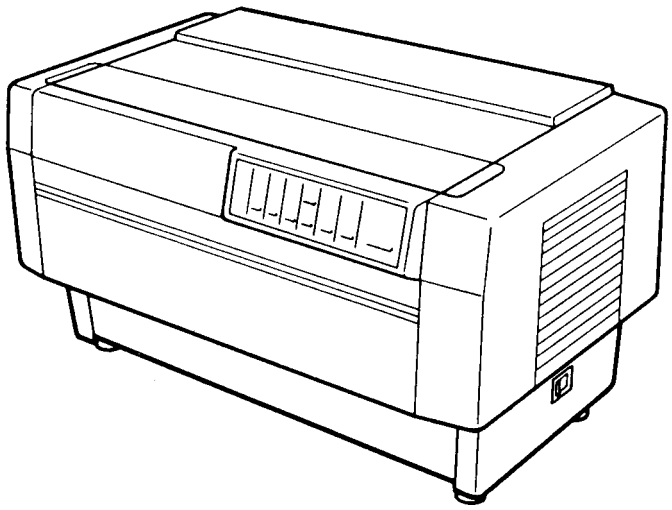
EPSON TERMINAL PRINTER

DFX-5000+

SERVICE MANUAL



EPSON

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NOTICE

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

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

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

PRECAUTIONS

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

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

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

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

DANGER

1. ALWAYS DISCONNECT THE PRODUCT FROM BOTH THE POWER SOURCE AND PERIPHERAL DEVICES PERFORMING ANY MAINTENANCE OR REPAIR PROCEDURE.

2. NO WORK SHOULD BE PERFORMED ON THE UNIT BY PERSONS UNFAMILIAR WITH BASIC SAFETY MEASURES AS DICTATED FOR ALL ELECTRONICS TECHNICIANS IN THEIR LINE OF WORK.

3. WHEN PERFORMING TESTING AS DICTATED WITHIN THIS MANUAL, DO NOT CONNECT THE UNIT TO A POWER SOURCE UNTIL INSTRUCTED TO DO SO. WHEN THE POWER SUPPLY CABLE MUST BE CONNECTED, USE EXTREME CAUTION IN WORKING ON POWER SUPPLY AND OTHER ELECTRONIC COMPONENTS.

WARNING

1. REPAIRS ON EPSON PRODUCT SHOULD BE PERFORMED ONLY BY AN EPSON CERTIFIED REPAIR TECHNICIAN.

2. MAKE CERTAIN THAT THE SOURCE VOLTAGE IS THE SAME AS THE RATED VOLTAGE, LISTED ON THE SERIAL NUMBER/RATING PLATE. IF THE EPSON PRODUCT HAS A PRIMARY AC RATING DIFFERENT FROM AVAILABLE POWER SOURCE, DO NOT CONNECT IT TO THE POWER SOURCE.

3. ALWAYS VERIFY THAT THE EPSON PRODUCT HAS BEEN DISCONNECTED FROM THE POWER SOURCE BEFORE REMOVING OR REPLACING PRINTED CIRCUIT BOARDS AND/OR INDIVIDUAL CHIPS.

4. IN ORDER TO PROTECT SENSITIVE MICROPROCESSORS AND CIRCUITRY, USE STATIC DISCHARGE EQUIPMENT, SUCH AS ANTI-STATIC WRIST STRAPS, WHEN ACCESSING INTERNAL COMPONENTS.

5. REPLACE MALFUNCTIONING COMPONENTS ONLY WITH THOSE COMPONENTS BY THE MANUFACTURE; INTRODUCTION OF SECOND-SOURCE ICS OR OTHER NON APPROVED COMPONENTS MAY DAMAGE THE PRODUCT AND VOID ANY APPLICABLE EPSON WARRANTY.

PREFACE

This manual describes functions, theory of electrical and mechanical operations, maintenance, and repair of DFX-5000+.
The instructions and procedures included herein are intended for the experience repair technician, and attention should be given to the precautions on the preceding page. The chapters are organized as follows:

CHAPTER 1. GENERAL DESCRIPTION

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

CHAPTER 2. OPERATING PRINCIPLES

Describes the theory of printer operation.

CHAPTER 3. DISASSEMBLY AND ASSEMBLY

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

CHAPTER *4.* ADJUSTMENTS

Includes a step-by-step guide for adjustment.

CHAPTER 5. TROUBLESHOOTING

Provides Epson-approved techniques for adjustment.

CHAPTER 6. MAINTENANCE AND LUBRICATION

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

APPENDIX

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

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

REVISION SHEET

Revision	Issue Data	Revision Page
Rev.-A	February 9, 1994	1 st issue
Rev.-B	April 20, 1994	Page 4-10: Addition the notes Page 4-1 1: Addition the notes
Rev.-C	November 22, 1994	Page 4-4 to 4-7: Change the explanation
Rev.-D	December 15, 1994	Whole Revise of the Chap.4
Rev.-E	March 7, 1995	Page 4-12: Change the explanation Page 4-12: Addition the notes

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CHAPTER 1 Product Description

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1.1 GENERAL FEATURES

The DFX-5000+ is a 9-pin, serial, dot matrix printer with a maximum speed of 560 characters per second (cps). It is designed for business use and provides high-speed, high-volume printing and continuous-sheet handling. The main features of the printer are:

- ❑ Maximum printing speeds:
  - 560 cps (high-speed draft mode)
  - 504 cps (draft elite mode)
  - 420 cps (draft pica mode)
- ❑ Advanced paper handling:
  - -10 inches per second (ips) paper feeding
  - Paper jam detection
  - Paper width detection
  - Front and rear two-way push tractors
  - Automatic paper back-out and loading from another paper path and paper park
  - Automatic platen gap adjustment for paper thickness
  - Automatic tear off
  - Paper memory function
  - Automatic paper path changing
- ❑ Eight-bit parallel interface and RS-232C serial interface standard
- ❑ Epson ESC/P-83 (ESC/P version 83) printer driver (compatible with the FX-870/1170 and DFX-5000)
- ❑ 9 character tables in the standard version
  21 character tables in the NLSP (National Language Support) version
- ❑ Upgraded data handling:
  - 20KB input buffer
  - Automatic interface selection
  - Type B optional I/F cards

The figure below shows the DFX-5000+.

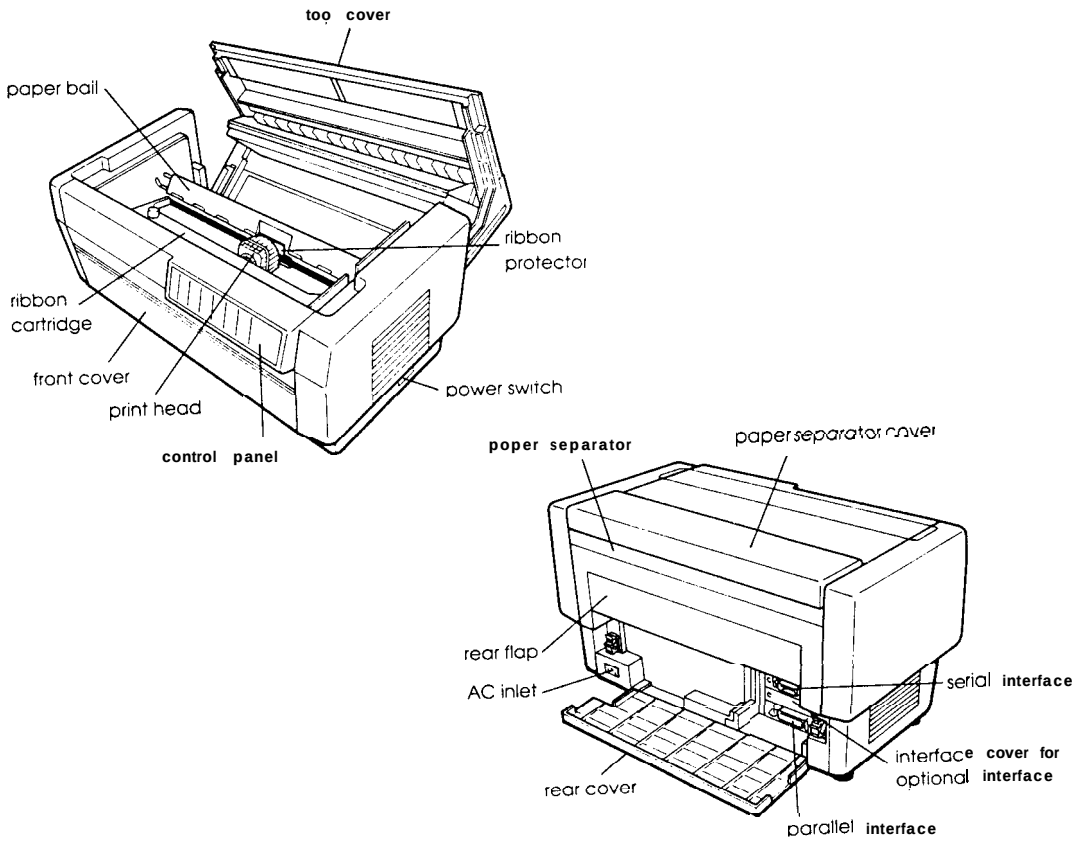


Figure 1-1. Exterior View of the DFX-5000+

Table 1-1. Options and Consumables

Model	Description
#8309	Pull tractor unit
#8766	Ribbon cartridge
#8767	Ribbon pack
C82305*	Serial I/Fcard, simple serial interface** (SSi), inch screw
C82306*	Serial I/F card, SSI, mm screw
C82307'	32KB intelligent serial I/F card (inch screw)
C82308*	32KB intelligent serial I/F card (mm screw)
C8231O*	32KB intelligent parallel I/F card
C82312*	LocalTalk I/F card
C82313*	32KB IEEE-488 I/F card
C82314*	Coax I/F card
C82315*	Twinax I/F card
C82324*	Ethernet I/Fcard

**The digit* *indicated by an asterisk (*) vanes by country.*

- ***A** simple serial interface card has no CPU; the printer processes the data from the card.*

1.2 SPECIFICATIONS

This section provides detailed information about the DFX-5000+.

1.2.1 Printer Capabilities

Printing method: Serial impact dot matrix

Pin configuration: 9 wires

Pin diameter: 0.29 mm (0.01 inches)

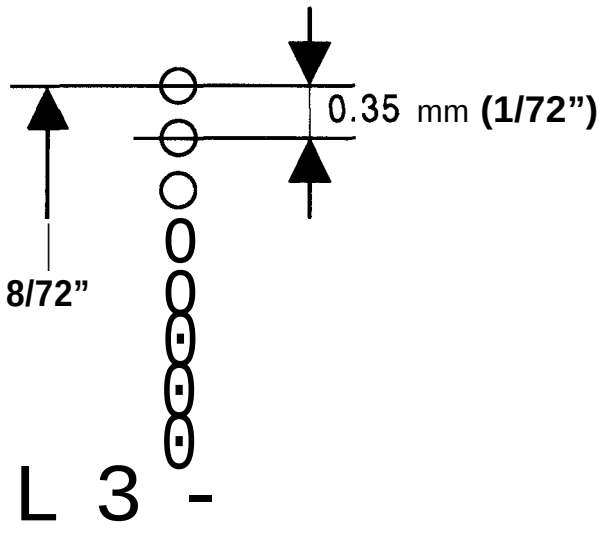


Figure 1-2. Pin Configuration

Dot matrix:

9 x 7 (high-speed draft mode)
9 x 9 (draft **mode)**
18x 23 (NLQ mode)

Printing direction:

Text mode: Bidirectional with logic seeking
(Unidirectional mode can be selected using the ESC U command.)

Bit image mode: Unidirectional

Built-in fonts:

Draft
NLQ Roman
NLQ Saris Serif

Table 1-2. Character Size and Pitch

Type of Letters	Width in mm (inches)	Height in mm (inches)	Pitch in mm (inches)	printable Columns
Pica (1 O cpi)	2.12 (0.08)	3.1 (0.12)	2.54 (0.10)	136
Elite (12 cpi)	1.69 (0.07)	3.1 (0.12)	2.12 (0.08)	163
15 cpi	1.41 (0.06)	3.1 (0.12)	1.69 (0.07)	204
Condensed (17.1 cpi)	1.06 (0.04)	3.1 (0.12)	1.48 (0.06)	233
Condensed elite (20 cpi)	0.85 (0.03)	3.1 (0.12)	1.27 (0.05)	272

Table 1-3. Printing Speeds

Type of Letters	Print Speed (cps)	High Duty (cps)
High-speed draft	560	533
Draft pica 10@	420	400
Draft elite 12 cpi	504	480
Draft 15 cpi	420	400
Draft condensed pica 17 Cpi	360	343
Draft emphasized pica 20cpi	210	200
NLQ pica	84	80
NLQ elite	101	96

Input data buffer: 20KB or O bytes (selectable by DIP switch 2-2)

control codes: ESC/P-83 mode

Table 1-4. Character Tables

Character Tables	standard Version	NLSP* Version	IBM Mode
Italic	o	0	x
PC437 (U. S., Standard Europe)	o	0	0
PC850 (Multilingual)	o	0	x
PC860 (Portuguese)	o	0	x
PC863 (Canadian-French)	o	0	x
PC865 (Norwegian)	o	0	0
PC861 (Iceland)	o	0	x
BRASCII	o	0	x
Abicornp	o	0	x
PC853(Turkish)	x	o	x
PC857(Turkish)	x	o	x
ISO Latin IT (Turkish)	x	o	x
PC437 (Greak)	x	o	x
PC869 (Greek)	x	o	x
ISO 8859-7 (Greek)	x	o	x
PC855 (Cyrillic)	x	o	x
PC866 (Russian)	x	o	x
PC852 (East Europe)	x	o	x
MAZOWIA (Polish)	x	o	x
Code MJK (Czecho, Slovak)	x	o	x
Bulgaria (Bulgaria)	x	o	x

0: supported

x: *Not supported*

**: Nationa/Language Support*

1.2.2 Paper Handling Specifications

Feeding methods:	Push tractor feed (front and rear) Push-pull feed with the optional pull tractor (front or rear)
Paper size:	
Fanfold paper	101 -406 mm (4 - 16 inches) wide
Single sheet paper	Not available
Roll paper	Not available
Line spacing:	1/6- or 1/8-inch feed or programmable with a 1/216-inch minimum increment
Feeding speed (1/6-inch per line):	
Continuous	17 ins/line (10 inches per second)
Intermittent	26 ins/line

Note: **The** feeding speed (10 ips) is reduced to 6 ips when the optional pull tractor is installed.

1.2.3 Paper Specifications

Fanfold Paper

Quality:	Plain paper
Width:	101 -406 mm (4 - 16inches)
Copy capability:	
Front	6 sheets (1 original + 5 carbonless copies)
Rear	4 sheets (1 original + 3 carbonless copies)
Total thickness:	
Front	Up to 0.46 mm (0.018 inches)
Rear	Up to 0.30 mm (0.012 inches)
Weight:	
Single	45-70 kg(14- 22 lb)
Multi-part	35-48 kg (11 - 15 lb) x n (n ≤ 8), up to the total thickness

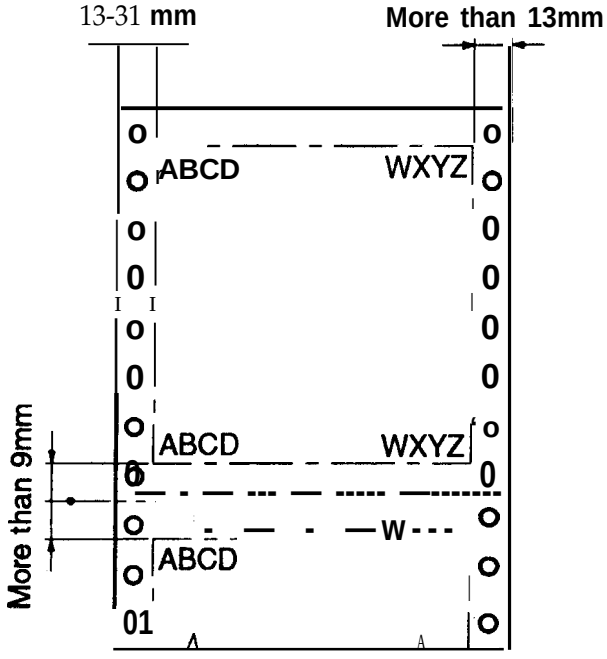


Figure 1-3. Printable Area for Fanfold Paper

Notes:

1. Horizontal alignment maybe irregular in the top 75 mm (3 inches) of the first page.
2. When using the optional pull tractor, the top 120 mm (4.8 inches) of the first page are unprintable.
3. Use clean paper with no folds, creases, or tears (especially for multi-part paper). Figure 1-4 shows paper you should not use.

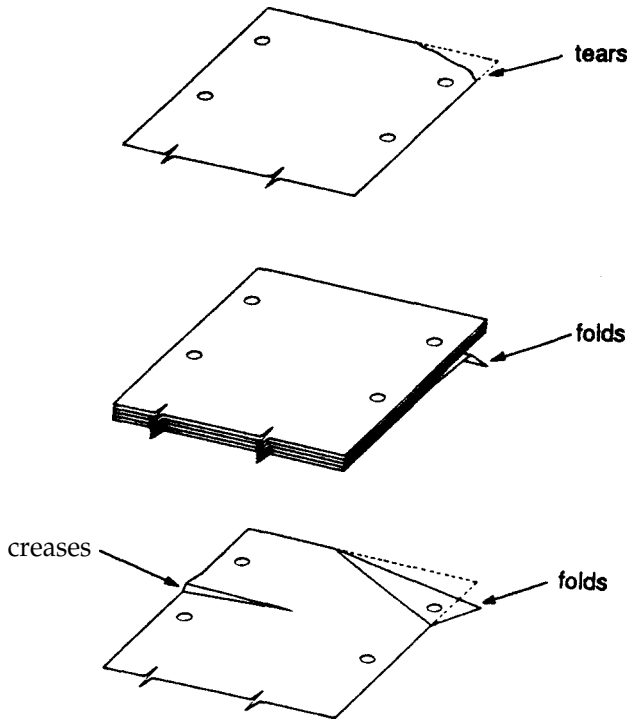


Figure 1-4. Unsuitable Paper

4. Form override printing is available for 20 lines after the paper end. The paper feeding pitch is not guaranteed. The end of the printable area is 15 mm (0.60 inches) above the bottom edge of the paper.

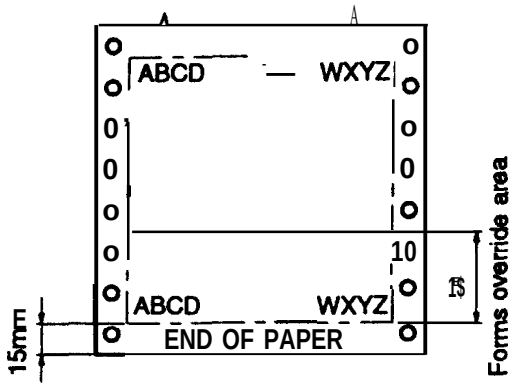


Figure 1-5. Form override Area

5. Weak horizontal and vertical perforations cause paper jams.
6. The pitch of perforations (the ratio of the cut part to the uncut part) must be less than **5:1.**

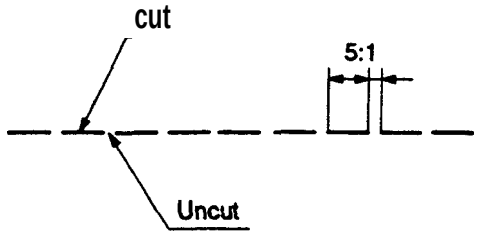


Figure 1-6. Perforation pitch

7. Horizontal perforations must have uncut parts on both edges of the paper.

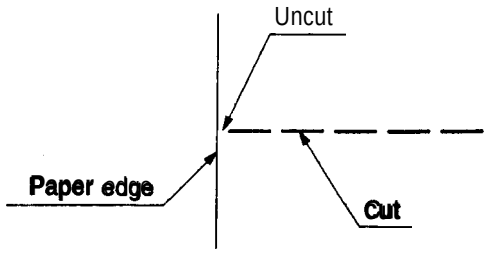


Figure 1-7. Paper Edge at a Horizontal Perforation

8. At the intersection of a horizontal and vertical perforation, the perforation cuts must not cross each other. Figure 1-8 shows examples of correct perforation intersections.

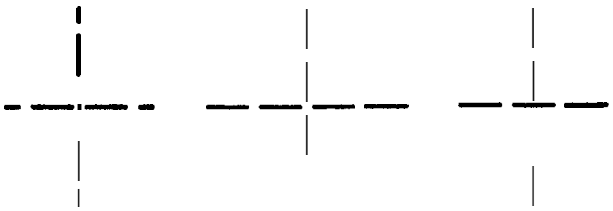


Figure 1-8. Perforation Intersections

9. The raised portion at a perforation (fold) must be less than 1 mm (0.04 inches) from the flat part, and the bottom layer must be kept flat by force.

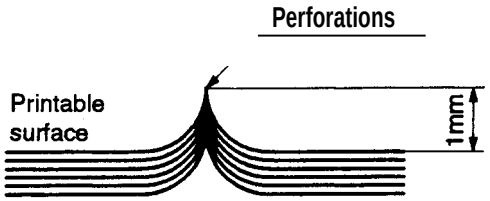


Figure 1-9. Raised Portion at a Perforation

10. Sprocket holes must be circular and may have teeth.

Figure 1-10. Sprocket Holes

11. The sprocket holes of each paper layer must be properly aligned.

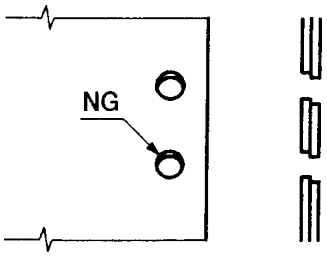


Figure 1-11. Aligned Sprocket Holes

12. Any pieces of paper remaining in the sprocket holes must be removed.
13. The paper should be fanfolded at the horizontal perforations. Never use incorrectly folded paper, such as the paper shown below.

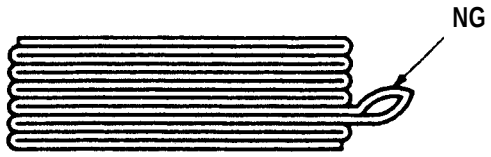


Figure 1-12. Incorrectly Folded Paper

14. Make sure there are no holes in the printable area.
15. The paper must be tom off cleanly along a perforation.

Overlapping Mutti-part Forms

Paper path:	Front only
Quality:	Plain paper
Width:	101-406 mm (4 -16 inches)
Copy capability:	5 sheets (1 original + 4 carbonless copies), excluding the bottom carrier
Overlap length:	10 mm (0.394 inches) maximum
Total thickness:	
Print area	0.46 mm (0.018 inches) maximum
Overlap area	0.70 mm (0.028 inches) maximum, including the bottom carrier
Weight:	
Multi-part	35-48 kg (11 - 15 lb), up to the total thickness
Carrier	45- 70kg (14- 221b)

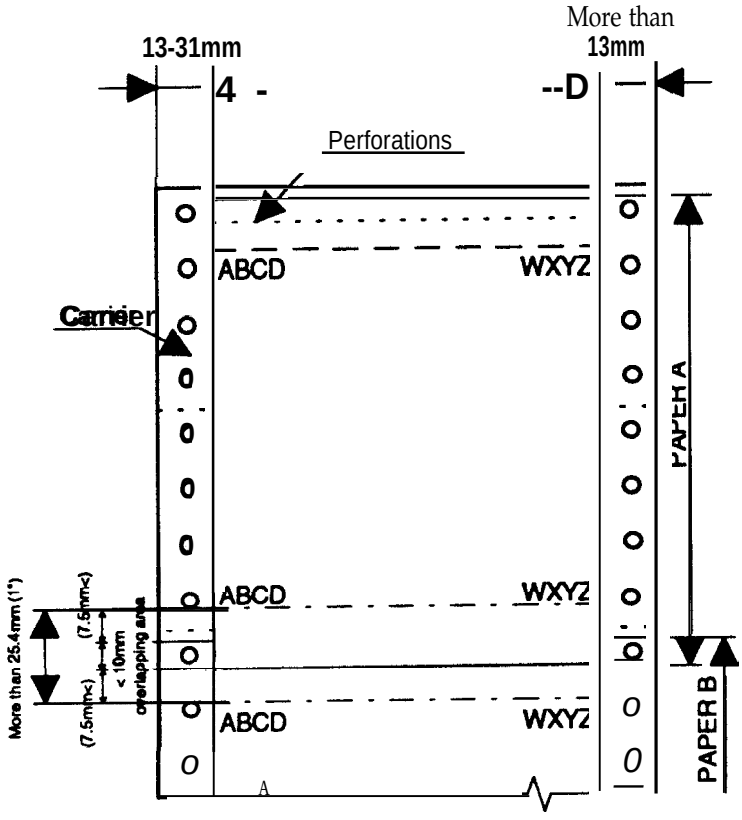


Figure 1-13. Printable Area, Overlapping Multi-part Forms

CAUTION

When using overlapping multi-part forms, do not use the paper select (change tractors) or tear off function; to avoid a paper jam, it is important not to feed overlapping multi-part forms backward.

Notes:

1. Rough multi-part form binding causes paper jams.
2. The multi-part form sheets should be bound together with spot gluing (dotted paste), paper stapling (mechanical staking), or tape stitching. Forms joined with spot gluing are recommended for the best printing quality.
3. For multi-part forms joined with dotted paste, the form sheets can be joined on either a single side or both sides. Figure 1-14 shows the recommended paste positions.

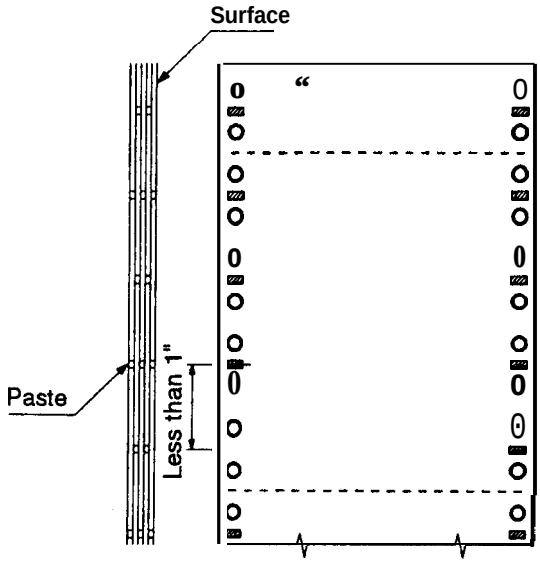
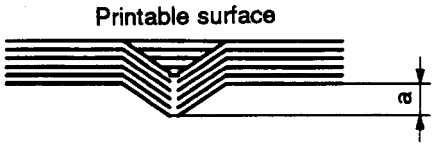


Figure 1-14. Dotted Paste Positions

4. The pasted areas must be pressed flat. There must be no creases in the paper.
5. Paper stapling must be applied from the front, and the paper must be flat. Figure 1-15 shows a cross section of the stapled area.



a: Less than paper thickness

Figure 1-15. Stapled Area 1

6. Paper stapling must be applied for both feeding directions. Figure 1-16 shows a cross section of the stapled area.

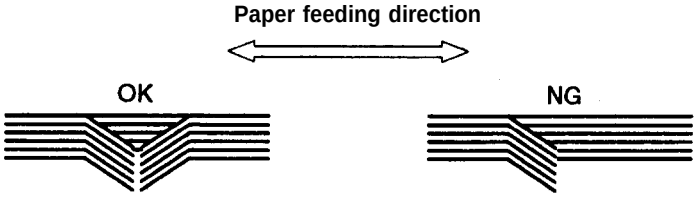


Figure 1-16. Stapled Area 2

7. The binding area must be fiat. Figure 1-17 shows a cross section of the stapled area.

Figure 1-17. Stapled Area 3

8. Never use forms joined with metal staples.
9. The binding (dots of paste or paper staples) must be outside the printable area.
10. Overlapping multi-part forms must be bound at the top side by spot gluing. The binding must be secure and there should be no spilled glue. Figure 1-18 shows the correct multi-part form binding method.
11. Multi-part form sheets should be securely bound to each other, and the binding area must not be too large.

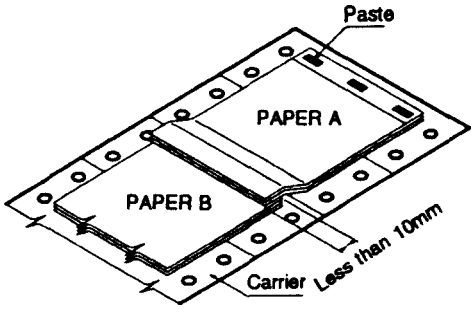


Figure 1-18. Correct Multi-part Form Binding

Fanfold Paper with a Label

Paper path:	Front only
Quality:	Plain paper
Width:	101-406 mm (4 - 16 inches)
Total thickness:	0.46 mm (0.018 inches) maximum
Weight:	
Single	45- 70 kg (14 ~ 22 lb)
Multi-part	35- 48kg (11 -15 lb) x n ($n \leq 8$), up to the total thickness

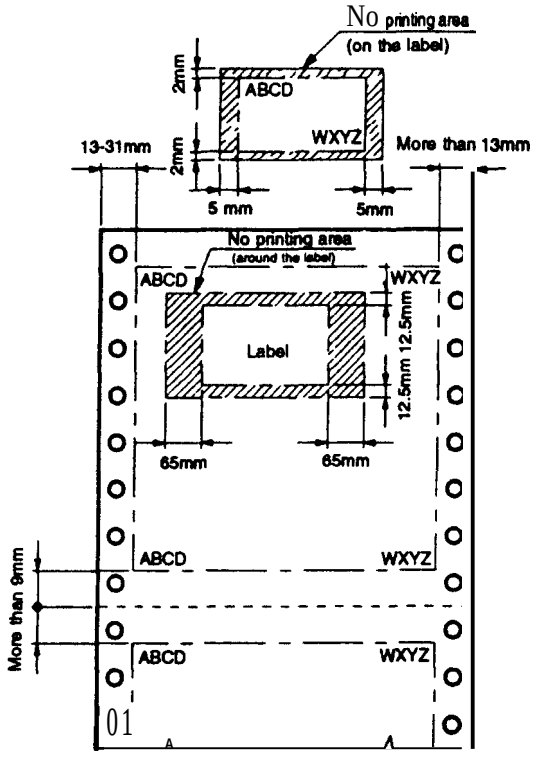
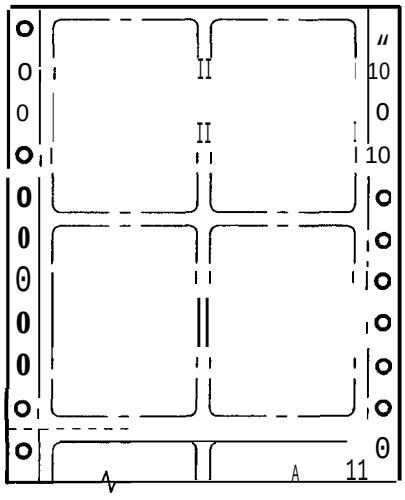


Figure 1-19. Printable Area for Fanfold Paper with a Label

Labels

Paper path:	Front only
Label size (W x H):	2½ × 15/16 inches 4 x 15/16 inches 4 x 17/16 inches
Bottom carrier:	
Width	4- 16 inches
Length	3.5 inches minimum
Total thickness:	0.19 mm (0.0075 inches) maximum Differences in thickness must be less than 0.12 mm (0.0047 inches).
Label examples:	Avery continuous form labels Avery mini-line labels



Inside of each. label

Figure 1-20. Printable Area for Labels

CAUTION

When using labels, do not use the paper select (change tractors) or tear off function; to avoid a paper jam, it is important not to feed label forms backward.

Notes:

1. Load label forms only onto the front tractor. The paper select function must not be used.
2. Feed label forms only in the forward direction, using the forward-feeding MICRO FEED button (A). Do not feed label forms in the reverse direction. (Feeding label forms backward may cause a paper jam, or the labels may come off the backing and stick to the printer.)
3. When using label forms, do not use the TOF (top of form) function.
4. Do not use easy-peel labels.
5. Label comers must be rounded.
6. The labels and the bottom carrier should have no folds or creases.
7. Labels must be on carrier paper, and there should be carrier paper between the labels. (The labels should not touch each other.)
8. The label surface must be flat.

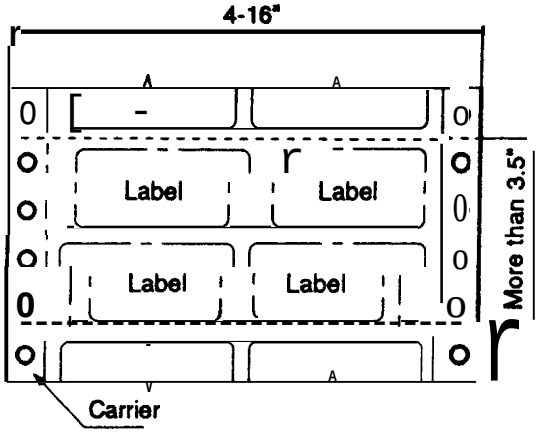


Figure 1-21. Label and Carrier

1.2.4 Ribbon Specifications

Ribbon cartridge:	#8766
Ribbon pack:	#8767
Ribbon pack exchanges:	4 times per cartridge maximum
Ribbon color:	Black
Dimensions:	
Cartridge	506 (W) x 23 (H) x 140(D) mm (20.24X 0.92 x5.60 inches)
Ribbon	13 mm x 70 m (0.52 inches x 231.0 feet), endless
Life:	15 million characters (14 dots/character)

1.2.5 Environmental Conditions

Table 1-5. Acceptable Environmental Conditions

Condition	Operating	storage
Temperature	5- 35°C (41" - 95°F)	-30- 60°C (-22 - 140°F) *1
Humidity	10- 80% RH *2	5- 85% RH *1,*2
Shock resistance	1 G (within 1 msec.)	2 G (within 2 msec.) *1
Vibration resistance	0.25 G, 55 Hz maximum	0.50 G, 55 Hz maximum

*1: *These conditions are acceptable when the printer is in its shipping container.*
*2: *Without condensation.*

1.2.6 Electrical Specifications

Table 1-6. Rated Electrical Ranges

m	120 V Version	220-240 V Version
Rated voltage	120 VAC	220-240 VAC
Input voltage range	103.5- 132 V	198-264 V
Rated frequency range	50-60 Hz	50-60 Hz
Input frequency range	49.5 -60.5 Hz	49.5 -60.5 Hz
Rated current	5.0 A	3.0 A
Power consumption	Approx. 115 W (self-test in 10 cpi draft mode)	Approx.110 W (self-test in 10 cpi draft mode)
Insulation resistance	10 MΩ, minimum (applying 500 VDC between AC line and chassis)	10 MΩ, minimum (applying 500 VDC between AC line and chassis)
Dielectric strength	1000 VAC rms -1 minute or 1200 VAC rms -1 second (between AC line and chassis)	1500 VAC rms -1 minute (between AC line and chassis)

1.2.7 Reliability

MTBF: 8000 power-on hours (POH) at a duty cycle of 25%

MCBF: 24 million lines (excluding the printhead and ribbon)

Printhead life: 300 million characters (14 dots/character)

1.2.8 Safety Approvals

Safety standards:
- U.S. version: UL1950 with D3; CSA22.2 #950 with D3
- European version: EN 60950 (TÜV, SEMKO, DEMKO, NEMKO, SETI)

Radio frequency interference (RFI):
- U.S. version: FCC part 15 sub-part B class B
- European version: Vfg 243 (VDE 0878 part 3); CISPR Pub 22 class B

1.2.9 Physical Specifications

Size (W x D x H): 700 x 382x 369 mm (27.6 x 15.0 x 14.5 inches)

Weight: 29 kg (63.8 lb)

1.3 INTERFACE SPECIFICATIONS

1.3.1 Parallel Interface

Data format:	8-bit parallel
Synchronization:	By $\overline{\text{STROBE}}$ pulse synchroniza tion
Handshaking:	By BUSY and $\overline{\text{ACKNLG}}$ signals
Signal level:	TT'compatible level
Connector:	%-pm 57-30360 (Amphenol) or equivalent

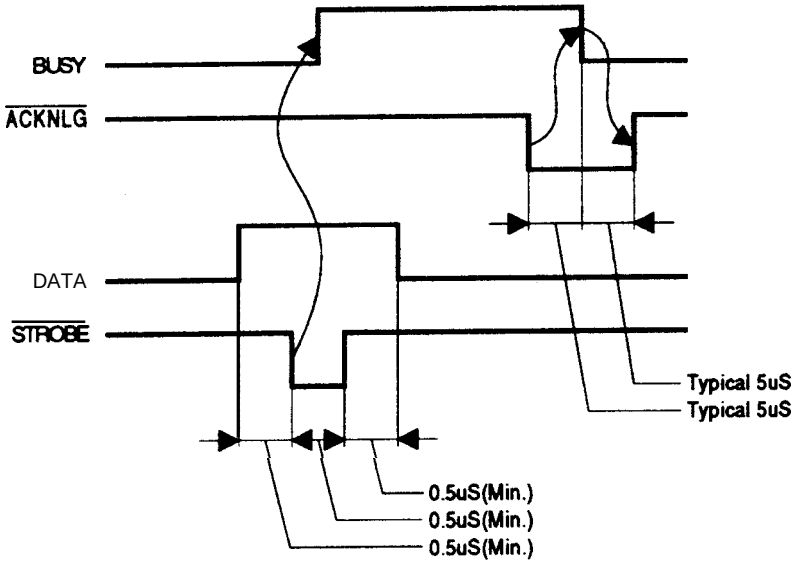


Figure 1-22. Data Transmission Timing

Note: The transition time (the rise and fall time) of each input signal must be less than 0.2 µs.

The BUSY signal is active (HIGH) under the following conditions:
- During data reception (See Figure 1-22.)
- When the input buffer is full
- When the INIT' input signal is active
- During initialization
- When the ERROR or PE signal is active
- During the self-test
- In paper memory setting mode
- In pause mode
- When a fatal error occurs

The $\overline{\text{ERROR}}$ signal is active (LOW) under the following conditions:
- When a paper out error occurs
- When a paper jam error occurs
- When a fatal error occurs

The PE signal is active (HIGH) when a paper out error occurs.

Table 1-7 shows the signal functions and connector pin assignments for the 8-bit parallel interface.

Table 1-7. Parallel Interface Signals and Connector Pin Assignments

Pin No.	Signal Name	Return Pin No.	I/O*	Description
1	$\overline{\text{STROBE}}$	19	I	$\overline{\text{STROBE}}$ pulse to read the input data. The pulse width must exceed 0.5 μs. Input data is latched after the falling edge of this signal.
2-9	DATA 1- DATA 8	20-27	I	Parallel input data to the printer. HIGH level means data 1. LOW level means data O.
10	$\overline{\text{ACKNLG}}$	28	0	This pulse indicates data has been received and the printer is ready to accept the next data. The pulse width is approximately 12 p.s.
11	BUSY	29	0	HIGH indicates the printer cannot accept the next data.
12	PE	30	0	HIGH indicates paper out. This signal is effective only when the $\overline{\text{ERROR}}$ signal is LOW.
13	SLCT		o	Always HIGH output. (Pulled up to +5 V through a 3.3 KΩ resistor.)
14	$\overline{\text{AFXT}}$		I	If the signal is LOW when the printer is initialized, a line feed is automatically performed when a CR code is input (auto LF).
15,34	NC			No connection (not used).
16	0V			Signal ground level.
17	FG	-		Chassis ground. In the printer, chassis ground and signal ground are short circuited.
18,35	+5 V			Pulled up to +5 V through a 3.3 KΩ resistor.
19-30	GND			Ground for twisted-pair return signal.
31	INIT		I	Pulse input (width: 50 μs minimum, active LOW) for printer initialization.
32	$\overline{\text{ERROR}}$		O	LOW indicates that some error has occurred in the printer.
33	GND			Signal ground.
36	$\overline{\text{SLCTIN}}$		I	If the signal is LOW when the printer is initialized, DC1/DC3 control is disabled.

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

1.3.2 RS-232C Serial Interface

Data format:	RS-232C serial
Synchronization:	Asynchronous
Handshaking:	By DTR signal or X-ON/X-OFF protocol
Word length:	
Start bit	1 bit
Data bit	8 bits
Parity bit	Odd, even, or no parity
Stop bit	1 bit or more
Bit rate:	300,1200,9600, or 19200 bps (selectable by DIP switches 2-7 and 2-8)
Logic level:	
MARK (logical 1)	-3 to –27 V
SPACE (logical O)	+3 to +27 V
Connector:	EIA standard 25-pin connector

Table 1-8 shows the signal functions and connector pin assignments for the serial interface.

Table 1-8. Serial Interface Signals and Connector Pin Assignments

Pin No.	Signal Name	I/O*	Description
1	FG	·	Chassis ground.
2	TXD	O	Transmit data for X-ON/X-OFF handshake.
3	RXD	I	Receive data.
7	SG	·	Signal ground.
11,20	DTR	O	Indicates whether the printer is ready to receive data. If the printer is not ready, the DTR signal becomes MARK.
4-6,8-10, 12-19.21-25	NC	·	No connection (not used).

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

1.4 PRINTER OPERATION

This section describes the basic operation of the printer.

1.4.1 Control Panel

The printer's control panel contains eight non-lock type push buttons and twelve LED indicators for easy use of the various printer functions.

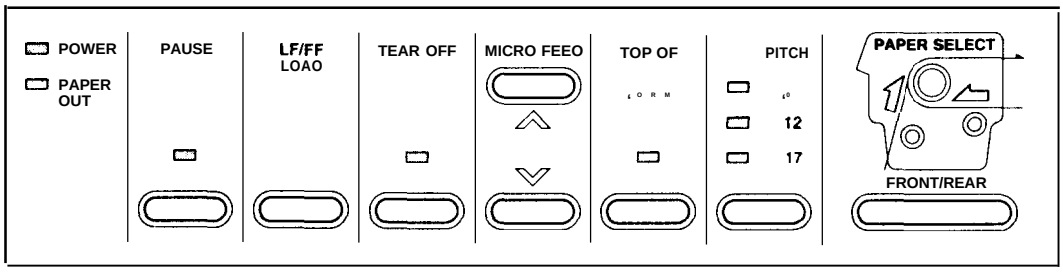


Figure 1-23. Control Panel

Buttons

PAUSE: Stops or starts printing, if any print data exists in the input buffer. (Turns pause mode on or off.)

LF/FF LOAD: Advances the paper line by line according to the set line spacing while the printer is ready to print or paused by the PAUSE button. Holding down the button for about one second advances the paper to the next top of form (TOF) position. This button is also used to load the paper from the push tractor of the selected paper path when the printer is in the paper-out state.

TEAR OFF: Enables tear off mode and advances the paper to the tear off position. This button functions only when the printer is in pause mode. The tear off position can be adjusted using the MICRO FEED buttons. The adjusted value is stored in the EEPROM on the main board when the printer is turned off.

MICRO FEED: Adjusts the paper position, including the top of form (TOF) and tear off positions. The forward MICRO FEED button (A) advances the paper in 1/216 inch increments and the backward MICRO FEED button (v) feeds the paper backward in 1 /216 inch increments.

TOP OF FORM: Enables top of form (TOF) setting mode, so that the TOF position can be adjusted using the MICRO FEED buttons. This button functions only when paper is loaded into the printer using the LF/FF LOAD button and the printer is in pause mode. In TOF setting mode, the PAUSE LED is lit and the TOF LED blinks.

PITCH: Selects a character pitch of 10,12, or 17 cpi.

PAPER SELECT: Selects the front or rear paper path. If there is paper in the current path and the printer is in pause mode, the paper is fed backward to the tractor. Then, the selected paper from the other tractor is fed to the TOF position. If all the paper in the current path is not fed backward to the tractor by the single 22-inch (55.9-cm) backward feeding sequence, make sure your previous print job is tom off and press the PAPER SELECT button again until the current path is empty.

LED Indicators

POWER (green):	Lit when the printer is turned on.
PAPER OUT (red):	Lit when the printer is out of paper. Flashes when there is a paper jam.
PAUSE (orange):	Lit when the printer is in pause mode.
TEAR OFF (orange):	Lit when the printer is in tear off mode.
TOP OF FORM (green):	Lit when the printer is in TOF mode.
PITCH (3) (green):	The lit PITCH LED indicates the selected pitch.
FRONT (2) (green):	Lit when the front paper path is selected with paper loaded onto the front tractor.
(red):	Lit when the front paper path is selected with no paper loaded onto the front tractor.
REAR (2) (green):	Lit when the rear paper path is selected with paper loaded onto the rear tractor.
(red):	Lit when the rear paper path is selected with no paper loaded onto the rear tractor.

1.4.2 Self-test

The printer's self-test (self printing) function checks the following

- Control circuit
  Printer mechanism
  Print quality

To run the self-test in draft* mode, hold down the LF/FF LOAD button and turn on the printer. To run the self-test in NLQ mode, hold down the TEAR OFF button and turn on the printer.

The self-test can be interrupted by pressing the PAUSE button. To end the self-test, press the PAUSE button and then turn off the printer.

The self-test prints the following:

- Program ROM version number
- Built-in characters

To print the current DIP switch settings, hold down the PAUSE button and turn on the printer.

* The printer does not print the self-test in draft mode if NLQ mode is selected using DIP switch 1-3.

1.4.3 Hexadecimal Dump Function

The hexadecimal dump function prints the data the printer receives in hexadecimal format. To print a hexadecimal dump, hold down the LF/FF LOAD and TEAR OFF buttons and turn on the printer. "HEX DUMP MODE" is printed on the first line. Then 16 bytes an? printed in hexadecimal on each line, and the ASCII character corresponding to each byte is printed on the right side. "." is printed if there is no corresponding ASCII character (such as, for a control code). If less than 16 bytes remain, they can be printed by pressing the PAUSE button. To cancel hexadecimal dump mode, turn off the printer.

1.4.4 Paper Out Detection Function

When the paper out sensor detects the printer is out of paper, the printer automatically enters pause mode. Load new paper properly, and then press the PAUSE button to turn off pause mode so the printer is ready to print.

1.4.5 Cover Open Detection

When the printer cover is opened, the printer stops printing, beeps 4 times with 0.1 second intervals, and enters pause mode. Close the printer cover and press the PAUSE button to turn off pause mode so the printer is ready to print.

1.4.6 Paper Width Detection

The printer detects the right paper edge and determines the right end of the printable area. This disables printing in areas where there is no paper.

1.4.7 Automatic Paper Thickness Adjustment

The printer measures the paper thickness each time paper is loaded. The distance between the printhead and the platen is automatically adjusted to match the paper's thickness and obtain the best print quality.

1.4.8 Paper Memory Function

The paper memory function allows the printer to print properly when different areas of the same form vary in thickness. For the best print quality when using forms with a label or overlapping forms, use the paper memory function. It allows you to save paper format and thickness information using the DIP switches and the control panel buttons. The paper memory function is available only for forms loaded on the front tractor.

❑ Forms with a label

Multi-part forms that vary in thickness include forms with a label; the label area is thicker than the rest of the form.

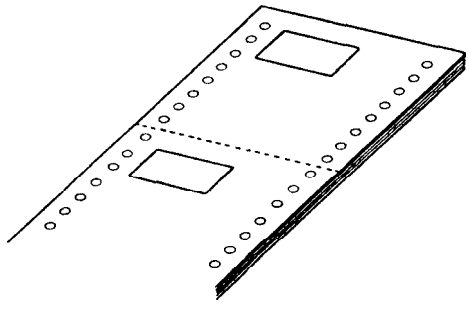


Figure 1-24. Multi-part Forms with a Label

❑ Multi-part forms that partly overlap the next page

Multi-part forms that vary in thickness include forms that overlap slightly where they are glued together; the overlap area is twice as thick as the rest of the form.

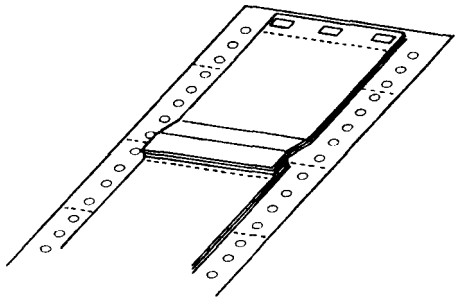


Figure 1-25. Overlapping Multi-part Forms

Set the information about the label and overlap areas before printing. The printer works according to this information.

Note: The tear off and paper select functions are not available when the paper memory function is used.

1.4.8.1 Using the Paper Memory Function

To use the paper memory function, you must first save paper format and thickness information for up to two different types of paper as described in Section 1.4.8.2, below.

To turn on the paper memory function after saving your paper format and thickness information, hold down one of the buttons below and turn on the printer.

MICRO FEED (A)	Recalls the paper format and thickness information stored in memory area 1.
MICRO FEED (v)	Recalls the paper format and thickness information stored in memory area 2.

To turn off the paper memory function and use normal paper, hold down the PAPER SELECT button and turn on the printer.

Notes:
- A l-inch skip over perforation area is automatically included for overlapping forms.
- ESC C (set page length) is valid when using the paper memory function.
- ESC N (set skip over perforation) is valid when using the paper memory function; however, if the skip length is less than 1 inch, the setting is ignored when using overlapping forms.
- ESC O (reset skip over perforation) is valid when using the paper memory function with overlapping forms.
- When using overlapping forms, the loading position must be adjusted each time you load paper.

1.4.8.2 Saving Paper Format and Thickness Information

To save paper format and thickness information for overlapping forms, forms with a label, or overlapping forms with a label, follow these steps:

1. Turn off the printer.
2. Use DIP switch 3-4 to select the memory area where you want the printer to store the paper format and thickness information. Memory area 1 is selected when DIP switch 3-4 is off. This is the printer's default setting. To select memory area 2, turn on the switch.

Table 1-9. Selecting the Paper Memory Area

Paper Memory Area	DIP SW 3-4
1	OFF
2	ON

3. Use DIP switches 3-1 and 3-2 or software commands to set the page length.

Table 1-10. Setting the Page Length

Page Length (inches)	DIP SW 3-1	DIP SW 3-2
11	OFF	OFF
12	OFF	ON
8.5	ON	OFF
70/6	ON	ON

4. Use DIP switches 3-5 and 3-6 to set the paper type.

Table 1-11. Setting the Paper Type

Paper Type	SW 3-5	SW 3-6
Normal paper	OFF	OFF
Forms with a label	OFF	ON
Overlapping forms	ON	OFF
Overlapping forms with a label	ON	ON

5. Hold down both MICRO FEED buttons and turn on the printer.

6. If you are using forms with a label, indicate the label's position by following these steps:
   (1) Open the printer cover.
   (2) Align the pointer on the ribbon mask with one of the label's comers.
   – To feed the paper up or down, press the appropriate MICRO FEED button.
   – To move the pointer right or left, move the printhead by hand.
   (3) Press the TOP OF FORM button.
   (4) Move the pointer to the comer of the label diagonally opposite the first comer.
   (5) Press the TOP OF FORM button.
   (6) Close the printer cover.

7. Use the printer beeps to confirm that the paper format and thickness information has been saved properly. If the printer beeps once or twice, the information has been saved correctly in memory area 1 or 2. If the printer beeps 10 times, the information has not been saved; carefully follow steps 1 through 7 in this section again.

1.4.9 Automatic Tear Off Function

Use DIP switch 3-8 to enable or disable the automatic tear off function. When the tear off function is enabled, the printer automatically feeds fanfold paper until its perforation reaches the tear off position of the printer cover under these conditions:

- ❑ The paper is advanced to the TOF position after a print job.
- ❑ The printer receives an FFcode and then no other codes or characters for at least3 seconds. (The printer has finished a print job.)
- ❑ The pull tractor is not being used.
- ❑ The paper memory function is not being used.

Then, if the printer receives more data, it automatically feeds the paper backward to the original position and printing starts.

1.4.10 Paper Jam Detection

When a paper jam is detected, the printer beeps, stops feeding the paper, and enters pause mode. The PAPER OUT indicator flashes. Remove the paper and load new paper properly. Then press the PAUSE button to turn off pause mode so the printer is ready to print.

1.4.11 Automatic Interface Selection

When the printer does not receive any data for the set time over the currently selected interface, it checks the parallel interface, serial interface, and optional interface, and selects the interface that receives data first. The standby time can beset to 10 seconds or30 seconds using DIP switches 24,2-5, and 2-6.

Note: The built-in serial interface and Type B simple serial interface card cannot be used at the same time. The simple serial interface card takes precedence over the built-in serial interface.

1.4.12 Thermal Protection

The printhead has a thermistor inside it, and the printhead cooling fan also has a thermistor. When the pnnthead or cooling fan is too hot, the printer stops printing while it cools.

1.4.13 Skip Binding Function

The skip binding function is used for printing on multi-part forms with binding that could scratch the printhead during paper feeding. When this function is used, the head parks away from the binding during paper feeding to avoid paper jams. Use DIP switch 3-7 to enable or disable the skip binding function; when it is enabled, throughput is reduced.

1.4.14 Printer Initialization

The printer is initialized in the following cases:

- ❑ When the printer is turned on.
- ❑ When the INIT signal is input through the parallel rnterface.

Initialization performs the following functions:

- ❑ Returns the printhead to the far left position (carriage home).
- ❑ Puts the printer in ready mode, so it is ready to print.
- ❑ Clears the print buffer and input data buffer.
- ❑ Clears download characters (CG ROM copy in IBM mode).
- ❑ Sets the line spacing to 1/6 inch.
- ❑ Sets the page length according to the DIP switch settings.
- ❑ Clears all vertical tab positions.
- ❑ Sets the horizontal tab position to every 8 columns.
- ❑ Sets the print mode according to the DIP switch settings and non-volatile memory.

The top of form (TOF) position is reset by the following:

- ❑ Printer initialization
- ❑ ESC/P software reset command (ESC @)
- ❑ Page length command (ESC C)
- ❑ IBM top-of-form setting command (ESC 4)

1.4.15 Buzzer Operation

The buzzer sounds for approximately 0.1 second when a BEL code (07H) is input. Buzzer beeps indicate printer status, as shown below. Each asterisk (*) represents one 0.1 second beep.

The ESC BEL command (07H) is input.	*(1 beep)
A carnage error is detected due to: - CR lockup. Low insulation resistance (less than 1 KΩ).	"** *** (2 sets of 3 beeps)
A paper out or paper jam is detected. (The printer runs out of paper or a paper jam occurs during paper feeding or printing.)	•*** '* *-*'~ ****(5 sets of 4 beeps)
Another paper error is detected: Incomplete back-out. (The previous print job is not tom off.) Empty during operation. (The paper is out at power on.)	*** (3 beeps)
An abnormal voltage is detected.	* **•" (5 beeps with a pause between each beep)
RAM error is detected.	** ** ** **•* (5 sets of 2 beeps)
A cover open is detected: The cover open sensor detects that the cover is open. The interlock switch detects that the cover is open.	**** (4 beeps)
A short circuited printhead is detected. (The head driver FETs are bad.)	* * **••* * •* (10 &P with a pause between each beep)
A short circuited printhead fan is detected.	** ** ** **•* ** ** ** (8 sets of 2 beeps)
An illegal paper memory setting is detected.	**** W-* (10 beeps)
A micro adjust limit is detected.	***-**-**... (continuous beeps)
A platen gap adjust error is detected.	*** *** *** (3* of 3 beeps)

Note: ** 0.1 second interval ** 0.3 second interval

1.5 DIP SWITCH SETTINGS

This section describes the functions of the DIP switches. After setting one or more DIP switches, turn on the printer to put your settings into effect.

Table 1-12. DIP Switch Settings

SW No.	Function	ON	OFF	Factory Setting
1-1	Emulation mode	IBM mode*	ESC/P mode	OFF
1-2	Draft speed	Normal	High	OFF
1-3	Character quality	NLQ	Draft	OFF
1-4 1-5 1-6 1-7 1-8	IBM mode ESC/P mode	See Table 1-13. See Table 1-14.		OFF OFF OFF OFF OFF
2-1	Shape of zero	Slashed	Not slashed	OFF
2-2	Input buffer	Invalid	Valid	OFF
2-3	Automatic LF bv CR	Valid	by $\overline{\text{AFXT}}$	OFF
2-4 2-5 2-6	Interface	See Table 1-15.		OFF OFF OFF
2-7 2-8	Serial bit rate	See Table 1-16.		OFF OFF
3-1 3-2	Page length	See Table 1-17.		OFF OFF
3-3	Skip over perforation	Valid (1")	Invalid	OFF
3-4	Paper memory area**	2	1	OFF
3-5	Overlapping forms**	Valid	Invalid	OFF
3-6	Forms with a label**	Valid	Invalid	OFF
3-7	Skip binding	Valid	Invalid	OFF
3-8	Automatic tear off	Valid	Invalid	OFF

** IBM mode indicates IBM ProPrinter emulation mode.*
*** These DIP switches are used for paper memory function settings.*

Table 1-13. IBM Mode Selection

SW No.	Function	ON	OFF	Factory Setting
1-4	Automatic CR by LF, ESC J	Invalid	Valid	OFF
1-5	Reserved			OFF
1-6	Codes 80-9FH	Characters	Commands	OFF
1-7	Reserved			OFF
1-8	Character table	PC865	PC437	OFF

Table 1-14. ESC/P Mode Selection

Character Table		Sw 1-4	Sw 1-a	Sw 1-6	Sw 1-7	Sw 1-8
Standard	NLSP					
Italic Us.		OFF	OFF	OFF	OFF	OFF
Italic France		OFF	OFF	OFF	OFF	ON
Italic Germany		OFF	OFF	OFF	ON	OFF
Italic U.K.		OFF	OFF	OFF	ON	ON
Italic Denmark		OFF	OFF	ON	OFF	OFF
Italic Sweden		OFF	OFF	ON	OFF	ON
Italic Italy		OFF	OFF	ON	ON	OFF
Italic Spain		OFF	OFF	ON	ON	ON
PC437	PC437	OFF	ON	OFF	OFF	OFF
PC850	PC850	OFF	ON	OFF	OFF	ON
PC860	PC860	OFF	ON	OFF	ON	OFF
PC863	PC863	OFF	ON	OFF	ON	ON
PC865	PC865	OFF	ON	ON	OFF	OFF
PC861	PC861	OFF	ON	ON	OFF	ON
BRASCII	BRASCII	OFF	ON	ON	ON	OFF
Abicomp	Abicomp	OFF	ON	ON	ON	ON
	PC437 Greek	ON	OFF	OFF	OFF	OFF
	PC869	ON	OFF	OFF	OFF	ON
	ISO 8859-7	ON	OFF	OFF	ON	OFF
	PC853	ON	OFF	OFF	ON	ON
	PC857	ON	OFF	ON	OFF	OFF
	ISO Latin IT	ON	OFF	ON	OFF	ON
	PC855	ON	OFF	ON	ON	OFF
	PC866	ON	OFF	ON	ON	ON
	PC852	ON	ON	OFF	OFF	OFF
	MAZOWIA	ON	ON	OFF	OFF	ON
	Code MJK	ON	ON	OFF	ON	OFF
	Bulgaria	ON	ON	OFF	ON	ON

Table 1-15. Interface Selection

Interface	Sw *2-4*	SW *2-5*	Sw *2-6*
Automatic selection, serial interface, odd parity (30 seconds*)	OFF	OFF	OFF
Automatic selection, serial interface, odd parity (10 seconds*)	OFF	OFF	ON
Automatic selection, serial interface, no parity (30 seconds*)	OFF	ON	OFF
Automatic selection, serial interface, no parity (10 seconds*)	OFF	ON	ON
Parallel interface	ON	OFF	OFF
Serial interface, odd parity	ON	OFF	ON
Serial interface, even parity	ON	ON	OFF
Serial interface, no parity	ON	ON	ON

**This is the standby time. See Section 1.4.11, 'Automatic Interface Selection."*

Table 1-16. Baud Rate Selection

Bit Rate (bps)	SW 2-7	Sw 2-8
19,200	**OFF**	**OFF**
9,600	OFF	ON
1,200	**ON**	OFF
300	**ON**	**ON**

Table 1-17. Page Length Selection

Page Length	Sw 3-1	SW 3-2
11 inches	OFF	OFF
12 inches	OFF	ON
8.5 inches	ON	OFF
70/6 inches	ON	ON

1.6 MAIN COMPONENTS

The main components of the DFX-5000+ are designed for easy removal and replacement. These main components are:

- Printer mechanism (M-3C11)
- Main control board (C117 MAIN board assembly)
- Power supply board (C117 PSB/PSE board assembly)
- Control panel (C117 PNL board assembly)
- Housing

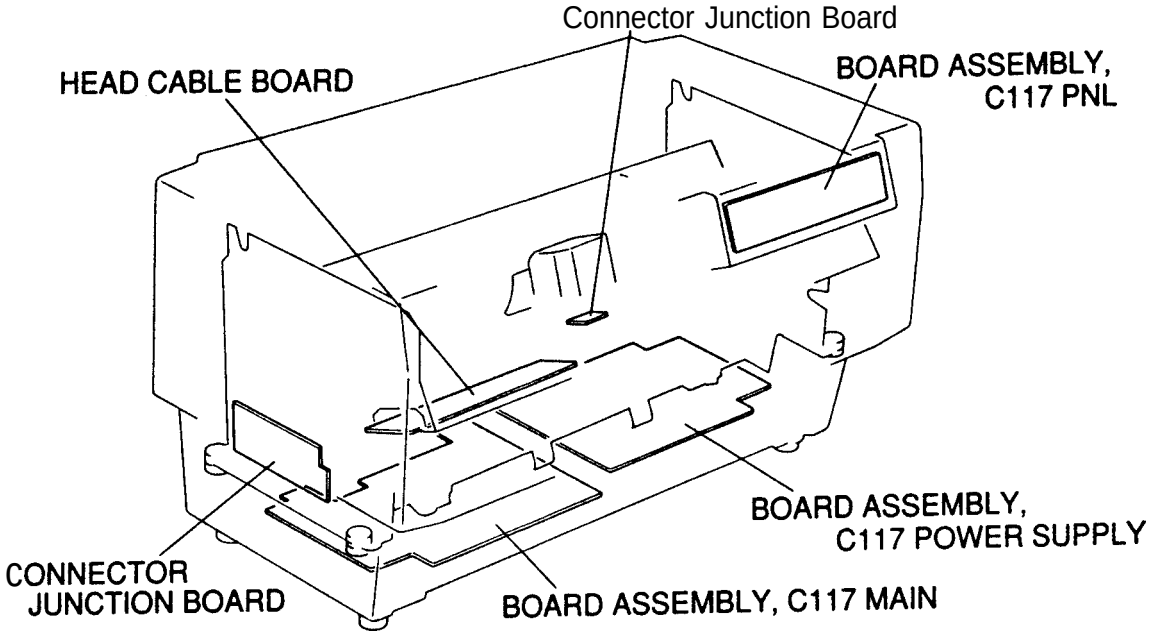


Figure 1-26. Main Components

1.6.1 M-3C11 Printer Mechanism

The M-3C11 printer mechanism is a 9-pin, serial, dot matrix printer mechanism developed for the DFX-5000+. It is designed to provide high-speed, high-volume printing, and is especially heavy and durable when compared with existing terminal printer mechanisms. Its paper feeding mechanism uses fanfold paper, and an automatic mechanism is included to provide enhanced paper handling.

The structural differences between the DFX-5000+ and the DFX-5000 are:

- ❑ The DFX-5000+ includes a CR motor isolation resistance sensor.
- ❑ The DFX-5000+ includes a paper jam sensor.
- ❑ To prevent paper jams, the DFX-5000+ includes a tractor wire at the front and rear tractors.
- ❑ The DFX-5000+ does not include a carriage home position sensor.
- ❑ The detection method of the carriage encoder sensor has been changed. In the DFX-5000, the encoder plate was attached to the rotor of the CR motor, while the DFX-5000+ uses a belt-type encoder.
- ❑ In the DFX-5000+, the angle between the printhead and the surface of the platen has been changed to reduce noise.
- ❑ In the DFX-5000+, the ribbon guide is not attached to the ribbon mask; the ribbon mask is attached to the pnnthead carriage.

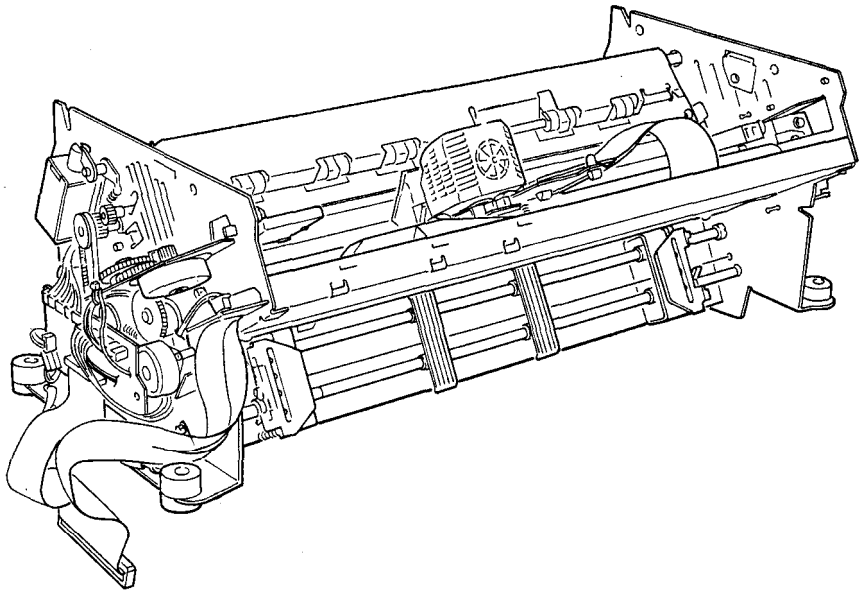


Figure 1-27. M-3C11 Printer Mechanism

1.6.2 Main Control Board (C117 MAIN Board Assembly)

The C117 MAIN board assembly consists of: a TMP96C14 8-bit CPU, an E05A87 gate array, a PROM (2 megabit including the CG ROM), a PS-RAM (256K), an EEPROM, an SLA7026M for the paper feed motor, an SLA5007 for the CR motor, each driver's IC, and the parallel and serial interface control circuits.

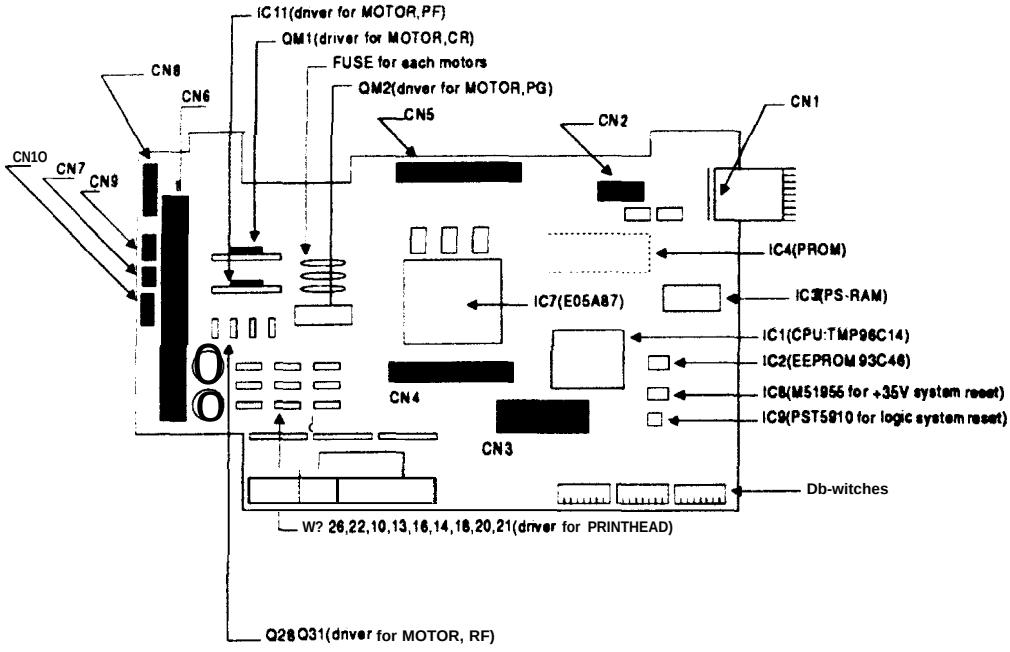


Figure 1-28. C117 MAIN Board Assembly

1.6.3 Power Supply Circuit (C117 PSB/PSE Board Assembly)

The C117 PSB/PSE board assembly power supply circuit supplies the control circuit and printer mechanism drive circuit with power. The fan motor on this board keeps the temperature in the lower case constant and cools the CR motor. The printer contains one of two power supply boards; see Table 2-1 for information on the input voltage and fuse ratings of your printer's board.

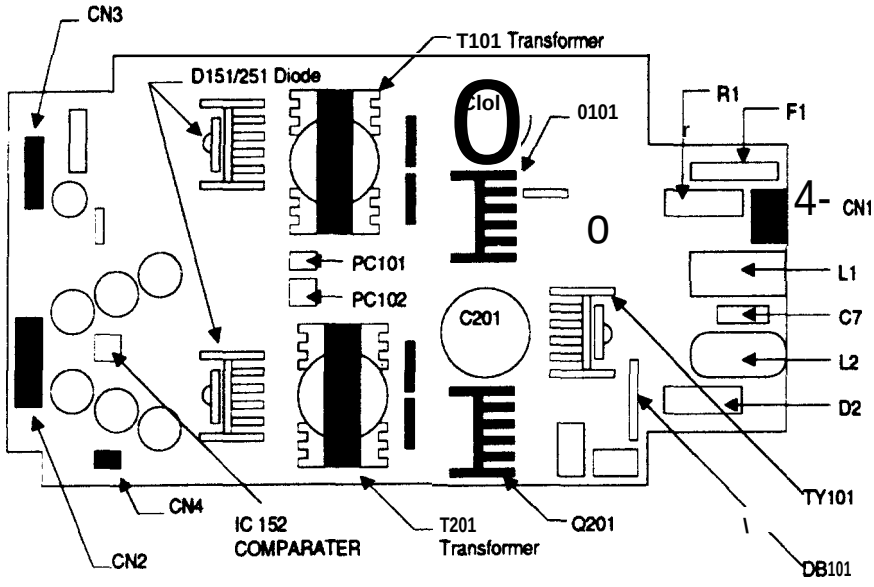


Figure 1-29. C117 PSB/PSE Board Assembly

1.6.4 Control Panel Board (C117PNL Board Assembly)

The C117PNL board assembly is the operator control panel. It contains the buttons, indicator LEDs, and buzzer.

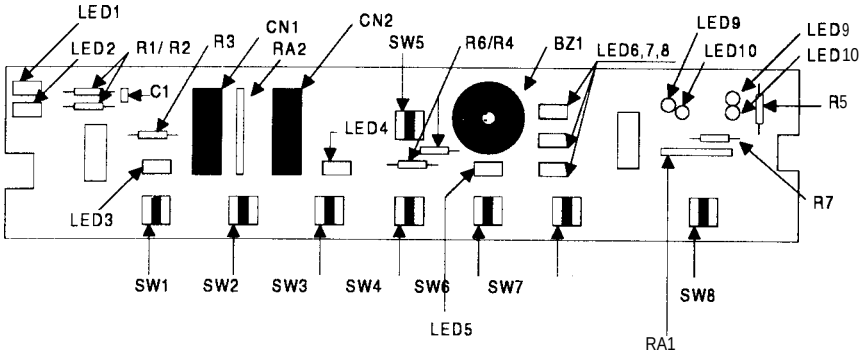


Figure 1-30. C117PNL Board Assembly

1.6.5 Housing

The housing consists of many parts. The lower case is the main frame which holds the printer mechanism and circuits. These components are covered by the upper case, bottom plate, and two side covers, each of which has various covers. The housing has large openings in the front and rear for the paper entrances and exits. It also has a cover on the bottom plate to provide easy access to the PROM on the main board.

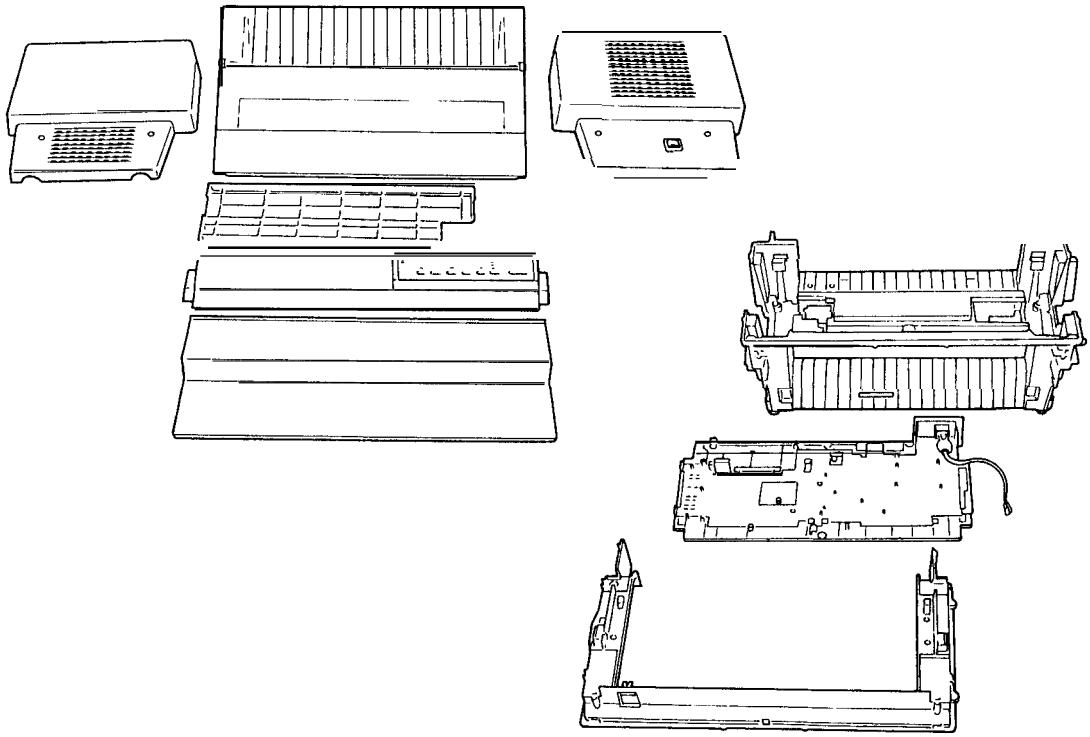


Figure 1-31. Housing

CHAPTER 2 Operating Principles

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2.1 OVERVIEW OF PRINTER MECHANISM OPERATION

This section describes the Model 3C11 printer mechanism and explains how the printer works. The Model 3C11 printer mechanism features a 9-pin, impact dot printhead for serial printing. The printer mechanism is the main component of the printer and is supported by the other components (the power supply and control circuits). Figure 2-1 shows the Model 3C11 printer mechanism.

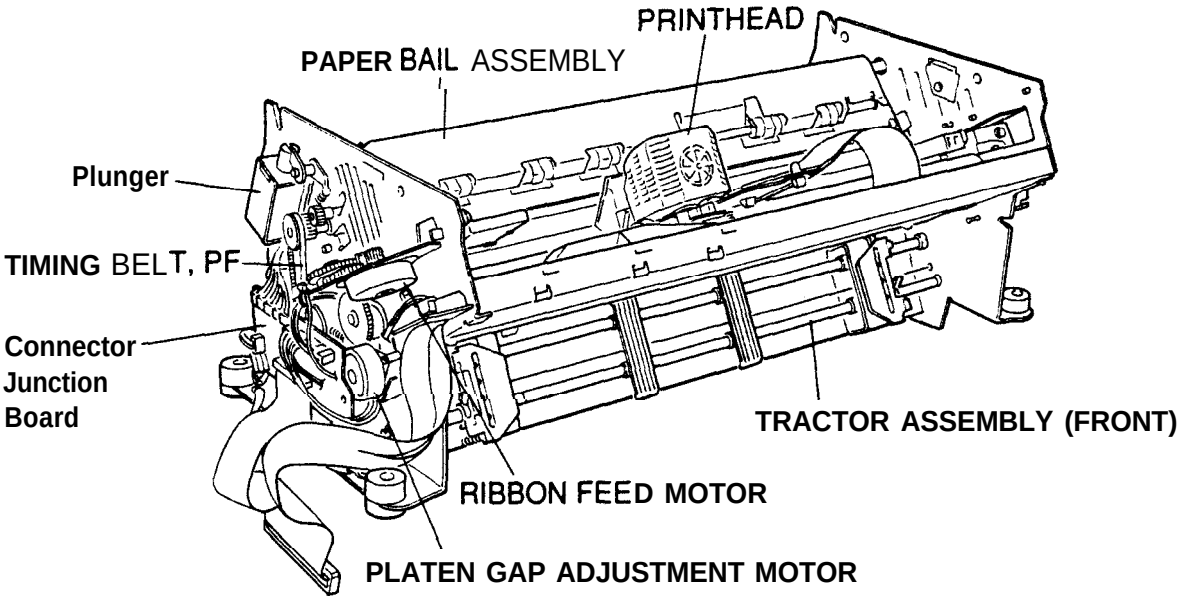


Figure 2-1. Model 3C11 Printer Mechanism

The printer mechanism consists of the following main components:

❑ Printhead

The printhead is the component that actually pMts characters (dot matrix patterns). Printing is performed by striking the pins (arranged in a vertical line) against the surface of the paper and the ribbon. A character is printed by repeating this printing operation in the horizontal direction (as the printhead moves). The printhead includes a head fan and temperature sensor. The head fan also has a thermistor. When the printhead or fan is too hot, the printer stops printing until it cools. (Refer to Section 1.4.12, *Thermal Probation.)*

❑ Carnage mechanism

The carriage mechanism moves the printhead in the horizontal direction. The CR motor drives the carriage, with the printhead on it. The CR sensor detects the CR motor speed and carriage position. The CR motor is closed-loop controlled. Because the CR motor is driven at a very high speed, it includes an isolation resistance sensor to detect abnormal resistance. The sensor detects an error if the resistance is less than 1 KΩ.

Cl Interlock switch

Because the carnage moves at a very high speed, it would be dangerous if a hand or finger were inserted inside the printer mechanism during printing. Therefore, as a safety measure, when the top cover is opened, the interlock switch cuts the drive voltage to the CR motor to slow down the carriage speed and prevent accidents. A control circuit controls CR motor driver deceleration. (Refer to Section 2.3.4., *CR Motor Drive Circuit.)* Printing resumes when the top cover is closed.

❑ Auto platen gap adjustment mechanism

The printer mechanism has an automatic platen gap adjustment function that measures the thickness of the paper and provides the appropriate gap between the platen and printhead. The platen gap is adjusted by moving the carriage (and printhead) either forward or backward. Because the front and rear carriage guide shafts which hold the carriage are purposely mounted off-center, the carriage moves as the PG motor rotates the shafts. The PG sensor transmits the amount of movement (= gap) to the control circuit.

❑ Ribbon feed mechanism

The printer's ribbon cartridge contains an endless ribbon. The ribbon feed mechanism takes up the ribbon so that the portion hit by the pins is constantly changing. The RF motor drives the ribbon feed mechanism. Figures 2-2 and 2-3 show the operation of the ribbon feed mechanism.

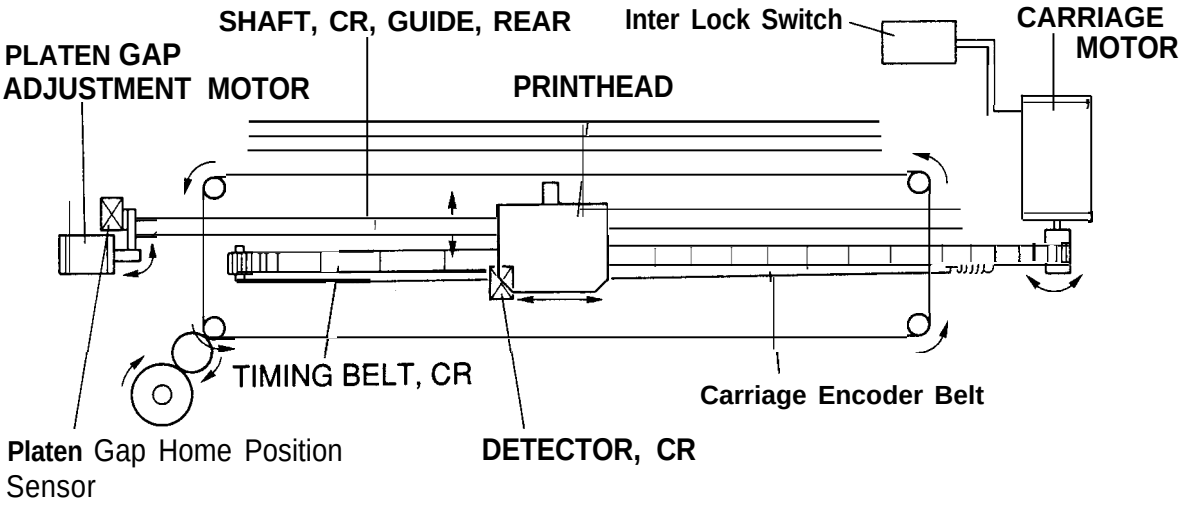


Figure 2-2. Printer Mechanism Operation 1

❑ Paper feed mechanism

The CR motor controls printing in the horizontal direction, and the paper feed mechanism controls movement in the vertical direction (line feeding and form feeding). The paper feed mechanism feeds paper vertically. The PF motor drives the paper feed mechanism.

The front, rear, and top PE sensors detect whether paper is present in the paper path, and stop the printer from printing when there is no paper. The printer is equipped with three PE sensors: the front PE sensor at the front tractor, the rear PE sensor at the rear tractor, and the top PE sensor at the paper bail. The pull tractor sensor detects whether the optional pull tractor is installed. The printer is also equipped with a paper jam sensor. The control circuit reads the signals from the sensors and indicates when an error occurs.

❑ Tractor select mechanism

The printer mechanism has two paper entrances: one at the front tractor and one at the rear tractor. By controlling the RF motor, the tractor select mechanism chooses which tractor to use, and power from the PF motor is conveyed via a series of gears. The tractor select sensor detects the selected tractor and signals that information to the control circuit.

❑ Plunger mechanism

During printing, the paper bail assembly holds the paper under tension so that it is fed smoothly. When paper is loaded or ejected or when the tear off function is executed, the paper bail assembly needs to move up to prevent a paper jam. The plunger moves the paper bail assembly up. Figure 2-3 shows this operation.

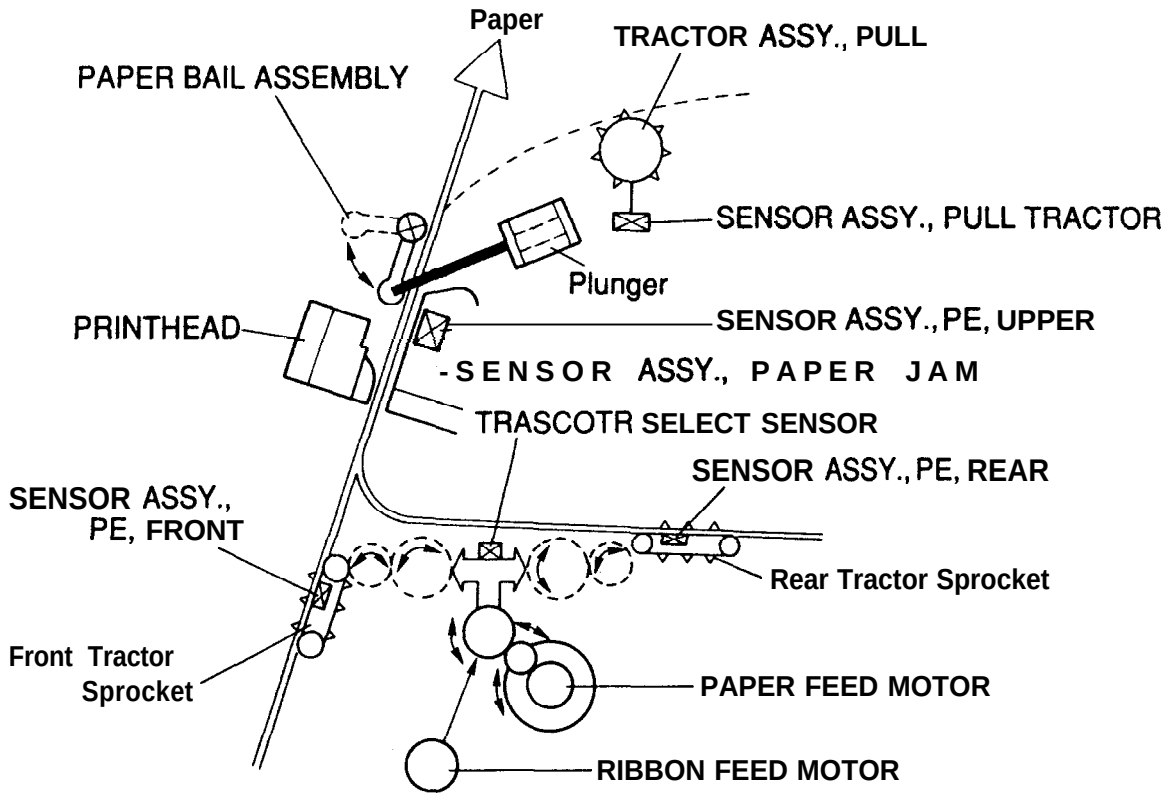


Figure 2-3. Printer Mechanism Operation 2

2.1.1 Printhead Mechanism

The printhead is a charge-type, impact dot printhead. Figure 2-4 shows its operation. The dot wire is attached to the actuating spring at point A. It is pulled back (left in the figure) by magnetic force when power is applied and during standby. The magnetic force holds back the actuating spring. When current flows through the coil, a countermagnetic field is induced in the coil. Then, the actuating spring ejects the dot wire fix-ward against the ink ribbon, printing a dot on the paper.

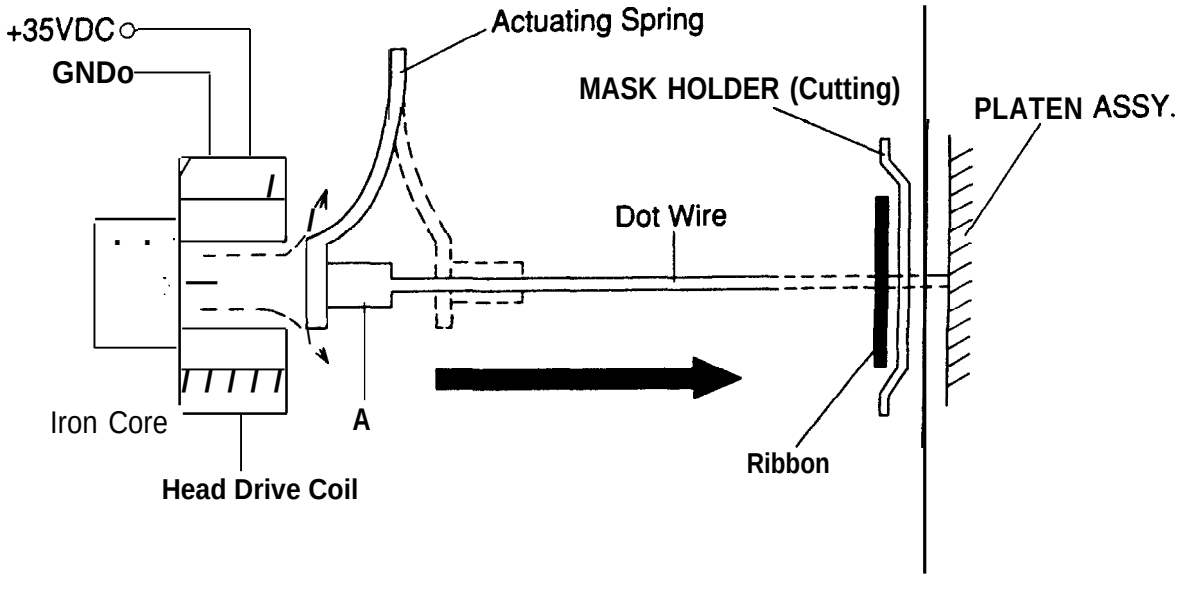


Figure 2-4. Printhead Operation

2.1.2 Carriage Mechanism

Figure 2-5 shows the carriage mechanism. The front and rear carriage guide shafts support the carriage. The rotation of the CR motor is transmitted to the carnage timing belt through the carriage belt pulleys at the right and left sides. The printhead is mounted on the carriage, which is attached to the carriage timing belt and moves horizontally.

The printer does not have a carriage home position sensor; the home position is detected using disordered pulses of the CR motor and CR sensor (linear, belt-type). A gum pad is attached to the left side of the frame. When the carriage hits the pad, the CR motor pulse is disordered by this obstacle. The control circuit monitors the CR motor's pulse; when it is disordered, the control circuit recognizes the carriage home position.

The CR motor is equipped with an encoder unit which generates pulses. The encoder belt has equally pitched slits and is mounted under the timing belt. A photo interrupter (encoder) surrounds the encoder belt and converts the carriage movement into a pulse train.

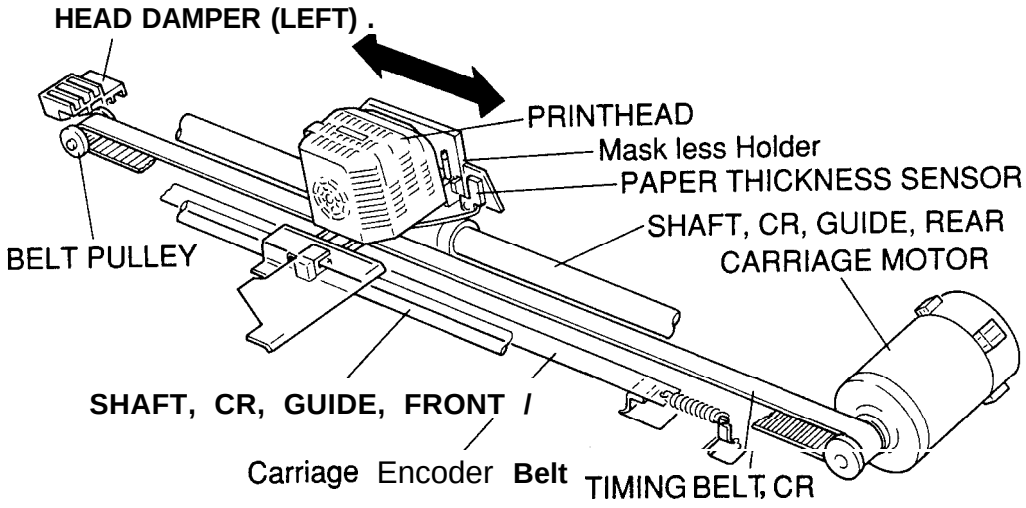


Figure 2-5. Carriage Mechanism

2.1.3 Platen Gap Adjustment Mechanism

Figure 2-6 shows the platen gap adjustment mechanism. The front and rear carriage guide shafts supporting the carriage have a vertical section. The rotation of the PG motor is transmitted to the rear carriage guide shaft through the gears. Counterclockwise rotation of the motor expands the platen gap and clockwise rotation reduces it.

The encoder plate with equally pitched slits is attached coaxially to the motor axis. When the motor rotates, the PG sensor detects it and outputs the pulses. Each pulse corresponds to detection of a 0.015 mm resolution (horizontal distance). The system range is O to 0.7 mm.

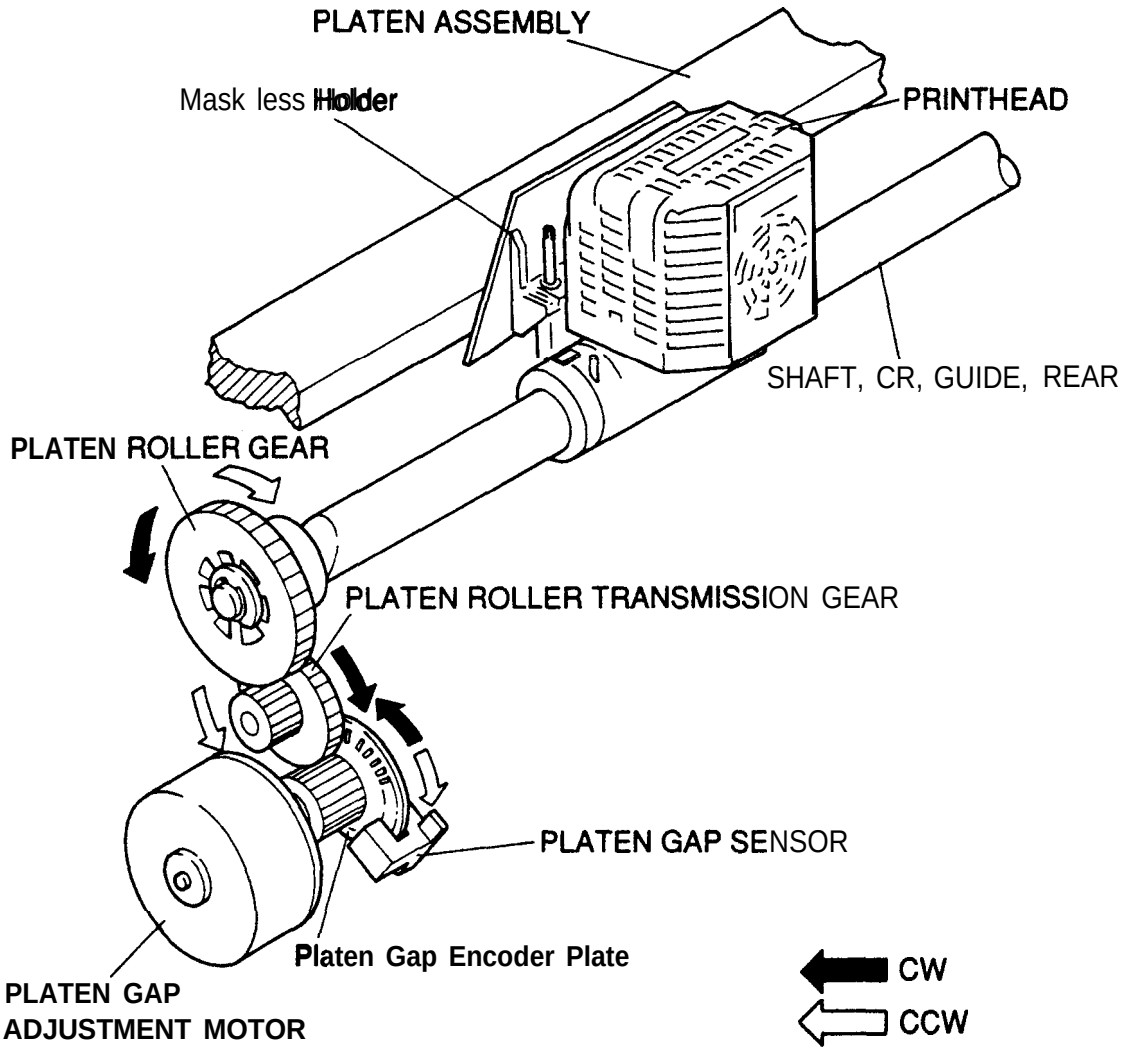


Figure 2-6. Platen Gap Adjustment Mechanism

2.1.4 Paper Feed Mechanism

Figures 2-7, 2-8, and 2-9 show the paper feed mechanism. After you load paper, it is fed by the tension roller, PF roller, and front or rear tractor assembly. The PF motor rotates the tension roller and tractor select gear (Figure 2-7) and moves either the front or rear tractor assembly. The rotation of the paper feed transmission gear rotates the tractor select gear, which can engage either tractor train. The tractor select mechanism alternates the engagement of the rear tractor assembly gear train and front tractor assembly gear train. (Refer to Section 2.1.5, *Ribbon Feed and Tractor Select Mechanisms,* for more information.)

The front and rear PE sensors are incorporated in the tractor sprocket. When paper is loaded, the paper pushes the leaf spring and blocks the photo interrupter. When no paper is loaded, the photo interrupter is not blocked. The top PE sensor is attached to the upper paper guide and is used with the reflection plate on the paper bail assembly. When paper is loaded, the paper surface reflects the beam; when there is no paper, the beam is absorbed (not reflected). The pull tractor sensor monitors whether the pull tractor is installed.

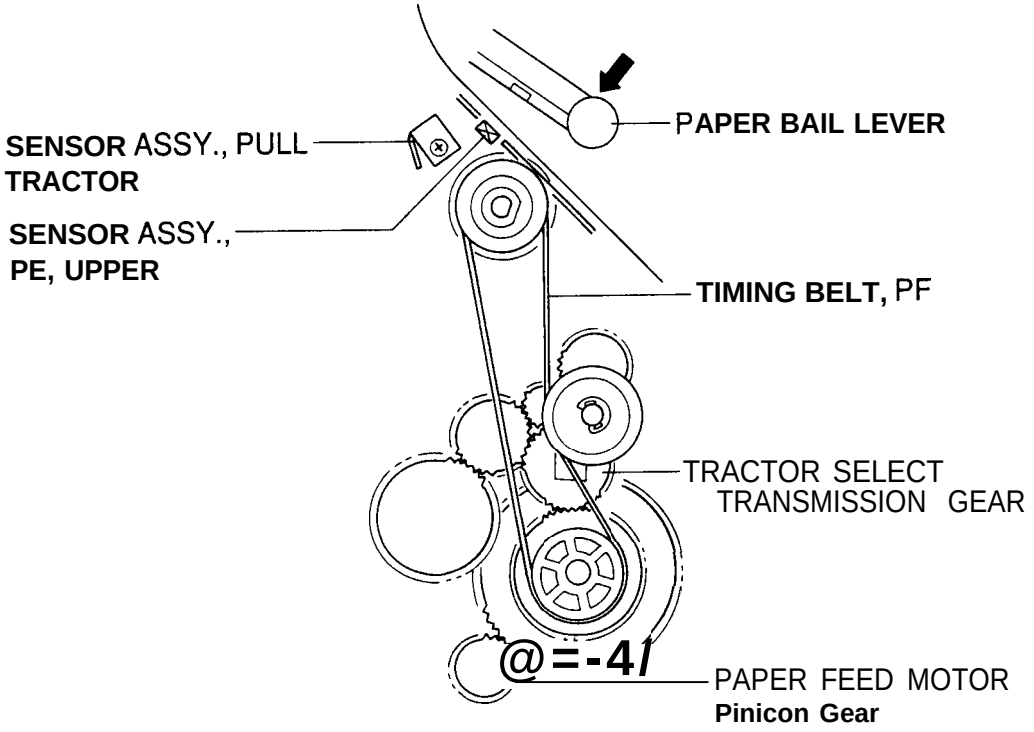


Figure 2-7. Tension Roller and PF Roller Operation

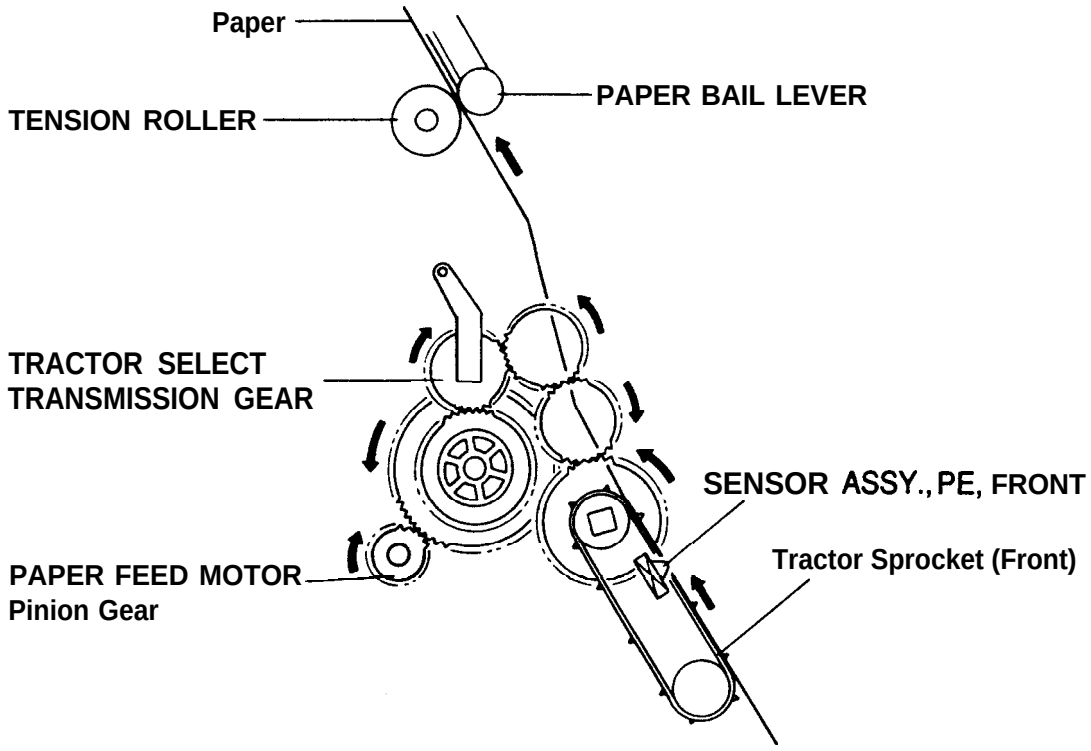


Figure 2-8. Front Tractor Assembly Operation

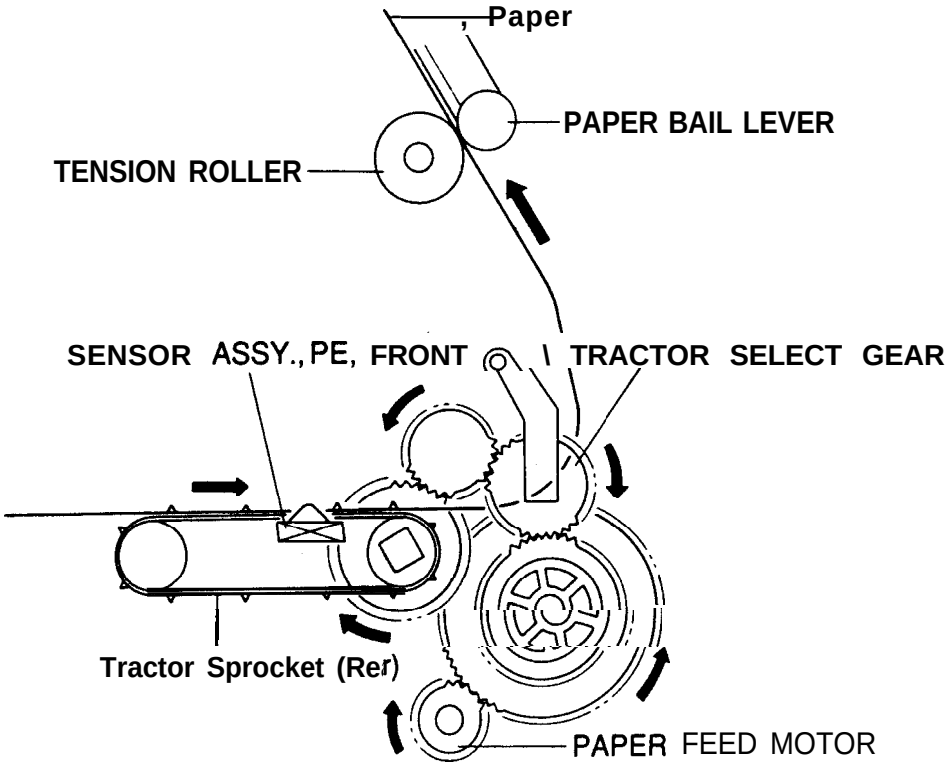


Figure 2-9. Rear Tractor Assembly Operation

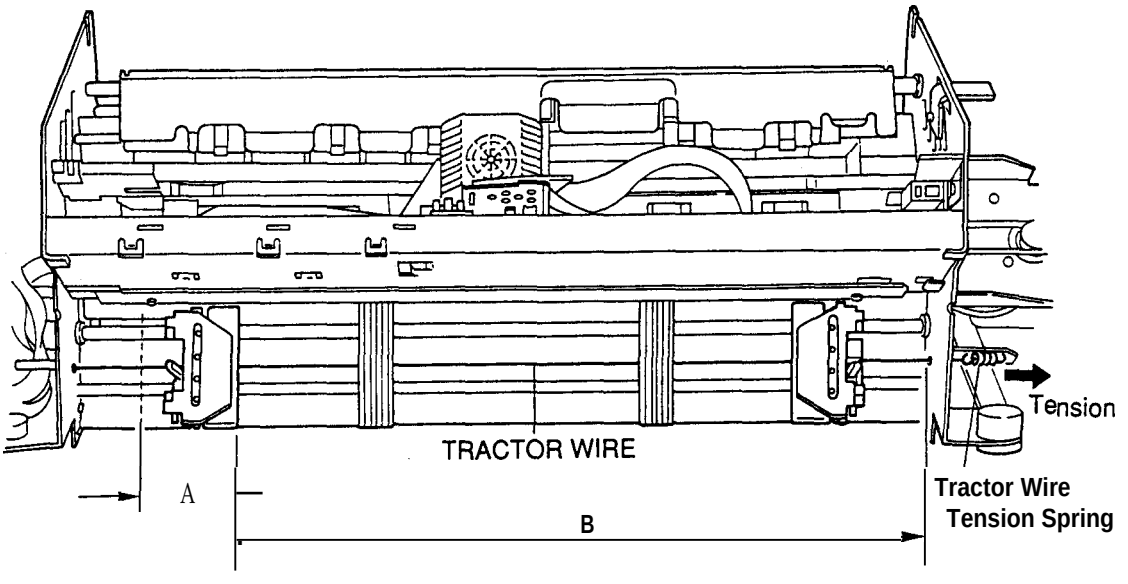
2.1.4.1 Tractor Wire Operation

The printer is equipped with a tractor wire (white line) to prevent paper jams when continuous paper is loaded from the front or rear entrance. The tractor tension spring on the right side frame pulls the wire and releases the stress on the continuous paper being fed. Figure 2-10 shows how the tractor wire operates.

The front left tractor sprocket or rear right tractor sprocket is fixed in position by the shape of the bottom frame of the printer mechanism, while the other sprocket (the front right sprocket or rear left sprocket) can move along the tractor shafts. When the tractor release lever is released, the sprocket can move smoothly side to side along the tractor shafts. When the tractor release lever is engaged, the sprocket can move along the tractor shafts, but it cannot move smoothly, because the tractor wire tension is valid.

In the Figure 2-10, point A shows the movement range of the left tractor sprocket when the tractor release lever is released. Point B shows the movement range of the right tractor sprocket when the release lever is engaged or released.

If the paper in the printer becomes bubbled, you can pull the tractor wire to the right to stabilize the paper tension between the left and right tractor sprockets.



(In case of Front Entrance)

Figure 2-10. Tractor Wire Operation

2.1.5 Ribbon Feed and Tractor Select Mechanisms

The RF motor supplies power to both the ribbon feed and tractor select mechanisms. The rotation of the RF motor pinion swings the ribbon feed select gear like a pendulum, using the lever axis as a support point. The rotation of the RF motor is transmitted after the gears are engaged. When the RF motor pinion gear rotates counterclockwise, the motor rotates the ribbon feed mechanism; when it rotates clockwise, the motor rotates the tractor select mechanism.

Figure 2-11 shows the ribbon feed mechanism. The ribbon is fed in only one direction. Counterclockwise rotation of the RF motor is transmitted to the ribbon feed gear through the ribbon feed select gear and ribbon feed transmission gear. The ribbon feed gear engages the winding roller on the ribbon cartridge to feed the ribbon.

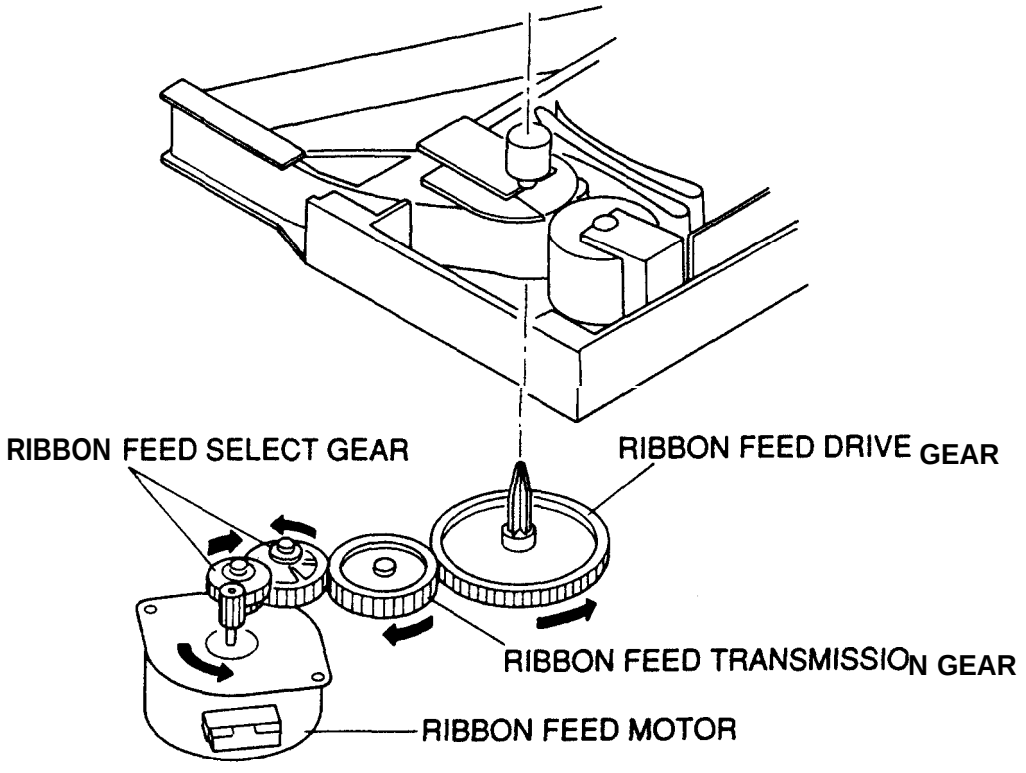


Figure 2-11. Ribbon Feed Mechanism

Figure 2-12 shows the operation of the tractor select mechanism. Clockwise rotation of the RF motor is transmitted to the tractor select cam through the ribbon feed select gear and tractor select transmission gear, and rotates the tractor select cam clockwise. The tractor select lever contacts the inside curve of the cam due to the spring force; when the cam rotates, the tractor select lever moves horizontally along the curve.

When the tractor select lever is set to the left, the tractor select gear engages the rear tractor assembly train, and the PF motor rotates the rear tractor assembly. When the tractor select lever is set to the right, the tractor select gear engages the front tractor assembly. The tractor select sensor contacts the cam and closes when it reaches the convex portion.

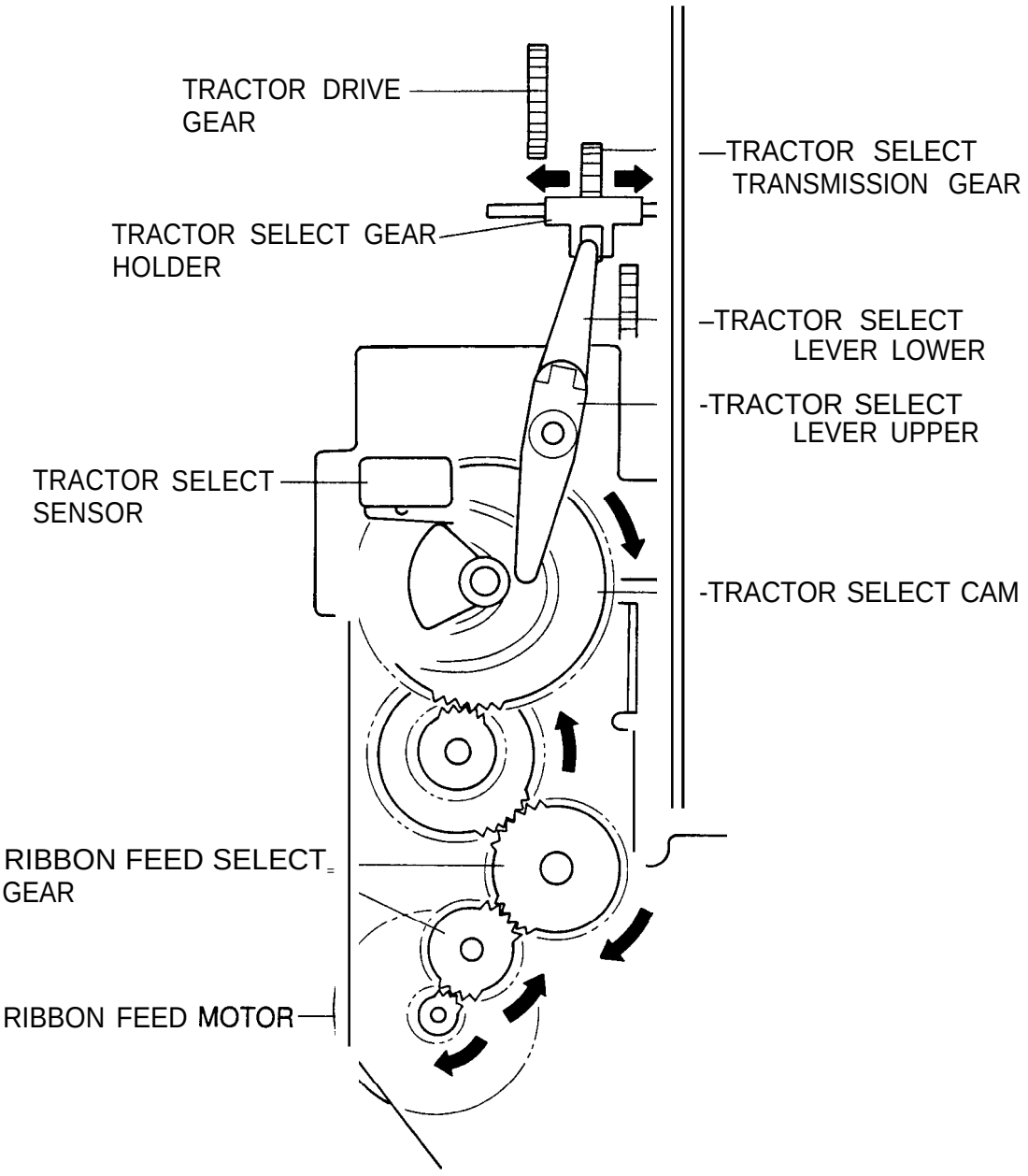


Figure 2-12. Tractor Select Mechanism

2.1.6 Plunger Mechanism

Figure 2-13 shows the plunger mechanism. The paper bail assembly is attached to the end of the plunger's iron core. The paper bail assembly axis is connected to the frame. When the plunger coil is energized, the force of the paper bail spring returns the paper bail assembly to its original position.

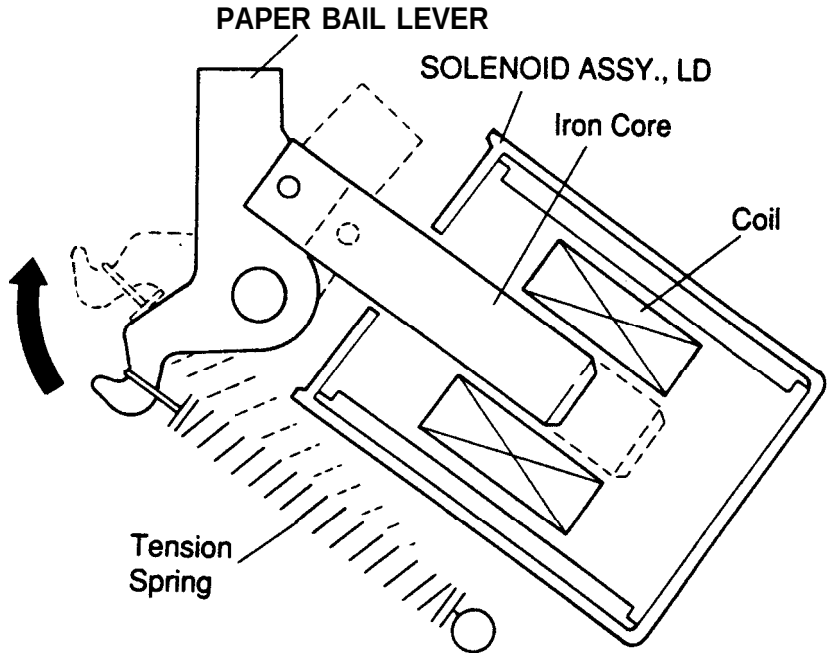


Figure 2-13. Plunger Mechanism

2.2 POWER SUPPLY OPERATION

The printer can be powered by either of two power supply boards: the 120 V C117 PSB board assembly or the 220/240 V PSE C117 board assembly. The only difference in the operation of these two boards is in the primary circuitry. They supply power to the printer in the same way. The power supply board outputs the DC current required to drive the control circuits and printer drive mechanism. Table 2-1 shows the input voltages and fuse ratings of the boards.

Table 2-1. Power Supply Boards

Board	Input Voltage	Fuse Ratings
Cl 17 PSB board assembly	100-120 VAC	6.3 A/250 VAC
Cl 17 PSE board assembly	220-240 VAC	12 A/125 VAC

2.2.1 Power Supply Overview

Figure 2-14 shows a block diagram of the power supply board.

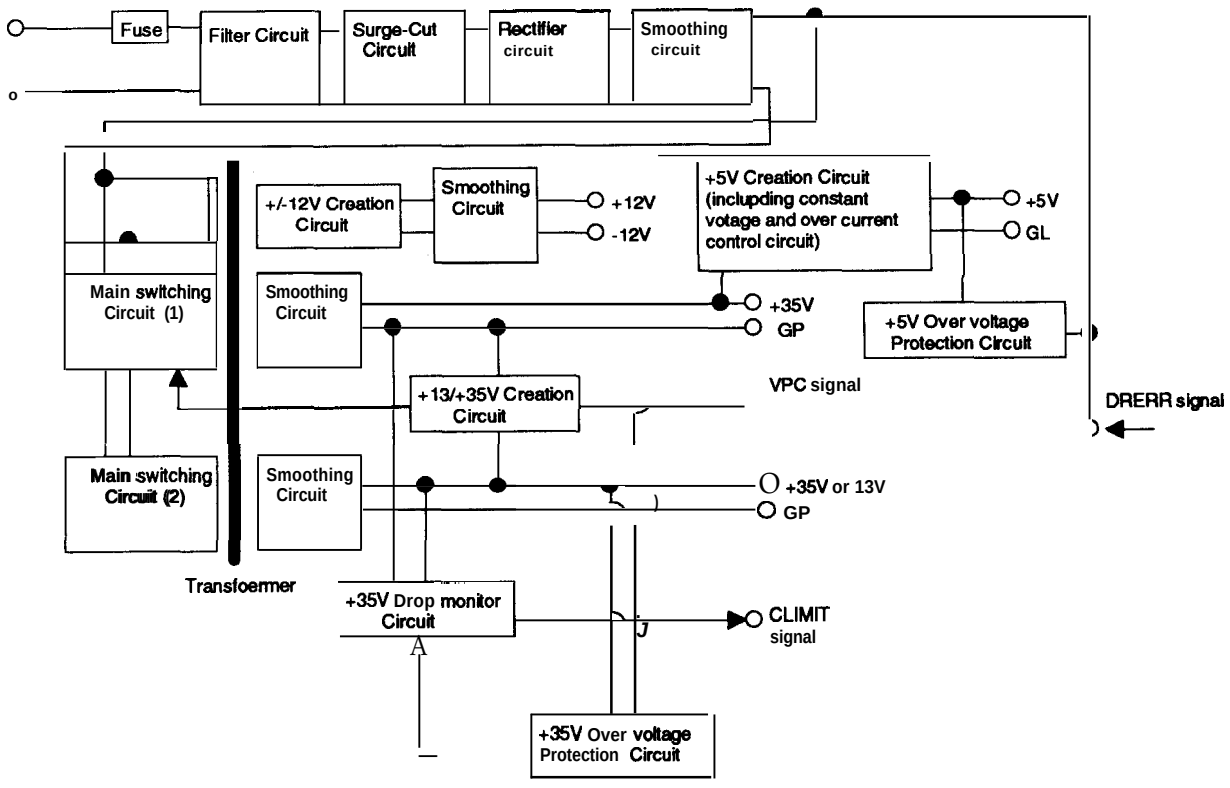


Figure 2-14. Power Supply Board Block Diagram

The power supply board converts the AC voltage to the DC voltages required to operate the printer. The AC voltage is input to the AC inlet, and is supplied to the C117 power supply board assembly via the power switch and fuse. Three switching regulator circuits convert the AC voltage to the three DC voltages (+35 V, +5 V, and +/-12 V) required to operate the printer.

The power supply board contains two +35 VDC creation circuits. (The +35 VDC line is divided into two sections.) One +35 VDC line supplies power to six of the nine printhead pins (pins 1,3,5, 7,8, and 9); the other +35 VDC line supplies power to three of the nine printhead pins (pins 2,4, and 6) and to the motors.

These switching regulator circuits perform voltage control and over-current limiting for each voltage. They supply or cut the DC voltage based on the DRERR (Driver Error) signal from the C117 MAIN board assembly, and output the CLIMIT (Power Down) signal when the printer has exceeded its duty cycle (the printhead temperature is too high).

The C117 power supply board assembly includes a cooling fan that is driven by the +35 VDC. The fan lowers the temperature of the circuit components, and is located under the carnage motor so that it also lowers the carriage motor temperature.

To prevent a surge in the current, the power supply board cannot recover for approximately three minutes after the power is turned off. Therefore, after the printer is turned off, wait three minutes before you turn it back on.

The specifications for the C117 power supply board assembly depend on the board type (120 V C117 PSB or 220/240 V C117 PSE).

Before using a different AC power supply, replace the fuse and power cord.

Table 2-2. DC Voltages

Voltage	Rated Current	Application
+35 V (CN2)	2 A	❑ Printhead drive ❑ CR motor drive ❑ PF motor drive ❑ PG motor drive ❑ RF motor drive ❑ Plunger drive ❑ Head fan motor drive
+35 V (CN4)	2 A	Cl Fan power for cooling the CR motor
+5 V (CN3)	1.0 A	❑ All logic systems (Cl 17 MAIN board assembly and Cl 17 PNL board assembly operating voltages) ❑ CR motor hold voltage ❑ Plunger hold voltage ❑ PG motor hold voltage ❑ Power for ail the sensors
+12 V (CN3)	0.1 A	❑ C117 MAIN board assembly operating voltage (serial interface conversion and Type B optional interface voltage supply)
-12 V (CN3)	0.1 A	❑ FET trigger for printhead firing

Note: Before the power supply board outputs +35 VDC, it outputs +13 VDC to the printhead drivers on the C117 MAIN board assembly. 'This procedure is a driver check to prevent printhead damage.

2.2.2 +5 VDC Line Regulator Circuit

The +5 VDC line regulator circuit uses a ringing choke coil (RCC) system DC/DC converter.

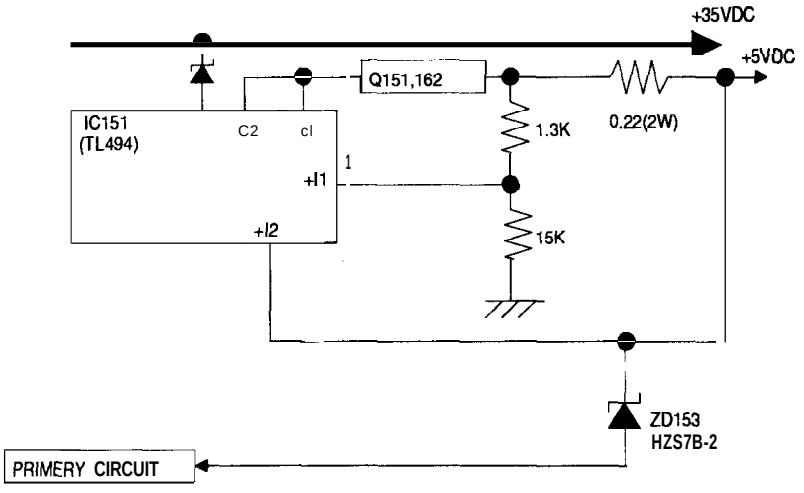


Figure 2-15. +5 VDC Line Regulator Circuit

The rectified and smoothed DC voltage turns on the +5 VDC line first. R118 is a starting resistor. When the +35 VDC line becomes +13 V, switching regulator IC TL494 (IC151) creates a +5 V line.

The power supply board uses a 2-step rise method. When the printer is turned on, the +35 VDC line outputs +13 VDC for 140 ms. The first rising voltage (+13 VDC) is used to check the printhead drivers on the C117 MAIN board assembly.

If a printhead driver is damaged, the control board outputs the error signal (HIGH DRERR signal) to the power supply board. When the power supply board receives this signal, the photo-coupler is turned on and it cuts off the voltage of the primary side. This prevents printhead damage when a printhead driver is damaged. If the printhead drivers are normal, the control board outputs the VPC signal to the power supply board. When the power supply board receives this signal, the line rises to +35 VDC after 140 ms.

The +5 VDC regulator circuit includes the following:

❑ +5 VDC line over-voltage protection circuit

If the +5 VDC line exceeds +7 VDC, the current flows to ZD153. Then Q155 is turned on, the photo-coupler (PC2) is turned on, and the voltage of the primary side is cut off. This circuit is a common circuit with the DRERR signal feedback circuit on the C117 MAIN board assembly.

❑ +5 VDC line over-voltage control/over-current control circuit

IC151 (TL494) includes this control circuit. IC151 contains two internal comparators. One comparator is used for over-voltage control. Pin 16 (+I2) monitors the +5 VDC line. If this voltage exceeds +5 V (pin 15), internal comparator 1 outputs a HIGH signal. The other comparator controls the +5 V line over-current. Pin 1 (+I1) monitors the current of the +5 V line. If the current exceeds the set value (pin 2), the voltage becomes HIGH and comparator 2 outputs a HIGH signal.

Both the comparator 1 signal and comparator 2 signal are tied by the wired OR. If the output signal is HIGH from either comparator, the output signal is HIGH. This switching procedure monitors the Cl and C2 ports. These switching waveforms are controlled by PWM (Pulse Width Modulation), which changes the level of the inverse terminal of comparator 1 and comparator 2.

❑ Printhead driver detection circuit

This circuit prevents printhead damage when a printhead driver is damaged. When the printer is turned on, the C117 MAIN board assembly tells the C117 power supply board assembly whether the printhead drivers are normal.

If a printhead driver is damaged, the C117 MAIN board assembly sends the DRERR signal to the C117 power supply board assembly. When the C117 power supply board assembly receives this signal, it stops creating +35 VDC and +5 VDC. If the printhead drivers are normal, the C117 MAIN board assembly sends the VPC signal to the C117 power supply board assembly. When the C117 power supply board assembly receives this signal, it creates +35 VDC.

2.2.3 +35 VDC Line Regulator Circuit

When the printer is turned on and the C117 MAIN board assembly sends the VPC signal, the +35 VDC line rises from +13 V to +35 V. The +35 VDC line circuit uses a ringing choke convertor (RCC) AC input switching power circuit. This system uses few parts and a small transformer, and is often used when a small power supply is required.

Figure 2-16 shows the +35 VDC line main switching circuit. When power is applied, drive current flows to the gate of switching FET (Q101) via starting resistor R118. Diodes D157, D156, D151, and D251 on the secondary side of T1 and T2 prevent current flow in the secondary side. When Q101 is turned on, the primary side of transformer coil T2-3 receives an input voltage, which induces voltage in windings T7-4 and '12-3. When Q101 is turned off, the current flows to the secondary side of the transformer coil.

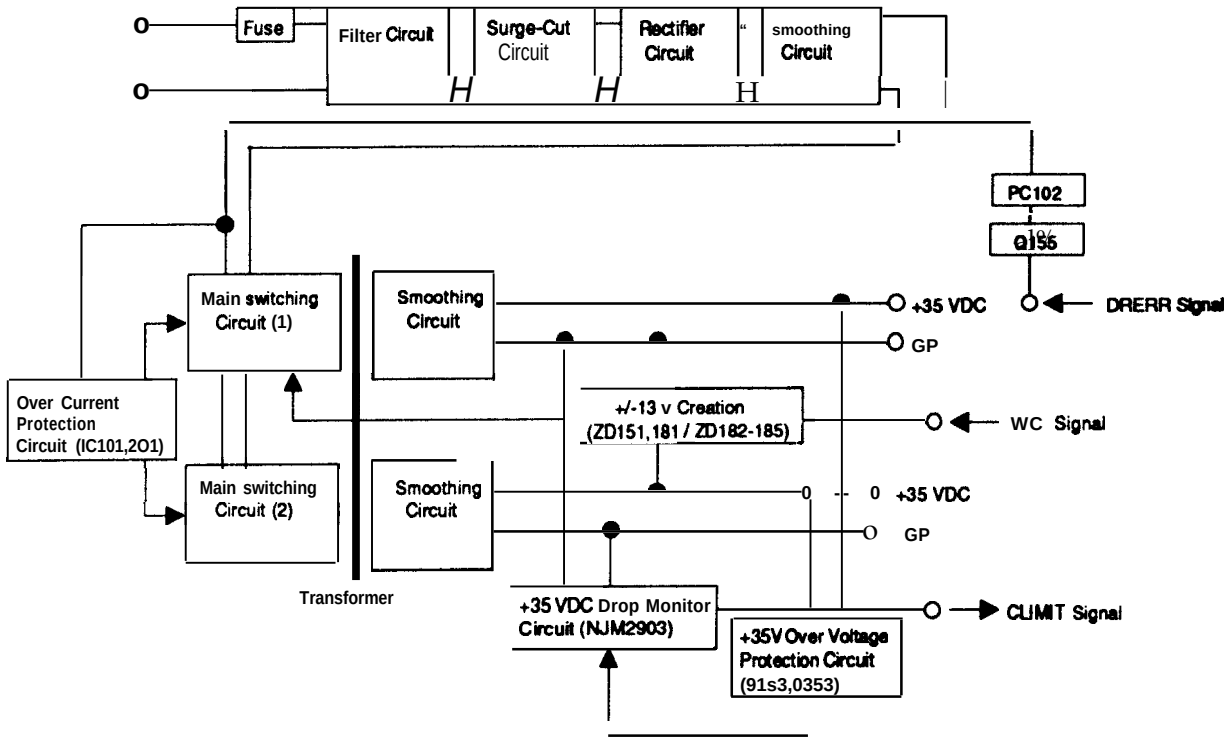


Figure 2-16. +35 VDC Line Regulator Circuit

The +35 VDC regulator circuit includes the following:

❑ Input voltage line over-current protection circuit (primary side)

IC101 and IC201 detect the input voltage of the primary circuit. When the input voltage is normal, the current does not flow into the shunt regulator. When the over-current flows to the input voltage line, the shunt regulator is turned on, Q103 (Q203) and Q102 (Q202) are turned on, and Q101 (Q201) is turned off.

❑ +35 VDC line over-current protection circuit

If the +35 VDC line drops to +13 VDC, the sensor circuit consisting of R172 (R272) and R173 (R273) turns on Q153 (Q253). Q154 is turned on, PC2 is turned on, and then the input voltage is cut. At this time, the delay timing creation circuit (CR circuit) consisting of C157 and R174 makes the delay timing. When the printer is turned on, the delay timing creation circuit cannot start this protection circuit; if it is operated during the printhead driver check, the power supply board cannot be turned on. The CR circuit has approximately a one-second delay timing.

❑ +35 VDC powerdown detection circuit

When the +35 VDC line drops (such as, when the printer has exceeded its duty cycle and the printhead temperature is too high), the voltage of PC101 approaches O VDC. If the voltage drops to 1.3 VDC, IC152 outputs a HIGH CLIMIT signal to the base of transistor Q187. IC152 monitors the two +35 VDC line creation circuits.

❑ +13 VDC creation circuit

When the printer is turned on, the C117 power supply board assembly creates +13 VDC to check the printhead drivers on the C117 MAIN board assembly. After 140 ms, the C117 MAIN board assembly sends the DRERR (driver error) or the VPC (+35 VDC permission) signal to the C117 power supply board assembly. If the printhead drivers are normal, the VPC signal is HIGH, Q182 is turned on, and Q181 is turned off. Therefore, six Zener diodes create the +35 VDC. During the motor driver check, the VPC signal is LOW. When this signal is LOW, Q182 stays off, the base of Q182 stays HIGH, and then two Zener diodes (ZD151 and ZD181) output +13 VDC.

2.2.4 +/-12 VDC Half-wave Rectifier Smoothing Circuit

The power from the half-wave rectifier smoothing circuit is mainly supplied to the RS-232C interface on the standard or optional board and uses the printhead fire trigger. Both the +12 VDC and -12 VDC lines have a half-wave rectifier circuit. This smoothing circuit consists of capacitors C182 and C181. Two Zener diodes stabilize the ±12 VDC line.

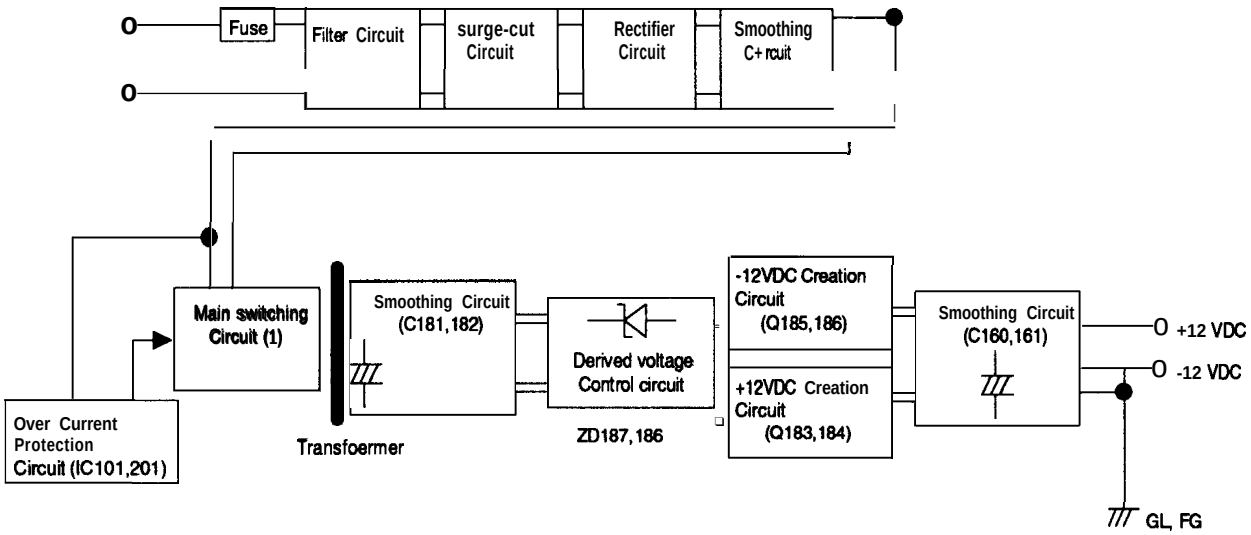


Figure 2-17. Half-wave Rectifier Circuit

2.3 CONTROL CIRCUIT

Figure 2-18 shows a block diagram of the control circuit with the C117 MAIN board assembly at the center.

2.3.1 Control Circuit Operation Overview

The core of the control circuit is the TMP96C14 CPU (IC1). This CPU is driven using a 14.74 MHz external clock (CRU1). The CPU executes programs stored in the internal mask ROM and 1M external PROM (IC4). The CPU starts executing a program upon receiving the reset signal from an external device (IC8, IC9). The CPU accesses the internal RAM and external PS-RAM (256K) memories. The CPU also controls the non-volatile memory (IC2) used to store the parameters, such as the tear off position, while the printer is turned off. The CPU controls all the printer operations via the peripheral ICs and controls the printer mechanism and interfaces by writing directly to the ports. The CPU controls the E05A87 gate array (IC7) via the address bus (MMIO: Memory Mapped Input/Output).

The main functions of the E05A87 gate array are: $\overline{CS}$ (Chip Select) signal creation, address decoding, printhead driver control, carriage driver control, encoder pulse circuit control, PG and fan motor phase signal creation, interface control, CR and PF motor driver abnormal sensor circuit control, reset signal creation, control signal creation for the power supply board, control of the LEDs on the Cl 17 PNL board assembly, and reading the DIP switch settings.

Signals, such as DRERR, VPC, and CLIMIT (power down), are connected to the C117 power supply board assembly to provide back-up control of the non-volatile memory (when the printer is turned off) and control of the power supply voltage. When the CLIMIT signal informs the CPU that the power has been turned off (or that the power supply voltage has dropped), the CPU turns off the power supply voltage from the C117 power supply board assembly by outputting the CLIMIT signal.

The reset circuit outputs the reset signal when the printer is turned on or off, the voltage level drops, or a reset signal is input from an external device. It resets the control circuit for a certain period directly or via the E05A87 gate array.

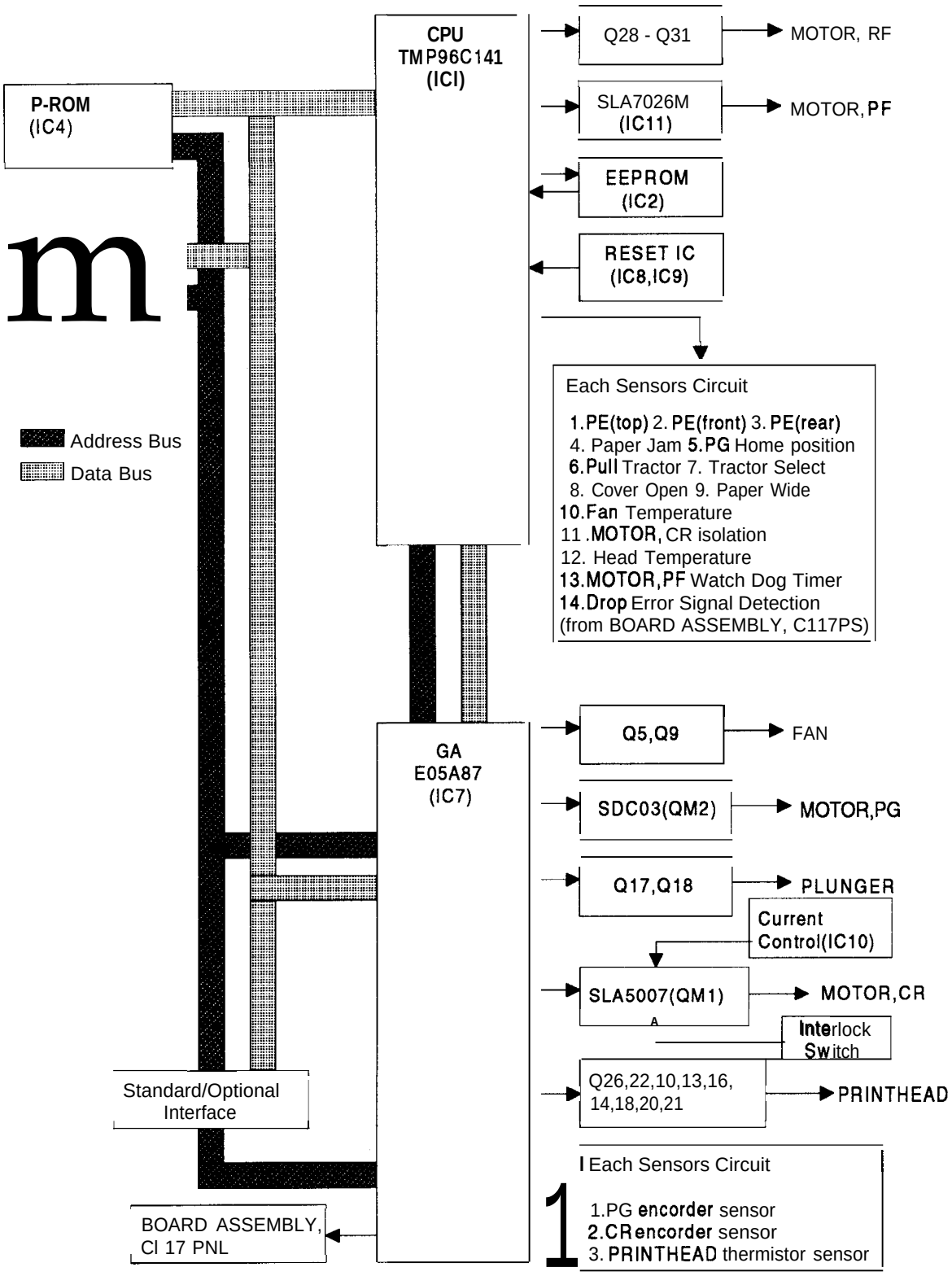


Figure 2-18. Control Circuit Block Diagram

Figure 2-19 shows the data flow for data input via the parallel interface. Although various circuits perform data processing, the control core is the CPU and all operations are executed via the CPU. In this circuit, the gate array IC (IC7) provides the interface between the external heat computer and the CPU, and all data processing is performed by read/write operations to MMIO (Memory Mapped Input/Output).

Data from the host computer is latched by repeating steps 1 through 3 below.

1. Upon receiving the STROBE signal, IC7 latches the data into ports DIO0 - 7and sets the BUSY signal to HIGH.
2. The CPU reads the latched data from the MMIO port, checks whether the data is a print command (CR code), and stores it in the input data buffer if it is not.
3. After checking the data, the CPU makes IC7 clear the BUSY signal and output the ACKNLG signal, via the MMIO accesses. When either a CR code is received or the input data buffer becomes full, the CPU sets the BUSY signal to HIGH and executes printing.

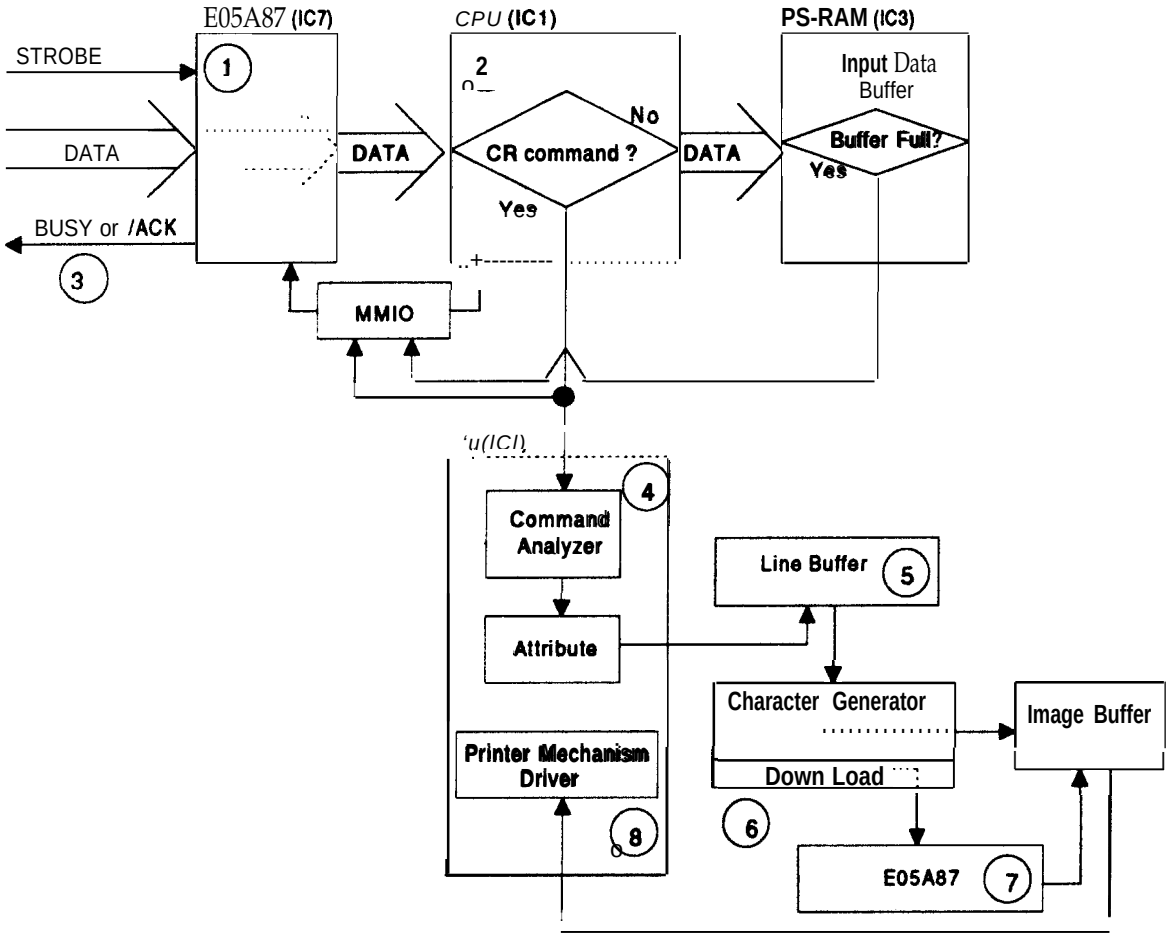


Figure 2-19. Data flow from the Parallel Interface

4. The CPU reads the data from the input data buffer, analyzes each byte to determine whether it is a character or a coremand, and converts it to print data. The print data consists of l-byte character codes and 2-byte attributes. Character data is stored as character codes and commands or character types are stored as attributes.

5. The print data is stored in the line buffer in units of one line of data.

6. The CPU reads the print data stored in the line buffer byte by byte, accesses the CG (Character Generator), and expands the data in the image buffer (in the case of download characters, in the download CG). A row of expanded data is output to the printhead control circuit as head data.

7. When data is expanded to an italic or super/subscript character, the CPU uses IC7 to expand it via MMIO.

8. The CPU controls the CR motor by calculating the control data for each line from the print data in the line buffer. When a paper feed command is sent after one line is printed, the CPU executes paper feeding.

For NLQ characters, printing one line consists of two passes; the printer performs steps 6 through 8 twice. When the CPU expands the data from the CG in the image buffer, it uses the 24-bit shift register in IC7. The CPU is always ready to fetch data so printing can be viewed as an interrupt-to-fetch operation. Whenever the input data buffer is not full between printing operations, data is fetched. Table 2-3 describes the functions of the main printer components.

Note: The data flow from the serial interface is the same as the data flow from the parallel interface, described above, except the signal names and data access method differ.

Table 2-3. Main IC Functions

IC Name	Location	Functions
TMP96C141 (CPU)	IC1	Receives data from the host computer via the gate array, loads the data to the input buffer in PS-RAM, and converts the image data to print data.
E05A87	IC7	The main E05A87 features are: ❑ $\overline{CS}$ (Chip Select) signal creation ❑ Address decoding ❑ Address latching ❑ Clock pulse creation (divided from the CPU clock) ❑ Printhead driver control ❑ CR motor driver control ❑ CR and PG motor pulse encoder I/O (input/output) ❑ Encoder pulse I/O ❑ Phase signal creation for the motors ❑ i/O port control ❑ Interface control ❑ Abnormal CR and PF motor detection ❑ $\overline{RESET}$ signal creation ❑ Control signal creation for the power supply board PROM
PROM	IC4	Contains the program that runs the CPU.
PS-RAM	IC3	Holds the CPU working area and buffers (input, line, and image buffers).
SLA7026	IC11	Drives the RF motor and controls the constant current.
SDC03	QM2	Drives the PG motor.
NJM2903	IC10	Detects the current in the CR motor driver and feeds it back to the gate array.
SLA5007	QM1	Drives the CR motor.

2.3.2 Reset Circuit

This section describes the hardware reset circuit. When the hardware reset signal is input, all ICs in the control circuit are reset, and the CPU executes the program from the starting address. Figure 2-20 shows the reset circuit block diagram.

The printer is equipped with two reset ICs: PTS591D is used for resetting the + 5 VDC line and M51955 is used for resetting the +35 VDC line. These reset ICs are described below.

❑ +5 VDC reset circuit

Reset IC PTS591D monitors the +5 VDC line on the C117 MAIN board assembly. If it drops to 42 VDC, the reset IC outputs a LOW signal to the CPU, gate array, and optional interface board. The gate array outputs the RESET signal to the reset port of the CPU and also to the gate array itself, via the delay control circuit (CR circuit). The delay control circuit consists of R26 and C72 and controls the reset timing for the CPU and Type B interface card.

❑ +35 VDC reset circuit

Reset IC M51955 monitors the +35 VDC line. Normally, the dividing resistors (R27 and R28) input approximately 1.7 VDC to pin 2. When the detection level is 1.7 VDC, the +35 VDC line drops into the 22.9 V to 30.0 V range.

If this voltage level drops to +1.25 VDC, the $\overline{\text{RESET}}$ signal (LOW level) is output to the CPU's NMI port. When the printer is turned off, this circuit operates and manages writing to the EEPROM.

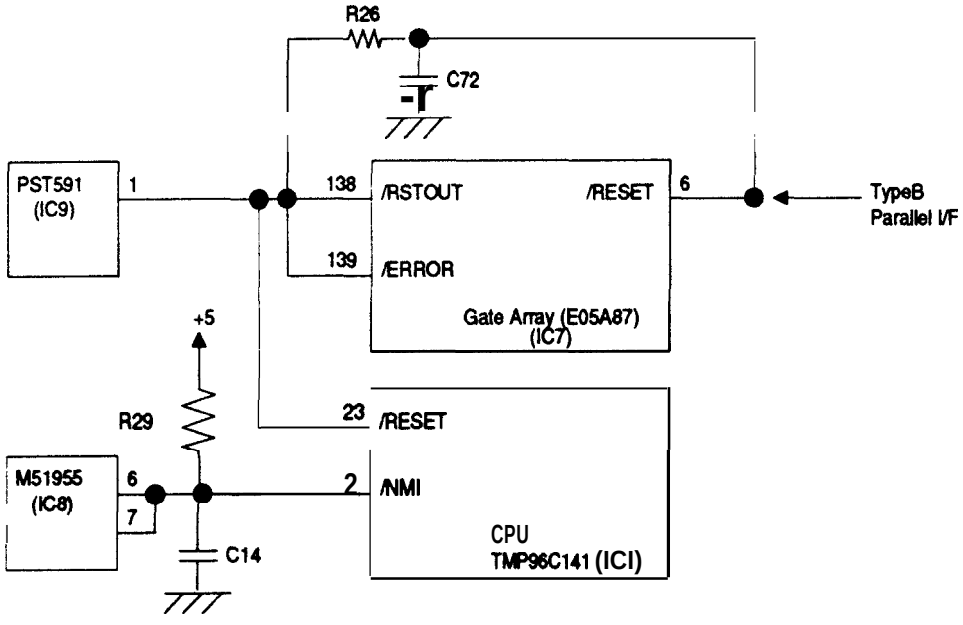


Figure 2-20. Reset Circuit Block Diagram

2.3.3 Sensor Circuits

Figure 2-21 shows the sensor circuits in block diagram form. The printer is equipped with the following sensors:

1. Front and rear PE sensors (use a photo interrupter)
2. Top PE sensor (to detect the TOF position, uses a photo interrupter)
3. Paper jam sensor (uses a magnetic transistor)
4. Tractor select sensor (uses a micro mechanical switch)
5. Pull tractor sensor (uses a micro mechanical switch)
6. Cover open sensor (uses a micro mechanical switch)
7. CR encoder sensor (uses an LED and photo diode)
8. PG sensor (uses a photo interrupter)
9. PG home sensor (uses a micro mechanical switch)
10. +35 VDC voltage drop sensor (signal interface)
11 Head temperature sensor (uses a thermistor)
12. Fan temperature sensor (uses a thermistor)
13. PW sensor (uses a photo reflector)
14. Carriage motor isolation resistance sensor (monitored by the analog port of the CPU)

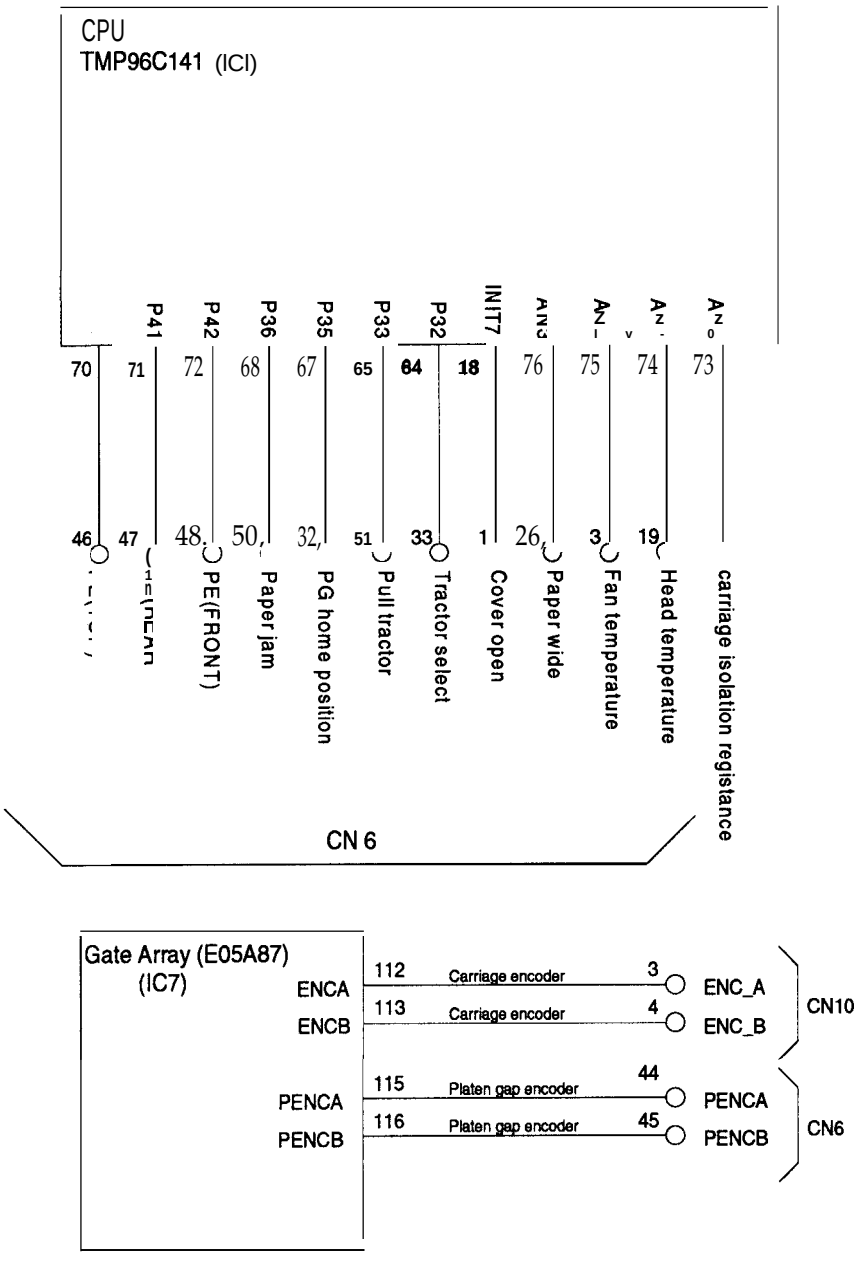


Figure 2-21. Sensor Circuit Block Diagram

Each sensor is described below.

1. Front and rear paper end sensors
   - ❑ Detection form: Photo interrupter
   - ❑ output form: Open collector (pulled up to 10 KΩ resistance)
   - ❑ Input circuit: CR filter circuit (10 KΩ and 39 pF)
   - ❑ Logical: Paper present: LOW
     Paper out: HIGH

2. Top paper end sensor (to detect the TOF position)
   - ❑ Detection form: Photo reflector
   - ❑ output form: Open collector
   - Cl Input circuit: CR filter circuit (10 KΩ and 39 pF)
   - ❑ Logical: Paper present: LOW
     Paper out: HIGH

3. Paper jam sensor
   - ❑ Detection form: Magnetic transistor
   - c1 output form: Rectangle wave (1 channel, TTL level)
   - ❑ Input circuit: Resistance for latch up prevention (10 KΩ)
   - ❑ Logical: Paper feed: Level changes continuously.
     Paper jam: Level remains the same.
   - ❑ Supplement: The magnetic transistor is attached to the tension roller on the paper tension unit.

4. Tractor select sensor
   - ❑ Detection form: Micro mechanical switch
   - ❑ Input circuit: Resistance for latch up prevention (10 KΩ)
     Pulled up to 390 Ω resistance
   - ❑ Logical: Front tractor: LOW (closed)
     Rear tractor: HIGH (open)

5. Pull tractor sensor
   - ❑ Detection form: Micro mechanical switch
   - ❑ Input circuit: Resistance for latch up prevention (10 KΩ)
     Pulled up to 390 Ω resistance
   - ❑ Logical: Pull tractor installed: LOW (closed)
     Pull tractor not installed: HIGH (open)

6. Cover open sensor
   - ❑ Detection form: Micro mechanical switch
   - ❑ Input circuit: CR filter circuit (10 KΩ and 0.01 µF)
     Pulled up to 390 Ω resistance
   - ❑ Logical: Cover closed: LOW
     Cover open: HIGH

7. Carnage encoder sensor
   - ❑ Detection form: LED and photo diode
   - ❑ Input circuit: Rectangle wave (2-phase, TTL level)
     CR filter circuit (10 KΩ and 390 pF)
     Pulled up to 10 KΩ resistance
   - ❑ Transaction: The carriage encoder outputs two pulses (A or B) to the gate array and the gate array tells the CPU which signal it receives.

8. Paper thickness sensor
   - ❑ Detection form: Photo interrupter
   - ❑ Input circuit: Rectangle wave (2 channels, TTL level)
     CR filter circuit (10 KΩ and 390 pF)
   - ❑ PG ability: 0.015 mm/pulse
   - ❑ Sensing range: O to 0.7 mm

9. Platen gap home position sensor
   - ❑ Detection form: Micro mechanical switch
   - ❑ Input circuit: Resistance for latch up prevention (10 KΩ)
     Pulled up to 390 Ω resistance

10. +35 VDC voltage drop sensor (signal interface)
    When the +35 VDC line voltages drop, the C117 power supply board assembly sends a HIGH CLIMIT signal to the C117 MAIN board assembly.

11. Head temperature sensor (uses a thermistor)
    - ❑ Input circuit: Pulled up to 3.32 KΩ resistance
      CR filter circuit (1 KΩ and 0.1 µF)

12. Fan temperature sensor (uses a thermistor)
    - ❑ Input circuit: Pulled up to 3.32 KΩ resistance
      CR filter circuit (1 KΩ and 0.1 µF)

13. Paper width sensor
    - ❑ Detection form: Photo reflector
    - ❑ Output form: Emitter follower
    - ❑ Input circuit: CR filter circuit (10 KΩ and 0.01 pF)
    - ❑ Judgement: No paper present: Standard voltage level.
      Paper present: The voltage level is double the standard voltage level.

14. Carnage motor isolation resistance sensor (monitored by port AN0 of the CPU)
To provide information about the carnage motor life, the analog port (AN0) of the CPU checks the isolation resistance every time the printer is turned on. If the isolation resistance is less than 10KΩ, a carriage error is detected and the printer beeps. (Refer to Section 1.4.15, *Buzzer Operation.)*

2.3.4 CR Motor Driver Circuit

Figure 2-22 shows the internal circuit for the CR motor, and Figure 2-23 shows a block diagram for the CR motor driver circuit. An SLA5007 bipolar driver IC drives the CR motor. It has built-in bipolar switching transistors and a current limiter. A comparator IC (NJM 2903) monitors the current in the CR motor driver IC (SLA5007). If the current exceeds the set value, it is fed back to the gate array (E05A87), and then the gate array outputs the signal for the current setting transistors (Q4, Q7, and Q8).

When the printer is turned on, CPU analog port AN0 measures the isolation resistance in the CR motor at once. If the isolation resistance is less than 1 KΩ, the CPU sounds the buzzer.

If the printer cover is open at power on, the CR motor driver power is cut. The ENC_A pulse that the carriage encoder outputs is input to general purpose port ENCA of the gate array, and the ENC_B pulse that the carriage encoder outputs is input to general purpose port ENCB of the gate array. The gate array counts these pulses using the internal counter and determines the amount and direction of motor rotation.

Table 2-4 lists the CR motor drive modes. The printer has three deceleration control modes. The degree of deceleration is determined by how the carriage motor transistors are driven. Table 2-5 describes how the transistors are driven for each mode.

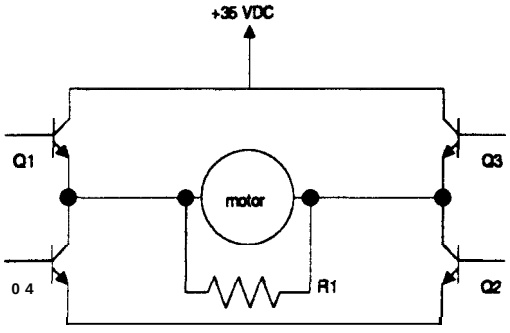


Figure 2-22. CR Motor Internal Circuit

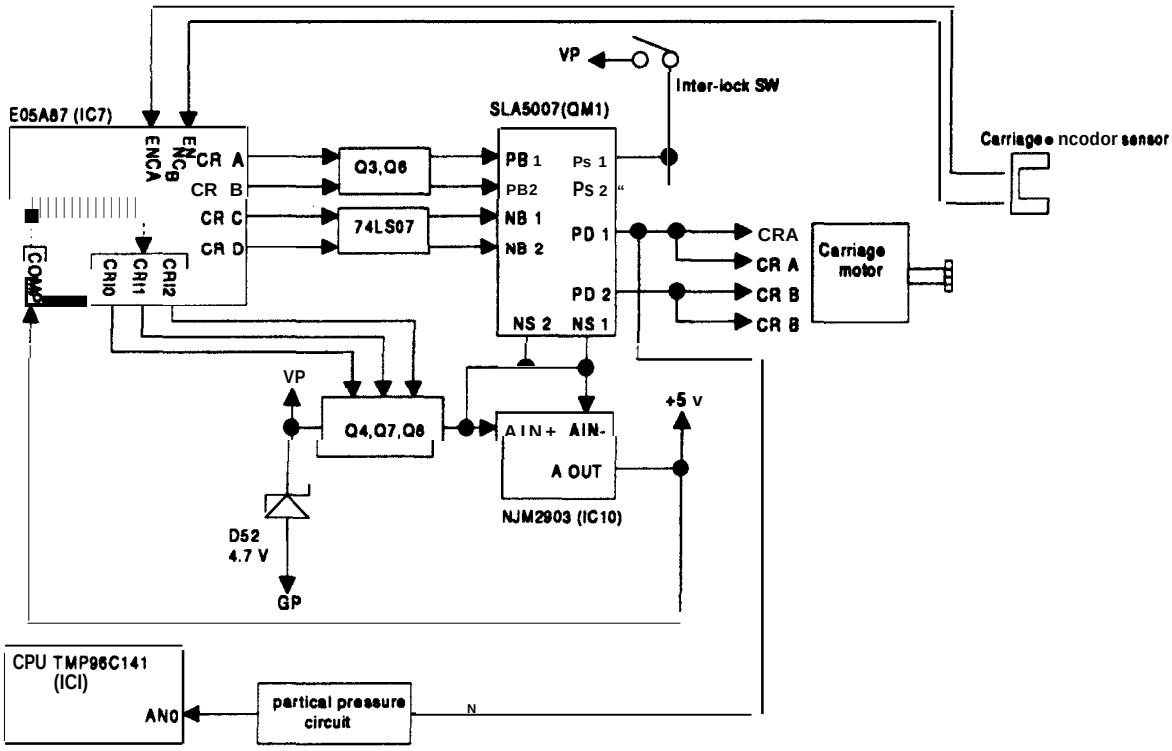


Figure 2-23. CR Motor Driver Block Diagram

Table 2-4. CR Motor Drive Modes

Division	Drive Mode	CR Motor Speed (rpm)	Acceleration/Deceleration Control Curve	Constan Speed Control
Carriage moves with printing. Note 2	Super draft	1680	Acceleration or deceleration control curve.	PI control
	Super draft_HD	1600		
	Draft	1260		
	Draft_HD	1200		
	Bit image 1	1050	Acceleration control curve only. Deceleration mode 3 controls deceleration. Note 1	
	Bit image 1–HD	1000		
	Bit image 2	945		
	Bit image 2–HD	900		
	Bit image 3	840		
	Bit image 3–HD	800		
	NLQ	630		
	NLQ_HD	600		
	Bit image 4	525		
	Bit image 4–HD	500		
Carriage moves without printing. Note 3	Home position seek	315		
	Paper width defection seek	630		
	Logical seek 1	630		
	Logical seek 2	1260		

Note 1: Table 2-5 describes Deceleration mode 3.

Note 2: This division applies to all printing modes. PI control oversees the constant speed. (Refer to page 2-32 for more information on PI control.) For increased throughput, this division allows printing during acceleration and deceleration.

Note 3: This division increases throughput when the carnage is moving and the printer is not printing.

Note 4: Carriage motor internal coil resistance: 6.2 Ω *0.45 Ω

Table 2-5. CR Motor Drive Sequence

Carriage Transfer Direction	Driving Mode	Driver (Refer to Figure 2-22.)			
		Q1	Q2	Q3	04
Left → Right	Acceleration			On	On
	Deceleration 1		on		on
	Deceleration 2				
	Deceleration 3	on	on		
Right → Left	Acceleration	On	On		
	Deceleration 1		On		on
	Deceleration 2				
	Deceleration 3			On	on

❑ PI control

PI control keeps the carriage motor speed constant using the following steps:

1. CN1O outputs two encoder pulses (ENC-A and ENC_B) to the gate array.
2. The gate array selects one of the two pulses and sends the signal to the CPU INIT4 port.
3. The CPU outputs the PWM (pulse width modulation) signal according to the carriage motor speed to the PWM port of the gate array and determines the duty of the carriage drive timing.
4. CR ports A, B, and C output the drive signal for the CR motor.

❑ Acceleration control

Until the carriage speed reaches the constant speed set by PI control, acceleration control determines the speed of the carriage. The printer can print while the carriage is accelerating. The carriage speed moves to constant control speed smoothly to prevent the CR motor from exceeding the constant control speed. 'l'he E05A87 gate array controls the motor driver (SLA5007), which performs the current chopping. Figure 2-24 shows the acceleration control curve.

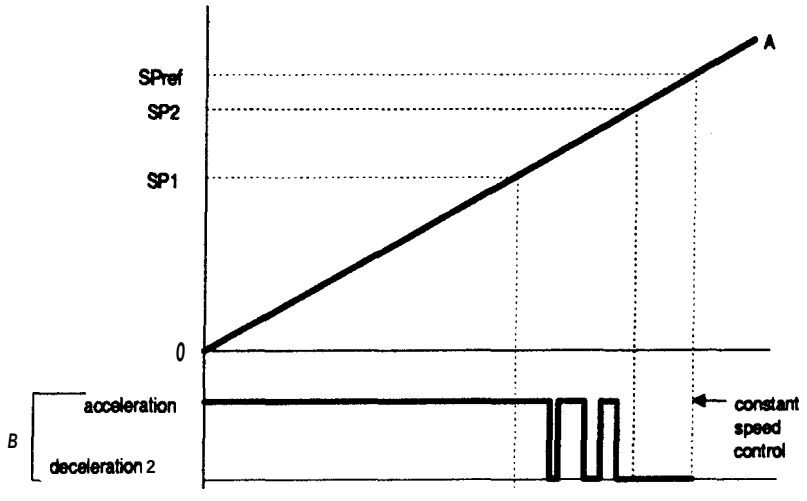


Figure 2-24. Acceleration Control Curve

Note: In Figure 2-24, the acceleration curve is labeled A and the driving modes are labeled B.

Speed0 - SP1

1. It causes the carriage to accelerate.
2. Because the control circuit measures time periods with the encoder signal, when the carriage speed reaches SP1, it changes to the next sequence (SP1 - SP2).

SP1 - SP2

1. The DFX-5000+ printer has a table programmed into its main program ROM to determine the duration of the acceleration pulses. This table is called the duty data table. Duty data is divided into ten sections, plus $Duty_{min}$. Section 1 is the largest, and $Duty_{min}$ represents the minimum duty data for acceleration control. Pulse width modulation (PWM) determines each section number. For each section, the carriage motor driver is turned on part of the time and off part of the time.
2. When the carriage speed reaches SP1, the printer uses the acceleration driving mode, based on the duty data, and the rest of the time, it uses Deceleration driving mode 2. (Refer to Table 2-5.)
3. During this time the control circuit measures time periods using the encoder signal, and controls the following:

   ❑ When duty data becomes $Duty_{min}$ before the carriage speed reaches SP2. Then, when the carnage speed reaches SP2, the next sequence (SP2-) takes effect.

   ❑ When the carriage speed reaches SP2 before duty data becomes $Duty_{min}$, the next sequence (SP2-) takes effect.

SP2 -

When the carriage speed reaches SP2, PI control oversees the carriage speed.

❑ Deceleration control

Deceleration control provides smooth deceleration and prevents rapid vibration.

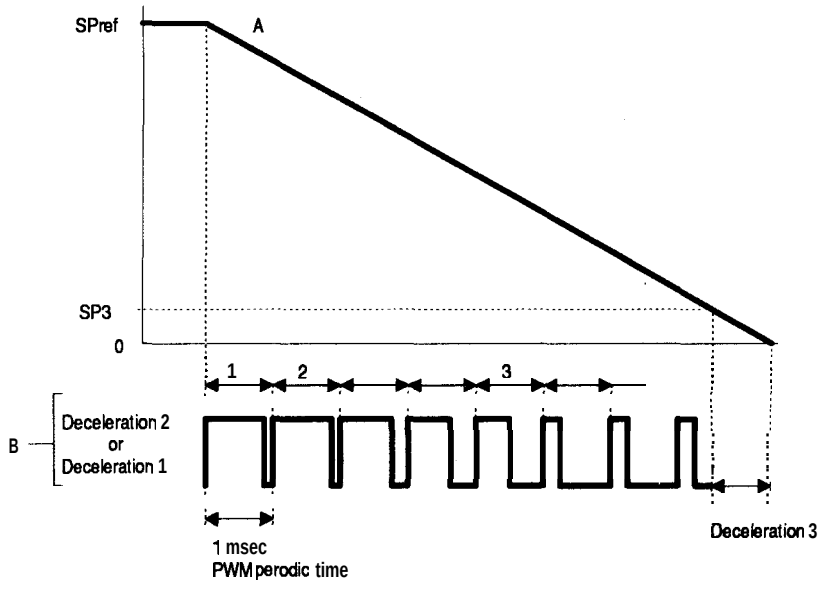


Figure 2-25. Deceleration Control Curve

Note: In Figure 2-25, the deceleration curve is labeled A and the driving modes are labeled B. 1,2, and 3 indicate the PWM control section number.

Current speed - SP3

1. The duty data for deceleration control is determined for each printing mode beforehand and programmed into a table in the main program ROM.

   Duty data is divided into 19 sections, plus $Duty_{min1}$. Section 1 is the largest, and $Duty_{min1}$ represents the minimum duty data for deceleration control. Pulse width modulation (PWM) determines each section number. For each section, the carriage motor driver is turned on part of the time and off part of the time.

2. The printer uses Deceleration driving mode 2, based on the duty data, and the rest of the time, it uses Deceleration driving mode 1. (Refer to Table 2-5.)

3. During this time the control circuit measures time periods using the encoder signal, and controls the following:

   - ❑ When duty data becomes $Duty_{min1}$ before the carriage speed reaches SP3.
   - ❑ When the carriage speed reaches SP3 before duty data becomes $Duty_{min1}$, the next sequence (SP3 - Speed0) takes effect.

SP3 - Speed0

1. When the carriage speed reaches SP3, Deceleration driving mode 3 takes effect. This control method is the inverse-continuity break method.

2. During this time, the control circuit measures time periods using the encoder signal. When the rising edge of next pulse is not detected after 1.5 seconds, Deceleration driving mode 1 takes effect and the control circuit controls short-break.

❑ High temperature detection sequence

The software supports a high temperature detection sequence, which consists of the following steps:

1. A unit of one section is 72.5 ms. Every 72.5 ms, the software monitors the number of carriage movements and saves this number.

2. The printer calculates the total number of movements for the eight most recent sections.

3. When the printer is in the normal drive sequence, and the total number of carriage movements is more than 3250, the printer assumes high CR motor temperature and changes to the high temperature drive sequence.

4. When the printer is in the high temperature drive sequence, and the total number of carriage movements is less than 2000, the printer changes back to the normal drive sequence.

❑ Measurement sequence

Because printer mechanisms differ, the acceleration and deceleration curves also differ. The measurement sequence control adjusts for these variations so that the carriage accelerates and decelerates smoothly.

During printing, printer software monitors the following items:

1. The time between the last 40 encoder pukes and the stopping point.
2. The number of encoder pulses from the established speed to the stopping point.
3. The number of encoder pulses until the carriage speed reaches SP2. (See Figure 2-24, *Acceleration Control Curve*, for SP2.)

The printer saves the values for each of the items listed above and uses it for every column. This procedure compensates for individual variations in the printer mechanism. Therefore, carriage operation control for column *n* is determined by the data in column n-l.

Figure 2-26 illustrates the measurement sequence.

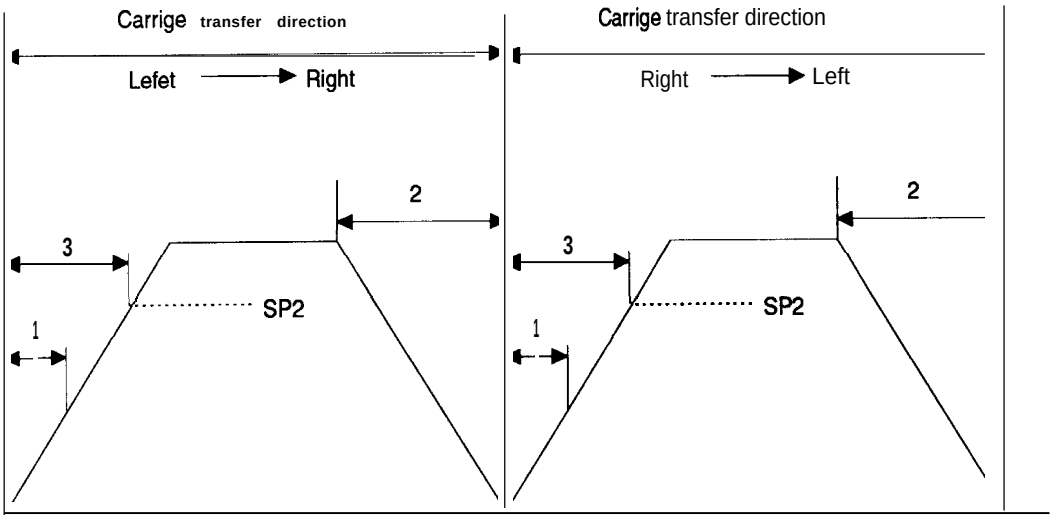


Figure 2-26. Measurement Sequence

2.3.5 PF Motor Driver Circuit

Stepping motor driver SLA7026 (IC11) drives the PF motor. Figure 2-27 shows the PF motor driver circuit block diagram, and Table 2-6 provides the PF motor specifications.

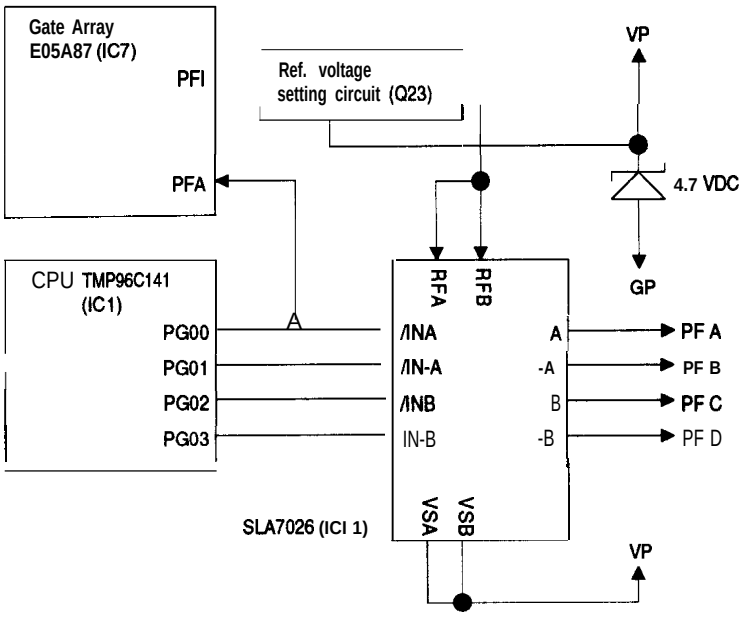


Figure 2-27. PF Motor Driver Circuit

The motor pulse switching signals are transmitted from CPU ports PG00 to PG03. The PF motor is controlled using open-loop phase switching based on the specified time data, and the phase driving method is 1-2 phase excitation. (When the PF motor is held, the phase driving method is 2 phase excitation.) The CPU selects the most suitable driving mode from the modes below according to conditions such as the paper feed step number and the pull tractor condition.

- ❑ Micro feed (adjust) mode
- ❑ Normal speed mode
- ❑ Middle speed mode

Each phase switching FET in driver IC11 is an open collector. When the phase switching data is HIGH, the motor is turned on. The PFA port of the gate array monitors the phase A signal of the PF motor and checks whether it is operating normally. The PFA port is used as the WDT (watch dog timer). If PF motor operation is abnormal, the gate array outputs the RSTOUT (reset request) signal to the CPU and the +5 V system reset IC (IC9).

Table 2-6. PF Motor Specifications

Specification	Description
Form	4-phase, 200-pole, HB* pulse motor
Supply voltage	35 VDC ± 6% (applied to the driver circuit)
Internal coil resistance	2.65 Ω ± 0.32 Ω per phase at 25°C (77°F)
Frequency	4274 pps** (normal mode, constant driving): 9.9 ips*** 2610 pps (middle speed mode, constant driving): 6 ips
Current consumption	Driving: 1.95 A, 0.20A per phase (average) Holding: 0.26 A, 0.02A per phase (average)

* HB = Hybrid
** pps = pulses per second
*** ips = inches per second

2.3.6 RF Motor Driver Circuit

Figure 2-28 shows a block diagram of the RF motor driver circuit, and Table 2-7 provides the RF motor specifications. The RF motor is a stepping motor. The control circuit performs open-loop phase switching control according to the timing data for acceleration constant speed, and deceleration. CPU ports PG10 to PG13 output the motor phase switching signals. The control method is not equipped with a hold circuit for changing the motor phase. The RF motor rotates when the carriage moves.

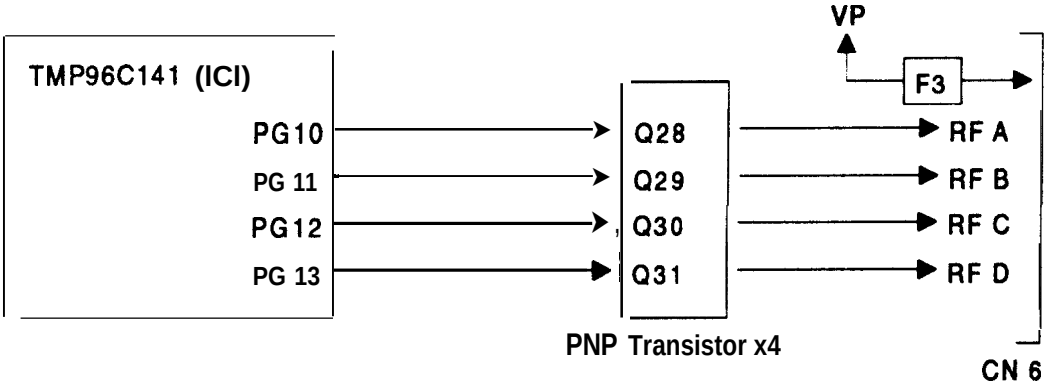


Figure 2-28. RF Motor Driver Circuit

Table 2-7. RF Motor Specifications

Specification	Description
Form	4-phase, 48-pole, PM pulse motor
Supply voltage	35 VDC ± 6% (applied to the driver circuit)
Internal coil resistance	150 Ω ± 10 Ω per phase at 25°C (77°F)
Current consumption	Driving: 0.10 A (average)
Frequency	720 pps
Driving method	Constant voltage driving, 2-2 phase drive only

2.3.7 PG Motor Driver Circuit

Figure 2-29 shows a block diagram of the PG motor driver circuit, and Table 2-8 provides PG motor specifications. The motor phase switching signals are output from the PGA port and input to the PGBN port of the gate array. The motor common voltage (PGCOM) alternates between drive mode (+35 VDC) and hold mode (+5 VDC) using the pulses from port PGI of the gate array. The phase driver IC (QM2) is turned on when the motor pulse switching data is LOW.

The phase A output pulse from the platen gap encoder (ENCA) is input to general purpose port ENCA of the gate array and the phase B output pulse from the platen gap encoder (ENCB) is input to general purpose port ENCB of the gate array. The gate array counts these pulses using the internal counter and determines the amount and direction of motor rotation.

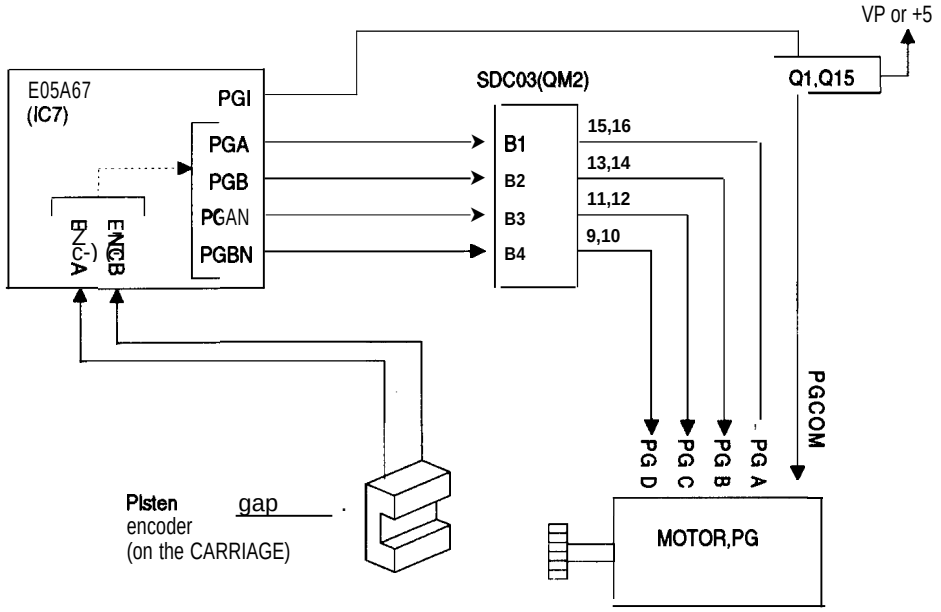


Figure 2-29. PG Motor Driver Circuit

Table 2-9. PG Motor Specifications

Specification	Description
Form	4-phase, 48-pole, PM pulse motor
Supply voltage	35 VDC ± 60/0 (applied to the driver circuit)
Internal coil resistance	250 Ω ± 18 Ω per phase at 25°C (77°F)
Current consumption	Driving: 0.20 A (average) Holding: 0.02 A ± 0.5 mA
Frequency	333 pps
Driving method	Constant voltage driving, 2-2 Phase drive only

2.3.8 Plunger Driver Circuit

Figure 2-30 shows a block diagram of the plunger driver circuit, and Table 2-9 provides the plunger switching pattern. The plunger is driven using three switching patterns. Gate array general purpose ports PLP and PLN output the plunger coil drive signals. The CPU latches the switching data in the gate array. When the PNP port of the gate array turns off switching transistor Q19, transistor Q17 is turned on and the supply voltage (VP) flows into the plunger coil. When switching transistor Q19 is turned on, transistor Q17 is turned off and the hold voltage (+5 V) flows into the plunger coil using general purpose port PLN of the gate array.

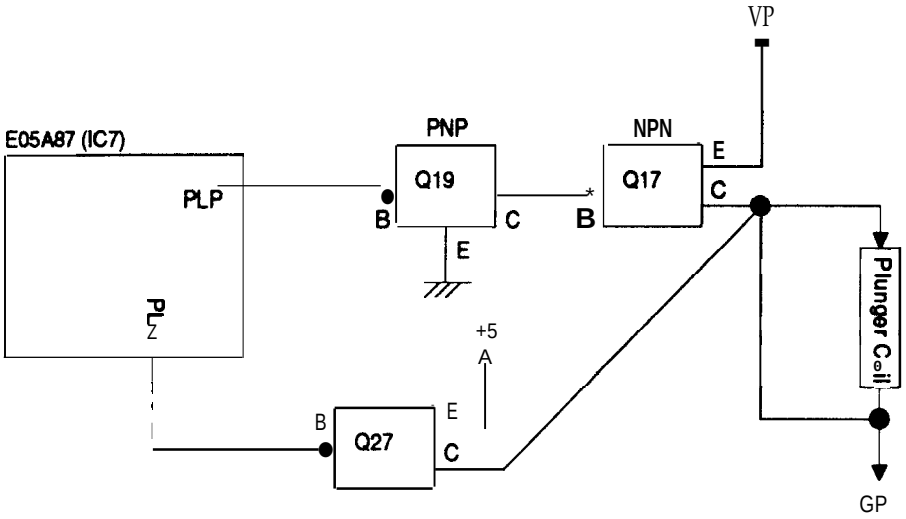


Figure 2-30. Plunger Driver Circuit

Table 2-10. Plunger Switching Pattern

Suspension Roller Status	Q17	Q27
closed	off	off
Closed → open	On	off
Closed with hold voltage	off	On

2.3.9 Printhead Driver Circuit

Figure 2-31 shows a printhead driver circuit block diagram. The print data lines from IC7 are active when they are LOW, but the invertor ICS (IC6 and IC7) convert these signals to HIGH. When ports HD1 to HD8 of IC7 go LOW, the FET gates are biased, and the FETs are turned on so that current flows through the printhead coil. When the HD port of IC7 goes HIGH, the FETs are turned off and the printhead coil current is cut. The trigger power of these FETs is +12 VDC. If extra current charges into the head coil (more than 62 VDC), the extra current escapes to the +35 VDC line using Zener diodes D4 to D6. (This prevents a large current from suddenly flowing into the head driving coil.) Two +35 VDC lines (VH and VP) assign the common voltage for the printhead coil. Pins HD1, HD3, HD5, HD7, HD8, and HD9 are supplied by the VH(HDCOM2) line (CN6 pins 5,6,7,8, and 10). Pins HD2, HD4, and HD6 are supplied by the VP (HDCOM1) line (CN6 pins 11,12, and 14).

The CPU monitors the head temperature and head fan temperature. When the temperature rises abnormally, printing stops at once until the temperature cools. The CPU also monitors the head driver status. If the head driver IC shorts, CPU port P34 detects a LOW level and the CPU sends the DRERR (Driver Error) signal to the C117 power supply board assembly. When the C117 power supply board assembly receives this signal, it stops the output voltage and the printer beeps.

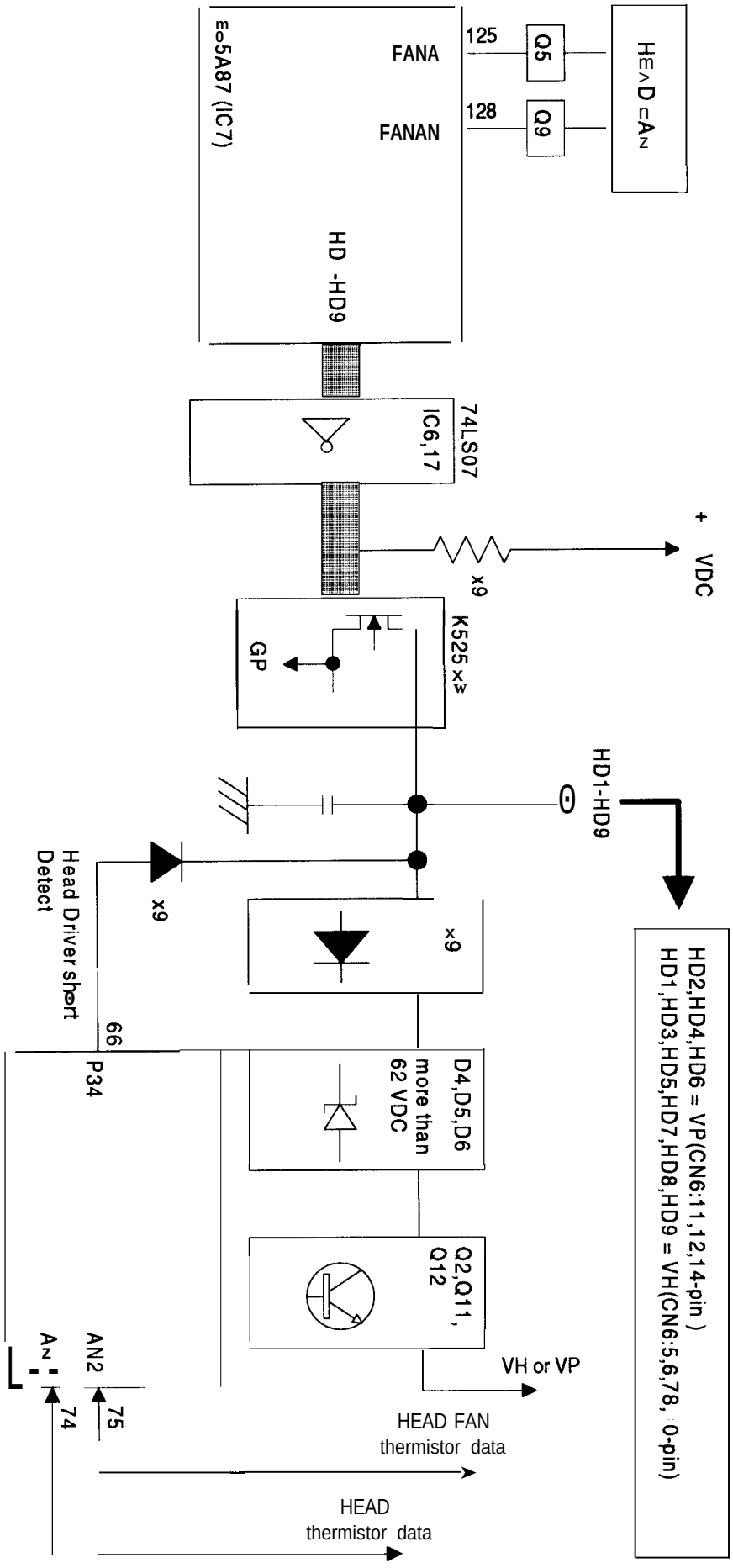


Figure 2-31. Printhead Driver Circuit

CHAPTER 3 Disassembly and Assembly

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3.1 BEFORE STARTING

Read this section before you disassemble, assemble, or transport the printer.

WARNING

Because the DFX-5000+ weighs 29.0 kg (63.8 lb) *and is much larger and heavier than most printers, you must be* ***careful*** *when handling it. Whenever it needs to be moved, two or more persons must carry it, supporting* ***it from*** *the* ***bottom.*** *Never* ***lift*** *the printer by holding the front cover, because it may come* ***off.***

Before transporting the printer, remove the paper and ribbon cartridge. Then attach the following packing materials, as shown in Figure 3-1:

- ❑ Transport locking bracket
- Cl Carriage guide shaft support bar
- ❑ Printhead protector
- ❑ Foam packing for paper bail

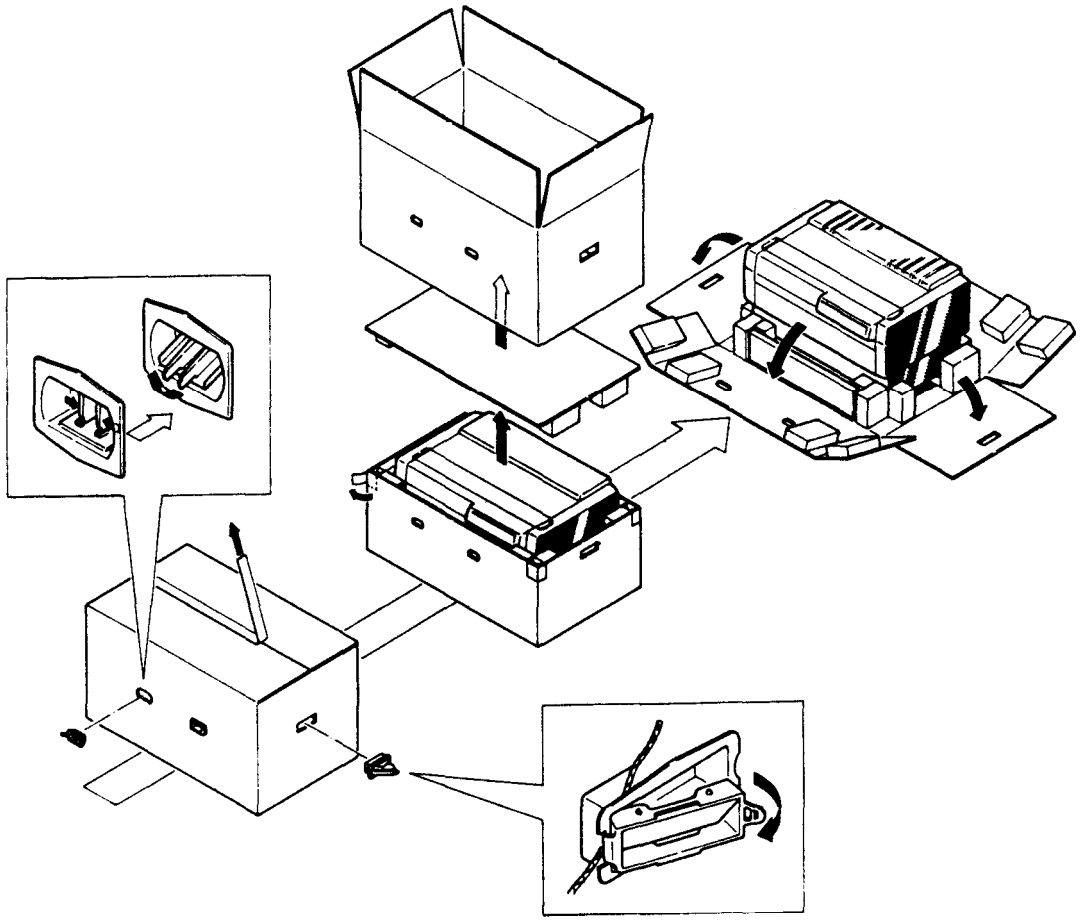


Figure 3-1. Attaching the Packing Materials

After attaching the packing materials, pack the printer in its container as shown in Figure 3-2. If you do not pack the printer properly, it may be damaged during transportation.

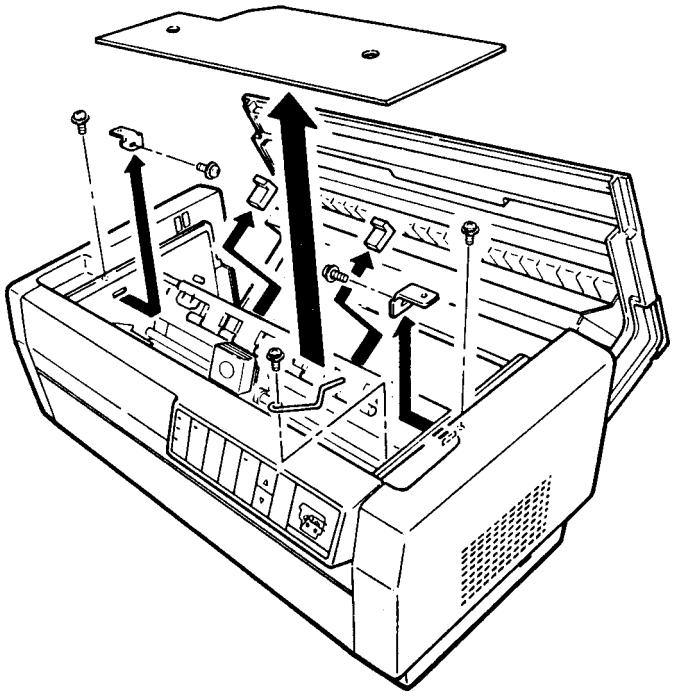


Figure 3-2. Packing the DFX-5000+

- Before disassembling the printer, turn it off and disconnect the power cord from the printer and the wall outlet. Disconnect the printer from the computer, and then remove the paper and ribbon cartridge.
- Because you may need to turn the printer while you disassemble or assemble it, place it on a clean, thick cloth, such as a blanket, before starting.
- Before assembling the printer, lubricate it as described @Chapter 6, *Maintenance and Lubrication.* (A substantial amount of oil maybe removed during maintenance or repair work.) Also, be sure to clean the printer as described in Chapter 6.

3.1.1 Tools

This section describes the tools required for assembling, disassembling, or adjusting the printer.

Note: Refer to Chapter 4 for adjustment tools, Chapter 5 for troubleshooting tools, and Chapter 6 for tools for maintenance, lubrication, and adhesives.

Table 3-1. Tools

Tool Name	Type	class	Part No.
Phillips screwdriver No. 2	O	A	B743800200
Phillips screwdriver No. 1	O	A	B743800100
Box driver (7 mm or .28 inches across)	O	A	B741700200
E-ring holder No. 3	O	A	B740800500
E-ring holder No. 6	O	A	B740800800
Round nose pliers	O	A	B740400100
Diagonal wire cutters	O	A	B740500100
Tweezers	O	A	B641000100
Electric soldering iron	O	A	B740200100
Tension gauge (4000 g)	O	A	B747700300
Tension gauge (2000 g)	O	A	B747700100
Tension gauge (200 g)	O	A	6765114601
Lift habdles #E656	E	A	B7651 11001
Dial gauges #F610	E	A	1019466
Dial gauge base #F611	E	A	1019467
Dial gauge master #F612	E	A	1019468
Thickness gauge #F616	E	A	1020471
Motor screwdriver (Phillips head, torque adjustable)	O	B	—

C

O: Commercially available
E: EPSON exclusive
A: Mandatory
B: Recommended

Part number: B1019466OO
Catalog number: Dial gauges **#F610**

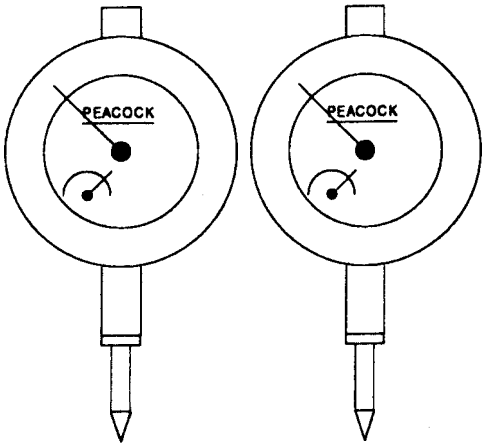


Figure 3-3. Dial Gauges

Part number: B1019467OO
Catalog number: Dial gauge base **#F611**

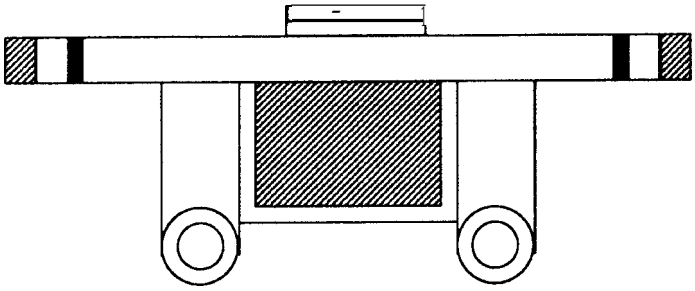


Figure 3-4. Dial Gauge Base

Part number: B1019468OO
Catalog number: Dial gauge master **#F612**

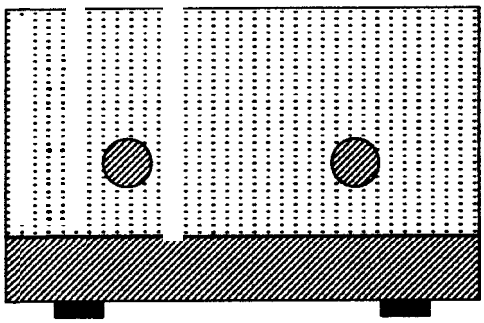


Figure 3-5. Dial Gauge Master

Part number: B102O47NXI
Catalog number: Thickness gauge #F616

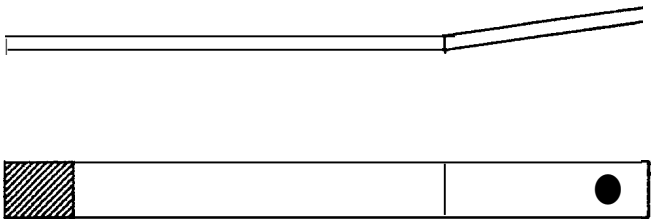


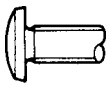
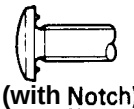
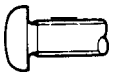
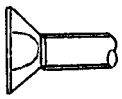
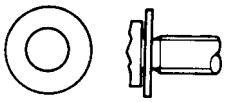
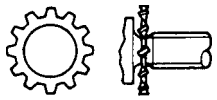
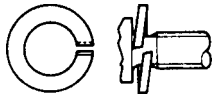
Figure 3-6. Thickness Gauge

3.1.2 Small Parts

Table 3-2. Abbreviations for Small Parts

Abbreviation	Part Name
CBB	Cross-Bind head, B-tight screw
CBS (0)	Cress-Bind head, S-tight screw with Outside-toothed lock washer
CBS (SP)	Cross-Bind head, S-tight screw with Spring lock washer + Plane washer
CFS	Cross-Flat head, S-tight screw
CP (SP)	Cross-Pan head with Spring lock washer + Plane washer
CP (PS)	Cross-Pan head with Plane washer + Spring lock washer
CPB	Cross-Pan head, B-tight screw
CPB (0)	Cross-Pan head, B-tight screw with Outside toothed lock washer
CPS	Cross-Pan head, S-tight screw
CPS (P)	Cress-Pan head, S-tight screw with Plain washer
CPS (SP)	Cross-Pan head, S-tight screw with Spring lock washer + Plain washer
CPN	Cress-Pan head screw
CPN (0)	Cross-Pan head screw with Outside toothed lock washer
CPN (SP)	Cross-Pan head screw with Spring lock washer + Plain washer
CPT (0)	Cross-Pan head Tapping screw with Outside toohed lock washer

Table 3-3. Screw Names and Illustrations

Head		Body	Washer
Top	Side		
1. Cross-recessed head 	1. Bind   (with Notch) 2. Pan  3. Flat 	1. Normal  2. S-tight  3. B-tight  4. Tapping  	1. Plain washer  2. Outside toothed lock washer  3. Spring washer 

3.2 DISASSEMBLY AND ASSEMBLY

WARNING

Before you *disassemble or assemble the printer, be sure to read and follow the instructions in Section 3.1, "BEFORE STARTING."*

This section describes how to disassemble the printer. See the Appendix for an exploded diagram of the printer. Use this diagram for simple disassembly procedures not described here. To assemble the printer, follow the disassembly instructions in this chapter in reverse. Any extra information you need to assemble printer components is provided in notes labeled "Assembly Note." Adjustments required before assembly are described in notes labeled "Adjustment Required." Be sure to follow the instructions in these notes.

3.2.1 Replacing the Printhead

You can replace the printhead without disassembling the printer.

CAUTION

- *When you remove the connector cover, be careful not to break the tabs.*
- *When you remove the printhead cable holder, be careful not to break the printhead cable holder latch. Use a slotted screwdriver if necessary.*

1. Remove the top cover.
2. Pry up the 2 hooks for the head cable cover and remove it from the carnage.
3. Discomect the white FPC cable, 4-pin white harness connector, and 4-pin red harness connector from the connector junction board on the carriage.
4. Release the harness from the carriage hook and remove the CP (SP) (M3 x 6) screw.

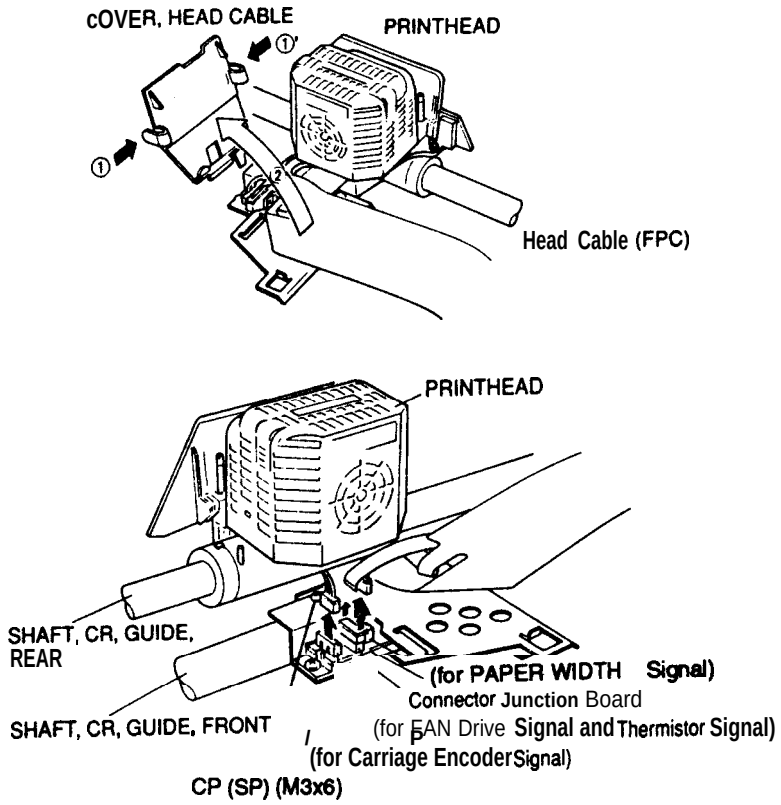


Figure 3-7. Removing the FPC Cover and the Connector

5. Remove the 2 CPN (M3 x 8) screws securing the FPC cover to the bottom plate of the printer mechanism.
6. Remove the 2 FPC printhead cables from the connector junction board on the bottom plate and remove the 2 CP (PS) (M4 x 7) screws securing the pnnthead to the carriage. Disengage the printhead with the PW sensor and the masldess holder.

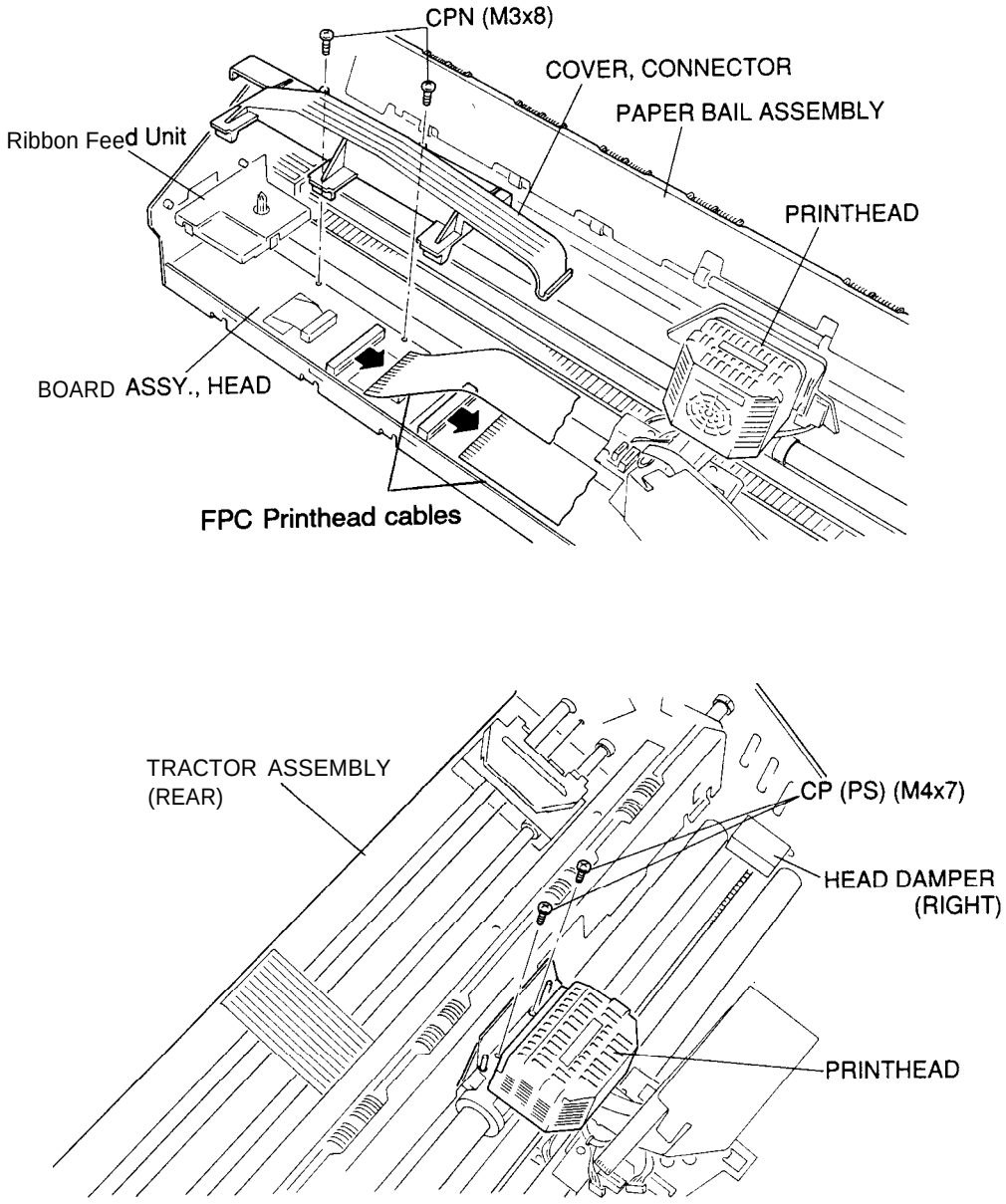


Figure 3-8. Removing the Printhead

Assembly Note

❑ *When you install the **printhead**, torque the screws to 8 **kg/cm (44 lb/inch).***
❑ *Tighten the screws while pulling the **printhead** backward to secure the **printhead firmly.***

ADJUSTMENT REQUIRED

*When you install the **printhead**, perform the platen gap motor value (platen gap) adjustment described in Section 4.1.7.*

3.2.2 Replacing the ROM

You can replace the ROM without disassembling the printer.

CAUTION

- ❑ *It is best to remove the top cover before you tilt back the printer as described in the steps below. Refer to Section 3.2.3.1 for instructions on removing the top cover.*
- ❑ *If you tilt back the printer with the top cover attached, be careful not to put too much weight on the top cover or any other printer components.*
- ❑ *Spread a thick, soft cloth under the printer before you follow the steps below.*
- ❑ *Remove the ROM carefully to avoid damaging the board.*
- ❑ *Before you install a new ROM, check the INDEX mark on the socket to be sure the ROM is oriented correctly. Insert the ROM care filly to avoid damaging the ROM pins and the board.*

1. Tilt back the printer and lay it on its back. Hold the top cover closed if it is not removed.
2. Remove the CBB (M3 x 10) screw securing the ROM cover, remove the cover, and replace the ROM using the ROM holder.

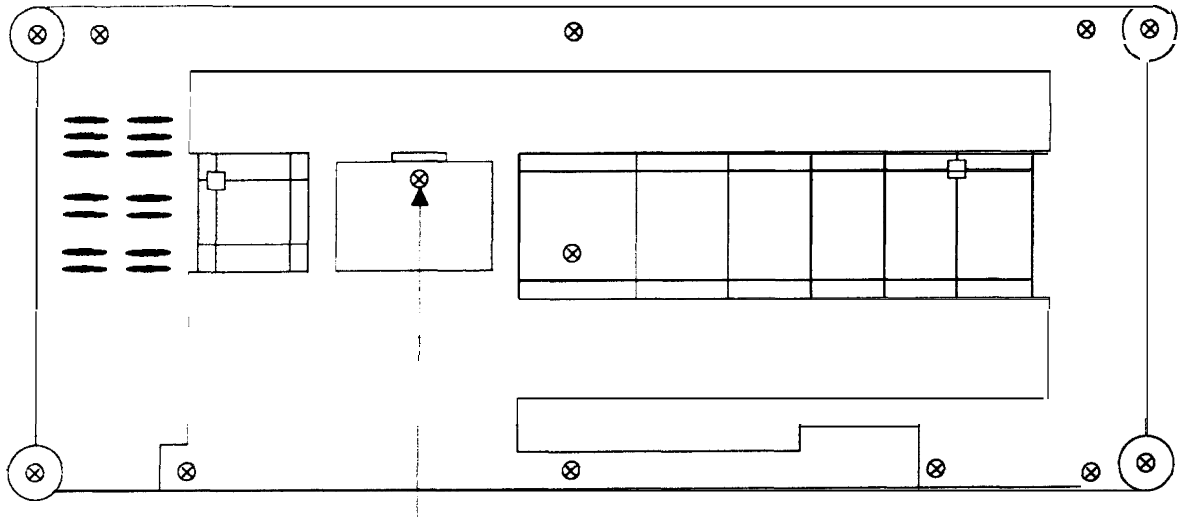


Figure 3-9. Replacing the ROM

3.2.3 Removing the Housing

This section describes how to remove the housing.

3.2.3.1 Removing the Top Cover

CAUTION

Two people are required to remove the top cover; one person must hold the top cover while the other person removes the screws. If the top cover is not supported while the screws are removed, the weight of the top cover may damage the rear hinges.

1. Open the top cover.
2. While someone supports the top cover, remove the4 screws (2 on therightand 2 on the left) securing the top cover to the hinges and remove the cover.

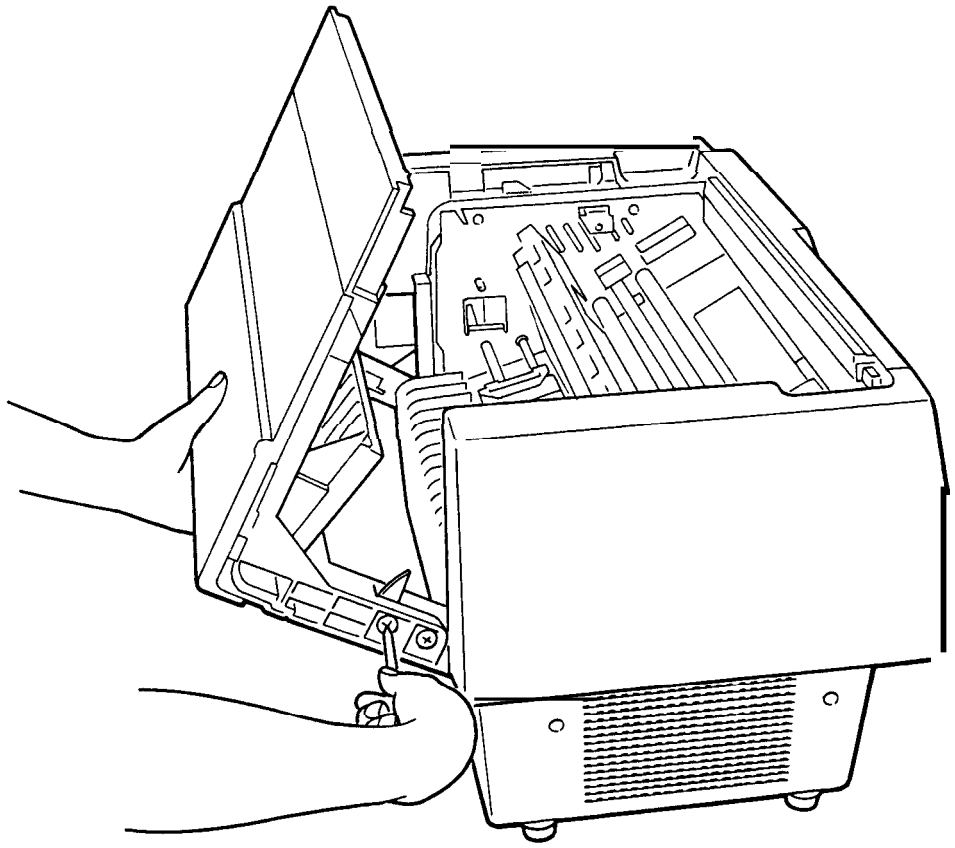


Figure 3-10. Removing the Top Cover

3.2.3.2 Removing the Left, Right, and Front Covers and Replacing the Fuse

1. Remove the 4 CBB (M4 x 16) screws securing the left side cover and remove the cover.
2. Remove the right side cover in the same way as you removed the left side cover. Also remove the 4 cables from the main switch on the right side cover.

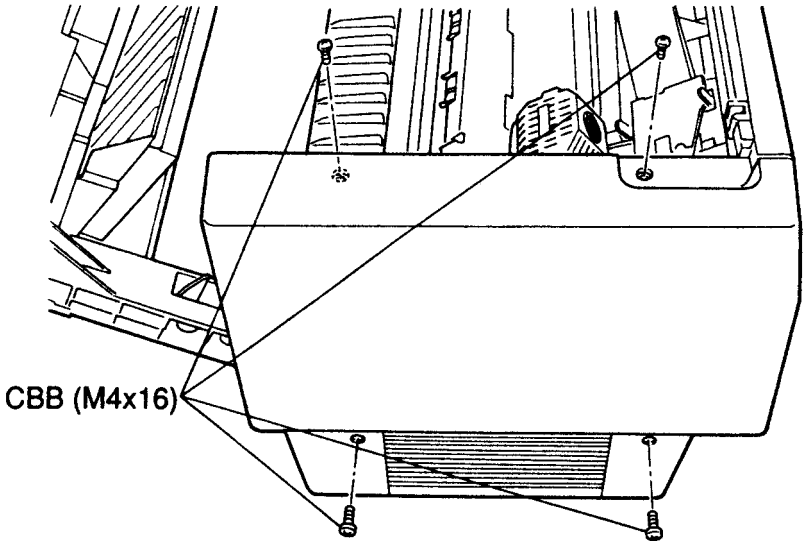


Figure 3-11. Removing the Left and Right Side Covers

Assembly Note

When you attach the right side cover, connect the cable from connector CN1 on the C117 power supply board assembly and the cable from the AC inlet to the main switch on the right side cover, as shown below.

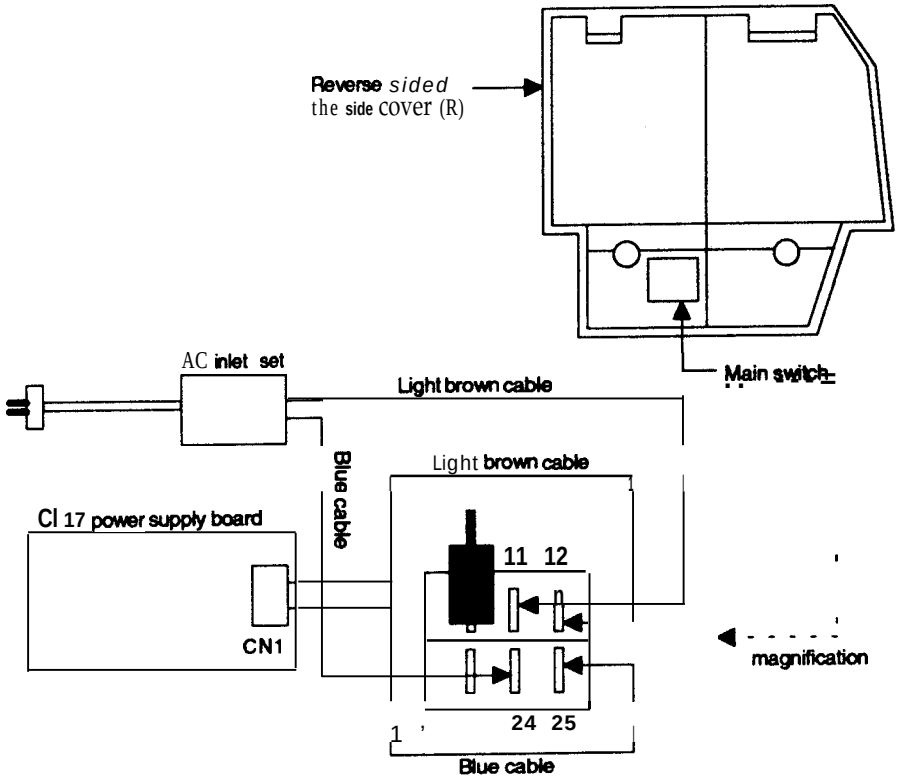


Figure 3-12. Connecting the Cables to the Main Switch

3. After you remove the right side cover, you can replace the input fuse for the C117 power supply board assembly.

WARNING

Make sure the new fuse meets the printer's AC power specifications.

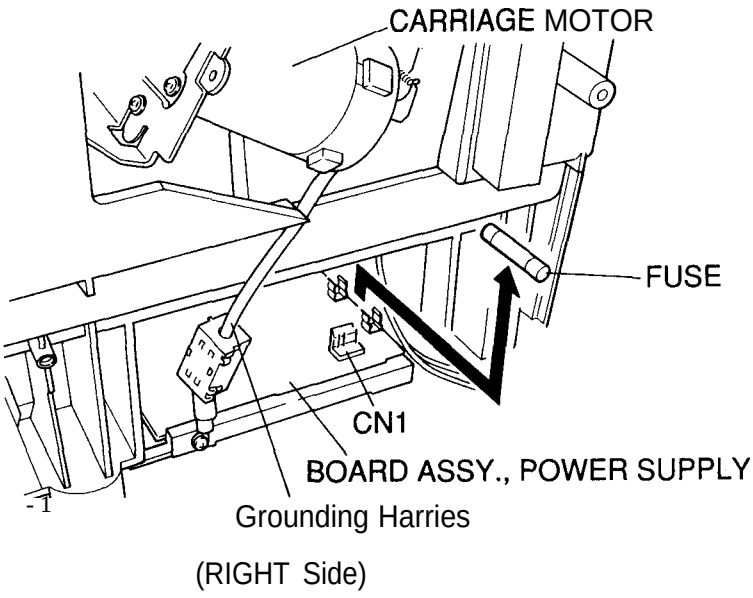


Figure 3-13. Removing the Fuse

4. Remove the 3 CBB (M4 x 10) screws securing the left side of the front cover to the lower cover. Then remove the screws on the right side and remove the front cover with the 2 hinges.

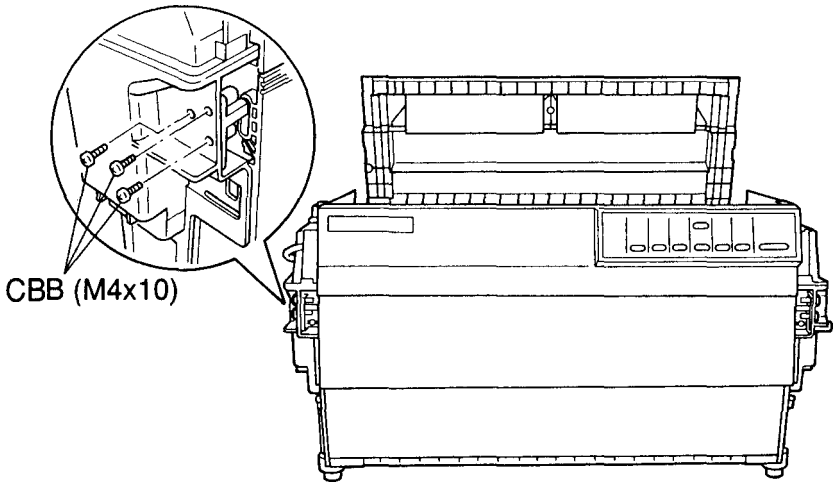


Figure 3-14. Removing the Front Cover

3.2.3.3 Removing the Front Panel

1. Remove the left and right side covers. (Refer to Section 3.23.2)
2. Open the top rover and disconnect connector CN8 (the control panel connector).
3. Remove the2 CBB (M4 x 16) screws from the front panel and rernovethe panel with the C117 PNL board assembly and its cable.

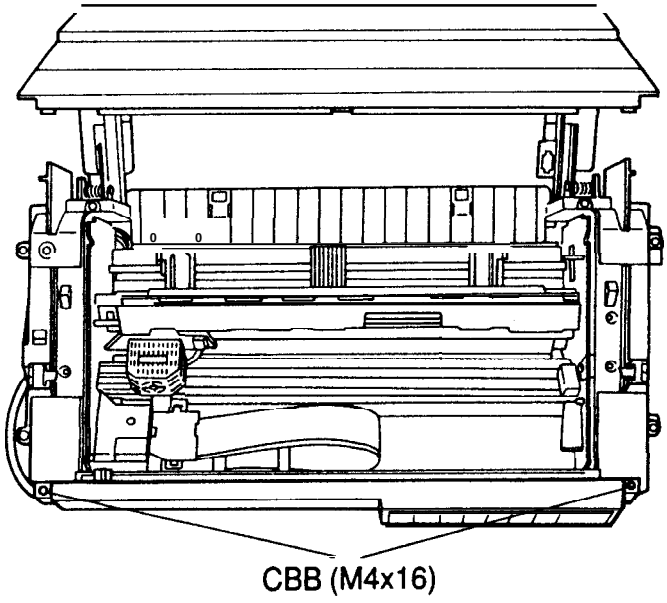


Figure 3-15. Removing the Front Panel

3.2.3.4 Removing the Upper Case

1. Remove the front panel. (Refer to Section 3.2.3.3)
2. Disconnect connector CN7 (the cover open sensor connector) from the C117 MAIN board assembly.
3. Remove the 6 CBB (M4 x 16) screws, and 2 CPS (M3 x 8) screws from the upper case, and then remove the upper case with the cover open sensor.

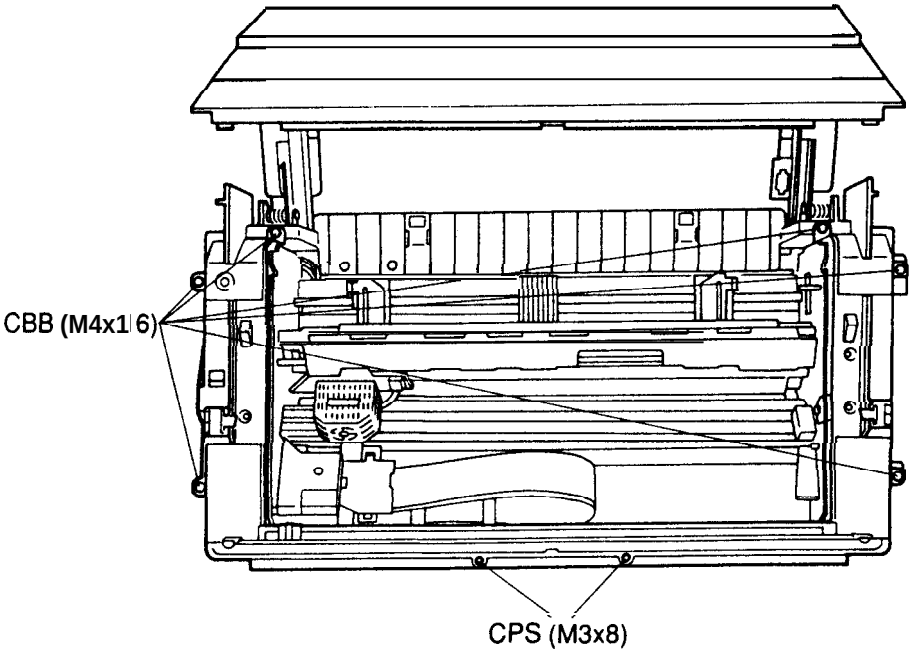


Figure 3-16. Removing the Upper Case

3.2.3.5 Removing the Cover Open Sensor

1. Remove the uppercase. (Refer to Section 3.2.3.4)
2. Tum over the upper case. Remove the 2 CPB (M2 x 8) screws from the case open sensor and remove the sensor.

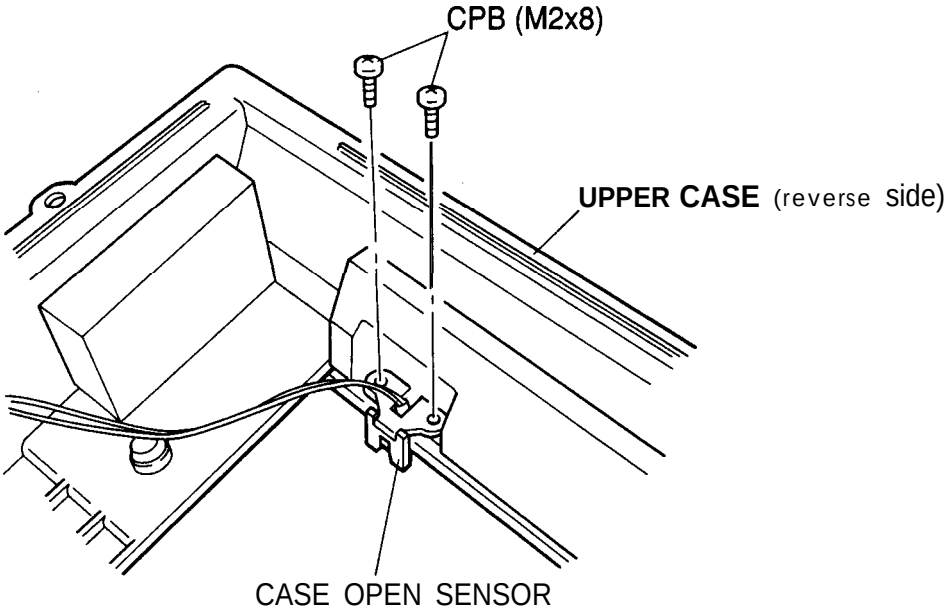


Figure 3-17. Removing the Cover Open Sensor

3.2.4 Removing the Circuit Boards

This section describes how to remove the circuit boards.

3.2.4.1 Removing the Bottom Panel Assembly

CAUTION

- *It is best to remove the top cover before you tilt back the printer as described in thesteps below. Refer to Section 3.2.3.1 for instructions on removing the top cover.*
- *If you tilt back the printer with the top cover attached, be careful not to put too much weight on the top cover or any other printer components.*
- *Spread a thick, soft cloth under the printer before you follow the steps below.*
- *When you attach the bottom panel, make sure the parallel interface cable latch is not caught between the lower case and bottom panel.*

1. Remove the left and right side covers. (Refer to Section 3.232)
2. Open the rear cover. Remove the4CPB (M3 x 12) screws and 2 CPT (O) (M3 x 12) screws securing the interface cover and remove the cover.
3. Remove the 2 CPT (0) (M3 x 12) screws securing the optional interface cover and remove the cover.

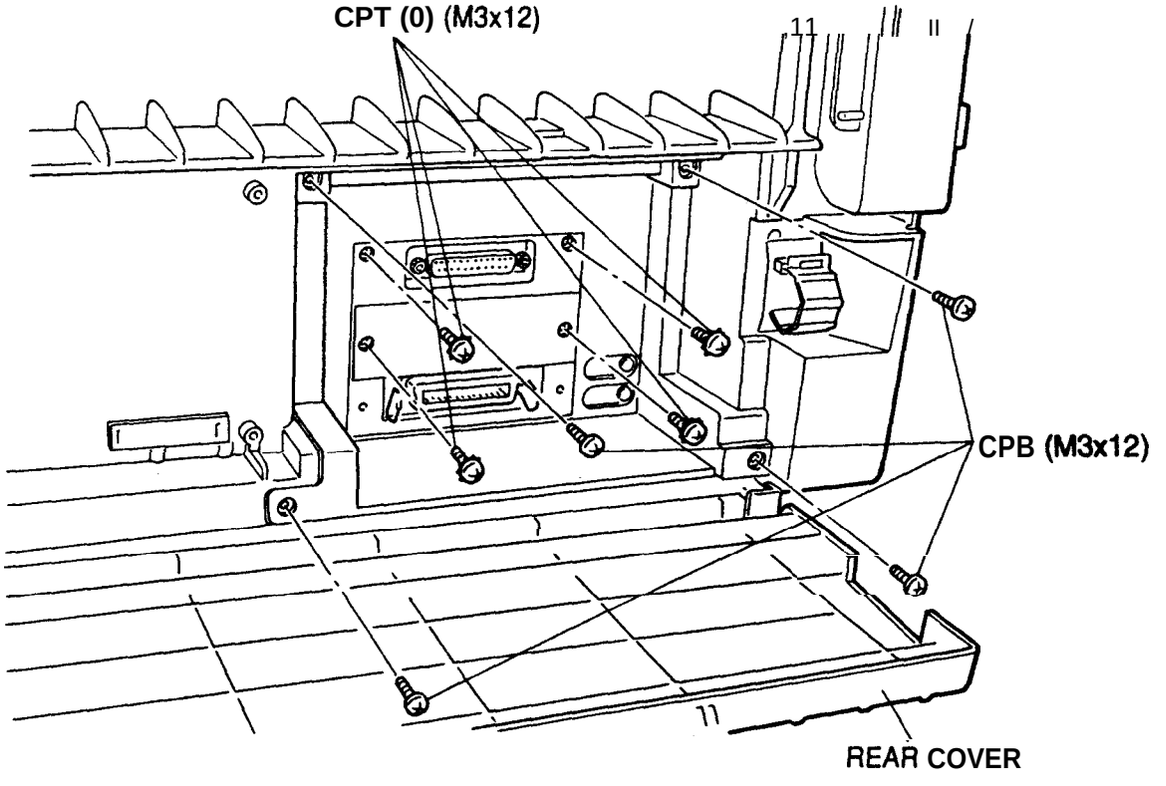


Figure 3-18. Removing the Interface Cover

4. While supporting the top cover to protect it from scratches, tilt back the printer and lay it on its back.

5. Remove the *8* CPB (M4 x 16) screws securing the bottom panel assembly. Slowly return the printer to its upright position before you remove the screws for the bottom panel assembly. Then remove the rear cover.

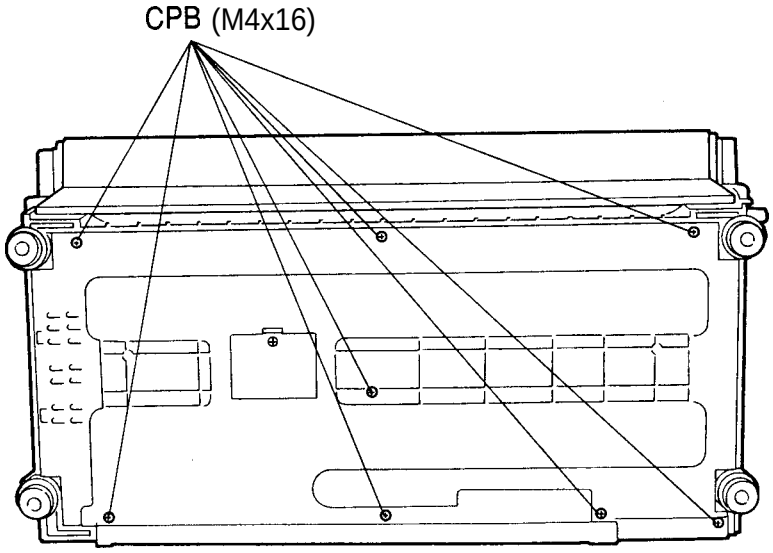


Figure 3-19. Removing the Bottom Panel Assembly 1

6. From the left side, remove the 2 CPB (0) (M4 x 8) screws securing the green and yellow earth cable between the bottom plate of the printer mechanism and the earth plate on the bottom panel assembly.

7. Disconnect connectors CN10, CN6, *CN7,* and CN8.

8. Since comector CN9 is fixed to the C117 MAIN board assembly, remove the junction connector (not labeled with a CN number) between the interlock switch and connector CN9 on the C117 MAIN board assembly.

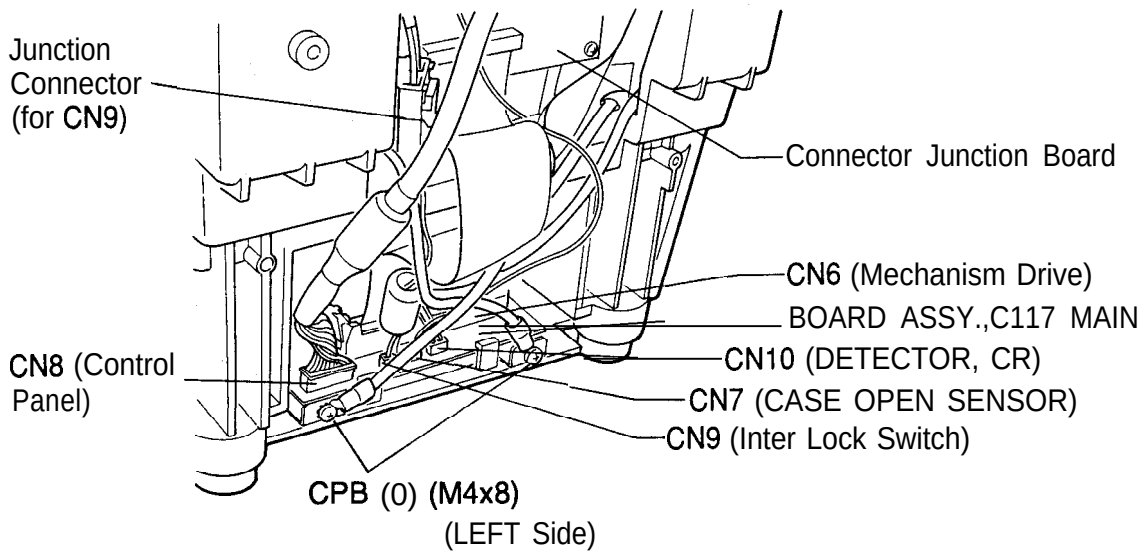


Figure 3-20. Removing the Connector and Earth Cable

9. On the right side of the printer mechanism, remove the green and yellow earth cable from the earth plate on the bottom panel assembly. Then slowly lift up the bottom panel assembly.
10. Remove the CBS (0) (M4 x 8) screw securing earth plate.

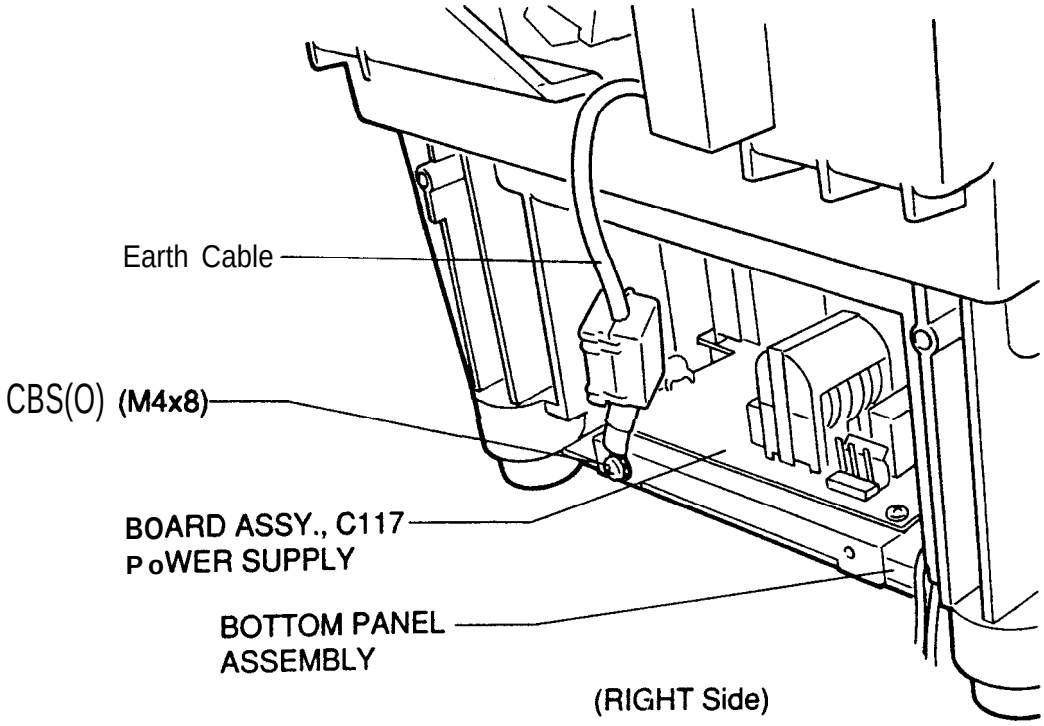


Figure 3-21. Removing the Bottom Panel Assembly 2

3.2.4.2 Removing the Cooling Fan and C117 Power Supply Board Assembly

1. Remove the bottom panel assembly. (Refer to Section 3.2.4.1)
2. If you need to remove the cooling fan, remove the 4 CCN (M3 x 30) screws securing it and remove the fan.
3. Disconnect connectors CN2, CN3, and CN4.
4. Remove the 6 CPB (M3 x 11) screws and CPN (0) (M3 x 8) screw securing the C117 power supply board assembly and remove the board.

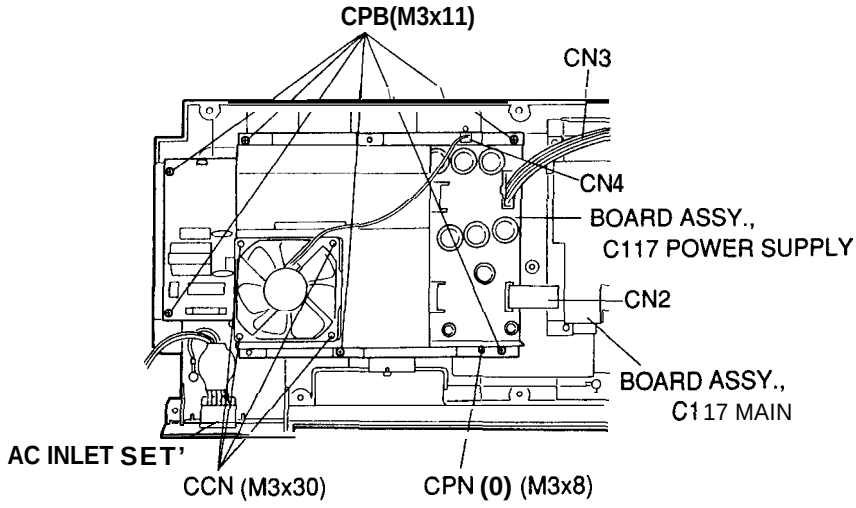


Figure 3-22. Removing the Cl 17 Power Supply Board Assembly

3.2.4.3 Removing the C117 MAIN Board Assembly

1. Remove the bottom panel assembly. (Refer to Section 3.2.4.1)
2. Disconnect connectors CN1 and CN3.
3. Remove the 5 CPB (M3 x 11) screws and 2 CPN (0) (M3 x8) screws securing the C117 MAIN board assembly and remove the board.

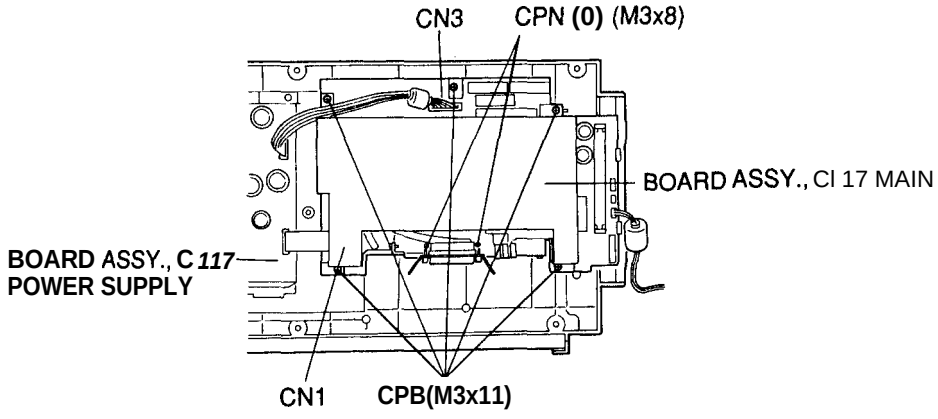


Figure 3-23. Removing the C117 MAIN Board Assembly

ADJUSTMENT REQUIRED

When you install the C117 MAIN board assembly, perform the following adjustments:
- ❑ *Platen gap motor value (platen gap) adjustment (described in Section 4.1.7)*
- ❑ *Bidirectional printing adjustment (described in Section 4.1.8)*

3.2.4.4 Removing the AC Inlet

1. Remove the C117 power supply board assembly. (Refer to Section 3.2.4.2)
2. Remove the C117 MAIN board assembly. (Refer to Section 3.2.4.3)
3. Remove the 3 CPS (M3 x8) screws and 1 CPB (0) (M4 x5) screw securing the earth plate to the bottom panel assembly and remove the earth plate.

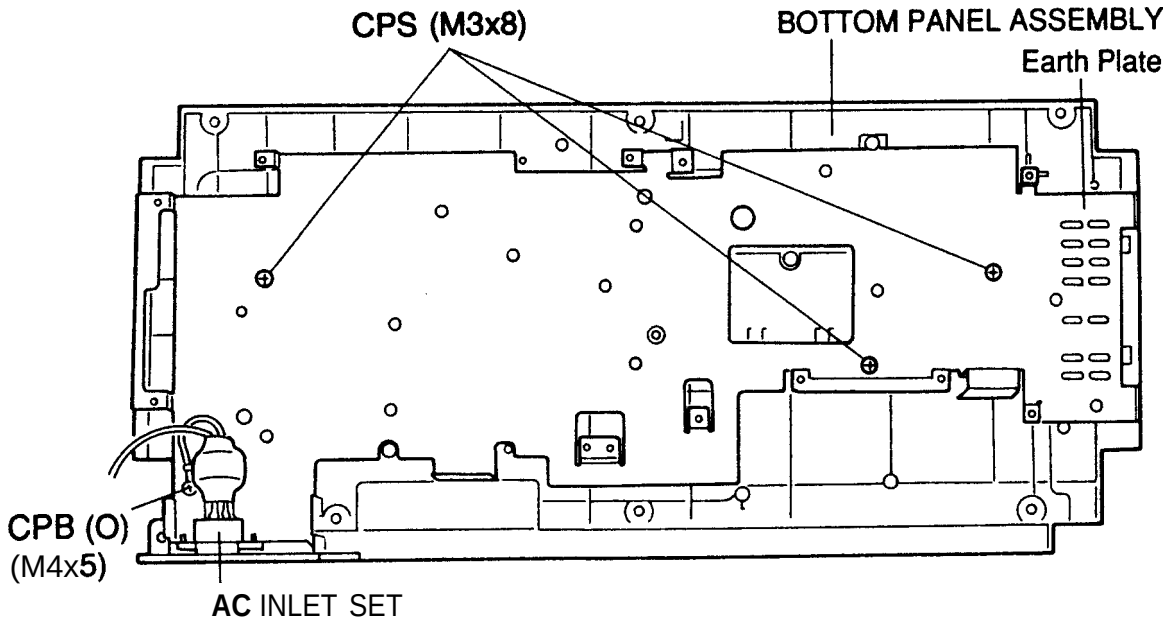


Figure 3-24. Removing the Earth Plate

4. Remove the 2 CFS (M3 x 12) screws securing the AC inlet to the earth plate and remove the AC inlet.

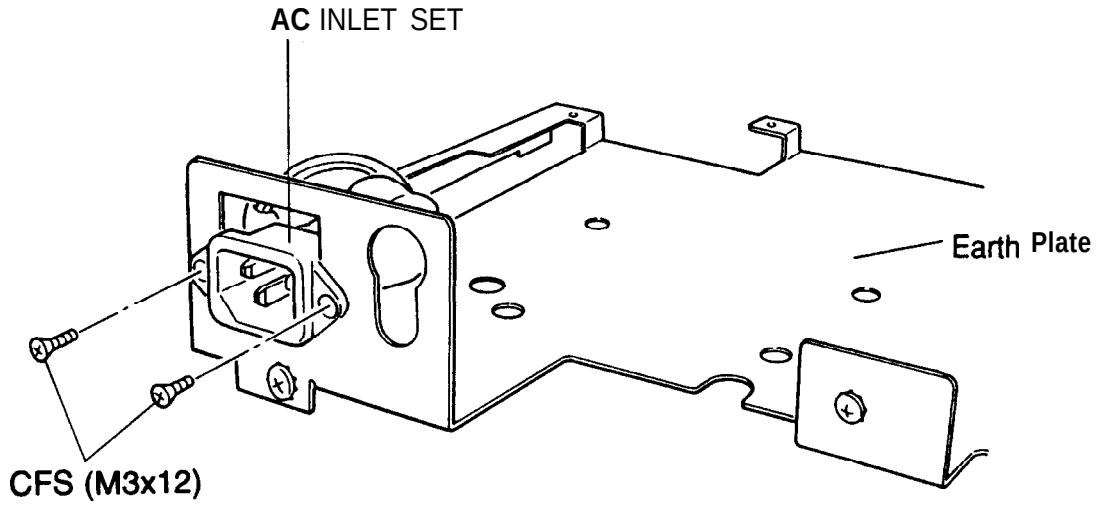


Figure 3-25. Removing the AC Inlet

3.2.4.5 Removing the C117 PNL Board Assembly

1. Remove the front panel. (Refer to Section 3.2.3.3)
2. Disconnect connectors CN1 and CN2 on the C117 PNL board assembly.
3. Remove the CPB (M4 x 9) screw securing the C117 PNL board assembly to the front cover and remove the board.

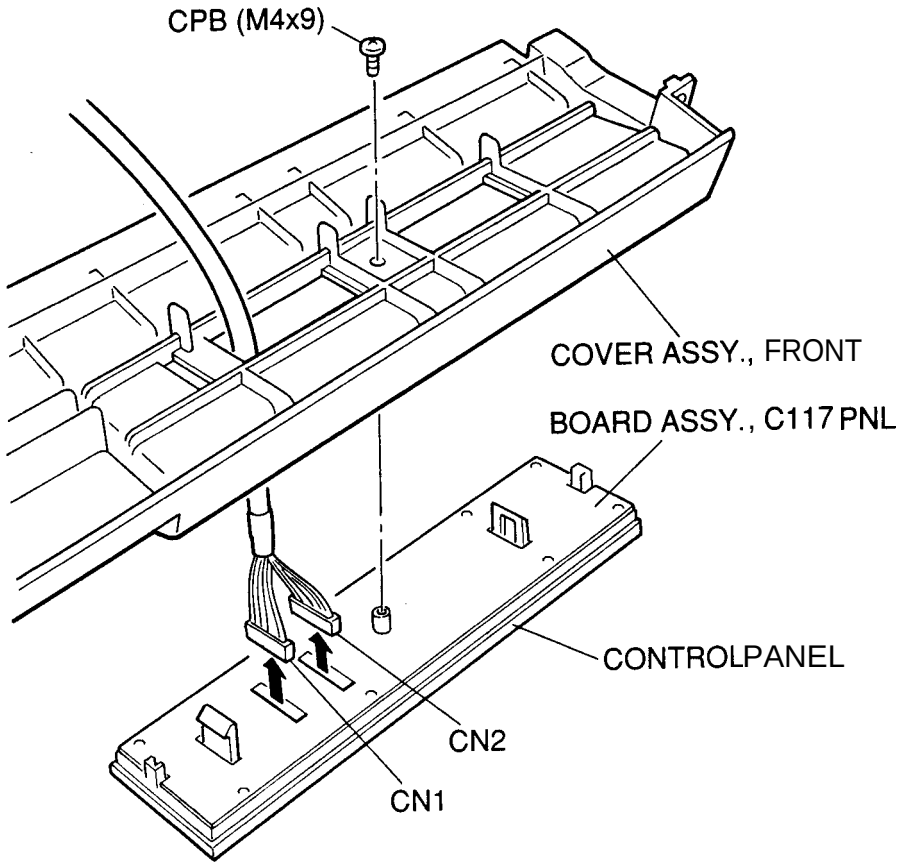


Figure 3-26. Removing the C117 PNL Board Assembly

3.2.5 Removing the Interlock Switch Assembly

1. Remove the upper case. (Refer to Section 3.23.4)
2. Di sconnect the interlock assembly cable from junction connector CN9 *on the C117 MAIN* board assembly.
3. Remove the CBB (M4 x 10) screw securing the interlock switch assembly to the lower case and remove the interlock switch assembly.

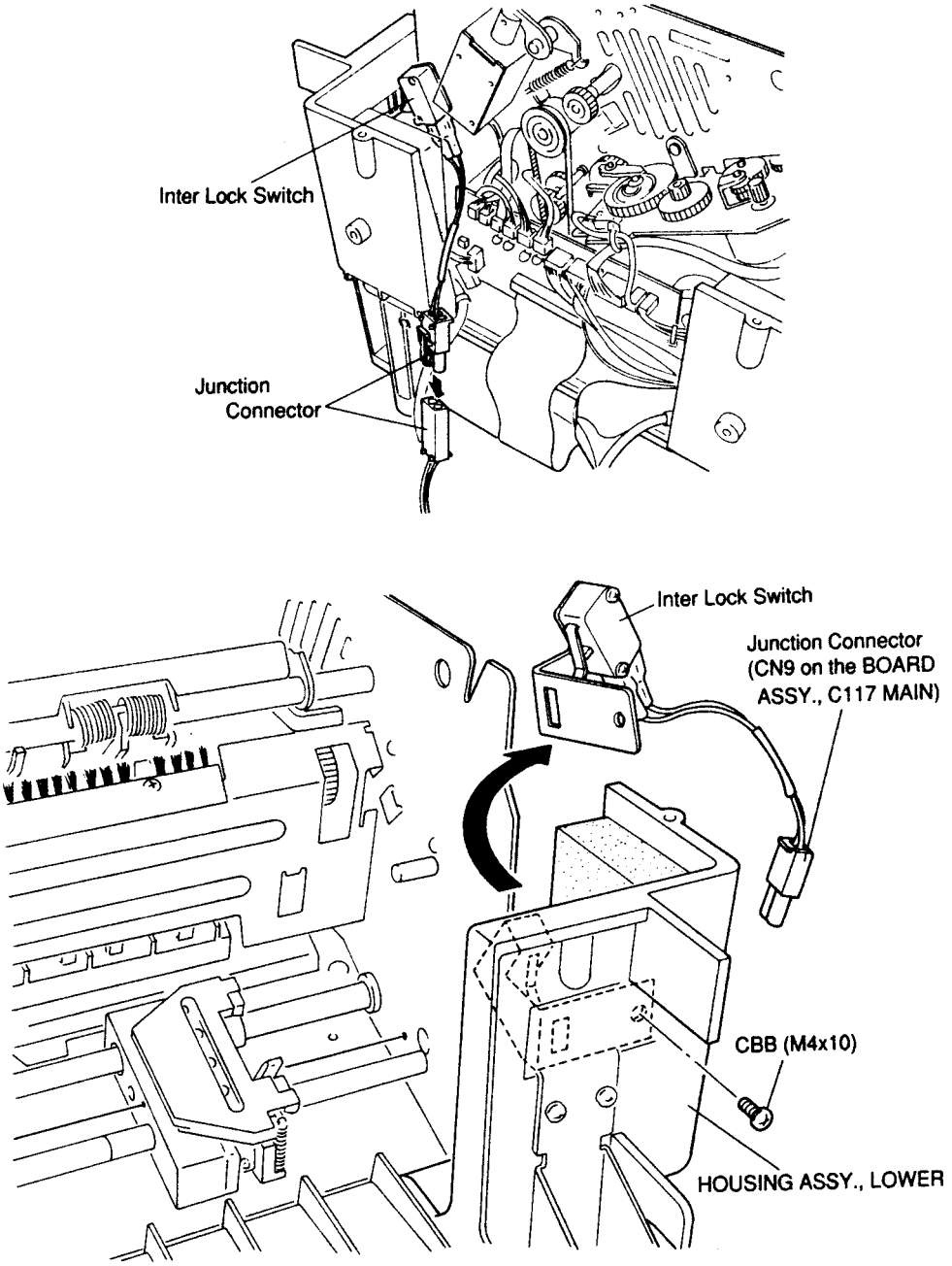


Figure 3-27. Removing the Interlock Switch Assembly

3.2.6 Removing the Printer Mechanism

This section describes how to remove the printer mechanism.

WARNING

Because the printer mechanism is large and heavy, you must be careful when you remove it. When you lift or lower the printer mechanism, follow these precautions:

- ❑ *Two people are required to remove or install the printer mechanism.*
- ❑ *Use the lift handles (#E656, part number B765111OO1) designed for lifting or lowering the printer mechanism when you remove or install it.*
- ❑ *To avoid straining your waist, hands, or feet, place the printer on a low table before following the steps below.*

1. Remove the interlock switch assembly. (Refer to Section 3.2.5)
2. Remove the 3 **CBS (0)** (M4 x 8) screws securing the green and yellow earth cables to the earth plate. There are two screws on the left and one on the right.
3. Disconnect the cables from connectors CN1O, CN7, and CN6 on the left side of the C117 MAIN board assembly.
4. Remove the 4 screws securing the printer mechanism to the lower case.

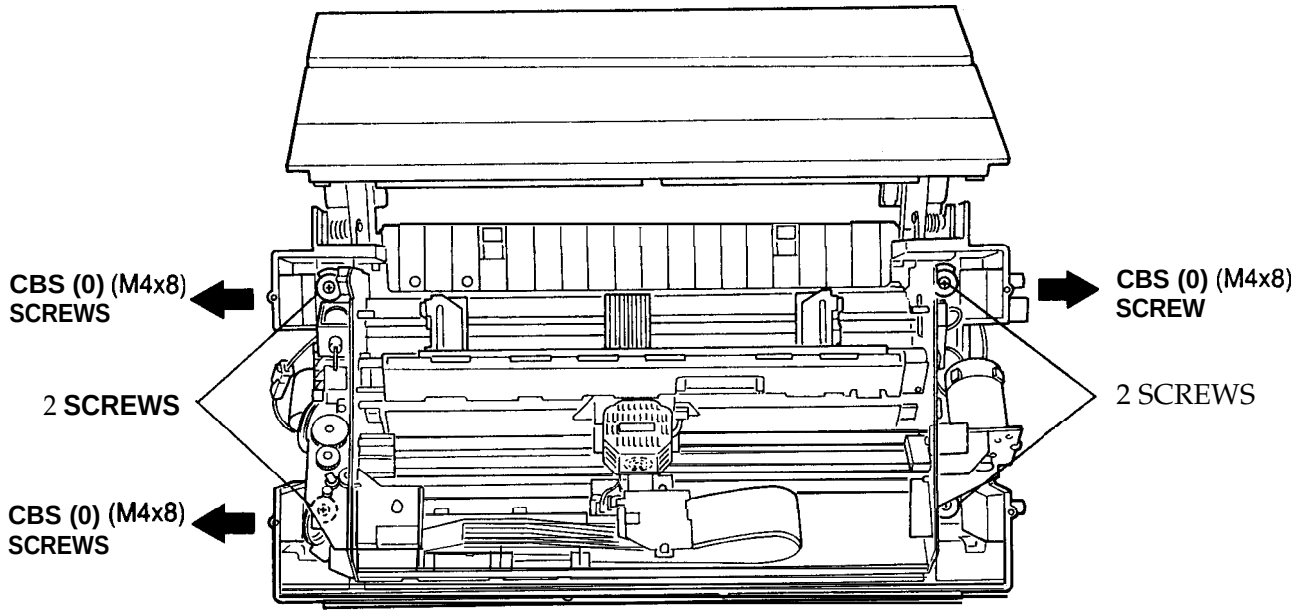


Figure 3-28. Removing the Printer Mechanism

5. Install the lift handles from the inside of the printer mechanism. Insert each handle through the 2 holes in the side frames of the printer mechanism. Then slowly lift the printer mechanism using the handles and remove it from the lowercase.

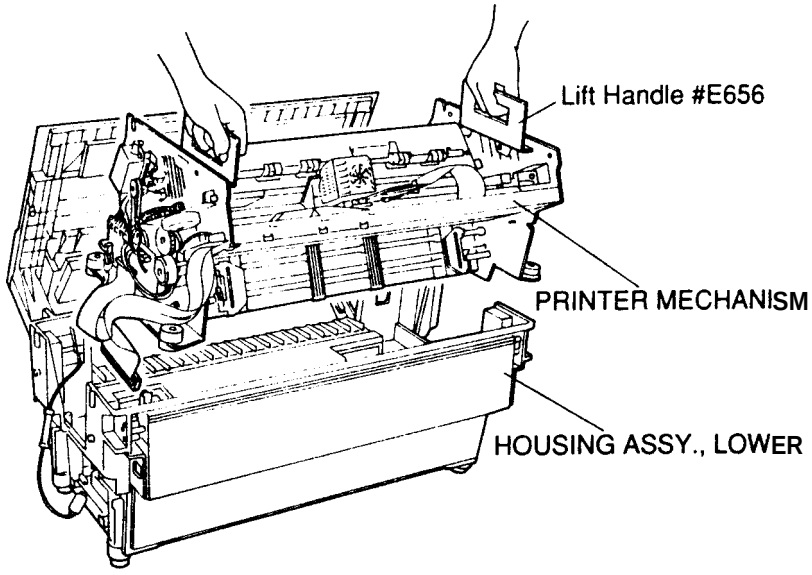


Figure 3-29. Lifting the Printer Mechanism

Assembly Note

*When you install the printer mechanism, route the cables as shown in Figure 3-30. Make sure the cables do not get caught between the **printer** mechanism and lowercase.*

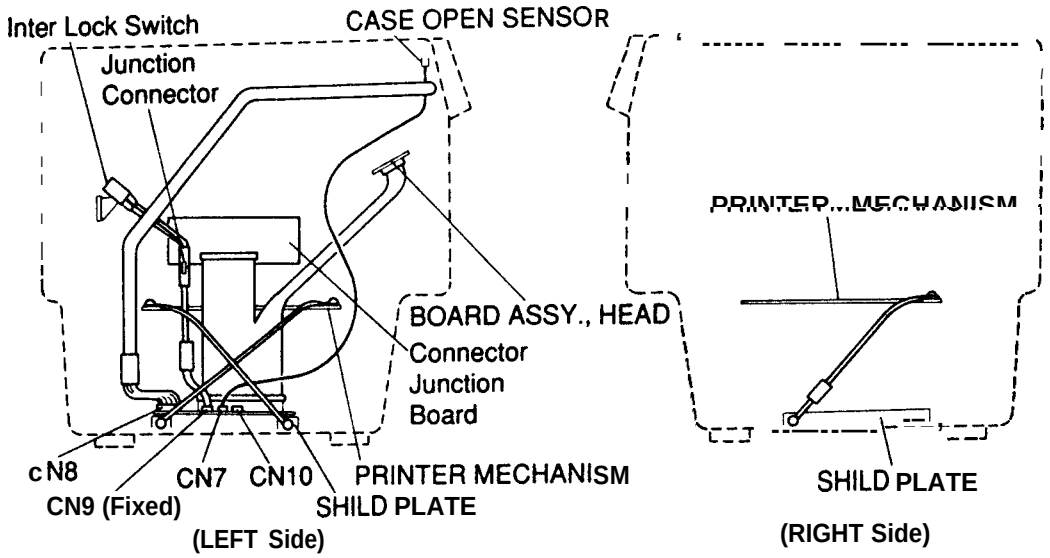


Figure 3-30. Connecting the Cables

ADJUSTMENT REQUIRED

*When you install the printer mechanism, **perform** the **following** adjustments:*
- ❏ *Platen gap motor **value** (platen gap) adjustment (described in Section 4.1.7)*
- ❏ *Bidirectional printing adjustment (described in Section 4.1.8)*

3.2.7 Printer Mechanism Disassembly

This section describes how to disassemble the printer mechanism. Before following the steps in this section, remove the printer mechanism from the printer as described in Section *3.2.6.*

3.2.7.1 Removing the Front/Rear Tractor Select Lever Assembly

1. Remove the head damper from the left side frame.
2. Remove the CPN (M3 x 6) screw securing the front/rear tractor select lever assembly to the left side frame.
3. Release the 3 hooks securing the RF motor gear cover to the front/rear tractor select lever assembly and remove the cover.

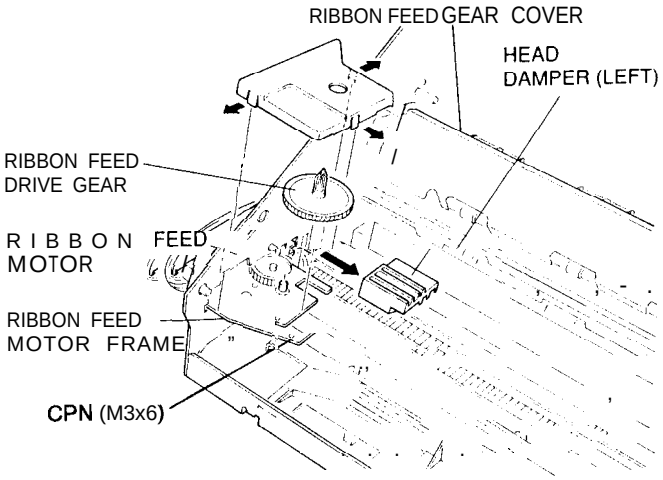


Figure 3-31. Removing the Tractor Select Lever 1

4. On the connector junction board assembly, disconnect the white, 6-pin connector for RF motor control and the yellow, 2-pin connector for the tractor select sensor.
5. Remove the CPN (M3 x 6) screw securing the front/rear tractor select lever assembly to the left side frame.
6. Remove the RF motor drive gear from the front/rear tractor select lever assembly. Then remove the lever assembly from the left side frame.

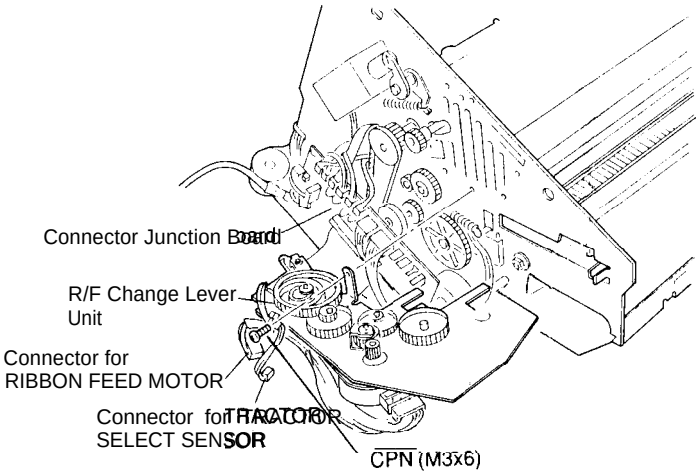


Figure 3-32. Removing the Tractor Select Lever 2

Assembly Note

When you install the front/rear tractor select lever assembly, join the tip of the tractor select lever and the tractor select gear holder correctly. (Refer to Figure 2-12.)

3.2.7.2 Disassembling the Front/Rear Tractor Select Lever Assembly

This section describes how to disassemble the front/rear tractor select lever assembly, including how to remove the RF motor and tractor select sensor.

1. Remove the front/rear tractor select lever assembly. (Refer to Section 3.2.7.1)
2. Remove the 2 CP (PS) (M3 x 6) screws securing the RF motor to the front/rear tractor select lever assembly and remove the motor. Disconnect the cable from the black connector on the RF motor.
3. Remove the E ring (#3) securing the front/rear tractor select lever and remove the lever. Remove the E ring (# 3) securing the tractor select cam and remove the mm.
4. Remove the CPS (M2 x 10) screw securing the tractor select sensor and remove the sensor.

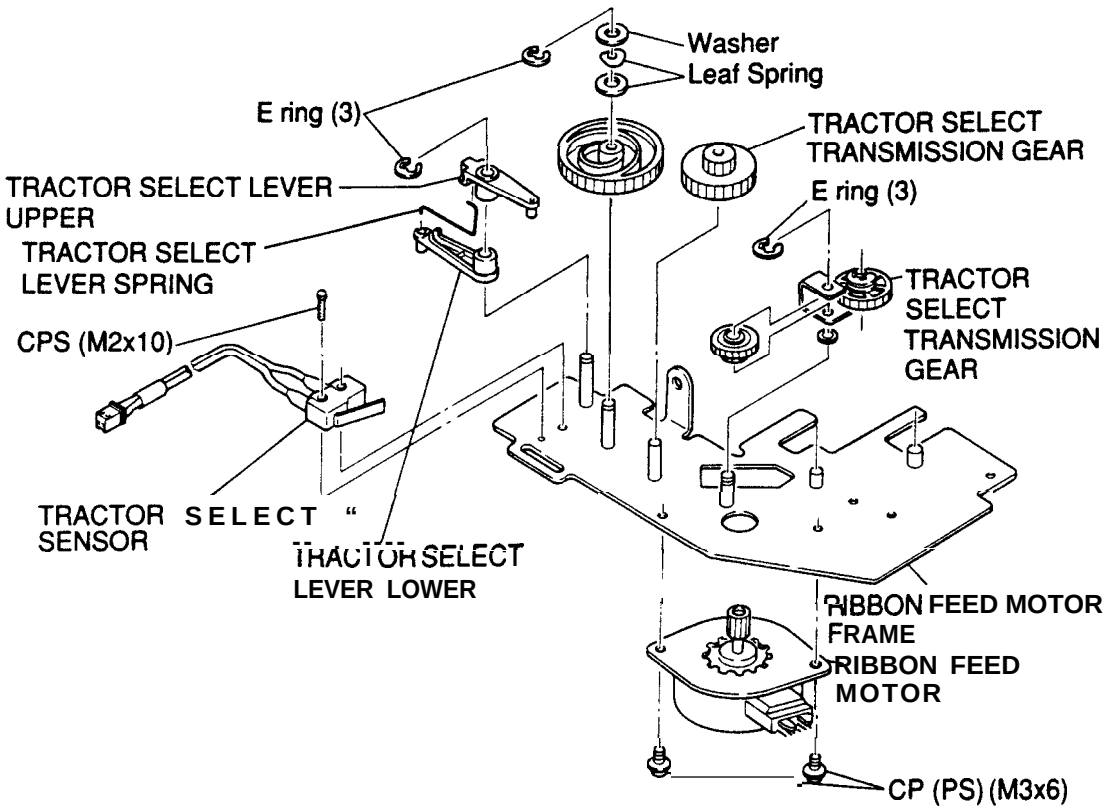


Figure 3-33. Disassembling the Tractor Select Lever

5. Using wire cutters, cut the wire band securing the RF motor and tractor select sensor cables to the front/rear tractor select lever assembly.

Assembly Note

Attach the front/rear tractor select lever to the tractor select cam as shown in Figure 3-34.

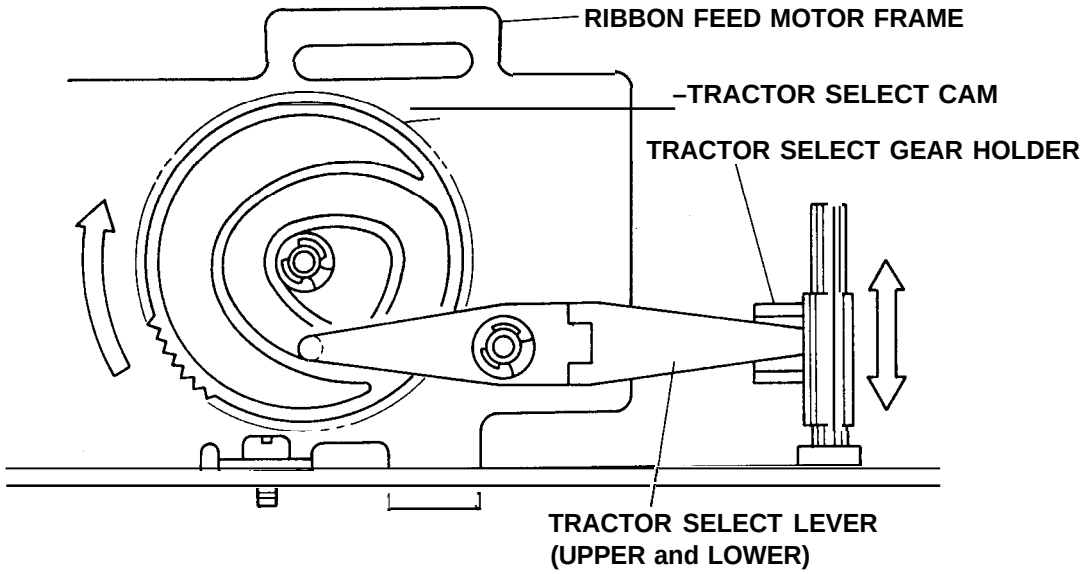


Figure 3-34. Tractor Select Lever Mounting Position

3.2.7.3 Removing Connector Junction Board Assembly and FPC Board Assembly

This section describes how to remove the connector junction board assembly (also called the relaying board) and FPC board assembly.

1. Remove the left side cover. (Refer to Section 3.2.3.2)
2. Disconnect all the cables from the connector junction board assembly. Remove the 2 CP (PS) (M3 x 6) screws securing the connector junction board assembly to the printer mechanism and then remove the connector junction board assembly.
3. Remove the front/rear tractor select lever assembly. (Refer to Section 3.2.7.1)
4. Disconnect the connector for the CR sensor (encoder) from the FPC board assembly.
5. Remove the 2 CPN (M3 x 8) screws securing the FPC cover and remove the cover. Then remove the CPB (M3 x 6) screw securing the FPC board assembly to the printer mechanism and remove the FPC board assembly.

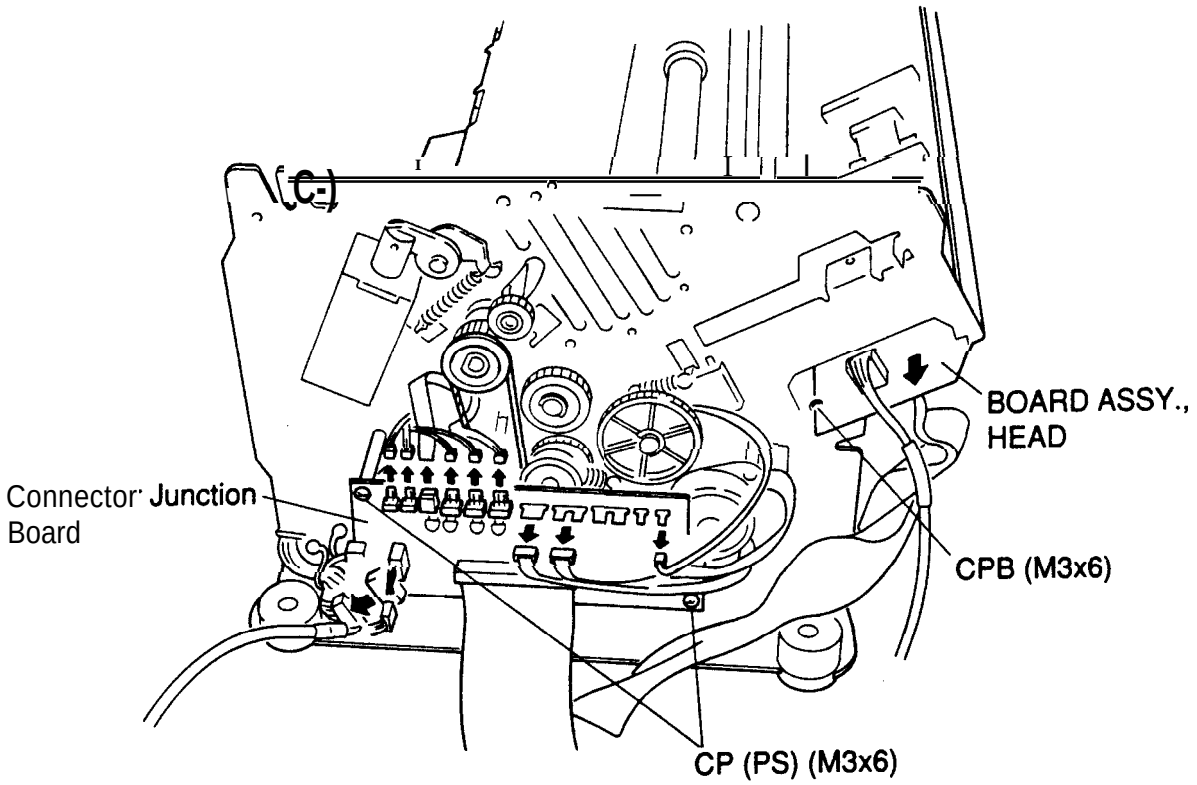


Figure 3-35. Removing the Connector Junction Board

Assembly Note

When you connect the cables to the connector junction board assembly, note that the matching connectors have the same color and number of pins. (The Appendix provides the connector pin assignments for the connector junction board assembly.)

3.2.7.4 Removing the PG Sensor and PG Motor

CAUTION

When you remove or install the PG sensor, be careful not to bend the PG motor detection board.

1. Remove the connector junction board assembly. (Refer to Section 3.2.7.3)
2. Remove the CPS (P) (M3 x 6) screw securing the PG sensor. Then pull the PG sensor forward and remove it.
3. Remove the 2 CP (PS) (M3 x 6) screws securing the PG motor and remove the motor.

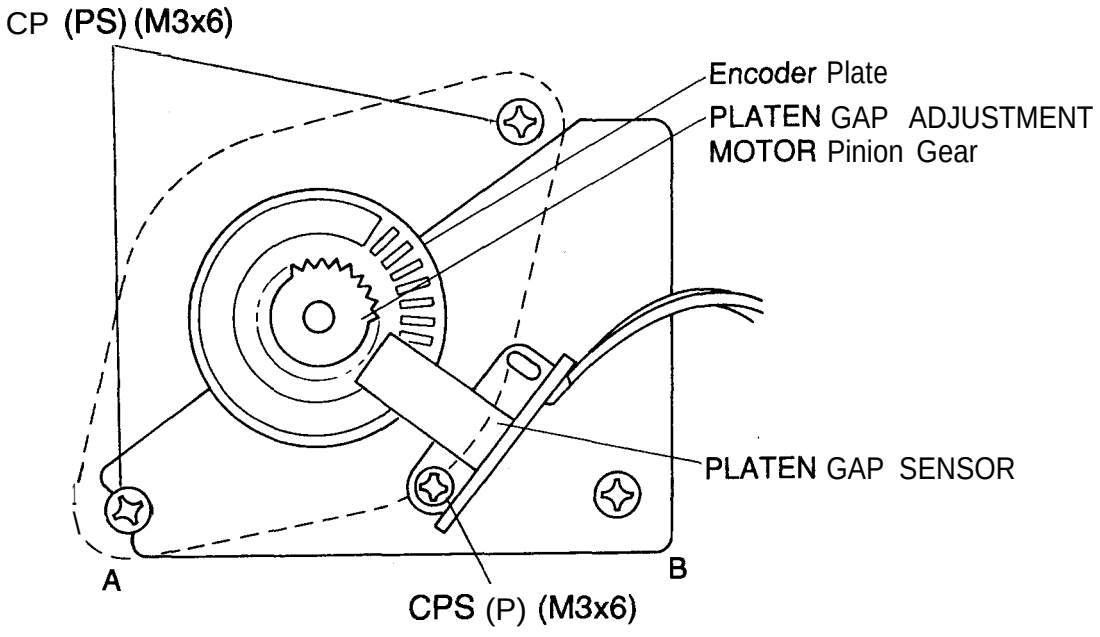


Figure 3-36. Removing the PG Sensor and PG Motor

Assembly Notes

- *When you install the PG motor, make sure the backlash between the PG motor and PG motor transmission gear is between 0.05 and 0.15 mm (almost no backlash).*
- *When you install the PG sensor, join portion A in Figure 3-36 correctly and match the screw at portion B to the frame hole, so that the PG sensor is secure.*

ADJUSTMENT REQUIRED

When you install the PG sensor or PG motor, perform the platen gap motor value (platen gap) adjustment, as described in Section 4.1.7.

3.2.7.5 Removing the Plunger and Paper Bail Assembly

This section describes how to remove the plunger (loading solenoid) and paper bail assembly.

1. Disconnect the black, 2-pin plunger connector from the connector junction board assembly, and remove the plunger cable from the connector junction board assembly. (Refer to the Appendix for more intimation on the connector junction board cable connections.)
2. Remove the 2 CPS (SP) (M3 x 6) screws securing the plunger to the left side frame and remove the plunger.
3. Remove the iron core of the plunger from the paper bail shaft.

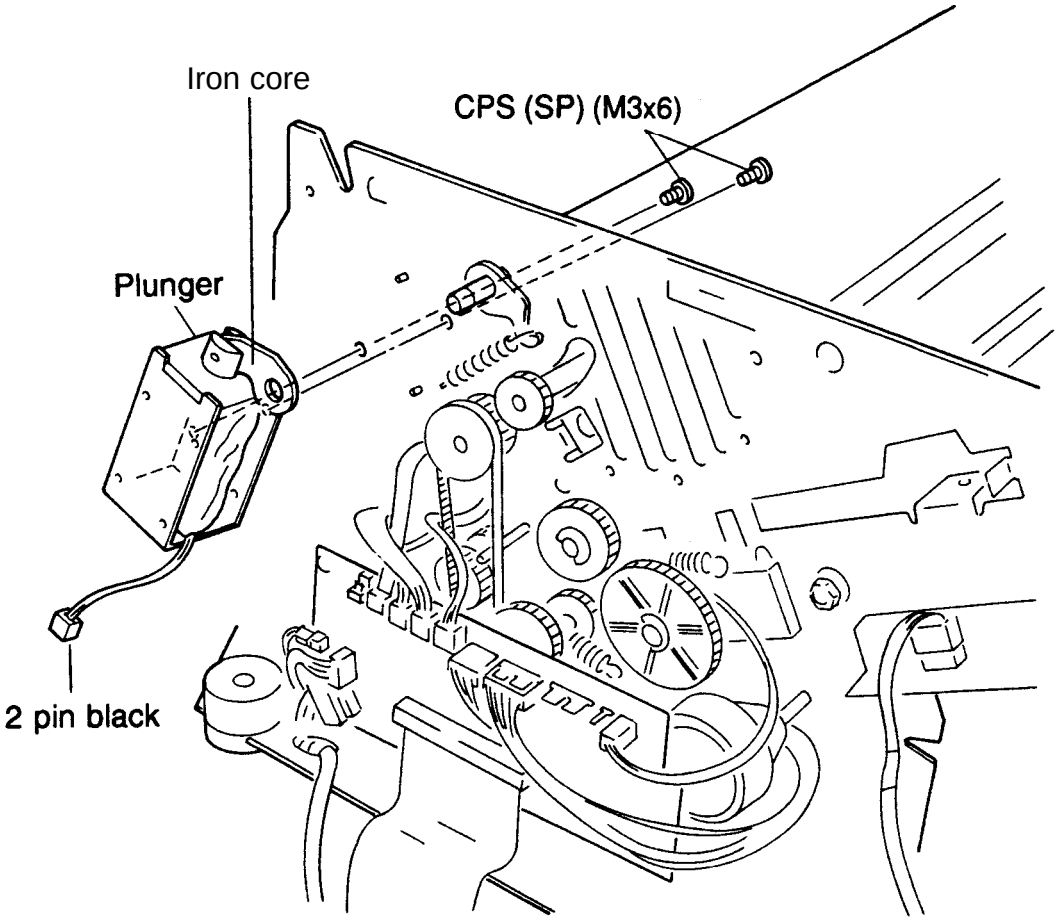


Figure 3-37. Removing the Plunger

4. Remove the left tension roller lever spring.

5. Remove the E-ring securing the paper bail shaft to the right side frame and remove the shaft holder.

6. Remove the right tension roller lever spring, and then remove the shaft holder with its washer.

7. While lifting the paper bail assembly on the right side, remove the paper bail gear; you can remove it easily by gently lifting the clip with tweezers.

8. Remove the E-ring at the right side of the paper bail shaft. Then remove the paper bail lever, paper bail balance lever, leaf spring, and shaft holder.

9. Remove the paperbail assembly.

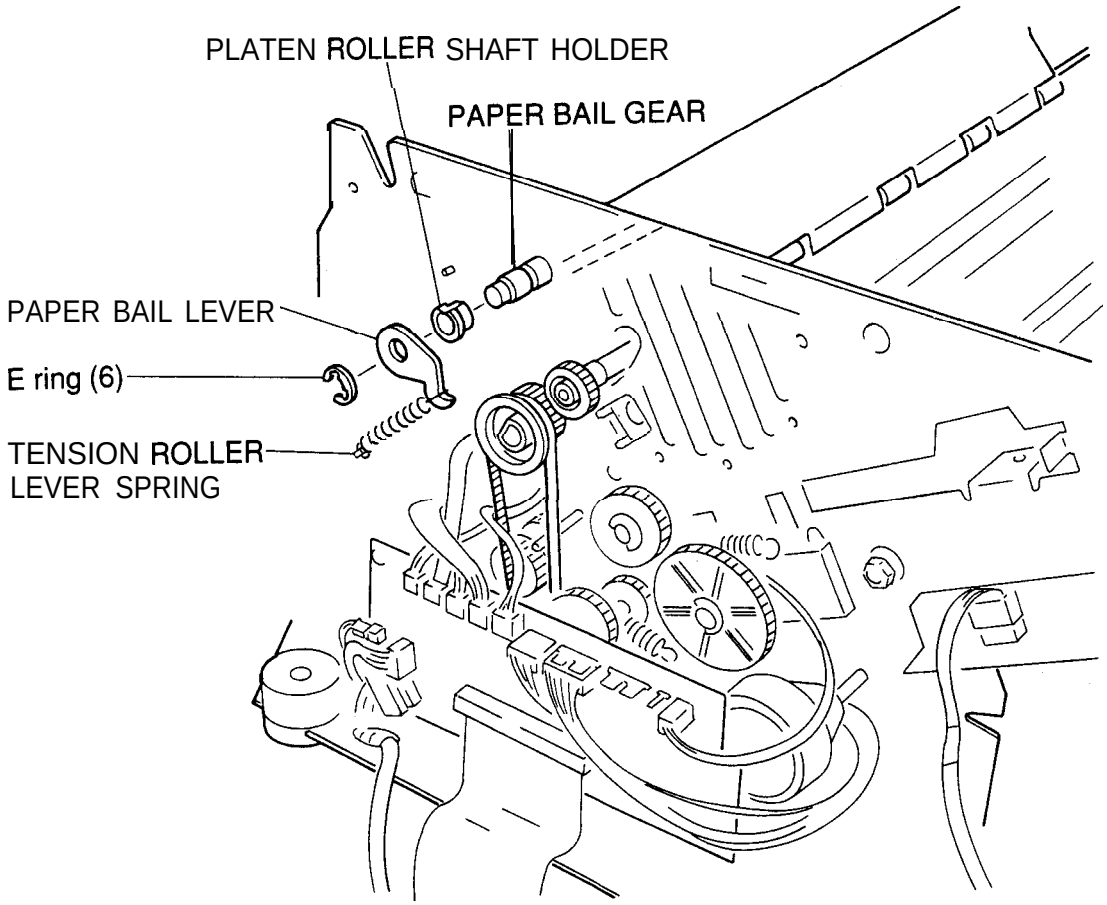


Figure 3-38. Removing the Paper Bail Assembly

3.2.7.6 Removing the Upper Paper Guide and Top PE Sensor

1. Remove the paper bail assembly. (Refer to Section 3.2.7.5)
2. Disconnect the red, 3-pin, top PE sensor connector from the connector junction board assembly. (Refer to Section 3.2.73)
3. *Remove the* 2 CPS (M4 x 6) screws securing the upper paper guide to both frames and remove the paper guide.
4. Release the 2 notches for the top PE sensor cover and remove the cover.
5. Remove the 2 CPS (SP) (M3 x 8) screws securing the top PE sensor to the upper paper guide and remove the sensor.

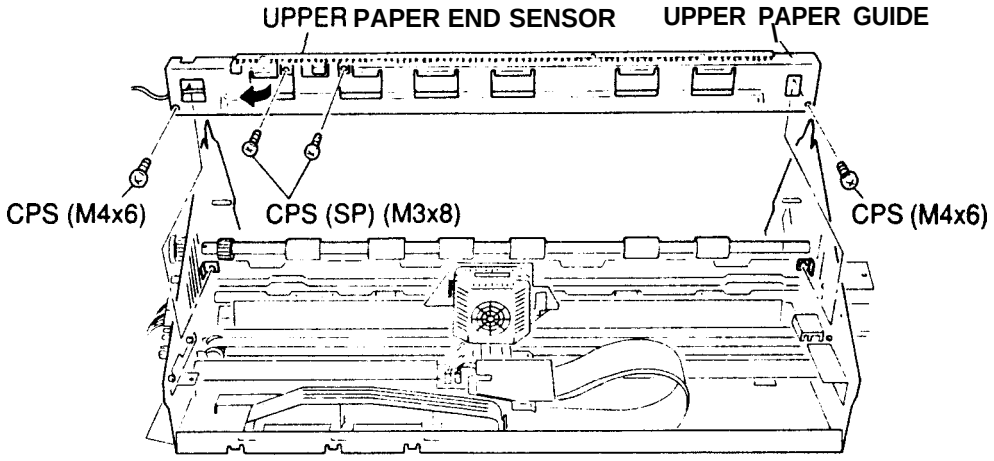


Figure 3-39. Removing the Top PE Sensor

3.2.7.7 Removing the Tension Roller Shaft

This section describes how to remove the tension roller shaft. It is easiest to remove the tension roller shaft when the paper bail assembly is removed; however, removing it is not required. (Refer to Section 3.2.7.5 for instructions on how to remove the paper bail assembly.)

1. Remove the connector junction board assembly. (Refer to Section 3.2.73)
2. While pushing on the tension pulley, remove the CR timing belt. (Refer to Section 3.2.7.19)
3. Remove the upper paper guide. (Refer to Section 3.2.7.6)
4. Remove the tension roller gear on the left side of the tension roller shaft by pulling it left and lifting the clip section with tweezers.

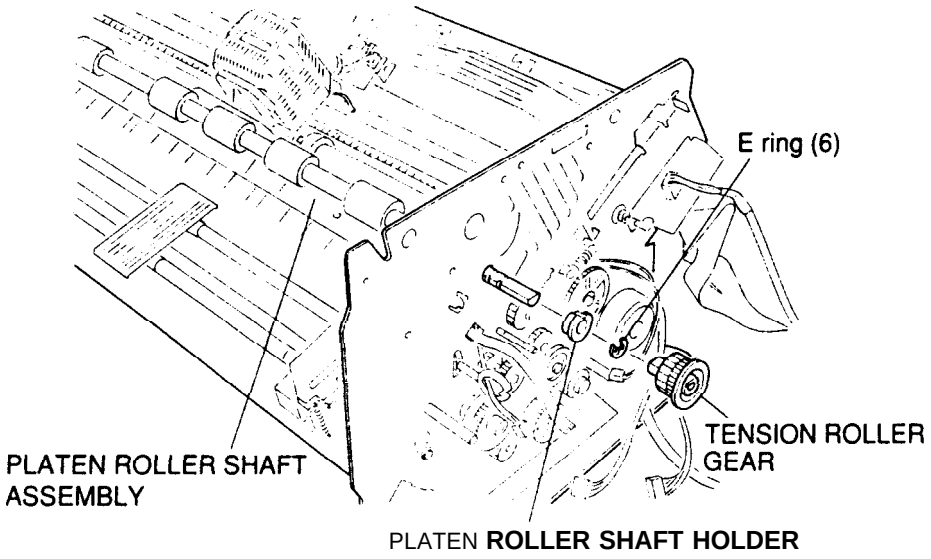


Figure 3-40. Removing the Tension Roller Gear

5. Remove the E-ring on the right side of the tension roller shaft and pull out the platen roller shaft holder with its leaf spring and washer.

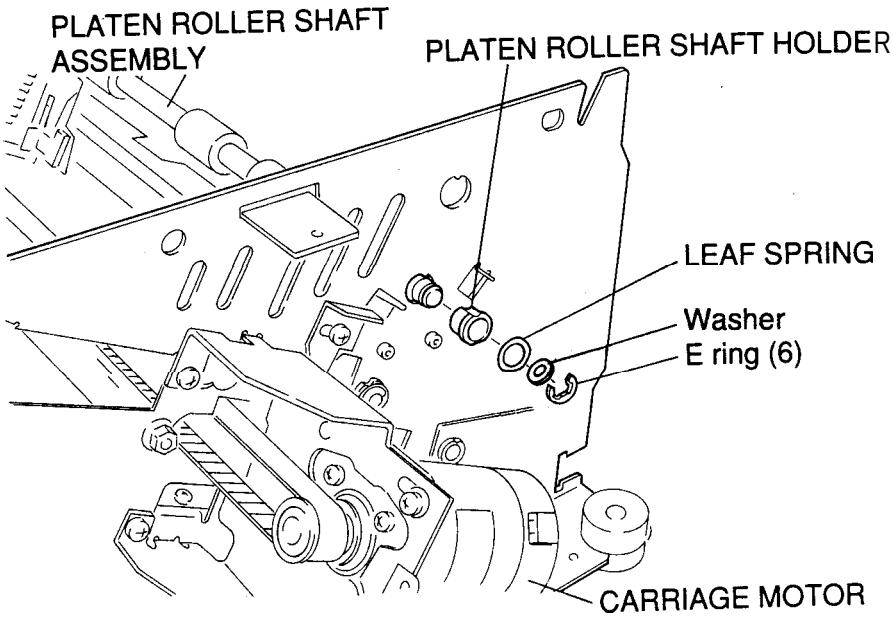


Figure 3-41. Removing the Shaft Holder

6. Remove the E-ring on the left side of the tension roller shaft and pull out the shaft holder. Then remove the tension roller shaft by pulling it right.

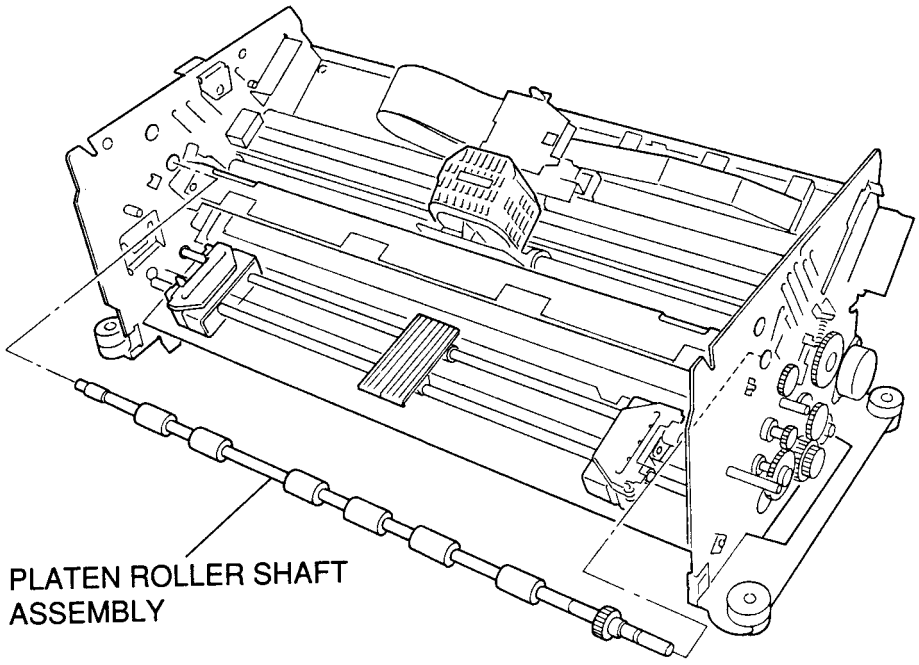


Figure 3-42. Removing the Tension Roller Shaft

3.2.7.8 Removing the Platen

1. Remove the paper bail assembly. (Refer to Section 3.2.7.5)
2. Remove the upper paper guide. (Refer to Section 32.7.6)
3. Remove the 4 hexagon screws securing the platen to both holders. Then remove the platen with the lower paper guide.
4. Slide the notches of the lower paper guide to the right and remove the paper guide from the platen. (The lower paper guide consists of three parts.)

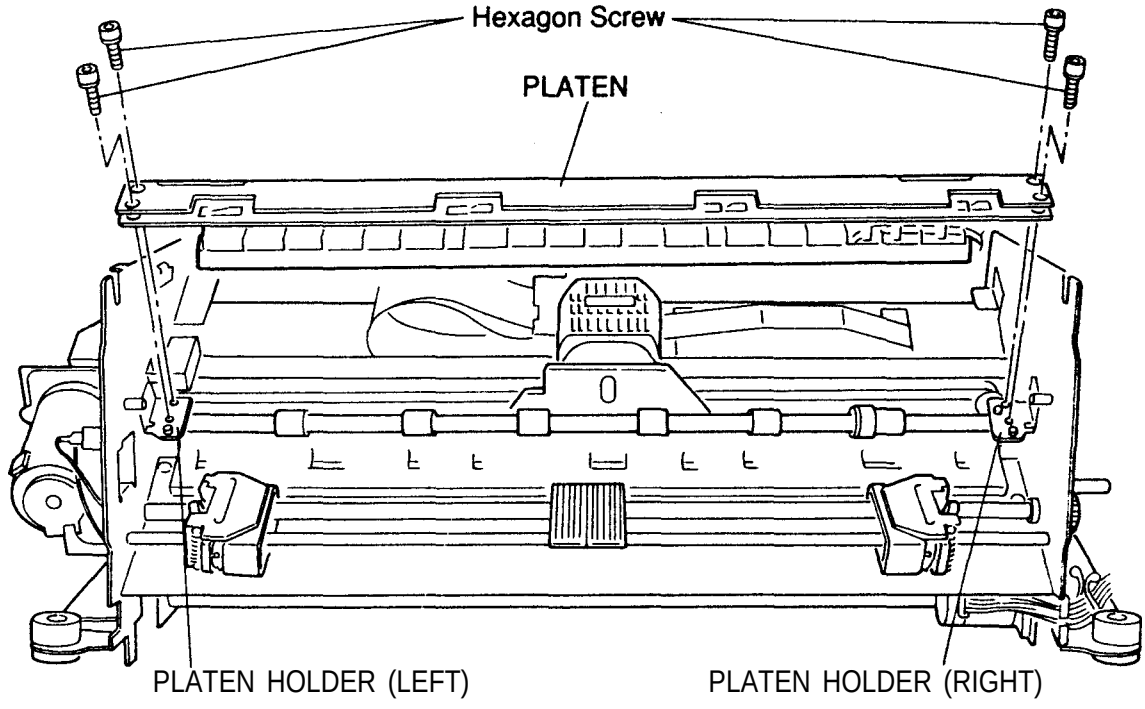


Figure 3-43. Removing the Platen

Assembly Note

When you attach the lower paper guide to the platen, start with the left most part of the paper guide and work toward the right.

ADJUSTMENT REQUIRED

When you install the platen, perform the following adjustments:
- ❑ *Carriage guide shaft parallelism adjustment (described in Section 4.1.5)*
- ❑ *Platen gap motor value (platen gap) adjustment (described in Section 4.1.7)*
- ❑ *Platen angle (right angle) adjustment (described in Section 4.1.6)*

3.2.7.9 Removing the Paper Jam Sensor

1. Remove the platen along with the lower paper guide. (Refer to Section 3.2.7.8)
2. Remove the left part of the lower paper guide. (The lower paper guide consists of three parts.)
3. Remove the CPN (SP) (M4 x 7) screw securing the left part of the lower paper guide to the platen.

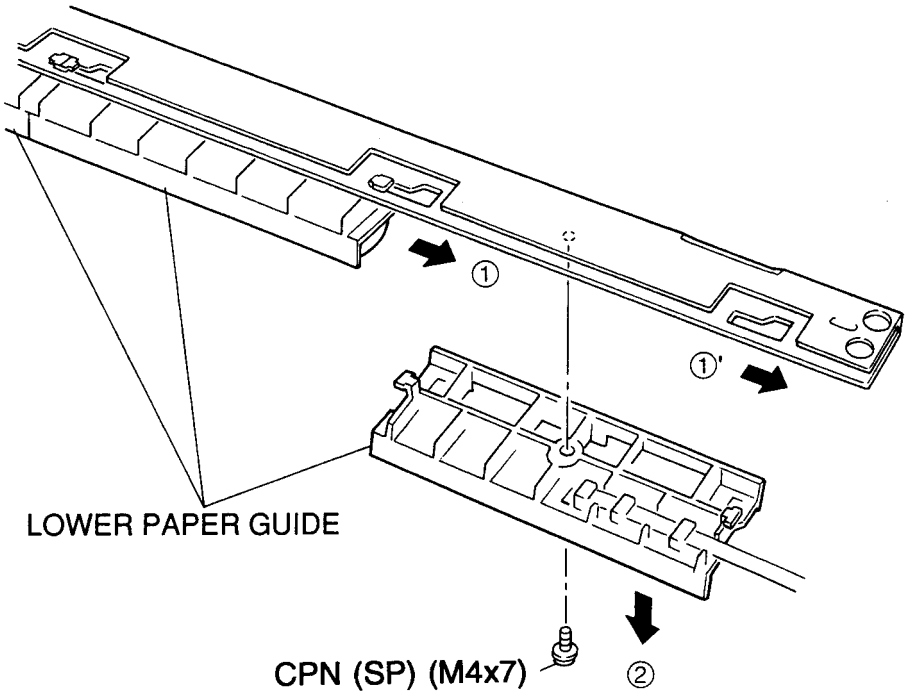


Figure 3-44. Removing the Left Part of Lower Paper Guide

3. Unhook the paper jam sensor (magnetic transistor) cover and remove the cover.
4. Remove the paper jam sensor.

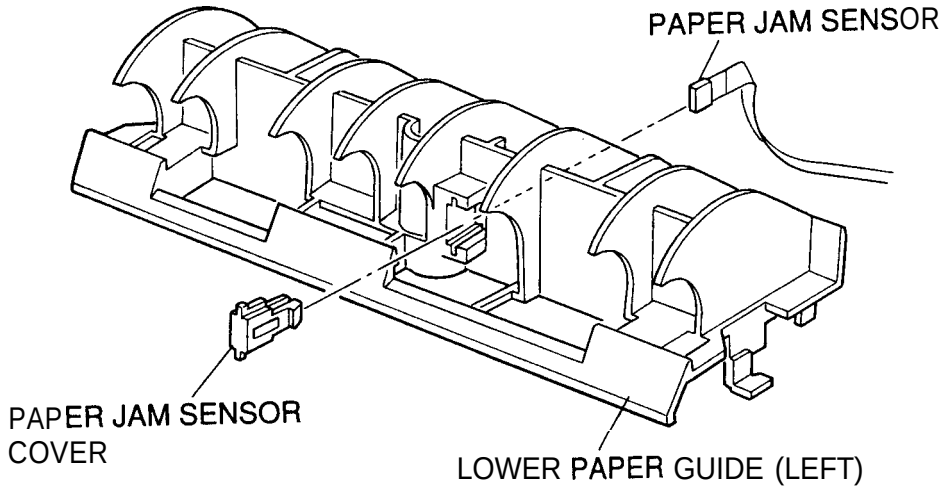


Figure 3-45. Removing the Paper Jam Sensor

Assembly Note

When you attach the paper jam sensor to the right part of the lower paper guide, make sure it is oriented correctly (front to back).

3.2.7.10 Removing the Pull Tractor Sensor

1. Remove the upper paper guide. (Refer to Section 3.2.7.6)
2. Disconnect the red, 2-pin, pull tractor sensor connector from the connector junction board assembly.
3. Remove the CPN (SP) (M2 x 14) screw securing the pull tractor sensor (a micro-switch type sensor) to the left side frame and remove the sensor.

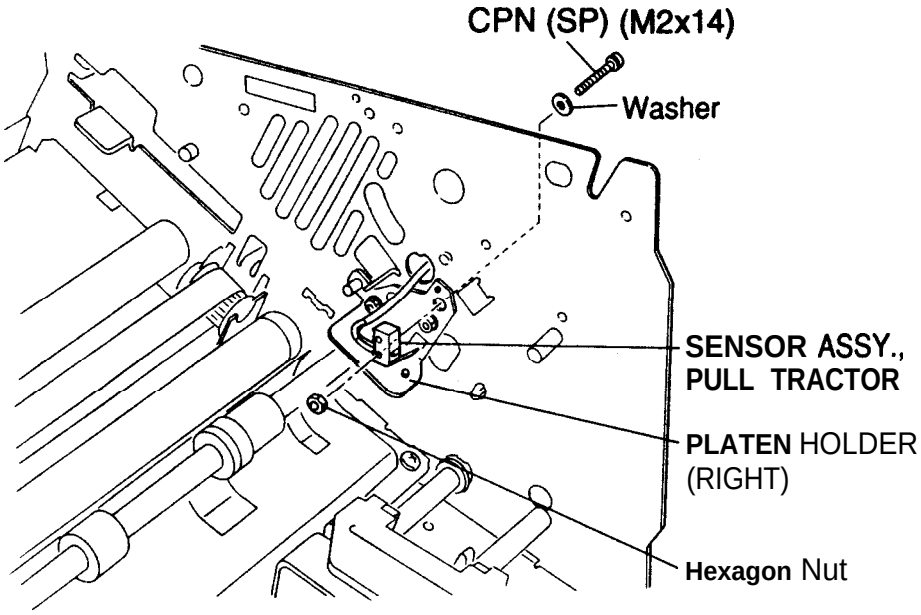


Figure 3-46. Removing the Pull Tractor Sensor

3.2.7.11 Removing the Paper Width (PW) Sensor

1. Remove theprinthead. (Refer to Section 3.2.1)
2. Remove the CPN (SP) (M2 x 6) screw securing the PW sensor to the maskless holder.

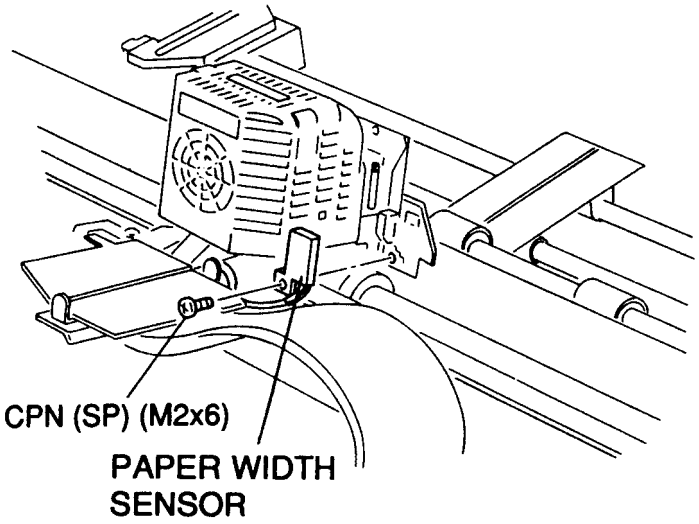


Figure 3-47. Removing the PW Sensor

3.2.7.12 Removing the PG Home Sensor

1. Remove the front/rear tractor select lever assembly. (Refer to Section 3.2.7.2)
2. Remove the E-ring securing the carriage guide shaft gear to the rear carnage guide shaft.

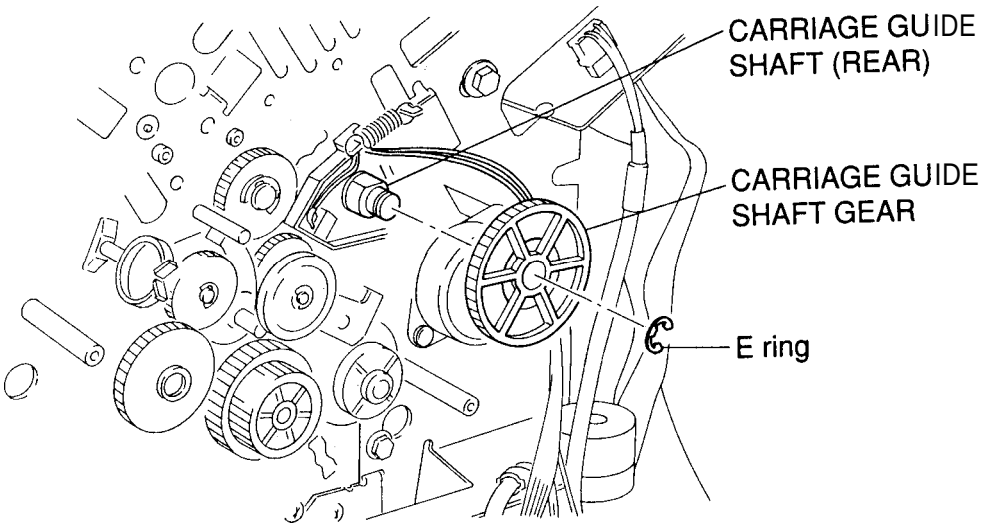


Figure 3-48. Removing the Carriage Guide Shaft Gear

3. Disconnect the white, 2-pin, PG home sensor connector from the connector junction board assembly.
4. Detach the hook securing the PG home sensor and remove the sensor.

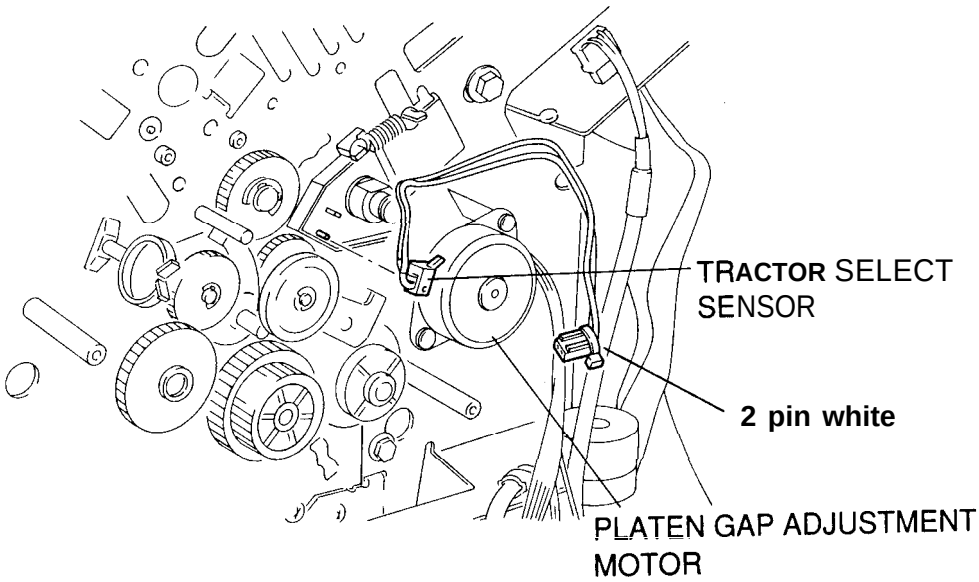


Figure 3-49. Removing the PG Home Sensor

3.2.7.13 Removing the PF Motor

1. Remove the connector junction board assembly. (Refer to Section 3.2.7.3)
2. Remove the 3 CP (PS) (M4 x 8) screws securing the PF motor to the left side frame.
3. Remove the PF motor from the inside of the left side frame.

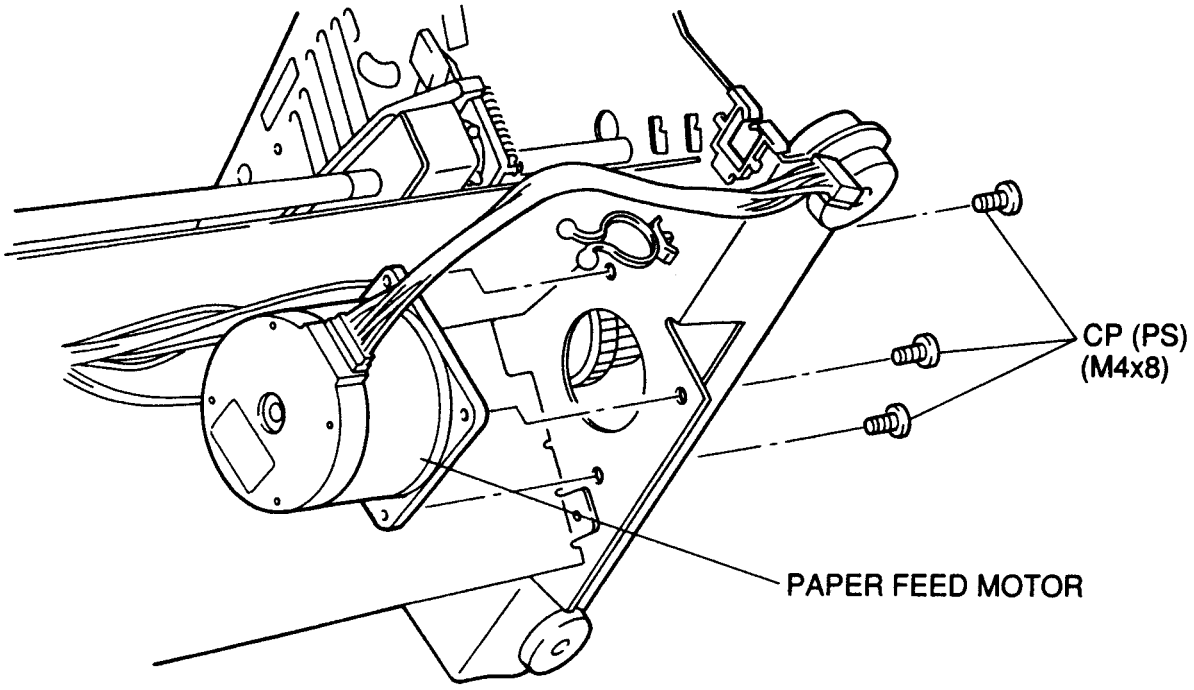


Figure 3-50. Removing the PF Motor

3.2.7.14 Removing the Left Side Frame Gears

1. Remove the front/rear tractor select lever assembly. (Refer to Section 3.2.7.2)
2. Remove the connector junction board assembly. (Refer to Section 3.2.7.3)
3. Remove the PG motor. (Refer to Section 3.2.7.4)
4. Remove the series of gears in the order indicated by the numbers in Figure 3-51.

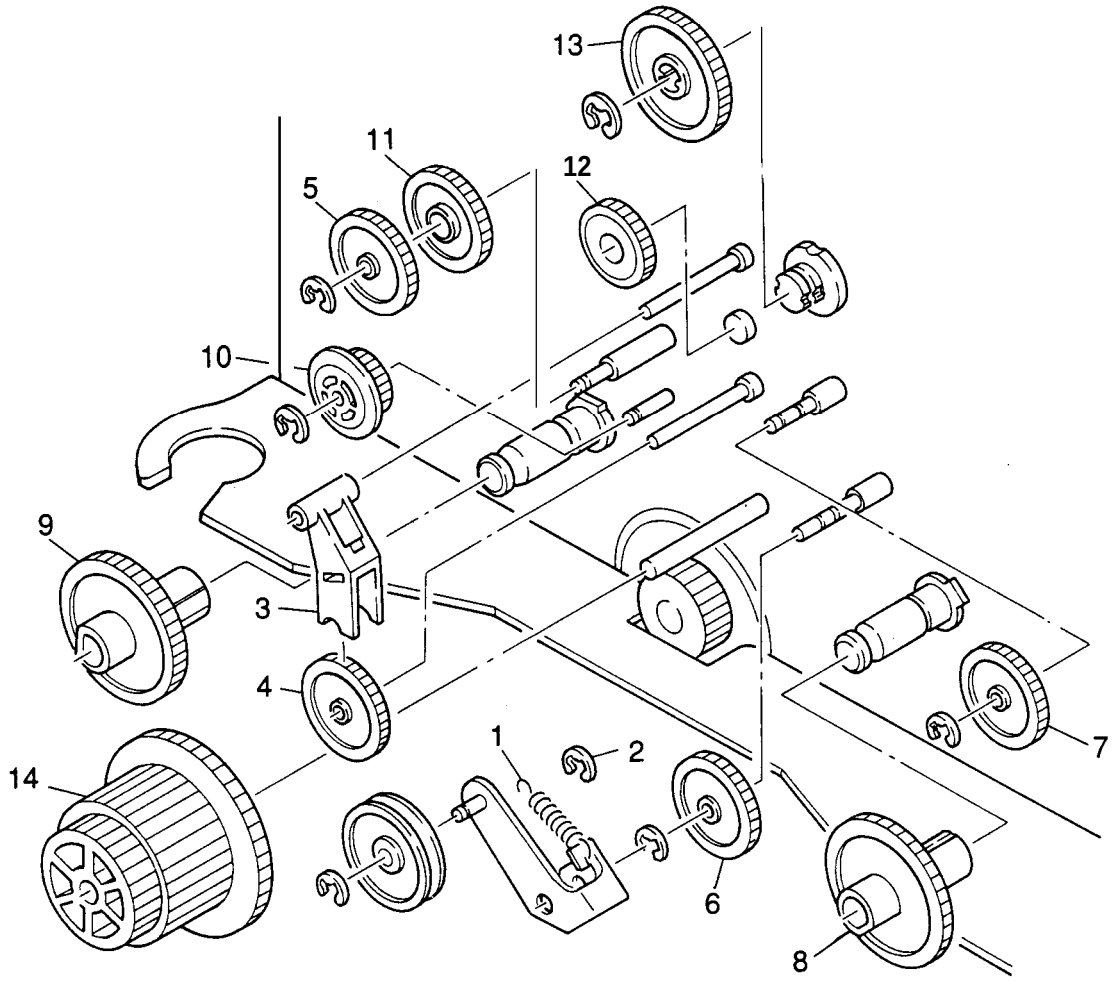


Figure 3-51. Removing the Left Side Frame Gears

3.2.7.15 Removing the Front Tractor Assembly

This section describes how to remove the front tractor assembly. You need to remove the front tractor assembly before removing the white, 3-pin, front PE sensor connector from the connector junction board assembly.

1. Remove the connector junction board assembly. (Refer to Section 3.2.73)
2. Loosen the hexagonal nuts securing the shaft at the front of the front tractor assembly to the left and right side frames.
3. After loosening the hexagonal nut on the right side, remove the right tractor wire spring holder set.
4. To release the tractor wire, remove the CPN (M4 x 8) screw securing the left tractor wire spring holder set to the left side frame.
5. Remove the E-ring Securing the shaft at the back of the front tractor assembly to the left side frame.
6. To remove the front tractor assembly, first move it to the left. Remove the right side of the shaft by pulling it forward, and then remove the left side of the shaft.

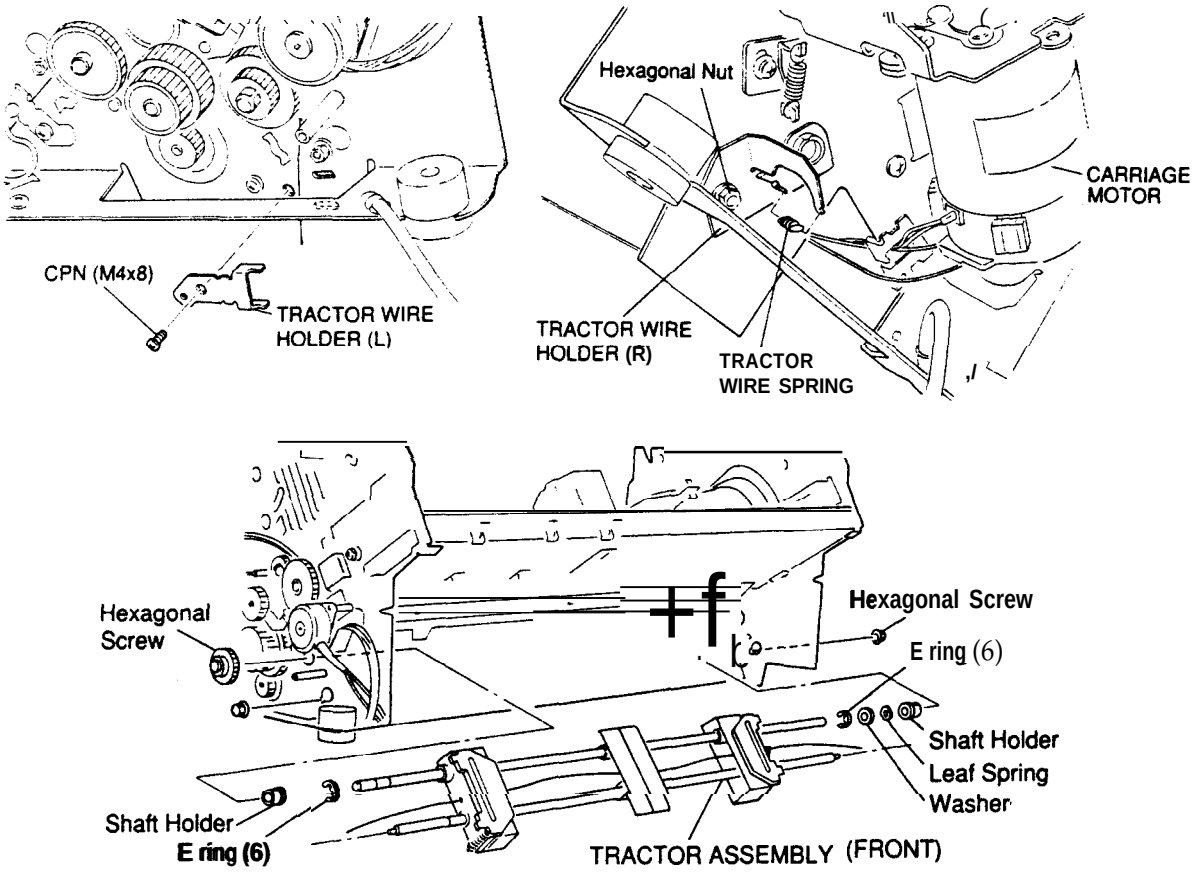


Figure 3-52. Removing the Front Tractor Assembly

ADJUSTMENT REQUIRED

When you install the front tractor assembly, perform the tractor wire spring adjustment, as described in Section 4.1.3.

3.2.7.16 Removing the Rear Tractor Assembly

This section describes how to remove the rear tractor assembly. You need to remove the rear tractor assembly before removing the black, 3-pin, rear PE sensor connector from the connector junction board assembly.

1. Remove the connector junction board assembly. (Refer to Section 3.2.7.3)
2. Remove the rear tractor gear.
3. Loosen the 2 hexagonal nuts securing the shaft at the front of the rear tractor assembly to the left and right side frames.
4. After loosening the hexagonal nut on the right side, remove the right tractor wire holder.
5. To release the tractor wire, remove the CPN (M4 x 8) screw securing the left tractor wire spring wire set to the left side frame. (Refer to Section 3.2.7.15)
6. Remove the 2 E-rings securing the shaft at the back of the rear tractor assembly to the both sides frame.
7. To remove the rear tractor assembly, first move it to the left. Remove the right side of the shaft by pulling it forward, and then remove the left side of the shaft.

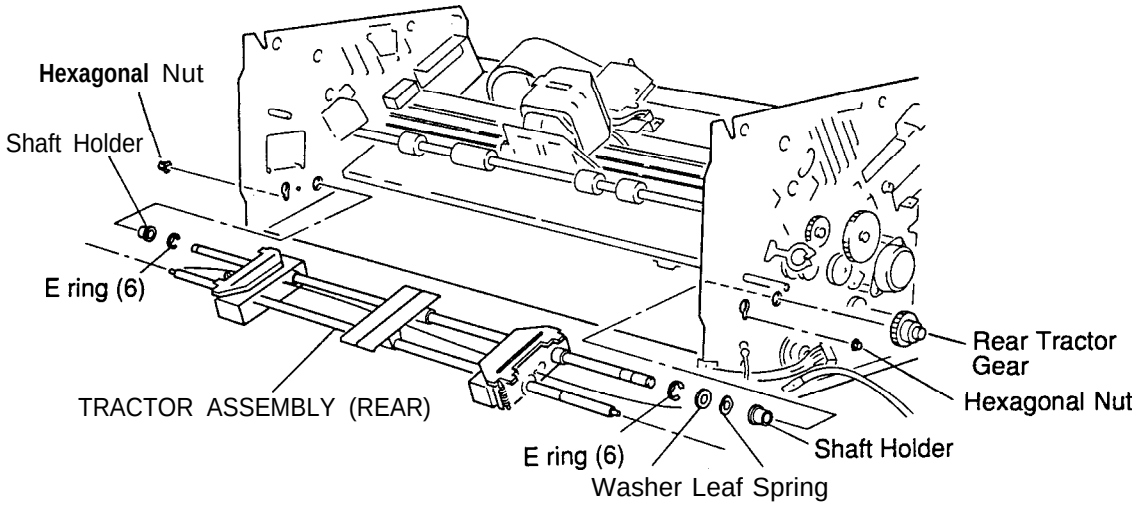


Figure 3-53. Removing the Rear Tractor Assembly

ADJUSTMENT REQUIRED

When you install the rear tractor assembly, perform the tractor wire spring adjustment, as described in Section 4.1.3.

3.2.7.17 Removing the CR Motor

1. Remove the printhead. (Refer to Section 3.2.1)
2. Remove the printer mechanism. (Refer to Section 3.2.6)
3. Remove the CP (PS) (M3 x 6) screw securing the timing belt holder and timing belt.

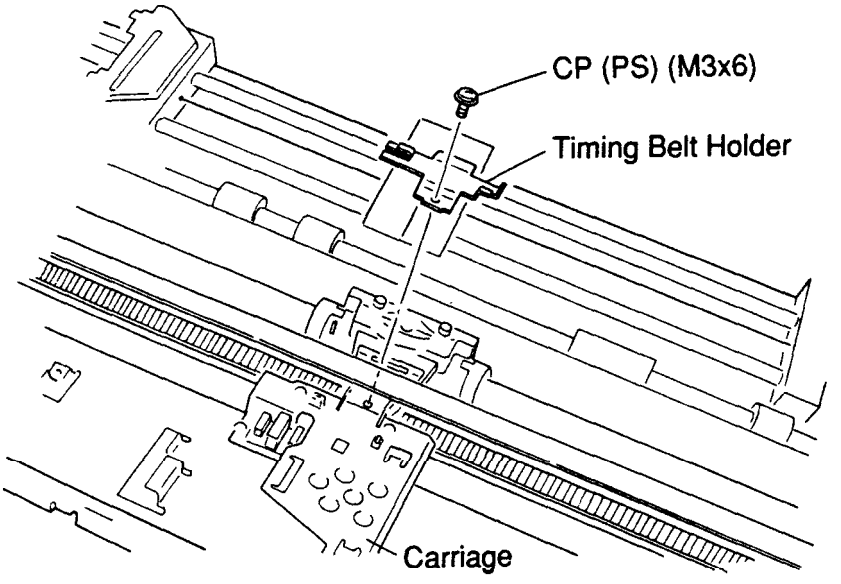


Figure 3-54. Removing the Timing Belt Holder

4. Disconnect the CR motor cable from the white, 2-pin connector on the connector junction board assembly and unhook the CR motor cables at the base frame of the printer mechanism.
5. Remove the 3 CBS (SP) (M4 x 10) screws securing the CR motor to the right side frame and remove the motor.

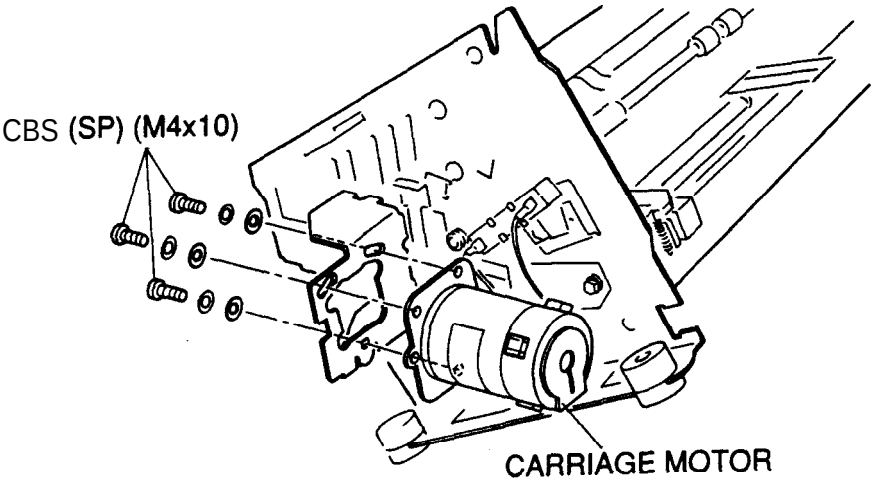


Figure 3-55. Removing the CR Motor

ADJUSTMENT REQUIRED

When you install the CR motor, perform the carriage timing belt tension adjustment, as described in Section 4.1.2.
When you install the printhead, perform the platen gap motor value (platen gap*) adjustment, as described in Section 4.1.7.*

3.2.7.18 Removing the CR (Carriage Encoder) Sensor

1. Remove the printhead. (Refer to Section 3.2.1)
2. Disconnect the red, 4-pin, CR sensor connector from the connector junction board assembly.
3. Remove the CPN (M3 x 5) screw securing the CR sensor to the carriage and remove the sensor.

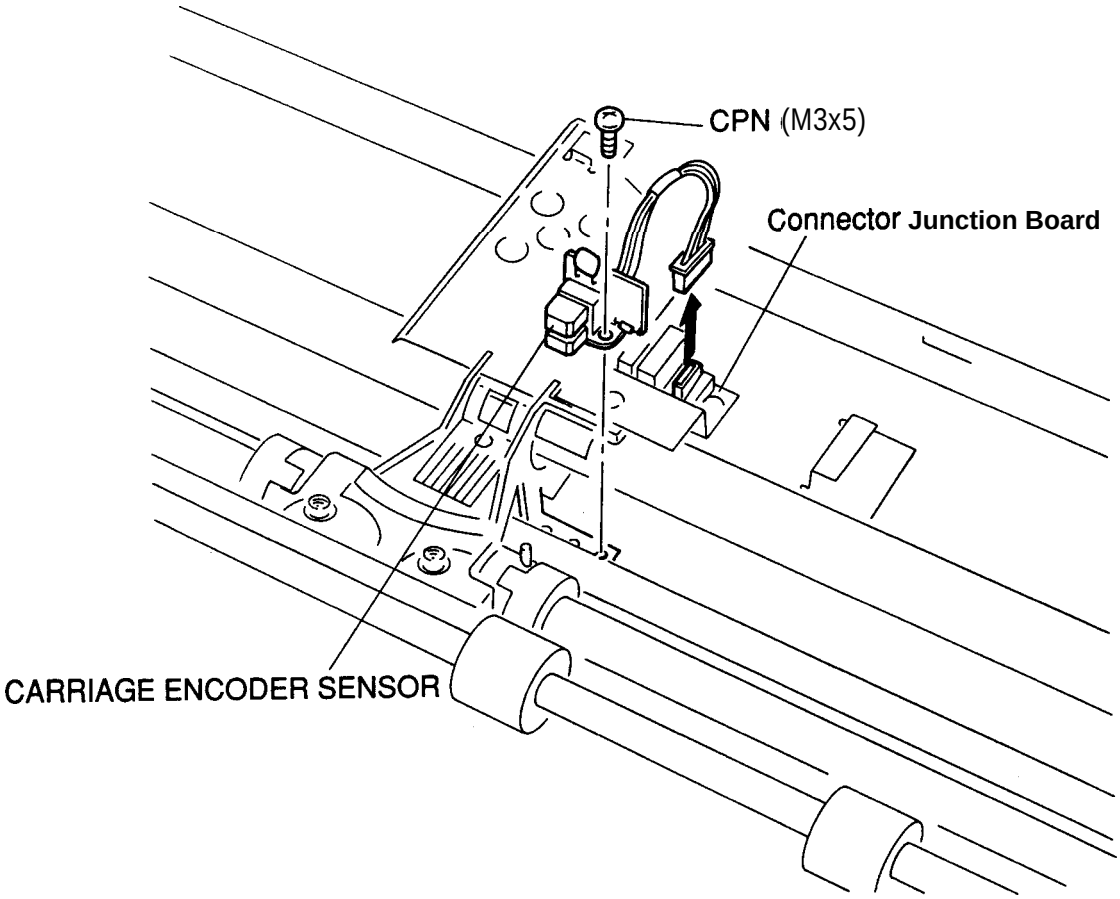


Figure 3-56. Removing the CR Sensor

3.2.7.19 Disassembling the Carriage Mechanism

This section describes how to disassemble the carriage mechanism, including removing the carriage, CR timing belt, and front and rear carriage guide shafts.

1. Remove the CR motor. (Refer to Section 3.2.7.17)
2. Remove the belt pulley from the belt pulley holder.

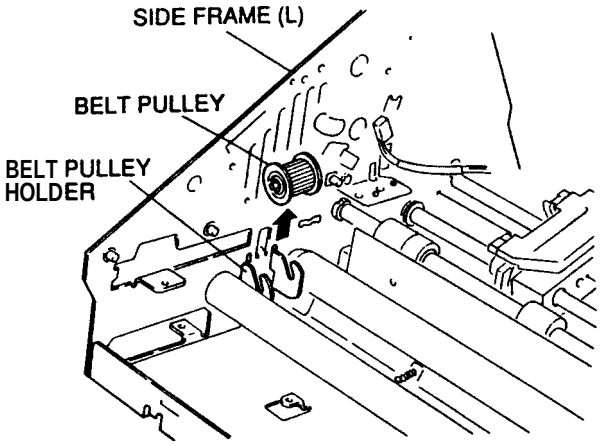


Figure 3-57. Removing the Belt Pulley

3. Unhook the spring securing the encoder belt to the right side frame.
4. Loosen the hexagonal nuts securing the front carriage guide shaft to the left and right side frames. Remove the front carriage guide shaft by pulling it through the hole in the right side frame. (When you remove the front carriage guide shaft, move the carriage to the left side.)
5. On the left side frame, remove the E-ring securing the carriage guide shaft gear to the rear carriage guide shaft, then remove the carriage guide shaft gear and paper thickness sensor holder.
6. Remove the PG motor. (Refer to Section 3.2.7.4)

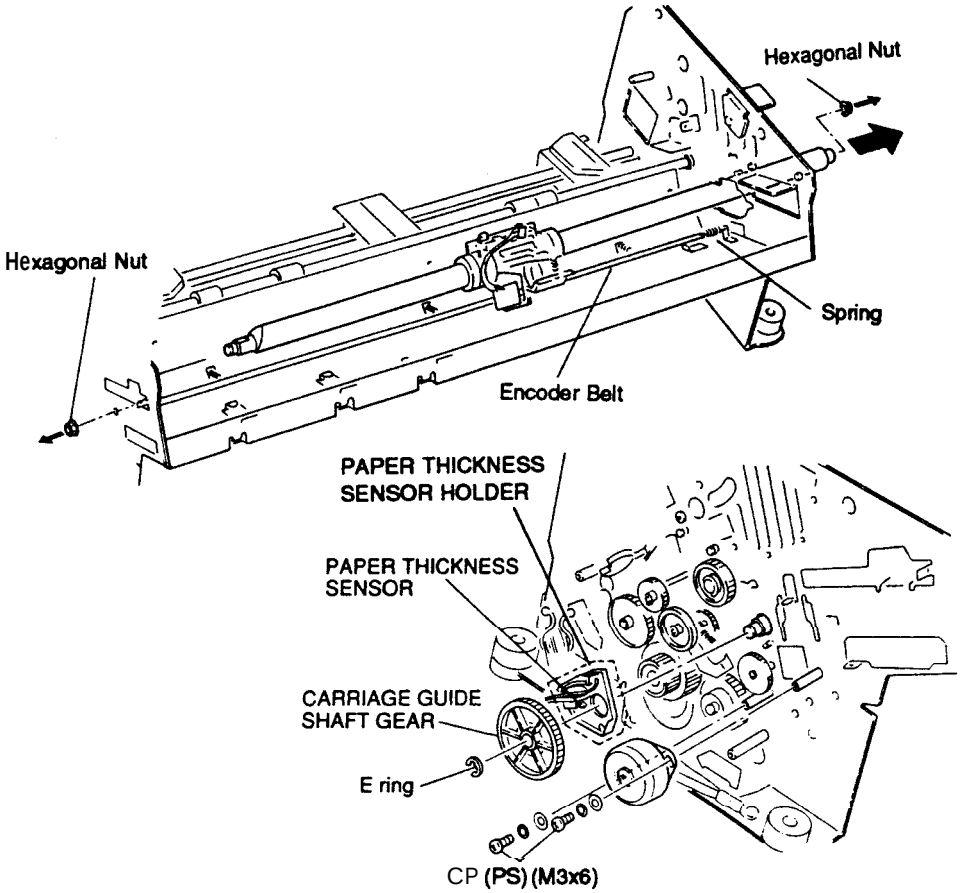


Figure 3-58. Removing the Front Carriage Guide Shaft

7. Remove the carriage damper from therightside frame, and remove the 3 CBS (0) (M4 × 8) screws securing the carnage motor holder to the right side frame.
8. Remove the right guide shaft holder lever.
9. Remove the 2 CP(PS) (M4 x 6) screws securing the rear carriage guide parallelism adjust lever and remove the lever.

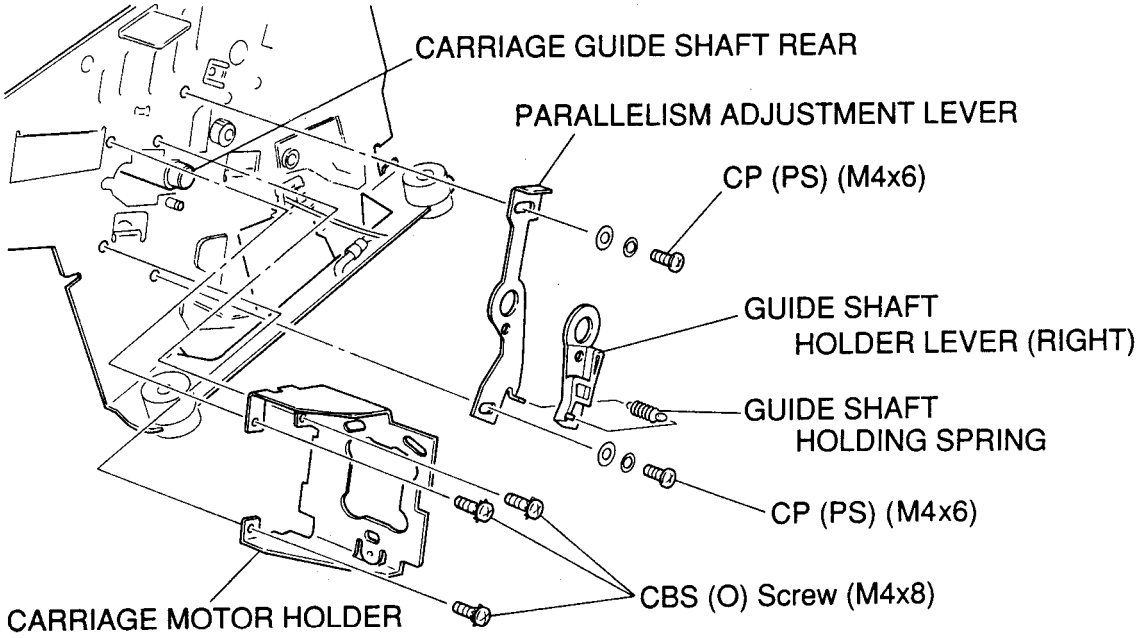


Figure 3-59. Removing the Right Side Frame

10. Remove the rear carriage guide shaft with the carriage base from the right side frame.

Assembly Note

When you install the front carriage guide shaft, tighten the screws while pushing the shaft toward the platen.

ADJUSTMENT REQUIRED

When you assemble the carriage mechanism, perform the following adjustments:
- ❑ *Carriage timing belt tension adjustment (described in Section 4.1.2)*
- ❑ *Carriage guide shaft parallelism adjustment (described in Section 4.1.5)*
- ❑ *Platen gap motor value (platen gap) adjustment (described in Section 4.1.7)*
- ❑ *Bidirectional printing adjustment (described in Section 4.1.8)*

3.2.7.20 Removing the Paper Guide Support Plate

1. Disassemble the carriage mechanism and remove all the parts related to the carriage. (Refer to Section 3.2.7.19)
2. Referring to the exploded diagram in the Appendix, remove the paper guide support plate.

ADJUSTMENT REQUIRED

When you install the paper guide support plate, perform the following adjustments:
- ❑ *Carriage timing belt tension adjustment (described in Section 4.1.2)*
- ❑ *Carriage guide **shaft parallelism** adjustment (described in Section 4.1.5)*
- ❑ *Platen gap motor value (platen gap) adjustment (described in Section 4.1.7)*
- ❑ *Bidirectional printing adjustment (described in Section 4.1.8)*

3.2.7.21 Removing the Platen Roller

1. Remove the platen. (Refer to Section 3.2.7.8)
2. Remove the CRmotor. (Refer to Section 3.2.7.17)
3. Remove the left side frame gears. (Refer to Section 3.2.7.14)
4. Referring to the exploded diagram in the Appendix, remove the platen roller.

ADJUSTMENT REQUIRED

When you install the platen roller, perform the following adjustments:
- ❑ *Carriage timing belt tension adjustment (described in Section 4.1.2)*
- ❑ *Carriage guide **shaft parallelism** adjustment (described in Section 4.1.5)*
- ❑ *Platen gap motor value (platen gap) adjustment (described in Section 4.1.7)*
- ❑ *Bidirectional printing adjustment (described in Section 4.1.8)*

CHAPTER 4 Adjustments

Table of Contents

List of Figures

4.1 PRINTER MECHANISM ADJUSTMENTS

This section describes the printer mechanism adjustments for the DFX-5000+. Whenever the printer is disassembled and the printer parts mentioned in this section are replaced or repaired, perform the appropriate adjustments to ensure proper printer operation. Perform adjustments before assembling the printer.

4.1.1 PG Motor Backlash Adjustment

In the PG motor backlash adjustment, the PG motor pinion gear must mesh smoothly with the carriage guide shaft gear cog. If the pinion gear is poorly aligned or the pinion gear and cog are too tight, printer operation is noisy or the character density is incorrect.

1. Loosen the 2 screws securing the PG motor to the left side frame. (Refer to Section 3.2.7.4)
2. Make sure the PG motor pinion gear is properly aligned with the carriage guide shaft gear cog. Move the PG motor until there is 0.05 to 0.15 mm (0.002 to 0.01 inches) between the PG motor pinion gear and carriage guide shaft gear cog. Then tighten the 2 screws.

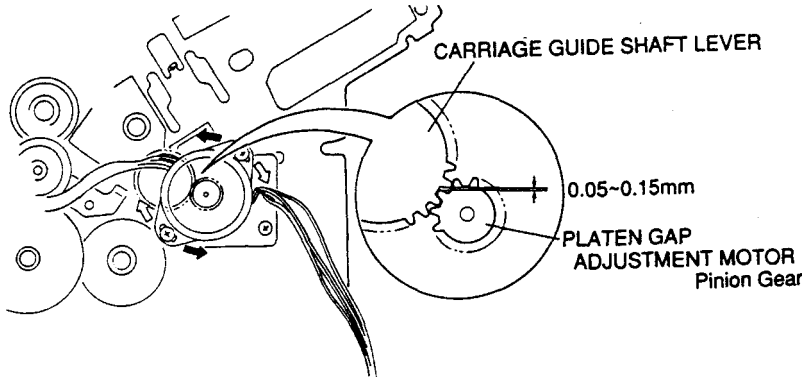


Figure 4-1. Platen Gap Motor Backrash Adjustment

4.1.2 Carriage Timing Belt Tension Adjustment

The CR motor timing belt tension must be adjusted when any carriage mechanism part (such as the CR motor, belt pulley, or carriage timing belt) is disassembled. Remove the printer mechanism before performing this adjustment. (Refer to Section 3.2.6)

WARNING

***Before** performing this adjustment, **carefully** secure the printer mechanism because a 4 **kg (8.8 lb)** force is applied to it when the tension **lever** is pulled in the horizontal direction.*

1. Refer to Figure 42 and loosen the 3 tension adjustment screws on the CR motor. (Loosen the screws, but do not remove them.)
2. Confirm that the carriage timing belt is attached properly and that no load is applied to it.
3. Insert the tension gauge hook through the hole in the tension lever. (Refer to Figure 42.)
4. Pull the tension gauge horizontally to apply a 4 kg (8.8 lb) force.
5. Move the belt left and right while pulling the tension gauge, and move the motor pulley slightly.
6. Tighten the 3 tension adjustment screws and secure them while the 4 kg (8.8 lb) force is applied.
7. Finish tightening the 3 tension adjustment screws.

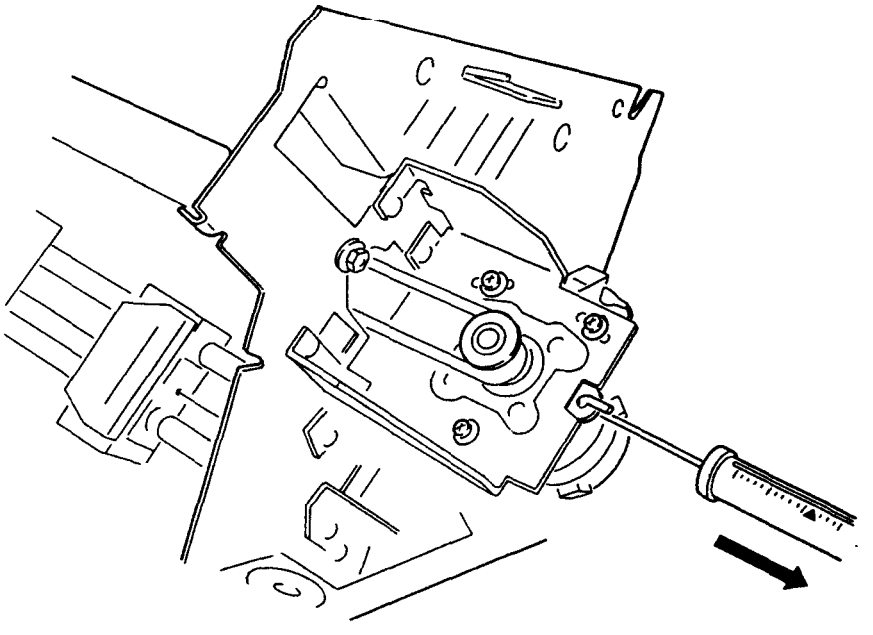


Figure 4-2. Carriage Timing Belt Tension Adjustment

4.1.3 Tractor Wire Spring Tension Adjustment

This section describes the tractor wire spring tension adjustment. If the spring is not adjusted properly, paper jams may occur, because the continuous paper tension (in the horizontal direction) is incorrect. When you remove the front or rear tractor assembly, perform this adjustment.

1. Remove the printer mechanism. (Refer to Section 3.2.6)
2. Release the release lever for the tractor sprocket.
3. At the right side frame, loosen the hexagonal nuts securing the shaft holder of the front or rear tractor assembly. (Refer to Sections 3.2.7.15 and 3.2.7.16)
4. Pull the tractor wire right. When the tractor wire spring tension is correct, the shaft-holder frame and the tip of the gold seal are 5 mm (0.2 inches) apart. (Refer to Figure 4-3)

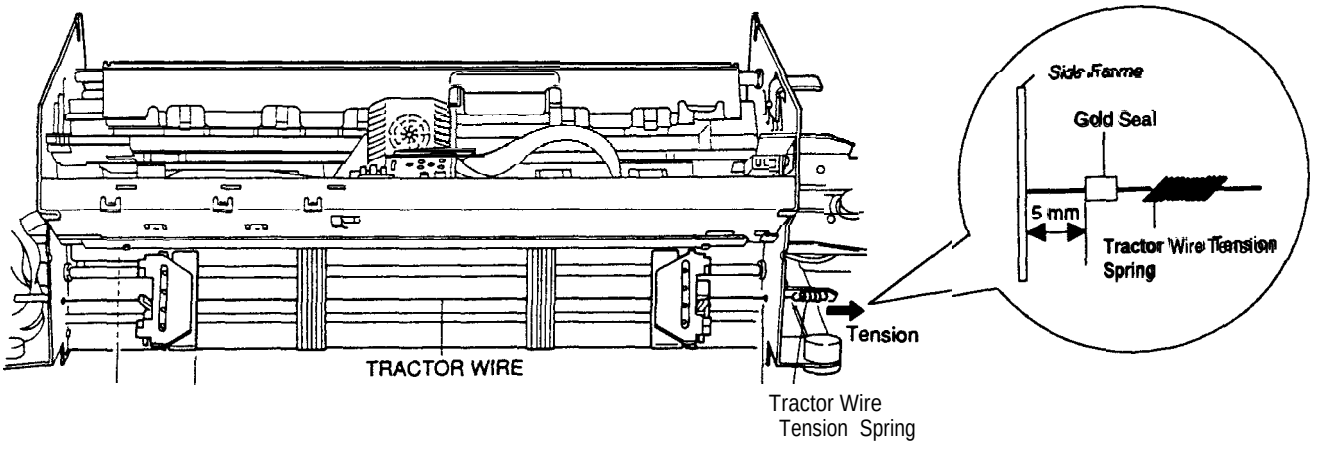


Figure 4-3. Tractor Wire tension Adjustment

4.1.4 Pull Tractor Sensor Position Adjustment

This section describes the pull tractor sensor position adjustment. If the sensor position is incorrect, the sensor is always on. When you replace or disassemble the platen, rear paper guide, platen roller shaft, tension roller shaft, or pull tractor sensor, perform this adjustment. Figure 4-4 illustrates the pull tractor sensor position adjustment.

When you assemble the pull tractor sensor or rear paper guide, check the following iterns:

- ❑ Verify that the pull tractor sensor lever is touching the rear paper guide frame, but the sensor is off.
- ❑ Make sure the distance between the sensor lever and sensor switch is approximately 2 mm (.08 inches).

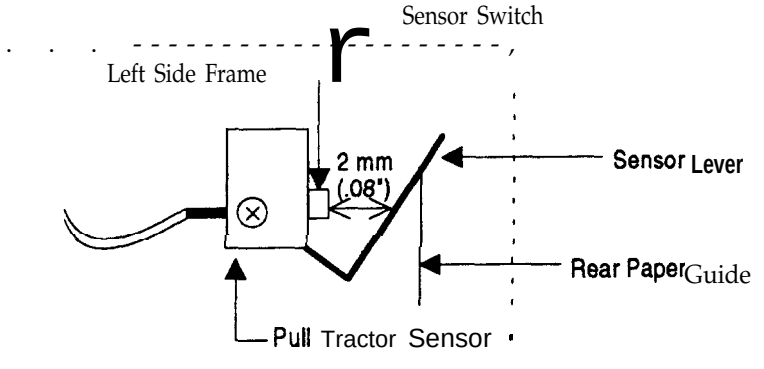


Figure 4-4. Pull Tractor Sensor Position Adjustment

4.1.5 Carriage Guide Shaft Parallelism Adjustment

The rear carriage shaft must be parallel to the platen. If it is not, printing maybe abnormal because paper is not fed evenly at the left and right sides of the platen. A paper jam may occur. This adjustment is required when the rear carriage guide shaft is removed during carriage mechanism disassembly, the parallelism adjust lever is moved, or the platen is removed. Do not remove the printer mechanism (If remove the printer mechanism from the lower case, the adjust value will be out of order when you reassemble the printer mechanism to the lower case.) Also, it is necessary to remove the tension roller shaft before performing this adjustment. (Refer to Section 3.2.7.7.)

CAUTION

The parallelism is adjusted so that the difference between the distances (from the rear carriage guide *shaft to the platen measured at the two positions shown in Figure 4-7) is less than 0.01 mm. Since this value is extremely small, you must use the 2 dial gauges, dial gauge base, and dial gauge master supplied by Epson. Do not adjust the parallelism using any other method.*

- *Dial gauge #F610 (Part No. B1019466)*
- *Dial gauge base #F611 (Part No. B1019467)*
- *Dial gauge master #F612 (Part No. B1019468)*

Before performing the carriage guide shaft parallelism adjustment, you must assemble the 2 dial gauges, dial gauge base, and dial gauge master to form one tool. Follow these steps:

1. Loosen a right hexagonal screw, then install a dial gauge to the hole of the dial gauge base, and tighten a hexagonal saew

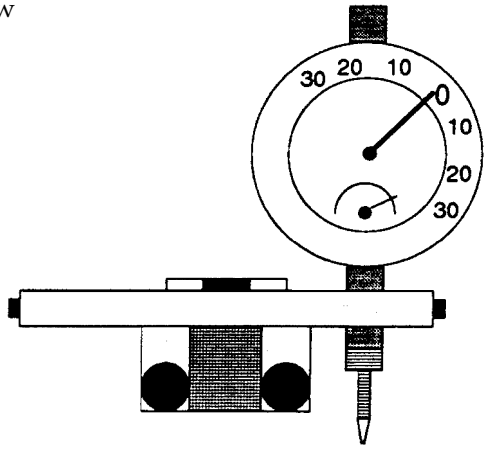


Figure 4-5. Set the Dial Gauge to the Dial Gauge Base

2. Remove a CP(PS)(M3X6) screw securing the timing belt holder to the timing belt, then remove the carriage plate.

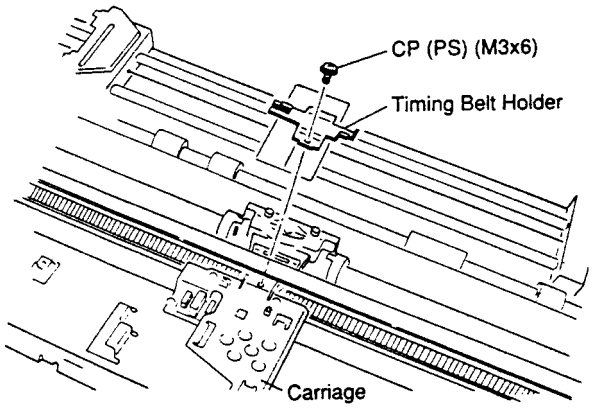


Figure 4-6. Removing the Carriage Plate

3. Remove the paper bail assembly. (Refer to Section 3.2.7.5)
4. Remove the tension roller shaft. (Refer to Section 3.2.7.7)
5. Remove the printhead with the maskless holder. (Refer to Section 3.2.1)
6. Attach the dial gauge base with the dial gauge in the same way as you attach the print head. When you attach this tool to the carriage, tighten the two thumb screws while you pulling by the tie bandtoward you.
7. Using the carriage guide shaft gear, adjust the gauge mounting position so that the tips of the gauges (portions A and B in the Figure 47) are securely attached to the platen.
8. Measure the distance between the platen and the carriage guide shaft on the left side. Then measure the distance between the platen and the carriage guide shaft on the right side, and compare these values. (Figure4-7 shows the measurement position and the parallelism adjust lever operation.)

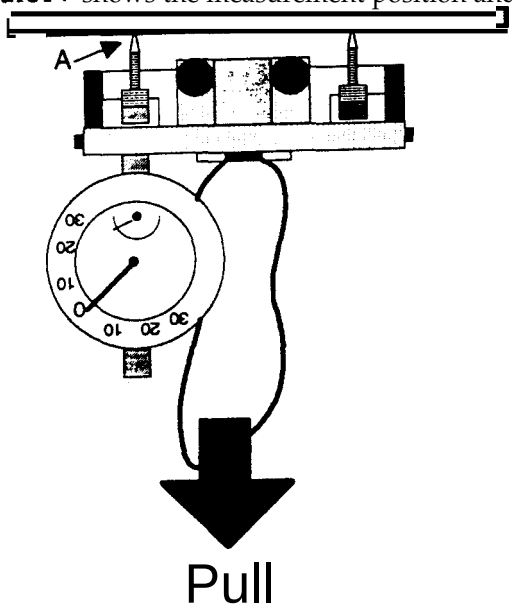


Figure 4-7. Dial Gauge Attachment

Note: **When** you shift the carriage manually, do not touch the both dial gauges. Rotate the carnage motor pulley.

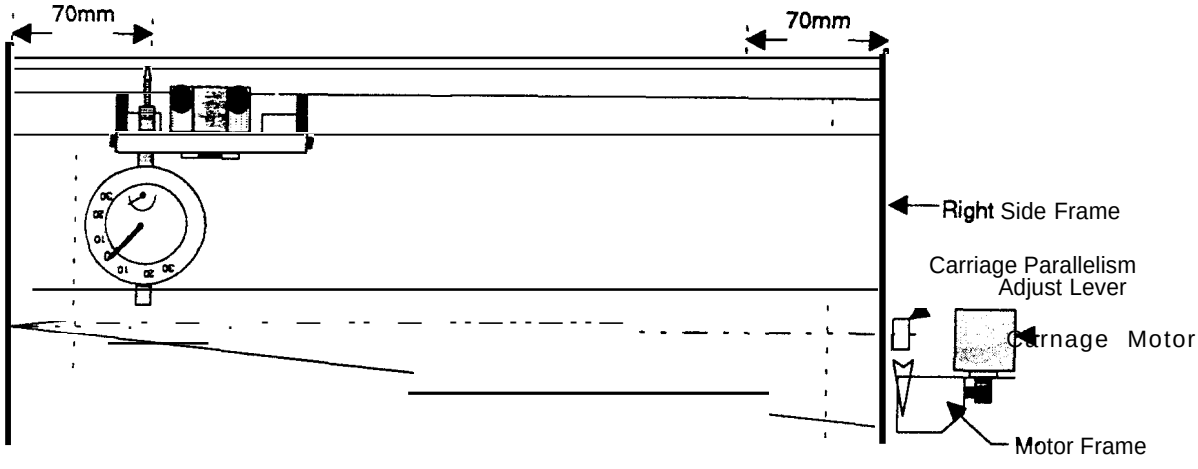


Figure 4-8. Carriage Guide Shafy Parallelism Adjustment

9. If the distance measured at the left side is greater than that measured at the right side, move the parallelism adjust lever in the direction shown by the white arrow in Figure 4-9. If the distance measured at the left side is less than that measured at the right side, move the lever in the direction shown by the black arrow.

Note: The carriage guide shaft moves as shown in Figure 4-8. For example, when the parallelism adjust lever is moved in the direction of the black arrow, the distance between the right side of the platen and printhead nose narrows a little bit.

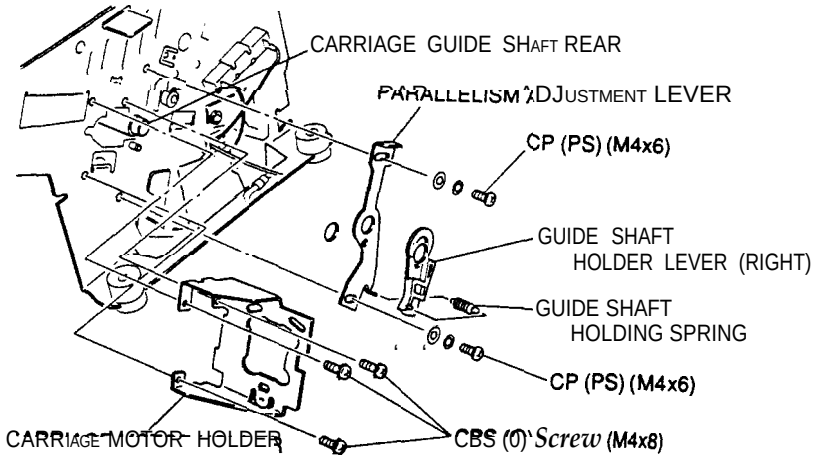


Figure 4-9. Parallelism Adjust Lever Operation

Note: The carnage guide shaft moves as shown in Figure 4-8. When the parallelism adjust lever is moved in the direction of the black arrow, the distance between the right side of the platen and print head nose narrows a little bit.

10. Repeat step 7 and 8 until the distance between the distance measured at the two positions is less than 0.01 mm.(The #F610 dial gauge matches the "1O" notches.)
11. When the distance is thithin the specified range, tighten the two screws securing the parallelism adjust lever. Then measure the distances again, as described in step 8.
12. If the distance between the measured distances is whithin the specified range, apply screw lock to the two screws. (Refer to Section 6.2 for lubrication and adhesive application instructions.)

4.1.6 Platen Angle Adjustment (Right Angle)

This section describes the platen angle adjustment. The platen must beat a right (90°) angle to the carriage assembly. This adjustment is required when the platen is removed or replaced or when the 2 hexagonal screws securing the platen to both side frames are loosened. Do not remove the printer mechanism from the lower case. (If remove the printer mechanism from the lower case, the adjust value will be out of order when *you* reassemble the printer mechanism to the lower case.) Also, it is necessary to remove the tension roller shaft be fore performing this adjustment. (Refer to Section *3.2.7.7)*

CAUTION

The parallelism is adjusted so that the difference between the distances (from the rear carriage guide shaft to the platen measured at the two positions shown in Figure 4-7) is less than 0.01 mm. Since this value is extremely small, you must use the 2 dial gauges, dial gauge base, and dial gauge master supplied by Epson. Do not adjust the parallelism using any other method.

- *Dial gauge #F610 (Part No. B1019466)*
- *Dial gauge base #F611 (Part No. B1019467)*
- *Dial gauge master #F612 (Part No. B1019468)*

1. Temporarily attach the two thumb screws for the dial gauge base to the dial gauge master, but do not secure them completely.

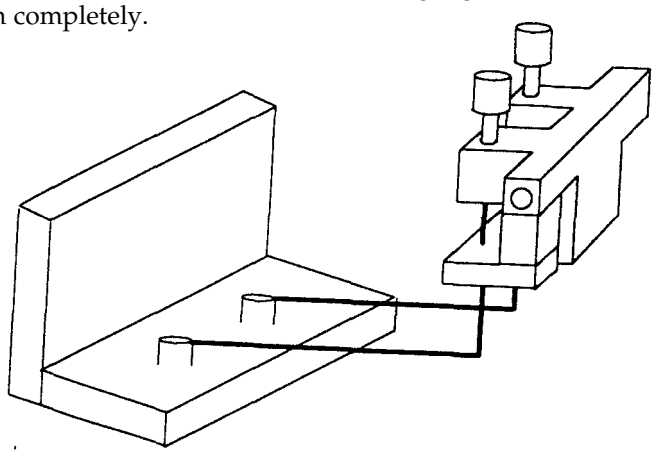


Figure 4-10. Set Up the Dial Gauge (1)

2. Attach a dial gauge needle to the suerface of the dial gauge master, then tighten the hexagonal screw securing the dial *gauge* to the dial gauge base. (Do not attach the dial gauge needle completely.)

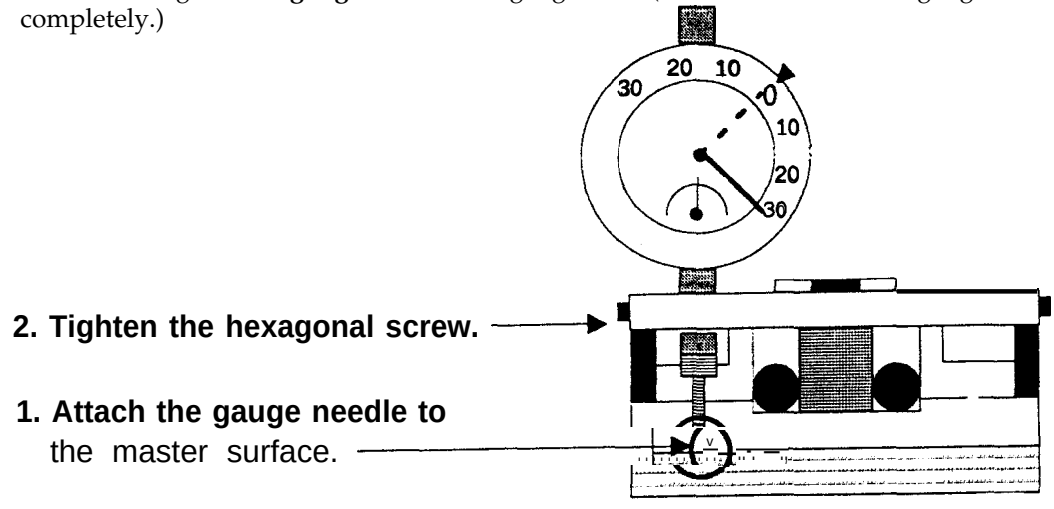


Figure 4-11. Set Up the Dial Gauge (2)

3. Attach the another needle to the master surface, then correspond to the another gauge measure, and tighten the hexagonal screw.

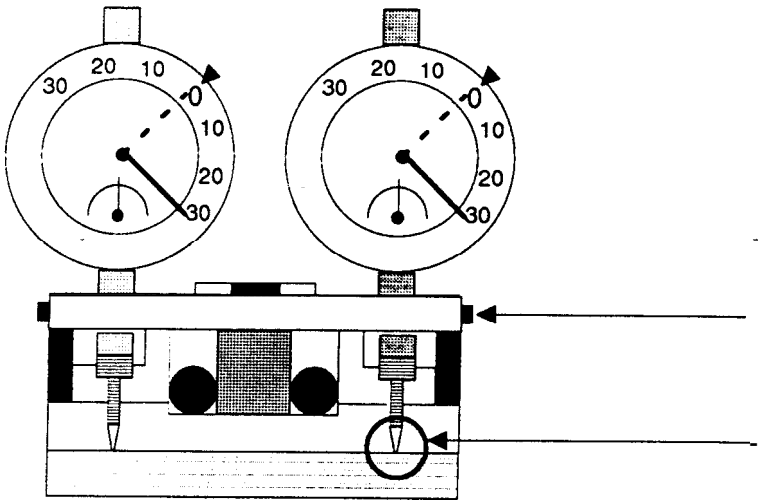


Figure 4-12. Attaching the Another Dial Gauge

4. To eliminate any play between the dial gauge base and the dial gauge master, pull the tie band to secure the dial gauge base and the dial gauge master before you securing the thumb screws. (Do procedure with two men.)

5. Then set the black marker to the "O" position.

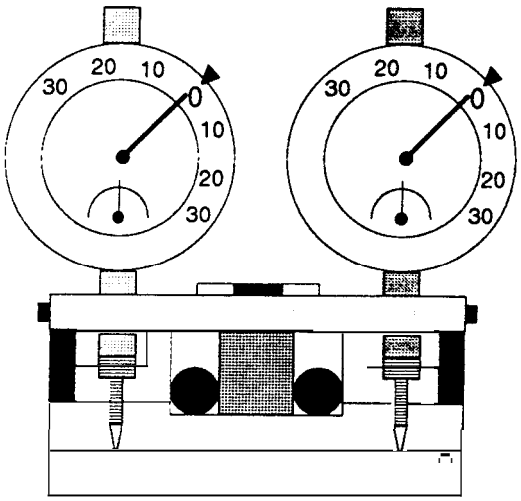


Figure 4-13. Setting the Black Marker to "O" Position

6. Remove a CP(PS)(M3X6) screw securing the timing belt holder and timing belt, then remove the carriage plate. (Refer to Figure 4-2.)
7. Remove the paper bail assernbly.(Refer to Section 3.2.7.5.)
8. Remove the tension roller shaft. (Refer to Section 3.2.7.7.)
9. Remove the pull tractor sensor.(Refer to Section 3.2.7.10.))
10. Loosen (but do not remove) the two hexagonal screws securing the platen stay to both side frames.

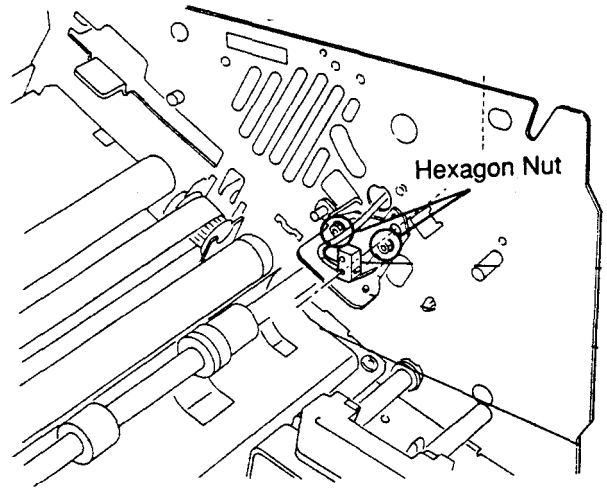


Figure 4-14. Loosen the 2 Hexagonal Screws

11. Remove the print headwith the maskless holder, as described in section 3.2.1. Then attach the dial gauge base with two dial gauges in the same way as you attach the print head.(When you attach the dial gauge base to the carriage, secure two thumbscrews while you pulling the tie band forward you to hold the tool securely.
12. Using the platen gap drive gear, attach the both dial gauge needles to the platen surface.(Do not attach completely.)

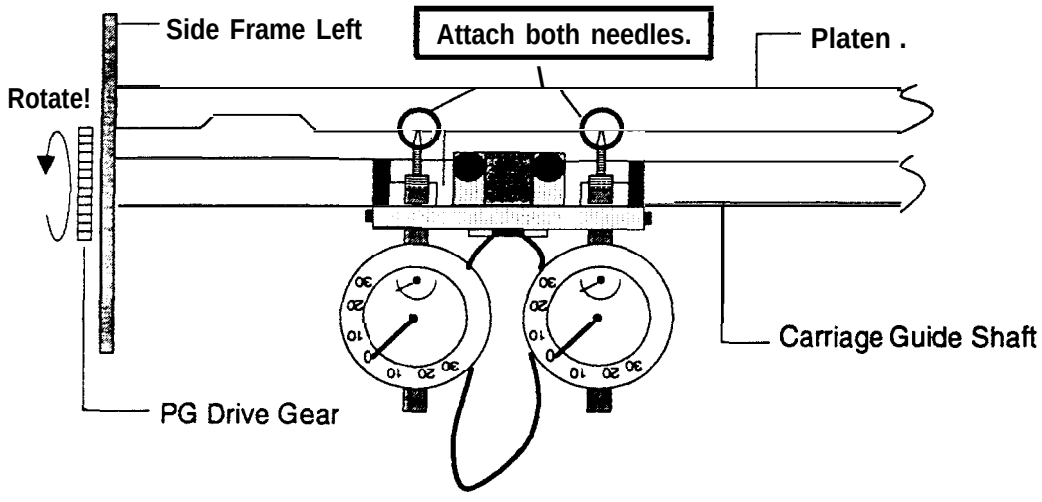
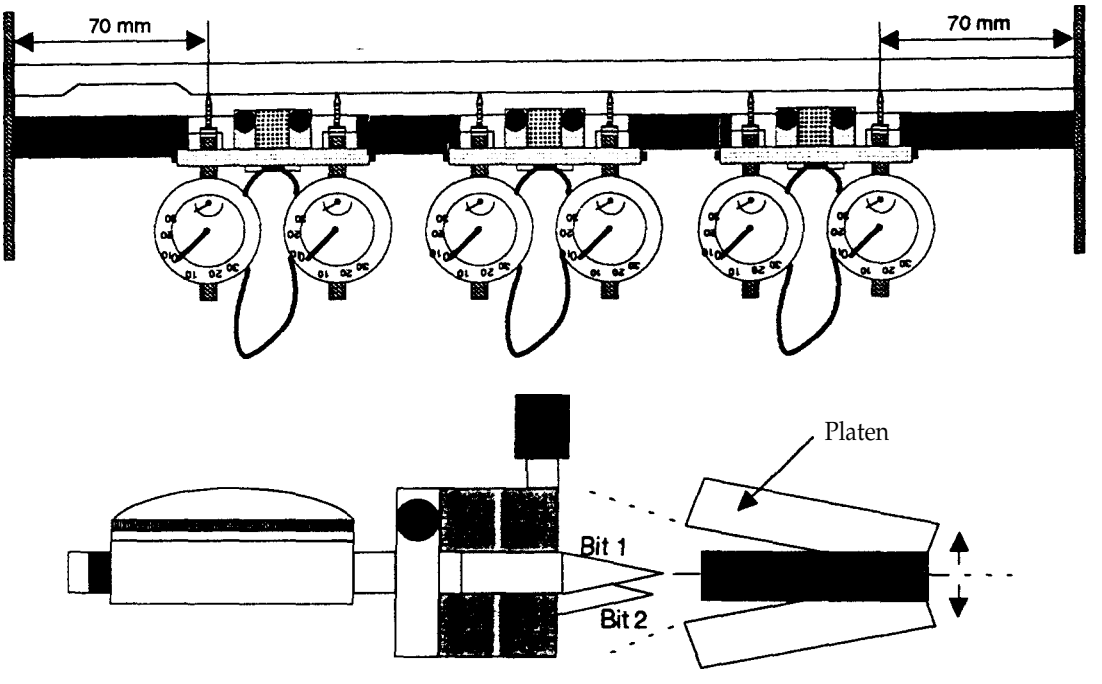


Figure 4-15. Attaching two needles to the Platen Surface

13. Reset the black marker to the "O" position.
14. Measure the angle difference about three position such as figure below.(Using the carriage motor pu lly to move the carriage with the dial gauge toward the right side.)



(Angle Adjustment Operation)

Figrue 4-16. Measuring the Angle Difference

15. If the angle difference of two values are more than +/- 0.015 mm, loosen(but do not remove) the two hexagonal screws securing the platen stay to both side frames, then change the platen angle manually.)
16. Tighten two hexagonal screws securing the platen stay to both side frames.

WARNING

After perform the adjustment, confirm the value of platen parallelism again. When this value is out of order, readjust the platen parallelism and the platen angle adjustment until the value to be correct.

4.1.7 Platen Gap Motor Value Adjustment

This section describes how to measure the parameter (ALPHA, BETA, GAMMA value) for the PG mechanism unit. Since the ALPHA and BETA value are unique to each mechanism unit, it is written on the label as shown in Figure 4-9, so that it can be comfirmed at gance. Be sure to perform this measurement and correct the value written on the label because the value is necessary when the other units (board, printhead) are changed (when BI-DIRECTIONAL PRINTING ALIGNMENT (section 4.1.8) is executed).

Note: The GAMMA value means the paper thickness parameter. DFX-5000+ has 4 tables in all from parameter O to parameter-3.-The default setting value is parameter 1, and it may changed this parameter that there is just reason for it. ``-

WARNING

- *This measurement is important because it determines the platen gap, so be sure to use the exclusive thickness gauge set and tension gauge supplied by EPSON.*
  Thickness gauge set (0.39 mm): #F616 (Part No. B102O472W
  Tension gauge (200 g) : #F545 (Part No. B765114601)
- *Do not turn the printer off during adjustment.*
  When adjusting the platen gap to narrower or wider using the MICRO FEED(A) and micro feed (v) switches, be sure to adjust thegap by 1 step at a time, and using the TEAR OFF and MICRO FEED (A) or(v) switches simultaneously, be sure to adjust the gap by 10 step at a time.
- *When install the parameter into the EEPROM, it is necessary to perform the reset operation by pressing the TEAR OFF and MICRO FEED (∨) switches at same time.*
- *After perform this adjustment, perform the Bi-Directional adjustment as explained in section 4.1.8.*

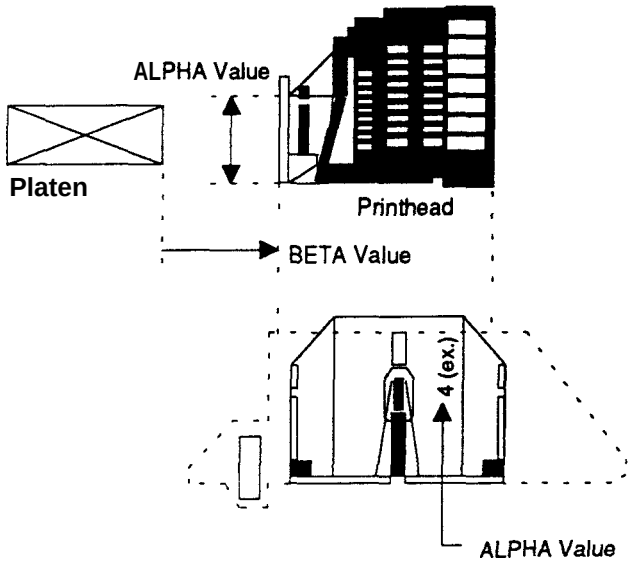


Figure 4-17. ALPHA and BETA Value

1. Remove the ribbon cartridge, and the paper from the printer. Then remove the print head for confirm the ALPHA value written on the print head surface. After you confirm the ALPHA value remount the print head.
2. Close the top cover.
3. Turn the printer on while pressing the TEAR OFF, MICRO FEED (v), and FRONT/REAR switches. (At this time the buzzer beeps the 2 sounds, and the carriage moves to the 15 column position automatically, and then the adjustment state shifts to the ALPHA value adjustment state.
4. Reset the ALPHA value by pressing the TEAR OFF and MICRO FEED (v) switches simultaneously. (At this time, the buzzer beeps the 2 sounds.)
5. Write the ALPHA value written on the printhead into the memory.
   - Press the MICRO FEED (A) switch to increment value by +1.
   - Press the MICRO FEED (v) switch to decrement the value by -1.
6. Confirm the ALPHA value written to the memory by pressing the LF/FF switch. (The buzzer beeps each time the MICRO FEED switch is pressed, and if the value incorrect, ***return*** to Step **5.)**
7. After writing the ALPHA value in the memory, press the PAUSE switch. (At this time, the adjustment state shifts to the BETA value adjustment.) Remove the ribbon cartridge.
8. Reset the BETA value pressing the TEAR OFF and MICRO FEED (v) switches simultaneously. (At this time, the buzzer beeps the 2 sounds.)
9. Open the top cover and inset the #F616 exclusive thickness gauge into the space between the maskless holder and the printhead nose. (At this time, Never move the pnnthead. If done it, return to Step 3.)

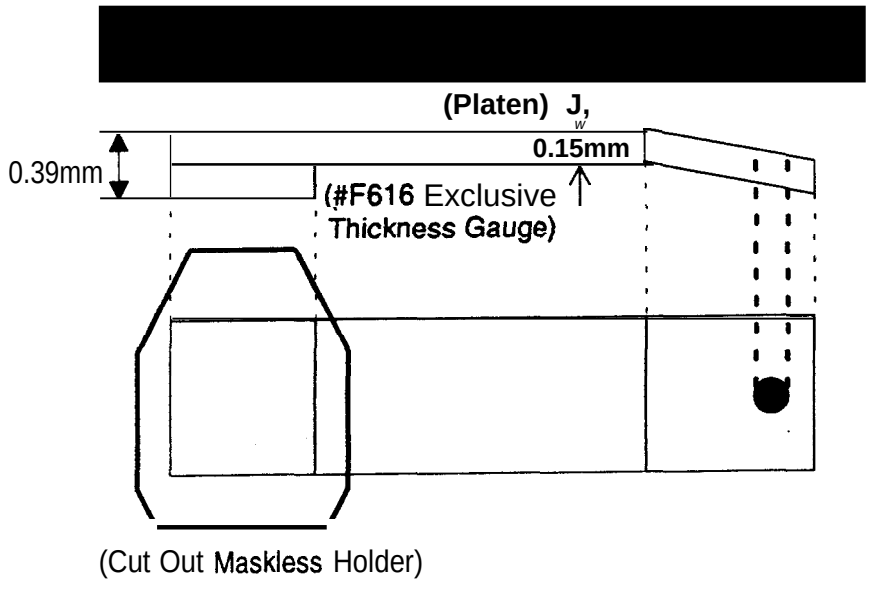


Figure 4-18. Thickness Gauge Setting Method

10. Hold the thickness gauge gradually with the printhead nose by pressing the MICRO FEED(A) switch. (At this time the value can be decreased by pressing the MICRO FEED(v) switch.)
11. Contact the tension gauge to the hole of the thickness gauge and pull it straight to the right. (Refer to Figure 4-19.)

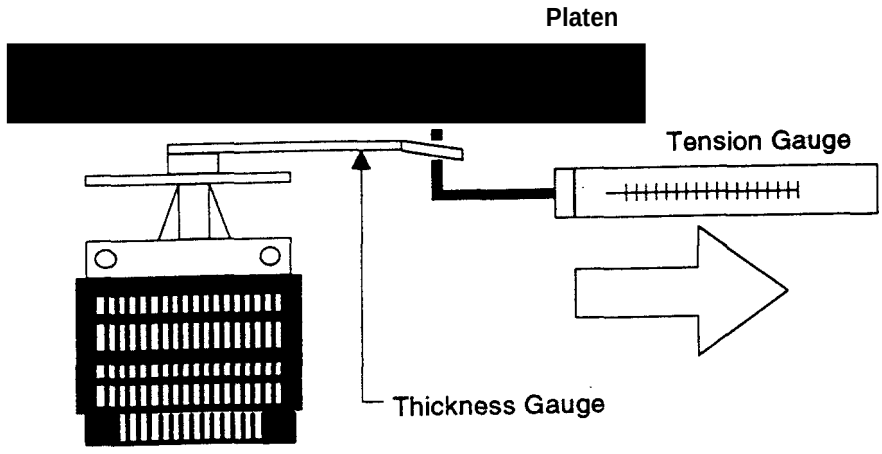


Figure 4-19. Pulling the Thickness Gauge

12. Set the BETA value when the tension gauge indicates the 150gf, the tension gauge can move to right in a degree.(Refer to under CAUTION.)
13. After complete this adjustment, turn the printer off, and rotate the PG drive gear manually toward you and remove the thickness gauge.

CAUTION

- *When remove the thickness gauge forcibly without using the PG drive gear, the maskless holder will be damaged. Therefore, after adjust the BETA value, never fail to perform Step 13 before turn off the printer.*
- *If the ROM version is younger than D, it is necessary to add one step (advance) after set the BETA value. If the ROM version is older than E, it is not necessary to add one step.*

4.1.8 Bi-Directional Printing Adjustment

The purpose of this adjustment is to correct the printer mechanism parameters which control bidirectional printing. Be sure to perform this adjustment when required. If this adjustment is not performed correctly, bidirectional printing may be misaligned, or, in the worst case, the carriage might operate incorrectly.
Before performing this adjustment, be sure to that the following adjustment are completed correctly.

4.1.2 Carriage Timing Belt Tension Adjustment
4.1.5 Carriage Guide Shaft parallelism Adjustment
4.1.6 Platen Angle Adjustment

The parameters to be written to the memory on the C117 Main board in this adjustment are as follows:

1) Mechanism platen gap adjustment value (BETA value)
2) Head nose platen gap offset value (ALPHA value)
3) Paper thickness value (GAMMA value)
4) Head flying time adjustment value (FLYING TIME)
5) Bi-directional printing alignment value (Bi-D Adjust)

Note: Above number 3 is decided by the default setting, and do not change this value in service.

1. Mount the ribbon cartridge.
2. Set the continuous paper to the front tractor and turn the printer on while pressing the LF/FF, MICRO FEED (A), FRONT/REAR switches. (At this time, the printer shifts the standby mode and the no paper state.)
3. Press the LF/FF switch to feed the continuous paper.
4. Press the PAUSE switch and then press the LF/FF switch to print the current BETA value automatically.
5. Press the PAUSE switch and then press the LF/FF switch to print the current ALPHA value automatically.
6. Press the PAUSE switch and then press the LF/FF switch to print the current GAMMA value automatically.

WARNING

- *If the DIP-SW"1-1" is set to the IBM mode (ON), it can not perform the Bi-D adjustment. Therefore, when you perform the Bi-D adjustment, set the DIP-SW"1-1" to OFF.*
- *When replace the C117 Main board, the ALPHA and BETA value is not written into the memory (In reality, "O" value is installed.) on the Main board. Since this reason, (Since PG is too large) it can not print the each current value to the paper. Due to this, Perform the platen gap value adjustment before perform this adjustment.*

7. Press the PAUSE switch and then press the LF/FF switch to print the current flying value automatically by NLQ mode. (The sample pattern "H" that is structured by 4 rows is printed automatically.)
8. Write the flying time value into the memory.
   - Press the MICRO FEED (A) switch to shift an even number toward left.
   - Press the MICRO FEED (v) switch to shift an even number toward right.
9. Press the PAUSE switch and then press the LF/FF switch to print the current flying value automatically by high speed mode.
10. Write the flying time value into the memory.
    - Press the MICRO FEED (A) switch to shift an even number toward left.
    - Press the MICRO FEED(v) switch to shift an even number toward right.
11. Press the PAUSE switch and then press the LF/FF switch to print the current Bi-D value automatically by Super Draft mode.
12. Write the Bi-D value into the memory,
    - Press the MICRO FEED (v) switch to shift an even number toward left.
    - Press the MICRO FEED(A) switch to shift an even number toward right.

Note: The bidirectional adjustment must adjust about the five speed modes (Super Draft, Draft, Bit 3, NLQ, HmSKsp modes). After perform Step 12, repeat the adjustment at 4 times (Step 11 to 12) for adjust the rest speed modes.

13. After adjust the all speed modes, press the TOP OF FORM switch. (The printer exhausts the paper and control panel prohibits the all switch operation.)
14. Turn off the printer.

CHAPTER 5 Troubleshooting

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5.1 TROUBLESHOOTING INFORMATION

The information in this chapter makes troubleshooting easier to perform by listing various problems that can occur and providing possible solutions.

Note: For this printer, no special tools are necessary for troubleshooting to the unit level, with the exception of a digital multimeter. Some component-level troubleshooting may require an oscilloscope.

5.1.1 Error Messages

The DFX-5000+ indicates errors using beeps. Table 5-1 lists and describes the error beep codes.

Table 5-1. Error Codes

Beeps	Error	Cause
* (1 beep)	BEL code (07H)	❑ The printer receives a BEL command.
*** *** (2 sets of 3 beeps)	Carriage trouble	❑ The carriage is locked. ❑ The isolation resistance in the carriage motor is too low.
• --- ---- ---- ---- • --- (5 sets of 4 beeps)	Paper out or paper jam	❑ The printer runs out of paper during printing or paper feeding. ❑ The printer detects a paper jam. ❑ The front, rear, or top PE sensor is broken.
*** (3 beeps)	Other paper error	❑ The paper is out at power on. ❑ The printer backs out paper, but the previous print job is not tom off.
* * * * * (5 beeps, with a pause between each beep)	Abnormal voltage	❑ The voltage of the CI 17 power supply board assembly is too low.
** ** ** ** ** (5 sets of 2 beeps)	Incorrect RAM	❑ Incorrect RAM is detected.
**** (4 beeps)	Cover open	❑ The top cover is open.
* * * * * * * * * * (1 O beeps, with a pause between each beep)	Head driver circuit short	❑ The printhead driver IC is shorted.
** ** ** .* ** .* ** ** (8 sets of 2 beeps)	Head fan circuit short	❑ The head fan driver IC is shorted.
********** (10 beeps)	Illegal paper memory setting	❑ Incorrect paper is loaded in printer.
********** (continuous beeps)	Micro adjustment function limit exceeded	❑ A MICRO FEED button is being pressed continuously.
*** .** *** (3 sets of 3 beeps)	Platen gap adjustment trouble	❑ The PG home sensor is broken. ❑ The PG motor is broken. ❑ The parallelism adjustment is incorrect.

Note: ** indicates a 0.1 second interval.
** indicates a ().3 second interval.

5.1.2 Bypassing the Interlock Switch and Cover Open Sensor

To print with the top cover open or removed, you need to bypass the interlock switch and cover open sensor because these sensors automatically disable printing when the top cover is open. To bypass the interlock switch, remove the top cover and close the left cover hinge.

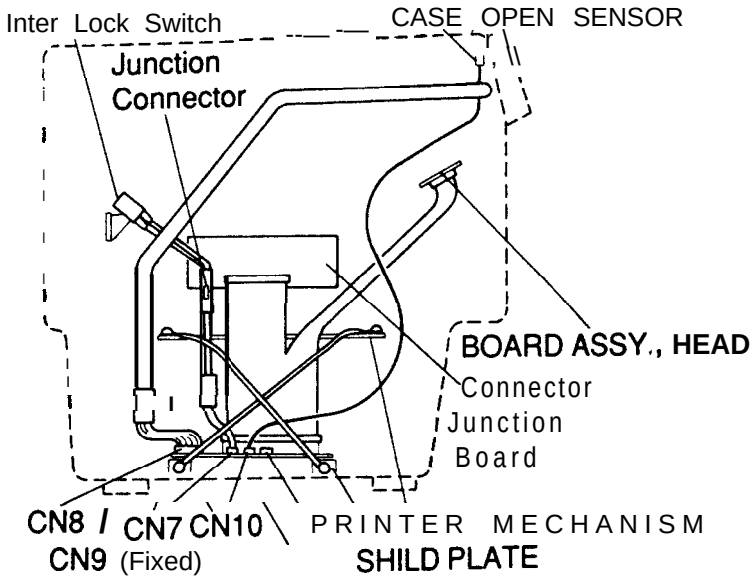


Figure 5-1. Bypassing the Interlock Switch

To bypass the cover open sensor, remove the left side cover, disconnect the cable from connector CN7 on the C117 MAIN board assembly, and jumper pins 1 and 2 of connector CN7.

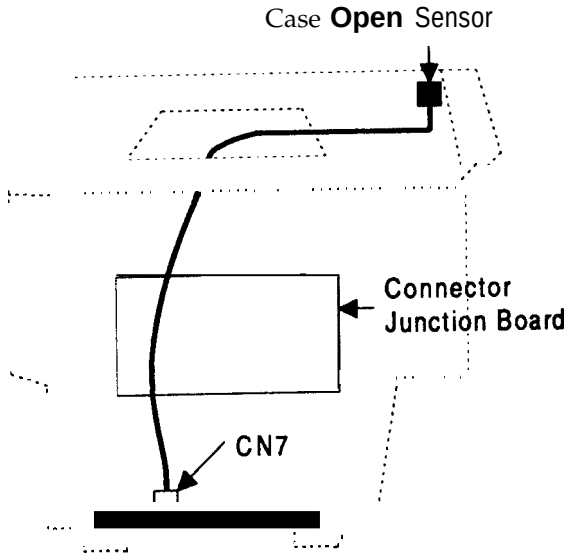


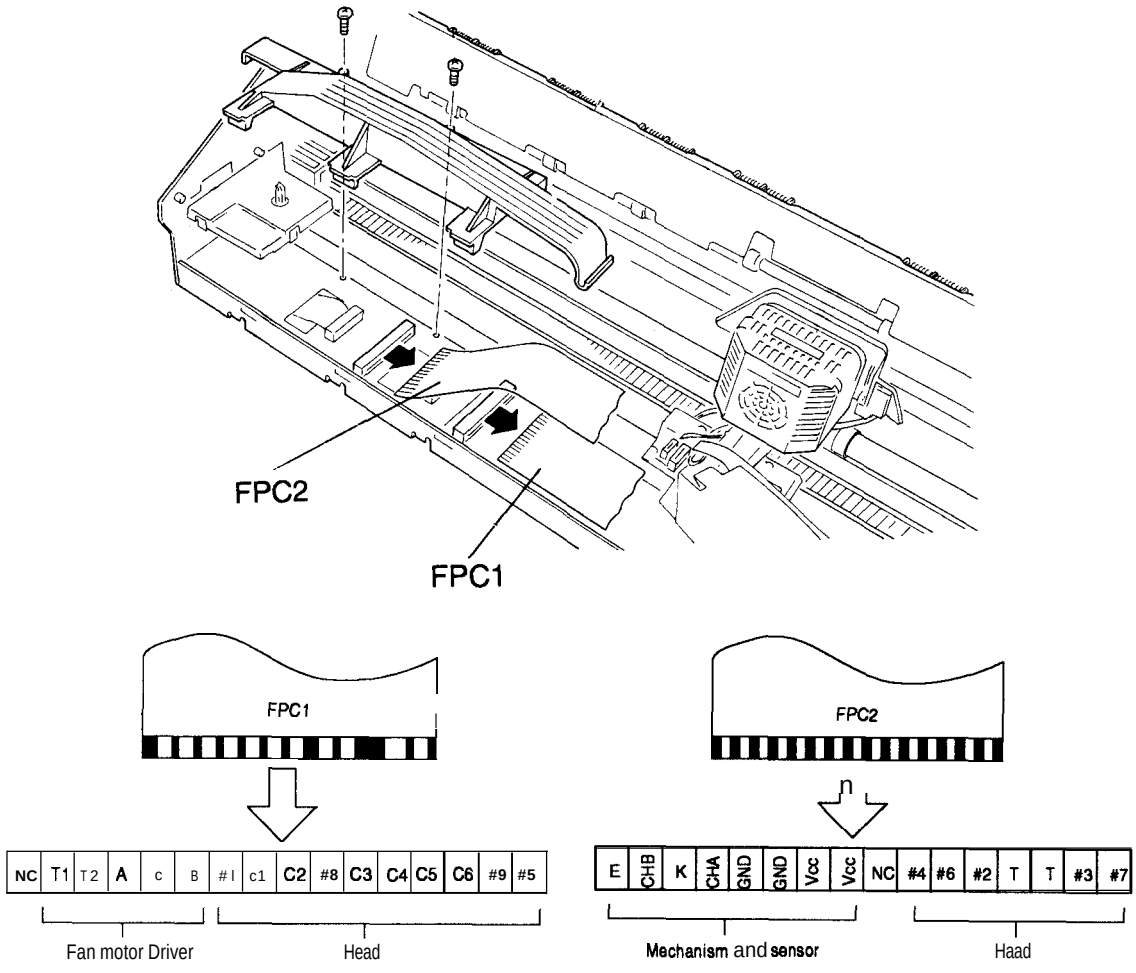
Figure 5-2. Bypassing the Cover Open Sensor

5.1.3 Coil Resistance

The following table provides the coil resistances for the motor, head fan, plunger, and pnnthead.

Table 5-2. Motor, Fan, Plunger, and Printhead Coil Resistances

Part	Coil Resistance
CR motor	6.2 ohms ± 0.45 ohms at 25°C (77°F)
PF motor	2.85 ohms ± 0.3 ohms at 25°C (77°F)
RF motor	150 ohms ± 10 ohms at 25°C (77°F)
PG motor	250 ohms ± 18 ohms at 25°C (77°F)
Head fan	61 ohms ± 4.3 ohms at 25°C (77°F)
Plunger	9 ohms ± 0.45 ohms at 25°C (77°F)
Printhead	8.1 ohms ± 0.8 ohms at 25°C (77°F)



Note: #1-#9 Head coil
C1, C2 Common - (#2, #4, #6)
C3 - C6 Common - (#1, #3, #5, #7, #8, #9)
T Thermistor
NC Not connection

Figure 5-3. Printhead Coil Resistance

5.2 REPAIR BY UNIT REPLACEMENT

You can correct most problems by replacing the unit and adjusting the printer when necessary. Refer to Table 5-3, identify the problem, and&n follow the steps in the flowchart indicated.

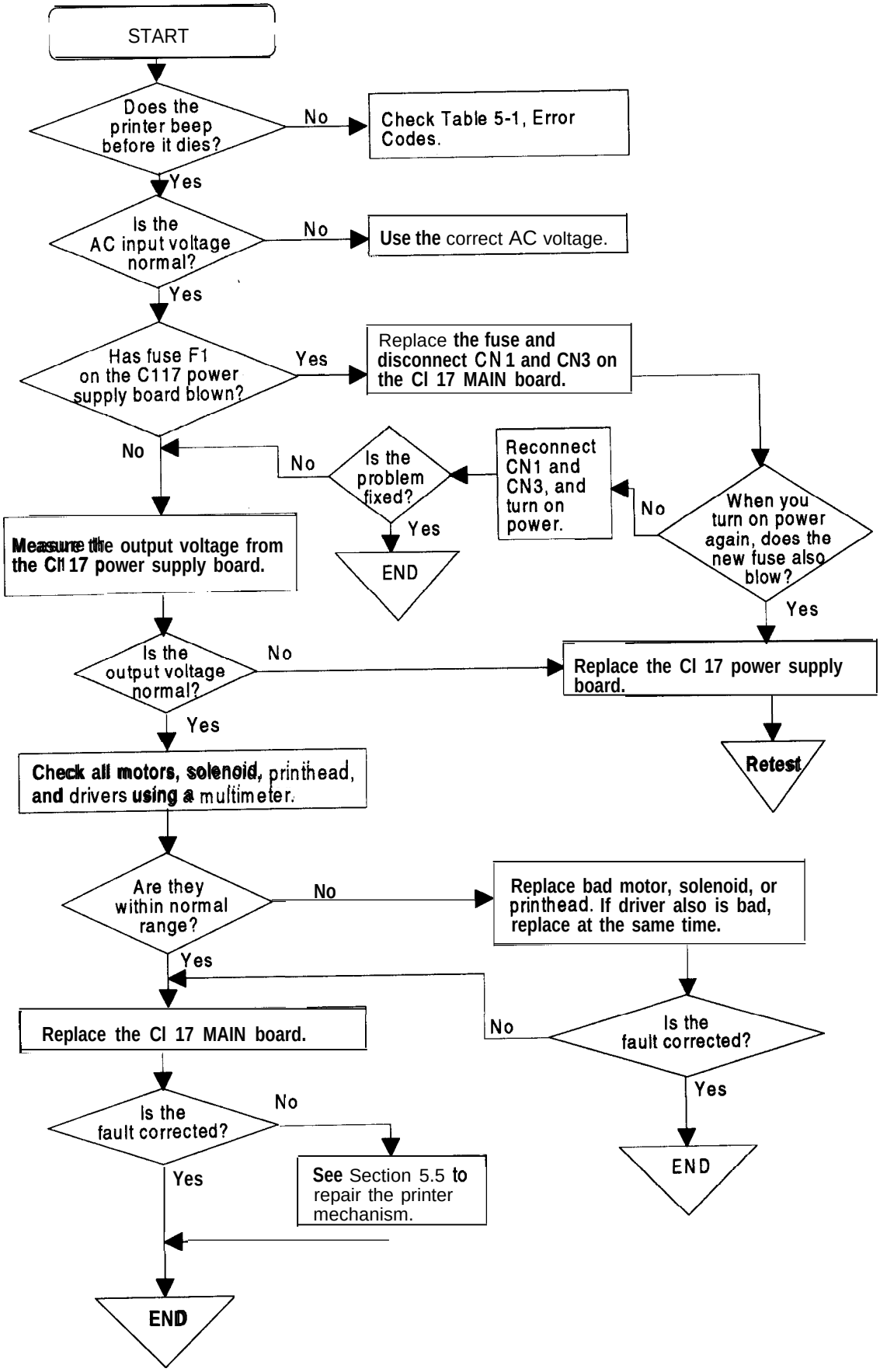
Table 5-3. Symptoms and Reference Pages

Symptom	Problem	See Chart
The printer does not operate when the power is on.	❑ The carnage does not move. ❑ The POWER LED does not light.	1
Carriage operation is abnormal.	❑ The carriage moves away from home position at power on. ❑ The carriage returns to home position correctly, but the printer fails to enter ready mode.	2
Carriage operation is normal, but the self-test is printed incorrectly.	❑ The self-testis not printed. Cl Some of the dots are not printed.	3
Printing is normal, but paper feeding is abnormal.	❑ The printer does not feed the paper at all. ❑ The printer feeds paper, but the line spacing varies.	4
Control panel operation is abnormal.	❑ When the LF button is pressed, no paper is fed.	5
Data sent by the host computer is printed incorrectly.	❑ The carriage operates normally at power on and the self-test is printed correctly, but print data from the host computer is not printed correctly.	6

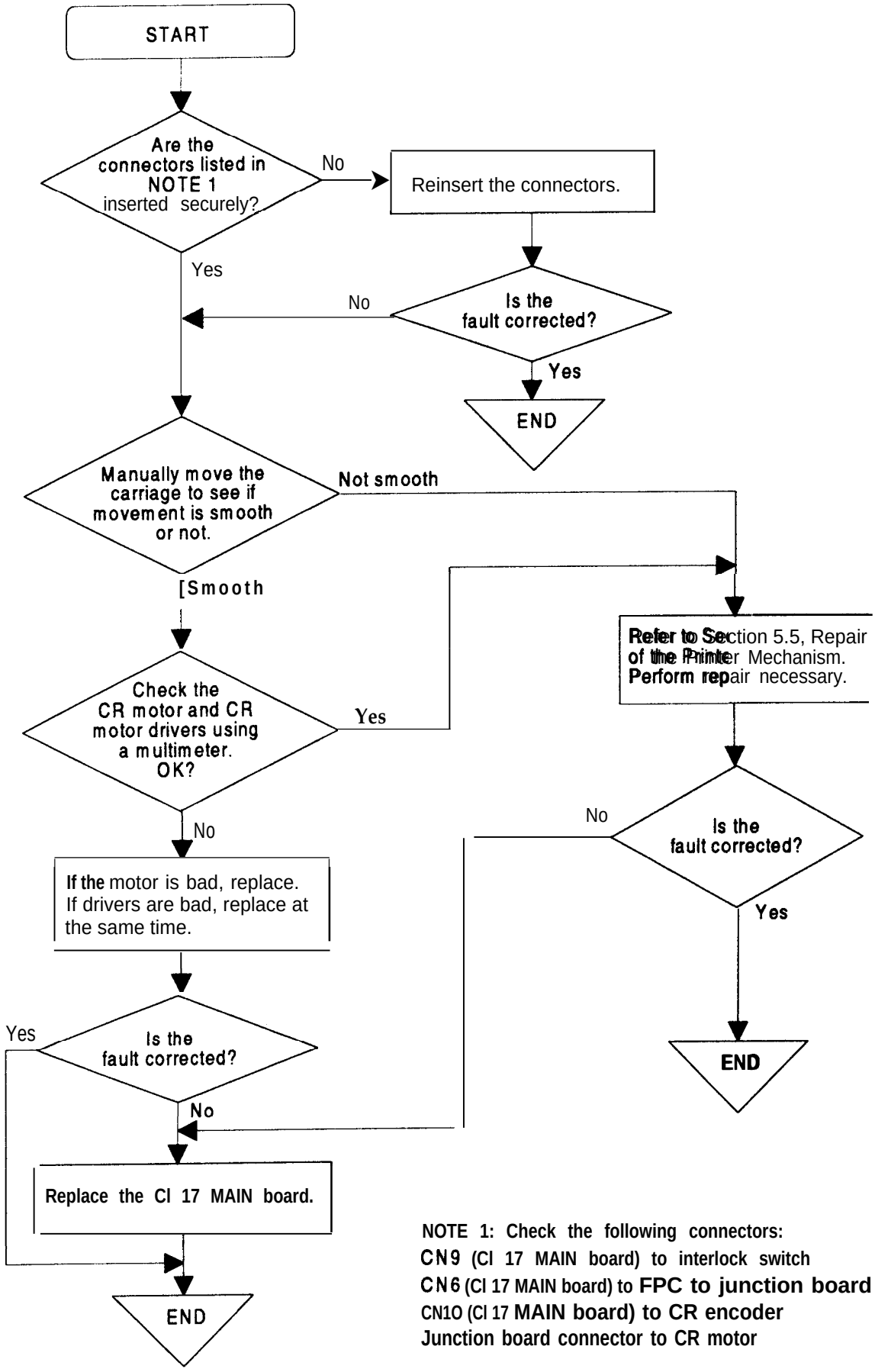
Note: Be sure to perform the appropriate adjustments below.

1. When you replace the C117 MAIN board assembly, perform these adjustments:
   - ❑ Bidirectional printing adjustment
   - ❑ Platen gap motor value adjustment
2. When you replace or disassemble the PG motor orPG sensor, perforrnthese adjustments:
   - ❑ Platen gap motor value adjustment
   - ❑ PG motor backlash adjustment
3. When you replace or disassemble the CR motor, perform the carriage timing belt tension adjustment.
4. When you disassemble the printer mechanism, perform these adjustments:
   - ❑ Carriage guide shaft parallelism adjustment
   - ❑ Platen angle adjustment
   - ❑ Platen gap motor value adjustment
   - ❑ PG motor backlash adjustment
   - ❑ Bidirectional printing adjustment
   - ❑ Carriage timing belt tension adjustment
   - ❑ Tractor wire spring tension adjustment

1. The printer does not operate when power is turned on.

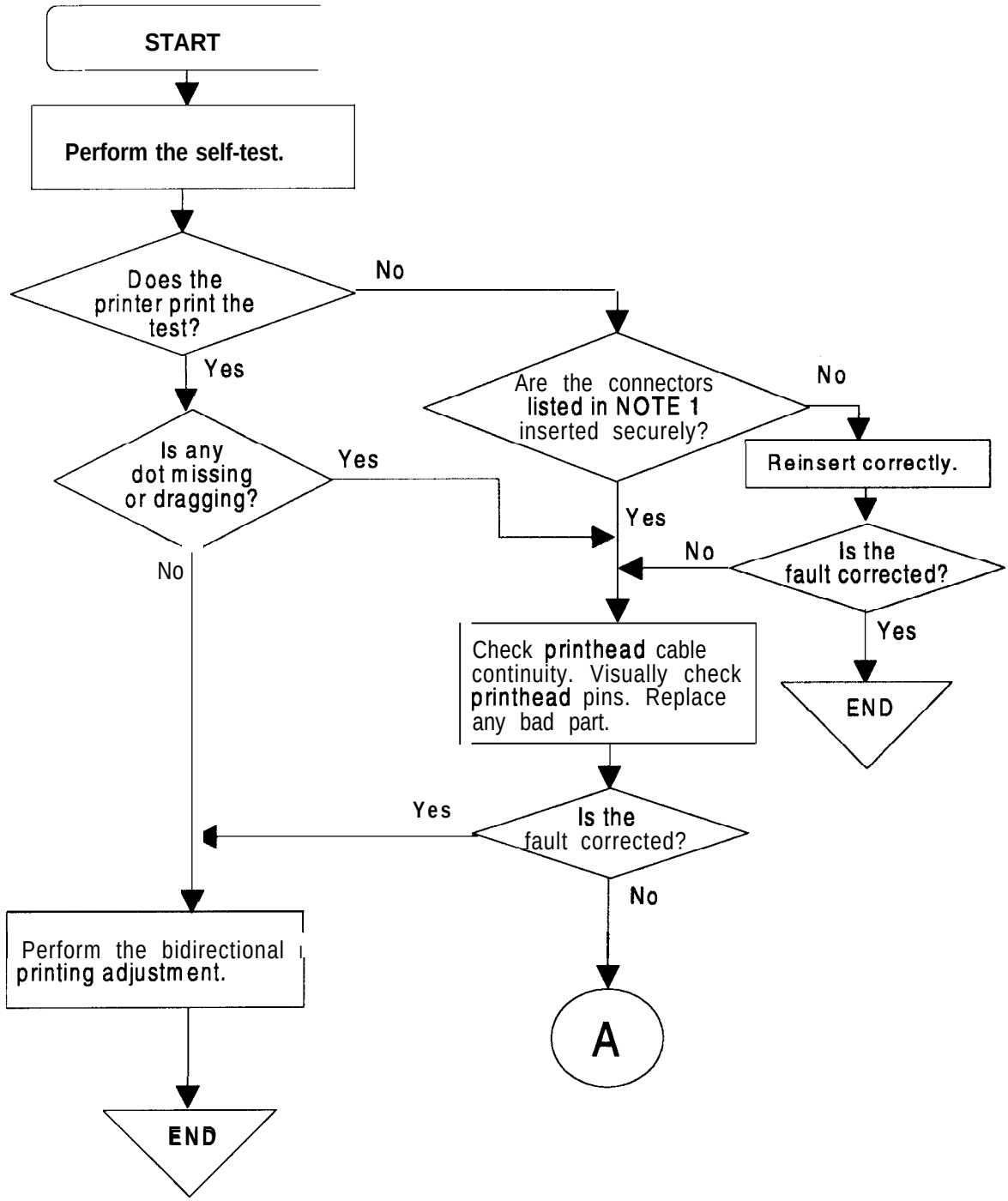


2. Carriage operation is abnormal.



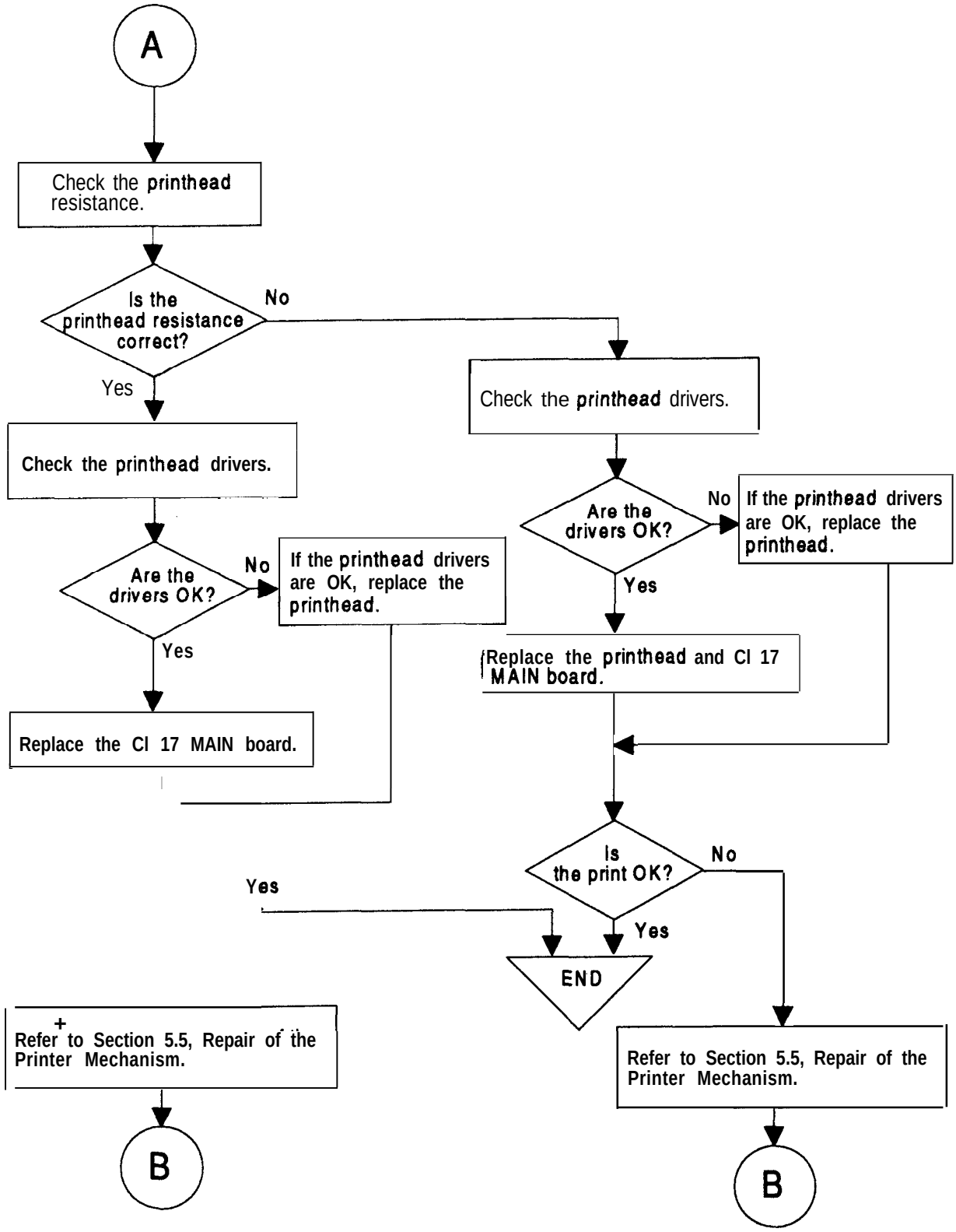
NOTE 1: Check the following connectors:
CN9 (CI 17 MAIN board) to interlock switch
CN6 (CI 17 MAIN board) to FPC to junction board
CN10 (CI 17 MAIN board) to CR encoder
Junction board connector to CR motor

3. Carriage operation is normal, but the self-testis printed incorrectly.



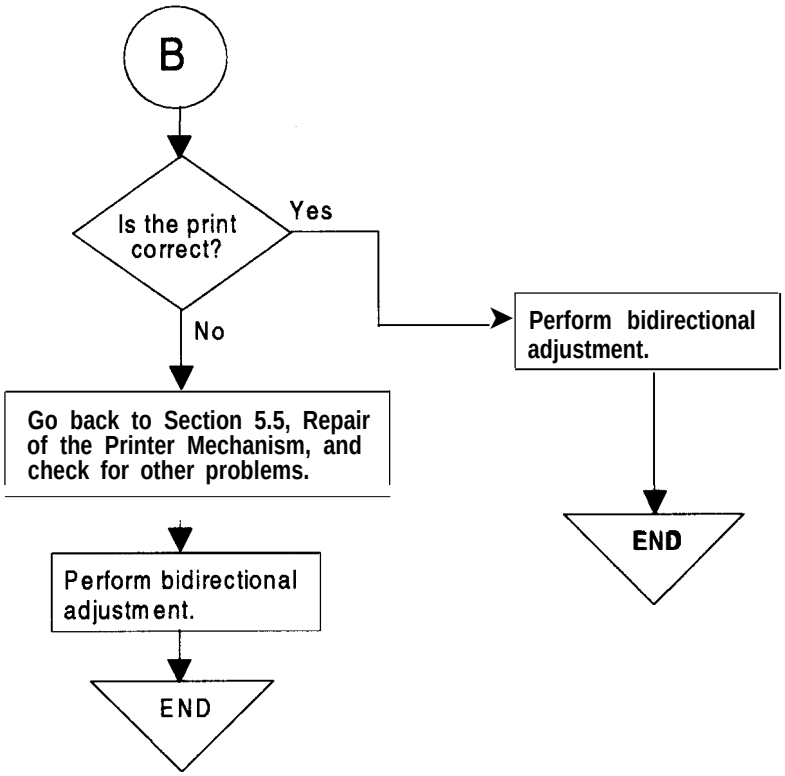
NOTE 1: Check the following connectors:
1. CN6 (Cl 17 MAIN board)
2. Four connectors on the connector junction board in the printer mechanism.

3. Carriage operation is normal, but the self-testis printed **incorrectly** (continued).

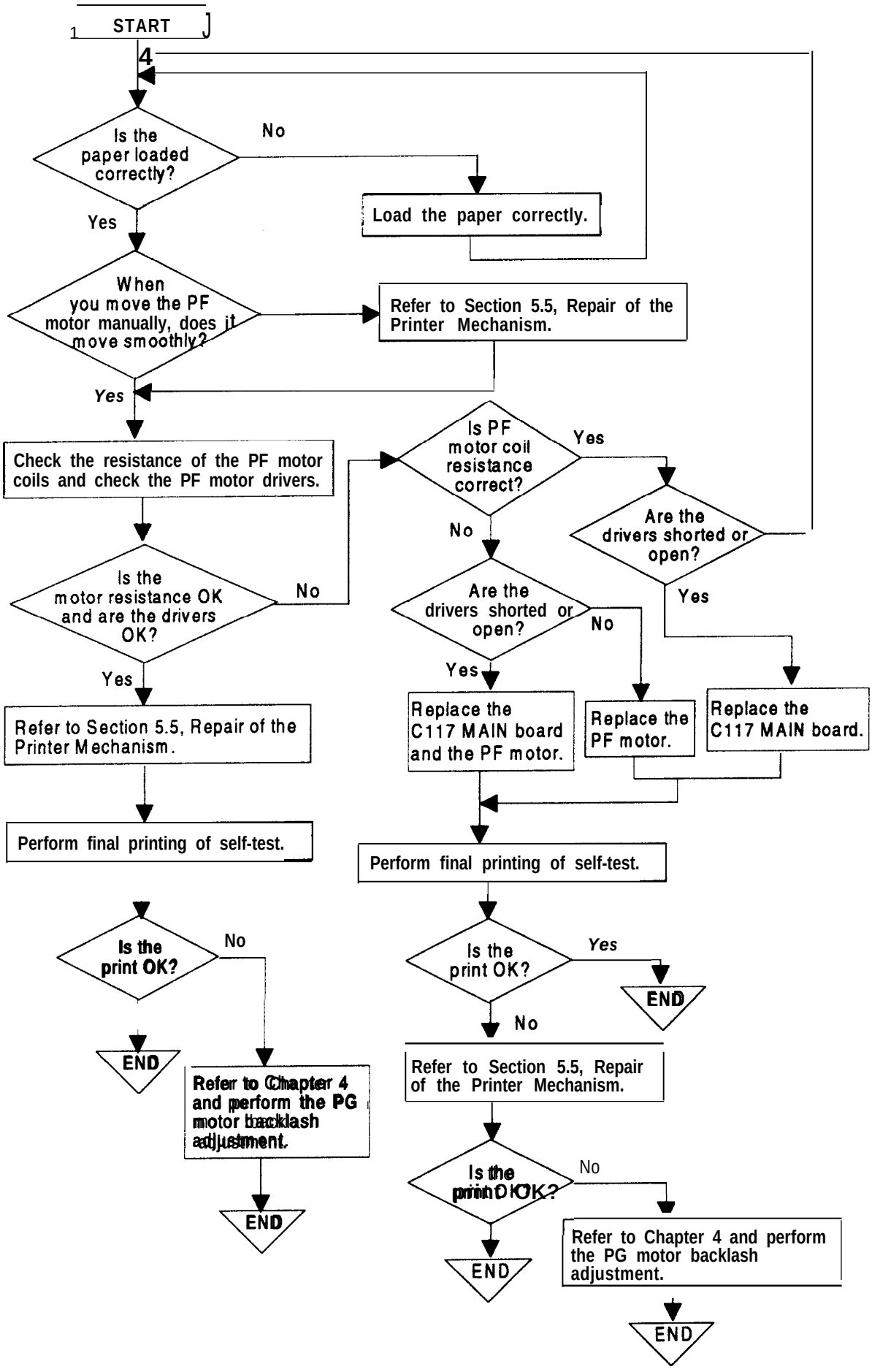


NOTE1: Check the following connectors:
1. CN6 (CI 17 MAIN board)
2. Four connectors on the connector junction board in the printer mechanism.

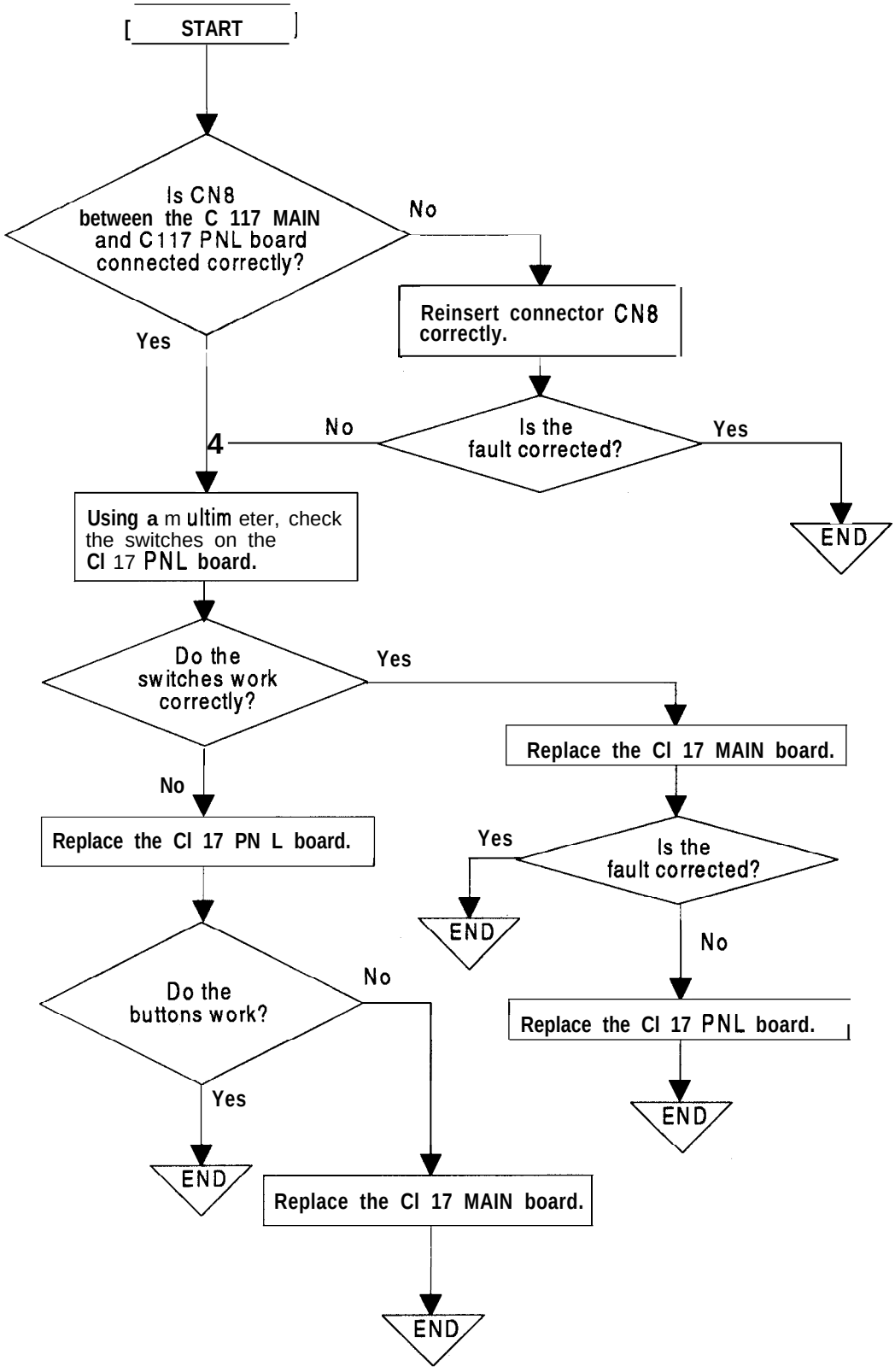
3. Carriage operation is normal, but the self-testis printed **incorrectly (continued).**



4. Printing is normal, but paper feeding is abnormal.

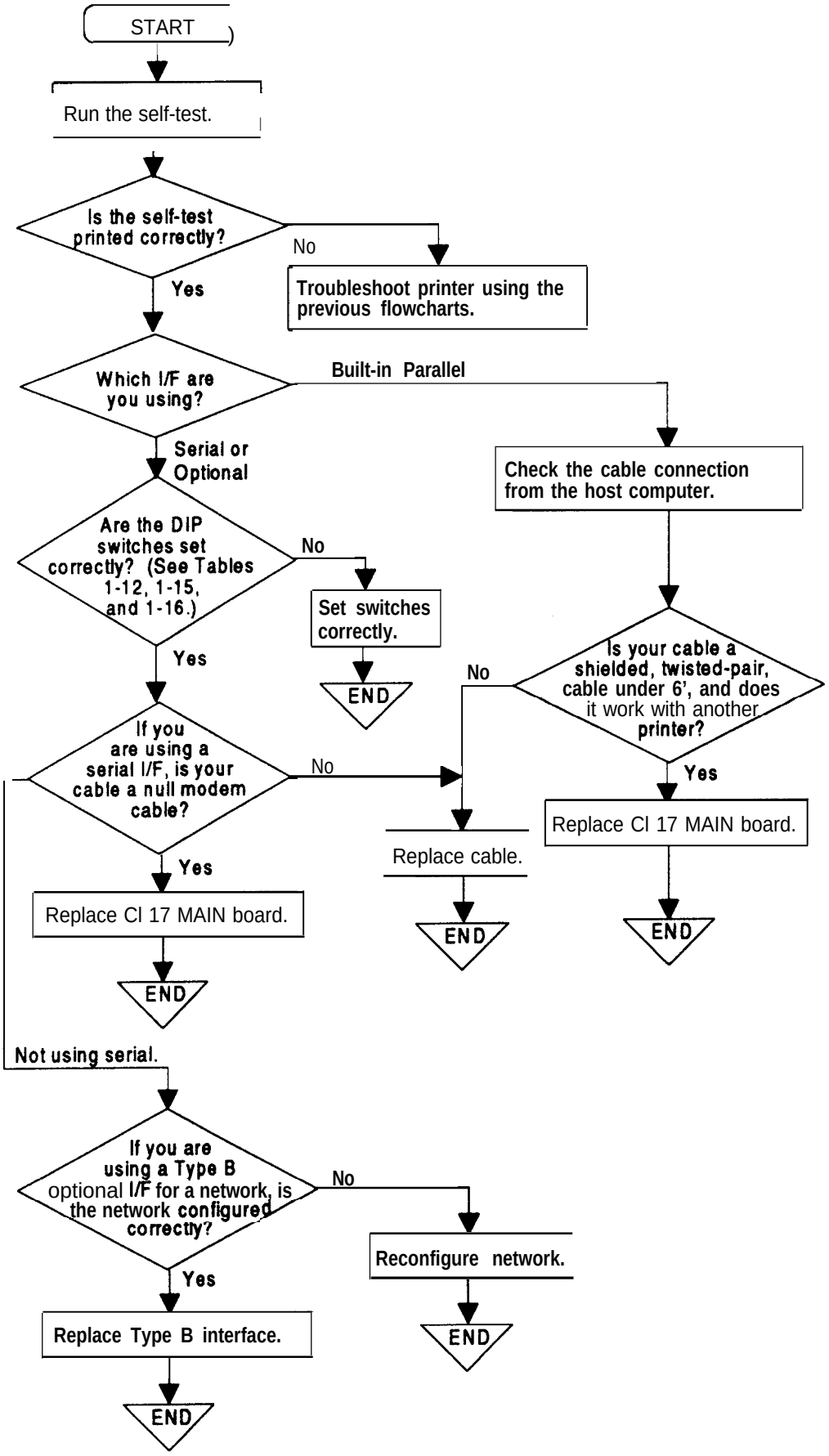


5. Control panel operation is abnormal.



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

Note: The flowchart below assumes the host computer is operating normally.



5.3 REPAIR OF THE POWER SUPPLY CIRCUIT

This section provides detailed troubleshooting methods to isolate components in the power supply or on the main board. This information is for use by servicers who repair to the component level. U.S. servicers repair to the unit level only, and may ignore this section.

The table below provides causes, checkpoints, and solutions for different power supply circuit problems. The checkpoints include waveforms for normal operation. By referring to the checkpoints, determine the defective component. Then perform the proper repair. The table provides the following four columns:

- ❑ Symptom: Check this column for a list of common printer problems.
- ❑ Cause: Use this column to identify possible causes that could produce this symptom.
- ❑ Checkpoint: Follow the troubleshooting checks in this column to isolate your problem.
- ❑ Solution: Repair the printer using the instructions in this column.

Table 5-4. C117 PSB/PSE Board Assembly Main Parts List

Location	Name	Description
IC151	TL494	PWM switching controller
IC152 (A/B)	NJM2903	Comparator IC (voltage drop monitor for the two +35 VDC lines)
Q101	K1531	Main switching FET
Q201	K1531	Main switching FET

Table 5-5. C117 PSB/PSE Board Assembly Component Repair

Symptom	Cause	Checkpoint	Solution
No DC voltage is present at the output.	The VPC signal (HIGH level) is not being sent from the main board.	Look at the voltage waveform from the gate array on the main board and check the head driver voltage waveform. (Refer to Table 5-6.)	Replace the gate array or head driver on the main board.
	The DRERR signal is HIGH.	Measure the voltage level of the DRERR signal at CN3.	Replace the head driver on the main board.
	CLIMIT signal is HIGH.	Measure the voltage level of the CLIMIT signal at CN3.	Wait until the printer prints again.
Fuse F1 blows immediately after replacement.	The line filter circuit is defective.	Check if any of pins C1-C6 or RI is shorting the AC line.	Replace the abnormal element.

Table 5-5. C117 PSB/PSE Board Assembly Component Repair (continued)

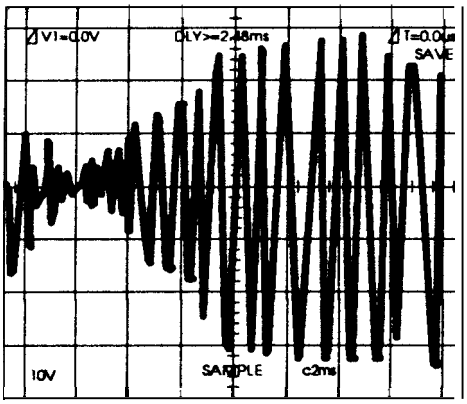
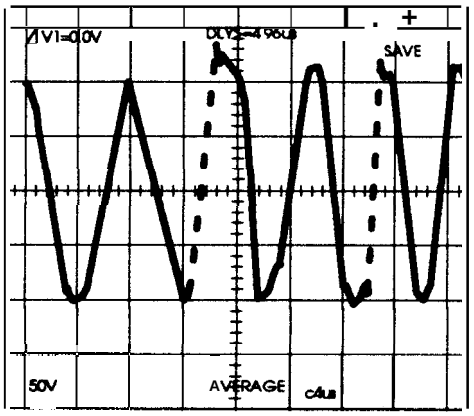
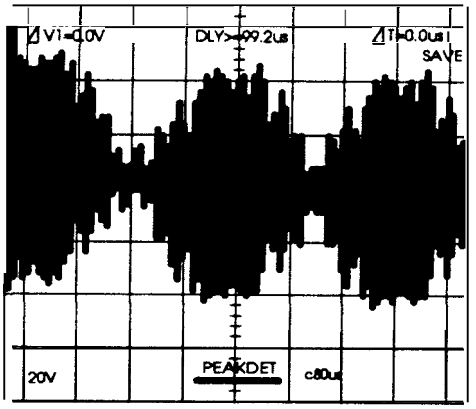
Symptom	Cause	Checkpoint	Solution
The +35 VDC line is dead.	The main switching FETs (Q101 or Q201) are defective.	*Check* the voltage waveform between the drain side and GND. 	Replace Q101 or Q201.
	QI02 or Q201 is defective.	Observe the voltage waveform between the collector side and GND. 	Replace Q101 or Q201.
	Q103 or Q203 is defective.	Check the voltage waveform between the collector side and GND. 	Replace Q103 or 2203.

Table 5-5. C117 PSB/PSE Board Assembly Component Repair (continued)

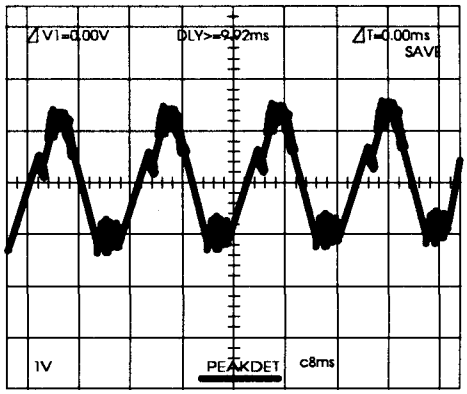
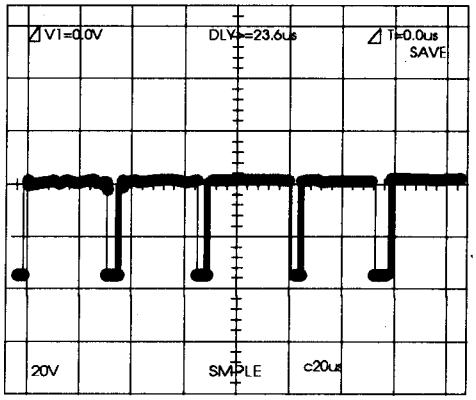
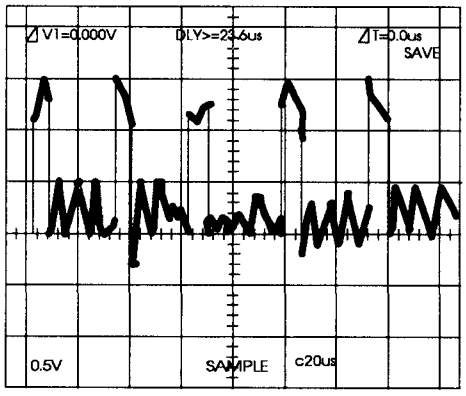
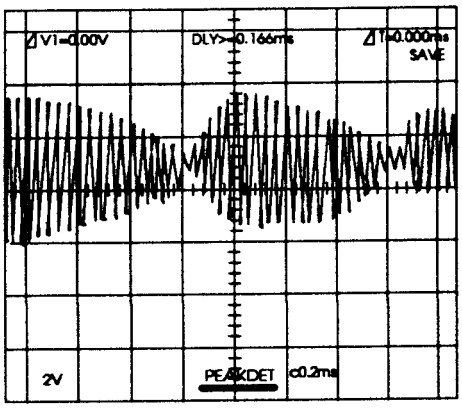
Symptom	Cause	Checkpoint	Solution
The +5 VDC line is defective.	IC151 is defective.	Observe the drive waveform for IC151 (at pin 4 or 5). 	Replace IC151.
		Look at the PWM control waveform for IC151 (at pin 8 or 11) and Q152. 	Replace IC151 or Q152.
	Q151 is defective.	Check the voltage waveform between the collector side and GND. 	Replace Q151.
+35 VDC line s abnormal.	IC152 is defective. (If this IC is defective, it cannot monitor the +35 VDC lines, and printing or motor operation becomes abnormal.)	When the input voltage of the minus port is less than 1.3 VDC, the comparator outputs a HIGH signal.	Replace IC152.

Table 5-5. C117 **PSB/PSE** Board Assembly Component **Repair** (continued)

Symptom	Cause	Checkpoint	Solution
+35 VDC line is abnormal.	Q153 or Q253 and Q154 are defective (constant voltage control transistors).	Observe the voltage waveform between the collector side and GND. 	Replace the abnormal element.
±12 VDC line is dead.	The rectifier circuit is defective.	Verify that approximately ±12 V is output at the terminal of C160 and C161, and verify that Q183 and Q184 (or Q185 and Q188) are not defective.	Replace the abnormal element.

5.4 REPAIR OF THE C117 MAIN BOARD ASSEMBLY

This section provides detailed troubleshooting methods to isolate components in the C117 MAIN board. This information is for use by servicers who repair to the component level. U.S. servicers repair to the unit level only, and may ignore this section.

The table below provides instructions to repair the C117 MAIN board assembly. It describes various symptoms, likely causes, troubleshooting checkpoints, and solutions. The checkpoints column describes proper waveforms, resistance values, and other values to check when evaluating the operation of a component that may be defective. Check these values and repair the board as described in the solution column.

Table 5-6. C117 MAIN Board Assembly Component Repair

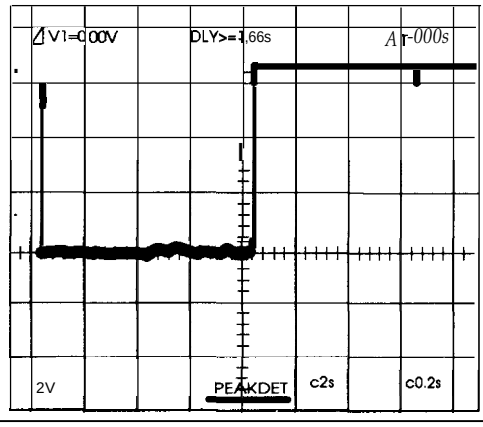
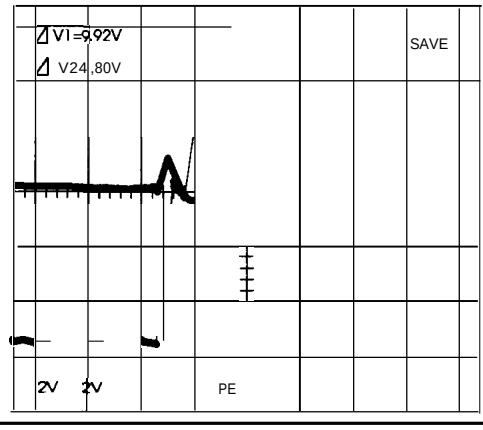
Symptom	Cause	Checkpoint	Solution
The printer does not operate at all.	The DRERR signal was sent to the CI 17 power supply board (a HIGH level turns off the power supply).	Measure the voltage level of the DRERR signal at CN1 or check the head driver IC's voltage waveform.	Replace the head driver.
	The VPC signal (HIGH level) was not sent to the CI 17 power supply board. (If VPC is output to the power supply, and the head driver is not defective, the gate array is probably defective.)	Check the voltage waveform for the VPC signal when power is turned on and verify the voltage waveform for the head driver. (Refer to the head driver waveform figure, above.) 	Replace the head driver or gate array.
	The reset circuit is not operational (for logic).	Look at the voltage waveform for the +5 V line (pin 3 of IC9) and the reset signal (pin 1 of IC9). 	Replace IC9.

Table 5-6. C117 MAIN Board Assembly Component Repair (continued)

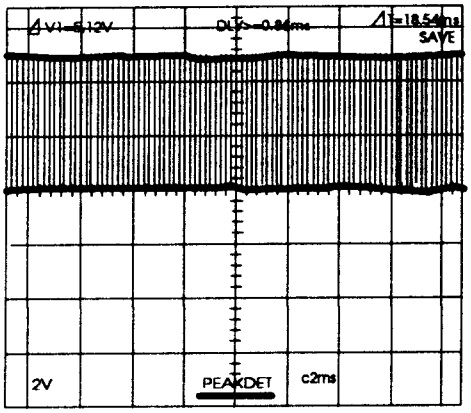
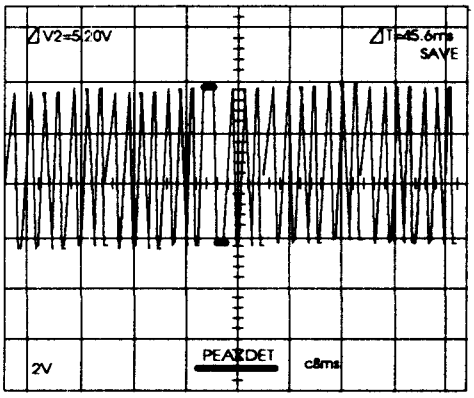
Symptom	Cause	Checkpoint	Solution
The printer does not operate at all.	The reset circuit is not operational (for the driver).	Check the voltage waveform for the +35 V line (pin 2 of IC8) and the reset signal (pin 6 of IC8). (Refer to the figure above.)	Replace IC9.
	The control ROM is defective.	Check pin 24 of IC4 for a change in the signal (HIGH or LOW). 	Replace IC4.
	The gate array is defective.	Check pin 46 of IC7 for a change in the signal (HIGH or LOW). Refer to the figure above.	Replace IC7.
	The CPU is defective.	Look at the oscillator at either pin 26 or pin 27 of the CPU. 	If this signal is detected, replace IC1. Otherwise, replace CRU1.
	The PS-RAM is defective.	Observe pin 21 of IC3 for a change in the signal (HIGH or LOW). Refer to the figure showing IC4.	Replace IC3.

Table 5-6. C117 MAIN Board Assembly Component Repair (continued)

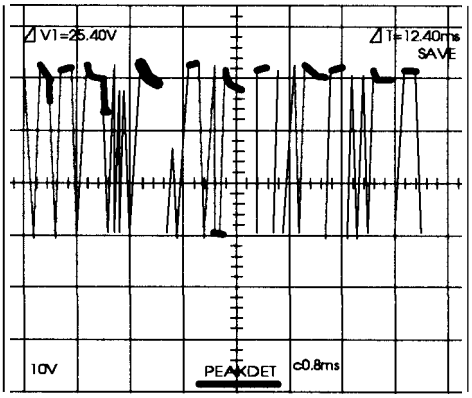
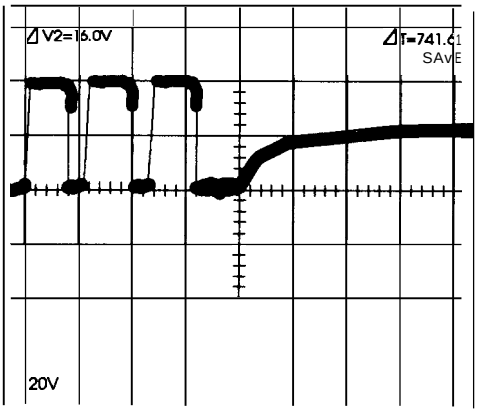
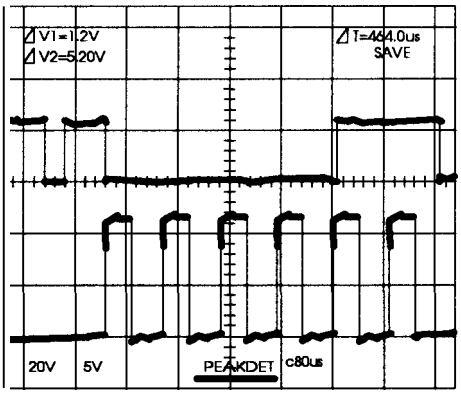
Symptom	Cause	Checkpoint	Solution
The carriage operates abnormally.	IC7 is defective.	Check the signals for the carriage motor phases at pins 108, 109, 110, and 111 of IC7. 	Replace IC7.
	QM1 is defective.	Check the signals for the carriage motor phases at pins 9 and 11 of QM1. 	Replace QM1.
	QM1 is defective.	Measure the voltage level at pins 9 anc 11 of IC QM1 when the carriage is operating. (The normal voltage level is approximatelv 35 VDC.)	Replace QM1.
	Q3 or Q6 (for P-ch. FET drive) is defective.	Observe the switching waveform between the base side and the collector side of Q3 or Q6. 	Replace Q3 or Q6.

Table 5-6. Cl 17 MAIN Board Assembly Component Repair (continued)

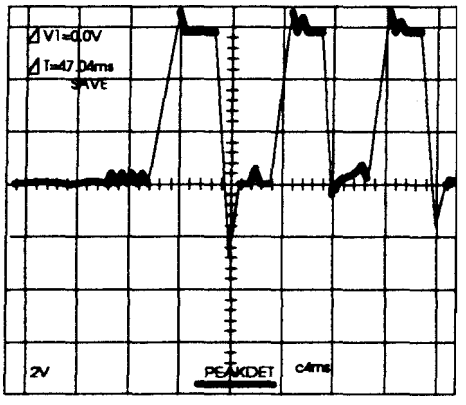
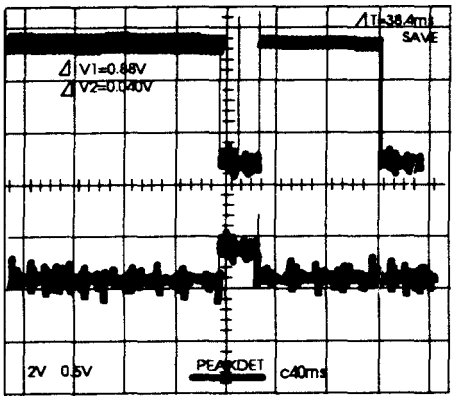
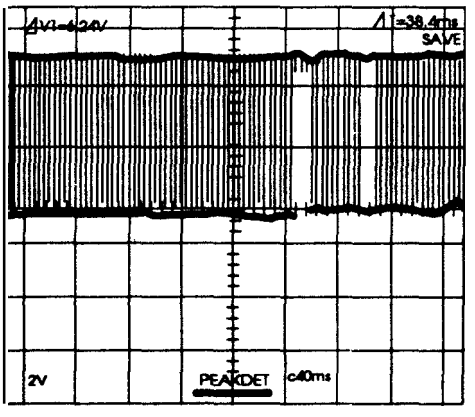
Symptom	Cause	Checkpoint	Solution
The carriage operates abnormally.	The carriage encode sensor is defective.	Observe the carriage encoder sensor output signal at pins 3 and 4 of CN1 O. 	Replace the carriage encoder sensor.
	Carriage operation is unstable (due to a lack of motor torque).	Check the switching waveform for Q4, Q7, and Q8. 	Replace the abnormal transistor.
		Observe the feedback signal at pin 101 IC1 O that detects the current in the carriage motor. 	Replace IC10.
		Measure the voltage level at pin 3 of C1O. (The normal voltage is approximately 4.7 VDC.)	Replace D52.

Table 5-6. C117 MAIN Board Assembly Component Repair (continued)

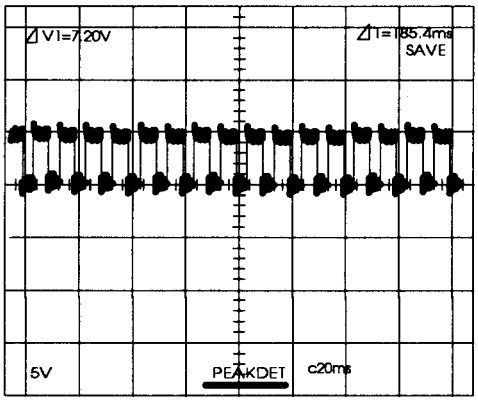
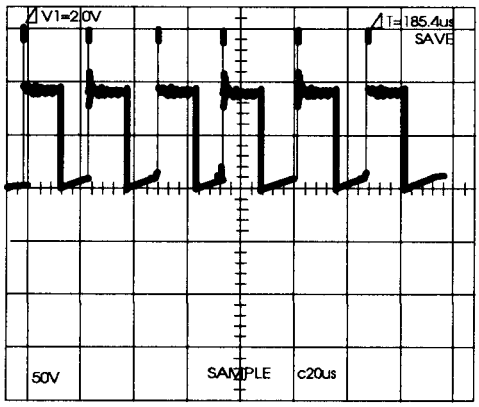
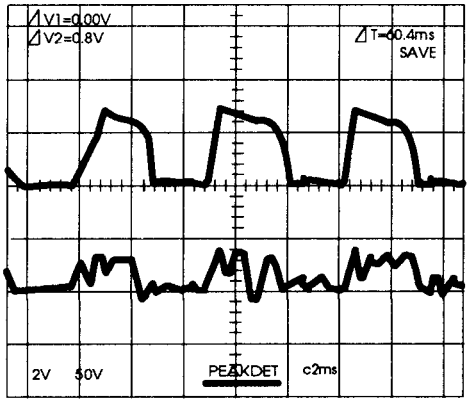
Symptom	Cause	Checkpoint	Solution
Paper feeding is abnormal.	The CPU is defective.	Check the paper feed motor phase drive signals at pins 1-4 of IC1. 	Replace IC1.
	IC11 is defective.	At IC11, check the output signals for pins 1, 8, 11, and 18. 	Replace IC11.
Ribbon feeding is abnormal.	The CPU is defective.	For transistors Q28 - Q31, observe the input signal from the CPU (base) and the output signal (collector). 	If there is no input signal, replace IC1; if there is no output signal, replace the abnormal transistor.
	Fuse F3 is defective.	Check if fuse F3 is defective.	Replace F3.

Table 5-6. C117 MAIN Board Assembly Component Repair (continued)

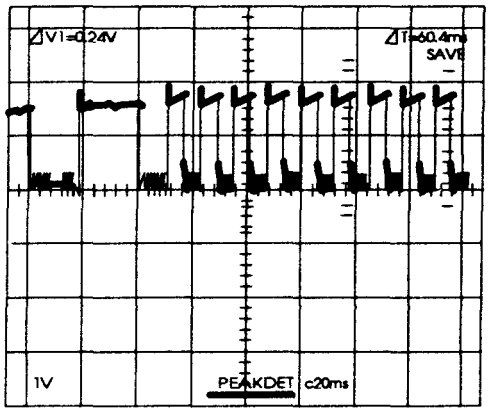
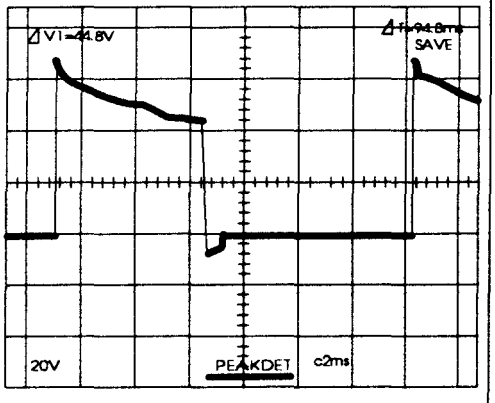
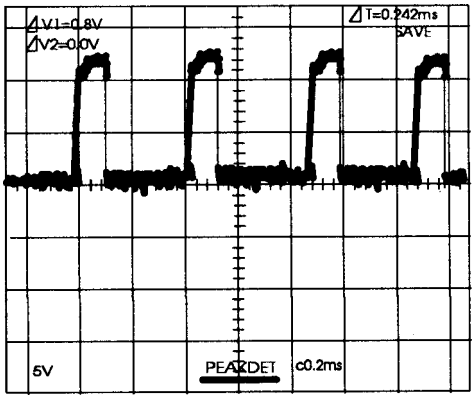
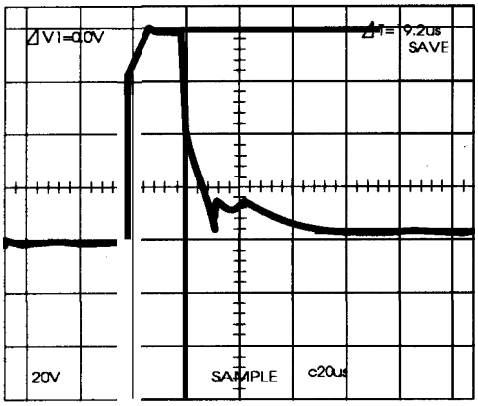
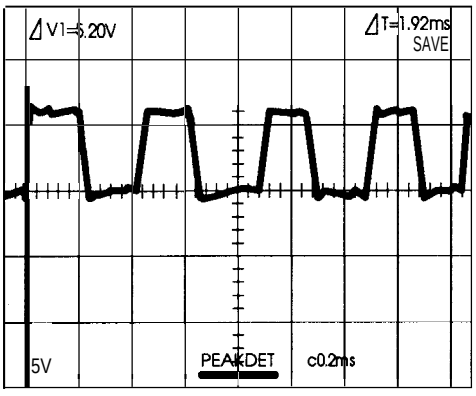
Symptom	Cause	Checkpoint	Solution
Head fan motor operation is abnormal.	Q5 or Q9 is defective.	Measure the voltage level for pins 1 and 4 of CN6. (The normal voltage is approximately 35 VDC.)	Replace Q5 or Q9.
The PG motor operates abnormally.	IC7 is defective.	Observe the PG motor phase signal at pins 120-123 of IC7. 	Replace IC7
	QM2 is defective.	At QM2, look at the output signal for pins 15, 13, 11, and 10. 	Replace QM2.
	Fuse F2 is defective.	Check if fuse F2 is defective.	Replace F2.
	The PG sensor is defective.	Observe the PG sensor output signal at pins 44 and 45 of CN6. Refer to the PG sensor figure.	Replace the PG sensor.
The plunger s defective.	Fuse F1 is defective.	Check if fuse F1 is defective.	Replace F1.
	IC7 is defective.	When paper is loaded into the printer, look at the switching signal at pins 117 and 118 of IC7.	If this signal is normal, replace C19 or Q17.
	The PG home sensor is defective.	Measure the voltage level at pin 32 of CN6 when the printer performs the platen gap measurement sequence. (PG home = LOW level; other = HIGH level.)	Replace the micro switch for the PG home sensor.

Table 5-6. C117 MAIN Board Assembly Component Repair (continued)

Symptom	Cause	Checkpoint	Solution
The self-test is printed incorrectly.	IC7 is defective.	Observe the output signal at pins 129-137 of IC7. 	Replace IC7.
	The head driver FETs are defective.	Observe the voltage waveform at the drain side. 	Replace the abnormal FET.
	The CPU is defective.	Observe the PTS signal at pin 15 of the CPU. 	Replace the CPU.

5.5 PRINTER MECHANISM REPAIR

The table below describes how to isolate problems with the printer mechanism. To replace or adjust printer mechanism parts, refer to Chapter 3, *Disassembly* and Assembly, and Chapter 4, *Adjustments*. If a **symptom** recurs following a repair attempt, look for other possible causes and solutions in the table b&low.

Table 5-7. Printer Mechanism Repair

Symptom	*Cause*	Checkpoint	**Solution**
The CR motor does not operate.	The transport locking bracket (used to hold the carriage in place when the printer is moved) has not been removed.	Verify that the transport locking bracket has been removed.	Remove bracket. (Refer to Section 3.1.)
	Foreign objects are lodged in the gears or elsewhere (e.g., paper dust on the carriage encoder belt) in the mechanism.	Manually move the carriage to see if the the motor rotates.	Remove any foreign objects.
	The CR motor is defective.	Measure the coil resistance of the CR motor. It should be approximately 6.2 ohms.	Replace the CR motor.
	The carriage timing belt is defective.	Manually check the carriage timing belt tension.	Perform the carriage timing belt tension adjustment, as described in Section 4.1.2.
	The carriage guide shaft parallelism value is incorrect.	Check whether the carriage moves smoothly when moved manually. (Check that foreign objects are not lodged in the printer mechanism.)	Perform the carriage guide shaft parallelism adjustment, as described in Section 4.1.5.
	The CR sensor is defective.	Check the waveform for the carriage encoder signal. (Refer to Table 5-6.)	Replace the CR sensor.
	The carriage encoder belt is damaged or covered with dust.	Check the encoder belt (below the carriage timing belt).	Replace or clean the carnage encoder belt.
The carriage moves, but no printing is performed.	The printhead FPC common wires are broken.	Check the continuity of the common wires for the printhead FPC.	Replace the FPC.

Table 5-7. Printer Mechanism Repair (continued)

Symptom	Cause	Checkpoint	Solution
A particular dot does not print.	The printhead is defective.	Measure the printhead coil resistance. (Refer to Figure 5-4 for details.)	Replace the printhead.
	The printhead is defective.	Check whether a dot wire is worn.	Replace the printhead.
The print is too light or print density is not uniform.	The printhead is defective.	Check if the tip of a dot wire is worn.	Replace the printhead.
	The parallelism value is incorrect.	Print density differs at the right and left sides of the page (darker on one side than the other).	Perform the parallelism adjustment, as described in Section 4.1.5.
Printing is performed, but the printer does not feed paper or does not feed it correctly.	Foreign objects are lodged in the paper path.	Visually check the paper path.	Remove any foreign substances.
	The PF motor is not driving the gear properly.	Check whether the PF motor pinion gear rotates smoothly when rotated manually.	Check backlash between PF motor pinion gear and paper feed reduction gear.
	The PF motor is defective.	Measure coil resistance for the PF motor. (The correct resistance is approximately 2.85 ohms.) Also check the PF motor drivers.	Replace the PF motor, and if drivers are bad, replace main board at the same time.
The ribbon feed (RF) motor does not operate.	The ribbon cartridge is defective.	Remove the ribbon cartridge, rotate it, and check whether it feeds the ribbon normally.	Replace the ribbon cartridge.
	Foreign objects are caught in the gears.	Check whether the ribbon driving gear rotates when the cartridge is moved manually.	Remove any foreign objects or replace darnaged ribbon feed mechanism part (the ribbon feed select gear, ribbon feed transmission gear, or ribbon feed gear).

Table 5-7. Printer Mechanism Repair (continued)

Symptom	Cause	Checkpoint	Solution
The RF motor does not operate.	The parallelism value is incorrect.	Check whether the carriage moves smoothly when moved manually. (Check that foreign objects are not lodged in the printer mechanism.)	Perform the parallelism adjustment, as described in Section 4.1.5.
The RF motor does not operate.	The RF motor is defective.	Check the coil resistance of the RF motor. (It should be about 150 ohms.)	Replace the RF motor.
The PG motor does not operate.	The backlash value is incorrect.	Check whether the carriage guide shaft rotates smoothly when rotated manually.	Loosen the 2 screws securing the PG motor to the left side frame. Then adjust the backlash between the PG motor pinion gear and the carriage guide shaft gear, as described in Chapter 4, *Adjustments*.
	The PG sensor is defective.	Check the output signal of the PG sensor. (Refer to Table 5-6.)	Replace the PG sensor.
	The encoder plate is defective.	Check whether the encoder plate is broken or stained.	Replace the PG motor or clean the encoder plate.
	The PG home sensor is defective.	Check the continuity of the sensor. (Check the status of the two micro switches.)	Replace the PG home sensor (micro switch type).
	The PG motor is defective.	Check the coil resistance of the PG motor. (It should be about 250 ohms.)	Replace the PG motor.
Printing continues past the end of the paper.	The front, rear, or top PE sensor is defective.	Check the PE sensor.	Replace the PE sensor.
When paper jams, the printer does not beep.	The paper jam sensor is defective.	Check the paper jam sensor.	Replace the paper jam sensor.

Table 5-7. Printer Mechanism Repair (continued)

Symptom	Cause	Checkpoint	Solution
Printing occurs outside the paper width.	The PW sensor is defective.	Check the PW sensor.	Replace the PW sensor.
The paper bail assembly does not work.	The plunger is defective.	Check the coil resistance of the plunger. (It should be about 9 ohms.)	Replace the plunger.
Continuous paper becomes crumpled at the front or rear tractor assembly.	The tension value of the tractor wire spring is incorrect.	The distance between the frame and the seal securing the white line should be about 3 mm (.12 inches).	PerForm the tractor wire spring tension adjustment, as described in Section 4.1.3.
The tractor select (front or rear) function is not working.	The tractor select sensor is defective.	Check the continuity of the tractor select sensor.	Replace the tractor select sensor.
	The tractor select gear is disconnected from the tractor select cam.	Visually check the tractor select gear holder.	Join the tip of the tractor select lever to the tractor select gear holder.

CHAPTER 6 Maintenance and Lubrication

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6.1 PREVENTIVE MAINTENANCE

To keep the printer in good condition, regularly clean the case exterior (using denatured alcohol) and vacuum the mechanism's interior to remove dust and paper debris. After cleaning the printer, check that it is adequately lubricated, as described in Section 6.2, below. Before returning the printer to the customer, inspect the springs and paper feed rollers and check that the printer operates properly.

WARNING

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.

Note: It is necessary to clean the carriage encoder belt periodically. When this printer is returned for service, clean the surface of carriage encoder belt.

6.2 LUBRICATION AND ADHESIVE APPLICATION

EPSON recommends that the printer be lubricated at the points illustrated in Figures 6-2,6-3, and 6-4 using EPSON lubricants 02 and G26. These lubricants have been extensively tested and found to comply with needs of the printer. Refer to Table 6-1 for information on lubricants 02 and G26. Table 6-2 lists the appropriate lubricant for each point. Make sure the parts to be lubricated are clean before applying lubricant. Also avoid applying too much lubricant because it may damage related parts.

Adhesive application is necessary at the points indicated in Table 6-3 when parts are disassembled or replaced. EPSON recommends Neji Lock #2 (G) adhesive be applied to the points indicated in Figures 6-2,6-3, and 6-4. Avoid allowing excess adhesive to overflow onto related parts.

Table 6-1. Lubricants and Adhesive

Classification	Description	Capacity	Availability	Part No.
Oil	02	40 cc	EPSON*	B71 0200001
Grease	G26	40 g	EPSON*	B702600001
Adhesive	Neji Lock #2 (G)	1000 g	EPSON*	B730200200

* EPSON-exclusive product

Table 6-2. Lubrication Points

Ref No.	Ref. Fig. No.	Lubrication Points	Lubricant
(1)	6-3	Carriage oil pad ring (on both left and right sides of carriage)	02
(2)	6-3	Carriage oil pad (under the carriage head cable holder)	02
(3)	6-3	Hole holding the tip of the rear carriage guide shaft (in both left and right side frames)	G26
(4)	6-3	Both edges of the rear carriage guide shaft	G26
(5)	6-3	Parallelism adjustment lever (contact point with the rear carriage guide shaft)	G26
(6)	6-4	Rear carriage shaft holding lever (contact point with the rear carriage guide shaft)	G26
(7)	6-3	Carriage guide shaft (on the both front and rear shafts)	02
(8)	6-4	Ptaten roller shaft holder (contact point with the platen toiler)	G26
(9)	6-4	Paper bail gear	G26
(lO)	6-2	Shafts of paper feed gears (shafts on the left frame)	G26,O2
(11)	6-2	Paper feed gears (gears on the left frame)	G26
(12)	6-2	Tension pulley (pulley shaft and hook for the tension pulley spring)	G26
(13)	6-3	Fulcrum point for the paper bail shaft and plunger	G26
(14)	6-4	Platen gap motor pinion	G26
(15)	6-3	Carriage guide shaft gear	G26
(16)	6-3	Ribbon feed gears	G26
(17)	6-3	Tractor select cam	G26

Table 6-3. Adhesive Application Points

Ref No.	Ref. Fig. No.	Adhesive Application Points	Adhesive
(18)	6-3	Carriage motor fixing screws (2 screws)	Neji Lock #2 (G)
(19)	6-3	Timing belt holder fixing screw	
(20)	6-3	Parallelism adjustment lever fixing screws (2 screws)	
(21)	6-4	Platen roller holder fixing screw (fixing the holder to the platen)	
(22)	6-4	Lower paper guide assembly fixing screws (3 screws)	
(23)	6-4	Connector junction board fixing screws (2 screws)	
(24)	6-4	Platen gap motor fixing screws (2 screws)	
(25)	6-3	Tractor tension wire	

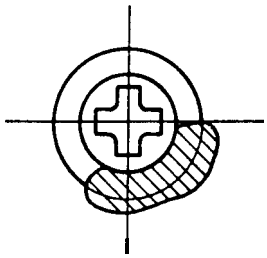

Figure 6-1. Correct Adhesive Application

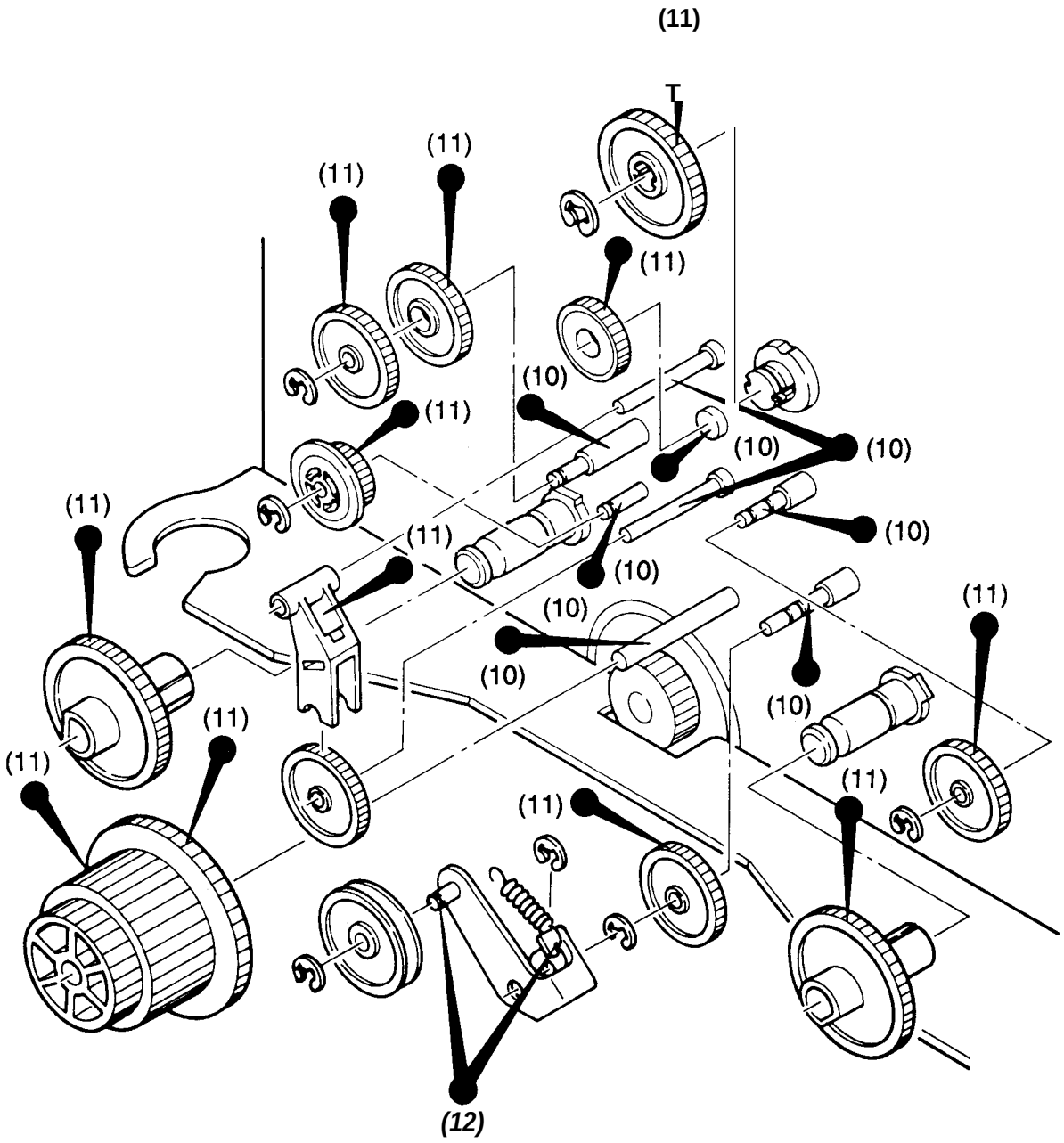

Figure 6-2. Lubrication and Adhesive Diagram 1

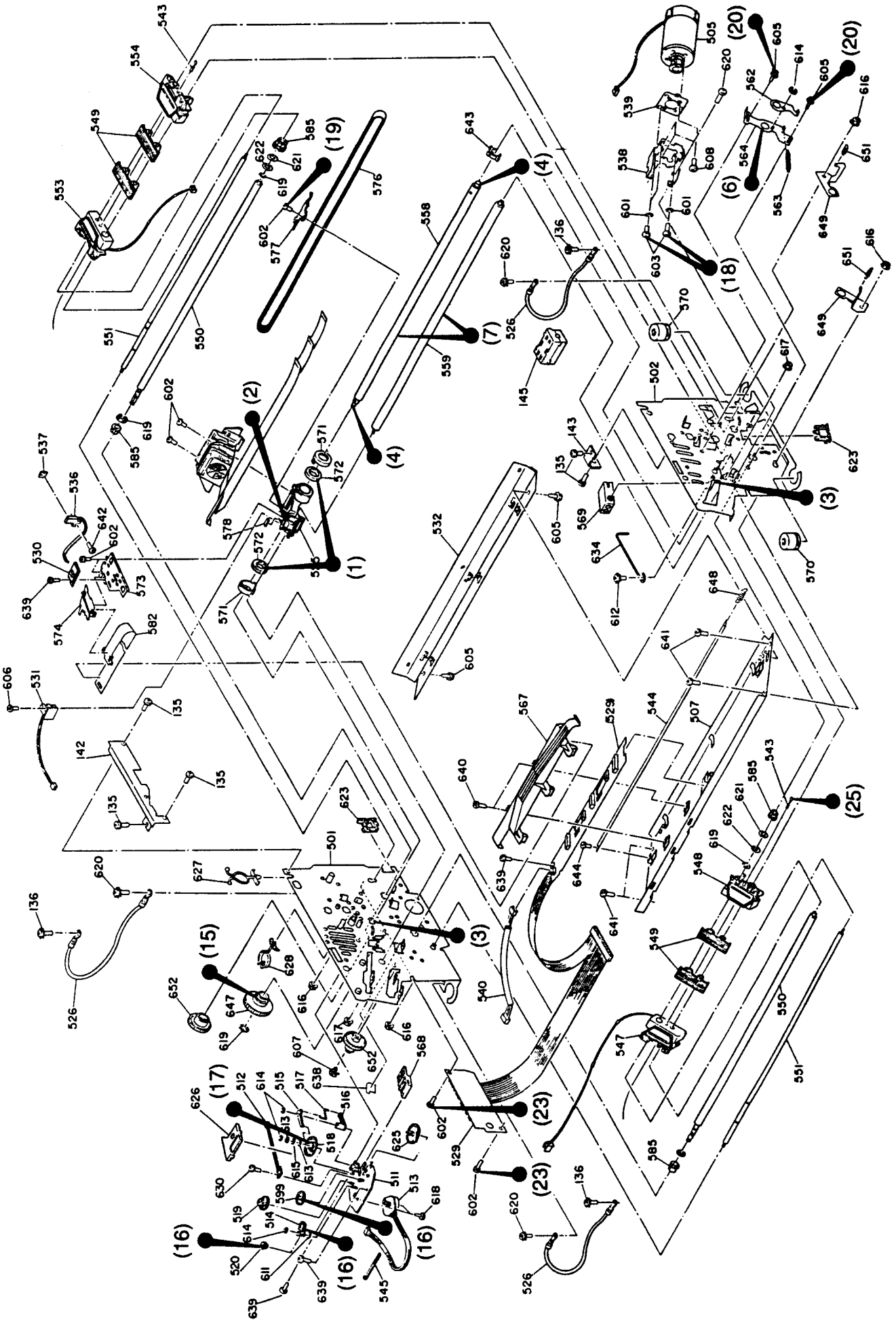

Figure 6-3. Lubrication and Adhesive Diagram 2

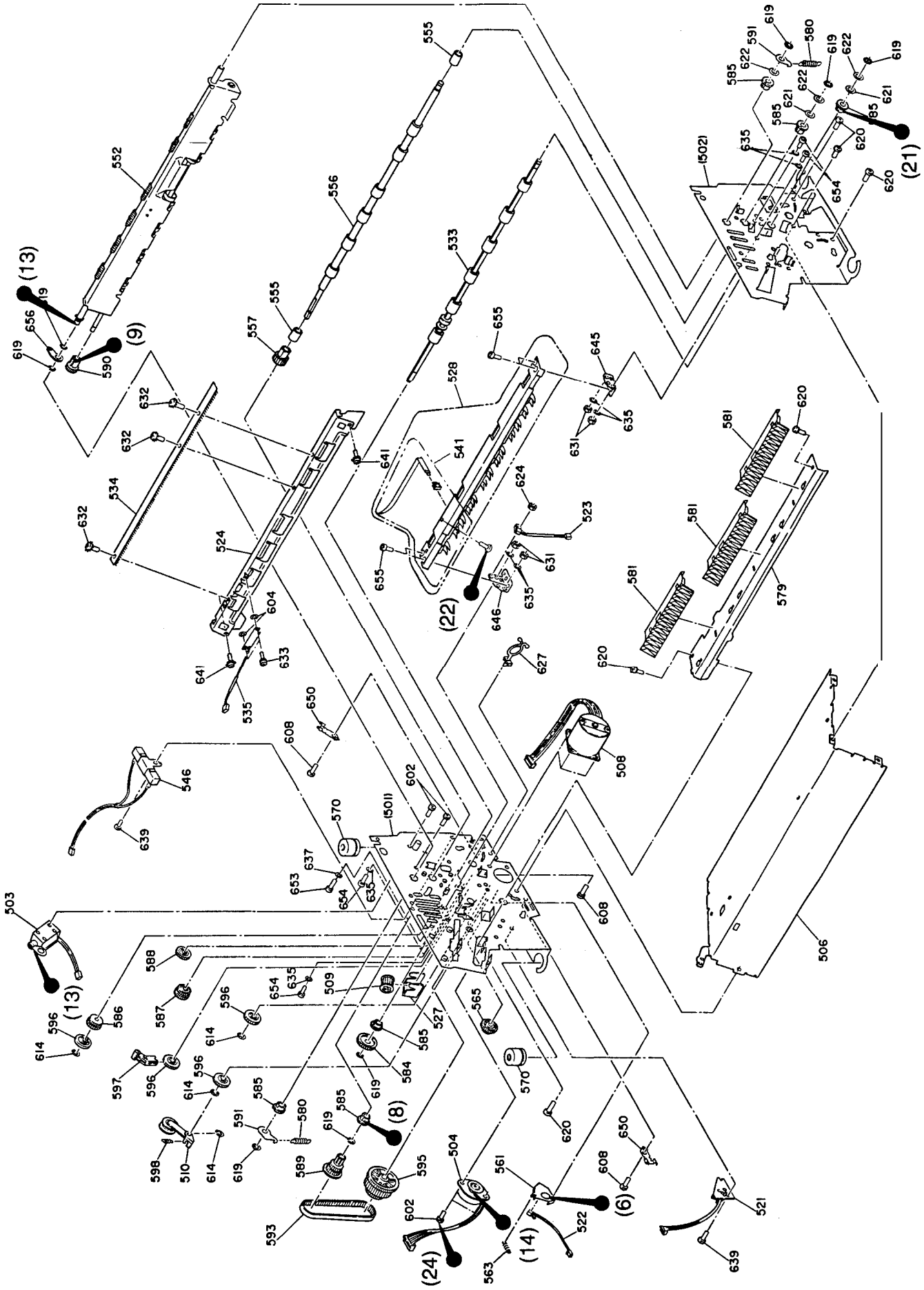

Figure 6-4. Lubrication and Adhesive Diagram 3

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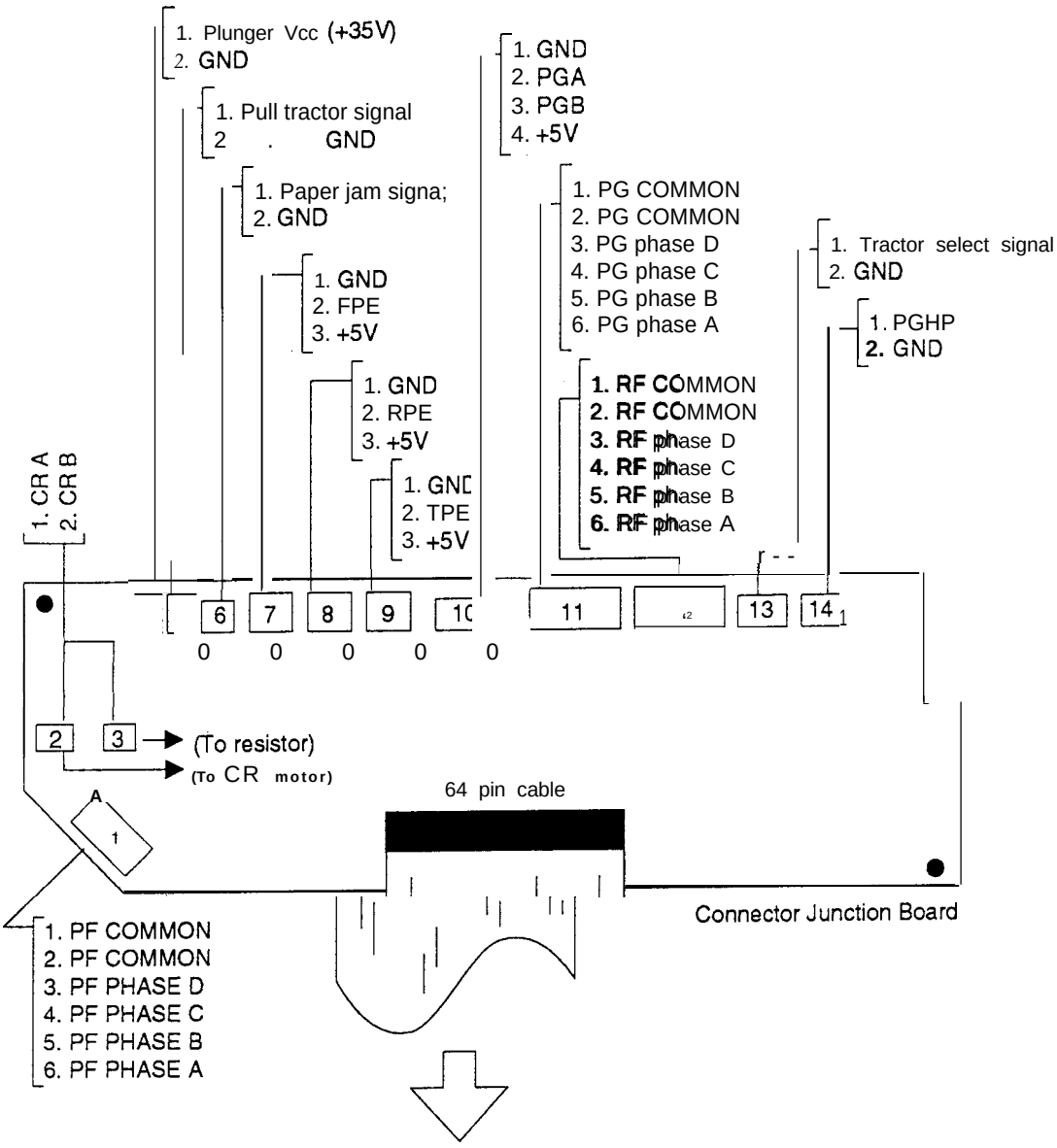

CI 17 Main Board

A.1 CONNECTOR SUMMARY

Figure A-1 illustrates the interconnection of the primary components, and Table A-1 summarizes the functions and sizes of the connectors.

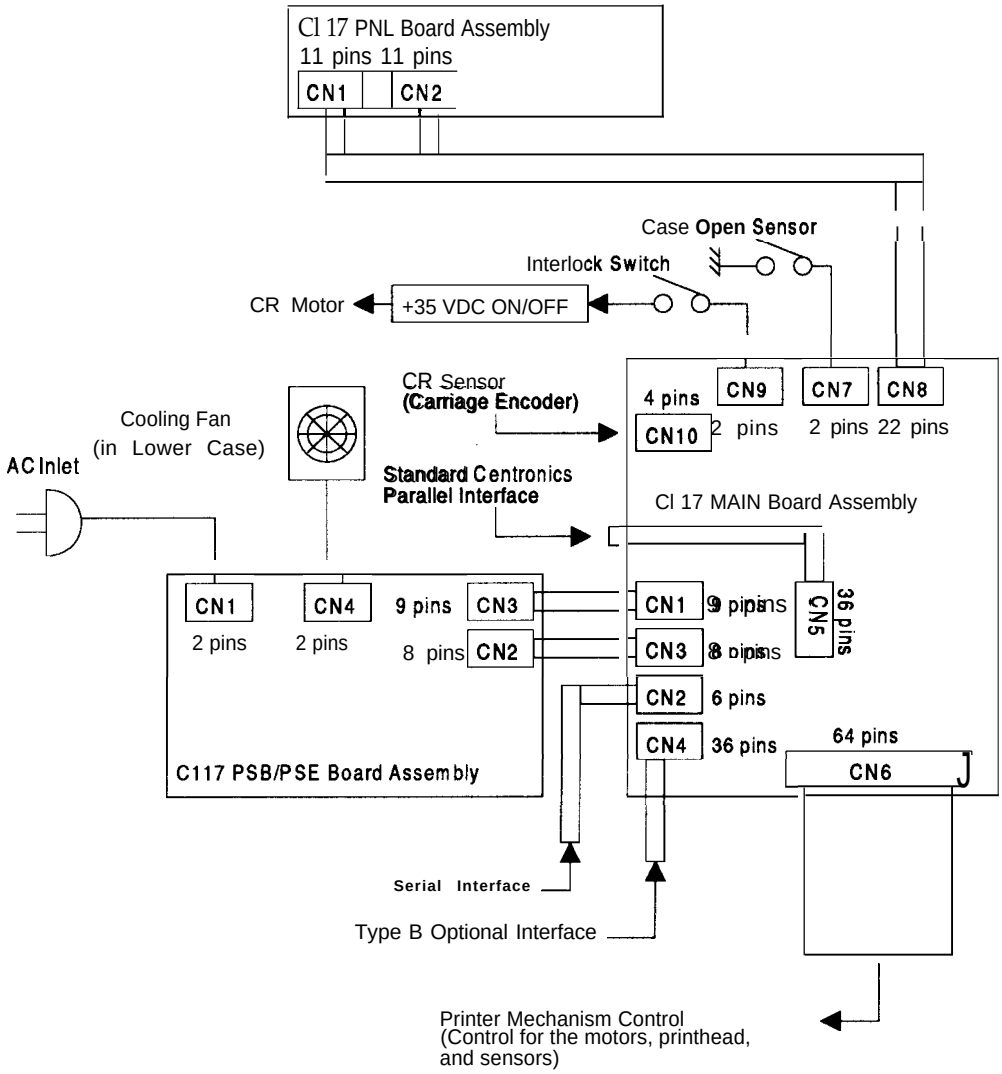

Figure A-1. DFX-5000+ Cable Connections

Table A-1. Connector Summary

Unit	Connector	Description	Pins	Reference Table
C117 MAIN	CN1	Receives the +5 VDC and ±12 VDC voltages from connector CN3 on the CI 17 PSB/PSE board.	9	A-2
	CN2	Standard serial interface; receives serial data from the external computer.	7	A-3
	CN3	Receives the +35 VDC voltage from connector CN2 on the CI 17 PSB/PSE board.	8	A-4
	CN4	Type B optional interface; receives parallel or serial data from the external computer.	36	A-5
	CN5	Standard parallel interface; receives 8-bit parallel data from the external computer.	36	A-6
	CN6	❑ RF, PF, CR, and PG motor and fan driver signals ❑ Plunger driver signals ❑ Head fan temperature CI PG sensor ❑ PW sensor ❑ Front, rear, or top PE sensor ❑ Paper jam sensor ❑ PG home sensor ❑ Tractor select sensor ❑ Pull tractor sensor ❑ Printhead temperature sensor ❑ Printhead coil driver signal.	64	A-7
	CN7	Connector for the signals from the cover open sensor.	2	A-8
	CN8	Connector for the signals from the CI 17 PNL board	22	A-9
	CN9	Connector for the interlock switch.	2	A-10
	CN10	Connector for the CR sensor (encoder).	4	A-1 1
C117 PSB/PSE	CN1	AC power input	3	A-12
	CN2	Supplies the DC voltage (+35V) to the CI 17 MAIN board for the motors, plunger, and printhead coils.	8	A-13
	CN3	Supplies the DC voltages (+5V and ±12V) to the CI 17 MAIN board assembly. Receives the control signal (DRERR) from the CI 17 MAIN board assembly.	9	A-14
	CN4	Supplies the DC voltage (+35V) to the CI 17 MAIN board assembly for the fan drivers.	2	A-15

Table A-2. CN1, C117 MAIN Board Assembly

Pin No.	I/O	Name	Description
1	O	VPC	OK for +35 VDC voltage output (used in conjunction with DRERR)
2	O	DRERR	Driver error signal to drop voltage to the head driver IC
3	I	CLIMIT	Power supply board voltage drop signal
4	I	+12	+12 VDC input for serial interface
5	I	-12	-12 VDC input for serial interface
6,7	-	GND	Ground for logic
8,9	I	+5	Power source for logic

Table A-3. CN2, C117 MAIN Board Assembly

Pin No.	I/O	Name	Description
1	O	REV	Reverse (same function as DTR)
2	O	DTR	Data terminal ready
3	I	RXD	Receive data
4	O	TXD	Transmit data
5		NC	Not connected
6		SG	Signal ground
7		FG	Frame ground

Table A-4. CN3, C117 MAIN Board Assembly

Pin No.	I/O	Name	Description
1,2	I	+35A	For six of the nine printhead pins (1,3,5,7,8 and 9)
3,4	-	GPA	Power ground
5,6	-	GPB	Power ground
7,8		+35B	For three of the nine printhead pins (2,4 and 6) and the motors

Table A-5. CN4, C117 MAIN Board Assembly

Pin No.	I/O	Name	Description
1-6	I	+5V	Power source for Type B optional interface
7	0	TXD	Serial transmission data
8	0	$\overline{\text{READY}}$	Ready to receive data
9	I	RXD	Serial receiving data input
10	-	NC	Not connected
11	0	$\overline{\text{RST}}$	Reset signal for Type B interface card
12	0	INH	Inhibit signal output
13	I	$\overline{\text{CMREQ}}$	Command request signal input
14	I	$\overline{\text{WRRDY}}$	Write ready signal input
15	I	$\overline{\text{RDREQ}}$	Read request signal input
16	0	$\overline{\text{WR}}$	Write signal input
17	0	$\overline{\text{RD}}$	Read signal input
18	0	$\overline{\text{CS}}$	Chip select signal input
19-24	-	GND	Ground
25-28	0	A3-A0	Address output
29-36	I/O	D7-D0	Data bus

Table A-6. CN5, Cl 17 MAIN Board Assembly

Pin No.	I/O	Name	Description
1	I	STRBX	Strobe signal input
2-9	I/O	DATA1-8	Data input/output
10	0	$\overline{\text{ACK}}$	Acknowledge signal output
11	0	BUSY	Busy Signal output
12	0	PE	Paper end signal output
13	0	SLCT	Printer select signal output
14	I	$\overline{\text{AFXT}}$	Auto line feed signal input
15,34	-	NC	Not connected
16,1&-30,	-	GND	Ground
17	-	FG	Frame ground
31	I	INIT	Initialize signal input
32	O	ERR	Error signal output
18,35	I	+5V	+5 VDC pullup
36	I	SLIN	Printer select signal input

Table A-7. CN6, Cl 17 MAIN Board Assembly

Pin No.	I/O	Name	Description
13,21,15, 25,20,23, 16,9,18	0	HD1 HD9	Head driver signal output
11,12,14	0	HDCOM1	Head common (HD2,4,6)
5-8,10	0	HDCOM2	Head common (HD1 ,3,5,7,8,9)
19	I	HTMP	Head temperature detection data input
59,61	0	CRA	CR motor driver signal output
55,57	0	CRB	CR motor driver signal output
53	0	PLGP	PNP transistor drive signal
54	O	PLGN	NPN transistor drive signal
39	O	PGCOM	PG motor common
40	0	PGD	PG motor phase D signal output
41	O	PGA	PG motorphase Asignaloutput
42	0	PGB	PG motor phase B signal output
43	0	PGC	PG motor phase C signal output
44,45	I	PENCA,PENCB	PG sensor data input
1,4	0	FANA, FANB	Head fan motor driver signal output
2	O	FANCOM	Head fan motor common
63,64	O	PFCOM	PF motor common
56,58,60, 62	O	PFA-PFD	PF motor phase signal output
34	0	RFCOM	RF motor common
36-38,35	0	RFA-RFD	RF motor phase signal output
3	I	FTMP	Head fan motor temperature detection data input
26	I	PWID	Paper width detection data input
33	I	TR.SEL	Pull tractor sensor status data input
51	I	P.TRCT	Pull tractor sensor
32	I	PGHOME	PG home sensor detection signal input
50	I	PJAM	Paper jam sensor data input
48	I	F.PE	Front PE sensor data input
47	I	R.PE	Rear PE sensor data input
46	I	T.PE	Top PE sensor data input
27,49	0	+5V	Power source for the sensors
17		HFTGND	Head fan temperature sensor
29,30,31, 52	-	GND	Ground for HTMP and FTMP sensor
22,24,28	-	NC	Not connected

Table A-8. CN7, C117 MAIN Board Assembly

Pin No.	I/O	Name	Description
1	I	COVER	Cover open sensordata input
2	O	GND	Ground

Table A-9. CN8, C117 MAIN Board Assembly

Pin No.	I/O	Name	Description
1	0	TEARLP	TEAR OFF LED output
2	0	BUZZER	Buzzer signal output
3	0	REGLP	REAR LED paper loaded output (green)
4	0	17CPI	17 cpi PITCH LED output
5	0	RERLP	REAR LED paper out output (red)
6	0	12CPIL	12 cpi PITCH LED output
7	0	FRGLP	FRONT LED paper loaded output (green)
8	0	10CPIL	10 cpi PITCH LED output
9	0	FRRLP	FRONT LED paper out output (red)
10	0	POUTLP	PAPER OUT LED output
11	0	TOFLP	TOP OF FORM LED output
12	0	PAUSEL	PAUSE LED OUtpUt
13	I	LFFFSW	LF/FF button input
14	I	MFBSW	Backward MICRO FEED button input
15	I	PSELSW	PAPER SELECT button input
16	I	MFFSW	Forward MICRO FEED button input
17	I	PITCH	PITCH button input
18	I	TEARSW	TEAR OFF button input
19	I	TOFSW	TOP OF FORM button input
20	I	PAUSE	PAUSE button input
21	-	GND	Ground
22	0	+5V	Power source for control panel

Table A-10. CN9, C117 MAIN Board Assembly

Pin No.	I/O	Name	Description
1	0	VP	+35 VDC
2	-	INTSW	Interlock switch

Table A-1 1. CN1O, Cl 17 MAIN Board Assembly

Pin No.	I/O	Name	Description
1		GND	Ground
2	0	+5V	Power source for CR sensor (encoder)
3	I	ENC_A	Encoder pulse phase A input
4	I	ENC_B	Encoder pulse phase B input

Table A-12. CN1, Cl 17 PSB/PSE Power Supply Board Assembly

Pin No.	I/O	Name	Description
1	I	L	Line
2			Not connected
3		N	Neutral

Table A-13. CN2, Cl 17 PSB/PSE Power Supply Board Assembly

Pin No.	I/O	Name	Description
1,2	0	+35V 12A	+35 VDC for the main board for six of the nine printhead pins (1 ,3,5,7,8 and 9)
3-6	-	GP	Ground for +35 VDC
7,8	0	+35V / 2A	+35 VDC for the main board for three of the nine printhead pins (2,4 and 6) and the motors

Table A-14. CN3, Cl 17 PSB/PSE Power Supply Board Assembly

Pin No.	I/O	Name	Description
1	I	VPC	OK for +35 VDC voltage output (used in conjunction with DRERR)
2	I	DRERR	Driver error signal to prohibit +35 VDC voltage (head driver broken)
3	0	CLIMIT	Voltage drop detection signal (sent to main board)
4	0	-12V	Supply for the serial interface circuit on the main board
5	0	+12V	Supply for the serial interface circuit on the main board
6,7	-	GL	Ground for logic
8,9	0	+5V	Supply for the logic circuit on the main board

Table A-15. CN4, Cl 17 PSB/PSE Power Supply Board Assembly

Pin No.	I/O	Name	Description
1	0	FAN	+35 VDC
2		FG	Frame ground

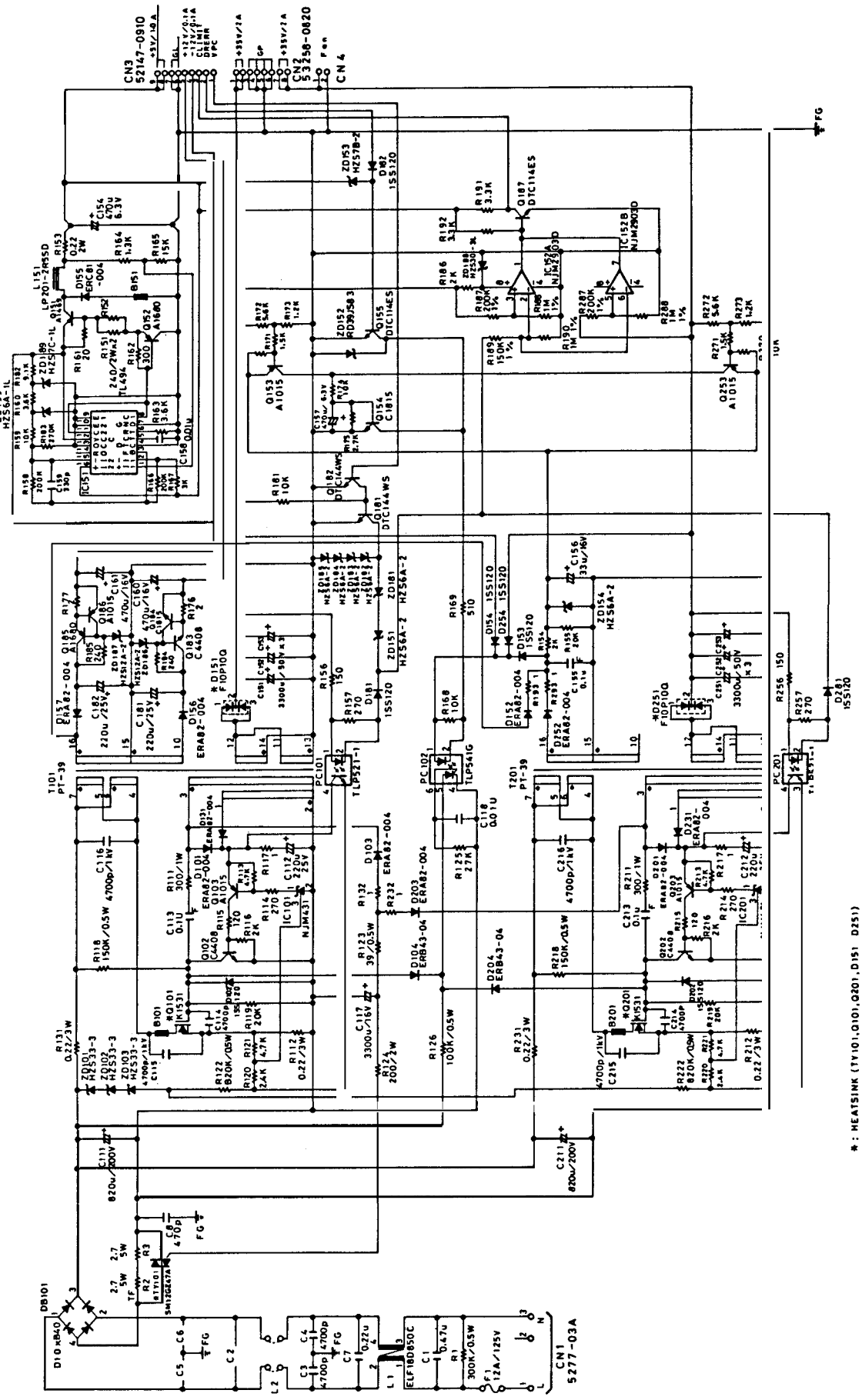

Figure A-3. C117 PSB Board Assembly Circuit Diagram

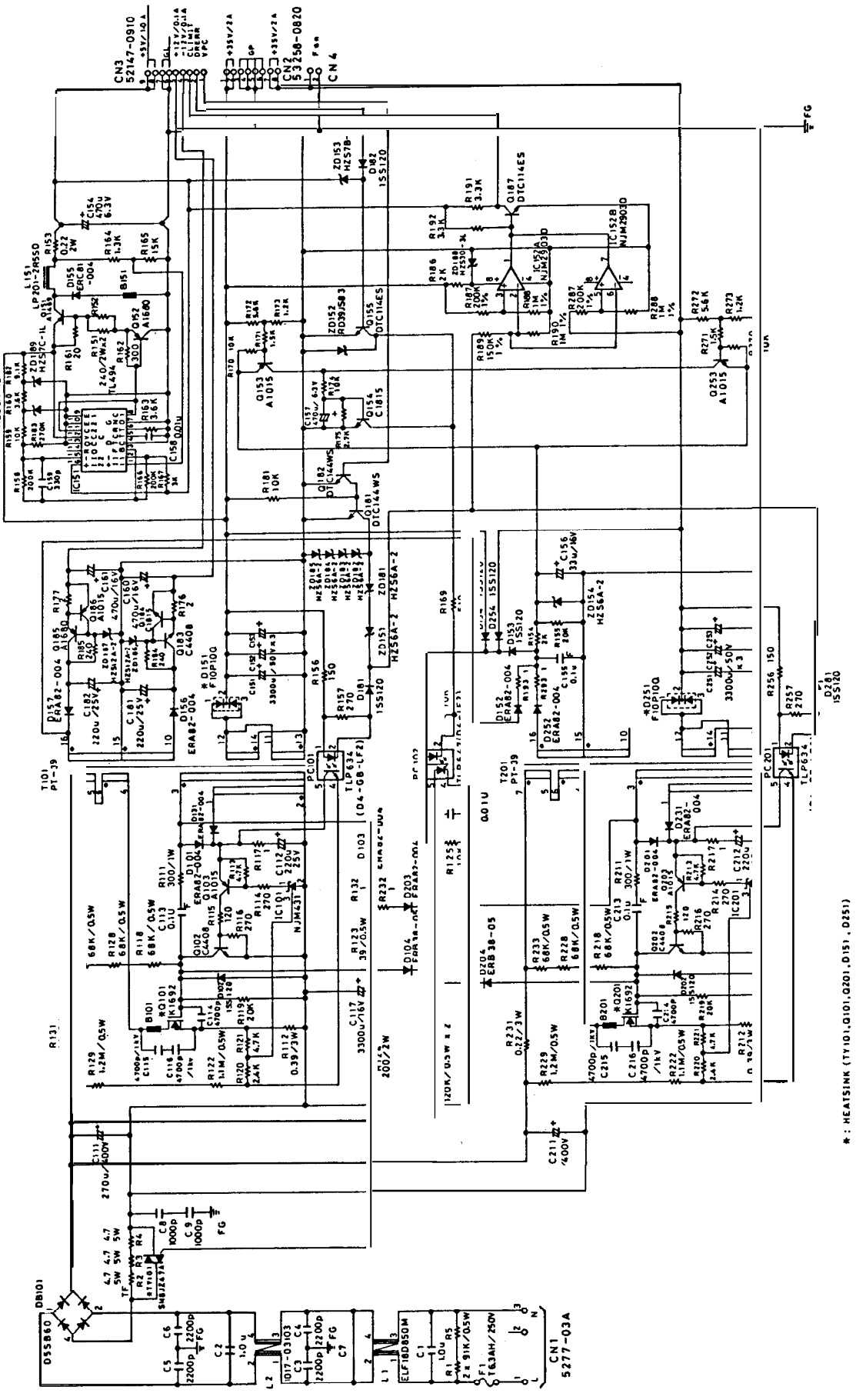

Figure A-4. C117 PSE Board Assembly Circuit Diagram

A.3 CIRCUIT BOARD COMPONENT LAYOUT

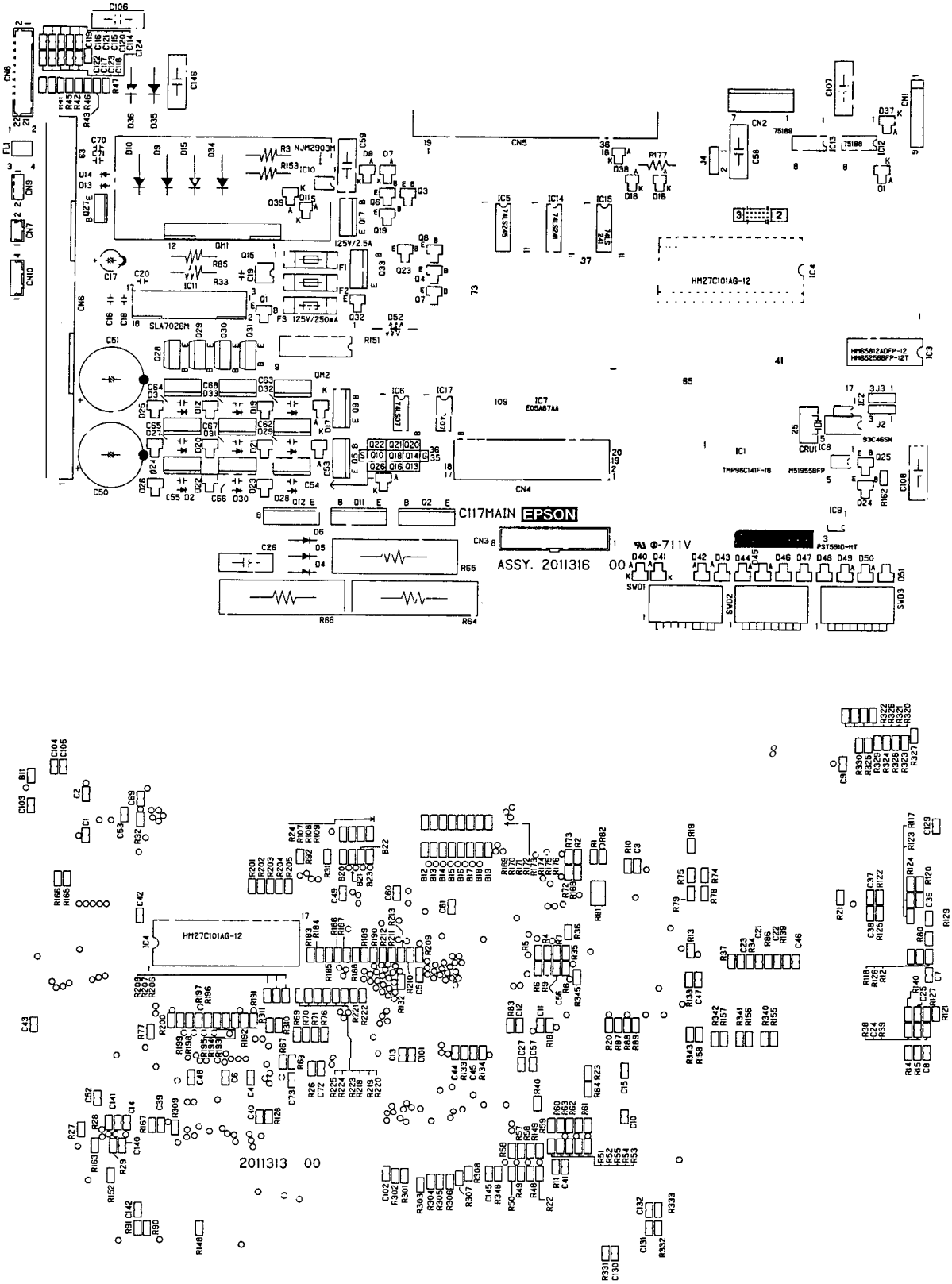

Figure A-5. C117 MAIN Board Assembly Component Layout

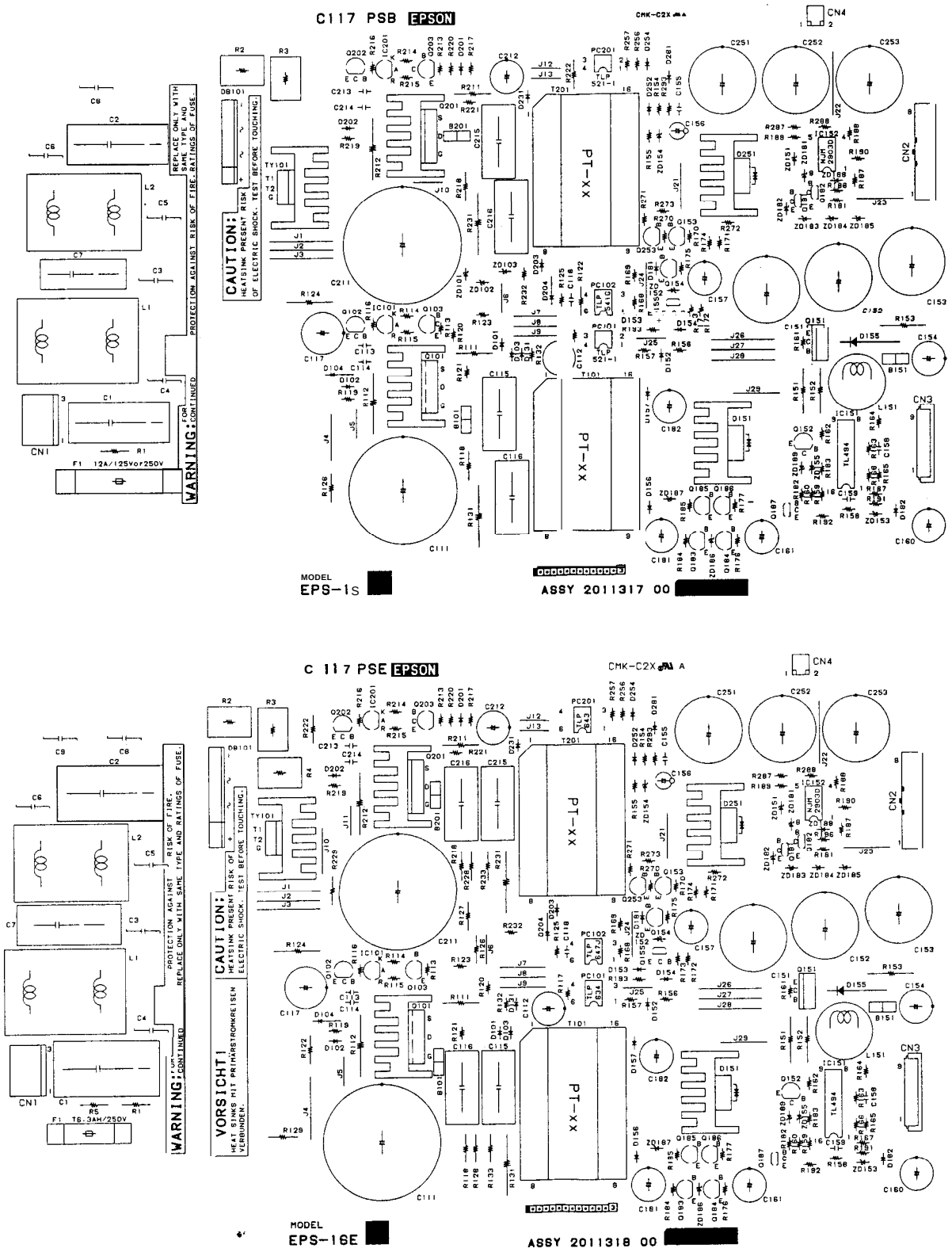

Figure A-6. C117 PSB/PSE Board Assembly Component Layout

A.5 CASE OUTLINE DRAWING

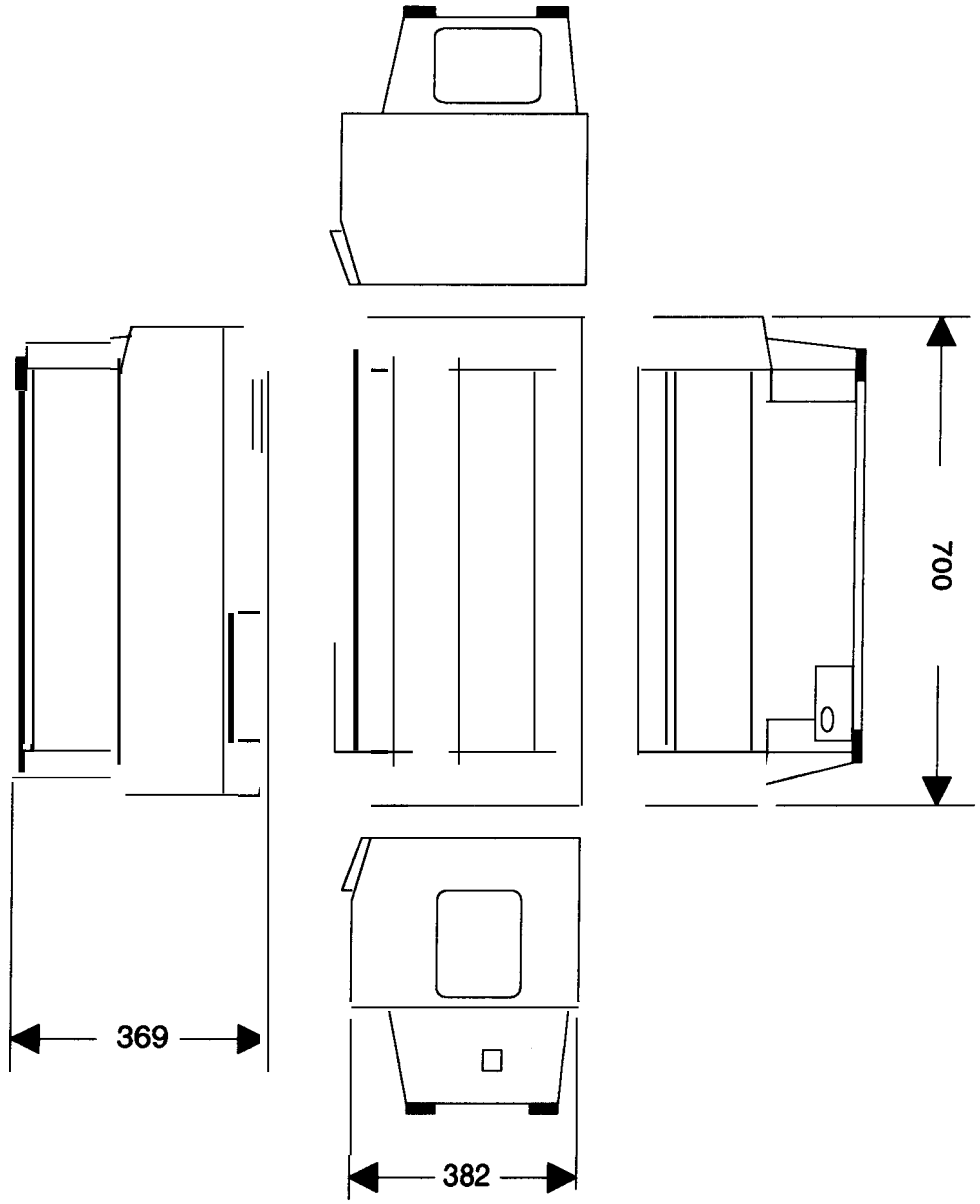

Figure A-10. DFX-5000+ Case Outline Drawing

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As of January 1994

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