EPSON®

Service Manual

LX-300

■ 24-PIN DOT MATRIX PRINTER

EPSON AMERICA, INC.

TM-LX300

Service Manual

LX-300

Revision Level

Revision	Date
1st printing	4/19/94

EPSON®

Printed on Recycled Paper.

FCC Compliance Statement

For American Users

This equipment has been tested and found to comply with limits for a Class B digital device pursuant to Part 15 of FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio or television reception. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause interference to radio or television reception, which can be determined by turning the equipment on and off, the user is encouraged to try to correct the interference by one or more of the following measures:

oReorient or relocate the receiving antenna.
oIncrease the separation between the equipment and the receiver.
oConnect the equipment into an outlet on a circuit different from the one connected to the receiver

For Canadian Users

This digital apparatus does not exceed the Class B limits for radio noise emissions from digital apparatus as set out in the radio interference regulations of the Canadian Department of Communications.

Le present appareil numérique n'èmet pas de bruits radioelectrique dépassant les limites applicables aux appareils numériques de Classe B prescrites dans le reglement sur le brouillage radioelectriques édicté par le Minister-e des Communications du Canada.

Caution

The connection of a non-shielded equipment interface cable to this equipment will invalidate the FCC Certification of this device and may cause interference levels which exceed the limits established by the FCC for this equipment. It is the responsibility of the user to obtain and use a shielded equipment interface cable with this device. If this equipment has more than one interface connector, do not leave the cables connected to unused interfaces.

Changes or modifications not expressly approved by the manufacturer could void the user's authority to operate the equipment.

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Precautions

Precautionary notations throughout the text are categorized relative to
1. personal injury
2. damage to equipment.

Warning

Signals a precaution which, if ignored, could result in serious or fatal personal injury. Great caution should be exercised in performing procedures preceded by a WARNING heading.

Caution

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

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

Warning

1. Always disconnect the product from both the power source and host computer beforeperforming any maintenance or repair procedure.
2. No work should beperformed on the unit by persons unfamiliar with basic safety measures dictatedfor all electronics technicians in their line of work.
3.In performing testing described in this manual, do not connect the unit to a power source until instructed to do so. When the power supply cable must be connected, use extreme caution in working on the power supply and other electronic components.

Caution

1.Repairs on EPSON products should beperformed only by an EPSON-certified repair technician.
2.Make certain that the source voltage is the same us the rated voltage listed on the serial number/rating plate. If the EPSON product has a primary AC rating different from the availablepower source, do not connect it to the power source.
3.Always verify that the EPSON product has been disconnectedfrom the power source before removing or replacingprinted circuit boards and/or individual chips.
4.To protect sensitive μP chip and circuitry, use static discharge equipment, such us anti-static wrist straps, when accessing internal components.
5.Replace malfunctioning components only with those components recommended by the manufacturer; introduction of second-source ICs or other nonapproved components may damage theproduct and void any applicable EPSON warranty.

CHAPTER 1 Product Description

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FEATURES

The LX-330 is a small, light-weight, 9-pin serial impact dot-matrix color printer suitable for personal use. The major features of this printer are as follows:

- Fast printing of 10-cpi draft characters at 220 cps
- Compact design saves precious work space
- Easy-to-operate panel
- Quiet printing
- Standard B-bit parallel interface and EIA-232D serial interface
- Printing of up to 66 lines on A4-size or 62 lines on letter-size paper
- Optional color printing using a color ribbon (black, magenta, cyan, yellow)
- Detachable push and pulL tractor

Figure l-l shows an exterior view of the LX-300 and Table l-l lists the optional units available for the LX-300.

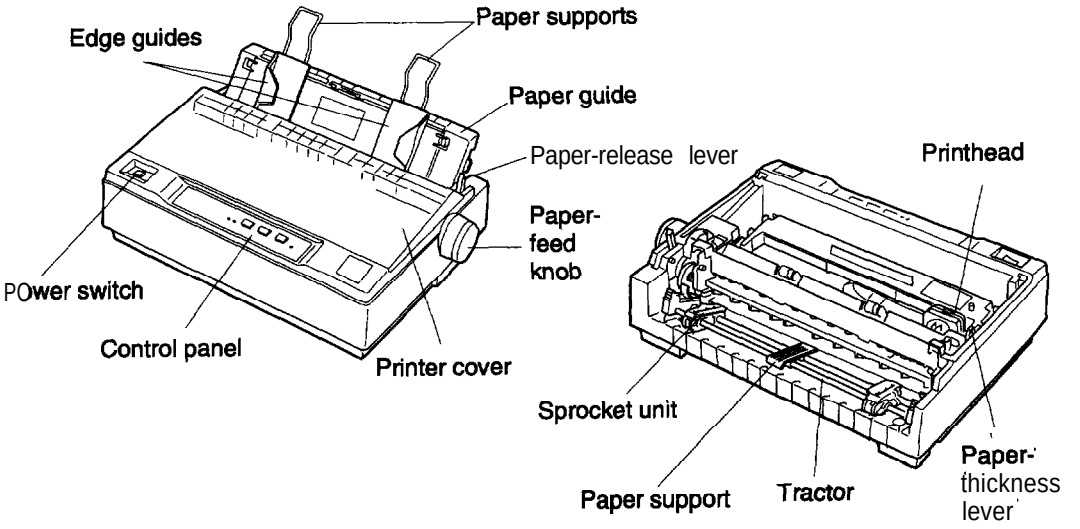


Figure 1-1. Exterior View of the LX-300

Table 1-1. Optional Units

Model	Description
#8750	Ribbon cartridge (monochrome)
#8758	Ribbon cartridge (monochrome, sub-cartridge)
so1 5073	Ribbon cartridge (color)
C806371	Single-bin cut sheet feeder
C832081	Color upgrade kit
C800301	Pull tractor unit
#8310	Roll paper holder

SPECIFICATIONS

This section provides detailed information about the LX-300.

Hardware Specifications

Printing method:	Serial impact dot matrix
Pin configuration:	9 wires
Pin diameter:	0.29 mm

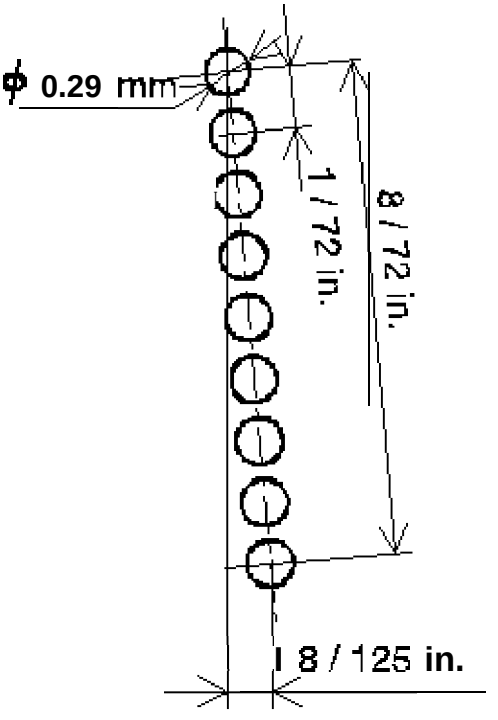


Figure 1-2. Pin Configuration

Printing direction:	Bidirectional with logic seeking for draft text with monochrome printing. Unidirectional printing for graphics, NLQ text, bit image, and color printing.

Paper Handling Specifications

Feeding system:	Friction feed or tractor (push and pull) feed
Feeding method	
Cut sheets:	Manual insertion (top entry) and feeding with the optional cut sheet feeder (CSF)
Continuous paper:	Push and pull tractor feeding
Feeding pitch:	1/6 inch, 1/8 inch, or programmable feeding in increments of 1/216 inch, minimum
Paper paths	
Cut sheet path:	Top entry (manual insertion or the optional CSF)
Continuous paper paths:	Rear entry (push tractor feed) Rear entry (pull tractor feed)
Continuous paper parking:	Possible, using push tractor
CSF:	Single bin, manual insertion using optional CSF (top entry)
Paper-feeding speed:	See Table 1-2.

Table 1-2. Feeding Speed

Feeding	1/6 inch Line Feed	Continuous Feed
Friction	79 ms/line	2.78 inches/second
Tractor (single)		
Tractor (double)	96 ms/line	2.08 inches/second

Friction feed

- Set the release lever to the friction position.
- When a sheet is inserted into the top slot, place its left edge at the marked position
- Do not perform reverse feeds greater than 0.27 inch (6.8 mm).

Push tractor feed

- Set the release lever to the tractor position.
- Do not perform reverse feeds greater than 0.27 inch (6.8 mm).
- During printing of labels, never perform reverse feeding.
- After printing labels, do not eject them from the rear.

Pull tractor feed

- Remove the tractor unit from the push position and mount it in the pull position.
- Do not perform reverse feeding.

The adjust lever must be set to proper position for the paper thickness, as shown below.

Table 1-3. Adjust Lever Settings

Lever Position	Paper Thickness
0	0.065 mm ~ 0.16 mm (0.0026 in. ~ 0.0063 in.)
1	0.16 mm ~ 0.25 mm (0.0063 in. ~ 0.0098 in.)
2	0.25 mm ~ 0.48 mm (0.0098 in. ~ 0.0189 in.)

Paper Specifications

Table 1-4. Specifications for Cut Sheet Paper (Manual Insertion)

Width	182 mm ~ 257 mm (7.2 in. ~ 10.1 in.)
Length	182 mm ~ 364 mm (7.2 in. ~ 14.3 in.)
Thickness	0.065 mm ~ 0.14 mm (0.0025 in. ~ 0.0055 in.)
Weight	52.3 ~ 90 g/m^2 (14 ~ 24 lb.)
Quality	Plain paper, recycled paper

Table 1-5. Specifications for Cut Sheet Paper (CSF)

Size	A4 (W x L: 210 mm (8.3 in.) x 297 mm (11.7 in.)) Letter (W x L: 216 mm (8.5 in.) x 279 mm (11 .O in.))
Thickness	0.065 mm ~ 0.14 mm (0.0025 in. ~ 0.0055 in.)
Weight	64 ~ 90 g/m^2 (17 ~ 24 lb.)
Quality	Plain paper, recycled paper

Table 1-6. Envelope Specifications

Size	No.6 width 166 mm x length 92 mm (6.5 in. x 3.6 in.) No.10 width 240 mm x length 104 mm (9.5 in. x 4.1 in.)
Thickness	0.16 mm ~ 0.48 mm (0.0063 in. ~ 0.019 in.)
Weight	45 ~ 90 g/m^2 (12 I- 24 lb.)
Quality	Bond paper (not curled, folded, or crumpled), plain paper, airmail paper

Notes:

- Printing of envelopes is guaranteed only when the temperature is room temperature and humidity is normal (15 ~ 25" C (59 ~ 77" F) , 20 ~ 60% RH).
- Variations in envelope thickness must be less than 0.25 mm (0.0098 in.).
- When inserting envelopes, keep the longer side horizontal.

Table 1-7. Specifications for Continuous Paper (Single Sheet and Multi-Part)

Width	101.6 mm ~ 254 mm (4.0 in. ~ 10.0 in.)
Total thickness	0.065 mm ~ 0.25 mm (0.0025 in. ~ 0.0098 in.)
Weights	52.3 ~ 82 g/m^2 (14 ~ 22 lb.) — not multi-part 40 ~ 58.2 g/m^2 (12 ~ 15 lb.) — multi-part
Copies	3 sheets (1 original + 2 copies)
Quality	Plain paper, recycled paper, carbonless multi-part paper

Table 1-8. Specifications for Continuous Paper with a Label

Label size (W x L)	63.5 mm (min.) x 23.8 mm (min.) [2.5 in. (min.) x 15/16 in. (min.)]
Width of base paper	101.6 mm ~ 254 mm (4.0 in. x 10.0 in.)
Thickness of base paper	0.07 mm ~ 0.09 mm (0.0028 in. ~ 0.0035 in.)
Total thickness	0.16 mm ~ 0.19 mm (0.0063 in. ~ 0.0075 in.)
Weight	64 g/m^2 (17 lb.)
Quality	Plain paper

Notes:

- Use only continuous-type labels and use them only with the tractor.
- Example of labels -Avery Continuous Form Labels
  -Avery Mini-Line Labels
- Printing of envelopes is guaranteed only when the temperature is room temperature and humidity is normal (15 ~ 25" C (59 ~ 77" F) , 20 ~ 60% RH).

Table 1-9. Roll Paper Specifications

Width	213 mm ~ 219 mm (8.38 in. ~ 8.62 in.)
Diameter	127 mm (5.0 in.)
Thickness	0.070 mm ~ 0.090 mm (0.0028 in. ~ 0.0035 in.)
Weight	52 ~ 64 g/m^2 (14 ~ 17 lb.)

Printable Area

Cut sheets using manual insertion

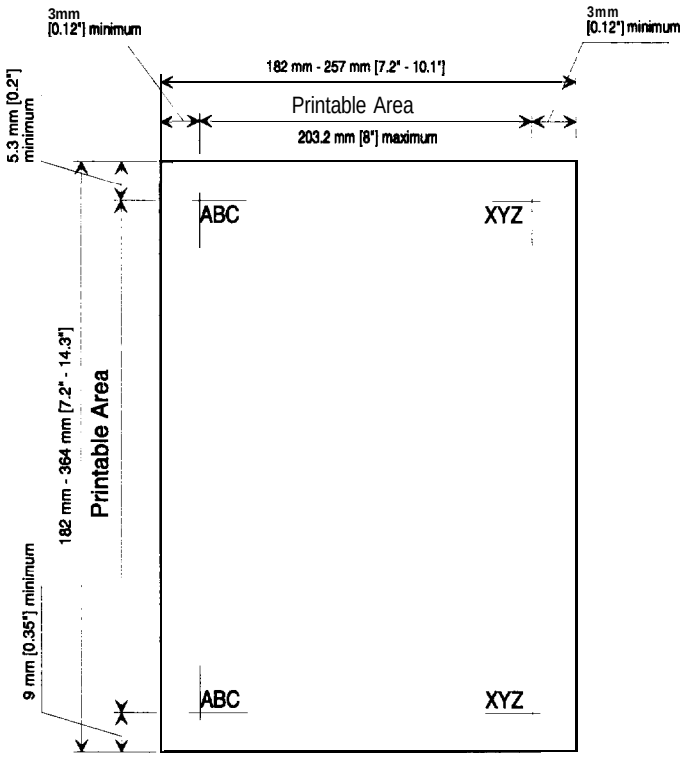


Figure 1-4. Printable Area for Cut Sheets Using Manual Insertion

Cut Sheets Using the CSF

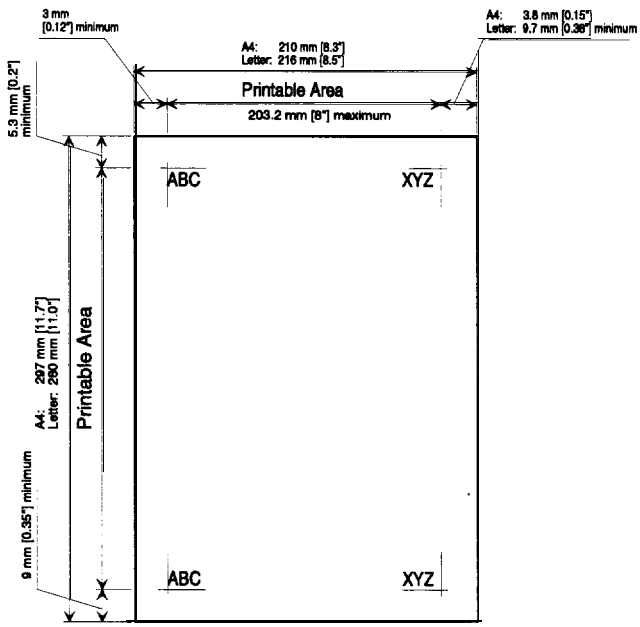
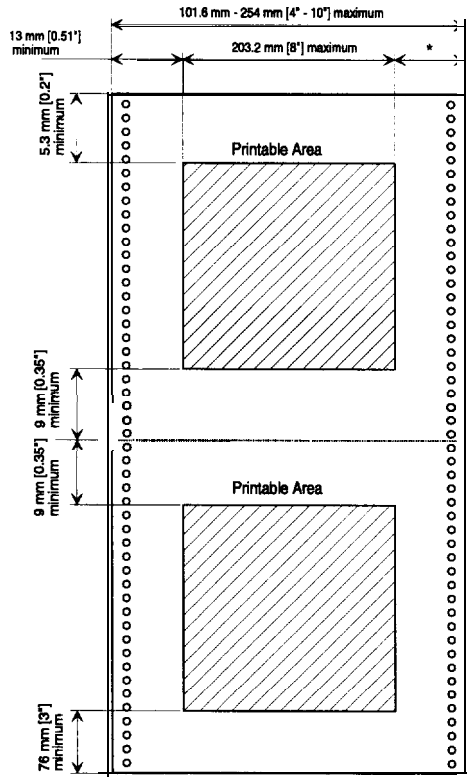


Figure 1-3. Printable Area for Cut Sheets Using the CSF

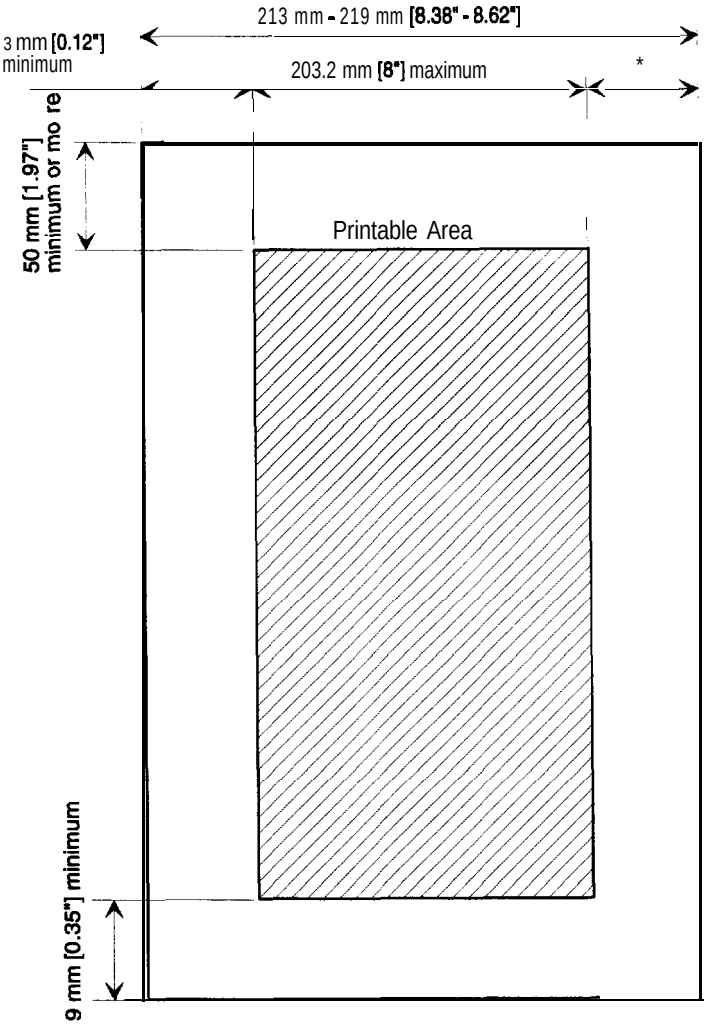
Continuous paper



*: 13 mm (0.51") or more when a paper width of 101.6 mm (4") to 241.3 mm (9.5") is used.
30 mm (1.18") or more when a paper width of 254 mm (10") is used.

Figure 1-5. Printable Area for Continuous Paper

Roll paper



*: 9.8 mm (0.39") or more when a paper width of 216 ± 3 mm is used.

Figure 1-6. Printable Area for Roll Paper

Ribbon Specifications

Ribbon cartridge (mono):	**#8750** **#8758** (sub-cartridge)
Ribbon cartridge (color):	so15073
Ribbon color:	Black, magenta, cyan, yellow
Black ribbon life:	3 million characters (14 dots/character)
Color ribbon life	
Black:	1 million characters (14 dots/character)
Magenta:	0.7 million characters (14 dots/character)
cyan:	0.7 million characters (14 dots/character)
Yellow:	0.5 million characters (14 dots/character)

Electrical Specifications

Table 1-10. Electrical Specifications

Description	120 V Version
Rated voltage	120 VAC
Input voltage range	103.5 ~ 132 VAC
Rated frequency range	50 ~ 60 Hz
Input frequency range	49.5 ~ 60.5 Hz
Rated current	1.0 A
Power consumption	30 W (self-test in 10 cpi draft)
Insulation resistance	10 MΩ, minimum (applying 500 VDC between AC line and chassis)
Dielectric strength	1000 VAC ms for 1 minute or 1200 VAC rms for 1 second (between AC line and chassis)

Environmental Conditions

Table l-l 1. Environmental Conditions

Description	Operating	Storage
Temperature	5 to 35" C (41 ~ 95" F) (*1)	–20 to 55° C (–4 ~ 131°F) (*2)
Humidity	30 to 80% RH (*1,*3)	5 to 85% RH (*2,*3)
Resistance to vibration	0.25 G, 55 Hz (*1)	0.50 G, 55 Hz (*2)

*1 = Operating conditions must be within this range.
*2 = When the printer is in the shipping container.
*3 = Without condensation.

Reliability

MTBF: 4000 power on hours (POH)

Printhead life: 200 million strokes/ wire (with monochrome ribbon)
100 million strokes/ wire (with color ribbon)

Safety Approvals

Safety standards: U.S. version: UL1950 with D3, CSA22.2 #950 with D3

Radio frequency interference (RFI): U.S. version: FCC part 15 subpart B class B

Physical Specifications

Dimensions (W x D x H): 366 x 275 x 132 (mm) (14.4 x 10.8 x 5.20 (inches) (without pull tractor)

Weight: 4 kg (8.8 lb.) without pull tractor

Firmware Specifications

Control codes: ESC/ P

Input data buffer: 4KB

Character sets: 13 international character sets

Character tables: See the table below.

Table 1-12. Character Tables

Character Table	Standard Model
ITALIC	0
PC437 (US, Standard Europe)	0
PC850 (Multilingual)	0
PC860 (Portuguese)	0
PC861 (Icelandic)	0
PC863 (Canadian-French)	0
PC865 (Norwegian)	0
BRASCII	0
Abicomp	0

Bitmap fonts: EPSON NLQ Roman
EPSON NLQ Sans Serif
EPSON DRAFT

Character size 10.5 points

Character matrix Draft 10 cpi; 11 horizontal dots, 9 vertical dots
NLQ 10 cpi; 23 horizontal dots, 18 vertical dots

Print mode

Draft mode: Double-width Condensed Emphasized
Double-strike Underlined Italics
Super/ subscript

NLQ mode: Double-width Emphasized Underlined
Italics Super/ subscript

Printing speed : See Table 1-13.

Printable columns: See Table 1-13.

Table 1-13. Printing Speed

Printing Mode	Character Pitch	Printable Columns	Maximum Print Speed [cps]	
			Monochrome	Color
Draft	10 cpi	80	220 (165)	165 (165)
Draft	12 cpi	96	264 (198)	198 (198)
Draft condensed	17.1 cpi	137	188 (141)	
Draft condensed	20 cpi	160	220 (165)	
Draft emphasized	10 cpi	80	110 (83)	
Draft double width	5 cpi	40	110 (83)	
NLQ	10 cpi	80	44 (33)	
NLQ	12 cpi	96	53 (40)	
NLQ double width	5 cpi	40	22 (16)	

Notes: Data in parentheses indicates the speed on a line containing at least one of the following:

- A line containing a user-defined character.
- A line containing one of the 50 characters corresponding to hex codes BO to DF and F4 and F5.
- A line that is printing when printhead driving voltage drops from over-duty printing (When voltage drops below the lower limit, the printer stops printing in the middle of the line, and then prints the rest of the line at a slower speed.)

Table I-I 4. Resolution

Printing Mode	Horizontal Density	Vertical Density	Adjacent Dot Print
Draft	120 dpi	72 dpi	No
Draft condensed	240 dpi	72 dpi	No
Draft emphasized	120 dpi	72 dpi	Yes
NLQ	240 dpi	144 dpi	No
Bit image	60 dpi	72 dpi	Yes
	72 dpi	72 dpi	Yes
	80 dpi	72 dpi	Yes
	90 dpi	72 dpi	Yes
	120 dpi	72 dpi	Yes
	120 dpi	72 dpi	No
	240 dpi	72 dpi	No

INTERFACE SPECIFICATIONS

LX-300 has parallel interface and serial interface, one of which can be selected in default setting mode. Auto selection is also available.

Parallel Interface Specifications

The LX-300 is equipped with an S-bit parallel interface, standard.

Data format:	S-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 l-7.

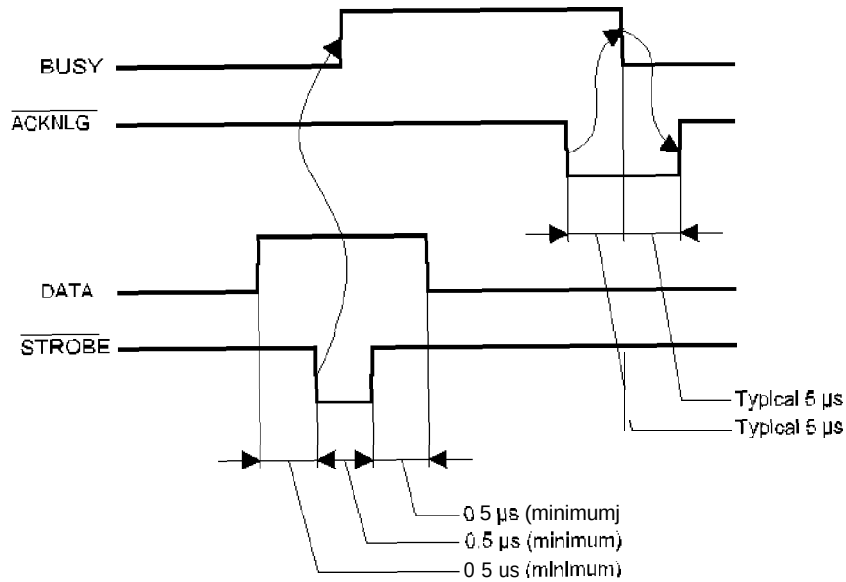


Figure 1-7. Data Transmission Timing

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 l-7.)
- When the input buffer is full
-When the INIT input signal is active
- During initialization
- When the $\overline{\text{ERROR}}$ signal is active
-During the self-test mode
-During the default-setting mode

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

-When a paper-out error occurs
-When a release lever operation error occurs
- When a fatal error occurs

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

-When a paper-out error occurs

Table 1-15 shows the connector pin assignments and signal functions for the S-bit parallel interface.

Table 1-15. Signal and Connector Pin Assignments for Parallel Interface

Pin No.	Signal Name	Return GND Pin	I/O*	Description
1	$\overline{\text{STROBE}}$	19	In	The $\overline{\text{STROBE}}$ pulse is used to read the input data. The pulse width must be more than 0.5 us. Input data is latched after the falling edge of this signal.
2-9	DATA1 -DATA8	20-27	In	Parallel input data to the printer. A HIGH level means data 1. A LOW level means data 0.
10	$\overline{\text{ACKNLG}}$	28	Out	This pulse indicates data has been received and the printer is ready to accept more data. The pulse width is approximately 12 us.
11	BUSY	29	Out	HIGH indicates the printer cannot accept more data.
12	PE	30	Out	HIGH indicates paper-out. This signal is effective only when the ERROR signal is LOW.
13	SLCT	—	Out	Always HIGH output. (Pulled up to +5 V through 3.3K Ω resistor.)
14	$\overline{\text{AFXT}}$	—	In	If the signal is LOW when the printer is initialized a line feed is automatically performed upon receipt of the CR code (auto LF).
15,34	NC	—	—	Not used.
16	GND	—	—	Signal ground.
17	Chassis	—	—	Chassis ground. In the printer, chassis ground and signal ground are short-circuited.
18	LOGIC-H	—	Out	A HIGH level means that printer power is on.
19-30	GND	—	—	Signal ground.
31	$\overline{\text{INIT}}$	—	In	Input for printer initialization. Pulse width 50 μs minimum, active LOW.
32	$\overline{\text{ERROR}}$	—	Out	LOW indicates that some error has occurred in the printer.
33	GND	—	—	Signal ground.
35	+5V	—	—	Pulled up to +5 V through 1 K Ω resistor.
36	$\overline{\text{SLCTIN}}$	—	In	Ignored.

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

Serial Interface Specifications

The LX-300 is equipped with an S-bit serial interface, standard.

Data format: EIA-232D serial
Synchronization: Asynchronous
Handshaking: By DTR signal and X-ON/ X-OFF protocol

DTR and X-ON/X-OFF Protocol

State	Buffer Space	DTR	X-ON/X-OFF
Busy	Less than 256 bytes	Off	X-OFF
Ready	More than 512 bytes	On	X-ON

ETX/ACK Protocol

State	Buffer Space	Response Code
Busy	Less than 256 bytes	NAK
Ready	256 bytes or more	ACK

Word length
- Start bits: 1 bit
- Data bits: 7 or 8 bit (selectable)
- Parity bit: 0 or 1 bit (selectable)
- Stop bits: 1 bit (transmitting)
  1 bit or more (receiving)

Bit rate: 300,600, 1200, 2400, 4800, 9600, 19200 bps (selectable)

Logic level
- MARK (logical 1): –3 V to –25 V
- SPACE (logical 0): +3 V to +25 V

Parity check: Odd, even, or no parity bit (selectable)

Connector: EIA standard 25-pin D-SUB female connector

Table 1-16. Signal and Connector Pin Assignments for Serial Interface

Pin No.	Signal Name	I/O*	Description
1	FG	—	Chassis ground.
2	TXD/SD	out	Transmit serial data.
3	RXD/RD	In	Receive serial data.
4	RTS/RS	out	This signal is always at the positive EIA level.
5	CTS/CS	In	Ignored.
7	SG	—	Return path for data and control signals.
11,20	DTWER	out	This signal is at the positive EIA level when the printer is ready to accept data entry and at the negative EIA level when the printer is not ready to accept data entry.
3,8-10,12-19,21-25	NC	—	No connection (not used).

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

OPERATING INSTRUCTIONS

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

Control Panel Operation

The printer control panel contains three non-lock-type push buttons and three LED indicators for easy operation of the various printer functions.

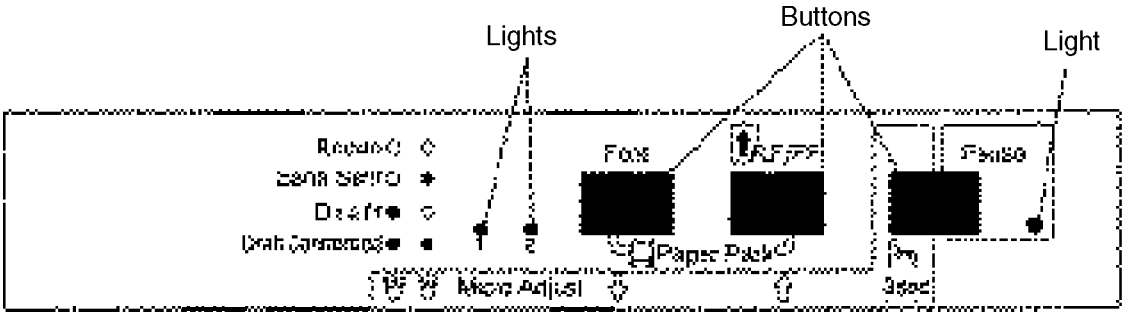


Figure 1-8. Panel Apperance

Paper Feeding

Load:	Press the LF/FF button.
Load (manual insertion):	Press the LF/FF button or the printer waits 2 seconds after insertion of a cut sheet to load paper automatically.
Line feed:	Press the LF/FF button once.
Eject cut sheet:	Hold down the LF/FF button continuously.
Form feed (continuous):	Hold down the LF/FF button continuously.
Paper park (continuous):	Press the FONT and LF/FF buttons at the same time.
Tear-off (continuous):	Only uses auto tear-off function.

Character Selection

Font selection:	Press the FONT button.
Pitch selection:	Selectable in default-setting mode: 10 cpi. or 12 cpi.
Condensed selection:	Press the FONT button. Only draft condensed is selectable

Enter Special Mode

Self-test mode:	Hold down the LF/FF button and turn on the printer.
Default-setting mode:	Hold down the FONT button and turn on the printer.
Hex dump mode:	Hold down the LF/FF and FONT button and turn on the printer.
Demonstration mode:	Not available.

Self-test Function

This section explain how to run the self-test.

1. Hold down the LF/FF button and turn on the printer to start the self-test.
2. If paper is not loaded, the printer attempts to load it.
3. If the printer cannot load paper, it indicates this by turning on the PAUSE light. In this case, insert paper again and press the LF/FF button.
4. The printer prints alphanumeric characters continuously.
5. Quit self-test mode printing by pressing the PAUSE button and turning the printer off.

Hexadecimal Dump Function

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

1. Turn on the printer while holding down the LF/FF and FONT buttons.
2. If paper is not loaded, the printer attempts it (either single sheet or continuous paper).
3. If the printer cannot load the paper, it indicates a paper-out error. In this case, insert paper again, and press the PAUSE button.
4. The printer waits for data after printing the message "Hex dump."
5. Received data is printed as both hexadecimal codes and ASCII characters. If a corresponding printable character does not exist, the printer outputs a period (.).
6. Quit hexadecimal dump printing by pressing the PAUSE button and turning the printer off.

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

Printer Status Indication

It describes how this printer indicates status and error conditions using LEDs and the beeper.

The symbols below describe the frequency of beeper sounds.

(•): The beeper sounds for 100 ms with an interval of 100 ms between beeps.
(—): The beeper sounds for 500 ms with an interval of 100 ms between beeps.

While initialize signal is active:	PAUSE light is on.
During initialization:	PAUSE light blinks and beeper sounds
Ready to print or printing:	PAUSE light is off
Paper-out error:	Beeper sounds (• • •) and PAUSE light blinks. (light on:off ratio = 6:1)
Tear-off:	PAUSE light blinks (light on:off ratio = 1:6)
Operating error, fatal error:	Beeper sounds (— — — — —) and PAUSE light is on.

Selected Font

The combination of two FONT LEDs (1 and 2) is used to indicate the selected font.

Table 1-17. Font Selection

Selected Font	FONT 1	FONT 2
Roman	ON	ON
Sans Serif	ON	OFF
Draft	OFF	ON
Draft condensed	OFF	OFF

Paper Position Adjustments

To enter adjustment mode, press the PAUSE button for three seconds, until the printer beeps once and the FONT lights blink to indicate that the adjustment operation is available. If the printer state is not one of the conditions shown below, this operation is ignored.

- TOF position adjustment:
  The position can be adjusted just after the paper is loaded.
- Tear-off position adjustment:
  The position can be adjusted when paper is actually located at the tear-off position

In the adjustment mode, press the LF/FF button to feed paper forward and the FONT button to feed paper backward. You can cancel adjustment mode by pressing the PAUSE button or inputting a print command. The adjusted position is stored in non-volatile memory.

Printer Initialization

There are two types of initialization: hardware initialization and software initialization.

Hardware Initialization

Hardware initialization is performed by:

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

When hardware initialization is performed:

- The printer mechanism is initialized.
- Print data in the input buffer is cleared.
- Download character definitions are cleared.
- The printer's settings are returned to the defaults.
- The printer is set to the standby condition, if no fatal error occurs.
- Continuous paper home-seeking is performed.

In continuous paper home-seeking:

- The printer feeds continuous paper to the paper park position.
- The printer then loads the paper again.
- If ejection to the paper park position cannot be completed within 16 inches, paper is returned to its previous position.

Software Initialization

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

- Print characters in the buffer are not cleared.
- The printer setting is changed to the default, but the download character definition is not cleared.

Printer Settings

Selectable Printer Settings

The following printer settings can be changed by users in default-setting mode:

Character spacing:	10 cpi / c p i
Shape of zero:	Slashed / Not slashed
1 inch skip-over-perforation:	On/ Off
Auto line feed:	On/ Off
Character table (Standard):	Italic (USA/ France/ Germany/ UK/ Denmark 1/ Sweden/ Italy/ Spain 1)/ PC437/ 850/ 860/ 861/ 863/ 865/ BRASCII/ Abicomp
Character table (NLSP):	Italic (USA/ France/ Germany/ UK/ Denmark 1/ Sweden/ Italy/ Spain 1)/ PC437/ 850/ 852/ 853/ 855/ 857/ 866/ 869/ 437 Greek/ IS0 Latin 1T / IS0 8859-7/ Code MJK/ Mazowia/ Bulgaria
Page length:	11 / 12 / 8.5 / 70/ 6 inches
Auto tear off:	On/ Off
Tractor:	Single / Double
Interface:	Auto selection (10 sec wait) / Auto selection (30 sec wait) / Parallel / Serial
Bit rate (serial I/ F):	300 / 600 / 1200 / 2400 / 4800 / 9600 / 19200 bps
Parity bit (serial I/ F):	None / Odd / Even
Data length (serial I/ F):	7 bits / 8bits
ETX/ ACK (serial I/ F):	Disabled / Enabled

Note: Underlines show factory setting.

Changing the Default Settings

You can change some parameters that the printer refers to at printer initialization.

1. To enter the default setting mode, turn on the printer while holding down the FONT button. The printer prints out the firmware version. If paper is not loaded, insert a sheet of paper.
2. The printer automatically loads the paper and prints a table of languages comprised of English, French, German, Italian, and Spanish. The FONT lights indicate the currently selected language, as shown in the table below.

Table 1-18. Font Lights and Language Selection

FONT Light 1	FONT Light 2	Language
OFF	ON	English
OFF	Blinks	French
ON	OFF	German
ON	***ON***	Italian
ON	Blinks	Spanish

3. Press the FONT button to change the language, and press the LF/FF button to select.
4. Press the FONT button again after selecting a language. The printer prints help text to guide you in setting defaults. The printed instructions include submenu tables listing all the settings you can change and showing you how the control panel lights appear for each selection.
5. To change the settings, press the FONT button to move down and press the LF/FF button to move up in the menu of options shown below. The printer beeps once each time you press the FONT button while you are in this menu.

Table 1-19. Default Options

FONT Light 1	FONT Light 2	PAUSE Light	Setting	Submenu
Blinks	OFF	OFF	Character spacing	Table 1-20
Blinks	ON	OFF	Shape of zero	Table 1-21
OFF	Blinks	OFF	Skip over perforation	Table 1-22
ON	Blinks	OFF	Character table	Table 1-23
Blinks	Blinks	Off	Auto line feed	Table 1-24
Blinks	OFF	ON	Page length	Table 1-25
Blinks	ON	ON	Auto tear off	Table 1-26
OFF	Blinks	ON	Tractor	Table 1-27
ON	Blinks	ON	Interface	Table 1-28
Blinks	Blinks	ON	Bit rate	Table 1-29
OFF	OFF	Blinks	Parity	Table 1-30
Blinks	OFF	Blinks	Data length	Table 1-31
ON	OFF	Blinks	ETX/ACK	Table I-32

6. When you reach the setting you want to change, press the PAUSE button once. The printer automatically enters the submenu for that setting.
7. Press the FONT button to move the through the settings in the submenu. The printer beeps twice each time you press the FONT button while in a submenu.
8. When the lights match your desired setting, press the PAUSE button to make your selection. The printer saves the new setting and returns to the menu shown above.
9. Repeat steps 5 through 8 for each additional setting you want to change.
10. When you are finished, turn the printer off. Any settings you have made remain in effect until you change them again.

Table 1-20. Character Spacing

Lights			Character Spacing
FONT 1	**FONT 2**	**PAUSE**	
OFF	OFF	OFF	10 cpi
ON	ON	ON	12 cpi

Table 1-21. Shape of Zero

Lights			Shape of Zero
FONT 1	**FONT 2**	**PAUSE**	
OFF	OFF	OFF	0
ON	ON	ON	∅

Table 1-22. Skip Over Perforation

Lights			Skip Over Perforation
FONT 1	**FONT 2**	**PAUSE**	
OFF	OFF	OFF	No skip
ON	ON	ON	Skip

Table 1-23. Character Table

Lights			Standard Table
FONT 1	FONT 2	PAUSE	
OFF	OFF	OFF	Italic — US
ON	OFF	OFF	Italic — France
Blinks	OFF	OFF	Italic — Germany
OFF	ON	OFF	Italic — UK
ON	ON	OFF	Italic — Denmark 1
Blinks	ON	OFF	Italic — Sweden
OFF	Blinks	OFF	Italic — Italy
Blinks	Blinks	OFF	Italic — Spain 1
OFF	OFF	ON	PC 437
ON	OFF	ON	PC 850
Blinks	OFF	ON	PC 860
OFF	ON	ON	PC 861
ON	ON	ON	PC 863
Blinks	ON	ON	PC 865
OFF	Blinks	ON	BRASCII
ON	Blinks	ON	Abicomp

Table 1-24. Auto Line Feed

Lights			Auto Line Feed
FONT 1	FONT 2	PAUSE	
OFF	OFF	OFF	Off
ON	***ON***	***ON***	On

Table 1-25. Page Length

Lights			Page Length
FONT 1	FONT 2	PAUSE	
ON	OFF	OFF	11 inches
OFF	ON	OFF	12 inches
ON	ON	OFF	8.5 inches
OFF	OFF	ON	70/6 inches

Table 1-26. Auto Tear Off

Lights			Auto Tear Off
FONT 1	FONT 2	PAUSE	
OFF	OFF	OFF	Off
ON	ON	ON	On

Table 1-27. Tractor

Lights			Tractor
FONT 1	FONT 2	PAUSE	
OFF	OFF	OFF	Single
ON	ON	ON	Double

Table 1-28. Interface

Lights			Interface
FONT 1	FONT 2	PAUSE	
ON	OFF	OFF	Auto selection (10 ms wait)
OFF	ON	OFF	Auto selection (30 ms wait)
ON	ON	OFF	Parallel
OFF	OFF	ON	Serial

Table 1-29. Bit Rate

Lights			Bit Rate
FONT 1	FONT 2	PAUSE	
ON	OFF	OFF	300 bps
ON	ON	OFF	600 bps
ON	***ON***	OFF	1200 bps
OFF	OFF	ON	2400 bps
ON	OFF	ON	4800 bps
OFF	ON	ON	9600 bps
ON	ON	ON	19200 bps

Table 1-30. Parity Bit

Lights			Parity Bit
FONT 1	FONT 2	PAUSE	
ON	OFF	OFF	None
ON	ON	OFF	Odd
ON	ON	OFF	Even

Table 1-31. Data Length

Lights			Data Length
FONT 1	FONT 2	PAUSE	
OFF	OFF	OFF	7 bits
ON	ON	ON	8 bits

Table 1-32. ETX/ACK

Lights			ETX/ACK
FONT 1	FONT 2	PAUSE	
OFF	OFF	OFF	Off
ON	***ON***	ON	On

CHAPTER 2 Operating Principles

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PRINTER MECHANISM OPERATION

This section describes the M-3Gl0 printer mechanism and explains how it works.

Printing Mechanism

The printer mechanism is composed of the printhead, ink ribbon, and ribbon mask. The printhead is a 9-pin head for impact dot printing. Each wire has own drive coil, which causes the wire to move in and out of the printhead to print each dot. The four steps below describe how these driving wires work.

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

This is the sequence used to print a single dot.

The mechanism is equipped with a built-in thermistor for head temperature detection. The temperature detected by the thermistor is converted to an electric signal and fed back to the control circuit.

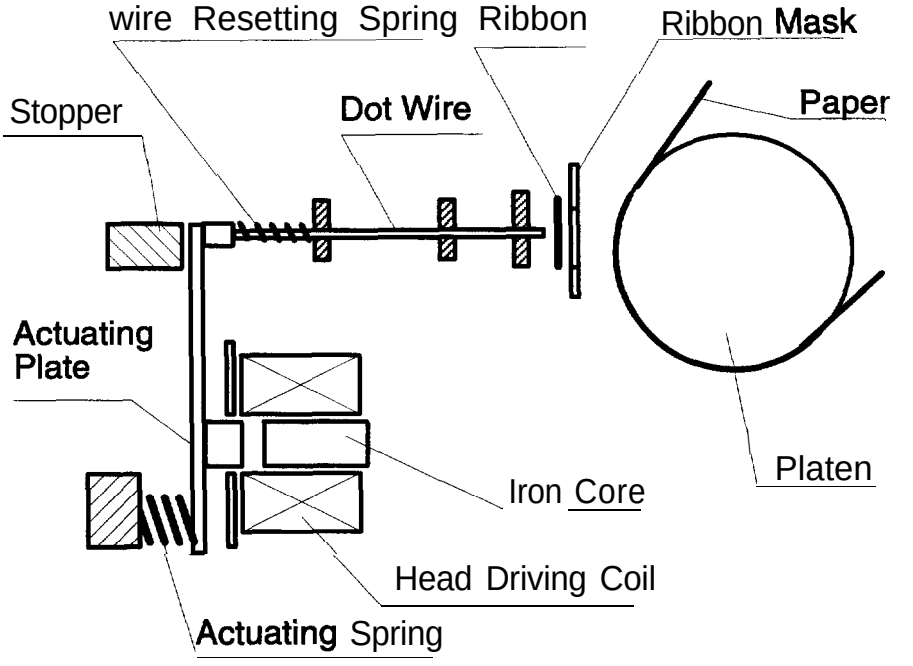

Figure 2-1. Printhead Operation Principles

Carriage Movement Mechanism

The carriage movement mechanism consists of the carriage assembly, CR motor assembly, timing belt, driven pulley, HP sensor, etc. The CR motor assembly drives the timing belt. The carriage assembly is connected to the timing belt, which is moved by the CR motor assembly. Figure 2-2 shows the carriage movement mechanism.

The printer detects the carriage home position with the HP sensor. This sensor is the basis for determining the carriage home position. The HP sensor informs the CPU of the carriage home position. The sensor is ON, when the carriage is pushed to the right or left. The striker on the carriage actives the sensor to indicate the carriage home position, which toggles the sensor to OFF.

Table 2-1. CR Motor Assembly Specifications

Category	Requirement
Type	4-phase, 48-pole, PM-type stepping motor
Drive Voltage	31.5 ~ 35.5 VDC
Coil Resistance	180 ohms ± 7% (per phase, at 25° C, 77° F)
Drive Pulse Frequency	Normal Mode Draft 1320 PPs Color Mode Draft 1980 pps
Excitation Method	Constant-voltage 2-2 phase excitation 1-2 phase excitation

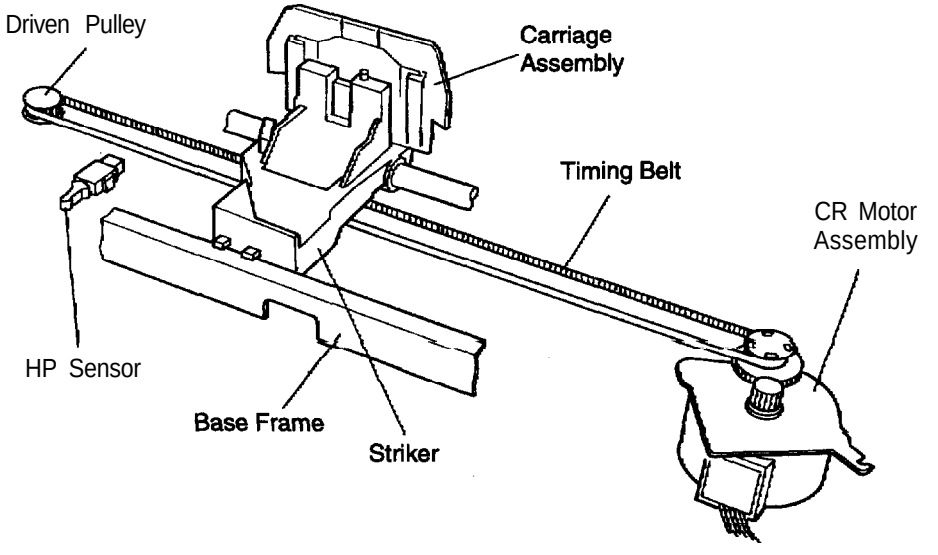

Figure 2-2. Carriage Movement Mechanism

Paper Handling Mechanism

During normal operation, the paper is fed to the printer, advanced to the specified position, and ejected from the printer. These paper handling operations are performed by various paper handling mechanisms, such as the tractors, rollers, and gears. This section describes the paper handling mechanism for this printer.

Paper Feed Mechanisms

Cut sheets are fed by friction. Continuous paper is fed by a tractor. There are three ways to feed with tractors: the push tractor method, the pull tractor method, and the push-pull tractor method. During normal operation, the printer is set up with only one tractor, which functions as either a push or a pull tractor, depending on where it is attached on the printer. To use the push-pull tractor feed method, an optional tractor must be attached.

There are two ways to insert paper into the printer. Cut sheets use the top entrance and continuous paper use rear insertion.

Paper Advance Mechanism

This section describes how the friction and tractor advance mechanisms feed paper through the printer. The paper advance mechanism consists of the PF motor assembly, platen, driven roller assembly, drive roller cover, tractor assembly, knob, PF gear train, etc. The PF motor assembly can drive the platen both forward and in reverse.

Friction Advance Method

Paper is held by the platen, the PF drive roller, and the eject roller assembly. Turning in the direction of the black arrows, the PF motor assembly pinion gear drives the paper advance reduction gear. The paper advance reduction gear turns the platen gear, PF drive roller, and the platen. The platen drives the drive roller cover; then the drive roller cover drives to eject the paper. The paper advances in the direction of white arrows. Figure 2-3 shows the friction advance method when the paper is fed through the top paper entrance.

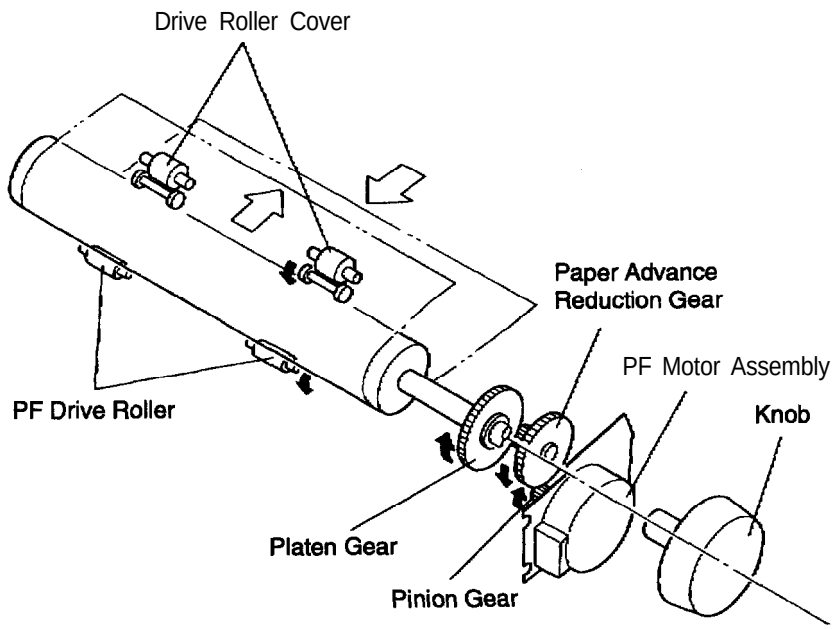

Figure 2-3. Friction Advance Mechanism

Table 2-2. PF Motor Assembly Specifications

Category	Requirement
Type	4-phase, 46-pole, PM-type stepping motor
Drive Voltage	31.5 ~ 38.5 VDC
Coil Resistance	56 ohms ± 5% (per phase, at 25°C, 77°F)
Drive Pulse Frequency	800, 900, 1000, 1200, 1300 pps
Excitation Method	Constant-voltage 1-2 phase excitation

Push Tractor Method

When the push tractor method is used with the rear entrance, the torque generated by the PF motor assembly is transmitted to the push tractor gear through the PF motor assembly pinion gear, the paper advance reduction gear, and the tractor transmission gear. When the PF motor assembly pinion gear turns in the direction of the black arrows, the tractor gear rotates in the direction of the black arrow and thus feeds the paper into the printer. The paper is advanced by the platen, which is also driven by the PF motor assembly through the gear train.

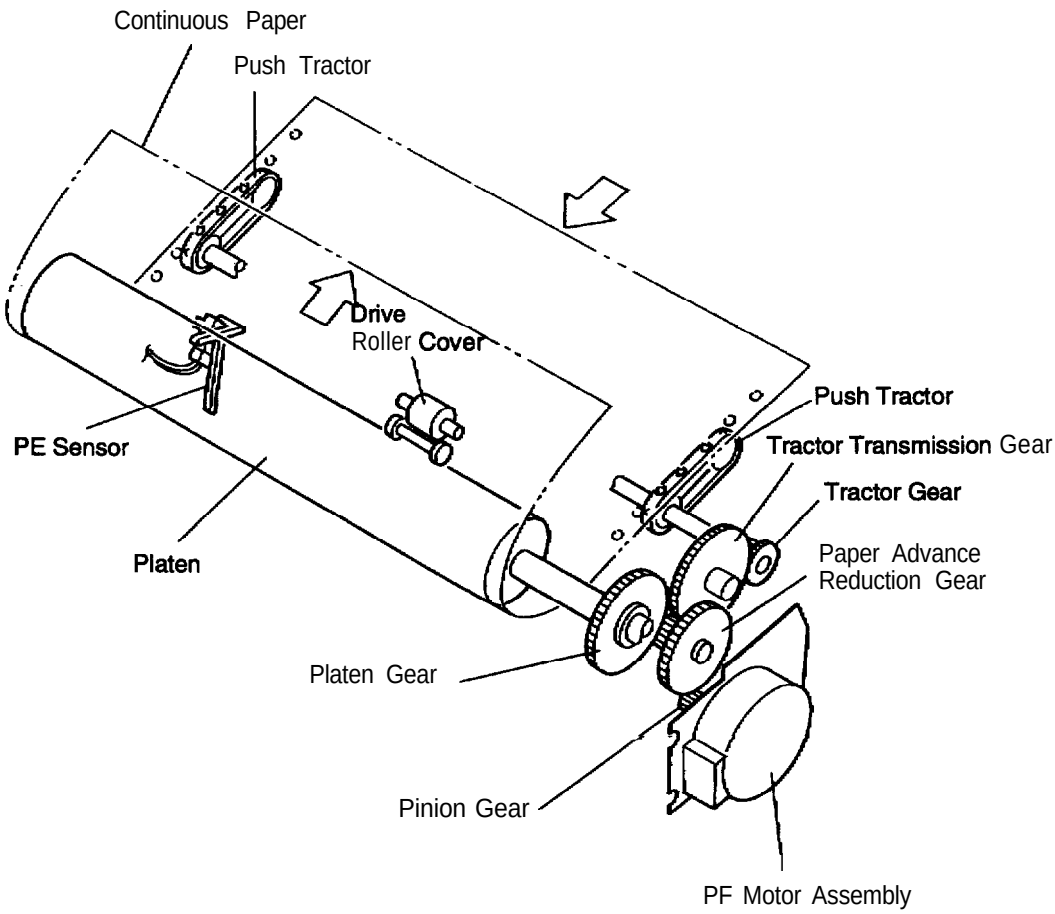

Figure 2-4. Push Tractor Paper Advance Mechanism

Pull Tractor *Method*

The pull tractor advances paper in basically the same way as the push tractor. When the push tractor is installed at the paper exit instead of paper entrance, the tractor functions as a pull tractor instead of a push tractor, pulling the paper out of the printer mechanism Figure 2-5 shows the pull tractor advance mechanism.

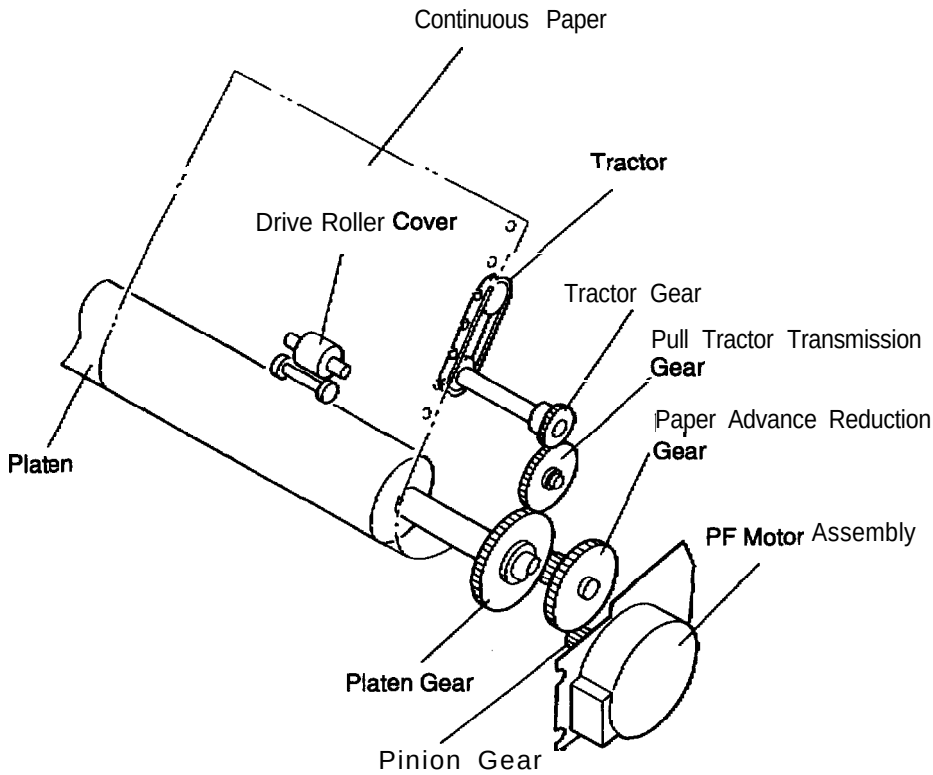

Figure 2-5. Pull Tractor Paper Advance Mechanism

Push - Pull Tractor Method

The push-pull tractor method is a combination of the push method, using the standard tractor, and the pull method, using an optional tractor. The two tractors operate simultaneously to push and pull the paper through the printer mechanism. Figure 2-6 shows push-pull tractor operation when the paper is fed through the rear paper entrance.

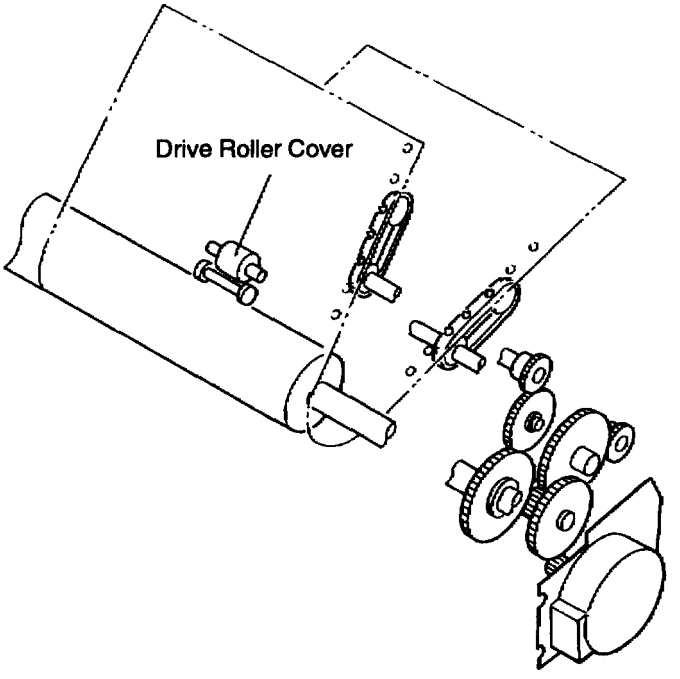

Figure 2-6. Push-Pull Tractor Paper Advance Mechanism

Disengage Lever

The disengage lever switches whether or not the printer transmits the torque of the PF motor assembly to the tractor transmission gear. (See Figures 2-5 and 2-6.)

The paper path is different from friction feed and tractor feed. The PF drive roller is not in the tractor feed paper path, so continuous paper is not advanced by this roller. Figure 2-7 shows the paper path.

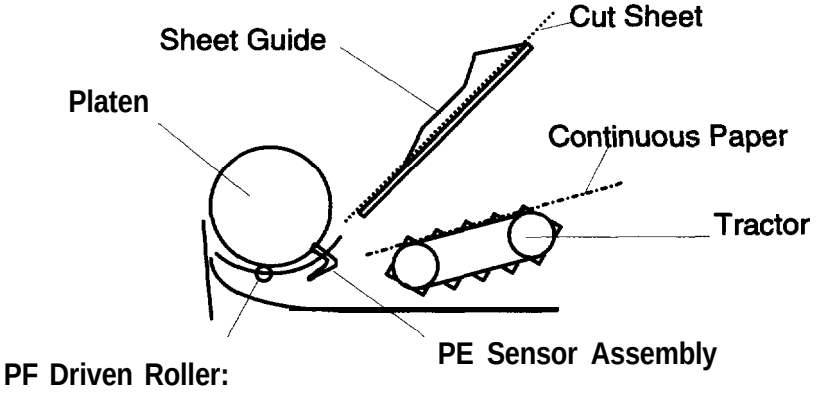

Figure 2-7. Paper Path

Ribbon Advance Mechanism

The ribbon is held between the ribbon advance roller (ribbon driven gear) and the ribbon pressure roller. When the carriage moves on the CR guide shaft from left to right and vice versa, the timing belt turns the belt driven pulley. Then the torque is transmitted to the ribbon driving gear through the gear trams. The ribbon driving gear rotates counterclockwise no matter what direction the carriage moves, because a planetary gear is used in the gear linkage.

Table 2-3. Ribbon Advance Gear Linkage

Direction of Carriage Movement	Gear Linkage
Left to right (indicated by the black arrow)	Belt driven pulley+ Gear (1)→ Gear (2)→ Ribbon driving gear
Right to light indicated by the white arrow)	Belt driven pulley+ Gear(I)+ Gear (3)→ Gear (4)→ Ribbon driving gear

The ribbon brake spring attached to the exit of the cartridge case, prevents slack in the ribbon and keeps the ribbon tension at an appropriate level. The ribbon mask prevents the ribbon from brushing against the paper.

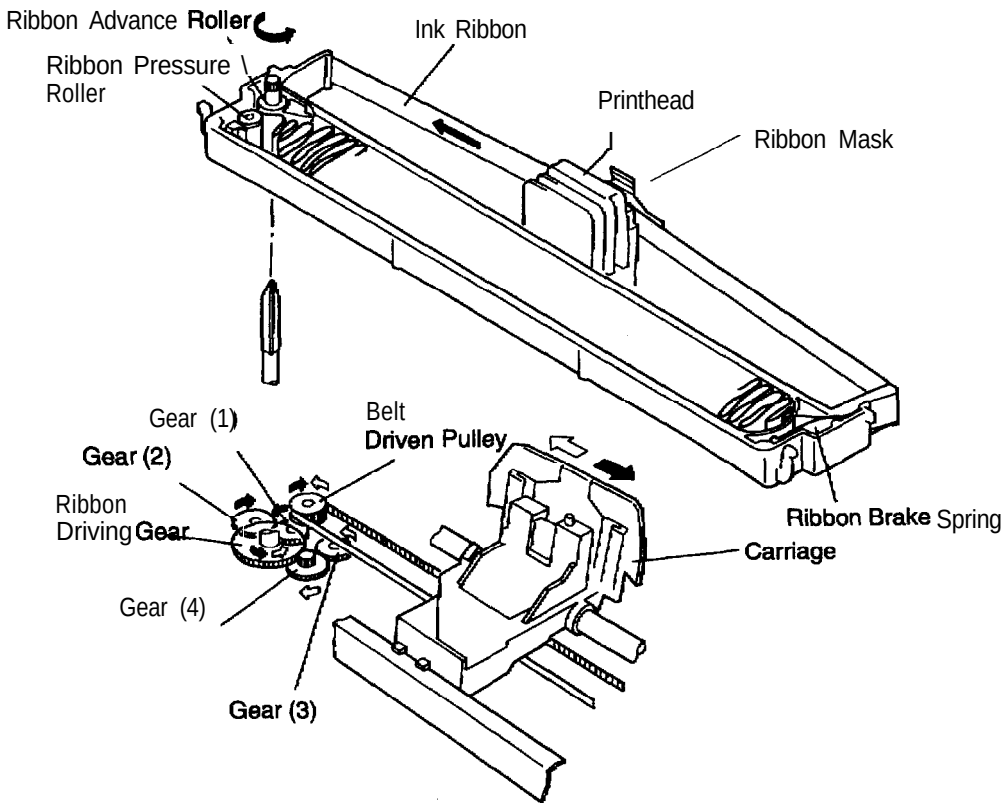

Figure 2-6. Ribbon Advance Gear Linkage

Ribbon Shift Mechanism

This printer can be equipped with a color upgrade kit to print in color. The printer performs color printing unidirectionally. The option is composed of the color ribbon shift mechanism. The color ribbon feed mechanism is shared in common with black ribbon feed mechanism, and the shift mechanism shifts the ribbon cartridge up and down.

Table 2-2 shows the CS motor assembly specifications. The motor control system is open-loop, so that when the color is being changed, the positioning is controlled by stepping pulse.

Table 2-4. CS Motor Assembly Specifications

Category	Requirement
Type	4-phase, 48-pole, PM-type stepping motor
Drive Voltage	*35* VDC ± 10%
Coil Resistance	150 ohms ± 5% (per phase, at 25° C or 77° F)
Drive Pulse Frequency	Color shift *500* pps
Excitation Method	Constant-voltage 2-2 phase excitation

The ribbon shift mechanism consists of the color ribbon and color upgrade kit. The color upgrade kit is composed of the CS motor assembly, ribbon shift gear/ cam, motor driver IC, and color ribbon sensor. The l-inch-wide color ribbon is separated into four equal-width bands of different colors. The ribbon shift mechanism shifts the ribbon cartridge up and down.

When the color ribbon cartridge is loaded, it is possible to print in up to seven colors. One of the four colors on the ribbon is selected by the color ribbon cartridge motion, which inserts a portion of the plastic posts into the slots in the printer mechanism as a fulcrum. Figure 2-9 illustrates the color shift mechanism. The mechanism shifts the ribbon cartridge by converting the gear rotation to liner motion (up and down) of the color ribbon cartridge, using color shift cam gear.

Any color band can be selected by rotation of the CS motor assembly, using the color home position (the position of the black color band) as a starting point and reference position. Home position is recognized by the CS motor assembly stepping pulse. When printer is power on, the CS motor assembly is excited at any phase position at first. Next, the CS motor assembly is turned for 235 steps (black → yellow). Then, the motor returns one step (yellow+ black), and the motor is stopped. Finally, the motor returns 223 steps (yellow+ black) and stops. This position is home position.

Table 2-5 gives coloring sequences. For halftones, as shown in the table, a color is created by printing one color on top of another.

Table 2-5. Coloring Sequences

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

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

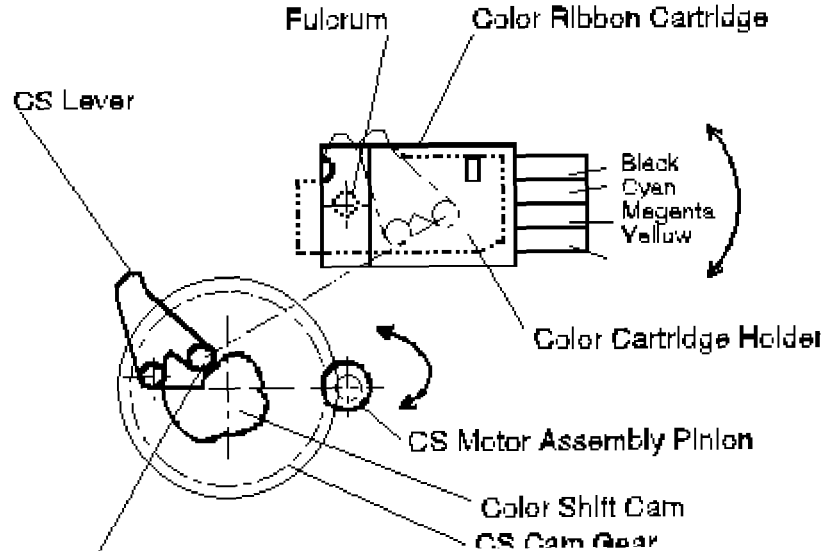

Figure 2-9. Color Shift Mechanism

Platen Gap Adjustment Mechanism

The platen gap (the gap between the platen and the printhead) can be adjusted to allow the printer to use paper of different weights or thicknesses. When the gap adjust lever is moved forward or backward, the CR guide shaft rotates. This rotation moves the carriage either toward or away from the platen and changes the platen gap. The correct platen gap is 0.45 ± 0.02 mm with the gap adjust lever set to position 0.

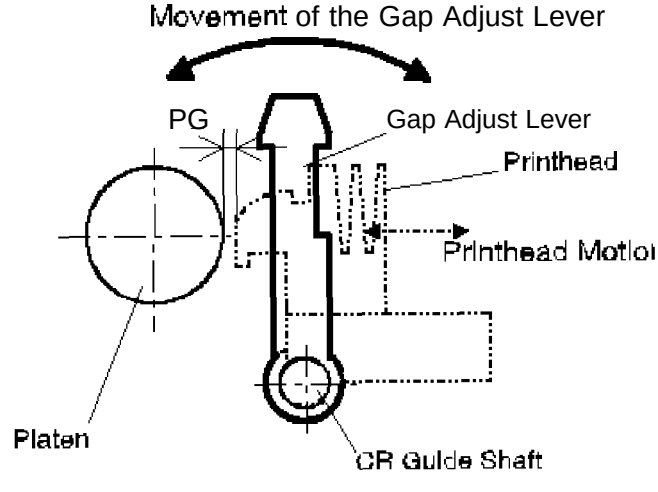

Figure 2-10. Platen Gap Adjustment Mechanism

POWER SUPPLY OPERATION

The printer can be powered by either of two power supply boards: the C130 PSB (120 V) board assembly or the C130 PSE (230 V) power supply. The function of these two boards is the same, except for a difference in primary circuitry. The power supply board outputs the DC current necessary to drive the printer control circuits and drive mechanism. Table 2-6 shows the input voltages and fuse ratings for these boards.

Table 2-6. Power Supply Board

Board	Input Voltage	Fuse F1 Rating
C130 PSB	100.5 - 132 VAC	2.5 A / 125 V, 250 V

Power Supply Overview

The power supply board has two power outputs for use in the various control circuits and drive mechanisms. Table 2-7 lists the circuitry and the units that are driven by the two DC output supply voltages.

Table 2-7. Power Supply Output Voltages and Applications

output Supply Voltage (DC)	Applications
+35 v (VP)	CR motor drivers
	PF motor drivers
	Printhead drivers
	CS motor drivers
+9 v (VL)	Main board assembly logic circuitry
	Various sensors
	Control panel LED
	PF motor / CS motor hold

Power Supply Circuit Operation

Figure 2-11 shows a block diagram of the power supply circuitry. When AC power is supplied to the printer from an external power source, a filter circuit removes the noise. The AC voltage then undergoes full-wave rectification and is smoothed to produce the direct current supply voltage. This voltage is fed through a switching circuit and secondary smoothing circuit to produce the stepped down +35 VDC supply. A +35 V line voltage detector (ZD51 and PC1) circuit is connected to the switching circuit. This feedback control arrangement ensures that the +35 VDC supply is kept stabilized.

A +9 VDC supply is created by putting the +35 VDC line through the +9 VDC power supply circuit. This circuit further steps down the +35 VDC voltage and outputs a stabilized supply. The +9 VDC output is stabilized to +5 VDC using the regulator on the Cl30 MAIN board assembly. There are several circuits to protect the supply circuits and avoid danger.

The +9 VDC line contains a voltage overload protection circuit. The +9 V voltage overload protection circuit (ZD53, Q82, and PC1) cuts the supply if the voltage reaches or exceeds +11 VDC. It stops switching circuit operation, which stops the output from the +35 VDC line.

The +35 VDC line has a voltage overload protection circuit. The +35 VDC voltage overload protection circuit (ZD52, Q82, and PC1) cuts the supply if the voltage reaches or exceeds +36 VDC. It stops switching circuit operation, which stops the output from the +35 VDC line.

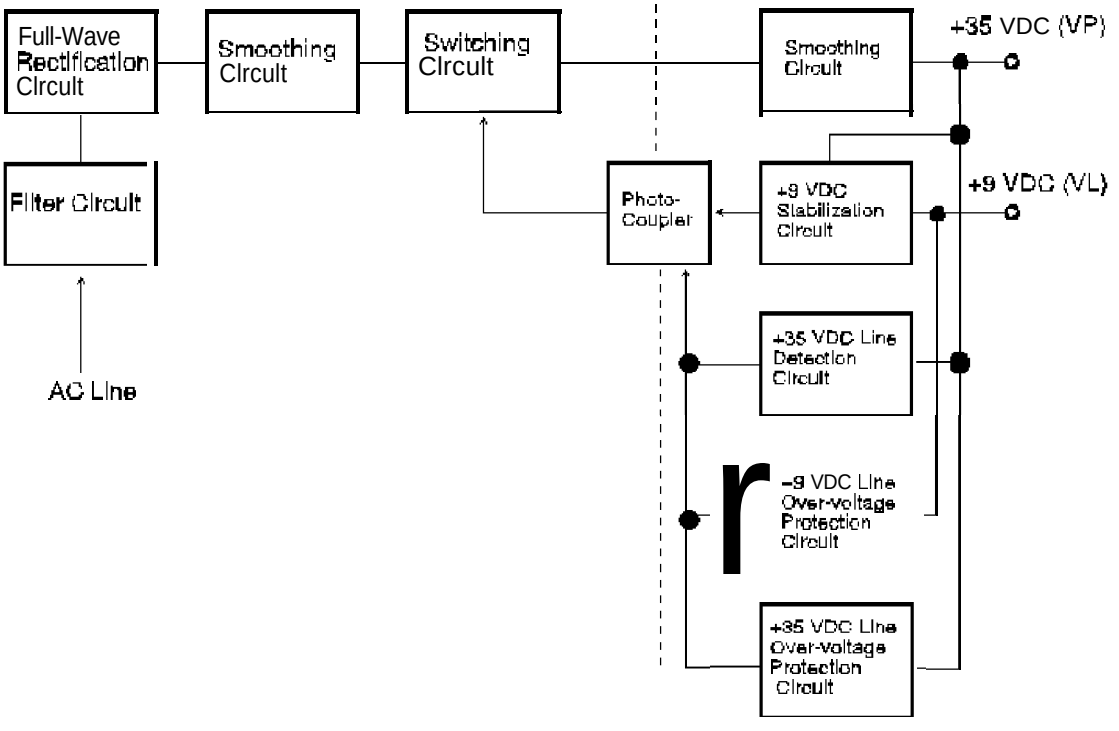

Figure 2-11. Power Supply Circuit Block Diagram

CONTROL CIRCUIT

The control circuit consists of the Cl30 MAIN board assembly. This section describes the major components and explains how the board works.

Control Circuit Operation Overview

The printer's system IC contains a CPU (µPD78C10A-type) that runs at 14.74 MHz, a gate array (E05A79-type) and a main RAM (8KB SRAM). It oversees control of all the components in the printer. The printer uses the E05A90 gate array to control address decoding, parallel communications, PF motor drive signals, etc. Table 2-8 shows functions of main IC and circuits. Figure 2-18 shows the control circuits in block diagram form.

Table 2-8. Functions of the Main IC

IC	Location	Function
SYSTEM IC	IC1	CPU Block: Receives data from the host computer and sends it to the input buffer in RAM (under interrupt processing control). Extends the input data held in the buffer to create image data. Loads this image data to the image buffer in RAM. Transfers the image data to the printhead drive circuit. Also controls various parts of the printer mechanism, such as PF motor control and color select motor control
		Gate Array Block: Controls the functions below. • Address decoding • Parallel communications • Impact head drive control • CR motor control
		Main RAM Block: Holds the CPU working area and various buffers.
ROM	EI	Contains the program that runs the CPU and holds the character design (also called the character generator).
RESET IC	A2	Hardware reset function
EEPROM	A3	An electrically writable and erasable ROM used to hold such information as the TOF position and bidirectional adjustment value.
Serial I/F IC	IC2	Driver / receiver

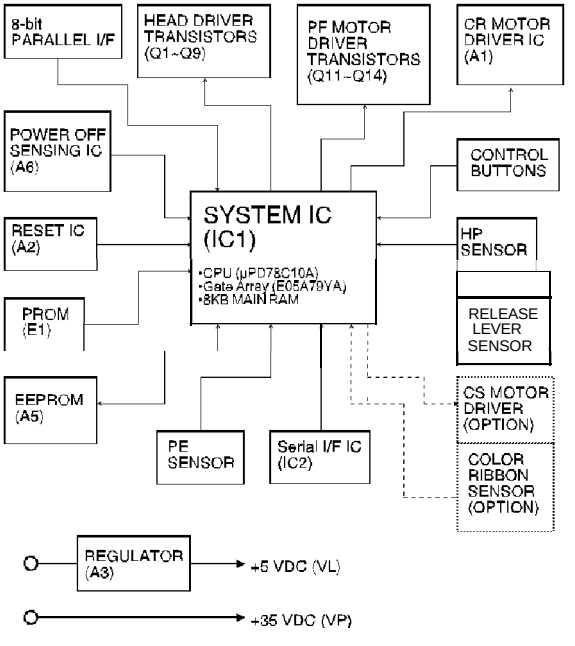

Figure 2-12. Control Circuit Block Diagram

Power On Reset Circuit

When the power supply is turned on, the VL goes up to +9 VDC immediately, but reset IC output (IC A2, pin 6) is delayed for approximately 80 ~ 1 ms before going up to +9 VDC. The system IC receives this LOW level signal from the reset IC and resets itself.

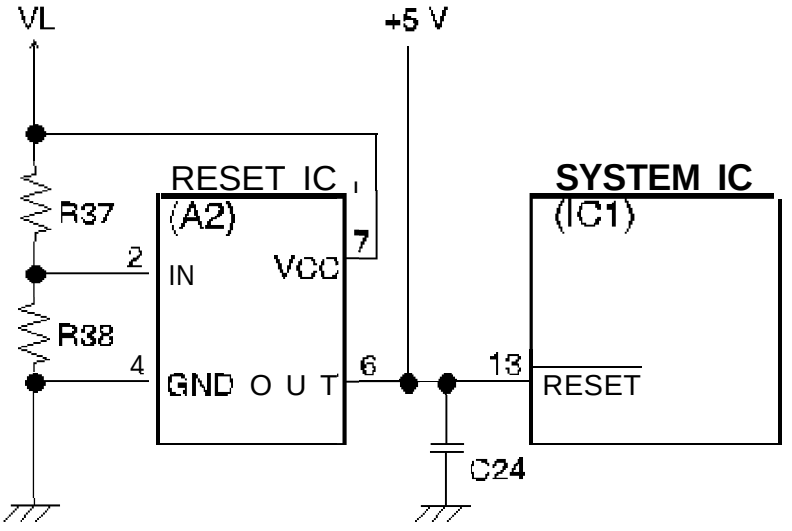

Figure 2-13. Power On Rest Circuit Diagram

Home Position Sensor Circuit

This printer has a connector switch to sense the carriage home position. The system IC receives a signal (HIGH or LOW) from the HP sensor and recognizes the carriage home position when the printer is turned on. The connector switch is closed (LOW) when the carriage is in the home position and is open (HIGH) when the carriage is out of home position.

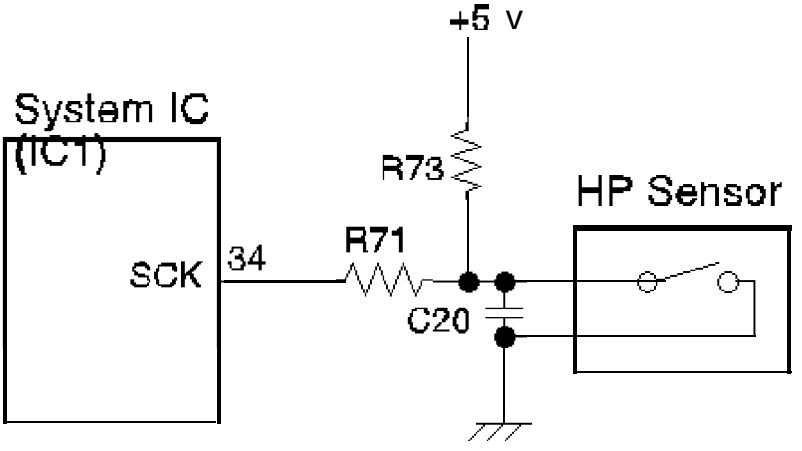

Figure 2-14. Home Position Sensor Circuit Diagram

Paper End Sensor Circuit

This printer has a connector switch for sensing the paper end. The system IC receives a signal (HIGH or LOW) from the connector switch and recognizes a paper end. The connector switch is closed (LOW) when there is no paper on the platen and is open (HIGH) when paper is present.

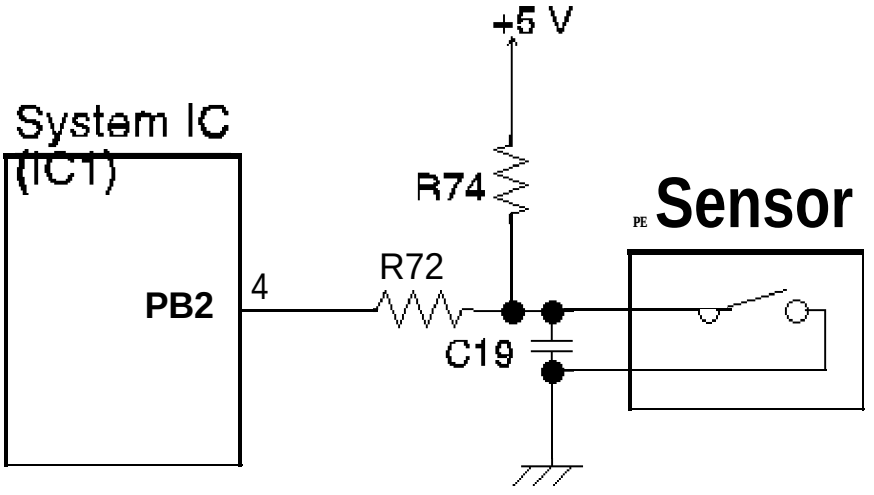

Figure 2-15. Paper End Sensor Circuit Diagram

Release Lever Position Sensor Circuit

This printer has a connector switch to detect the type of paper handling. The system IC receives a HIGH or LOW signal from the connector switch to indicate whether the paper is fed using friction feed or push tractor feed. The connector switch is closed (LOW) when friction feed is selected and is open (HIGH) when push tractor feed is selected.

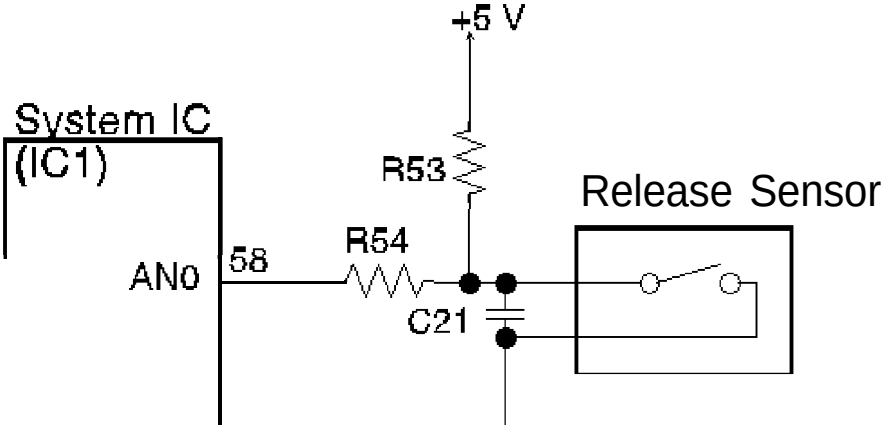

Figure 2-16. Release Lever Position Sensor Circuit Diagram

Carriage Motor Driver Circuit

Figure 2-17 shows the carriage motor driver circuit. The carriage motor driver uses an open-loop, constant-current drive arrangement. The motor is driven with 2-2 phase excitation and l-2 phase excitation.

The carriage motor driver IC (Al) detects the amount of current in the carriage motor coils and regulates the current. The amount of current flowing in the coils varies, depending on the speed of the carriage motor. The amount of the current is set by the system IC (IC1). Signals are sent to CRI1 and CRI2 on the system IC. The motor driver IC sets the coil current to correspond to the carriage motor speed. Ports PA0 - PA3 on the CPU block control the stepping motor via the gate array block in IC1.

Table 2-9. Carriage Motor Drive Modes

Driver Mode	Excitation Type	Drive Frequency Type	Standard Print Character
3 x speed	2-2 phase	1080 pps	60 dpi printing (draft)
2 x speed	I-2 phase	1600 pps	60 dpi printing
1 x speed	I-2 phase	800 pps	180 dpi printing (LQ) 120, 90 dpi printing
2/3 x speed	I-2 phase	533 pps	180, 120, 90 dpi printing
7/8 x speed	I-2 phase	630 pps	Home position seek

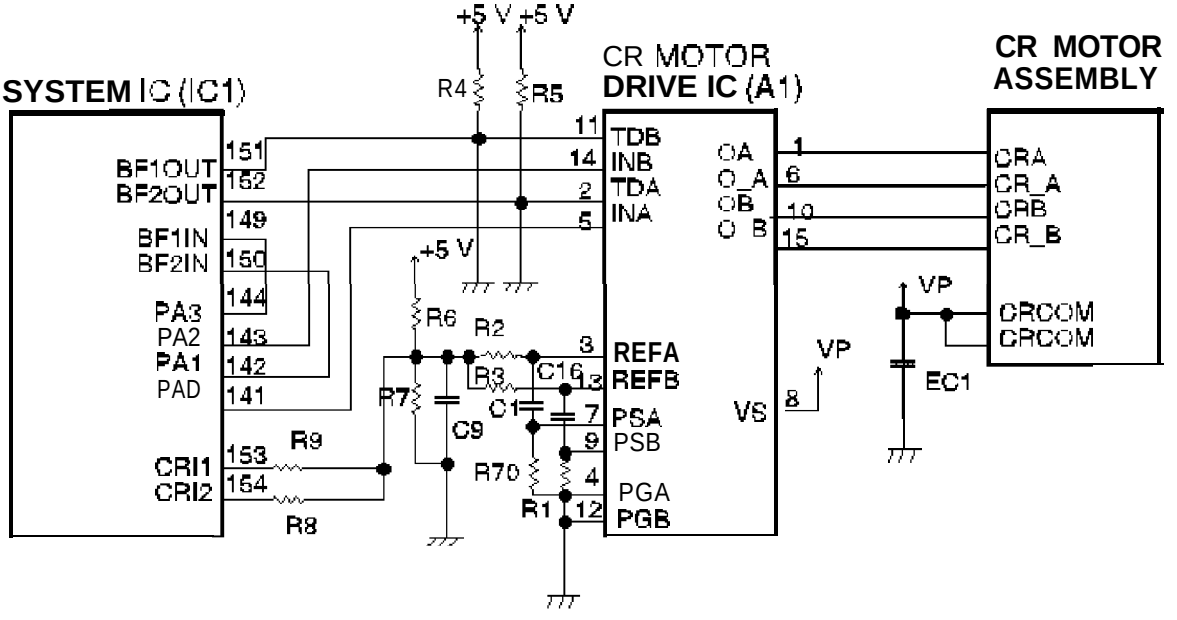

Figure 2-17. Carriage Motor Driver Circuit

Paper Feed Motor Driver Circuit

Figure 2-18 shows the paper feed motor driver circuit, an open-loop, constant-voltage drive with l-2 phase excitation.

The ports (pins 137 - 140) on the system IC (IC1) are used to control the stepping motor. The pulse signal from the IC1 controls four transistors and the stepping motor. The motor is driven at five speeds, 800, 900, 1000, 1200, and 1300 pps, to correspond to the idling voltage and the paper handling condition. The IC1 controls motor speed. At the holding time, The PFCOM voltage is changed VP into VL via A4 by the IC1.

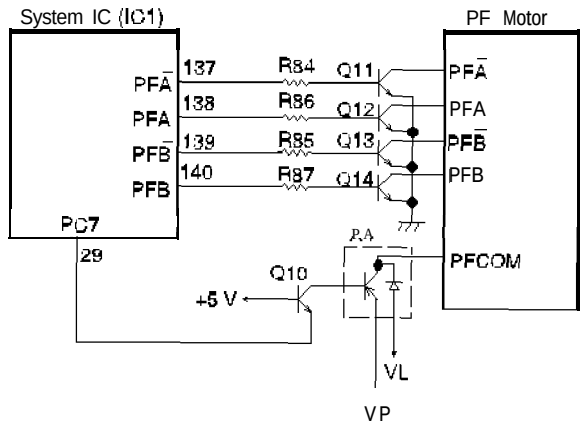

Figure 2-18. Paper Feed Motor Driver Circuit Diagram

Printhead Driver Circuit

Figure 2-19 shows the printhead driver circuit block diagram. Print data, already expanded into image data, is split by the CPU block and transferred to the latch circuit in the gate array block in the system IC (IC1). Port AN6 (pin 66) of IC1 samples the voltage of the +35 VDC line via the A/ D converter. By sampling the +35 VDC line voltage and determining the length of the head drive signal, it is possible to maintain the energy supplied to the head at a constant level. If the voltage from the +35 V line is HIGH, IC1 shortens the output pulse. If the voltage from the +35 VDC line is LOW, IC1 lengthens the output pulse.

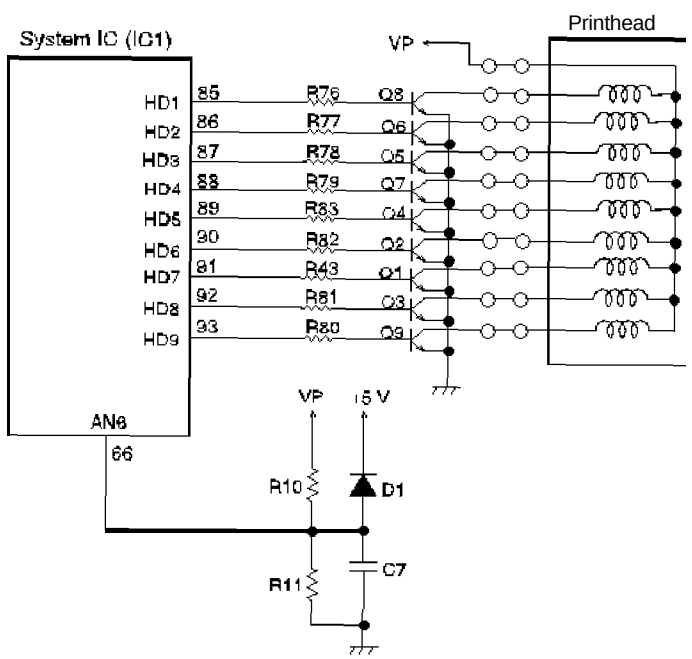

Figure 2-19. Printhead Driver Circuit Diagram

Interface Circuit

Figure 2-20 shows the parallel interface circuit block diagram. Data from the host computer is latched within the system IC by a STROBE signal. The system IC outputs a BUSY signal automatically to stop the host computer from sending further data. The CPU block reads the data latched in the gate array block periodically without generating an interrupt.

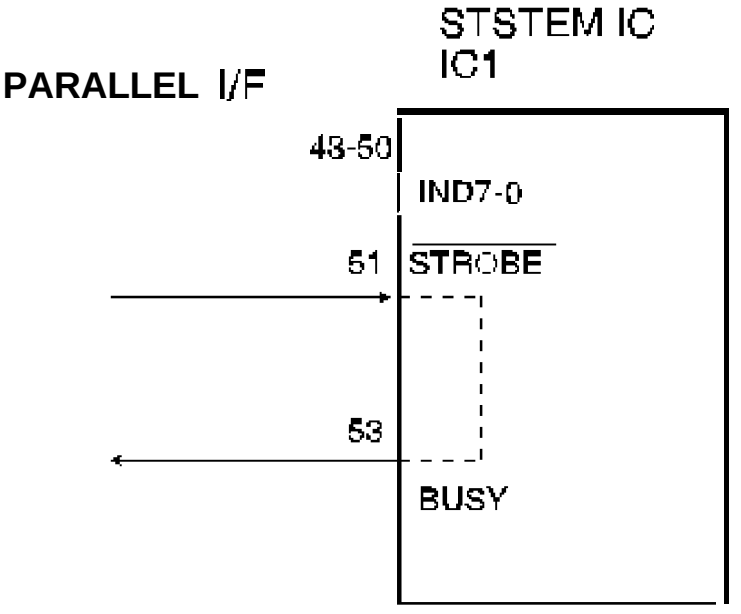

Figure 2-20. Parallel Interface Block Diagram

Figure 2-21 shows the serial interface circuit block diagram. The serial interface conforms to EIA-232D. RXD is data received by the serial I/ 0 of the CPU block from the host computer via driver/ receiver IC2. Data is transmitted to an input buffer in the system IC from the CPU block. Printing starts when a CR code is received or when the input buffer is filled.

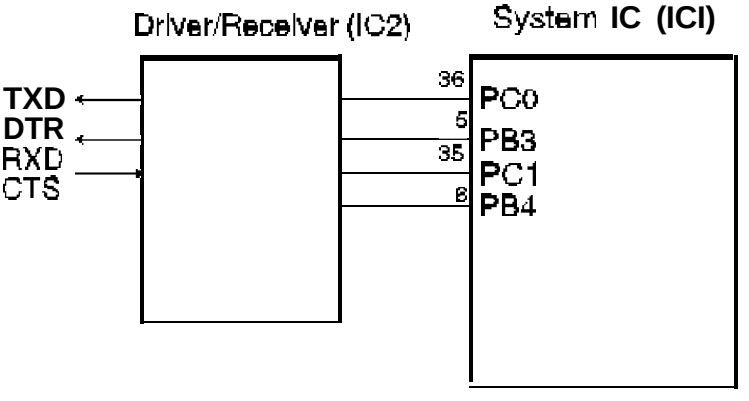

Figure 2-21. Serial Interface Block Diagram

EEPROM Control Circuit

Figure 2-22 shows the EEPROM control circuit block diagram. The EEPROM (A5) contains such information as the top-of-form position. The EEPROM is non-volatile memory, so information is not lost if the printer is powered off. Since the EEPROM is a serial I/ O-type device, the CPU converts S-bit data into serial data.

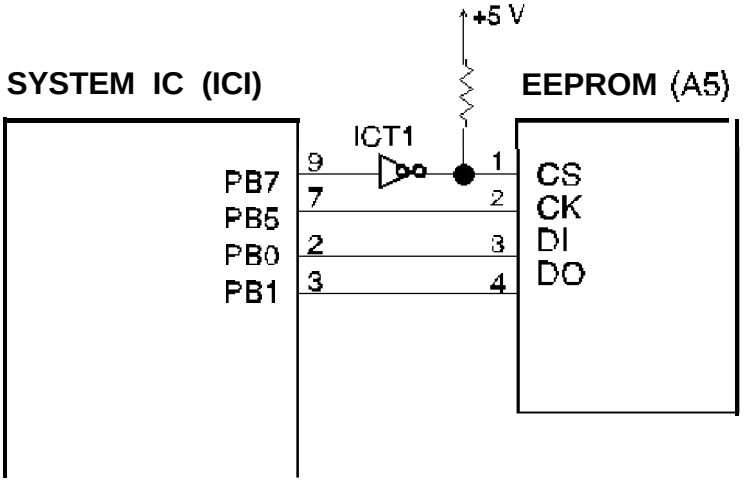

Figure 2-22. EEPROM Control Circuit Diagram

CS Motor Assembly Circuit

Figure 2-23 shows a block diagram of the CS motor assembly circuit in the optional color upgrade kit. The CS motor assembly is a permanent magnet (PM) stepping motor, driven with 2-2 phase excitation in proportion to the desired rotational speed. This motor can be rotated in either direction and stopped at any position. Four phase signals are directly output from the system IC and pass through a transistor array. The drive voltage is constant (i.e., +35 VDC from the VP line).

Source Voltage	35 VDC ± 10%
Current Consumption	245 mA (peak)

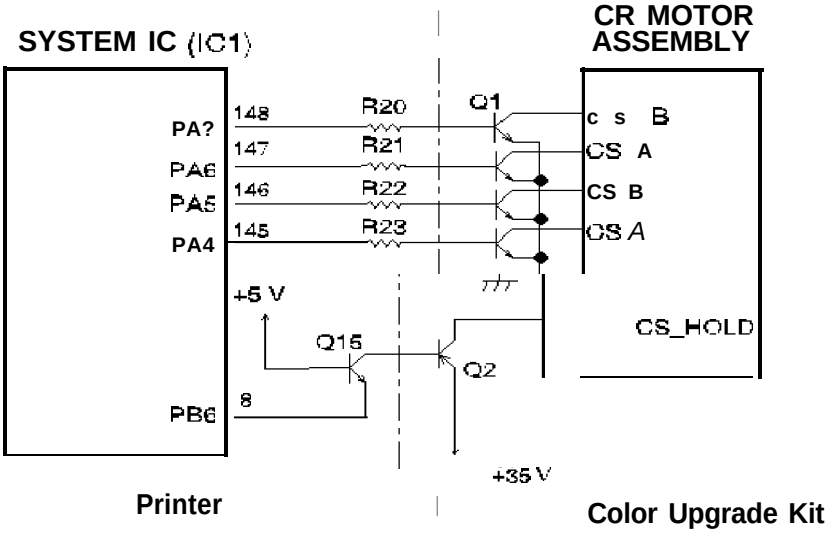

Figure 2-23. CS Motor Assembly Circuit Diagram

Color Ribbon Sensor Circuit

The printer's color ribbon circuitry in shown in the figure below. The CPU receives signals (HIGH or LOW) from the mechanical switch. The signal is HIGH when a color ribbon is installed and is LOW otherwise.

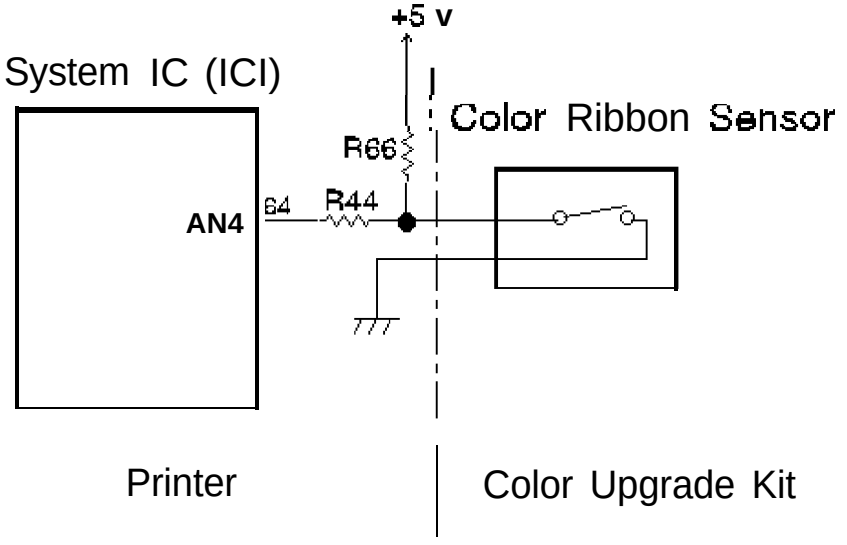

Figure 2-24. Color Ribbon Sensor Circuit Diagram

CHAPTER 3 Disassembly and Assembly

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OVERVIEW

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

Disassembly Precautions

Follow the precautions below when disassembling the printer.

WARNING

Before disassembling, assembling, or adjusting the printer, disconnect the power supply cable from the AC power socket. Failure to do can cause personal injury.

CAUTION

To maintain efficient printer operation:

- ***Use only the recommended tools for maintenance work.***
- ***Use only the recommended lubricants and adhesives (see Chapter 6).***
- ***Adjust theprinter only in the manner described in this manual.***

Tools

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

Table 3-1. Recommended Tools

Tool	Part No.
Round-nose pliers	B740400100
Nippers	B740500100
Tweezers	B741000100
Soldering iron	B740200100
E-ring holder #2.5	B740800400
Phillips screwdriver No.2	B743800200
Normal screwdriver	B743000100
Thickness gauge	—

Note: All tools are commercially available.

Table 3-2. Equipment Required for Maintenance

Description	Specification
Multimeter	
Oscilloscope	50 MHz

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

Service Checks After Repair

Before returning the printer after service, use the checklist in Table 3-3, which provides a record to make servicing and shipping more efficient.

Table 3-3. Inspection Checklist for Repaired Printer

Category	Component	Item to Check	Is Check Required?
Printer units	Printhead	Are any wires broken?	☐ Checked ☐ Not necessary
		Are any wires worn out?	☐ Checked ☐ Not necessary
	Carriage mechanism	Does the carriage move smoothly? ☐ Movement noisy ☐ Mechanism dirty ☐ Mechanism oily	☐ Checked ☐ Not necessary
		Is the CR motor assembly at the correct temperature (not overheating)	☐ Checked ☐ Not necessary
	Paper advance mechanism	Is paper advancing smoothly? ☐ Movement noisy ☐ Mechanism dirty ☐ Mechanism oily	☐ Checked ☐ Not necessary
		Is the paper advance motor running at the correct temperature (not overheating)	☐ Checked ☐ Not necessary
	Paper path	Is the *type* of paper in the printer feeding smoothly?	☐ Checked ☐ Not necessary
		Is the tractor feeding the paper correctly?	☐ Checked ☐ Not necessary
		Is the paper path clear of all obstructions?	☐ Checked ☐ Not necessary
		Is the platen free of damage?	☐ Checked ☐ Not necessary
	Ribbon mask	Is the ribbon mask free of distortion?	☐ Checked ☐ Not necessary
	Self-print test	Was the self-print successful?	☐ Checked ☐ Not necessary
	On-line test	Was the on-line test successful?	☐ Checked ☐ Not necessary
Adjustment	Printhead printing	Is the platen gap adjusted correctly?	☐ Checked ☐ Not necessary
		Is the bidirectional print position adjusted correctly?	☐ Checked ☐ Not necessary
	Default setting	Have user changeable settings been reset to the default value?	☐ Checked ☐ Not necessary
System upgrade	ROM version	ROM version _____	☐ Checked ☐ Not necessary
	Shipment	Has the ribbon been removed?	☐ Checked ☐ Not necessary
		Have all relevant parts been included in the shipment?	☐ Checked ☐ Not necessary

Specifications for Screws

Table 3-4 lists the abbreviations used in the following sections for small parts, such as screws and washers.

Table 3-4. Screw Abbreviations

Abbreviation	Part Name
CPB	Cross-recessed pan head B-tight screw
CBB	Cross-recessed bind head B-tight screw
CBS	Cross-recessed bind head S-tight screw
CBC	Cross-recessed bind head C-Lamitite screw
CTB	Cross-recessed bind head tapping screw
CB(O)	Cross-recessed bind head with outside toothed lock washer
CTBP	Cross-recessed bind head tapping screw with flat washer
CF	Cross-recessed countersunk screw

DISASSEMBLY AND ASSEMBLY

This section describes the procedures for disassembling and assembling the main components of the printer. When the procedure for installing a component is simply the reverse of the procedure for removing the component, no description of the installation is given. Any points of special concern follow the description of the procedure.

CAUTION

- ***Before disassembling any part of theprinter, note the warnings in the "Overview" Section.***
- ***Before disassembling any part of theprinter, remove the paper and the ink ribbon.***

Disassembly includes the following seven procedures:

1. Removing the printhead
2. Removing the upper housing assembly
3. Removing the main board assembly and PSB
4. Removing the printer mechanism
5. Removing the interface board assembly
6. Disassembling the drive roller assembly
7. Disassembling the optional color upgrade kit

Refer to the diagrams in the appendix to see how components fit together.

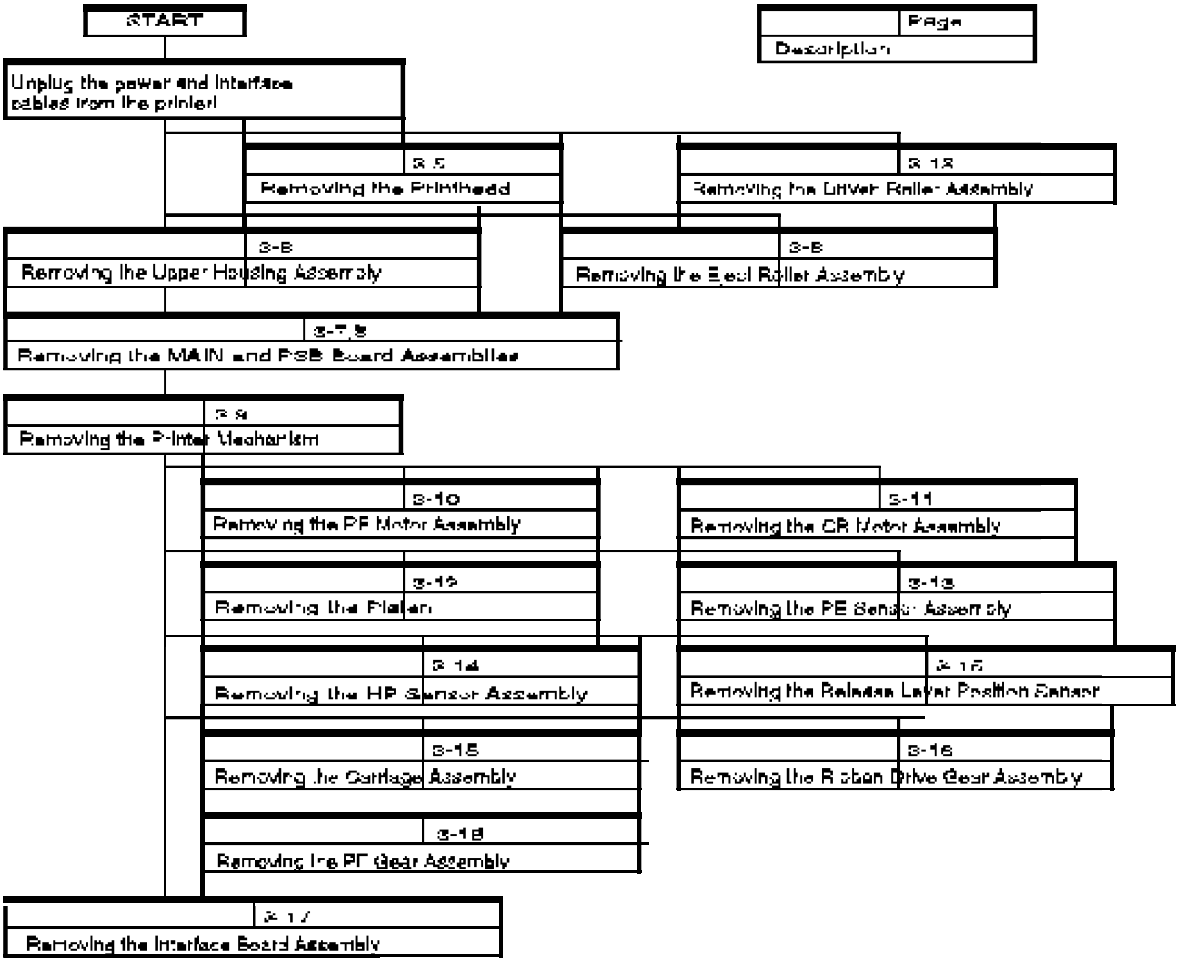

Figure 3-1. Procedure for Disassembling the Printer

Removing the Printhead

1. Remove the printer cover assembly, edge guide assembly, ribbon cartridge, tractor assembly, platen knob, and optional color upgrade kit.
2. Remove the CPB (M3×14) screw attaching the printhead.
3. Remove the printhead.
4. Remove the flexible flat cable (FFC) from the printhead.

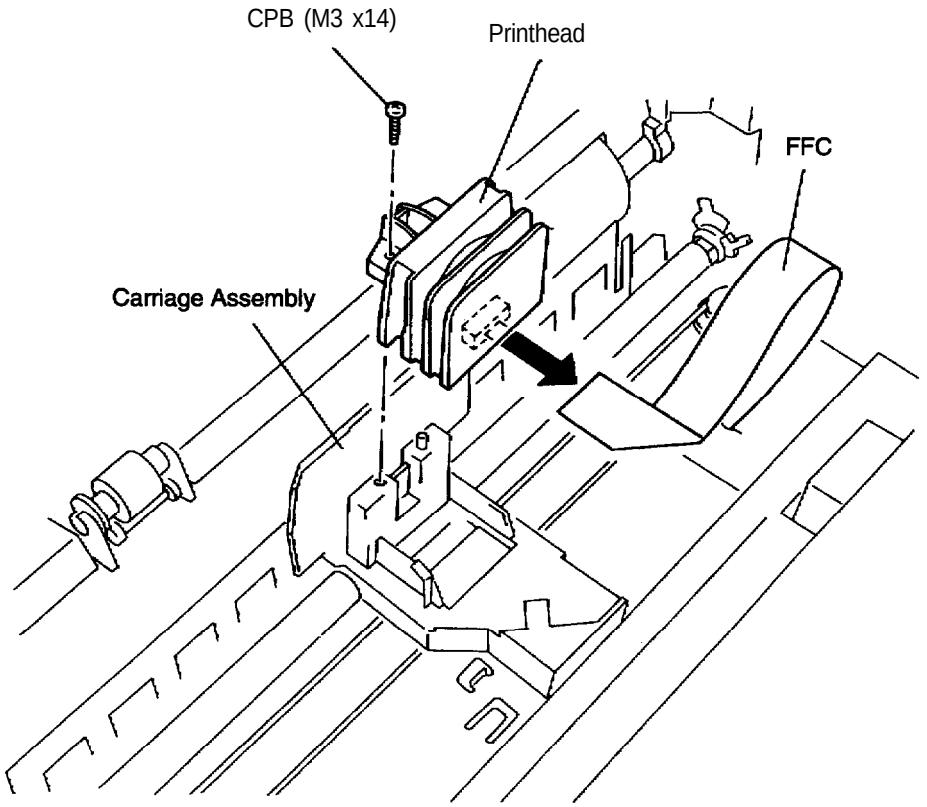

Figure 3-2. Removing the Printhead

Removing the Upper Housing Assembly

1. Remove the printer cover assembly, edge guide assembly, ribbon cartridge, tractor assembly, platen knob, and optional color upgrade kit.
2. Remove the 4 CPB (M4x14) screws attaching the upper housing assembly to the lower housing.
3. Lift off the upper housing assembly.

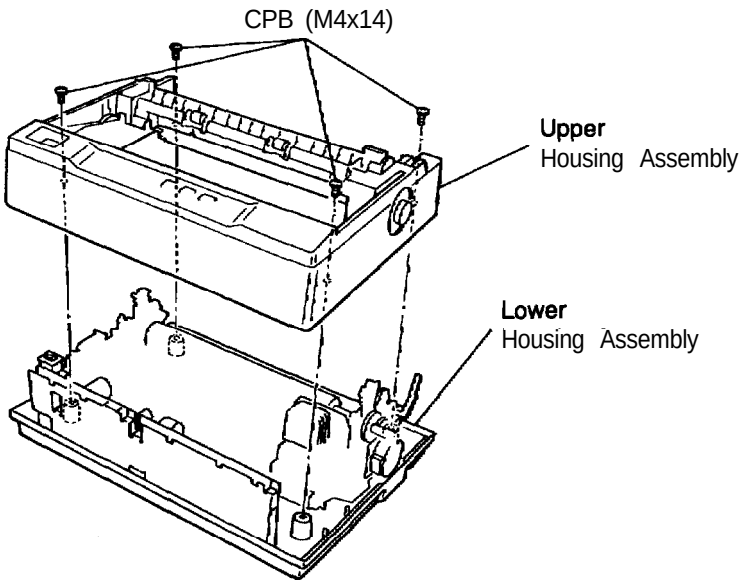

Figure 3-3. Removing the Upper Housing Assembly

Removing the Eject Roller Assembly

1. Remove the upper housing assembly. (See the "Removing *the Upper Housing Assembly"* Section on page 3-6).
2. Lift the roller assembly up and at an angle from the upper housing assembly.

Note: *When removing the eject roller assembly, the spring (500 G) may pop out.*

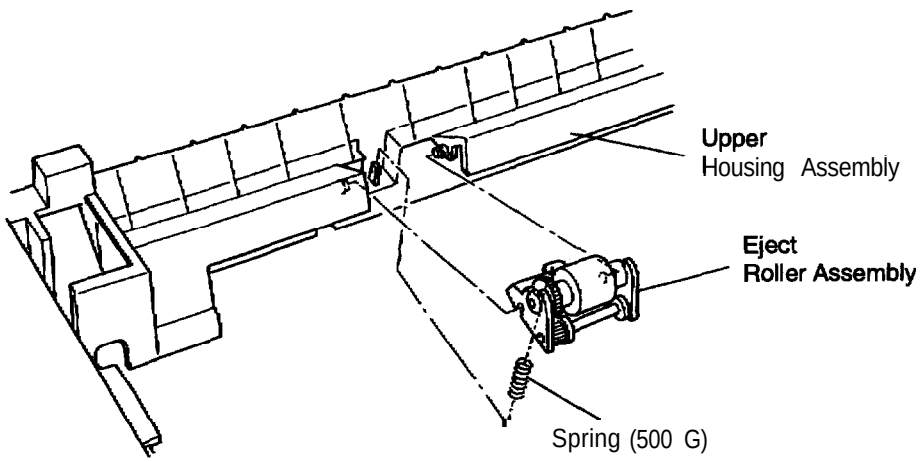

Figure 3-4. Removing the Eject Roller Assembly

Removing the Main Board Assembly and PSB

1. Remove the printer cover assembly, edge guide assembly, ribbon cartridge, tractor assembly, platen knob, and optional color upgrade kit.
2. Remove the upper housing assembly. (See the "*Removing the Upper Housing Assembly*" Section on page 3-6).
3. Disconnect the 3 flexible flat cable (FFCs) and 6 connectors from the main board assembly and PSB.
4. Remove the 4 CBB (M3x8) screws attaching the shield plate to the main board assembly and PSB, the CBB (M3x8) screw attaching the CS board and the CBC (M4x8) screw attaching the ground wire of the power cable.
5. Disengage the shield plate and main board assembly and FSB from the grounding plate.

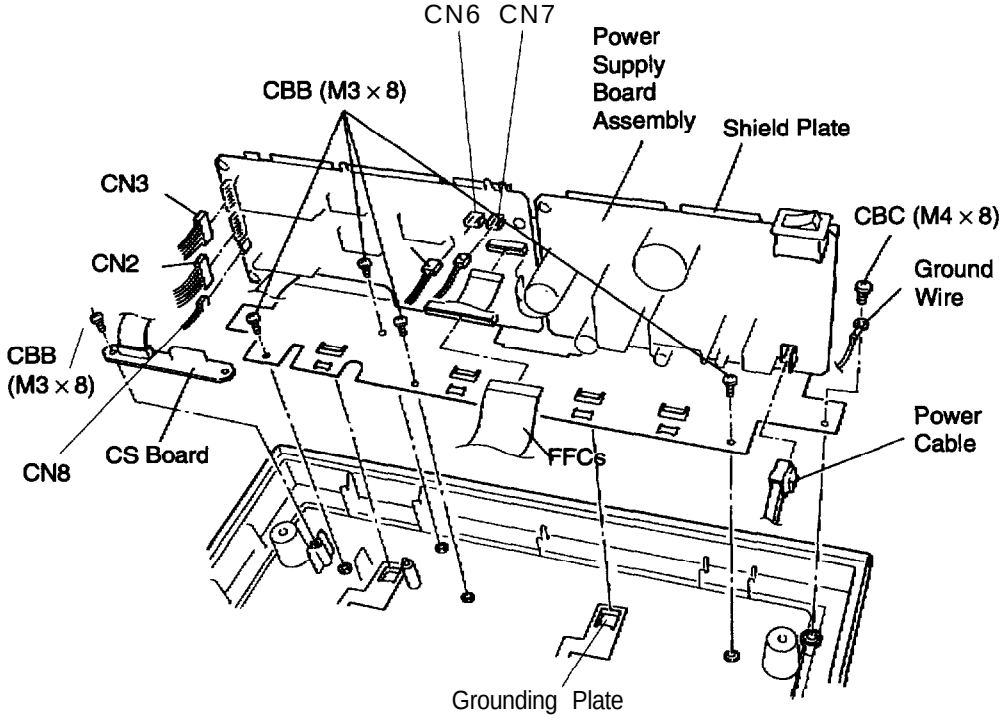

Figure 3-5. Removing the Shield Plate

Removing the Main Board Assembly

1. Remove the FFC of the power supply board assembly from connector CN2 of the main board assembly.
2. Remove the CBC (M3×8) screw and the 3 CTB (M3×8)
3. Remove the main board assembly.

Removing the PSB Board Assembly

1. Remove the FFC for the PSB board assembly from connector CN2 on the main board assembly.
2. Remove the CBTP (M3×10) screw and 2 CBT (M3×8) screws.
3. Remove the PSB board assembly.

Assembly Note

- ***When replacing the main board assembly, bend the LED lead wires parallel to the main*** board ***assembly (see Figure 3-7).***
- ***The shield plate is easily bent; be careful when tightening the screws that attach it to the main board assembly and PSB.***

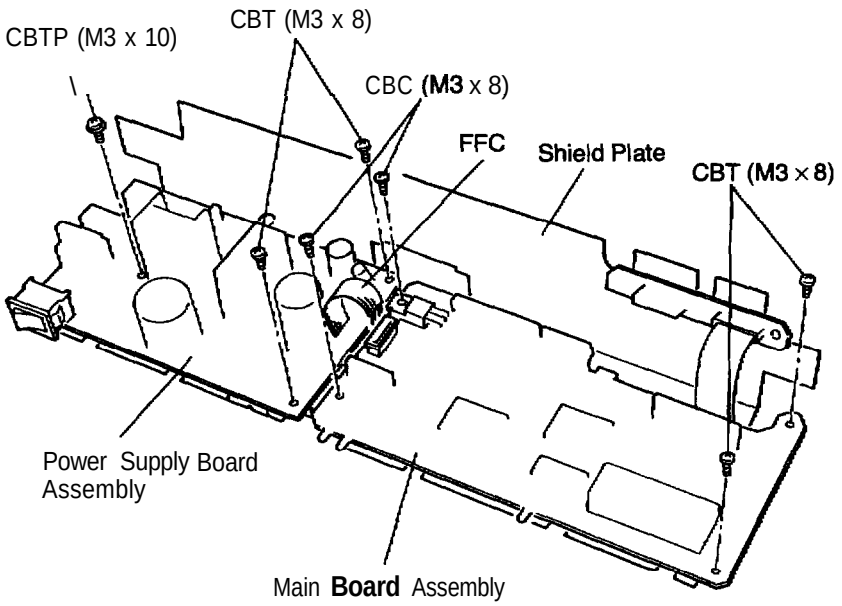

Figure 3-6. Removing the Main Board Assembly and PSB

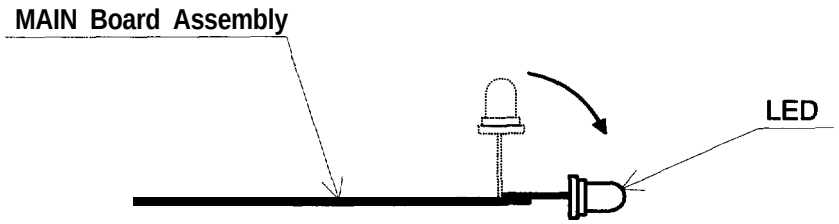

Figure 3-7. Bending the LED Lead Wires

Removing the Printer Mechanism

1. Remove the printer cover assembly, edge guide assembly, ribbon cartridge, tractor assembly, platen knob, and optional color upgrade kit.
2. Remove the upper housing assembly. (See the "Removing the *Upper Housing Assembly" Section* on page 3-6).
3. Remove the connectors and FFCs from the main board assembly.
4. Remove the 3 lower housing shafts (labeled B in the figure below).
5. Remove the lower housing shaft (labeled A in the figure below). Note that this shaft is different from the three described in the previous step.
6 Remove the printer mechanism.

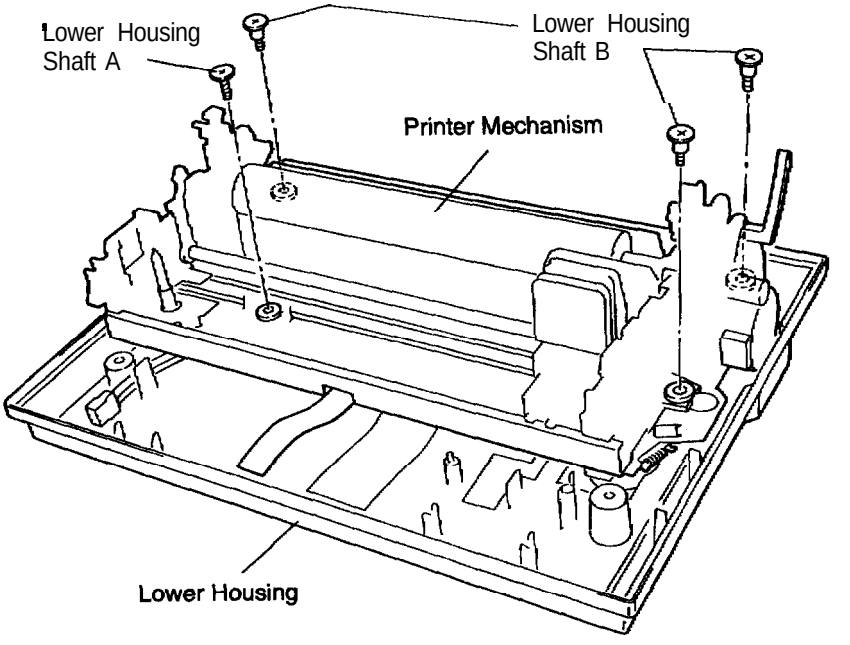

Figure 3-8. Removing the Printer Mechanism

Removing the PF Motor Assembly

1. Remove the printer mechanism. *(See the "Removing the Printer Mechanism"* Section on page 3-9).
2. Remove the platen grounding spring that secures the platen shaft.
3. Remove the CBB (h43 x 8) screw attaching the PF motor assembly to the right frame.
4. Release the clip holding the PF motor assembly from the right frame.
5. Remove the PF motor assembly from the right frame.

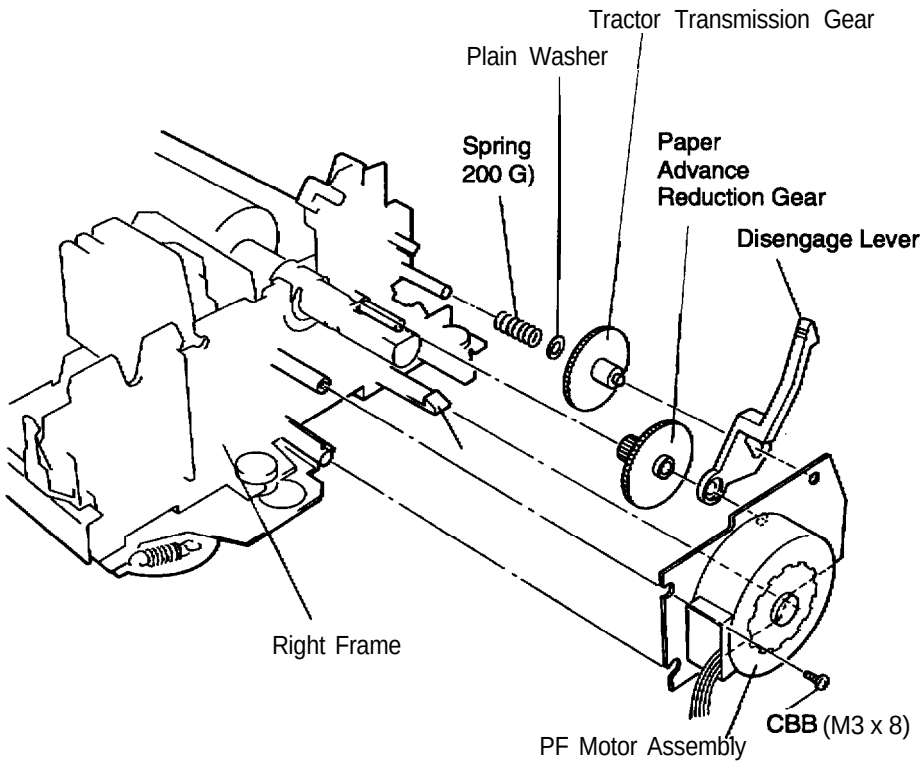

Figure 3-9. Removing the PF Motor Assembly

Removing the CR Motor Assembly

1. Remove the printer mechanism. (See the "Removing *the Printer Mechanism"* Section on page 39).
2. Remove the belt tension spring from the hook on the CR motor assembly and the hook on the base of the frame.
3. Remove the timing belt from the pulley drive.
4. Remove the E-ring, pulley washer, belt pulley flange, and pulley drive from the CR motor assembly.
5. Rotate the CR motor assembly counterclockwise and remove it.

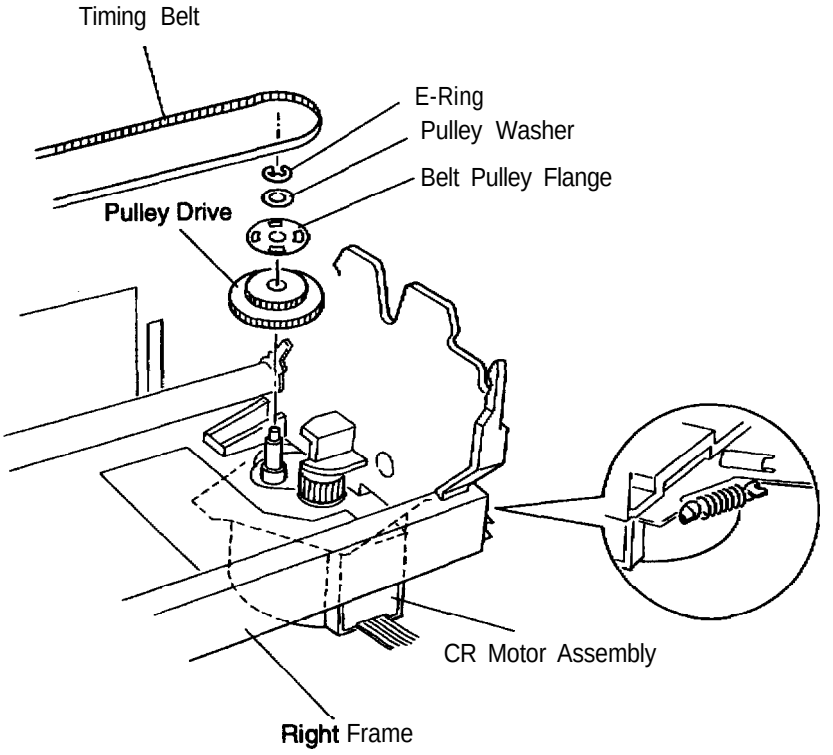

Figure 3-10. Removing the CR Motor Assembly

Removing the Platen

1. Remove the printer mechanism. (See the "Removing *the Printer Mechanism"* Section on page *3-9).*
2. Remove the platen grounding spring that secures the platen shaft.
3. Remove the gear (25 mm) from the right frame.
4. Disengage the teeth of the 2 bushings (11) and rotate them.
5. Rotate the platen and remove it.

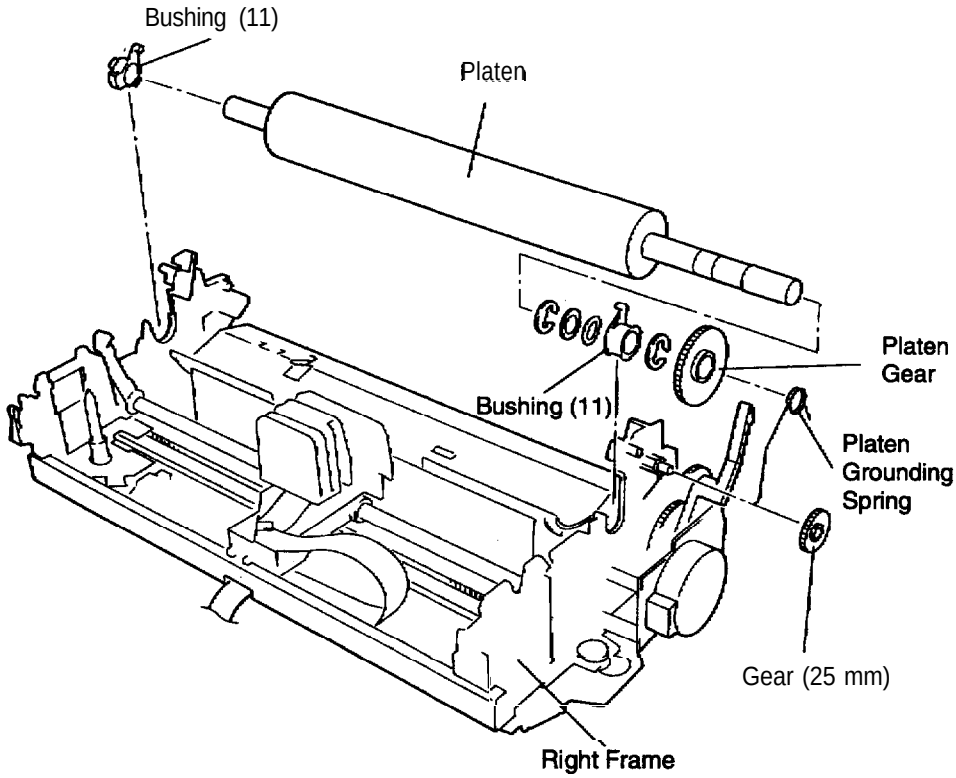

Figure 3-11. Removing the Platen

Removing the Page End (PE) Sensor

1. Remove the printer mechanism *(See the "Removing the Printer Mechanism"* Section on page 39).
2. Remove the platen. (See the *"Removing the Platen"* Section on page 312).
3. Release the friction shaft of the upper paper guide from the clips on the left and right frame.
4. Remove the upper paper guide from the frame.

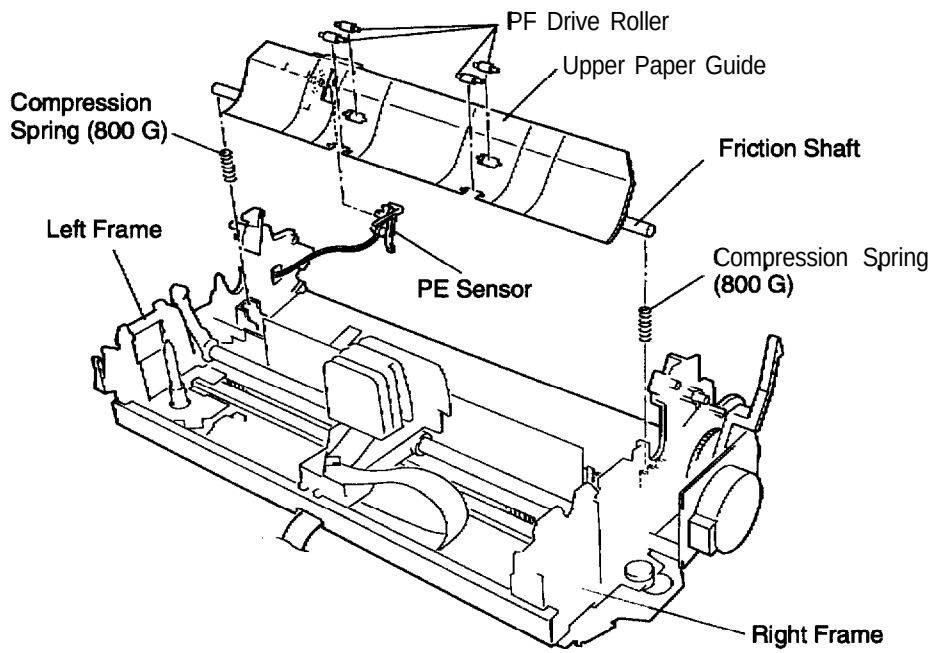

Figure 3-12. Removing the PE Sensor

5. Release the 2 clips securing the PE sensor and remove it.

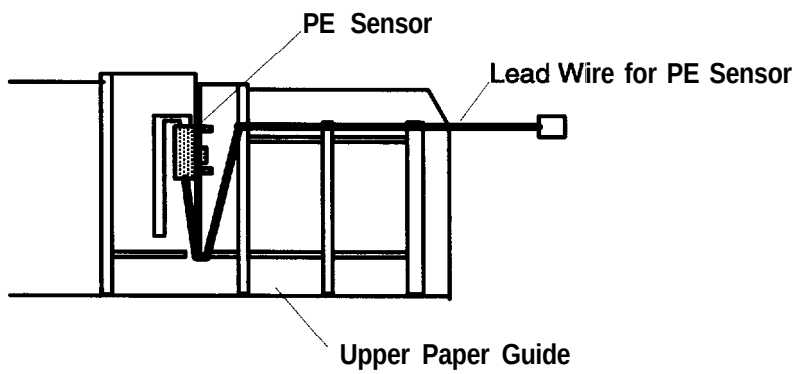

Figure 3-13. Wiring of the PE Sensor

Removing the Home Position (HP) Sensor

1. Remove the printer mechanism. (See the "Removing *the* Printer *Mechanism"* Section on page **39).**
2. Release the 2 clips attaching the HP sensor and remove it. The clips can be accessed through 2 holes in the base of the frame; to release the clips, push each with a pair of tweezers.

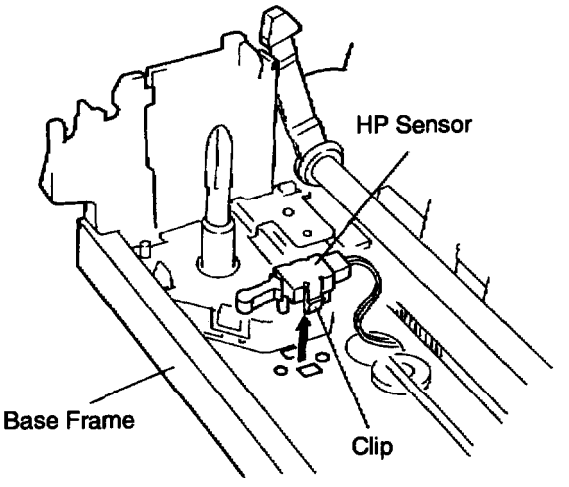

Figure 3-14. Removing the HP Sensor

Removing the Release Lever Position Sensor

1. Remove the PF motor assembly. (See the "Removing *the PF Motor Assembly"* Section on page 310).
2. Release the 2 clips that attach the release lever position sensor to the frame of the PF motor assembly.
3. Remove the release lever position sensor from the frame of the PF motor assembly.

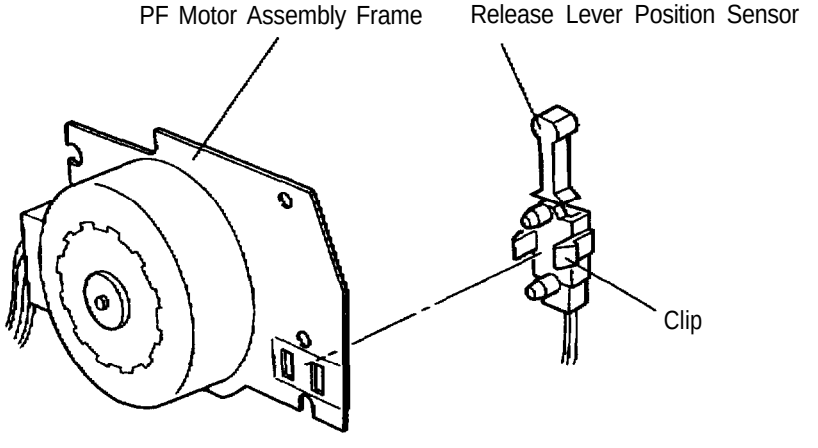

Figure 3-15. Removing the Release Lever Position Sensor

Removing the Carriage Assembly

1. Remove the printer mechanism (See the *"Removing* the Printer Mechanism" Section on page 3-9).
2. Remove the belt tension spring from the hook on the CR motor assembly. (See the *"Removing the CR Motor Assembly"* Section on page 3-11), and remove the timing belt of the carriage assembly from the pulley drive.
3. Release the hook that attaches the head cable sheet to the base of the frame. Slide the cable to the left and remove it.
4. Remove the printhead FFC from the base frame.
5. Remove the CR shaft ground plate from the left side of the printer mechanism.
6. Rotate both sides of the parallelism adjustment bushing and remove them from the left and right frames.
7. Remove the CR shaft assembly guide and the carriage assembly.

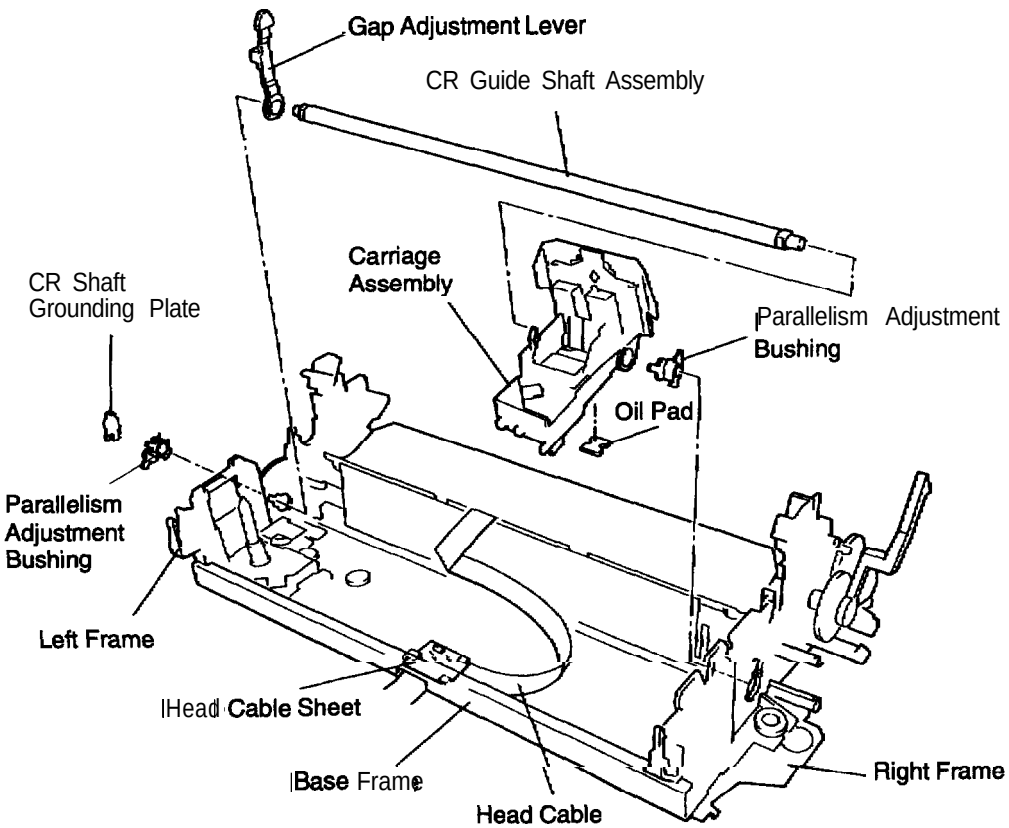

Figure 3-18. Removing the Carriage Assembly

Removing the Ribbon Drive Gear Assembly

1. Remove the printer mechanism. (See the "Removing *the Printer Mechanism"* Section on page **3-9).**
2. Release the 3 hooks attaching the ribbon drive cover to the left frame.
3. Remove the ribbon drive (RD) cover.
4. Remove the belt tension spring between the hook on the CR motor assembly and the hook on *the* base frame. *(See the "Removing the CR Motor Assembly"* Section on page 311).

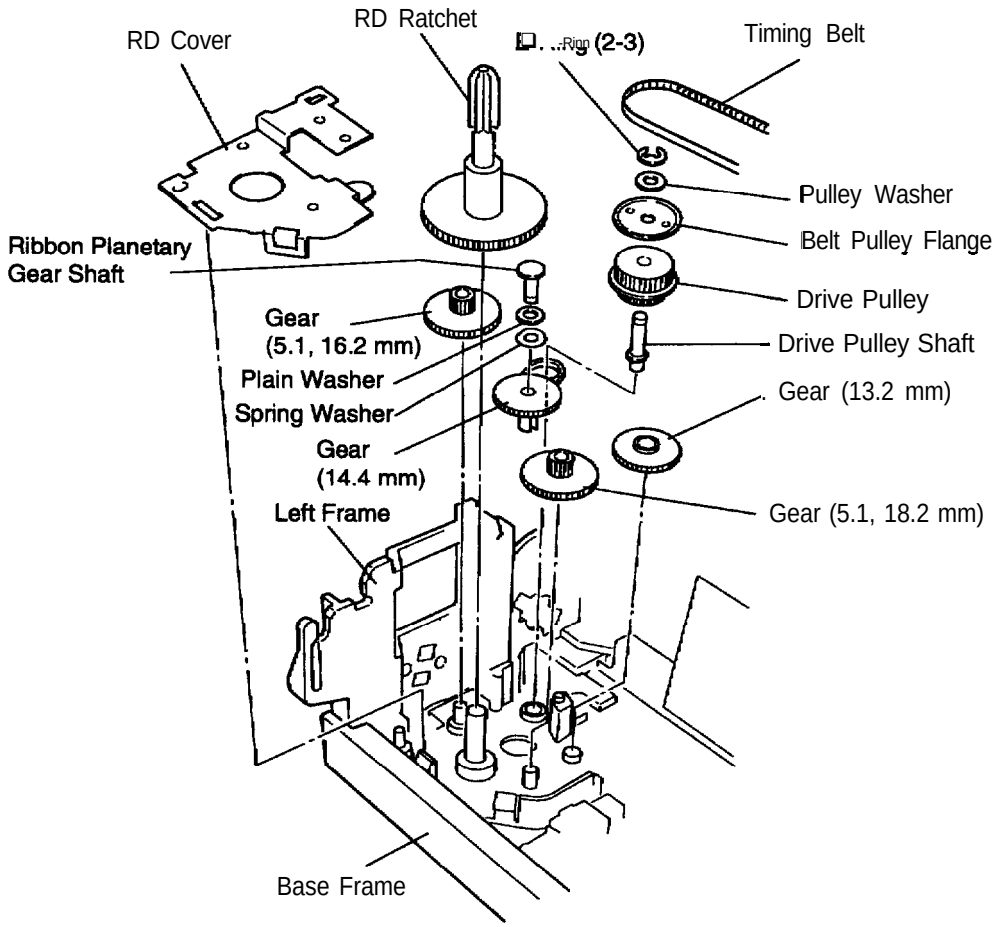

Figure 3-17. Removing the Ribbon Drive Gear Assembly

5. Remove the timing belt from the driven pulley.

Assembly Note

Make sure ***not to put the timing belt between the ribbon drive*** cover and ***the left frame.***

Removing the PF Gear Assembly

1. Remove the PF motor assembly. (See the "Wing *the PF Motor Assembly" Section* on page 3-10).
2. Remove the PF gear train and the release lever.

Removing the Interface Board Assembly

1. Remove the printer mechanism. (See the *"Removing the Printer Mechanism" Section* on page 3-9).
2. Remove the grounding plate connecting the interface shield plate and the shield plate.
3. Remove the CBB (M3×8) screw and the CBT (M3×10) screw attaching the bottom cover to the lower housing.
4. Remove the 2 CBB (M3×8) screws attaching the interface board assembly to the lower housing.
5. Remove the bottom cover and the interface board assembly.

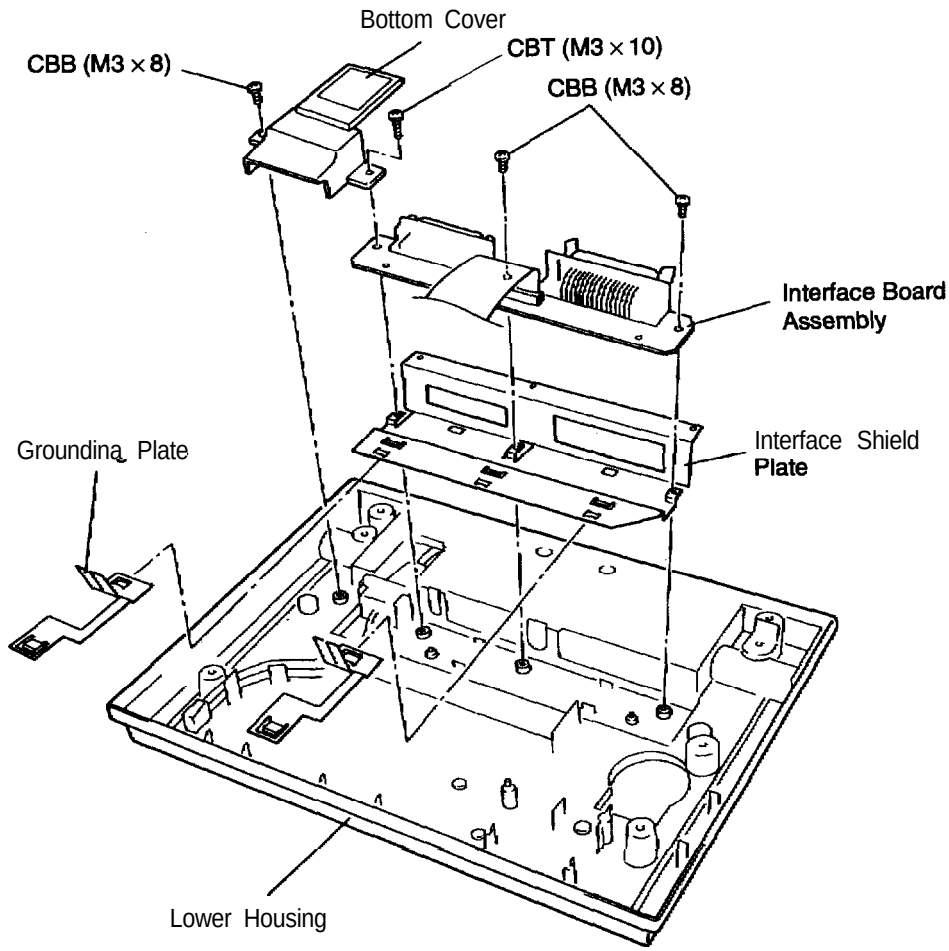

Figure 3-18. Removing the Interface Board Assembly

Removing the Drive Roller Assembly

1. Remove the printer cover.
2. Remove the CF (M2.6×8) screw attaching the drive roller assembly.
3. Remove the driven roller assembly.

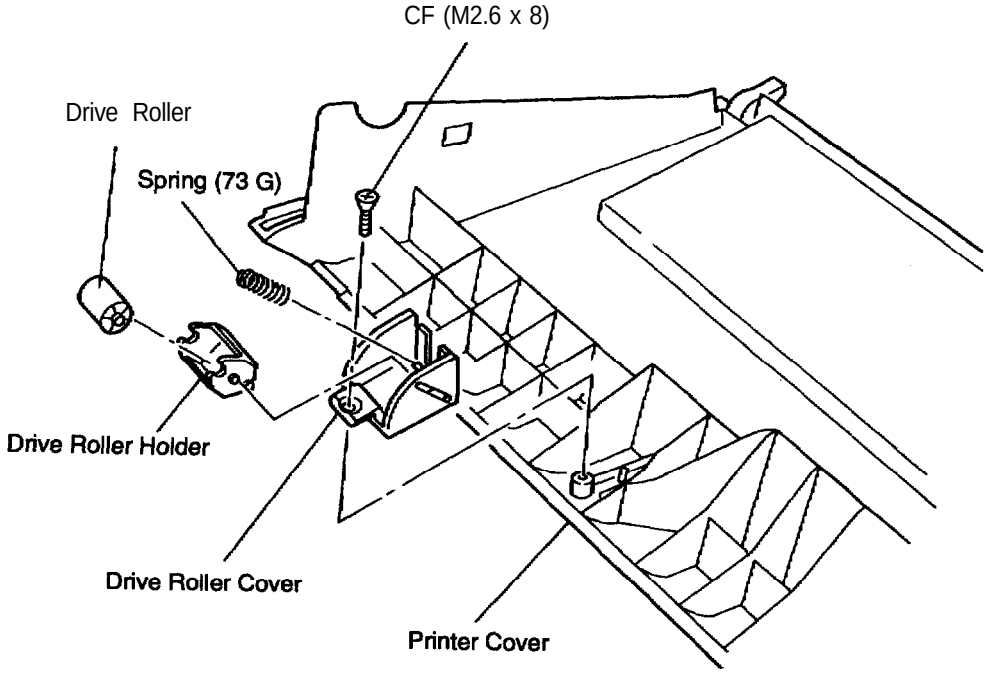

Figure 3-19. Removing the Drive Roller Assembly

Disassembling and Assembling the Optional Color Upgrade Kit

Removing the CS Motor Assembly

1. Remove the CBB (M3×8) screw attaching the CS motor assembly to the CS cover.
2. Release the 2 clips attached to the CS cover.
3. Remove the CS motor assembly with the CS board assembly from the CS cover.

Remove the CS Cam Gear

1. Remove the CS motor assembly. (See the *"Removing the CS Motor Assembly"* Section above).
2. Remove the E-ring (3) from the color cam shaft.
3. Remove the CS cam gear.

Removing the Color Ribbon Sensor

1. Remove the CS motor assembly and the CS board assembly. (See the *"Removing the CS Motor Assembly"* Section above).
2. Remove the E-ring (4) from the cartridge holder shaft.
3. Remove the color cartridge holder from the CS motor assembly.
4. Release the clip that attaches the color cartridge holder to the color ribbon sensor.
5. Remove the color ribbon sensor connector from the CS board assembly.

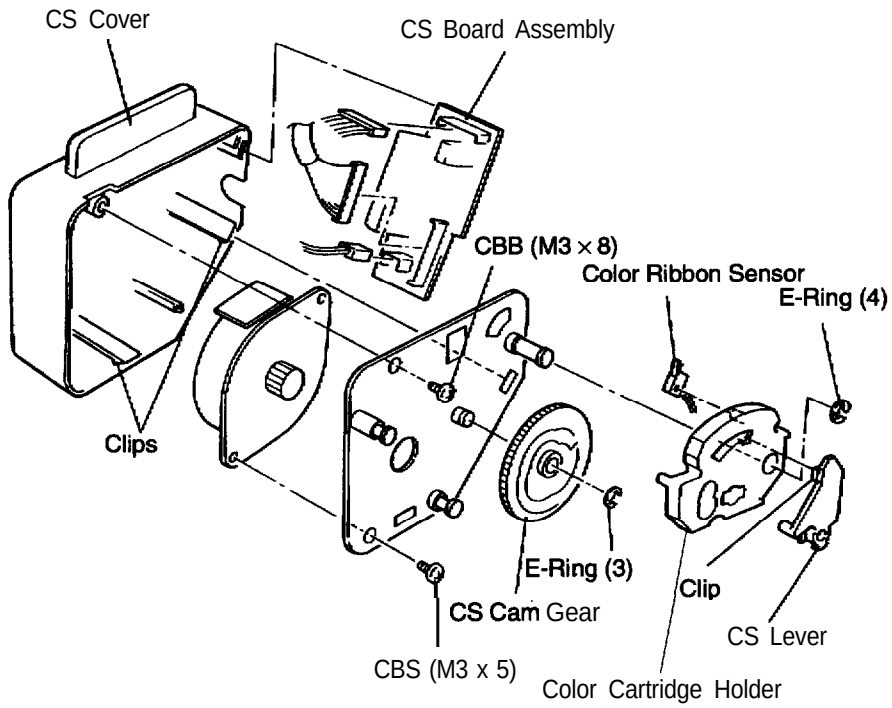

Figure 3-20. Disassembling the Optional Color Upgrade Kit

CHAPTER 4 Adjustments

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ADJUSTMENTS

This section describes the adjustments you may need to make to the printer mechanism.

Platen Gap Adjustment

If you have rotated or reassembled the CR guide shaft assembly or the parallelism adjustment bushing, or if printing is abnormal, you must adjust the platen and the printhead-to-platen gap.

1. If the optional push tractor unit is installed, set the release lever to the friction position.
2. Remove the upper housing assembly. *(See* the *"Removng the Housing Assembly"* Section on page 3-6.
3. Set the gap adjustment lever to 0.
4. Remove the printhead.
5. Remove the ribbon mask using tweezers.
6. Install the printhead.
7. Adjust the platen gap using the following flowchart. The correct platen gap is 0.455 mm ± 0.015 mm. When measuring the gap, take care to let the gauge fall between the platen and the printhead by gravity only. To increase the platen gap, turn the parallelism adjustment bushing toward the platen using a screwdriver. To reduce the platen gap, turn the parallelism adjustment bushing away from the platen. One notch rotation of the parallelism adjustment bushing changes the gap by approximately 0.025 mm.

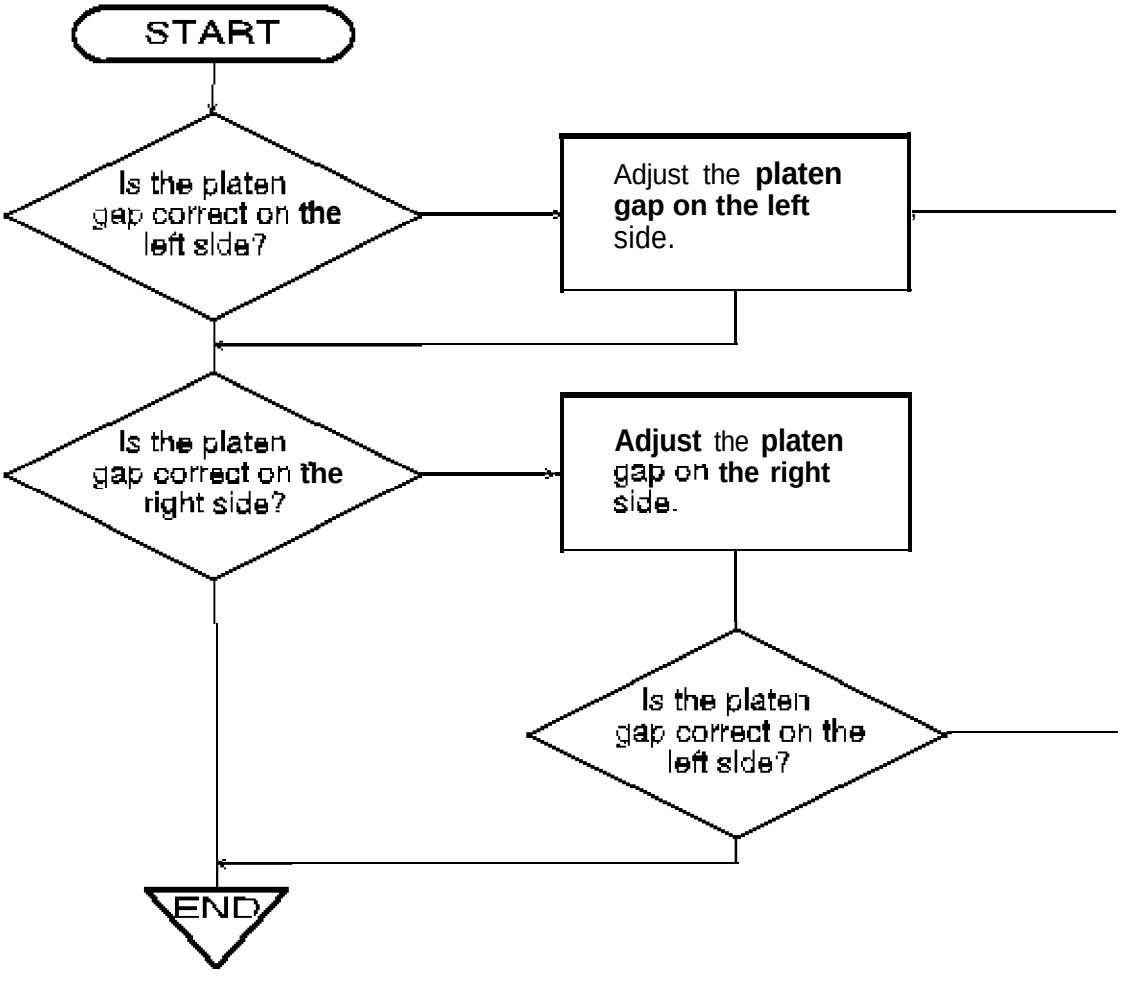

Figure 4-1. The Flowchart for the Platen Gap Adjustment

BIDIRECTIONAL ADJUSTMENT

This Section decribes the adjustment procedure necessary when the LX-300 printer is reassembled or when parts are reinstalled ro replaced. This procedure is also necessary if the main board assembly has been replaced.

Notes: Remove the optional color upgrade kit before you perform this adjustment.
Install the printer cover before you perform the bidirectional adjustment.
Do not perform the bidirectional adjustment if there is a heavy fluctuation in the input voltage.

The bidirectional adjustment procedure for the LX-300 requires a program that is available in Version 4.5 or higher of the Epson Confidence Test. You can obtain a copy of the Confidence Test from the Epson Dealer Bulletin Board System by dialing 1 (800) 234-1445, extension 8777. Once you have the Confidence Test, follow the steps below to adjust the bidirectional alignment.

1. Loadcontinuous paper into thefeeder, and turn on the printer.
2. Load a diskette containing the Confidence Test into an MS-DOS-based computer that is connected to the LX-300, and start the test by typing *CTEST* and pressing **Enter.**
3. Highlight 9 *Pin Printers* in the menu and press **Enter.**
4. Highlight *Additional Printers* in the menu and press **Enter.**
4. Highlight Lx-300 in the menu and press **Enter.**
6. Highlight *Bi-Dir Adj* in the menu and press **Enter.**

The printer resets and pauses for 20 seconds. The following message displays: “When ready to begin, press the “Y” key.”

6. Press Y and **Enter.**

The LX-300 printer prints 21 draft patterns (ranging from -10 to 10). Then the program asks, “Which value looks the best (Draft):”

7. Type the number from the left-hand column for the value that is most closely aligned and press **Enter.**

The LX-300 printer prints the selected pattern for your verification. Then the LX-300 prints 21 letter-quality patterns (ranging from -10 to 10) and asks, “Which value looks the best (LQ):”

8. Type the number from the left-hand column for the value that is most closely aligned and press **Enter.**

The LX-300 prints the selected pattern for your verification. The menu displays again, indicating that the test is complete.

The following page shows an example of the bidirectional patterns.

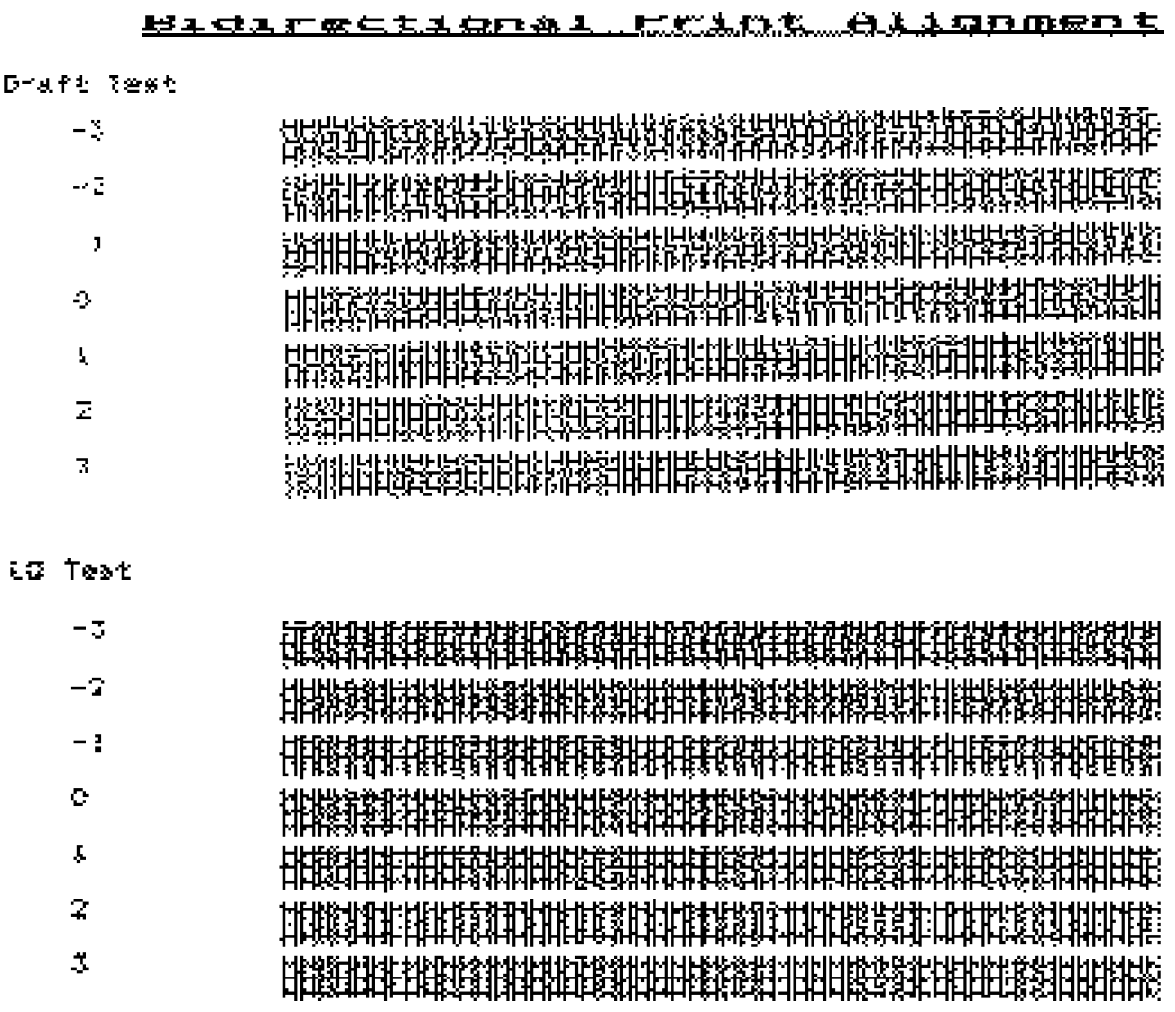

Figure 4-2. The Bidirectional Print Patterns

CHAPTER 5 Troubleshooting

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OVERVIEW

This Chapter provides tables and flowcharts to make troubleshooting the printer easier.

Note: If the power supply board assembly is faulty, it must be replaced as a whole unit. No field repair should be performed on it, except for the replacement of fuse F1.

The following tables provide troubleshooting information.

Table 5-1. Printhead Coil Resistance

Pat-t	Specifications
Printhead	Coil resistance 33.3 Ω ± 3.3 Ω at 25° C (77" F)

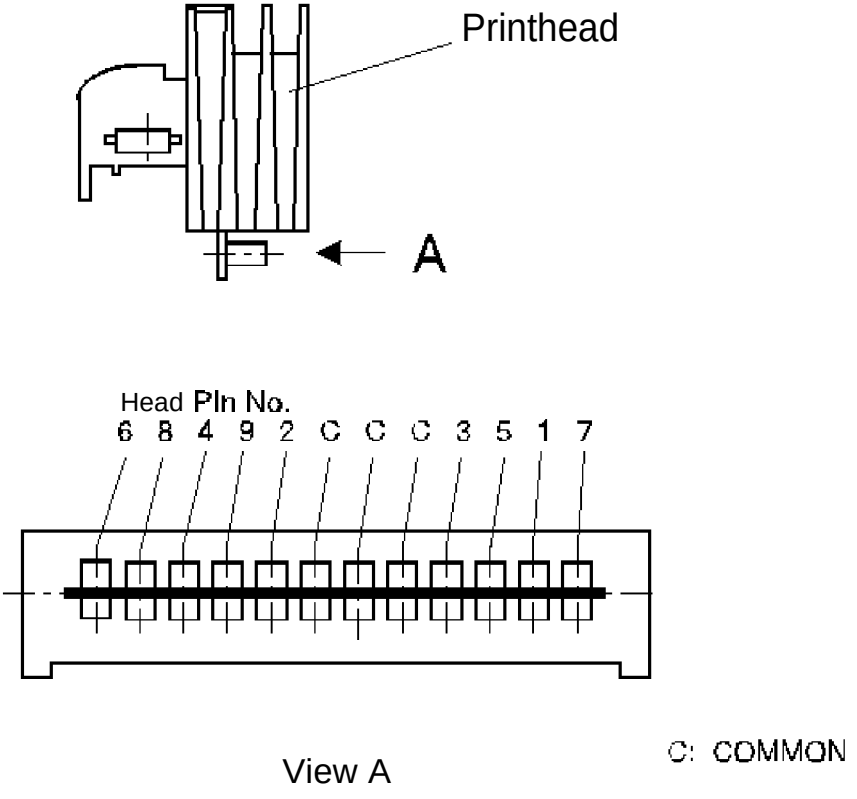


Figure 5-1. Printhead Connector Pin Alignment

Table 5-2. Printhead Driver Test Points

Transistor Numbers	Test Method (Set Meter to Diodes. Check with Power Off.)	Meter Reading
Q1,Q2,Q3,Q4 Q5,Q6,Q7,Q8, Q9	Check from base to collector. Check from base to emitter. Reverse leads and test again.	Not open and not shorted from base to collector, base to emitter.

Table 5-3. Motor Driver Test Points

Transistor Numbers	Test Method (Set Meter to Diodes. Check with Power Off.)	Meter Reading
PF Motor Driver (Q11,Q12,Q13, Q14)	Check from base to collector and from base to emitter. Reverse leads and test again. (Emitter and base are marked on the main board assembly.)	Neither open nor shorted from base to collector or base to emitter.

Table 5-4. Motor Coil Resistance Test Points

Motor Connector Number	Common Pin Number	Test Pin Number	Test Method (Set Meter to Ohms. Disconnect Motor from Main Board and Check it with Printer Power Off.)	Meter Reading
CR Motor Assembly (CN2)	3, 4	1, 2, 5, 6	Place one lead on pin 3 or 4 and the other lead on each of the 4 test pins to check the two motor phases.	18 Ω ± 7 % (at 25” C, 77” F)
PF Motor Assembly (CN3)	3, 4	1, 2, 5, 6	Place one lead on pin 4 and the other lead on each of the two test pins to check the two motor phases.	56 Ω ± 5% (at 25” C, 77” F)
CS Motor Assembly (CS Board Assembly)	5	1, 2, 5, 6	Place one lead on pin 5 (brown) and the other lead on each of the 4 test pins to check the 4 motor phases. (Pin 3 is a common pin.)	150 Ω ± 5 % (at 25° C, 77° F)

Table 5-5. Sensor Test Points

Sensor Connector Number	Test Method (Set Meter to Ohms. Check Printer with Power Off.)	Method Reading
HP sensor (CN7)	Place one lead on pin 1 and the other lead on pin 2. Toggle the sensor position.	Meter should toggle between open and short. (Closed = active.:
PE sensor (CN6)	Place one lead on pin 1 and the other lead on pin 2. Toggle the sensor by inserting and removing a sheet of paper.	Meter should toggle between open and short. (Open = active.)
Release Lever Position Sensor (CN3)	Place one lead on pin 1 and the other lead on pin 2. Change the paper-release lever position.	Meter should toggle between open and short. (Open = continuous paper.)
Color Ribbon Sensor (CS Board Assembly)	Place one lead on pin 1 and the other lead on pin 2. Toggle sensor position.	Meter should toggle between open and short. (Open = active.)

Table 5-6. Error State Indication

Error Indication	Error Status	Cause
The printer beeps (•••) and the PAUSE light blinks	Paper-out error.	Paper is not installed
The printer beeps (-- -- --) and the PAUSE light stays on	Operating error.	• The release lever is set to the TRACTOR position before the cut sheet is ejected. • The release lever is set to the FRICTION position before the continuous paper is ejected.
	Fatal error.	Power supply voltage is abnormal.

Notes: (•) The printer beeps for l/l 0 of a second with a l/l O-second pause.
(--) The printer beeps for 1/2 of a second with a l/l O-second pause.

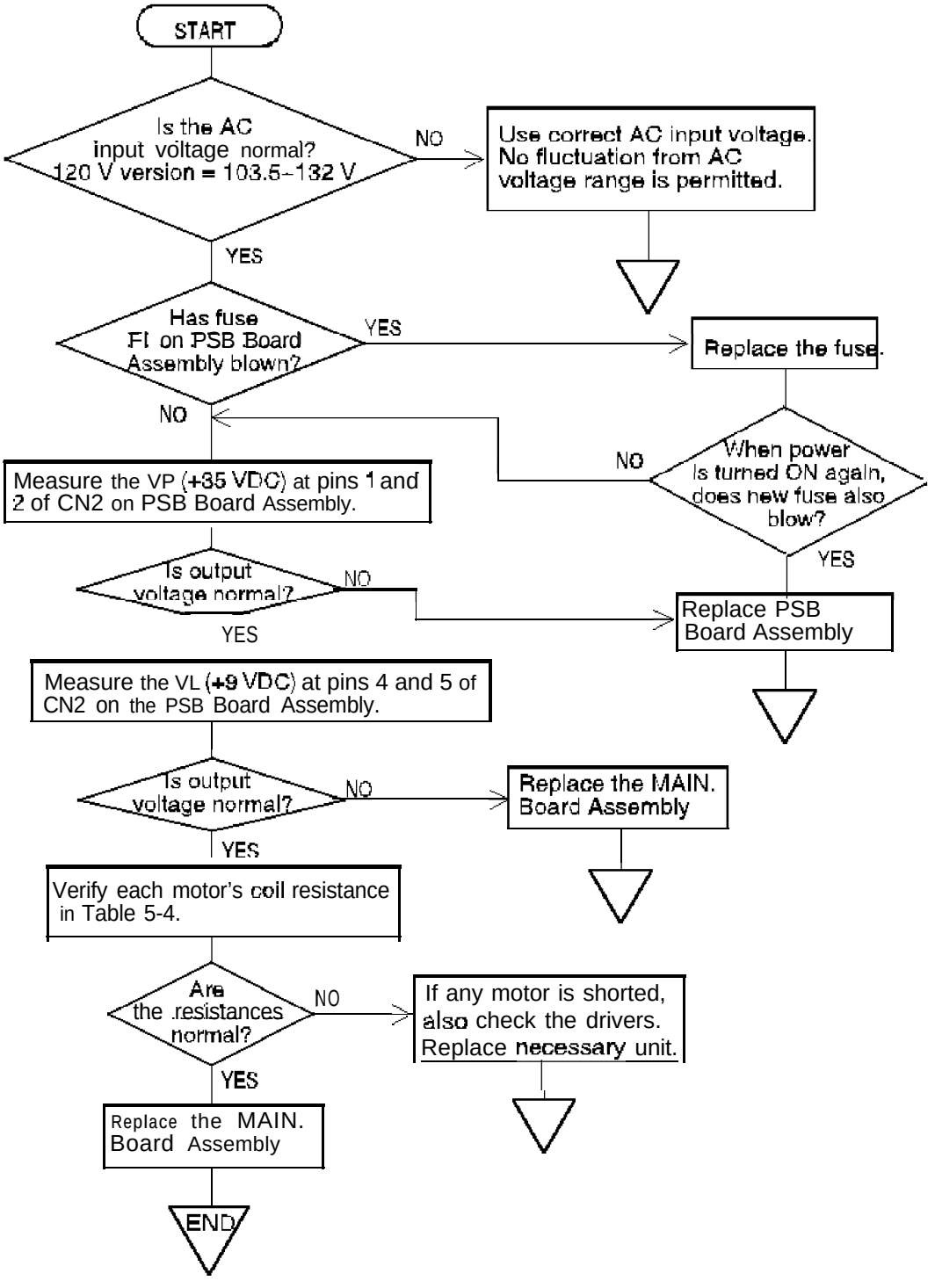
UNIT LEVEL TROUBLESHOOTING

You may be able to identify the defective unit just from the symptom displayed. The table below provides the symptoms for a number of failures, so that you can easily identify the problem. Once the problem has been identified, refer to the flowchart listed in the right-hand column of the table below to determine the cause of the problem.

Table 5-7. Symptoms and Problems

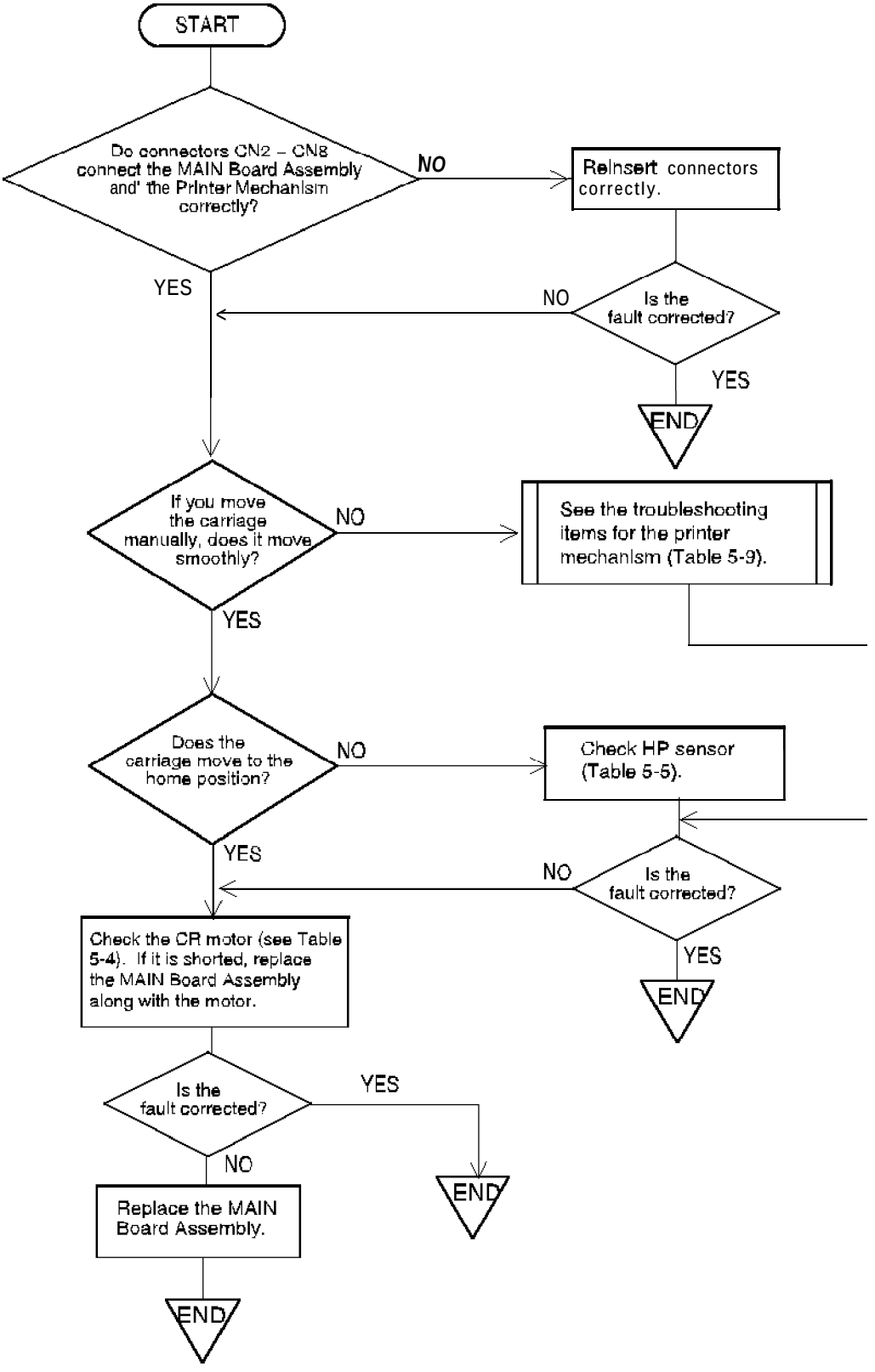
Symptom	Problem	See Page
Printer fails to operate when the power is on.	• Carriage does not move. • Control panel indicator LEDs do not light.	5-5
Abnormal carriage operation.	• Carriage moves away from home position at power on. • The carriage returns to home position correctly, but the printer then fails to enter the READY mode.	5-6
Printing is faulty during self-test, but carriage operation is normal.	• No printing at all. • Faulty printing — some of the dots are not printing.	5-7
Abnormal paper feed.	• The printer prints but paper feeds incorrectly.	5-8
Abnormal control panel operation.	• When the LF/FF button is pressed, no paper is fed.	5-9
Data sent by the host computer is printed incorrectly.	• Carriage operates normally at power up, and self-test is executed correctly, but data is not printed. • Data from the computer is printed incorrectly.	5-10

1. Printer fails to operate when the power is on.



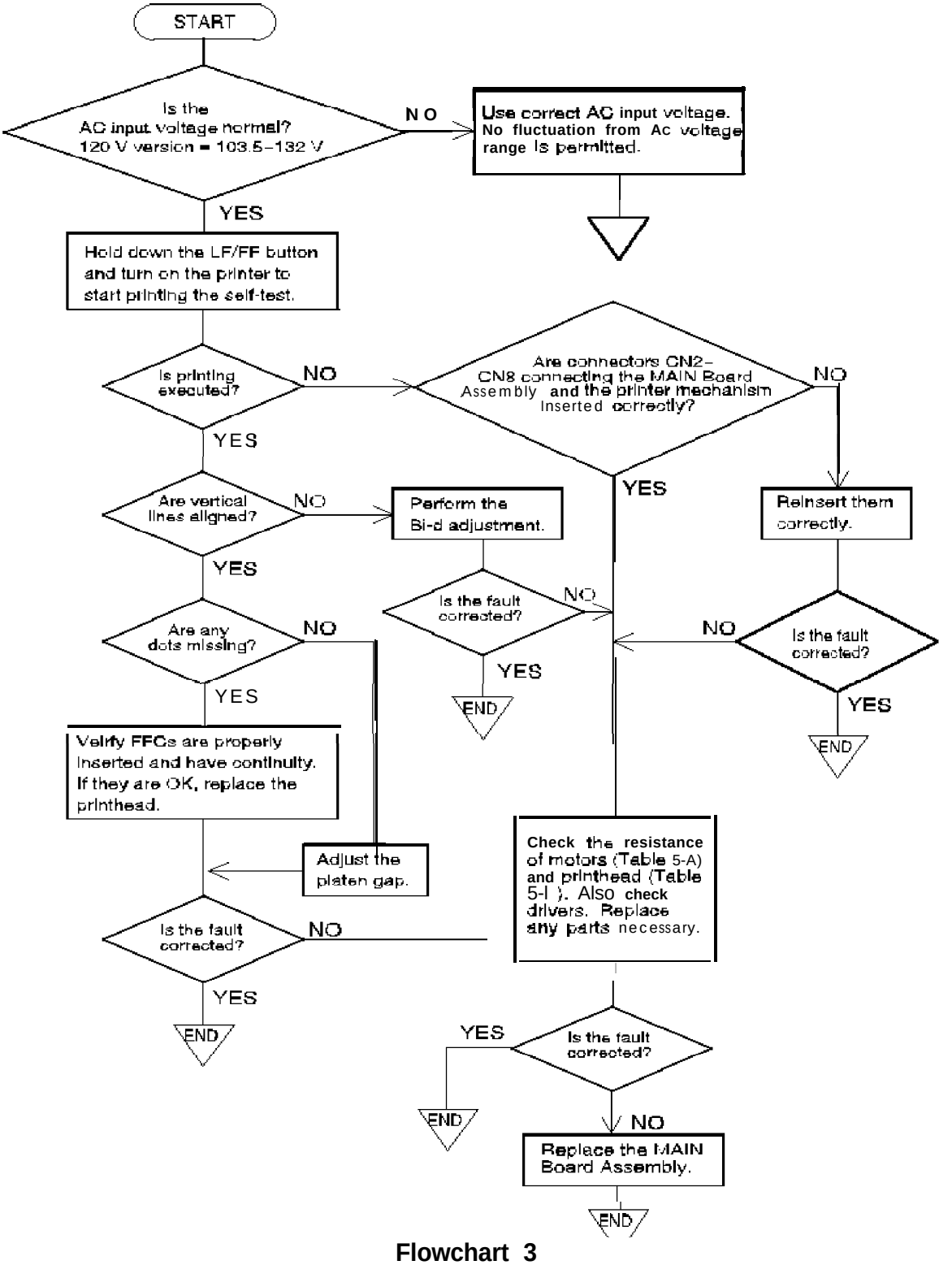
Flowchart 1

2. Abnormal carriage operation.



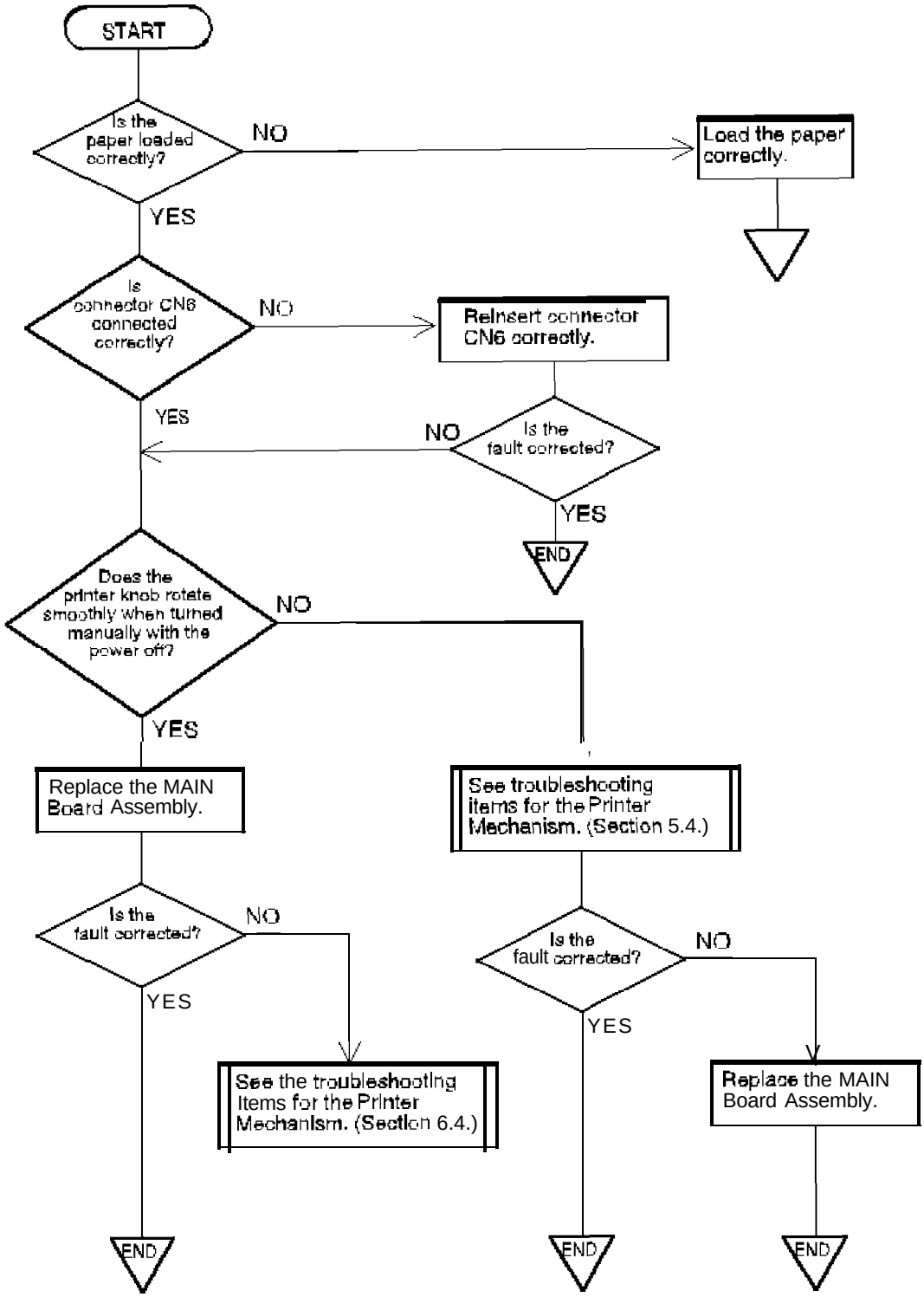
Flowchart 2

3. Printing is faulty during self-test, but carriage operation is normal.



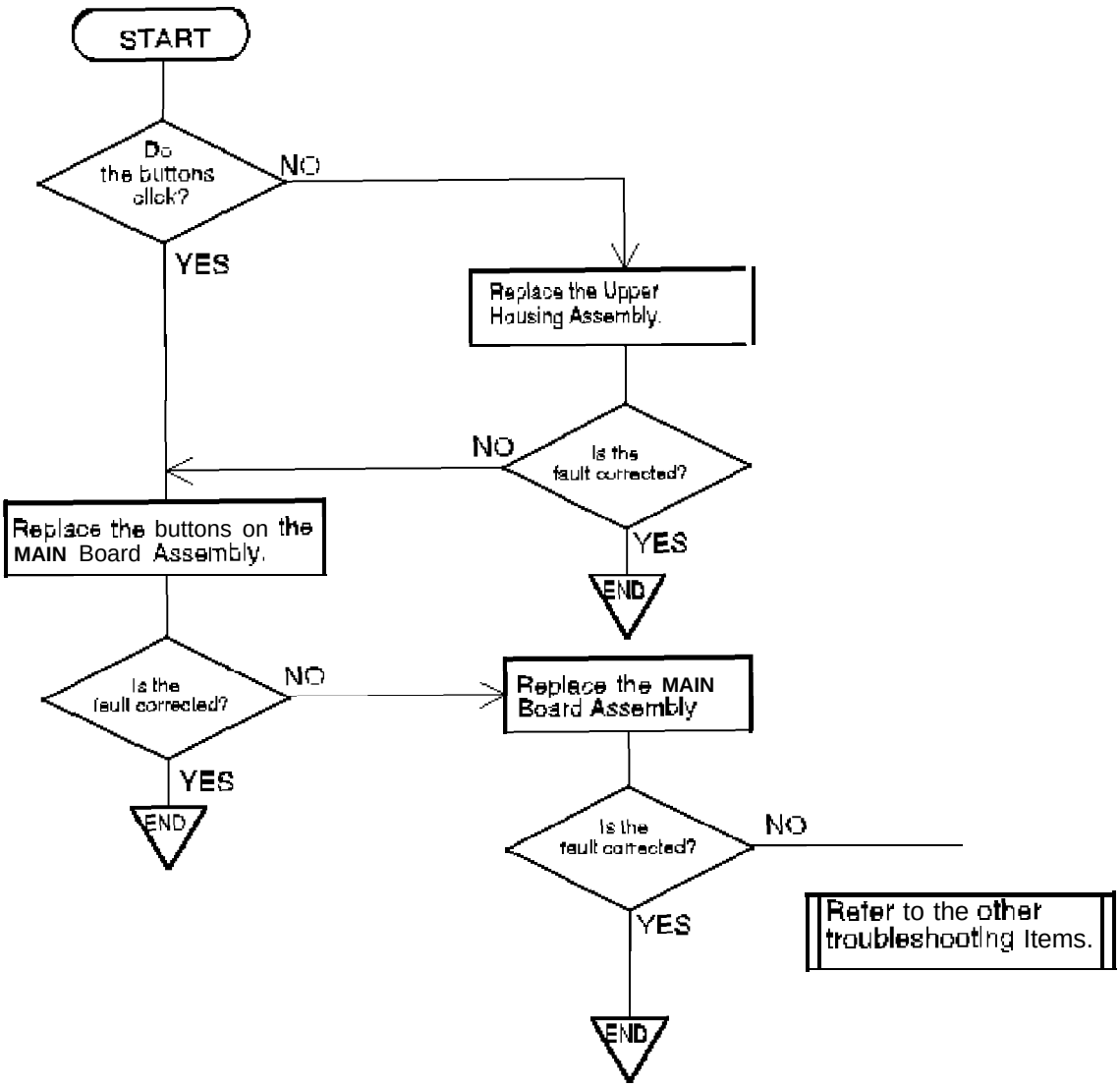
Flowchart 3

4. Abnormal paper feed.



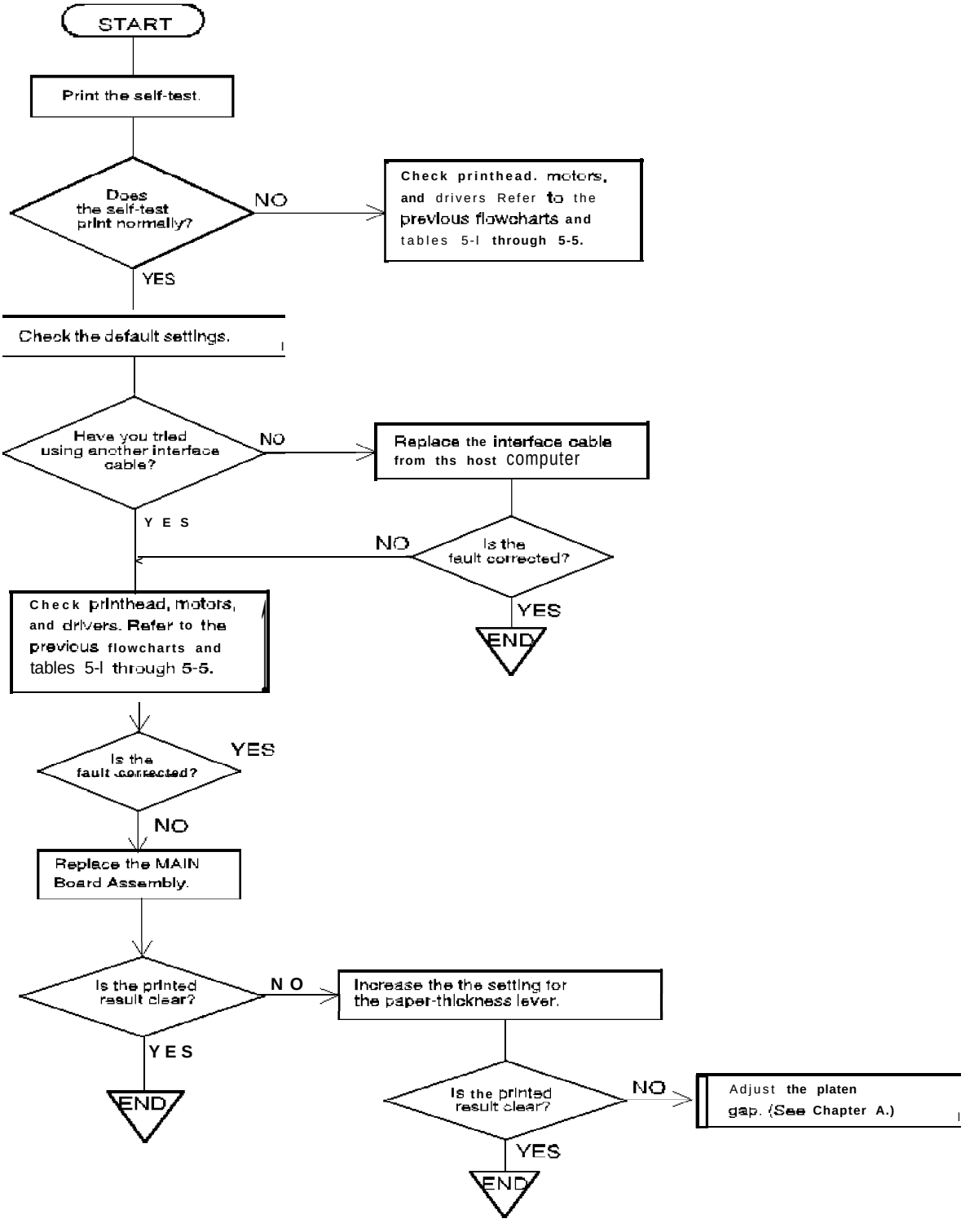
Flowchart 4

5. Abnormal control panel operation.



Flowchart 5

6. Data sent by the host computer is printed incorrectly.



Flowchart 6

REPAIRING THE MAIN BOARD ASSEMBLY

This section provides instructions for repairing a defective main board assembly. It describes various symptoms, likely causes, and checkpoints. Checkpoints refer to proper waveforms, resistance values, and other values to be checked when evaluating the operation of any potentially faulty component. Check these values and take the appropriate action.

Note: This section is required only for servicers who repair to the component level,

Table 5-8. Repairing Problems in the Main Board Assembly

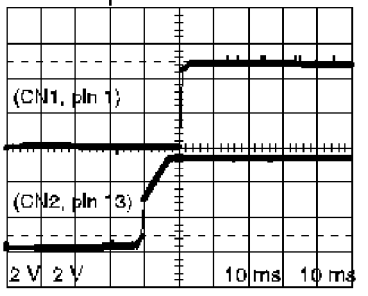
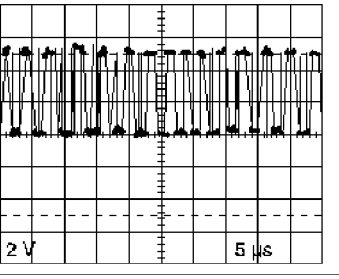
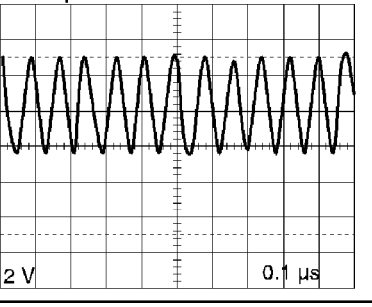
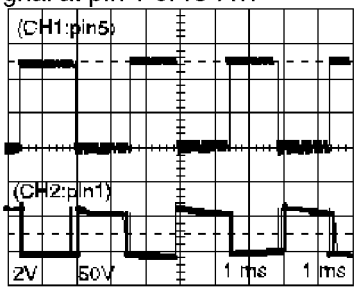
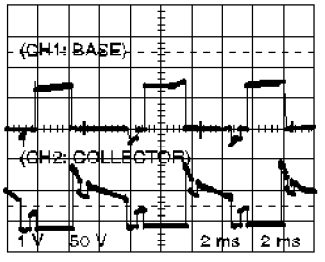
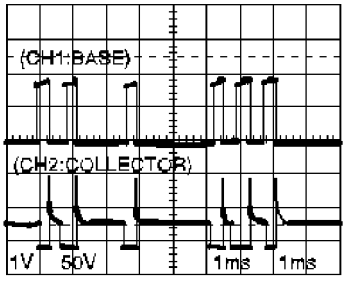
Problem	Symptom	Cause	Checkpoint	Solution
The printer does not operate at all.	The CPU does not operate.	The reset circuit is not operational.	Check the voltage waveforms for the +5 VDC line (IC1, pin 1) and for the reset signal (IC1, pin 13) when the power is on. 	Replace IC A2. Otherwise, replace the main board assembly.
		Selection control ROM is abnormal.	Check that pin 105 of IC 1 change from HIGH to LOW. 	Replace IC E3. Otherwise, replace the main board assembly.
		The CPU is defective.	Check the oscillator signal at either pin 158 or 159 of the CPU. 	If a signal is detected, replace CR1. Otherwise, replace the main board assembly.

Table 5-8. Repairing Problems in the Main Board Assembly (Continued)

Problem	Symptom	Cause	Checkpoint	Solution
The carriage operates abnormally.	The carriage does not operate at all.	IC A1 is defective.	Check the CR motor assembly phase signal at pin 5 and output signal at pin 1 of IC A1. 	Replace IC A1. Otherwise, replace the main board assembly.
The paper feeds abnormally.	The paper does not feed at all.	One or more of the following transistors is defective: Q11, Q12, Q13, Q14.	Check the signal at the collector and base of Q11, Q12, Q13 or Q14. 	Replace any of these transistors that are defective: Q11, Q12, Q13 or Q14. Otherwise, replace the main board assembly.
Self-test printing is abnormal.	The self-test is not executed or a particular dot is not being printed.	Any transistor from Q1-Q9, are defective.	Check the input signal at the collector and base of Q1-Q9. 	Replace any of these transistors that are defective: Q1-Q9. Otherwise, replace the main board assembly.
Data from the host computer is printed incorrectly.	Data corruption occurs when the interface is used.	IC1 or IC2 is defective.		Replace IC2 or the main board assembly.

REPAIRING THE PRINTER MECHANISM

For detailed procedures for replacing or adjusting parts, refer to Chapter *3, Disassembly and Assembly*, and Chapter *4, Adjustments.* If a problem or symptom recurs following an attempted repair, refer to Table 5-10 to try find other potential causes.

Table 5-9. Repairing the Printer Mechanism

Problem	Symptom	Cause	Checkpoint	Solution
The CR motor assembly fails to operate.	The CR motor assembly fails to operate the timing belt after power on.	Foreign substances are lodged in the gears or elsewhere in the mechanism.	Manually move the timing belt to see if the motor can rotate freely.	Remove the foreign substances.
		The CR motor assembly is defective.	Measure the motor coil resistance. It should be about 18 ohms. If the motor is shorted, also check the CR motor assembly drivers on the main board.	Replace the CR motor assembly(and drivers, if necessary).
The carriage does not operate when turned on (after the carriage has been manually centered prior to power on.)	The CR motor assembly rotates, but the carriage does not move.	The belt pulleys are defective.	Check for broken or worn pulleys.	Replace the belt pulleys.
		The timing belt is defective.	Check that the timing belt is inserted correctly into the bottom of the carriage.	Reinsert the timing belt.
			Check for a broken timing belt.	Replace the timing belt.
	The carriage moves to the left slightly, then stops.	The carriage movement is not smooth.	Check whether the carriage moves smoothly when moved manually.	Clean and lubricate the CR guide shaft assembly. Replace the CR motor assembly.
	The carriage moves to the left or right end, then stops.	The HP sensor is defective.	Use a multimeter to check the HP sensor.	Replace the HP sensor.
Self-test printing is not executed.	The carriage moves, but does not print.	The printhead FFC common wires are disconnected.	Check the common wires for the printhead FFC.	Replace the FFC.
		The printhead is bad.	Measure the printhead coil resistance. It should be approximately 33.3 ohms. If the printhead is shorted, also check the drivers.	Replace the printhead (anc drivers, if necessary).

Table 5-9. Repairing the Printer Mechanism (Continued)

Problem	Symptom	Cause	Checkpoint	Solution
Self-test printing is abnormal.	A particular dot is missing.	The printhead is defective.	Measure the printhead coil resistance. It should be approximately 33.3 ohms. If the printhead is shorted, also check the drivers.	Replace the printhead (and drivers, if necessary).
			Check to see if the dot wires are worn.	Replace the printhead.
	The printing is too light, or the print density is not uniform.	The printhead is defective.	Check whether the tips of the wires are worn.	Replace the printhead.
		The platen gap is not properly adjusted.	Set the gap adjustment lever to the first position, and check the platen gap. The appropriate value is 0.45 mm.	Adjust the gap. Refer to the *Platen Gap Adjustment* Section.
Paper feed is abnormal.	Printing is performed but the paper is not fed or is not fed uniformly.	Foreign substances are lodged in the paper path.	Perform a visual check of the paper path.	Remove any foreign substances.
		The PF motor assembly is not driving the gear correctly.	Check that no foreign substance is lodged between the gears and that the gears are not broken or worn.	Remove any foreign substances. Replace the PF motor assembly reduction gears. Replace the paper pickup gears.
		The PF motor assembly is defective.	Measure the coil resistance for the PF motor assembly. The approximate value should be 56 ohms. If the motor is shorted, also check the drivers.	Replace the PF motor assembly (and drivers, if necessary).
The ribbon feed is abnormal.	The ribbon is not turning.	The ribbon cartridge is defective.	Remove the ribbon cartridge, rotate its knob manually, and see if the ribbon feeds normally.	Replace the ribbon cartridge.
		Foreign substances are caught in the gears.	Check whether the RD ratchet rotates when the carriage is moved manually.	Remove any foreign substances. Replace the ribbon feed mechanism.

Table 5-9. Repairing the Printer Mechanism (Continued)

Problem	Symptom	Cause	Checkpoint	Solution
The ribbon feed is abnormal.	The ribbon feeds properly only when the carriage moves in one direction (i.e., it fails to feed when the carriage moves in the other direction).	The planetary gear is defective.	Move the carriage manually; check whether the planetary gear turns in reverse and engages the gear.	Replace the ribbon feed mechanism.
Paper becomes stained with ink.	Ink stains appear on areas where there is print.	The ribbon mask is positioned incorrectly.	Make sure the ribbon mask is in the correct position.	Reinstall the ribbon mask.
		The platen gap is not adjusted correctly.	Set the gap adjustment lever to the first position, and check the platen gap. The appropriate value is 0.47 mm.	Adjust the gap. Refer to the *Platen Gap Adjustment* Section.
Printing continues after the paper ends or when no paper is loaded.	Printing continues past the end of the page.	The PE sensor is detective.	Check the PE sensor.	Replace the PE sensor.
Color printing is abnormal.	The color does not change.	The CS motor assembly is defective.	Measure the coil resistance for the CS motor assembly. It should be approximately 150 ohms. If the motor is shorted, also check the drivers on the driver board.	Replace the CS motor assembly (and drivers, if necessary).
		The ribbon is caught in the ribbon mask.	Check to see if the ribbon mask is defective.	Replace the ribbon mask.
	The color ribbon is not advanced.	The CS motor assembly is defective.	Measure the CS motor assembly coil resistance. It should be approximately 150 ohms. If the motor is shorted, also check the drivers on the driver board.	Replace the CS motor assembly (and drivers, if necessary).
		The color ribbon feed gears are defective.	Check whether the ribbon advances when the printer is turned on.	Replace the ribbon feed mechanism.

CHAPTER 6 Maintenance

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PREVENTIVE MAINTENANCE

Preventive maintenance includes regular cleaning of the case exterior (using denatured alcohol), as well as occasional vacuuming of the mechanism's interior to remove dust and paper debris. After cleaning the unit, check that it is adequately lubricated (as described in the "Applying Lubrication" Section below). Before returning the printer to the customer, inspect the springs, paper-feed rollers, and basic operation.

CAUTION

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

APPLYING LUBRICATION

EPSON recommends that the printer be lubricated at the points illustrated in Figure 6-1. Table 6-2 lists each point along with its recommended lubricant. The recommended lubricants are EPSON G-20, G-26 and O-2, all of which have been tested extensively and found to comply with the needs of this printer. (Table 6-1 provides details about these lubricants.) Before applying a lubricant, be sure that the surface to be lubricated is clean. Do not apply too much lubricant, as this may damage nearby parts.

Table 6-1. Lubrication

Type	Name	Quantity	Availability	Part No.
Grease	*G-26*	*40* gm	EPSON	B702600001
	G-20	*40* gm	EPSON	B702000001
Oil	*o-2*	*40 cc*	EPSON	B703700001

Table 6-2. Lubrication Points

Ref. No.	Lubrication Points	Lubricant
(1)	The hooks that attach the CR motor assembly to the base frame. *(3* places)	*G-26*
(2)	The shafts for the gear train on the left frame.	*G-26*
(3)	The shafts for the gear train on the right frame.	*G-26*
(4)	The contact surface of the release lever and tractor transmission gear.	*G-26*
(5)	The oil pad in the carriage assembly.	*o-2*
(6)	The teeth of gear 34.	*G-26*
(7)	The point at which the platen ground spring contacts the platen shaft.	*G-20*
(8)	The portions of the carriage assembly that contacts the CR guide frame.	*G-26*
(9)	The contact portion of the left tractor frame and tractor shaft.	*G-26*
(10)	The contact point of the right tractor frame and tractor shaft.	*G-26*
(11)	The contact point of the driven pulley shaft and drive pulley.	*G-26*

Note: Lubrication must be applied during the reassembly process.

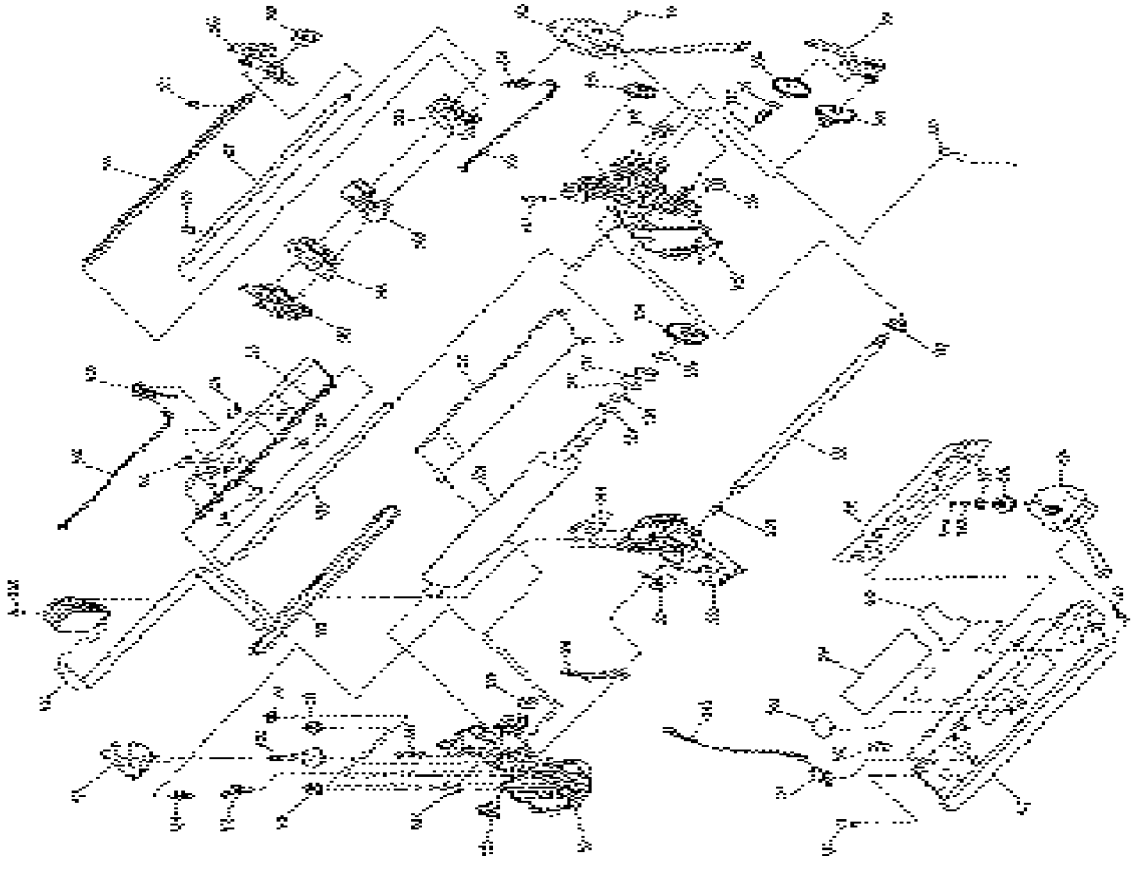

Figure 6-1. LX-300 Lubrication Points

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CONNECTOR SUMMARY

Figure A-1 illustrates how the primary components are connected. Table A-l summarizes the functions and sizes of the connectors.

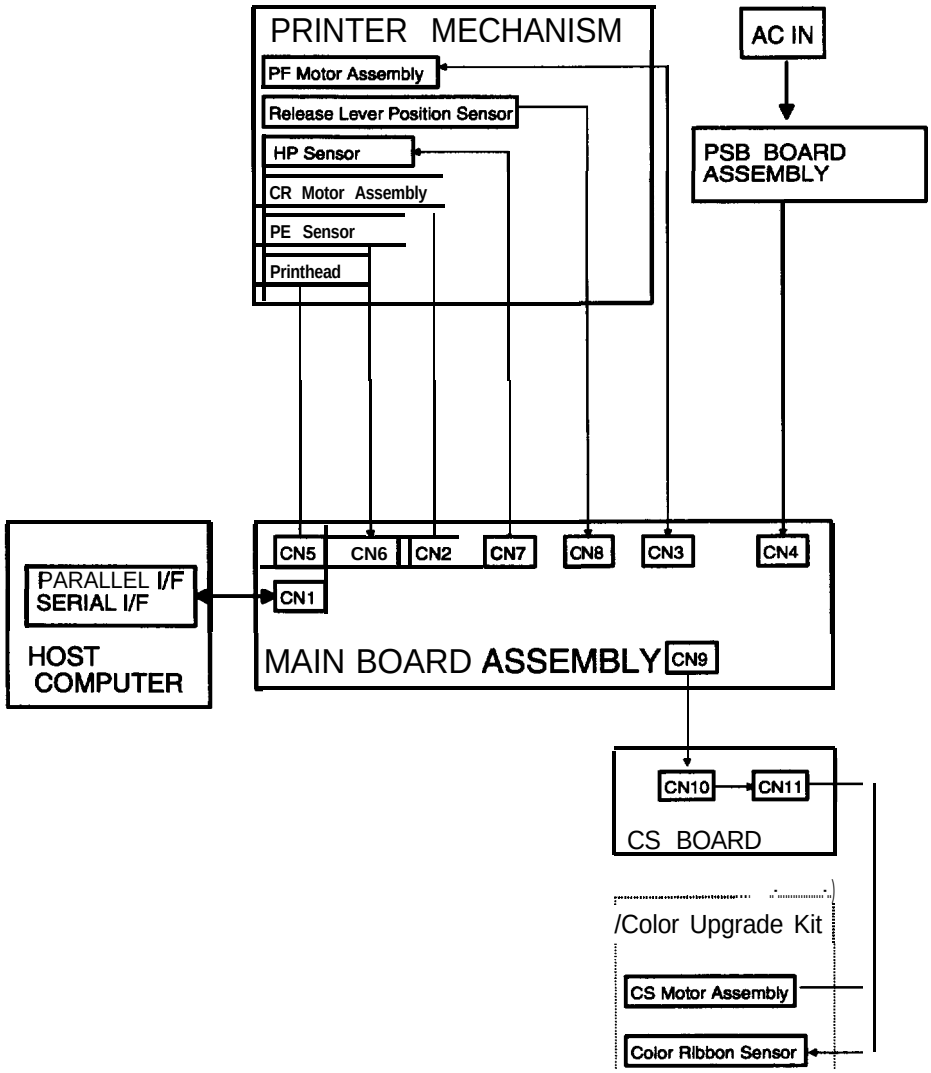

Figure A-1. Cable Connections

Table A-1. Connector Summary

Board	Connector	Function	Pins
Main Board Assembly	CN1	Parallel, serial interface	–
	CN2	CR motor assembly	6
	CN3	PF motor assembly	6
	CN4	PSB board assembly	5
	CN5	Printhead	12
	CN6	PE sensor	2
	CN7	HP sensor	2
	CN8	Release lever position sensor	2
	CN9	CS motor assembly (optional) Color ribbon sensor (optional)	10
	CN10	CS motor assembly (optional) Color ribbon sensor (optional)	10
	CN11	CS motor assembly (optional) Color ribbon sensor (optional)	10

Table A-2. Connector Pin Assignments - CN2

Pin	I/O	Signal Name	Function
1	0	CRA	CR motor assembly phase A
2	0	CR B	CR motor assembly phase B
3	-	CRCOM	CR motor assembly common
4	-	CRCOM	CR motor assembly common
5	0	CR-A	CR motor assembly phase _A
6	0	CR-B	CR motor assembly phase _B

Table A-3. Connector Pin Assignments – CN3

Pin	I/O	Signal Name	Function
1	O	PFA	PF motor assembly phase A
2	0	PFB	PF motor assembly phase B
3	-	PFCOM	PF motor assembly common
4	-	PFCOM	PF motor assembly common
5	O	PF _A	PF motor assembly phase _A
6	O	PF _B	PF motor assembly phase B

Table A-4. Connector Pin Assignments - CN4

Pin	I/O	Signal Name	Function
1	I	VP	+35 VDC
2	I	VP	+35 VDC
3	-	GND	Signal ground
4	-	GND	Signal ground
5	I	VL	DC voltage for logic
6	I	VL	DC voltage for logic

Table A-5. Connector Pin Assignments - CN5

Pin	I/O	Signal Name	Function
1	O	HD 7	Head data 7
2	O	HD 1	Head data 1
3	O	HD 5	Head data 5
4	O	HD 3	Head data 3
5	-	HDCOM	Common (VP)
6	-	HDCOM	Common (VP)
7	-	HDCOM	Common (VP)
8	O	HD 2	Head data 2
9	O	HD 9	Head data 9
10	O	HD 4	Head data 4
11	O	HD 8	Head data 8
12	0	HD6	Head data 6

Table A-6. Connector Pin Assignments - CN6

Pin	I/O	Signal Name	Function
1	I	PE	PE sensor
2	-	GND	Signal ground

Table A-7. Connector Pin Assignments - CN7

Pin	I/O	Signal Name	Function
1	I	HP	HP Sensor
2	-	GND	Signal ground

Table A-6. Connector Pin Assignments - CN6

Pin	I/O	Signal Name	Function
1	I	RELSW	Release lever position sensor
2	–	GND	Signal ground

Table A-9. Connector Pin Assignments – CN9,CN10,CN11

Pin	I/O	Signal Name	Function
1	–	+35	+35 VDC
2	-	CS_HOLD	+5 VDC
3	-	+5V DC	+5 VDC
4	O	CS A	CS motor assembly phase A
5	O	CS_A	CS motor assembly phase _A
6	O	CS B	CS motor assembly phase B
7	O	CS_B	CS motor assembly phase _B
8	-	GP	Signal ground
9	I	ccsw	Color ribbon sensor
10	-	GND	Signal ground

CIRCUIT DIAGRAMS

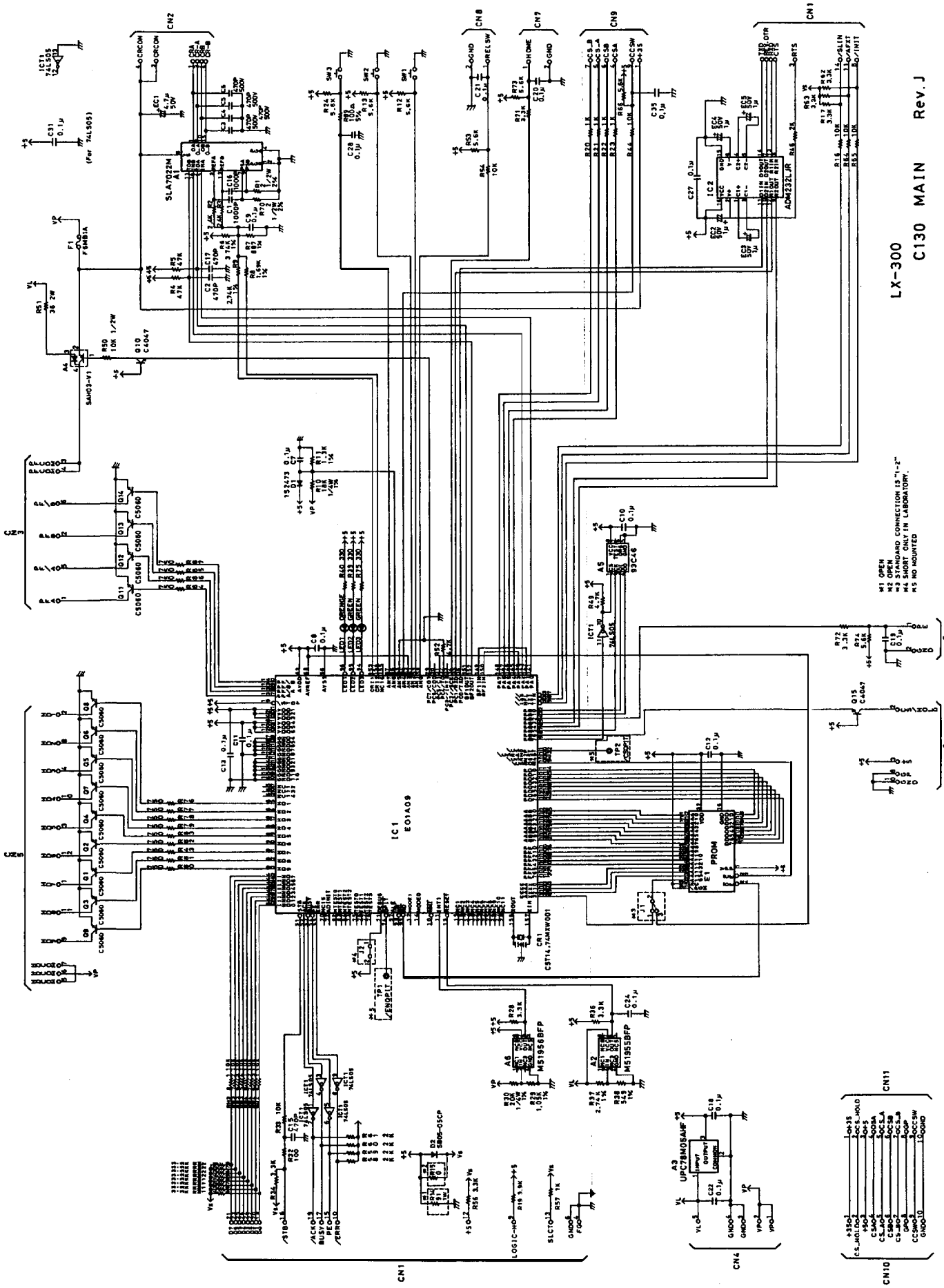

Figure A-2. Main Board Assembly Circuit Diagram

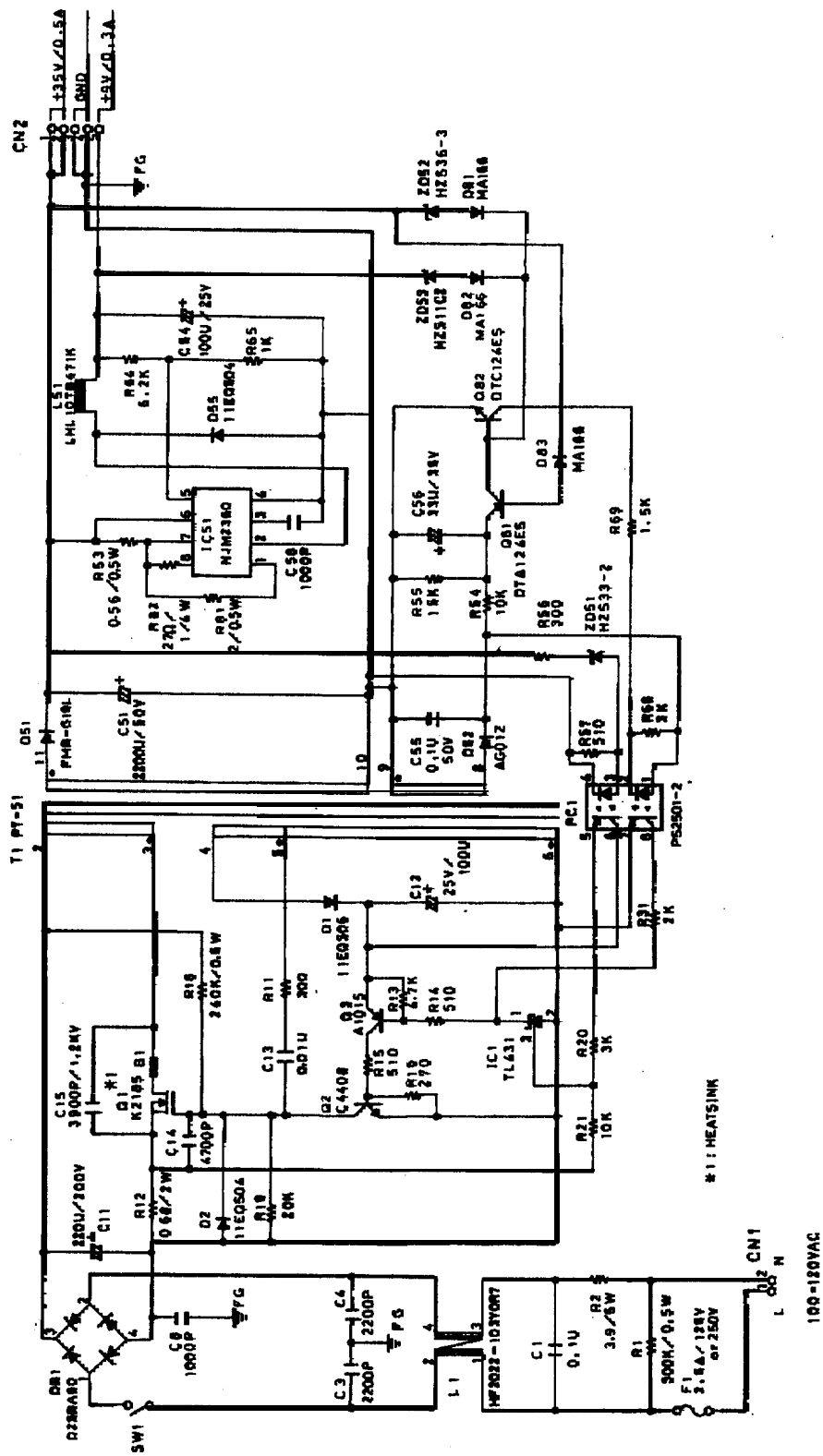

Figure A-3. PSB Board Assembly Circuit Diagram

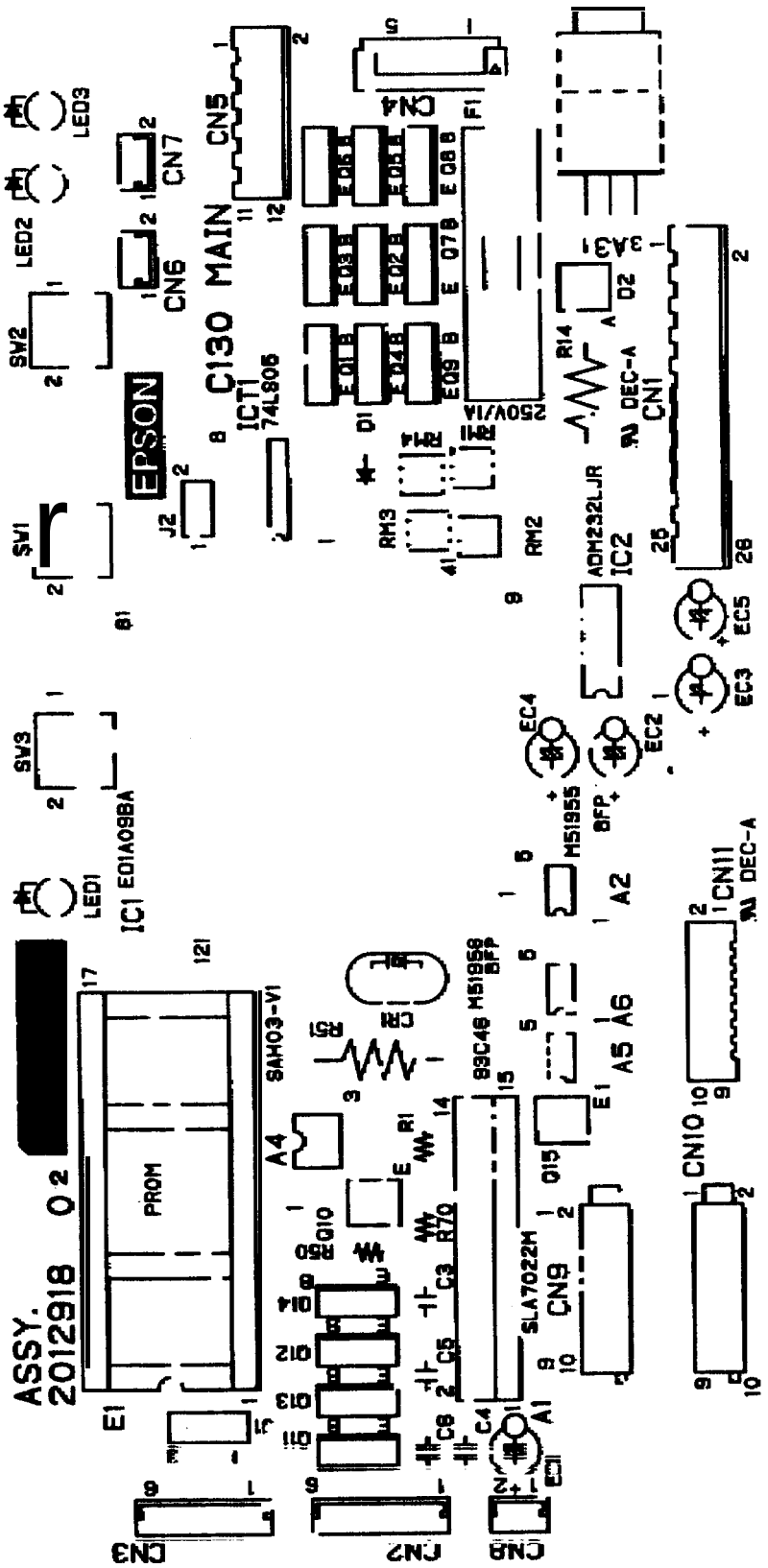

Figure A-4. Main Board Assembly Component Layout

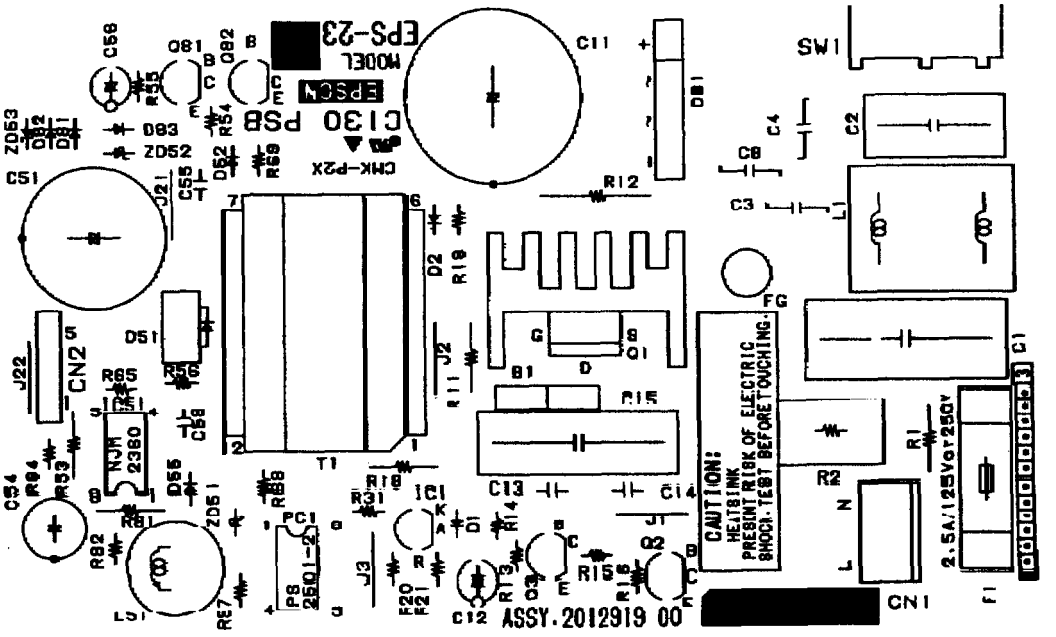

Figure A-5. PSB Board Assembly Component Layout

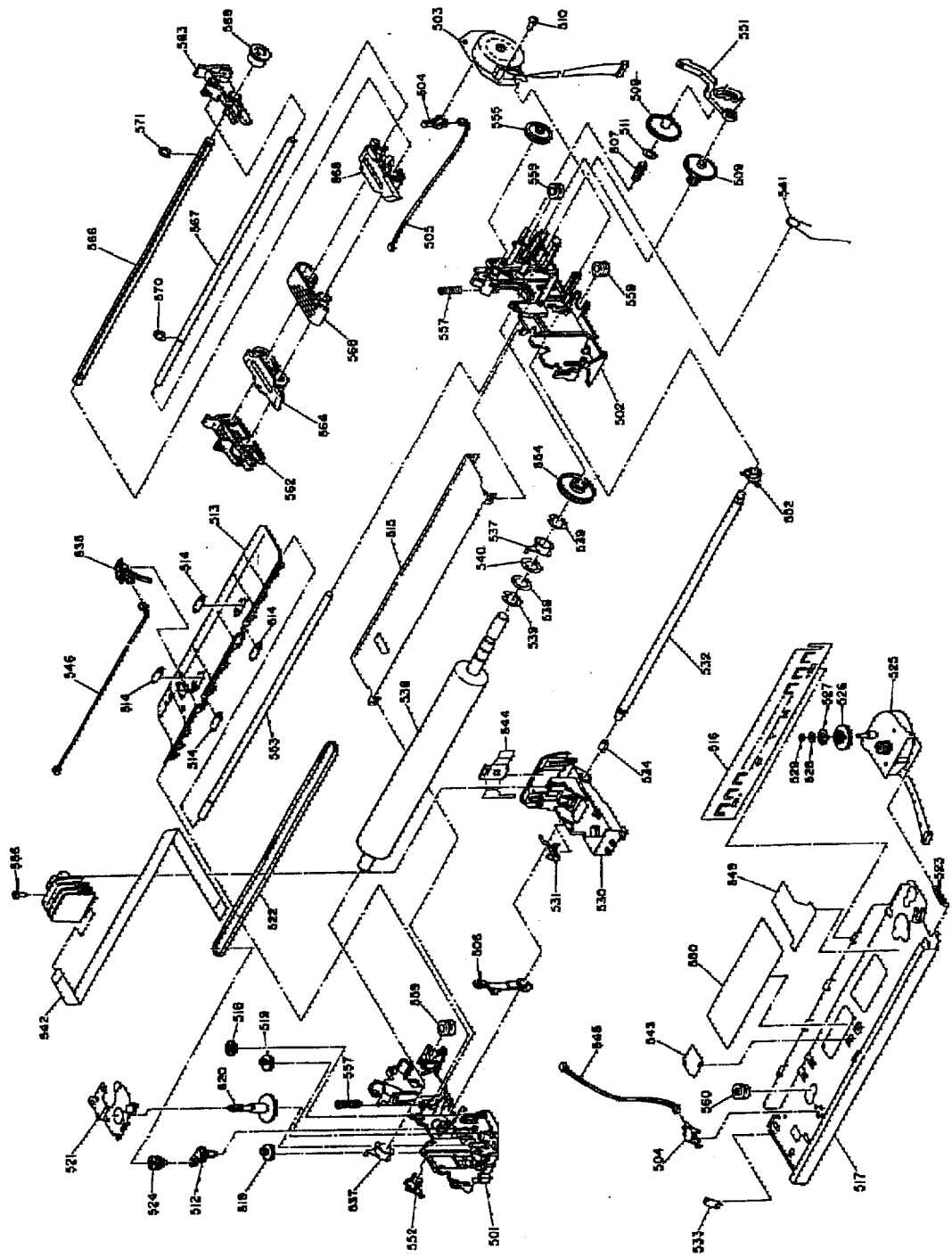

Figure A-6. LX-300 Exploded Diagram

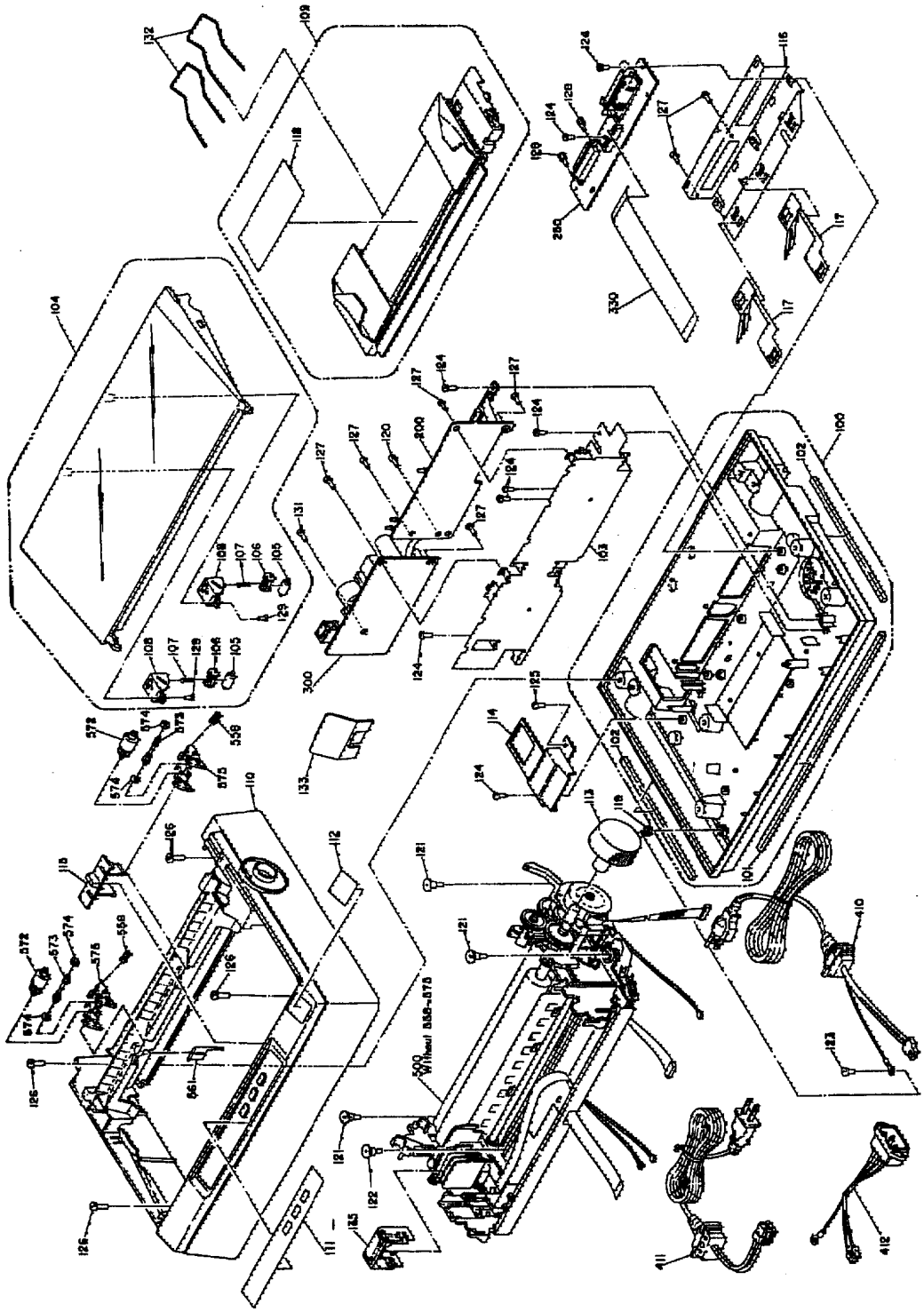

Figure A-6. LX-300 Exploded Diagram (Continued)

Table A-10. Part No. Reference Table

Ref.No.	Description	Ref.No.	Description
100	Lower Housing Assembly	132	Stacker Guide
101	Insulator (A)	133	Stacker
102	Insulator (B)	135	Heat Sink Cover
103	Shield Plate	200	Main Assembly Board
104	Printer Cover Assembly	E1	P-ROM TCN00
105	Drive Roller	250	I/F Board Assembly
106	Drive Roller Holder	300	PSB Board Assembly (120V)
107	Compression Spring (73)	350	Wire Harness
108	Driven Roller Cover	410	Power Cable Assembly
109	Edge Guide Assembly	411	Power Cable Assembly
110	Upper Housing Assembly	412	Wire Harness
111	Panel Sheet	500	Printer Mechanism
112	Logo Plate	501	Left Frame
113	Knob	502	Right Frame
114	Bottom Cover	503	PF Motor Assembly
115	CS Connector Cover	504	Leaf Sensor (B1)
116	I/F Shield Plate	505	TR Harness
117	Grounding Plate	506	Disengage Lever
118	Position Label	507	Compression Spring (200)
119	Hexagon Nut (M4)	508	Tractor Reduction Gear
120	CBC Lamitite (M3 × 8)	509	Paper Advance Reduction Gear
121	Lower Housing Shaft (1018296)	510	CBB Screw (M3 × 8)
122	Lower Housing Shaft (1015457)	511	Plain Washer
123	CB (O) Screw (M4 × 8)	512	Planetary Lever Assembly
124	CBB Screw (M3 × 8)	513	Upper Paper Guide
125	CBB Screw (M3 × 10)	514	PF Drive Roller
126	CBB Screw (M4 × 10)	515	Lower Paper Guide
127	CB USCA C (M3 × 8) F/Zn	516	Support Paper Guide
128	Jack Socket	517	Base Frame
129	CFP Tite Screw (2.6 × 8) F/Zn	518	Spur Gear (13.2)

Table A-10. Part No. Reference Table (continued)

Ref.No.	Description	Ref.No.	Description
131	CFP USCA C (S-P1) (M3 × 8) F/Zn	519	Combination Gear (5.1, 16.2 mm)
520	RD Ratchet	551	Gap Adjustment Lever
521	RD Cover	552	Parallelism Adjustment Bushing
522	Timing Belt	553	Friction Shaft
523	Belt Tension Spring	554	Gear (34 mm)
524	Driven Pulley Assembly	555	Spur Gear (25 mm)
525	CR Motor Assembly	556	CPB Screw (M3 × 14)
526	Drive Pulley	557	Compression Spring (800 G)
527	Belt Pulley Flange	558	Compression Spring (500 G)
528	Plain Washer (3.2 × 0.5 × 7)	559	Damper
529	E-Retaining Ring (2.3)	560	Base Damper
530	Carriage Assembly	561	PE Sensor Sheet
531	Grounding Plate	562	TR Left Frame
532	CR Guide Shaft Assembly	563	TR Right Frame
533	CR Shaft Grounding Plate	564	Left Tractor
534	Oil Pad	565	Right Tractor
535	PE Sensor	566	TR Shaft
536	Platen	567	TR Guide Shaft
537	Bushing (11)	568	Paper Support
538	Plain Washer (11.3 × 0.5 × 16.5)	569	Spur Gear (17 mm)
539	Type E(8) Retaining Ring	570	E-Retaining Ring (5)
540	U-Type (11.2 × 0.13 × 16S/NA)	571	E-Retaining Ring (6)
541	Platen Grounding Wire	572	Eject Roller Subassembly
542	Head Cable	573	Eject Transmission Roller
543	Head Cable Sheet	574	Eject Support Roller
544	Ribbon Mask	575	Eject Roller Holder
545	HP Harness		
546	PE Harness		
549	Bass Frame Pad		
550	Bass Frame Sheet		

CASE OUTLINE DRAWING

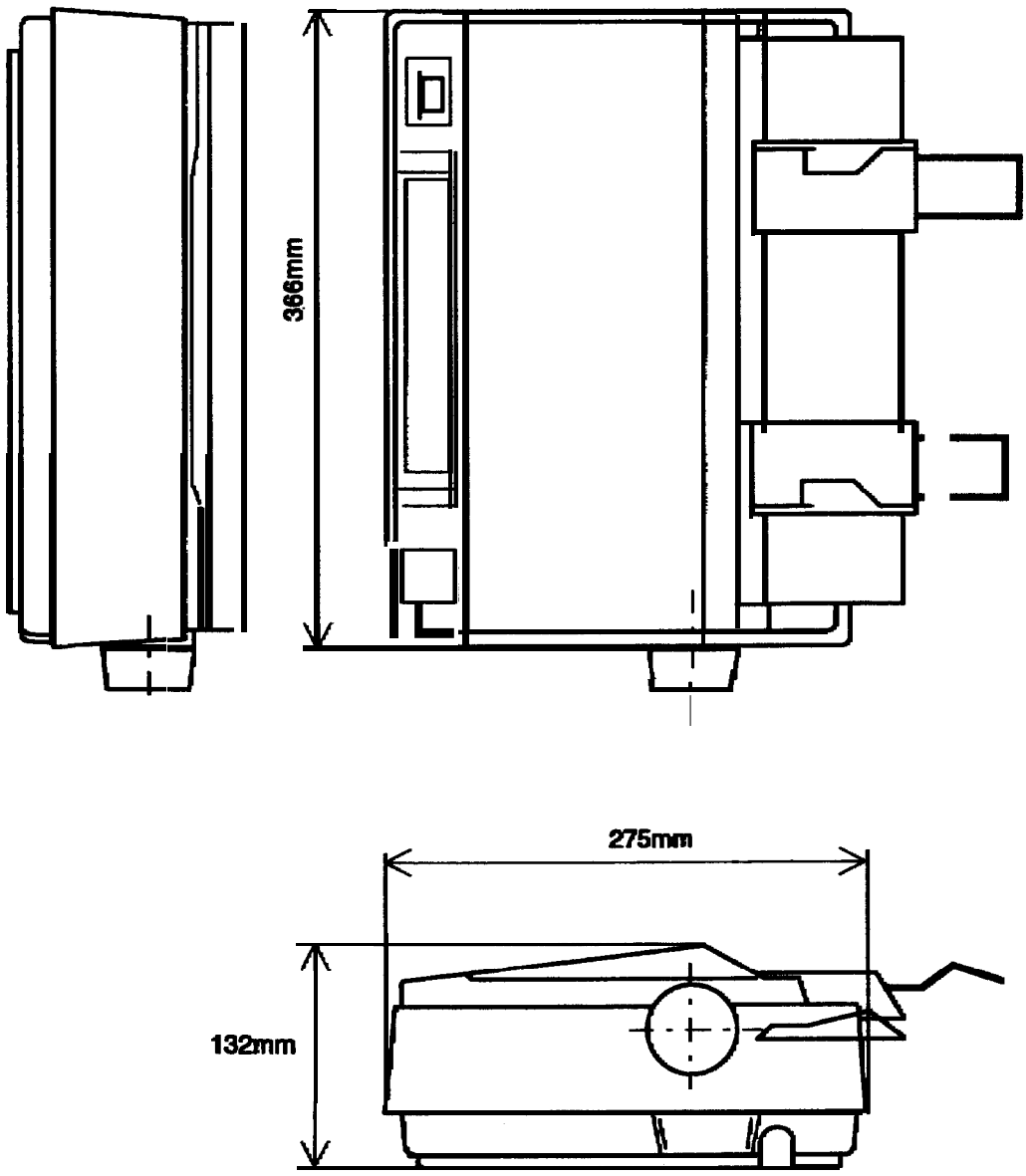

Figure A-7. LX-300 Case Outline Drawing