PAUSE Button
This button controls printer action. Pressing the button toggles the printer between PAUSE condition (no printing, no paper feeding, and not accepting data) and RUNNING. This button is also used in conjunction with the ALT button as a buffer clear to clear the input buffer and perform software initialization, as if ESC @ had been received.

(3) LINE FEED/FORM FEED Button
Pressing this button performs a line feed, and holding down the button performs a form feed, irrespective of the PAUSE/RUNNING condition. This button is also used in conjunction with the ALT button as the micro reverse feed.

(4) LOAD/EJECT Button
Pressing this button loads or ejects the paper. Refer to Section 1.6.8, Sheet Loading and Sheet Ejection. This button is also used in conjunction with the ALT button as the micro forward feed.

(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 lit. In friction-feed mode, pressing this button toggles between bin 1 and bin 2, and the selected BIN indicator is lit.

(6) ALT Button
This button is used only in combination with another button.

(7) FONT Button

Pressing this button selects a font, and pressing it continuously selects the next one, sequentially. The FONT LED indicates the currently selected font.

(8) CONDENSED Button

Pressing this button toggles the printing mode between normal and condensed, alternatively.

NOTE: Selections of the FONT and CONDENSED buttons are stored as defaults, so that the last FONT and the CONDENSED selection become effective when the printer is initialized.

INDICATORS

(1) OPERATE (green)

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

(2) PAUSE (orange)

Lit when the printer is in PAUSE mode (no printing, no paper feeding, and not accepting data).

(3) TEAR-OFF (orange)

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

(4) DATA (orange)

Lit when the printer has received data from the host.

(5) PAPER-OUT (red)

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

(6) MULTI-PART (green)

Lit when the adjust lever is positioned at the 4th step or higher.

(7) BIN 1 (green)

Lit when bin 1 is selected.

(8) BIN 2 (green)

Lit when bin 2 is selected

(9) FONT (green) – Draft, Courier, Roman, Sans Serif, Prestige, Script, Script C, Orator, Orator-S, OCR-B

These indicators show the currently selected font.

(10) CONDENSED (green)

Lit when condensed mode is selected.

1.5 DIP SWITCHES AND JUMPER SETTING

This section describes the DIP switch selections and jumper setting for the LQ-570 printer.

1.5.1 DIP Switch Settings

The two DIP switch banks for the printer, located on control panel, function as shown in tables l-l 2 through l-l 5. (Note that the status of the DIP switches is read only at power on or upon receipt of the INIT signal.)

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

No.	Description	ON	OFF	Factory Setting
1 2 3	International character set and PC selection	See Table l-l 4.		ON ON ON
4	Character table selection	Graphic	Italic	OFF
5	Graphic print direction	Unidir.	Bidir.	OFF
6	High-speed draft	Invalid	Valid	OFF
7	Input buffer	Invalid	Valid	OFF
8	l-inch skip continuous paper	ON	OFF	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 l-l 5.		OFF OFF
3	Auto tear-off	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	U.S.	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 l-4 is OFF,
If graphic table was selected by
ESC t 1, PC becomes 437.

When SW 1-4 is ON,
if italic table was selected by
ESC t 0, country setting becomes U.S.

Table l-l 5. Page Length

2-l	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 3 is connected to GND, the $\overline{\text{SLCT-IN}}$ signal is fixed to LOW

1.6 OPERATING INSTRUCTIONS

This section describes the self-test and hexadecimal dump functions and also includes 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 LOAD/EJECT button. To run the self-test using the letter quality (LQ) mode, turn the printer on while pressing the LINE FEED/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.

```
XXXXXX
Country/PC      SW1-1 1-2 1-3 1-4    High speed draft SW1-6
  U.S.A.          on   on  on  off     Valid              off
  France          on   on  off off     Invalid            on
  Germany         on   off on  off   Receive buffer     SW1-7
  U.K.            on   off off off     Valid              off
  Denmark         off  on  on  off     Invalid            on
  Sweden          off  on  off off   1 inch skip        SW1-8
  Italy           off  off on  off     Invalid            off
  Spain           off  off off off     [illegible]        on
  PC 437          on   on  on                           SW2-1 2-2
  [illegible]     [illegible]                               off off
```

Figure 1-B. Self-Test Printout

1.6.2 Hexadecimal Dump Function

To put the printer in hex. dump mode, power it on while pressing both the LOAD/EJECT and LINE FEED/FORM FEED buttons. In hex. dump mode, the printer prints out the hexadecimal representation of the input data, along with the corresponding ASCII characters. This function is valuable 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.

```
1B 40 1B 52 00 1B 74 01 1B 36 12 1B 50 1B 70 00   .@.R..t..6..P.p.
20 20 54 68 69 73 20 69 73 20 61 6E 20 65 78 61     This is an exa
6D 70 6C 65 20 6F 66 20 61 20 64 61 74 61 20 64   mple of a data d
75 6D 70 20 70 72 69 6E 74 6F 75 74 2E 20 54 68   ump printout. Th
69 73 20 66 65 61 74 75 72 65 20 6D 61 6B 65 73   is feature makes
0A 20 20 20 20 20 69 74 20 65 61 73 79 20 66 6F   it        easy fo
```

Figure I-9. Hexadecimal Dump Function

1.6.3 Paper-out Detection and Forms Override Function

When the paper-out detector, attached to the printer mechanism, detects a paper-end, the printer first performs a forms override. If paper loading fails, the BUSY signal goes HIGH, the PAPER OUT indicator is lit, the interface PE signal becomes HIGH, the $\overline{\text{ERROR}}$ signal becomes LOW, and the printer enters the PAUSE condition automatically.

By ignoring the paper out, the printer can print additional lines after the paper out is detected. This function is called the forms override function. After you load new paper and press the PAUSE button, the printer recovers to the RUNNING condition, and printing restarts.

The printer enters the paper-out condition only when a paper-out is detected after the printer performs paper loading.

1.6.4 Error Conditions

If any of the following error conditions are detected, the printer automatically enters PAUSE condition.

- Home position is not detected at printer mechanism initialization.
- Home position is detected during printing.
- The PAUSE button is pressed, and the printer enters PAUSE condition.
- A paper-out is detected after performing paper loading operation.

If parallel interface is selected, the following interface signals are output to indicate the error and to stop data transmission:

The BUSY signal becomes HIGH.
The $\overline{\text{ERROR}}$ signal becomes LOW.
No $\overline{\text{ACKNLG}}$ pulse is sent.

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, with 0.1 second intervals).
- Abnormal carriage movement is detected (beeps 5 times for 0.5 second, with 0.5 second intervals).
- A panel setting is accepted (0.1 second beep).

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 (and the AC power cord is plugged in) or when the INIT signal is received.

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

(a) Initializes 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 initializes the printer. Printer initialization by ESC @ code does not perform functions (a), (b), and (c) above. The settings changed by the last SelecType operation are maintained.

(3) Panel initialization

This printer can be initialized by pressing the PAUSE button in combination with the ALT button. When the printer is initialized from the front panel, functions (a) and (c) 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	10 cpi
Printing effects	Cleared, except condensed printing
Condensed printing	Last setting selected from the panel
Printer condition	RUN

1.6.8 Sheet Loading and Sheet Ejection

The release lever can disengage the pull-tractor unit drive mechanism, giving this printer improved paper-handling for functions that utilize the release lever. These functions are described below:

Automatic cut-sheet loading without the cut-sheet feeder

Move the release lever to the friction-feed position, and place the sheet along the paper guide (top or front). A few seconds later, the sheet is automatically loaded to the top-of-form position and the printer enters the RUNNING condition.

Automatic cut-sheet loading and ejection with cut-sheet feeder

Move the release lever to the friction-feed position, and place the sheets into the hopper of the cut-sheet feeder.
Pressing the LOAD/EJECT button loads one sheet to the top-of-form position. If a paper-out is detected before printing starts, a sheet will again be loaded automatically to the top-of-form position.

Continuous paper loading and ejection (backout)

Move the release lever to the REAR PUSH position, and insert the paper into the tractor unit. Pressing the LOAD/EJECT button loads the paper automatically to the top-of-form position. If a paper-out is detected before printing starts, the paper will be loaded automatically to the top-of-form position.

If the LOAD/EJECT button is pressed after continuous paper has been loaded, the paper is ejected backward to the push tractor unit. To back out several pages, press the LOAD/EJECT button several times. Each time LOAD/EJECT is pressed, reverse feed is performed for a single page.

When the paper is at the current setting for the top-of-form position, the top-of-form adjustment function is valid for the next loaded position. At this time, the LOAD/EJECT button advances the paper forward, and the LINE FEED/FORM FEED button moves the paper backward.

The adjusted top-of-form position for continuous paper is saved in EEPROM, but the setting for cut sheet paper is not saved.

1.6.9 Tear-off Function

The below tear-off function is limited under the push tractor mode.

Auto-tear-off

The auto-tear-off function is enabled by DIP switch setting. When this function is enabled and the release lever is in the tractor position, the paper advances to the tear-off position automatically if the input data buffer is empty and the printer is in the RUNNING condition. The TEAR-OFF LED lights to indicate that you can use the LOAD/EJECT and LINE FEED/FORM FEED buttons, in combination with the ALT button, for backward and forward micro feed adjustment.

Using micro feed, adjust the paper to meet the tear-off edge. Once the tear-off position is set, this setting remains valid even after the printer is turned off or initialized. If subsequent data is sent to the printer, the paper returns to the original position automatically and printing starts. If the PAUSE button is pressed while the paper is advanced to the tear-off position, the paper returns to the original position (and the printer enters the PAUSE condition).

Short-tear-off

To access the short-tear-off function, press the TEAR-OFF button. The release lever must be in the tractor position. The paper advances to the tear-off position whether the printer is in **PAUSE** or **RUNNING** condition. At this time, **the** TEAR-OFF LED lights to indicate that you can use the LOAD/EJECT and LINE FEED/FORM FEED buttons, in conjunction with **the** ALT button, for backward and forward micro feed adjustment. Using micro feed, adjust the paper to meet the tear-off edge. Once the tear-off position is set, this setting remains valid even after the printer is turned off or initialized. If subsequent data is sent to the printer and the printer is in the RUNNING condition, the paper returns to its original position automatically and printing starts. If the TEAR-OFF button is pressed again while the paper is advanced to the tear-off position, paper returns to its original position whether the printer is in PAUSE or RUNNING condition.

1.6.10 LEVER, G, ADJUST Operation

The LEVER ,G, ADJUST must be set to the proper position for the paper thickness. If this lever has been set to the 4th step or higher, printing speed is reduced and the head energy is increased.

Table l-1 6. Lever Positions

Lever Position	Paper Thickness
0 (2nd step)	0.06-0.12 mm
1 (3rd step)	0.13-0.18 mm
2 (4th step)	0.19 - 0.25 mm
3 (5th step)	0.26 - 0.32 mm

NOTE: If printing density becomes lighter, adjust the LEVER, G, ADJUST position one step higher.

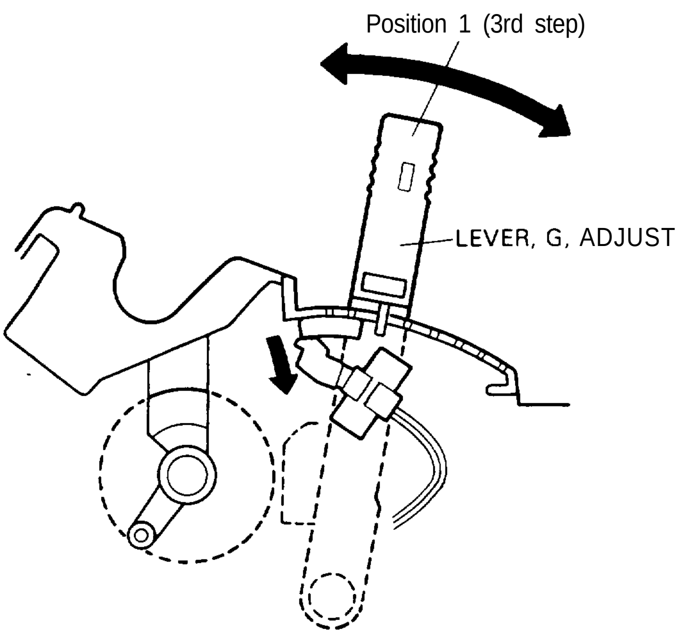


Figure l-10. Lever Positions

1.6.11 Printer Protection for Heavy-Duty Printing

This printer has a printhead protection function to prevent it from overheating and to protect the printer when the head driver voltage drops. If head temperature exceeds its maximum value, printing stops automatically until the head temperature drops to a certain value before printing resumes. Printing resumes at a lower print speed at first.

However, as the head temperature decreases, print speed increases to normal speed automatically. If the head temperature continues to increase at the lower speed, printing is stopped or resumed as temperature increases or decreases.

If the voltage supplied to the head drive circuit drops below its minimum limit as a result of heavy-duty printing, printing is interrupted immediately. When the power supply voltage recovers to a certain value, the remaining print line is printed at half speed. This protective action occurs when half or more of the wires are activated continuously.

1.7 MAIN COMPONENTS

The main components of the LQ-570/1070 printers are designed for easy removal and replacement to maintain and repair the printer. The main components are:

1) CO62 MAIN board: the main control board; the CPU on this board controls all main functions.
2) CO62 PNL board: the control panel board.
3) CO62 PSB/PSE board: the power supply board.
4) M-5E10/5E60: the printer mechanism.

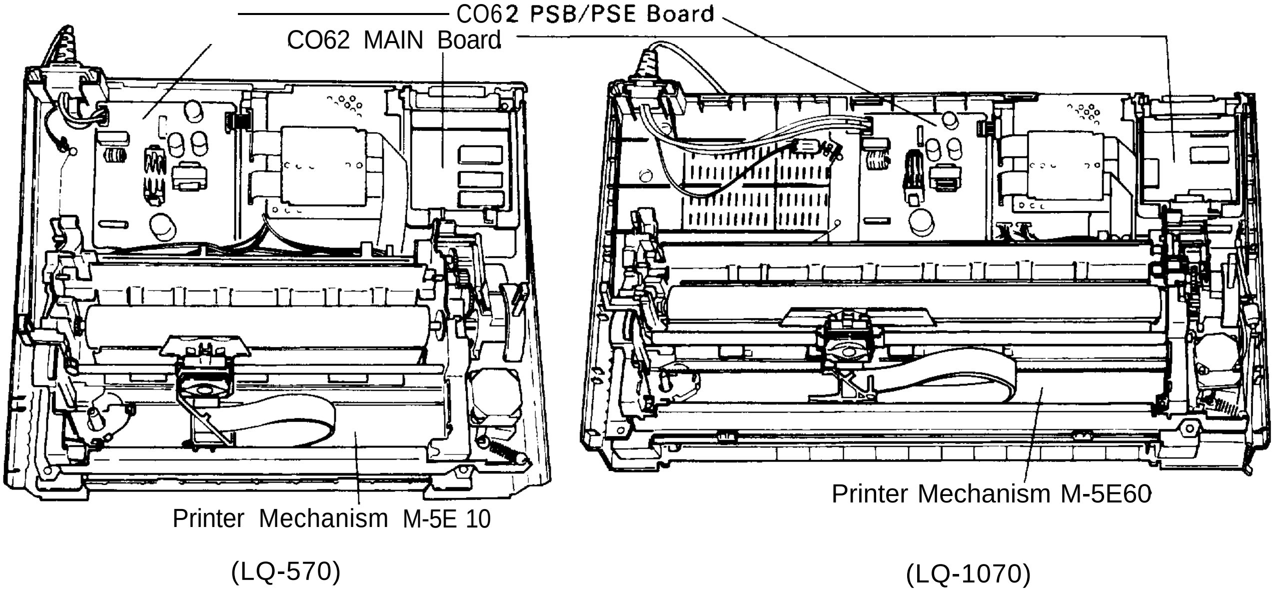


Figure I-1 1. LQ-570/1 070 Component Layout

1.7.1 C062 MAIN Board (Main Control Circuit Board)

The CO62 MAIN Board for the LQ-570 consists of a TMP90C04 1 N 8-bit CPU, an E05A50 **gate** array, a PROM (5 12K), a PSRAM (256K), a mask ROM (character generator, 2M), an EEPROM, and a hybrid IC (STK-6022B). In addition to this, the board for the LQ-1070 also includes **a SRAM (64K).**

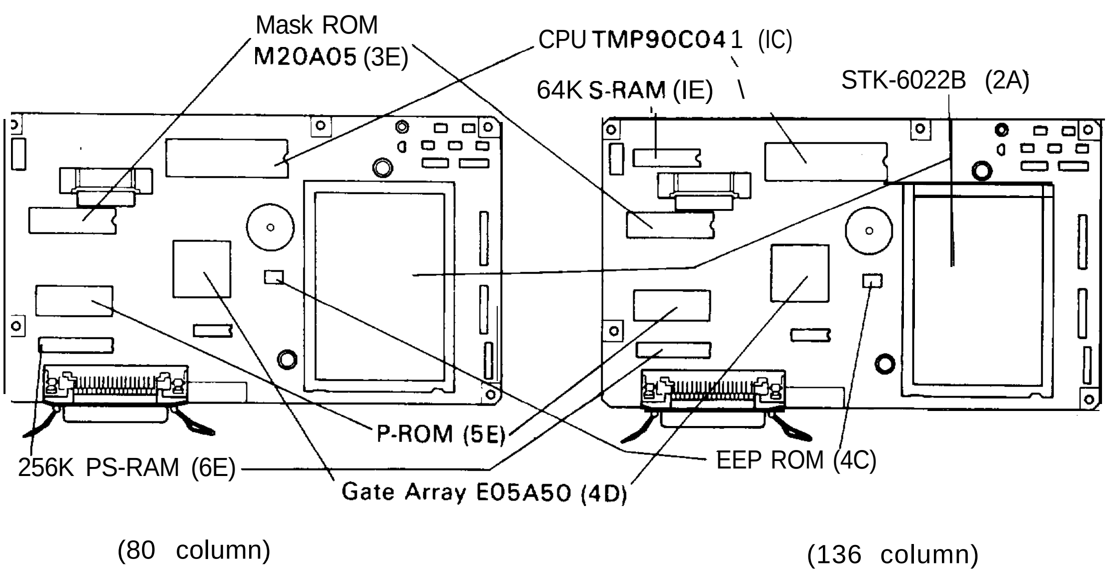


Figure 1-12. CO62 MAIN Board (80 column and 130 column)

1.7.2 C062 PNL Board (Control Panel Circuit Board)

The CO62 PNL board is the LQ-570/1 070 control panel, which includes the indicator LEDs, switches, and DIP switches.

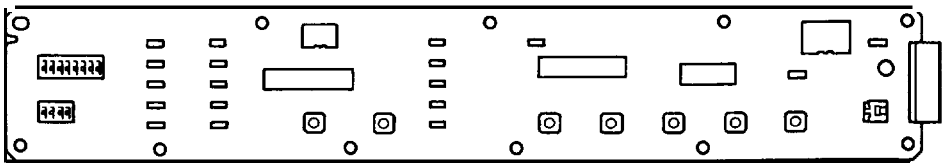


Figure 1-13. C062 PNL Board

1.7.3 C062 PSB/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 CO62 PSB board is 120V input type, and the CO62 PSE board is 220/240V input type.

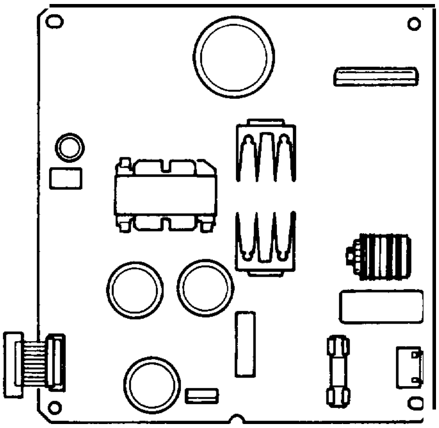
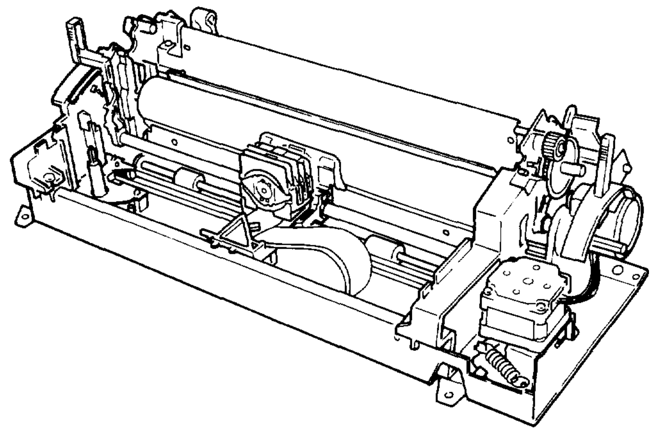


Figure 1-14. C062 PSB/PSE Board

1.7.4 Printer Mechanism (M-5E10/M-5E60)

The M-5E10/M-5E60 printer mechanism was developed specifically for use with LQ-570/1070 printer. The components include a carriage motor, carriage mechanism, paper-feed motor, paper-feed mechanism, ribbon-feed mechanism, printhead, and sensors. This printer mechanism allows three ways of paper insertion.



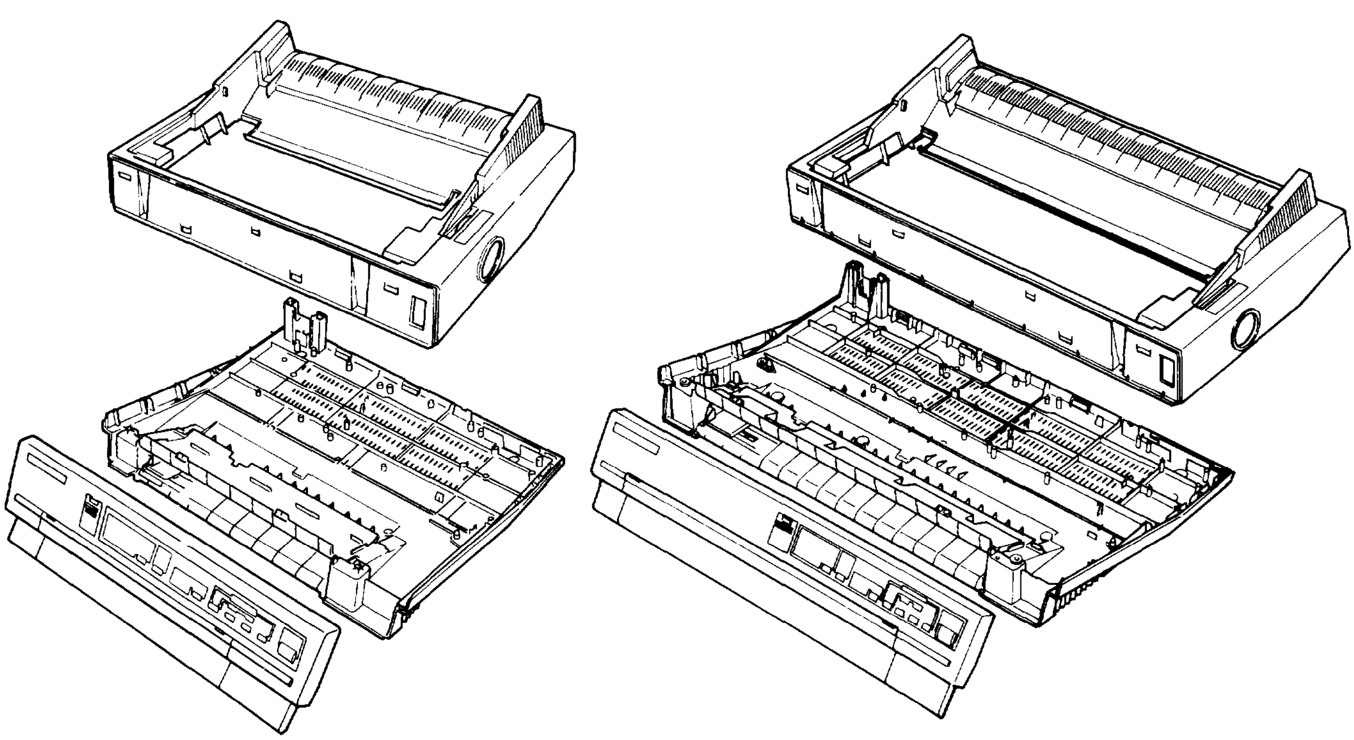
This picture shows an 80-column Printer. The M-5E10 and M-5E60 differ in width only.

Figure 1-15. Model-5E10/5E60 Printer Mechanism

1.7.5 Housing

The LQ-570/1070 housing consists of the upper, lower, and front cases. The front case houses the control panel board.

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



(LQ-570) (LQ-1070)

Figure 1-16. Housing (LQ-570/LQ-1070)

CHAPTER 2
OPERATION PRINCIPLES

LIST OF FIGURES

CHAPTER 2

LIST OF TABLES

2.1 OVERVIEW OF PRINTER MECHANISM OPERATION

This section describes the **PRINTER MECHANISM** of the Model-5E10/5E60 printer unit and explains how the printer works. The Model-5E10/5E60 has a PRINTER MECHANISM that features a 24-pin impact dot printhead for serial printing. There are four main parts to the printer mechanism: 1) the printhead mechanism, 2) the carriage movement mechanism, 3) the paper advance mechanism, and 4) the ribbon advance mechanism. Each of these is described below.

2.1.1 Printhead Mechanism

The printhead mechanism consists of the printhead itself, the ink ribbon, and the PLATEN. The printhead contains 24 wires in a zigzag arrangement in two rows of 12. A drive coil is provided for each of these wires to make the wires move in and out of the printhead and print dots independently of each other. The basic way that the wires are driven is described in the four steps below.

1. The control circuit outputs the drive signal to the printhead drive circuit. This changes the printhead drive voltage, and current flows through the corresponding printhead coil. The coil acts as a solenoid and generates a magnetic force.
2. This induced force causes the plate to approach the coil rod and the associated dot wire is rapidly ejected to impact on the platen.
3. The dot wire presses the ink ribbon up against the paper as it hits the platen, and in this way prints a dot on the paper.
4. As soon as the current through the coil is switched off, the force induced in the coil rod stops. The plate then returns to its original position (its position before the coil was energized) through the action of the plate spring. After the dot wire hits the platen, the rebounding force of hitting the platen works together with the wire return spring to pull the wire back to its original position in relation to the plate.

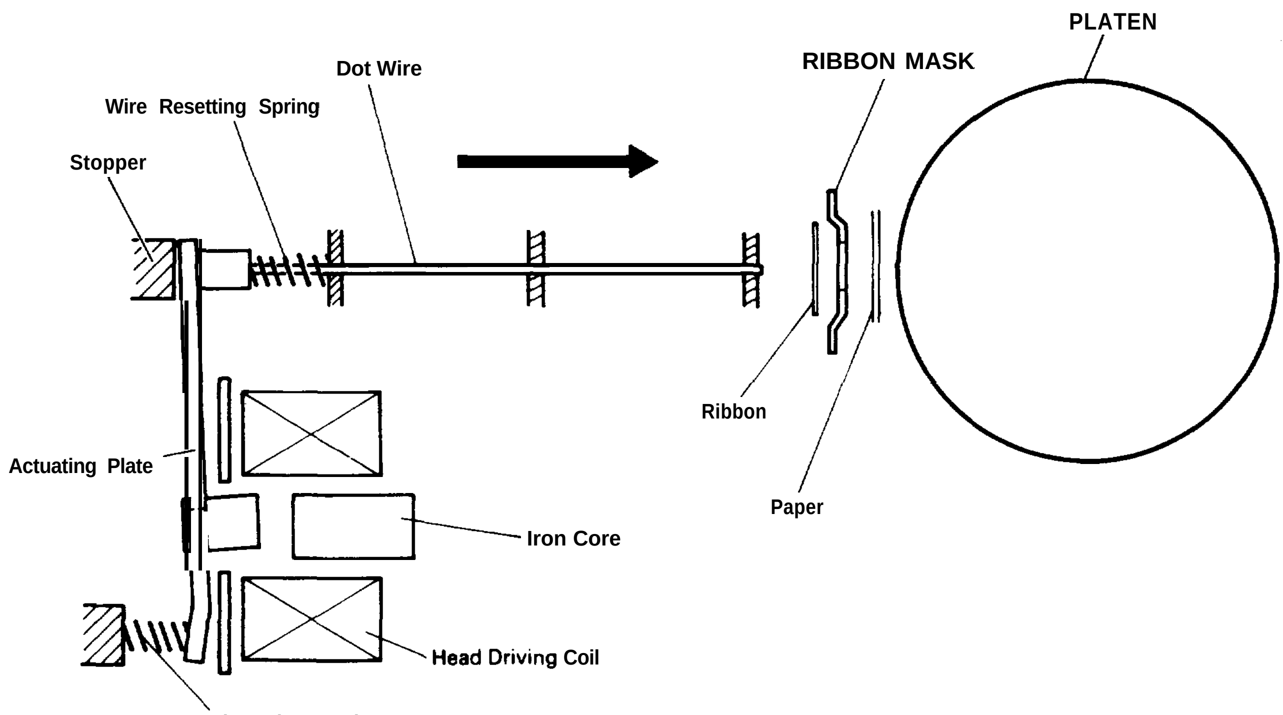


Figure 2-1. How the Printhead Works

Figure 2-l shows the action of the PRINTER MECHANISM when a single dot is printed.

The printhead tends to heat up after a period of continuous printing. To minimize the possibility of the dot wire drive coils overheating within the printhead and any loss of performance, the head is equipped with a thermistor that detects the head temperature. When this thermistor detects changes in the printhead temperature, the voltage signal changes. This signal change is read by the control circuit for feedback control.

2.1.2 Carriage Movement Mechanism

A timing belt is connected to the carriage on the lower side. With the printhead installed, this carriage moves in either direction along the SHAFT, CR, GUIDE. The carriage is driven by the MOTOR, CR a stepping motor that drives the TIMING BELT via the BELT PULLEY. The DETECTOR ASSY., HP DETECTS when the carriage is in the home position.

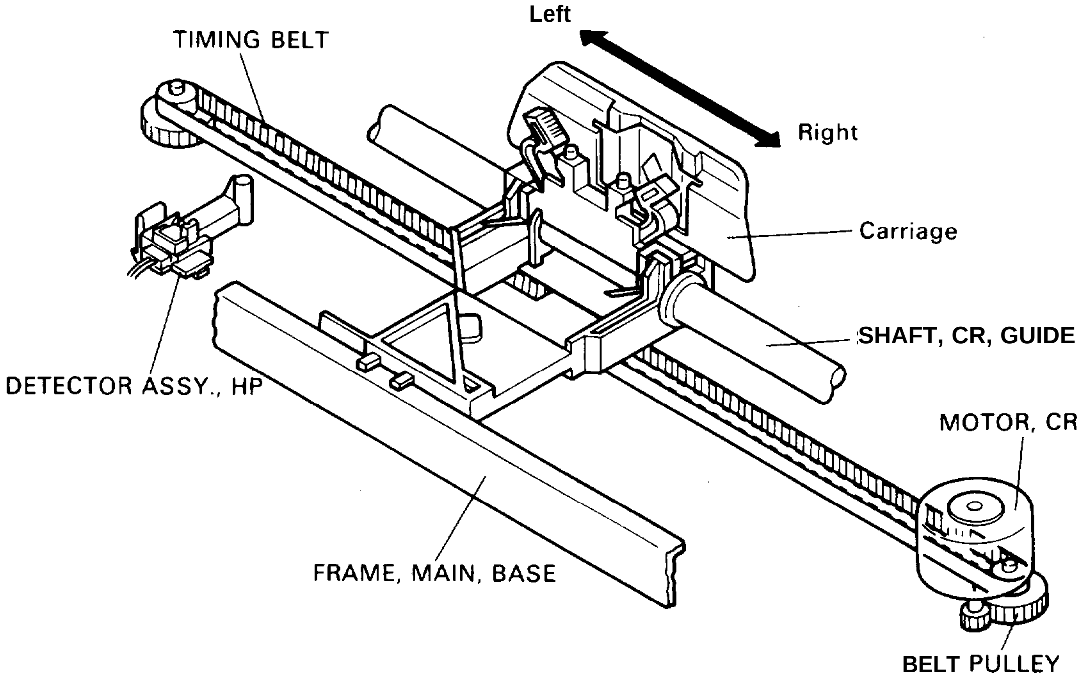


Figure 2-2. Carriage Movement

The paper-thickness LEVER, G, ADJUST allows the printer to use different weights of paper (different thicknesses). The user controls this lever and alters the platen gap on the SHAFT, CR, GUIDE by changing **its** position. Changing the position of the lever rotates the CHAFT, CR, GUIDE and moves the carriage either toward or away **from the PLATEN.** Moving the paper-thickness LEVER, G, ADJUST to the fourth position or higher slows down the printing speed to protect the printhead. The PG sensor reads the current position of the paper-thickness LEVER,G,ADJUST.

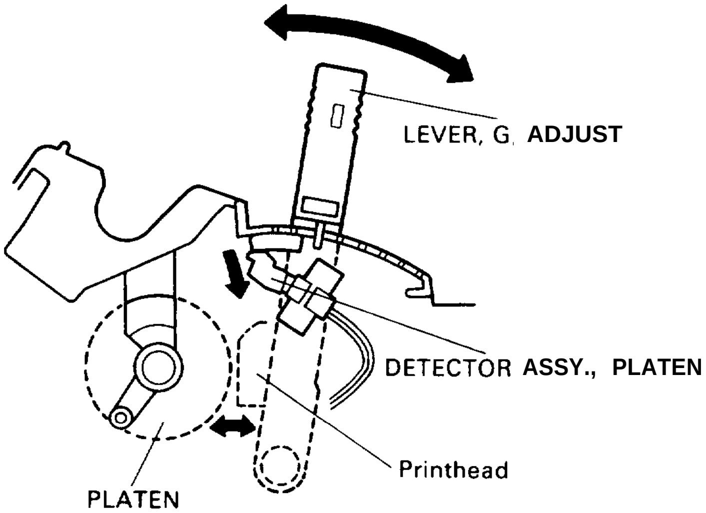


Figure 2-3. Paper-Thickness LEVER, G, ADJUST Movement

2.1.3 Paper Feed Mechanism

Cut sheet paper is advanced by friction feed. Continuous form paper is advanced using a tractor feed mechanism.

There are three ways to advance the paper with tractor feed: using the push tractor, using the pull tractor, and using the push and pull tractors together. Any one of these three tractor configurations can feed paper through the printer. In normal operation, the printer is set up with one tractor, which functions as either a push tractor or pull tractor, depending on where it is attached to the printer body. To use the push-pull tractor feed method, an optional tractor must be attached in addition.

There are also four ways to insert paper into the printer. Different paper paths are used for different types of paper. Table 2-l lists which paper paths can be used for each of the various paper advance methods.

Table 2-1. Paper Advance Methods and Paper Paths

	Paper Insertion (Paper Paths)			
Paper Advance Method	**Rear Entrance**	**Front Entrance**	**Bottom Entrance**	**Top Entrance**
Friction Feed	No	OK	No	OK
Push Tractor	OK	No	No	No
Pull Tractor	No	OK	OK	No
Push-pull Tractor Feed	OK	No	No	No

2.1.3.1 Paper Advance Mechanisms

This section describes how the friction feed and tractor feed mechanisms work to advance the paper in the printer.

Friction Feed Method

The paper is held between the platen and paper advance roller, and between the paper eject roller and paper eject unit cover. The paper-feed pinion gear, turning in the direction of the black arrow, drives the COMBINATION GEAR, 8.5, 30. The COMBINATION GEAR, 8.5, 30 turns the SPUR GEAR, 34, paper-feed rollers, and top ROLLER ASSY., PAPER EJECT. The paper then advances in the direction of the white arrow.

The paper advance roller spring holds the paper against the platen. Setting the LEVER, G, ADJUST to the tractor feed position releases this pressure and frees the paper. Figure 2-4 illustrates friction feed when paper is inserted through the top entrance.

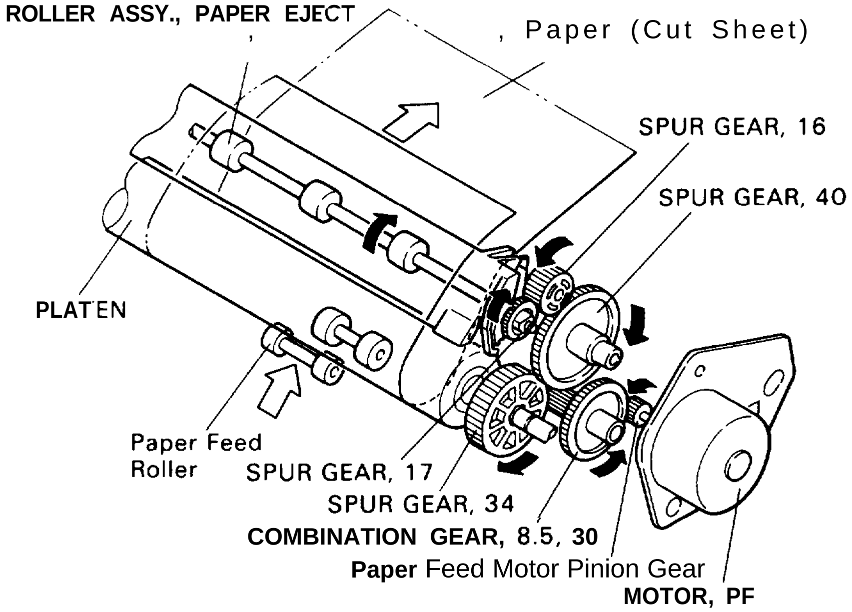


Figure 2-4. Top Path Friction Feed

Push Tractor Method

When the push tractor is selected, the SPUR GEAR, 16 engages the SPUR GEAR, 17 (Tractor gear) on the TRACTOR ASSY. COMBINATION GEAR, 8.5, 30 is driven by the paper-feed gear, which in turn is driven by the paper-feed motor pinion gear. The paper-feed pinion gear, when turning in the direction of the black arrow, results in pushing the paper through the mechanism.

I During tractor feeding, the LEVER, G, ADJUST is set to the tractor position to disengage the friction drive. This releases the pressure between the paper advance roller and the platen. Figure 2-5 illustrates push tractor operation.

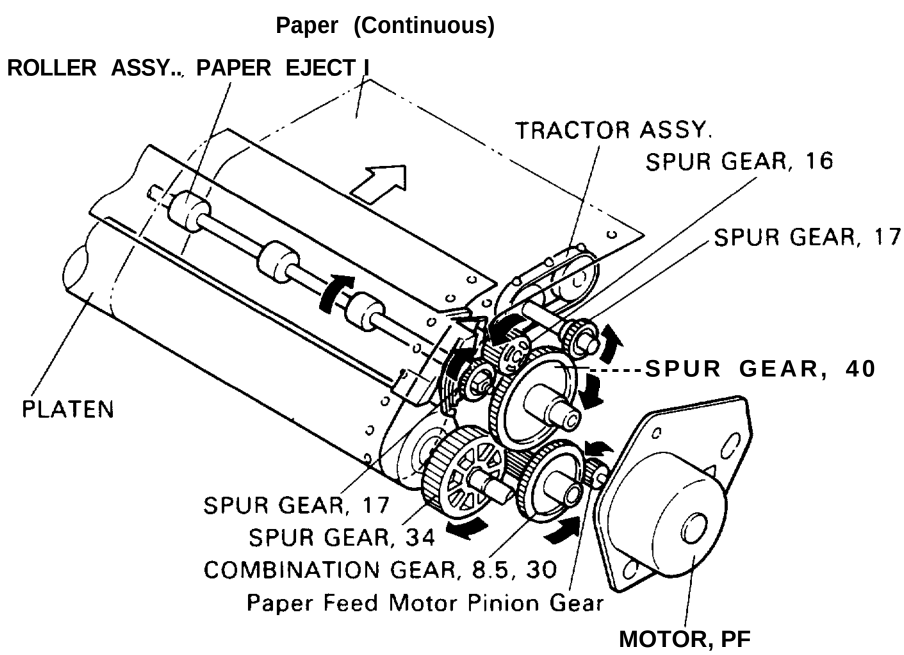


Figure 2-5. Push Tractor Operation

Pull Tractor Method

Using pull tractor feed to advance the paper is basically the same **as** using push tractor feed. In push tractor feed, the TRACTOR ASSY. (paper advance mechanism) is before the paper entrance. It pushes the paper through the PRINTER MECHANISM. Pull tractor feed, however, has the opposite arrangement, with the tractor situated after the paper entrance. Since it pulls the paper through the PRINTER MECHANISM, it requires no paper tension unit. Figure 2-6 illustrates pull tractor operation tractor when paper is inserted through the bottom path.

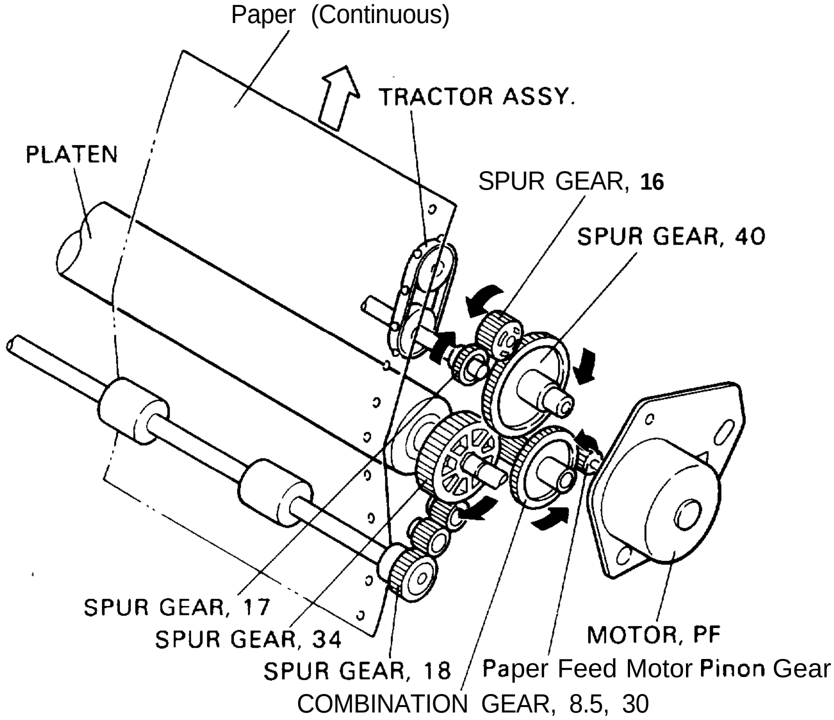


Figure 2-6. Pull Tractor Operation

Push-Pull Tractor Method

This is a combination of the push tractor and pull tractor methods. Two tractors are used, one in front of and one behind the paper entrance, to advance the paper. They act simultaneously to push and pull the paper through the PRINTER MECHANISM. Figure 2-7 illustrates push-pull tractor operation.

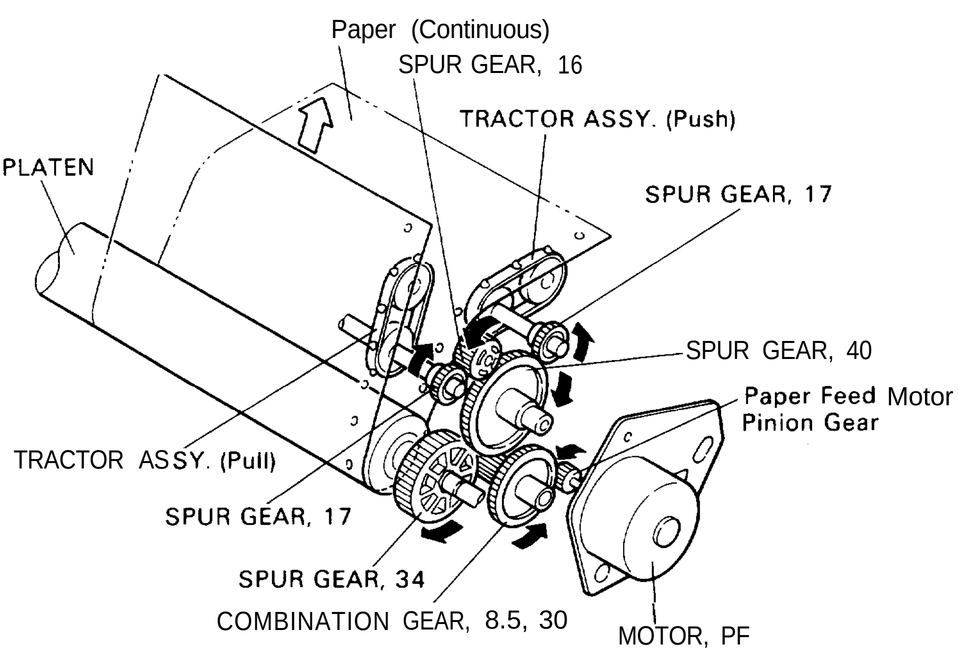


Figure 2-7. Push-Pull Tractor Operation

The LEVER, RELEASE switches between friction feed and tractor feed. Setting the LEVER, RELEASE to the friction feed position presses the paper advance roller against the PLATEN. Setting the release lever to the tractor feed position releases this pressure, so that the paper advance roller separates from the PLATEN. The DETECTOR ASSY., RELEASE senses the current position of the LEVER, RELEASE.

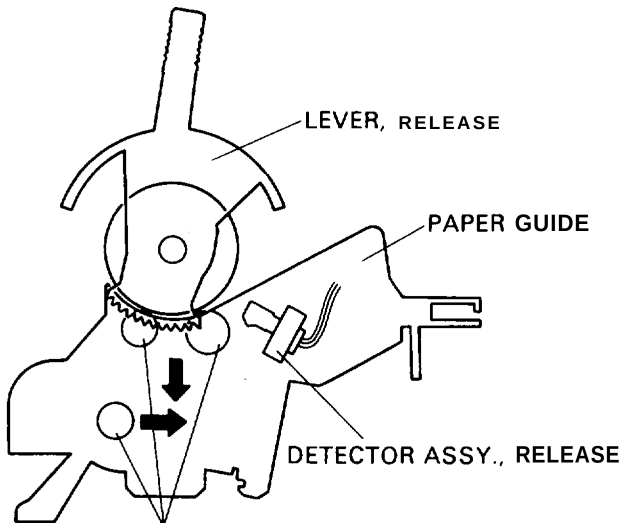


Figure 2-8. LEVER, RELEASE Movement

2.1.3.2 Paper Insertion Entrances

This section describes the different ways to feed paper into the printer.

Top entrance paper insertion

When you feed paper into the printer through the top entrance, the method to advance the paper is friction feed.

There are two paper-out detectors: the front paper-out detector is in front of the PRINTER MECHANISM and the rear paper-out detector is behind the PRINTER MECHANISM. When paper is inserted through the top entrance, the rear detector senses when the paper runs out.

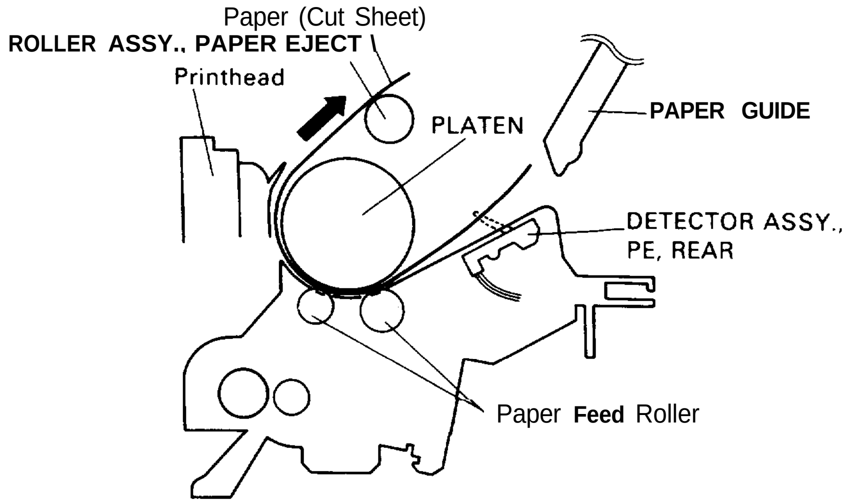


Figure 2-9. Paper Path for Top Entrance Friction Feed

Rear entrance paper insertion

When you feed paper into the printer through the rear entrance, the method to advance the paper can be: the push tractor, or the push-pull tractor. The rear paper-out detector senses when the paper- has run out.

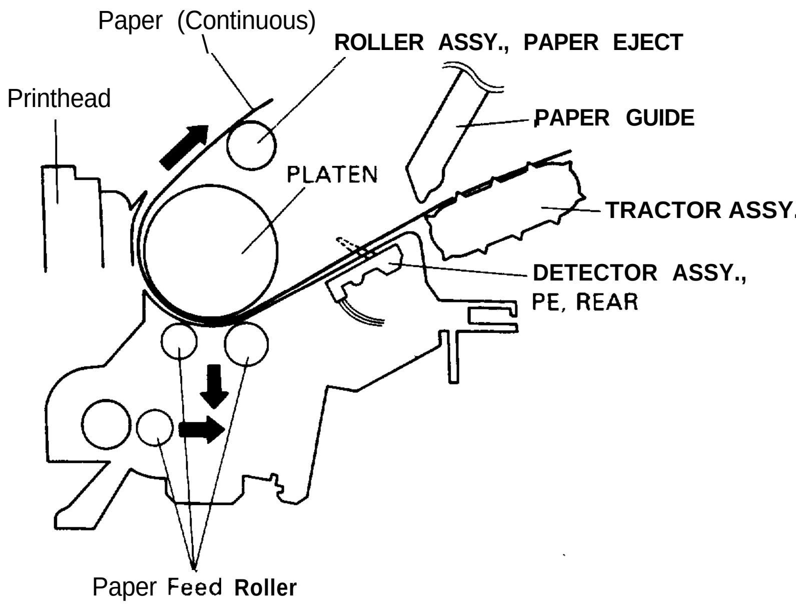


Figure 2-10. Paper Path for Rear Entrance Push Tractor Feed

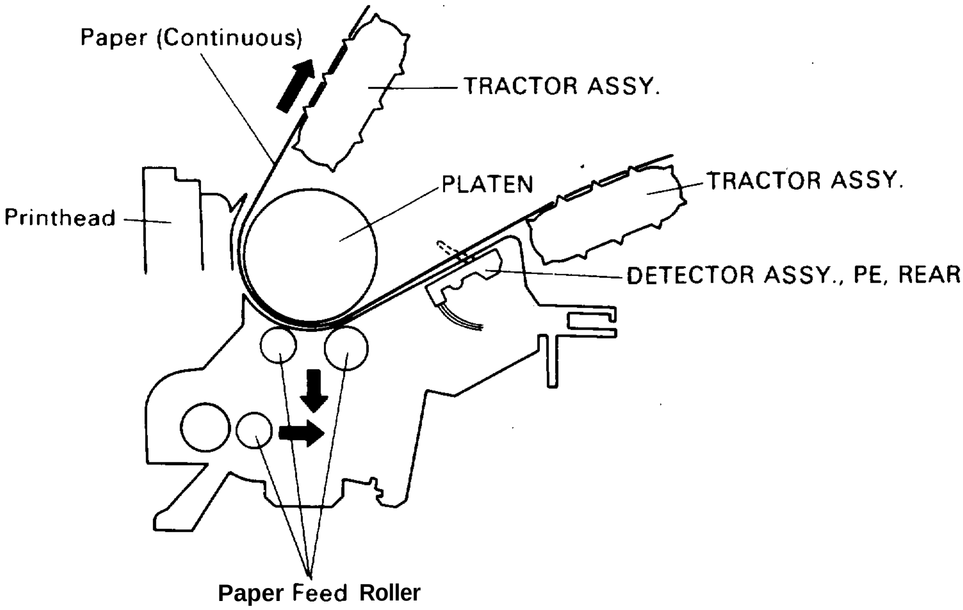


Figure 2-l 1. Paper Path for Rear Entrance Push-Pull Tractor Feed

Bottom entrance paper insertion

When you feed paper into the printer through the bottom entrance, the pull tractor advances the paper. The front paper-out detector senses when the paper runs out.

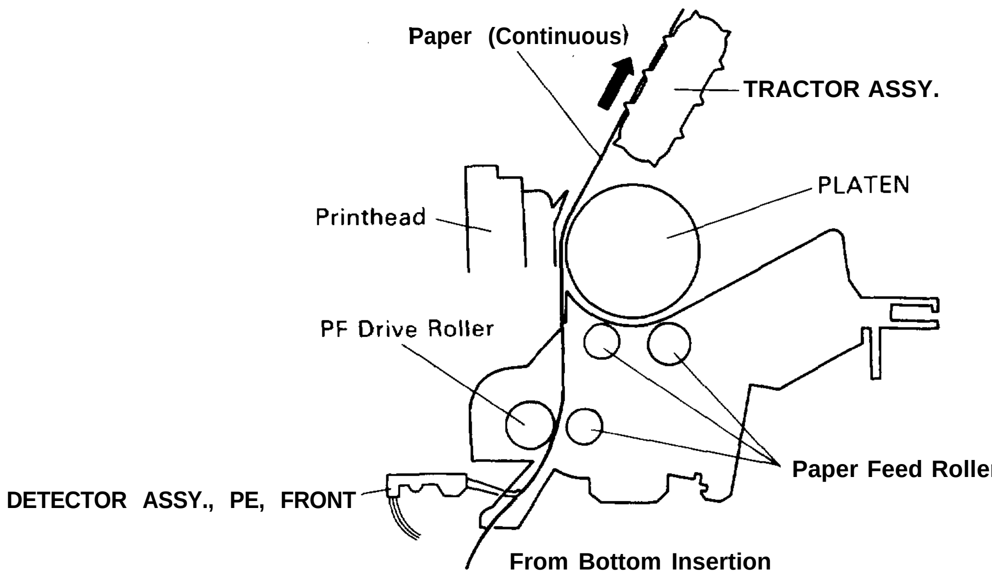


Figure 2-12. Paper Path for Bottom Entrance Pull Tractor Feed

Front entrance paper insertion

When you feed paper into the printer through the front entrance, the paper can be advanced either with friction feed or the pull tractor. The front paper-out detector senses when the paper runs out.

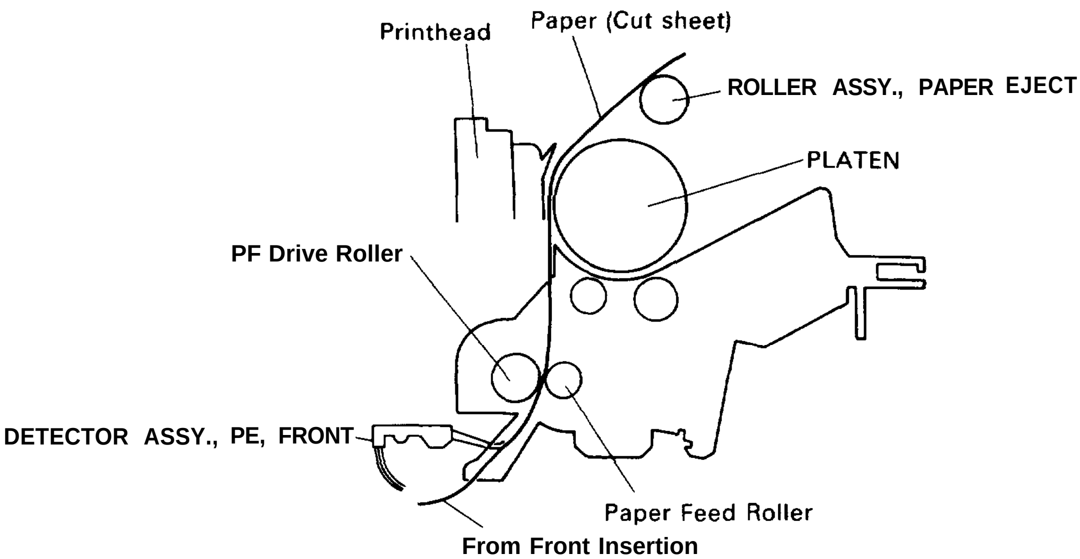


Figure 2-13. Paper Path for Front Entrance Friction Feed

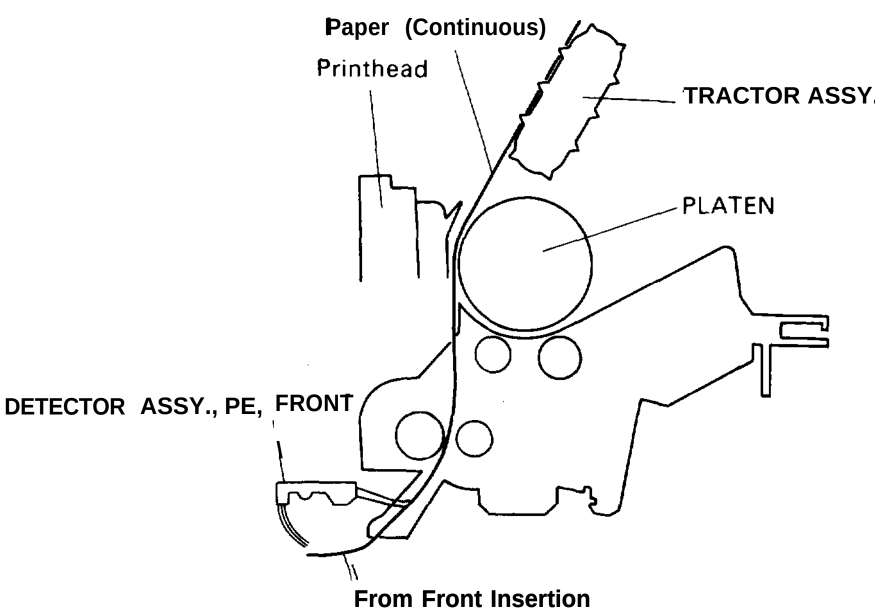


Figure 2-14. Paper Path for Front Entrance Pull Tractor Feed

2.1.4 Ribbon Advance Mechanism

The ribbon drive gear advances the ribbon through a gear linkage. This arrangement of gears makes the ribbon drive gear always rotate in a counterclockwise direction, regardless of the direction the carriage is moving.

Table 2-2. Ribbon Advance Gear Linkage

Direction of Carriage Movement	Gear Linkage
Left to right (arrow ●)	PULLEY, DRIVEN ● Ribbon transmission gear ➧ COMBINATION GEAR (1) ● COMBINATION GEAR (3) ➧ COMBINATION GEAR (4) ● RATCHET, RD
Right to left (arrow ⇨)	PULLEY, DRIVEN ⇨ Ribbon transmission gear ⇨ COMBINATION GEAR (1) ⇨ COMBINATION GEAR (2) ⇨ RATCHET. RD

The ink ribbon within the cartridge case is an endless ribbon that is held against the ribbon advance roller by the pressure of the ribbon grip roller. The ribbon advance roller, linked to the ribbon drive gear, winds the ink ribbon.

The ribbon brake spring, attached to the exit slot of the cartridge case, prevents slack in the ribbon and keeps the ribbon tension correct. The ribbon mask keeps the paper clean by preventing the ribbon from brushing against the paper.

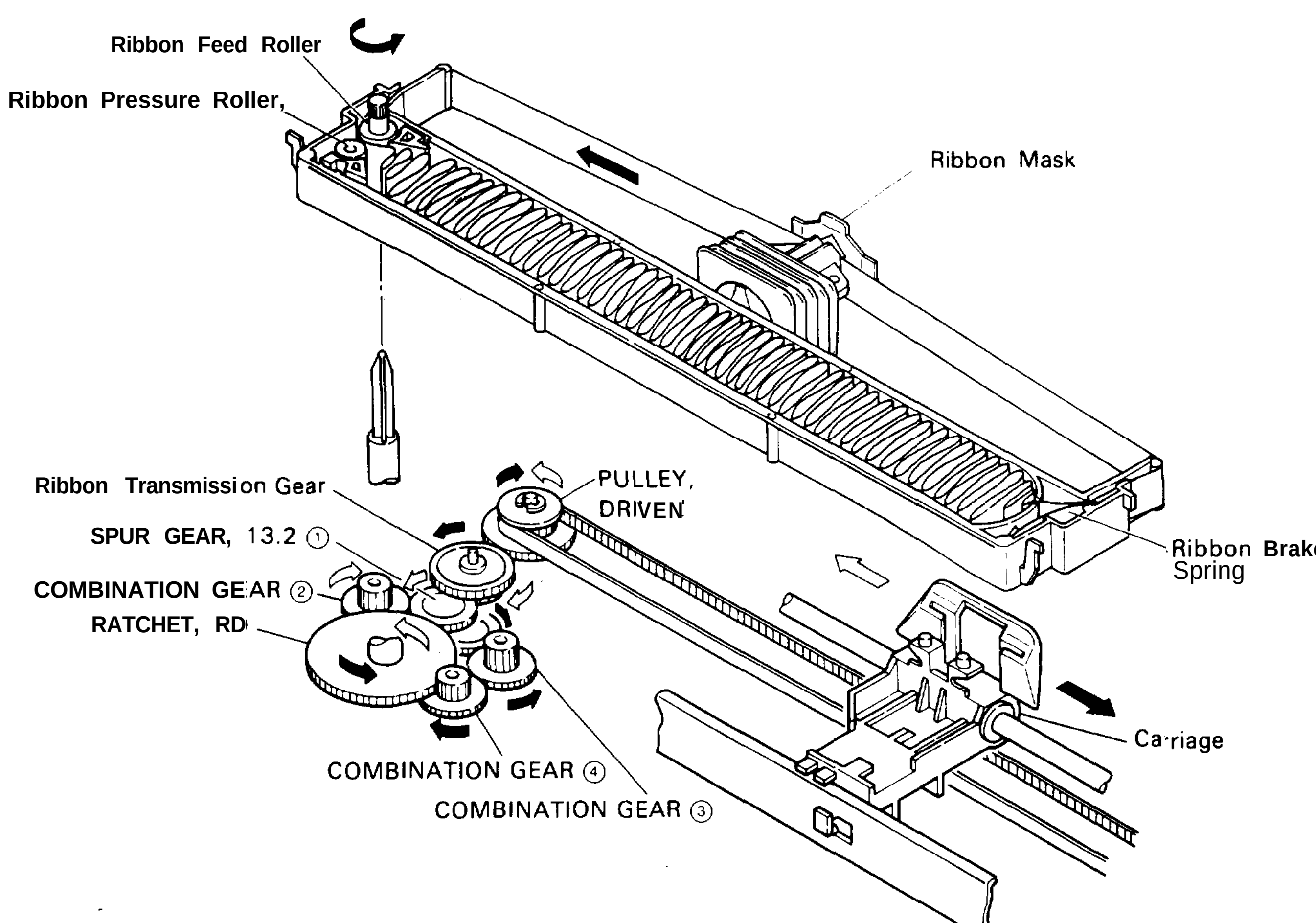


Figure 2-15. Ribbon Advance Mechanism

2.2 POWER SUPPLY OPERATION

The printer can be powered by either of two power supply boards: the 120 V CO62 PSB board or the **2201240** V CO62 PSE board. The only difference in the way these two boards operate is in the primary circuitry. How they work to supply power to the printer is identical. These power boards output the DC current necessary to drive the printer control circuits and printer drive mechanism. Table 2-3 shows the input voltages and fuse ratings for these boards.

Table 2-3. Power Supply Boards

Board	Input Voltage (VAC)	Fuse F1 Rating
CO62 PSB	103.5 to 132	2.5A / 125 V
CO62 PSE	198 to 264	1.25A / 250 V

2.2.1 Power Supply Overview

The power supply board has two power output lines that supply power to the various control circuits and drive mechanisms. Table 2-4 lists the parts of the printer that run off these two DC output supply voltages.

Table 2-4. Power Supply Output Voltages and Applications

Output Supply Voltage (DC)	Applications
+35 v	MOTOR, CR drive MOTOR, PF drive Printhead drive
+5 v	CO62 MAIN board logic circuitry Various sensors Control panel LEDs MOTOR, PF hold

2.2.2 Supply Circuit Operation

Figure 2-16 shows the power supply circuitry in block diagram form. AC power feeds into the printer from the external power source. A filter circuit removes the noise. The AC voltage then undergoes full wave rectification and is smoothed to produce the direct current supply voltage. This voltage is fed through a switching circuit and secondary smoothing circuit to produce the stepped down +35 VDC supply. A +35 V line voltage detector circuit is connected to the switching circuit. This feedback control arrangement ensures that the +35 VDC supply is kept stabilized.

The +5 VDC supply is achieved by feeding the +35 VDC line through the +5 VDC power supply circuit. This circuit further steps down the +35 VDC voltage and outputs a stabilized +5 VDC supply.

There are two main features of the power supply circuit. First, the power supply switch is in the secondary circuitry. When this switch is turned off, the switching circuit is de-energized and output of the +35 VDC supply stops. However, since the switch is in the secondary circuitry, while the printer remains plugged into the external AC supply current continues to flow in the primary circuitry, whether the power supply switch is turned off or on. For this reason, before you perform any maintenance work, you must disconnect the printer from the external AC power supply by unplugging it from the power source.

Second, there are four circuits to protect the supply circuitry and avoid danger. The +5 VDC line contains a current overload protection circuit and a voltage overload protection circuit. The current overload protection circuit is part of the +5 VDC supply circuit. It cuts the +5 VDC line if the current is too great. The +5 V voltage overload protection circuit cuts the supply if the voltage reaches or exceeds +7 VDC. It stops the switching circuit operation, which stops the output of the +5 VDC line.

The +35 VDC line has a voltage overload protection circuit and a voltage drop protection circuit. The + 35 V voltage overload protection circuit cuts the supply if the voltage reaches or exceeds + 36 VDC. It stops the switching circuit operation, which stops the output of the + 35 VDC line. The voltage drop protection circuit protects the printer from such damage as might occur from short circuiting in the secondary circuitry of the +35 VDC line. If a voltage drop is detected, it stops the switching circuit operation, which stops the output of the +35 VDC line.

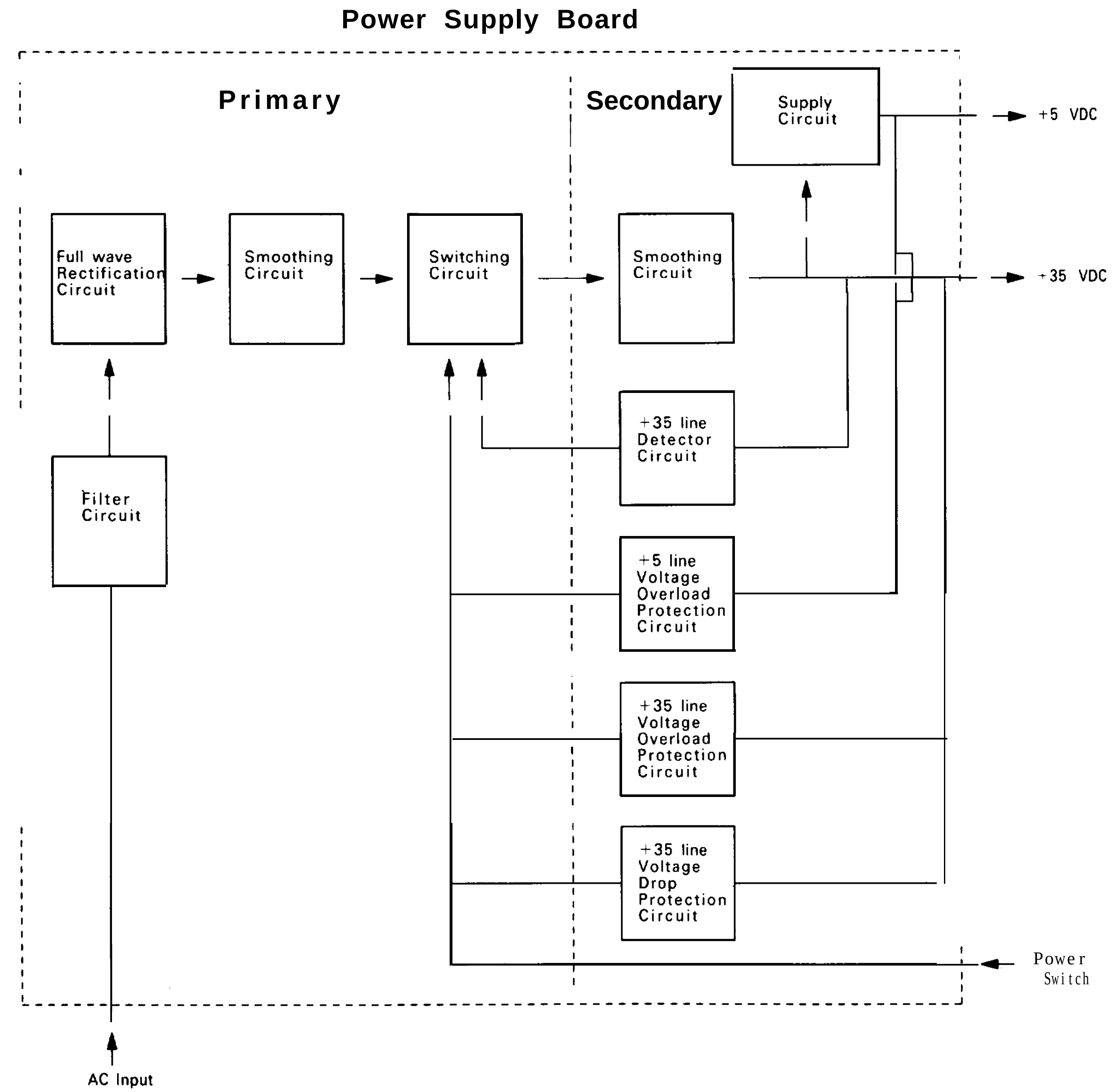


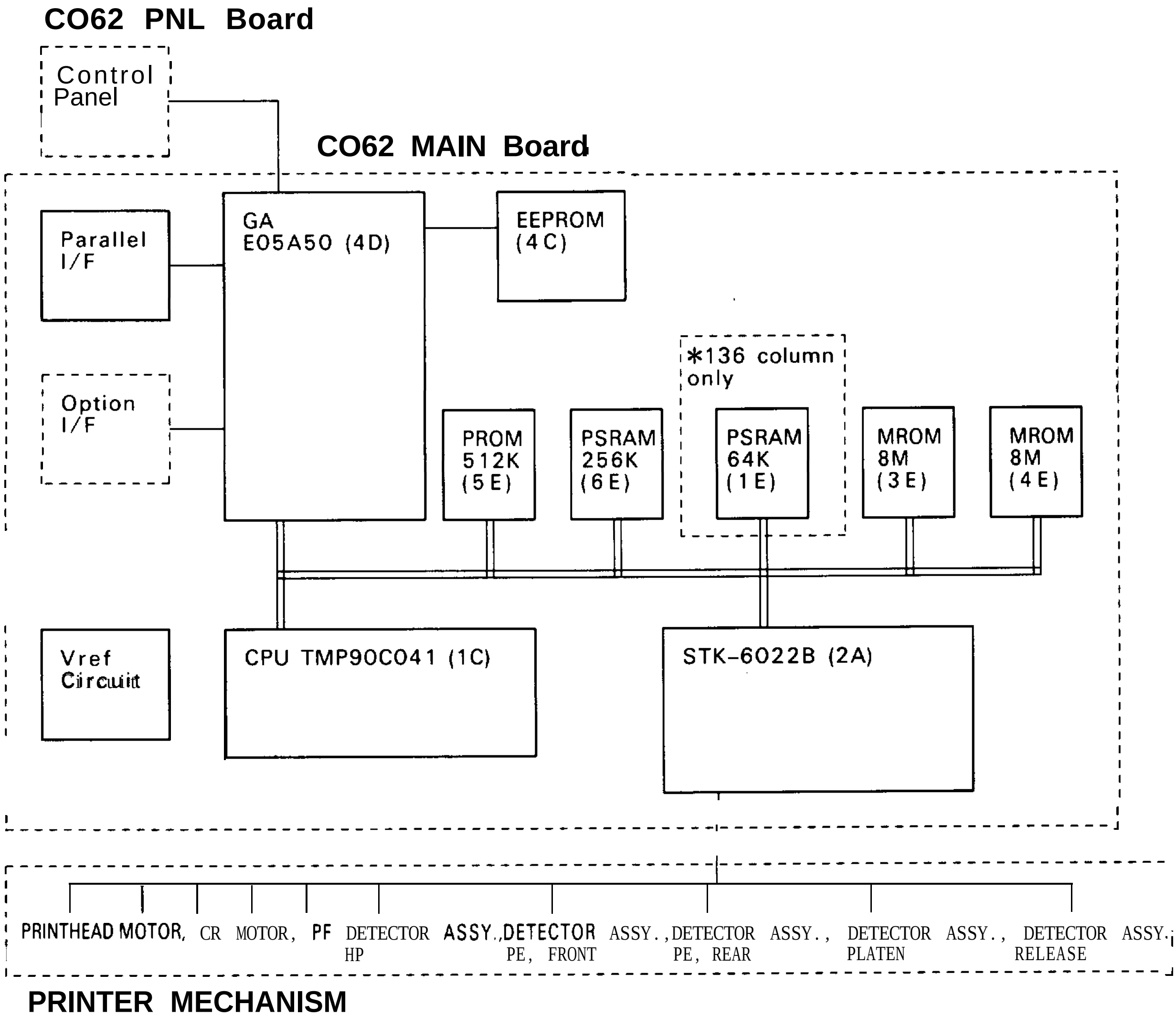
Figure 2-16. Power Supply Circuit Block Diagram

2.3 CONTROL CIRCUIT OPERATION

The control circuit consists of two boards: the C062 MAIN board, which acts as the main board, and the C062 PNL board, which acts as the control panel board. This section describes how these boards work.

2.3.1 Control Circuit Operation Overview

The printer CPU is an 8-bit CPU TMP90C04 1 running at 10 MHz. It oversees control of all the components of the printer. The E05A50 gate array contains various memory management functions that control the assignment of the memory and I/O areas. Rationalization and simplification of the circuitry is achieved through use of the STK-6022B, which holds all the driver circuits for driving the PRINTER MECHANISM on a single chip. Figure 2-l 7 shows the control circuits in block diagram form.



GA	Gate array	DETECTOR ASSY., HP	Home position sensor
DETECTOR ASSY., RELEASE	Platen gap sensor	MOTOR, CR	Carriage motor
DETECTOR ASSY., RELEASE	Release sensor	MOTOR, PF	Paper advance motor

DETECTOR ASSY., PE, FRONT Front paper-out detector (positioned in front of the PRINTER MECHANISM)

DETECTOR ASSY., PE, REAR Rear paper-out detector (positioned behind the PRINTER MECHANISM)

Figure 2-17. Control Circuit Block Diagram

Table 2-5 lists the functions of the main components and circuits of the printer. The CPU converts the print data sent from the host computer to image data (the print image). The image data is then loaded to RAM. Each line of data is processed sequentially. The CPU transfers the print data to the printhead drive circuit. The CPU sends the printhead drive pulse to the printhead drive circuit. The length of this pulse corresponds to the printhead drive voltage. The head drive circuit then outputs the head drive signal.

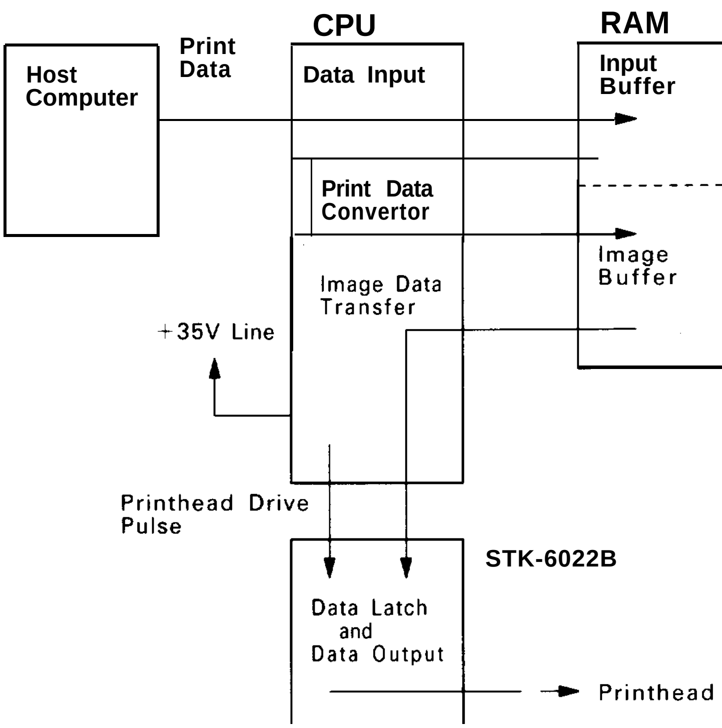


Figure 2-18. Data Flow

Table 2-5. Functions of the Main IC and Circuits

IC or Circuit	Location	Functions
TMP90C041	1C	Receives data from the host computer and loads the data to the input buffer in RAM (under interrupt processing control). Expands the input data held in the buffer to create image data. Loads this image data to the image buffer in RAM. Transfers the image data to the printhead drive circuit. Also controls various parts of the PRINTER MECHANISM, such as the motors.
E05A50	4D	This is a gate array consisting of three components configured on a single chip: . Memory Management Unit Handles CPU memory in ROM, RAM, and mask ROM, and assigns addresses for other devices. Parallel Interface (Parallel I/F) Holds the parallel interface functions. Reset Circuit Contains the circuit that generates the $\overline{\text{RESET}}$ signal.

Table 2-5. Functions of the Main IC and Circuits (Cont.)

IC or Circuit	Location	Functions
STK-6022B	2A	This is a single chip that houses drive circuits for the printhead, MOTOR,CR and MOTOR, PF of the PRINTER MECHANISM. The chip also includes the various sensor input circuits for the PRINTER MECHANISM.
PROM	5E	PROM contains the program that runs the CPU.
RAM	6E 1E	Holds the CPU working area and the various buffers. (1 E is not used for an 80-column device and is not installed.)
MROM (Mask ROM)	3E 4E	Holds the character design (also called the character generator).
EEPROM	4c	EEPROM is an electronically writable and erasable ROM used to hold such information as the TOF position.
Vref Circuit	—	This is a circuit for generating the reference voltage used in the A/D convertor within the CPU.

2.3.2 Reset Circuit

Figure 2-19 shows the reset circuit in block diagram form. The reset circuit issues the RESET signal. Each part of the control circuits is initialized when this RESETsignal is received. The conditions when the RESET signal is output are described below.

When turning on the power supply

Immediately after the power has been turned on, STK-6022B (2A) outputs the VCCON pulse. E05A50 (4D) receives this pulse and then outputs the DISC pulse. The electrical charge in the condenser within the STK-6022B is then discharged. After this, STK-6022B outputs the THLD signal, and E05A50 then outputs the RESET signal. After a certain time has elapsed, the charge in the condenser in the STK-6022B builds up again. The THLD signal is canceled and then the RESET signal is canceled.

Resets performed by the CPU itself (CPU self-reset)

The CPU outputs the RESET signal if there is a RESET request for E05A50 and if E05A50 has output the DISC pulse.

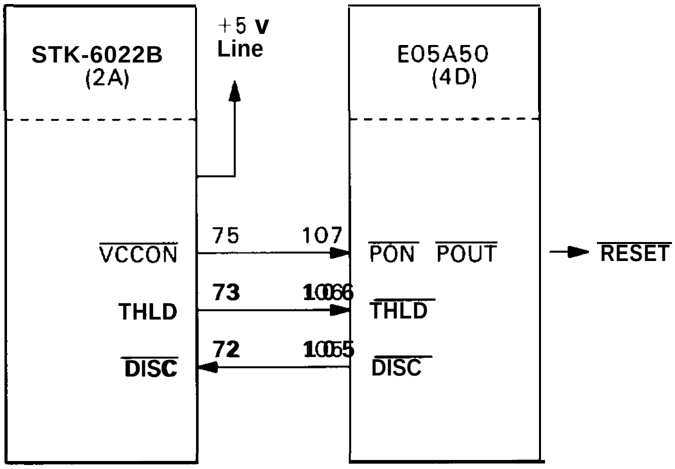


Figure 2-19. Reset Circuit Block Diagram

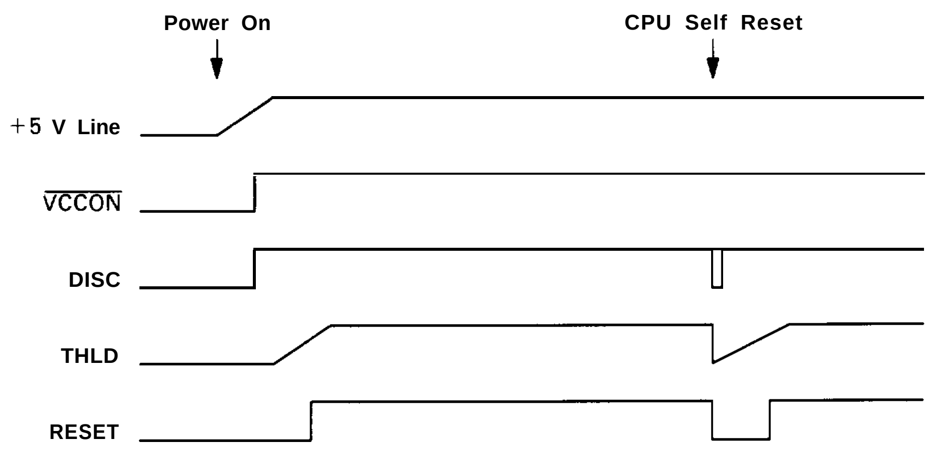


Figure 2-20. RESET Signal Timing

2.3.3 Sensor Circuits

Figure 2-21 shows the sensor circuits in block diagram form. Detection of any excessive printhead temperature causes the TEMP2 signal to be sent directly to the CPU. Other signals, such as the CRHOME signal, pass through the STK-6022B unit before reaching the CPU. Terminals P50 to P55 on the CPU are used for the A/D convertor.

The Vref circuit generates the A/D convertor reference voltage Vref.

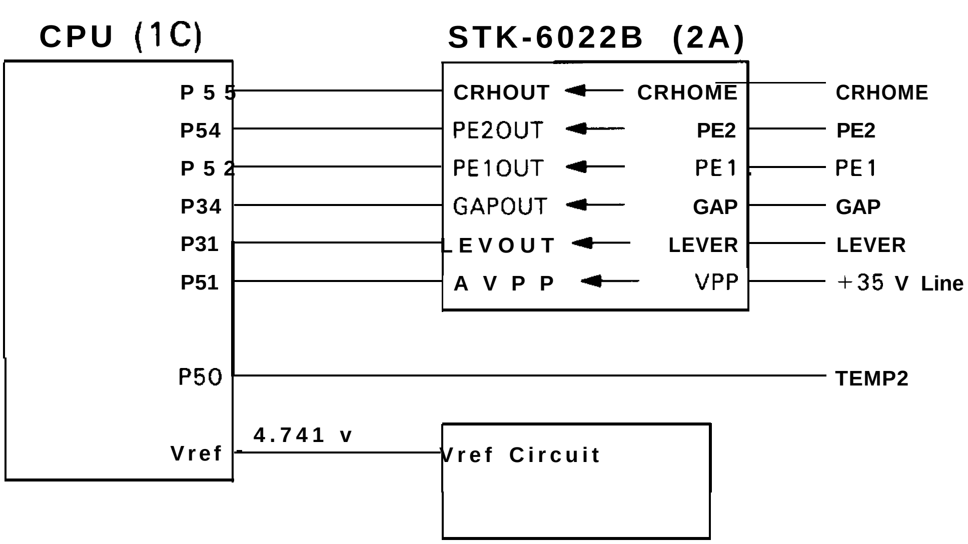


Figure 2-21. Sensor Circuit Block Diagram

2.3.4 MOTOR, CR Drive Circuit

Figure 2-22 shows the MOTOR, **CR drive circuit. An open-loop,** constant-current drive arrangement is used for running the MOTOR, CR. The motor is driven by 2.2 phase excitation and l-2 phase excitation. 2-2 phase excitation corresponds to two l-2 phase excitation steps. Thus, for each single step phase change of a 2-2 phase excitation motor, the carriage moves l/l 20 inch. For each single step phase change of a l-2 phase excitation motor, the carriage moves 1/240 inch.

The MOTOR, CR drive circuit of the STK-6022B detects the amount of current flowing in the MOTOR, CR coil and regulates this current. The current flowing through the coil varies, depending on the speed of the MOTOR, CR. The amount of current is set by the CPU via the E05A50 I/O port. Signals are sent to SELR1 to SELR4 on the STK-6022B. The STK-6022B sets the coil current to correspond to the MOTOR, CR speed.

Ports P60 to P63 on the CPU are used exclusively as control ports for the stepping motor.

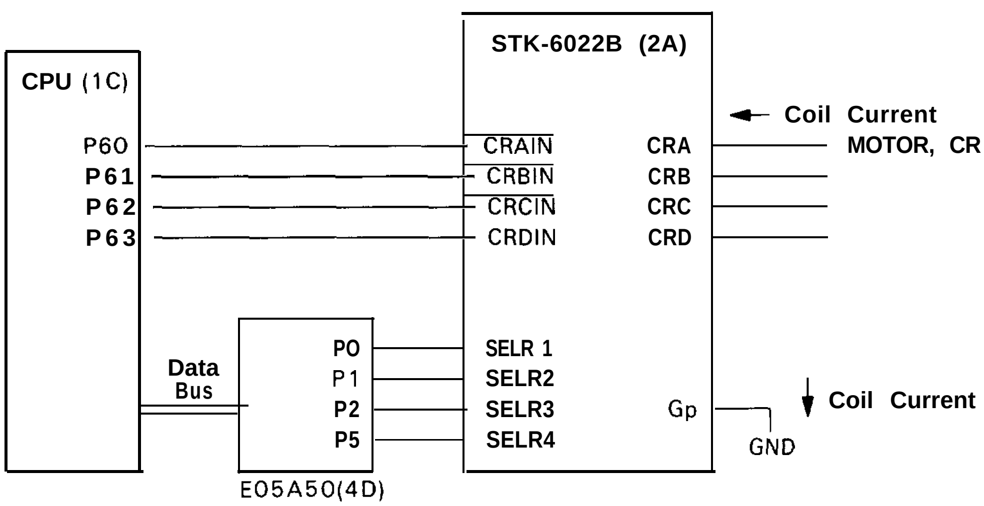


Figure 2-22. MOTOR, CR Drive Circuit

Table 2-6. MOTOR, CR Drive Modes

Drive Mode	Excitation Type	Drive Frequency Type	Standard Print Character
3.214 × speed	2-2 phase	2700 pps	High Speed Draft
3 × speed	2-2 phase	2520 pps	Draft
2 × speed	2-2 phase	1680 pps	
1.5 × speed	1-2 phase	2520 pps	
4/3 × speed	1-2 phase	2240 pps	
1 X speed	l-2 phase	1680 pps	LO
2/3 × speed	l-2 phase	1120 pps	
1/2 × speed	1-2 phase	840 pps	

2.3.5 MOTOR, PF Drive Circuit

The printer uses a stepping motor to advance the paper. The minimum amount of paper that can be advanced is 1/360 inch. The motor is a 2-2 phase or l-2 phase, constant-voltage drive type. P70 to P73 on the CPU are the control ports for the stepping motor. MOTOR, PF phase data is output through these ports. PFA to PFD are turned on and off within the STK-6022B according to this phase data sent from the CPU.

When the MOTOR, PF is running, the voltage supplying the coil of the MOTOR, PF is +35 V. When the MOTOR, PF is not running and is in hold status, the supply voltage to the coil is + 5 V. Switching between these two supply voltages occurs at the PFCOM terminal of the STK-6022B when $\overline{\text{PFENB}}$ is turned on or off.

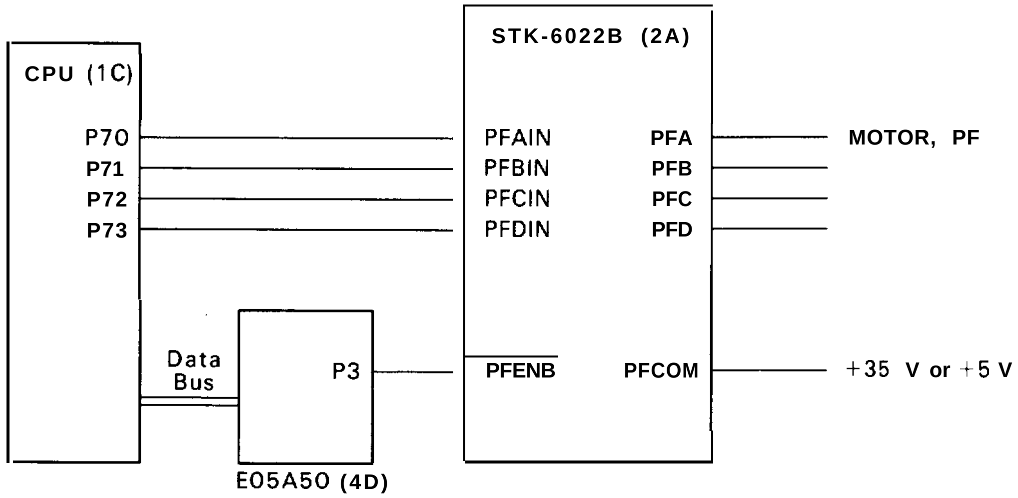


Figure 2-23. MOTOR, PF Drive Circuit

2.3.6 Printhead Drive Circuit

Figure 2-24 shows the printhead drive circuit in block diagram form. The print data already has been expanded to create the image data. The CPU splits up this data three times and transfers this information to the latch circuit within the STK-6022B'. The CPU samples the voltage of the +35 V line via the A/D convertor (see Section 2.3.3).

The CPU outputs a pulse via the CPU time output port P83. The length of this pulse corresponds to the voltage of the + 35 V line. This pulse becomes the head drive signal. In this way, STK-6022B outputs head drive signals (signals HD 1 to HD24) that relate to voltage levels through the length of the pulses. These signals are output to the head for each of the sections of print data that were created by subdividing the data three times before sending.

By sampling the +35 V line voltage and determining the length of the head drive signal, it is possible to maintain the energy supplied to the head at a constant level. If the voltage of the +35 V line is HIGH, the CPU shortens the output pulse. If the voltage of the + 35 V line is LOW, the CPU lengthens the output pulse.

Figure 2-25 shows the timing of the output of the head drive signal.

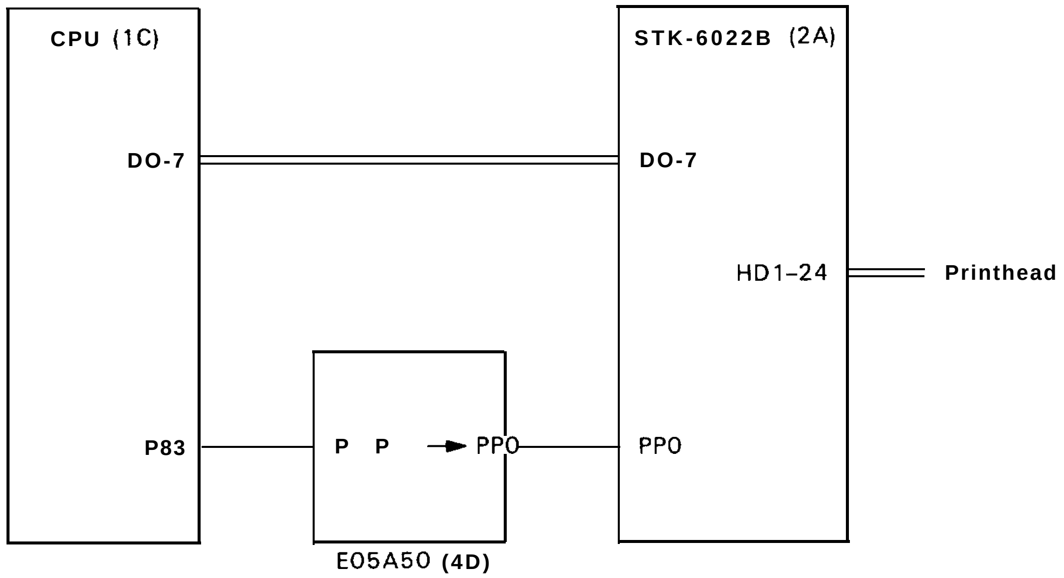


Figure 2-24. Printhead Drive Circuit

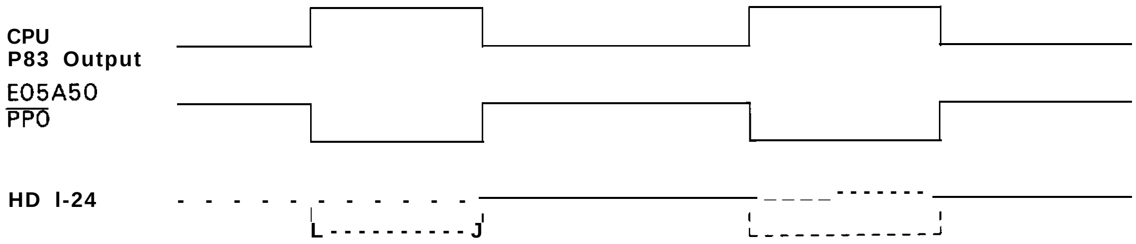


Figure 2-25. Head Drive Signal Output Timing

2.3.7 Parallel Interface Circuit

Figure 2-26 shows the parallel interface circuit in block diagram form. The data sent from the host computer is latched within E05A50 by the $\overline{\text{STROBE}}$ signal. E05A50 outputs the BUSY signal automatically to stop the host computer from sending the next data and then outputs the IBF signal for the CPU. The CPU receives the IBF signal via the interrupt signal input port P82, recognizes that the data has been received from the host computer, and reads the data that was latched in the E05A50. Next, the CPU resets the BUSY signal so that the printer is ready to receive more data from the host computer.

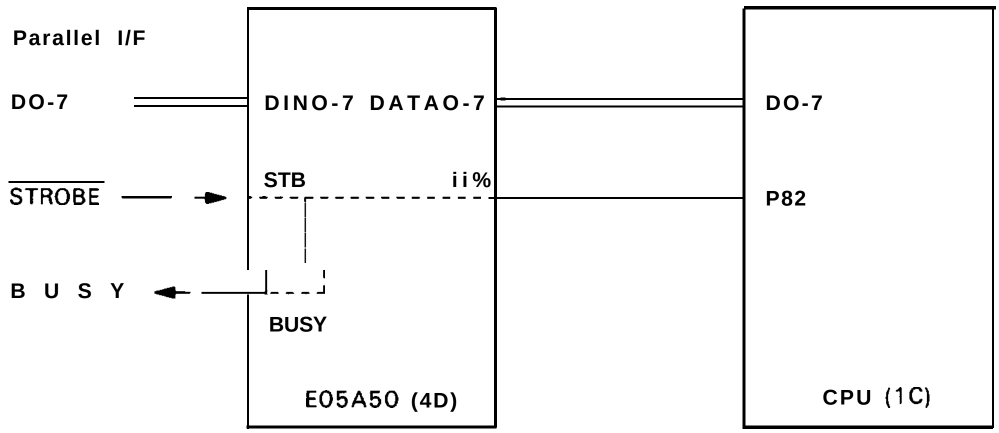


Figure 2-26. Parallel Interface Circuit

2.3.7 EEPROM Control Circuit

Figure 2-27 shows the EEPROM control circuit in block diagram form. The EEPROM is used to hold such information as the top-of-form position. EEPROM is non-volatile memory and information is not lost when the printer is powered off. Since the EEPROM is a serial I/O type device, the 8-bit parallel data received from the CPU is converted to serial data by the E05A50.

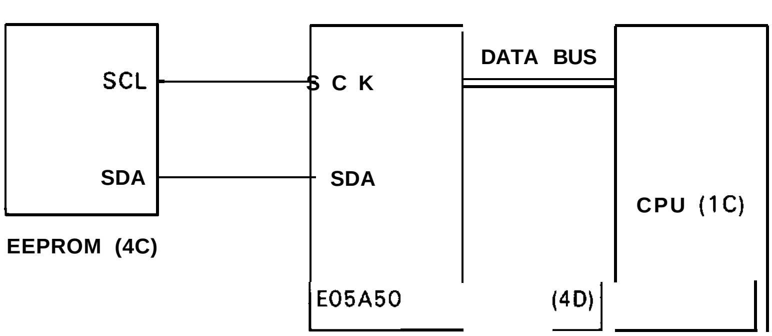


Figure 2-27. EEPROM Control Circuit

CHAPTER 3
DISASSEMBLY AND ASSEMBLY

CHAPTER 3

LIST OF FIGURES

LIST OF TABLES

3.1 OVERVIEW

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

3.1.1 Precautions for Disassembling the Printer

Follow the precautions below when disassembling the printer.

WARNING

Before disassembling, assembling, or adjusting the printer, disconnect the power supply cable from the external AC power socket. Failure to do so risks personal injury. The power supply **switch for** the printer is wired into the secondary circuitry. As a result, the printer still remains live with current flowing even when this switch is off.

CAUTION

To maintain efficient printer operation, use only the recommended tools for maintenance work.
Use only the recommended lubricants and adhesives (see Chapter 6).
Adjust the printer only in the manner described in this manual.

3.1.2 Tools

Tables 3-l and 3-2 list the various recommended tools that are needed when disassembling, assembling, or adjusting the printer. Use only tools that meet these specifications.

Table 3-1. List of Recommended Tools

Tool	Part No.
Round-nose pliers	B740400100
Nippers	8740500100
Tweezers	B741000100
Soldering iron	B740200100
E-ring holder # 2.5	8740800400
E-ring holder # 5	8740800700
E-ring holder # 6	8740800800
Phillips screwdriver No. 2	B743800200
Normal screwdriver	B743000100
Box driver (7 mm across)	B741700200
Thickness gauge (0.44 mm)	—
Thickness gauge (0.47 mm)	—

NOTE
All tools are commercially available.

Table 3-2. Equipment Required for Maintenance

Description	Specification
Multimeter Oscilloscope	20 MHz

3.1.3 Service Checks After Repair

When printer components are to be sent back to the customer after servicing, use the checklist shown in Table 33 to note the current state of the components. This checklist provides a record to make servicing and shipping more efficient.

Table 3-3. Inspection Checklist for Repaired Printer

Category	Component	Item to Check	Is Check Required?
Printer features	Printhead	Are any wires broken?	☐ Checked, CI Not necessary
		Are any wires worn out?	CI Checked, ☐ Not necessary
	Carriage mechanism	Does the carriage move smoothly? ☐ Movement noisy, ☐ Mechanism dirty, CI Mechanism oily	☐ Checked, ☐ Not necessary
		Is the carriage motor running at the correct temperature and not overheating? ☐ Checked, ☐ Not necessary	☐ Checked, ☐ Not necessary
	Paper advance mechanism	Is the paper advancing smoothly? ☐ Movement noisy, ☐ Mechanism dirty, ☐ Mechanism oily	☐ Checked, ☐ 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?	☐ Checked, ☐ Not necessary
		Is the tractor feeding the paper correctly?	•i Checked, ☐ Not necessary
		Is the paper path clear of all obstructions?	☐ Checked, ☐ Not necessary
		Is the platen free of damage?	☐ Checked, •i Not necessary
	Ribbon mask	Is the ribbon mask free of distortion?	☐ Checked, ❑ Not necessary
	Self-print test	Was the self-print test successful?	☐ Checked, ☐ Not necessary
	On-line test	Was the on-line test successful?	☐ Checked, ❑ Not necessary
Adjustment	Printhead	Is the platen gap adjusted correctly?	☐ Checked, ❑ Not necessary
	Printing	Is the bidirectional print position adjusted correctly?	☐ Checked, ☐ Not necessary
	DIP switch settings	Have DIP switches been reset to their factory shipment settings?	☐ Checked, ☐ Not necessary
System upgrade	ROM version	The ROM version is XXX.	☐ Checked, ☐ Not necessary
Shipment		Has the ribbon been removed?	☐ Checked, ☐ Not necessary
		Have all relevant parts been included in the shipment?	☐ Checked, ☐ Not necessary

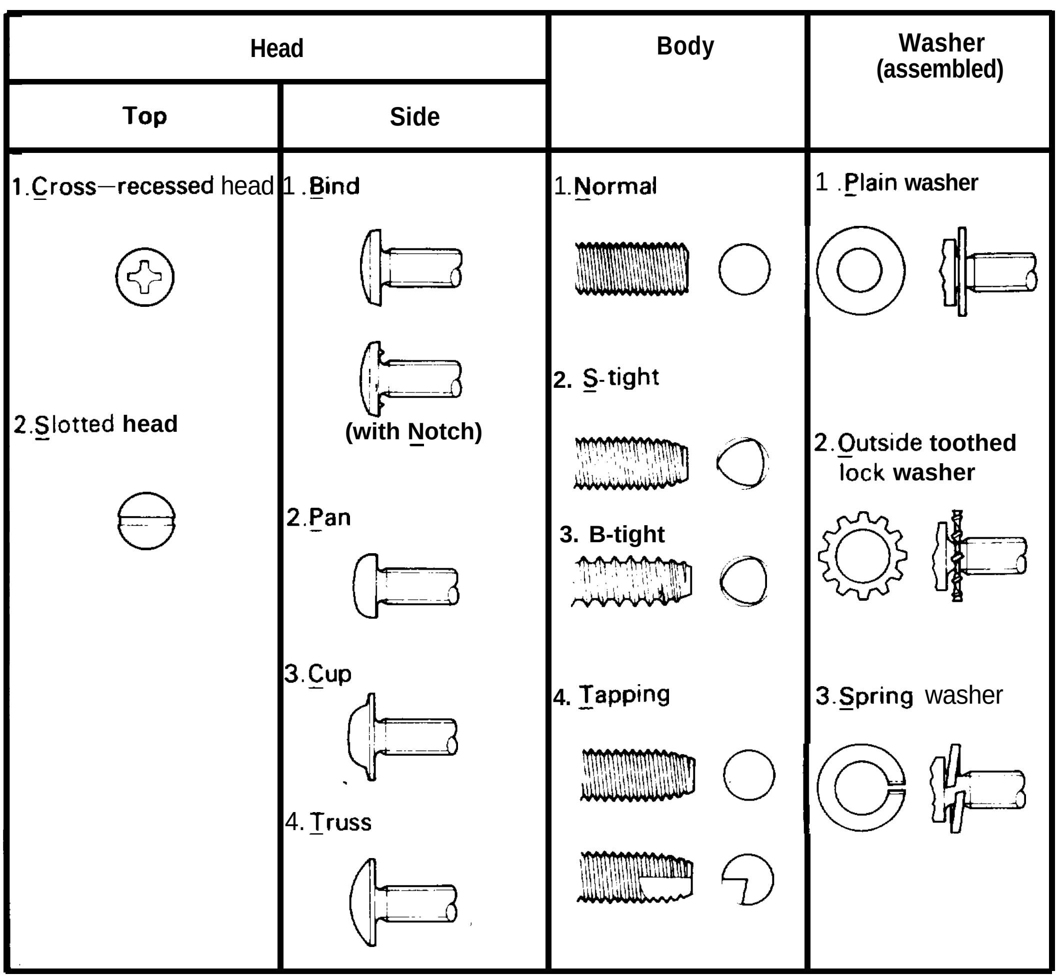
3.1.4 Specifications for Screws

In the following sections, abbreviations are used for small parts, such as screws and washers. Tables 3-4 and 3-5 list these abbreviations.

Table 3-4. Abbreviations Used for Screws

Abbreviation	Part Name
CBS(C)	Cross-recessed Bind head Cone point S tight screw
CBB(C)	Cross-recessed Bind head Cone point B tight screw
CB	Cross-recessed Bind head screw
CBS(O)	Cross-recessed Bind head S tight with screw with Outside toothed lock washer

Table 3-5. Types of Screws and Abbreviations



3.2 DISASSEMBLY AND ASSEMBLY

This section describes the procedures for disassembling and assembling the main components of the printer. When the procedure for installing a component into the printer is simply the reverse of the procedure for removing the component, no description of how to install the component is given.

Any points of special concern when assembling or adjusting a component part are given after the description of the procedure. It is important to take note of these points.

CAUTION

Before disassembling any part of the printer, note the warnings in Section 3.1.
Before disassembling any part of the printer, remove the paper and the ink ribbon.

Disassembly **includes the following five procedures:**

1. Removing the printhead
2. Removing the case
3. Removing the electrical circuits
4. Removing **the** printer mechanism
5. Disassembling the printer mechanism

Diagrams in the appendix show how the components fit together. Refer to them as necessary.

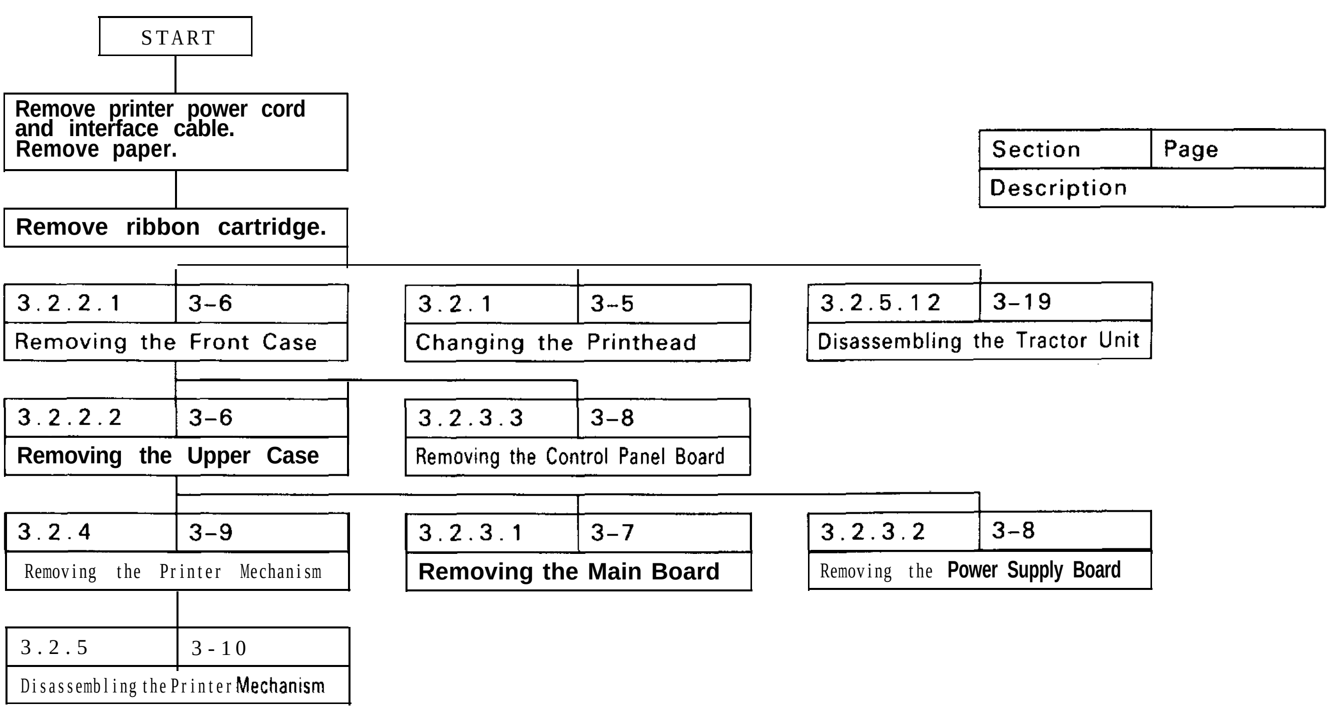
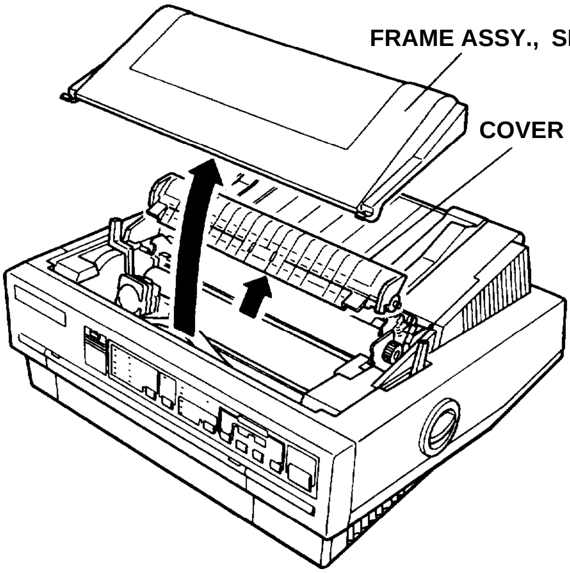


Figure 3-1. Flowchart for Disassembling the Printer

3.2.1 Changing the Printhead

1. Remove the FRAME ASSY., SHEET GUIDE.
2. Remove the COVER ASSY., EJECT.



(This illustration shows the LQ-570, an 80-column printer. The difference between the LQ-570 and LQ-1070 is in carriage width only.)

Figure 3-2. Removing the FRAME ASSY., SHEET GUIDE and the COVER ASSY., EJECT

3. **Release the two levers that hold the printhead to the carriage. Lift out the printhead.**
4. Remove the two FFCs (CABLE, HEAD, FRONT (,REAR)) from the printhead.

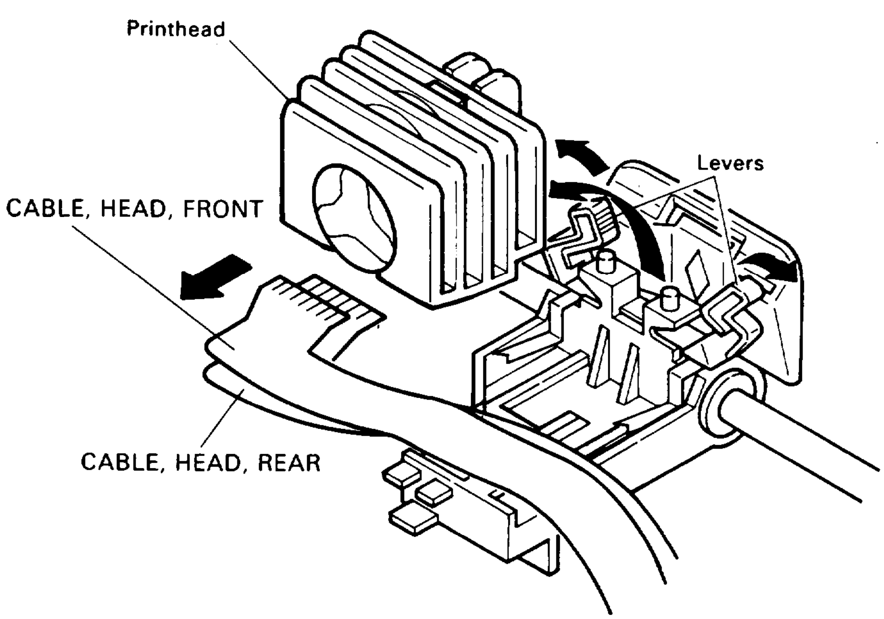


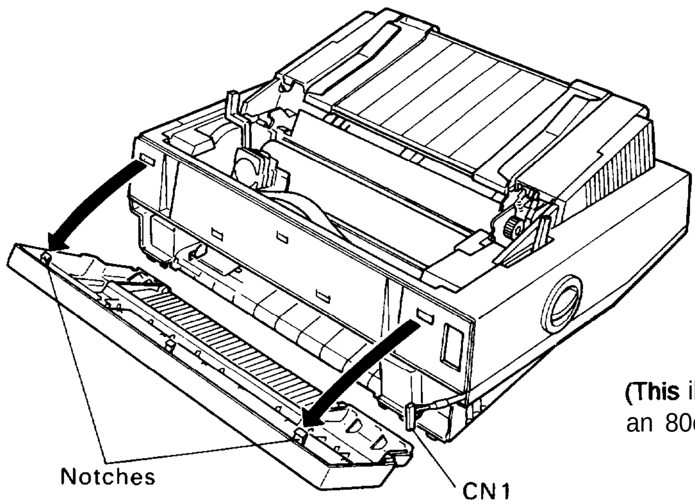
Figure 3-3. Removing the Printhead

3.2.2 Removing the Printer Case

This section describes how to remove the front case and HOUSING ASSY., UPPER.

3.2.2.1 Removing the HOUSING, FRONT

1. Remove the COVER ASSY., PRINTER, FRONT.
2. Remove the HOUSING, FRONT.
3. Use a screwdriver to release the clips that hold the front case to the HOUSING ASSY., UPPER. Open the HOUSING, FRONT. Remove connector CN 1 on the BOARD ASSY., PANEL (CO62 PNL). Remove the HOUSING, FRONT.

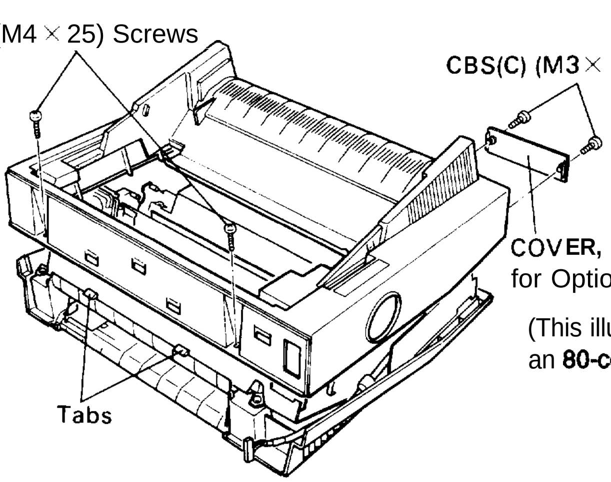


(This illustration shows the LQ-570, an 80column printer.)

Figure 3-4. Removing the HOUSING, FRONT

3.2.2.2 Removing the HOUSING ASSY., UPPER

1. Remove the COVER ASSY., PRINTER, FRONT, the COVER ASSY., EJECT, the TRACTOR ASSY, and the KNOB.
2. Remove the two CBS(C) (M3 × 10) screws that hold the optional interface card cover. Remove the cover.



(This illustration shows the LQ-570, an 80-column printer.)

Figure 3-5. Removing the COVER, CONNECTOR, UPPER for the Optional Interface Card

3. Remove the HOUSING, FRONT (see Section 3.2.2.1).
4. Remove the two CBB(C) (M4 × 25) screws that hold the HOUSING ASSY., UPPER to the HOUSING ASSY., LOWER.
5. Depress the two clips that hold the HOUSING ASSY., UPPER to the FRAME ASSY., SHEET GUIDE. Remove the HOUSING ASSY., UPPER.

3.2.3 Removing the Circuit Boards

This section describes how to remove the BOARD ASSY., MAIN (CO62 MAIN board), the BOARD ASSY., POWER SUPPLY (CO62 PSB/PSE board) and the BOARD ASSY., PANEL (CO62 PNL board).

3.2.3.1 Removing the BOARD ASSY., MAIN (C062 MAIN Board)

1. Remove the HOUSING ASSY.,UPPER (see Section 3.2.2.2).
2. Remove the CB (M3×6) screws that hold the HOLDING PLATE, FFC to the SHIELD PLATE, MAIN BOARD . Remove the HOLDING PLATE, FFC.
3. Disconnect the FFC (CABLE, HEAD, FRONT (, REAR)) removing the cables for the CN6 and CN7 connectors on the main board.
4. Remove the three CBB (C) (M3× 10) screws that hold the SHIELD PLATE, MAIN BOARD to the BOARD ASSY., MAIN. Remove the SHIELD PLATE, MAIN BOARD.

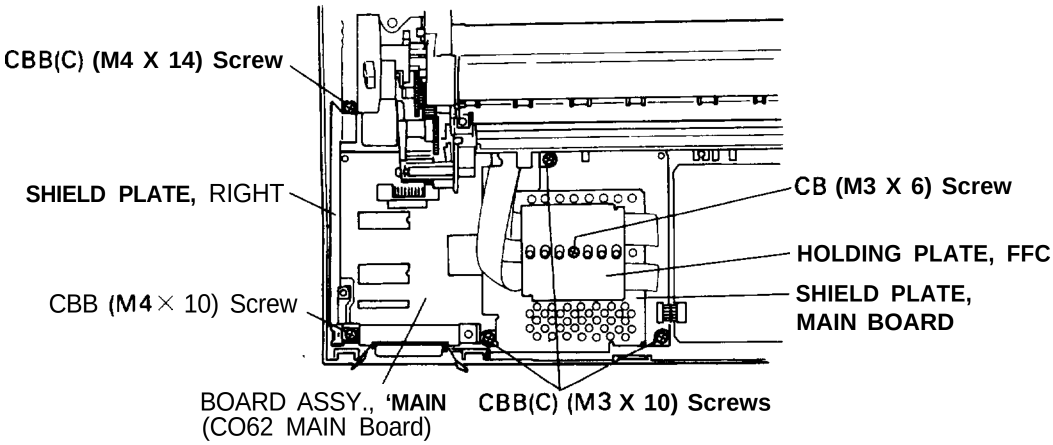


Figure 3-6. Removing the SHIELD PLATE, MAIN BOARD

5. Remove the CBB (M4 X 10) screw that holds the SHIELD PLATE, RIGHT to the BOARD ASSY., MAIN. Remove the CBB(C)(M4 X 14) screw that holds it to the HOUSING ASSY., LOWER. Remove the SHIELD PLATE, RIGHT.
6. Remove the cables for the following BOARD ASSY., MAIN connectors: CN3 (brown 12-pin), CN4 (white 5-pin), CN5 (white 6-pin), CN8 (yellow 2-pin), CN9 (black 2-pin), CN 10 (blue 2-pin), CN 1 1 (white 2-pin), and CN 12 (red 2-pin).
7. Remove the three CBB(C) (M3 X 10) screws and CB (M3 X 8) screws that hold the BOARD ASSY., MAIN to the HOUSING ASSY., LOWER. Remove the BOARD ASSY., MAIN.

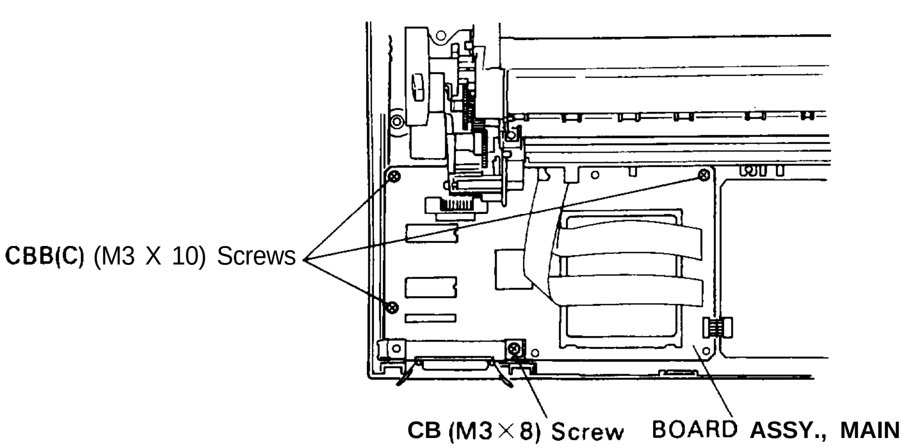


Figure 3-7. Removing the BOARD ASSY., MAIN

Point to Note for Assembly and Adjustment

After replacing the BOARD ASSY., MAIN, you must adjust the bidirectional print position again to ensure bidirectional printing is correctly aligned (see Section 4.2).

3.2.3.2 Removing the BOARD ASSY., POWER SUPPLY (C062 PSB/PSE Board)

1. Remove the HOUSING ASSY., UPPER (see Section 3.2.2.2).
2. Remove the cable for connector CN 13 from the BOARD ASSY., MAIN.
3. Remove the cable for connector CN1 from the BOARD ASSY., POWER SUPPLY.
4. Remove the four CBB(C) (M3 X 10) screws and the CB (M3 X 8) screws that hold the BOARD ASSY., POWER SUPPLY to the HOUSING ASSY., LOWER. Remove the BOARD ASSY., POWER SUPPLY.

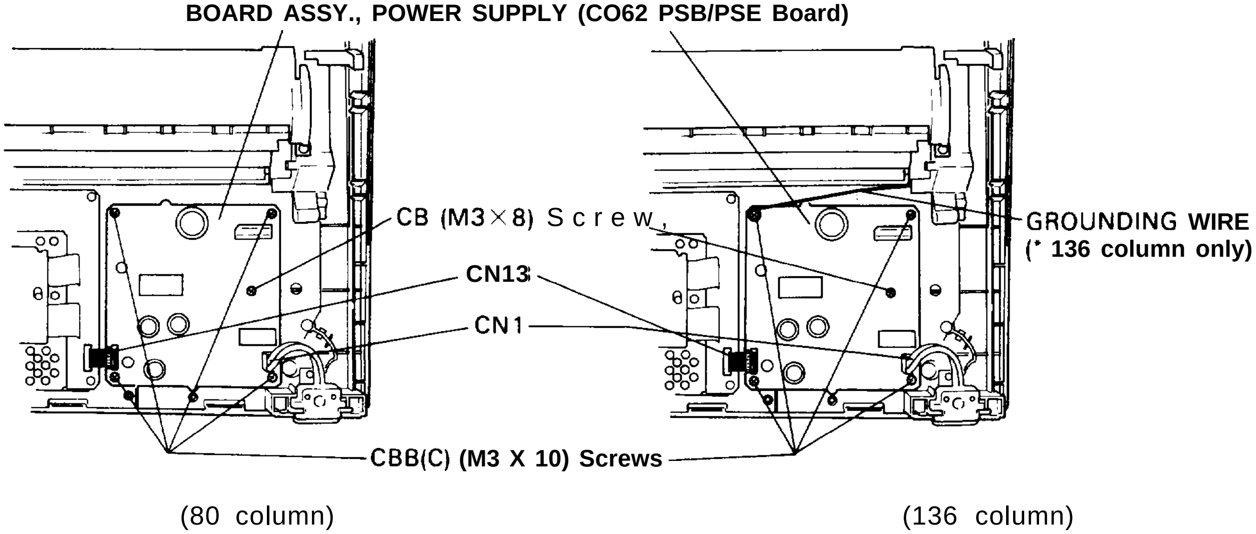


Figure 3-6. Removing the BOARD ASSY., POWER SUPPLY

3.2.3.3 Removing the BOARD ASSY., PANEL (C062 PNL Board)

1. Remove the HOUSING, FRONT (see Section 3.2.2.1).
2. Remove the 10 CBB(C) (M3 X 10) screws that hold the BOARD ASSY.,PANEL to the HOUSING, FRONT. Remove the BOARD ASSY., PANEL.

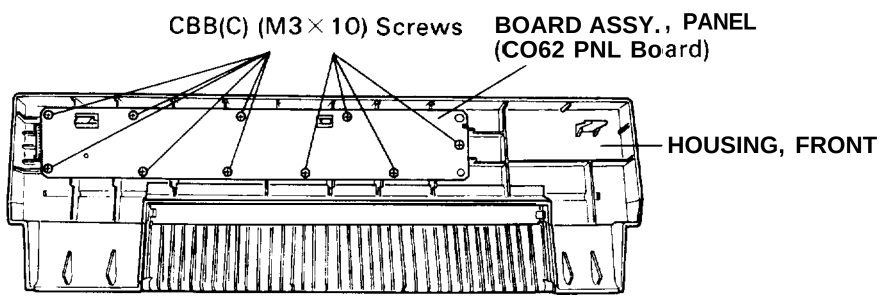
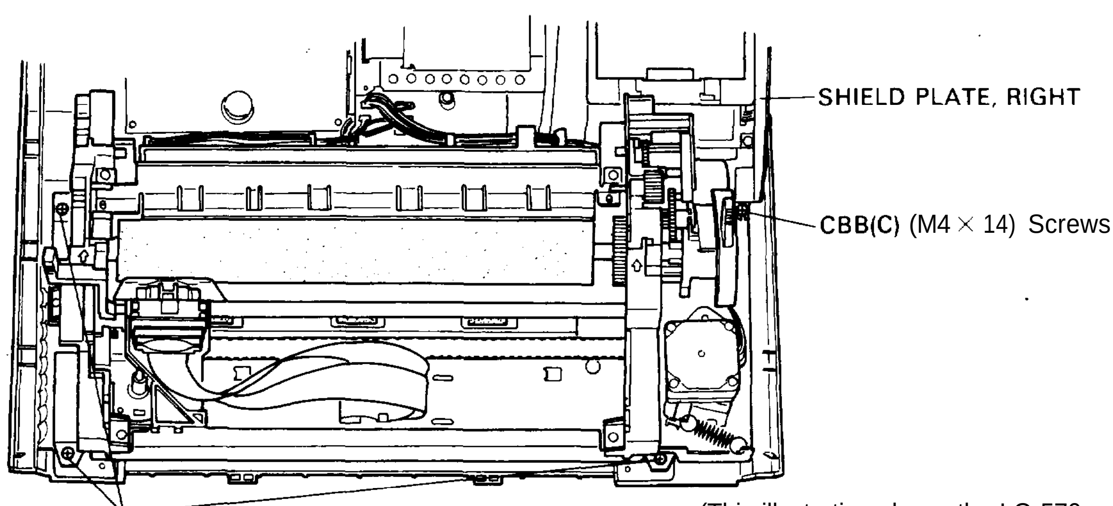


Figure 3-9. Removing the BOARD ASSY., PANEL

3.2.4 Removing the PRINTER MECHANISM

1. Remove the HOUSING ASSY., UPPER (see Section 3.2.2.2).
2. Remove the CB (M3×6) screws that attach the HOLDING PLATE., FFC to the SHIELD PLATE, MAIN BOARD. Remove the HOLDING PLATE,FFC.
3. Disconnect the 2 FFCs(CABLE, HEAD, FRONT(,REAR)) from the CN6 and CN7 connectors on the BORAD ASSY., MAIN. Remove the cables for the following BOARD ASSY., MAIN connectors: CN3 (brown 12-pin), CN4 (white 5-pin), CN5 (white g-pin), CN8 (yellow 2-pin), CN9 (black 2-pin), CN10 (blue 2-pin), CN 1 1 (white 2-pin) and CN 12 (red 2-pin).
4. Remove the CBB(C) (M4 X 10) screw that holds the SHIELD PLATE., RIGHT to the BOARD ASSY., MAIN (see Figure 3-6). Remove the CBB(C) (M4× 14) screws that hold it to the HOUSING ASSY., LOWER. Remove the SHIELD PLATE., RIGHT.
5. Remove the three CBB(C) (M4× 14) screws that hold the PRINTER MECHANISM to the HOUSING ASSY., LOWER. Remove the PRINTER MECHANISM.



(This illustration shows the LQ-570, an 80-column printer.)

Figure 3-10. Removing the PRINTER MECHANISM

Point to Note for Assembly and Adjustment

After replacing the PRINTER MECHANISM, you must adjust the bidirectional print position to ensure bidirectional printing is correctly aligned (see Section 4.2).

3.2.5 Disassembling the PRINTER MECHANISM

This section describes how to disassemble the main components of the PRINTER MECHANISM.

3.2.5.1 Removing the MOTOR, CR

1. Remove the PRINTER MECHANISM from the HOUSING ASSY., LOWER (see Section 3.2.4).
2. Remove the printer spring (778 gm) from the base frame and the MOTOR, CR frame.
3. Remove the TIMING BELT from the BELT PULLEY.
4. Remove the MOTOR, CR frame from the HOUSING ASSY., LOWER.
5. Remove the two CBS(O) (M3 X 6) screws that hold the MOTOR, CR to the FRAME ASSY., CR, MOTOR. Remove the MOTOR, CR

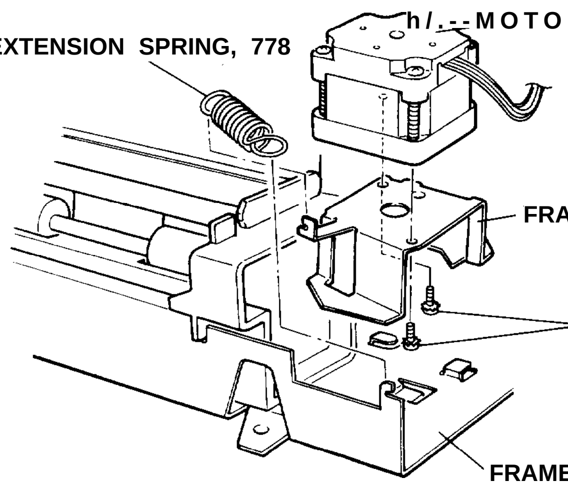


Figure 3-11. Removing the MOTOR, CR

Points to Note for Assembly and Adjustment

See Section 3.2.5.13 for details on arranging and positioning the motor cable.

After removing the MOTOR, CR from the FRAME ASSY., CR, MOTOR, you must adjust the MOTOR, CR backlash (see Section 4.1 .1). You also must adjust the bidirectional print position to ensure bidirectional printing is correctly aligned (see Section 4.2).

3.2.5.2 Removing the MOTOR, PF

1. Remove the PRINTER MECHANISM from the HOUSING ASSY., LOWER (see Section 3.2.4).
2. Remove the COMPRESSION SPRING, 200 that holds the platen shaft.
3. Release the two clips holding the MOTOR, PF to the FRAME, MAIN, RIGHT.
4. Remove the MOTOR, PF from the FRAME, MAIN, RIGHT.

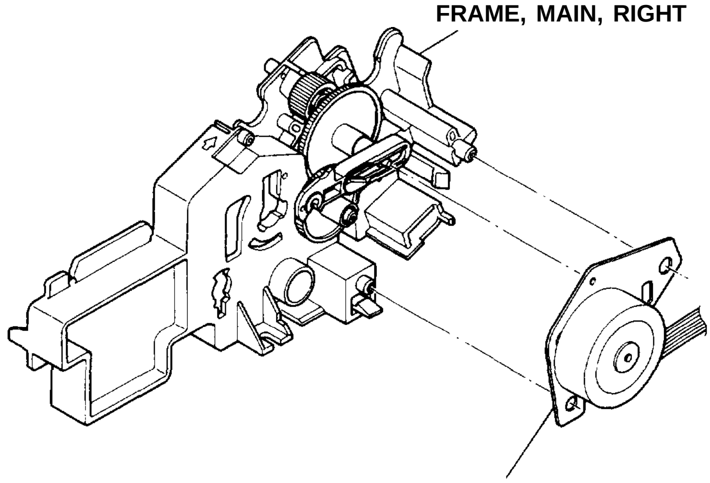


Figure 3-12. Removing the MOTOR, PF

Point to Note for Assembly

See Section 3.2.5.13 for details on arranging and positioning the motor cable.

3.2.5.3 Removing the FFC (CABLE, HEAD, FRONT (,REAR))

1. Remove the printhead (see Section 3.2.1).
2. Remove the PRINTER MECHANISM from the HOUSING ASSY., LOWER (see Section 3.2.4).
3. Remove the FFC from the clips that hold it along the rear side of the PRINTER MECHANISM. Make sure that the FFC is free.
4. Remove the FFC from clip on the HOLDING PLATE, FFC at the rear of the PRINTER MECHANISM.
5. Remove the four clips that hold the HOLDING PLATE, FFC to the base frame. Remove the FFC together with the HOLDING PLATE, FFC.

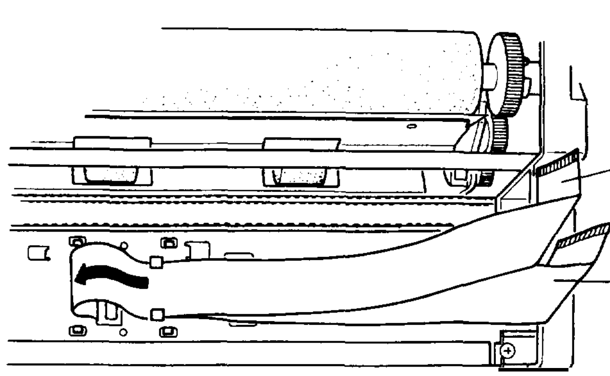


Figure 3-13. Removing the FFC Cable

Point to Note for Assembly

See Section 3.2.5.13 for details on arranging and positioning the FFC.

3.2.5.4 Removing the Carriage

1. Remove the FFC (CABLE, HEAD, FRONT (,REAR)) (see Section 3.2.5.3).
2. Remove the TIMING BELT from the carriage.
3. Use the box driver to rotate and free the adjusting bushing. This bushing holds the SHAFT, CR, GUIDE to the FRAME, MAIN, RIGHT. Remove the bushing.
4. Remove the carriage unit together with the SHAFT, CR, GUIDE by pulling the SHAFT, CR, GUIDE a little to the right.

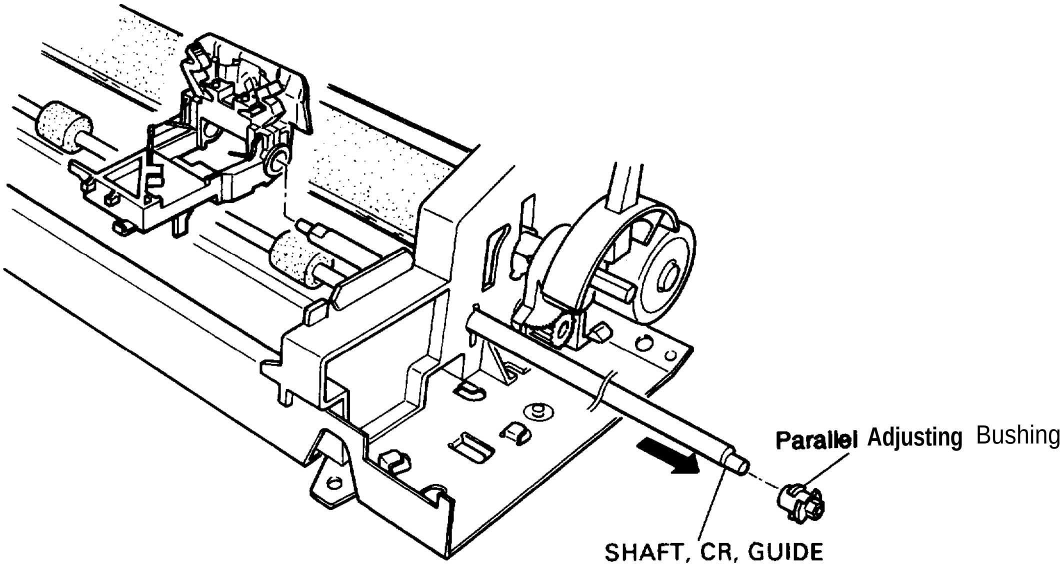


Figure 3-14. Removing the Carriage Unit

Point to Note for Assembly and Adjustment

After removing or rotating the adjusting bushing, you must adjust the platen gap (see Section 4.1.2).

3.2.5.5 Removing the PLATEN

1. **Remove** the PRINTER MECHANISM from the HOUSING ASSY., LOWER (see Section 3.2.4).
2. Remove the two **CBP(C) (M3×** 10) screws that hold the COVER, PLATEN, LOWER to the left and FRAME, MAIN, RIGHT. Remove the COVER, PLATEN, LOWER.
3. Remove the COMPRESSION SPRING, 200 that holds the platen shaft (see Section 3.2.5.2, step 2).
4. Set the head LEVER, **G,** ADJUST to the most forward position.
5. Remove the two clips that **hold the LEVER, RELEASE** to the platen shaft. Remove the LEVER, RELEASE from the platen shaft.
6. **Using tweezers, rotate the bushing (8 mm) that holds the platen to the frame, main, left. Remove this bushing, along with the ground spring.**
7. **Using tweezers, rotate the bushing (8 mm) that holds the platen to the frame, main, right. Remove the platen by lifting it up toward the right.**

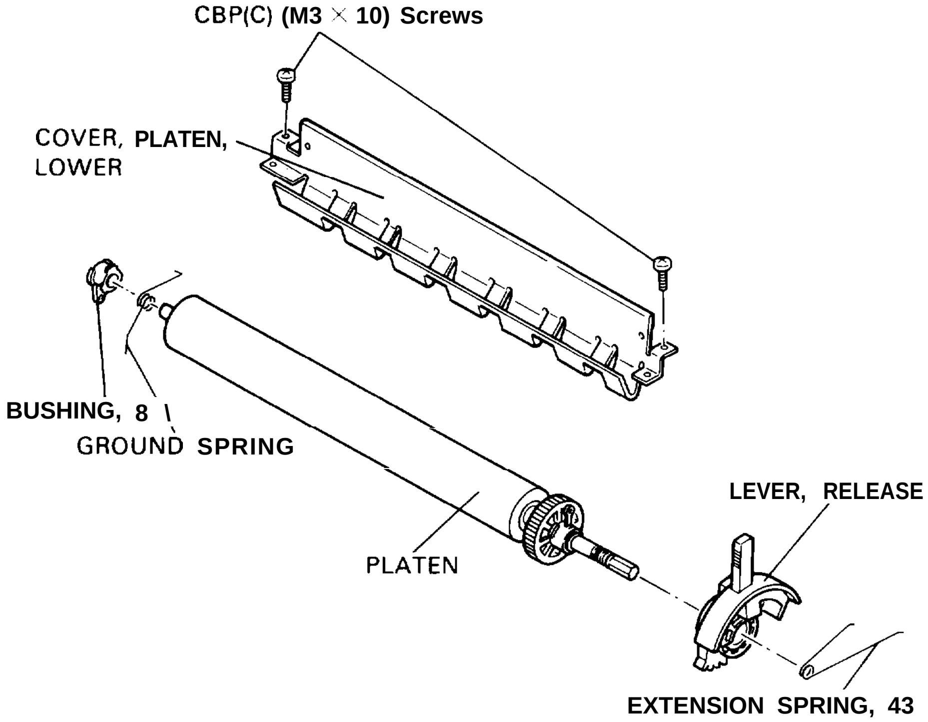


Figure 3-15. Removing the PLATEN

Point to Note for Assembly

When inserting the LEVER, RELEASE onto the platen shaft, mesh the LEVER, RELEASE with the mechanism correctly by positioning it at the mark on the auxiliary release shaft.

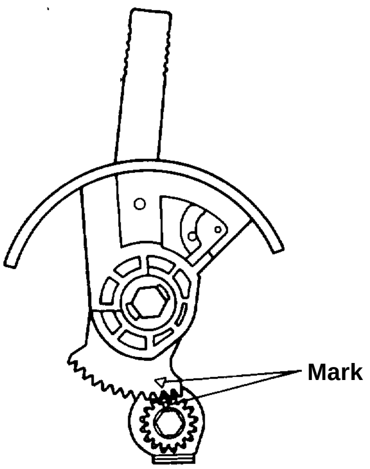


Figure 3-16. LEVER, RELEASE Insertion Positioning

3.2.5.6 Removing and Disassembling the FRAME, MAIN, RIGHT

1. Remove the PRINTER MECHANISM from the HOUSING ASSY., LOWER (see Section 3.2.4).
2. Remove the PLATEN from the PRINTER MECHANISM (see Section 3.2.5.5).
3. Remove the MOTOR, CR from the FRAME, MAIN, BASE (see Section 3.2.5.1).
4. Remove the two CBS(C)(P) (M3 X 10) screws that hold the FRAME, MAIN, RIGHT to the FRAME, MAIN, BASE. Remove the FRAME, MAIN, RIGHT from the FRAME, MAIN, BASE.
5. Remove the following items from the FRAME, MAIN, RIGHT in the specified order: MOTOR, PF (see Section 3.2.5.2), CAM, CLUTCH, TRACTOR, COMBINATION GEAR, 8.5,30, SPUR GEAR, PLAIN WASHER, COMPRESSION SPRING 200, and SPUR GEAR, 16.

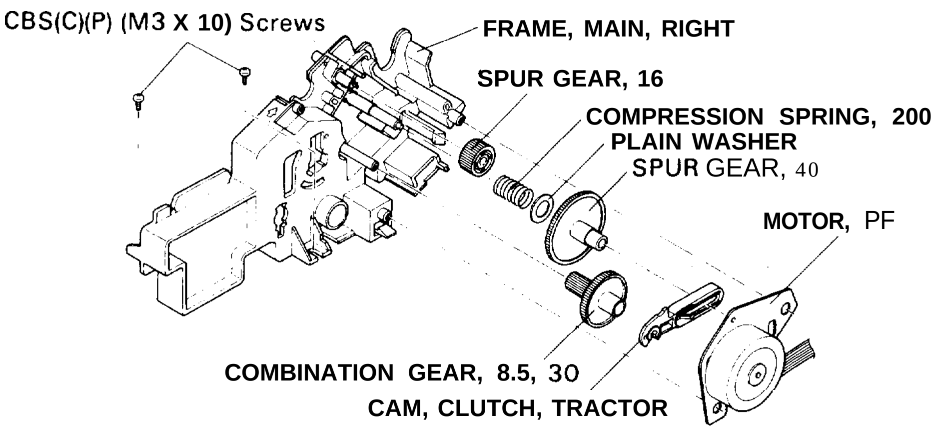


Figure 3-17. Disassembling the FRAME, MAIN, RIGHT

Point to Note for Assembly

When installing the PLAIN WASHER, insert it from the front in the direction indicated by the mark.

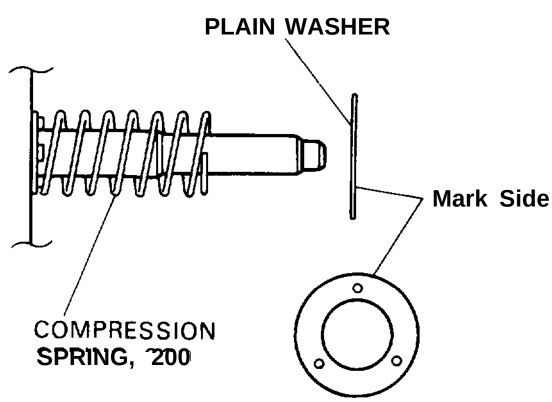


Figure 3-18. Direction for Inserting the PLAIN WASHER

3.2.5.7 Removing and Disassembling the PAPER GUIDE (Including the DETECTOR ASSY., HP)

1. Remove the PRINTER MECHANISM from the HOUSING ASSY., LOWER (see Section 3.2.4).
2. Remove the PLATEN from the PRINTER MECHANISM (see Section 3.2.5.5).
3. Remove the FRAME, MAIN, RIGHT from the FRAME, MAIN, BASE (see Section 3.2.5.6).
4. Remove the three springs (32 gm) from the lower side of the PRINTER MECHANISM (These springs join the PAPER GUIDE support to the FRAME, MAIN, BASE.)
5. While holding open the clips that secure the PAPER GUIDE to the FRAME, MAIN, BASE, slide the PAPER GUIDE to the left. Remove the PAPER GUIDE.

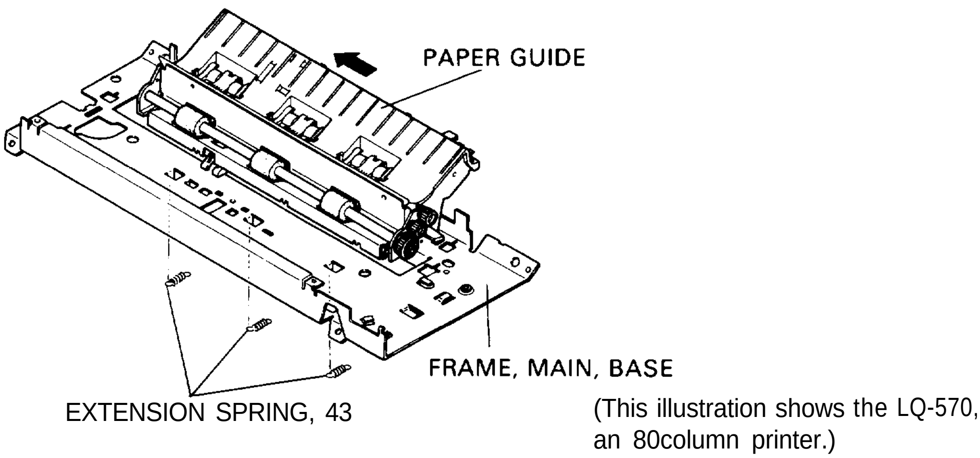


Figure 3-19. Removing the PAPER GUIDE

6. Open the clips that hold the SPUR GEAR, 18 to the ROLLER ASSY., PF, DRIVE. Remove the SPUR GEAR, 18 from the ROLLER ASSY., PF, DRIVE.
7. Remove the ROLLER ASSY., PF, DRIVE from the PAPER GUIDE.
8. Slide the PAPER GUIDE support to the right. Remove the PAPER GUIDE support from the PAPER GUIDE.

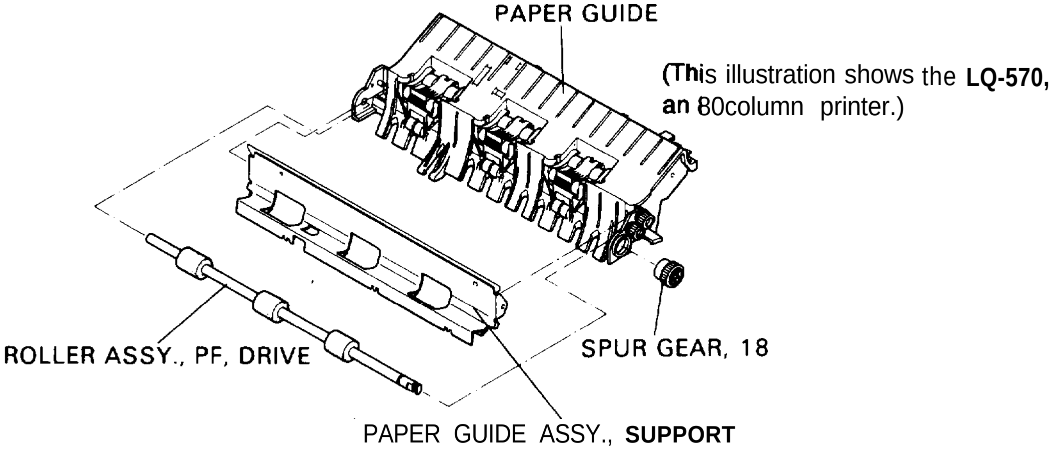


Figure 3-20. Removing the PAPER GUIDE ASSY., SUPPORT

9. While holding down the three PF lever assemblies, pull out and remove the release shaft. Remove the PF lever assemblies and the compression spring (1300 gm) from the paper guide.

10. While holding open the clips that secure the DETECTOR ASSY., RELEASE to the PAPER GUIDE, remove the DETECTOR ASSY., RELEASE.

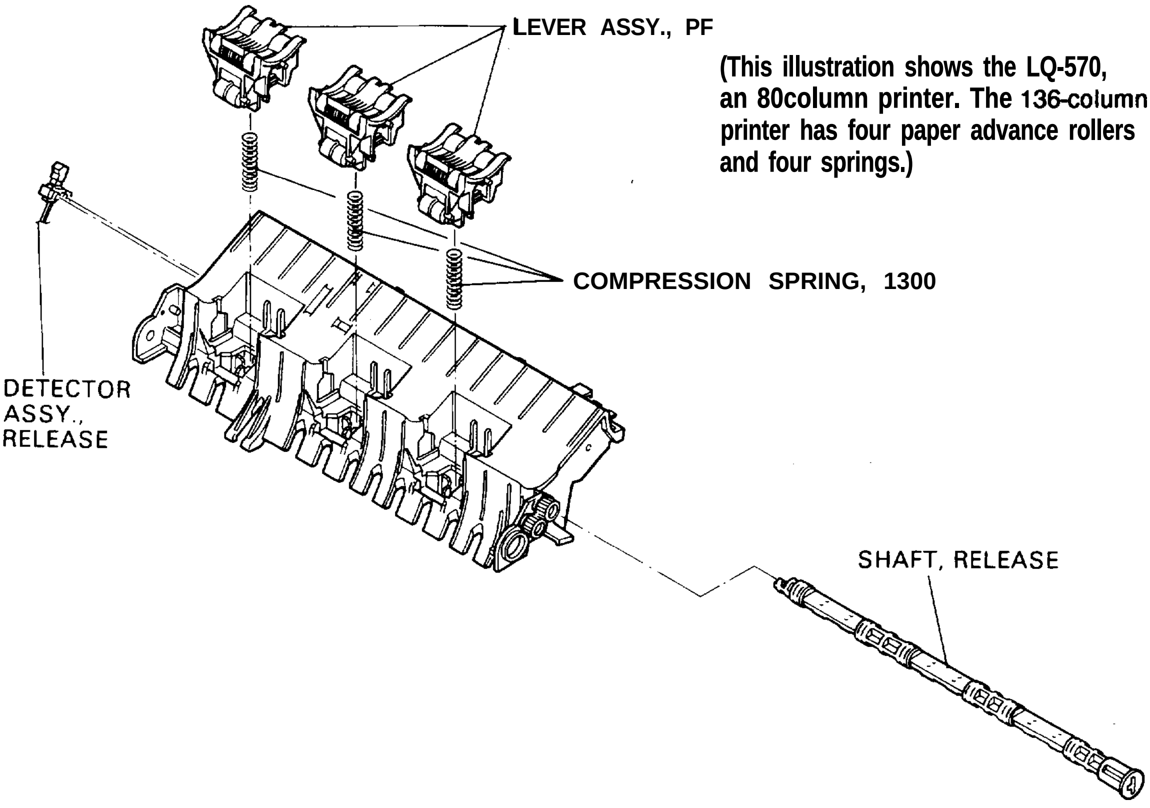


Figure 3-21. Removing the LEVER ASSY., PF

Point to Note for Assembly

Insert the SHAFT, RELEASE in the PAPER GUIDE in the way shown in the diagram below.

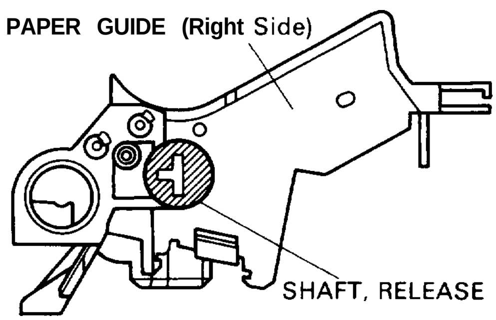


Figure 3-22. How to Insert the SHAFT, RELEASE

3.2.5.8 Removing the DETECTOR ASSY., HP

1. Remove the PRINTER MECHANISM from the HOUSING ASSY., LOWER (see Section 3.2.4).
2. Remove the clips from the rear side of the FRAME, MAIN, BASE that hold the DETECTOR ASSY., HP. Remove the DETECTOR ASSY., HP from the rear of the FRAME, MAIN, BASE.

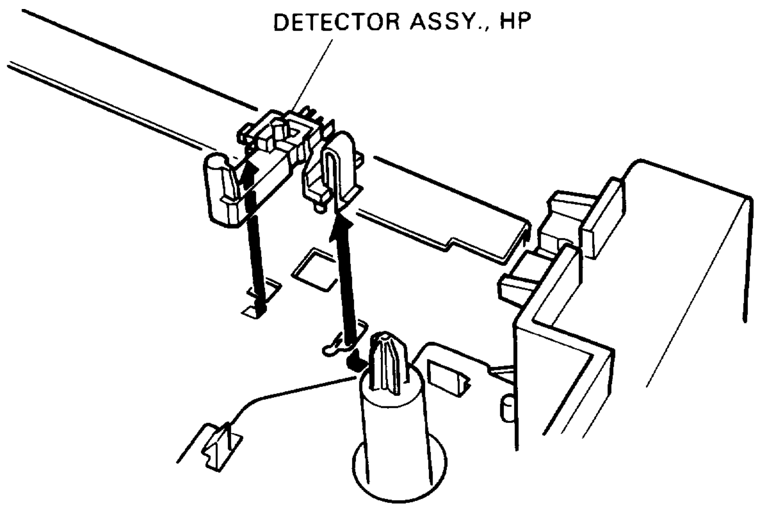


Figure 3-23. Removing the DETECTOR ASSY., HP

3.2.5.9 Removing the DETECTOR ASSY., PE, REAR

1. Remove the PRINTER MECHANISM from the HOUSING ASSY., LOWER (see Section 3.2.4).
2. Remove the two CBP(C) (M3 X 10) screws that hold the COVER, PLATEN, LOWER to the frame. Remove the COVER, PLATEN, LOWER.
3. Remove the clips that hold the DETECTOR ASSY., PE, REAR in the PAPER GUIDE. Remove the DETECTOR ASSY., PE, REAR

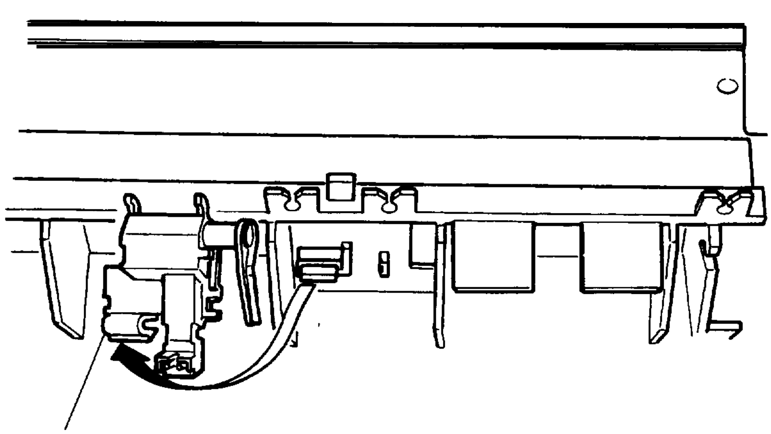


Figure 3-24. Removing the DETECTOR ASSY., PE, REAR

3.2.5.10 Removing the DETECTOR ASSY., PE, FRONT

1. Remove the PRINTER MECHANISM from the HOUSING ASSY., LOWER (see Section 3.2.4).
2. Open the clips that hold the DETECTOR ASSY., PE, FRONT to the FRAME, MAIN, BASE. Remove the DETECTOR ASSY., PE, FRONT.

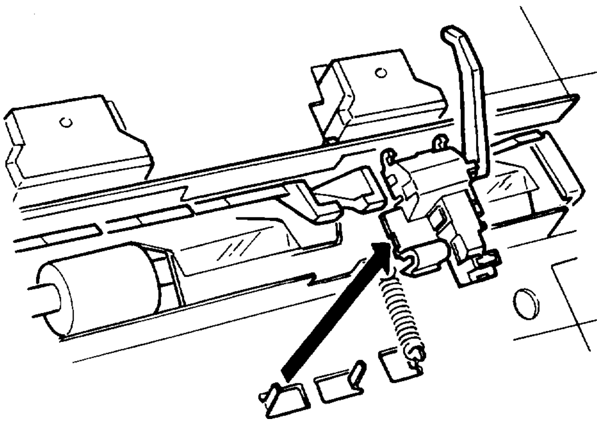


Figure 3-25. Removing the DETECTOR ASSY., PE, FRONT

3.2.5.11 Removing the DETECTOR ASSY., PLATEN

1. Remove the PRINTER MECHANISM from the HOUSING ASSY., LOWER (see Section 3.2.4).
2. Remove the clips that hold DETECTOR ASSY., PLATEN to the FRAME, MAIN, LEFT. Remove the DETECTOR ASSY., PLATEN.

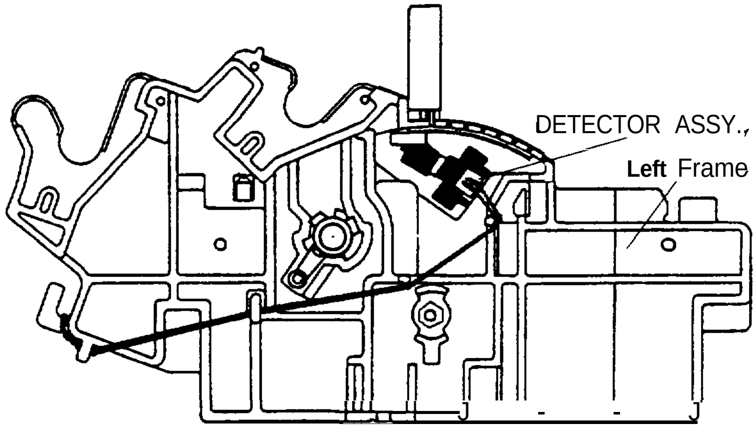


Figure 3-26. Removing the DETECTOR ASSY., PLATEN

3.2.5.12 Disassembling the TRACTOR ASSY.

1. Remove the TRACTOR ASSY. from the printer.
2. Remove the SPUR GEAR, 17 from the SHAFT, TRACTOR.
3. Remove the FRAME, TRACTOR, RIGHT from the SHAFT, TRACTOR and the SHAFT, TRACTOR, GUIDE.
4. Remove RETAINING RING from the SHAFT, TRACTOR.
5. Remove the TRACTOR ASSEMBLY (RIGHT), the PAPER SUPPORT unit, and the TRACTOR ASSEMBLY (LEFT) from the SHAFT, TRACTOR and SHAFT, TRACTOR, GUIDE.

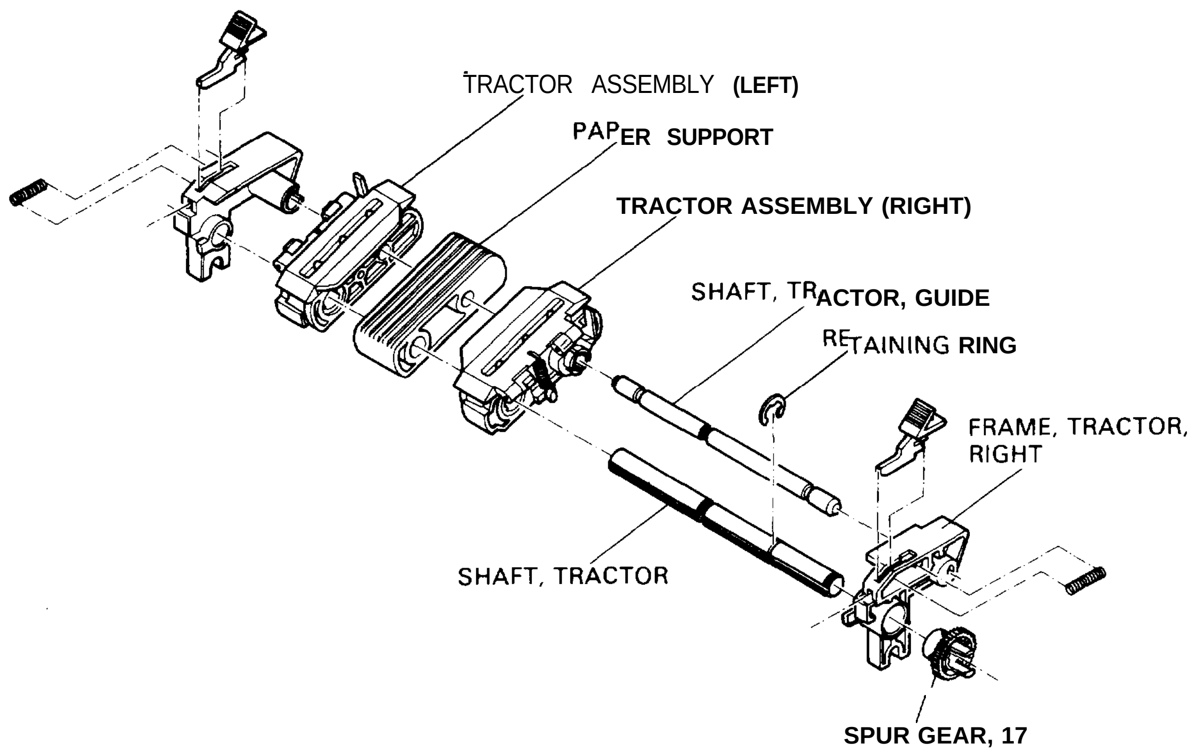
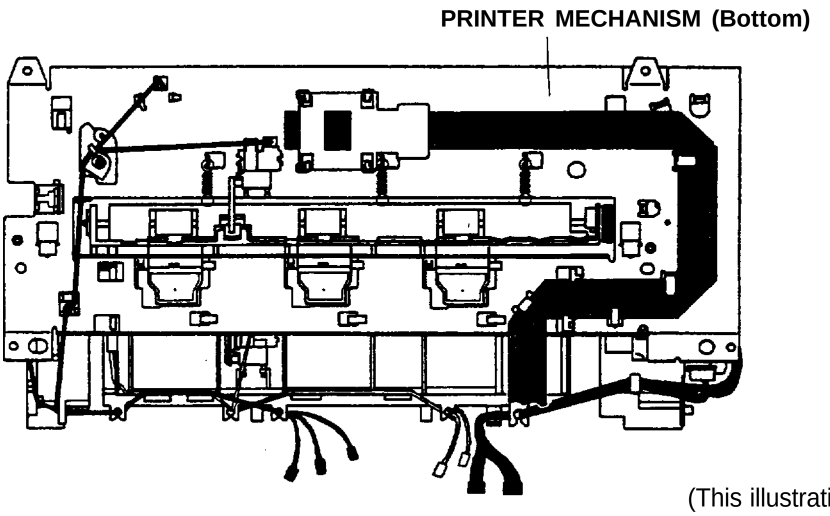


Figure 3-27. Disassembling the TRACTOR ASSY.

3.2.5.13 Arranging the Cables

Figure 3-28 shows how the cables are **arranged** for the PRINTER MECHANISM. When assembling the printer, make sure that the cables are laid out as shown in this figure.



(This illustration shows the LQ-570, an **80-column** printer.)

Figure 3-28. Arranging the Cables

CHAPTER 4
ADJUSTMENTS

LIST OF FIGURES

4.1 ADJUSTING THE PRINTER MECHANISM

This section describes the various adjustments you may need to make to the PRINTER MECHANISM.

4.1.1 MOTOR, CR Backlash Adjustment

In the MOTOR, CR backlash adjustment, the pinion gear of the MOTOR, CR is meshed smoothly with the BELT PULLEY cog. If the pinion gear is poorly aligned, printer operation becomes noisy, and the accuracy of character alignment during printing suffers.

1. Remove the MOTOR, CR, along with the FRAME ASSY., CR, MOTOR, from the PRINTER MECHANISM (see Section 3.2.5.1).
2. Loosen the two CBS(O) (M3 X 6) screws that hold the MOTOR, CR to the FRAME ASSY., CR, MOTOR.
3. Check the alignment of the **MOTOR,** CR pinion gear with the BELT PULLEY cog. Move the MOTOR, CR until you judge that there is a gap of about 0.05 – 0.15 mm between the two. Tighten the two CBS(O) (M3 X 6) screws.

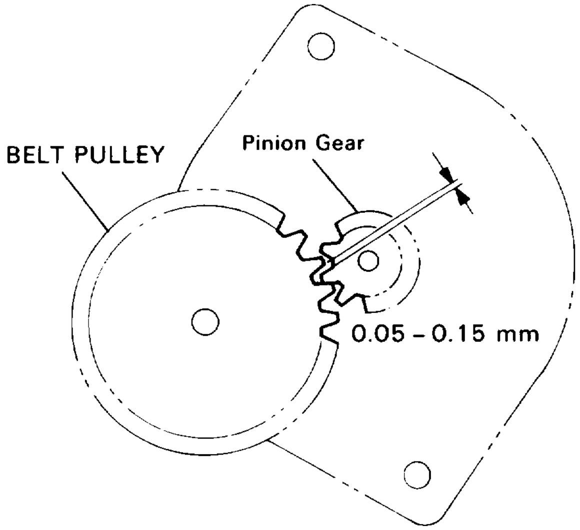


Figure 4-l. MOTOR, CR Backlash Adjustment

4.1.2 Platen Gap Adjustment

If you have rotated or reassembled the SHAFT, CR, GUIDE or the adjusting bushing, or if printing is abnormal, you must adjust the gap between the PLATEN and the printhead.

1. Remove the PRINTER MECHANISM from the HOUSING ASSY., LOWER (see Section 3.2.4).
2. Remove the printhead from the carriage (see Section 3.2.1).
3. Use tweezers to remove the RIBBON MASK from the carriage.

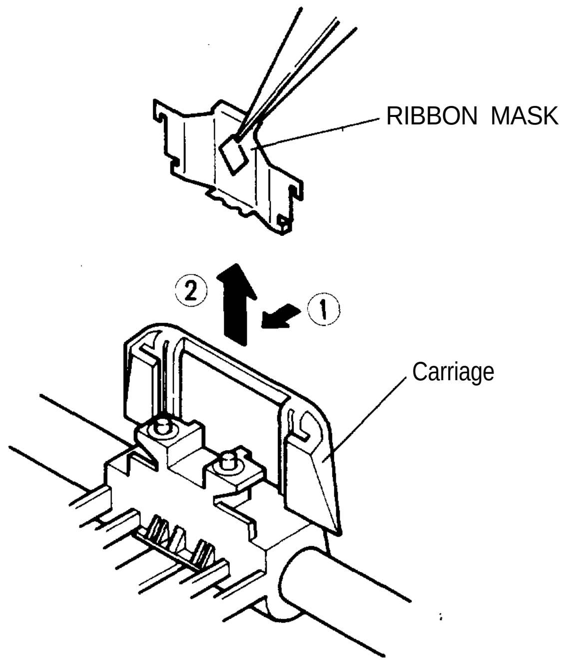


Figure 4-2. Removing the RIBBON MASK

4. Remount the printhead on the carriage.
5. Set the paper-thickness LEVER, G, ADJUST to position 0 (the second step position).
6. Move the LEVER, RELEASE back to the friction setting.
7. Move the carriage until the edge of the printhead is at the 5th column print position.
8. **Use the box driver (7 mm) to rotate the adjusting bushing on the frame, main, left of the printer mechanism. (There is one on each side of the printer mechanism.)**

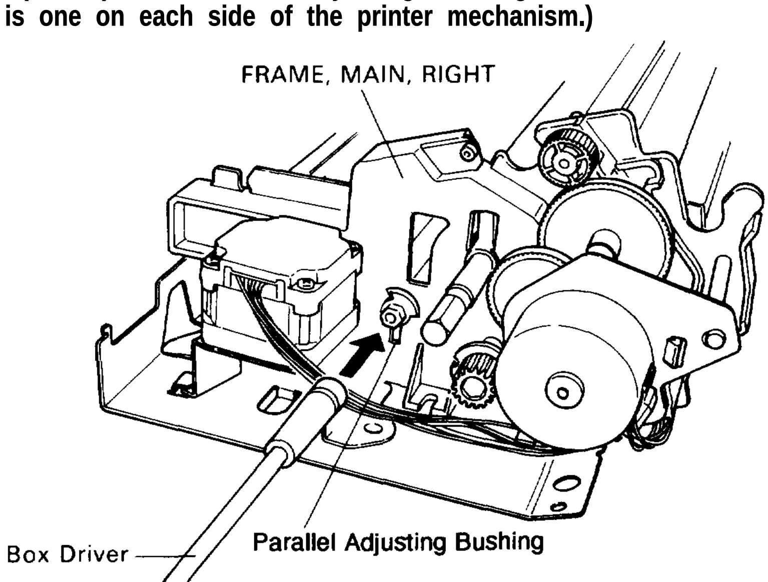


Figure 4-3. The Adjusting Bushing

9. Rotate the adjusting bushing until the platen gap is large enough for a thickness gauge of 0.44 mm thickness but too narrow for one of 0.47 mm thickness.

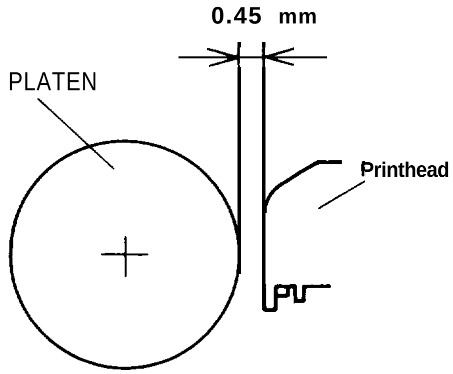


Figure 4-4. Platen Gap

10. Move the carriage until the edge of the printhead is at the 75th column print position.
1 1. Use the box driver (7 mm) to rotate the adjusting bushing on the FRAME, MAIN, RIGHT of the PRINTER MECHANISM.
12. Rotate the adjusting bushing until the platen gap is large enough for a thickness gauge of 0.44 mm thickness but too narrow for one of 0.47 mm thickness.
13. Move the printhead back again so that the edge of the printhead is at the 5th column print position. Check the platen gap again with the thickness gauge. It should still be large enough for a thickness gauge of 0.44 mm thickness but too narrow for one of 0.47 mm thickness. If this is not the case, go back to step 8.
14. Center the carriage. Check the platen gap again with the thickness gauge. It should still be large enough for a thickness gauge of 0.44 mm thickness but too narrow for one of 0.47 mm thickness. If this is not the case, go back to step 8.
15. Remove the printhead, install the RIBBON MASK and then replace the printhead.

4.2 BIDIRECTIONAL PRINT POSITION ADJUSTMENT

This section describes how to adjust the bidirectional print position to ensure correct printing alignment.

4.2.1 Overview of Bidirectional Print Position Adjustment

This printer prints characters when the carriage is moving in either direction (i.e., from left to right or from right to left).

Adjustment is necessary to ensure that the printing of characters in one direction is properly aligned with the printing of characters in the opposite direction. For example, if the print position is out of alignment, printing of a vertical line shows staggering ‘because of the skew effect.

It is important to readjust the bidirectional print position if anything has been done to the gear arrangement that might affect this printing alignment. By making the timing lag a fraction during printing while the carriage moves from right to the left, it is possible to line up the printing done in this direction so that it will match the printing done in the left to right direction. This procedure to alter the timing is called bidirectional print position adjustment.

The degree of bidirectional printing skew differs, depending on the unique characteristics of each PRINTER MECHANISM. For this reason, there is no standard skew correction value that can be applied to each printer. The unique skew correction value for each printer has to be written to EEPROM on the BOARD ASSY., MAIN (CO62 MAIN BOARD).

Whenever the PRINTER MECHANISM, or the BOARD ASSY., MAIN (CO62 MAIN BOARD) itself, is changed during servicing, the bidirectional print position must be readjusted and a new bidirectional skew correction value must be written to EEPROM.

4.2.2 Bidirectional Print Position Adjustment Procedure

Initial operation

Before performing the bidirectional alignment adjustment, complete the initial operation below:

- Position the LEVER, G, ADJUST at position 0. • Verify that the DIP switch l-6 is on).
- Verify that the DIP switch setting for country is U.S. (DIP switches l-l, l-2, l-3 are on).
- Load paper.
- Feed at least 10 lines.
- Turn the printer off.

NOTE: The printer enters unidirectional printing mode automatically from the top of form to the line 10 position on the paper, because this improves paper-feed accuracy. Therefore, you must perform the bidirectional alignment adjustment after 10 lines or more have been fed.

Adjustment operation

The alignment procedure is as follows:

1. Turn the printer power on while pressing the ALT, LF/FF, and LOAD/EJECT buttons.
2. The printer enters draft mode and prints the reference value and “|” characters for 4 lines.

Are the characters aligned vertically? NO → GO TO STEP 3.
YES → GO TO STEP 4.

3. Referring the odd-numbered lines (1st and 3rd), adjust the even-numbered lines (2nd and 4th).

- If the even-numbered lines are shifted to the right:

→ Press the LOAD/EJECT button once while pressing the ALT button. (The reference value increases + 1 and even lines shift to the left.)

- If the even-numbered lines are shifted to the left:

→ Press the LF/FF button once while pressing the ALT button. (The reference value decreases − 1 and even lines shift to the right.)

4. Press the ALT, LF/FF, and LOAD/EJECT buttons at the same time.
5. The printer enters LQ mode, and the printer prints the reference value and the "|" characters for 4 lines.

Are the characters aligned vertically? NO → GO TO STEP 6.
YES → GO TO STEP 7.

6. Referring to the odd-numbered lines (1st and 3rd), adjust the even-numbered lines (2nd and 4th).

- If the even-numbered lines are shifted to the right:

  → Press the LOAD/EJECT button once while pressing the ALT button. (The reference value increases + 1 and even lines shift to the left.)

- If the even-numbered lines are shifted to the left:

  → Press the LF/FF button once while pressing the ALT button. (The reference value decreases − 1 and even lines shift to the right.)

7. Turn printer power off.

4.3 CIRCUIT ADJUSTMENT

The BOARD ASSY., MAIN (C062 MAIN BOARD) contains variable resistor VR1, which is used for balancing the circuitry. When any of the following parts are replaced, the circuitry must be balanced again by adjusting this variable resistance:

R14, R15, R13, C8, and VR1

If the circuitry is not correctly balanced in this way, the CPU A/D converter fails to function normally and printer operation is affected.

4.3.1 Adjustment Process

Attach a digital multimeter to the check terminal TP2 (Vref voltage) on the BOARD ASSY., MAIN (CO62 MAIN BOARD). Turn on printer power and turn variable resistor VR1 until a reading of 4.74 1 V is obtained.

CHAPTER 5
TROUBLESHOOTING

LIST OF FIGURES

LIST OF TABLES

CHAPTER 5

5.1 OVERVIEW

Problems in the printer may exhibit **a variety of symptoms, which** can complicate the task of troubleshooting, unless you follow the procedure shown in the flowchart below.

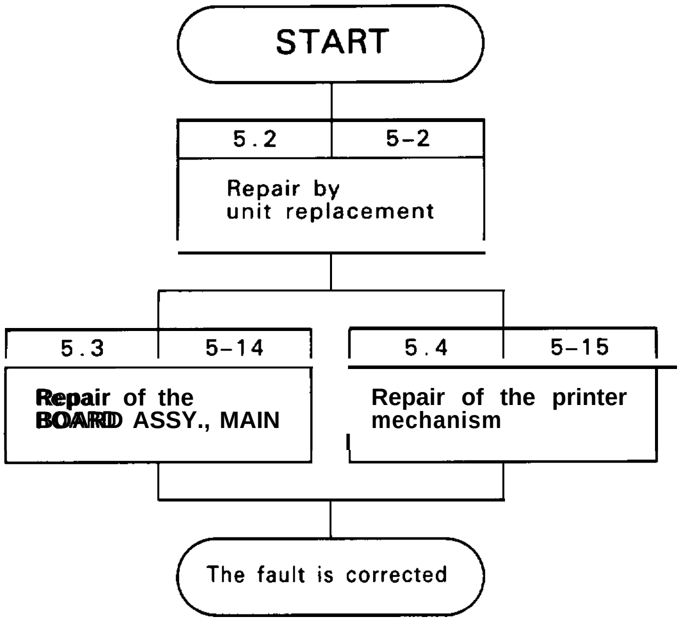


Figure 5-1. Troubleshooting Procedure

The following tables provide troubleshooting information.

Table 5-1. Motor and Printhead Coil Resistance

Part	Specifications
MOTOR, CR	Coil resistance 19.5 ohms +/− 7% at 25 degrees C (77 degrees F)
MOTOR, PF	Coil resistance 79.0 +/− 5 ohms at 25 degrees C (77 degrees F)
Printhead	Coil resistance 45.5 +/− 3.2 ohms at 25 degrees C (77 degrees F)

Table 5-2. Error Codes

Error Display	Error	Cause
Buzzer beeps 3 times for 0.1 second, with 0. l-second intervals.	Paper-out error	. Printer is out of paper. . DETECTOR ASSY., PE, FRONT (,REAR)
Buzzer beeps 5 times for 0.5 second, with 0.5-second intervals.	Carriage error	. MOTOR, CR malfunction. . Carriage mechanism malfunction. . MOTOR, CR driver current malfunction.

5.2 REPAIR BY UNIT REPLACEMENT

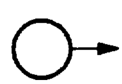
For most problems, it is sufficient for you to determine the difficulty to the unit level. Refer to Table 5-3, identify what the problem is, then perform the checks according to the corresponding flowchart.

Table 5-3. Symptoms and Reference Pages

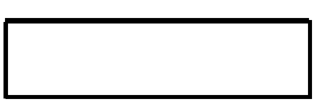
Symptom	Problem	See Page
Printer fails to operate when power is on.	. **Carriage does not move.** . Control panel indicator lamp does not light.	**5-3**
Carriage operation is abnormal.	. **Carriage moves away from home position at power** on. . **The carriage returns to the home position correctly, but the printer then fails to enter the** READY mode.	**5-4**
Printing **is** faulty during self-**test, but carriage operation is normal.**	. **No printing at all.** . **Faulty printing -some of the dots are not printed.**	**5-5**
Paper feeding is abnormal.	. **No paper is fed.** . **Regular paper feed, but with variations in the separations between lines.**	**5-9**
Control panel operation is abnormal.	. When the LF switch is activated, no paper is fed.	**5-12**
Printing of data sent by the host computer is faulty.	. **Carriage operates normally at power on, and self-test is executed correctly.** . **Print data from the computer, however, is not printed correctly.**	**5-13**

The repair procedure flowcharts are represented using the following symbols:

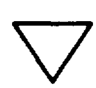
Start



Branching



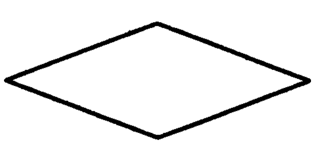
Processing



Returning to the Start of the item

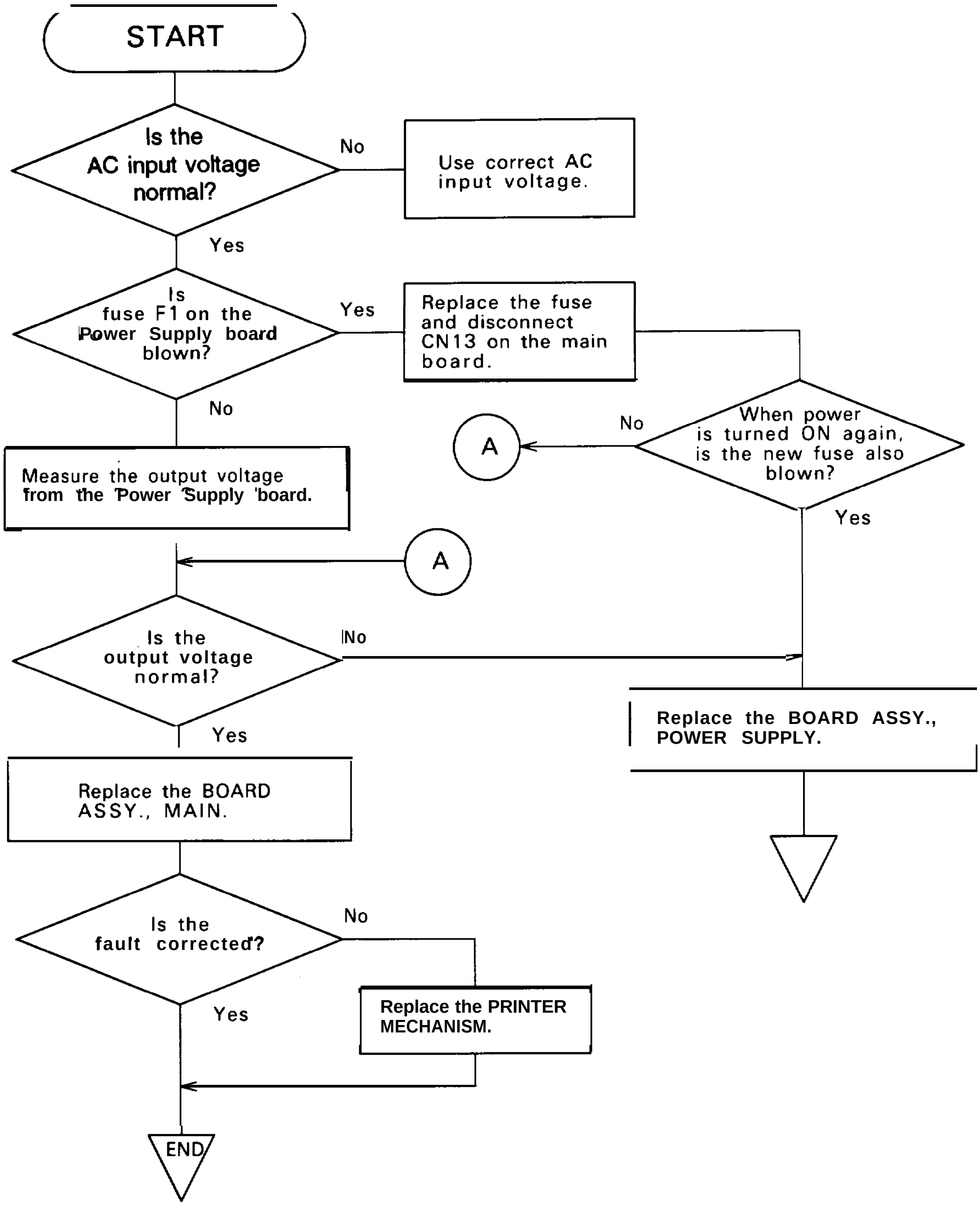
Forwarding to another item

End

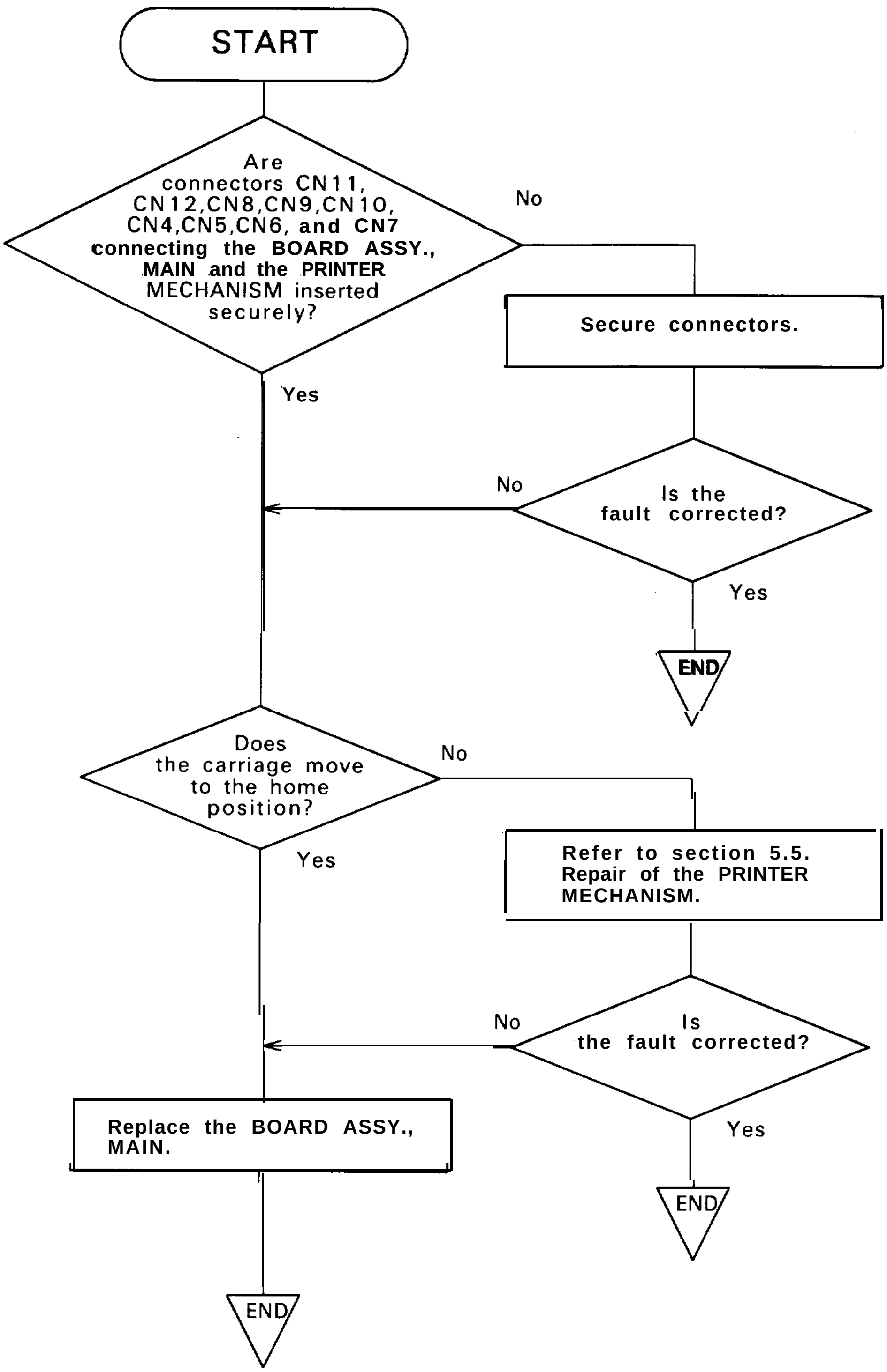


Decision

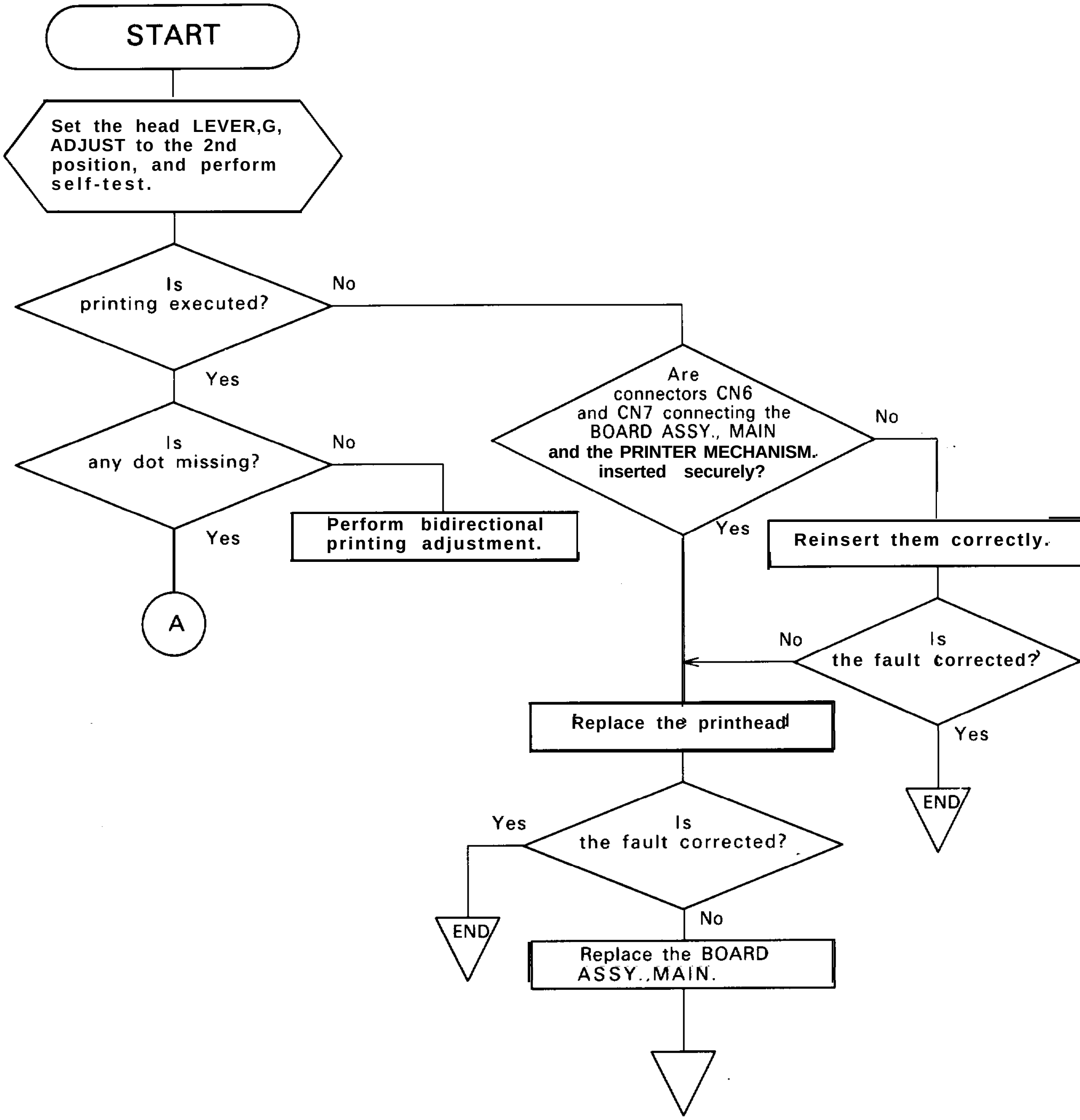
(1) Printer Fails to Operate when Power is On

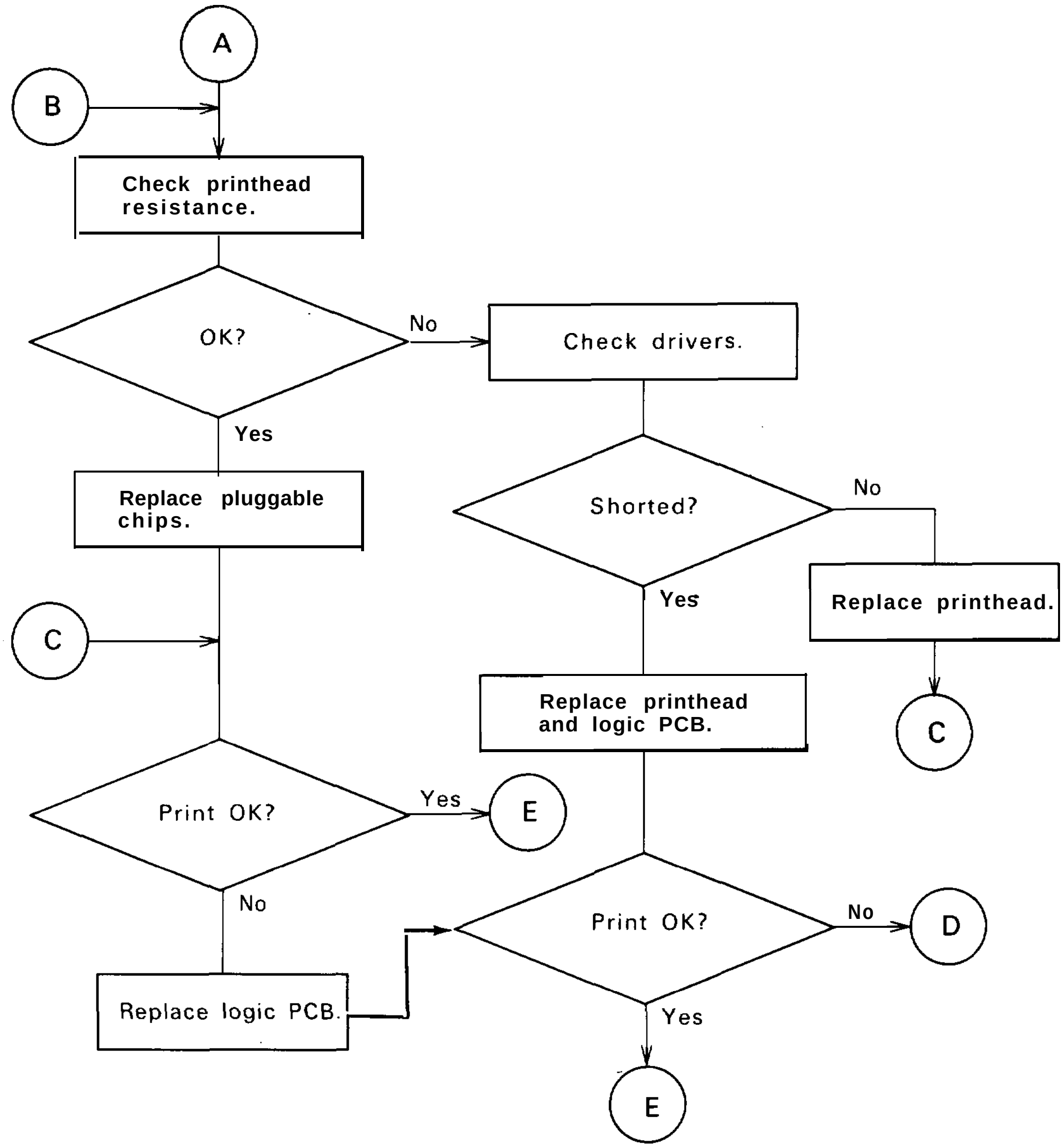


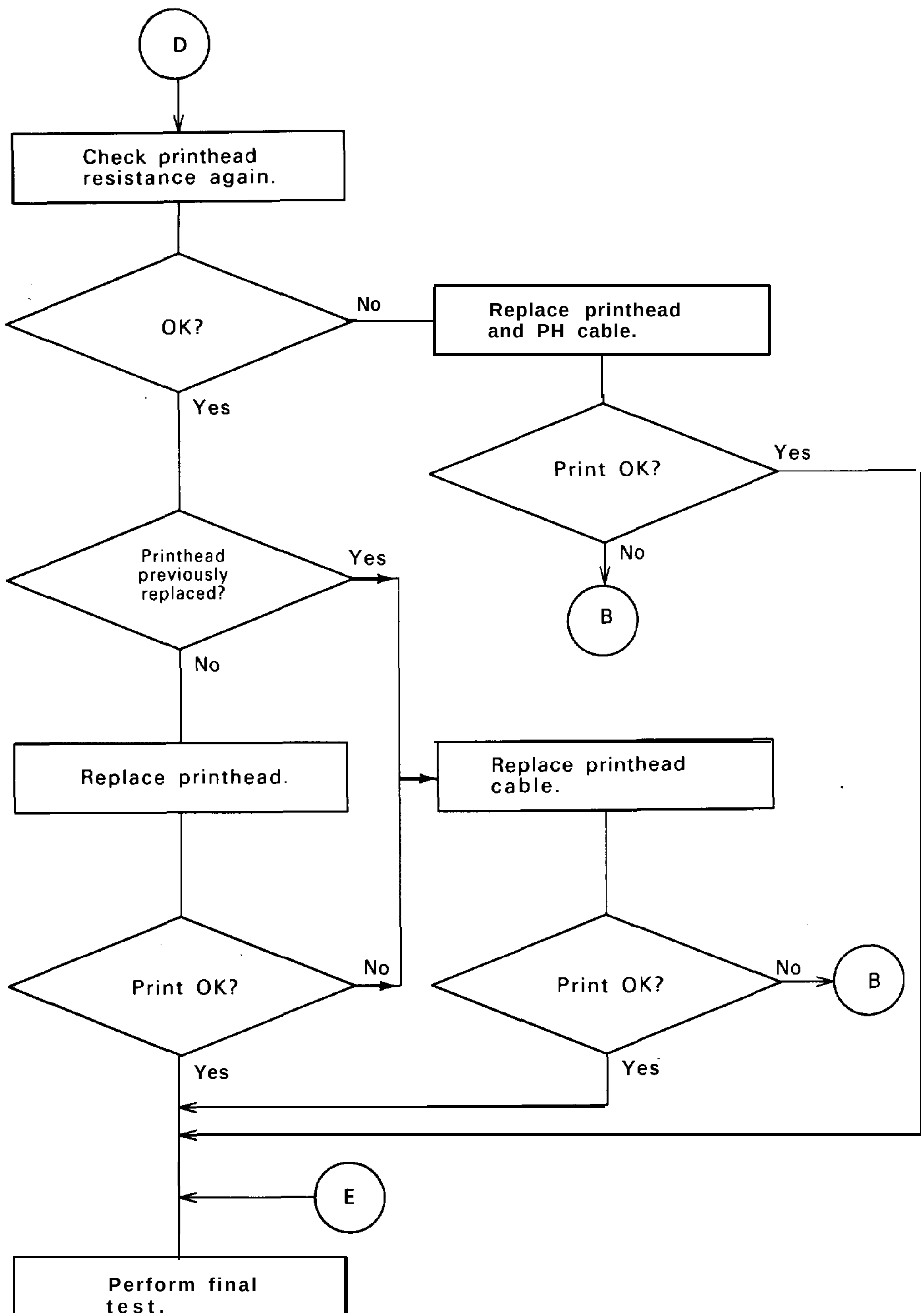
(2) Carriage Operation is Abnormal

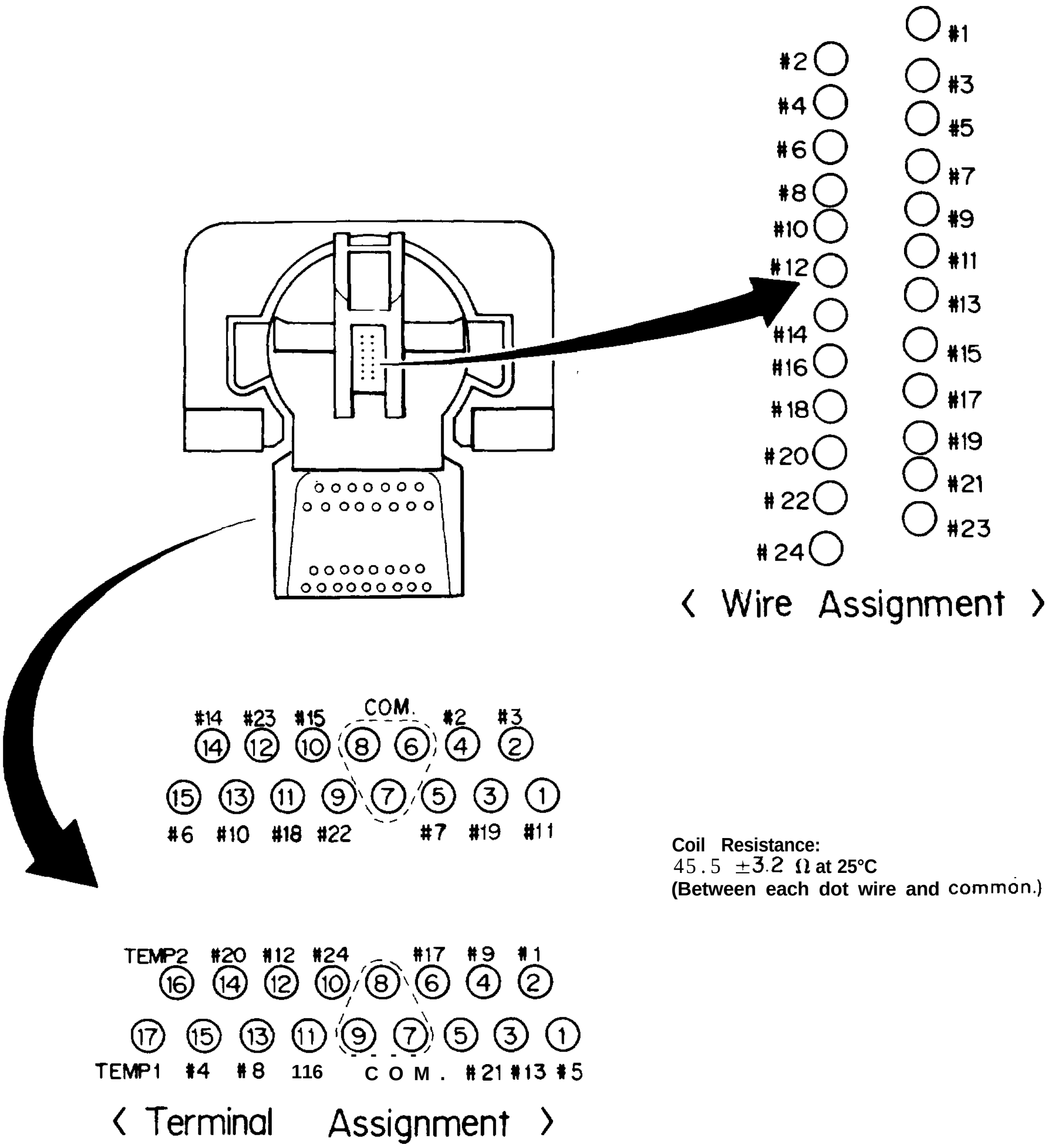


(3) Printing is Faulty During Self-Test, but Carriage Operation is Normal




A
B
Check printhead resistance.
OK?
No
Check drivers.
Yes
Replace pluggable chips.
Shorted?
No
Replace printhead.
C
Yes
Replace printhead and logic PCB.
C
Print OK?
Yes
E
No
Replace logic PCB.
Print OK?
No
D
Yes
E

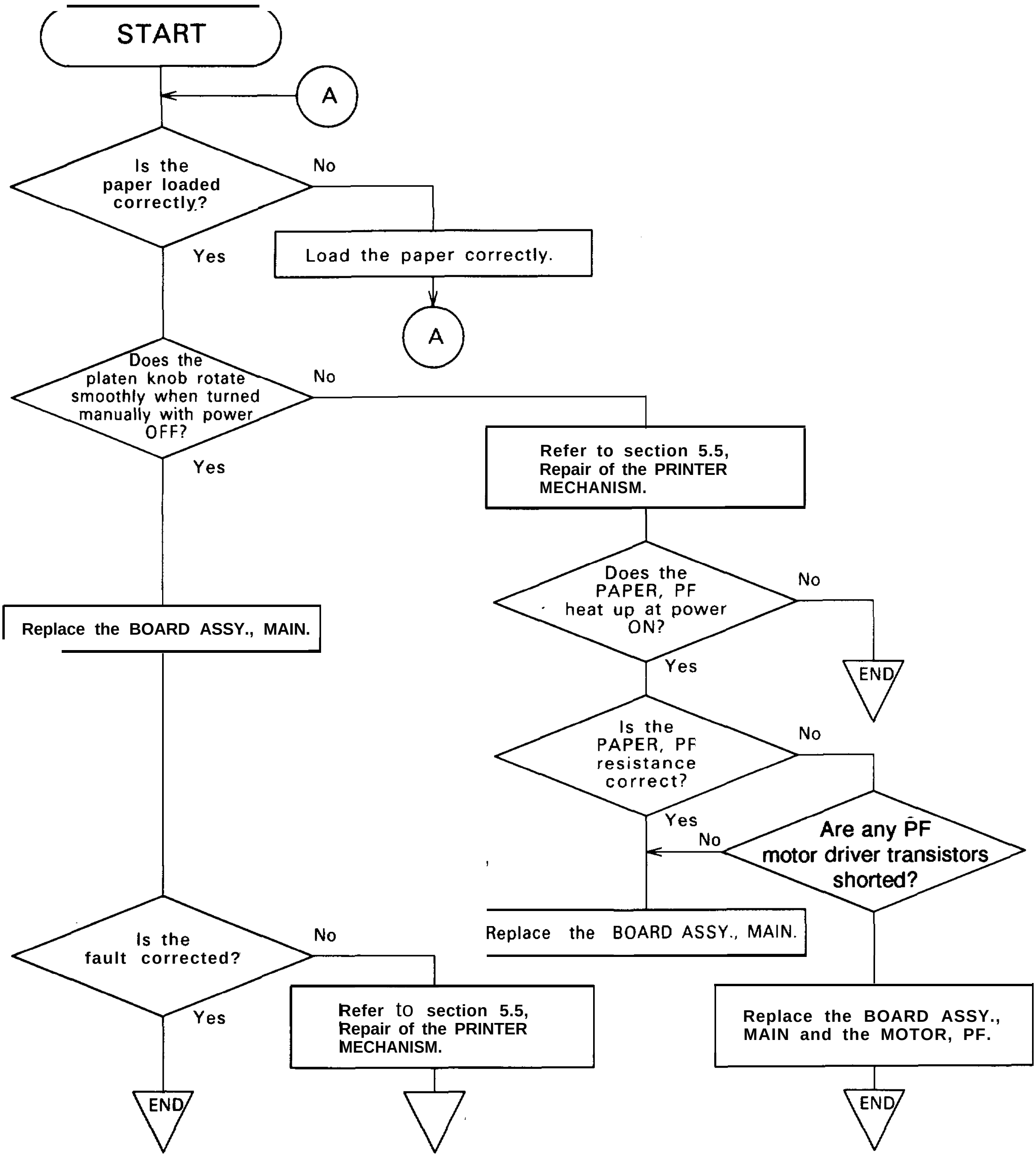

D
Check printhead resistance again.
OK?
No
Replace printhead and PH cable.
Yes
Print OK?
Yes
No
B
Printhead previously replaced?
Yes
No
Replace printhead.
Replace printhead cable.
Print OK?
No
Print OK?
No
B
Yes
Yes
E
Perform final test.

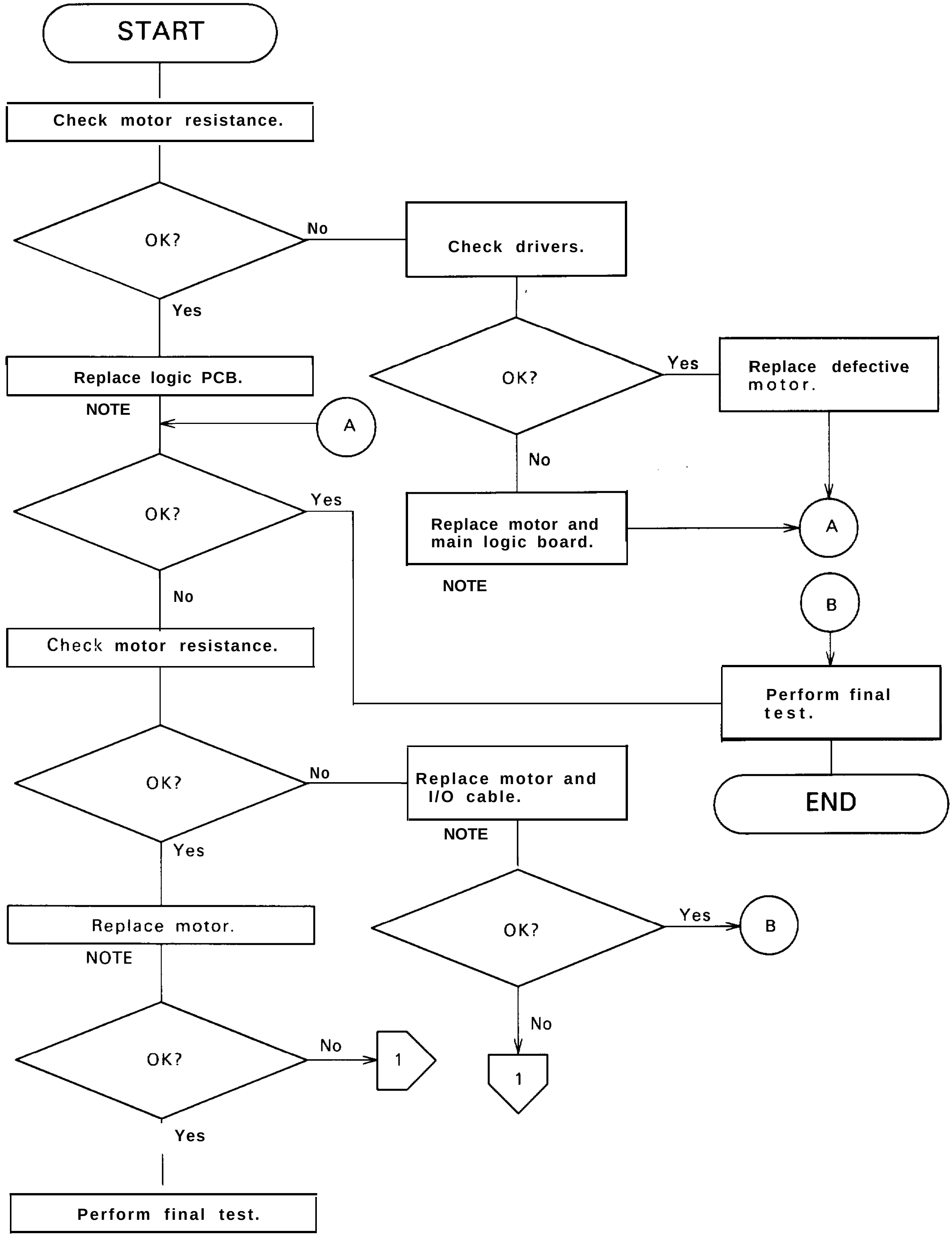


Coil Resistance:
45.5 ±3.2 Ω at 25°C
(Between each dot wire and common.)

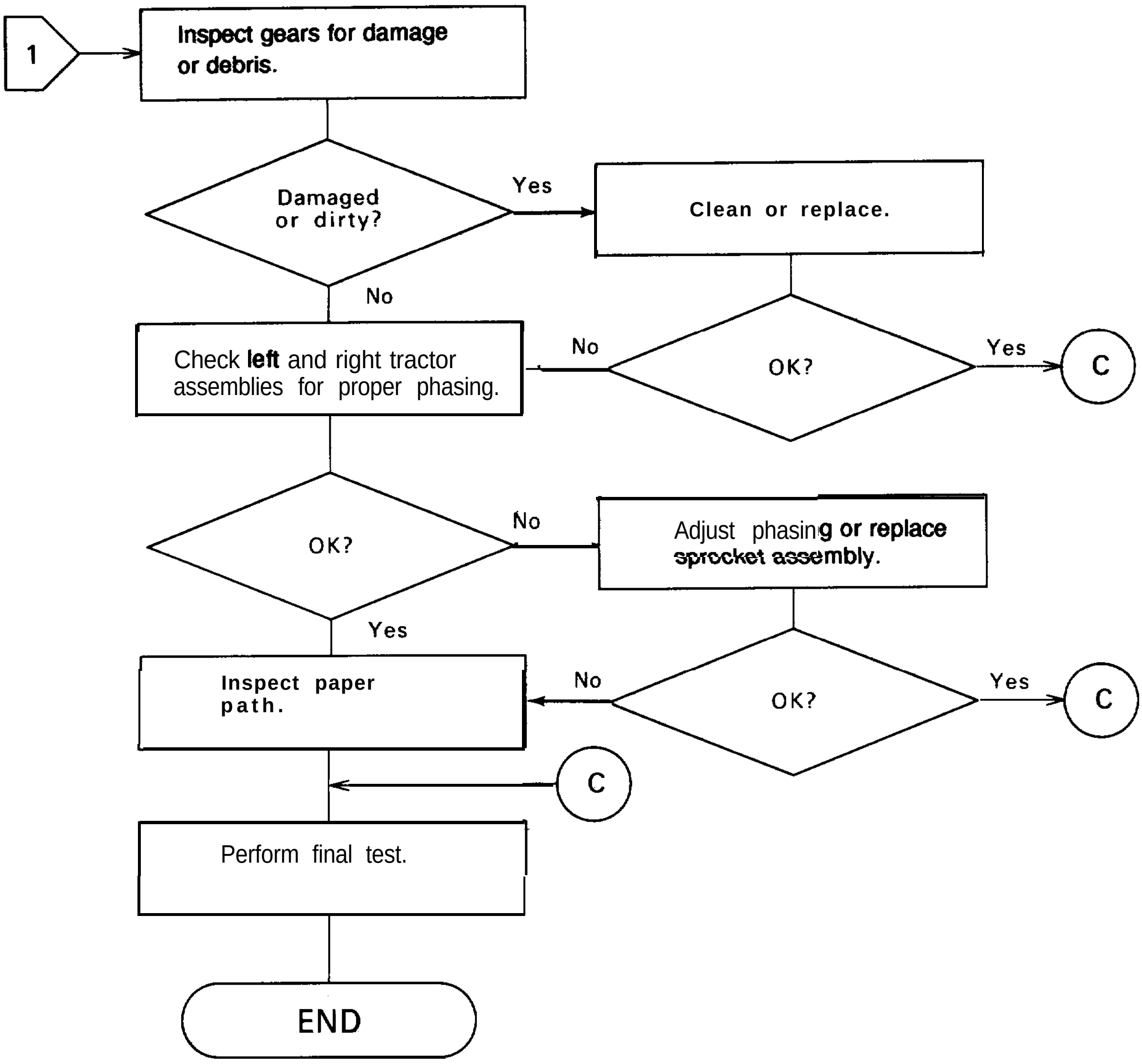
Figure 5-2. Printhead Resistance

(4) Paper Feeding is Abnormal (but Printing is Normal)

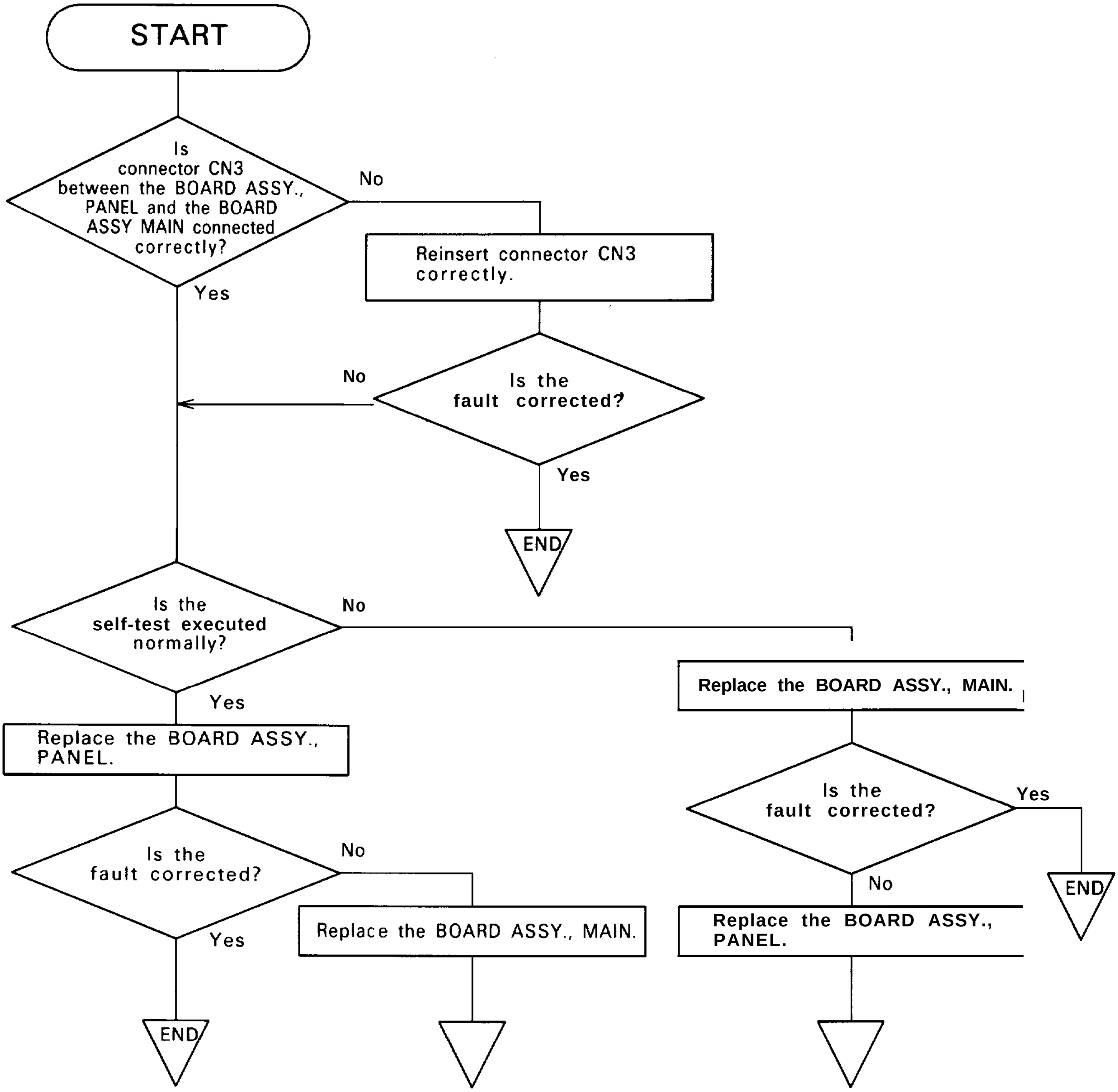




NOTE : Perform bidirectional print alignment adjustment.

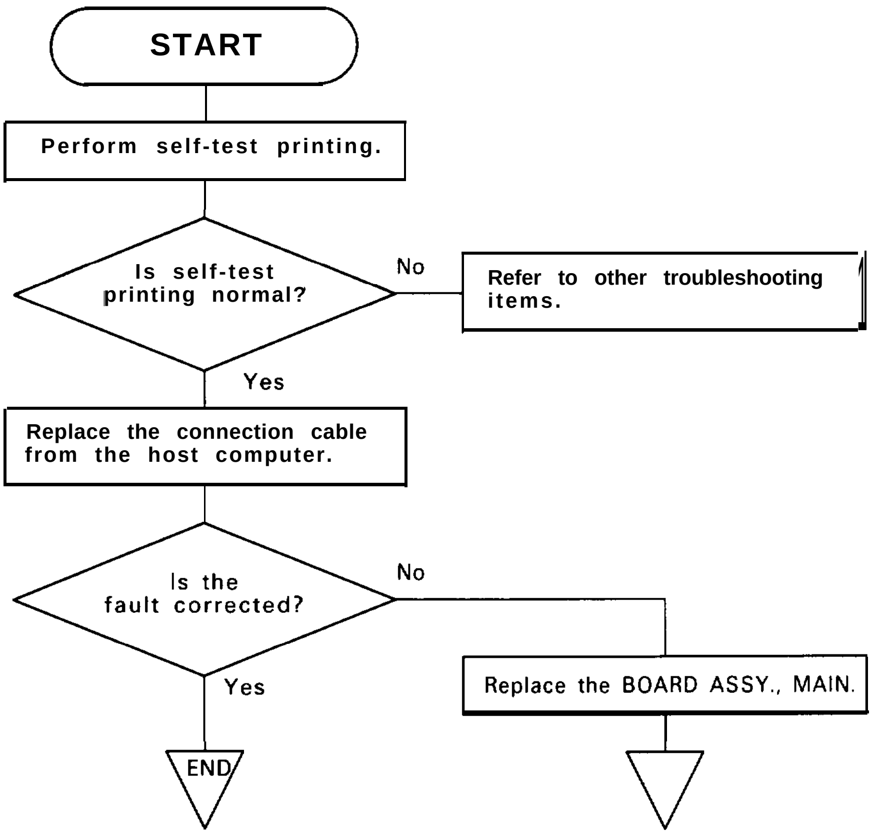

1
Inspect gears for damage or debris.
Damaged or dirty?
Yes
Clean or replace.
No
OK?
No
Yes
C
Check left and right tractor assemblies for proper phasing.
OK?
No
Adjust phasing or replace sprocket assembly.
Yes
OK?
No
Yes
C
Inspect paper path.
C
Perform final test.
END

(5) Control Panel Operation is Abnormal



(6) Printing of Data Sent by the Host Computer is Faulty

NOTE: It is assumed here that the host computer is operating normally.



5.3 REPAIR OF THE MAIN BOARD

This section provides instructions for repairing the BOARD ASSY., MAIN when it is defective and describes various symptoms, likely causes, and checkpoints. Checkpoints refer to proper waveforms, resistance values, and other values to be checked to evaluate the operation of any component that might be bad. Check these values and take the appropriate action.

Table 5-4. Repair of a Problem in the BOARD ASSY., MAIN

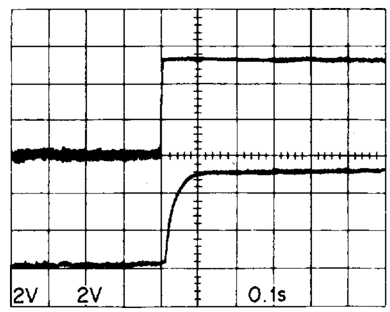
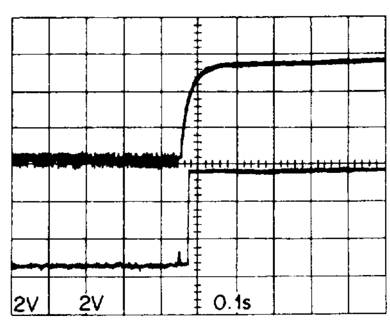
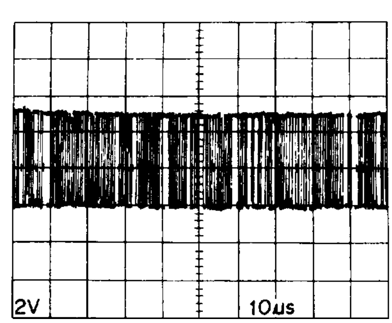
Problem	Symptom	Cause	Checkpoint	Solution
The printer does not operate at all.	The CPU does not operate.	The reset circuit is not operational.	Check the voltage waveforms for the +5V line (IC2A pin 52) and for the THLD signal (IC2A pin 73) when power is on. 	Replace IC2A.
			Check the voltage waveforms for the THLD signal (IC2A pin 73) and for the RESET signal (IC4D pin 4) when power is on. 	Replace IC4D.
			Check pin 21 of IC1C for a HIGH Vx voltage (NMI signal).	Replace IC1C.
		Selection of control ROM is abnormal.	Check pin 36 of IC4D for a change in the signal HIGH/LOW. 	Replace IC4D.

Table 5-4. Repair of a Problem in the BOARD ASSY., MAIN (Cont.)

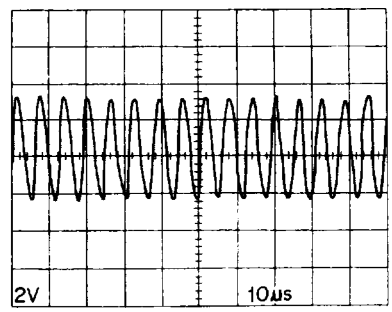
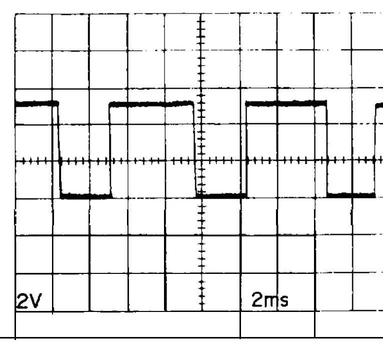
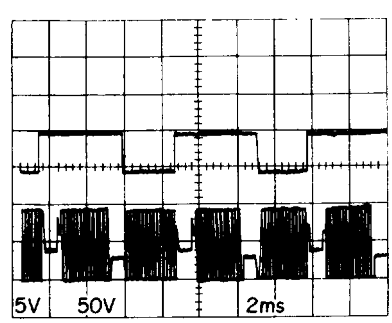
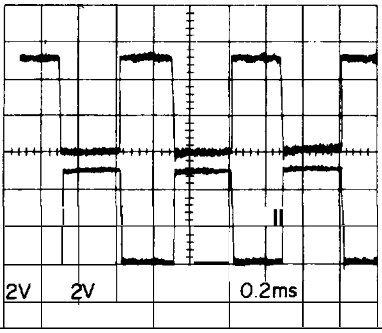
Problem	Symptom	Cause	Checkpoint	Solution
The printer does not operate at all.	The CPU does not operate.	Either ROM or RAM is defective.		Replace IC5E or IC6E.
		The CPU is defective.	Check the oscillator signal at either pin 33 or pin 34 of the CPU. 	If a signal is detected, replace IC 1 C. Otherwise, replace CR 1.
The carriage operates abnormally.	The carriage does not operate at all.	IC1C is defective.	Check the MOTOR, CR phase signal at pins 9, 10, 11, and 12 of IC1C. 	Replace IC 1 C.
		IC2A is defective.	At IC2A, check the input signal for pin 90 and the output waveform for pin 100. 	Replace IC2A.
	Carriage operation is unstable (lack of torque).	IC2A is defective.		Replace IC2A.

Table 5-4. Repair of a Problem in the BOARD ASSY., MAIN (Cont.)

Problem	Symptom	Cause	Checkpoint	Solution
Self-test printing is abnormal.	Self-test is not executed.	The CPU can't measure the voltage on the +35V line.	Measure the voltage at Vref (pin 1) of IC1C. The normal voltage is 4.741 V.	Adjust VR1.
		IC4D is defective.	At IC4D, check the input signal at pin 101 and the output signal at pin 46. 	Replace IC4D.
	A particular dot is not being printed.	IC2A is defective.		Replace IC2A.
Paper is not fed normally.	The paper does not feed, or the feed pitch is abnormal.	IC2A is defective.		Replace IC2A.
Printing of data from the host computer is faulty.	Data corruption occurs when the parallel interface is used.	IC4D or IC5D is defective.		Replace IC4D or IC5D.

5.4 REPAIR OF THE PRINTER MECHANISM

For detailed procedures for replacing or adjusting parts, refer to Chapter 3, ***Disassembly and Assembly,*** and Chapter ***4, Adjustment.*** If a problem or symptom recurs following an attempted repair, refer to Table 5-5 to try to find other potential causes.

Table 5-5. Repair of the PRINTER MECHANISM

Problem	Symptom	Cause	Checkpoint	Solution
The MOTOR, CR fails to operate.	The MOTOR, CR completely fails to activate at power on.	Foreign substances are lodged in the gears or elsewhere in the mechanism.	Manually move the TIMING BELT to see if this causes the motor to rotate.	Remove any foreign substances.
		The MOTOR, CR is defective.	Measure the coil resistance of the motor. The resistance should be about 19.5 ohms.	Replace the MOTOR, CR.
The carriage does not operate normally at power on (after the carriage has been manually centered prior to power on).	The MOTOR, CR rotates, but the carriage does not move.	The BELT PULLEY is defective.	Check for broken or worn pulley.	Replace the BELT PULLEY.
		The TIMING BELT is defective.	Check that the TIMING BELT is correctly inserted into the bottom of the carriage.	Reinsert the TIMING BELT.
			Check for a broken timing belt.	Replace the timing belt.
	The carriage moves left slightly, then stops.	Carriage movement is not smooth.	Check whether the carriage moves smoothly when moved manually.	Clean and lubricate. Replace the MOTOR, CR.
	The carriage moves to the left or right end, then stops.	The DETECTOR ASSY., HP is defective.	Use a multimeter to check the DETECTOR ASSY., HP.	Replace the DETECTOR ASSY., HP.
Self-test printing does not execute.	The carriage moves, but no printing is performed.	The printhead FFC (CABLE, HEAD, FRONT (,REAR)) common wires are disconnected.	Check the common wires for the printhead FFC (CABLE, HEAD, FRONT (,REAR)).	Replace the FFC (CABLE, HEAD, FRONT (,REAR)).

Table 5-5. Repair of the PRINTER MECHANISM (Cont.)

Problem	Symptom	Cause	Checkpoint	Solution
Self-test printing is abnormal.	A particular dot fails to print.	The printhead is defective.	Measure the coil resistance of the printhead. The normal value is approximately 45.5 ohms.	Replace the printhead.
			Check whether the dot wire is worn.	Replace the printhead.
	The printing is too light, or the print density is not uniform.	The printhead is defective.	Check whether the tip of the dot wire is worn.	Replace the printhead.
		The platen gap is not properly adjusted.	Set the gap LEVER, G, ADJUST to the second position, and check the gap between the tip of the printhead and the PLATEN. The appropriate value is 0.46 mm.	Adjust the gap. Refer to Section *4.1.2, Platen Gap Adjustment.*
Paper feeding is abnormal.	Printing is performed, but the paper is not fed, or is not fed uniformly.	Foreign substances are lodged in the paper path.	Perform a visual check of the paper path.	Remove any foreign substance.
		The MOTOR, PF is not driving the gear correctly.	Check that no foreign substance is lodged between the gears, and that the gears are not broken or worn.	. Remove any foreign substance. . Replace the paper-feed reduction gear. . Replace the plat en gear.
		The MOTOR, PF is defective.	Measure the coil resistance for the MOTOR, PF. The approximate value should be 79 ohms.	Replace the MOTOR, PF.

Table 5-5. Repair of the PRINTER MECHANISM (Cont.)

Problem	Symptom	Cause	Checkpoint	Solution
The ribbon feed is abnormal.	The ribbon is not fed.	The ribbon cartridge is defective.	Dismount the ribbon cartridge, rotate its knob manually, and check whether the ribbon feeds normally.	Replace the ribbon cartridge.
		Foreign substances are caught in the gears.	Check whether the ribbon driving gear rotates when the carriage is moved manually.	• Remove any foreign substance. • Replace the ribbon-feed mechanism.
	The ribbon feeds properly only when the carriage moves in one direction (i.e., it fails to feed when the carriage moves in the other direction).	The planetary lever is defective.	Move the carriage manually, and check whether the planetary lever turns in reverse and engages the gear.	Replace the ribbon cartridge.
Paper becomes stained.	Ink stains appear on areas where there is printing.	The RIBBON MASK is not correctly positioned.	Check whether the RIBBON MASK is in the correct position.	Reinstall the RIBBON MASK.
		The platen gap is not adjusted.	Set the gap adjust lever to the second position, and check the gap between the tip of the printhead and the PLATEN. The appropriate value is 0.46 mm.	Adjust the gap. Refer to Section 4.1.2, *Platen Gap Adjustment.*
Printing continues after the paper ends or when no paper is loaded.	Printing continues past the paper end.	The DETECTOR ASSY., PE. FRONT (,REAR)	Check the DETECTOR ASSY., PE, FRONT (,REAR)	Replace the DETECTOR ASSY., PE, FRONT (,REAR)

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, inspect the springs, paper-feed rollers, and basic operation.

CAUTION

Disconnect the printer from the external AC power source before performing maintenance. **Do** not use thinner, trichloroethylene, or ketone-based solvents on the plastic components of the printer.

6.2 LUBRICATION AND ADHESIVE APPLICATION

EPSON recommends that the printer be lubricated at the points illustrated in Figure 6-2. Table 6-2 lists each point together with its recommended lubricant. The three recommended lubricants are EPSON O-2, G-20, and G-26, all of which have been tested extensively and found to comply with the needs of this printer. (Table 6-l 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 damage related parts.

Adhesive application is necessary at the point described in Table 6-3. Figure 6-1 indicates the point at which adhesive must be applied following disassembly or replacement. EPSON recommends that Neji lock #2 (G) adhesive be applied to the point illustrated. Avoid overflow to adjacent parts.

Table 6-1. Lubricants and Adhesive

Type	Name	Quantity	Availability	Part No.
Oil	o-2	40 cc	E	B710200001
Grease	G-20	40 gm	E	8702000001
Grease	G-26	40 gm	E	8702600001
Adhesive	Neji lock #2 (G)	1000 gm	E	B730200200

E: **EPSON-exclusive product**

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

Ref. No.	Lubrication Points	Lubricant
1	1/4 of the perimeter of the top edge of the gear (8.5 mm, 30 mm)	G-26
2	1/3 of the perimeter of the top edge of the gear (40 mm)	G-26
3	1/3 of the perimeter of the top edge of the platen gear	G-26
4	Portion of carriage that contacts base frame	G-26
5	Oil pad	o-2
6	Portion of platen shaft that contacts ground spring	G-20
7	Gear (40 mm) shaft	G-26
8	Gear (8.5, 30 mm) shaft	G-26
9	Ribbon-feed gear shafts	G-26
10	Gear (1 1.5 mm) shaft	G-26
11	Portion of paper guide that contacts gear (18 mm)	G-26
12	Portion of paper guide that contacts sub paper guide	G-26
13	Portion of release shaft that contacts paper guide	G-26
14	Portion of paper tension roller shaft that contacts paper tension frame	G-26
15	Portion of tractor shaft that contacts tractor frame (left)	G-26
16	Tractor clutch cam	G-26

NOTE: Lubrication must be applied during the reassembly process.

Table 6-3. Adhesive Application Point (Refer to Figure S-l.)

Adhesive Application Point	No. of Points
Portion where timing belt engages the carriage	1

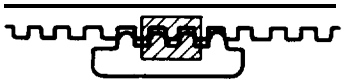


Figure 6-l. Correct Adhesive Application

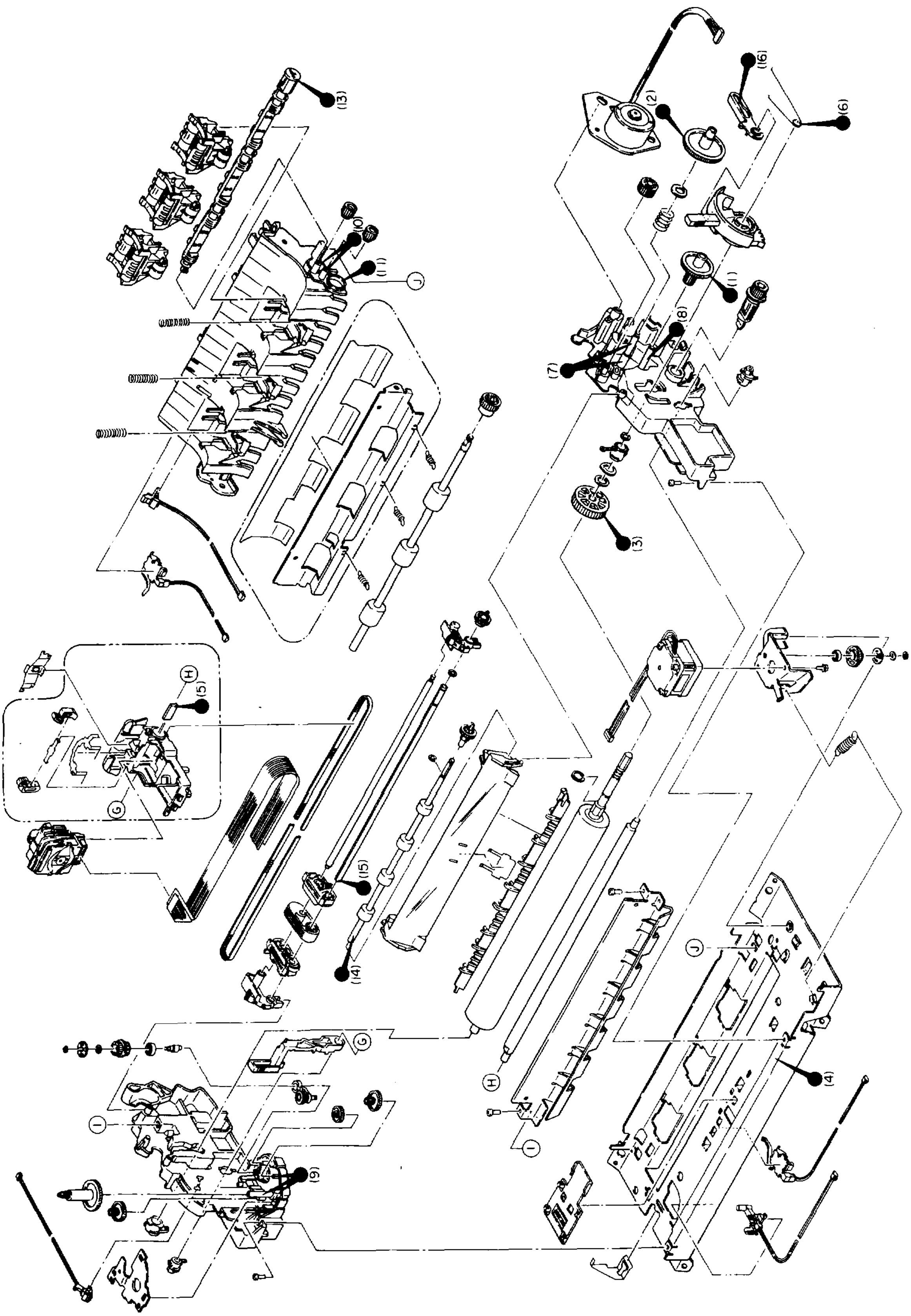


Figure 6-2. LQ-570 Lubrication Points

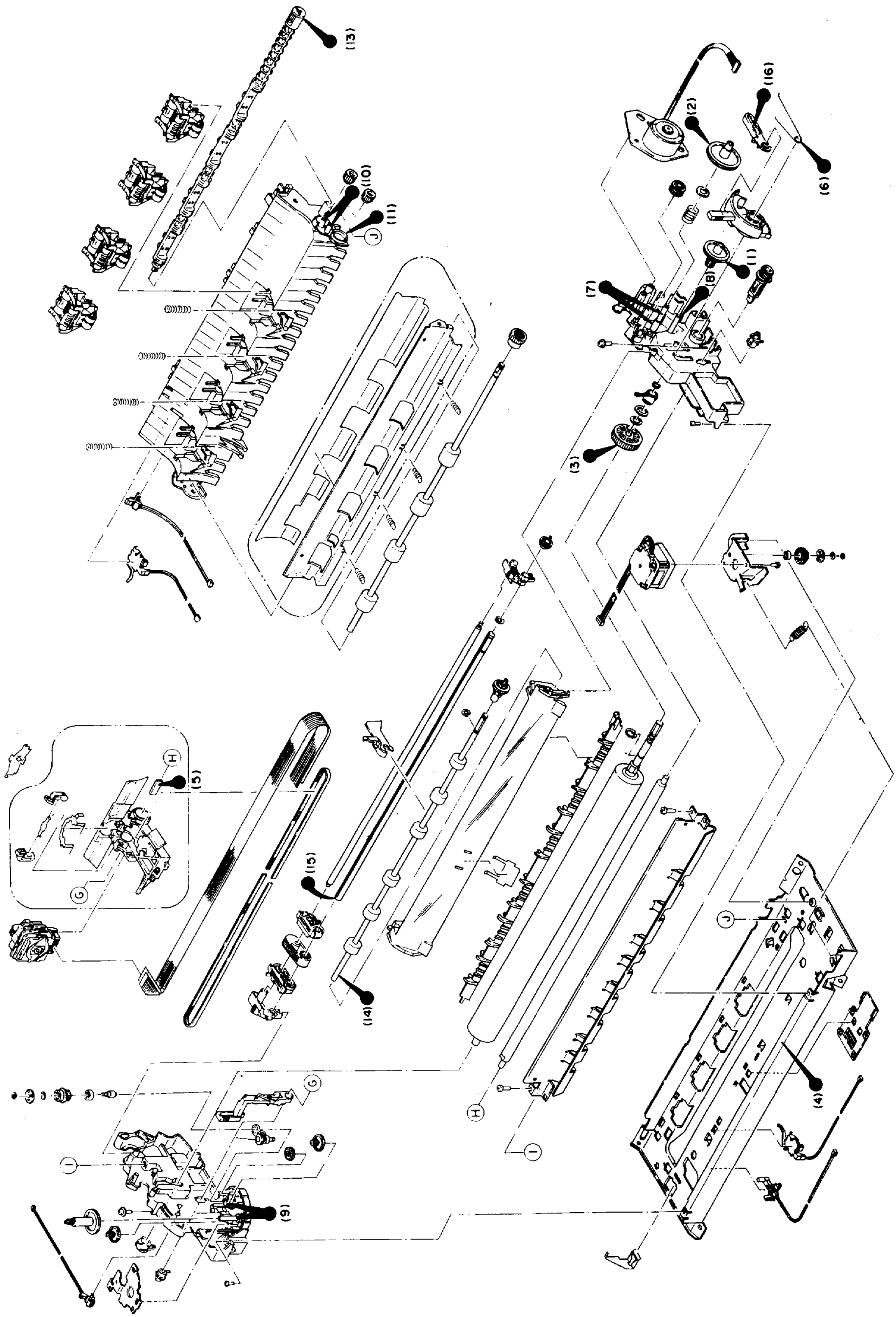


Figure 6-3. LQ-1 070 Lubrication Points

APPENDIX

LIST OF FIGURES

APPENDIX

LIST OF TABLES

A.1 CONNECTOR SUMMARY

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

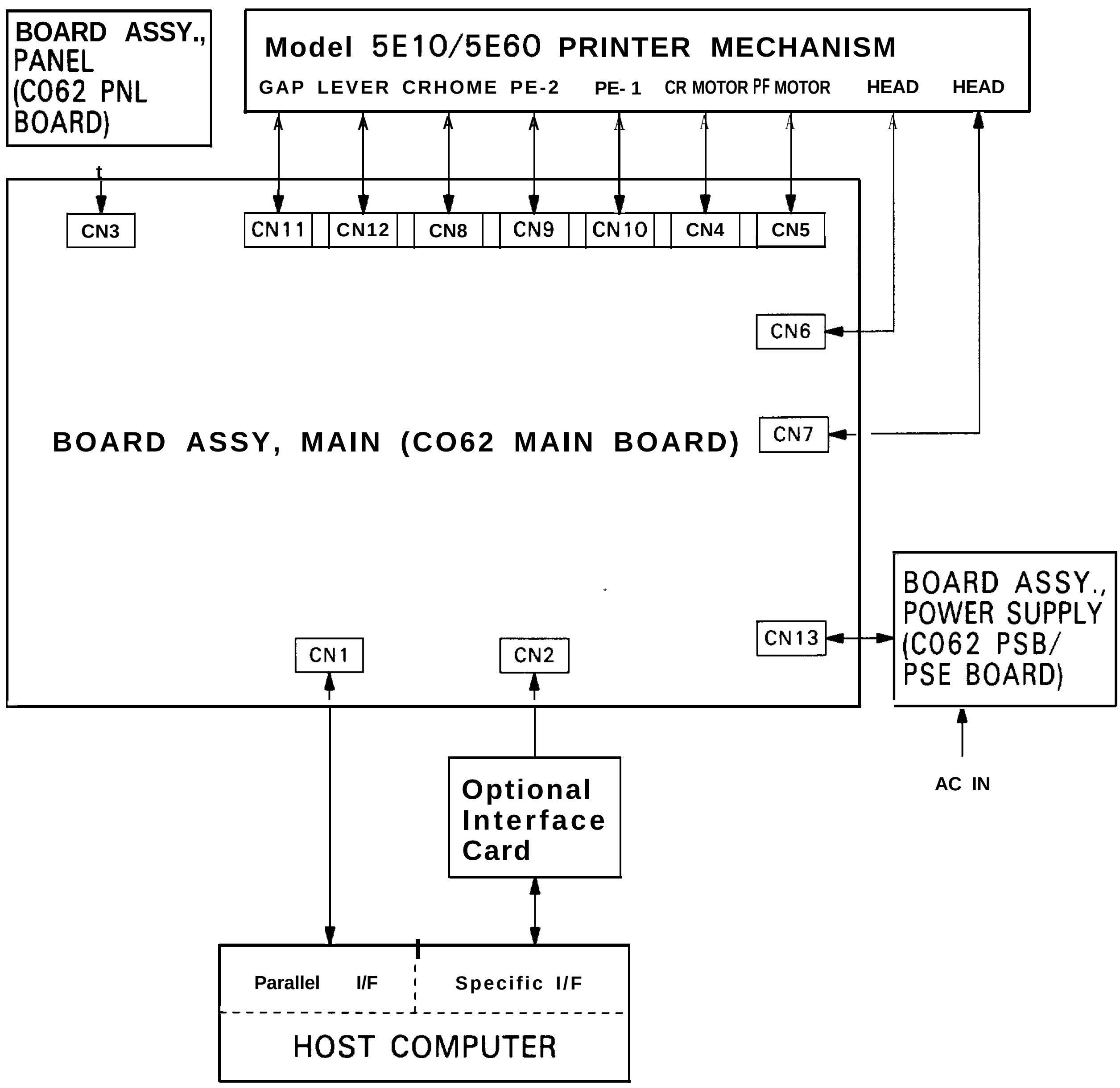


Figure A-l. Cable Connections

Table A-l. Board Connector Summary

Board	Connector	Function	Pins
BOARD ASSY., MAIN (CO62 MAIN BOARD)	CN1	Parallel interface	36
	CN2	Optional interface card	36
	CN3	Control panel	12
	CN4	MOTOR, CR	5
	CN5	MOTOR, PF	5
	CN6	Printhead	17
	CN7	Printhead	15
	CN8	DETECTOR ASSY., HP (HP sensor)	2
	CN9	DETECTOR ASSY., PE, REAR	2
	CN10	DETECTOR ASSY.,. PE, PRONT	2
	CN11	DETECTOR ASSY., PLATEN	2
	CN12	DETECTOR ASSY., RELEASE	2
	CN13	DC power inputBOARD ASSY., (POWER SUPPLY): (C062 PSB/PSE board)	11
BOARD ASSY., POWER SUP-PLY (C062 PSB/PSE BOARD)	CN1	AC power input	2
	CN2	DC power output (BOARD ASSY., MAIN): (CO62 MAIN board)	11
BOARD ASSY., PANEL (CO62 PNL BOARD)	CN 1	BOARD ASSY., MAIN (CO62 MAIN board)	12

Table A-2. CN2 BOARD ASSY., MAIN (C062 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	/READY	Ready to receive data
9	I	RXD	Receive data
10	–	NC	No connection
11	0	/RST	Reset
12	0	INH	Inhibit
13	I	/CMREQ	Command request
14	I	/WRRDY	Write ready
15	I	/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	A0	Address bus bit 0
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	D0	Data bus bit 0

Table A-3. CN3 BOARD ASSY., MAIN (C062 MAIN)

No.	I/O	Signal Name	Function
1	I	/PAUSE	Pause switch
2	–	/READY	Fixed GND
3	0	TXS	Transmit signal (LED)
4	0	/LDLED	LED data latch
5	0	/CKS	Shift clock
6	0	/LDSW	Load switch data
7	I	RXS	Receive data (switch)
8	–	+5	+5 VDC
9	–	GND	Signal ground
10	–	SHLD	Shield ground
11	I	POWER1	Power switch
12	–	POWER2	Fixed GND

Table A-4. CN4 BOARD ASSY., MAIN (C062 MAIN)

No.	I/O	Signal Name	Function
1	O	CRA	MOTOR, CR phase A
2	0	CRB	MOTOR, CR phase B
3	0	CRC	MOTOR, CR phase C
4	0	CRD	MOTOR, CR phase D
5	0	CRCOM	MOTOR, CR common

Table A-5. CN5 BOARD ASSY., MAIN (C062 MAIN)

No.	I/O	Signal Name	Function
1	0	PFA	MOTOR, PF phase A
2	0	PFB	MOTOR, PF phase B
3	0	PFC	MOTOR, PF phase C
4	0	PFD	MOTOR, PF phase D
5	0	PFCOM	MOTOR, PF common
6	0	PFCOM	MOTOR, PF common

Table A-6. CN6 BOARD ASSY., MAIN (C062 MAIN)

No.	I/O	Signal Name	Function
1	O	HD5	Head data 5
2	0	HD1	Head data 1
3	0	HD13	Head data 13
4	0	HD9	Head data 9
5	0	HD21	Head data 21
6	0	HD17	Head data 17
7	–	COM	Common
8	–	COM	Common
9	–	COM	Common
10	0	HD24	Head data 24
11	0	HD16	Head data 16
12	0	HD12	Head data 12
13	0	HD8	Head data 8
14	0	HD20	Head data 20
15	0	HD4	Head data 4
16	I	TEMP2	Head temperature
17	–	TEMP1	+vu

Table A-7. CN7 BOARD ASSY., MAIN (C062 MAIN)

No.	I/O	Signal Name	Function
1	O	HD3	Head data 3
2	0	HD11	Head data 11
3	0	HD2	Head data 2
4	0	HD19	Head data 19
5	0	HD7	Head data 7
6	–	COM	Common
7	–	COM	Common
8	–	COM	Common
9	0	HD22	Head data 22
10	0	HD15	Head data 15
11	0	HD18	Head data 18
12	0	HD23	Head data 23
13	0	HD10	Head data 10
14	0	HD14	Head data 14
15	0	HD6	Head data 6

Table A-8. CN8 BOARD ASSY., MAIN (C062 MAIN)

No.	I/O	Signal Name	Function
1	I	CRHOME	DETECTOR ASSY.,HP
2	–	GND	Signal ground

Table A-9. CN9 BOARD ASSY., MAIN (C062 MAIN)

No.	I/O	Signal Name	Function
1	I	PE2	DETECTOR ASSY.,PE, REAR
2	–	GND	Signal ground

Table A-10. CN10 BOARD ASSY., MAIN (C062 MAIN)

No.	I/O	Signal Name	Function
1	I	PE1	DETECTORASSY.,PE,FRONT
2	–	GND	Signal ground

Table A-11. CN11 BOARD ASSY.,MAIN(C062 MAIN)

No.	I/O	Signal Name	Function
1	I	GAP	DETECTOR ASSY., PLATEN
2	–	GND	Signal ground

Table A-12. CN12 BOARD ASSY., MAIN (C062 MAIN)

No.	I/O	Signal Name	Function
1	I	LEVER	DETECTOR ASSY., RELEASE
2	–	GND	Signal ground

Table A-13. CN13 BOARD ASSY., MAIN (C062 MAIN)

No.	I/O	Signal Name	Function
1	O	PSC	Power switch signal
2		+5	+5 VDC
3	–	+5	+5 VDC
4	–	GND	Signal ground
5	–	GND	Signal ground
6	–	GND	Signal ground
7	–	GND	Signal ground
8	–	GND	Signal ground
9	–	+35	+35 VDC
10	–	+35	+35 VDC
11	–	+35	+35 VDC

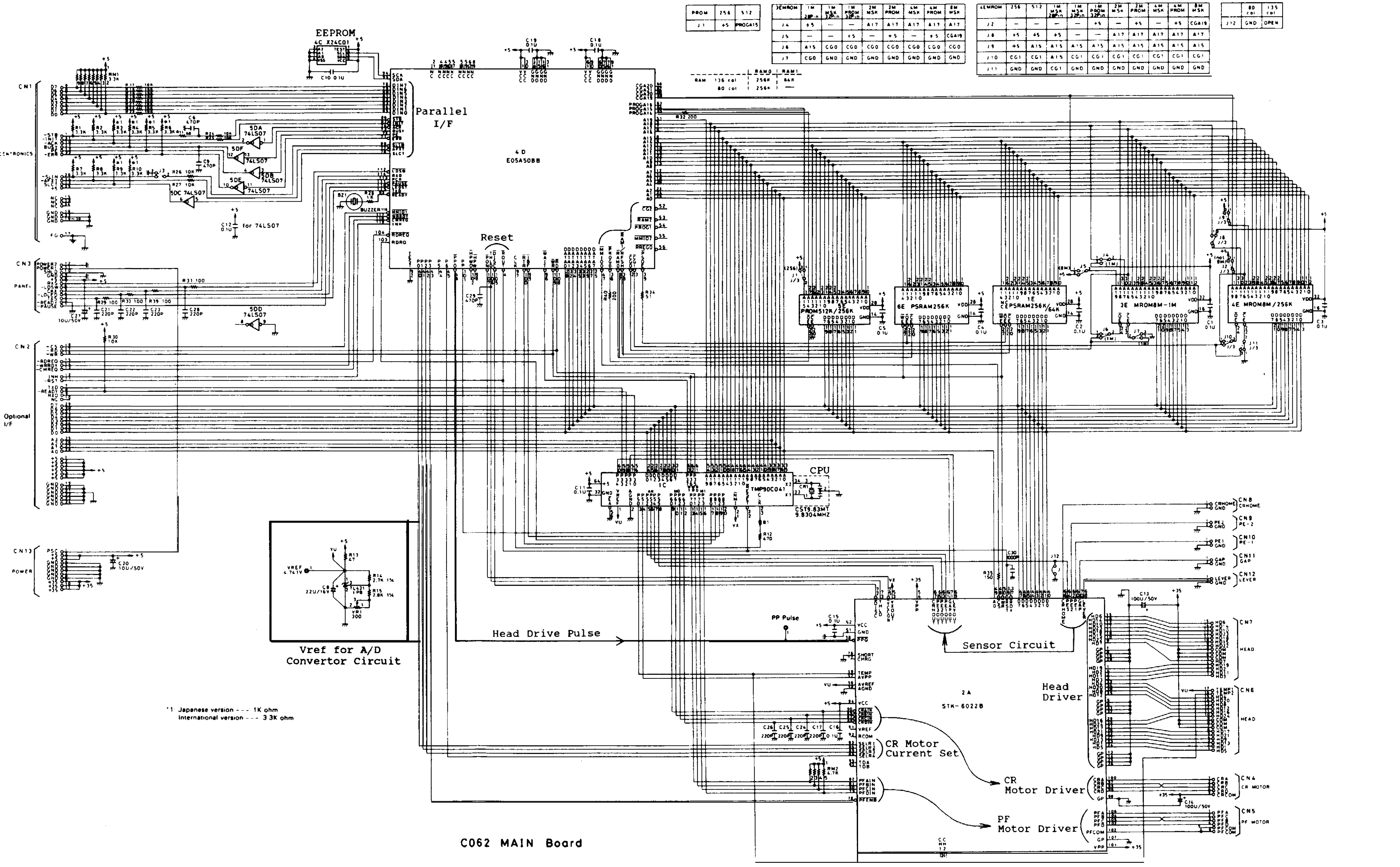
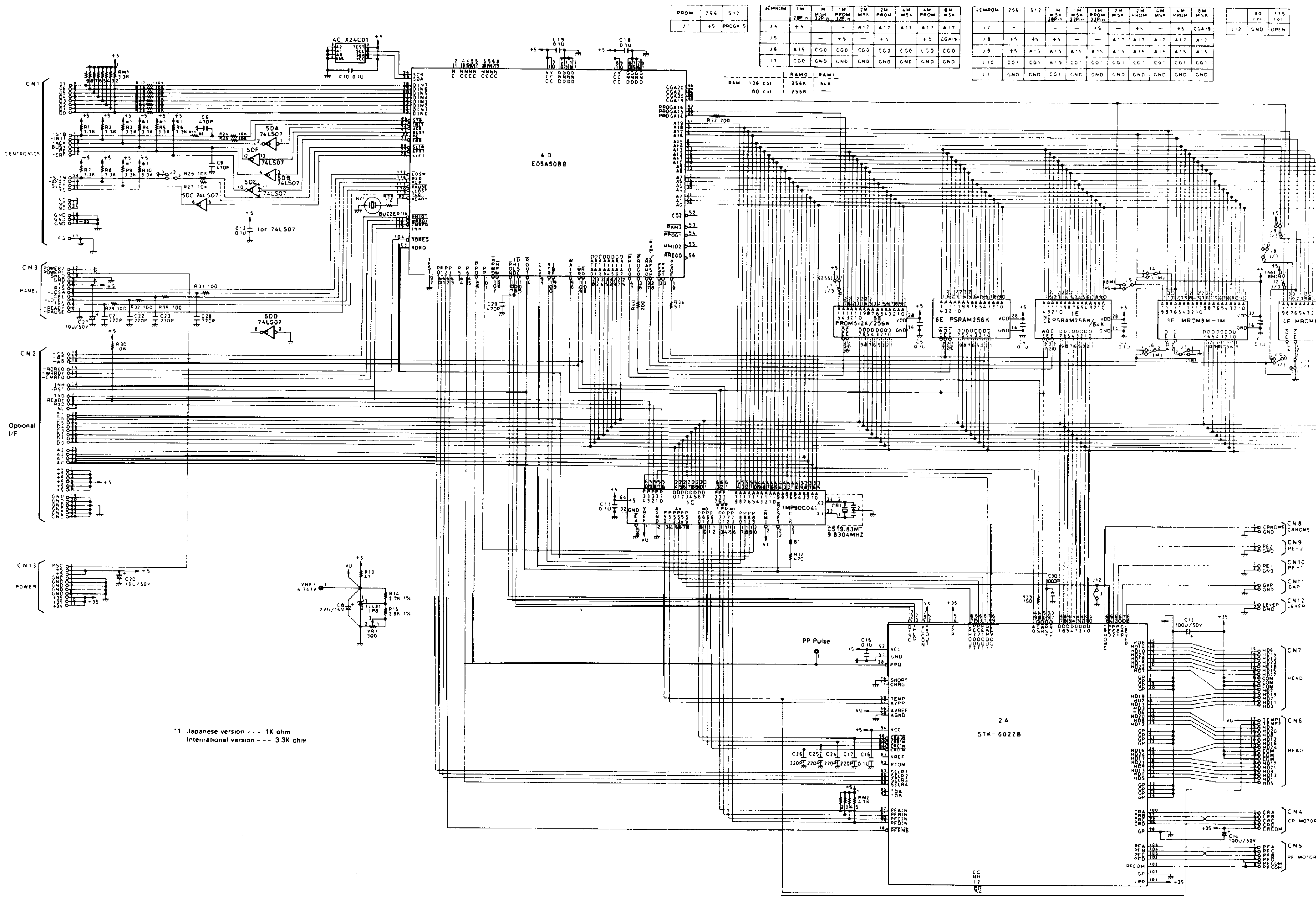


Figure A-2. BOARD ASSY., MAIN (C062 MAIN BOARD)
Circuit Diagram (Annotated)



C062 MAIN Board

Figure A.3. BOARD ASSY.. MAIN (C062 MAIN BOARD) Circuit Diagram

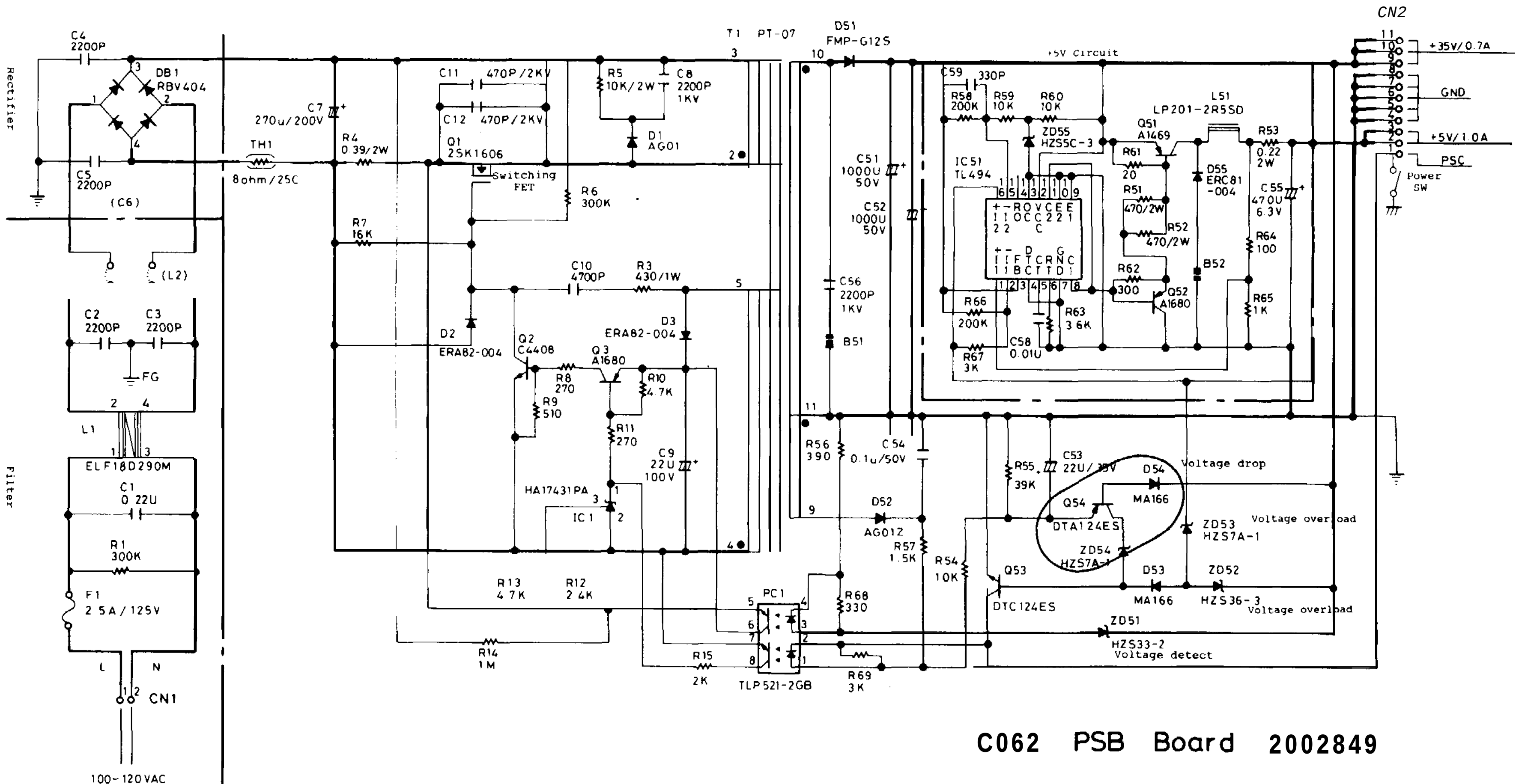


Figure A-4. BOARD ASSY., POWER SUPPLY (C062 PSB BOARD) Circuit Diagram (Annotated)

REV.-B

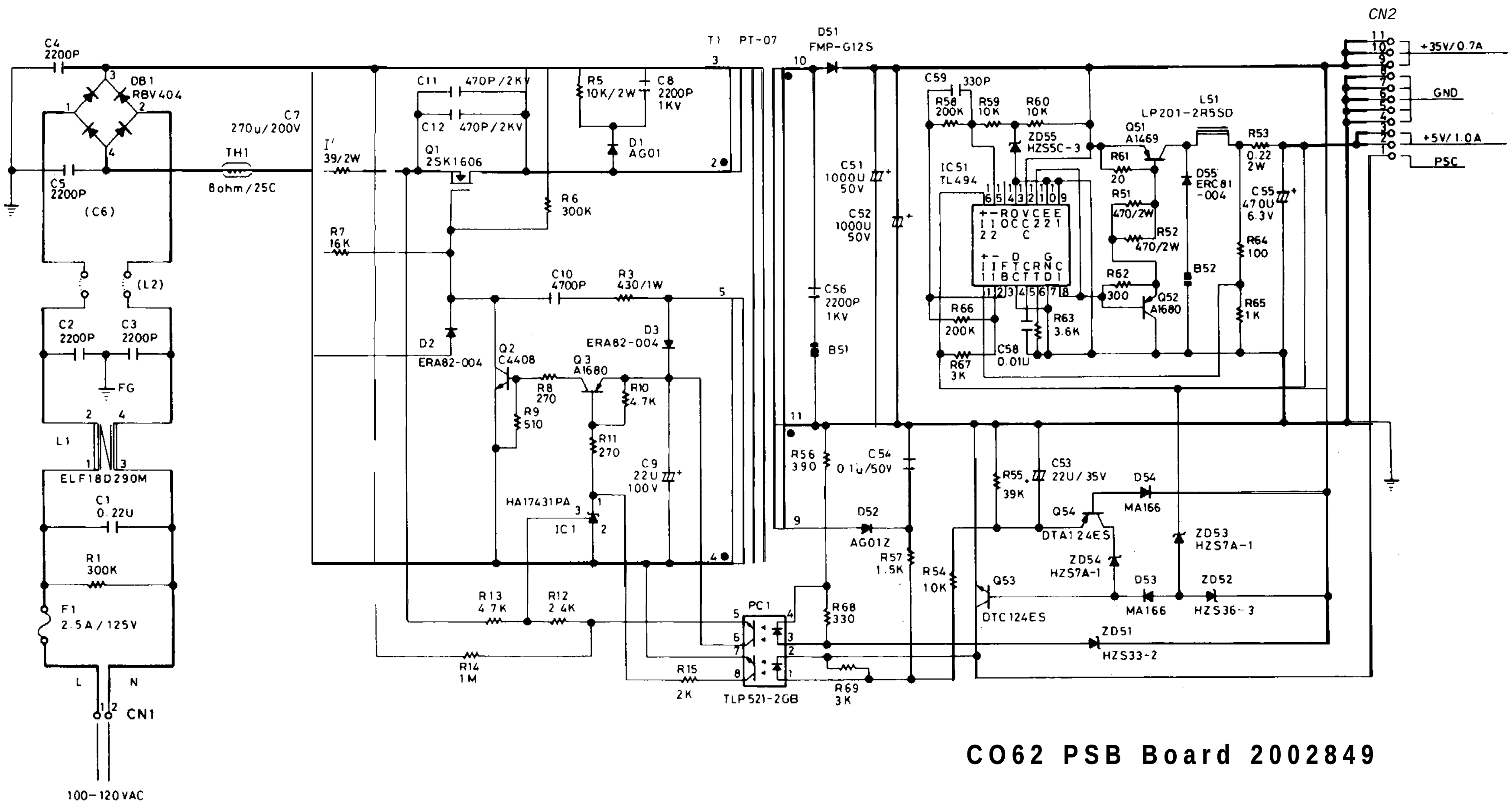


Figure A-5. Power Supply Board Assembly (C062 PSB Board) Circuit Diagram

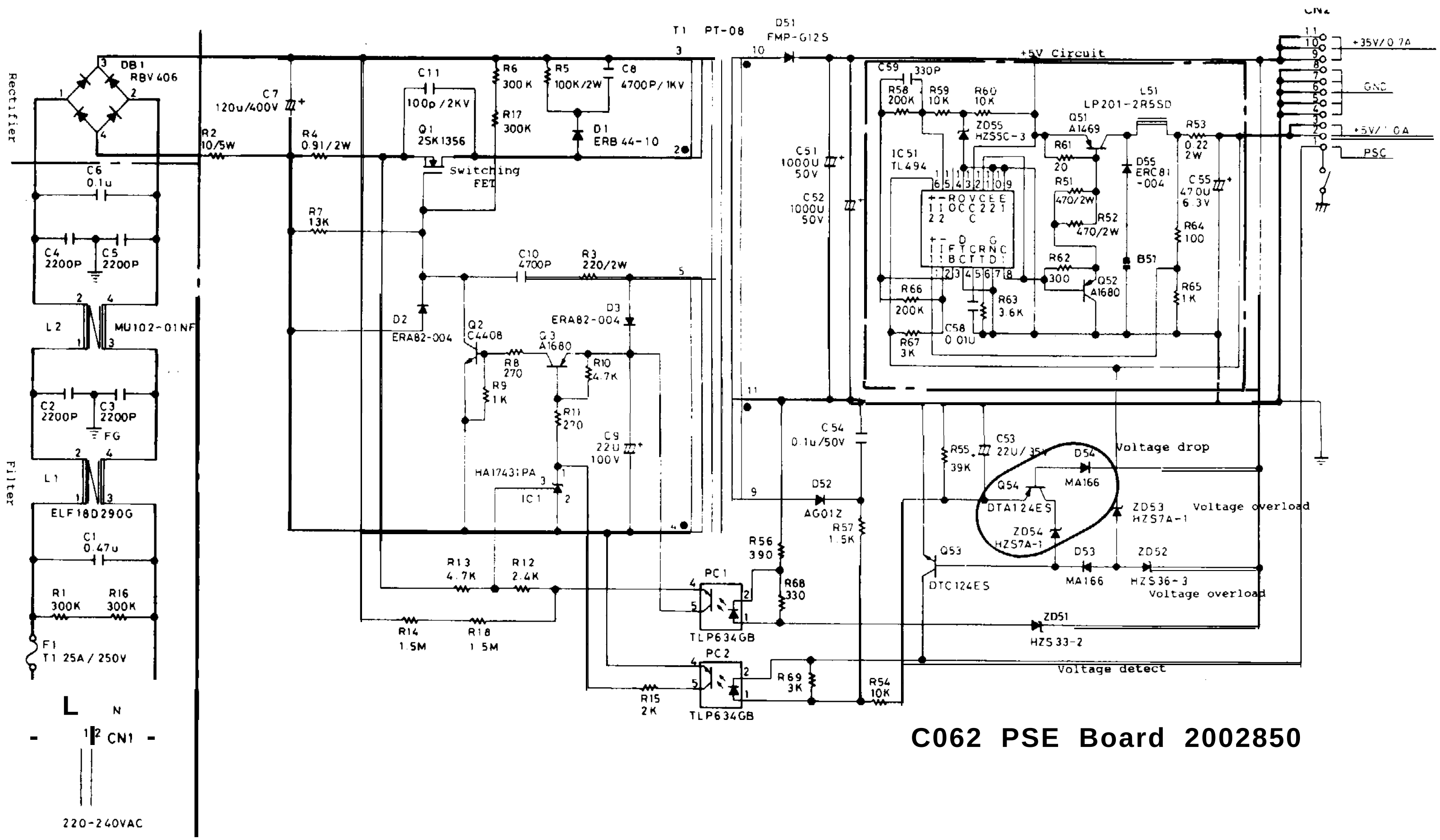
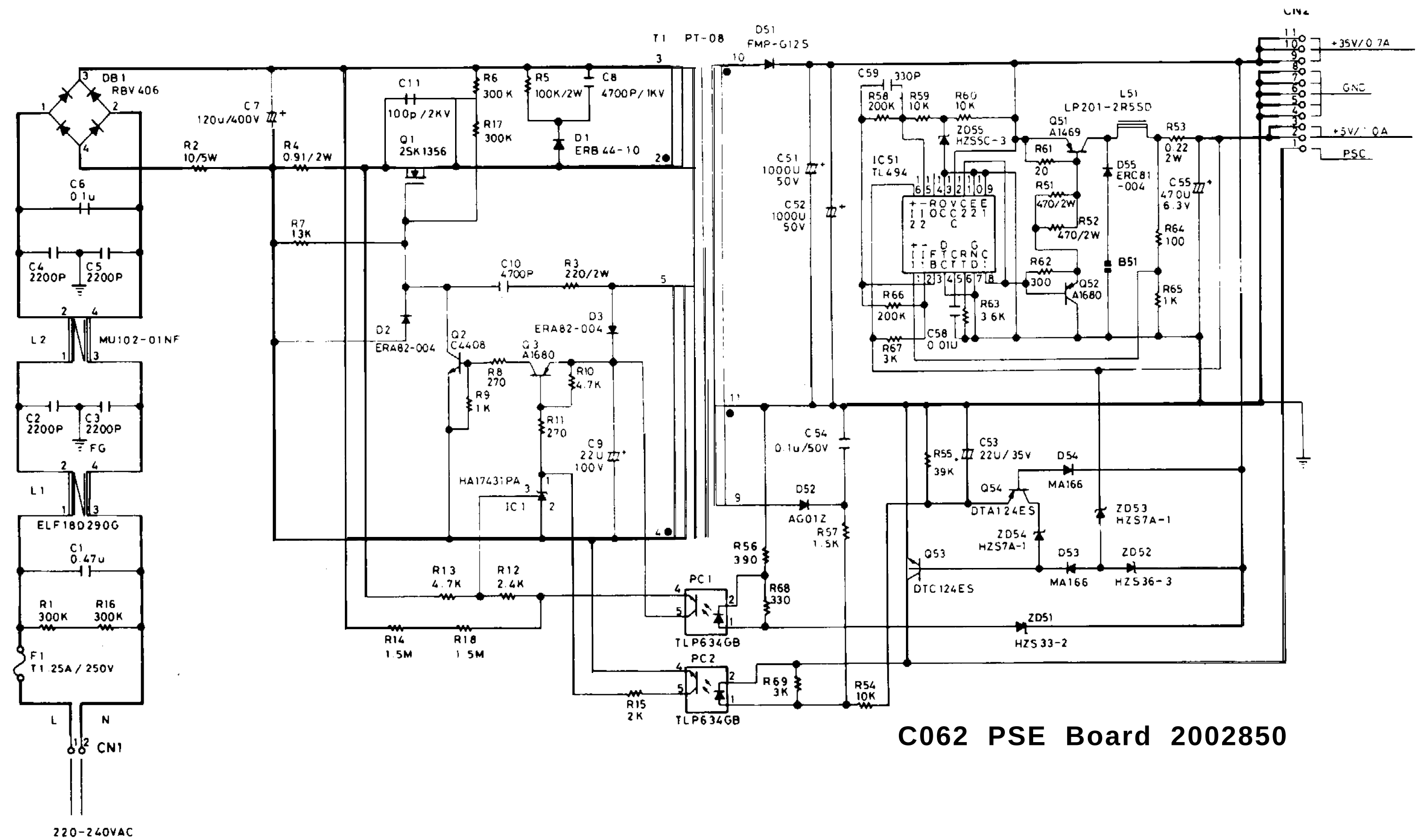


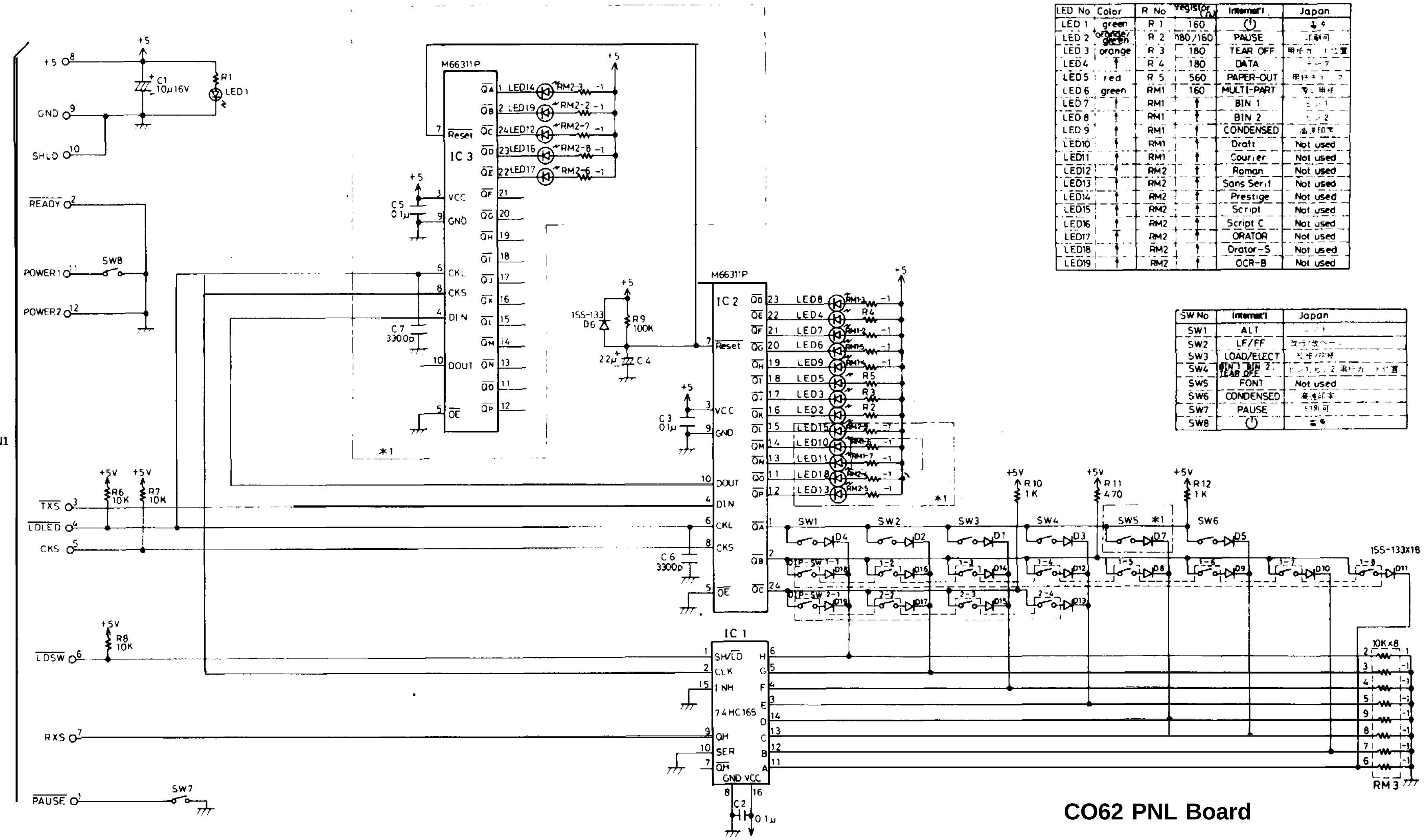
Figure A-6. BOARD ASSY., POWER SUPPLY (C062 PSE BOARD) Circuit Diagram (Annotated)



C062 PSE Board 2002850

Figure A-7. Power Supply Board Assembly (C062 PSE Board) Circuit Diagram

Figure A-8. BOARD ASSY., PANEL (C062 PNL BOARD) Circuit Diagram



LED No	Color	R No	registor (Ω)	Internat'l	Japan
LED 1	green	R 1	160	⏻	[illegible]
LED 2	orange/green	R 2	180/160	PAUSE	[illegible]
LED 3	orange	R 3	180	TEAR OFF	[illegible]
LED 4	↑	R 4	180	DATA	[illegible]
LED 5	red	R 5	560	PAPER-OUT	[illegible]
LED 6	green	RM1	160	MULTI-PART	[illegible]
LED 7	↑	RM1	↑	BIN 1	[illegible]
LED 8	↑	RM1	↑	BIN 2	[illegible]
LED 9	↑	RM1	↑	CONDENSED	[illegible]
LED10	↑	RM1	↑	Draft	Not used
LED11	↑	RM1	↑	Courier	Not used
LED12	↑	RM2	↑	Roman	Not used
LED13	↑	RM2	↑	Sans Serif	Not used
LED14	↑	RM2	↑	Prestige	Not used
LED15	↑	RM2	↑	Script	Not used
LED16	↑	RM2	↑	Script C	Not used
LED17	↑	RM2	↑	ORATOR	Not used
LED18	↑	RM2	↑	Orator-S	Not used
LED19	↑	RM2	↑	OCR-B	Not used

SW No	Internat'l	Japan
SW1	ALT	[illegible]
SW2	LF/FF	[illegible]
SW3	LOAD/ELECT	[illegible]
SW4	BIN 1 BIN 2 TEAR OFF	[illegible]
SW5	FONT	Not used
SW6	CONDENSED	[illegible]
SW7	PAUSE	[illegible]
SW8	⏻	[illegible]

CO62 PNL Board

*1 Excluding Japan

A-3. CIRCUIT BOARD COMPONENT LAYOUT

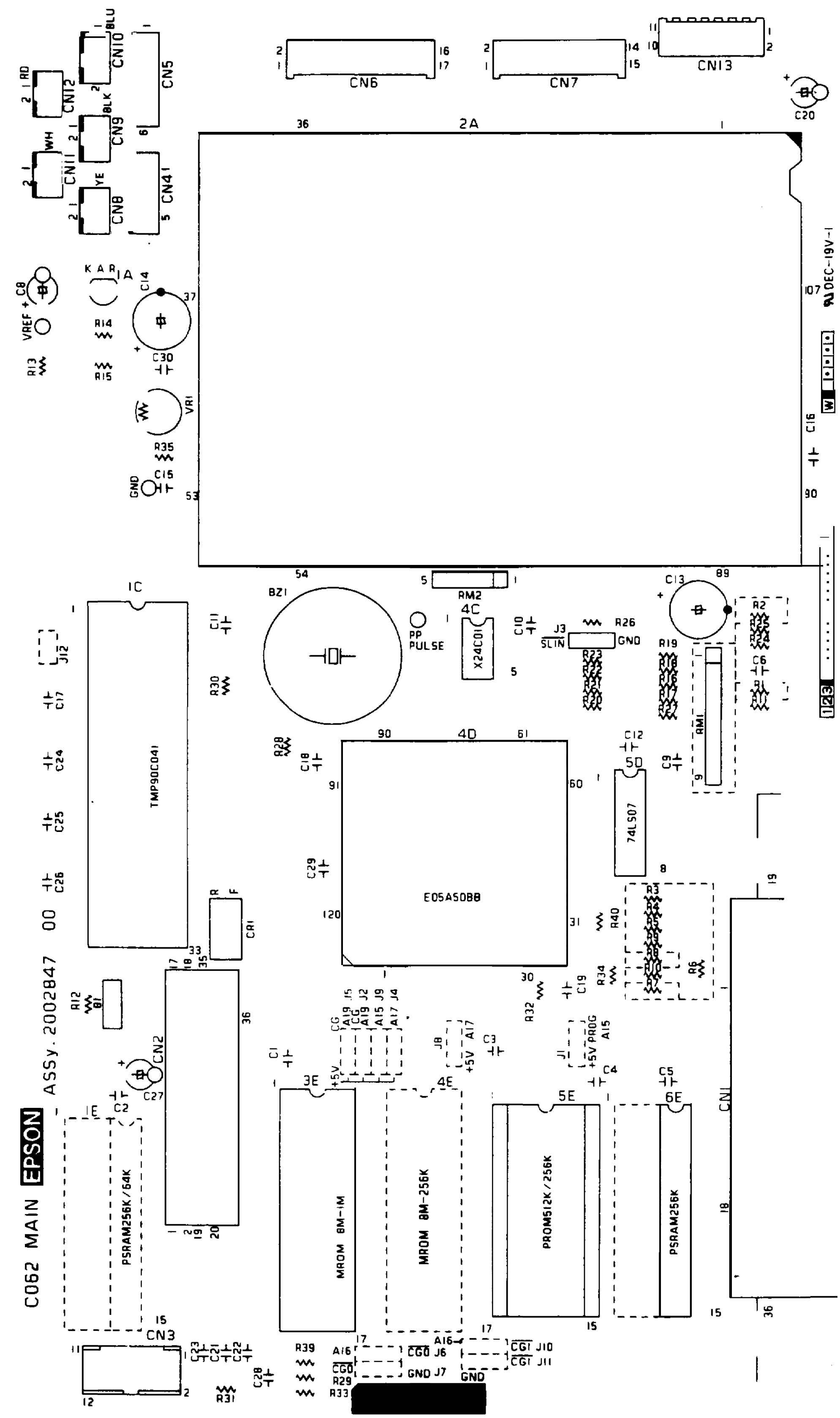


Figure A-9. BOARD ASSY., MAIN (C062 MAIN Board) Component Layout

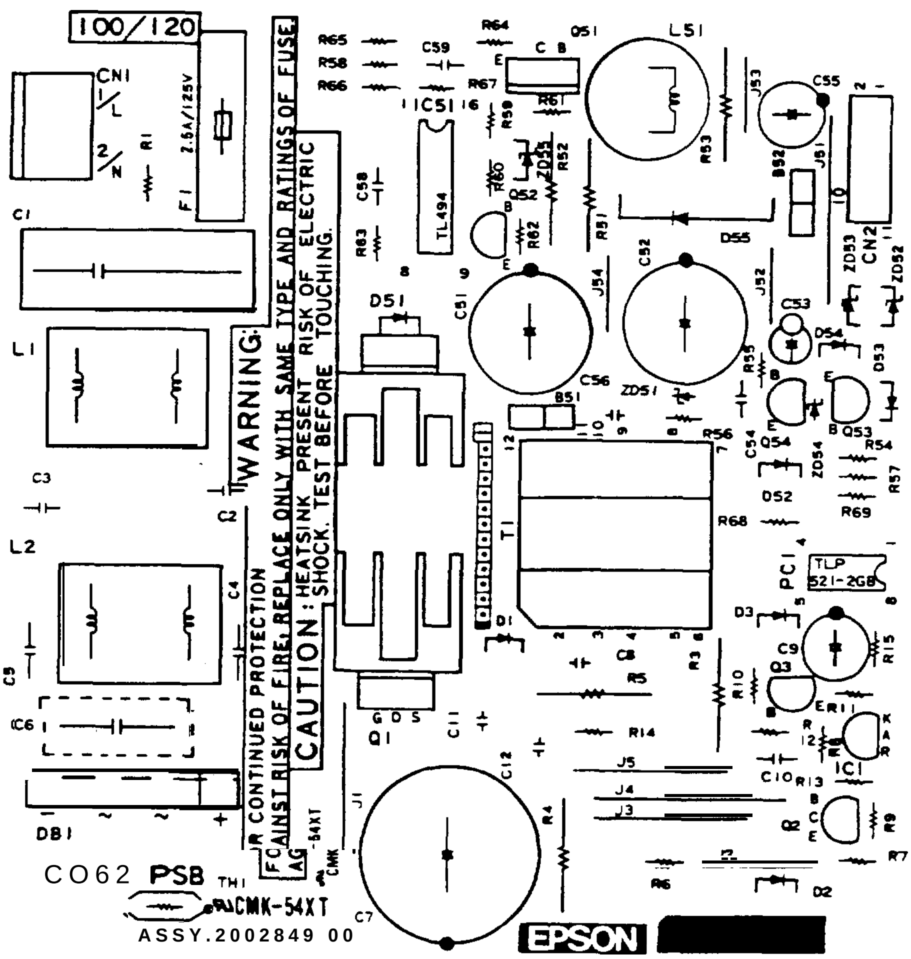


Figure A-10. BOARD ASSY., POWER SUPPLY (C062 PSB BOARD) Component Layout

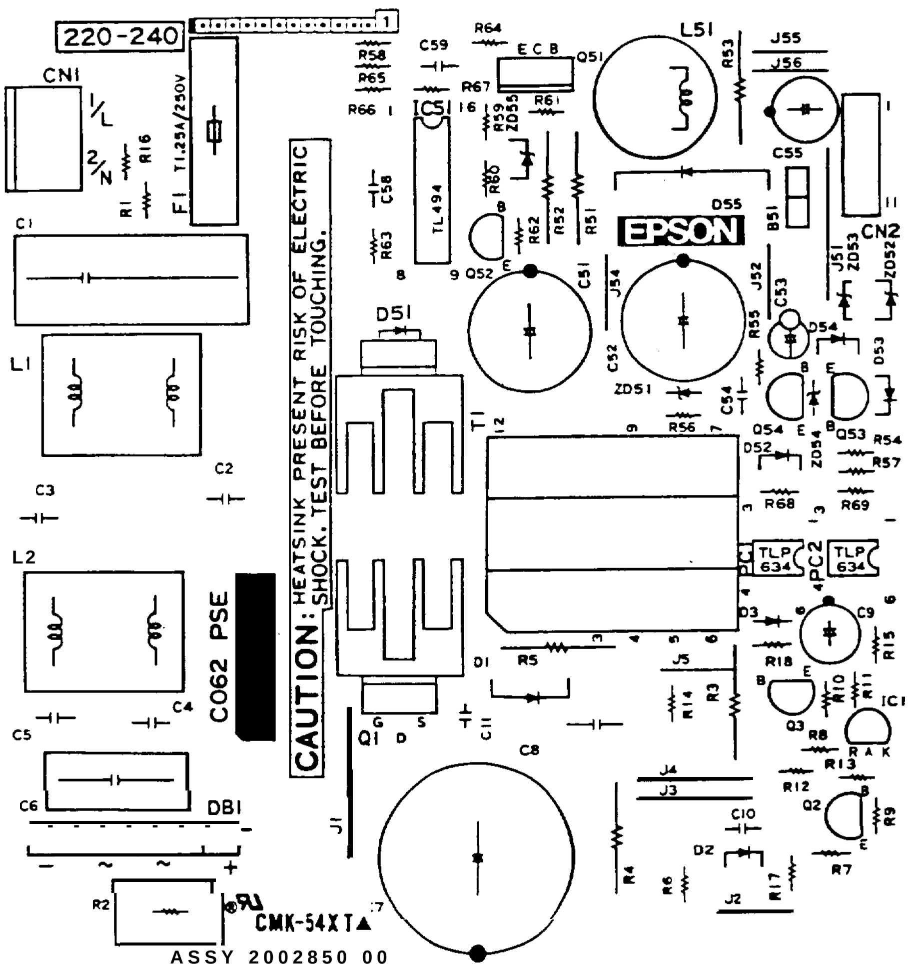


Figure A-11. BOARD ASSY., POWER SUPPLY (C062 PSE Board) Component Layout

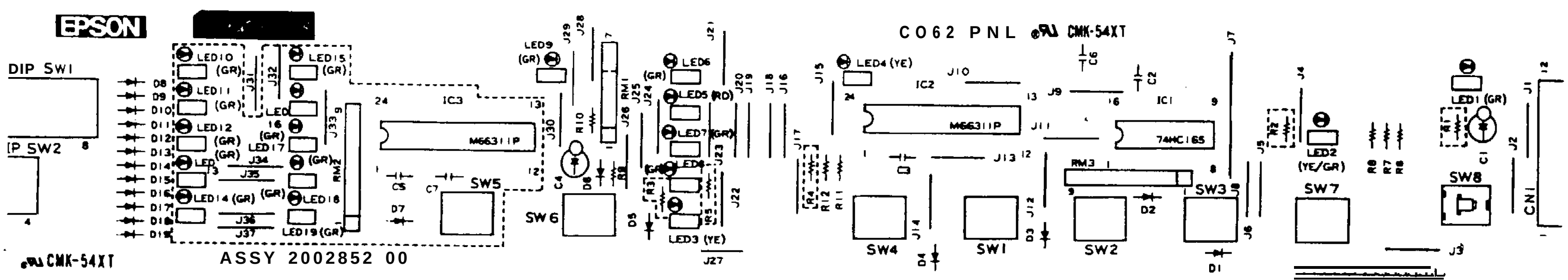


Figure A-12. BOARD ASSY., PANEL (C062 PNL BOARD) Component Layout

A.4 EXPLODED DIAGRAM

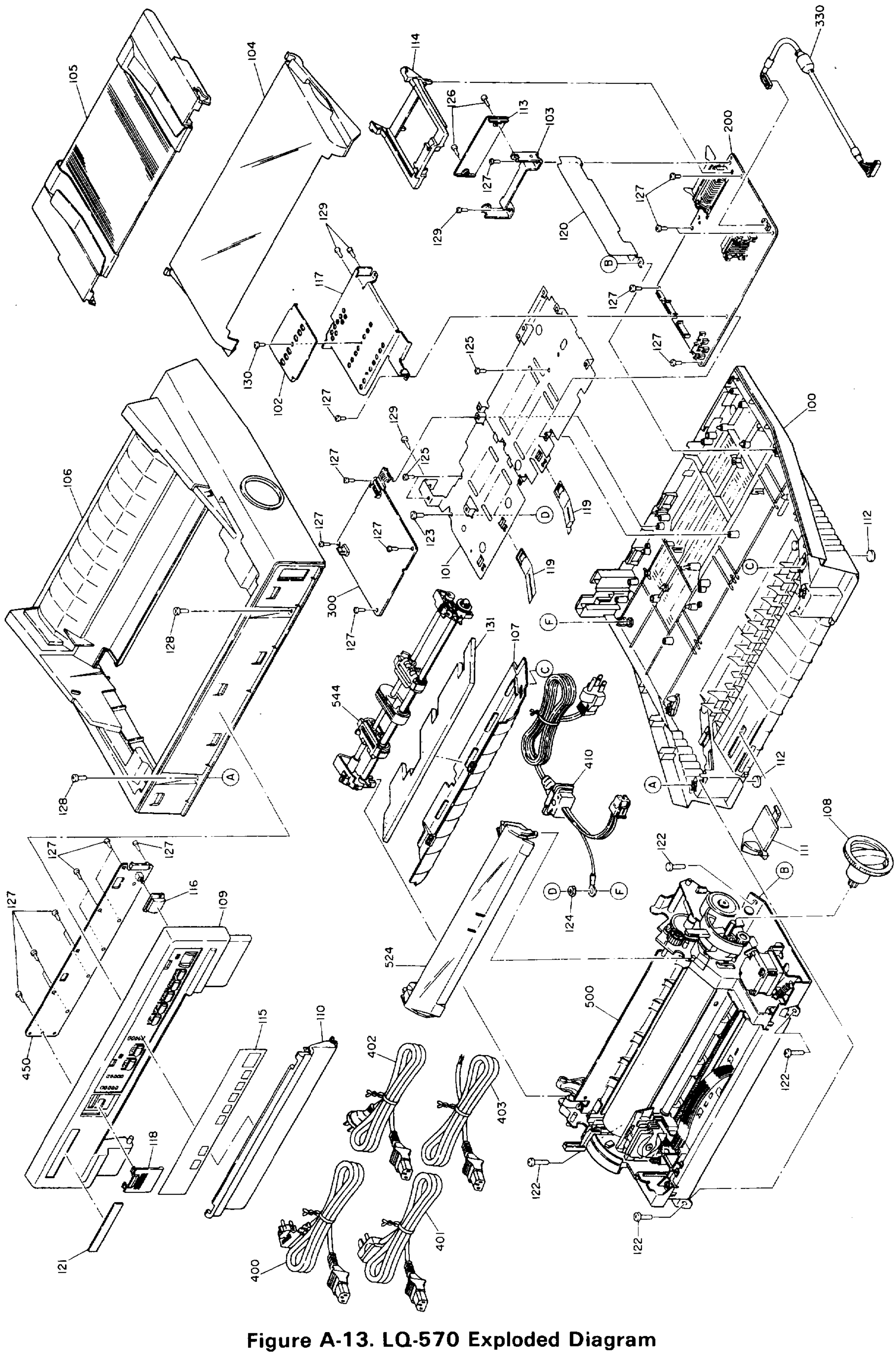


Figure A-13. LQ-570 Exploded Diagram

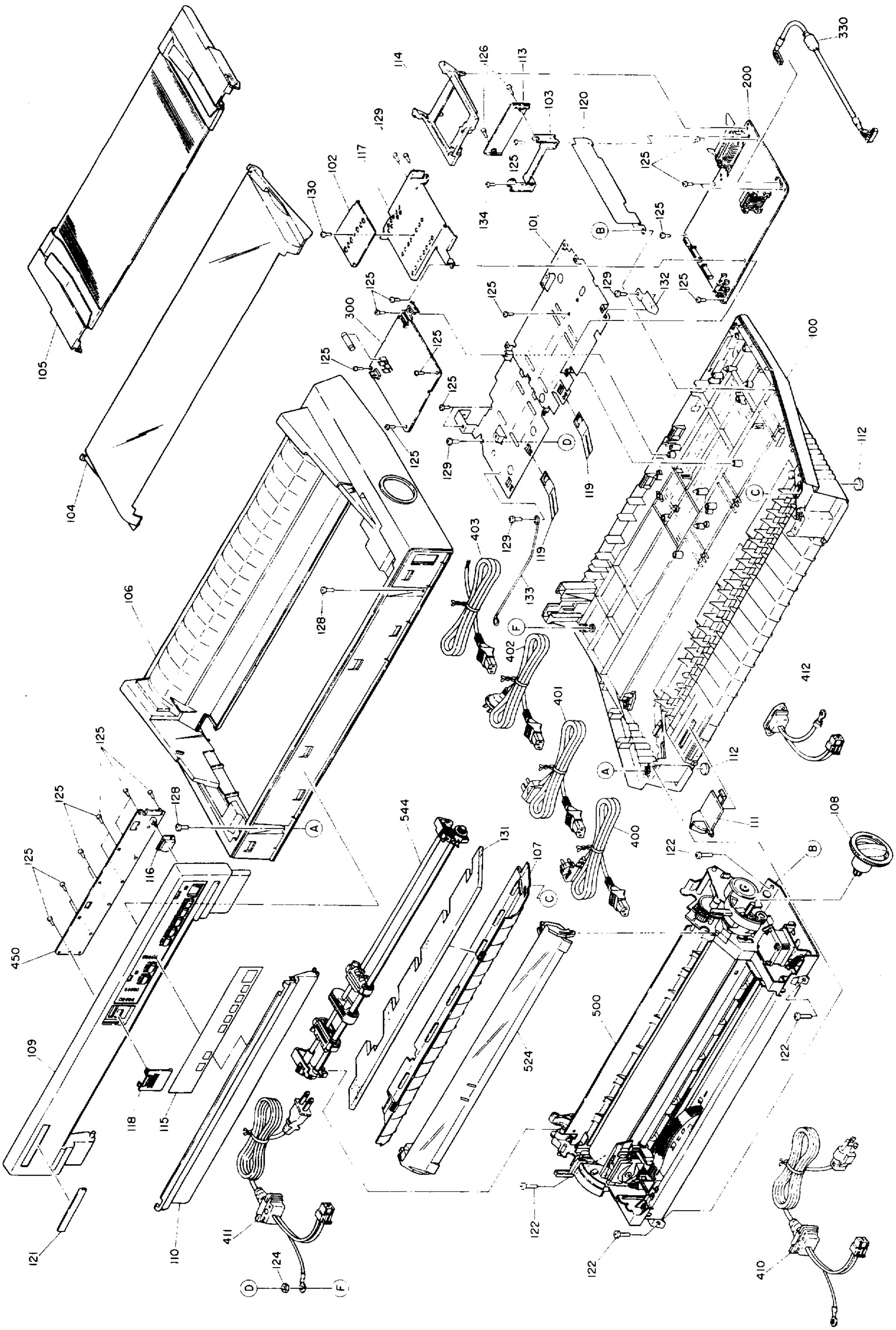


Figure A-14. LQ-1070 Exploded Diagram

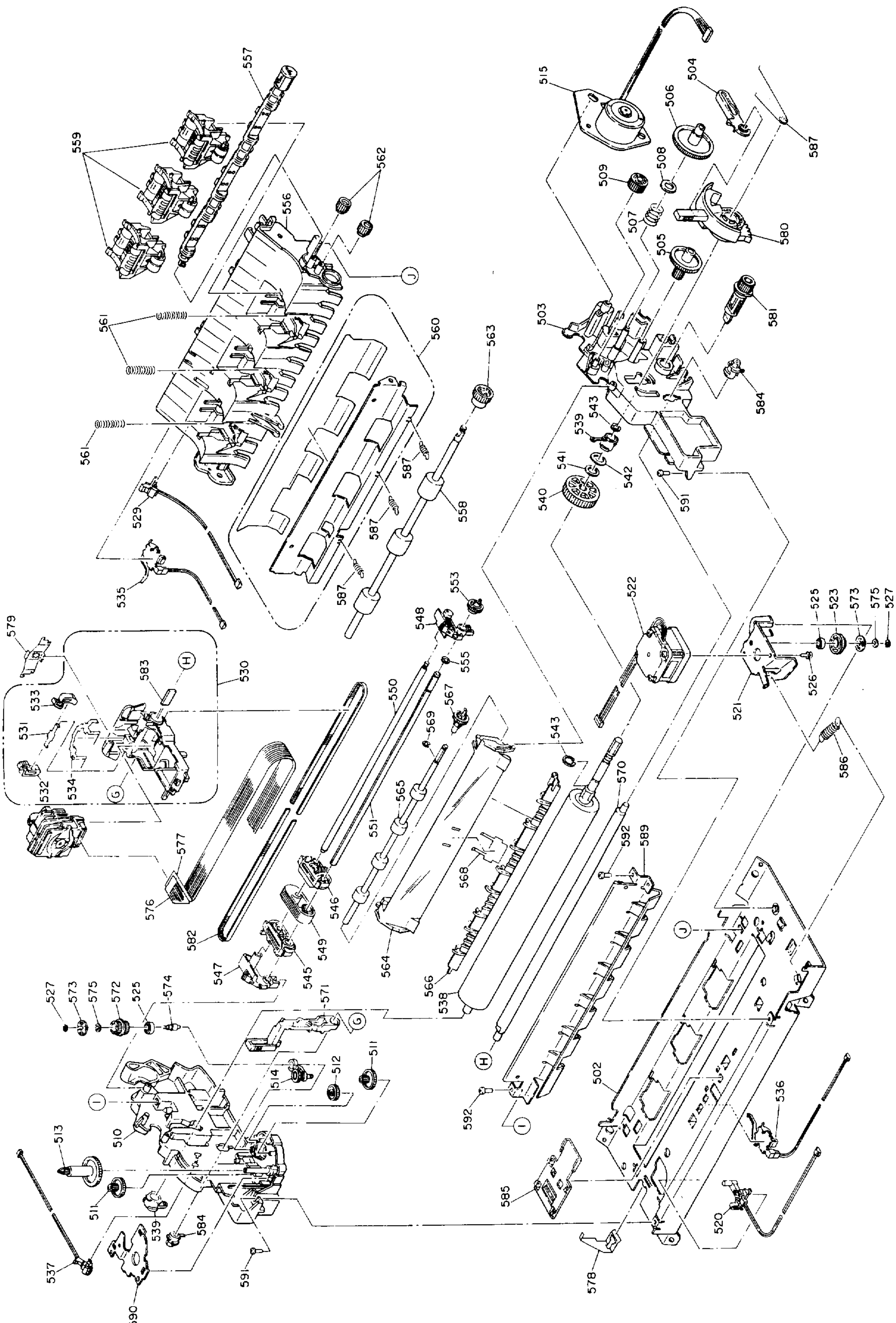


Figure A-15. Model-5E10 Exploded Diagram

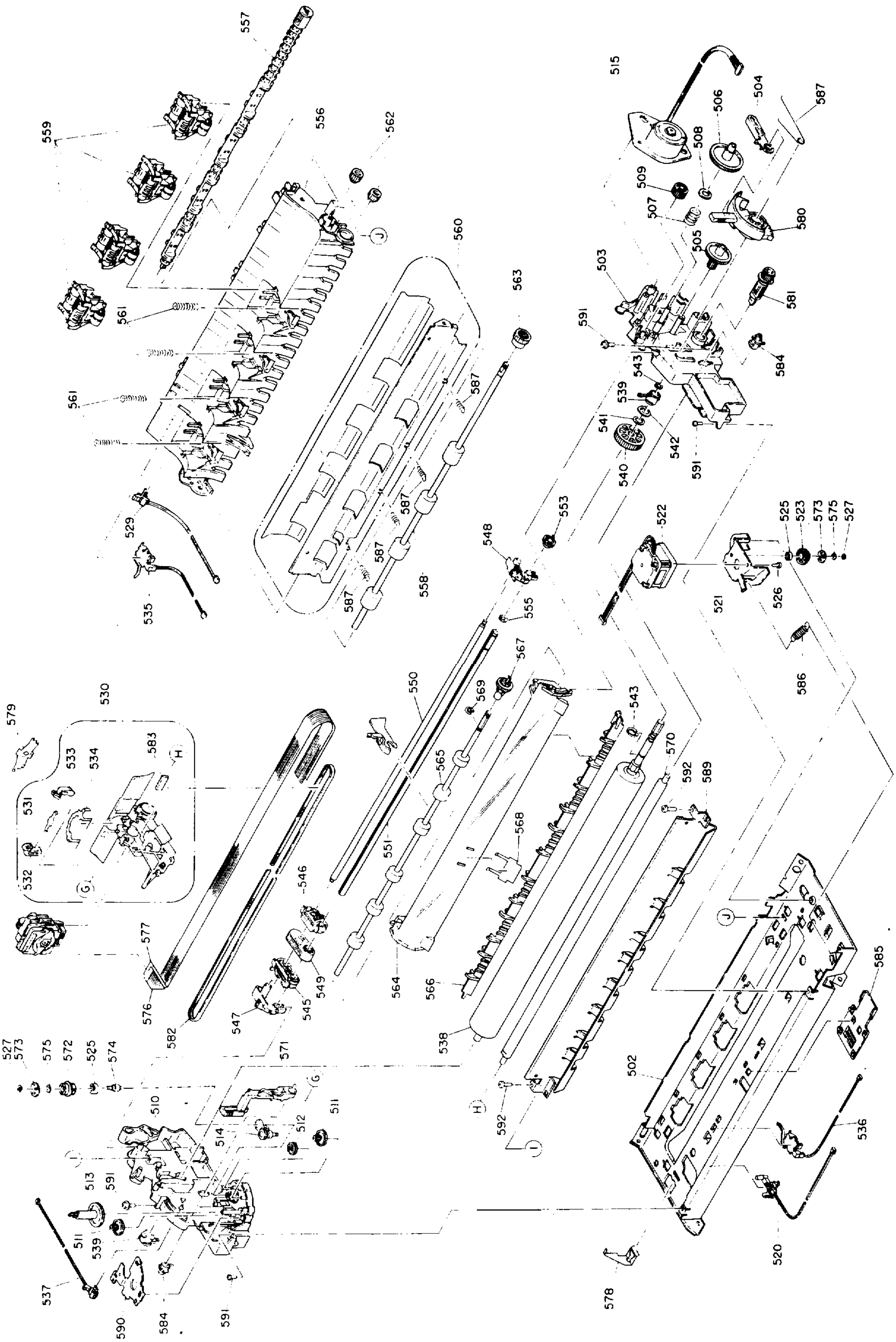


Figure A-16. Model-5E60 Exploded Diagram

Table A-14. Part Number Reference Table

Ref. No.	Description	Ref. No.	Description
100	Lower housing assembly	507	Compression spring (200 gm)
101	Bottom shield plate	508	Plain washer (M5 x 16)
102	FFC holding plate	509	Spur gear (40 mm)
103	I/F grounding plate	510	Left main frame
104	Printer front cover assembly	511	Combination gear
105	Sheet guide frame assembly	512	Spur gear (13.2 mm)
106	Upper housing assembly	513	RD ratchet
107	Front paper guide	514	Ribbon planet lever assembly
108	Knob	515	PF motor
109	Front housing	520	HP detector
110	Front cover	521	CR motor frame assembly
111	Front edge guide	522	CR motor
1 1 2	Rubber foot	523	Belt pulley
113	Upper connector cover	524	E cover assembly
114	I/F board guide	525	Ball bearing
115	Panel sheet	526	CBS(O) screw
116	Power switch key top	527	Type E retaining ring (2.3)
117	Main board shield plate	529	Release detector
118	DIP switch cover	530	Carriage assembly
119	Grounding plate	531	Head lock lever spring
120	Right shield plate	532	Left head lock lever
121	Logo plate	533	Right head lock lever
122	CBB(C) screw (M4 x 14)	534	Head grounding plate
123	CB(O) screw (M4 x 8)	535	Rear PE detector
124	Hexagon nut (M4)	536	Front PE detector
125	CBB(C) screw (M3 x 10)	537	Platen detector
126	CBS(C) screw (M3 x 10)	538	Platen
127	CBB(P) screw (M3 x 12)	539	Bushing (8 mm)
128	CBB(P) screw (M4 x 25)	540	Spur gear (34 mm)
129	CB screw (M3 x 6)	541	Plain washer (8 x 0.5 x 15)
130	CB screw (M3 x 6)	542	Leaf spring (8.2 x 0.15 x 15)
131	Sound absorber	543	Type C retaining ring
		544	Tractor assembly
200	Main board assembly	545	Left tractor assembly
		546	Right tractor assembly
300	Power supply board assembly	547	Left tractor frame
310	Fuse	548	Right tractor frame
302	CBS screw (M3 x 8)	549	Paper support
330	Wire harness	550	Tractor guide shaft
		551	Tractor shaft
400	Power cable VD31303SA-1 OA	552	Tractor frame lever
401	Power cable (BS31303SA-SR)	553	Spur gear (17 mm)
402	Power cable (AS31 303SI)	554	Compression spring (150 gm)
403	Power cable VD00303SA-1 OA	555	Type E retaining ring (6)
410	Power cable assembly	556	Paper guide
411	Power cable assembly	557	Shafl release
412	Wire harness	558	PF drive roller assembly
450	Panel board assembly	559	PF lever assembly.
		560	Paper guide assembly support
500	M-5ElO printer mechanism	561	Compression spring (1300 gm)
502	Main base frame	562	Spur gear (11.5 mm)
503	Right main frame	563	Spur gear (18 mm)
504	Tractor clutch cam	564	Eject cover
505	Combination gear (8.5 mm, 30 mm)	565	Eject roller assembly
506	Spur gear (40 mm)	566	Upper platen cover

Table A-14. Part Number Reference Table (Cont.)

Ref. No.	Description	Ref. No.	Description
567	Spur gear (17 mm)		
568	Paper tension spring		
569	Type E retaining ring (5)		
570	CR guide shaft		
571	G adjustment lever		
572	Driven pulley		
573	Belt pulley flange		
574	Driven pulley shaft		
575	Plain washer (3.2 x 0.5 x 7)		
576	Front head cable		
577	Rear head cable		
578	CR grounding plate		
579	Ribbon mask		
580	Release lever		
581	Release support shaft		
582	Timing belt		
583	Oil pad		
584	Parallel adjusting bushing		
585	Head cable holder		
586	Extension spring (778 gm)		
587	Extension spring (32 gm)		
588	Lower platen cover		
589	RD cover		
590	CBS(C) screw (P2) (M3 x 10)		
591	CBP(C) screw (M3 x 10)		
592			

A.5 CASE OUTLINE DRAWING

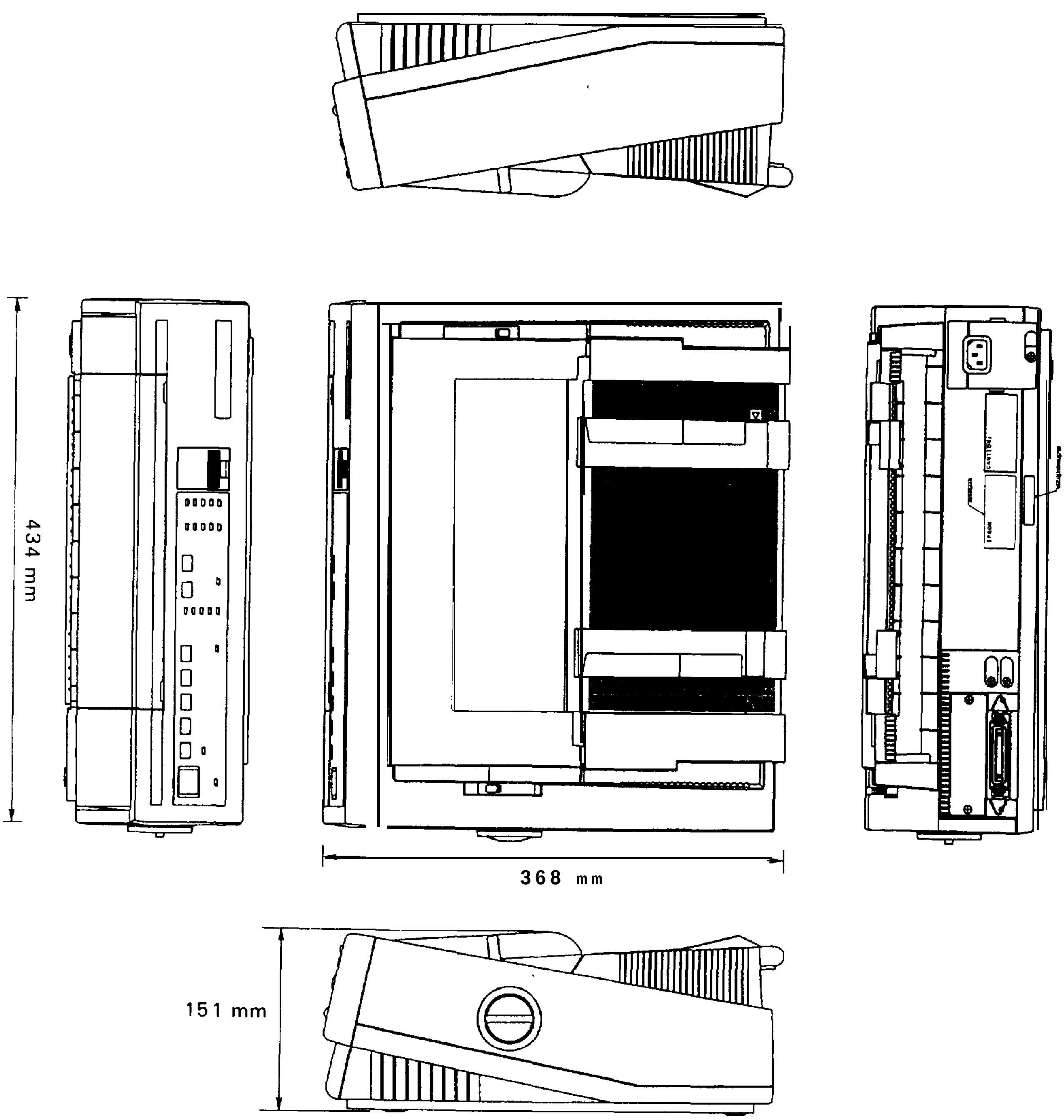


Figure A-17. LQ-570 Case Outline Drawing

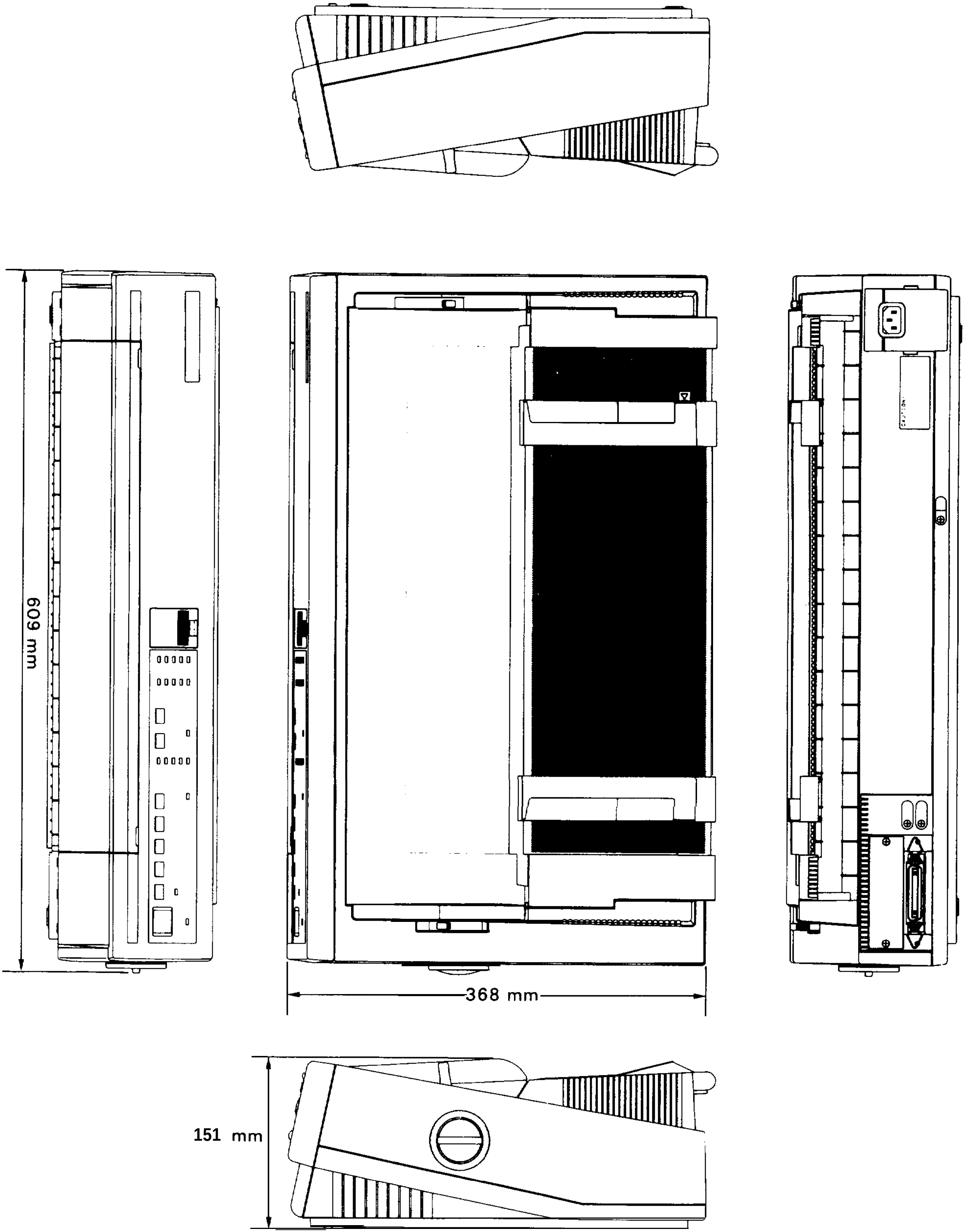


Figure A-18. LQ-1070 Case Outline Drawing

Appendix B

The LQ-570+/1070+

Figures

Tables

Appendix B. The LQ-570+/1070+

This appendix describes the LQ-570+/1070+ printer, a **small,** low-cost printer with advanced paper-handling features that is compatible with the LQ-570 and LQ-1070.

Differences between the LQ-570+/1070+ and LQ-570/1070

Important Component Differences

Table B-l. Component Compatibility

LQ-570+/1 **070+**	**LQ-570/1070**	**Comments**
Cl 07 MAIN boards	CO62 MAIN boards	Not interchangeable. (Different boards for **LQ-570+** and **LQ-1 070+**. See Table B-7.)
CR motor	CR motor	Not interchangeable.
Printhead	Printhead	New printhead **built** for quieter operation.
M-5J10 (LQ-570+) **M-5J60** (LQ-1 **070+)** printer mechanism	**M-5E10** (LQ-570) M-5E60 (LQ-l 070) printer mechanism	The major difference is the CR motor.

Faster Print Speeds

Table B-2. Print Speed Comparison

Printer Model	Print Pitch	Condensed	Columns	Character Pitch	Printing Speed		
					Draft	**LQ**	**HSD**
LQ-570+/1 **070+** LQ-57011 070	10 10	OFF OFF	**80/1**36 801136	10 10	225 210	75 70	NA 225
LQ-570+/1 **070+** LQ-570/1 070	10 10	ON ON	**137/1**64 1371164	17.1 17.1	192 180	128 120	NA NA
LQ-570+/1 **070+** LQ-57011 070	12 12	OFF OFF	961204 961204	12 12	269 252	90 84	NA NA
LQ-570+/1 **070+** LQ-57011 070	12 12	ON ON	**160/233** 1601233	20 20	225 210	154 140	NA NA
LQ-570+/1 **070+** LQ-57011 070	15 15	OFF OFF	1201272 **120/272**	15 15	337 315	112 105	NA NA
LQ-570+/1 **070+** LQ-570/1 070	15 15	ON ON	INVALID INVALID				

Note: HSD = high-speed draft. The LQ-570+/1 **070+** has no high-speed draft.

Faster Bit Image Print Speeds

Table B-3. Bit Image Print Speed Comparison

Pins	Bit Image Printing Mode	Density (dpi)	Printable Dots	LQ-570+/1070+ Speed (ips)	LQ-57011 070 Speed (ips)
8	Single-density	60	480	22.5	21 .o
8	Dual-density	120	960	11.2	10.5
8	Double-speed, dual-density	120	960	22.5	21 .o
8	Quadruple-density	240	1920	11.2	10.5
8	CRT graphics	80	640	11.2	10.5
8	CRT graphics II	90	720	15.0	14.0
24	Single-density	60	480	22.5	21 .o
24	Dual-density	120	960	11.2	10.5
24	CRT graphics II	90	720	15.0	14.0
24	Triple-density	180	1440	7.5	7.0
24	Hex-density	360	2880	7.5	7.0

Faster Paper Feed Speeds

Friction without CSF

LQ-570+	LQ-1 070+	LQ-570	LQ-1 070	
65.2 ms 2.8 ips	81.1 ms 2.8 ips	77.6 ms 2.2 ips		per 1/6-inch (4.23 mm) feed continuous

Friction with CSF

LQ-570+	LQ-1 070+	LQ-570	LQ-1 070	
73.1 ms 2.5 ips	86.0 ms 2.5 ips	77.6 ms 2.2 ips		per 1/6-inch (4.23 mm) feed continuous

Tractor

LQ-570+	LQ-1 070+	LQ-570	LQ-1 070	
65.2 ms 2.8 ips	81.1 ms 2.8 ips	77.6 ms 2.2 ips		per 1/6-inch (4.23 mm) feed continuous

Tractor (with Multipart Paper)

LQ-570+	LQ-1 070+	LQ-570	LQ-1070	
80.6 ms 2.2 ips	90.9 ms 2.2 ips			per 1/6-inch (4.23 mm) feed continuous

Additional Scalable Fonts

LQ-570+/1070+	*LQ-57011070*
Epson Roman	Epson Roman
Epson Sans Serif	Epson San Serif
Epson Roman T	
Epson Roman H	

Character Table Differences

BRASCII and Abicomp added to LQ-570+/1070+

Table B-4. DIP Dwitch SW1 Differences

SW	Description	ON	OFF	LQ-570+/1 070+ Factory Setting
1 2 3	International character set and PC table selection	(See character set selection table below.)		ON ON ON
4	Character table	Graphic	Italic	OFF
5	Graphic print	Unidirectional	Bidirectional	OFF
6	Not used			OFF
7	Input buffer	Invalid	Valid	OFF
8	1 -inch skip	ON	OFF	OFF

Note: For the LQ-570/1 070, SW1 -6 selects high-speed draft. The LQ-570+/1 070+ has no high-speed draft.

Table B-5. Character Set Selection (Same for Both Printers)

Country	I-I	1-2	1-3	1-4
U.S.	ON	ON	ON	OFF
France	ON	ON	OFF	OFF
Germany	ON	OFF	ON	OFF
U.K.	ON	OFF	OFF	OFF
Denmark 1	OFF	ON	ON	OFF
Sweden	OFF	ON	OFF	OFF
Italy	OFF	OFF	ON	OFF
Spain 1	OFF	OFF	OFF	OFF

Table B-6. Character Table Selection Differences

Character Table	1-1	1-2	13	I-4
Italic	(Using character set selected above.)			OFF
PC 437 (U.S.)	ON	ON	ON	ON
PC 850 (Multilingual)	ON	ON	OFF	ON
PC 860 (Portugal)	ON	OFF	ON	ON
PC 863 (Canadian-French)	ON	OFF	OFF	ON
PC 865 (Norway)	OFF	ON	ON	ON
BRASCII (Brazilian Portuguese)	**OFF**	**ON**	**OFF**	**ON**
Abicomp (Brazilian Portuguese)	**OFF**	**OFF**	**ON**	**ON**
PC 437 (U.S.)	**OFF**	**OFF**	**OFF**	**ON**

Note: Listings in bold are for the LQ-570+/1070+ only.

Jumper Differences

LQ-570+/1070+
When jumper J12 is connected to SLIN, the printer recognizes the SELECT IN signal from the host.

LQ-570/1070
When jumper J3 is connected to GND, the SLCT-IN signal is fixed to LOW.

Printer Weight Difference

LQ-570+/1070+	*LQ-570/1070*
15 lb. (6.8 kg)/20 lb. (9.5 kg)	13.5 lb. (6.1 kg)/18.6 lb. (8.4 kg)

Printer Height Difference

LQ-570+11070+	*LQ-570/1070*
6.3 inches	6 inches

Weight Difference for Cut Sheet Carbonless Duplicating Paper

LQ-570+/1070+	*LQ-570/1070*
12 to 15 lb paper, maximum	17 to 24 lb., maximum

Lower Noise

LQ-570+11070+	*LQ-570/1070*
46.5 dB(A)	55 dB(A)

Power Consumption

LQ-570+/1070+	*LQ-570/1070*
33 W / 36 W	33 w

(during a self-test in draft mode at 10 cpi)

Mean Cycles Between Failures (MCBF)

LQ-570+/1070+
3 million lines, excluding printhead (same as LQ-570/1070)

Differences in Power On Function with Buttons Held Down

Button	LQ-570	LQ-570/1070+
LF/FF	Prints PROM version, DIP switch settings, rotating pattern of LQ fonts	Prints rotating pattern of LQ fonts
LOAD/ EJECT	Prints PROM version, DIP switch settings, draft font pattern	Prints draft font pattern
ALT	No function	Prints PROM version and DIP switch settings and ejects page

C107 MAIN Board Component Layout

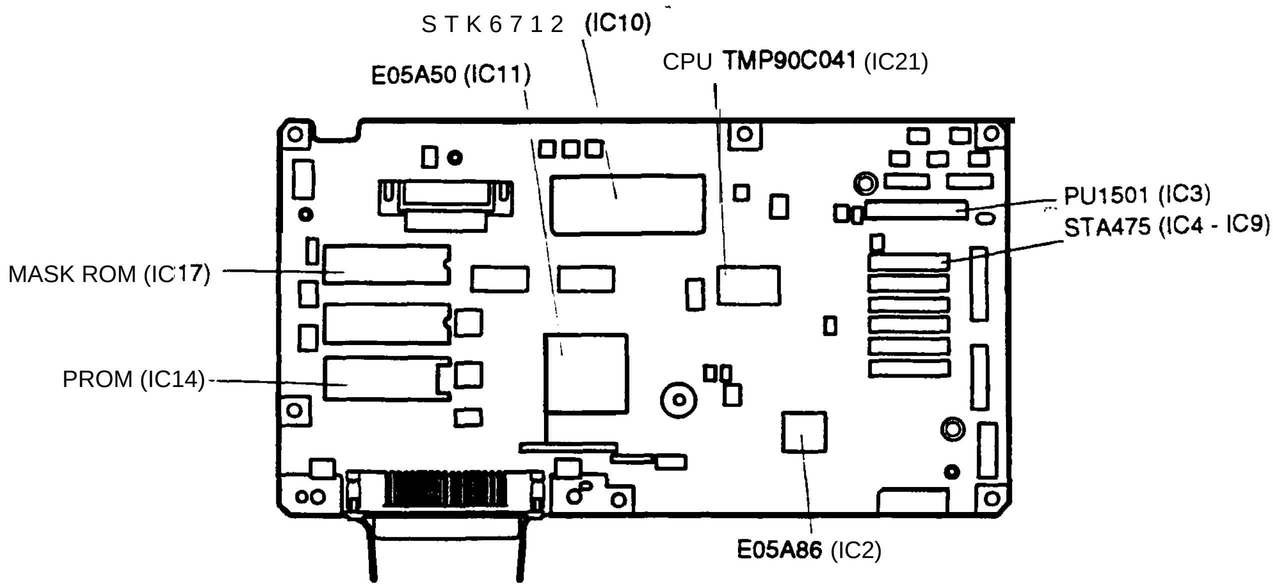


Figure B-l. C107 MAIN Board Component Layout

Note:

The LQ-570+ and the LQ-1070+ use different versions of the Cl07 MAIN board. The differences between the boards are shown in the table below.

Table B-7. Differences in the Cl07 MAIN for the LQ-570+ and LQ-1070+

	LQ-570+	LQ-1070+
IC16 (64K SRAM)	Not installed	Installed
BZ1 (Buzzer) and R14 (1K-ohm resistor for buzzer circuit) installed	Installed	Not
IC 14 (PROM)	A0262A	WOO234

LQ-570+/1070+ Control Circuit Operation

The control circuitry consists of two boards: the Cl07 MAIN board and the CO62 PNL board (the control panel).

The printer's CPU is an 8-bit CPU TMP90C041 running at 10 MHz. It oversees control of all the components of the printer. The E05A50 gate array contains various memory management functions that control the assignment of the memory and I/O areas, and it controls a head gate array IC2 (E05A86), a PU1501 or SW-67129 for the PF and CR motor driver, STA475A(IC4 IC9) is transistor array for the head pins drive, several sensor circuits and so on. Figure B-2 shows the block diagram of the Cl07 Main Board.

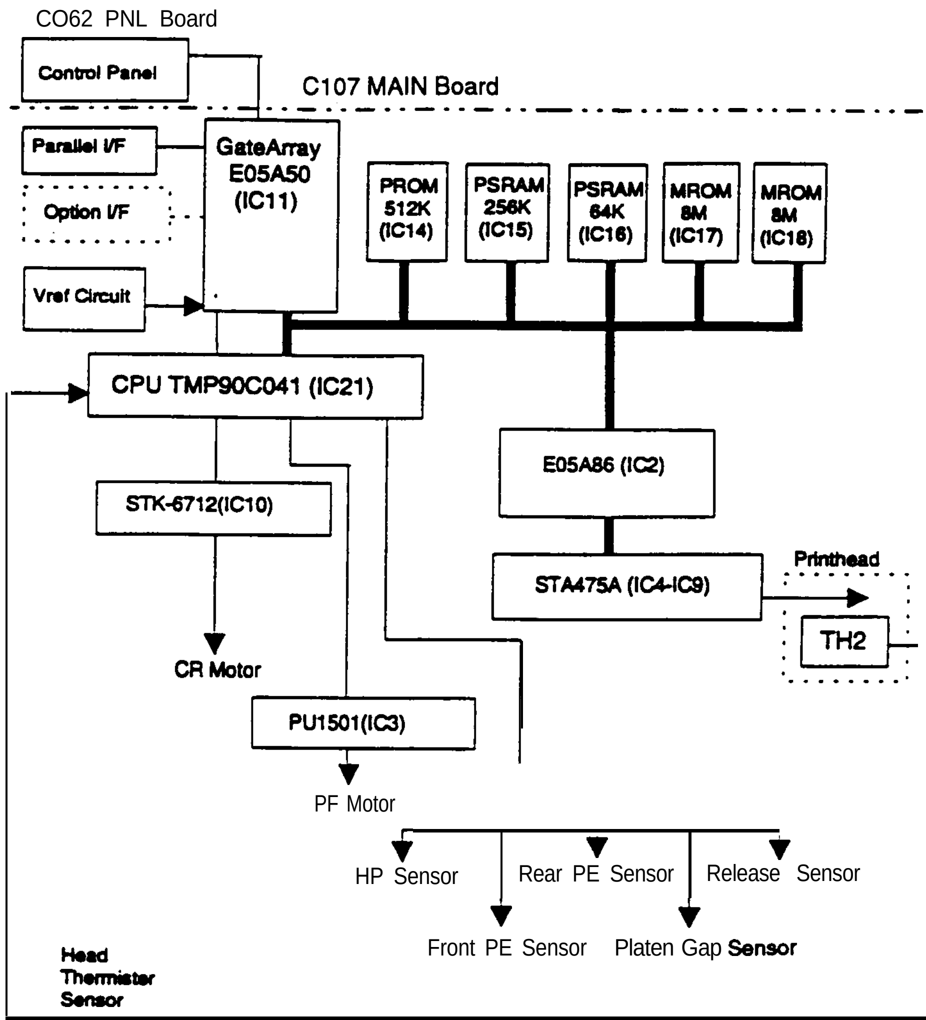


Figure B-2. Control Circuit Block Diagram

Table B-8 lists the functions of the main components and circuits of the printer. The CPU converts the print data sent from the host computer to image data (the print image). The image data is then loaded into RAM. Each line of data is processed sequentially. The CPU transfers the print data to the printhead drive circuit. The CPU sends the printhead drive pulse to the printhead drive circuit. The length of this pulse corresponds to the printhead drive voltage. The head drive circuit then outputs the head drive signal.

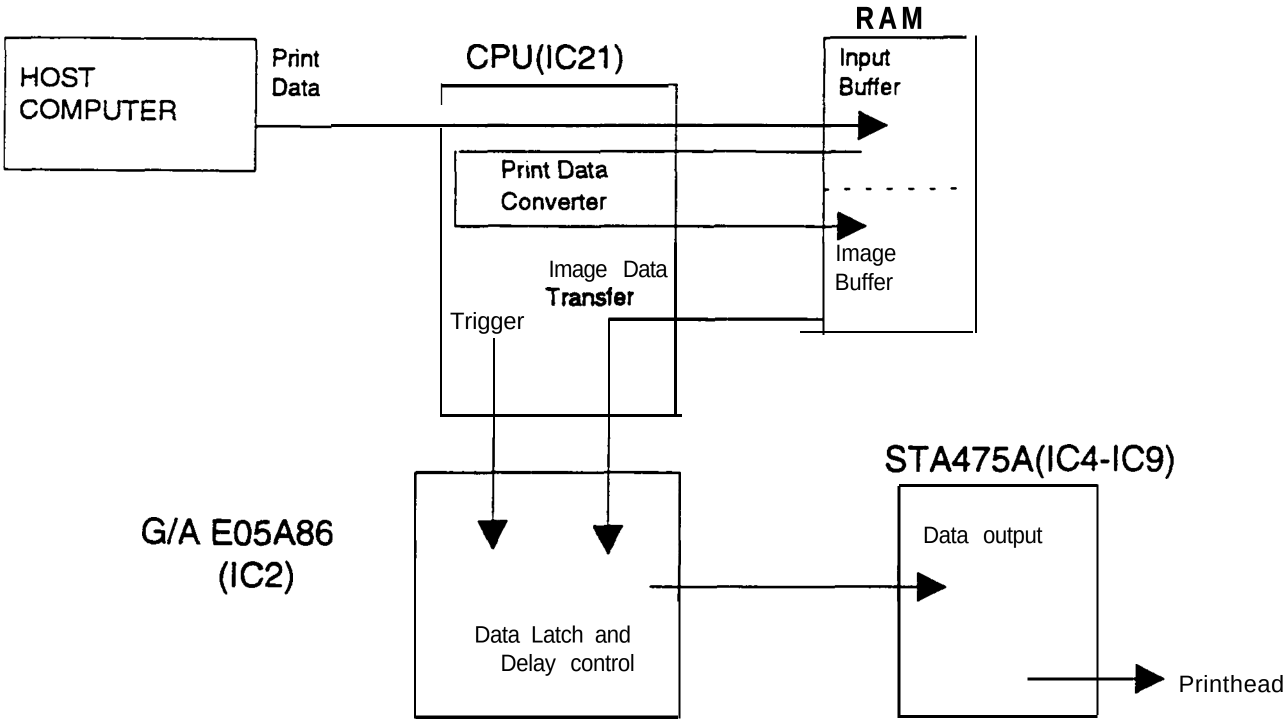


Figure B-3. Data Flow

Table B-8. Functions of the Main IC and Circuits

IC or Circuit	Location	Functions
TMP90C41	IC21	Receives data from the host computer and loads the data to the input buffer in RAM (under interrupt processing control). Expands the input data held in the buffer to create image data. Loads this image data to the image buffer in RAM. Transfers the image data to the printhead drive circuit. Also controls various parts of the printer mechanism, such as the motors.
E05A50	IC11	This gate array consists of three components configured on a single chip: *Memory Management Unit* Handles CPU memory in ROM, RAM, and mask ROM, and assigns addresses for other devices. *Parallel interface (Parallel I/F)* Holds the parallel interface functions. *Reset Circuit* Contains the circuit that generates the /RESET signal.
PROM	IC14	The PROM contains the program that runs the CPU.
RAM	IC15 and IC16	Holds the CPU working area and the various buffers. (1 E is not used for an 80column device and is not installed.)
Mask ROM	IC17 and IC16	Holds the character design (also called the character generator).
EEPROM	IC12	The EEPROM is an electronically writable and erasable ROM used to hold such information as the TOF position.
Head Gate Array	IC2	This gate array consists of three components configured on a single chip: Change order of the head pulse outputs Mode 1: HD1→HD2→HD3→......→HD22→HD23→HD24 Mode 2: HD24→2HD23→HD22→......→HD3→HD2→HD1 Delay control (for low noise) Image data latching
Vref Circuit	—	This circuit generates the reference voftage used in the A/D converter within the CPU.

Reset Circuit

Figure B-4 shows a block diagram for the reset circuit, which issues the /BESET signal to initialize each part of the control circuit as it receives this signal. The conditions when the /RESET signal is output are described below.

When Turning on the Power Supply

Immediately after power is turned on, PST 529 (IC19) outputs the /PON pulse. The E05A50 (IC11) receives this pulse and outputs the /DISC pulse. The electrical charge in capacitor C29 is then discharged. After this, the /THLD port within E05A50 detects the low level and outputs the /RESET signal from the /OUT port of IC19. After time has elapsed, the charge in the condenser builds up again. The /THLD signal is canceled and then the /RESET signal is canceled.

Resets Performed by the CPU Itself (CPU Self-Reset)

The CPU outputs the /RESET signal if there is a /RESET request for E05A50 and E05A50 output the /DISC pulse.

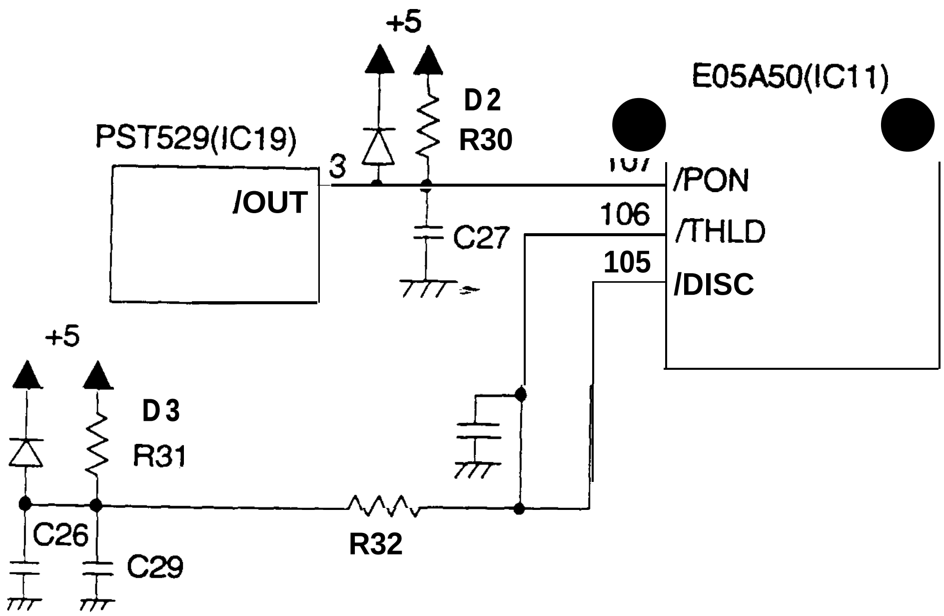


Figure B-4. Reset Circuit Block Diagram

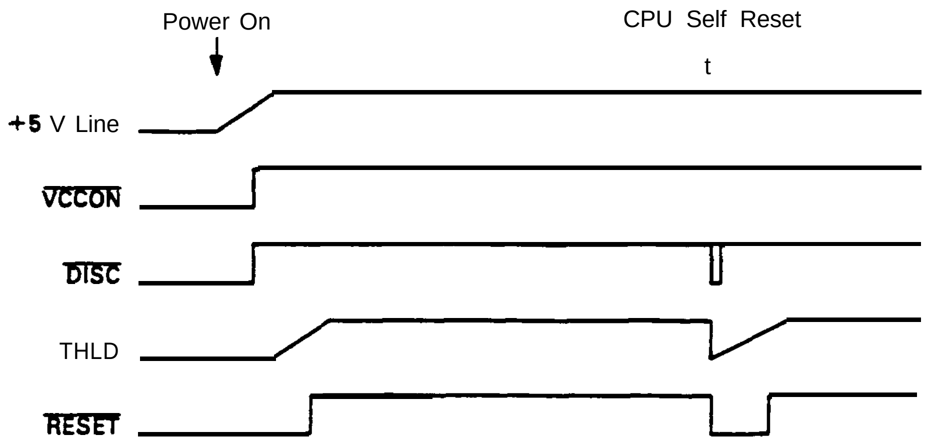


Figure B-5. Timing of Reset Signal

Sensor Circuits

Figure B-6 shows a block diagram for the sensor circuits. Detection of any excessive printhead temperature causes the TEMP2 signal to be sent directly to the CPU. Other signals, such as the CRHOME signal, pass through each low pass filter before reaching the CPU. Terminals P50 to P55 on the CPU are used for the A/D converter. The Vref circuit generates the A/D converter reference voltage Vref.

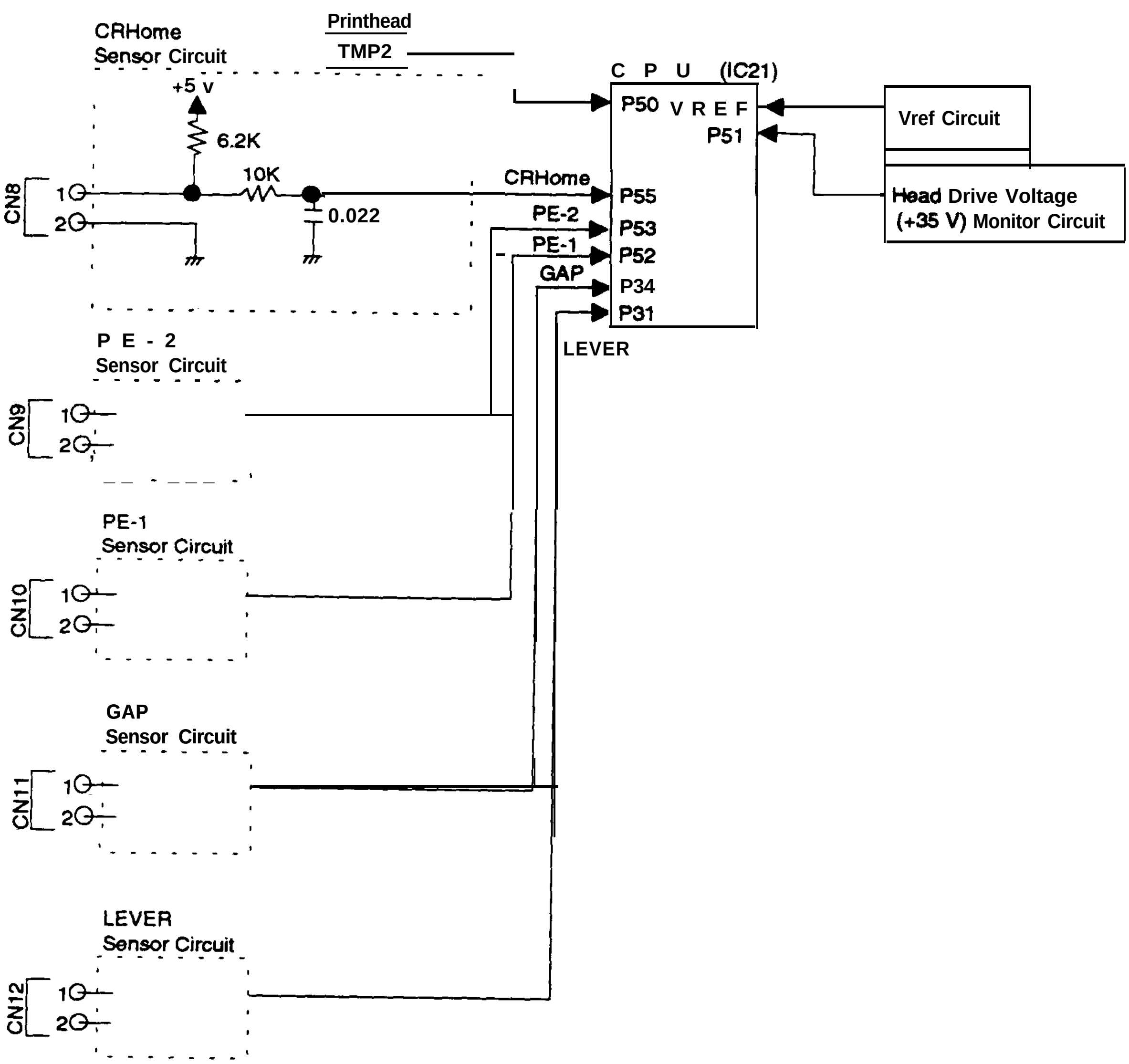


Figure B-6. Sensor Circuit Block Diagram

CR Motor Drive Circuit

Figure B-7 shows the CR motor drive circuit, which uses an open-loop, constant-current drive control to drive the CR motor. The motor is driven with 2-2 phase excitation and 1-2 phase excitation. The 2-2 phase excitation corresponds to two 1-2 phase excitation steps, so for each single step phase change of a 2-2 phase excitation motor, the carriage moves 1/120 inch. For each single step phase change of a 1-2 phase excitation motor, the carriage moves l/240 inch.

The CR motor drive circuit of the STK-67128 detects the amount of current flow in the CR motor coil and regulates it. The current flowing through the coil varies depending on the speed of the CR motor. The amount of current is set by the CPU via the E05A50 I/O port. Signals are sent to Vrefl or Vref2 on the STK-67128. The SIX-67128 sets the coil current to correspond to the CR motor speed. Ports P60 to P63 on the CPU are used exclusively as phase control ports for the stepping motor.

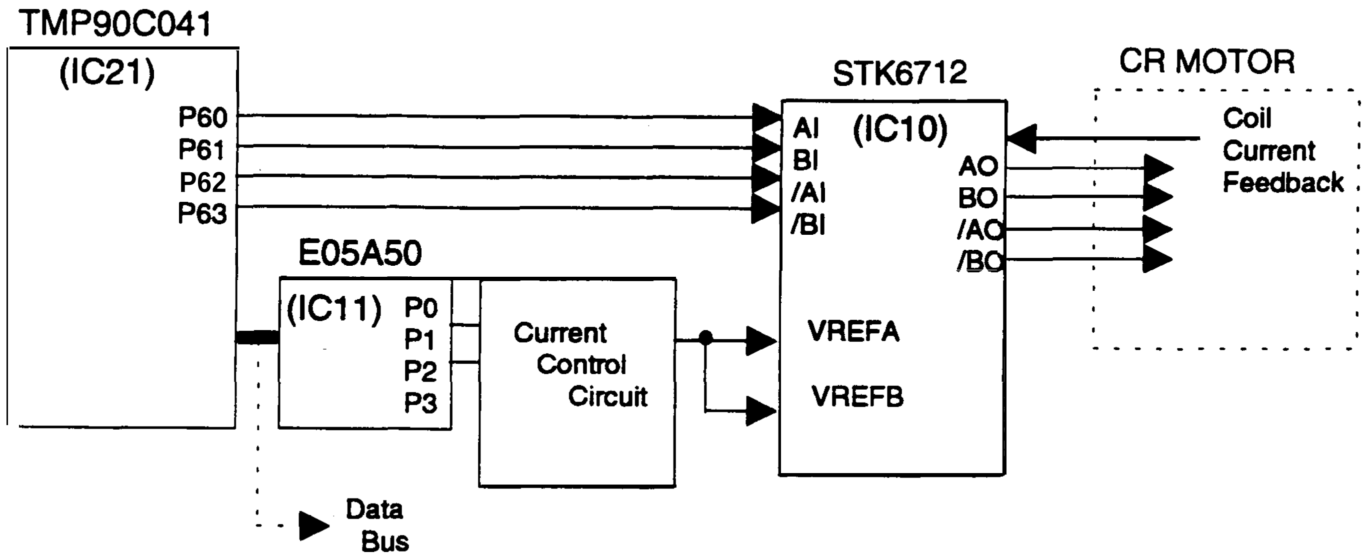


Figure B-7. CR Motor Drive Circuit

Table B-9. CR Motor Drive Modes

Drive Mode	Excitation Type	Type Drive Frequency	Standard Print Character
3 x speed	2-2 phase	2695 pulses per second (pps)	Draft
2 x speed	2-2 phase	1773 pps	High speed LO
1.5 x speed	2-2 phase	1347 pps	Draft (emphasized, condensed)
4/3 x speed	l-2 phase	1191 pps	
1 x speed	l-2 phase	1796 pps	LQ
3/4 x speed	l-2 phase	1347 pps	
2/3 x speed	1-2 phase	119opps	
1/2 x speed	l-2 phase	698 pps	

PF Motor Drive Circuit

The stepping motor that the printer uses to advance the paper can advance it by a minimum of 1/360 inch. The motor is a 2-2 phase or 1-2 phase, constant-voltage drive type. P70 to P73 on the CPU are the phase control ports for the stepping motor. PF motor phase data is output through these ports. Cl to C4 are turned on and off within the PU1501 (IC3) based on the phase data sent from the CPU.

When the paper advance motor is running, the supply voltage to the PF motor coil is +35 V. When the paper advance motor is not running and is in the hold state, the supply voltage to the coil is +5 V. Switching between these two supply voltages occurs at the CP terminal of the PU1501 (IC3) when the switch is turned on or off.

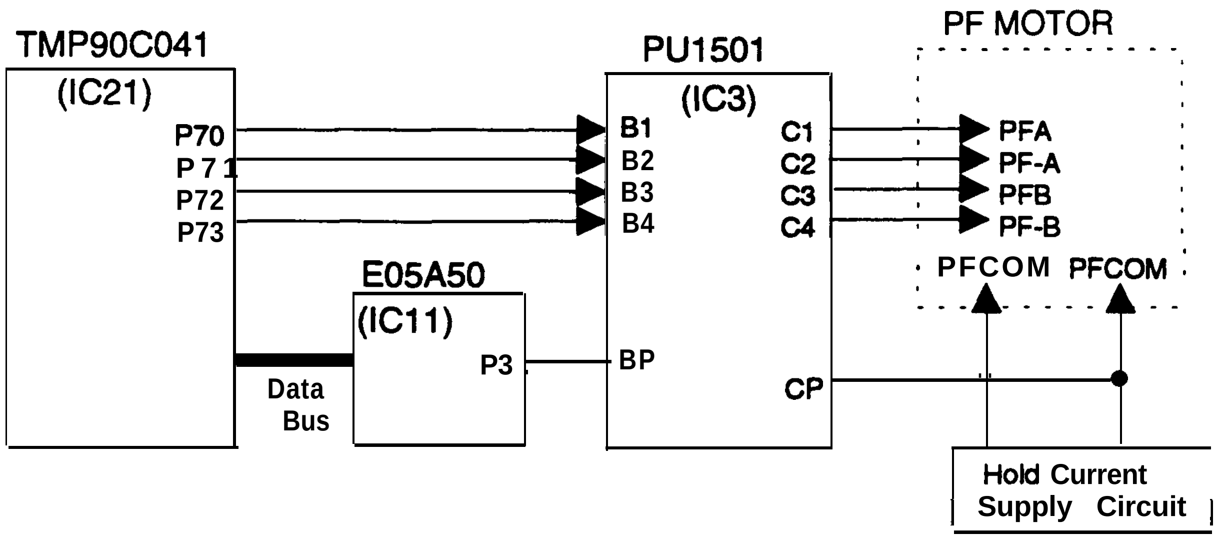


Figure B-8. PF Motor Drive Circuit

Printhead Drive Circuit

Figure B-9 shows the printhead drive circuit block diagram. The print data already is expanded to create the image data. The CPU splits up this data three times and transfers this information to the latch circuit within the head gate array (IC2). The CPU samples the voltage from the +35 V line via the ND converter. The CPU outputs a pulse via P83, the CPU time output port. The length of this pulse corresponds to the voltage of the +35 V line. This pulse becomes the head drive signal. In this way, head gate array (IC2) outputs head drive signals (signals HD1 to HD24) that relate to voltage level through the width of the pulses. These signals are output to the head for each of the section of print data that were created by subdividing the data three times before sending.

By sampling the +35 V line voltage and determining the length of the head drive signal, it is possible to maintain the energy supplied to the head at a constant level. If the voltage of the +35 V line is HIGH, the CPU shortens the output pulse. If the voltage of the +35 V line is LOW, the CPU lengthens the output pulse.

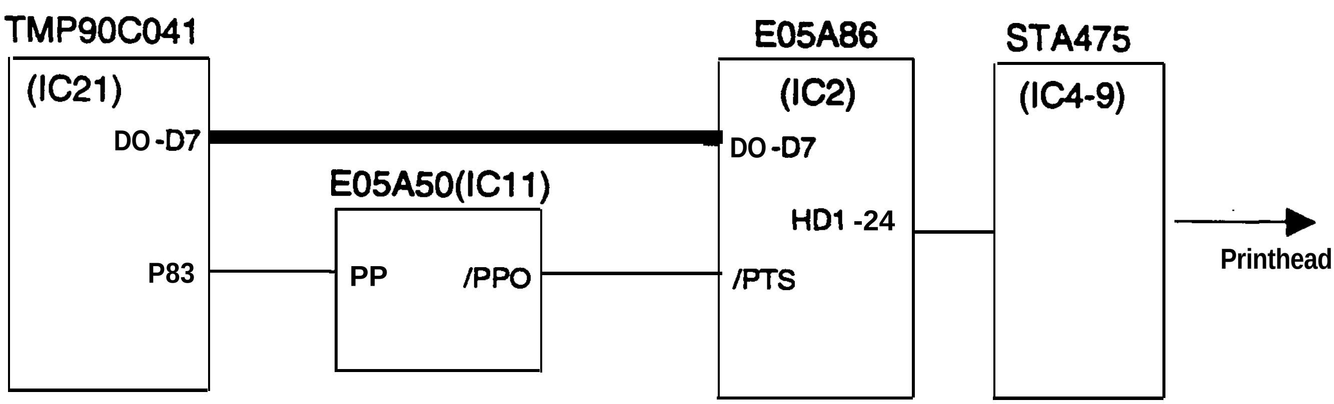


Figure B-9. Printhead Drive Circuit

Disassembly Procedures Unique to the LQ-570+/1070+

For the most part, disassembly of the LQ-570+/1070+ is the same as for the LQ-570/1070. For the power supply and control panel, however, there a different number of screws to remove for the LQ-570+/1070+ than the LQ-570/1070. For your convenience, this section describes disassembly of the Cl07 MAIN board, power supply board, and control panel. Refer to Chapter 3 of the *LQ-570/1070 Service Manual* for other disassembly procedures.

Removing the Cl07 MAIN Board Assembly

1. Remove the upper housing assembly. (See Section 3.2.2.2.)
2. Remove 1 CB (M3 x 6) screw securing the holding plate for the flat flexible cable (FFC) to the main board shield plate. Then remove the holding plate.
3. Disconnect the FFC (front and rear head cable) by disconnecting the cables from connectors CN6 and CN7 on the main board assembly.
4. Remove the 3 CBB(C) (M3 x 10) screws that hold the main board shield plate to the main board assembly, and remove the shield plate.

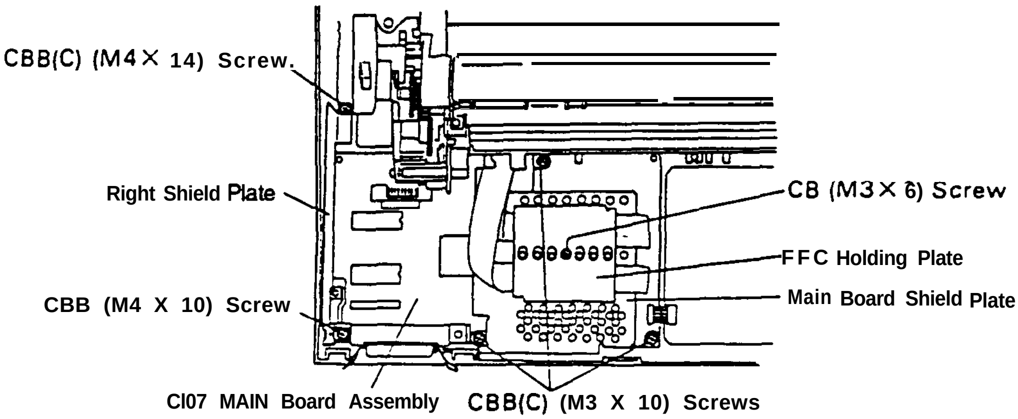


Figure B-IO. Removing the Main Board Shield Plate

5. Remove 1 CBB (M4 x 10) screw that holds the right shield plate to the main board assembly. Remove 1 CBB(C) (M4 x 14) screw that holds the right shield plate to the lower housing assembly. Then remove the right shield plate.
6. Remove cables from the following connectors on the main board: CN3 (brown, 12 pins); CN4 (white, 5 pins); CN5 (white, 6 pins); CN8 (yellow, 2 pins); CN9 (black, 2 pins); CN10 (blue, 2 pins); CN11 (white, 2 pins); and CN12 (red, 2 pins).
7. Remove 3 CBB(C) (M3 x 10) screws and 1 CB (M3 x 8) screw that hold the main board to the lower case. Then remove the main board.

CAUTION

Both connector CN11 and CN12 are 2-pin connectors, so be careful not to mix them up when you connect them to the main board:

BLACK WIRE AND WHITE WIRE: CN11
GRAY WIRES: CN12

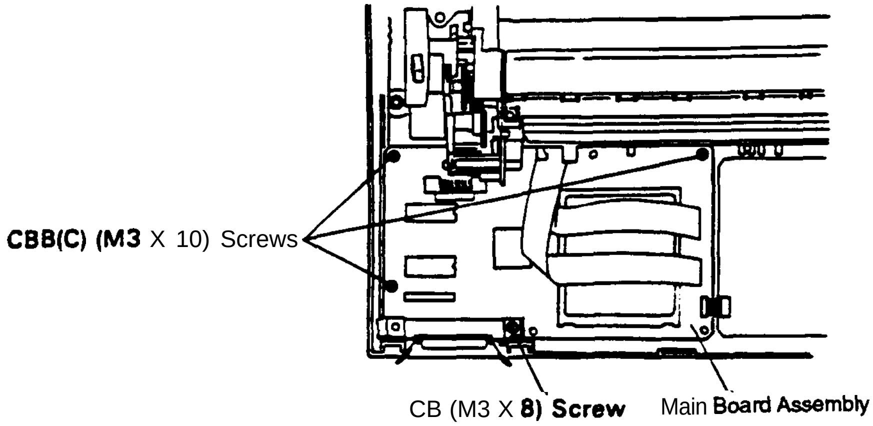


Figure B-11. Main Board Assembly

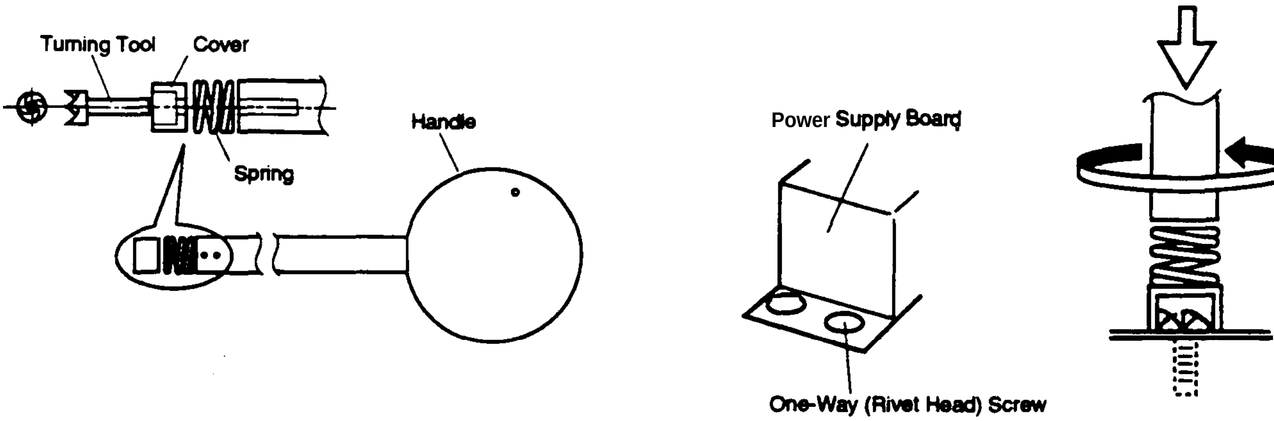
ADJUSTMENT REQUIRED

After you have replaced the main board assembly, you must adjust the bidirectional print alignment. See Section 4.2 in the *LQ-570/1070 Service Manual.*

Removing the C062 PSB Power Supply Board Assembly

1. Remove the upper housing assembly. (See Section 3.2.2.2.)
2. Remove the cable from connector CN13 on the main board assembly.
3. Remove the cable from connector CN1 on the power supply board assembly.
4. Remove 5 CBB(C) (M3 x 10) screws and 1 CB (M3 x 8) screw that hold the power supply board assembly to the lower housing assembly. Then remove the power supply.

Note: The power supply is secured with a one-way screw that requires the special tool illustrated below for removal.



Special Tool

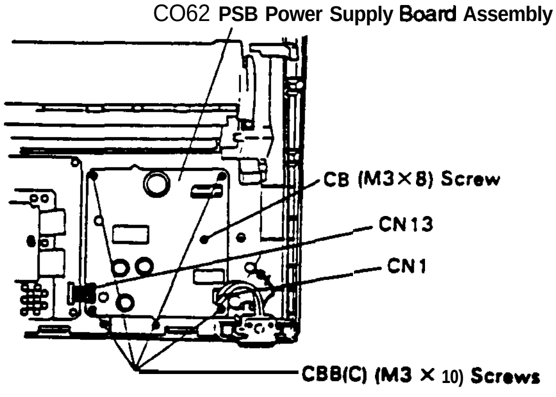


Figure B-12. Removing the Power Supply Board Assembly

Removing the C062 PNL Board

1. Remove the front housing. (See Section 3.2.2.1.)
2. Remove the 5 CBB(C) (M3 x 10) screws that hold the panel board assembly to the front housing. Remove the panel board assembly.

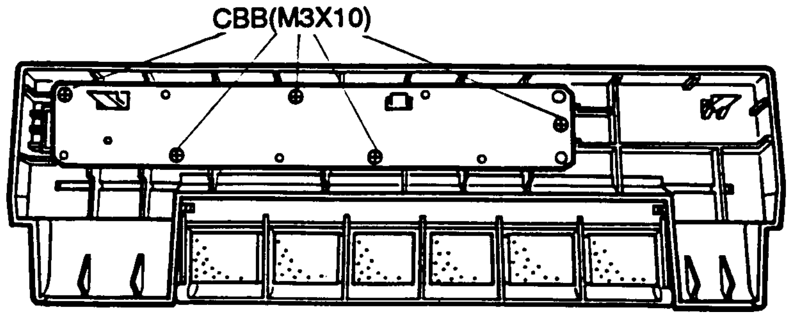


Figure B-13. Removing the Panel Board Assembly

Adjustments

The adjustments for the LQ-570+/1070+ are the same as those for the LQ-570/1070, with the exception of the circuit adjustment described in Section 4.3. This adjustment is not applicable to U.S. dealers, because the variable resistor is set correctly for the main board in the factory and does not need to be changed. The **LQ-570+/1070+** circuit adjustment is described below only for Epson dealers outside the U.S., who may require this information.

Circuit Adjustment

The **C107 MAIN** board contains variable resistor **VR1,** which is used for balancing the circuitry. When any of the following components are replaced, the circuitry must be balanced by adjusting **VR1.**

R6, R7, TL431 **(IC1),** and **VR1**

If the circuitry is not properly adjusted, the CPU **A/D** converter functions abnormally and causes irregular printer operation.

To adjust the circuit, attach a digital multimeter to check terminal **TP1** (Vref voltage) on the **C107** MAIN board. Turn on the printer and adjust variable resistor **VR1** until you obtain a reading of 4.741 V.

Troubleshooting

The tables below provide the test points you can use to check the motors, printhead, and drivers for the LQ-570+/107&.

Table B-10. Printhead Test Points

Connector	Commons	Test Pins	Test Method (Power off. Set Meter to Ohms)	Resistance
CN6	7, 8, 9	1, 2, 3, 4, 5, 6, 10, 11, 12, 13, 14, 15	Place one lead on one of the commons and the other lead on each of the test pins.	45.5 ohms +/– 3.2 ohms (at 77° F, 25° C)
CN7	6, 7, 6	1, 2, 3, 4, 5, 9, 10, 11, 12, 13, 14, 15	Place one lead on one of the commons and the other lead on each of the test pins.	45.5 ohms +/– 3.2 ohms (at 77° F, 25° C)
CN6 (Thermistor)	—	16 and 17	Place one lead on each of the thermistor pins.	3K ohms (decreases as temperature increases)

Table B-11. Motor Test Points

Connector	Commons	Test Pins	Test Method (Power off. Set Meter to Ohms)	Resistance
CN4 CR Motor	5	1, 2, 3, 4	Place one lead on one of the commons and the other lead on each of the test pins.	19 ohms +/– 7 ohms (at 77° F, 25° C)
CN5 PF Motor	6 5	1, 2 3, 4	Place one lead on one of the commons and the other lead on each of the test pins.	79 ohms +/– 5 ohms (at 77° F, 25° C)

Note:

Common pins may be reversed for the PF motor. If you do not obtain a proper reading with one common, try the other common. (If you leave CN5 connected when you make the check, pins 5 and 6 are tied together.)

Table B-12. Driver Test Points

Driver	Test Point 1	Test Point 2	Test Method (Power off. Set Meter to Diodes)	Reading
Printhead IC4 — IC9 (STA475A)	GND	CN6 pins 1, 2, 3, 4, 5, 6, 10, 11, 12, 13, 14, 15 CN7 pins 1, 2, 3, 4, 5, 9, 10, 11, 12, 13, 14, 15	Disconnect the printhead connector. Place the + lead on GND and the – lead on each of the test pins.	Consistent readings within +/– 20%.
PF Motor IC3 (PU1501)	GND	CN5 pins 1, 2, 3, 4	Disconnect the paper feed motor. Place the + lead on GND and the – lead on each of the test pins.	Consistent readings within +/– 20%.
PF Common	CN5 pin 5 or6	CN4 pin 5	Place the + lead on CN5 pin 5 or 6 and the – lead on pin CN4 pin 5.	Approximately .581
CR Motor IC10 (STK6712)	GND	CN4 pins 1, 2, 3, 4	Disconnect the carriage motor. Place the – lead on pin 5 and the + lead on each of the test pins.	Consistent readings within +/– 20%.

Error Codes

The printer indicates errors with the following beep codes:

- 3 beeps paper out error
- 5 beeps carriage error

After beeping, the printer goes off line and enters the error mode. If the printer has detected a fatal error (indicated by 5 long beeps), you can find out what type of error occurred by pressing the LOAD/EJECT or PAPER FEED button on the control panel. The printer lights a FONT indicator to signal the type of error.

Indicator	**Error**
DRAFT	Carriage control error.
COURIER	Illegal voltage from power supply circuit.
ROMAN	Paper feed motor control error.
SANS SERIF	Illegal thermistor resistance in printhead. (Also printhead not installed or broken.)
PRESTIGE	Firmware problem.
SCRIPT	Illegal data read from the character generator.

The figure below shows how printhead connector pins are assigned to the dot wires in the printhead.

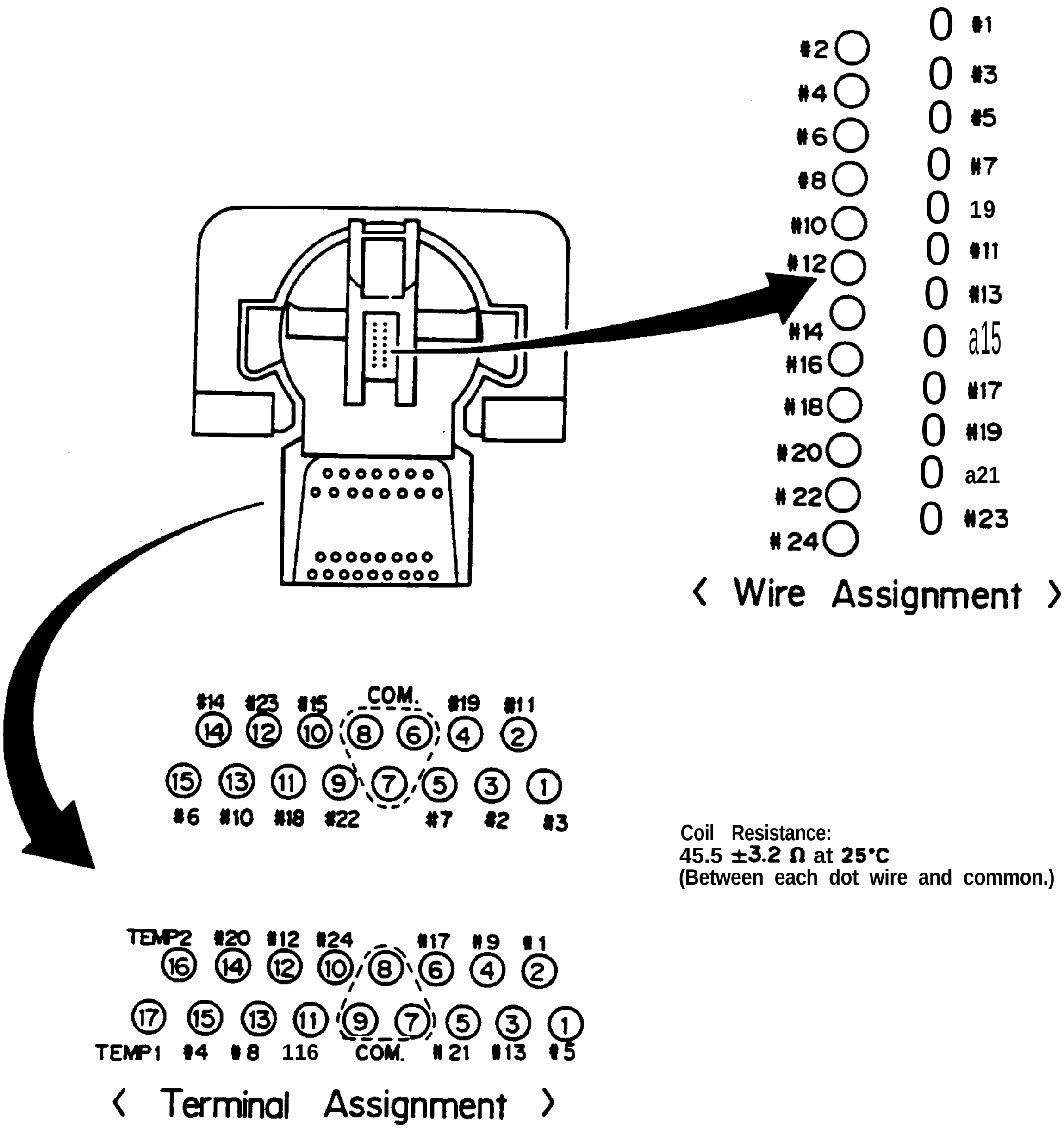


Figure B-14. Printhead Connector Wire Assignments

Reference Materials

This section contains tables, diagrams, and schematics specific to the LQ-570+/1070+. The figure below is a connection diagram for the Cl07 MAIN board and the M-5J10 printer mechanism (for the LQ-570+) or M-5J60 printer mechanism (for the LQ-1070+).

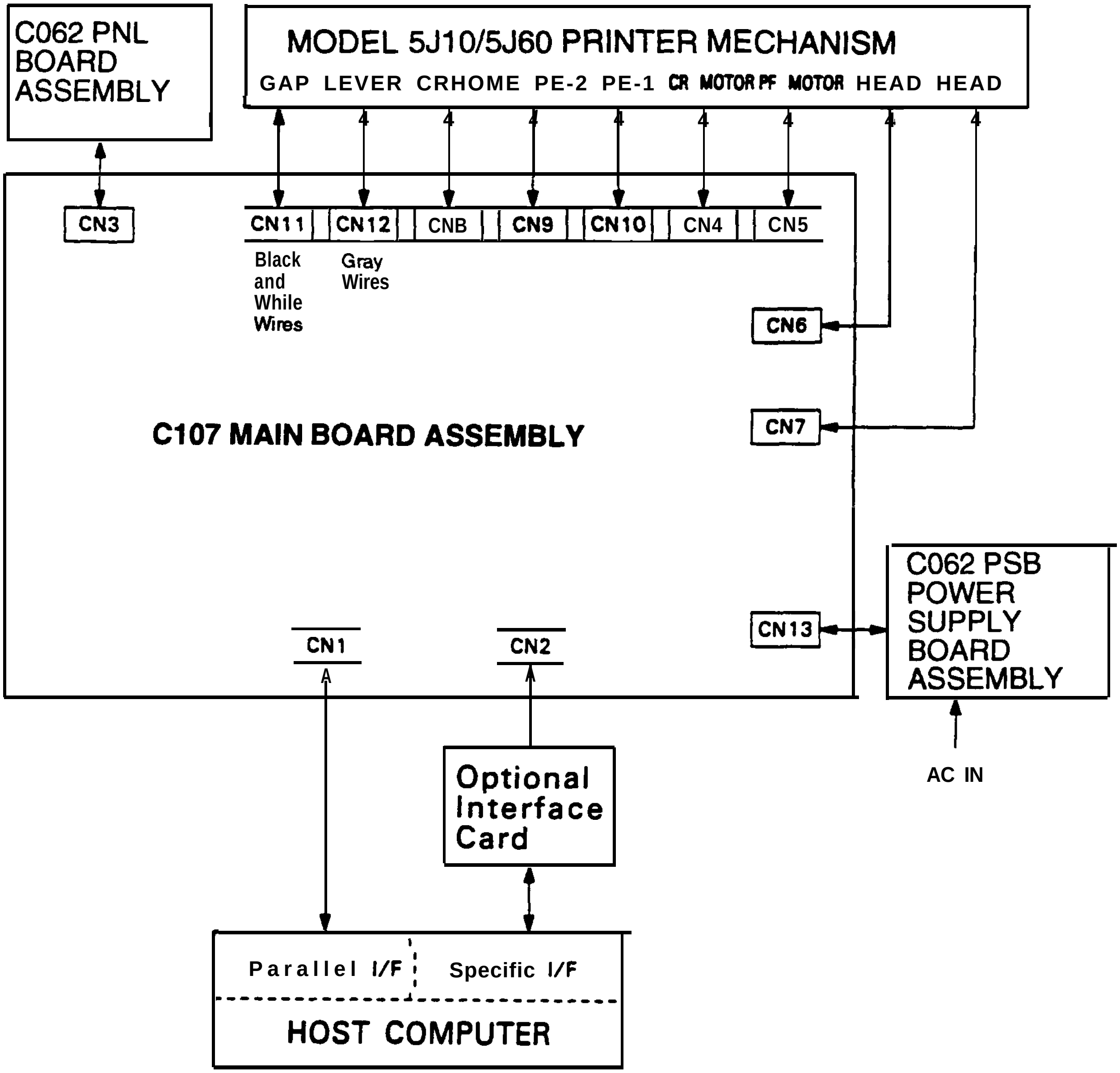


Figure B-15. LQ-570+/1070+ Connection Diagram

Table B-13. Board Connector Summary

Board	Connector	Function	Pins
Panel Board Assembly	CN1	Control panel input to main board	12
Power Supply Board Assembly	CN1	AC power input	2
	CN2	DC power input	11
Cl 07 MAIN Board Assembly	CN1	Parallel interface	36
	CN2	Optional interface card	36
	CN3	Control panel	12
	CN4	CR motor	5
	CN5	PF motor	5
	CN6	Printhead	17
	CN7	Printhead	15
	CN8	HP sensor	2
	CN9	Rear PE sensor	2
	CN10	Front PE sensor	2
	CN11	Platen gap sensor	2
	CN12	Release lever sensor	2
	CN13	DC power input	11

Table B-14. Cl 07 MAIN Board — CN2

Pin No.	I/O	Signal Name	Function
1	—	+5 V	+5 VDC
2	—	+5 v	+5 VDC
3	—	+5 V	+5 VDC
4	—	+5 v	+5 VDC
5	—	+5 V	+5 VDC
6	—	+5 V	+5 VDC
7	0	TXD	Transmit data
8	0	/READY	Ready to receive data
9		RXD	Receive data
10	—	NC	Not connected
11	0	/RST	Reset
12	0	INH	Inhibit
13		/CMREQ	Command request
14		/WRRDY	Write ready
15		/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	AI	Address bus bit 1
28	0	A0	Address bus bit 0
29	I/O	D7	Data bus bit 7
30	VO	D6	Data bus bit 6
31	I/O	D5	Data bus bit 5
32	I/O	D4	Data bus bit 4
33	VO	D3	Data bus bit 3
34	I/O	D2	Data bus bit 2
35	I/O	D1	Data bus bit 1
36	I/O	D0	Data bus bit 0

Table B-15. C107 MAIN Board — CN3

Pin No.	I/O	Signal Name	Function
1	I	/PAUSE	PAUSE button
2	—	/READY	Fixed to GND
3	0	TXS	Transmit signal (LED)
4	0	/LDLED	LED data latch
5	0	/CKS	Shift clock
6	0	/LDSW	Load button data
7	I	RXS	Receive data (button)
8	—	+5 V	+5 VDC
9	—	GND	Signal ground
10	—	SHLD	Signal ground
11	I	POWER 1	Power button
12	—	POWER 2	Fixed to GND

Table B-16. C107 MAIN Board — CN4

Pin No.	I/O	Signal Name	Function
1	0	CRA	CR motor phase A
2	0	CR-A	CR motor phase -A
3	0	CUB	CR motor phase B
4	0	CR-B	CR motor phase -B
5	0	CRCOM	CR motor common

Table B-17. C107 MAIN Board — CN5

Pin 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	0	PFCOM	PF motor common
6	0	PFCOM	PF motor common

Table B-18. C107 MAIN B ard — CN6

Pin No.	I/O	Signal Name	Function
1	0	HD5	Head data 5
2	0	HD1	Head data 1
3	0	HD13	Head data 13
4	0	HD9	Head data 9
5	0	HD21	Head data 21
6	0	HD17	Head data 17
7	—	COM	Common
8	—	COM	Common
9	—	COM	Common
10	0	HD24	Head data 24
11	0	HD16	Head data 16
12	0	HD12	Head data 12
13	0	HD8	Head data 8
14	0	HD20	Head data 20
15	0	HD4	Head data 4
16	I	TEMP2	Head temperature
17	—	TEMP1	+vu

Table B-19. C107 MAIN B ard — CN7

Pin No.	I/O	Signal Name	Function
1	0	HD3	Head data 3
2	0	HD11	Head data 11
3	0	HD2	Head data 2
4	0	HD19	Head data 19
5	0	HD7	Head data 7
6	—	COM	Common
7	—	COM	Common
8	—	COM	Common
9	0	HD22	Head data 22
10	0	HD15	Head data 15
11	0	HD18	Head data 18
12	0	HD23	Head data 23
13	0	HD10	Head data 10
14	0	HD14	Head data 14
15	0	HD6	Head data 6

Table B-20. C107 MAIN Board — CN8

Pin No.	VO	Signal Name	Function
1	I	CRHOME	Home position sensor
2	—	GND	Signal ground

Table R21. Cl07 MAIN Board — CN9

Pin No.	I/O	Signal Name	Function
1	I	PE2	Rear PE sensor
2	—	GND	Signal ground

Table R22. Cl07 MAIN Board — CN10

Pin No.	I/O	Signal Name	Function
1	I	PE1	Front PE sensor
2	—	GND	Signal ground

Table B-23. Cl07 MAIN Board — CN11

Pin No.	vo	Signal Name	Function
1	I	GAP	Platen gap sensor
2	—	GND	Signal ground

Table B-24. Cl07 MAIN Board — CN12

Pin No.	I/O	Signal Name	Function
1	I	LEVER	Release lever sensor
2	—	GND	Signal ground

Table B-25. Cl07 MAIN Board — CN13

Pin No.	I/O	Signal Name	Function
1	0	PSC	Power button signal
2	—	+5 v	+5 VDC
3		+5 v	+5 VDC
4		GND	Signal ground
5		GND	Signal ground
6		GND	Signal ground
7		GND	Signal ground
8		GND	Signal ground
9		+35 v	+35 VDC
10		+35 v	+35 VDC
11		+35 v	+35 VDC

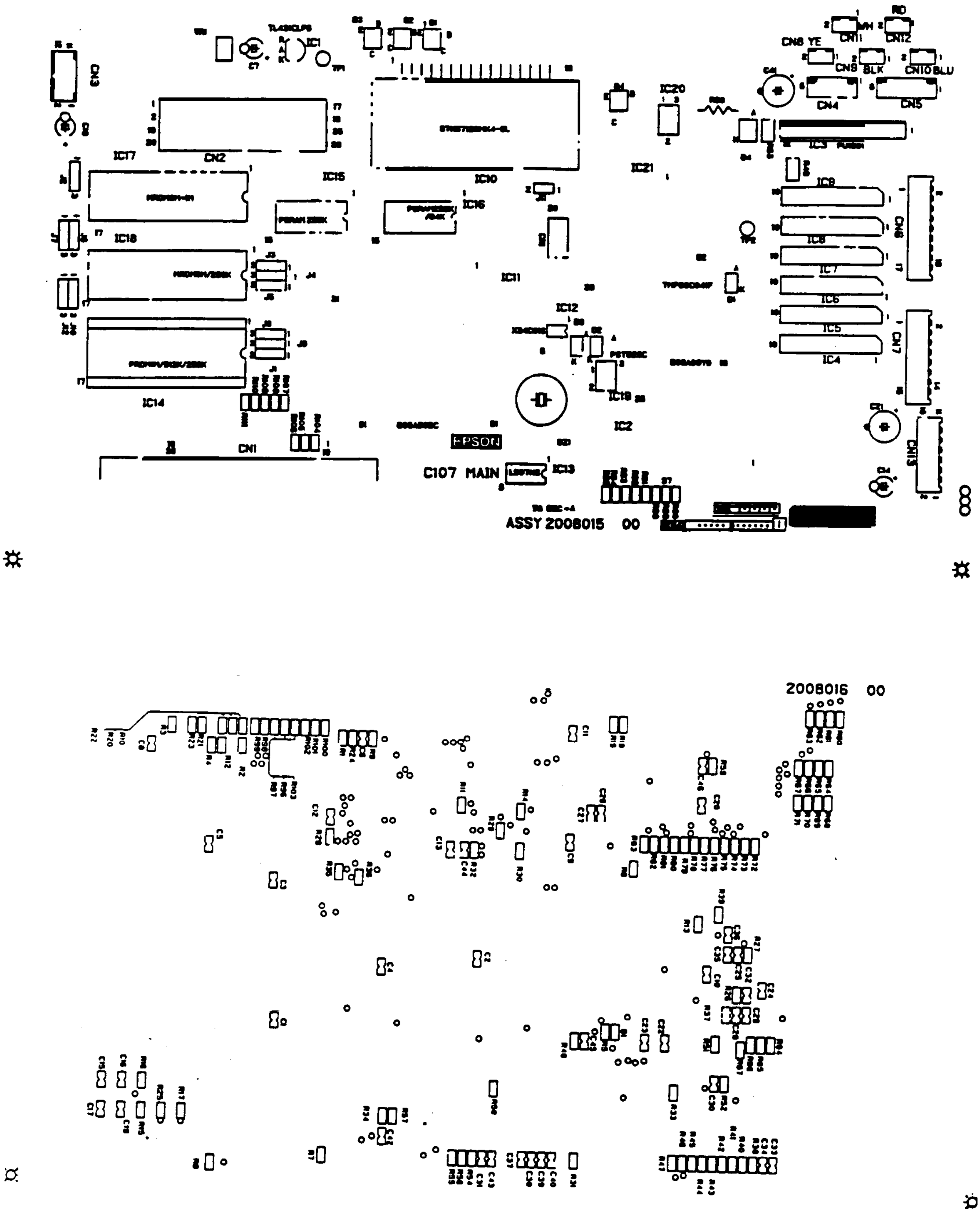
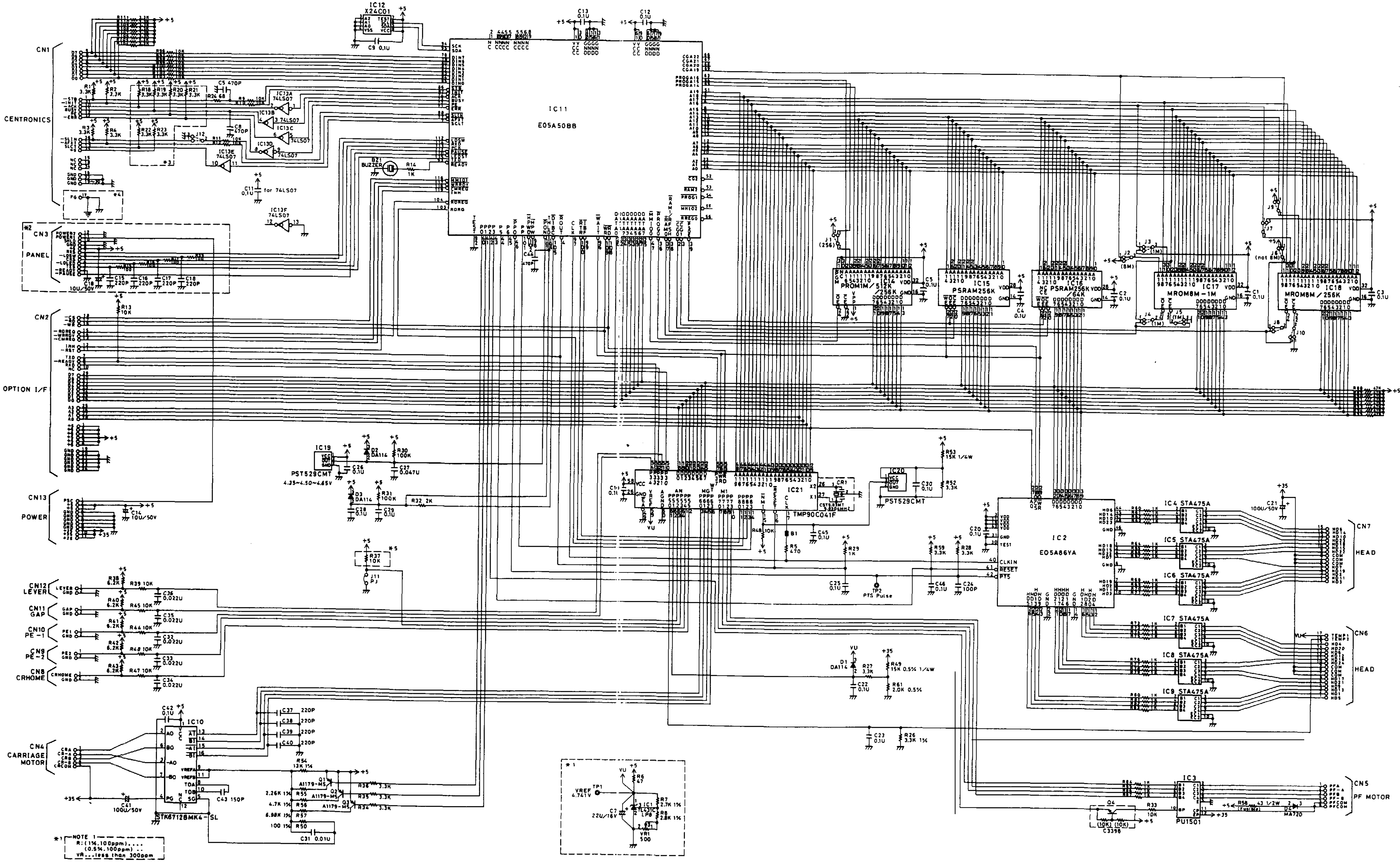


Figure B-16. Cl07 MAIN Board Component Layout



*1 NOTE 1
R:(1%.100ppm)....
(0.5%.100ppm) ..
VR...less than 300ppm

*2 NOTE 2
Ground loop between panel unit and other unit must be connected at the specified point only.

*3 NOTE 3
Japanese version --- 1Kohm
The others --- 3.3Kohm

*4 NOTE 4
Frame Ground and Signal Ground must be connected at the specified point only.

*5 NOTE 5
Keep the resistor open for LQ-570+

PROGRAM (EPROM)	256K	512K	1M 32pin JEDEC
J1	+5	PROGA16	PROGA16

CG (IC17)	1M 28pin	1M MSK 32pin	1M PROM 32pin	2M MSK	2M PROM	4M MSK	4M PROM	8M MSK
J2	—	—	+5	—	+5	—	+5	CGA19
J3	+5	—	—	A17	A17	A17	A17	A17
J4	A16	CG0	CG0	CG0	CG0	CG0	CG0	CG0
J5	CG0	GND	GND	GND	GND	GND	GND	GND

CG (IC18)	256K	512K	1M MSK 28pin	1M MSK 32pin	1M PROM 32pin	2M MSK	2M PROM	4M MSK	4M PROM	8M MSK
J6	—	—	—	—	+5	—	+5	—	+5	CGA19
J7	+5	+5	+5	—	—	A17	A17	A17	A17	A17
J8	CG1	CG1	A16	CG1	CG1	CG1	CG1	CG1	CG1	CG1
J9	+5	A15	A15	A15	A15	A15	A15	A15	A15	A15
J10	GND	GND	CG1	GND	GND	GND	GND	GND	GND	GND

Width	80 col.	136 col.
J11	GND	OPEN

SELECT IN	Signal available	Signal not available
J12	SLIN	GND

Figure B-17. C107 MAIN Board Circuit Diagram