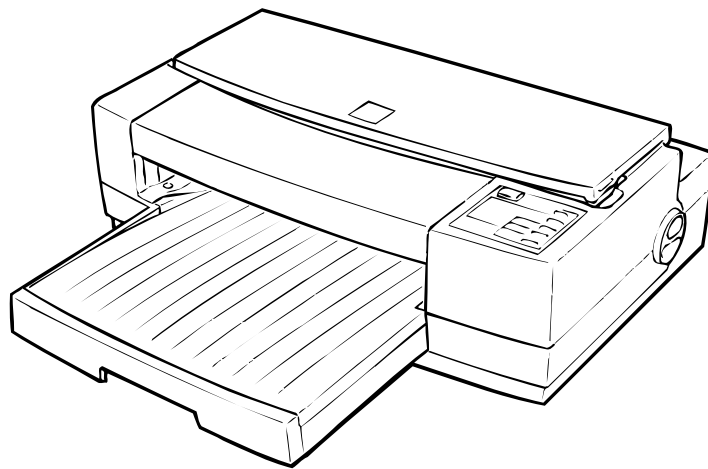


EPSON COLOR INKJET PRINTER

Stylus Pro XL

SERVICE MANUAL



EPSON

4004677

Chapter 1 Product Description

Table of Contents

1.1 FEATURES	1-1
1.2 SPECIFICATIONS	1-3
1.2.1 Printing Specifications	1-3
1.2.2 Paper Handling Specifications	1-5
1.2.3 Paper Specifications	1-5
1.2.4 Ink Cartridge Specifications	1-7
1.2.5 Electrical Specifications	1-8
1.2.6 Environmental Conditions	1-8
1.2.7 Reliability	1-9
1.2.8 Safety Approvals	1-9
1.2.9 Physical Specifications	1-9
1.3 INTERFACE SPECIFICATIONS	1-10
1.3.1 Serial Interface Specifications	1-10
1.3.2 Parallel Interface Specifications	1-12
1.4 OPERATIONS	1-13
1.4.1 Control Panel	1-13
1.4.2 Panel Operation at Power On	1-14
1.4.3 Default settings	1-15
1.4.3.1 Default Setting Items	1-15
1.4.3.2 Changing the Default Settings	1-16
1.4.4 Error Conditions	1-18
1.4.5 Printer Initialization	1-18
1.4.5.1 Hardware Initialization	1-18
1.4.5.2 Software Initialization	1-18
1.4.5.3 Panel Initialization	1-18
1.5 MAIN COMPONENTS	1-19
1.5.1 Main Control Board (C162 MAIN Board)	1-19
1.5.2 Power Supply Board (C137 PSB/PSE Board)	1-20
1.5.3 Control Panel (C137 PNL Board)	1-20
1.5.4 Printer Mechanism (M-4A60)	1-21
1.5.5 Housing	1-21

List of Figures

- Figure 1-1. Exterior View of the Stylus Pro XL
- Figure 1-2. Nozzle Configuration
- Figure 1-3. Printable Area for Cut Sheet
- Figure 1-4. Printable Area for Envelope
- Figure 1-5. Adjustment Lever Setting
- Figure 1-6. Temperature/Humidity Range
- Figure 1-7. Data Transmission Timing
- Figure 1-8. Control Panel Appearance
- Figure 1-9. C162 MAIN Board Component Layout
- Figure 1-10. C137 PSB/PSE Board Component Layout
- Figure 1-11. Printer Mechanism (M-4A60)

List of Tables

- Table 1-1. Interface Cards
- Table 1-2. Print Speed and Printable Columns
- Table 1-3. Character Table
- Table 1-4. Cut Sheet Paper Specifications
- Table 1-5. Envelope Specifications
- Table 1-6. Adjust Lever Setting
- Table 1-7. Rated Electrical Ranges
- Table 1-8. Acceptable Environmental Conditions
- Table 1-9. Signal and Connector Pin Assignments for Parallel Interface
- Table 1-10. DTR and X-ON/X-OFF Protocol
- Table 1-11. Signal and Connector Pin Assignments for Serial Interface
- Table 1-12. Printer Condition Panel Status
- Table 1-13. Default Setting Items
- Table 1-14. Characteristics of Print Direction Mode
- Table 1-15. Printing Direction and ESC U Command
- Table 1-16. Language Selection
- Table 1-17. Feature Selection
- Table 1-18. Character Table Selection
- Table 1-19. Error Indications

1.1 FEATURES

The Stylus Pro XL is a 64 + 48-nozzle (monochrome and CMY) color ink jet dot matrix printer. The major features of this printer are:

- ❑ High-quality color print
 - Micro Dot 720 dpi printing
 - Plain paper 720 dpi printing
 - Special coated paper 720 dpi printing
- ❑ High print speed
 - LQ 200 cps
- ❑ Built-in auto sheet feeder
 - Holds 100 cut sheets (64 g/m²)
 - Holds 10 envelopes
 - Holds 50 transparency films
 - Hold 70 special paper
- ❑ Built-in 3 I/
 - Mac serial I/F
 - Parallel I/F
 - Type B I/F (option)
- ❑ Easy setup.
 - No dip-switches
 - Multi-lingual setting messages (5 languages)
- ❑ 4 scalable fonts and 5 LQ fonts standard.
 - Roman T, Sans Serif H, Roman, Sans Serif (scalable)
 - Roman, Sans Serif, Courier, Prestige, Script (LQ)
- ❑ 21 character tables
 - Italic, PC437, PC850, PC860, PC863, PC865, PC437, Greek, PC852, PC853, PC858, PC857, PC866, PC869, PC861, BRASCII, Abicomp, MAZOWIA, Code MJK, ISO 8859-7, ISO Latin 1T, Bulgaria
- ❑ Low running cost

The figure below shows the Stylus Pro XL.

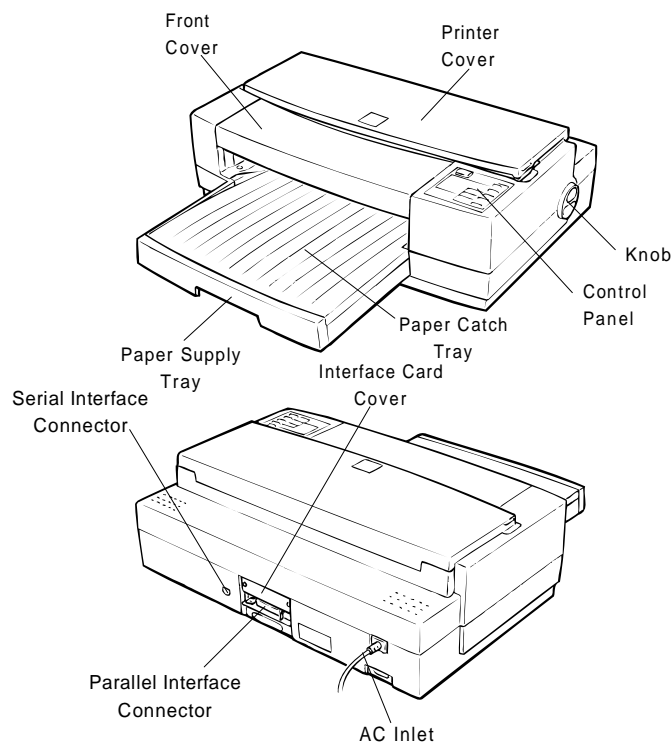


Figure 1-1. Exterior View of the Stylus Pro XL

Table 1-1. Interface Cards

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

* The asterisk represents the last digit, which varies by country.

1.2 SPECIFICATIONS

This section provides statistics and other detailed information for the printer.

1.2.1 Printing Specifications

Print system: On demand ink jet system
 Nozzle configuration: 64 nozzles (16 × 4 staggered): monochrome
 48 nozzles (16 × 3 staggered): color

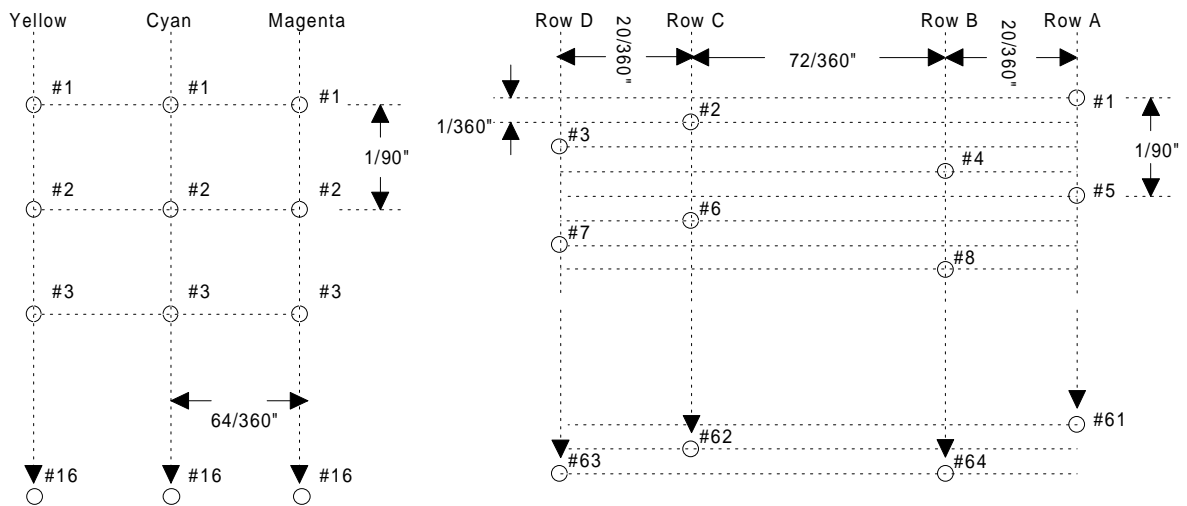


Figure 1-2. Nozzle Configuration

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

Table 1-2. Print Speed and Printable Columns

Character Pitch	Printable Columns	Print Speed (LQ)
10 cpi (Pica)	127	200 cps
12 cpi (Elite)	152	240 cps
15 cpi	190	300 cps
17 cpi (Pica condensed)	218	340 cps
20 cpi (Elite condensed)	254	400 cps

Character sets: Legal and 14 international character sets.

Character tables: See Table 1-3.

Table 1-3. Character Tables

Character Tables	Bit map font	Scalable font	
	EPSON Roman EPSON Sans Serif EPSON Courier EPSON Prestige EPSON Script	EPSON Roman EPSON Sans Serif	EPSON Roman EPSON Sans Serif H
Italic	○	○	m
PC437 (U.S./Standard Europe)	○	○	m
PC850 (Multilingual)	○	○	m
PC860 (Portuguese)	○	○	m
PC861 (Iceland)	○	○	m
PC863 (Canadian-French)	○	○	m
PC865 (Nordic)	○	○	m
Abicomp	○	m	m
BRASCI	○	m	m
PC437 (Greek)	○	m	×
PC852 (East Europe)	○	○	×
PC853 (Turkish)	○	m	×
PC855 (Cyrillic)	○	m	×
PC857 (Turkish)	○	m	×
PC866 (Russian)	○	m	×
PC869 (Greek)	○	m	×
MAZOWIA (Poland)	○	m	×
Code MJK (Czecho/Slovakia)	○	m	×
ISO 8859-7 (Greek)	○	m	×
ISO Latin 1T (Turkish)	○	m	×
Bulgaria (Bulgaria)	○	m	×

○ Supported × *Not supported*

Fonts:

[Bitmap LQ fonts]

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

[Scalable fonts]

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

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

Input data buffer: 64KB

1.2.2 Paper Handling Specifications

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

Notes: The following operations are not allowed.

1. Reverse feeding within 3 mm (0.12 in.) from the top edge of the paper or 16 mm (0.63 in.) from the bottom edge of the paper.
2. Reverse feeding beyond 7.9 mm (0.3 in.).

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

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

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

1.2.3 Paper Specifications

Table 1-4. Cut Sheet Paper Specifications

Size (W × L)	A3+/US B+: 329 mm (13.0 in.) × 483 mm (19.0 in.)
	A3: 297 mm (11.7 in.) × 420 mm (16.5 in.)
	US B: 279 mm (11.0 in.) × 432 mm (17.0 in.)
	Legal: 216 mm (8.5 in.) × 356 mm (14.0 in.)
	Letter: 216 mm (8.5 in.) × 279 mm (11.0 in.)
	A4: 210 mm (8.3 in.) × 297 mm (11.7 in.)
	Executive: 184 mm (7.25 in.) × 267 mm (10.5 in.)
	Statement: 140 mm (5.5 in.) × 216 mm (8.5 in.)
Thickness	0.08 mm (0.003 in.) ~ 0.11 mm (0.004 in.)
Weight	64g/m ² (17 lb.) ~ 90 g/m ² (24 lb.)
Quality	Plain paper, Special coated paper for 720dpi, Special coated paper for 360dpi, Transparency film, High Quality Glossy paper, Glossy paper

- Note:**
- Special coated paper for 720dpi, Special coated paper for 360dpi, Transparency film
 - High Quality Glossy paper printing are only available at normal temperature.

Table 1-5. Envelope Specifications

Size (W × L)	No. 10: 240 mm (9 1/2 in.) × 104 mm (4 1/8 in.)
	DL: 220 mm (8.7 in.) × 110 mm (4.3 in.)
	C5: 229 mm (9.0 in.) × 162 mm (6.4 in.)
Thickness	Less than 0.52 mm (0.020 in.)
Weight	75 g/m ² (20 lb) ~ 90 g/m ² (24 lb)
Quality	Plain paper

- Note:**
- Envelope Printing is only available at normal temperature.
 - Keep the longer side of the envelopes horizontal at setting.

Printable area: Cut sheets

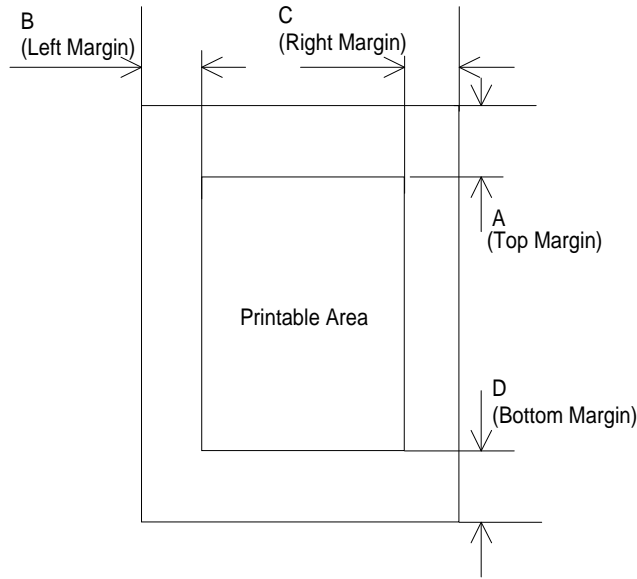


Figure 1-3. Printable Area for Cut Sheets

Envelopes

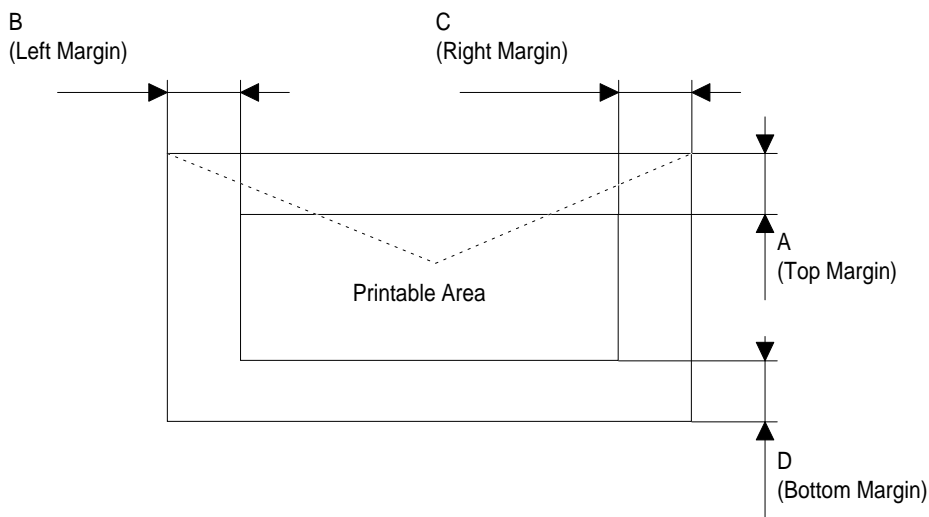


Figure 1-4. Printable Area for Envelopes

- Notes:**
- A: The minimum top margin = 3 mm (0.12 in.)
 - B: The minimum left margin = 3 mm (0.12 in.)
 - C: The minimum right margin is:
 - A3+/US B+ size: 3mm (0.12 in.)
 - A3 size: 3 mm (0.12 in.)
 - A4 size: 3 mm (0.12 in.)
 - A4 (Landscape)size:3 mm (0.12 in.)
 - USB size: 9 mm (0.35 in.)
 - Legal size: 9 mm (0.35 in.)
 - Letter size: 9 mm (0.35 in.)
 - Letter size (Landscape)size:9 mm (0.35 in.)
 - Executive size: 9 mm (0.35 in.)
 - Statement size: 9 mm (0.35 in.)
 - Envelopes: 3 mm (0.12 in.)
 - D: The minimum bottom margin = 14 mm (0.55 in.)

Setting the

adjust lever:

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

Table 1-6. Adjust Lever Settings

Lever Position	Paper	Paper Thickness
LEFT (Vertical)	Cut Sheets	0.08 ~ 0.11 mm (0.003 ~ 0.004 in.)
RIGHT (Horizontal)	Envelopes	Less than 0.5 mm (0.020 in.)

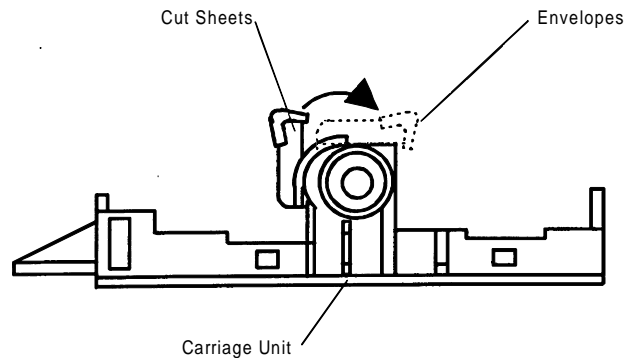


Figure 1-5. Setting the Adjust Lever

1.2.4 Ink Cartridge Specifications

Black

Type: Exclusive cartridge

Color: Black

Print capacity: 1.2 million characters (315 dots/character, Roman 10 cpi)

Life: The effective life from the indicated production date is 2 years.

Storage temperature: -30 ~ 40° C (-22 ~ 104° F) (Storage: a month or less at 40° C (104° F))
 -30 ~ 60° C (-22 ~ 140° F) (Transit: a month or less at 40° C (104° F))
 -30 ~ 60° C (-22 ~ 140° F) (Transit: 120 hours or less at 60° C (140° F))

Dimension (W × D × H): 26.9 × 67.4 × 41.8 mm (1.06 × 2.65 × 1.65 in.)

Color

Type: Exclusive cartridge

Colors: Cyan, magenta, yellow

Print capacity: 28 sheets/color (A4 or letter, full-image printing at 360 dpi)

Life: The effective life from the indicated production date is 2 years.

Storage temperature: -30 ~ 40° C (-22 ~ 104° F) (Storage: a month or less at 40° C (104° F))
 -30 ~ 60° C (-22 ~ 140° F) (Transit: a month or less at 40° C (104° F))
 -30 ~ 60° C (-22 ~ 140° F) (Transit: 120 hours or less at 60° C (140° F))

Dimension (W × D × H): 54.0 × 67.4 × 41.8 mm (2.13 × 2.65 × 1.65 in.)

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

1.2.5 Electrical Specifications

Table 1-7. Rated Electrical Ranges

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

1.2.6 Environmental Conditions

Table 1-8. Acceptable Environmental Conditions

Condition	Operating	Non Operating
Temperature	10 ~ 35° C (50 ~ 95° F) ^{*1}	-20 ~ 60° C (-4 ~ 122° F) ^{*2}
Humidity	20 ~ 80% RH ^{*1,3}	5 ~ 85% RH ^{*2,3}
Shock resistance	1G (within 1 msec.)	2G (within 2 msec.) ^{*2}
Vibration resistance	0.15 G	0.50 G ²

^{*1} : For printer operation, conditions must be in the range shown in the figure below.

^{*2} : These conditions are applicable when the printer is in its shipping container.

^{*3} : Without condensation.

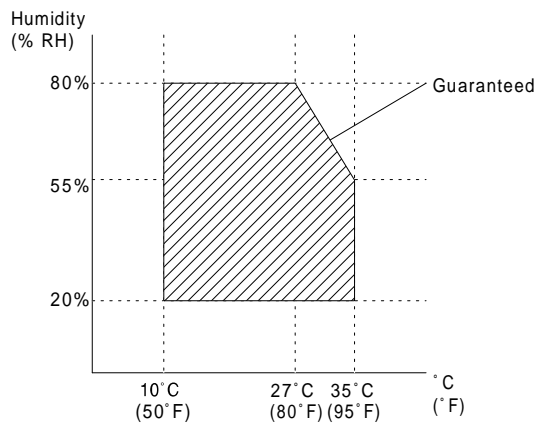


Figure 1-6. Temperature / Humidity Range

1.2.7 Reliability

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

1.2.8 Safety Approvals

Safety standards:	120 V version:	UL1950 with D3, CSA22.2 #950 with D3
	220-240 V version:	EN 60950 (TÜV, SEMKO, DEMKO, NEMKO, SETI)
Radio frequency interference (RFI):	120 V version:	FCC Part 15 Subpart B Class B
	220-240 V version:	Vfg.243 (VDE0878 part 3, part 30) EN55022 (CISPR PUB. 22) class B

1.2.9 Physical Specifications

Dimensions (W × D × H):	580 × 597 × 182 (mm) (22.8 × 23.5 × 7.17 in.)
Weight:	About 10 Kg (22 lb)

1.3 INTERFACE SPECIFICATIONS

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

1.3.1 Parallel Interface Specifications

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

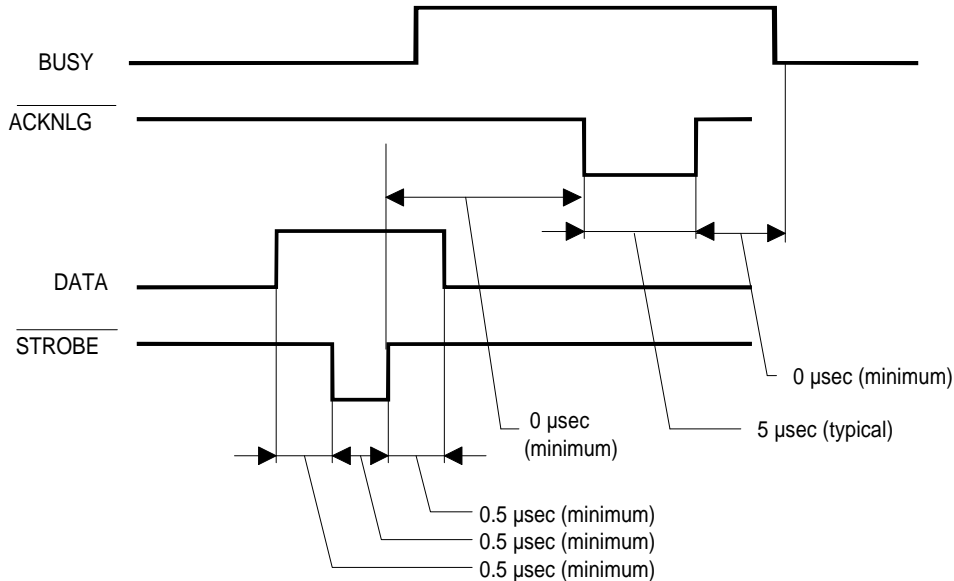


Figure 1-7. Data Transmission Timing

Note: Transition time (rise time and fall time) of every input signal must be less than 0.2 μs .

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

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

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

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

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

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

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

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

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

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

1.3.2 Serial Interface Specifications

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

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

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

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

Bit rate: 57.6K bps /230.4 Kbps

Adaptable connector: 8-pin mini-circular connector

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

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

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

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

1.4 OPERATIONS

This section describes the basic operations of the printer.

1.4.1 Control Panel

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

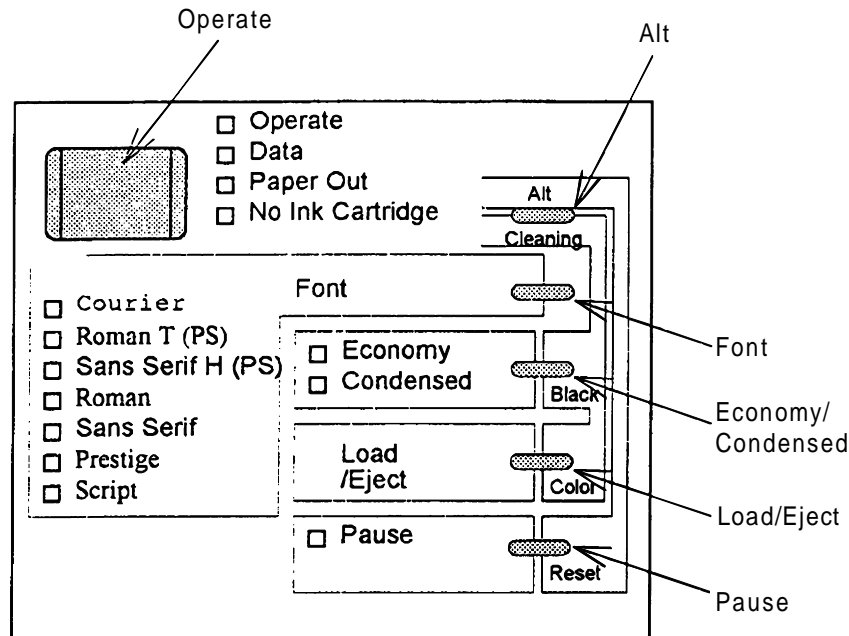


Figure 1-8. Control Panel Appearance

Buttons

Operate

Turns the printer on or off.

Alt

Modifies the function of other buttons. Holding down this button for 3 seconds causes the printer to move the carriage to the ink cartridge installation position. Pressing Alt again causes the carriage to return to the home position.

Font

Cycles through the font choices. Pressing the FONT button, while holding down the Alt button causes the carriage to move to the gap adjustment position. Pressing the Alt button again causes the carriage to return to the home position.

Economy/Condensed

Selects either economy or condensed printing mode. Pressing the Economy/Condensed button while holding down the Alt button starts the color printhead cleaning cycle.

Load/Eject

Either loads a new sheet into the printer or ejects paper currently in the paper path. Pressing the Load/Eject button while holding down the Alt button starts the black printhead cleaning cycle.

Pause

Stops printing temporarily or resumes printing if it has been stopped temporarily. Pressing Pause while holding down the Alt button resets the printer.

Indicators

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

1.4.2 Panel Operation at Power On

You can activate the following modes by doing the following:

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

Table 1-12. Printer Condition Panel Status

Printer status	Indicators							+
	Operate	Data	Paper Out	No Ink Cartridge	Economy	Condensed	Pause	
^								
Power on condition	On	—	—	—	—	—	—	—
Data exit	—	On	—	—	—	—	—	—
Economy mode	—	—	—	—	On	—	—	—
Condensed mode	—	—	—	—	—	On	—	—
Pause condition	—	—	—	—	—	—	—	On
Power on/off sequence	Blinks	—	—	—	—	—	—	—
Ink sequence	—	—	—	—	—	—	—	Blinks
Ink cartridge change mode	—	—	—	—	—	—	—	Blinks
Head gap adjust mode	—	Blinks	—	—	—	—	—	—
Paper out	—	—	On	—	—	—	—	—
No ink cartridge	—	—	—	On	—	—	—	—
Paper jam condition	—	—	Blinks	—	—	—	—	—
Maintenance request	—	Blinks	Blinks	Blinks	—	—	—	Blinks
Cartidge error	—	Blinks	—	—	—	—	—	Blinks

— don't care

1.4.3 Default Settings

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

1.4.3.1 Default Setting Items

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

Table 1-13. Default Setting Items

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

Table 1-14. Characteristics of Print Direction Mode

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

Table 1-15. Printing Direction and ESC U Command

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

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

1.4.3.2 Changing the Default Settings

To change the printer's default settings:

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

Table 1-16. Language Selection

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

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

Table 1-17. Feature Selection

Menu				Setting Value			+
Feature/Menu	Courier LED	Roman T (PS) LED	Sans Serif H (PS) LED	Setting	Operate LED	Data LED	Paper Out LED
Character table	On	On	On	See Table 1-18			+
Print direction	On	Off	Off	Auto	On	Off	Off
^				Bi-D	Off	On	Off
^				Uni-D	On	On	Off
Network I/F mode	Off	On	Off	Off	Off	Off	Off
^				On	On	Off	Off
Auto line feed	On	On	Off	Off	Off	Off	Off
^				On	On	Off	Off
Loading position	Off	Off	On	3 mm	Off	Off	Off
^				8.5 mm	On	Off	Off
Interface mode	On	Off	On	Auto	On	Off	Off
^				Parallel	Off	On	Off
^				Serial	On	On	Off
^				Option	Off	Off	On
Auto I/F wait time	Off	On	On	10 sec.	Off	Off	Off
^				30 sec.	On	Off	Off

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

Table 1-18. Character Table Selection

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

6. Repeat steps 4 and 5 to change other printer settings. The setting menu selection will return to the first menu after the last menu selection is over.
7. Turn off the printer. The setting is stored in non-volatile memory.

1.4.4 Error Conditions

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

Table 1-19. Error Indications

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

1.4.5 Printer Initialization

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

1.4.5.1 Hardware Initialization

Hardware initialization is performed by:

- Turning on the printer.
- Sending the parallel interface $\overline{\text{INIT}}$ signal.
(If the $\overline{\text{INIT}}$ signal is active when the printer is turned on, hardware initialization is started when the $\overline{\text{INIT}}$ signal becomes inactive.)

When the hardware initialization is performed:

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

1.4.5.2 Software Initialization

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

When the software initialization is performed:

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

1.4.5.3 Panel Initialization

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

When the panel initialization is performed:

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

1.5 MAIN COMPONENTS

The main components of the Stylus Pro XL are:

- ❑ Printer mechanism (M-4A60)
- ❑ Main control board (C162 MAIN Board)
- ❑ Power supply unit (C137 PSB/PSE Board)
- ❑ Control panel board (C137 PNL Board)
- ❑ Housing

1.5.1 Main Control Board (C162 MAIN Board)

The Main Control Board (C162 MAIN Board) consists of an H8/3003 16-bit CPU, E05A96 gate array, a program ROM (4M), a dynamic RAM (4M), a mask ROM (4M or 8M), an EEPROM (1K), and a lithium battery for powering the protect counters. The reset IC (M51955 and PST 592) is equipped with both a logic system and a power system. The 8M program ROM is used only for the NLSP (National Language Support Printer) specification.

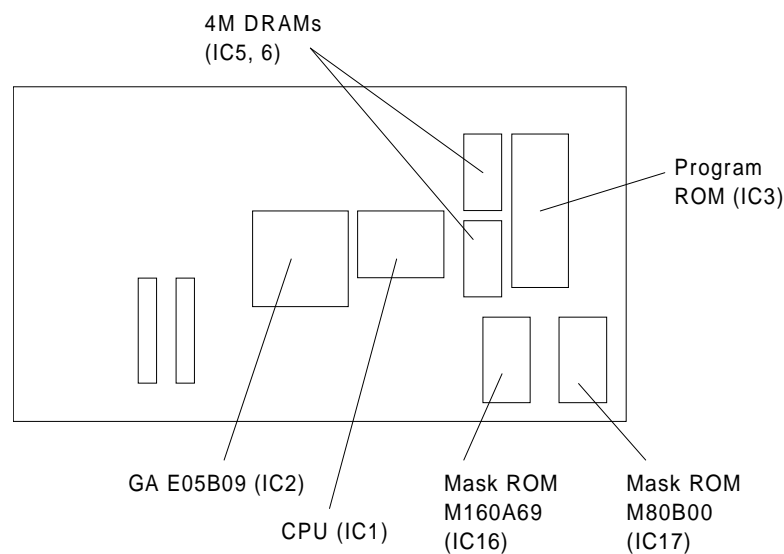


Figure 1-9. C162 MAIN Board Component Layout

1.5.2 Power Supply Board (C137 PSB/PSE Board)

The power supply board (C137 PSB/PSE Board) consists of an RCC switching regulator circuit. This board is equipped with a power switch connected to the secondary circuit. Thus, if the printer is turned off, it can continue to operate in order to eject the paper and perform the head capping operation. The power on/off signal is always monitored by the E05A96 gate array on the C162 MAIN Board, and the logic system recognizes the power switch status.

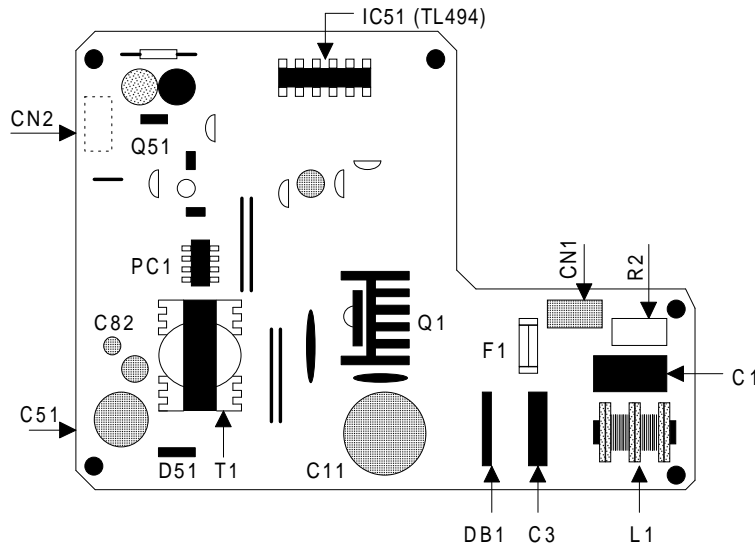


Figure 1-10. C137 PSB / PSE Board Component Layout

1.5.3 Control Panel (C137 PNL Board)

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

1.5.4 Printer Mechanism (M-4A60)

The M-4A60 printer mechanism is equipped with a 64-nozzle black printhead and 48-nozzle color (CMY) printhead on the carriage unit. Resolution of 720 dpi is possible with special (non-absorbent) paper.

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

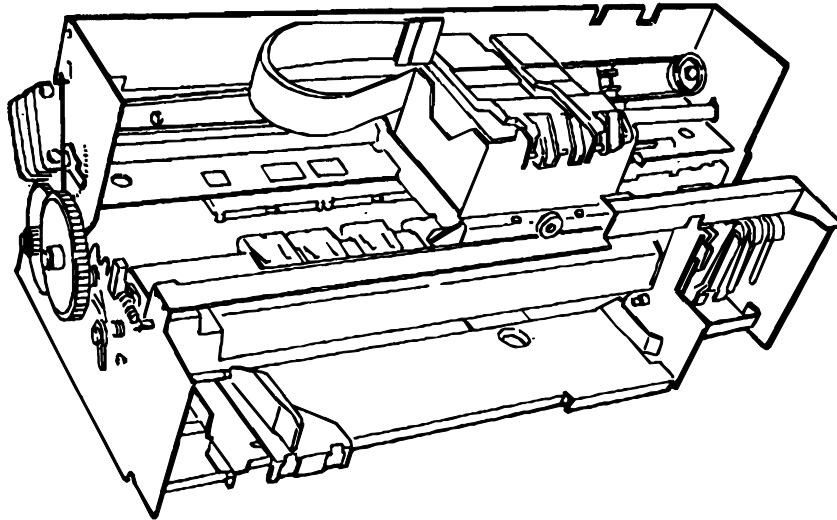


Figure 1-11. Printer Mechanism (M-4A60)

1.5.5 Housing

The Stylus Pro XL housing consists of the printer cover, upper case, and the lower case. Attached to the housing are the front paper support and the ejected paper support with paper separator.

Chapter 2 Operating Principles

Table of Contents

2.1 OVERVIEW	2-1
2.2 OPERATING PRINCIPLES OF THE PRINTER MECHANISM	2-1
2.2.1 Printer Mechanism	2-2
2.2.2 Carriage Drive Mechanism	2-5
2.2.2.1 Platen Gap Adjust Lever	2-6
2.2.3 Paper Feed Mechanism	2-6
2.2.4 Ink System	2-8
2.2.5 Pump Mechanism	2-9
2.2.6 Cap Mechanism	2-12
2.2.7 Wiping Mechanism	2-12
2.3 OPERATING PRINCIPLES OF THE ELECTRICAL CIRCUITS	2-13
2.3.1 Operating Principles of the Power Supply Circuit	2-13
2.3.2 Operating Principles of the Main Control Circuit	2-15
2.3.2.1 Reset Circuit	2-16
2.3.2.2 Sensor Circuit	2-16
2.3.2.3 Carriage Motor Drive Circuit	2-17
2.3.2.4 Paper Feed Motor Drive Circuit	2-19
2.3.2.5 Printhead Drive Circuit	2-20
2.3.2.6 DMA Controller	2-22
2.3.2.7 D-RAM Refreshment Controller	2-23
2.4 INK SYSTEM MANAGEMENT	2-24
2.4.1 Ink Operations	2-25
2.4.2 Timer and Counter	2-27
2.4.2.1 Refresh Timer (Monochrome and YMC Head)	2-27

List of Figures

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

List of Tables

Table 2-1. Carriage Drive Motor Specifications	2-5
Table 2-2. Drive Terms.	2-5
Table 2-3. Platen Gap Adjust Lever Position	2-6
Table 2-4. Paper Feed Drive Motor Specifications	2-6
Table 2-5. Drive Terms.	2-7
Table 2-6. Pump Mechanism Operation	2-11
Table 2-7. DC Voltage Distribution.	2-13
Table 2-8. Serial Data Contents.	2-17
Table 2-9. Paper Feed Motor Drive Modes	2-19
Table 2-10. Junction Method (CPU-2CAS DRAM)	2-23

2.1 OVERVIEW

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

2.2 OPERATING PRINCIPLES OF THE PRINTER MECHANISM

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

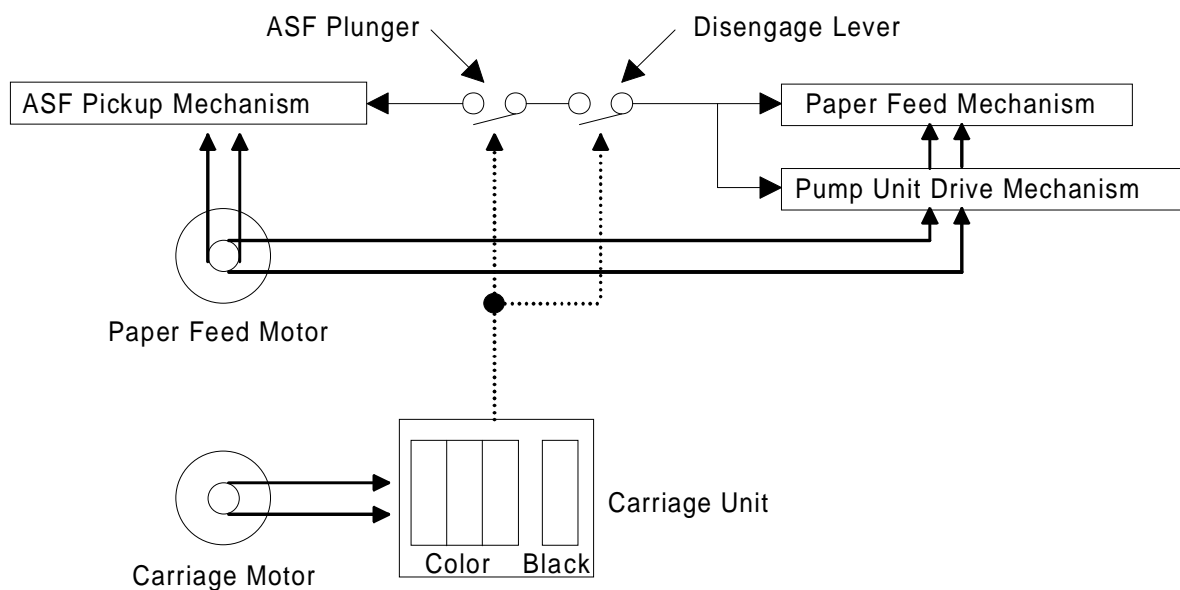


Figure 2-1. Printer Mechanism Block Diagram

2.2.1 Printer Mechanism

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

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

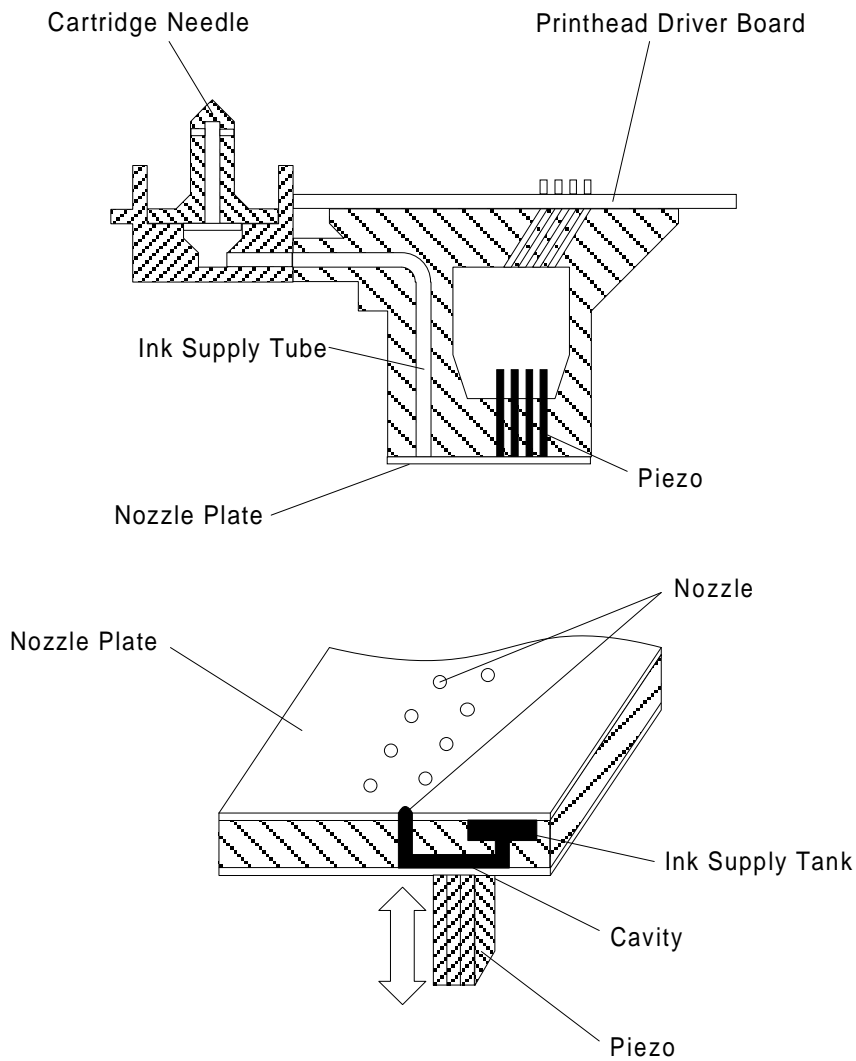


Figure 2-2. Structure of Printhead

Principles of the Printing Operation

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

❑ Normal state

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

❑ Ejecting state

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

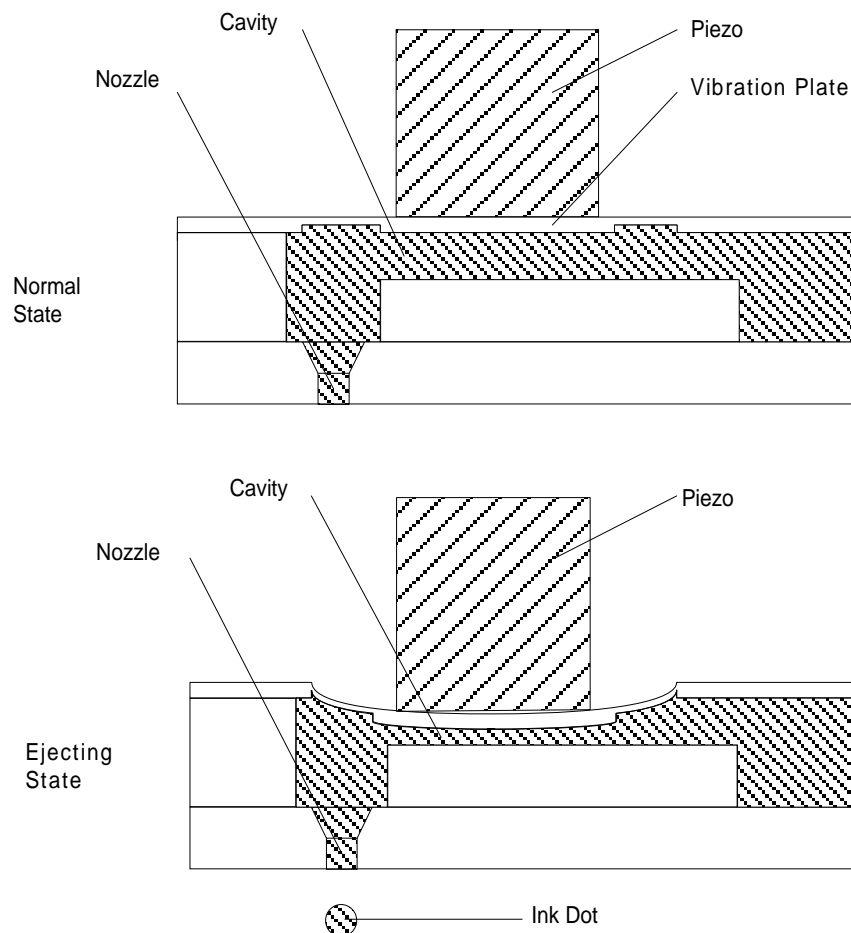


Figure 2-3. Principles of the Printing Operation

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

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

Micro Dot Printing mode

The Stylus Pro XL printer has a special printing mode, called "Micro Dot Printing mode". This printing mode can be selected by a command from the host computer. Using the Micro Dot printing mode can improve the quality of output. In Micro Dot Printing mode, the ink dot size became to be smaller than the normal dot size.

2.2.2 Carriage Drive Mechanism

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

Table 2-1. Carriage Drive Motor Specifications

Item	Description
Motor Type	4-phase / 200-pole hybrid-type stepping motor
Drive Voltage	+35 VDC \pm 5%
Coil Resistance	10.0 Ω \pm 7%
Drive Frequency	960 ~ 4800 PPS
Excitation Mode	Constant current unipolar drive, micro step drive

In the following table, 2 W1-2 phase means the 1/8 2-2 phase drive control. Values in parentheses () are for the 2-2 phase.

Table 2-2. Drive Terms

CR Speed	Frequency	Phase Drive Method	Acceleration/Deceleration Step
Mode 1 (200 CPS)	4800 (2400)	<input type="checkbox"/> Acceleration/Deceleration Area: 2 W1-2 phase + 1-2 phase <input type="checkbox"/> Constant Area: 1-2 phase	Acceleration 40 (5)+110 (55) Deceleration 32 (4)+112 (56)
Mode 2 (100 CPS)	2400 (1200)	<input type="checkbox"/> Acceleration/Deceleration Area: 2W1-2 phase + 1-2 phase <input type="checkbox"/> Constant Area: 1-2 phase	40 (5)+40 (20)
Mode 3 (40 CPS)	960 (480)	<input type="checkbox"/> Acceleration/Deceleration Area: 2W1-2 phase <input type="checkbox"/> Constant Area: 2 W1-2 phase	16 (2)

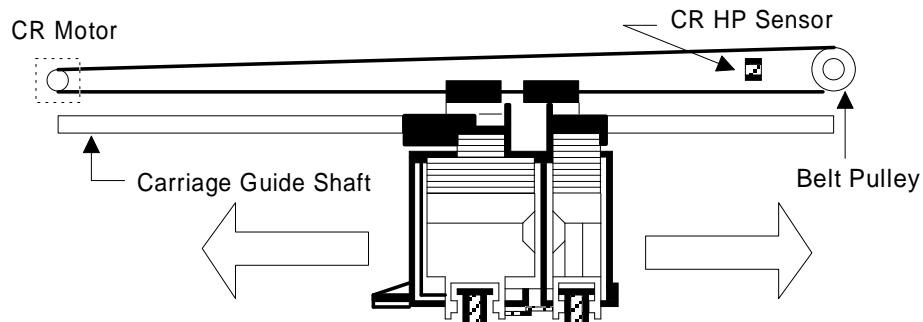


Figure 2-4. Carriage Drive Mechanism

2.2.2.1 Platen Gap Adjust Lever

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

Table 2-3. Platen Gap Adjust Lever Position

Paper Type	Lever Position
Cut sheets	Horizontal (A) (± 0 mm)
Envelopes	Vertical (B) (+0.6 mm)

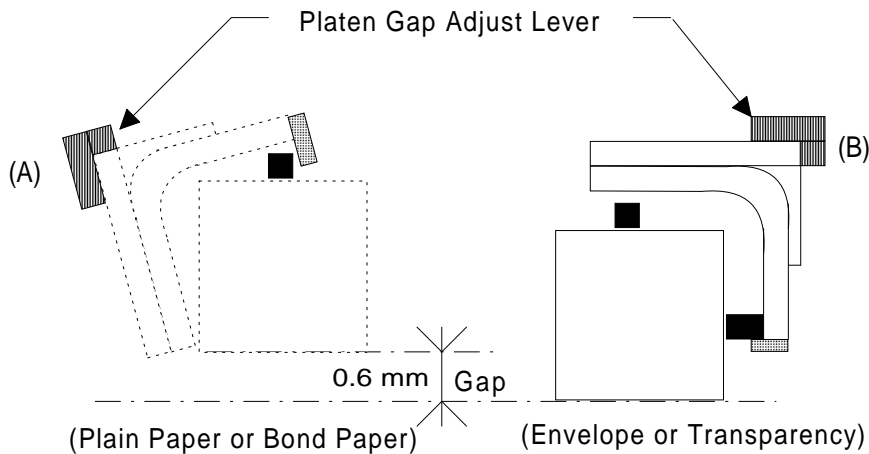


Figure 2-5. Platen Gap Adjust Lever Operation

2.2.3 Paper Feed Mechanism

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

Table 2-4. Paper Feed Drive Motor Specification

Item	Description
Motor Type	4-phase, 96-pole, hybrid-type
Drive Voltage	+35 VDC \pm 5%
Coil Resistance	11.5 Ω \pm 1.1 Ω
Drive Frequency	300 ~ 1800 PPS
Excitation Mode	Paper feed / pump drive: 2-2 phase, 2 W1-2 phase

Table 2-5. Drive Terms

Mode	Frequency (pps)	Current Value (mA)			
		Acceleration/Deceleration	Constant	Rush	Hold
Paper loading	1600	970/750	750	750	240
ASF feed	1600	970/750	750	750	240
Paper feed	391	— / —	970	—	240
Pump drive 1	1800	1380/1380	1380	750	240
Pump drive 2	300	— / —	1380	—	240

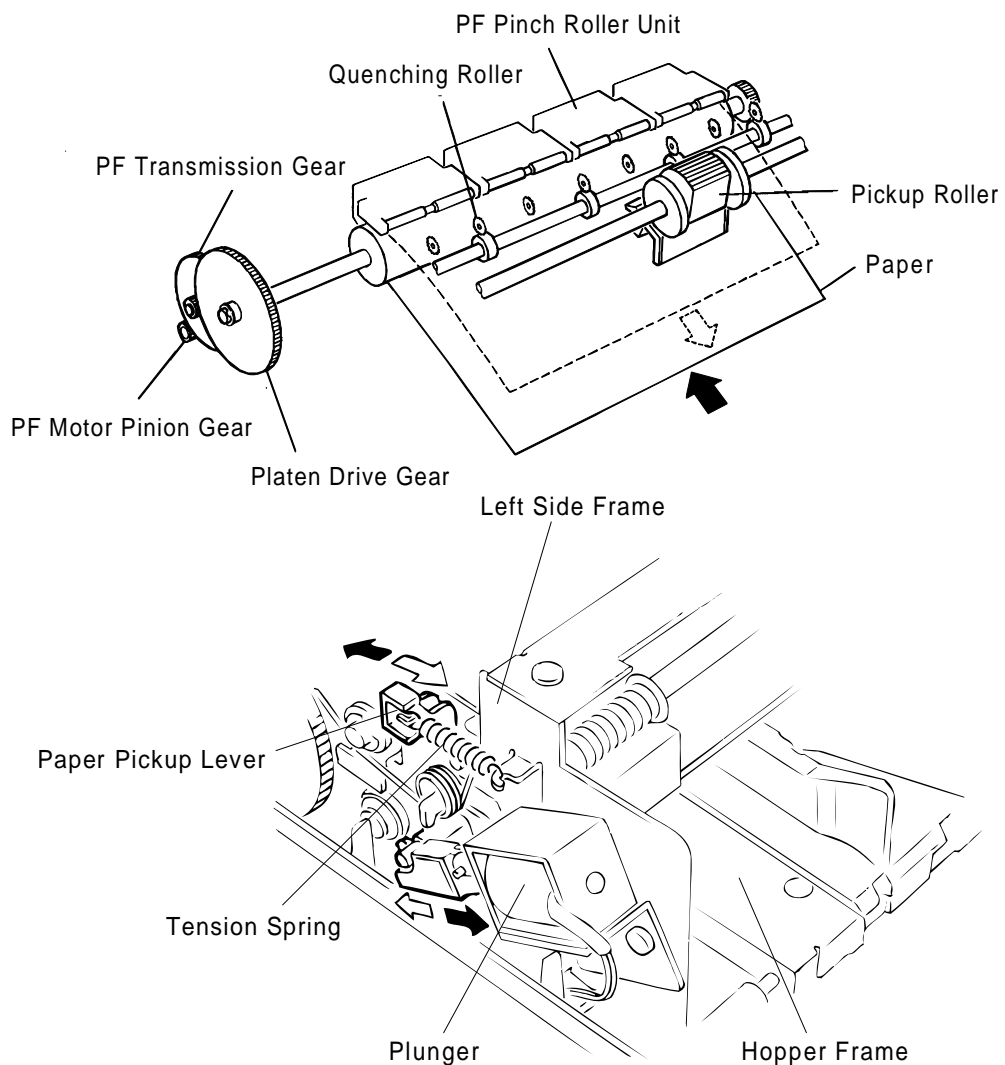


Figure 2-6. Paper Feed Mechanism

2.2.4 Ink System

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

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

The figure below shows a diagram of the ink system.

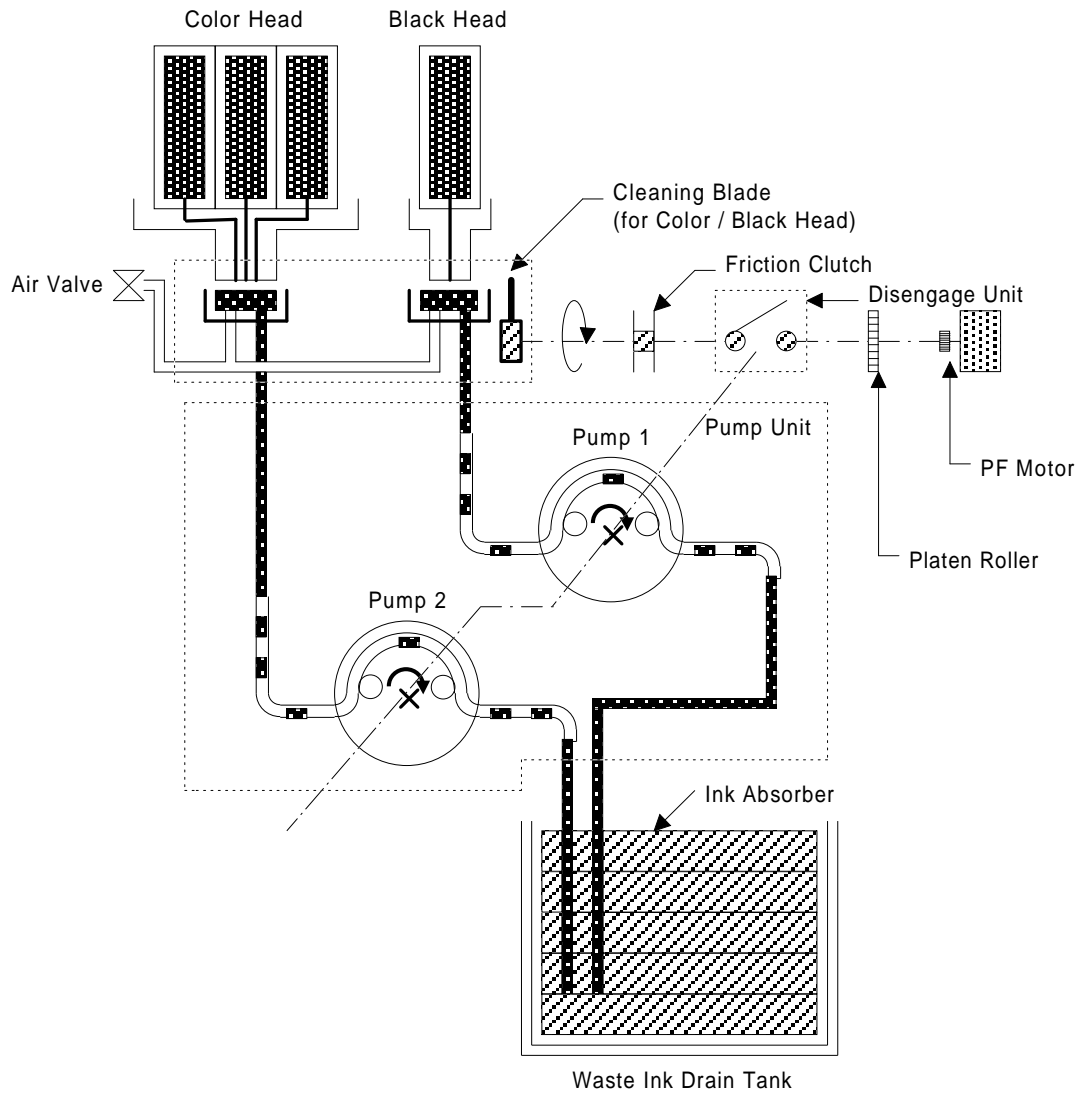


Figure 2-7. Ink System Block Diagram

2.2.5 Pump Mechanism

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

Drive: Pump Mechanism

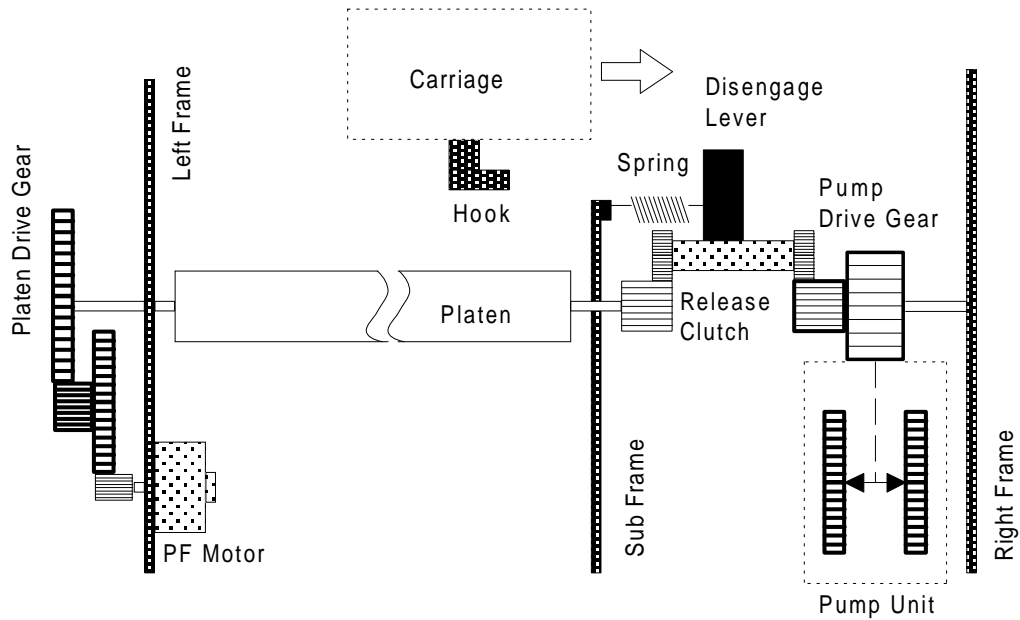


Figure 2-8. Pump Mechanism Block

Drive: Switch Lever Set

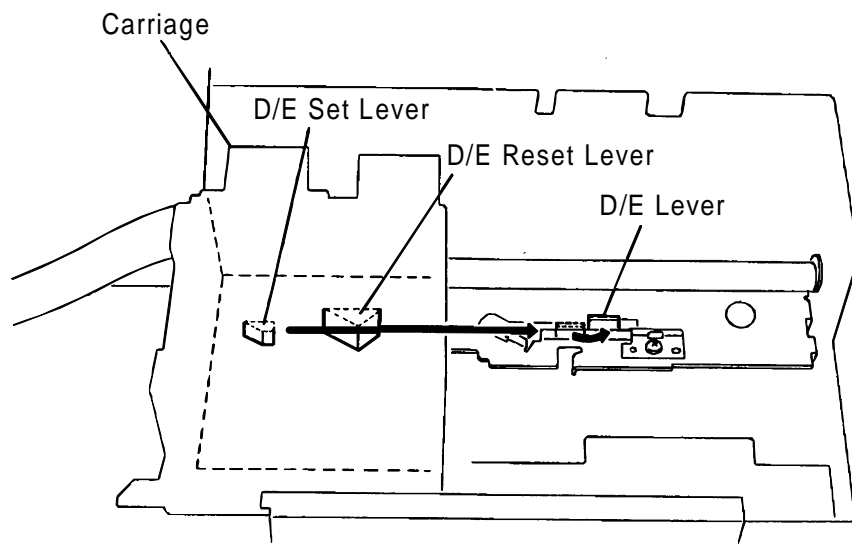


Figure 2-9. Switch Lever Set

Drive: Paper Feed Mechanism

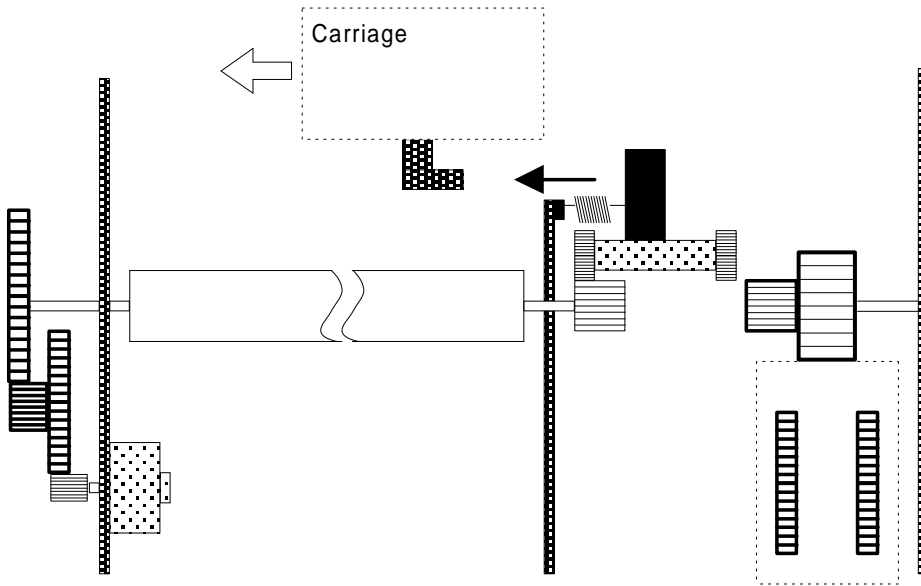


Figure 2-10. Paper Feed Mechanism Block Diagram

Switch Lever: Reset

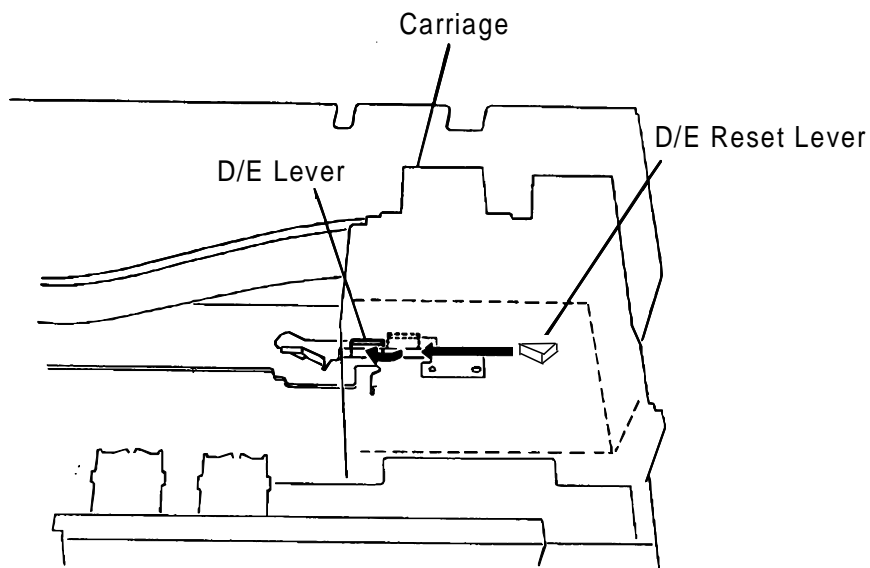


Figure 2-11. Switch Lever Reset

Table 2-6. Pump Mechanism Operation

PF Motor Rotational Direction	Operation
Clockwise (CW) forward rotation	<input type="checkbox"/> Color absorption <input type="checkbox"/> Color micro absorption <input type="checkbox"/> Color false absorption <input type="checkbox"/> Wiper reset <input type="checkbox"/> Carriage lock reset
Counterclockwise (CCW) backward rotation	<input type="checkbox"/> Monochrome absorption <input type="checkbox"/> Monochrome micro absorption <input type="checkbox"/> Monochrome false absorption <input type="checkbox"/> Wiper set <input type="checkbox"/> Carriage lock set

The pump draws ink from the printhead nozzles and drains it to the waste ink drain tank. The printer performs this operation to eliminate dust or bubbles in the nozzles. Figure 2-12 illustrates pump operation. When the paper feed drive motor rotates CW (forward), the color pulley pumps in the wheel pump unit rotate in the direction of the arrow while squeezing the ink tube to push the ink inside the tube out to the waste ink drain tank. When the motor rotates CCW (backward), the black pulley pumps in the wheel pump unit rotate in the direction of the arrow while squeezing the ink tube to push the ink inside the tube out to the waste ink drain tank.

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

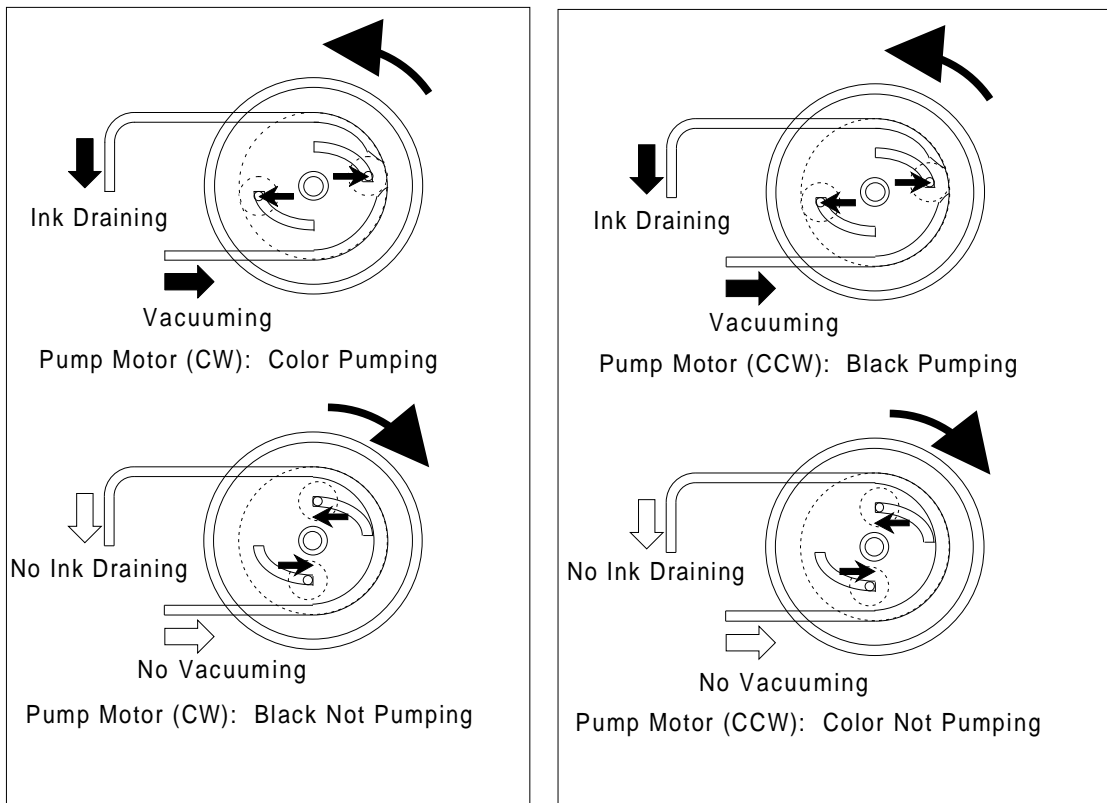


Figure 2-12. Pump Operation

2.2.6 Cap Mechanism

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

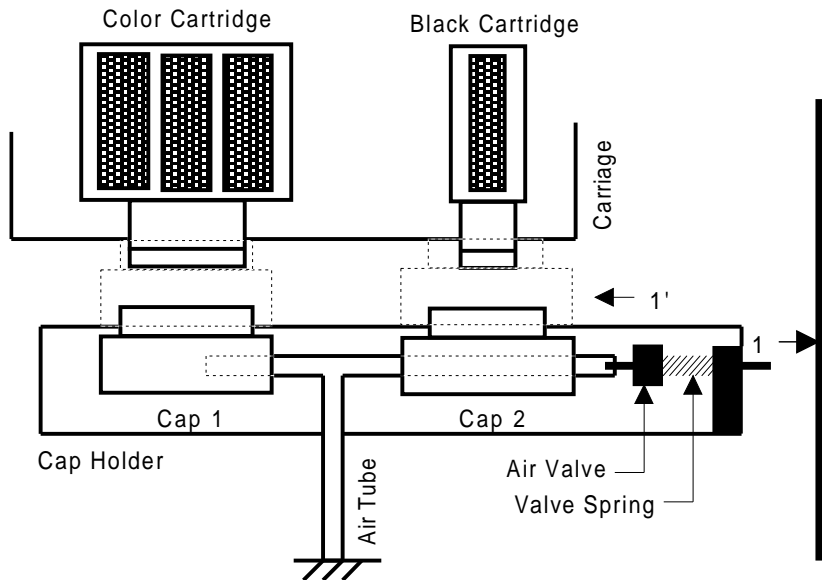


Figure 2-13. Cap Mechanism

2.2.7 Wiping Mechanism

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

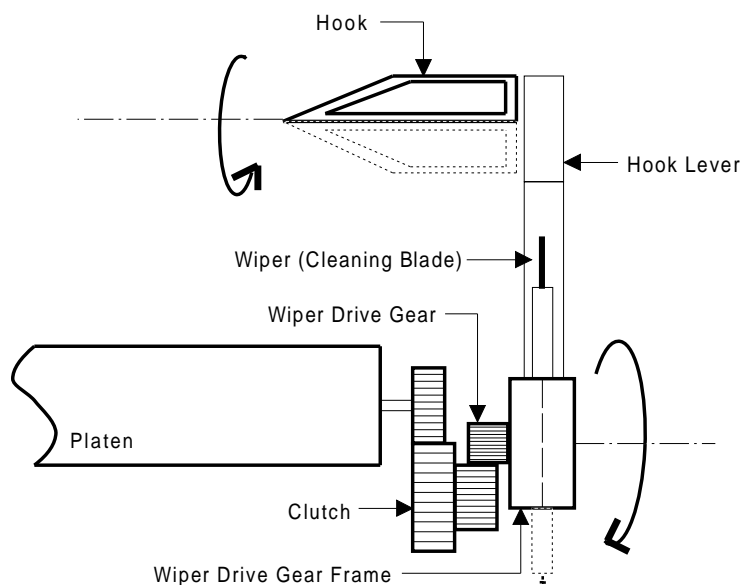


Figure 2-14. Wiping Mechanism

2.3 OPERATING PRINCIPLES OF THE ELECTRICAL CIRCUITS

The Stylus Pro XL contains the following circuit board units:

- ❑ C162 MAIN Board (main control circuit board)
- ❑ C137 PSB/PSE Board (power supply circuit board)
- ❑ C137 PNL (control panel board)

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

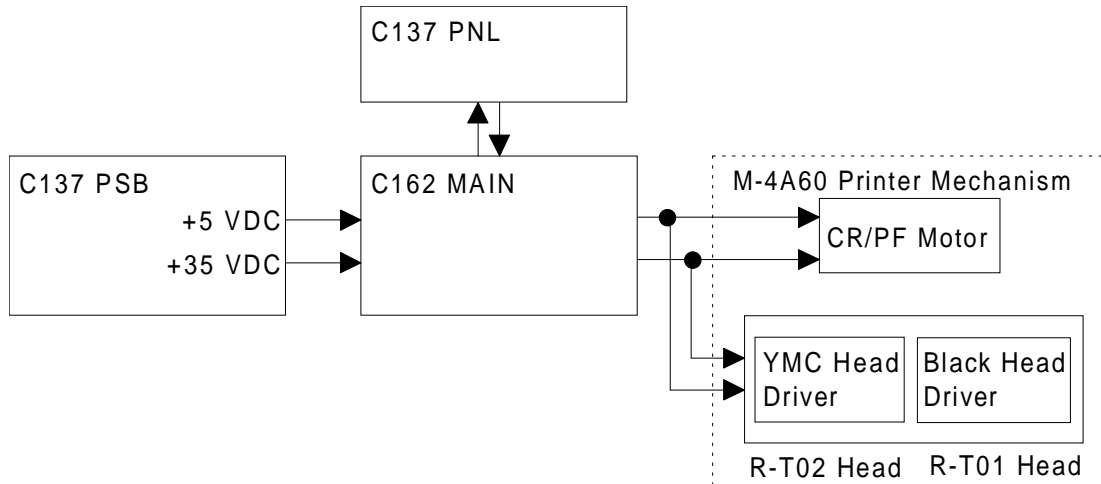


Figure 2-15. Block Diagram of the Electrical Circuitry

2.3.1 Operating Principles of the Power Supply Circuit

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

Table 2-7. DC Voltage Distribution

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

The figure below shows a block diagram of the power supply circuit (C137 PSB/PSE). The power switch is equipped with a secondary circuit that allows the CPU to remain active for a while after the printer is turned off. This allows the printhead to return to the capping position after power is off. The CPU mounted on the C137 MAIN Board always monitors the PSC (power on/off) signal. If this signal becomes LOW, the CPU resets each device after performing the head capping sequence.

Also, this board employs the RCC (ringing choke converter) switching system. This AC voltage is first input to the filter circuit for higher harmonics absorption, and then input to the rectification and smoothing circuit, converting it into DC voltage. This DC voltage is then input to the switching circuit for the switching operation. Along with the switching operation on the primary side, +35 VDC is generated after passing through the +35 V line voltage detection circuit. This +35 VDC output level is stabilized. This +35 VDC is also input to the +5 VDC generation circuit to generate a stable +5 VDC.

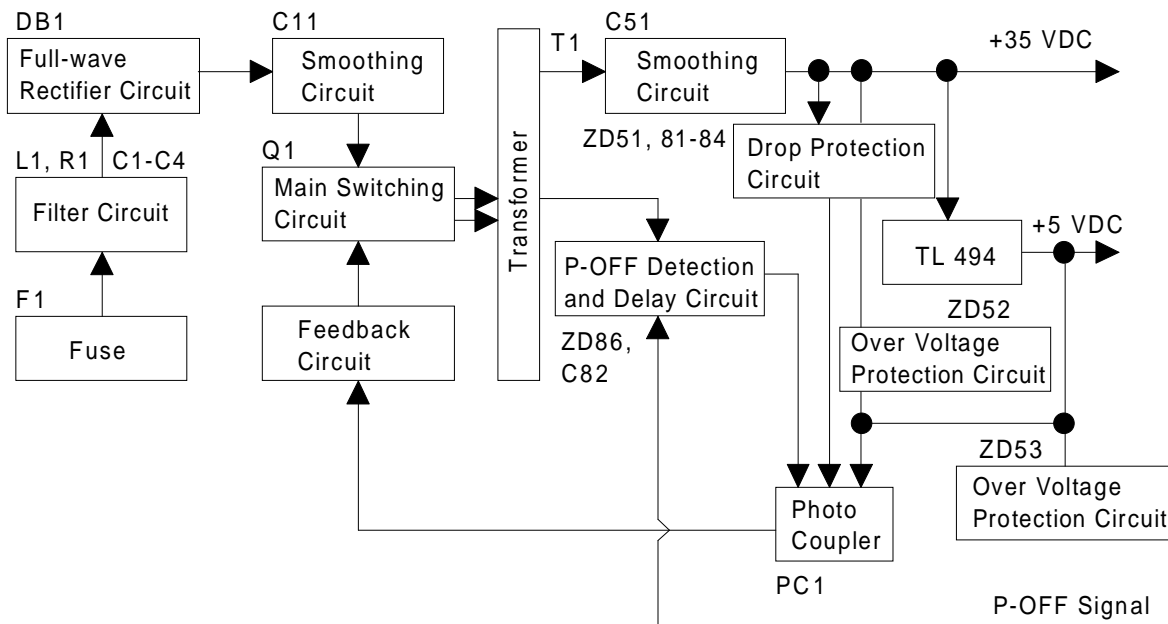


Figure 2-16. Power Supply Circuit Block Diagram

1) +5 VDC line over voltage protection circuit

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

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

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

3) +35 VDC line over voltage protection circuit

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

4) +35 VDC line drop protection circuit

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

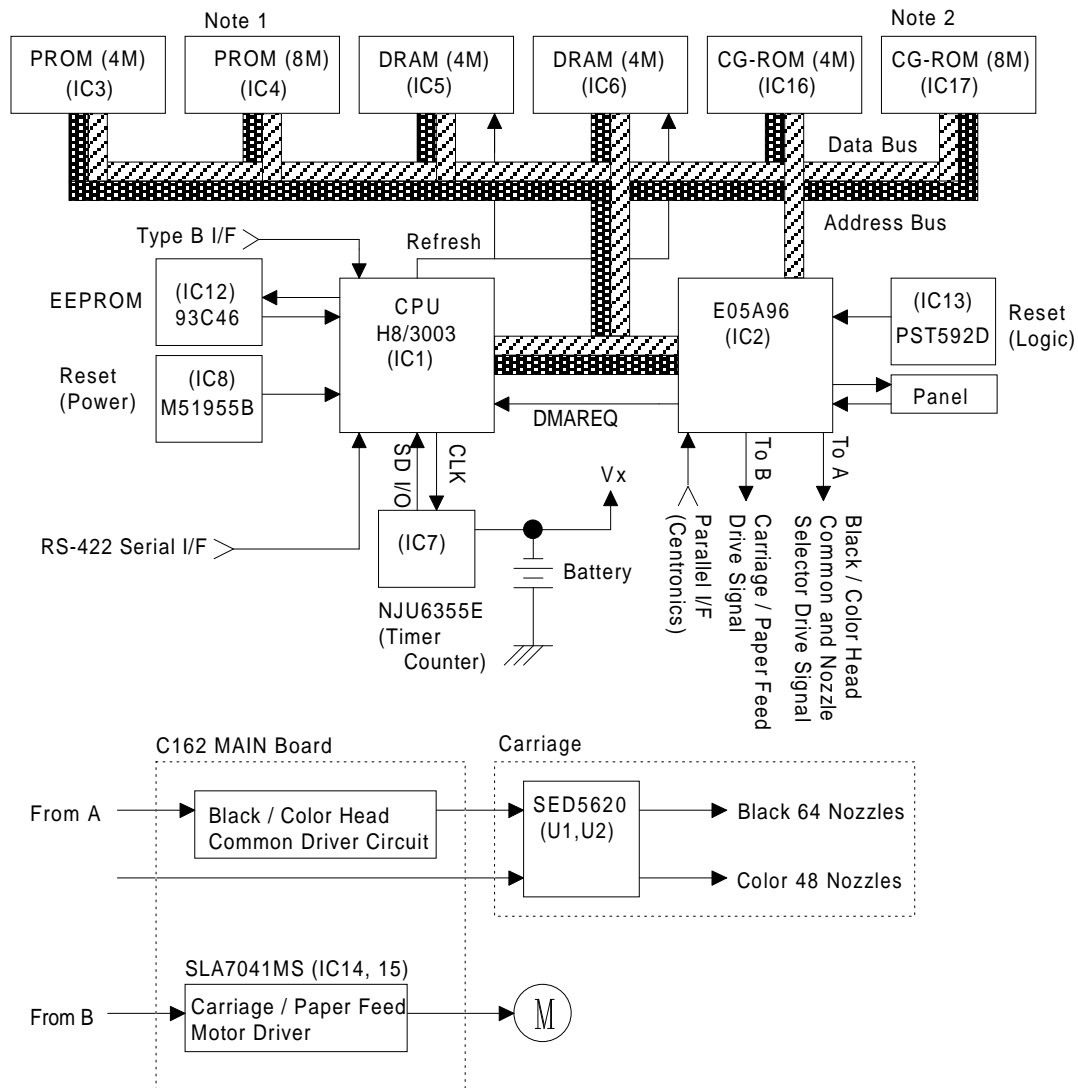
2.3.2 Operating Principles of the Main Control Circuit

The main control circuit of this printer is the C162 MAIN Board. This circuit is controlled by the 16-bit CPU H8/3003 (IC1), running at 14.7456 MHz. This CPU has a unique architecture capable of handling data on the data bus at either an 8-bit or 16-bit bus width. Because of this, a 16-bit or 8-bit data bus width-type ROM is used on this board, increasing the internal processing speed. Also, the CPU has a unique architecture capable of the refresh control function. A 4M DRAM (2 CAS method) on this board is controlled by the CPU itself. The CPU controls the serial interface control (RS-422 for Mac).

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

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

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



Note 1: IC4 is a 32-pin IC socket only.

Note 2: IC17 is an IC socket only.
(IC17 is only installed in JAPAN version.)

Figure 2-17. Main Control Circuit Block Diagram

2.3.2.1 Reset Circuits

The C162 MAIN Board contains 2 reset circuits: the +5 V monitor reset circuit and the +35 V monitor reset circuit. The +5 V monitor reset circuit monitors the voltage level of the +5 V line, using reset IC PST592D (IC12), and outputs a reset signal to the E05A96 gate array (IC2) when the voltage level drops below +4.2 V. The +35 V monitor reset circuit monitors the voltage level of the +35 V line, using reset IC M51955B (IC8), and outputs a reset signal to the E05A96 gate array (IC2) when the voltage level drops below +4.2 V. The reset signal is generated when the voltage level drops below +28 V, and this causes a non-maskable interrupt (NMI).

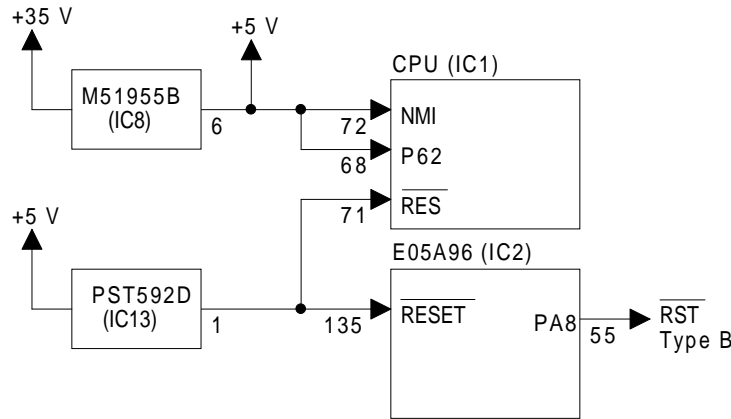


Figure 2-18. Reset Circuit Block Diagram

2.3.2.2 Sensor Circuits

The following sensor circuits enable the C162 MAIN Board to monitor printer mechanism status:

- HP sensor The photocoupler-type home position (HP) sensor is attached to the surface of the printer mechanism to detect the carriage home position. A LOW level from the signal indicates that the carriage is in home position.
- PE sensor The mechanical switch paper end (PE) sensor is built into the printer mechanism to determine whether there is paper in the printer or not. A LOW level from the signal indicates that no paper is loaded.
- BCO sensor, The cartridge out (CO) sensor is micro switch attached to the bottom of each ink
CCO sensor cartridge holder in the carriage unit. When the ink cartridge is installed, these
switches are pressed and a LOW level from the signal indicates that the ink
cartridge is installed into the ink cartridge holder.
- Thermistor A thermistor is attached to the color printhead driver board to monitor its
temperature by thermistor's resistance value (at 25°C approx. 10kΩ). The CPU
changes the printhead drive signal's pulse width (charge pulse width) based on the
temperature level.

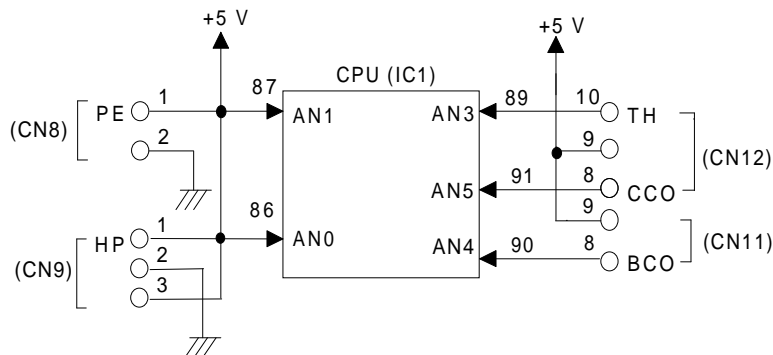


Figure 2-19. Sensor Circuit Block Diagram

2.3.2.3 Carriage Motor Drive Circuit

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

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

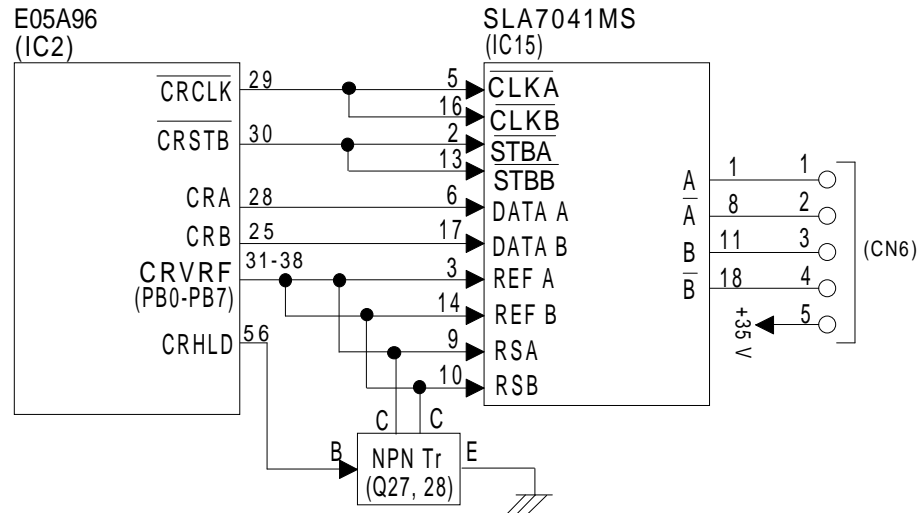


Figure 2-20. Carriage Motor Circuit Block Diagram

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

Table 2-8. Serial Data Contents

Mode	c b a	Vref (typical)	+
0	0 0 0	Vref × 1/3 (Vref = +5 V)	× 0%
1	0 0 1		× 20%
2	0 1 0		× 40%
3	0 1 1		× 55.5%
4	1 0 0		× 71.4%
5	1 0 1		× 83%
6	1 1 0		× 91%
7	1 1 1		× 100%

The following figure shows the contents of the four-bit serial data and how this data transacts with the SLA7041MS driver. The step time of the reference voltage is determined by the interval time of the STROBE pulse.

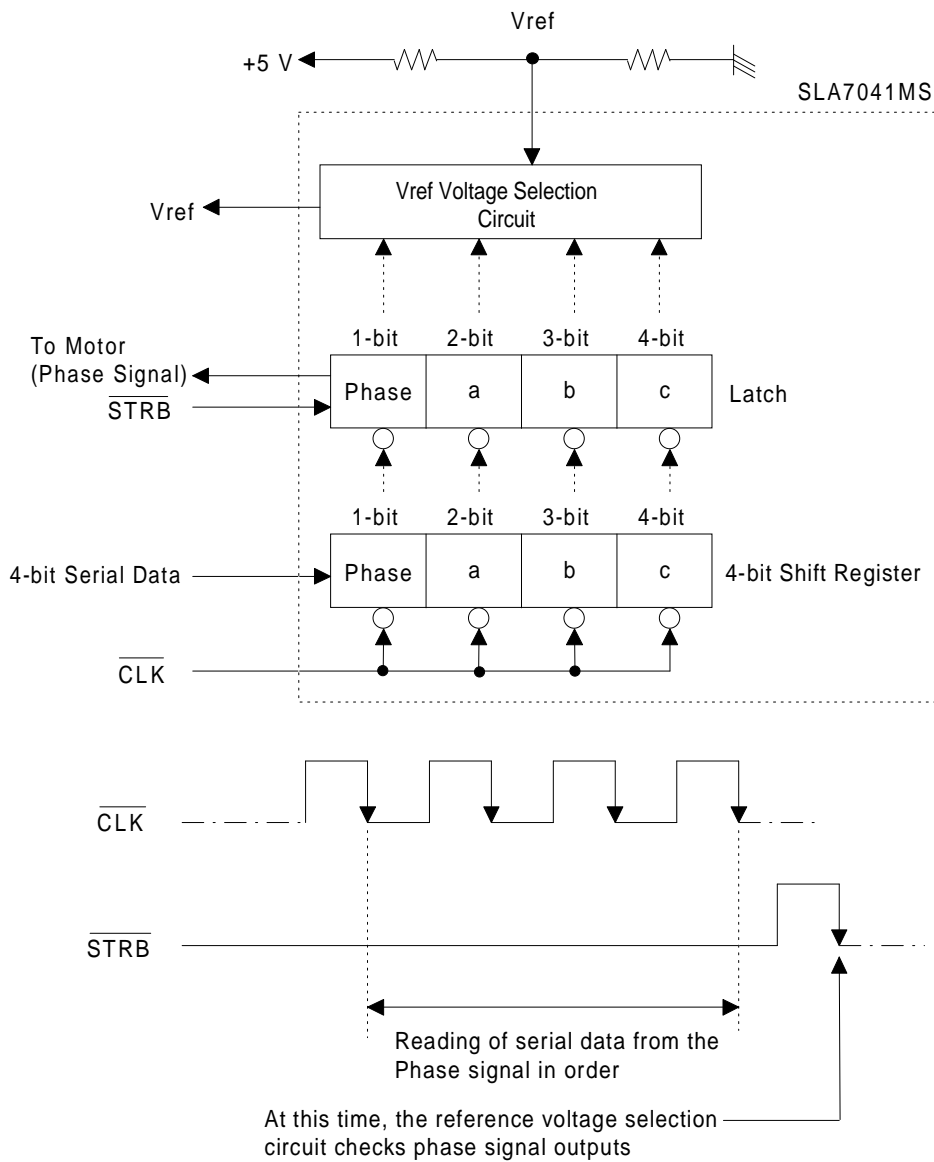


Figure 2-21. Serial Data Transfer Procedure

2.3.2.4 Paper Feed Motor Drive Circuit

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

- Paper feed mechanism
- Paper pickup mechanism
- Pump mechanism

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

Table 2-9. Paper Feed Motor Drive Modes

Mode	Phase Excitation	Drive Frequency
Paper feed	2-2 phase or 2 W1-2 phase	391 or 1600 pps
Pump drive	2-2 phase	300 or 1800 pps

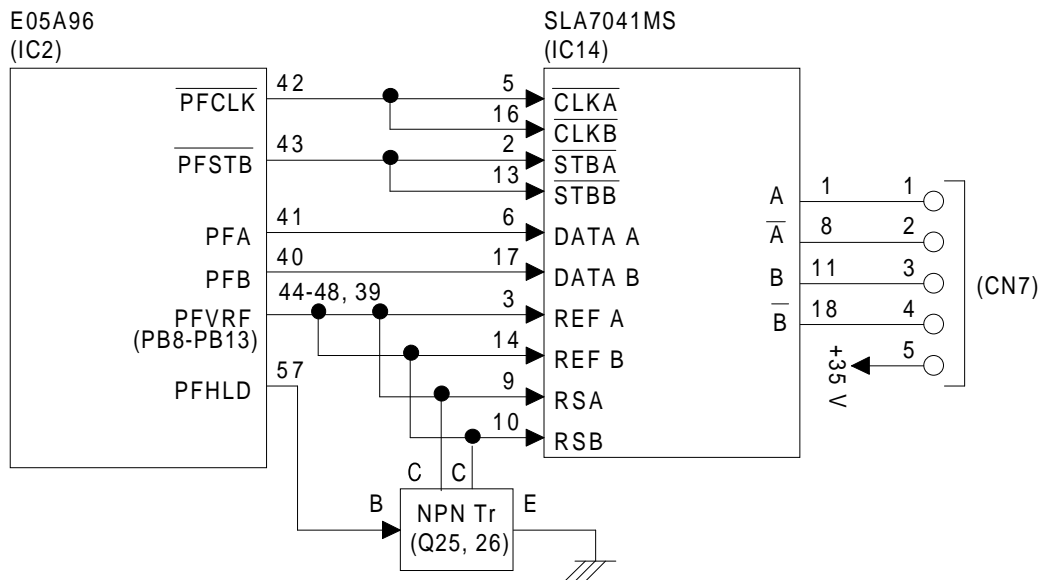


Figure 2-22. Paper Feed Motor Drive Circuit Diagram

2.3.2.5 Printhead Drive Circuit

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

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

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

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

In the Micro Dot Printing mode, the gate array E05B09 arranges the pulse width of CPWC and CPWD to become small size of injection ink dot.

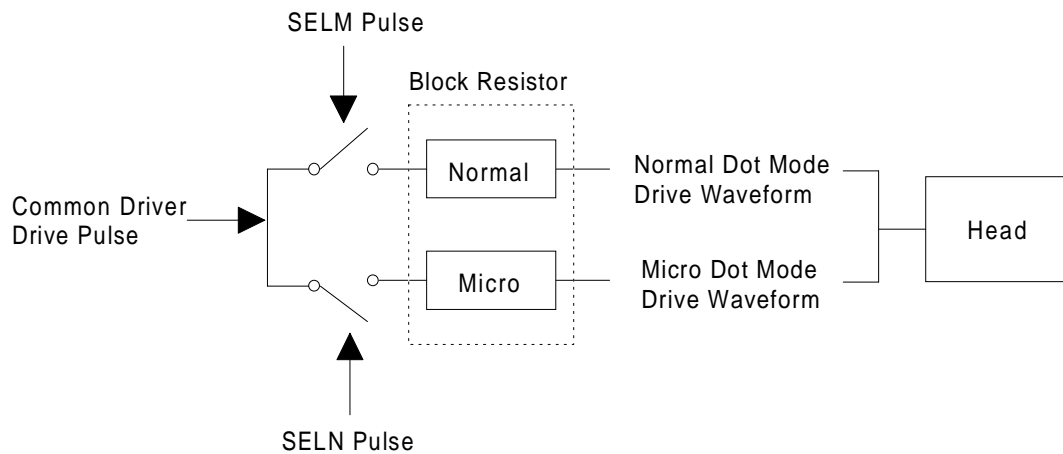


Figure 2-23. Normal / Micro Dot Mode Switch Block

Micro Dot Printing Mode

The Stylus Pro XL printer has a special printing mode, called "Micro Dot Printing Mode." This printing mode can be selected by command from computer. Using Micro Dot Printing Mode can improve the quality of output. In Micro Dot Printing Mode, the ink dot size becomes smaller than the normal dot size.

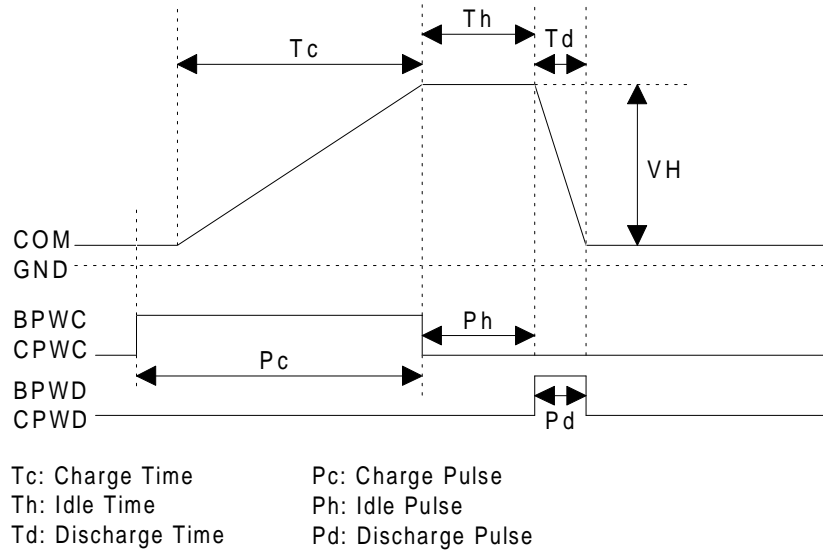


Figure 2-24. Trapezoidal Drive Waveform

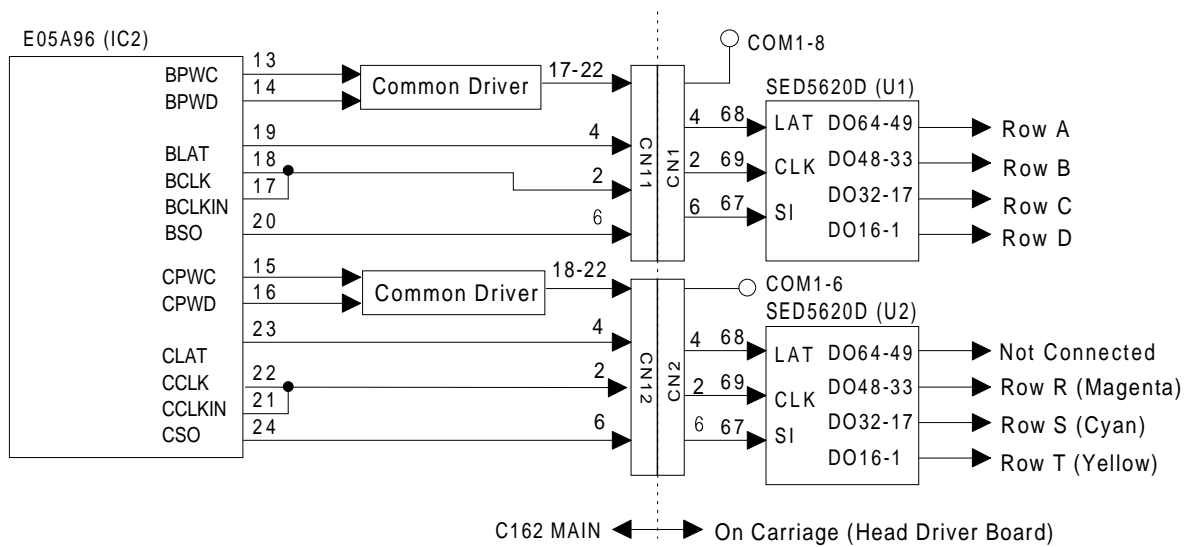


Figure 2-25. Printhead Drive Circuit Block Diagram

2.3.2.6 DMA Controller

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

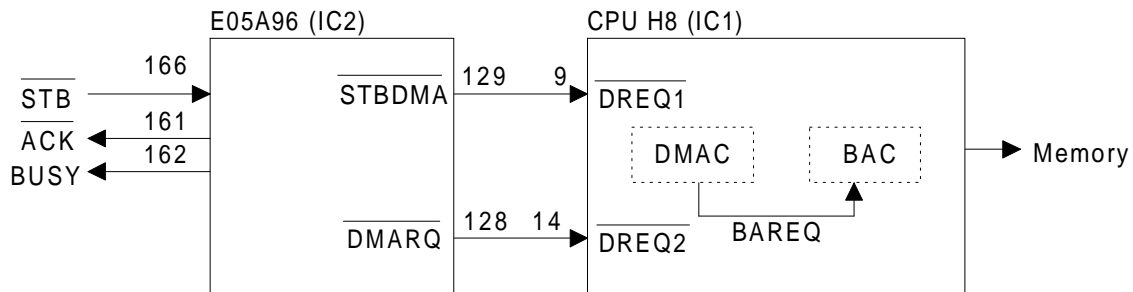


Figure 2-26. DMA Controller Operation

2.3.2.7 DRAM Refresh Controller

The H8 CPU is equipped with a refresh controller in the internal controller. This CPU can contact the 16-bit-long IC5 DRAM, which is a 2 CAS type. The following table lists the junction method between the H8 CPU and the 2 CAS DRAM.

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

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

The method of the DRAM refresh is used only for the CAS before RAS cycle method. The following figure shows the timing for each cycle.

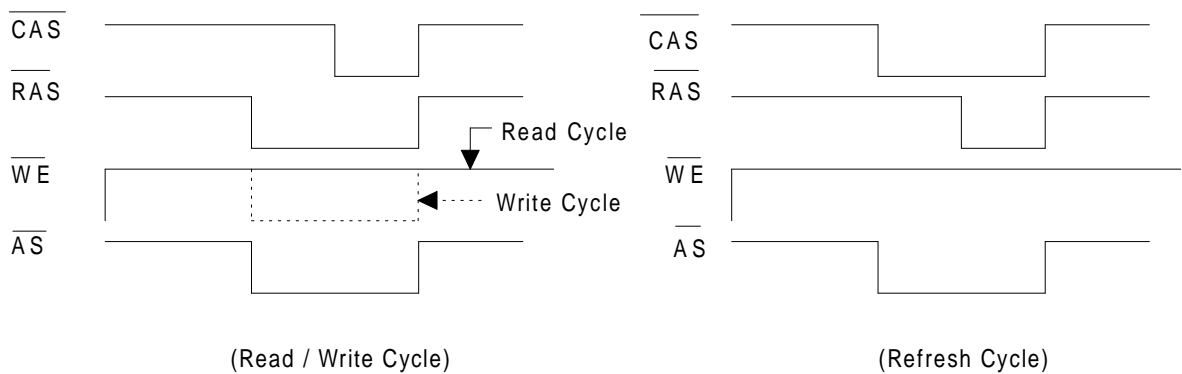


Figure 2-27. DRAM Cycle Timing

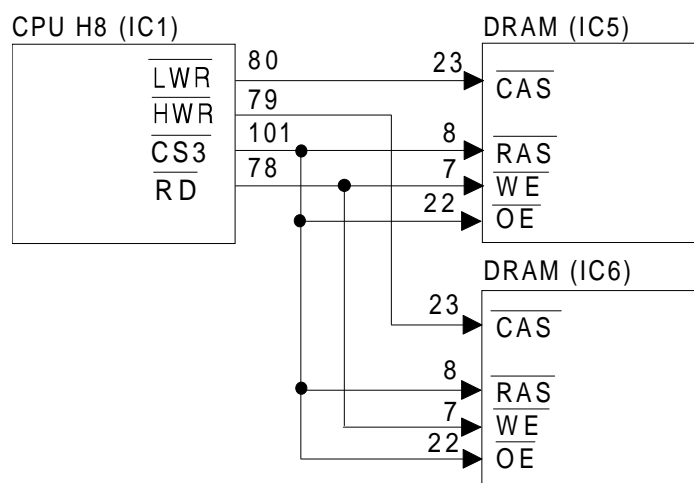


Figure 2-28. Junction Method (CPU — DRAM)

2.4 INK SYSTEM MANAGEMENT

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

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

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

- Refresh Timer
- Flushing Counter
- CL Counter K
- Monochrome / Color Head Timer
- Ink Level Counter R
- Protect Counter

2.4.1 Ink Operations

Various ink operations can be performed selectively by the printer.

1 Power On Operation

This operation is performed when power is turned on.

2 Cleaning Selection Mode

This operation cleans each nozzle to ensure that the nozzle fires and that no dots are skipped during printing. Cleaning selection is performed by pressing the cleaning switch (Alt + Load/Eject or Economy/Condensed) while the printer is in PAUSE status.

3 Micro Absorbing Cleaning Operation

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

4 Power Off Operation

This operation ensures the carriage is in the home position when the printer turns off, and prevents the disengage gear from turning continuously when the printer turns off. Power off operation is performed when the secondary side switch is turned off.

5 Print Start Operation

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

6 Refresh Operation

This operation prevents an increase in the viscosity of the head ink.

7 Standby Operation

This operation prevents an increase in the viscosity of the head ink.

8 False Absorbing Operation

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

9 Ink Cartridge Replacement Operation

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

10 Wiping Operation 1

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

11 Wiping Operation 2

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

12 Rubbing Operation

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

13 Disengage ON Operation

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

14 Disengage Off Operation

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

15 Micro Absorbing Operation

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

16 Carriage Lock Set

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

17 Carriage Lock Reset

This operation resets the carriage lock lever.

18 Refresh Operation (Performed when Loading or Ejecting Paper)

This operation prevents an increase in the viscosity of ink inside the black head while paper is being loaded or ejected. When paper is loaded or ejected, just the black head is ready, and the color head is capped. The refresh flushes the black head only.

19 Adjust Lever Position Moving Sequence

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

20. Transportation Sequence

This sequence is performed to clean the printhead when the printer is transported to the market.

2.4.2 Timer and Counter

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

2.4.2.1 Protect Counter

Protect counter A and Ink Amount Counter R values are stored in the EEPROM on the main board, and while the printer is on, this data is saved in the RAM on the main board.

□ Protect Counter A This counter is used to manage the total amount of drained ink. If the counter value is equal to or exceeds 51000, the printer indicates an error on the control panel and maintenance is required. This counter is incremented by the following every sequence. (Values in parentheses () mean only the color head. 1 point = 0.025 cc.)

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

Note for Service

Also, protect counter A resets when:

- 1. The printer is shipped from the factory.*
- 2. After the maintenance is performed.*

(When the ink drain tank (ink-eject porous pad, part number 130) is replaced.)

Chapter 3 Disassembly and Assembly

Table of Contents

3.1 OVERVIEW	3-1
3.1.1 Precautions for Disassembling the Printer	3-1
3.2 DISASSEMBLY AND ASSEMBLY	3-2
3.2.1 Upper Case Removal	3-3
3.2.2 Power Supply Unit (C137 PSB/PSE Board) Removal	3-4
3.2.3 Main Controller (C162 MAIN Board) Removal	3-5
3.2.4 Printer Mechanism (M-4A60) Removal	3-7
3.2.5 Printer Mechanism Disassembly	3-8
3.2.5.1 Printhead Unit Removal	3-8
3.2.5.2 Carriage Unit Removal	3-12
3.2.5.3 Pump Unit Removal	3-13
3.2.5.4 Cleaner Head Replacement	3-14
3.2.5.5 CR Motor Removal	3-15
3.2.5.6 PF Motor Removal	3-15
3.2.5.7 Carriage Home Position (HP) Sensor Removal	3-16
3.2.5.8 Paper End (PE) Sensor Removal	3-16
3.2.5.9 Paper Feed Roller Assembly Removal	3-17
3.2.5.10 Upper Frame Removal	3-18

List of Figures

Figure 3-1. Disassembly Flowchart	3-2
Figure 3-2. C137 PNL Control Panel Removal	3-3
Figure 3-3. Upper Case Removal.	3-3
Figure 3-4. Power Supply Unit Removal	3-4
Figure 3-5. Main Controller Removal	3-5
Figure 3-6. Printer Mechanism (M-4A60) Removal	3-7
Figure 3-7. Ink Cartridge Clamp Removal	3-8
Figure 3-8. Ink Cartridge Holder removal.	3-9
Figure 3-9. Printhead Removal	3-9
Figure 3-10. Head Spacer Position	3-11
Figure 3-11. Front Frame Removal	3-12
Figure 3-12. Carriage Unit Removal.	3-12
Figure 3-13. Pump Unit Removal.	3-13
Figure 3-14. Cleaner Head Replacement	3-14
Figure 3-15. CR Motor Removal	3-15
Figure 3-16. PF Motor Removal.	3-15
Figure 3-17. HP Sensor Removal	3-16
Figure 3-18. PE Sensor Removal.	3-16
Figure 3-19. Tension Roller Assembly Removal	3-17
Figure 3-20. Paper Feed Roller Assembly Removal	3-17
Figure 3-21. Upper Frame Removal.	3-18
Figure 3-22. Attaching the Torsion Spring	3-18

List of Tables

Table 3-1. Insert Location of the Block Resistor	3-7
Table 3-2. Insert Location of the Block Resistor	3-10

3.1 OVERVIEW

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

3.1.1 Precautions for Disassembling the Printer

See the precautions below when disassembling the printer.

WARNING

- Disconnect the power cable before disassembling or assembling the printer.*
- Wear protective goggles to protect your eyes from ink. If ink gets in your eye, flush the eye with fresh water and see a doctor immediately.*
- If ink comes into contact with your skin, wash it off with soap and water. If irritation occurs, contact a physician.*
- A lithium battery is installed on the C162 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 the opposite polarity do not come in contact with each other.*
 - 2. Do not heat the battery or put it near fire.*
 - 3. Do not solder on any part of the battery. (Doing so may result in leakage of electrolyte from the battery, burning, or explosion. The leakage may affect other devices close to the battery.)*
 - 4. Do not 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.)*

CAUTION

Danger of explosion if battery is incorrectly replaced. Replace 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 manual instructions specify to do so.*
- When transporting the printer after installing the ink cartridge, be sure to pack the printer for transportation without removing the ink cartridge.*
- Use only recommended tools for disassembling, assembling, or adjusting the printer.*
- Apply lubricants and adhesives as specified. (See Chapter 6.)*
- Make specified adjustments when you disassemble the printer. (See Chapter 4.)*

3.2 DISASSEMBLY AND ASSEMBLY

WARNING

Follow the precautions in Section 3.1.1 when disassembling the printer.

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

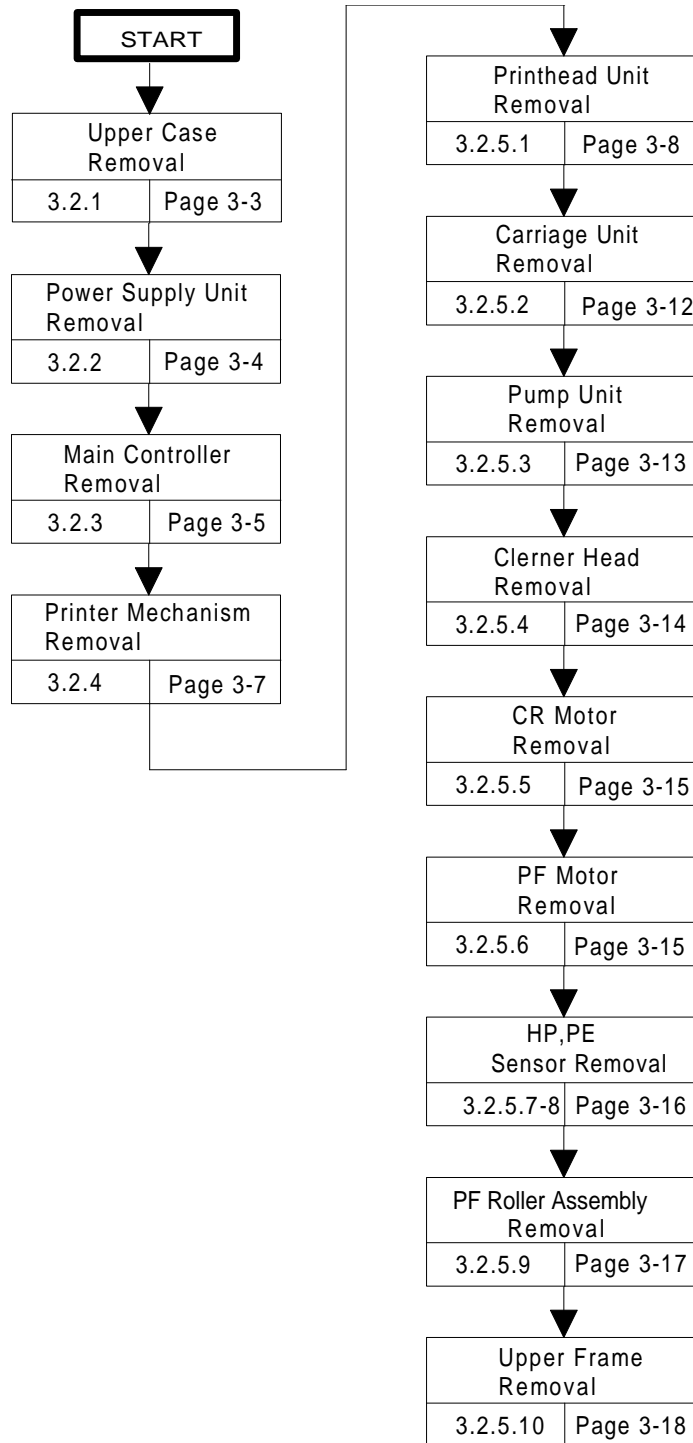


Figure 3-1. Disassembly Flowchart

3.2.1 Upper Case Removal

1. Remove the printer cover (center of top) by releasing the 2 tabs holding it to the upper case.
2. Remove the front cover (front of top) by releasing the 2 tabs holding it to the lower case.
3. Remove the paper guide by releasing the 2 tabs holding it to the printer mechanism.
4. Move the carriage to the middle of the printer while pressing the hook that fixes the carriage unit to the home position.
5. Remove the control panel. (Release the tab by inserting a screwdriver into the hole in the upper case, as shown in the figure below.) At this time, disconnect the connector on the C137 PNL Board.

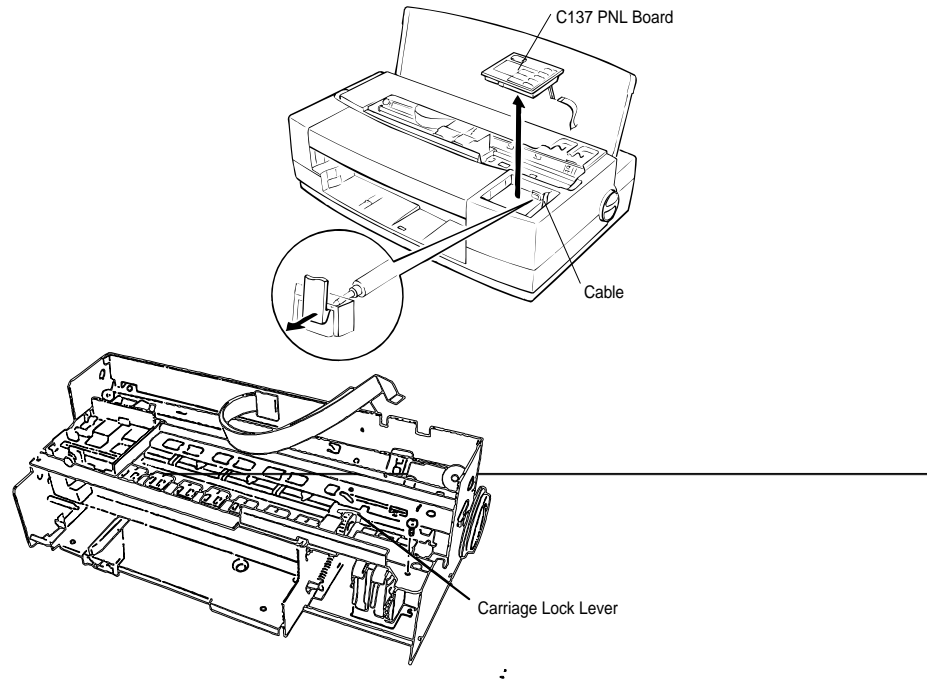


Figure 3-2. C137 PNL Control Panel Removal

5. Remove the 2 CBB (M3 × 11) screws securing the upper case to the lower case.
6. Release 1 tab by inserting a flathead screwdriver into the holes at the bottom of the lower case, as shown in the figure below.
7. Remove the upper case by lifting the front side. At the same time release 1 tab, located in the center front of the lower case.

DISASSEMBLY/ASSEMBLY POINT

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

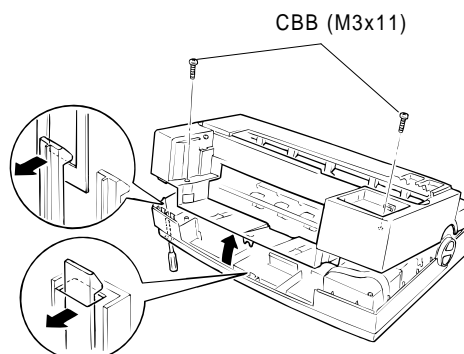


Figure 3-3. Upper Case Removal

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

1. Remove the upper case (see Section 3.2.1).
2. Disconnect the cables from connectors CN1 on the C137 PSB /PSE Board and CN5 on the C162 MAIN Board.
3. Remove the 2 screws, 1 CBN (M3×8) and 1 CBB (M3×12), securing the shield plate to the lower case via the C137 PSB/PSE Board.
4. Remove the 3 screws, 2 CBB (M3×12) and 1 CBN (M3×8), securing the C137 PSB/PSE Board to the lower case, and remove a CBN (O) (M3×6) screw fixing the earth line from the AC cable to the earth plate.
5. Remove the wire harness for the motors in the locking tab on the shield plate, and take the shield plate out by pulling upward toward the back of the printer.
6. Remove the power supply unit by pulling it upward toward the back of the printer.

CAUTION

The shield plates of C137 PSB/PSE and C162 MAIN boards have sharp edges, so take care in handling them.

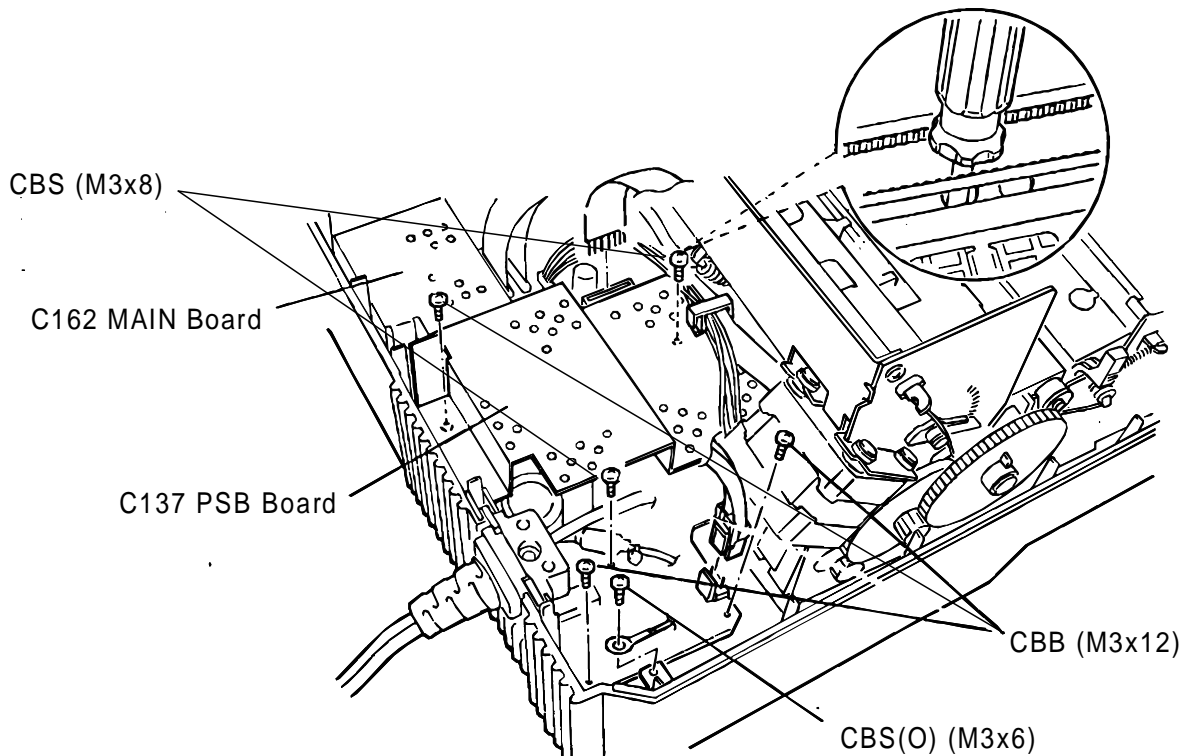


Figure 3-4. Power Supply Unit Removal

3.2.3 Main Controller (C162 MAIN Board) Removal

1. Remove the upper case (see Section 3.2.1).
2. Remove the grounding plate from the shield plate.
3. Remove the 4 CBB (M3x12) screws securing the shield plate to the lower case.
4. Remove the 2 CBB (M3x12) screws securing the Type-B interface cover to the lower case.
5. Disconnect the cables from connectors CN5, CN6, CN7, CN8, CN9, CN10, CN11, CN12, and CN13 of the C162 MAIN Board.
6. Remove the 4 CBB screws, 2 (M3x12) and 2 (M3x8), securing the main controller to the lower case and then remove the C162 MAIN Board.

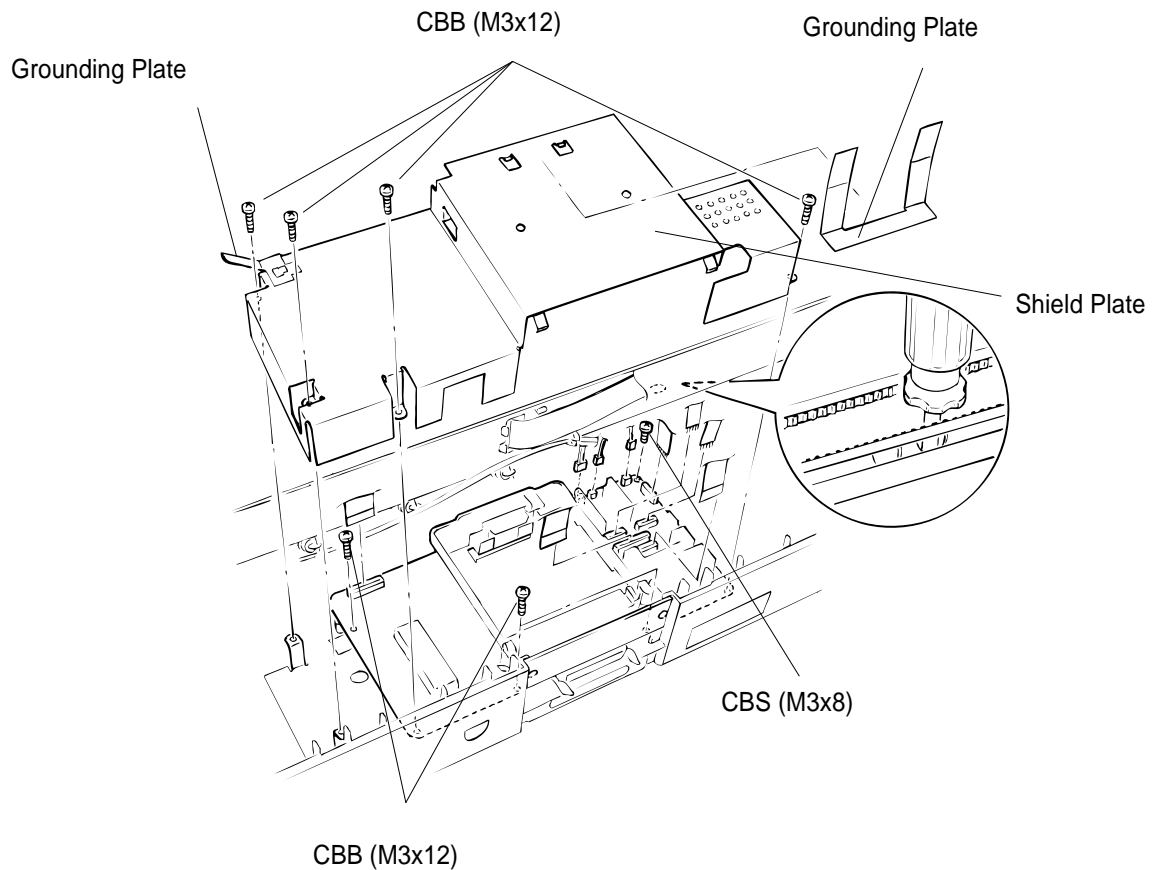


Figure 3-5. Main Controller Removal

ASSEMBLY POINT

- ❑ *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, Font, Load/Eject, and Pause buttons on the control panel.*
- ❑ *It is possible to misconnect the cables. When reconnecting the cables from connectors CN6, CN7 and connectors CN11, CN12 of the C162 MAIN board, see the following instructions.*
 1. *CN11: Printhead FFC cable (white mark: rear direction)*
CN12: Printhead FFC cable (blue mark: rear direction)
 2. *CN6: Carriage motor cable (red mark: the red mark indicates pin 1 of CN6.)*
CN7: Paper feed motor cable (black mark: the black mark indicates pin 1 of CN7.)

REQUIRED ADJUSTMENT

- ❑ *When replacing the main controller board, adjust both the head gap and the bidirectional adjustment alignment, and save the adjusted parameters into the EEPROM on the C162 MAIN Board. (See Chapter 4.)*
- ❑ *When you replace the main board, the parameters in the internal timer are all reset. Therefore, it is possible for printing to become abnormal. At this time, perform the cleaning operation using the control panel or command (Refer to Chapter 4) until the printing becomes normal.*

CAUTION

The shield plates for the C162 MAIN Board and C137 PSB/PSE Board have sharp edges, so take care in handling them.

3.2.4 Printer Mechanism (M-4A10) Removal

1. Remove the upper case (see Section 3.2.1).
2. Remove the power supply unit (see Section 3.2.2).
3. Remove the main controller (see Section 3.2.3).
4. Remove the 4 CBN (M4×13) screws and take out the printer mechanism.

DISASSEMBLY/ASSEMBLY POINT

Wipe off any ink around the end of the ink drain tube when you remove the printer mechanism.

- When reinstalling the printer mechanism, check that the waste ink drain tube is properly inserted between the lower case and the waste ink absorbing material.*

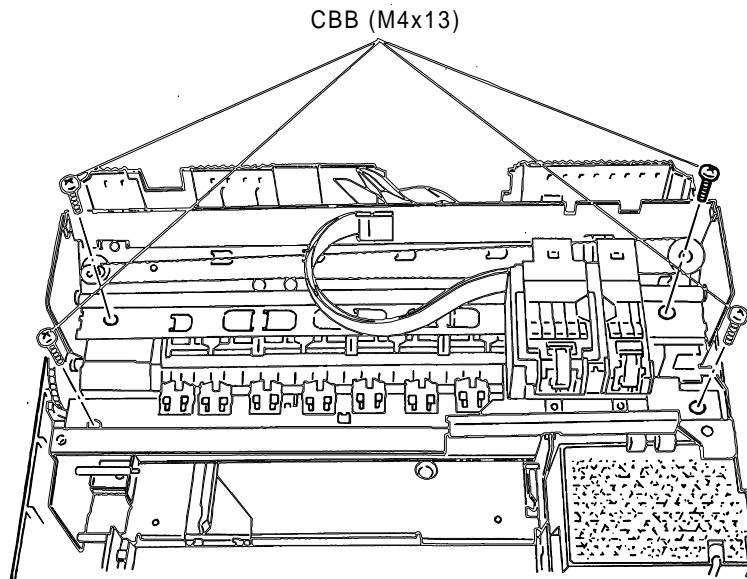


Figure 3-6. Printer Mechanism (M-4A60) Removal

CAUTION

When you replace the printhead or printer mechanism, you must replace the block resistor at location RM4 (for Micro Mode - Color (R-No.)), RM5 (for Normal Mode - Color (M-No.)), RM11 (for Micro Mode - Monochrome (R-No.)), and RM12 (for Normal Mode - Monochrome (M-No.)) on the C162 MAIN Board. (Every spare printhead or spare printer mechanism comes with a block resistor that is specifically selected for each printhead.) Refer to Table 3-1.

- Adjust both the head gap and bidirectional alignment when replacing the printer mechanism.*

Table 3-1. Insertion Location for Block Resistors

Mode	Head	Indication No.	Location
Normal	Monochrome	M-xx	RM12
	Color	M-xx	RM5
Micro	Monochrome	R-xx x	RM11
	Color	R-xx x	RM4

3.2.5 Printer Mechanism Disassembly

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

3.2.5.1 Printhead Unit Removal

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

CAUTION

When removing the ink cartridge, always install a new cartridge immediately after removing the old one.

- When the ink cartridge is replaced, the printer performs the ink cartridge replacement operation automatically.*

*The exclusive cartridge is: Monochrome: 1020626
YMC: 1020627*

- Ink cartridges should never be kept longer than 6 months.*

4. Push the 2 hooks from the inside of ink cartridge holder with tweezers, and push down the ink cartridge clamp (monochrome/color) to remove the clamps from ink cartridge holder.
5. Remove the 3 CBB (M3×11) screws and 3 plain washers securing the ink cartridge holder to the carriage base, and then lift the ink cartridge holder out of the carriage base sliding a little toward left.

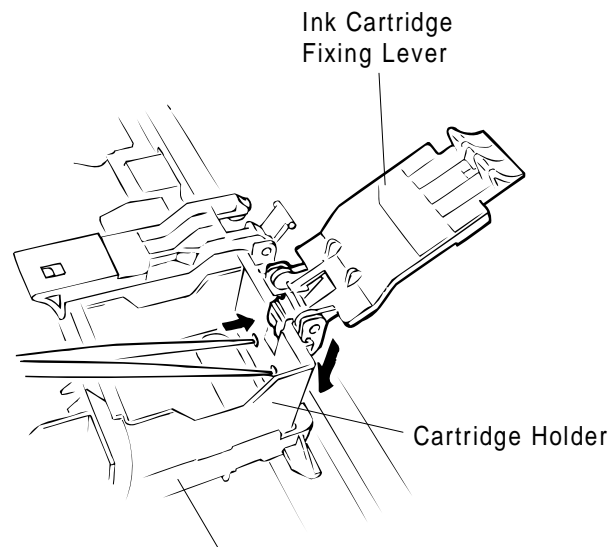


Figure 3-7. Ink Cartridge Clamp Removal

Note: The head flexible flat cables (FFCs) are secured to the ink cartridge holder with adhesive tape. Tear the cables off the ink cartridge holder before removing the ink cartridge holder from the carriage base.

6. Remove the CBB (M3x11) screw (under the CR cap cover) and plain washer securing the monochrome and color printheads to the carriage base.

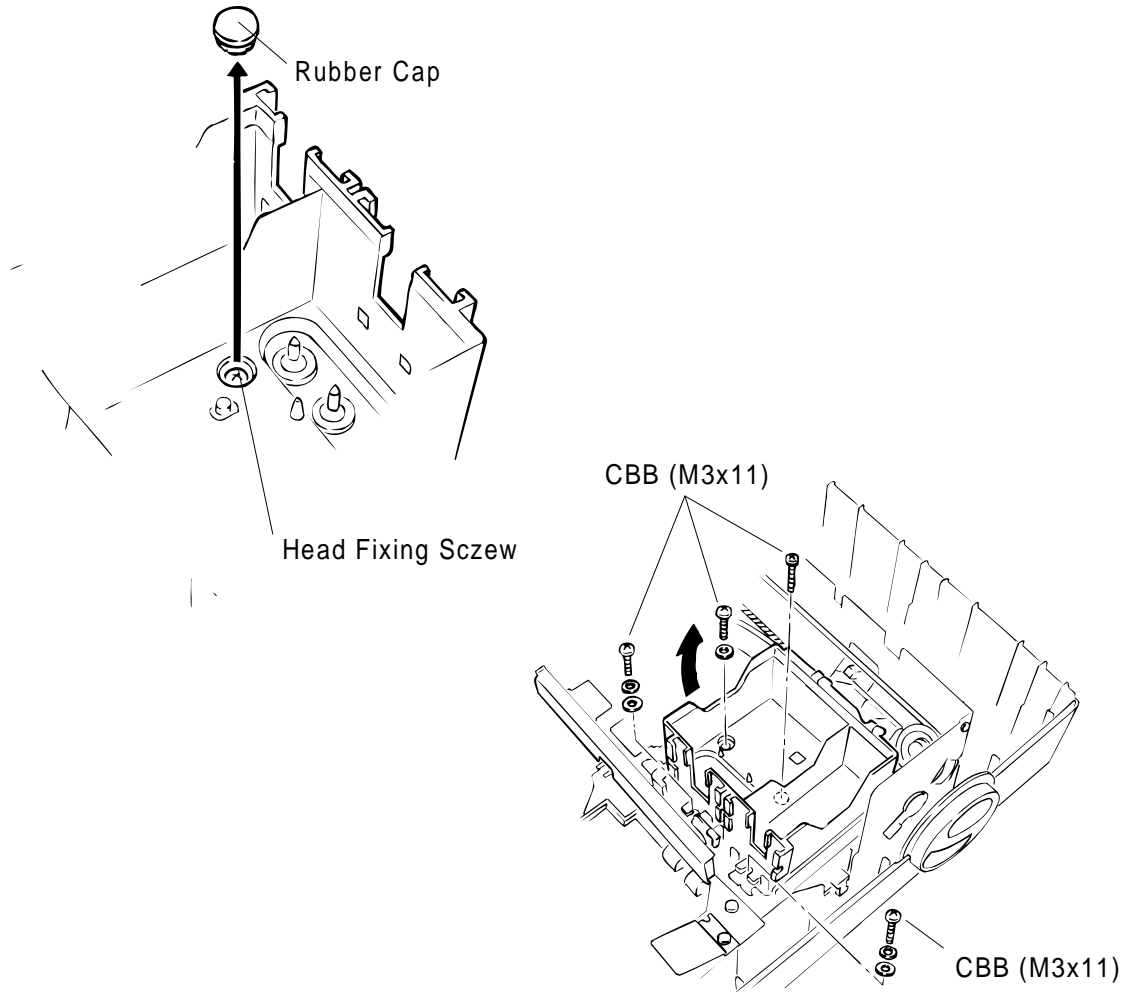


Figure 3-8. Ink Cartridge Holder Removal

7. Pull the black or color head toward you, and disconnect the head FFC cable on the head driver board (nozzle selector). Then remove the black or color head.

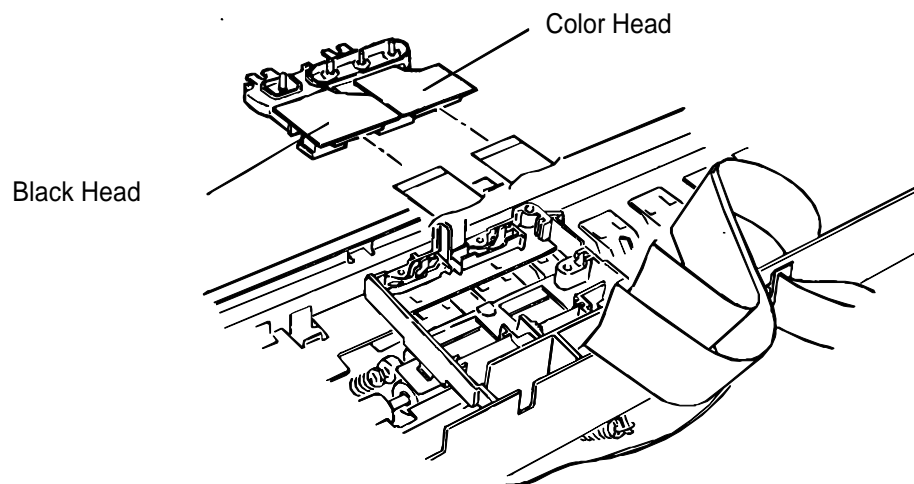


Figure 3-9. Printhead Removal

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 printhead's metallic nozzle cover surface. Handle it only by holding the edges of the printhead.*
- ❑ *When you replace the printhead or the printer mechanism, you must replace the block resistor at location RM4 (for Micro Mode - Color (R-No.)), RM5 (for Normal Mode - Color (M-No.)), RM11 (for Micro Mode - Monochrome (R-No.)), and RM12 (for Normal Mode - Monochrome (M-No.)) on the C162 MAIN Board. (Every spare printhead or spare printer mechanism comes with a block resistor that is specifically selected for each printhead. (Refer to Table 3-2.)*

Table 3-2. Insertion Location of the Block Resistors

Mode	Head	Indication No.	Location
Normal	Monochrome	M-xx	RM12
	Color	M-xx	RM5
Micro	Monochrome	R-xx x	RM11
	Color	R-xx x	RM4

REQUIRED ADJUSTMENT

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

WARNING

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

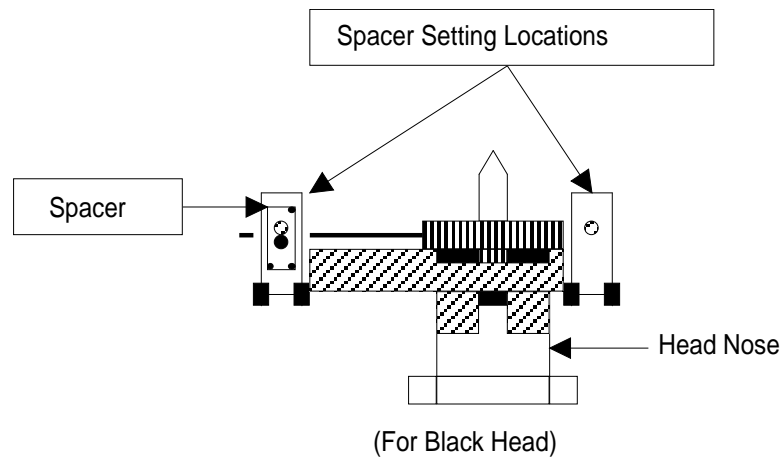


Figure 3-10. Head Spacer Position

3.2.5.2 Carriage Unit Removal

1. Remove the printer mechanism (see Section 3.2.4).
2. Move the carriage to the left side of the printer while pressing the hook that fixes the carriage to the home position.
3. Remove the 2 CBS(O) (M3×6) screws securing the eject frame to both side frames.

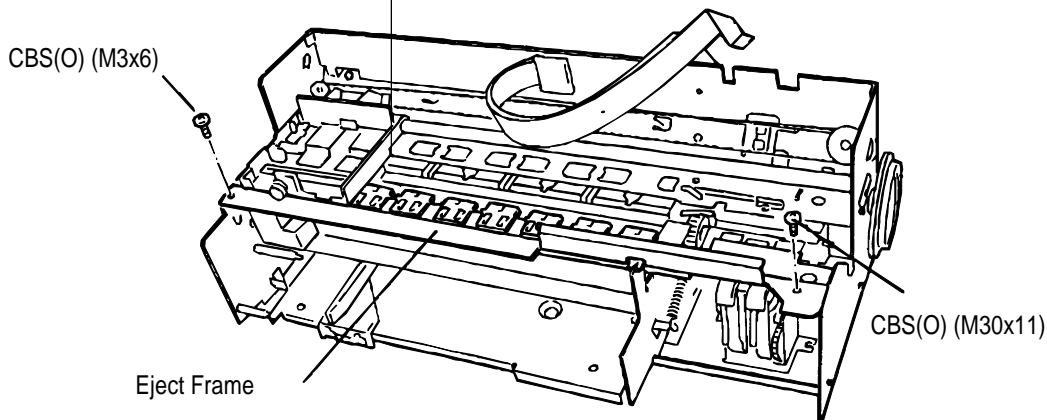


Figure 3-11. Front Frame Removal

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

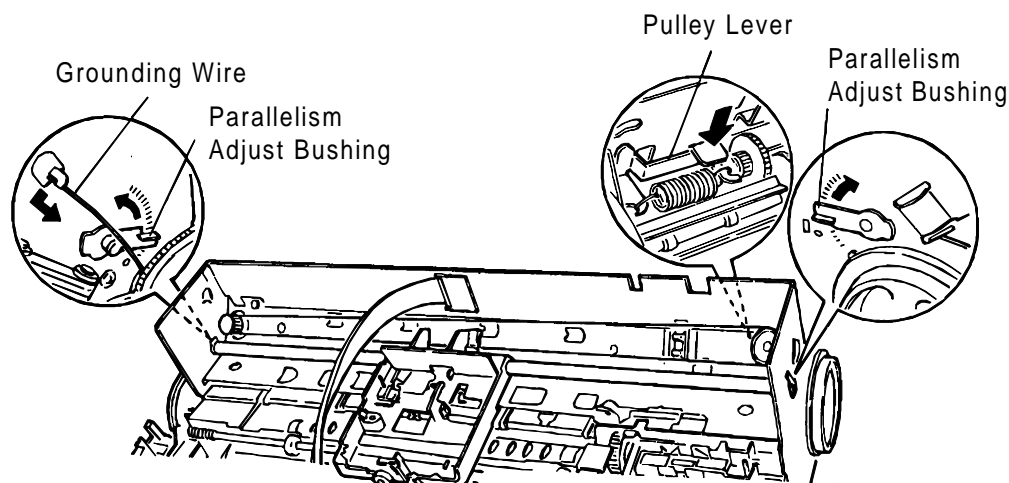


Figure 3-12. Carriage Unit Removal

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 printhead's metallic nozzle cover surface. Handle it only by holding the edges of the printhead.
- ❑ When you replace the printhead or the printer mechanism, you must replace the block resistor. (see Table 3-2).

ADJUSTMENT REQUIRED

Platen gap adjustment (see Chapter 4).

3.2.5.3 Pump Unit Removal

1. Remove the printer mechanism. (See Section 3.2.4.)
2. Remove the carriage unit. (See Section 3.2.5.2.)
3. Remove the CBS (M3×6) screw securing the pump unit to the bottom frame.
4. Push the pump unit outward while releasing the tab at the bottom side of the pump unit, and then lift up the pump unit.

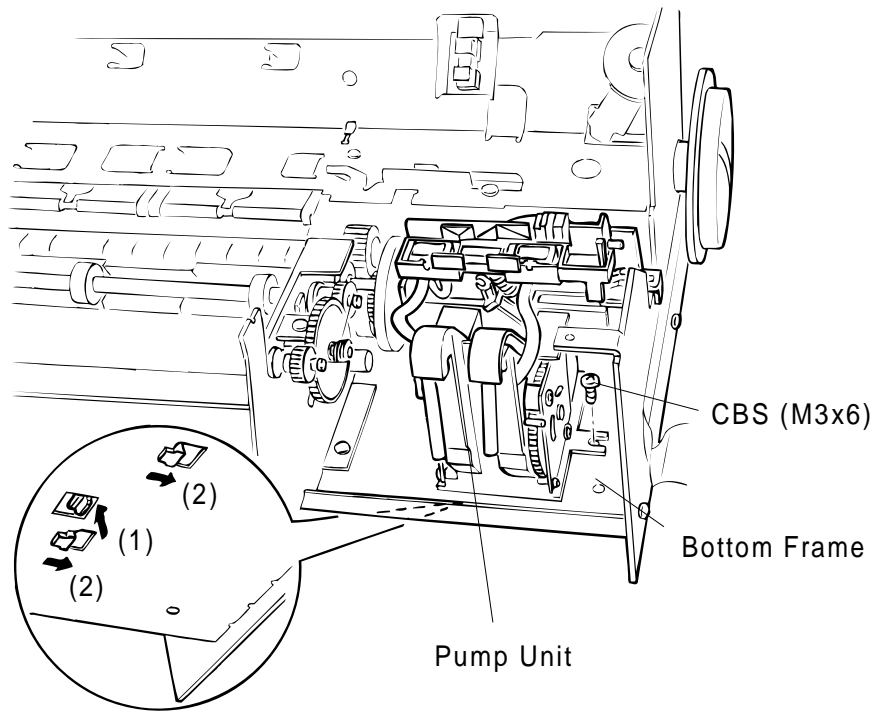


Figure 3-14. Pump Unit Removal

3.2.5.4 Cleaner Head Replacement

1. Remove the printer mechanism (see Section 3.2.4).
2. Use tweezers to unhook the cleaner head from the hook on the cleaning lever.

CAUTION

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

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

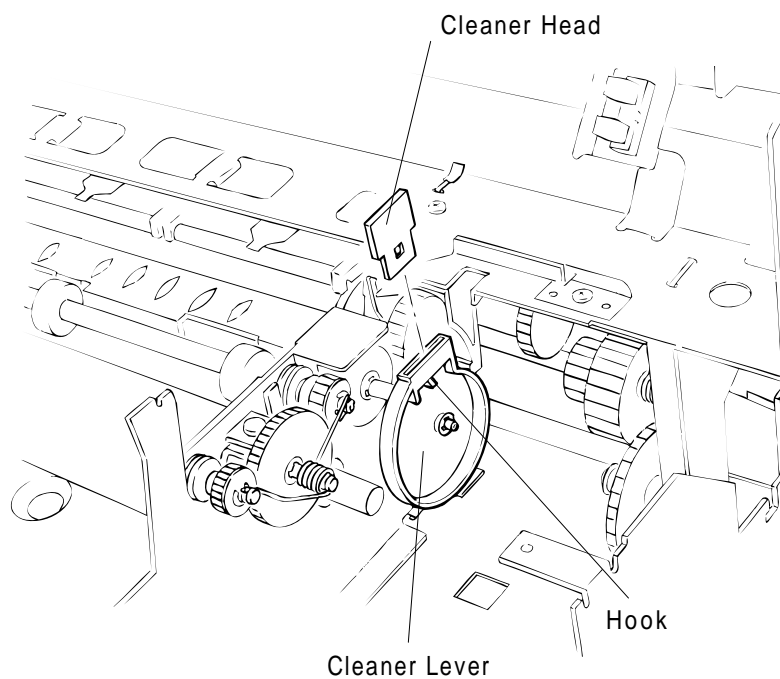


Figure 3-14. Cleaner Head Replacement

3.2.5.5 CR Motor Removal

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

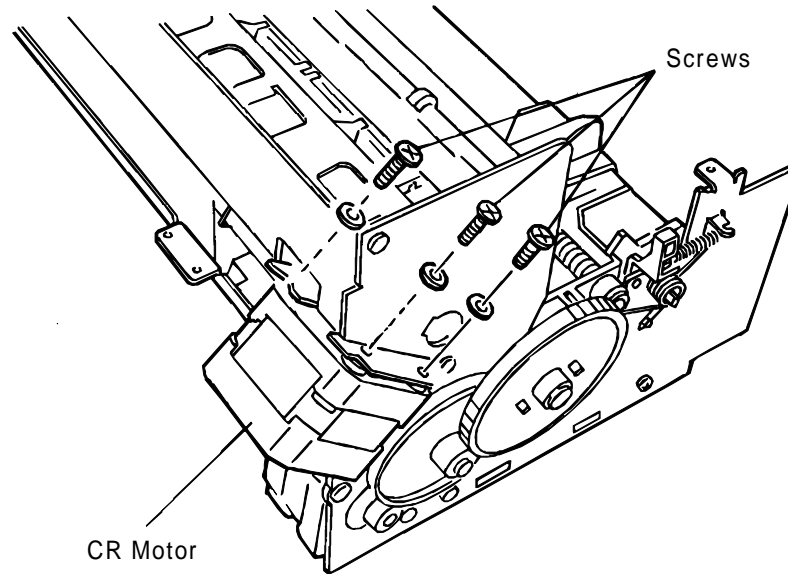


Figure 3-15. CR Motor Removal

3.2.5.6 PF Motor Removal

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

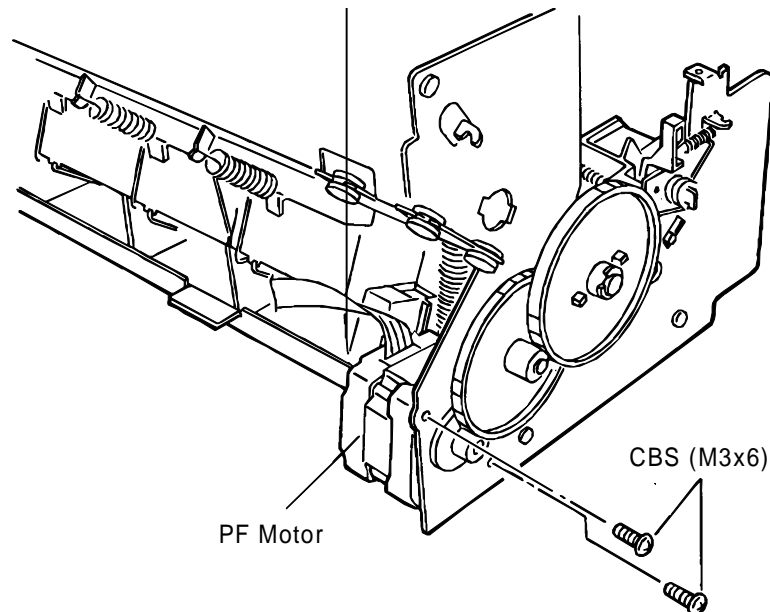


Figure 3-16. PF Motor Removal

3.2.5.7 Carriage Home Position Sensor Removal

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

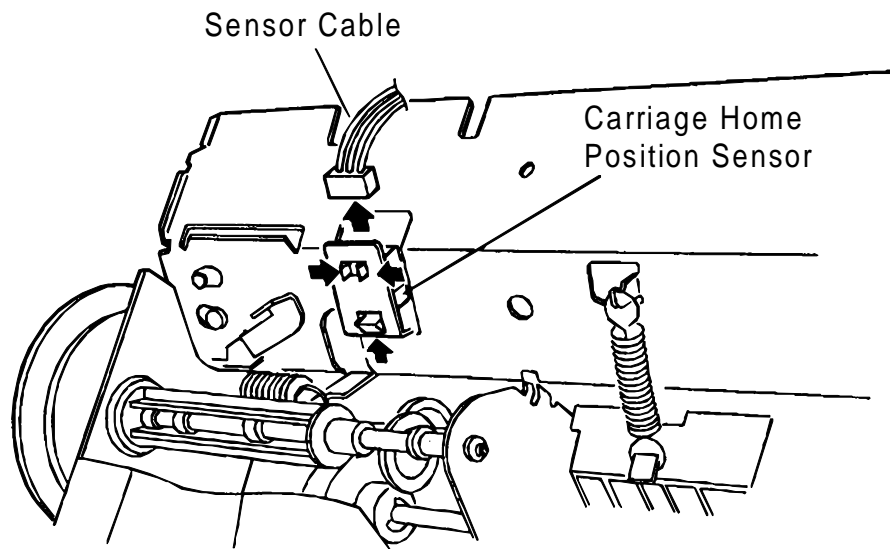


Figure 3-18. Carriage Home Position Sensor Removal

3.2.5.8 PE Sensor Removal

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

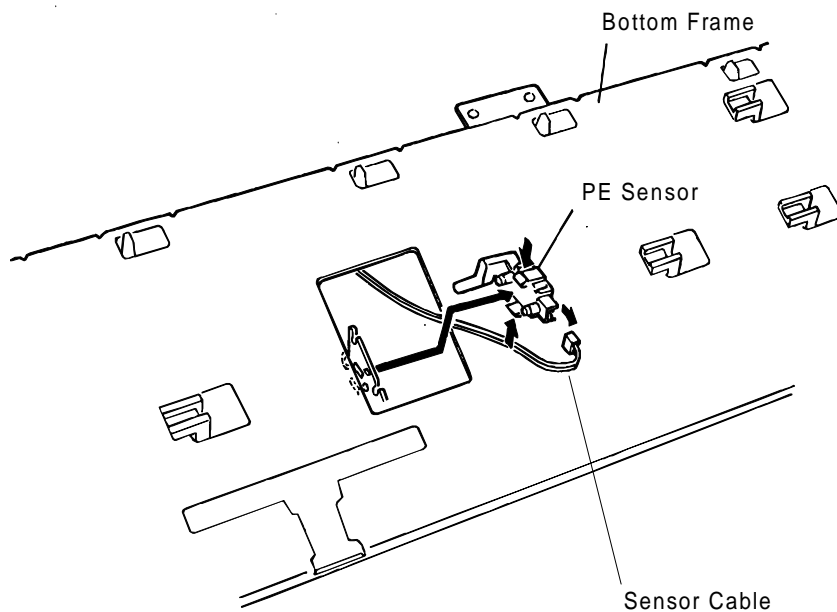


Figure 3-19. PE Sensor Removal

3.2.5.9 Paper Feed Roller Assembly Removal

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

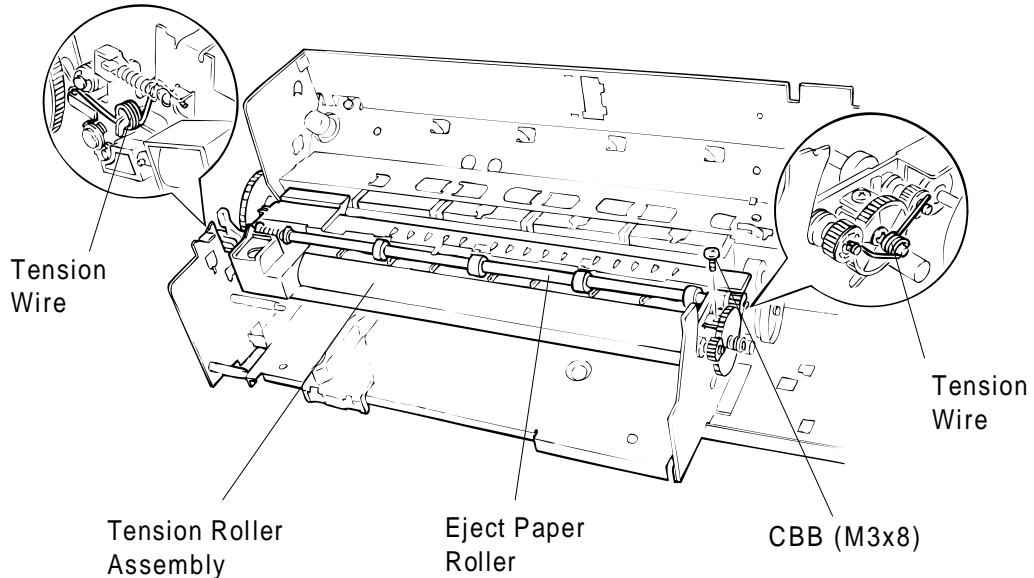


Figure 3-19. Tension Roller Assembly Removal

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

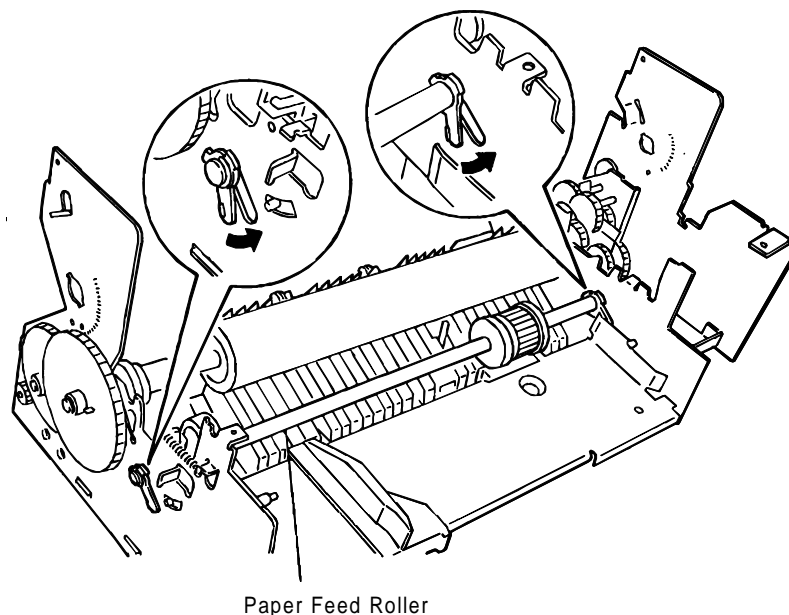


Figure 3-20. Paper Feed Roller Assembly Removal

3.2.5.10 Upper Frame Removal

1. Remove the printer mechanism (see Section 3.2.4).
2. Remove the carriage unit (see Section 3.2.5.2).
3. Remove the E-ring securing the knob shaft to the sub frame; then remove the knob with the knob shaft from the right side frame.
4. Remove the 5 CBS (M3x5) screws securing the upper frame to both side frames or the sub frame. Then remove the upper frame with 4 PF support rollers.
5. Remove the upper frame with 4 PF support rollers.

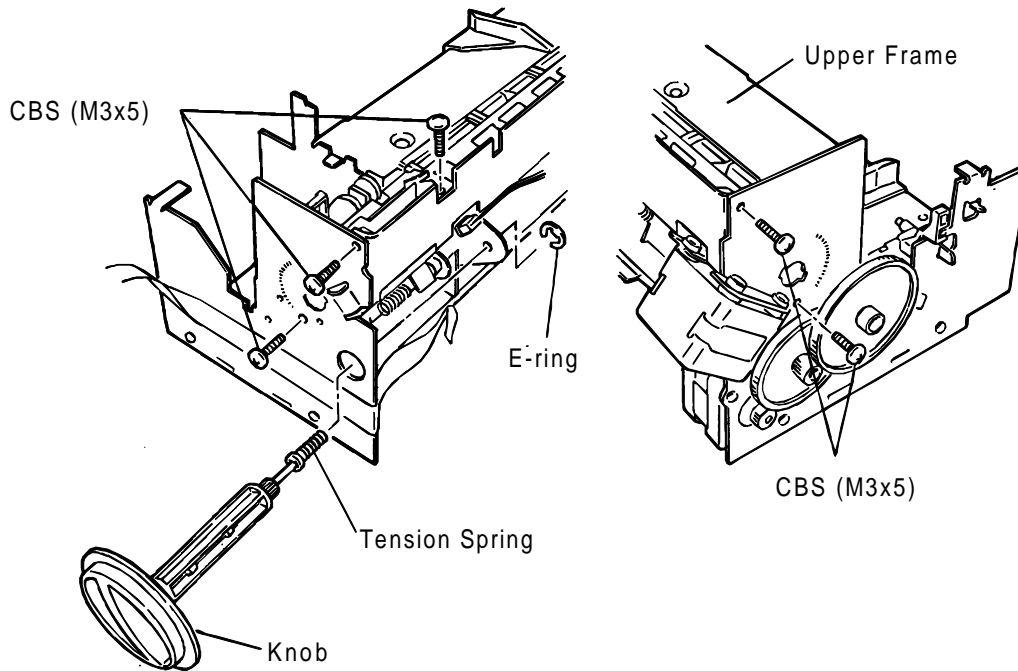


Figure 3-21. Upper Frame Removal

ASSEMBLY POINT

Assemble each straight end of torsion spring 6700s to attach to the center of the driven roller support.

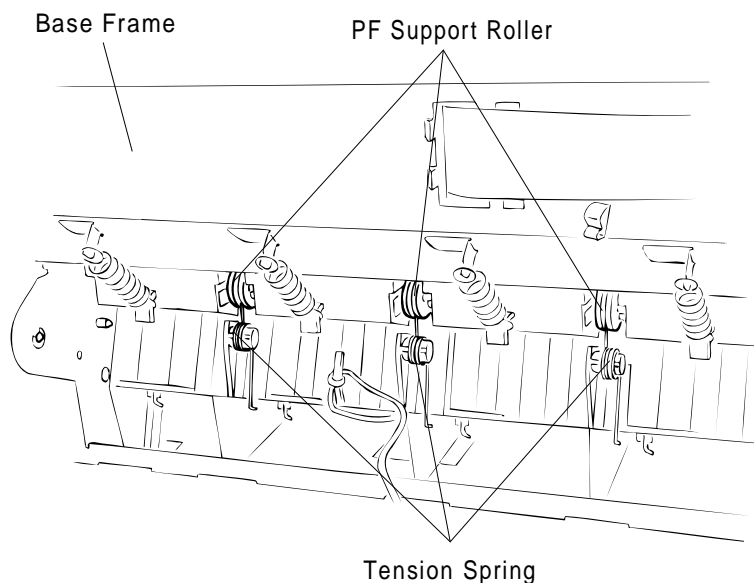


Figure 3-22. Attaching the Torsion Spring

Chapter 4 Adjustments

Table of Contents

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

List of figures

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

List of Table

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

4.1 OVERVIEW

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

WARNING

- ❑ *Always perform the adjustments in the order indicated.*
- ❑ *After performing steps 1-5, perform a cleaning operation for the black and color printheads. the cleaning operation is needed because printing sample patterns for the head angle, Bi-D alignment, and the head gap increases the viscosity of the ink, and the printer will not print the correct value. For instance if you replace the black head, you must do the following adjustments in the order shown:
(1) Black head angle, (2) black-color head vertical, (3) head gap, (4) Bi-D alignment.*
- ❑ *After removing an ink cartridge, always install a new cartridge immediately. During adjustments and testing, use cartridges designed exclusively for service (Monochrome: 1020626, CMY: 1020627).*

Table 4-1. Required Adjustments

Service Performed	Adjustment Needed
When replacing the M-4A60 printer mechanism	<ol style="list-style-type: none"> 1. Bi-D alignment adjustment (see Section 4.1.2). 2. Head gap adjustment (see Section 4.1.3). 3. Internal timer reset operation (see Section 4.1.8).
When replacing or disassembling the C162 MAIN board or printer mechanism	<ol style="list-style-type: none"> 1. Destination data writing operation (see Section 4.1.1). 2. Bi-D alignment adjustment (see Section 4.1.2). 3. Head gap adjustment (see Section 4.1.3).
When replacing or disassembling the black head (board)	<ol style="list-style-type: none"> 1. Black head angle adjustment (see Section 4.1.4). 2. Black - Color head vertical adjustment (see Section 4.1.5). 3. Head gap adjustment (see Section 4.1.3). 4. Bi-D alignment adjustment (see Section 4.1.2).
When replacing or disassembling the color head (board)	<ol style="list-style-type: none"> 1. Color head angle adjustment (see Section 4.1.6). 2. Black - Color head vertical adjustment (see Section 4.1.5). 3. Head gap adjustment (see Section 4.1.3). 4. Bi-D alignment adjustment (see Section 4.1.2).
When replacing or disassembling both the color and black head	<ol style="list-style-type: none"> 1. Color head angle adjustment (see Section 4.1.6). 2. Black head angle adjustment (see Section 4.1.4). 3. Black - Color head vertical adjustment (see Section 4.1.5). 4. Head gap adjustment (see Section 4.1.3). 5. Bi-D alignment adjustment (see Section 4.1.2).
When replacing or disassembling the carriage unit	<ol style="list-style-type: none"> 1. Platen gap adjustment (see Section 4.1.7).

4.1.1 Destination Data Writing Operation

The setup value that specifies the printer destination is stored in the EEPROM on the C162 MAIN board. Therefore, this setup value must be written into the EEPROM when the MAIN board or EEPROM chip is replaced.

CAUTION

Before writing the destination data writing, set the interface to parallel.

1. Connect the PC to the target printer using a parallel interface cable and turn the printer on.
2. Execute BASIC on the PC, and run the program "VERxxx.BAS." You see the following menu.

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

3. When the main menu appears, choose "Destination Setting" by typing **1** and **Enter**.
4. The main menu immediately disappears briefly and then reappears. (At this time, specific destination parameters, including the destination, interface mode, TOF value, and economy/condensed, are automatically written to the EEPROM.)
5. Choose "END" by typing **7** and **ENTER**. The next message appears on the display.

All parameters that you have specified so far
are written to EEPROM upon power off.

Turn the printer OFF, Now!

6. Turn off the printer.

4.1.2 Bi-D (Bidirectional Printing) Alignment Adjustment

The bidirectional alignment is required when the printer mechanism, main board, or printhead (board) is replaced. Performing this adjustment determines a compensation value to rectify any deviation in the print position. This deviation could be caused by the different print speeds, which are due to tolerances in the mechanical components, or to differences in print timing between odd-numbered lines and even-numbered lines in bidirectional printing. The printer stores the compensation data in the EEPROM on the C162 MAIN board and refers to this data when performing bidirectional printing.

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

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

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

Input Bi-D value No. (-30= \leq No. \leq 30,If O.K, input [Y] key.)? _

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

When the sample print becomes vertically aligned for both lines, press **Y** and **ENTER**; this returns you to the main menu.
6. Choose "END" by typing **7** and **ENTER**. The next message appears on the display.

All parameters that you have specified so far
are written to EEPROM upon power off.

Turn the printer OFF, Now!

7. Turn off the printer.

4.1.3 Head Gap Adjustment (Black and Color Head)

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

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

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

3. When the main menu appears, choose "Head Gap Adjustment" by typing **4** and **ENTER**. (The printer prints a check pattern with a sample compensation value.)
4. The printer prints a sample like the one shown in Figure 4-1.
5. If the sample print is not vertically aligned for both odd-numbered lines (black lines) and even-numbered lines (magenta lines), enter a compensation value in the range from -16 to +16.
 - Positive compensation value: Shifts the 2nd line to the left
 - Negative compensation value: Shifts the 2nd line to the right
 When both the black and magenta lines are vertically aligned, press **Y** and **ENTER**; this returns you to the main menu.
6. Choose "END" by typing **7** and **ENTER**. The next message appears on the display.

All parameters that you have specified so far are written to EEPROM upon power off.

Turn the printer OFF, Now!

7. Turn off the printer.

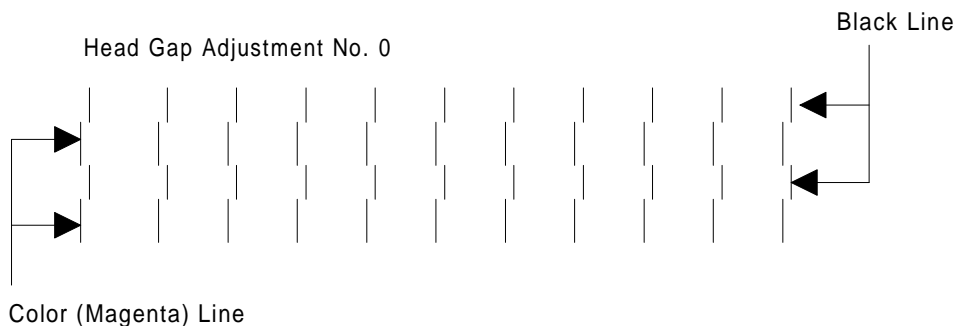


Figure 4-1. Head Gap Adjustment Sample

4.1.4 Black Head Angle Adjustment

The black head angle adjustment is required when the black head is replaced or disassembled. If this adjustment is not correct, 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.

The black head angle is adjusted with linear and angular spacers. A linear spacer is attached to both sides of the head base, and an angular spacer is attached only to the right side of the head base. Spacers for the black head come in different shapes for the thickness needed. The following figure shows the relationship between the shape and thickness.

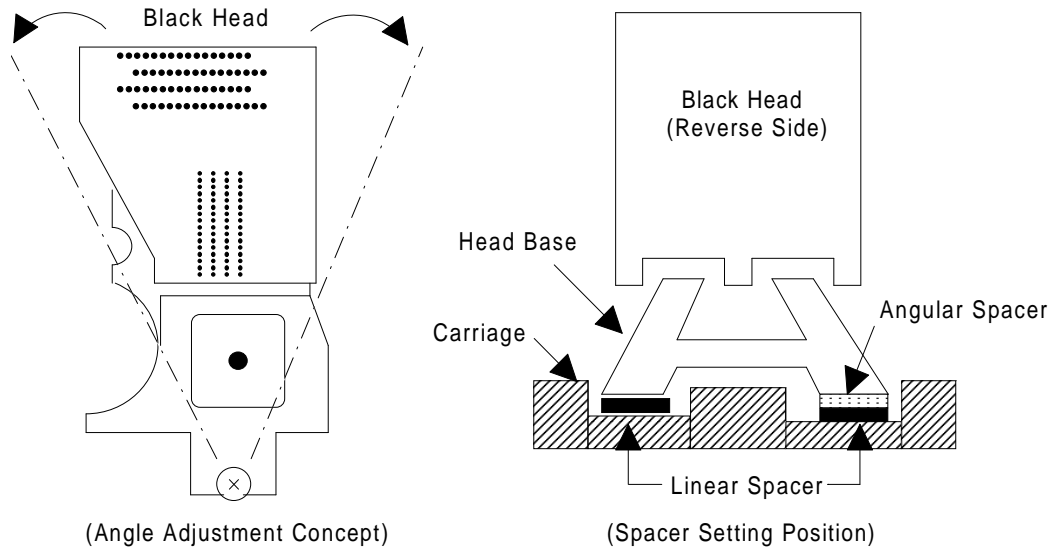


Figure 4-2. Black Head Angular and Linear Spacers

Angular Spacers (For Black Head)

Spacer Name	Thickness	Shape
angular spacer BK	0.05	
angular spacer BK:B	0.10	
angular spacer BK:C	0.15	
angular spacer BK:D	0.20	
angular spacer BK:E	0.25	

Linear Spacers (Only Use for Black Head)

Spacer Name	Thickness	Shape
linear spacer K	0.05	
linear spacer J	0.12	
linear spacer I	0.19	
linear spacer	0.26	
linear spacer B	0.33	
linear spacer C	0.40	
linear spacer D	0.47	
linear spacer E	0.54	
linear spacer F	0.61	
linear spacer G	0.68	
linear spacer H	0.75	

Figure 4-3. Types of Spacers and Relationship between Shape and Thickness

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

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

3. When the main menu appears, choose "Head Angle Confirmation Pattern Printing" by typing 2 and **ENTER**. (The printer prints the check pattern, along with the sample name.)

WARNING

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

4. The printer prints a pattern like one in the following sample. Only the nozzles in rows A and D are fired (making it is easy to see the angle of the black head).

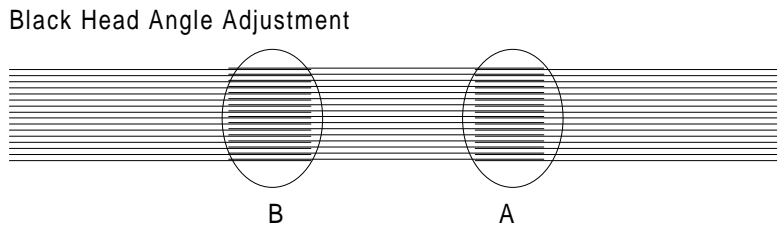


Figure 4-4. Black Head Angle Adjustment Sample

5. In the figure above, pay attention to position A. (Do not look at position B.)
6. Using the following flowchart, replace the angular spacer for the black head, which is under the right linear spacer. The procedure for this replacement is explained beginning with step 7.

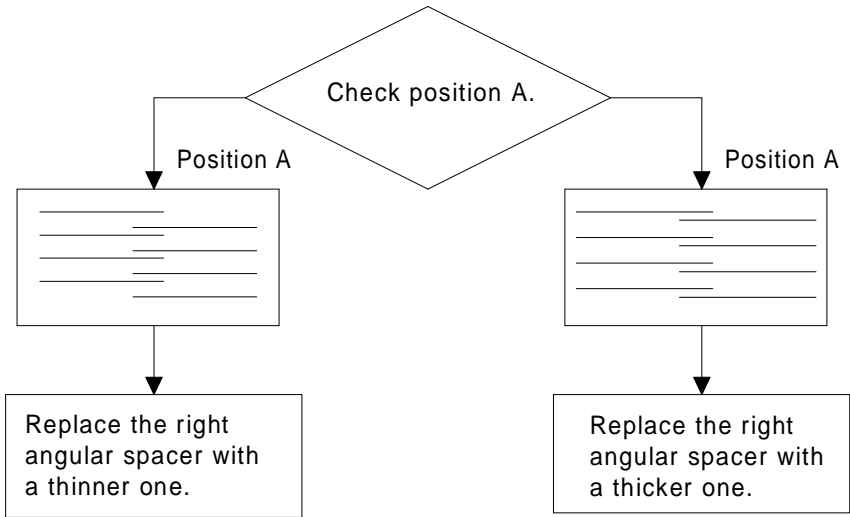


Figure 4-5. Spacer Selection

7. Turn the printer power off now.
8. Manually move the carriage to the center while pressing the carriage lock lever, and remove the two ink cartridges.
9. Remove the rubber cap covering the head screw at the side of color ink cartridge. Then loosen (but do not remove) 3 screws. (Refer to Figure 4-6.)

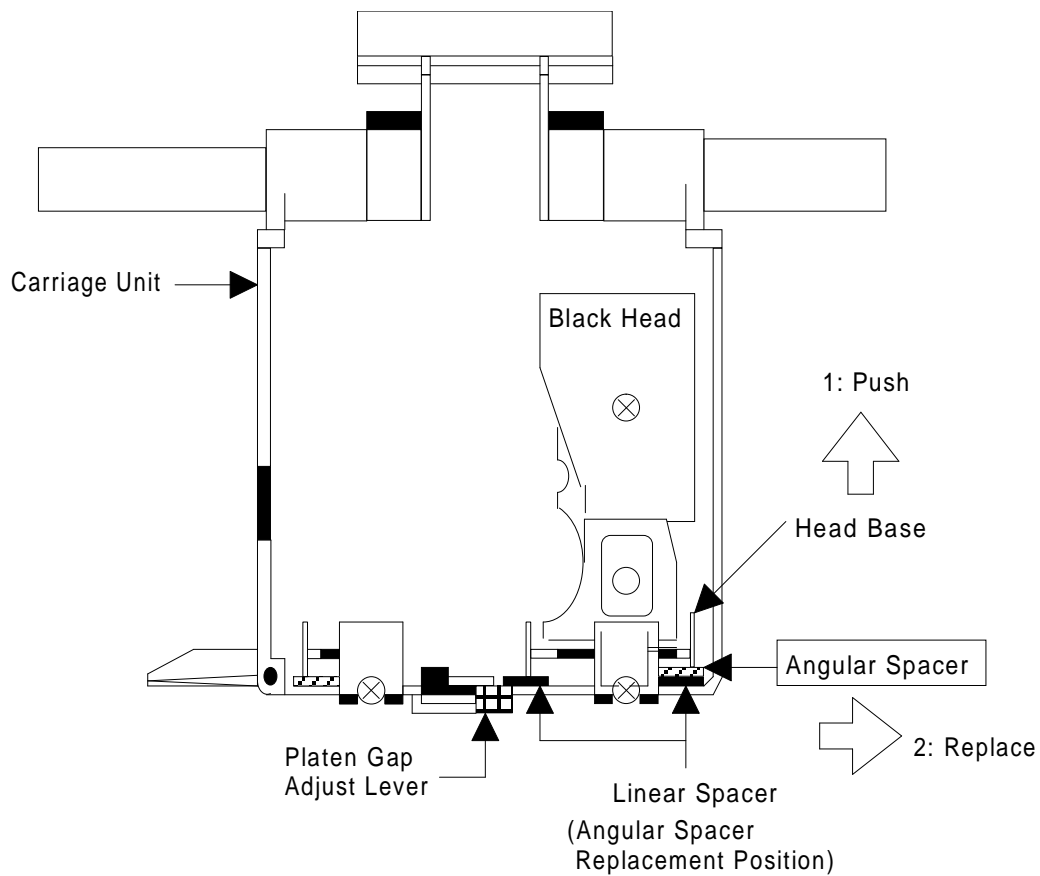


Figure 4-6. Removing the Rubber Cap

WARNING

After replacing the spacer, always install new ink cartridges before returning the printer to the user. During this adjustment, use ink cartridges exclusively for service (Monochrome: 1020626, CMY: 1020627). You can reuse old ink cartridges for other purposes.

10. Replace the angular spacer for the black head with a new one, referring Figure 4-7. (Replace the angular spacer by using tweezers to push the head base toward the rear.)

11. After replacing the angular spacer, reassemble the ink cartridge holder and reinstall the ink cartridges. Use the BASIC program to verify the angle of the black head. Confirm the angle by performing the steps 1 to 6 again, and if the angle is wrong, perform the adjustment again until the head angle is correct.

WARNING

- ❑ *The angular spacer comes in five thicknesses. Continue performing this adjustment, by changing the black head angle is correct.*
- ❑ *When inserting an angular spacer, always place the angular spacer on the linear spacer.*

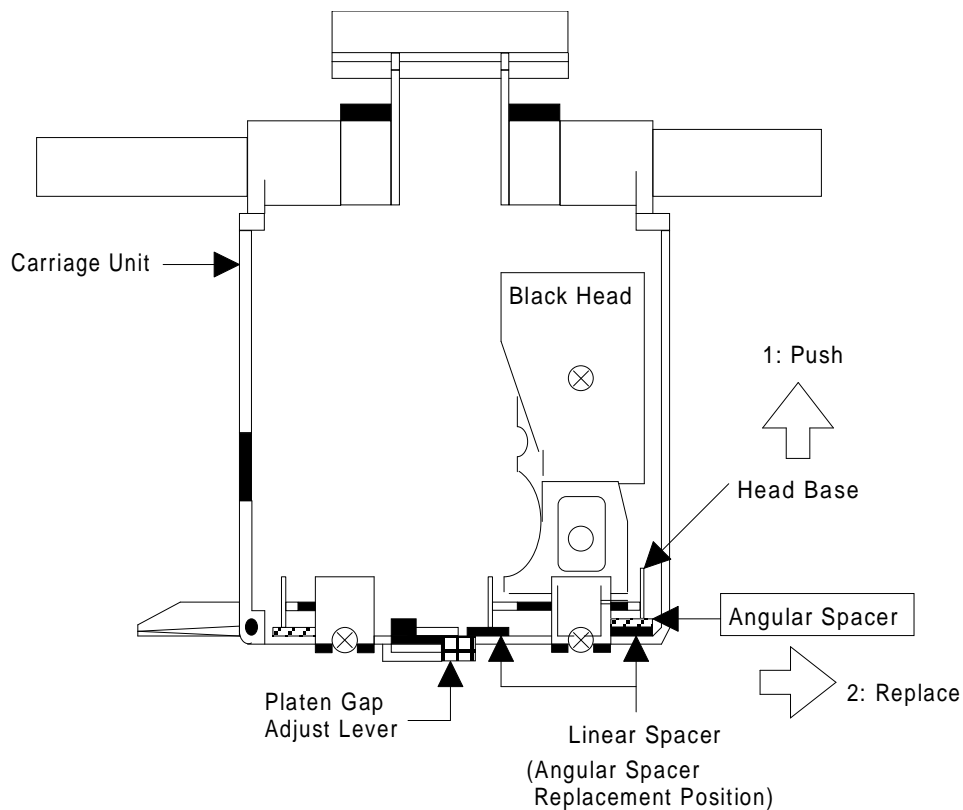


Figure 4-7. Angular Spacer Replacement Method

4.1.5 Black - Color Head Vertical Adjustment

This adjustment calibrates the vertical position between the black head and the color head. Align the top nozzles (both nozzle #1 on the black head and nozzle #1 on the color head). You can make this adjustment by using only the linear spacers for the black head. This adjustment is required when the black head or the color head is replaced or disassembled. The following figure illustrates this adjustment.

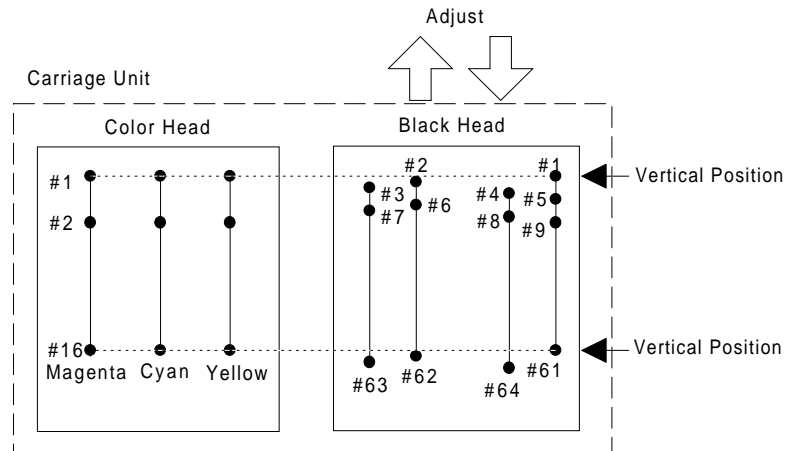


Figure 4-8. Black-Color Head Vertical Adjustment Concept

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

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

3. When the main menu appears, choose "Head Vertical Position Confirmation" by typing 3 and **ENTER**. (The printer prints the check pattern, along with the sample name.)

WARNING

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

2-3 BLACK HEAD SPACER SELECTION

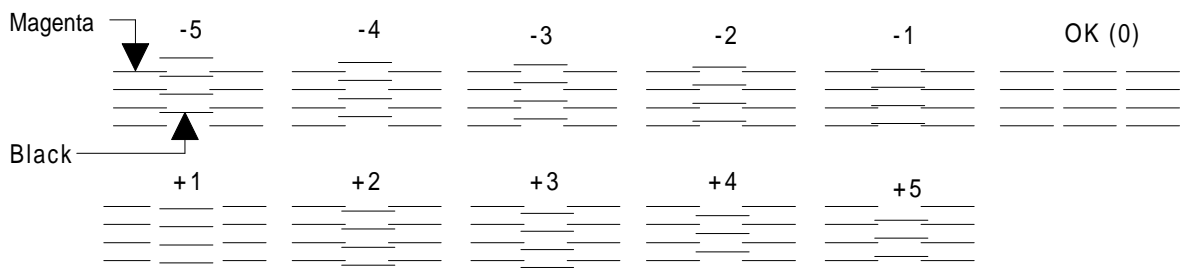


Figure 4-9. Linear Spacer Selection Sample

4. In Figure 4-10, the vertical position is correct when both the magenta line and the black line are aligned (as shown in position OK (0)). If the vertical position is correct, turn off the printer. If the black and magenta lines are not aligned, perform the vertical adjustment as described in steps 5-10.

WARNING

- ❑ *The number shown in the sample indicates the thickness level compared to the current linear spacer. (See *.) There are 11 linear spacers with 11 different thicknesses.*
- ❑ *The linear spacer is attached by two pieces, one on each side of the head base. Therefore, when you need to replace one linear spacer, always replace both linear spacers at the same time.*
- ❑ *When replacing the linear spacer, place it under the angular spacer.*

- * If necessary, replace the linear spacer. For instance, if your pattern is similar to the pattern shown under -2, replace the linear spacer with a thinner linear spacer. If your pattern is similar to the pattern shown under 2, replace the linear spacer with a thicker spacer.
5. Turn the printer off.
 6. Move the carriage to the center while pressing the carriage lock lever, and remove the two ink cartridges.

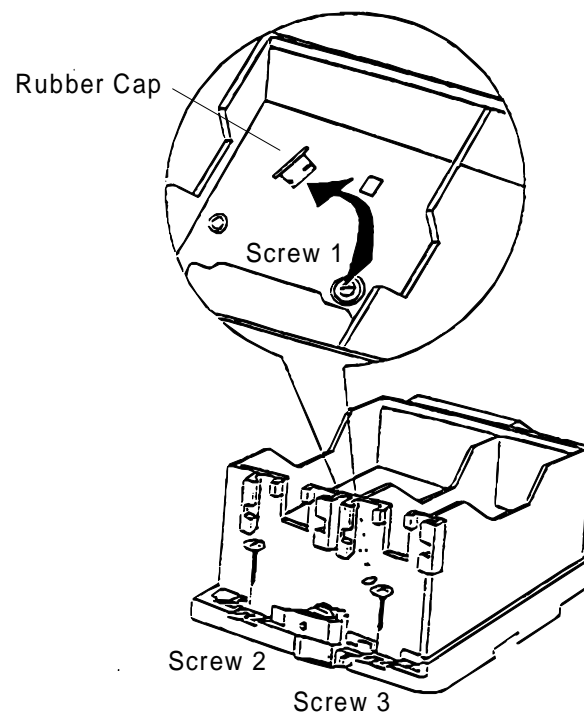


Figure 4-10. Removing the Rubber Cap

7. Remove the rubber cap that covering a head screw at the side of color ink cartridge and then loosen (but do not remove) 3 screws. (Refer to the figure below.)

WARNING

After replacing the spacer, always install new ink cartridges before returning the printer to the user. During adjustment, use the ink cartridges exclusively for service (Monochrome: 1020626, CMY: 1020627). You can reuse the old ink cartridges for other purposes.

8. Change the linear spacers (2 spacers for the monochrome head only) with new ones, referring the figure below. (Replace linear spacers using tweezers to push the head base toward the rear.)

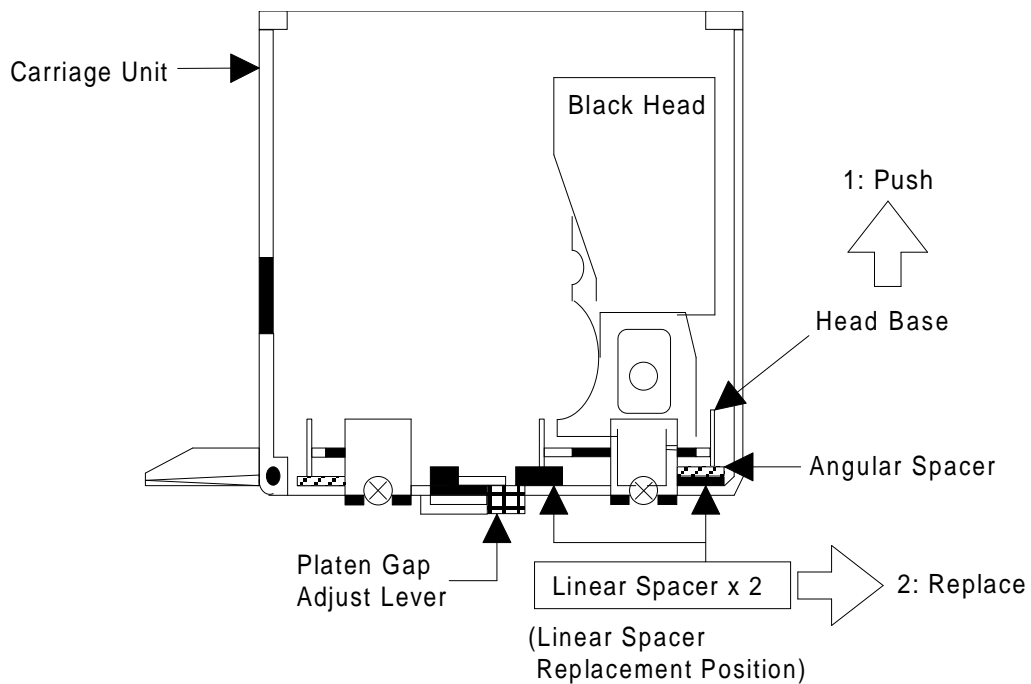


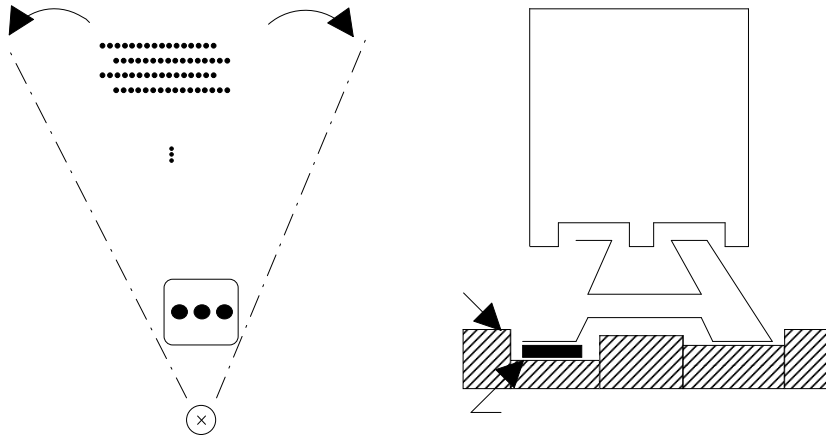
Figure 4-11. Linear Spacer Replacement Method

9. Rerun the BASIC program, and choose the "Head Vertical Position Confirmation" by typing **3** and **ENTER**; then confirm that the sample print is correct. If the sample is incorrect, change the thickness of the linear spacer and perform this adjustment again until the two black and magenta lines are aligned at the position "OK (0)."
10. When you complete this adjustment, exit the BASIC program and turn off the printer.

4.1.6 Color Head Angle Adjustment

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

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



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

<ol style="list-style-type: none">1. Destination Setting2. Head Angle Confirmation Pattern Printing (Black Head Spacer Selection)3. Head Vertical Position Confirmation4. Head Gap Adjustment5. Bi-D Adjustment6. Internal Timer Reset7. END
--

3. When the main menu appears, choose "Head Angle Confirmation Pattern Printing" by typing 2 and **ENTER**. (The printer prints the check pattern with the sample name.)

WARNING

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

Angular spacers for the color head come in five thicknesses, each having its own shape. The following figure shows the relationship between the shape and thickness. Since the color head is not equipped with a linear spacer, the angle adjustment is decided only by the angular spacer (specifically designed for the color head), which is placed under the left side of the head base.

Angular Spacer (for Color Head)






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

Figure 4-14. Relationship between the Shape and Thickness

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

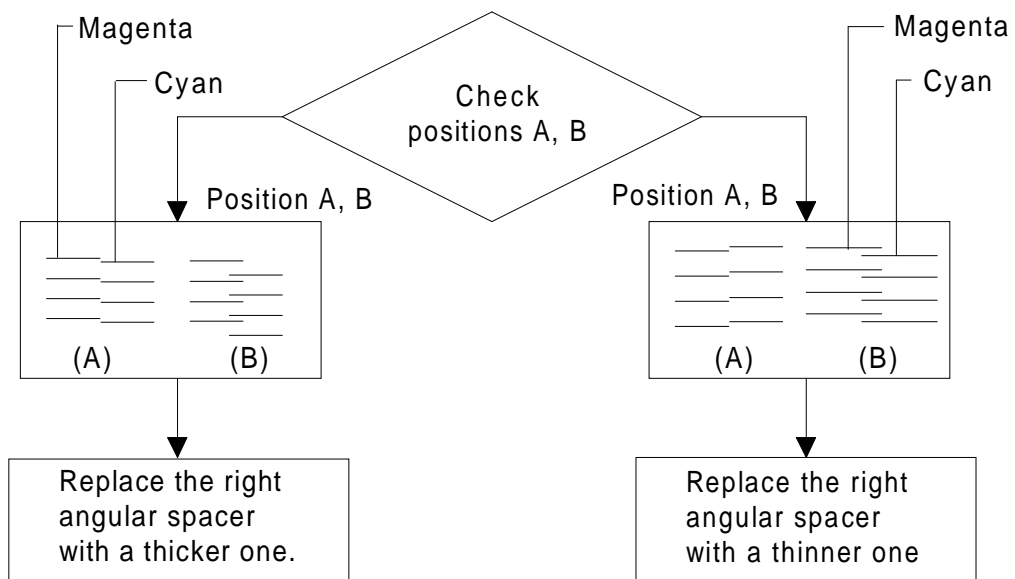


Figure 4-15. Spacer Selection

- Turn off the printer now.
- Move the carriage to the center manually, and loosen (but do not remove) the screw securing the color head to the carriage.

7.

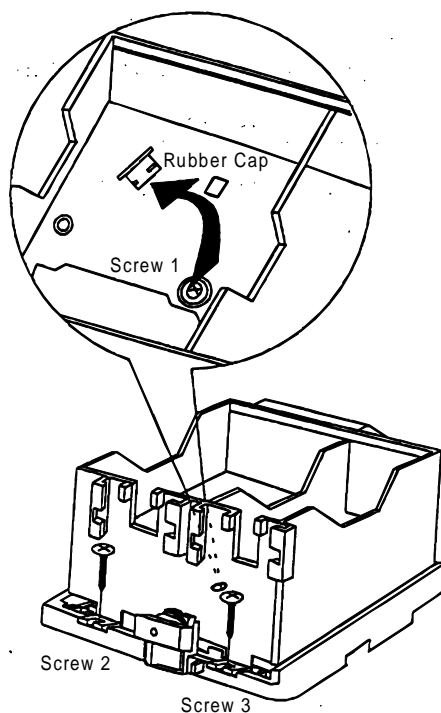


Figure 4-16. Removing the Rubber Cap

Remove the rubber cap covering the head screw at one side of color ink cartridge. Then loosen (but do not remove) 3 screws. (Refer to the figure below.)

8. Replace the angular spacer on the left side with a new one, referring the figure below. (Replace the angular spacer using tweezers to push the head base toward the rear.)

9. Rerun the BASIC program and choose "Head Angle Confirmation Pattern" again by typing 2 and **ENTER**. Then verify that the confirmation sample is correct.

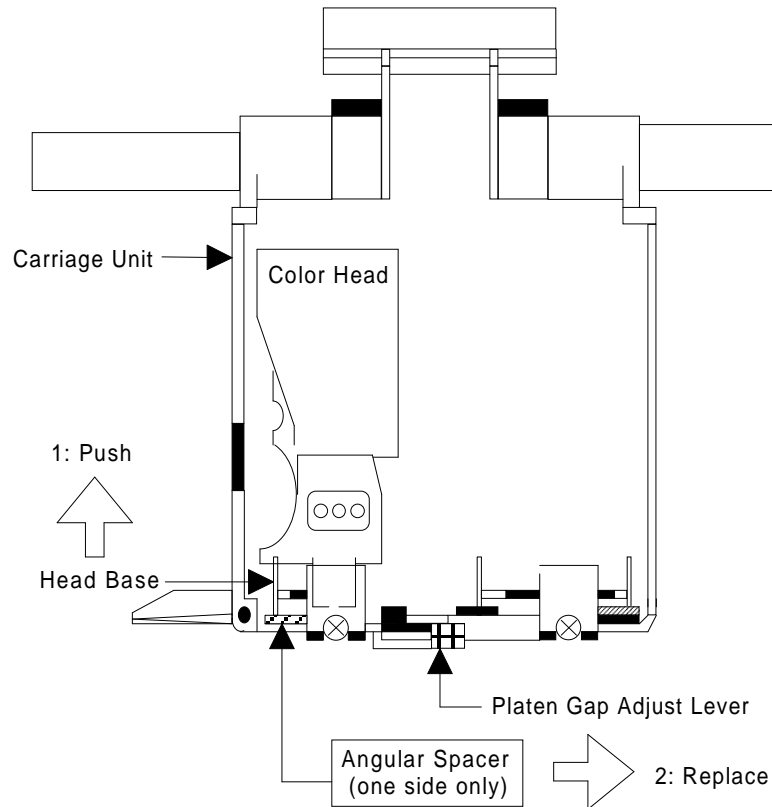


Figure 4-17. YMC Angular Spacer Replacement

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

4.1.7 Platen Gap Adjustment

This adjustment is required when the carriage unit is replaced or removed from the printer mechanism. Adjust the distance between the printhead nose and the paper surface to 1.1 mm.

1. Attach a thickness gauge (commercially available) to the left side adjustment position on the paper guide plate, as shown in the figure below, so that one side hooks the paper feed pinch roller unit.
2. Move the carriage unit manually onto the thickness gauge.

Table 4-2. Gap and Adjustment Direction

Gap between Head Nose and Gauge Surface	Left Bushing	Right Bushing
Narrow	CW	CCW
Spread	CCW	CW

3. Rotate the parallelism adjustment bushing, attached to the left and right ends of the carriage guide shaft, when the black and color printheads contact the thickness gauge.
4. After attaching the printheads to the gauge surface, verify that the gap between the carriage roller and the front frame is less than 0.04 mm. (See Figure 4-16.)
5. Attach the 1.1 mm thickness gauge to the right side adjustment position on the paper guide plate, as shown below, so that one side hooks the paper feed pinch roller unit.

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

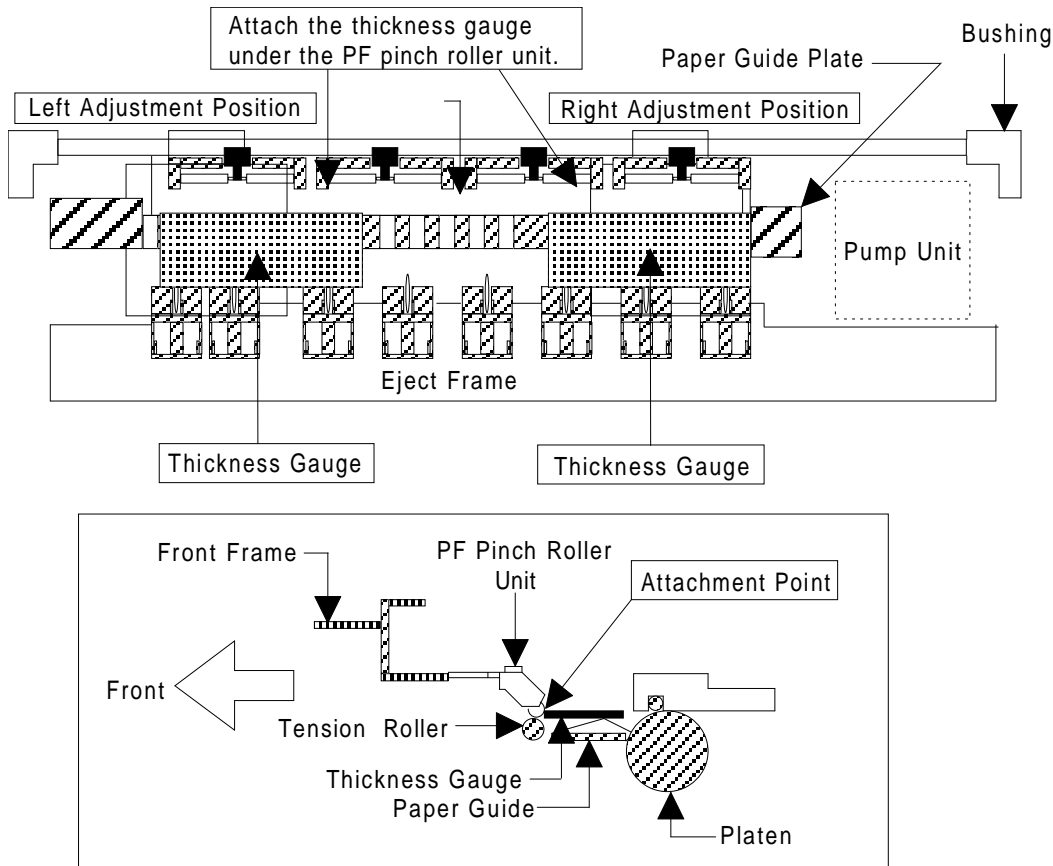


Figure 4-18. Adjusting the Platen Gap

6. Move the carriage manually to the right adjustment position and repeat steps 3 and 4, referring to Figures 4-18 and 4-19.

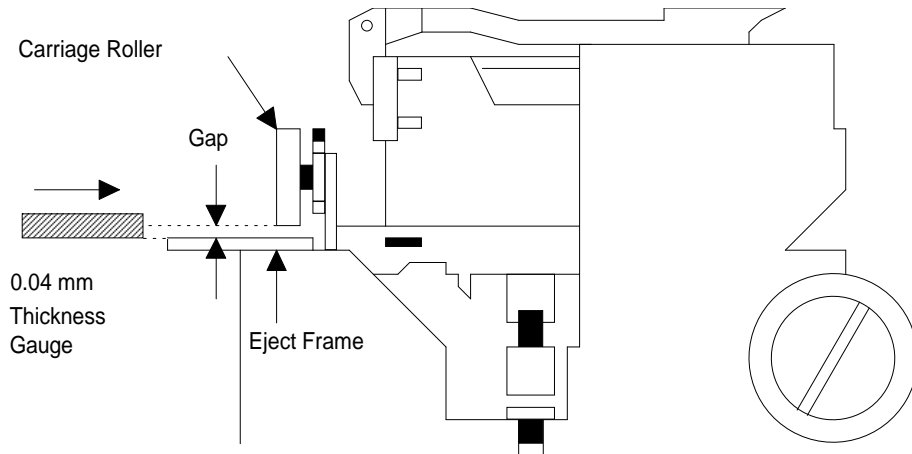


Figure 4-19. Confirming the Gap

4.1.8 Internal Timer Reset Operation

This operation is required when the M-4A60 printer mechanism is replaced. There are 6 timers in this printer:

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

When the printer mechanism is replaced, reset the timers as described here:

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

<ol style="list-style-type: none"> 1. Destination Setting 2. Head Angle Confirmation Pattern Printing (Black Head Spacer Selection) 3. Head Vertical Position Confirmation 4. Head Gap Adjustment 5. Bi-D Adjustment 6. Internal Timer Reset 7. END
--

3. When the main menu appears, choose "Internal timer reset" by typing **6** and **ENTER**. This resets the internal timer. The following message then appears.

<p>All parameters of the internal timer are now reset. Press Y and ENTER to return to the main menu.</p>
--

4. Press **Y** and **ENTER**.
5. Press **7** and **ENTER**.
6. Turn off the printer.

Chapter 5 Troubleshooting

Table of Contents

5.1 OVERVIEW	5-1
5.2 UNIT LEVEL TROUBLESHOOTING	5-3
5.2.1 Printer Does Not Operate at Power on	5-4
5.2.2 Error is Detected	5-5
5.2.3 Failure Occurs During Printing	5-6
5.2.4 Printer Does Not Feed the Paper Correctly	5-7
5.2.5 Control Panel Operation is Abnormal	5-8
5.3 UNIT REPAIR - C137 PSB/PSE BOARD	5-9
5.4 UNIT REPAIR - C164 MAIN BOARD	5-10
5.5 UNIT REPAIR - PRINTER MECHANISM (M-4A11)	5-12

LIST OF FIGURES

Figure 5-1. Troubleshooting Process Flowchart	5-1
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LIST OF TABLES

Table 5-1. Motor Coil Resistance Test Points	5-1
Table 5-2. Sensor Status	5-1
Table 5-3. Sensor Test Points	5-2
Table 5-4. Error Codes	5-2
Table 5-5. Symptoms and Problems	5-3
Table 5-6. Repair of the C137 PSB/PSE	5-9
Table 5-7. Repair of the C164 MAIN	5-10
Table 5-8. Repair of the Printer Mechanism	5-12

5.1 OVERVIEW

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

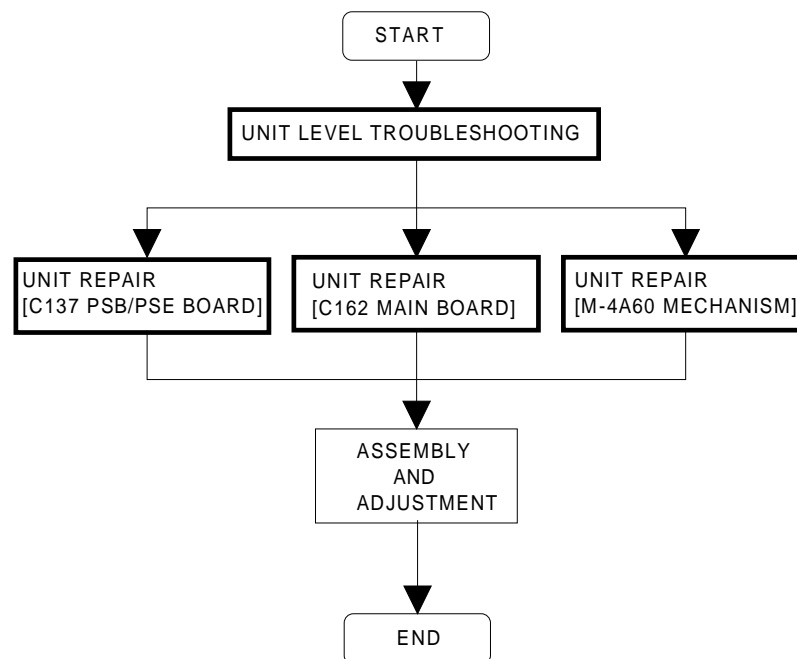


Figure 5-1. Troubleshooting Process Flowchart

Table 5-1. Motor Resistances

Motor	Resistance Range	Temperature
CR Motor	10.0Ω ± 10%	At 25 °C (77 °F)
PF Motor	11.5Ω ± 10%	At 25 °C (77 °F)

Table 5-2. Sensor Status

Sensor	Point	Signal Level	Status
PE Sensor	CN8 Pin 1 (PE) to Pin 2 (GND)	H (5 V)	Paper exists
		L (GND)	No paper (paper end)
BCO Sensor	CN11 Pin 8 (BCO) to Pin 7 (GND)	L (GND)	Black cartridge exists
		H (5 V)	No black cartridge
CCO Sensor	CN12 Pin 8 (CCO) to Pin 7 (GND)	L (GND)	Color cartridge exists
		H (5 V)	No color cartridge
HP Sensor	CN9 Pin 3 (HPV) to Pin 2 (GND)	L	At home position (HP)
		H	Out of HP
TH Sensor	CN10 Pin 10 (SW0-5) to Pin 1 (GND)	Analog data	Change the pulse width of the charge pulse for the common driver circuit

Table 5-3. Error Codes

Error Status	LED						Recovery
	Data	Paper Out	No Ink Cartridge	Economy	Condensed	Pause	
Paper out		On				On	Load paper in the tray, press Load/Eject, and then the Pause button.
No ink cartridge			On			On	Install the new ink cartridge and press the Pause button.
Paper jam		Blinks					Load paper and press Pause and Load/Eject buttons.
Maintenance request	Blinks	Blinks	Blinks	Blinks	Blinks	Blinks	Service maintenance request. (Change the waste ink drain tank and reset the counter.)
Carriage error	Blinks					Blinks	Turn off the printer and turn it on again.

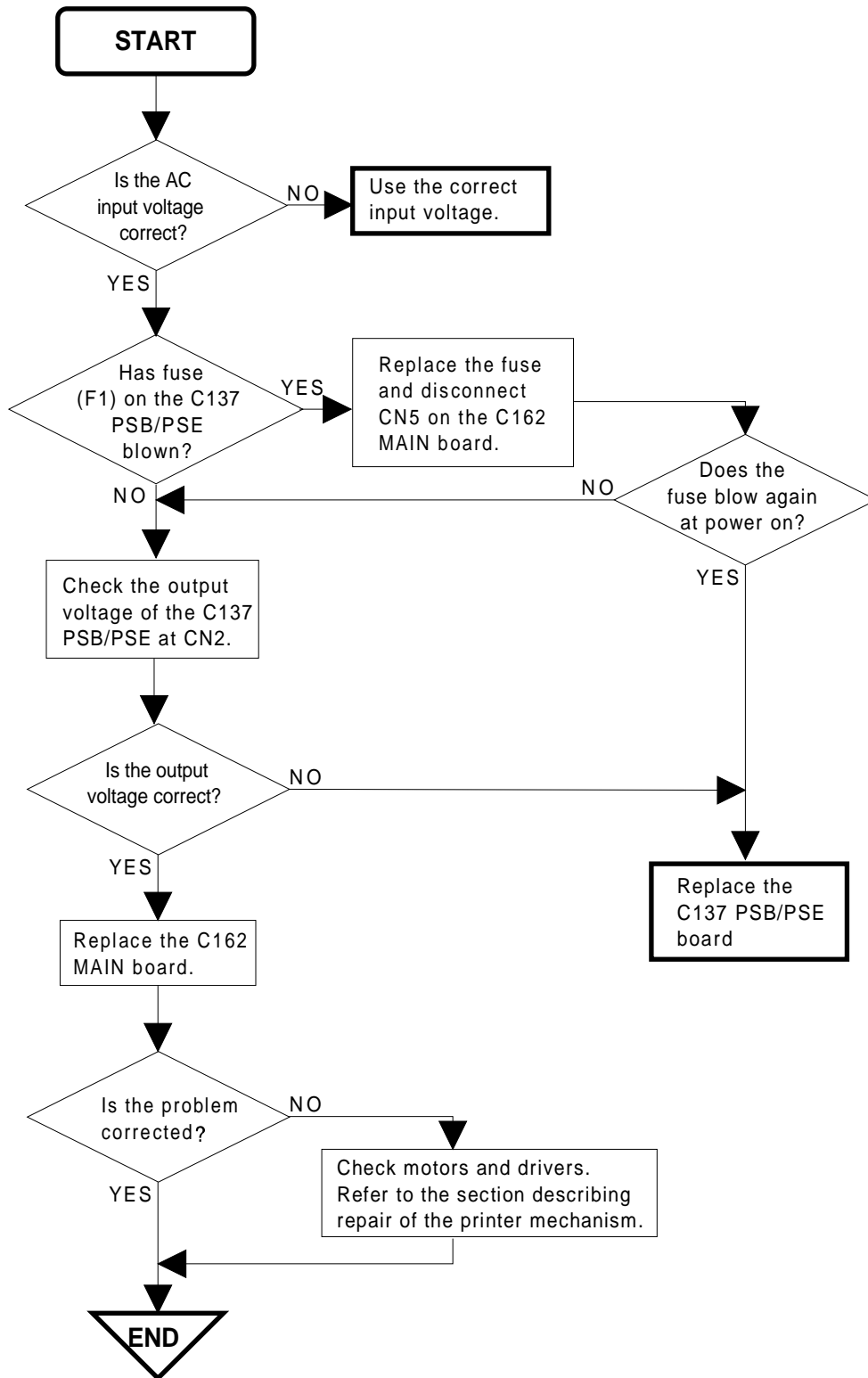
5.2 UNIT LEVEL TROUBLESHOOTING

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

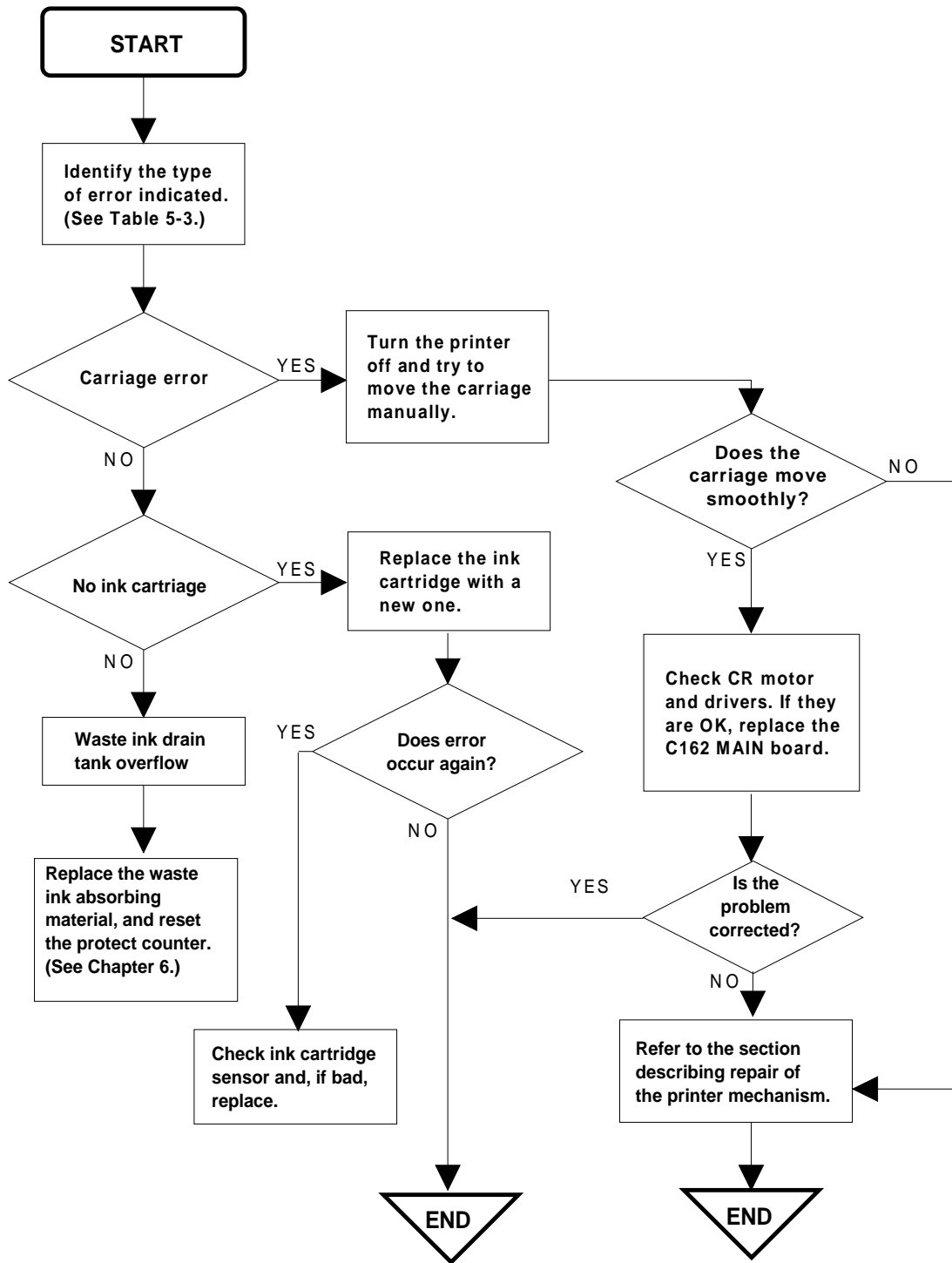
Table 5-4. Symptom and Problem

Symptom	Problem	Flowchart No.
Printer does not operate at power on	<input type="checkbox"/> LEDs do not light up. <input type="checkbox"/> Printer mechanism does not operate.	5.2.1
Error is detected	<input type="checkbox"/> Error is indicated by LED indication.	5.2.2
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	5.2.3
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.	5.2.4
Control panel operation is abnormal	<input type="checkbox"/> No response to button access.	5.2.5

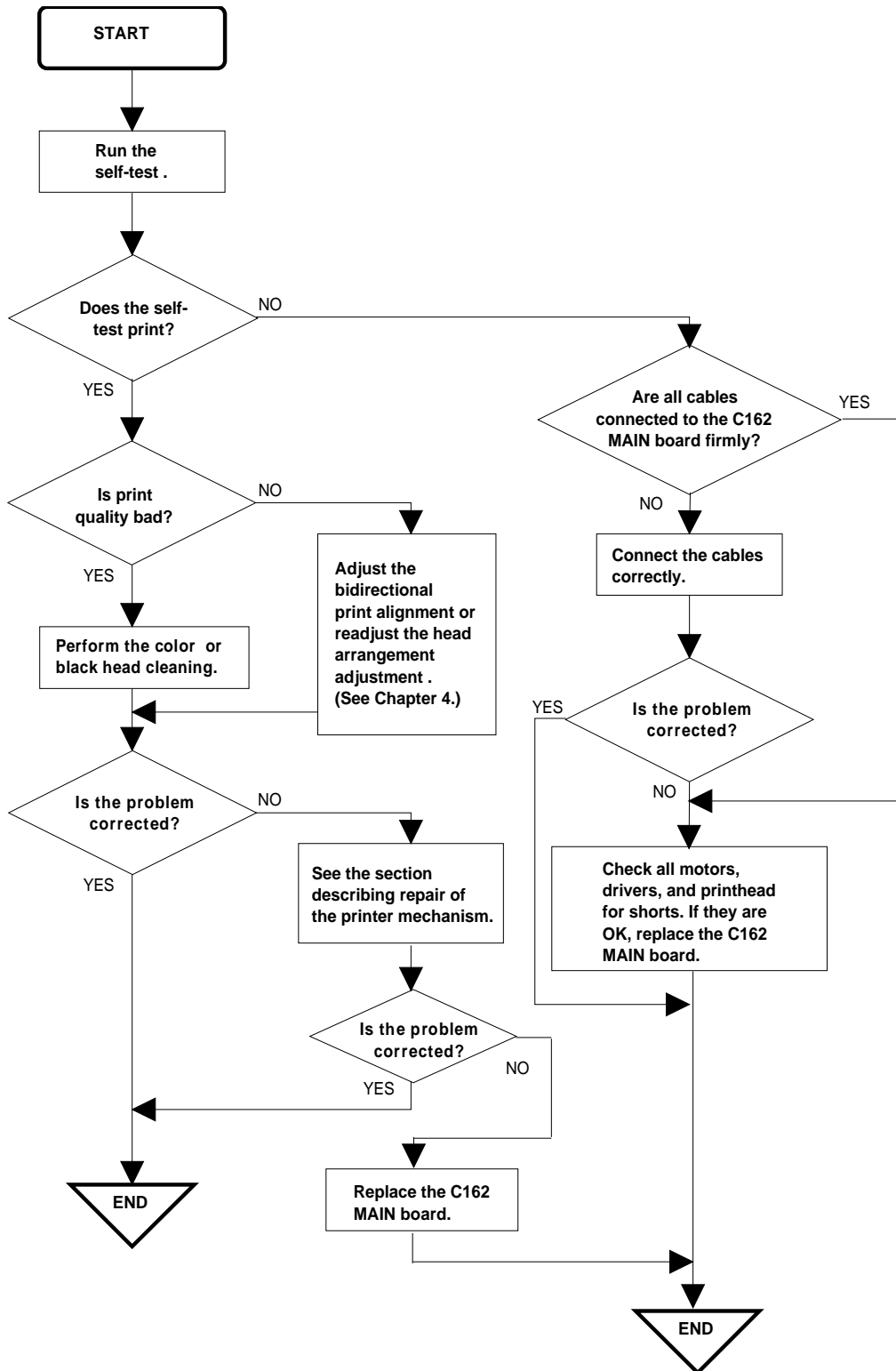
5.2.1 Printer does not operate at power on.



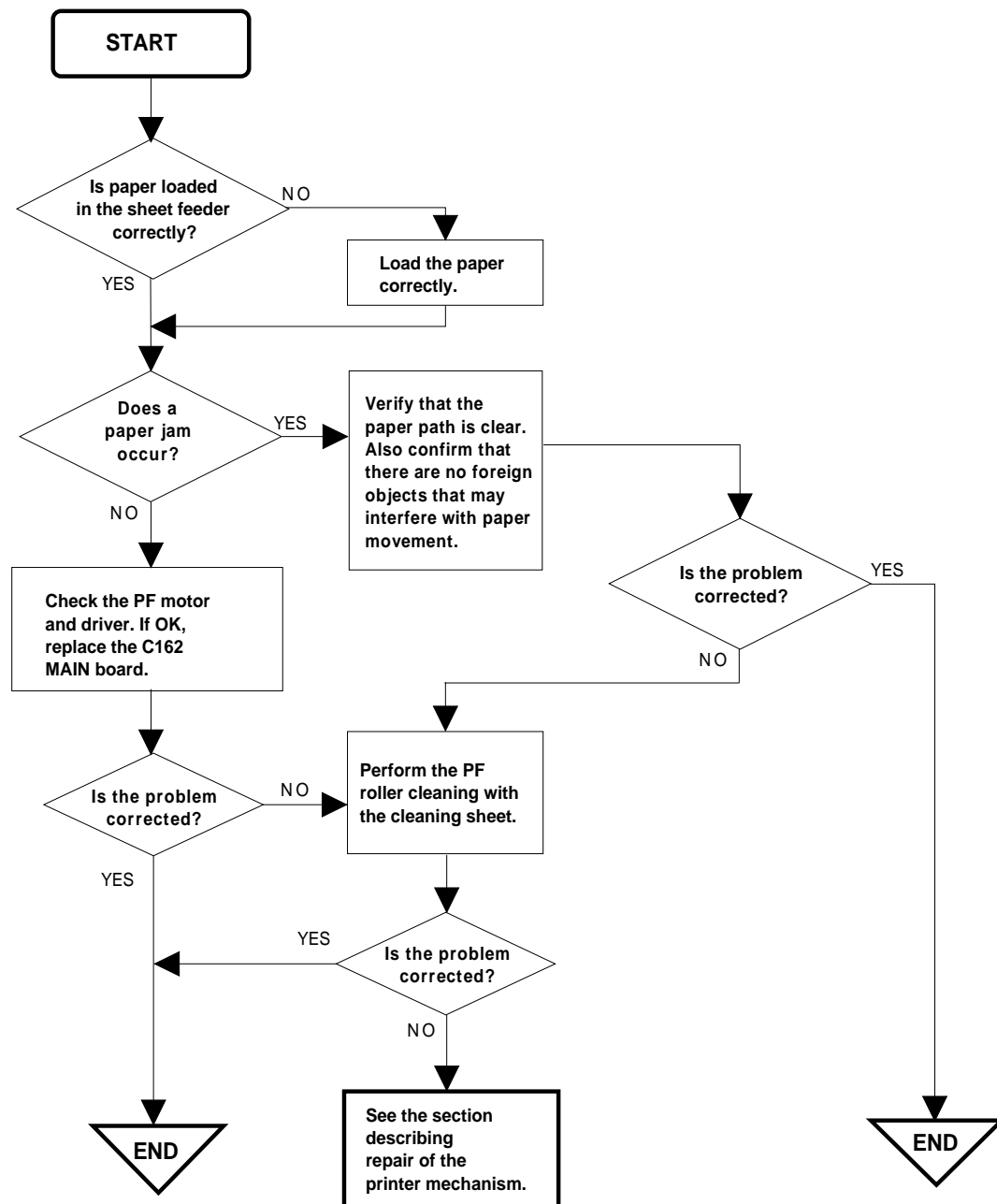
5.2.2 Error is detected.



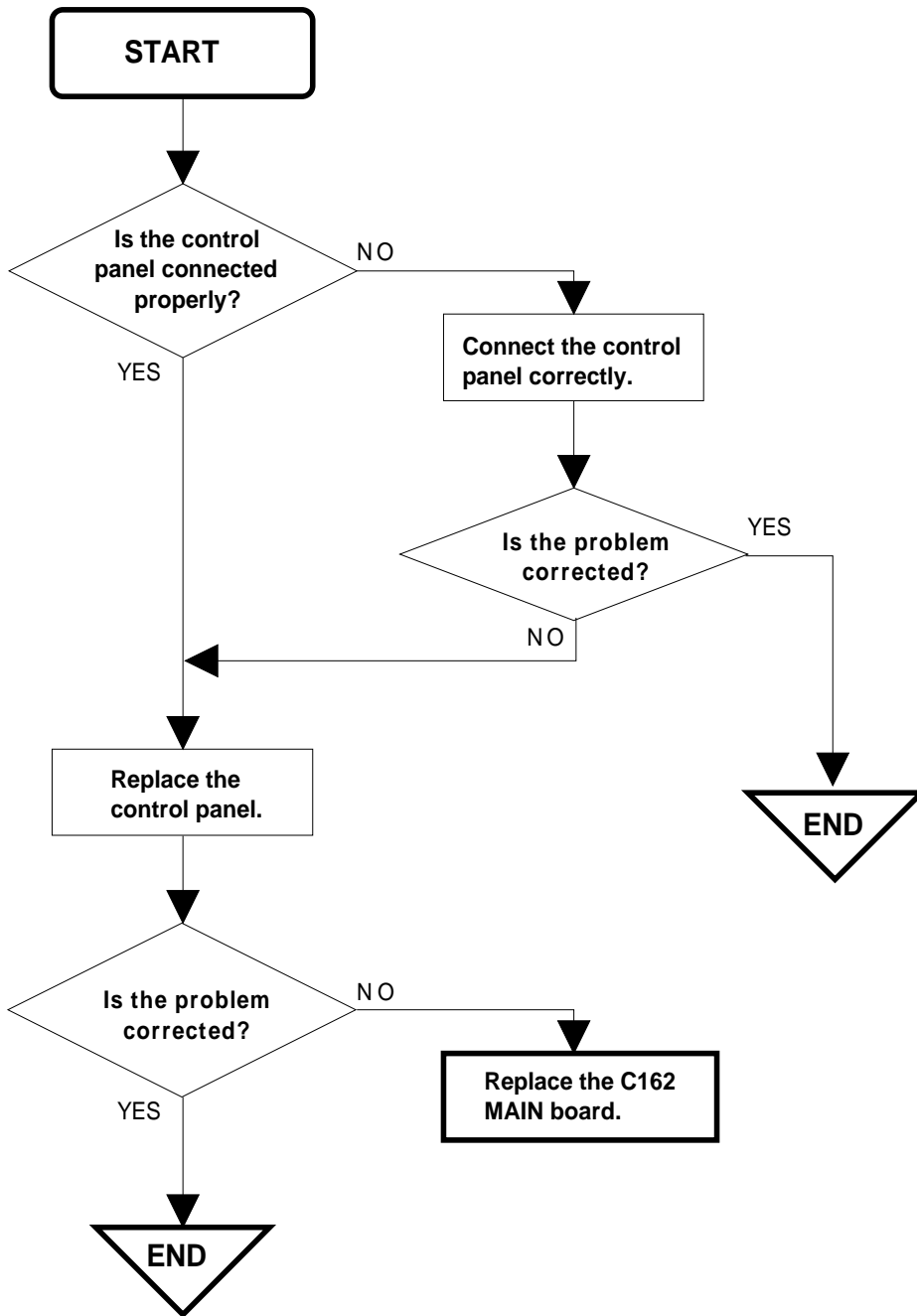
5.2.3 Failure occurs during printing.



5.2.4 Printer does not feed the paper correctly.



5.2.5 Control panel operation is abnormal.



5.3 UNIT REPAIR - C137 PSB/PSE BOARD

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

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

Symptom	Condition	Cause	Checkpoint	Solution
The printer does not operate at all.	+35 V line is dead.	Transformer coils are open.	Check the transformer coils using a multimeter.	Replace T1.
		Switching FET (Q1).	Check the waveform at the drain of Q1.	Replace Q1.
	+35 V line is abnormal.	ZD52, Q83, or PC1 is dead.	Check the voltage level of the collector side. The correct voltage is as follows: Power Switch Off = +1.8 VDC Power Switch On = 0 VDC	Replace ZD52, Q82, or PC1.
	+5 V line is dead.	+35 V line is dead.	Check the +35 V line.	Replace IC51.
IC51 is dead.		Check the oscillation waveform and switching waveform of IC51. Oscillation waveform (IC51, pin 5) Switching waveform (IC51, pin 8)		
Auto capping operation is invalid.	+35 V line is invalid when power is off.	IC81 is dead.	Turn off the printer and check the voltage at pin 1 of IC81. <input type="checkbox"/> Normal voltage = 0 VDC	Replace IC81.
		C82 is dead or R88 is short.	Turn off the printer and check the voltage at plus side of C82. <input type="checkbox"/> Normal voltage = 2.5 VDC <input type="checkbox"/> R88 resistance = 100 ohms	Replace C82 or R88.

5.4 UNIT REPAIR - C162 MAIN BOARD

This section describes the problems related to the main controller board (C162 MAIN). The table below provides various symptoms, likely causes, and checkpoints. The checkpoints refer to waveforms, resistance, and other values to be checked to evaluate the operation of each component

Table 5-6. Repair of the C162 MAIN

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

Table 5-6. Repair of the C162 MAIN (Cont.)

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

5.5 UNIT REPAIR - PRINTER MECHANISM (M-4A60)

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

Table 5-7. Repair of the Printer Mechanism

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

Table 5-8. Repair of the Printer Mechanism (Continued)

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

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

Symptom	Condition	Cause	Checkpoint	Solution
Paper is not fed normally.	Paper is not fed.	Foreign substances are lodged in the paper path.	Visually check the paper path.	Remove any foreign substances.
		Paper feeding gears are defective.	Visually check the gears.	Replace defective gears.
		The paper feed motor is defective.	Measure the coil resistance of the PF motor.	Replace the PF motor.
	Paper top of form position slips (comes out too narrow).	Particles of power residue from coating on glossy paper are sticking to the PF roller.	Check that particles of the power residue from the coating on glossy paper are not sticking to the PF roller.	Perform the PF roller cleaning with the cleaning sheet (See Note)

★ **Note:** Cleaning sheets are available as service parts.

Chapter 6 Maintenance

Table of Contents

6.1 PREVENTIVE MAINTENANCE	6-1
6.2 SERVICE MAINTENANCE	6-2
6.2.1 Printhead Cleaning	6-2
6.2.2 Waste Ink Drain Tank Replacement	6-2
6.3 LUBRICATION AND ADHESIVE	6-3

LIST OF FIGURES

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

LIST OF TABLES

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

6.1 PREVENTIVE MAINTENANCE

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

Outer case

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

Auto sheet feeder

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

Inside the printer

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

WARNING

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

CAUTION

- Do not use a hard or abrasive brush for cleaning.*
- Be careful not to damage the components of the printer when using a vacuum cleaner.*
- A lithium battery is installed on the C164 MAIN board of this printer. Be sure to observe the following instructions when servicing the printer or storing the after-service parts:*
- 1. Keep the battery away from any metal or other batteries so that electrodes of opposite polarity do not come in contact with each other.*
 - 2. Do not heat the battery and place it near fire.*
 - 3. Do not solder on any part of the battery. (Doing so may result in leakage of electrolyte from the battery, burning, or 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

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

6.2.1 Printhead Cleaning

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

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

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

6.2.2 Waste Ink Drain Tank Replacement

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

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

6.3 LUBRICATION AND ADHESIVES

The printer must be lubricated properly when it is disassembled for component replacement, or if mechanical noise exceeds a certain level. EPSON recommends only the lubricants listed in the table below for this printer, both of which have been tested extensively and comply with the requirements of this printer mechanism. Figure 6-1 shows the lubrication and adhesive points.

Table 6-1. Recommended Lubricants

Type	Name	Quantity	Part No.	Availability
Oil	O-5	40 cc	1010513	E
Grease	G-20	40 gm	B700000001	E
	G-36	40 gm	B703600001	E
Adhesive	Neji Lock #2 (G)	1000 g	B730200200	E

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

Table 6-2. Lubrication and Adhesive Points

Ref. No.	Lubrication/Adhesive Point	Lubricant
1	The teeth of gear 60	G-36 (1-3 mg)
2	The teeth of combination gear 10, 50	G-36 (1-3 mg)
3	End point of shaft securing sub frame assembly	G-36 (1-3 mg)
4	Cutout for the CR motor in the base frame assembly (2 points)	G-36 (1-3 mg)
5	Shaft located in the center frame assembly	G-36 (1-3 mg)
6	Shaft located in the center frame assembly	G-36 (1-3 mg)
7	Surface of the eject roller assembly	
8	Contact surface of the right side of the front paper guide and the eject roller assembly	G-36 (1-3 mg)
9	Right end point of the eject roller assembly	G-20 (1-3 mg)
10	Contact surfaces of the shaft and combination gear 13.5, 22 and the combination gear holder on the sub frame assembly	G-36 (1-3 mg)
11	The teeth of gear 22.5	G-36 (1-3 mg)
12	The teeth of combination gear 28, 17.5	
14	End points of the pump speed-up shaft (both sides)	G-36 (1-3 mg)
16	Cut point for knob on the right main frame	G-36 (1-3 mg)
17	Contact points of gear 60, the platen roller shaft, and the PF cap spring.	G-36 (1-3 mg)
18	2 points on the combination gear holder.	G-36 (1-3 mg)
19	Oil pad on the carriage	O5 (1-3 mg)
20	Contact surface of gear 25 and the plain washer	G-36 (1-3 mg)
21	Contact surface of the platen shaft bushing and plain washer	G-36 (1-3 mg)
22	Cutout in the platen roller shaft	G-20 (1-3 mg)
27	Contact point of the pressure spring and washer	G-36 (1-3 mg)
28	Combination gear 13.5, 22	G-36 (1-3 mg)
30	The teeth of gear 24	G-36 (1-3 mg)
(1)	Angular spacer for the black head and the cartridge base	Neji Lock #2 (1-3 mg)
(2)	Angular spacers for the color head and the cartridge base	Neji Lock #2 (1-3 mg)
(3)	The screw and washer attaching the ink cartridge holder to the carriage base.	Neji Lock #2 (1-3 mg)

CAUTION

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

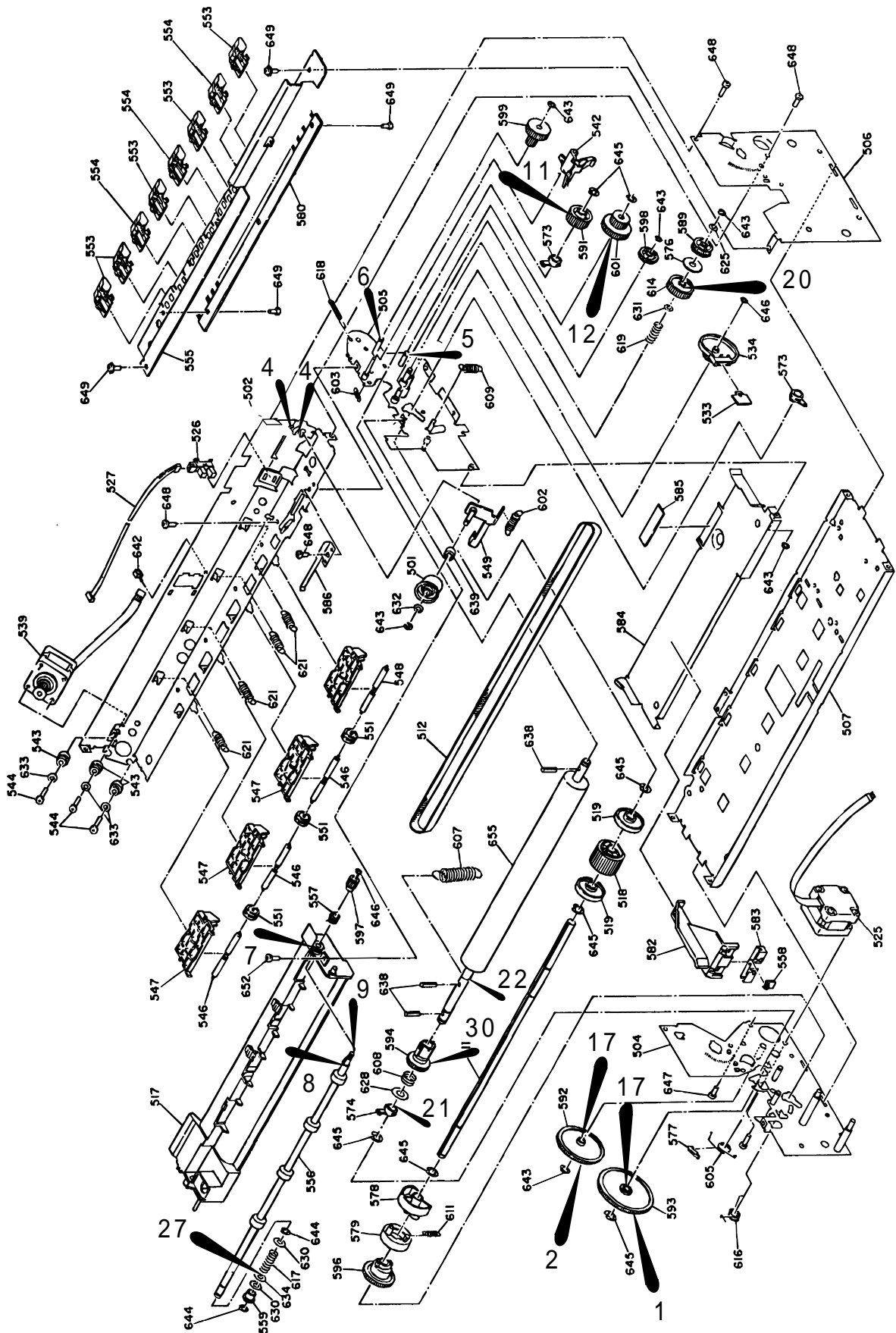


Figure 6-1. Lubrication Points and Adhesive Points (1)

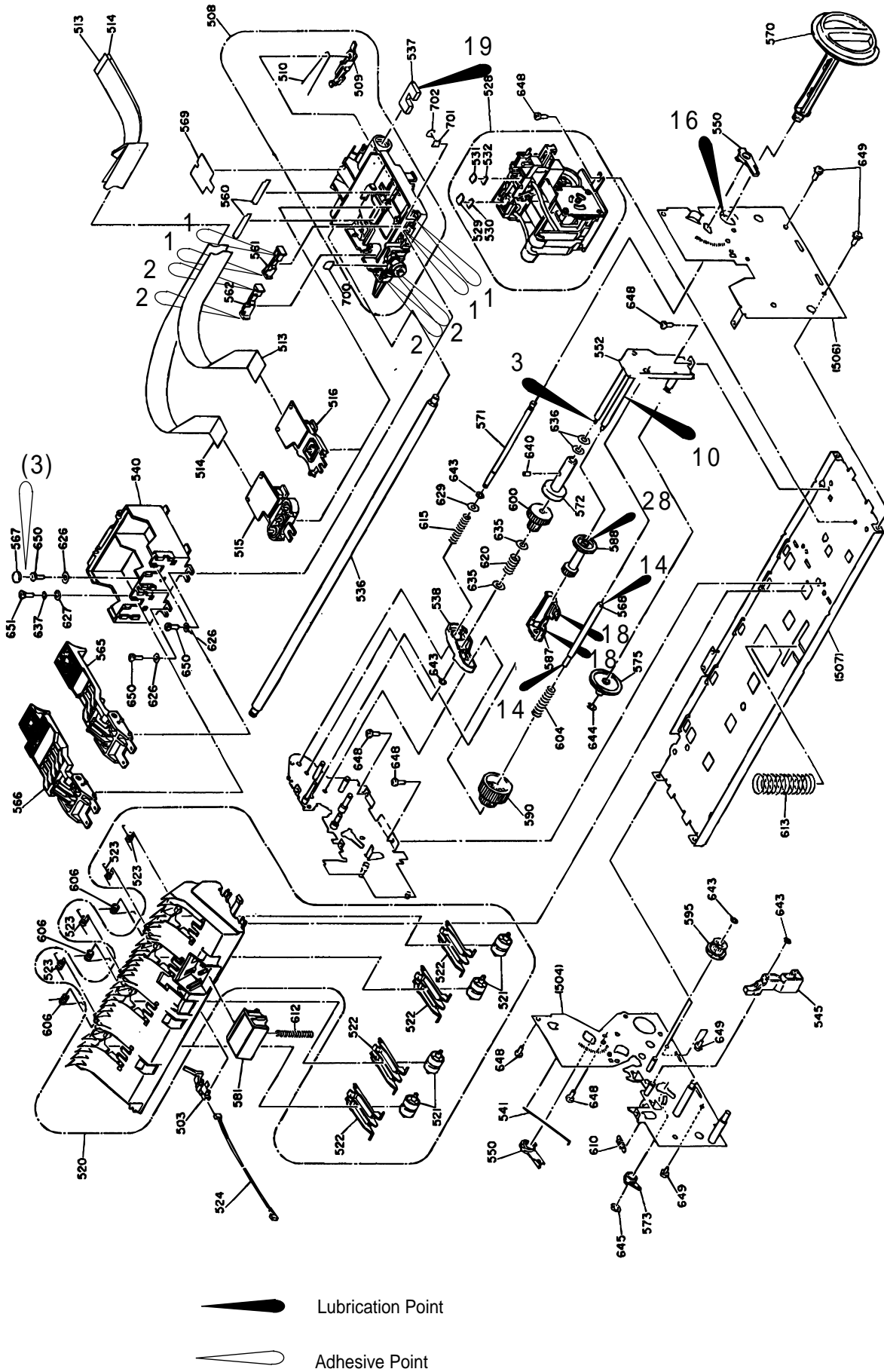


Figure 6-2. Lubrication Points and Adhesive Points (2)

Appendix

Table of Contents

A.1 CONNECTOR SUMMARY	A-1
A.2 CIRCUIT DIAGRAM	A-7
A.3 CIRCUIT BOARD COMPONENT LAYOUT	A-14
A.4 EXPLODED DIAGRAM	A-18

List of Figures

Figure A-1. Interconnection of Major Component	A-1
Figure A-2. C162 MAIN Board Circuit Diagram (1)	A-7
Figure A-3. C162 MAIN Board Circuit Diagram (2)	A-9
Figure A-4. C137 PSB Board CircuitDiagram	A-11
Figure A-5. C137 PSE Board CircuitDiagram	A-12
Figure A-6. C137 PNL Board CircuitDiagram	A-13
Figure A-7. C162 MAIN Board Component Layout (1)	A-14
Figure A-8. C162 MAIN Board Component Layout (2)	A-15
Figure A-9. C137 PSB Board Component Layout.	A-16
Figure A-10. C137 PSE Board Component Layout.	A-16
Figure A-11. C137 PNL Board Component Layout.	A-17
Figure A-12. Exploded Diagram for Stylus Pro XL (1)	A-18
Figure A-13. Exploded Diagram for Stylus Pro XL (2)	A-19
Figure A-14. Exploded Diagram for Stylus Pro XL (3)	A-20

List of Table

Table A-1. Connector Summay	A-2
Table A-2. Connector Pin Assignments - CN1	A-2
Table A-3. Connector Pin Assignments - CN2	A-3
Table A-4. Connector Pin Assignments - CN3	A-3
Table A-5. Connector Pin Assignments - CN5	A-3
Table A-6. Connector Pin Assignments - CN6	A-4
Table A-7. Connector Pin Assignments - CN7	A-4
Table A-8. Connector Pin Assignments - CN8	A-4
Table A-9. Connector Pin Assignments - CN9	A-4
Table A-10. Connector Pin Assignments - CN10	A-4
Table A-11. Connector Pin Assignments - CN11	A-5
Table A-12. Connector Pin Assignments - CN12	A-5
Table A-13. Connector Pin Assignments - CN13	A-5
Table A-14. Part No. Reference Table	A-21

A.1 CONNECTOR SUMMARY

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

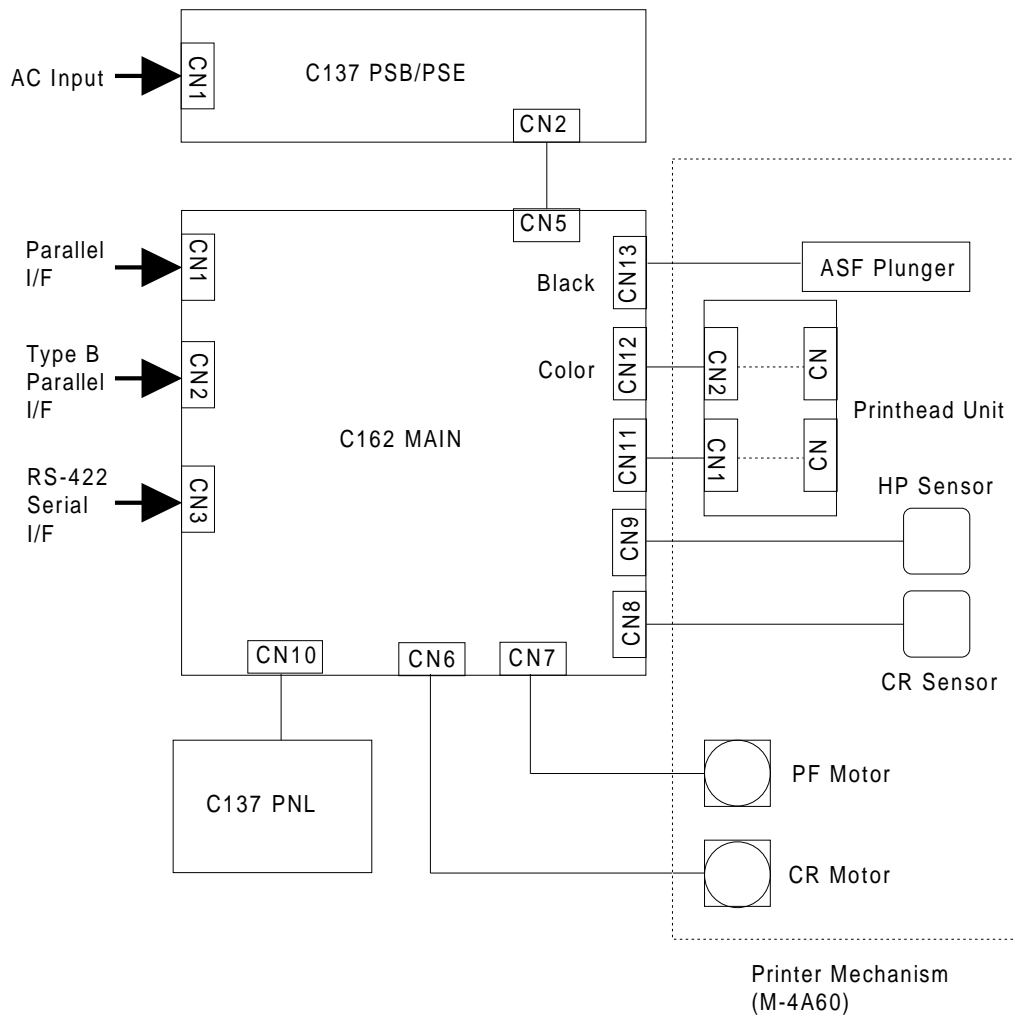


Figure A-1. Interconnection of Major Components

Table A-1. Connector Summary

Board	Location	Pin	Description
C162 MAIN	CN1	36	Centronics parallel I/F
	CN2	36	Type B parallel I/F
	CN3	8	RS-422 serial I/F
	CN4	—	There is no connector CN4
	CN5	6	Power supply from PS board
	CN6	5	Carriage motor phase output
	CN7	5	PF/PM motor phase output
	CN8	2	Paper end sensor
	CN9	3	Carriage home position sensor
	CN10	20	Control panel (to C137 PNL)
	CN11	22	Black head nozzle selector and common driver
	CN12	22	Color head nozzle selector and common driver
	CN13	2	ASF plunger
C137 PSB/PSE	CN1	2	AC inlet (L/N)
	CN2	8	DC output (+5 V / +35 V)
C137 PNL	CN1	20	(to C162 MAIN)

Table A-2. Connector Pin Assignments — CN1

Pin	I/O	Name	Description
1	I	$\overline{\text{STB}}$	Strobe signal
2-9	I	DATA1-8	Data strobe signal
10	O	$\overline{\text{ACK}}$	ACK signal
11	O	BUSY	Busy signal
12	O	PE	Paper end signal
13	O	SLCT	Printer select signal
14	I	$\overline{\text{AFXT}}$	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	$\overline{\text{INIT}}$	INIT signal
32	O	$\overline{\text{ERR}}$	Error signal
33	—	GND	Ground
34	—	NC	Not connected
35	—	+5 V	+5 VDC
36	I	$\overline{\text{SLIN}}$	Select in signal

Table A-3. Connector Pin Assignments — CN2

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

Table A-4. Connector Pin Assignments — CN3

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

There is no connector CN4.

Table A-5. Connector Pin Assignments — CN5

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

Table A-6. Connector Pin Assignments — CN6

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

Table A-7. Connector Pin Assignments — CN7

Pin	I/O	Name	Description
1	O	PFA	Phase A drive signal
2	O	PFA \bar{A}	Phase \bar{A} drive signal
3	O	PFB	Phase B drive signal
4	O	PFB \bar{B}	Phase \bar{B} drive signal
5	O	PFCOM	Carriage drive power (common voltage)

Table A-8. Connector Pin Assignments — CN8

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

Table A-9. 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-10. Connector Pin Assignments — CN10

Pin	I/O	Name	Description
1, 3, 5, 7	—	GND	Ground
2	O	LDATA	LED data
4	O	LCLK	Clock signal for LED drive
6	O	LLAT	LED data latch signal
8	O	LCLR	LED data reset signal
9, 11, 19, 20	I	+5 V	LED driver and power
10, 12-16	I	SW0-5	Switch 0-5 input signal
17	I	PSW	Power switch
18	I	PSC	Power scan

Table A-11. Connector Pin Assignments — CN11

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

Table A-12. Connector Pin Assignments — CN12

Pin	I/O	Name	Description
1	—	GND	Ground
2	○	CCLK	Clock signal for color head
3	—	GND	Ground
4	○	CLAT	Latch signal for color head
5	—	GND	Ground
6	○	CSI	Color head serial data output
7	—	GND	Ground
8	○	CCO	Color cartridge out sensor
9		+5 V	Power supply for cartridge out sensor
10		TH	Thermistor signal
11-16	○	GP	Ground
18-22	○	COM	Common voltage for printhead drive

Table A-13. Connector Pin Assignments — CN13

Pin	I/O	Name	Description
1		+35 V	Power supply for ASF plunger
2		PL	Paper loading signal

Table A-14. Part No. Reference Table

Ref.No.	Description	PPL Name
100	LOWER HOUSING	HOUSING, LOWER
101	FOOT	FOOT
102	LOWER SHIELD PLATE	SHIELD PLATE, LOWER
103	UPPER SHIELD PLATE	SHIELD PLATE, UPPER
104	P/S SHIELD PLATE	SHIELD PLATE, P/S
105	GROUNDING PLATE	GROUNDING PLATE
106	PAPER SUPPORT COVER B	COVER, PAPER SUPPORT; B
107	UPPER HOUSING	HOUSING, UPPER
108	REAR PRINTER COVER	COVER, PRINTER, REAR
109	PAPER SUPPORT	PAPER SUPPORT, ASSY.
110	EDGE GUIDE	EDGE GUIDE
111	GROUNDING PLATE D	GROUNDING PLATE; D
112	PAPER SUPPORT SUPPORT PLATE	SUPPORT PLATE, PAPER SUPPORT
115	LOGO PLATE B	LOGO PLATE; B
117	PS EARTH PLATE	EARTH PLATE, PS
118	I/F GROUNDING PLATE	GROUNDING PLATE, I/F
119	I/F BOARD GUIDE	GUIDE, I/F BOARD
120	UPPER CONNECTOR COVER	COVER, CONNECTOR, UPPER
121	CLAMP	CLAMP
122	CBB SCREW (M3×12)	C.B.B. SCREW (M3×12)
123	CBS-TITE SCREW (M3×12)	C.B.S.-TITE SCREW (M3×12)
124	CBS SCREW M3×8 F/UC	C.B.S. SCREW M3×8, F/UC
125	CB(O) SCREW (M4×8)	C.B.(O) SCREW (M4×8)
126	HEXAGON NUT (M4)	HEXAGON NUT (M4)
127	CB USCA 3×6 F/ZN	C.B. USCA, 3×6, F/ZN
128	CB SCREW 4×14 F/ZN	C.B. SCREW, 4×14, F/ZN
129	CBB SCREW (M3×10)	C.B.B. SCREW (M3×10)
130	INK EJECT POROUS PAD	POROUS PAD, INKEJECT
131	FRONT PRINTER COVER	COVER, PRINTER, FRONT
132	PAPER SUPPORT COVER	COVER, PAPER SUPPORT
133	EDGE GUIDE SLIDER	SLIDER, EDGE GUIDE
134	SUB EDGE GUIDE	EDGE GUIDE, SUB
135	GROUNDING PLATE E	GROUNDING PLATE; E
136	GROUNDING PLATE F	GROUNDING PLATE; F
137	I/F UPPER GROUNDING PLATE	GROUNDING PLATE, I/F, UPPER
138	CBB SCREW (M4×12)	C.B.B. SCREW (M4×12)
139	GROUNDING PLATE B	GROUNDING PLATE; B

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

Ref.No.	Description	PPL Name
200	MAIN BOARD (FOR USA, S.E. ASIA)	BOARD ASSY., MAIN (FOR USA, S.E. ASIA)
200	MAIN BOARD (FOR EUROPE)	BOARD ASSY., MAIN (FOR EUROPE)
300	POWER SUPPLY BOARD (FOR 120 V)	BOARD ASSY., POWER SUPPLY (FOR 120V)
300	POWER SUPPLY BOARD (FOR 220 V / 240 V)	BOARD ASSY., POWER SUPPLY (FOR 220V/240V)
330	HARNESS	HARNESS
400	POWER CABLE (VD31303SA-10A) (230 V)	POWER CABLE (VD31303SA-10A) (230V)
401	POWER CABLE (VD31303SA-10A) (240 V)	POWER CABLE (BS31303SA-SR-10A) (240V)
402	AC CABLE (240 V)	AC CABLE (240V)
403	POWER CABLE (VD00303SA-10A) (220 V)	POWER CABLE (VD00303SA-10A) (220V)
403	POWER CABLE (220 V)	POWER CABLE (220V)
410	POWER CABLE	POWER CABLE ASSY.
411	POWER CABLE (100 V)	POWER CABLE ASSY. (100V)
412	HARNESS (220 V / 240 V AC INLET)	HARNESS (220V / 240V AC INLET)
450	PANEL BOARD	BOARD ASSY., PANEL
500	PRINTER MECHANISM (M-4A60)	PRINTER MECHANISM (M-4A60)
501	DRIVEN PULLEY	PULLEY, DRIVEN
502	BASE FRAME	FRAME ASSY., BASE
503	PE DETECTOR (0 V, 0 A, 0 W)	DETECTOR, PE (0V, 0A, 0W,)
504	LEFT FRAME	FRAME ASSY., LEFT
505	MIDDLE FRAME	FRAME ASSY., MIDDLE
506	RIGHT MAIN FRAME	FRAME, MAIN, RIGHT
507	BOTTOM MAIN FRAME	FRAME, MAIN, BOTTOM
508	CARRIAGE B	CARRIAGE ASSY.; B
509	GEAR CHANGE LEVER	LEVER, CHANGE, GEAR
510	SUPPORT CHANGE LEVER	LEVER, CHANGE, SUPPORT
511	PAPER LOAD SHAFT	SHAFT, PAPER LOAD
512	TIMING BELT	TIMINGBELT
513	BK HEAD CABLE	CABLE, HEAD, BK
514	YMC HEAD CABLE	CABLE, HEAD, YMC
515	PRINT HEAD, IJ48-0CA (COLOR)	PRINT HEAD, IJ48-0CA (COLOR)
516	PRINT HEAD, IJ64-0AA (BLACK)	PRINT HEAD, IJ64-0AA (BLACK)
517	FRONT APER GUIDE	PAPER GUIDE , FRONT
518	PAPER LOADING ROLLER	ROLLER ASSY., PAPER LOAD
519	PAPER LOADING ROLLER SUPPORT	ROLLER, PAPER LOAD, SUPPORT

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

Ref.No.	Description	PPL Name
520	REAR PAPER GUIDE	PAPER GUIDE ASSY., REAR
521	PF ROLLER SUPPORT	ROLLER, PF, SUPPORT
522	PF HOLDER SUPPORT	HOLDER, PF, SUPPORT
523	TORSION SPRING, 5800	TORORSION SPRING, 5800
524	PE HARNESS	HARNESS, PE
525	PF STEPPING MOTOR	STEPPING MOTOR, PF
526	HP DETECTOR	DETECTOR, HP
527	HP HARNESS	HARNESS, HP
528	PUMP B	PUMP ASSY.; B
529	UPPER YMC CAP POROUS PAD	POROUS PAD, CAP, YMC, UPPER
530	LOWER YMC CAP POROUS PAD	POROUS PAD, CAP, YMC, LOWER
531	UPPER BK CAP POROUS PAD	POROUS PAD, CAP, BK, UPPER
532	LOWER BK CAP POROUS PAD	POROUS PAD, CAP, BK, LOWER
533	ASP HEAD CLEANER	CLEANER, HEAD, ASP
534	CLEANER LEVER	LEVER, CLEANER
535	DRIVEN ROLLER HOLDER C	HOLDER, ROLLER, DRIVEN; C
536	CR GUIDE SHAFT	SHAFT, CR, GUIDE
537	OIL PAD	OIL PAD
538	KNOB LEVER	LEVER, KNOB
539	CR STEPPING MOTOR (.4.0 VDC, 0.4 A)	STEPPING MOTOR, CR (DC.4.0V,0.4A)
540	CR COVER B	COVER ASSY., CR; B
541	CR GUIDE GROUNDING SPRING	GROUNDING SPRING, CR, GUIDE
542	CR STOPPER LEVER	LEVER, CR, STOPPER
543	CR DAMPER	DAMPER, CR
544	CR DAMPER SHAFT B	SHAFT, DAMPER, CR; B
545	PAPER LOAD LEVER	LEVER, PAPER LOAD
546	DRIVEN ROLLER	ROLLER, DRIVEN
547	DRIVEN ROLLER HOLDER	HOLDER, ROLLER, DRIVEN
548	DRIVEN ROLLER C	ROLLER, DRIVEN; C
549	DRIVEN PULLEY LEVER	LEVER ASSY., PULLEY, DRIVEN
550	PARALLEL ADJUST BUSHING	BUSHING, PARALLEL, ADJUST
551	DRIVEN ROLLER SUPPORT	ROLLER, DRIVEN, SUPPORT
552	SUB FRAME	FRAME ASSY., SUB
553	PAPER EJECT HOLDER	HOLDER ASSY., PAPER EJECT
554	PAPER EJECT HOLDER, B	HOLDER ASSY., PAPER EJECT; B
555	PAPER EJECT FRAME	FRAME, PAPER EJECT
556	PAPER EJECT ROLLER	ROLLER ASSY., PAPER EJECT
557	PAPER EJECT CLUTCH	CLUTCH PAPER EJECT
558	EDGE GUIDE SLIDER	SLIDER, EDGE GUIDE
559	BUSHING 6 mm	BUSHING, 6
560	HEAD FASTENING PRESSURE PLATE	PRESSINGPLATE, FASTEN, HEAD

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

Ref.No.	Description	PPL Name
561	BK HEAD BASE	BASE, HEAD, BK
562	YMC HEAD BASE	BASE, HEAD, YMC
563	UPPER HEAD CABLE HOLDER	HOLDER, HEAD CABLE, UPPER
564	LOWER HEAD CABLE HOLDER	HOLDER, HEAD CABLE, LOWER
565	BK CARTRIDGE LEVER	LEVER ASSY., CARTRIDGE, BK
566	YMC CARTRIDGE LEVER	LEVER ASSY., CARTRIDGE, YMC
567	CR COVER CAP	CAP, COVER, CR
568	PUMP SPEED UP SHAFT	SHAFT, SPEED UP, PUMP
569	OIL PAD PRESSURE PLATE	PRESSING PLATE, OIL PAD
570	KNOB	KNOB
571	KNOB SHAFT	SHAFT, KNOB
572	DRIVEN ROLLER E	ROLLER ASSY., DRIVEN; E
573	PLATEN SHAFT HOLDER	PLATEN SHAFT HOLDER
574	PLATEN SHAFT HOLDER (GRAY)	PLATEN SHAFT HOLDER (GRAY)
575	TRACTOR REDUCTION GEAR	TRACTOR REDUCTION GEAR
576	CLUTCH PAD	PAD, CLUTCH
577	PF SPRING CAP	CAP, SPRING, PF
578	HOPPER CAM	CAM, HOPPER
579	CLUTCH CAM	CAM, CLUTCH
580	ANTI-STATIC BRUSH	ANTI-STATIC BRUSH
581	PAD HOLDER C	HOLDER ASSY., PAD; C
582	EDGE GUIDE	EDGE GUIDE
583	EDGE GUIDE PRESSING PLATE	PRESSING PLATE, EDGE GUIDE
584	HOPPER	HOPPER ASSY.
585	PAPER LOADING CORK	CORK, PAPER LOAD
586	GEAR CHANGE GUIDE	GUIDE, CHANGE, GEAR
587	COMBINATION GEAR HOLDER	HOLDER, COMBINATION GEAR
588	COMBINATION GEAR, 13.5 mm, 22 mm	COMBINATION GEAR, 13.5,22
589	SPUR GEAR, 20 mm	SPUR GEAR, 20
590	COMBINATION GEAR, 16 mm, 28 mm	COMBINATION GEAR, 16,28
591	SPUR GEAR, 22.5 mm	SPUR GEAR, 22.5
592	COMBINATION GEAR, 10 mm, 50 mm	COMBINATION GEAR, 10,50
593	SPUR GEAR, 60 mm	SPUR GEAR, 60
594	SPUR GEAR, 24 mm	SPUR GEAR, 24
595	COMBINATION GEAR, 17.5 mm, 14 mm	COMBINATION GEAR, 17.5, 14
596	SPUR GEAR, 27.5 mm	SPUR GEAR, 27.5
598	SPUR GEAR, 19 mm	SPUR GEAR, 19
599	COMBINATION GEAR, 21.5 mm, 9 mm	COMBINATION GEAR, 21.5, 9
600	COMBINATION GEAR, 21.5 mm, 9 mm	COMBINATION GEAR, 21.5,9
601	COMBINATION GEAR, 28 mm, 17.5 mm	COMBINATION GEAR, 28,17.5
602	EXTENSION SPRING 1937 g	EXTENSION SPRING, 1937

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

Ref.No.	Description	PPL Name
603	EXTENTION SPRING, 1.6 g	EXTENTION SPRING, 1.6
604	COMPRESSION SPRING, 90 g	COMPRESSION SPRING, 90
605	TORSION SPRING, 15000 g	TORSION SPRING, 15000
606	TORSION SPRING, 6700 g	TORSION SPRING, 6700
607	EXTENSION SPRING, 102 g	EXTENSION SPRING, 102
608	COMPRESSION SPRING, 1500 g	COMPRESSION SPRING, 1500
610	EXTENSION SPRING, 10 g	EXTENSION SPRING, 10
612	COMPRESSION SPRING, 100 g	COMPRESSION SPRING, 100
613	COMPRESSION SPRING, 485 g	COMPRESSION SPRING, 485
614	SPUR GEAR, 25 mm	SPUR GEAR, 25
615	COMPRESSION SPRING C, 100 g	COMPRESSION SPRING,100; C
616	TORSION SPRING, 6120 g	TORSION SPRING, 6120
617	COMPRESSION SPRING, 450 g	COMPRESSION SPRING, 450
618	EXTENSION SPRING, 200 g	EXTENSION SPRING, 200
619	COMPRESSION SPRING, 900 g	COMPRESSION SPRING, 900
620	COMPRESSION SPRING,180 g	COMPRESSION SPRING,180
621	EXTENSION SPRING, 567 g	EXTENSION SPRING, 567
622	TORSION SPRING, 10400 g	TORSION SPRING, 10400
625	PLAIN WASHER (4×0.5×8)	PLAIN WASHER (4×0.5×8)
626	PLAIN WASHER (3.2×1×7, F/ZN)	PLAIN WASHER, 3.2×1×7, F/ZN
628	PLAIN WASHER (8×0.5×15)	PLAIN WASHER (8×0.5×15)
629	PLAIN WASHER (4.2×1×11)	PLAIN WASHER (4.2×1×11)
630	PLAIN WASHER (6×0.7×12)	PLAIN WASHER (6×0.7×12)
631	PLAIN WASHER (6.5×1×18 S/NA)	P.W., 6.5×1×18, S/NA
632	PLAIN WASHER (4.2×0.3×8 L/NA)	P.W., 4.2×0.3×8, L/NA
633	PLAIN WASHER (3×0.5×8 F/ZN)	PLAIN WASHER, 3×0.5×8 F/ZN
634	PLAIN WASHER (6.1×0.3×12 L/NA)	PLAIN WASHER, 6.1×0.3×12, L/NA
635	PLAIN WASHER (5.07×0.3×10 L/NA)	PLAIN WASHER, 5.07×0.3×10, L/NA
637	SPRING WASHER (3×0.7×5.9 F/ZN)	SPRING WASHER, 3×0.7×5.9, F/ZN
638	SPRING PIN (2×14)	SPRING PIN (2×14)
639	BALL BEARING	BALL BEARING
640	WIRE BAND	WIRE BAND
641	WIRE SADDLE	WIRE SADDLE
642	CLAMP	CLAMP
643	RETAINING RING (TYPE-E (3))	RETAINING RING (TYPE-E(3))
644	RETAINING RING (TYPE-E (4))	RETAINING RING (TYPE-E(4))
645	RETAINING RING (TYPE-E (5))	RETAINING RING (TYPE-E(5))
646	RETAINING RING (TYPE-E (2.3))	RETAINING RING (TYPE-E(2.3))
647	CB SCREW (M3×6)	C.B. SCREW (M3×6)
648	CBS SCREW (3×6 F/ZN)	C.B.S. SCREW 3×6 F/ZN
649	CBS (O) SCREW (M3×6)	C.B.S. (O) SCREW (M3×6)

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

Ref.No.	Description	PPL Name
650	CBB SCREW (M3×12)	C.B.B. SCREW (M3×12)
652	CBS SCREW (M3×8 F/UC)	C.B.S. SCREW (M3×8 F/UC)
653	CPB SCREW (3×15 F/ZN)	C.P.B. SCREW, 3×15, F/ZN
654	HEAD MOUNTING PRESSURE PLATE	PRESSING PLATE, MOUNTING, HEAD
655	PF ROLLER	ROLLER, PF
656	SPUR GEAR, 9 mm	SPUR GEAR, 9
657	SPUR GEAR, 27 mm	SPUR GEAR, 27
659	SPUR GEAR, 12 mm	SPUR GEAR, 12
660	PLUNGER	PLUNGER ASSY.
661	EXTENSION SPRING, 3.35 g	EXTENSION SPRING, 3.35
662	EXTENSION SPRING, 0.196 g	EXTENSION SPRING, 0.196
663	TORSION SPRING, 0.000206 g	TORSION SPRING, 0.000206
664	SUPPORT EARTHPLATE	EARTHPLATE, SUPPORT
665	PAPER EJECT ROLLER B	ROLLER ASSY., PAPER EJECT; B
666	PAPER EJECT GUIDE	GUIDE, PAPER EJECT
667	PAPER EJECT HOLDER C	HOLDER ASSY., PAPER EJECT; C
668	DRIVEN ROLLER HOLDER	HOLDER, ROLLER, DRIVEN
669	DRIVEN HOLDER	ROLLER, DRIVEN
670	PLUNGER COVER	COVER, PLUNGER
700	YMC ANGULAR SPACER (COLOR)	SPACER, ANGULAR, YMC (COLOR)
700	YMC ANGULAR SPACER B (COLOR)	SPACER, ANGULAR, YMC; B (COLOR)
700	YMC ANGULAR SPACER C (COLOR)	SPACER, ANGULAR, YMC; C (COLOR)
700	YMC ANGULAR SPACER D (COLOR)	SPACER, ANGULAR, YMC; D (COLOR)
700	YMC ANGULAR SPACER E (COLOR)	SPACER, ANGULAR, YMC; E (COLOR)
701	BK ANGULAR SPACER (BLACK)	SPACER, ANGULAR, BK (BLACK)
701	BK ANGULAR SPACER B (BLACK)	SPACER, ANGULAR, BK; B (BLACK)
701	BK ANGULAR SPACER C (BLACK)	SPACER, ANGULAR, BK; C (BLACK)
701	BK ANGULAR SPACER D (BLACK)	SPACER, ANGULAR, BK; D (BLACK)
701	BK ANGULAR SPACER E (BLACK)	SPACER, ANGULAR, BK; E (BLACK)
702	LINEAR SPACER (BLACK)	SPACER, LINEAR (BLACK)
702	LINEAR SPACER B (BLACK)	SPACER, LINEAR; B (BLACK)
702	LINEAR SPACER C (BLACK)	SPACER, LINEAR; C (BLACK)
702	LINEAR SPACER D (BLACK)	SPACER, LINEAR; D (BLACK)
702	LINEAR SPACER E (BLACK)	SPACER, LINEAR; E (BLACK)
702	LINEAR SPACER F (BLACK)	SPACER, LINEAR; F (BLACK)
702	LINEAR SPACER G (BLACK)	SPACER, LINEAR; G (BLACK)
702	LINEAR SPACER H (BLACK)	SPACER, LINEAR; H (BLACK)
702	LINEAR SPACER I (BLACK)	SPACER, LINEAR; I (BLACK)
702	LINEAR SPACER J (BLACK)	SPACER, LINEAR; J (BLACK)
702	LINEAR SPACER K (BLACK)	SPACER, LINEAR; K (BLACK)

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