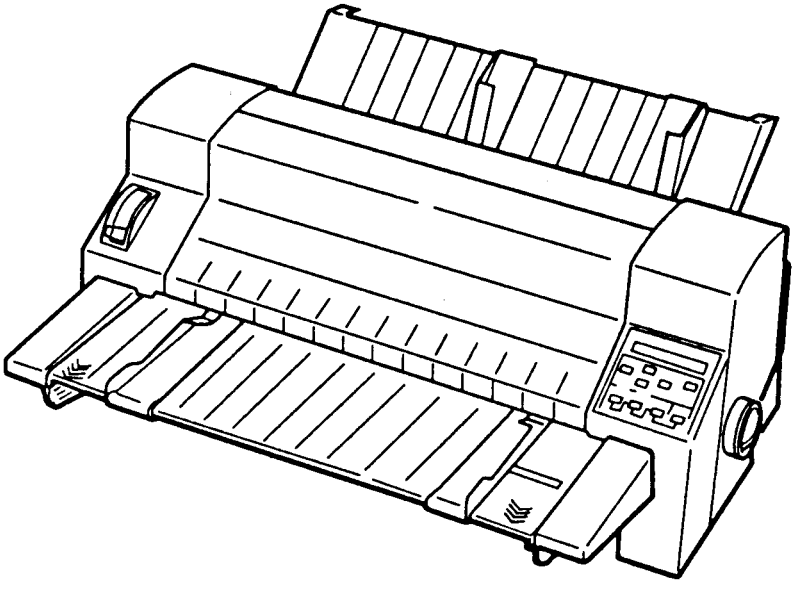
EPSON TERMINAL PRINTER

DLQ-3000

SERVICE MANUAL



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NOTICE

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

All efforts have been made to ensure the accuracy of the contents of this manual. However, should any errors be detected, SEIKO EPSON would greatly appreciate being informed of them.

The above notwithstanding SEIKO EPSON can assume no responsibility for any errors in this manual or the consequence thereof.

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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 DANGER Headings.

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

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

DANGER

1. ALWAYS DISCONNECT THE PRODUCT FROM BOTH THE POWER SOURCE AND PERIPHERAL DEVICES 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 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 MICROPROCESSORS AND CIRCUITRY, USE STATIC DISCHARGE EQUIPMENT, SUCH AS ANTI-STATIC WRIST STRAPS, WHEN ACCESSING INTERNAL COMPONENTS.

5. REPLACE MALFUNCTIONING COMPONENTS ONLY WITH THOSE COMPONENTS BY THE MANUFACTURE; 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 DLQ-3000.
The instructions and procedures included herein are intended for the experience repair technician, and attention should be given to the precautions on the preceding page. The chapters are organized as follows:

CHAPTER 1. PRODUCT DESCRIPTION

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

CHAPTER 2. OPERATING PRINCIPLES

Describes the theory of printer operation.

CHAPTER 3. DISASSEMBLY AND ASSEMBLY

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

CHAPTER 4. ADJUSTMENT

Includes a step-by-step guide for adjustment.

CHAPTER 5. TROUBLESHOOTING

Provides Epson-approved techniques for adjustment.

CHAPTER 6. MAINTENANCE

Describes preventive maintenance techniques and lists lubricants and adhesives required to service the equipment.

APPENDIX

Describes connector pin assignments, circuit diagrams, circuit board component layout and exploded diagram.

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

REVISION SHEET

Revision	Issue Date	Revision Page
Rev. A	June 1,1994	1st issue
REV.B	November 22,1994	2nd issue

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CHAPTER 1 Product Description

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1.1 FEATURES

The DLQ-3000 is 24-pin serial dot-matrix and flat-bed type impact printer. The main features are:

- ❑ Optional color printing using the optional color ribbon (black, magenta, cyan, yellow).
- ❑ Use of ESC/P2 control codes
- ❑ Printing speed
  10 cpi LQ character: 120 cps
  10 cpi draft: 360 cps
  10 cpi High speed draft: 444 cps
- ❑ Copy capacity
  Up to 5 copies plus an original can be printed.
- ❑ High speed loading
  1.5 second to load a sheet from cut sheet feeder.
- ❑ No DIP-switches to set
- ❑ 14 international and legal character sets.
- ❑ 8 character tables (standard model)
  14 character tables (consolidated model)
- ❑ 4 scalable fonts, 9 bitmap LQ fonts and 2 draft fonts.

Figure 1-1 shows an exterior view of the DLQ-3000 and Table 1-1 lists the optional units available for the DLQ-3000.

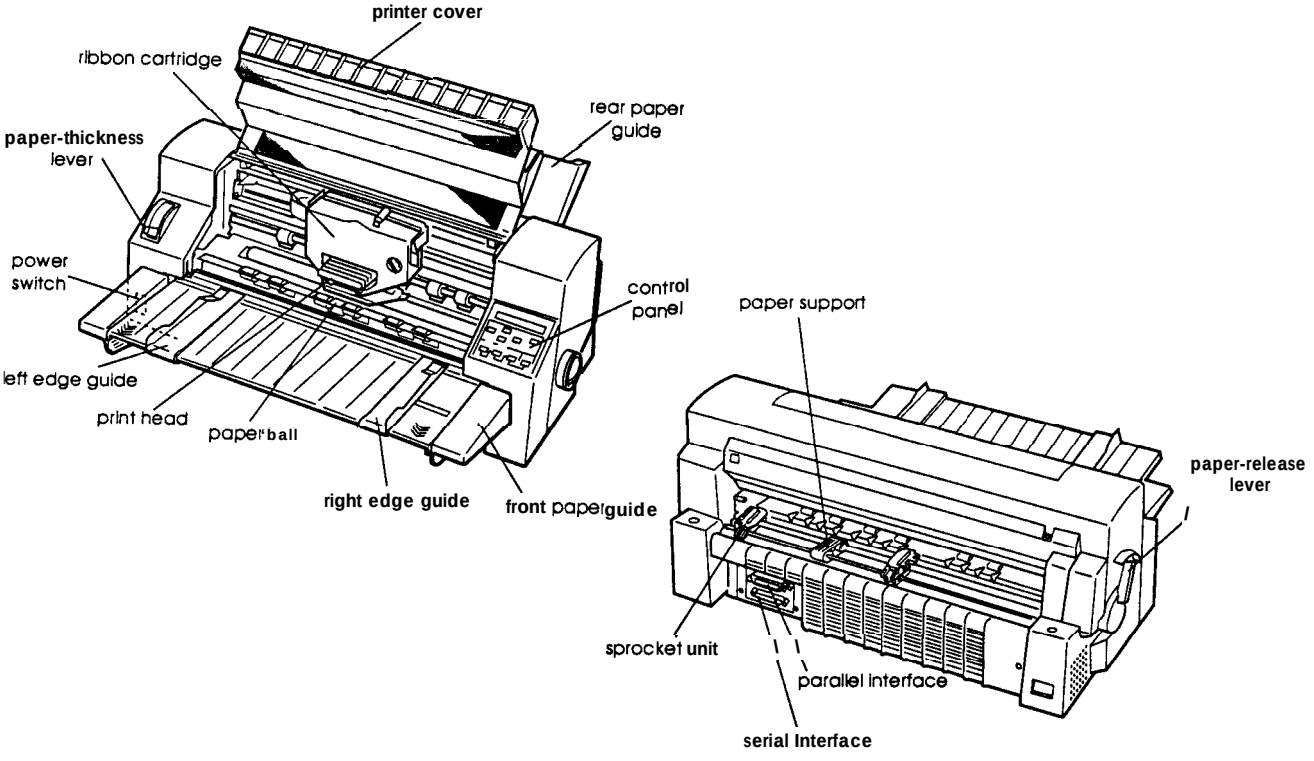


Figure 1-1. Exterior View of the DLQ-3000

Table 1-1. Optional Units

Model	Description
*C80630**	Cut Sheet Feeder
S01 5066	Ribbon Cartridge (Black)
S015067	Ribbon Cartridge (Color)
S015068	Film Ribbon Cartridge (Black)

*: The last digit vanes by country.

1.2 SPECIFICATIONS

This section provides detailed information about the DLQ-3000.

1.2.1 Hardware Specifications

Printing method: Serial impact dot matrix
Pin configuration: 24 wires
Pin diameter: 0.0079 inch (0.2 mm)

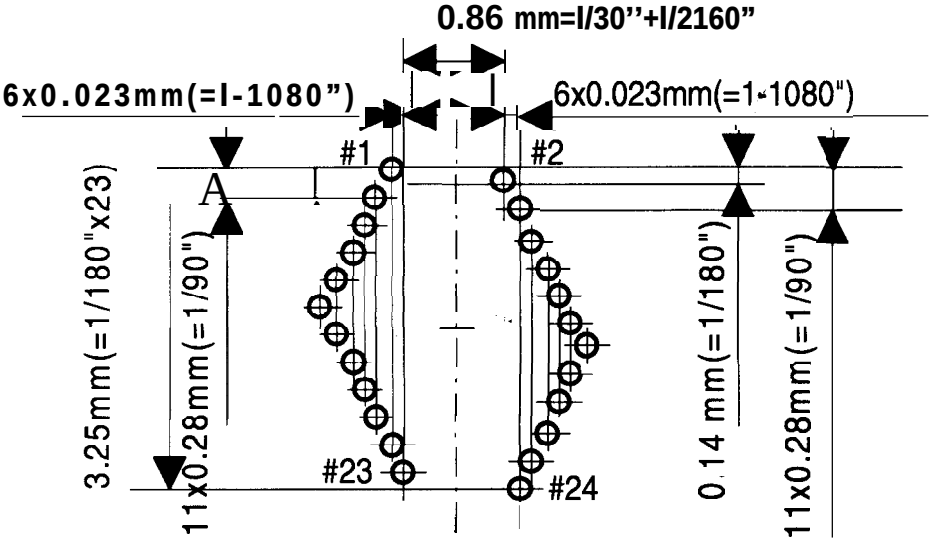


Figure 1-2. Pin Configuration

Print direction
Text: Bidirectional with logic seeking
Uni-directional mode can be selected by software.
Image: Bidirectional with logic seeking
Uni-directional mode can be selected by software and default setting.

1.2.1.1 Paper Handling Specifications

Feeding system:
1. Friction feed
- Set the release lever to FRICTION.
  During envelope printing, set it horizontally the longer side. During No.6 envelope printing, the left sheet edge guide must beat the marked position.

2. Tractor feed
- Set the release lever to TRACTOR.
  Do not perform reverse line feeds greater than 1/6 inch.
- Set left and right sheet edge guides on the front paper guide at both ends.

Feeding pitch: 1/360 inch (1/6 inch, 1/8 inch, or programmable in units as small as 1/360 inch)

Feeding speed
1/6 inch line feed: 42 ms
Continuous feed: 6 inches/see.

Paper path
Cut sheet (Single): Front and rear entry manual insertion, and optional CSF.
Cut sheet (Multi part): Rear entry manual insertion, and optional CSF.
Continuous paper: Rear entry push tractor feed with paper parking function.

The paper thickness lever must be set at the proper position as shown below.

Table 1-2. Paper Thickness Lever

Lever Position	Paper Thickness
0	0.06 mm -0.11 mm (0.0024 in. -0.0043 in.)
1	0.11 mm -0.15 mm (0.0043 in. -0.0059 in.)
2	0.15 mm -0.19 mm (0.0059 in. -0.0075 in.)
3	0.19 mm -0.25 mm (0.0075 in. - (0.0098 in.)
4	0.25 mm -0.31 mm (0.0098 in. -0.0122 in.)
5	0.31 mm -0.37 mm (0.0122 in. -0.0146 in.)
6	0.37 mm -0.42 mm (0.0146 in. -0.0165 in.)
7	0.42 mm -0.47 mm (0.0165 in. -0.0185 in.)
8	0.47 mm -0.51 mm (0.0185 in. -0.0201 in.)
9	0.51 mm -0.55 mm (0.0201 in. -0.0217 in.)

1.2.1.2 Paper Specifications

Table 1-3. Cut Sheet Paper (Single Sheet) Specifications

Width	92 mm -364 mm [3.6 in. -14.3 in.]
Length	92 mm -364 mm [3.6 in. -14.3 in.]
Thickness	0.065 mm -0.12 mm [0.0025 in. -0.0047 in.]
Weight	52.3 g/m^2 - 105 g/m^2 [14 lb. -27 lb.]
Quality	Standard and recycled paper (not curled, folded, or crumpled)

Table 1-4. Cut Sheet Paper (Multi-part) Specifications

Width	92 mm -364 mm [3.6 in. -14.3 in.]
Length	92 mm -364 mm [3.6 in. -14.3 in.]
Copies	1 original+ 5 copies (using fabric ribbon) 1 original only (using film ribbon)
Total thickness	0.12 mm -0.46 mm [0.0047 in. -0.018 in.]
Weight	40 g/m^2 -58 g/m^2 [12 lb. -15 lb.]
Quality	Carbonless multi-part paper (not curled, folded, or crumpled)

Table 1-5. Envelope Specifications

Size	NO.6 width 165 mm x length 92 mm [6.5 in. x 3.6 in.] No.1O width 241 mm x length 105 mm [9.5 in. x 4.1 in.]
Thickness	0.16 mm – 0.52 mm [0.0063 in. - 0.020 in.]
Weight	45 g/m^2 -91 g/m^2 [12 lb. -24 lb.]
Quality	Plain paper, bond paper, airmail paper (not curled, folded, or crumpled and no glue at flaps)

Notes: . Variations in envelope thickness must be less than 0.25 mm **(0.0098").**

. *When inserting envelopes, keep the longer side horizontal.*

Table 1-6. Continuous Paper (Single Sheet and Multi-part) Specifications

Width	101-406 mm [4 - 16 in.]
Single sheet length	101- 559 mm [4 - 22 in.]
Copies	1 original+ 5 copies (using fabric ribbon) 1 original only (using film ribbon)
Total thickness	0.065 mm - 0.46 mm [0.0025 in. - 0.018 in.]
Single sheet weights	52.3 g/m^2 - 105 g/m^2 [14 lb. - 27 lb.]
Multi-part weights	40 g/m^2 - 58 g/m^2 [12 lb. - 15 lb.]
Quality	Standard paper, recycled paper, carbonless multi-pad paper

Table 1-7. Continuous Paper with Labels Specifications

Label size (W x L)	63.5 mm (min.) x 23.8 mm (min.) [2.5 in. (min.) x 15/16 in. (min.)]
Width of base paper	101 mm- 406 mm [4 in. x 16 in.]
Length of base paper	101 mm - 559 mm [4 in. x 22 in.]
Thickness of base paper	0.07 mm - 0.09 mm [0.0028 in. - 0.0035 in.]
Total thickness	0.16 mm - 0.19 mm [0.0063 in. - 0.0075 in.]
Weight	68g/m2[17 lb.]
Quality	Plain paper

Notes:
- *Labels must be continuous paper.*
- *Examples of labels - AVERY CONTINUOUS FORM LABELS*
  - AVERY MINI-LINE LABELS

Printable area: See Figures 1-3 and 1-4.

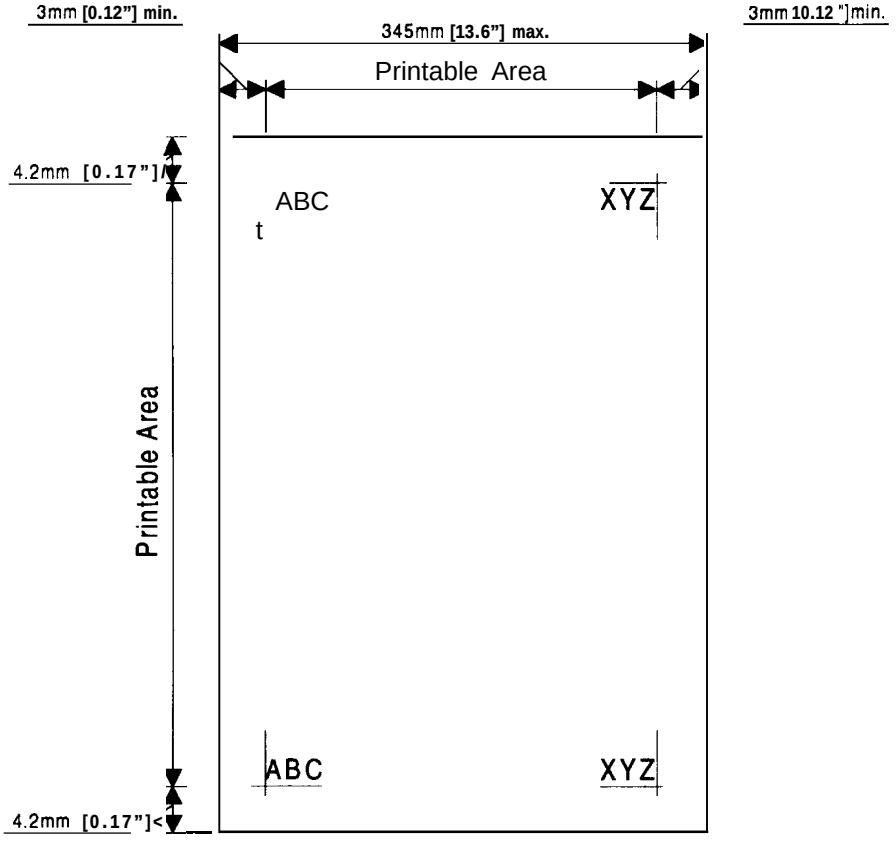


Figure 1-3. Printable Area for Cut Sheet

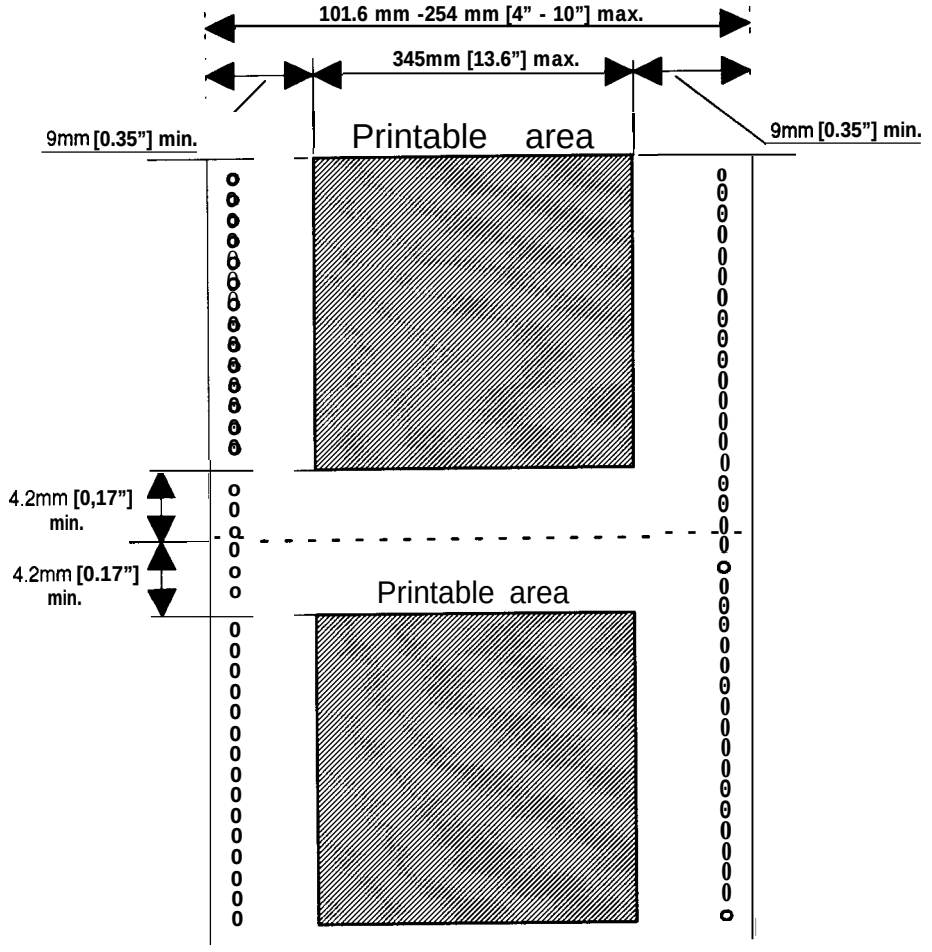


Figure 1-4. Printable Area for Continuous Paper

1.2.1.3 Ribbon Cartridge Specifications

● Ribbon cartridge (black): No. S015066

- Life: 6 million characters at 48 dots/1 character
- Cartridge dimensions: 153 mm (W) x 105 mm (D) x 33 mm (H) (6.0 in. x 4.1 in. x 1.3 in.)
- Cartridge weight: 117 g (0.26 lb.)

Note: Ribbon cartridges are not reusable.

● Ribbon cartridge (color): No. S015067

- Life:
  Black: 1.4 million characters at 48 dots/character
  Cyan: 1.0 million characters at 48 dots/character
  Magenta: 1.0 million characters at 48 dots/character
  Yellow: 0.7 million characters at 48 dots/character
- Cartridge dimensions: 153 mm (W) x 105 mm (D) x 33 mm (H) (6.0 in. x 4.1 in. x 1.3 in.)
- Cartridge weight: 117 g (0.26 lb.)

Note: Ribbon cartridges are not reusable.

● Film ribbon cartridge (black): No. S015068

- Life: 0.1 million 10 cpi characters at LQ mode
- Cartridge dimensions: 153 mm (W) x 119 mm (D) x 33 mm (H) (6.0 in. x 4.7 in. x 1.3 in.)
- Cartridge weight: 109 g (0.24 lb.)

1.2.1.4 Electrical Specifications

Table 1-8. Electrical Specifications

Description	120 V Version	230 V Version
Rated voltage	120 VAC	220-240 VAC
Input voltage range	103.5-132 VAC	198-264 VAC
Rated frequency range	50- 60 Hz	
Input frequency range	49.5- 60.5 Hz	
Rated current	7A	4A
Power consumption	Approx. 105W (self-test in 10 cpi draft)	
Dielectric strength	1000 VAC rms for 1 minute or 1200 VAC rms for 1 second (between AC line and chassis)	1500 VAC rms for 1 minute (between AC line and chassis, 500 VDC)

1.2.1.5 Environmental Conditions

Operating

- **Temperature:** **5to35'C (41 to 95 "F)**
- **Humidity:** **10 to** 80% RH without condensation

Operating (using the optional film ribbon)

- Temperature: 15to35'C (59 to 95 'F)
- Humidity: 10 to 80% RH without condensation

Operating (during printing of envelopes or labels)

- Temperature: 15to25"C (59 to 77 "F)
- Humidity: 20 to 60% RH without condensation

Storage

- Temperature: -20 to60'C (-4 to 140 'F)
- Humidity: 5 to 85% RH without condensation

Storage (when the optional film ribbon is installed)

- Temperature: -20 to40'C (-4 to 104 'F)
- Humidity: 5 to 85% RH without condensation

1.2.1.6 Reliability

MTBF: 8000 Power On Hours (25% duty)

Printhead life: 200 million strokes / wire

1.2.1.7 Safety Approvals

Safety standards:	U.S version:	UL1950 with D3, CSA22.2 #950 with D3
	European version:	EN 60950 (TÜV) IEC950 (SEMKO, DEMKO, NEMKO, SETI)
RFI:	U.S. version:	FCC part 15 subpart B class B
	European version:	Vfg.243 (VDE0878 part 3, part 30) EN55022 (CISPR PUB. 22) class B

1.2.1.8 Physical Specifications

Dimensions (W x D x H): 670 mm x 509 mm x 285 mm (26.4 in. x 20.0 in. x 11.2 in.)
Weight: 15.0 Kg (33.1 lb.)

Dimensions (W x D x H): 670 mm x 559 mm x 445 mm (26.3 in. x 22.0 in. x 17.5 in.)
(Including CSF)
Weight: 16.8 Kg (37.0 lb.)

1.2.2 Firmware Specifications

Control code:	ESC/P2	
Character sets:	Legal and 14 international character sets	
Standard model:	Italic table PC437 (US.) PC850 (Multilingual) PC860 (Portuguese) PC863 (Canadian-French) PC865 (Nordic) BRASCII (Brazilian Portuguese) Abicomp (Brazilian Portuguese)	
Consolidated model:	PC437 Greek (Greek) PC852 (East Europe) PC853 (Turkish) PC855 (Cyrillic) PC857 (Turkish) PC866 (Russian) PC869 (Greek) PC861 (Iceland) ISO Latin IT (Turkish) ISO 8859-7 (Latin/Greek) MAZOWIA (Polish) Code MJK (Czech) Bulgaria (Bulgarian) PC864 (Arabic)	
Bitmap fonts:	EPSON Roman EPSON Sans serif EPSON Courier EPSON Prestige EPSON Script EPSON Script C EPSON OCR B EPSON Orator EPSON Orator S EPSON Draft EPSON High Speed Draft	
Scalable fonts:	EPSON Roman EPSON Serif EPSON Roman T EPSON Saris Serif H	8-32 points (in units of 2 points) 8-32 points (in units of 2 points) 8-32 points (in units of 2 points) 8-32 points (in units of 2 points)
Print mode:	Double-width Double-height Condensed Bold Double-strike Underline (single, double, single-broken, double-broken line) Overscore (single, double, single-broken, double-broken line) Strike through (single, double, single-broken, double-broken line) Italics Super/subscript Outline Shadow	
Resolution:	See Table 1-9.	
Printing speed:	See Table 1-10.	
Printable columns:	See Table 1-10.	
Input data buffer:	128K byte	

Table 1-9. Resolution

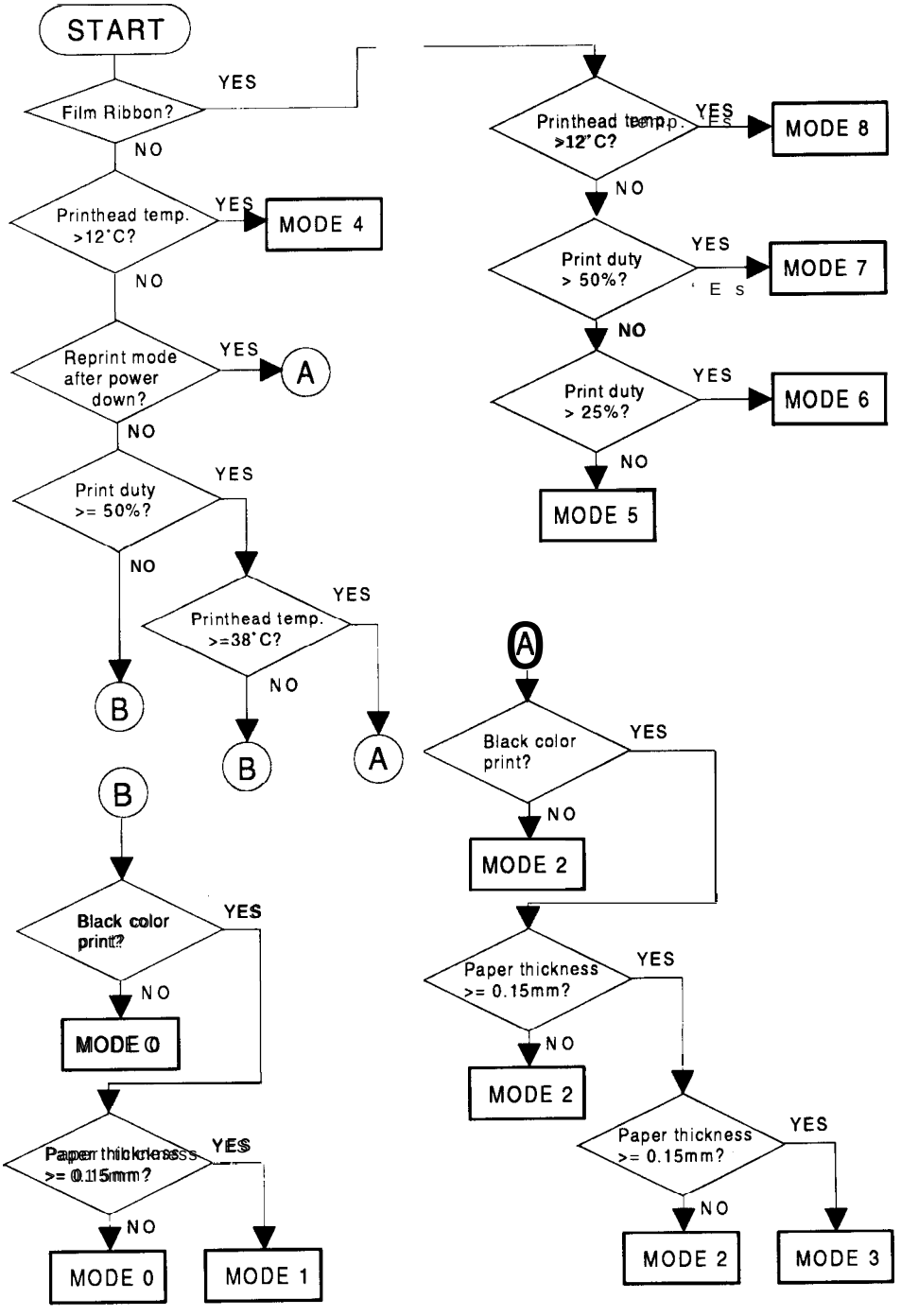
Printing Mode	Horizontal Density	Vertical Density	Adjacent Dot Print
High speed draft	90 dpi	180 dpi	No
Draft	120 dpi	180 dpi	No
Draft condensed	240 dpi	180 dpi	No
LQ	360 dpi	180 dpi	No
8-pin bit image	60,80,90 or 120 dpi	60 dpi	Yes
	120 or 240 dpi	60 dpi	No
24-pin bit image	60,90,120 or 180 dpi	180 dpi	Yes
	360 dpi	180 dpi	No
Raster graphics	180 or 360 dpi	180 or 360 dpi (*)	Yes

* When a color ribbon is installed, the printer cannot print 360 dpi vertically for raster graphics. In this case, the printer changes the vertical density.

Table 1-10. Printing Speed

Print Mode	Character Size	Maximum Printing Spsed (cps)								
		Mode 0	Mode 1	Mode 2	Mode 3	Mode 4	Mode 5	Mode 6	Mode 7	Mode 8
High speed draft	10 cpi	444	444	160	160	240	120	80	80	60
Draft	10 cpi	360	333	240	120	180	120	80	80	60
	12 cpi	432	400	288	144	216	144	96	96	72
	15 cpi	540	500	360	180	270	180	120	120	90
Draft condensed	17 cpi	308	285	205	103	154	205	137	137	103
	20 cpi	360	333	240	120	180	240	160	160	120
LQ	10 cpi	120	111	80	40	60	120	80	40	60
	12 cpi	144	133	96	48	72	144	96	48	72
	15 cpi	180	167	120	60	90	180	120	60	90
LQ condensed	17 cpi	205	190	137	68	103	205	137	68	103
	20 cpi	240	222	160	80	120	240	160	80	120
Raster (360dpi)	10 cpi	20	20	20	20	20	20	20	20	20

These modes are selected by several conditions as follows flowchart;



1.3 INTERFACE OVERVIEW

The printer provides an 8-bit parallel interface and serial interface as standard. Moreover, it is possible to interface to various computers using the optional type-B interface board. This section describes the specifications of the standard interfaces.

1.3.1 Parallel Interface Specifications

Data format:	8-bit parallel, IEEE-1284 compatibility mode
Synchronization:	By $\overline{\text{STROBE}}$ pulse
Handshaking:	By BUSY and $\overline{\text{ACKNLG}}$ signal
Signal level:	TTL-compatible level, IEEE-P1284 level 1 device
Adaptable connector:	57-30360 (Amphenol) or equivalent
Data transmission timing:	See Figure 1-5.

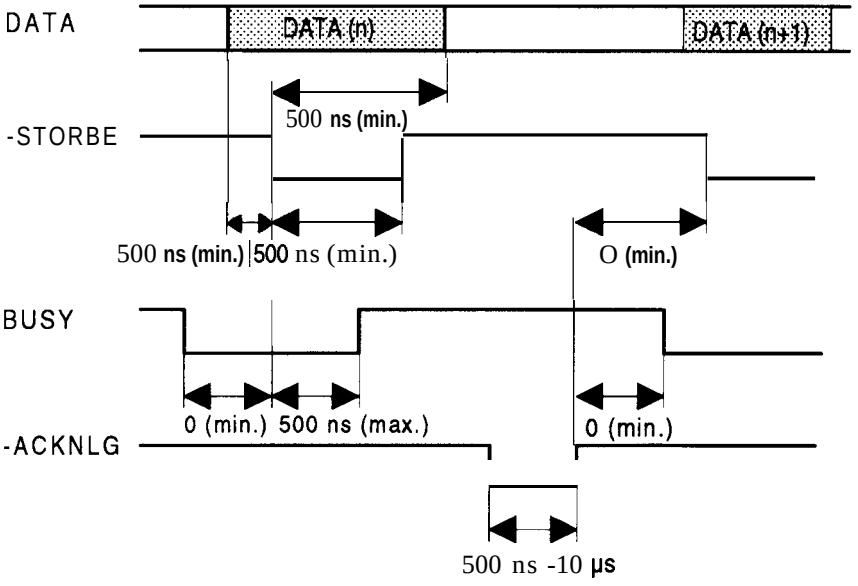


Figure 1-5. Data Transmission Timing

Note: Transition time (rise time and fall time) of every input signal must be less than 200 ns and every output signal must be less than 120ns.

The BUSY signal is at a HIGH level before either -ERROR signal is at a LOW level or the PE signal is at a HIGH level until all these signals return to their inactive state. The BUSY signal is at a HIGH level in the following cases:

During data reception (see the figure above)
When the input buffer is full
When the INIT input signal is active
During initialization
When the ERROR signal is active
In the self-test mode
In the SelecType
When the parallel interface is not selected.

The $\overline{\text{ERROR}}$ signal is at a LOW level when the printer is in one of the following conditions:

Printer hardware error (fatal error)
A paper-out error
Release lever operation error

PE signal is at a HIGH level during paper out error.

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

Table 1-11. Signal and Connector Pin Assignments for Parallel Interface

Pin No.	Signal Name	Return GND Pin	I/O	Description
1	$\overline{\text{STROBE}}$	19	In	Strobe pulse. Input data is latched at the falling edge of this signal.
2-9	DATA1-8	20-27	In	Parallel input data to the printer. Active-HIGH input. LSB: DATA1 MSB: DATA8
10	$\overline{\text{ACKNLG}}$	28	Out	Indicates that data has been received and the printer is ready to accept more data.
11	BUSY	29	Out	A HIGH level means the printer cannot accept further data.
12	PE	30	Out	A HIGH level means a paper-out error. Always the logical opposite of the ERROR signal.
13	SLCT		Out	Always at a HIGH level (pulled up to +5 V through a 1 K-ohm resistor).
14	$\overline{\text{AFXT}}$		In	Auto feed execution means that a line feed is automatically performed upon input of a CR code. Checked when the printer is initialized. Active-LOW signal.
31	INIT	16	In	Initialize printer. Minimum 50 µs pulse is necessary. Active-LOW signal.
32	$\overline{\text{ERROR}}$		out	A LOW level means that an error has occurred.
36	SLIN	30	In	Not used.
18,35	Logic H		out	Pulled up to +5V and shorted to +5V via Schottky diode, making these signals appear low to the host when the printer is turned off.
17	Chassis GND	-	-	Chassis GND
16,19-30, 33	GND			Signal GND
15,34	NC			Not used. Not connected.

Note: /n/Out refers to the direction of signal flow as viewed from the printer.

1.3.2 Serial Interface Specifications

Data format: RS-232C serial
Synchronization: Asynchronous
Handshaking By DTR (REV) signal or X-ON / OFF protocol

Table 1-12. Serial Interface Handshaking

DTR Signal	X-ON/X-OFF Protocol	Description
MARK	X-OFF (DC3/13H)	When the number of bytes remaining in the input buffer reaches 256 or less, the signal level goes to MARK and X-OFF code is sent to the host computer. This indicates that the printer is not ready to receive data.
SPACE	X-ON (DC1/1 IH)	When the number of bytes remaining in the input buffer reaches 512 or less, the signal level goes to SPACE and X-ON code is sent to the host computer. This indicates that the printer is ready to receive data.

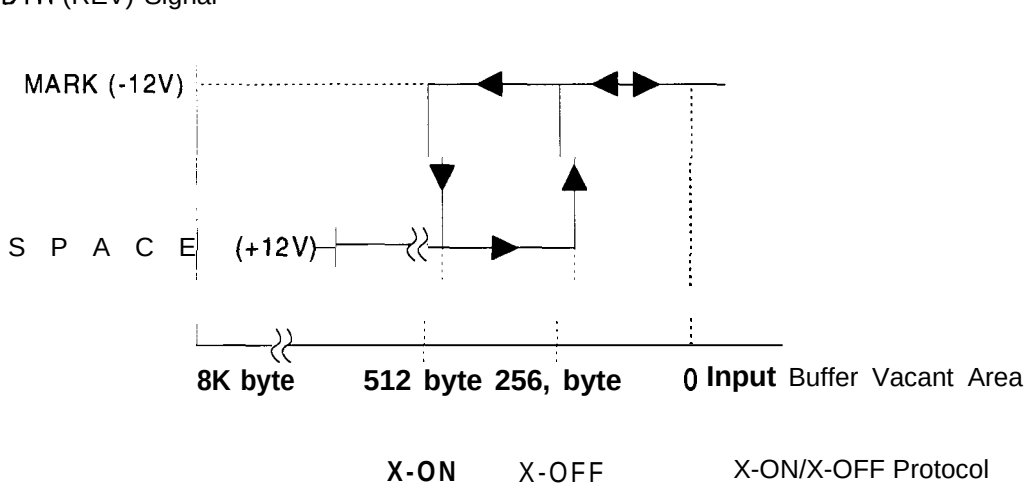


Figure 1-6. Handshaking for RS-232C Interface

Word length
- Start bit: 1 bit
- Data bit: 8 bits
- Parity bit: Odd, Even, or None
- Stop bit: 1 bit or more

Bit rate: 300, 600, 1200, 2400, 4800,9600,19,200 bps

Logic level: EIA-232D MARK (logical 1): -3V to -25V
SPACE (logical 1): +3V to +25V

Error handling: When parity error is detected, the received byte is changed to the "*" character cede. Overrun error and framing error are ignored.

Connector: 25 pin subminiature D-shell connector (female) or equivalent

Data transmission timing: See Figure 1-7.

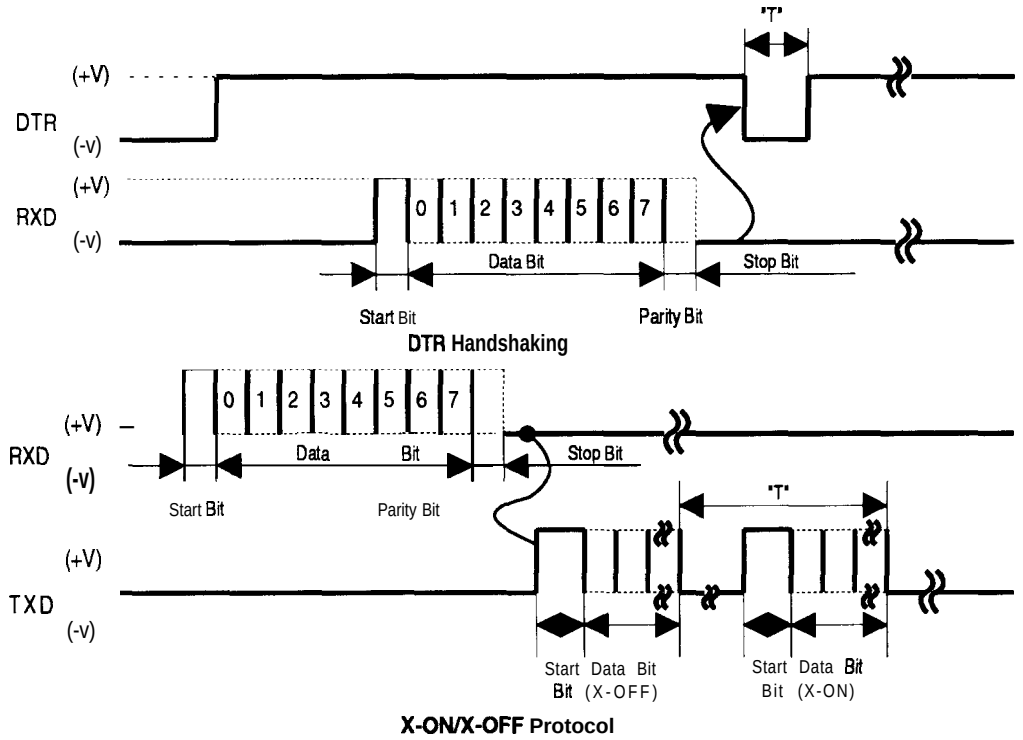


Figure 1-7. Serial Data Transmission Timing

Notes: The value of "T" varies according to the input data.
The word structure of serial data is 1 start bit + 8 data bits + parity (Odd, Even, or none) + 1 or more stop bits.

Table 1-13 shows the connector pin assignments and signal functions for the RS-232C serial interface.

Table 1-13. Signal and Connector Pin Assignments for Serial Interface

Pin No.	Signal Name	I/O	Description
2	TXD	out	Transmit data.
20	DTR	Out	Indicates that the printer is ready to receive data or not.
11	REV	out	Connected directly to the DTR signal.
3	RXD	In	Receive data.
7	SIGNAL GND	-	Signal ground level.
1	CHASSIS GND	-	Chassis GND.
Other	NC		Not used. Not connected.

Note: /n/Out refers to the direction of signal flow as viewed from the printer.

1.3.3 Optional Interface

Type-B and Type level 2 optional interfaces are available except for C82305 and C82306 serial interface.

1.3.4 Interface Selection

The printer has 3 interfaces; the parallel interface, serial interface and optional interface. These interfaces are selected manually by SelecType or selected automatically.

● Manual selection

One of 3 interfaces can be selected by SelecType.

● Automatic selection

The automatic interface selection is enabled by SelecType. In this automatic interface selection mode, the printer is initialized to the idle state scanning in which interface receives data when it is powered on. The interface that receives data first is selected. When the host stops data transfer, the printer is returned to idle state. As long as the host sends data to the printer interface is busy state, the selected interface is let as it is.

● Interface state and interface selection

When the parallel interface is not selected, the interface is in a BUSY state. When the serial interface is not selected, the interface sends XOFF and sets the DTR signal MARK. When the optional interface is not selected, the printer sends disable commands to the optional interface. When the printer is initialized or returned to the idle state, the parallel interface is in a READY state, the serial interface sends XON and sets the DTR SPACE and the printer sends enable commands to the optional interface. Notice that the interrupt signal such as a -INIT signal on the parallel interface is not effective while that interface is not selected.

1.3.5 Prevention Host from Data Transfer Timeout

Hosts abandons data transfer to peripherals when a peripheral is in BUSY state for dozens of seconds continuously. To prevent hosts from this kind of timeout, the printer receives data very slowly, several bytes per minute, even if the printer is in BUSY state. This slowdown is started when the rest of the input buffer becomes several hundreds of bytes. At last, when the input buffer is full, the printer is continuously in BUSY state.

1.4 OPERATING INSTRUCTIONS

This section describes the control panel operation functions, self-test, hexadecimal dump, and printer initialization methods, etc.

1.4.1 Control Panel Operation

On the control panel, there are five non-locking switches, four LEDs, and a 16-column liquid crystal display (LCD) as shown in Figure 1-8.

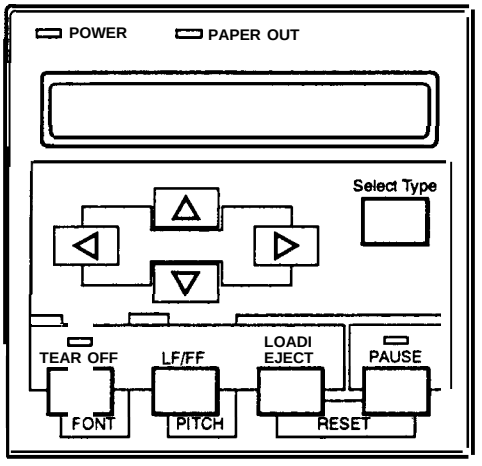


Figure 1-8. Panel Apperance

Indicator Lights

- POWER (Green): Lights when turning on the printer.
- PAPER OUT (Red): Lights when the printer is out of paper
- TEAR OFF (Orange): Lights when the printer is in TEAR OFF mode.
- PAUSE (Orange): Lights when the printer is in PAUSE mode.

Buttons

- SelecType: Enters SelecType Level 1 and 2.
- TEAR-OFF: The printer has 2 types of tear-off functions; manual tear-off and auto tear-off. The manual tear-off is performed by pressing the TEAR-OFF button. Auto-tear off is enabled by SelecType.
- LOAD / EJECT: When you press this button, the printer either loads new paper into the printer or ejects paper currently in the printer paper path.
- PAUSE: Press the PAUSE button during printing to stop printing and press the button to restart printing when the printer is paused. Even if the printer is paused, the printer interface does not stop receiving data until the input buffer is full.
- LF/FF: See Table 1-14.
- RESET: Press the PAUSE and LOAD / EJECT buttons at the same time to initialize the printer.
- FONT: When you press this button, the printer select a font from among the built-in fonts after enters SelecType mode.
- PITCH: When you press this button, the printer select a character per inch after enters SelecType mode.

Table 1-14. Paper Feeding Functions

Operations	Tractor Feed		Friction Feed	
	Not Paper Out	Paper Out State	Not Paper Out	Paper Out State
Press LF/FF shortly	Line feed (*1)	Load continuous paper	Line feed	Load a sheet (*2)
Press LF/FF for a few seconds	Form feed (*1)	Load continuous paper	Form feed	Load a sheet (*2)
Press LOAD/EJECT	Paper park (*1)	Load continuous paper	Eject	Load a sheet (*2)
Press ↓ button	Micro feed (forward) (*3)	-	Micro feed (forward)	—
Press ↑ button	Micro feed (backward) (*3)	-	Micro feed (backward)	-
Insert a sheet to the manual insertion slot	—	—	—	Load inserted sheet (*2)

(*l): **When the printer** is in tear-off state, these functions are performed after returning from the tear-off position.

('2): If a manually inserted sheet is once loaded, the printer enters manual insertion mode. After that, even if data remains in the buffer, the printer goes into paper out error state at the end of every a sheet and waits for inserting the next sheet. CSF is enabled again by CSF sheets loading operation or by initialization.

(*3): When the printer is in tear-off state, the micro feed function is used for adjusting the tear-off position. This adjusted position is saved into a non-volatile memory.

1.4.2 Printer State and LCD/LED Indication

The table below shows the LCD messages and LED conditions that indicate the printer states except for SelecType. When the printer gets into more than one state, the printer indicates the highest priority state.

Table 1-15. Printer State and LCD/LED Indication

Priority	Printer State	LCD Message	PE LED	PAUSE LED	TEAR OFI LED
13	Stand-by	Ready	off	off	off
12	Hex dump mode	Hex Dump	off	off	off
11	Ordinary printing	Printing	off	off	off
11	Test printing	Test printing	off	off	off
11	Setting printing	Setting Printing	off	off	off
10	Pause	Pause	off	On	off
9	Data is in buffer but the printer is paused	Data in Buffer	off	Blinking	off
8	Tear-off	Cut the Paper	off	On/Off (*1)	On
7	The entry to SelecType 1	SelecType 1	off	off	off
7	The entry to SelecType 2	SelecType 2	off	off	off
6	Print head is overheated	Please wait	off	On/Off(*1)	or-t/o ff(*1)
5	Paper out error (*2)	Paper Out	On	On	On/Off(*1]
4	Release lever operation error (*3)	Put Lever Back	Blinking	On	On/Off(*1)
3	Cover open error	Cover Open	On/Off(*1)	O n	On/Off(*1)
2	Program reload mode	Program Mode	off	off	off
1	Fatal error (*4)	Please Turn Off	Blinking	On	off

(*1): Depends on the previous printer state is pause state or not.

(*2): Paper-out error occurs in the following conditions:
Paper is not loaded after loading is attempted.
The full sheet finishes printing after loading single sheets by manual insertion.
The end of continuous paper is reached.

(*3): Occurs when the friction lever is not at the proper position. (i.e. The lever is set up at the friction position even if continuous paper is loaded.)

(*4): Fatal error occurs in the following conditions:
Voltage of power supply is abnormal.
The print head temperature is abnormal.
- Carriage cannot move correctly.
Error occurs during executing EEPROM control commands or program reload mode.
The printer control circuit does not work correctly.

1.4.3 Self-test

This section explains how to run the self-test.

(1) Hold down the LF/FF button and turn on the printer to start the self-test.
(2) If paper is not loaded, the printer attempts to load paper.
(3) If the printer cannot load the paper, it will indicate paper out. In this case, insert paper again and press the LOAD/EJECT button.
(4) Alphanumeric characters are printed continuously.
(5) Press the PAUSE button and turn off the printer to quit self-test.

1.4.4 Hexadecimal Dump Function

The hexadecimal dump is a useful tool in troubleshooting data control problems. This section describes how to run the hex dump.

(1) Hold down the LF/FF and LOAD/EJECT buttons at the same time and turn on the printer to enter hex dump mode.
(2) If paper is not loaded, the printer attempts to load paper.
(3) If the printer cannot load the paper, it will indicate paper out. In this case, insert paper again and press the LOAD/EJECT button.
(4) First, the following message is printed in the language selected in the default-setting mode.

Hex Dump:	When English, French, or German is selected.
Dump esadecimale:	When Italian is selected.
Volcado hex:	When Spanish is selected.

(5) The printer is ready to receive data.
(6) The received data is printed as both hexadecimal codes and ASCII characters. If a corresponding printable character does not exit, the printer outputs a period (.).
(7) Press the LF/FF button to print remaining data in data buffer. Then turn off the printer to quit hex dump mode.

Note: In hex dump mode, the character table depends on the default setting, and 10 cpi draft is selected automatically.

1.4.5 Setting Print

(1) Hold down the SelecType button and turn on the printer to enter the setting print.
(2) If paper is not loaded, the printer attempts to load paper.
(3) If the printer cannot load the paper, it will indicate paper out. In this case, insert paper again and press the LOAD/EJECT button.
(4) First, the firmware version is printed. Then the user changeable printer default is printed in the language selected.
(5) When the printer finishes the setting printing, the Printhead sheet is ejected or if it is continuous paper, the printer feeds the sheet to the tear-off position. Then the printer enter the ordinary stand-by mode.
(6) All interfaces keep a busy state during the setting printing.

1.4.6 SelecType Function

The DLQ-3000 is equipped with a SelecType function to change default settings.

1.4.6.1 SelecType Phase Transitions

The figure below shows the SelecType phase transitions.

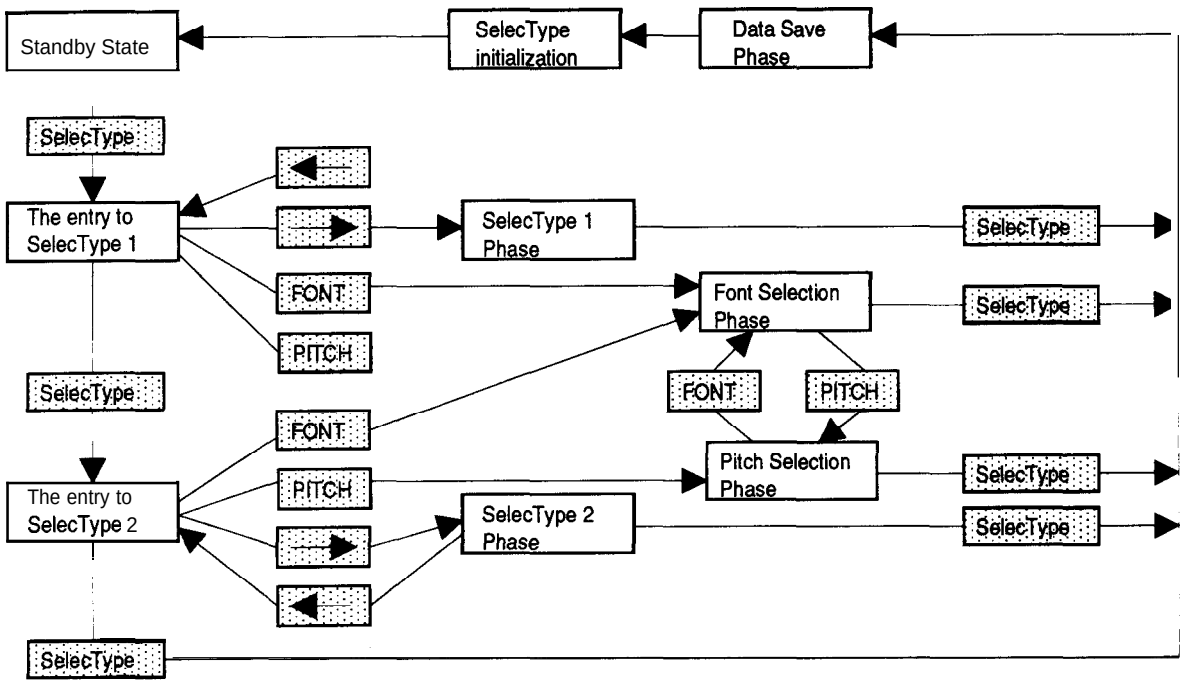


Figure 1-9. SelecType Phase Transitions

1.4.6.2 SelecType 1 and 2 Operations

(1) When the SelecType 1 or 2 phase starts, the first feature is displayed. The feature is changed by pressing the ↓ (next) and ↑ (previous) button. When the desired feature is displayed on the LED, press the → (enter) button to display the option.

(2) After choosing a feature by pressing the → (enter) button, the current selected option is displayed with "*". If it is not necessary to change the displayed option, press the ← (escape) button to return to the feature menu.

(3) When an option is displayed, press the ↓ (next) and ↑ (previous) button, so that options that are available for the selected feature are displayed. Choose the desired option and press the →(enter) button to select that option. When the "Other" option is selected, another option menu appears. In this case, choose the desired option and press the → (enter) button again to select it.

(4) Press the ← (escape) button to return to the previous menu. By pressing the+ (escape) button several times it is possible to return to the SelecType 1 or 2 entry state.

(5) Press the SelecType button to exit from every SelecType phase. By pressing the SelecType button, the settings are saved into a non-volatile memory if there are any. After that, the SelecType initialization is performed automatically and the printer is returned to the stand-by state. The user's settings are effective at once and remain in effect until they are changed again.

(6) Choose the "Standard Setting" in SelecType 2 feature menu. Select it by pressing the → (enter) button. The message "Really?" is displayed. If yes, then press the → (enter) button to execute, if no, press the ← (escape) button to return to the feature menu. When the → (enter) button is pressed, all the settings are reset to the standard settings and then the printer is returned to the feature menu. After that, exit SelecType by pressing the SelecType button.

1.4.6.3 Font and Pitch Selection Operations

(1) When the font or pitch selection phase starts, the currently selected default font or default pitch is displayed with "*".

(2) Press the ↓ (next) and ↑ (previous) button to the desired font or pitch, and press the+ (enter) button to select it. Then the selected font or pitch is displayed with "*".

(3) Press the SelecType button to exit from the font or pitch selection phase. By pressing the SelecType button, the settings are saved into a non-volatile memory if there are any. After that, the SelecType initialization is performed automatically and the printer is returned to the stand-by state. The user's settings are effective at once and remain in effect until they are changed again.

1.4.7 Program Reload Mode

The printer has a 128K byte Flash-EEPROM as a printer control software storage and a boot-strap program in a Mask-ROM. This Flash-EEPROM can electrically erase all the data in itself at once and reprogram. Using this program reload mode, the printer control software can be changed completely. The new software file can be transmitted to the printer through the built-in parallel interface with the IPL (Initial Program Loader) file. At first, the built-in bootstrap program loads the IPL file in the printer's RAM then jumps to the IPL start address. After that, the IPL program can control the printer. The IPL program loads the new printer control software file and reprograms the Flash-EEPROM. Finally, the IPL program jumps to the new software start address in the reprogrammed Flash-EEPROM.

1.4.7.1 Reprogramming Operation

(1) Turn on the printer while the TEAR-OFF, LF/FF, LOAD / EJECT and PAUSE buttons are depressed.

(2) Transmit the IPL file through the built-in parallel interface. If the IPL ID code is not correct, the printer enter a fatal error state. The printer is also in a fatal error state when a sum error occurs during IPL file transfer. The IPL file must be Intel-hex format.

(3) Transmit the new printer software file to the printer. At this time, the printer is controlled by the IPL program.

1.4.7.2 Bootstrap

The figure below shows a bootstrap program flow.

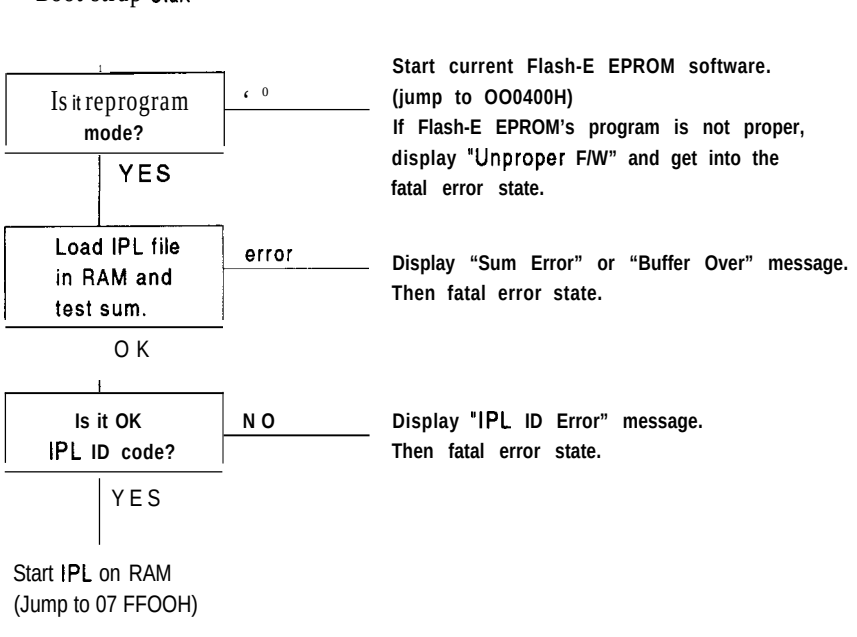


Figure 1-10. Bootstrap Program Flow

1.4.8 Printer Status and Buzzer

The DLQ-3000 is equipped with a buzzer on the control board. The buzzer sounds as follows:

Paper out error: ...
Release lever operation error: -----
Fatal error: -----
Illegal operation in SelecType: .

Note: (.):beeper sounds for 100 ms and interval between beeps is 100 ms.
(-):beeper sounds for 500 ms and interval between beeps is 100 ms.

1.4.9 Printer Initialization

There are 4 initialization methods: power-on, hardware, software, and SelecType initialization.

1.4.9.1 Power-on Initialization

Power-on initialization is performed by turning the printer on. When the power-on initialization is performed:

The printer mechanism is initialized.
The interface selection is initialized to the idle state when the automatic interface selection is enabled or is initialized to the default interface when that function is disabled.
The parallel interface AFXT signal level is sensed.
All the printer settings are initialized to default.
All the printing data is cleared.
The download character definitions are cleared.
The printer is set to the standby condition, if a fatal error does not occur.

1.4.9.2 Hardware Initialization

The hardware initialization is performed by

The falling edge of a negative pulse when the parallel interface is selected or in automatic interface selection idle state.
Hardware initialization request command that is sent to the printer from the optional interface is selected or the automatic interface selection idle state is selected.

When the hardware initialization is performed:

All the printing data is cleared.
The download character definition is cleared.
The printer settings are changed to default.
The printer is set to the stand-by condition, if a fatal error does not occur.

1.4.9.3 Software Initialization

Software initialization is performed upon receipt of the control code ESC @. When the software initialization is performed:

Data to be printed on the same line as ESC @ that is not yet printed is cleared.
Printer settings are changed to the default settings, except that the download character set is not cleared.

1.4.9.4 SelecType Initialization

When SelecType is terminated, initialization is also performed. When this initialization is performed:

All the printer settings are changed to default but the download character definition is not cleared.
The printer is set to the stand-by state.

1.4.10 Default Settings

When users change, they can be refer to the default setting at the time of initialization of this printer. These standard settings are shown below.

Table 1-16. Initialize Default Settings

Font		Roman
Pitch		10 cpi
Character Table		PC 437
Page Length	Tractor CSF	11 inch A4
Line Spacing		1/6 inch
Top Margin	Tractor Manual Insertion CSF	0.33 inch (8.5 mm) 0.33 inch (8.5 mm) 0.33 inch (8.5 mm)
Bottom Margin	Tractor	0.00 inch (0.0 mm)
Left Margin		O column
Right Margin		136 column
Graphic Print Direction		I Bi-directional
Message Language		English
Software		ESC/P2
Interface		Auto Selection
Interface Auto Selection Timeout		10 sec.
Input Buffer		On
Serial Interface Baud Rate Parity		19,200 bps None
Auto Tear-off		off
Auto LF		off
Auto CR		off
AGM		off
Copy Mode		copy 1

CHAPTER 2 Operating Principles

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2.1 PRINTER MECHANISM OPERATION

This section describes the M-5L60 printer mechanism and explains how it works.

2.1.1 Printing Mechanism

The printer mechanism is composed of the Printhead, ink ribbon, and ribbon mask. The Printhead is a 24-pin head employing impact dot printing. 24 dot wires are aligned in a 12 x 2 diamond layout inside the Printhead. Each wire has its own drive coil.

1) A drive signal is transmitted from the control circuit to the Printhead drive circuit. It is converted to the proper Printhead driving voltage, which energizes a corresponding coil. The energized coil then causes the iron core to become magnetized.
2) The magnetic force draws the actuating plate toward the core and the dot wire, which is connected to the core, and rushes toward the platen.
3) When the dot wire cause impact to the platen, pressing against the ribbon and paper, it prints a dot.
4) When the coil energizing is terminated, the magnetic force from the iron core vanishes. The actuating plate returns to its original position (the position before coil energizing), acting as a spring. The dot wire also returns to its original position.

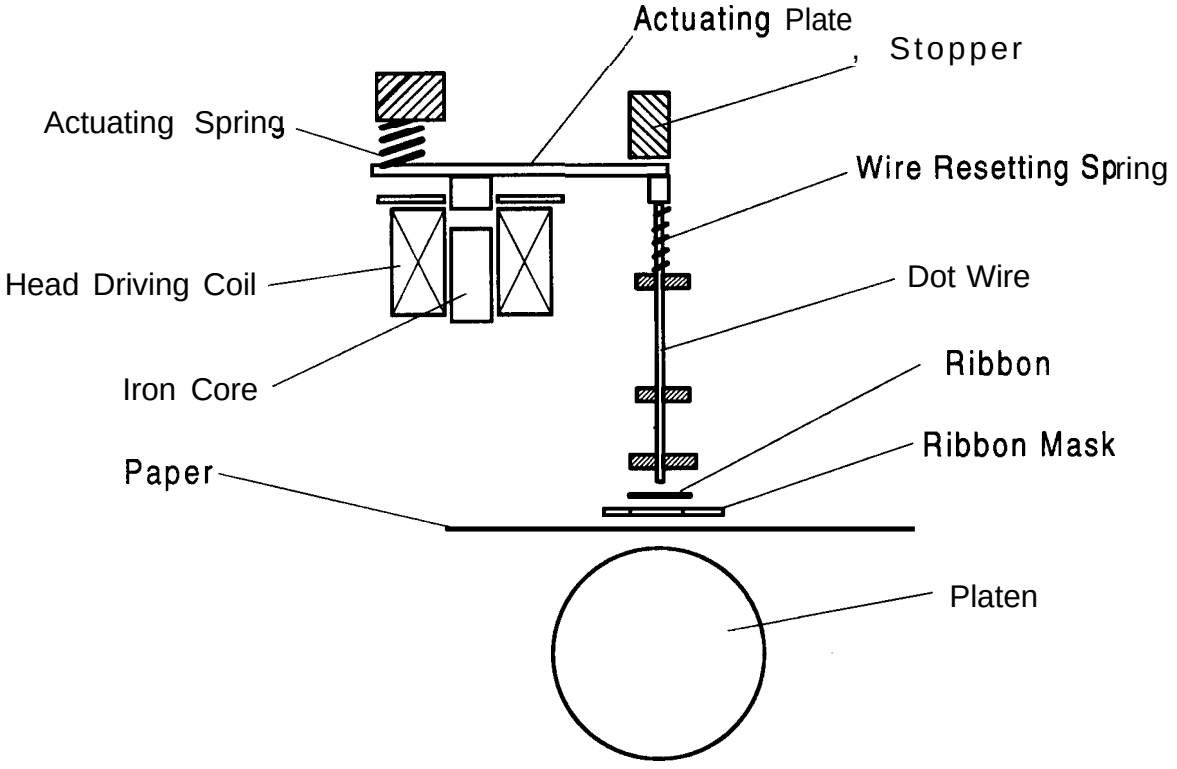

Figure 2-1. Printhead Operating Principle

The sequence used to print a dot has been described above.
The mechanism is equipped with a built-in thermistor for head temperature detection. The temperature detected by the thermistor is converted to an electric signal and fed back to the control circuit.
As shown in Table 2-1, the energizing mode changes according to the paper thickness and head temperature. This control is aimed at providing consistent print quality. The temperature compensation is particularly necessary in order to minimize burning or degradation of the dot wire driving coils inside the Printhead, which may result from excessive temperatures due to continuous printing.

Table 2-1 lists the Printhead unit specifications for the DLQ-3000. Refer to later section for the electrical specifications.

Table 2-1. Printhead Specifications

Printing Method	Impact Dot Printing
Number of wires	24 (12 x 2 lines, vertically) = number of driving coils
Wire diameter	0.2 mm
Head life	200 million strokes /wire (monochrome fabric ribbon) 100 million strokes /wire (film ribbon, color ribbon)
Weight	Approx. 200 g
Coil resistance	8.19 +0.5(2 (at 25°C)
Response period	Normal service: 462 μs
Driving voltage	31.5 to 38.5 VDC
Driving condition	Normal Copy mode (when thick paper is used) Warm mode (when the head temperature is high) Cold mode (when the head temperature is below 12°C)
Insulation resistance	500 VDC, 100 MΩ or more
Environment conditions	Temperature: 5 -55'C Humidity: 10-857.
Printhead drive method	Flywheel type

2.1.2 Carriage Mechanism

The carriage mechanism is composed of the carriage motor and home position sensor. This section also describes the exterior cooling fan.

The high and low ends of the carriage is supported by the two carriage guide shafts. Since stepping motor is used as carnage motor, the carriage can move to or stop at any position. The rotation of the motor is transmitted to the carriage timing belt through the left and right carriage motor pulleys. The belt tension is maintained by the belt tensioner on the driven pulley side (the left side as seen from the front) and the tension spring. This is a maintenance free portion. The DLQ-3000 is equipped with an adjustment mechanism for the parallelism between the platen and carriage guide shaft. Therefore, lateral non-parallel print density and abnormal loads on the printhead can be avoided (refer to section 2.1.3).

The carriage on which the printhead is mounted is fixed to the timing belt, and moves horizontally. The home position sensor (photo interrupter) is located at the reference position (on the right side as seen from the front), and transmits a signal when the sensor plate crosses the sensor.

Once the carriage reference position is found using the home position sensor, the position control system becomes open- loop. After the goal position is determined, the control circuit calculates the number of steps required for driving the motor the required distance, and outputs it to the motor.

An error is assumed if a home position signal is detected while printing or if the signal is not detected during initialization (home position seek). In these cases, the printer enters the error state (refer to section 1.3.8). In the same way, the speed is controlled according to programmed data.

External Cooling Fan Unit

The printhead and main / power supply boards are cooled by an external cooling fan.

The external cooling fan unit is located on the right side of the mechanism, and blows air if the temperature of the heat sink of two switching FET's on the power supply board is excessively. The printer enters the slow printing state due to excessively high temperature until the head is cooled down by the cooling fan.

Figure 2-2 illustrates the carriage mechanism.

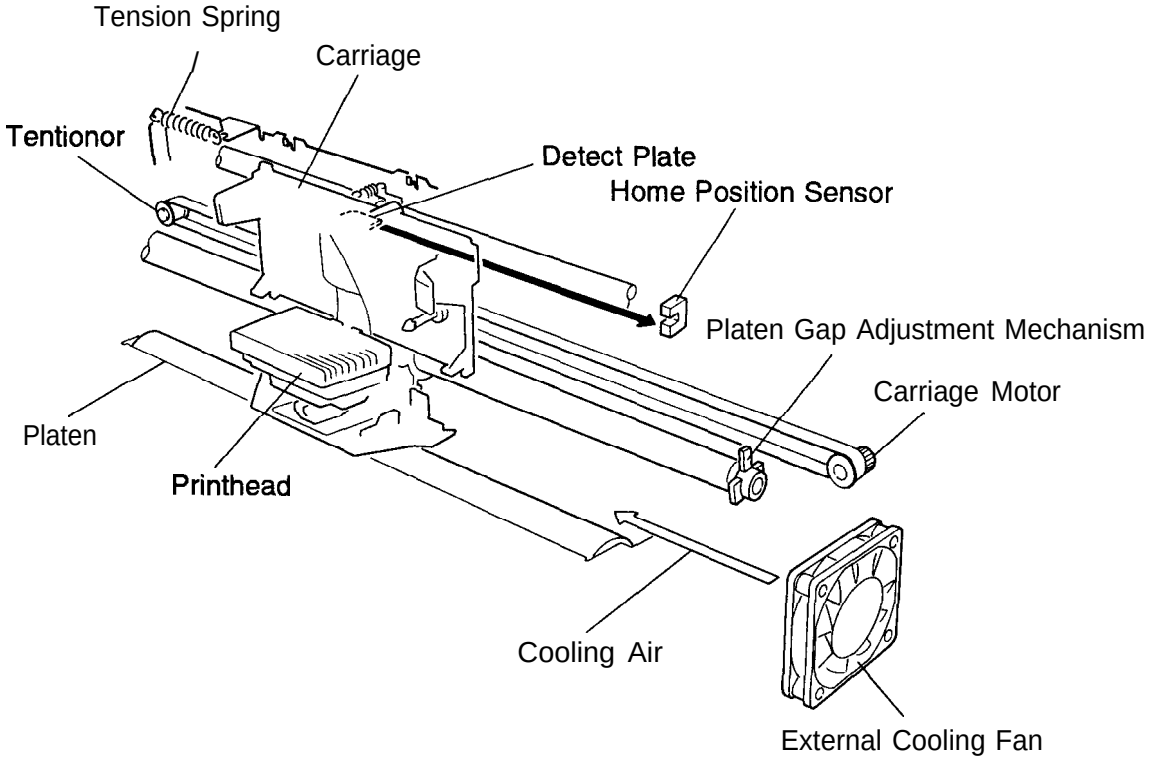

Figure 2-2. Carriage Mechanism

Table 2-2. Specifications of the Carriage Motor and Home Position Sensor

Carriage Motor Specifications	
Type	4-phase 200-pole HB type stepping motor
Power Supply Voltage	35 VDC ±10% (31.5 to 38.5 ohms)
Coil Resistance	1.1 ohms ± 10?!o(perphase,at25'C)
Drive Pulse Frequency	960 to= pps
Excitation Method	1-2 phase and 2-2 phase excitation
HP Sensor Specifications	
Detection Element	Photo interrupter
output	TTL level
Power Supply Voltage	5 VDC ±5%
Signal Mode	Closed: Home Position Open :Any position except the Home Position

Note: The drive pulse frequency and excitation method vary according to the print speed.

Table 2-3. External Cooling Fan Unit Specifications

Type	DC brush-less motor (with internal ball bearing)
Power Supply Voltage	35 VDC ± 10%
Rotational Speed	More than 3690 rpm

2.1.3 Platen Gap Mechanism

The DLQ-3000 is equipped with a platen gap adjustment mechanism which allows setting of the gap (between the platen and printhead) for paper of any thickness.

The cross section of the carriage guide shaft which supports the front of the carnage is oval-shaped. The PG (Platen Gap) adjust lever (the left lever as seen from the front) is fixed to the carnage guide shaft with the carnage guide fixing nut, and these two interlock. As seen from the left side, therefore, counterclockwise rotation of the lever widens the platen gap, and clockwise rotation of the lever narrows the gap.

On the right side as seen from the front, there is a shaft holder (LEVER,PARALLEL SHAFT) used to adjust the parallelism between the carriage guide shaft and platen. Because the cross section of the shaft holder is oval-shaped, the overall carriage guide shaft (including the carriage and head) moves up and down as the shaft holder rotates.

Consequently, it can be pointed out that improper parallelism between the carriage guide shaft and platen leads to an improper platen gap.

The platen gap sensor, which moves along the locus of the PG adjust lever, detects whether or not the adjust lever is set to position four or above. If the lever is set to position 4 or above (up to 10), the printer enters the "Copy Mode", and the printhead energizing mode switches accordingly. Table 2-4 gives the platen gap sensor specifications.

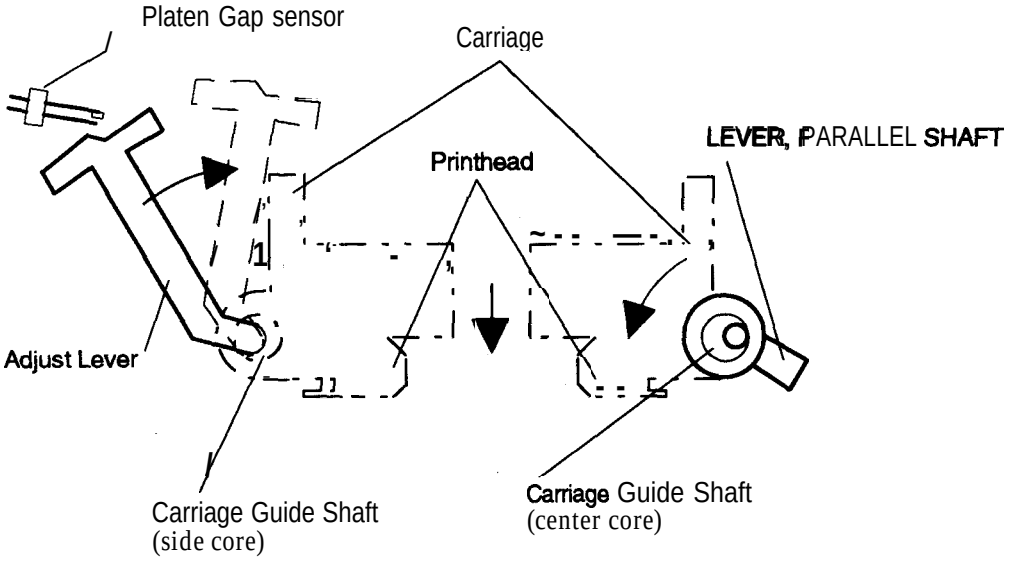

Figure 2-3. Platen Gap Adjustment Mechanism

Table 2-4. Platen Gap Sensor Specifications

Detection Element	Leaf switch
output	TTL level
Power Supply Voltage	5 VDC ±5%
Signal Mode	o to 3 : closed 4 to 10: Open

2.1.4 Ribbon Feed/Shift Mechanism

This mechanism is composed of the ribbon feed and ribbon shift mechanisms. The former mechanism winds up the ribbon inside the ribbon cartridge, and the latter shifts the ribbon cartridge back and forth. The switching operation corresponds to the rotation direction of the CS/RF motor as described below. Since a stepping motor is used, the cartridge can stop at or move to any position.

CS/RF motor normal rotation (clockwise) — Ribbon Shift
CS/RF motor reverse rotation (counterclockwise) — Ribbon Feed

Table 2-5 specifies the CS/RF motor specification. The motor control system is open-loop so that when the color is being changed, the positioning is controlled using the reference position detected by the home position sensor. The motor speed and exaltation method change according to the print mode (carriage speed and copy/normal).

Table 2-5. CS/RF Motor Specifications

Item	Content
Type	4-phase 48-pole PM type stepping motor
Drive Voltage	35 VDC ± 10Yo
Hold Current	120 mA ± 25 mA (per motor, 2-phase hold)
Coil Resistance	76 ohm+ 5% (per phase,at25'C)
Drive Pulse Frequency	Color Select: 460,600 pps Ribbon Feed: 320,370,640,770 pps
Excitation Method	Color Select: 2-2 phase excitation Ribbon Feed: 2-2 & 1-1* Dhase excitation
Drive Method	Constant-voltage Drive

* : 2-2 phase excitation is used under the 640 and 770 pps condition.

<Ribbon Feed Mechanism>

The mechanism is composed of the ribbon feed mechanism, CS/RF motor, and ribbon cartridge, all of which are inside the carriage.
Counterclockwise rotation of the CS/RF motor makes the ribbon driving pulley rotate to feed the ribbon.

Table 2-6. CS/RF Motor Rotation and Gearing Sequence (1)

CS/RF Motor Rotation Direction	Linkage
C.C.W.	CS/RF Motor Pinion Gear+ Ribbon Planetary Gear+ Ribbon Feed Gears → Ribbon Drive Gear

The ribbon cartridge case contains an endless ink ribbon. The ribbon passes between the ribbon feed roller and ribbon hold roller, and is wound by driving the ribbon feed roller attached to the ribbon drive gear. In order to prevent the ribbon from becoming loose while winding, a ribbon brake spring is installed at the ribbon exit.

Figure 2-4 illustrates the ribbon feed mechanism.

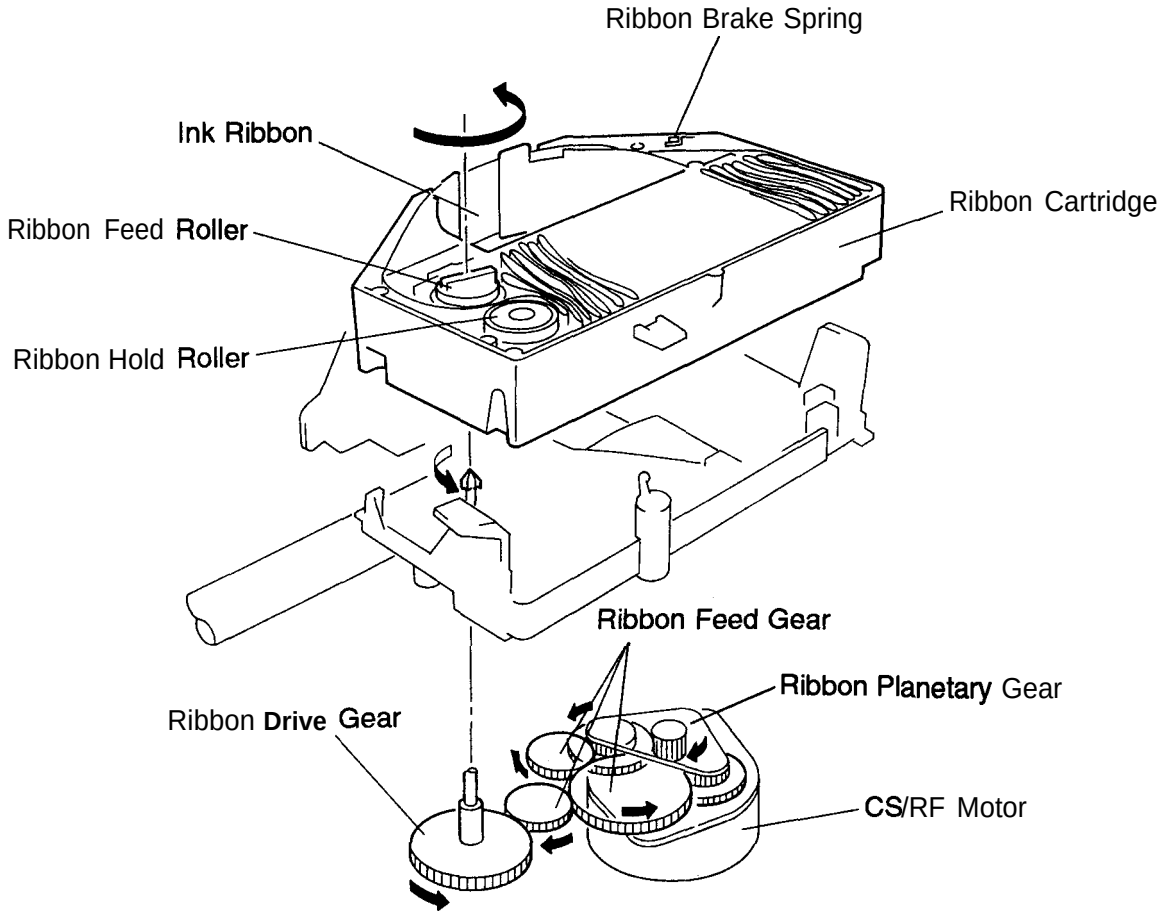

Figure 2-4. Ribbon Feed Mechanism

< Ribbon Shift Mechanism >

Both the monochrome and color ribbons are 1 inch wide. The film ribbon is 8 mm wide. The monochrome ribbon and the film ribbon are entirely black, and the color ribbon is separated into 4 different colored equal-width bands. The ribbon shift mechanism shifts the ribbon cartridge back and forth on the carriage. The mechanism is composed of the CS/RF motor, ribbon shift gears, film ribbon sensor and color ribbon sensor.

Color printing using 7 colors is made possible by loading the color ribbon cartridge on the carriage and sensoring with the color ribbon sensor.

When the monochrome ribbon is loading on the carriage, and the monochrome ribbon is used, the ribbon shifts by 1/4 after each paper feed operation. This function lengthens the ribbon life.

In the color mode sequence each color is selected corresponding to a host command. However, any host command for color selection will be ignored in monochrome mode. Instead, the ribbon shifts 1/4 inch after each paper feed operation.

When the film ribbon is loading on the carriage, and the film ribbon is used, however, the print speed is decreased in the film ribbon mode.

This function is to keep away from file ribbon destruction. As illustrated in Figure 2-5, the color ribbon is separated into 4 color bands. One of the 4 colors is selected by the carriage motion, which uses a portion of the carriage (A) as a fulcrum. The monochrome ribbon shifts at the same pitch as the color ribbon (1 pitch= 6.35 mm).

Figure 2-5 illustrates the ribbon shift gearing. The mechanism shifts the ribbon cartridge by converting the gear rotation to CS drive lever linear motion (up and down) using the series of linked gears (refer to Table 2-7).

Table 2-7. CS/RF Motor Rotation and Gearing Sequence (2)

CS/RF Motor Rotation Direction	Linkage
C.W.	CS/RF Motor Pinion Gear+ Ribbon Feed Gear (A)+ Ribbon Planetary Gear → Ribbon Feed Gear (B)+ CS Reduction Gear → CS Drive Cam → CS Drive Lever

The cartridge positioning spring behind the cartridge firmly holds the ribbon cartridge by pulling it in the direction the CS drive lever is pressed, using the cartridge positioning pin.
Any color band can be selected by the CS/PF motor rotation using the start point **C (the** color home position: the position of the black color band) as a reference position (see Figure 2-5). The home position is recognized by the CS sensor.

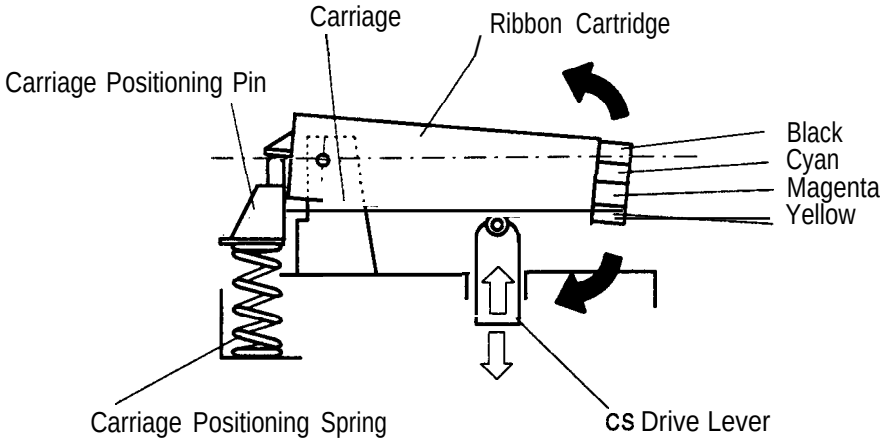

Figure 2-5. Ribbon Shift Gearing

Table 2-8 gives the coloring sequences. For half-toning, as shown in the table, a color is created by printing one color on top of another. Table 2-9 specifies the CS sensor, Table 2-10 specifies the color ribbon sensor and Table 2-11 specifies the film ribbon sensor.

Table 2-8. Coloring Sequences

Print Color	Print Ribbon	
	First Printing	Second Printing
Black	Black	—
Magenta	Magenta	—
Cyan	Cyan	—
Violet	Magenta	Cyan
Yellow	Yellow	—
Orange	Yellow	Magenta
Green	Yellow	Cyan

Note: The printer prints the brighter color first to prevent the ribbon from being stained.

Table 2-9. CS Sensor

Item	Description
Method	Photo-interrupter
Power Supply Voltage	5 VDC ± 5%
Collector Explosion Proof	30 V or less
Output	Open Collector

Table 2-10. Color Ribbon Sensor

Item	Description
Method	Mechanical Switch
Power supply voltage	5 VDC ± 5%
output	TTL level
Signal Mode	Monochrome Ribbon: close Color Ribbon: open

Table 2-11. Film Ribbon Sensor

Item	Description
Method	Mechanical Switch
Power supply voltage	5 VDC ± 5%
output	TTL level
Signal Mode	Film Ribbon : close Fabric Ribbon: open

2.1.5 Paper Feed Mechanism

The mechanism is composed of the paper feed motor, tractor, PEW detector, loading sensor, release sensor, and paper shift mechanism.
Figures 2-7, 2-8, and 2-9 show the core of the mechanism, paper feed sensor, and release mechanism.

< Core of the Paper Feed Mechanism >

The DLQ-3000 feeds the paper by sliding it horizontally. The paper feed operation differs according to the release lever mode as follows:

a. Friction Mode

The paper is held by the front paper bail and the four roller assemblies (two upper rollers and two lower rollers) which are located just under the carriage guide shaft.

Paper Supply: Paper is supplied automatically from the front paper guide, manually from the rear side, or from the CSF (Cut Sheet Feeder).
Paper Eject: Paper is ejected through the front paper path.

b. Tractor Mode

When the tractor mode is selected, power is transmitted to the push tractor. The mode is changed from friction to tractor. The following items are operated manually using the release mechanism (as described in a later section).

Paper Supply: From the rear tractor
Paper Eject: Through the front paper path

c. Paper Jam Removal Mode

All the rollers are released (same as in b. above, refer to the later section for details).

A stepping motor is used to feed the paper, and can move to any position in any direction and stop at any position. This is an open-loop system which calculates the distance to move using a signal transmitted from the sensor on the paper feed mechanism, determines the number of motor pulses, and executes the operation. Table 2-12 gives the paper feed motor specifications.
Power generated by the paper feed motor is conveyed in good balance to both front and rear driving rollers by the two belts . If the belts are not tensioned correctly (i.e. the belts are too loose or too tight), the front and rear rollers will not be in proper balance. This will cause paper jam.
The mechanism is therefore designed so as to allow belt tension adjustment by adjusting the paper feed motor position. The motor is fixed with two screws and the PF tension adjusting tool AXIS,PF,TENSION. Since the cross section of the AXIS,PF,TENSION is oval-shaped, rotation will pull the motor downward. Then the motor can be fixed. The belts can be adjusted and fixed at the appropriate tension in this way.

Table 2-12. Paper Feed Motor Specifications

Type	4-phase 200-pole HB type stepping motor
Power Supply Voltage	35 VDC ±10%
Coil Resistance	5.4ohrn ±10%
Drive Pulse Frequency (speed switching)	4300 pps (6 inches/sec.)
Excitation Method	2-2 phase excitation

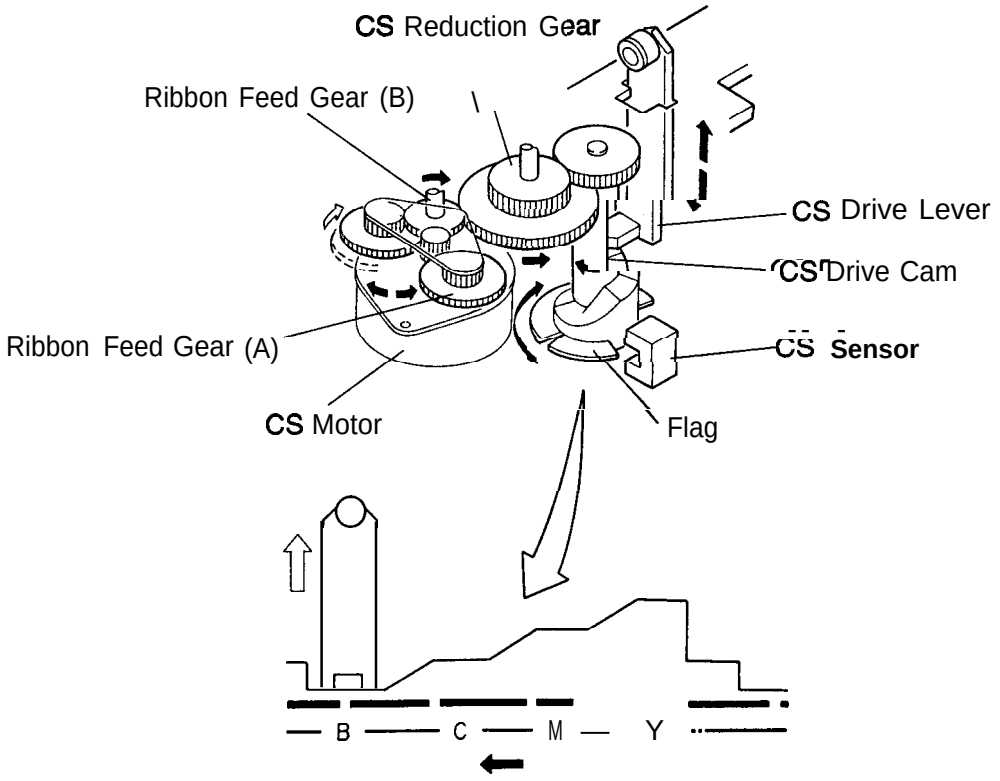

Figure 2-6. Core of Paper Feed Mechanism

< Paper Fsed Sensor>

Sensors are used to feedback information about paper movement (horizontal and vertical) to the mechanism which controls paper feeding. The sensors operate continually. The feedback timing for a read signal is selected by the CPU depending on the movements of the paper feed and carriage motors. Table 2-13 lists the functions of the PEW detector and paper loading sensor. Table 2-14 gives the specifications for both sensors.

Table 2-13. PEW Detector and Paper Loading Sensor Functions

Detector	Detection	Function
PEW Detector	Paper Width Measurement (detects the left and right paper edges.)	Selects the left and right margins.
	Paper Top Detection (detects the top edge.)	Selects the top margin.
	Paper Bottom Detection (detects the bottom edge.)	Selects the paper length for the forms override function and paper length error detection.
	Paper End Detection	Supplies/ejects paper and detects paper jams.
Paper Loading Sensor	Paper Top Detection (along the paper bail)	Automatically supplies a cut sheet from the front paper guide.
	Paper End Detection	Supplies/ejects paper and detects paper jams.

Table 2-14. Paper Feed Sensor Specifications PEW Detector and Paper Loading Sensor (Common Spec.)

Detection Element	Photo-reflector
Detection Method	Photoelectric Transfer (Before the paper end is detected, the detector voltage is sampled and the voltage is compared with the voltage measured after the paper-end detection to judge whether or not paper is loaded.
output	Open collector
Power Supply Voltage	5VDC ± 5%
Collector Explosion Proof	30 V or less
Signal Mode	Paper is loaded: Before Paper-end Sampled Voltage >/= After Paper-end Detection Voltage
	Paper is not loaded: Before Paper-end Sampled Voltage > After Paper-end Detection Voltage

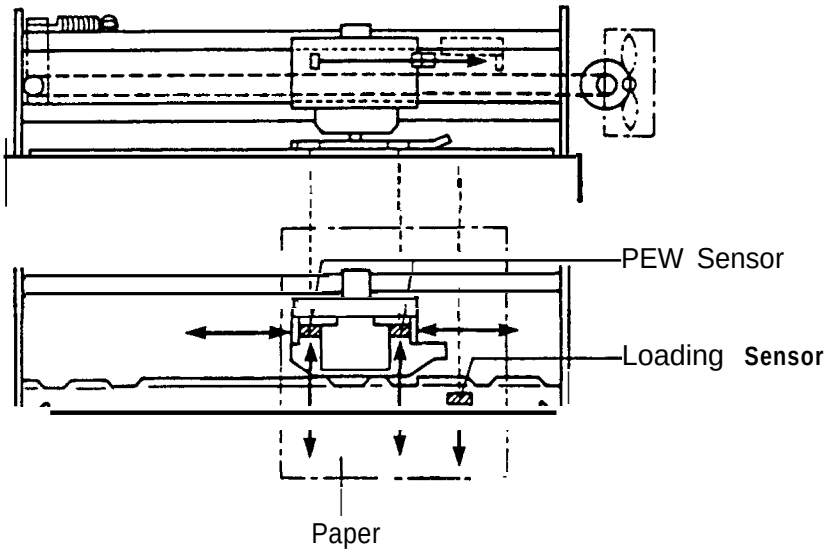

Figure 2-7. Paper Feed Sensor

<Release Mechanism>

The mechanism is used to switch the paper feed mode by setting the release lever. This operation switches the paper feed motor power transmission and paper feed rollers. The lever rotation is converted into horizontal and vertical linear motion.
In the paper jam removal mode, all the paper feed rollers are released, making it is easy to remove the jammed paper. At this time the release link lever links to the paper bail release operation.
The release sensor detects whether the release mechanism is set to friction or tractor mode. The control circuit switches the paper feed sequence according to the sensor state indicating the release mode.
Abnormal wear, teeth loss, or looseness of any gear causes bad power transmission to the tractor or unstable paper feed pitch.
Table 2-15 summarizes the release mechanism for each mode, and Table 2-16 gives the release sensor specifications.

Table 2-15. Release Mechanism Modes

	Friction Mode	Tractor Mode	Paper Jam Removal Mode
Paper Bail Roller Assembly	closed	←	Open
Carriage Guide Roller Assembly	Closed	←	Open
Tractor Transmission Gear → Tractor Gear	Not engaged	Gearing engaged	←
Paper Supply Guide Position	Parallel to the rear paper guide (top)	Parallel to the tractor (middle)	Waiting Position (bottom)
Release Sensor State	Open	Closed	←

Table 2-16. Release Sensor Specifications

Type	Leaf Switch
Power Supply Voltage	5 VDC ±5%
Switch Mode	Friction Mode: Open (OFF) Tractor Mode: Closed (ON) Release Mode: Closed (ON)

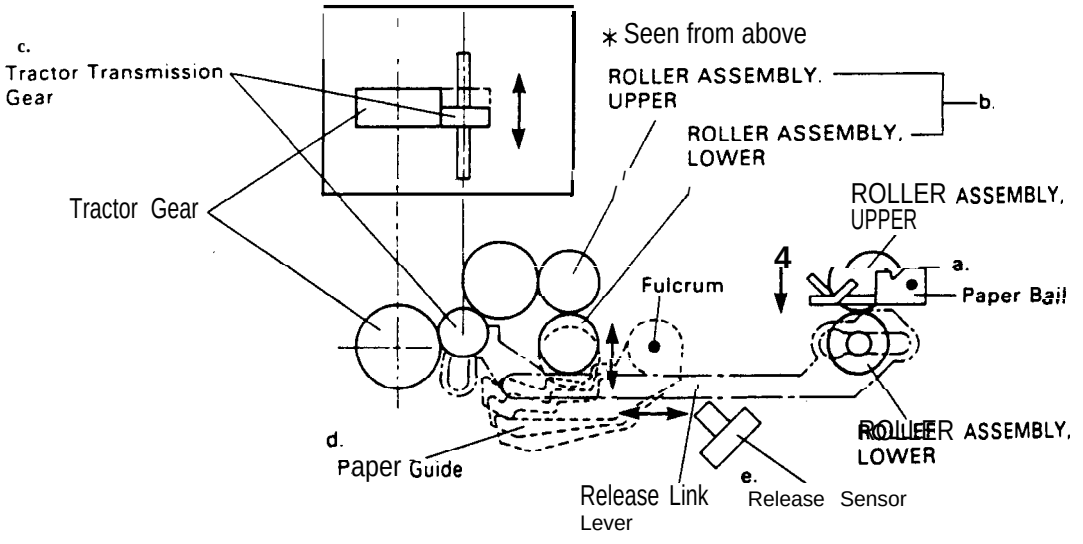

Figure 2-8. Release Mechanism

2.2 POWER CIRCUIT

Figure 2-9 provides a block diagram of the power supply circuit.

The primary structure of the BOARD ASSY., C124 PSB and C124 PSE units is the same. The lower portion of each block gives the location of the element.

The power supply of the DLQ-3000 is composed of the power switch, AC inlet, and switching power supply boards (BOARD ASSY., C124 PSB/PSE). They supply the voltages necessary for controlling the printer and driving the printer mechanism. Table 2-17 gives the electrical specifications for each power supply board.

Table 2-17. Electrical Specifications of the Power Supply Boards

Name	Input Voltage (AC V)	Primary Fuse Rating
BOARD ASSY., C124 PSB	115-10% to 120+10%	10A
BOARD ASSY., C124 PSE	220-1 0% to 240+1 0%	T5AH

2.2.1 Type and Usage of the Power Supply Voltages

The DC voltages are represented by the three blocks; +35V (CH.A, CH.B) and +5V.
The ringing choke converter (RCC) switching regulator circuit converts them into the DC voltages necessary for the printer. Table 2-18 classifies the DC voltage used by the printer.

Table 2-18. DC Voltages

Nominal Power	Connector No.	Pin No.	Usage
+35V (CH. B) Max. continuous Power Consumption : 152.5W	CN 2	1,2,3	Power Supply CH.B for Printer Mechanism •Printhead Drive * Cooling Fan Motor Drive •Paper Feed Motor Drive * CS/Ribbon Feed Motor Drive Flash ROM Vp
GpB	CN 2	4,5,6	Power Ground CH.B (+35V side GND)
GL	CN 2	7,8	Logic Ground (+5V side GND)
+5V Max. continuous Power Consumption : 7.5W	CN 2	9,10	Power Supply CH.A for Printer Mechanism •Paper Feed Motor Hold * CS/Ribbon Feed Motor Hold * Sensor Power Supply * Main Board Control Circuit Power Supply * Reset Voltage (VX) •Control Panel Circuit Power Supply * Serial Interface Level Converter Circuit Power Supply for Main Board •Type-B Interface Power Supply
+35V (CH.A) Max. continuous Power Consumption : 160W	CN 3	1,2,3	Power Supply CH.A for Printer Mechanism •Carriage Motor Drive •Printhead Drive
GpA	CN 3	4,5,6	Power Ground CH.A (+35V side GND)

2.2.2 Power Supply Circuit Operation

The AC power source is connected to the inlet, and voltage is provided to the power supply board via the power switch and fuse. The AC voltage is full-wave rectified using diode bridge DB1 and smoothed.
The surge cut circuit reduces the rush current at power-on.

● +35VDC Block

For the +35V block, the voltage is applied with AC/DC conversion between the primary and secondary side via coil T101 and T201. The amount of voltage and current output to the secondary coil can be adjusted by controlling the gate voltage of the main switching circuit MOS FET's (Q101 and Q201), i.e. by switching it on/off. Control is fed back from each protection circuit and control circuit to Q101 and Q201.

Voltage Line Overcurrent Protection Circuit (Primary Side)

IC 101 and IC 201 detect the input voltage of the primary circuit. When the input voltage is normal, the current dose not flow into the shunt-regulator. But the overcurrent flows to the input voltage line, the shunt-regulator is turned on, Q103 (Q203) is turned on, Q102 (Q202) is turned on, and then the Q101 (Q201) is turned off.

+35VDC line Overcurrent Protection Circuit

If the +35VDC line drops down to +13VDC, Q153 (Q253) and Q154 are turned on by detector circuit that consists of R173 (R273) and R174 (R274), Q154 is turned on, PC102 is turned on, and then the input voltage cuts off.

At this time, the delay timing creation circuit that consists of the C157 and R174 makes the delay timing.
When the printer turns on, this protection circuit can not be started by this circuit, because if this protection circuit is operated before the +5VDC line raises up, the drivers of the BOARD ASSY., C124 MAIN are not active.

● +5V Block

The +5V line is supplied with voltage and stabilized by the regulator IC TL494, based on the stabilized output through the +35V block. Therefore, all of the controlling and stabilizing circuits for current and voltage are located inside the TL494 (with the circuit constants determined by external elements). There is no feedback to the primary side as there is for the +35V line.
The only feedback to the primary side is for circuit protection. When the +5V output exceeds the max. overvoltage level (i.e. 7V), PC102 cuts power to the primary side using Zener diode ZD153 and shortcircuits the gates of the switching FET Q101 or Q201 in order to prevent abnormal operation of the mechanism.

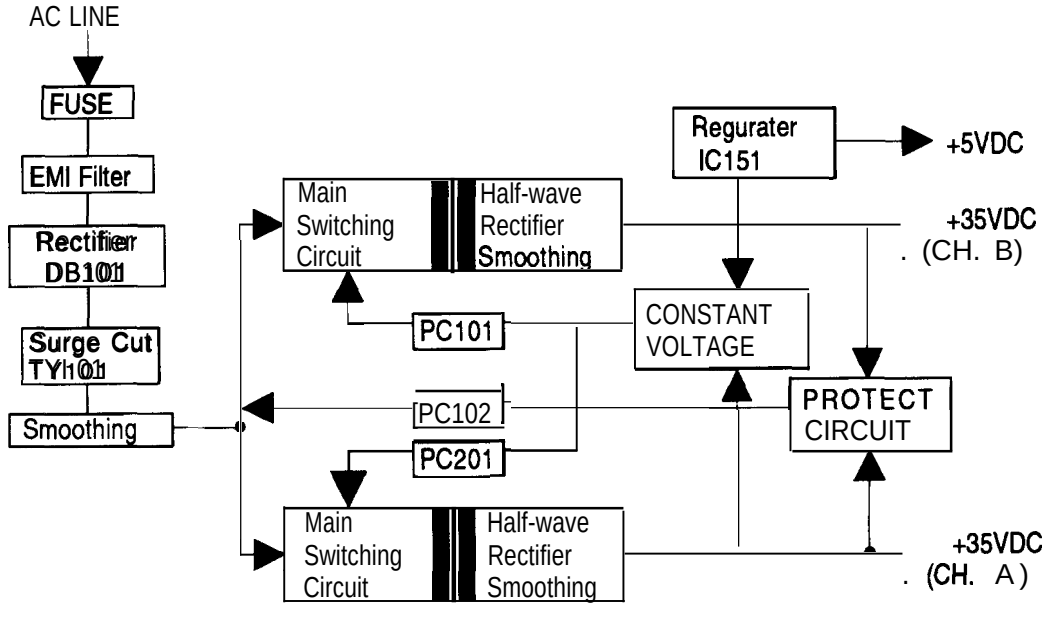

Figure 2-9. Power Circuit Block Diagram

2.3 CONTROL CIRCUIT

Figure 2-10 gives the control circuit block diagram for the DLQ-3000. The BOARD ASSY., C124 MAIN is located at the center.

The printer uses a 16-bit internal 8-bit external l-chip CPU µPD70433/V55PI (IC1O) as the main CPU, with a clock frequency of 24.8832 MHz (CR1).

The control program is stored in a 1Mbit Flash EEPROM Intel 28FO1O(IC13). The CPU starts the program after an external reset signal is received. The program can be reloaded by PC.

For memory, two D-RAM's are used for external PSRAM. A non-volatile memory (EEPROM 93LC46) is used to store the TEAR OFF position, operator's control panel setting, reload controlling parameter for the Flash-EEPROM, adjustment parameters and so on.

Further more, gate arrays E05A88 (IC11) are used for assigning the clock control, address control, memory management, DRAM control, I/F control, Type-B I/F control, port control, RF motor control, bit manipulation, head control. Gate array E05A89 is used for controlling the panel interface functions. Both are employed to simplify the circuit, and operate under the control of the CPU.

The printer has a IEEE-1284 parallel interface Level 1 device hardware that will provide bi-directional interface in the future.

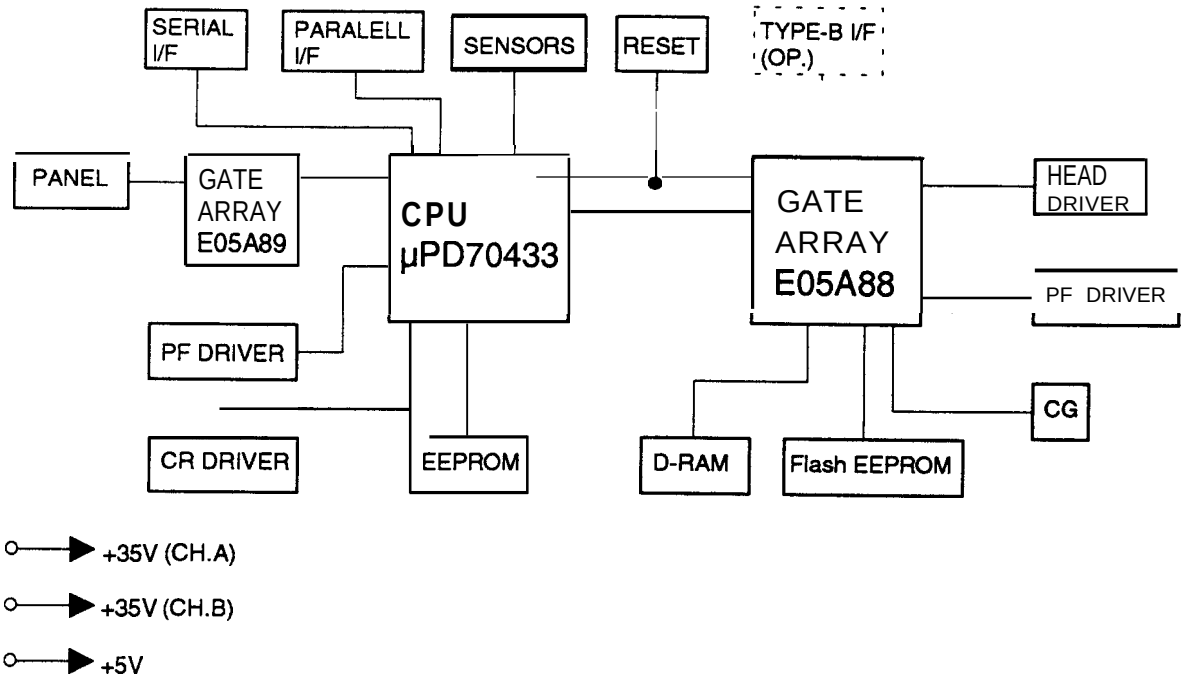

Figure 2-10. Control Circuit Block Diagram

The functions of the main ICS are as follows.

■ Main CPU µPD70433/V55PI (IC1O)

This is the main CPU, which receives data from the host computer directly (parallel) or via the gate array E05A88 (serial) and store the data in the D-RAM input buffer.
Then, when a print start interrupt occurs (CR code, or buffer full), it transfers the input buffer data to the CG (character generator) and converts the data into image data.
The four printing modes of the printer correspond to the four different drive conditions, and in each the energizing pulse width is modified (i.e. lengthens or shortens the time) based on the information from the sensors (voltage, PG, and head temperature).
The main CPU has parallel I/F and the input buffer control hardware.
The main CPU directly controls the reception from each mechanism sensor, platen feed motor, carriage motor and control panel.
The built-in 8-channel 8-bit A/D converter is used for the V source voltage check and head temperature detection. For abnormal voltage drops on the +V, an interrupt port is used to execute a physical interrupt (error detection).

■ Gate Array E05A88 (IC11)

This is a l-chip gate array which handles the following functions.

- Clock Control Unit (CCU):	Outputs clock pulse
- Address Latch (ALU):	Latches and outputs the lower address.
- AB20 Control Unit (AXU)	
- Memory Management Unit (MMU):	PROG select, CGROM select, QPIT select, MMIO1 select, etc.
- DRAM Control Unit (DCU)	
- I/F Control Unit (IFU):	Output of BUSY, ERR, PE, SLCT and SL245 signals
- Type-B I/F Control Unit (TIB):	Option I/F select
- Port Control Unit (PCU):	CR current, PF current, LOD / PEW sensor read enable and VPPENB signal control
- RF Motor Control Unit (MCU)	
- Bit Manipulation Unit (BMU):	Double-Height rendition manipulation, etc.
- Head Control Uni (HCU)	
- Head Control Unit 2 (HCU2)	
- Read Data Unit (RDU):	Outputs internal MMIO data

■ Gate Array E05A89

This is a l-chip gate array used for controlling the control panel interface.

■ Inter 28F010 (lMbit Flash-EEPROM, IC13)

The memory is the CPU program ROM which contains the firmware that controls the mechanisms, Character Code Table, Panel message and all of the control programs for the main printer. The program can be reloaded from an external PC.

■ 8Mbit Mask Rom (CG ROM-1: Character Generator-1, IC12)

A mask ROM which contains printing pattern, Character code table, multi-font character generation, panel message and Boot-strap program is provided as standard equipment.

■ HM514256A/AL (1-Kbyte D-RAM, IC19,20)

This RAM is used as the CPU working area. Internally, it is mapped as the print data expansion area for the data input buffer, line buffer, image buffer, etc.

■ 93LC46 (EEPROM, IC16)

This EEPROM stores and protects the hardware settings for the bi-directional adjustment value, and data for SELECTYPE settings, TOF positions, TEAR OFF amount, etc. When power is off, these data are protected by interrupt program.
If the combination of main board and mechanisms changes, the settings must be rewritten by the program. (Refer to Section 4.5)

2.3.1 Interface Circuit

Figure 2-11 is a block diagram of this circuit. This section describes the data set interface for the parallel and serial interfaces of the DLQ-3000.

■ Parallel Interface:

This printer has a IEEE-1284 parallel interface level 1 device hardware that will provide bi-directional interface in the future.
The CPU (V55PI) has parallel I/F and input buffer control hardware.
Gate array E05A88 latches data from the host computer (with a STRB signal), and automatically transmits a BUSY signal. At this time, the CPU reads the hardware/software BUSY signal by reading a MMIO. The CPU then stores the data in an input buffer. After the data is stored, the E05A88 transmits a BUSY signal clear and the CPU transmits an ACK signal to the host computer.

■ Serial Interface:

Received data RXD from the host computer (i.e. RECEIVE DATA, this is also applied to an optional serial interface) will be transformed for the level (TTL), and be received by an synchronous serial communication interface of the CPU.
The data is transmitted to an input buffer from the CPU.
The CPU directly outputs transmit data TXD (TRANSMIT DATA).
For DC1/DC3 protocols, a DC3 code is output when the buffer is full. (After the buffer is restored, a DC1 code is output.)
A REV signal (same as DTR: DATA TERMINAL READY) is output at the CPU port P36, and controls the DTR.

Printing starts when a CR code is received or when the input buffer is full. Data stored in the input buffer is stored in a line edit buffer. Image data (to access CG) referenced by each of the line edit buffer parameters is buffered into an image buffer.
This buffered image data is transmitted to gate array E05A88 in 8 bit units creating print data.
When the host computer outputs an initialize signal INIT, the P16 port of the CPU is initialized with an INTP5.

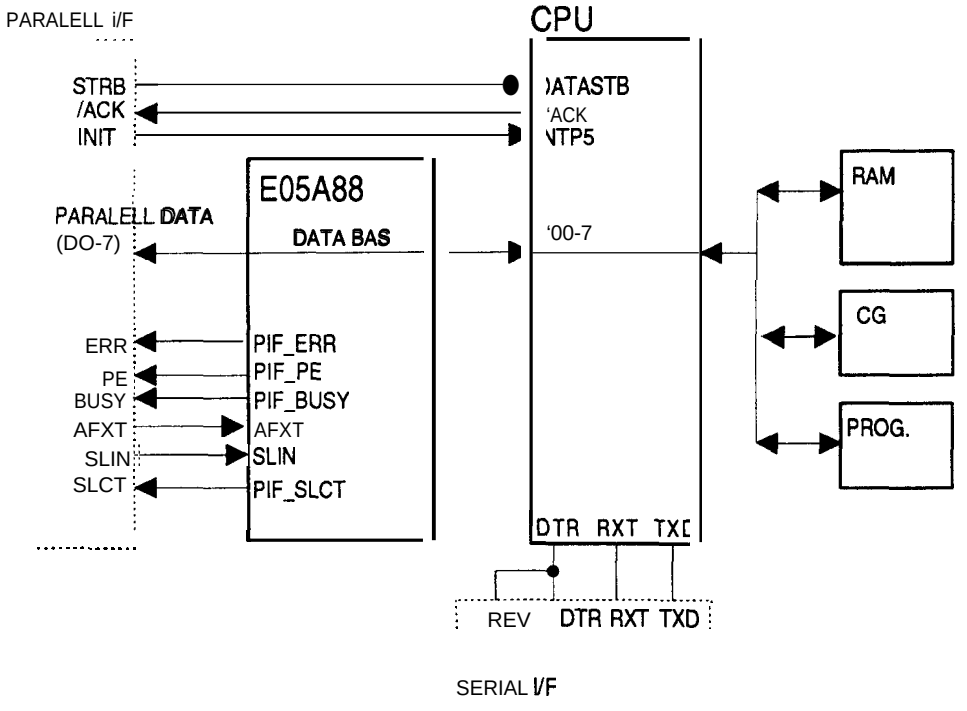

Figure 2-11. Interface Circuit Block Diagram

2.3.2 Reset Circuit

Figure 2-12 is a block diagram of the reset circuit.
IC PST523DTM (IC 14) is a power on reset IC which generates a reset signal when the power source voltage becomes unstable due to power on/off switching.
The circuit detects the +5V line leading edge with IC 14. The threshold voltage is set atapprox. 4.2 VDC. The printer is in the system reset condition.
A reset signal is input into gate array E05A88 and CPU, then supplied to each of the devices to reset them.

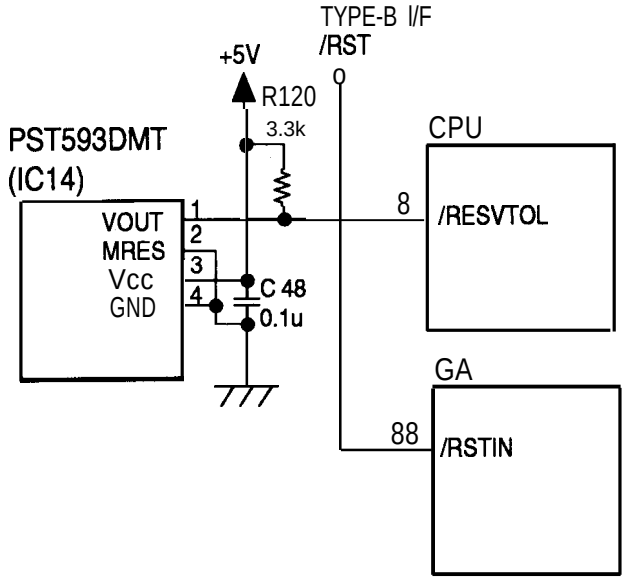

Figure 2-12. Reset Circuit Diagram

2.3.3 Memory Back-up Circuit

Figure 2-13 is a block diagram of this circuit.
When the power is turned off, mainly the following data will be backed up to EEPROM (IC16).

- TOF, TEAR OFF FUNCTION, character fonts, panel configuration
- USER DEFINED CHARACTER
- Set values for mechanism control (for state control of all the sensors)

. Adjusted values for mechanism control (e.g. Bid Adjustment)
. Boot strap program flag (for loading program of the Flash EEPROM)

Data to be backed up is written by the CPU, i.e. by setting the NMI port to Low.
The back-up monitor circuit shown in Figure 2-14 is in the A/D converter of the CPU. The +35 VDC line drops to 27 VDC or less when the power is turned off. The CPU generates a chip select signal (at P21) for the EEPROM and writes back-up data into the EEPROM.
The back-up data can be stored in this way, before the power source voltage drops completely.

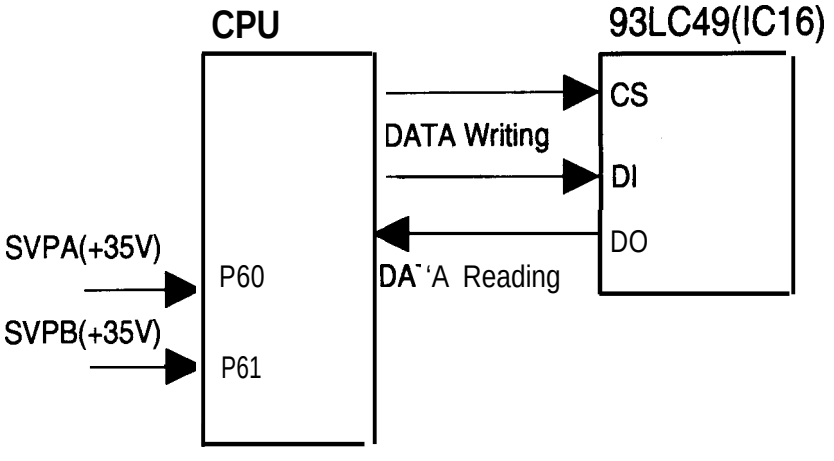

Figure 2-13. Memory Back-up Circuit Block Diagram

2.3.4 A/D Converter Detection Circuit

Figure 2-14 is a block diagram of the circuit.
The CPU contains a built-in 8-bit A/D converter. All detection terminals are used to detect transit analog signals.

Table 2-19. A/D Converter Signal Assignment

Port	Signal Name	Purpose	Operation respondent to what is detected
AN IO	SVPA	Monitors +35VDC (VPA)	If the voltage drops below approx. +24V
ANI1	SVPB	Monitors +35VDC (VPA)	If the voltage drops below approx. +24V
ANI2	HD_TH	Monitors head coil temperature to detect overheat (1 00°C or higher) and over cool (less than 12°C).	If the head coils are overheated or over-cooled
ANI3	PEW/L	Detects the paper width left /right signal and paper end signal.	The printable area is set.

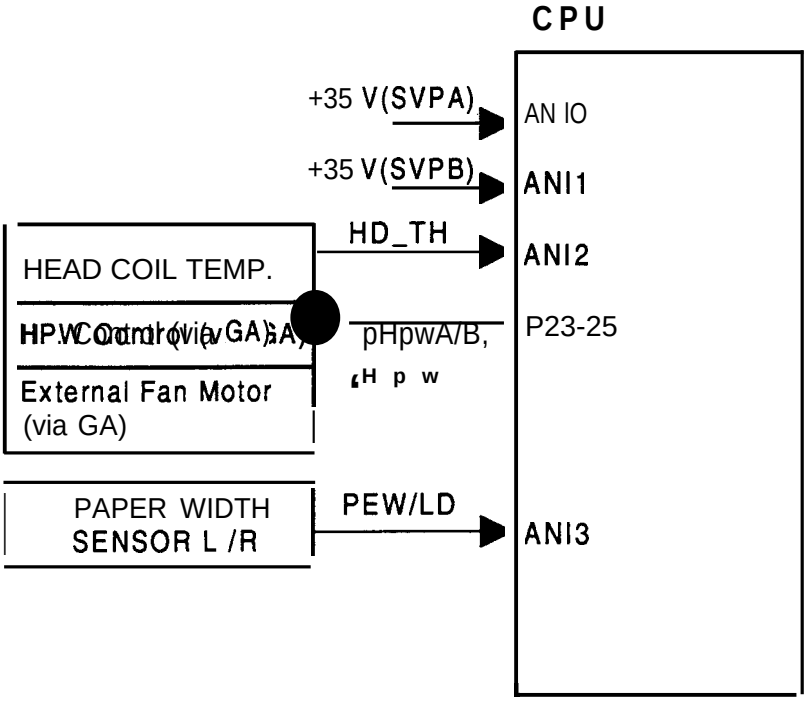

Figure 2-14. A/D Converter Detection Circuit

2.3.5 Detector Circuit for General Ports

Figure 2-15 is a block diagram of detection signal assignment for general ports. All completely of the sensor signals of the mechanism are assigned to each of the general ports of the CPU as follows.

Table 2-20. Signal Assignment of Detector Circuit for General Ports

Port	Signal Name	Purpose	Operation responding to what is detected
P03	CO-R	Detects a color ribbon sensor signal	Print speed control
P04	FI_R	Detects a film ribbon sensor	Print speed control
P05	CSHOME	Detects a color select (ribbon shift) home position signal	Ribbon shift control
P06	PGSW	Detects a signal platen gap sensor signal	Copy mode control
P07	RLSW	Detects a release lever position sensor signal	Paper handling control
PI 1	CV_OP	Detects a cover open sensor signal	Cover open warning
P33	CRHOME	Detects a carriage home position sensor signal	Carriage position control, carriage error warning
P63	PEW/LO	Detects a loading sensor signal	Paper feed control (for checking paper supply/eject and paper jam, and paper feed error warning)

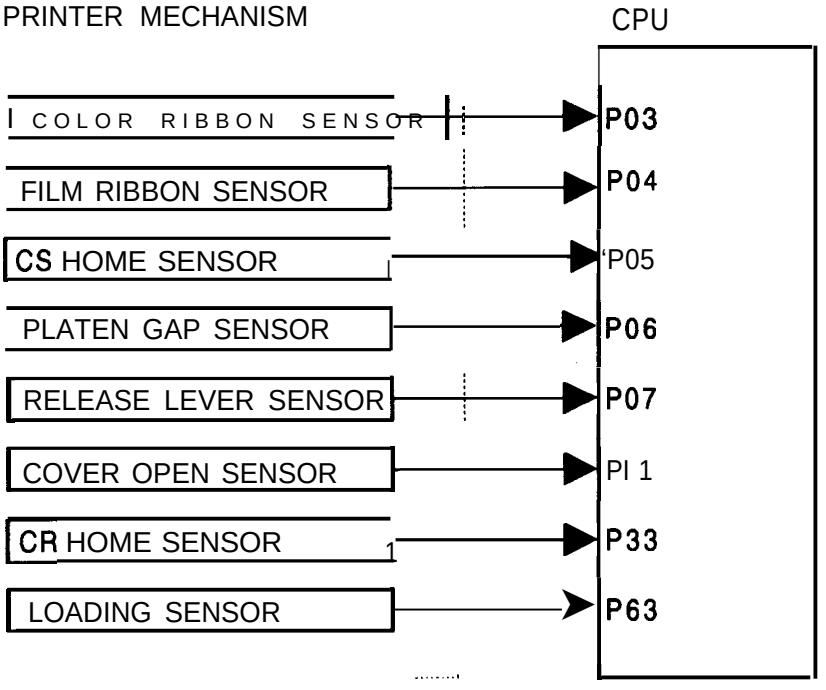

Figure 2-15. Detection Signal Assignment for General Ports

2.3.6 CS/RF Motor Controller/Driver Circuit

Figure 2-16 shows a block diagram of the color shift and ribbon feed (CS/RF) motor driver circuit. The CS/RF motor is a PM (permanent magnet) stepping motor, and is driven with 1-1 or 2-2 phase excitation in proportion to the desired rotational speed. This motor can be rotated in both directions and stopped at any position. Four phase signals (RFA to RF-B) are output from the gate array (IC11), and pass through a driver transistor array (QM7). A common voltage switching signal (RF-R/H: hold/run switching) is output from the CPU (at P20).
The drive voltage is constant (i.e. 35VDC from the VPB line). Table 2-21 gives the CS/RF motor current consumption.

Table 2-21. CS/RF Motor Current Consumption

Source Voltage	35 VDC ± 10%	
Current Consumption (1/ Motor)	Ribbon Feed : fabric ribbon film ribbon color select	less than 350 mA less than 350 mA less than 550 mA

Table 2-22. Motor Drive Frequency Settings and Conditions

Mode	Condition (Note)	Drive Frequency	Excitation Method
Ribbon Feed	4 times, 3 times, twice, 3/2 times or 4/3 times as fast as the default	770 pps	2-2 phase
	The default or 3/4 times as fast as the default	640 pps	2-2 phase
	1/2 as fast as the default	320 pps	1-1 phase
Color Select	Copy mode Normal mode	460 pps 660 pps	2-2 phase 2-2 phase

Note: Carriage speed or Print mode

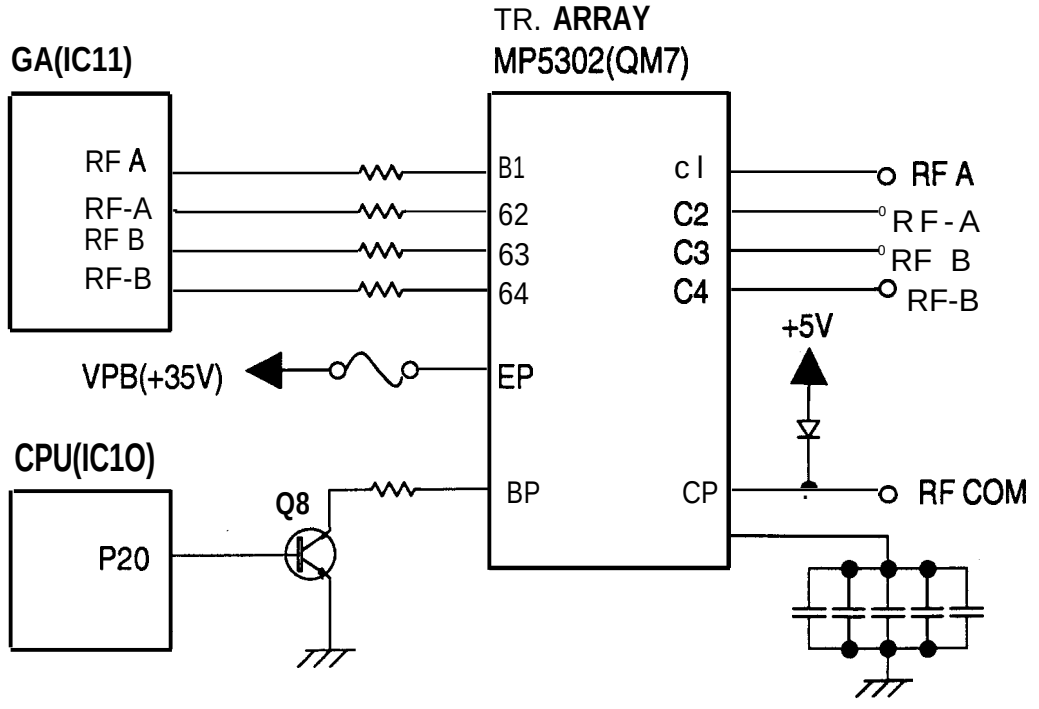

Figure 2-16. CS/RF Motor Driver Circuit Block Diagram

2.3.7 Paper Feed Motor Controller/Driver Circuit

Figure 2-17 shows a block diagram of the paper feed motor controller/driver circuit.
The paper feed motor is a hybrid type stepping motor, and is driven with 2-2 phase excitation. This motor can be rotated in both directions and stopped at any position. Four phase signals (PFA to PFD) are output from the CPU and driven by PF motor drive IC2. The common voltage is constant (35 VDC from the VPB (+35V) line). Table 2-23 gives the circuit specifications.
Table 2-24 gives the motor drive frequency settings.

Table 2-23. Paper Feed Motor Controller/Driver Circuit Specifications

Source Voltage		35 VDC ± 10%
Current Consumption	6 IPS	1.3 ± 0.1 A/phase
Rush		1.3 ± 0.1 A/phase
Hold		0.2 A/phase

Table 2-24. Motor Drive Frequency Settings

Speed Mode	Drive Frequency	Excitation Method
6 IPS (Inch Per Second)	4300 PPS	1-2 phase

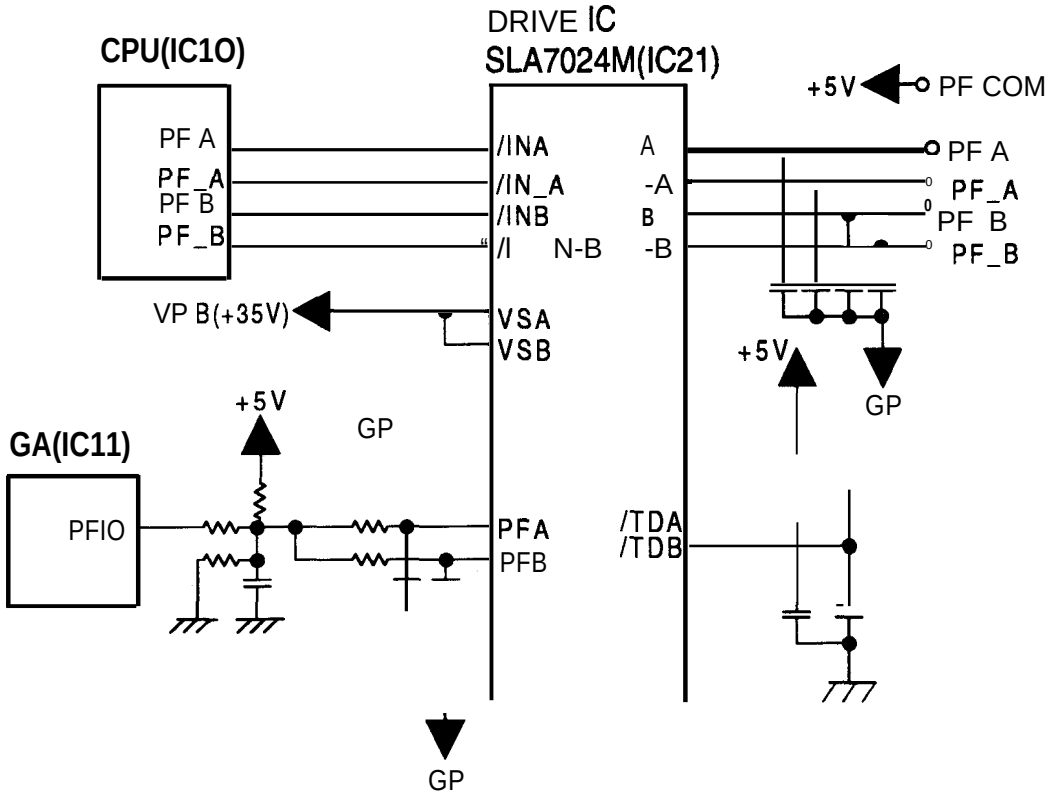

Figure 2-17. Paper Feed Motor Driver Circuit Block Diagram

2.3.8 Carriage Motor Controller/Driver Circuit

The carriage motor is a hybrid type stepping motor which is driven with 1-2 phase or 2-2 phase excitation in proportion to the desired rotational speed. This motor can be rotated in both directions and stopped at any position. Four phase signals are directly output from the CPU and pass through driver IC SLA7026M (ICI).
There are 10 speed modes which correspond to the desired printing speed. Beside these, there is also a hold mode.

When the speed mode is changed, the current setting for the SLA7026M (ICI) motor driver is changed. This enables it to supply the motor with the proper current for the speed mode setting.
The PFA and PFB terminals of the SLA7026M (ICI) ports are used to set the reference voltage for the built-in chopping controller. The voltage is set at the output voltage level of the drive current switching circuit.
The drive current switching signals (which set the voltage level between the PFA and PFB terminals of the SLA7026M (IC1)) are output from general ports of gate array E05A88 (IC11).

This circuit is also equipped with a drive voltage cut-off circuit. If an error occurs, there maybe a condition in which the carriage motor energizing cannot be terminated, or an instantaneous over-current may be supplied to the carnage motor. In such cases, some elements could be damaged and faulty operation could occur. This is the reason for the drive voltage cut-off circuit.

When an error is detected, the all CPU ports are set HIGH, and all current setting ports of E05A88 (CI11) are set LOW, then the drive voltage cut-off circuit sets the TDA/B terminal of the SLA7026M motor driver to LOW. This cuts off the carriage motor energizing.

Table 2-25 gives the carnage motor controller / driver circuit specifications.

Table 2-25. Carriage Motor Controller / Driver Circuit Specifications

Source Voltage		35 VDC ± 10%								
Drive Method		Chopper constant current drive, 1-2/2-2 phase excitation								
CR speed	x 4	x 3	x 2	x 3/2	x 4/3	x I	x 3/4	x 2/3	x 1/2	x 1/3
Drive Frequency (pps)	—	4320	2880	4320	3640	2860	2160	1920	1440	960
Excitation Method	2-2 phase	2-2 phase	2-2 phase	1-2 phase	1-2 phase	1-2 phase	1-2 phase	1-2 phase	1-2 phase	1-2 phase
Drive Current Accelerating Constant speed / decelerating (A/phase)	2.5 2.0	2.0 1.5	2.0 1.5	1.5 1.0	1.5 1.0	1.0 1.0	1.0 0.6	1.0 0.6	1.0 0.6	1.0 0.6

< Bi-d Adjustment Function >

The bidirectional printing adjustment is used to align dots vertically for bi-directional printing. This is accomplished by delaying the print timing pulse for a line on which the carriage moves from the 136th column to the Ist, using the print timing pulse when the carriage moves from the 1st to 136th column as a reference. Since the print timing pulse vanes according to the carriage speed, the adjustment should be implemented for each speed mode. For this printer, the adjustment can be made for the 4fold and the default speed using 2-2 phase excitation (fast) or 1-2 phase excitation (slow) respectively.
The print timing delay time is set and adjusted by the software.
Figure 2-18 shows a block diagram of the carriage motor controller/driver circuit.

< Interlock Function>

The cover open switch is serially connected to the common (VPA) of Carnage motor. When the PRINTER COVER is open, the common line is closed for safety.

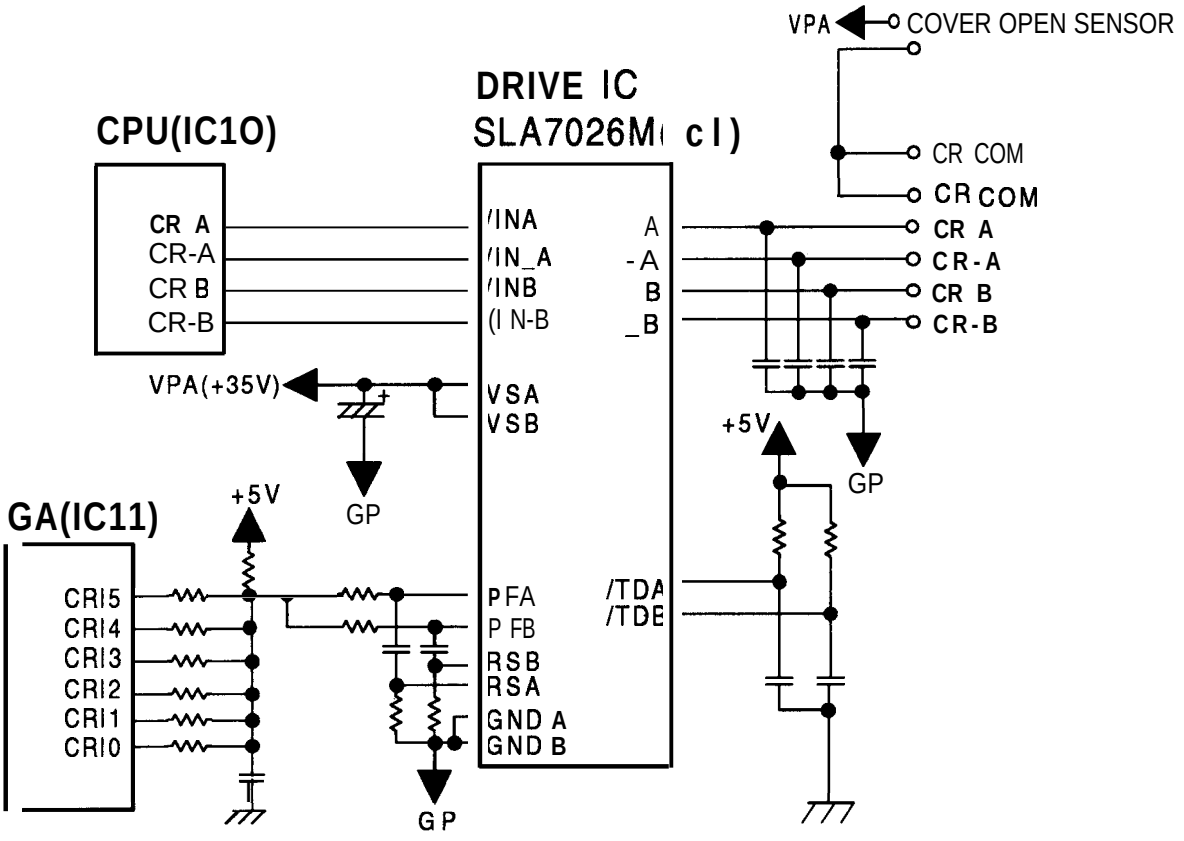

Figure 2-18. Carriage Motor Drive Circuit Diagram

2.3.9 Printhead Controller/Driver Circuit

Figure 2-19 shows a block diagram of the Printhead controller / driver circuit.
This printer is equipped with 24 head coils (12x 2 lines), and the driver circuit is a constant current coil driver circuit.
Each coil is driven by its two transistors (PNP and NPN) and a MOS-FET. The transistors supply common currents VPA and VPB, and the MOS-FET connects and disconnect ground GP, and they drive the coil with different timing. This is to increase the response speed of the head pin by driving coil T after the MOS-FET is turned off.
The data from the host computer is expanded into image data (CG data) and latched in the E05A88 (IC11).
Allocation of the head data is performed in the E05A88. The latched data is output by the internal processing of E05A88.

Table 2-26. Printhead Controller/Driver Circuit Specifications

Item	Content
Source Voltage	**35** VDC ±10%
Drive Current	Max. peak current (at 5'C) 3.3A/ pin
Response Period	463 sec. (2.16 KHz) at 5 'C, Copy 2 mode

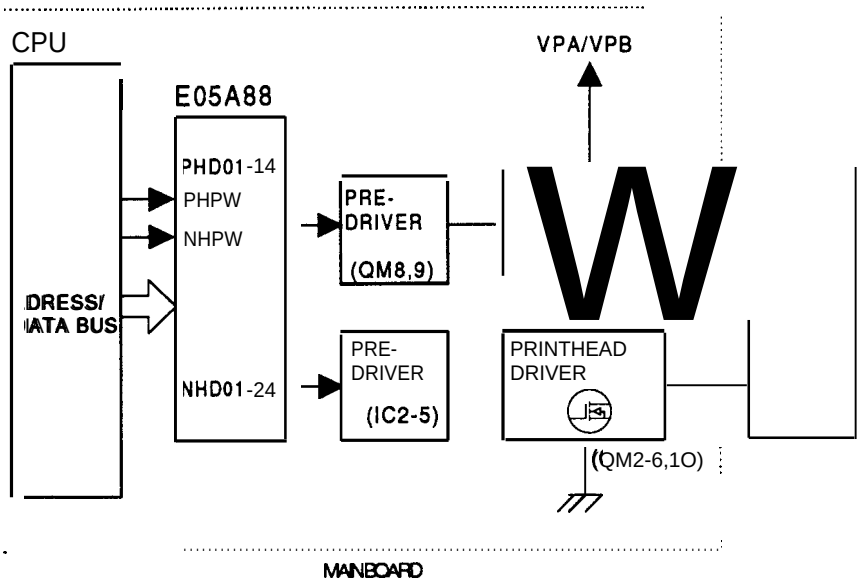

Figure 2-19. Printhead Controller/Driver Circuit Diagram

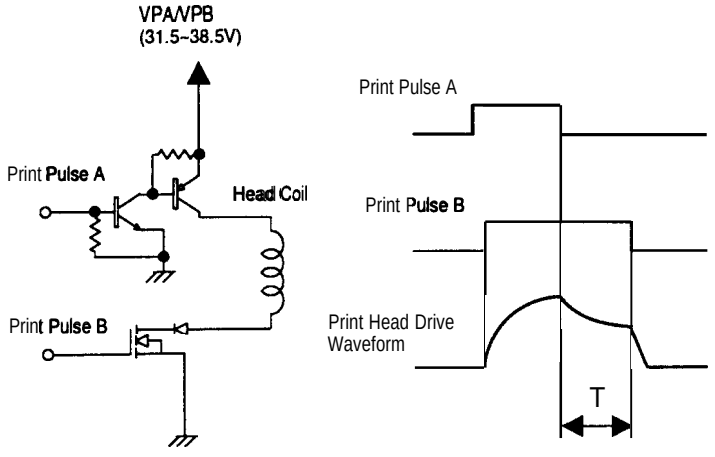

Figure 2-20. Printhead Drive Mechanism

2.3.10 Control Panel Circuit

Figure 2-21 shows a block diagram of the control panel circuit. E05A89 is agate array of the panel I/F. LCD driver I/F, the LED driver and the SW's input circuit are built-into the gate array. The serial interface is used between the control panel and the main board.

The cover open sensor is comected to the control panel circuit. If the PRINTER COVER is open, a cover open signal is output to the main board via the panel circuit. Then the printer is turned off-line.

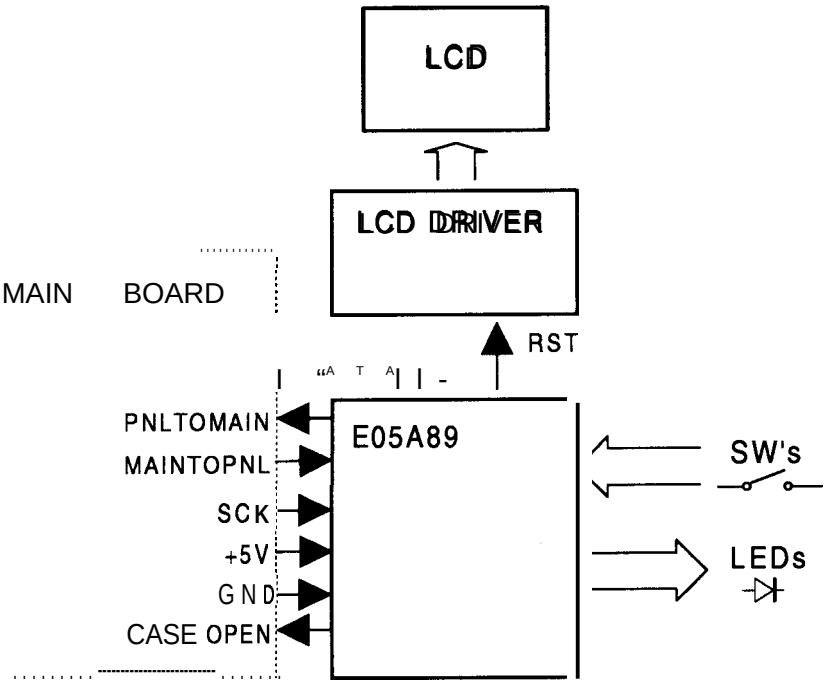

Figure 2-21. Control Panel Circuit Diagram

CHAPTER 3 Disassembly and Assembly

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List of Figures

List of Tables

3.1 OVERVIEW

The following sections describe disassembly and assembly procedures for the DLQ-3000. Several notes on transporting the unit are also provided.

3.1.1 Precaution for Disassembling the Printer

Read the following warnings before assembly or disassembly.

WARNING

- ***The Printhead reaches vey high temperatures, and if you place your hand on it, it could burn you. Always be sure that the Printhead is cool when you handle it.***
- ***The AC power cord and interface cable must be disconnected before moving the printer.***

CAUTIONS

- ***To maintain efficient printer operation, use only 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

The tools listed **in Table 3-1 should be available when replacing the main components.**

Table 3-1. List of Recommended Tools

Tool	Part No.
Phillips screwdriver #2	B743800200
Box driver (The opposite side is 7 mm.)	B741 700200
Thickness gauge set	B776702201
Round-nosed plier	B7404OO1OO
Diagonal wire cutter	B7405OO1OO
Tweezers	B741OOO1OO
ET holder #3	B740800500

3.1.3 Service Checks After Repair

When printer components are to be sent for servicing, first use the checklist shown in Table 3-2 to note the current state of the components. This checklist provides a record to make servicing and shipping more efficient.

Table 3-2. Inspection Checklist for Repaired Printer

Category	Component	Item to Check	Is Check Required?
Printer units	Printhead	Are any wires broken?	❑ Checked ❑ Not necessary
		Are any wires worn out?	❑ Checked ❑ Not necessary
	Carriage mechanism	Dose the carriage move smoothly? ❑ Movement noisy ❑ Mechanism dirty ❑ Mechanism oily	❑ Checked ❑ Not necessary
		Is the MOTOR ASSY., CR at the correct temperature and not over-heating?	❑ Checked ❑ Not necessary
	Paper advance mechanism	Is 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 paper in the printer feeding smoothly?	❑ Checked ❑ Not necessary
		Is the tractor feeding the paper correctly?	❑ CheckedD Not necessary
		Is the paper path clear of all obstructions?	❑ Checkeda Not necessary
		is the PLATEN free of damage?	❑ Checkeda Not necessary
	Ribbon mask	Is the ribbon mask free of distortion?	❑ CheckedDNot necessary
	Self- print test	Was the self-print successful?	❑ Checkeda Not necessary
	On-line test	Was the on-line test successful?	❑ Checked H Not necessary
adjustment	Printhead printing	Is the platen gap adjusted correctly?	❑ Checked ❑ Not necessary
		Is the Bi-directional print position adjusted correctly?	❑ Checked ❑ Not necessary
	Default setting	Have user changeable setting been reset to default value?	❑ Checked ❑ Not necessary
		Has the SENSOR ASSY.,LOAD been reset to default value?	❑ Checked DNot necessary
	Carriage	Has the BELT TENSION,CR been adjusted?	❑ Checked ❑ Not necessary
System upgrade	ROM version	The ROM version is XXX.	❑ Checkeda Not necessary
	Shipment	Has the ribbon been removed?	❑ Checkedn Not necessary
		Have all relevant parts been included in the shipment?	❑ Checkeda Not necessary

3.1.4 Specifications for Screws

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

Table 3-3. Abbreviations Used for Screws

Addreviaiton	Part Name
CB	**Cross-Bind head Screw**
CBB	Cross-Bind head B-tight Screw
CBS	I Cross-Bind head S-tight Screw
CBB(P4)	Cross-Bind head B-tight Screw with Plain Washer
CP(P4)	Cross-Pan head Screw with Plain Washer
CC	Cross-Cap head Screw
RE	Retaining E-ring

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.
- After replacing the BOARD ASSY.,MAIN, reload the printer control software in Section 3.3.

Disassembly includes the following six procedures:

1. Removing the Printhead
2. Removing the COVER, REAR
3. Removing the Circuit Board
4. Removing the Control Panel
5. Removing the HOUSING ASSY., UPPER
6. Removing the Printer Mechanism

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

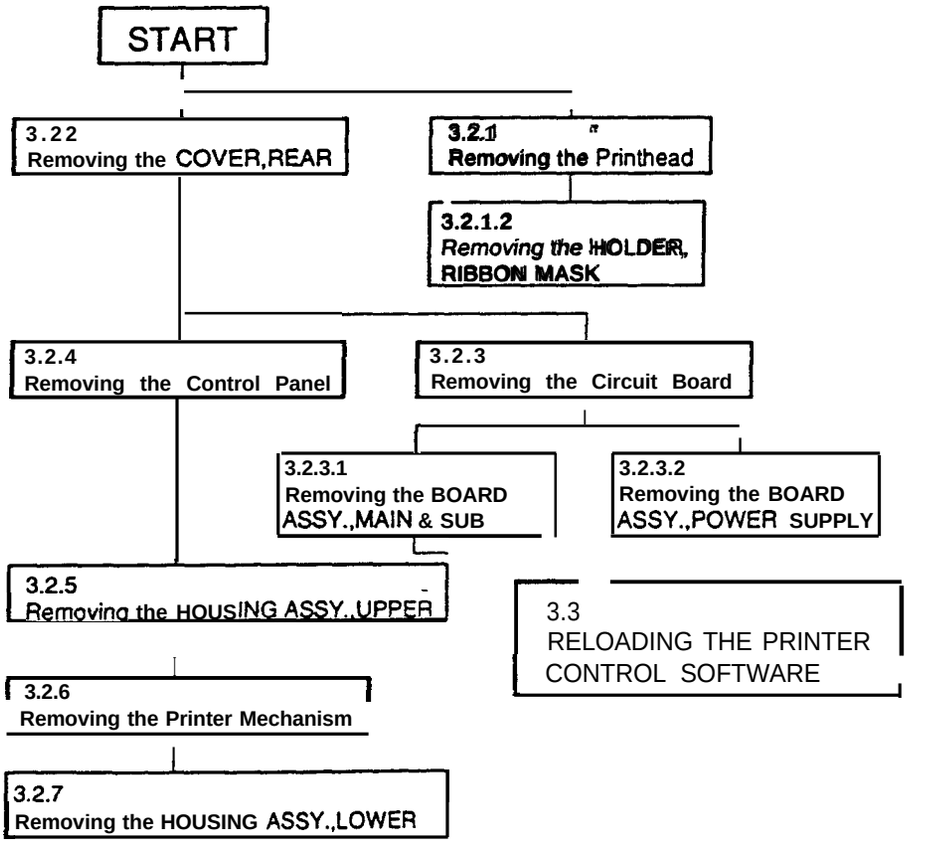

Figure 3-1. Disassembly and Assembly

3.2.1 Removing the Printhead '

3.2.1.1 Removing the Printhead

The printhead should be changed by performing the following procedure.

Step 1 : Open the COVER ASSY.,PRINTER and remove the SHEET GUIDE ASSY.,FRONT.
Step 2: Remove the ribbon cartridge.
Step 3: Remove the two screws CBS (M3 x 10) attaching the printhead.
Step 4: Putting the printhead upward a little, the two FFCs from the pnnthead.
Step 5 : Remove the printhead from the carriage.

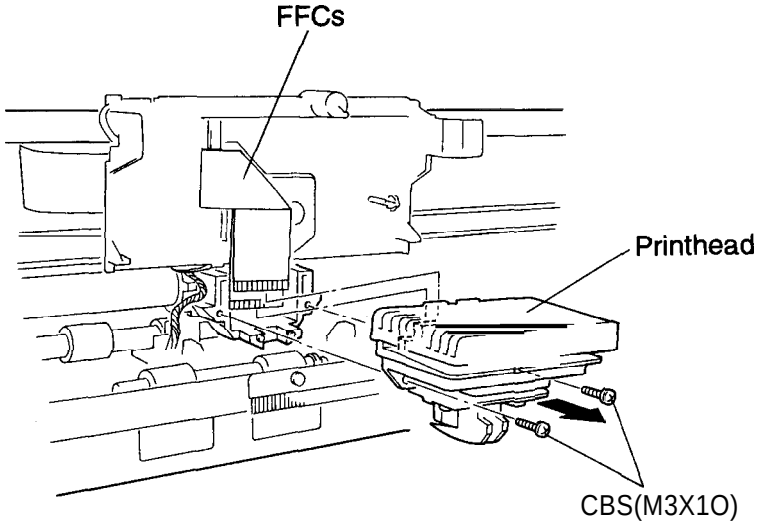

Figure 3-2. Removing the Printhead

3.2.1.2 Removing the HOLDER, RIBBON MASK

This section describes the procedure used to remove the HOLDER,RIBBON MASK which is required for precise measurement of the gap between the head and the platen during the parallelism and platen gap adjustments described in Chapter 4.2. Remove the LEVER ASSY., EJECT to insert the thickness gauge. Then proceed as follows.

Step 1 : Remove the printhead. (Refer to Section 3.2.1.1.)
Step 2 : Untie the PW detector cord from the CARRIAGE ASSY.
Step 3: Pull the two notches of the HOLDER,RIBBON MASK outward. Then remove the HOLDER,RIBBON MASK by sliding it forward.

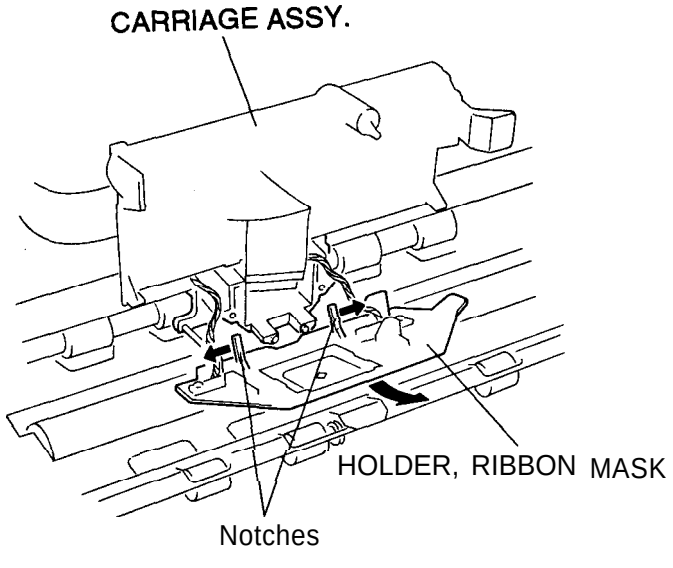

Figure 3-3. Removing the HOLDER, RIBBON MASK

3.2.2 Removing the COVER,REAR

Step 1 : Remove the two screws CBS (M3 x 12) which secure the COVER,CONNECTOR, UPPER. Then remove the COVER,CONNECTOR,UPPER.

Step 2: Remove the screw CBB (M3 x 12) and CBB (M3 x 40) which secure the COVER, REAR.

Step 3 : Remove the COVER,REAR.

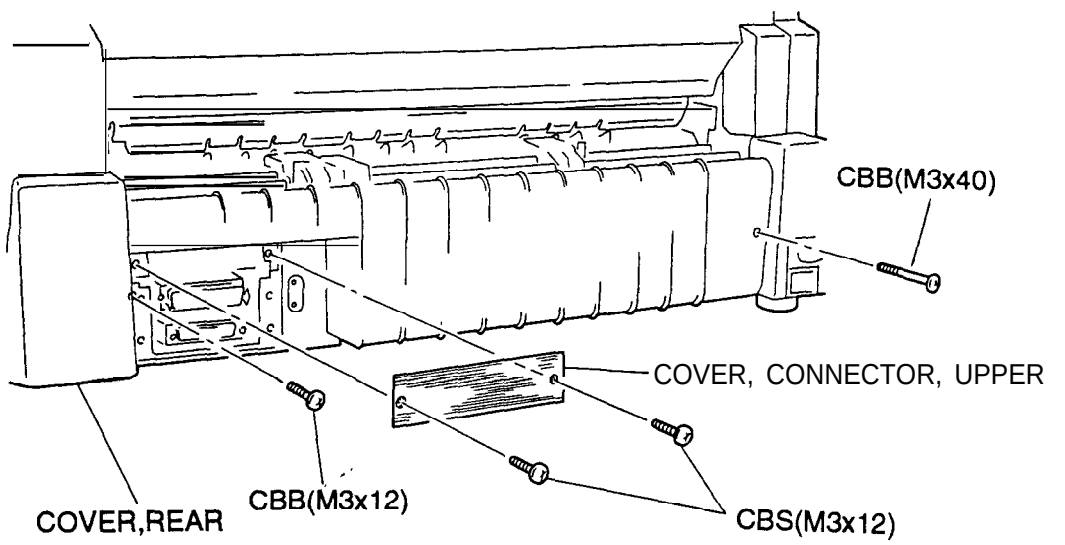

Figure 3-4. Removing the COVER,REAR

3.2.3 Removing the Circuit Board

The circuit boards in the DLQ-3000 are composed of the BOARD ASSY., C124 MAIN & SUB (control circuit board) and the BOARD ASSY., C124 PSB/PSE (power supply board). These two boards can be removed by simply removing the COVER,REAR.

3.2.3.1 Removing the BOARD ASSY., MAIN& SUB

Step 1: Remove the COVER,REAR. (Refer to Section 3.2.2)

Step 2: Remove the two screws CBB (M3 x 10) which fix the BOARD ASSY.,MAIN to the SHIELD PLATE.

Step 3: Remove the two screws CBS (M3 x 6) under the I/F connecter located at the lower left of the main board.

Step 4: Remove the two screws CBS (M3 x 8) tightening the FG cable of the fan and panel cables.

Step 5: Pull off all the connectors from the BOARD ASSY.,MAIN and pull the board out.

ASSEMBLY POINT

1. After replacing the BOARD ASSY.,MAIN, reload the printer control software in Section 3.3.
2. For assembly, the board should be fixed by tightening the right screw together with the FG cable for the fan and the left screw with the FG cable for the panel where the cable touches the connector.

WARNING

For assembly, the Blue Headwire harness should be connected to CN 2 on the BOARD ASSY.,MAIN., and the Red Headwire harness should be connected to CN 1. otherwise, the Printhead or the BOARD ASSY., MAIN maybe permanently damaged.

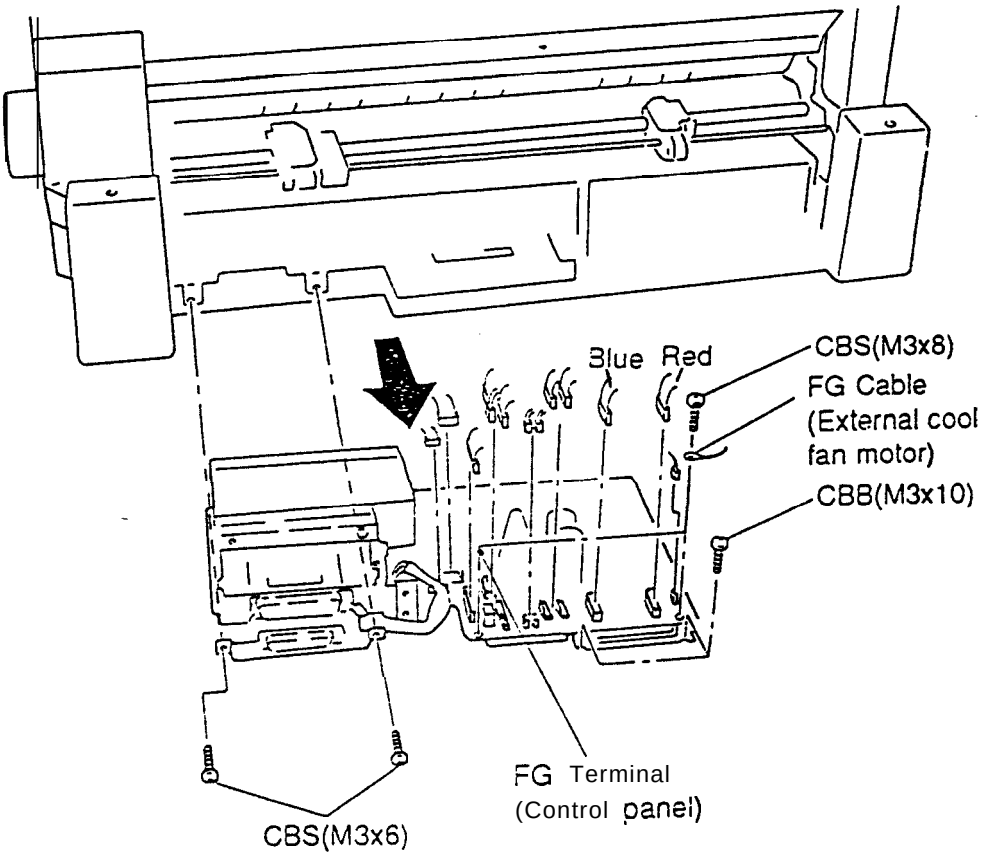

Figure 3-5. Removing the BOARD ASSY., MAIN& SUB

3.2.3.2 Removing the BOARD ASSY., POWER SUPPLY

Step 1 : Remove the COVER,REAR. (Refer to Section 3.2.2.)

Step 2: Remove the two screws CBS (M3 x 6) which fix the BOARD ASSY., POWER SUPPLY to the SHIELD PLATE.

Step 3: Pull off all the comectors from the BOARD ASSY., POWER SUPPLY and pull the board out.

Note: For disassembly, the board should be fixed by tightening the right screw together with the FG cable for the FAN ASSY. of the power supply board.

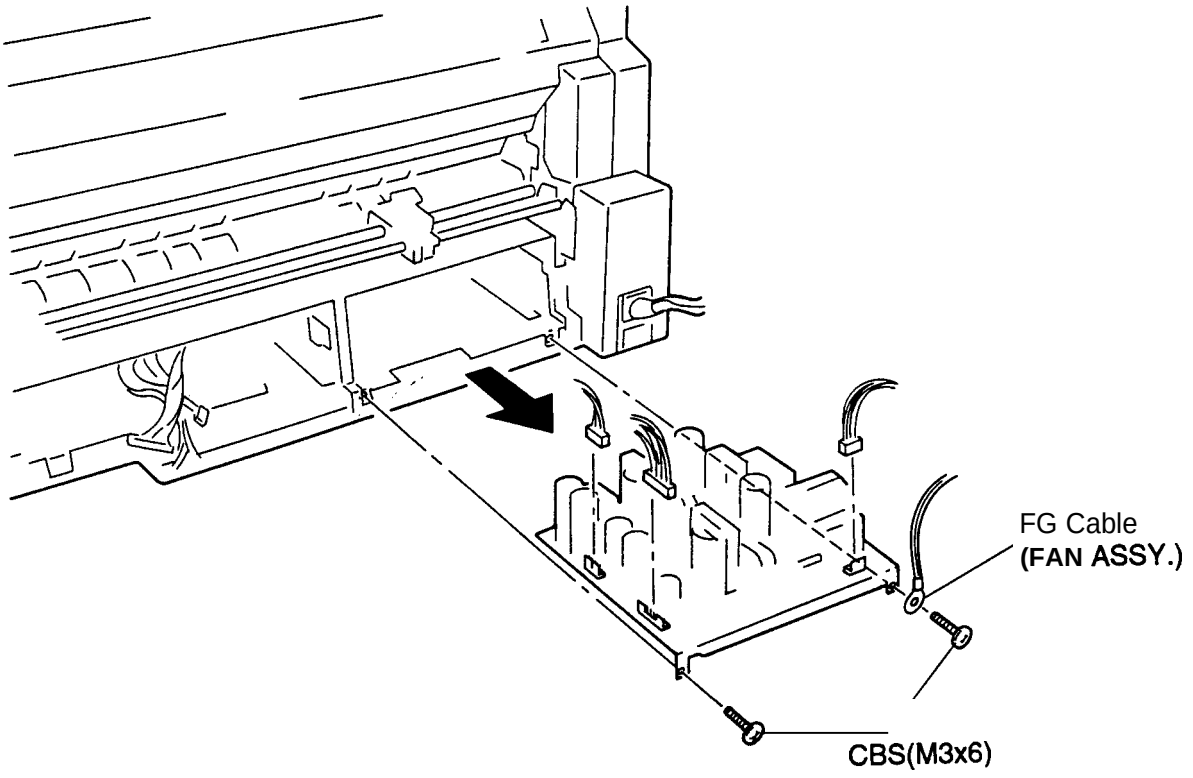

Figure 3-6. Removing the BOARD ASSY., POWER SUPPLY

3.2.4 Removing the Control Panel

Step 1 : Open the printer cover.

Step 2: Disengage a hook of the control panel from the HOUSING ASSY., UPPER on the inside of the HOUSING ASSY., UPPER.

Step 3: Pull off the WIRE-HARNESS from the control panel on the inside of the HOUSING ASSY.,UPPER.

Step 4: Remove the control panel from the HOUSING ASSY.,UPPER.

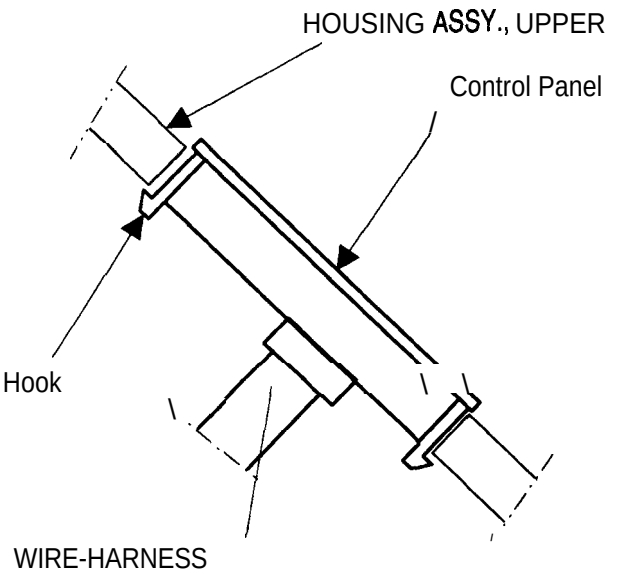

Figure 3-7. Removing the Control Panel

3.2.5 Removing the HOUSING ASSY.,UPPER

Step 1 : Remove the screw CBB (M3 x 12) which secures the COVER,SHIELD,REAR and remove it.

Step 2 : Remove the COVER,REAR. (Refer to Section 3.2.2.)

Step 3 : Remove the KNOB, LEVER,RELEASE and CAP,G,ADJUST.

Step 4: Remove the control panel. (Refer to Section 3.2.3.)

Step 5 : Remove the two screws CBB (M4 x 16) which secure the HOUSING ASSY.,UPPER.

Step 6: Push the two notches at the lower end of the main body with screwdrivers, and remove the HOUSING ASSY.,UPPER by lifting it up.

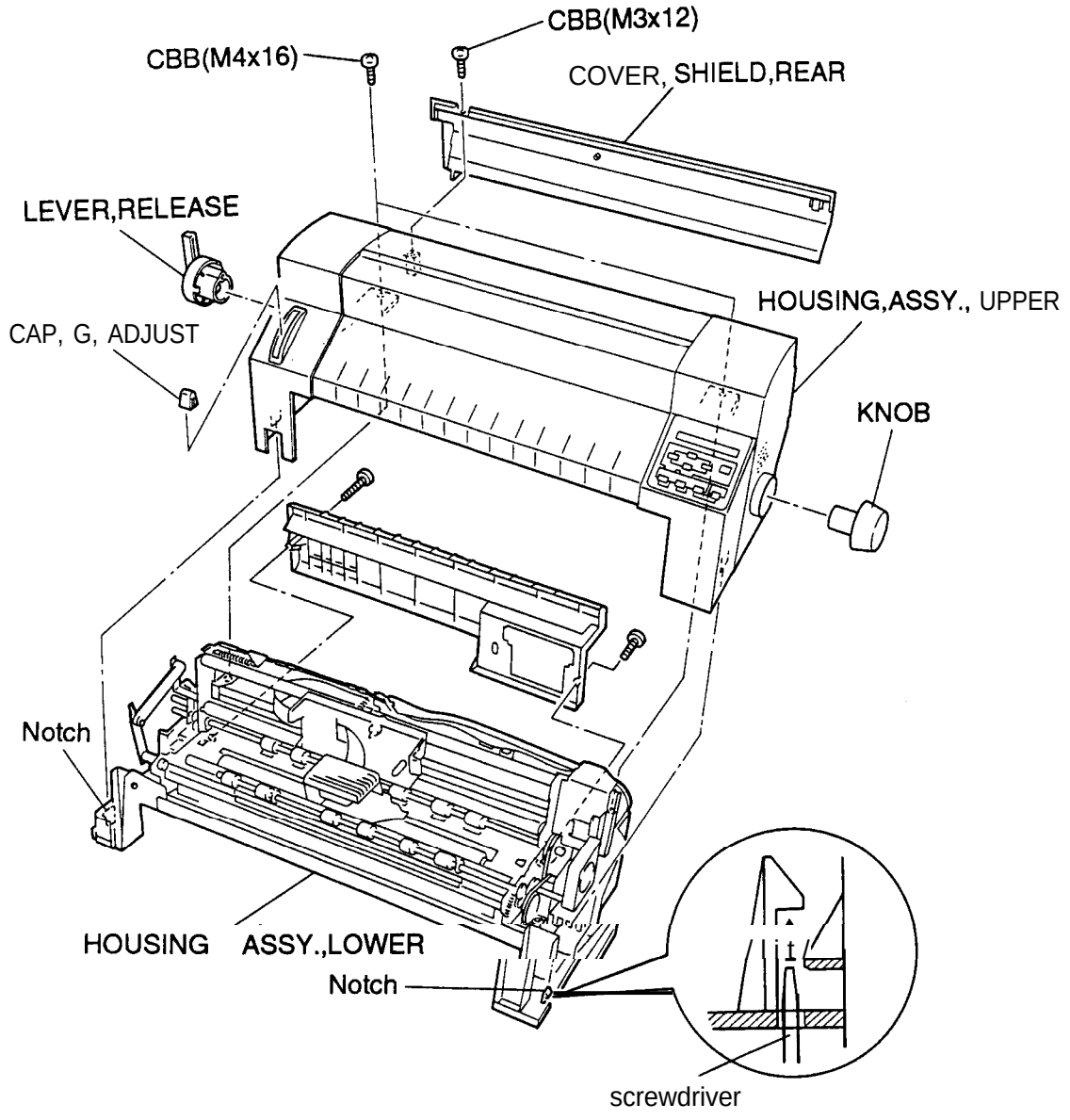

Figure 3-8. Removing the HOUSING,ASSY.,U PPER

3.2.6 Removing the Printer Mechanism

The figure below shows the removal procedure for the main components of the DLQ-3000.

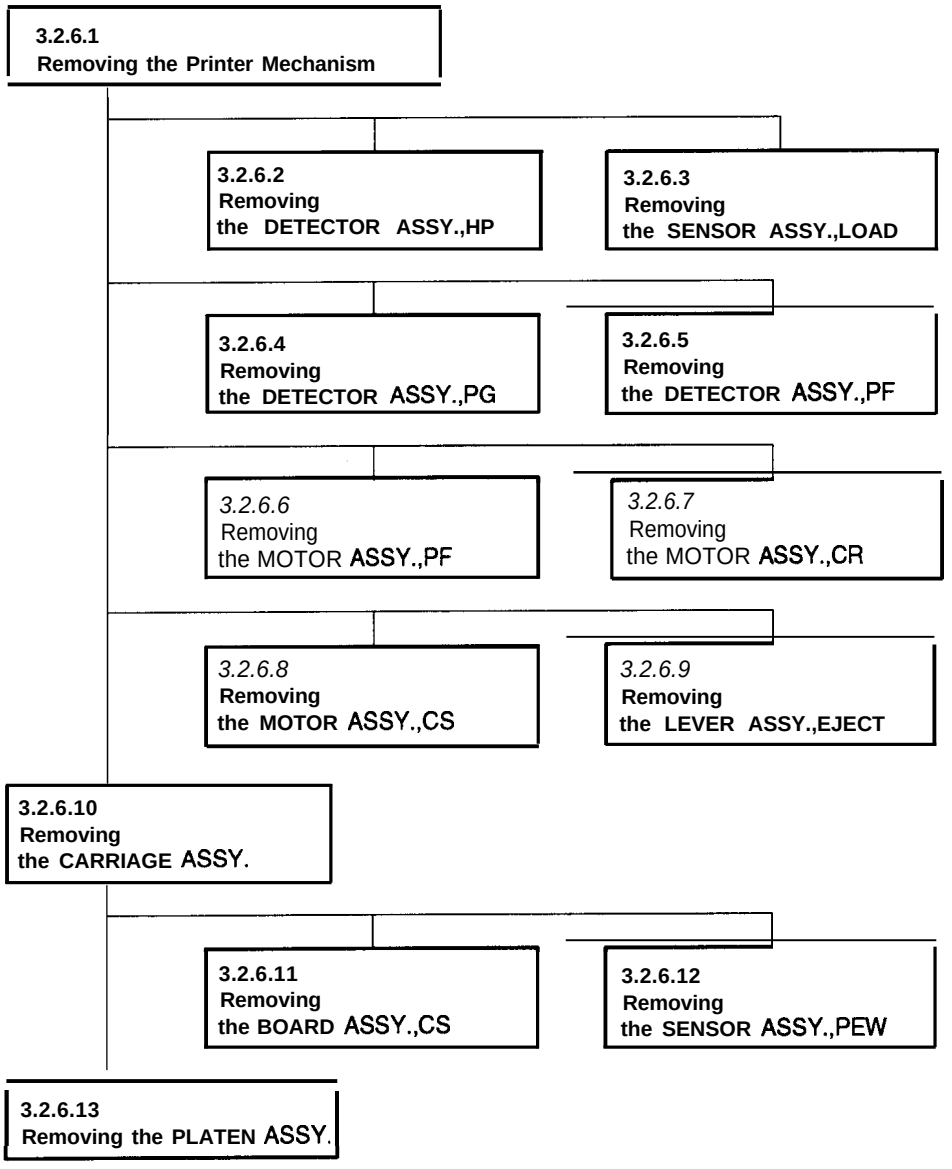

Figure 3-9. Removal Procedure for the Main Components

3.2.6.1 Removing the Printer Mechanism

Step 1 : Remove the HOUSING ASSY.,UPPER. (Refer to Section 3.2.5.)

Step 2: Disconnect the three FFCs from the mechanism junction board.

Step 3: Remove the two screws CBS (M3 x 6) from both sides of the frame which fix the printer mechanism to the left and right GRANDING PLATEs.

Note: The screw on the right side should be removed by inserting a Screwdriver from under the junction board through the hole in the HOUSING, LOWER.

Step 4: Remove the screw CBS (M3 x 6) which secures the FG cable of the control panel harness at the right front of the mechanism. Then remove the FG cable from the printer mechanism.

Step 5 : Remove all the connectors from the back right of the printer mechanism.

Step 6: Remove the four screws CBB(P)(M4 x 25) which fix the printer mechanism to the HOUSING ASSY.,LOWER. Then remove the printer mechanism.

ASSEMBLY POINT

1. For reassembly, match the colors of the connectors.
2 The FFCs should be inserted so that the coated side faces outward.

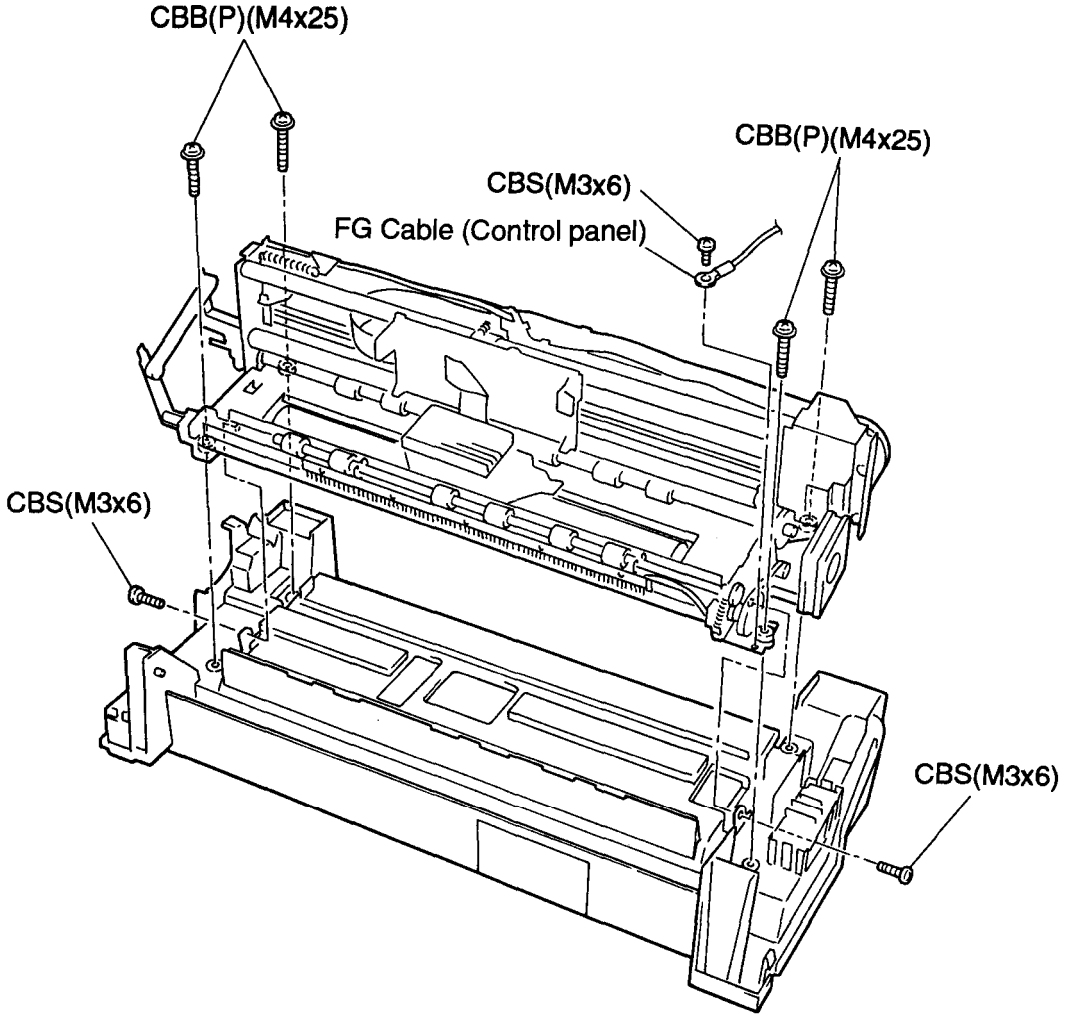

Figure 3-10. Removing the Printer Mechanism

3.2.6.2 Removing the DETECTOR ASSY.,HP

Step 1 : Remove the printer mechanism. (Refer to Section 3.2.6.1.)

Step 2 : Push the notches (black) from the rear of the FRAME,CR. Then remove the DETECTOR ASSY.,HP.

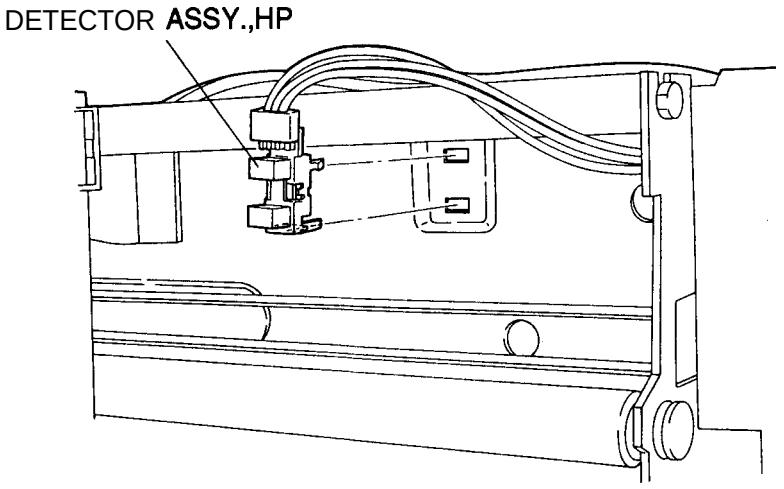

Figure 3-11. Removing the DETECTOR ASSY.,HP

3.2.6.3 Removing the SENSOR ASSY.,LOAD

Step 1 : Remove the printer mechanism. (Refer to Section 3.2.6.1)

Step 2: Remove the screw CB (M2.5 x 5) which fixes the SENSOR ASSY.,LOAD to the LEVER ASSY.,EJECT. Then remove the SENSOR ASSY.,LOAD.

ASSEMBLY POINT

1) Do not to set the sensor wire to the hook of the LEVER ASSY.,LOAD too tight or loose.
2) Perform the SENSOR ASSY.,LOAD adjustment. (Refer to Section 4.5)

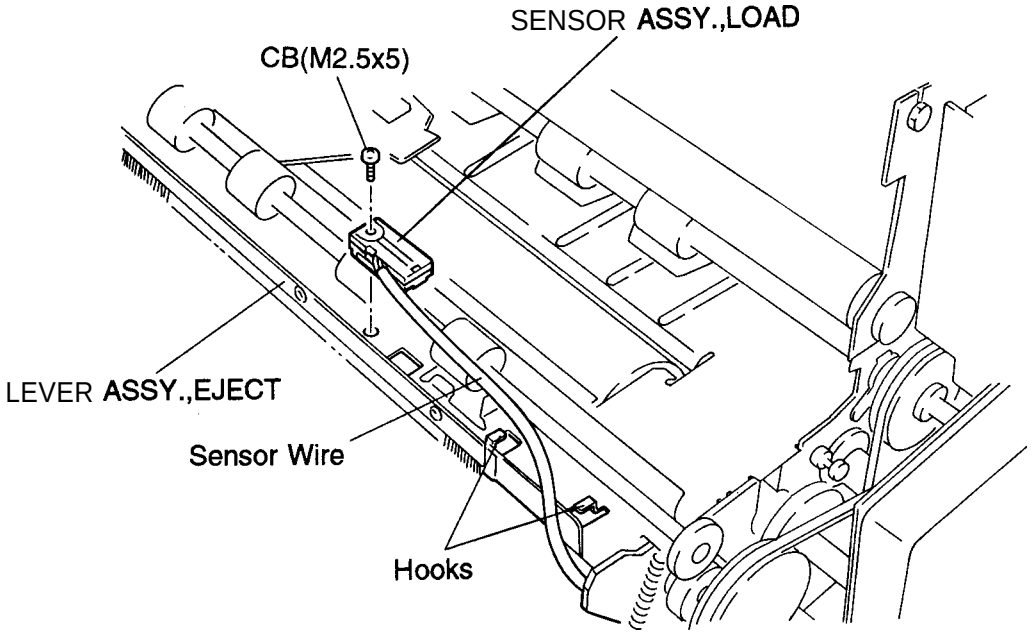

Figure 3-12. Removing the SENSOR ASSY.,LOAD

3.2.6.4 Removing the DETECTOR ASSY.,PG

Step 1 : Remove the printer mechanism. (Refer to Section 3.2.6.1.)

Step 2: Set the LEVER, G, ADJUST to 9.

Step 3: From the rear of the FRAME ASSY., LEFT, push the two notches securing the DETECTOR ASSY., PG using a screwdriver, and remove the DETECTOR ASSY, PG.

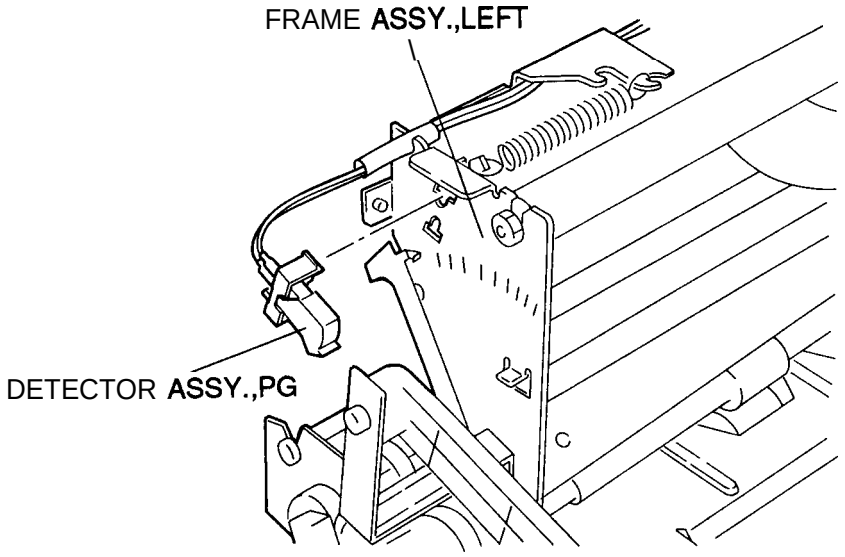

Figure 3-13. Removing the DETECTOR ASSY.,PG

3.2.6.5 Removing the DETECTOR ASSY.,PF

Step 1 : Remove the printer mechanism. (Refer to Section 3.2.6.1)

Step 2 : Set the LEVER,RELEASE to the left.

Step 3: From the rear of the FRAME ASSY.,LEFT, push the two notches and remove the DETECTOR ASSY.,PF.

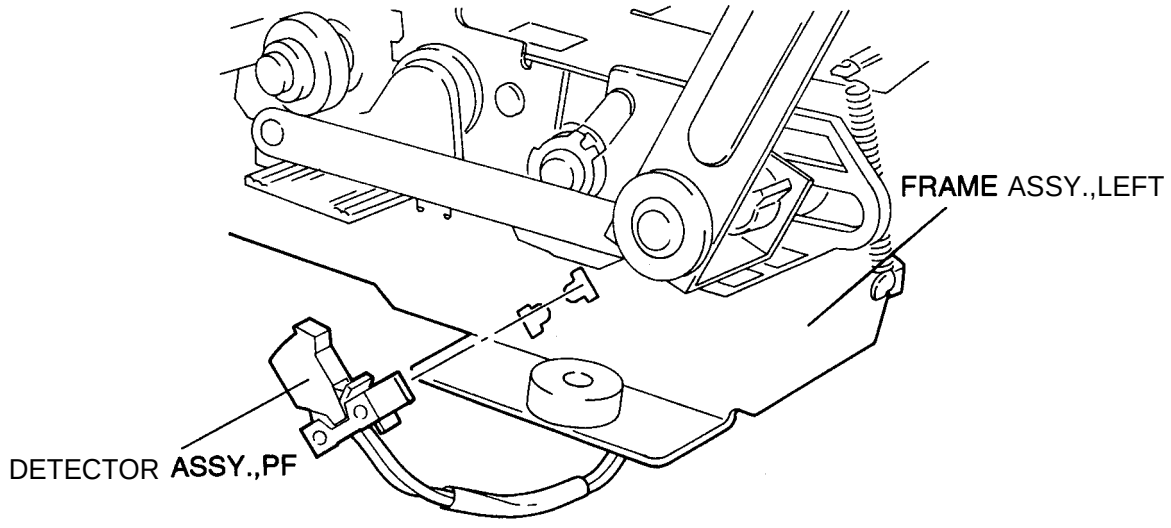

Figure 3-14. Removing the DETECTOR ASSY.,PF

3.2.6.6 Removing the MOTOR ASSY.,PF

Step 1 : Remove the printer mechanism. (Refer to Section 3.2.6.1.)

Step 2: Remove the two screws CS(P4) (M3 x 6) securing the MOTOR ASSY.,PF.

Step 3: Remove the SHAFT,PF,TENSION securing the MOTOR ASSY.,PF, then remove the MOTOR ASSY.,PF.

ADJUSTMENT REQUIRED

The following adjustments must be performed when the carriage unit is removed or replaced: TIMING BELT,CR Tension Adjustment (See Section 4.4.)

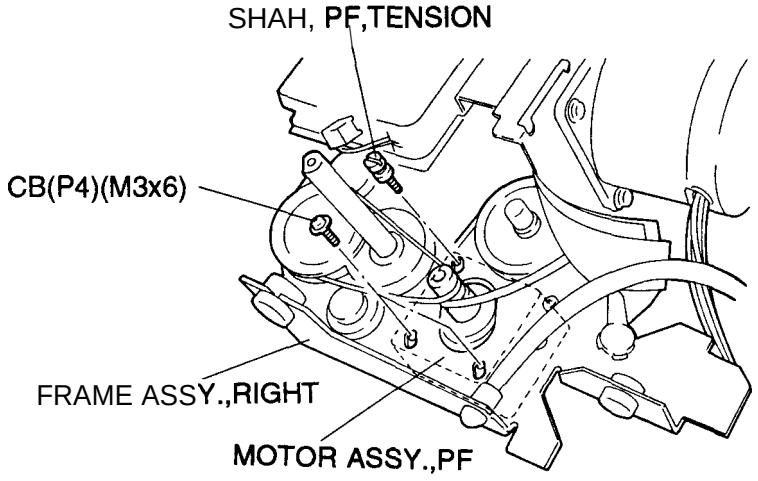

Figure 3-15. Removing the MOTOR ASSY.,PF

3.2.6.7 Removing the MOTOR ASSY.,CR

Step 1: Remove the printer mechanism. (Refer to Section 3.2.6.1)

Step 2: Remove the screw CBS (M3 x 6) securing the GROUNDING PLATE,FFC with external cooling fan to FRAME,CR and remove the GROUNDING PLATE,FFC.

Step 3: Remove the EXTENSION SPRING,3275 and untie the tension of TIMING BELT,CR.

Step 4: Remove the four screws CP(M3 x 16) securing the MOTOR ASSY.,CR to the FRAME,CR and the screw CBS (M3 x 6) securing the GROUNDING PLATE,CR,MOTOR, then remove the MOTOR ASSY.,CR.

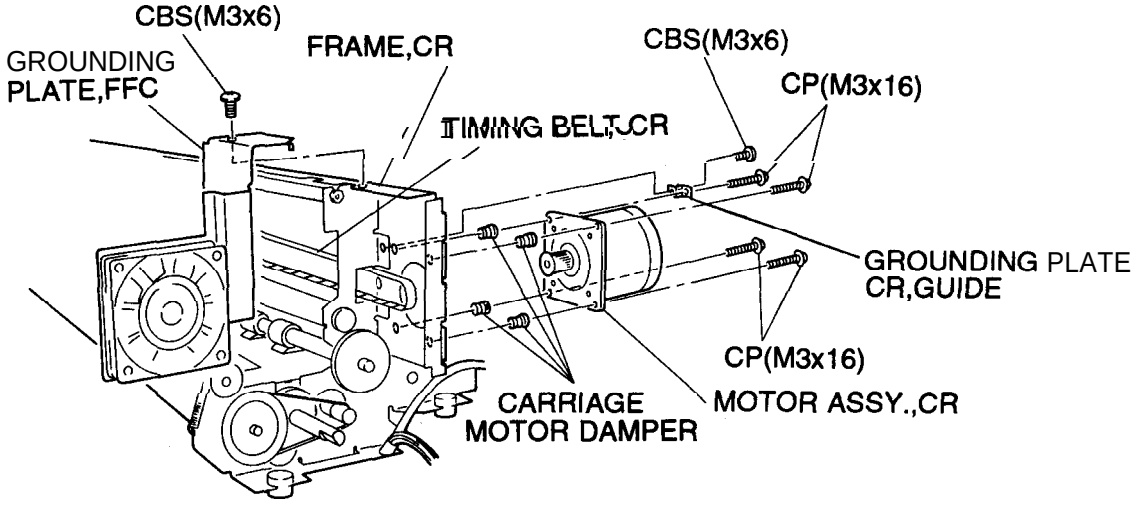

Figure 3-16. Removing the MOTOR ASSY.,CR

3.2.6.8 Removing the MOTOR ASSY.,CS

Step 1 : Remove the printhead. (Refer to Section 3.2.1.)

Step 2: Move the CARRIAGE ASSY. completely to the right.

Step 3: Move the CARRIAGE ASSY. to the left, pull off the connectors from the BOARD ASSY.,CS, and remove the MOTOR ASSY.,CS.

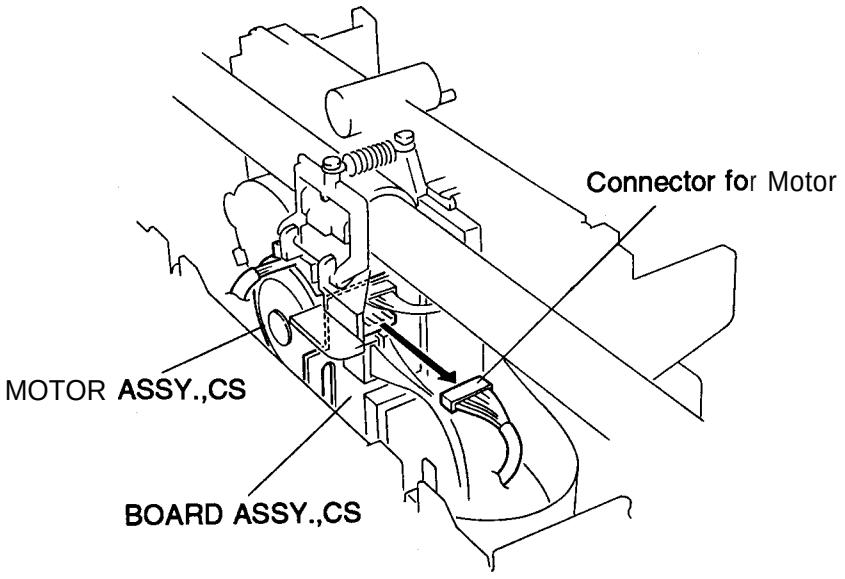

Figure 3-17. Removing the Connector of MOTOR ASSY.,CS

Step 4: Insert a screwdriver through each of the two holes from the rear of the FRAME ASSY.,CR, and remove the two screws CBS (M3 x 6) securing the MOTOR ASSY.,CS to the CARRIAGE ASSY.

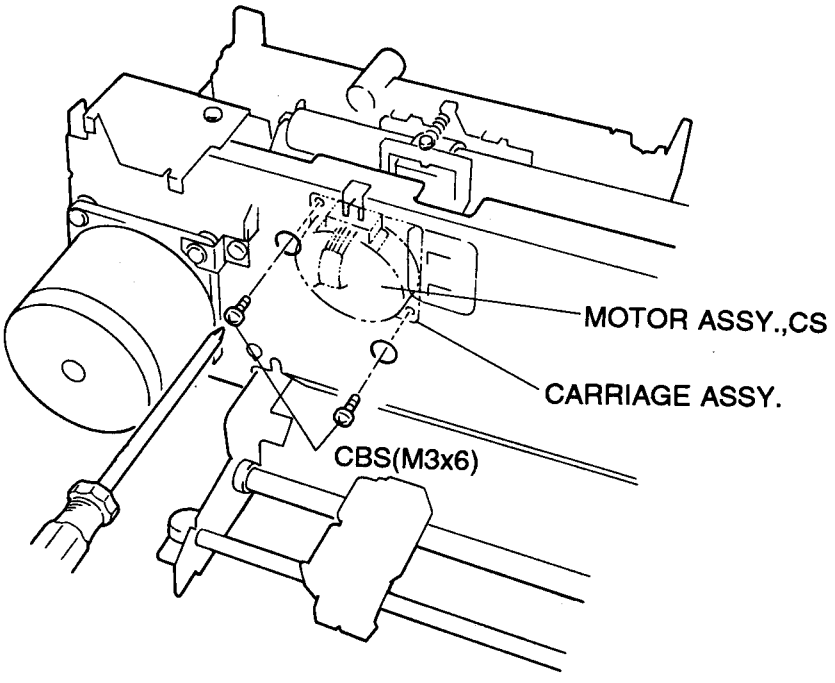

Figure 3-18. Removing the MOTOR ASSY.,CS

3.2.6.9 Removing the LEVER ASSY.,EJECT

Step 1 : Remove two EXTENSION SPRING,353 from both ends of the LEVER ASSY., EJECT.

Step 2: Remove the SENSOR ASSY.,LOAD. (Refer to Section 3.2.6.3.)

Step 3 : Remove the E ring (#3) which fixes the LEVER ASSY.,EJECT to the FRAME,ASSY., RIGHT.

Step 4: Move the LEVER ASSY.,EJECT to the left. Then remove it from both ends of the FRAME.

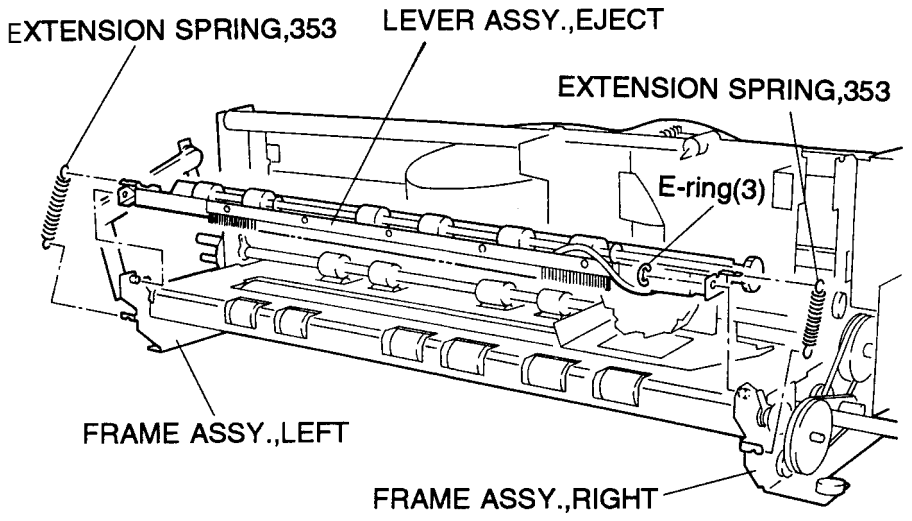

Figure 3-19. Removing the LEVER ASSY.,EJECT

3.2.6.10 Remove the CARRIAGE ASSY.

Step 1 : Remove the printer mechanism. (Refer to Section 3.2.6.1.)

Step 2 : Pulling the two notches on the HOLDER,HEAD,CABLE outward, pull up the HOLDER, HEAD,CABLE (with FFCs) from the FRAME,CR.

Step 3 : Remove the FFCs from the HOLDER,HEAD,CABLE.

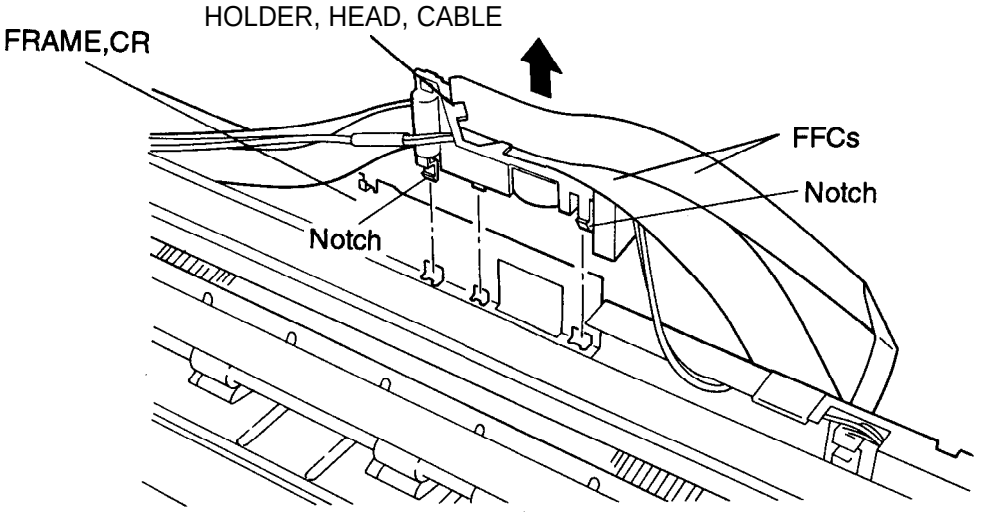

Figure 3-20. Removing the HOLDER,HEAD,CABLE

Step 4: Remove the SPRING,CR,GUIDE, LOWER pushing the LEVER,PARALLEL,SHAFT between the FRAME,CR and the FRAME ASSY.,RIGHT.

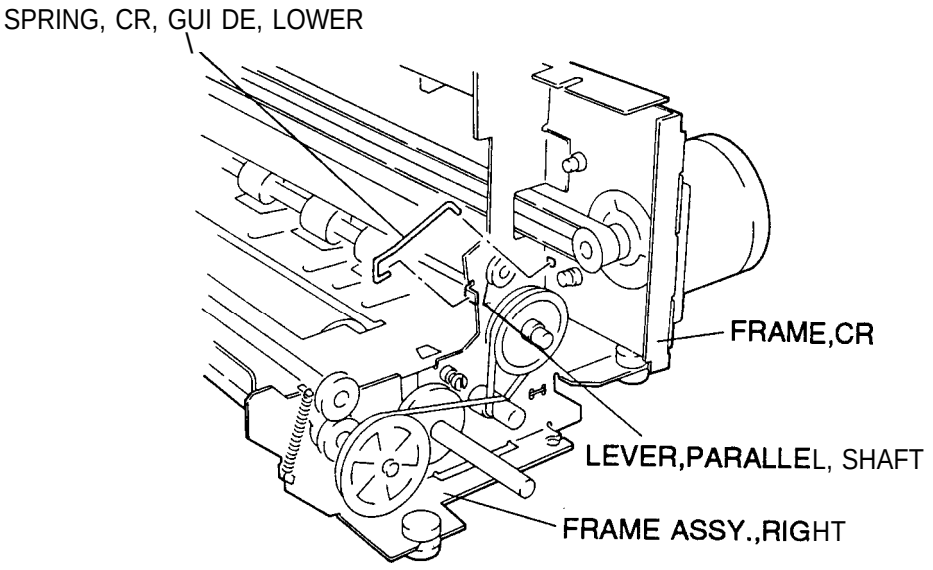

Figure 3-21. Removing the SPRING,CR,GUIDE, LOWER

Step 5: Remove the BELT TENSION SPRING to loose the tension of the TIMING BELT,CR. Then remove the TIMING BELT,CR from the pulley of the MOTOR ASSY.,CR.

Step 6: Remove the four screws CBS (M3 x 6) securing the FRAME,CR to FRAME ASSY., RIGHT and LEFT. Pulling the FRAME,CR upward a little and remove backward. Then remove the TIMING BELT,CR from the PULLEY ASSY.,DRIVEN.

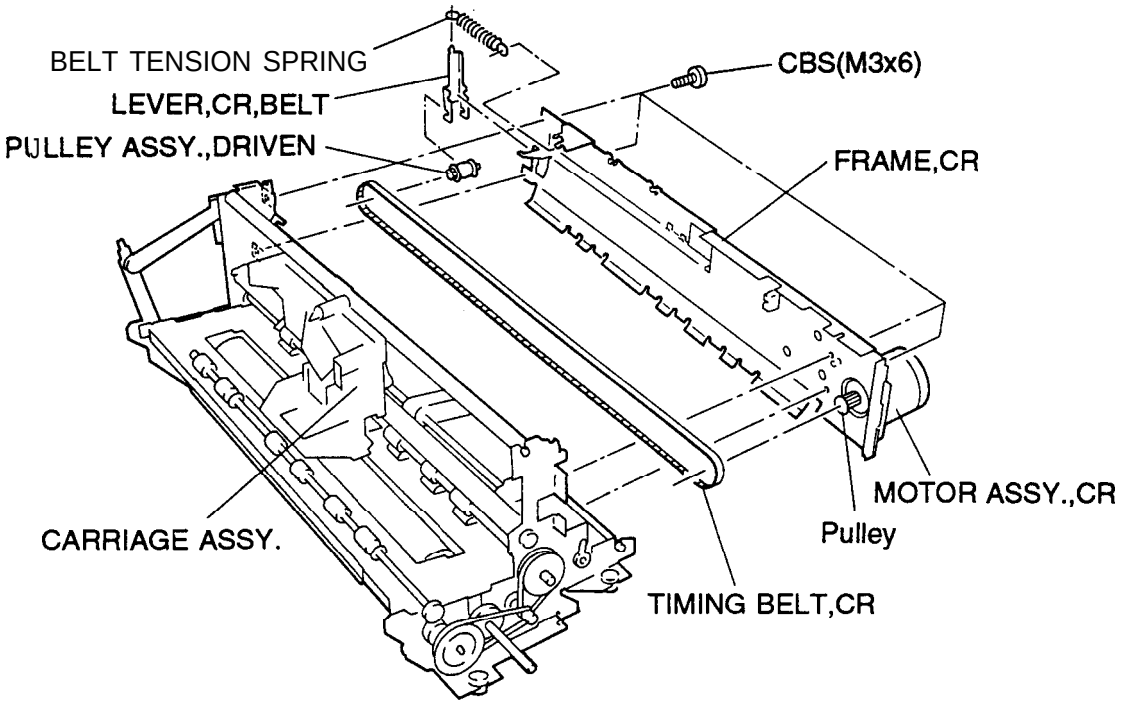

Figure 3-22. Removing the TIMING BELT,CR

ASSEMBLY POINT

When reassembling, pay attention to the TIMING BELT,CR orientation.

ASSEMBLY POINT

Attach the TIMING BELT,CR as 3-10 teeth of the TIMING BELT appear.

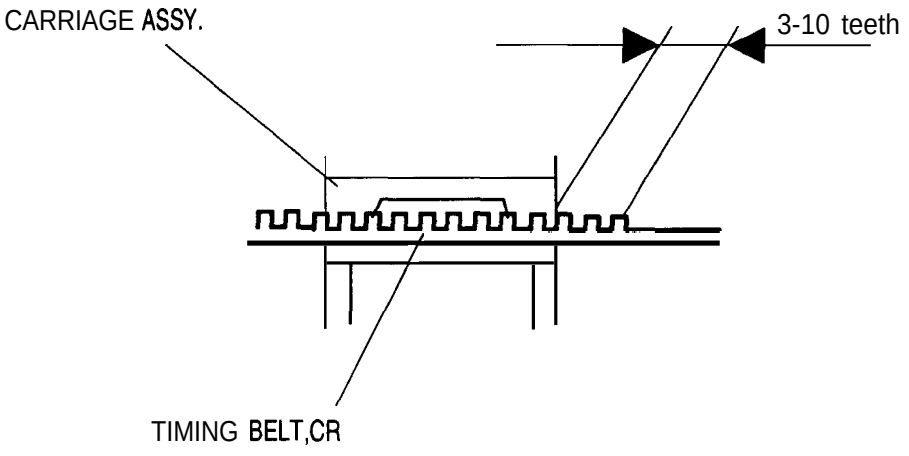

Figure 3-23. Attaching the TIMING BELT,CR

Step 7: Remove the two HEXAGON NUTS WITH OW(M4) securing the SHAFT,CR,GUIDE, UPPER to the FRAME ASSY.,LEFT and RIGHT. Remove the SPRING,154 and then remove the SHAFT,CR,GUIDE, UPPER upward.

Step 8 : Remove the HEXAGON NUT WITH OW(M4) securing the LEVER,G,ADJUST to the SHAFT,CR,GUIDE,LOWER. Remove the SPACER,CR,SHAFT and the LEVER, PARALLEL,SHAFT. Then, remove the CARRIAGE ASSY. with the SHAFT,CR, GUIDE,LOWER, moving the SPACER,CR,SHAFI' with CARRIAGE ASSY., left and right.

Step 9: Pull out the SHAFT,CR,GUIDE,LOWER.

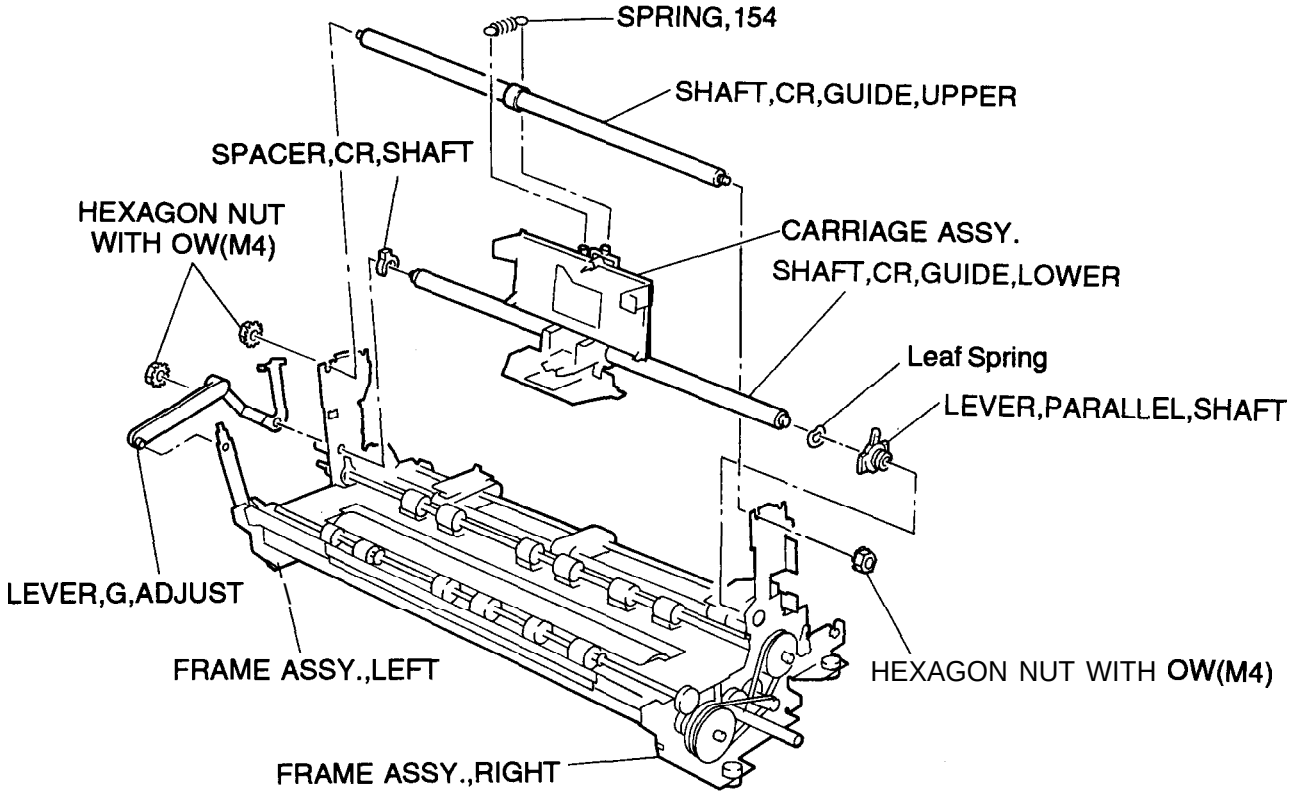

Figure 3-24. Removing the CARRIAGE ASSY.

3.2.6.11 Removing the DETECTOR ASSY.,CS

Step 1 : Remove the pnnthead. (Refer to Section 3.2.1.)

Step 2: Remove the CARRIAGE ASSY. (Refer to Section 3.2.6.10.)

Step 3 : Detach six notches on the rear of the carnage. Then remove the HOLDER, RIBBON, CARTRIDGE.

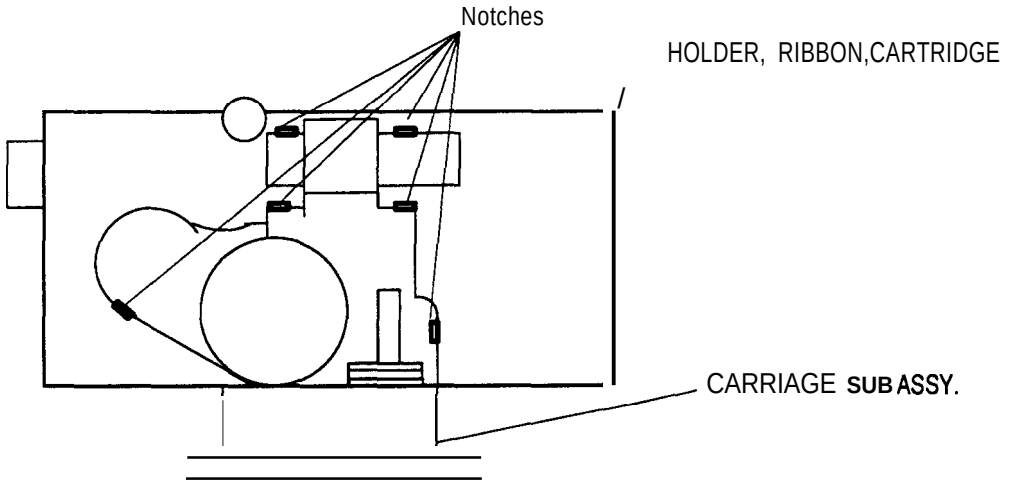

Figure 3-25. Bottom View of the CARRIAGE ASSY.

Step 4: Pull out the connectors for the BOARD ASSY.,CS which is secured in the CARRIAGE. Then remove the CS detector together with the board.

Step 5: Remove the FFC of the BOARD ASSY.,CS from the HOLDER,RIBBON,CARTRIDGE and then remove the BOARD ASSY.,CS from the CARRIAGE.

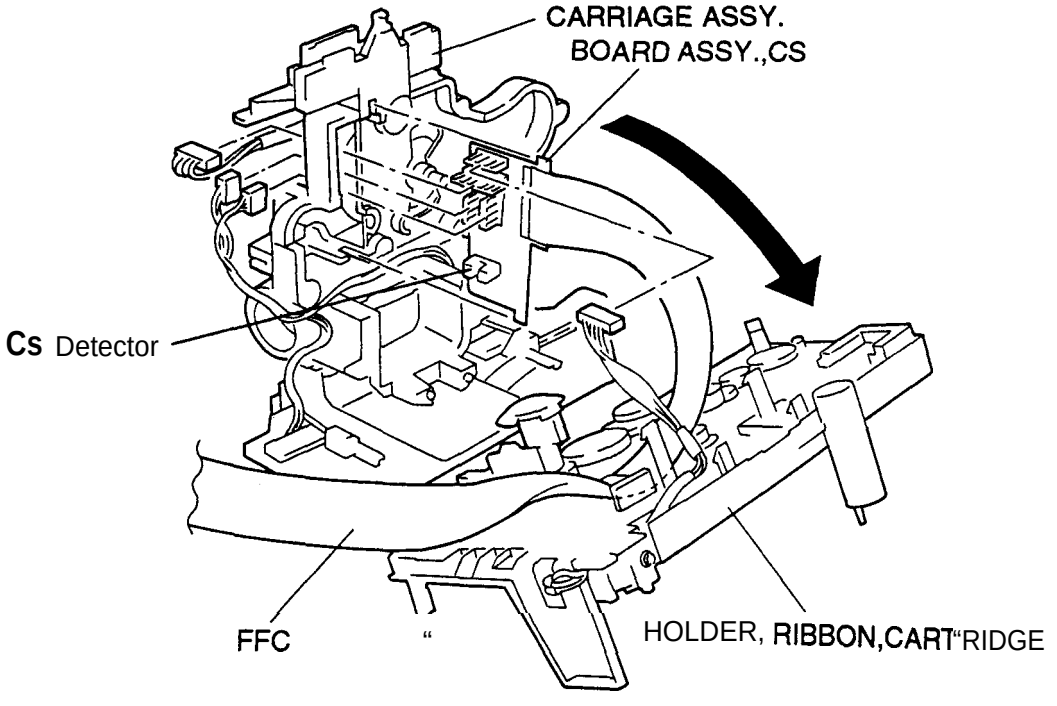

Figure 3-26. Removing the BOARD ASSY.,CS

ASSEMBLY POINT

It is possible to remove the BOARD ASSY.,CA without removing the CARRIAGE ASSY. But it is necessary to notice the following.
When the carriage cover is attached for reassembly, set the CAM,CS so that the follow section faces the CS detector.

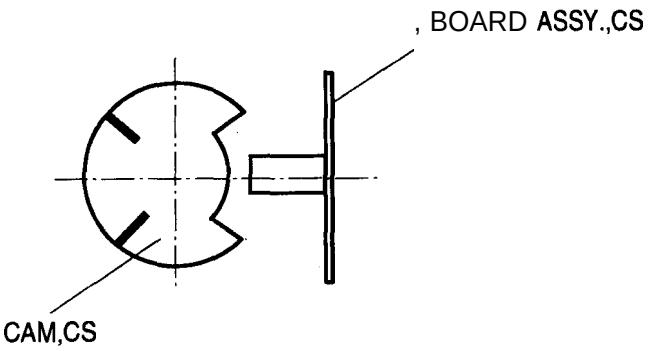

Figure 3-27. CAM,CS Positioning for Reassembly

Note: As viewed from front of CARRIAGE.

3.2.6.12 Removing the SENSOR ASSY., PEW

Step 1 : Remove the printhead. (Refer to Section 3.2.1.)
Step 2: Remove the CARRIAGE ASSY. (Refer to Section 3.2.6.10.)
Step 3: Remove the HOLDER,RIBBON,CARTRIDGE. (Refer to Section 3.2.6.11.)
Step 4: Remove the wire of the SENSOR ASSY.,PEW from the connector of the BOARD ASSY.,CS.
Step 5: Remove both screws CB (M2.5 x 5) fixing the detectors to the HOLDER, RIBBON MASK, pull off the connectors secured in the carriage, and untie the cords. Then remove the SENSOR ASSY.,PEW.

ASSEMBLY POINT

The connectors are not easy to insert. For reassembly, insert them firmly using a screwdriver.

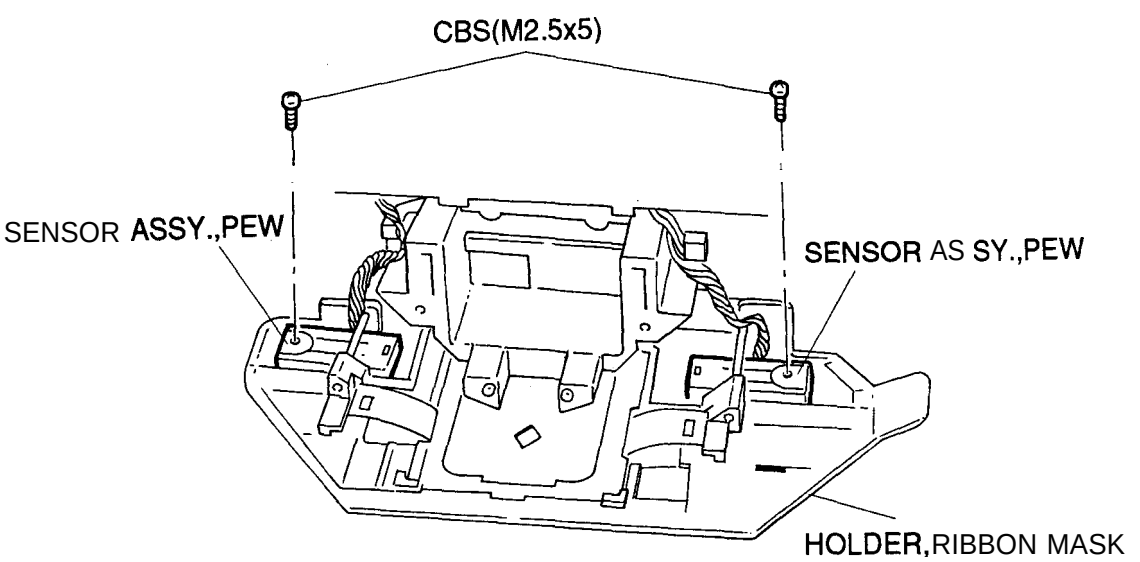

Figure 3-28. Removing the SENSOR ASSY.,PEW

3.2.6.13 Removing the PLATEN ASSY.

Step 1 : Remove the printer mechanism. (Refer to Section 3.2.6.1.)

Step 2: Remove the CARRIAGE ASSY. (Refer to section 3.2.6.10.)

Step 3: Make loose two screws CB (P4) and the SHAFT',PF,TENSION securing the MOTOR ASSY.,PF to the FRAME ASSY.,RIGHT. Loose the tension of TIMING BELT,PF, FRONT and REAR.

Step 4: Remove the timing belts and the COMBINATION GEAR,16,34,93.

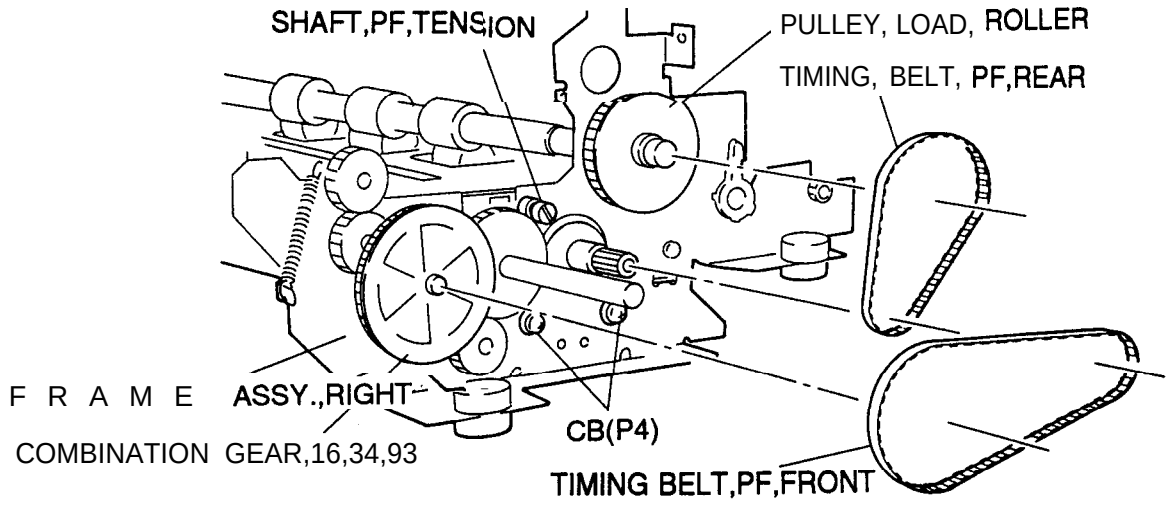

Figure 3-29. Removing the Paper Feed Gear Train -1

ADJUSTMENT REQUIRED

The following adjustments must be performed when the carriage unit is removed or replaced: TIMING BELT,CR Tension Adjustment (See section 4.3.)

Step 5: Remove the COMBINATION GEAR,16,20 , SPUR GEAR,16 , PLAIN WASHER and LEAF SPRING.

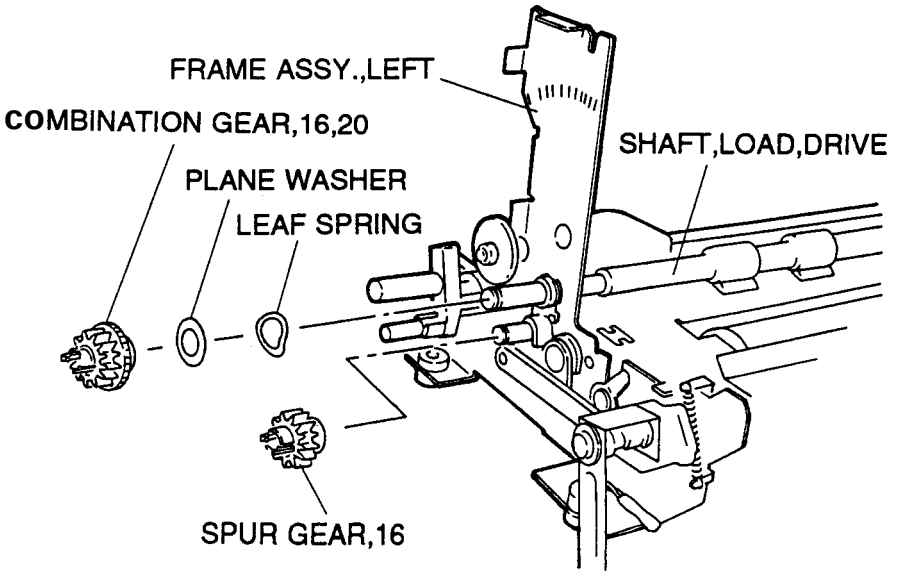

Figure 3-30. Removing the Paper Feed Gear Train - 2

Step 6: Remove the PLATEN SHAFT HOLDER of the right end of the SHAFT,LOAD,DRIVE.

Step 7: Remove four screws CBS (M3 x 6) securing the PAPER GUIDE to the FRAME ASSY.,LEFT and RIGHT. And remove the PAPER GUIDE upward.

Step 8 : Remove the right PLATEN SHAFT HOLDER of the PLATE ASSY., and remove the PLATEN ASSY.

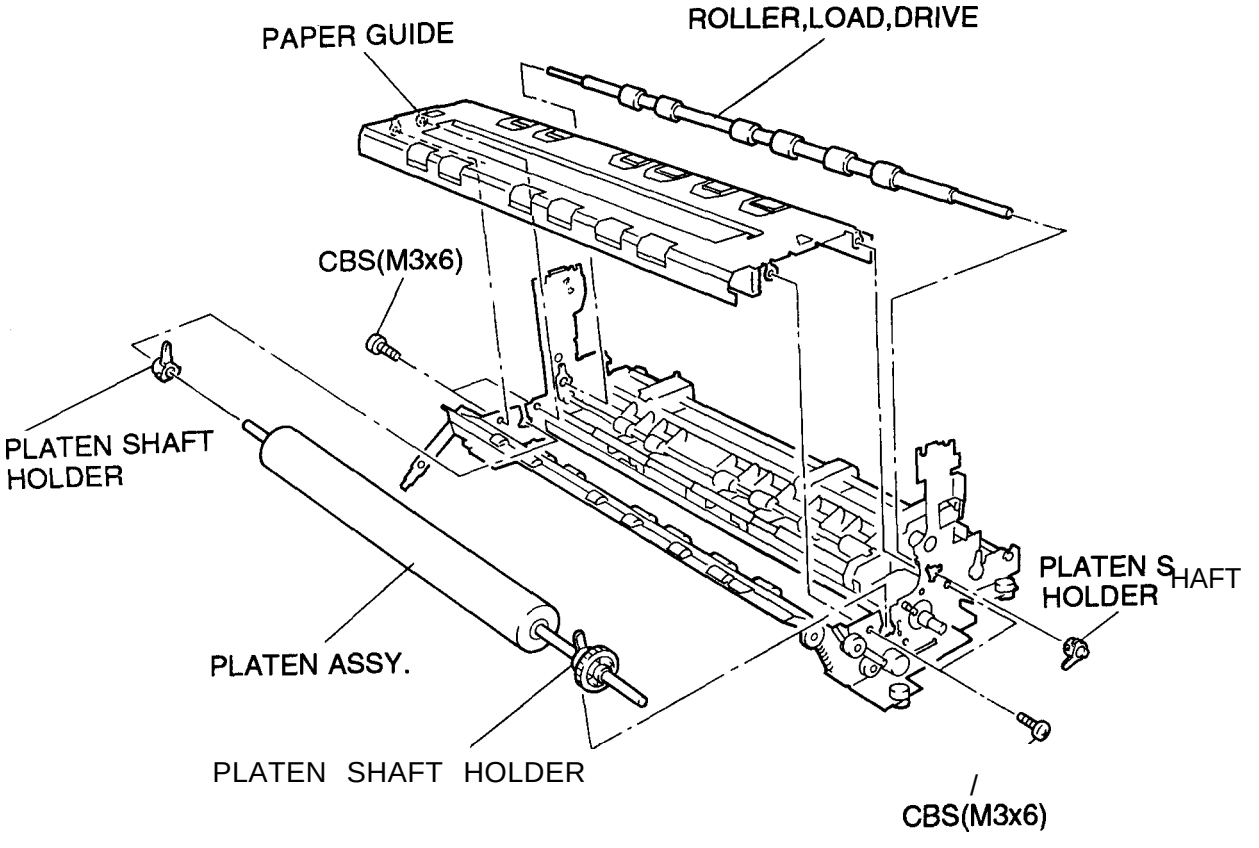

Figure 3-31. Removing the PLATEN ASSY.

3.2.7 Removing the HOUSING ASSY.,LOWER

Step 1 : Remove the COVER,REAR. (Refer to Section 3.2.2.)

Step 2: Remove the circuit board.(Refer to Section 3.2.3.)

Step 3: Remove the control panel. (Refer to Section 3.2.4.)

Step 4: Remove the HOUSING ASSY.,UPPER. (Refer to Section 3.2.5.)

Step 5 : Remove the printer mechanism. (Refer to Section 3.2.6.1.)

Step 6: Remove four screws CBB (M4 *x* 16) securing the HOUSING ASSY.,LOWER to the FRAME ASSY.,BOTTOM.

Step 7: Remove the power switch from the HOUSING ASSY.,LOWER.

Step 8 : Detach two-notches securing the HOUSING ASSY.,LOWER to the FRAME ASSY., BOTTOM and pull the HOUSING ASSY.,LOWER upward.

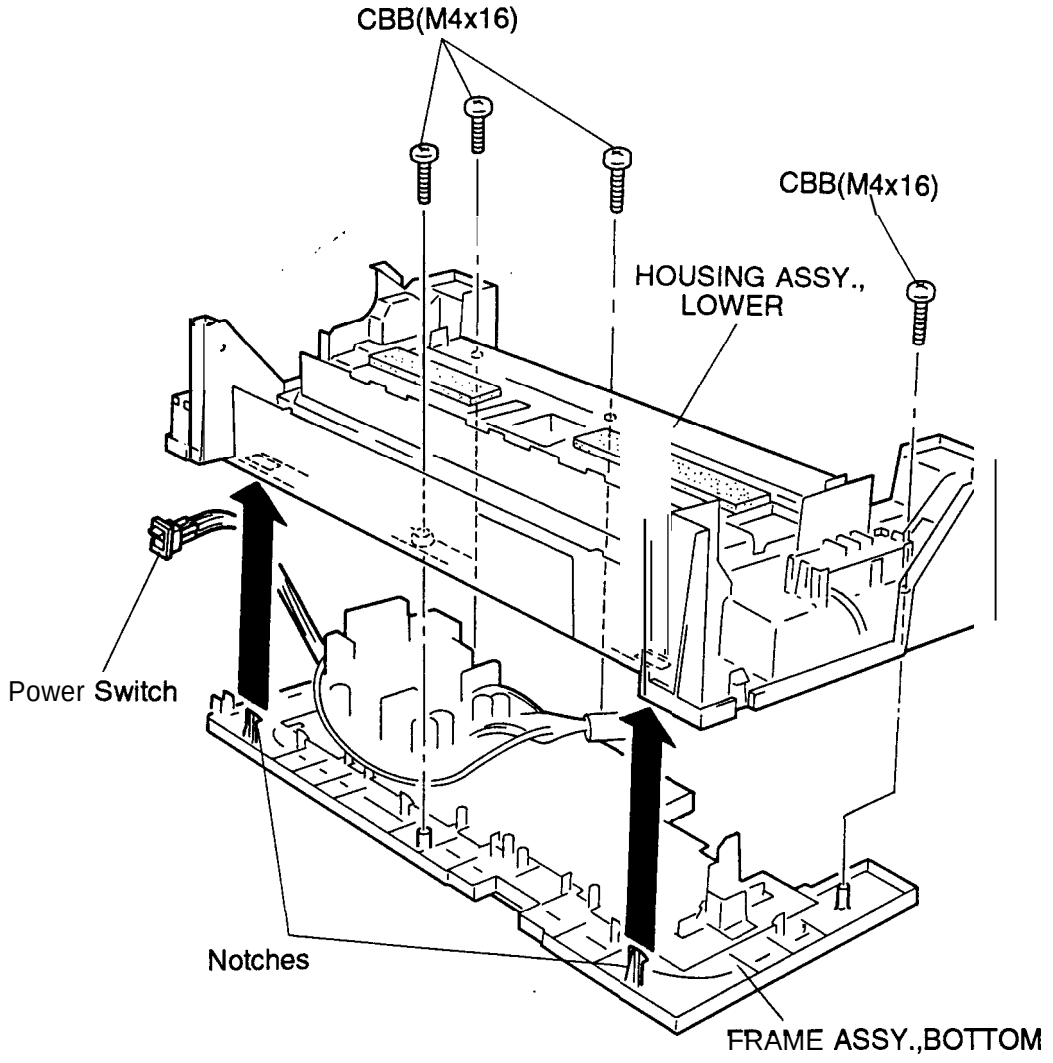

Figure 3-32. Removing the HOUSING ASSY.,LOWER

3.3 RELOADING THE PRINTER CONTROL SOFTWARE

This section describes the procedure used to reload the printer control software to the 128 K byte Flash-EEPROM. Using this program reload ***mode , the*** printer control software can be changed completely. After replacing the BOARD ASSY.,MAIN, reload the printer control software. This mode is for use in DOS or DOS/V only. These files which is used to reload the printer control software consists of the IPL(Initial Program Loader) "Z40Bxxxx.HEX" ("xxx" means Ver. No.) and the main program files.

The procedure is as follows:

Step 1: Connect the Parallel I/F cable to the printer.

Step 2: Change the current drive path of the PC to the drive path of the IPL file and main program is installed.

Step 3: Turn on the printer on while the TEAR-OFF, LF/FF, LOAD/EJECT and PAUSE buttons are depressed. Then the printer LCD displays "Program Mode", and enters the program reload mode.

Step 4: Translate these files by "COPY "command function as follow.

```
> copy Z40Bxxxx.HEX PRN
> copy Control software file PRN
```

Then the PC starts to transfer the printer control software to the printer.

Step 5: When the printer LCD displays "Check Sum XXXX", turn off the printer. Then the reload mode is ended. ("'XXXX" depend on the main program file.)

CHAPTER 4 Adjustment

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4.1 OVERVIEW

The following sections describe the adjustments required when reassembling the DLQ-3000. After any part concerned is disassembled or replaced for maintenance/repair, be sure to adjust the printer to guarantee correct operation.

Table 4-1. Adjustment Items

Disassembly/Assembly	Adjustment
Printhead (Section 3.2.1)	Platen Gap Adjustment
BOARD ASSY., C124 MAIN (Section 3.2.3.1)	Default, Machine Information Setting Bi-d Adjustment SENSOR ASSY.,LOAD Adjustment
Printer Mechanism (Section 3.2.6.1)	Bi-d Adjustment
SENSOR ASSY.,LOAD (Section 3.2.6.3)	SENSOR ASSY.,LOAD Adjustment
MOTOR ASSY.,PF (Section 3.2.6.6)	Belt Tension Adjustment
MOTOR ASSY.,CR (Section 3.2.6.7)	Bi-d Adjustment
CARRIAGE ASSY. (Section 3.2.6.1 O)	Platen Gap Adjustment Belt Tension Adjustment Bi-d Adjustment
SHAFT, CR, GUIDE	Platen Gap Adjustment Belt Tension Adjustment Bi-d Adjustment
TIMING BELT,CR	Platen Gap Adjustment Belt Tension Adjustment Bi-d Adjustment
PLATEN ASSY. (Section 3.2.6.13)	Platen Gap Adjustment Belt Tension Adjustment Bi-d Adjustment

4.2 PLATEN GAP ADJUSTMENT

This adjustment consists of parallelism adjustment and platen gap adjustment.
The platen and head locus are adjusted to be parallel. The LEVER,PARALLEL,SHAFT is eccentric toward the SHAFT,CR,GUIDE. When the LEVER,PARALLEL,SHAFT rotates, the right end of it moves up and down.

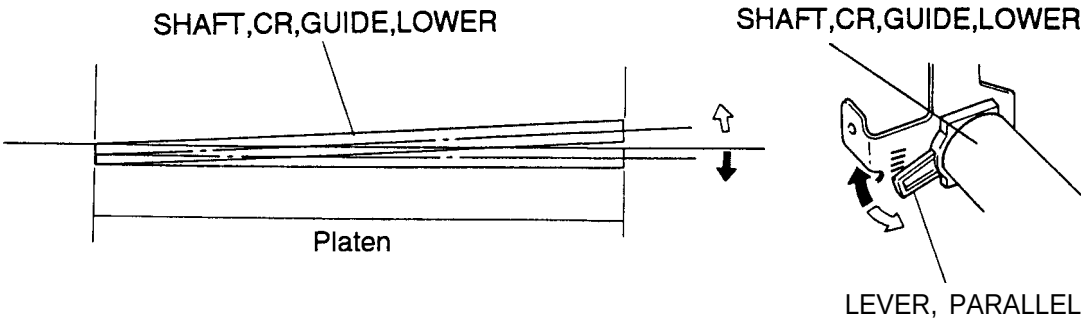

Figure 4-1. Parallelism Adjustment

The platen gap between the platen and the printhead is adjusted. Since the SHAFT,CR, GUIDE,LOWER is eccentric, the distance between the head top and platen can be changed by rotating it.

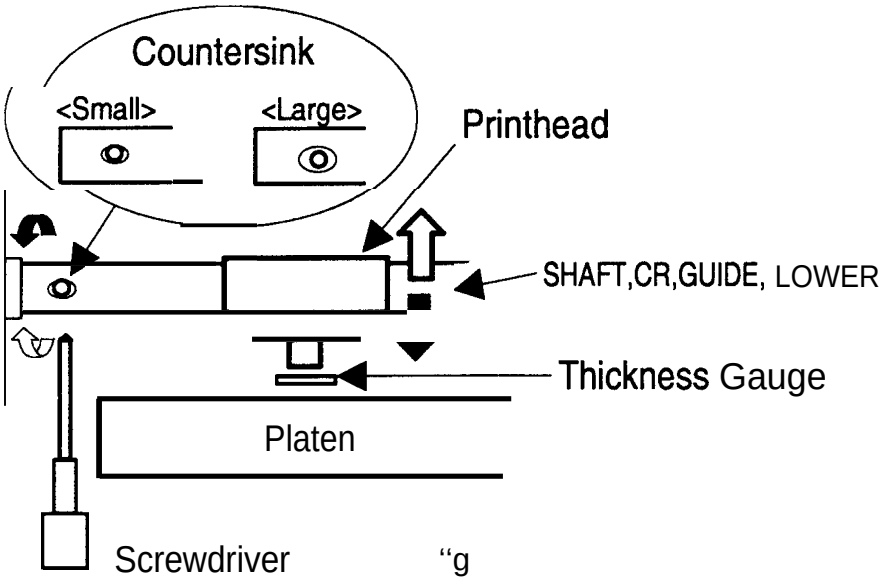

Figure 4-2. Platen Gap

These adjustments can be performed at the same time.
The parallelism should be adjusted whenever the SHAFT,CR,GUIDE is repositioned, or when needed.

The platen gap adjustment should be performed as follows procedure.

Step 1 : Remove the HOUSING ASSY.,UPPER. (Refer to Section 3.2.5.)

Step 2: Remove the printhead. (Refer to Section 3.2.1.)

Step 3 : Remove the HOLDER,RIBBON,MASK together with the RIBBON MASK. (Refer to Section 3.2.1.2.)

Step 4: Reattach the printhead.

Step 5 : Open the LEVER ASSY.,EJECT.

Step 6: Slightly loosen the HEXAGON NUT, which fixes the adjust lever.

Note: If the nut is loosened too much, the SHAFT, CR, GUIDE, LOWER will also revolve when the nut is tightened. For this adjustment, therefore, it should be loosened just slightly (see the figure below).

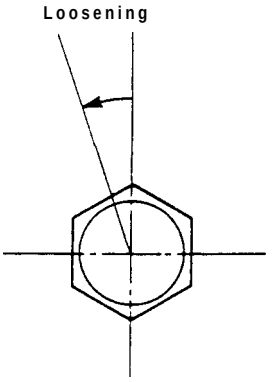

Figure 4-3. Loosening the Nut

Step 7: Insert a screwdriver (diameter: 3 mm) into the larger countersink of SHAFT,CR, GUIDE,LOWER.

Step 8 : Move the carriage so that the top of the head meets the left end of the platen.

Step 9: Insert the thickness gauge between the platen and printhead. Adjust the platen gap to its adjustment value using the thickness gauge. (Refer to Table 4-2).

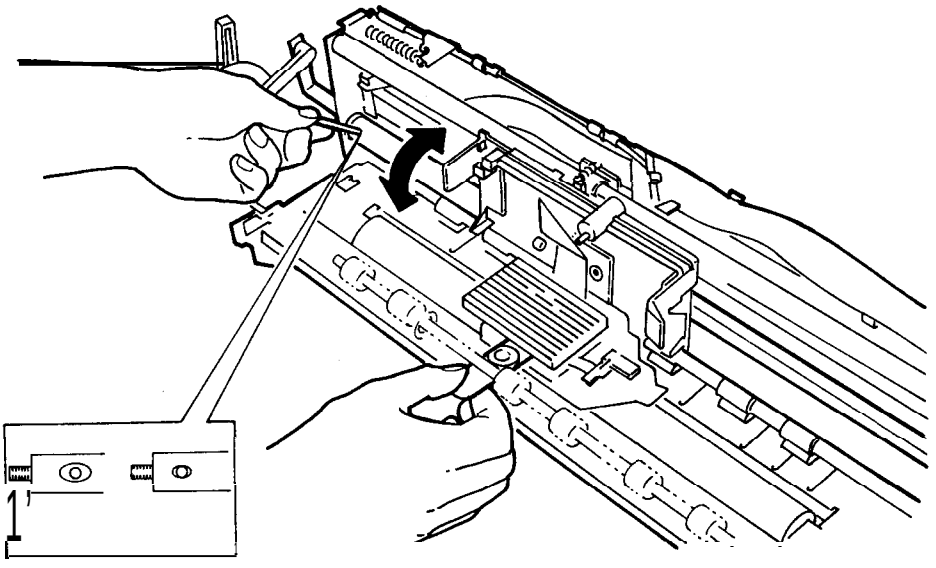

Figure 4-4. Platen Gap Adjustment

Table 4-2. Platen Gap Adjustment Value

Adjustment Value	0.37 ± 0.02 mm	LEVER, G, ADJUST position 1
Reference Value	0.43 ± 0.02 mm	LEVER, G, ADJUST position 2

Step 10: Move the carriage so that the top of the head meets the right end of the platen.

Step 11: Rotate the LEVER,PARALLEL,SHAFT so as to set the platen gap to its reference value at the right. (Refer to Table 4-2)

Step 12: Adjust the platen gap with the thickness gauge by sliding it along the SHAFT,CR,GUIDE,LOWER.

Step 13: Move the carriage so that the top of the head meets the left end of the platen again.

Step 14: Insert the thickness gauge between the platen and printhead. Confirm that the platen gap is at its adjustment value using the thickness gauge. (Refer to Table 42).
If not correct fit in the value, retry from step 7.

Step *15:* Remove the printhead.

Step 16: Reattach the HOLDER, RIBBON MASK together with the RIBBON MASK.

Step 17: Insert the FFC into the printhead, and reattach the printhead to the carriage.

4.3 BELT TENSION ADJUSTMENT

Be sure to adjust the tension before reattaching the MOTOR ASSEMBLY,PF.

Step 1 : Attach the MOTOR ASSEMBLY,PF to the WE ASSEMBLY,RIGHT, and fix it temporarily with the screw CB(P4)(M3 x 6).

Step 2: Attach the timing belt.

Step 3: Press down the SHAFT,PF,TENSION with the tension gauge at an angle of 45 degrees until the tension is set to the reference value. Then, tighten the SHAFT,PF,TENSION.

Step 4: Tighten the screw CB(P4)(M3 x 6).

Tension Gauge Reference Value: 725 ± 25 gf

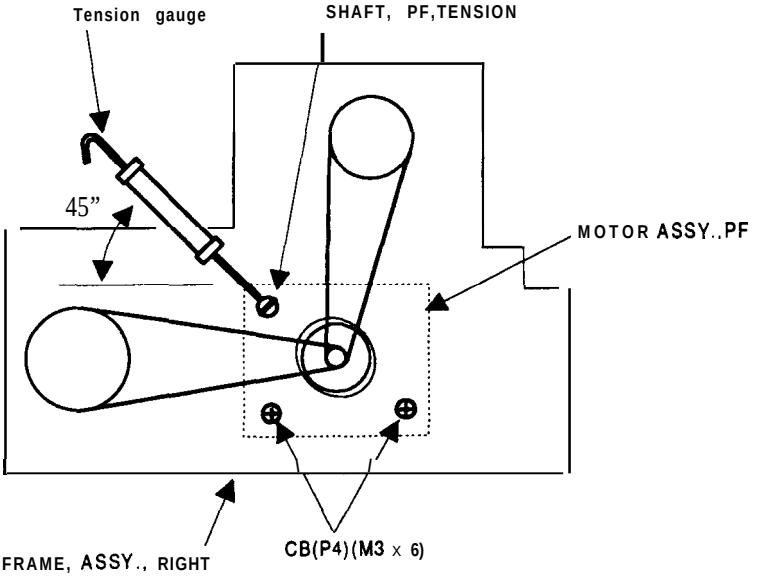

Figure 4-5. BELT TENSION Adjustment

4.4 DEFAULT, MACHINE INFORMATION SETTING AND BI-DIRECTIONAL ADJUSTMENT

4.4.1 Default and Machine Information Setting

The procedure below is necessary when the DLQ-3000 main board is replaced.

Step 1 : Connect the printer to the PC.

Step 2: Turn the printer on.

Step 3 : Load paper into the printer by pressing the FF button. You can use either cut-sheet paper or continuous paper.

Step 4: Load the GWBASIC program into the PC.

Step 5: Insert a diskette containing the DLQ-3000 Adjustment Program.

Step 6: Load the DLQ-3000 Adjustment Program" MIxxx.BAS". (xxx for each destination)

Step 7: When you run the program, the following message appears on the display:

```
DLQ-3000 Adjustment Program

1. Bi-D Adjustment
2. Default& Machine Information Setting
3. END
If ready, press 1-3 and the ENTER key. -
```

Step 8 : Press 2 and then the Enter key to select Default& Machine Information Setting.

Step 9: The following message appears on the display:

```
DLQ-3000
Default & Machine Information Data
Registration Program
```

If you press the Y key, all data stored in the EEPROM on the main board will be initialized to the factory default settings.

Before proceeding, confirm the following:

1. The printer is correctly connected to the computer.
2. The printer is on.
3. Paper is loaded in the printer.

If ready, press Y and the ENTER key. –

Step 10: Press the Y and Enter keys. Then the default setting table below appears on the display.

Table 4-3. Default Setting

Add Function	SW& Valid	Add Function	SW&Valid
FONT	Roman	Graphic Print Direction	Bi-directional
Pitch	10 cpi	Message Language	English
Character Table	PC 437	Software	ESC/P2
Page Length Tractor	11 inch	Interface	Auto Selection
CSF	A4	Interface Auto Selection Timeout	10 sec.
Line Spacing	1/6 inch	Input buffer	ON
Top Margin Tractor	0.33 inch (8.5 mm)	Serial Interface Baud Rate	19200 bps
Manual Insertion	0.33 inch (8.5 mm)	Parity	None
CSF	0.33 inch (8.5 mm)	Auto Tear-off	OFF
Bottom Margin Tractor	0.00 inch (0.0 mm)	Auto LF	OFF
Left Margin	O column	Auto CR	OFF
Right Margin	136 columns	AGM	OFF
Copy Mode	copy 1		

*These settings are the factory **defaults** programmed **into** this printer.*

Step 11 : Press the Y and the Enter key to confirm these settings and return to the initial menu.

Step 12: Exit the program by pressing 3 and the Enter key.

Step 13: The following message appears on the display:

> Any setting value specified within this program
> is not stored in the EEPROM until you turn the printer OFF.
>
> Turn the printer OFF now.

Step 14: Turn the printer off to store the defaults shown in the table into the EEPROM on the main board.

*Note: If you have replaced the main board, you must also perform the **bi-directional adjustment** procedure after competing this procedure.*

4.4.2 Bi-directional Adjustment

This section describes the bidirectional adjustment procedure necessary when the DLQ-3000 printer is reassembled or when parts are reinstalled or replaced. This procedure is also needed if the BOARD ASSY.,C124 MAIN has been replaced.

Notes: . When the main board is replaced, perform the defaults and machine information setting procedure first, and then perform the Bi-D adjustment procedure.

• Do not perform the Bi-D adjustment if there is heavy fluctuation of the input voltage.

The procedure is as follows:

Step 1 : Connect the printer to a PC.

Step 2: Turn the printer on.

Step 3: Load paper into the printer by pressing the LOAD button.

Step 4: Load the GWBASIC program onto PC.

Step 5: Insert a diskette containing the DLQ-3000 Adjustment Program.

Step 6: Load the DLQ-3000 Adjustment Program" MIxxx.BAS". (xxx for each destination).

Step 7: When you run the check program, the following message appears on the display:

```
        DLQ-3000 Adjustment Program

1. Bi-D Adjustment
2. Default& Machine Information Setting
3. END

If ready, press 1-3 and the ENTER key. –
```

Step 8: Type **1** to select *Bi-D Adjustment* and press the Enter key. After several line feeds, the printer starts to print 5 rows of 1 characters in both draft and LQ modes. When the printer begins Bi-D printing, the message "Bi-D TEST PRINTING" appears on the display.

Step 9: After printing is completed, the following message appears on the display:

```
Bi-D INPUT
      Draft: -
```

Among the 5 rows of draft patterns, find the row in which the vertical lines of I are best aligned. Then enter the value assigned to that specific row. The following figure is an example of the Bi-D printout.

Step 10: After you enter the value for draft, the following message appears on the display:

```
LQ : -
```

Among 5 rows of LQ patterns, find the row in which the vertical lines of 1 are best aligned. Then enter the value assigned to that specific row.

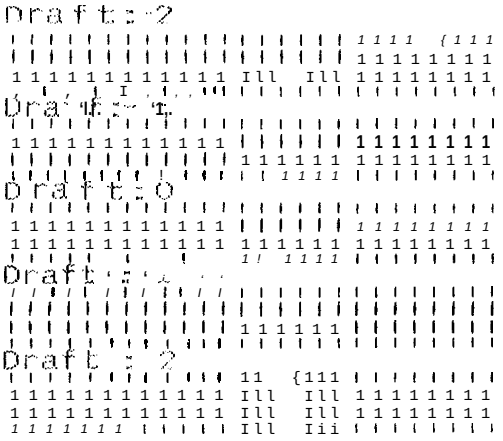

Figure 4-6. Bi-D Pattern Printing

Step 11 : The printer lets you check your print pattern selection for confirmation of the following steps 9 and 10 by printing one row of the pattern you selected.

Step 12: After the printer prints check patterns for confirmation, the following message appears on the display:

> If Bi-D is correct, press "Y' and the ENTER key, and if Bi-D is incorrect, press "N" and ENTER. –

Step 13: If your printed pattern is aligned vertically, press Y and Enter to complete the Bi-D adjustment. Otherwise, press N to return to step 9 to specify another adjustment value.

4.5 SENSOR ASSY.,LOAD ADJUSTMENT

This section describes the SENSOR ASSY.,LOAD Adjustment procedure necessary to store in paperless condition when the SENSOR ASSY.,LOAD is replaced.

The procedure is as follows:

Note: After performing the Defaults and Machine Information, perform the SENSOR ASSY., LOAD adjustment.

Step 1 : Set the SHEET GUIDE ASSY.,FRONT which is in stacking condition to the printer.

Step 2 : Pushing 'TEAR OFF" and "SELECT TYPE" switches at the same time, turn on the printer.

The printer is in the adjustment condition.

Step 3 : Confirm that the four LEDs turn on and the LCD display turns dark.

Step 4: Confirm the printer initialization, then turn off the printer.

When the printer is turned off, the paperless condition of the SENSOR ASSY.,LOAD is stored in the EEPROM.

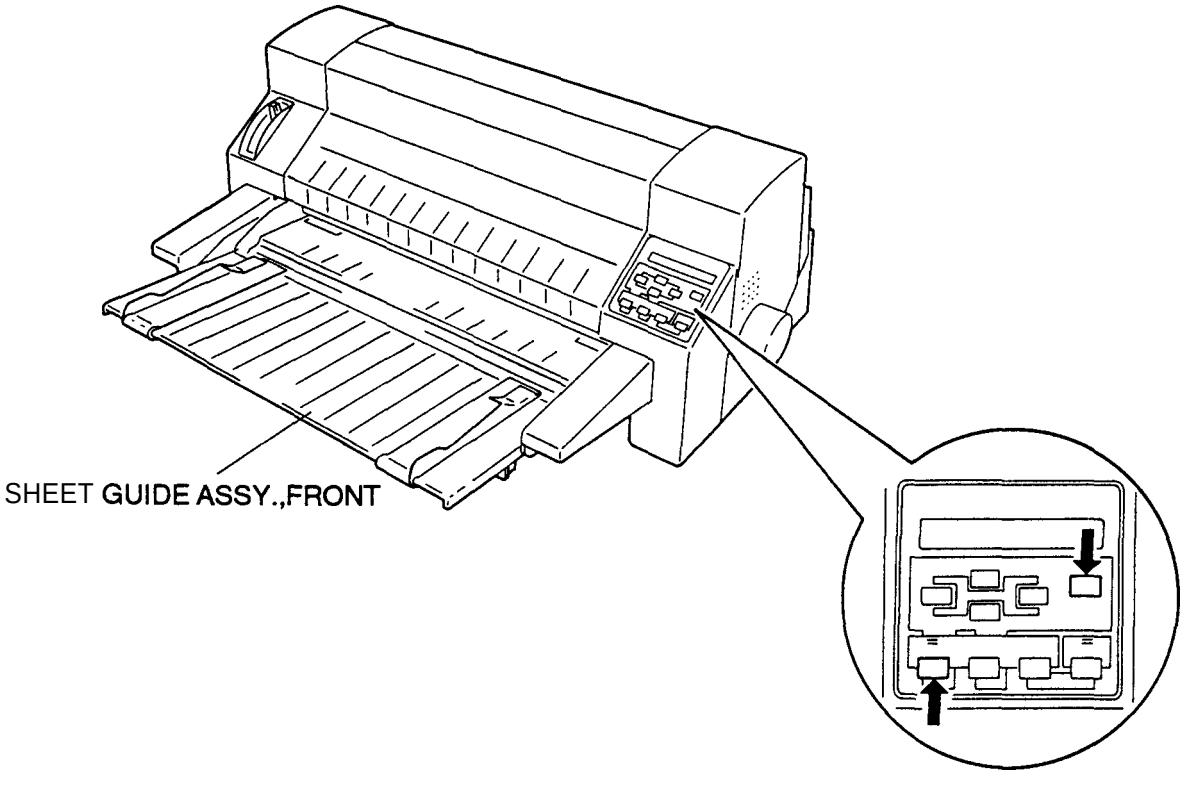

Figure 4-7. SENSOR ASSY.,LOAD Adjustment

CHAPTER 5 Troubleshooting

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5.1 OVERVIEW

Troublesome phenomena of different types can be seen at different locations. Therefore, the troubleshooting strategy is not so simple. Considering this situation, this section provides a flow chart (see Figure 5-1) which can be used to implement troubleshooting.

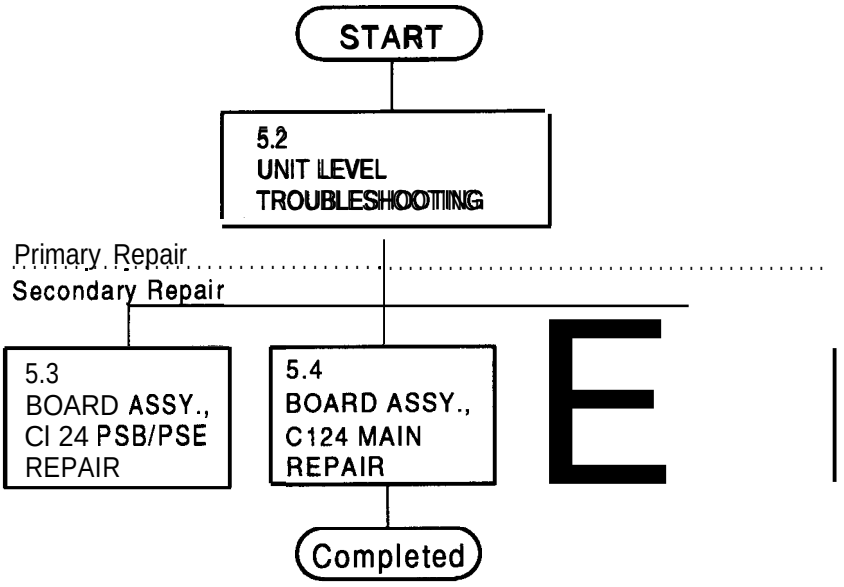

Figure 5-1. Troubleshooting Procedure

The first step of the repair procedure involves unit replacement.
After any unit is replaced, be sure to execute the necessary adjustments (Refer to Chapter 4) and lubrication (Refer to Chapter 6).
Table 5-1 specifies the measuring instruments necessary for the troubleshooting.

Table 5-1. Measuring Instruments Necessary for Troubleshooting

Name	Specification
Multimeter	Refer to Note below.

Note: An analog multimeter can be used, but since the measurements consist mainly of resistances at various locations, a digital multimeter is recommended.

The DLQ-3000 employs a self test function and is equipped with a warning buzzer. The printer detects and classifies error states, and informs the user of a specific error type using one of several buzzer patterns. Table 5-2 lists the error types.

Table 5-2. Error Type

Buzzer Pattern	Error Status	Cause
(Sounds 0.5 sec. with interval of 0.1 sec.) x 5 times	Release Lever Operation Error	. The LEVER, RELEASE is not at the proper position. • Sensor component degradation
	Fatal Error	• Voltage of power supply is abnormal. . The Printhead temperature is abnormal. . The Carriage cannot move correctly. . The error occurs during executing EEPROM control commands or program reload mode. • The printer control circuit dose not work correctly.
(Sounds 0.1 sec. with interval of 0.1 sec.) x 3 times	Paper Out Error	• Paper is not loaded after loading is attempted. • The full sheet finishes printing after loading single sheets by manual insertion. • The end of continuous paper is reached.

5.2 UNIT LEVEL TROUBLESHOOTING

For troubleshooting, make repairs by unit replacement and adjustment based on the problem symptoms. Follow the corresponding flow chart after finding the problem in Table 5-3.

Table 5-3. Problems (Requiring Unit Replacement)

Problems	Description	Reference Page
The printer does not operate after the power is turned on.	• No LEDs and LCDs on the control panel light. . The mechanism does not initialize.	5-4
The printer goes to an error state after the power is turned on.	. One or more LEDs light or blink, LCDs displays error message (refer to Table 5-2). . The mechanism initial izes,but goes to an error state.	5-5
Improper printing (during self test)	. The mechanism does not print. • One or more dots are missing. • Bad print quality • Incorrect color switching (during color printing)	5-6
Abnormal paper feed	• The paper cannot be fed. . The paper feed length varies. • Paper jams often.	5-7
The control panel does not function correctly.	. The printer does not respond normally to the switches. . Abnormal control panel indication (LEDs or LCDs). . The Select Type is not reflected correctly. . Panel switch setting doesn't work.	5-8
Improper operation during ON-LINE mode	. Although the self test printing is normal, the printer cannot print data from the host computer correctly. . The printer cannot print. . When the printer is operating, an error occurs on the host computer side.	5-9

<The printer does not operate after the power is turned on.>

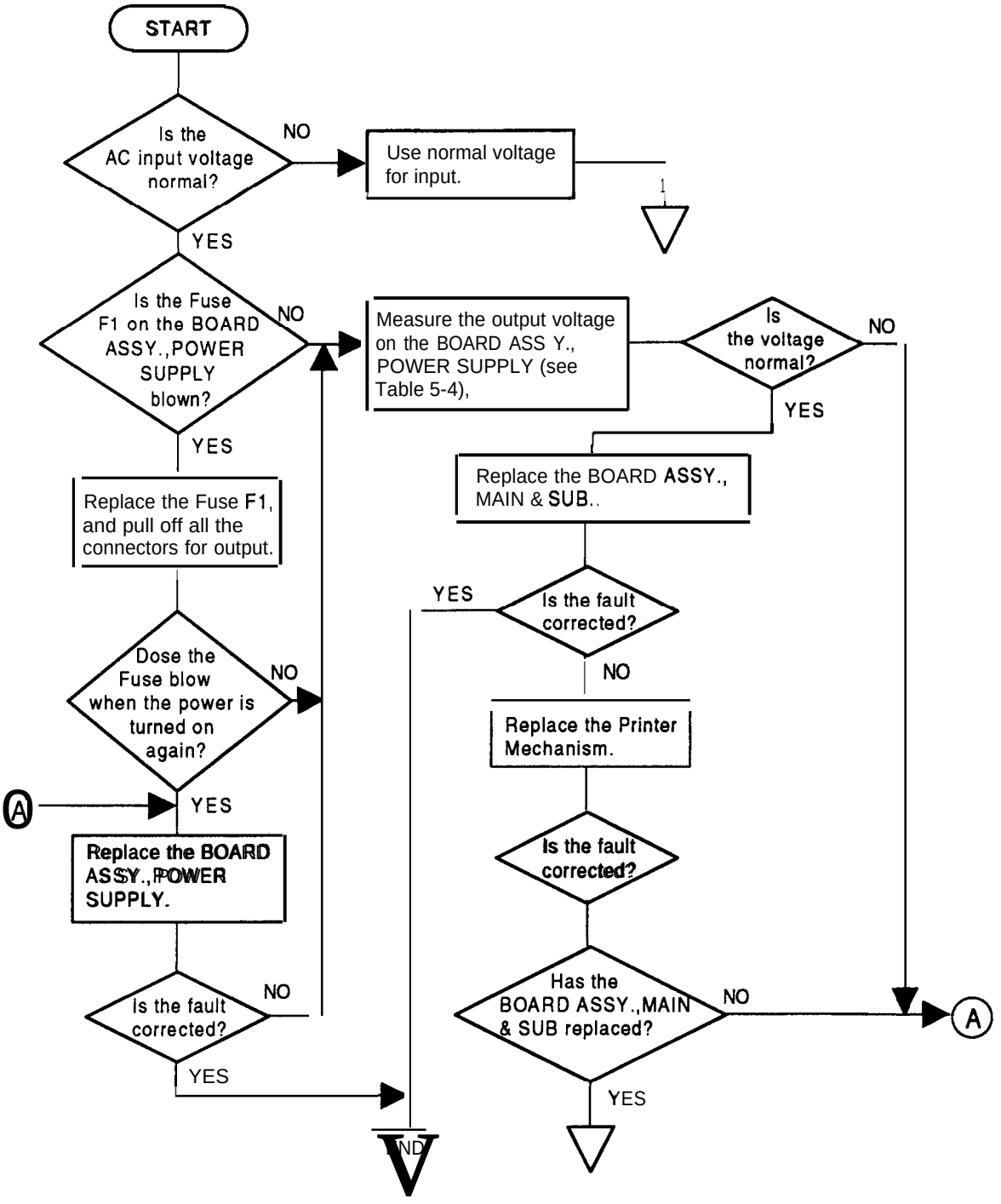

Figure 5-2. Unit Replacement - 1

<The printer goes to an error state after the power is turned on.>

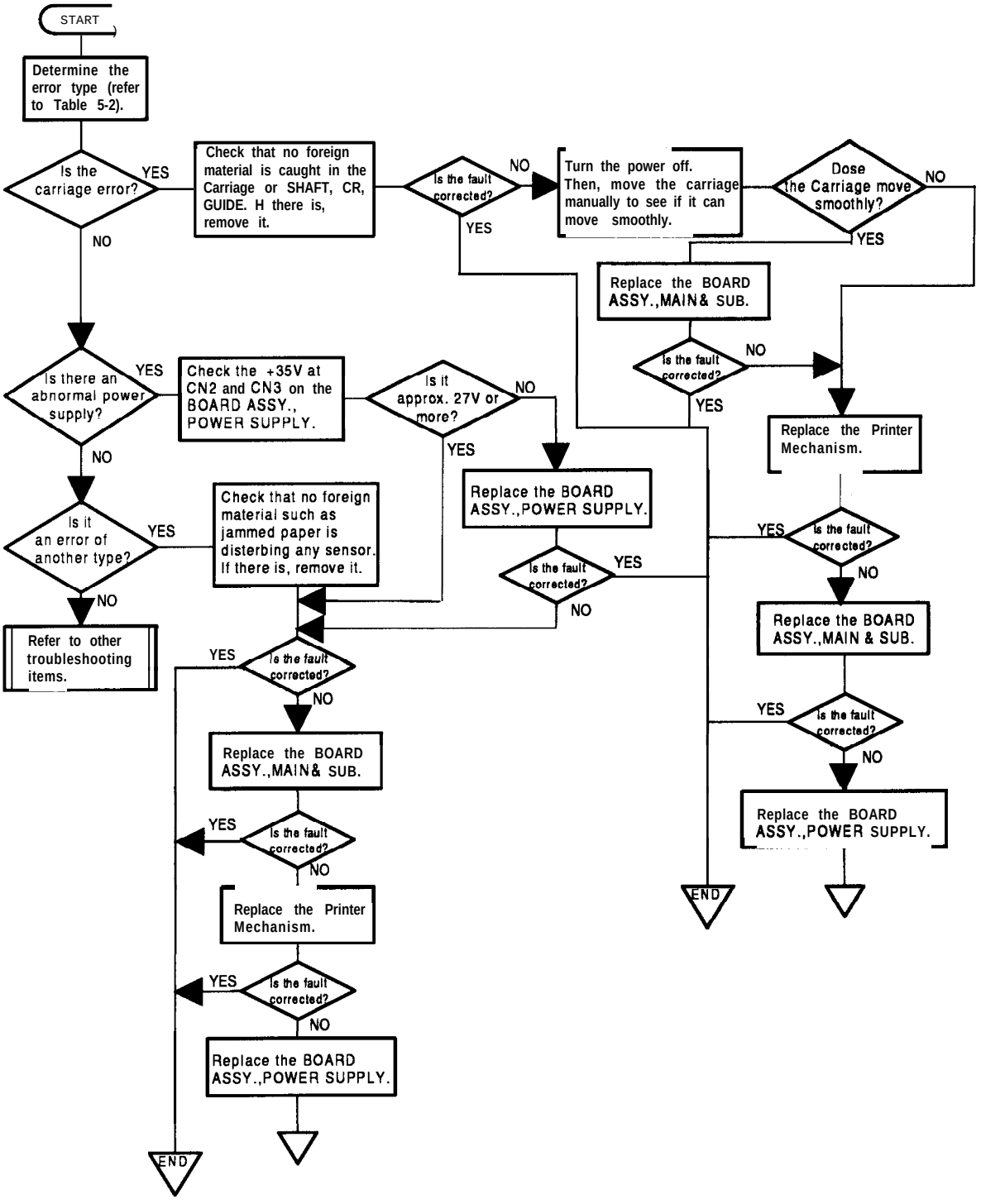

Figure 5-3. Unit Replacement -2

< Improper printing (during selftest) >

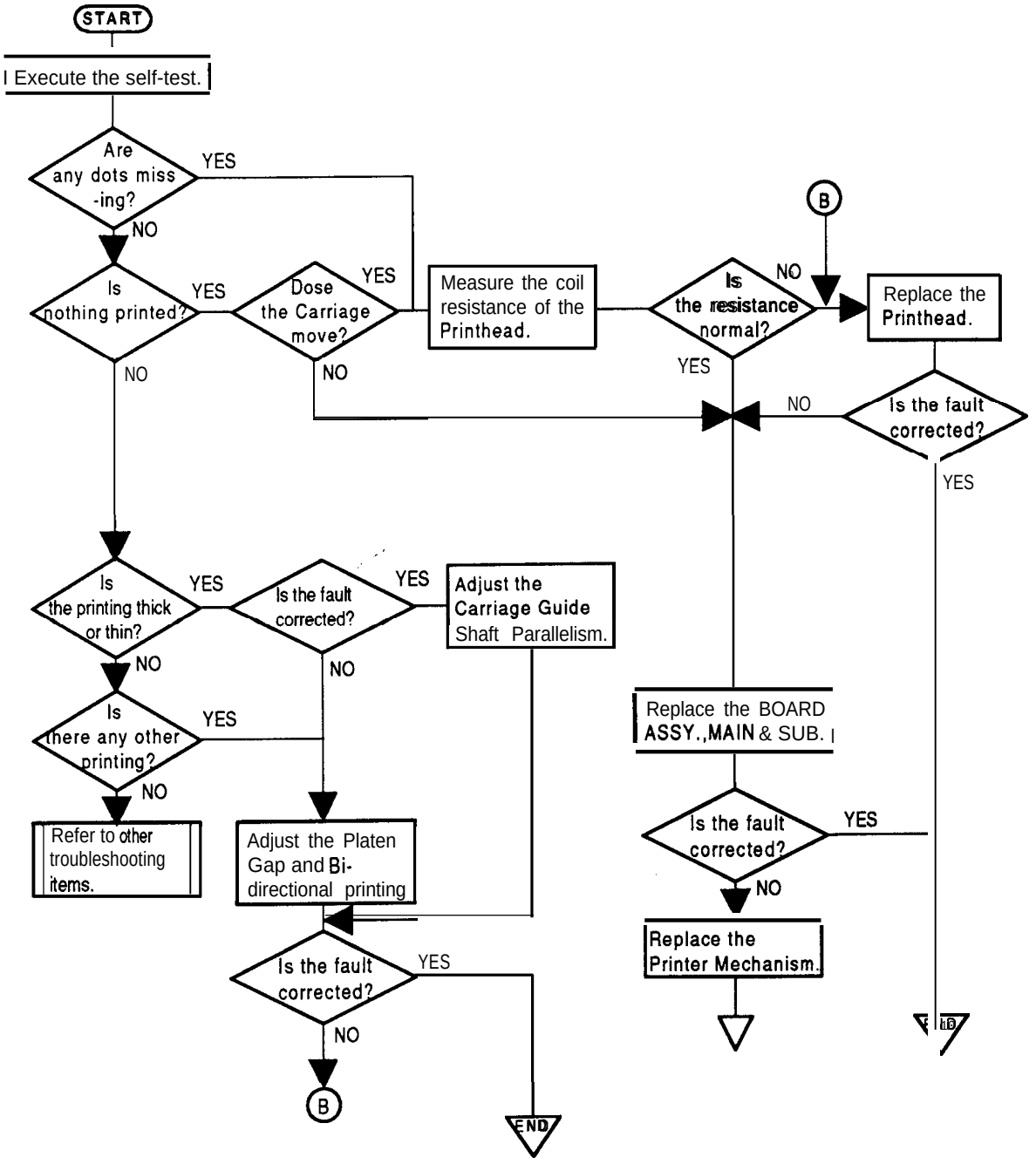

Figure 5-4. Unit Replacement -3

< Abnormal paper feed. >

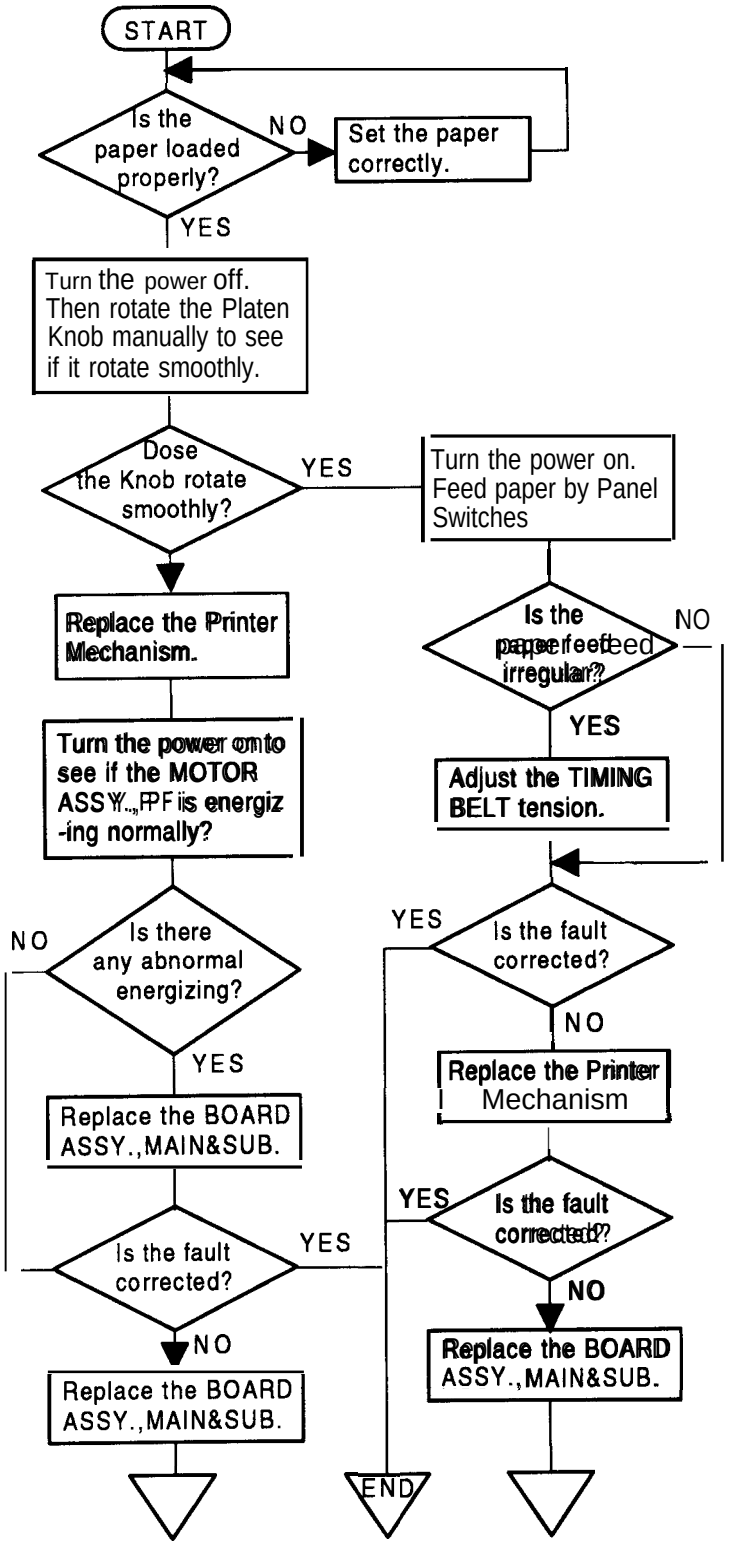

Figure 5-5. Unit Replacement -4

< The control panel does not function correctly. >

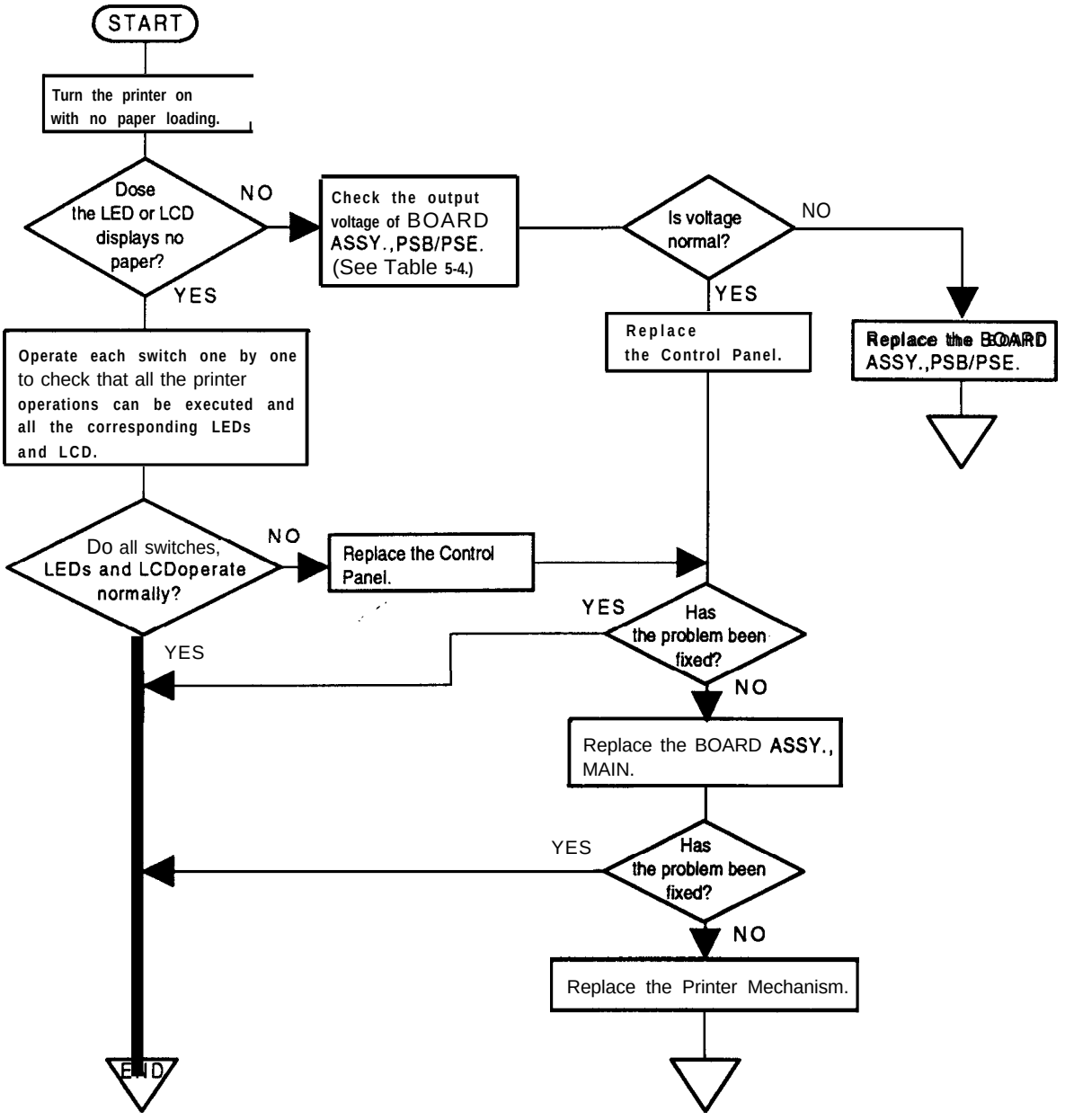

Figure 5-6. Unit Replacement -5

< Improper operation during ON-LINE mode>

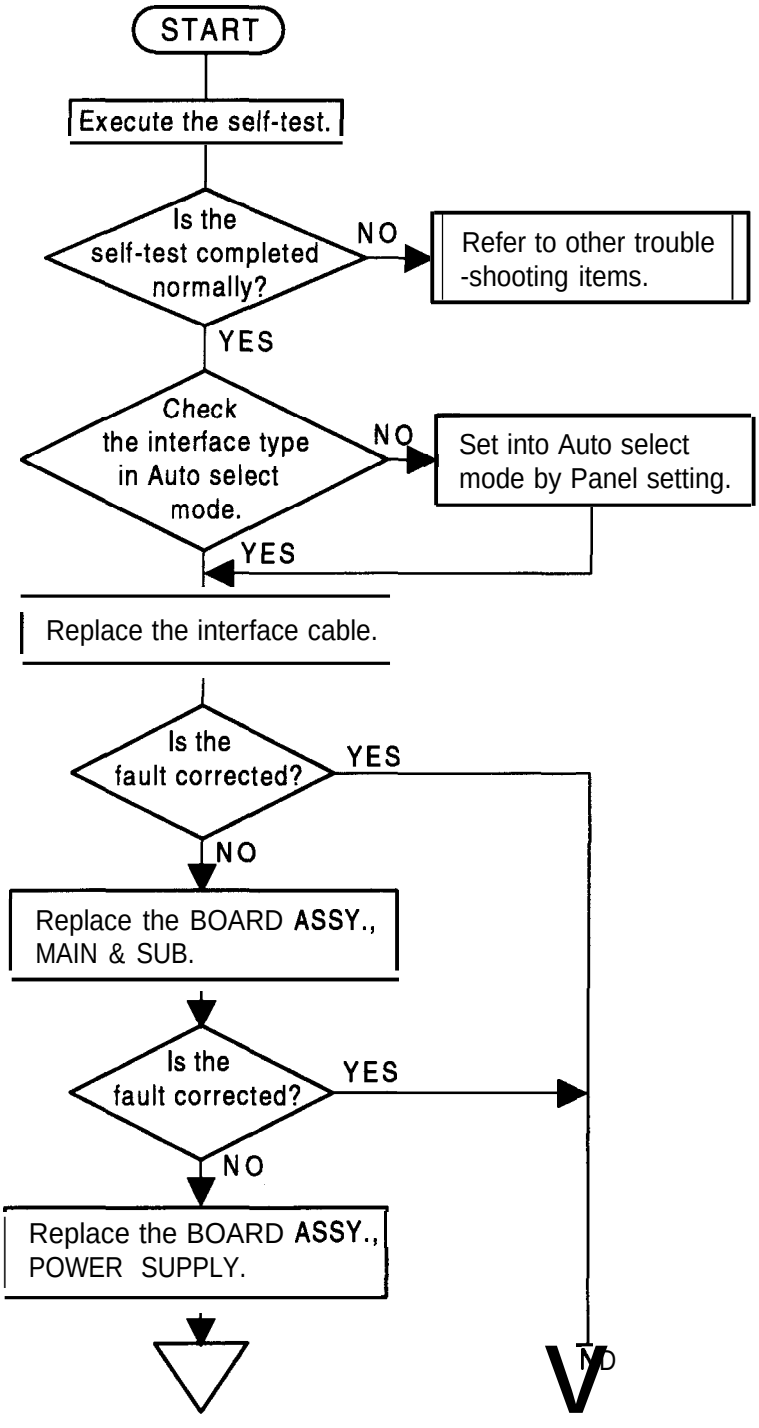

Figure 5-7. Unit Replacement -6

Table 5-4. BOARD ASSY., C124 PSB/PSE Output Voltage

Connector No.	Pin No.	Output Voltage
CN 2	1,2,3	+35 V (ch B)
	4,5,6	GpB (O V)
	7,8	GL (O V)
	9,10	+5 V
CN 3	1,2,3	+35 V (ch A)
	4,5,6	GpA (O V)

HDn (n=l to 24) correspond with each pin of the printhead. Measure the resistance value between "COM" and "HDn", then decide whether the printhead coil is OK or not. Normal resistance value of the printhead coil is :

8.19 ± 0.5 ohms (at 25°C)

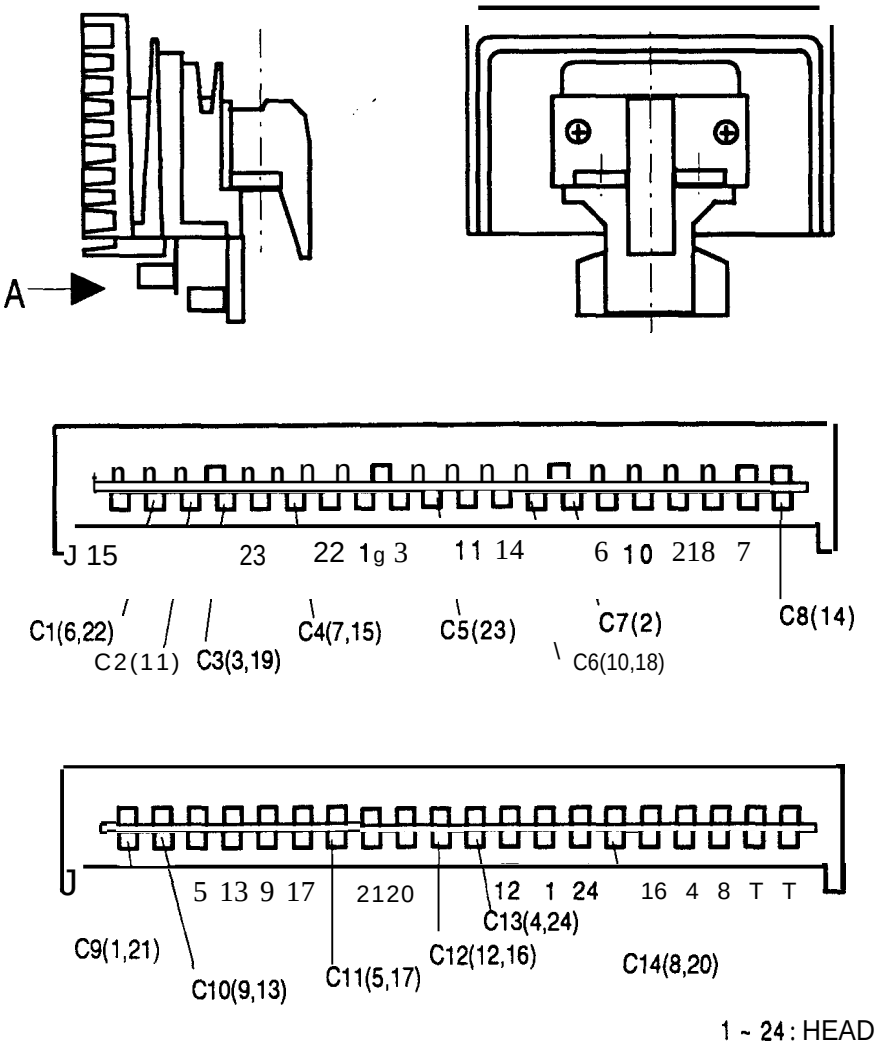

Figure 5-8. Printhead Cable Signal Assignment

Table 5-5. Motor Coil Resistance

Motor Connecter Number	Common Pin Number	Test Pin Number	Test Method (Set Meter to ohms. Disconnect Motor from BOARD ASSY.,MAIN and check it with Printer Power OFF.)	Meter Reading
CN 4 (MOTOR ASSY.,CR)	5,6	1,2,3,4	Place one lead on pin 5 or 6, and the other lead on each of the two check the two motor phase.	Approx. 1 .1Ω (25°C)
CN 4 (MOTOR ASSY.,PF)	11	7,8,9,10	Place one lead on pin 11, and the other lead on each of the two check the two motor phase.	Approx. 5.4Ω (25°C)
CN 3 (MOTOR ASSY.,CS)	7	8,9,10,11	Place one lead on pin 7, and the other lead on each of the two check the two motor phase.	Approx. 76Ω (25°C)

Table 5-6. Printhead Driver Test Point

Transistor Numbers	Test Method (Set meter Diodes. Check POWER OFF.)	Meter Reading
Q7,Q9 ~ Q35	Check to base to collector. Check to base to emitter. Reverse leads and test again.	Not open and not shorted from base to collector, base to emitter.

Table 5-7. Sensor Test Point

Sensor Connector Number	Test Method (Set Meter to Ohms. Check Printer POWER OFF.)	Meter Reading
CN 5 (DETECTOR ASSY.,PG)	Place one lead on pin 8 and the other lead on pin 9. Change the LEVER, G,ADJUST position.	Meter should toggle between open and short.
CN 5 (DETECTOR ASSY.,PF)	Place one lead on pin 10 and the other lead on pin 11. Change the LEVER, RELEASE position.	Meter should toggle between open and short.
CN 3 (DETECTOR ASSY.,CS)	Place one lead on pin 13 and the other lead on pin 4 or 12. Set the Color Ribbon Cartridge on the CARRIAGE ASSY.	Meter should toggle between open and short.
CN 3 (DETECTOR ASSY.,FILM)	Place one lead on pin 14 and the other lead on pin 12. Set the Film Ribbon Cartridge on the CARRIAGE ASSY.	Meter should toggle between open and short.
CN 14 (COVER OPEN SENSOR for +35V)	Place one lead on pin 1 and the other lead on pin 2. Open and close the COVER ASSY.,PRINTER.	Meter should toggle between open and short.
CN 13 (COVER OPEN SENSOR for +5V)	Place one lead on pin 10 and the other lead on pin 4,5 or 6. Open and close the COVER ASSY.,PRINTER.	Meter should toggle between open and short.

5.3 BOARD ASSY., C124 PSB/PSE REPAIR

Table 5-8 describes the repair procedure of the BOARD ASSY., C124 PSB/PSE.

Table 5-8. BOARD ASSY., C124 PSB/PSE Repair

Phenomenon	Trouble	Cause	Item to Check	Troubleshooting
Normal voltage cannot be output.	The F1 fuse blows soon after replacing it.	The line filter circuit component is bad.	Check that none of Cl to C4, Ll, has short-circuited the AC line.	Replace any bad components.
		A rectification / smoothing circuit component is bad.	Check DB101 for a short circuit. Check all the components, such as Cl 01, connected between the (+) and (-) terminals of DB101. Then check T101 or 201. A DB101 short circuit may have occurred behind DB101.	Replace DB101 and any associated bad components.
	All output voltages are abnormal. Because of the circuit structure, when the +35V output is abnormal, all other output voltages will be affected.	DB101 (one of the diode bridges) is bad.	Check that correct DC voltage (C124 PSB = approx. 170V, C124 PSE = approx. 300V) is output between the (-) terminal (pin 3) and the (+) terminal (pin 4). Degradation of some component behind DB101 may suppress the DB101 output vottage.	Replace DB101 and any associated bad components.
		The soft start circuit is bad.	Measure the DC voltage at both ends of R2 to confirm that it is 0V. R2 and R3 are open. TY101 is bad or one or more of the components (R124, D1OW2O3 or T101/201) used to turn TY101 on is bad.	Replace any associated bad components.
		Switching of FET Q101 / 201 is bad.	Check the waveform of the T101I2O1 primary coil (between pin 4 to pin 7) to see that Q101/ 201 switching is normal. See Figure 5-9.	Replace Q101/201 Or the peripheral components.
		T101 or 201 is bad.	Check the drive voltage applied to the T101/201 primary coil (between pin 4 to pin 7) and the output voltage of each secondary coil. Degradation of a component behind the secondary coils may suppress the T101/201 output voltage.	Replace T101/201 and bad components connected to T101I2O1 at the secondary coils side.
		Rectifier diode D151/251 is bad.	Check that correct DC voltage (approx. 35V) is output between the terminals of C23 (C24, or C25). If the DC voltage is 0V, check the secondary output of theT101K201.	Replace D151/251 Or the peripheral components.

Table 5-8. BOARD ASSY., C124 PSB/PSE Repair (Continued)

Phenomenon	Trouble	Cause	Item to Check	Troubleshooting
output voltage is abnormal.	All the output voltages are abnormal. Because of the circuit structure, when the +35V output is abnormal, all the other Output voltages are affected.	The current limiting circuit is bad.	Check that transistor Q154 is not turned ON (i.e. the collector has not reached the GP level = max. voltage). IfQ154 is OFF, some component behind PC102 and the main switching circuit (Q1OZ2O2) is bad. If Q155 is ON, Q153,Q253 or some component behind Q154 is bad.	Replace Q154 or the associated bad components.
		The voltage limiting circuit is bad.	Check that transistor Q155 is not turned ON (i.e. the collector has not reached the GP level=max. voltage). If Q155 is OFF, some component behind PC102 and the main switching circuit (Q1022O2) is bad. IfQ155 is ON, Q155 or ZD153 or a peripheral component is bad. Q155 turns ON when the +5V output is too high. Check transistor Q155 is not turned ON (i.e. the collector has not reached the GP level= min. voltage). If Q155 is ON, IC 151 or some other component is bad. When Q155 is OFF, some component behind PC102 is bad. Since PC102 is a photo-thyristor,once it turns on,it never turn OFF until the C11 1 charge is completely discharged. Therefore, the operator should wait for a few minutes before turning the power on again.	Replace the associated bad components.
		The stabilizing circuit for the +35V is bad.	Investigate the waveform at pin 4 of photo-coupler PC101 and 201. When it is normal,a waveform with a constant interval should be seen (with no load). If the waveform is abnormal, PC1OI, PC201, ZD151, ZD181 -185 or a peripheral component is bad. If the waveform is normal, check that the switching waveform ofQ101 or Q201 is normal. Then check the operation of Q102 orQ202toQ103 or Q203 and the peripheral components. See Figure 5-10.	Replace the associated bad components.
	+5VDC output is abnormal. When the +35V output is normal.	IC151 is bad.	Check the voltage at pin 12 of IC151. If the input voltage of pin 12 is normal, IC151 is bad	Replace IC151 or the peripheral components.
		The smoothing circuit is bad.	Check that the correct DC voltage (approx. 5v) is present between the (-) and (+) terminals of Cl 54. If there is no output voltage, L151 or Cl 54 is bad.	Replace L151 or C154.

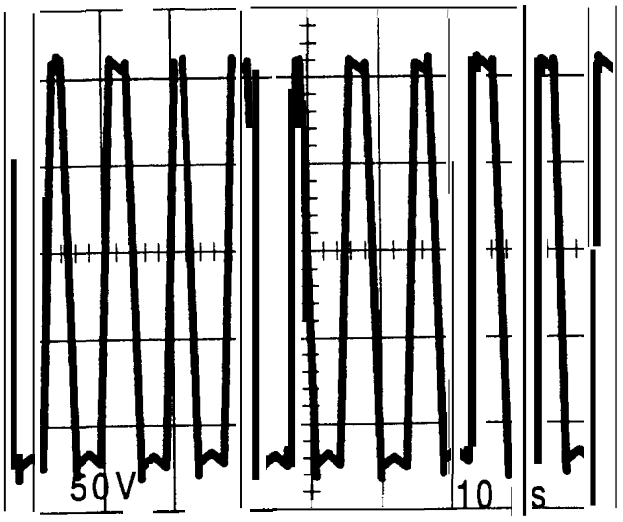

Figure 5-9. Power Supply Board Sample Waveform -1

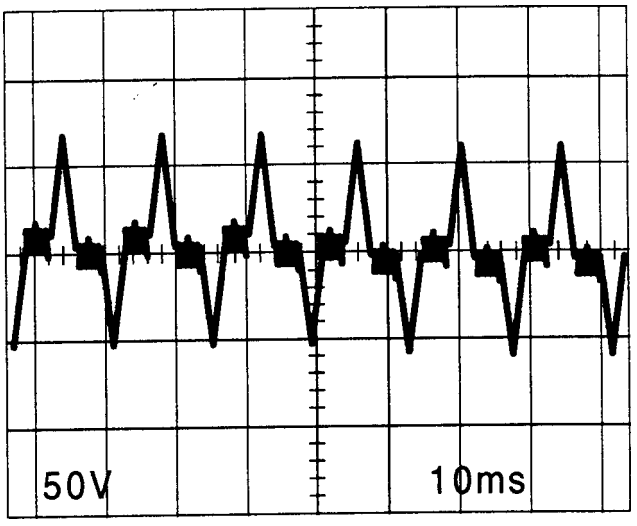

Figure 5-10. Power Supply Board Sample Waveform -2

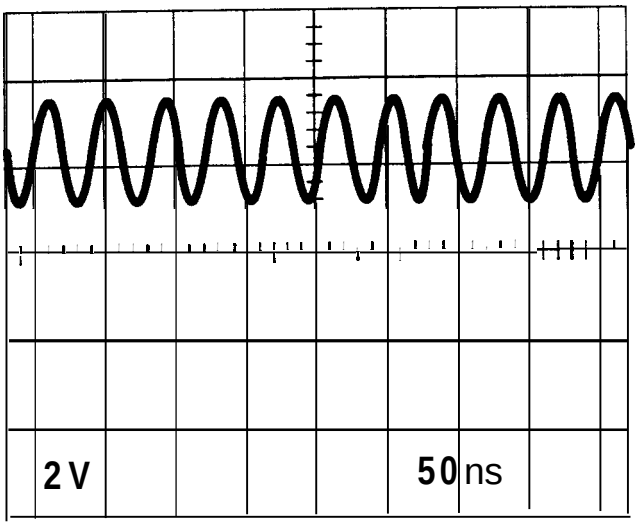

Figure 5-11. Power Supply Board Sample Waveform - 3

5.4 BOARD ASSY., C124 MAIN REPAIR

Table 5-9. describes the repair procedure for the BOARD ASSY., C124 MAIN board.

Table 5-9. BOARD ASSY., C124 MAIN Repair

Phenom-enon	Trouble	Cause	Item to Check	Troubleshooting
Does not operate at all.	The reset signal is not released.	The reset circuit operates abnormally.	Check that IC14 pin 1 goes LOW shortly after the power is turned on. The reset signal is generated from signal VOUT by IC14. If the pin goes LOW, refer to the section entitled "The CPU does not operate.".	Replace IC14.
		VOUT signal is not generated.	Check that the +5V is normal. Then, check the connector of CN1 O pin 3 and 4.	Replace the BOARD ASSY.,POWER SUPPLY.
	The CPU does not operate.	The CLOCK signal does not oscillate	Check the clock waveform at pins 11 and 12 of ICI o. See Figure 5-11.	Replace the BOARD ASSY.,POWER SUPPLY or CR1.
		The flash ROM is bad.	Reload the Printer Control Program. (see Section 3.3)	Replace the BOARD ASSY.,MAIN.
		The CPU is bad.	Check that the waveforms at pin 112 (ASTB) and pins84to99(ADOtoAD15) of ICI O are changing. See Figure 5-12.	Replace the BOARD ASSY.,MAIN.
Goes to an error state.	"Fatal error"	The +35V monitor circuit is bad.	Measure the reference voltage of the sensor (approx. 35V) at pin 63 of IC1 O. If the voltage is normal, the CPU: IC10 is bad.If the voltage is extremely high or low, the IC15 or IC22, and the peripheral components are bad.	Replace the BOARD ASSY.,MAIN. Otherwise, replace IC15, IC22 and the peripheral components.
		The carriage motor control circuit is bad.	Check the CR motor control pulse at pins 66,67,68 and 69 of IC1 O. Check the CR motor drive pulse at pins 1, 8,11, and 18 (CRA to CR/B) of IC1. Check the common voltage at pin 1 of connector CN 14. See Figure 5-13. (phase data)	Replace the BOARD ASSY.,MAIN. Otherwise, replace IC1 and the peripheral components.

Table 5-9. BOARD ASSY., C124 MAIN Repair (Continued)

Phenom-enon	Trouble	Cause	Item to Check	Troubleshooting
Goes to an error state.	"Release lever operation error"	The detection circuit is bad.	Measure the reference voltage of the sensor (approx. 5V) at pin 62 of ICI O. If the voltage is normal, the CPU IC1 O is bad.If the voltage is extremely high or low, the CPU, SENSOR ASSY.,LOAD and the peripheral components are bad.	Replace the BOARD ASSY., MAIN. Otherwise, replace SENSOR ASSY.,LOAD or the peripheral component
	"Paper out error"	The detection circuit is bad.	Measure the reference voltage of the sensor (approx. 35V) at pin 63 of ICI O. If the voltage and the CPU are normal, : the SENSOR ASSY.,PEW and the peripheral components are bad.	Replace the BOARD ASSY., MAIN. Otherwise, replace SENSOR ASSY.,PEW or the peripheral component
Degraded printing	Abnormal printhead control	The printhead control circuit is bad.	If a specific dot is bad, check the drive transistor corresponding to the dot. There are two types of drivers. The first type makes the pulse A and the other type makes the pulse B. If the degraded dot cannot be determined or the trouble is mainly with the print density, replace QM2-6, QM8-1 O, Q7, Q9-35 respectively.If the problem cannot be solved even after replacing these, replace the BOARD ASSY.,MAIN.	Replace the components concerned.
	Abnormal control during the copy mode	The pulse B generator circuit is bad.	Check the HPW pulse inputtoIC11. See Figure 5-14.	Replace the BOARD ASSY., MAIN.
	Abnormal CR motor control	The CR motor control circuit is bad.	Check the control signal input to the CR motor drive IC1. There are three types of control signals; phase data, enable, and the reference voltage. The phase data and enable are transmitted by the CPU. The current control is switched by G.A: ICI 1 which switches IC1.	Replace the components concerned.
Abnormal paper feed	Abnormal PF motor control	The PF motor control circuit is bad.	Check the control signal input to the PF motor drive IC21 and the common voltage pin 11 of connector CN 4. See Figure 5-15.	Replace the components concerned.

Table 5-9. BOARD ASSY.,C124 MAIN Repair (Continued)

Phenom-enon	Trouble	Cause	item to Check	Troubleshooting
The control panel does not operate normally. Including abnormal DIP switch settings.	The switches, LCD or LEDsof the control panel are not working.	The control panel control circuit is bad.	When the switches, LCD or LEDs are not available, the G.A of the Panel circuit board is bad. Otherwise, replace the CPU: IC10, if the problem is not solved off even after replacing the IC concerned. Check the cable and connector connections of the control panel.	Replace the components concerned.
The host computer cannot execute normal printer operation.	Data transmission error is displayed or data is garbled.	The interface component is bad.	Check the interface signals related to the error while communicating with the host computer. Parallel IIF: DATA1 to DATA8, STROBE, ACK, BUSY. Serial I/F: TXD, RXD, DTR	Parallel I/F: Replace the BOARD ASSY., MAIN. Serial I/F: Replace IC 9 '1 and the peripheral components.
		The CPU is bad.	If all the interface components are normal, the CPU: IC10 or the ICs 12,13,17,18 maybe bad.	Replace the BOARD ASSY.,MAIN
The mode settings are not stored.	Memory back-up is not available	Abnormal writing to the EEPROM	The EEPROM IC16 or the CPU IC10 may be bad.	Replace the BOARD ASSY., MAIN. Otherwise replace IC16

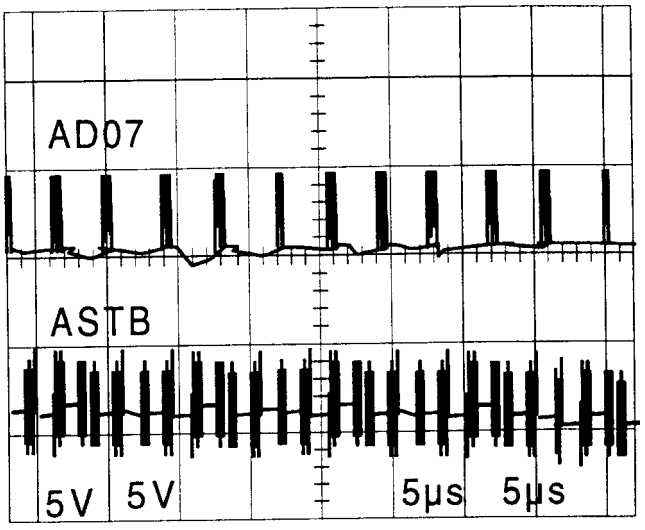

Figure 5-12. Main Board Sample Waveform -1

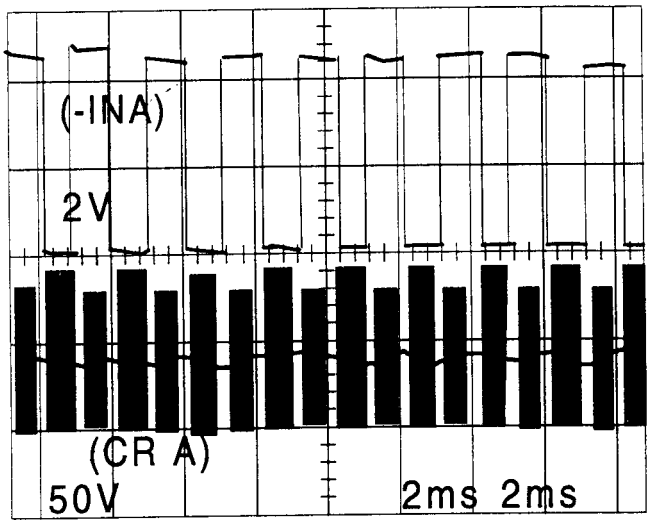

Figure 5-13. Main Board Sample Waveform -2

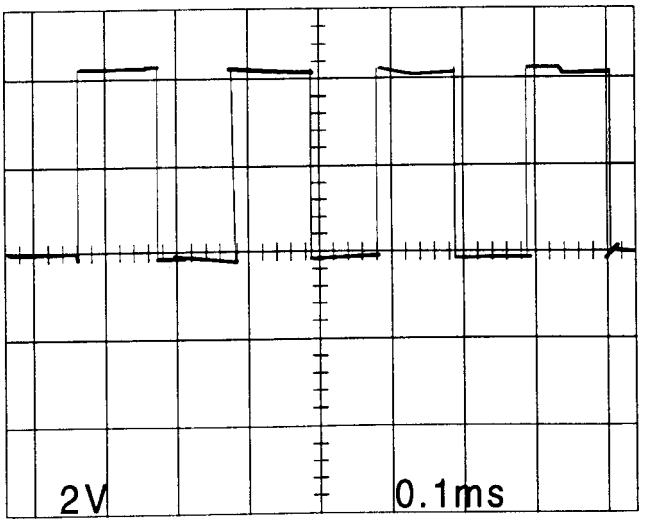

Figure 5-14. Main Board Sample Waveform -3

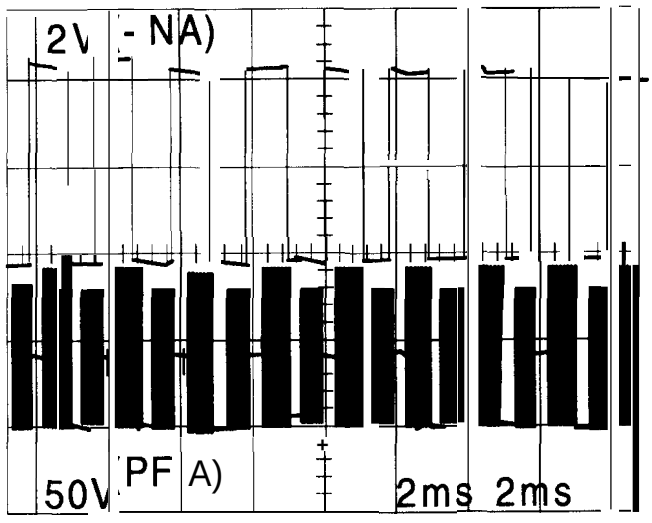

Figure 5-15. Main Board Sample Waveform -4

CHAPTER 6 Maintenance

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6.1 PREVENTIVE MAINTENANCE

Proper maintenance is essential to maintain optimal printer performance for the longest possibly period and to minimize malfunction frequency.
Preventive maintenance includes regular cleaning of the case exterior, using neutral detergent, and occasional vacuuming of the mechanism interior to remove dust and paper particles.
Following cleaning, refer to Section 6.2 to verify that the unit is adequately lubricated. Before returning the serviced printer to the consumer, inspect the springs, paper feed rollers, and the basic operation of the unit.

WARNING

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

6.2 LUBRICATION AND ADHESIVE

EPSON recommends that the points illustrated in Figures 6-1 and 6-2 be lubricated, with EPSON 02 and G26, which have been extensively tested and found to comply with needs of this printer. (Refer to Table 6-1 for details of 08 and G26.) Table 6-2 indicates the lubricant for each points.
Be sure that the parts to be lubricated are clean before applying lubricant, and avoid excessive application, which may damage related parts.

Table 6-1. Lubricants and Adhesive Agents

Classification	Description	Capacity	Availability	Parts No.
Oil	O-8	40CC	EPSON	1019753
Grease	G-26	4og	EPSON	B702600001
Adhesive Agent	1320N			
Adhesive Agent	1401B			

Vote: EPSON = EPSON-exclusive product

Table 6-2. Lubrication Points

Ref No.	Lubrication Points	Lubricant
(1)	LEVER, RELEASE (contact point with the GEAR,15.5)	G-26
(2)	LEVER, RELEASE, SUPPORT (contact point with the LEVER, RELEASE)	G-26
(3)	Slits of the FRAME, ASSY.,LEFT (contact portion with the LEVER. G, ADJUST)	G-26
(4)	OIL PAD, PLAN E, LOWER on the carriage	O-8
(5)	OIL PAD, PLANE, UPPER on the carriage	O-8
(6)	LINK, RELEASE, SUPPORT (contact point with the LEVER ASSY.,EJECT)	G-26
(7)	LEVER, PARALLEL, SHAFT (contact point with the SHAFT,CR,GUIDE,LOWER)	G-26
(8)	GEAR,30 (CARRIAGE ASSY.)	G-26
(9)	GEAR,18 (FRAME ASSY.,RIGHT)	G-26

Note: Lubricants must be applied during the reassembly process.

Table 6-3. Adhesive Points

Ref No.	Adhesive Points	Adhesive Agents
(lo)	HEXAGON NUT N4 securing the SHAFT,CR,GUIDE, LOWER to the LEVER, G,ADJUST	1320N
(11)	Notch of the LEVER, PARALLEL,SHAFT	1401B

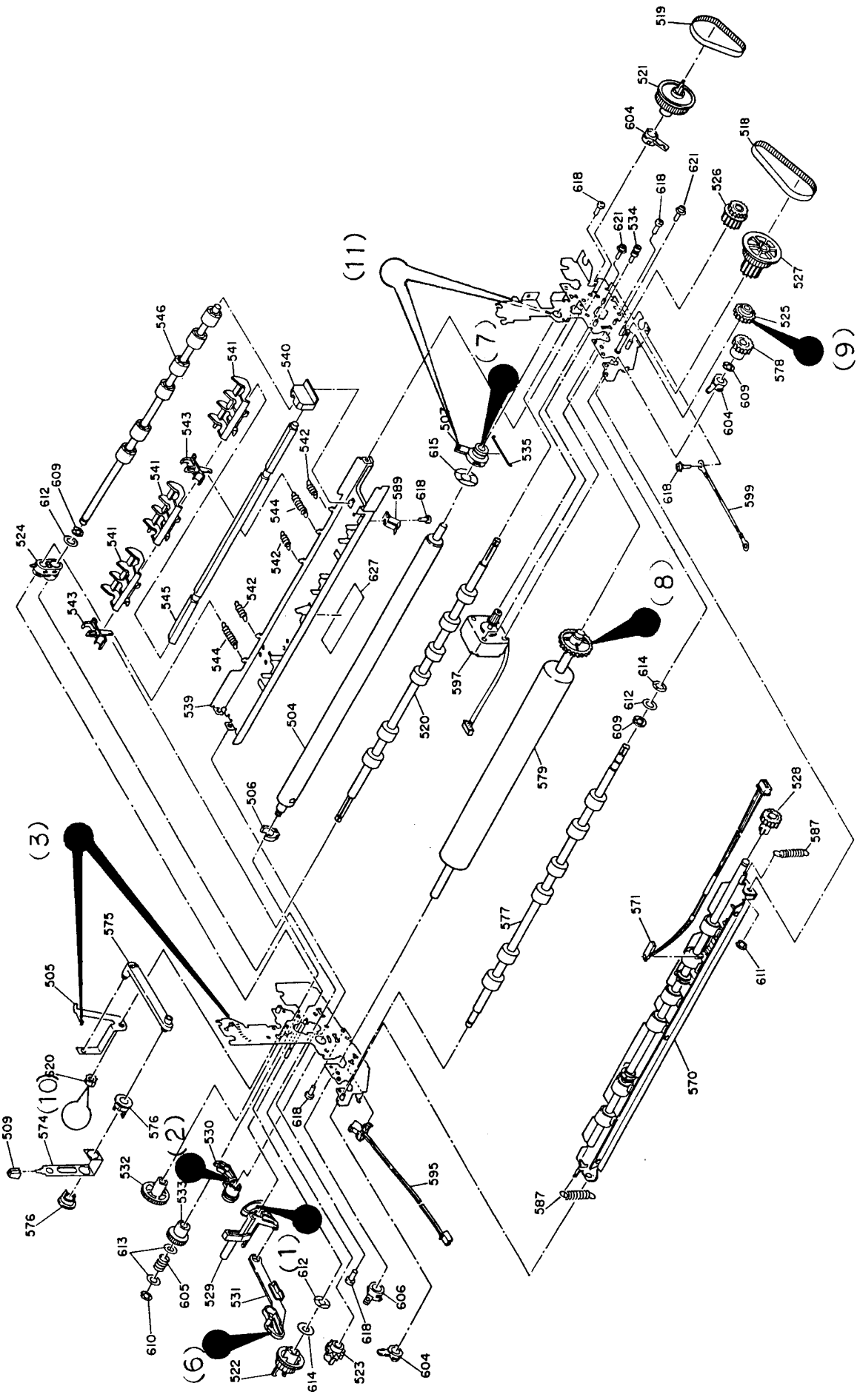

Figure 6-1. Lubrication and Adhesive Points (1)

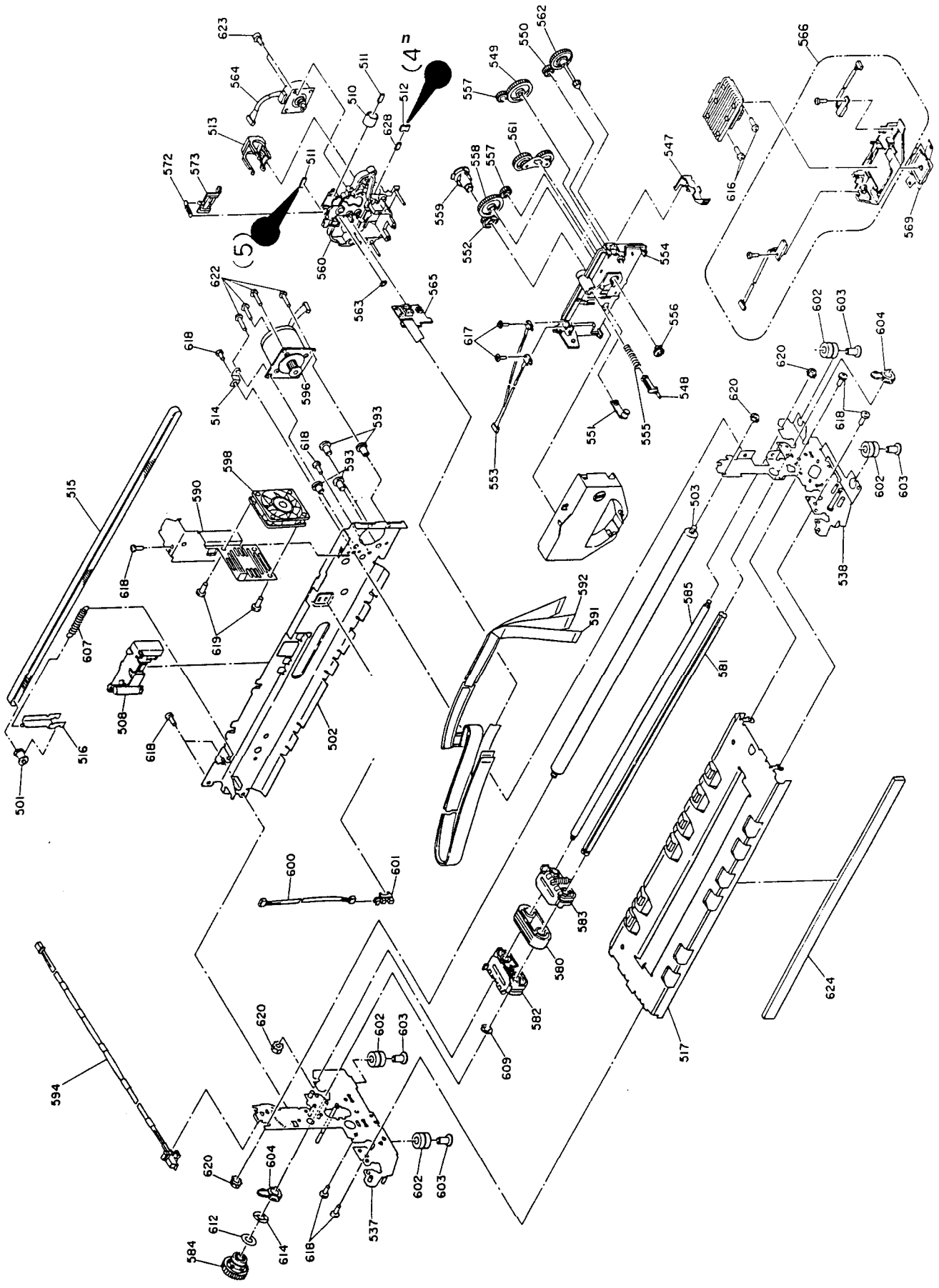

Figure 6-2. Lubrication and Adhesive Points (2)

APPENDIX

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A.1 CONNECTOR SUMMARY

This section describes the component connection and detailed pin assignments of each connector of the units.
Figure A-1 shows the component connections of the DLQ-3000, and Table A-1 lists the connector assignments and reference tables.
Table A-2 through appendix lists connector pin assignments. (Pin assignments of CN1, CN9 on the C124 MAIN and CN2 on the C124 PSB/PSE power supply board are listed in Tables 1-12, 1-15 (chapter 1) and 2-16 (chapter 2).)

"DIR" in each table indicates the signal direction viewed from the comector on the board.

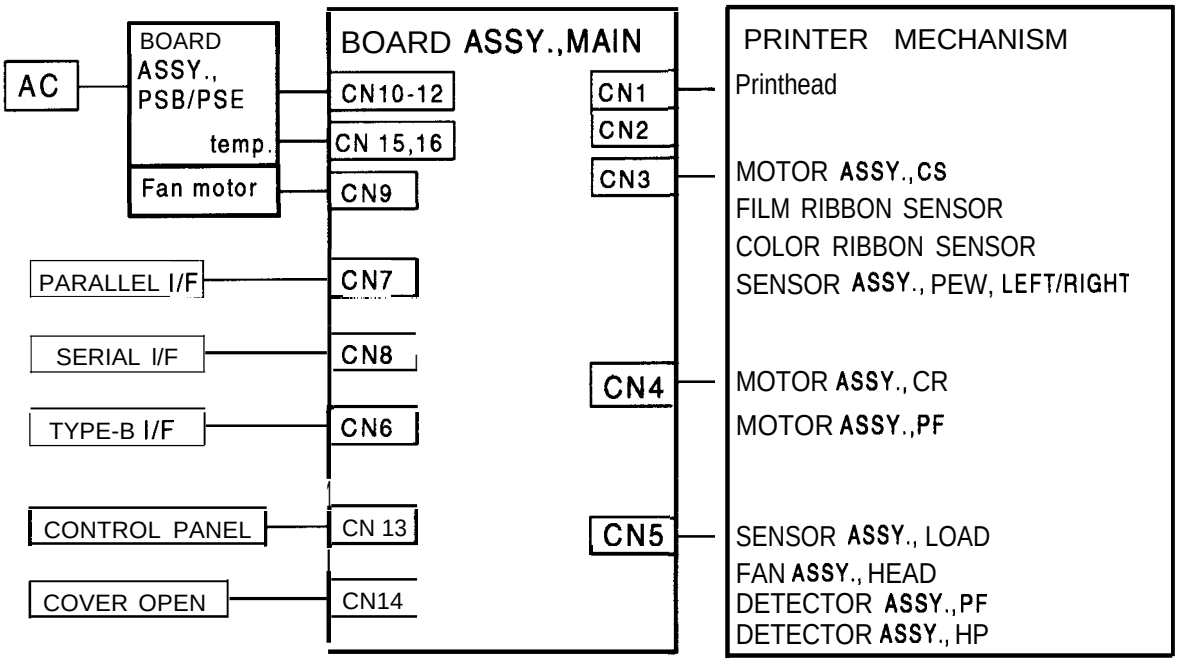


Figure A-1. Cable Connections

Table A-1. Connector Assignment

Board	Connector	Pin	Description
BOARD ASSY.,C 24 MAIN	CN 1	20	Printhead drive signal output
	CN 2	20	Printhead drive signal output
	CN 3	14	CS motor, Color ribbon/film ribbon/ CS home sensor
	CN 4	11	CR motor, PF motor output
	CN 5	13	PG/ REL/COVER OPEN/LOAD sensor, External fan motor
	CN 6	36	Type -B I/F
	CN 7	36	Centronics parallel I/F
	CN 8	25	Serial I/F
	CN 9	2	Power supply board fan motor
	CN 10	4	Power supply input (+5V)
	CN 11	6	Power supply input (+35V)
	CN 12	6	Power supply input (+35V)
	CN 13	10	Control panel
	CN 14	2	CR motor common (cover open sensor)
	CN 15	2	Power supply board temp.
	CN 16	2	Power supply board temp.
C124 SUB BOARD	CN 4		From CN1 to Printhead output signal
	CN 5		From CN2 to Printhead output signal
	CN 6		From CN3 to CS motor, Color ribbon/film ribbon/ CS home sensor
BOARD ASSY., PSB / PSE	CN 1	2	AC input line
	C124 CN 2	10	DC output (+5V, +35V)
	CN 3	6	DC output (+35V)

Table A-2. Connector Pin Assignment - CN1

Pin	1/0	Name	Description
1	0	NHD 15	#15 print pulse
2	0	COM 6/12	#6, #12 common
3	0	COM 11	#11 common
4	0	COM 10/18	#1 O, #18 common
5	0	NHD 23	#23 print pulse
6	0	COM 7/15	#7, #15 common
7	0	HD 22	#22 print pulse
8	0	HD 19	#19 print pulse
9	0	HD 3	#3 print pulse
10	0	COM 23	#23 common
11	0	HD 11	#11 print pulse
12	0	HD 14	#14 print pulse
13	0	COM 10118	#1O,#18 common
14	0	COM 2	#2 common
15	0	HD 6	#6 print pulse
16	0	HD 10	#1 O print pulse
17	0	HD 2	#2 print pulse
18	0	HD 18	#18 print pulse
19	0	HD 7	#7 print pulse
20	0	COM 14	#14 common

Table A-3. Connector Pin Assignment - CN2

Pin	I/O	Name	Description
1	0	COM 1/21	#1, #21 common
2	0	COM 9/13	#9, #13 common
3	0	HD 5	#5 print pulse
4	0	HD 13	#13 print pulse
5	0	HD 9	#9 print pulse
6	0	HD17	#17 print pulse
7	0	COM 5/17	#5, #17 common
8	0	HD 21	#21 print pulse
9	0	HD 20	#20 print pulse
10	0	COM 12/16	#12, #16 common
11	0	COM 4/24	#4, #24 common
12	0	HD 12	#12 print pulse
13	0	HD 1	#1 print pulse
14	0	HD 24	#24 print pulse
15	0	COM 8/20	#8, #20 common
16	0	HD 16	#16 print pulse
17	0	HD 4	#4 print pulse
18	0	HD 8	#18 print pulse
19	I	TEMP	Printhead temperature
20	I	TEMP	Printhead temperature

Table A-4. Connector Pin Assignment - CN3

Pin	I/O	Name	Description
1	-	+ 5V	+ 5V DC
2	-	PWLCOM	PWL common
3	I	CSHOME	CS home position signal
4	-	GND	Ground
5	I	PEWR/L	PEW sensor signal
6	-	PWRCOM	PWR common
7	-	RFCOM	RF power supply line (+35V/+5V)
8	0	RF-B	Phase –B drive signal
9	0	RF-A	Phase –A drive signal
10	0	RF B	Phase B drive signal
11	0	RF A	Phase A drive signal
12	-	GND	Ground
13	I	COLOR	Color ribbon sensor signal
14	I	FILM	Film ribbon sensor signal

Table A-5. Connector Pin Assignment - CN4

Pin	I/O	Name	Description
1	0	CR A	Phase A drive signal
2	0	CR-A	Phase –A drive signal
3	0	CR B	Phase B drive signal
4	0	CR-B	Phase -B drive signal
5	-	CRCOM	CR motor power supply line (VPA)
6	-	CRCOM	CR motor power supply line (VPA)
7	0	PF A	Phase A drive signal
8	0	PF_A	Phase–A drive signal
9	0	PF B	Phase B drive signal
10	0	PF_B	Phase–B drive signal
11		PFCOM	PF power supply line (VPB)

Table A-6. Connector Pin Assignment - CN5

Pin	I/O	Name	Description
1	-	+5V	+5V DC
2	I	CRHOME	CR home position sensor signal
3	-	GND	Ground
4	I	LOAD	Loading sensor signal
5	-	GND	Ground
6	-	+5V	+5V DC
7	I	ANODE	Photo-diode anode (Loading sensor, +5V DC)
8	I	PG	PG sensor signal
9	-	GND	Ground
10	I	REL	Release sensor signal
11	-	GND	Ground
12	-	+35V	+35V DC (External fan motor)
13	-	GP	Power line ground

Table A-7. Connector Pin Assignment - CN6

Pin	I/O	Name	Description
1-6	-	+5V	+5V DC line
7	0	TAD	Transmit data
8	0	-READY	Ready to receive data
9	I	RAD	Receive data
10	-	NC	No connection
11	0	-RAT	Reset
12	0	INH	Inhibit
13	I	_CMREQ	Command request
14	I	_WRRDY	Write ready
15	I	_RDREQ	Read ready
16	0	–WR	Write
17	0	_RD	Read
18	0	-Cs	Chip select
19-24	-	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 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	D0	Data bus bit O

Table A-8. Connector Pin Assignment - CN9

Pin	I/O	Name	Description
1	-	35V	+35V DC
2	-	GP	Power line ground

Table A-9. Connector Pin Assignment - CN1O

Pin	I/o	Name	Description
1	-	GL	Logic ground
2	-	GL	Logic ground
3	-	+5	+5V DC
4	-	+5	+5V DC

Table A-10. Connector Pin Assignment - CNI 1

Pin	I/O	Name	Description
1	-	35V	+35V DC
2	-	35V	+35V DC
3	-	35V	+35V DC
4	-	GP	Power ground
5	-	GP	Power ground
6	-	GP	Power ground

Table A-1 1. Connector Pin Assignment -CN12

Pin	I/O	Name	Description
1		35V	+35V DC
2		35V	+35V DC
3		35V	+35V DC
4		GP	Power ground
5		GP	Power ground
6		GP	Power ground

Table A-12. Connector Pin Assignment - CN13

Pin	I/O	Name	Description
1-3	-	5V	+5V DC
4-6	-	GND	Ground
7	I	PNLTOMAIN	Serial data input
8	0	MAINTOPNL	Serial data output
9	-	SCK	Clock
10	I	COVER	Cover open sensor signal

Table A-13. Connector Pin Assignment - CN14

Pin	I/O	Name	Description
1	-	VPA	+35V DC (VPA)
2	-	CRCOM	CRCOM (COVER OPEN SWITCH)

Table A-14. Connector Pin Assignment - CN15,CN16

Pin	I/o	Name	Description
1	I	VTH1	Power board temp. signal
2	I	PSTEMP	Power board temp. signal

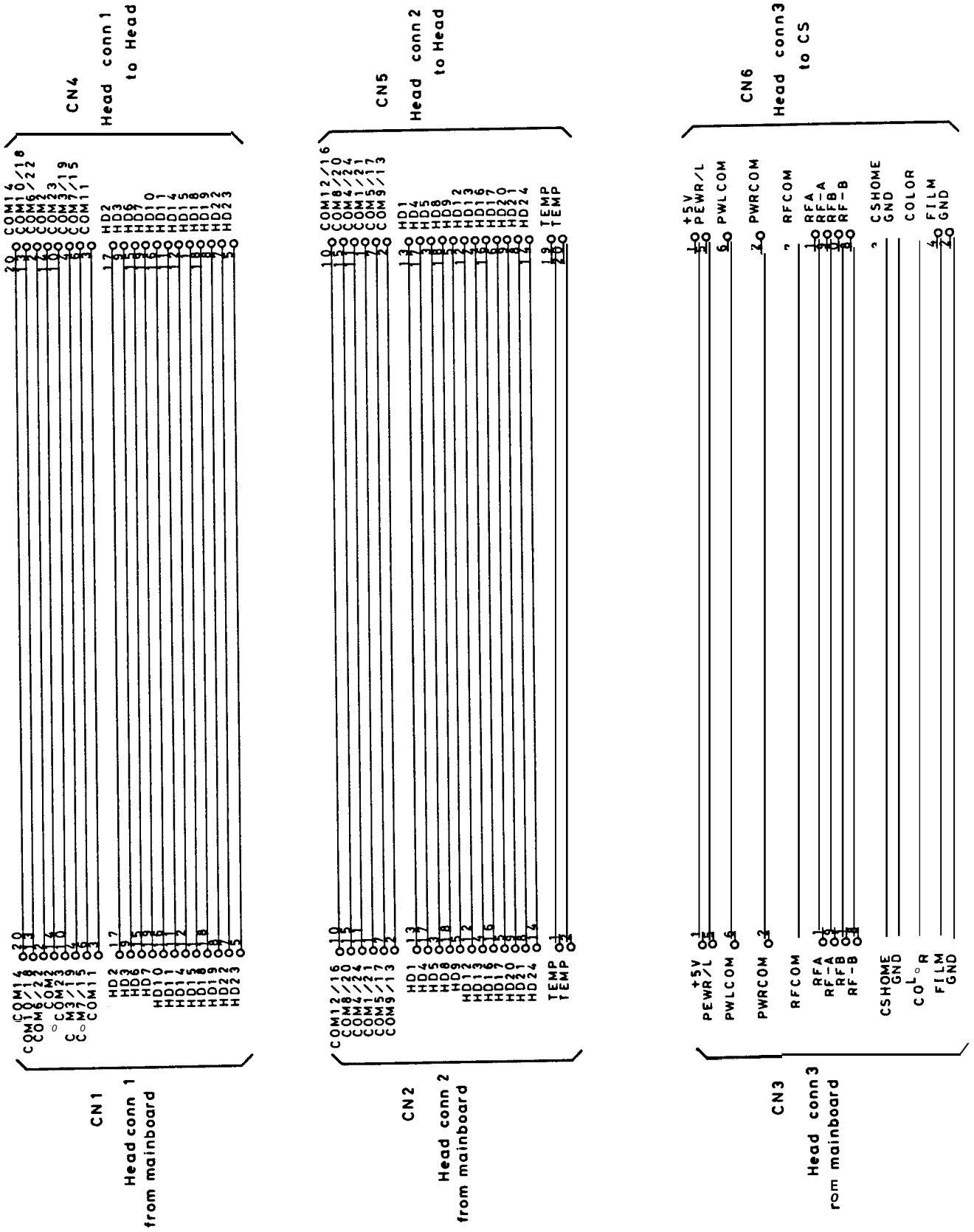


Figure A-4. BOARD ASSY.,C124 MAIN SUB Circuit Diagram

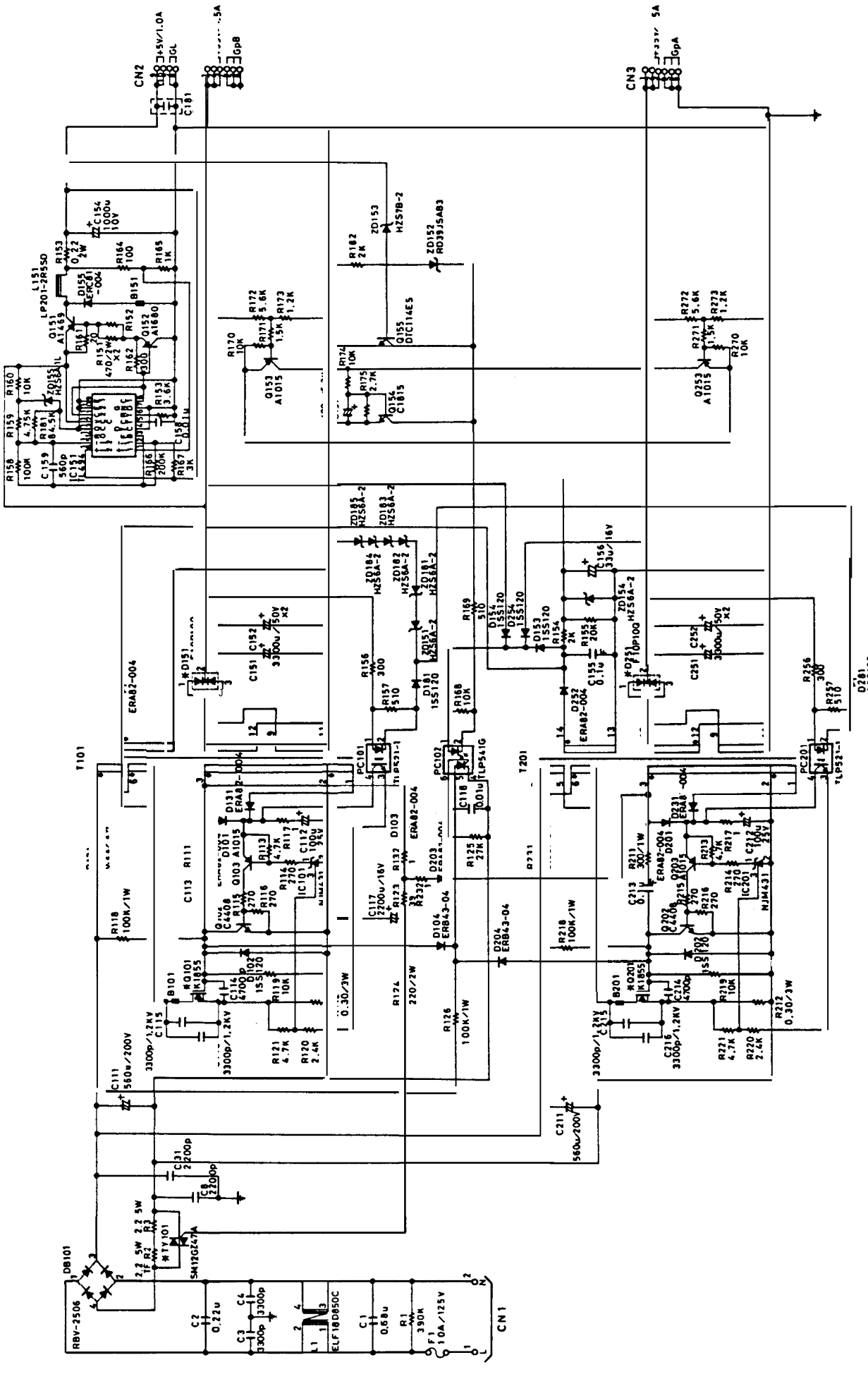


Figure A-5. BOARD ASSY.,C124 PSB Circuit Diagram

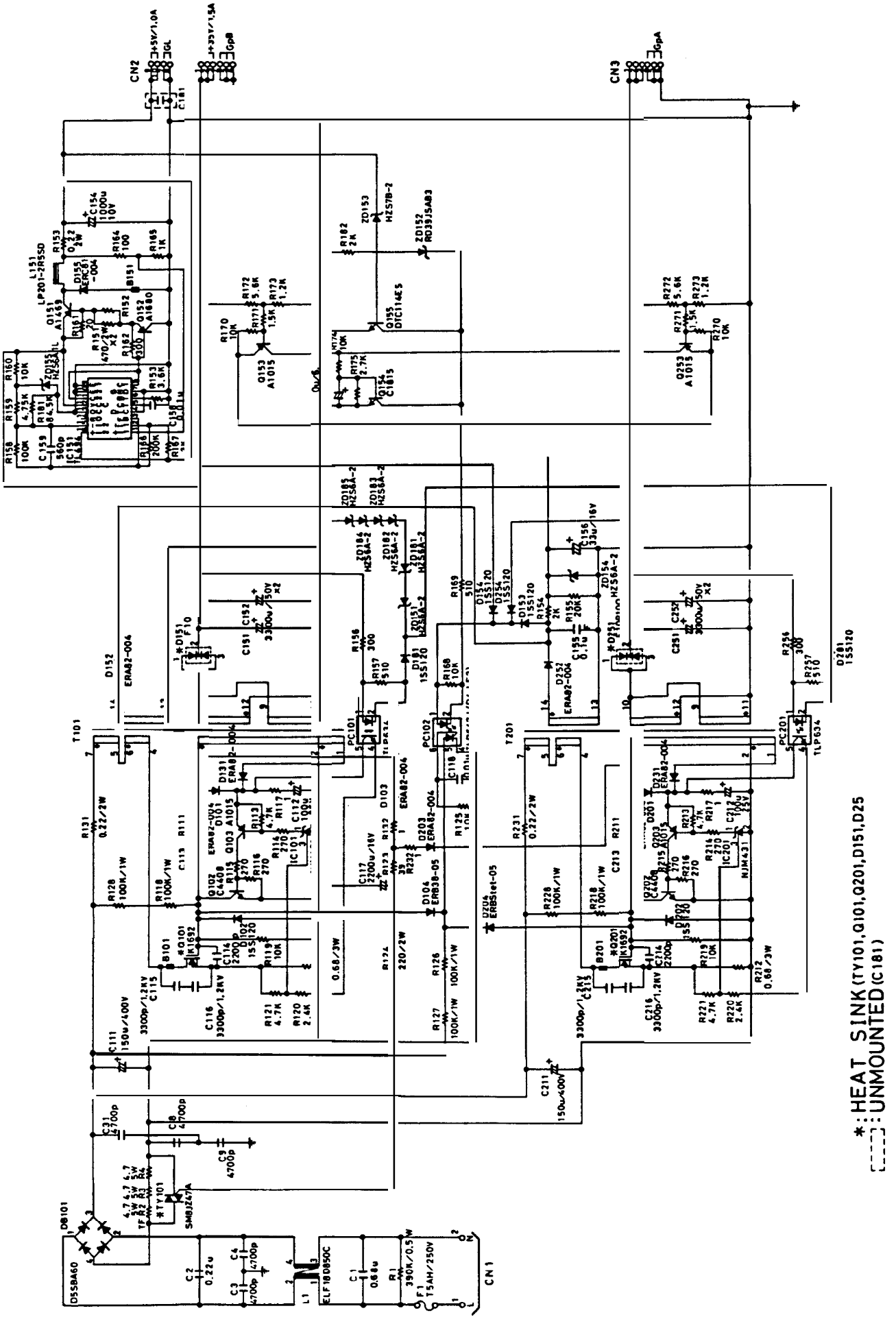


Figure A-6. BOARD ASSY.,C124 PSE Circuit Diagram

A.3 CIRCUIT BOARD COMPONENT LAYOUT

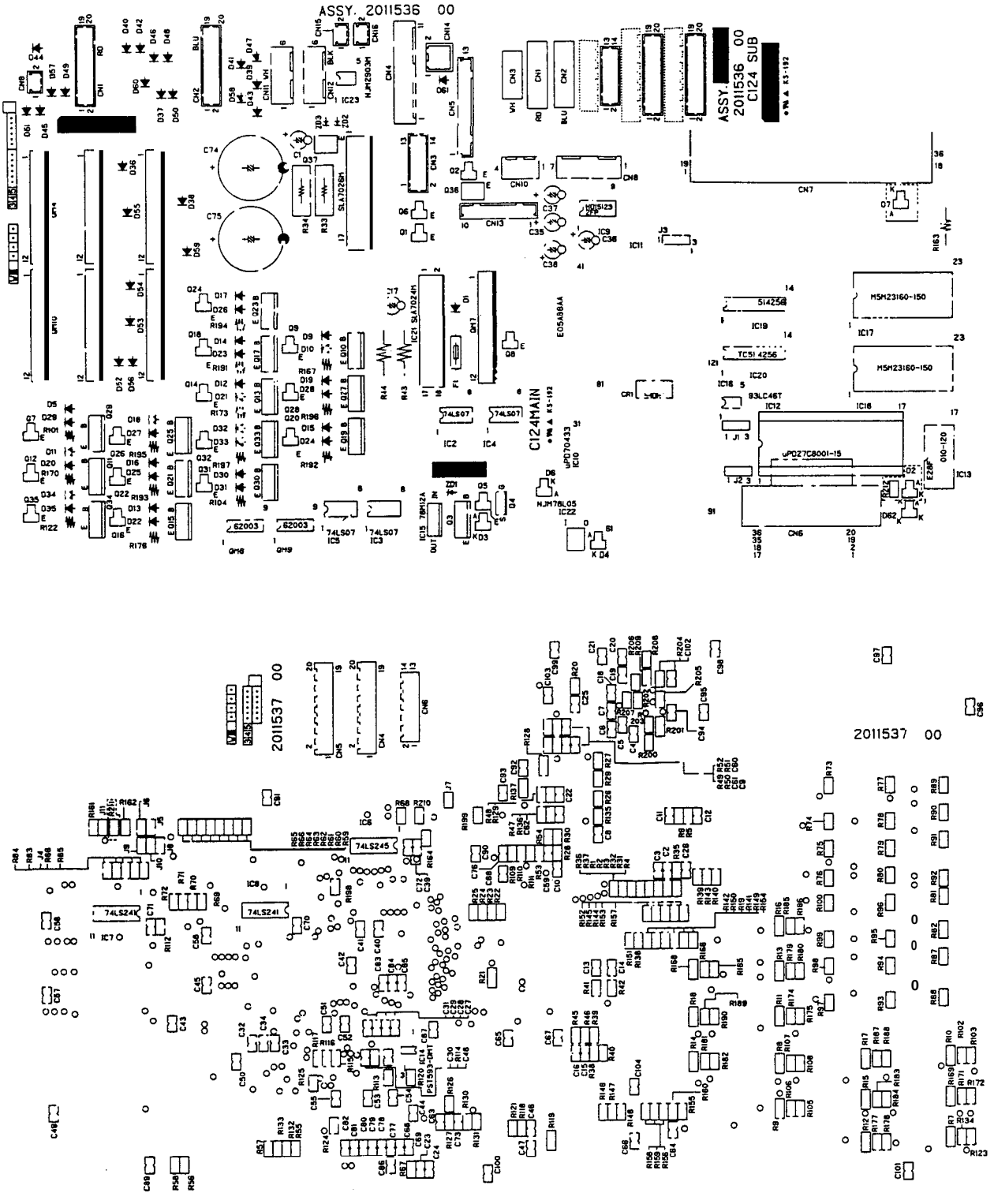


Figure A-7. BOARD ASSY.,C124 MAIN & SUB Component Layout

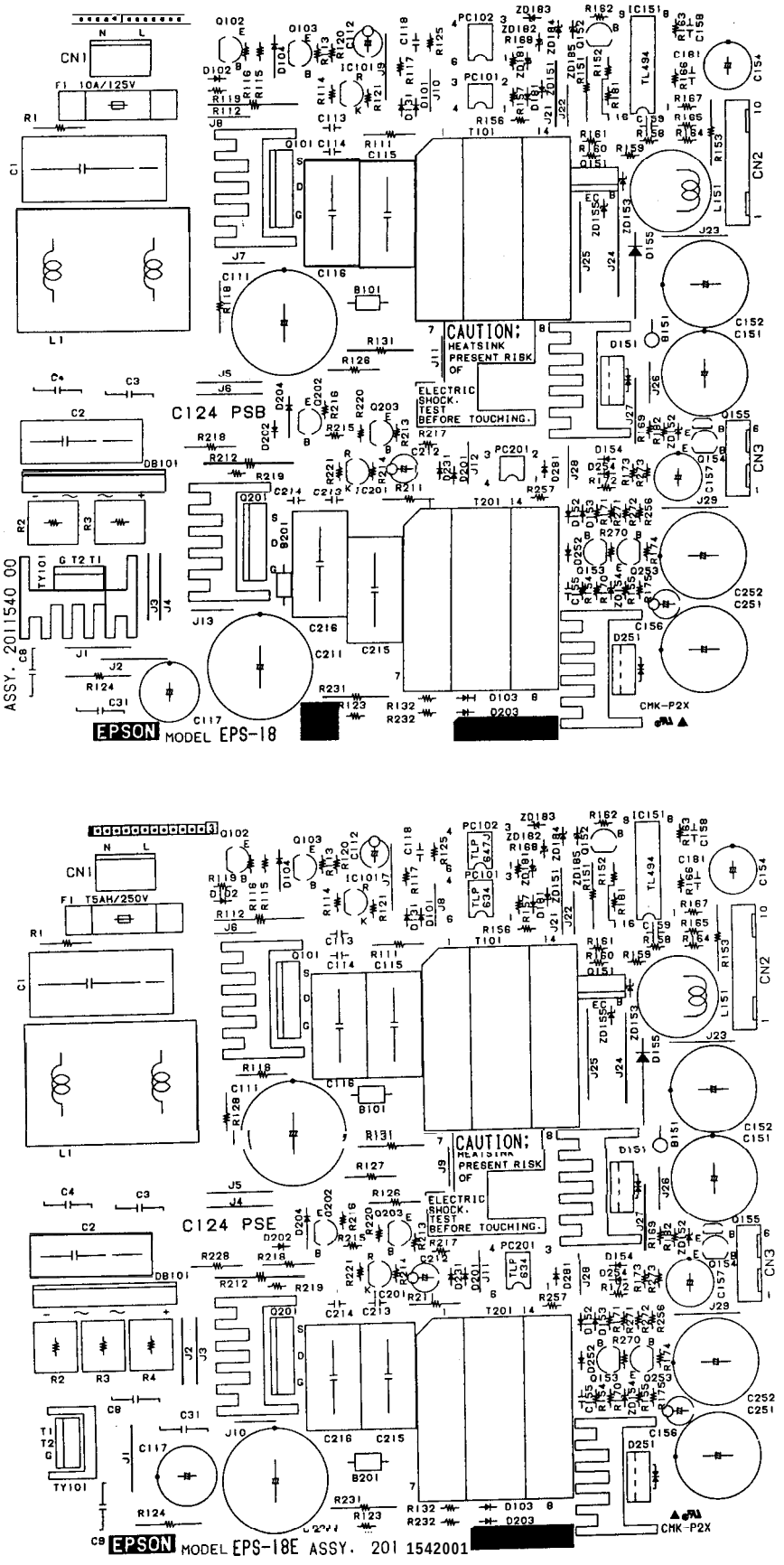
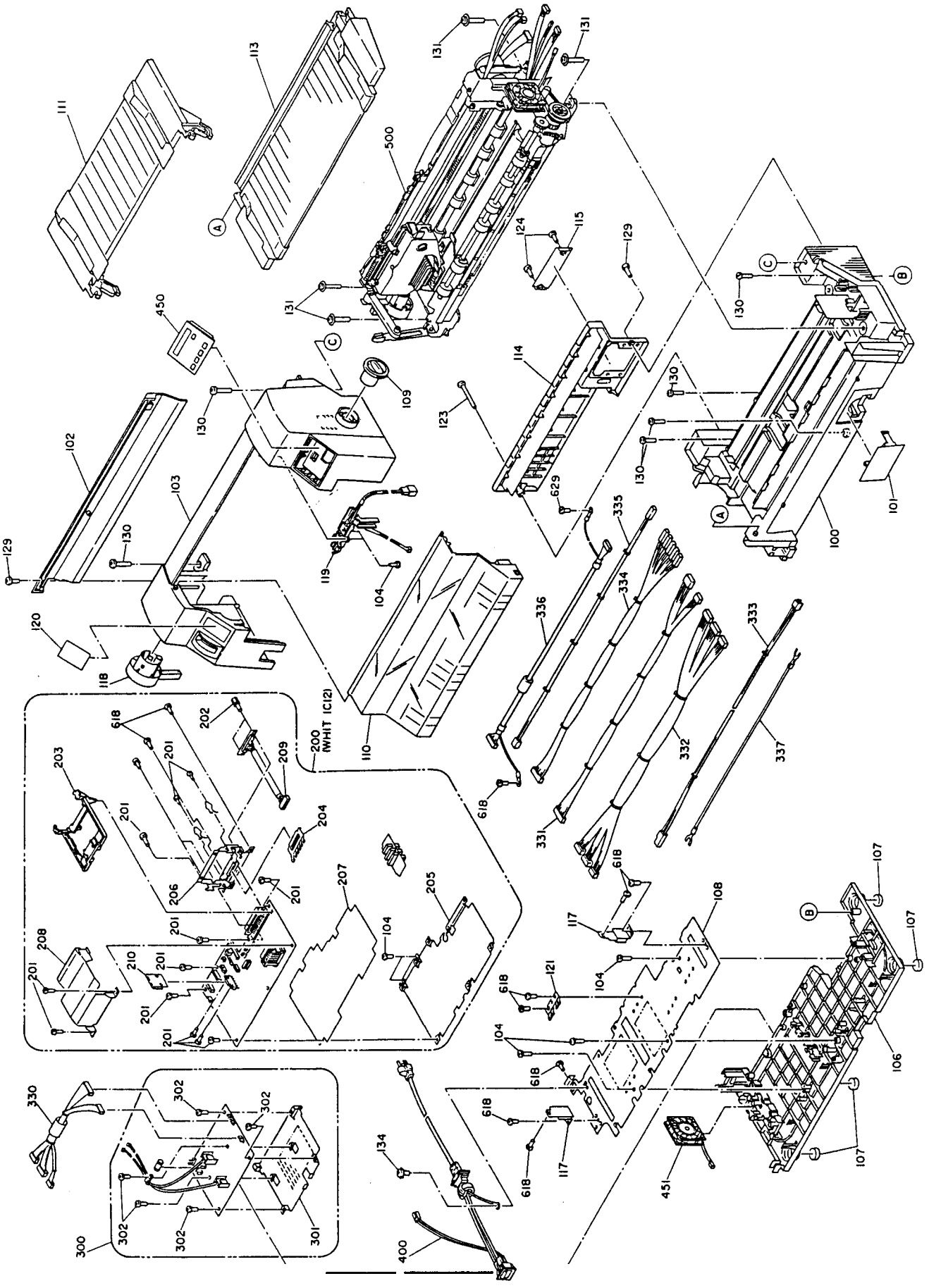
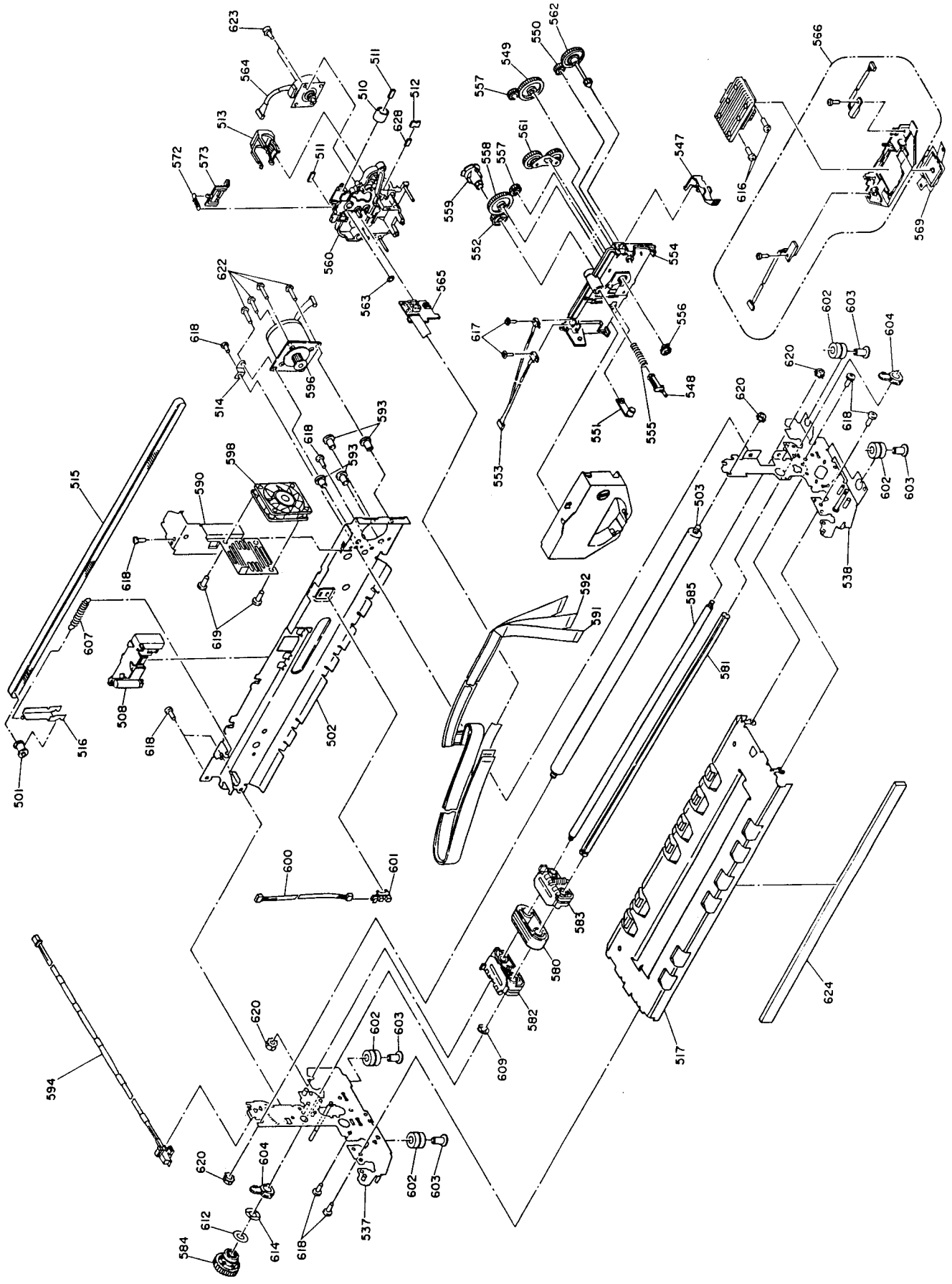


Figure A-8. BOARD ASSY.,C124 PSB/PSE Component Layout

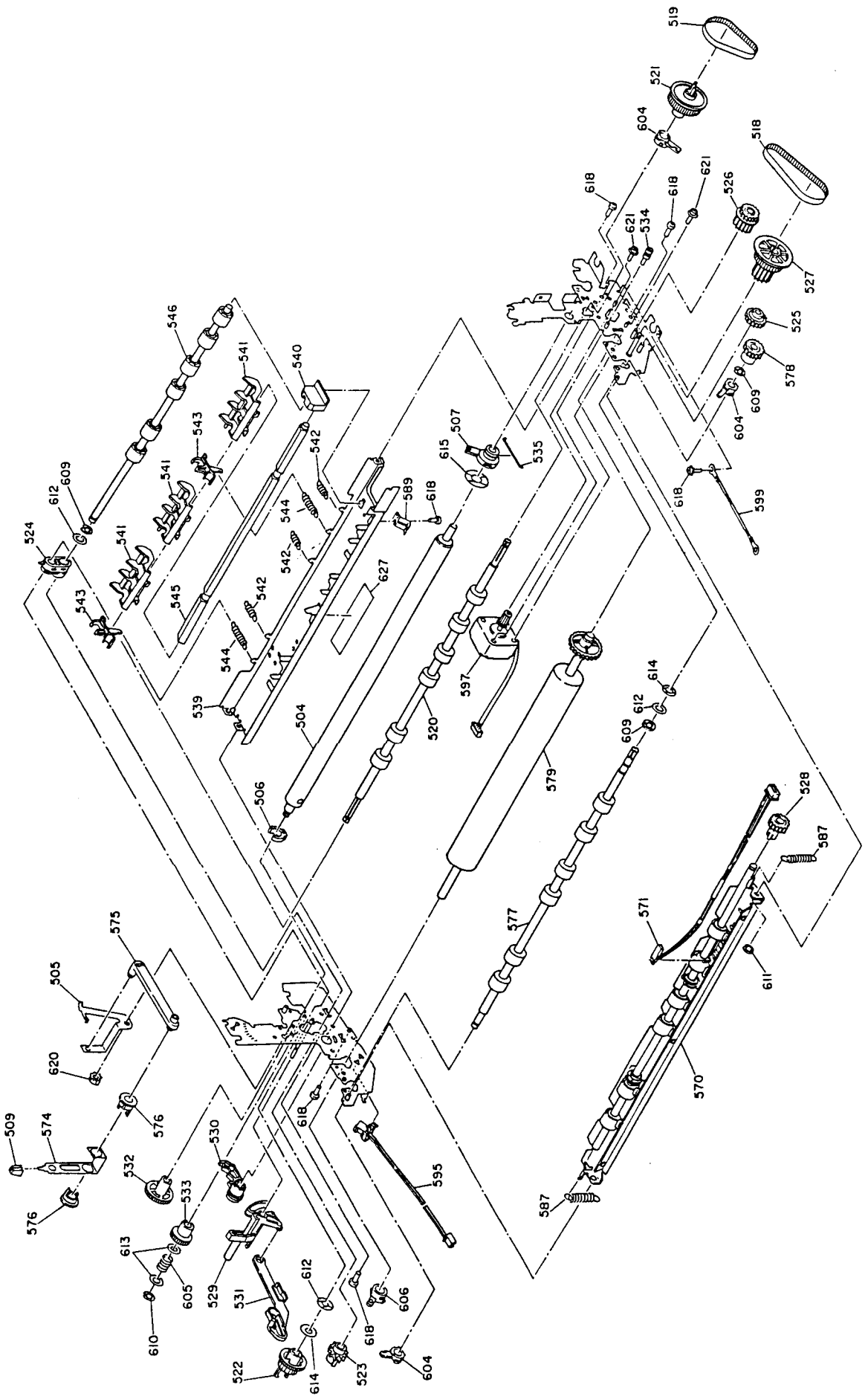
A.4 EXPLODED DIAGRAM



Fgiure A-9. DLQ-3000 Exploded Diagram (1)



Fgiure A-10. DLQ-3000 Exploded Diagram (2)



Fgiure A-11. DLQ-3000 Exploded Diagram (3)

Table A-15. Parts List

Ref. No.	Description	Ref. No.	Description
100	HOUSING ASSY.,LOWER	204	BRACKET,B
101	COVE R, SHIELD, FRONT	205	FRAME,MAIN
102	COVER, SHIELD, REAR	206	GROUNDING PLATE,I/F
103	HOUSING ASSY.,UPPER	207	INSULATION PLATE,I/F
104	C.C.B. SCREW (M3x1O)	208	SHIELD CASE,TYPE B
106	FRAME ASSY.,BOTTOM	209	HARNESS
107	RUBBER FOOT	210	HEAT SINK
108	SHIELD PLATE	300	BOARD ASSY.,POWER SUPPLY
109	KNOB	301	FRAME, POWER SUPPLY
110	COVER ASSY.,PRINTER	302	C.B.S. SCREW (M3×6)
111	SHEET GUIDE ASSY.,REAR	330	WIRE-HARNESS
113	SHEET GUIDE ASSY.,FRONT	331	WIRE-HARNESS
114	COVER,REAR	332	WIRE-HARNESS
115	COVER, CON NECTOR,UPPER	333	WIRE-HARNESS
117	GROUNDING PLATE	334	WIRE-HARNESS
118	LEVER, RELEASE	335	WIRE-HARNESS
119	INTER LOCK ASSY.	336	WIRE-HARNESS
120	LOGO PLATE;B	337	WIRE-HARNESS
121	GROUNDING PLATE, P.C.B.	400	POWER CABLE
123	C.B.B. SCREW (M3×40)	401	WIRE-HARNESS
124	C.B.S. SCREW (M3×12)	450	CONTROL PANEL
129	C.B.B. SCREW (M3×12)	451	FAN ASSEMBLY
130	C.B.B. SCREW (M4×16)	500	PRINTER MECHANISM
131	C. B. B.(P) SCREW (M4×25)	501	BELT DRIVEN PULLEY ASSY.
134	C. B.(O) SCREW (M4×6)	502	FRAME,CR
135	FERRITE CLUMP	503	SHAFT,CR,GUIDE, UPPER
200	BOARD ASSY.,MAIN&SUB	504	SHAFT,CR,GUIDE, LOWER
201	C.B.S. SCREW (M3×6)	505	LEVER,G,ADJUST
202	SCREW DEUE-M2.6-0.45	506	SPACER, CR, SHAFT
203	GUI DE,I/F BOARD	507	LEVER, PARALLEL, SHAFT

Table A-15. Parts List (Continued)

Ref. No.	Description	Ref. No.	Description
508	HOLDER, HEAD, CABLE	538	FRAME ASSY.,RIGHT
509	KNOB, G, ADJUST	539	FRAME,BASE
510	BUSHING,14.04	540	HOLDER, LOAD, ROLLER
511	OIL PAD ,PLANE,UPPER	541	LEVER, PAPER GUIDE, CHANGE
512	OIL PAD, PLAN E. LOWER	542	EXTENSION SPRING,350
513	COVER, OIL PAD	543	LEVER, PAPER GUI DE, CHANGE, SUPPORT
514	GROUNDING PLATE, CR, MOTOR	544	EXTENSION SPRING,180
515	TIMING BELT,CR	545	SHAFT, PAPER GUIDE, CHANGE
516	LEVER, CR,BELT	546	ROLLER ASSY.,LOAD,SUPPORT
517	PAPER GUIDE	547	CARTRIDGE MOUNTING LEVER
518	TIMING BELT, PF,FR'ONT	548	CARTRIDGE LOCATION PIN
519	TIMING BELT, PF,REAR	549	SPUR GEAR,18
520	ROLLER, LOAD, DRIVE	550	SPUR GEAR,12
521	PULLEY, LOAD, ROLLER	551	COLOR SELECT DRIVE LEVER
522	COMBINATION GEAR,16,20	552	COLOR SELECT DRIVE GEAR
523	SPUR GEAR,16	553	DETECTOR ASSY.,RC
524	BUSH ING,LOAD,ROLLER	554	HOLDER, RIBBON CARTRIDGE
525	SPUR GEAR,18	555	COMPRESSION SPRING,645
526	COMBINATION GEAR,1 5,18	556	FASTEN, RIBBON, PLANET
527	COMBINATION GEAR,1 6,34,93	557	SPUR GEAR,1O.4
528	SPUR GEAR,16	558	SPUR GEAR,21 .5
529	LEVER, RELEASE	559	CAM,CS
530	LEVER, RELEASE, SUPPORT	560	CARRIAGE SUB ASSY.,
531	LINK, RELEASE, LEVER	561	LEVER ASSY.,PLANET
532	SPUR GEAR,25	562	GEAR ASSY.,RIBBON,DRIVE
533	SPUR GEAR,1 5.5	563	SPACER,CS
534	SHAFT, PF,TENSION	564	MOTOR ASSY.,CS
535	SPRING, CR, GUIDE, LOWER	565	BOARD ASSY.,CS
536	COVER, CR, FRAME	566	HOLDER ASSY., RIBBON MASK,B
537	FRAME ASSY.,LEFT	569	RIBBON MASK ASSY.

Table A-15. Parts List (Continued)

Ref. No.	Description	Ref. No.	Description
570	LEVER ASSY.,EJ	600	HARNESS,HP
571	SENSOR ASSY.,LOAD;B	601	PHOTO INTERRUPTER
572	LEVER,CR	602	DAMPER
573	EXTENSION SPRING,154	603	DAMPER SPACER
574	KNOB, TRANSMISSION, ADJUST	604	PLATEN SHAFT HOLDER
575	LEVER, TRANSMISSION, ADJUST	605	TRACTOR REDUCTION GEAR SPRING
576	SPACER, TRANSMISSION, ADJUST	606	PLATEN SHAFT HOLDER
577	ROLLER ASSY.,EJ,ADJUST	607	EXTENSION SPRING,3275
578	SPUR GEAR,16	609	RETAINING RING TYPE-E(5)
579	PLATEN ASSY. ,	610	RETAINING RING TYPE-E(4)
580	PAPER SUPPORT	611	RETAINING RING TYPE-E(3)
581	DRIVE SHAFT, PUSH TRACTOR	612	PLAIN WASHER 8x0.5x15
582	TRACTOR,LEFT	613	PLAIN WASHER 5x0.5x1 O
583	TRACTOR, RIGHT	614	LEAF SPRING 8.2x0.15x15
584	SPUR GEAR,25	615	LEAF SPRING 10.5xO.25X18.5
585	SHAFT,TRACTOR, REAR	616	CTPS SCREW (M3x1O)
586	LEAF SPRING ASSY.,CR,GUIDE, UPPER	617	C.C.B. SCREW (M2×8) F/Zn
587	EXTENSION SPRING,353	618	C.B.S. SCREW (M3×6)
589	GROUNDING PLATE, FRAME,BASE	619	C.B.B. SCREW (M5x1O)
590	GROUNDING PLATE,FFC	620	HEAXAGON NUT WITH OW (M4)
591	CABLE, HEAD, FRONT	621	C. P.(P) SCREW (M3×6)
592	CABLE, HEAD, REAR	622	CUP SCREW (M3×16)
593	CARRIAGE MOTOR DAMPER	623	C. B.S.(O) SCREW (M3×6)
594	DETECTOR ASSY.,RG	624	SOUND ABSORBER
595	DETECTOR ASSY.,PF	625	DAMPER, CR, MOTOR
596	MOTOR ASSY.,CR	627	SHEET, PROTECT
597	MOTOR ASSY.,PF	628	OIL PAD, CLEANING
598	FAN ASSEMBLY	629	C.B.S. SCREW (M3×8)
599	LEAD		

A.5 CASE OUTLINE DRAWING

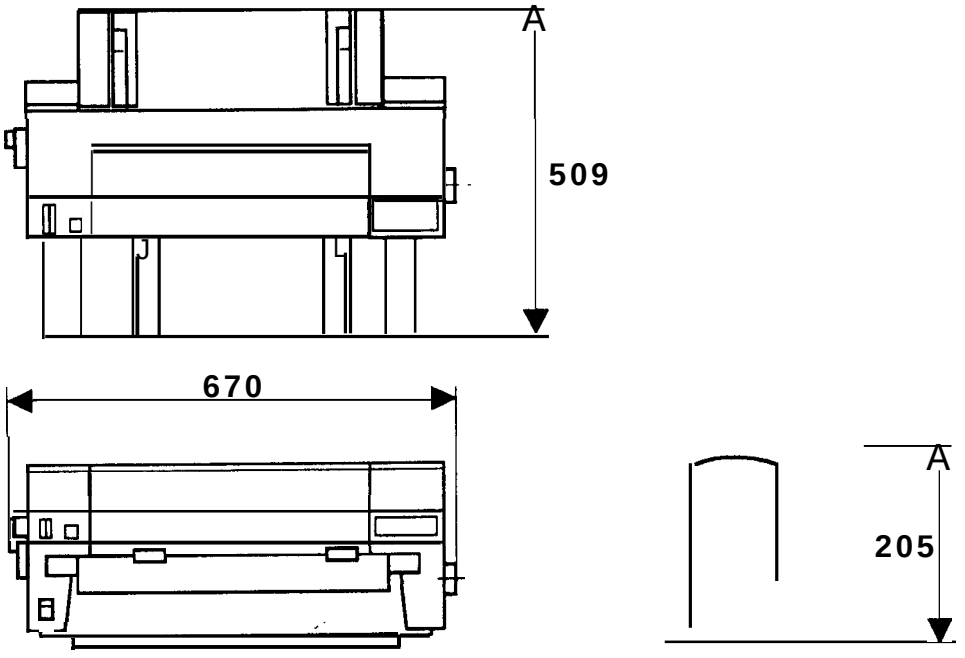


Figure A-12. DLQ-3000 Case Outline Drawing

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