

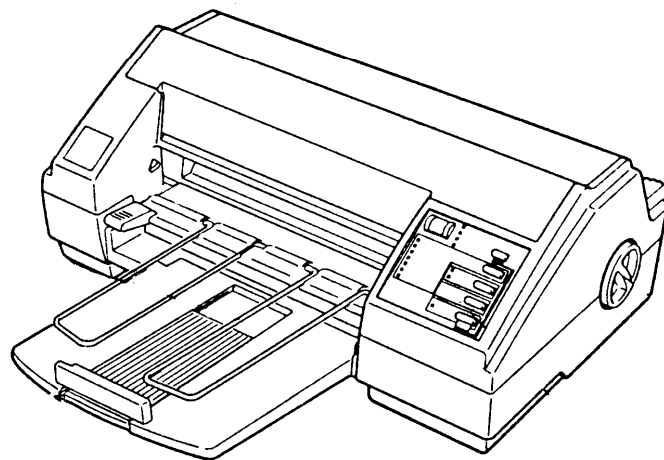
EPSON TERMINAL PRINTER

*Stylus*<sup>™</sup> COLOR

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**SERVICE MANUAL**

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**EPSON**

4003353

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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 Stylus Color.

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. ADJUSTMENTS**

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	Page /Contents	
Rev.-A	April 27, 1994		1 st issue
Rev.-B	October 4, 1994	3-1	Change the WARNING contents
Rev.-C	November 30, 1994	3-3	Change the explanation for the upper case removal
Rev.-D	January 11, 1995	4-7 to 4-17	Incorporate the simple adjust method.

# **TABLE OF CONTENTS**

<b>CHAPTER 1.</b>	<b>PRODUCT DESCRIPTION</b>
<b>CHAPTER 2.</b>	<b>OPERATING PRINCIPLES</b>
<b>CHAPTER 3.</b>	<b>DISASSEMBLY AND ASSEMBLY</b>
<b>CHAPTER 4.</b>	<b>ADJUSTMENTS</b>
<b>CHAPTER 5.</b>	<b>TROUBLESHOOTING</b>
<b>CHAPTER 6.</b>	<b>MAINTENANCE</b>
<b>APPENDIX</b>	

# Chapter 1 Product Description

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## Table of Contents

<b>1.1 FEATURES</b>	<b>1-1</b>
<b>1.2 SPECIFICATIONS</b>	<b>1-2</b>
1.2.1 Printing Specifications . . . . .	1-2
1.2.2 Paper Handling Specifications . . . . .	1-4
1.2.3 Paper Specifications . . . . .	1-4
1.2.4 Ink Cartridge Specifications . . . . .	1-6
1.2.5 Electrical Specifications . . . . .	1-7
1.2.6 Environmental Conditions . . . . .	1-7
1.2.7 Reliability . . . . .	1-8
1.2.8 Safety Approvals . . . . .	1-8
1.2.9 Physical Specifications . . . . .	1-8
<b>1.3 INTERFACE SPECIFICATIONS</b>	<b>1-9</b>
1.3.1 Serial Interface Specifications . . . . .	1-9
1.3.2 Parallel Interface Specifications . . . . .	1-11
<b>1.4 OPERATIONS</b>	<b>1-12</b>
1.4.1 Control Panel . . . . .	1-12
1.4.2 Panel Operation at Power On . . . . .	1-13
1.4.3 Default Settings . . . . .	1-14
1.4.3.1 Default Setting Items . . . . .	1-14
1.4.3.2 Changing the Default Settings . . . . .	1-15
1.4.4 Error Conditions . . . . .	1-17
1.4.5 Printer Initialization . . . . .	1-17
1.4.5.1 Hardware Initialization . . . . .	1-17
1.4.5.2 Software Initialization . . . . .	1-17
1.4.5.3 Panel initialization . . . . .	1-17
<b>1.5 MAIN COMPONENTS</b>	<b>1-18</b>
1.5.1 Main Control Board (C137 MAIN Board) . . . . .	1-18
1.5.2 Power Supply Board (C137 PSB/PSE Board) . . . . .	1-19
1.5.3 Control Panel (C137 PNL Board) . . . . .	1-19
1.5.4 Printer Mechanism (M-4A10) . . . . .	1-20
1.5.5 Housing . . . . .	1-20

## List of Figures

Figure 1-1. Exterior View of the Stylus Color. . . . .	1-1
Figure 1-2. Nozzle Configuration. . . . .	1-2
Figure 1-3. Printable Area for Cut Sheet. . . . .	1-5
Figure 1-4. Printable Area for Envelope . . . . .	1-5
Figure 1-5. Adjust Lever . . . . .	1-6
Figure 1-6. Temperature/Humidity Range. . . . .	1-7
Figure 1-7. Data Transmission Timing . . . . .	1-9
Figure 1-8. Control Panel Appearance . . . . .	1-12
Figure 1-9. C137 MAIN Board Component Layout . . . . .	1-18
Figure 1-10. C137 PSB/PSE Component Layout . . . . .	1-19
Figure 1-11. C137 PNL Board Component Layout . . . . .	1-19
Figure 1-12. Printer Mechanism (M-4A1O) . . . . .	1-20
Figure 1-13. Housing. . . . .	1-20

## List of Tables

Table 1-1. Interface Cards. . . . .	1-1
Table 1-2. Print Speed and Printable Columns. . . . .	1-2
Table 1-3. Character Tables . . . . .	1-3
Table 1-4. Cut Sheet Paper Specifications. . . . .	1-4
Table 1-5. Envelope Specifications. . . . .	1-4
Table 1-6. Adjust Lever Setting. . . . .	1-6
Table 1-7. Rated Electrical Ranges. . . . .	1-7
Table 1-8. Acceptable Environmental Conditions. . . . .	1-7
Table 1-9. Signal and Connector Pin Assignments for Parallel Interface . . . . .	1-10
Table 1-10. DTR and X-ON/X-OFF Protocol. . . . .	1-11
Table 1-11. Signal and Connector Pin Assignments for Serial Interface. . . . .	1-11
Table 1-12. Default Setting Items . . . . .	1-14
Table 1-13. Characteristics of Print Direction Mode . . . . .	1-14
Table 1-14. Printing Direction and ESC U Command. . . . .	1-14
Table 1-15. Language Selection . . . . .	1-15
Table 1-16. Feature Selection. . . . .	1-15
Table 1-17. Character Table Selection . . . . .	1-16
Table 1-18. Error Indications. . . . .	1-17



## 1.1 FEATURES

The Stylus Color is a 64- + 48-nozzle (monochrome and CMY) color ink jet dot matrix printer that uses new ink jet technology to achieve high-quality, high-speed printing. The major features of this printer are:

- ❑ Highquality color printing as a result of new inkjet technology.
- ❑ Fast print speeds, capable of printing LQ characters at 200 cps.
- ❑ Compact design to save precious work space.
- ❑ Built-in auto sheet feeder with a maximum capacity of 100 cut sheets, 50 transparencies, 70 heavy or special papers, or 10 envelopes.
- ❑ 8-bit parallel interface and Macintosh<sup>®</sup> serial interface standard.
- ❑ Easy setup.
- ❑ Four scalable fonts and five LQ fonts standard.
- ❑ Support for 9 character tables in the standard version and 15 character tables in the NLSP (National Language Support Printer) version.
- ❑ Inexpensive to run and maintain.

The figure below shows the Stylus Color.

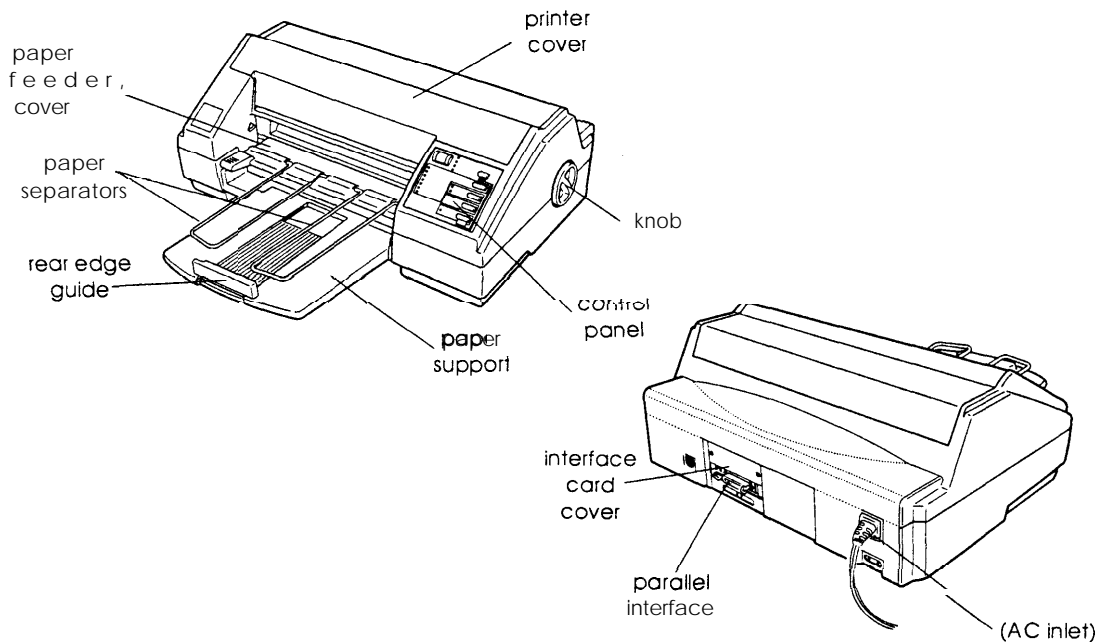


Figure 1-1. Exterior View of the Stylus Color

Table 1-1. Interface Cards

Interface Card	Model Number
Serial interface card	C823051/C823061
32KB serial interface card	C823071/C823081
32KB parallel interface card	C82310*
32KB IEEE-488 interface card	C82313*
LocalTalk@ interface card	C82312*
Twinax interface card	C82315*
Coax interface card	C82314*

\* The asterisk is a substitute for the last digit, which varies by country.

## 1.2 SPECIFICATIONS

This section provides statistical facts and other detailed intonation for the printer.

### 1.2.1 Printing Specifications

Print system: On demand inkjet system  
 Nozzle configuration: 64 nozzles (16 x 4 staggered): Monochrome  
 4\$ nozzles (16 x 3 staggered): Color

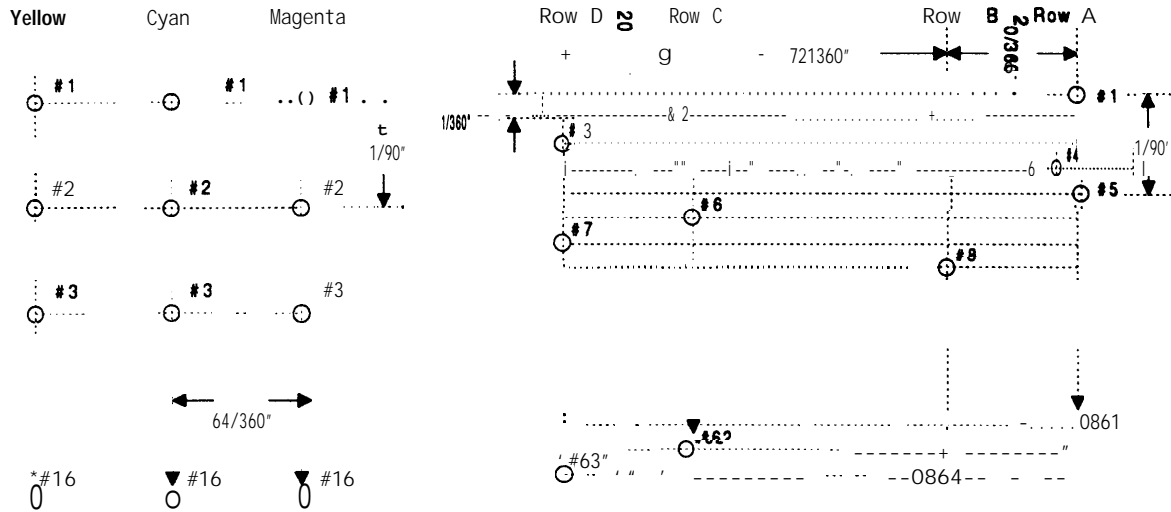


Figure 1-2. Nozzle Configuration

Printing direction: Bidirectional with logic-seeking  
 Printspeed: See Table 1-2.  
 Printable columns: See Table 1-2.

Table 1-2. Print Speed and Printable Columns

CharacterPitch	PrintableColumns	Print Speed (LQ)
10 cpi (Pica)	60	200 cps
12 cpi (Elite)	96	240 cps
15 cpi	120	300 cps
17 cpi (Pica condensed)	137	340 cps
20 cpi (Elite condensed)	160	400cps

Character sets: Legal and 14 international character sets.  
 Character tables: See Table 1-3.

**Table 1-3. Character Tables**

Character Tables	Standard Version	NLSP* Version
Italic	o	0
PC437 (U.S./Standard Europe)	0	o
PC850 (Multilingual)	o	0
PC860 (Portuguese)	o	x
PC861 (Iceland)	o	x
PC863 (Canadian-French)	o	x
PC865 (Nordic)	o	x
PC437 (Greek)	x	0 (Note)
PC852 (East Europe)	x	0 (Note)
PC853 (Turkish)	x	0 (Note)
PC855 (Cyrillic)	x	0 (Note)
PC857 (Turkish)	x	0 (Note)
PC866 (Russian)	x	0 (Note)
PC869 (Greek)	x	0 (Note)
MAZOWIA (Poland)	x	0 (Note)
Code MJK (Czechoslovakia)	x	0 (Note)
ISO 8859-7 (Greek)	x	0 (Note)
ISO Latin IT (Turkish)	x	0 (Note)
Bulgaria (Bulgaria)	x	0 (Note)
Abicomp	0	x
BRASCII	0	x

o supported      x Not **Supported**      \*National Language Support Printer

**Note:** These fonts are not supported for EPSON Roman Tand EPSON Saris Serif H of scalable fonts.

Fonts:

*Bitmap LQ fonts*

- EPSON Roman (10 cpi/12 cpi/15 cpi/Proportional)
- EPSON Saris Serif (10/12/15/Proportional)
- EPSON Courier (10/12/15)
- EPSON Prestige (10/12/15)
- EPSON Script (10/12/15)

*Scalable fonts*

- EPSON Roman 10.5 points, 8 -32 **points** (in units of 2 points)
- EPSON Saris Serif 10.5 points, 8 -32 points (in units of 2 points)
- EPSON Roman T 10.5 points, 8-32 points (in units of 2 points)
- EPSON Saris Serif H 10.5 points, 8-32 points (in units of 2 points)

Control code: ESC/P 2 and expanded raster graphics code

Input data buffer: 64K bytes

**1.2.2 Paper Handling Specifications**

Feeding method: Friction feed paper is fed from the built-in auto sheet feeder (ASF).

**Notes:** *The following operations are not allowed.*

1. Reverse feeding within 3 mm (0.12 in.) from the top edge of the paper or 16mm (0.63 in.) from the bottom edge of the paper.
2. Reverse feeding beyond 7.9mm (0.31 in.).

Line spacing: 1/6 inch feed, 1/8 inch feed, or programmable with a 1/360 inch minimum increment.

Paper path: Cut sheet: Built-in auto sheet feeder (ASF) (front entry)

Feeding speed: 89 msec. (at 1/6-inch feed pitch)

**1.2.3 Paper Specifications**

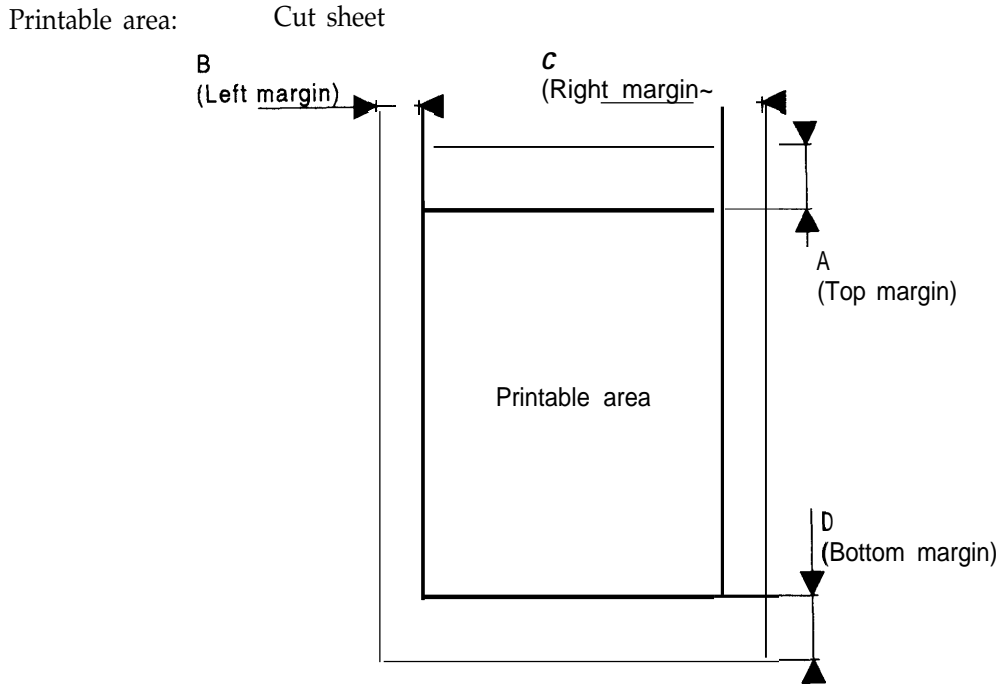
**Table 1-4. Cut Sheet Paper Specifications**

<b>Size (W x L)</b>	<b>A4:</b> 210 mm (8.3 in.) x 297 mm (11.7 in.)
	<b>Letter:</b> 216 mm (8.5 in.) x 279 mm (11.0 in.)
	<b>B5:</b> 182 mm (7.2 in.) x 257 mm (10.1 in.)
	<b>Legal:</b> 216 mm (8.5 in.) x 356 mm (14.0 in.)
<b>Thickness</b>	0.08 mm (0.003 in.) -0.11 mm (0.004 in.)
<b>Weight</b>	55 g/m <sup>2</sup> (17 lb) -90 g/m <sup>2</sup> (24 lb)
<b>Quality</b>	Bond paper, PPC

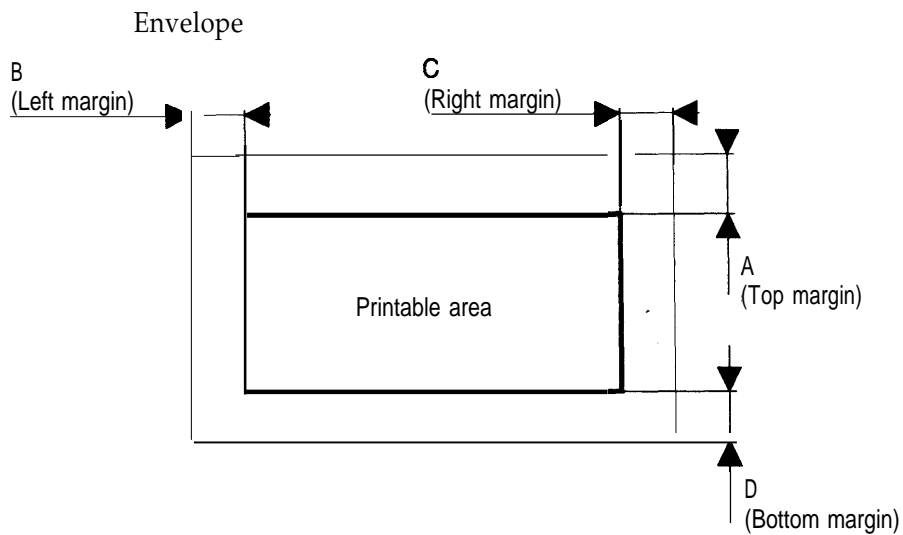
**Table 1-5. Envelope Specifications**

<b>Size (W x L)</b>	<b>No. 6:</b> 166 mm(6½ in.) x 92 mm (3 5/8 in.)
	<b>No. 10:</b> 240 mm(9½ in.) x 104mm(4 1/4 in.)
	<b>DL:</b> 220 mm (8.7 in.) x 110 mm (4.3 in.)
<b>Thickness</b>	<b>Less than 0.52 mm (0.020 in.)</b>
<b>Weight</b>	75 g/m <sup>2</sup> (20 lb) -90 g/m <sup>2</sup> (24 lb)
<b>Quality</b>	Bond Paper

**Note:** *Envelope printing is supported only at room temperature. When inserting envelopes, keep the longer side horizontal.*



**Figure 1-3. Printable Area for Cut Sheet**



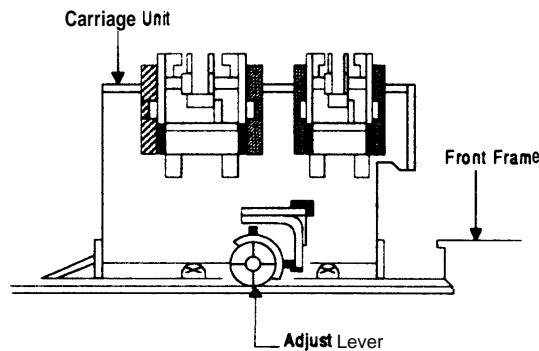
**Figure 1-4. Printable Area for Envelope**

- Note:*
- A: The minimum top margin= 3 mm (0.12 in.)
  - B: The minimum left margin= 3 mm (0.12 in.)
  - C: The minimum right margin is:
    - A4 size: 3 mm (0.12 in.)
    - Letter size: 9 mm (0.35 in.)
    - B5 size: 3 mm (0.12 in.)
    - Legal size: 9mm (0.35 in.)
    - Envelope: 3 mm (0.12 in.)
  - D: The minimum bottom margin= 13 mm (0.51 in.)

Adjust lever setting: The adjust lever on the carriage unit must be set to the proper position for the paper thickness, as shown in Table 1-6.

**Table 1-6. Adjust Lever Setting**

Lever Position	Paper	Paper Thickness
LEFT (Vertical)	Cut Sheet	0.08-0.11 mm (0.003 -0.004 in.)
RIGHT (Horizontal)	Envelope	Less than 0.5 mm (0.020 in.)



**Figure 1-5. Adjust Lever**

## 1.2.4 Ink Cartridge Specifications

### Black

Type:	Exclusive cartridge
Color:	Black
Print capacity:	1.5 million characters (315 dots/character, Roman 10 cpi)
Life:	The effective life from the indicated production date is 2 years.
Storage temperature:	-30- 40° C (-22 - 104° F) (Storage, within a month at 40° C (104° F)) -30- 60° C (-22 - 140° F) (Transit, within a month at 40° C (104° F)) -30 - 60° C (-22 - 140° F) (Transit, within 120 hours at 60° C (140° F))
Dimension (W x D x H):	26.9 x67.4 x 41.8 mm (1.06 x2.65 x 1.65 in.)

### Color

Type:	Exclusive cartridge
Color:	Cyan, Magenta, Yellow
Print capacity:	28 sheets/color (A4, Full image printing at 360 dpi)
Life:	The effective life from the indicated production date is 2 years.
Storage Temperature:	-30- 40° C (-22 - 104° F) (Storage, within a month at 40° C (104° F)) -30- 60° C (-22 - 140° F) (Transit, within a month at 40° C (104° F)) -30 - 60° C (-22 - 140° F) (Transit, within 120 hours at 60° C (140° F))
Dimension (W x D x H):	54.0 x 67.4X 41.8 mm (2.13 x 2.65X 1.65 in.)

- Notes:**
- Ink cartridge **cannot be re-tiled**; it is the **only consummable** article.
  - **Do not use an ink cartridge that has exceeded the ink life.**
  - Ink freezes **below -3° C**; however, it **can be used after it returns** to room temperature.

1.2.5 Electrical Specifications

Table 1-7. Rated Electrical Ranges

Item	120 V Version	220-240 V Version
Rated voltage	120 VAC	220-240 VAC
Input voltage range	103.5-132 V	198-264 V
Rated frequency range	50-60 Hz	50-60 Hz
Input frequency range	49.5 -60.5 Hz	49.5 -60.5 Hz
Rated current	0.6 A	0.4 A
Power consumption	Approx. 20 W (self-test with 10-cpi LQ characters)	Approx. 20 w (self-test with 10-cpi LQ characters)
Insulation resistance	10 MΩ, minimum (applying 500 VDC between AC line and chassis)	10 MΩ, minimum (applying 500 VDC between AC line and chassis)
Dielectric strength	1000 VAC rms -1 minute or 1200 VACrms -1 second (between AC line and chassis)	1500 VAC rms -1 minute (between AC line and chassis)

1.2.6 Environmental Conditions

Table 1-8. Acceptable Environmental Conditions

Description	Operating	Non Operating
Temperature	10- 35° c (50 - 95° F) <sup>1</sup>	-20 - 60° C (-4 - 122° F) <sup>2</sup>
Humidity	20- 80% RH <sup>3</sup>	5- 85% RH <sup>2,3</sup>
Shock resistance	1G (within 1msec.)	2G (within 2 msec.) <sup>2</sup>
Vibration resistance	0.15 G	0.50 G <sup>2</sup>

<sup>1</sup>: For operating the printer, conditions must be in the range shown in the figure below.

<sup>2</sup>: These conditions are acceptable when the printer is in its shipping container.

<sup>3</sup>: Without condensation.

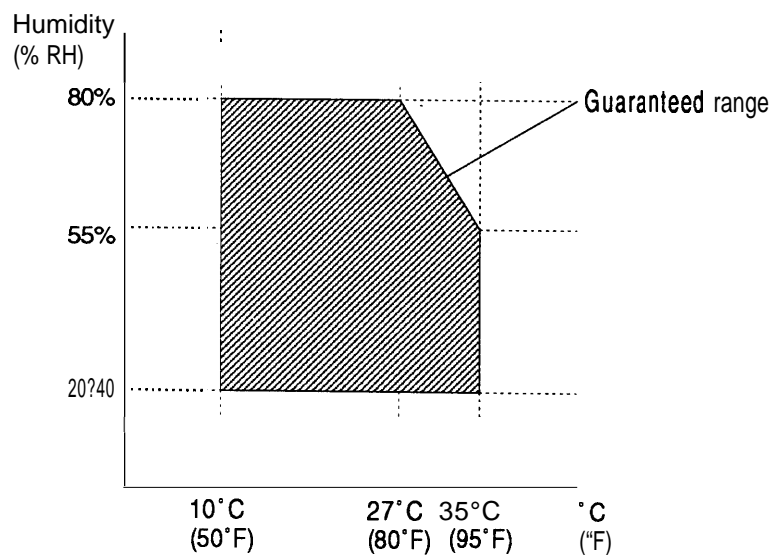


Figure 1-6. Temperature/Humidity Range

**1.2.7 Reliability**

MTBF: 4,000 power on hour (POH)  
Total print volume: 75,0(X) pages (A4, Letter)  
Printhead life: 1\$00 million dots/nozzle

**1.2.8 Safety Approvals**

Safety standards: 120V version: UL1950 with D3,  
CSA22.2 #950 with D3  
220-240V version: EN 60950 (TÜV, SEMKO, DEMKO,  
NEMKO, SETI)

Radio frequency interference (RFI): 120V version: FCC part 15 subpart B class B  
220-240V version: Vfg.243 (VDE0878 part 3, part 30)  
EN55022 (CISPR PUB. 22) class B

**1.2.9 Physical Specifications**

Dimension (W x D x H): 470 x 525X 192 (mm) (18.5X 20.7X 7.56 (in.))  
Weight: 7.4 Kg (16.3 lb)

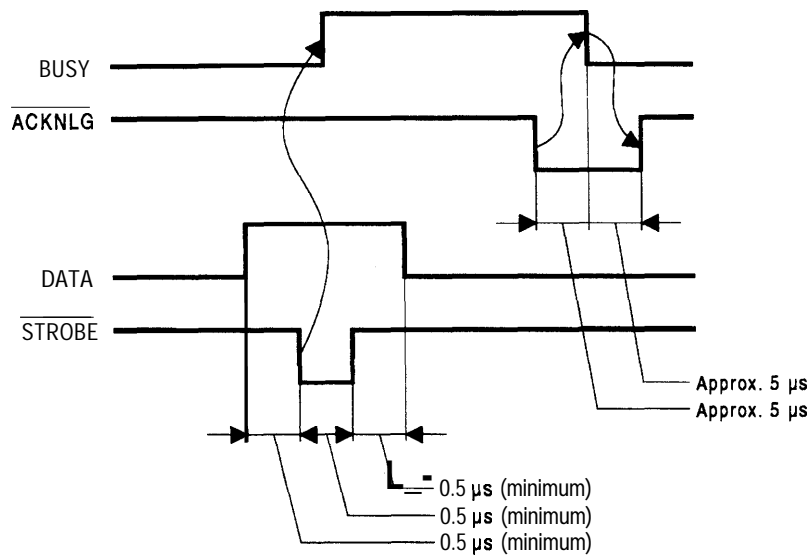


## 1.3 INTERFACE SPECIFICATIONS

The Stylus Color is standard-equipped with an 8-bit parallel and serial interface.

### 1.3.1 Serial interface Specifications

Data format:	8-bit parallel
Synchronization:	By $\overline{\text{STROBE}}$ pulse synchronization
Handshaking:	By $\text{BUSY}$ and $\overline{\text{ACKNLG}}$ signals
Signal level:	TTL compatible level
Adaptable connector:	36 pin 57-30360 (Amphenol) or equivalent
Data transmission timing:	See Figure 1-7.



**Figure 1-7. Data Transmission Timing**

**Note:** Transition time (rise time and fall time) of every input signal must be less than 0.2  $\mu\text{s}$ .

The Busy signal is active (HIGH) under the following conditions:

- During data reception (See Figure 1-7.)
- When the input buffer is full
- When the INIT input signal is active
- During initialization
- When the  $\overline{\text{ERROR}}$  or PE signal is active
- During the self-test mode
- During the demonstration mode
- During the default setting mode
- When a fatal error occurs

The  $\overline{\text{ERROR}}$  signal is active (LOW) under the following conditions:

- When a paper-out error occurs
- When a no ink cartridge error occurs
- When a fatal error occurs



The PE signal is active (HIGH) under the following conditions:

- When a paper-out error occurs
- When a fatal error occurs

Table 1-9 shows the connector pin assignments and signal functions of the 8-bit parallel interface.

**Table 1-9. Signal and Connector Pin Assignments for Parallel Interface**

Pin No.	Signal Name	I/O*	Description
1	$\overline{\text{STROBE}}$		The $\overline{\text{STROBE}}$ pulse is used to read data from the host computer. The pulse width must be 0.5 $\mu\text{s}$ or more. Normally, it is HIGH, and data is latched with the rising edge of this signal.
2-9	DATA 1-8		<b>DATA 1-8 are parallel data</b> bits. When one of these signals is HIGH, the data bit is 1; when LOW, the data bit is 0. The most significant bit (MSB) is <b>DATA 8</b> . The signal state must be maintained for 0.5 $\mu\text{s}$ on either side of the STROBE signal's active edge.
10	$\overline{\text{ACKNLG}}$	o	$\overline{\text{ACKNLG}}$ is an acknowledge pulse with a width of approximately 10 p.s. This signal goes LOW upon the completion of data reception to indicate that the printer is ready to receive further data.
11	BUSY	o	The BUSY signal informs the host computer of the printer's status. When this signal is HIGH, the printer cannot accept any more data.
12	PE	o	This signal indicates whether paper is available in the printer or not. A HIGH level indicates no paper.
13	SLCT	o	Pulled up to +5V through a 1.0 K $\Omega$ resistor in the printer.
14	$\overline{\text{AFXT}}$		If this signal is set to LOW, the printer automatically performs one line feed upon receipt of a CR (carriage return) code. The status of this signal is checked only at power on and initialization.
31	$\overline{\text{INIT}}$		If this signal goes LOW, the printer is initialized. The pulse width of this signal must be 50 $\mu\text{s}$ or more.
32	$\overline{\text{ERROR}}$	o	This signal goes LOW if the printer has a fatal error or runs out of paper.
35	+5V		Pulled up to +5V through 1.0 K $\Omega$ resistor in the printer.
17	CHASSIS	-	Chassis ground.
16	GND	-	Signal ground.
19-30	-	.	.
33,36	-	.	Not used.
15,18,34	-	-	

\* The I/O column indicates the direction of the signal as viewed from the printer.

### 1.3.2 Parallel Interface Specifications

Data format: RS-422 serial  
 Synchronization: Asynchronous  
 Handshaking: By DTR signal and X-ON/X-OFF protocol

**Table 1-10. DTR and X-ON/X-OFF Protocol**

State	Buffer Space	DTR	X-ON/X-OFF
Busy	Less than 512 bytes	off	X-OFF
Ready	More than 1,024 bytes	On	X-ON

Word length

Start bit: 1 bit  
 Data bit: 8 bit  
 Parity bit: none  
 Stop bit: 1 bit

Bit rate: 57.6K bps

Adaptable connector: 8-pin mini-circular connector

Recommended I/F cable: Apple® System Peripheral-8 cable

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

Pin No.	Signal Name	I/O'	Description
1	DTR	out	Data terminal ready
2	NC		No connection
3	$\overline{\text{TXD}}$	out	Transmit data
4	SG	In	Signal ground
5	$\overline{\text{RXD}}$	In	Receive data
6	TXD	out	Balanced transmit
7	NC		No connection
8	RXD	In	Balanced receive

\* The I/O column indicates the data flow as viewed from the printer.

## 1.4 OPERATIONS

This section describes the basic operations of the printer.

### 1.4.1 Control Panel

The control panel for this printer has 1 lock type, 5 non-lock type push buttons, and 14 LED indicators for easy operation of the various printer functions.

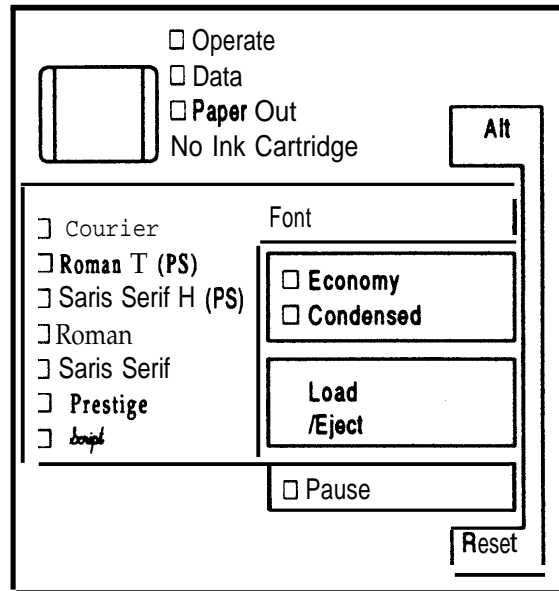


Figure 1-8. Control Panel Appearance

#### Buttons

Operate	Turns the printer on or off.
Alt	Modifies the function of other buttons. Holding down this button for 3 seconds causes the printer to move the carriage to the ink cartridge installation position. Pressing Alt again causes the carriage to return to the home position.
Font	Cycles through the font choices. pressing the FONT button, while holding down the Alt button causes the carriage to move to the gap adjustment position. Pressing the Alt button again causes the carriage to return to the home position.
Economy/Condensed	Selects either the economy printing or condensed printing mode. Pressing the Economy/Condensed button while holding down the Alt button starts the color printhead cleaning cycle.
Load/Eject	Either loads a new sheet into the printer or ejects paper currently in the paper path. Pressing the Load/Eject button while holding down the Alt button starts the black printhead cleaning cycle.
Pause	Stops printing temporarily or resumes printing if it has been stopped temporarily. Pressing Pause while holding down the Alt button resets the printer.

### Indicators

Operate	On when the printer is on. Blinks during power on and off sequence.
Data	On when print data is in the input buffer. Data and Pause lights blink if an error occurs.
Paper Out	On when the printer is out of paper. Blinks when a paper jam occurs.
No Ink Cartridge	On when the ink is exhausted.
Economy	On when economy printing mode is selected.
Condensed	On when condensed printing mode is selected.
Font	These LEDs indicate the selected font.
Pause	On when printing is paused.

### 1.4.2 Panel Operation at Power On

You can activate the following modes by doing the following:

Self-test mode	Turn on the printer while holding down the Load/Eject button.
Hex dump mode	Turn on the printer while holding down the Font and Load/Eject buttons. Once this mode is selected, the printer prints all received data in hexadecimal format.
Demonstration mode	Turn on the printer while holding down the Alt button.
Default setting mode	Turn on the printer while holding down the Economy/Condensed button. For more information about the mode, see Section 1.4.3.
Initialize EEPROM	Turn on the printer while holding the Alt, Font, Load/Eject, and Pause buttons.

### 1.4.3 Default Settings

The printer can save some printer setting parameters that define its functions at initialization. You can change these parameters by using the printer's default setting mode.

#### 1.4.3.1 Default Setting Items

You can use the default setting mode to change the settings listed in the table below. Activate the default-setting mode by holding down the Economy/Condensed button while turning on the printer.

**Table 1-12. Default Setting Items**

Menu Contents	Description	Factory Setting
Character table	Selects the character table	-
Print direction	Controls the print direction. (See Tables 1-12 and 1-13) Auto <b>Bi-D</b> Uni-D	-
Network I/F mode	Off: For normal environments. On: For network environments.	off
Auto line feed	On: Valid Off: Invalid	-
Loading position	3.0/8.5 mm (0.12/0.33 in.)	3.0 mm
Interface mode	Auto I/F mode Parallel I/F mode <b>Serial</b> I/F mode Optional I/F mode	-
Auto I/F wait mode	1 0/30 seconds	10 sec.

**Table 1-13. Characteristics of Print Direction Mode**

Item	Black and White Printing	Color (CMYK) Printing
Auto	Throughput and quality is better.	Throughput is better. Color quality with special paper is <b>worse</b> . (Color correction depends on the printing direction.)
Bi-D	Throughput is best. Print quality may be down.	Throughput is better. Color quality with special paper is worse. (Color correction depends on the printing direction.)
Uni-D	Throughput is worse. Print quality is better.	Throughput is worse. Color quality is best.

**Table 1-14. Printing Direction and ESC U Command**

Default Setting Mode	Auto			Bi-D			Uni-D		
	ESC U0	ESC U1	None	ESC U0	ESC U1	None	ESC U0	ESC U1	None
Character mode (for MS-DOS®)	Auto	Auto	Auto	Bi-D	Uni-D	Bi-D	Uni-D	Uni-D	Uni-D
Raster graphics mode (for Windows™)	Bi-D	Uni-D	Auto	Bi-D	Uni-D	Bi-D	Bi-D	Uni-D	Uni-D

Note: Printing direction is controlled by driver in Windows environment.

### 1.4.3.2 Changing the Default Settings

To change the printer's default settings:

- a. Hold down the Economy/Condensed button and turn on the printer. The printer prints a sheet that shows the firmware version and describes how to select the language used to print messages.
- b. Press the Font button until the appropriate font LED is selected. The following table shows which language corresponds to which font LED.

**Table 1-15. Language Selection**

Language	Font LED
English	Courier
Français	Roman T (PS)
Deutsch	Saris Serif H (PS)
Italiana	Roman
Español	Saris Serif

- c. Press the Alt button. The printer prints the current settings using the selected language. It also prints a table showing how to change the printer settings.
- d. Press the Font button to advance through the setting menu. The current printer settings are indicated by the Courier, Roman T (PS), and San Serif H (PS) LEDs. Each time you press the Font button, you advance to the next setting, and the three font LEDs change according to the selection.

**Table 1-16. Feature Selection**

Feature/Menu	Menu			Setting Value			
	Courier LED	Roman T (PS) LED	Saris Serif H (PS) LED	Setting	Operate LED	Data LED	Paper Out LED
Character table	On	On	On	See Table 1-16			+
Print direction	On	off	off	Auto	On	off	off
				Bi-D	off	On	off
				Uni-D	On	On	off
Network I/F mode	off	On	off	off	off	off	off
				On	On	off	off
Auto line feed	On	On	off	off	off	off	off
				On	On	off	off
Loading position	off	off	On	3 mm	off	off	off
				8.5 mm	On	off	off
interface mode	On	off	On	Auto	On	off	off
				Parallel	off	On	off
				Serial	On	On	off
				Option	Off	off	On
Auto I/F wait time	off	On	On	10 sec.	off	off	off
				30 sec.	On	off	off

- e. Change the setting value by pressing Alt button. Pressing the Alt button changes the setting for the current menu. The status of the LEDs will be changed as the button is pressed,

Table 1-17. Character Table Selection

Version	Settings	Operate LED	Data LED	Paper Out LED
Common	Italic U.S.A.	off	off	Off
	Italic France	On	<b>Off</b>	off
	Italic Germany	Blinks	off	off
	Italic U.K.	Off	On	off
	<b>Italic Denmark 1</b>	On	On	off
	Italic Sweden	Blinks	On	<b>Off</b>
	Italic Italy	off	Blinks	Off
	Italic Spain 1	On	Blinks	oft
	<b>PC437</b>	Blinks	Blinks	Off
	<b>PC850</b>	<b>Off</b>	<b>off</b>	<b>on</b>
Standard	<b>PC860</b>	On	off	On
	<b>PC863</b>	Blinks	off	on
	<b>PC865</b>	off	On	on
	<b>PC861</b>	On	On	On
	<b>BRASCII</b>	Blinks	On	On
	<b>Abicomp</b>	off	Blinks	On
NLSP	<b>PC437 Greek</b>	off	off	On
	<b>PC853</b>	Blinks	Off	on
	<b>PC855</b>	off	On	on
	<b>PC852</b>	On	On	on
	<b>PC857</b>	Blinks	On	on
	<b>PC866</b>	off	Blinks	On
	<b>PC869</b>	On	Blinks	on
	<b>MAZOWIA</b>	Blinks	Blinks	On
	Code MJK	off	off	Blinks
	<b>ISO 8859-7</b>	On	off	Blinks
	<b>ISO Latin IT</b>	Blinks	off	Blinks
<b>Bulgaria</b>	off	On	Blinks	

f. Repeat d and e to change other printer settings. The setting menu selection will return to the first menu after the last menu selection is over.

g. Turn off the printer. The setting is stored into non-volatile memory.



### 1.4.4 Error Conditions

The printer can detect the various errors and indicate them with the LEDs.

**Table 1-18. Error Indications**

Error	Data LED	Paper Out LED	No Ink Cartridge LED	Economy LED	Condensed LED	Pause LED
Paper out	off	On	off	off	off	off
No ink cartridge	off	off	On	off	off	off
Paper jam	off	Blinks	off	off	off	off
Maintenance request	Blinks	Blinks	Blinks	Blinks	Blinks	Blinks
Carriage error	Blinks	off	off	off	off	Blinks

INK ABSORBER FULL

### 1.4.5 Printer Initialization

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

#### 1.4.5.1 Hardware Initialization

Hardware initialization is performed by:

Turning on the printer.

- Sending the parallel interface INIT signal.

(If the INIT signal is active when the printer is turned on, hardware initialization is started when the INIT signal becomes inactive.)

When the hardware initialization is performed:

- The printer mechanism is initialized.
  - Input data buffer is cleared.
  - Downloaded character definitions are cleared.
  - Print buffer is cleared.
  - Default values are set.

#### 1.4.5.2 Software Initialization

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

When the software initialization is performed:

- Print buffer is cleared.
- Default values are set.

#### 1.4.5.3 Panel Initialization

This printer is initialized by pressing the Load/Eject button while pressing the Alt button.

When the panel initialization is performed:

- Input data buffer is cleared.
- Print buffer is cleared.
- Default values are set.

## 1.5 MAIN COMPONENTS

The main components of the Stylus Color are:

- ❑ Printer mechanism (M-4A10)
- ❑ Main control board (C137 MAIN Board)
- ❑ Power supply unit (C137 PSB/PSE Board)
- ❑ Control panel board (C137 PNL Board)
- ❑ Housing

### 1.5.1 Main Control Board (C137 MAIN Board)

The Main Control Board (C137 MAIN Board) consists of an H8/3003 16-bit CPU, E05A% gate array, a program ROM (4M), a dynamic RAM (4M), a mask ROM (4M or 8M), an EEP-ROM (1K), and a lithium battery for powering the protect counters. The reset IC (M51955 and PST 592) is equipped with both a logic system and a power system. The 8M program ROM is used only for the NLS (National Language Support Printer) specification.

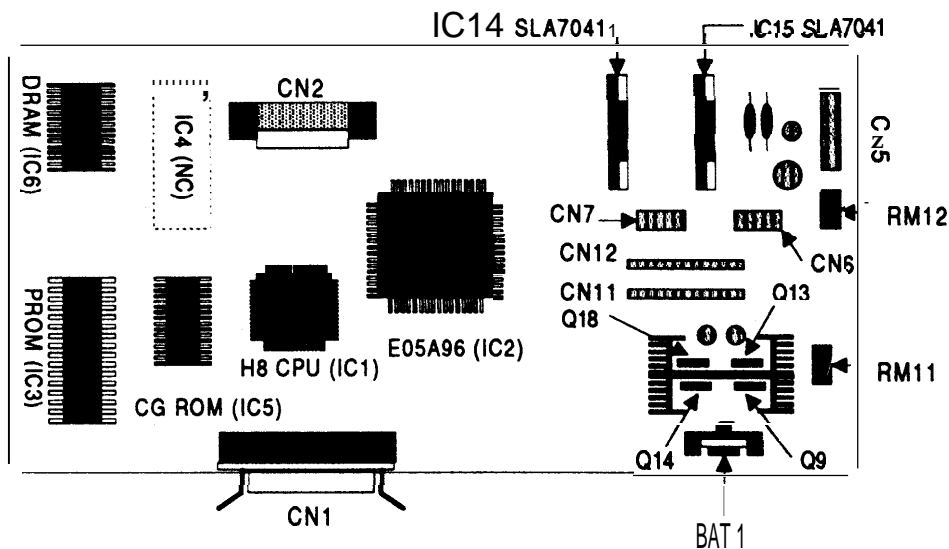


Figure 1-9. C137 MAIN Board Component Layout

### 1.5.2 Power Supply Board (C137 PSB/PSE Board)

The Power Supply Board (C137 PSB/PSE Board) consists of an RCC switching regulator circuit. This board is equipped with a power switch **connected** to the secondary circuit. Thus, if the printer is turned off, it can continue to operate in order to eject the paper and perform the head capping operation. The power on/off signal is always monitored by the E05A96 gate array on the C137 MAIN Board, and the logic system recognizes the power switch status.

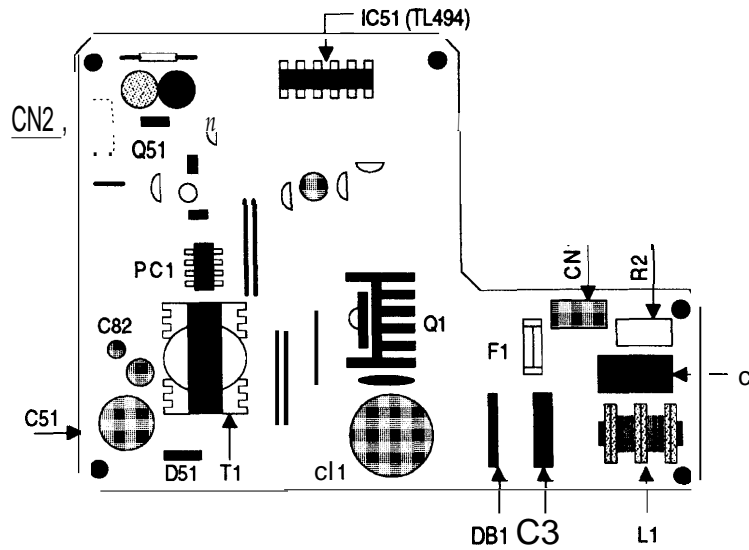


Figure 1-10. C137 PSB/PSE Component Layout

### 1.5.3 Control Panel (C137 PNL Board)

The 14 LEDs on this board indicate the error status (there is no buzzer system); by using the 6 switches in combination with one another, the printer can operate in each protect operation (color or black cleaning, cartridge exchanging self-test, default setting value exchanging, reset, and EEPROM clear operation).

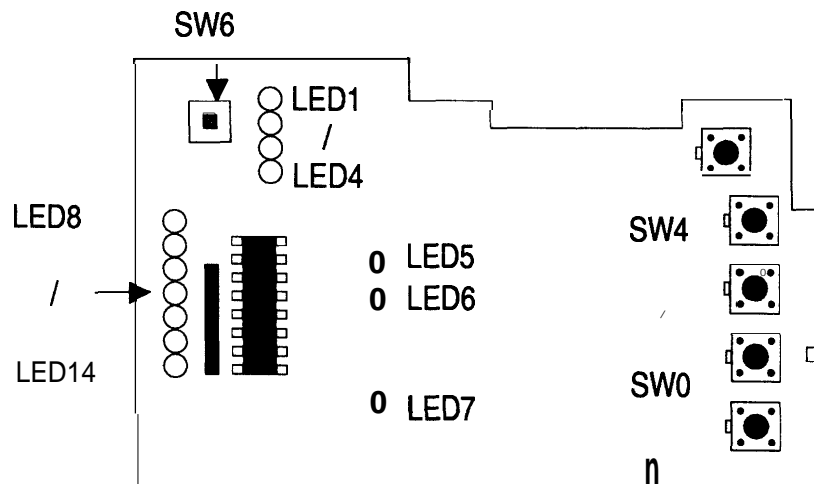


Figure 1-11. C137 PNL Board Component Layout

### 1.5.4 Printer Mechanism (M-4A10)

The M-4A10 printer mechanism is equipped with a 64-black printhead and M-color (CMY) printhead on the carriage unit. Resolution of 720 dpi is possible with special (non-absorbent) paper.

The ink system has both a black pump unit and a color pump unit. Waste ink from each printhead is made to flow into the individual caps. Power for the pump system and paper feed system is supplied from the paper feed motor.

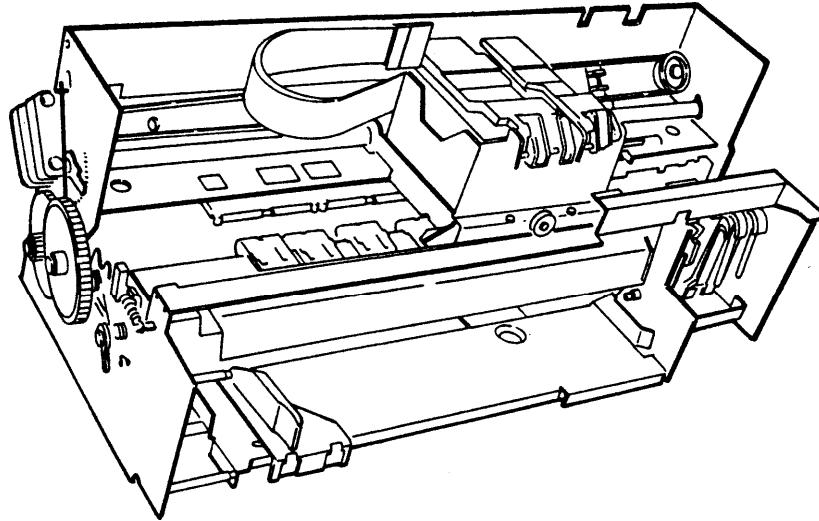


Figure 1-12. Printer Mechanism (M-4A10)

### 1.5.5 Housing

The Stylus Color housing consists of the printer cover, uppercase, and the lowercase. Attached to the housing are the front paper support and the ejected paper support with paper separator.

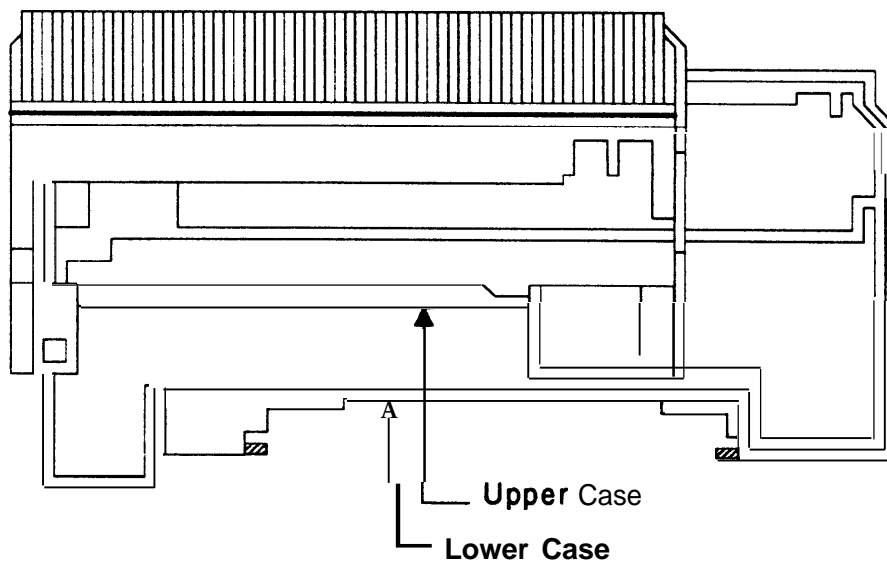


Figure 1-13. Housing

# Chapter 2 Operating Principles

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## Table of Contents

<b>2.1 OVERVIEW</b>	<b>2-1</b>
<hr/>	
<b>2.2 OPERATING PRINCIPLES OF THE PRINTER MECHANISM</b>	<b>2“1</b>
2.2.1 Printer Mechanism. . . . .	2-2
2.2.2 Carriage Drive Mechanism . . . . .	2-5
2.2.2.1 Platen GapAdjust Lever . . . . .	2-6
<b>2.2.3 Paper Feed Mechanism.</b> . . . . .	<b>2-6</b>
<b>2.2.4 InkSystem.</b> . . . . .	<b>2-8</b>
<b>2.2.5 Pump Mechanism .</b> . . . .	<b>2-9</b>
<b>2.2.6 Cap Mechanism.</b> . . . . .	<b>2-12</b>
<b>2.2.7 Wiping Mechanism .</b> . . . .	<b>2-12</b>
<hr/>	
<b>2.3 OPERATING PRINCIPLES OF THE ELECTRICAL CIRCUITS</b>	<b>2-13</b>
2.3.1 Operating Principles of the Power Supply Circuit . . . . .	2-13
2.3.2 Operating Principles of the Main Control Circuit . . . . .	2-15
2.3.2.1 Reset Circuits.. . . .	2-16
2.3.2.2 SensorCircuits. . . . .	2-16
2.3.2.3 Carriage MotorDriveCircuit . . . . .	2-17
2.3.2.4 Paper Feed Motor Drive Circuit. . . . .	2-19
2.3.2.5 Printhead Drive Circuit . . . . .	2-20
2.3.2.6 DMA Controller . . . . .	2“21
2.3.2.7 D-RAM Refreshment Controller. . . . .	2-22
<hr/>	
<b>2.4 INK SYSTEM MANAGEMENT</b>	<b>2-23</b>
2.4.1 InkOperations. . . . .	<b>2-24</b>
2.4.1.1 PowerOnOperation. . . . .	<b>2-24</b>
2.4.1.2 Cleaning Selection Mode . . . . .	<b>2-25</b>
2.4.1.3 Micro Absorbing Cleaning Operation . . . . .	<b>2-26</b>
2.4.1.4 PowerOffOperation . . . . .	<b>2-26</b>
2.4.1.5 Print Start Operation . . . . .	<b>2-26</b>
2.4.1.6 Refresh Operation . . . . .	<b>2-27</b>
2.4.1.7 Standby Operation . . . . .	<b>2-27</b>
2.4.1.8 Fail Absorbing Operation . . . . .	<b>2-27</b>
2.4.1.9 Ink Cartridge Replacement Operation . . . . .	<b>2-28</b>
2.4.1.10 Wiping Operation 1 . . . . .	<b>2-29</b>
2.1.4.11 WipingOperation2 . . . . .	<b>2-29</b>
2.4.1.12 Rubbing Operation . . . . .	<b>2-29</b>
2.4.1.13 Disengage ON Operation . . . . .	<b>2-29</b>
2.4.1.14 Disengage OFFOperation . . . . .	<b>2-29</b>
2.4.1.15 Micro Absorbing Operation . . . . .	<b>2-30</b>
2.4.1.16 Carriage Lock Set. . . . .	<b>2-30</b>
2.4.1.17 Carriage Lock Reset. . . . .	<b>2-30</b>
2.4.1.18 Refresh Operation (Performed when loading or ejecting paper) . . . . .	<b>2-30</b>
2.4.1.19 Adjust Lever Operate Position Moving Sequence. . . . .	<b>2-30</b>
<b>2.4.2 TimerandCounter.</b> . . . . .	<b>2-30</b>
2.4.2.1 Refresh Timer (Monochrome and CMY Head) . . . . .	<b>2-30</b>
2.4.2.2 Timer (Monochrome and CMY Head). . . . .	<b>2-31</b>
2.4.2.3 Flushing Counter (Black, CMY Head). . . . .	<b>2-31</b>

2.4.2.4 Fail Absorbing Timer (Black, <b>CMY</b> Head) . . . . .	2-31
2.4.2.5 Ink Level Counter R (On the RAM) (Monochrome = Rb, <b>CMY</b> = Ry) . . . . .	2-31
2.4.2.6 CL Counter K (Monochrome = Kb, <b>CMY</b> = Ky) . . . . .	2-32
2.4.2.7 CL2 Counter KK (Monochrome = KKb, <b>CMY</b> = KKy). . . . .	2-32
2.4.2.8 Protect Counter. . . . .	2-32

## List of Figures

Figure 2-1. Printer Mechanism Block . . . . .	2-1
Figure 2-2. Structure of Printhead . . . . .	2-2
Figure 2-3. Principles of the Printing Operation. . . . .	2-3
Figure 2-4. Microwave Mode Operation . . . . .	2-4
Figure 2-5. Carriage Drive Mechanism . . . . .	2-5
Figure 2-6. Platen Gap Lever Operation. . . . .	2-6
Figure 2-7. Paper Feed Mechanism . . . . .	2-7
Figure 2-8. Ink System Block . . . . .	2-8
Figure 2-9. Pump Mechanism Block. . . . .	2-9
Figure 2-10. Switch Lever Set. . . . .	2-9
Figure 2-11. Paper Feed Mechanism Block . . . . .	2-10
Figure 2-12. Switch Lever Reset. . . . .	2-10
Figure 2-13. Pump Operation . . . . .	2-11
Figure 2-14. Cap Mechanism . . . . .	2-12
Figure 2-15. Wiping Mechanism . . . . .	2-12
Figure 2-16. Block Diagram of the Electrical Circuit . . . . .	2-13
Figure 2-17. Power Supply Circuit Block Diagram. . . . .	2-14
Figure 2-18. Main Control Circuit Block Diagram . . . . .	2-15
Figure 2-19. Reset Circuit Block Diagram. . . . .	2-16
Figure 2-20. Sensor Circuit Block Diagram. . . . .	2-16
Figure 2-21. Carriage Motor Circuit Block Diagram. . . . .	2-17
Figure 2-22. Serial Data Transfer Procedure. . . . .	2-18
Figure 2-23. Paper Feed Motor Drive Circuit Diagram . . . . .	2-19
Figure 2-24. Trapezoidal Drive Wave Form. . . . .	2-20
Figure 2-25. Printhead Drive Circuit Block Diagram . . . . .	2-20
Figure 2-26. DMA Controller Operation. . . . .	2-21
Figure 2-27. D-RAM Cycle Timings. . . . .	2-22
Figure 2-28. Junction Method (CPU-DRAM). . . . .	2-22
Figure 2-29. Relation of Ink System & Carriage Operation. . . . .	2-23
Figure 2-30. Power On Operation Classification. . . . .	2-24
Figure 2-31. Power Off Operation Classification. . . . .	2-26
Figure 2-32. Ink Cartridge Replacement Classification . . . . .	2-28

## List of Tables

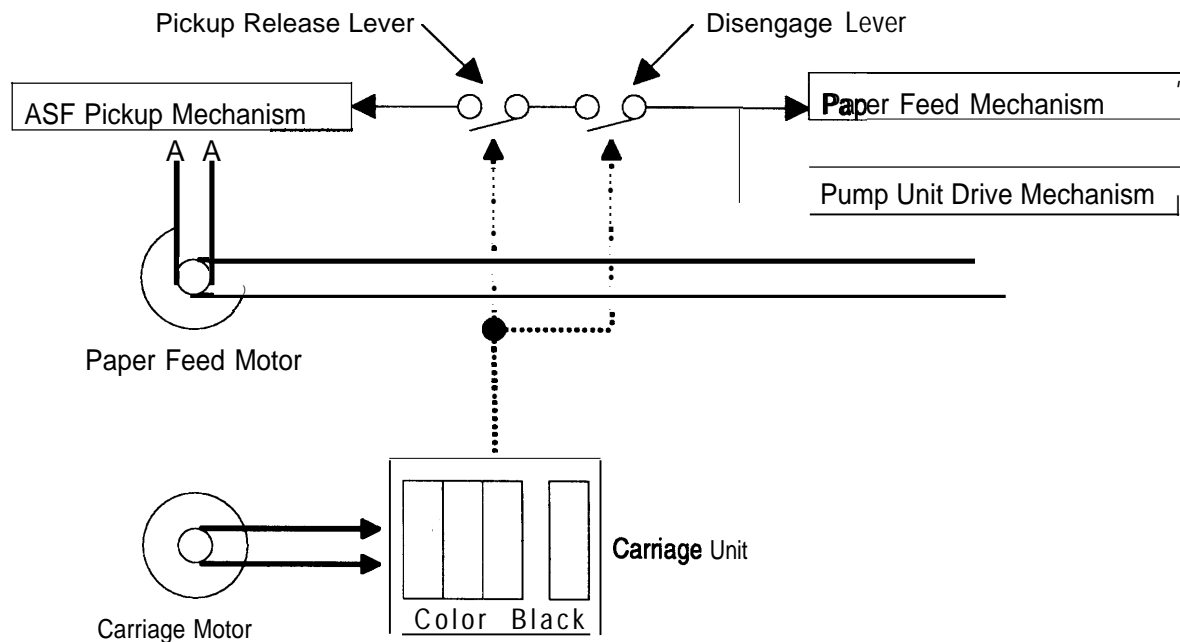
Table 2-1. Carriage Drive Motor Specifications. . . . .	2-5
Table 2-2. Drive Terms . . . . .	2-5
Table 2-3. Platen Gap Adjust Lever Position. . . . .	2-6
Table 2-4. Paper Feed Drive Motor Specification . . . . .	2-6
Table 2-5. Drive Terms. . . . .	2-7
Table 2-6. Pump Mechanism Operation . . . . .	2-11
Table 2-7. DC Voltage Distribution . . . . .	2-13
Table 2-8. Serial Data contents . . . . .	2-17
Table 2-9. Paper Feed Motor Drive Modes. . . . .	2-19
Table 2-10. Junction Method (CPU-2CAS DRAM) . . . . .	2-22

## 2.1 OVERVIEW

This section describes the operating **principles** of the printer mechanism and the electrical circuits of the Stylus Color.

## 2.2 OPERATING PRINCIPLES OF THE PRINTER MECHANISM

The Stylus Color printer mechanism is composed of the printhead unit, paper feed mechanism, carriage drive mechanism, pump mechanism, and various sensors. The figure below shows a functional block diagram of the printer mechanism.



**Figure 2-1. Printer Mechanism Block**

### 2.2.1 Printer Mechanism

The printer mechanism of this printer uses a **drop-on-demand** inkjet system similar to the system used on all other EPSON ink jet printers. However, the **printhead** in this system is **completely** redesigned to make it more **compact** and ensure a high level of reliability. The figure below shows the structure of the **printhead** and ink supply system.

- **MLP** MLP is the abbreviation for **Multi-Layer Piezoelectric** element. When a drive pulse (voltage) is applied, this element pushes the vibration plate, compressing the cavity for ink injection from the nozzle.
- **Cavity** Ink supplied from the ink cartridge is stored in this space and is injected from the nozzles when the vibration plate compresses this area.
- **Nozzles** These inject ink against the paper's surface in response to the application of the print signal. There are 64 (black head) or 48 (color head) individual nozzles making up the **printhead**.

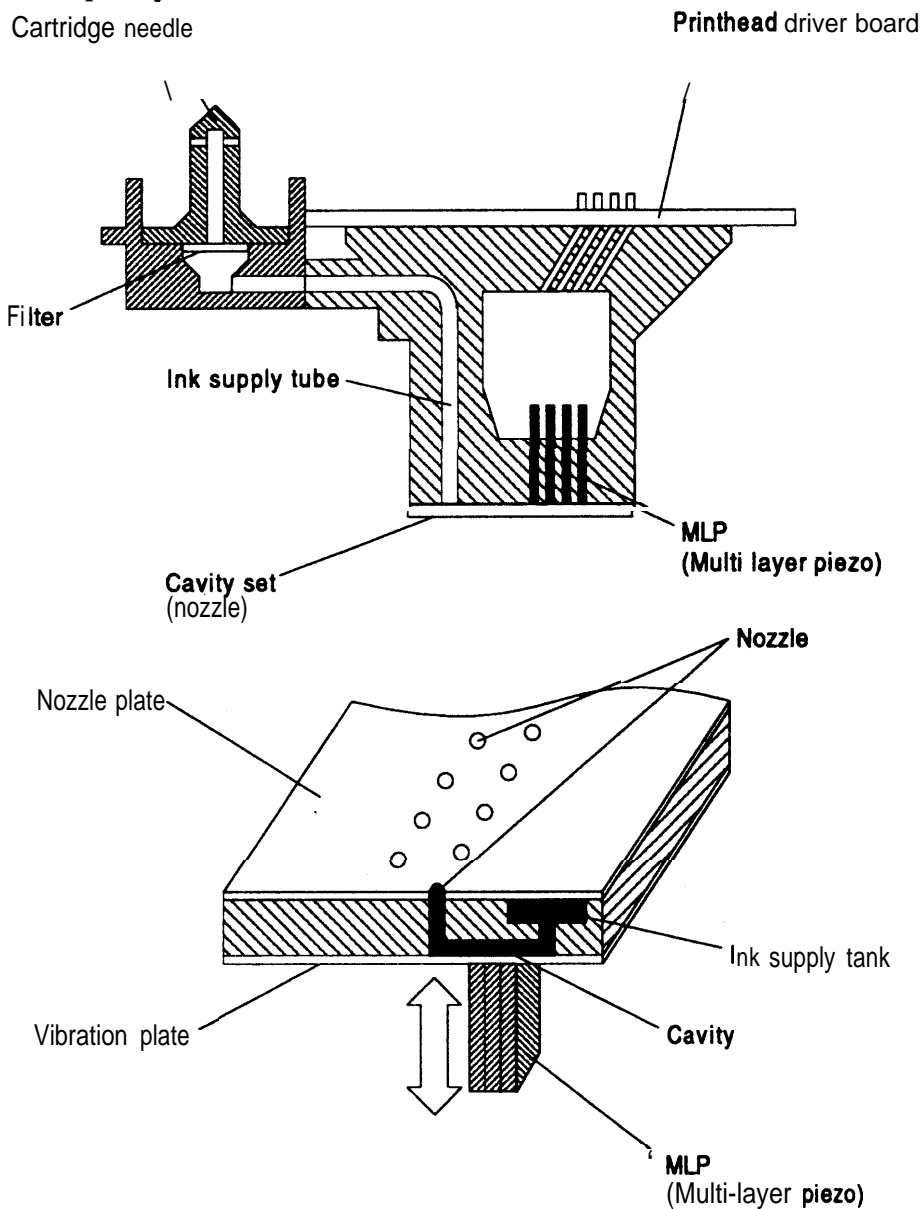


Figure 2-2. Structure of Printhead



### Principles of the Printing Operation

The printhead operates in one of two modes to inject ink from each nozzle:

■ Normal state

No electrical charge is applied to the **MLP** (Multi-Layer **Piezoelectric**) element attached to the back of the cavity, and pressure inside the cavity is kept at a constant level.

■ Injecting state

The head data signal is applied to the specific nozzle control **line** to select the active nozzle for printing, and the **MLP** element is gradually charged by the drive voltage. By charging the **MLP** element, the vibration plate is bent to compress the cavity. Then, ink is injected from the nozzle.

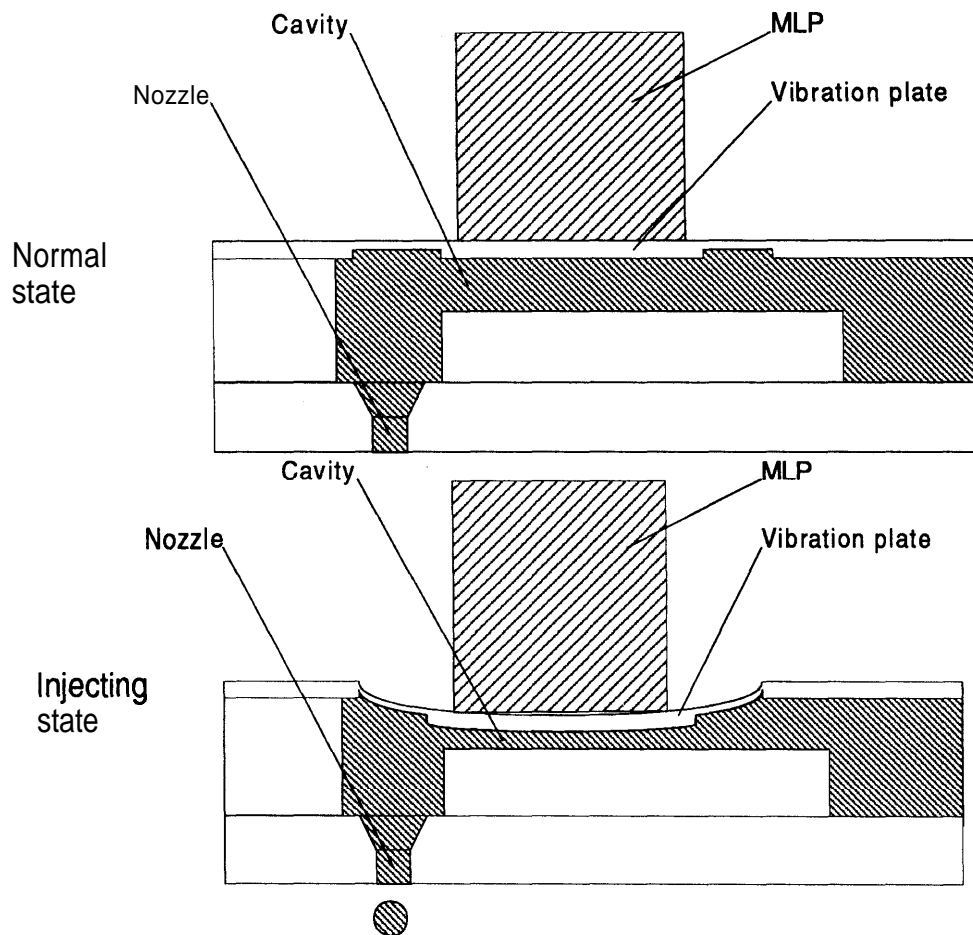


Figure 2-3. Principles of the Printing Operation

When the ink charge or printhead cleaning operation is performed, the ink in the cavity is vacuumed out with the pump mechanism. During printing, on the other hand, the ink is simultaneously supplied from the ink cartridge and injected from the nozzle, according to the change of volume in the cavity.

A thermistor is attached to the side of the color printhead drive board to monitor the temperature because the viscosity of the ink varies, depending on the temperature. The detected temperature level is fed back to the printhead drive voltage control circuit to change the time of the  $T_c$  pulse. (The  $T_c$  pulse is shown in Section 2.3.2.5.)

The Stylus Color printer has a special printing mode, called microwave mode, for printing raster graphics. This printing mode can be selected from the custom driver. Using the microwave mode can improve the quality of output because it eliminates the banding that can sometimes occur in normal mode. In microwave mode, the paper feed operation is performed after each print pass, thus eliminating the pitch variation as the paper feed that causes the banding.

Microwave print mode is available for both 360-and 720-dpi resolution.

■ Normal mode

Normally the printer uses all nozzles for printing and each print line is completed in one pass. But if the image data contains both monochrome and color in a single print line, the printer prints the line in four passes even for monochrome printing ( 1/360 x 4 line feed), because if the image data contains color in a single print line, it uses only 16 nozzles in row A of the black head.

■ Microwave mode

In microwave mode, the printer prints the whole image as a single image rather than as continual lines. In this mode, the printer uses only 15 nozzles of row A of the nozzles (#1 to #15). After printing the first pass, the printhead moves to a new position 15/360 inch forward. The printer repeats this sequence until it finishes printing the whole image. In microwave mode the printing starts from the under nozzle (#57 pin).

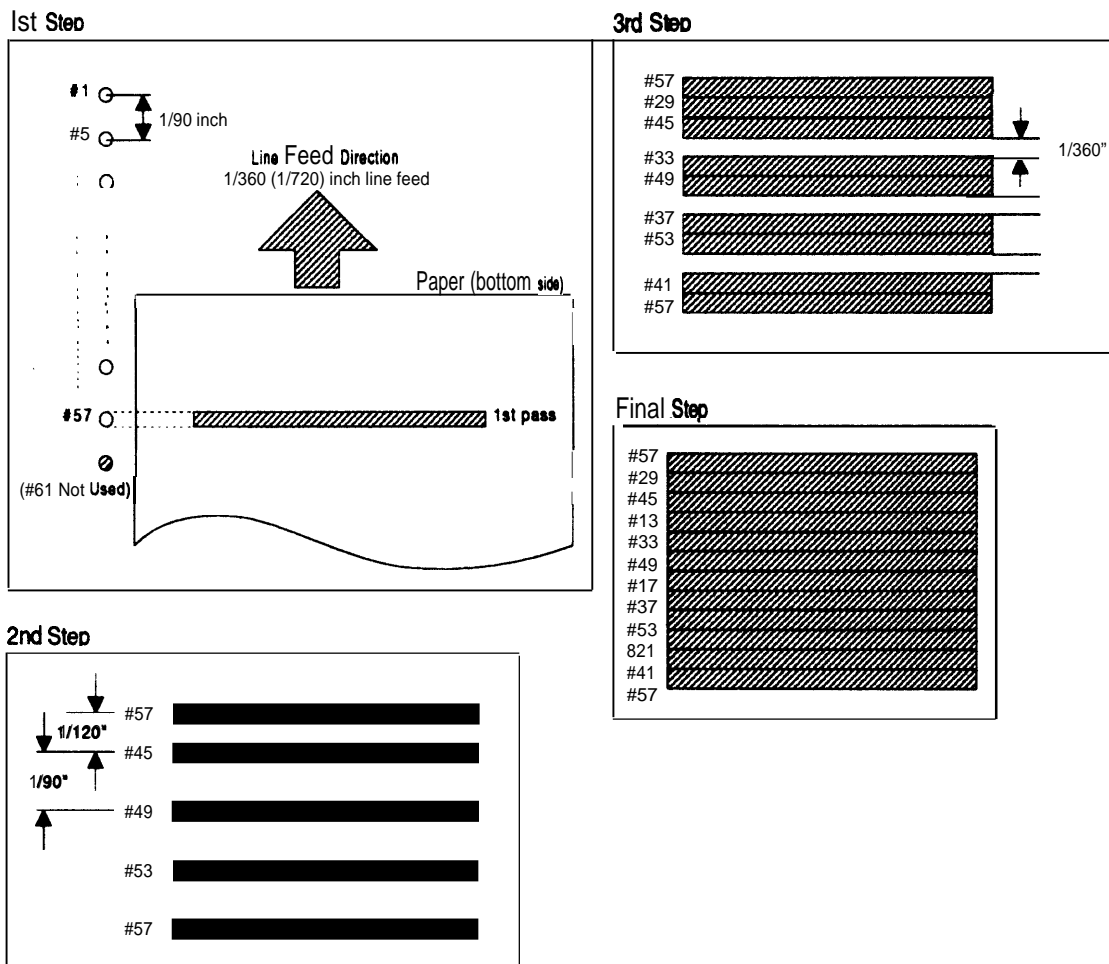


Figure 2-4. Microwave Mode Operation

### 2.2.2 Carriage Drive Mechanism

The timing belt attached to the base of the carriage unit is driven by the carriage motor, causing the carriage unit to move along the carriage guide shaft left to right, or vice versa. The carriage drive motor on this printer is a 4-phase, 200-pole, hybrid-type stepping motor mechanism, allowing the printer to stop the carriage or change the carriage movement at any position. The position of the carriage is recognized by the home position sensor, and position information is fed back to the carriage drive control circuit. This carriage motor is driven by the motor driver IC SLA7041 (see Section 2.3.2.3 for more information).

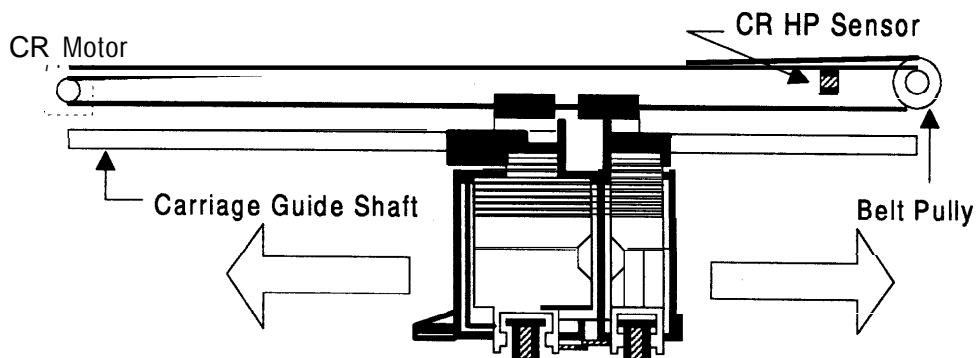
**Table 2-1. Carriage Drive Motor Specifications**

Item	Description
Motor Type	4-phase/ 200-pole hybrid-type stepping motor
Drive Voltage	+35 VDC ± 5%40
Coil Resistance'	10.0 Ω ± 7%
Drive Frequency	960-4800 PPS
Excitation Mode	Constant current unipolar Drive, Micro Step Driving

In the following table, 2W1-2 phase means the 1/8 2-2 phase drive control. ( ) is the value of 2-2 phase.

**Table 2-2. Drive Terms**

CR Speed	Frequency	Phase Drive Method	Acc./ Deceleration Step
Mode 1 (200 CPS)	4800(2400)	<ul style="list-style-type: none"> <li>■ Acc./Deceleration Area: 2W1-2 phase + 1-2 phase</li> <li>■ Constant Area: 1-2 phase</li> </ul>	Acc. 40(5)+110(55) Dec.32(4)+112(56)
Mode 2 (100 CPS)	2400(1200)	<ul style="list-style-type: none"> <li>■ Acc./Deceleration Area: 2W1-2 phase + 1-2 phase</li> <li>■ Constant Area: 1-2 phase</li> </ul>	40(5)+40(20)
Mode 3 (40 CPS)	960(480)	<ul style="list-style-type: none"> <li>■ Acc./Deceleration Area: 2W1-2 phase</li> <li>■ Constant Area: 2W1-2 phase</li> </ul>	16(2)



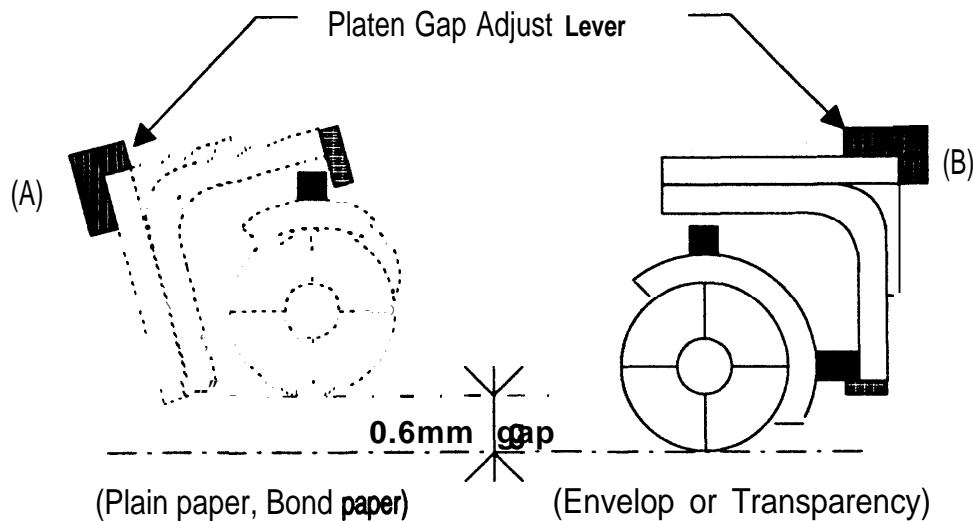
**Figure 2-5. Carriage Drive Mechanism**

### 2.2.2.1 Platen Gap Adjust Lever

The platen gap adjust lever, which is attached to the carriage unit, needs to be set to an appropriate position for the paper thickness. To change the platen gap, put the printer in the PAUSE state, then press the Font&& while holding down the Alt button; the carriage unit moves the platen gap adjustment position automatically.

**Table 2-3. Platen Gap Adjust Lever Position**

Paper Type	Lever Position
Cut sheet	Horizontal (A) ( $\pm 0$ mm)
Envelope	Vertical (B) (+0.6 mm)



**Figure 2-6. Platen Gap Lever Operation**

### 2.2.3 Paper Feed Mechanism

This printer's paper feed mechanism can feed paper only from the built-in ASF (auto sheet feeder). The paper feed drive motor is a 4-phase, 96-pole, hybrid-type stepping motor that directly drives the paper feed mechanism (paper advancing operation, paper pick-up operation). This motor also drives the pump mechanism, but only when the printer is in the cleaning state. The paper feed drive method is driven by the 2-2 phase drive method, except the paper feed drive sequence (2W1-2 phase).

**Table 2-4. Paper Feed Drive Motor Specification**

Item	Description
Motor Type	4-phase, 96-pole, hybrid-type
Drive Voltage	+35 VDC $\pm$ 5%
Coil Resistance	11.5 $\Omega$ $\pm$ 1.1 $\Omega$
Drive Frequency	300-1600 PPS
Excitation Mode	Paper feed/ Pump drive: 2-2 phase, 2W1-2 phase

Table 2-5. Drive Terms

Mode	Frequency (pps)	Current Value (mA)			
		Acc./Dcce.	Constant	Rush	Hold
Paper loading	1600	970/750	750	750	240
ASF feed	1600	970/750	750	750	240
Paper feed	391	-/-	970		240
Pump Drive 1	1800	1380/1380	1380	750	240
Pump Drive 2	300	-/-	1380		240

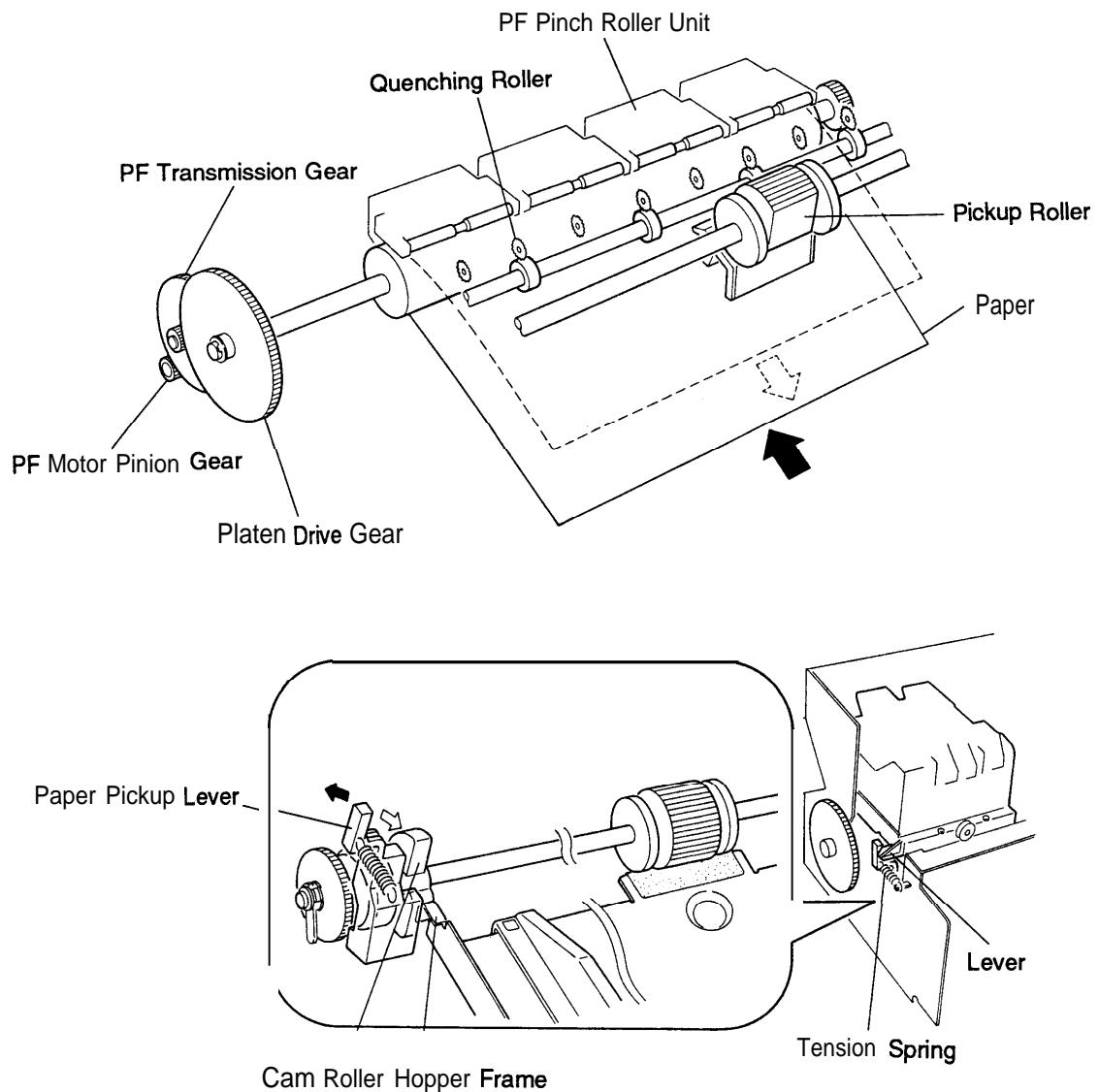


Figure 2-7. Paper Feed Mechanism

### 2.2.4 Ink System

This printer's ink system is composed of the following mechanisms:

- Ink cartridge
- Pump mechanism
- Cap mechanism
- Waste ink drain tank
- Wiping mechanism

The figure below shows a diagram of the ink system.

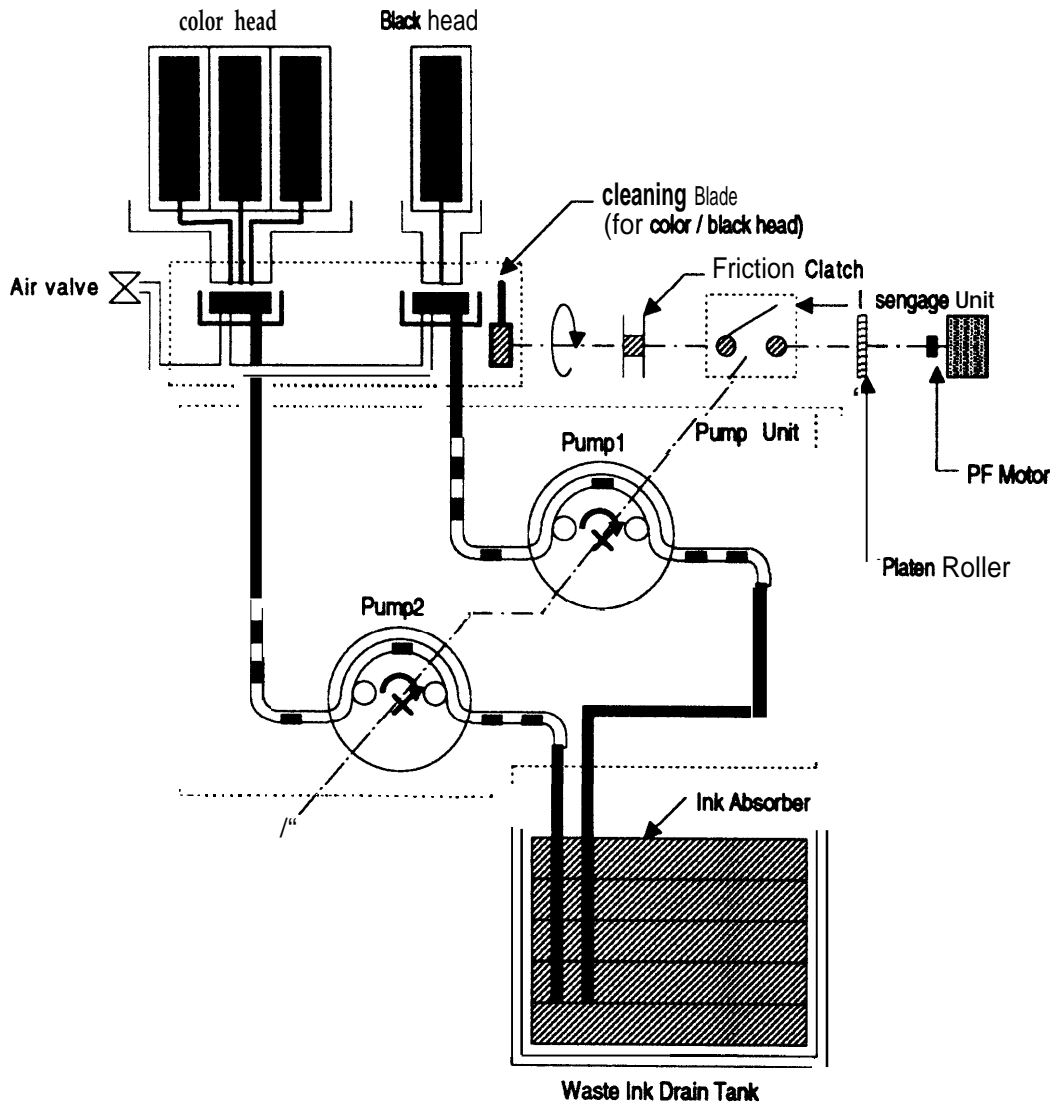


Figure 2-8. Ink System Block

### 2.2.5 Pump Mechanism

The paper feed motor drives the pump mechanism when the transmission gear is moved to the position where the paper feed motor disengages the pump mechanism gear trains, when the carriage unit is at the ink system home position. The figure below shows a block of the pump mechanism. Pump system operation depends on the rotational direction of the paper feed drive motor, as shown in Table 2-6.

**Drive: Pump Mechanism**

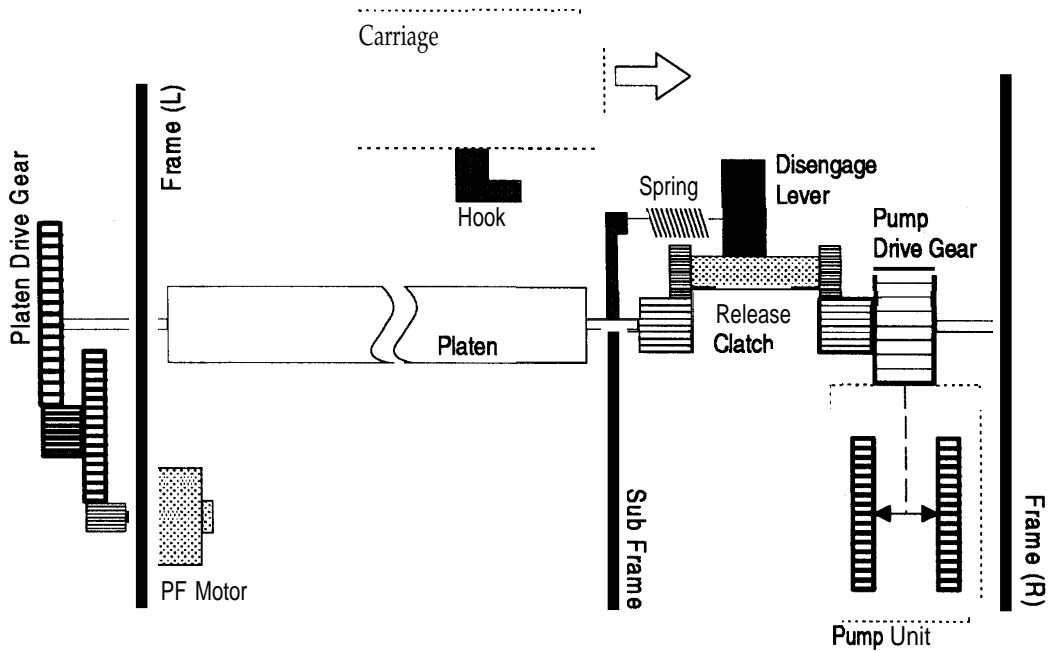


Figure 2-9. Pump Mechanism Block

**Drive: Switch Lever Set**

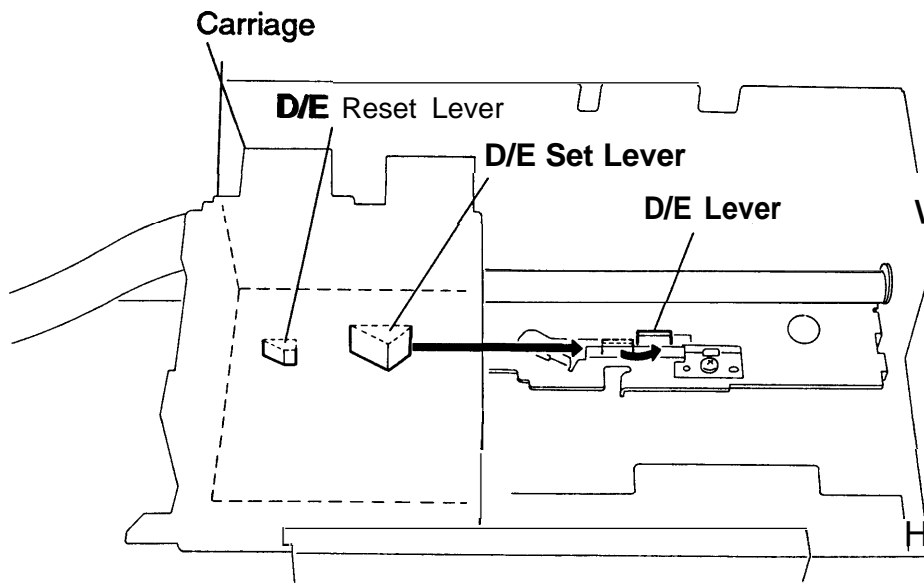


Figure 2-10. Switch Lever Set

Drive: Paper Feed Mechanism

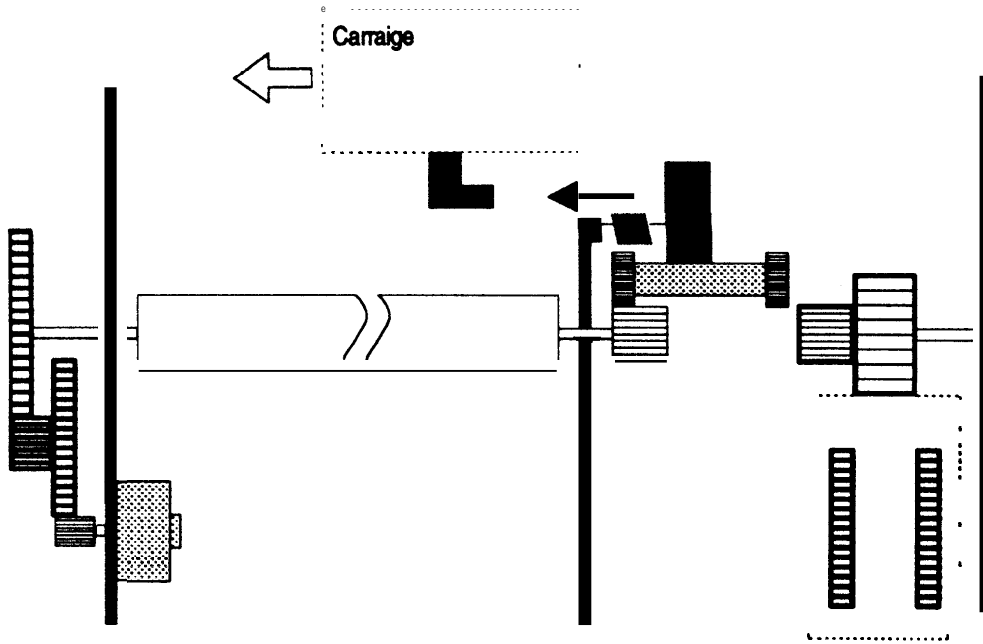


Figure 2-11. Paper Feed Mechanism Block

Switch Lever: Reset

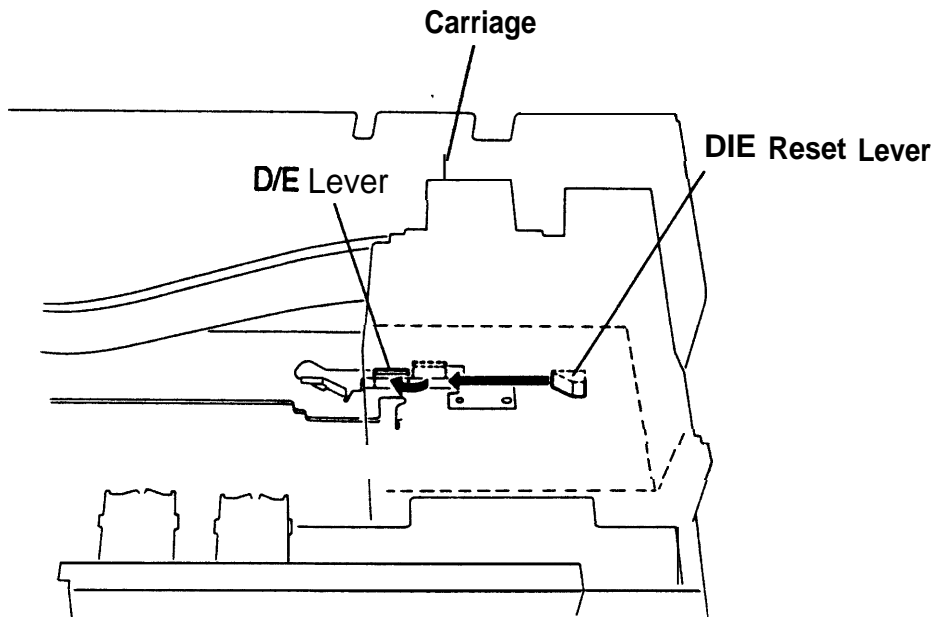


Figure 2-12. Switch Lever Reset



Table 2-6. Pump Mechanism Operation

PF Motor Rotational Direction	Operation
CW (forward rotation)	<ul style="list-style-type: none"> <li>■ Color absorption</li> <li>■ Color micro absorption</li> <li>■ Color fail absorption</li> <li>■ Wiper reset</li> <li>■ Carriage lock reset</li> </ul>
CCW (backward rotation)	<ul style="list-style-type: none"> <li>■ Monochrome absorption</li> <li>■ Monochrome micro absorption</li> <li>■ Monochrome fail absorption</li> <li>■ Wiper set</li> <li>■ Carriage lock set</li> </ul>

The pump draws ink from the printhead nozzles and drains it into the waste ink drain tank. The printer performs this operation to eliminate dust or bubbles within the nozzles. Figure 2-13 illustrates the pump operation. When the paper feed drive motor rotates CW (forward), the color pulley pumps in the wheel pump unit rotate in the direction of the arrow while squeezing the ink tube to push the ink inside the tube out to the waste ink drain tank. When the motor rotates CCW (backward), the black pulley pumps in the wheel pump unit rotate in the direction of the arrow while squeezing the ink tube to push the ink inside the tube out to the waste ink drain tank. There are 2 pump rollers in the pump unit, and the drive power is supplied from the paper feed motor via the pump drive gear (D/E gear) that is moved by the carriage operation. In the pump unit, the transmission gear supplies both the black and color pulley, which are rotated by the rotation of the other.

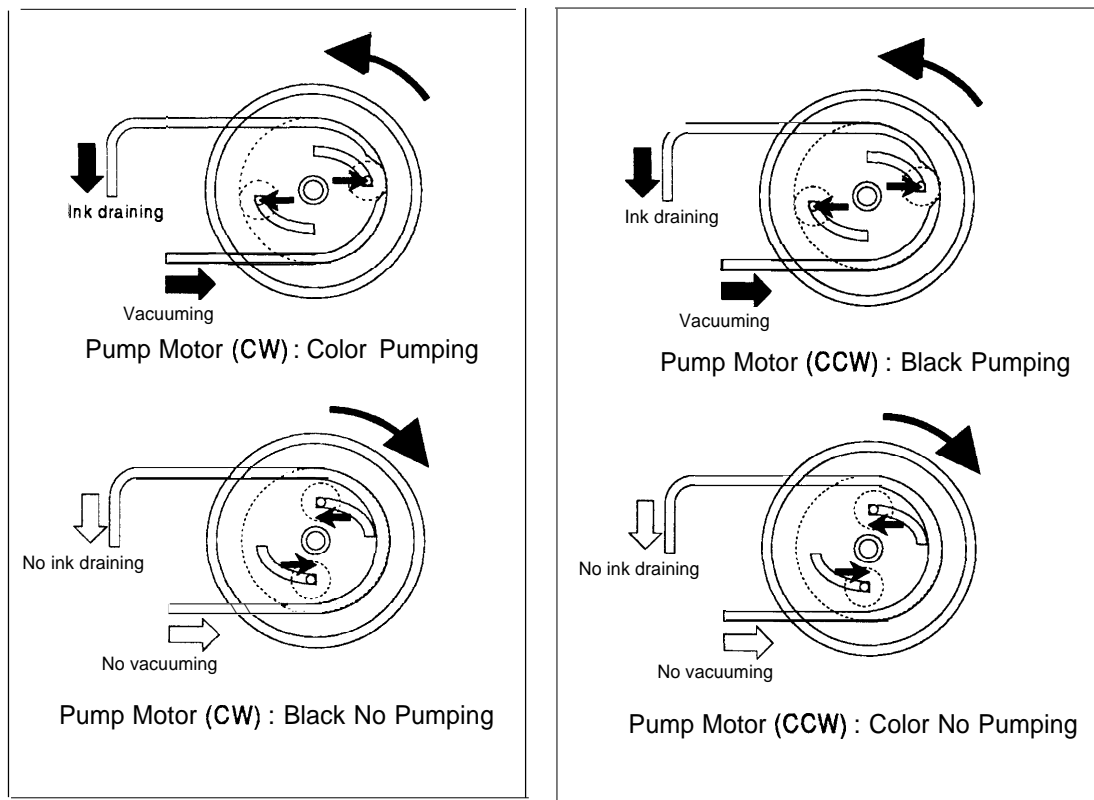


Figure 2-13. Pump Operation

### 2.2.6 Cap Mechanism

The cap mechanism prevents the printhead nozzles from drying or keeps bubbles from forming inside the nozzle while the printer is not in use. The printer performs this operation automatically when print data is not received or when the printer power is turned off during the printing or ink system operations. (Since the power switch is equipped with a secondary circuit, this operation can be performed.) Also this printer has 2 caps, 1 for the blackhead and 1 for the color head.

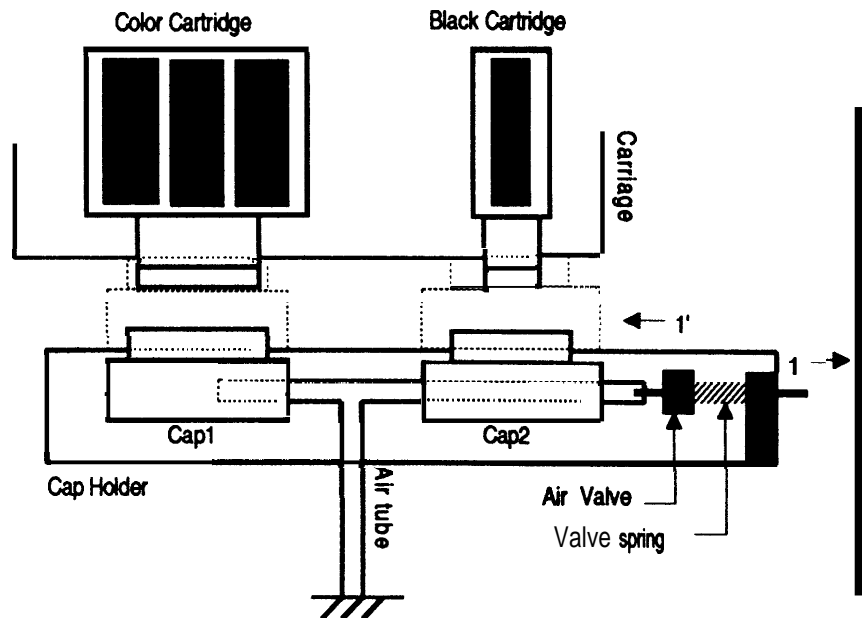


Figure 2-14. Cap Mechanism

### 2.2.7 Wiping Mechanism

The wiping mechanism cleans the surface of the printhead nose when the printer is in the ink system sequence. The wiper drive gear transmits power from the paper feed motor via the clutch gear. When the wiper is raised up (against the printhead surface), the hook for securing the carriage to the home position is raised, too. When the wiper goes down toward the bottom frame, the hook goes down, too. Both the black head and the color head are cleaned by this wiper.

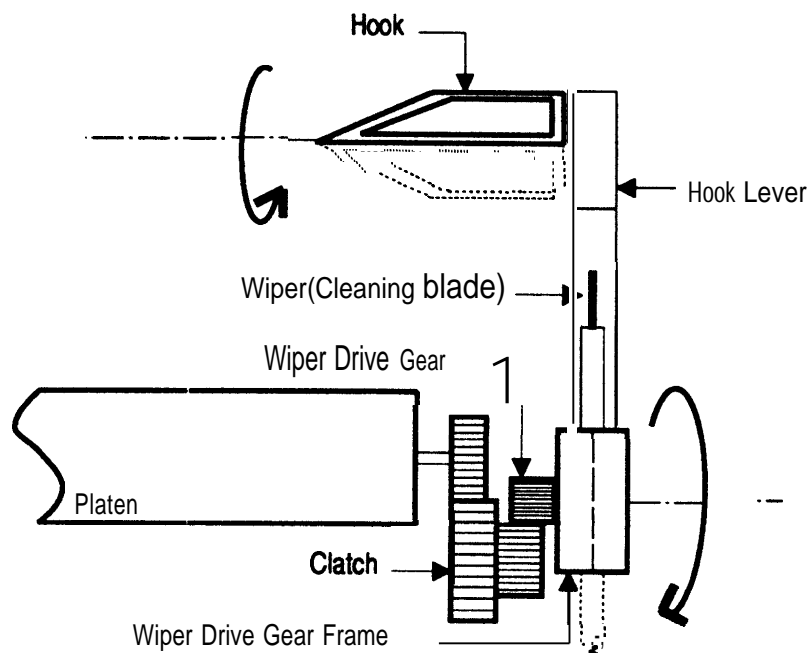


Figure 2-15. Wiping Mechanism

## 2.3 OPERATING PRINCIPLES OF THE ELECTRICAL CIRCUITS

The Stylus Color contains the following circuit board units:

- C137MAIN Board (Main control circuit board)
- C137PSB/PSEBoard (Power supply circuit board)
- C137 PNL (Control panel board)

In addition to the circuit boards above, part of the **printhead** drive circuit is built on a separate circuit board installed in the carriage unit; the **printhead** is attached directly to this board. The figure below shows a block diagram of the electrical circuitries.

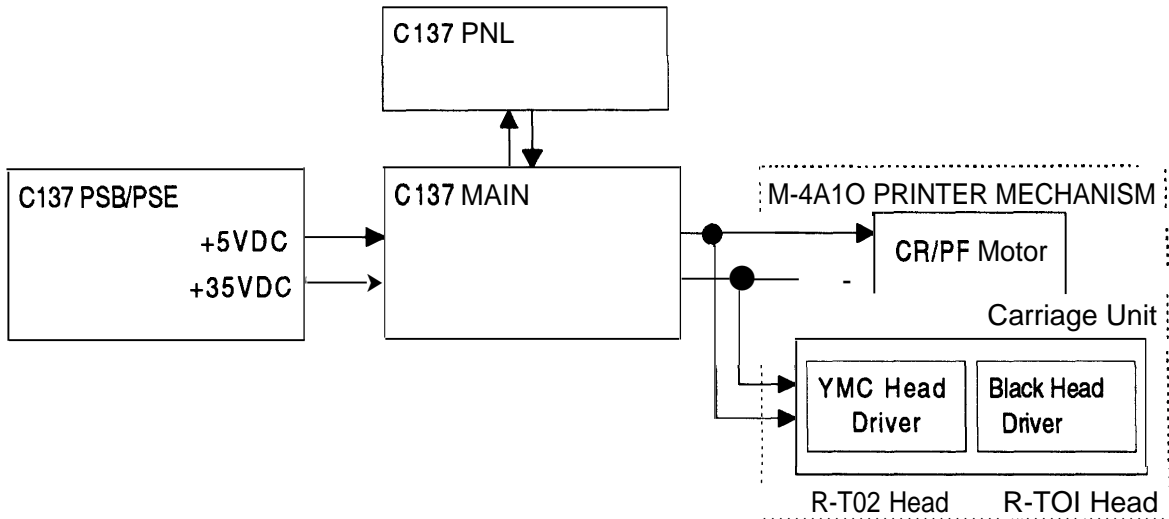


Figure 2-16. Block Diagram of the Electrical Circuit

### 2.3.1 Operating Principles of the Power Supply Circuit

The power supply circuitry for this printer is provided either by the C137 PSB board (120 VAC) or the C137 PSE board (220-240 VAC). Both boards are identical in design and functionality, except for the components in the primary circuit that accommodate the specified input voltage. The input voltage and the application of output voltages are summarized in the table below.

Table 2-7. DC Voltage Distribution

Voltage	Application
+35 VDC	Motor drive (carriage and paper feed) Printhead (through the drive voltage generation circuit)
+5 VDC	C137 MAIN Board Sensors (home position, paper end, no ink cartridge, head thermistor) Control panel, head nozzle selector

The figure below shows a block diagram of the power supply circuit (C137 PSB/PSE). The power switch is equipped with a secondary circuit that allows the CPU to remain active for a while after the printer is turned off. This allows the printhead to return to the capping position after power has been turned off. The CPU that is mounted on the C137 MAIN board always monitors the PSC (Power @/\_signal. If this signal becomes "Low", the CPU resets each device after performing the head capping sequence. Also, this board employs the RCC (Ringing Choke Converter) switching system. This AC voltage is first input to the filter circuit for higher harmonics absorption, and then input to the rectification and smoothing circuit, converting it into DC voltage. This DC voltage is then input to the switching circuit for the switching operation. Along with the switching operation on the primary side, +35 VDC is generated after passing through the +35V line voltage detection circuit. This +35 VDC output level is stabilized. This +35 VDC is also input to the +5 VDC generation circuit to generate a stable +5 VDC.

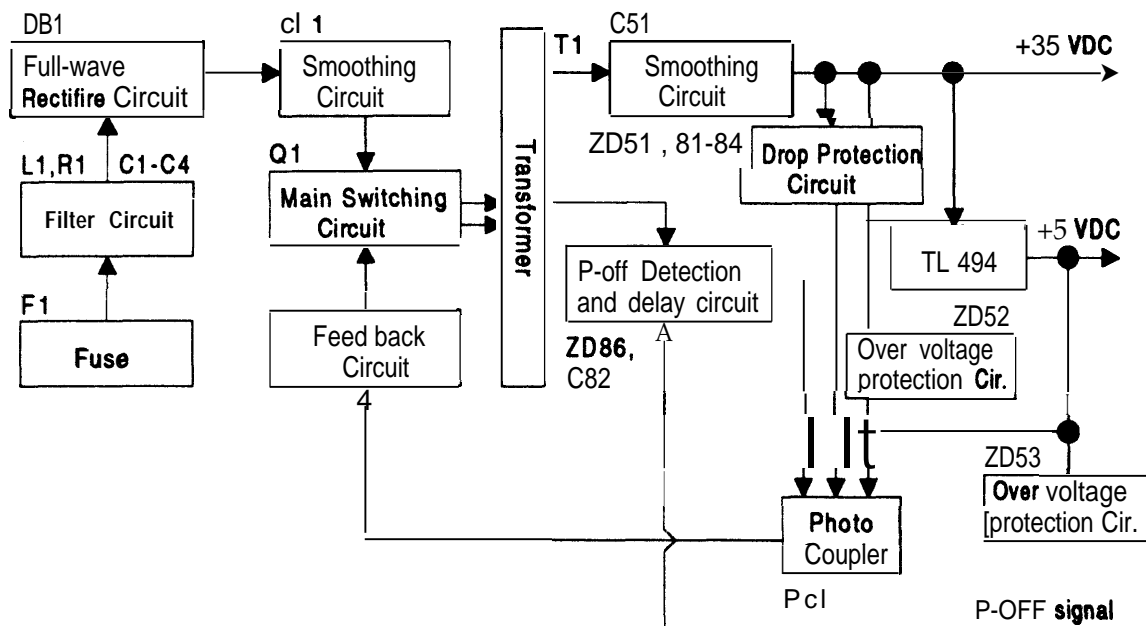


Figure 2-17. Power Supply Circuit Block Diagram

1) +5 VDC line overvoltage protection circuit

The output voltage level of +5V line is monitored by a Zener diode (ZD53). If the voltage level exceeds +7V, the status is fed back to the primary switching circuit through a photocoupler (PC1) to stop the +35V generation.

2) +5 VDC line over current/ overvoltage control circuit.

The output current is monitored by a detection resistor (R53) and fed back to the +5 VDC generation switching control IC (IC51), which monitors the output voltage. This information is input to the internal comparator and outputs the high signal to turn off the transistor (Q51) when the voltage or the current becomes abnormal.

3) +35 VDC line overvoltage protection circuit

The output level is monitored by a Zener diode (ZD36). If the voltage level exceeds +36V, a photocoupler (PC1) is activated; stopping the primary switching circuit operation.

4) +35 VDC line drop protection circuit

The output level of +35 VDC line is monitored by a detection circuit that consists of a Zener diode (ZD51 and ZD81 to 84). This circuit feeds back the output voltage level status through a photocoupler to the primary switching circuit to control the ON/OFF time of the switching transistor for constant output voltage.

### 2.3.2 Operating Principles of the Main Control Circuit

The main control circuit of this printer is the C137 MAIN board. This circuit is controlled by the 16-bit CPU H8/3003 (IC1), running at 14.7456 MHz. This CPU has a unique architecture capable of handling data on the data bus at either an 8-bit or 16-bit bus width. Because of this, a 16-bit or 8-bit data bus width-type ROM is used on this board, increasing the internal processing speed. Also, the CPU has a unique architecture capable of the refresh control function. A 4M D-RAM (2CAS method) on this board is controlled by the CPU itself. The CPU controls the serial interface control (RS-422 for Mac).

Gate array E05A96 (IC2) manages printhead drive control, external Centronics® parallel I/F, extension CG board and the control panel, and the controls that create the 4-bit signal for the carriage or the paper feed motor. (The carriage and paper feed motor are controlled by the current duty data.)

This board is also equipped with EEPROM 93C46 (IC12) to store certain parameters, such as the printer mechanism control parameter, default setting parameters, as well as a special counter value used for printhead (ink management) protection.

The timer IC NJU6355E (IC7) counts each time the printer is cleaned and keeps track of how long the printer is not used, thereby allowing the printer to be cleared only when necessary.

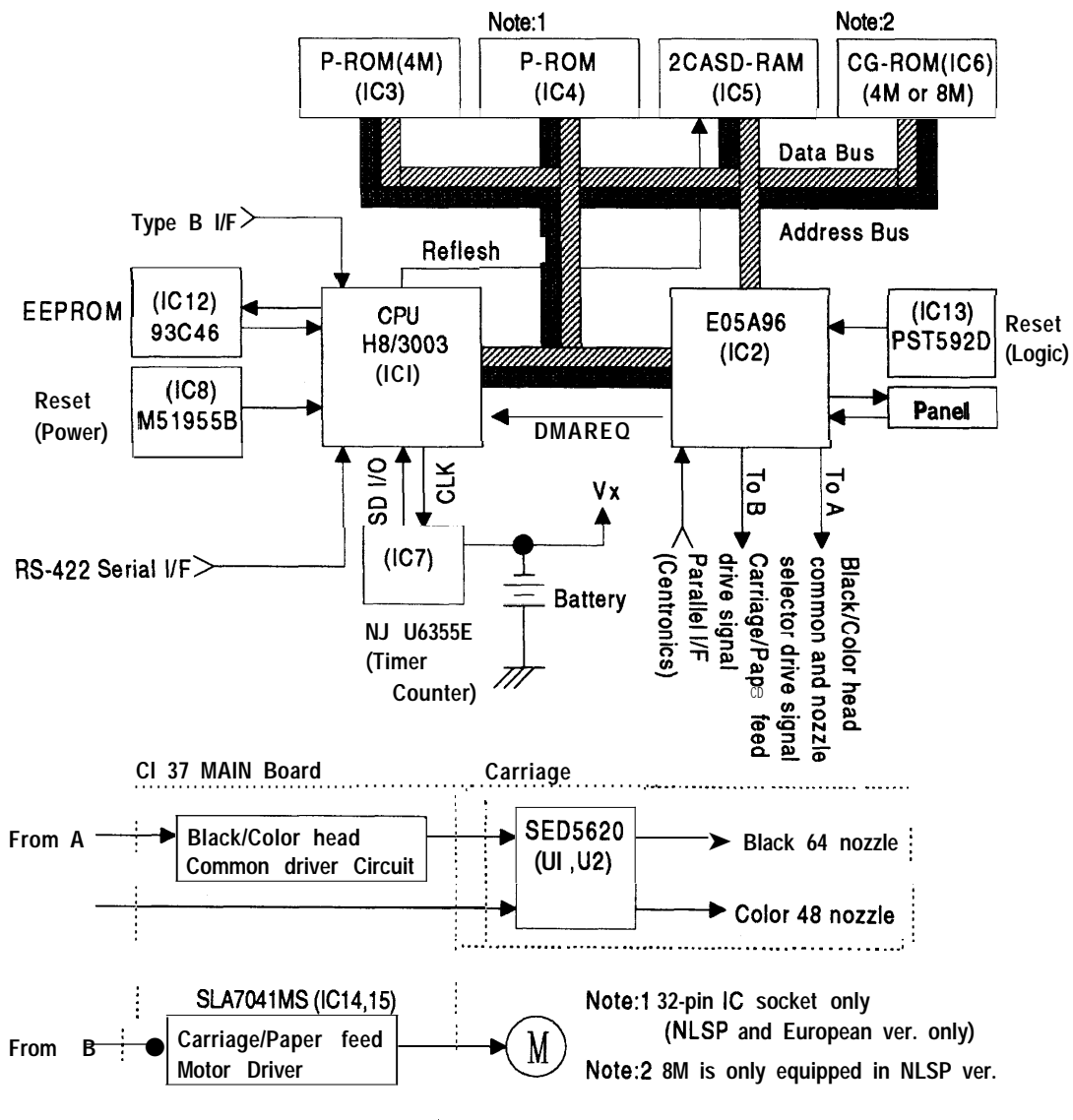


Figure 2-18. Main Control Circuit Block Diagram

### 2.3.2.1 Reset Circuits

The C137 MAIN board contains 2 reset circuits: the +5V monitor reset circuit and the +35V monitor reset circuit. The +5V monitor reset circuit monitors the voltage level of the +5V line, using reset IC PST592D (IC12), and outputs a reset signal to the E05A96 gate array (IC2) when the voltage level drops below +4.2V. The +35V monitor reset circuit monitors the voltage level of the +35V line, using reset IC M51955B (IC8), and outputs a reset signal to the CPU (IC1) when the voltage level drops below +28V. The reset signal is generated when the voltage level drops below +28V, and this causes a non-maskable interrupt (NMI).

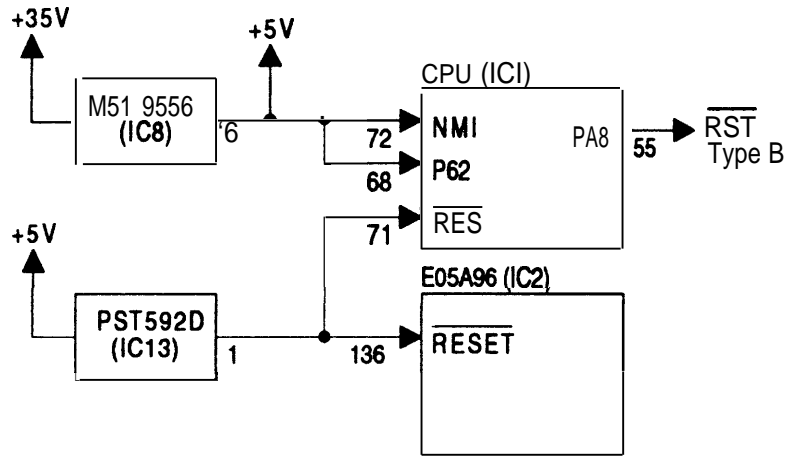


Figure 2-19. Reset Circuit Block Diagram

### 2.3.2.2 Sensor Circuits

The following sensor circuits enable the C137 MAW board to monitor printer mechanism status:

- HP sensor     A photocoupler-type HP (home position) sensor is attached to the surface of the printer mechanism to detect the carriage home position. A LOW level from the signal indicates that the carriage is in home position.
- PE sensor     A mechanical switch PE (paper end) sensor is built into the printer mechanism to determine whether there is paper in the printer or not. A LOW level from the signal indicates that no paper is loaded.
- CO sensor     A micro switch is attached to the bottom of each ink cartridge holder in the carriage unit. When the ink cartridge is installed, these switches are pressed and a LOW level from the signal indicates that the ink cartridge is installed into the ink cartridge holder.
- Thermistor     A thermistor is attached to the color printhead driver board to monitor its temperature. The CPU changes the printhead drive signal's pulse width (charge pulse width) based on the temperature level.

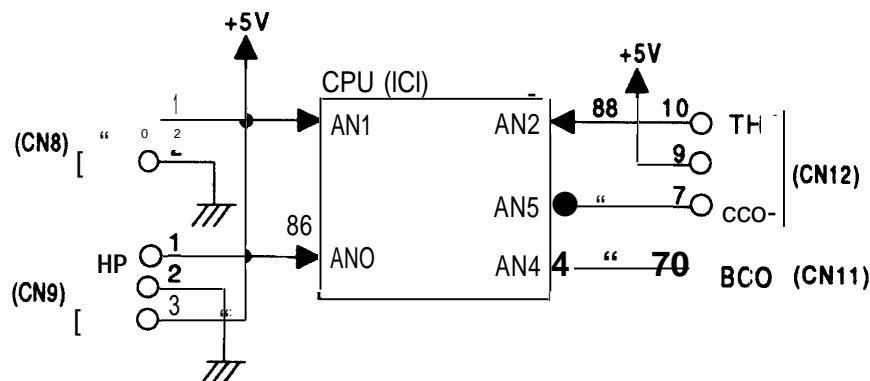


Figure 2-20. Sensor Circuit Block Diagram

### 2.3.2.3 Carriage Motor Drive Circuit

The carriage motor drive IC SLA7041MS (IC15) outputs a constant current to drive the carriage motor for the printer mechanism. Gate array E05A96EA (IC2) decides the motor phase and speed and then sends a signal to the carriage motor driver IC (SLA7041MS) using the 4-bit serial transmission line.

The first bit indicates the direction of the motor rotation. The other three bits are current duty data for the motor speed of each printing sequence. SLA7041MS can select the reference voltage itself based on these three current duty data. Also, it receives these signals by 2 serial transmission lines for 2 motor's phases (phase A and phase B). Due to this, the carriage motor can drive the miao step sequence (min. 1/720 inches).

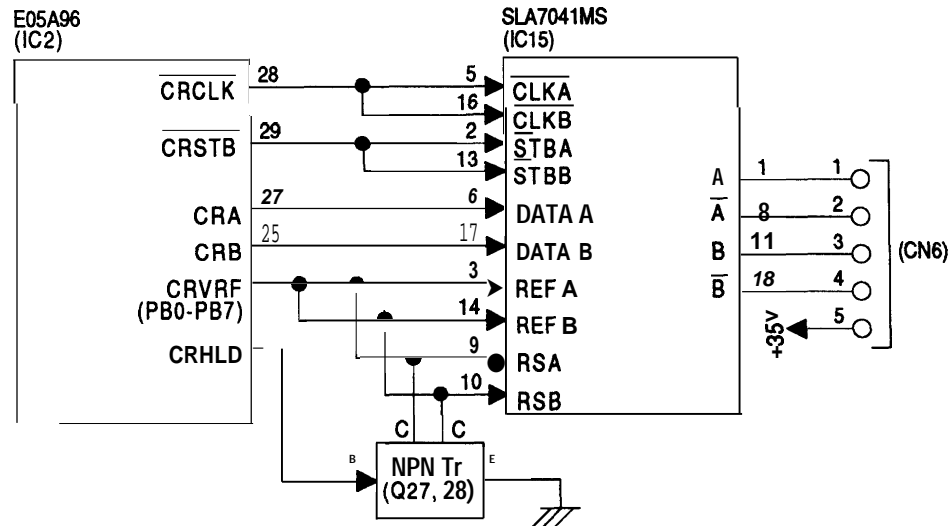


Figure 2-21. Carriage Motor Circuit Block Diagram

The 4-bit serial data is read by the SLA7041MS motor driver by 4 clock counts from the E05A96 (IC2) clock. Each bit is read by the falling edges of these clock pulses. Due to this, the received serial data is set into the shift register and then shifts the latch register. When the strobe pulse becomes active from the E05A96 (IC2), the serial data is moved into the reference voltage selection circuit and the voltage is changed. Therefore, when the printer is in the constant speed mode, this strobe pulse becomes inactive. The following table indicates the current duty of each carriage motor speed mode.

Table 2-8. Serial Data Contents

Mode	C b a	Vref (typ.)	
0	0 0 0	Vref x 1/3 (Vref = +5V)	x 0%
1	0 0 1		x 20%
2	0 1 0		x 40%
3	0 1 1		x 55.57%
4	1 0 0		x 71.47%
5	1 0 1		x 83%
6	1 1 0		x 91%
7	1 1 1		x 100%

The following figure shows the contents of the 4-bit serial data and how these data are transacted by the SLA7041MS driver. The step time of the reference voltage is determined by the interval time of the strobe pulse.

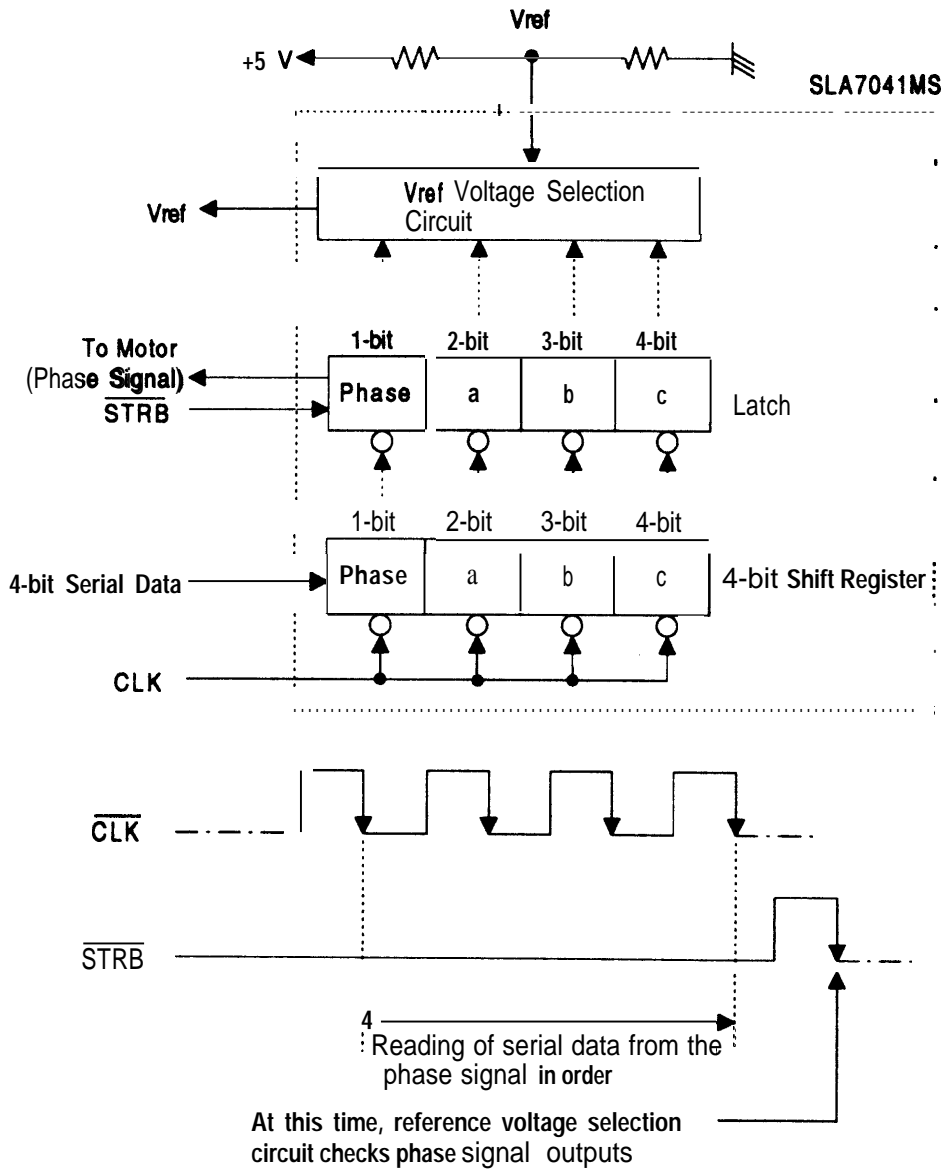


Figure 2-22. Serial Data Transfer Procedure



2.3.2.4 Paper Feed Motor Drive Circuit

The paper feed motor for this printer drives the following mechanisms:

- Paper feed mechanism
- Paper pickup mechanism
- Pump mechanism

Driver IC SLA7041MS (IC14) drives the paper feed motor by a constant current. The operation principle is same as the carriage motor drive circuit. But the driving method is different for paper feed and the pump.

Table 2-9. Paper Feed Motor Drive Modes

Mode	Phase Excitation	Drive Frequency
Paper feed	2-2 phase or 2WI -2 phase	391 or 1600 pps
Pump drive	2-2 phase	300 or 1800 pps

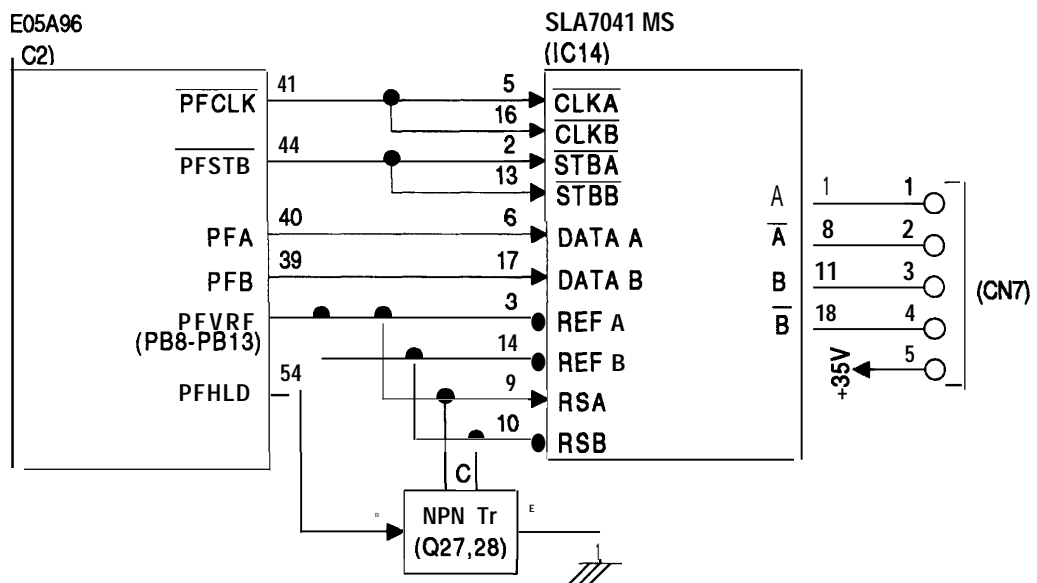


Figure 2-23. Paper Feed Motor Drive Circuit Diagram

### 2.3.2.5 Printhead Drive Circuit

The printhead drive circuit for this printer is composed of the following two parts:

- Common drive circuit (trapezoidal drive pulse generation)
- Head drive circuit (nozzle control built on the printhead)

The W-bit thermal head driver SED5620D in the head drive circuit on the carriage is used as a nozzle selector to selectively drive the printhead nozzles. Print data is converted into serial data by gate array E05A96 (IC2) and is output from port BSO (pin 20) to the black head drive circuit or output from port CSO (pin 24) to the color head drive circuit. Then, head driver SED5620D latches the head data when gate array E05A96BA outputs the BLAT or CLAT signal, and the latched data becomes 64-bit parallel data for the black head, or 48-bit parallel data for the color head. One bit corresponds to each nozzle.

When data transfer and nozzle selection is complete, gate array E05A96 outputs the common drive pulse BPWC or CPWC (charge pulse) and BPWD or CPWD (discharge pulse) to the common drive circuit. The common drive circuit then generates the trapezoidal pulse and applies it to the printhead as a common drive pulse. After this, the nozzle selected by the head data is activated to inject ink.

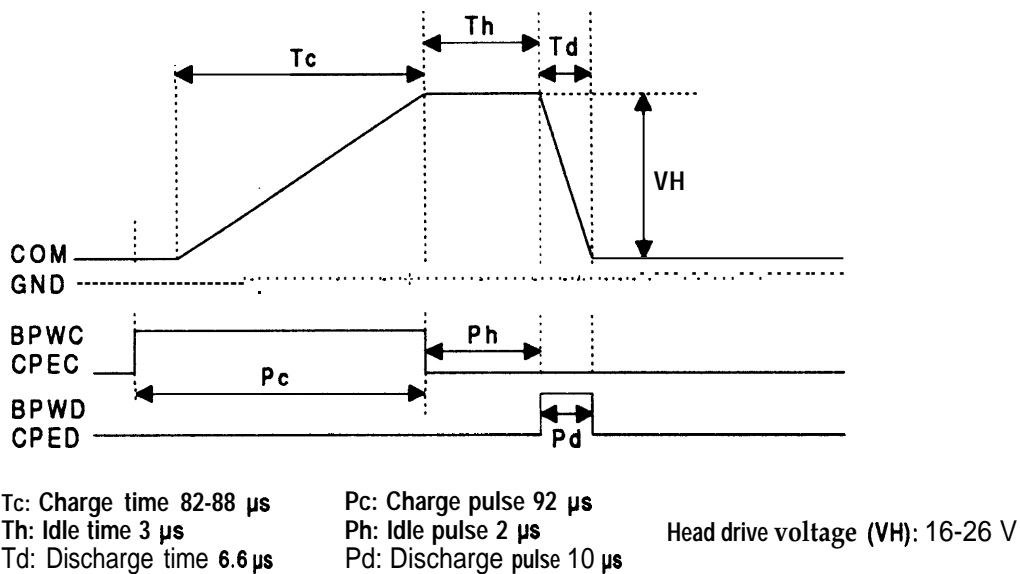


Figure 2-24. Trapezoidal Drive Wave Form

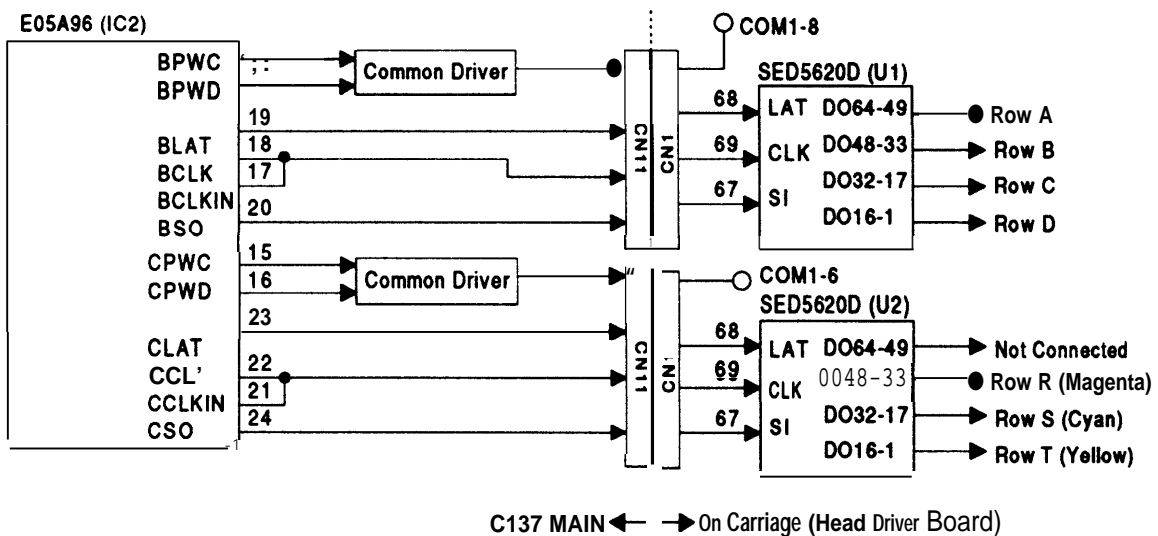


Figure 2-25. Printhead Drive Circuit Block Diagram

2.3.2.6 DMA Controller

Data from the host computer is received automatically by the /STB signal via the external Centronics interface. The data is input into the input buffer on the D-RAM (IC5). At this time, E05A96 detects the rising edge of the external /STB signal and outputs the /STBDMA (strobe DMA request) signal to the CPU. When the CPU detects this signal, the DMA controller in the CPU sends a bus request to the bus controller in the CPU, and then the CPU releases the bus line. Due to this, the external data is transported into the memory, bypassing the CPU.

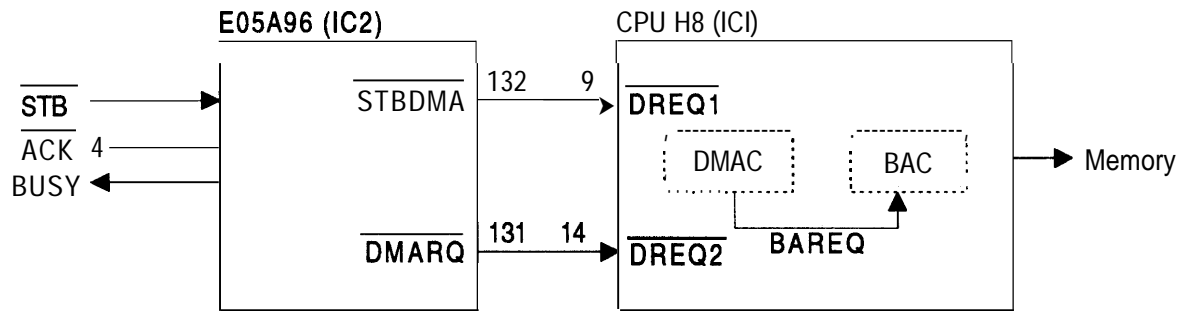


Figure 2-26. DMA Controller Operation

2.3.2.7 D-RAM Refreshment Controller

The H8 CPU is equipped with a refresh controller into the internal controller. This CPU can contact the 16-bit length IC5 D-RAM which is a 2 CAS type. The following table lists the junction method between the H8 CPU and the 2 CAS D-RAM.

Table 2-10. Junction Method (CPU-2CAS DRAM)

CPU	2 CAS D-RAM
$\overline{\text{HWR}}$	$\overline{\text{UCAS}}$
$\overline{\text{LWR}}$	$\overline{\text{LCAS}}$
$\overline{\text{CS3}}$	$\overline{\text{RAS}}$
$\overline{\text{RD}}$	$\overline{\text{WR}}$

The method of the D-RAM refreshment is only used to the CAS before RAS cycle method. The following figure shows the timing of each cycle.

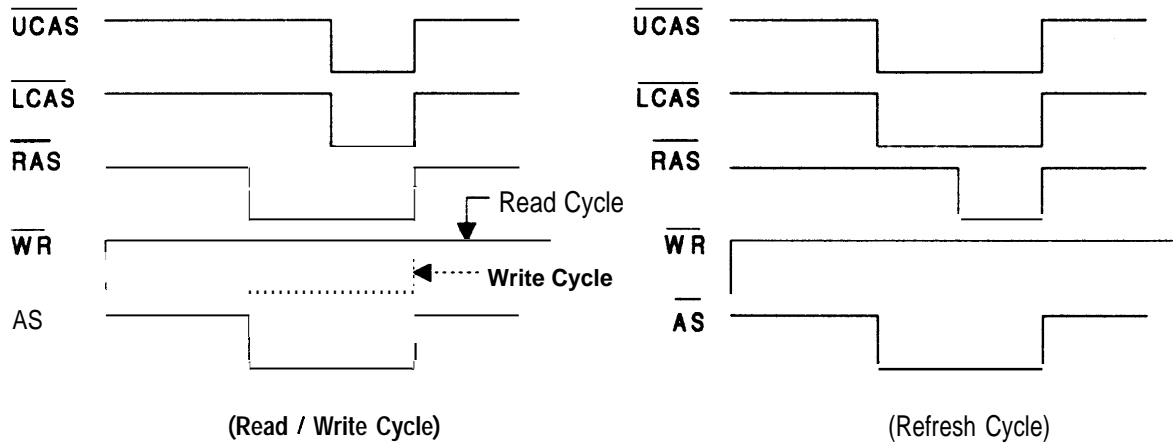


Figure 2-27. D-RAM Cycle Timings

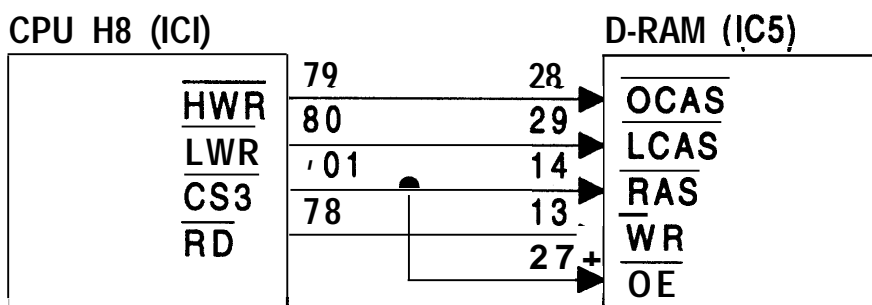


Figure 2-28. Junction Method (CPU-DRAM)

## 2.4 INK SYSTEM MANAGEMENT

This section explains how the ink system is controlled to protect the printhead and the ink supply system and to ensure high-quality output. The ink system control is composed of the following operations:

- Power On
- Cleaning Selection
- Micro Absorbing Cleaning
- Power Off
- Print Start
- Refresh
- Standby
- Fail Absorbing
- Ink Cartridge Replacement
- Wiping Operation 1
- Wiping Operation 2
- Rubbing Operation
- Disengage On
- Disengage Off
- Micro Absorbing
- Carriage Lock Set
- Carriage Lock Reset
- Refresh (When loading or ejecting paper)
- Forwarding (Not described)

These ink system operations are controlled by the following counters and timers:

- Refresh timer
- Flashing counter
- CL counter K
- Monochrome / color head timer
- Ink level counter R
- Protect counter

The figure below shows how the carriage position determines which ink system operation to execute.

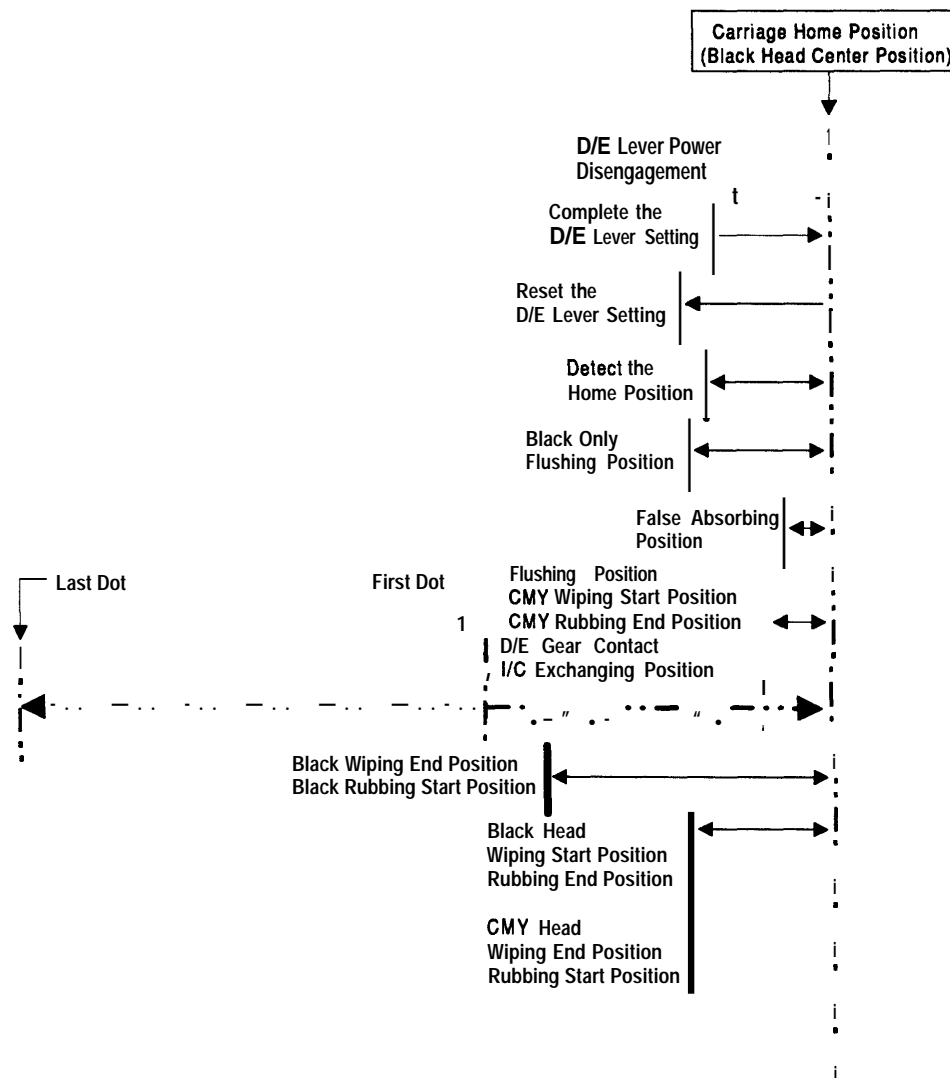


Figure 2-29. Relation of Ink System & Carriage Operation

## 2.4.1 Ink Operations

There are various ink operations that can be performed selectively by the printer.

### 2.4.1.1 Power On Operation

This operation is performed when power is turned on. There are four separate sequences of steps, depending on the following conditions:

1. The carriage position at the printer power turns on.
2. Ink cartridge status (No/In)
3. Printer condition before turning off the printer power
4. Timer counter

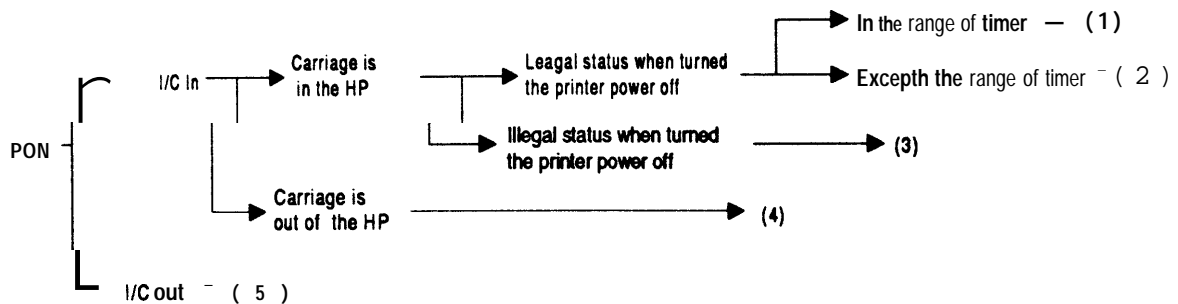


Figure 2-30. Power On Operation Classification

- (1) Normal Mode:
  1. Releases the carriage lock.
  2. Moves the carriage to the flushing position, and operates the 500-pulse flushing monochrome, CMY order.
  3. Moves the carriage to the home position.
  4. Sets the carriage lock and takes the printer out of standby mode.
- (2) Micro Absorption Mode 1: (Micro Absorption timer times out)
  1. Releases the carriage lock.
 

If there is a head before the timer times out, the following two substeps are performed:

    - 1-1. Moves the carriage to the flushing position, and the head (before the timer times out) performs the flushing operation.
    - 1-2. Moves the carriage to the home position.
  2. Performs the micro absorbing operation. (Performs the cleaning operation toward the head that the timer times up in accordance with the timer excess time. If both the black and the color head are times out, performs the cleaning operation first for the color printhead, then for the black printhead.)
  3. Sets the carriage lock
  4. Waits for print data.
- (3) CL1 Mode: (Head position is illegal when the printer is turned on.)
  1. Releases the carriage lock.
  2. Performs the CL1 operation at the color head.
  3. Performs the CL1 operation at the blackhead.
  4. Sets the carriage lock.
  5. Waits for print data.
- (4) Micro Absorbing Operation Mode 2:
  1. Moves the carriage to the home position.
  2. Performs the micro absorbing operation at the color head.
  3. Performs the micro absorbing operation at the blackhead.
  4. Sets the carriage lock.
  5. Waits for print data.

No Ink Cartridge Mode:

1. Sets the LED to indicate no ink cartridge.
2. The printer enters the PAUSE status.

**Note:** *The flushing operation is driven by all nozzles at 7.2 KHz, and is performed when the carriage is stopped.*

### 2.4.1.2 Cleaning Selection Mode

This operation cleans each nozzle to ensure that the nozzle fires and that no dots are skipped when printing. This operation is performed by pressing the cleaning switch (**Alt + Load/Eject** or **Economy/Condensed**) while the printer is in PAUSE status. Three different sequence of steps can be performed depending on the value of the CL Counter K (see section 2.4.7.6), the value of the CL counter KK, and how much printing has been done since the last cleaning.

- CL1 (Normal Cleaning)
- CL2 (Power Cleaning)
- CL3 (Fail Cleaning)

#### **CL 1 (Normal Cleaning):**

1. If the carriage is not in the home position, moves the carriage to the home position.
2. If paper is in the printer, ejects the paper; if paper is not in the printer, releases the carriage lock.
3. Performs the home position seek.
4. Performs the wiping operation 1.
5. Sets the disengage gear (pump unit drive).
6. Absorbs the ink (micro absorption).
7. Releases the negative pressure.
8. Performs the interval micro absorbing operation.
9. Performs the fail absorption (including the pump release operation).
10. Performs the wiping operation 2 (including the flushing operation).
11. Moves the carriage to the home position.
12. Sets the carriage lock, and pauses the printer.

#### **CL2 (Power Cleaning):**

1. If the carriage is not in the home position, moves the carriage to the home position.
2. If the paper is in the printer, ejects the paper; if paper is not in the printer, releases the carriage lock.
3. Performs the home position seek.
4. Performs the wiping operation 1.
5. Sets the disengage gear (pump unit drive).
6. Absorbs the ink. (Wets the surface of the nozzle plate.)
7. Releases the negative pressure.
8. Performs the fail absorption (including the pump release operation).
9. Performs the rubbing operation.
10. Sets the disengage gear (pump unit drive).
11. Absorbs the ink (high absorption).
12. Releases the negative pressure.
13. Performs the interval micro absorbing operation.
14. Performs the fail absorption (including the pump release operation).
15. Performs the wiping operation 2 (including the flushing operation).
16. Moves the carriage to the home position.
17. Sets the carriage lock, and pauses the printer.

#### **CL3 (Fail Cleaning)**

This operation applies only to the blackhead and is identical with the CL1 operation except that step 6 is changed as follows:

6. Moves the carriage to the fail absorbing position and **performs** the ink absorbing operation.

### 2.4.1.3 Micro Absorbing Cleaning Operation

This operation prevents an increase in the viscosity of the ink inside the printhead by the ink absorbing discharge.

1. Performs the wiping operation 1.
2. Sets the disengage gear (pump unit drive).
3. Performs the ink absorbing operation (micro absorbing).
4. Performs the negative pressure.
5. Performs the fail absorbing operation (including the flushing operation).

### 2.4.1.4 Power Off Operation

This operation ensures the carriage is in the home position when the printer turns off, and prevents the disengage gear from turning continuously when the printer turns off.

This operation is performed when the switch of the secondary side is turned off.

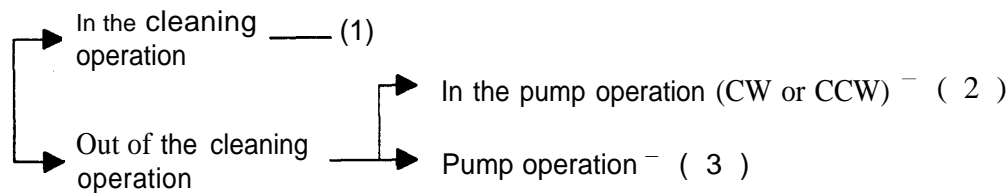


Figure 2-31. Power Off Operation Classification

#### (1) Normal mode:

1. When the paper is in the printer, ejects the paper.
2. Sets the carriage lock

#### (2) D/E lever OFFmode:

1. Stops the printer operation.
2. Moves the carriage to the flushing position and releases the pump unit
3. Moves the carriage to the home position. (When the paper is in the printer, ejects the paper.)
4. Sets the carriage lock and **performs the flushing operation.**

#### (3) Fail absorption and D/E lever reset mode:

1. Stops the pump motor.
2. Releases the negative pressure.
3. Moves the carriage to the fail absorption position.
4. Exhausts the ink inside the **carriage.**
5. Moves the carriage to the flushing position.  
When the pump motor rotates **CCW**, performs step 5-1; otherwise advances to step 6.
- 5-1. Resets the wiper.
6. Releases the pump unit.
7. Releases the pump system transmission gear.
8. Moves the carriage to the home position.
9. Sets the carriage lock.

### 2.4.1.5 Print Start Operation

This operation eliminates the ink from the node surface, and is performed when the printer receives print data while in the standby state.

1. Releases the carriage lock if paper is not loaded.
2. Moves the carriage to the flushing position, and performs the lo-pulse flushing in **monochrome, CMY** order; then the printer begins printing.



### 2.4.1.6 Refresh Operation

This operation prevents an increase in the viscosity of the head ink. This operation is activated by the RFSH signal that occurs automatically every 2 seconds (blackhead) or 7 seconds (color head). If 3 seconds elapses after an RFSH signal, this operation is performed immediately. Also, if 10 seconds elapses, the printer enters the standby mode.

1. Moves the carriage to the flushing position. (If only the black head is being flushed, moves the black head on the color cap position.)
2. The blackhead performs the flushing operation in accordance with excess time from before refresh operation, and color head performs the 12-pulse flushing operation.
3. If the value of ink counter R or if the timer of fail absorption is over the setting value, performs the fail absorbing operation when the next paper ejecting operation is completed.
4. Returns to the previous operation.

### 2.4.1.7 Standby Operation

This operation prevents an increase in the viscosity of the head ink. It is performed automatically if no data is received for more than three seconds.

1. Moves the carriage to the flushing position.
2. Counts the number of the flushing operations from the last standby operation, using the combined print counter N, and performs the flushing based on this counter value.
3. Moves the carriage to the home position.
4. If paper is not loaded, sets the carriage lock. To ensure the paper feed precision, the carriage lock is not performed if paper is loaded.
5. Waits for print data. (Depending on the value of ink counter R, the fail absorption might be performed at this time.)

### 2.4.1.8 Fail Absorbing Operation

This operation absorbs ink inside the cap, and eliminates the ink of the nozzle plate. There are two patterns in this operation.

■ After performing the ink absorption:

1. Moves the carriage to the fail absorption position.
2. Performs the fail absorbing operation for the black or color cap.
3. Moves the carriage to the flushing position.
4. Performs the fail absorption for the other cap.
5. If the pump motor rotated CCW in step 4, resets the wiper; this step is not necessary if the pump motor rotated CW.
6. Releases the pump unit.
7. Releases the D/E lever.
8. Moves the carriage to the home position.

■ Fixed time fail absorbing:

1. Moves the carriage to the flushing position.
2. Performs the ink absorbing operation inside the black cap.
3. Performs the ink absorbing operation inside the color cap.
4. Releases the pump unit.
5. Moves the carriage to the home position.

### 2.4.1.9 Ink Cartridge Replacement Operation

This operation is performed when the **Alt button** is pressed for **more than 3 seconds**; the carriage then moves to the ink cartridge **replacement** position.

1. When paper is loaded, ejects the paper; if paper **is not loaded**, releases the **age lock**.
2. Moves the carriage to the carriage replacement position.
3. The printer enters the **ink cartridge** exchanging state. (The printer **remains** in this state until the **Alt button** is pressed or until **10 seconds** elapse.) While the printer is in this waiting status, performs the following step (3-1) and then advances to step 4.
  - 3-1. Performs the **five-pulse** flushing operation every **5 seconds** (blackhead only).

The sequence of steps performed after the **ink cartridge** is replaced depends on the printer status:

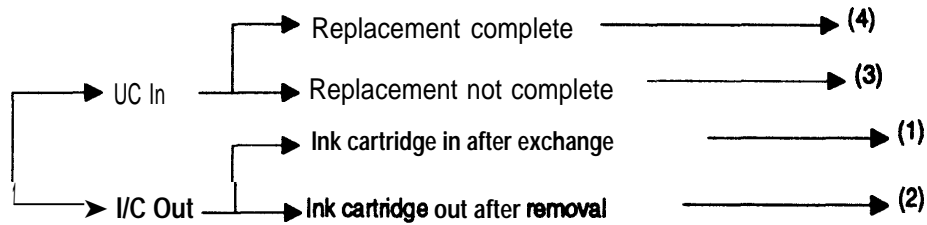


Figure 2-32. Ink Cartridge Replacement Classification

#### (1) Normal Mode

4. Depending on whether the I/C is in or out, performs the absorbing operation for the color head (see A or B).
5. Depending on whether the I/C is in or out, performs the absorbing operation for the black head (see A or B).

##### A (I/C In)

- A-1. Performs the wiping operation 1.
- A-2. Sets the D/E lever (pump transmission on).
- A-3. Performs the **ink** absorption.
- A-4. Pauses the printer for **3 seconds**.
- A-5. Performs the ink absorption.
- A-6. Performs the negative **pressure**.
- A-7. Performs the **interval** micro **absorbing** operation.
- A-8. Performs the fail absorbing operation (including the D/E lever set operation).
- A-9. Performs the wiping **operation 2** (including the flushing operation).

##### B (I/C Out):

- B-1. Performs the micro absorption **cleaning** operation
- B-2. Moves the carriage to the home **position**.
- B-3. Waits **for** print data.

#### (2) No I/CMODE

4. Sets the **carriage lock**.
5. Turns on the No Ink Cartridge LED.
6. Pauses the printer.

#### (3) PAUSE Mode

4. Performs the flushing operation and then moves the carriage to the home **position**.
5. Sets the **carriage lock**.
6. Pauses the printer.

### 2.4.1.10 Wiping Operation 1

This operation eliminates dust from the nozzle plate before performing the ink absorption.

1. Moves the carriage to the wiping start position.
2. Sets the wiper.
3. Moves the carriage to the wiping end position.
4. Resets the wiper.
5. Moves the carriage to the home position.

### 2.1.4.11 Wiping Operation 2

This operation eliminates dust or ink from the nozzle plate after performing the ink absorption.

1. Moves the carriage to the wiping start position.
2. **Sets** the wiper.
3. Moves the carriage to the wiping end position.
4. Resets the wiper.
5. Moves the carriage to the home position.
6. Moves the carriage to the flushing position, and performs the flushing operation (color= 7000 pulse).
7. Moves the carriage to the home position.

### 2.4.1.12 Rubbing Operation

This operation removes dust or ink that adheres to the head surface.

1. Moves the carriage to the rubbing start position.
2. Sets the wiper.
3. Moves the carriage to the rubbing end position.
4. Resets the wiper.
5. Moves the carriage to the home position.

### 2.4.1.13 Disengage ON Operation

This operation sets the switch lever to the position where it transmits the PF motor drive to the pump mechanism. It also moves the carriage to the home position where the lever is set to the specified position.

1. Sets the D/E lever (moves the carriage to the **D/E lever** set start position).
2. **Performs** the PF system compensation.
3. **Pauses** the printer (waits for the D/E gear to move).
4. **Releases** the pressure to the D/E holder.
5. **Moves** the carriage to the home position.

### 2.4.1.14 Disengage OFF Operation

This operation resets the switch lever to the position where it transmits the PF motor drive to the pump mechanism. It also moves the **carriage** to the flushing position where the lever is reset to the specified position.

1. **Performs** the pump system compensation.
2. **Pauses** the printer.
3. Resets the D/E lever and **D/E gear**.
4. Moves the carriage to the home position.

### 2.4.1.15 Micro Absorbing Operation

When the cartridge is removed, it is possible for a small amount of air to form small air bubbles that can block the ink from the nozzle. This operation eliminates small air bubbles from the cavity of the printhead.

1. Performs the fail absorbing operation.
2. Performs the micro absorbing operation.

### 2.4.1.16 Carriage Lock Set

This operation prevents the carriage from moving out of the home position if the printer is turned off or is paused. This operation is performed when the carriage is in the ink system home position and no paper is loaded.

1. Sets the carriage lock.

### 2.4.1.17 Carriage Lock Reset

This operation resets the carriage lock lever.

1. Resets the carriage lock.

### 2.4.1.18 Refresh Operation (Performed when loading or ejecting paper)

This operation prevents an increase in the viscosity of the ink inside the black head surface when paper is being loaded or ejected. When the blackhead is just on the color cap as paper is loaded or ejected, performs the flushing operation at the blackhead only.

### 2.4.1.19 Adjust Lever Operate Position Moving Sequence

This operation is performed when the **Att** and **Font** buttons are pressed simultaneously while the printer is paused.

1. Releases the carriage lock. (If paper is loaded, this operation is invalid.)
2. Moves the carriage to the adjust lever operate position.
3. Puts the printer in pause mode. (When the **Att** button is pressed or if 60 seconds elapses, the carriage returns to the home position automatically.)
4. Moves the carriage to the flushing position and performs the flushing operation.
5. Moves the carriage to the home position. (If the paper is not in the printer, sets the carriage lock-)

## 2.4.2 Timer and Counter

EEPROM LE93C46 (IC12) on the main board stores certain counter and timer values that are used for controlling the ink system operation.

### 2.4.2.1 Refresh Timer (Monochrome and CMY Head)

This timer prevents an increase in viscosity of the ink inside the nozzle. It counts every 2 seconds during the printing operation. This timer has both the **Rf1** (Black head= every 2 seconds) and **Rf2** (color head = every 7 seconds).

It resets when:

- **Rf1**: When the blackhead flushing operation is performed.
- **Rf2**: When the color head flushing operation is performed.

#### 2.4.2.2 Timer (Monochrome and CMY Head)

This timer eliminates an increase in the viscosity of the ink inside the **printhead nozzles** or **eliminates** the air bubbles that can block the cavity of the **printhead**. This timer confirms the time up from the EEPROM when the printer is turned on. (Time Up Interval: 10 days.)

The time up values areas follows:

- Monochrome:    15 hours  
                      40 hours  
                      65 hours
  
- Color:            40 hours  
                      85 hours  
                      135 hours

It resets when:

- When the black ink absorbing operation (black head) is performed.
- When the color ink absorbing operation (color head) is performed.

#### 2.4.2.3 Flushing Counter (Black, CMY Head)

This timer counts how long the caps open continuously to prevent dryness inside the caps.

This timer starts or stops (resets) when:

- **start:**        Caps are opened.
- **stop:**        The pause state is completed.

#### 2.4.2.4 Fail Absorbing Timer (Black, CMY Head)

This timer absorbs the stained ink inside the caps periodically and it calculates the accumulation time. This timer starts or stops (resets) when:

- **start:**        Printing is started.
- **stop:**        The printer is in the pause state.

Also this timer resets when the fail absorbing operation is performed.

#### 2.4.2.5 Ink Level Counter R (On the RAM) (Monochrome= Rb, CMY = Ry)

This counter indicates the amount of ink that exists in the cap, in proportion to the number of flushing operations. When the counter value of the black head exceeds or equals 12000 and when the counter value of the color head exceeds or equals 17000, the fail absorbing operation is performed.

- The counter Rb counts when the black head performs the flushing operation to the **mono-chrome** cap.
- The counter Ry counts when the color head performs the flushing operation to the **CMY** cap.

Also this timer resets when the fail absorbing operation is performed.

2.4.2.6 CL Counter K (Monochrome = Kb, CMY = Ky)

This counter selects the cleaning mode according to the value of the CL counter K and the CL2 counter KK. The CL counter K counts when the cleaning operation is performed and it resets where

- The printer power turns m.
- The cleaning operation is performed.
- The ink cartridge is replaced.

2.4.2.7 CL2 Counter KK (Monochrome = KKb, CMY = KKy)

This counter controls the order of the cleaning mode selection to the following:

CL1 - CL2 - CL2—repeat.

2.4.2.8 Protect Counter

The protect counter A or Ink amount counter R is stored into the EEPROM on the main board, and while the printer is on, this data is stored into the RAM on the main board.

- Protect counter A This counter is used to manage the total amount of drained ink. If the counter value is equal to or exceeds M, the printer indicates the error on the control panel and maintenance is required. This counter is counted by the following every each sequences. ( ) means only the color head, and 1 point= 0.025cc.)

1. Power On		
(Micro):	40step x 6(5)	: 2 point
	40 step x 10(9)	:3 point
	40 step X 15(12)	: 5(4) point
2. CL 1:	3600 (4800) step	: 16(20) point
	40 step x 12 absorption	: 4 point
3. CL 2:	720 step	: 4 point
	7800 (8200) step	: 40 point
	40 step x 12	: 4 point
4. CL 3:	40 step x 12	: 4 point
5. I/C Replacement:	8900 (14000) Step	: 48(72) point
	8900 (8800) step	: 48(44) point
	40 step x 12	: 4 point
6. Fixed time		
Fail Absorption:	Monochrome and CMY = 2	
7. Power On		
(Normal):	3600 (4800) step	: 16(20) point
	40 step x 12	: 4 point

Also the protect counter A resets when:

1. The printer is at the default forwarding.
2. After the maintenance is performed (when the ink drain tank is replaced).

- Ink Amount Counter R This counter monitors the amount of ink inside the caps, selects the absorbing operation mode when the power is turned on, performs the refresh operation, and standby operation.

# Chapter3 Disassembly and Assembly

## Table of Contents

<b>3.1 OVERVIEW</b>	<b>3-1</b>
3.1.1 Precautions for Disassembling the Printer. . . . .	3-1
<b>3.2 DISASSEMBLY AND ASSEMBLY</b>	<b>3-2</b>
3.2.1 Upper Case Removal . . . . .	3-3
3.2.2 Power Supply Unit (C137 PSB/PSE Board) Removal. . . . .	3-4
3.2.3 Main Controller (C137 MAIN Board) Removal. . . . .	3-5
3.2.4 Printer Mechanism (NP4A10) Removal . . . . .	3-7
3.2.5 Printer Mechanism Disassembly. . . . .	3-8
3.2.5.1 Printhead Unit Removal . . . . .	3-8
3.2.5.2 Carriage Unit Removal . . . . .	3-10
3.2.5.3 Pump Unit Removal . . . . .	3-11
3.2.5.4 Cleaner Head Replacement . . . . .	3-12
3.2.5.5 CR Motor Removal . . . . .	3-13
3.2.5.6 PF Motor Removal . . . . .	3-13
3.2.5.7 Carriage Home Position Sensor Removal. . . . .	3-14
3.2.5.8 PE Sensor Removal . . . . .	3-14
3.2.5.9 Paper Feed Roller Assembly Removal. . . . .	3-15
3.2.5.10 Upper Frame Removal . . . . .	3-16

## List of Figures

Figure 3-1. Disassembly Flowchart . . . . .	3-2
Figure 3-2. C137 PNL Control Panel Removal . . . . .	3-3
<b>Figure 3-3. Upper Case Removal.</b> . . . . .	<b>3-3</b>
<b>Figure 3-4. Power Supply Unit Removal.</b> . . . . .	<b>3-4</b>
Figure 3-5. Shield Plate Removal. . . . .	3-5
Figure 3-6. Main Controller Removal . . . . .	3-6
Figure 3-7. Printer Mechanism (M-4A10) Removal . . . . .	3-7
Figure 3-8. Black or Color Head Removal . . . . .	3-9
Figure 3-9. Head Spacer Position. . . . .	3-9
Figure 3-10. Front Frame Removal . . . . .	3-10
Figure 3-11. Carriage Unit Removal. . . . .	3-10
Figure 3-12. Pump Unit Removal. . . . .	3-11
Figure 3-13. Cleaner Head Replacement. . . . .	3-12
Figure 3-14. CR Motor Removal. . . . .	3-13
Figure 3-15. PF <b>Motor Removal.</b> . . . . .	<b>3-13</b>
<b>Figure 3-16. Carriage Home Position Sensor Removal</b> . . . . .	<b>3-14</b>
Figure 3-17. PE Sensor Removal. . . . .	3-15
Figure 3-18. Tension Roller Assembly Removal. . . . .	3-15
Figure 3-19. Paper Feed Roller Assembly Removal. . . . .	3-14
Figure 3-20. Upper Frame Removal. . . . .	3-16

## 3.1 OVERVIEW

This section describes the procedures for disassembling the main components of this printer. Unless otherwise specified, the disassembled unit or components can be reassembled by reversing the disassembly procedure. Therefore no assembly procedures are included. Precautions for any disassembly or assembly procedure are described under the heading "Disassembly/Assembly Points." Adjustments required after assembling the unit are described under the heading "Required Adjustments."

### 3.1.1 Precautions for Disassembling the Printer

See the precautions below when disassembling the printer.

#### **WARNING**

- **Disconnect the power cable before disassembling or assembling the printer.**
- **Wear protective goggles to protect your eyes from ink. If ink gets in your eye, flush your eye with fresh water and see a doctor immediately.**  
**If ink comes into contact with your skin, wash it off with soap and water. If irritation occurs, contact a physician.**
- **A lithium battery is installed on the C137 MAIN board of this printer. Be sure to observe the following instructions when servicing the battery:**
  1. **Keep the battery away from any metal or other batteries so that electrodes of opposite polarity do not come in contact with each other.**
  2. **Do not heat the battery or put it near fire.**
  3. **Do not solder on any part of the battery. (Doing so may result in leakage of electrolyte from the battery, burning, or explosion. The leakage may affect other devices close to the battery.)**
  4. **Do not change the battery. (An explosive gas may be generated inside the battery, and cause burning or explosion.)**
  5. **Do not dismantle the battery. (The gas inside the battery may hurt your throat. Leakage, burning, or explosion may also result.)**
  6. **Do not install the battery in the wrong direction. (This may cause burning or explosion.)**

#### **CAUTION**

- **Never remove the ink cartridge from the carriage unless specified to do so.**
- **When transporting the printer after installing the ink cartridge, be sure to pack the printer for transportation without removing the ink cartridge.**
- **Use only recommended tools for disassembling, assembling, or adjusting the printer.**
- **Apply lubricants and adhesives as specified. (See Chapter 6.)**
- **Make specified adjustments when you disassemble the printer. (See Chapter 4.)**
- **There is a danger of explosion if the battery is not replaced correctly. Replace only with the same or equivalent type recommended by the manufacturer. Dispose of used batteries according to laws and regulations.**



## 3.2 DISASSEMBLY AND ASSEMBLY

### WARNING

Follow the precautions in Section 3.1.1 when disassembling the printer.

This section consists of the subheads shown in the diagram below. See the exploded view of the printer in the Appendix, if necessary.

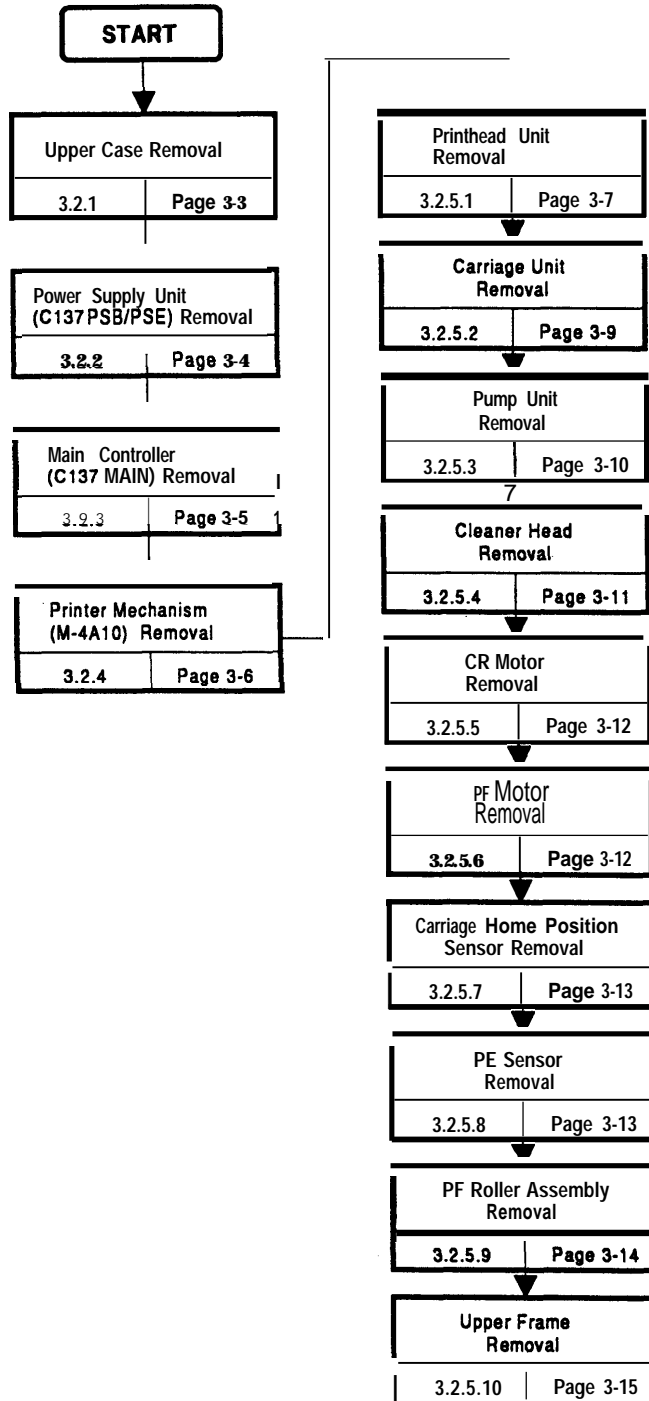
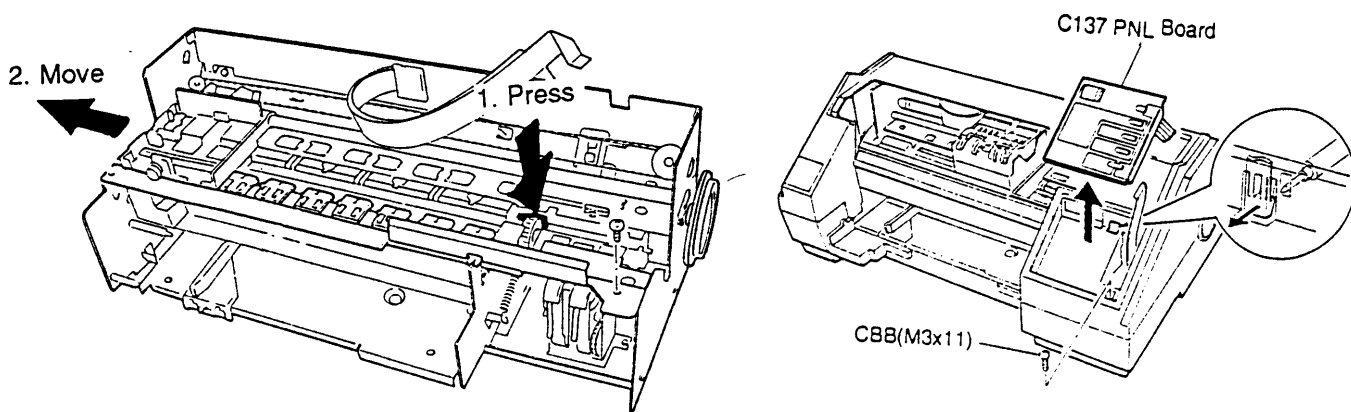


Figure 3-1. Disassembly Flowchart

### 3.2.1 Upper Case Removal

1. Remove the printer cover by releasing the 2 tabs holding it to the upper case.
2. Remove the paper support by releasing the 2 tabs holding it to the lower case.
3. Remove the paper guide by releasing the 2 tabs holding it to the printer mechanism, and move the carriage to the center while you pressing the carriage lock lever.
4. Remove the control panel. (Release the tab by inserting a screwdriver into the hole in the upper case, as shown in the figure below.) At this time, disconnect the connector on the C137 PNL board.

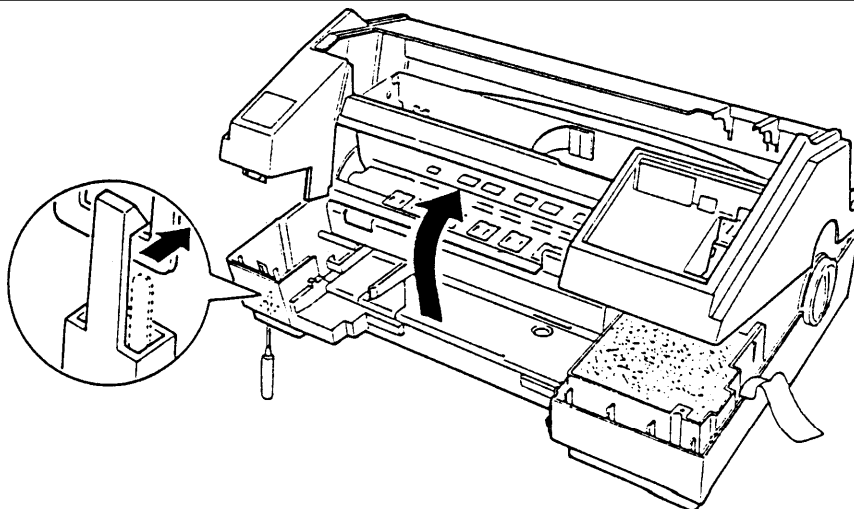


**Figure 3-2. C137 PNL Control Panel Removal**

5. Remove the CBB (M3x11) screw securing the uppercase to the lower case.
6. Release 1 tab by inserting a flathead screwdriver into the holes at the bottom of the lower case, as shown in the figure below.
7. Remove the uppercase by lifting the front side.

#### **DISASSEMBLY/ASSEMBLY POINT**

*Hold the upper case firmly and pull it to remove it, while you release the tabs.*



**Figure 3-3. Upper Case Removal**

### 3.2.2 Power Supply Unit (C137 PSB/PSE Board) Removal

1. Remove the uppercase. (See Section 3.2.1.)
2. Disconnect the cables from connectors CN1 on the C137 PSB/PSE board and CN5 on the C137 MAIN board.
3. Remove the 2 CBN (M3×8) screws securing the shield plate to the lower case via the C137 PSB/PSE board.
4. Remove the 3 CBB (M3×12) screws securing the C137 PSB/PSE board to the lower case and remove a CBN (0) (M3×6) screw fixing the earth line from the AC cable to the earth plate.
5. Push in the locking tab and take out the power supply unit by sliding it toward the back of the printer.

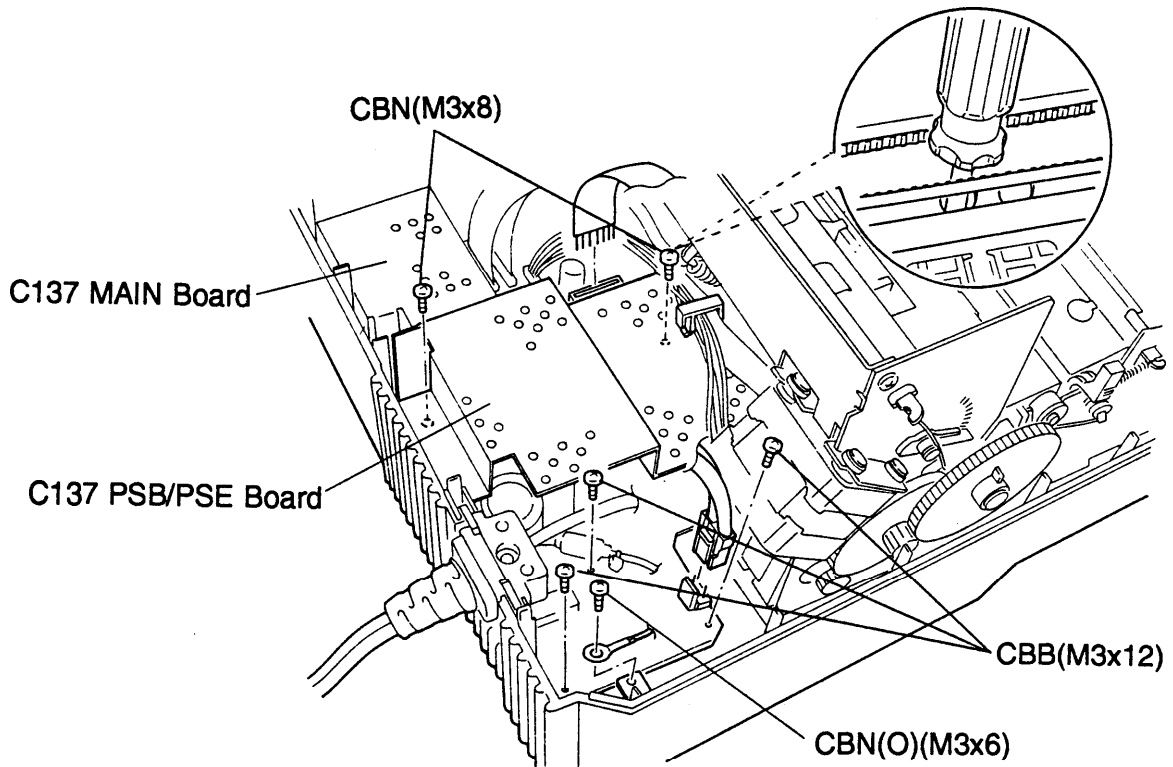


Figure 3-4. Power Supply Unit Removal

### 3.2.3 Main Controller (C137 MAIN Board) Removal

1. Remove the uppercase. (See Section 3.2.1.)
2. Remove the grounding plate from the shield plate.
3. Remove the 4 CBB(M3x12) screws securing the shield plate to the lower case.
4. Remove the 2 CBB (M3x12) screws securing the Type-B interface cover to the lower case.

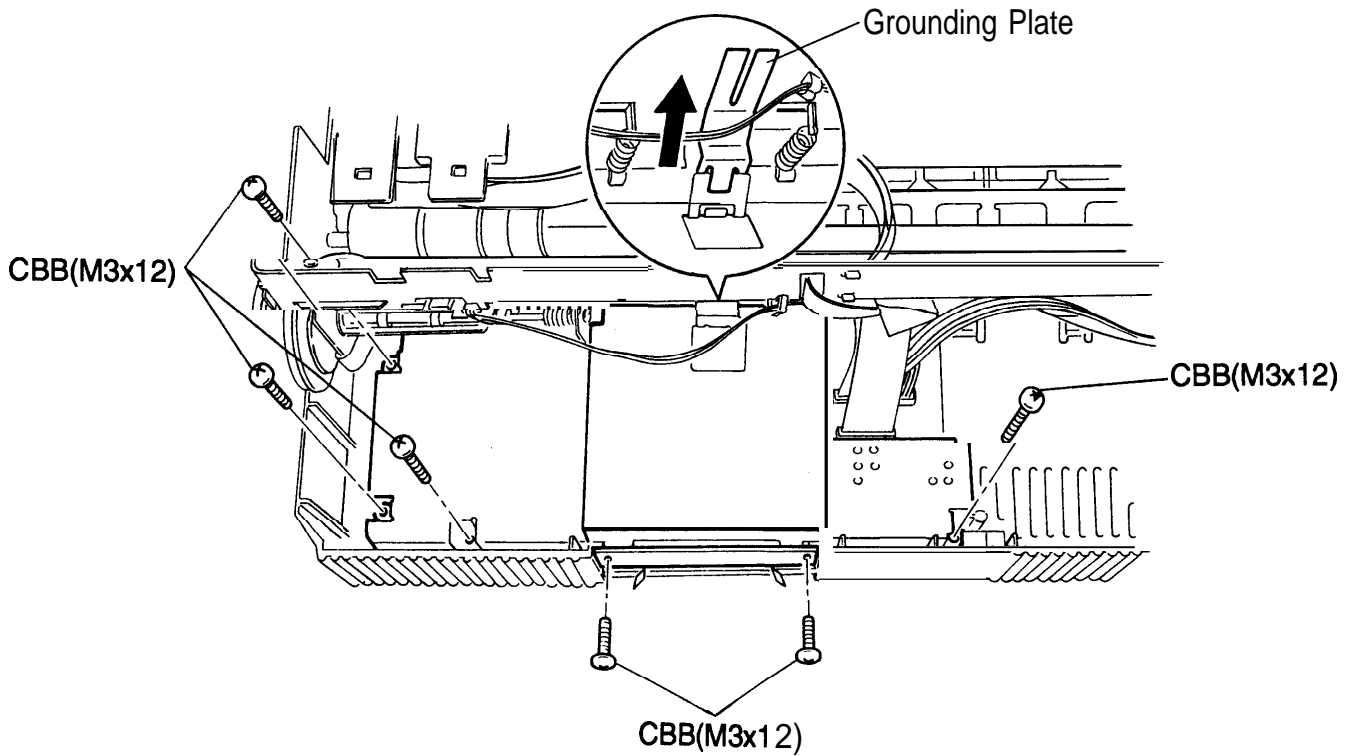


Figure 3-5. Shield Plate Removal



5. Disconnect the cables from the connectors CN5, CN6, CN7, CN8, CN9, CN10, CN11, and CN12 of the C137 MAIN board.

### ASSEMBLY POINT

- When you replace the main board, initialize the EEPROM contents as follows;
  - 1) Reassemble the printer.
  - 2) Turn the printer ON while hold down [Alt], [Font], [Load/Eject] and [Pause] buttons on the control panel.
- It is possible to disconnect the cables. When reconnecting the cables from the connectors CN6, CN7 and connectors CN11, CN12 of the C137 MAIN board, see the following instructions.
  1. CN11 : Printhead FFC cable (white color mark)
  - CN12 : Printhead FFC cable (blue color mark)
  2. CN6 : Carriage motor cable (red color mark : Also the red color indicates the 1-pin of the CN6.)
  - CN7 : Paperfeed motor cable (black color mark : Also the black color indicates the 1-pin of the CN7.)

6. Remove the 4 CBB (M3x12) screws securing the main controller to the lower case and then remove the C137 MAIN board.

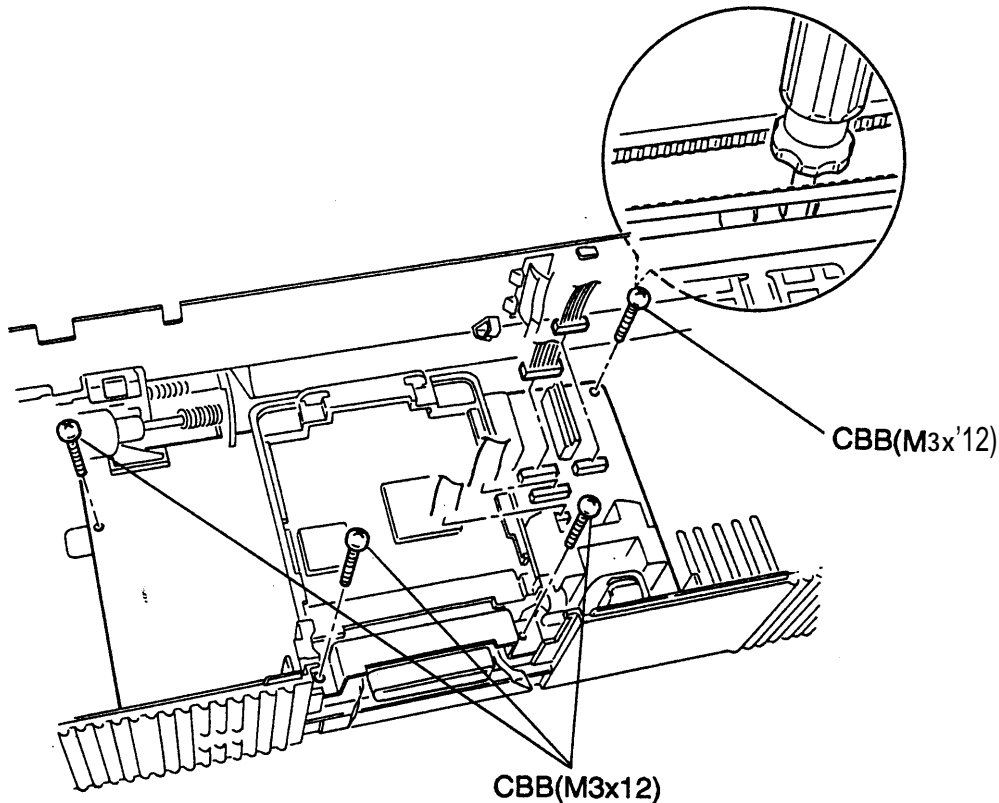


Figure 3-6. Main Controller Removal

### REQUIRED ADJUSTMENT

- When replacing the main controller board, adjust both the head gap and the Bi-D adjustment alignment, and input the destination parameter into the EEPROM on the C137 MAIN Board. (See Chapter 4.)
- When you replace the main board, the parameters in the internal timer are all reset. Therefore, it is possible that printing becomes abnormally. At this time, perform the cleaning operation by the control panel on command (Refer to Chapter 4) until the printing becomes normally.

### 3.2.4 Printer Mechanism (M-4A10) Removal

1. Remove the uppercase. (See section 3.2.1.)
2. Remove the power supply unit. (See section 3.2.2.)
3. Remove the main controller. (See section 3.2.3.)
4. Remove the 4 CBN (M4x13) screws and take out the printer mechanism.

#### DISASSEMBLY/ASSEMBLY POINT

- Wipe off any ink around the end of the ink drain tube when you remove the printer mechanism.
- When reinstalling the printer mechanism, check that the waste ink drain tube is properly inserted between the lower case and the waste ink absorbing material.

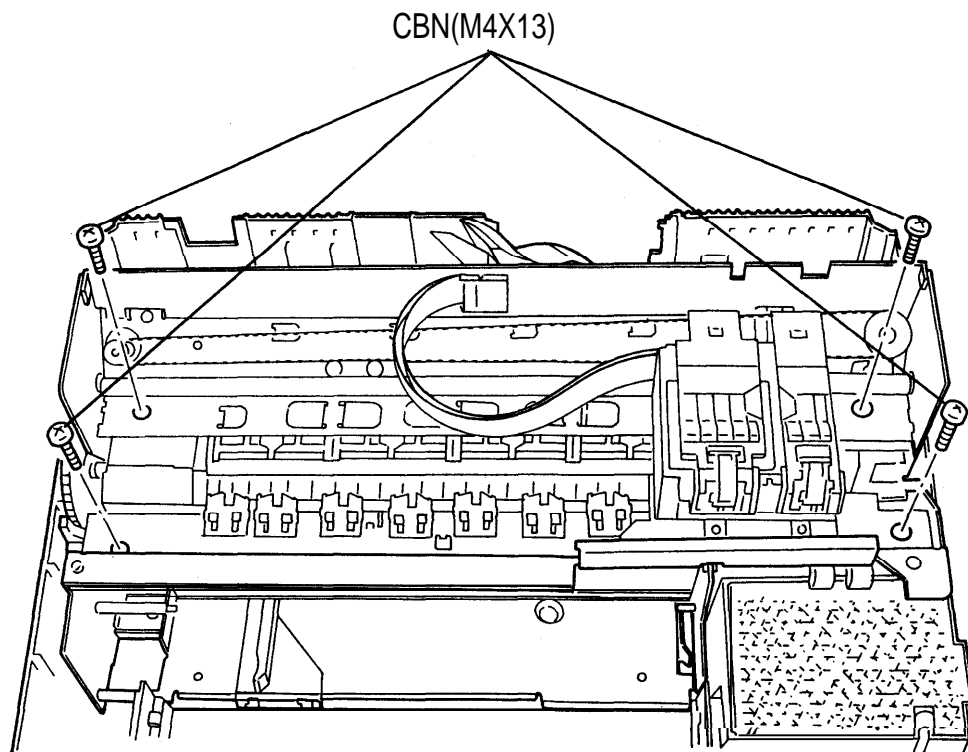


Figure 3-7. Printer Mechanism (M-4A10) Removal

#### CAUTION

- When the printhead or the printer mechanism is replaced, the block resistor must be replaced at location RM11 and RM12 on the C137 MAIN board. (Every spare printhead or spare printer mechanism comes with a block resistor that is specially selected for each printhead.)
- Adjust both the head gap and the Bi-D alignment when replacing the printer mechanism.

### 3.2.5 Printer Mechanism Disassembly

The procedures described in this section explain how to remove the components within the printer mechanism.

#### 3.2.5.1 Printhead Unit Removal

1. Remove the printer mechanism. (See section 3.2.4.)
2. Move the carriage to the middle of the printer while pressing the **hook that fixes the carriage unit to the home position**.
3. Pull the ink cartridge **clamp** toward you and remove the ink cartridge.

#### **CAUTION**

- When removing the ink cartridge, always install a new cartridge immediately after removing the old one.
- When the ink cartridge is replaced, the printer performs the ink cartridge replacement operation automatically.  
Exclusive cartridge is as follows; Monochrome: 1020626  
YMC: 1020627
- Ink cartridges should never be kept longer than 6 months.

4. Remove the 4 CBB (P) (M3×11) screws securing the ink cartridge holder to the carriage base, and then lift the ink cartridge holder out of the carriage base.
5. Pull the black or color head toward you and disconnect the head FFC cable on the head driver board (nozzle selector). Then remove the black or color head.

#### **CAUTION**

- Take a proper measurement to protect the printhead unit from static electricity, since the driver IC is directly attached to the printhead unit.
- Never touch the metallic nozzle surface cover of the printhead. Handle it only by holding the edges of the printhead.
- When the printhead or the printer mechanism is replaced, the block resistor must be replaced at location RM11 and RM12 on the C137 MAIN Board. (Every spare printhead or spare printer mechanism comes with a block resistor that is specifically selected for each printhead.)

#### **REQUIRED ADJUSTMENT**

- When removing or changing the black head, the following adjustments are needed.
  1. Black head angle adjustment (See section 4.1.4)
  2. Black - Color head vertical adjustment (See section 4.1.5)
  3. Head gap adjustment (See section 4.1.3)
  4. Bi-D alignment adjustment (See section 4.1.2)
- When removing or changing the color head, the following adjustments are needed.
  1. Color head angle adjustment (See section 4.1.6)
  2. Black - Color head vertical adjustment (See section 4.1.5)
  3. Head gap adjustment (See section 4.1.3)
  4. Bi-D alignment adjustment (See section 4.1.2)
- When removing or changing both heads, the following adjustments are needed.
  1. Color head angle adjustment (See section 4.1.6)
  2. Black head angle adjustment (See section 4.1.4)
  3. Black - Color head vertical adjustment (See section 4.1.5)
  4. Head gap adjustment (See section 4.1.3)
  5. Bi-D alignment adjustment (See section 4.1.2)

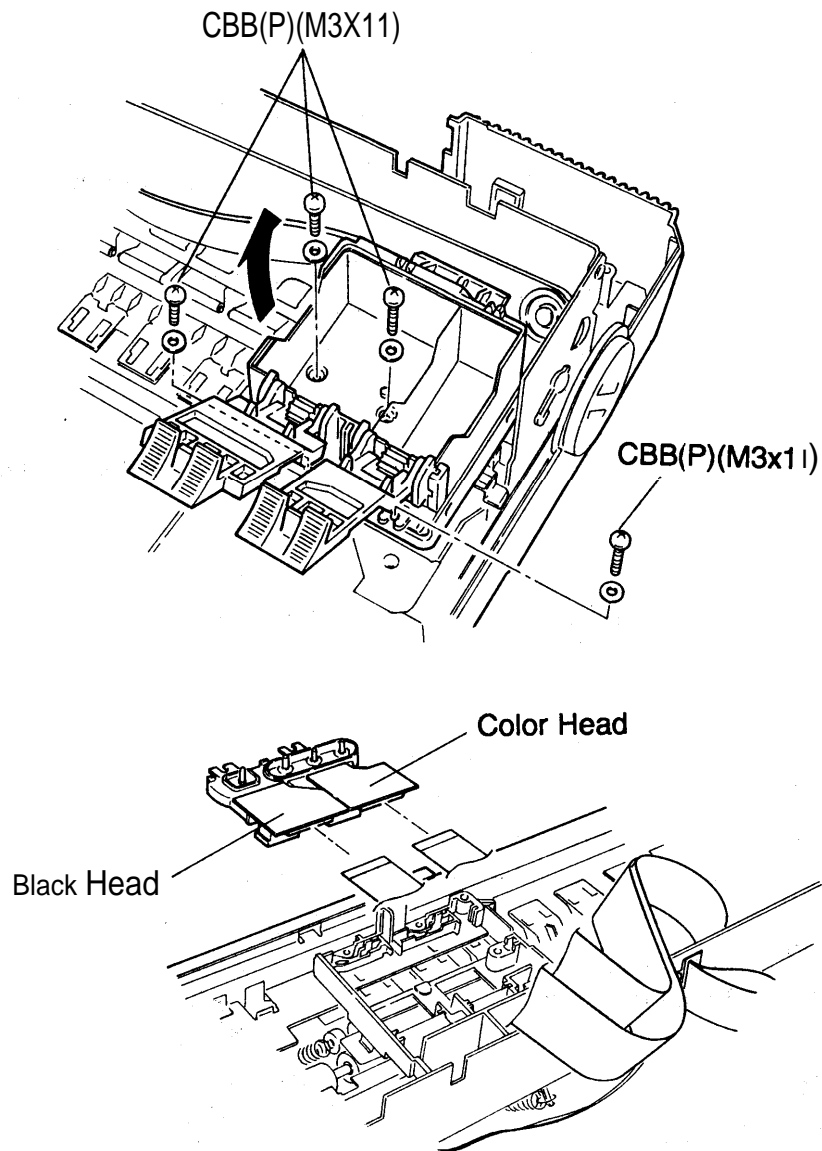


Figure 3-8. Black or Color Head Removal

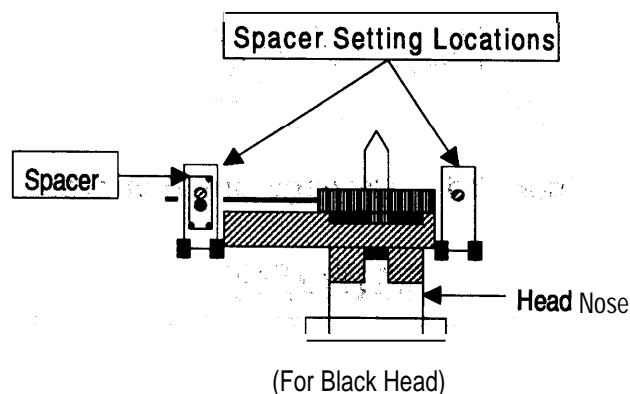


Figure 3-9. Head Spacer Position

**WARNING**

■ When removing the color or black head, do not lose the spacer that is fixed to each head. This spacer modifies the angle error that occurs during manufacturing. Also, this spacer is different from the linear spacer or angular spacer. (See Chapter 4.)



### 3.2.5.2 Carriage Unit Removal

1. Remove the printer mechanism. (See section 3.2.4.)
2. Move the carriage to the left side of the printer while pressing the hook that fixes the carriage to the home position.
3. Remove the 2 CBN (0) (M3x6) screws securing the front frame to both side frames.

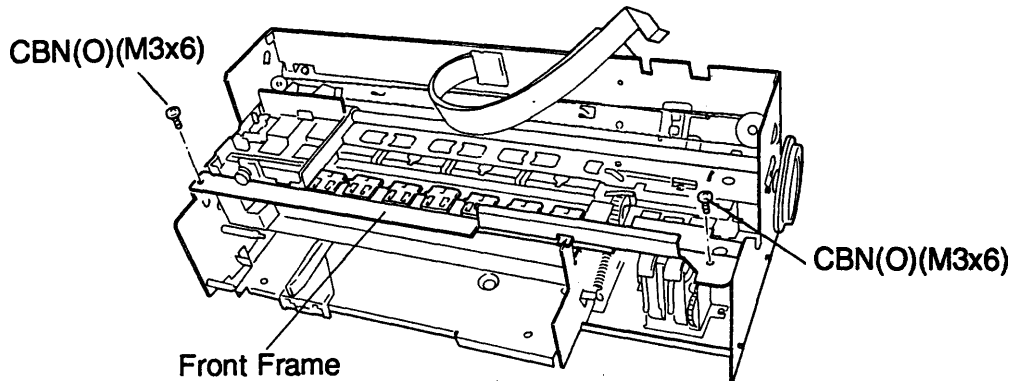


Figure 3-10. Front Frame Removal

4. Remove the cartridge holder with ink cartridge from the carriage unit. (See section 3.2.5.1.)
5. Release the carriage timing belt from the belt pulley while pressing the pulley lever.
6. Remove the grounding wire from the side frame (L).
7. Remove the 2 parallelism adjust bushings from both side frames.
8. Lift the carriage unit with the carriage guide shaft out of the printer mechanism.

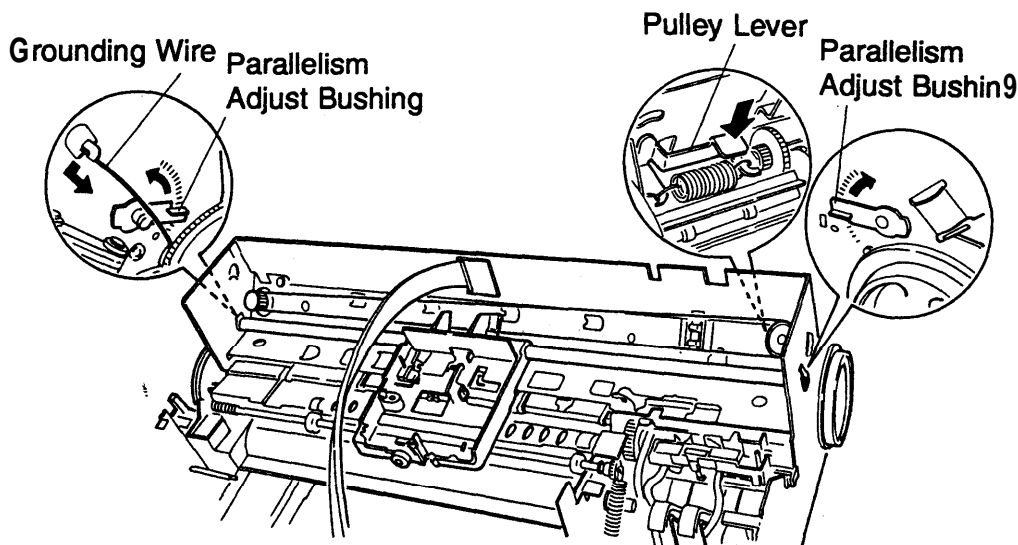


Figure 3-11. Carriage Unit Removal

### CAUTION

- Take a proper measurement to protect the printhead unit from static electricity, since the driver IC is directly attached to the printhead unit.
- Never touch the metallic nozzle surface cover of the printhead. Handle it only by holding the edges of the printhead.
- When the printhead or the printer mechanism is replaced, the block resistor must be replaced at location RM11 and RM12 on the C137 MAIN Board.

### ADJUSTMENT REQUIRED

- Platen gap adjustment (See Chapter 4.)

### 3.2.5.3 Pump Unit Removal

1. Remove the printer mechanism. (See section 3.2.4.)
2. Remove **the carriage unit.** (See **section 3.2.5.2.**)
3. Remove the CBN (M3x5) screw securing the pump unit to the bottom frame.
4. Push the pump unit outward while releasing the tab at the bottom side of the pump unit, and then lift up the pump unit.

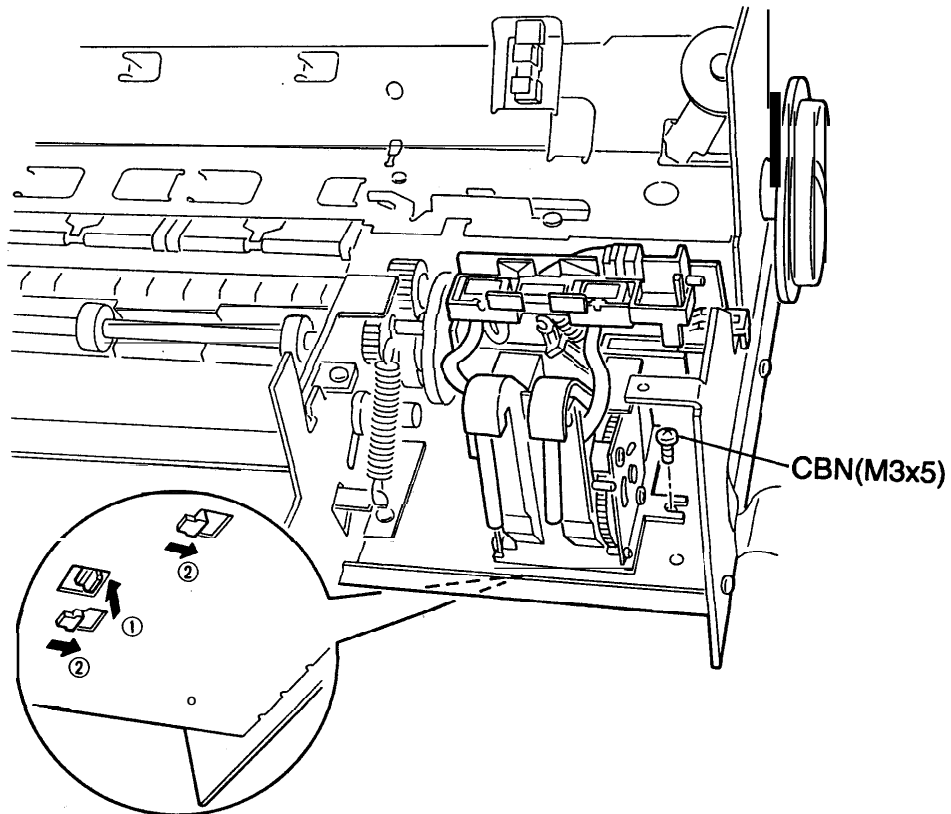


Figure 3-12. Pump Unit Removal

### 3.2.5.4 Cleaner Head Replacement

1. Remove the printer mechanism. (See section 3.2.4.)
2. Use tweezers to unhook the **cleaner head** from **the hook** on the cleaning roller.

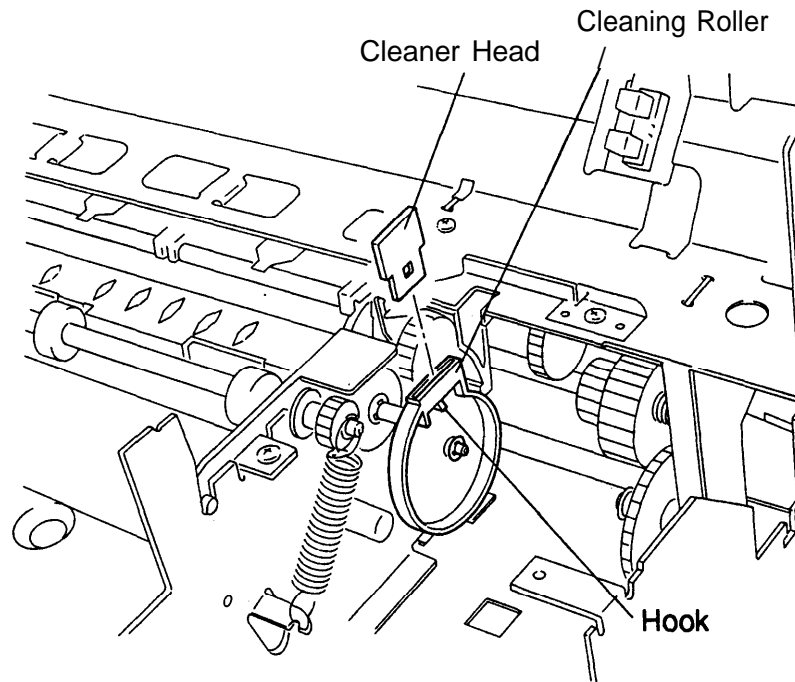


Figure 3-13. Cleaner Head Replacement

#### **CAUTION**

**Keeping the cleaner head clean is extremely important to keep the ink injection system working properly in the printhead, and it directly affects printing quality.**

Therefore, handle the cleaner head very carefully, and **observe the following precautions.**

- Never touch the cleaner head with your bare hands.
- When attaching the cleaner head to the pump unit, wear gloves and use clean tweezers to handle it.

### 3.2.5.5 CR Motor Removal

1. Remove the printer mechanism. (See section 3.2.4.)
2. Release the timing belt. (See section 3.2.5.2.)
3. Remove the 3 screws securing the CR motor to the upper frame, and then remove the CR motor.

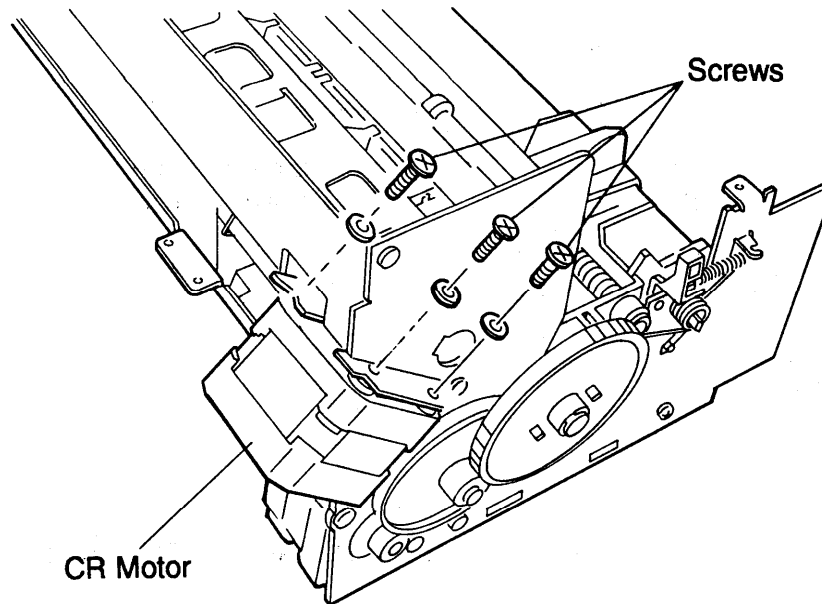


Figure 3-14. CR Motor Removal

### 3.2.5.6 PF Motor Removal

1. Remove the printer mechanism. (See section 3.2.4.)
2. Remove the 2 CBN (M3x6) screws and then remove the PF motor.

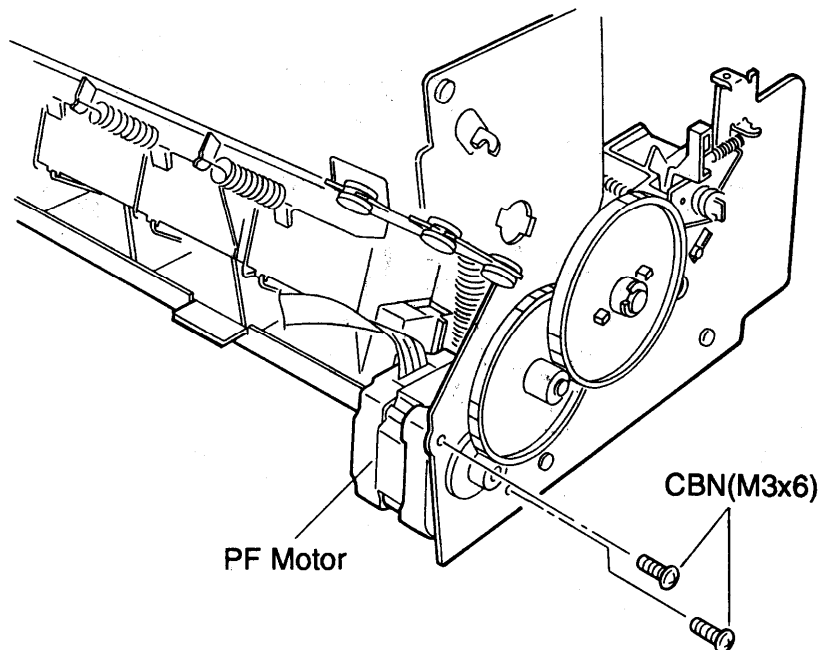
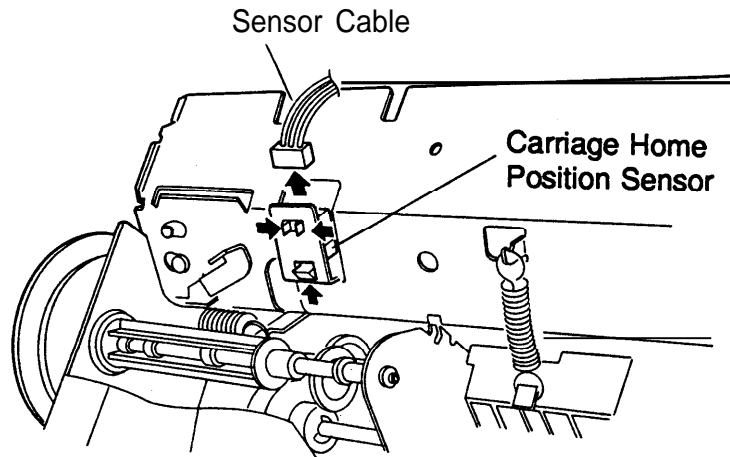


Figure 3-15. PF Motor Removal

### 3.2.5.7 Carriage Home Position Sensor Removal

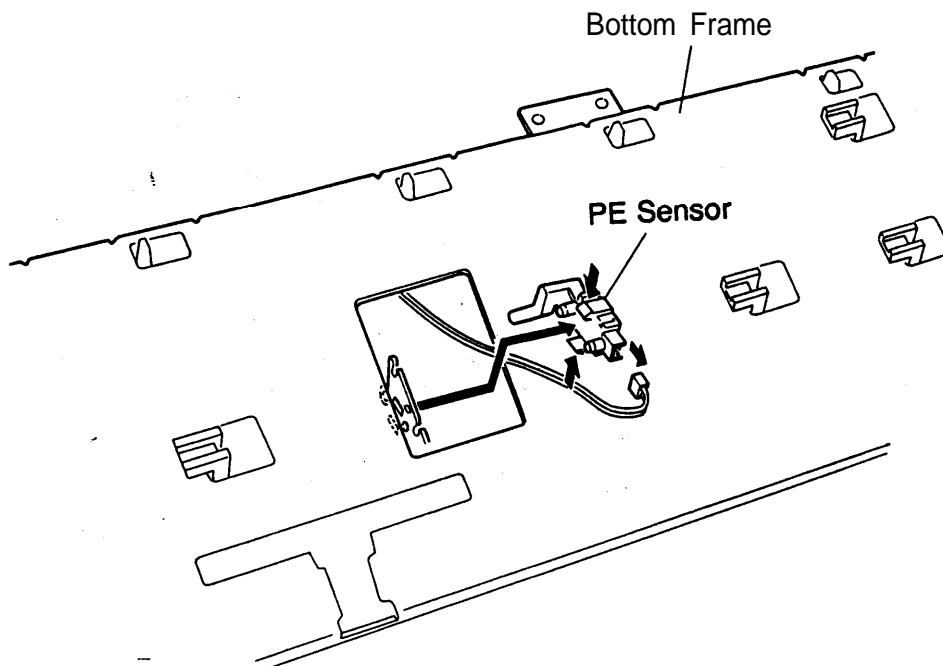
1. Remove **the printer mechanism**. (See section 3.2.4.)
2. **Disconnect** the sensor cable from the **carriage** home position sensor.
3. Unhook the 3 notches securing the carriage home position sensor to the upper frame. Then remove the carriage home position sensor.



**Figure 3-16. Carriage Home Position Sensor Removal**

### 3.2.5.8 PE Sensor Removal

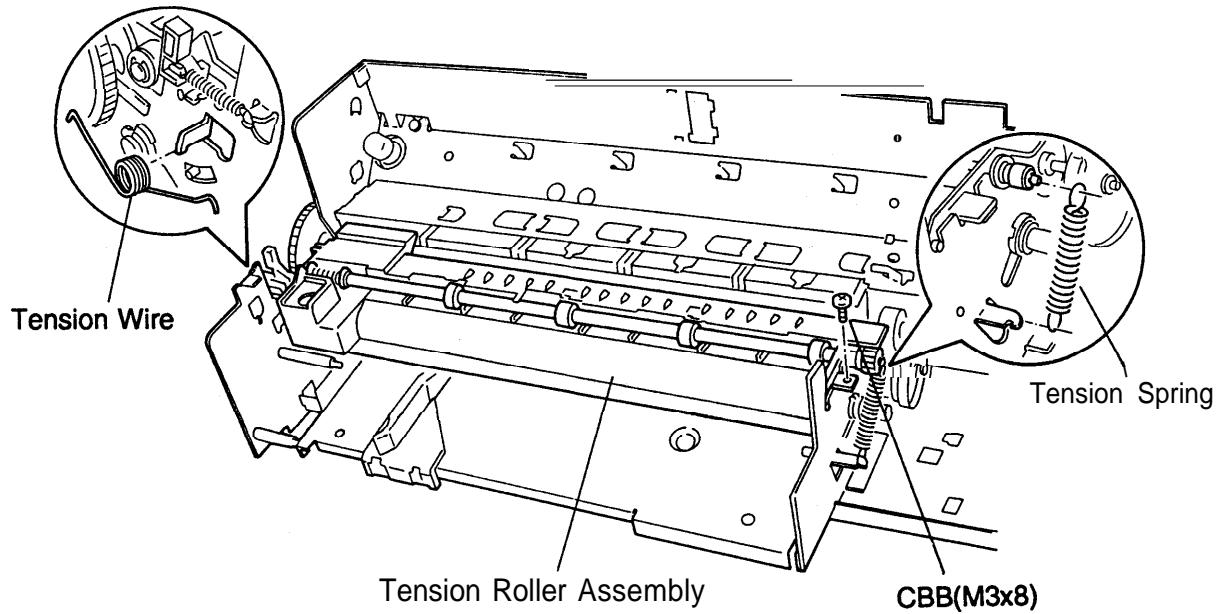
1. Remove **the printer mechanism**. (See section 3.2.4.)
2. Disconnect the connector **from** the PE sensor.
3. Rotate the printer mechanism upside down; use tweezers to release the 2 hooks securing the PE sensor to the paper feed roller assembly; then remove the PE sensor.



**Figure 3-17. PE Sensor Removal**

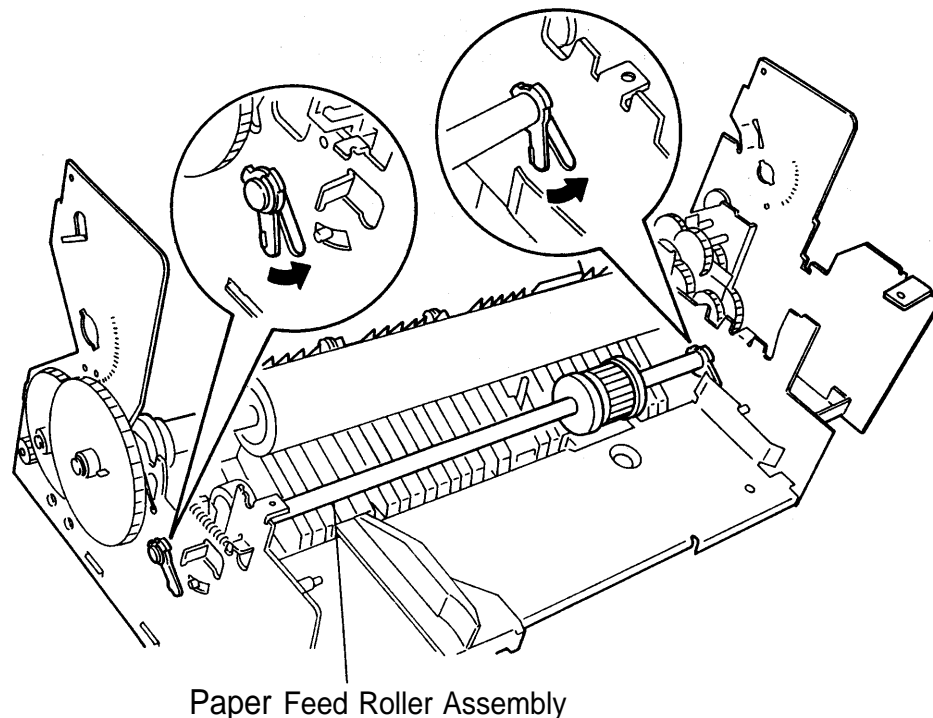
### 3.2.5.9 Paper Feed Roller Assembly Removal

1. Remove the printer mechanism. (See section 3.2.4.)
2. Remove the carriage unit. (See section 3.2.5.2.)
3. Remove the pump unit. (See section 3.2.5.3.)
4. Remove the tension spring holding the tension roller assembly to the sub frame.
5. Remove the tension wire on the side frame (L) holding the tension roller assembly to the side frame (L).
6. Remove a CBB (M3x8) screw securing the tension roller assembly to the sub frame and remove the tension roller assembly.



**Figure 3=18. Tension Roller Assembly Removal**

7. Release the 2 bushings securing the paper feed roller assembly to both the side frame(L) and the sub frame. Then remove the paper feed roller assembly.



**Figure 3-19. Paper Feed Roller Assembly Removal**

### 3.2.5.10 Upper Frame Removal

1. Remove the printer mechanism. (See section 3.2.4.)
2. Remove the carriage unit. (See section 3.23.2.)
3. Remove the E-ring securing the knob shaft to the sub frame; then remove the knob with the knob shaft from the side frame (R).
4. Remove the 5 CBN (M3x5) screws securing the upper frame to both side frames or the sub frame. Then remove the upper frame with 4 PF support rollers.

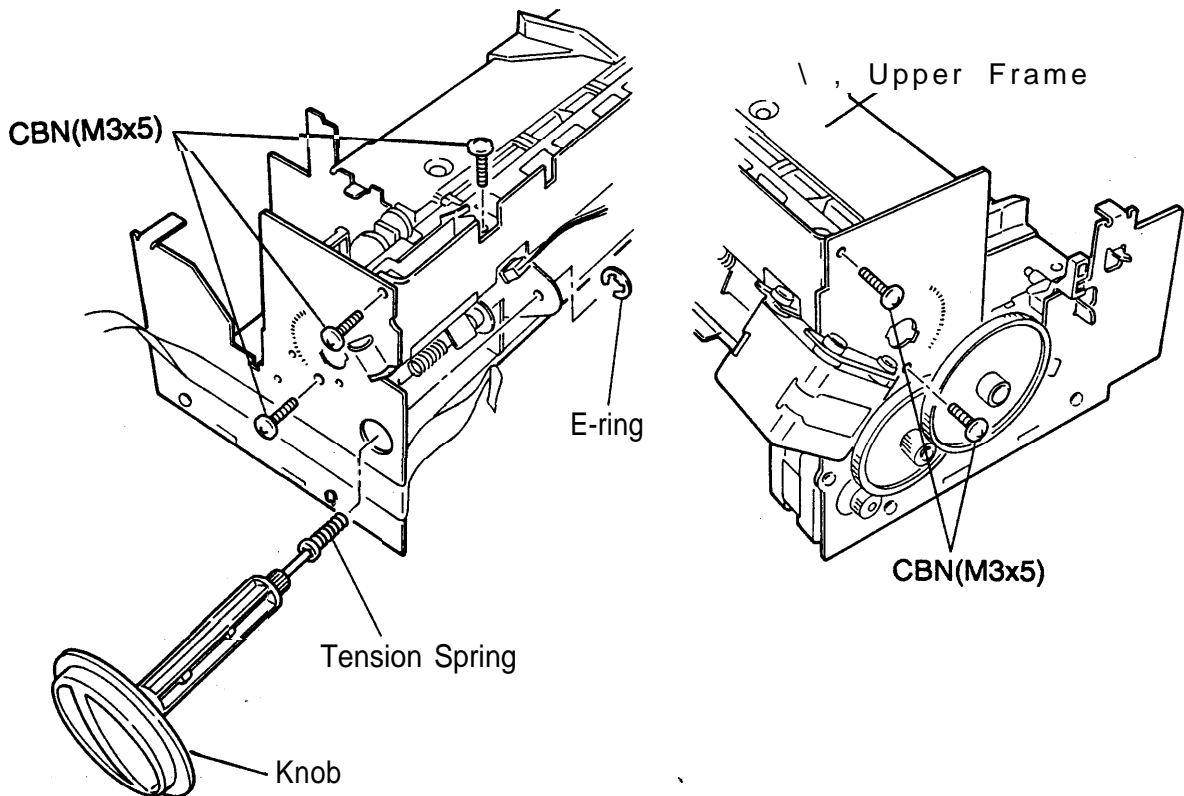


Figure 3-20. Upper Frame Removal

# Chapter 4 Adjustments

## Table of Contents

4.1 OVERVIEW	4-1
4.1.1 Destination Data Writing Operation	4-2
4.1.2 Bi-D (Bidirectional Printing) Alignment Adjustment	4-3
4.1.3 Head Gap Adjustment (Black and Color head)	4-4
4.1.4 Black Head Angle Adjustment	4-5
4.1.5 Black - Color Head Vertical Adjustment.	4-9
4.1.6 Color Head Angle Adjustment	4-12
4.1.7 Platen Gap Adjustment	4-16
4.1.8 Internal Timer Reset Operation	4-17

## List of Figures

Figure 4-1. Head Gap Adjustment Sample.	4-4
Figure 4-2. B-Head Angle and Linear, Angular Spacer.	4-5
Figure 4-3. Spacer Kinds & Relation of Shape and Thickness.	4-5
Figure 4-4. Black Head Angle Adjustment Sample.	4-6
Figure 4-5. Spacer Selection.	4-6
Figure 4-6. Removing the Rubber Cap.	4-7
Figure 4-7. Spacer Angular Replacement Method	4-8
Figure 4-8. Black-ColorHead Vertical Adjust Conception	4-9
Figure 4-9. Spacer Linear Selection Sample.	4-9
Figure 4-10. Removing the Rubber Cap.	4-10
Figure 4-11. Spacer Linear Replacement Method	4-11
Figure 4-12. C-Head Angle and Spacer Angular Position.	4-12
Figure 4-13. Color Head Angle Confirmation Sample.	4-12
Figure 4-14. Relation of the Shape and Thickness.	4-13
Figure 4-15. Spacer Select Judgement.	4-13
Figure 4-16. Removing the Rubber Cap.	4-14
Figure 4-17. Spacer Angular Replacement Method(YMC)	4-15
Figure 4-18. Adjusting the Paper Gap.	4-16
Figure 4-19. Confirming the Gap.	4-17

## List of Tables

Table 4-1. Required Adjustments	4-1
Table 4-2. Gap and Adjustment Direction	4-16



## 4.1 OVERVIEW

This section describes the adjustments that are required when the printer is disassembled and assembled after repair. **Since** this printer has both the black head and color head, it needs new adjustments not required for previous printers. Perform the suitable adjustments by referring to the following table.

### WARNING

- *The adjustments must be performed in the order indicated. Always follow the correct order.*
- *When performing steps 1-5, perform the cleaning operation for the black and color print heads. The cleaning operation is needed because printing the sample patterns for the head angle, Bi-D alignment, and the head gap increases the viscosity of the ink and the printer will not print the correct value. For instance if you replace the blackhead, you must do the following adjustments in the order shown:  
(1) Black head angle, (2) black-color head vertical, (3) head gap, (4) Bi-D alignment.*
- *When removing the ink cartridge, always install a new cartridge immediately after removing the old one. At this time, use the cartridges exclusively for Service (Monochrome: 1020626, CMY: 1020627).*

**Table 4-1. Required Adjustments**

Work Contents	Adjustment Contents
When replacing the M-4A10 printer mechanism	1. Bi-D alignment adjustment (See section 4.1.2) 2. Head gap adjustment (See section 4.1.3) 3. Internal timer reset operation (See section 4.1.8)
When replacing or disassembling the C137 MAIN board or printer mechanism	1. Destination data writing operation (See section 4.1.1) 2. Bi-D alignment adjustment (See section 4.1.2) 3. Head gap adjustment (See section 4.1.3)
When replacing or disassembling the black head (board)	1. Blackhead angle adjustment (See section 4.1.4) 2. Black - Color head vertical adjustment (See section 4.1.5) 3. Head gap adjustment (See section 4.1.3) 4. Bi-D alignment adjustment (See section 4.1.2)
When replacing or disassembling the color head (board)	1. Color head angle adjustment (See section 4.1.6) 2. Black - Color head vertical adjustment (See section 4.1.5) 3. Head gap adjustment (See section 4.1.3) 4. Bi-D alignment adjustment (See section 4.1.2)
When replacing or disassembling both the color and black head	1. Color head angle adjustment (See section 4.1.6) 2. Black head angle adjustment (See section 4.1.4) 3. Black - Color head vertical adjustment (See section 4.1.5) 4. Head gap adjustment (See section 4.1.3) 5. Bi-D alignment adjustment (See section 4.1.2)
When replacing or disassembling the carriage unit	1. Platen gap adjustment (See section 4.1.7)

### 4.1.1 Destination Data Writing Operation

The setup value that specifies the destination setting is stored into the **EEPROM** on the C137 MAIN board. Therefore, this setup value must be written into the **EEPROM** when the MAIN board or the **EEPROM** chip is replaced.

1. **Connect** the PC to the target printer and turn the printer on.
2. Execute BASIC on the PC and run the program "VERxxx.BAS".

1. Destination Setting
2. Head Angle Confirmation Pattern Printing  
(Head Front/Rear Vertical Position Printing)
3. Head Front/Rear Vertical Position Confirmation
4. Head Gap Adjustment
5. Bi-D Adjustment
6. Internal Timer Reset
7. END

3. When the main menu appears, choose "DestinationSetting" by entering "1" from the keyboard.
4. When you press "1" and ENTER, the main menu immediately disappears briefly and then reappears. (At this time, each parameter such as the destination, interface mode, TOF value, economy/condensed, etc. is stored into the **EEPROM**.)
5. Choose "END" by entering "7" from the keyboard. The next message appears on the display.

All parameters that you have specified so far  
are written to **EEP-ROM** upon power off.

Turn the printer OFF, Now!

6. Turn off the printer.

### 4.1.2 Bi-D (Bidirectional Printing) Alignment Adjustment

The bidirectional alignment is required when the printer mechanism, the MAIN board, or the printhead (board) is replaced. By performing this adjustment, a compensation value is determined to compensate for the deviation in the print position. This deviation can be caused by the different print speeds due to the tolerance of the mechanical components, and the deviation of print timing between odd-numbered lines and even-numbered lines in **bidirectional** printing. The printer stores the compensation data in the **EEPROM** on the C137 MAIN board and refers to this data when performing bidirectional printing.

1. Connect the PC to the target printer and turn the printer on.
2. Execute BASIC on the PC and run the program "VERXXX.BAS".

1. Destination Setting
2. Head Angle Confirmation Pattern Printing  
(Head Front/Rear Vertical Position Printing)
3. Head Front/Rear Vertical Position Confirmation
4. Head Gap Adjustment
5. **Bi-D** Adjustment
6. Internal Timer Reset
7. END

3. When the main menu appears, choose "Bi-D Adjustment" by entering "5" from the keyboard. (The printer prints the check pattern with a sample compensation value.)
4. The next menu appears on the display.

Input **Bi-D** value No. (If **O.K.**, input [**Y**] key.)?-

5. If the sample printing is not vertically aligned **in** both the odd-numbered lines and **even**-numbered lines, enter a compensation value in the range from -30 to +30.
  - Positive compensation value: Shifts the 2nd line to the left
  - Negative compensation value: Shifts the 2nd line to the right

When the sample printing becomes vertically aligned in both lines, press [Y] and ENTER; this returns you to the main menu.
6. Choose "END" by entering "7" from the keyboard. The next message appears on the display.

All parameters that you have specified so far are written to **EEP-ROM** upon power off.

Turn the printer OFF, Now!

7. Turn off the printer.

### 4.1.3 Head Gap Adjustment (Black and Color head)

The head gap printing alignment adjustment is required when the printer mechanism, the MAIN board, or the **printhead** (board) is **replaced** or disassembled. This adjustment adjusts the head drive **timing** between the black head and the **color** head. If **this** adjustment is not made, the vertical **alignment** will not be completed.

1. Connect the PC to the target printer and turn the printer on.
2. Execute BASIC on the PC and **run the program "VERxxx.BAS"**.

- |   |
|---|
| <ol style="list-style-type: none"> <li>1. Destination setting</li> <li>2. Head Angle Confirmation Pattern Printing<br/>(Head Front/Rear Vertical Position Printing)</li> <li>3. Head Front/Rear Vertical Position Confirmation</li> <li>4. Head Gap Adjustment</li> <li>5. Bi-D Adjustment</li> <li>6. <b>Internal Timer</b> Reset</li> <li>7. END</li> </ol> |
|---|

3. When the main menu appears, choose "Head Gap Adjustment" by entering "4" from the keyboard. (The printer **prints** the check pattern with a sample compensation value.)
4. The printer **prints** a sample such as the one shown in Figure 4-1.
5. If the sample printing **is not vertically** aligned in both the odd-numbered lines (**black line**) and even-numbered lines (magenta), enter a compensation value in the range from -8 to +8.
  - Positive compensation value: Shifts the 2nd line to the left
  - Negative compensation value: Shifts the 2nd line to the right
 When both the **black and magenta lines** are vertically aligned, press [Y] and ENTER; this returns you to the main menu.
6. Choose "END" by entering "7" from the keyboard. The next message appears on the display.

<p>All parameters that you have specified so far are written to EEP-ROM upon power off.</p>
---

<p>Turn the printer OFF, Now!</p>
-----------------------------------

7. Turnoff the printer.

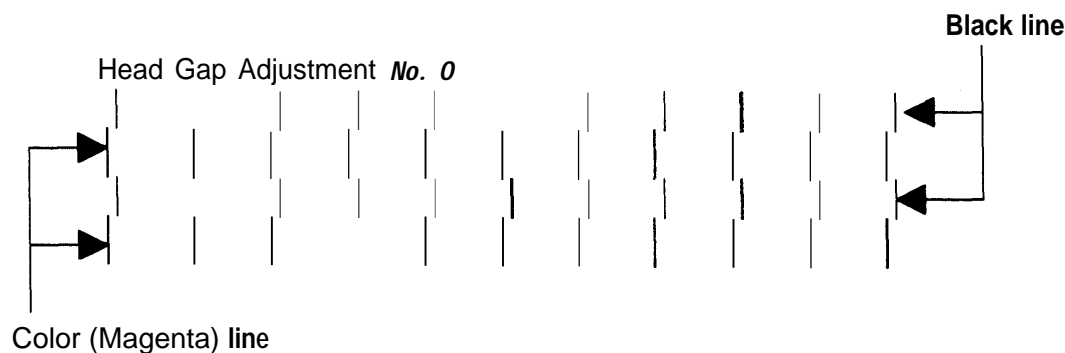


Figure 4-1. Head Gap Adjustment Sample

### 4.1.4 Black Head Angle Adjustment

The black head angle adjustment is required when the black head is replaced or disassembled. If this adjustment is not correct, the white banding problem might occur or the color head timing might not match the black head timing. The following figure illustrates the black head angle adjustment.

The black head angle is adjusted by the linear spacer and the angular spacer. The linear spacer is fixed to both sides of the base head, and the angular spacer is fixed only to the right side of the base head.

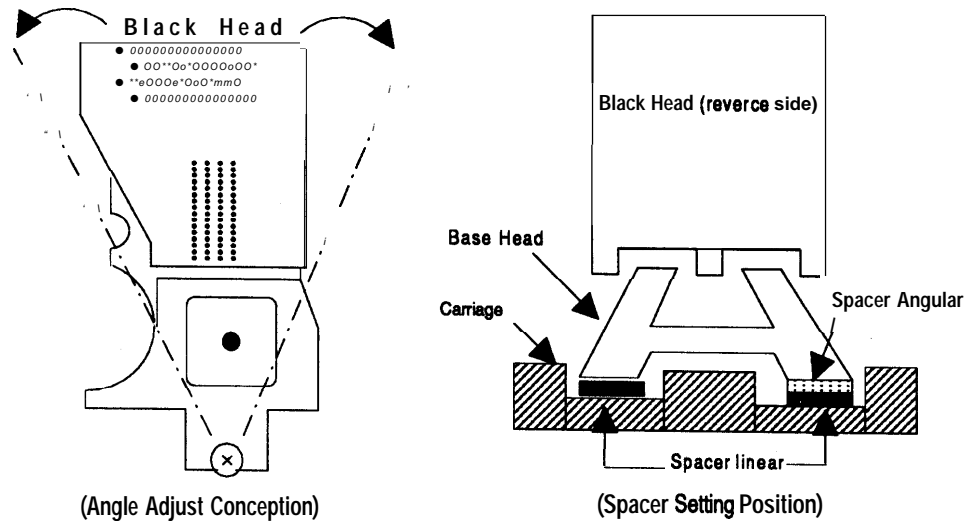


Figure 4-2. B-Head Angle and Linear, Angular Spacer

The spacer for the black head comes in different shapes, depending on the needed thickness. The following figure shows the relation of the shape and the thickness.

Spacer Angular (For Black head)			Spacer linear (Only Use Black head)		
Spacer Name	Thickness	Shape	Spacer Name	Thickness	Shape
space r,angular,BK	0.05		spacer, linear;K	0.05	
space r,angular,BK;B	0.10		spacer,linear;J	0.12	
spacer, angular, BK;C	0.15		spacer,linear;l	0.19	
spacer, angular, BK;D	0.20		spacer,linear	0.26	
spacer,angular,BK;E	0.25		spacer,linear;B	0.33	
			spacer, linear;C	0.40	
			spacer,linear;D	0.47	
			spacer,linear;E	0.54	
			spacer,linear;F	0.61	
			spacer,linear;G	0.68	
			spacer,linear;H	0.75	

Fig. 4-3. Spacer Kinds & Relation of Shape and Thickness

1. Connect the PC to the target printer and turn the printer on.
2. Execute BASIC on the PC and run the program "VERxxx.BAS".

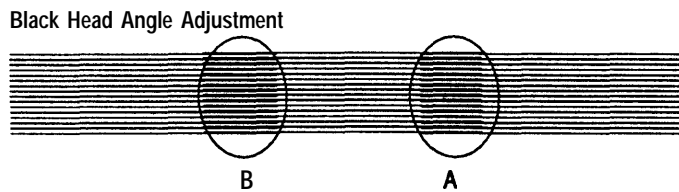
1. Destination Setting
2. Head Angle **Confirmation** Pattern Printing  
(Head Front/Rear Vertical Position Printing)
3. Head Front/Rear Vertical Position Confirmation
4. Head Gap Adjustment
5. Bi-D Adjustment
6. Internal Timer Reset
7. END

3. When the main menu appears, choose "Head Angle Confirmation Pattern Printing" by entering "2" from the keyboard. (The printer prints the check pattern with a sample name.)

**WARNING**

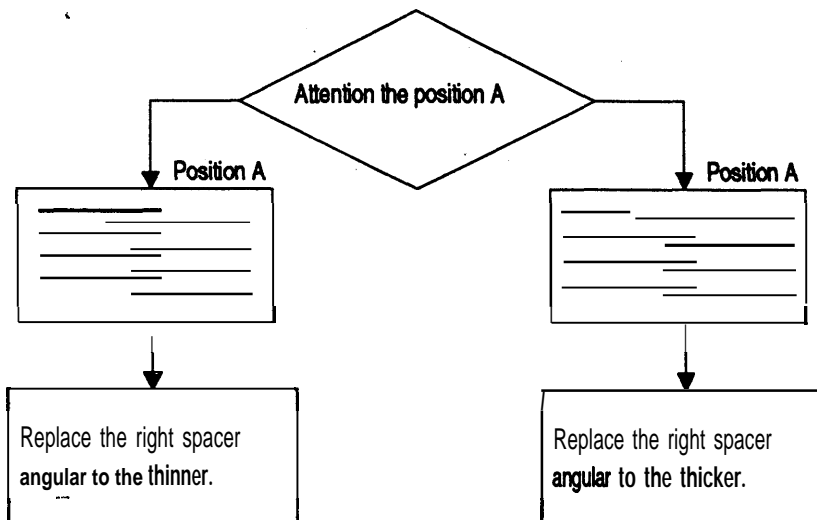
- When replacing **both** the blackhead and the **color** head, always adjust the color head angle first. The black head **angle is** based upon **the color head** angle.
- **After** you replace the blackhead and **print** the black head angle pattern, you only have to insert the angular spacer **if** the pattern **is** incorrect.

The printer pMts a pattern such as one in the following sample.  
**Only** the nozzles in row A and row D are fired (making it is easy to see the blackhead angle).



**Figure 4-4. Black Head Angle Adjustment Sample**

5. **In** the above figure, pay attention to position A. (Do not look at position B.)
6. By referring to the following flowchart, reset the angular spacer (for the black head) that is under the right linear spacer. The replacement procedure for the angular spacer is explained in step 7.



**Figure 4-5. Spacer Selection**

7. Turn the printer power off at once.
8. Move the carriage to the center **manually** while pressing the carriage lock lever, and remove the two ink cartridges.
9. Remove the rubber cap that covering a head screw at a side of color ink cartridge and then **loosen**(but do not remove) three screws. (Refer to figure 4-6.)

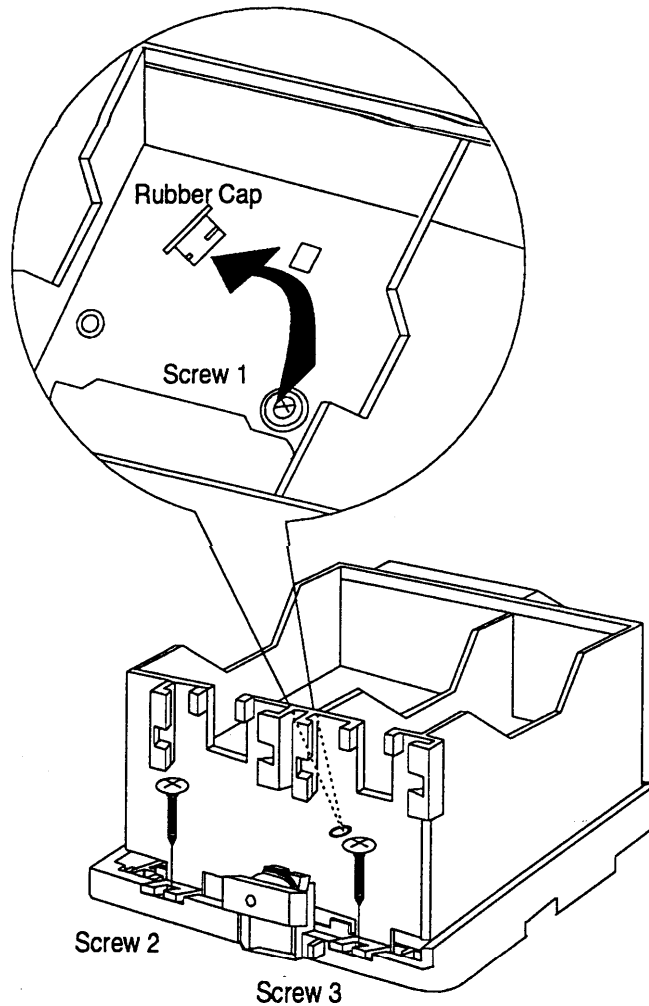


Figure 4-6. Removing the Rubber Cap

### WARNING

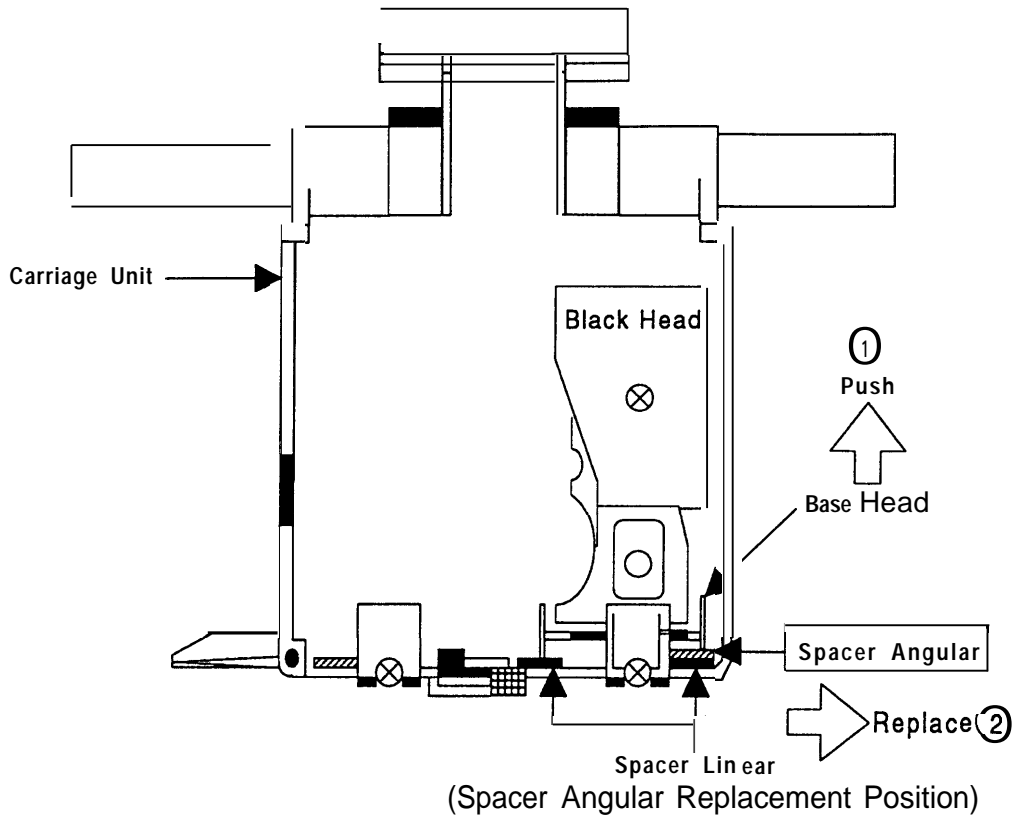
*After replacing the **spacer**, always install new ink cartridges before returning the **printer** to the user. At this time, use the ink cartridges that are exclusive for **service** (Monochrome: 1020626, CMY: 1020627). You can **re-use** the old ink cartridges for other **purposes**.*

10. Change the spacer **angular**(for monochrome head) to new one with referring the figure 47. (Replace spacer angular while using the tweezers to push the base head toward the rear.)

11. After replacing the angular spacer, reassembly the ink cartridge holder and reinstall the ink cartridges. Use the BASIC program to **verify the black head angle**. Confirm the angle condition by re-performing the step 1 to **step6**, and if the angle condition is wrong you must perform this adjustment until the head angle becomes correct.

**WARNING**

- *The angular spacer comes in five thicknesses. Until the black head angle is correct, perform this adjustment by changing the angular spacer.*
- *When setting the angular spacer, always set the angular spacer on the linear spacer.*



**Figure 4-7. Spacer Angular Replacement Method**



### 4.1.5 Black - Color Head Vertical Adjustment

This adjustment adjusts the vertical position between the **black** head and the color head. (Join the top nozzle of both the #1 nozzle of the black head and the #1 nozzle of the color head.) This adjustment can be made only by using the linear spacer of the black head side. This adjustment is required when the black head or the color head is replaced or disassembled. The following figure illustrates this adjustment.

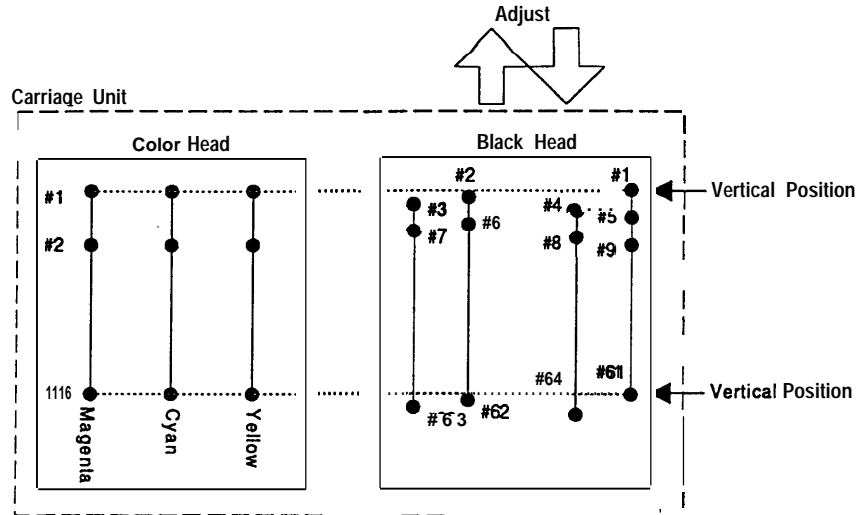


Figure 4-8. Black-Color Head Vertical Adjust Conception

1. Connect the PC to the target printer and turn the printer on.
2. Execute BASIC on the PC and run the program "VERxxx.BAS".
  1. Destination setting
  2. Head **Angle** Confirmation Pattern Printing (Head **Front/Rear** Vertical Position Printing)
  3. Head Front/Rear Vertical Position Confirmation
  4. Head Gap Adjustment
  5. Bi-D Adjustment
  6. Internal Timer Reset
  7. END
3. When the main menu appears, choose "Head Front/Rear Vertical Position Confirmation" by entering "3" from the keyboard. (The printer prints the check pattern with a sample **name**.)

### WARNING

*When replacing the black head, always adjust the black head angle first, because the black-color head vertical adjustment is based upon the black head angle.*

#### 2-3, BLACK HEAD SPACER SELECT



Figure 4-9. Spacer Linear Selection Sample

4. In Figure 4-8, the vertical position is correct when both the magenta line and the black line are aligned [as in position OK (0)]. If the vertical position is correct, turn off the printer.

If the black and magenta lines are not aligned, perform the vertical adjustment as described in steps 5-10.

### WARNING

- The number shown in the sample indicates the thickness level compared with the current linear spacer (see step 5), and the linear spacer is prepared with 11 kinds.
- The linear spacer is fixed by two pieces at both sides of the base head. For this reason, when you replace the linear spacer, replace the two linear spacers at the same time,
- When replacing the linear spacer, place it under the angular spacer.

If necessary, replace the spacer linear. For instance, if your pattern is similar to the pattern shown under -2, replace the spacer linear with a thinner linear spacer. If your pattern is similar to the pattern shown under 2, replace the spacer linear with a thicker spacer.

5. Turn the printer off at once.

6. Move the carriage to the center while pressing the carriage lock lever, and remove the two ink cartridges.

7. Remove the rubber cap that covering a head screw at a side of color ink cartridge and then loosen (but do not remove) three screws. (Refer to figure below.)

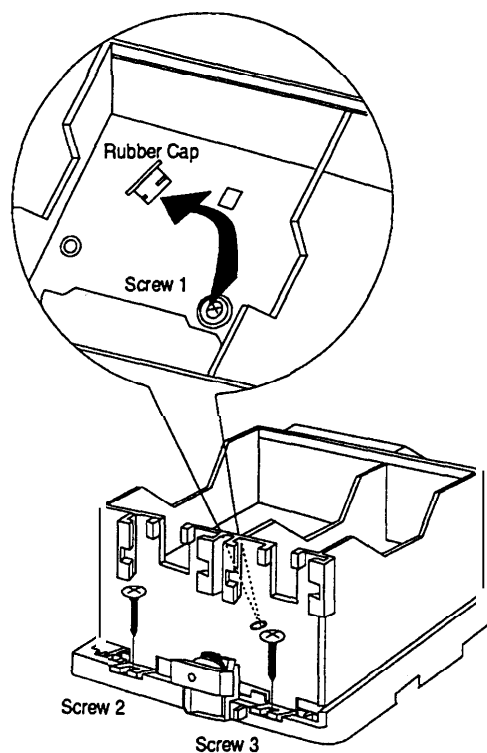
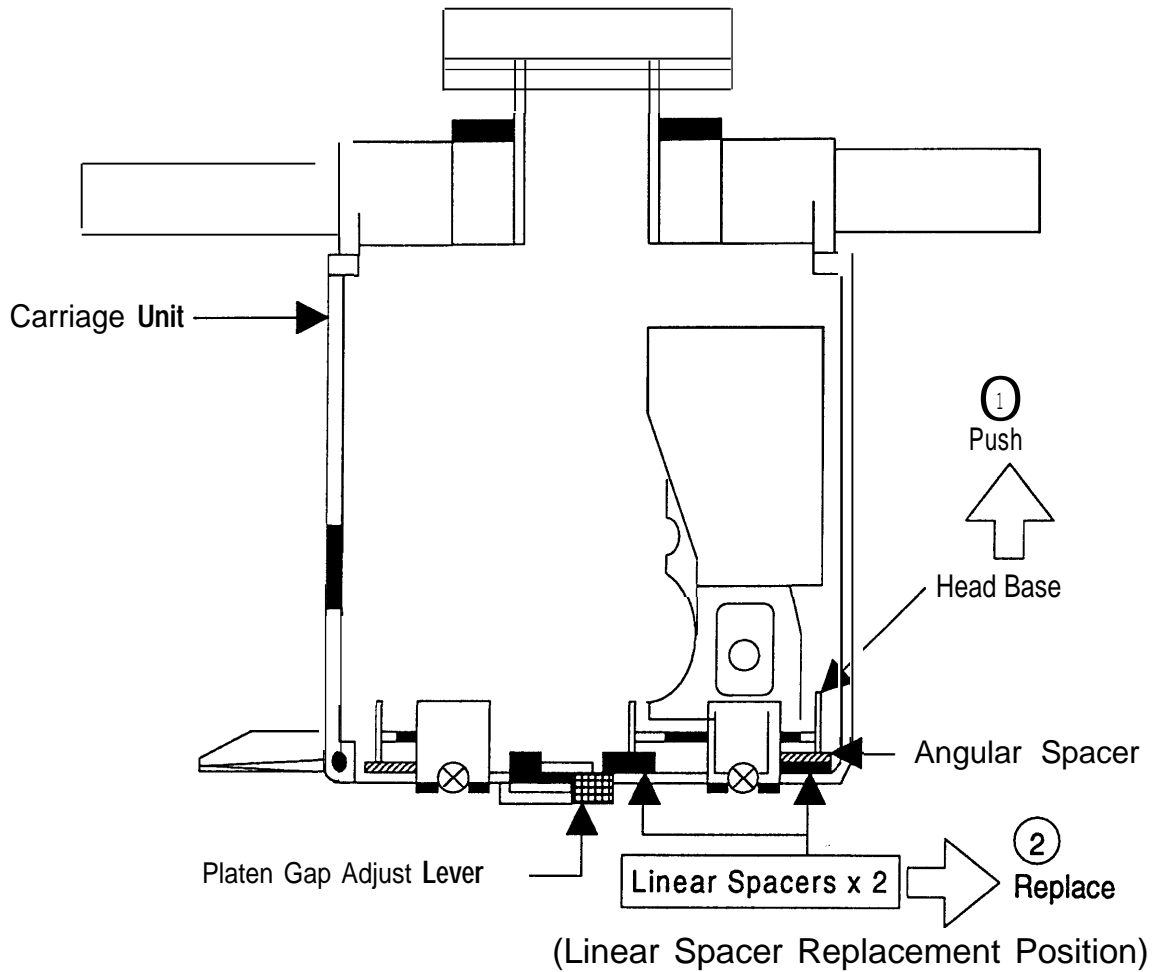


Figure 4-10. Removing the Rubber Cap

### WARNING

After replacing the spacer, always install new ink cartridges before returning the printer to the user. At this time, use the ink cartridges that are exclusive for service (Monochrome: 1020626, CMY: 1020627). You can re-use the old ink cartridges for other purposes.

8. Change the spacer linear(monochrome head only x2 pieces) to new one with referring the figure below. (Replace spacer linear while using the tweezers to push the base head toward the rear.)



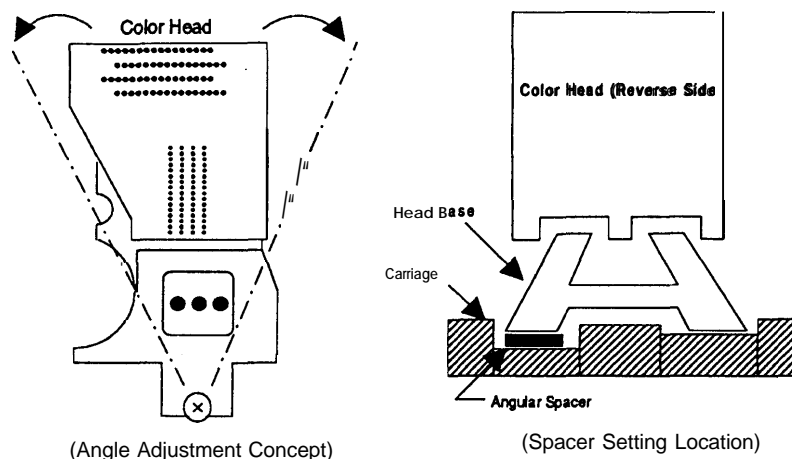
**Figure 4-11. Spacer linear Replacement Method**

9. Rerun the BASIC program and choose the "Head Front/Rear Vertical Position Confirmation" by entering "3" from the keyboard; then confirm that the confirmation sample is correct. If the sample is incorrect, change the thickness level of the linear spacer and perform this adjustment until the two black and magenta lines are aligned at the position "OK (0)".
10. When you complete this adjustment, quit out of the BASIC program and turn off the printer.

### 4.1.6 Color Head Angle Adjustment

The color head angle adjustment is required when the color head is replaced or disassembled. If this adjustment is not correct, the white banding problem occurs or the black head timing will not match the color head timing. The following figure illustrates the color head angle adjustment.

The color head angle is adjusted by the angular spacer. The angular spacer is fixed to only left side of the base head.

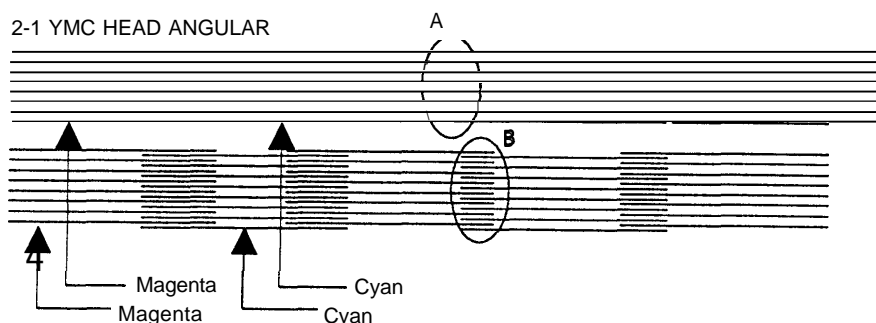


**Figure 4-12. C-Head Angle and Spacer Angular Position**

1. Connect the PC to the target printer and turn the printer on.
2. Execute BASIC on the PC and run the program "VERXXX.BAS".
  1. Destination Setting
  2. Head Angle Confirmation Pattern Printing (Head Front/Rear Vertical Position Printing)
  3. Head Front/Rear Vertical Position Confirmation
  4. Head Gap Adjustment
  5. Bi-D Adjustment
  6. Internal Timer Reset
  7. END
3. When the main menu appears, choose 'Head Angle Confirmation Pattern Printing' by entering "2" from the keyboard. (The printer prints the check pattern with a sample name)

### **WARNING**

*When replacing both the black head and the color head, always adjust the color head angle first. The black head angle and the black-color head vertical position adjustments are based on the color head angle adjustment.*



**Figure 4-13. Color Head Angle Confirmation Sample**

The angular spacer for the color head come in five thicknesses, each having its own shape. The following figure shows the relation of the shape and the thickness level.

Since the color head is not equipped with a linear spacer, the angle adjustment is decided only by the angular spacer (exclusive use for color head), which is placed under the left side of the base head.

Angular Spacer (For Color Head)






Spacer Name	Thickness	Shape
angular spacer YMC	0.30	
angular spacer YMC-B	0.35	
angular spacer YMC-C	0.40	
angular spacer YMC-D	0.45	
angular spacer YMC-E	0.50	

Figure 4-14. Relationship of the Shape and Thickness

4. In Figure 4-13, pay attention to the position of A and B while you reset the left angular spacer. The replacement procedure is explained beginning in step 5.

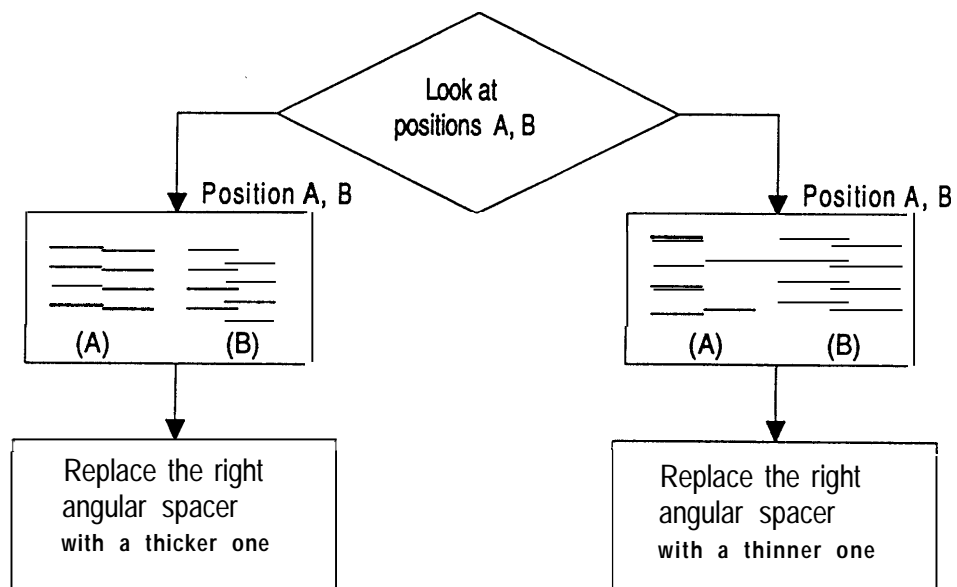
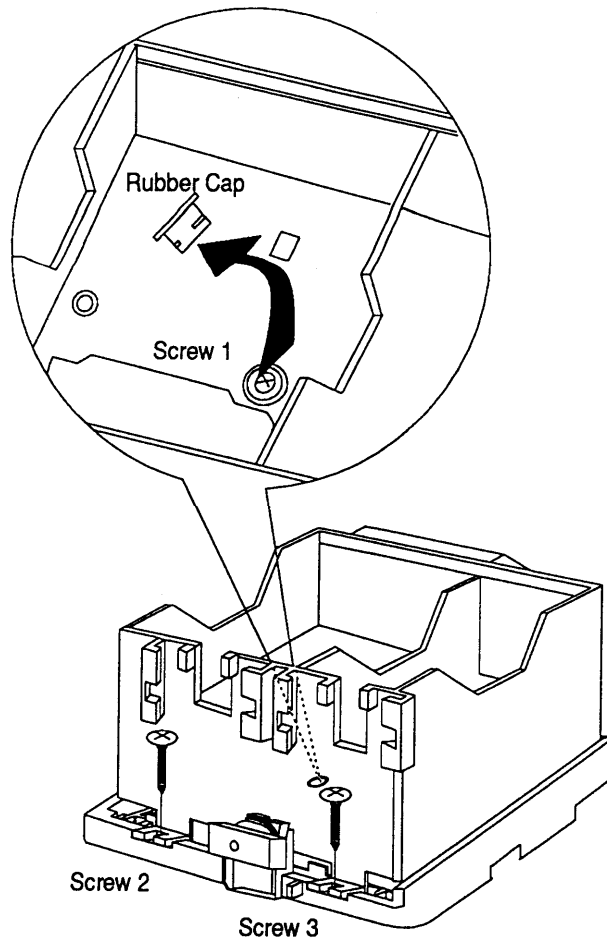


Figure 4-15. Spacer Select Judgement

5. Turn off the printer at once.
6. Move the carriage to the center manually, and loosen (but do not remove) the screw securing the color head to the carriage.

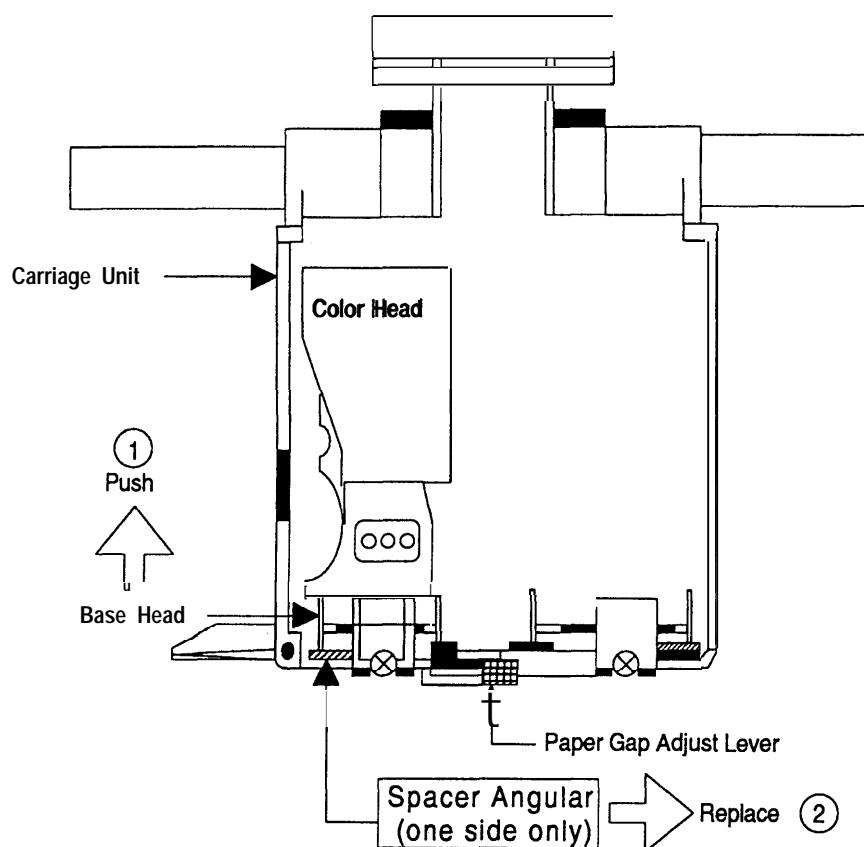
7. Remove the rubber cap that covering a head screw at a side of color Ink cartridge and then loosen (but do not remove) three screws. (Refer to figure below.)



**Figure 4-16. Removing the Rubber Cap**

8. **Change the** spacer angular (left side only) to new one with referring the figure below. (Replace spacer angular while using the tweezers to push the base head toward rear.)

9. Rerun the BASIC program and choose the "Head Angle Confirmation Pattern" by entering "2" from the keyboard, then verify that the confirmation sample is correct.



**Figure 4-17. Spacer Angular Replacement Method(YMC)**

10. If the sample is incorrect, repeat steps 5-9 until the upper sample lines are aligned with one another and the lower sample lines are exactly equidistant between one another (as shown at B in Figure 4-15).
11. When you complete this adjustment, turn off the printer.

### 4.1.7 Platen Gap Adjustment

This adjustment is required when replacing or removing the carriage unit from the printer mechanism.

The distance between the printhead nose and the paper surface should be adjusted to 1.1 mm.

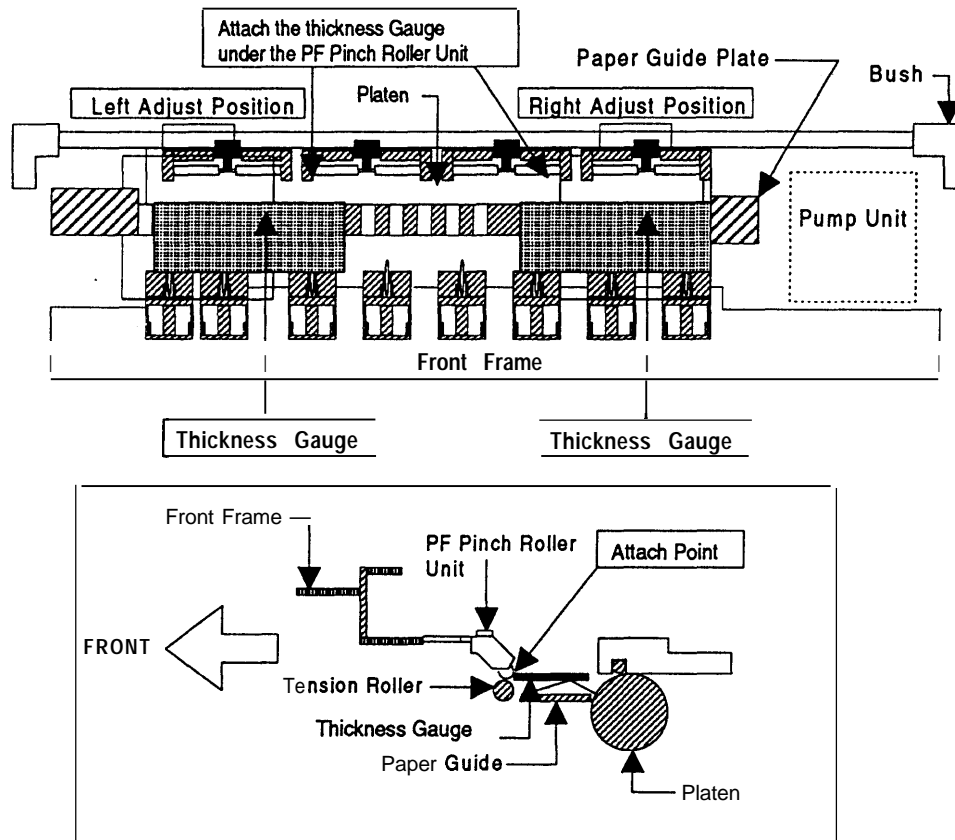
1. Attach the thickness gauge (marketing gauge) at the left side adjust position (on the paper guide plate) shown in the figure below so that one side hooks a paper feed pinch roller unit.
2. Move the carriage unit manually onto the thickness gauge.

**Table 4-2. Gap and Adjustment Direction**

Gap between head nose and gauge surface	Left Bushing	Right Bushing
Narrow	CW	CCW
Spread	CCW	CW

3. Rotate the parallel adjust bushing that is attached at the left and right end of the carriage guide shaft as the black and color printhead contact the thickness gauge.
4. After attaching the printhead to the gauge surface, verify that the gap between the carriage roller and the front frame is less than 0.04 mm. (See Figure 416.)
5. Attach the thickness gauge (marketing gauge) at the right side adjust position (on the paper guide plate) shown below as the one side edge hooks a paper feed pinch roller unit.

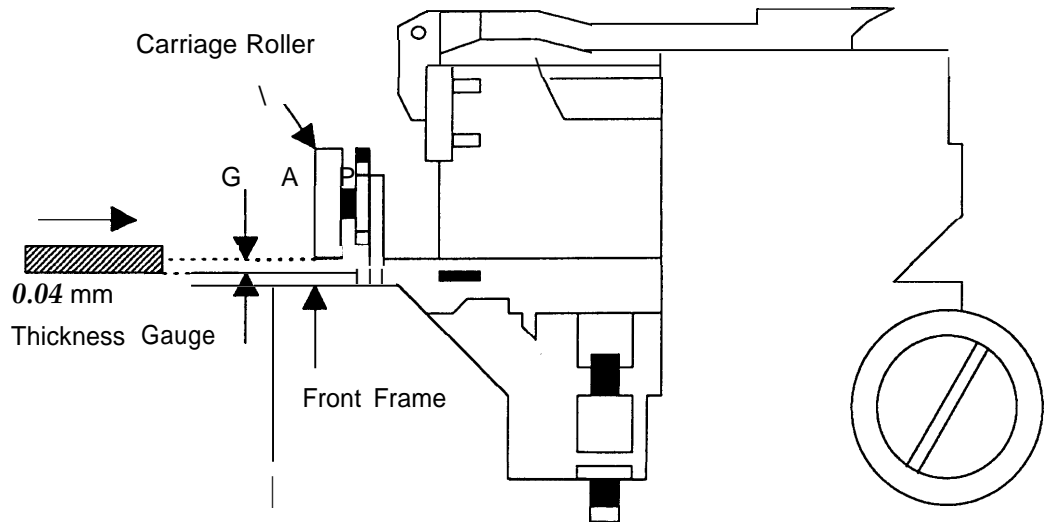
**Note:** When checking the gap between the carriage roller and the front frame, use a thickness gauge or the paper guide plate. If the gap is correct the gauge cannot be inserted into the gap. If the gap is incorrect, the gauge can be inserted in the gap.



**Figure 4-18. Adjusting the Paper Gap**



6. Move the carriage manually to the right adjust position and repeat steps 3 and 4, referring to Figures 418 and 419.



**Figure 4-19. Confirming the Gap**

#### 4.1.8 Internal Timer Reset Operation

This operation is required when replacing the M-4A1O printer mechanism. There are 6 timers in this printer:

1. Refresh timer
2. Timer (monochrome and CMY)
3. Flushing level decision timer
4. Fail absorbing timer
5. Total print timer
6. PAUSE timer

When replacing the printer mechanism, it is necessary to reset the timers as described here:

1. Connect the PC to the target printer and turn on the printer.
2. Execute BASIC on the PC and run the VERXXX.BAS program.
  1. Destination Setting
  2. Head Angle Confirmation Pattern Printing  
(Head Front/Rear Vertical Position Printing)
  3. Head Front/Rear Vertical Position Confirmation
  4. Head Gap Adjustment
  5. Bi-D Adjustment
  6. Internal Timer Reset
  7. END
3. When the main menu appears, choose 'Internal timer reset' by entering "6". This resets the internal timer. The following message then appears.
 

All parameters of the internal timer are now reset. Press Y and ENTER to return to the main menu.
4. Press "Y" and ENTER.
5. Press "7" and ENTER.
6. Turn off the printer.

# Chapter 5 Troubleshooting

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## Table of Contents

<b>5.1 OVERVIEW</b>	<b>5-1</b>
<b>5.2 UNIT LEVEL TROUBLESHOOTING</b>	<b>5-3</b>
5.2.1 Printer does not operate at power on . . . . .	5-4
5.2.2 Error is detected . . . . .	5-5
5.2.3 Failure occurs during printing . . . . .	5-6
5.2.4 Printer does not feed the paper correctly. . . . .	5-7
5.2.5 Control panel operation is abnormal . . . . .	5-8
<b>5.3 UNIT REPAIR - C137 PSB/PSE BOARD</b>	<b>5-9</b>
<b>5.4 UNIT REPAIR - C137 MAIN BOARD</b>	<b>5-10</b>
<b>5.5 UNIT REPAIR - PRINTER MECHANISM (M-4AIO)</b>	<b>5-12</b>

### List of Figures

Figure 5-1. Troubleshooting Process Flowchart. . . . .	5-1
--	-----

### List of Tables

Table 5-1. Motor Resistance. . . . .	5-1
Table 5-2. Sensor Status . . . . .	5-1
Table 5-3. Error Codes. . . . .	5-2
Table 5-4. Symptom and Problem . . . . .	5-3
Table 5-5. Repair of the C137 PSB/PSE . . . . .	5-9
Table 5-6. Repair of the C137 MAIN . . . . .	5-10
Table 5-7. Repair of the Printer Mechanism . . . . .	5-12

## 5.1 OVERVIEW

The printer may exhibit different symptoms for the same problem, which makes troubleshooting more difficult. This section, however, provides simple and effective ways to facilitate troubleshooting. The following flowchart illustrates the main steps of the troubleshooting process.

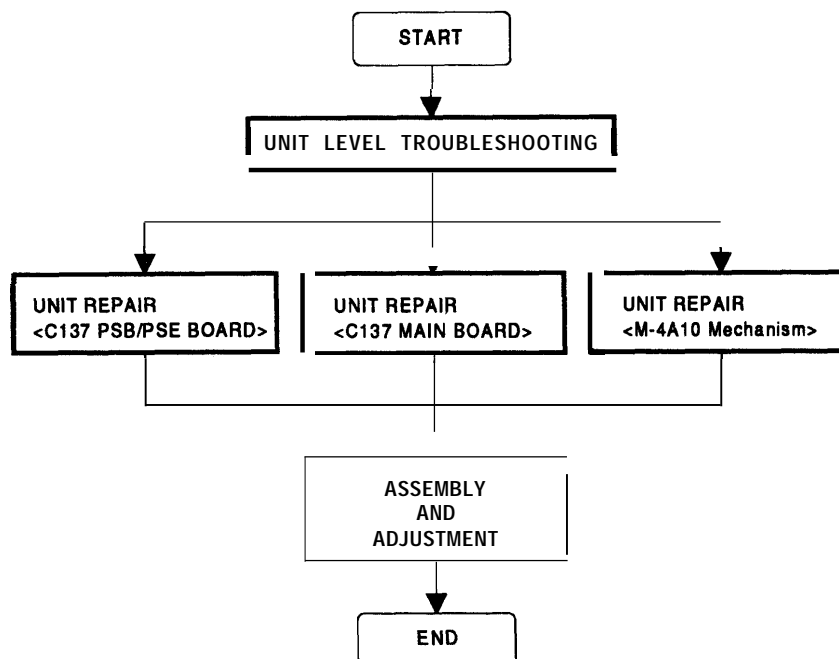


Figure 5-1. Troubleshooting Process Flowchart

Table 5-1. Motor Resistance

Motor	Resistance	Remark
CR Motor	1 0.0Ω ± 7%	At 25°C (77 °F)
PF Motor	11.5 + 1.1Ω	At 25°C (77 °F)

Table 5-2. Sensor Status

Sensor	Point	Signal Level	status
PE Sensor	CN8 / Pin 1	H (5V)	Paper exist
		L (GND)	No paper (Paper end)
BCO Sensor	CN11 / Pin 8	L (GND)	<b>Black cartridge exist</b>
		H (5V)	No black cartridge
CCO Sensor	CN12 / Pin 8	L (GND)	Color cartridge exists
		H (5V)	<b>No color cartridge</b>
HP Sensor	CN9 / Pin 3	L	<b>At home position (HP)</b>
		H	Out of HP
TH Sensor	CN10 / Pin 10	Analog data	Change the pulse width of the charge <b>pulse for the common driver circuit</b>

**Table 5-3. Error Codes**

Error status	LED						Recovery
	DATA	Paper out	No ink cartridge	Economy	Condensed	pause	
Paper out		On					Load paper and press Pause and Load/Eject buttons.
No ink cartridge			on				Install the new ink cartridge and press the Pause button.
Paper jam		Blink					Load paper and press Pause and Load/Eject Buttons
Maintenance request	Blink	Blink	Blink	Blink	Blink	Blink	Service maintenance request. (Change the waste ink drain tank and meet the counter.)
Carriage error	Blink					Blink	Turn off the printer and turn it on again.

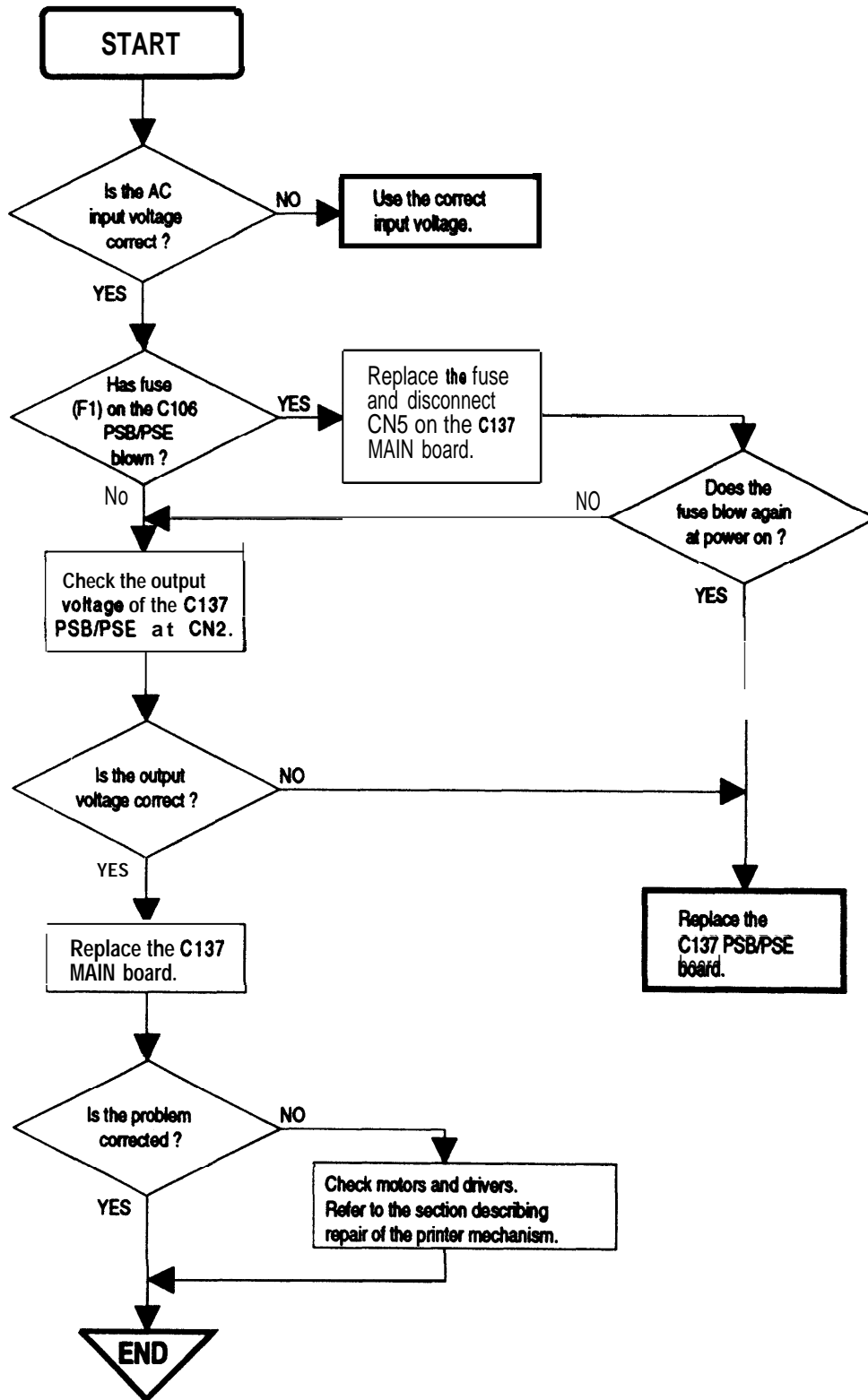
## 5.2 UNIT LEVEL TROUBLESHOOTING

When a problem occurs, you can identify the defective unit according to the symptoms exhibited. The table below lists the symptoms of certain problems. Once the problem is identified, refer to the flowchart that corresponds to the problem.

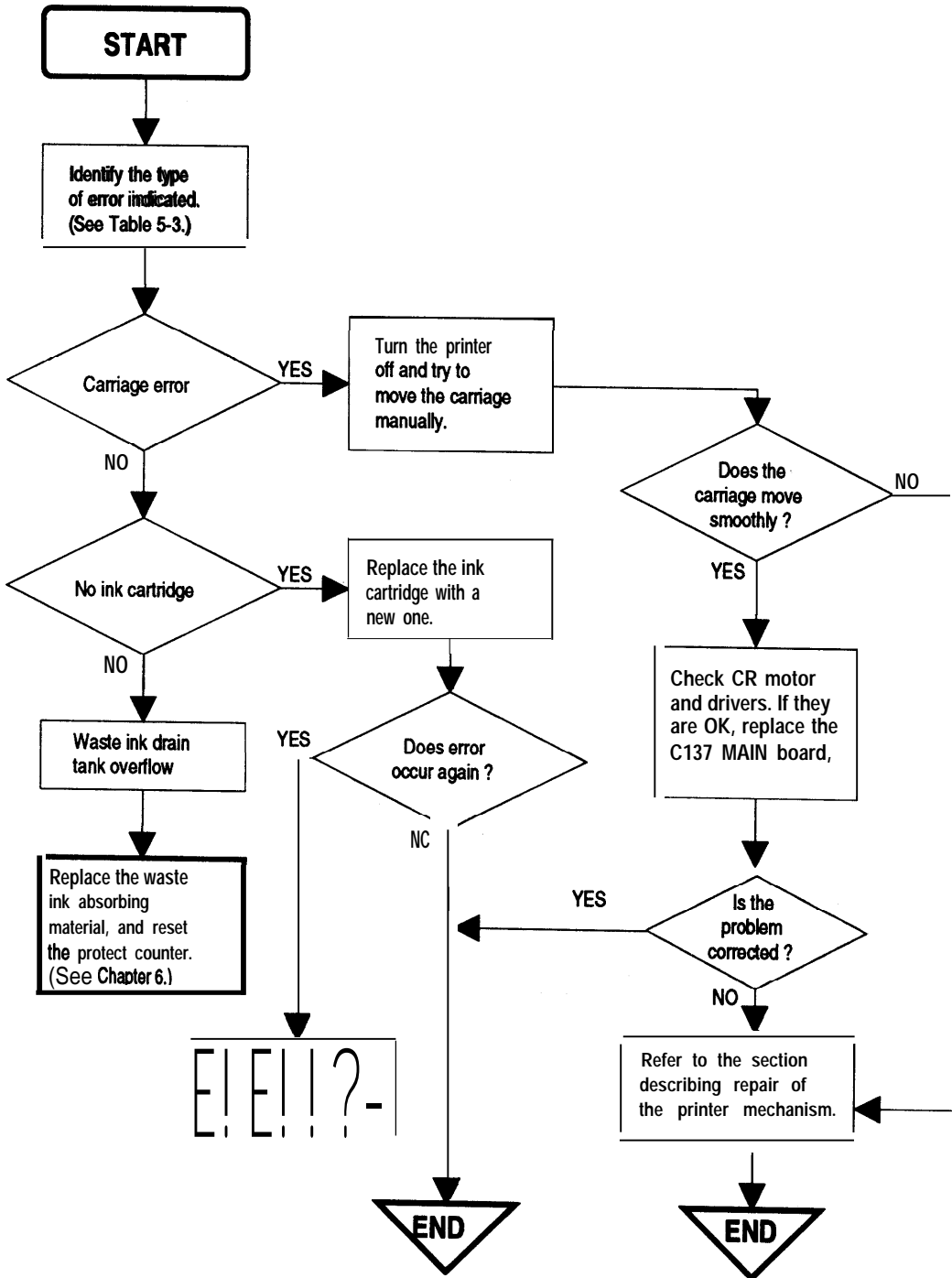
**Table 5-4. Symptom and Problem**

Symptom	Problem	Flowchart No.
Printer does not operate at power on	<ul style="list-style-type: none"> <li>■ LEDs do not light up.</li> <li>■ Printer mechanism does not operate.</li> </ul>	5.2.1
Error is detected	<ul style="list-style-type: none"> <li>■ Error is indicated by LED indication.</li> </ul>	5.2.2
Failure occurs during printing	<ul style="list-style-type: none"> <li>■ Printing is not performed.</li> <li>■ <b>Abnormal printing (missing dots, etc.)</b></li> <li>■ Print quality is poor</li> </ul>	<b>5.2.3</b>
Printer does not feed the paper correctly	<ul style="list-style-type: none"> <li>■ No paper is fed.</li> <li>■ Paper feed is irregular.</li> <li>■ Paper jam occurs.</li> </ul>	5.2.4
Control panel operation is abnormal	<ul style="list-style-type: none"> <li>■ No response to button access.</li> </ul>	<b>5.2.5</b>

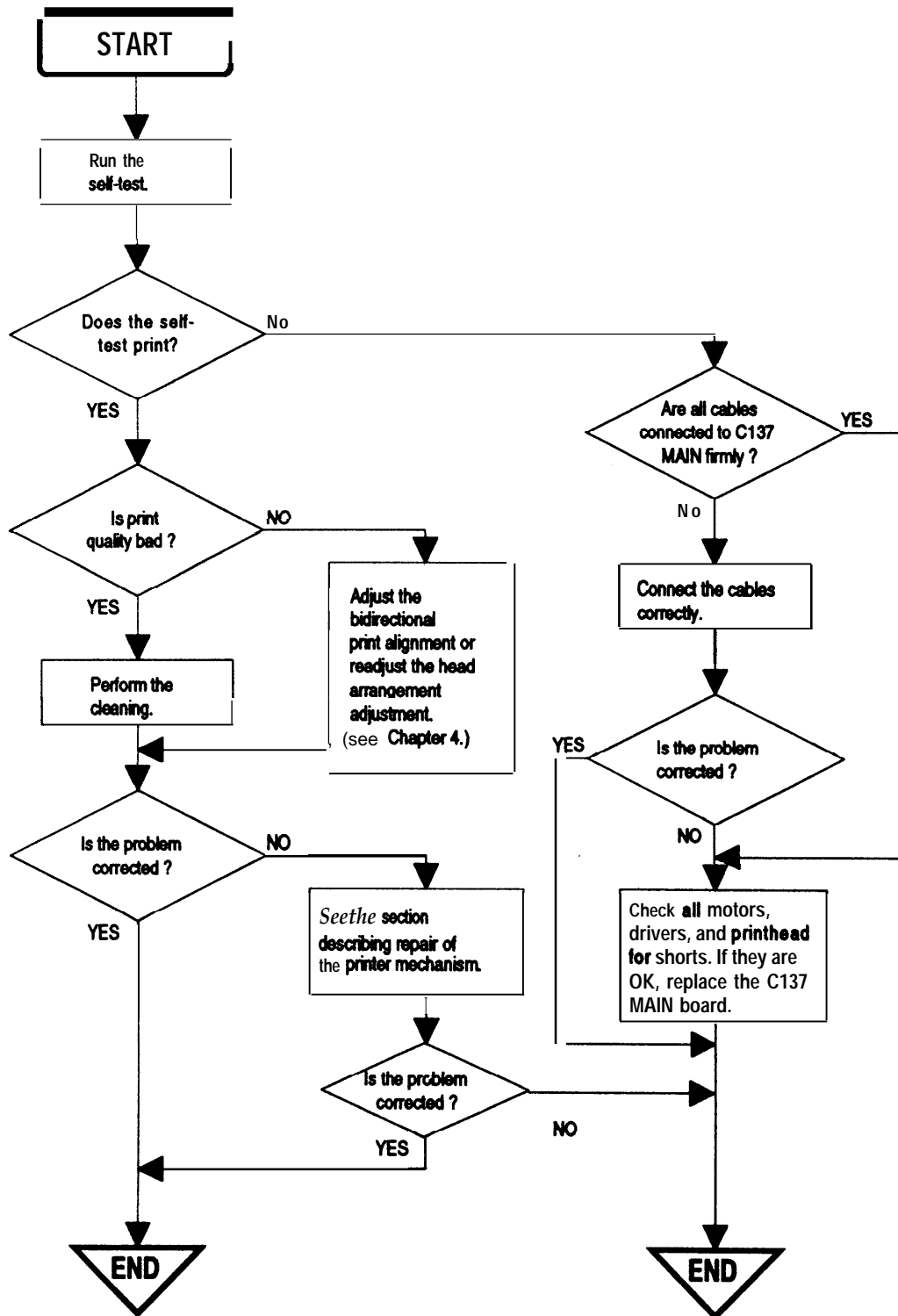
5.2.1 Printer does not operate at power on



5.2.2 Error is detected

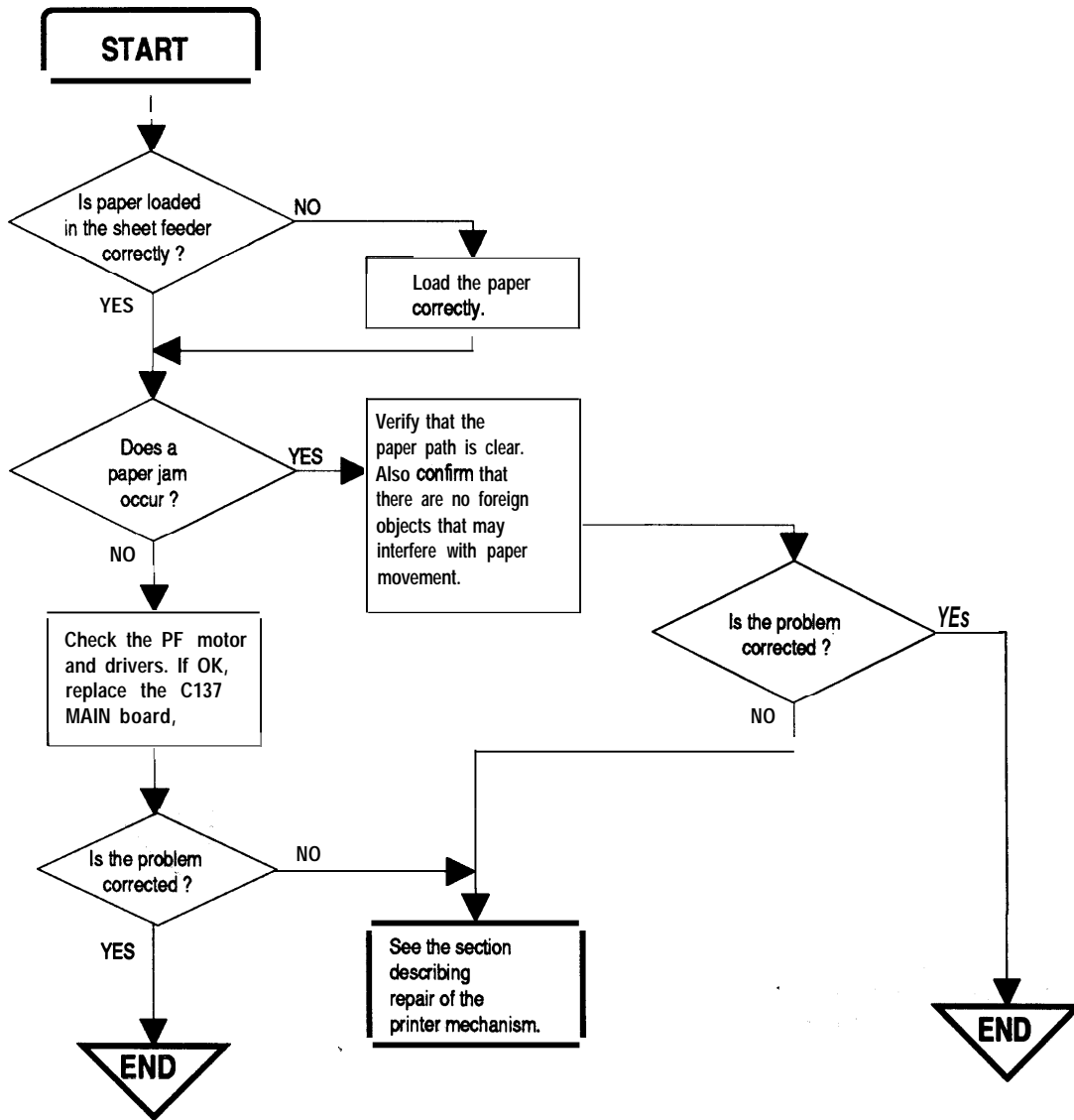


5.2.3 Failure occurs during printing

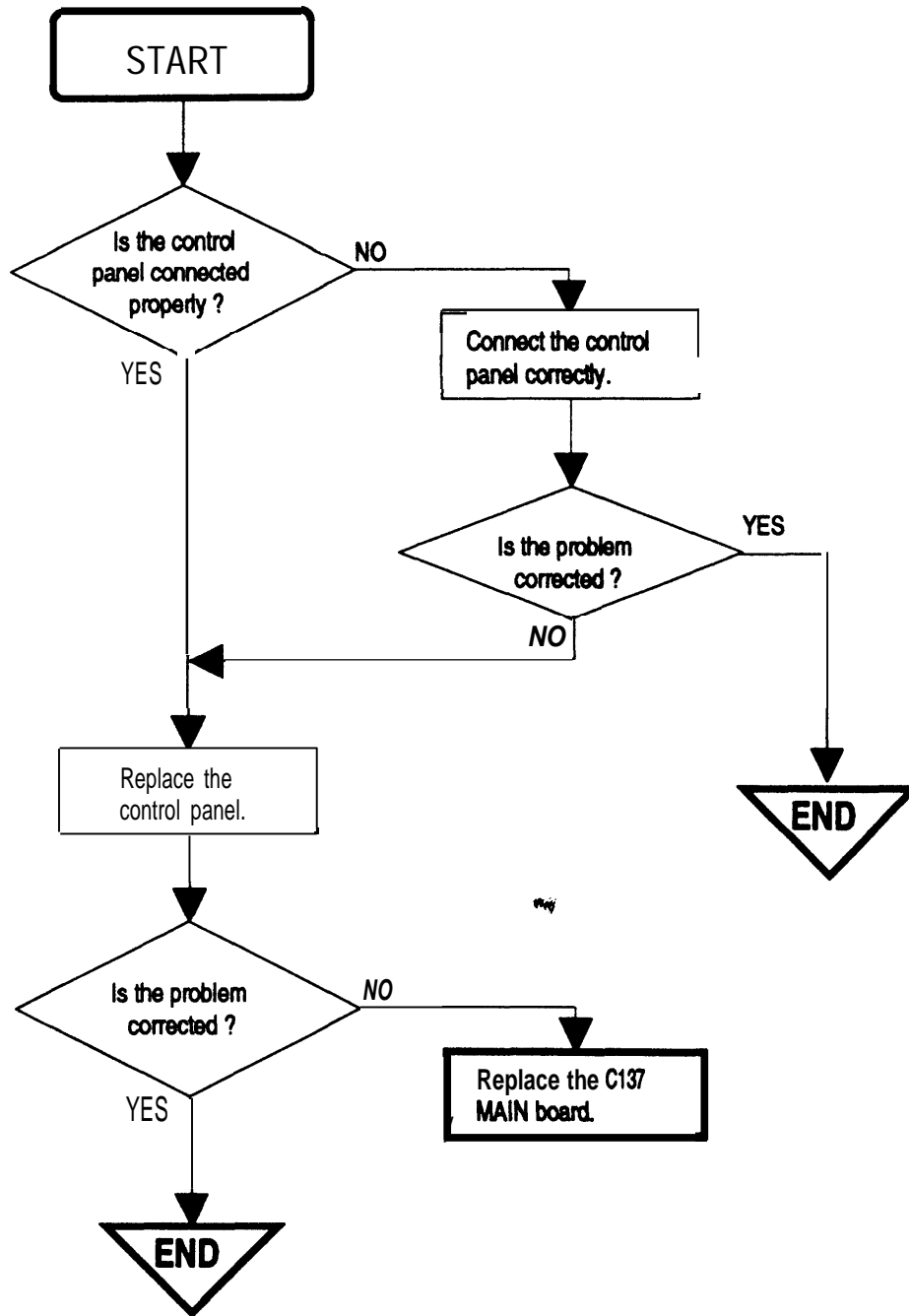




5.2.4 Printer does not feed the paper correctly



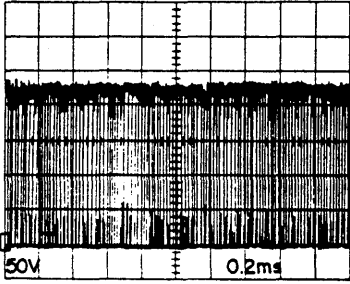
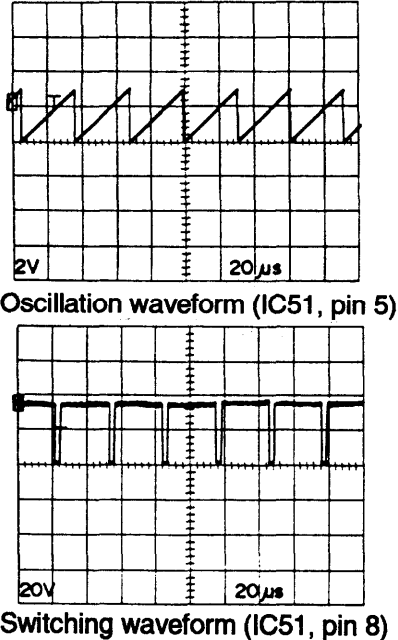
5.2.5 Control panel operation is abnormal



### 5.3 UNIT REPAIR - C137 PSB/PSE BOARD

This section describes the problems related to the power supply board (C137 PSB/PSE). The table below provides various symptoms, likely causes, and checkpoints. The checkpoints refer to waveforms, resistance, and other values to be checked to evaluate the operation of each component.

Table 5-5. Repair of the C137 PSB/PSE

Symptom	Condition	Cause	Checkpoint	Solution
The printer does not operate at all.	+35V line is dead.	Transformer coils are open.	Check the transformer coils by using a multimeter.	Replace T1
		Switching FET (Q1)	Check the waveform at the drain of Q1. 	Replace Q1
	+35V line is abnormal.	ZD52, Q83, or PC1 is dead.	Check the voltage level of the corrector side. Correct voltage is as follows: Power Switch Off = +1.8VDC Power Switch On = 0VDC	Replace ZD52, Q82, or PC1.
	+5V line is dead.	+35V line is dead.	Check the +35V line.	Replace IC51.
IC51 is dead.		Check the oscillation waveform and switching waveform of IC51. 		
Auto capping operation is invalid.	+35V line is invalid when power off.	IC81 is dead.	Turn off the printer and check the voltage at pin 1 of IC81. ■ Normal voltage = 0 VDC	Replace IC81.
		C82 is dead or R88 is short.	Turn off the printer and check the voltage at plus side of C82. ■ Normal voltage = 2.5 VDC ■ R88 resistance = 100 ohms	Replace C82 or R88.

### 5.4 UNIT REPAIR - C137 MAIN BOARD

This section describes the problems related to the main controller board (C137 MAIN). The table below provides various symptoms, likely causes, and checkpoints. The checkpoints refer to waveforms, resistance, and other values to be checked to evaluate the operation of each component.

Table 5-6. Repair of the C137 MAIN

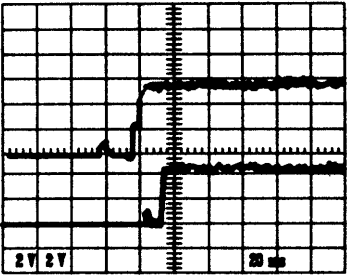
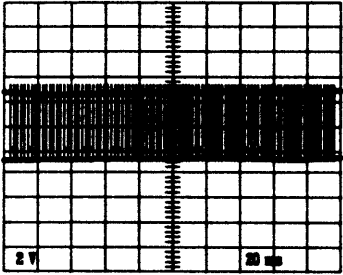
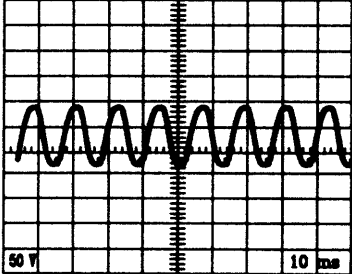
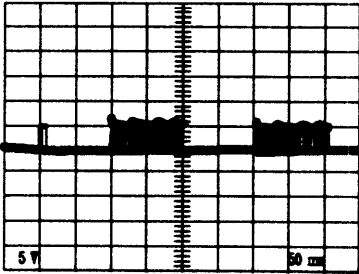
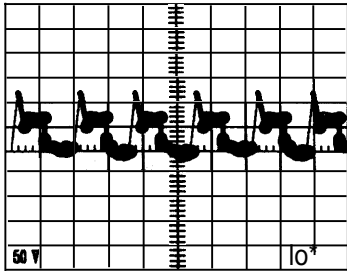
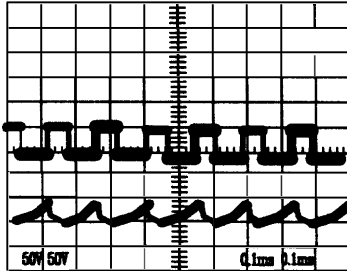
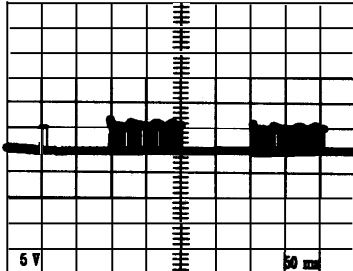
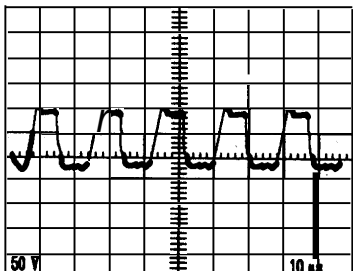
Symptom	Condition	Cause	Checkpoint	Solution
The printer does not operate at all.	The CPU does not operate. (Drive system does not operate normally when you turn the printer on or off.)	The reset circuit does not operate.	Check the waveform of the +5V line and that of the RESET signal. 	Replace IC13 or IC8.
		Selection of control ROM is abnormal.	Check pin 2 of IC3 for a change in the signal HIGH/LOW. 	Replace IC1.
		Either CG or RAM is defective.		Replace CG or RAM.
		CPU is defective.	Check the oscillator signal at either pin 75 or 74 of the CPU. 	If signal is detected, replace CPU. Otherwise replace CR1.
The carriage does not operate normally.	The carriage motor does not operate at all.	IC2 is defective.	Check the serial signal output from pin 25 or 27 of IC2 to the driver IC15. 	Replace IC2.
		CPU is defective.		Replace the CPU.

Table 5-6. Repair of the C137 MAIN (Cont.)

Symptom	Condition	Cause	Checkpoint	Solution
Carriage does not operate normally.	The carriage does not operate at all.	IC1 5 is defective.	<p>Check the output signal at pin 1, 8 or 11, 18 of IC15.</p> 	Replace IC15.
Self-test printing is abnormal.	Self-test is not executed.	IC2 is defective.	<p>Check the output signal at pin 13 or 14 and pin 15 or 16 of IC2.</p> 	Replace IC2.
		Printhead unit is defective.		Replace printhead unit.
Paper feed does not operate normally.	The paper feed motor does not rotate.	IC2 is defective.	<p>Check the serial signal output from pin at 39 or 40 of IC2 to the driver IC14.</p> 	Replace IC2.
		IC14 is defective.	<p>Check the output signal at pin 1, 8 or 11,18 of IC14.</p> 	Replace IC14.

## 5.5 UNIT REPAIR -PRINTER MECHANISM (M-4A10)

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

Table 5-7. Repair of the Printer Mechanism

Symptom	Condition	cause	Checkpoint	solution
The pump mechanism does not operate.	The PF motor fails to rotate at time of power on.	Foreign substances are lodged in the gear of the mechanism.	Manually drive the gear train connected to the pump mechanism to check if the motor rotates.	Remove any foreign substance.
		The PF motor is defective.	Check the coil resistance of the motor.	Replace the PF motor.
Ink is not absorbed or is poorly absorbed.	Used ink does not go through the used ink tube during the cleaning operation.	The tube is not properly connected to the cap.	Check that the tube is properly connected to the cap.	Set the tube properly.
		The ink tube is damaged.	Check the ink tube visually.	Replace the tube.
		The cap is defective.	Check for any defective part.	Replace the head cap.
		The pump is defective.	Replace the pump to see if this causes the ink to be absorbed normally.	Replace the pump unit.
The carriage motor does not rotate.	The carriage motor fails to rotate at time of power on.	Foreign substances are lodged in the gear of the mechanism.	Manually drive the timing belt to see if the carriage motor rotates.	Remove any foreign substance.
		The carriage motor is defective.	Measure the coil resistance of the CR motor.	Replace the carriage motor.
The carriage does not operate normally at time of power on (after the carriage has been manually centered prior to power on).	The carriage motor rotates, but the carriage does not move.	The pulley is defective.	Check for broken or worn pulley.	Replace the driven pulley.
		The timing belt is defective.	Check that the timing belt is properly inserted into* bottom of the carriage.	Reinsert the timing belt.
	The carriage moves slightly and then stops.		Carriage movement is not smooth.	Check the timing belt for any damage.
		Check whether the carriage moves smoothly when moved manually.		Clean and lubricate the carriage.
			Check tension of the timing belt.	Adjust tension of the timing belt.

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

Symptom	Condition	Cause	Checkpoint	Solution	
Printing is not performed.	The carriage moves, but no printing is performed.	The head cable is disconnected.	Check whether the head cable is disconnected.	Reconnect the head cable.	
		The head cable is defective.	Replace the head cable to see if operation is normal.	Replace the head cable.	
		The printhead is defective.	Replace the printhead to see if the printhead operates normally.	Replace the printhead.	
		Ink absorption is poor.	See "Ink is not absorbed" on the previous page.		
Abnormal printing.	A particular dot is not printed.	Printhead surface is not clean.	Perform the cleaning operation.	Clean.	
		The head cable is disconnected.	Check whether the head cable is disconnected.	Reconnect the head cable.	
		The head cable is defective.	Replace the head cable to see if operation is normal.	Replace the head cable.	
		The printhead is defective.	Replace the printhead.	Replace the printhead.	
	A dot is not printed occasionally.	Printhead surface is not clean.	Printhead surface is not clean.	Check the front of the printhead.	Clean.
			The ink cartridge is expired.	Check whether the ink cartridge has expired.	Replace the ink cartridge.
		Insufficient contact of the head cable.	Insufficient contact of the head cable.	Check whether the cable is properly plugged into the connector.	Plug the cable into the connector properly.
			Check the cleanliness.	Clean.	
		The printhead is defective.	Replace the printhead to see if this causes printing to be performed normally.	Replace.	
		Ink is poorly absorbed.	Check whether the used ink goes through the used ink tube.	See "Ink is not absorbed".	
	Printhead characters are not aligned.	The platen gap is not adjusted.	Check the platen gap.	Adjust the gap	
	The intervals between the characters are irregular.	The timing belt is defective.	Check that the timing belt is properly inserted into the bottom of the carriage.	Set the timing belt properly.	
	Vertical line is not aligned.	Bidirectional alignment is not adjusted.	Check it with bidirectional alignment program.	Adjust the bidirectional alignment.	
Paper is not fed normally	Character or dot pitch is abnormal.	Character or dot pitch is abnormal.	Check it with head inclination, distance front/rear position.	Make each adjustment.	

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

Symptom	condition	Cause	Checkpoint	Solution
Paper is not fed normally.	Paper is not fed.	Foreign substance is lodged in the paper path.	Visually check the paper path.	Remove any foreign substance.
		Paper feeding gears are defective.	Visually check the gears.	Replace defective gears.
		The paper feed motor is defective.	Measure the coil resistance of the PF motor.	Replace the PF motor.



# Chapter 6 Maintenance

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## Table of Contents

<b>6.1 PREVENTIVE MAINTENANCE</b>	<b>6-1</b>
<hr/>	
<b>6.2 SERVICE MAINTENANCE</b>	<b>6-2</b>
6.2.1 Printhead Cleaning . . . . .	6-2
6.2.2 Waste Ink Drain Tank Replacement . . . . .	6-2
<hr/>	
<b>6.3 LUBRICATION AND ADHESIVE</b>	<b>6-3</b>

### List of Figures

Figure 6-1. Lubrication and Adhesive Points (1) . . . . .	6-4
Figure 6-2. Lubrication and Adhesive Points (2) . . . . .	6-5

### List of Tables

Table 6-1. Recommended Lubricants. . . . .	6-3
Table 6-2. Lubrication and Adhesive Points. . . . .	6-3

## 6.1 PREVENTIVE MAINTENANCE

Although this printer is designed so that no specific maintenance is required on a regular basis, it is recommended that you clean the printer thoroughly whenever you get a chance to do so. You can clean:

■ Outer case

Use a soft, clean cloth, dampened with mild detergent, if necessary.

■ Auto sheet feeder

If the inside of the auto sheet feeder is dirty (dusty), carefully brush away all dust and dirt using a soft brush. If the pickup roller of the sheet feeder is dirty, clean its surface with a soft, clean cloth.

■ Inside the printer

If you notice any dust or dirt that has accumulated inside the printer when you open the outer case for repair, remove all dust and dirt using a small vacuum cleaner designed for such purposes.

### WARNING

- *Never use paint thinner, trichloroethylene, or ketone-based solvents for cleaning. These chemicals can damage the components of the printer.*

### CAUTION

- *Do not use a hard or abrasive brush for cleaning.*
- *Be careful not to damage the components of the printer when using a vacuum cleaner.*
- *A lithium battery is installed on the C137 MAIN board of this printer. Be sure to observe the following instructions when servicing the printer or storing the after-service parts:*
- 1. Keep the battery away from any metal or other batteries so that electrodes of opposite polarity do not come in contact with each other.*
  - 2. Do not heat the battery and place it near fire.*
  - 3. Do not solder on any part of the battery. (Doing so may result in leakage of electrolyte from the battery, burning, explosion. The leakage may damage devices close to the battery.)*
  - 4. Do not change the battery. (An explosive gas may be generated inside the battery, and cause burning or explosion.)*
  - 5. Do not dismantle the battery. (The gas inside the battery may hurt your throat. Leakage, burning, or explosion may also result.)*
  - 6. Do not install the battery in the wrong direction. (This may cause burning or explosion.)*

## 6.2 SERVICE MAINTENANCE

Certain maintenance is required when the printer detects an error or when a decline in print quality is observed.

### 6.2.1 Printhead Cleaning

If print quality deteriorates, clean the printhead using the built-in printhead cleaning function. The printer also has an automatic printhead cleaning cycle to ensure the proper nozzle operation for ink injection as well as to preserve its best condition. Therefore, perform this printhead cleaning operation only if print quality declines, in order to avoid wasting ink.

1. Turn the printer on and press the **Pause** button to pause the printer. Make sure that the PAUSE LED is on.
2. Hold down the **Alt** button and press the **Load/Eject** button for blackhead cleaning.  
Hold down the **Alt** button and press the **Economy/Condensed** button for color head cleaning.

When the panel switch operation is accepted by the printer, the PAUSE LED flashes during the cleaning cycle. When the cleaning completes, the PAUSE LED stops flashing and returns to the standby mode.

### 6.2.2 Waste Ink Drain Tank Replacement

The printer counts the total amount of ink wasted to the waste ink drain tank and this information is stored in the EEPROM on the main board (**Protect counter A**) for the ink system operation management. If the value of this counter reaches the predetermined value, the printer displays an error ("Waste ink tank over-flow," see Chapter 1, section 1.4.4, Error Conditions, Table 1-10). When this error is displayed, replace the waste ink absorbing materials and reset the protect counter.

1. Open the upper case and replace the waste ink absorbing materials from the compartment of the lower case. Reassemble the printer.
2. Turn the printer while holding down the **Alt, Font, Load/Eject, Pause** buttons. This resets the protect counter.

## 6.3 LUBRICATION AND ADHESIVE

The printer must be lubricated properly when the printer is disassembled for component replacement, or if the mechanical noise exceeds a certain level. EPSON recommends only the lubricants listed in table below for this printer, both of which have been tested extensively and found to comply with the requirements of this printer mechanism. Figure 6-2 shows the lubrication points.

**Table 6-1. Recommended Lubricants**

Type	Name	Q'ty	Part No.	Availability
Oil	o-5	40 cc	1010513	E
Grease	G-20	40 gm	B700000001	E
	G-36	40 gm	B703600001	E
Adhesive	NEJI LOCK #2 (G)	1000 g	B730200200	E

Note) E= EPSON Exclusive product (Not commercially available)

**Table 6-2. Lubrication and Adhesive Points**

Ref. No.	Lubrication/Adhesive Point	Lubricant
(1)	Extreme point of the knob (Gear)	G-36 (1-3 mg)
(2)	Cut point for knob on the right main frame	<b>G-36 (1-3 mg)</b>
(3)	Extreme point of shaft securing sub frame assembly	G-36 (1-3 mg)
(4)	Gearing point of the complex gear	<b>G-36 (1-3 mg)</b>
(5)	Both sides of gear holder (2-points)	<b>G-36 (1-3 mg)</b>
(6)	Shaft located at the center frame assembly (2-points)	<b>G-36 (1-3 mg)</b>
(7)	Cut point for the CR motor on the base frame assembly (2-points)	<b>G-36 (1-3 mg)</b>
(8)	Right extreme point of the eject roller assembly	G-36 (1-3 mg)
(9)	Contact point of the pressure spring and washer	<b>G-36 (1-3 mg)</b>
(10)	Right side of the front paper guide	<b>G-20 (1-3 mg)</b>
(11)	Cut point on the platen roller shaft	<b>G-20 (1-3 mg)</b>
(12)	Oil pad on the carriage	<b>05 (1-3 mg)</b>
(13)	On securing the screw	<b>NEJI LOCK #2 (1-3 mg)</b>

### CAUTION

■ Do not apply too much lubricant, as it may cause a stain on the mechanism as well as a malfunction of the mechanism.

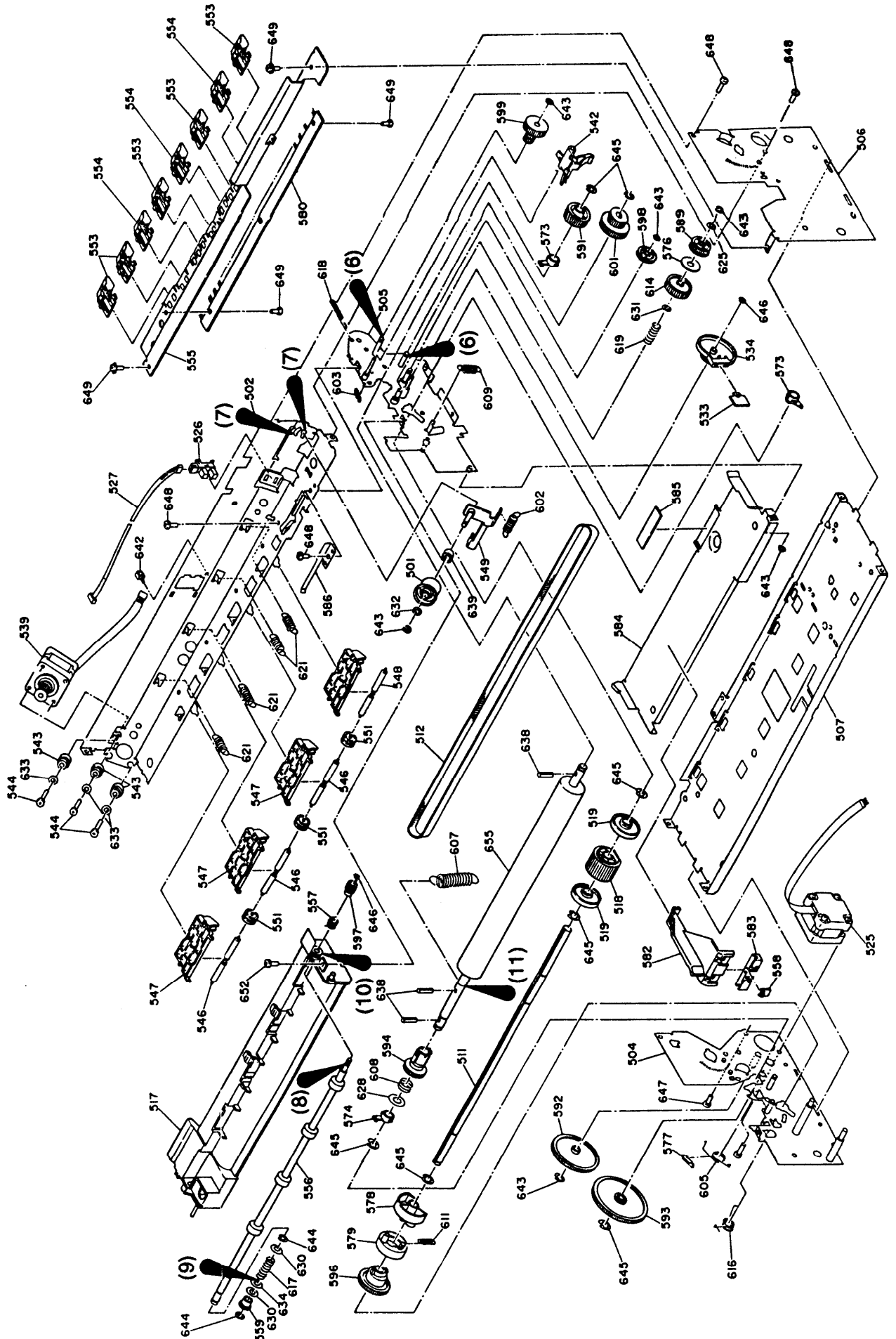


Figure 6-1. Lubrication and Adhesive Points (1)

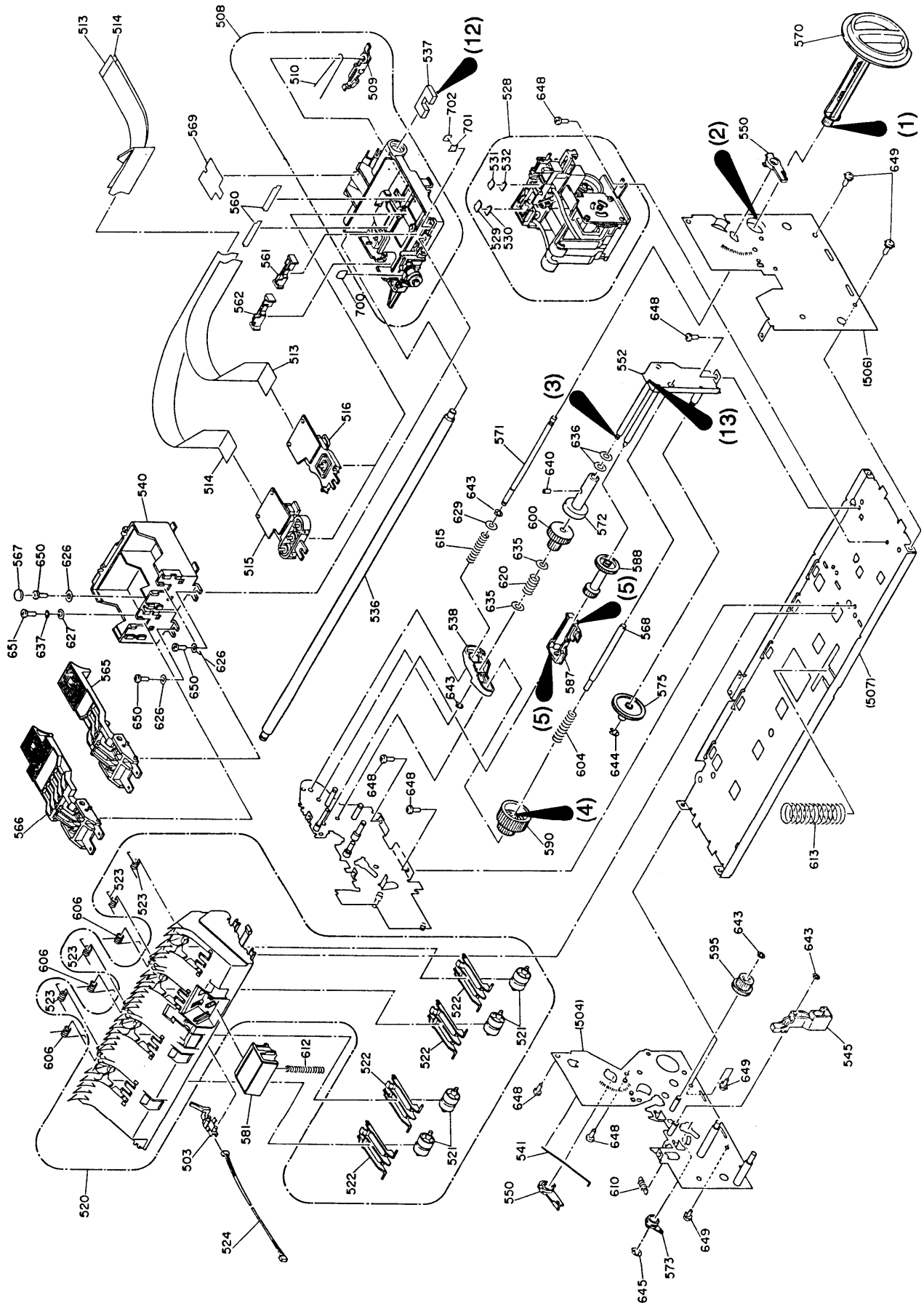


Figure 6-2. Lubrication and Adhesive Points (2)

# Appendix

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## Table of Contents

<b>A.1 CONNECTOR SUMMARY</b>	<b>A-3</b>
<b>A.2 CIRCUIT DIAGRAM</b>	<b>A-7</b>
<b>A.3 CIRCUIT BOARD COMPONENT LAYOUT</b>	<b>A-13</b>
<b>A.4 EXPLODED DIAGRAM</b>	<b>A-16</b>

## List of Figures

Figure A-1. Interconnection of Major Components . . . . .	A-2
Figure A-2. C137 MAIN Board Circuit Diagram (1) . . . . .	A-7
Figure A-3. C137 MAIN Board Circuit Diagram (2) . . . . .	A-9
Figure A-4. C137 PSB Board Circuit Diagram. . . . .	A-10
Figure A-5. C137 PSE Board Circuit Diagram. . . . .	A-11
Figure A-6. C137 PNL Board Circuit Diagram. . . . .	A-12
Figure A-7. C137 MAIN Board Component Layout . . . . .	A-13
Figure A-8. C137 PSB/PSE Board Component Layout. . . . .	A-14
Figure A-9. C137 PNL Board Component Layout . . . . .	A-15
Figure A-10. Stylus Color Exploded Diagram (1). . . . .	A-16
Figure A-11. Stylus Color Exploded Diagram (2). . . . .	A-17
Figure A-12. Stylus Color Exploded Diagram (3) . . . . .	A-18

## List of Tables

Table A-1. Connector Summary . . . . .	A-3
Table A-2. Connector Pin Assignments - CN1 . . . . .	A-3
Table A-3. Connector Pin Assignments - CN2 . . . . .	A-4
Table A-4. Connector Pin Assignments - CN3 . . . . .	A-4
Table A-5. Connector Pin Assignments - CN4 . . . . .	A-4
Table A-6. Connector Pin Assignments - CN5 . . . . .	A-5
Table A-7. Connector Pin Assignments - CN6 . . . . .	A-5
Table A-8. Connector Pin Assignments - CN7 . . . . .	A-5
Table A-9. Connector Pin Assignments - CN8 . . . . .	A-5
Table A-10. Connector Pin Assignments - CN9 . . . . .	A-5
Table A-11. Connector Pin Assignments - CN10 . . . . .	A-6
Table A-12. Connector Pin Assignments - CN11 . . . . .	A-6
Table A-13. Connector Pin Assignments - CN12 . . . . .	A-6

## A.1 CONNECTOR SUMMARY

The figure below shows the interconnection between the major components of the Stylus Color.

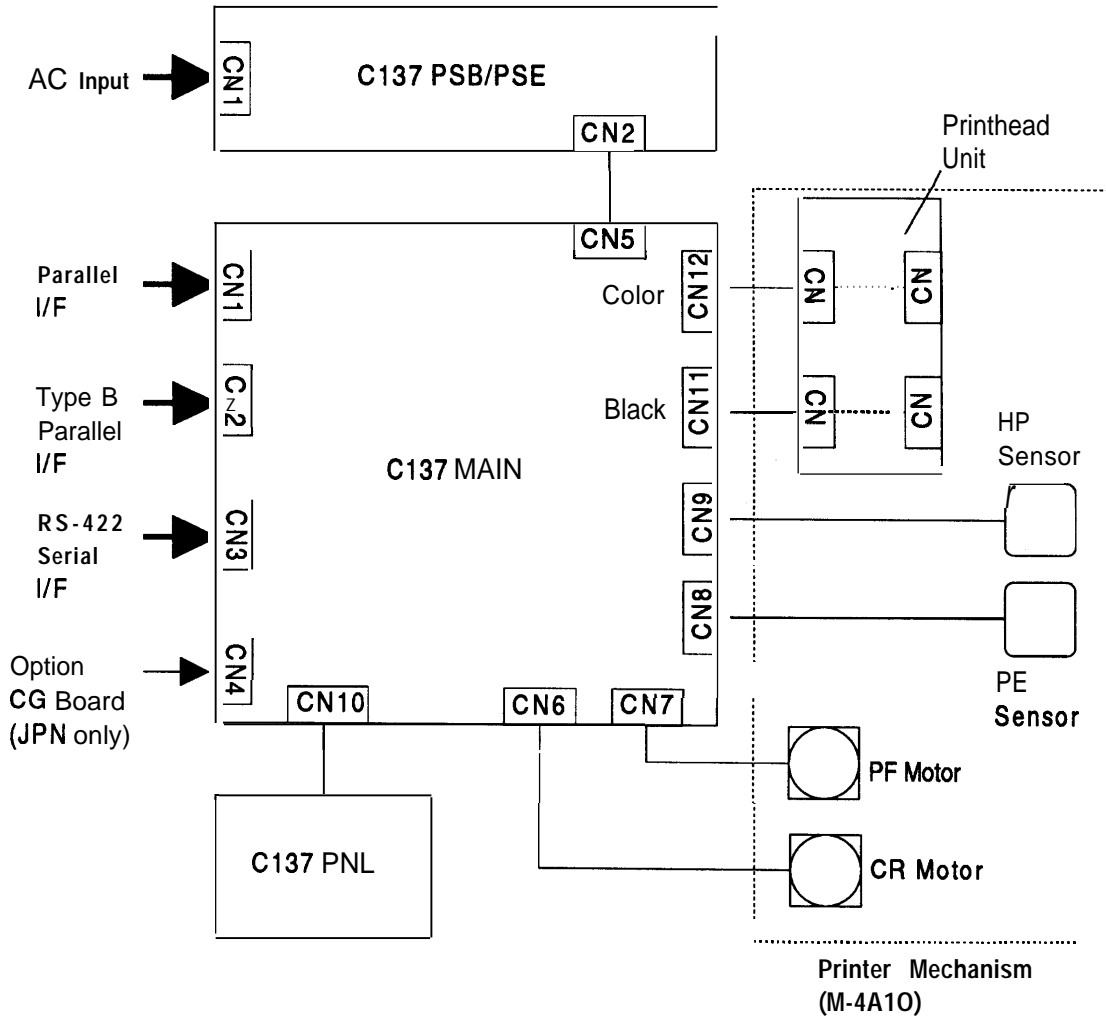


Figure A-1. Interconnection of Major Components



Table A-1. Connector Summary

Board	Location	Pin	Description
C137 MAIN	CN1	36	Centronics parallel I/F
	CN2	36	Type B parallel I/F
	CN3	8	RS-422 serial I/F
	CN4	60	CG board (JPN only)
	CN5	6	Power supply from PS board
	CN6	5	carriage motor phase output
	CN7	5	PF/PM motor phase output
	CN8	2	Paper end sensor
	CN9	3	Carriage home position sensor
	CN10	20	Control panel (to C137 PNL)
	CN11	22	Black head nozzle selector & common driver
	CN12	22	Color head nozzle selector & common driver
C137 PSB/PSE	CN1	2	AC inlet (L/N)
	CN2	8	DC output (+5V/+35V)
C137 PNL	CN1	20	(to C137 MAIN)

Table A-2. Connector Pin Assignments - CN1

Pin	I/O	Name	Description
1	I	/STB	Strobe signal
2-9	I	DATA1-8	Data strobe signal
10	O	/ACK	ACK signal
11	O	BUSY	Busy signal
12	O	PE	Paper end signal
13	O	SLCT	Printer select signal
14	I	/AFXT	Auto line feed signal
15	.	NC	Not connected
16	-	GND	Ground
17	.	FG	Frame ground
18	.	+5V	+5V DC
19-30	.	GND	Ground
31	I	/INIT	INIT signal
32	O	/ERR	Error signal
33	-	GND	Ground
34	-	NC	Not connected
35	.	+5V	+5V DC
36	I	/SLIN	Select in signal

Table A-3. Connector Pin Assignments - CN2

Pin	I/o	Name	Description
1-6	I	+5V	Power supply for I/F drive
7	o	TXD	Transmit data
8	0	/READY	Ready signal
9	I	RXD	Receive data
10		NC	Not connected
11	o	IRESET	Reset signal
12	0	INH	Inhibit signal
13	0	/CMREQ	Command request signal
14	0	/WRRDY	Write ready signal
15	0	/RDREQ	Read request signal
16	0	/HWR	High write signal
17	0	/RD	Read signal
18	0	/CS	Chip select signal
19-24	.	GND	Ground
25-28	I/O	A3-A0	Address bus signal 3-0
29-36	I/O	D15-D8	Data bus signal 15-8

Table A-4. Connector Pin Assignments - CN3

Pin	I/O	Name	Description
1	-	DTR	Data terminal ready
2		NC	Not connected
3	0	TXD-	Transmit data-
4		GND	Ground
5	I	RXD-	Receive data -
6	o	TXD+	Transmit data+
7		NC	Not connected
8	I	RXD+	Receive data +

Table A-5. Connector Pin Assignments - CN4

Pin	I/o	Name	Description
13,67,10,35, 37,41,67,69	I	+5V	Power supply for option CG
2,4,5,8,9,39, 48,52,56,60		GND	Ground
46,44,42,40, 38,36,34,32, 30,28,26,24, 22,20,18,16, 14,12,33,31, 29,27	0	A0-A21	Address signal 0-21
25,23,21,19, 17,15,13,11	I/O	D8-D15	Data bus signal 8-15
43	o	/RD	Read signal for CG board
55	0	/CGOE	Output enable CG ROM on CG board
58,45,47,49, 50,51,53,54	0	/CG	CG ROM output enable signal on CG board (Memory select signal)

**Table A-6. Connector Pin Assignments - CN5**

Pin	I/O	Name	Description
1	I	PSC	Power scan signal
2,3	I	+35V	Head common driver for common drive circuit
4-6		GND	Ground
7,8	I	+5V	Power supply for logic system

**Table A-7. Connector Pin Assignments - CN6**

Pin	I/O	Name	Description
1	0	CRA	Phase A drive signal
2	0	CR/A	Phase /A drive signal
3	0	CRB	Phase B drive signal
4	0	CR/B	Phase /B drive signal
5	0	CRCOM	Carriage drive power (common voltage)

**Table A-8. Connector Pin Assignments - CN7**

Pin	I/O	Name	Description
1	0	PFA	Phase A drive signal
2	0	PF/A	Phase /A drive signal
3	0	PFB	Phase B drive signal
4	0	PF/B	Phase /B drive signal
5	0	PFCOM	Carriage drive power (common Wage)

**Table A-9. Connector Pin Assignments - CN8**

Pin	I/O	Name	Description
1	I	PE	Paper on/out state detection signal
2	.	GND	Ground

**Table A-10. Connector Pin Assignments - CN9**

Pin	I/O	Name	Description
1	I	HP	Home position detection signal
2	.	GND	Ground
3	0	HPV	Sensor drive power supply

**Table A-1 1. Connector Pin Assignments- CN10**

Pin	I/O	Name	Description
1,3,5,7	.	GND	Ground
2	0	LDATA	LED data
4	0	LCLK	Clock signal for LED drive
6	0	LLAT	LED data latch signal
8	0	LCLR	LED data reset signal
9,11,19,20	I	+5V	LED driver and power
10,12-16	I	SWO-5	Switch 0-5 input signal
17	I	PSW	Power switch
18	I	PSC	Power scan

Table A-1 2. Connector Pin Assignments- CN11

Pin	I/o	Name	Description
1		GND	Ground
2	o	BCLK	Clock signal for black head
3		GND	Ground
4	0	BLAT	Latch signal for black head
5		GND	Ground
6	0	BSI	Black head Serial data output
7		GND	Ground
8	0	BCO	Black cartridge out sensor
9		+5V	Power supply for cartridge out sensor
10		NC	Not connected
11-16	o	GP	Ground
17-22	0	COM	Common voltage for <b>printhead</b> drive

Table A-13. Connector Pin Assignments - CN12

Pin	I/o	Name	Description
1		GND	Ground
2	o	CCLK	Clock signal for color head
3		GND	Ground
4	0	CLAT	Latch signal for color head
5	.	GND	Ground
6	0	CSI	Color head Serial data output
7		GND	Ground
8	0	Cco	Color cartridge out sensor
9		+5V	Power supply for cartridge out sensor
10		TH	Thermistor signal
11-16	o	GP	Ground
18-22	0	COM	Common voltage for <b>printhead</b> drive

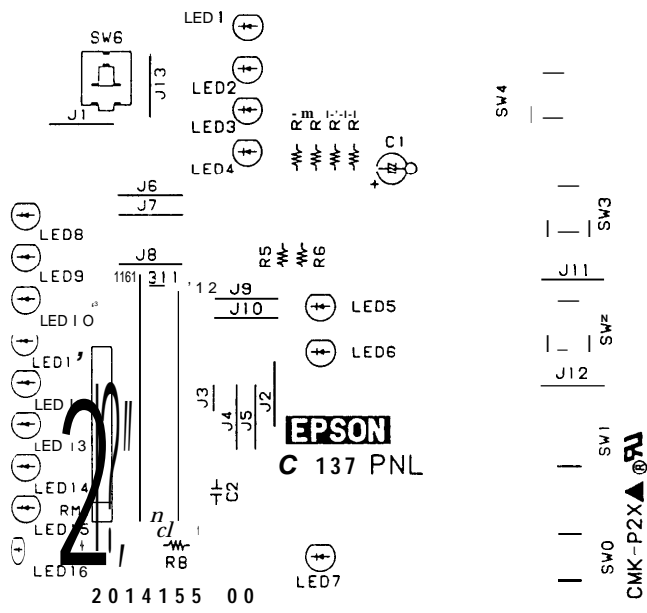


Figure A-9. C137 PNL Board Component Layout

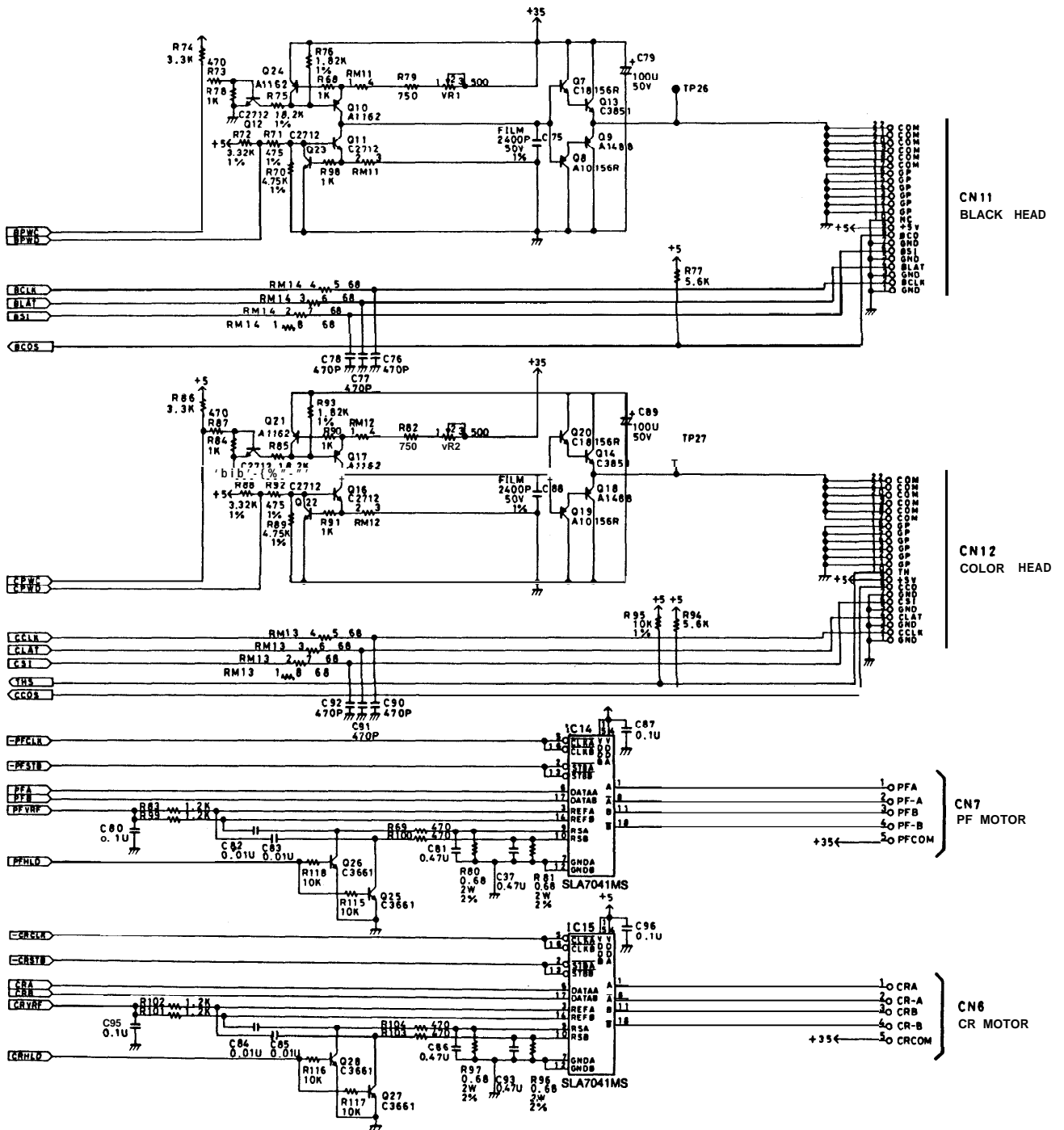


Figure A-3. C137 MAIN Board Circuit Diagram (2)

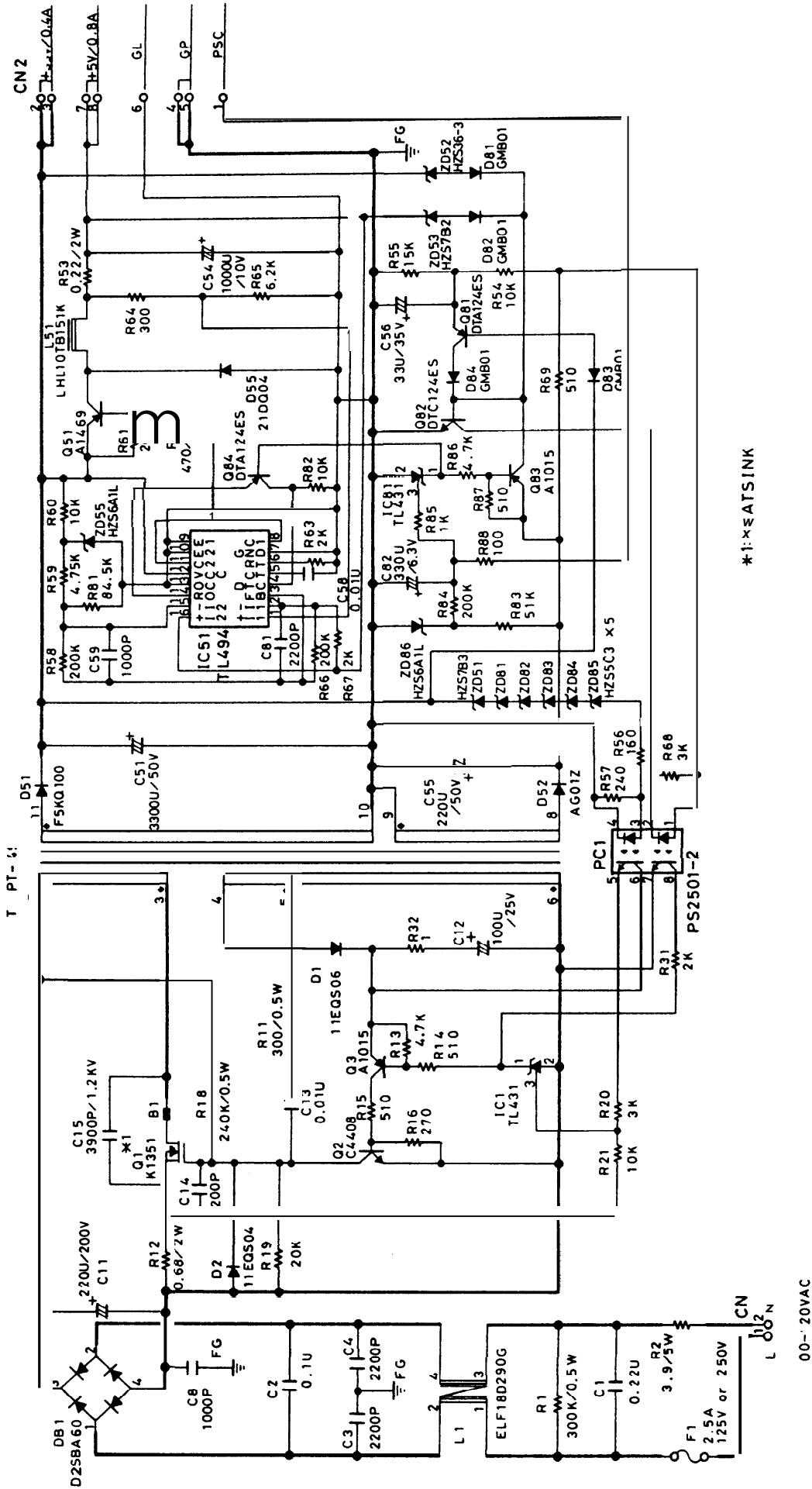


Figure A-4. C137 PSB Board Circuit Diagram

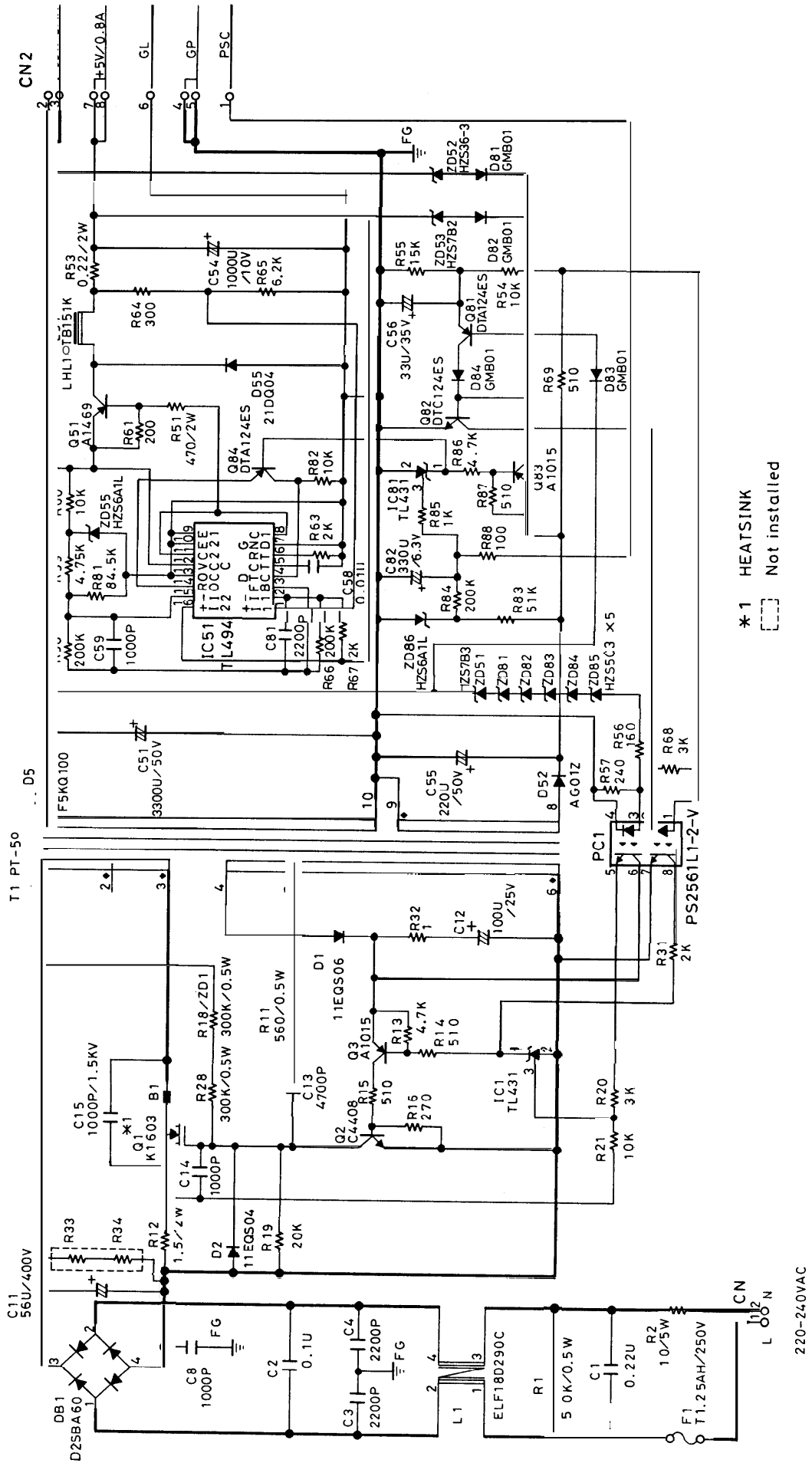


Figure A-5. C137 PSE Board Circuit Diagram



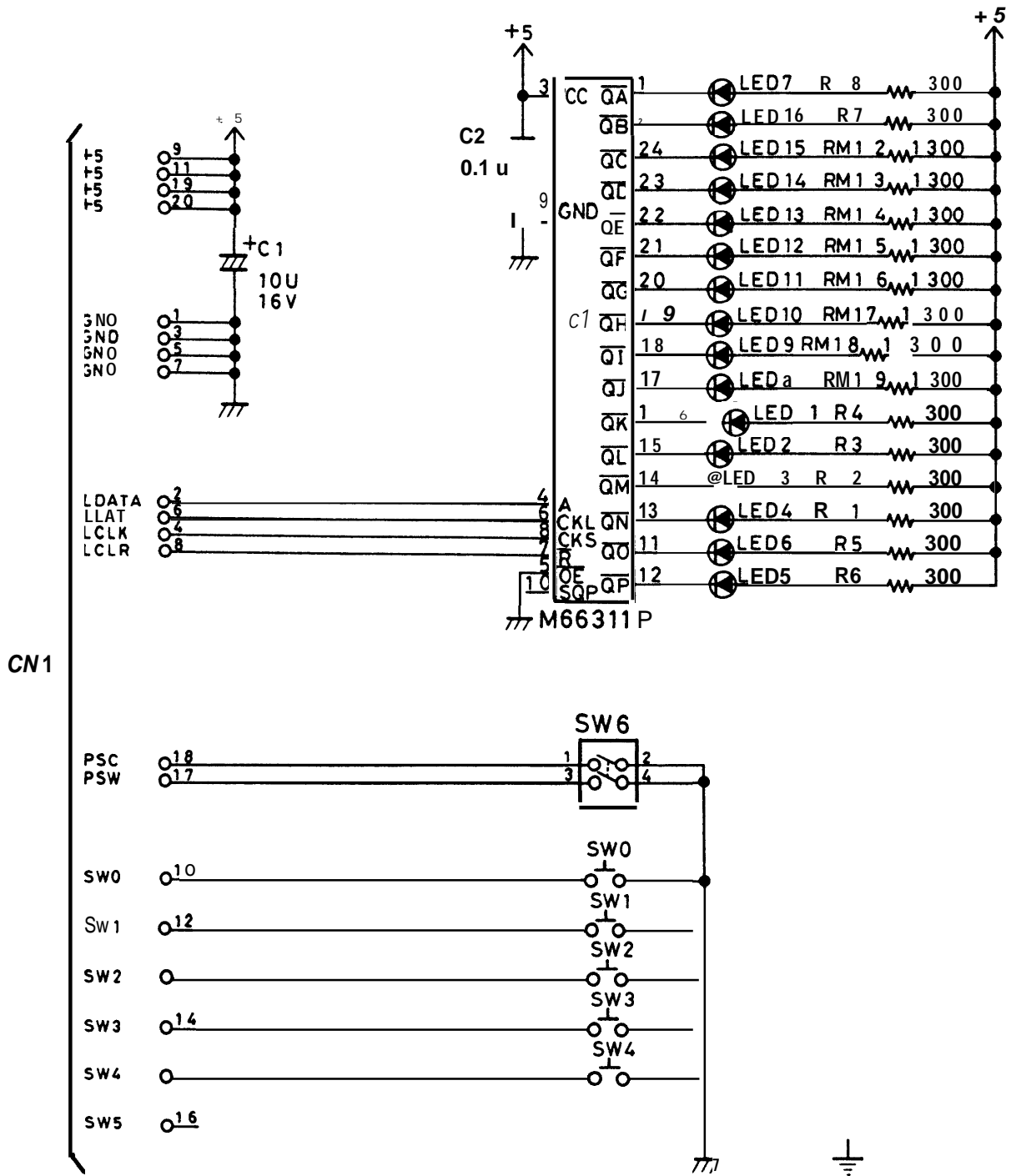


Figure A-6. C137 PNL Board Circuit Diagram

# A.3 CIRCUIT BOARD COMPONENT LAYOUT

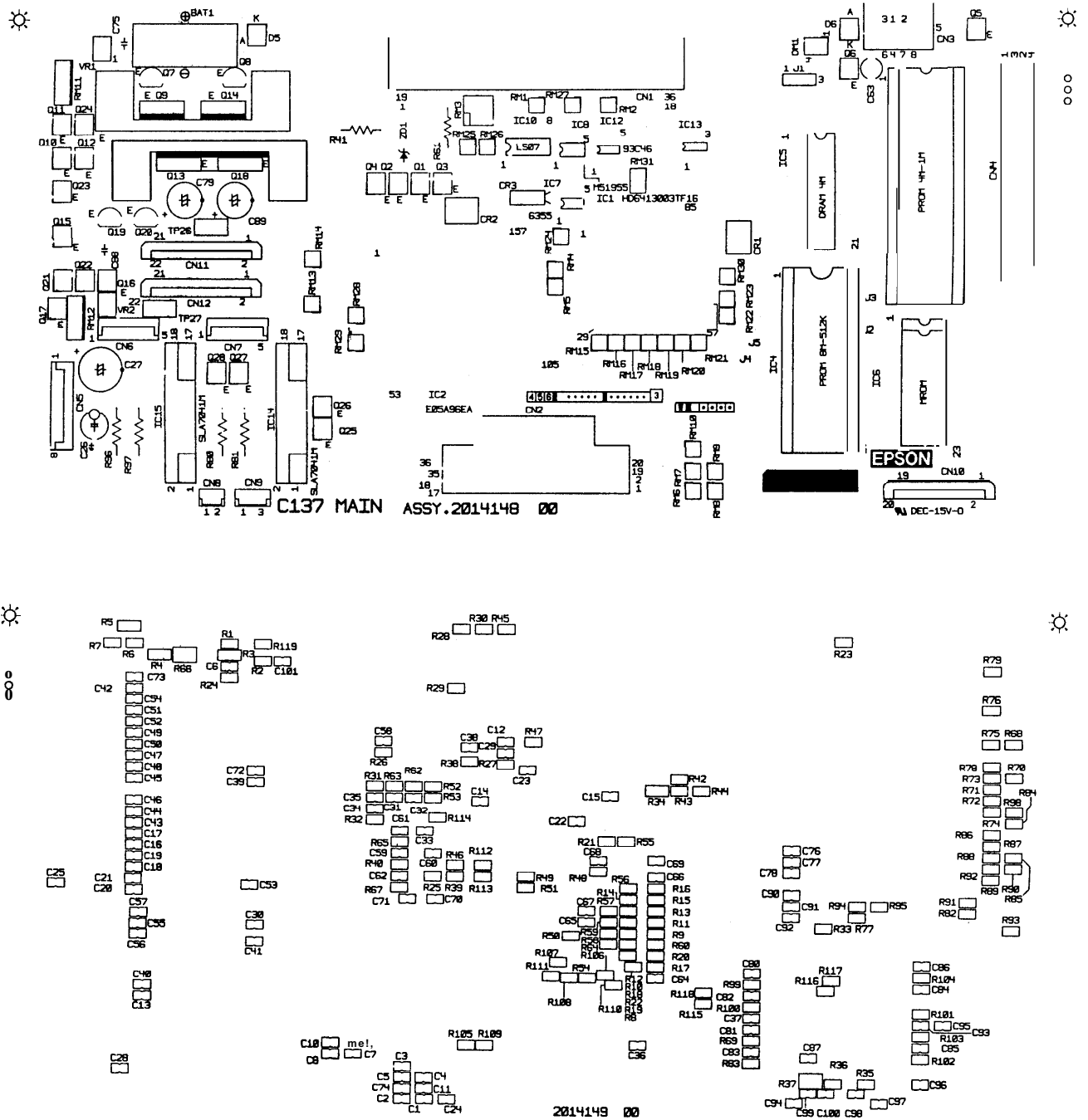


Figure A-7. C137 MAIN Board Component Layout

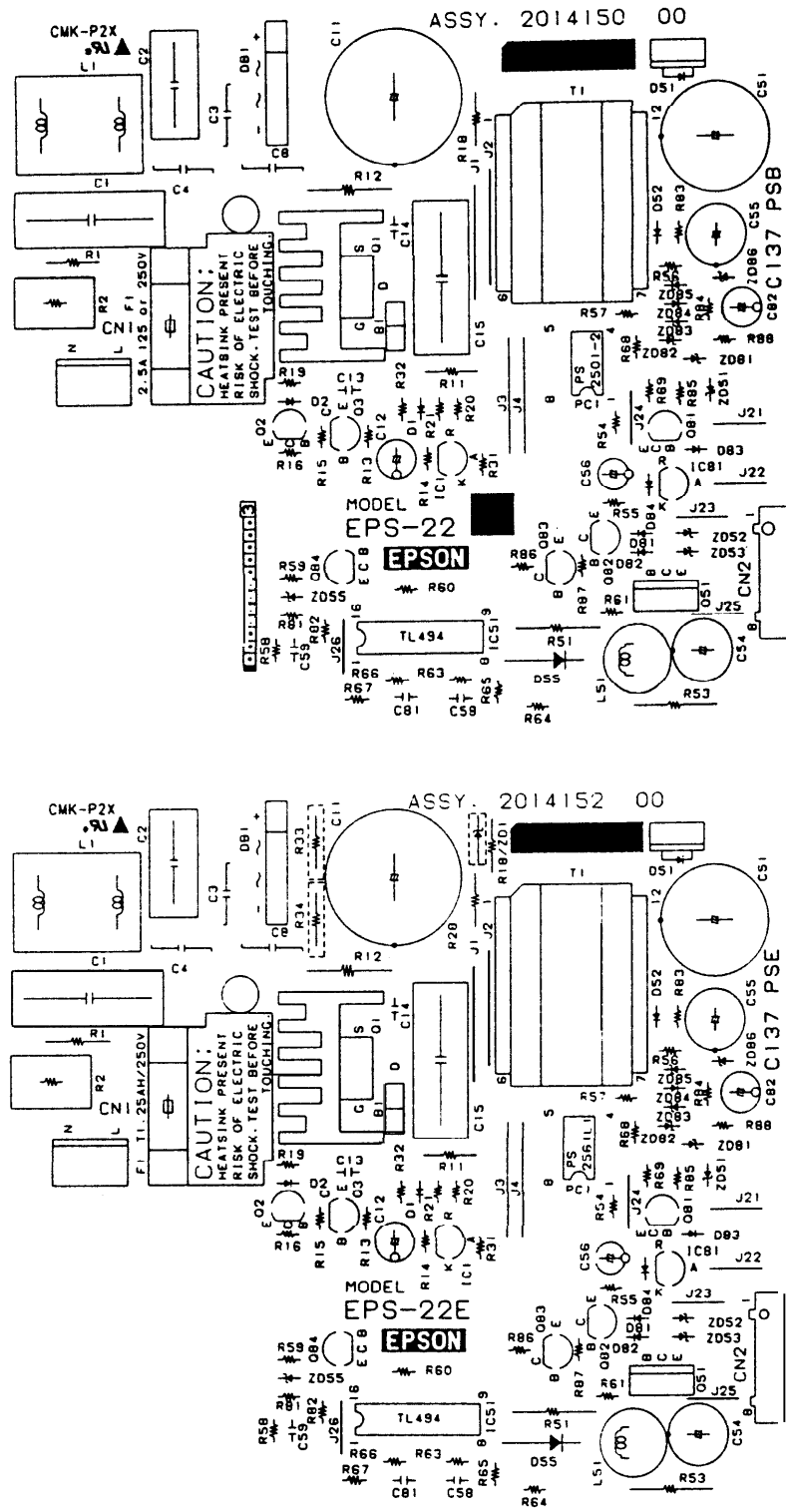


Figure A-8. C137 PSB/PSE Board Component Layout

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