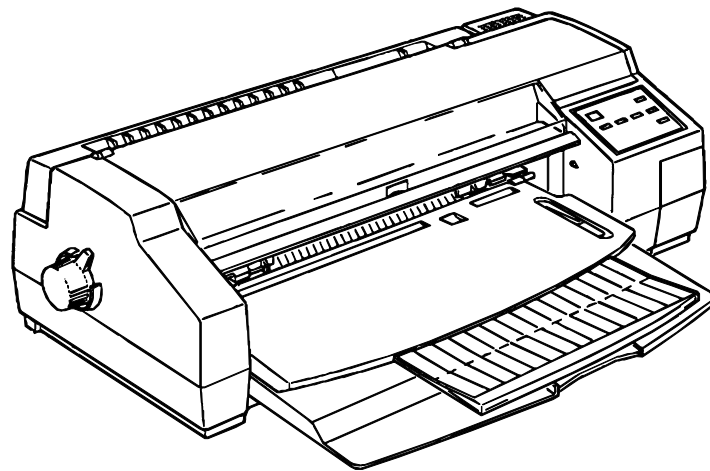


EPSON COLOR INKJET PRINTER

Stylus 1500

SERVICE MANUAL



EPSON

4005452

REVISION SHEET

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PREFACE

This manual describes functions, theory of electrical and mechanical operations, maintenance, and repair of Stylus 1500.

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. GENERAL 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.

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Chapter 1 Product Description

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1.1 FEATURES

The Stylus 1500 is a business-use, high-speed, and high-quality color ink jet printer. The main features of this printer are:

- High print quality for color graphics
 - 720 dpi printing
 - High Speed semi 720 dpi printing
- Large capacity black ink cartridge
 - 3 million characters (LQ mode)
- High-speed printing
 - LQ printing at 200 cps
 - Draft printing at 400 cps
- Built-in auto sheet feeder and push tractor
 - This holds:
 - Envelope to A2 size portrait
 - 100 cut sheets, using 14 lb (55 g/m²) paper
 - 10 envelopes
 - 50 transparency sheets
 - 70 sheets of special paper
- Two built-in interfaces
 - Bidirectional parallel I/F (IEEE-P1284 compatible)
 - Type-B I/F
- Easy setup
 - Multilingual messages (five languages), selected using the control panel
 - No DIP switches
- Four scalable fonts, five LQ fonts, and one draft font installed
 - Scalable fonts: Roman T, Sans Serif H, Roman, Sans Serif
 - LQ bitmap fonts: Roman, Sans Serif, Courier, Prestige, Script
- Useful character tables
 - Standard: Italic, PC437, PC850, PC860, PC861, PC863, PC865, BRASCII, Abicomp, Roman 8, ISO Latin 1
 - NLSP: Italic, PC437, PC437 Greek, PC850, PC852, PC853, PC855, PC857, PC866, PC869, MAZOWIA, Code MJK, ISO 8859-7, ISO Latin 1T, Bulgaria, Roman 8, PC774, Estonia, ISO Latin 1, ISO Latin 2, PC866 LAT

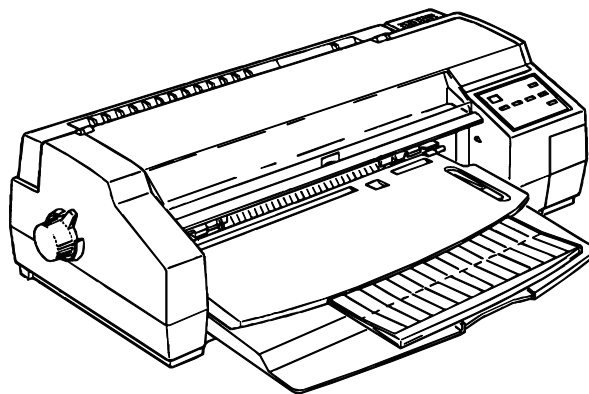


Figure 1-1. Stylus 1500 Exterior View

Table 1-1. Options and Consumables

Model	Description
C83216*	Color upgrade kit
C823071 / C823081	32 KB serial interface card
C82310*	32 KB parallel interface card
C82313*	32 KB IEEE-488 interface card
C82315*	TWAIN interface card
C82312*	Coax interface card
C82312*	LocalTalk™ interface card
C82331*	Ethernet interface card
C836021 / C836022	Parallel interface cable (from D-SUB 25-pin to Amphenol 57)
C836031 / C836061	Serial interface cable (from D-SUB 25-pin to D-SUB 25-pin)
C836051 / C836061	Serial interface cable (from D-SUB 9-pin to D-SUB 25-pin)
S020062	Monochrome ink cartridge
S020049	Color ink cartridge
S041059	Exclusive paper (360 dpi) A4
S041060	Exclusive paper (360 dpi) Letter
S041065	Exclusive paper (360 dpi) A3
S041066	Exclusive paper (360 dpi) Super A3 / B
S041077	Exclusive paper (360 dpi) A2
S041066	Exclusive paper (720 dpi) A4
S041062	Exclusive paper (720 dpi) Letter
S041067	Exclusive paper (720 dpi) Legal
S041068	Exclusive paper (720 dpi) A3
S041069	Exclusive paper (720 dpi) Super A3 / B
S041070	Exclusive paper (720 dpi) B
S041076	Exclusive paper (720 dpi) A2
S041071	High quality glossy paper A4
S041072	High quality glossy paper Letter
S041073	High quality glossy paper A3
S041074	High quality glossy paper Super A3 / B
S041075	High quality glossy paper B
S041063	Transparency A4
S041064	Transparency Letter
S041054	Super coated index card for 720 dpi A6

*: The asterisk mean substitute for the last digit, which varies by each destinations.

1.2 SPECIFICATIONS

This section provides detailed information about the Stylus 1500.

1.2.1 Printing Specifications

Printing method:

On-demand ink jet

Nozzle configuration:

Monochrome: 64 nozzles (32 x 2 staggered)

Color: 60 nozzles (20 x 3, magenta, cyan, yellow)

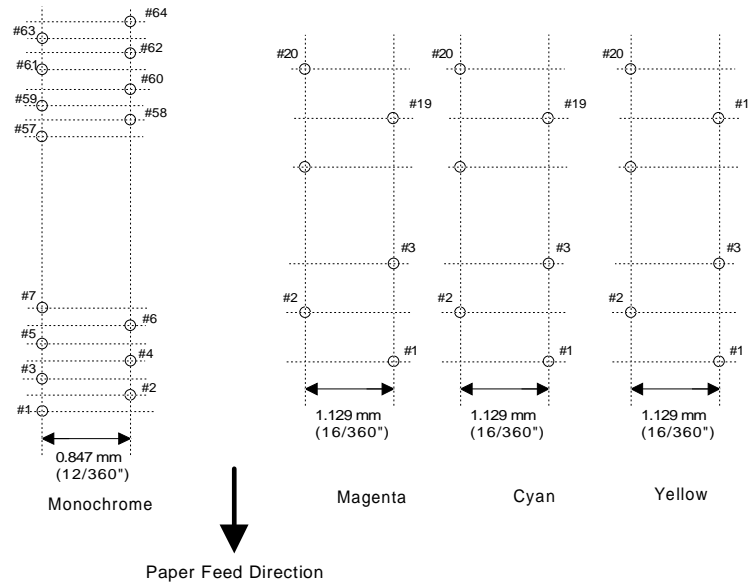


Figure 1-2. Nozzle Configuration

Printing direction:

Bidirectional with logic-seeking

Table 1-2. Print Speeds and Printable Columns

Character Pitch	Printable Columns	LQ Speed	Draft Speed
10 cpi (pica)	136	200 cps	400 cps
12 cpi (elite)	163	240 cps	480 cps
15 cpi	204	300 cps	600 cps
17 cpi (pica condensed)	233	343 cps	686 cps
20 cpi (elite condensed)	160	400 cps	800 cps

Control codes:

ESC/P2 and extended raster graphics codes
 EPSON remote commands
 IBM XL24E emulation

Fonts:

Bitmap LQ fonts:	EPSON Roman	10 cpi, 12 cpi, 15 cpi, Proportional
	EPSON Sans Serif	10 cpi, 12 cpi, 15 cpi, Proportional
	EPSON Courier	10 cpi, 12 cpi, 15 cpi
	EPSON Prestige	10 cpi, 12 cpi, 15 cpi
	EPSON Script	10 cpi, 12 cpi, 15 cpi
Scalable fonts:	EPSON Roman	10.5 pt., 8 pt. - 32 pt. (in units of 2 pt.)
	EPSON Sans Serif	10.5 pt., 8 pt. - 32 pt. (in units of 2 pt.)
	EPSON Roman T	10.5 pt., 8 pt. - 32 pt. (in units of 2 pt.)
	EPSON Sans Serif H	10.5 pt., 8 pt. - 32 pt. (in units of 2 pt.)

Note: Each typeface has four variations (normal, bold, italic, and bold italic).

Table 1-3. Character Tables and Fonts

Character Tables		Bitmap Fonts	Scalable Fonts	
		EPSON Roman EPSON Sans Serif EPSON Courier EPSON Prestige EPSON Script	EPSON Roman EPSON Sans Serif	EPSON Roman T EPSON Sans Serif H
Standard Version	Italic PC437 (U.S., Standard Europe) PC850 (Multilingual) PC860 (Portuguese) PC861 (Icelandic) PC863 (Canadian-French) PC865 (Nordic) BRASCII Abicomp Roman 8 ISO Latin 1	Supported	Supported	Supported
NLSP Version	Italic PC437 (U.S., Standard Europe) PC437 (Greek) PC850 (Multilingual) PC852 (East Europe) PC853 (Turkish) PC855 (Cyrillic) PC857 (Turkish) PC866 (Russian) PC869 (Greek) MAZOWIA (Poland) Code MJK (CSFR) ISO 8859-7 (Latin/Greek) ISO Latin 1T (Turkish) Bulgaria Roman 8 PC774 Estonia ISO Latin 1 ISO Latin 2 PC866 LAT	Supported	Supported	None supported

1.2.2 Paper Feeding

Feeding method:	Friction feed with built-in auto sheet feeder (ASF) and push tractor feed
<i>Note : Reverse feeding beyond 9.5 mm (0.38") is not allowed.</i>	
Line spacing:	1/6 inch, 1/8 inch, or programmable in units of 1/360 inch
Paper path:	Cut sheet front entry / front exit by ASF Single sheet rear entry / front exit and continuous paper rear entry / front exit
Feeding speed:	71 ms (1/6 inch) 3 inches/second (continuous feeding)

1.2.3 Input Data Buffer

Capacity:	256 KB
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1.2.4 Electrical Specifications

120 V Version

Rated voltage:	120 VAC
Input voltage range:	103.5 - 132 VAC
Rated frequency range:	50 - 60 Hz
Input frequency range:	49.5 - 60.5 Hz
Rated current:	0.7 A
Power consumption:	Approximately 23 W (self-test with 10-cpi LQ characters)
Insulation resistance:	10 M Ω minimum (500 VDC between AC line and chassis)
Dielectric strength:	1000 VAC RMS - 1 minute or 1200 VAC RMS - 1 second (between AC line and chassis)

220 V Version

Rated voltage:	220 - 240 VAC
Input voltage range:	198 - 264 VAC
Rated frequency range:	50 - 60 Hz
Input frequency range:	49.5 - 60.5 Hz
Rated current:	0.4 A
Power consumption:	Approximately 20 W (self-test with 10-cpi LQ characters)
Insulation resistance:	10 M Ω minimum (500 VDC between AC line and chassis)
Dielectric strength:	1000 VAC RMS - 1 minute or 1200 VAC RMS - 1 second (between AC line and chassis)

1.2.5 Environmental Conditions

Temperature:	Operating:	10 to 35° C
	Non-operating:	-20 to 40° C
	Non-operating: *1	-20 to 60° C
		1 month at 40° C
		120 hours at 60° C
Humidity:	Operating: *2	20 to 80% RH
	Non-operating: *1, *2	5 to 80% RH
Resistance to shock:	Operating:	1G, within 1 ms
	Non-operating: *1	2 G, within 2 ms
Resistance to vibration:	Operating:	0.15 G
	Non-operating: *1	0.50 G

Notes: *1 In shipment container. *2 Without condensation.

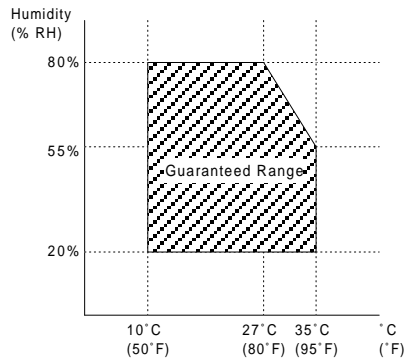


Figure 1-3. Environmental Conditions

1.2.6 Reliability

Total print volume:	75,000 pages (letter or A4)
Printhead life:	1,000 million dots/nozzle

1.2.7 Safety Approvals

120 V Version

Safety standards:	UL 1950 with D3 CSA 22.2 950 with D3
EMC:	FCC part 15 subpart B class B

220 - 240 V Version

Safety standards:	EN 60950 (TÜV, SEMKO, DEMKO, NEMKO, FIMKO)
EMC:	EN 55022 (CISPR Pub. 22) class B EN 50082-1

1.2.8 CE Marking

220 - 240 V Version

Lower Voltage Directive 73/23/EEC:	EN60950
EMC Directive 89/336/EEC:	EN55022 Class B EN50082-1 IEC801-2 IEC801-3 IEC801-4

1.2.9 Acoustic Noise

Noise level: Approximately 45 dB(A) (according to ISO 7779)

1.3 INTERFACES

1.3.1 Hardware Interfaces

This section describes the Stylus 1500 interfaces. The printer is standard-equipped with a parallel interface.

1.3.1.1 Parallel Interface

Forward Channel

Transmission mode:	8 bit parallel, IEEE-P1284 compatibility mode
Synchronization:	<u>STROBE</u> pulse
Handshaking:	<u>BUSY</u> and <u>ACKNLG</u> signal
Signal level:	TTL-compatible level (IEEE-P1284 Level 1 device)
Adaptable connector:	57-30360 (Amphenol or equivalent)

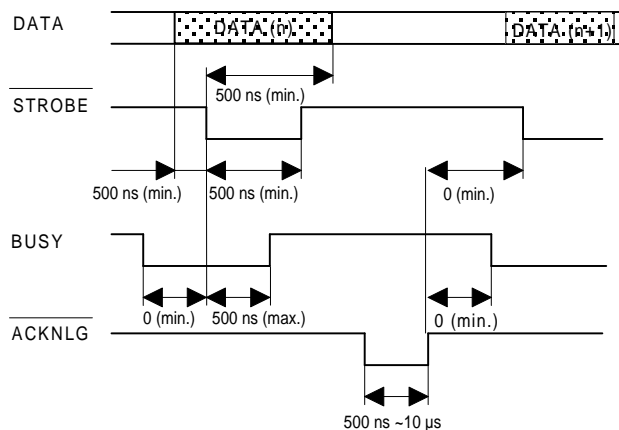
The BUSY signal is set HIGH before either ERROR is set LOW or PE is set HIGH, and BUSY is held HIGH until all these signals return to the inactive state. The BUSY signal goes HIGH in the following cases:

- o During data entry (See Figure 1-4 below.)
- o When the input data buffer is full.
- o When the INIT signal is LOW or during hardware initialization.
- o During a printer error condition (See the ERROR signal description below.)
- o During self-test printing.
- o In default setting mode.
- o When the parallel interface is not selected.

The ERROR signal is LOW when the printer is in one of the following conditions:

- o Printer hardware error (fatal error).
- o Paper-out error.
- o Release lever operation error.

The PE signal is HIGH during a paper-out error.



* : The rise and fall time of every output signal must be less than 120 ns.
The rise and fall time of every input signal must be less than 200 ns.

Figure 1-4. Data Transmission Timing

Table 1-4 shows the connector pin assignments and signals for the forward channel of the parallel interface. Table 1-5 shows this information for the reverse channel.

Table 1-4. Connector Pin Assignments and Signals (Forward Channel)

Pin No.	Signal Name	Return GND Pin	I/O	Description
1	$\overline{\text{STROBE}}$	19	I	Reading of data is performed at the falling edge of this pulse.
2 - 9	DATA 0 - 7	20 - 27	I	Signals DATA0 - DATA7 represent data bits 0 to 7, respectively. Each signal is HIGH when the data is logical 1 and LOW when the data is logical 0.
10	$\overline{\text{ACKNLG}}$	28	O	This signal is a negative pulse indicating that the printer can accept more data.
11	BUSY	29	O	When this signal is HIGH, the printer cannot receive data.
12	PE	28	O	When this signal is HIGH, the printer detects a paper-out error.
13	SLCT	28	O	This signal is always HIGH when the printer is powered on.
14	$\overline{\text{AFXT}}$	30	I	
15	NC	—	—	Not connected.
31	$\overline{\text{INIT}}$	30	I	The falling edge of a negative pulse or a LOW signal on this line causes the printer to initialize. A 50 μs (minimum) pulse is necessary.
32	$\overline{\text{ERROR}}$	29	O	When this signal is LOW, the printer detects an error.
36	$\overline{\text{SLIN}}$	30	I	Not used.
18	Logic H	—	O	Pulled up to +5 V via a 3.9 K Ω resistor.
35	+5 V	—	O	Pulled up to +5 V via a 3.3 K Ω resistor.
17	Chassis GND	—	—	Chassis ground.
16, 33 19 - 30	GND	—	—	Signal ground.
15, 34	NC	—	—	Not used.

Note: The I/O column indicates the direction of the signal as viewed from the printer.

Reverse Channel

Transmission mode:	IEEE-P1284 nibble mode
Adaptable connector:	See the Forward Channel section earlier in this manual.
Synchronization:	Refer to the IEEE-P1284 specification.
Handshaking:	Refer to the IEEE-P1284 specification.
Data transmission timing:	Refer to the IEEE-P1284 specification.
Signal level:	Refer to the IEEE-P1284 specification.
Extensibility request:	The printer responds affirmatively when the extensibility request values are 00H or 04H, as follows: 00H: Request nibble mode reverse channel transfer 04H: Request device ID Return data using nibble mode channel transfer
Device ID:	The printer sends following device ID string when requested:
ESC/P2	00H 36H MFG: EPSON; CMD: ESCPL2-00; MDL: Stylus 1500; CLS: PRINTER;
XL24E	00H 37H MFG: EPSON; CMD: PRPXL24-00; MDL: Stylus 1500; CLS: PRINTER;

Note: 00H denotes a hexadecimal value of zero.

Table 1-5. Connector Pin Assignments and Signals (Reverse Channel)

Pin No.	Signal Name	Return GND Pin	I/O	Description
1	Host Clk	19	I	Host clock signal.
2 - 9	DATA 0 - 7	20 - 27	I	Signals DATA0 - DATA7 represent data bits 0 to 7, respectively. Each signal is HIGH when the data is logical 1 and LOW when the data is logical 0. These signals are used to transfer the extensibility request values (described in IEEE-P1284) to the printer.
10	PtrClk	28	O	Printer clock signal.
11	Ptr Busy / Data Bits 3, 7	29	O	Printer busy signal and reverse channel transfer data bit 3 or 7.
12	Ack Data Req / Data Bits 2, 6	28	O	Acknowledge data request signal and reverse channel transfer data bit 2 or 6.
13	Xflag / Data Bits 1, 5	28	O	X-flag signal and reverse channel transfer data bit 1 or 5.
14	Host Busy	30	I	Host busy signal.
31	$\overline{\text{INIT}}$	30	I	Not used.
32	$\overline{\text{Data Avail}}$ / Data Bits 0, 4	29	O	Data available and reverse channel transfer data bit 0 or 4.
36	1284-Active	30	I	Active signal for IEEE-P1284 mode.
18	Logic-H	—	O	Pulled up to +5 V via a 3.9 K Ω resistor.
35	+5 V	—	O	Pulled up to +5 V via a 3.3 K Ω resistor.
17	Chassis GND	—	—	Chassis ground.
16, 33 19 - 30	GND	—	—	Signal ground.
15, 34	NC	—	—	Not connected.

Note: The I / O column indicates the direction of the signal as viewed from the printer.

1.3.1.2 Optional Interface

The Stylus 1500 supports an optional Type-B interface with the following characteristics:

Reply Message: ESC/P2 is selected:

Main type: MTP48p, PW136c110cpi, PRG(L0xxxx)rev,AP800ma

Product name: Stylus 1500

Emulation type: ESCPL2-00

Entity type: EPSON LQ2

 XL24E is selected:

Main type: MTP48p, PW136c110cpi, PRG(L0xxxx)rev,AP800ma

Product name: Stylus 1500

Emulation type: PRPXL24-00

Entity type: EPSONPRPXL24

1.3.2 Printer Languages and Control Codes

Printer languages and control codes:

- ESC/P2
- IBM 24XL
- EPSON Remote

1.4 OPERATIONS

This section describes the controls, settings, and adjustments used to operate the Stylus 1500.

1.4.1 Control Panel

The control panel for this printer is in the center of the upper case. The panel has 1 lock-type and 6 non-lock-type pushbuttons, and 10 LED indicators for easy operation of the various print functions.

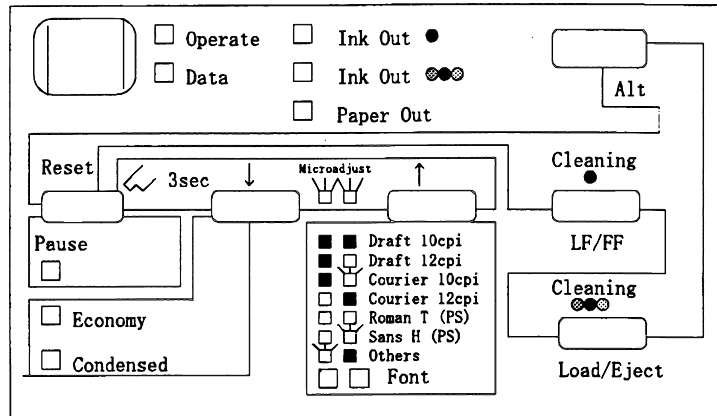


Figure 1-5. Control Panel Appearance

1.4.1.1 Buttons

Power

This button turns the printer on or off.

ATTENTION

The power button controls the secondary power supply circuit. Therefore, the primary circuit is hot after power off. Do not connect the interface cable even if the printer power is off while the AC inlet is connected. Otherwise, the circuit board or interface may be damaged.

Pause

This button alternates between printing and non-printing states when there is data in the print buffer. In the pause state, printing stops but communication with the I/F does not stop. Therefore, even in the pause state, the printer receives data from the host until the input data buffer is full.

- Pressing the Pause button while holding down the Alt button resets the printer.

Alt

This button is usually used with another button.

- o Holding down Alt for 3 seconds moves the printer carriage to the ink cartridge installation position. Pressing Alt again returns the carriage to the home position.

LF/FF

This button feeds one line or a page.

- o Pressing LF/FF while holding down Alt starts the black printhead cleaning cycle.

Economy/Condensed

This button selects economy or condensed printing mode.

Font

This button selects the desired font.

- Pressing Font while holding down Alt starts the color printhead cleaning cycle.

Load/Eject

This button loads and ejects the paper.

1.4.1.2 Indicators**Operate (green)**

Lights when the printer power is on.

Data (orange)

- Lights when there is data in the print buffer.
- Blinks with the Pause LED when an error occurs.

Black Ink Out (red)

Lights when there is no ink in the black ink cartridge, and blinks when the cartridge is low.

Color Ink Out (red)

Lights when there is no ink in the color ink cartridge, and blinks when the cartridge is low.

Paper Out (red)

Lights when the printer is out of paper, and blinks when a paper jam occurs.

Pause (orange)

Lights when printing is paused.

Economy (green)

Lights when economy printing mode is selected.

Condensed (green)

Lights when condensed printing mode is selected.

Font (green)

Shows the selected font.

1.4.2 Panel Functions at Power On

The table below describes the functions performed when the indicated buttons are held down while turning on the printer.

Table 1-6. Panel Functions at Power On

Button	Function at Printer Power On
Alt	Starts demonstration printing.
Economy/Condensed	Enters default setting mode.
Pause	Enters print adjustment mode.
Load/Eject	Starts LQ mode self-test printing.
LF/FF	Starts Draft mode self-test printing.
Alt + Pause	Enters ink smudge prevention mode.
LF/FF + Load/Eject	Enters hex dump mode.
Alt + Economy/Condensed + LF/FF + Pause	Enters reset mode for the EEPROM and Timer IC (for factory and service use only).

Notes: 1. "+" means to press one button while holding down the other button(s).
 2. The EEPROM and Timer IC must be reset only by qualified service personnel.

1.4.3 Printer Conditions and Status

The table below shows how the printer LEDs indicate status and operating conditions.

Table 1-7. Indicator Status

Printer Status	LEDs									
	Power	Data	Ink Out (Black)	Ink Out (Color)	Paper Out	Economy	Condensed	Pause	Font L	Font R
Power on	On	—	—	—	—	—	—	—	—	—
Capping after power off	Blink	—	—	—	—	—	—	—	—	—
Data present	—	On	—	—	—	—	—	—	—	—
Economy mode	—	—	—	—	—	On	—	—	—	—
Condensed mode	—	—	—	—	—	—	On	—	—	—
Pause	—	—	—	—	—	—	—	On	—	—
Micro adjust mode	—	—	—	—	—	—	—	—	Blink	Blink
Draft 10 cpi	—	—	—	—	—	—	—	—	Off	Off
Draft 12 cpi	—	—	—	—	—	—	—	—	Off	On
Courier 10 cpi	—	—	—	—	—	—	—	—	Off	Blink
Courier 12 cpi	—	—	—	—	—	—	—	—	On	Off
Roman T Proportional	—	—	—	—	—	—	—	—	On	On
Sans Serif H Proportional	—	—	—	—	—	—	—	—	On	Blink
Ink sequence	—	—	—	—	—	—	—	Blink	—	—
Ink cartridge change mode	—	—	—	—	—	—	—	Blink	—	—
Paper out	—	—	—	—	On	—	—	—	—	—
Paper jam	—	—	—	—	Blink	—	—	—	—	—
No ink cartridge or ink end (black)	—	—	On	—	—	—	—	—	—	—
Ink level low (black)	—	—	Blink	—	—	—	—	—	—	—
No ink cartridge or ink end (color)	—	—	—	On	—	—	—	—	—	—
Ink level low (color)	—	—	—	Blink	—	—	—	—	—	—
Release lever error	—	Blink	—	—	Blink	—	—	—	—	—
Maintenance request	Blink	Blink	Blink	Blink	Blink	Blink	Blink	Blink	Blink	Blink
EEPROM and timer reset	—	On (for 1 second only)								
Fatal error	—	Blink	—	—	—	—	—	Blink	—	—

Note: “—” means that the indicated printer status does not affect the LED.

1.4.4 Default Settings

This printer has user-selectable default settings to which it refers at initialization. The default settings (and factory settings) are listed in Table 1-8.

1.4.4.1 Setting Method

The method of setting defaults is shown in the flowchart below.

ATTENTION

n Any default value specified is not stored in the EEPROM until the printer is turned off.
n The last default value specified before power-off is stored in the EEPROM.

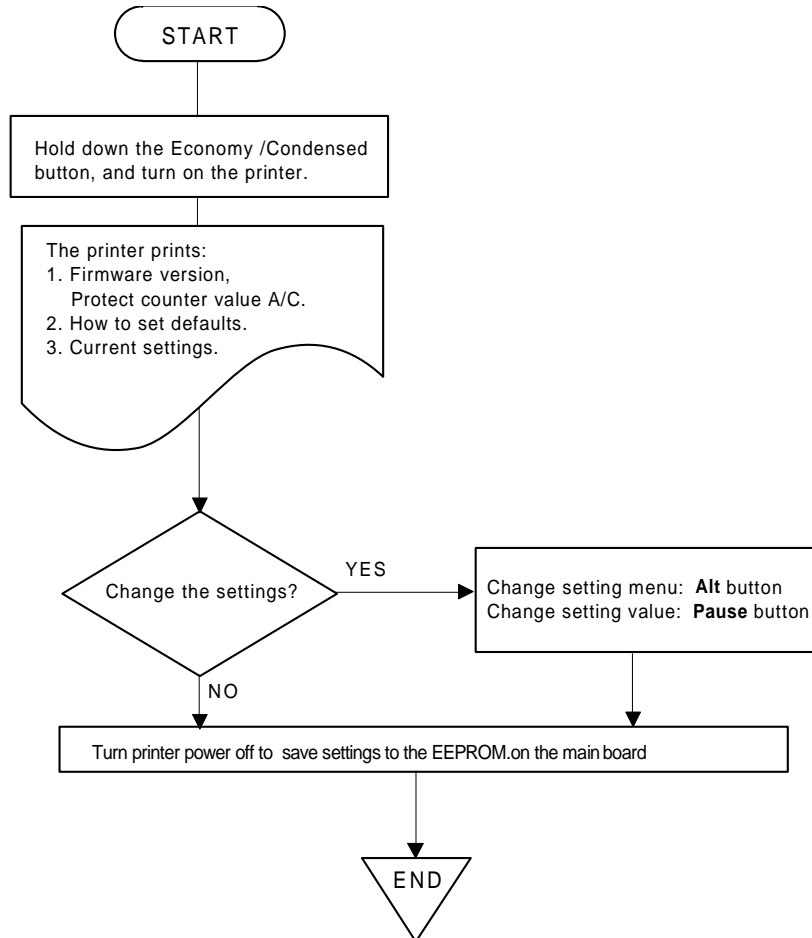


Figure 1-6. Default Setting Flowchart

1.4.4.2 Setting Menus

The default setting menus are described in the table below.

Table 1-8. Default Settings

Menus	Settings (underlines indicate factory default settings)
Print direction ^{*1}	<u>Auto</u> / Bi-D / Uni-D
Font	Draft / Roman / Sans Serif / <u>Courier</u> / Prestige / Script / Roman T / Sans Serif H
Pitch	<u>10 cpi</u> / 12 cpi / 15 cpi / 17.1 cpi / 20 cpi / Proportional
<u>I/F mode</u>	Auto / Parallel / Serial
<u>Auto I/F wait mode</u>	10 seconds / 30 seconds
<u>Software</u>	<u>ESC/P2</u> / IBM X24E
Auto CR (IBM mode only)	On / <u>Off</u>
AGM (IBM mode only)	On / <u>Off</u>
Character tables (standard version)	Italic PC 437 PC 850 PC 860 PC 863 PC 865 PC 861 BRASCI I Abicom p Roman 8 ISO Latin 1
Character tables (NLSP version)	Italic PC 437 PC 437 Greek PC 850 PC 853 PC 855 PC 852 PC 857 PC 866 PC 869 MAZOWIA Code MJK ISO 8859-7 ISO Latin 1T Bulgaria Roman 8 PC774 Estonia ISO Latin 1 ISO Latin 2 PC866 LAT
International character set for italic table	<u>Italic U.S.A.</u> Italic France Italic Germany Italic U.K. Italic Denmark Italic Sweden Italic Italy Italic Spain 1
Auto line feed	On / <u>Off</u>
<u>Network I/F mode</u>	Off: Used in standalone environment On: Used in network environment
<u>Zero slash</u>	0 / 0 with slash
<u>Page length for continuous paper</u>	<u>11 inch</u> 12 inch 8.5 inch 70/6 inch Other ^{*2}
Skip over perforation	On / <u>Off</u>
Auto tear off	<u>On</u> / Off
Print mode ^{*3}	Plain paper (pure black) / Plain paper (composite black) / Exclusive paper / Transparency
Paper roll	On / <u>Off</u>

Notes: *1. Refer to Tables 1-9 and 1-10.

*2. This is selected when a value other than 11, 12, 8.5, or 70/6 inches has been placed in EEPROM by the **ESC |** command.

*3. This mode is provided only for DOS users and is selected according to paper type. Pure black and composite black are selected according to the printed result.

Table 1-9. Print Direction Mode Characteristics

Item	Monochrome Printing	Color Printing
Auto	Throughput and quality is better.	<ul style="list-style-type: none"> • Throughput is better. • Color quality with special paper is worse. (Color correction depends on the printing direction.)
Bi-D	<ul style="list-style-type: none"> • Throughput is best. • Print quality may be down. 	<ul style="list-style-type: none"> • Throughput is better. • Color quality with special paper is worse. (Color correction depends on the printing direction.)
Uni-D	<ul style="list-style-type: none"> • Throughput is worse. • Print quality is better. 	<ul style="list-style-type: none"> • Throughput is worse. • Color quality is best.

Table 1-10. Printing Direction and ESC U Command

Default Setting Mode	Auto			Bi-D			Uni-D		
	ESC U 0	ESC U 1	None	ESC U 0	ESC U 1	None	ESC U 0	ESC U 1	None
Character mode (for 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 a driver in the Windows environment.

1.4.5 Printer Adjustment Mode

The Stylus 1500 allows the user to adjust the printing direction and head gap without a special program. The following list shows the adjustments for this printer in order:

- Pattern 1 Uni-D adjustment at 400 cps
- Pattern 2 Bi-D adjustment at 100 cps
- Pattern 3 Bi-D adjustment at 200 cps
- Pattern 4 Bi-D adjustment at 400 cps
- Pattern 5 Head gap adjustment (for the black and color printheads in the carriage movement direction at 100 cps)*
- Pattern 6 Head gap adjustment (for the black and color printheads in the carriage movement direction at 200 cps)*
- Pattern 7 Head gap adjustment (for the black and color printheads in the paper feed direction)*

* These adjustments are performed only when the color upgrade kit is installed in the printer.

Adjustment Method

Use the following steps to perform the adjustments:

1. Hold down the Pause button while turning on the power. The printer enters adjustment mode. "Using this mode" and the pattern 1 are printed.
2. Select the number of the most closely aligned columns by pressing the Alt button. The black Ink Out, color Ink Out, and Paper Out LEDs show the line number currently selected. This selection advances once each time the Alt button is pressed, and the three LEDs change their combination of On /Off / Blinking to indicate the selection.
3. Specify the selected number by pressing the Pause button. The selected number is set, and the next pattern is printed.

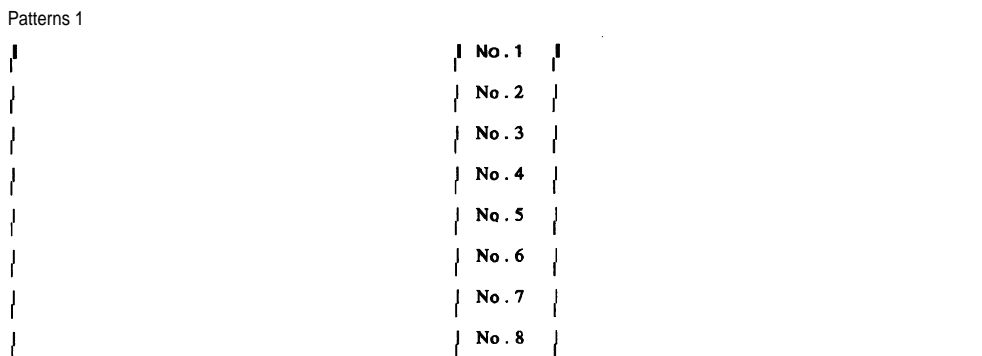


Figure 1-7. Sample Adjustment Pattern

4. Repeat steps 2 and 3 until the pattern No.4 or 7 is printed.

The adjustments are executed in the following order:

- | | |
|-------------|--|
| Pattern 1. | Uni-D adjustment at 400 cps |
| Pattern 2. | Bi-D adjustment at 100 cps |
| Pattern 3. | Bi-D adjustment at 200 cps |
| Pattern 4. | Bi-D adjustment at 400 cps |
| Pattern 5.* | Head gap adjustment (for the black and color printheads in the carriage movement direction at 100 cps) |
| Pattern 6.* | Head gap adjustment (for the black and color printheads in the carriage movement direction at 200 cps) |
| Pattern 7.* | Head gap adjustment (for the black and color printheads in the paper feed direction at 360 dpi.) |

- *: When the optional color kit is not installed, the pattern 4 is the final pattern and the rest adjustments (pattern 5, 6 and 7) are not executed.

ATTENTION

- | |
|--|
| <p>n Any adjustment value specified is not stored in the EEPROM until the printer is turned off.</p> <p>n The last adjustment value specified before power-off is stored in the EEPROM..</p> <p>n Before the whole adjustments are executed, the setting value is not stored in the printer.</p> |
|--|

5. Turn off the power to exit adjustment mode.

1.4.6 Printer Initialization

This printer has three initialization types: hardware, software, and panel.

1. Hardware Initialization

Hardware initialization is performed by turning on the printer or sending the **INIT** signal to the parallel interface. The following functions are executed:

- o The printer mechanism is initialized.
- o The input data buffer is cleared.
- o Downloaded character definitions are cleared.
- o The print buffer is cleared.
- o Default values are set.

2. Software Initialization

Software initialization is performed when the printer receives the **ESC @** command. The following functions are executed:

- o The print buffer is cleared.
- o Default values are set.

Note: The last panel settings are kept after software initialization.

3. Panel Initialization

Panel initialization is performed by pressing the Load/Eject button while holding down the Alt button. The following functions are executed:

- o The input data buffer is cleared.
- o The print buffer is cleared.
- o Default values are set.

Note: The last panel settings are kept after panel initialization.

1.4.7 Monochrome Printing Mode

This printer has a monochrome printing function that allows printing to continue with black ink when the color ink cartridge is out or the color upgrade kit is not installed. This function is selected by the printer driver setting. To enter monochrome printing mode, turn the Power button off and back on again.

- Notes:**
1. Once the printer has entered this function, print data must be resent.
 2. The color select command (**ESC r**) is ignored.

1.5 PAPER SPECIFICATIONS

1.5.1 Paper Type Specifications

1. Cut Sheets

Table 1-11. Cut Sheet Specifications

Size	A4: 210 mm (8.3") × 297 mm (11.7") Letter: 215.9 mm (8.5") × 279.4 mm (11.0") B5: 182 mm (7.2") × 257 mm (10.1") Legal: 215.4 mm (8.5") × 355.6 mm (14.0") B4: 257 mm (10.1") × 364 mm (14.3") A3: 297 mm (11.7") × 420 mm (16.5") Ledger: 279.4 mm (13.0") × 431.8 mm (17.0") A3 wide: 329 mm (13.0") × 483 mm (19.0") B3: 364 mm (14.3") × 514 mm (20.2") A2: 420 mm (16.5") × 594 mm (23.4") US C: 431.8 mm (17.0") × 558.8 mm (22") B5 (ISO) 176 mm (6.9") × 250 mm (9.8") B4 (ISO) 250 mm (9.8") × 353 mm (92.6")
Thickness	0.065 mm (0.0025") - 0.11 mm (0.004")
Weight	ASF: 64 g/m ² (17 lb) - 90 g/m ² (24 lb) Manual Insertion: 52 g/m ² (14 lb) - 90 g/m ² (24 lb)
Quality	Exclusive paper, bond paper, PPC, glossy paper

Note : The designated face must be used when printing on exclusive paper.
 : A2 portrait, US-C portrait are used by manual insertion only.

2. Transparencies

Table 1-12. Transparency Specifications

Size	A4: 210 mm (8.3") × 297 mm (11.7") Letter: 215.9 mm (8.5") × 279.4 mm (11.0")
Thickness	0.075 mm (0.003") - 0.085 mm (0.0033")

Notes: 1. Printing on transparencies is supported only at normal temperatures.
 2. The designated face must be used when printing on exclusive paper.

3. Envelopes

Table 1-13. Envelope Specifications

Size	No. 10: 241.3 mm (9.5") × 104.8 mm (4.125") DL: 220 mm (8.7") × 110 mm (4.3") C5: 229 mm (9") × 162 mm (6.4")
Thickness	0.16 mm (0.006") - 0.52 mm (0.02")
Weight	45 g/m ² (12 lb) - 90 g/m ² (24 lb)
Quality	Exclusive paper, bond paper, PPC, glossy paper

Notes: 1. Printing on envelopes is supported only at normal temperatures.
 2. When inserting envelopes, keep the longer side horizontal.
 3. When printing on envelopes, set the adjust lever to the proper position. (Refer to Section 1.5.3, Adjust Lever Position.)

4. Index Cards

Table 1-14. Index Card Specifications

Size	A6: 105 mm (4.1") × 148 mm (5.8")
Thickness	0.23 mm (0.0091") and less

Note: When printing on index cards, set the adjust lever to the proper position. (Refer to Section 1.5.3, Adjust Lever Position.)

5. Labels (Cut Sheet)

Table 1-15. Label (Cut Sheet) Specifications

Size	A4: 210 mm (8.3") × 297 mm (11.7") Letter: 215.9 mm (8.5") × 279.4 mm (11.0")
Thickness	0.2 mm (0.0079") and less (base sheet and label)
Quality	Page printer label

Note: Printing on cut-sheet labels is supported only at normal temperatures.

6. Continuous Paper

Table 1-16. Continuous Paper Specifications

Size	Width: 101.6 mm (4") – 406.4 mm (16") Folding length: 220 mm (8.7") – 110 mm (4.3")
Thickness	0.065 mm (0.0026") - 0.1 mm (0.0039")
Weight	52 g/m ² (14 lb) - 82 g/m ² (22 lb)

7. Labels (Continuous Paper)

Table 1-17. Label (Continuous Paper) Specifications

Size (base paper)	Width: 101.6 mm (4") - 406.4 mm (16") Folding length: 101.6 mm (4")
Size (label)	Width: 63.5 mm (2.5") Folding length: 23.9 mm (0.94")
Thickness (base paper + label)	0.2 mm (0.0079") (The height from the base sheet to the label face is 0.12 mm or less.)
Thickness (label)	0.12 mm (0.0047")
Quality	Plain paper

Note: Printing on continuous-paper labels is supported only at normal temperatures.

8. Banner**Table 1-18. Banner Specifications**

Size	Width: 210 mm (8.3") – 432 mm (17") Length: 5 m (196.6") and less
Thickness	0.08 mm (0.0031") - 0.1 mm (0.0039")
Weight	64 g/m ² (17 lb) - 82 g/m ² (22 lb)
Quality	Plain paper

1.5.2 Printable Area

1. Cut Sheets

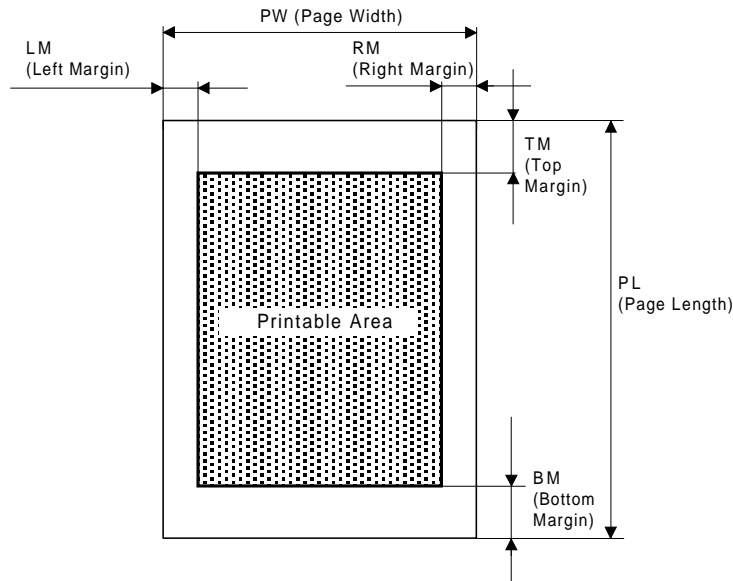


Figure 1-8. Printable Area for Cut Sheets

Table 1-19. Minimum Margins for Different Cut Sheet Sizes

PW (Paper Width)	LM (Left Margin) (minimum)		RM (Right Margin) (minimum)		TM (Top Margin) (minimum)	BM (Bottom Margin) (minimum)
	Distance to Left Edge	Distance to Right Edge	Distance to Left Edge	Distance to Right Edge		
A4 297 mm (11.7")	3 mm (0.12")	3 mm (0.12")	3 mm (0.12")	3 mm (0.12")	3 mm (0.12")	14 mm (0.54")
Legal landscape 356 mm (14.0")	5 mm (0.20")	3 mm (0.12")	3 mm (0.12")	5 mm (0.20")	3 mm (0.12")	14 mm (0.54")
B4 landscape 364 mm (14.3")	16 mm (0.63")	3 mm (0.12")	3 mm (0.12")	16 mm (0.63")	3 mm (0.12")	14 mm (0.54")
A3 landscape 420 mm (16.5")	25 mm (0.98")	13 mm (0.51")	50 mm (1.97")	62 mm (2.44")	3 mm (0.12")	14 mm (0.54")
Ledger landscape 432 mm (17.0")	25 mm (0.98")	25 mm (0.98")	62 mm (2.44")	62 mm (2.44")	3 mm (0.12")	14 mm (0.54")

Note: The printable area for a cut-sheet label is as same as that for the cut sheet itself.

2. Envelopes

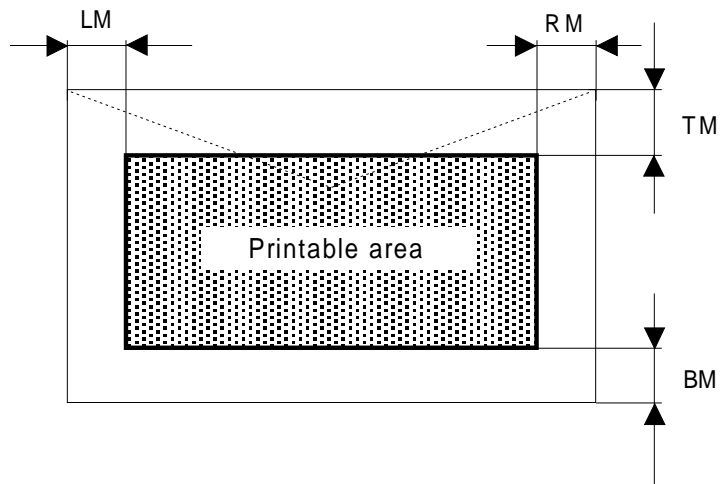


Figure 1-9. Printable Area for Envelopes

Table 1-20. Minimum Margins for Envelopes

LM (Left Margin) (minimum)	RM (Right Margin) (minimum)	TM (Top Margin) (minimum)	BM (Bottom Margin) (minimum)
3 mm (0.12")	3 mm (0.12")	3 mm (0.12")	14 mm (0.55")

3. Continuous Paper

Printable Area 1 : Paper feed pitch is not guaranteed in this area.

Printable Area 2 : Paper feed pitch is guaranteed in this area.

*When the paper width is 406.4 mm (16"), this width is more than 38 mm (1.50").

- Notes: 1. The printable area for a label is the same as that for continuous paper.
 2. The base paper of a continuous-paper label is not within the printing area.

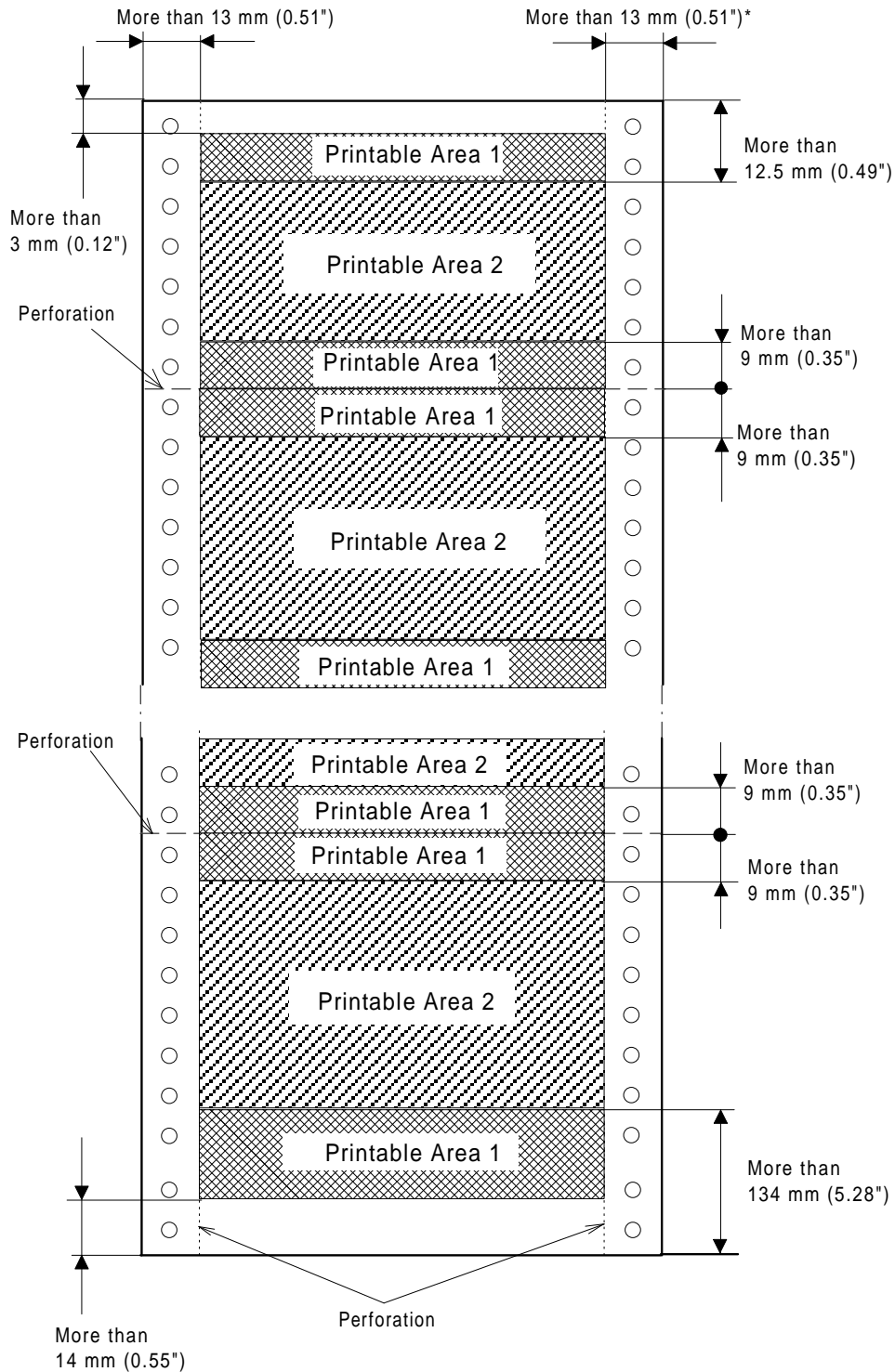


Figure 1-10. Printable Area for Continuous Paper

1.5.3 Adjust Lever Position

This printer has an adjust lever to prevent printing smudges caused by the paper thickness not fitting the head gap. The adjust lever must be set to the proper position for the paper type. The adjust lever is located at the left upper side of the printer cover.

Table 1-21. Adjust Lever Position

Paper Type	Lever Position	Platen Gap Adjustment Value
Cut sheets, transparencies, continuous paper, labels	Far side	0
Envelopes, index cards	Near side	+ 0.7 mm

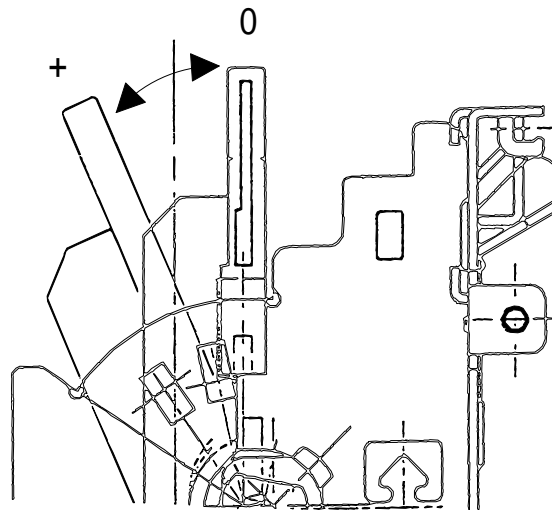


Figure 1-11. Adjust Lever Settings

1.6 INK CARTRIDGE SPECIFICATIONS

Black

Type:	Exclusive cartridge
Model:	S020062
Color:	Black
Print capacity	1900 pages /A4 (LQ Roman ECMA text)
Life:	2 years from indicated production date
Storage temperature:	-30° C - 40° C (86° F - 104° F) Storage under a month at 40° C (104° F) -30° C - 60° C (86° F - 140° F) Transit under 120 hours at 60° C (140° F) and under a month at 40° C (104° F)
Dimensions:	25.1 mm (W) × 139.6 mm (D) × 105.3 mm (H)

Color

Type:	Exclusive cartridge
Model:	S020049
Color:	Magenta, cyan, yellow
Print capacity:	320 pages / A4 (at 360 dpi, 5% duty and each color)
Life:	2 years from indicated production date
Storage temperature:	-20° C - 40° C (-4° F - 104° F) Storage under a month at 40° C (104° F) -30° C - 40° C (86° F - 104° F) Packing storage under a month at 40° C (104° F) -30° C - 60° C (86° F - 140° F) Transit under 120 hours at 60° C (140° F) and under a month at 40° C (104° F)
Dimensions:	42.9 mm (W) × 56.8 mm (D) × 38.5 mm (H)

- Notes:*
- 1. The ink cartridge cannot be refilled; it is the only consumable.*
 - 2. Do not use an ink cartridge that has exceeded the ink life.*
 - 3. The ink freezes below -3° C (37° F); however, it can be used after it returns to room temperature.*

1.7 PHYSICAL SPECIFICATIONS

Weight: 11 .5 kg

Dimensions: 664 mm (W) × 504 mm (D) × 202 mm (H)

1.8 MAIN COMPONENTS

The main components of the Stylus 1500 are designed for easy removal and repair. They are as follows:

- o Main control board (C172 MAIN Board)
- o Power supply board (C172 PSB/PSE Board)
- o Control panel board (C172 PNL Board)
- o Printer mechanism (M-4E60)
- o Housing

1.8.1 Main Control Board (C172 MAIN Board)

This board consists of a CPU (TMP95C061AF), gate array (E05B16), ROM (CG), PROM, DRAM, EEPROM, motor driver ICs, printhead driver circuits, etc.

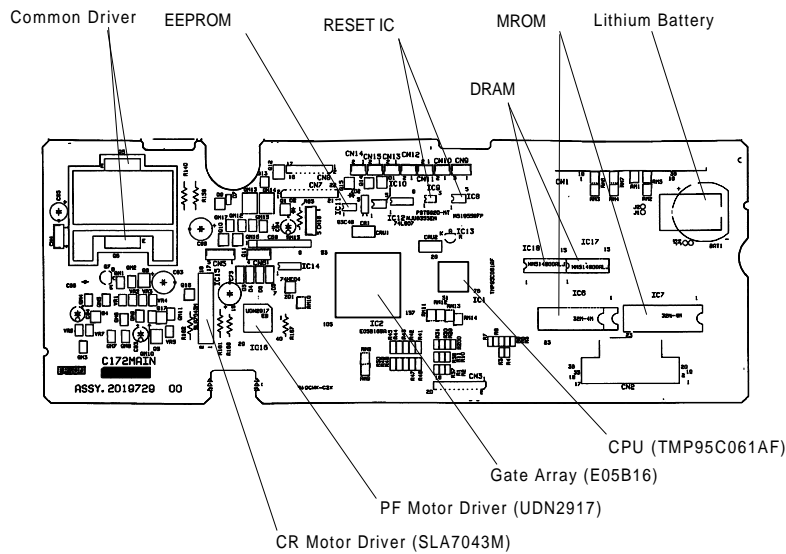


Figure 1-12. C172 MAIN Board Component Layout

1.8.2 Power Supply Board (C172 PSB/PSE Board)

This board consists of a transformer, switching FET, regulator IC, diode bridge, etc. This board has two ratings for input AC voltages (120 VAC/220-240 VAC). The power switch is equipped with a secondary circuit that allows the CPU to remain active (min. 20 sec.) after the printer is turned off.

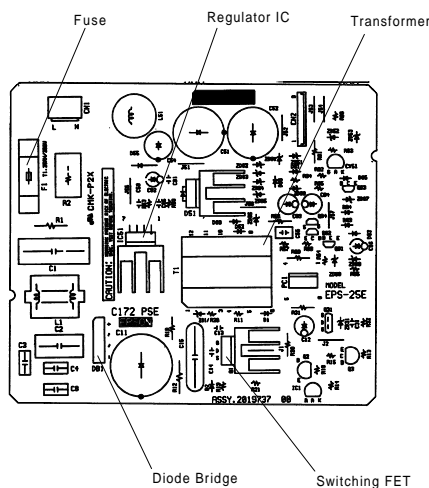


Figure 1-13. C172 PSB/PSE Board Component Layout

Chapter 2 Operating Principles

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2.1 OVERVIEW

This section describes the operating principles of the Stylus 1500 printer mechanism and electrical circuits.

2.2 PRINTER MECHANISM OPERATING PRINCIPLES

2.2.1 Printing Operation Principles

This printer mechanism uses a drop-on-demand ink jet system similar to the one used on all other EPSON ink jet printers. However, the printhead in this system is completely redesigned to make it more compact and to ensure a high level of reliability. The printer has two printheads: monochrome (black ink) and color (yellow, cyan, and magenta ink).

1. Monochrome Printhead

The figure below shows the structure of the monochrome printhead, which consists of the nozzle, nozzle plate, piezo elements, cavities, and printhead driver board.

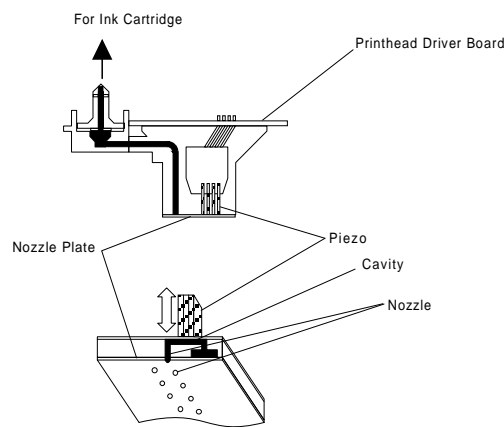


Figure 2-1. Black Printhead Structure

2. Color Printhead

The figure below shows the structure of the color printhead. Its structure is different from the monochrome printhead. The color printhead consists of the nozzle plates, two rows of nozzles, piezo elements, and cavities for each of the three colors.

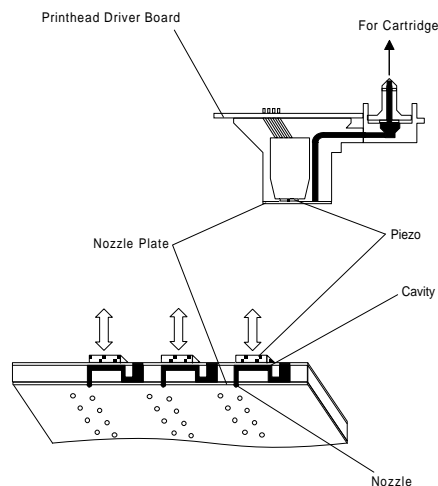


Figure 2-2. Color Printhead Structure

The printhead operates in one of two states to eject ink from each nozzle:

❑ Normal state

No electrical charge is applied to the piezoelectric element attached to the back of the cavity, and pressure inside the cavity is kept at a constant level.

❑ Ejecting state

The head data signal is applied to a specific nozzle control line to select the active nozzle for printing, and the piezoelectric element is gradually charged by the drive voltage. Charging the piezoelectric element bends the vibration plate to compress the cavity. Ink is then ejected from the nozzle.

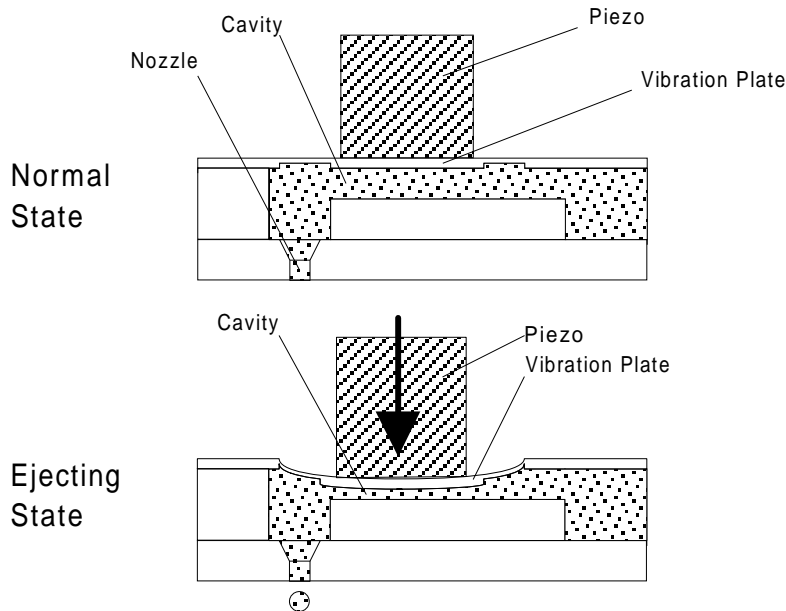


Figure 2-3. Printing Operation States

When the ink charge or printhead cleaning operation is performed, ink in the cavity is vacuumed out with a pump mechanism. During printing, the ink is simultaneously supplied from the ink cartridge and ejected from the nozzle, depending on changes in the volume of the cavity.

A thermistor is attached to the side of the black ink printhead driver 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 driver voltage control circuit to change the time of the Tc pulse.

3. EPSON Micro Dot Printing Mode

The Stylus 1500 has a special black ink printing mode called EPSON Micro Dot Printing Mode. This mode can be selected when using a special paper type (such as glossy or transparency). Selecting this printing mode via the printer driver can improve output quality because it eliminates banding that can sometimes occur in normal mode. In normal dot printing mode, the print dot consists of two ink dots combined into a single dot. In EPSON Micro Dot Printing Mode, the print dot consists of a single ink dot only. Using this mode, the ink dot size is smaller than the normal dot and the graded representation is larger than normal dot printing. This mode is effective for 720 dpi printing on normal paper.

2.2.2 Printer Mechanism

The Stylus 1500 printer mechanism is composed of the printhead unit; paper feed, carriage drive, pump, and push tractor feed mechanisms; and various sensors. The figure below shows a functional block diagram of the printer mechanism. Depending on the position of the carriage unit, the paper feed motor torque is transmitted to the paper feed, auto sheet feeding, push tractor feed, or pump mechanisms via a disengage mechanism.

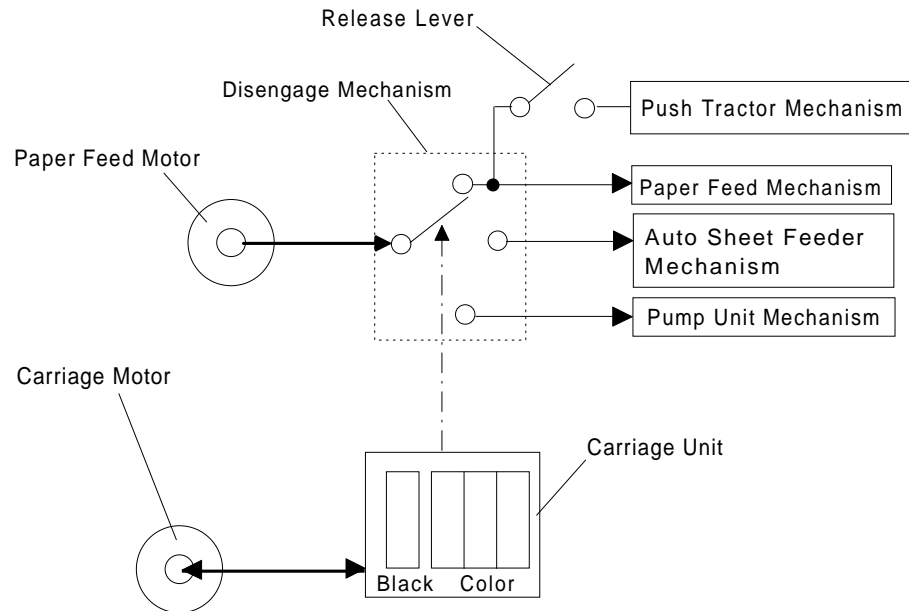


Figure 2-4. Printer Mechanism Block Diagram

2.2.3 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 from left to right or vice versa. The carriage drive motor in this printer is a 4-phase, 96-pole, hybrid-type stepping motor, allowing the printer to stop the carriage or change the carriage movement at any position. The carriage position is recognized by the home position (HP) sensor, and position information is fed back to the CPU. This carriage motor is driven by the SLA7043M motor driver IC.

Table 2-1. Carriage Motor Specifications

Item	Description
Motor type	4-phase / 96-pole hybrid-type stepping motor
Drive voltage	+42 VDC \pm 5%
Coil resistance	5 Ω \pm 7 %
Drive frequency	480 - 9600 Hz
Excitation mode	Constant current unipolar drive
Minimum step	<input type="checkbox"/> 0.026 mm (at 2W1-2 phase) <input type="checkbox"/> 0.106 mm (at 1-2 phase)

Table 2-2. Drive Terms (Carriage Drive Mechanism)

Print Mode	Print Speed (cps)	Current Value (A / Phase)			+ Rush (before/after)
		Acceleration 1 / 2	Constant	Deceleration 1 / 2	
Draft (black)	400	0.8 / 0.8	0.7	0.96 / 0.96	0.5 / 0.5
Draft (color)		0.9 / 0.9			^
LQ	200	0.9 / 0.9	0.7	0.8 / 0.8	0.5 / 0.5
SLQ	100	0.9 / 0.9	0.6	0.8 / 0.8	0.5 / 0.5

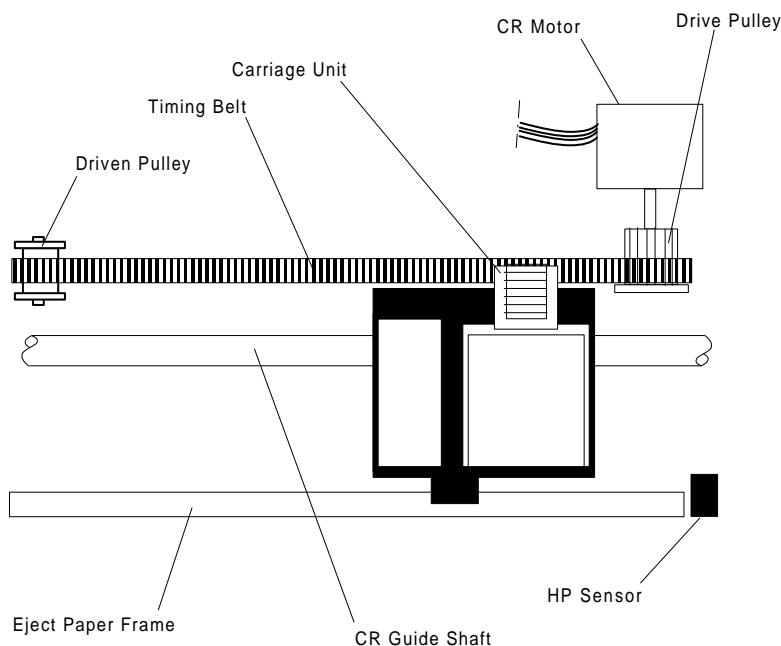


Figure 2-5. Carriage Movement Mechanism

2.2.4 Paper Feed Mechanism

This printer's paper feed mechanism consists of the built-in ASF (auto sheet feeder), push tractor, PF (paper feed) motor, front/rear PE (paper end) sensors, PF roller, eject roller unit, and disengage mechanism. The PF motor is a 4-phase, 48-pole, PM-type stepping motor that directly drives the paper feed mechanism (for paper advancing and paper pickup). This motor also drives the pump mechanism, but only when the printer is in the cleaning state. The paper feed mechanism is driven using a 1-2 phase drive method, except in the paper feed drive sequence (W1-2 phase). The paper feed mechanism is illustrated in Figure 2-6.

The disengage mechanism switches the PF motor torque between the PF drive and pump drive via the carriage unit stop positions. The PF motor torque is transmitted to the PF roller via the PF motor pinion, disengage mechanism, and gear train. The torque is then separated for each of the two directions of the PF roller. One direction of torque transmission is used to drive the paper-ejecting mechanism via the gear train of the upper paper guide assembly. The other direction is used to drive the push tractor or ASF mechanism.

Table 2-3. Paper Feed Motor Specifications

Item	Description
Motor type	4-phase, 96-pole, HB-type
Drive voltage	+42 VDC \pm 5%
Coil resistance	10 Ω \pm 10%
Drive frequency	300 - 2160 Hz
Excitation mode	<input type="checkbox"/> Constant current bipolar drive <input type="checkbox"/> Paper feed / pump drive: 2-2 phase, W1-2 phase
Minimum step	1/720" (2-2 phase)

Table 2-4. Drive Terms (Paper Feed Mechanism)

Mode	Frequency (Hz)	Current Value (A / Phase)			+
		Acceleration W1-2 / 2-2 Phase	Constant	Deceleration W1-2 / 2-2 Phase	
Paper loading (ASF)	2160	0.9 / 0.9	0.9	0.75 / 0.75	0.6 / 0.6
Paper feed	2160	0.9 / 0.9	0.9	0.75 / 0.75	0.6 / 0.6
Pump drive	700	— / 0.9	0.9	0.9 / —	0.75 / 0.75
Pump drive (lower speed)	300	— / —	0.9	— / —	0.75 / 0.75

Note: Hold current is 0.6 A.

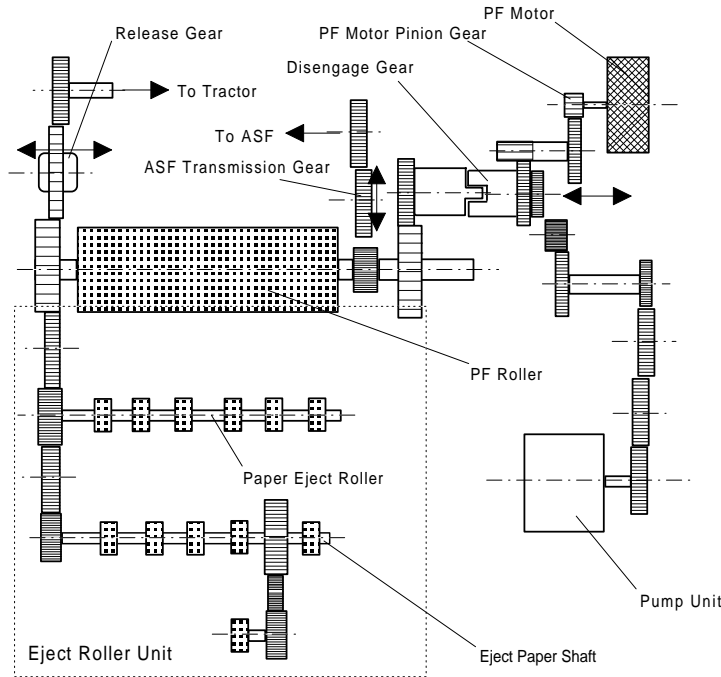


Figure 2-6. Paper Feed Mechanism

2.2.4.1 Auto Sheet Feeder Mechanism

The PF motor torque is transmitted to the ASF pickup rollers via a planetary gear in the disengage mechanism. The pickup roller shaft has two arms on each side. The arms engage the paper support to cause the paper surface to contact the pickup rollers. The one-way clutch makes the rollers rotate in one direction for paper pickup. When not in paper pickup motion, the planetary gear does not transmit torque to the pickup roller shaft.

After picking up paper, the planetary gear is released from the ASF mechanism. The torque of the PF motor is then transmitted to the paper feed mechanism.

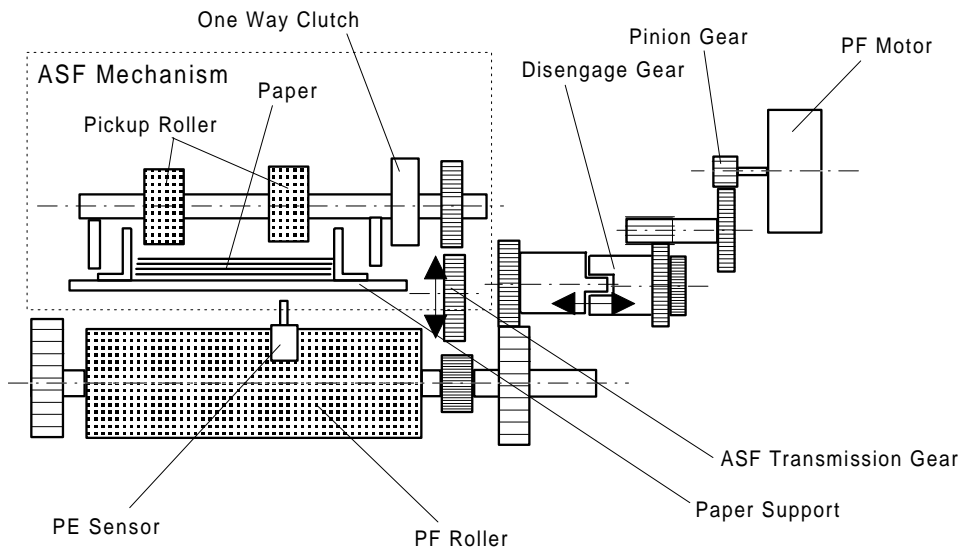


Figure 2-7. ASF Mechanism

2.2.4.2 Push Tractor Mechanism

The release gear of the push tractor is located on the left side of the printer mechanism. By operating the release lever, the release gear is engaged between the PF roller gear and the push tractor gear. The release gear transmits the PF motor torque from the PF roller to the push tractor. Continuous paper can then be fed into the printer.

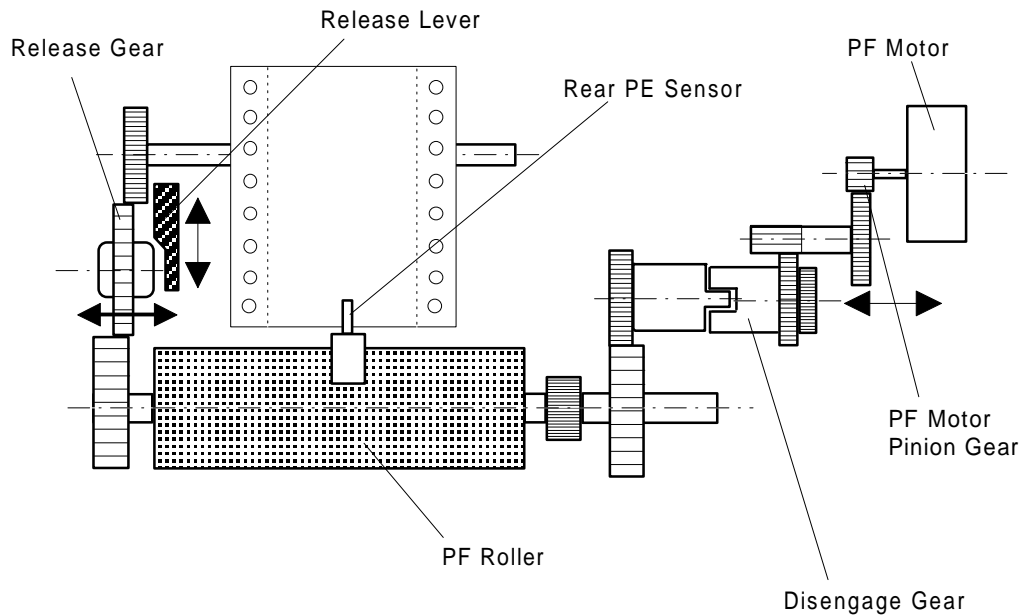


Figure 2-8. Tractor Paper Advance Mechanism

2.2.4.3 Manual Feed Mechanism

With the release lever moved to friction feed mode and a sheet inserted in the rear paper slot, the printer switches to manual paper feed mode. In this mode, a single sheet can be fed from the rear paper slot even if there is paper in ASF. This mode therefore allows the use of normal paper in the ASF and special paper (such as glossy or transparency paper recommended for single-sheet feeding) in the rear slot at the same time.

2.2.5 Platen Gap Adjust Mechanism

The platen gap adjust lever, attached to the left upper side of the printer cover, should be set to the appropriate position for the paper thickness. The platen gap adjust mechanism consists of the platen gap adjust lever, carriage guide shaft, and two parallelism adjust bushings. Switching the lever between positions 0 and + rotates the carriage guide shaft toward the front or rear. The bushings have an eccentricity toward the center of the carriage guide shaft, and the platen gap is changed from wide to narrow or vice versa.

Table 2-5. Platen Gap Adjust Lever Positions

Paper Type	Lever Position	Platen Gap Adjustment Value
Cut sheet Transparency Index card Continuous paper	0	± 0 mm
Envelope	+	+ 0.7 mm

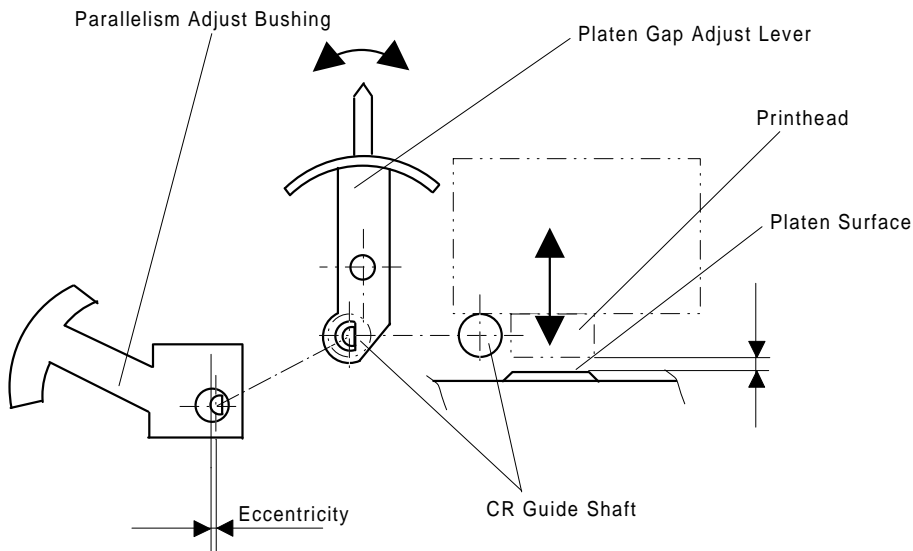


Figure 2-9. Platen Gap Adjust Mechanism

2.2.6 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.

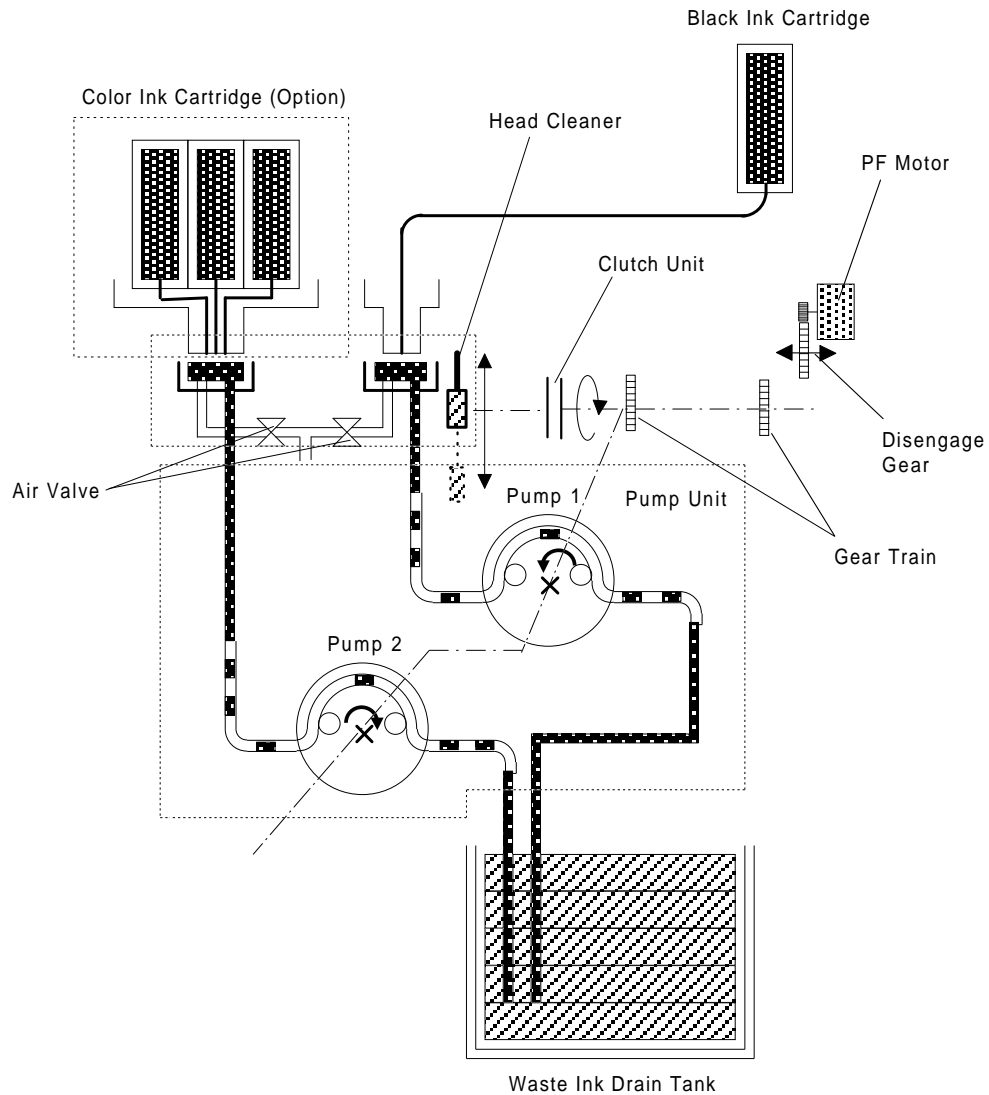


Figure 2-10. Ink System Block Diagram

2.2.7 Pump Mechanism

The paper feed motor drives the pump mechanism when the transmission gear moves to the position where the motor engages the pump mechanism gear trains, when the carriage unit is at the ink system home position. The release cam set is used to engage the pump mechanism (Figure 2-11) and disengage it (Figure 2-13) to switch to paper feeding (Figure 2-14). Figure 2-12 shows a block diagram of the pump mechanism. Pump system operation depends on the rotational direction of the paper feed motor, as shown in Table 2-6.

1. Switching to the Pump Function

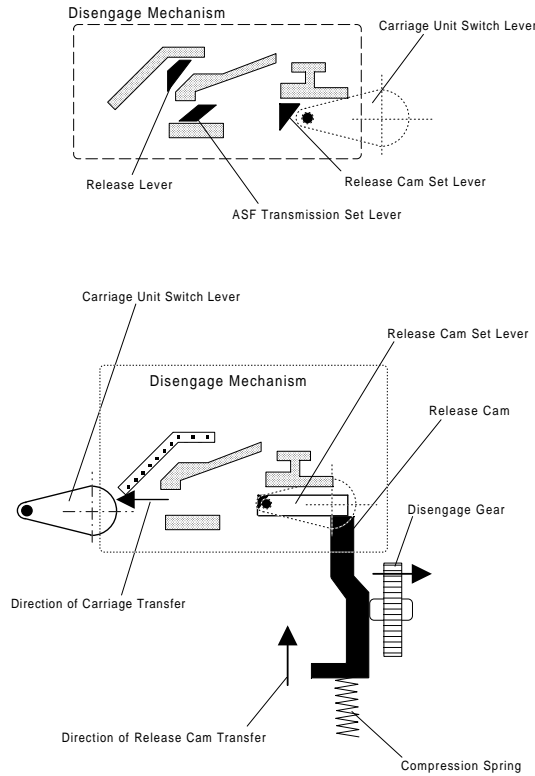


Figure 2-11. Release Cam Set

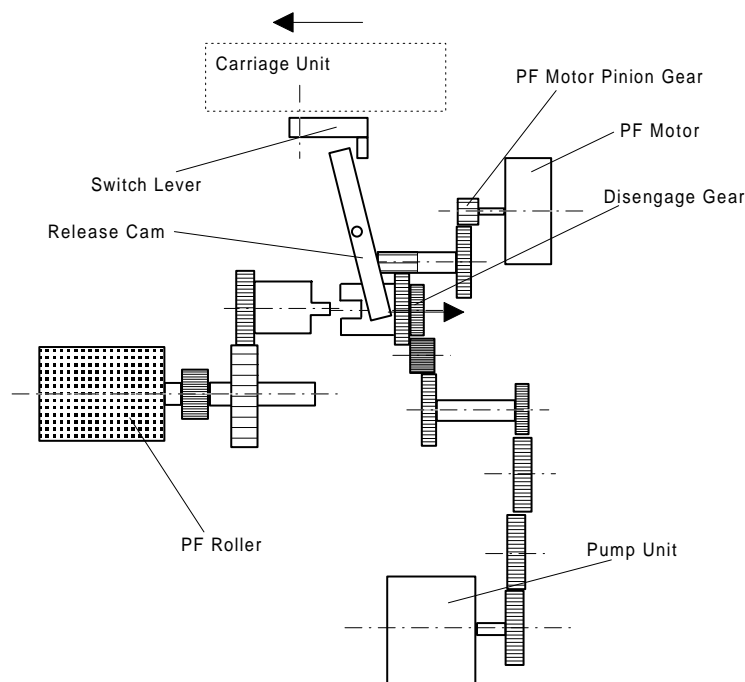


Figure 2-12. Pump Mechanism Function

2. Resetting from the Pump Function

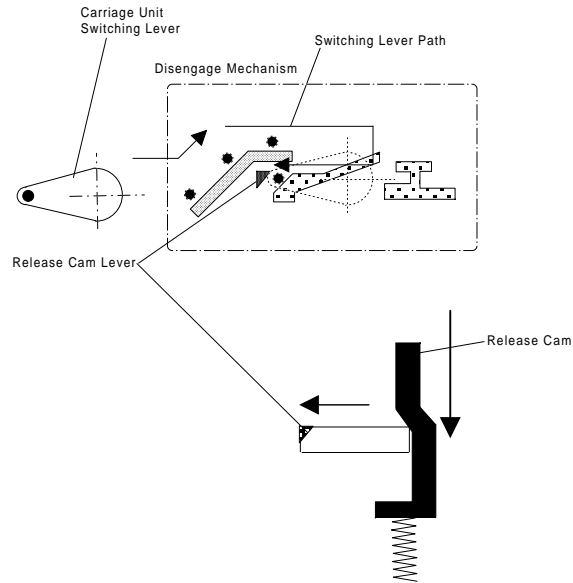


Figure 2-13. Release Cam Reset

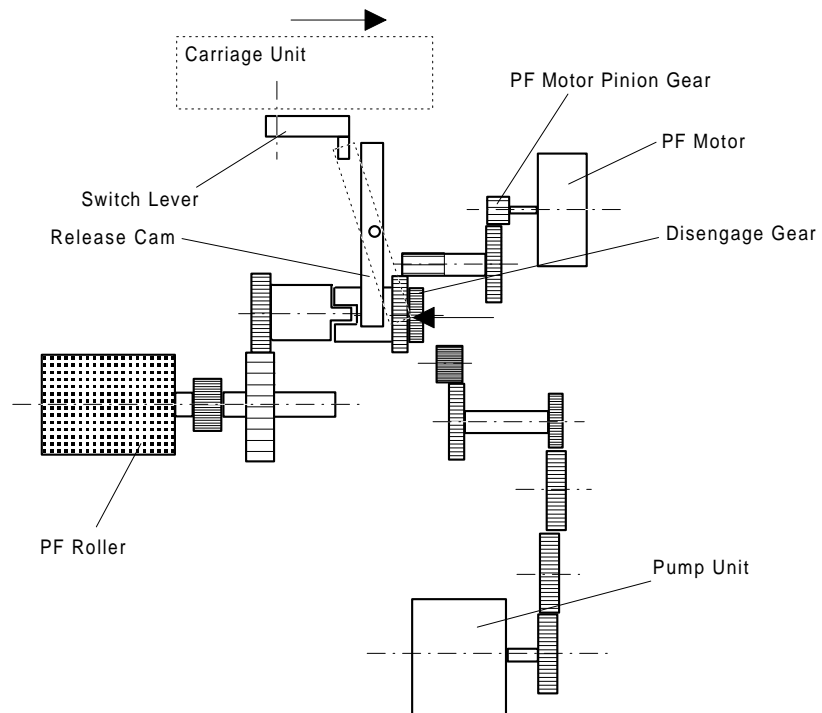


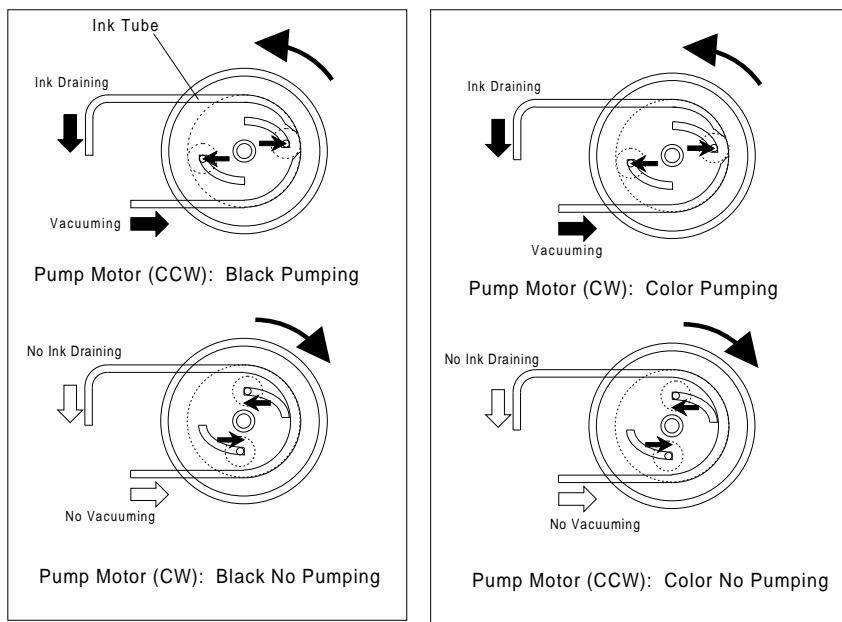
Figure 2-14. Paper Feed Mechanism Function

3. Pump Operation

The pump draws ink from the printhead nozzles and drains it into the waste ink drain tank to eliminate dust or bubbles in the nozzles. The figure below illustrates pump operation. When the paper feed drive motor rotates CCW (backward), the color pulleys in the wheel pump unit rotate in the direction of the arrow while squeezing the ink tube to push the ink out to the waste ink drain tank. When the motor rotates CW (forward), the black pulleys in the wheel pump unit rotate in the direction of the arrow while squeezing the ink tube to push the ink out to the waste ink drain tank.

Table 2-6. Pump Mechanism Operation

PF Motor Rotational Direction	Operation
Clockwise (CW) forward rotation	<input type="checkbox"/> Black ink absorption <input type="checkbox"/> Wiper reset
^	^
Counterclockwise (CCW) backward rotation	<input type="checkbox"/> Color ink absorption <input type="checkbox"/> Wiper set
^	^



Note: CW = Clockwise; CCW = Counterclockwise

Figure 2-15. Pump Operation

There are two pump rollers in the pump unit, and drive power is supplied from the paper feed motor via the pump drive gear (D/E gear), which is moved by the carriage. In the pump unit, the transmission gear supplies both the black and color pulleys, which are each rotated by the movement of the other.

2.2.8 Cap Mechanism

The cap mechanism prevents the printhead nozzles from drying and keeps bubbles from forming inside the nozzles while the printer is not in use. The printer performs the capping operation automatically when it is not printing. If the printer power is turned off during printing or ink system operations, capping is performed and then turn off. (The power switch uses a secondary circuit that allows this operation to be performed.) This printer has two caps: one for the black printhead and one for the color printhead.

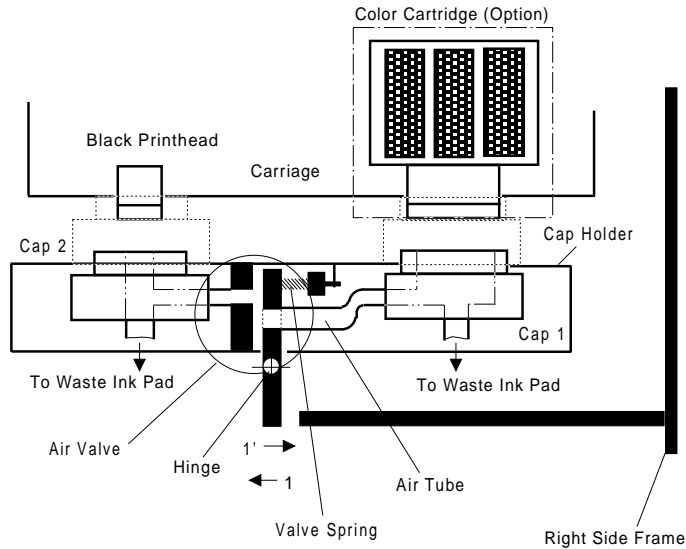


Figure 2-16. Cap Mechanism

2.2.9 Wiping Mechanism

The wiping mechanism cleans the surface of the printhead when the printer is in the ink system sequence. When the paper feed drive motor rotates CCW (backward), power from the motor (via the clutch unit and gears) is transmitted to the head cleaner (wiper) drive gear. The head cleaner moves across the carriage unit's path. When the motor rotates CW (forward), the head cleaner moves toward the front to remove itself from the carriage unit's path. Both the black and color printheads are cleaned by this wiper.

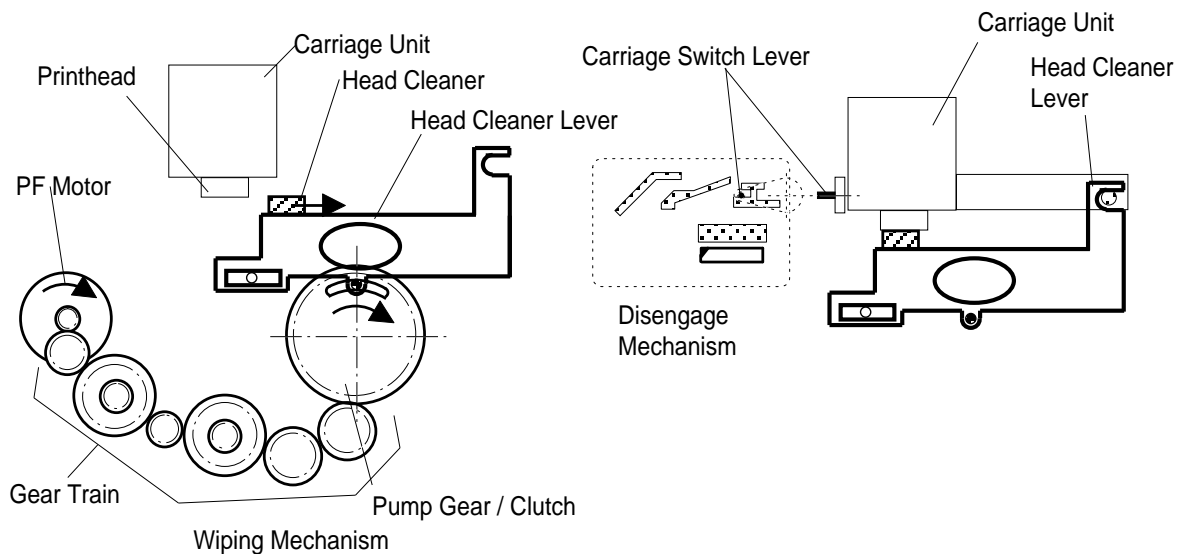


Figure 2-17. Wiping Mechanism

2.3 ELECTRICAL CIRCUIT OPERATING PRINCIPLES

The Stylus 1500 contains the following circuit boards:

- ❑ C172 MAIN Board (main control circuit board)
- ❑ C172 PSB/PSE Board (power supply circuit board). This is the same board used in the Stylus Color printer.
- ❑ C172 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 circuitry.

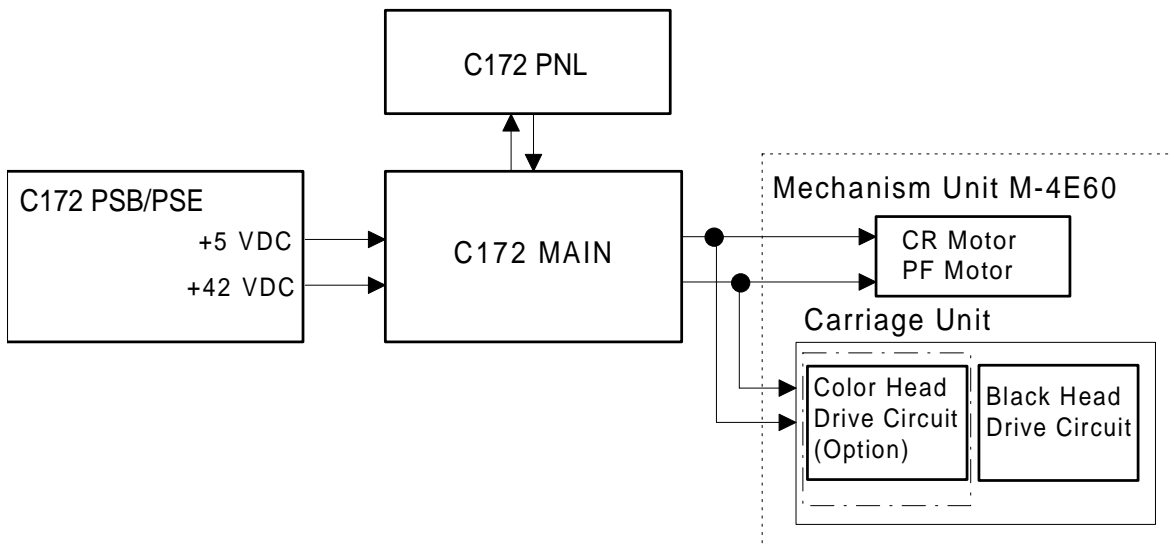


Figure 2-18. Electrical Circuit Block Diagram

2.3.1 Power Supply Circuit Operating Principles

The power supply circuit for this printer is provided either by the C172 PSB board (120 VAC) or by the C172 PSE board (220-240 VAC). Both boards are identical in design and function, except for the components in the primary circuit that accommodate the specified input voltage. The input voltages and applications of output voltages are summarized in the table below.

Table 2-7. DC Voltage Distribution

Voltage	Application
+42 VDC	<ul style="list-style-type: none"> ❑ Motor drive (carriage and paper feed) ❑ Printhead (through the drive voltage generation circuit)
+5 VDC	<ul style="list-style-type: none"> ❑ C172 MAIN board logic circuit ❑ Sensors (home position, paper end, no ink cartridge, head thermistor) ❑ C172 PNL control panel board, head nozzle selector

The figure below shows a block diagram of the power supply circuit (C172 PSB/PSE). The power switch is in a secondary circuit that allows the CPU to remain active for a minimum of 20 seconds after the printer is turned off. This allows the printhead to return to the capping position. The CPU, which is mounted on the C172 MAIN Board, monitors the PSC (power on/off) signal. If this signal goes LOW, the CPU resets each device after performing the head-capping sequence.

This board also employs an RCC (Ringing Choke Converter) switching system. The AC voltage is first input to the filter circuit for higher harmonics absorption and is then input to the rectification and smoothing circuit, converting it into DC voltage. This DC voltage is input to the switching circuit. Along with the switching operation on the primary side, +42 VDC is generated after passing through the +42 V line voltage detection circuit. This +42 VDC output level is stabilized and is also input to the +5 VDC generation circuit to produce a stable +5 VDC.

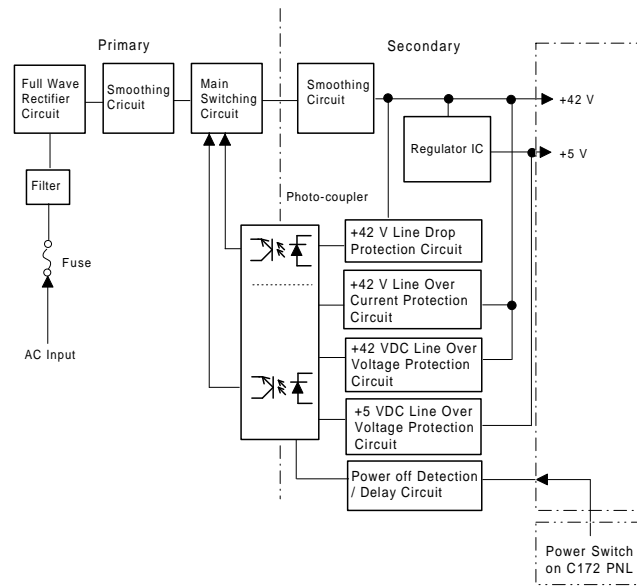


Figure 2-19. Power Supply Circuit Diagram

+5 VDC Line Overvoltage Protection Circuit

The output voltage level of the +5 V line is monitored by a Zener diode (ZD53). If the voltage level exceeds +9 V, the status is fed back to the primary switching circuit through photocoupler PC1 to cut the +42 V until the power is turned on again.

+5 VDC Line Overcurrent / Overvoltage Control Circuit

The output current is monitored by a +5 VDC generation switching control IC (IC51), which also monitors the output voltage. This information is input to the internal comparator and cuts the +5 VDC when the voltage or current becomes abnormal.

+42 VDC Line Overvoltage Protection Circuit

The output level is monitored by two Zener diodes (ZD52 and ZD87). If the voltage level exceeds +48 V, photocoupler PC1 is activated to stop the primary switching circuit operation.

+42 VDC Line Drop Protection Circuit

The output level of the +42 VDC line is monitored by a detection circuit consisting of Zener diodes (ZD51 and ZD81 to ZD86). This circuit feeds back the output voltage level status through photocoupler PC1 to the primary switching circuit, to control the on/off time of the switching transistor for constant output voltage.

+42 VDC Line Overcurrent Protection Circuit

The output current is monitored by transistors Q81 and Q82. This circuit feeds back the output voltage level status through photocoupler PC1 to the primary switching circuit to stop the circuit's operation.

2.3.2 Main Control Circuit Operating Principles

The main control circuit for this printer is the C172 MAIN Board, which is controlled by a 16-bit TMP96C061AF CPU (IC1) running at 24.57 MHz. A 4M DRAM (CAS method) on this board is controlled by the CPU itself. The CPU manages the Type-B interface control.

Gate array E05B16 (IC2) manages the printhead driver control, external Centronics® parallel I/F, control panel, and control motors.

This board is also equipped with a 93C46 EEPROM (IC11) to store parameters such as the printer mechanism control parameter, default setting parameters, and the special counter value used for printhead (ink management) protection.

The NJU6355E timer IC (IC10) counts each time the printer is cleaned and keeps track of how long the printer is not used, thereby allowing the printer to be cleaned only when necessary.

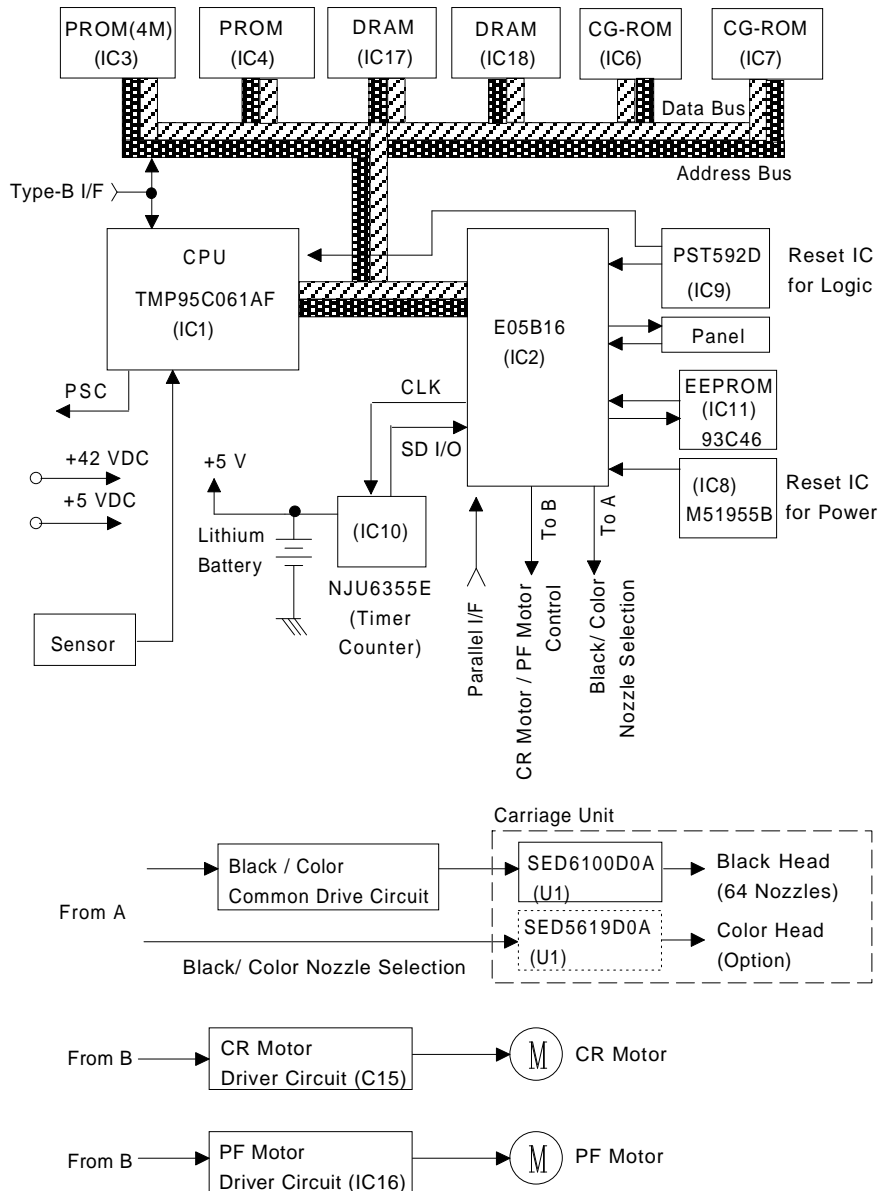


Figure 2-20. Main Control Circuit Block Diagram

2.3.2.1 Reset Circuits

The C172 MAIN Board contains two monitor reset circuits: +5 V and +42 V. The +5 V circuit monitors the voltage level of the +5 V line (logic line) using a PST592D reset IC (IC9), and outputs a reset signal to the CPU (IC1) and the E05E16 gate array (IC2) when the voltage level drops below +4.0 V. The +42 V circuit monitors the voltage level of the +42 V line using an M51955B reset IC (IC8), and outputs a reset signal to the CPU (IC1) when the voltage level drops below +33.3 V. This causes a non-maskable interrupt (NMI).

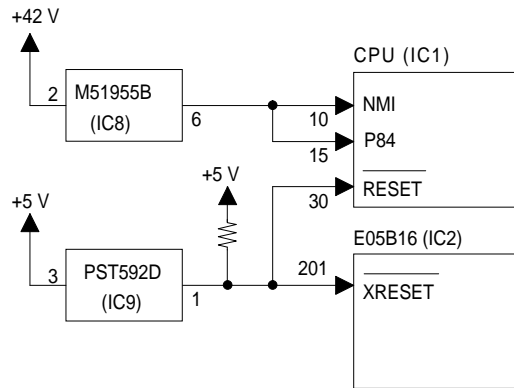


Figure 2-21. Reset Circuit Block Diagram

2.3.2.2 Sensor Circuits

The following sensor circuits enable the C172 MAIN Board to monitor printer mechanism status:

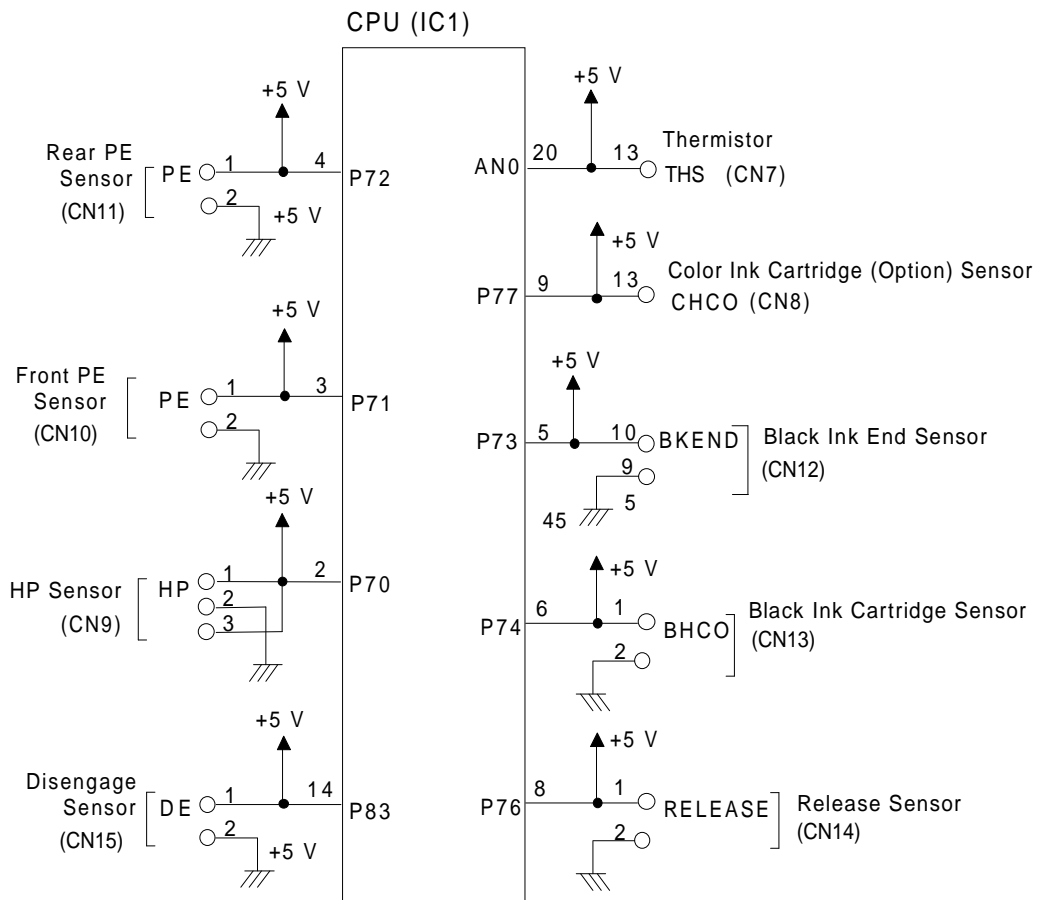


Figure 2-22. Sensor Circuit Block Diagram

- 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 HIGH level signal from this sensor indicates that the carriage is in the home position.
- Front PE sensor A mechanical switch PE (paper end) sensor is built into the printer mechanism to determine if there is paper in the printer. A CLOSE condition from this sensor indicates that no paper is loaded.
- Rear PE sensor A mechanical switch PE sensor is built into the rear paper guide to determine if there is paper in the printer. A CLOSE condition from this sensor indicates that no paper is loaded.
- Release sensor A mechanical switch release sensor is built into the left-side frame of the printer mechanism to determine whether the release lever is switched to friction mode or push tractor mode. A CLOSE condition from this sensor indicates that tractor mode is selected.
- Black ink cartridge sensor A mechanical switch black ink cartridge sensor is built into the ink cartridge holder of the printer mechanism to determine if the black ink cartridge is installed. A CLOSE condition from this sensor indicates that the cartridge is installed.
- Black ink-out sensor A mechanical switch black ink-out sensor is built into the ink cartridge holder of the printer mechanism to determine whether the black ink supply is empty or low. This sensor is used with the black ink cartridge sensor signal as shown in the following table:

Table 2-8. Black Ink-Out Sensing Mode

Black Ink-Out Sensor	Black Ink Cartridge Sensor	
	OPEN	CLOSE
OPEN	Ink out	Ink out
CLOSE	Ink out	Ink remaining

- Thermistor A thermistor is attached to the black ink printhead driver board to monitor temperature, using thermistor resistance values (at 25° C or 77° F, approximately 10 KΩ). The CPU changes the printhead drive signal's pulse width (charge pulse width) based on the temperature level.
- DE sensor A mechanical switch DE (disengage) sensor is built into the printer mechanism to determine whether the disengage gear is on the PF (paper feed) side or the pump side. A CLOSE condition from this sensor indicates that the disengage gear is on the PF side.
- Color ink cartridge sensor A mechanical switch color ink cartridge sensor is built into the optional color upgrade kit to determine if the color ink cartridge is installed. A HIGH level signal from this sensor indicates that the cartridge is installed.
- Color ink-out sensor Data regarding the consumption of color ink is stored in the EEPROM. If the consumption value reaches the regular value, the printer indicates an ink-end or ink-low condition. This value is reset when the ink cartridge is replaced due to these conditions.

2.3.2.3 Carriage Motor Driver Circuit

The SLA7043M carriage motor driver IC (IC15) outputs a constant current to drive the carriage motor in the printer mechanism. The E05B16 gate array (IC2) determines the motor phase and speed and then sends a signal to the carriage motor driver IC using the 4-bit serial transmission line.

The first bit indicates the motor rotation direction. The other three bits are current duty data for the motor speed of each printing sequence. The SLA7043M motor driver can select the reference voltage based on these three current duty data bits. It also receives these signals by two serial transmission lines for the two motor phases (A and B). As a result, the carriage motor can drive in micro-step sequences (a minimum of 1/720 inch).

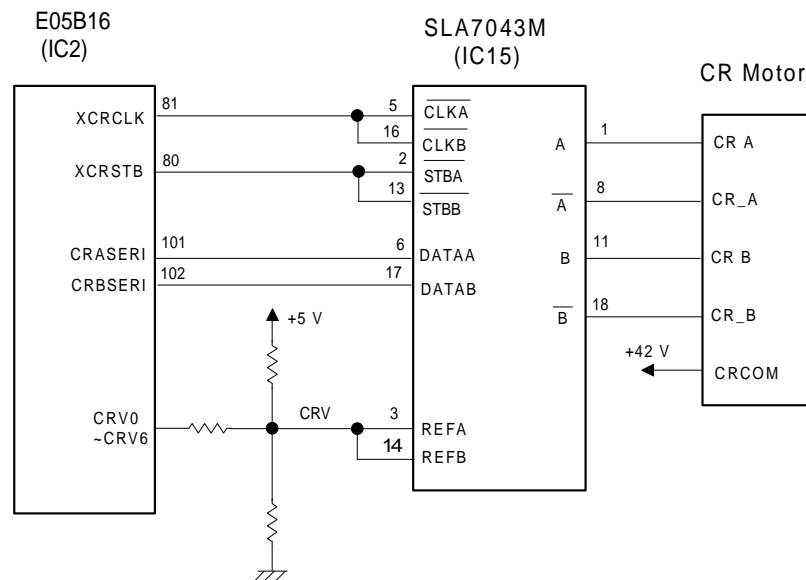


Figure 2-23. Carriage Motor Driver Circuit Block Diagram

The SLA7043M motor driver reads the 4-bit data using four clock counters from the E05B16 (IC2) clock. Each bit is read at the falling edge of these clock pulses. As a result, received serial data is placed in the shift register and then shifts the latch register. When the strobe pulse becomes active from the E05B16 (IC2) clock, serial data is moved into the reference voltage selection circuit and the voltage is changed. Therefore, when the printer is in constant-speed mode, this strobe pulse becomes inactive.

2.3.2.4 Paper Feed Motor Driver Circuit

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

- Paper feed
- Paper pickup
- Pump

The UDN2917EB paper feed motor driver IC (IC15) outputs a constant current to drive the paper feed motor for the printer mechanism. The E05B12 gate array (IC2) determines the motor phase (PFAPH and PFBPH), phase current (PFA0/1 and PFB0/1), and current setting signals (PFV), and then sends the signals to the paper feed motor driver IC.

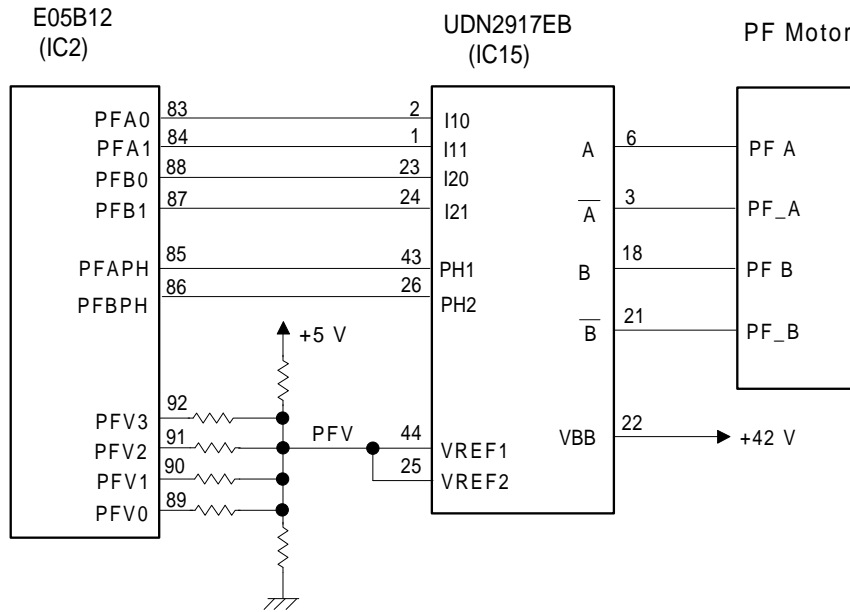


Figure 2-24. Paper Feed Motor Driver Circuit Block Diagram

2.3.2.5 Printhead Driver Circuit

The printhead driver circuit for this printer is composed of the following:

- ❑ Common driver circuit (trapezoidal drive pulse generation)
- ❑ Head driver circuit (nozzle control built into the printhead)

The SED6100D 64-dot head driver in the black ink printhead driver circuit is used to selectively drive the black ink printhead nozzles. Similarly, the SED5619D 60-dot (yellow, magenta, cyan × 20) head driver in the color ink printhead driver circuit is used to selectively drive the color ink printhead nozzles.

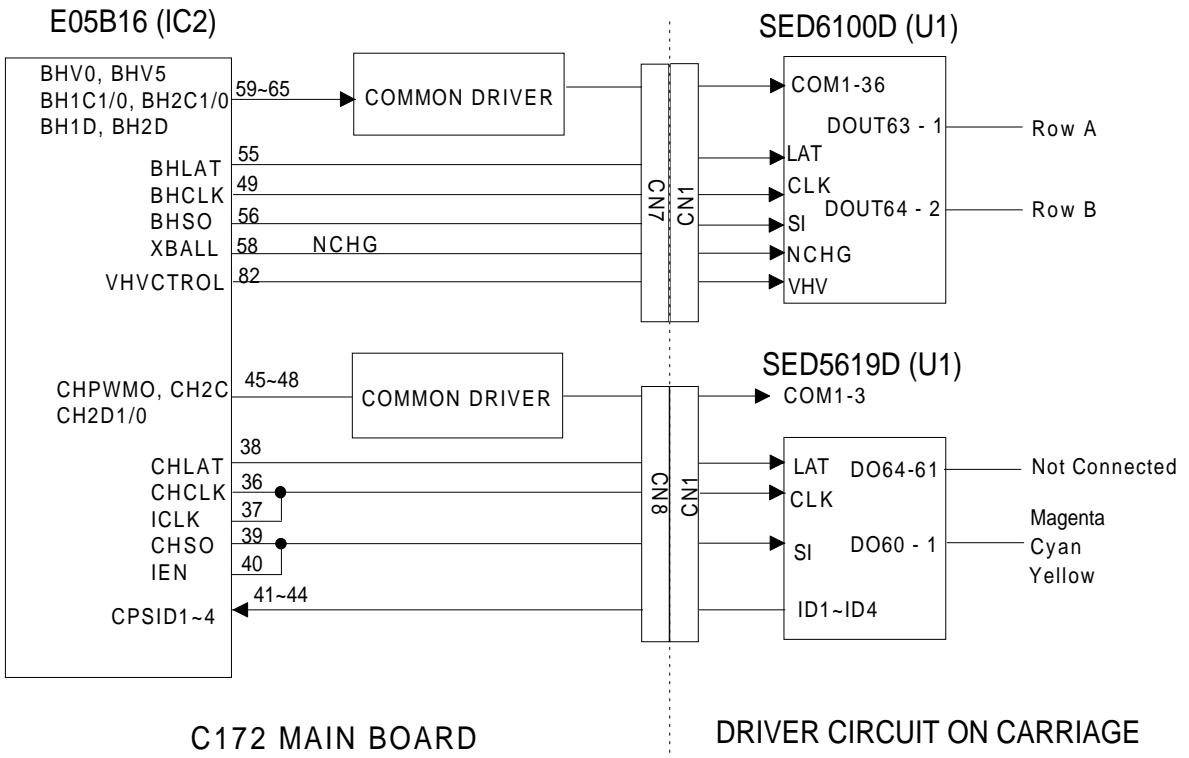


Figure 2-25. Printhead Driver Circuit Block Diagram

1. Black Ink Printing

Common driver circuit

The common voltage (VH) is established to correspond to each of the black printhead characteristics. This value is stored in advance in the EEPROM on the C172 MAIN Board by the host computer. The E05B16 gate array (IC2) outputs the parallel data of the voltage control signals (BHV0 - BHV5) to the common driver circuit referring to this value. The common voltage is then established at 64 levels of the 26 V center value.

Corresponding to the temperature of the printhead environment, the CPU monitors the signal from the thermistor in the black printhead driver circuit to compensate for changes in ink viscosity. The CPU then adjusts the VH value and the interval (Tdh) between the first and second common pulses in one dot.

Head driver circuit

The print data is converted into serial data by the E05B16 gate array (IC2) and is output from port CHSO (pin 39) to the color head driver circuit. Head driver SED6100D then latches the head data when the E05B16 gate array (IC2) outputs the BHLAT signal, and the latched data becomes 64-bit parallel data for the black head. One bit corresponds to each nozzle.

When data transfer and nozzle selection are complete, the E05B16 gate array (IC2) outputs the all-nozzles ON signal (NCHG), black head charge pulse (BH1C/2C), and black head discharge pulse (BH1/2D) to the common drive circuit. This 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 eject the ink.

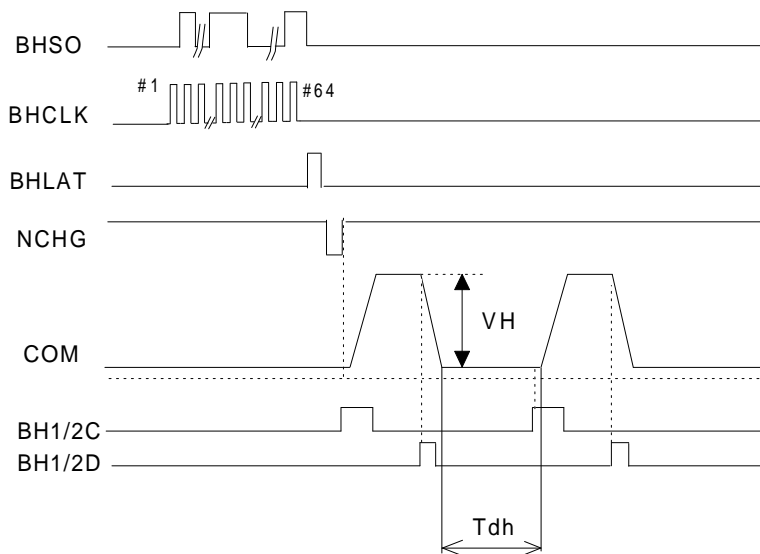


Figure 2-26. Normal Dot Data Transmission Timing

2. Color Ink Printing

Common driver circuit

The color printing common voltage (VH) is established to correspond to each of the color printhead characteristics. This value is stored in ID1 - ID4 patterns in each printhead driver circuit. By connecting the color printhead unit (color upgrade kit) to the carriage unit, these ID data are transmitted to the C172 MAIN Board by the printhead harness. The E05B16 gate array (IC2) outputs the parallel data of the voltage control signals (CHPWMO) to the common driver circuit referring to this value. The common voltage is then established at 15 levels of the 24 V center value.

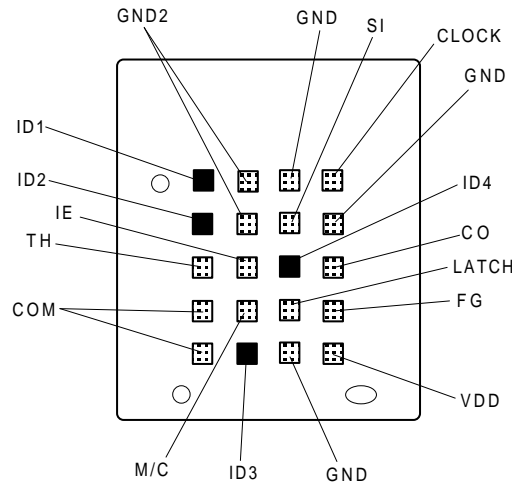


Figure 2-27. Color Upgrade Kit Connector Pin Alignment

Head driver circuit

The print data is converted into serial data by the E05B16 gate array (IC2) and is output from port BHSO (pin 56) to the black head driver circuit. Head driver SED5619D then latches the head data when the E05B16 gate array (IC2) outputs the CHLAT signal, and the latched data becomes 60-bit parallel data for the color head. One bit corresponds to each nozzle.

When data transfer and nozzle selection are complete, the E05B16 gate array (IC2) outputs the color head charge pulse (CH2C) and discharge pulse (CH2D1/0) 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 eject the ink.

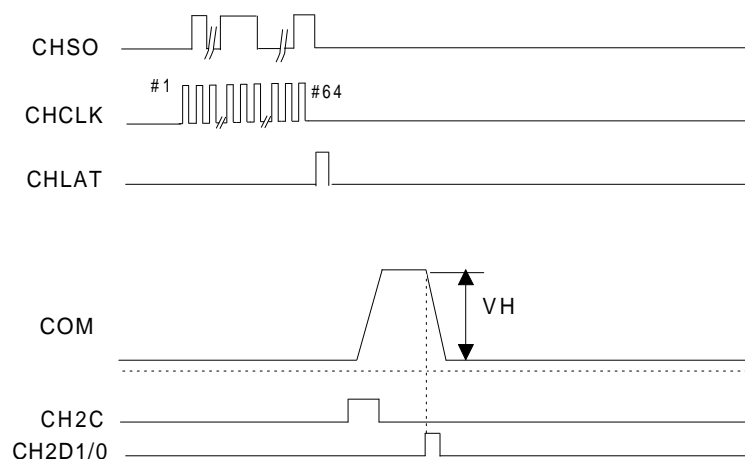


Figure 2-28. Color Data Transmission Timing

3. Normal Dot / EPSON Micro Dot Printing Modes

The Stylus 1500 uses two ink ejection modes (normal dot and EPSON Micro Dot) for monochrome ink printing.

In normal dot printing mode, the print dot consists of two ink dots combined into a single dot. Since this mode uses a larger dot size, the space between dots becomes narrower.

In EPSON Micro Dot Printing Mode, the print dot consists of only one ink dot, so a smaller dot is used. This mode is therefore useful for a larger graded representation and for preventing white banding. Micro Dot mode can be used for EPSON exclusive paper or transparencies with the appropriate paper settings. This mode can also be selected for normal paper printing in super fine (720 dpi) quality.

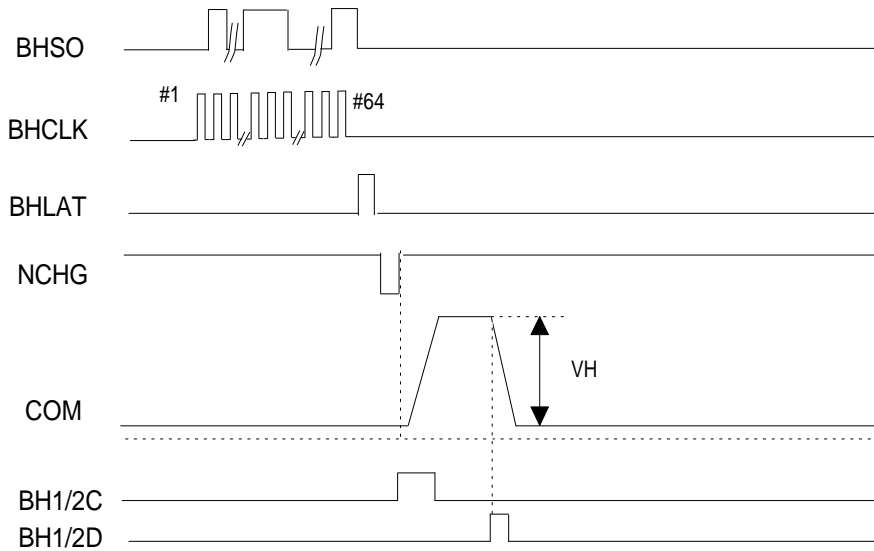


Figure 2-29. EPSON Micro Dot Printing Driver Waveform

2.4 INK SYSTEM MANAGEMENT

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

- Power On
- Ink Cartridge Replacement
- Cleaning Selection
- Print Start
- Flushing
- False Absorbing
- Wiping
- Rubbing
- Micro Absorbing
- Transportation Sequence

These ink system operations are controlled by the following counters:

- Protect counters A, B, and C
- Ink consumption counter

2.4.1 Ink Operations

The ink operations that can be performed selectively by the printer are described below.

1. Power On

This operation is performed when the power is turned on. The control counters are summed.

2. Ink Cartridge Replacement

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

3. Cleaning Selection

This operation cleans each nozzle to ensure that the nozzle fires and that no dots are skipped during printing. This operation is performed by pressing the cleaning button combinations (Alt + Load/Eject or LF/FF) while the printer is paused.

4. Print Start

This operation eliminates ink from the nozzle surfaces and is performed when the printer receives data in the standby state.

5. Flushing

This operation is to inject few ink dots from printhead nozzles preventing from increasing in the viscosity of the head ink. It is performed during continuous printing outside of the printable area to increase throughput.

6. False Absorbing

This operation absorbs ink inside the cap and eliminates ink on the nozzle plate.

7. Wiping

This operation eliminates dust or ink from the nozzle plate by using the head cleaner.

8. Rubbing

This operation removes dust or ink that adheres to the head surface. It eliminates ink by ejection and absorption.

9. Micro Absorbing

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

10. Transportation Sequence

This operation is performed to clean the printhead when the printer is transported from factory to market. A special command is entered at the factory to perform this operation.

2.4.2 Counters

The counters used for controlling ink system operation are stored in EEPROM 93C46 (IC11) on the main board. This data is stored in RAM on the main board while the printer is on.

The counters and their functions are as follows:

- Protect Counter A This counter is used to manage the total amount of drained ink. If the counter value is equal to or exceeds 40,000, the printer indicates an error on the control panel; maintenance is then required. This counter is reset only by the EEPROM reset function. (Refer to Section 1.4.2.)

- Protect Counter B This counter sets a limit to prevent the user from frequent initial ink charging. This counter is stored in the EEPROM as a flag and is reset only by the EEPROM reset function. (Refer to Section 1.4.2.)

- Protect Counter C This counter is used to manage the amount of ink in the left-side drained ink pad in the paper ejection unit. If the counter value is equal to or exceeds 400,000, the printer indicates an error on the control panel; maintenance is then required. This counter is reset only by the EEPROM reset function. (Refer to Section 1.4.2.)

- Ink Consumption Counter This counter is reset during ink cartridge replacement and during EEPROM reset.

Note : *Disassembling or replacing the ink cartridge carelessly before the ink is low or out will cause the ink consumption counter to miscount.*

Service Notes

■ *The protect counters are also reset when:*

- 1. The printer is shipped from the factory.*
- 2. After maintenance is performed (when the ink drain tank is replaced).*

■ *When resetting the EEPROM, perform EEPROM data installation as described in Chapter 4.*

■ *Also when resetting the EEPROM, replace the left-side drained ink pad and the drained ink pad under the mechanism.*

Chapter 3 Disassembly and Assembly

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3.1 OVERVIEW

This section describes procedures for disassembling the main components of the printer. Unless otherwise specified, disassembled units or components can be reassembled by reversing disassembly procedures. 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

Follow 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 it 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 C172 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 polarities do not come in contact with each other.*
 - 2. Do not heat the battery or place it near fire.*
 - 3. Do not solder 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 charge 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.)*
- Never touch the primary parts of the power supply unit (including the heat sink) while plugging it in.*

CAUTION

There is danger of explosion if the battery is replaced incorrectly. Replace it only with the same or equivalent type, recommended by the manufacturer. Dispose of used batteries according to government's laws and regulations.

ATTENTION

Risque d'explosion si la pile est remplacée incorrectement. Ne remplacer que par une pile du même type ou d'un type équivalent recommandé par le fabricant. Éliminer les piles déchargées selon les lois et les règles de sécurité en vigueur.

CAUTION

- Never remove the ink cartridge from the carriage unless specified to do so.*
- Color Cartridge*
When transporting the printer after installing the color ink cartridge, be sure to pack the printer for transportation without removing the ink cartridge.
- Black Cartridge*
On the other hand, to prevent the black ink from leaking, the black ink cartridge is not mounted in the printer during transport. Be sure to pack the printer for transportation with the black ink cartridge removed.
- 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.)*

3.1.2 Tools

This section describes the tools and equipment required for assembling, disassembling, or adjusting the printer. Use only tools that meet these specifications.

Table 3-1. Tools

Tool Name	Type	Part No.
Phillips screwdriver no. 1	O / E	B743800400
Phillips screwdriver no. 2	O / E	B743800200
Standard screwdriver	O / E	B743000100
Thickness gauge	O / E	B776702201
Tweezers	O / E	B741000100
Wrench (M3)	O	—
Box driver (7 mm across)	O / E	B741700200
Torque wrench	E	B765106901

O: Commercially available

E: EPSON-exclusive

Table 3-2. Equipment Required for Maintenance

Description	Specification
Multimeter	—
Oscilloscope	50 MHz

Note : An oscilloscope is required only for servicers who repair to the component level.

3.2 DISASSEMBLY AND ASSEMBLY PROCEDURES

WARNING

☐ Follow all the precautions in Section 3.1.1 when disassembling the printer.

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

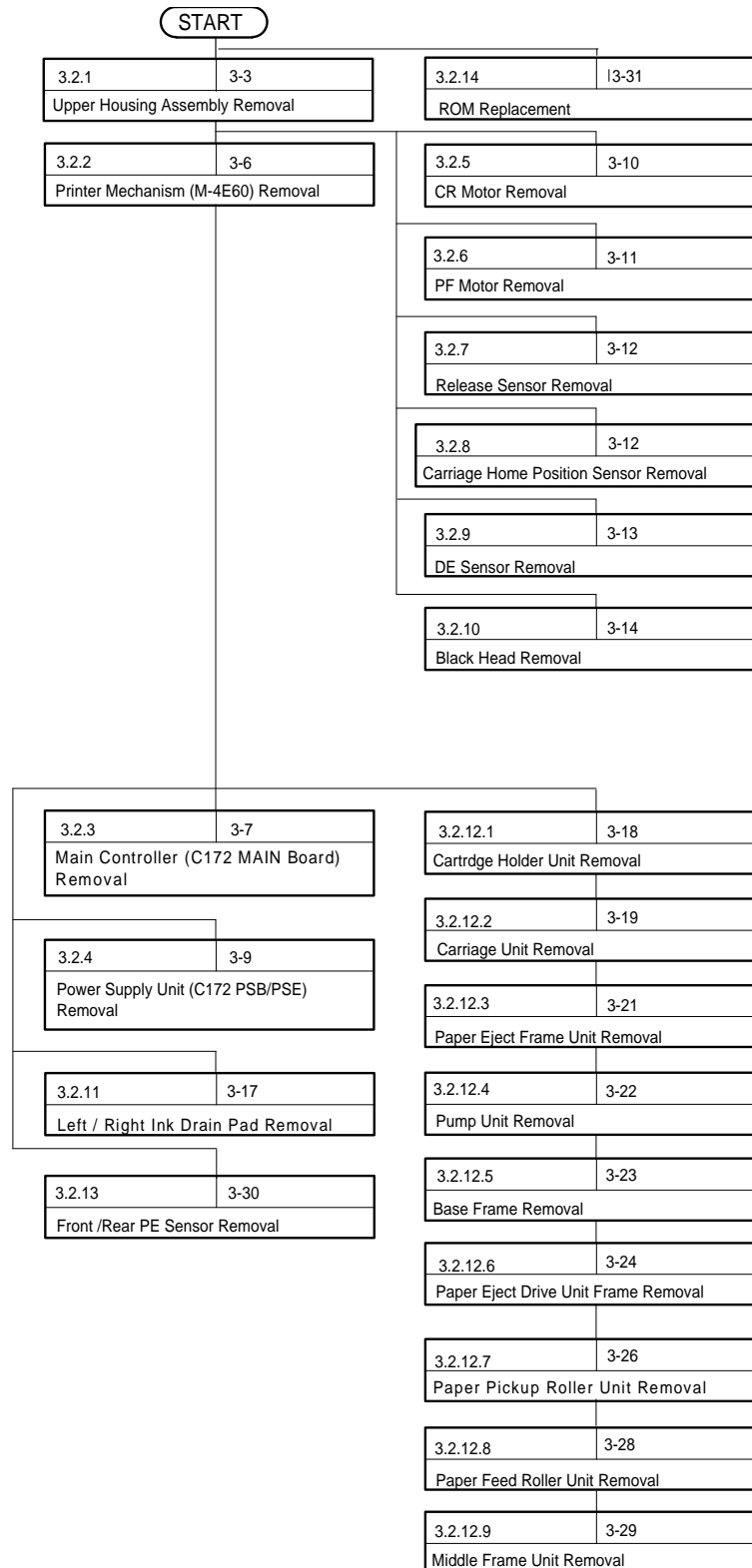


Figure 3-1. Disassembly Flowchart

3.2.1 Upper Housing Assembly Removal

1. Remove the knob, release lever, and ink cartridge cover from the printer. (Refer to Figure 3-4.)
2. Remove the rear sheet guide from the printer by pulling it toward the back. (See Figure 3-4.)
3. Remove the tractor unit from the printer mechanism. (Release the hooks from both sides of the tractor by inserting a tweezers between the tractor and mechanism, and pull up at the rear end of tractor frame as shown in the figure below.)

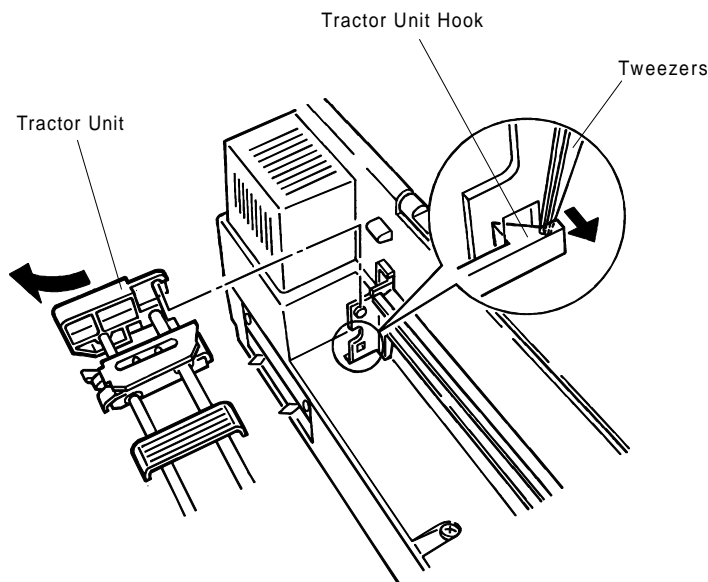


Figure 3-2. Releasing the Tractor Hook

4. Remove the control panel from the printer mechanism. (Release the tab by inserting a screwdriver into the hole in the upper housing, as shown in the figure below.) At this time, disconnect the panel harness from the connector on the C172 MAIN board.

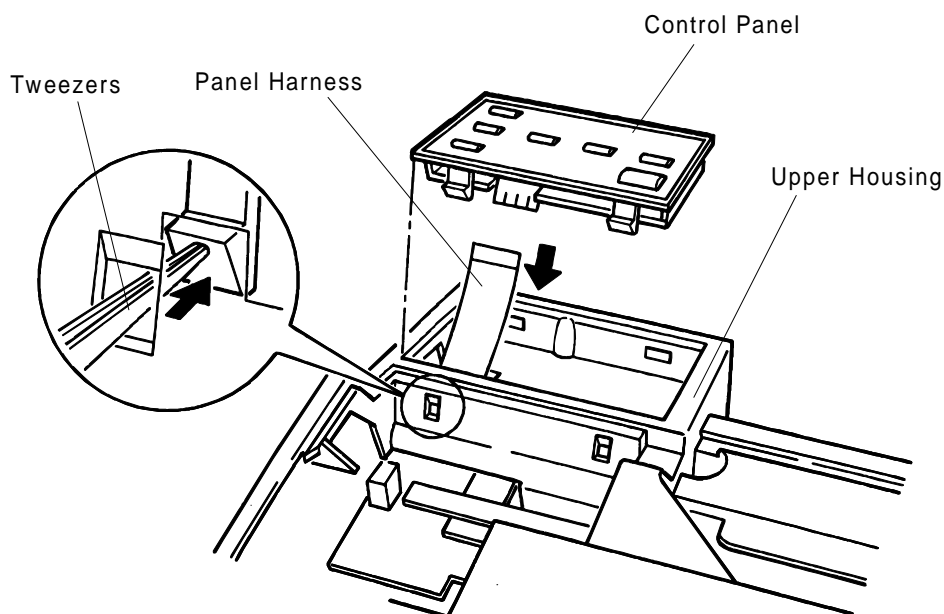


Figure 3-3. Removing the Control Panel

5. Remove 3 (CBB 3 × 12) screws and 3 (CBB 4 × 20) screws securing the upper housing to the lower housing.
6. Insert a standard screwdriver in the holes in the lower housing, disengage the hooks, and remove the upper housing from lower housing by lifting it upward.

CAUTION

☐ Hold the carriage unit in the capping position to prevent the head from drying up.

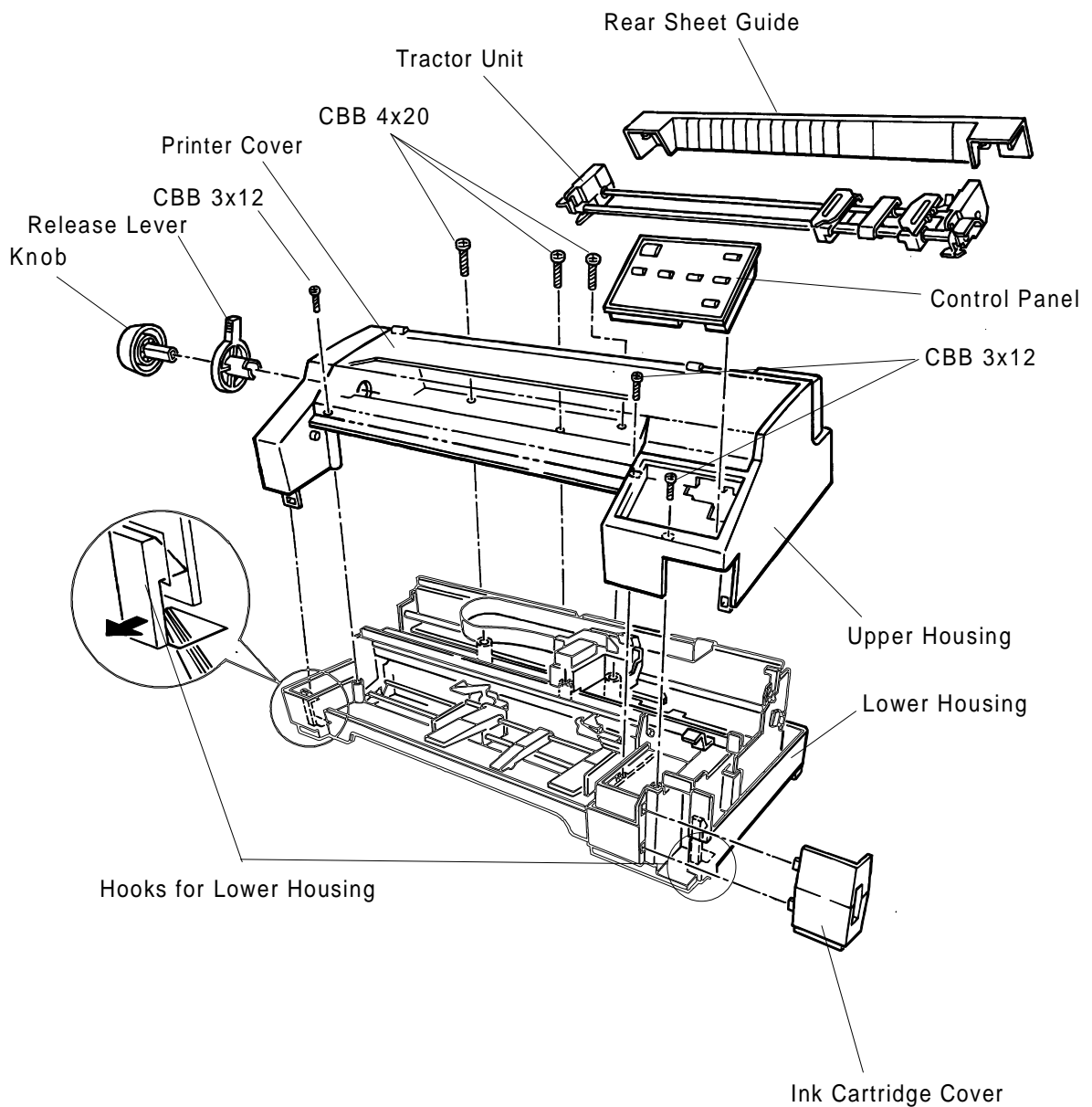


Figure 3-4. Removing the Upper Housing

3.2.2 Printer Mechanism (M-4E60) Removal

1. Remove the upper housing. (See Section 3.2.1.)
2. Remove the cables from connectors CN5 ~ 14 between the mechanism and C172 MAIN board.
3. Remove 4 (CB 4 × 14) screws securing the mechanism to the lower housing.
4. Remove the mechanism from the lower housing by lifting it upward.

CAUTION

Never touch the white PF gears. Handling them will cause damage or contamination that will affect print quality.

DISASSEMBLY / ASSEMBLY POINTS

- ❑ *The mechanism unit does not have lubrication on paper eject frame, where it contacts the carriage unit. Therefore, you may want to put lubricant on it first. (Refer to Chapter 6.)*
- ❑ *When mounting the printer mechanism, insert the shaft for the lower housing into the hole in the ink cartridge holder cover, as shown in the figure below.*
- ❑ *Take care to connect cables to the same color connectors. With CN10 and CN14, which have the same color connectors but different cable lengths, the cable for CN10 does not reach CN14.*

REQUIRED ADJUSTMENTS

- ❑ *When you replace the main board, initialize EEPROM contents as follows:*
 1. *Reassemble the printer.*
 2. *Turn the printer on while holding down the Alt, LF/FF, Economy / Condensed and Pause buttons on the control panel.*
- ❑ *When the EEPROM is initialized, some default settings (for example, the Bi-D setting, head gap / angle / black-color head gap, head drive voltage settings, etc.) are lost. So, you need to adjust the printer. (See Chapter 4.)*
- ❑ *When the EEPROM is initialized, the protect counter is also reset; so you need to replace the ink drain pad. (See Section 3.2.11.)*

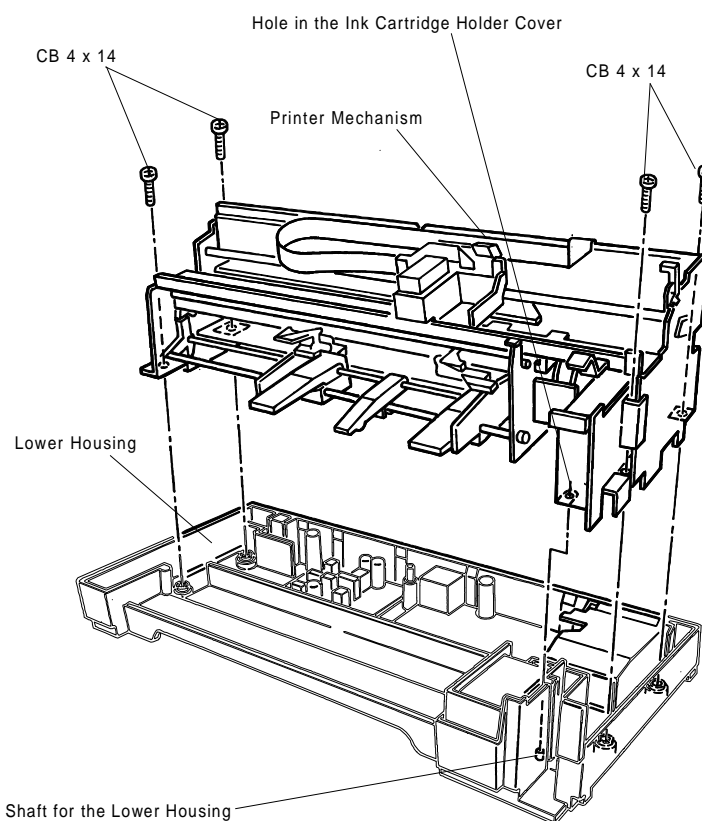


Figure 3-5. Removing the Printer Mechanism

3.2.3 Main Controller (C172 MAIN Board) Removal

1. Remove the upper housing. (See Section 3.2.1.)
2. Remove the printer mechanism. (See Section 3.2.2.)
3. Remove the cables from connectors CN4 and CN16 between the power supply unit and the C172 MAIN board and the cable from control panel connector CN3.
4. Remove 2 (CBS 3 × 12) screws securing the upper connector cover and the Type-B interface shield cover to the lower housing. Then remove the upper connector cover.
5. Remove 7 (CBP 3 × 12) screws and 2 (CBS 3 × 6) screws securing the C172 MAIN board to the lower housing. Then remove the controller board along with the shield cover.
6. Remove 2 (CP 3 × 6) screws securing the shield cover to the C172 MAIN board, and remove the shield cover.

REQUIRED ADJUSTMENTS

When you replace the main board, initialize EEPROM contents as follows:

1. Reassemble the printer.

2. Turn the printer on while holding down the Alt, LF/FF, Economy / Condensed, and Pause buttons on the control panel.

When the EEPROM is initialized, some default settings (for example, the Bi-D setting, head gap / angle / black-color head gap, head drive voltage settings, etc.) are lost. So, you need to adjust the printer. (See Chapter 4.)

When the EEPROM is initialized, the protect counter is also reset; so you need to replace the ink drain pad. (See Section 2.4.2. and Section 3.2.11.)

CAUTION

The C172 MAIN board shield plate has sharp edges, so take care in handling them.

Take care in handling the lithium battery, as described in Section 3.1.1.

Replace the control panel harness, and then remove the main controller .

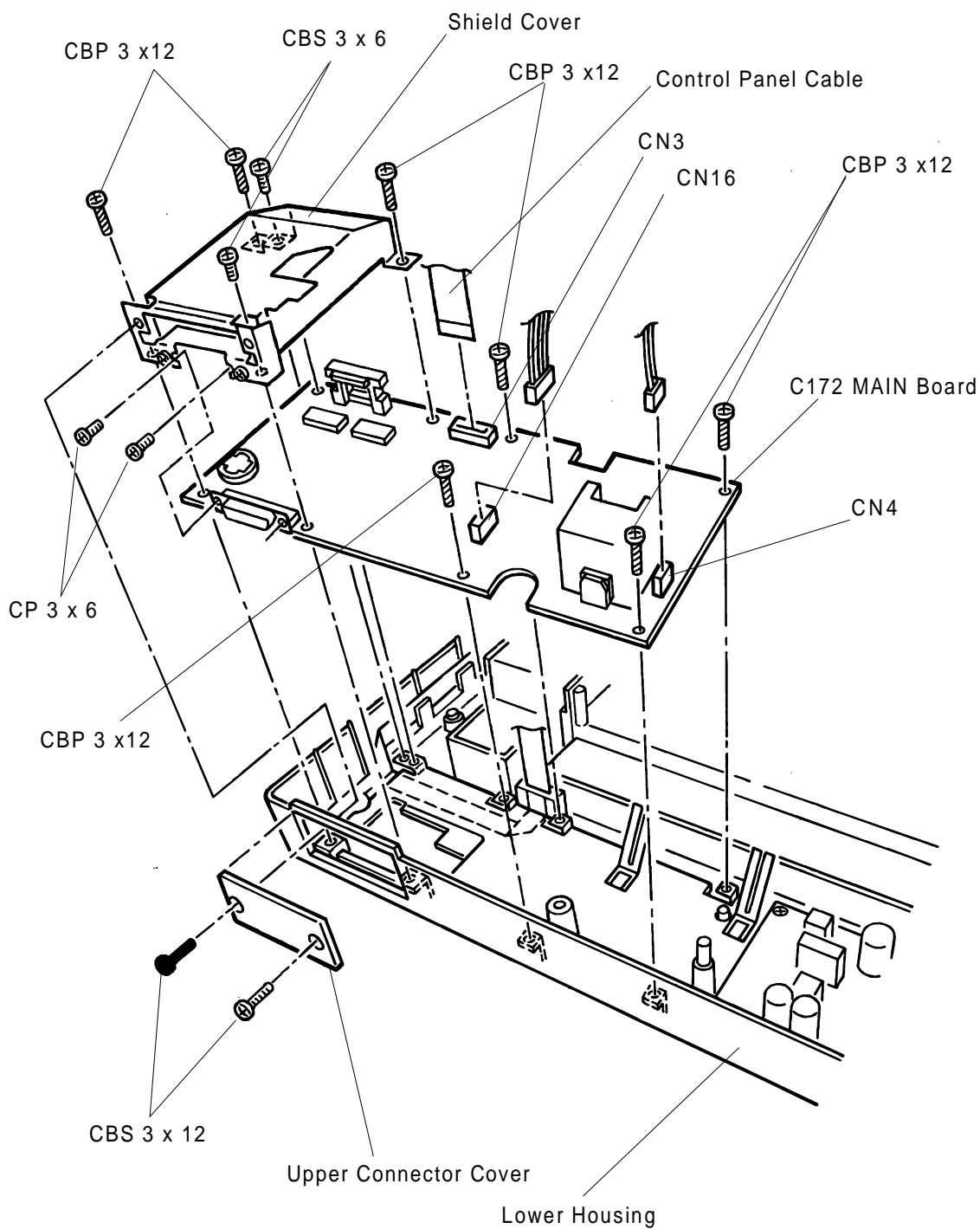


Figure 3-6. Removing the C172 MAIN Board

3.2.4 Power Supply Unit (C172 PSB/PSE Board) Removal

1. Remove the upper housing. (See Section 3.2.1.)
2. Remove the printer mechanism. (See Section 3.2.2.)
3. Disconnect the power cable from connector CN1 on the C172 PSB/PSE board and the harness from connector CN2 from the main controller board.
4. Remove 4 (CBP 3 × 12) screws securing the power supply unit to the lower housing; then remove the power supply unit.

WARNING

Because the power switch is located in the secondary side of C172 PSB/PSE, the primary side remains hot, even if power is off. Therefore, disconnect the power cable from the AC inlet.

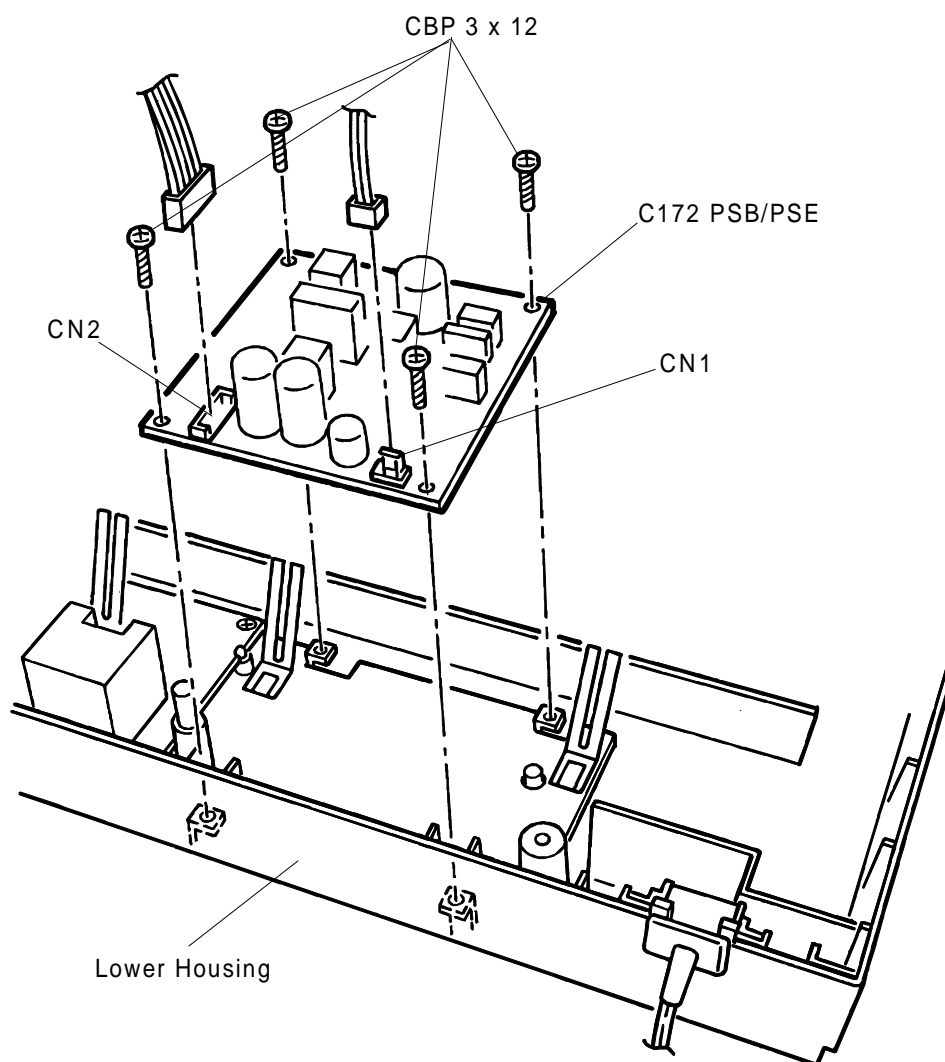


Figure 3-7. Removing the Power Supply Unit

3.2.5 CR Motor Removal

1. Remove the upper housing. (See Section 3.2.1.)
2. Disconnect the cable from the CR motor.
3. Remove the timing belt spring to loosen belt tension. Then remove the timing belt from the CR motor pulley.
4. Tip the CR motor unit slightly clockwise. Then remove the motor from the base frame (procedures 1 to 3 below).

REQUIRED ADJUSTMENTS

After you have removed the CR motor, perform the Uni-D and Bi-D adjustments. (See Chapter 4.)

CAUTION

- ❑ Do not damage the surface of ink supply tube.
- ❑ When assembling the CR motor, do not catch the cable for the DE sensor between the base frame and middle frame unit.
- ❑ Never touch the white PF gears. Handling them will cause damage or contamination that will affect print quality.

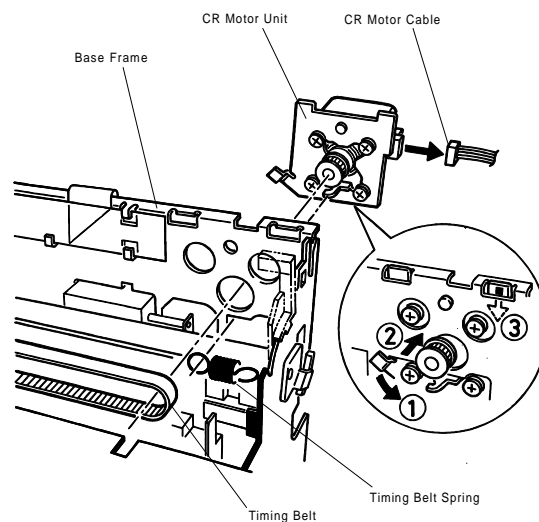


Figure 3-8. Removing the CR Motor

DISASSEMBLY/ASSEMBLY POINT

When placing adhesive on the CR motor fan to attach the CR motor shaft, position the shaft within 1 mm of the back of the fan and set the sink side of fan toward outside. (Refer to Chapter 6.)

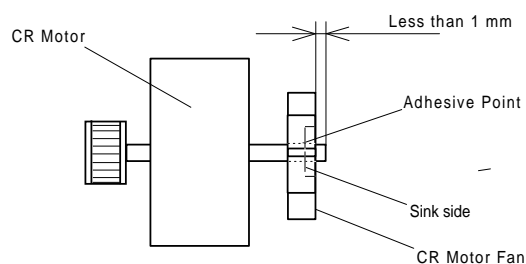


Figure 3-9. Applying Adhesive to the CR Motor Fan

3.2.6 PF Motor Removal

1. Remove the upper housing. (See Section 3.2.1.)
2. Unclamp the cable for the PF motor from the printer mechanism, and disconnect the cable from connector CN6 on the main controller board.
3. Use a wrench to remove 2 (M3) hexagon nuts securing the PF motor to the middle frame, and then remove the PF motor.

CAUTION

Never touch the white PF gears. Handling them will cause damage or contamination that will affect print quality.

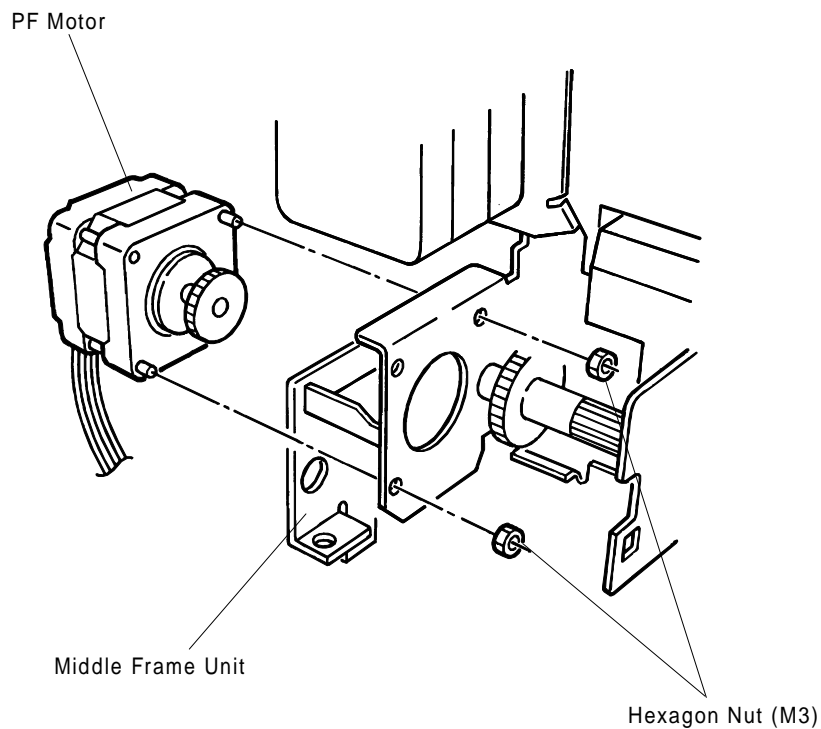


Figure 3-10. Removing the PF Motor

3.2.7 Release Sensor Removal

1. Remove the upper housing. (See Section 3.2.1.)
2. Disconnect the cable from the connector on the sensor.
3. Remove the sensor from the left frame. (Insert tweezers to release the hook securing the sensor to the left frame. Then pull the sensor off, as shown in the figure below.)

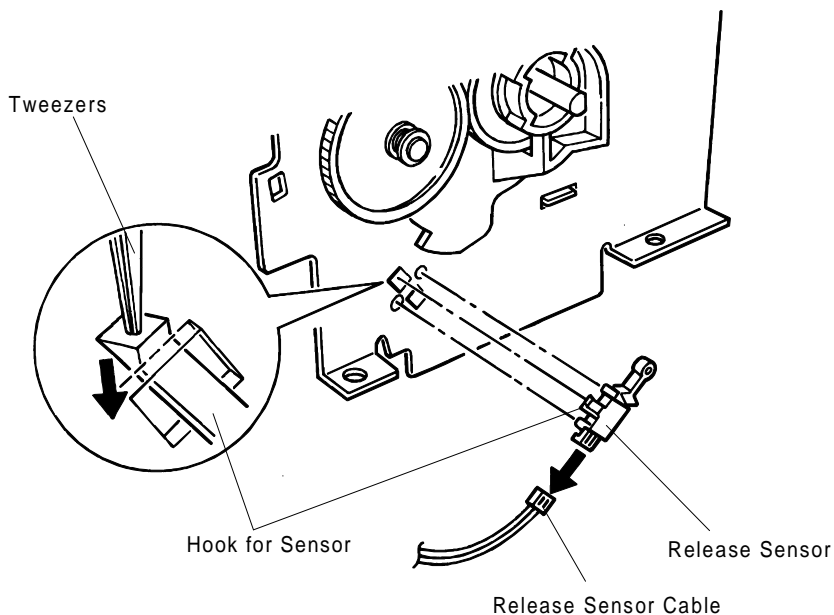


Figure 3-11. Removing the Release Sensor

3.2.8 Carriage Home Position (HP) Sensor Removal

1. Remove the upper housing. (See Section 3.2.1.)
2. Disconnect the cable from the connector on the sensor.
3. Remove the sensor from the paper eject frame. (Insert tweezers to release the hooks securing the sensor to the paper eject frame. Then pull the sensor off, as shown in the figure below.)

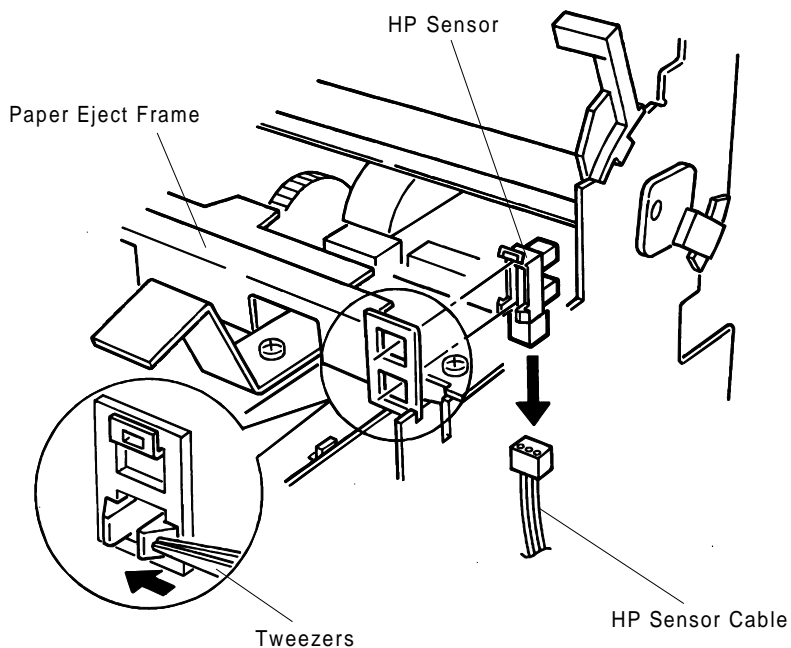


Figure 3-12. Removing the HP Sensor

3.2.9 DE Sensor Removal

1. Remove the upper housing. (See Section 3.2.1.)
2. Disconnect the cable from the connector on the sensor.
3. Remove the sensor from the sub-select cam frame. (Insert tweezers to release the hooks securing the sensor to the sub-select cam frame. Then pull the sensor off, as shown in the figure below.)

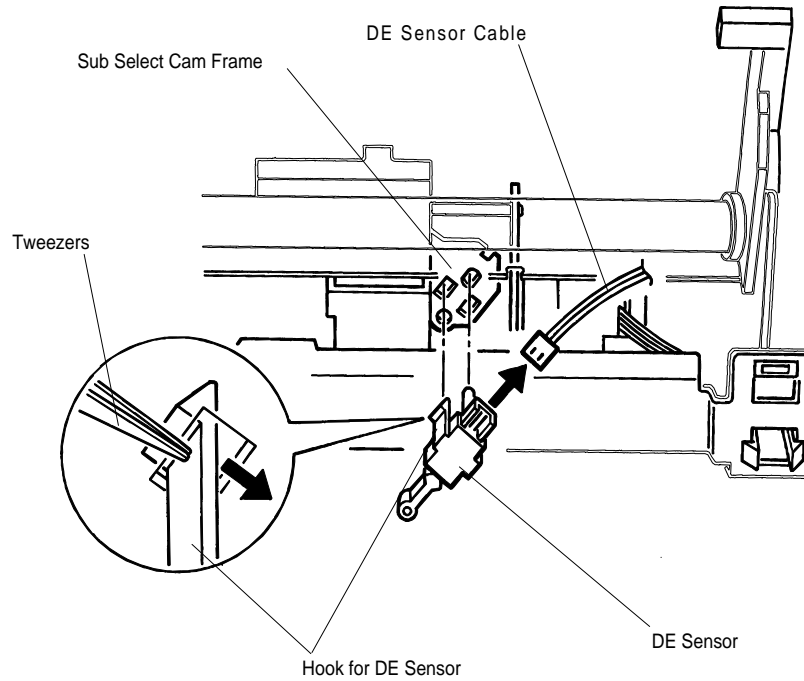


Figure 3-13. Removing the DE Sensor

3.2.10 Black Head Removal

1. Remove the upper housing. (See Section 3.2.1.)
2. Remove 2 (CB(P2) 3 × 6) screws securing the CR cover to the carriage unit.
3. Remove the CR cover from the carriage unit. (Insert tweezers to release the hooks securing the cover to the carriage unit, as shown in the figure below.)
4. Remove the head fastening pin securing the black head to the carriage unit, and remove the black head along with the head FFC by lifting it upward.

CAUTION

- ❑ Take measures to protect the printhead unit from static electricity, because the driver IC is attached directly to the printhead unit.
- ❑ Never touch the metallic surface of the nozzle cover for the printhead. Handle it only by holding the edges of the printhead.

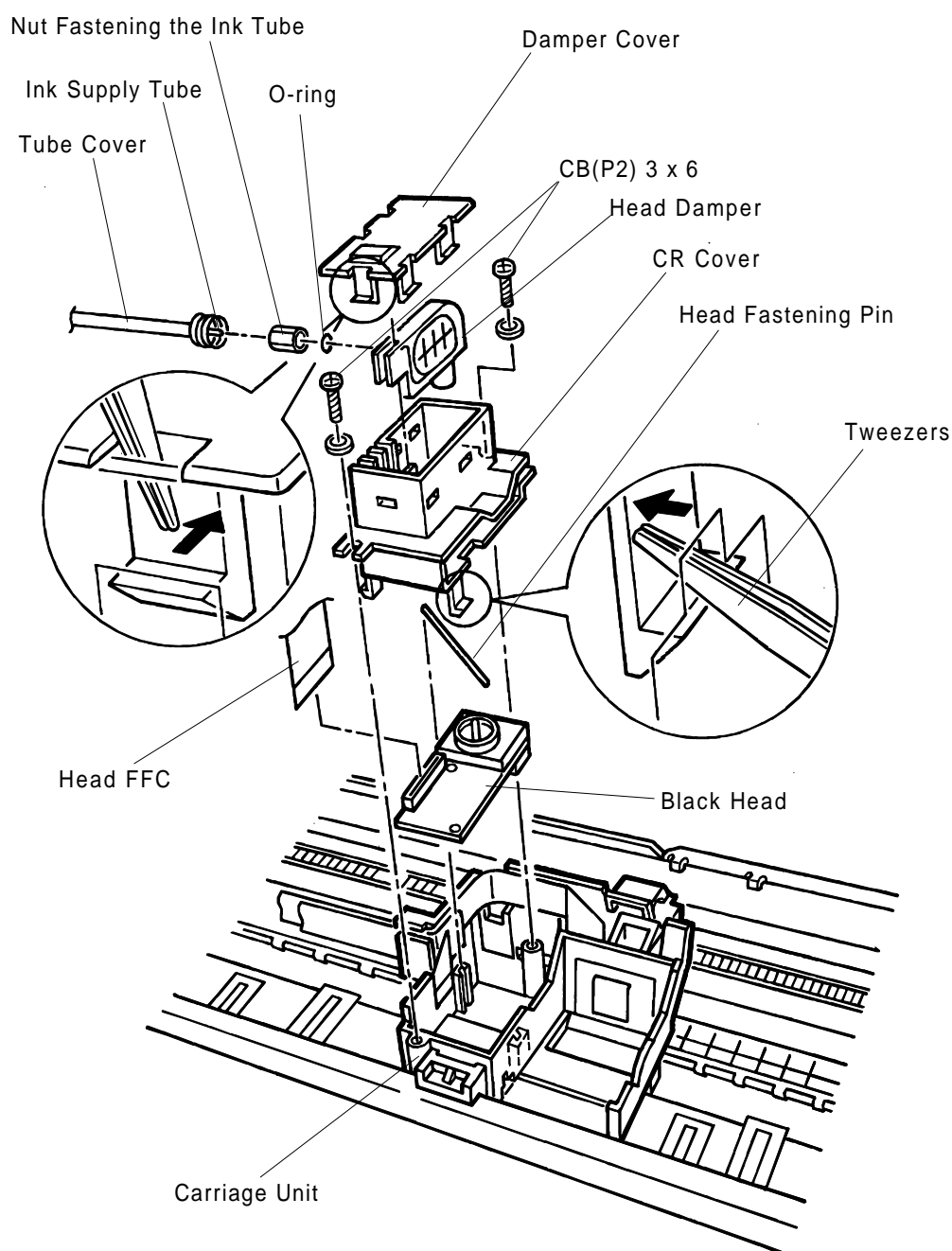


Figure 3-14. Removing the Black Head

3.2.10.1 Black Head Assembly

1. Connect the black head cable to the black head, and mount the head to the carriage unit, along with the YMC head cable and the FFC holder.
2. Attach FFC holder B to the carriage unit.
3. Fit the black head fastening pin into the notch in the carriage unit.
4. Attach the CR cover (without the damper cover installed) to the carriage unit, and fasten the cover to the carriage with 2 (CBP(P2) 3 × 6) screws.
5. Attach the damper to the carriage unit.
6. Insert the nut fastening the tube first; then insert the O-ring for the ink supply tube.
7. Use a torque wrench to attach the tube to the damper with the nut. The torque for tightening the nut is 0.09 ~ 0.11 Nm (0.90 ~ 1.1 kg-cm).
8. Cover the ink supply tube with the tube cover, and attach the tube to the base frame.
9. Attach the tube cover and damper to the CR cover.
10. Attach the damper cover to the CR cover.
11. Secure the black head cable, YMC head cable, and plate holding the tube to the base frame with a (CBS 3 × 6) screw. The torque for tightening the screw is 0.78 ~ 0.98 Nm (8 ~ 10 kg-cm).

REQUIRED ADJUSTMENT

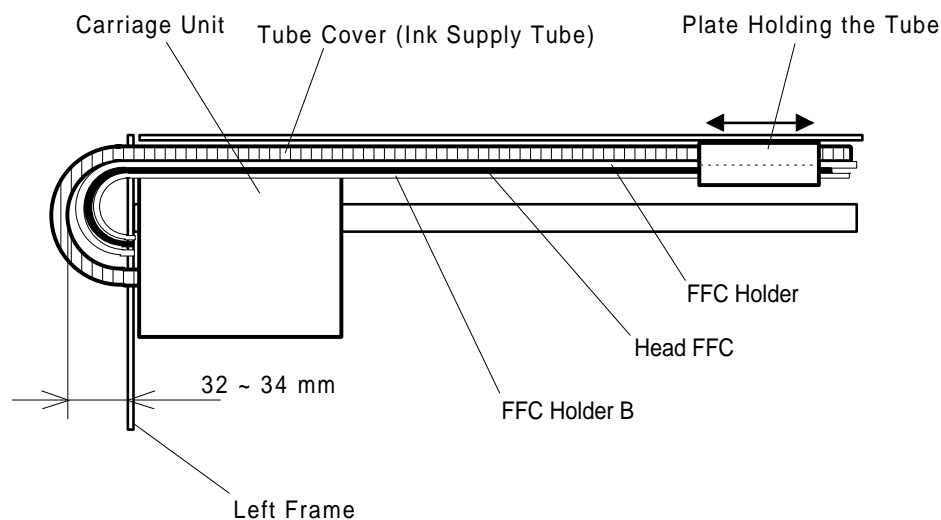


Figure 3-15. Adjusting the Ink Supply Tube and Left Frame

Move the carriage to the left end of the printer by hand, and adjust the distance between the tube and the left frame to 32 ~ 34 mm by sliding the plate holding the tube right and left.

DISASSEMBLY/ASSEMBLY POINT

- Use a torque wrench to tighten the screws. Do not over-tighten!
- After attaching the head, push it toward the back twice to remove any looseness between the black head and carriage unit.
- When you attach the tube cover to the CR cover, twist it a little to prevent the tube from dropping and contacting other parts of the mechanism.

REQUIRED ADJUSTMENTS

When removing or changing the black head, the following adjustments are needed.

1. Writing the black head data (See Section 4.1.3.)
2. Black head angle adjustment (See Section 4.1.4)
3. Black - color head vertical adjustment (See Section 4.1.8.)
4. Head gap adjustment (See Section 4.1.9.)

CAUTION

Make a note of the following head data, which is written on the printhead. This information is required for printer adjustments described in Chapter 4.

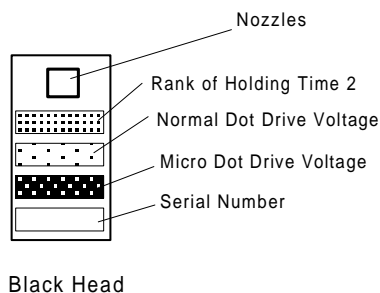


Figure 3-16. Data Found on the Black Head

3.2.11 Left / Right Ink Drain Pad Removal

Right Ink Drain Pad Removal

When protect counter A reaches 40,000, the printer displays a maintenance request error. (Refer to Section 2.4.2.)

1. Remove the upper housing. (See Section 3.2.1.)
2. Remove the printer mechanism. (See Section 3.2.2.)
3. Remove the right ink drain pad from the lower housing.

Left Ink Drain Pad Removal

When protect counter C reaches 400,000, the printer displays a maintenance request error. (Refer to Section 2.4.2.)

1. Remove the upper housing. (See Section 3.2.1.)
2. Remove the ink drain pad cover on the paper eject drive unit. Then remove the left ink drain pad.

REQUIRED ADJUSTMENT

When you replace the ink drain pad, initialize protect counter A in EEPROM contents as follows to fit printer mechanism parameters to EEPROM data:

1. Reassemble the printer.

2. Turn the printer on while holding down Alt, LL/FF, Economy/Condense and Pause buttons on the control panel.

When the EEPROM is initialized, some default settings (for example; Bi-D setting, head gap / angle / black-color head gap, head drive voltage settings, etc.) are lost. So, you need to adjustment to the printer. (See Chapter 4.)

If you find that the value of counter A is less than 32,000, and there has been no maintenance request error, be sure to let the customer know that you replaced the ink drain pad.

If you find that the value of counter C is less than 320,000, and there has been no maintenance request error, let the customer know that you replaced the ink drain pad.

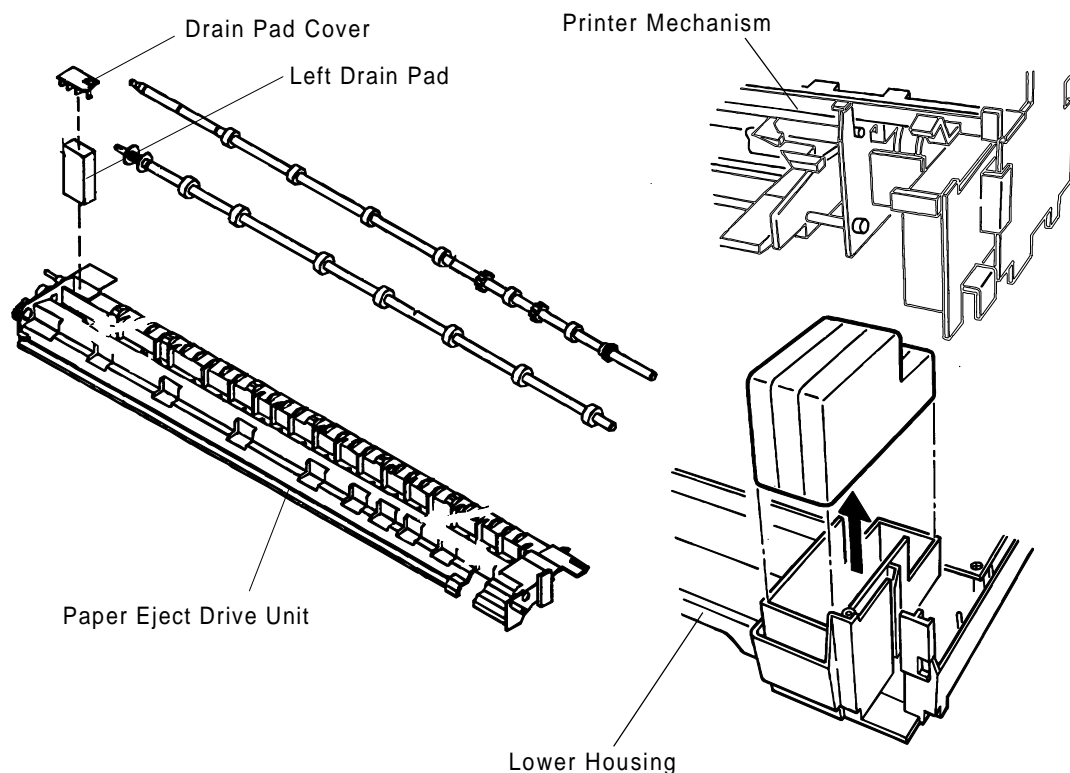


Figure 3-17. Removing the Ink Drain Pad

3.2.12 Printer Mechanism (M-4E60) Disassembly

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

CAUTION

Never touch the white PF gears. Handling them will cause damage or contamination that will affect print quality.

3.2.12.1 Cartridge Holder Unit

1. Remove the printer mechanism. (See Section 3.2.2.)
2. Unclamp the cables for the ink cartridge sensor and black ink end sensor from the right frame.
3. Remove 2 (CBS 3 × 6) screws securing the cartridge holder to the right frame, and remove the cartridge holder unit from the right frame, along with the ink supply tube.
4. Remove the nut fastening the ink tube, and remove the tube from cartridge holder.

DISASSEMBLY/ASSEMBLY POINTS

- When you attach the ink supply tube, insert the nut used to fasten the tube first, and then insert O-ring into the ink supply tube.
- Tighten the screws using a torque wrench. The tightening torque for the nut is 0.09 ~ 0.11 Nm (0.90 ~ 1.1 kg-cm).

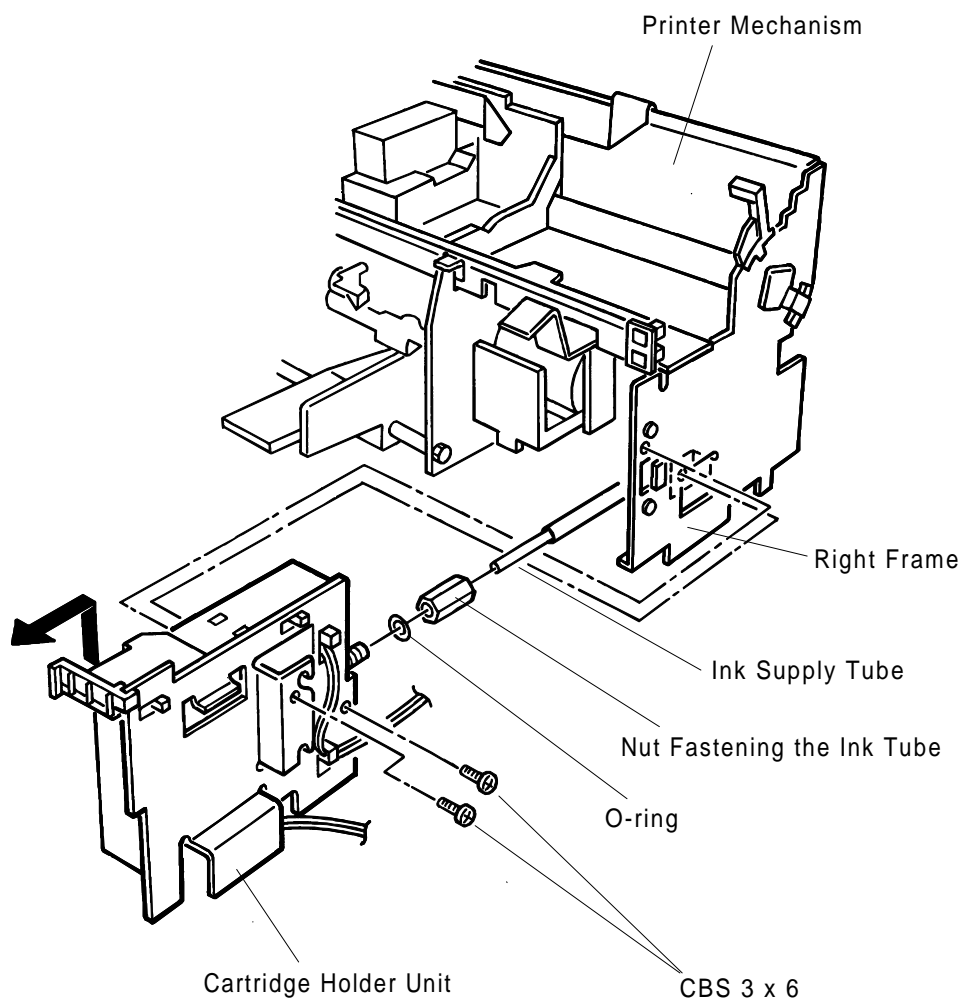


Figure 3-18. Removing the Cartridge Holder Unit

3.2.12.2 Carriage Unit Removal

1. Remove the printer mechanism. (See Section 3.2.2.)
2. Remove the timing belt spring to loosen belt tension. Then, remove the timing belt from the CR motor pulley and the timing belt driven pulley on base frame. (See Section 3.2.5.)
3. If the head cleaner lever gets caught on the carriage unit, manually remove the lever from the carriage unit. (See Figure 3-22.)
4. Remove the (CBS 3 × 6) screw securing the plate that holds the tube and the head FFC to the base frame, and then remove the tube, along with the tube cover and head FFC, from the base frame.
5. Turn the PG adjust bushings in both directions to disengage them from left and right frames, and then remove the carriage unit and the CR guide shaft.
6. Remove the CR guide shaft from the carriage unit.

REQUIRED ADJUSTMENTS

- ❑ When you replace or remove the carriage unit, you must perform the platen gap (PG) adjustment. (See Chapter 4.)
- ❑ If you remove the printhead and carriage unit, you need to write the head setting parameters to the EEPROM on the C172 MAIN board. (See Section 3.2.10 and Chapter 4.)

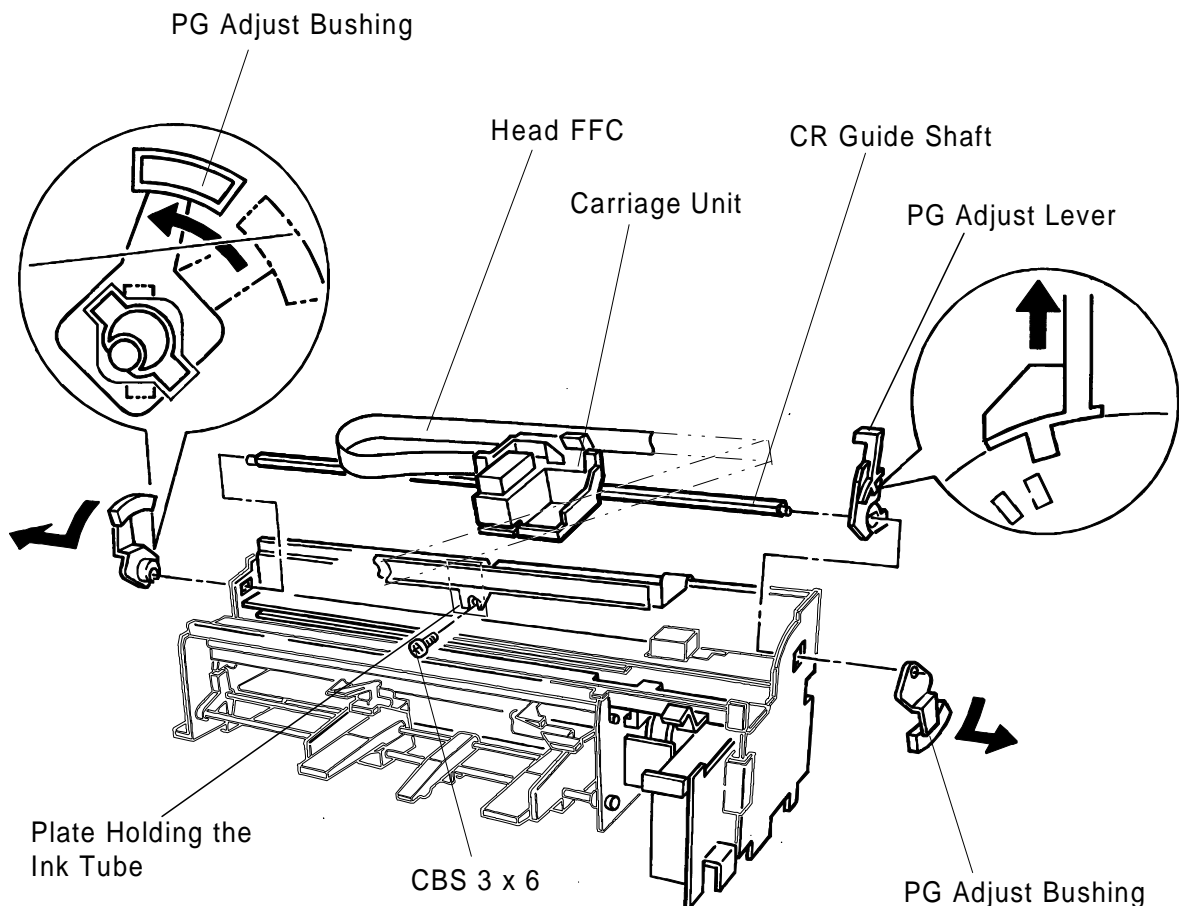


Figure 3-19. Removing the Carriage Unit

CAUTION

- Take proper measures to protect the printhead unit from static electricity, because the driver IC is directly attached to the printhead unit.
- Never touch the metallic surface of the nozzle cover for the printhead. Handle it only by holding the edges of the printhead.
- Never touch the white PF gears. Handling them will cause damage or contamination that will affect print quality.

DISASSEMBLY/ASSEMBLY POINT

When you attach the timing belt to the carriage unit, insert the timing belt with the teeth out from the carriage unit, as shown in the figure below.

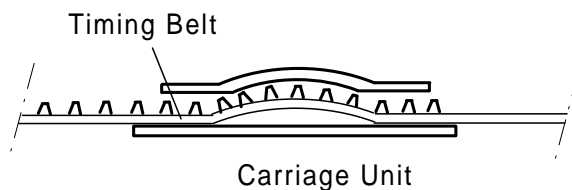


Figure 3-20. Attaching the Timing Belt

3.2.12.3 Paper Eject Frame Unit Removal

1. Remove the printer mechanism. (See Section 3.2.2.)
2. Remove the carriage unit. (See Section 3.2.12.2.)
3. Remove 3 (CBS 3 × 6) screws securing the paper eject frame unit to the left frame, the right frame, and the middle frame, and then remove the paper eject frame unit.

CAUTION

While removing the paper eject frame unit, insert a clean and soft paper towel between printhead and the paper feed roller unit to protect the printhead nozzles.

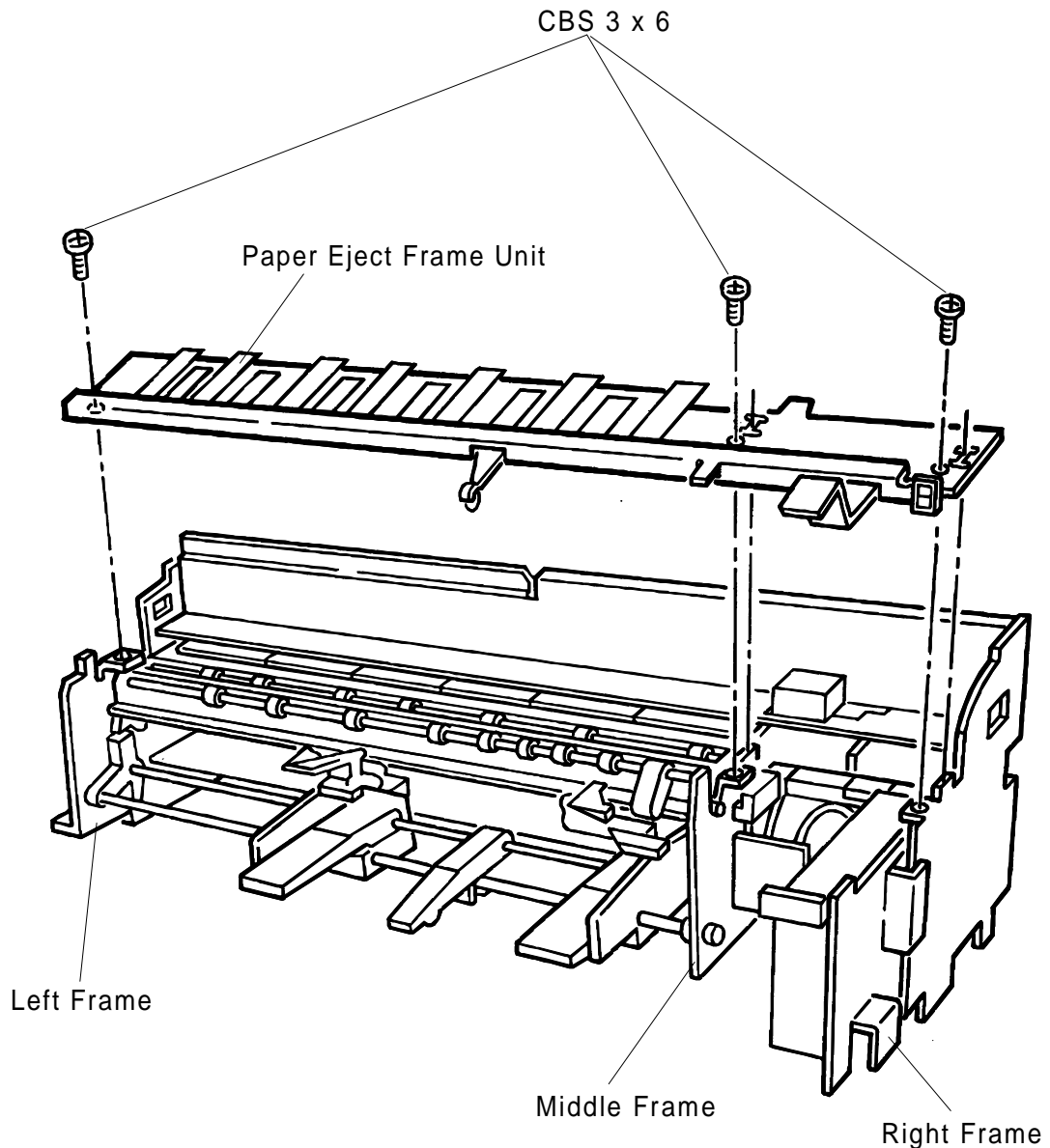


Figure 3-21. Removing the Paper Eject Frame Unit

3.2.12.4 Pump Unit Removal

1. Remove the printer mechanism. (See Section 3.2.2.)
2. Remove the carriage unit. (See Section 3.2.12.2.)
3. Remove the paper eject frame unit. (See Section 3.2.12.3.)
4. Remove the (CBP 3 × 8) screw securing the pump unit to the right frame and the (CBS 3 × 6) screw securing the pump unit to the middle frame, and then remove the pump unit.

CAUTION

Keeping the head cleaner clean is extremely important to keep the ink ejection system in the printhead working properly, and it directly affects print quality. Therefore, handle the head cleaner very carefully, and observe the following precautions:

- Never touch the head cleaner with your bare hands.*
- When attaching the head cleaner to the pump unit, place the rubber face of the head cleaner toward the right, using gloves and clean tweezers.*

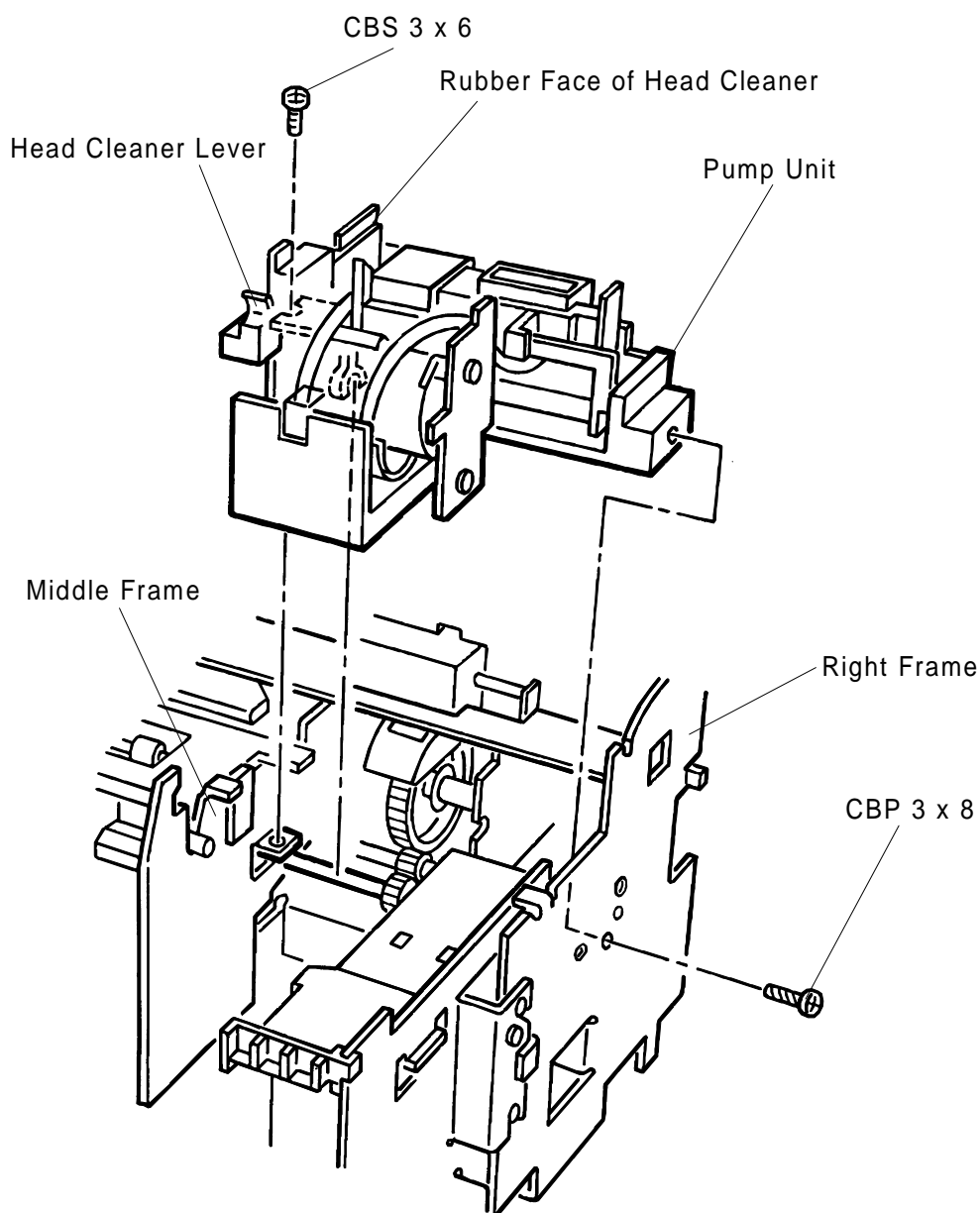


Figure 3-22. Removing the Pump Unit

3.2.12.5 Base Frame Removal

1. Remove the printer mechanism. (See Section 3.2.2.)
2. Remove the carriage unit. (See Section 3.2.12.2.)
3. Remove the paper eject frame unit. (See Section 3.2.12.3.)
4. Remove the E-ring securing the spur gear (46 mm) to the shaft of the left frame, and then remove 2 plain washers, a compression spring (1.96 g), and the gear from the left frame.

CAUTION

When removing the E-ring, be careful not to lose the 1.96 g spring and plain washer attached to spur gear.

5. Remove the tractor release cam from the paper feed roller unit.
6. Remove the tractor release cam support from the left frame, working it through the hole in the left frame.
7. Remove 5 (CBS 3 × 6) screws securing the base frame to the left frame, right frame, and middle frame. Then remove the base frame by lifting it upward.

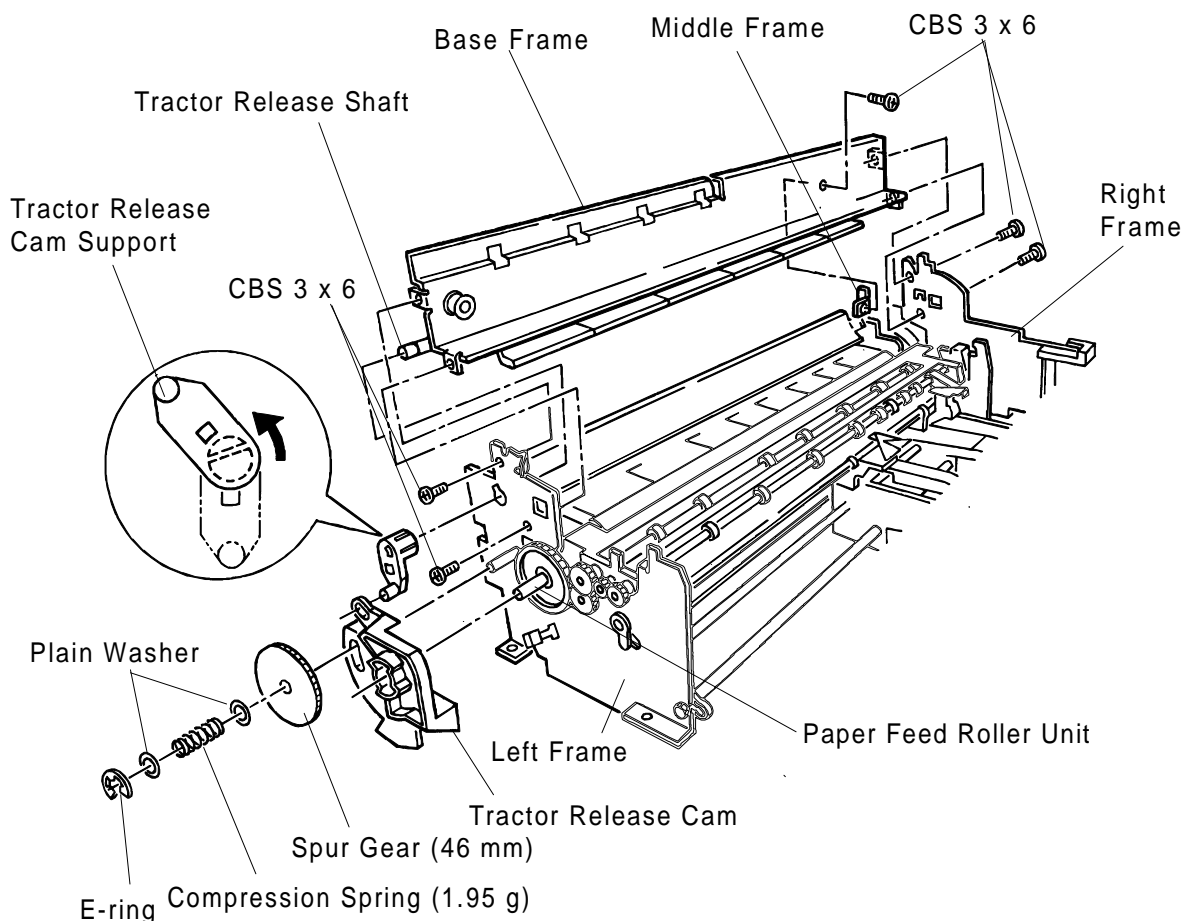


Figure 3-23. Removing the Base Frame

3.2.12.6 Paper Eject Drive Unit Removal

1. Remove the printer mechanism. (See Section 3.2.2.)
2. Remove the carriage unit. (See Section 3.2.12.2.)
3. Remove the paper eject frame unit. (See Section 3.2.12.3.)
4. Remove the base frame. (See Section 3.2.12.5.)
5. Remove the left paper eject assembly stopper, and move the left and right paper eject assemblies to the notches on the right side of the paper eject drive unit. Then remove the assemblies by pulling them forward.
6. Turn the paper feed roller unit clockwise with the knob, moving the trigger lever on the right end of paper feed roller to set the hopper assembly to the lowest position. (The trigger lever is shown in Figure 3-24.)
7. Remove the (CBP 3 × 8) screw securing the paper eject drive unit to the left frame and then remove the paper eject drive unit.

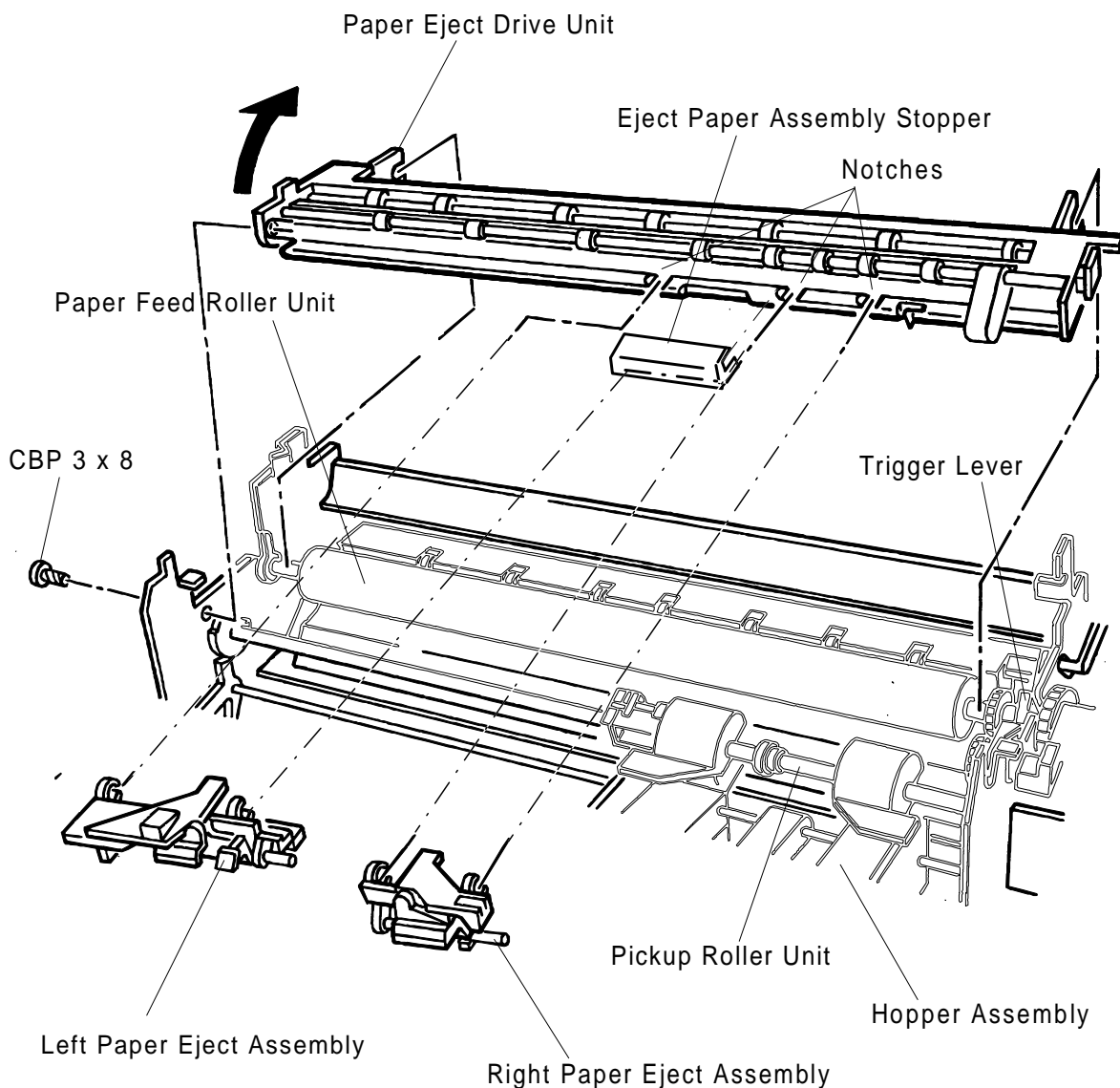


Figure 3-24. Removing the Paper Eject Drive Unit

DISASSEMBLY/ASSEMBLY POINT

When attaching the left and right paper eject assemblies to the paper eject drive unit, assemble the left paper eject assembly as follows to fit the cam cover assembly for the paper pickup roller unit and to fit the right paper eject assembly for the paper pickup roller unit:

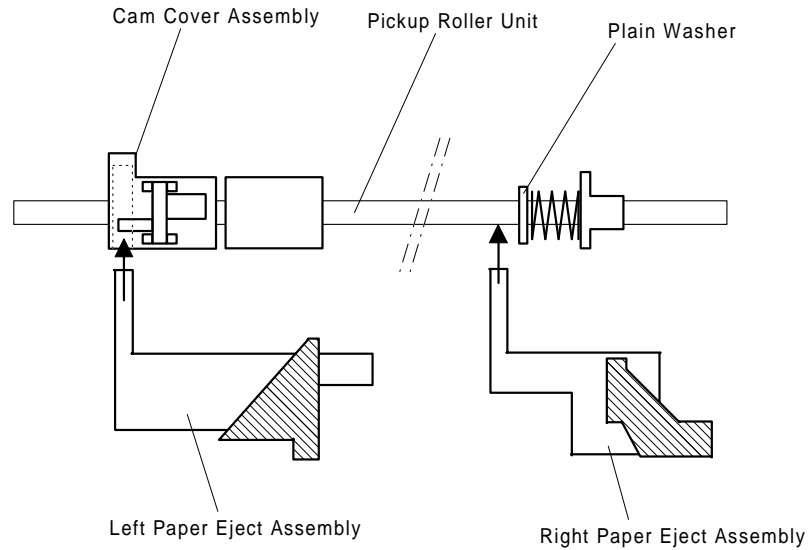


Figure 3-25. Attaching the Left / Right Paper Eject Assembly

3.2.12.7 Paper Pickup Roller Unit Removal

1. Remove the printer mechanism. (See Section 3.2.2.)
2. Remove the carriage unit. (See Section 3.2.12.2.)
3. Remove the paper eject frame unit. (See Section 3.2.12.3.)
4. Remove the base frame. (See Section 3.2.12.5.)
5. Remove the paper eject drive unit. (See Section 3.2.12.6.)
6. Turn the paper feed roller unit clockwise with the knob, moving the trigger lever on the right end of paper feed roller to set the hopper assembly to the lowest position. (The trigger lever is shown in Figure 3-24.)
7. Remove the E-ring on the left end of the paper pickup roller unit.
8. Disengage the left end of the paper pickup roller bushing, securing it to the left frame.
9. Disengage the connection between the spur gear and paper pickup gear, and then remove the paper pickup roller unit by moving it to the left side.

CAUTION

When disengaging the ASF transmission ratchet from the paper pickup roller unit, remove the ratchet to prevent it from hitting the spur gear (24 mm) as shown in the following figure.

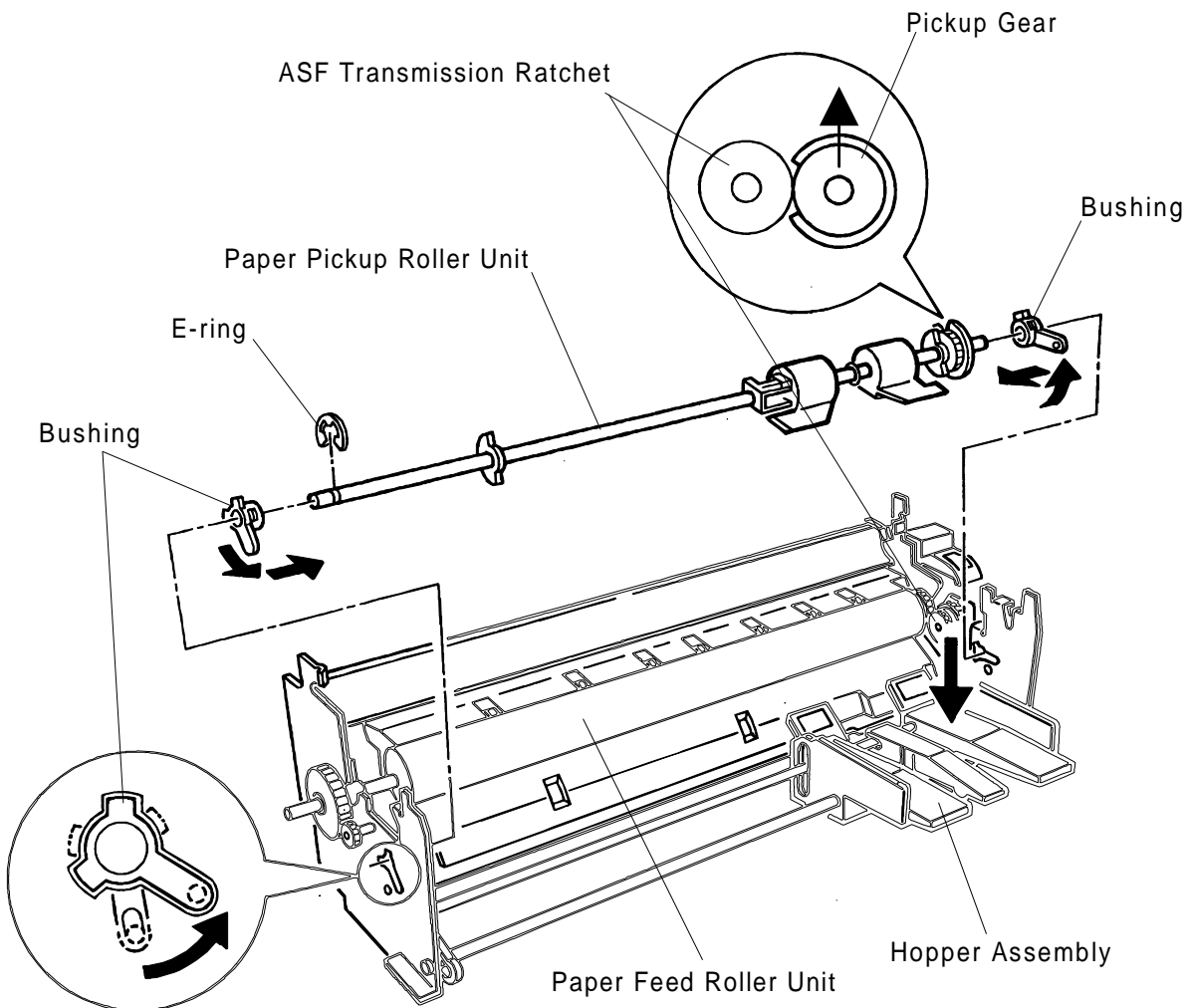


Figure 3-26. Removing the Paper Pickup Roller Unit

DISASSEMBLY/ASSEMBLY POINT

Engage the paper pickup gear with the spur gear (29 mm) so that the teeth are as shown:

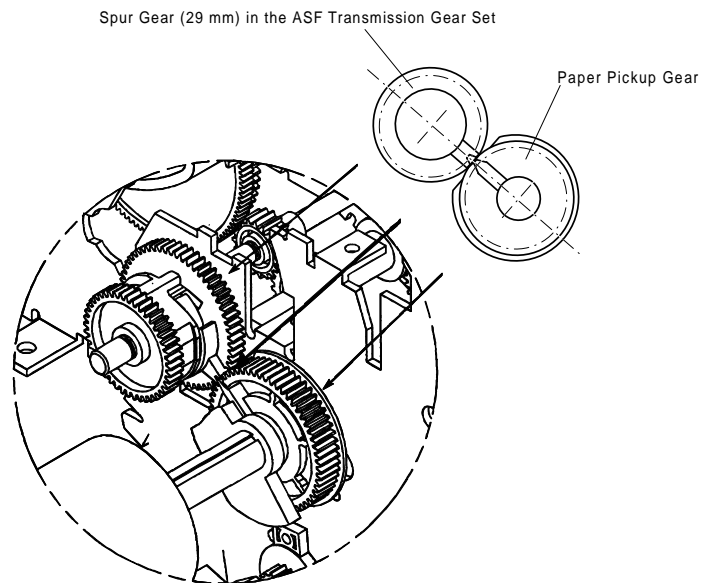


Figure 3-27. Engaging the Gears

CAUTION

To preserve paper-feed accuracy, do not damage the surface of the gears, and do not touch them with your bare hands.

3.2.12.8 Paper Feed Roller Unit Removal

1. Remove the printer mechanism. (See Section 3.2.2.)
2. Remove the carriage unit. (See Section 3.2.12.2.)
3. Remove the paper eject frame unit. (See Section 3.2.12.3.)
4. Remove the base frame. (See Section 3.2.12.5.)
5. Remove the paper eject drive unit. (See Section 3.2.12.6.)
6. Disengage the connection between the trigger lever and trigger transmission ratchet on the middle frame unit.
7. Remove the trigger lever from the paper feed roller unit.
8. Remove the grounding roller spring in the paper feed roller unit, where it contacts the left frame.
9. Remove the E-rings on the left bushing of the paper feed roller unit.
10. Turn the left and right bushings to disengage the connection between the bushings and frame.
11. Move the paper feed roller unit to the left, and disengage the connection between the spur gear (24 mm) and the ASF transmission ratchet, and then remove the paper feed roller unit by pulling it upward.

CAUTION

To preserve paper-feed accuracy, do not damage the gear surface, and do not touch it with your bare hands.

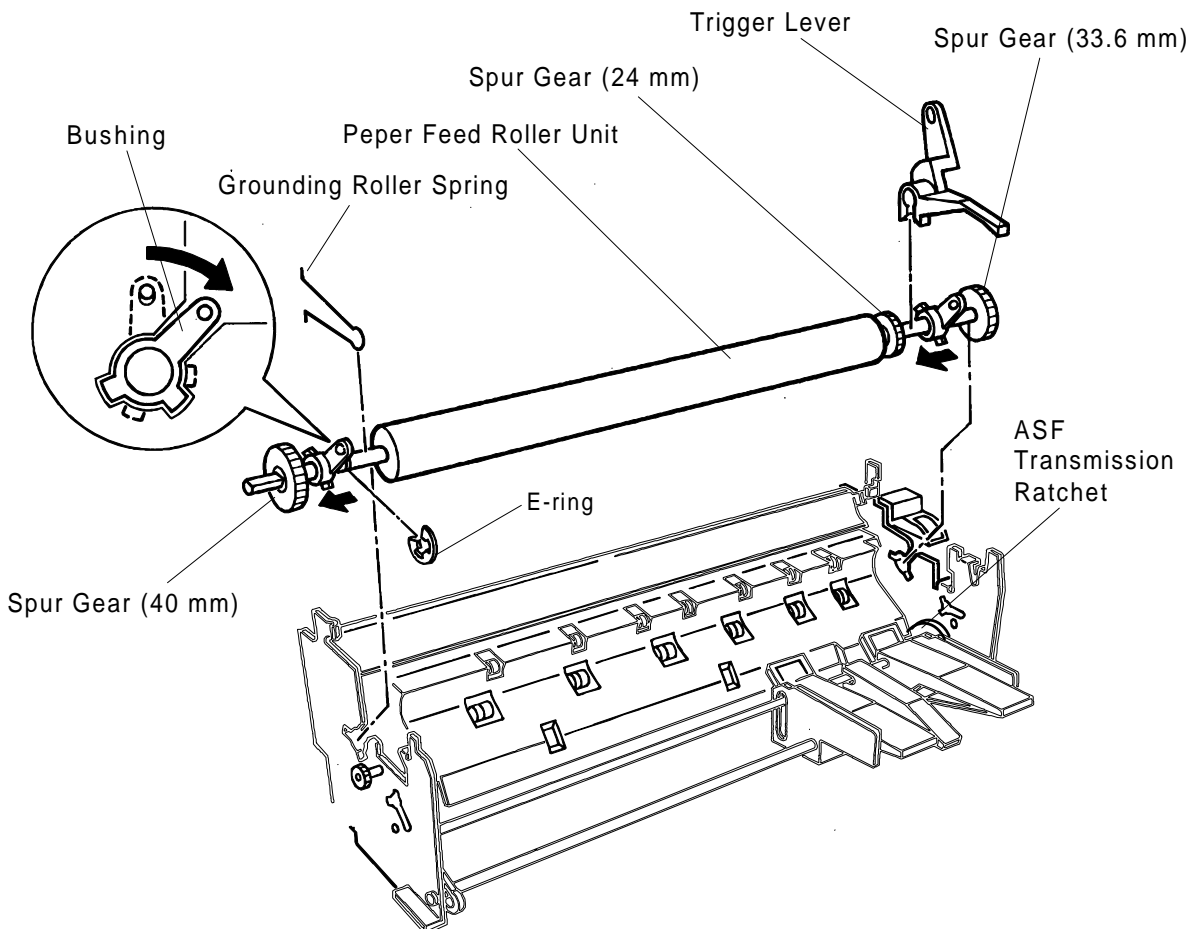


Figure 3-28. Removing the Paper Feed Roller Unit

3.2.12.9 Middle Frame Unit Removal

1. Remove the printer mechanism. (See Section 3.2.2.)
2. Remove the carriage unit. (See Section 3.2.12.2.)
3. Remove the paper eject frame unit. (See Section 3.2.12.3.)
4. Remove the base frame. (See Section 3.2.12.5.)
5. Remove the paper eject drive unit. (See Section 3.2.12.6.)
6. Remove the paper feed roller unit. (See Section 3.2.12.8.)
7. Remove 2 (CBS 3 × 6) screws securing the middle frame to the bottom frame and the (CBS 3 × 6) screw securing the middle frame to the paper pickup guide frame.
8. Remove the middle frame unit by pulling it forward and then upward.

DISASSEMBLY/ASSEMBLY POINT

Assemble the middle frame unit so that it fits the bottom frame completely.

CAUTION

Do not place the cables between the sub frame and the bottom frame.
 Never touch the white PF gears. Handling them will cause damage or contamination that will affect print quality.

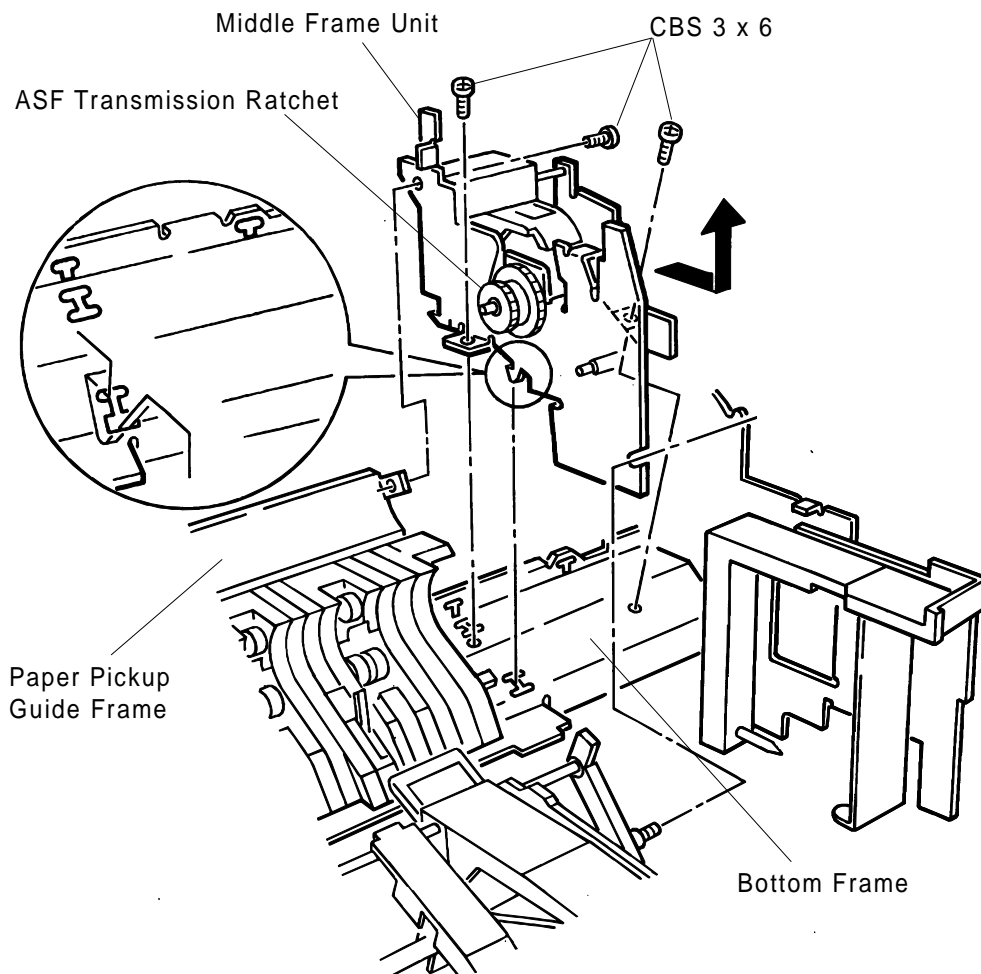


Figure 3-29. Removing the Middle Frame Unit

3.2.13 Front / Rear PE Sensor Removal

1. Remove the upper housing. (See Section 3.2.1.)
2. Remove the printer mechanism. (See Section 3.2.2.)
3. Disconnect the sensor cables from the sensor connectors.
4. Remove the sensors from the rear paper guide assembly. (Release the hooks on both sides of the sensors by inserting a screwdriver between the sensors and the rear paper guide assembly as shown in the figure below.)

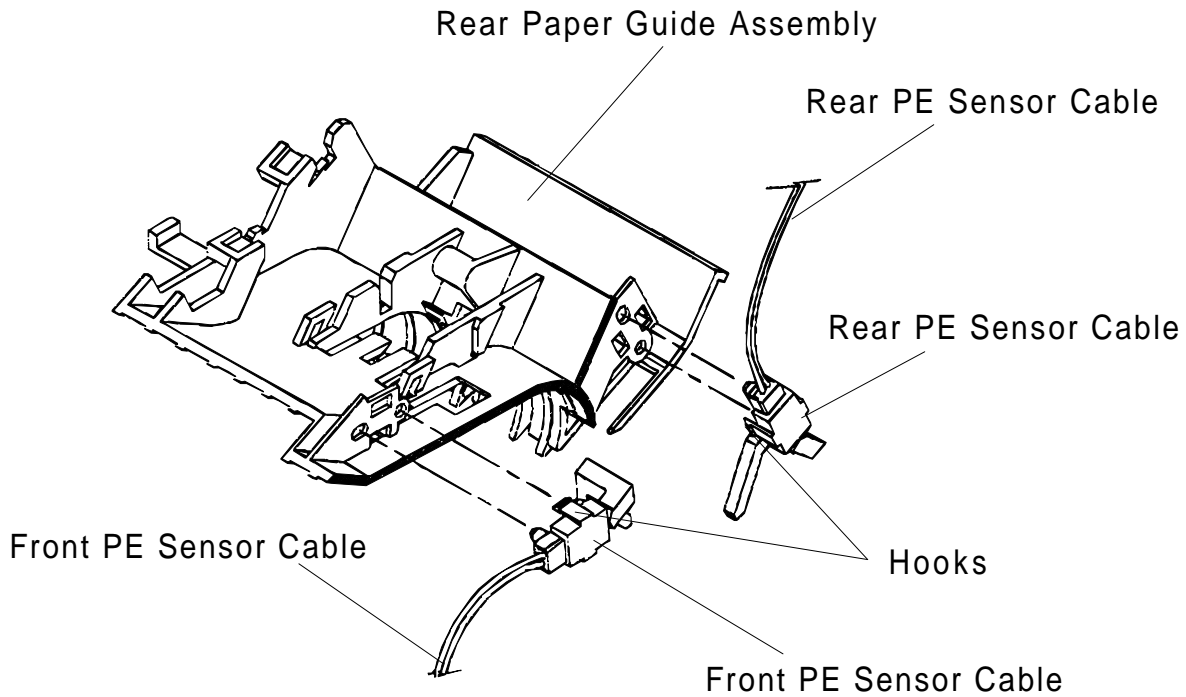


Figure 3-30. Removing the Front / Rear PE Sensors

3.2.14 ROM Replacement

1. Remove the (CBP 3 × 6) screw securing the ROM cover to the lower housing, and then remove the cover.
2. Replace the ROM.

CAUTION

When replacing the ROM, disconnect the AC cable from the AC inlet.

Chapter 4 Adjustments

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4.1 OVERVIEW

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

CAUTION

- Perform adjustments in the order indicated. Always follow the correct order.
- In printing the adjustment pattern, use 720 dpi exclusive paper, B4-size or wider.
- If you need to remove the color ink cartridge, always install a new cartridge immediately after removing the old one. During adjustments, use cartridges exclusively for service (Color cartridge part number: 1023207).
- Perform the initial ink charge operation using the adjustment program before sending the unit back to the customer.

Table 4-1. Required Adjustments

Work Performed	Adjustments Needed
After replacing the M-4E60 printer mechanism or the C172 MAIN board or printer mechanism	<ol style="list-style-type: none"> 1. EEPROM initialization (See Section 1.4.2.) 2. Destination data writing operation (See Section 4.1.2.) 3. Head data writing operation (See Section 4.1.3.)* 4. Uni-D alignment adjustment (See Section 4.1.6.) 5. Bi-D alignment adjustment (See Section 4.1.7.) 6. Black - color head vertical adjustment (See Section 4.1.8.) 7. Head gap adjustment (See Section 4.1.9.)
After reset the EEPROM	<ol style="list-style-type: none"> 1. Destination data writing operation (See Section 4.1.2.) 2. Head data writing operation (See Section 4.1.3.)* 3. Uni-D alignment adjustment (See Section 4.1.6.) 4. Bi-D alignment adjustment (See Section 4.1.7.) 5. Black - color head vertical adjustment (See Section 4.1.8.) 6. Head gap adjustment (See Section 4.1.9.)
After replacing or disassembling the black head (or the driver board attached to it)	<ol style="list-style-type: none"> 1. Destination data writing operation (See Section 4.1.2.) 2. Head data writing operation (See Section 4.1.3.)* 3. Black head angle adjustment (See Section 4.1.4.) 4. Uni-D alignment adjustment (See Section 4.1.6.) 5. Bi-D alignment adjustment (See Section 4.1.7.) 6. Black - color head vertical adjustment (See Section 4.1.8.) 7. Head gap adjustment (See Section 4.1.9.)
After replacing or disassembling both black head and optional color head	<ol style="list-style-type: none"> 1. Destination data writing operation (See Section 4.1.2.) 2. Head data writing operation (See Section 4.1.3.)* 3. Black head angle adjustment (See Section 4.1.4.) 4. Color head angle adjustment (See Section 4.1.5.) 5. Black - color head vertical adjustment (See Section 4.1.8.) 6. Head gap adjustment (See Section 4.1.9.)
After replacing or disassembling the carriage unit	<ol style="list-style-type: none"> 1. Destination data writing operation (See Section 4.1.2.) 2. Head data writing operation (See Section 4.1.3.)* 3. Uni-D alignment adjustment (See Section 4.1.6.) 4. Bi-D alignment adjustment (See Section 4.1.7.) 5. Black - color head vertical adjustment (See Section 4.1.8.) 6. Head gap adjustment (See Section 4.1.9.)
After replacing or disassembling the CR motor	<ol style="list-style-type: none"> 1. Uni-D alignment adjustment (See Section 4.1.6.) 2. Bi-D alignment adjustment (See Section 4.1.7.)

* Black head only

4.1.1 Platen Gap (PG) Adjustment

This adjustment is required after the carriage unit has been removed from the printer mechanism or replaced. Adjust the distance between the printhead nose and paper surface to within 1.14 ~ 1.18 mm.

1. To prepare for the adjustment, set the platen gap adjust lever to +, set the left parallelism adjustment bushing to its lowest position in the adjustable area, and set the right parallelism adjustment bushing to its highest position in the adjustable area.
2. Insert a thickness gauge (Use a commercially available gauge; for example, you can combine a 1.0 mm blade, a 0.1 mm blade, and a 0.08 mm blade from the gauge.) in the adjustment position on the left side of the lower paper guide assembly, as shown in the figure. Then move the carriage unit to the left side of the printable area.

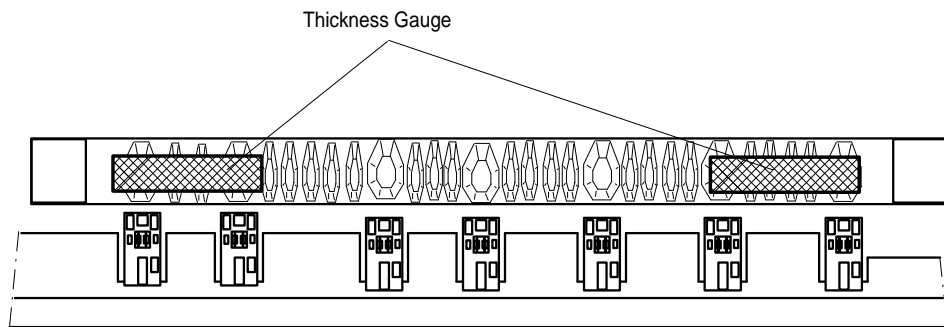


Figure 4-1. Thickness Gauge Position

CAUTION

Only set the black printhead on the thickness gauge. Never let the color printhead touch the gauge.

3. Set the platen gap adjustment lever to 0.
4. Adjust the platen gap using the table below. The correct platen gap is 1.16 ± 0.02 mm.

Table 4-2. Gap and Adjustment Direction

Gap Between Head and Gauge Surface Is:	Turn Left Bushing:	Turn Right Bushing:
Too Narrow	Clockwise (CW)	Counterclockwise (CCW)
Too Wide	Counterclockwise (CCW)	Clockwise (CW)

5. After adjusting the gap on the left side, perform the gap adjustment on the right side in the same way as for the left side.
6. Repeat steps 1 to 5 for both sides of printer to create the correct platen gap.

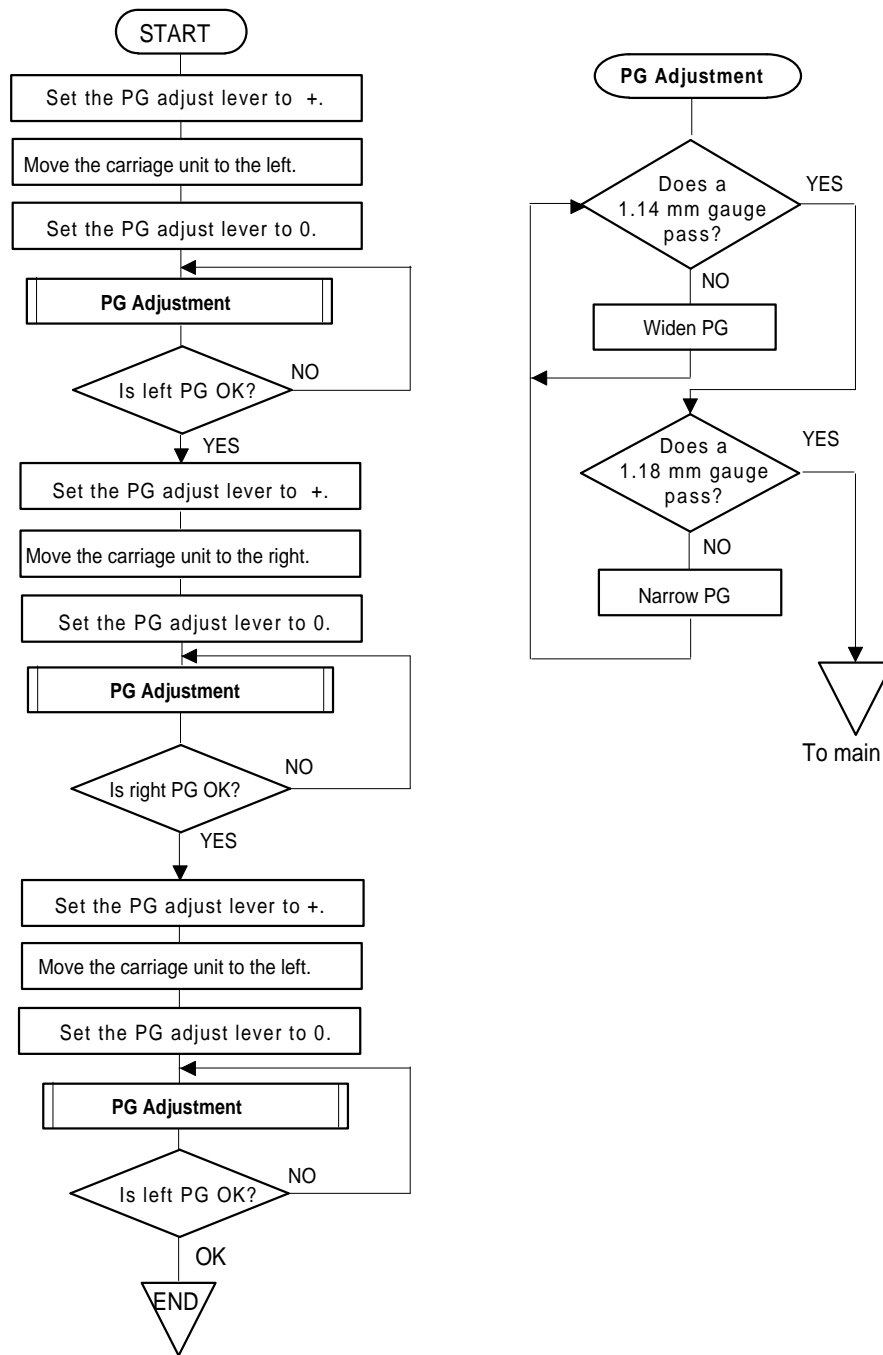


Figure 4-2. Platen Gap Adjustment Flowchart

4.1.2 Destination Data Writing Operation

The value that specifies the printer's geographic destination is stored in the EEPROM on the C172 MAIN board. This value must be rewritten to the EEPROM when the printer mechanism, main board, or EEPROM chip is replaced, and also whenever the EEPROM is reset.

CAUTION

Before starting this procedure, be sure the interface setting is set to parallel or auto select.

1. Connect a PC to the target printer using a parallel interface cable, and turn the printer on.
2. Load BASIC on the PC, and run the program ST1500.BAS. Then the main menu appears, as shown below:

Customer Data
Printer Setting[*****]

3. Using Table 4-3, input the appropriate 8-digit ID number for the destination as the printer setting for "Customer Data." (For example, EAI: 20000A00). Then the main menu appears, as shown at the bottom of the page.

Table 4-3. Customer Data

Destination	ID Number	Destination	ID Number	Destination	ID Number	Destination	ID Number
EAI	20000A00	EDG	20010A01	EIS	20010A00	ETT	20000A00
EAI (Latin America)	20000A00	EFS	20010A01	EIB	20010A00	EHK	20010A00
EAL	20000A00	ESP	20000A00	—	—	—	—
EUL	20010A00	EUL (Northern Europe)	20010A00	EUL (Middle East)	20010A00	—	—

CAUTION

If you enter an incorrect ID number for the "Customer Data" field, printer functions are not guaranteed.

```

Stylus 1500
Customer Data <*****> 95/**/**
<< Menu 1 >>          <<Menu 2>>
Head Data Writing    _____
                    _____
Black Head Angle Adj.      END
Uni-D Adj.                Destination Data Writing only
Bi-D Adj.                 Initial Black Ink Charging
Color Head Angle Adj.     Black - Color HV Adj.
                          Head Gap Adj.
                          _____

Select : <Up> or <Down> Go : <SPACE> or <RETURN> Change menu : <1> or <2>

```

4. Move the cursor to the menu item "Destination Data Writing Only" to perform destination data writing by pressing **1**, **2**, **↑**, and **↓**.
5. Immediately after you press the **SPACE** and **ENTER** keys, the main menu disappears briefly and then reappears. When this happens, each parameter, such as destination, interface mode, TOF value, economy/condensed, etc., is stored to the EEPROM.)
5. Choose **END** by selecting it from the keyboard. Choose another selection if you want to continue in the adjustment mode.
6. The following menu appears on the display. If you want end the program, press **5**.

```

Stylus 1500 <*****> Customer Data <*****> 95/**/**

( Customer Data Input) .... 1
( Adjustment           ) .... 2

( END                   ) .... 5
SELECT MENU
n

```

CAUTION

*rThe settings are not stored permanently in the EEPROM until the printer is turned off.
Turn off the printer at once after adjustment.
rPerform the initial ink charge operation using the adjustment program before sending the unit back to the customer.*

7. Turn off the printer.

4.1.3 Head Data Writing Operation

Data unique to the specific black printhead used in the printer is stored in the EEPROM on the C172 MAIN board. This value must be rewritten to the EEPROM when the printer mechanism, main board, or EEPROM chip is replaced, and also whenever the EEPROM is reset. On the other hand, when an optional color head is installed on the carriage, color head data is automatically set in the printer.

CAUTION

Before running this program, be sure the interface setting is set to parallel or auto select.

1. Connect a PC to the target printer using a parallel interface cable, and turn the printer on.
2. Load BASIC on the PC and run the program ST1500.BAS. Then the main menu appears, as shown below:

Customer Data
Printer Setting[*****]

3. Using Table 4-3, input the appropriate 8-digit ID number for the destination as the printer setting for "Customer Data." (For example, EAI: 20000A00). Then the main menu appears, as shown below.

```

Stylus 1500
Customer Data <*****> 95/**/**
<< Menu 1 >>          <<Menu 2>>
Head Data Writing      -----
                        Color Ink Counter Rest
                        END
                        Destination Data Writing only
                        Initial Black Ink Charging
                        Black - Color HV Adj.
                        Head Gap Adj.
                        -----

Select:<Up> or <Down> Go:<SPACE> or <ENTER> Change menu:<1> or <2>
    
```

4. Move the cursor to "Head Data Writing Only" to perform the black head data writing operation by pressing 1, 2, ↑, and ↓.
5. Press the **SPACE** and **ENTER** keys to input the head data (Head Voltage Values). The head voltage values display appears. Refer to the printhead circuit board to input the head data (see Section 3.2.10.1).

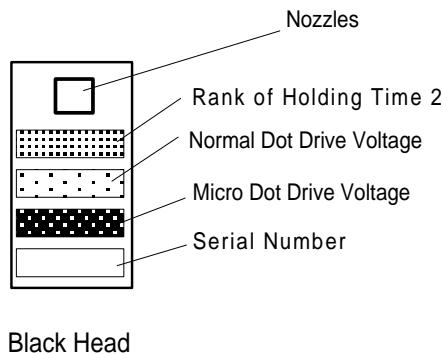


Figure 4-3. Printhead Voltage Value

```
<Head Voltage Value Setting>
```

```
Head Rank (0-14) : n
```

6. Change the value by pressing the ↑ and ↓ keys. If the current value is same as the value printed on the printhead, press **Enter** to write the head rank data to the EEPROM. The program next lets you write the normal dot and micro dot head voltage data.
7. Use the ↑ and ↓ keys to change the normal dot / micro dot head voltage values, in the same way as was described in step 6.

```
<Head Voltage Value Setting>
```

```
Head Rank (0-14) : n
```

```
Normal Dot      : n
```

```
Micro Dot       : n
```

```
Go: <ENTER>    Again: <SPACE> n
```

8. Press **ENTER** to exit the menu, or press **SPACE** to continue making settings.

CAUTION

rThe values are not permanently stored in EEPROM until the printer is turned off. Turn off the printer at once after adjustment.

rPerform the initial ink charge operation using the adjustment program before sending the unit back to the customer.

9. The menu below appears on the display. If you want to end the program, press **5**.

```
Stylus 1500 <*****> Customer Data <*****> 95/**/**
```

```
( Customer Data Input ) .... 1
```

```
( Adjustment           ) .... 2
```

```
( END                   ) .... 5
```

```
SELECT MENU
```

```
n
```

10. Turn off the printer.

4.1.4 Black Head Angle Adjustment

The black head angle adjustment is needed when the black head is replaced or disassembled. If this adjustment is not correct, a white banding problem may occur, or the color head timing may not match the black head timing. The following figure illustrates the black head angle adjustment. Adjust the black head angle using the adjust lever. The lever has an eccentricity toward the fulcrum of the lever. When you move the lever toward the front or back, the lever shaft pushes the printhead toward the front or back. Then the black head is swung right or left. This motion makes the head angle adjustment.

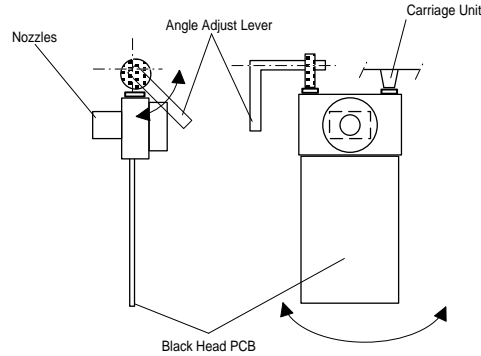


Figure 4-4. Black Head Angle Adjustment

The program produces an adjustment pattern. Refer to the pattern to perform the adjustment with the lever.

1. Connect a PC to the target printer using a parallel interface cable, and turn the printer on.
2. Load BASIC, and run the program ST1500.BAS. Then the main menu appears, as shown below.

```
Customer Data
Printer Setting[*****]
```

3. Using Table 4-3, input the appropriate 8-digit ID number for the destination as the printer setting for "Customer Data." (For example, EAI: 20000A00). Then the main menu appears, as shown below.

```
Stylus 1500
Customer Data <*****> 95/**/**
<< Menu 1 >>          <<Menu 2>>
Head Data Writing    -----
-----              Color Ink Counter Rest
Black Head Angle Adj.  END
Uni-D Adj.           Destination Data Writing only
Bi-D Adj.            Initial Black Ink Charging
Color Head Angle Adj. Black - Color HV Adj.
Head Gap Adj.
-----
```

Select:<Up> or <Down> Go:<SPACE> or <ENTER> Change menu:<1> or <2>

4. Move the cursor to "Black Head Angle Adj." to perform the black head angle adjustment operation by pressing the 1, 2, ↑, and ↓ keys.

- Press **SPACE** and **ENTER** to enter the adjustment mode. The printer prints out an adjustment pattern, and the adjustment selection menu appears, as shown below.

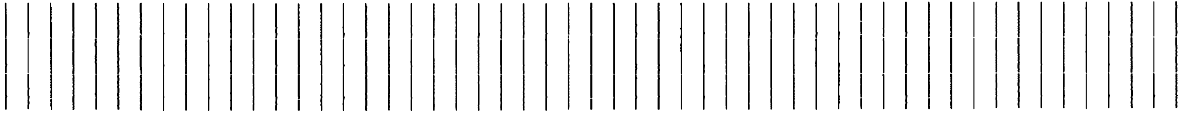


Figure 4-5. Black Head Angle Adjustment Pattern

- Loosen 2 (CBP(P2) 3 × 6) screws securing the CR cover to the carriage unit (see Section 3.2.10).
- Move the angle adjust lever to the back or front so that the vertical lines are aligned continuously (to bring A within 0 ± 0.02 mm), as shown in the following flowchart.

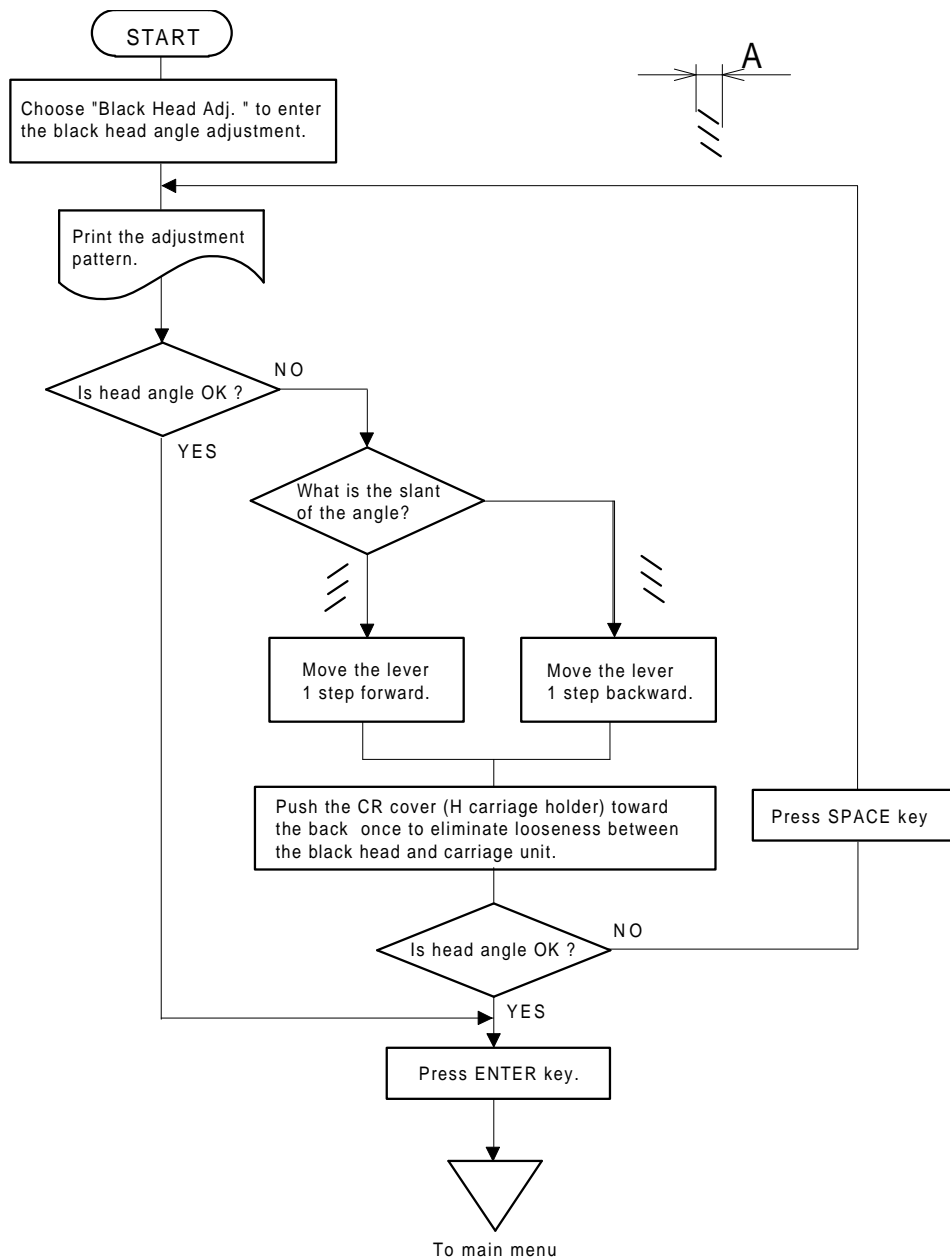


Figure 4-6. Black Head Angle Adjustment Flowchart

- Press **ENTER** to exit the setting mode, or press **SPACE** to continue entering settings.

- Fasten the 2 (CBP(P2) 3 × 6) screws.

CAUTION

rWhen you replace both the black and color head, always adjust the black head angle first. The black head angle is the basis for the color head angle.
rPerform the initial ink charge operation using the adjustment program before sending the unit back to the customer.

- The menu below appears on the display. If you want end the program, press 5.

```
Stylus 1500 <*****> Customer Data <*****> 95/**/**  
  
( Customer Data Input) .... 1  
( Adjustment          ) .... 2  
  
( END                   ) .... 5  
SELECT MENU  
■
```

- Turn off the printer.

4.1.5 Color Head Angle Adjustment

The color head angle adjustment is required when the optional color head is replaced or disassembled. If this adjustment is not correct, a white banding problem may occur or black head timing may not match the color head timing. The following figure illustrates the color head angle adjustment. The color printhead angle is adjusted using the adjust lever as was done with the black head. The lever has an eccentricity at the lever's fulcrum. Moving the lever toward the front or back, pushes the printhead toward the front or back. Then the color head is swung right or left. This motion makes the head angle adjustment. This program produces an adjustment pattern. Refer to the pattern to perform the adjustment.

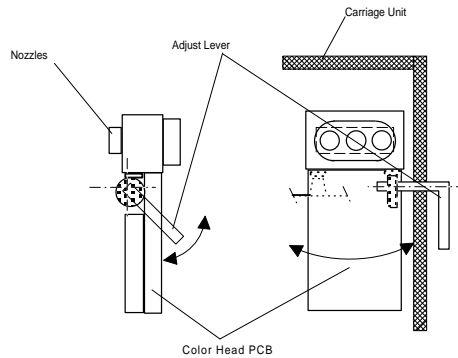


Figure 4-7. Color Head Angle Adjustment

1. Connect a PC to the target printer using a parallel interface cable and turn the printer on.
2. Load BASIC and run the program ST1500.BAS. Then the main menu appears, as shown below.

```
Customer Data
Printer Setting[*****]
```

3. Using Table 4-3, input the appropriate 8-digit ID number for the destination as the printer setting for "Customer Data." (For example, EAI: 20000A00). Then the main menu appears, as shown below.

```
Stylus 1500
Customer Data <*****> 95/**/**
<< Menu 1 >>                <<Menu 2>>
Head Data Writing           -----
-----                    Color Ink Counter Rest
Black Head Angle Adj.      END
Uni-D Adj.                 Destination Data Writing only
Bi-D Adj.                  Initial Black Ink Charging
Color Head Angle Adj.     Black - Color HV Adj.
                          Head Gap Adj.
                          -----t

Select:<Up> or <Down> Go:<SPACE> or <ENTER> Change menu:<1> or <2>
```

4. Move the cursor to "Color Head Angle Adj." to perform the color head angle adjustment operation by pressing 1, 2, ↑, and ↓. Patterns are printed out with the color (magenta, cyan and yellow) adjustment pattern. The color head angle adjustment pattern is shown in the following illustration.

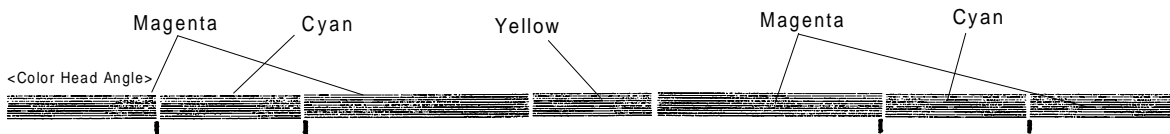


Figure 4-8. Color Head Angle Adjustment Pattern

- Look at the magenta and cyan patterns, and move the adjust lever on the left side of the carriage unit toward the back or front to make the interval between each magenta and yellow line the same (to make B within 0 ± 0.02 mm), as shown in the following flowchart.

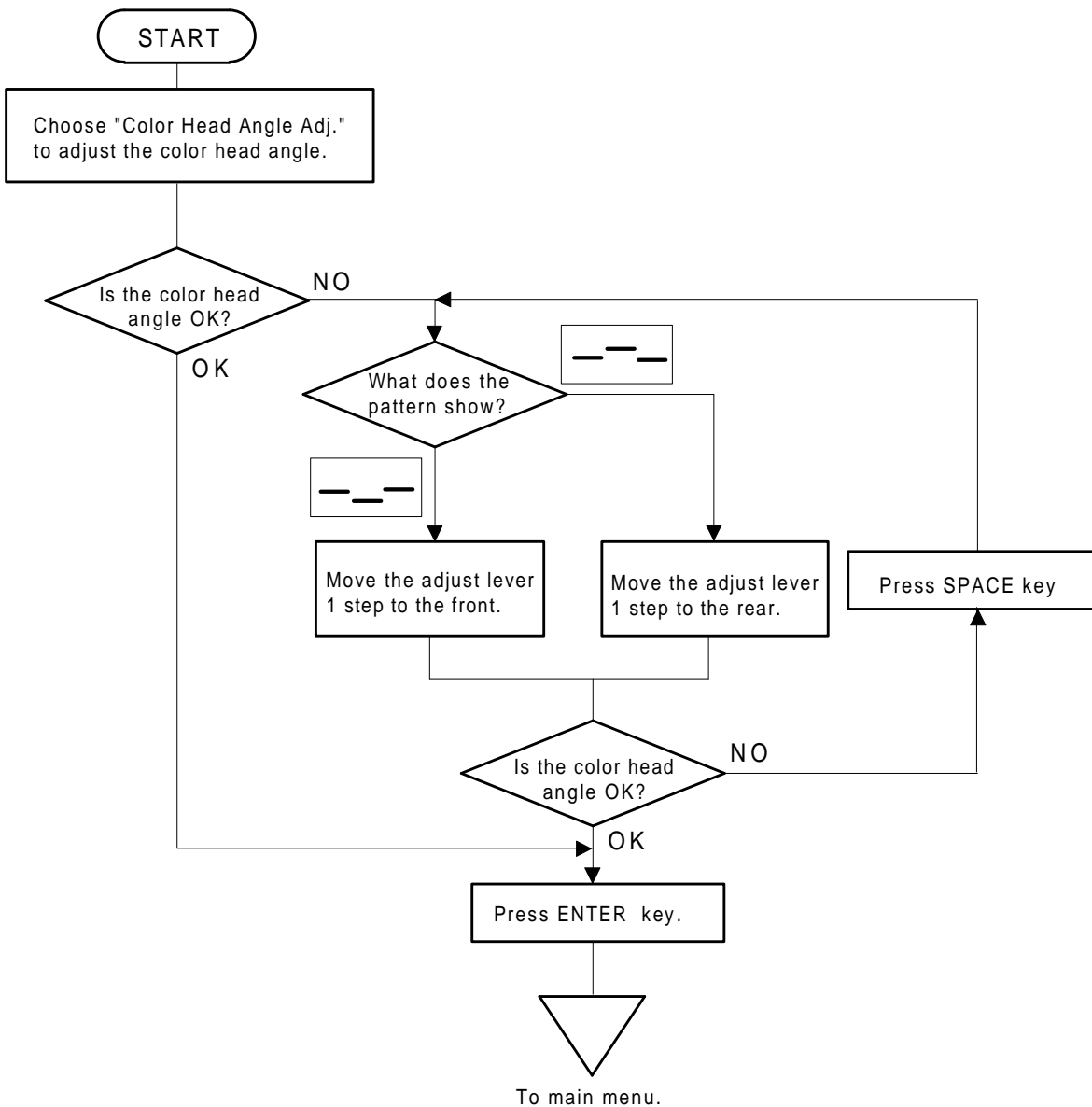


Figure 4-9. Color Head Angle Adjustment Flowchart

8. Press **ENTER** to exit the setting mode, or press **SPACE** to continue making settings.

CAUTION

rWhen you replace both the black and the color heads, always adjust the black head angle first. The black head angle is the basis for the color head angle.
rPerform the initial ink charge operation using the adjustment program before sending the unit back to the customer.

10. The following menu appears on the display. If you want end the program, press **5**.

```
Stylus 1500 <*****> Customer Data <*****> 95/**/**  
  
( Customer Data Input ) .... 1  
( Adjustment ) .... 2  
  
( END ) .... 5  
SELECT MENU  
n
```

11. Turn off the printer.

4.1.6 Uni-D (Unidirectional Printing) Alignment Adjustment

The unidirectional alignment is required when the printer mechanism, main board, or printhead (board) is replaced, or when the carriage mechanism is disassembled. Performing this adjustment sets a compensation value to correct for deviations in the print position. This deviation can be caused by the speed of printing, by tolerances in the mechanical components, and by differences in print timing between odd- and even-numbered lines in unidirectional printing. The printer stores the compensation data in the EEPROM on the C172 MAIN board and refers to this data to perform unidirectional printing. Make the adjustment using the adjustment program, and set the Adjustment mode ID = 2 400 cps on the control panel (see Section 1.4.5).

1. Connect a PC to the target printer using a parallel interface cable, and turn the printer on.
2. Load BASIC on the PC and run the program ST1500.BAS. Then the main menu appears, as shown below:

```
Customer Data
Printer Setting[*****]
```

3. Using Table 4-3, input the appropriate 8-digit ID number for the destination as the printer setting for "Customer Data." (For example, EAI: 2000A00). Then the main menu appears, as shown below.

```
Stylus 1500
Customer Data <*****> 95/**/**
<< Menu 1 >>          <<Menu 2>>
Head Data Writing    -----
-----              Color Ink Counter Rest
Black Head Angle Adj.  END
Uni-D Adj.           Destination Data Writing only
Bi-D Adj.            Initial Black Ink Charging
Color Head Angle Adj. Black - Color HV Adj.
                     Head Gap Adj.
                     -----t

Select:<Up> or <Down> Go:<SPACE> or <ENTER> Change menu:<1> or <2>
```

4. Move the cursor to "Uni-D Adj." by pressing **1**, **2**, **↑**, and **↓**.
5. Press **SPACE** and **ENTER** to enter the adjustment mode. The printer prints out an adjustment pattern, and the adjustment selection menu appears, as shown below.

```
< Draft Uni-D >

DATA : ** n

Select: Cursor<Up> or <Down>  Print:<SPACE>  OK:<ENTER>
```

Draft Uni-d No. 0

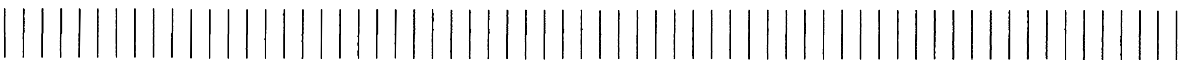


Figure 4-10. Uni-D Adjustment Pattern

6. Refer to the pattern to change the value, within the range 30 to -30, by pressing the ↑ and ↓ keys. Press **Enter** to write the data to the EEPROM. The printer immediately prints a new pattern using the input value.
7. Press **ENTER** to exit the setting mode, or press **SPACE** to continue making settings.

CAUTION

rThe settings are not stored permanently in the EEPROM until the printer is turned off. Turn off the printer at once after adjustment.

rPerform the initial ink charge operation using the adjustment program before sending the unit back to the customer.

8. The menu below appears on the display. If you want end the program, press 5.

```

Stylus 1500 <*****> Customer Data <*****> 95/**/**

( Customer Data Input ) .... 1
( Adjustment           ) .... 2

( END                   ) .... 5
SELECT MENU
n

```

9. Turn off the printer.

4.1.7 Bi-D (Bidirectional Printing) Alignment Adjustment

The bidirectional adjustment is required when the printer mechanism, main board, or printhead (board) is replaced, or when the carriage mechanism is disassembled. Performing this adjustment sets a compensation value to correct for deviations in the print position. The deviation can be caused by different print speeds, by tolerances in the mechanical components, or by differences in print timing between odd- and even-numbered lines in bidirectional printing. The printer stores the compensation data in the EEPROM on the C172 MAIN board and refers to this data when performing bidirectional printing. Make the adjustment using the adjustment program, and set the Adjustment mode ID = 4 (100 CPS), 5 (200 CPS), and 6 (100 CPS) on the control panel (see Section 1.4.5).

1. Connect a PC to the target printer using a parallel interface cable, and turn the printer on.
2. Load BASIC on the PC and run the program ST1500.BAS. Then the main menu appears, as shown below:

```
Customer Data
Printer Setting[*****]
```

3. Using Table 4-3, input the appropriate 8-digit ID number for the destination as the printer setting for "Customer Data." (For example, EAI: 20000A00). Then the main menu appears, as shown below.

```
Stylus 1500
Customer Data <*****> 95/**/**
<< Menu 1 >>          <<Menu 2>>
Head Data Writing    -----
-----              Color Ink Counter Rest
Black Head Angle Adj.  END
Uni-D Adj.            Destination Data Writing only
Bi-D Adj.              Initial Black Ink Charging
Color Head Angle Adj.  Black - Color HV Adj.
                       Head Gap Adj.
                       -----

Select:<Up> or <Down> Go:<SPACE> or <ENTER> Change menu:<1> or <2>
```

4. Move the cursor to "Bi-D Adj." by pressing **1**, **2**, **↑**, and **↓**.
5. Press **SPACE** and **ENTER** to enter the adjustment mode. The adjustment selection menu appears, as shown below

```
<Bi-D Adjustment>

400 CPS ..... 1
200 CPS ..... 2
100 CPS ..... 3
Select speed

END ..... ENTER
```

6. Choose the number for printer speed you are using for the adjustment. If you choose 1, the Bi-D adjustment pattern is printed out at 400 cps, as shown in the next illustration.

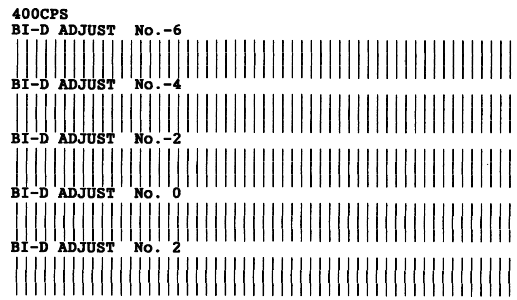


Figure 4-11. Bi-D Adjustment Pattern

- Input a value from -30 to 30 to bring C within 0 ± 0.02 mm, as shown in the following flowchart.

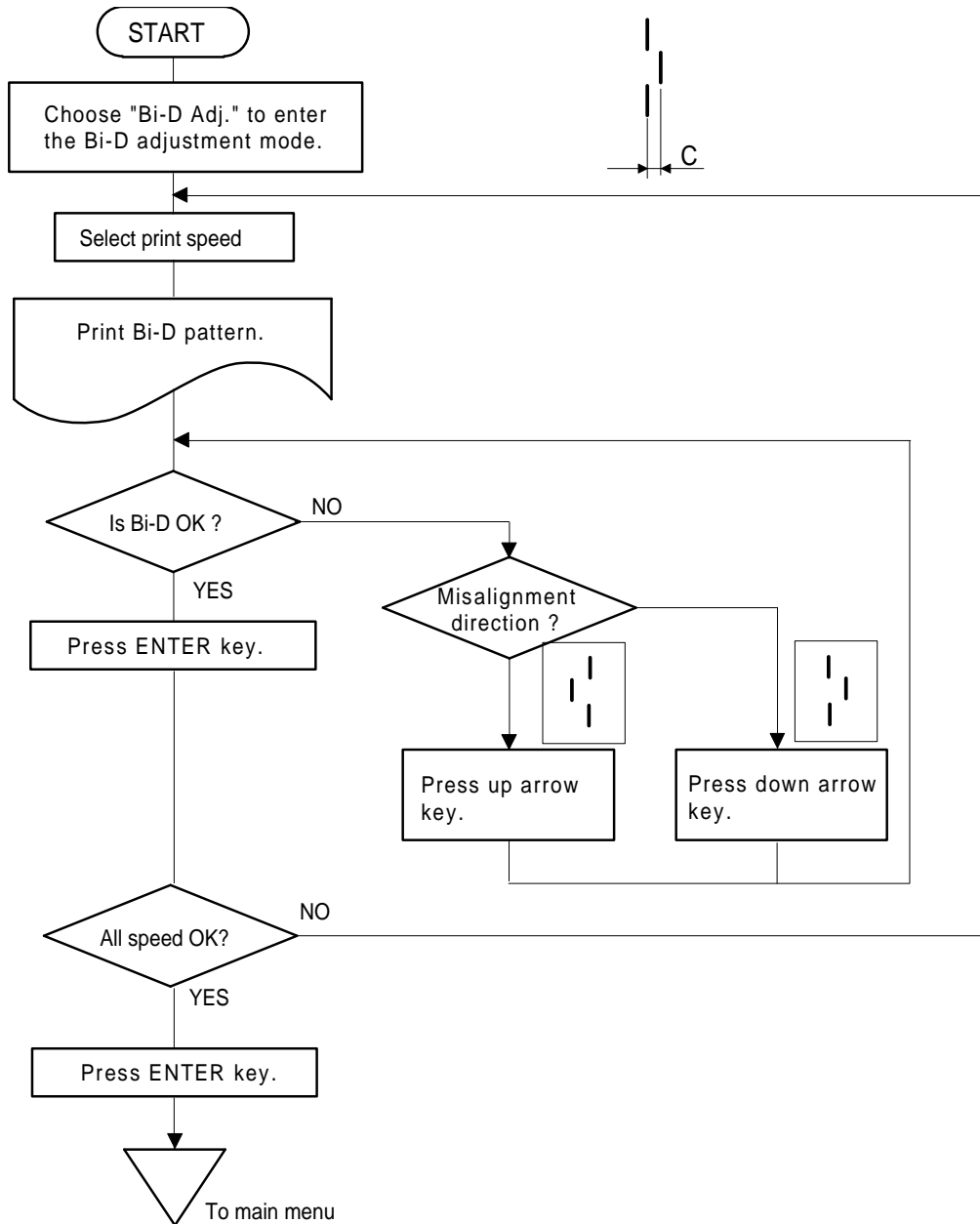


Figure 4-12. Bi-D Adjustment Flowchart

8. Press **ENTER** to exit the setting mode, or press **SPACE** to continue making settings.

CAUTION

rThe setting values are not stored permanently in the EEPROM until you turn the printer off. Turn off the printer at once after the adjustment.
rPerform the initial ink charge operation using the adjustment program before sending the unit back to the customer.

9. The menu below appears on the display. If you want end the program, press **5**.

```
Stylus 1500 <*****> Customer Data <*****> 95/**/**  
  
( Customer Data Input ) .... 1  
( Adjustment           ) .... 2  
  
( END                   ) .... 5  
SELECT MENU  
n
```

10. Turn off the printer.

4.1.8 Black - Color Head Vertical Adjustment

This adjustment sets the vertical position for the black and color heads. (Aligning the top nozzle for both, the # 4 nozzle on the black head and the # 1 nozzle on the color head, and aligning the bottom nozzle for both, the # 61 nozzle on the black head and the # 20 nozzle of the color head.) Make this adjustment using this adjustment program and set the Adjustment mode ID = 8 on the control panel (see Section 1.4.5). This adjustment is required when the black head or the color head is replaced or disassembled. The following figure illustrates this adjustment.

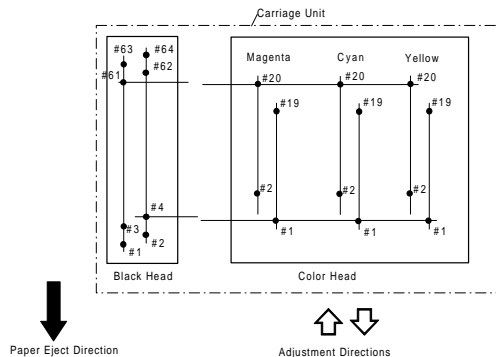


Figure 4-13. Black - Color Head Vertical Adjustment

CAUTION

When you replace the black head, always adjust its angle first, because the black - color head vertical adjustment is based on the black head angle.

1. Connect a PC to the target printer using a parallel interface cable, and turn the printer on.
2. Load BASIC on the PC and run the program ST1500.BAS. The main menu appears, as shown below:

Customer Data
Printer Setting[*****]

3. Using Table 4-3, input the appropriate 8-digit ID number for the destination as the printer setting for “Customer Data.” (For example, EAI: 20000A00). Then the main menu appears, as shown below.

```

Stylus 1500
Customer Data <*****> 95/**/**
<< Menu 1 >>           <<Menu 2>>
Head Data Writing     -----
-----              Color Ink Counter Rest
Black Head Angle Adj. END
Uni-D Adj.            Destination Data Writing only
Bi-D Adj.             Initial Black Ink Charging
Color Head Angle Adj. Black - Color HV Adj.
                      Head Gap Adj.
                      -----

Select:<Up> or <Down> Go:<SPACE> or <ENTER> Change menu:<1> or <2>
    
```

4. Move the cursor to “Black-Color HV Adj.” to perform the Black - Color Head vertical adjustment operation by pressing 1, 2, ↑, and ↓.
5. Press **SPACE** and **ENTER** to enter the adjustment mode. The adjustment selection menu appears, and the adjustment patterns are printed as follows:

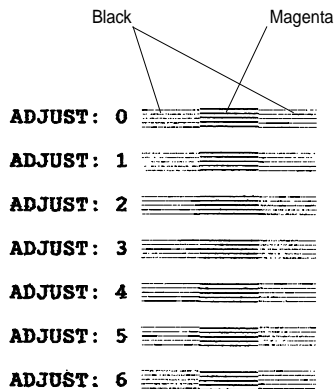


Figure 4-14. Black - Color Head Vertical Adjustment

Input No. (Quit : ENTER)
DATA INPUT ? n

6. Look at the 7 patterns, and input the nearest pattern number, from 0 to 6, to align both black and magenta lines (or to make E within 0 ± 0.035 mm) in the middle of the pattern, as shown in the following flowchart.

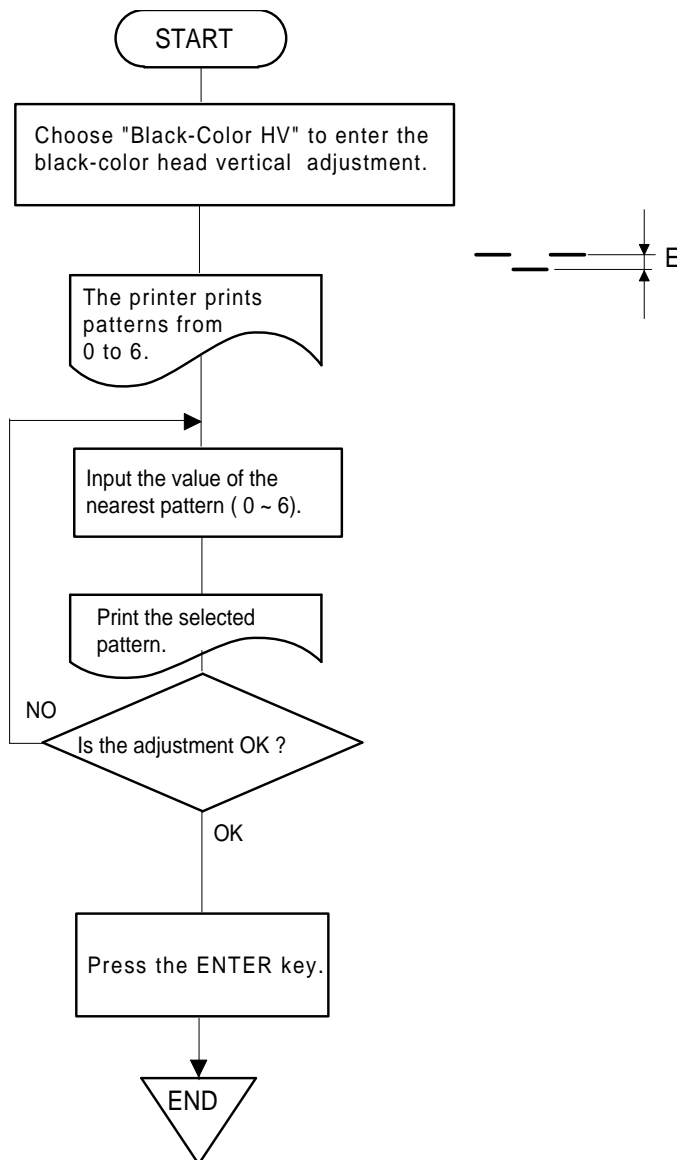


Figure 4-15. Black - Color Head Vertical Adjustment Flowchart

- Press **ENTER** to exit the setting mode, or press **SPACE** to continue making settings.

CAUTION

rThe setting values are not stored permanently in the EEPROM until you turn the printer off. Turn off the printer at once after the adjustment.
rPerform the initial ink charge operation using the adjustment program before sending the unit back to the customer.

- The menu below appears on the display. If you want end the program, press **5**.

```
Stylus 1500 <*****> Customer Data <*****> 95/**/**  
  
( Customer Data Input ) .... 1  
( Adjustment           ) .... 2  
  
( END                   ) .... 5  
SELECT MENU  
n
```

- Turn off the printer.

4.1.9 Head Gap Adjustment (Black and Color Head)

The head gap printing alignment adjustment is required when the printer mechanism, C172 MAIN board, or printhead (board) is replaced or disassembled. This adjustment sets the head drive timing between the black head and the color head. If the adjustment is not made, vertical alignment is not completed. Make the adjustment using the program and set the Adjustment mode ID = 12 and 13 using the control panel (see Section 1.4.5).

1. Connect a PC to the target printer using a parallel interface cable, and turn the printer on.
2. Load BASIC on the PC and run the program ST1500.BAS. Then the main menu appears, as shown below:

```

Customer Data
Printer Setting[*****]

```

3. Using Table 4-3, input the appropriate 8-digit ID number for the destination as the printer setting for "Customer Data." (For example, EAI: 20000A00). Then the main menu appears, as shown below.

```

Stylus 1500
Customer Data <*****> 95/**/**
<< Menu 1 >>                <<Menu 2>>
Head Data Writing           -----
-----                     Color Ink Counter Rest
Black Head Angle Adj.      END
Uni-D Adj.                 Destination Data Writing only
Bi-D Adj.                  Initial Black Ink Charging
Color Head Angle Adj.     Black - Color HV Adj.
                          Head Gap Adj.
                          -----

Select:<Up> or <Down> Go:<SPACE> or <ENTER> Change menu:<1> or <2>

```

4. Move the cursor to "Black-Color Head Vertical Adj." to perform the black - color head vertical adjustment operation by pressing **1**, **2**, **↑**, and **↓**.
5. Press **SPACE** and **ENTER** to enter the adjustment mode. The adjustment selection menu appears, as shown below.

```

Head Gap Adjustment

360 DPI      Adjustment Mode ..... 1
720 DPI      Adjustment Mode ..... 2

END          ..... ENTER
SELECT No.

```

6. Enter **1** or **2** to select the print resolution. Then the printer outputs an adjustment pattern, as shown below.

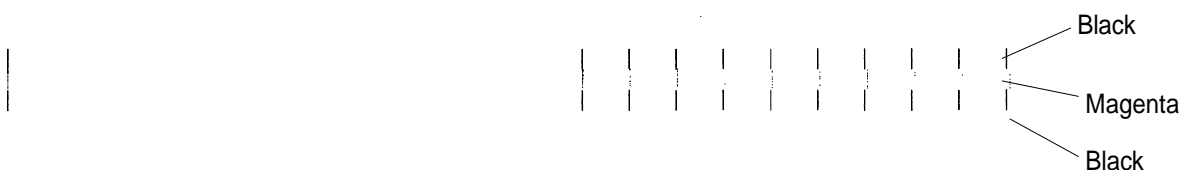


Figure 4-16. Head Gap Adjustment Pattern

- Refer to the pattern and input a value from -12 to 12 to align both black and magenta lines (or to bring F within 0 ± 0.035 mm), as shown in the following flowchart.

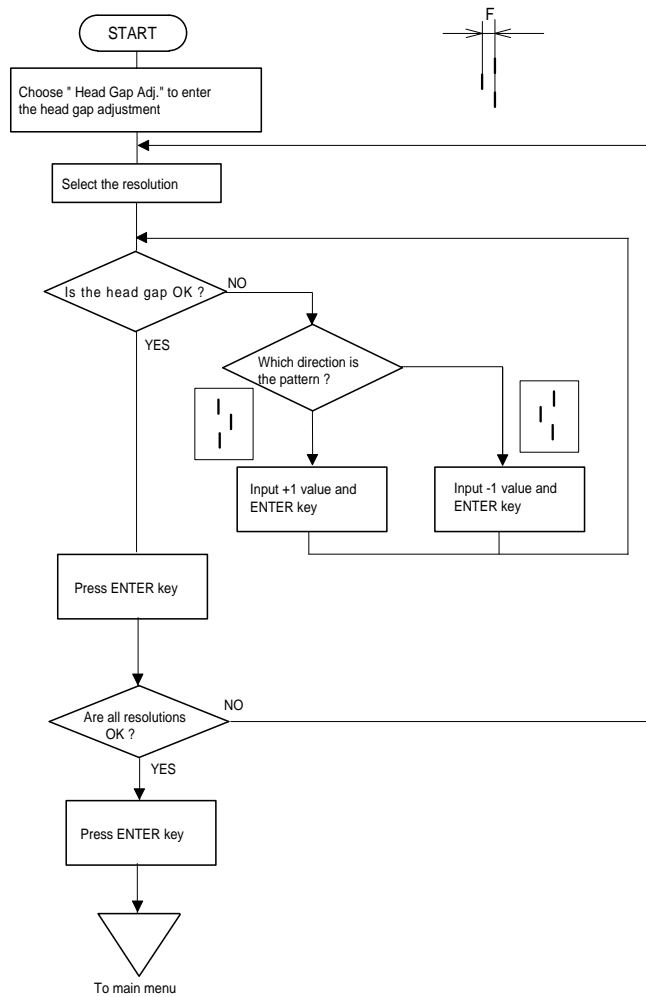


Figure 4-17. Head Gap Adjustment Flowchart

- Press **ENTER** to exit the setting mode, or press **SPACE** to continue making settings.

CAUTION

rThe values are not permanently stored in EEPROM until the printer is turned off. Turn off the printer at once after adjustment.
rPerform the initial ink charge operation using the adjustment program before sending the unit back to the customer.

- The menu below appears on the display. To end the program, press 5.

```

Stylus 1500 <*****> Customer Data <*****> 95/**/**

( Customer Data Input ) ... 1
( Adjustment           ) ... 2

( END                   ) ... 5
SELECT MENU
n
  
```

- Turn off the printer.

4.1.10 Other Functions of the Adjustment Program

Color Ink Counter Reset Function

This function initializes only the color ink consumption counter. The adjustment program cannot initialize the color ink counter unless you perform the ink cartridge replacement operation (see Section 1.4.1.1) and the EEPROM reset function (see Section 1.4.2). This function is required when the color ink cartridge is replaced and you do not want to initialize the EEPROM.

Initial Black Ink Charging Function

This function is to forceably charge black ink into printer ink system. The function is required when the printer is transported from the servicer to the customer. Since the black ink cartridge is not mounted on the printer during transport, black ink initial charging is necessary for the customer. This initial charge function is the same as the one the user performs when the printer is new.

CAUTION

Perform the initial ink charge operation using the adjustment program before sending the unit back to the customer.

Chapter 5 Troubleshooting

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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.

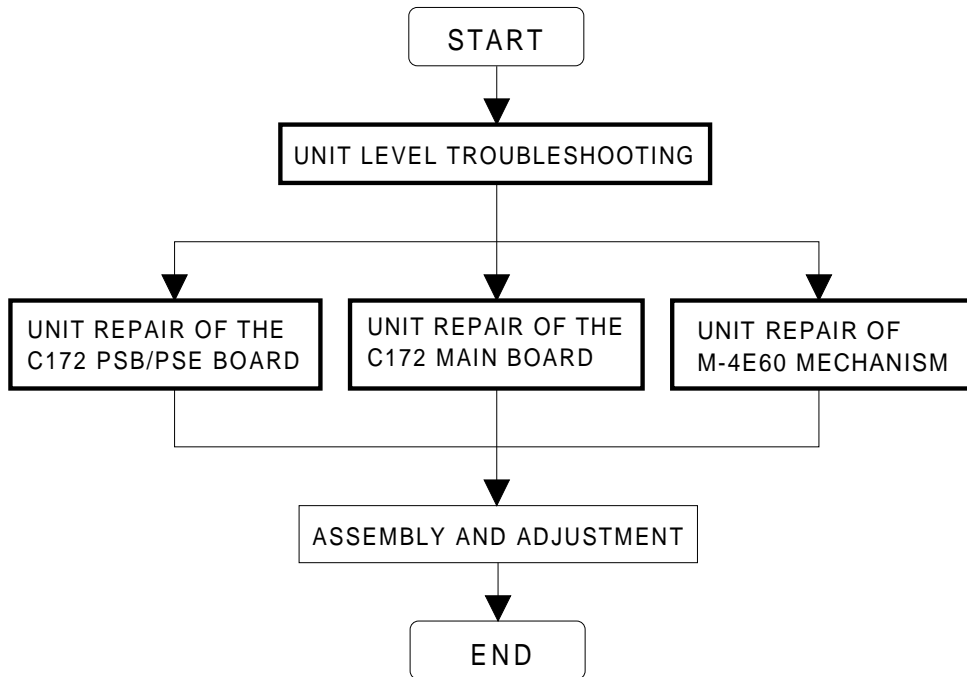


Figure 5-1. Troubleshooting Process Flowchart

Table 5-1. Motor Coil Resistance Test Points

Motor Connector Number	Test Pin Number	Test Method (Set Meter to Ohms. Disconnect Motor from Main Board and check it with Printer Power Off.)	Meter Reading
CR Motor (CN5)	Common pin: 5 Test pins: 1, 2, 3, 4	Place one lead on pin 5 and the other lead on each of the 4 test pins to check the two motor phases.	5 Ω ± 7 % (At 25° C, 77° F)
PF Motor (CN6)	1 and 3 / 2 and 4	Place one lead on pin 1 (pin 2) and the other lead on pin 3 (pin 4) each of the test pins to check the two motor phases.	10 Ω ± 10 % (At 25° C, 77° F)

Table 5-2. Sensor Status

Sensor	Point	Signal Level	Status
HP Sensor	CN9 / Pin 1	H (>2.5 V)	In home position (HP)
		L(GND)	Away from HP
Front PE Sensor	CN10 / Pin 1	Open	Paper present
		Closed	No paper (Paper end)
Rear PE Sensor	CN11 / Pin 1	Open	Paper present
		Closed	No paper (Paper end)
Black Ink End Sensor	CN12 / Pin 1	Closed and Black ink cartridge sensor closed	Ink present
		Any other	Ink end
Black Ink Cartridge Sensor	CN13 / Pin 1	Open	No black ink cartridge
		Closed	Black ink cartridge installed
Release Sensor	CN14 / Pin 1	Open	Friction feed
		Closed	Tractor Feed
Disengage Gear Sensor	CN15 / Pin 1	Open	Disengage gear is on pump side
		Closed	Disengage gear is on print side
TH Sensor	CN7/ Pin 13	Analog data	Change the pulse width of the charge pulse for the common driver circuit Thermistor resistance: Approx.10K Ω (at 25° C, 77° F)

Table 5-3. Error Codes

Error Status	LEDs										Recovery
	Power	Data	Ink Out (Black)	Ink Out (Color)	Paper Out	Econo my	Condens ed	Pause	Font L	Font R	
Paper out	—	—	—	—	On	—	—	—	—	—	Load paper and press Pause and Load/Eject buttons.
Paper jam	—	—	—	—	Blinks	—	—	—	—	—	Load paper and press Pause and Load/Eject buttons.
No ink cartridge (Black)	—	—	On	—	—	—	—	—	—	—	Install the new ink cartridge and press the Pause button.
Ink Level Low (Black)	—	—	Blinks	—	—	—	—	—	—	—	—
No ink cartridge (Color)	—	—	—	On	—	—	—	—	—	—	Install the new ink cartridge and press the Pause button.
Ink Level Low (Color)	—	—	—	Blinks	—	—	—	—	—	—	—
Release lever error	—	Blinks	—	—	Blinks	—	—	—	—	—	Reset the release lever and eject installed paper.
Maintenance request	Blinks	Blinks	Blinks	Blinks	Blinks	Blinks	Blinks	Blinks	Blinks	Blinks	Service required. (Change the waste ink drain tank and reset the counter.)
Fatal error	Blinks	—	—	—	—	—	—	Blinks	—	—	Turn off the printer and turn it on again.

Note: — means this light's status is not used to indicate the message in the left column.

5.2 UNIT LEVEL TROUBLESHOOTING

When a problem occurs, you may be able to identify the defective unit by the symptoms. 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.
The printer does not operate at power on	<input type="checkbox"/> LEDs do not light up. <input type="checkbox"/> Printer mechanism does not operate.	1
An error is detected	<input type="checkbox"/> Error is indicated by LEDs.	2
A failure occurs during printing	<input type="checkbox"/> Printing is not performed. <input type="checkbox"/> Abnormal printing (missing dots, etc.) <input type="checkbox"/> Print quality is poor	3
Printer does not feed the paper correctly	<input type="checkbox"/> No paper is fed. <input type="checkbox"/> Paper feed is irregular. <input type="checkbox"/> Paper jam occurs.	4
Control panel operation is abnormal	<input type="checkbox"/> No response to button access.	5

5.2.1 Printer does not operate at power on

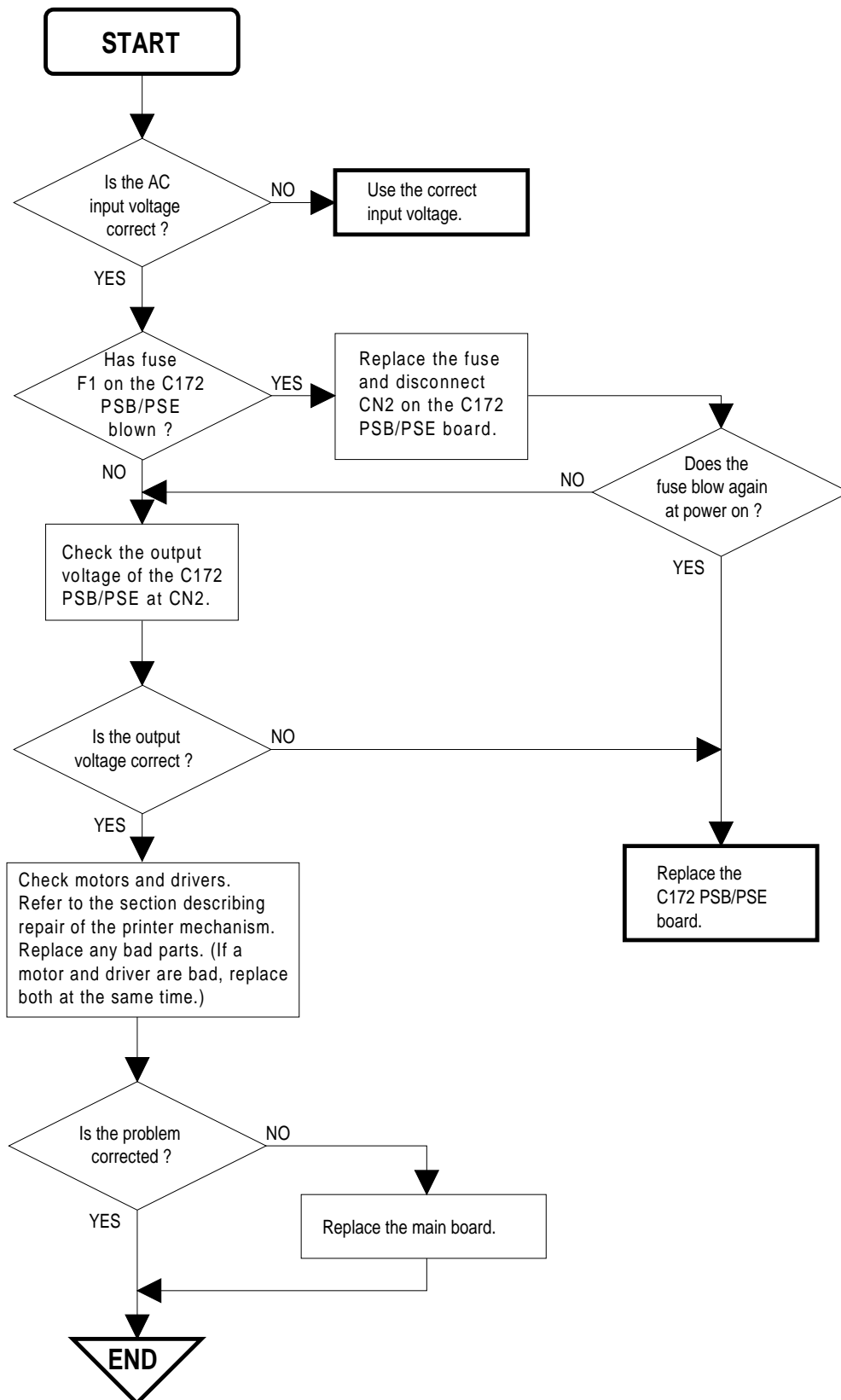


Figure 5-2. Flowchart — 1

5.2.2 Error is detected

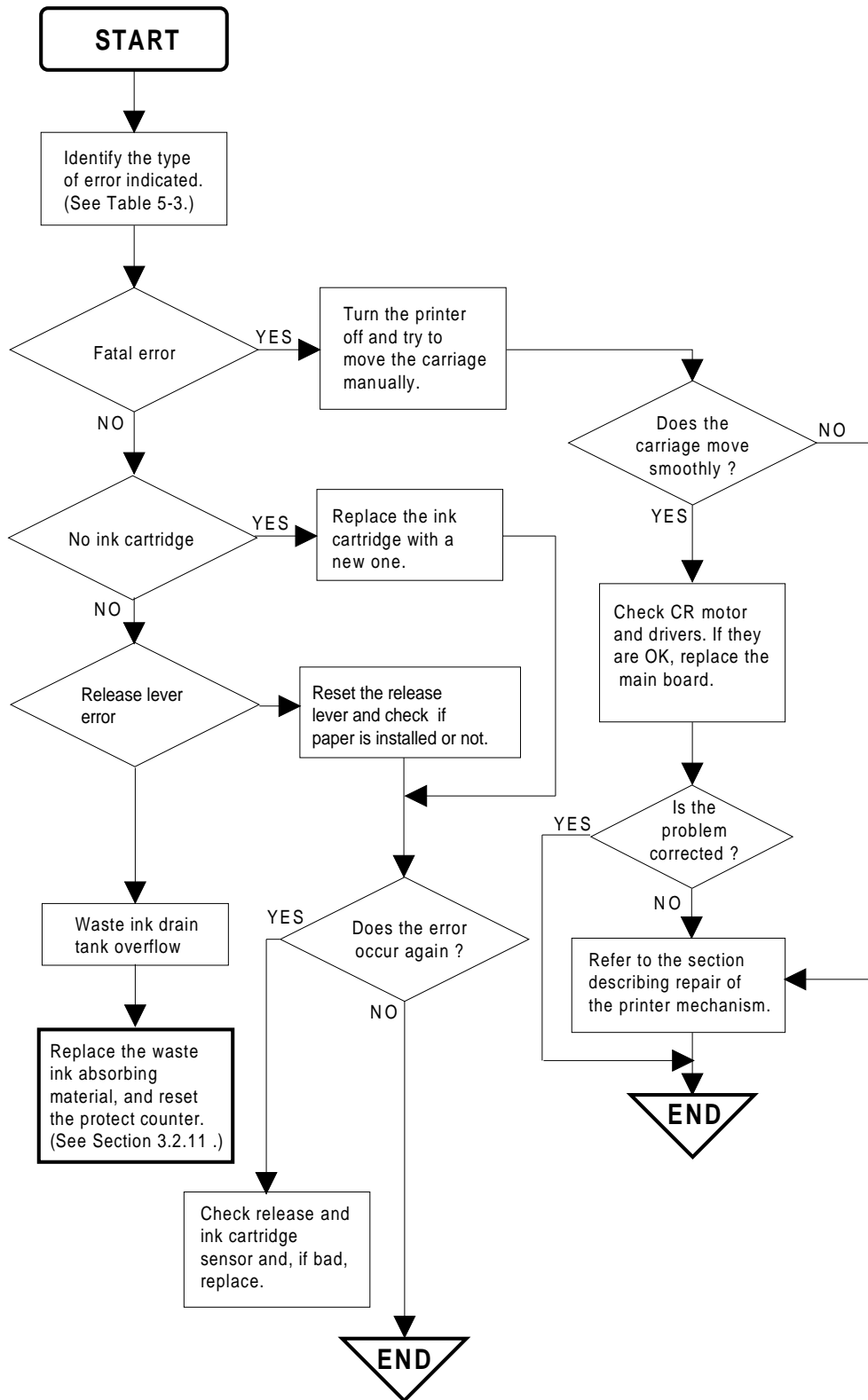


Figure 5-3. Flowchart — 2

5.2.3 Failure occurs during printing

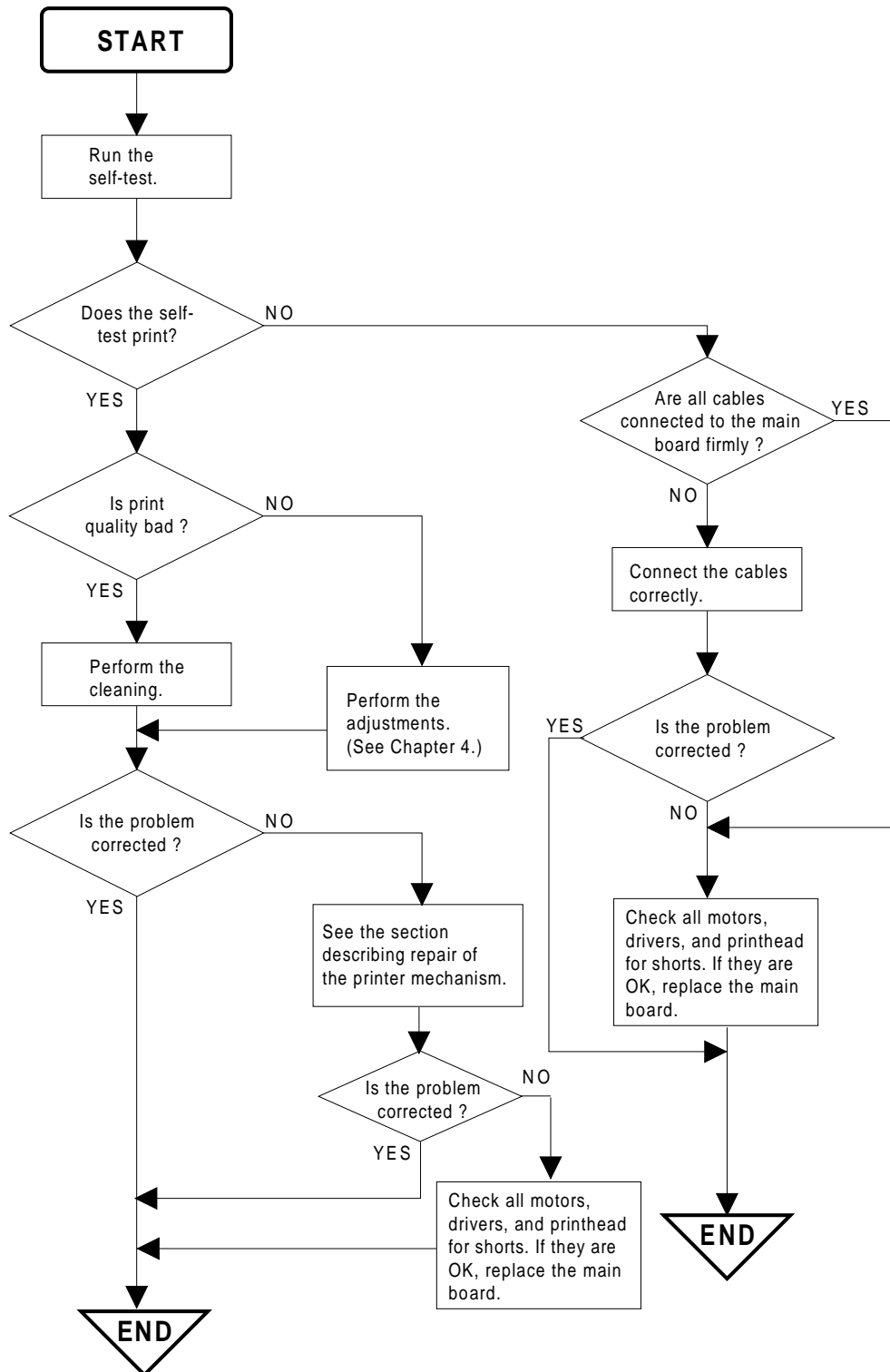


Figure 5-4. Flowchart — 3

5.2.4 Printer does not feed the paper correctly

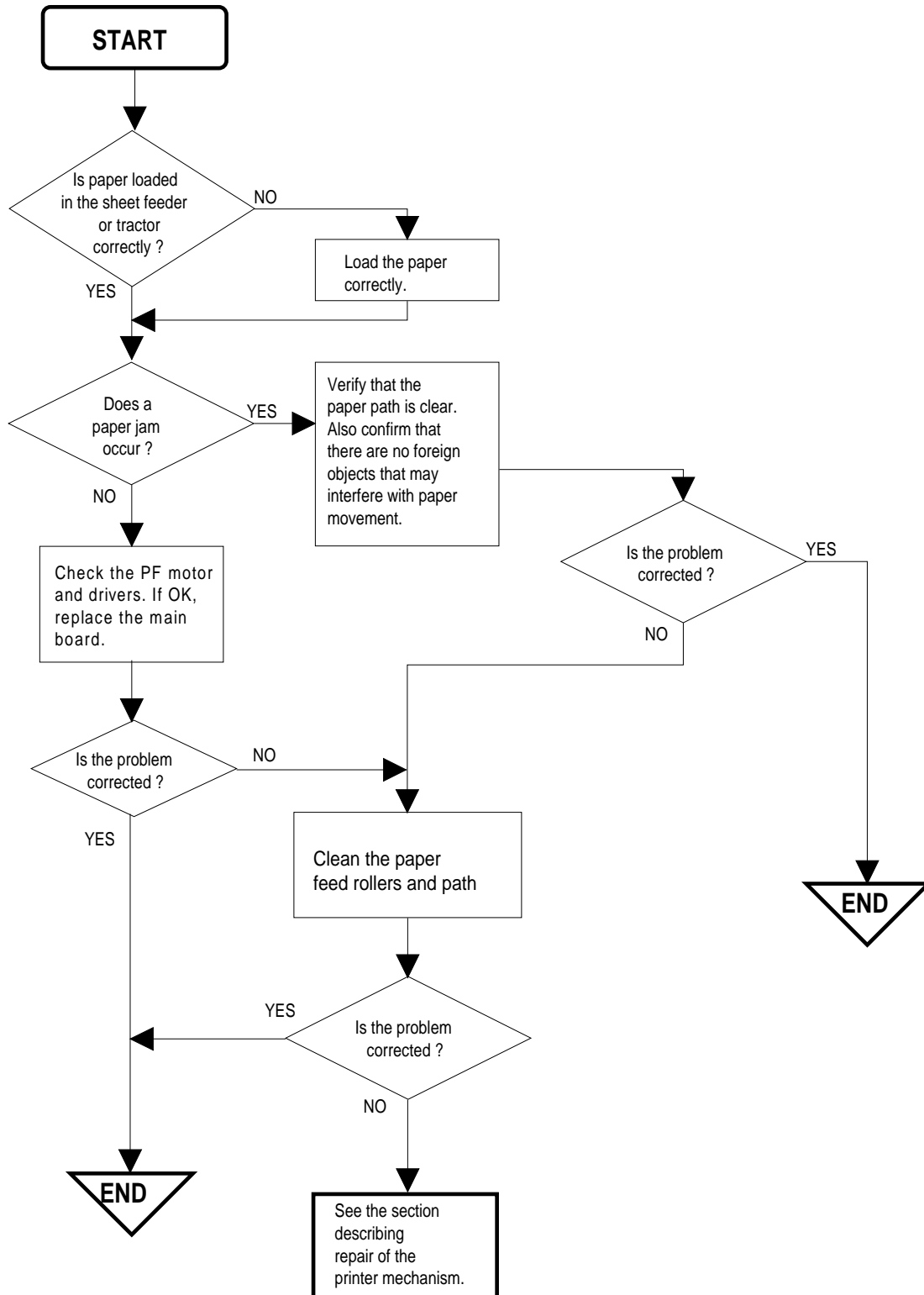


Figure 5-5. Flowchart — 4

5.2.5 Control panel operation is abnormal

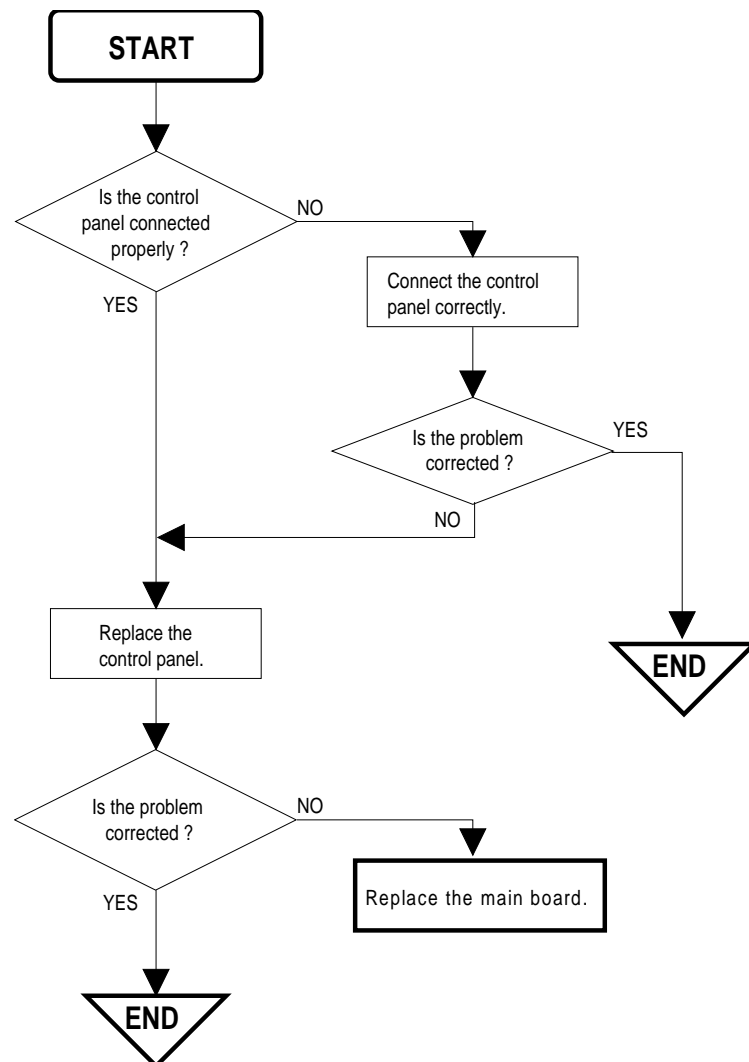


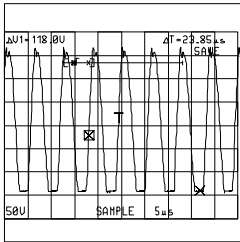
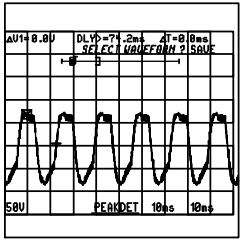
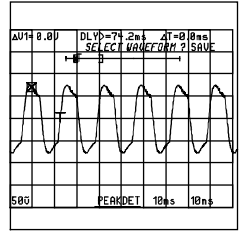
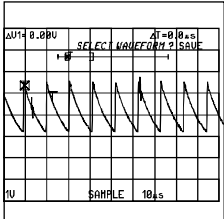
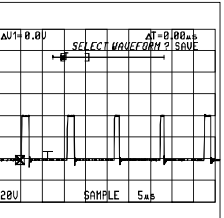
Figure 5-6. Flowchart — 5

5.3 UNIT REPAIR — C172 PSB/PSE BOARD

This section is necessary only for servicers who repair to the component level. Servicers who perform only board replacement (including all U.S. servicers) can ignore this section.

The table below lets you troubleshoot problems with the power supply board (C172 PSB/PSE). The table provides various symptoms, likely causes, and checkpoints. Checkpoints include waveforms, resistances, and other values to be checked to evaluate the operation of each component.

Table 5-5. Repair of the C172 PSB/PSE

Symptom	Condition	Cause	Checkpoint	Solution
The printer does not operate at all	+42 V line is dead	F1 is open.	Check whether F1 is normal or not.	Replace F1.
		Transformer (T1) is open.	Check the coils for transformer using a multimeter.	Replace T1.
		Switching FET(Q1) is dead.	Check the waveform at drain of Q1 	Replace Q1.
		Q2 or Q3 is dead.	Check the waveform at corrector of Q2 or Q3. 	Replace Q2 or Q3.
		PC1 is dead.	Check the pin 5 or 7 waveform of PC1. 	Replace PC1.
		+5 V line is dead.	Regulator IC L4962 is dead.	Check the pin 5 waveform of L4962. 
Check the pin 7 waveform of L4962. 	Replace L4962.			

5.4 UNIT REPAIR — C172 MAIN BOARD

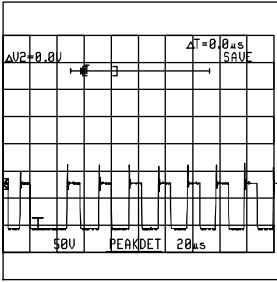
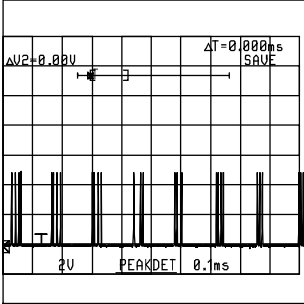
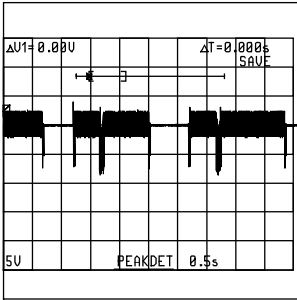
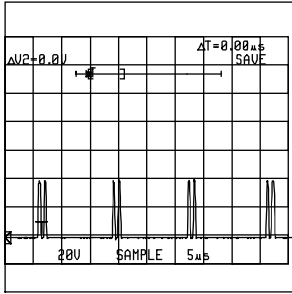
This section is necessary only for servicers who repair to the component level. Servicers who perform only board replacement (including all U.S. servicers) can ignore this section.

The table below lets you troubleshoot problems with the main controller board (C172 MAIN). This table provides various symptoms, likely causes, and checkpoints. Checkpoints include waveforms, resistances, and other values to be checked to evaluate the operation of each component.

Table 5-6. Repair of the C172 MAIN Board

Symptom	Condition	Cause	Checkpoint	Solution
The printer does not move at all.	The CPU does not operate. (Drive system does not operate normally when turn the printer on and off.)	The reset circuit does not operate.	Check the waveform of the +5 V line and that of the RESET signal. 	Replace IC8 or IC9.
		Selection of control ROM is abnormal.	Check the pin 2 of IC3 for a change in the signal HIGH/LOW. 	Replace MAIN board
		CG-ROM or RAM is defective.		Replace CG-ROM or RAM.
		CPU is defective.	Check the oscillator signal at either pin 27 or pin 28 of the CPU. 	Replace CPU or MAIN board
The carriage does not operate normally.	The carriage motor does not operate normally.	IC2 is defective.	Check the waveforms of IC15 pin 6 or 17. 	Replace IC2.
		CPU is defective.		Replace IC2 or MAIN board

Table 5-6. Repair of the C172 MAIN Board(Continued)

Symptom	Condition	Cause	Checkpoint	Solution
The carriage unit does not operate normally.	The carriage unit does not operate at all.	IC15 is defective.	<p>Check the pin 1, 8, 11 or 18 of IC15.</p> 	Replace IC15 or MAIN board..
Self-test printing is abnormal.	Self-test printing is not executed.	IC2 is defective.	<p>Check the output signal at pin 17 of CN7 (black) or pin 9 of CN8 (color).</p> 	Replace IC2 or MAIN board.
		Printhead is defective.		Replace printhead.
Paper feed does not operate normally.	PF motor does not rotate.	IC2 is defective.	<p>Check the signals from pin 1, 2 or pin 23, 24 of IC16.</p> 	Replace IC2 or MAIN board.
		IC15 is defective.	<p>Check the signals from pins 3, 6, or pins 18, 21 of IC16.</p> 	Replace IC16 or MAIN board.

5.5 UNIT REPAIR — PRINTER MECHANISM (M-4E60)

Repair any problems with the printer mechanism using the troubleshooting procedures in the table below.

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 power on.	Foreign substances are lodged in the mechanism gear s.	Manually drive the gear train connected to the pump mechanism to check whether the knob rotates.	Remove any foreign substances.
		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 waste 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.	Insert the tube properly.
		The ink tube is damaged.	Check the ink tube visually.	Replace the tube.
		The cap is defective.	Check for any defective part.	Replace the head cap.
		The pump is defective.	Replace the pump to see if this causes the ink to be absorbed normally.	Replace the pump unit.
		The printhead is defective.	Replace the printhead to see if this causes the ink to be absorbed normally.	Replace the printhead.
		The ink supply tube or head damper is not properly connected to the black head.	Check that the tube and head damper are properly connected to the head.	Reinstall the tube or damper properly.
		The ink supply tube or head damper is damaged.	Check the ink visually.	Replace the ink tube or head damper.
The carriage motor does not rotate.	The carriage motor fails to rotate at power on.	Foreign substances are lodged in the mechanism gear s.	Manually drive the timing belt to see if the carriage motor rotates.	Remove any foreign substances.
		The carriage motor is defective.	Measure the coil resistance of the CR motor.	Replace the carriage motor.

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

Symptom	Condition	Cause	Checkpoint	Solution
The carriage does not operate normally at 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 the bottom of the carriage.	Reinsert the timing belt.
	The carriage moves slightly and then stops.		Carriage movement is not smooth.	Check whether the carriage moves smoothly when moved manually.
		Check tension of the timing belt.		Adjust tension of the timing belt.
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.	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.	Check whether the cable is properly plugged into the connector.	Plug the cable into the connector properly.
Check the cleanliness.	Clean.			

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

Symptom	Condition	Cause	Checkpoint	Solution
Abnormal printing.	A dot is not printed occasionally.	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 waste 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.	Install the timing belt properly.
	A vertical line is not aligned.	Bidirectional alignment is not adjusted.	Check the printer with the 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 the head inclination, distance, and front/rear position.	Make each adjustment.
Paper is not fed normally.	Paper is not fed.	Foreign substances are lodged in the paper path.	Visually check the paper path by.	Remove any foreign substance.
		Paper feed gears are defective.	Visually check the gears, rotating the gears with the knob.	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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6.1 PREVENTIVE MAINTENANCE

Although this printer requires no specific maintenance on a regular basis, it is recommended that you clean the printer thoroughly whenever you get a chance. 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 sheet feeder's pickup roller is dirty, clean its surface with a soft, clean cloth.

Inside the printer

If you notice any dust or dirt has accumulated inside the printer when you open the outer case for repair, remove it 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 printer components when using a vacuum cleaner.*
- A lithium battery is installed on the C172 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 polarities do not come in contact with each other.*
 - 2. Do not heat the battery or 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 charge 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

This printer requires some maintenance if it detects an error or if you observe a decline in print quality.

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 ejection, as well as to preserve the printhead in its best condition. Therefore, to avoid wasting ink, perform this printhead cleaning operation only if print quality declines.

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 black head cleaning.
Hold down the Alt button and press the Economy/Condensed button for color head cleaning.

When the printer accepts the panel button selection, the PAUSE LED flashes during the cleaning cycle. When cleaning completes, the PAUSE LED stops flashing and returns to the standby mode.

6.3 LUBRICATION AND ADHESIVES

The printer must be lubricated properly when it is disassembled for component replacement, or if mechanical noise increases. 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 6-1 shows the lubrication points and adhesive points.

Table 6-1. Recommended Lubricants

Type	Name	Quality	Part No.	Availability
Oil	O-9	40 gm	102588000	E
Grease	G-26	40 gm	B702600001	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	The shaft for the middle frame unit (3 points)	G-26 (3-5 mg)
2	The slope of select cam (2 points)	G-26 (3-5 mg)
3	Front paper guide unit (the contact points for the pickup roller shaft, eject paper roller, and contact point of the shaft with gear 11.5.)	G-26 (3-5 mg)
4	The shaft for the eject paper roller unit	G-26 (3-5 mg)
5	The contact surface of base frame with tractor release shaft (6 points)	G-26 (3-5 mg)
6	The contact points base frame with the CR motor unit (4 points)	G-26 (3-5 mg)
7	Oil pad of carriage unit	O-9 (0.3 ml)
8	The slope of tractor release cam	G-26 (3-5 mg)
9	The contact points for the paper eject frame unit and carriage unit (8 points)	G-26 (10 ~ 20 cm length)
(1)	From the shaft of the CR motor to the CR motor fan	NEJI LOCK #2 (1-3 mg)

CAUTION

Do not apply too much lubricant or adhesive, as it may stain the mechanism or cause a malfunction.

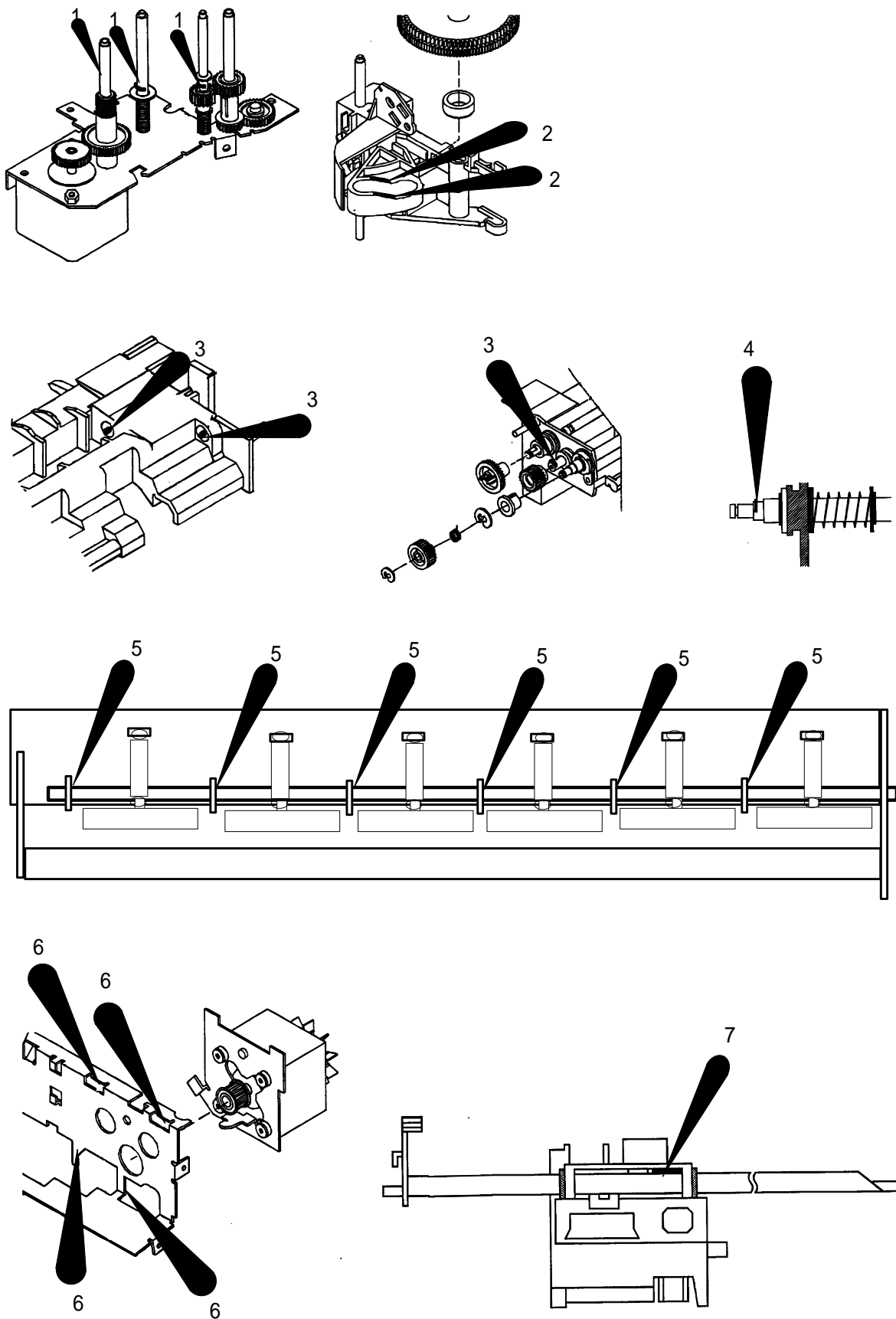


Figure 6-1. Lubrication and Adhesive Points

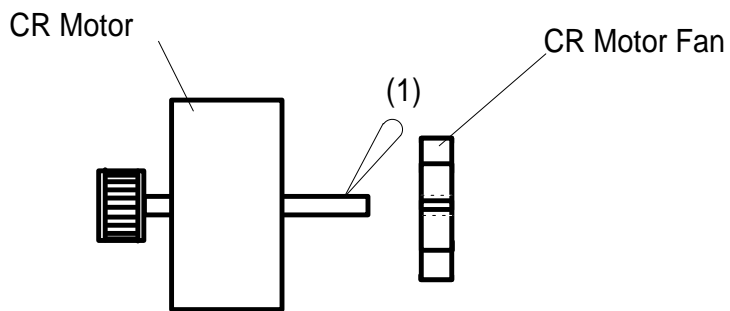
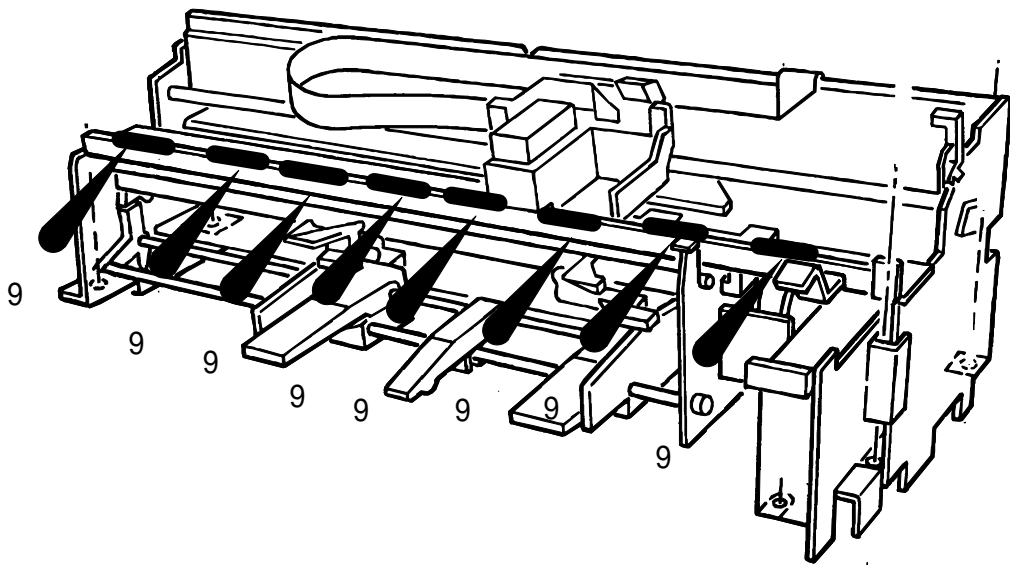
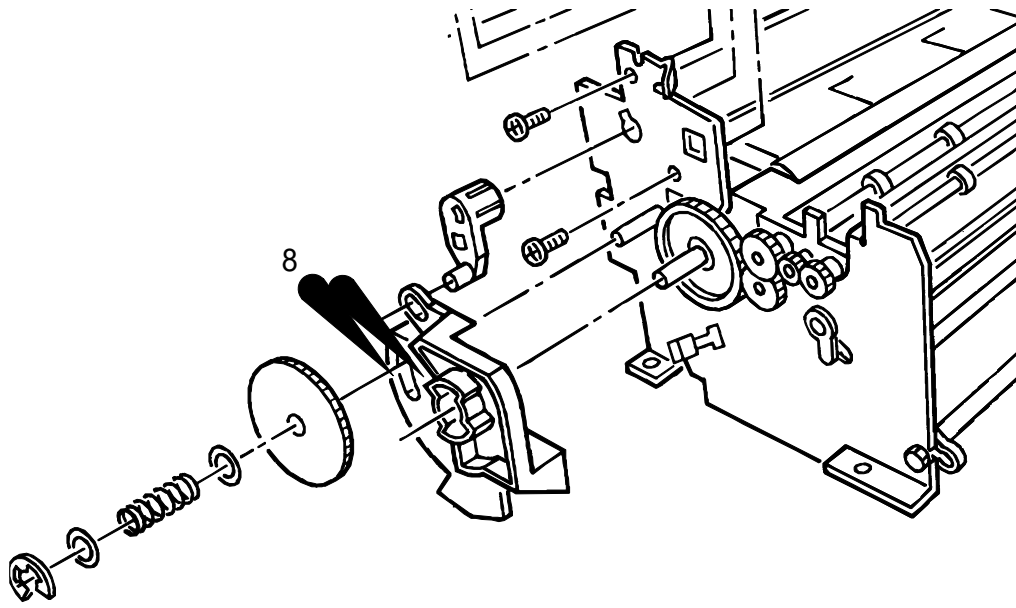


Figure 6-2. Lubrication and Adhesive Points (2)

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A.1 CONNECTOR SUMMARY

The figure below shows the interconnection between major components of the Stylus 1500.

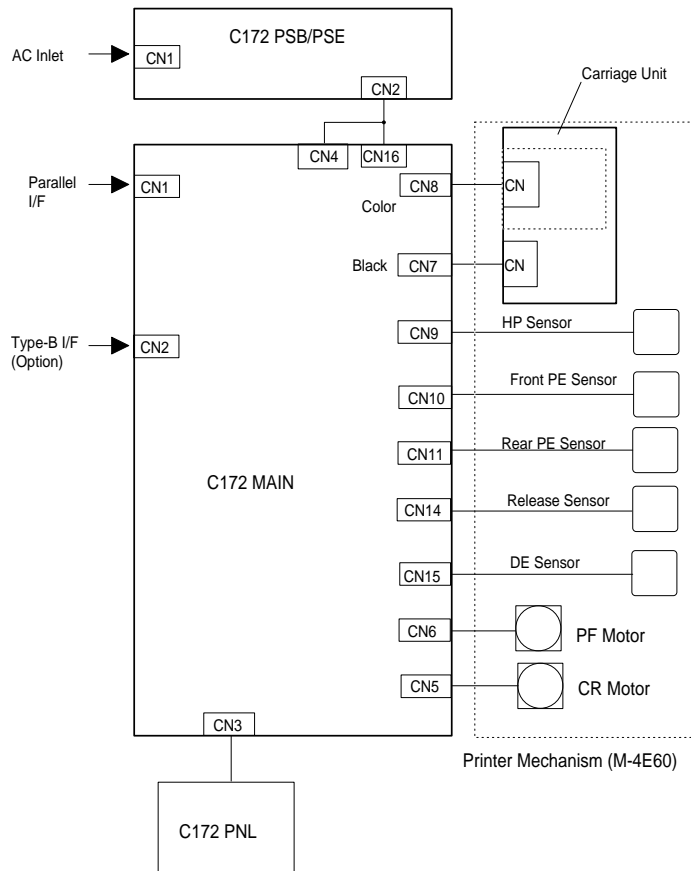


Figure A-1. Interconnection of Major Components

Table A-1. Connector Summary

Board	Location	Pins	Description
C172 MAIN	CN1	36	Centronics parallel I/F
	CN2	36	Type-B I/F (option)
	CN3	20	Control panel (C172 PNL)
	CN4	4	+42 V power supply from the power board
	CN5	5	Carriage motor phase output
	CN6	4	PF/PM motor phase output
	CN7	22	Black head nozzle selector and common driver
	CN8	17	Color head nozzle selector and common driver
	CN9	3	Carriage home position sensor
	CN10	2	Front paper-end sensor
	CN11	2	Rear paper-end sensor
	CN12	2	Black ink end sensor
	CN13	2	Black ink cartridge sensor
	CN14	2	Release sensor
	CN15	2	Disengage sensor
	CN16	5	<ul style="list-style-type: none"> • +5 V power supply from the power board • Power ON signal (PSC)
C172 PSB/PSE	CN1	2	AC inlet (L/N)
	CN2	9	DC output (+5 V / +42 V)
C172 PNL	CN1	20	(to C172 MAIN)

Table A-2. Connector Pin Assignments – CN1

Pin	I/O	Name	Description
1	I	STB	$\overline{\text{STROBE}}$ signal
2-9	I	DATA1-8	Data strobe signal
10	O	ACK	$\overline{\text{ACK}}$ signal
11	O	BUSY	Busy signal
12	O	PE	Paper end signal
13	O	SLCT	Printer select signal
14	I	AFXT	$\overline{\text{AUTO LINE FEED}}$ signal
15	—	NC	Not connected
16	—	GND	Ground
17	—	FG	Frame ground
18	—	+5 V	+5 VDC
19-30	—	GND	Ground
31	I	INIT	$\overline{\text{INIT}}$ signal
32	O	ERR	$\overline{\text{ERROR}}$ signal
33	—	GND	Ground
34	—	NC	Not connected
35	—	+5 V	+5 VDC
36	I	SLIN	$\overline{\text{SELECT IN}}$ signal

Table A-3. Connector Pin Assignments – CN2

Pin	I/O	Name	Description
1 - 6	—	+5 V	+5 VDC
7	O	TXD	Transmit data
8	O	$\overline{\text{READY}}$	Ready to receive data
9	I	RXD	Receive data
10	—	NC	Not connected
11	O	$\overline{\text{RST}}$	Reset
12	O	INH	Inhibit
13	I	$\overline{\text{CMREQ}}$	Command request
14	I	$\overline{\text{WRRDY}}$	Write ready
15	I	$\overline{\text{RDREQ}}$	Read ready
16	O	$\overline{\text{WR}}$	Write
17	O	$\overline{\text{RD}}$	Read
18	O	$\overline{\text{CS}}$	Chip select
19 - 24	—	GND	Ground
25	O	A3	Address bus bit 3
26	O	A2	Address bus bit 2
27	O	A1	Address bus bit 1
28	O	A0	Address bus bit 0
29	I/O	D7	Data bus bit 7
30	I/O	D6	Data bus bit 6
31	I/O	D5	Data bus bit 5
32	I/O	D4	Data bus bit 4
33	I/O	D3	Data bus bit 3
34	I/O	D2	Data bus bit 2
35	I/O	D1	Data bus bit 1
36	I/O	D0	Data bus bit 0

Table A-4. Connector Pin Assignments – CN3

Pin	I/O	Name	Description
1	—	GND	Ground
2	I	SW1	Switch 1 input signal
3	O	LED9	LED 9 data
4	O	LED8	LED 8 data
5	I	SW2	Switch 2 input signal
6	I	SW5	Switch 5 input signal
7	I	SW0	Switch 0 data
8	O	LED7	LED 7 data
9	O	LED6	LED 6 data
10		LED5	LED 5 data
11	—	+5 V	Logic line
12	O	LED1	LED 1 data
13	O	LED0	LED 0 data
14	I	PSW	Power switch
15	I	PSC	Power scan
16	I	SW3	Switch 3 input signal
17	I	SW4	Switch 4 input signal
18	O	LED3	LED 3 data
19	O	LED2	LED 2 data
20	O	LED4	LED 4 data

Table A-5. Connector Pin Assignments – CN4

Pin	I/O	Name	Description
1, 4	—	GND	Ground
2, 3	—	+42 V	+42 V power supply

Table A-6. Connector Pin Assignments – CN5

Pin	I/O	Name	Description
1	O	CR A	Phase A drive signal
2	O	CR B	Phase B drive signal
3	O	CR/A	Phase \bar{A} drive signal
4	O	CR/B	Phase \bar{B} drive signal
5	—	CRCOM	Common (+42 V)

Table A-7. Connector Pin Assignments – CN6

Pin	I/O	Name	Description
1	O	PFA	Phase A drive signal
2	O	PF B	Phase B drive signal
3	O	PF/A	Phase \bar{A} drive signal
4	O	PF/B	Phase \bar{B} drive signal

Table A-8. Connector Pin Assignments – CN7

Pin	I/O	Name	Description
1	—	VHV	Head drive voltage VH
2	O	NCHG	Head ON signal for black head
3, 4, 5, 6, 7	O	COM	Common voltage for printhead drive
8, 9, 10, 11, 12, 16, 18, 20	—	GND	Ground
13	I	TH	Thermistor signal
14	—	VDD	Power supply for black head driver
15	I	CO	Black cartridge out sensor
17	O	SI	Black head serial data output
19	O	LAT	Latch signal for black head
21	O	CLK	Clock signal for black head
22	—	FG	Frame ground

Table A-9. Connector Pin Assignments – CN8

Pin	I/O	Name	Description
1	I	ID3	ID 3 signal
2	I	ID2	ID 2 signal
3	I	ID1	ID 1 signal
4, 5	—	COM	Common voltage for printhead drive
6, 7, 10, 12, 14	—	GND	Ground
8	I	ID4	ID 4 signal
9	O	SI	Color head serial data output
11	O	LAT	Latch signal for color head
13	O	CLOCK	Clock signal for color head
15	I	CO	Color cartridge out sensor
16	—	VDD	Power supply for color head driver

Table A-10. Connector Pin Assignments – CN9

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

Table A-11. Connector Pin Assignments – CN10

Pin	I/O	Name	Description
1, 4	I	PE	Front paper on/out detection signal
2, 3	—	GND	Ground

Table A-12. Connector Pin Assignments – CN11

Pin	I/O	Name	Description
1, 4	I	PE	Rear paper on/out detection signal
2, 3	—	GND	Ground

Table A-13. Connector Pin Assignments – CN12

Pin	I/O	Name	Description
1	I	BKEND	Black ink end detection signal
2	—	GND	Ground

Table A-14. Connector Pin Assignments – CN13

Pin	I/O	Name	Description
1	I	BHCO	Black ink cartridge out detection signal
2	—	GND	Ground

Table A-15. Connector Pin Assignments – CN14

Pin	I/O	Name	Description
1	I	RELEASE	Release lever position detection signal
2	—	GND	Ground

Table A-16. Connector Pin Assignments – CN15

Pin	I/O	Name	Description
1	I	DE	Disengage gear position detection signal
2	—	GND	Ground

Table A-17. Connector Pin Assignments – CN16

Pin	I/O	Name	Description
1, 5	—	+5 V	Power supply for logic system
2, 4	—	GND	Ground
3	I	PSC	Power scan signal

A.2 CIRCUIT DIAGRAMS

Figure A-2. C172 MAIN Board Circuit Diagram (1)

Figure A-3. C172 MAIN Board Circuit Diagram (2)

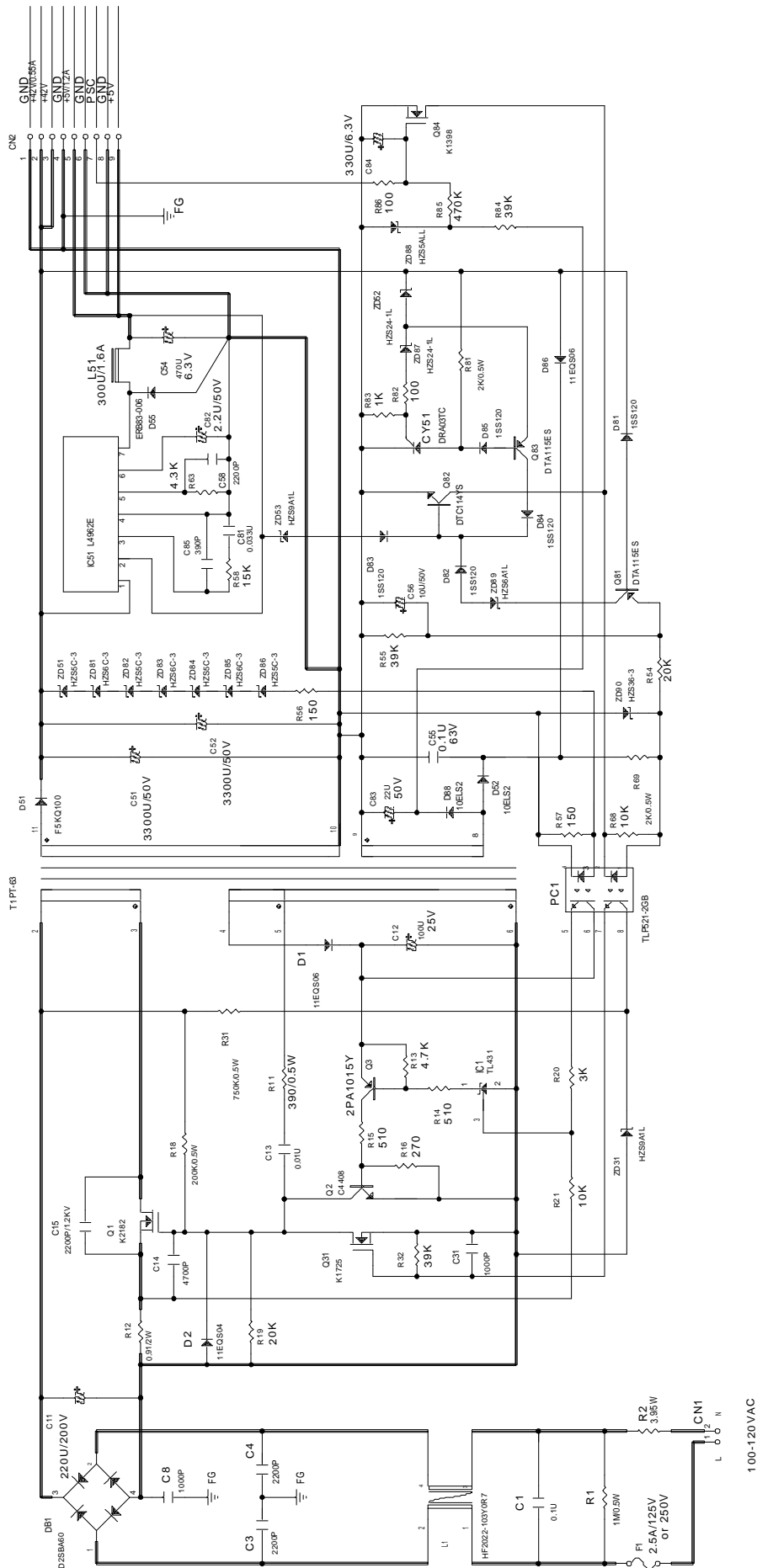


Figure A-4. C172 PSB Board Circuit Diagram

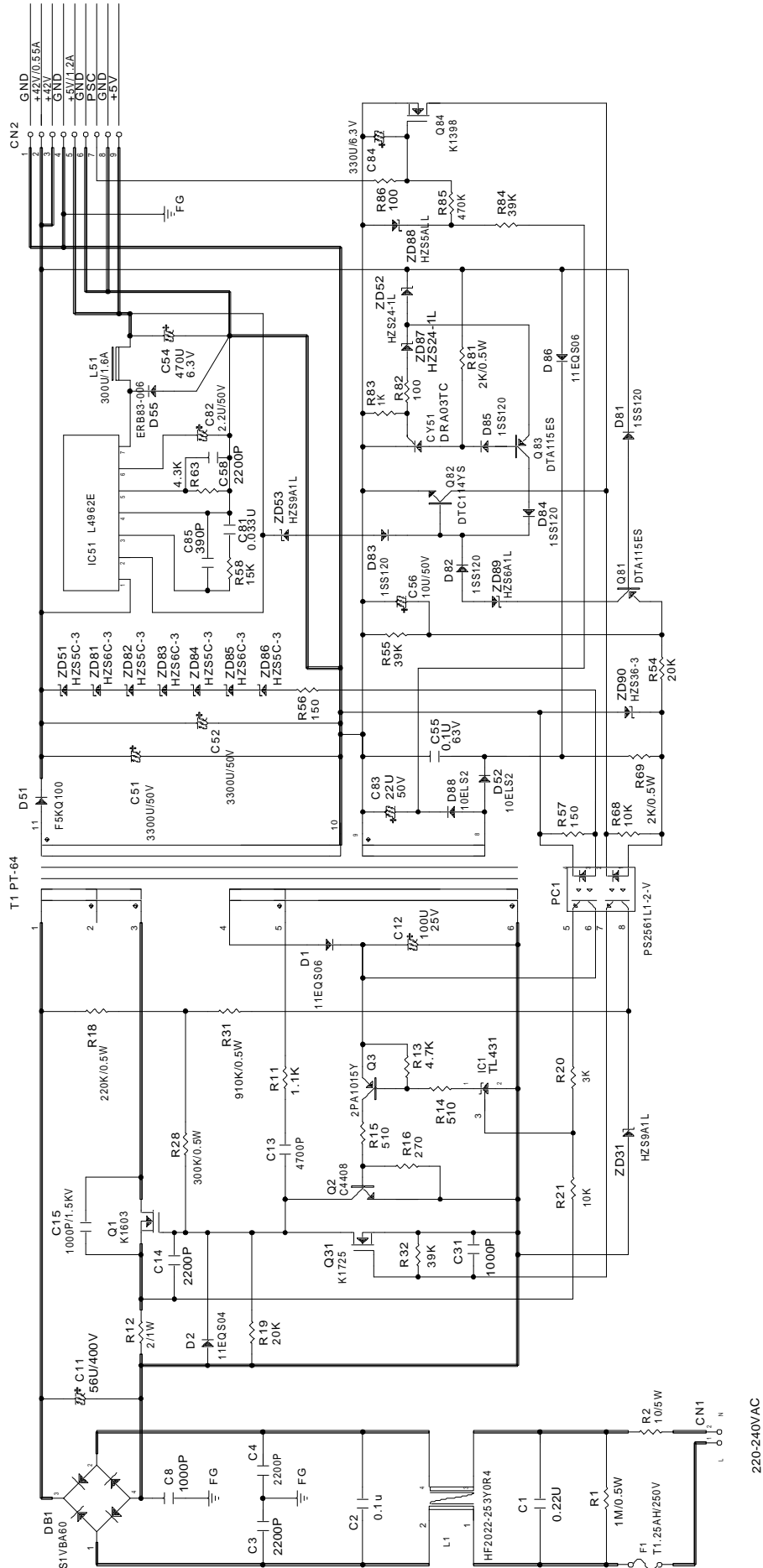


Figure A-5. C172 PSE Board Circuit Diagram

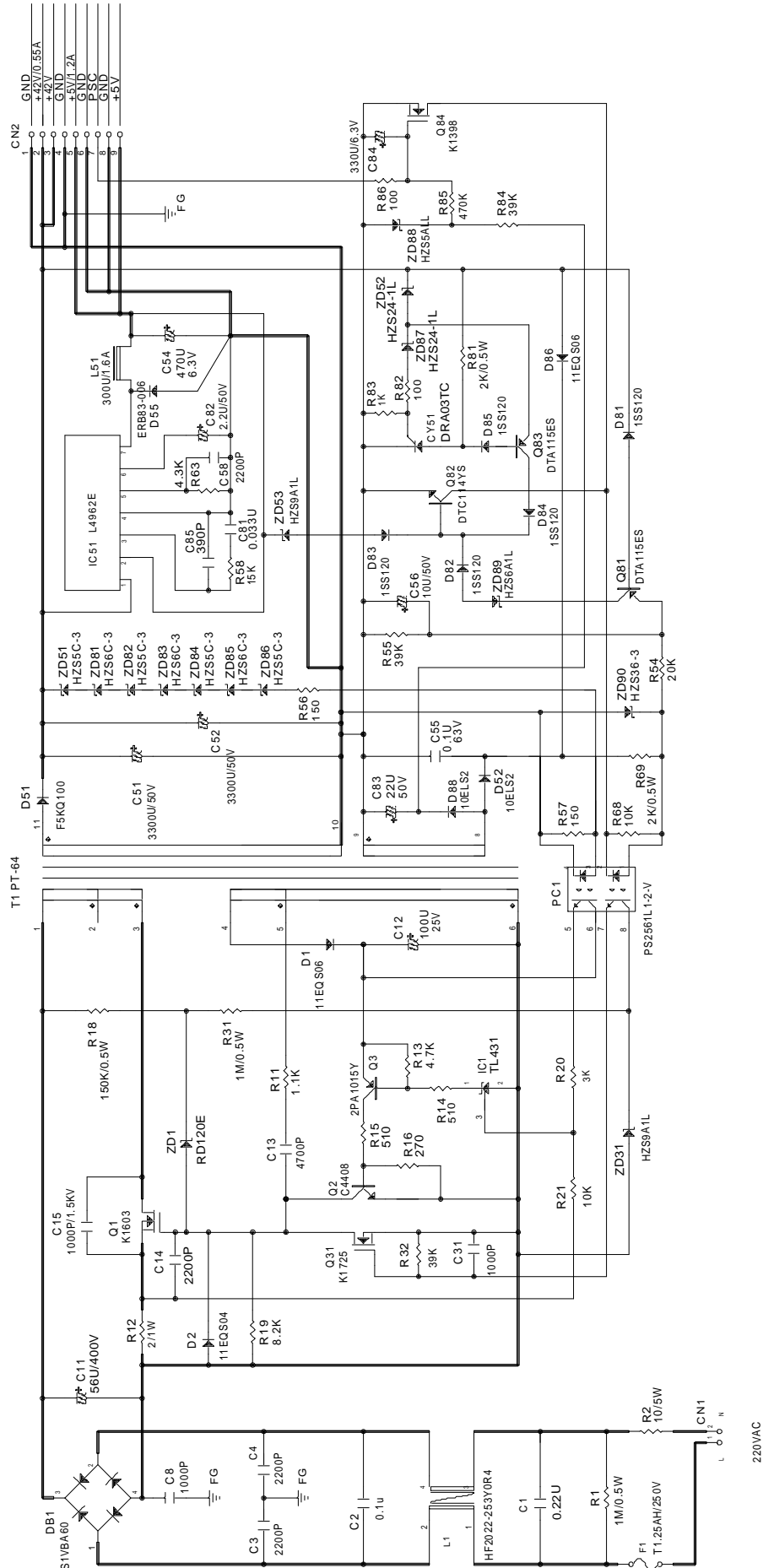


Figure A-6. C172 PSE (Korea) Board Circuit Diagram

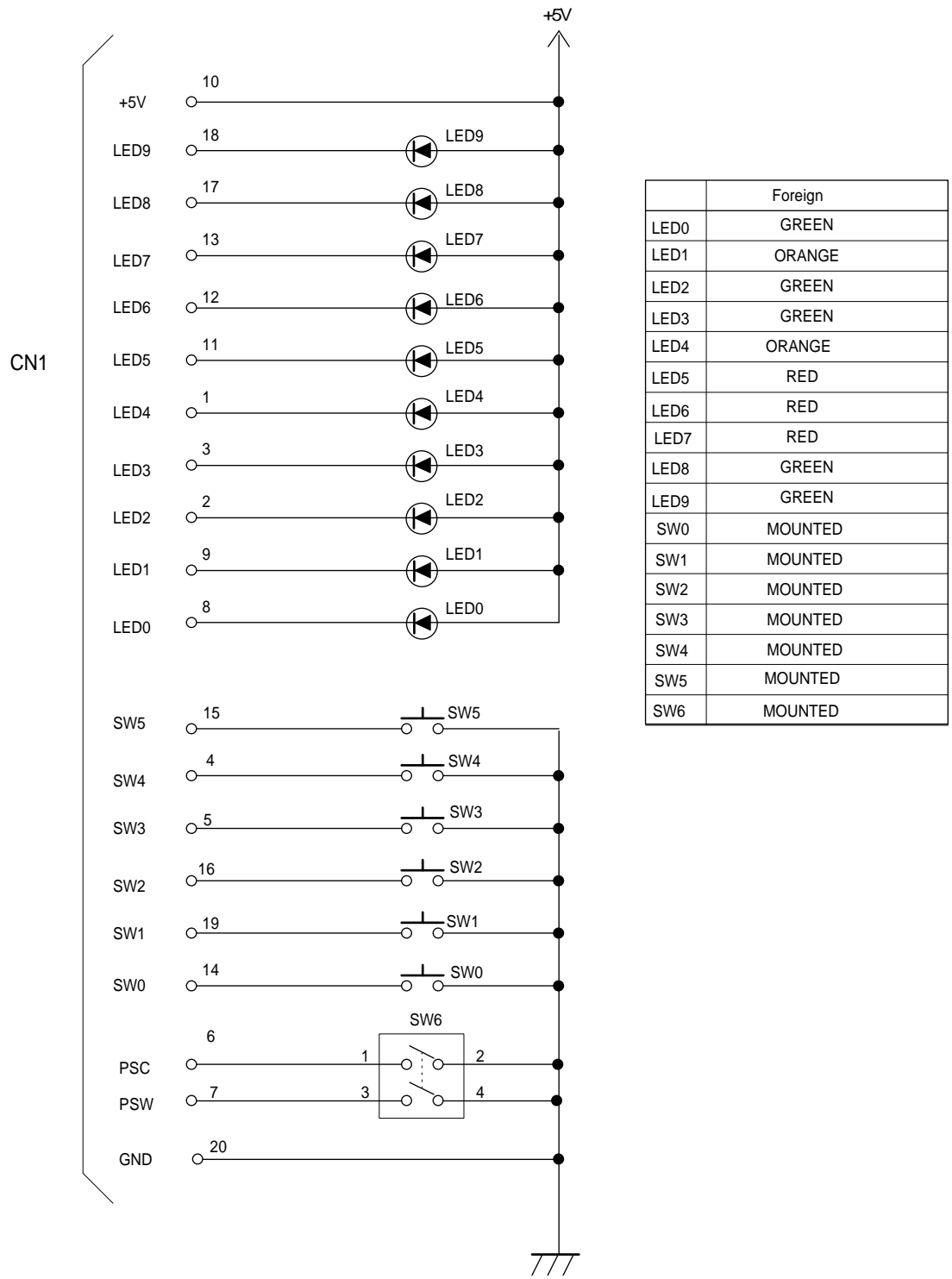


Figure A-7. C172 PNL Board Circuit Diagram

A.3 CIRCUIT BOARD COMPONENT LAYOUTS

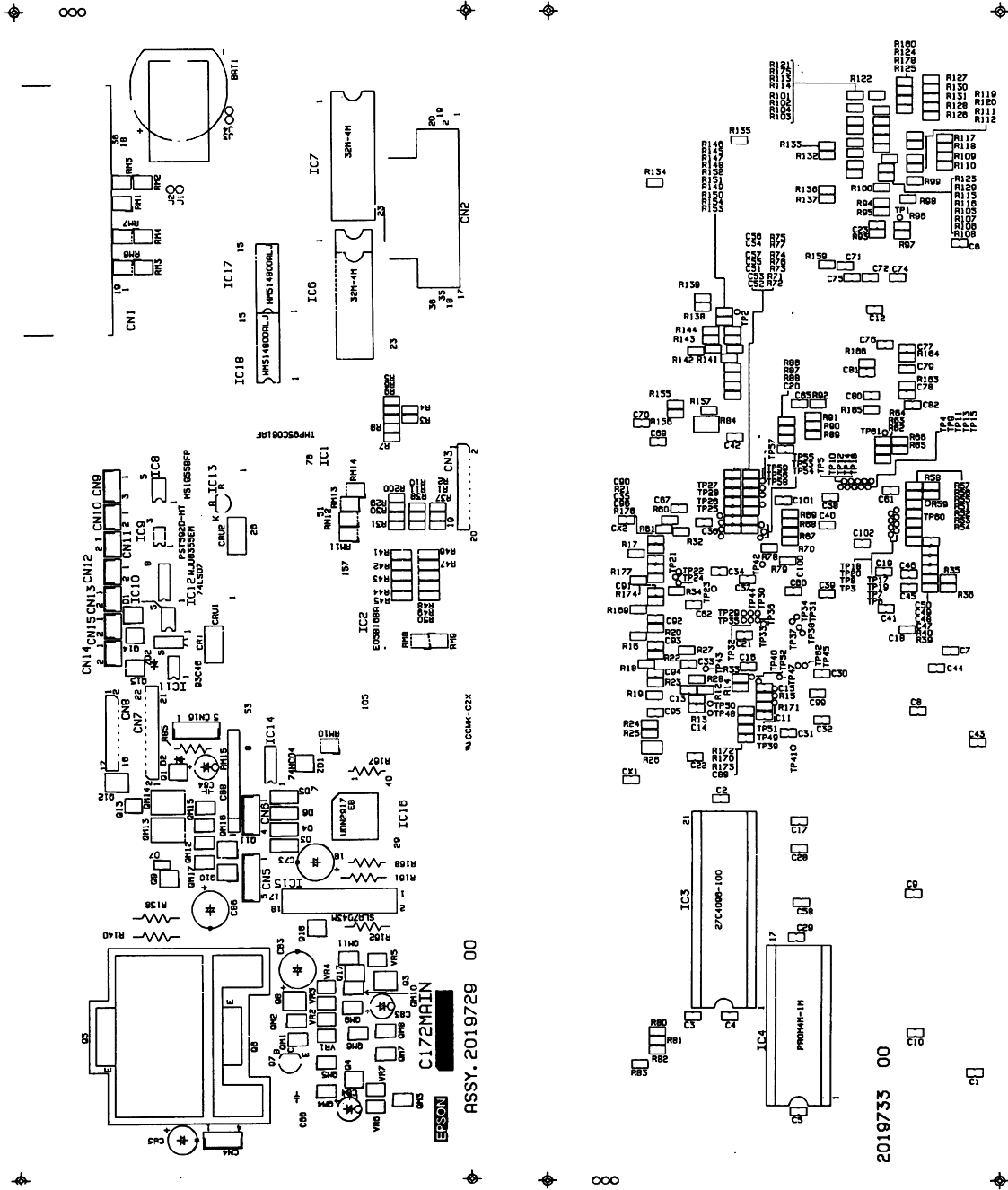


Figure A-8. C172 MAIN Board Component Layout

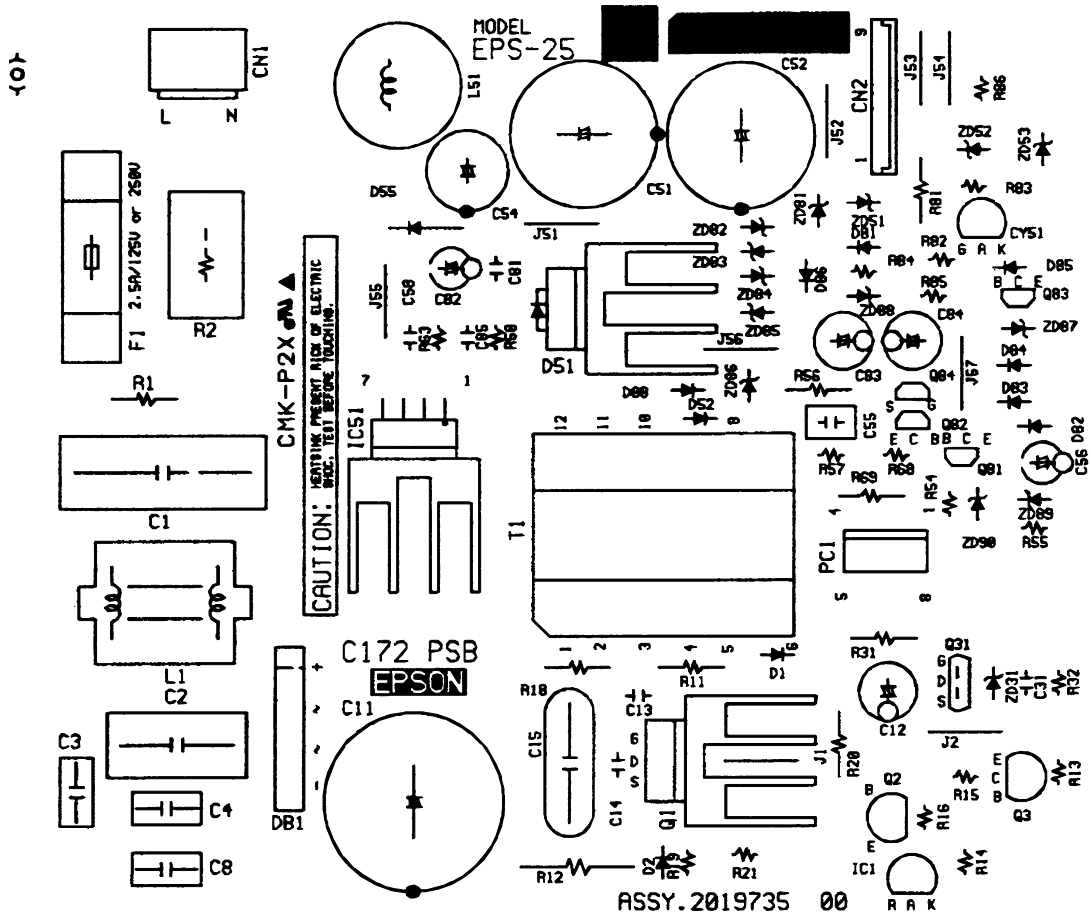


Figure A-9. C172 PSB/PSE Board Component Layout

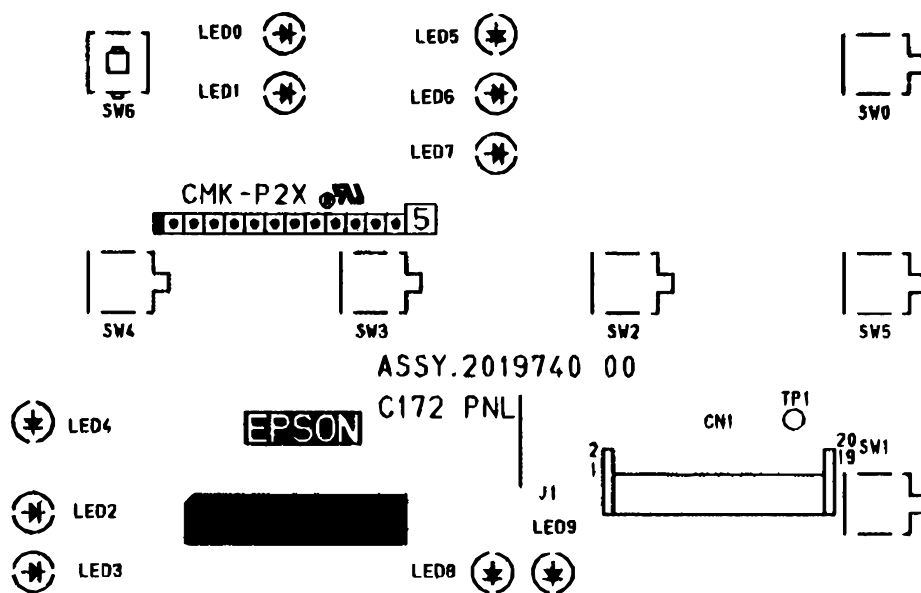


Figure A-10. C172 PNL Board Component Layout

A.4 EXPLODED DIAGRAMS

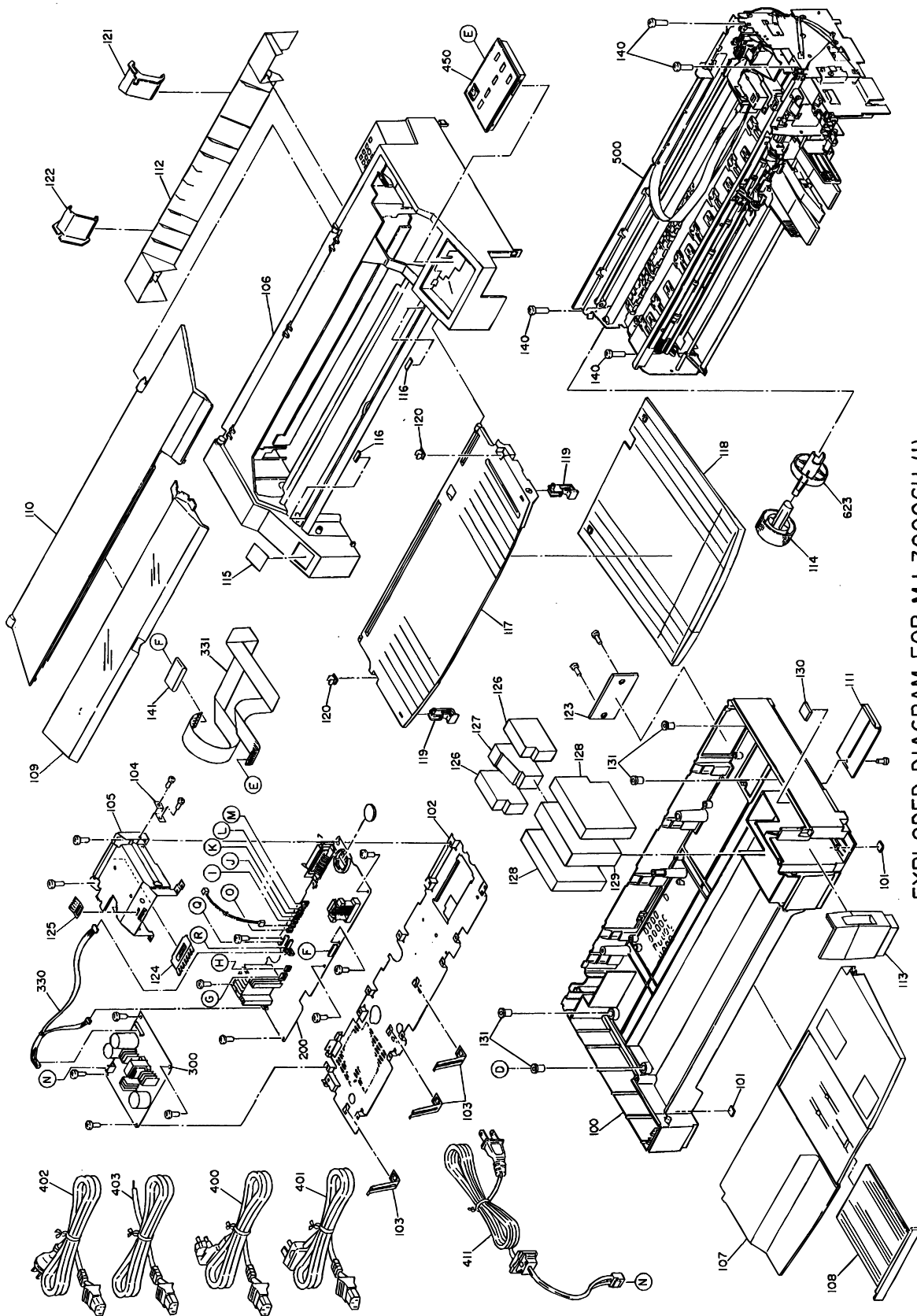
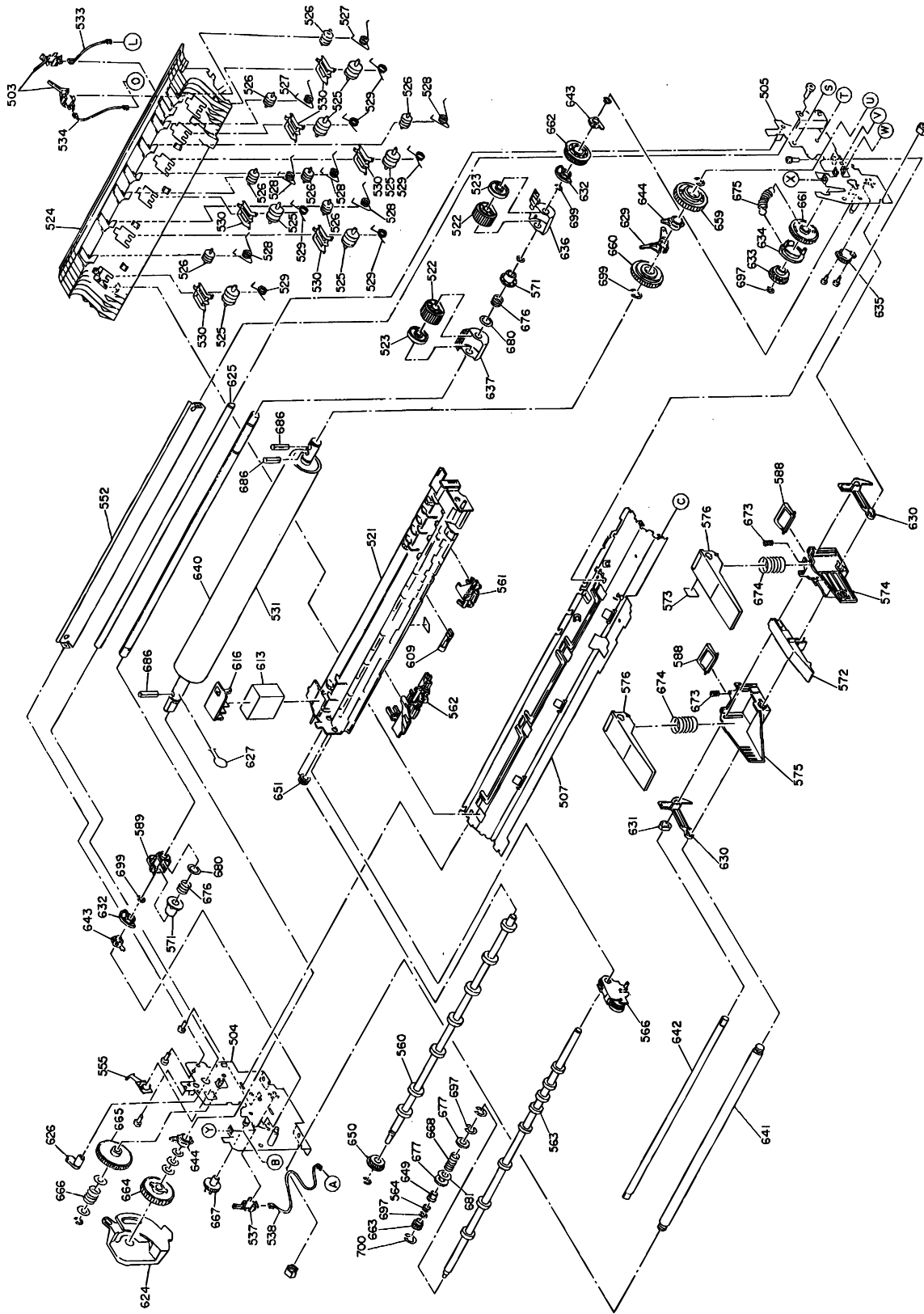
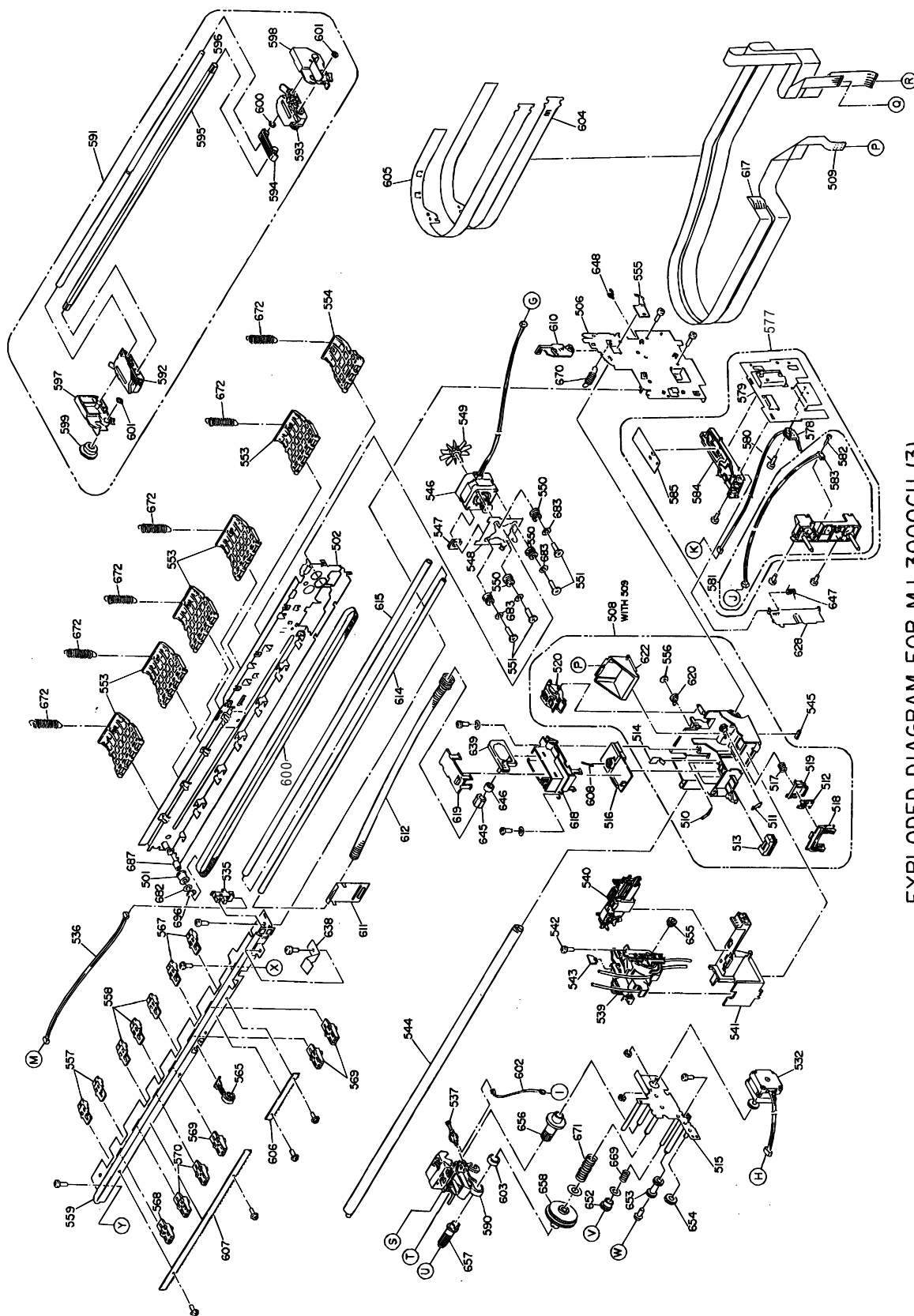


Figure A-11. Stylus 1500 Exploded Diagram (1)



EXPLODED DIAGRAM FOR MJ-3000C (2)

Figure A-12. Stylus 1500 Exploded Diagram (2)



EXPLODED DIAGRAM FOR MJ-3000CU (3)

Figure A-13. Stylus 1500 Exploded Diagram (3)

Table A-18. Part No. Reference Table

Ref. No.	Description	PPL Name
100	Lower Housing	HOUSING, UPPER
101	Foot	FOOT
102	Shield Plate	SHIELD PLATE
103	Grounding Plate	GROUNDING PLATE
104	Grounding Plate B	GROUNDING PLATE; B
105	Type -B Interface Shield Cover	SHIELD COVER, TYPE-B, I/F
106	Upper Housing	HOUSING, UPPER
107	Paper Support	PAPER SUPPORT
108	Paper Guide	PAPER GUIDE
109	Printer Cover 01	COVER, PRINTER, 01
110	Printer Cover 02	COVER, PRINTER, 02
111	ROM Cover	COVER, ROM
112	Rear Sheet Guide	SHEET GUIDE, REAR
113	Ink Cartridge Cover	COVER, I/C
114	Knob	KNOB
115	Logo Plate	LOGO PLATE
116	Dumper Sheet	DUMPER SHEET
117	Stacker	STACKER
118	Stacker Support	STACKER, SUPPORT
119	Stacker Lever	LEVER, STACKER
120	Stacker Hook	HOOK, STACKER
121	Right Rear Edge Guide	EDGE GUIDE, REAR, RIGHT
122	Left Rear Edge Guide	EDGE GUIDE, REAR, LEFT
123	Upper Connector Cover	COVER, CONNECTOR, UPPER
124	Type-B Interface Earth Spring	EARTH SPRING, TYPE-B
125	Earth Spring	EARTH SPRING
126	Waste Ink Pad 1	POROUS PAD, INK EJECT, 1
127	Waste Ink Pad 2	POROUS PAD, INK EJECT, 2
128	Waste Ink Pad 3	POROUS PAD, INK EJECT, 3
129	Waste Ink Pad 4	POROUS PAD, INK EJECT, 4
130	Ink Cartridge Holder Waste Ink Pad	POROUS PAD, INK HOLDER
131	Insulator	INSULATOR
134	Pan Head Screw M3 × 4	PAN HEAD SCREW M3 × 4
135	Bind Head S-tight Screw M3 × 6	BIND HEAD S-tight SCREW M3 × 6
136	Bind Head B-tight Screw M4 × 20	BIND HEAD B-tight SCREW M4 × 20
137	Bind Head S-tight Screw M3 × 12	BIND HEAD S-tight SCREW M3 × 12
138	Bind Head P-tight Screw 3 × 12	BIND HEAD P-tight SCREW 3 × 12
139	Bind Head P-tight Screw M3 × 8	BIND HEAD P-tight SCREW M3 × 8
140	Bind Screw 4 × 14	BIND SCREW 4 × 14
141	Ferrite Core	FERRITE CORE

Table A-18. Part No. Reference Table (Continued)

Ref. No.	Description	PPL Name
200	Main Board Assembly	BOARD ASSY., MAIN
300	Power Supply Board Assembly	BOARD ASSY., POWER SUPPLY
330	Harness	HARNESS
331	Harness	HARNESS
411	Power Cable	CABLE ASSY., POWER SUPPLY
450	Panel Board Assembly	BOARD ASSY., PANEL
500	Printer Mechanism	PRINTER MECHANISM
501	Driven Pulley B	PULLEY DRIVEN;B
502	Base Frame Assembly	FRAME ASSY., BASE
503	PE Sensor	DETECTOR, PE
504	Left Frame Assembly	FRAME ASSY., LEFT
505	Middle Frame Assembly	FRAME ASSY., MIDDLE
506	Right Main Frame	FRAME, MAIN, RIGHT
507	Bottom Main Frame	FRAME, MAIN, BOTTOM
508	Carriage Assembly	CARRIAGE ASSY.
509	Head Cable Assembly	CABLE ASSY., HEAD
510	H Adjust Lever	LEVER, ADJUST, H
511	1D Caution Label	LABEL, CAUTION 1;D
512	Head Cable Pad	PAD, HEAD CABLE
513	CR Slider	SLIDER, CR
514	Head Grounding Plate	GROUNDING PLATE, HEAD
515	Sub-Frame Assembly	FRAME ASSY., SUB
516	Printhead, IJ64-0B0	PRINTHEAD, IJ64-0B0
517	Compression Spring 18.4	COMPRESSION SPRING, 18.4
518	Slider	SLIDER
519	Head Cable Pad Holder	HOLDER, PAD, HEAD CABLE
520	Head Fastening Lever Assembly	LEVER ASSY., FASTENING, HEAD
521	Front Paper Guide Assembly	PAPER GUIDE ASSY., FRONT
522	Load Paper Roller Assembly	ROLLER ASSY., LOAD PAPER
523	Paper Load Support Roller	ROLLER, PAPER LOAD, SUPPORT
524	Rear Paper Guide	PAPER GUIDE, REAR
525	PF Support Roller	ROLLER, PF, SUPPORT
526	Driven Support Roller	ROLLER, DRIVEN SUPPORT
527	Torsion Spring 675.2	TORSION SPRING, 675.2
528	Torsion Spring 908.5	TORSION SPRING, 908.5
529	Torsion Spring 728.1	TORSION SPRING, 728.1
530	PF Support Holder	HOLDER, PF, SUPPORT
531	PF Drive Roller	ROLLER, PF, DRIVE
532	PF Motor Assembly	MOTOR ASSY., PF
533	Rear PF Harness	HARNESS, PF, REAR

Table A-18. Part No. Reference Table (Continued)

Ref. No.	Description	PPL Name
534	Front PE Harness	HARNESS, PE, FRONT
535	HP Sensor	DETECTOR, HP
536	HP Harness	HARNESS, HP
537	Leaf Detector B1	DETECTOR, LEAF, B1
538	Platen Harness	HARNESS, PLATEN
539	Pump Assembly	PUMP ASSY.
540	Cap Assembly	CAP ASSY.
541	Pump Fastening Plate	FASTENING PLATE, PUMP
542	Bind Head P-tight Screw 3 × 10	BIND HEAD P-tight SCREW 3 × 10
543	Head Cleaner	CLEANER, HEAD, ASP;B
544	CR Guide Shaft	SHAFT, CR GUIDE
545	Oil Pad B	OIL PAD; B
546	CR Motor Assembly	MOTOR ASSY., CR
547	CR Motor Grounding Plate	GROUNDING PLATE, CR MOTOR
548	CR Motor Fastening Plate	FASTENING PLATE, CR MOTOR
549	CR Motor Fan	FAN, CR MOTOR
550	CR Dumper	DUMPER, CR
551	CR Dumper Shaft B	SHAFT, DUMPER, CR;B
552	Paper Load Guide Frame	FRAME, GUIDE, PAPER LOAD
553	Driven Roller Assembly	ROLLER ASSY., DRIVEN
554	Driven Roller Assembly B	ROLLER ASSY., DRIVEN;B
555	Parallel Adjust Bushing	BUSHING, PARALLEL, ADJUST
556	Switch Lever Bushing	BUSHING, LEVER, SWITCH
557	Paper Eject Holder Assembly	HOLDER ASSY., PAPER EJECT
558	Paper Eject Holder Assembly B	HOLDER ASSY., PAPER EJECT;B
559	Paper Eject Frame	FRAME, PAPER EJECT
560	Paper Eject Roller	ROLLER, PAPER EJECT
561	Right Paper Eject Assembly	PAPER ASSY., PAPER EJECT, R
562	Left Paper Eject Assembly	PAPER ASSY., PAPER EJECT, L
563	Paper Out Roller Assembly	ROLLER ASSY., PAPER OUT
564	Paper Out Clutch	CLUTCH, PAPER OUT
565	Paper Out Lever Assembly	LEVER ASSY., PAPER OUT
566	EJ Lever Assembly	LEVER ASSY., EJ
567	Paper Eject Holder Assembly C	HOLDER ASSY., PAPER EJECT;C
568	Paper Out Holder Assembly D	PAPER OUT HOLDER ASSY.;D
569	Paper Out Holder Assembly C	PAPER OUT HOLDER ASSY.;C
570	Paper Out Holder Assembly E	PAPER OUT HOLDER ASSY.;E
571	Paper Eject Cam	CAM, PAPER EJECT
572	Middle Edge Guide Assembly	EDGE GUIDE ASSY., MIDDLE
573	Edge Guide Label	LABEL, EDGE GUIDE

Table A-18. Part No. Reference Table (Continued)

Ref. No.	Description	PPL Name
574	Right Edge Guide Assembly	EDGE GUIDE ASSY., RIGHT
575	Left Edge Guide Assembly	EDGE GUIDE ASSY., LEFT
576	Hopper Assembly	HOPPER ASSY.
577	Ink Cartridge Assembly	HOLDER ASSY., INK CARTRIDGE
578	Ink Sensor Assembly	DETECTOR ASSY., INK
579	Ink Cartridge Holder Fastening Plate	FASTENING PLATE INK CARTRIDGE HOLDER
580	Bind S-tight Screw M3 × 12	BIND S-tight SCREW M2 × 12
581	Needle Holder Assembly	HOLDER ASSY., NEEDLE
582	Pan Head B-tight Micro Screw M2 × 10	PAN HEAD B-tight MICRO SCREW M2 × 10
583	Ink Cartridge Sensor Assembly	DETECTOR ASSY., INK CARTRIDGE
584	Ink Cartridge Holder Frame	FRAME, HOLDER, INK CARTRIDGE
585	Ink Cartridge Holder Holding Plate	HOLDING PLATE, HOLDER, INK CARTRIDGE
586	Tube Fastening Screw	TUBE FASTENING SCREW
587	Tube Fastening O Ring	TUBE FASTENING O RING
588	Holder Assembly Pad	HOLDER ASSY. PAD
589	Cam Cover Assembly	COVER ASSY., CAM
590	Cam Select Assembly	SELECT ASSY., CAM
591	Tractor Assembly	TRACTOR ASSY.
592	Left Tractor	TRACTOR, LEFT
593	Right Tractor	TRACTOR, RIGHT
594	Paper Support	PAPER SUPPORT
595	Tractor Drive Shaft	SHAFT, TRACTOR, DRIVE
596	Tractor Guide Shaft	SHAFT, TRACTOR, GUIDE
597	Left Tractor Frame	FRAME, TRACTOR, LEFT
598	Right Tractor Frame	FRAME, TRACTOR, RIGHT
599	Spur Gear 25	SPUR GEAR, 25
600	Timing Belt	TIMING BELT
602	DE Harness	HARNESS, DE
603	DE Gear Bushing	BUSHING. GEAR, DE
604	FFC Holder	FFC, HOLDER
605	FFC Holder B	FFC, HOLDER;B
606	Right Discharge Brush	DISCHARGE BRUSH, RIGHT
607	Left Discharge Brush	DISCHARGE BRUSH, LEFT
608	Head Fastening Pin	PIN, FASTENING HEAD
609	Paper Support Stopper	STOPPER, PAPER SUPPORT
610	PG Adjust Lever	LEVER, PG ADJUST
611	Tube Fastening Plate	FASTENING PLATE, TUBE
612	Tube Cover	COVER, TUBE

Table A-18. Part No. Reference Table (Continued)

Ref. No.	Description	PPL Name
613	Left Waste Ink Pad	POROUS PAD, INK EJECT, LEFT
614	Ink Supply Tube	TUBE, SUPPLY, INK
615	Ink Supply tube Protector	PROTECTOR, TUBE, INK SUPPLY
616	Waste Ink Pad Cover	COVER, POROUS PAD, INK EJECT
617	Black Head Cable	CABLE, HEAD, Bk
618	CR Cover	COVER, CR
619	Dumper Cover	COVER, DUMPER
620	Switch Lever Cam	LEVER, SWITCH, CAM
621	Switch Lever Spring	SPRING, LEVER, SWITCH
622	Color Head Cover	COVER, HEAD, YMC
623	Release Lever	LEVER, RELEASE
624	TR Release Cam	CAM, RELEASE, TR
625	TR Release Shaft	SHAFT, RELEASE, TR
626	TR Release Cam Support	CAM, RELEASE, TR, SUPPORT
627	Roller Grounding Spring	SPRING, ROLLER GROUNDING
628	Ink Cartridge Holder Cover	COVER, HOLDER, INK CARTRIDGE
629	Trigger Lever	LEVER, TRIGGER
630	Release Transmission Lever	LEVER, RELEASE, TRANSMISSION
631	ASF Release Shaft Bushing	BUSHING, SHAFT, RELEASE, ASF
632	ASF Release Cam	CAM, RELEASE, ASF
633	ASF Transmission Ratchet	RATCHET, ASF, TRANSMISSION
634	Clutch Cam	CAM, CLUTCH
635	Rotary Dumper	ROTARY DUMPER
636	Right Slide Cover	COVER, SLIDE, RIGHT
637	Left Slide Cover	COVER, SLIDE, LEFT
638	Panel Grounding Plate	GROUNDING PLATE, PANEL
639	Dumper Assembly	DUMPER ASSY.
640	Paper Load Shaft	SHAFT, PAPER LOAD
641	Edge Guide Shaft	SHAFT, EDGE GUIDE
642	ASF Release Shaft	SHAFT, RELEASE, ASF
643	Platen Shaft Bearing	PLATEN SHAFT BEARING
644	Gray Platen Shaft Bearing	PLATEN SHAFT BEARING (Gray)
645	Tube Fastening Screw	TUBE FASTENING SCREW
646	Tube Fastening O-ring	TUBE FASTENING O-RING
647	Torsion Spring 3490	TORSION SPRING, 3490
648	Wire Saddle	WIRE SADDLE
649	Bushing 6	BUSHING, 6
650	Spur Gear 16	SPUR GEAR, 16
651	Spur Gear 11.5	SPUR GEAR, 11.5
652	Spur Gear 11.4	SPUR GEAR, 11.4

Table A-18. Part No. Reference Table (Continued)

Ref. No.	Description	PPL Name
653	Combination Gear 13.8, 11	COMBINATION GEAR, 13.8, 11
654	Spur Gear 17	SPUR GEAR 17
655	Spur Gear 12	SPUR GEAR, 12
656	Combination Gear 22, 8.4	COMBINATION GEAR, 22, 8.4
657	Spur Gear 8	SPUR GEAR 8
658	Combination Gear 48, 45	COMBINATION GEAR, 48, 45
659	Spur Gear 33.6	SPUR GEAR, 33.6
660	Spur Gear 24	SPUR GEAR, 24
661	Spur Gear 29	SPUR GEAR, 29
662	Paper Load Gear	GEAR, PAPER LOAD
663	Spur Gear 13.5	SPUR GEAR, 13.5
664	Spur Gear 40	SPUR GEAR, 40
665	Spur Gear 46	SPUR GEAR, 46
666	Compression Spring 1.96	COMPRESSION SPRING, 1.96
667	Spur Gear 19.5	SPUR GEAR, 19.5
668	Compression Spring 450	COMPRESSION SPRING, 450
669	Compression Spring 0.245	COMPRESSION SPRING, 0.245
670	Extension Spring 23.2	EXTENSION SPRING, 23.2
671	Compression Spring 0.47	COMPRESSION SPRING, 0.47
672	Extension Spring 7.63	EXTENSION SPRING, 7.63
673	Compression Spring 1.13	COMPRESSION SPRING, 1.13
674	Compression Spring 2.16	COMPRESSION SPRING, 2.16
675	Extension Spring 0.698	EXTENSION SPRING, 0.698
676	Compression Spring 27	COMPRESSION SPRING, 27
677	Plain Washer 6 × 0.7 × 12	PLAIN WASHER 6 × 0.7 × 12
678	Plain Washer 8 × 0.5 × 15	PLAIN WASHER 8 × 0.5 × 15
679	Plain Washer 8.1 × 0.2 × 7.8	PLAIN WASHER 8.1 × 0.2 × 7.8
680	Plain Washer 8.1 × 0.5 × 13.3	PLAIN WASHER 8.1 × 0.5 × 13.3
681	Plain Washer 6.1 × 0.3 × 12	PLAIN WASHER 6.1 × 0.3 × 12
682	Plain Washer 4.2 × 0.3 × 8	PLAIN WASHER 4.2 × 0.3 × 8
683	Plain Washer 3 × 0.5 × 8	PLAIN WASHER 3 × 0.5 × 8
684	Plain Washer 7 × 1 × 17.6	PLAIN WASHER 7 × 1 × 17.6
685	Leaf Spring 8.2 × 0.25 × 15	LEAF SPRING 8.2 × 0.25 × 15
686	Spring Pin 2 × 14	SPRING PIN 2 × 14
687	Ball Bearing	BALL BEARING
688	Hexagon Nut M3	HEXAGON NUT M3
689	Hexagon Nut M4	HEXAGON NUT M4
690	Plain Washer 5.2 × 0.3 × 10	PLAIN WASHER 5.2 × 0.3 × 10
696	Retaining Ring TYPE -E (3)	RETAINING RING TYPE -E (3)

Table A-18. Part No. Reference Table (Continued)

Ref. No.	Description	PPL Name
697	Retaining Ring TYPE -E (4)	RETAINING RING TYPE -E (4)
698	Retaining Ring TYPE -E (5)	RETAINING RING TYPE -E (5)
699	Retaining Ring TYPE -E (6)	RETAINING RING TYPE -E (6)
700	Retaining Ring TYPE -E (2.3)	RETAINING RING TYPE -E (2.3)
701	Cup Screw M2 × 4	CUP SCREW M2 × 4
702	Bind S-tight Screw M3 × 6	BIND S-tight SCREW M3 × 6
703	Pan S-tight Screw M3 × 6	PAN S-tight SCREW M3 × 6
704	Bind P-tight Screw M3 × 8	BIND P-tight SCREW M3 × 8
705	Bind P-tight Screw with Plain Washer 3 × 8	BIND P-tight SCREW WITH PLAIN WASHER 3 × 8
706	Bind S-tight Screw 2 × 6	BIND S-tight SCREW 2 × 6