LX-800

TECHNICAL MANUAL

EPSON

NOTICE

- **The contents of this manual are subject 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 their consequences.**

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 THE HOST COMPUTER BEFORE 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 THE AVAILABLE POWER SOURCE, DO NOT CONNECT IT TO THE POWER SOURCE.**
3. **ALWAYS VERIFY THATTHE 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 μP CHIPS AND CIRCUITRY, USE STATIC DISCHARGE EQUIPMENT, SUCH AS ANTI-STATIC WRIST STRAPS, WHEN ACCESSING INTERNAL COMPONENTS.**
5. **REPLACE MALFUNCTIONING COMPONENTS ONLY WITH THOSE COMPONENTS RECOMMENDED BY THE MANUFACTURER; INTRODUCTION OF SECOND-SOURCE ICS OR OTHER NONAPPROVED COMPONENTS MAY DAMAGE THE PRODUCT AND VOID ANY APPLICABLE EPSON WARRANTY.**

PREFACE

This manual describes functions, theory of electrical and mechanical operations, maintenance, and repair of the LX-800.
The instructions and procedures included in this document are intended for the experienced repair technician, who should pay attention to the precautions on the preceding page. The chapters are organized as follows:

Chapter 1 — Provides a general product overview, lists specifications, and illustrates the main components of the printer

Chapter 2 — Describes the theory of printer operation

Chapter 3 — Discusses the options

Chapter 4 — Includes a step-by-step guide for product disassembly, assembly, and adjustment

Chapter 5 — Provides Epson-approved techniques for troubleshooting

Chapter 6 — Describes preventive maintenance techniques and lists lubricants and adhesives required to service the equipment

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

REVISION SHEET

REVISION	DATE ISSUED	CHANGE DOCUMENT
A	Feb. 28, 1987	1st issue
B	July 14, 1987	1-1, 5, 8, 12 through 18 2-2,11, 13,28,30,38 through 42 4-1, 13, 17, 19 5-1, 2, 6 6-1 A-2, 17, 18

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CHAPTER 1
GENERAL DESCRIPTION

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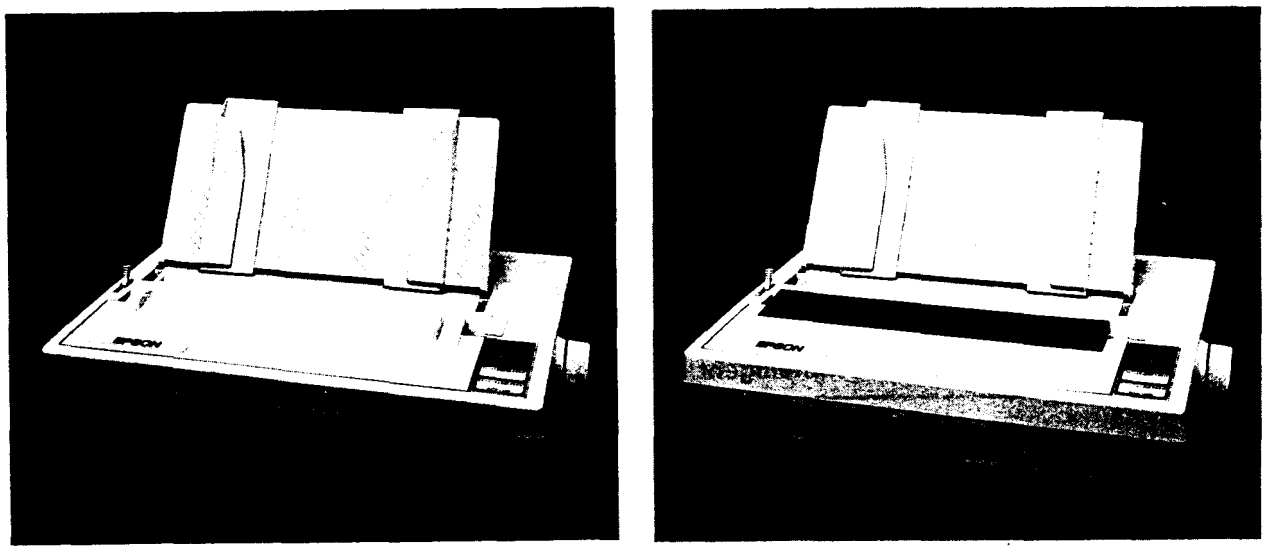
1.1 FEATURES

The LX-800 is a multifunctional and high speed serial dot impact printer with a compact body and the low price.

Features include:

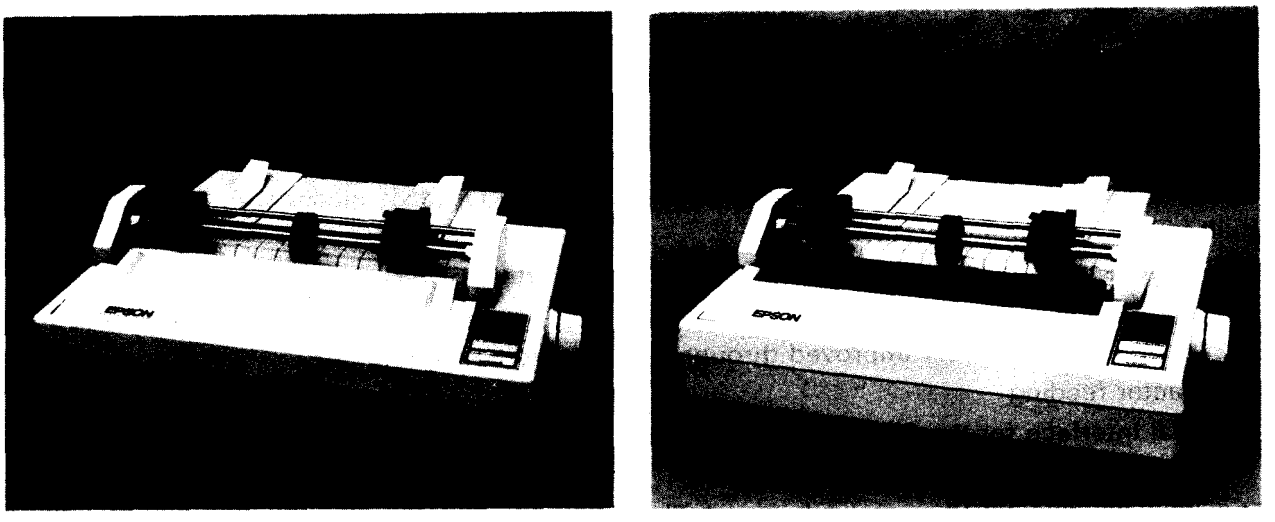
- 180 cps maximum speed (draft-elite), 150 cps (draft-pica)
- Upward compatibility with the LX-86
- Built in two NLQ fonts (Roman and Saris-serif)
- Direct selection of NLQ/Draft modes, and easy selection of 4 typestyle modes with SelecType controls
- Built in IBM graphics characters
- Super/Subscript, Italics, and Elite modes can be supported in NLQ
- Automatic sheet loading function
- A 3K-byte input buffer for improved throughput from the host computer
- Pull tractor feeding
- Optional interface for the EPSON #81 XX series

Two models of the LX-800 are manufactured. The model for the U.S and Australia uses printer cover A and the model for all countries except the U.S. and Australia uses printer cover B.
Figures 1-1 and 1-2 show the external view of the LX-800. Table 1-1 lists the options.



(Printer cover A) (Printer cover B)

Fig. 1-1. Exterior View of LX-800



(Printer Cover A) (Printer Cover B)

Fig. 1-2. Exterior View of LX-800 with Tractor Unit

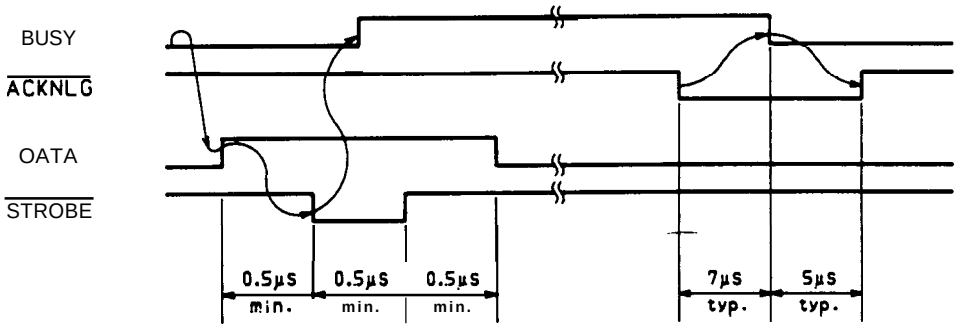
Table 1-1. LX-800 Options

Option No.	Description
#83 10	Roll Paper Holder
#81 33	APPLE II Intelligent Interface
#8 143	New Serial Interface
#8 145	RS-232C/Current Loop Type 2 InterFace
#81 48	Intelligent Serial Interface
#8 165	Intelligent IEEE-488 Interface

1.2 INTERFACE

The LX-800 has a 8-bit parallel interface as a standard. The specifications for the 8-bit parallel interface are as follows:

Data Format:	**8-bit parallel**
Synchronization:	**By $\overline{\text{STROBE}}$ pulse**
Hand Shaking:	**By both $\overline{\text{ACKNLG}}$ and BUSY, or either of them**
Logic Level:	**TTL (LS type) compatible**
Data transmission timing:	**See Figure 1-3.**
Connector:	**57-30360 (AMPHENOL) or equivalent (See Figure 1-4.)**



NOTE: Transmission time (rising and falling time) of every input signal must be less than 0.2μs.

Fig. 1-3. Data Transmission Timing for 8-Bit Parallel Interface

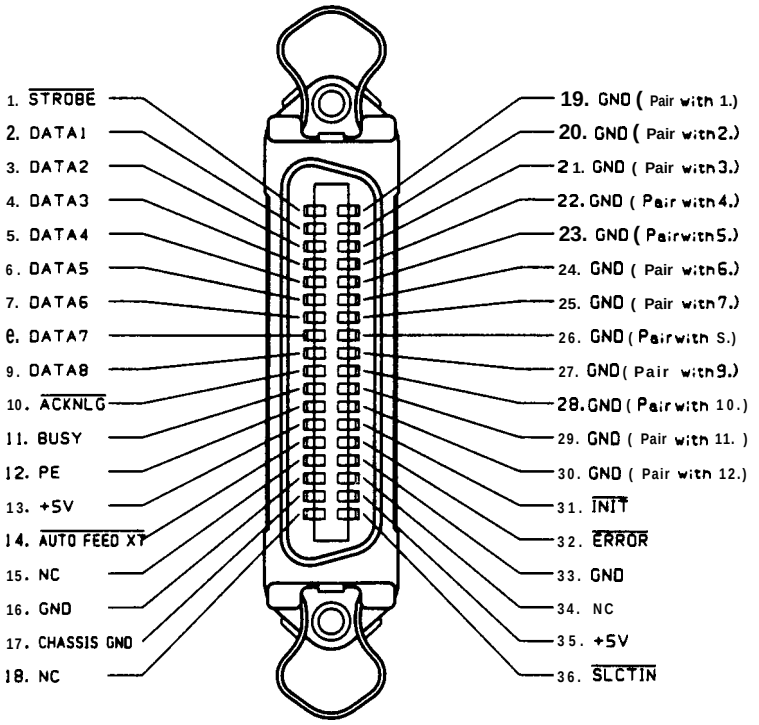


Fig.1-4. 57-30360 36-Pin Connector

Table 1-2 shows the connector pin assignments and signal functions of the 8-bit parallel interface.

Table 1-2. Connector Pin Assignments and Signal Functions

Pin No.	Signal Name	Return Pin No.	DIR	Functional Description
1	$\overline{\text{STROBE}}$	19	In	Strobe pulse to read the input data. Pulse width must be more than 0.5μs. Input data is latched after falling edge of this signal.
2	DATA 1	20	In	Parallel input data to the printer.
3	DATA2	21	In	"HIGH" level means data " 1".
4	DATA3	22	In	"LOW" level means data "O".
5	DATA4	23	In	
6	DATA5	24	In	
7	DATA6	25	In	
8	DATA7	26	In	
9	DATA8	27	In	
10	$\overline{\text{ACKNLG}}$	28	out	This pulse indicates data are received and the printer is ready to accept next data. Pulse width is approx. 12 μs.
11	BUSY	29	out	HIGH indicates printer can not accept next data.
12	PE	30	out	HIGH indicates paper-out. This signal is effective only when $\overline{\text{ERROR}}$ signal is "LOW".
13	SLCT	—	out	Always "HIGH" output. (Pulled up to +5V through 3.3 K ohms register.)
14	$\overline{\text{AUTOFEED-XT}}$	—	In	If the signal is "LOW" when the printer is initialized, a line feed is automatically performed by input of "CR" code. (Auto LF)
15	—	—	—	Not used.
16	GND	—	—	Ground for twisted-pair grounding.
17	Chassis GND	—	—	Chassis ground level of printer
18	—	—	—	Not used.
9 to 30	GND	—	—	Ground for twisted-pair grounding.
31	INIT	16	In	Pulse (width: 50μs min., active "LOW") input for printer initialization.
32	$\overline{\text{ERROR}}$	—	out	LOW indicates that some error has occurred in the printer.
33	GND	—	·	Ground for twisted-pair grounding
34	—	—	—	Not used.
35	—	—	out	Always "HIGH". (Pulled up to +5V through a 3.3k-ohm register.)
36	$\overline{\text{SLCT-IN}}$	—	In	If the signal is "LOW" when printer is initialized, the DC I/DC3 control is disabled.

NOTES 1. "Return" denotes a twisted pair return line connected to signal ground. When interfacing the printer to the host, use twisted pairs for each signal. Shield the twisted pairs, and connect the shield to GND in order to reduce interface.

2. All interface conditions are based on TTL levels. Both the rise and fall times of all signals must be less than 0.2μs.
3. Refer to the Parallel Interface Timing Chart for the timing of the signals.
4. Data transfer protocol must not ignore the $\overline{\text{ACKNLG}}$ or BUSY signal. (Data can be transferred either after recognizing the $\overline{\text{ACKNLG}}$ signal or when the BUSY signal is LOW.)
5. The $\overline{\text{AUTO FEED XT}}$ and $\overline{\text{SLCT IN}}$ signals are valid when they are not fixed to LOW level by the DIP switch or jumper.
6. Printing tests, including those of the interface circuits, can be performed without using external equipment: set interface connector data lines 1-8 to the desired code (a floating signal will be a logical 1, and a grounded signal will be a O) connect the $\overline{\text{ACKNLG}}$ signal to the $\overline{\text{STROBE}}$ signal.
7. The PE signal is valid when the $\overline{\text{ERROR}}$ signal is LOW.

Table 1-3. Printer Select/Deselect (DC1/DC3) Control

$\overline{\text{SLCT IN}}$ Signal State at Initialization	DC1/DC3	Printer Select/Deselect	Data entry
HIGH	DC 1	Select	Enable
	DC3	Deselect	Enable (Waits for a DC1. Input data is ignored until a DC 1 code is received.)
LOW	DC1	Select	Enable
	DC3	Select	Enable

1.3 SPECIFICATIONS

This chapter describes the specifications of the LX-800 printer.

● General Specifications

Printing method:	Serial impact dot matrix
Pin configuration:	9 wires (see Figure 1-5)
Pin diameter:	0.29 mm
Dot Pinch:	0.35 mm (1/72 inch)

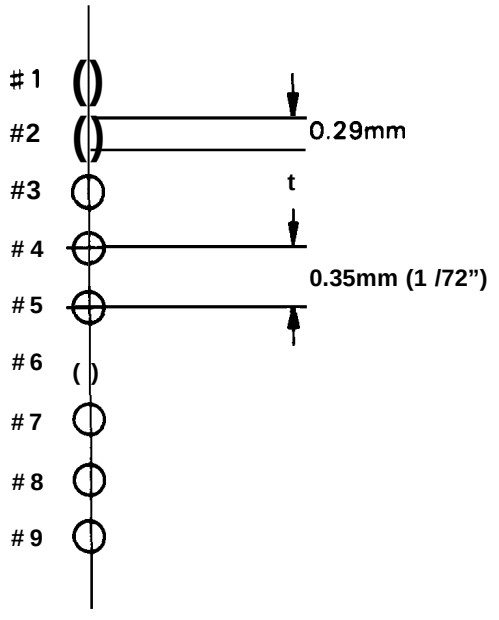


Fig. 1-5. Printhead Pin Configuration

Printing direction:	
Text mode:	Bi-directional with logic seeking
Bit-image mode:	Uni-directional (left to right)
Dot matrix:	9 X 9 (Draft)
	11 X 18 (NQL)
	6 X 8 (Graphics)
Character sets:	96 ASCII characters
	96 Italic characters
	32 International characters
	32 International Italic characters
	32 Graphics characters
	96 IBM Graphics characters
Fonts:	Draft, NLQ-Roman, Saris-serif
Printing speed:	See Table 1-4
Character size:	See Table 1-4
Column width:	See Table 1-4
	480 dots/line at 60 dots/inch (Bit-image)

Table 1-4. Printing Speed, Character Size, and Column Width

Type Style					Printing Speed (CPS)	Character Size (mm)		Column Width (maximum Characters/Line-CPL)	Pitch (maximum Characters /inch-CPI)
Font	Normal	Double Width	Empha-sized	Con-densed		Width	Height		
Draft (Pica)	0	—	—	—	150	2.1	3.1	80	10
		o	—	—	75	4.2	3.1	40	5
	—	.	0	—	75	2.1	3.1	80	10
		0	0	—	37	4.2	3.1	40	5
	—	—	—	o	128	1.05	3.1	132	17
		0	—	o	64	2.1	3.1	66	8.5
Draft (Elite)	o	—	—	—	180	2.1	3.1	96	12
	—	o	—	—	90	4.2	3.1	48	6
	—	—	—	o	150	1.05	3.1	160	20
NLQ	o	—	—	—	25				
Super-sub-script	0	—	—	—			1.6		

Line spacing: 1/6" or Programmable (n/2 16")
Line feed speed: Approx.95ms/line (Line feed)
(1 line = 1/6") Approx.75ms/line (Form feed)
Paper feed method: Friction feed or Tractor feed
Paper path: From rear of printer

● **Paper Specifications**

Type of paper: See Table 1-5

Table 1-5. Type of Paper

	Cut sheet	Fan-fold paper	Roll paper
Size	(Width) 182 mm to 216 mm 7. 15“ to 8.5” (Length) Max. 305 mm Max. 12“	(Width) 101 mm to 254 mm 4“ to 10”	(Width) 216 ± 3 mm 8.5″ ± 0.12“ (Diameter of roll) Max. 127 mm Max. 5“
Thickness	0.06 mm to 0.1 mm	Max. 0.25 mm	0.07 mm to 0.09 mm
Copies	———	1 original +2	———
Weight	52g/m² to 82g/m²	(1 sheet) 52g/m² to 82g/m² (2 sheets) 35g/m² to 58g/m² (3 sheets) 35g/m² to 58g/m² for 2 sheets + 35g/m² to 47g/m² for 1 sheet	52g/m² to 64g/m²
Feeding method	Friction feed	Tractor feed	Friction feed
Precautions	1. Do not use continuous form or copy paper. 2. Dismount the Tractor unit.	1. Release the friction mechanism using the release lever. 2. Use the pressure sensitive paper for copying. Be sure that perforations have a smooth finsh.	1. Use the Roll paper holder. 2. Dismount the Tractor unit.

Printable area: **See Figures 1-6 through 1-8**

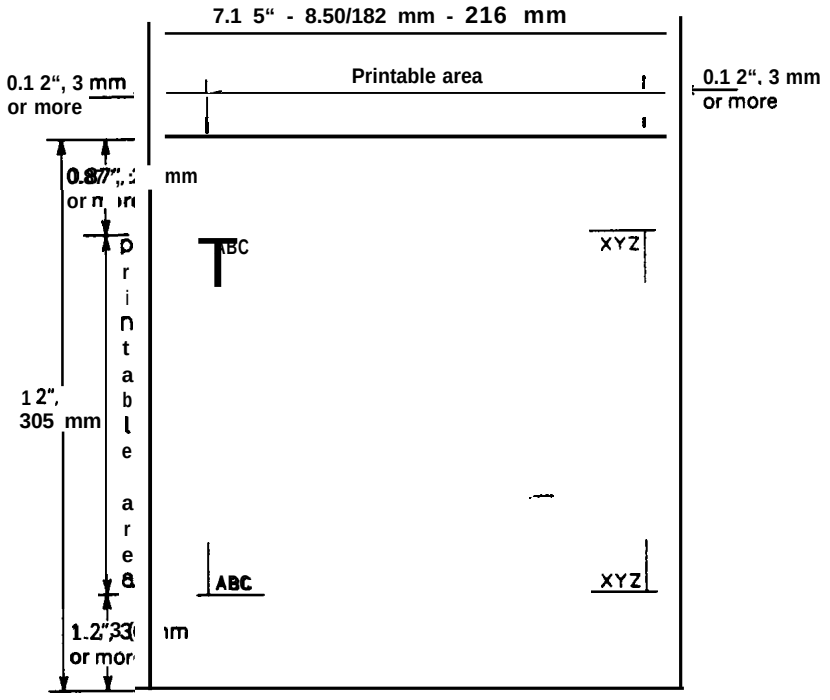


Fig. 1-6. Printable Area for Cut Sheet Paper

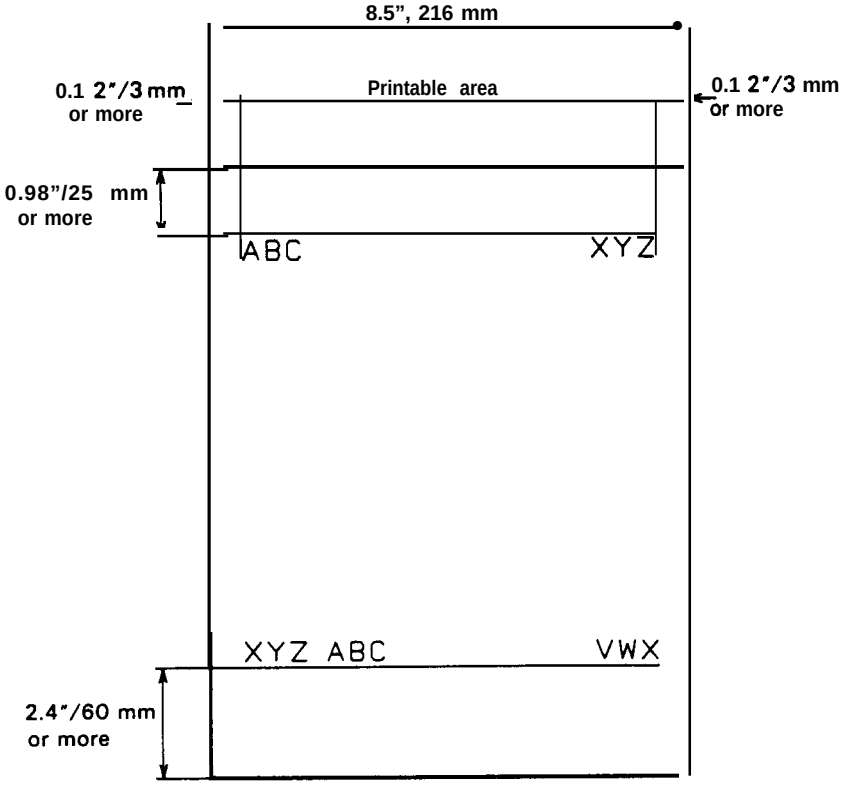
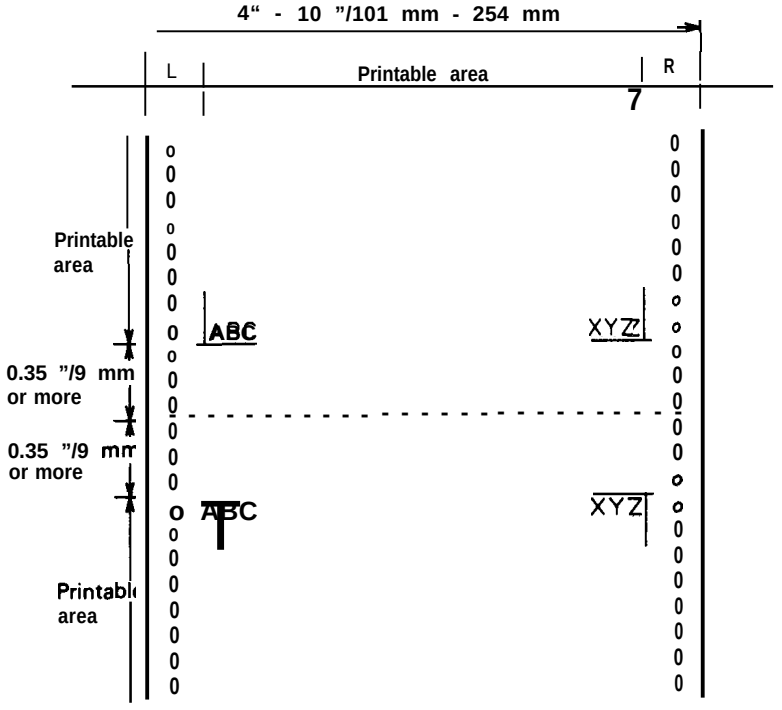


Fig. 1-7. Printable Area for Roll Paper



L: 0.75"/19 mm (Paper width is less than 9.5"/241 mm)
1.02")26 mm (Paper width is more than 9.5 "/241 mm)
R: 0.75"/19 mm (Paper width is less than 9.5 "/241 mm)
0.94"/24 mm (Paper width is more than 9.5 "/241 mm)

Fig. 1-8. Printable Area for Fan Fold Paper

- **Ribbon Cartridge**

Cartridge number:	**#8750**
Color:	**Black**
Life:	**3 million characters (14 dots/character)**

- **Electrical Specifications**

Power Voltage:	**120VAC ± 10%**
	220/240VAC ± 10%
Frequency range:	**59.5Hz to 60.5Hz (120VAC)**
	49.5Hz to 60.5Hz (220/240VAC)
Power consumption:	**Max. 70VA**
Insulating resistance:	**More than 10M ohms**
	(between the AC line and chassis)
Dielectric strength:	**1 KVAC rms/minute or 1.2KVAC rms/second**
	between AC line and chassis (120V)
	1.25 kVAC rms/minute or 1.5 kVAC rms/second
	between AC line and chassis (220/240V)

● **Environmental Specifications**

Temperature:	**−30°C to 60 ”C/–22°F to 149°F (Storage)**
	5°C to 35°C/4 1“F to 95°F (Operating)
Humidity:	**5% to 85%RH, no condensation (Storage)**
	10% to 80%RH, no condensation (Operating)
Resistance to shock:	**2G, 1 ms (Storage)**
	IG, 1 ms (Operating)
Resistance to vibration:	**0.50G, max. 55Hz (Storage)**
	0.25G, max 55Hz (Operating)

● **Reliability**

MCBF:	**3 million lines (Printer mechanism except the printhead)**
MTBF:	**4000 hours**
Life of printhead:	**200 million strokes/needle**

● **Safety Approvals**

. safety Standards:	**UL 478 (U. S.A.)** —
	CSA 22.2 No. 0.154 (Canada)
	VDE 0806 (West Germany)
RFI:	**FCC class B (U. S.A.)**
	VDE 0871 (West Germany)

● **Physical**

Dimensions:	**91 mm (height)**
(Refer to Figure A-19)	**377 mm (width)**
	399 mm (width including paper feed knob)
	308 mm (depth)
Weight:	**5.1 kg**

1.4 OPERATING CONTROLS

This section describes the operating controls of LX-800 printer.

1.4.1 DIP Switch and Jumper Settings

The DIP switches that users can set are SW1 and SW2. These switches are positioned at the rear center of the printer and have the functions shown in Tables 1-6 through 1-8. (Note: the status of the DIP switches is read only when at power on or at input of the INIT signal).

Table 1-6. DIP Switch Settings

DIP SW	Function	ON	OFF
1-1	Typeface select	Condensed	Normal
1-2	ZERO font select	0	0
1-3	Character Table select	Graphic	Italic
1-4	Paper-out detection	Valid	invalid
1-5	Printing quality select	NLQ	Draft
1-6 1-7 1-8	International character set select	See Table 1-7	
2-1	Page length select	12“	1 1“
2-2	Cut sheet feeder mode	Valid	Invalid
2-3	1“ skip over perforation	Valid	Invalid
2-4	$\overline{\text{AUTO FEED XT}}$ control	Fix to LOW	Depends on external signal

Table 1-7. International Character Set

Country	SW 1-6	Sw 1-7	SW 1-8
U.S.A.	ON	ON	ON
FRANCE	ON	ON	OFF
GERMANY	ON	OFF	ON
U.K.	ON	OFF	OFF
DENMARK	OFF	ON	ON
SWEDEN	OFF	ON	OFF
ITALY	OFF	OFF	ON
SPAIN	OFF	OFF	OFF

Table 1-8. DIP Switches Factory Settings

DIP SW No. / Country	1-1	1-2	1-3	1-4	1-5	1-6	1-7	1-8	2-1	2-2	2-3	2-4
U. S.A., Southeast Asia, Middle and Near East	OFF	OFF	OFF	OFF	OFF	ON	ON	ON	OFF	OFF	OFF	OFF
Germany, Northern Europe	OFF	OFF	OFF	OFF	OFF	ON	OFF	ON	ON	OFF	OFF	OFF
U. K., Australia	OFF	OFF	OFF	OFF	OFF	ON	OFF	OFF	OFF	OFF	OFF	OFF
France, Italy, Spain	OFF	OFF	ON	OFF	OFF	ON	ON	ON	OFF	OFF	OFF	OFF

Jumper J 1 on the ROCX board has the function and factory setting shown in Table 1-9.

Table 1-9. Jumper Setting

Jumper	Function	Open	Close	Factory setting
J1	$\overline{\text{SLCT IN}}$ control	Depends on external signal	Fix to LOW	Open

1.4.2 Control Panel (and Auto Sheet Load Function)

Figure 1-9 shows the control panel of LX-800 printer.

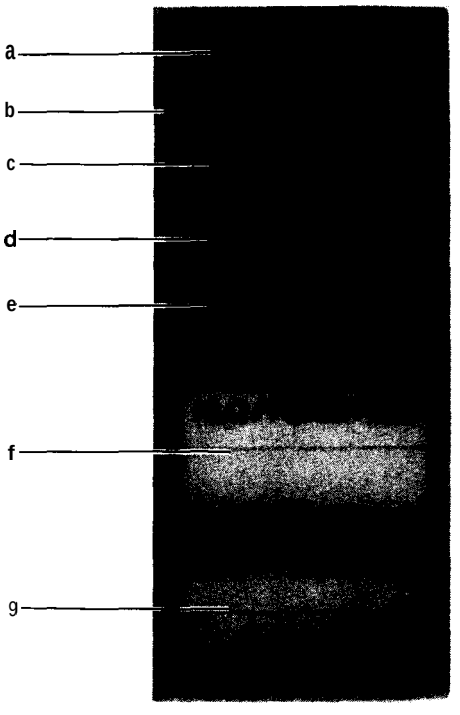


Fig. 1-9. Control Panel

The functions of the LEDs and switches are:

a. POWER LED (green)
   Lights when the power switch is turned on and AC power is applied.
b. READY LED (green)
   Lights when the printer is ready to receive data.
c. PAPER OUT LED (red)
   Lights when the printer runs out of paper.
d. ON LINE LED (green)
   Lights when the printer is ON-LINE.
e. ON/OFF LINE Switch (non-locking push switch)
   Switches between the ON-LINE and OFF-LINE modes.
   The printer is automatically set ON-LINE and becomes ready when power is turned on. If the printer is set OFF-LINE, printing is stopped and the printer enters the busy state.
f. NLQ/FORM FEED Switch (non-locking push switch)
   - When this switch is pressed once in the OFF-LINE mode, the paper is advanced vertically to the top of form on the next page.
   - When this switch is pressed in the ON-LINE mode, the NLQ-Roman or NLQ-Sans-serif fonts are selected, and the buzzer sounds to inform the user which font is selected.

     NLQ-Roman: Two beeps
     NLQ-Sans-serif: Three beeps

g. DRAFT/LINE FEED and AUTO LOAD Switch (non-locking push switch)

- **When this switch is pressed once in the OFF-LINE mode, the paper is advanced vertically one line, and the paper advanced continuously while this switch is pressed.**
- **When this switch is pressed in the ON-LINE mode, the Draft font is selected, and beeps once a buzzer to inform the Draft font is selected.**
- **Cut sheets are automatically loaded when the paper is placed at the sheet guide, printer is paper out, OFF-LINE state and the this switch is pressed.**

1.4.3 Self Test and Hexadecimal Dump Functions

The conditions of LX-800 may be checked via the self test functions. The self test checked:

- **Circuit**
- **Printer mechanism**
- **Printing quality**
- **ROM (firmware) code number**

The code number of ROM is printed on the first line of the self test.

To start the self test in either the Draft mode or NLQ mode, turn the power on while pressing the DRAFT/LINE FEED or NLQ/FORM FEED switch, respectively. In the NLQ self test mode, both Roman font and Saris-serif font are printed every other line. When the DIP switch 1-5 set to on (NLQ mode), only NLQ mode self test is performed, no related switches. To stop the self test, turn the power off by power switch.

The conditions of data transmission between LX-800 and the host computer may be checked via the hexadecimal dump functions. To set the hexadecimal dump mode, turn the power while pressing the both LINE FEED and FORM FEED switches. Then the message "Data Dump Mode" is printed.

The printer prints 16 hexadecimal values, followed by the corresponding ASCII characters. If there is no corresponding printable characters for a value (e.g. a control code), a period (.) is printed. One line is printed for each set of 16 values received, and any remaining data (less than 16 values) can be printed by pushing the ON/OFF LINE switch.

To cancel the hexadecimal dump mode, turn the power off by power switch.

1.4.4 SelecType Function

SelecType is a feature of the LX-800 which permits type style programming via the control panel switches without software assistance.

In the SelecType mode, following 4 type styles can be selected:

- Emphasized
- Double-strike
- Condensed
- Elite

Figure 1-10 shows the operation flow chart of SelecType function:

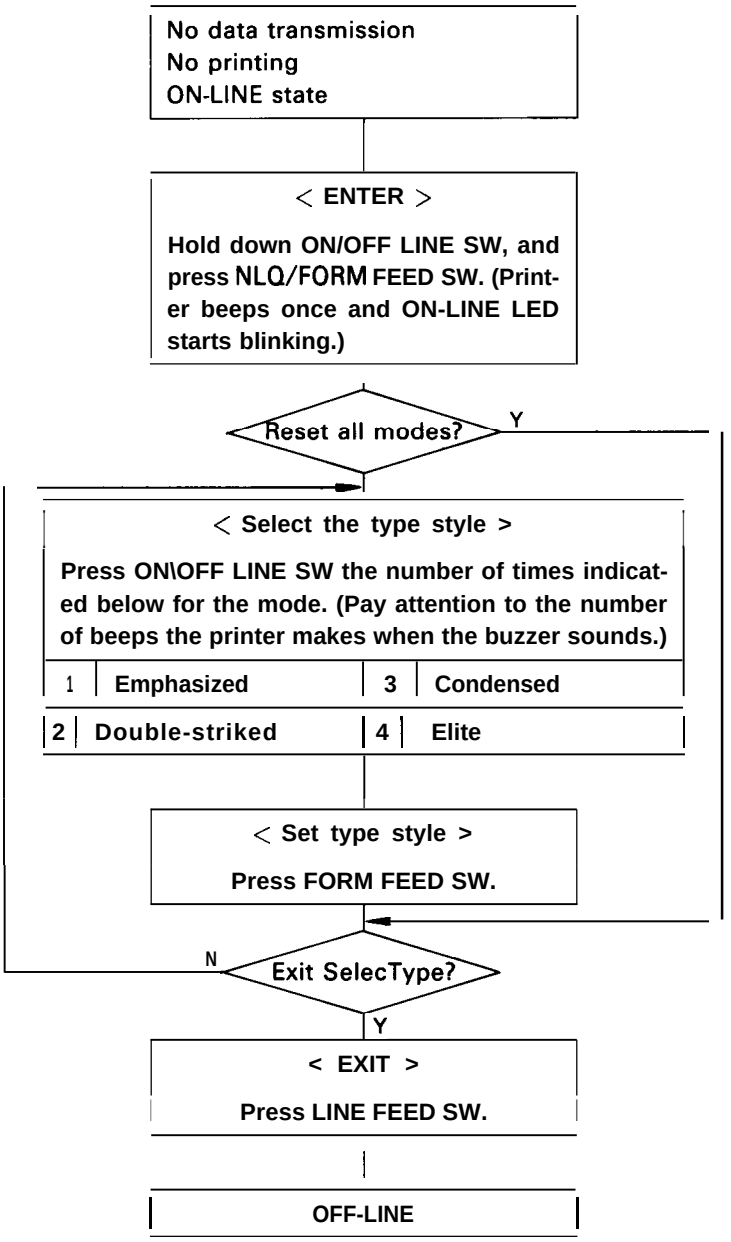


Fig. 1-10. SelecType Flow Chart

1.4.5 Buzzer and Error Functions

The buzzer rings under the following circumstances:

- When a BEL code is sent to the printer, the buzzer rings once (for 0.1 sec.).
- When the NLQ Roman font is set using the FORM FEED switch, the buzzer rings twice (for 0.1 sec. each, with 0.1 sec. pause between rings).
- When the NLQ Saris serif font is set using the NLQ/FORM FEED switch, the buzzer rings three times (for O. 1 sec. each, with O. 1 sec. pause between rings).
- When the Draft font is set using the DRAFT/LINE FEED switch, the buzzer rings once (for O. 1 sec.).
- When the printer enters the SelecType mode, the buzzer rings once (for O. 1 sec.).
- When paper out is detected, the buzzer rings eight times (for 0.5 sec. each, with 0.5 sec. pause between rings).
- When abnormal carriage operation is detected (hardware error), the buzzer rings five times (for 0.5 sec. each, with 0.5 sec. pause between rings).
- When abnormal voltage is detected (hardware error), the buzzer rings five times (for 0.5 sec. each, with 0.5 sec. pause between rings).

When the paper end sensor detects paper out, the state of the interface changes as follows:

$\overline{\text{ERROR}}$ signal → LOW
BUSY signal → HIGH
PE signal → HIGH

The printer enters an error state when any of the following occurs:

a. Home position is not detected after the printer mechanism has been initialized (home position seek).
b. The +24V voltage (which is used to drive the printhead and motors) rises to +27V or more.

When the printer enters an error state, the printer stops the printing, and the state of the interface changes as follows:

$\overline{\text{ERROR}}$ signal → LOW
BUSY signal → HIGH

1.4.6 Printer Initialization and Default Values

The LX-800 initialized when any of the following occurs.

- The power switch is turned on.
- Interface signal INIT goes low.

When the printer is initialized, the following operations are performed:

a. Seek to carriage home position.
b. Set to ON-LINE mode.
c. Clear the all buffers.
d. Set the line spacing to 1/6 inches.
e. Set the page length to 11 or 12 inches, according to the DIP switch.
f. Clear all vertical tab positions.
g. Set the horizontal tab position to every 8 columns.
i. Set the print mode according to the DIP switches.

1.5 MAIN COMPONENTS

The LX-800 consists of the following components:

- Printer Mechanism Model-3A10 (include the Tractor Unit)
- ROC Filter Unit
- ROCX Board Unit
- LCPNL Board Unit
- Housing

1.5.1 Printer Mechanism Model-3A10

The Model-3A10 printer mechanism was developed expressly for use with LX-800 printer: the components include a carriage motor, carriage mechanism, paper feed motor, paper feed mechanism, ribbon feed mechanism, printhead, sensors, and the tractor unit. For the tractor unit, there are two tabs on both side frames to allow the printer cover to float slightly when tractor feeding is performed.

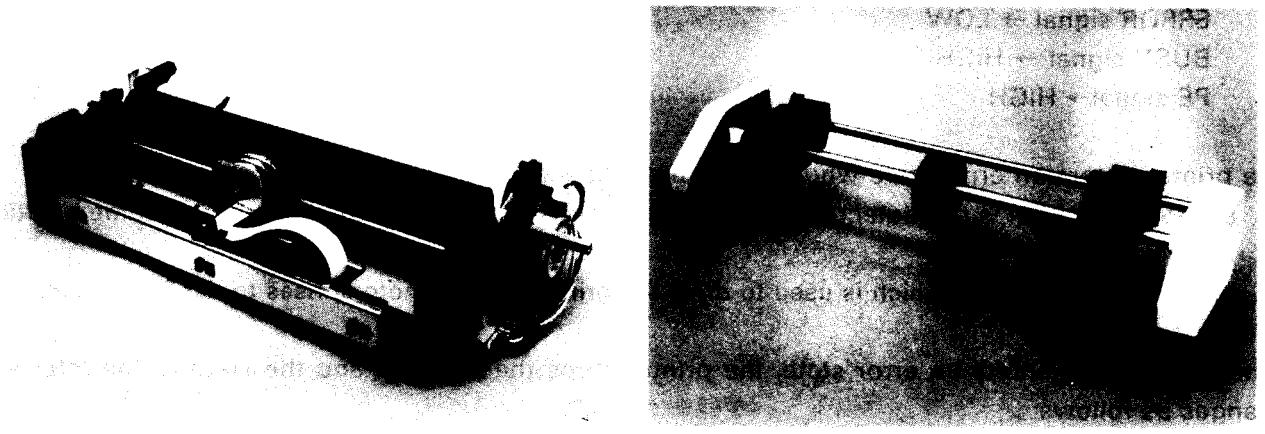


Fig. 1-11. Model-3A10 Printer Mechanism

1.5.2 ROC Filter Unit

The ROC filter unit contains a power cord (120 V version) or AC inlet (220/240 V version), power switch, fuse, filter circuit, and power transformer.

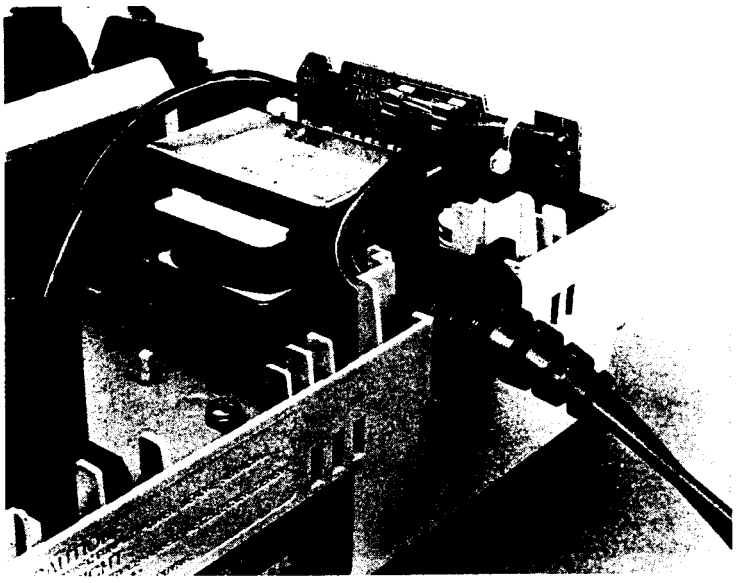


Fig. 1-12. ROC Filter Unit (120V version)

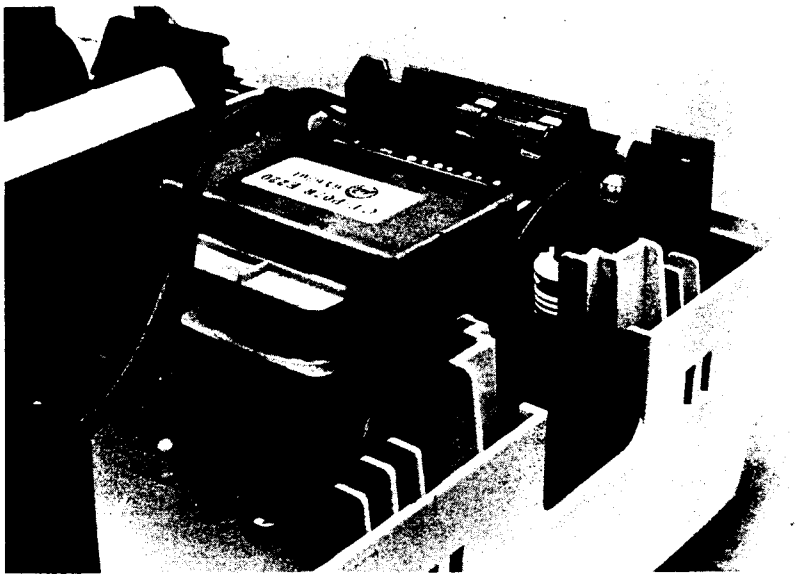


Fig. 1-13. ROC Filter Unit (220 V/240V versions)

1.5.3 ROCX Board Unit

The ROCX board contains the main control circuit, driver circuit, and voltage regulator circuit. The main ICs on the ROCX boards are the μPD78 10HG CPU and the E05A03 gate array which controls everything.

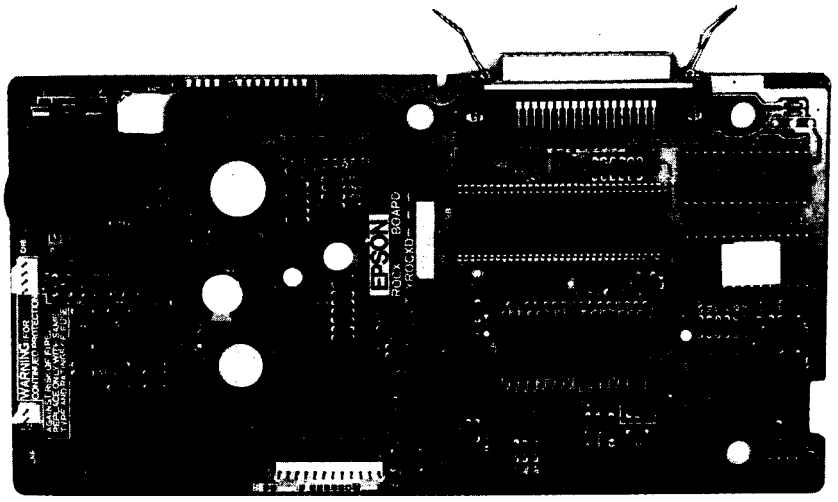


Fig. 1-14. ROCX Board Unit

1.5.4 LCPNL Board Unit

The LCPNL board unit is a control panel of LX-800 which contains the indicator LEDs, switches and buzzer.

Fig. 1-15. LCPNL Board Unit

1.5.5 Housing

The housing is comprised of the upper and lower cases, and paper feed knob, which accommodate the printer mechanism, ROCX board unit, LCPNL board unit, and ROC filter unit.

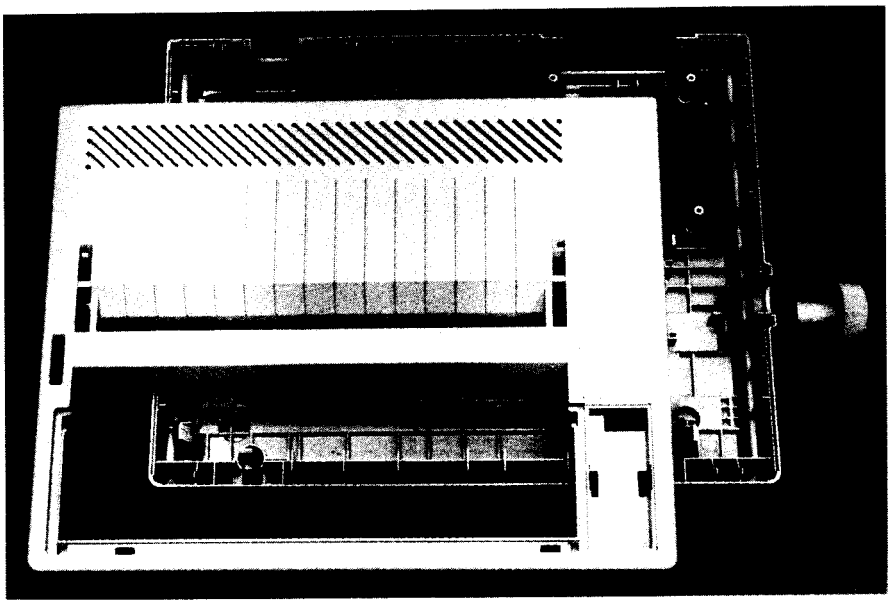


Fig. 1-16. Housing

CHAPTER 2
OPERATING PRINCIPLES

LIST OF FIGURES

LIST OF TABLES

2.1 GENERAL

This chapter describes the component connections, specifications and operation of the power supply circuit section, the software for the control circuit section, and the operation of the hardware and the printer mechanism.

Please note that the following units are assumed when omitted in this chapter.

Resistor: Units are Ohms.
Capacitor: Units are Farads.

The components listed below are referred to as follows:

ROCX board: Main board
LCPNL board: Control panel
Model-3AI O: Printer mechanism

2.2 CABLE CONNECTIONS

Figure 2-1 shows the interconnection of the primary components, with the main board at the center.

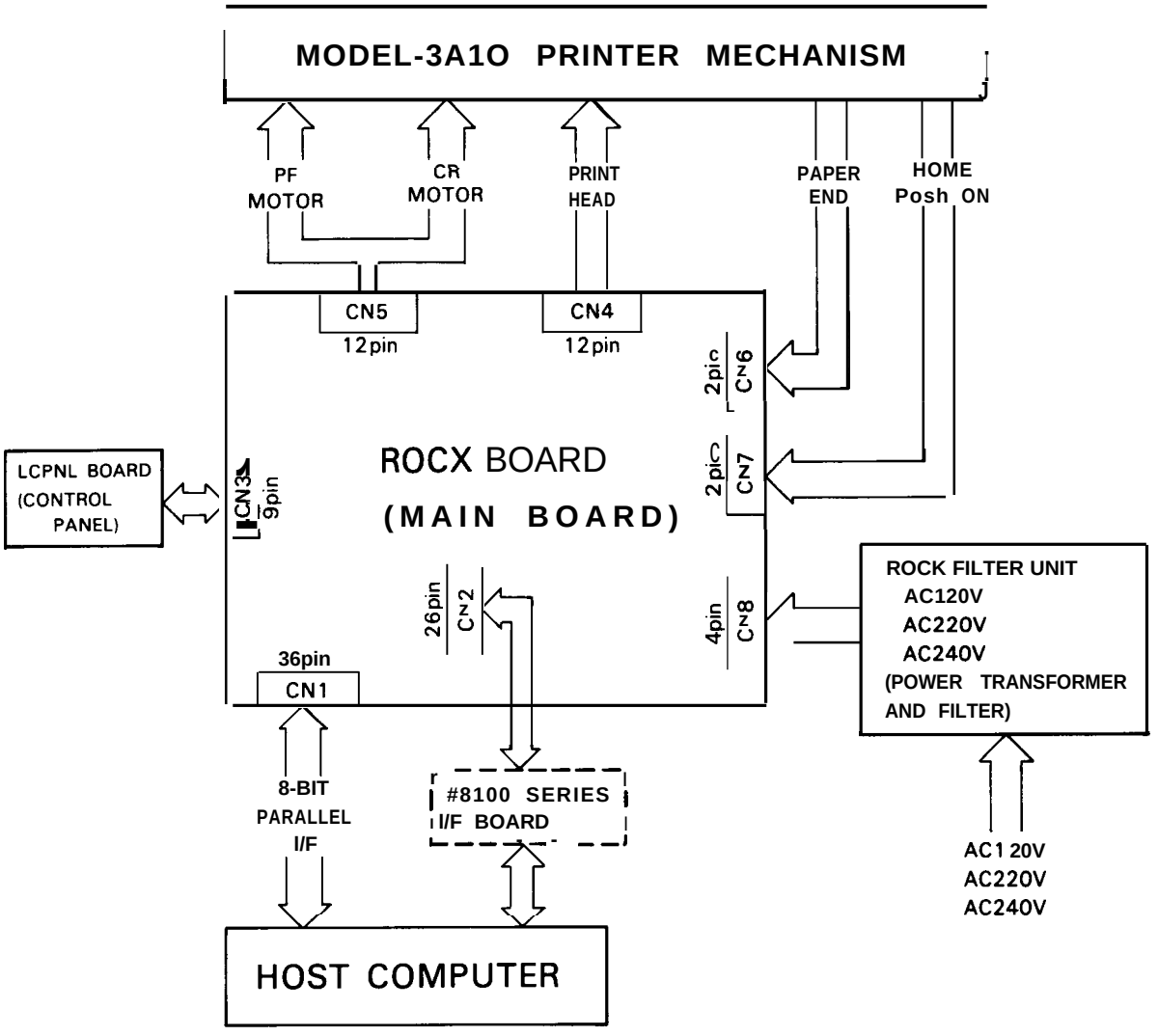


Fig. 2-1. Cable Connections

The ROCX board connectors are as follows:

- **CN1: 8-bit parallel interface connector. Used for data communication with the host computer.**
- **CN2: Connector for the #8 100 series optional interface**
- **CN3: Receives data from the LCPNL board switches, and outputs the signals to the LEDs and the buzzer.**
- **CN4: Outputs data to the printhead.**
- **CN5: Outputs the control signals and drive voltages to the paper feed and carriage motors.**
- **CN6: Receives the paper end signal from the printer mechanism.**
- **CN7: Receives the home position signal from the printer mechanism.**
- **CN8: Receives AC voltages from the ROC filter unit.**

The pin numbers and functions for each connector are listed in Tables A-8 through A-15 of the APPENDIX.

2.3 POWER SUPPLY CIRCUIT

This section describes the operation of the ROC filter unit and regulator circuit on the ROCX board. Figure 2-2 shows the block diagram of the power supply circuit. Table 2-1 shows output voltages and their applications.

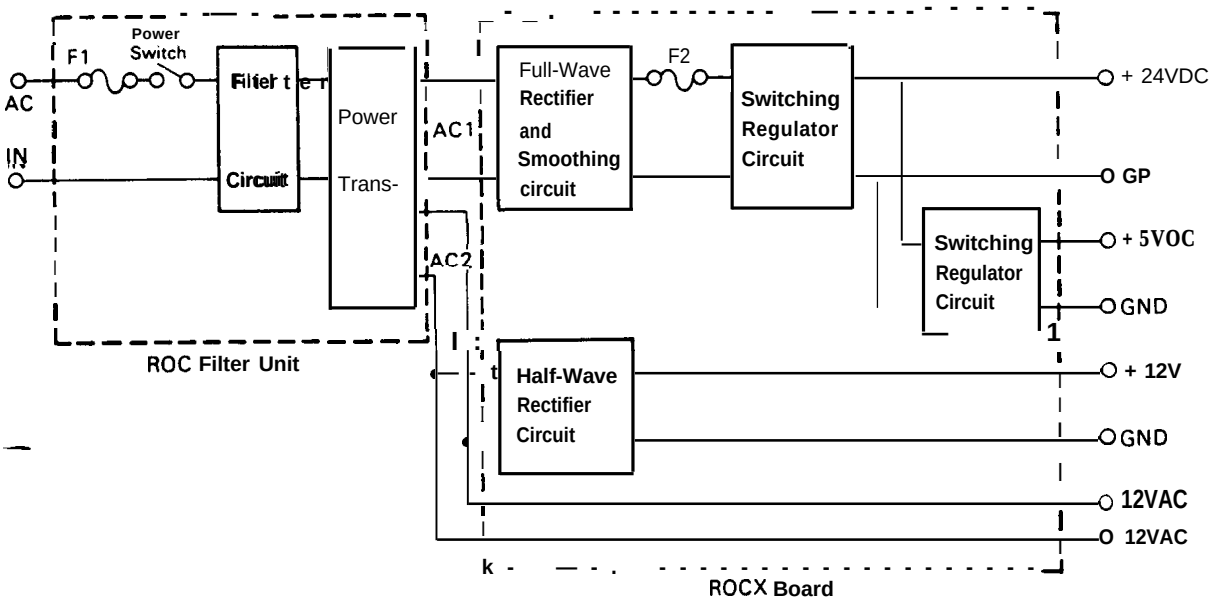


Fig. 2-2. Power Supply Circuit Block Diagram

Table 2-1. Voltage Types and Applications

Power Voltage	Application
+ 24 VDC-Gp	Printhead common voltage Paper feed motor drive voltage Carriage motor drive voltage Optional interface board
+5 VDC-GND	Logic circuit Paper feed motor hold voltage Carriage motor hold voltage Control panel power Optional interface board
+ 12VDC-GND	Optional interface board
12V AC	Optional interface board

2.3.1 ROC Filter Unit

The ROC filter unit consists of an AC power cord (or AC power inlet), power switch, fuse, filter circuit, and power transformer. The AC power cord, AC power inlet, fuse, and power transformer differ depending on the power supply voltage. Three kinds of ROC filter units, for 120 V, 220 V, and 240 V, are available.

2.3.1.1 Fuse and Filter Circuit

The AC input from the power line first flows across the power switch and fuse F1. After being filtered by C 1 and C2, it is supplied to the primary side of the power transformer via the L1/C3 noise prevention circuit. Power line noise (external noise) and internal noise from the printer are eliminated by this circuit. The value of fuse F1 changes as follows, according to the power supply voltage:

120 V version: 125 V or 250 V, 1.25 A
220 V version: 250 V, 0.63A
240 V version: 250 V, 0.63A

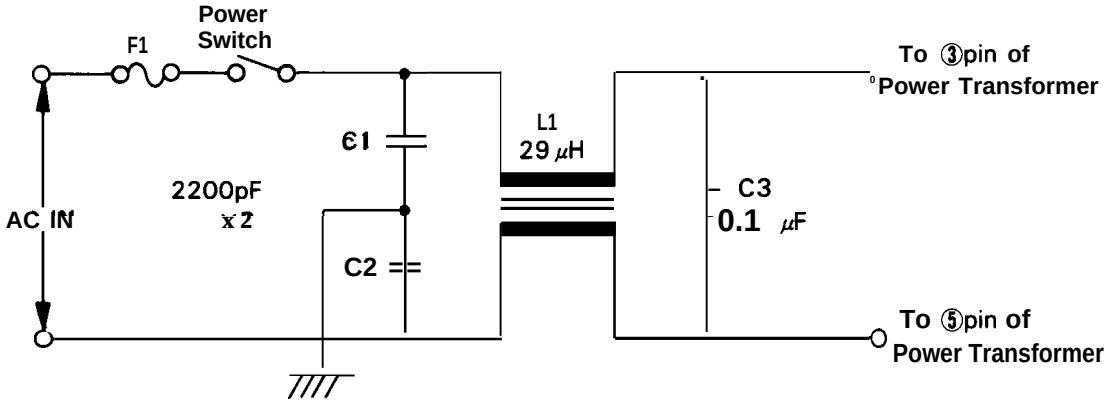


Fig. 2-3. Filter Circuit

2.3.1.2 Power Transformer

Three types of power transformers, for 240 V, 220 V, and 120 V, are available. The AC voltage from the filter circuit is transformed to the voltages listed in Table 2-2 so that they can be output to the regulator circuit (on the ROCX board) at the next stage. The power transformer includes thermal fuses TF1 and TF2.

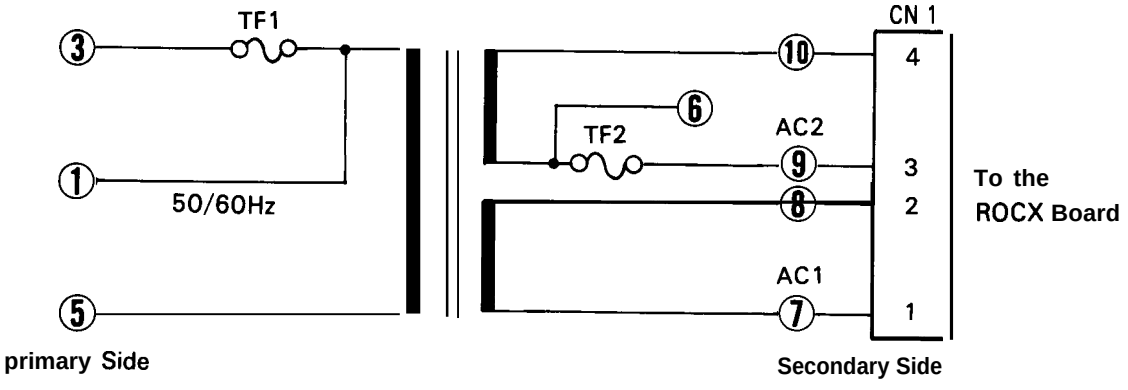


Fig. 2-4. Power Transformer

Table 2-2. Power Transformer Output Voltages

Type	Pin No.	No-load AC Voltage [V]	Rated Voltage	
			AC [V]	DC [V]
220V 240V	⑧ – ⑦	29.3	27.1	32.3
	⑩ – ⑨	9.0	8.33	+9.0/– 9.9
120V	⑧ – ⑦	29.3	27.7	33.3
	⑩ – ⑨	8.96	8.41	+9.27/– 10.0

NOTE: Column "DC [V]" for the rated voltages indicates the output of the transformer when the ROCX board is connected. The plus and minus values between pins 10 and 9 are different due to the voltage drop across thermal fuse TF2.

2.3.2 Regulator Circuit

AC1 and AC2 output from the ROC filter unit are input to connector CN8 of the ROCX board. The regulator circuit can be divided mainly into two portions, the +24 V/+5 V and + 12 V lines. AC 1 is full-wave rectified by diode bridge DB 1 and converted to +24 V and +5 V via the chopper type switching regulator. AC2 is half-wave rectified by D4-C 10, converted to + 12 V, and input to the optional interface board.

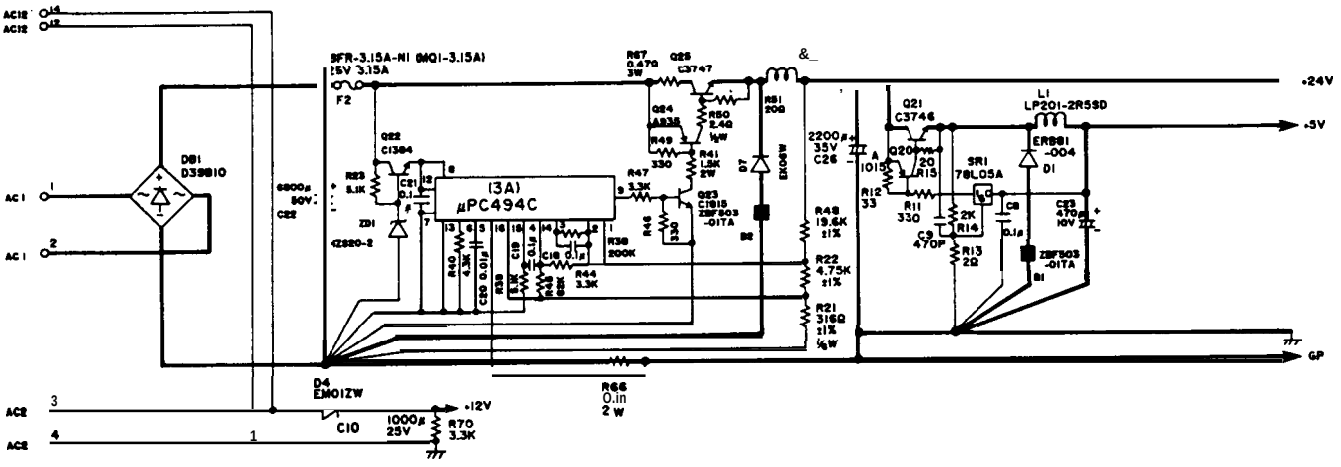


Fig. 2-5. +24/+5 VDC Regulator and +12 V Half-Wave Rectifier Circuits

2.3.2.1 Operation Principles of Chopper Type Switching Regulator

The operating principle of the switching regulator is illustrated in Figures 2-6 and 2-7.

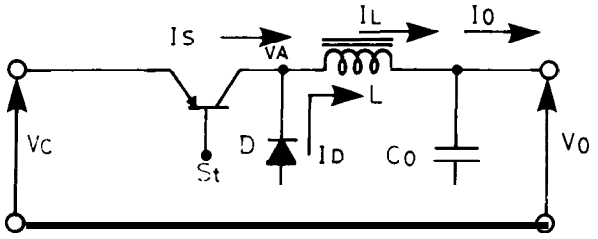
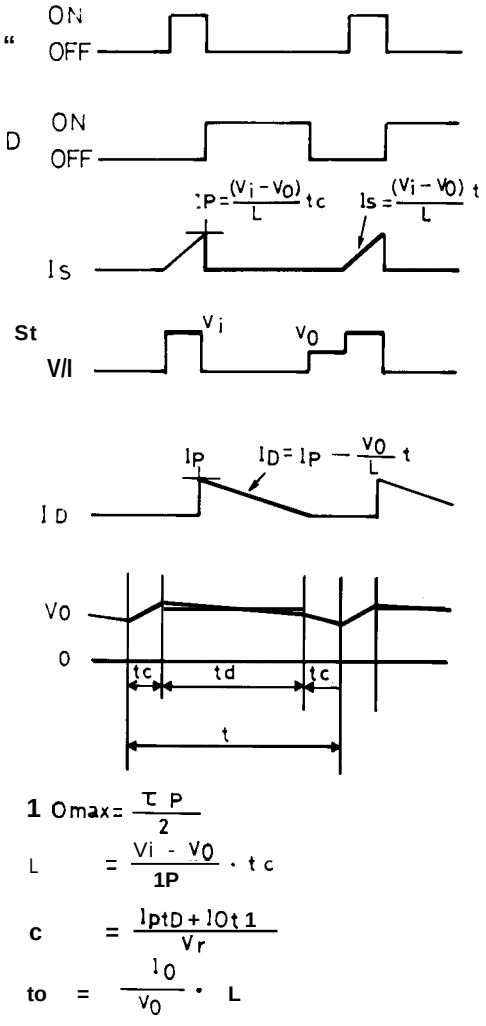


Fig. 2-6 Chopper Switching Regulator Circuit



$$1\,\text{Omax} = \frac{\tau P}{2}$$

$$L = \frac{Vi - V0}{1P} \cdot tc$$

$$c = \frac{IptD + I0t1}{Vr}$$

$$to = \frac{I_0}{V_0} \cdot L$$

Fig. 2-7 Voltage Waveforms

When switching transistor St is on, current Is is supplied to inductor L in proportion to time;

$$Is = \frac{(Vi - Vo)}{} t$$

When energy has accumulated in the inductor L, current 10 is supplied to the load. When St is off, the energy accumulated in L causes current I_D to flow via diode D and to supply load current 10;

$$I D = Ip - \frac{Vo}{L} t$$

The longer the on-time of St, the more the output voltage increases, and the shorter the on-time of St, the more the output voltage decreases. Theoretically, electric power efficiency is assumed to be 100%;

$$\text{Output voltage } Vo = \frac{to}{t} Vi$$

2.3.2.2 +24 V Supply Circuit

The +24 V supply circuit is a chopper type switching regulator circuit. Figure 2-8 shows the block diagram of the +24 V supply circuit based on Figure 2-6.

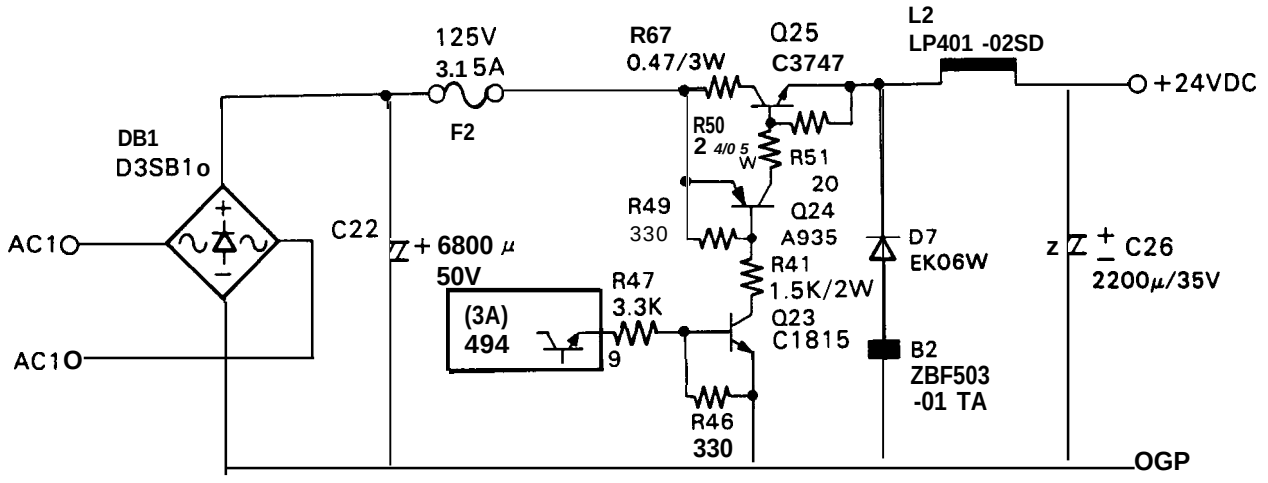


Fig. 2-8. +24 V Supply Circuit

AC 1 input from the ROC filter unit is full-wave rectified by DB 1 and is smoothed by C22. The voltage across C22 becomes 32.3 VDC. Transistors Q23, Q24, and Q25, which are used as Darlington amplifiers, D7, L2 and C26 in Figure 2-8 are equivalent to switching transistor St, flywheel diode D, choke coil L, and smoothing capacitor C in Figure 2-6. Switching is controlled by the 494 (IC3A), and pin 9 of the 494 is the emitter of the internal switching transistor. Therefore, switching is performed as follows:

494 internal transistor: ON → Q23: ON → Q24: ON → Q25: ON
494 internal transistor: OFF → Q23: OFF → Q24: OFF → Q25: OFF

Figure 2-9 shows a block diagram of IC 494.

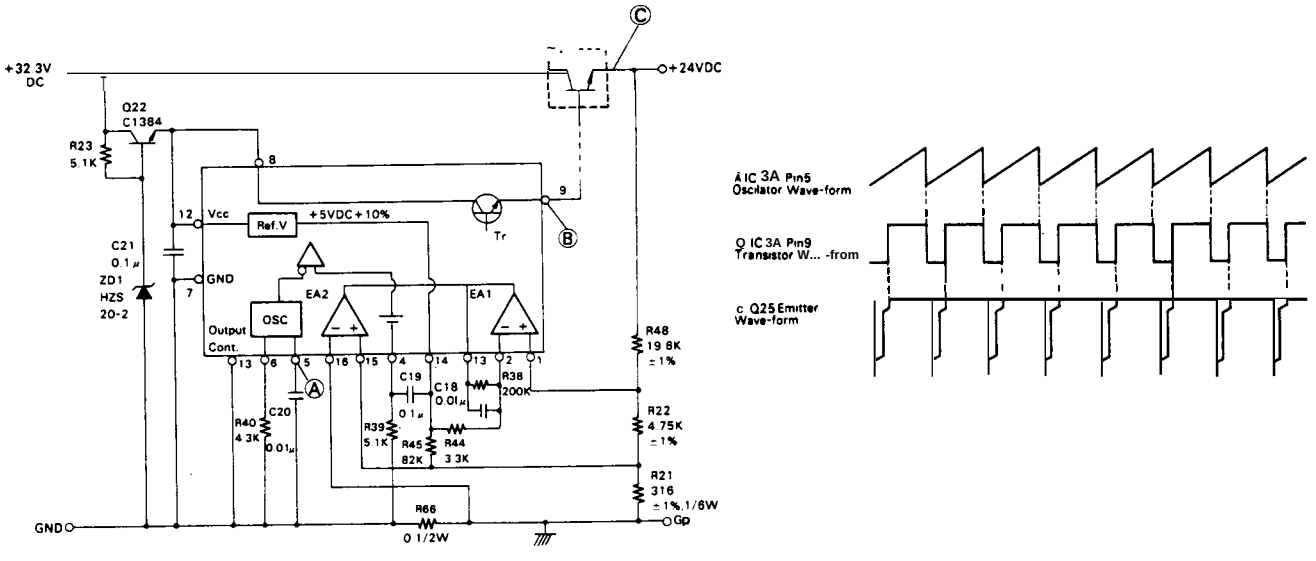


Fig. 2-9. IC494 Block Diagram and Switching Wave-form

When the printer power is turned on, ZD1 on the +20 VDC line turns on, Q22 turns on, and Vcc is applied to IC 494. Then the oscillator (OSC) starts generating an approximately 20 kHz sawtooth waveform, which is regulated by R40 and C20, and the reference voltage generator outputs the +5 VDC ± 10% reference voltage. Internal switching transistor Tr is switched on and off using the output from error amplifiers 1 and 2. EA1 and EA2 limit voltage and current, respectively. EA1 compares the voltage obtained by dividing the +24 V applied to pin 1 by R22 and R21 (approx. 4.9 V) with the + 5 V reference voltage applied to pin 2. EA2 compares the voltage monitored by R66 with the voltage obtained by dividing the +24 V applied to pin 16 by R21 (approx. 0.31 V). Therefore, the current is limited to approximately 3.1 [amps].

2.3.2.3 +5 V Supply Circuit

The +5 V supply circuit is also a chopper type switching regulator, which is the same as the +24 V supply circuit.

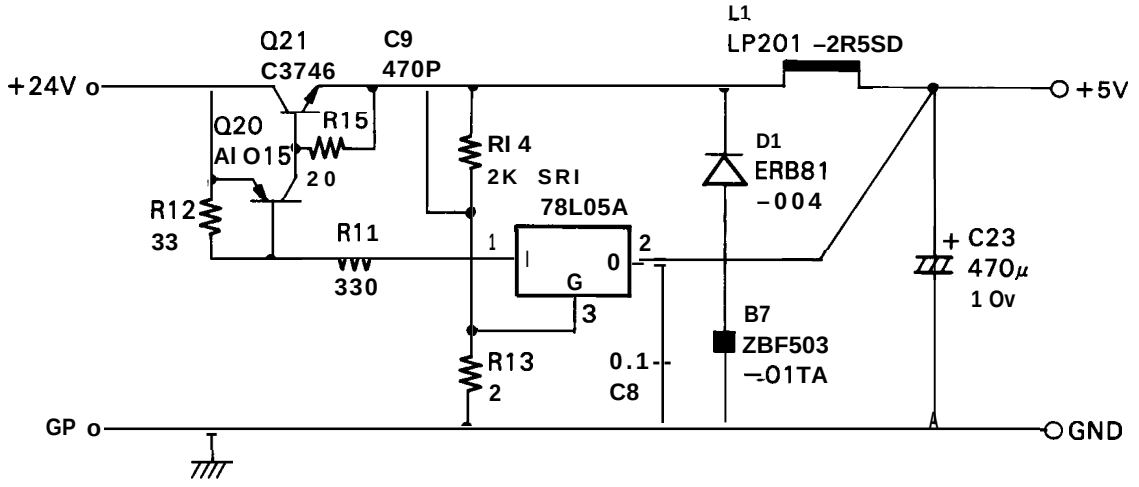


Fig. 2-10. +5 V Supply Circuit

When +24 V is applied to this circuit, current flows via R12 and R11, and operation of SR1 is started. SR1 includes a +5 V reference voltage generator and compares the voltage at terminal O (pin 2) with the reference voltage. When this voltage is lower than the reference voltage, SR 1 turns terminal I (pin 1) on. If the voltage is higher than the reference voltage, SR 1 turns the terminal off. This controls the switching transistors Q20 and Q21, and the output voltage is kept constant. Actual output voltage is 5.024 V (calculated value) because the GND terminal (pin 3) of SR 1 is raised to 0.024 V using the divider composed of R 14 and R 13.

2.4 CONTROL CIRCUIT

This section describes the software operation, specifications, and circuit operation of the control circuit (ROCX board). This section consists of the following descriptions:

1. **Function of the CPU which controls the overall operation and its peripheral circuits (Section 2.4.1)**
2. **Gate array function (Section 2.4.2)**
3. **Outline of the overall firmware operation (Section 2.4.3)**
4. **Software control and circuit operation of the analog circuits (Sections 2.4.4 through 2.4.8)**

The control circuit is very simple, and consists mainly of four chips: the CPU, gate array, ROM, and RAM. (Refer to Figure 2-1 1.) The main operation of the control circuit is to control the CPU and the gate array. Other components are described in each section that describes the functions of the CPU and gate array. Figure 2-11 shows a block diagram of the control circuit.

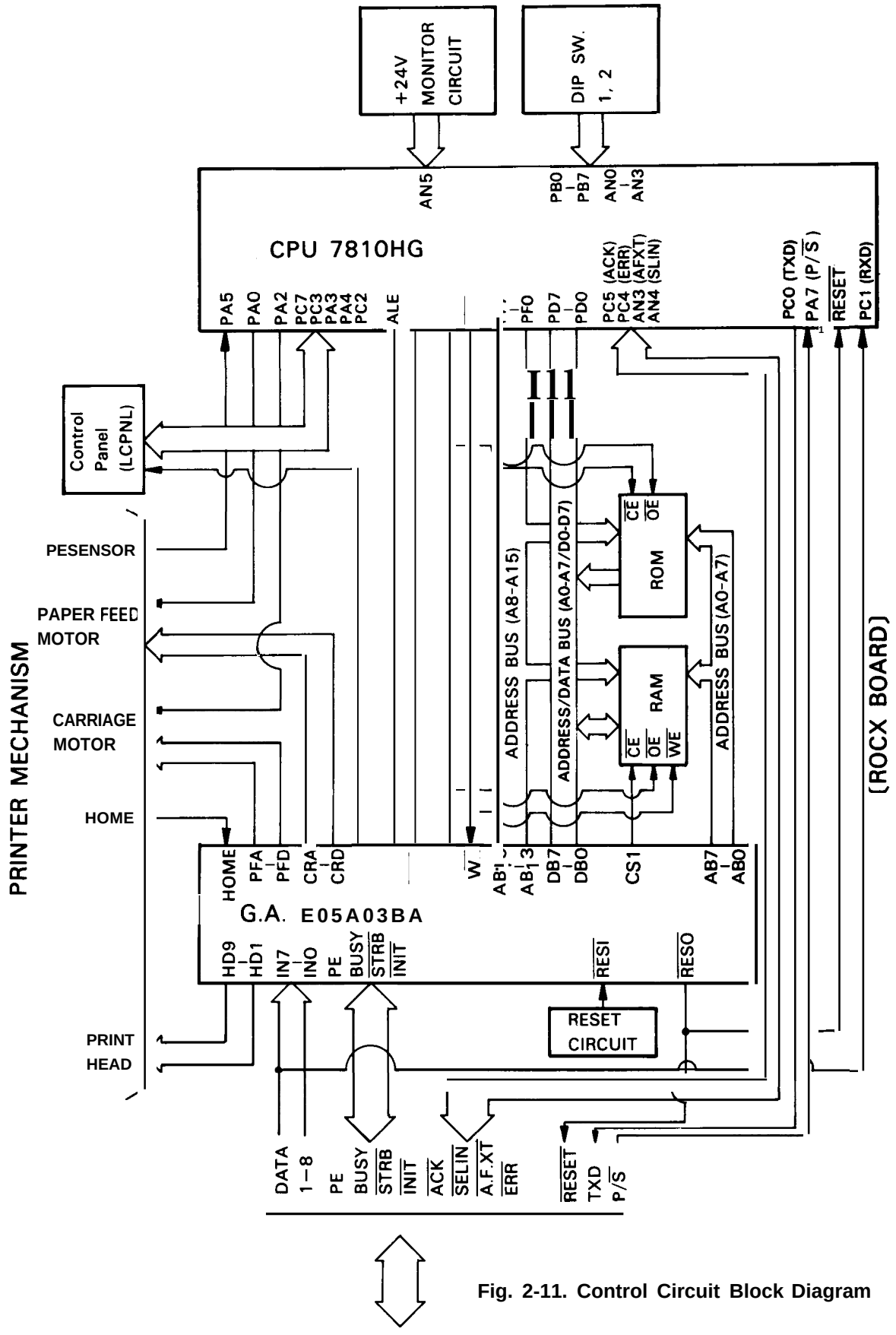


Fig. 2-11. Control Circuit Block Diagram

Fig. 2-11. Control Circuit Block Diagram

2.4.1 Functions of the CPU

The core of the control circuit is the 78 10H CPU (IC2B). Table 2-3 shows the function of each pin and the related circuits.

Table 2-3. CPU Port Assignments

Pin Number	Port Assignment	I/O	Signal Line Name	Description
1	PA0	o	CRCOM	I/O port. Switches the carriage motor drive voltage and the holding voltage. When this signal is HIGH (LOW), the drive voltage (holding voltage) is applied to the carriage motor.
2	PA1		—	Not used.
3	PA2	o	PFCOM	I/O port. Switches the paper feed motor drive voltage and the holding voltage. When this signal is HIGH (LOW), the drive voltage (holding voltage) is applied to the paper feed motor.
4	PA3	I	$\overline{\text{LF SW}}$	I/O port. Reads the state of the LINE FEED switch on the control panel.
' - 5	PA4	I	$\overline{\text{FF SW}}$	I/O port. Reads the state of the FORM FEED switch on the control panel.
6	PA5	I	PE SW	I/O port. Reads the state of the paper end sensor. When no paper is loaded, this signal goes LOW.
7	PA6		—	Not used.
8	PA7	I	P/$\overline{\text{S}}$	I/O port. Reads the P/~ signal from the optional interface.
9) 16	PB0) PB7	I	SW1 - 8) SW1 - 1	I/O port. Reads the state of DIP SW1.
17	PC0	o	TXD	TXD output port. Outputs the data from the serial I/O channel in the CPU to the TXD (transmit data to the host computer) terminal of the optional interface.
18	PC1	I	RXD	RXD input port. Used as a receive control signal when the optional serial interface board (for serial/parallel data conversion) is connected. (Data reception detection)
19	PC2	o	$\overline{\text{ONLINE LP}}$	I/O port. Controls the ON LINE LED on the control panel. When this signal is LOW, the LED lights.
20	PC3	I	$\overline{\text{ONLINE SW}}$	INT2 input port. Reads the state of the ON LINE switch on the control panel. Connected to the interrupt controller in the CPU, which executes the ON LINE/OFF LINE switch interrupt routine when this signal is LOW.
21	PC4	o	$\overline{\text{ERR}}$	I/O port. Outputs an error signal to the interface board when the printer is in an error state. When this signal is LOW, the printer is in an error state.
22	PC5	o	$\overline{\text{ACKNLG}}$	I/O port. Outputs the acknowledge signal to the interface. This signal is LOW active.
23	PC6	0	FIRE	COO output port. Outputs the drive pulse width signal, which is determined by the timer/event counter in the CPU, to the FIRE terminal of gate array E05A03. This signal is LOW active.
24	PC7	0	$\overline{\text{BUZZER}}$	I/O port. Outputs the buzzer signal to the control panel. When this signal is LOW, the buzzer rings.

Table 2-3. CPU Port Assignment (cent'd)

Pin Number	Port Assignment	I/O	Signal Line Name	Description
25	NMI	I	—	Non-maskable interrupt input. The interrupt routine is executed at the trailing edge of this signal. This pin is invalid because it is tied to ground.
26	INT 1	I	—	Interrupt input. The interrupt routine is executed at the leading edge of this signal. This pin is invalid because it is tied to ground.
27	MODE 1	I	—	External memory space setting port. MODES 1 and O (pin 29) are both pulled up to HIGH so that an external memory of 64K bytes (addresses O through FFFFH) can be used.
28	$\overline{\text{RESET}}$	I	$\overline{\text{RESET}}$	Reset terminal. When this signal is LOW, the printer is reset, and ports A through C and D are set to be high impedance input ports, and port F is set to be an address output (start address OH).
29	MODE O	I	—	Refer to pin 27, MODE 1.
30	x 2	I	—	CPU external clock input. This printer is driven with a 14.74 MHz clock. The operation codes are fetched at approximately 1.3 MHz, and memory read/write operations are performed at approximately 1.6 MHz.
31	x I			
32	Vss	-	—	Ground terminal.
33	AVss		—	Ground terminal for the A/D converter in the CPU.
34) 36	AN0) AN2	I	SW2-1) SW2-3	Analog input port of the 8-bit A/D converter in the CPU. Reads the states of DIP SW2-1 through SW2-3.
37	AN3	I	SW2-4	Analog input port of the 8-bit A/D converter in the CPU. Reads the state of DIP SW2-4. This signal line is connected to the $\overline{\text{AUTO FEED XT}}$ signal line of the interface. When DIP SW2-4 is ON, the automatic paper feed function is valid. When the DIP switch is OFF, this function is controlled by a signal from the host computer (not fixed).
38	AN4	I	—	Analog input port for the 8-bit A/D converter in the CPU. Reads the $\overline{\text{SLCT IN}}$ signal from the interface. When the SLCT-~ signal is HIGH, DC 1/DC3 control from the host computer is valid. When it is LOW, DC 1/DC3 control is ignored, and the printer is always selected as a device. (The signal can be tied LOW using jumper J 1.)
39	AN5	I	+24	Analog input port for the 8-bit A/D converter in the CPU. Monitors the +24 V voltage and controls the printhead drive pulse width.
40	AN6	-	—	Not used.
41	AN7	-	—	Not used.
42	VAREF	I	—	Reference voltage input for the 8-bit A/D converter in the CPU.
43	AVcc	I	—	Power supply input for the 8-bit A/D converter in the CPU.
44	$\overline{\text{RD}}$	o	$\overline{\text{RD}}$	Memory read timing strobe signal. Connected to the RD strobe terminal of the gate array and the output enable terminal of the ROM and RAM.

Table 2-3. CPU Port Assignment (cent'd)

Pin Number	Port Assignment	I/O	Signal Line Name	Description
45	WR	o	WR	Memory write timing strobe signal. Connected to the WR strobe terminal of the gate array and the write enable terminal of the RAM.
46	ALE	0	ALE	Address latch enable signal. Controls address latching performed inside the gate array (enables latching when the signal is HIGH).
47 ~ 54	PFO ~ PF7	0	A 8 ~ A 15	8-bit I/O ports with output latch. Used as the upper address bus according to the MODE 0/1 terminal selection. For 64K external memory assignment), Al 3 through Al 5 are input to the address decoder in the gate array.
55 ~ 62	PDO ~ PD7	I/O	DBO (AO) ~ DB7 (A7)	Multiplexed address/data bus. Used as the lower address and data bus.
63	V_{DD}	I	—	Power supply for the internal RAM (+5 VDC).
64	Vcc	I		Power supply for the CPU (+5VDC). When this voltage is not stable, such as at either a leading or trailing edge (when the printer power is turned on or off), the reset circuit prevents the CPU from running.

NOTES: 1. All barred signal are LOW active.

2. "1/0" denotes either input or output when viewing the signal from the CPU.

2.4.2 E05A03 Gate Array Functions

This section describes the E05A03 functions. Figure 2-12 shows the E05A03 block diagram.

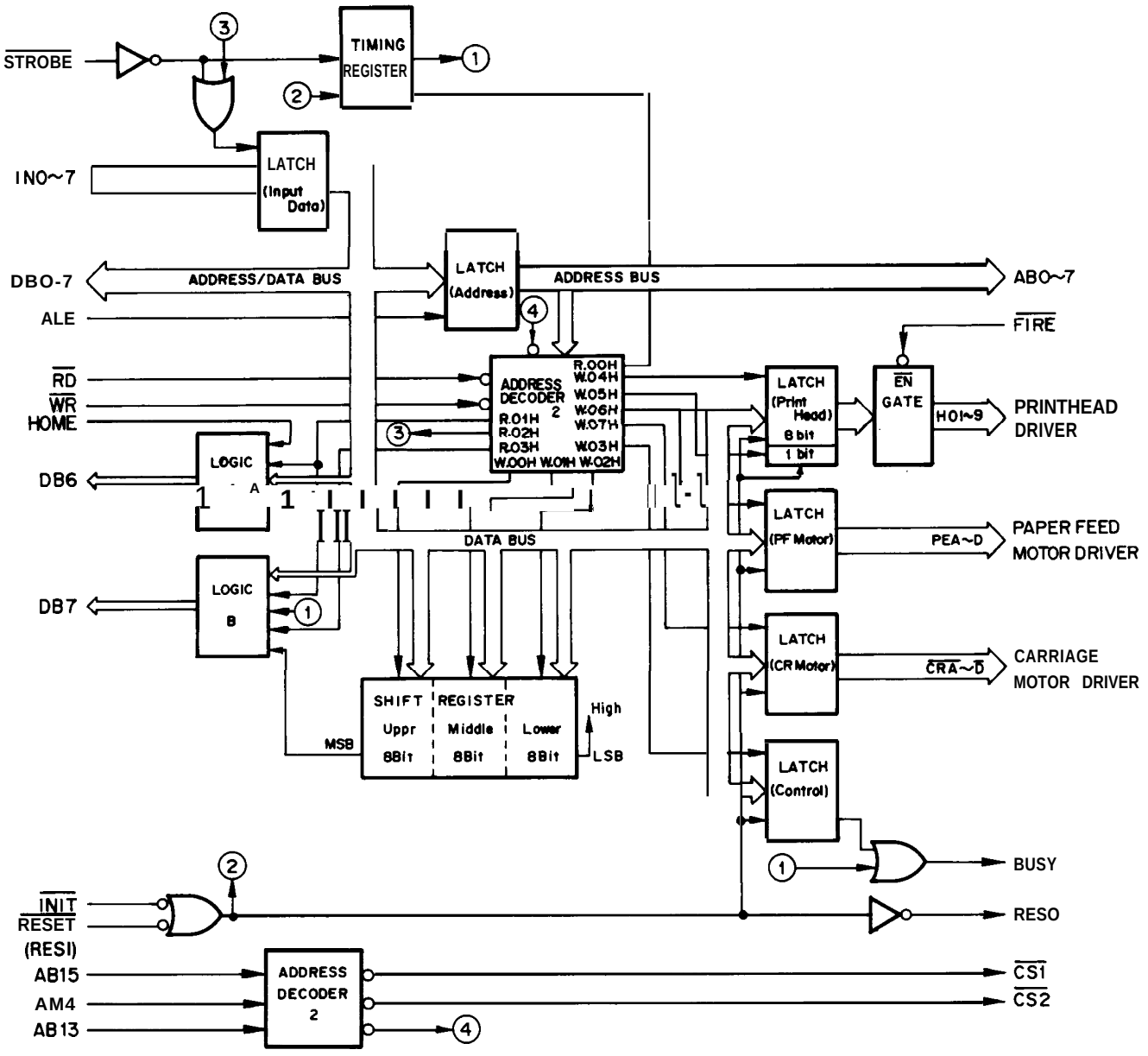


Fig. 2-12. E05A03 Block Diagram

Functions of the E05A03 gate array (IC3B) are as follows:

1. Address latch

The gate array latches data on address data lines DB0 - DB7 at the leading edge of the ALE signal, and outputs it to AB0 - AB7 (when ALE is high, the data is passed through without latching.)

2. Address mapping

The gate array inputs an address on AB 13- AB 15, and selects $\overline{CS1}$ or $\overline{CS2}$ or enables the R/W mode of this gate array using internal decoder 2.

3. Handshaking

- The gate array latches data on IN0 - IN7 at the leading edge of the $\overline{STROBE}$ signal, and automatically outputs the BUSY signal. The BUSY signal (DB7) is latched by the timing register to inform the CPU that data has been transmitted to the CPU.
- The timing for the BUSY signal, which is set at either the trailing or leading edge of the $\overline{STROBE}$ signal, is selected by the control program (firmware).
- The BUSY signal output from the timing register is wire-ORed with the BUSY signal controlled by the firmware.

4. Printhead solenoid drive pulse

. When the FIRE signal from the CPU is brought Low, the data that was previously latched is output on HD 1 - HD9 to drive the corresponding solenoids in the printhead.

- When FIRE is high, HD1 - HD9 are all low.

5. Shift register

- This gate array includes a shift register (8bits × 3), and the MSB (Most Significant Bit) can be read by accessing the specified address (XX03H) once. The data is shifted one bit to the left at the leading edge of the $\overline{RD}$ signal.

6. Initialization

When the $\overline{INIT}$ or $\overline{RESI}$ signal is low, the gate array sets $\overline{RESO}$ low and initializes the following.

- Printhead latch (HD 1 - HD9 are all set low even if FIRE is low.)
- PF motor latch (PFA - PFD) are all set low.)
- CR motor latch ($\overline{CRA}$ - $\overline{CRD}$) are all set high.)

. Timing generator (enters the state indicating that no data has been received.)

- Control latch (BUSY is set high (software-BUSY), PE is set low, and PELP, NLQLP, and CNDLP are set high.)

7. Address decoder 2

Address decoder 2 selects one of the twelve modes listed in Table 2-13 according to the combination of lower address bits OOH - 07H, $\overline{RD}$, and $\overline{WR}$.

Table 2-4 shows the E05A03 functions and Table 2-5 shows the E05A03 pin functions.

Table 2-4. E05A03 Functions

Lower Address	R/W	Pin Name	Function
00H	R	IN0 - IN7	Reads the data which was latched using STROBE, and resets the STROBE-BUSY output.
	W	—	Writes data to the upper eight bits of the 24-bit shift register (DB7 - DB0 → Bits 23 - 16).
01H	R	STRB HOME	Bit 7: 1 (Indicates the trailing edge of the $\overline{\text{STROBE}}$ signal.) Bit 6: 1 (The HOME input is HIGH.)
	w	—	Writes data to the middle eight bits of the 24-bit shift register (DB7 - DB0 → Bits 15 - 8).
02H	R	IN0 - IN7	Directly reads IN0 - IN7. Does not affect the BUSY signal.
	w	—	Writes data to the lower eight bits of the 24-bit shift register (DB7 - DB0 → Bits 7 - o).
03H	R	—	Reads the MSB of the 24-bit shift register and shifts the data one bit to the left (MSB → DB7).
	w	BUSY	Bit 7: 1 (The BUSY signal is output at the leading edge of STROBE.) O (The BUSY signal is output at the trailing edge of STROBE.) Bit 6: 1 (Resets software-BUSY.) O (Sets software-BUSY.)
		$\overline{\text{NLQLP}}$	Bit 4: 1 (NLQLP is LOW.) ● See NOTES 2. 0 (NLQLP is HIGH.)
		$\overline{\text{CNDLP}}$	Bit 3: 1 (CNDL is LOW.) ‘See NOTES 2. 0 (CNDL is HIGH.)
		PE PELP	Bit 2: 1 (PE is HIGH and PELP LOW.) O (PE is LOW and PELP HIGH.)
04H	W	HD1 - HD8	Latches (and inverts) the data for pins 1 - 8 of the printhead. (DB7 - DB0 → HD1 - HD8 Data is output when FIRE goes LOW.)
05H	w	HD9	Latches (and inverts) the data for pin 9 of the printhead. (DB7 → HD9 Data is output when FIRE goes LOW.)
06H	w	PFA - PFD	Latches the phase data for the PF motor. (DB7 - DB4 → PFA - PFD)
07H	w	$\overline{\text{CRA}}$ - $\overline{\text{CRD}}$	Latches the phase data for the CR motor. (DB3 - DB0 → CRA - CRD)

NOTES: 1. The above functions are mapped to every eight bytes from COOOH to DFFFH.

2. These are not used in this printer.

Table 2-5. E05A03 Port Assignments

Pin No.	Signal	Direction	Description
1	Vcc	In	Power (+ 5V DC)
2	$\overline{\text{NLQ LP}}$	out	NLQ lamp (~/off) "See NOTES 1
3	$\overline{\text{PE LP}}$	out	Paper end lamp (~/off)
4	CR D	out	Carriage (CR) motor phase D drive pulse
5	CR C	out	CR motor phase C drive pulse
6	CR B	out	CR motor phase B drive pulse
7	CR A	out	CR motor phase A drive pulse
8 ~ 15	DB 7 ~ DB8	In/Out	Data bus 7 - 0
16 ~ 18	AB 15 ~ AB 13	In ~ In	Address bus 15 - 13
19	ALE	In	Address latch enable
20	WR	In	Write stroba-
21	$\overline{\text{RD}}$	In	Read strobe
22	FIRE	In	Printhead solenoids trigger (drive/rest)
23	HOME	In	Home position signal (Home/$\overline{\text{Not home}}$)
24	RESI	In	Reset signal input
25	$\overline{\text{RESO}}$	out	Reset signal output
26	PF A	out	Paper feed (PF) motor phase A drive pulse
27	PF B	out	PF motor phase B drive pulse
28	PF C	out	PF motor phase C drive pulse
29	PF D	out	PF motor phase D drive pulse
30	Cs 1	out	Chip select 1 (lower address)
31	Cs 2	out	Chip select 2 (upper address) "See NOTES 1.
32,33	GND	—	GND
34	$\overline{\text{CND LP}}$	out	CONDENSED lamp (on/off) ● See NOTES 1.
35	PE	out	Paper end (Valid/Invalid)
36	BUSY	out	Busy
37 ~ 44	AB O ~ AB 7	out	Address bus O - 7
45	INIT	In	Initialize
46	$\overline{\text{STROBE}}$	In	Strobe
47 ~ 54	IN 7 ~ IN O	In	Data bus 1 - 8
55 ~ 63	HD 9 ~ HD 1	out	Printhead solenoid drive pulse #9 - #1
64	Vcc	In	Power (+ 5V DC)

NOTES: 1. These are not used in this printer.

2. Signal direction is viewed from the E05A03 side.

2.4.3 Data Flow

This section describes the firmware start-up operation when the printer is initialized, data flow (especially printing data flow), and command processing. Figure 2-13 shows a memory map of the LX-800.

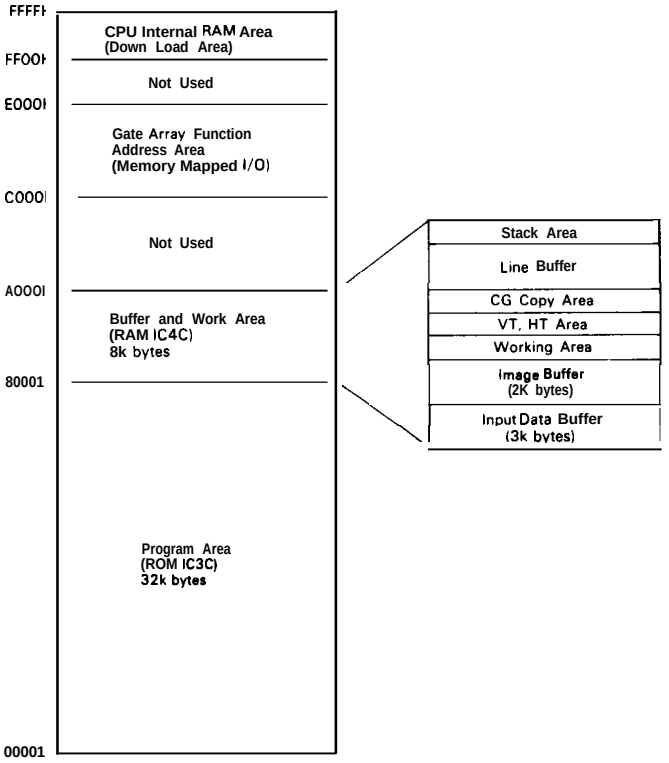


Fig. 2-13. LX-800 Memory Map

The CPU can access an external memory of 64K bytes, and executes the program (32K bytes) in the external ROM (IC3C). The external RAM (IC4C) area (8K bytes) and the CPU internal RAM (256 bytes) are used as a buffer and working area. The CPU accesses the gate array using the instruction codes (See Table 2-4). C000H through DFFFH are defined as memory mapped 1/0.

2.4.3.1 Initialization

When the reset signal is input, the printer is initialized as follows:

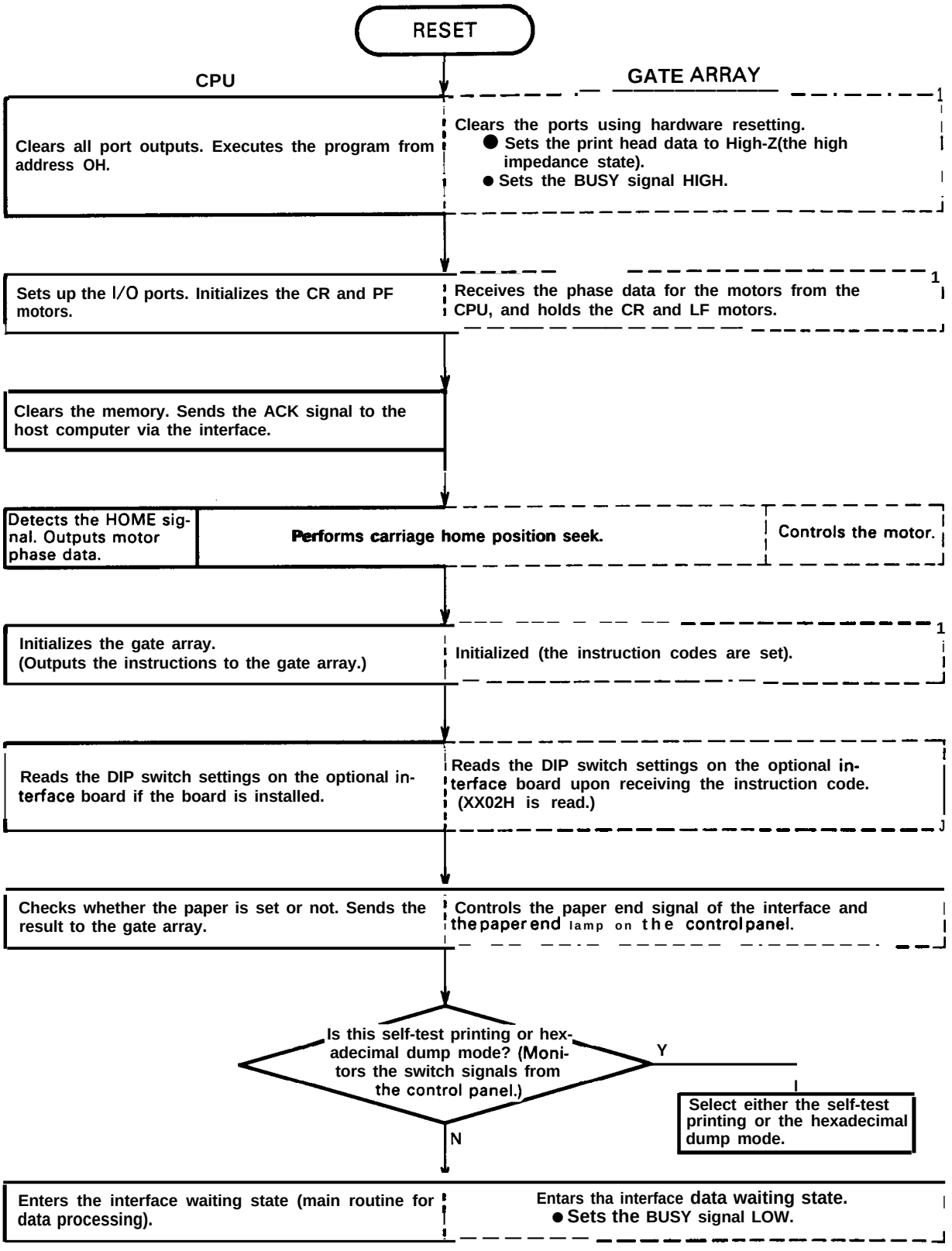


Fig. 2-14. Initialization Flow

2.4.3.2 Print Data Processing

After the initialization, the CPU enters the data waiting state. When data is input from the interface, the CPU starts reading the data. Besides this process (main routine), the actual printing process is performed by an interrupt routine. The print data is processed by repeating the main and interrupt routines.

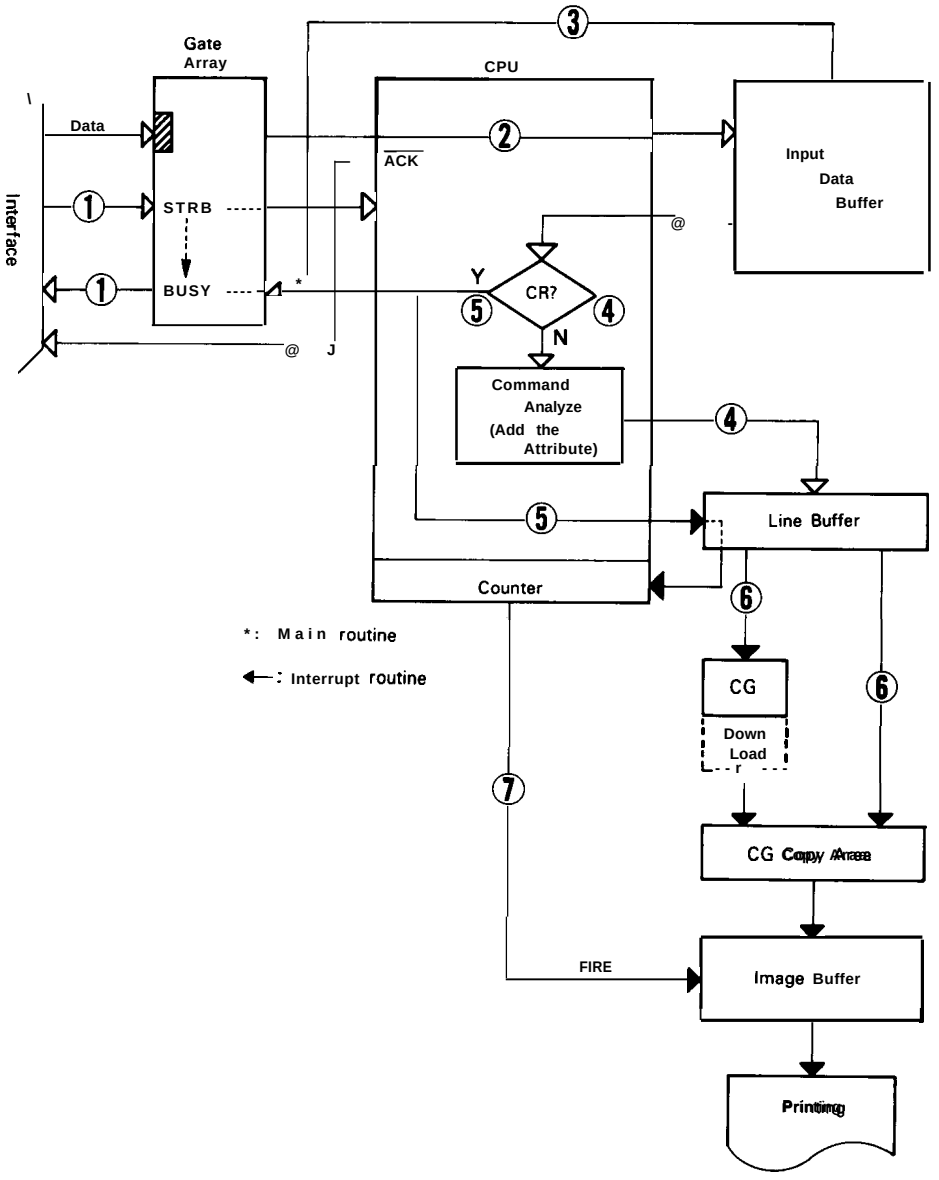


Fig. 2-15. Print Data Flow

The data flow in the Draft printing mode is as follows. Step numbers used in the explanation below correspond to the data flow numbers used in Figure 2-15.

① The CPU detects the $\overline{STRB}$ signal from the gate array (Reads MMIO and XX01 H). When the gate array detects the trailing edge of the $\overline{STRB}$ signal, it automatically sets the BUSY signal HIGH and latches the transferred data.

② The CPU fetches the data latched by the gate array (reads MMIO and XX00H), and stores the data in the input buffer. The CPU analyzes each byte of data to determine whether it is a control code or print data, then returns the ACK signal to the interface.

③ Steps@ and@ are repeated until the input data buffer becomes full. When the buffer becomes full, the BUSY signal is set HIGH.

④ Either during steps@ and@ or after the input data buffer becomes full, the CPU analyzes each byte of data. If the data is not a printing command (CR), the CPU sets the printing mode and parameters and transfers the data to the line buffer. The line buffer is shown in Figure 2-16.

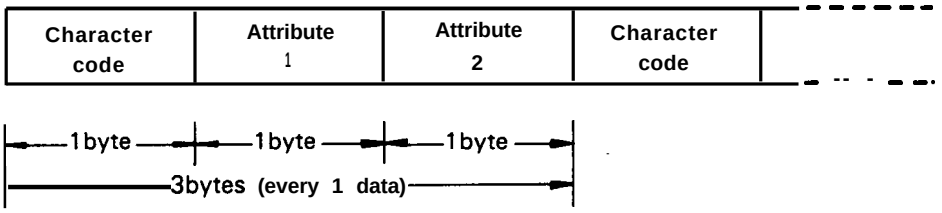


Fig. 2-16. Line Buffer

The line buffer temporarily stores the data for one line using the format shown in Figure 2-16, and also contains the command flags (1 6 bits), for attributes 1 and 2, for each character. The command flags indicate what kind of command or mode is specified for the character. According to the command flags, any of the EPSON ESC/P commands, NLQ, underline, emphasized character, and font selection, is specified for the character.

⑤ When either the CPU detects a printing command (CR) or the line buffer becomes full, the printing process (interrupt routine) is started.

⑥ The CPU transfers the character codes from the line buffer to the CG (Character Generator), and transfers image data to the CG copy area. The CG copy area refers to the attribute flags in the line buffer and expands the image data. The expanded data is then transferred to the image buffer.

⑦ The CPU writes the (vertical) dot patterns in the image buffer to port HD of the gate array (writes MMIO, XX04H, and XX05H). At the same time, the CPU references the contents of the line buffer, and outputs the FIRE signal (which corresponds to the dot patterns expanded in the image buffer) to the gate array.

When the NLQ mode is selected, note the following difference from the Draft mode:

- During command analysis in step ④, if the data is determined to bean NLQ character, the steps after step ④ are repeated two times for every one pass (NLQ requires two-pass printing).

When the download mode is selected, the following point is different from the draft mode:

- When referencing the CG in step ⑥, the CPU accesses the down load buffer but not the CG.

2.4.4 Reset Circuit

A reset operation is performed when the INIT signal is input from the interface and when the printer power is turned on. (Refer to Sections 1.4.6, 2.4.1, 2.4.2, and 2.4.3.1 for the reset operation.) Figure 2-17 shows the reset circuit.

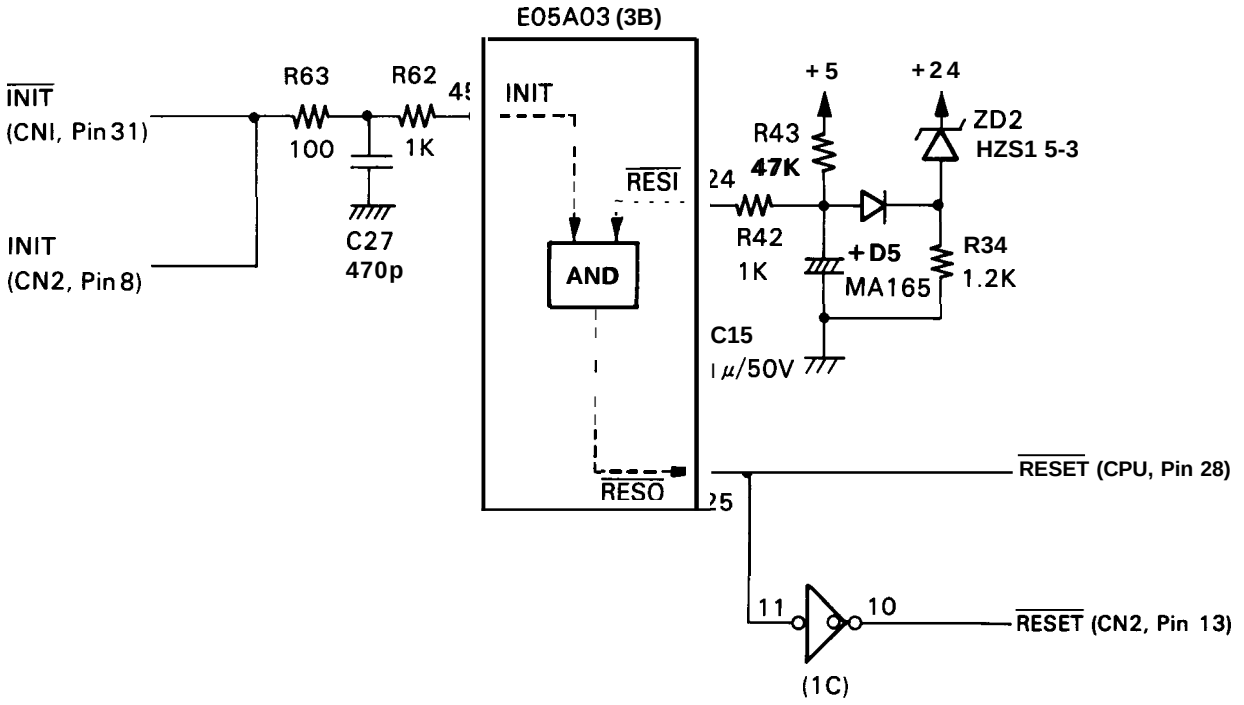


Fig. 2-17. Reset Circuit

The I NIT signal from which noise is attenuated by R63 and C27 is input to the E05A03. The RESI terminal of the E05A03 is connected to the power supply (+5 V and +24 V) reset circuit. When the printer power is turned on, the level of the RESI signal is held at its threshold level or below (LOW level) until the voltage of the +24 V line reaches the Zener voltage of ZD2 (when the power is turned off, the sequence reverses). The same sequence is followed for the + 5 V line. The level of the RESI signal is held at its threshold level or below (LOW level) until the voltage of the +5 V line reaches +5 V. In addition, the level of the RESI signal is held LOW by R43 and C 15 for approximately 47 ms after the power supply voltages become stable. The Schmitt trigger gate (CMOS level) at the input terminal of the RESI signal shapes the analog waveform. The INIT and RESI signals are ANDed in the E05A03, then output from the $\overline{\text{RESO}}$ terminal to the $\overline{\text{RESET}}$ terminals of the CPU and the interface board.

2.4.5 Carriage Motor

This section describes the sensor circuit, an outline of the firmware, and the drive circuit, which are used to control the carriage motor. The specifications of the carriage motor are as follows:

Angle per step:	7.5°
Number of steps per revolution:	48 steps
Number of phases:	Four
Excitation system and drive frequency:	Unipolar drive, 2-2 phase excitation system (900 PPS) Unipolar drive, 1-1 phase excitation system (450 pps)
Drive voltage:	+24 VDC
Resistance per coil:	41.5 ohms ±7%

2.4.5.1 Home Position Sensor

The home position sensor detects the reference position of the carriage. The sensor is located at the home position which is to the left of the first column. Figure 2-18 shows the home position sensor circuit.

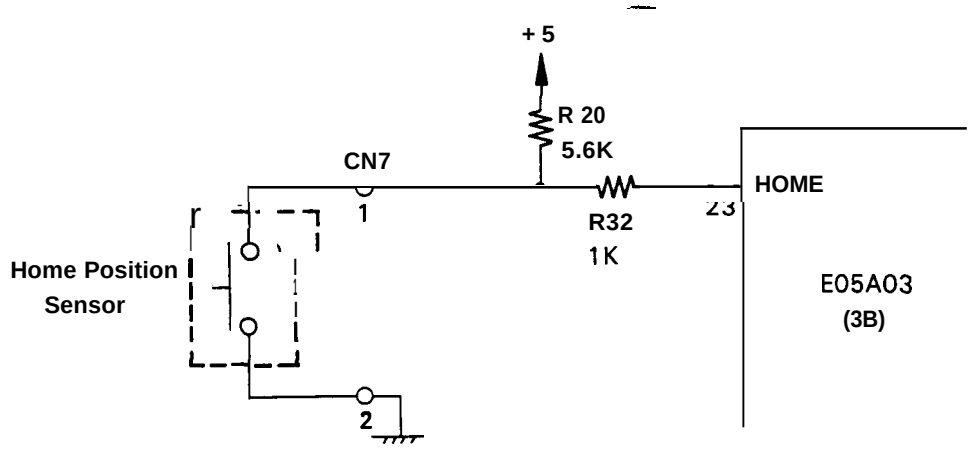


Fig. 2-18. Home Position Sensor Circuit

When the carriage is at the home position, the reed switch is closed, and a LOW signal is input to the HOME terminal of the E05A03. The CPU reads MMIO port XX1H of the E05A03 to determine when the carriage is at the home position.

2.4.5.2 Carriage Motor Control

The carriage motor control system is an open-loop system. There are two basic phase switching speeds: 450 PPS (I-1 phase drive) and 900 PPS (2-2 phase drive), as shown below. The phase switching is performed according to the time data (time required to switch a phase) which is determined by the firmware, for the number of counts determined by the firmware. Figure 2-19 shows the basic phase switching patterns.

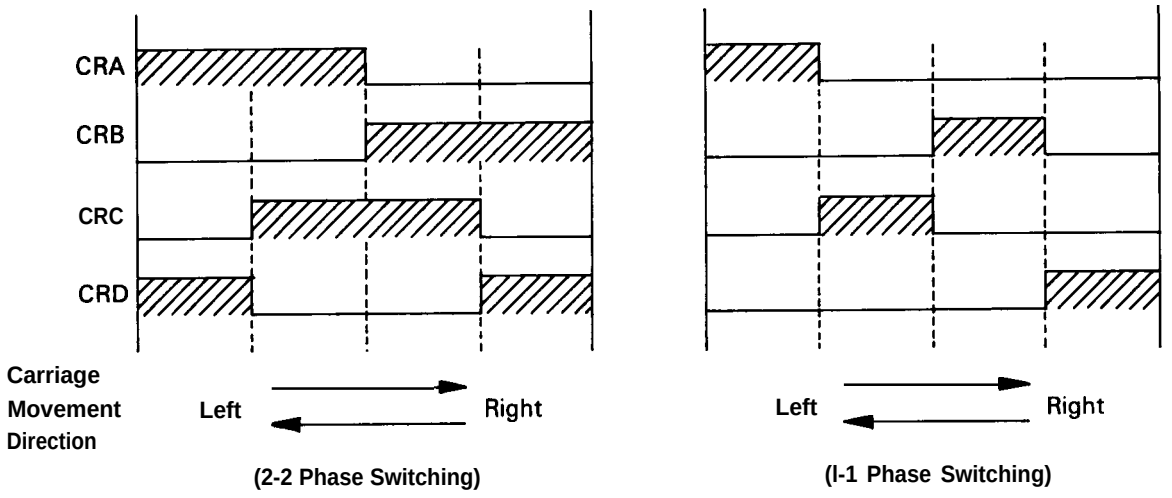


Fig. 2-19. Basic Phase Switching Patterns

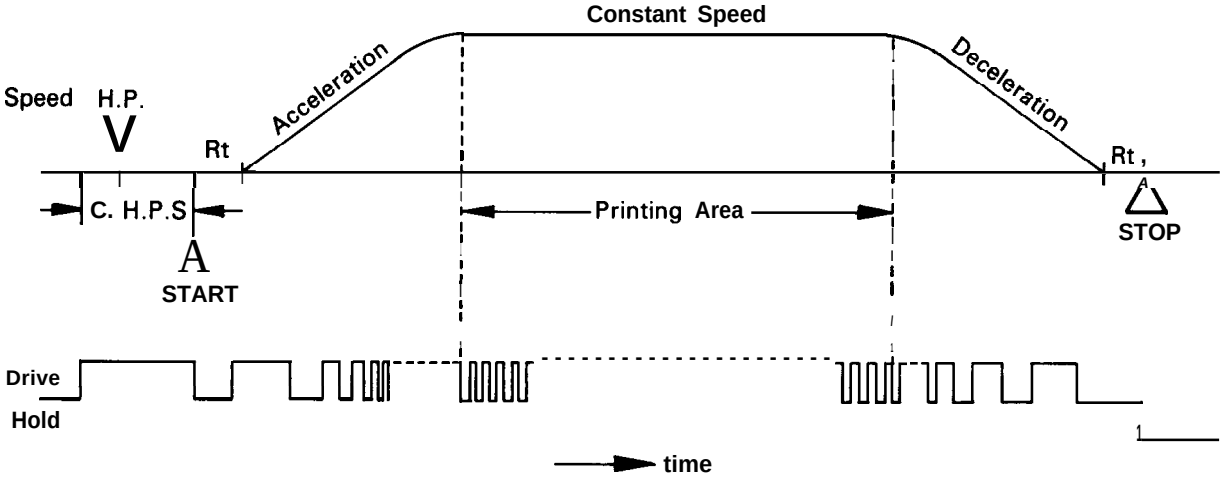


Fig. 2-20. Basic Operation Sequence

Figure 2-20 shows the basic sequence for the carriage operation.

● C. H.P.S. (Refer to Section 2.4.5.3)

When the printer is initialized, a carriage home position seek is performed. Then the carriage motor enters the holding mode at the operation start position (START).

● Rt

At least 6 ms of rush time (Rt) is set just before acceleration and after deceleration to stabilize the motor operation. It takes 75 ms for the carriage motor to restart from the stop mode.

● Acceleration mode

The acceleration mode consists of a maximum of 12 steps, and the time period for each step becomes shorter as the step number increments. In the acceleration mode, the CPU checks the home position signal each time the phase is switched, and a carriage error occurs if the home position signal goes HIGH.

● Constant speed mode

After acceleration completes, the carriage motor enters the constant speed mode. Printing is started when the carriage motor enters this mode. The time period for each step is the same, 2.22 ms at 450 PPS and 1.11 ms at 900 PPS.

● Deceleration mode

The deceleration mode consists of a maximum of 12 steps. The time period for each step becomes longer as the step number increments.

The 450 PPS speed (l-1 phase drive) is used for printing NLQ characters, and the 900 PPS speed (2-2 phase drive) is used for printing Draft characters. The patterns for the phase switching and the time data are contained in the working area of the RAM. The CPU uses this data as a reference table, and outputs the phase data to the E05A03 in accordance with the timing of the character to be printed. (MMIO XX07H write operation)

2.4.5.3 Home Position Seek

Figure 2-21 shows the home position seek operation (actual carriage movement)

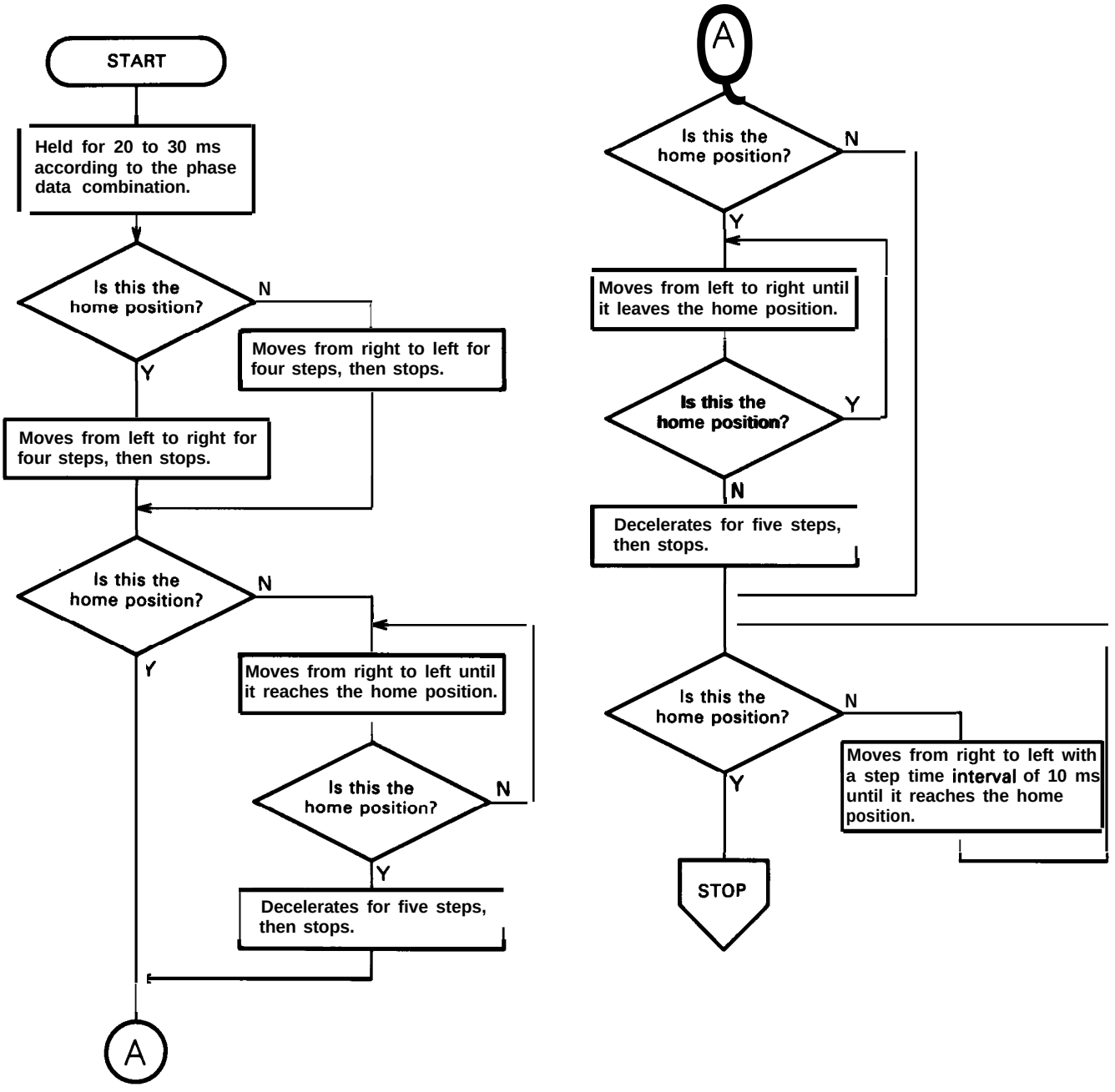


Fig. 2-21 Home Position Seek Operation Flow

A home position seek is performed when the hardware is initialized. Because the carriage control is an open-loop system, the CPU must perform a home position seek in order to get the carriage to a known reference position. This operation is performed at 450 PPS (l-1 phase drive). The printing start position (column 1) is 25 steps to the right of the home position. The carriage does not return to the home position unless the printer power is turned off. When the carriage motor is in the acceleration mode or the normal printing mode, the CPU checks the home position signal every time the phase is switched. If the CPU detects that the carriage is at the home position, it regards this as a carriage error.

2.4.5.3 Carriage Motor Drive Circuit

Figure 2-22 shows the carriage motor drive circuit.

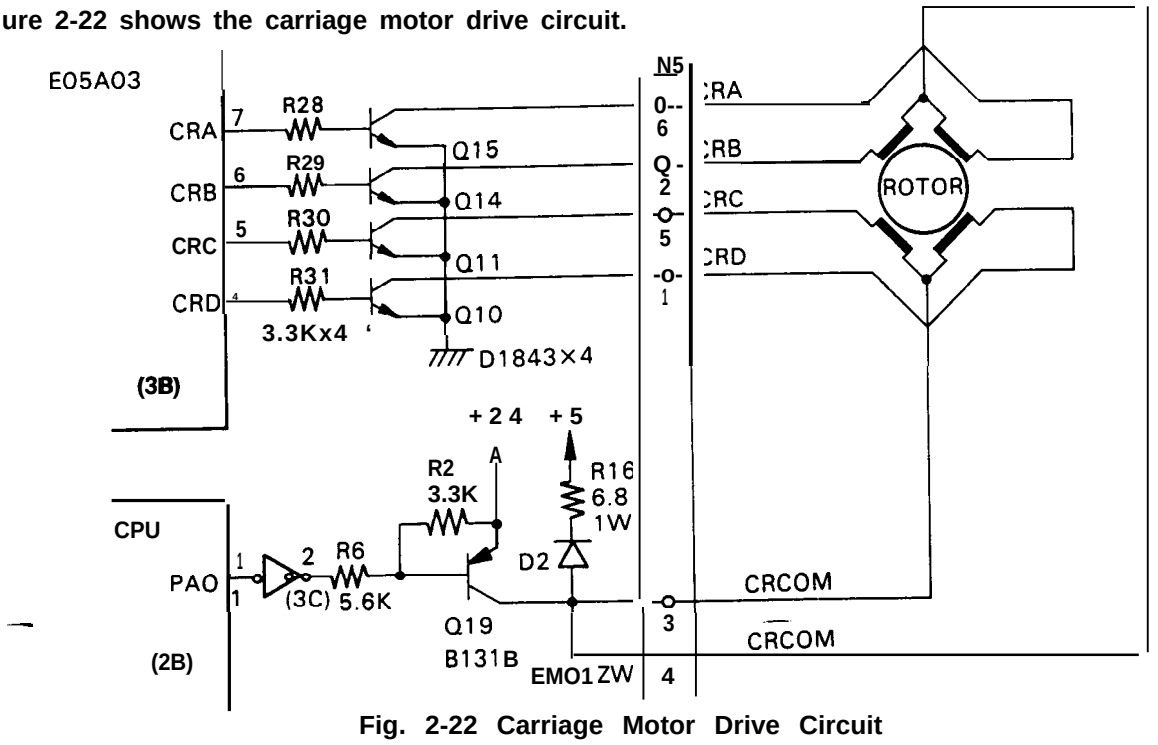


Fig. 2-22 Carriage Motor Drive Circuit

The carriage motor drive circuit is a constant voltage switching circuit (unipolar drive). When output CR of the E05A03 is HIGH, the voltage is applied to the coil of the motor. When PAO of the CPU is HIGH, the +24 V is applied to CRCOM (drive mode). When it is LOW, +5 V is applied to CRCOM (holding mode).

2.4.6 Paper Feed Motor

This section describes the sensor circuit, an outline of the firmware, and the drive circuit, which are used to control the paper feed motor. The specifications of the paper feed motor are as follows:

Angle per step:	7.5”
Number of steps per revolution:	48 steps
Number of phases:	Four
Excitation system and drive frequency:	Unipolar drive, 2-2 phase excitation system (480 PPS)
Drive voltage:	+24 VDC
Resistance per coil:	58 ohms ±7%

2.4.6.1 Paper End Sensor

The paper end sensor detects whether paper is present or not. Figure 2-23 shows the paper end sensor circuit.

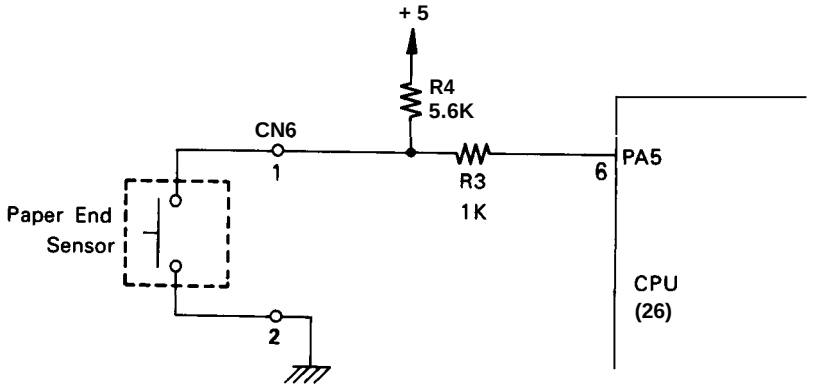


Fig. 2-23. Paper End Sensor Circuit

When the paper runs out (of the detection area), the reed switch closes, and port PA5 of the CPU goes LOW. The paper end detector is checked each time the phase is switched. The firmware controls the following three operations:

- When a paper end is detected during printing, firmware stops printing and sets the printer OFF LINE.
- When a paper end is detected during initialization, firmware sets the printer OFF LINE.
- When the AUTO LOAD switch is pressed in the OFF LINE state: Firmware executes the auto loading function (refer to Section 2.4.6.3) if paper is not already loaded or executes paper feeding (normally one line) when the paper is loaded.

If the paper is loaded or ejected by pressing the FF or LF switch without executing printing, the printer is not placed OFF LINE due to paper end detection.

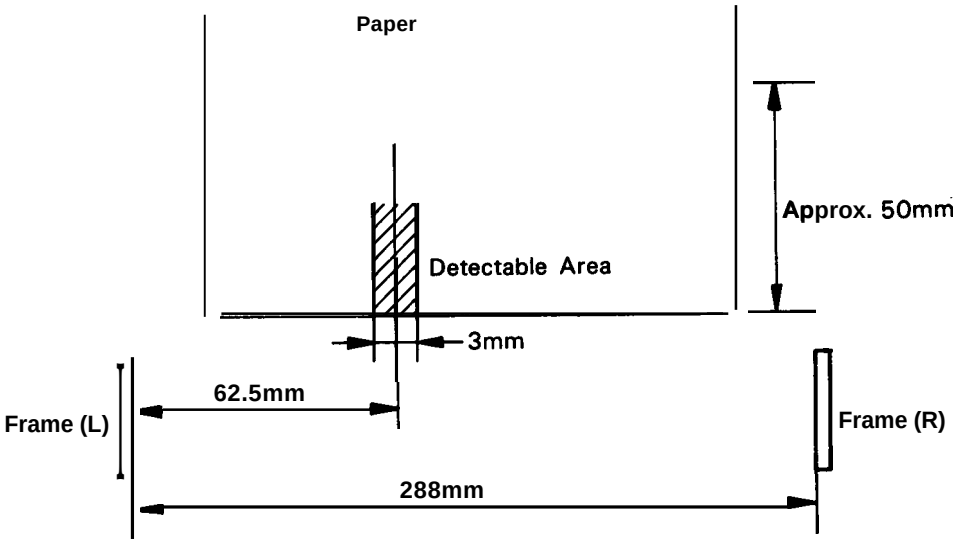


Fig. 2-24. Paper End Detection Area

2.4.6.2 Paper Feed Motor Control

The paper feed motor is controlled by an open-loop system just like the carriage motor. The basic phase switching speed is 480 PPS (2-2 phase drive), and the phase switching is performed according to the phase pattern stored in the firmware. Figure 2-25 shows the basic phase switching pattern.

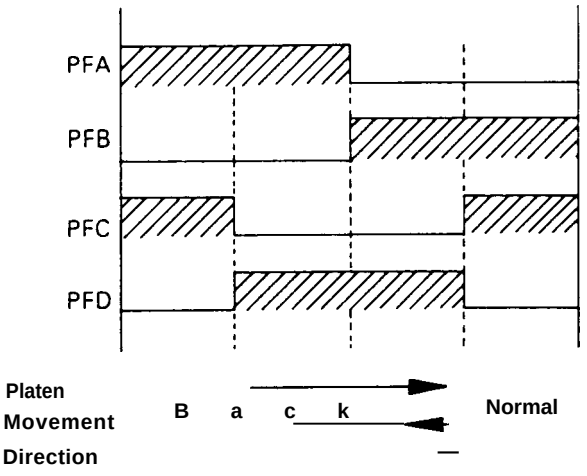


Fig. 2-25. Phase Switching Basic Pattern

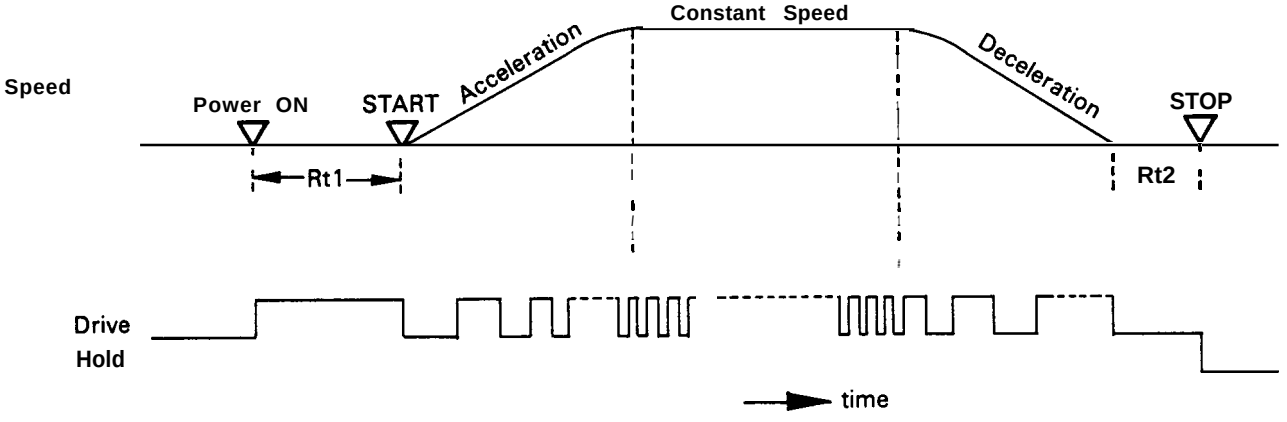


Fig. 2-26. Basic Operation Sequence

Figure 2-26 shows the basic sequence for the paper feed motor.

● Rt1

When the printer power is turned on, the paper feed motor is rushed for 30 to 60 ms in any phase. It takes 25 ms for the paper feed motor to restart from the stop mode. And after that, the paper feed motor rotates both back and front for each 16 steps to fix the back-rush between the motor pinion and gears.

● Acceleration mode

The acceleration mode consists of a maximum of four steps, and the phase switching time for each step becomes shorter as the step number increments.

● Constant speed mode

After the acceleration completes, the motor enters the constant speed mode. The time period for each step is the same, 2.03 ms.

. Deceleration mode

The deceleration mode consists of a maximum of 12 steps, and the phase switching time for each step becomes longer as the step number increments.

● Rt2

When the paper feed motor decelerates and stops, it enters the holding mode after the rush time of 15 ms.

The paper is fed 1/6 inch (4.23 mm) per 36 steps. When the total number of steps is 10 or less, the paper feed motor is driven only in the constant speed mode, but with a step time of 3.28 ms. The phase switching pattern and time data are contained in the working area of the RAM. The CPU outputs the data to the E05A03 the number of times specified by the program. (MMIO XX06H write operation)

2.4.6.3 Auto Loading Function

The sequence for the auto loading function is shown below.

1. The printer moves the carriage to the 40th column.
2. The printer drives the paper feed motor for 433 steps to load the paper.

In this way, the printing start position is set approximately 22 mm from the top of the paper.

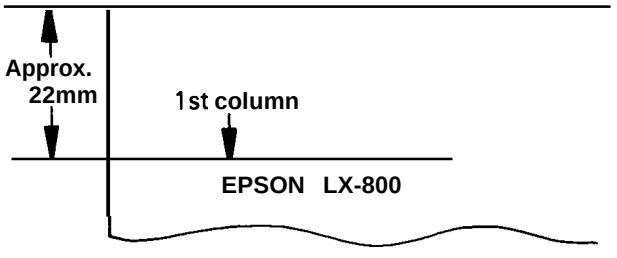


Fig. 2-27. Printing Start Position

The auto loading function is valid under the following conditions:

- When the printer is OFF LINE.
- Just after the signal from the paper end sensor changes from LOW to HIGH. (The leading edge of the signal is checked for.)

2.4.6.4 Paper Feed Motor Drive Circuit

Figure 2-28 shows the paper feed motor drive circuit.

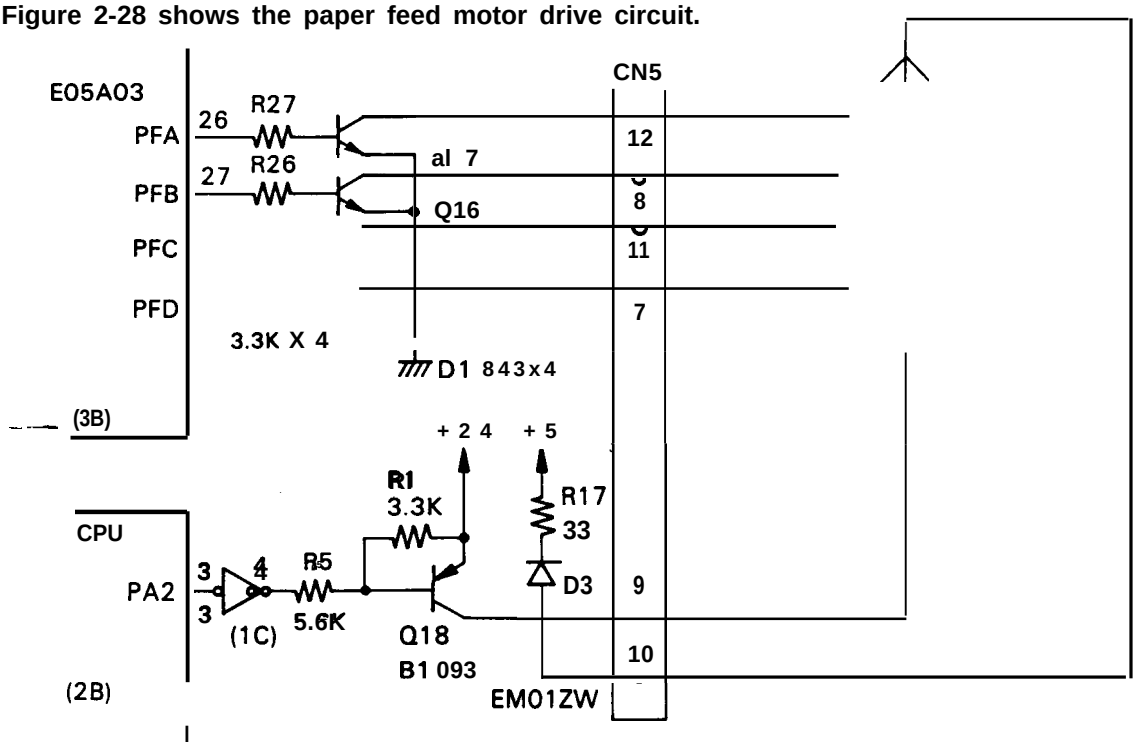


Fig. 2-28. Paper Feed Motor Drive Circuit

The paper feed motor drive circuit is a constant voltage switching circuit (unipolar drive), which is the same as the carriage motor drive circuit. When output port PF of the E05A03 is HIGH, voltage is applied to the motor coil. When PA2 of the CPU is HIGH, +24 V is applied to PFCOM. When it is LOW, +5 V is applied to PFCOM.

2.4.7 Printhead

This section gives an outline of the software that controls the printhead, the drive pulse width control, and the drive circuit. The specifications of the printhead are as follows:

Number of solenoids : Nine
Drive voltage : +24 VDC
Coil resistance : 19.2 ohms ±10%
Printhead drive pulse width: 360 μs ± 10 μs (at 24 V, 25°C)

2.4.7.1 Printhead Control

The data is output to the printhead in the following sequence:

1. Print data is expanded in the image buffer as dot patterns. The CPU outputs the dot patterns to the E05A03.
2. The data for pins 1 through 8 of the printhead is latched by HD 1 through HD8 of the E05A03. (MMIO XX04H write operation)
3. The data for pin 9 of the printhead (usually for underlining) is latched by HD9 of the E05A03 via DB7.
4. After latching the data, the printhead drive pulse width signal FIRE is output from the event counter in the CPU. While the FIRE signal is LOW, the gate opens so that the data at HD 1 through HD9 is output.

The timing of the event counter in the CPU is set mechanically. The data write operation is completed within one cycle of the counter. The operation described below is inhibited to protect the printhead from being damaged.

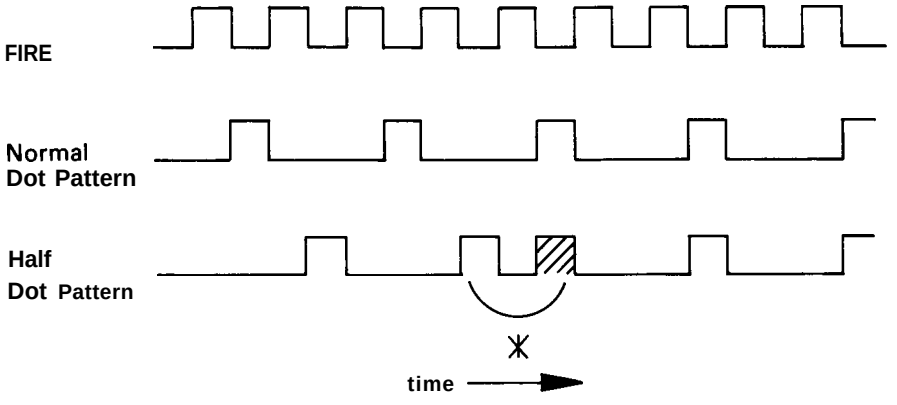


Fig. 2-29. Printhead Drive Pulse Pattern

Figure 2-29 shows the sequences for the normal and half dot printing, which can be performed at any pin of the printhead. Driving the printhead continuously to print adjacent half dots (the portion marked * in the above figure) is inhibited. If this pattern exists after expanding the image data, one dot will be ignored.

2.4.7.2 Printhead Drive Pulse Width Control Circuit

In order to keep the value of the printhead drive pulse width constant, the CPU monitors the +24 VDC line, the printhead common voltage, and uses the voltage level to adjust the width of the FIRE signal. The printhead drive pulse width is controlled to be within the area shown by the oblique lines in Figure 2-30.

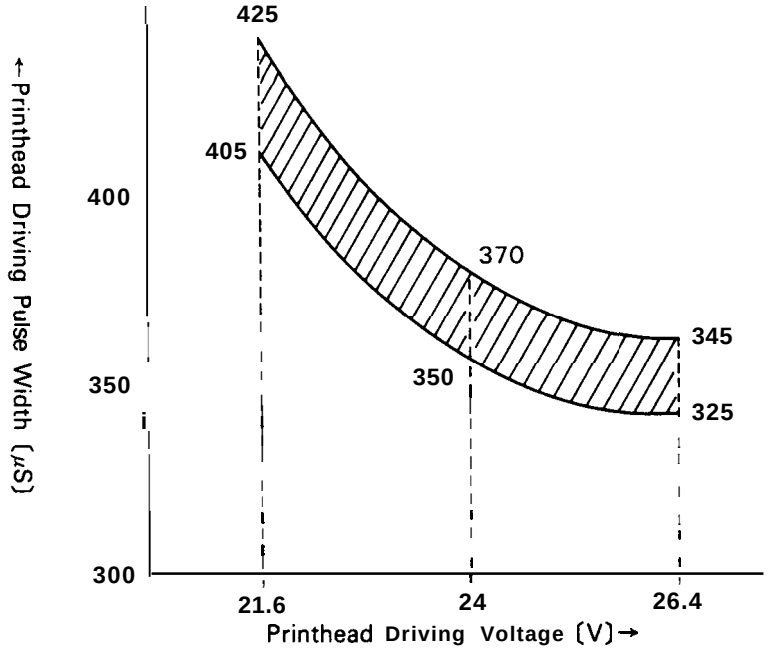


Fig. 2-30. Printhead Drive Pulse Width Range

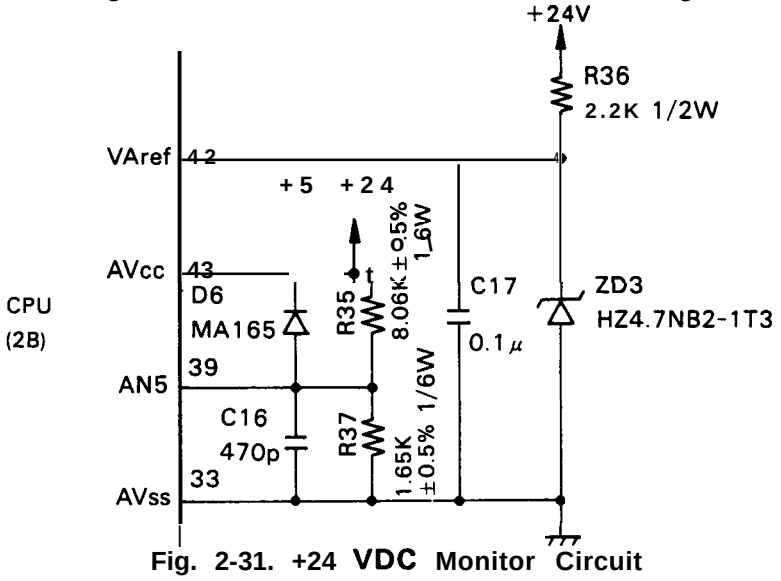


Fig. 2-31. +24 VDC Monitor Circuit

The CPU monitors the +24 V line at AN5 of the 8-bit analog to digital converter, computes the result, and controls the drive pulse width of the signal (FIRE) output from the event timer. 4.7 V is applied to reference voltage input VAref by ZD3, and the voltage obtained by dividing +24 V by R37 and R35 (approximately 4.08 V at +24.0V) is input to AN5.

2.4.7.3 Printhead Drive Circuit

Figures 2-32 and 2-33 show the printhead drive circuit and the waveform of the drive voltage.

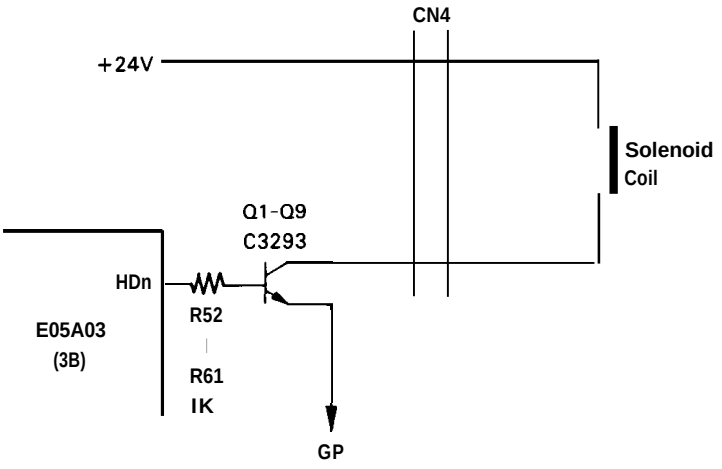


Fig. 2-32. Printhead Drive Circuit

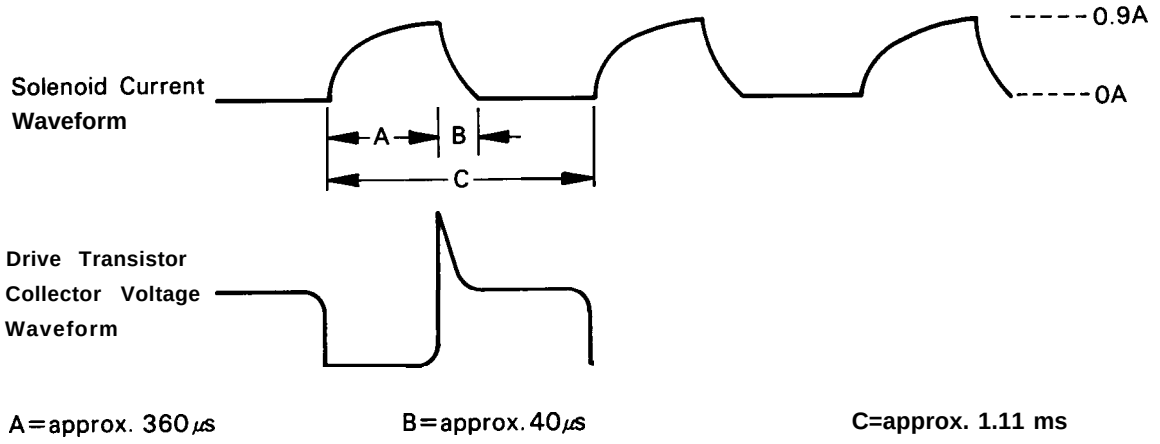


Fig. 2-33. Solenoid Current and Drive Voltage Waveforms

2.4.8 Print Timing Control

This section describes the print timing control for the carriage and printhead and the bidirectional logic seeking function.

2.4.8.1 Print Timing Control for the Carriage and Printhead

The phase switching of the carriage motor and the printhead driving are controlled by the CPU, and the relationship between the two is shown in Figure 2-34.

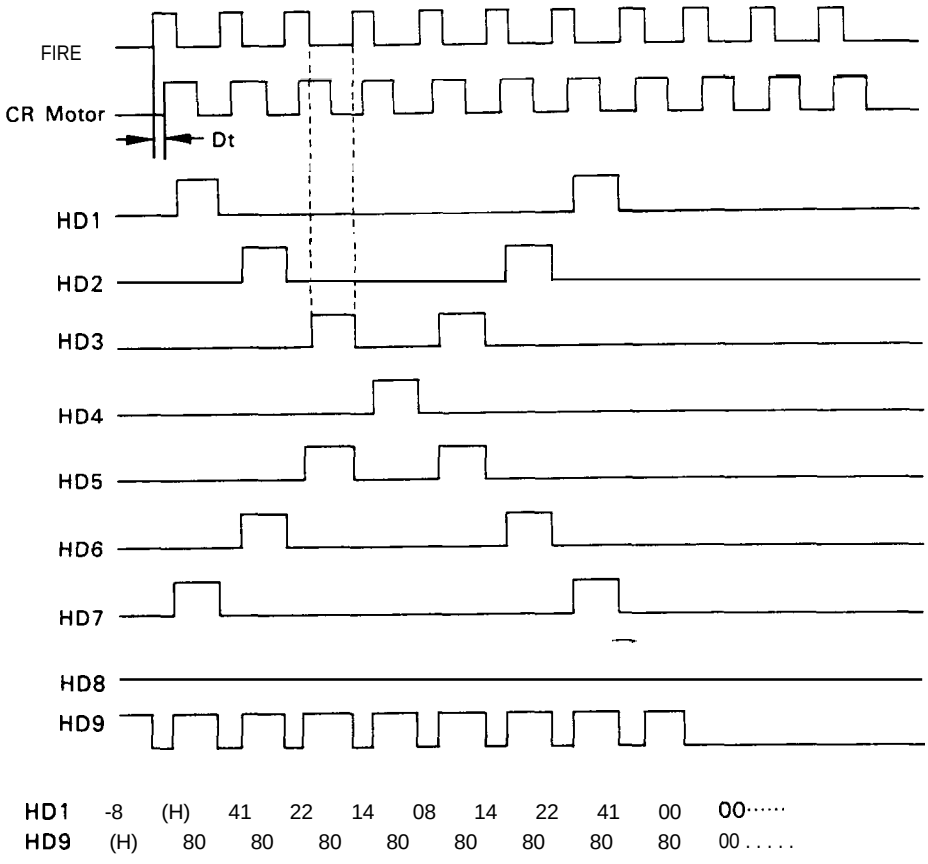
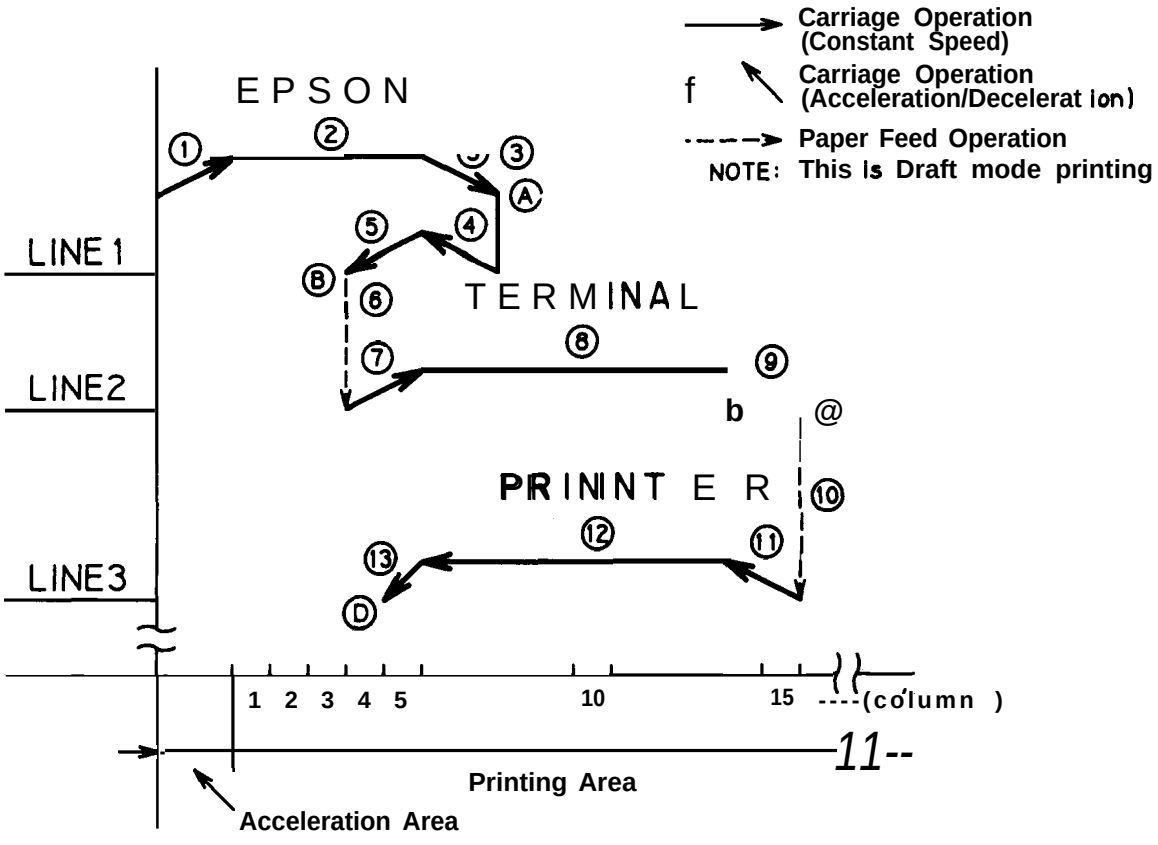


Fig. 2-34. The Relationship Between the Carriage and Printhead Control Signals

Figure 2-34 shows the relationship between the carriage and the printhead when character "X" is printed in the Draft mode. The dot data of HD 1 through HD8 and HD9 synchronizes with the LOW level of $\overline{\text{FIRE}}$. The phase switching for the carriage motor is performed asynchronously with the application of the drive voltage to the printhead. A delay time (Dt) of 46 μsec. in the Draft mode (900 PPS) and 92 μsec. in the NLQ mode (450 PPS) is used in order to protect the +24 V line from being overloaded. Printing for one line is performed in the sequence described above. In the NLQ mode, half of the dot pattern is printed for one line, the paper is fed for 1/216 inch, and the remaining half of the dot pattern is printed. In the half speed mode (valid when the printing speed is 900 PPS), the printhead drive pulse width is doubled (720 μs) and the carriage drive speed is halved (450 PPS).

2.4.8.2 Bidirectional Logic Seeking

The bidirectional logic seeking is controlled by the CPU. The CPU starts printing after expanding the print data. However, the processing of the next group of data is started while printing the former group. In this way, the CPU can determine the carriage return position for the next group of data so that the carriage can be moved the shortest distance before printing the next line. Figure 2-35 shows this operation.



1-3: Printing of the 1st line
4-5: Logic seeking
6: Paper feed
7-9: Printing of the 2nd line
10: Paper feed
1 1-12: Printing of the 3'rd line

Fig. 2-35. Logic Seeking

1. Upon receive in print data "EPSON" for a line from the host computer, the printing is performed in an action of ① to ③ with the carriage and printhead moving to position Ⓐ.
2. The CPU, receiving the next data from the host computer, analyzes it and determines the acceleration start position of the carriage.
3. In an action of ④ to ⑤, the carriage is moved to position Ⓑ, here paper feed is operated ⑥. Then the carriage goes through acceleration printing and deceleration ⑦, ⑧, ⑨ to position Ⓒ, next paper feed is operated ⑩.
4. In an action of ⑪ to ⑬, acceleration, printing, and deceleration are performed Ⓓ.

2.5 PRINTER MECHANISM OPERATION

The printer mechanism includes sensors, the carriage, the paper feed, and the ribbon feed mechanism. Figure 2-36 shows an external view of the printer mechanism.

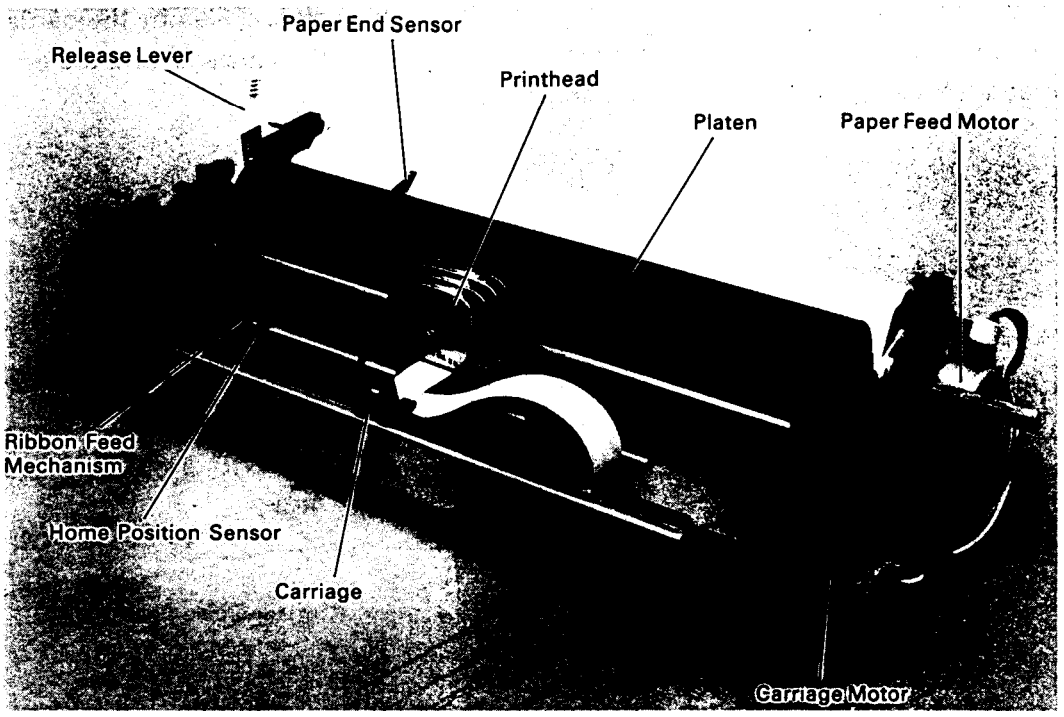


Fig. 2-36. Printer Mechanism External View (Model-3A10)

2.5.1 Sensor Mechanism

This subsection describe the two sensor mechanisms: home position sensor and paper end sensor.

Home Position Sensor

The home position sensor functions to determine the home position of the carriage, and sends a reference signal for print start position. The home position sensor mechanism consists of the mechanical switch which is operated by lever at the bottom of the frame. When the detection plate pushes the lever of sensor, the mechanical switch closes.

Paper End Sensor

The paper end sensor detects the presence/absence of paper. The paper end sensor mechanism consists of a mechanical switch which is operated by paper end sensor lever. When the paper supply has run out, the mechanical switch closes.

2.5.2 Carriage Mechanism

The carriage mechanism includes the printhead, the carriage, the timing belt, the carriage motor, and the platen. Fig. 2-37 shows the carriage mechanism.

The timing belt is connected into the bottom of the carriage. This belt is driven by the carriage motor and moved via the belt driven pulley. The printhead is mounted on the carriage, and the entire unit is moved right and left along the carriage guide shaft and plate.

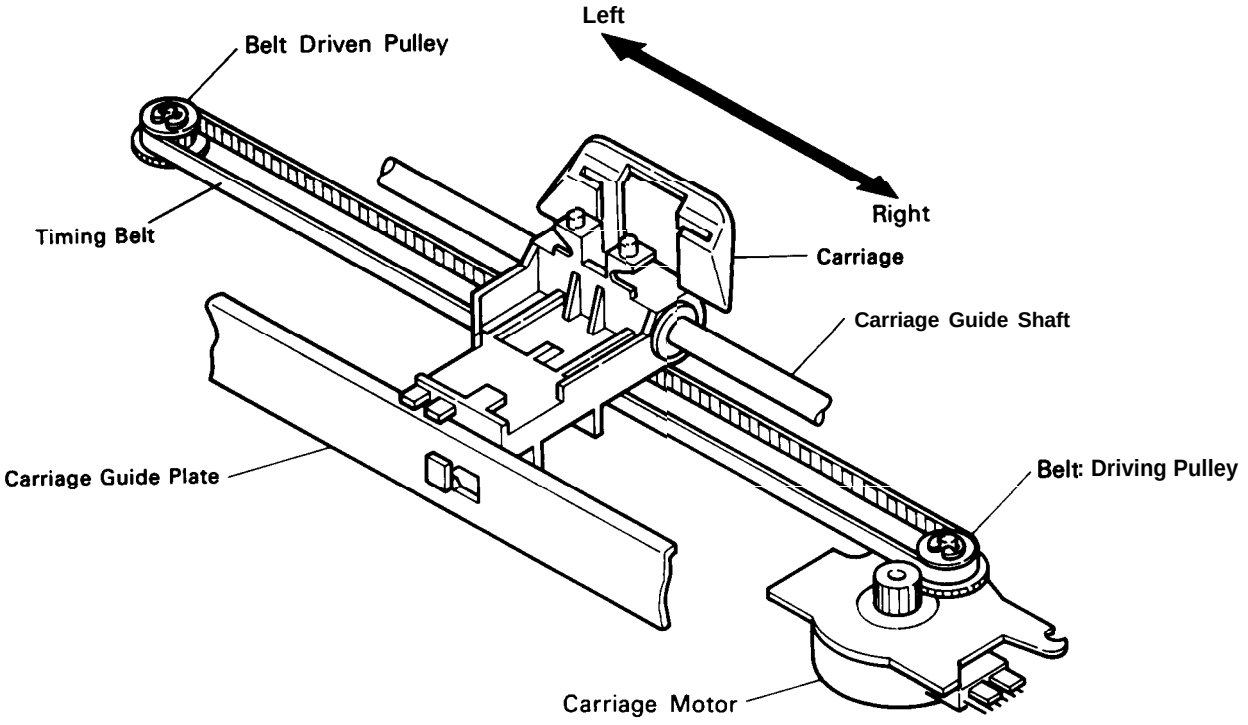


Fig. 2-37. Carriage Mechanism

Printhead

The dot wire operation during printing is as follows: when the head driving coil for a dot wire is energized, the actuating plate engaged with the dot wire at one end is attracted to the iron core and drives the dot wire toward the platen. The dot wire strikes the ribbon and the paper against the platen to print a dot in the paper.

When the head driving coil is deenergized, the actuating plate returns to the initial position as a result of the action of the actuating plate spring. After striking the platen, the dot wire also returns to its initial position as a result of impact energy and from the wire resetting spring, and the dot wire is held in engagement with the actuating plate until it is driven again.

Fig. 2-38 shows the printhead printing operation.

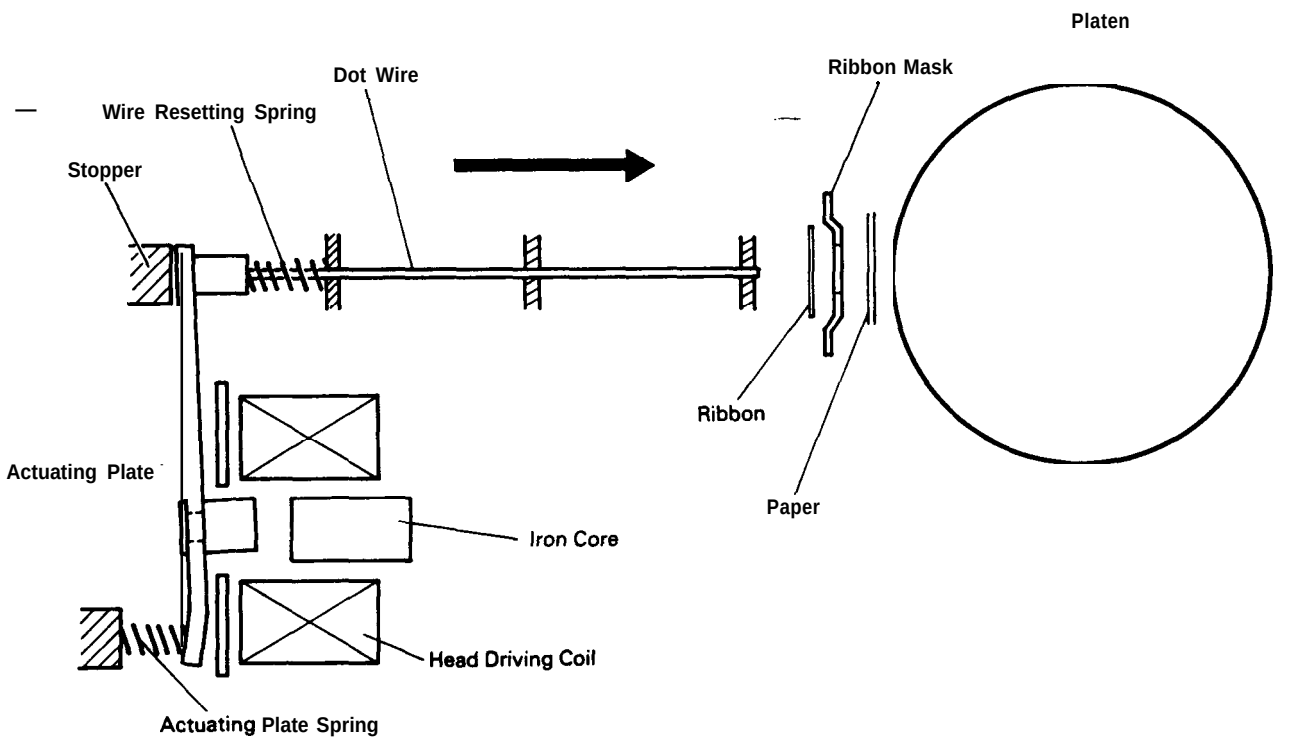


Fig. 2-38. Printhead Printing Operation

2.5.3 Paper Feed Mechanism

The paper feed mechanism operates by friction feed method for cut sheets, and roll paper, and by the sprocket feed method for fanfold paper.

2.5.3.1 Friction Feed Operation

The paper is held against the platen by two paper feed rollers and by the printer cover. At this time, the paper feed motor is driven to rotate the platen gear, via the paper feed reduction gear, in the direction shown in Figure 2-39. The rotation of the platen Gear feeds the paper in the direction of the arrow due to friction from the paper feed rollers and platen.

Because the paper is held against the platen by the spring force of the paper feed rollers, the paper can be released by shifting the paper release lever forward.

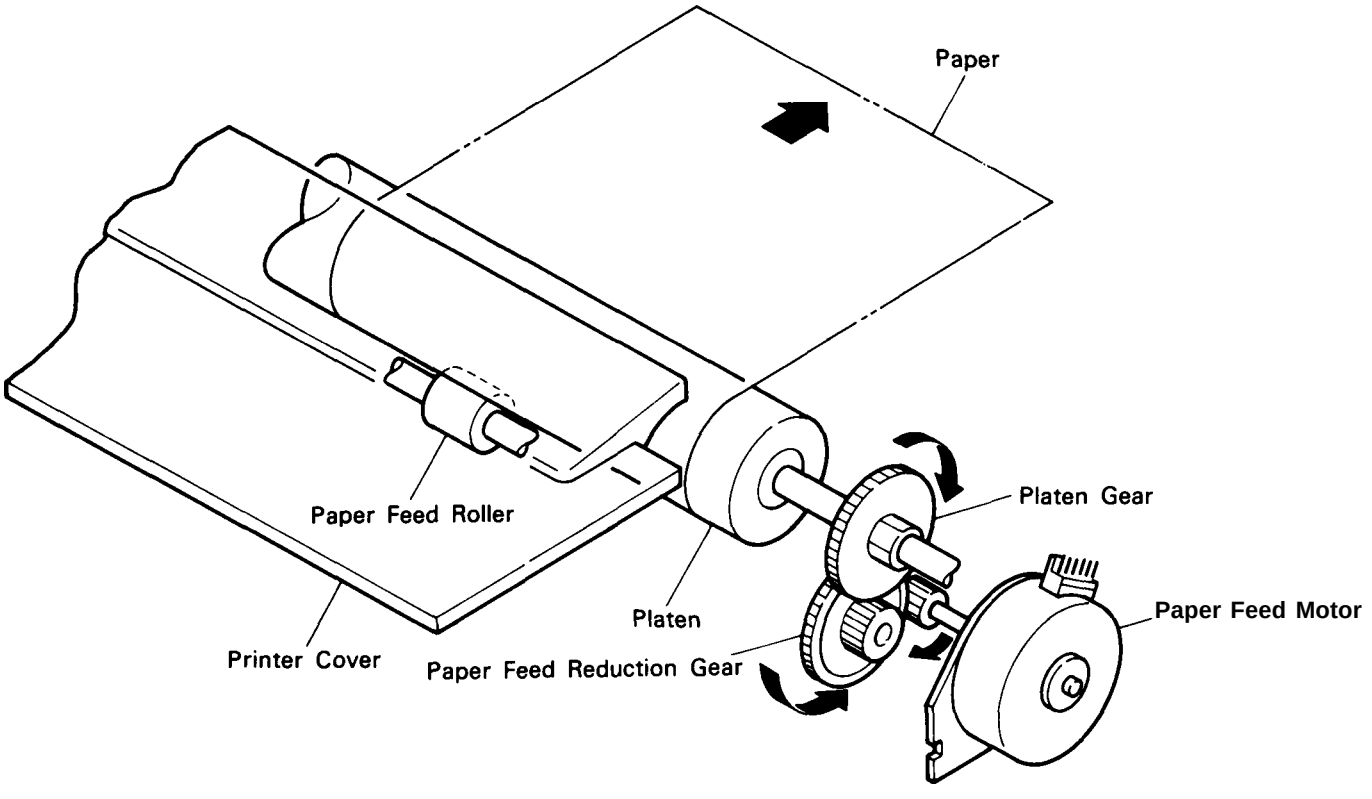


Fig. 2-39. Friction Feed Operation

2.5.3.2 Sprocket Feed Operation

When the printer is using the sprocket feed method, the holes in the paper are set over the sprocket pins along the sprocket wheel.

The paper feed motor is driven to rotate the gears, via the pinion on the shaft of the motor, in the direction shown in Figure 2-40. Rotating the gears rotates the sprocket wheels, which advances the paper in the direction shown by the arrow.

For the sprocket feed method, the pressure of the paper feed rollers against the platen is released by shifting the release lever forward.

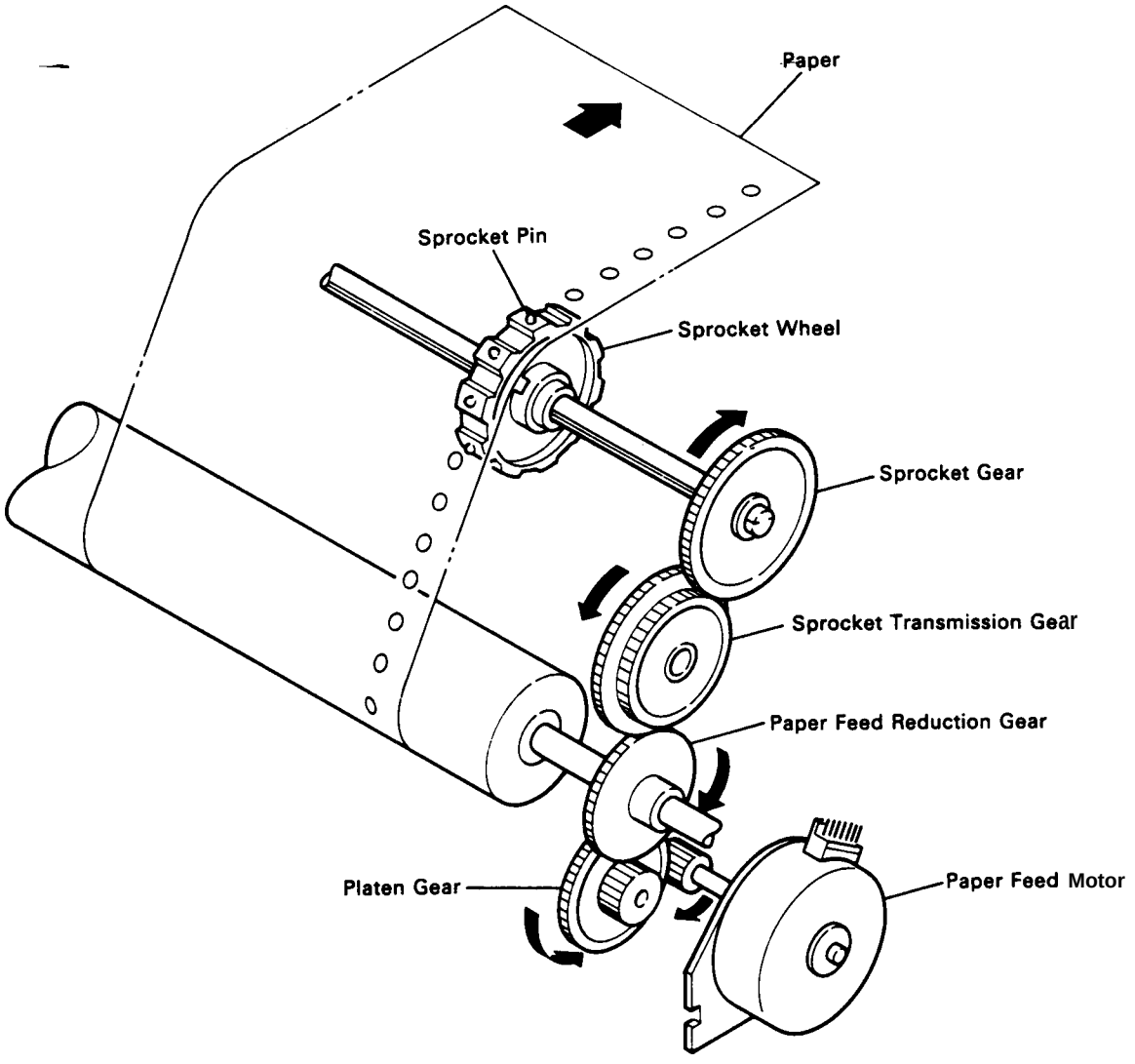


Fig. 2-40. Sprocket Feed Operation

2.5.4 Ribbon Feed Mechanism

The ribbon feed mechanism consists of the ribbon cartridge and the ribbon feed section. A ribbon driving gear always turns counterclockwise, via the gear trains shown in Table 2-6, irrespective of the direction of the timing belt.

Table 2-6 Ribbon Feed Gear Train

Direction of Movement of Carriage	Gear Train
Left to right (arrow ●)	Belt driven pulley → Planet gear (1) → Planet gear (2) → Ribbon driving gear
Right to left (arrow ⇨)	Belt driven pulley → Planet gear (1) → Planet gear (3) → Planet gear (4) → Ribbon driving gear

Figure 2-41 shows ribbon feed mechanism. The inked ribbon is inside the cartridge case in an endless state, held between the ribbon feed and ribbon pressure roller mounted on the ribbon driving gear. The rollers are driven by the movement of the gear, and the inked ribbon is fed.
A ribbon breaking spring is attached at the exit of the cartridge case to prevent the ribbon from slacking.
A ribbon mask is installed for preventing the ribbon from staining the paper.

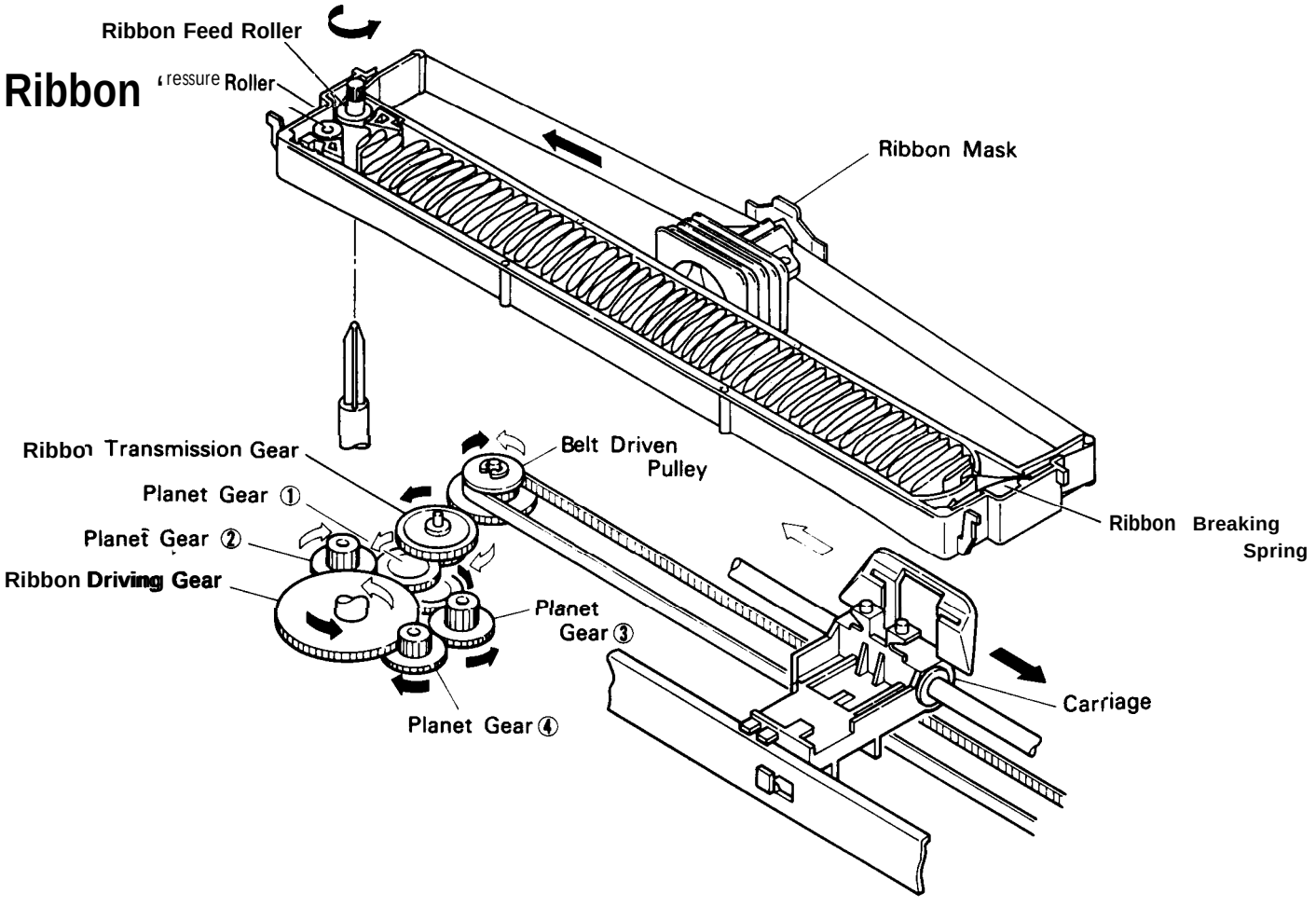


Fig. 2-41. Ribbon Feed Mechanism

CHAPTER 3
OPTIONAL EQUIPMENT

LIST OF TABLES

3.1 GENERAL

This chapter describes the options available for the LX-800.

3.2 OPTIONAL INTERFACES

The LX-800 use the 8100 series optional interfaces. The optional interfaces are listed in Table 3-1.

Table 3-1. Optional Interfaces

	Cat No.	Description			
RS-232C Current Loop		Buffer Size	Flag Control	X-ON/OFF Control	Max. Bit Rates (BPS)
	● 8 143	None	o	0	19200
	8145	2K	o	x	9600
	8148	2K/8K	o	0	19200
IEEE-488 (GP-IB)		Buffer Size	Function	Listen Only Operation	Address Operation
	8165	2K/8K	AH, L, DC	0	0
Special Interface		Application			
	8133W	APPLE II, using 8K-byte ROM			

o ..... Available x ..... Not available

- When the #8 143 is used in LX-800, serial/parallel conversion is available only following conditions.

  Baud rate: 75 to 9600 bps
  Handshaking: DTR or X-ON/OFF control

NOTE: Refer to the “Optional Interface Technical Manual” for details.

CHAPTER 4
DISASSEMBLY, ASSEMBLY, AND ADJUSTMENT

CHAPTER 4

LIST OF FIGURES

LIST OF TABLES

4.1 GENERAL REPAIR INFORMATION

This chapter describes the disassembly, assembly, and adjustment procedures for replacing any of the main components of the LX-800.

DANGER

- Prior to beginning the disassembly, assembly, and adjustment procedures, be sure to disconnect the AC power cord.
- When assembling, disassembling, and adjusting the printer, wear gloves to protect your hands from being cut by the printer mechanism or an edge of a plate, such as the ground plate.

WARNING

- The printer mechanism, the various boards, and other parts are sometimes held without screws by plastic clips. When removing these units be careful not to damage the plastic clips.

The tools and measuring instruments listed in Tables 4-1 and 4-2 are recommended for use when disassembling and repairing the printers.

Table 4-1. Repair Tools

Description	Type	Part No.
Brush No. 1	O	B74 1400200
Brush No. 2	O	B74 1400100
Cleaning Brush	O	B74 1600100
Round nose pliers	O	B7404OO1OO
Diagonal cutting nipper	O	B7405OO1OO
Tweezers	O	B64 1000100
Electric soldering iron	O	B740200 100
E-ring holder #2.5"	O	B740800400
E-ring holder #5	O	B740800700
Phillips screwdriver No. 2	O	B743800200
Screwdriver No. O	○	B743800300
Thickness gauge (0.47 mm)	Ⓔ	B776701201

NOTES: 1. The tool marked . is used when attaching the E-ring (2.3 mm).
2.0 = Commercially available tool
3. Ⓔ = EPSON exclusive tool

Table 4-2. Measuring instruments

Description	Specification	Class
Oscilloscope	50 MHz	A
Tester		A
Slide calipers		A
Multi meter		B
Logic Analyzer		B

NOTE: A = Mandatory, B = Recommended

After printer disassembly, assembly, and adjustment, be sure to perform lubrication, adhesive application, cleaning, and maintenance as indicated in Chapter 6, in order to maintain optimal printer performance.

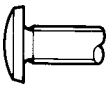
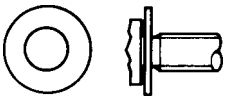
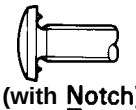
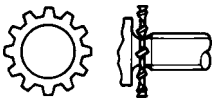
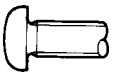
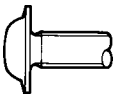
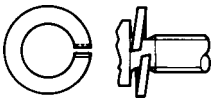
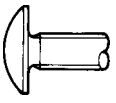
All small parts are described by abbreviations.

Table 4-3. Abbreviations List of Small Parts

Abbreviation	Part Name
CS	Cup Screw
CP	Cross-recessed head machine screw (Pan head)
CPO	C.P. screw with Outside toothed lock washer
CP (P)	C.P. screw with Plain washer
CPSP	Cross-recessed head machine screw Spring washer and Plain washer assemblies (Pan head)
CTC	Cross-recessed head Tapping screw (Cup screw)
CTB	Cross-recessed head Tapping screw (Bind)
CTB (P)	C.T.B. screw with Plain washer
CTBS (0)	C.T.B (S tight) screw with Outside toothed lock washer
CTPS (0)	C.T.P. (S tight) screw with Outside toothed lock washer
CTPS (P)	C.T.P. (S tight) with Plain washer

Table 4-4 describes the relationship between the form and the abbreviated part name of screw.

Table 4-4. Form and Abbreviated Part Name of Screw

Heed		*Body*	Washer (assembled)
1. Cross—recessed head 	1. Bind 	1. Normal 	1. Plain washer 
	 (with Notch)	2. Tap tight Stight 	2. Outside toothed lock washer 
2. Slotted head 	2. Pan 	Btight 	
	3. Cup 	3. Tapping 	3. Spring washer 
	4. Truss 		

4.2 DISASSEMBLY AND ASSEMBLY

This chapter describes disassembly of the LX-800. Assembly can be performed by simply reversing the order of disassembly, with special notes for assembly mentioned as "ASSEMBLY POINTS." For assembly and disassembly procedures which require adjustment, the necessary adjustment is indicated as "ADJUSTMENT REQUIRED." After assembly and disassembly, perform the necessary adjustment as indicated.

WARNING

. Read Section 4.1 (GENERAL REPAIR INFORMATION) before disassembly.
. Remove paper and the ribbon cartridge before disassembly.

The disassembly sequence of this section is grouped into five parts:(1) removal of printhead, (2) removal of cases, (3) removal of the electric circuits boards, (4) removal of printer mechanism unit, and (5) disassembly of printer mechanism.
Refer to Figures A- 16 through A- 18, the LX-800 exploded diagrams and the printer mechanism exploded diagram.

4.2.1 Removal of Printhead (Figure 4-1)

1. **Remove the printer cover, and confirm that the paper and the ribbon cartridge have been removed.**
2. **Unlock the two levers securing the printhead to the carriage, by pulling them down, and lift the printhead to remove it.**

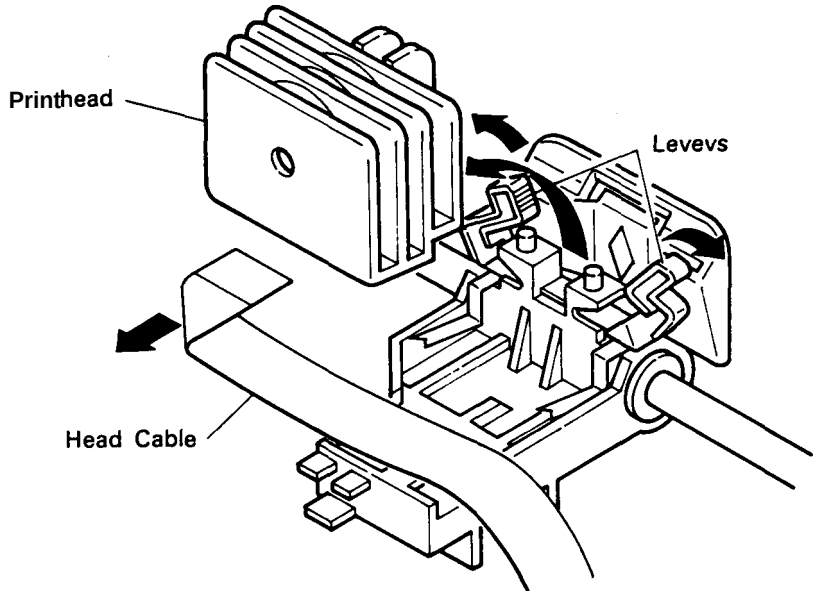


Fig. 4-1. Printhead Removal

3. **Disconnect the head cable from the connector on the printhead.**

4.2.2 Removal of Cases

This section describes the upper case and control panel (LCPNL) removal.

4.2.2.1 Upper Case Removal (Figures 4-2 through 4-3)

1. **Remove the sheet guide unit, printer cover, tractor unit, and paper guide.**
2. **Insert a standard screwdriver into the two holes at the front of the lower case, unlock the notches, then lift the upper case.**

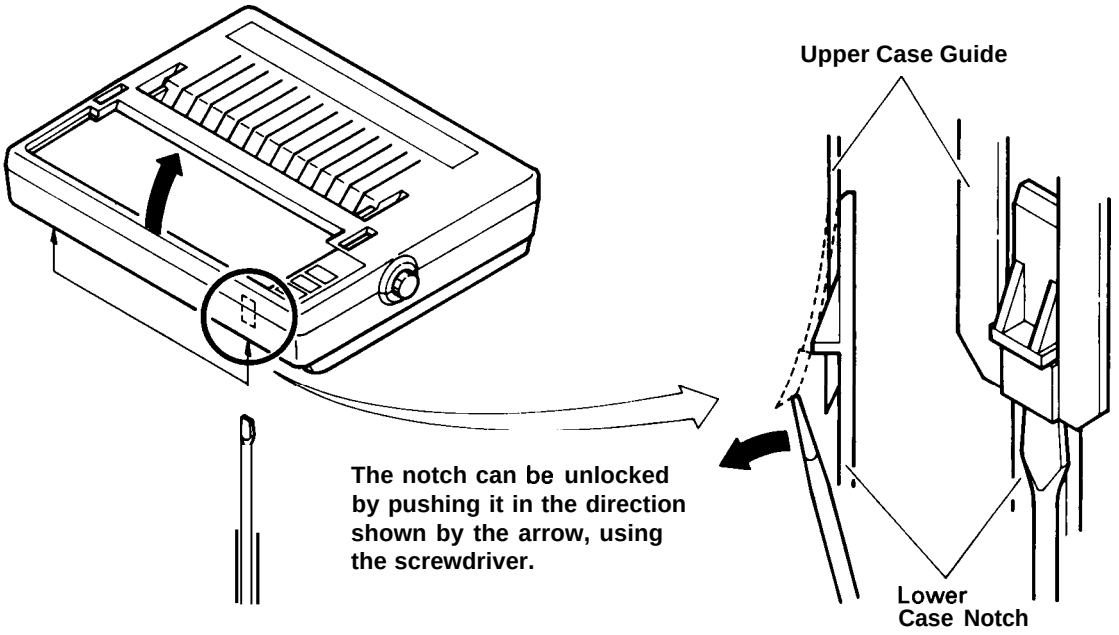


Fig. 4-2. Upper Case Removal - 1

3. **While lifting the upper case, disconnect the FPC of the control panel (LCPNL) from connector CN3 on the ROCX board, and remove the upper case.**

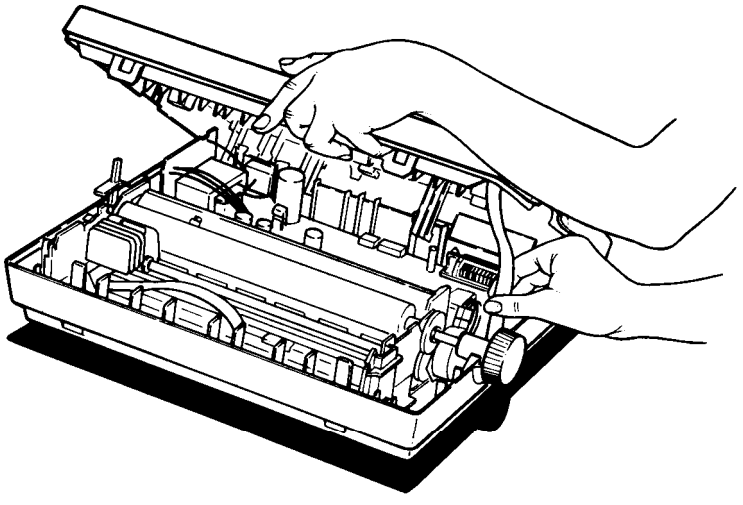


Fig. 4-3. Upper Case Removal -2

4.2.2.2 Control Panel (LCPNL Board) Removal (Figure 4-4)

1. Remove the upper case. (Refer to Section 4.2.2.1)
2. Turn the upper case over, push the two notches securing the control panel to the upper case inward, and remove the control panel from the upper case.

WARNING

When mounting and removing the control panel, be careful not to damage the FPC of the control panel with the FPC guide of the upper case.

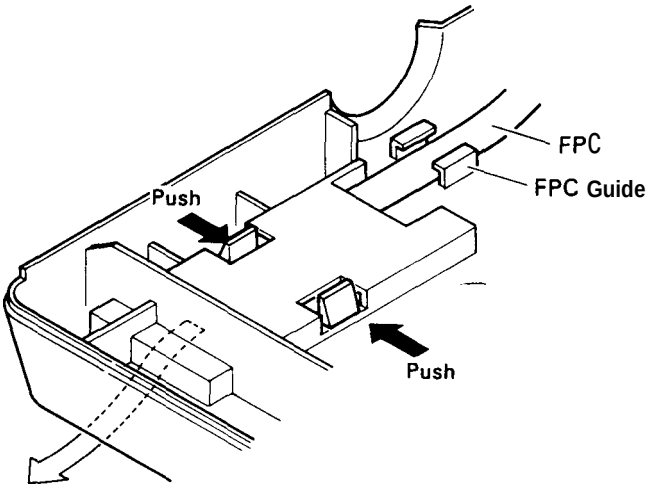


Fig. 44. Control Panel Removal

4.2.3 Removal of Electric Circuit Boards

This section describes the ROCX board and ROC filter unit removal.

4.2.3.1 ROCX Board Removal

1. Remove the upper case. (Refer to Section 4.2.2.1)
2. Disconnect connectors CN5, CN4, CN6, CN7, and CN8 on the ROCX board, which connect each component to the ROCX board.

WARNING

When disconnecting the connectors, pull them out slowly while holding the board. The board could be damaged if the connectors are pulled out roughly.

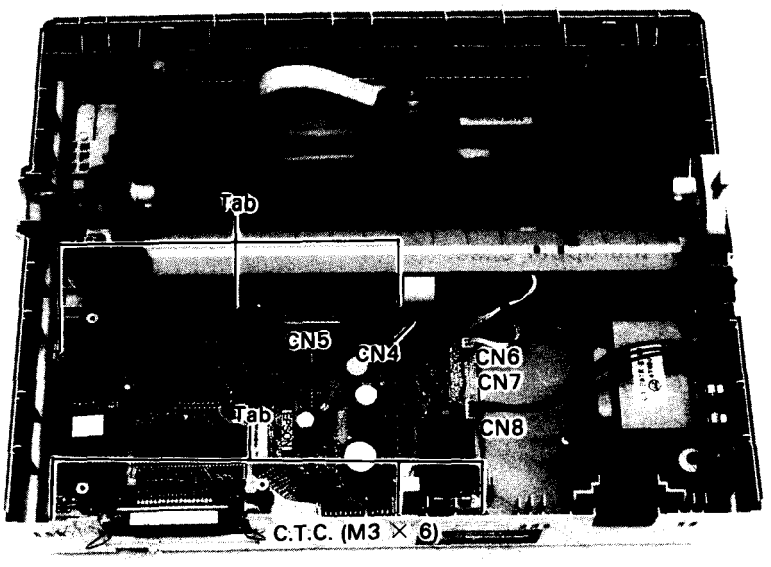


Fig. 4-5. ROCX Board Removal

3. Remove the C.T.C. screws (M3 x 6) securing the ROCX board to the base plate.
4. Loosen the six bent tabs of the lower case, which secure the ROCX board to the lower case, using a screwdriver, and remove the ROCX board.

WARNING

When removing the ROCX board from the lower case, do not bend the tabs too far. Be careful when pushing the tabs so as not to break them or damage the components on the ROCX board.

4.2.3.2 ROC Filter Unit Removal (Figure 4-6)

1. Remove the upper case. (Refer to Section 4.2.2.1)
2. Disconnect the cable connecting the ROC filter unit to the ROCX board from connector CN8 on the ROCX board.

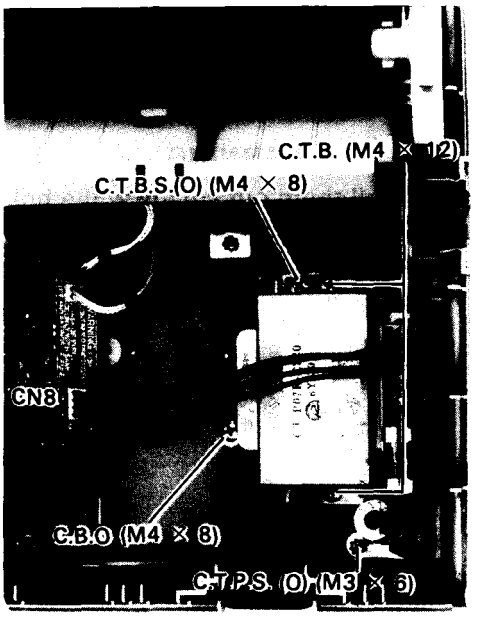


Fig. 4-6. ROC Filter Unit Removal

3. Remove the five screws securing the ROC filter unit to the base plate.
   The screws are as follows:
   1 X C.B.O. (M4 X 8)
   1 X C. T. B.S.(O) (M4 X 8)
   2 × C.T.B. (M4 x 12)
   1 X C. T. P.S.(O) (M3 × 6)
4. Remove the ROC filter unit (including the AC cable (120 V), AC inlet (220/240 V), and power switch).

4.2.4 Removal of Printer Mechanism

This section describes the platen unit, paper guide, and printer mechanism removal. Before removing the printer mechanism, remove the platen unit and the paper guide so that the printer mechanism can be removed quickly and easily.

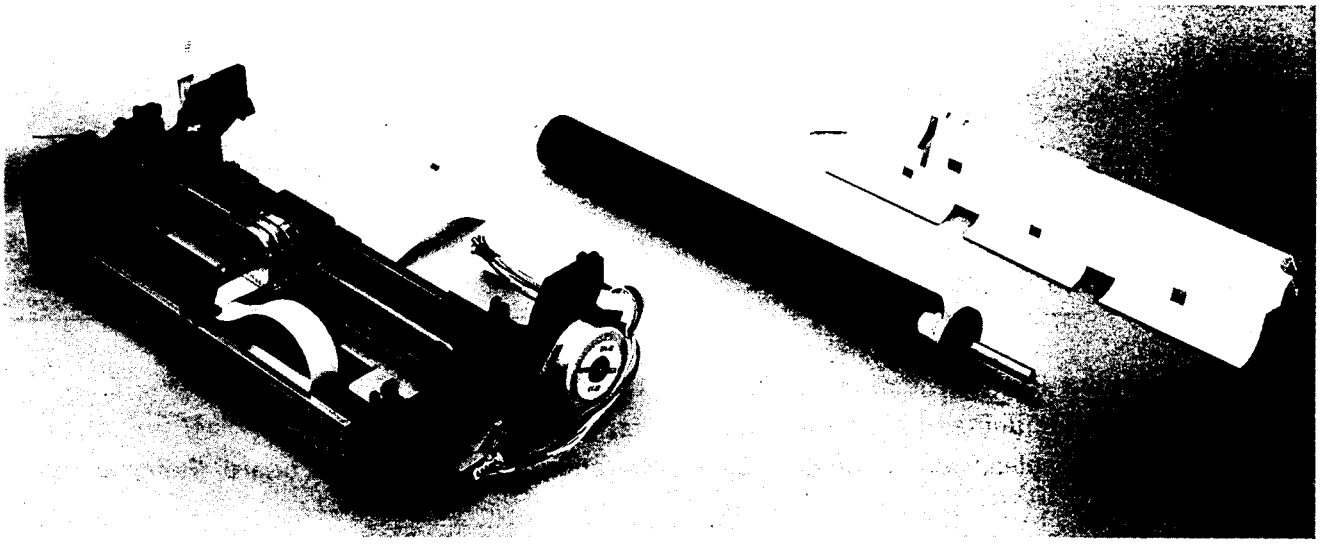


Fig. 4-7. Printer Mechanism Removal

4.2.4.1 Removal of Platen Unit and Paper Guide (Figures 4-8 through 4-9)

1. Remove the upper case. (Refer to Section 4.2. 1.1)
2. Turn the shaft holders at the left and right sides of the platen unit as shown in Figure 4-8, and lift the platen unit to remove it.
   a. Push the shaft holder outward using a screwdriver.
   b. Turn the shaft holder counterclockwise.

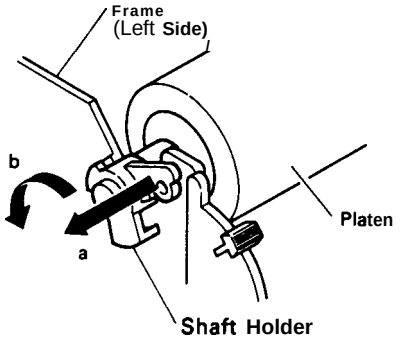


Fig. 4-8. Platen Unit Removal

3. Disconnect the cable from connector CN6 on the ROCX board.
4. Unlock the two notches of the paper guide by pushing them frontward from the back side of the printer mechanism, and remove the paper guide.

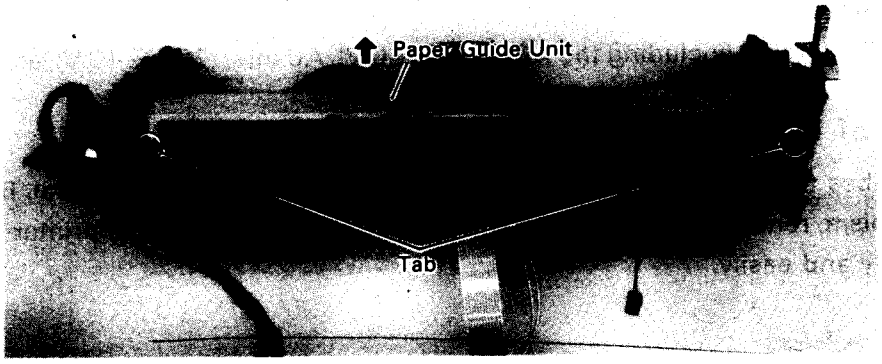


Fig. 4-9. Printer Mechanism Rear View

ADJUSTMENT REQUIRED

If any problems occur (such as non-uniform print density) after removing and installing the platen unit or replacing the platen unit with a new one, perform the following adjustment.

● 4.3.1 Platen Gap Adjustment

4.2.4.2 Removal of Printer Mechanism (Figure 4-10)

1. Remove the platen unit and the paper guide. (Refer to Section 4.2.4.1.)
2. Disconnect the cables from connectors CN5, CN4, and CN7 on the ROCX board. (Refer to Figure 4-5.)
3. Loosen the six tabs of the lower case, which secure the printer mechanism to the lower case, by pushing them with a screwdriver. The printer mechanism can be removed easily using the following procedure:

WARNING

When loosening the tabs, be sure to push them softly so as not damage the lower case or printer mechanism.

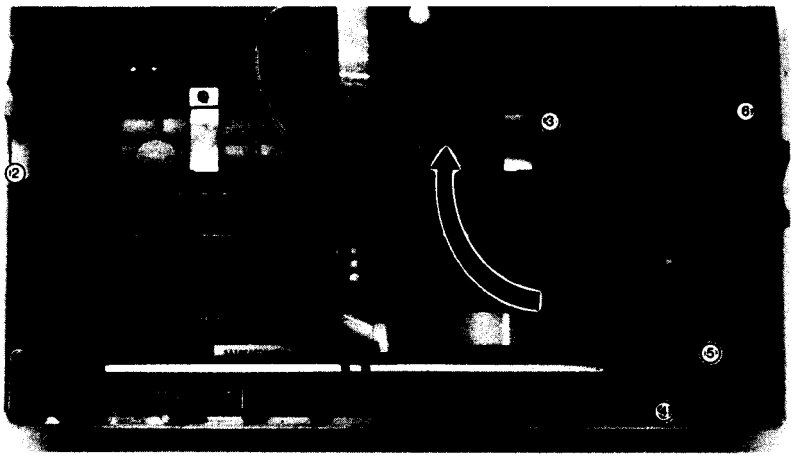


Fig. 4-10 Printer Mechanism Removal

a. Loosen tabs ① and ②, and lift the left side of the frame 1 cm from the lower case.
b. Loosen tab ③, and lift the left side of the frame 5 more cm from the lower case.
c. Slide the printer mechanism in the direction shown by the arrow in Figure 4-10 to remove it from tabs ④ and ⑤. Use tab ⑥ as a fulcrum.

4.2.5 Disassembly of Printer Mechanism

This section describes the removal of each component from the printer mechanism. Refer to Figure A-1 8, the Printer Mechanism Exploded Diagram, and Table A-16, "Component Name List".

4.2.5.1 Paper Feed Mechanism Removal (Figures 4-11 through 4-16)

1. Remove the printer mechanism. (Refer to Section 4.2.4)
2. Push the notch of the paper guide plate release lever, and pull the paper guide release lever and the paper guide release shaft to remove them.

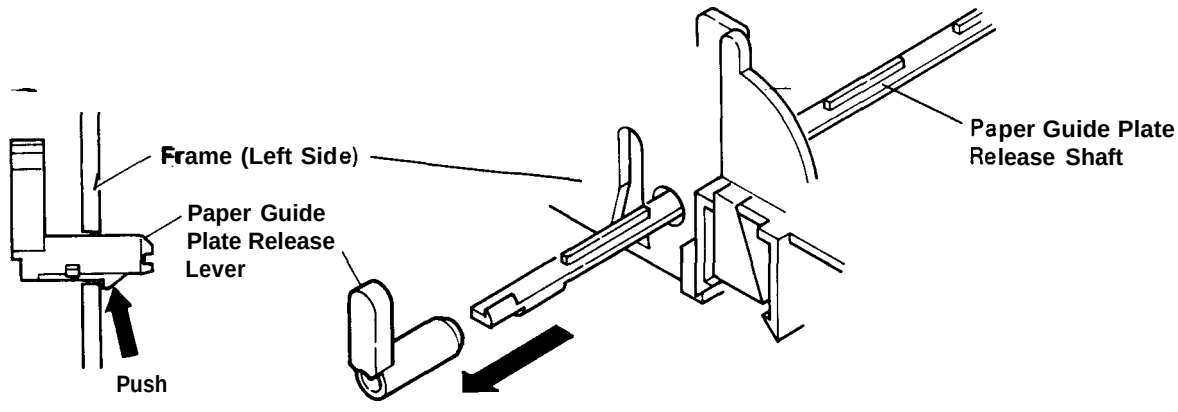


Fig. 4-11. Removal of Paper Guide Plate Release Lever

3. Push the notch of the paper guide plate release lever from the inside of the frame, and remove the release lever.

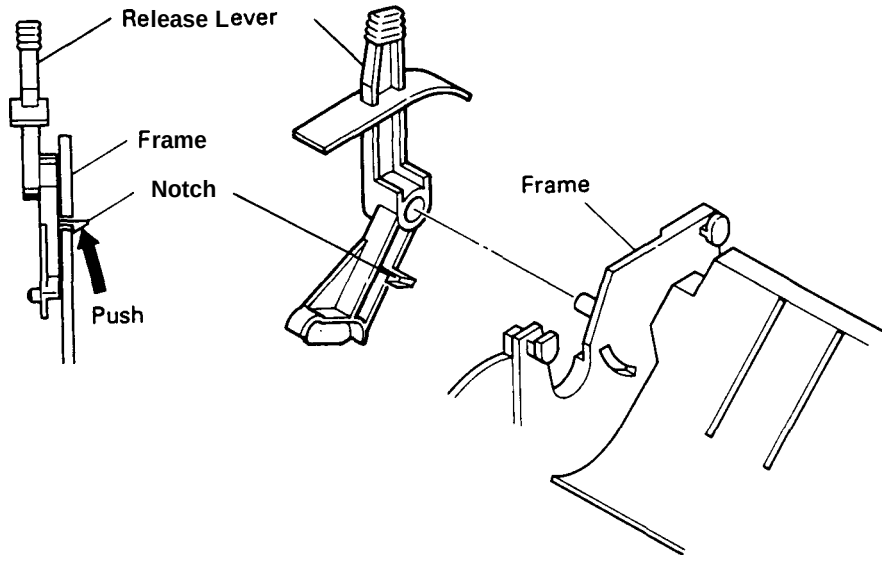


Fig. 4-12. Removal of Release Lever

4. Push the paper feed roller shaft down, slide it approximately 2 cm to the left, and lift it to remove it.

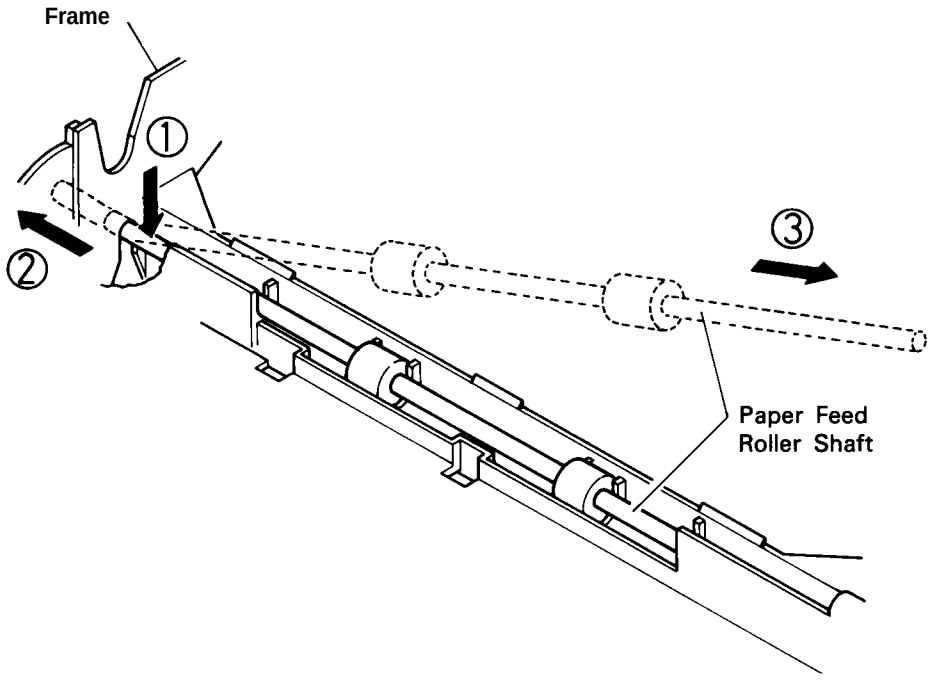


Fig. 4-13. Removal of Paper Feed Roller Shaft

5. Loosen the four tabs securing the paper guide plate and the paper guide plate spacer to the frame, using a screwdriver, and lift them to remove them. (Push the tabs out from the frame.)

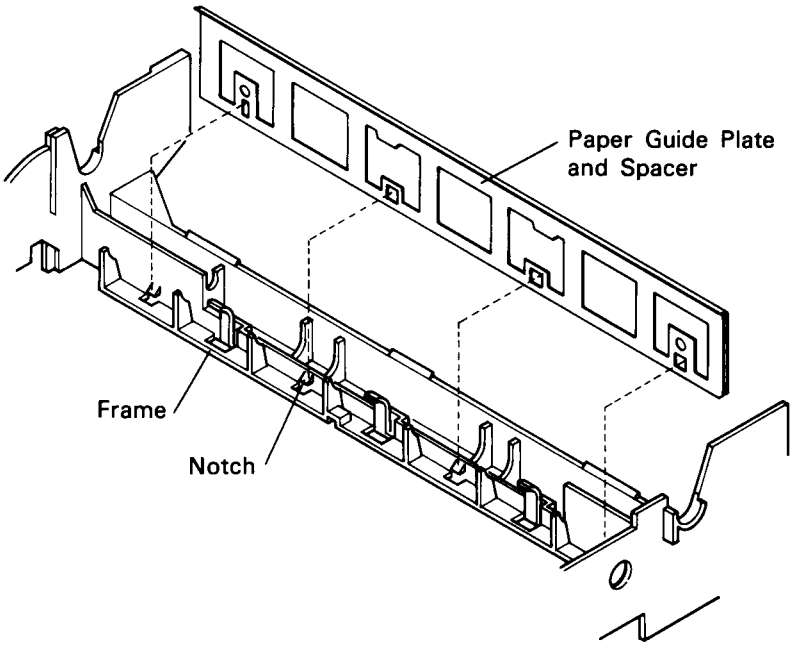
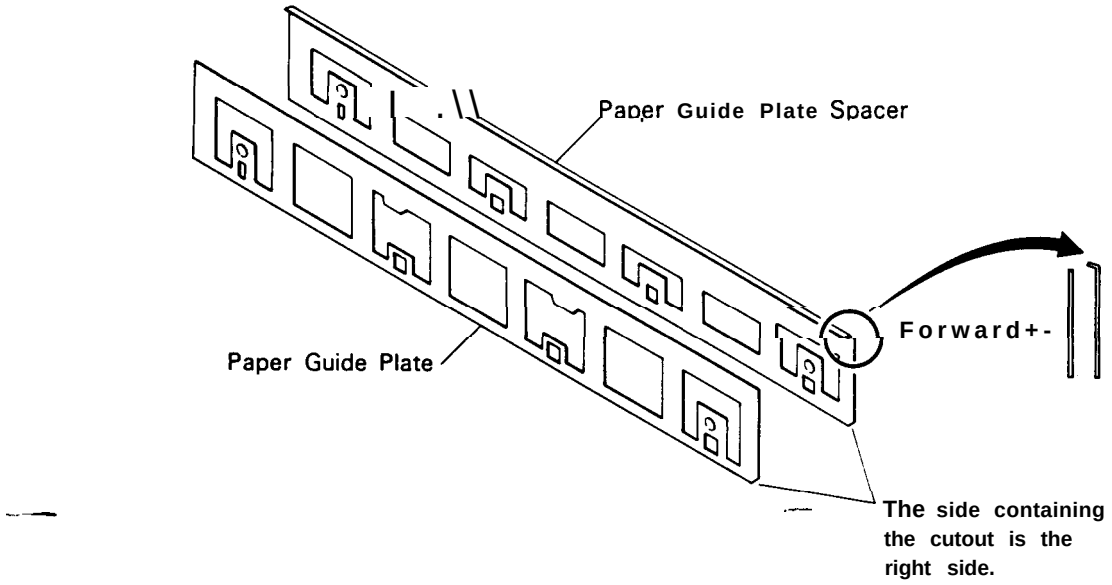


Fig. 4-14. Removal of Paper Guide Plate and Spacer

ASSEMBLING POINTS:

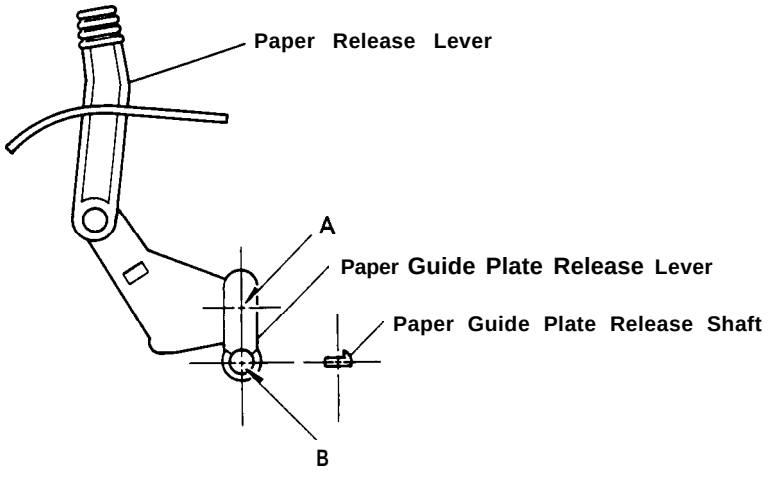
1. **When reassembling the paper guide plate and the paper guide spacer, refer to Figure 4-15 for the mounting direction.**



(Viewed from front of Printer Mechanism)

Fig. 4-15. Paper Guide Plate and Spacer Assembly Points

2. **When installing the paper release lever and the paper guide plate release lever, carefully observe the mounting positions shown in Figure 4-16.**



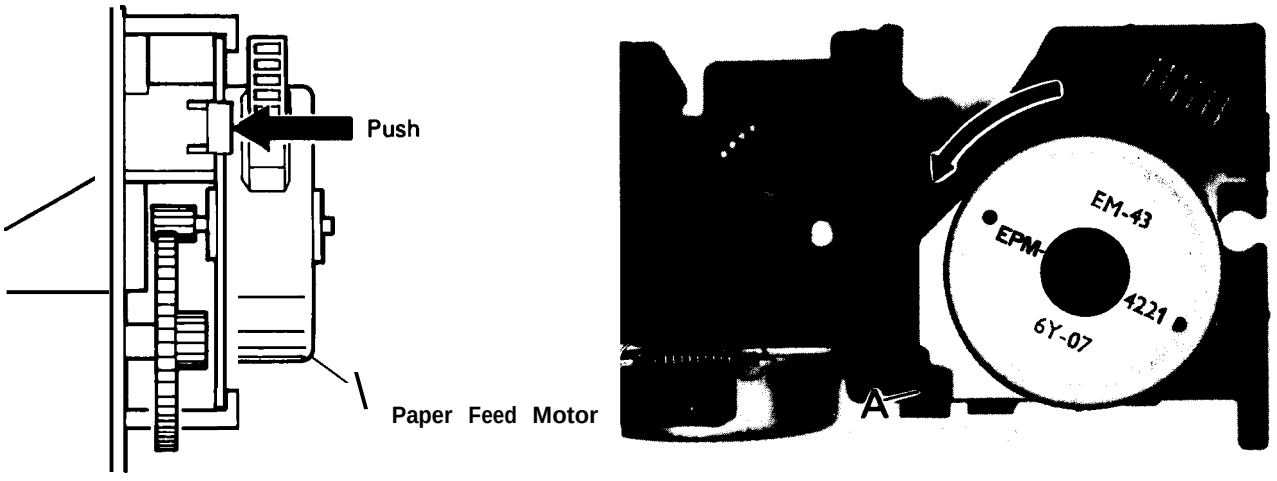
(Viewed from left side of Printer Mechanism)

Fig, 4-16. Paper Release Lever and Paper Guide Plate Release Lever Assembling Point

. The paper release lever and the paper guide plate release lever must be joined at point A, and the paper guide plate release shaft and a section of the paper guide plate release shaft must be joined at point B, as shown in the figure above.

4.2.5.2 Removal of Paper Feed Motor (Figure 4-17)

1. Remove the printer mechanism. (Refer to Section 4.2.4)
2. Disconnect the motor cable from the paper feed motor.
3. Loosen the tab of the frame, which secures the paper feed motor to the frame, by pushing it using a screwdriver, and remove the paper feed motor by turning it in the direction shown by the arrow below, using point A as a fulcrum.

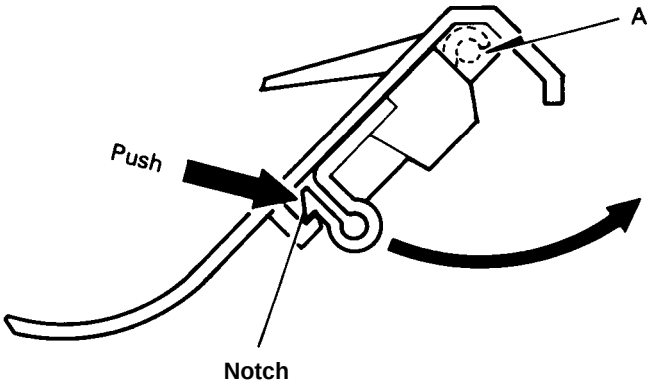


(Viewed from upward) (Viewed from left side)

Fig. 4-17. Removal of Paper Feed Motor

4.2.5.3 Removal of Paper End Sensor (Figure 4-18)

1. Remove the platen unit and paper guide. (Refer to Section 4.2.4.1)
2. Loosen the tab securing the paper end sensor to the paper guide, remove the paper end sensor by turning it in the direction shown by the arrow below, using point A as a fulcrum.



(Cross section of Paper Guide)

Fig. 4-18. Removal of Paper End Sensor

4.2.5.4 Disassembly of Platen Unit (Figure 4-19)

1. **Remove the platen unit. (Refer to Section 4.2.4.1)**
2. **Remove the left shaft holder and the paper feed knob from the platen unit.**
3. **Pull out the platen gear at the right side of the platen unit.**
4. **Remove the five E-rings from the platen, and pull out the right shaft holder and the flat spring.**

ASSEMBLY POINT:

When reassembling the platen unit, refer to Figure 4-19 to install the flat spring and the shaft holder correctly, and insure that the gap between the platen and the platen gear is adequate.

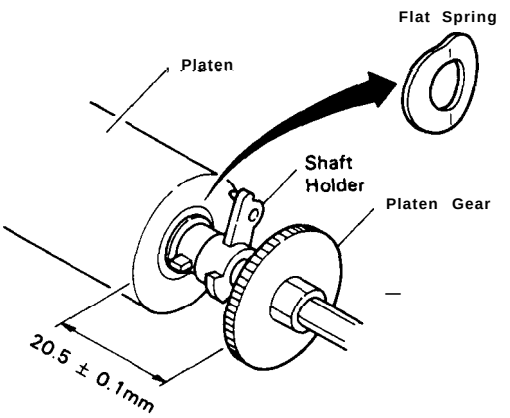


Fig. 4-19. Platen Unit Assembling Point

4.2.5.5 Removal of Carriage Unit (Figures 4-20 through 4-24)

1. **Remove the printer mechanism. (Refer to Section 4.2.4)**
2. **Remove the printhead and disconnect the head cable.**
3. **Turn the printer mechanism over, and manually move the carriage unit over to the cutout in the carriage motor frame. (Move the carriage unit so that the joint of the carriage unit and the timing belt can be seen through the cutout.)**

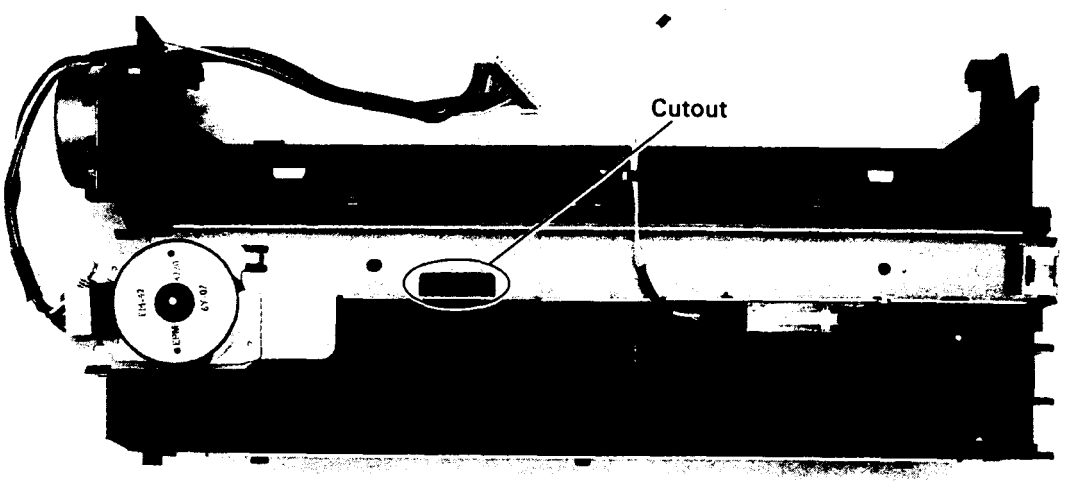


Fig. 4-20. Printer Mechanism Bottom View

4. Detach the timing belt from the carriage unit using round nose pliers.
   Be careful not to damage it.
5. Lift portion A of the carriage guide shaft ground plate to remove it from the notch in the carriage motor frame, and slide the plate so that it can be removed from the frame (through the cutout at portion B of the plate).

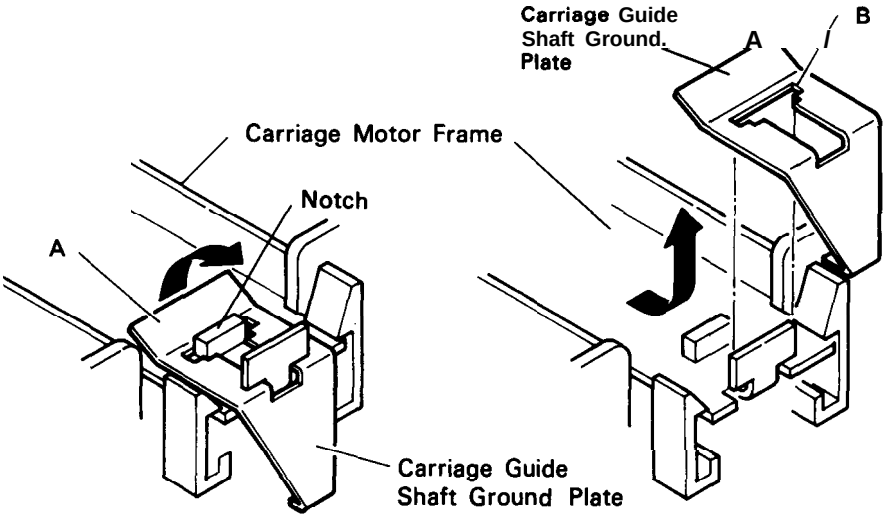
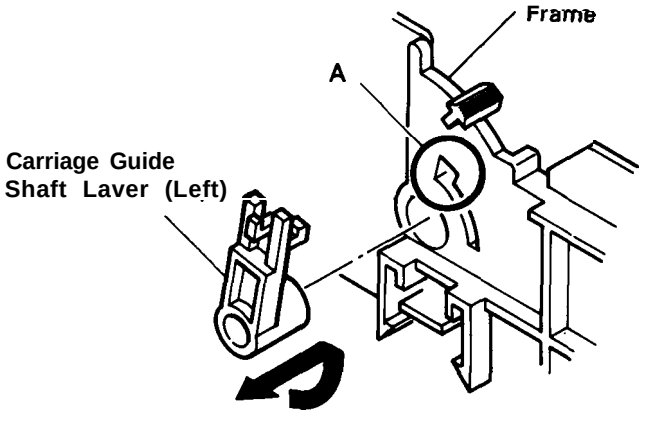


Fig. 4-21. Removal of Carriage Guide Shaft Ground Plate

6. Place the printer mechanism face up. Turn the left carriage guide shaft lever fully counterclockwise and pull it out through cutout A. Then turn the right carriage guide shaft lever fully clockwise, and pull it out the same way as the left lever.



(Viewed from Left Side)
Fig. 4-22. Removal of Carriage Guide Shaft

7. Push the notch of the frame, which secures the carriage guide plate to the frame, and slide the carriage quide plate to the left to remove it.

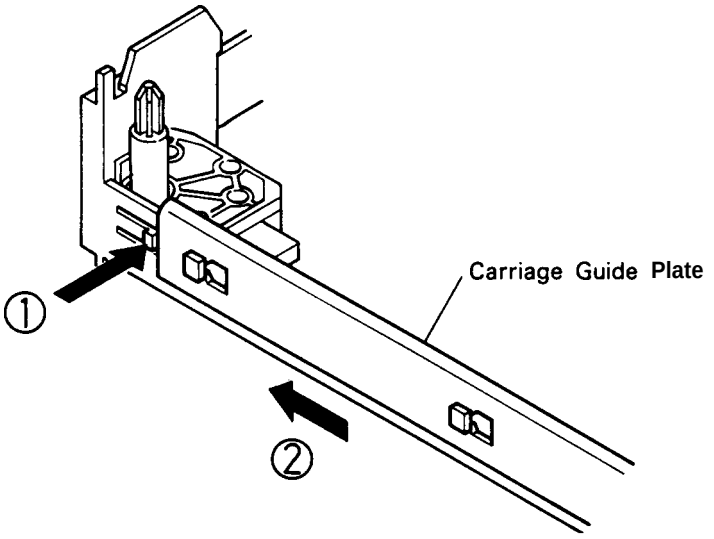


Fig. 4-23. Removal of Carriage Guide Plate

8. Lift the carriage unit, carriage guide shaft, and head adjust lever to remove them.

ASSEMBLING POINTS:

1. Before installing the carriage guide shaft and the head adjust lever, position them as shown in Figure 4-24.

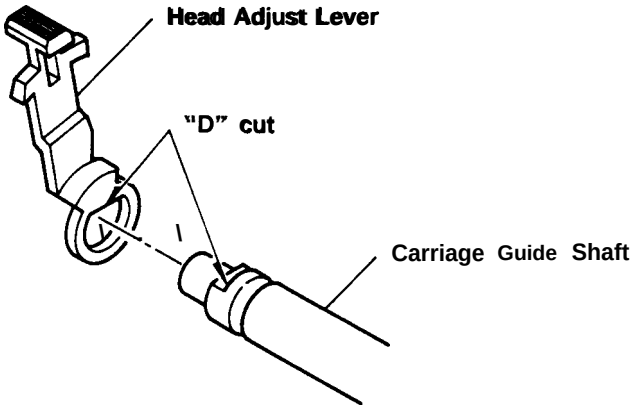


Fig. 4-24. Carriage Guide Shaft and Head Adjust Lever

2. The colors of the left and right carriage guide shaft lever are gray and black, respectively. The hole in each lever must slide onto the corresponding end of the shaft.
3. When connecting the head cable, pass it correctly through the FPC guide at the frame.

ADJUSTMENT REQUIRED

When the carriage unit is reassembled, perform the following adjustment.

● 4.3.1 Platen Gap Adjustment

4.2.5.6 Removal of Carriage Motor (Figures 4-25 through 4-26)

1. Perform steps 1 to 5 of Section 4.2.5.5.
2. Disconnect the motor cable from the carriage motor. Disconnect the lead wire of the home position sensor from the molded clip at the bottom of the frame. (Refer to Figure 4/-25.)
3. Loosen the four tabs securing the carriage motor frame to the chassis frame, using a screwdriver, and remove the carriage motor frame.

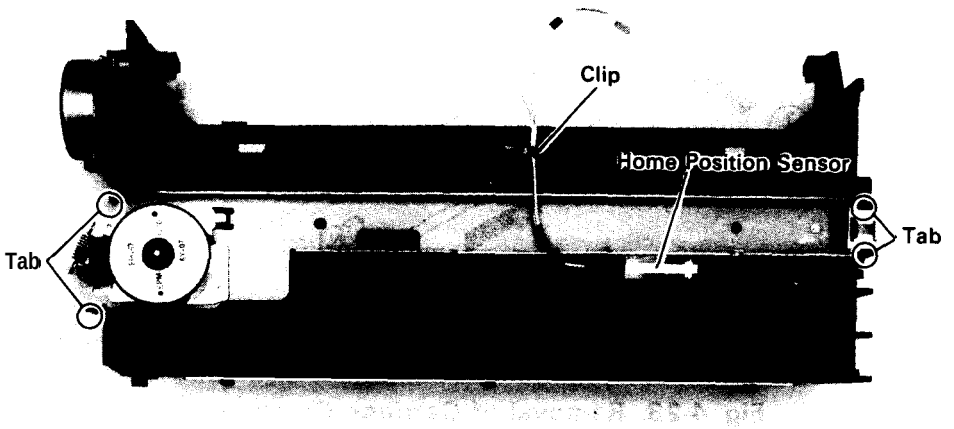


Fig. 4-25. Carriage Motor Frame Removal

4. Remove the belt tension spring from the carriage motor frame. Remove the E type (3.2) retaining ring on the carriage motor side, then remove the plain washer, belt pulley flange, belt pulley shaft holder, belt pulley and timing belt.

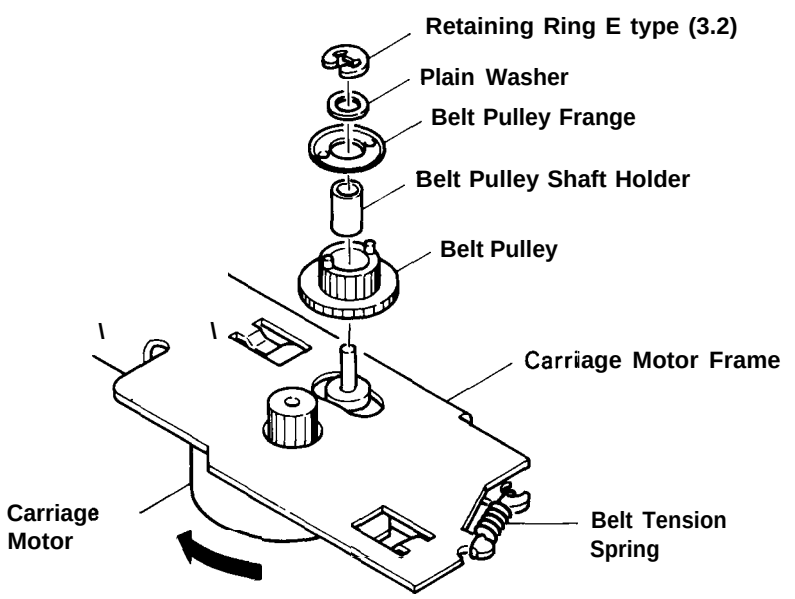


Fig. 4-26. Removal of Carriage Motor

5. Move the carriage motor in the direction shown by the arrow to remove it.

ASSEMBLY POINT:

Attach the E-rings as follows:

- **When attaching a ring to the left pulley shaft, set it so that its opening faces to the left.**
- **When attaching a ring to the right pulley shaft, set it so that its opening faces to the right.**

Confirm that the attached retaining rings do not move, using the tweezers.

4.2.5.7 Removal of Home Position Sensor (Figure 4-27)

1. **Perform steps 1 to 3 of Section 4.2.5.6 to remove the carriage motor frame.**
2. **Push the notch of the home position sensor, and remove the home position sensor from the carriage motor frame.**

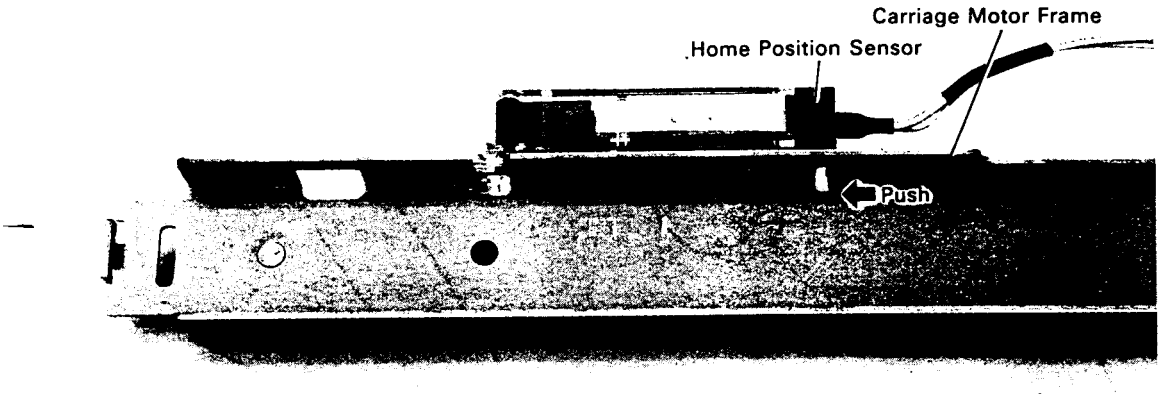
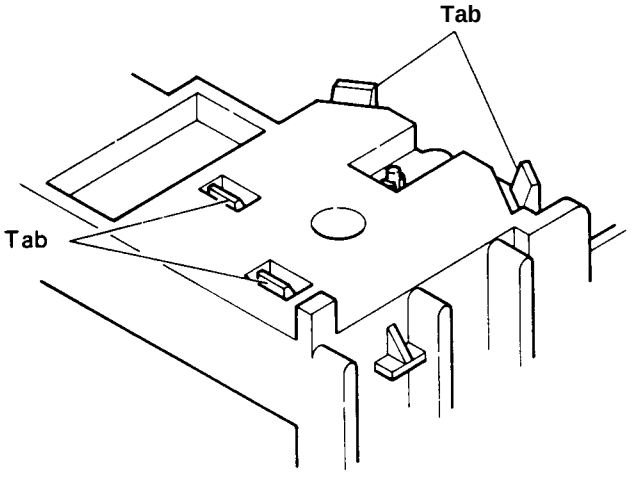


Fig. 4-27. Removal of Home Position Sensor

4.2.5.8 Disassembly of Ribbon Feed Mechanism (Figure 4-28)

1. **Remove the printer mechanism. (Refer to section 4.2.4)**
2. **Turn the printer mechanism over, and loosen the four bent tabs of the ribbon gear cover using a screwdriver. (At this time, just loosen the tabs slightly but do not remove the ribbon gear cover. If it is removed before the printer mechanism is turned over, the gears will be scattered.)**



(Printer mechanism bottom view)

Fig. 4-28. Ribbon Gear Cover Removal

3. **Place the printer mechanism face up, and lift the ribbon gear cover to remove it.**

4.2.5.9 Disassembly of Tractor Unit (Figures 4-29 through 4-32)

1. **Loosen the three tabs of the sprocket mounting plate using a screwdriver and remove the side cover. (Both the left and right side covers can be removed at the same time.)**

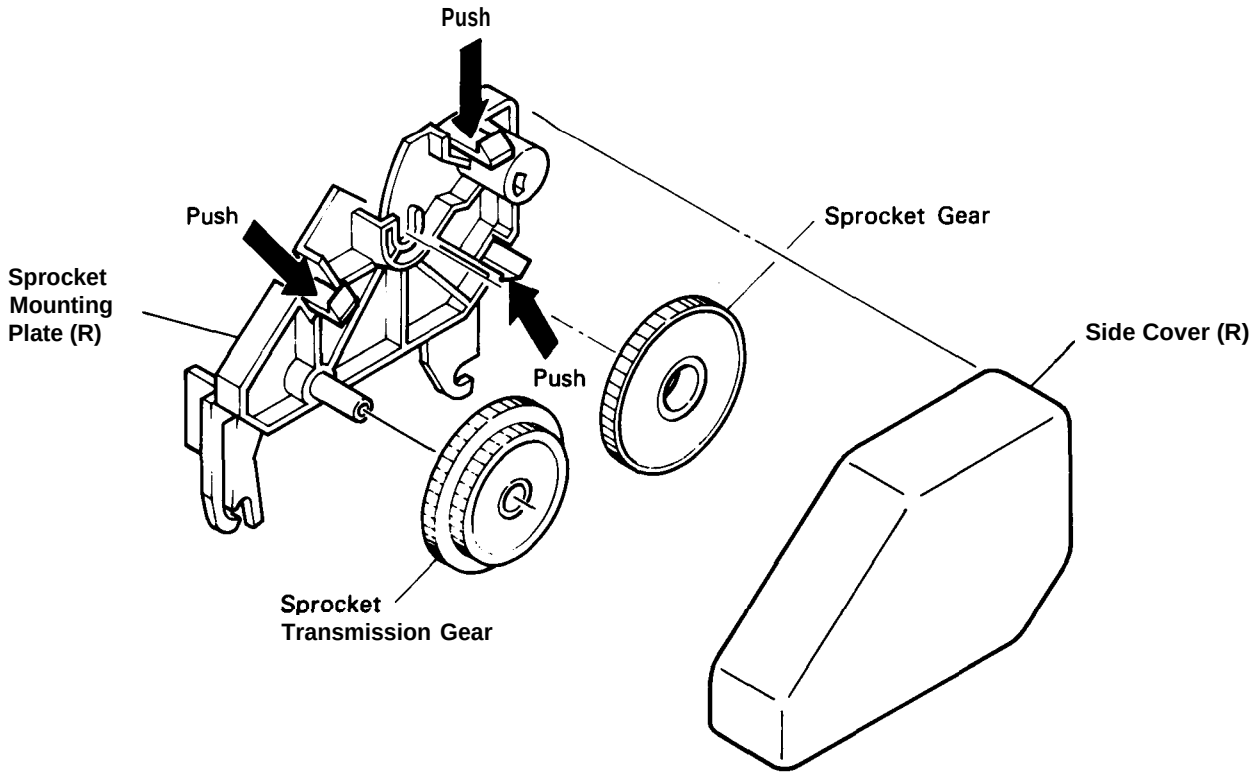


Fig. 4-29. Removal of Side Cover

2. **Remove the sprocket gear and the sprocket transmission gear.**
3. **Remove the shaft holder. (Refer to Figure 4-8. The left and right shaft holders can be removed at the same time.) Remove the sprocket shaft from the sprocket mounting plate.**
4. **Loosen the sprocket mounting plate tab using a screwdriver, and pull out the sprocket guide shaft.**

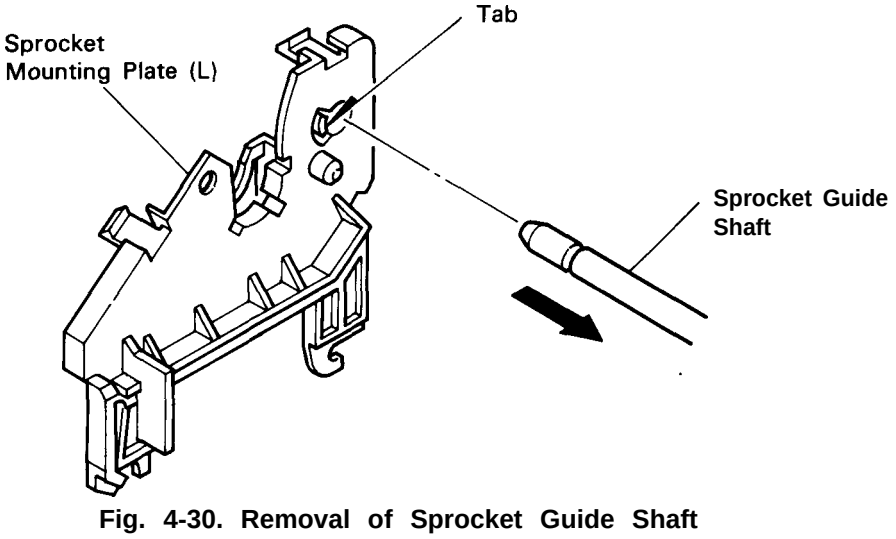


Fig. 4-30. Removal of Sprocket Guide Shaft

5. Pull out the sprocket assembly and the paper guide roller from the sprocket shaft and the sprocket guide shaft. When pulling out the paper guide roller, move it along the sprocket shaft toward the side with the T-shaped notch. (When assembling the paper guide roller, insert the sprocket shaft from the side with the T-shaped notch.)

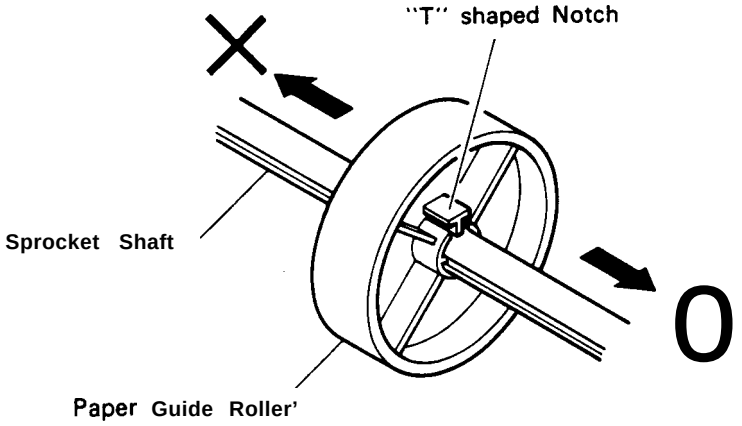


Fig. 4-31. Paper Guide Roller Removal and Attaching

ASSEMBLY POINTS:

1. Attach the paper guide roller to the sprocket shaft from the direction indicated in Figure 4-31.
2. Attach the sprocket wheel to the sprocket shaft so that the sprocket wheel marks are on the left side and so that the marks on the two wheels line up.

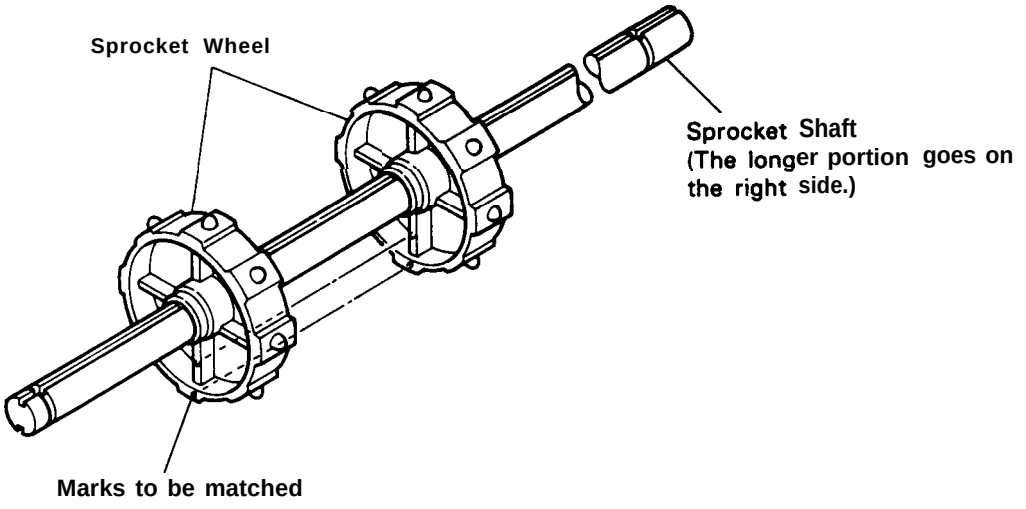


Fig. 4-32. Sprocket Wheel Attachment

4.3 ADJUSTMENT

This section describes the adjustment procedures required for reassembling the LX-800 printer. When disassembly or replacement is performed during maintenance or repairs of the parts described in this section, the following adjustments should be performed to ensure proper operation.

4.3.1 Platen Gap Adjustment (Figures 4-33 through 4-36)

The gap between the platen and the printhead should be adjusted when the carriage guide shaft or carriage guide shaft levers are rotated or removed, or the printing is abnormal.

1. **Remove the printer mechanism. (Refer to Section 4.2.4)**
2. **Install the paper guide and the platen unit on the printer mechanism.**
3. **Remove the printhead, then remove the ribbon mask using tweezers. When removing the ribbon mask, pull it frontward slightly, then lift it.**

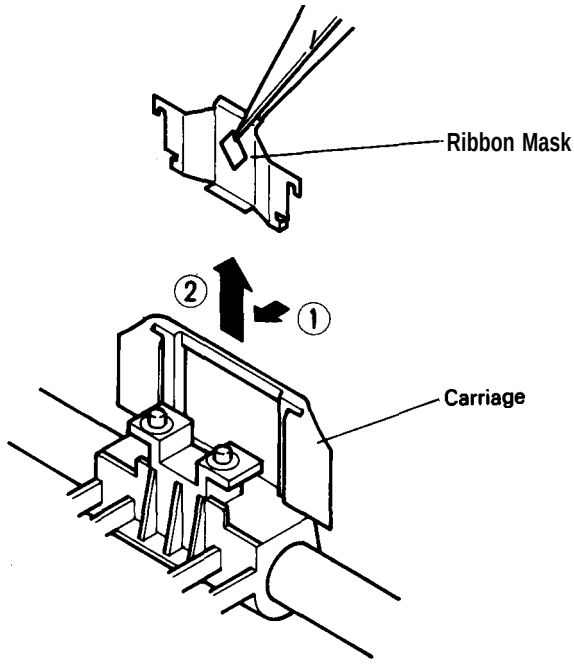


Fig. **4-33. Removal of Ribbon Mask**

4. **Reinstall the printhead.**
5. **Set the head adjust lever at the nearest position to the platen.**
6. **Manually move the carriage to the paper-end sensor lever position (column 10).**
7. **Insert a thickness gauge (0.47 mm) between the platen and the printhead, and adjust the left and right carriage guide shaft levers so that the gap becomes 0.47 ± 0.02 mm. When the thickness gauge starts to slip down due to its own weight, the gap adjustment is adequate. If the 0.49 mm thickness gauge cannot be inserted and the 0.45 mm one can be inserted easily, the gap adjustment is adequate.**

WARNING

When setting the position of the carriage guide shaft lever, be sure that both tabs A and B do not enter the notch at the same time. It is designed so that tab B may not enter when tab A is inside, and that tab A may not enter when tab B is inside.

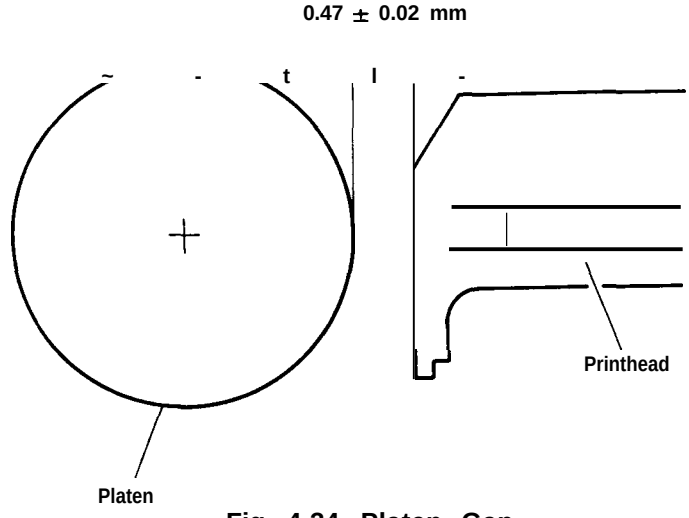


Fig. 4-34. Platen Gap

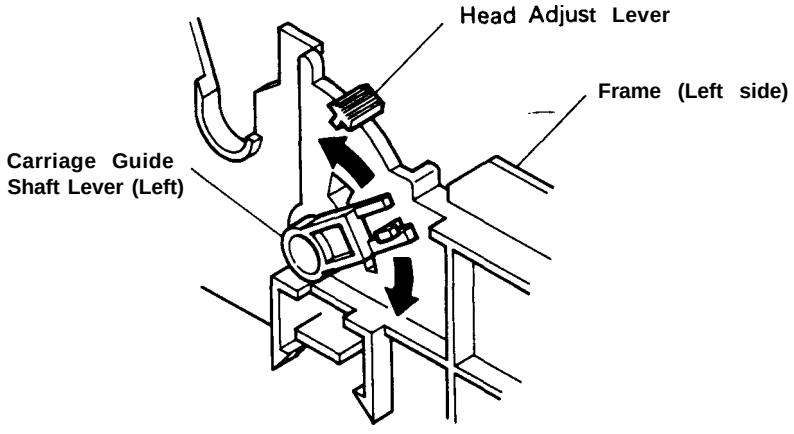


Fig. 4-35. Carriage Guide Shaft Lever Movement

Carriage guide shaft (left): Turned clockwise - The platen gap widens.
Turned counterclockwise - The platen gap narrows.
Carriage guide shaft (right): Turned clockwise - The platen gap narrows.
Turned counterclockwise - The platen gap widens.

Perform the above adjustment at the 10th and 70th column positions, and at the middle of the platen. When the gaps at all three positions match, the adjustment is complete.

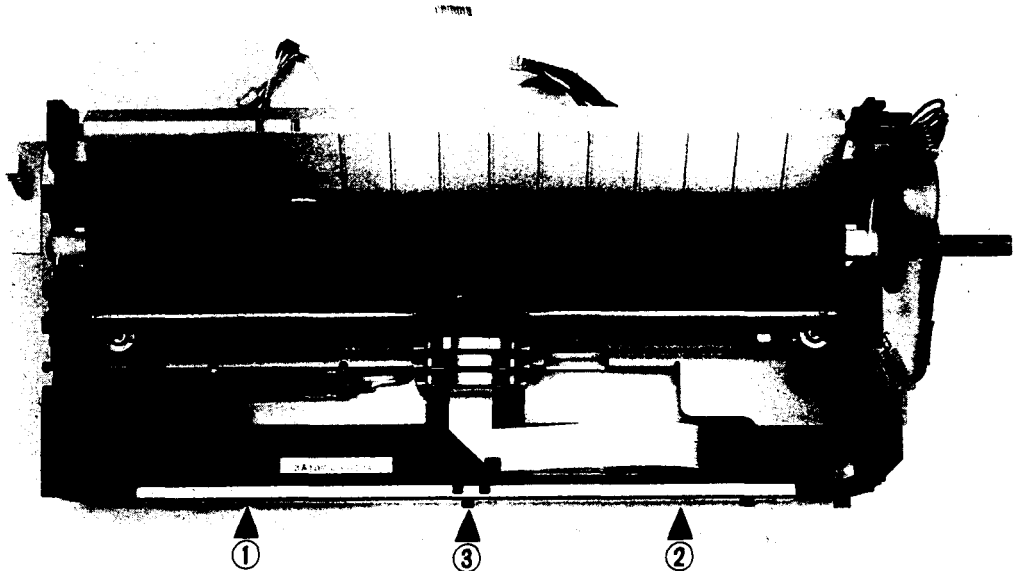


Fig. 4-36. Platen Gap Adjustment Positions

CHAPTER 5
TROUBLESHOOTING

LIST OF FIGURES

LIST OF TABLES

5.1 GENERAL

The difficulty in troubleshooting is that error symptoms vary, depending on the defective component. However, troubleshooting may be accomplished more easily by following the process shown in Figure 5-1. This flowchart shows the two levels of repair: one is unit replacement, in which the defective subassembly is identified and replaced; and the other is component isolation and repair.

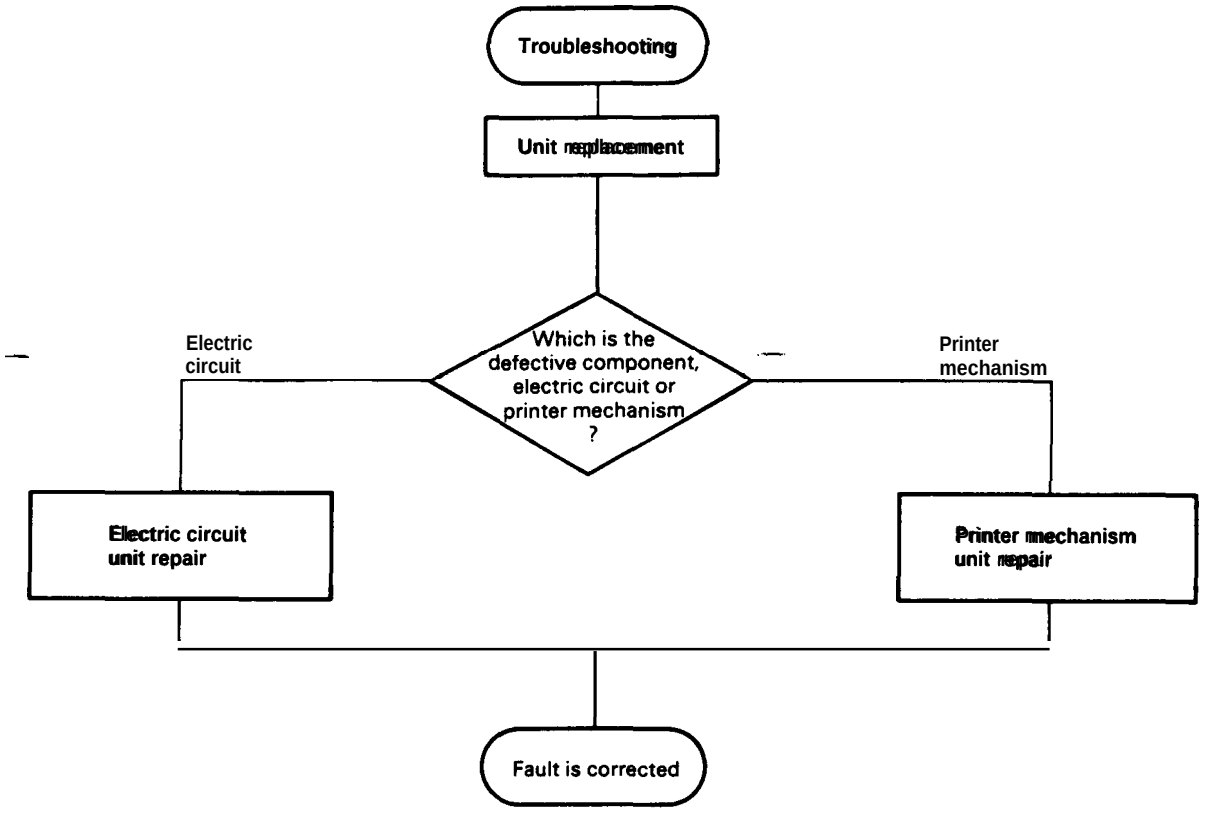


Fig. 5-1. Troubleshooting Procedure

WARNING

- **Read section 4.1 (GENERAL REPAIR INFORMATION).**

For troubleshooting, repair tools are listed in Tables 4-1 and 4-2. In addition, EPSON has prepared the following specified tools to increase the work efficiency and safety:

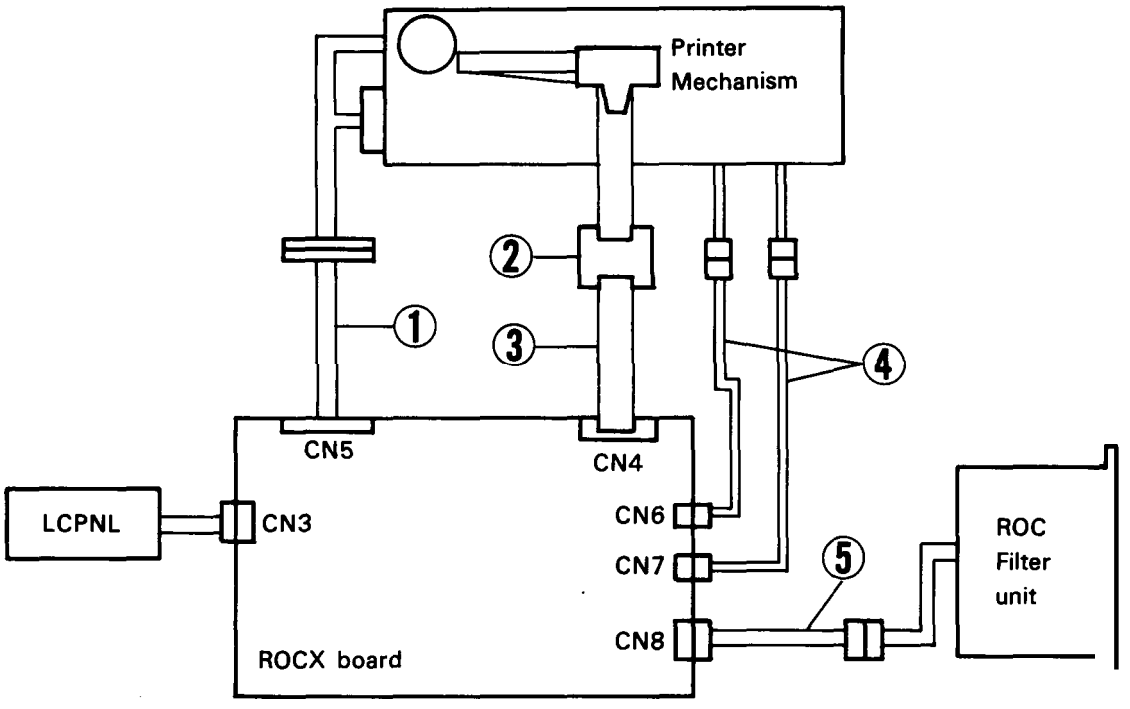


Fig. 5-2. Special Tools for LX-800

Table 5-1. Special Tools for LX-800

No.	*Name*	*Description*	*Part No.*
①	*#E626*	Extension cable between the ROCX (CN5) and motors.	B765 107901
②	#E524	Connector board and extension cable between the ROCX (CN4) and a printhead.	B765 105201
③	#E523		B765 105101
④	#E594	Extension cable between the ROCX (CN6) and a paper end sensor.	B765 105401
		Extension cable between the ROCX (CN7) and a home position sensor	
⑤	#E201	Extension cable between the ROCX (CN8) and a ROC Filter unit.	B777603801

5.2 UNIT REPLACEMENT

The unit replacement procedure is based on symptom analysis. According to the particular symptom found by the multimeter, the units listed in Table 5-2 need to be replaced.

Table 5-2. List of Units

Unit Name	Description	Unit Code No.
Fuse (Fl)	125V/1 .25A (for 120V)	X50206 1050
	250V/0.63A (for 220/240V)	X502063030
ROC Filter Unit	120V version	Y565503000
	120V 2 plugs version	Y565507000
	220V version	Y565504000
	240V version	Y565505000
ROCX board unit	Control board	Y565201 000
LCPNL board unit	Control panel	Y565501OOO
Model-3A10	printer mechanism	Y565590000

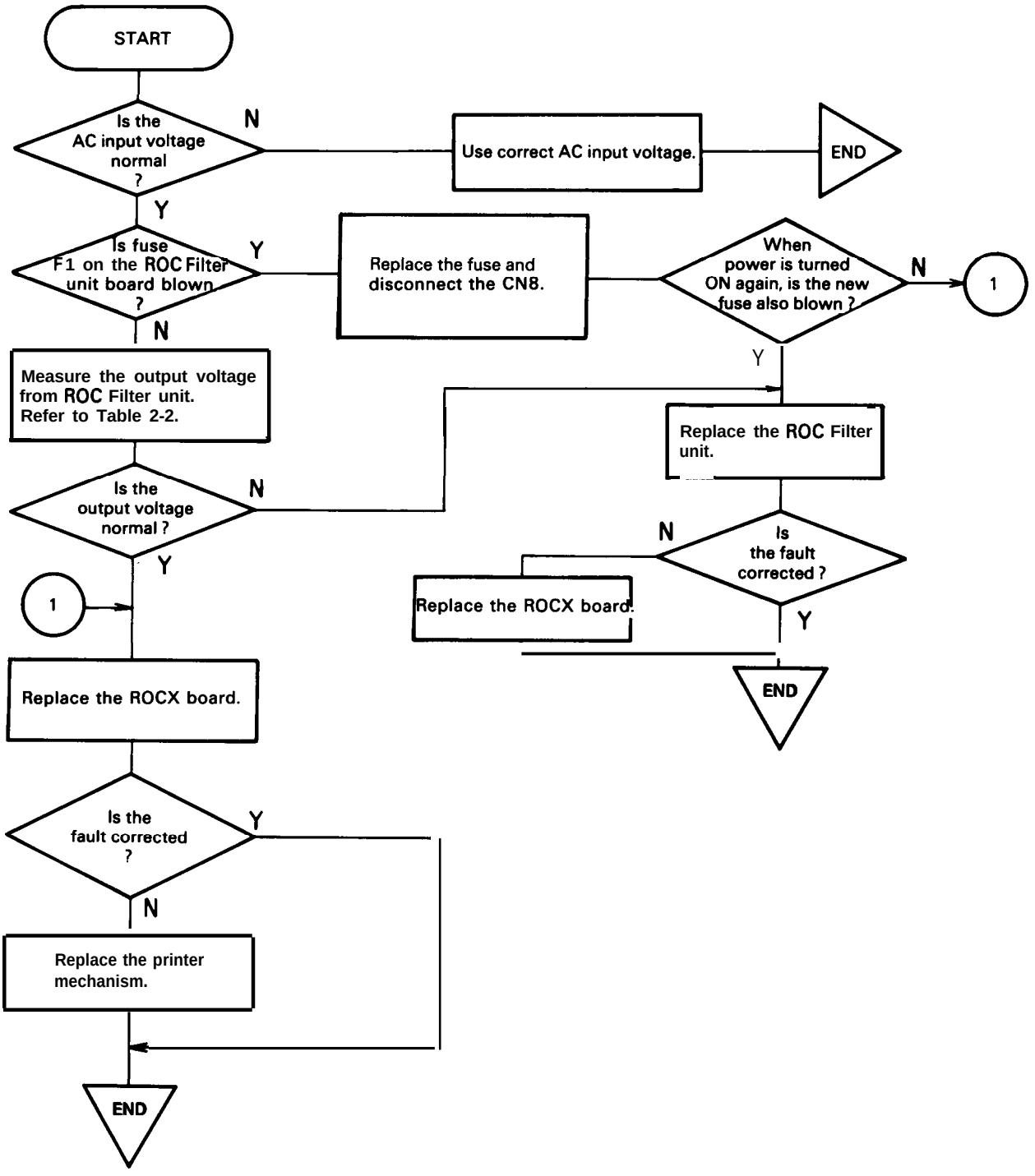
Table 5-3 shows the flow chart to be referred to depending on the symptoms.

Table 5-3. Symptom and Reference Pages

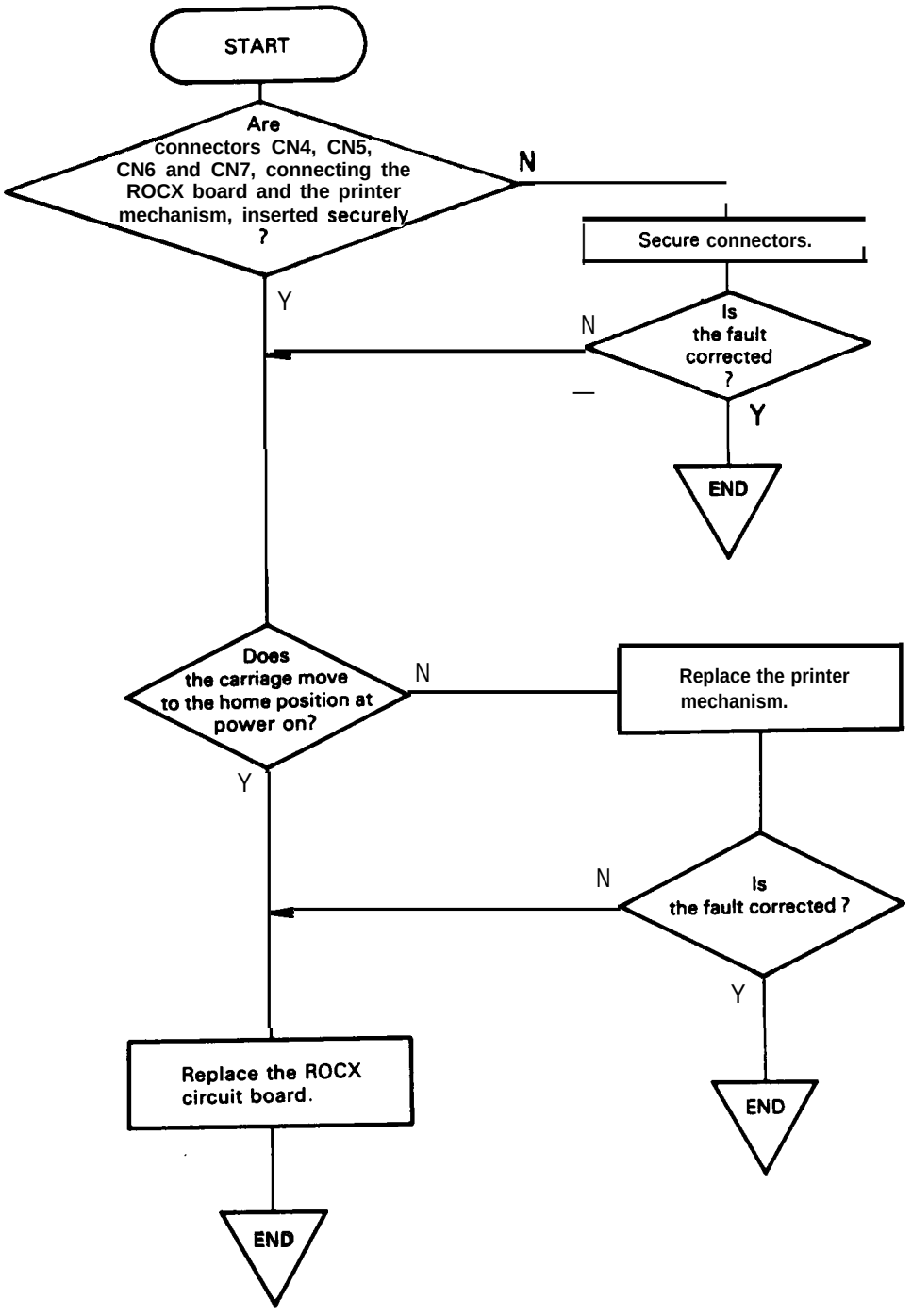
Symptom	*Problem Indicators*	*Reference Page*
Printer Does Not Operate with Power Switch ON	. No indicator on the control panel lights. . Carriage does not move.	5-4
Abnormal Carriage Operation	. Carriage moves away from home position 'at power ON. . Although the carriage returns to the home position, the printer does not enter READY mode.	5-5
Incorrect Printing (in self-test) with Normal Carriage Operation	. No printing is executed. ● Some dots do not appear.	5-6
Abnormal Paper Feed	. No paper is fed. . Separation between lines varies with irregular paper feed.	5-7
Abnormal Operation of Control Panel	. No paper is fed (by operation of the LF or FF switch) in OFF-LINE mode. . No operation mode is set from the control panel. . ON-LINE or OFF-LINE mode is not obtained.	5-8
Incorrect Printing in ON LINE Mode	. Carriage operates normally at power ON and the result of the self-test is correct. However, the print data from the computer is not output normally.	5-9

REV.-A

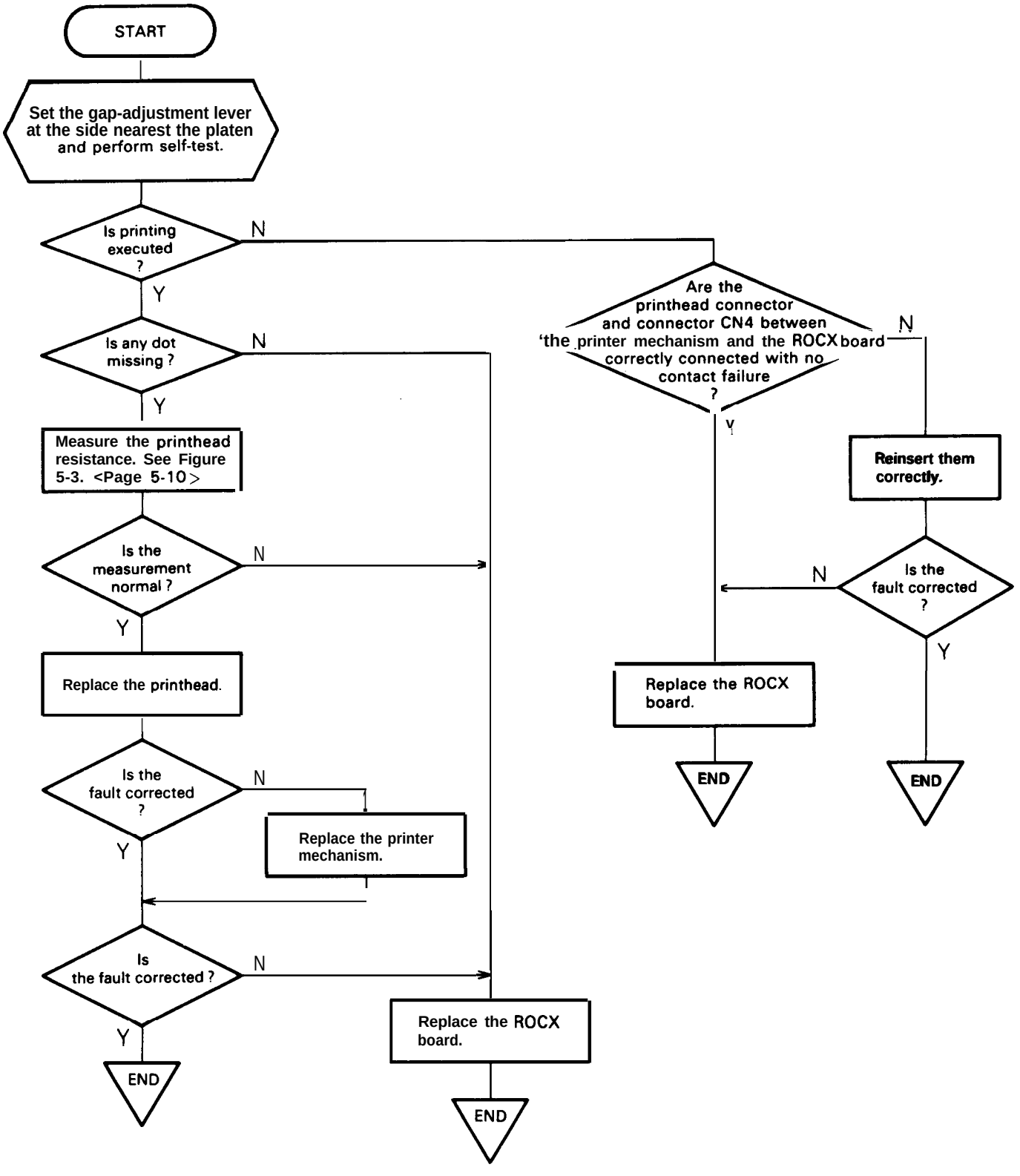
(1) Printer does not operate when power switch is on.



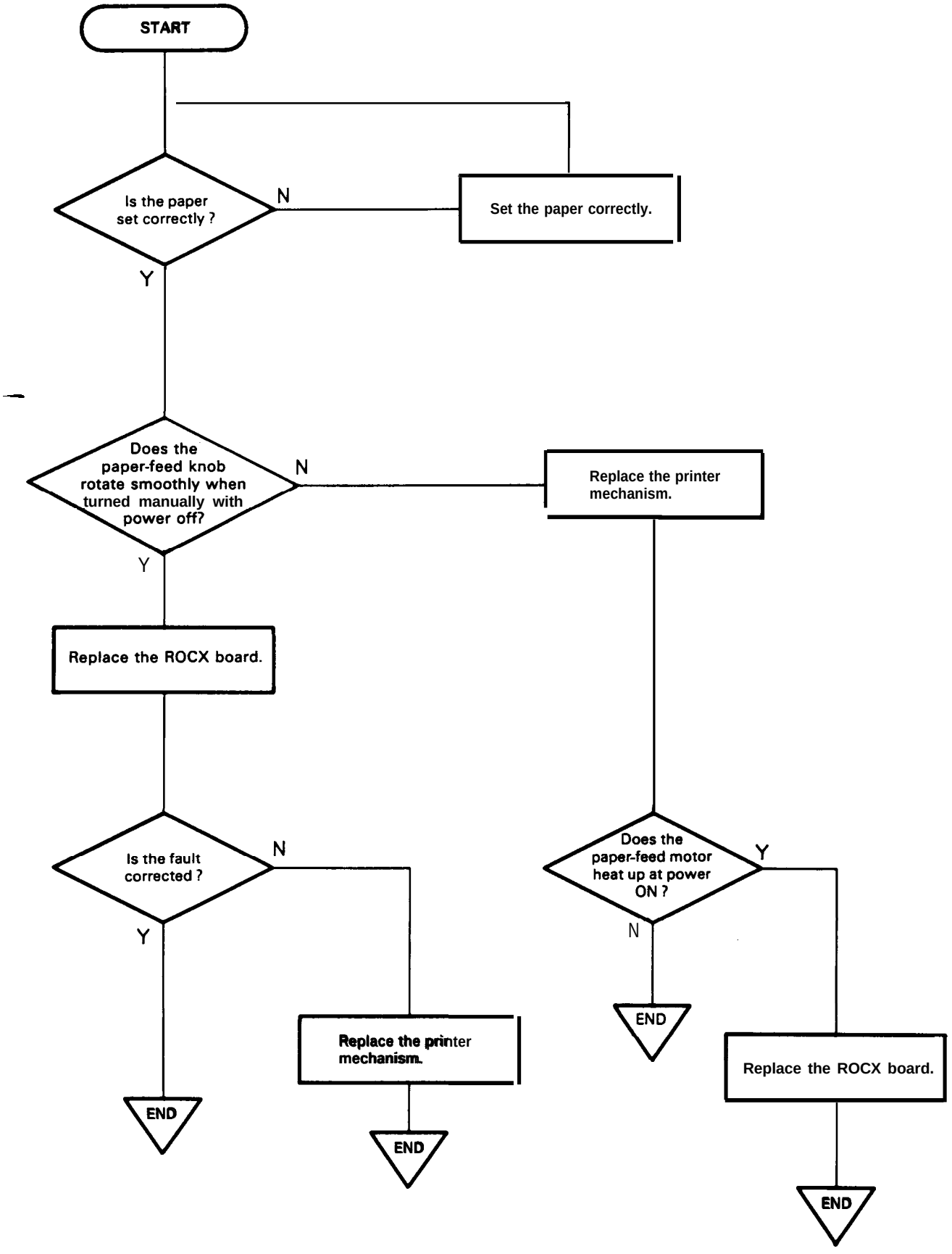
(2) The carriage does not operate correctly.



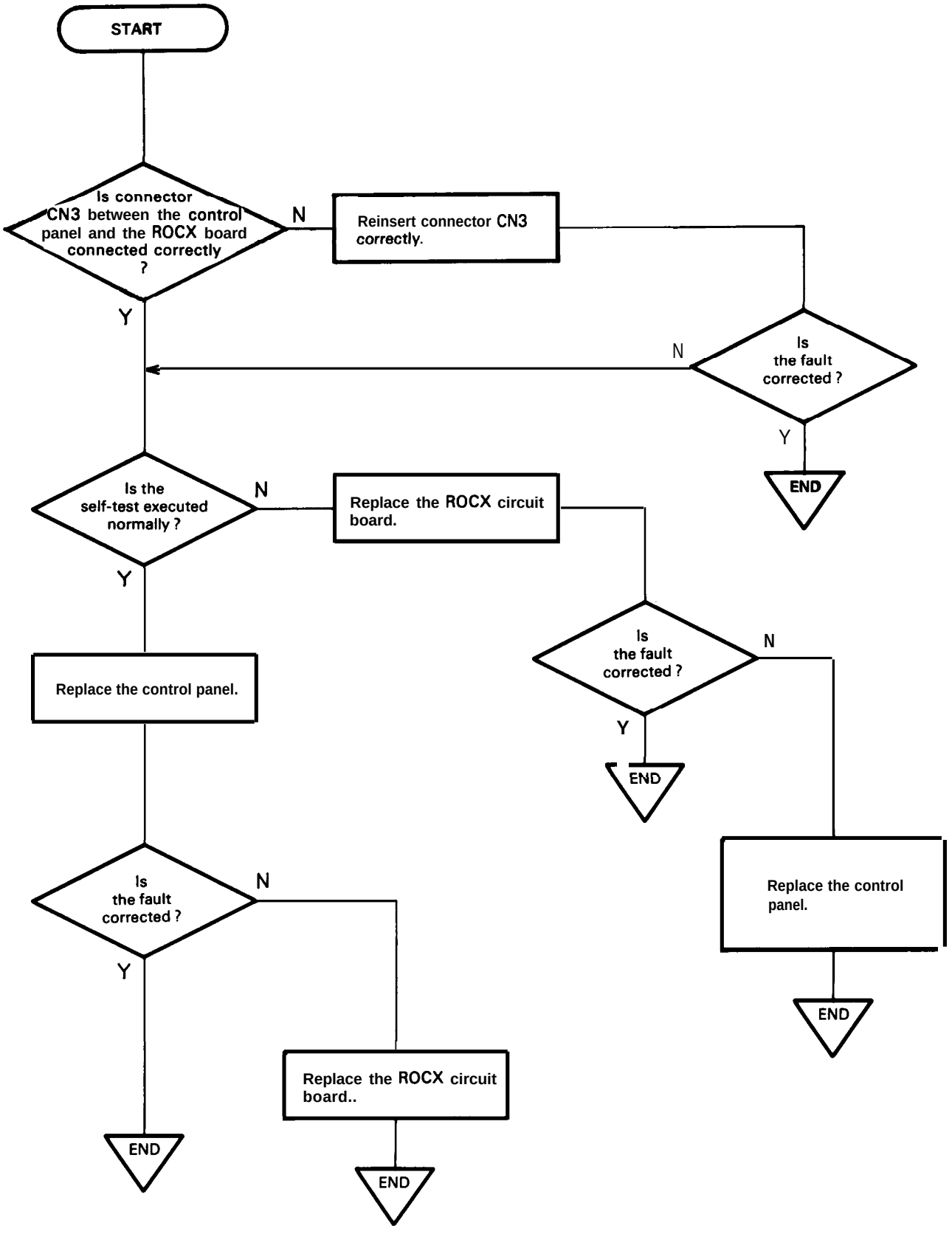
(3) The carriage operates normally, but the self-test printing is incorrect.



(4) The self-test printing is normal, but the paper is not fed properly.

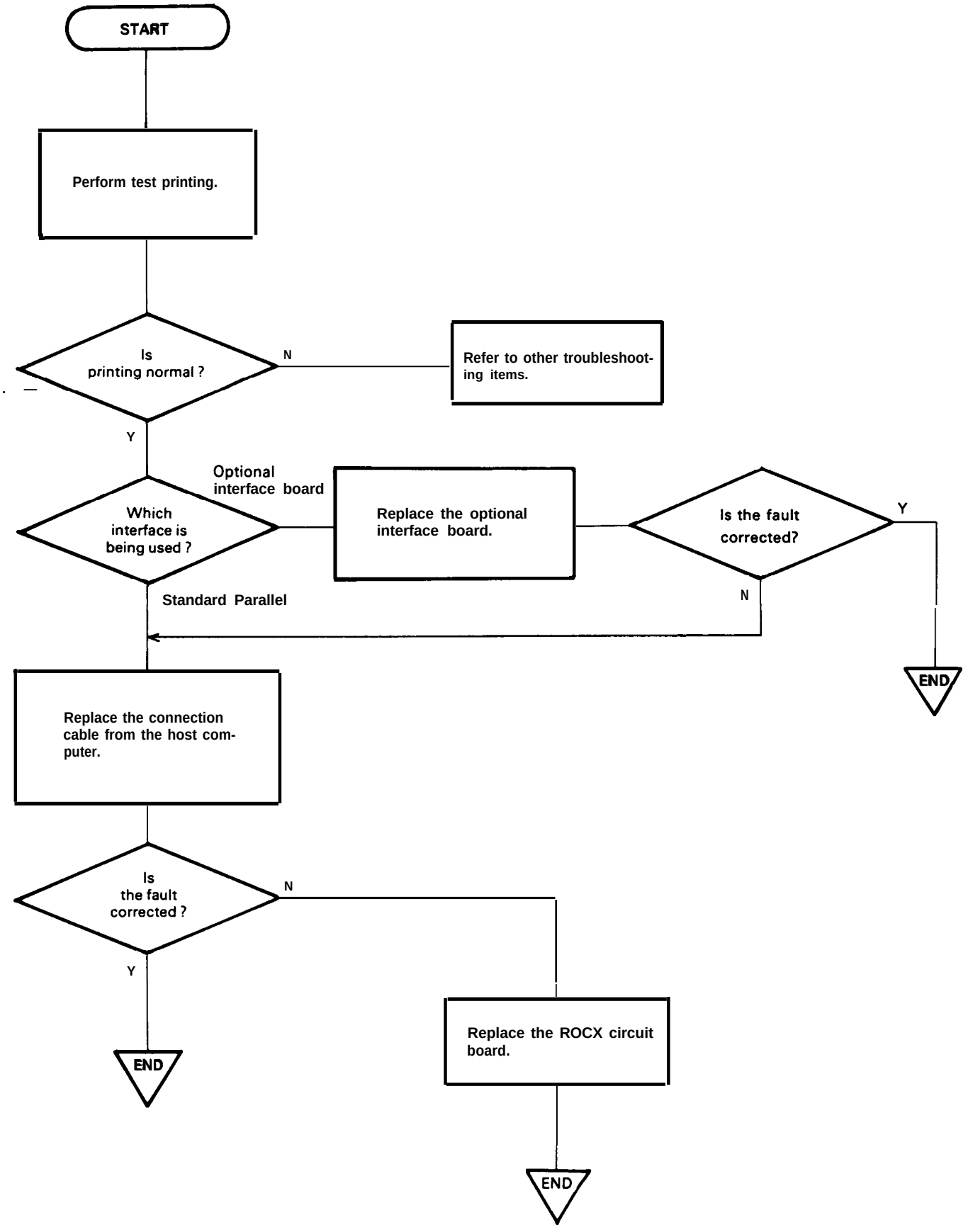


(5) The control panel does not operates correctly.



(6) The printing is incorrect in the ON-LINE mode.

NOTE: It is assumed that the host computer operates normally.



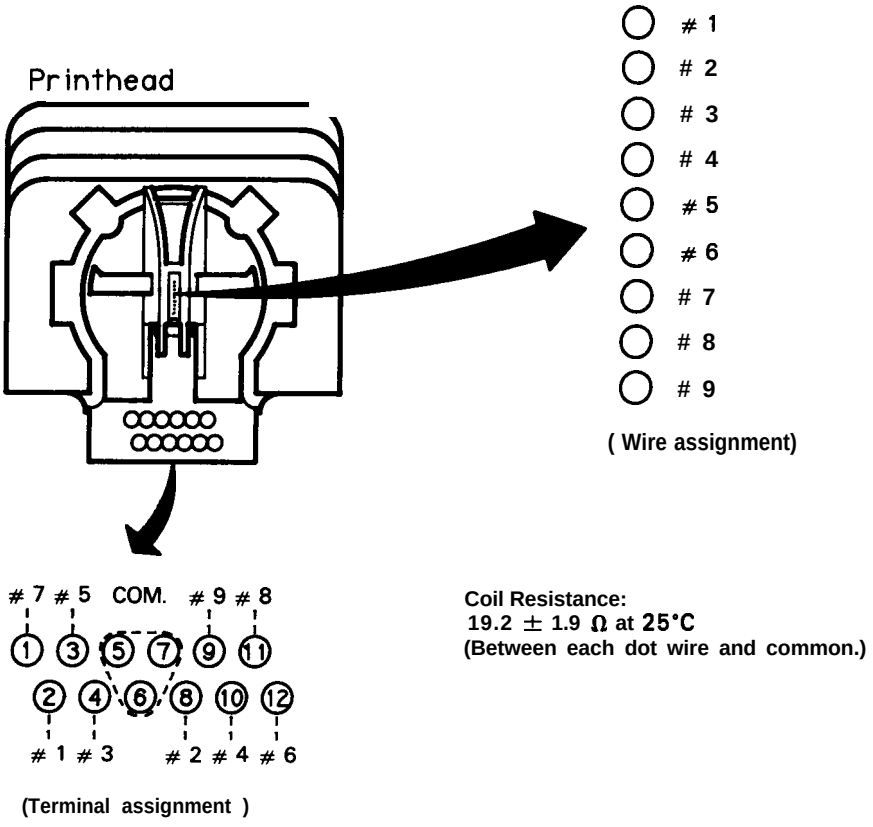


Fig. 5-3. **Printhead** Resistance

5.3 UNIT REPAIR

This section indicates possible causes and checkpoints for different symptoms. The checkpoints include waveforms and resistance values for normal operation. By referring to the checkpoints, determine the detective component and perform the proper repair. Tables 5-5 and 5-7 have the following five columns:

. Problem:	**Identify the problems listed in this column.**
● Symptom:	**Check symptoms against those given in this column.**
● Cause:	**Check problems against the causes listed in this column.**
. Checkpoint:	**Use the instructions given in this column for troubleshooting.**
● Solution:	**Make repairs according to the instructions given in this column.**

5.3.1 ROCX Board

Table 5-4 shows the main components of the ROCX Board. The unit repair procedure for the ROCX board is described in Table 5-5.

Table 54. ROCX Board Parts List

Location	*Part* Name	Description	Part No.
F2	Fuse	125V, 3.15A, UL, CSA	X502084020
Q21	2SD1832C4	60V, 5A, 20W	X3021 83209
Q25	2SD1833C4	60V, 7A, 25W	X302 183309
Q1 - Q9	2SD1647C3	5V, 100mA, 700mW	X302 164709
3A	μPC494C	Switching Regulator IC	X440064940
1 c, 2C	7407	Hex. Buf. Drv. O.C.	X4201 OOO7O
4C	μPD4364C	Static RAM	X4001 43644
SRI	μPC78L05J	Switching Regulator IC	X440078054
2B	/.LPD7810HG	CPU	X400078 101
3B	E05A03	Gate array	Y448800001
ZD1	HZS20-2TD	20 ±0,5V, 150mA, 400mW	X3301 60309
ZD2	HZS 15-3TD	15 ±0.5V, 150mA, 400mW	X3301 60209
ZD3	HZS4.7NB2-1 TJ	4.7 ±0.5V, 150mA, 400mW	X3301 60109

Table 5-5. ROCX Board Unit Repair

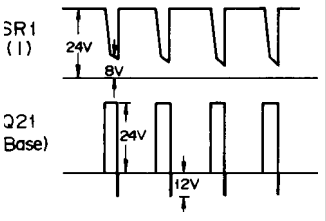
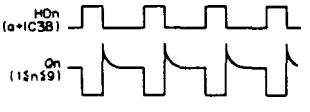
Problem	Symptom	Cause	Checkpoint	Solution
The printer does not operate at all. (The power lamp on the control panel does not light.) ● The I/F cable is disconnected.	The +24V DC line is dead.	ROC filter unit is defective.	Check fuse (Fl) on the ROC Filter unit.	Replace F1.
			Measure the output voltage of ROC filter unit. Refer to Table 2-2.	Replace the ROC filter unit.
		Resistors are open.	Measure the resistances of R21 and R66. R21: 316Ω R66: 0.1Ω	Replace the R21 or R66
		Switching regulator IC or Switching transistors are defective.	Measure the wave-form of IC3A or Swithcing transistors. Refer to Figure 2-9.	Replace the IC3A, Q25, Q24, or Q23.
			Measure the voltage of IC3A Pin 8. (Pin 8 = 20VDC)	Replace the IC3A or Q22.
		Fuse (F2) is open.	Check fuse on the ROCX board.	Replace F2.
	The +5V DC line is dead.	Switching regulator IC SR1 or switching transistors are defective.	Measure the waveform of SR1 and Q21. 	Replace SR1, Q20, or Q21.
		Resistor is open.	Measure the resistance of R13. R13: 2Ω	Replace R13.
	Reset circuit is dead.	+24V, +5V line is defective.	Check the +24V, +5V line.	
		Gate array (36) is defective.	Check the level of IC3B Pin 25. In operating: High	Replace Gate array (3 B).
	The printer mechanism does not initialize at power on.	The ROM is defective.	Check the pin insertions of ROM.	Replace ROM [3 C).
		The Gate array is defective.	Check the level of IC3B Pin 25. In operating: High	Replace Gate array (3 B).

Table 5-5. ROCX Board Unit Repair (Cent'd)

Problem	Symptom	Cause	Checkpoint	Solution
The printer does not operate. (The power lamp on the control panel lights.) . The I/F cable is disconnected.	Buzzer rigns 5 times.	Home position sensor is defective.	Check the level of IC3B Pin 23. Carriage at the home position: LOW	Replace Gate array (3 B).
		+24V line is abnormal.	Check the +24V line.	
In self-test mode, printing is abnormal	Carriage control is abnormal.	Phase switching is abnormal.	Measure the wave-form of transistors Q12, 13, 16, 17 collector. Refer to Figure 2-19.	Replace the defective transistor (or IC3B).
		Common voltage switching is defective.	Check the voltage of transistor Q19 emitter. In driving: +24V In holding +5V	Replace Q19 (or IC2B).
	Paper feed control is abnormal.	Phase switching is abnormal.	Measure the wave-form of transistors Q 10, 11, 14, 15 collector. Refer to Figure 2-25.	Replace the defective transistor (or IC3B).
		Common voltage switching is defective.	Check the voltage of transistor Q 18 emitter. In driving: +24V In holding: +5V	Replace Q18 (or IC2B).
	A specific dot is missing.	Printhead drive is defective.	Observe the high/low change at HDn (Pin 55 - 63) of the IC4B and at collector of transistor Qn. 	If there are not high/low changes, replace IC3B. Otherwise, replace any defective transistors.

5.3.2 Printer Mechanism

If trouble occurs with the printer mechanism, troubleshoot it as described in Table 5-7. Refer to sections 4.2 Disassembly and Assembly and 4.3 Adjustment for replacement and adjustment of parts. If the same problem or symptom persists, check other items in the cause column and try again. Table 5-6 lists the recommended parts to keep in stock for repairing the printer mechanism. The location numbers given in this table correspond to the numbers shown in Figure A-1 7.

Table 5-6. Printer Mechanism Parts List

Location No.	*Part Description*	**Part No.**
402	Frame	F333OO1O1O
413	Paper Feeding Roller Spring	F322253020
416	Home Position Sensor	F333053000
417	Carriage Motor	F33305 1010
418	Timing Belt	F33305 1020
430	Paper End Sensor	F333252000
444	Head Cable	F333003080
446	Paper Feed Motor	F3330031 10
448	Printhead	F4201OOOOO

Table 5-7. Printer Mechanism Unit Repair

Problem	*Symptom*	*Cause*	*Checkpoint*	*Solution*
Carriage motor does not operate.	The carriage motor does not operate at all at power ON.	Foreign substances are lodged in the gears or mechanism.	Move the timing belt manually and check if the carriage motor rotates.	Remove any foreign substances.
		The carriage motor is defective.	Measure the coil resistance of the motor. . Resistance value: Approx. 41.50 ± 7% (25°C)	Replace the carriage motor.
Carriage does not operate normally at power ON. (When the power is turned on with the carriage manually moved to its center position.)	The carriage motor rotates, but the carriage does not move.	Defective belt driven pulley assembly, or belt driving pulley on the shaft of the carriage motor.	Check for broken or worn pulleys.	● Replace the belt driven pulley assembly. ● Replace the carriage motor.
		The timing belt is defective.	Check that timing belt is inserted correctly into the bottom of the carriage.	Reinsert the timing belt.
			Check if the timing belt is broken.	Replace the timing belt.
	The carriage moves left slightly and stops.	Carriage movement is not smooth.	Check if the carriage moves smoothly when it is moved manually.	Clean and lubricate.
			Check if the tension of the timing belt is too high.	Replace the belt tension spring.
	Buzzer rings 5 times.	The home position sensor is defective.	Use an oscilloscope to check the output waveform.	Replace the home position sensor.
Printing is not performed in Self-Test.	The carriage moves, but printing is not performed at all.	The common wires of the head cable are disconnected.	Check the connector for the common wires of the head cable.	. Replace the printhead cable. ● Replace the printhead.
		The contact of the head cable connectors is poor.	Check the connector continuity of the head cable.	
		The common wires of the head cable are disconnected.	Check the continuity of the common wires in the head cable.	
	Printing stops before the end of a page.	The paper guide plate is not in the right postion.	Verify that the paper guide plate is mounted in the right position.	Reset the paper guide plate.
		The paper guide is weak.	Verify that the paper guide is effective.	Replace the paper guide plate.

Table 5-7. Printer Mechanism Unit Repair (cent'd)

Problem	*Symptom*	*Cause*	*Checkpoint*	*Solution*
Printing is abnormal.	**A specific dot is not printed.**	**The ribbon cartridge is installed incorrectly.**	**Check that the ribbon cartridge is installed correctly.**	*Reset the ribbon cartridge.*
		The printhead is disconnected.	**Check the continuity of the printhead.**	*Replace the* **printhead.**
		The head cable is disconnected.	**Check the continuity of the head cable.**	*Replace the head cable.*
		The printhead is defective.	**Measure the coil resistance of the printhead. See Fig. 5-3.** ● **Resistance value: 19.2 Ω ± 10%**	**Replace the printhead.**
			Verify that the dot wire is not broken.	**Replace the printhead.**
	A dot is occasionally not printed.	**The printhead or head cable is not connected correctly.**	**Verify that the printhead or head cable is firmly inserted into the connector.**	**Insert the printhead or head cable firmly.**
			Check for foreign objects in the head cable connector.	**Clean and reconnect,**
		The printhead is defective.	**Verify that the tip of the dot wire is not worn.**	**Replace the printhead.**
	The overall printing color is light, or the printing density is not uniform.	**The printhead is defective.**	**Verify that the tip of the dot wire is not worn.**	**Replace the printhead.**
		The paper thickness lever is not set at the correct position.	**Check that the set position of the paper thickness lever is proper for the paper.**	**Place the lever in the right position.**
		The ribbon life is completed.	**Perform a visual check.**	**Replace the ribbon cartridge.**
		The platen gap is not properly adjusted.		**Perform adjustment according to Section 4.3.1 "Platen Gap Adjustment".**
	The printing is misaligned during bidirectional printing.	**The timing belt tension is not correct, or defective.**	**Verify that the timing belt is inserted firmly into the carriage.**	**Reinsert the timing belt firmly.**
			Check if the timing belt is loose.	**Replace the belt tension spring.**

Table 5-7. Printer Mechanism Unit Repair (cent'd)

Problem	*Symptom*	*Cause*	*Checkpoint*	*Solution*
Paper does not feed correctly.	● Sheet loading mechanism does not operate. . Printing is performed, but the paper is not fed.	The paper end sensor is defective.	Verify that the switch clicks when the paper end sensor lever is approached.	Replace the paper end sensor.
		The paper release lever is not in the right position.	Verify that the paper release lever is in the right position.	Place the lever in the right position.
		Foreign substances are caught in the paper path.	Perform a visual check of the paper path.	Remove any foreign substances.
		The paper feed motor does not drive the gear correctly.	Verify that no foreign substance is lodged between the gears and that the gears are not broken or worn.	. Remove the foreign substance. . Replace the defective gear.
		The paper feed motor is defective.	Measure the coil resistance of the paper feed motor. . Resistance value: 58Ω ± 7%	Replace the paper feed motor.
	The paper feed quantity is not uniform.	The backlash between the paper feed motor and the paper feed reduction gear is not correct.	Check the backlash.	Replace the paper feed reduction gear.
Paper does not feed correctly.	The paper is fed aslant.	Phases of the right and left sprocket assembly do not match.	Verify that the marks on the right and left sprocket assembly are at the same position.	Refer to Section 4.2.3.9 "Tractor Unit Disassembly".
Ribbon feed is da fective.	The ribbon does not feed.	The ribbon cartridge is defective.	Verify that the ribbon is fed when the ribbon cartridge is dismounted and the knob is rotated manually in the direction of the arrow.	Replace the ribbon cartridge.
		Foreign substances are caught in the gears, or the gear is worn.	Verify that the ribbon drive gear rotates when the carriage is moved manually to right and left.	● Remove any foreign substances. ● Replace the defective gear. . Lubricate.
	The ribbon is fed only when the carriage moves to the right *(or to* the left).	The planetary lever in the cartridge holder is defective.	Verify that the planetary lever turns in reverse and engages with the gear when the carriage is moved manually to the right and left.	Replace the belt driven pulley assembly.

Table 5-7. Printer Mechanism Unit Repair (cent'd)

Problem	Symptom	Cause	Checkpoint	Solution
Ribbon feed is defective.	The ribbon feed quantity is not uniform.	The ribbon slips inside the ribbon cartridge.	Verify that the ribbon is fed when the ribbon cartridge is dismounted and the knob is rotated manually in the direction of the arrow.	Replace the ribbon cartridge.
Paper becomes stained.	The paper becomes ink stained where printing is not performed.	The ribbon mask is in the incorrect position.	Verify that the ribbon mask is in the correct position.	Reset the ribbon mask.
		The paper thickness lever is not set at the correct position.	Check that the set position of the paper thickness lever is proper for the paper.	Place the lever in the right position.
		The platen gap is not properly adjusted.		Perform adjustment according to Section 4.3.1 "Platen Gap Adjustment".
Printing is performed after the end of the paper or without paper.	Printing does not stop after the end of the paper.	The paper end sensor is defective.	Verify that the switch clicks when the paper end sensor lever is approached.	Replace the paper end sensor.

CHAPTER 6
MAINTENANCE

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6.1 PREVENTIVE MAINTENANCE

Proper maintenance is essential to maintain optimal printer performance for the longest possible period and to minimize malfunction frequency. Preventive maintenance includes regular cleaning of the case exterior, using alcohol, and occasional vacuuming of the mechanism interior to remove dust and paper particles. Following cleaning, refer to Section 6.2 to verify that the unit is adequately lubricated. Before returning the serviced printer to the consumer, inspect the springs, paper feed rollers, and the basic **operation of the unit.**

WARNING

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

6.2 LUBRICATION AND ADHESIVE APPLICATION

EPSON recommends that the points illustrated in Figure 6-2 be lubricated at the points listed in Table 6-2 with EPSON O-2 and G-27, which have been tested for compliance with the needs of this printer. (Refer to Table 6-1 for details about O-2 and G-27.) Be sure that the parts to be lubricated are clean before applying lubricant, and avoid excessive application, which may damage related parts.
Adhesive application is necessary at the point indicated in Table 6-3 when the part is disassembled or replaced. EPSON recommends Neji lock #2 (G) adhesive be applied to the point diagramed in Figure 6-1. Avoid overflow of excess to related parts.

Table 6-1. Lubricants and Adhesive

Classification	*Description*	*Capacity*	*Availability*	*Parts No.*
Oil	o-2	40 cc	Ⓔ	B7 10200001
Grease	G-27	40 gm	Ⓔ	B702700001
Adhesive	Neji lock #2 (G)	1000 gm	Ⓔ	B730200200

Ⓔ: EPSON-exclusive product

Table 6-2. Lubrication Points (Refer to Figure 6-2)

Ref. No.	Lubrication Points	Lubricant
(1)	Carriage guide shaft. (On the both left and right sides of carriage.)	o-2
(2)	Carriage guide plate. (Contact portion with the carriage. 50 mm (L) X 2 mm (W))	G-27
(3)	Platen gear. (Quarter of gears circle.)	G-27
(4)	Shafts that sets the ribbon gears.	G-27
(5)	Gear portions of the ribbon gears.	G-27
(6)	Felt ring (inside of the carriage)	o-2

NOTE: Lubrication is necessary in the process of assembly.

Table 6-3. Adhesive Application Point (Refer to Figure 6-l.)

Adhesive Application Point	*No. of Point*
Engaging part between timing belt and carriage.	1

<To Timing Belt>

Fig. 6-1. Correct Adhesive Application

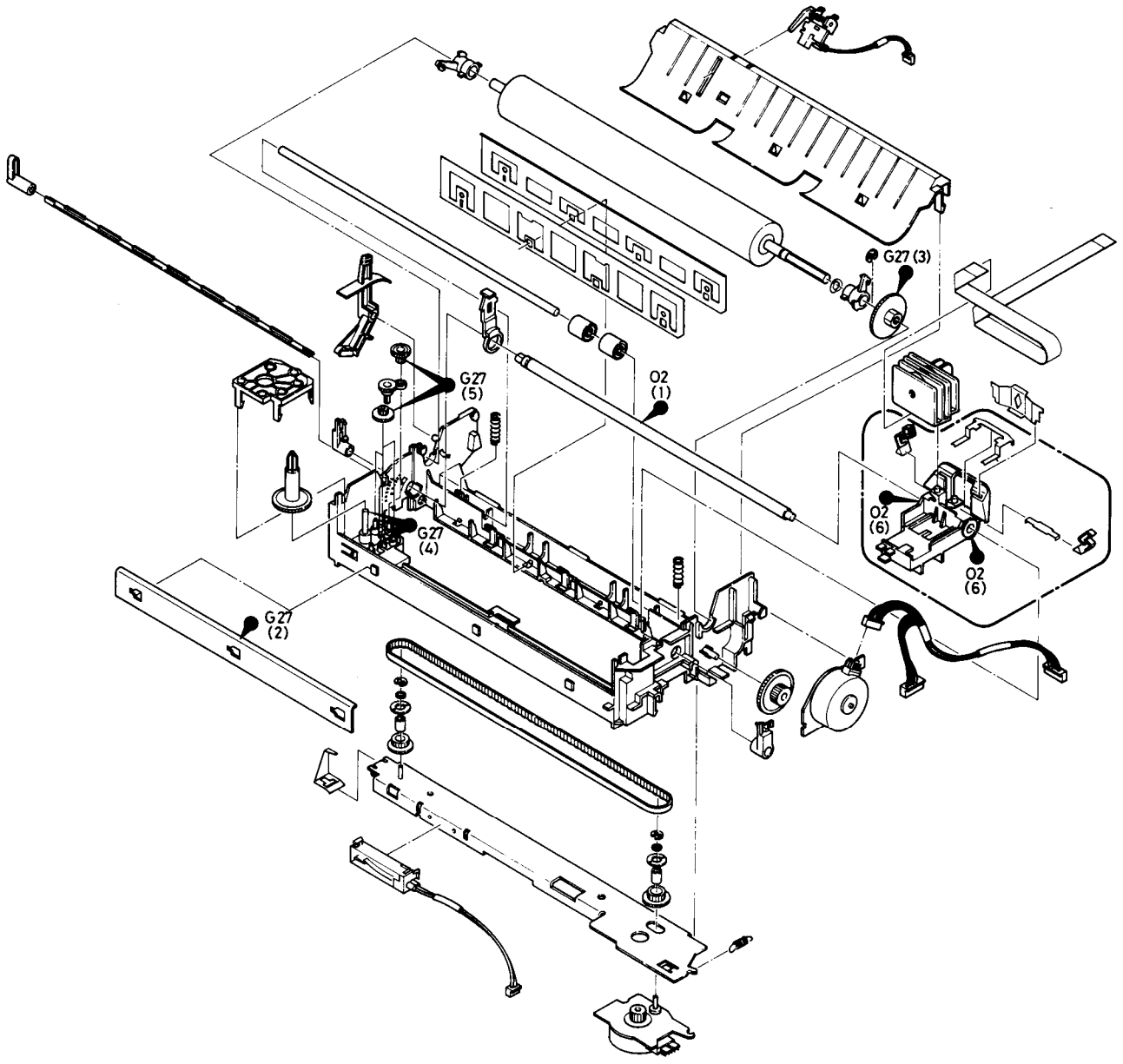


Fig. 6-2. LX-800 Lubrication Points

APPENDIX

LIST OF FIGURES

LIST OF TABLES

A.1 PRINCIPAL IC SPECIFICATIONS

This chapter describes the principal ICs used in LX-800. The ICs are shown in Table A-1.

Table A-1. Primary ICs on the ROCX Board

Location No.	ICs Name	Part Code No.
2B	pPD7810HG	X400078 101
3B	E05A03	Y448800001
4C	2064C	X4001 43644
3A	μPC494C	X440064940
1 c, 2C	7407	X4201 OOO7O

A.1.1 μPD7810HG (CPU)

The 7810 (78 11) HG has the following differences from the conventional G type.

(a) Driving oscillation frequency is guaranteed up to 15 MHz.

(b) Reference voltage AVref (A/D converter reference voltage) is different.

For point (b), the multiplier for the AVref terminal's peripheral circuit is different. Therefore, a board with the HG type can use only HG type replacement parts. (The G type cannot be substituted.)

The μPD78 10/781 1 is an 8-bit CPU that includes two 8-bit timer counters, an 8-bit A/D *converter,* 256 bytes of RAM, and a serial interface. A system can be constructed easily using this IC. The main features of this IC are as:

- 256 bytes of built-in RAM (addresses FFOOH - FFFFH)
- 4096 bytes of mask ROM (addresses O - OFFFH) for the 7811 CPU
- Direct addressing of up to 64K bytes
- 8-bit A/D converter
- 158 instructions
- 1 μs instruction cycle
- 16-bit event counter
- Two 8-bit timer counters
- 3 external and 8 internal interrupts; 6 priority levels and 6 interrupt addresses
- General purpose serial interface (asynchronous, synchronous, and I/O modes)
- I/O line (78 1 1: 40-bit I/O port; 78 10: 24 bit edge detection, 4 inputs)
- Zero cross detection
- Standby function
- Built-in clock pulse circuit
- NMOS

Figures A-1 and A-2 illustrate the 78 10/781 1 microprocessor, and Tables A-2 through A-5 describe its functions.

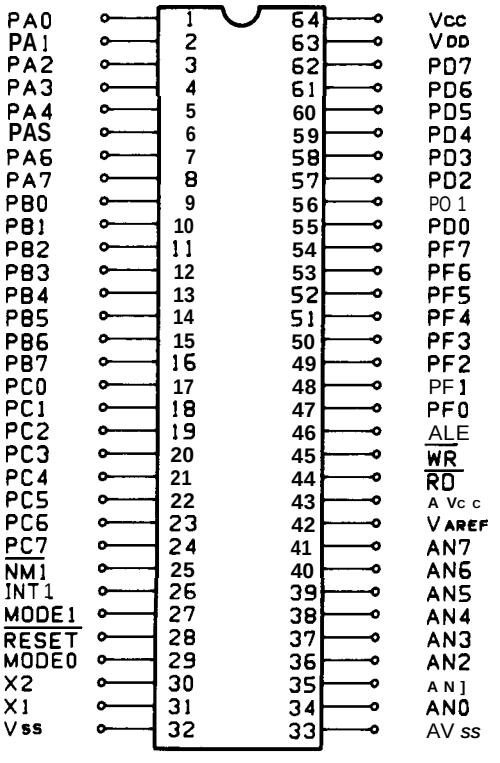


Fig. A-1. pPD7810/7811 Pin Diagram

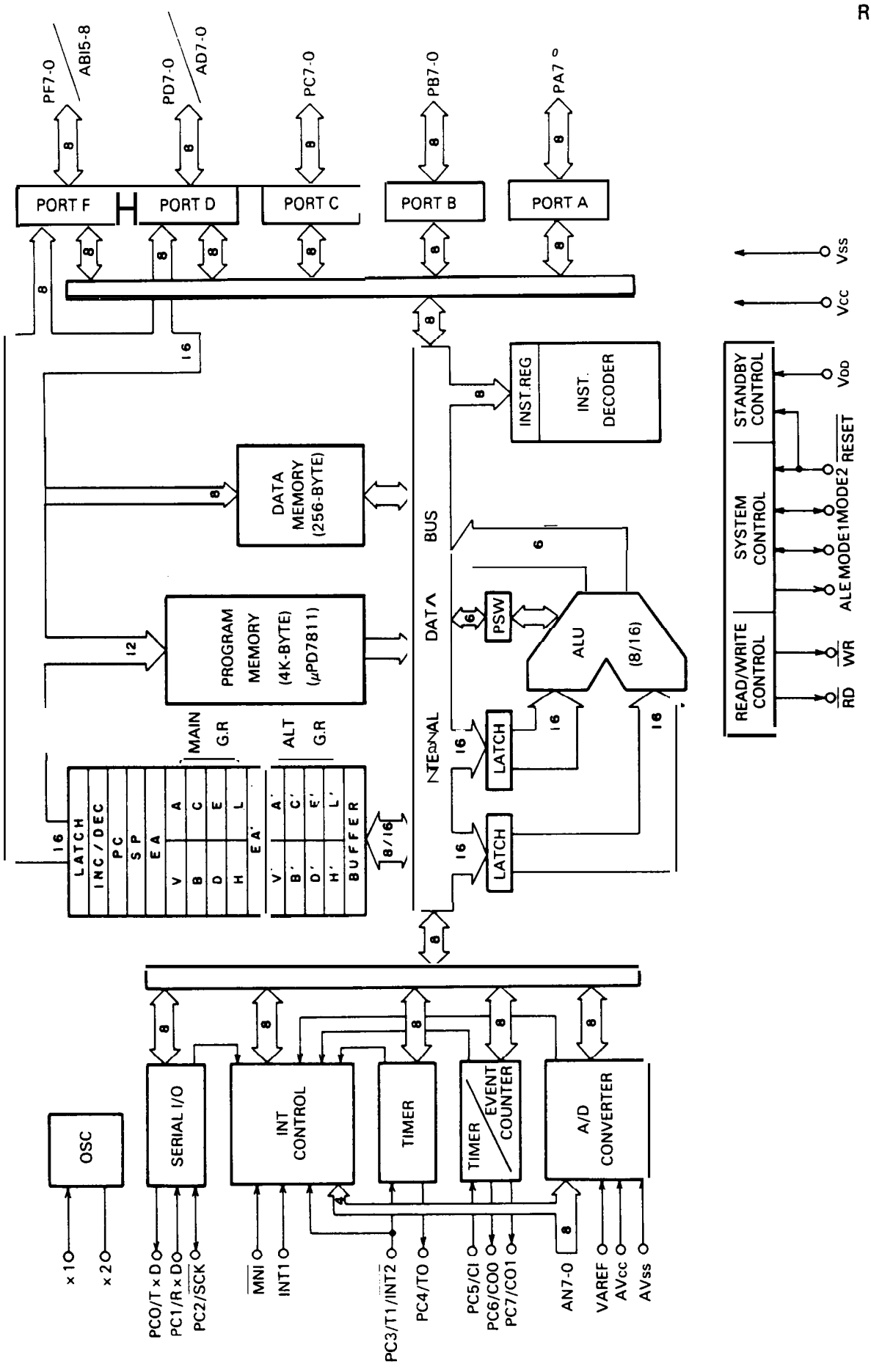


Fig. A-2. wPD7810/7811 Block Diagram

Table A-2. PPD781O Mode Setting

Mode 1	Mode O	External memory
o	0	4K Byte Addresses O to OFFFH
o	1 (Note)	16K Byte Addresses O to 3FFFH
1 (Note)	1 (Note)	64K Byte Addresses O to OFEFFH

NOTE: **Pull-up is made.**

Table A-3. KPD7811 PF Operation

PF7	PF6	PF5	PF4	PF3	PF2	PF1	PF0	External Memory
Port	Port	Port	Port	Port	Port	Port	Port	256 Bytes (max.)
Port	Port	Port	Port	AB11	AB10	AB9	AB8	4K Bytes (max.)
Port	Port	AB 13	AB 12	AB 11	AB10	AB9	AB8	16K Bytes (max.)
AB 15	AB14	AB 13	AB 12	AB 11	AB 10	AB9	AB8	64K Bytes (max.)

Table A-4. **μPD7810** *PF Operation*

MODE 1	MODE O	PF7	PF6	PF5	PF4	PF3	PF2	PF1	PF0	External Memory
o	0	Port	Port	Port	Port	AB 11	AB 10	AB9	AB8	4K Bytes
o	1	Port	Port	AB13	AB12	AB 11	AB10	AB9	AB8	16K Bytes
1	1	AB15	AB 14	AB 13	AB12	AB11	AB10	AB9	AB8	64K Bytes

Table A-5. APD7810/7811 Port Functions

Pin	Signal	Direction	Description
1 - 8	PAO -7	In/Out	Port A. Eight-bit I/O with output latch. I/O possible by mode A (MA) register. Output HIGH.
9 - 16	PBO - 7	In/Out	Port B. Eight-bit I/O with output latch. I/O possible by mode B register (MB). Output HIGH.
17 -24	Pco - 7	In/Out	Port C. Eight-bit I/O with output latch. Port/control mode can be set by mode control C (MCC) register. Output HIGH.
25	NMI	In	Non-maskable interrupt of the edge trigger (trailing edge).
26	INT 1	In	Maskable interrupt input of the edge trigger (leading edge). Also used as the AC input zero cross detecting terminal.
27, 29	MODE 1, 0	In/Out	781 1: O = LOW and 1 = HIGH 7810 modes set in accordance with external memory (see Table A-2).
28	$\overline{\text{RESET}}$	In	LOW reset
30, 31	x2, xl	—	Crystal connection for built-in clock pulse. When clock pulses are supplied externally, input must be to Xl.
32	Vss	·	Supply voltage, Vss, OV
33	AVss	—	Analog Vss
34 - 41	AN0 - 7	In	Eight analog inputs of the A/D converter. AN7 -4 can be used as the input terminals to detect the leading edge and to set the test flag upon detection of the trailing edge.
42	VAref	In	Reference voltage
43	AVcc	—	Analog Vcc
44	$\overline{\text{RD}}$	out	Read strobe. LOW at the read machine cycle and at reset, HIGH at other times.
45	WR	out	Write strobe. LOW during the write machine cycle and at reset, HIGH at other times.
46	ALE	out	Address latch enable. Latches the lower 8 address bits to access external memory.
47 - 54	PFO -7		Port F 781 1: Port bit-by-bit I/O possible by mode F register. In extension mode, gradual address output assignment is possible in accordance with the size of external memory. See Table A-3. 78 10: By setting modes O and 1, assignment to the address bus (AB 15 - 8) can be made in accordance with the size of the external memory. The remaining terminals can be used as I/O ports. See Table A-4.
55 -62	PDO -7		Port D. 781 1: Port bit-by-bit I/O possible. In extension mode, PD7-0 act as the multiplexed address/data bus (AD7-0). 78 10: Multiplexed address/data bus to access external memory.
63	VDD	—	Supply voltage, VDD, +5V
64	Vcc	—	Supply voltage, Vcc, +5V

. CPU Timing (Figures A-3 through A-5)

Three oscillations define one state. The OP code fetch requires four states: during T1 to T3, program memory is read; instructions are interpreted during T4. Address bus lines 15 - 8 are output from T1 to T4. Address bus lines 7 - 0 (PD7 - O) are used in the multiplex mode; the address is latched during T1 at the ALE signal. Since the memory addressed is enabled after disengaging the driver (AD7 - O), $\overline{RD}$ is output from T1 - T3, fetched at T3, and processed internally at T4. The ALE and $\overline{RD}$ signals are executed from T1 - T3; the OP code fetch for these two signals is performed at T4. The WR signal is output from the middle of T1 to the beginning of T3. The address and ALE timing is the same as that for memory read; however, following address output bus lines AD7 -0 (PD7 - O) are not disabled, and write data is output at AD7 - 0 at the beginning of T1 and the end of T3.

NOTE: **When lines PD7 - 0 are set to the multiplexed address/data bus (AD7 - O), and PF7 -0 to the address bus (AB7 - O), the $\overline{RD}$ and WR signals in the machine cycle are high when memory is not being accessed.**

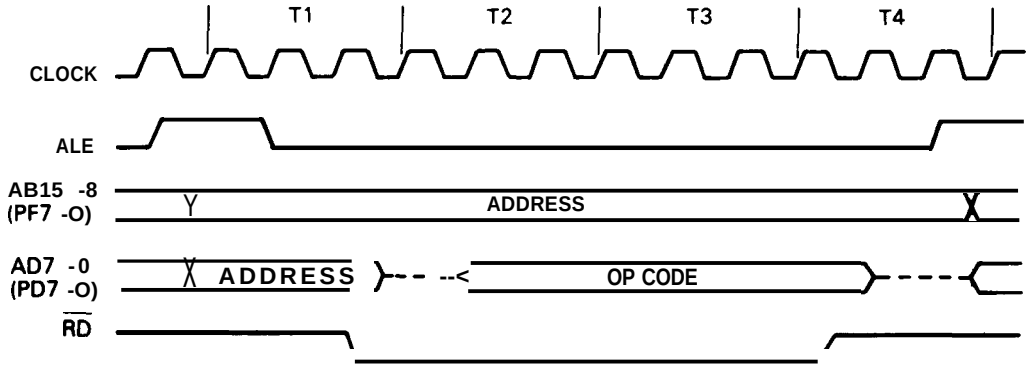


Fig. A-3. OP Code Fetch Timing

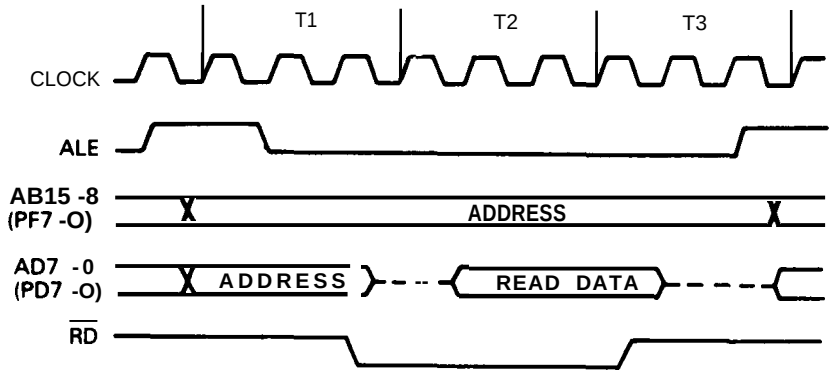


Fig. A-4. Memory Read Timing

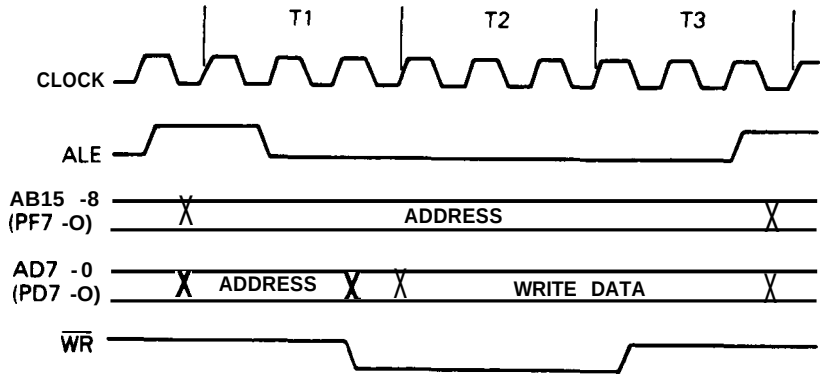


Fig. A-5. Memory Write Timing

A.1.2 E05A03BA (E05A03CA) Gate Array

The E05A03BA gate array intergrates many CPU peripheral functions, so that fewer chips are required to construct a complete system. Figure A-6 shows the E05A03BA pin diagram, and Figure A-7 shows the E05A03BA block diagram. The details of the E05A03BA are given in section 2.4.2.

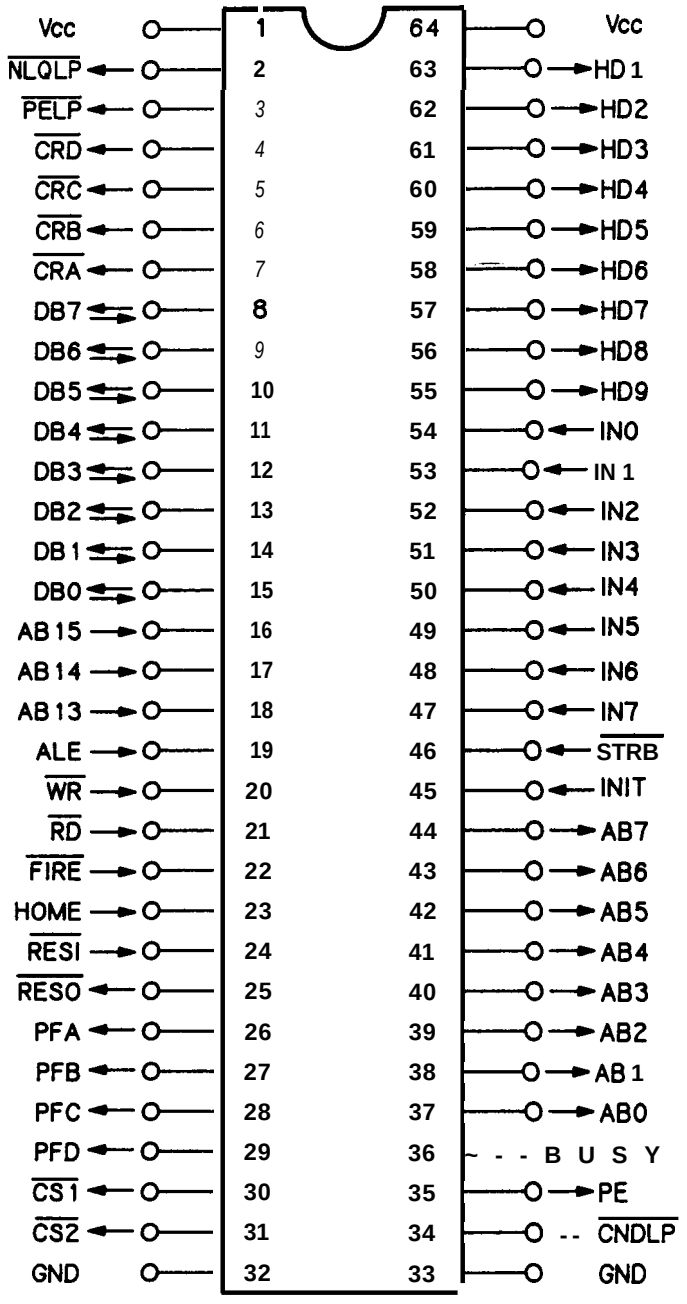


Fig. A-6. E05A03BA (E05A03CA) Pin Diagram

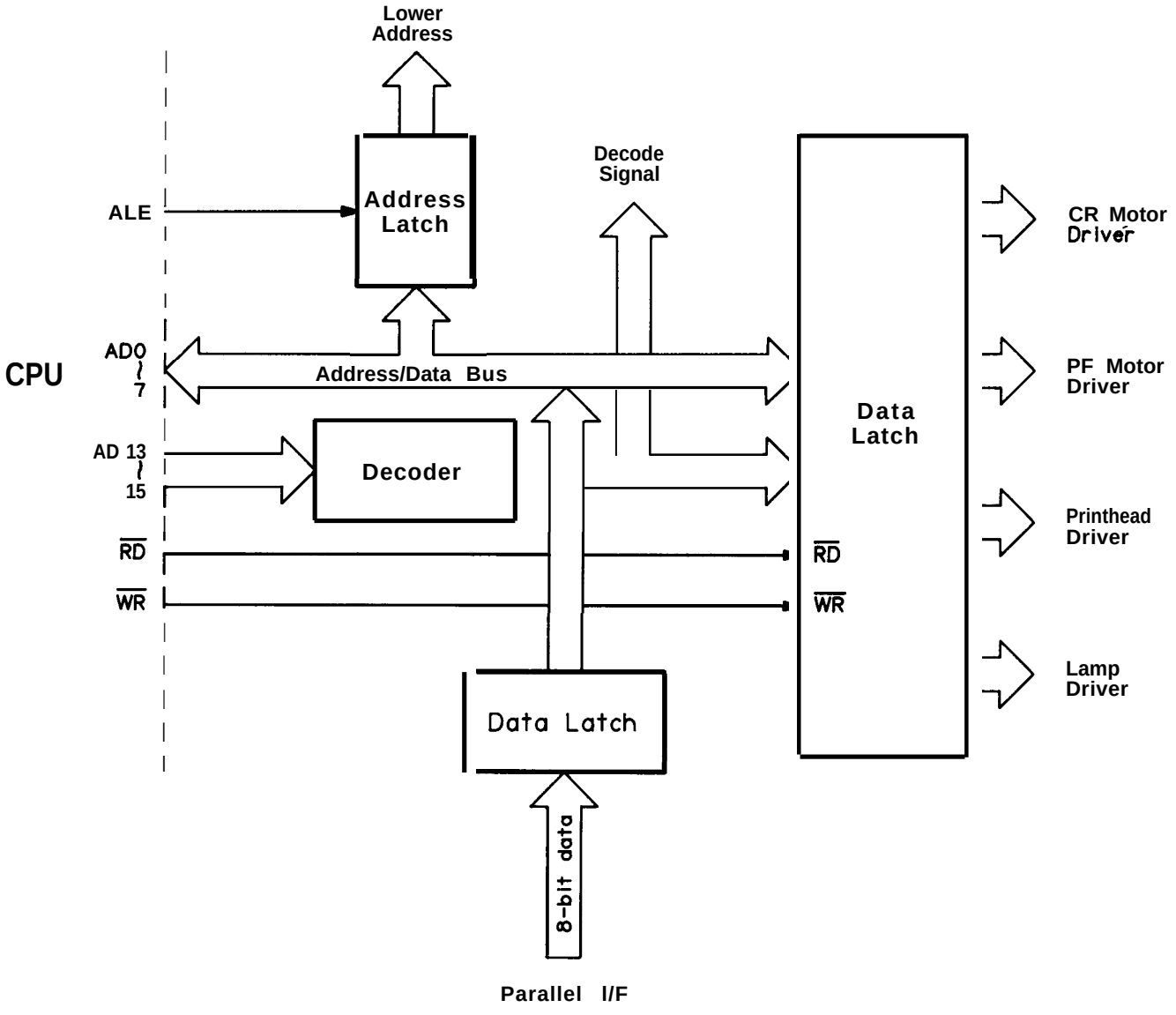


Fig. A-7. E05A03BA **(E05A03CA)** *Block Diagram*

A.1.3 2064C CMOS SRAM

The 2064C is a 8K-byte CMOS static RAM. The 2064C has low power consumption, and its input/output level is compatible with the TTL ICS. Figure A-8 shows the 2064C pin diagram, and Figure A-9 shows *a* block diagram *for the* 2064C *static* RAM.

- Features
  - Capacity of 8192 words X 8 bits
  - . TTL-compatible I/O
  - Power supply + 5V DC
  - 28-pin DIP Switch
- Functions
  - AO - Al 2 Input address
  - w Write enable
  - - Output enable
  - CS1, CS2 Chip select
  - DO - D7 Input/Output data
  - NC No connection

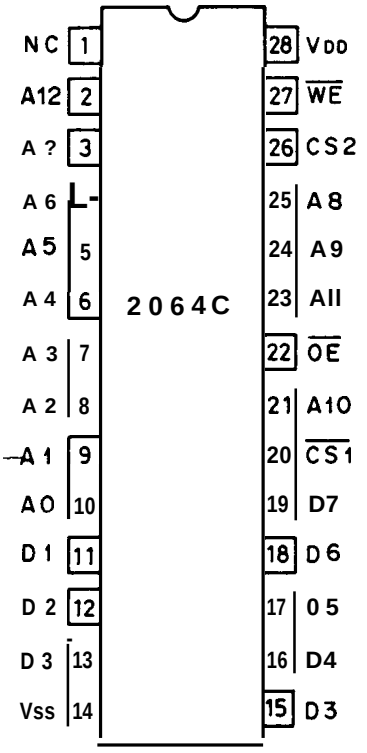


Fig. A-8. **2064C** *Pin Diagram*

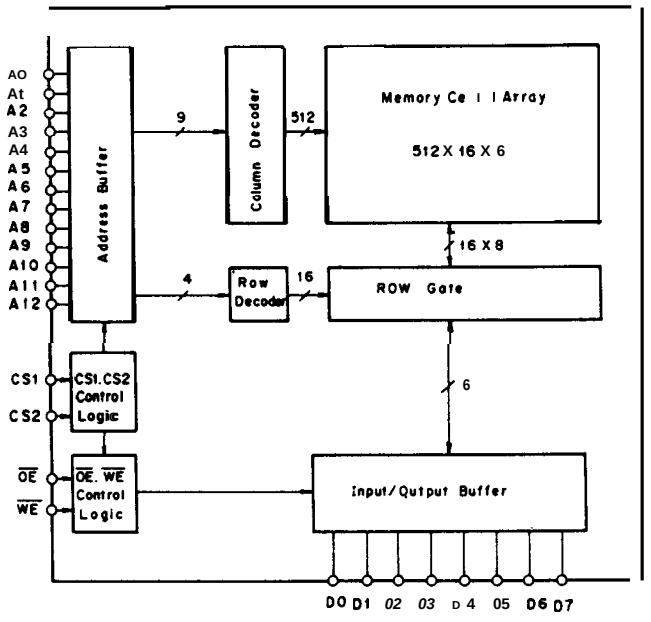


Fig. A-9. **2064C SRAM** *Block Diagram*

Table A-6. **2064C** *Truth Table*

CS1	CS2	$\overline{OE}$	$\overline{WE}$	A0 - A12	DATA I/O	MODE
H	x	—	—	—	High impedance	Wait
—	L	—	—	—	High impedance	Wait
L	H	x	L	Stable	Input data	Read
L	H	L	H	Stable	Output data	Write
L	H	H	H	Stable	High impedance	Output disable

NOTES: 1. X = HIGH or LOW

2. – = HIGH, LOW or High-impedance

A.1.4 494 Regulator IC

The 494 regulator IC is described in Figures A-10 and A-1 1 and Table A-7.

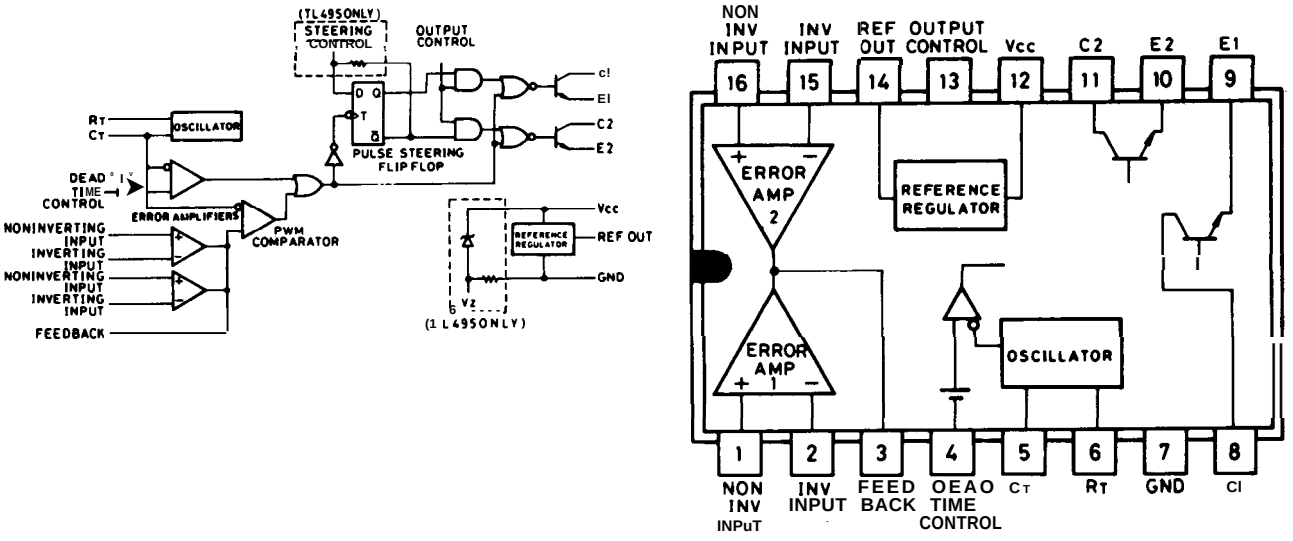


Fig. 'A"-10. 494 **IC** *Pin and Block Diagrams*

Table A-7. 494 **IC** *Port Functions*

pin No.	Signal	*Description*
1	NON INV	Non. Inv. Input of error amplifier for output voltage detection.
2	INV	Inv. Input of error amplifier for output voltage detection.
3	FEEDBACK	Feedback for phase correction.
4	CONTROL	Controls transistor OFF time.
5	CT	Capacitor for oscillation frequency adjustment.
6	RT	Resistor for oscillation frequency adjustment.
7	GND	Ground
8	c I	Transistor collector for pulse amplification.
9	EI	Transistor emitter for pulse amplification.
10	E2	Transistor emitter for pulse amplification.
11	C2	Transistor collector for pulse amplification.
12	Vcc	Power
13	OUTPUT CONTROL	Selection of parallel or push-pull.
14	REF OUT	● 1-5V reference voltage
15	INV	Inv. Input of error amplifier for output current detection.
16	NON INV	Non. Inv. Input of error amplifier for output current detection.

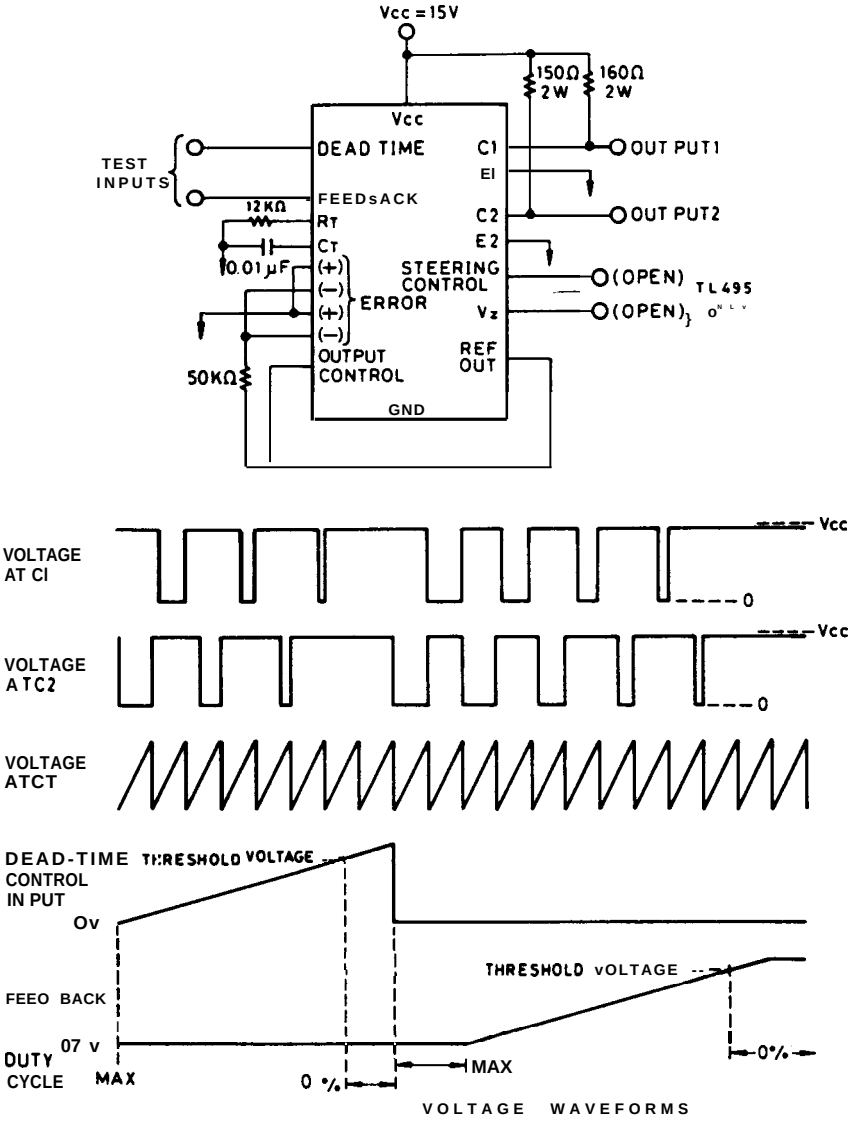


Fig. A-1 1.494 Dead Time and Feedback Control

A.1.5 7407

The 7407 has hex open-collector buffers as shown in Figure A-12.

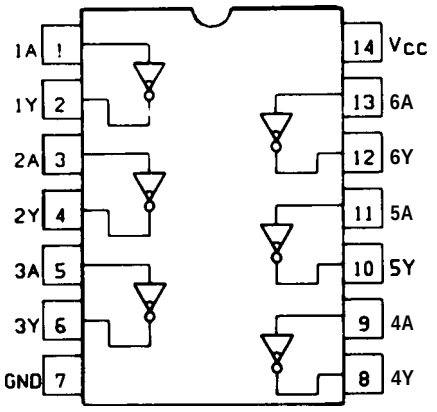


Fig. A-1 2. 7407 Pin Diagram

A.2 SCHEMATICS AND DIAGRAMS

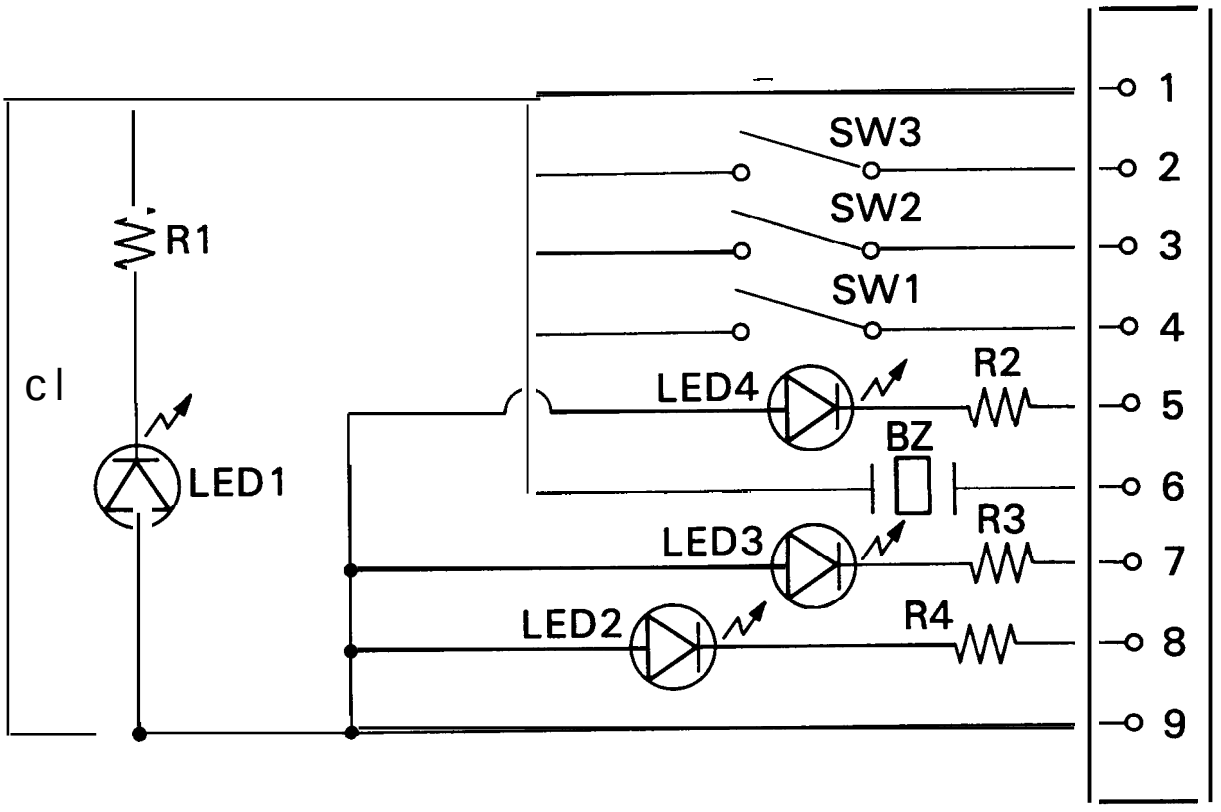
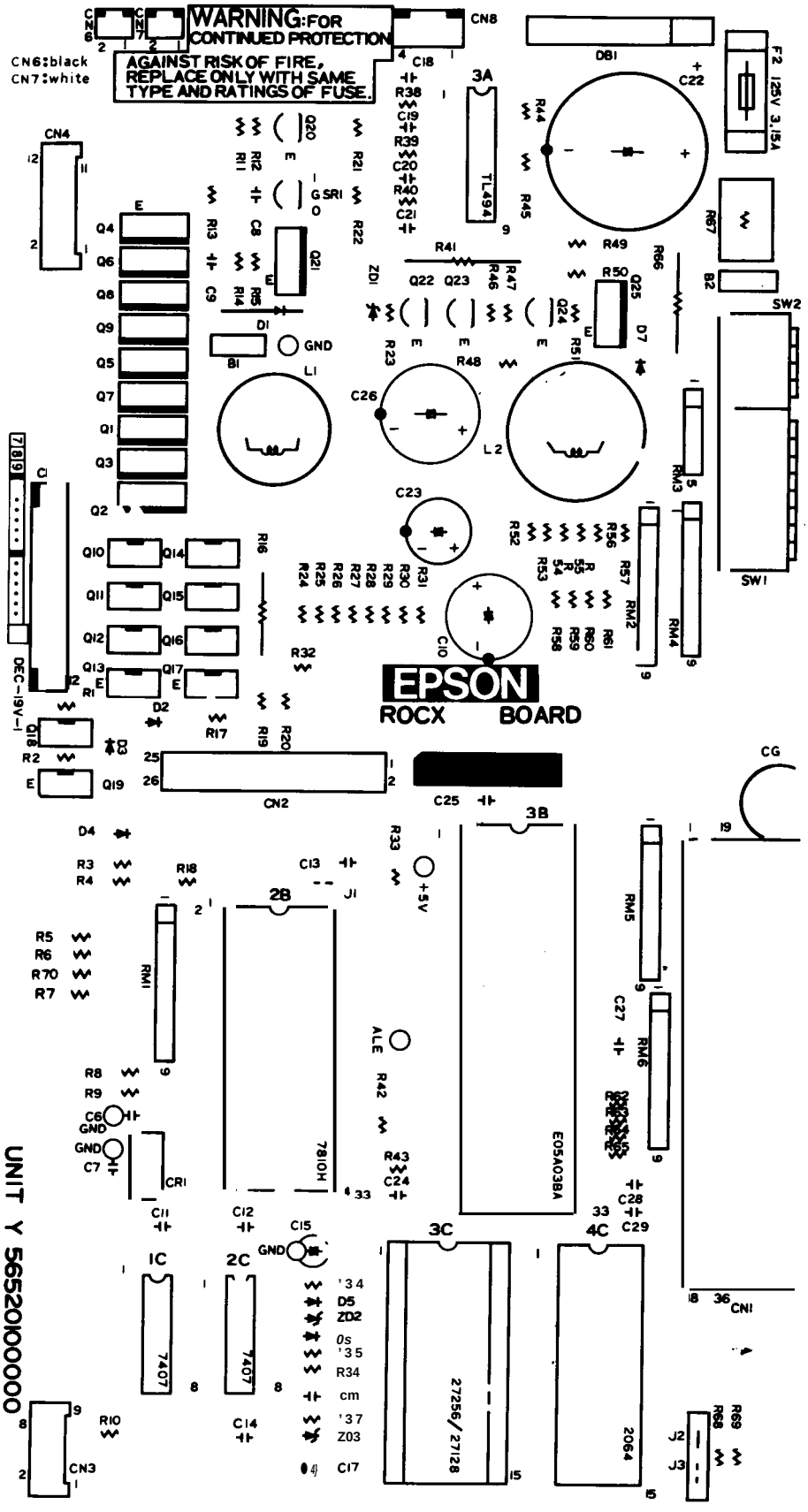


Fig. A-1 3. LCPNL Circuit Diagram



Fig, A-15, ROCX Board Component Layout

Table A-16. Part No. **Reference** *Table*

Ref. No.	Description	Ref. No.	Description
100	LOWER CASE ASSEMBLY	424	RETAINING RING TYPE-E (2.3)
101	BASE PLATE	425	CARRIAGE UNIT
102	RUBBER FOOT	426	HEAD GROUND PLATE
103	INSULATOR	427	HEAD LOCK LEVER SPRING
104	GROUND PLATE	428	HEAD LOCK LEVER (LEFT)
105	DAMPER	429	HEAD LOCK LEVER (RIGHT)
106	CTB SCREN (M3×8)	430	PAPER END SENSOR
107	CTPS(0) SCREW (M3×6)	431	PAPER GUIDE
108	UPPER CASE	432	PLATEN
109	GEAR WHEEL COVER	433	SHAFT HOLDER
110	PAPER FEED KNOB	434	PLATEN GEAR
111	SHEET GUIDE FRAME	435	LEAF SPRING 8.2 X 0.15 × 15
112	SHEET GUIDE (LEFT)	436	RETAINING RING TYPE-E (6)
113	SHEET GUIDE (RIGHT)	437	CARRIAGE GUIDE SHAFT
114	LOGO PLATE	438	CARRIAGE GUIDE SHAFT LEVER (LEFT)
115	PRINTER COVER A	439	CARRIAGE GUIDE SHAFT LEVER (RIGHT)
116	PRINTER COVER B	440	CARRIAGE GUIDE SHAFT GROUND PLATE
117	CTB SCREW (M4×12)		
118	CBO SCREW (M4×8)	441	CARRIAGE GUIDE
119	CTC SCREW (M3×6)	442	HEAD ADJUSTMENT LEVER
120	CTBS(0) SCREW (M4×8)	443	MOTOR CABLE
121	PAPER GUIDE	444	HEAD CABLE
200	ROCX BOARD UNIT	445	RIBBON MASK
250	LCPNL PANEL	446	PAPER FEED MOTOR
300	ROC FILTER UNIT (120V)	447	PAPER FEED REDUCTION GEAR
301	ROC FILTER UNIT (220V)	448	PRINTHEAD
302	ROC FILTER UNIT (240V)	501	SPROCKET ASSEMBLY (LEFT)
303	ROC FILTER UNIT (120V. 2PLUGS)	502	SPROCKET ASSEMBLY (RIGHT)
304	FUSE (125V/1.25A)	503	PAPER HOLDING COVER (LEFT)
305	FUSE (250V/0.63A)	504	PAPER HOLDING COVER (RIGHT)
400	PRINTER MECHANISM UNIT	505	PAPER HOLDING COVER SPRING
401	RIBBON PLANETARY LEVER ASSEMBLY	506	SPROCKET LOCK LEVER
402	FRAME	507	SHAFT HOLDER
403	PAPER RELEASE LEVER	508	SPROCKET MOUNTING PLATE (LEFT)
404	PAPER GUIDE PLATE	509	SPROCKET MOUNTING PLATE (RIGHT)
405	PAPER GUIDE PLATE RELEASE SHAFT	510	SPROCKET SHAFT
406	PAPER GUIDE PLATE RELEASE LEVER	511	SPROCKET GEAR
407	PAPER FEED ROLLER	512	SPROCKET TRANSMISSION GEAR
408	PAPER FEED ROLLER SHAFT	513	SPROCKET GUIDE SHAFT
409	RIBBON DRIVING GEAR	514	SIDE COVER (LEFT)
410	RIBBON TRANSMISSION GEAR	515	SIDE COVER (RIGHT)
411	RIBBON GEAR	516	PAPER GUIDE ROLLER
412	RIBBON GEARS COVER		
413	PAPER FEEDING ROLLER SPRING		
414	PAPER GUIDE PLATE SPACER		
415	CARRIAGE MOTOR FRAME		
416	HOME POSITION SENSOR		
417	CARRIAGE MOTOR		
418	TIMING BELT		
419	BELT PULLEY		
420	BELT PULLEY FLANGE		
421	BELT PULLEY SHAFT HOLDER		
422	BELT TENSION SPRING		
423	PLAIN WASHER 3.2 X 0.5 X 7		

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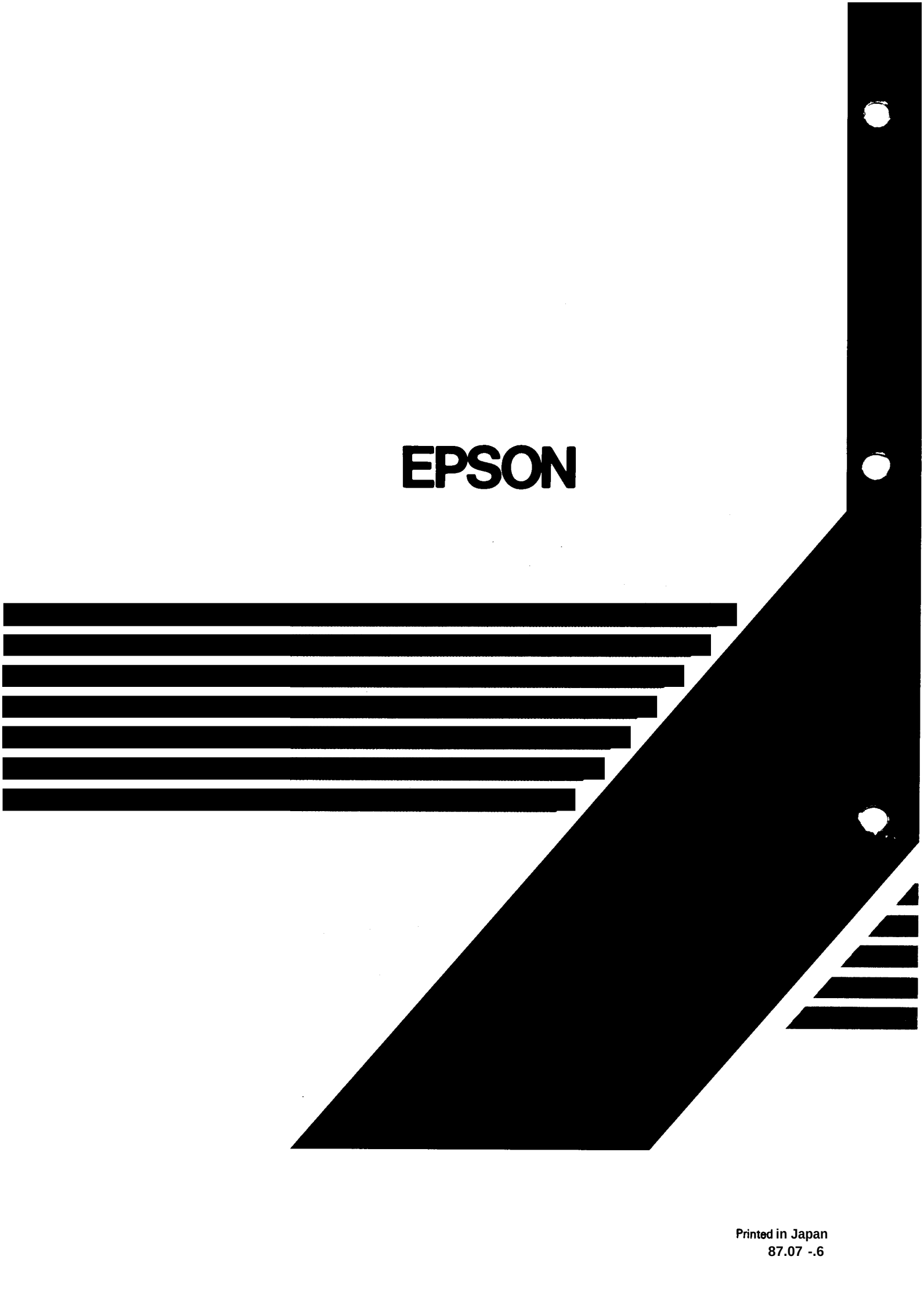
Phone: 410-3400
Telex: 50129 STTK

SEIKO EPSON CORPORATION
(Hirooka Office)
80 Harashinden, Hirooka
Shiojiri-shi, Nagano-ken
399-07 Japan
Phone: (0263) 52-2552
Telex: 3342-214 (SEPSON J)



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