LX-810/850

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 the consequences thereof.

PRECAUTIONS

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

DANGER Signals a precaution which, if ignored, could result in serious or fatal personal injury. Great caution should be exercised in performing procedures preceded by a 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 THAT THE EP'SON 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-8 10/850.
The instructions and procedures included herein are intended for the experienced repair technician, and attention should be given 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 TABLE

REVISION	DATE ISSUED	CHANGE DOCUMENT
A	Mar 27, 1989	1st issue

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CHAPTER 1
GENERAL DESCRIPTION

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1.1 FEATURES

The LX-8 10/850 is a small, light-weight, low-cost, advanced paper handling printer comparable to the LX-800. Its main features are:

1. Advanced paper handling: Auto backout and cut sheet loading
2. Expanded ESC/P-code printing, implemented as a standard feature
3. Printing speeds: 200 cps (high speed draft)
   150 cps (draft 10 cpi)
   180 cps (draft 12 cpi)
4. Optional 8100 series interface
5. Clear, easy-to-read printing with a standard EPSON font
6. Two built-in NLQ (Near Letter Quality) fonts (Roman and Saris Serif)
7. Control panel switch selection of Draft, Roman, or Saris Serif font
8. Control panel switch selection of normal or condensed printing
9. Control panel mode settingd are saved in non-volatile memory
10. Easy handling of cut sheets with the optional cut-sheet feeder (CSF)

The LX-8 10/850 is equipped with the standard EPSON 8-bit parallel interface. Various interface options enable users to print data from a variety of computers. Table 1-1 lists the interface options, Table 1-2 lists the optional units available for the LX-8 10/850, and Figure 1-1 shows an exterior view of the LX-8 10/850.

Table 1-1. Interface Options

Model	Description
8143	New serial interface board
8148	Intelligent serial interface board
8165	Intelligent IEEE-488 interface board

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

Table 1-2. Optional Units

Model	Description
C8061 2*	Single bin cut sheet feeder
C80006*	Pull tractor unit
8310	Roll paper holder
8750	Ribbon cartridge (Black)

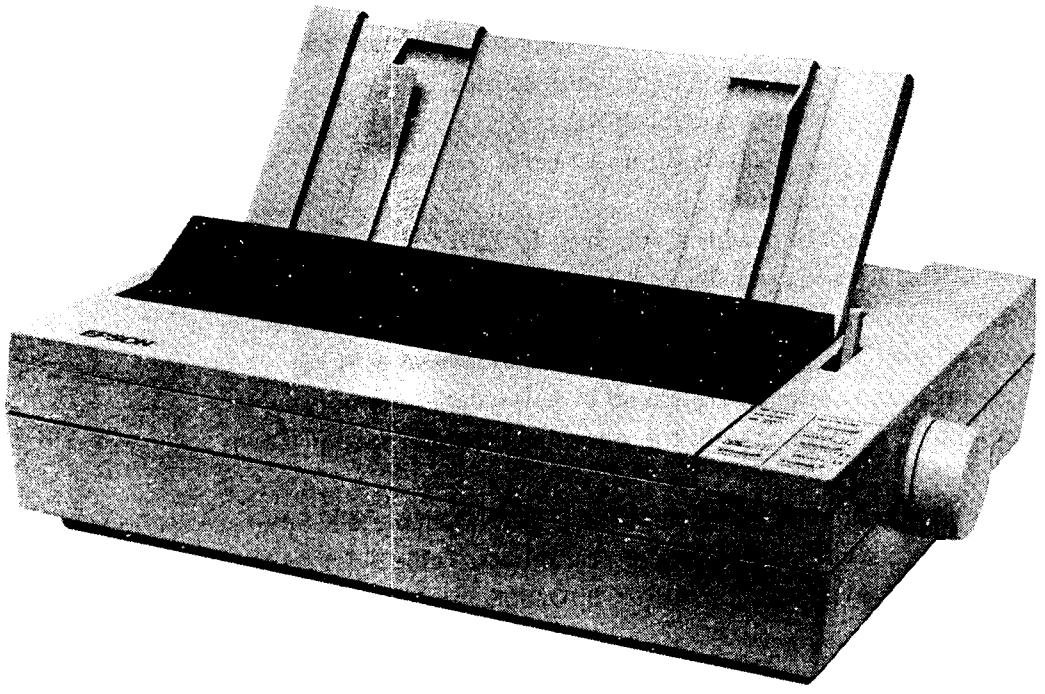


Figure 1-1. Exterior *View of the LX-81 0/850*

1.2 SPECIFICATIONS

This section describes LX-8 10/850 printer specifications.

1.2.1 Hardware Specifications

Printing Method	Serial, impact, dot matrix
Pin Configuration	9 wires (diameter 0.29mm)

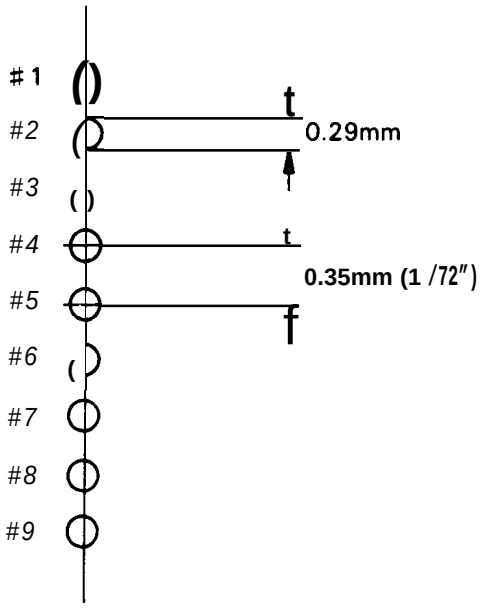


Figure 1-2. Pin Configuration

Feeding Method	Friction feed, tractor feed (push tractor: standard, pull tractor: optional)

When handling paper, note the following precautions described below

Friction Feed Precautions:

1. Do not use continuous paper.
2. Do not use a single sheet shorter than 182mm or longer than 364mm.
3. Do not perform any reverse paper feed within 8.5mm from the top, or 22mm from the bottom.
4. Do not perform reverse feed greater than 1/6 inch after the paper end is detected.
5. Use the pull-out unit.
6. Do not use multi-part single sheet forms.

Tractor Feed Precautions:

1. Release the friction feed mechanism.
2. Joining of copying paper must be by line or dotted pasting.
3. Copy paper must be a carbon-less, multi-part paper.

a. Push Tractor Feed

1. Use the pull-out unit.
2. Do not perform reverse feeding greater than 1/6 inch.
3. After paper end detection, accuracy of paper feed cannot be assured and reverse feeding cannot be performed.

b. Push Pull Feed

1. Remove the pull-out unit and attach the pull tractor unit.
2. Do not loosen the paper between the platen and pull tractor unit.
3. Adjust precisely the horizontal position of the pull and push tractor.
4. Do not perform reverse feeding greater than 1/6 inch.
5. Do not perform reverse feeding after the paper end is detected.

c. Pull Tractor Feed

1. Remove the pull-out unit and attach the pull tractor unit.

Line Spacing	1/6 inch, 1/'8 inch, or programmable in units of 1/216 inch
Paper Insertion	From rear
Paper-Feed Speed	Approximately 95 ins/line (1/6 inch line feeding)
	Approximately 75 ins/line (1/6 inch in page feed)

Paper Specifications See Table 1-3 through 1-6

Table 1-3. Cut-Sheet Specifications

Width	182 mm to 257 mm (7.15 in. to 10.1 in.)
Length	182 mm to 364 mm (7.15 in. to 14.3 in.)
Thickness	0.065 mm to 0.14 mm (0.0025 in. to 0.0055 in.)
Weight	14 lb. to 24 lb. (52.3 g/m² to 90 g/m²)
Quality	Plain paper
Copies	Not available

Table 1-4. Continuous Paper Specifications

Width	101 mm to 254 mm (4.0 in. to 10.0 in.)
Copies	3 sheets (1 original and 2 copies)
Quality	Plain paper
Total Thickness	0.065 mm to 0.25 mm (0.0025 in. to 0.01 in.)
Weight	1 sheet - 14 lb. to 22 lb., (52.3 g/m² to 82 g/m²)
	3 sheets -- 12 lb. to 15 lb., (40 g/m² to 58.2 g/m²) each

Table 1-5. Roll Paper Specifications

Width	216 mm ± 3 mm (8.5 in. ± 0.12 in.)
Weight	14 lb. to 17 lb. (45 kg to 55 kg)
Quality	Plain paper
Thickness	0.07 mm to 0.09 mm (0.0028 in. to 0.0035 in.)

Table 1-6. Envelope Specifications

Size	No.6 (166 mm x 92 mm), No. 10 (240 mm x 104 mm)
Quality	Bond paper, Plain paper, Air mail
Thickness	0.16 mm to 0.52 mm (0.0063 in. to 0.0197 in.) Difference of thickness within printing area must be less than 0.25 rnm (0.0098 in.).
Weight	12 lb. to 24 lb. (45 g/m² to 91 g/m²)

NOTES: " Envelope printing is only available at normal temperature.
* Keep the *long* side of the envelope horizontal at setting.
* Set the left of a No.6 envelope at the setting mark of the sheet guide.

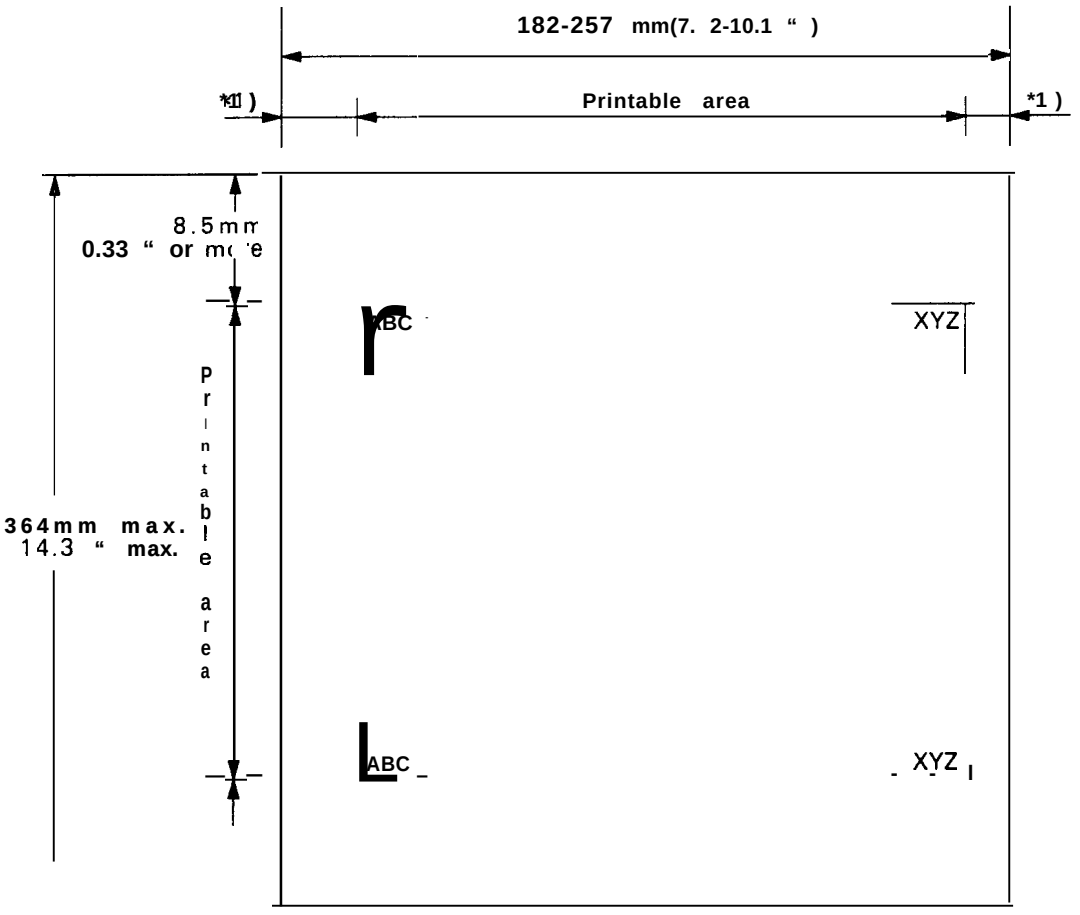
Table 1-7. Label Specifications

Size	2 1/2 in. X 15/16 in. (63.5 mm X 23.8 mm)
Weight	55Kg (68 g/m²)
Thickness	O.19 mm (0.0075 in.) max. Thickness excluding the base paper must be equal to or less than 0.12 mm (0.0075 in.).

NOTES: * Label printing is only available at normal temperature.
- Labels must be a fanfold type.
- For printing labels on pressure sensitive paper, the following conditions must be met: (1) jointed by dotted or line pasting. (2) total thickness is equal to or less than 0.3mm (0.01 18 inch). (3) 5 degree C to 35 degree C and 10% to 80% RH.

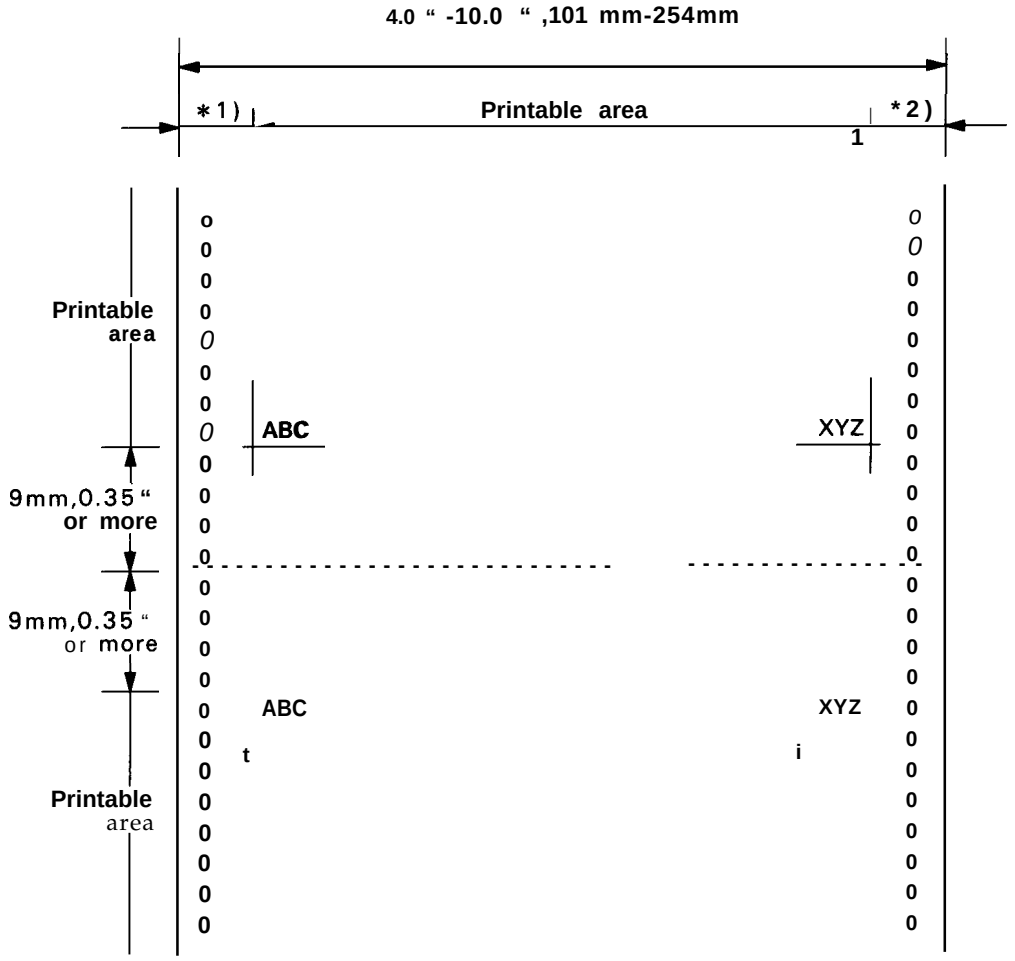
Printing Area

The figures **below show the printing area for cut sheets.**



- **1) At least 3.0 mm (O. 12 in.) when the paper width is less than 229 mm (9 in.); at least 24 mm (0.9 in.) when the paper width is 257 mm (10.1 in.)**
- **Printing is possible approx. 28 mm from the paper's detected bottom edge; the 13.5 mm value (lowest print position) is for reference only. Paper feed accuracy can not be assured within 22 mm (0.87 in.) of either the top or bottom edge.**

Figure 1 -3. Cut-Sheet Printing Area



● 1) 13 mm or greater for paper widths of 101 - 242 mm (4 - 9.5. in.)
26 mm or greater for paper widths of 254 mm (10 in.)
*2) 13 mm or greater for paper widths of 101 - 242 mm (4 -9.5 in.)
24 mm or greater for paper widths of 254 mm (1 O in.)

Figure 1-4. Printing Area for Continuous Paper

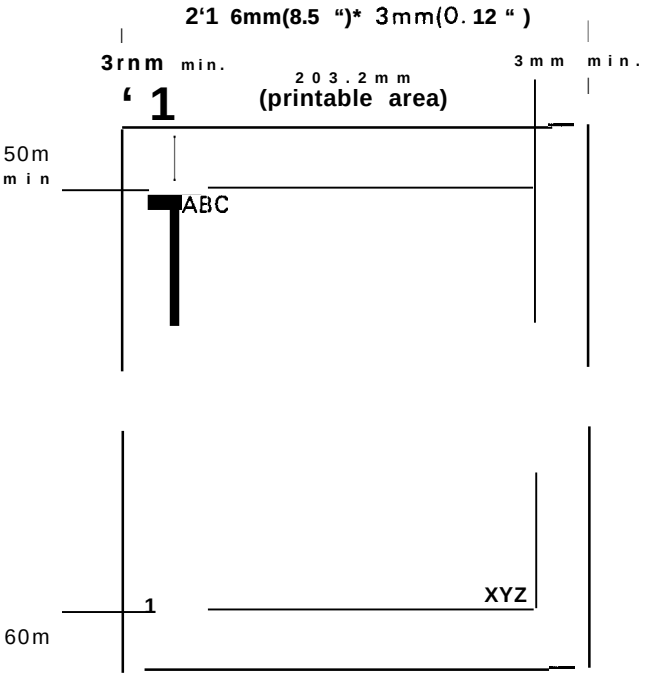


Figure **1-5.** *Roll Paper Printing Area*

Ink Ribbon

Type:	**8750 Ribbon Cartridge**
Color:	**Black**
Reliability:	**3 million characters at 14 dots/character**

Reliability

Mean Cycles Between Failure (MCBF):	**3 million lines (excluding printhead)**
Mean Time Between Failure (MTBF):	**4000 POH (25% duty)**
Life of Printhead	**200 million strokes/wire**

Safety Approval

Safety Standards	**UL478 (U.S. version)**
	CSA22.2 #220 (Canada version)
	VDE0806 (TUV) (European version)
Radio Frequency Interference (RFI)	**FCC class B (U.S. version)**
	VDE 0871 (Self-certification)(European version)

Electrical Specifications

Power Conditions	120 VAC ± 10% (120V version)
	220/240 VAC ± 10% (220/240V version)
Frequency Range	49.5 to 60.5 Hz
Power Consumption	28W (Draft self-test)
insulation Resistance	10 Mgohms min. (Between AC Line and Chassis)
Dielectric Strength	(At 50 or 60 Hz, between the AC line and chassis)
120V Version	1 KV AC (rms/minute) or 1250V AC (rms/second)
220/240V Version	1.5KV AC (rms/1 O minutes) or 1250V AC (rms/second)

Environmental Conditions

Temperature	5 to 35 degrees C (41 to 95 degrees F) -operating
	–30 to 60 degrees C (-22 to 149 degrees F) -storage
Humidity	10 to 80 % RH (no condensation) –operating
	5 to 85 % RH (no condensation) -storage
Resistance to Shock	1 G, within 1 mS -operating
	2 G, within 1 mS -storage
Resistance to Vibration	0.25 G, 55 Hz max. -operating
	0.50 G, 55 Hz max. -storage

Physical Specifications

Weight	5.75 Kg
Dimensions	418 mm (Width) X 339 mm (Depth) X 141 mm(Height), excluding knobs and paper guides

1.2.2 Firmware Specifications (ESC/P)

Control Code	ESC/P™level ESC/P-81
	(EPSON Standard Code for Printers)
Printing Direction	Bi-directional printing with logic seeking (text)
	Uni-directional (left to right) printing (Bit-image)
Input data buffer	4 K bytes
Character Set	96 ASCII characters
	96 Italic characters
	32 International characters (13 countries)
	32 International Italic characters
	96 IBM Graphics characters
Font	EPSON NLQ Roman
	EPSON NLQ Saris Serif
	EPSON Draft
Printing Speed	See Table 1-8

Table 1-8. Printing Speed

Type of Letters	Print Speed (cps)
High Speed Draft	200
Pica	150
Elite	180
Double-Width	75
Emphasized	75
Double-Width Emphasized	37
Condensed	128
Double-Width condensed	64
Double-Width Elite	90
Condensed Elite	150
NLQ Pica	25
NLQ Elite	30

Dot-matrix Format	9×9 Text mode (Draft)
	18 X 20 Text mode (NLQ)
Character Size	See Table 1-9

Table 1-9. Character Size

Type of Letters	Width (mm)	Height (mm)
Pica	2.1	3.1
Elite	1.7	3.1
Condensed	1.05	3.1
Double-Width Pica	4.2	3.1
Double-Width Elite	3.4	3.1
Double-Width Condensed	2.1	3.1
Condensed Elite	0.85	3.1
Emphasized	2.1	3.1
Double-Width Emphasized	4.2	3.1
Super/Subscript	Depends On Pitch	1.6

Printing Columns See Table 1-10

Table 1-10. Column Width (maximum characters/line)

Type of Letters	Column Width (CPL)	Column/inch (cpi)
Pica	80	10
Elite	96	12
Condensed	137	17
Double-Width Pica	40	5
Double-Width emphasized	40	5
Double-Width Elite	48	6
Double-Width Condensed	68	8.5
Condensed Elite	160	20
Emphasized	80	10

1.3 INTERFACE OVERVIEW

The standard 8-bit parallel interface provided with this printer meets the specifications described below.

Data Format	**8-bit parallel**
Synchronization	**By $\overline{\text{STROBE}}$ pulse**
Handshaking	**By BUSY and $\overline{\text{ACKNLG}}$ signal**
Signal Level	TTL-compatible
Adaptable Connector	**57-30360 (amphanol) or equivalent**
Data Transmission Timing	**See Figure 1-6**

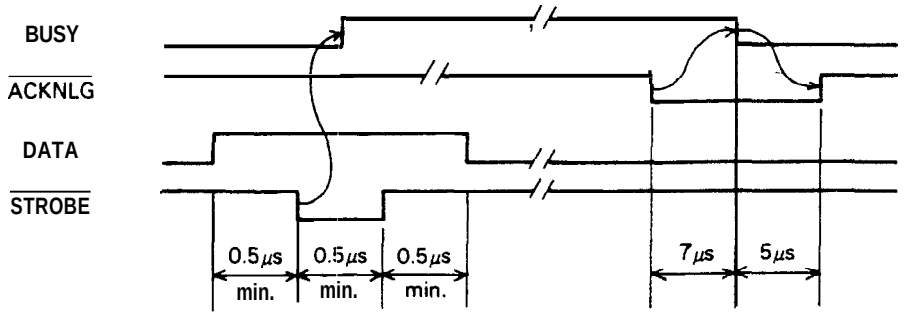


Figure 1-6. Data Transmission Timing

Table 1-11 shows the connector pin assignments and signal functions of the 8-bit parallel interface.

Table 1-11. Connector Pin Assignments and Signal Functions

Pin No.	Signal Name	Return Pin No.	DIR	Functional Description
1	$\overline{\text{STRORE}}$	19	In	Strobe pulse to read the input data. Pulse width must be more than 0.5μs. Input data is latched at falling edge of this signal.
2	DATA 1	20	In	Parallel input data to the printer. "HIGH" level means data " 1". "LOW" level means data "O".
3	DATA 2	21	In	
4	DATA 3	22	In	
5	DATA 4	23	In	
6	DATA 5	24	In	
7	DATA 6	25	In	
8	DATA 7	26	In	
9	DATA 8	27	In	
10	$\overline{\text{ACKNLG}}$	28	out	This pulse indicates data is received and ready to accept next data. Pulse width is 12μs approx.
11	BUSY	29	out	"HIGH" indecates printer cannot 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 3.3kohms register.)

Table 1-11. Connector Pin Assignments and Signal Functions (Cont.)

Pin No.	Signal Name	Return Pin No.	DIR	Functional Description
14	$\overline{\text{AUTOFEED-XT}}$	—	In	if "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			Grounds for twisted-pair grounding
31	I NIT	16	In	Pulse (Width: 50μs min., active "LOW") input for printer initialization.
32	$\overline{\text{ERROR}}$		out	"LOW" indicates some error is occurred in the printer.
33	GND	—	—	Ground for twisted-pair grounding
34		—	—	Not used
35		—	Out	Always "HIGH". (Pulled up to +5V through 3.3 Kohms register.)
36	$\overline{\text{SLCT-IN}}$	—	In	If "LOW" when prinater is initialized, the DC1/DC3 control is disabled.

NOTES: 1. "DIR" refers to the direction of the signal flow as viewed from the printer.

2. "Return" denotes a twisted-pair return line.

3. The cable used must be shielded to prevent noise.

4. **All interface conditions are based on TTL levels. Both the rise and fall times of all signals must be less than 0.2 us.**

5. The $\overline{\text{AUTO FEED-XT}}$ signal can be set LOW by DIP switch 2-4.

6. The $\overline{\text{SELECT-IN}}$ signal can be set LOW by jumper 1.

7. Printing tests, including interface circuit tests, can be performed without using external equipment by setting DATA 1-8 of the interface connector to certain codes and connecting the $\overline{\text{ACKNLG}}$ signal to the $\overline{\text{STROBE}}$ signal.

Table 1-12 shows Printer Select/Deselect (DC1/DC3) control, including relations among ON-LINE, $\overline{\text{SELECT-IN}}$ input, DC 1/DC3 and interface signals.

Table 1-12. Printer Select/Deselect Control

ON-LINE SW	$\overline{\text{SLCT-IN}}$	DC1/DC3	$\overline{\text{ERROR}}$	BUSY	$\overline{\text{ACKNLG}}$	DATA ENTRY
OFF-LINE	HIGH/LOW	DC 1/DC3	LOW	HIGH	No pulse	Disable
ON-LINE	HIGH	DC 1	HIGH	LOW/HIGH (During data entry)	Pulse output after entry	Enable(Normal Process)
		DC3	HIGH	LOW/HIGH (During data entry)	Pulse output after entry	Enable (Waits DC 1. See Note 2)
	LOW	DC 1	HIGH	LOW/HIGH (During data entry)	Pulse output after entry	Enable (Normal process)
		DC3	HIGH	LOW/HIGH (During data entry)	Pulse output after entry	

NOTES: 1. In Table 1-12, it is assumed that no $\overline{\text{ERROR}}$ status exists other than that attributable to the OFF-LINE mode.

2. **Once the printer has been put in the deselected state by the DC3 code, the printer will not revert to the selected state unless the DC 1 code is input again. (In the deselected state, the printer ignores input data until the DC 1 code is received.)**
3. **The DC 1 and DC3 codes are enabled only when the $\overline{\text{SLCT-IN}}$ signal (Input Connector No.36 for the parallel interface unit) is HIGH and printer power is initialized.**
4. **if the $\overline{\text{SLCT-IN}}$ signal is LOW when the printer is initialized, DC1/DC3 printer select/deselect control is invalidated, and these control codes are ignored.**
5. **If the $\overline{\text{SLCT-IN}}$ signal is HIGH and is not set to LOW by jumper 1 when the printer is initialized, the printer starts from the selected (DC 1) state.**

1.4 DIP SWITCH AND JUNIPER SETTINGS

This section describes DIP switch settings for the LX-8 10/850 printer.

1.4.1 DIP Switch Settings

The two DIP switches are located on the side of the printer and function as shown in Tables 1-13 through 1-15. Note that the status of the DIP switches is read only at power on or upon receipt of the I NIT signal.

Table 1-13. Settings for **DIP** *Switch 1* **(SW1)**

No.	Description	ON	OFF	Fectory Setting
1	Character Pitch	12 cpi	10 cpi	OFF
2	Shape of Zero	0	0	OFF
3	Table Selection (note)	Graphics	Italics	OFF
4	Tear Off	Invalid	Valid	OFF
5	Draft Mode	Normal	High	OFF
6	International	See Table 1-15		ON
7	Character Set			ON
8	Selection			ON

NOTE: When the DIP switch is set for the Italic table, at power on printer defaults to ESC 7 table. When the switch is set for the Graphic table, at power on it defaults to ESC 6 table.

Table 1-14. Settings for DIP Switch 2 **(SW2)**

No.	Description	ON	OFF	Factory Setting
1	Page length	12 in.	11 in.	OFF
2	Cut-Sheet Feeder (CSF) Mode	On	off	OFF
3	l-inch skip	On	off	OFF
4	$\overline{\text{AUTO FEED XT}}$ Signal Internally Fixed or Not	Fixed to LOW	Depends On External Signal	OFF

Table 1-15. International Character Set Selection

1-6	1-7	1-8	Country	1-6	1-7	1-8	Country
On	On	On	U.S.A	Off	On	On	Denmark 1
On	On	Off	France	Off	On	Off	Sweden
On	Off	On	Germany	Off	Off	On	Italy
On	Off	Off	U.K.	Off	Off	Off	Spain 1

1.4.2 Jumper Setting

Jumper 1 (user-selectable) is located on the TAMA board. If the jumper is connected, the $\overline{\text{SLCT-IN}}$ signal is fixed to LOW, and DC 1 /DC3 printer select control is ignored.

1.5 SELECTYPE FUNCTION

SelecType **allows the user to choose fonts and the printing mode easily.** This function provides for selection of Draft, Roman, or Saris Serif fonts and selection of normal printing or condensed printing **modes.** SelecType **is effective only when the printer is ON** LINE **and not printing.**

To select Roman or Saris Serif, press the NLQ **button. A buzzer sounds when the** NLQ **button is pressed. When it sounds twice, the Roman font is selected. When it sounds three times, the Saris Serif font is selected.**

To select the Draft font, press the DRAFT button. The buzzer will sound once, indicating that the DRAFT font is selected.

To set for condensed printing when the printer is in the print mode, press the CONDENSED button once (the buzzer will sound once), and the printer will enter the condensed print mode.

To cancel **condensed printing, press the CONDENSED button again. After** you **press the button, the buzzer sounds twice to tell you that condensed printing is** cancelled.

1.6 SHEET LOADING AND SHEET EJECTION

The release lever enables disengaging of the push tractor unit drive mechanism. The printer therefore provides some improved paper-handling functions through combination of the release-lever and LOAD/EJECT control panel switch.

Cut Sheet Loading And Ejection

To load a sheet of paper, position the paper release lever back, place the sheet along the paper guide, and press the LOAD/EJECT switch. This loads the paper to the top-of-form position.
Pressing the LOAD/EJECT switch after the paper has been loaded will cause the paper to be ejected.

Continuous Paper Loading And Ejection (Back-out)

To load fanfold paper, move the paper release lever forward, and insert the paper into the push tractor. Pressing the LOAD/EJECT switch will then cause paper to be automatically loaded to the top-of-form position. Pressing the LOAD/EJECT switch after the fanfold paper has been loaded will cause the printer to eject the paper backward from the push tractor. To back out several pages, press the LOAD/EJECT switch several times (reverse feed is performed on a page-by-page basis).

The ON-LINE LED will flash only when the paper is loaded and the ON-LINE switch pressed. This indicates that the printer has entered "Top-of-form adjust" mode, and that the user may adjust the top-of-form position, as well as the loading positions for subsequent forms. Adjustment is made using the FORM FEED button,
which will increment the paper forward, and the LINE FEED switch, which will increment the paper in reverse. (The minimum feed amount is 2/216 inch).
When cut sheet is used, the adjusted Top-of-form position will be lost when the printer is re-initialized, and the Top-of from will be reset to the default value. When continuous paper is used, however, the memory of the adjusted Top-of-form position will be retained even after printer initialization.

1.7 TEAR-OFF FUNCTION

The Tear-Off function can be enabled by making the appropriate DIP switch setting, and will operate when the release-lever is set to the tractor position. In such a case, if the input **data buffer is empty and the printer is** ON-LINE, **the paper** will **automatically be fed to the tear-off position, and the ON-LINE LED will flash to indicate that the FORM FEED and LINE FEED switches are now available to perform micro-adjustment. The user may then adjust the paper to the tear-off position. This position becomes the new tear-off position default, and will remain valid even if the printer is reset and reinitialized, and regardless of whether the main power has been interrupted. When new data are input to the printer, the paper will automatically be returned to its original position, and printing will then start. Paper having been advanced to the tear-off position will also be returned to its original position if the ON-LINE switch is pressed (switching the printer from ON-LINE to OFF-LINE).**

1.8 OPERATING INSTRUCTIONS

This section describes the self-test, hexadecimal **dump** functions, error states, printer initialization, and buzzer operation.

1.8.1 *Self-Test*

To begin printing the self-test in the Draft mode, turn the printer ON while pressing the LIN E-FEED button. **To** begin printing the self-test using the NLQ **mode (Near Letter Quality),** press FORM FEED and hold **it down, then turn the printer power ON.**

Self-test printing can be stopped or started by pressing ON-LINE (ON-LINE indicator is not lit). To finish the self-test, stop the printing by pressing the ON-LINE switch then turn OFF the printer power.

The firmware revision number is printed as the first line of the self-test, and subsequently, current DIP switch settings are printed.

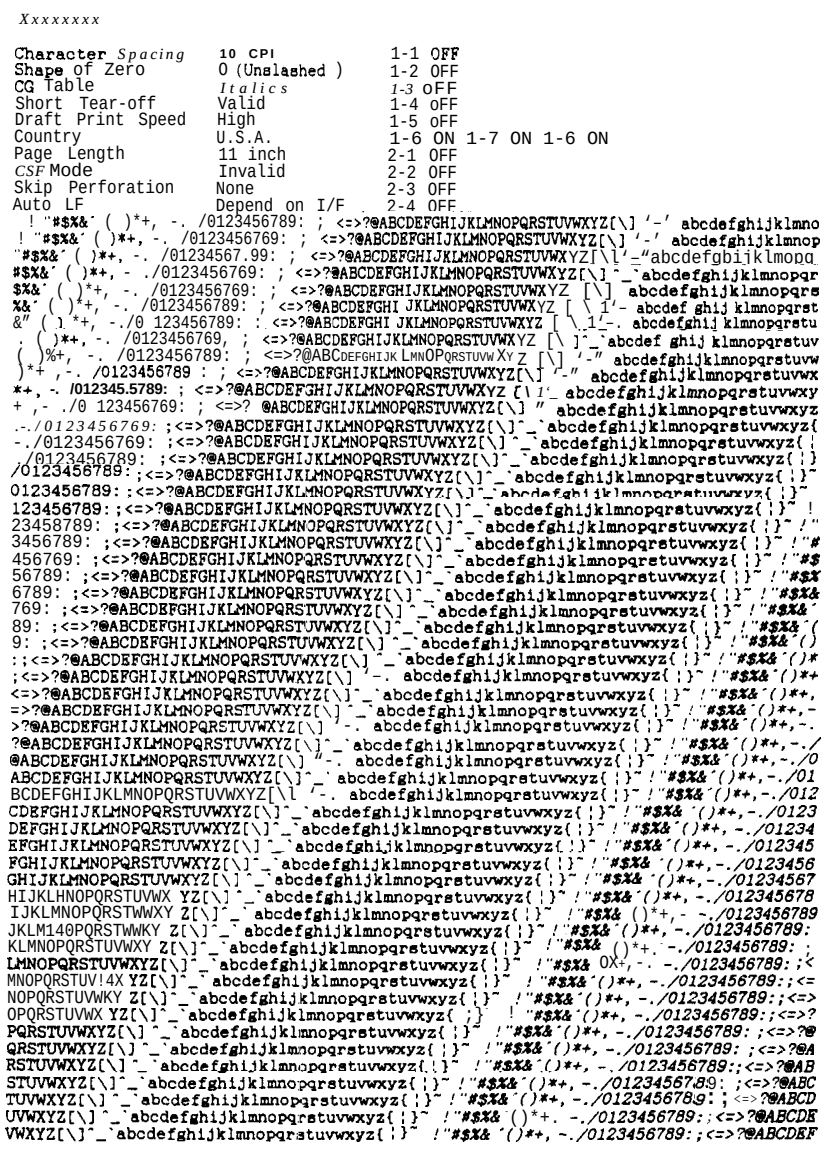


Figure 1-7. Self-Test Printout

1.8.2 Hexadecimal Dump Function

The printer enters the HEX-DUMP mode when it is powered on while the LINE-FEED and FORM-FEED buttons are pressed down.

In the HEX-DUMP mode, the hexadecimal representation of the input data is printed out, along with corresponding ASCII characters. This function is valuable for checking the data the printer has received from the host. If input data is a control code rather than a character code, a period (.) is printed in the ASCII column.

```
Data Dump Mode

0000  1B 40 0D 1B 55 00 1B 33 1E 00 0D 0A 0D 0A 0D 0A  .@..U..3........
0010  12 1B 70 00 1B 78 01 1B 57 00 1B 4D 20 20 20 20  ..p..x..W..M
0020  43 48 41 50 54 45 52 20 31 0D 0A 20 20 20 20 47  CHAPTER 1 .    G
0030  45 4E 45 52 41 4C 20 44 45 53 43 52 49 50 54 49  ENERAL DESCRIPTI
0040  4F 4E 0D 0A 0D 0A 20 20 20 20 31 2E 31 20 46 45  ON....    1.1 FE
0050  41 54 55 52 45 0D 0A 20 20 20 20 31 2E 32 20 53  ATURE..    1.2 S
0060  50 45 43 49 46 49 43 41 54 49 4F 4E 53 0D 0A 20  PECIFICATIONS..
0070  20 20 20 20 20 20 20 31 2E 32 2E 31 20 48 61 72        1.2.1 Har
0080  64 77 61 72 65 20 53 70 65 63 69 66 69 63 61 74  dware Specificat
0090  69 6F 6E 73 0D 0A 20 20 20 20 20 20 20 20 31 2E  ions..        1.
00A0  32 2E 32 20 46 69 72 6D 77 61 72 65 20 53 70 65  2.2 Firmware Spe
00B0  63 69 66 69 63 61 74 69 6F 6E 73 20 28 45 53 43  cifications (ESC
00C0  2F 50 29 0D 0A 20 20 20 20 31 2E 33 20 49 4E 54  /P)..    1.3 INT
00D0  45 52 46 41 43 45 20 4F 56 45 52 56 49 45 57 0D  ERFACE OVERVIEW.
00E0  0A 20 20 20 20 31 2E 34 20 44 49 50 20 41 4E 44  .    1.4 DIP AND
00F0  20 4A 55 4D 50 45 52 20 53 45 54 54 49 4E 47 53   JUMPER SETTINGS
0100  0D 0A 20 20 20 20 20 20 20 20 31 2E 34 2E 31 20  ..        1.4.1
0110  44 49 50 20 53 77 69 74 63 68 20 53 65 74 74 69  DIP Switch Setti
0120  6E 67 73 0D 0A 20 20 20 20 20 20 20 20 31 2E 34  ngs..         1.4
0130  2E 32 20 4A 75 6D 70 65 72 20 53 65 74 74 69 6E  .2 Jumper Settin
0140  67 0D 0A 20 20 20 20 31 2E 35 20 53 45 4C 45 43  g..    1.5 SELEC
0150  54 59 50 45 20 46 55 4E 43 54 49 4F 4E 0D 0A 20  TYPE FUNCTION..
0160  20 20 20 31 2E 36 20 53 48 45 45 54 20 4C 4F 41     1.6 SHEET LOA
0170  44 49 4E 47 20 41 4E 44 20 53 48 45 45 54 20 45  DING AND SHEET E
0180  4A 45 43 54 49 4F 4E 0D 0A 20 20 20 20 31 2E 37  JECTION..    1.7
0190  20 54 45 41 52 2D 4F 46 46 20 46 55 4E 43 54 49   TEAR-OFF FUNCTI
01A0  4F 4E 0D 0A 20 20 20 20 31 2E 38 20 4F 50 45 52  ON..    1.8 OPER
01B0  41 54 49 4E 47 20 49 4E 53 54 52 55 43 54 49 4F  ATING INSTRUCTIO
01C0  4E 53 0D 0A 20 20 20 20 20 20 20 20 31 2E 38 2E  NS..         1.8.
01D0  31 20 53 65 6C 66 2D 54 65 73 74 0D 0A 20 20 20  1 Self-Test..
01E0  20 20 20 20 31 2E 38 2E 32 20 48 65 78 61 64        1.8.2 Hexad
01F0  65 63 69 6D 61 6C 20 44 75 6D 70 20 46 75 6E 63  ecimal Dump Func
0200  74 69 6F 6E 0D 0A 20 20 20 20 20 20 20 20 31 2E  tion..        1.
0210  38 2E 33 20 42 75 7A 7A 65 72 20 4F 70 65 72 61  8.3 Buzzer Opera
0220  74 69 6F 6E 0D 0A 20 20 20 20 20 20 20 20 31 2E  tion..        .
0230  38 2E 34 20 50 72 69 6E 74 65 72 20 49 6E 69 74  8.4 Printer Init
0240  69 61 6C 69 7A 61 74 69 6F 6E 0D 0A 20 20 20 20  ialization..
0250  20 20 20 20 31 2E 38 2E 35 20 41 64 6A 75 73 74      1.8.5 Adjust
0260  20 4C 65 76 65 72 20 4F 70 65 72 61 74 69 6F 6E   Lever Operation
0270  0D 0A 20 20 20 20 31 2E 36 20 4D 41 49 4E 20 43  ..    1.6 MAIN C
0280  4F 4D 50 4F 4E 45 4E 54 53 0D 0A 20 20 20 20 20  OMPONENTS..
0290  20 20 20 31 2E 36 2E 31 20 54 41 4D 41 20 42 6F     1.6.1 TAMA Bo
02A0  61 72 64 0D 0A 20 20 20 20 20 20 20 20 31 2E 36  ard..         1.6
02B0  2E 32 20 54 41 50 4E 4C 2D 57 20 43 6F 6E 74 72  .2 TAPNL-W Contr
02C0  6F 6C 20 50 61 6E 65 6C 0D 0A 20 20 20 20 20 20  ol Panel..
02D0  20 20 31 2E 36 2E 33 20 54 41 20 46 69 6C 74 65    1.6.3 TA Filte
02E0  72 20 55 6E 69 74 0D 0A 20 20 20 20 20 20 20 20  r Unit..
02F0  31 2E 36 2E 35 20 50 72 69 6E 74 65 72 20 4D 65  1.6.5 Printer Me
0300  63 68 61 6E 69 73 6D 20 28 4D 2D 33 44 31 30 29  chanism (M-3D10)
0310  0D 0A 20 20 20 20 20 20 20 20 31 2E 36 2E 36 20  ..        1.6.6
0320  48 6F 75 73 69 6E 67 0D 0A 0D 0A 20 20 20 20 31  Housing....    1
0330  2E 31 20 46 45 41 54 55 52 45 53 0D 0A 0D 0A 20  .1 FEATURES....
0340  20 20 20 54 68 65 20 4C 58 2D 38 31 30 2F 38 35     The LX-810/85
0350  30 20 69 73 20 61 20 73 6D 61 6C 6C 20 6C 69 0  is a small, li
0360  67 68 74 2D 77 65 69 67 68 74 2C 20 6C 6F 77 2D  ght-weight, low-
0370  63 6F 73 74 2C 20 61 64 76 61 6E 63 65 64 0D 0A  cost, advanced..
0380  20 20 20 20 70 61 70 65 72 20 68 61 6E 64 6C 69      paper handli
0390  6E 67 20 70 72 69 6E 74 65 72 20 63 6F 6D 70 61  ng printer compa
03A0  72 61 62 6C 65 20 74 6F 20 74 68 65 20 4C 58 2D  rable to the LX-
03B0  38 30 30 2E 20 49 74 73 20 6D 61 69 6E 0D 0A 20  800. Its main..
03C0  20 20 20 66 65 61 74 75 72 65 73 20 61 72 65 3A      features are:
03D0  0D 0A 0D 0A 20 20 20 20 31 2E 20 20 20 41 64 76  ....    1.   Adv
03E0  61 6E 63 65 64 20 70 61 70 65 72 20 68 61 6E 64  anced paper hand
03F0  6C 69 6E 67 3A 20 41 75 74 6F 20 62 61 63 6B 6F  ling: Auto backo
0400  75 74 20 61 6E 64 20 63 75 74 20 73 68 65 65 74  ut and cut sheet
```

Figure 1-8. Hexadecimal Dump Function

1.8.3 Buzzer Operation

The buzzer sounds under the following conditions:

BEL code: **The buzzer sounds for 0.1 second when a BEL code is input.**

Carriage trouble: **Beeps 6 times, pausing briefly after 3rd beep.**

Paper-out: **Beeps 20 times, pausing briefly after every 4 beeps.**

Abnormal voltage: **Beeps 5 times, pausing after every beep.**

Incorrect RAM: (SRAM) **Beeps 8 times, pausing briefly** after every 2 beeps. (Inside CPU) Beeps indefinitely until **power OFF.**

Recognition of panel operation:

Beeps 1 or 2 or 3 times in setting print mode.

Factory setting: **Beeps once when the value under micro-adjusting is equal to the factory-set value.**

Sheet ejection failure (in CSF mode):

Beeps 20 times, pausing briefly after every 4 beeps.

Illegal paper *release/unrelease*:

Beeps continuously when the paper release lever is changed when the paper is in the paper path. Beeps until the lever is changed again or the paper is completely out of the path.

1.8.4 Printer Initialization

The printer is initialized when:

1) AC power is turned on

2) The INIT signal is input

Here is a brief summary of the initialization sequence.

a) Return the printhead to the leftmost position.

b) Set ON LINE mode.

c) Clear the print buffer and input buffer.

d) Set the line spacing to 1/6 inches.

e) Set the page length to 11 or 12 inches according to the DIP switch setting.

f) Clear all vertical tab positions.

g) Set the horizontal tab position at 13-column intervals.

h) Set the print mode according to tlhe DIP switch setting and the non-volatile memory setting of the control panel.

1.8.5 *Adjust Lever Operation*

The adjust lever must be set to the proper position according to the paper of paper you are using. Refer to Table 1-16 and Figure 1-9 below.

Table 1-16. Lever Position

Lever Position	*Paper*
2nd **step**	**Cut sheet, continuous paper (non copy, 1 + 1 copy)**
3rd step	**Continuous paper (1 +2 copies)**
4th step	**Label**
4th to 7th step	**Envelope**

- **If printing density becomes lighter, set the adjust lever position one step narrower.**

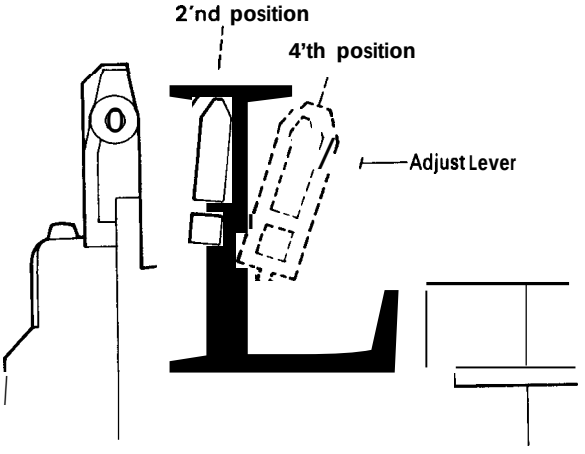


Figure 1-9. Lever Position

1.6 MAIN COMPONENTS

The main components of the LX-8 10/850 printer are designed for easy removal and replacement to maintain/repair the printer.

The main components are:

1) TAMA board: Main control board. The CPU on this board controls all main functions.
2) TAPNL-W control panel: Control panel.
3) TA filter unit: Transformer and filter board.
4) M-3D 10: Printer mechanism.

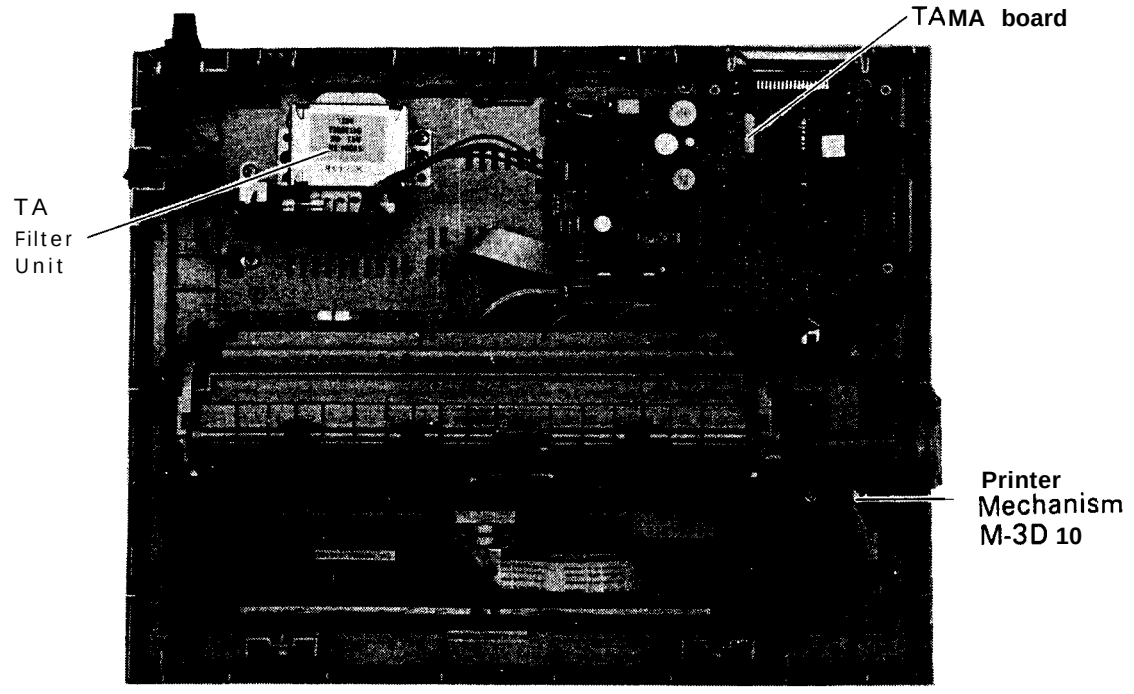


Figure 1-10. 1.X-81 0/850 Component Layout

1.6.1 TAMA Board

The use of the μPD78 10HG CPU simplifies the main control board circuit design.

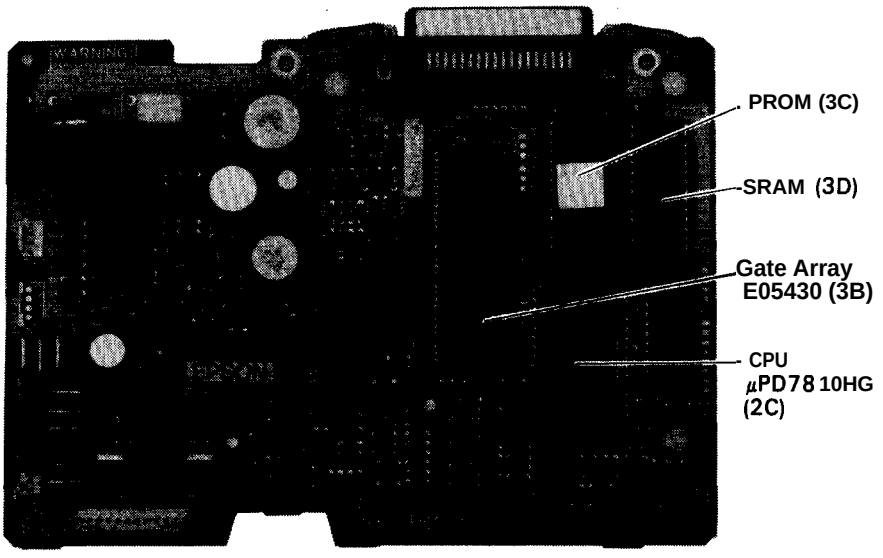


Figure 1-II 1. **TAMA** *Main Control Board*

1.6.2 TAPNL-W Control Panel

The TAPNL-W control panel is the LX-8 10/850 control panel which contains the indicator LEDs and switches.

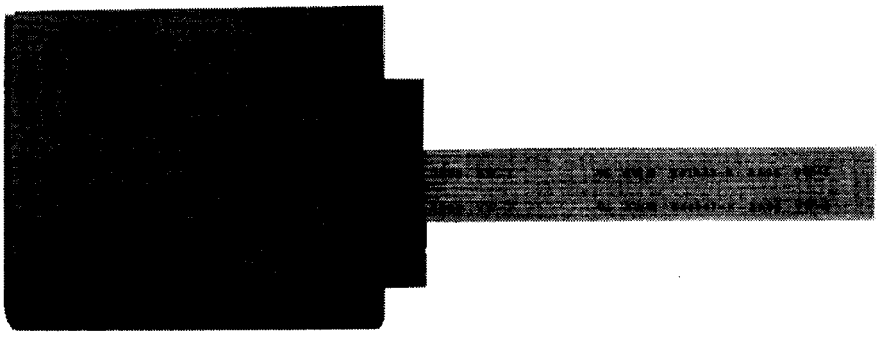
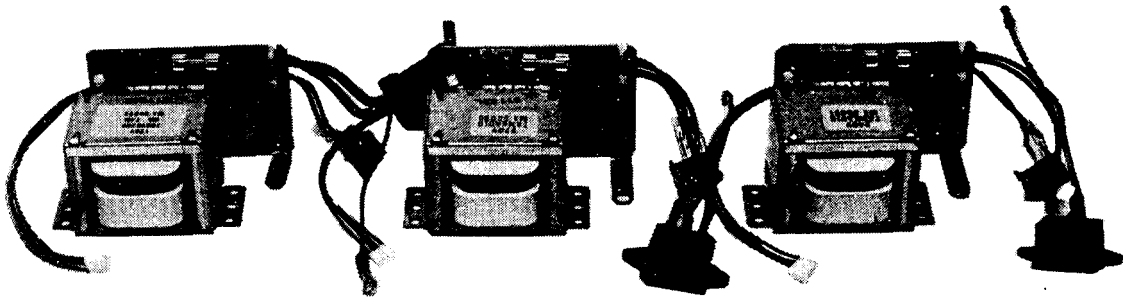


Figure **1-12. TAPNL-W** *Control Panel*

1.6.3 *TA Filter Unit*

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



(120V Version) **(220V Version)** **(240V Version)**

Figure 1-13. TA Filter Unit

1.6.4 Printer Mechanism (M-3D1O)

The M-3D 10 printer mechanism was developed specifically for the LX-8 10/850 printer. Its components include:

- **Carriage motor**
- **Carriage mechanism**
- **Paper feed motor**
- **Paper feed mechanism**
- **Ribbon feed mechanism**
- **Printhead**
- **Sensors**

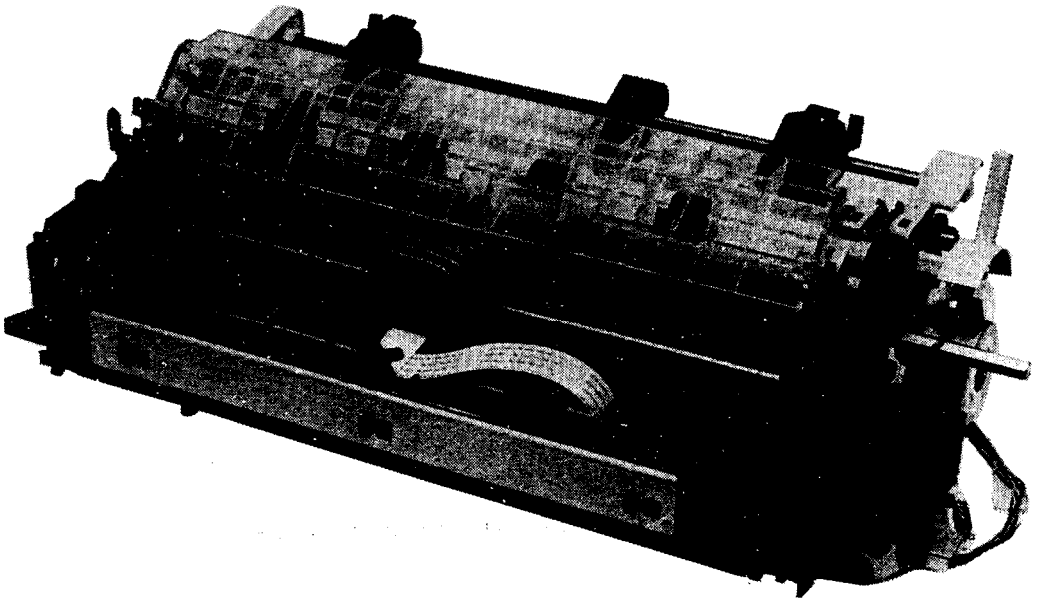


Figure 1-14. Model-3D1 O Printer Mechanism

1.6.5 Housing

The LX-8 10/850 housing consists of the upper and lower cases. The upper case houses the control panel. The lower case houses the printer mechanism and the main control board.

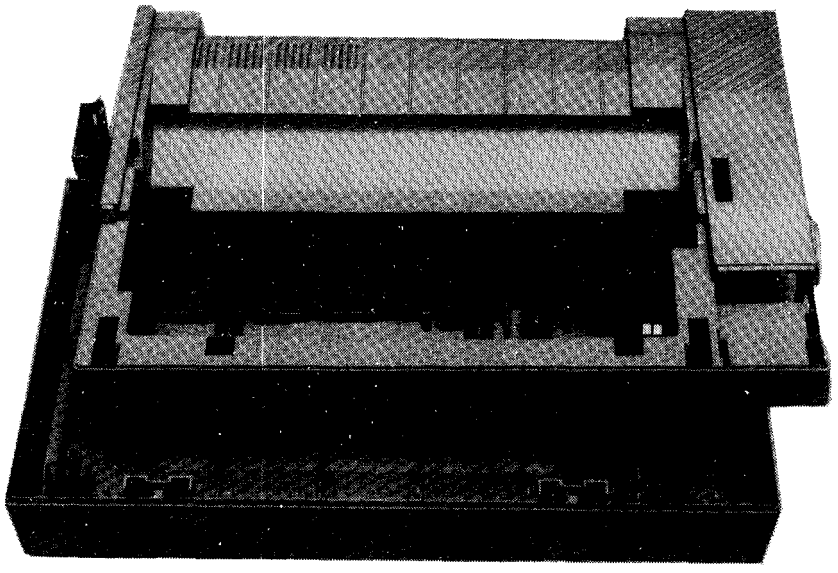


Figure *1-15. Housing*

CHAPTER 2
PRINCIPLES OF OPERATION

LIST OF FIGURES

LIST OF TABLES

2.1 OVERVIEW

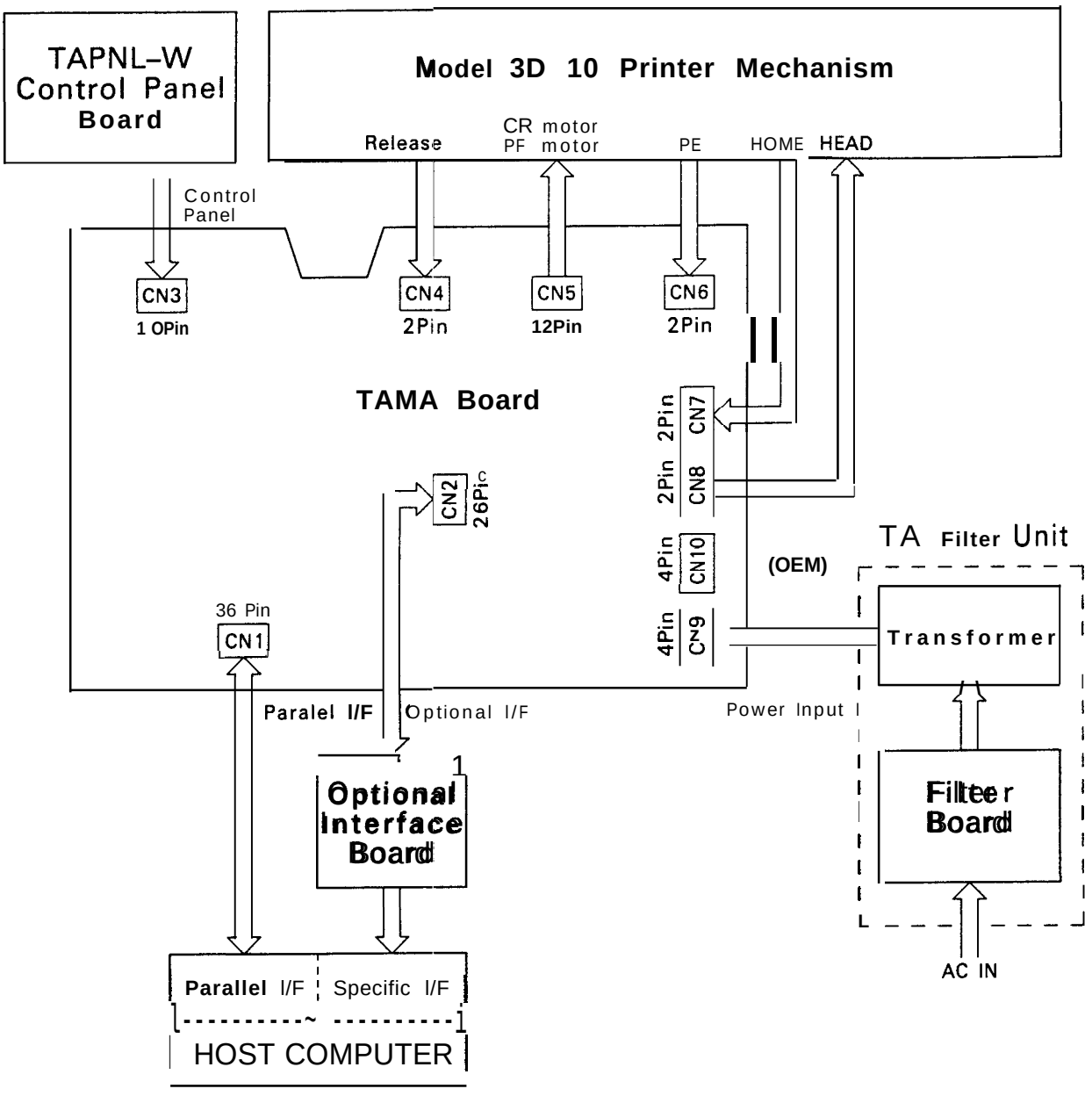
This chapter describes the signals at the connectors linking the primary components of the LX-8 10/850. These components include the printer mechanism and control circuits. The chapter also describes the operation of the printer's circuitry and printer mechanism.

2.1.1 Connector Summary

The interconnection of the primary components is illustrated in Figure 2-1. Table 2-1 summarizes the functions, sizes, and types of the connectors shown in the figure.

Table 2-'1. Board Connector Summary

Board	*Connector*	*Function*	*Pins*	*Reference Table*
TAMA Board	CN1	Host I/F (Parallel)	36	1-11
	CN2	Optional I/F Board	26	A-8
	CN3	Control Panel	10	A-9
	CN4	Release Lever	2	A-1 O
	CN5	CR Motor and PF Motor	12	A-1 1
	CN6	PE Signal	2	A-12
	CN7	Home Position Signal	2	A-13
	CN8	Head	12	A-1 4
	CN9	AC Power Input	4	A-15
	CN 10	DC Power Input (OEM)	4	A-16

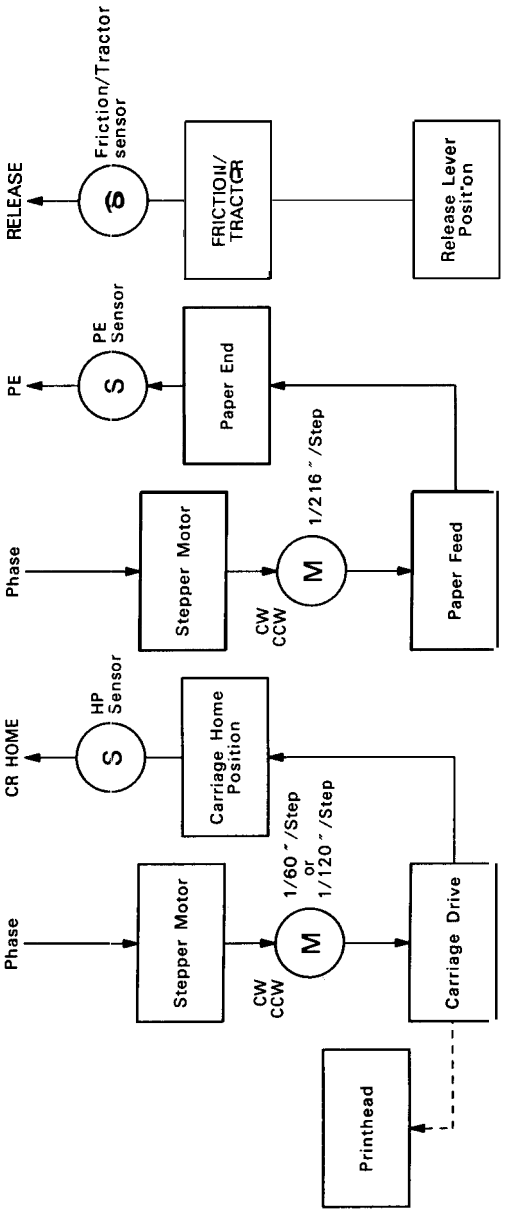


NOTE: **CR = carriage.**
PF = paper feed.
HP = home position.
PE = paper end.

Figure 2-1. Cable Connections

2.1.2 Outline of Printer Mechanism Operation

The Model 3D 10 is a 9-pin serial dot matrix printer. Because the frame and many of the components are of plastic, the mechanism is lightweight. A block diagram of the printer mechanism is shown in Figure 2-2.



CW = clockwise; CCW= counterclockwise.
HP = home position; PE= paper end.

Figure 2-2. Printer Mechanism Block Diagram

2.1.2.1 Sensors

The printer mechanism is equipped with the following sensors:

Paper-End (PE) Sensor
Home-Position (HP) Sensor
Friction/Tractor Sensor

Paper-End Sensor (PE *sensor)*

Figures 2-3 and 2-4 show the paper-end **sensor. This sensor switch is ON when no paper is in place (e.g., when the paper supply has run out).**

"Paper-out" → ON → LOW
Paper present → OFF → HIGH

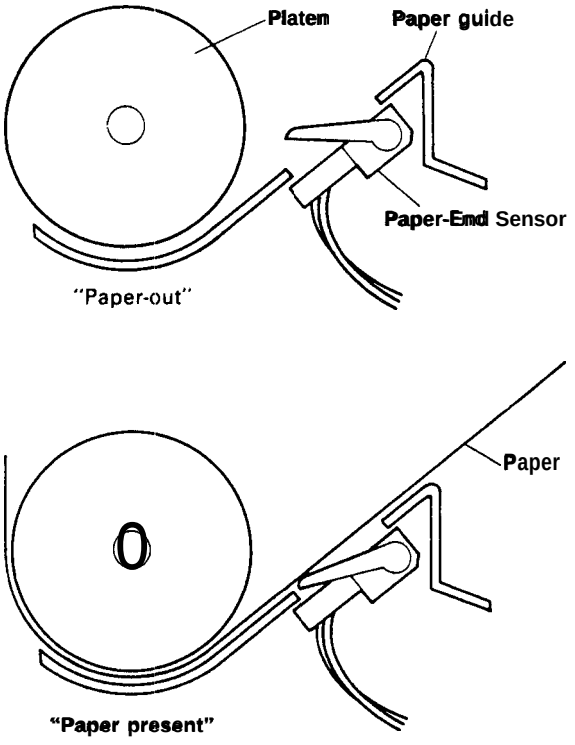


Figure 2-3. Paper-End Sensor Mechanism

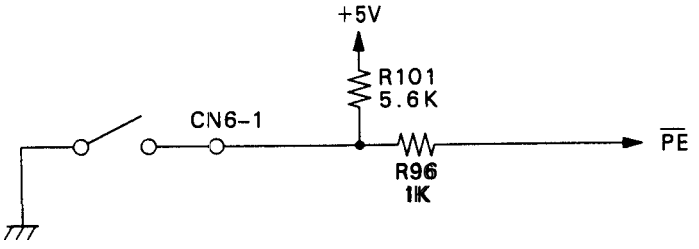


Figure 2-4. Paper-End Sensor Circuit

Home-Position Sensor (HP sensor)

Figures 2-5 and 2-6 show the home-position sensor. The sensor switch is ON when the carriage is at the home position.

Home position + ON →LOW
Other positions → OFF → HIGH

This sensor determines the reference position for the carriage drive,

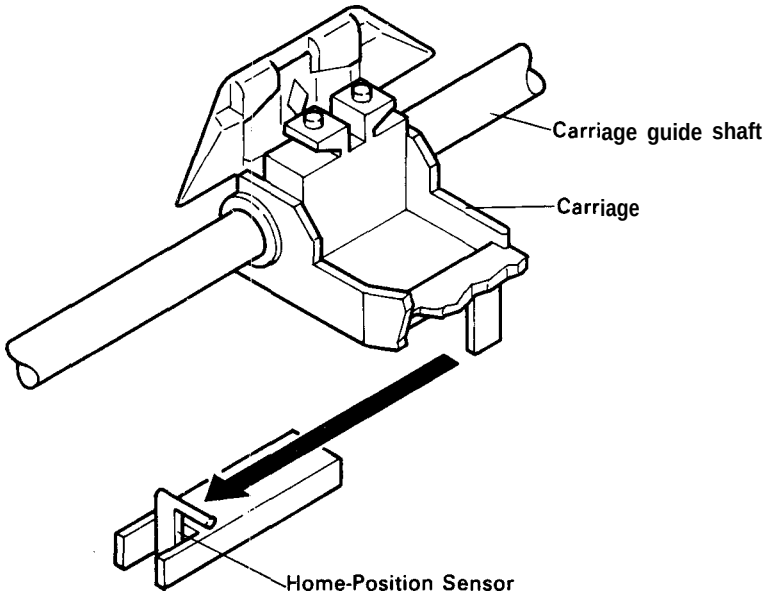


Figure 2-5. Home-Position Sensor Mechanism

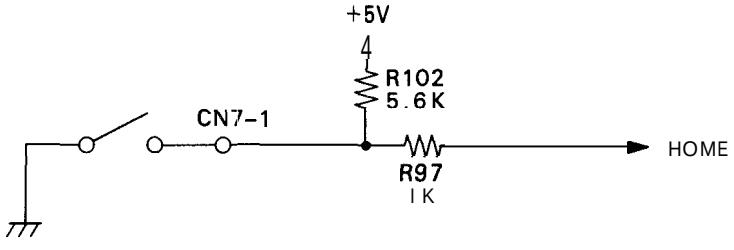


Figure 2-6. Home-Position Sensor Circuit

Friction/Tractor Sensor

The release sensor senses the position of the release lever in order to detect whether tractor feed or friction feed is in effect.

Release Lever Position : Front → F:riction Feed → OFF → HIGH level

Release Lever Position : Rear → Tractor Feed → ON → LOW level

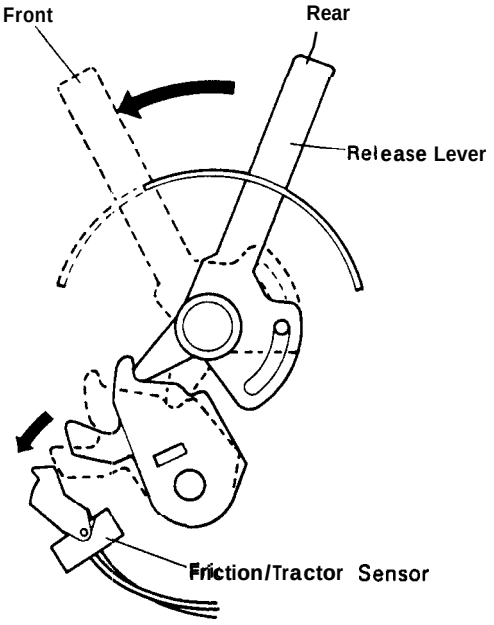


Figure 2-7'. *Release Sensor Mechanism*

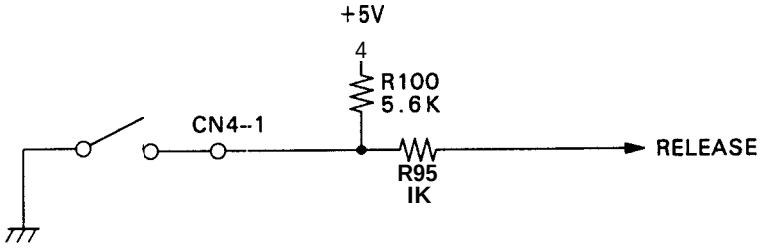


Figure 2-8. Release *Sensor Circuit*

2.1.2.2 Motors

This printer has the following motors:

Carriage motor (step motor)

Paper-feed motor (step motor)

Carriage Motor

The carriage motor is used to move the carriage right and left along the platen. This unit employs a 4-phase, 48-step motor using either 1-2 or 2-2 phase excitation. An open-loop system is used for control.

Paper-Feed Motor

Paper **feed is also driven by a 4-phase 48-step motor operating with 2-2 phase excitation. Each phase switch causes the paper to advance by advanced 1/2 16“ for each phase switch. The gate array controls the motor through an open loop.**

2.1.2.3 **Printhead**

Figure 2-9 shows the dot-wire operation.

When the head-driving coil is energized, the dot wire is pushed out. The dot wire strikes the ribbon, causing the ribbon to impact the paper, thereby printing a dot.

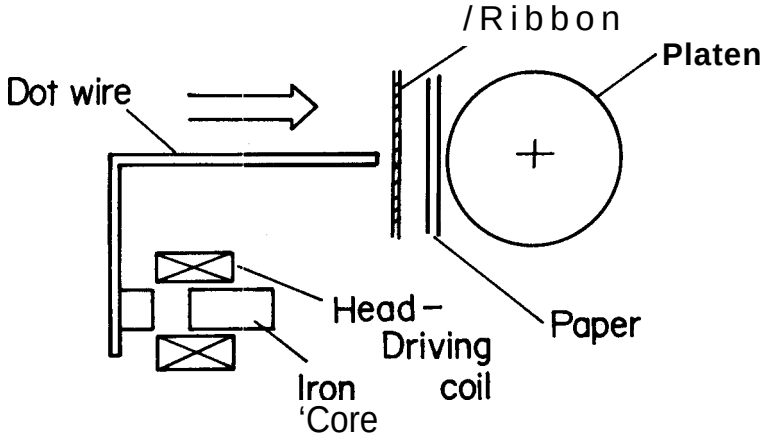
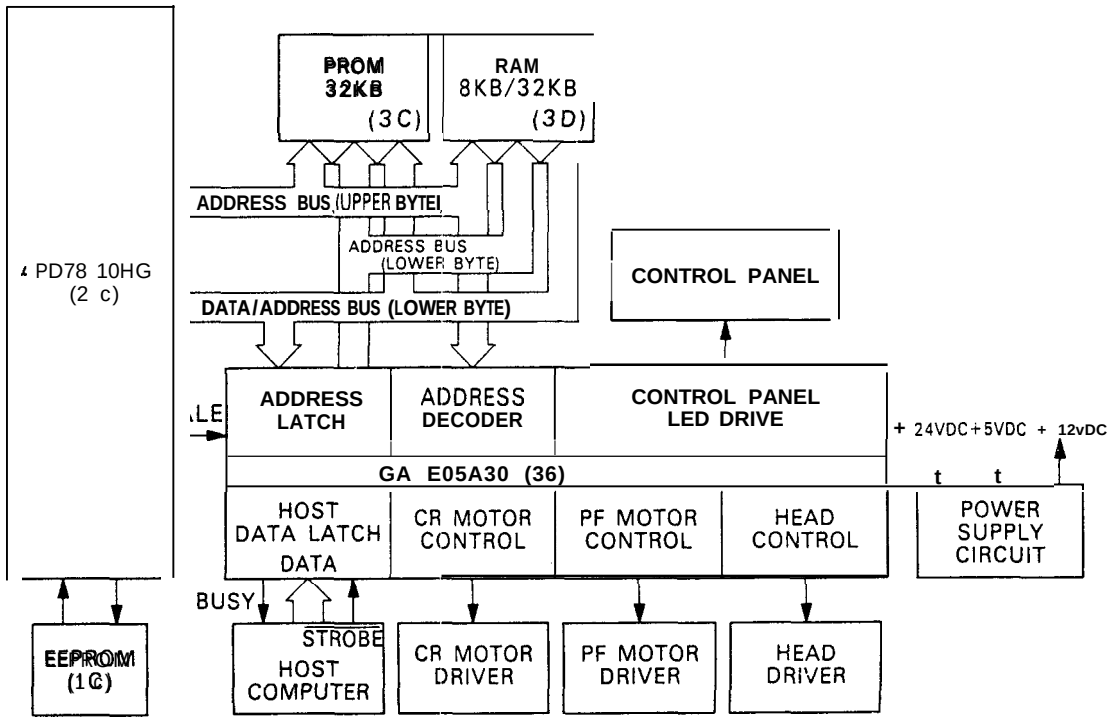


Figure 2-9. **Printhead**

2.1.3 Circuit Overview

Figure 2-10 shows a block diagram of the TAMA board circuitry.



CG = character generator; GA = gate array.

Figure 2-10. TAMA Board Circuit *Block Diagram*

The circuit consists mainly of the following ICs:

•~PD7810HG CPU (2C)

The μPD78 10HG executes the program in the PROM (3C) and controls all of the printer operations, Upon receiving the RESET signal, the CPU begins program execution from address 0000H.

•PROM (3C)

The PROM includes the control program (firmware) and character generators.

*** SRM 2064C (3D)**

The SRM2064C SRAM is external memory for the CPU. It is used as an input data buffer and line buffer for expanding data, and as working area for the program.

•E05A30 gate array (3B)

The E05A30 functions are as follows

1. Parallel I/F
2. Address decoder
3. Data address multiplexer
4. PF motor control
5. CR motor control
6. Control panel LED drive
7. Printhead drive control

• EEPROM (1C)

The EEPROM has a 256-bit memory, and remembers the current paper position.

Other control circuits are as follows:

‘ Paper feed motor drive circuit

The paper feed motor drive circuit drives the paper feed motor. The paper feed motor is a 4 phase-step motor. The rotation of the motor (position and speed) is controlled by outputting the phase switching signal by the E05A30 gate array.

•Carriage motor drive circuit

The carriage motor drive circuit drives the carriage motor. The carriage motor is a 4 phase-step motor. The rotation of the motor (position and speed) is controlled by outputting the phase switching signal by the E05A30 gate array.

•Power supply circuit

The circuit converts the AC power source to the DC voltages required by the unit. Specifically, the circuit converts the AC power to +24, +5, and + 12 V DC.

2.2 PRINCIPLES OF OPERATION

This section describes the operation of each component.

2.2.1 Power Supply Circuit

The electrical power required by this mechanism is developed using the TA Filter Unit (which combines a filter and a power transformer) and the TAMA board. **The AC input passes first through the filter circuit, where line noise is removed, and is then set to the transformer, where it is stepped down into two separate voltages: AC 26V and AC 12V. The transformer output is sent to the power circuits on the** TAMA **board, which converts the power to the DC voltages (see below) required for operation.**

Table 2-2. Voltage Applications

Voltage	Purpose
+5 v	Logic circuit voltage Holding voltage for paper feed motor Others
+24 V	Carriage motor drive voltage Paper-feed motor drive voltage Printhead drive voltage
+12 V	Voltage for the optional I/F

A block diagram of the power supply circuit is shown in Figure 2-11.

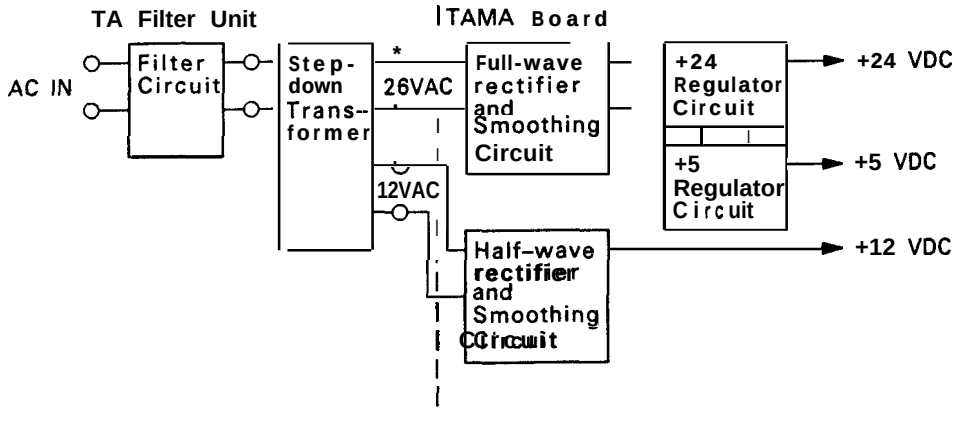


Figure 2-11. *Power Supply Circuit Block Diagram*

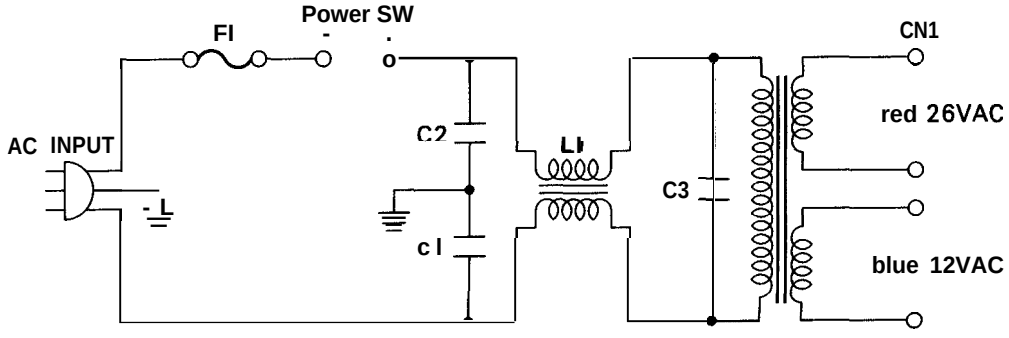
2.2.1.1 TA Filter Unit

The filter board and the transformer are integrated into a single unit. This unit also incorporates the power switch and the inlet for the incoming AC cable.

The incoming AC power passes first through the over-current protection fuse (F 1) and the power switch, and then into the filter circuit comprised of C 1, C2, C3, and L 1. This circuits removes the noise on the AC input line, and also serves to present noise generated within the printer from running through the AC line.

The transformer steps down the incoming AC power into 26 VAC and 12 VAC outputs. To prevent overheating, a temperature fuse is incorporated into the transformer.

Figure 2-12 illustrates the design of the circuit.



F1: 125V, 1.25A (120V Version)
250V, 0.63A (220V Version)
250V, 0.63A (240V Version)

Figure 2-12. Transformer Circuit

2.2.1.2 + 12V DC Power Supply Circuit:

As Figure 2-13 shows, a half-wave rectifying circuit is used to convert the incoming 12VAC voltage to + 12VDC.

The 12V output is used only for the option I/F board (via the CN2 connector on the TAMA board). The TAMA board itself does not utilize this voltage.

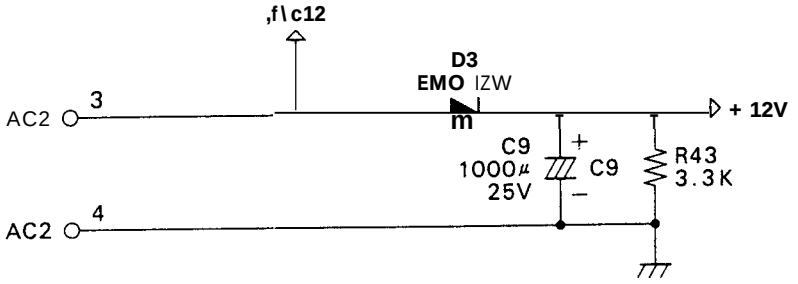


Figure 2-13. + 12V DC Power Supply Circuit

2.2.1.3 +24V DC Power Supply Circuit

The incoming AC + 26V is full-wave rectified by diode bridge DB 1, generating a DC voltage of about 36V. This voltage is converted by the switching regulator (uPC494C) to +24V DC.

Figure 2-14 illustrates the circuit design.

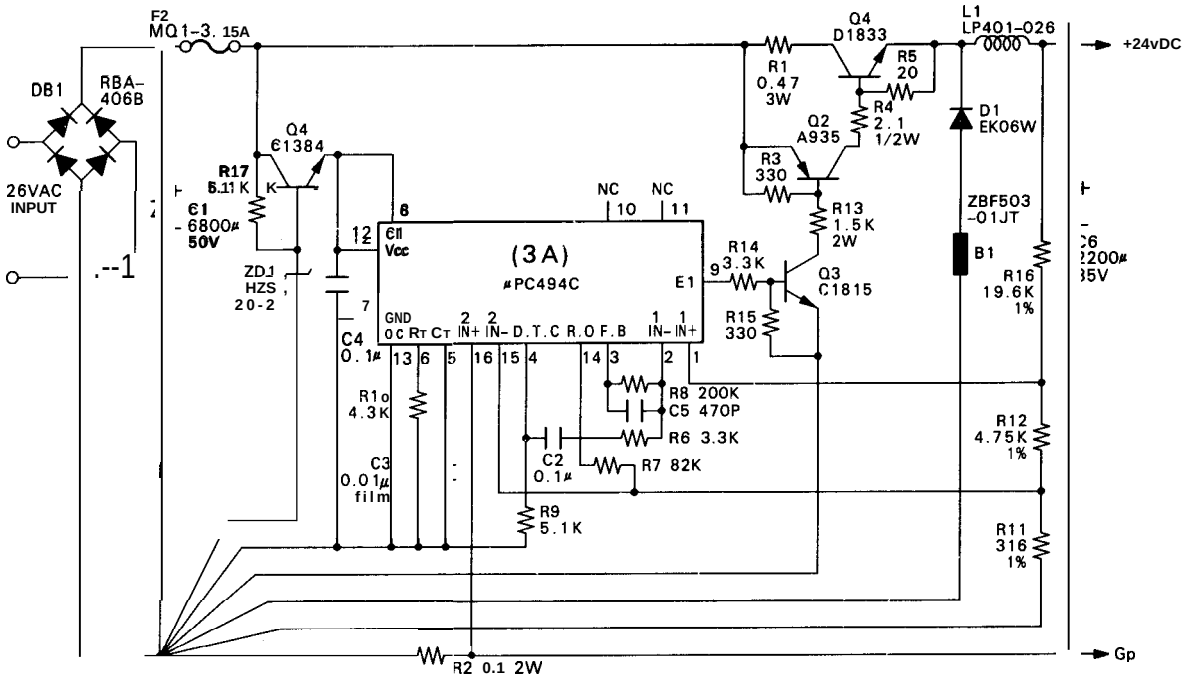


Figure 2-14. +24V DC Power Supply Circuit

Rectifier And Smoothing Circuit

When the AC + 26V is full-wave rectified by diode bridge DB 1, and the result is smoothed by the action of electrolytic capacitor C 1, a voltage of about + 36V DC is generated. This voltage, after passing over-current protector fuse F2, is supplied to transistors Q4 and Q 1.

When the power comes on, the potential at the collector side of Q4 increases. When the voltage reaches about 20V, Zener breakdown occurs at ZD 1, so that a potential difference is generated between the collector and base of Q4. This causes Q4 to come ON, so that an operating bias is supplied to the switching regulator.

Note **that because the switching regulator does not begin to operate immediately following power on, Q 1 will also remain off during this time, so that the +36V input will not be output to the +24V line.**

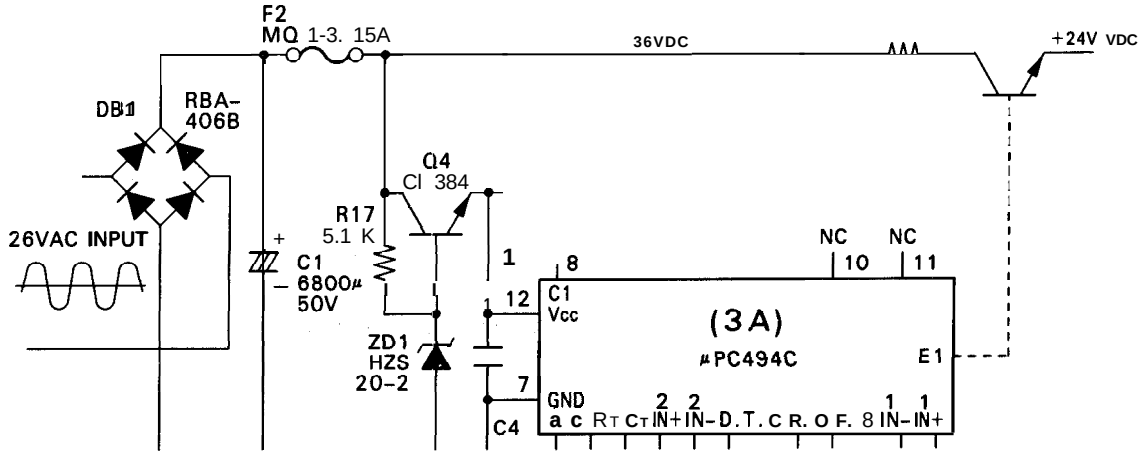


Figure 2-15. Rectifier and Smoothing Circuit

Switching Regulator Circuit

When the voltage is supplied from the rectifying circuit, a 27 KHz switching pulse based on the external C3-R 10 circuit is created. At the same time, the standard voltage regulator outputs 5V, which is supplied, as a comparative voltage, to the negative terminal of error amplifier EA 1. Immediately after power comes on, + 24V is not yet **being generated, so that** EA 1 output will be **LOW,** and the switching control circuit will output a switching signal to the base of internal transistor Qx. External transistors Q3, Q2, and Q 1 will operate, and a 36V DC switching **pulse will be output.**

The output pulse passes through the smoothing circuit, which converts it to a direct voltage. As explained below, this voltage is then returned, via a feedback circuit, to the positive terminal of EA1. EA1 output is thus controlled so that +24V is always maintained.

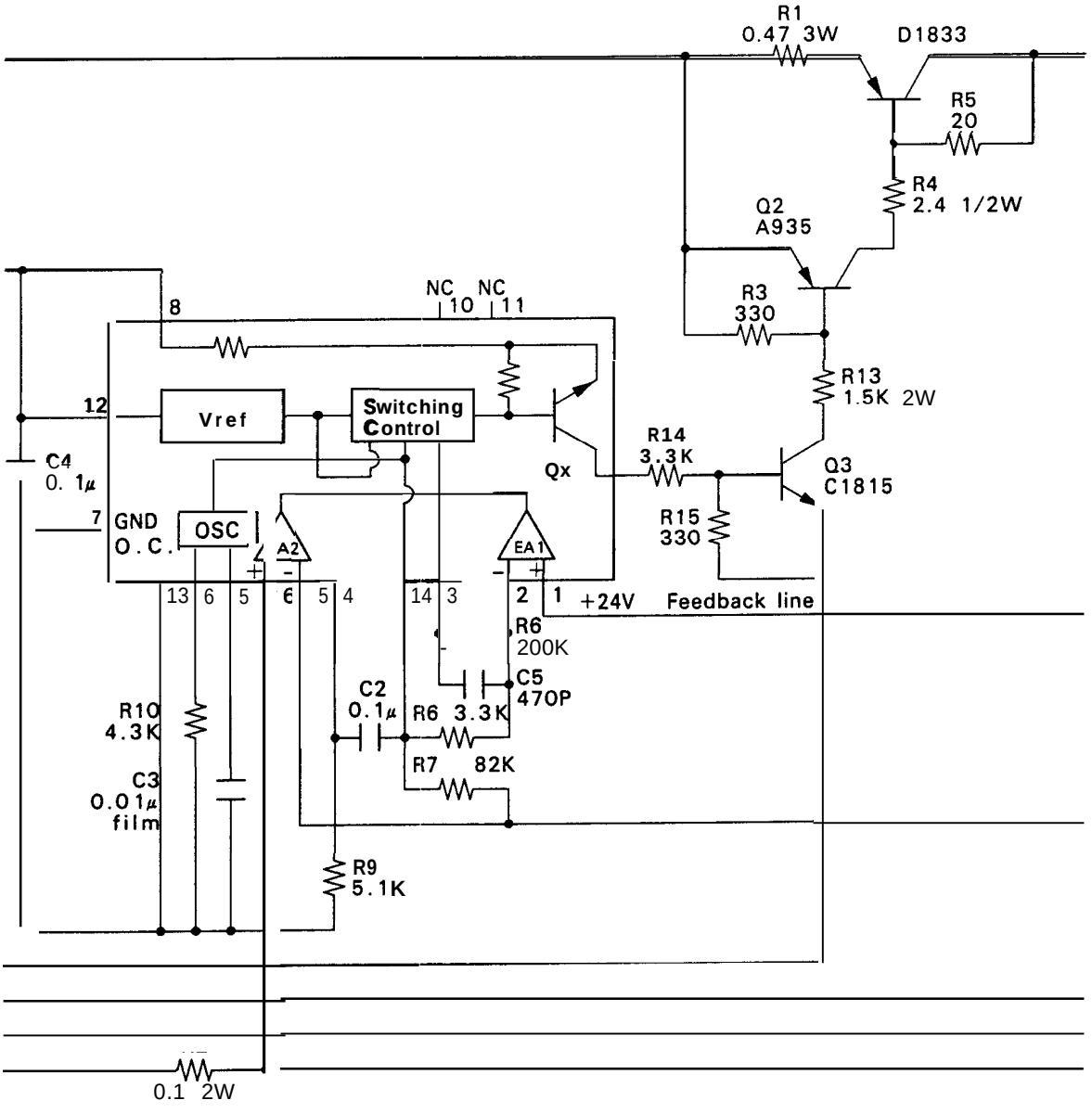


Figure 2-16. +24VDC Switching Regulator Circuit

Feedback Circuit

A voltage switching circuit is formed **by RI 1, R 12, and R16, and the potential of the +24V output voltage is fed back to μPC494C.**

The line between R 12 and R 16 feeds back to the positive terminal of EA 1 in the μPC494C, where it is compared against the standard + 5V voltage. The electric potential of the feedback line becomes the same as the standard potential at 24.3V, as shown by the equation below. If the voltage exceeds 24.3V, the EA1 output goes HIGH, the ON time of the switching pulse drops, the switching duty is lowered, and, as a result, the +24V potential drops. This action is repeated in order to maintain a stable voltage of +24V.

$$\frac{5V \times (RI\ 1+R12+R16)}{(RI\ 1 + R12)} = 24.3V$$

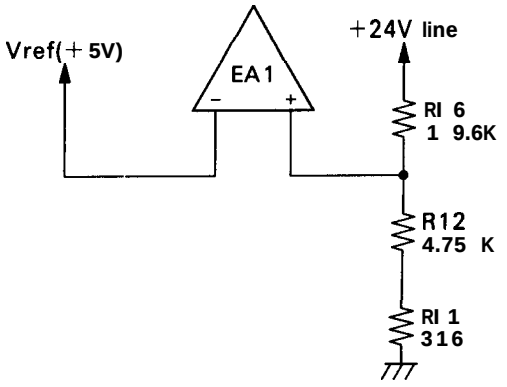


Figure 2-17. Voltage Feedback Circuit

Over-Current Protection Circuit

Error amplifier EA2, in the μPC494, detects over-current caused either by abnormal operation, or by abnormality in the 24V line at the time of power up. Current-detecting resistor R2 is set at the EA2's positive terminal (pin 16), and the current, converted to a voltage value, is monitored. The negative terminal of the EA2 is connected to the dividing circuit for the standard voltage (+ 5V) and the 24V output.

Immediately after power enters the circuit, and until the time that 24V output begins, the voltage at the negative terminal of EA2 is about 19.2 mV:

Vx1 = (RI 1 X 5V)/(R7 + R1 1).

After 24V output begins, the voltage at the terminal is about 0.31 V:

Vx2 = **(R1** 1 × **24** V)/(R11 + R12 + R 16).

In order for the positive terminal of EA2 to generate the same conditions, the Ix current, immediately after power up, is about 192 mA (11 = 19.2mV/R 1). During operation, the Ix current is about 3.1A (I_2 = 0.3 I/RI).

Accordingly, this circuit is furnished so that, in the event of the problems listed **below, it will halt 24V switching, in order to prevent the propagation of damage.**

When, at the time of power up, abnormality in Q 1 or elsewhere causes excessive current leak to the 24V output line.

When excessive current leak occurs during operation due to abnormality in the motor or the dot head.

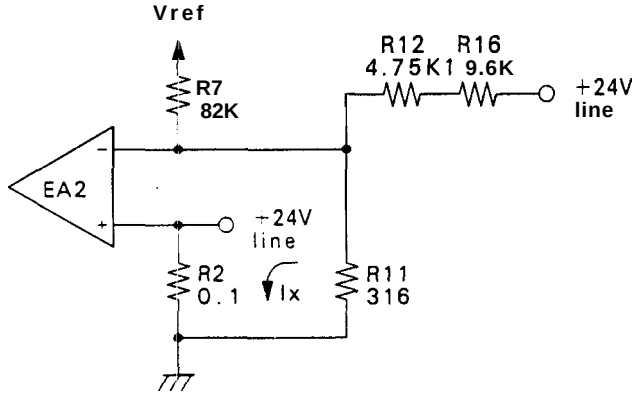


Figure 2-18, Over-Current Protection Circuit

Switching Pulse Output

The output of the error amplifier in μPC494C is determined by the difference between the output pulse of the internal oscillating circuit and the feedback voltage from the + 24V output. The feedback voltage changes according to printer operation (i.e., printer load). The output of the error amplifier acts to minimize this change, however, by responding as indicated in Figure 2-19.

Operation Low feedback voltage: Amplifier ON time increases (supply voltage increase)

High feedback voltage: Amplifier ON time decreases (supply voltage decreases)

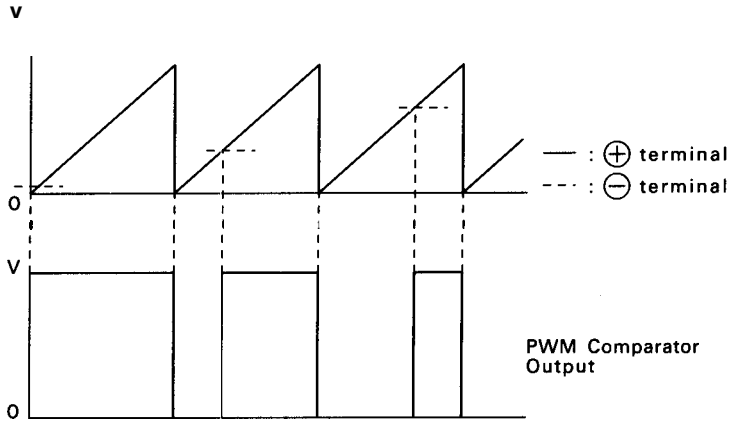


Figure 2-19. output Transistor Drive Waveform

Chopping Circuit

A chopper circuit consisting of diode D 1 and coil L1 is utilized at the output stage. If Q1 in ON, the coil acts as a resistor, and suppresses violent current surges. When Q 1 goes OFF, the stored energy in the coil generates a reverse starting current, and current flows via D 1. Thus, the circuit works as a current stabilizer.

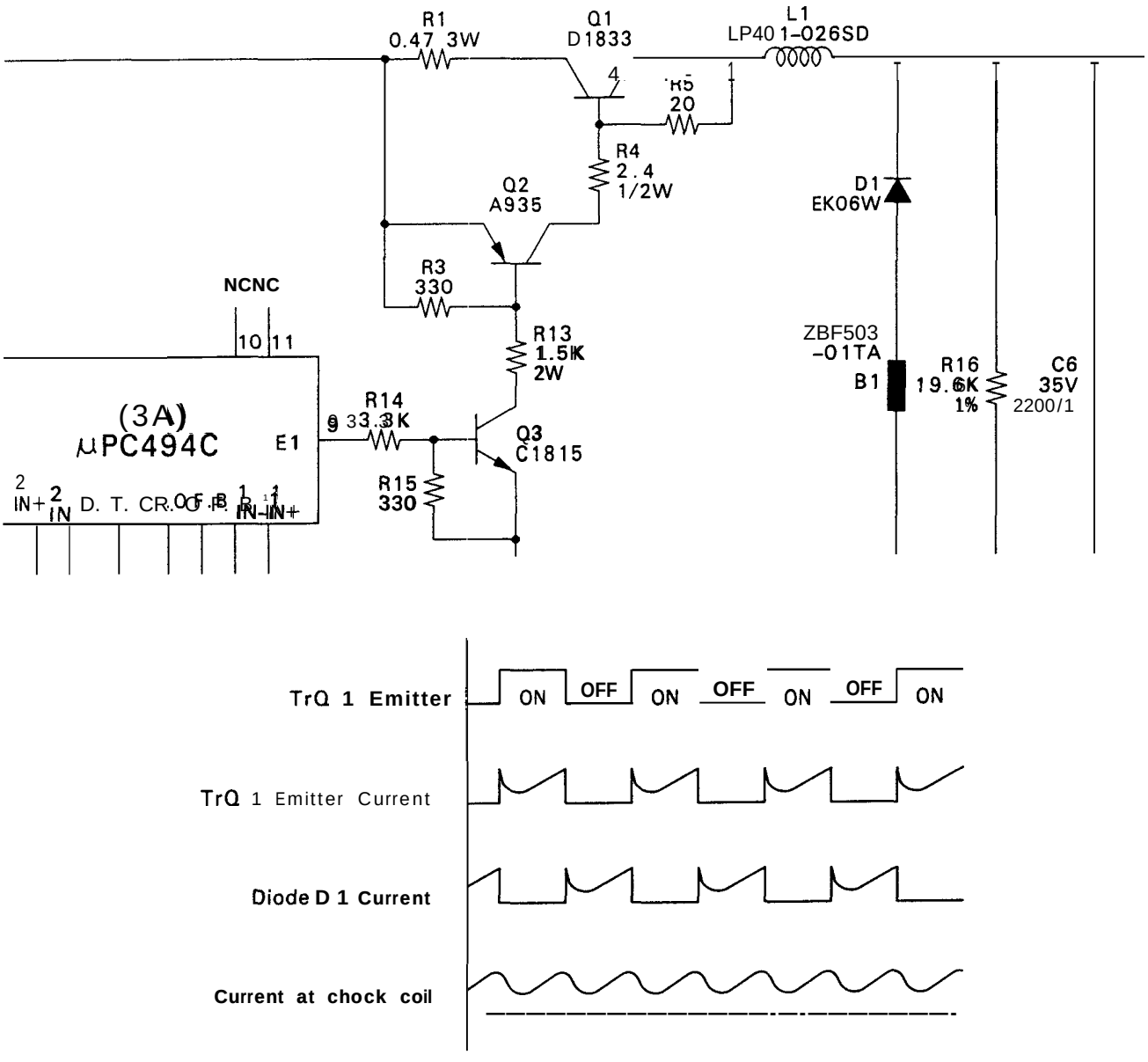


Figure *2-20. Chopping Circuit*

2.2.1.4 +5V DC Power Supply Circuit

The +5VDC is generated by the switching and step-down action that Q6 applies to the 24VDC supplied from the 24V power circuit.

Immediately following power up, VI of SR 1 will be LOW, so that Q6 will be ON. Therefore, + 24V will be supplie, via Q6, to the chopper circuit (D2, L2) and the smoothing circuit (C7). When the charge in C7 reaches 5V, however, SR 1 brings VI into a high-impedance condition, and Q6 goes OFF. Thereafter, based on this 5V charge, Q6 will switch ON when the voltage drops, and switch off when the voltage rises to a certain level. This intermittent action will generate a stable + 5V voltage.

The chopper circuit provided at the output stage acts, just as with the 24V voltage, to stabilize the current.

R31 serves to control the 5V output at a slightly higher (about 5 mV) level, so as to prevent voltage drop to due switching delay.

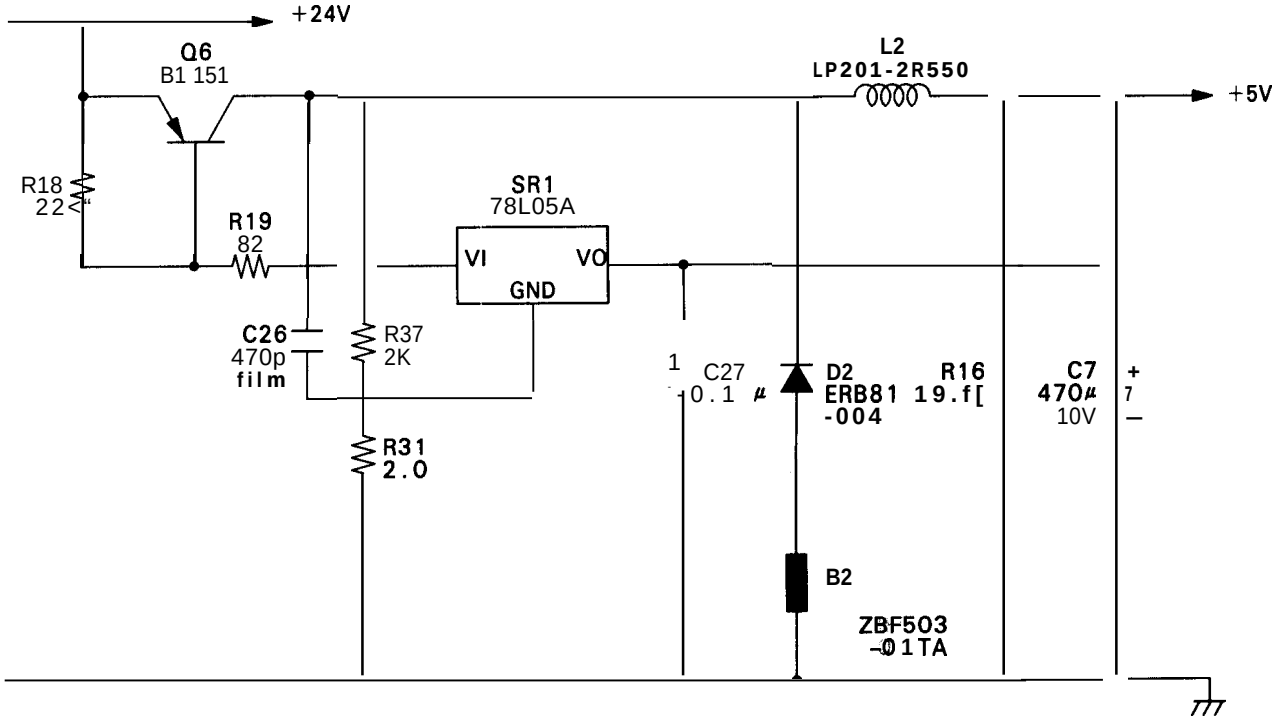


Figure 2-2'1. +5V DC Power Supply **Circuit**

2.2.2 *Reset Circuit*

This circuit generates the signal that initializes the printer, and is made by monitoring the + 5 and + 24V voltages when the power is switched ON and OFF.

The reset signal line is connect to the CF'U and gate array 3B. Figure 2-22 shows the reset circuit.

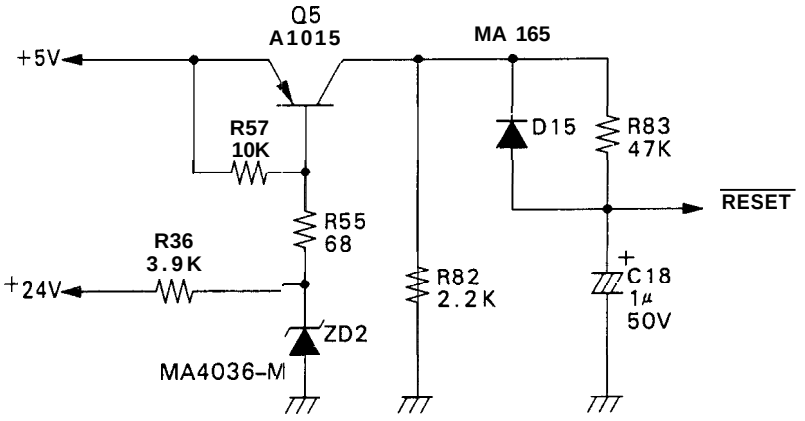


Figure 2-22. Reset Circuit

2.2.2.1 Power-on Reset

As Figure 2-23 indicates, a rising +24V pulse occurs first, after which a + 5V rising pulse occurs. Immediately after power up, the positive side of C 18 is LOW, which acts to maintain the output condition of the reset signal.

The + 24VDC is connected to Q5 to provide the Zener bias current. Because the Zener voltage is 3.6V, the base of Q5 becomes 3.6V. Q5 will be ON when the following voltage is added to the Q5 emitter:

(Zener voltage) +(Voltage decrease along the easy-flow direction of the P-N junction) = 4.2V

When Q5 is ON, the voltage of the + 5V line is output to the Q5 collector.

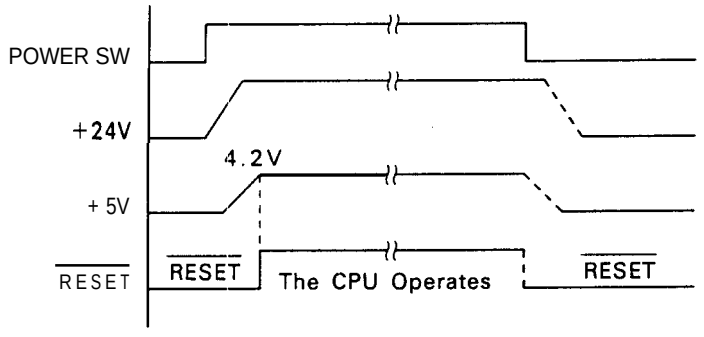


Figure 2-23. $\overline{\text{RESET}}$ Output

2.2.2.2 Operation at Reset

The reset signal causes the following operations to occur.

1. **The printhead carriage moves to the left-side home position.**
2. **The printer enters the ON-LINE mode.**
3. **The print buffer and input buffer are cleared.**
4. **The line spacing is set to 1/6 inch, and the page length is set, depending on the DIP switch setting, to either 11 or 12 inches.**
5. **Vertical tabs are cleared.**
6. **Horizontal tabs are set for every 8 columns (columns 8,1 6,24...)**
7. **The print mode is set according to DIP switch setting and the contents of EEPROM.**

EEPROM (1 C) stores the previously set operating modes and conditions, such as font and position of fanfold paper.

2.2.2.3 *Power-off Reset*

When the + 5V potential drops, Q5 goes off, the energy stored in the electrolytic condesner is released via D 15 and R82, and the reset condition is entered.

2.2.3 Carriage Operation

This section describes the carriage operation.

2.2.3.1 Carriage Mechanism

The carriage mechanism includes the printhead, the carriage, the timing belt, the carriage motor, and the platen. Figure 2-24 shows the carriage mechanism.

The timing belt is connected to the bottom of the carriage. The 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.

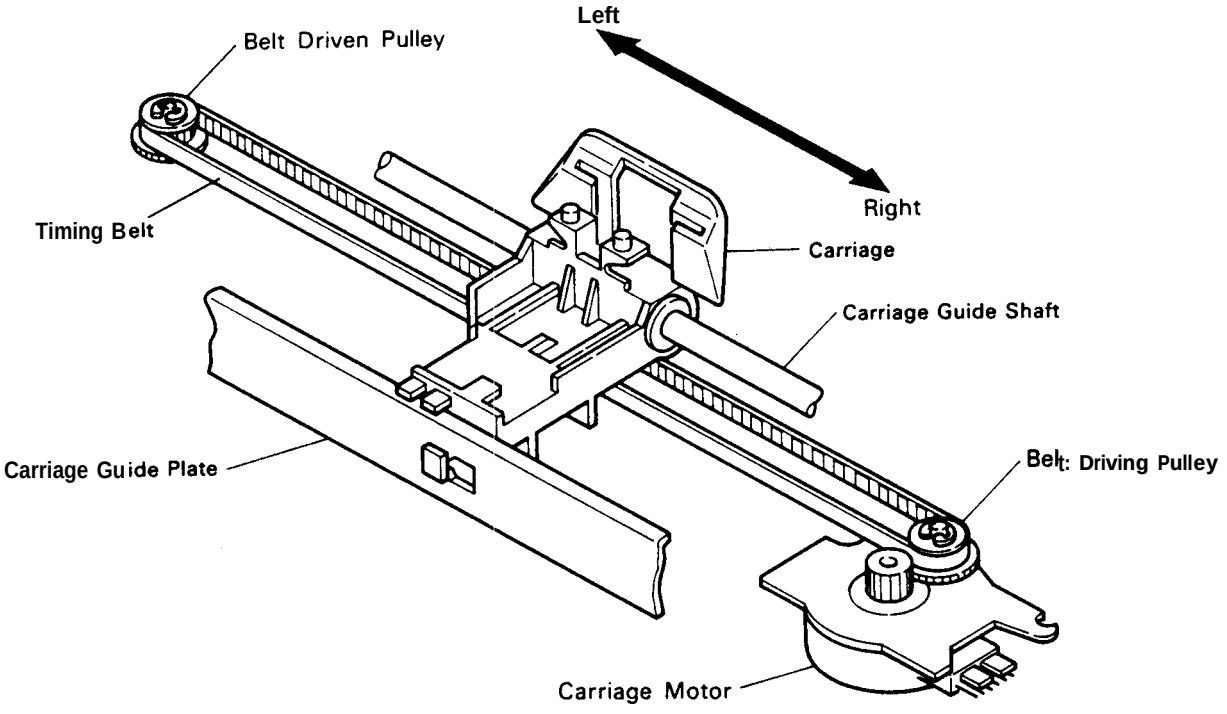


Figure **2-24.** *Carriage Mechanism*

2.2.3.2 *Carriage Motor Specifications*

Carriage motor specifications are as follows:

Type	*4-phase, 48-pole* **step motor**
Drive Voltage	*24 V ± 10%*
Coil Resistance	**11 ohms &7% at 25 degrees C**
Current	**Driving: 0.36 A ±10%(Typical) (Super Draft or Draft Printing)**
	0.28 A ±10%(Typical)(NLQ Printing)
	Holding: 0.09 A ± 10%

2.2.3.3 Carriage Drive Circuit Block Diagram

Figure 2-25 shows a block diagram of the carriage motor drive circuit. In this circuit, the phase switching for the carriage motor is directly executed not by the CPU, but by the gate array (3 B), which acts on the basis of the CPU phase data. SLA7020M drives the carriage motor with a stabilized current.

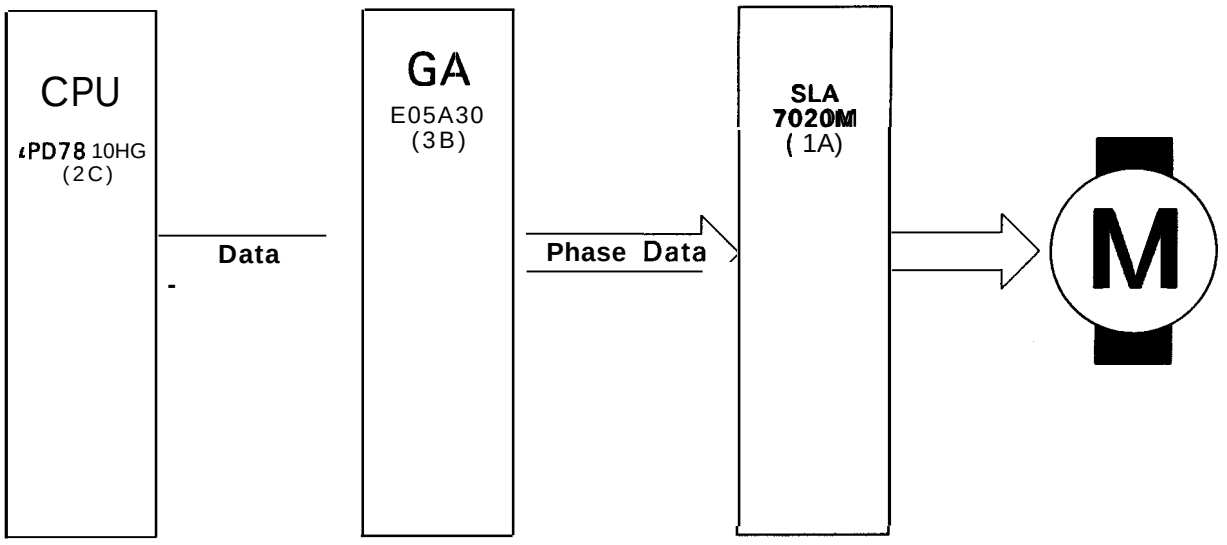


Figure 2-25. Carriage Drive Circuit Block Diagram

2.2.3.4 Carriage Motor Drive Circuit

This unit utilizes an SLA7020M IC for the step motor drive. This IC causes the motor to be driven at the specified current. The IC utilizes a MOSFET power element, so that heat generation is low, and there is no need to use a radiator board. The current value is determined by the value of the external voltage input.

Within the IC, the AB ($A\overline{A}$) phase and the CD ($B\overline{B}$) phase are completely differentiated, and create identical circuits.

For convenience, only the AB ($A\overline{A}$) circuit is explained below. Figure 2-26 shows the carriage motor drive circuit. Figure 2-27 shows the SLA7020M circuit diagram.

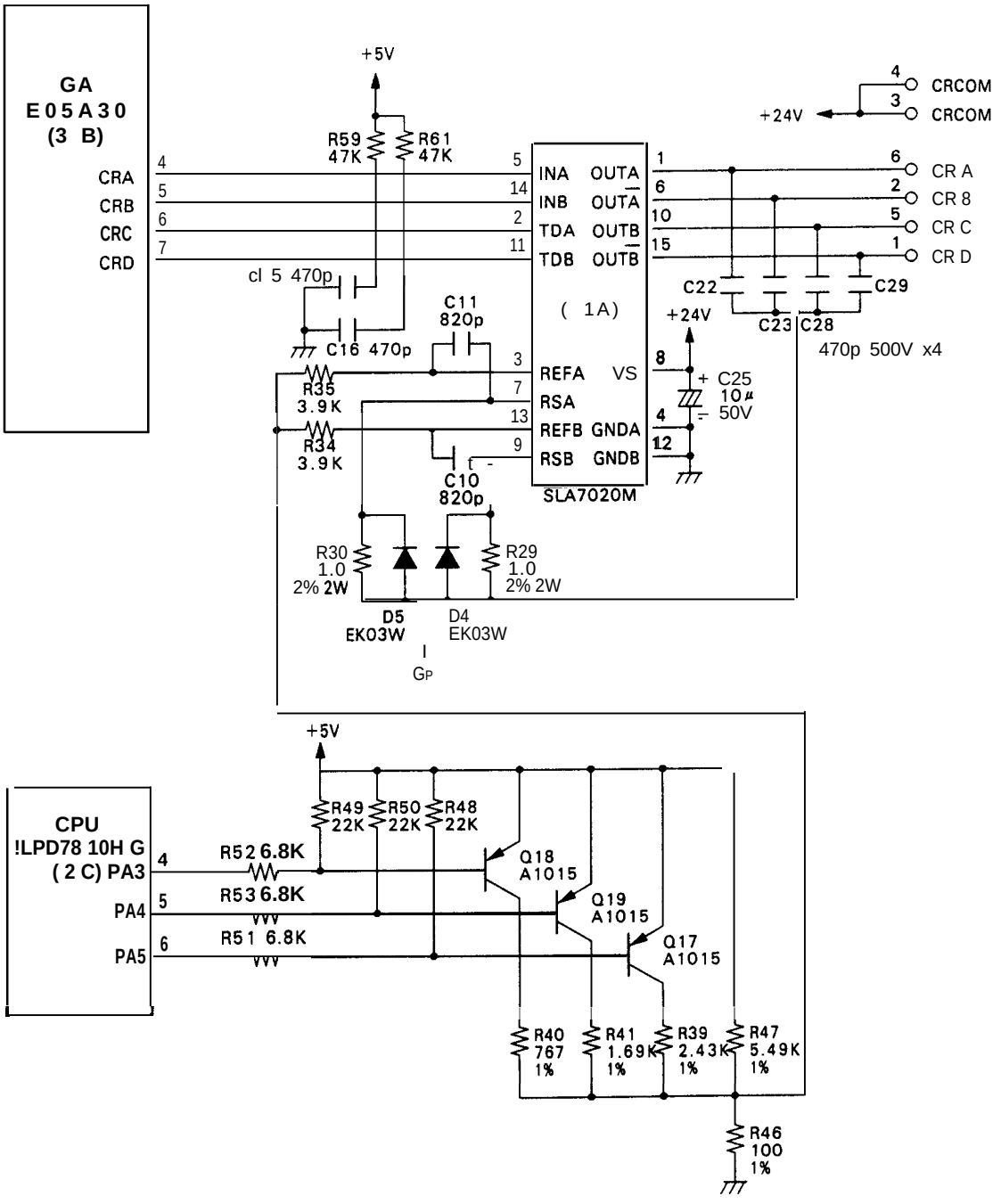
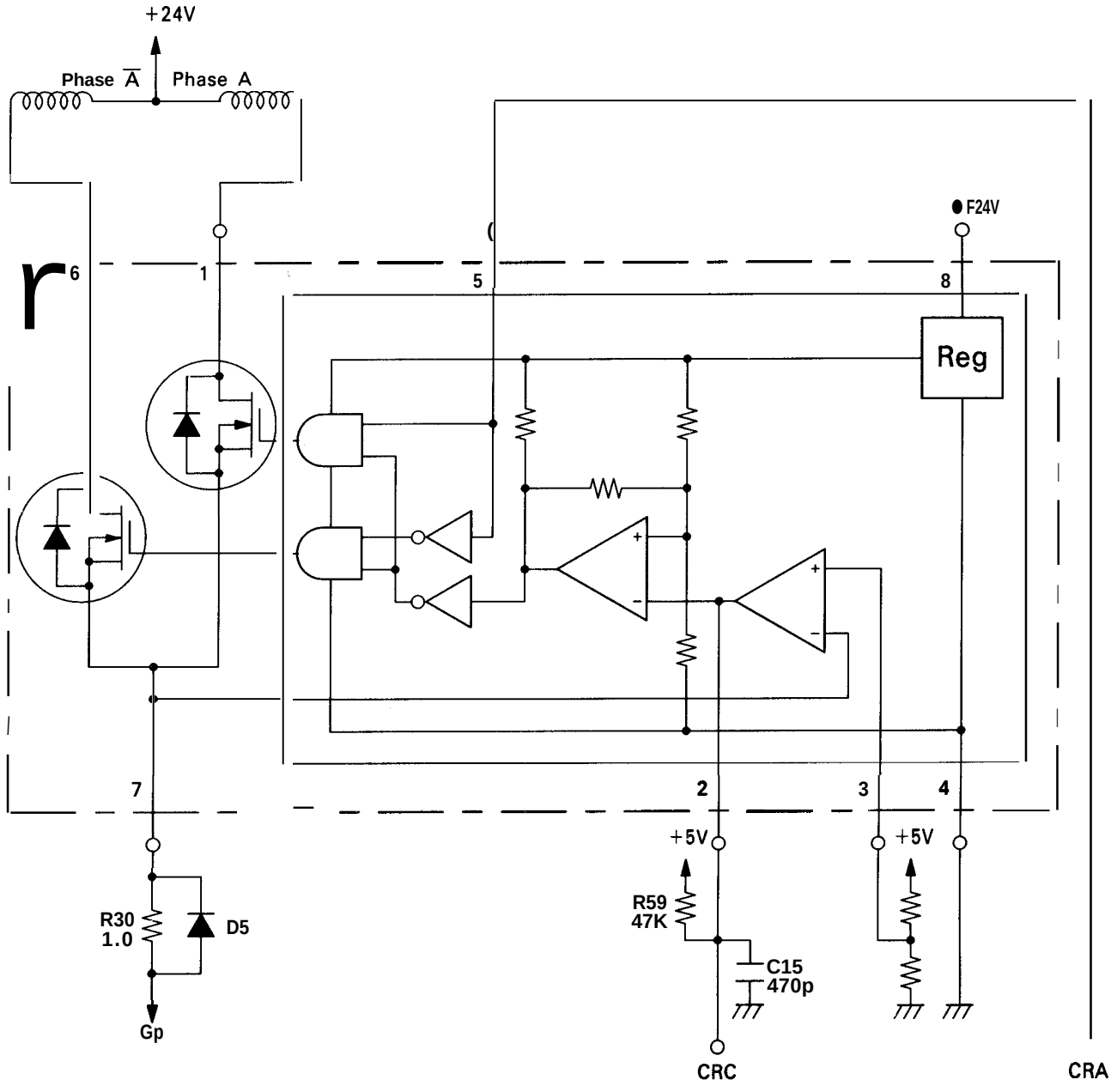


Figure 2-26. Carriage Motor Drive Circuit



NOTE: Phase CD is equivalent to the above.

Figure 2-27. SLA7020M Circuit Diagram

SLA7020M Phase Signal Input Circuit

Although most step-motor control IC'S input 4-phase data directly, the SLA7020M requires a special type of phase data.

In the case of *2-2* phase excitation:

Figure 2-28 shows the excitation signal input circuit.

The A-phase-side excitation signal input is via a single line. The output is divided among non-inverted A-phase output and A-phase output passed through an inverter. Therefore, the A-phase output side will be ON when the excitation input signal is HIGH. The A-phase output side will be ON when the excitation input signal is LOW.

Figure 2-29 shows the timing chart for 2-2 phase excitation.

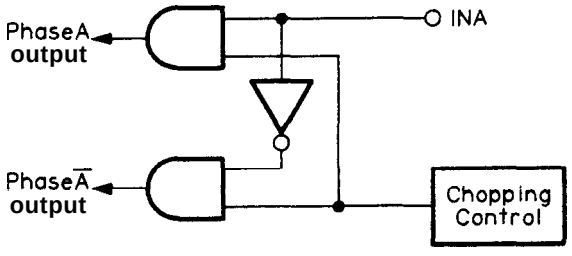


Figure 2-28. Phase Data Input Circuit (2-2 Phase)

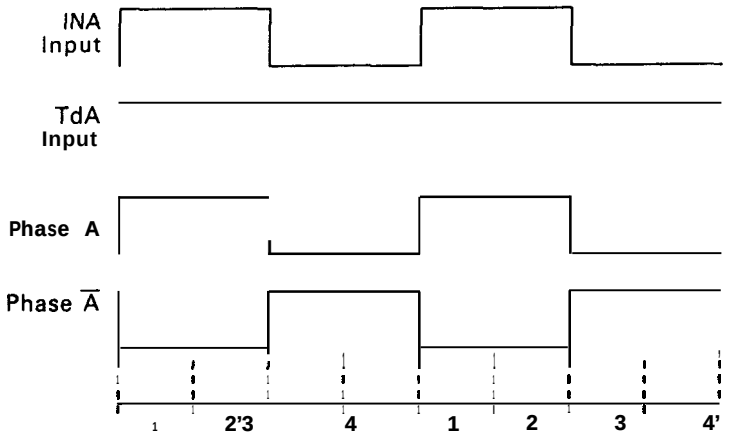


Figure 2-29. Phase Signal Timing Chart (2-2 Phase)

In the case of 1-2 phase excitation:

Figure 2-30 shows the excitation signal input circuit. When the Td terminal is LOW, the SLA702M can cut off the output current. By using this function, the unaltered 2-phase excitation signal can cause the 1-2 phase excitation to be on 3/8ths of the time, which is a suitable value.

Figure 2-31 shows the timing chart.

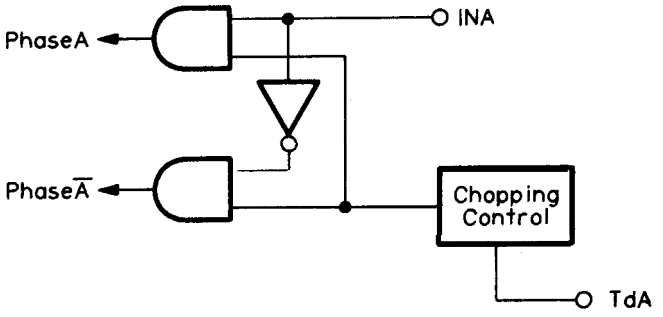


Figure 2-30. Phase Data Input Circuit (I-2 Phase)

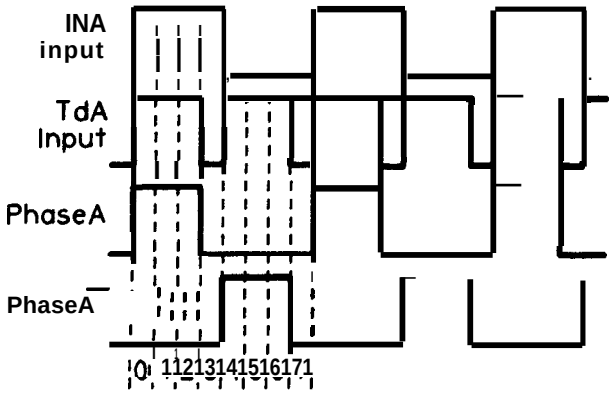


Figure 2-31. Phase Signal Timing Chart (I-2 Phase)

Reference Voltage Generation Circuit

Figure 2-32 shows the reference voltage generation circuit and Table 2-3 shows the reference voltage.

The reference voltage generation circuit is shown in Figure 2-32, the reference voltages are shown in Table 2-3. The SLA7020M drives the stepping motor based on current proportional to the reference voltages set here. There are four stages of reference voltage values (motor drive current values), and these are switched to correspond to the drive speed of the motor.

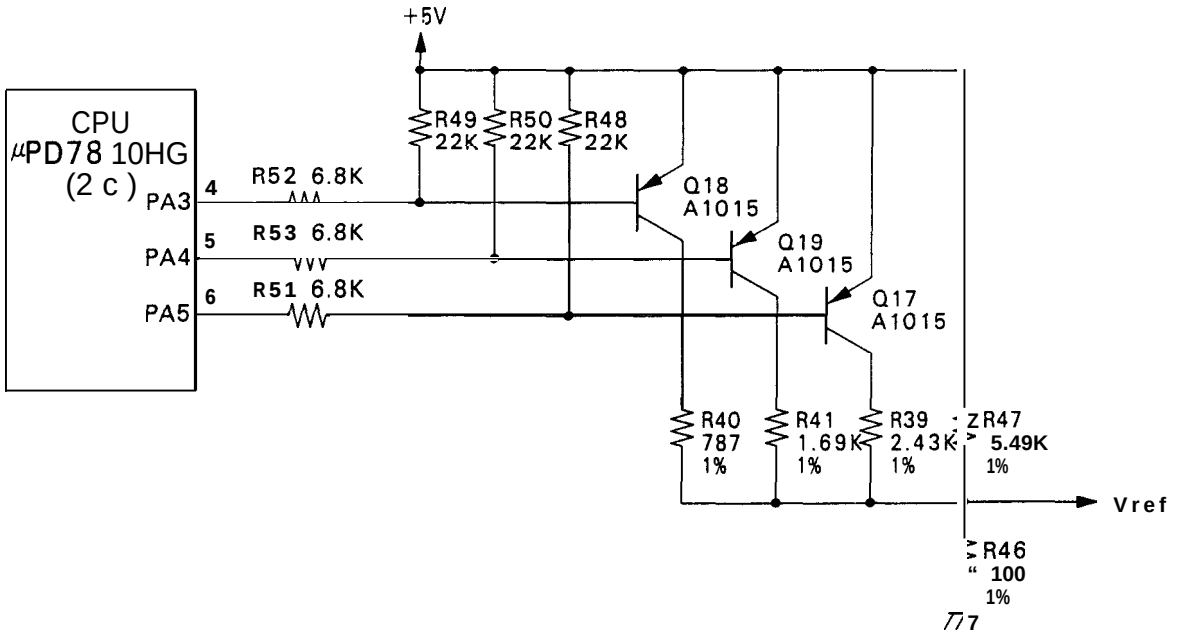


Figure 2-32. Reference Voltage Generation Circuit

Table 2-3. Reference Voltage

PA5	PA4	PA3	Reference Voltage
H	H	L	0.634 V
H	L	H	0.359 V
L	H	H	0.280 V
H	H	H	0.089 V

Constant Current Drive Circuit

The constant current drive circuit is shown in Figure 2-33 (for A-phase only), and the waveforms for each part are shown in Figure 2-34. In Figure 2-33, the reference voltage is indicated by Vref; this voltage determines the peak current through resistance R30. Resistance R59 and capacitance C 15 determine the OFF time of the chopper.

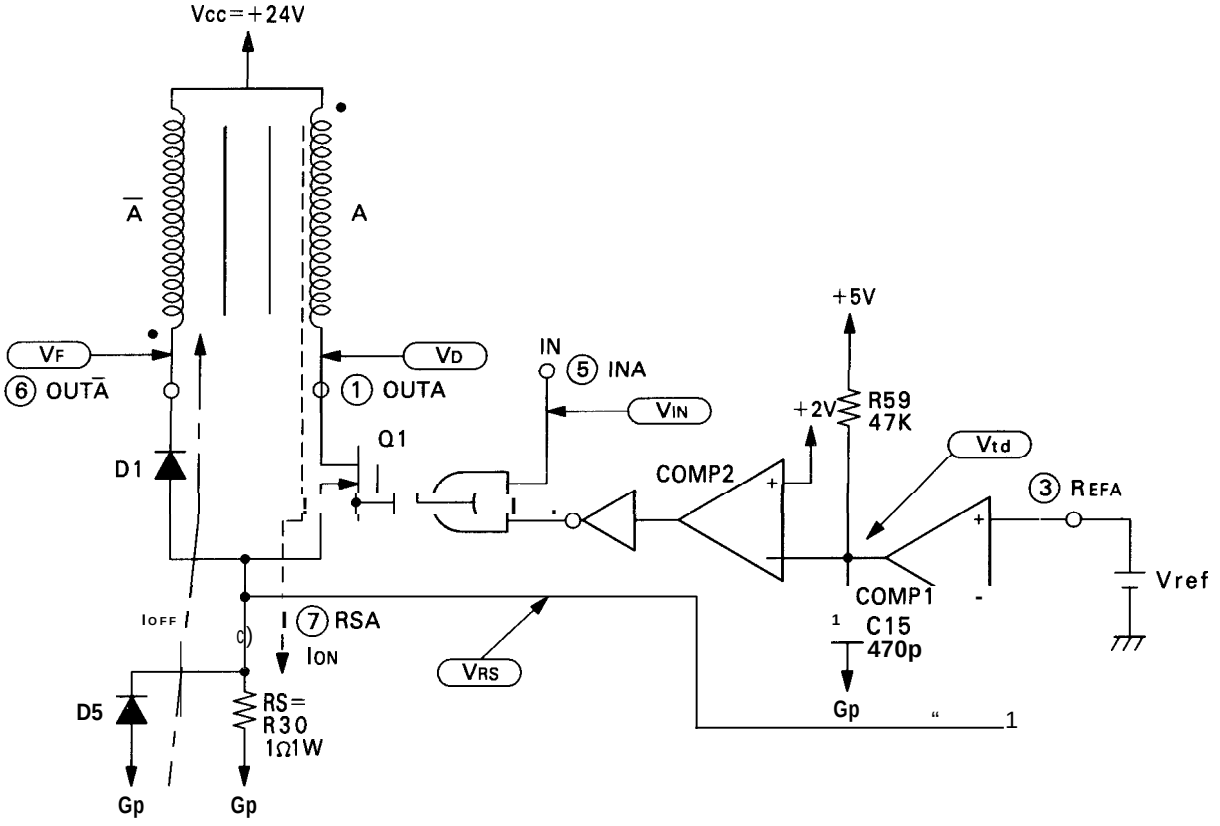


Figure 2-33. Constant Current Control Circuit

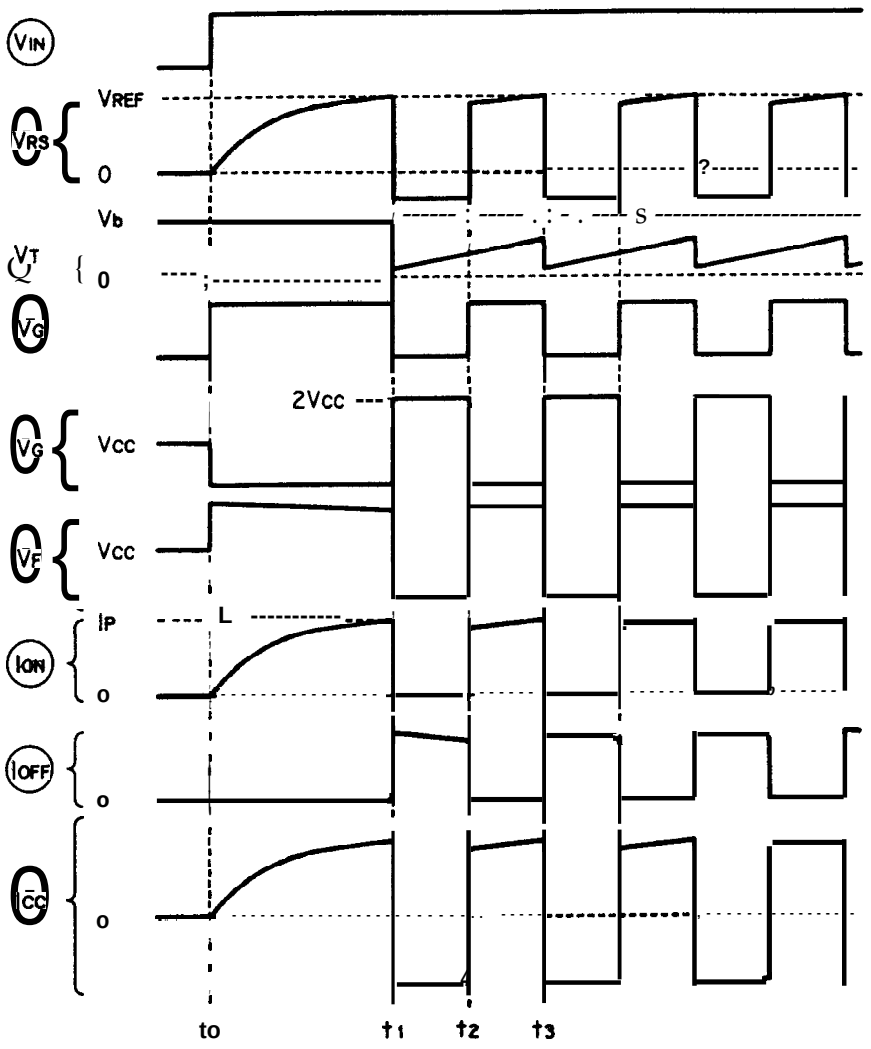


Figure 2-34. Waveforms

The circuit's constant current control process is shown above.

Peak current detection (to-t 1)

(1) When excitation input IN goes ON, so does MOS FET Q 1. The A-coil excitation current I_{ON} then flows along route –.

(2) As I_{ON} increases, so does the voltage at R30.

(3) When R30 voltage exceeds Vref, COMP 1 inverts, and the T_D voltage falls to near zero.

(4) When V_{TD} drops below the COMP2 threshold voltage, COMP2 inverts.

(5) COMP2 inversion causes Q1 gate voltage to go LOW, and Q1 goes OFF.

Chopper off time (t 1-t2)

(6) When Q1 goes OFF, reverse potential is generated in the motor coil, causing the coil current route to switch from I_{ON} to I_{OFF}.

(7) I_{OFF} flow then causes current flow in R30 to change direction. COMP1 feedback voltage V_{RS} (V-) thereby drops below V_{REF}, and COMP1 again inverts.

(8) COMP 1 output stages are formed by an open collector circuit. As a result of the inversion in step (7), COMP 1 output goes HIGH, so that T_D voltage V_{TD} gradually rises, in line with the time constant determined by resistance R59 and capacitance C 15.

(9) The MOS FET gate voltage is maintained at OFF until the value of the T_D voltage reaches the COMP2 reference voltage of 2V.

The period above, during which V_{TD} is rising from OV to 2V, is equivalent to T_{OFF}.

Chopper on time (t2-t3)

(10) When T_D voltage V_{TD} reaches the COMP2 reference value (2 V), COMP2 inverts, and Q 1 goes on.

(1 1) When Q1 goes on, the current flow switches from I_{OFF} to I_{ON}.

(12) On the basis of the time content of motor coil A, I_{ON}, after a certain delay, gradually rises in response to power source voltage Vcc.

(13) As I_{ON} increases, R30 potential V_{RS} also increases. Until the value of V_{RS} reaches that of V_{REF}, Q1 remains on, supplying current I_{ON} from the power source to the motor.

The period in which V_{RS} advances toward V_{TD} is equivalent to T_{ON}.

2.2.3.5 Carriage Motor Software Control

This section describes the carriage motor software control.

Excitation System

The excitation system is determined by the firmware and is executed in accordance with the carriage speed, as shown in Table 2-4. The motor drive sequence for each excitation system is shown in Tables 2-5 and 2-6.

Table 2-4. Phase-Excitation Method

Carriage Speed	Phase-Excitation Method
1200 PPS	2-2 Phase
900 PPS	2-2 Phase
900 PPS	1-2 Phase

Table 2-5. Drive Sequence (2-2 Excitation)

CR DIRECTION	Left → Right				Right → Left			
Step No.	Phase A	Phase B	Phase C	Phase D	Phase A	Phase B	Phase C	Phase D
1	ON	OFF	ON	OFF	ON	OFF	OFF	ON
2	ON	OFF	OFF	ON	ON	OFF	ON	OFF
3	OFF	ON	OFF	ON	OFF	ON	ON	OFF
4	OFF	ON	ON	OFF	OFF	ON	OFF	ON

Table 2-6. Drive Sequence (l-2 Excitation)

CR DIRECTION	Left → Right				Right → Left			
Step No.	Phase A	Phase B	Phase C	Phase D	Phase A	Phase B	Phase C	Phase D
1	ON	OFF	OFF	ON	ON	OFF	ON	OFF
2	ON	OFF	OFF	OFF	ON	OFF	OFF	OFF
3	ON	OFF	ON	OFF	ON	OFF	OFF	ON
4	OFF	OFF	ON	OFF	OFF	OFF	OFF	ON
5	OFF	ON	ON	ON	OFF	OFF	ON	ON
6	OFF	ON	OFF	OFF	OFF	ON	OFF	OFF
7	OFF	ON	OFF	ON	OFF	ON	ON	OFF
8	OFF	OFF	OFF	ON	OFF	OFF	ON	OFF

Because the carriage is driven by a step motor, the printing direction can be changed at any time, and the carriage can be stopped at any position. Carriage motor control is effected by an open-loop system which switches the phases in accordance with the set speeds.

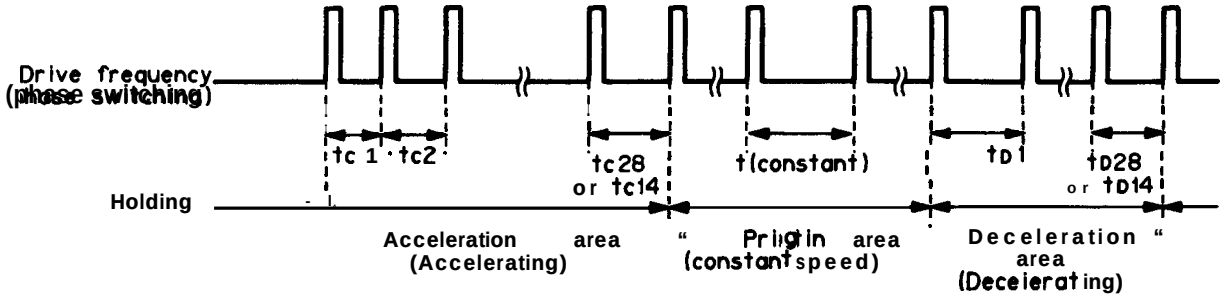


Figure 2-35. Carriage Motor Control

Home-Position Seek

The control that causes the carriage to move to the home position when the power is turned on is called home-position seek. Figure 2-36 shows the home-position seek operation.

When power is applied, the printer executes 2-2 phase excitation for 20 or 30 ms (regardless of the phase switching timing) and checks the $\overline{\text{HOME}}$ signal. The result of this check determines whether the starting position should be 1 or 2. The carriage enters the home position only once during the initialization.

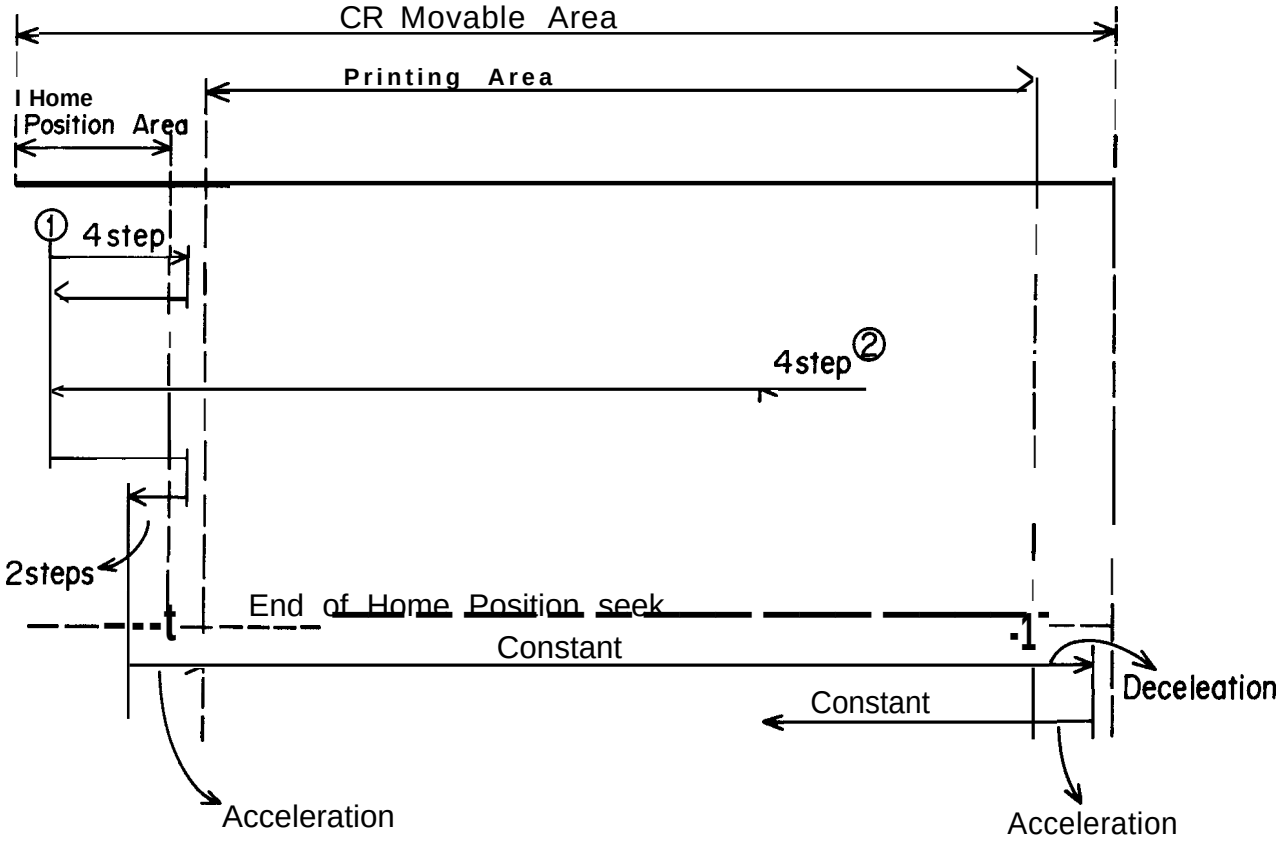


Figure 2-36. Home-Position Seek

Printing Area

The printing area is defined as starting 26 phase switching times following the home position.

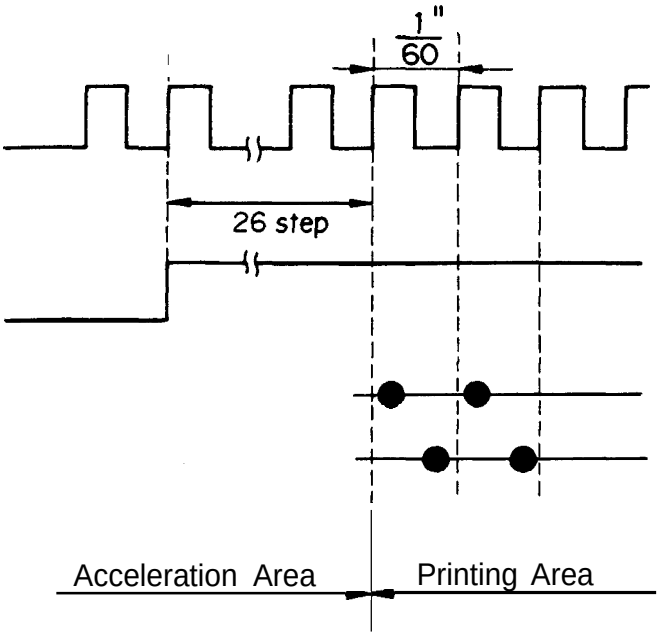


Figure 2-37. Printing Area and Printing Timing

Abnormal Carriage Operation

This unit does not employ a print timing signal (PTS) sensor and cannot detect abnormal carriage operation. There will therefore be no error recognition if, for example, the carriage movement is blocked or otherwise affected by an external force. An error will only occur if the $\overline{\text{HOME}}$ signal while the printhead is in the printing area, in which case the carriage will stop.

2,2.4 Paper Feed

This section describes the paper-feed operation.

2.2.4.1 Paper Feed Mechanism Operation

Friction feeding is used for cut sheets, and push tractor feeding is used for fanfold paper.

Friction-Feed Operation

The paper is held against the platen by paper-feed rollers. The paper-feed motor rotates the platen gear, via the paper-feed reduction gear, in the direction shown in Figure 2-38. Because of the friction between the paper-feed rollers and the platen, the rotation of the platen gear causes the paper to be fed. The feeding direction is indicated by the arrow in the Figure.

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

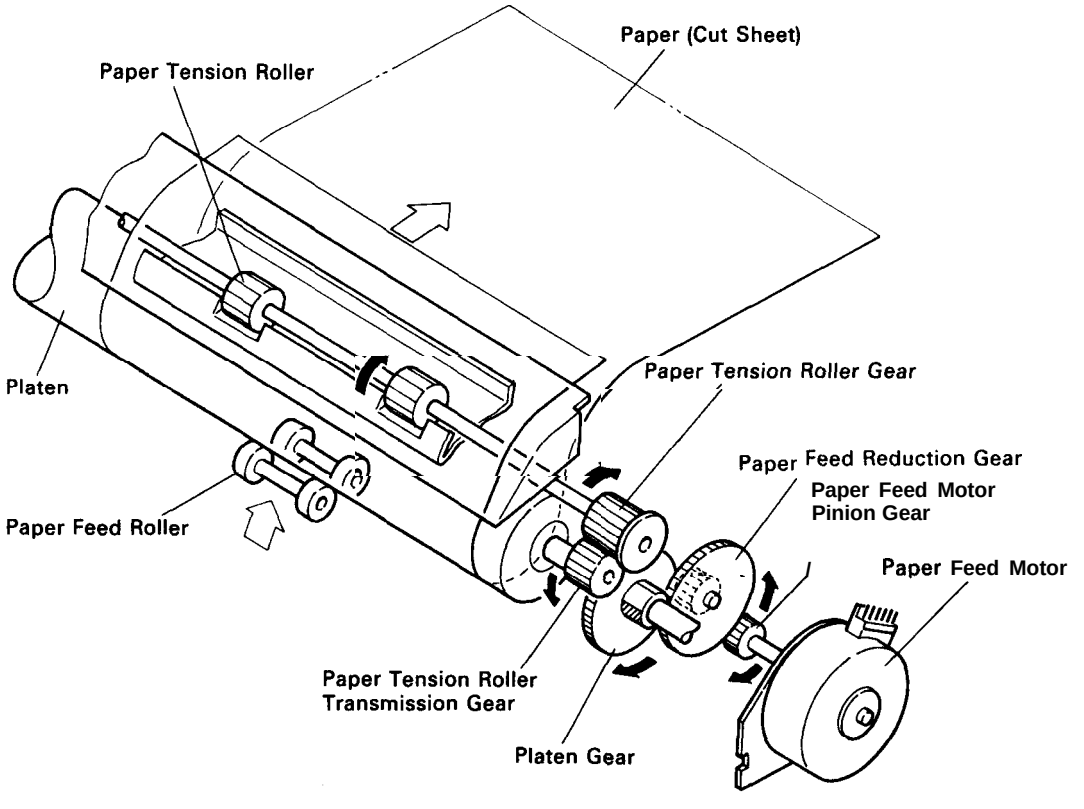


Figure 2-38. Friction-Feed Operation

Push Tractor Feed Operation

When the push tractor unit is used, the paper is set such that its holes mesh with the tractor pins along the tractor belt. The paper feed motor is driven and, via the pinion on the motor shaft, rotates the gears in the direction shown in Figure 2-39, rotating the tractor belts. This causes the paper advances in the direction indicated by the arrow. When push tractor feeding is used, the pressure of the paper feed rollers against the platen is released by moving the paper release lever to its forward setting.

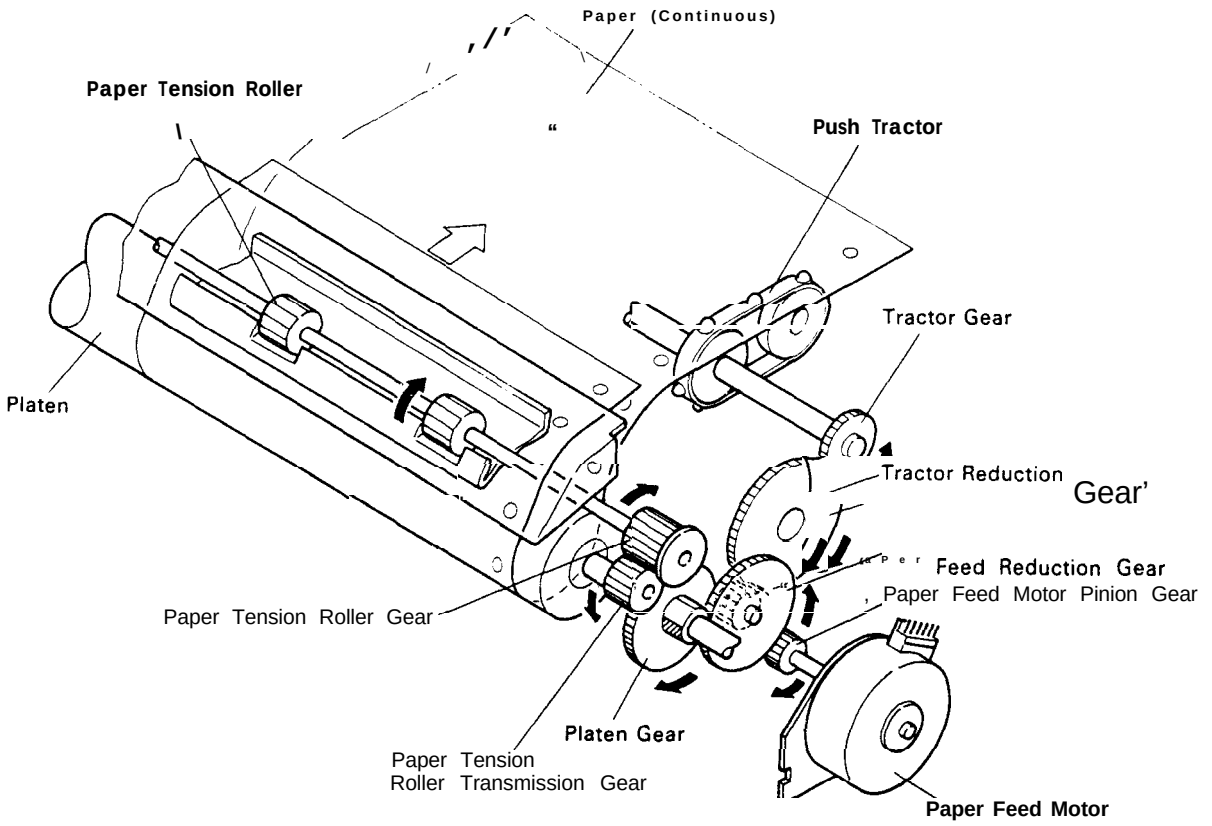


Figure 2-39. Push Tractor Feed Operation

2.2.4.2 Paper-Feed Motor Specifications

Paper-feed motor specifications are as follows:

Type	**4-phase, 48-pole step motor**
Drive Voltage	**24 VDC ± 10%**
Coil Resistance	**40 ohms ±7% at 25 degrees C**
Phase Excitation	**2-2 phase**
Current	**Maximum, 1.1 A (Rush Current, 26.4 VDC)**
	Driving: 0.30 A (Typ., 480pps, 24VDC)
	Holding: 0.06 A ± 20 mA
Driving Frequency	**480 PPS**

2.2.4.3 Paper-Feed Motor Drive Circuit

The paper-feed motor drive circuit is shown in Figure 2-40. The paper-feed motor is a step motor which can utilize 2-2 phase excitation. When the paper-feed signal PC2 is set to HIGH, Q20 and Q 16 are turned on, and +24 V is supplied to the motor. When the paper-feed motor is not driven, + 5 V is supplied, via resistor R42 and diode D6, to hold the motor.

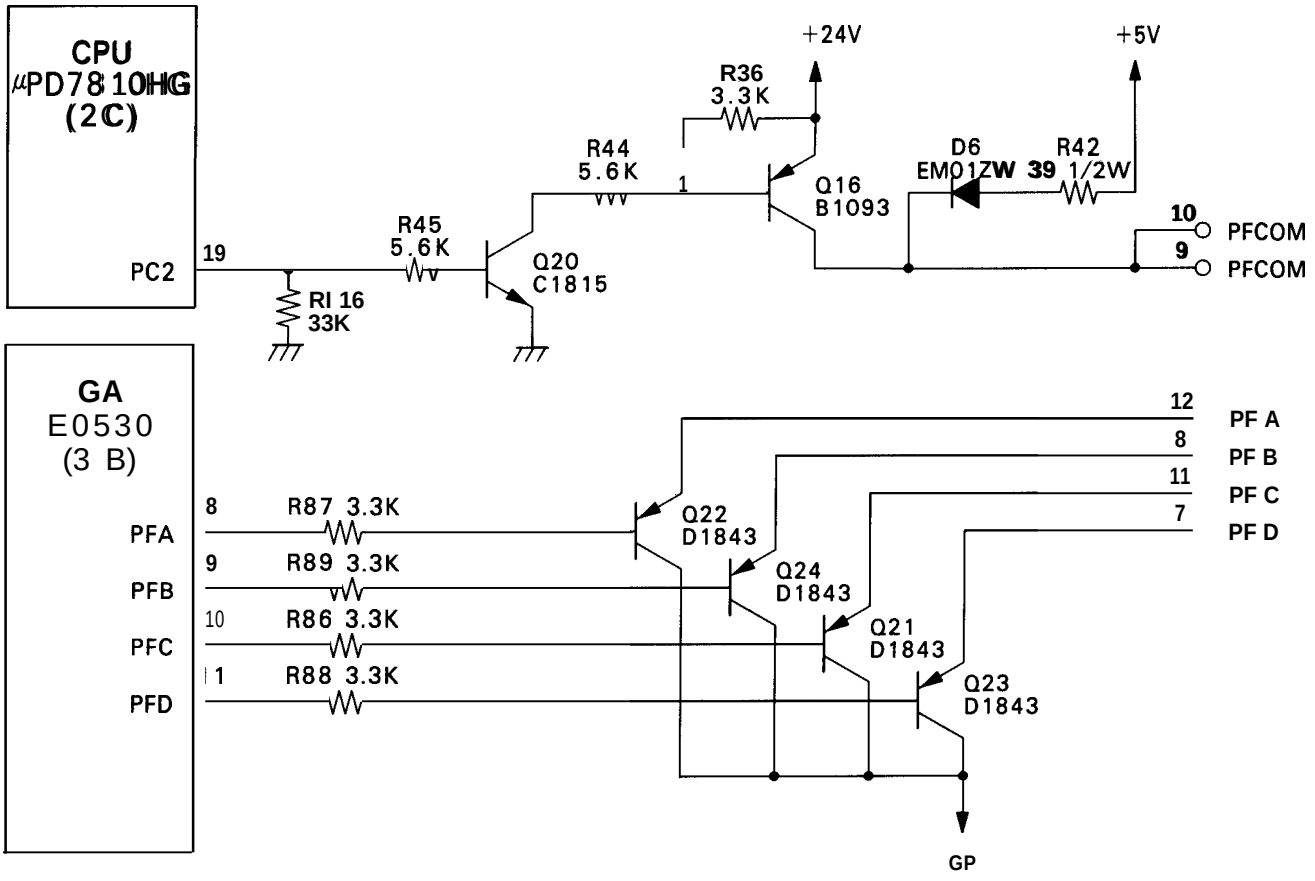


Figure 2-40. Paper-Feed Motor Drive Circuit

2.2.4.4 Paper-Feed Motor Software Control

The paper feed motor is a 48-pole step motor and is open-loop controlled. When 2-2 phase excitation is used to drive the motor, each step feeds the paper a distance of *1/2 16th* inch.

Table 2-7 shows the paper-feed motor excitation system.

Table 2-7. Excitation Sequence (Clockwise: Paper Feeds Forward)

Step No.	Phase A	Phase B	Phase C	Phase D
o	ON	OFF	ON	OFF
1	ON	OFF	OFF	ON
2	OFF	ON	OFF	ON
3	OFF	ON	ON	OFF

NOTE: If the paper-feed motor is driven counterclockwise, the paper is fed in reverse.

Figure 2-41 shows the paper-feed motor drive timing chart.

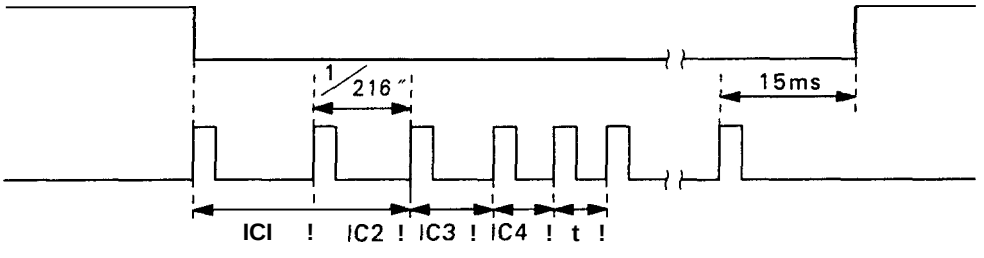


Figure 2-41. Paper-Feed Motor Drive Timing Chart

NOTE: If there are less than 10 steps, the speed will not change.

2.2.5 Printhead

This section describes the printhead operation.

2.2.5.1 Printhead Printing Operation

The dot-wire operation during printing is as follows. When the head-driving coil for a dot wire is energized, the actuating plate, which is engaged to one end of the dot wire, is attracted to the iron core, and drives the dot wire toward the platen. The dot wire forcefully pushes both ribbon and paper against the platen, causing a dot to be printed.

When the head-driving coil is deenergized, the actuating plate spring causes the actuating plate to return to its initial position. After striking the platen, the dot *wire* also returns to its initial position, partly in response to the impact energy, and partly as a result of the wire-resetting spring. The dot wire then remains engaged to the actuating plate until it is driven again. Figure 2-42 illustrates the printhead printing operation.

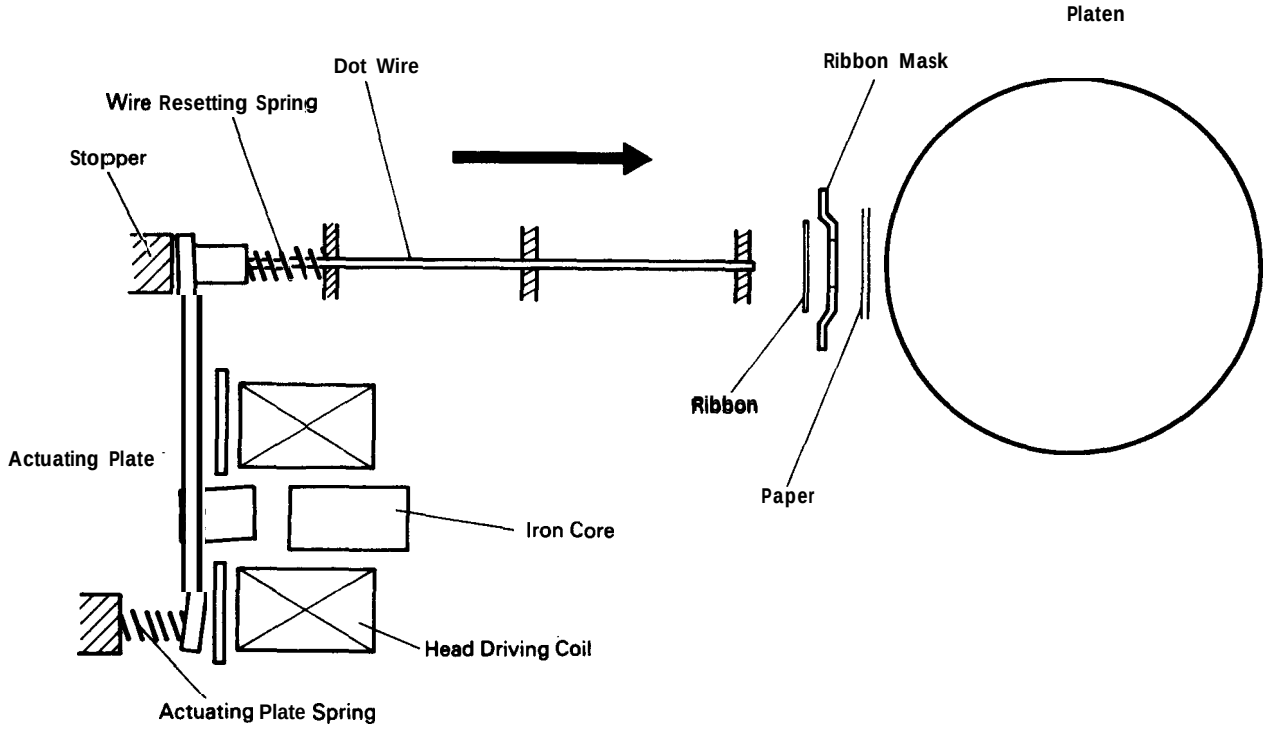


Figure 2-42. Printhead Printing Operation

2.2.5.2 Printhead Specifications

Printhead specifications are as follows:

Solenoids	9 solenoids
Wire Diameter	0.29 mm
Drive Voltage	24 VDC ± 10%
Coil Resistance	19.2 ± 1.0 ohms at 25 degrees C

2.2.5.3 Printhead Drive Circuit Block Diagram

Gate array E05A30 is used as an 8-bit + l-bit data latch.

The CPU determines the pulse width for the head-wire drive pulses from gate array E05A30 by monitoring the printhead drive power (+24 V line).

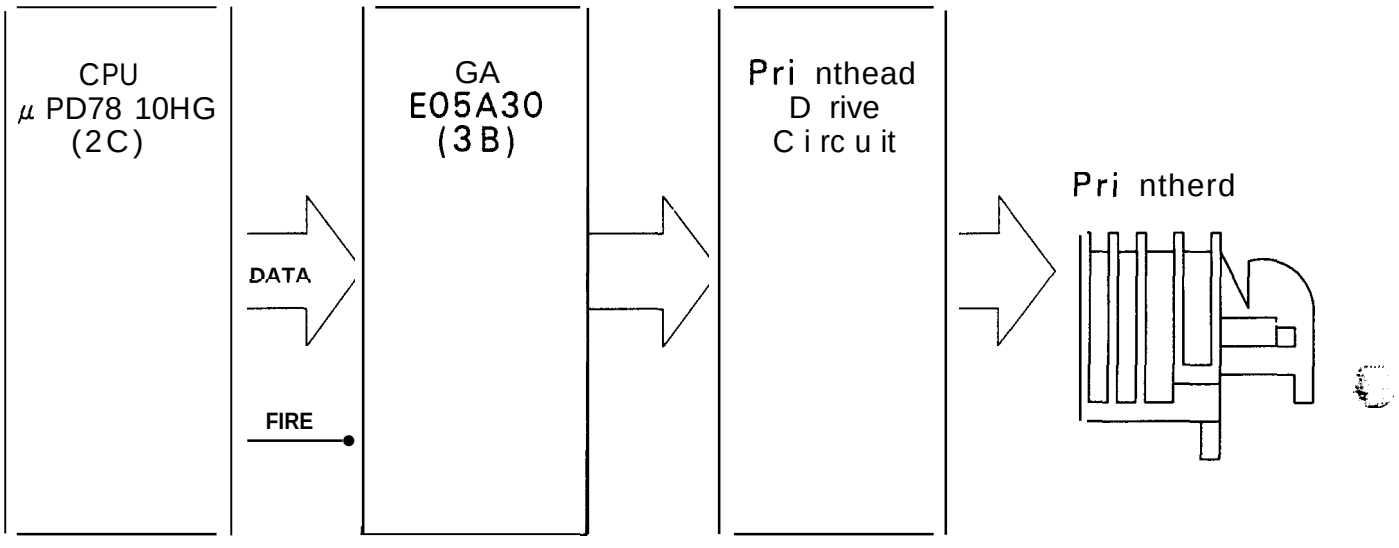


Figure 2-43. Printhead Drive Circuit Block Diagram

2.2.5.4 Gate Array E05A30 Operation in Printhead Drive Circuit

The E05A30 gate array includes circuitry to interface the CPU and the printhead.

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 E05A30.
2. The data for pins 1 through 8 of the printhead is latched by HD 1 trough HD8 of the E05A30.(MMIO 0C006H write operation)
3. The data for pin 9 of the printhead is latched by HD9 of the E05A30.(MMIO 0C005H write operation)
4. After data latching, the printhead drive pulse width signal $\overline{\text{FIRE}}$ is output from the CPU's event counter. When the signal is LOW, the gate array will be open, so that the data from HD1 through HD9 will be output.

2.2.5.5 Printhead Drive Circuit

The drive pulse width is adjusted using CPU port PC6.

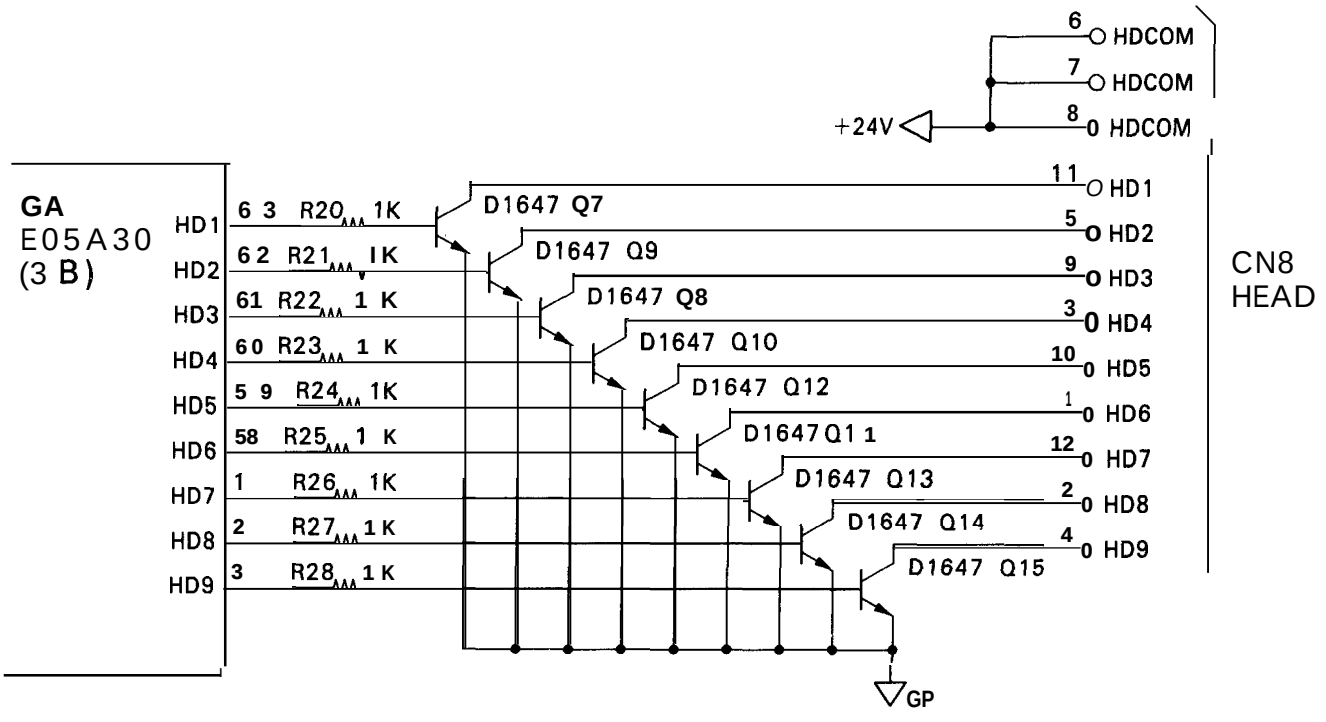


Figure 2-44. Printhead Drive Circuit

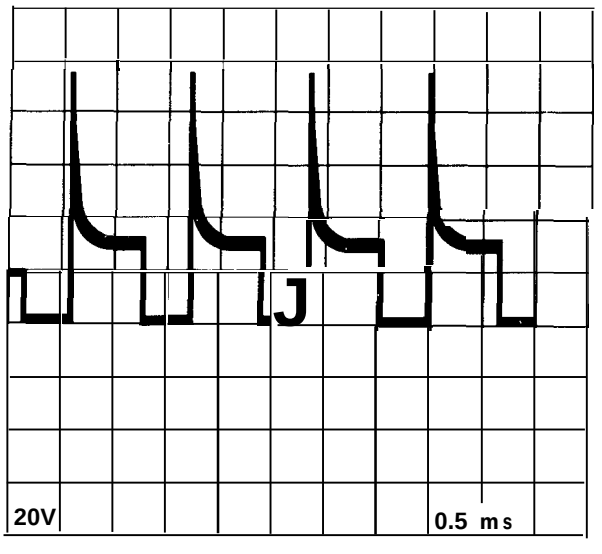


Figure 2-45. Printhead Driving Waveforms

2.2.5.6 Printhead Software Control

During operation at 900 PPS, one print cycle is performed at each phase switching step, so as to meet the specifications of the printhead (solenoid drive frequency: 900 Hz).

The drive pulse width is adjusted by using an A/D converter (Figure 2-47) to detect the drive voltage, and is kept within the area outlined by the oblique lines in Figure 2-47.

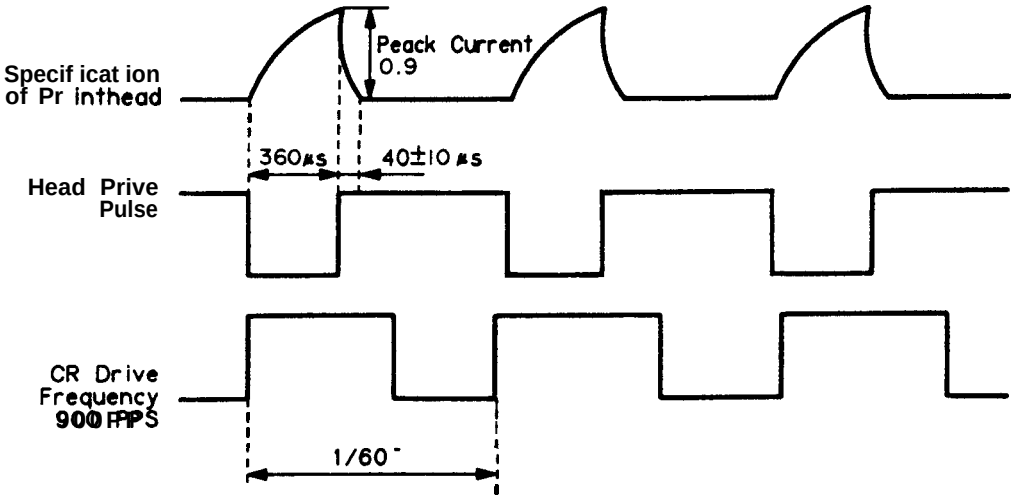


Figure 2-46. Print Timing

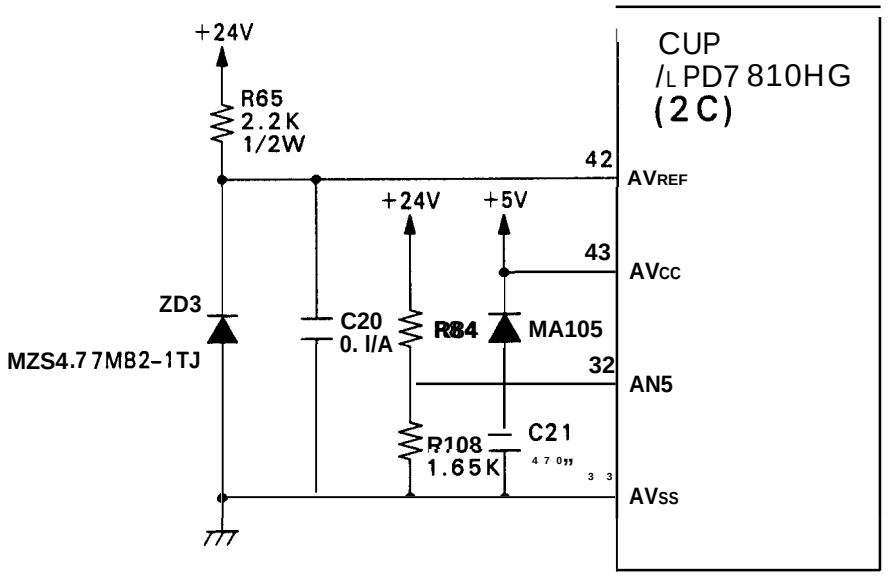


Figure 2-47. A/D Converter (+24 VDC Line Monitor) Circuit

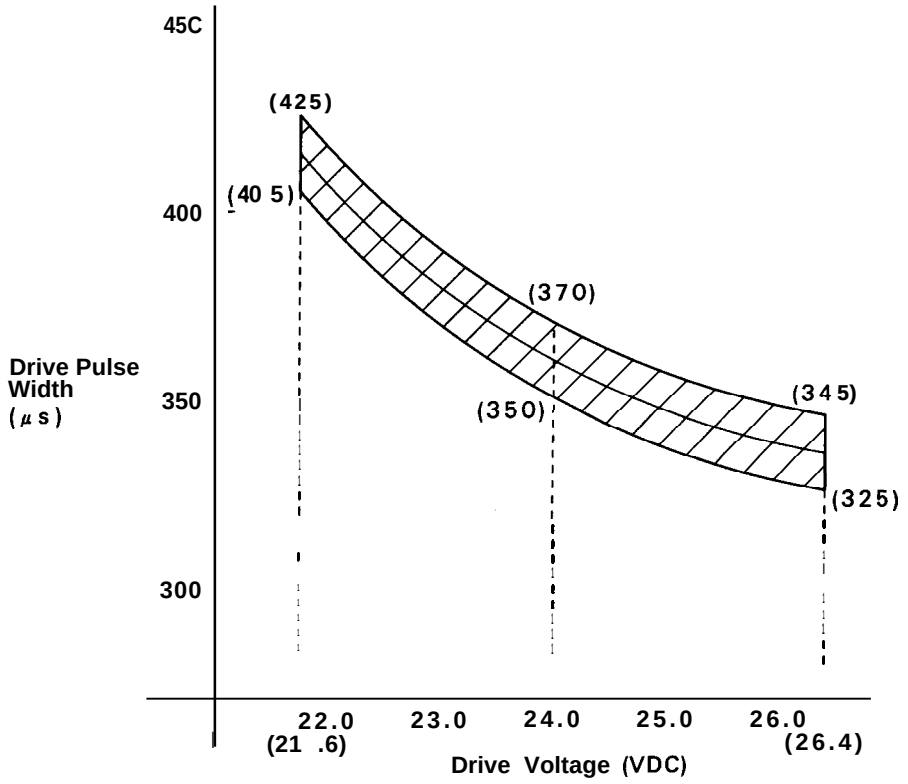


Figure 2-48. Relationship between Head Driver Voltage and Print Driving Pulse Width

2.2.6 Host Interface

The host interface circuit is shown in Figure 2-49. $\overline{\text{STROBE}}$ pulses from the host computer pass through the low-pass filter, consisting of R72 and C 12, and flow into the $\overline{\text{STROBE}}$ terminal.

These pulses latch the parallel data and set the BUSY signal HIGH, so that subsequent data transfer is inhibited.

At this time, the CPU, by reading address 0C002H, can detect whether the data from the computer are latched in the gate array. When the CPU determines that data have been latched, it proceeds to read the data. After the data have been read, the gate array automatically resets its busy signal.

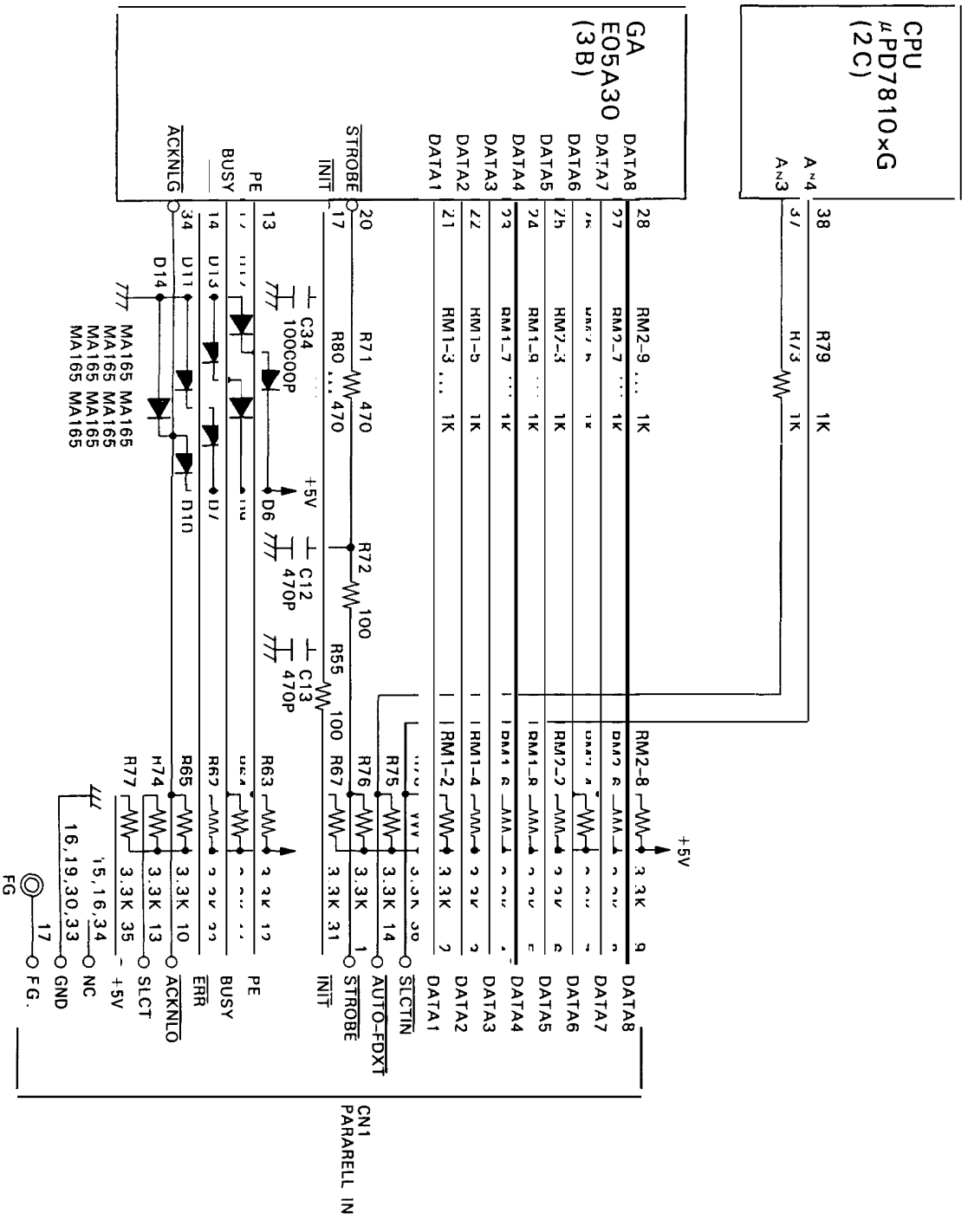


Figure 2-49, Host Interface

2.2.7 EEPROM Circuit

The EEPROM stores in its memory the current feed position of continuously fed paper, as well as the current panel settings. This memory is retained even after power is shut off.

EEPROM can memorize the current position of continuously fed paper, so that this information can be maintained even if power goes off.

Figure 2-50 shows the EEPROM circuit. Note that this is external to the CPU's memory space.

EEPROM is selected when CPU port PC5 goes HIGH. Once EEPROM has been selected, the data to be sent is set in CPU port PB 1, and is fed bit-by-bit to the EEPROM in line with rising pulses from CPU port PC4'S clock. Data are read, bit-by-bit, in line with falling clock pulses.

The EEPROM receives commands to indicate whether to read or write data, and to indicate addresses.

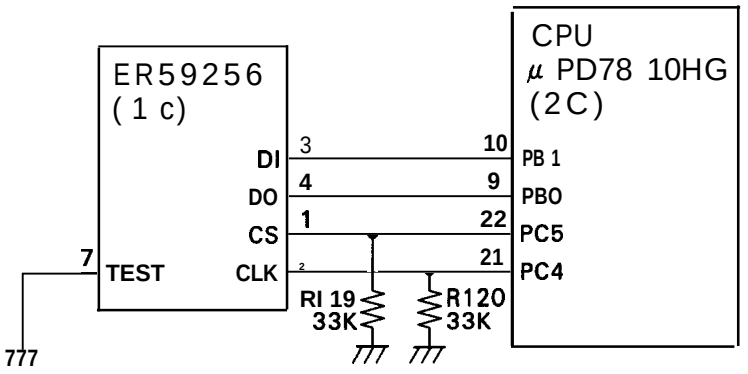


Figure 2-50. EEPROM Circuit

2.2.8 Ribbon-feed Mechanism

The ribbon-feed mechanism consists of the ribbon cartridge and the ribbon-feed section. The ribbon-driving gear is always driven counterclockwise (regardless of the timing belt direction) via the gear trains shown in Table 2-8.

Table 2-8. Ribbon-Feed Gear Train

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

Figure 2-51 shows the ribbon-feed mechanism. The inked ribbon is held in the cartridge case between the ribbon-feed and the ribbon-pressure roller mounted on the ribbon-driving gear. The ribbon configuration is such that the ribbon can feed endlessly.

The ribbon-driving gear drives the rollers, which causes the ribbon to be fed.

To prevent ribbon slack, a ribbon-breaking spring is attached at the exit of the cartridge case. A ribbon mask is installed to prevent the ribbon from staining the paper.

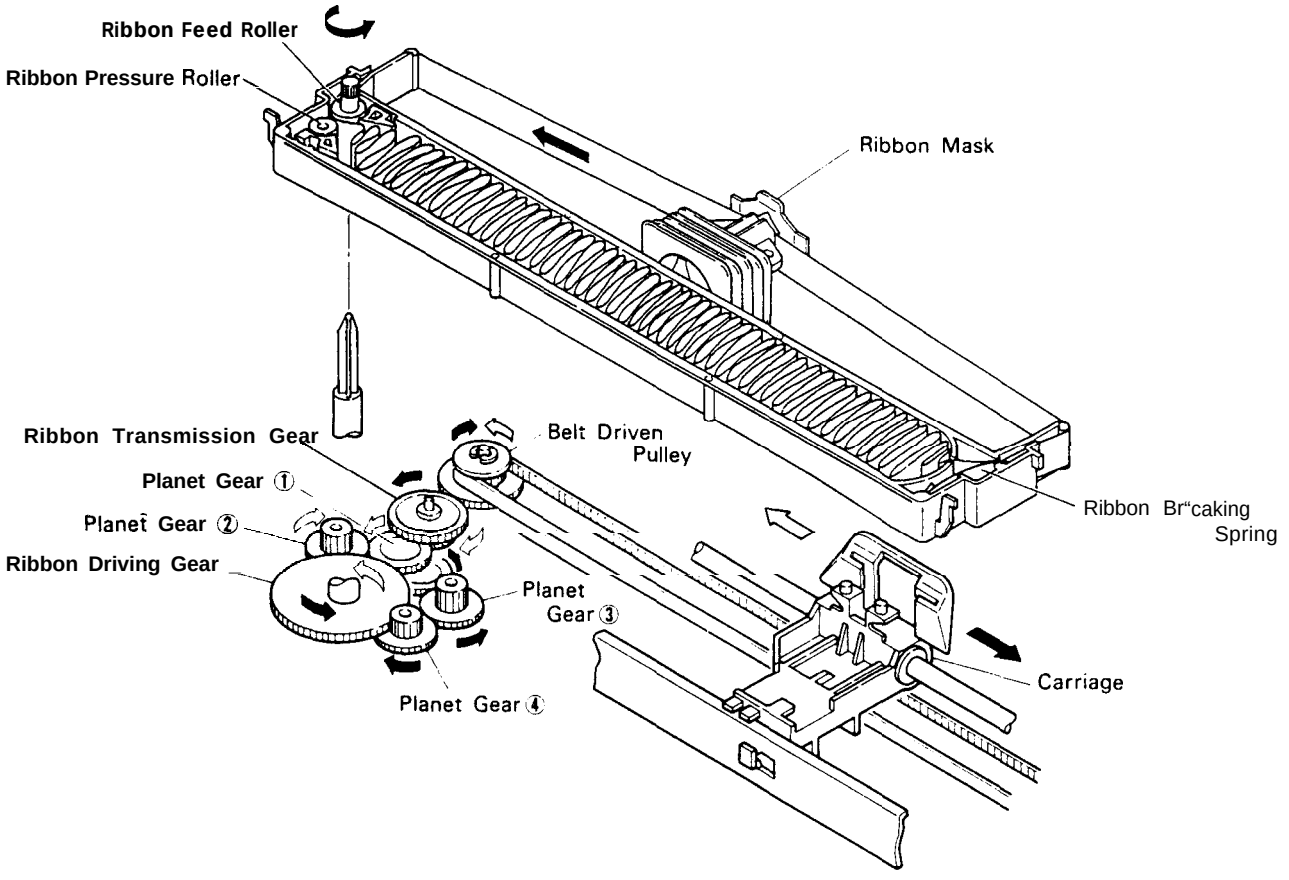


Figure 2-51. Ribbon-Feed Mechanism

CHAPTER 3
OPTIONAL EQUIPMENT

CHAPTER 3

LIST OF FIGURES

LIST OF TABLES

3.1 INTERFACE OPTIONS

The LX-8 10/850 is able to utilize the Model 8100 series optional interfaces. The main 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)
	8143 8148	None 2K/8K	o	0	19200
IEEE-488 (GP-IB)		Buffer Size	Function	Listen Only Operation	Address Operation
	8165	2K/8K	AH, L, DC	o	0

NOTE: For details, refer to the "Optional Interface Technical Manual."

3.1.1 Model 8143 Serial Interface Operation

With the RS-232C and a 20mA neutral current loop, the printer is able to support the optional Model 8143 interface.

Specifications

Synchronization	**Asynchronous**
Bit rate	**75 to 19200 bps .**
Word length	
Start bit	**1 bit**
Data bits	**7 or 8 bits .**
Parity bit	**Odd, Even, or None ***
Stop bit	**1 bit or more**
Signal level	
RS-232C	**Mark = logical "1" (–3 to –27 V)**
	Space = logical "O" (+3 to +27 V)
Current loop	**Mark = logical "I" (current ON)**
	Space = logical "O" (current off)
Handshaking	**By REV signal or X-ON/OFF code**
	(Signal polarity can be inverted by jumper setting.)

*** Selectable by DIP switch.**

NOTE: If the parallel interface cable is connected, disconnect it before using the 8143 board, as parallel interface input is used to read jumper settings and DIP switch status.

Jumper Settings

Table 3-2. Jumper Settings

	Function				
J1	ON: "TTY TXD" is brought to + 12V through 470 ohm register.				
J2	ON: "TTY TXD RET" is connected to signal ground.				
J3	ON: "TTY RXD" is brought to + 12V through 470 ohm register.				
J4	ON: "TTY RXD RET" is connected to signal ground.				
J5	ON: "DTR and DCD" are brought to 12V through 4.7 Kohm register.				
JRC	Select input signal level	ON	RS-232C level	ON	Current loop level
JC		OFF		OFF	
JNOR	Select input Data entry	ON	MARK (RS-232C)	ON	Current loop level
JREV		OFF	SPACE (Current loop)	OFF	
JF	Select TTY TXD function	ON	Output REV flag	OFF	Output X-ON/X-OFF signal
JX		OFF		ON	

DIP Switch Settings

Table 3-3. DIP Switch Settings

DIP SW No.	Function	ON	OFF
1-1 (JB3)	Bit rate selection	See Table 3-4	
1-2 (J8/7)	Data length selection	7 bits	8 bits
1-3 (JB1)	Bit rate selection	See Table 3-4	
1-4 (JB2)	Bit rate selection	See Table 3-4	
1-5 (JO/E)	Parity selection	EVEN	ODD
1-6 (JPDS)	Parity selection	See Table 3-4	
1-7 (P/s)	8143 selection	Enabled	Disabled

Table 3-4. Bit Rate Settings

Bit Rata (bps)	SW1-7 (JB4)	SW1-1 (JB3)	SW1-4 (JB2)	SW1-3 (JB1)	Bit Rata (bps)	SW1-7 (JB4)	SW1-1 (JB3)	SW1-4 (JB2)	SW1-3 (JB1)
75	ON	ON	ON	ON	1800	OFF	ON	ON	ON
110	ON	ON	ON	OFF	2400	OFF	ON	ON	OFF
134.5	ON	ON	OFF	ON	4800	OFF	ON	OFF	ON
150	ON	ON	OFF	OFF	9600	OFF	ON	OFF	OFF
200	ON	OFF	ON	ON	19200	OFF	OFF	ON	OFF
300	ON	OFF	OFF	ON	19200	OFF	OFF	ON	OFF
600	ON	OFF	OFF	ON	19200	OFF	OFF	OFF	OFF
1200	ON	OFF	OFF	OFF	19200	OFF	OFF	OFF	OFF

NOTE: For current loop operation, a data transfer rate greater than 1200bps cannot be guaranteed.

Handshaking Timing

When the amount of buffer space for input data becomes 256 bytes, the printer indicates that it is "not ready to receive data" by outputting the X-OFF code and/or REV signal (polarity can be selected by jumper setting). When the available buffer space becomes 528 bytes, the printer indicates that it is "ready to receive data" by outputting the X-ON code and/or changing the REV signal.

Error Handling

An asterisk (*) is printed when a parity error is detected. Other errors (e.g., "overrun error" and "framing error") are ignored.

3.2 CUT SHEET FEEDER C80612*

The LX-8 10/850 printer can use C806 12* cut sheet feeder. This cut sheet feeder has the following features:

1. **Cut sheets may be handled in the same way as fanfold paper.**
2. **Sheets may be manually inserted.**
3. **The feeder is easily mounted and dismounted from the printer.**
4. **The feeder requires no electrical connection to the printer.**
5. **The feeder is extremely reliable.**
6. **A high level of performance can be achieved.**

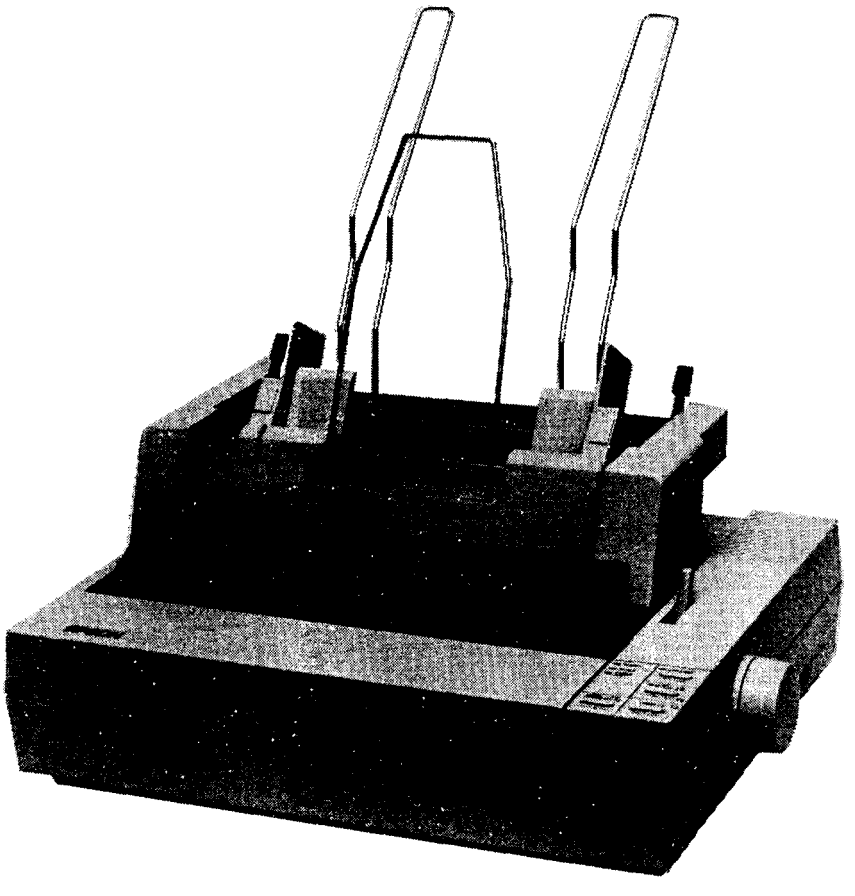


Figure 3-1. LX-81 0/850 with Cut Sheet Feeder

3.2.1 Cut Sheet Feeder C80612* Specifications

This section details the operating specifications for Cut Sheet Feeder C806 12*.

3.2.1.1 General Specifications

Hopper Capacity: **For paper weight of:**

64 g/m² ..... 185 sheets maximum

90 g/m² ..... 100 sheets maximum

NOTE: If the weight of the paper differs from the above, total thickness must be less than 0.59 inches (15mm).

Stacker Capacity:

64 g/m² paper ..... 100 sheets maximum

90 g/m² paper ..... 55 sheets maximum

Reliability: **MCBF (Mean Cycles Between Failures): 100,000 cycles**

Environmental requirements:

Operating temperature range - +5 to 35 deg. C
Storage temperature range - –30 to 65 deg. C
Operating humidity range - 15% to 80% (with no condensation)
Storage humidity range - 5% to 85% (with no condensation)

3.2.1.2 Paper Specifications

Cut sheet paper must be in new condition. It must not be curled or curved, and must be free of surface and edge damage.

Paper type and quality: Plain bond, typewriter or PPC quality paper with a minimum wood pulp content

NOTE: Paper with higher wood content, and very light and very heavy paper, must be operationally tested prior to regular use. Paper with a textured embossed, glossy, or hammered surface must also be so tested.

Paper width and length: **Width - 182 mm (7.17 inches) to 216 mm (8.50 inches)**
Length – 257 mm (10.1 inches) to 364 mm (1 4.3 inches)

Paper thickness: **0.07 mm (0.0028 inches) to 0.1 mm (0.0039 inches)**

Paper weight: **64 g/m² to 90 g/m² (17 lb to 24 lb)**

Angular deviation: **Below ±0.5 mm (0.02 inches)**

Recommended conditions for paper storage:

Temperature: + 18 to 22 deg. C
Humidity: 40% to 60%

3.2.1.3 Printing Area

See Figure 3-2.

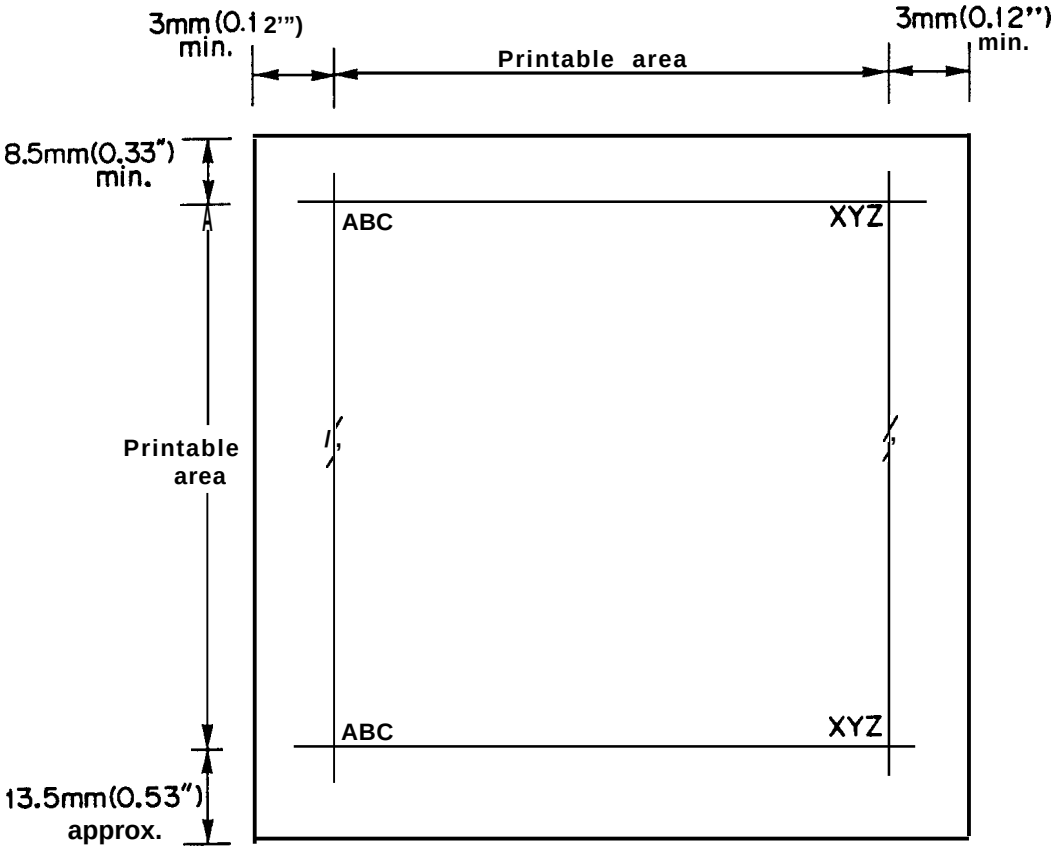


Figure 3-2. Printing Area

NOTES: **The printable length is approximately 22mm (0.87 inches) less than the actual page length. Paper feed accuracy can not be assured within 22mm (0.87 inches) from either top or bottom edge.**

3.2.1.4 Dimensions and Weight

Dimensions: 444 mm (1 7.5 inches) (Width) X 434 mm (1 7.1 inches) (Depth) X 416 mm (1 6.4 inches) (Height) (including paper feed knob)

NOTE: Dimensions were measured with the cut sheet feeder mounted on the printer.

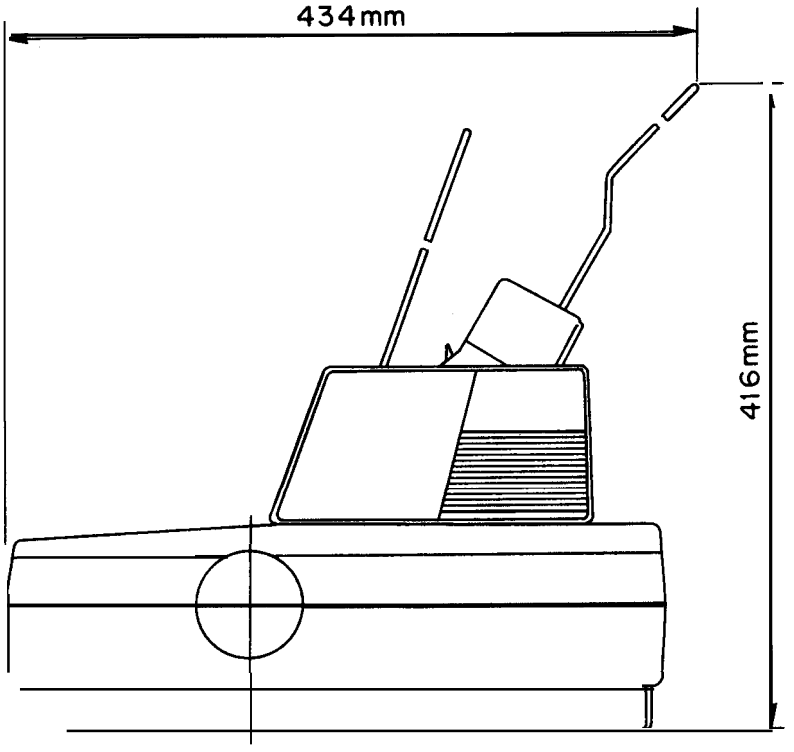


Figure 3-3. Dimensions

Weight Approx. **1.1 kg (excluding covers)**

3.2.2 Cut Sheet Feeder Operating Principles

The cut sheet feeder is driven by firmware incorporated in the printer. The feeder need not be electronically connected to the printer.

Cut sheet feeder mode can be selected either by DIP switch or by command.

Selection by DIP switch

The cut sheet mode is selected by the DIP switch setting.

Table 3-5. DIP Switch Selection

DIP Switch	Function	ON	OFF
2-2	Cut Sheet Feeder **Mode**	Valid	Invalid

Selection by comman'd

After the cut sheet feeder has been mounted on the printer, the following command can be used.

Command: **ESC EM**

Format: CHR$(27);CHR$(25); "n"

where "n" signifies the following

n = 0	**Cancels the CSF mode**
n = 4	**Specifies the CSF mode**
n = R	**Ejects a sheet**

NOTE: This command should be input when paper is loaded.

3.2.2.1 Mechanism Operation

Paper is loaded between the paper holder and the paper loading rollers. When the paper feed motor rotates in reverse, the gears, via the pinion on the motor's shaft, rotate in the direction of the white arrows (see Figure 3-4), and friction causes the paper to advance to the paper guide. When the paper comes into contact with the platen, the rotation of the paper feed motor changes to the forward direction, and the gears rotate in the direction indicated by the black arrows. Friction causes the paper to advance between the platen and the paper feed rollers. As it advances, the paper is further guided by the paper ejecting rollers. Figure 3-4 illustrates the feed operation.

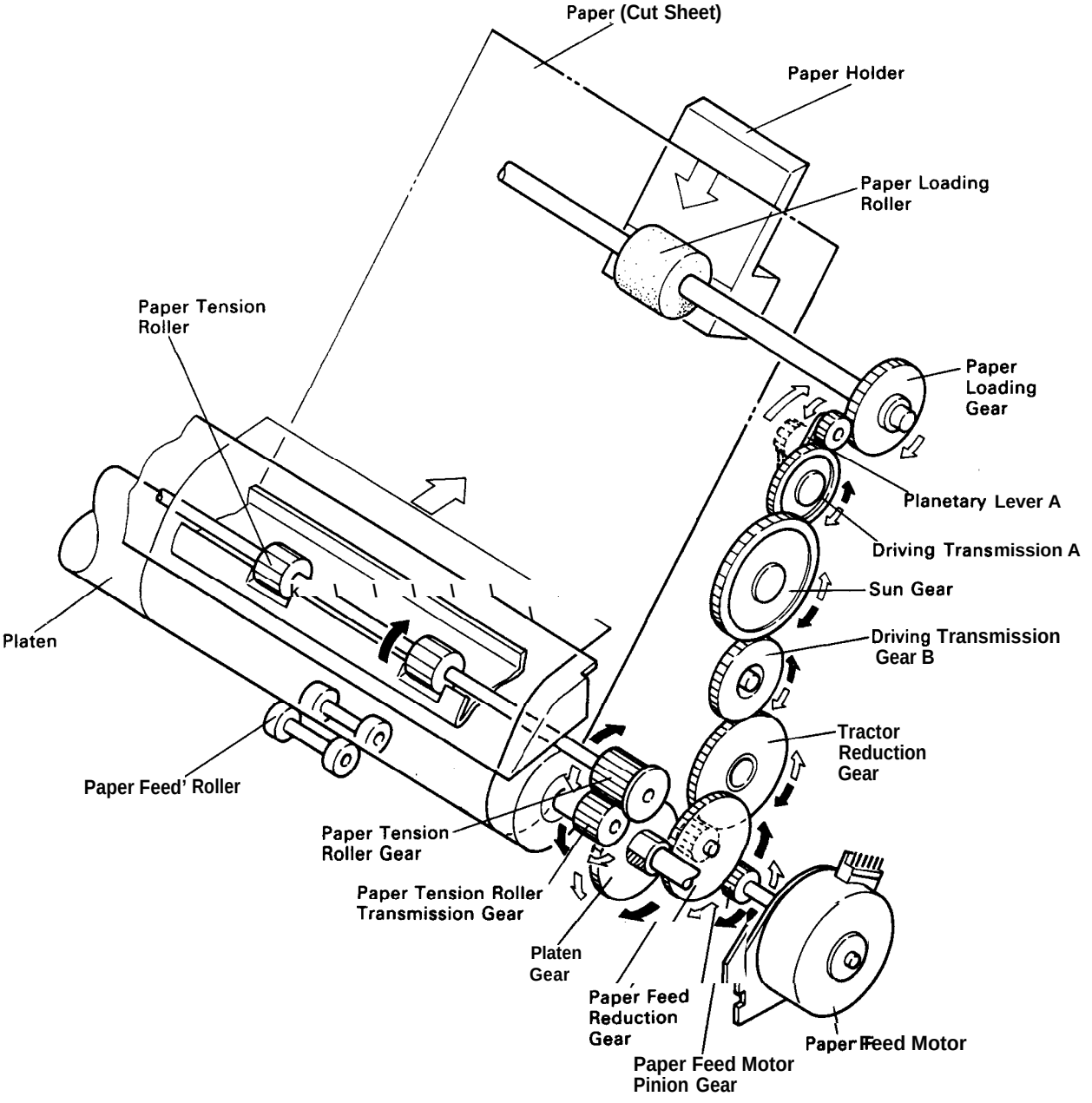


Figure 3-4. Cut Sheet Feeder Operation

3.2.3 Cut Sheet Feeder Disassembly and Reassembly

This section describes the procedure for removing the hopper unit of the C806 12' cut sheet feeder. Unless otherwise specified, reassembly is performed by reversing the sequence. The diagrams in Figure A-2 1, which are provided as reference for disassembly and reassembly, show an exploded view of the parts configuration.

The required tools are listed in Table 3-6.

Table 3-6. Tools for Assembly or Disassembly

Designation	Availability	Part No.
Philips screwdriver No.2	o	B743800200
E-ring holder #6	o	B740800800

o: Commercially available

CAUTION

For safety, gloves should be worn during disassembly and assembly.
Dismount the cut sheet feeder from the printer before starting disassembly.
Do not allow oil or grease to contaminate the paper path. If contamination does occur, wipe it away with alcohol.

WARNING

If it is necessary to replace one of the paper loading rollers, both right and left rollers must be replaced at the same time.

1. Remove side covers L and R.

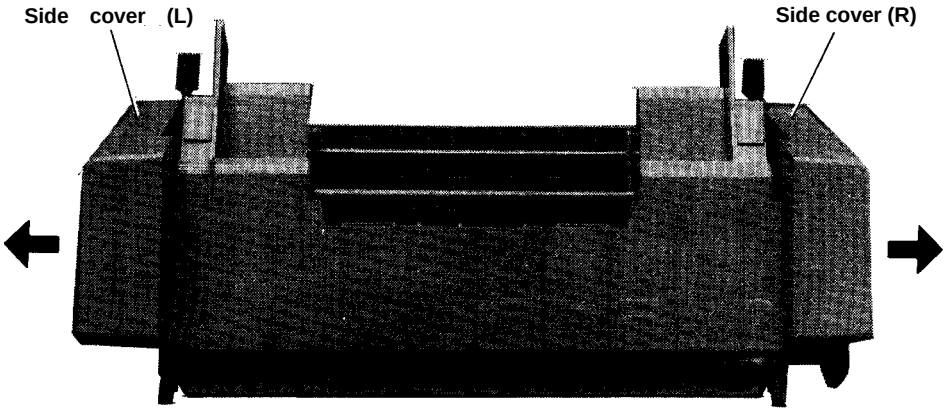


Figure 3-5. Side Cover Removal

2. Remove the E-ring (6) on the paper loading roller shaft, and then remove the shaft.

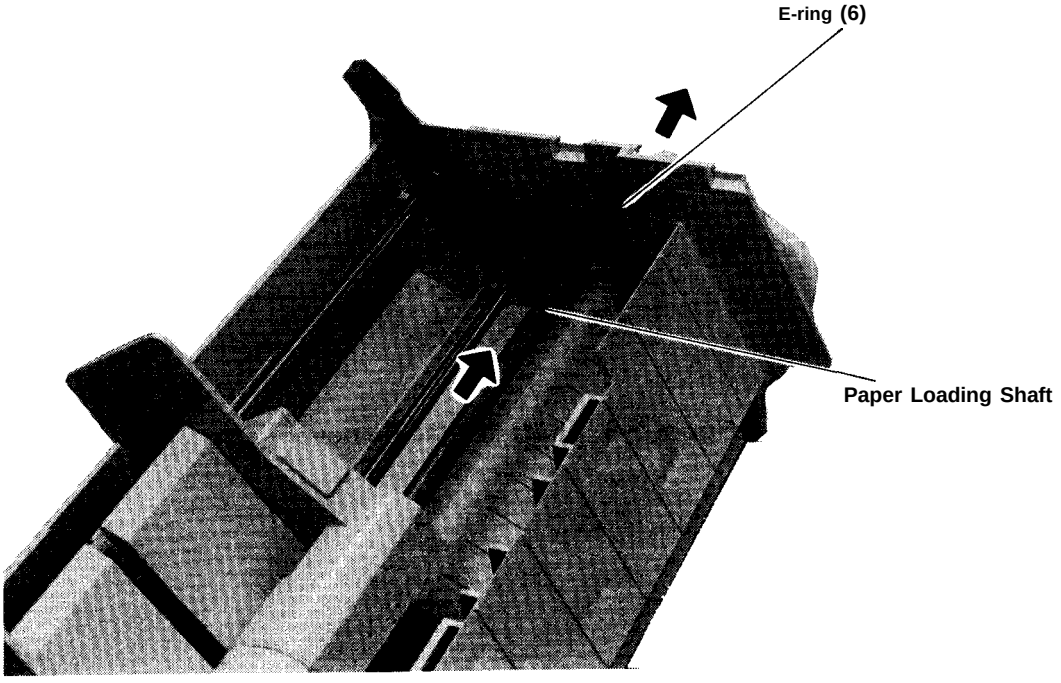


Figure 3-6. Paper Loading Roller Shaft Removal

3. Remove the 2 E-rings (6) on the paper support shaft.

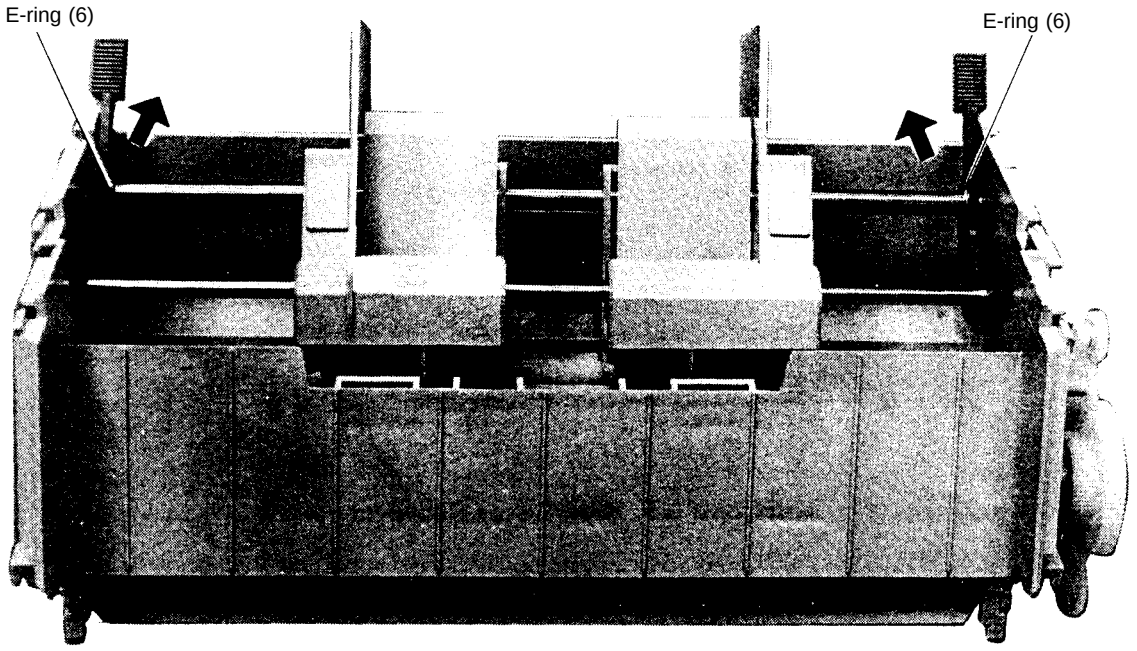


Figure 3-7. E-Ring Removal

4. Remove the shaft holder fastening the paper support shaft to frame L.

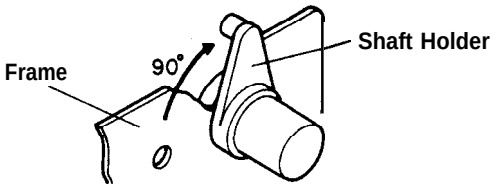


Figure 3-8. Shaft Holder Removal

5. Remove the E-ring (6) on the paper support shaft (See Figure 3-9)
6. Lift, together, the hopper unit and the paper support shaft.

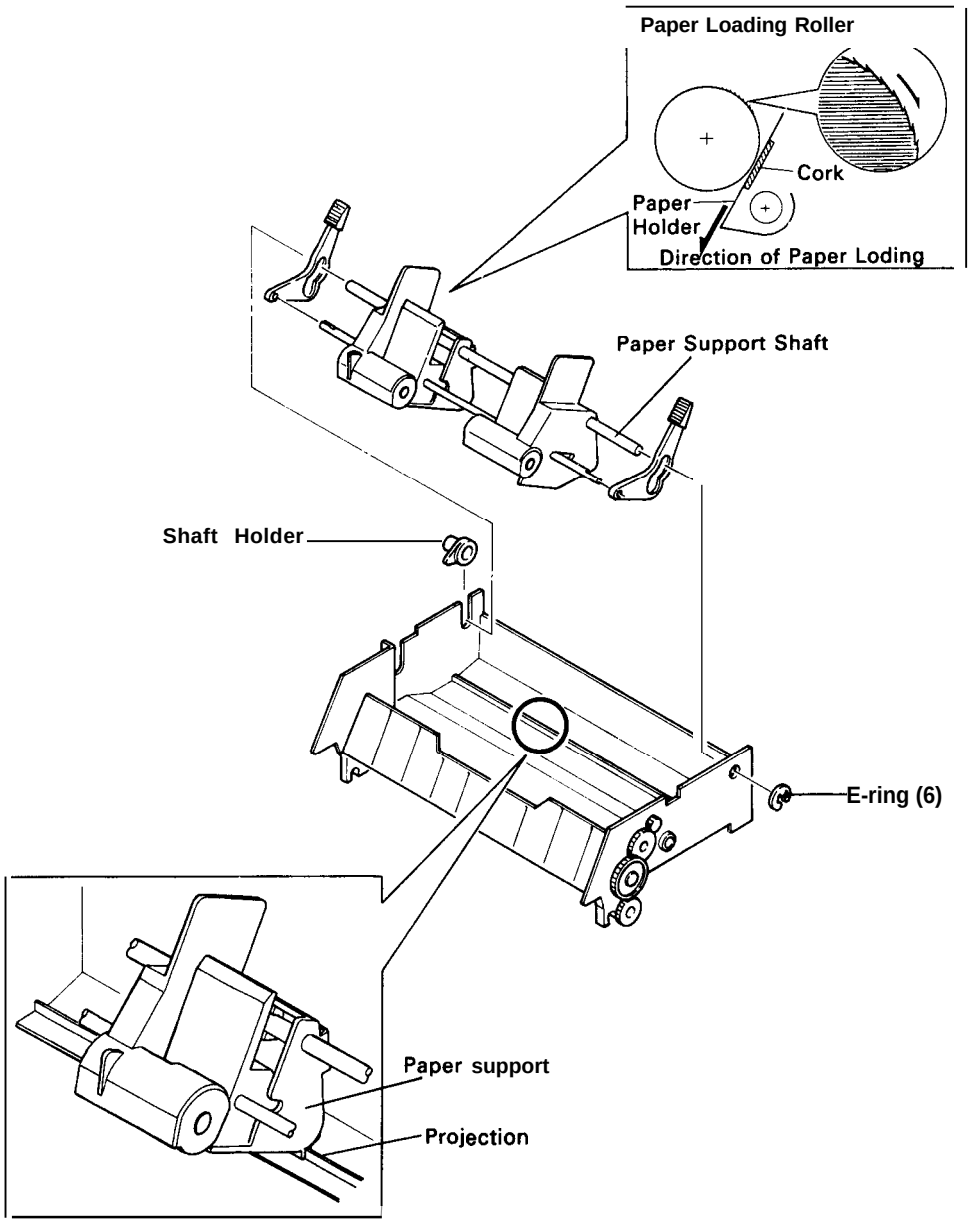


Figure 3-9. Hopper Unit Removal

3.2.4 Cut Sheet Feeder Preventive Maintenance

The cut sheet feeder C806 12* is well designed and requires only a minimum of preventive maintenance, as follows:

a) General cleaning of the device.
b) Checking the mechanical functions.

3.2.4.1 Cleaning

a) Brush off all paper dust.
b) Check the surfaces of the paper loading and paper ejecting rollers.

NOTE: If one of the paper loading rollers is damaged, or if wear is uneven, both rollers must be replaced.

WARNING

Regularly check the shafts of the paper loading and paper ejecting rollers. If the printer fails to move the paper, open the right side cover and check the gear wheels for wear or damage.

3.2.4.2 Lubrication

EPSON recommends that the points indicated in Figures 3-10 and 3-11 be lubricated with EPSON O-3 and G-1 4 (see Table 3-7). These lubricants have been thoroughly tested and have been found to fully comply with the needs of the cut sheet feeder.

Table 3-7. Lubricants

Classification	Designation	Capacity	Availability	Part No.
Oil	o-3	40 cc	E	B7 10300001
Grease	G-1 4	40 g	E	B701400001

E: EPSON exclusive product

Lubricate the paper support shaft and the paper holder shaft using a cloth moistened with O-3.

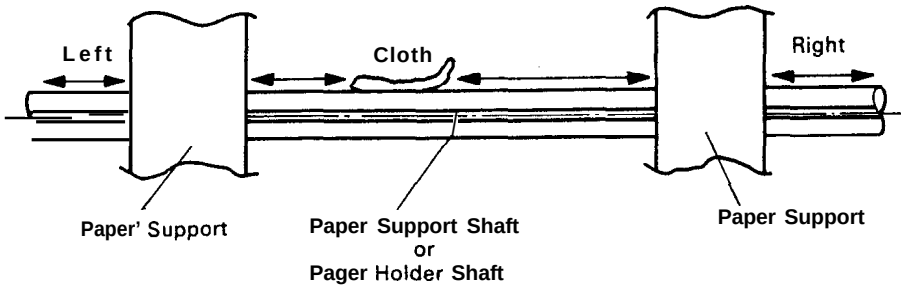


Figure 3-10. Lubrication Point (1)

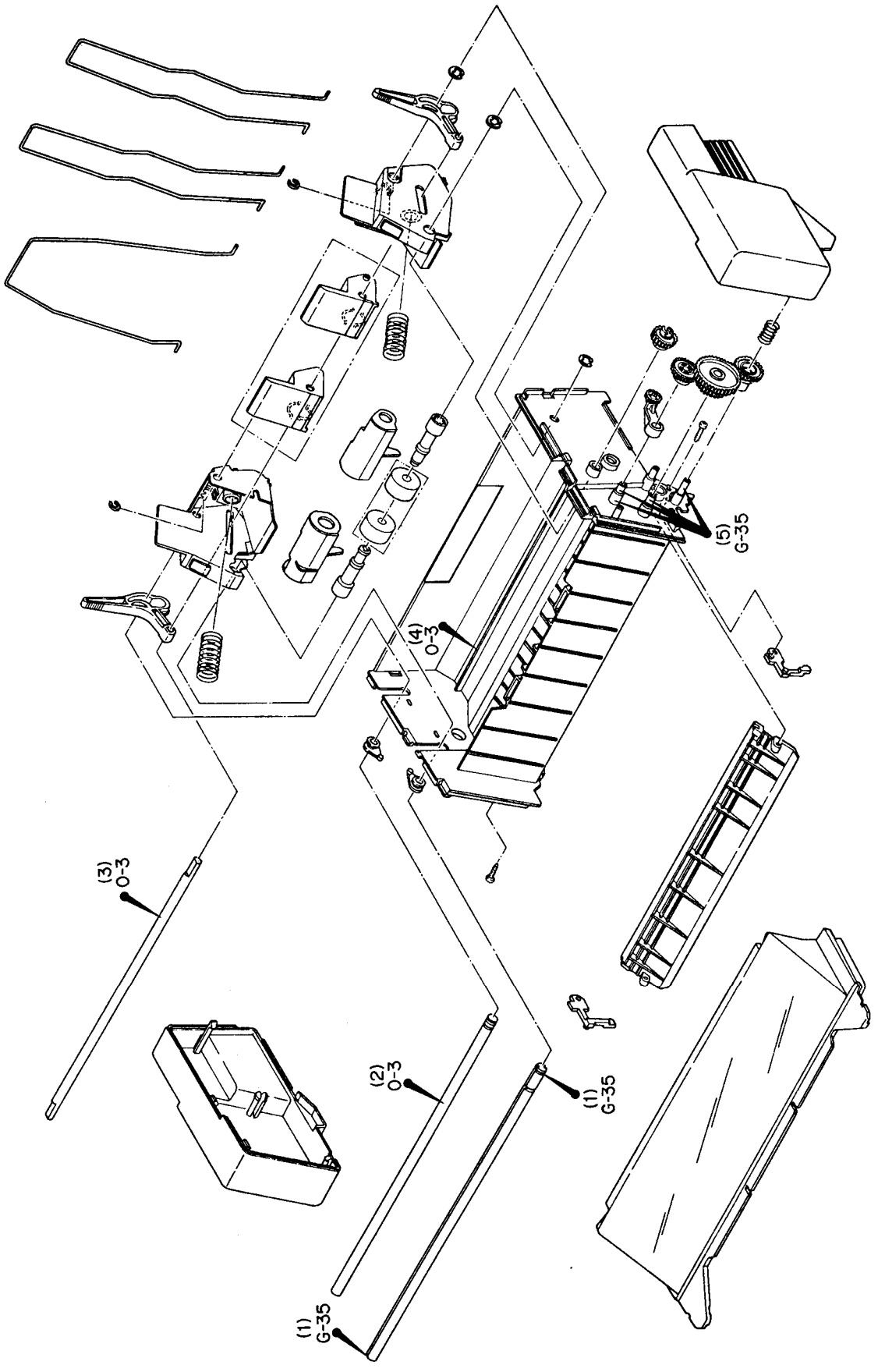


Figure 3-11. Lubrication Point (2)

3.3 PULL TRACTOR C80006*

The optional pull tractor C80006* provides optimum continuous paper handling. The pull tractor is especially useful with continuous multipart forms and labels.

3.3.1 Pull Tractor Operation

When using the push-pull feed method, set the paper holes onto the pins along the sprocket wheel, and also onto the tractor pins along the tractor belt. The paper-feed motor is driven, via the pinion on the motor's shaft, to rotate the gears in the direction shown in Figure 3-12. The gears, in turn, rotate the sprocket wheels and tractor belt, advancing the paper in the direction indicated by the arrow.

Shifting the release lever forward moves the feed rollers away from the platen and releases the feed.

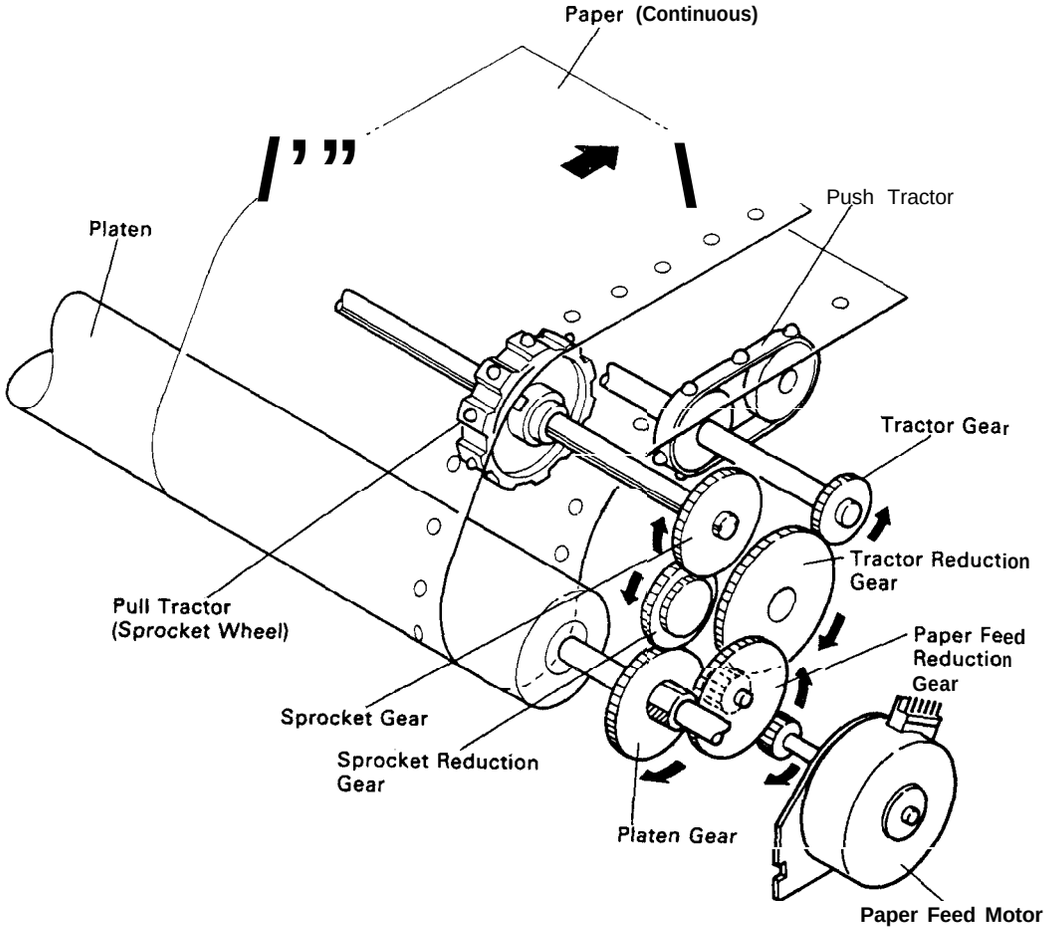


Figure 3-12. Push-Pull Feed Operation

3.3.2 Pull Tractor Disassembly and Reassembly

1. Remove the catch fastening the sprocket reduction gear to spocket mounting plate R. Then remove the Reduction gear.
2. From the sprocket shaft, remove the E-ring (6), the sprocket gear, the sprocket gear spring, and the washer.
3. Remove the E-ring (6) on the inside of mounting plate R.

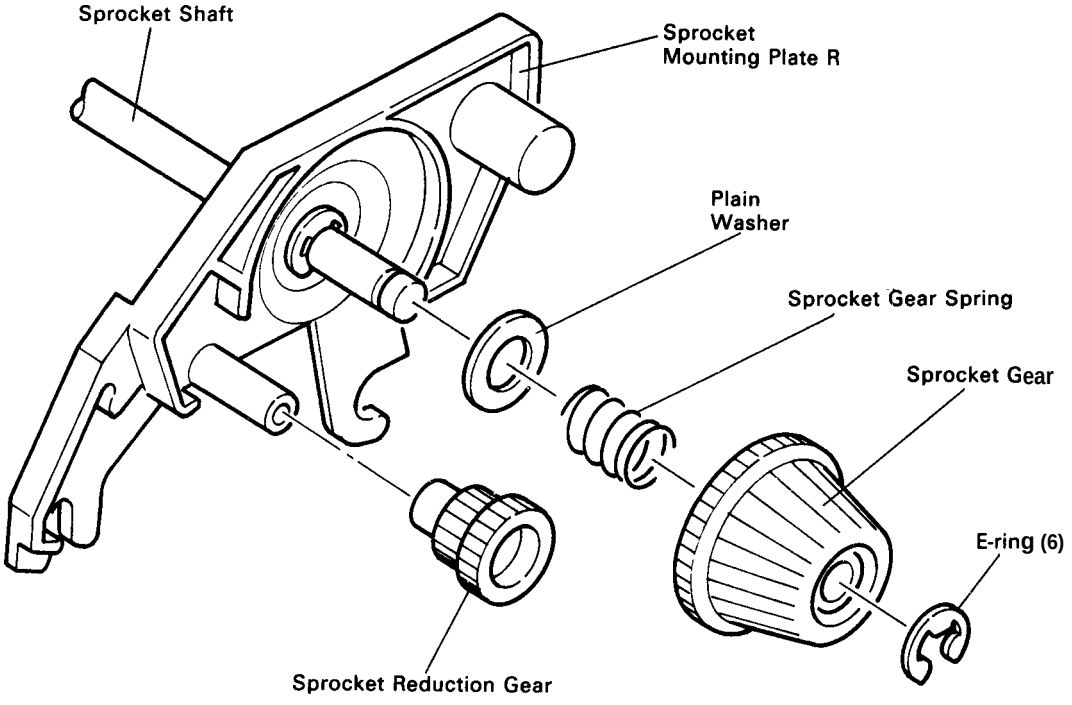


Figure 3-13. Removal of Sprocket's Intermediate Gear and Related Parts

4. Pull to remove the sprocket shaft and the sprocket support shaft from mounting plate L.

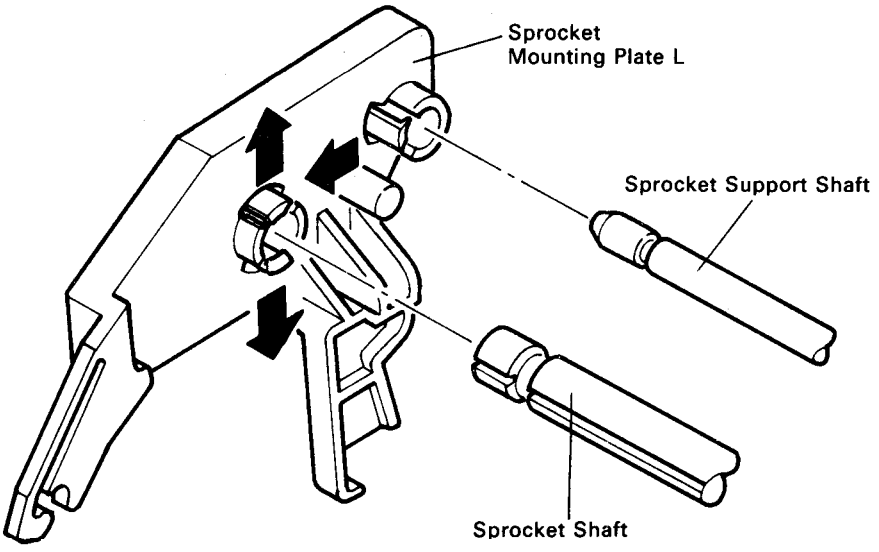


Figure 3-14. Removal of Sprocket Mounting Plate L

5. Remove the E-ring (6) from the sprocket shaft, then remove sprocket mounting plate R.

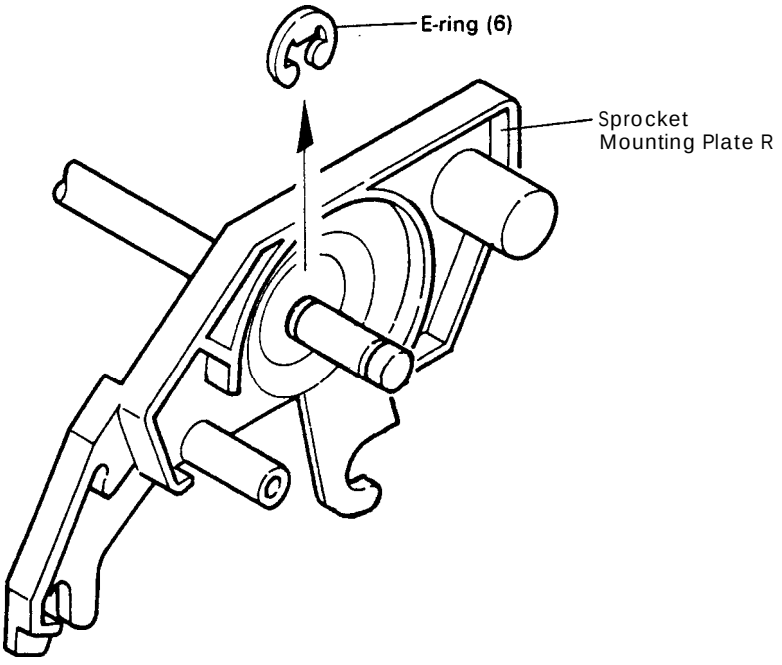


Figure 3-15. Removal of Sprocket Mounting Plate.

6. From the sprocket shaft and the sprocket guide shaft, pull and remove sprocket set R, the paper guide roller, and sprocket set L. In separating the paper guide roller, pull in the same direction as the side on which the T-shaped notch is located. (When reassembling, insert from the same side.)

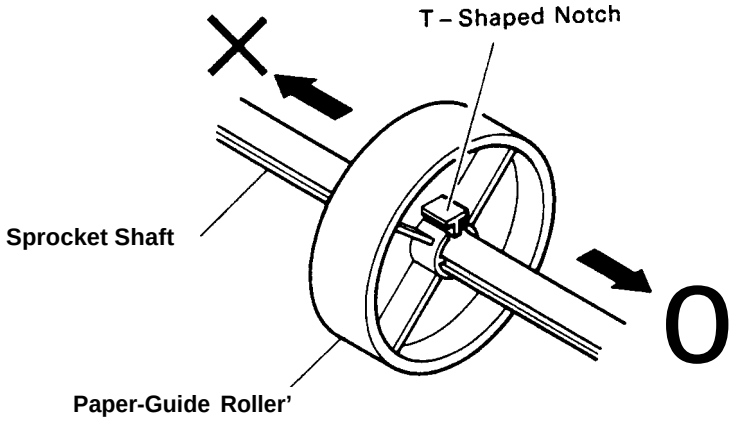


Figure 3-16. Direction of Paper Guide Roller Removal

Reassembly

1. **Insertion of the paper guide roller onto the sprocket shaft should be in the direction indicated in Figure 3-17.**
2. **When inserting the sprocket roller into the sprocket shaft, the marked sides of both wheels should face to the left, and the markings should be analogously positioned.**

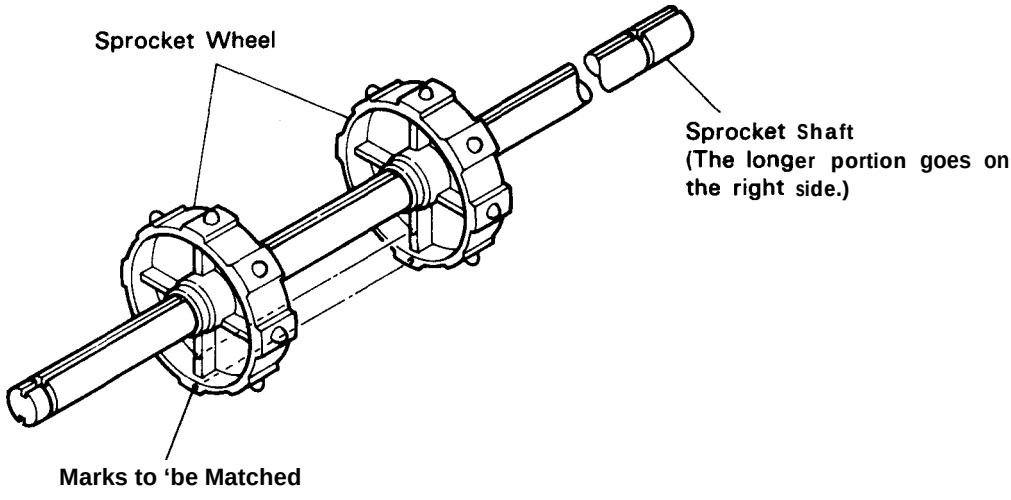


Figure 3-17. Direction for Insertion of Sprocket Wheels

CHAPTER 4
DISASSEMBLY, ASSEMBLY, AND ADJUSTMENT

LIST OF FIGURES

LIST OF TABLES

4.1 GENERAL REPAIR INFORMATION

This chapter describes the procedures for removing, replacing, and adjusting the main components of the LX-8 10/850.

CAUTION

- Prior to beginning any of these procedures, be certain that the AC power cord is disconnected.
- To help prevent hands from being cut by the printer mechanism or sharp plate edges, wear gloves when performing these procedures.

WARNING

. The printer mechanism, boards, and other parts are sometimes held in place with plastic clips rather than screws. Be careful not to damage these clips when removing them.

Tables 4-1 and 4-2 list tools and measuring instruments recommended for carrying out disassembly and repair.

Table 4-1. Repair Tools

Description	Type	Pert No.
Brush No. 1	0	B74 1400200
Brush No. 2	0	B74 1400100
Cleaning Brush	o	B74 1600100
Round-nose pliers	o	B740400100
Diagonal cutting nipper	o	B740500100
Tweezers	o	B64 1000100
Electric soldering iron	o	B7402OO1OO
E-ring holder #2.5 •	o	B740800400
E-ring holder #5	o	B740800700
Philips screwdriver No. 2	0	B743800200
Screwdriver No. O	0	B743800300
Thickness gauge (0.44)	o	
Thickness gauge (0.47)	o	

NOTES: 1. (*) indicates the tool used to attach the (2.3 mm) E-ring.
2. o = Commercially available

Table 4-2. Measuring Instruments

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

NOTE: A = Required; B = Recommended

To ensure optimal performance of the printer, be sure, following reassembly and adjustment, to lubricate, apply adhesive, clean, and maintain, according to the procedures described in Chapter 6.

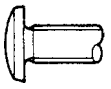
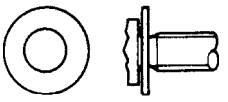
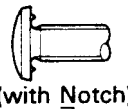
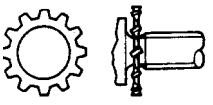
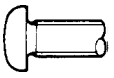
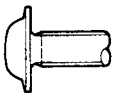
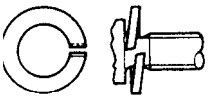
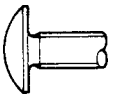
In referring to small parts, this manual utilizes the abbreviations listed in Table *4-3.*

Table 4-3. Abbreviations for Small Parts

Abbreviation	Part Name
CBB	Cross-recessed Bind B-tight screw head
CB(O)	Cross-recessed head, Bind screw with Outside toothed lock washer

Table 4-4 correlates the screw forms with the abbreviated 'part names.

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

Head		Body	Washer (assembled)
1. Cross-recessed hea	Bind	Normal	1. Plain washer
			
	 (with Notch)	2. Tap tight Stight	
2. SLotted head			2. Outside toothed lock washer
	Pan	Btight	
			
	Cup	3. Tapping	3. Spring washer
			
	Truss		
			

4.2 DISASSEMBLY AND REASSEMBLY

This chapter details the disassembly procedures for the LX-8 10/850. As a rule, reassembly is performed by simply reversing the procedures; a number of special notes, however, are provided under the heading "Notes for Reassembly." When a disassembly or reassembly procedure requires that an adjustment be performed, the adjustment is described under the heading, "Required Adjustment." Be sure to perform these adjustments as indicated.

WARNING

- Be sure that you have read Section 4. 1,"General Repair Information," before performing disassembly.
- Be sure that paper and ribbon cartridge are removed before disassembly.

The disassembly procedure detailed below is in the following sequence:

(1) Removal of the printhead
(2) Removal of the casings
(3) Removal of the circuit boards
(4) Removal of the printer mechanism unit
(5) Disassembly of the printer mechanism

Exploded diagrams of the LX-8 10/850 and of the printer mechanism are provided in Figures A-18 and A- 19.

4.2.1 Printhead Removal

1. Remove the printer cover, and confirm that paper and ribbon cartridge have been removed.
2. Open the cover of the paper tension unit.

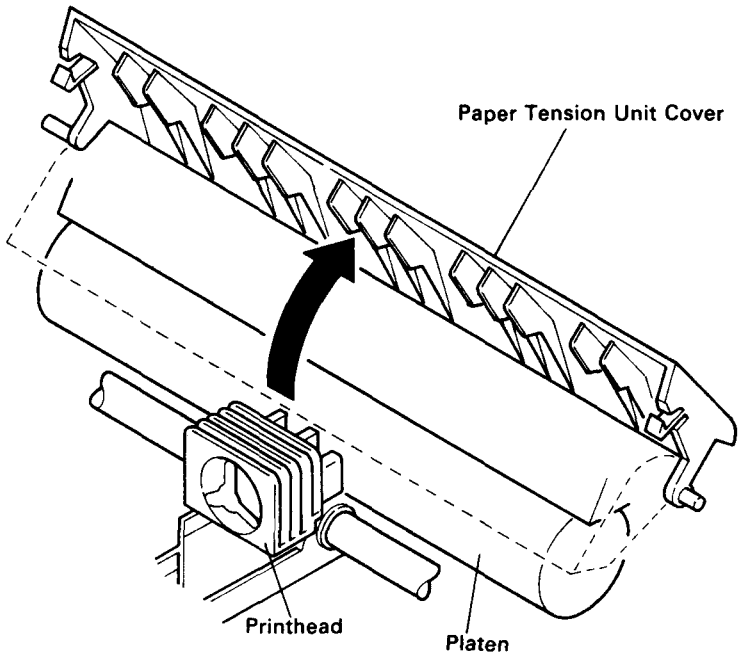


Figure 4-1. Paper Tension Unit Cover

3. Unlock the two levers securing the printhead to the carriage by pulling them down. Then lift and remove the printhead.

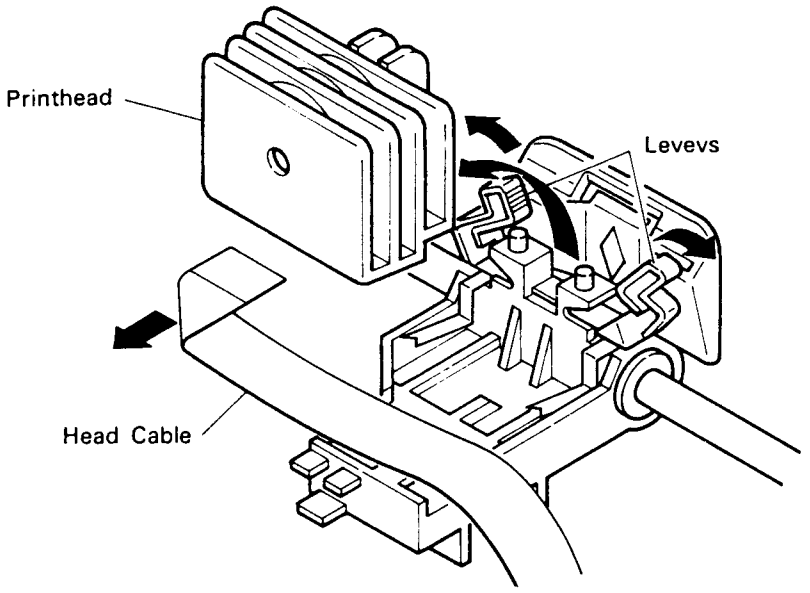


Figure 4-2. Printhead Removal

4. Disconnect the head cable from the connector on the printhead.

NOTE

- For the European version of the printer, a net is mounted on the printhead.

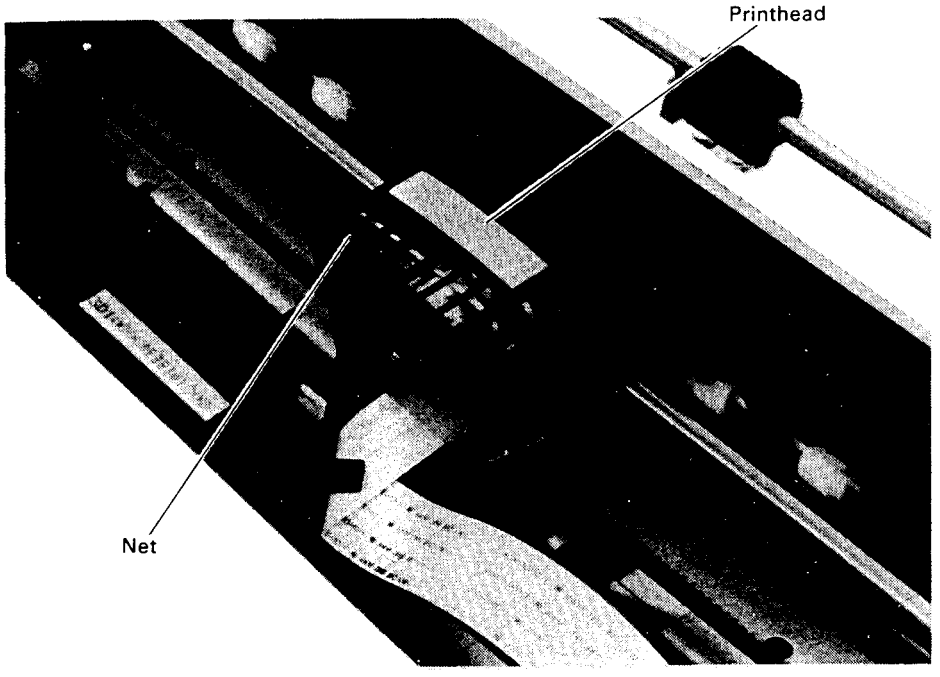


Figure 4-3. Net

4.2.2 Removal of Casing

This section details the procedure for removing the upper casing and the control panel (TAPNL).

4.2.2.1 Upper Casing Removal

1. Remove the sheet guide unit, printer cover, and paper feed knob.
2. Push in the two notches securing the push tractor to the printer mechanism, and remove the push tractor from the printer mechanism.

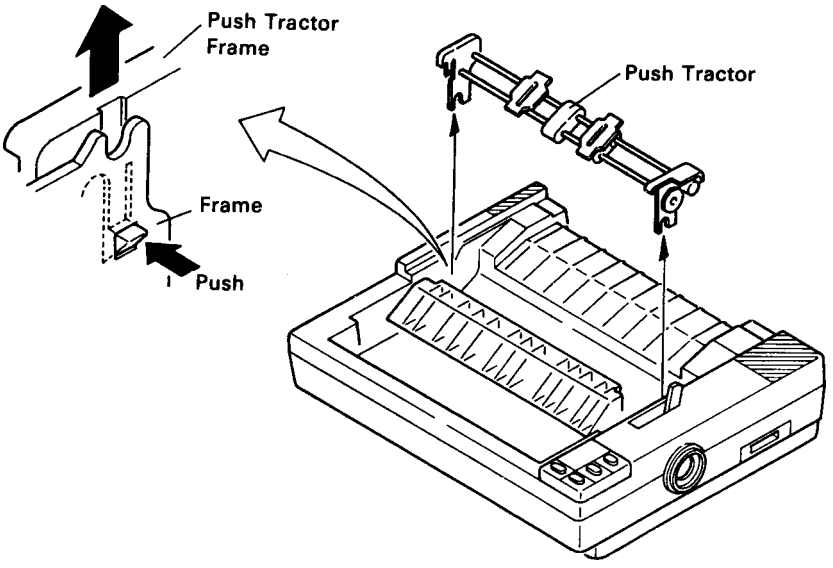


Figure 4-4. Push Tractor Removal

3. Insert a standard screwdriver into each of the two holes at the front of the lower casing, and gently push (see Figure 4-5) to unlock the notches.

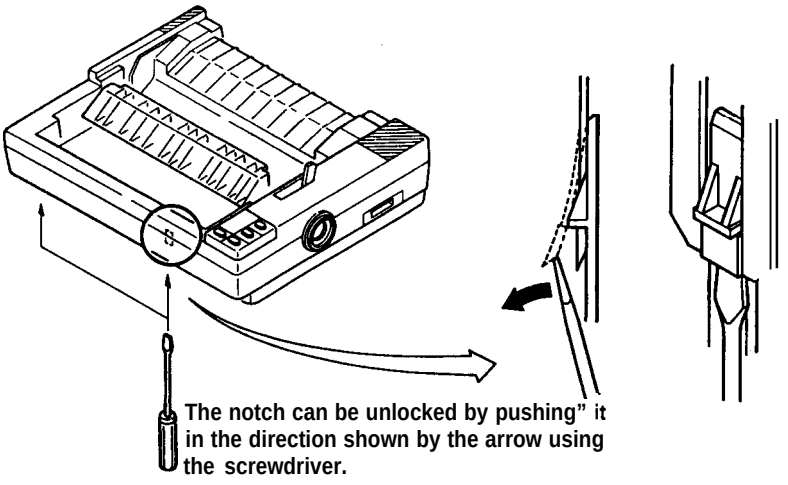


Figure 4-5. Upper Casing Removal -1

4. **While lifting the upper casing, disconnect the cable of the control panel (TAPNL) from connector CN3 on the TAMA board. Then remove the upper casing.**

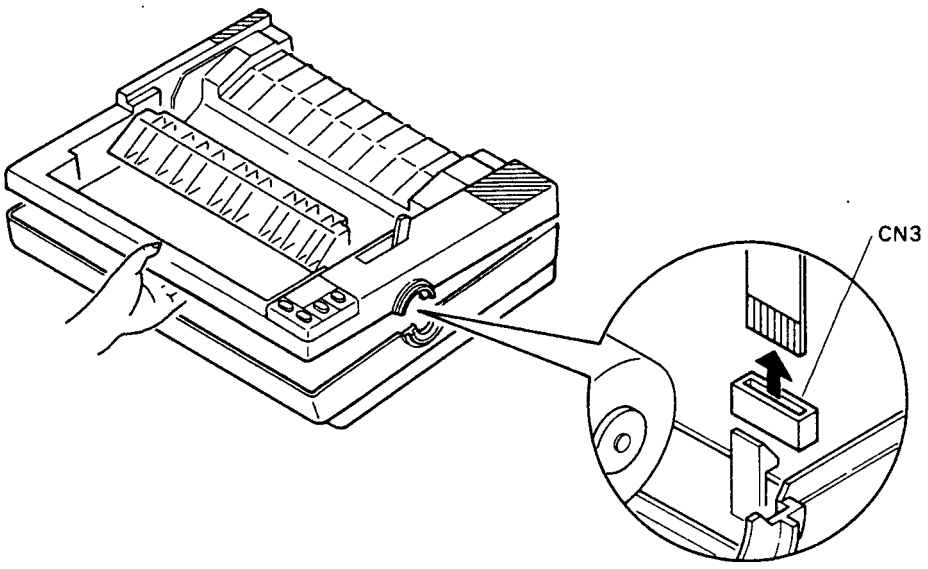


Figure 4-6. Upper Casing Removal -2

NOTE FOR REASSEMBLY:

Before reassembling the upper casing, prepare the FFC (Flat Flexible Cable) that connects the Contol Panel and TAMA Board in such a way that it can be connected to the Panel Cable Shield Plate. Refer Figure 4-7,

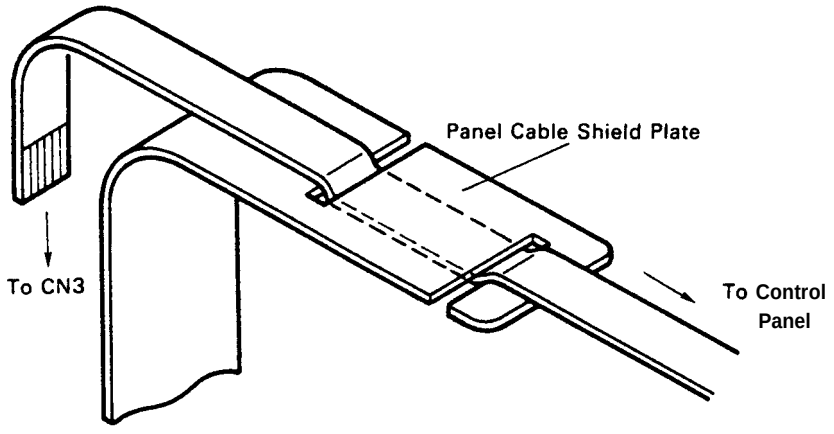


Figure 4-7. Control Panel FFC

4.2.2.2 Control Panel (TAPNL) Removal

1. Remove the upper casing (as described in the previous Section).
2. Turn the upper casing over, push in the two notches on the casing that are securing the control panel to it, and remove the control panel.

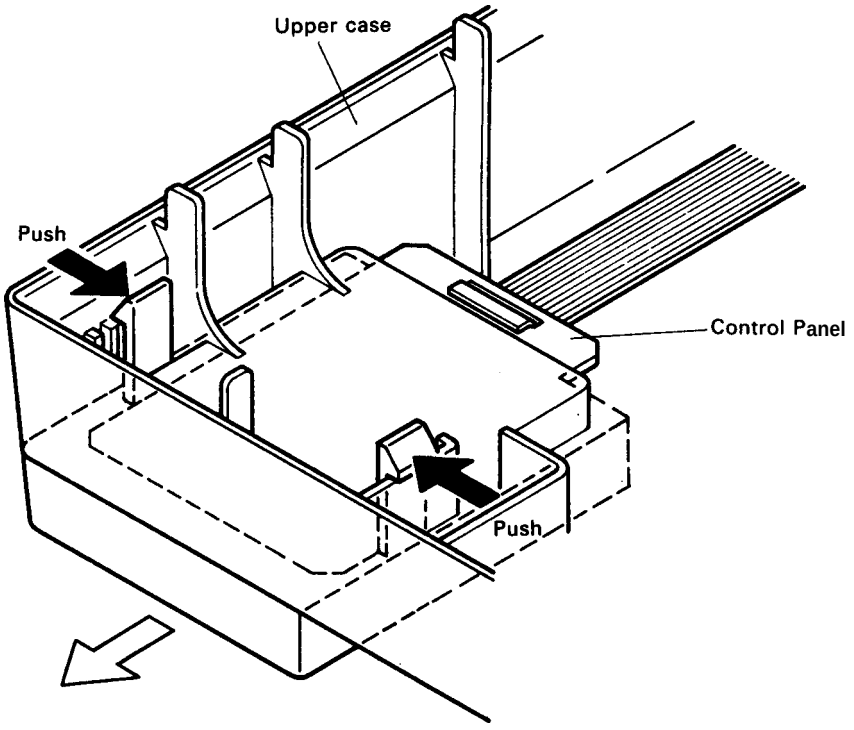


Figure 4-8. Control Panel Removal

4.2.3 Removal of Circuit Boards

This section describes the procedure for removing the TAMA Board and the TA filter unit.

4.2.3.1 TAMA Board Removal

1. Remove the upper casing (refer to Section 4.2.2. 1). The following connectors on the TAMA board, which are connecting it to external components, should be disconnected: CN4 (red), CN5 (white), CN6 (black), CN7 (white), CN8 FFC (Flexible Flat Cable), and CN9 (white).

WARNING

Do not pull roughly on the connectors, or you may damage the board. Remove them by pulling gently while at the same time holding the board.

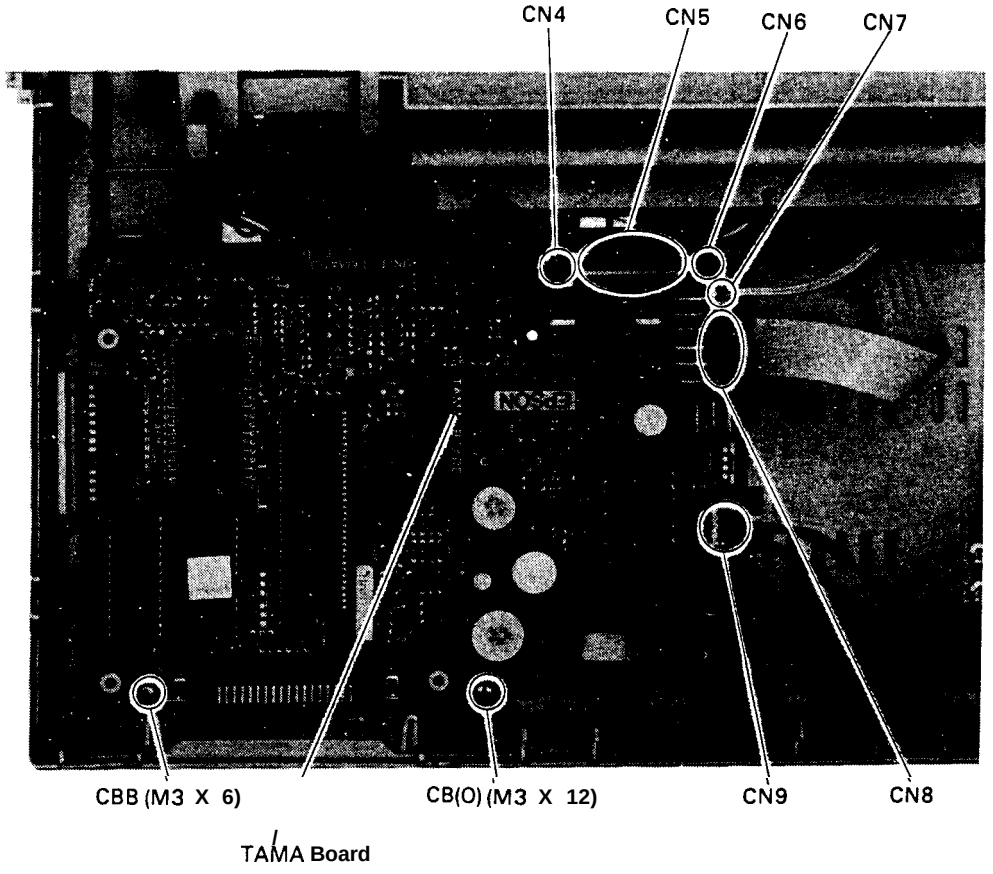


Figure 4-9. TAMA Board Removal

3. Remove the CB(O) (M3 x 12) screws and the CBB (M3 x 6) screws which are securing the TAMA board to the base plate and the lower casing.
4. Loosen the four bent tabs on the lower casing which are securing it to the TAMA board. Then remove the TAMA board.

WARNING

Be careful not to bend the tabs too far, and when pushing the tabs, be careful not to break them or to cause damage to components on the TAMA board.

4.2.3.2 TA Filter Unit Removal

1. Remove the upper casing (refer to Section 4.2.2.1).
2. Disconnect connector CN9 at the TAMA board. This connector connects the TA filter unit.
3. Remove the CB(O) (M3 x 6) screws securing the frame GND wire.
4. Remove the CBB (M3 x 12) screws and CB(O) (M3 x 6) screws securing the filter unit, and then remove the unit.

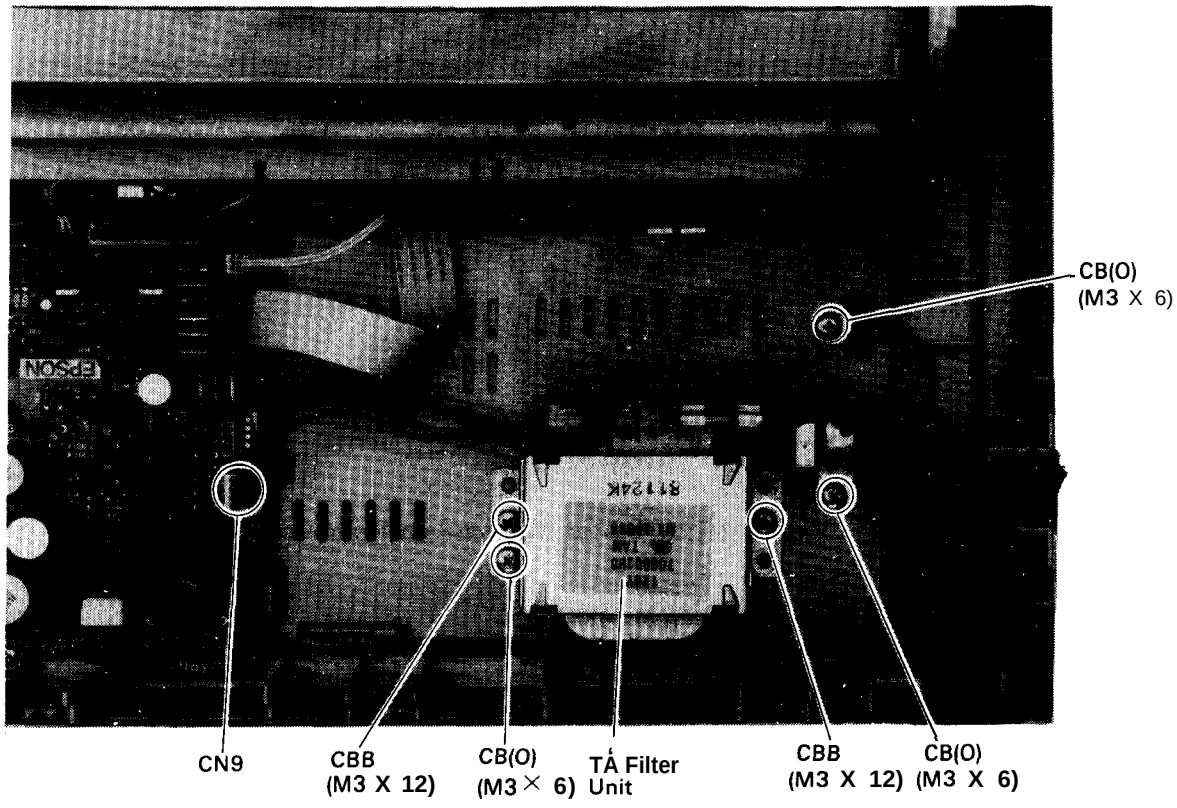


Figure 4-10. TA Filter Unit Removal

4.2.4 Removal of Printer Mechanism

This section describes the removal of the platen unit, paper guide shaft, and printer mechanism. The platen unit and paper guide are removed first in order to enable quick and easy removal of the printer mechanism.

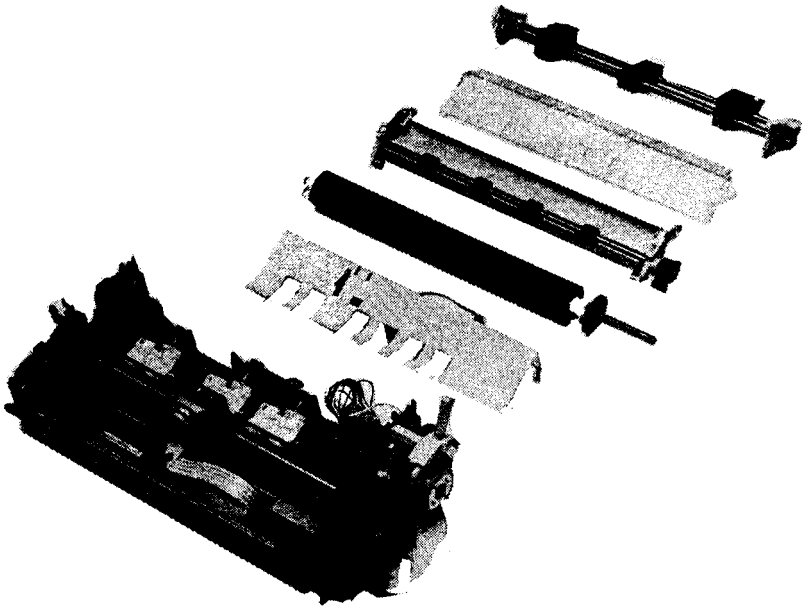


Figure 4-11. Printer Mechanism Removal

4.2.4.1 Removal of Platen Unit and Paper Guide

1. **Remove the upper casing (refer to Section 4.2. 1.1).**
2. **Remove the cover of the paper tension unit.**

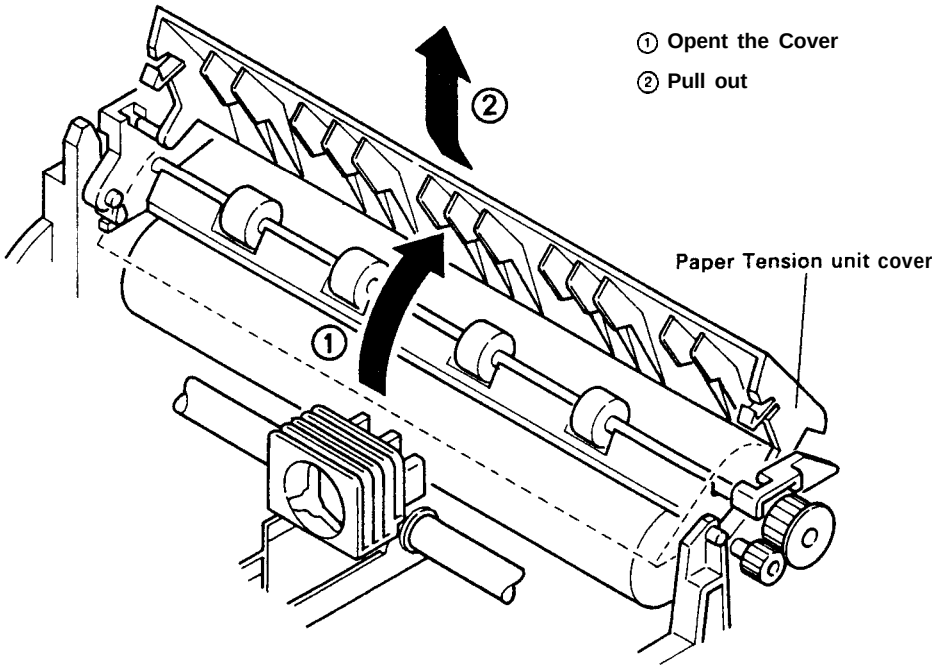


Figure 4-12. Removal of Paper Tension Unit Cover

3. Remove the paper tension unit.

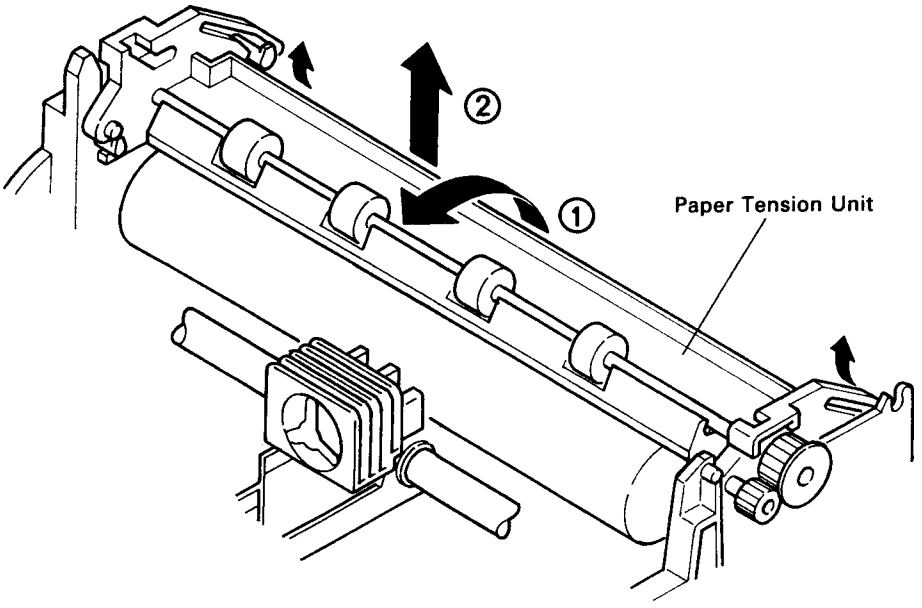


Figure 4-13. Paper Tension Unit Removal

4. Remove the GND spring.

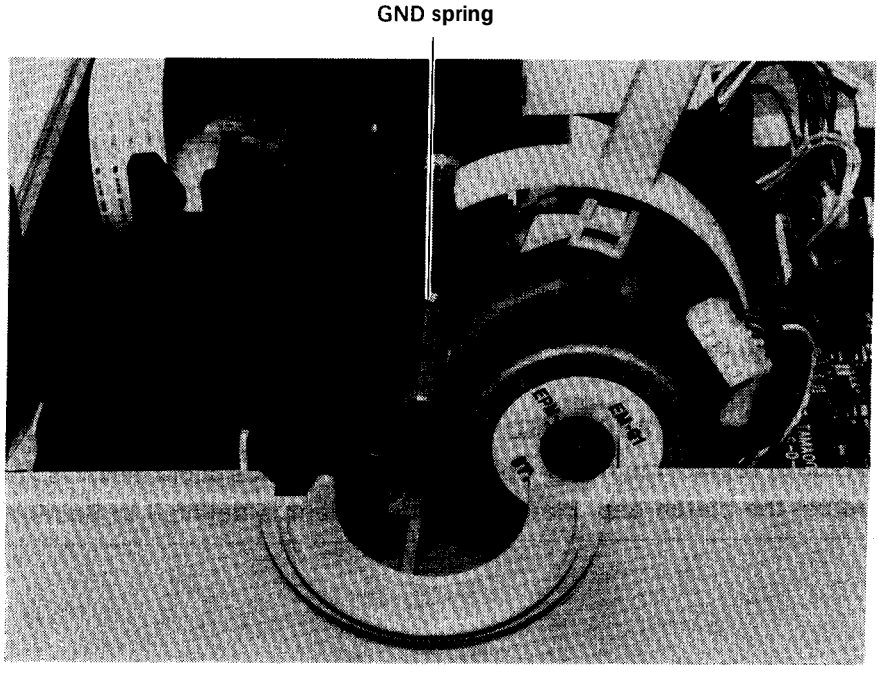
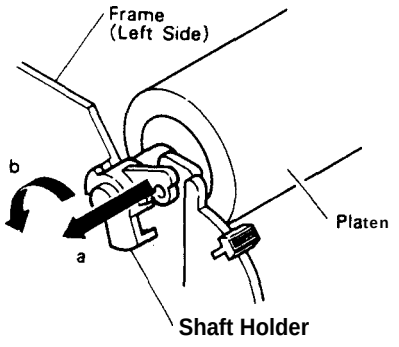


Figure 4-14. GND Spring Removal

5. **Turn the shaft holders at the left and right sides of the platen unit as shown in Figure 4-15. Lift and remove the platen unit.**



a. **Use a screwdriver to push the shaft holder outward.**
b. **Turn the shaft holder counterclockwise.**

Figure 4-15. Platen Unit Removal

6. **Disconnect the cable from CN6 on the TAMA board.**
7. **Unlock the two notches of the paper guide by pushing them forward from the rear side of the printer mechanism. Remove the paper guide.**

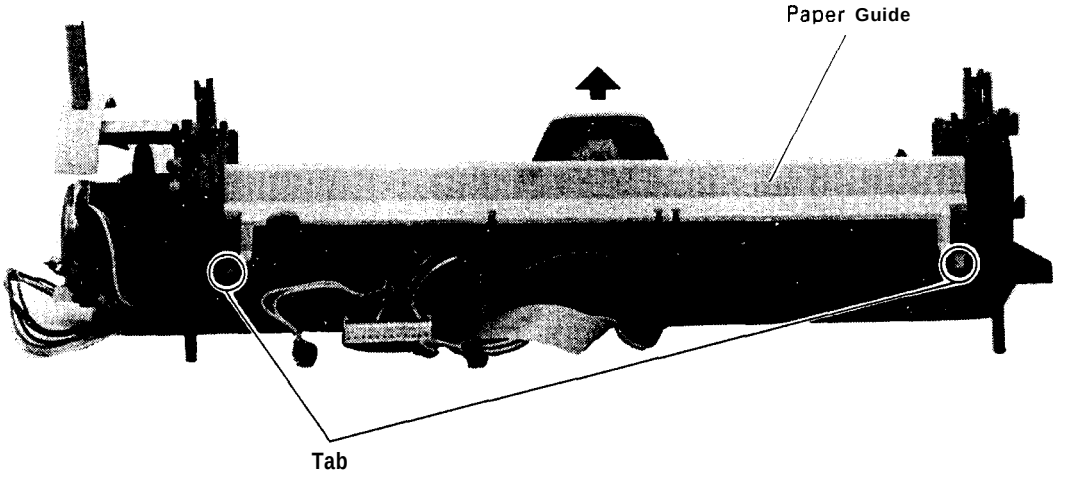


Figure 4-16. Rear View of Printer Mechanism

REQUIRED ADJUSTMENT

Following reinstallation or replacement of the platen unit, if problems occur (such as non-uniformity of print density), adjust the platen gap. Platen gap adjustment is detailed in Section 4.3.1.

4.2.4.2 Removal of Printer Mechanism

1. Remove the platen unit and paper guide (refer to Section 4.2.4.1, immediately above).
2. Disconnect the cables from the following connectors on the TAMA board: CN4 (red), CN5 (white), CN7 (white), and CN8 (flexible flat cable, or "FFC). Refer to Figure 4-9.
3. With a screwdriver, push and loosen the six tabs securing the printer mechanism to the lower casing. For easiest removal, follow the procedure below.

WARNING

Be sure to push the tabs GENTLY, so as not to damage the lower casing or printer mechanism.

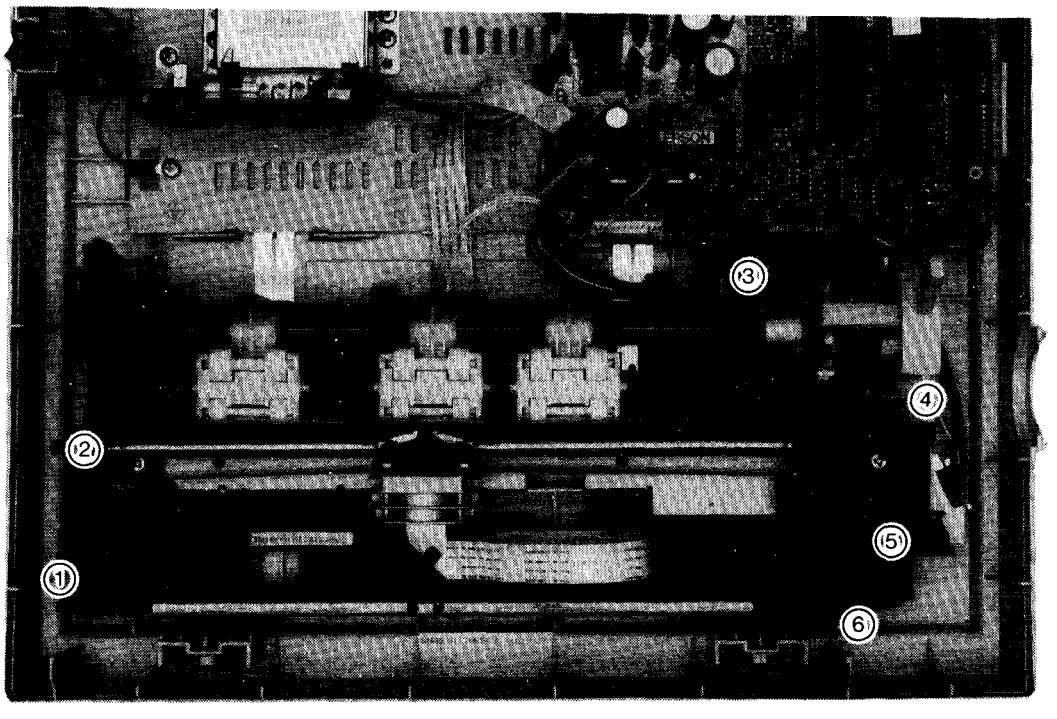


Figure 4-17. Printer Mechanism Removal

a. Loosen tabs 1 and 2, and lift the left side of the frame about 1 cm above the lower casing.
b. Loosen tab 3, and raise the left side further, so that it is about 3 cm above the lower casing.
c. Loosen tab 4,5, and 6 and remove the printer mechanism.

4.2.5 Disassembly of Printer Mechanism

This section details the removal of components from the printer mechanism. Figure A-1 9 shows an exploded diagram of the printer mechanism, offering a view of the various components. Table A-1 7 lists the components by name. COMPONENT NAME LIST.

4.2.5.1 Removal of The Paper-Feed Mechanism

1. **Remove the printer mechanism (refer to Section 4.2.4).**
2. **Remove the three paper-feed rollers from the frame.**

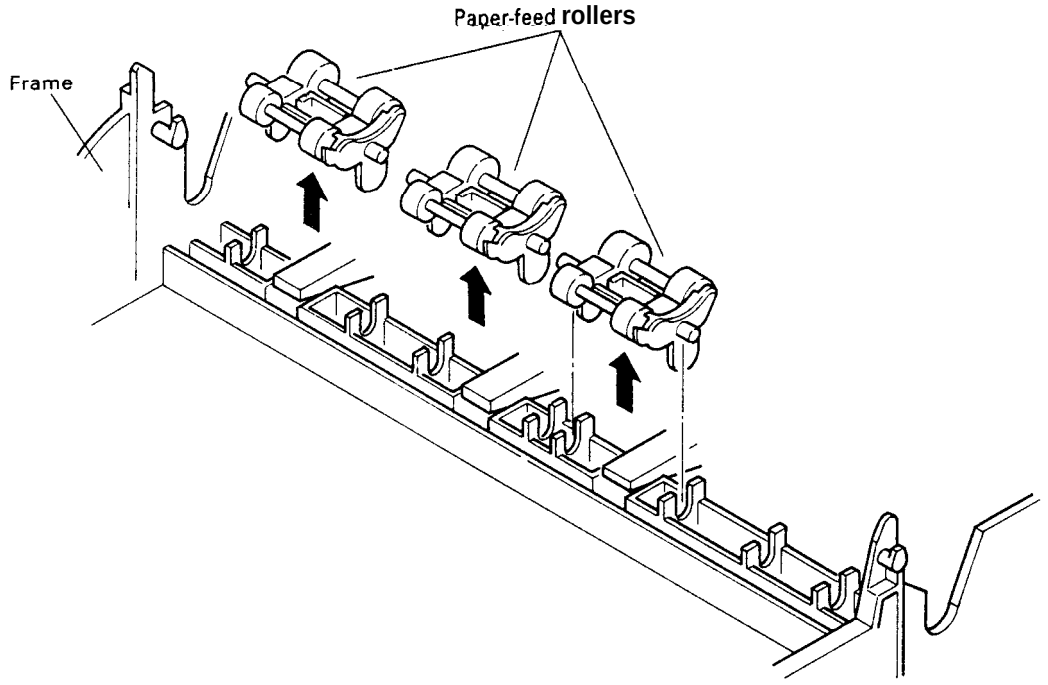


Figure 4-18. Removal of Paper Feed Rollers

3. Loosen the two tabs securing the paper guide plate and spacer to the frame, and lift and remove the plate.

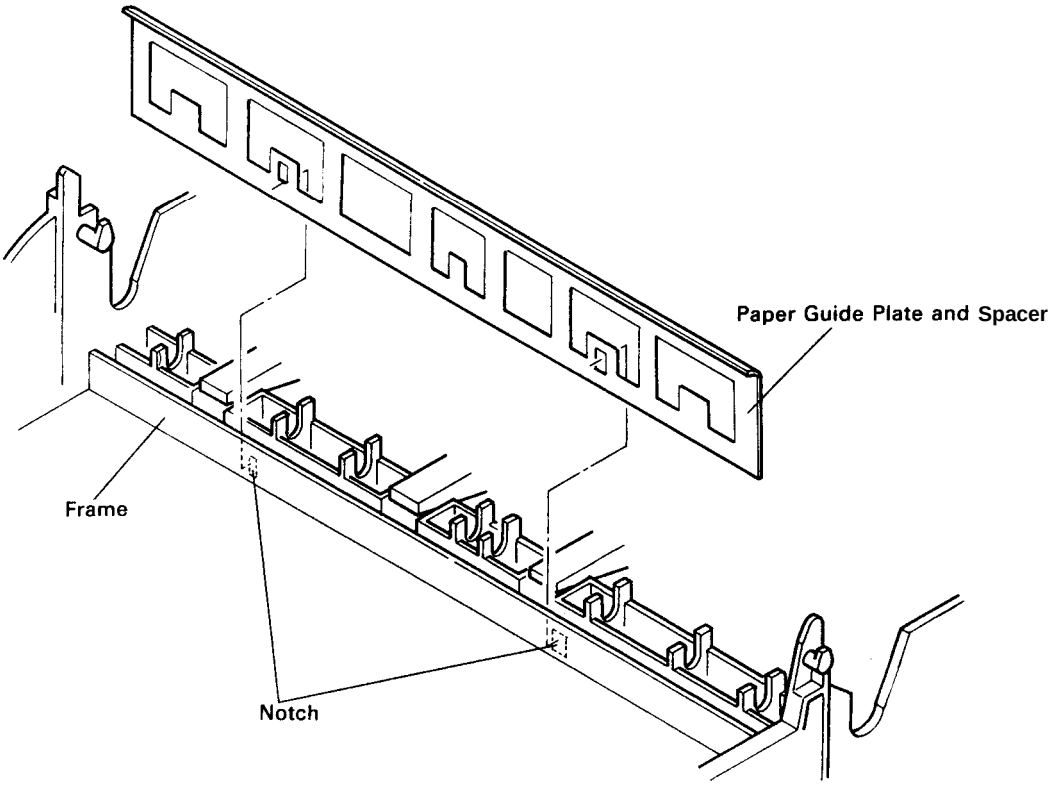


Figure 4-19. Removal of Paper Guide Plate

NOTES FOR REASSEMBLY

When remounting the paper guide plate and spacer to the frame, refer to Figure 4-20 for the mounting direction.

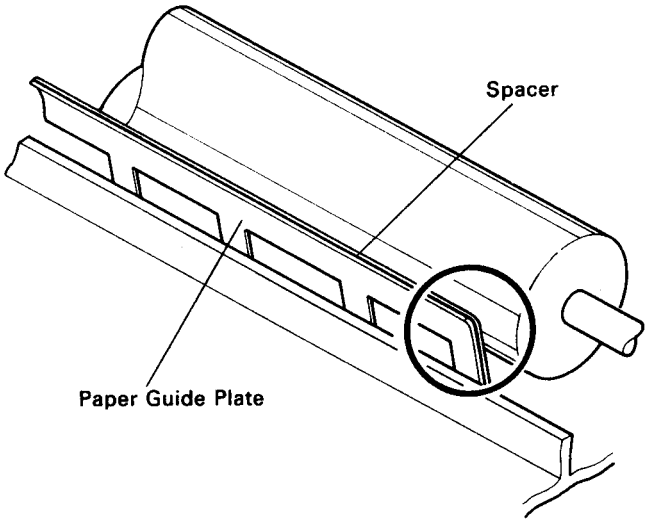


Figure 4-20. Mounting Direction for Paper Guide Plate

4.2.5.2 **Removal of Paper-Feed Motor, Release Lever, and Release /Tractor Sensor**

1. **Remove the printer mechanism (refer to Section 4.2.4).**
2. **Disconnect the motor cable from the paper-feed motor.**
3. **Loosen the two bent tabs on the frame which are securing the paper-feed motor, and remove the paper-feed motor.**

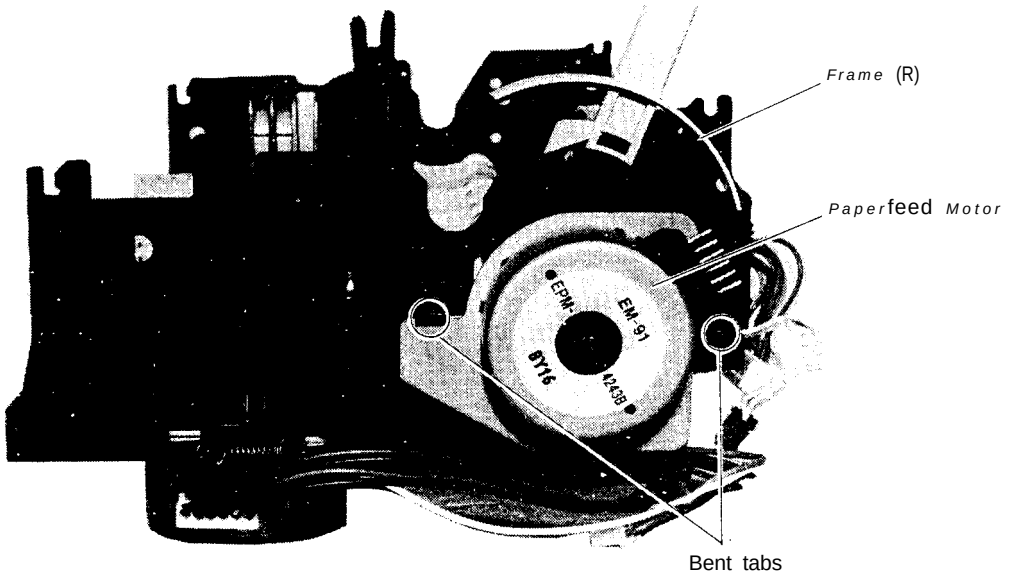


Figure 4-21. Removal of Paper-Feed Motor

4. **Remove the tractor reduction gear spring, the tractor reduction gear, and the paper feed reduction gear.**

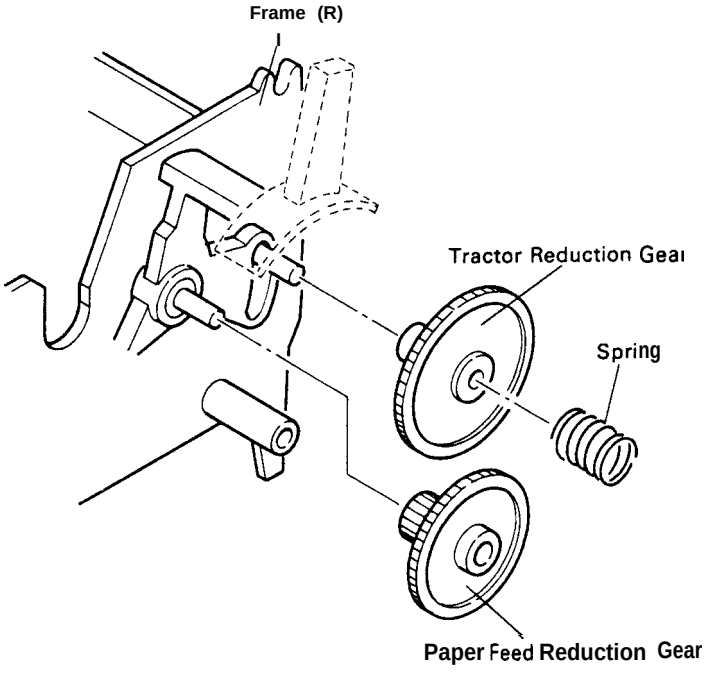


Figure 4-22. Spring and Gear Removal

5. From the inside of the frame, push the notch of the release lever outward. Remove the release lever.

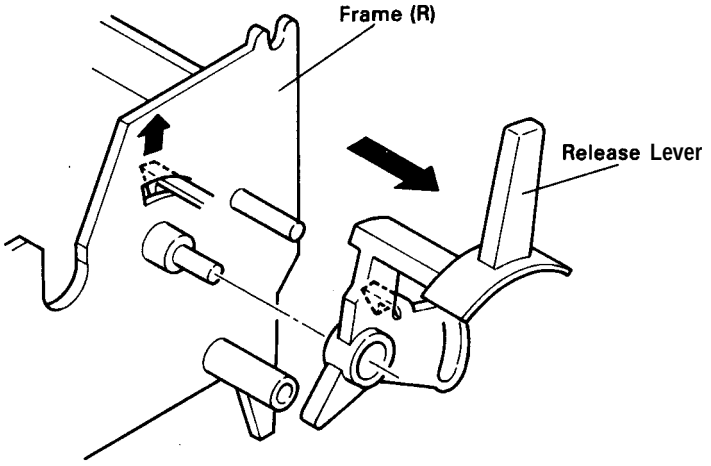


Figure 4-23. Removal of The Release Lever

6. Push the two notches securing the release/tractor sensor, and remove the sensor.

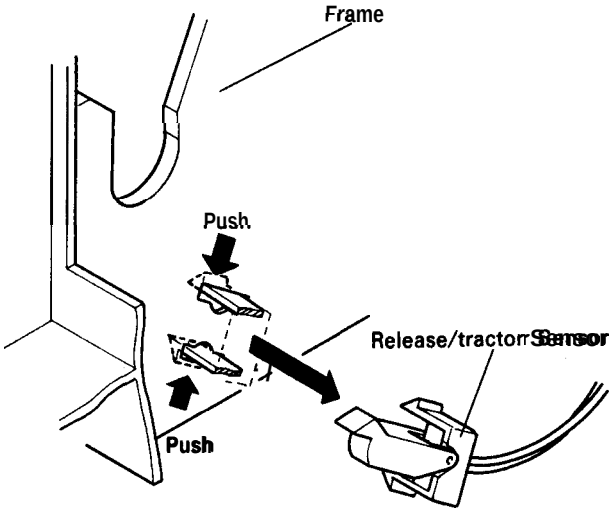
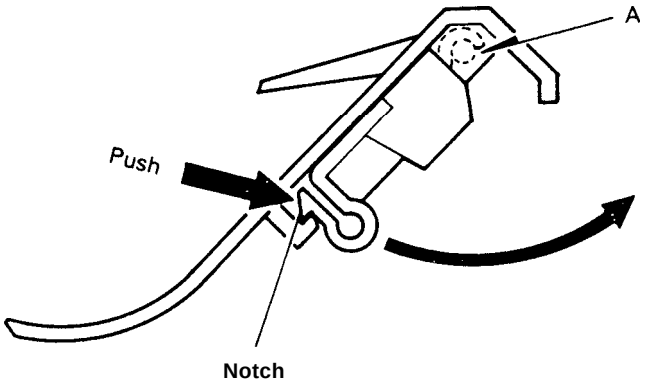


Figure 4-24. Removal of Release/Tractor Sensor

4.2.5.3 Removal of Paper-End Sensor

1. Remove the platen unit and paper guide (refer to Section 4.2.4. 1).
2. Loosen the tab securing the paper guide. Using point A (refer to the Figure below) as a fulcrum, rotate the sensor in the direction indicated by the arrow, and remove itin the direction shown by the arrow below.



(Cross-section of Paper Guide)

Figure 4-25. Removal of Paper-End Sensor

4.2.5.4 Disassembly of Platen Unit

1. Remove the platen unit (refer to Section 4.2.4.1)
2. Remove the left shaft holder.
3. Pull out the platen gear on the right side of the platen unit.
4. Remove the E-ring from the platen, and pull out the right shaft holder and the flat spring.

NOTES FOR REASSEMBLY:

When reassembling the platen unit, refer to Figure 4-26 and be sure that the flat spring and shaft holder are installed correctly. Be sure that the gap between the platen and the platen gear is adequate.

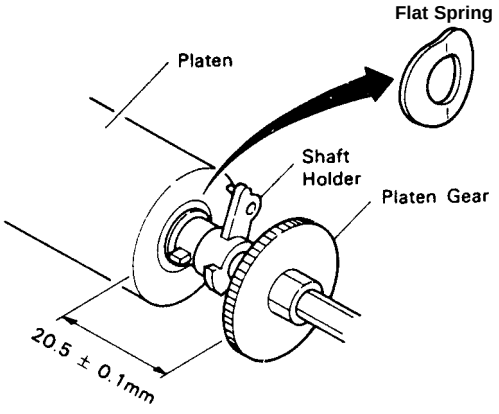


Figure 4-26. Platen Unit Reassembly

4.2.5.5 Removal of Carriage Unit

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 upside-down, and manually move the carriage unit until it is at the cut-out section of the carriage motor frame. The joint of the carriage unit and timing belt should be visible through the cut-out.

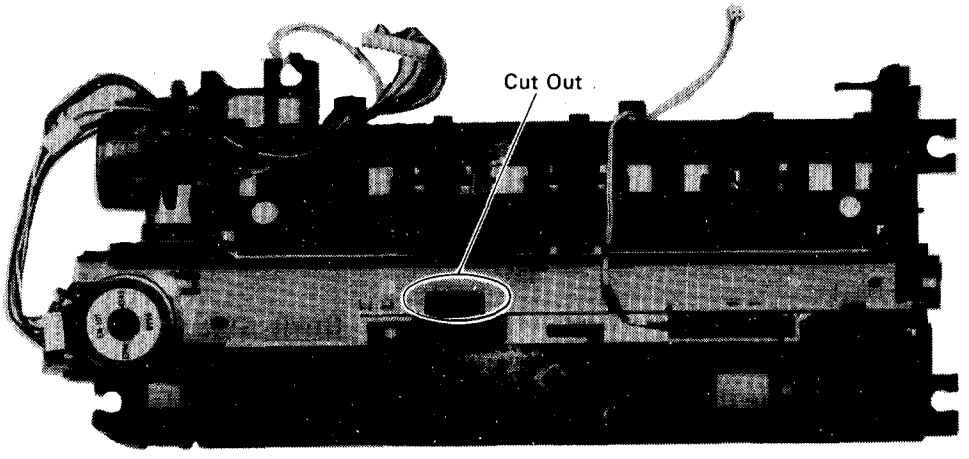


Figure 4-27. Bottom View of Printer Mechanism

4. Using round-nose pliers, detach the timing belt from the carriage unit. Be careful not to cause any damage.
5. Lift portion A (see Figure 4-28) of the carriage guideshaft's ground plate, so as to free the plate from the notch on the carriage motor frame. Slide the plate so that it can be removed from the frame (through the cutout at portion B of the plate).

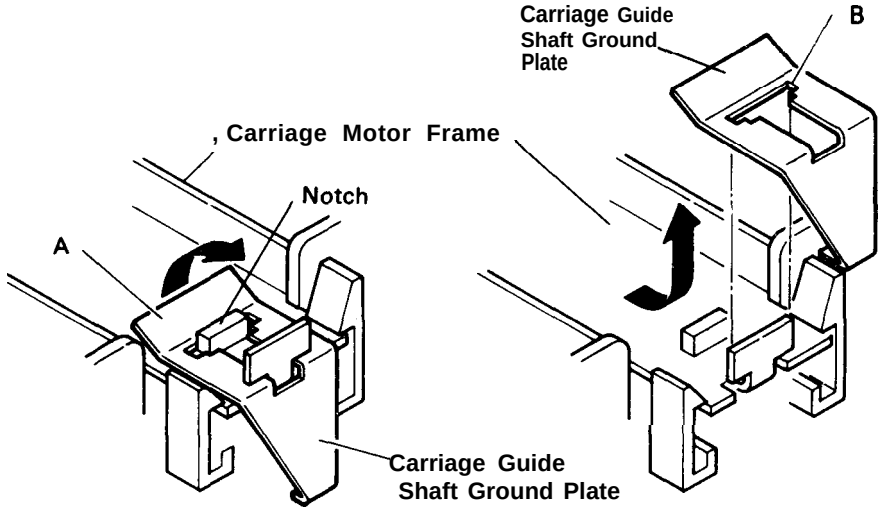


Figure 4-28. Removal of Carriage Guide Shaft Ground Plate

6. Turn the printer mechanism over so that it is again face up. Rotate the lever on the left side of the carriage guide shaft counterclockwise, and pull it out through cutout A. Rotate the lever on the right side of the guide shaft clockwise, and remove it in the same way.

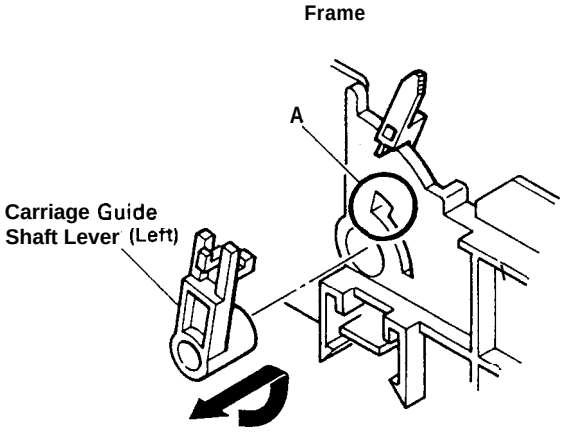


Figure 4-29. Removal of Carriage Guide Shaft

7. Push the notch on the frame that is securing the carriage guide plate, and slide the plate to remove it.

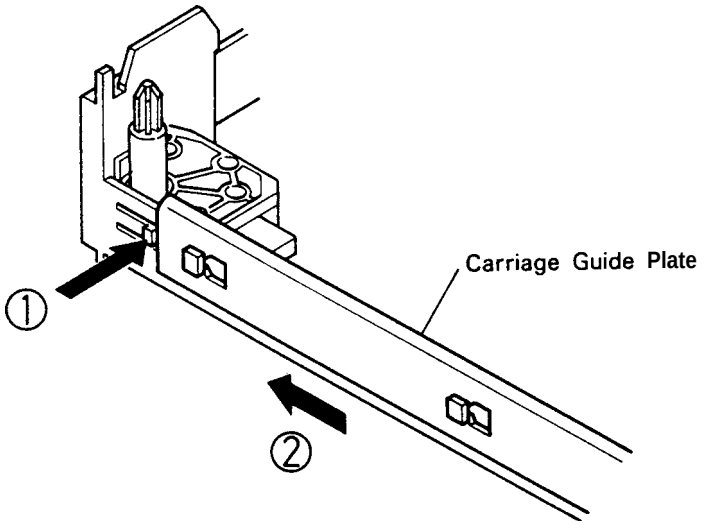


Figure 4-30. Removal of Carriage Guide Plate

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

NOTES FOR REASSEMBLY

1. When reinstalling, position the carriage guide shaft and the head adjust lever as shown in Figure 4-31.

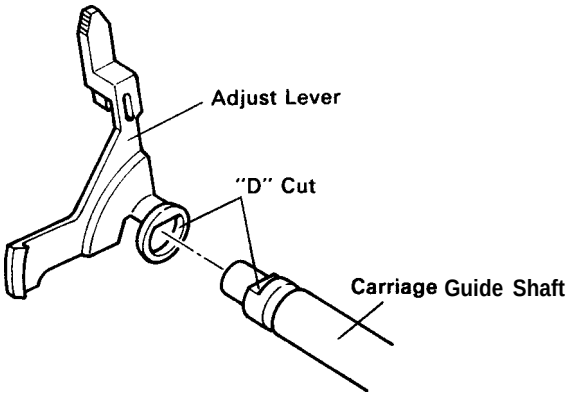


Figure 4-31. Carriage Guide Shaft and Head Adjust Lever

2. The lever for the left side of the guide shaft is gray in color; the lever for the right side is black. Slide each lever onto the appropriate side of the shaft.
3. When connecting the head cable, be sure to pass it correctly through the FFC guide on the frame.

REQUIRED ADJUSTMENT

Following reassembly of the carriage unit, adjust the platen gap. Platen gap adjustment is detailed in Section 4.3.1.

4.2.5.6 Removal of Carriage Motor

1. **Perform Steps 1 to 5 of Section 4.2.5.4.**
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 4-32.)**
3. **With a screwdriver, loosen the four tabs securing the carriage motor frame to the chassis frame. Remove the carriage motor frame.**

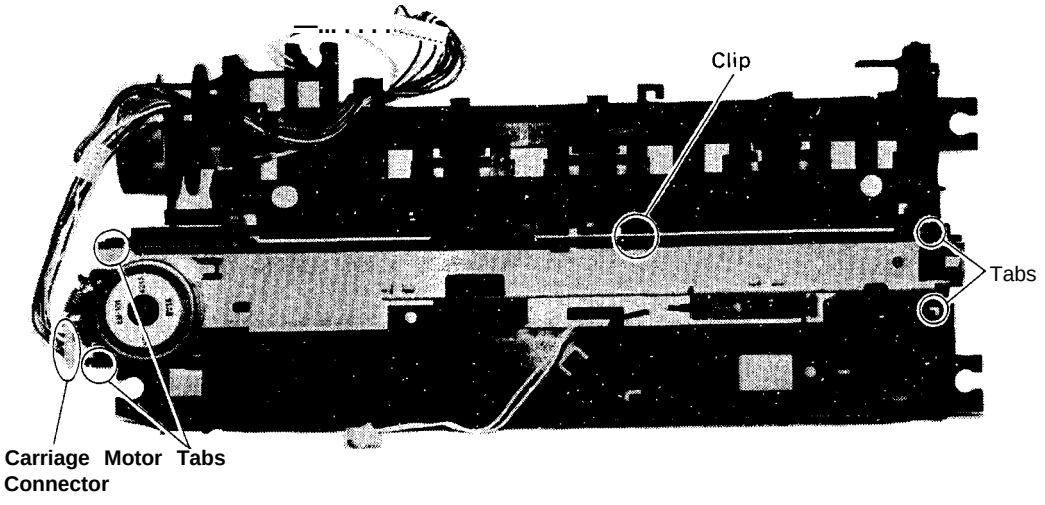


Figure 4-32. Carriage Motor Frame Removal

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 shaft holder, belt pulley, and timing belt.**

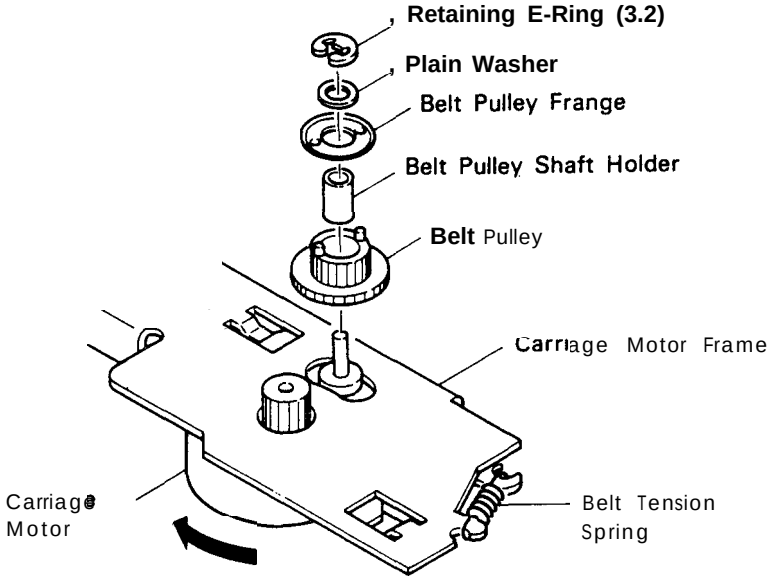


Figure 4-33. Removal of Carriage Motor

5. **Remove the carriage motor by moving it in the direction shown by the arrow above.**

NOTES FOR REASSEMBLY:

The following applies to E-ring reattachment:

- **When attaching a ring to the left pulley shaft, set it so that its opening faces left.**
- **When attaching a ring to the right pulley shaft, set it so that its opening faces right.**
- **Use tweezers to check that the attached retaining rings are firmly in place and will not not move.**

4.2.5.7 Removal of Home-Position Sensor

1. Remove the carriage motor frame. Follow Steps 1 to 3 of Section 4.2.5.6.
2. Push in the notch securing the home-position sensor, and remove the sensor from the carriage motor frame.

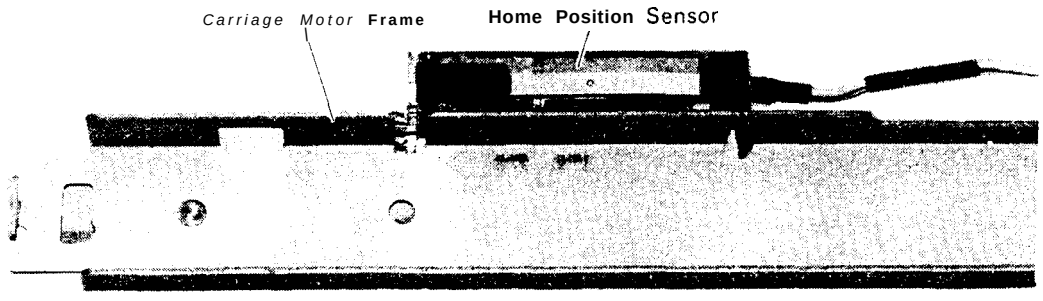
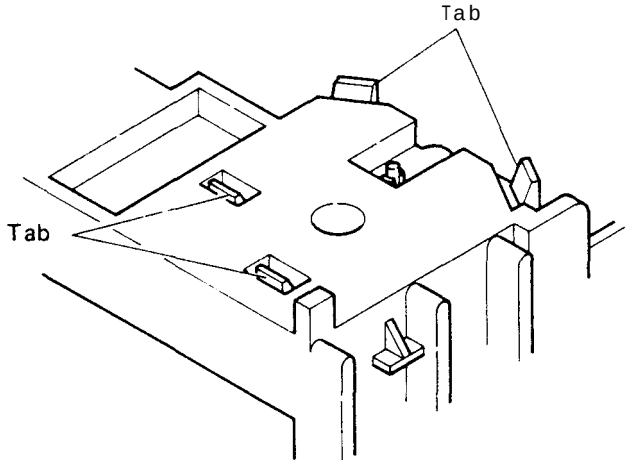


Figure 4-34. Removal of Home-Position Sensor

4.2.5.8 Disassembly of Ribbon-Feed Mechanism

1. Remove the printer mechanism (refer to Section 4.2.4.2).
2. Turn the printer mechanism upside-down, and use a screwdriver to slightly loosen the four bent tabs securing the ribbon gear cover. Only loosen the tabs slightly, and do not yet remove the cover. If the cover is removed while the printer mechanism is upside-down, the gears will scatter.



(Bottom view of printer mechanism)

Figure 4-35. Removal of Ribbon Gear Cover

3. Turn the printer mechanism over so that it is again face up, then lift and remove the ribbon gear cover.

4.2.5.9 Disassembly of The Tractor Unit

1. **Remove the E-ring on the tractor shaft.**
2. **Pull and remove the tractor shaft from the tractor frame.**
3. **Pull and remove the sprocket guide shaft from the tractor frame.**

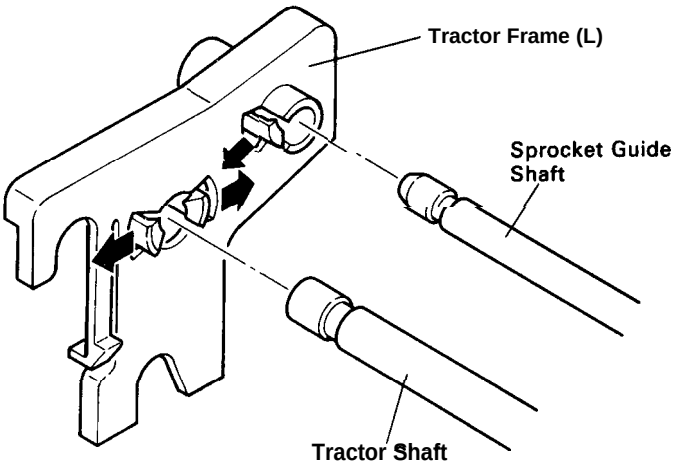


Figure 4-36. Removal of Tractor Frame L

4. **Remove tractor set L, the paper support, and tractor set R from the tractor and sprocket guide shafts.**

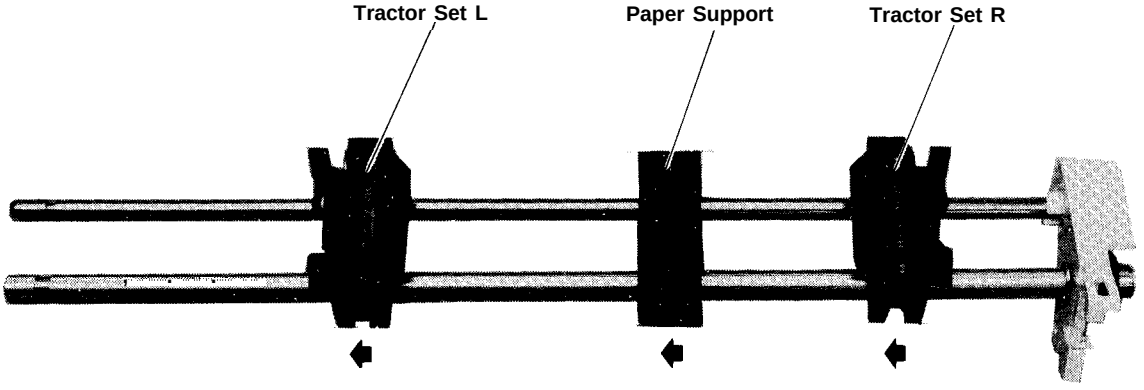


Figure 4-37. Extraction of Tractor Set L, Paper Support, and Tractor Set R

NOTES FOR REASSEMBLY

When reassembling, align the phases as shown below.

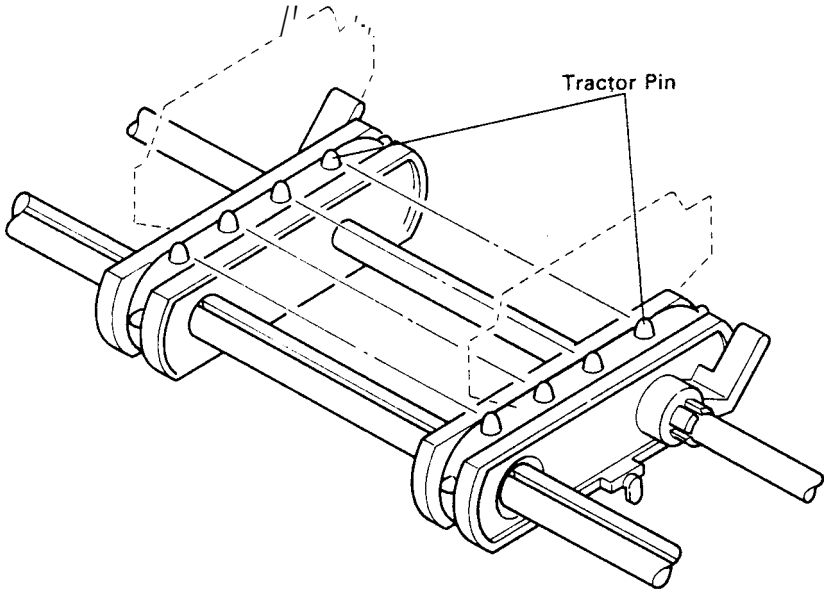


Figure 4-38. Tractor Phase Alignment

4.3 ADJUSTMENT

This section describes the adjustment procedures necessary when the LX-8 10/850 printer is reassembled or when parts are reinstalled or replaced. These procedures are necessary to ensure the correct operation of the printer.

4.3.1 Platen Gap Adjustment

Following the removal of the carriage guide shaft or carriage guide shaft levers, or if printing is abnormal, the gap between the platen and the print head should be adjusted.

1. Remove the printer mechanism (refer to Section 4.2.4).
2. Install the paper guide and the platen unit onto the printer mechanism.
3. Remove the printhead. Using tweezers, remove the ribbon mask. Remove the mask by pulling it slightly forward, then lifting.

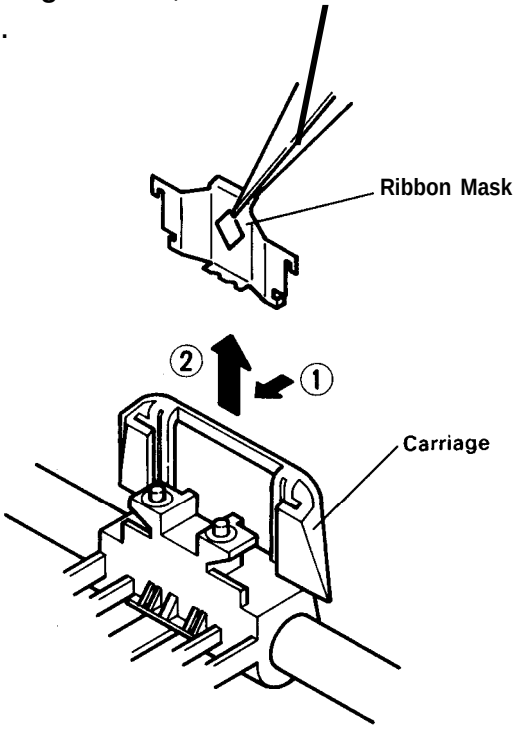


Figure 4-39. Removal of Ribbon Mask

4. Reinstall the printhead.
5. Set the head adjust lever to the position nearest the platen.
6. Set the release lever to the release position.
7. Manually move the carriage to column 10.
8. Adjust the platen so that the gap between the head and the platen allows unimpeded insertion of the 0.44-mm gap gauge, but does not allow insertion of the 0.47-mm gap gauge.

WARNING

When positioning the carriage guide shaft lever, be sure that tabs A and B do not both enter the notch at the same time. The design is such that neither of the tabs can enter if the other tab is entered.

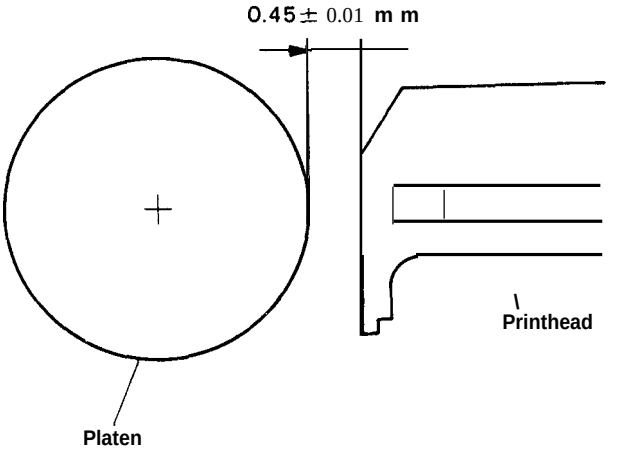


Figure 4-40. Platen Gap

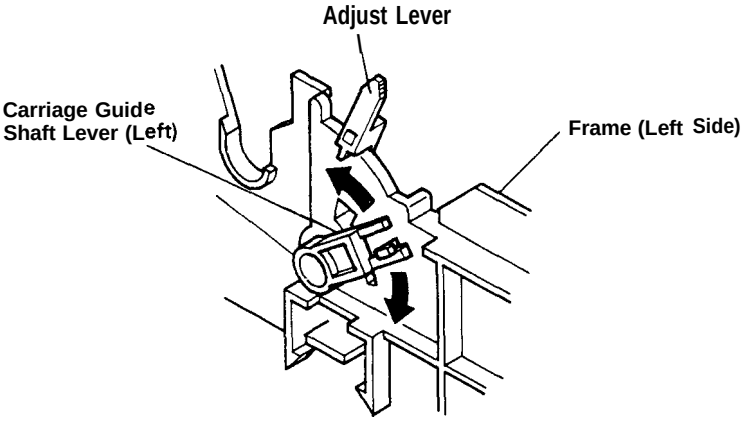


Figure 4-41. Carriage Guide Shaft Lever Movement

Carriage guide shaft (left): Clockwise rotation widens gap.
Counterclockwise rotation narrows gap.

Carriage guide shaft (right): Clockwise rotation narrows gap.
Counterclockwise rotation widens the gap.

Perform gap adjustment at the 10th and 70th column positions, and also at the center of the platen. The gaps at all three positions should match.

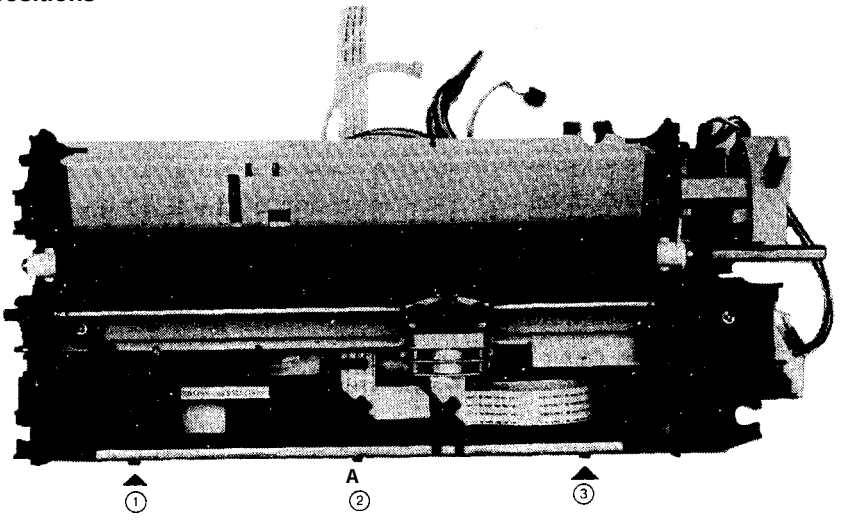


Figure 4-42. Platen Gap Adjustment Position

CHAPTER 5
TROUBLESHOOTING

LIST OF FIGURES

LIST OF TABLES

5.1 GENERAL

Troubleshooting is based on the idea that error symptoms vary according to the defective component. Troubleshooting may involve either unit replacement or unit repair, each of which is treated separately below.

First try to determine the defective unit by referring to section 5.2. The flowcharts in the section should help you to isolate the defective unit. Then refer to section 5.3 for instructions for further checking and for replacement. Section 5.3 lists, for various symptoms, the potentially defective unit(s) that may account for them. In addition, the section mentions the appropriate waveforms and resistance values that should be checked for.

If trouble occurs in the printer mechanism, refer to section 5.3.3, which specifies procedures for identifying defective components, and the replacements, adjustments, and lubrication which should be carried out.

5.2 UNIT REPLACEMENT

This section correlates symptoms with the potentially defective units that may be causing them. The unit numbers are listed in Table 5-1.

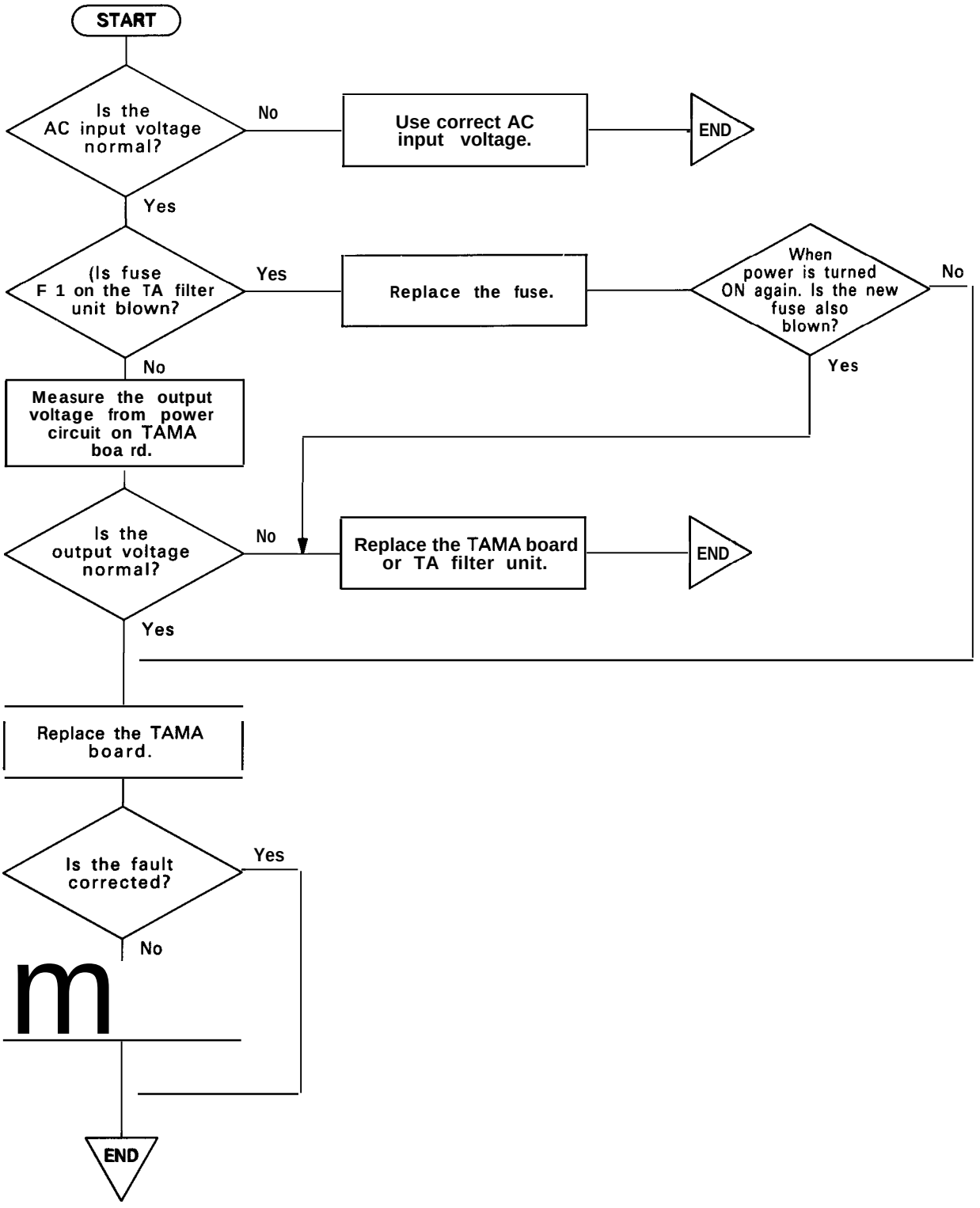
Table 5-1. Unit Replacement Numbers

Name of Unit	Description	Unit No.
TA Filter Unit	Filter and Transformer (120V)	Y463504000
TA Filter Unit	Filter and Transformer (220V)	Y463506000
TA Filter Unit	Filter and Transformer (240V)	Y463507000
TAMA Board	Main Board	Y46320 1000
TAPNL-W	Control Panel	Y46350 1000
Model-3DI O	Printer Mechanism	Y463590000
Model-3D10 (TUV)	Printer Mechanism	Y463590 100
Printhead		F425 100000
Printhead (TUV)		F425200000
Fuse (F1) (120V)	125V, 1.25A	X50206 1050
Fuse (F1)(220/240V)	250V, 0.63A	X502063030

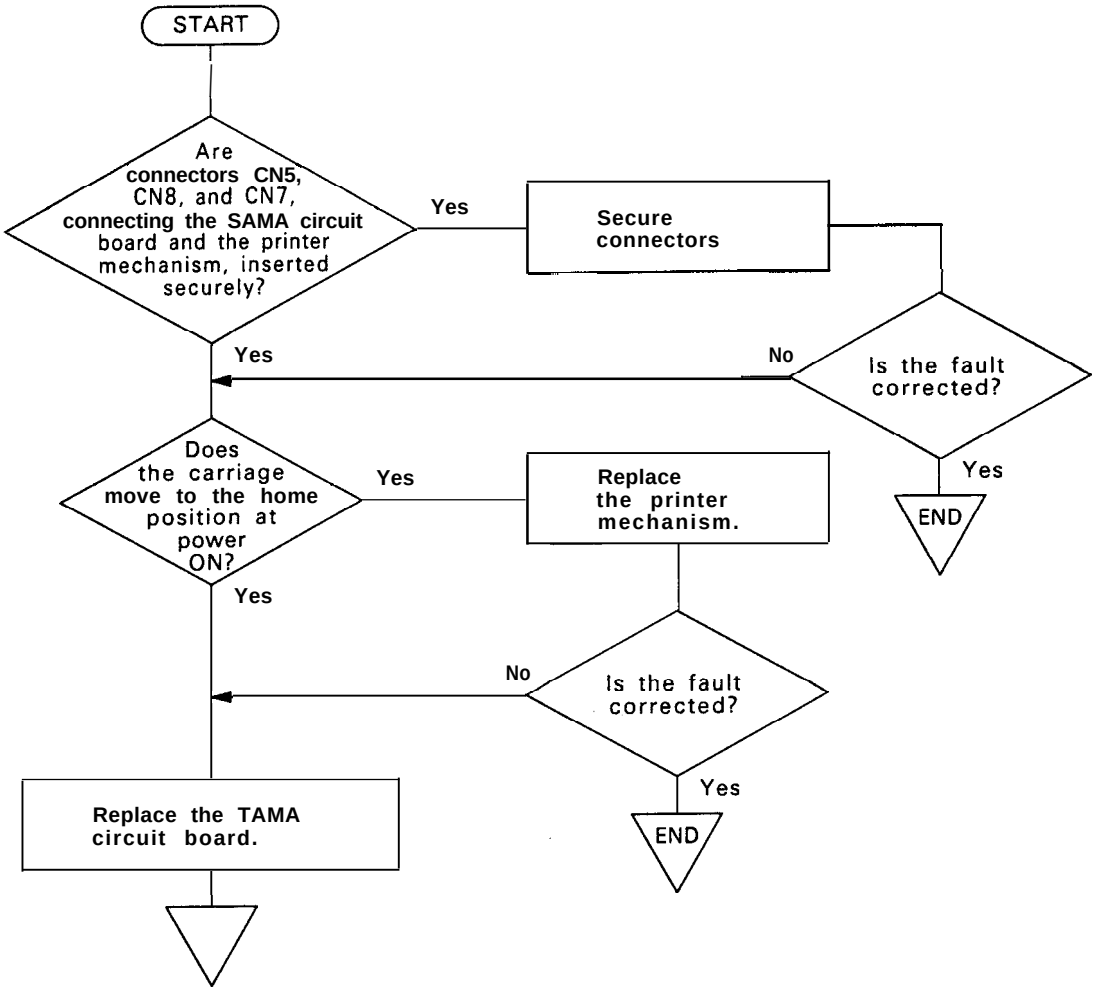
Table 5-2. Symptom and Reference Pages

Symptom	Problem	Reference Page
Printer Fails to Operate with Power Switch ON	. Carriage does not move. ● Control panel indicator lamp does not light.	5-3
Abnormal Carriage Operation	● Carriage moves away from home position at power ON. ● The carriage correctly returns to the home position, but the printer then fails to enter READY mode.	5-4
Faulty Printing During Self-Test, but Carriage Operation is Normal	● No printing at all. ● Faulty printing—some of the dots are not printed.	5-5
Abnormal Paper Feed	● No paper is fed. ● Irregular paper feed, and variation in the separations between lines.	5-7
Abnormal Control Panel Operation	● When the LF or FF switch is activated in OFF-LINE mode, no paper if fed. . No operation mode is set from the control panel. ● ON-LINE or OFF-LINE mode cannot be activated.	5-8
Faulty Printing in ON-LINE Mode	● Carriage operates normally at power ON, and self-test is correctly executed. Print data from the computer, however, are not printed correctly.	5-9

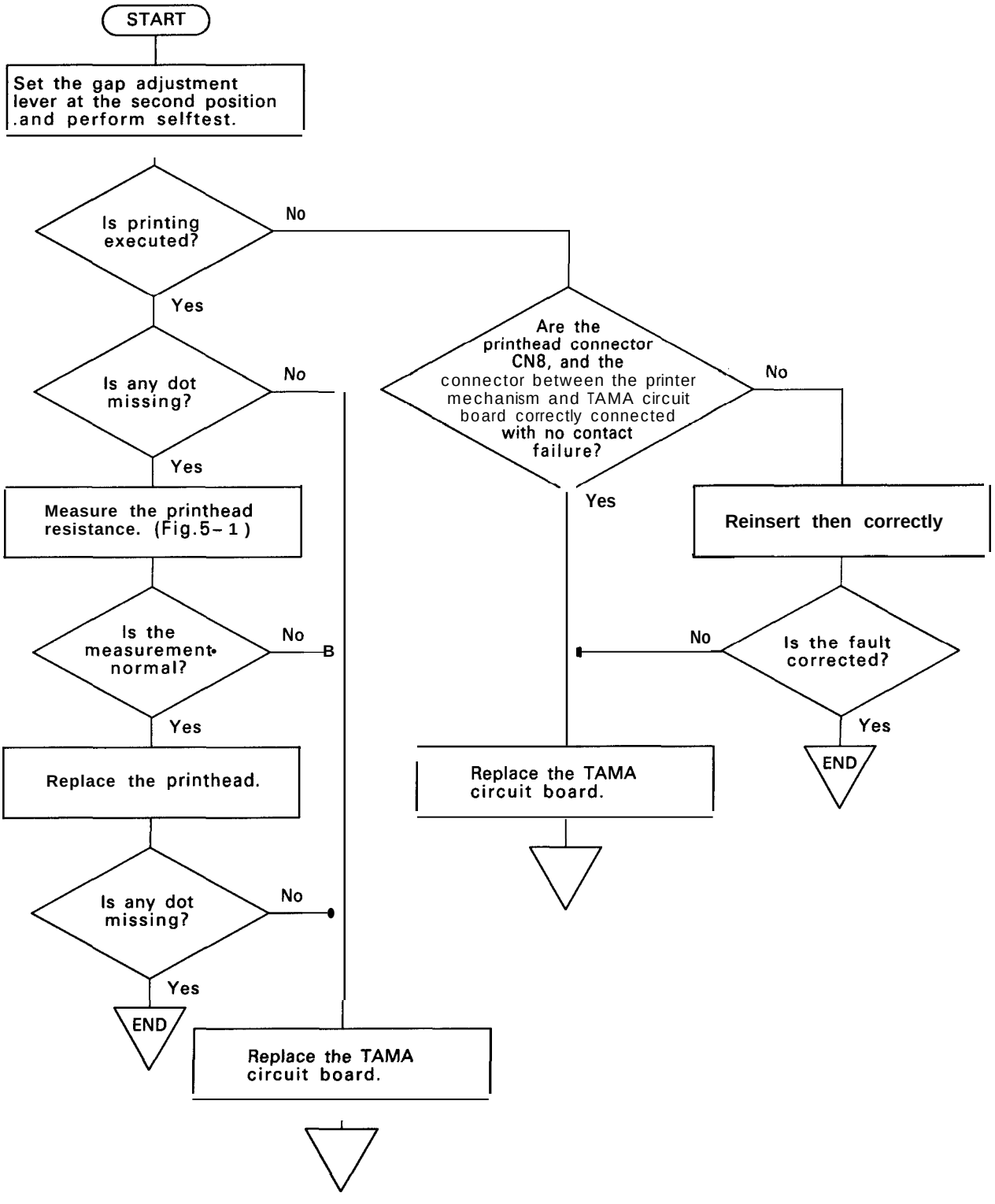
(1) Printer Fails to Operate with Power Switch ON



(2) Abnormal Carriage Operation



(3) Faulty Printing during Self-Test, but Carriage Operation is Normal



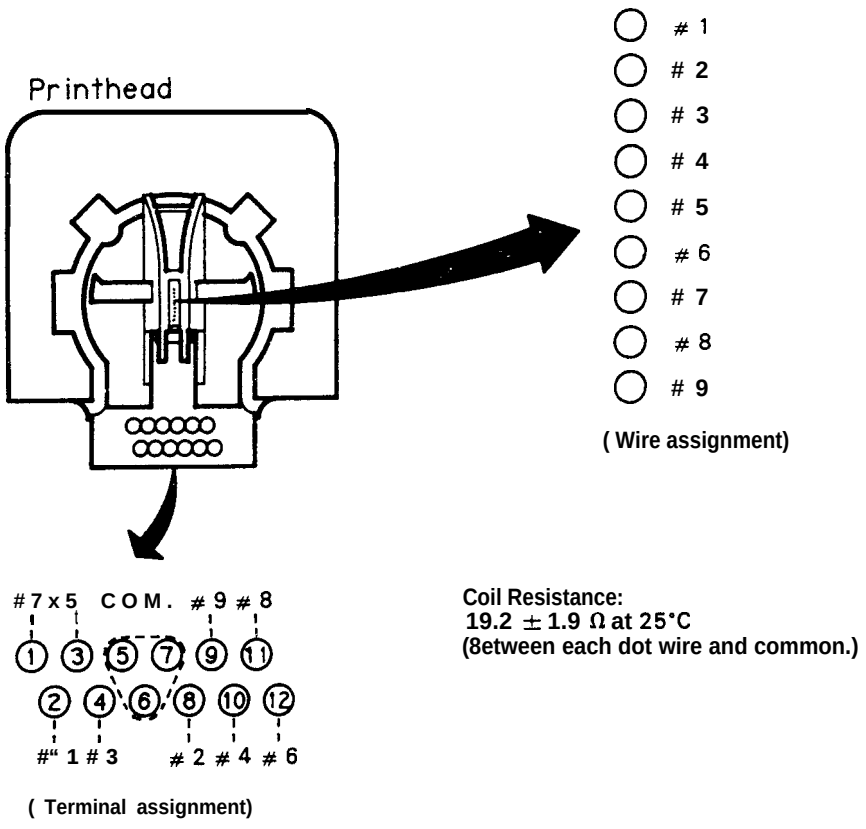
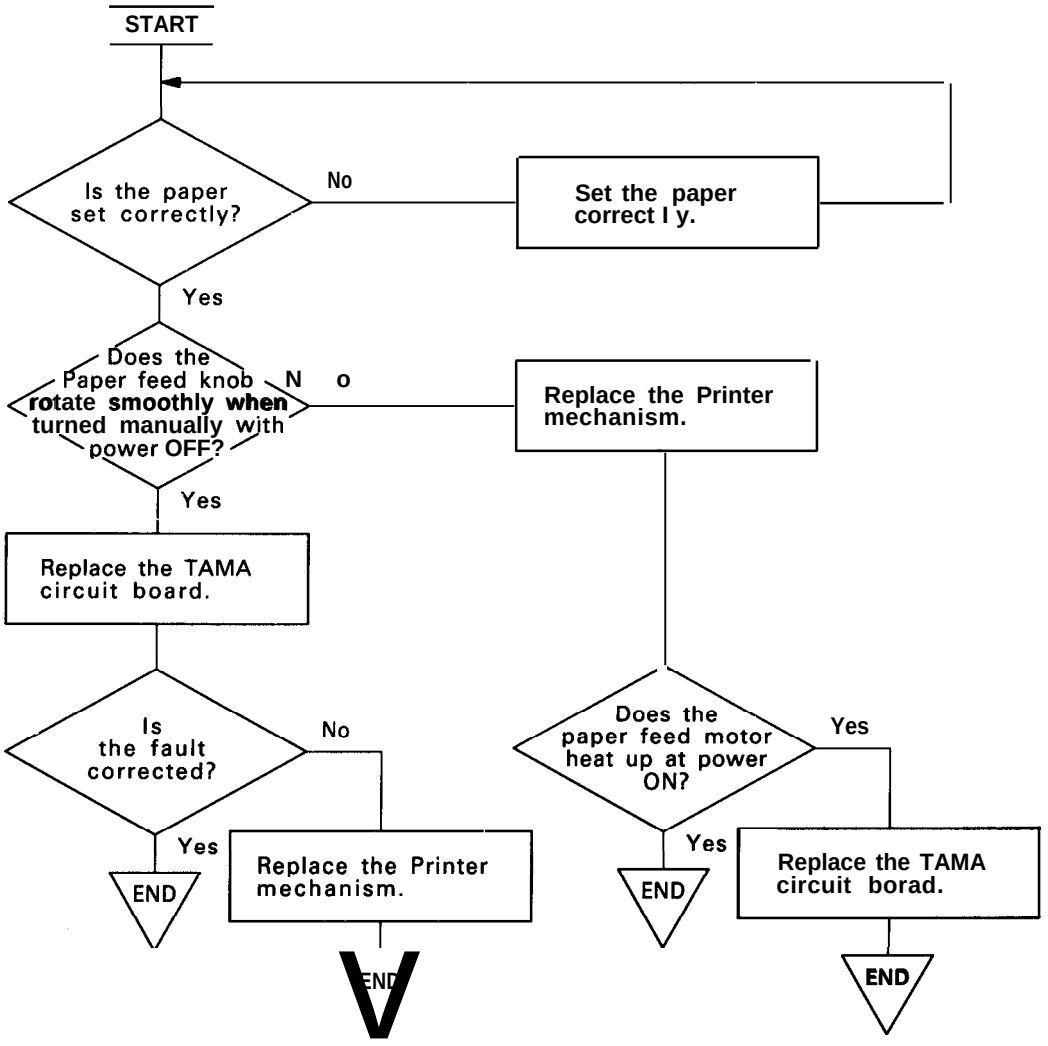
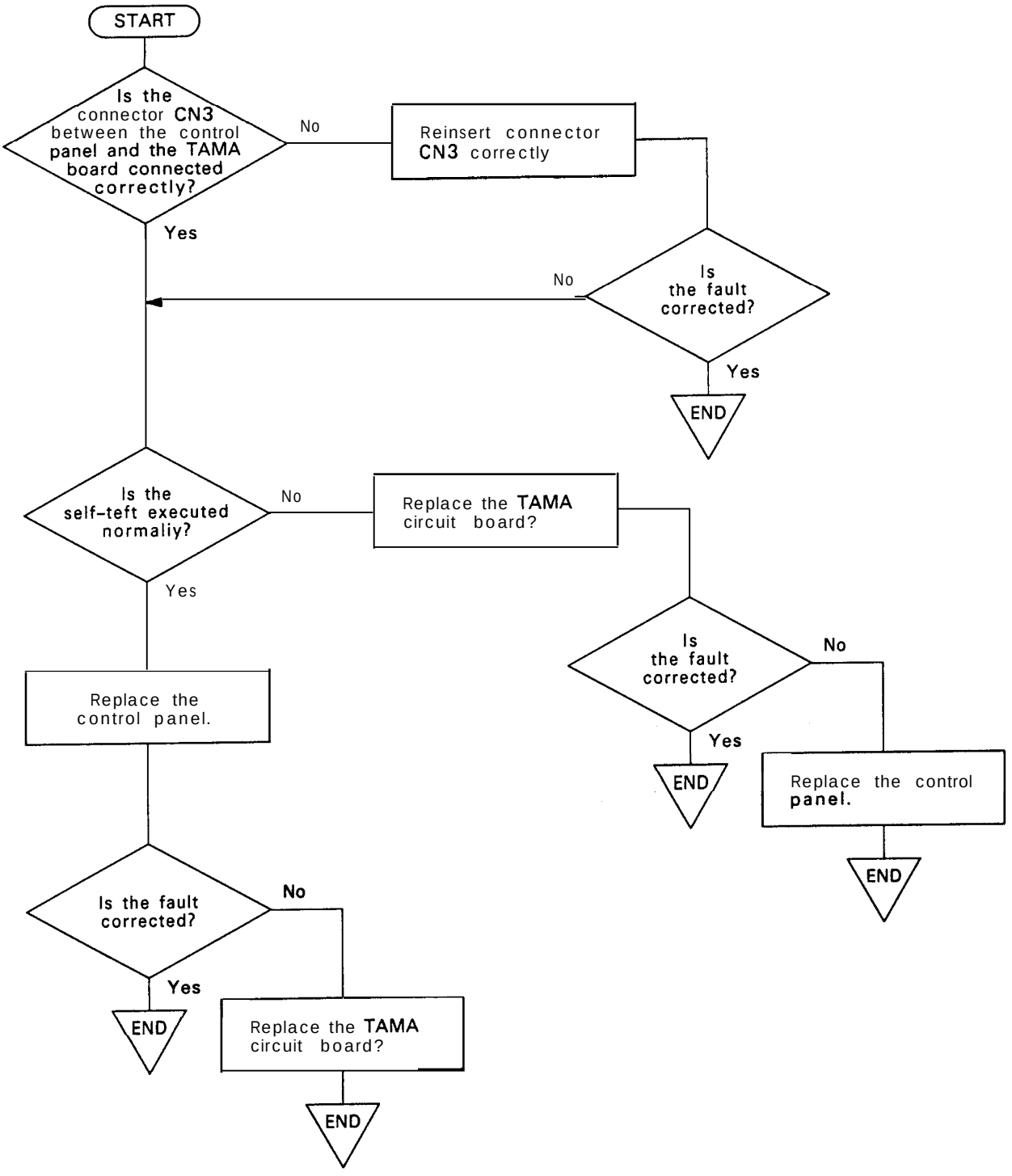


Figure 5-1. Printhead Resistance

(4) Abnormal Paper Feed (but normal printing)

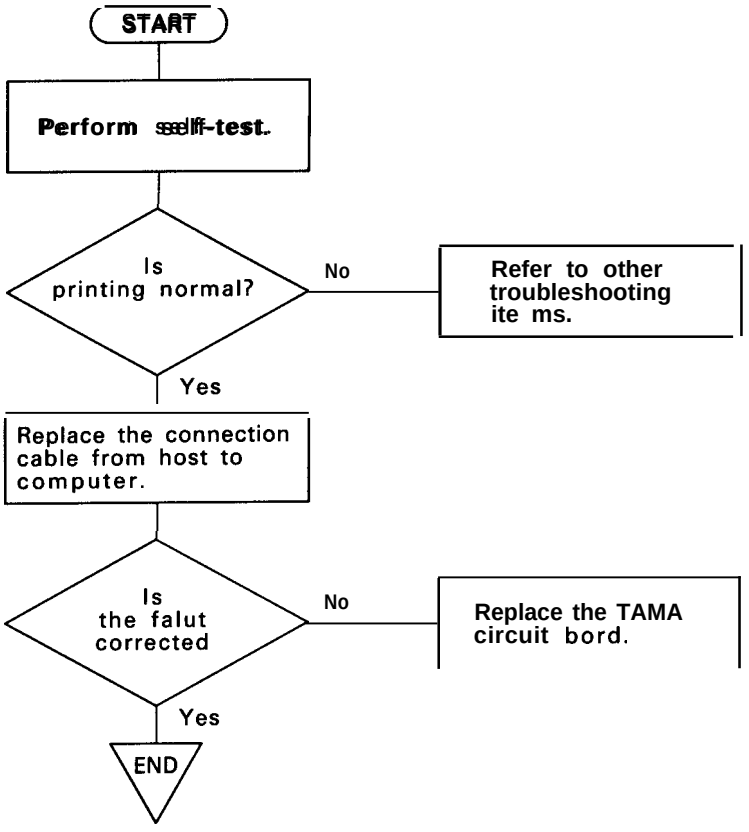


(5) Abnormal Control Panel Operation



(6) Faulty Printing in ON-LINE Mode

NOTE: It is assumed here that the host computer is operating normally.



5.3 UNIT REPAIR

This section indicates the points to be checked in response to problems, and the measures to be taken based on the result of the check. Utilize the checkpoints to determine and correct defective components.

Tables 5-4 and 5-5, below, are divided into the five following columns:

- **Problem:** **Indicates the problem**
- **Symptom:** **Indicates potential condition which may be underlying the problem. You must check to see which if any of the symptoms apply.**
- **‘ Cause:** **Indicates the potential cause of the problem.**
- **Checkpoint:** **Perform this check to determine whether the problem is the result of the cause listed at left.**
- **Solution:** **Indicates the repair that will correct the fault.**

5.3.1 TAMA Control Board Unit Repair

The following chart shows the main components on the TAMA board.

Table 5-3. TAMA Board Parts List

Location	Parts Name	Description	Parts No.
2C	KPD7810HG	CPU	X400078 101
3B	E05A30	Gate Array	Y463800001
3D	SRAM2064C-15	SRAM	X400 120642
1A	SLA7020M	Step Motor Driver	X440070200
1C	ER59256	EEPROM	X400592560
3A	μPC494C	Switching Regulator IC	X440064940
SRI	NJ M78L05	Switching Regulation IC	X440078058
Q1	2SD 1833C4	60V,5.0A, 30W	X303 183309
Q2	2SA935T103	80V, 700mA, 750mW	X300093509
Q3, Q20, Q25	2SC 18 15-TPE2	50V, 150mA, 400mW	X302 181509
Q4	2SC1 384	50V,1.0A, 1.OW	X302 138400
15,Q17,Q18, Q 19	2SA 10 15-TPE2	50V, 150mA, 400mW	X300 101509
Q6	2SB 1151	−60V,−5.0A, 20W	X301 115100
Q7 -Q15	2SD 1647C3	60V,2.0A, 25W	X303 164709
Q16	2SB 1093-T	80V, 1.5A, 1.0W	X30 1109309
Q21, Q22, Q23, Q24	2SD 1843-T	60V,1.0A, 10W	X303 184309

Table 5-4. TAMA Board Unit Repair

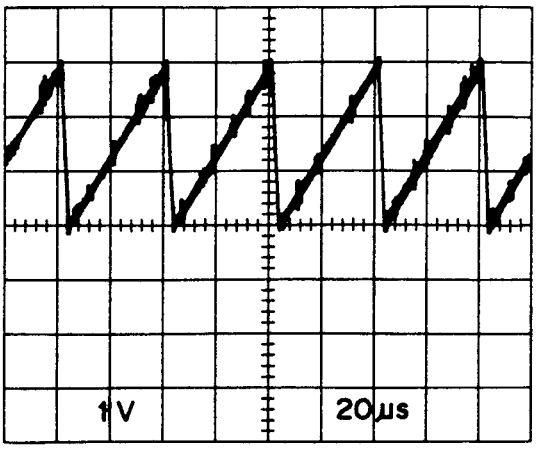
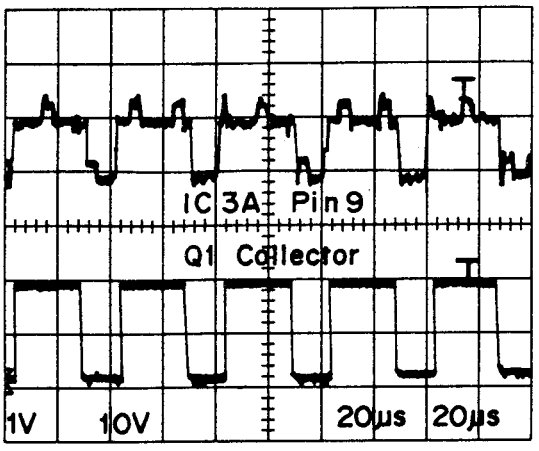
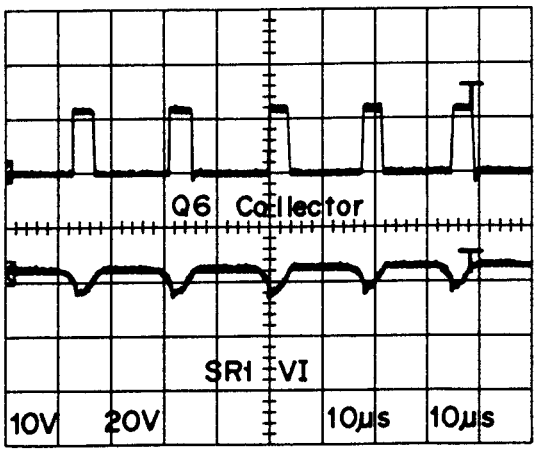
Problem	Symptom	Cause	Check point	Solution
The printer does not operate at all.	The +24V is dead.	IC 3A is defective.	At IC 3A, check the input waveform at pin 5. 	Replace IC 3A.
		IC 3A or transistor Q1 (Q2) is defective.		Replace 2C 3A or Q1 (Q2).
	The +5V is dead.	SRI or transistor Q6 is defective.		Replace SRI or Q6.

Table 5-4. TAMA Board Unit Repair (Continued)

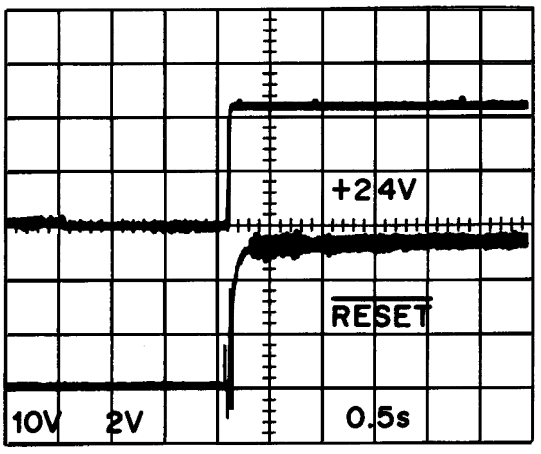
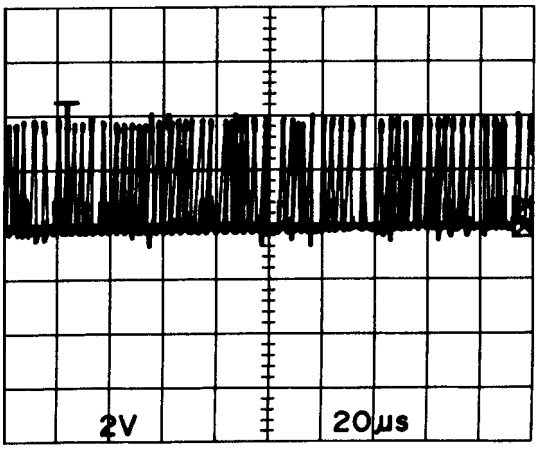
Problem	Symptom	Cause	Check point	Solution
The printer does not operate at all.	The CPU is not operating.	The reset circuit is not operating.	Check the Voltage Waveforms at the + 24V and for the $\overline{\text{RESET}}$ signal. 	Replace Q5.
		Selection of control ROM is abnormal.	Check pin 54 of IC 2C for a changing signal HIGH/LOW. 	Replace C3C.
		RAM is defective.		Replace C3D.

Table 5-4. TAMA Board Unit Repair (Continued)

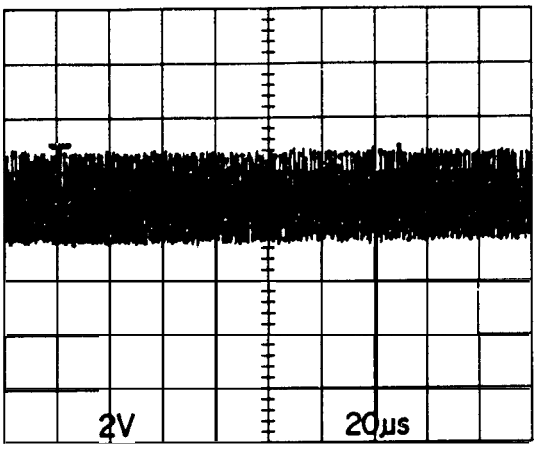
Problem	Symptom	Cause	Check point	Solution
The printer does not operate at al 1.	The CPU is not operating	The CPU is defective.	Check for oscillator signal at either pin 31 or pin 32 of the CPU. 	Replace CPU.

Table 5-4. TAMA Board Unit Repair (Continued)

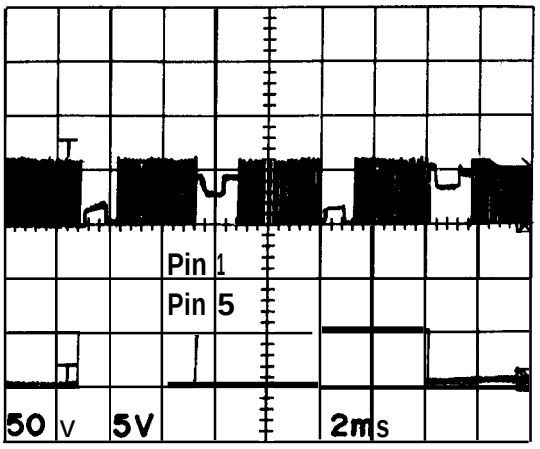
Problem	Symptom	Cause	Check point	Solution
The Carriage operates abnormally.	The Carriage does not operate at all	IC 3B or IC IA is defective.	At IC 1A, check the input signal at pin 5 and the output waveform at pin 1 	Replace 3B or 1A.
	Carriage operation is unstable (lack of torque)	The reference Voltage generating circuit is faulty.	Check transistor Q 17, Q18 and Q19.	Replace Q17, Q18 or Q19.

Table 5-4. TAMA Board Unit Repair (Continued)

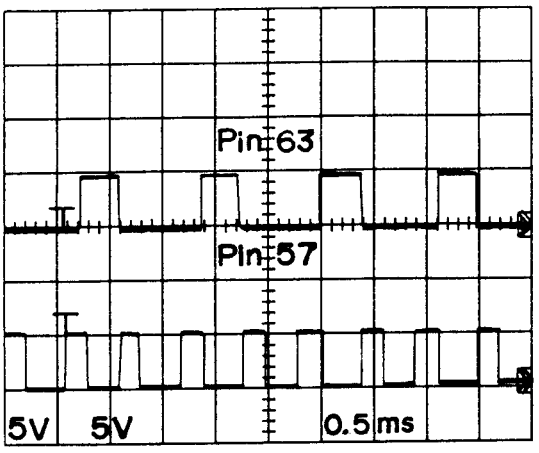
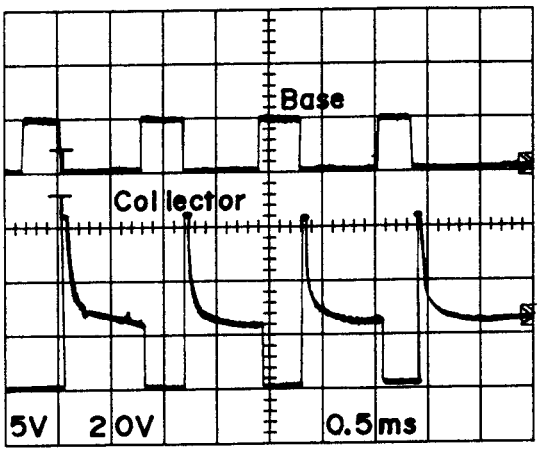
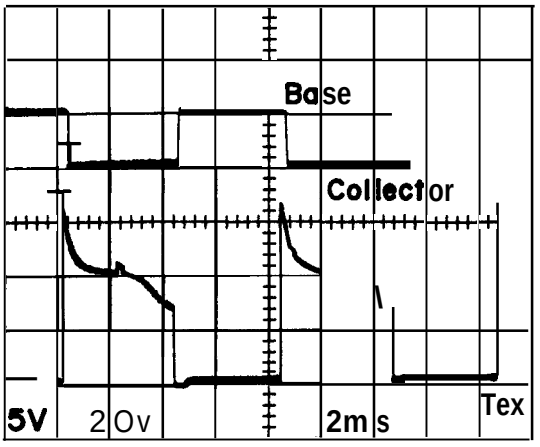
Problem	Symptom	Cause	Check point	Solution
Self-test printing abnormal	Self-test printing is not executed	IC 3B is defective	At IC 3B, check the input signal at pin 57 and the out put signal pin 1, 2, 3, 58, 59, 60, 61, 62 and 63. 	Replace 3B.
		Transistor Q7 - Q15 are defective	At Q7 - Q15, check the base waveform and the Collector waveform. 	Replace Q7 - Q15

Table 5-4. TAMA Board Unit Repair (Continued)

Problem	Symptom	Cause	Check point	Solution
Paper is not fed normally.	The paper feed pitch is abnormal (open-phase)	The IC 3B or transistor Q21, Q22, Q23 and Q24 defective.	At Q21-Q24, check the base waveform and collector waveform. 	Replace Q21-Q24. or IC3B.
	The paper does not feed, or the feed pitch is abnormal (lack of torque).	Q16 OR Q20 is defective	Check transistor Q 16 or Q20.	Replace Q16 or Q20
Printing in ON-LINE mode is abnormal.	Data corruption occurs when the parellel interface is used.	IC 3B is defective.	Check the input/output signals of IC3B.	Replace IC 3B.

5.3.2 Printer Mechanism Repair

For detailed procedures for replacing or adjusting parts, refer to Sections 4.3 ("Disassembly and Reassembly") and 4.4 ("Adjustment").

If a problem or system recurs following an attempted repair, refer back to the Tables above to try to find other potential causes.

Table 5-5. Printer Mechanism Repair

Problem	Symptom	Cause	Checkpoint	Solution
The carriage motor fails to operate.	The carriage motor completely fails to activate at power ON.	Foreign substances are lodged in the gears or elswhere in the mechanism. The carriage motor is defective.	Manually move the timing belt to see if this causes the motor to rotate. Measure the coil resistance of the motor. The resistance should be about 11 ohms.	Remove any foreign substances. Replace the carriage motor.
The carriage does not operate normally at power ON (when the carriage has been manually centered prior to power ON.)	The carriage motor rotates, but the carriage does not move.	The belt pulley is defective.	Check for broken or worn pulley.	Replace the belt pulley.
		The timing belt is defective.	Check that the timing belt is correctly inserted into the bottom of the carriage.	Reinsert the timing belt.
			Check for a broken timing belt.	Replace the timing belt.
	The carriage moves leftwards a little, then stops.	The carriage movement is not smooth.	Check whether the carriage moves smoothly when moved manually.	Clean and lubricate.
	The carriage moves to the left end, then stops.	The home position sensor is defective.	Use a tester to check the the home position sensor.	Replace the home position sensor.
Self-test printing does not execute.	The carriage moves, but no printing is performed.	The common wires of the printhead FFC are disconnected.	Check the connector for the common wires of the printhead FFC.	Replace the FFC.
	Printing stops before the page end.	The paper guide plate is not correctly positioned.	Check whether the paper guide plate is mounted in the right position.	Reset the paper guide plate.

Table 5-5. Printer Mechanism Repair (Continued)

Problem	Symptom	Cause	Checkpoint	Solution
Self-test printing is abnormal.	A particular dot fails to print.	The printhead is defective.	Measure the coil resistance of the printhead. The normal value is approx. 19.2 ohms	Replace the printhead
			Check whether the dot wire broken.	Replace the printhead
	The printing is too light, or the print density is not uniform.	The printhead is defective.	Check whether the tip of the dot wire is not worn.	Replace the printhead
		The platen gap is not properly adjusted.	Set the gap adjust lever to the second position, and check the gap between the tip of the printhead and the platen. The appropriate value is 0.45mm.	Adjust the gap. Refer to section 4.3.1, "Platen gap adjustment"'.
Paper feed is defective.	Printing is performed, but the paper is not fed, or is not fed uniformly.	Foreign substances are lodged in the paper path.	Perform a visual check of the paper path.	Remove any foreign substances.
		The paper feed motor is not driving the gear correctly.	Check that no foreign substance is lodged between the gears, and that the gears are not broken or worn.	* Remove the foreign substance. • Replace the paper feed reduction gear. • Replace the platen gear.
		The paper feed motor is defective.	Measure the coil resistance of the paper feed motor. The appropriate value is approx. 40 ohms.	Replace the paper feed motor.

Table 5-5. Printer Mechanism Repair (Continued)

Problem	Symptom	Cause	Checkpoint	Solution
Ribbon feed is defective.	The ribbon is not fed.	The ribbon cartridge is defective.	Dismount the ribbon cartridge, rotate its knob manually, and check whether the ribbon feeds normally.	Replace the ribbon cartridge.
		Foreign substances are caught in the gears.	Check whether the ribbon driving gear rotates when the carriage is moved manually.	Remove any foreign substance. Replace the ribbon feed mechanism.
	The ribbon feeds properly only with the carriage moving in one direction (i.e. fails to feed when the carriage moves in the other direction).	The planetary lever is defective.	Move the carriage manually, and check whether the planetary lever turns in reverse and engages the gear.	Replace the ribbon feed mechanism.
Paper becomes stained.	Ink stains appear on areas where there is printing.	The ribbon mask is not correctly positioned.	Check whether the ribbon mask is in the correct position.	Reset the ribbon mask.
		The platen gap is adjusted.	Set the gap to the second position, and check the gap between the tip of the . printhead and the platen. The appropriate value is 0.45mm.	Adjust the gap. Refer to section 4.3.1, “Platen Gap Adjustment”.
Printing continues past the end of paper, or when no paper is in place.	Printing is continues past the end of paper.	The paper end sensor is defective.	Check the paper end sensor switch.	Replace the paper end sensor.

CHAPTER 6
MAINTENANCE

LIST OF FIGURES

LIST OF TABLES

Proper maintenance assures optimal and long-term printer performance and and minimizes the occurrence of malfunctions.

6.1 PREVENTIVE MAINTENANCE

The case exterior should be regularly cleaned with alcohol. Occasionally vacuum clean the interior of the mechanism to remove accumulated dirt, dust, and paper particles.

After the unit has been cleaned, check that it is adequately lubricated (refer to Section 6.2, below). Before returning the printer to the customer, inspect the springs, paper-feed rollers, and the basic operation of the unit.

WARNING

Be sure to disconnect the printer from the power supply before maintenance. Do not apply thinner, trichloroethylene, or ketone-based solvents to any of the printer's plastic components.

6.2 LUBRICATION AND ADHESIVE APPLICATION

EPSON recommends lubrication at the points illustrated in Figure 6-2. Table 2 provides a list of these points, and the recommended lubricant to be used for each. The lubricants-EPSON O-2, EPSON G-20, EPSON G-26, and EPSON G-37–have all been thoroughly tested and fully meet the needs of this printer. (Table 6-1 lists details of these lubricants.)

Before applying any lubricant, make sure that the part to be lubricated is clean. Do not apply excess lubrication, as this can potentially cause damage.

Following its disassembly or replacement, adhesive must be applied to the part indicated in Table 6-3. EPSON recommends application of Neji lock #2 (G) adhesive to the point illustrated in Figure 6-1. When applying the adhesive, be careful that no excess overflows onto nearby parts.

Table 6-1. Lubrication and Adhesive

Type	Name	Capacity	Availability	Parts No.
Oil	O-2	40CC	E	B7 10200001
Grease	G-20	40gm	E	B702000001
Grease	G-26	40gm	E	B702600001
Grease	G-37	40gm	E	B703700001
Adhesive	Neji lock #2 (G)		E	B730200200

E: EPSON-exclusive product

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

Ref. No.	Lubrication Points	Lubricant
(1)	**Shaft which sets paper feed reduction**	**G-26**
(2)	**Contact portion of sub paper release lever and paper release lever,**	**G-26**
(3)	**Oil pad**	**o-2**
(4)	Carriage guide shaft (at both left and right sides of carriage)	G-26
(5)	Carriage guide plate (the portion that contact the carriage)	G-26
(6)	Platen gear	G-26
(7)	Belt pulley gear	G-26
(8)	Ribbon transmission gear	G-26
(9)	Paper tension roller shaft	G-26
(lo)	Gear portion of the ribbon gear	G-26
(11)	Shaft which sets the ribbon gears	G-26
(12)	Paper feed roller shaft	G-37
(13)	Contact portion of tractor frame L and tractor shaft.	G-26
(14)	Contact portion of **GND spring and platen shaft**	**G-20**

NOTE: Lubrication is necessary when assembling.

Table 6-3. Adhesive Application Point (Refer to Figure 6-1.)

Adhesive Application Point	No. of Points
Where the timing belt engages the carriage.	1

<To Timing Belt>

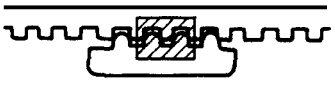


Figure 6-1. Correct Adhesive Application

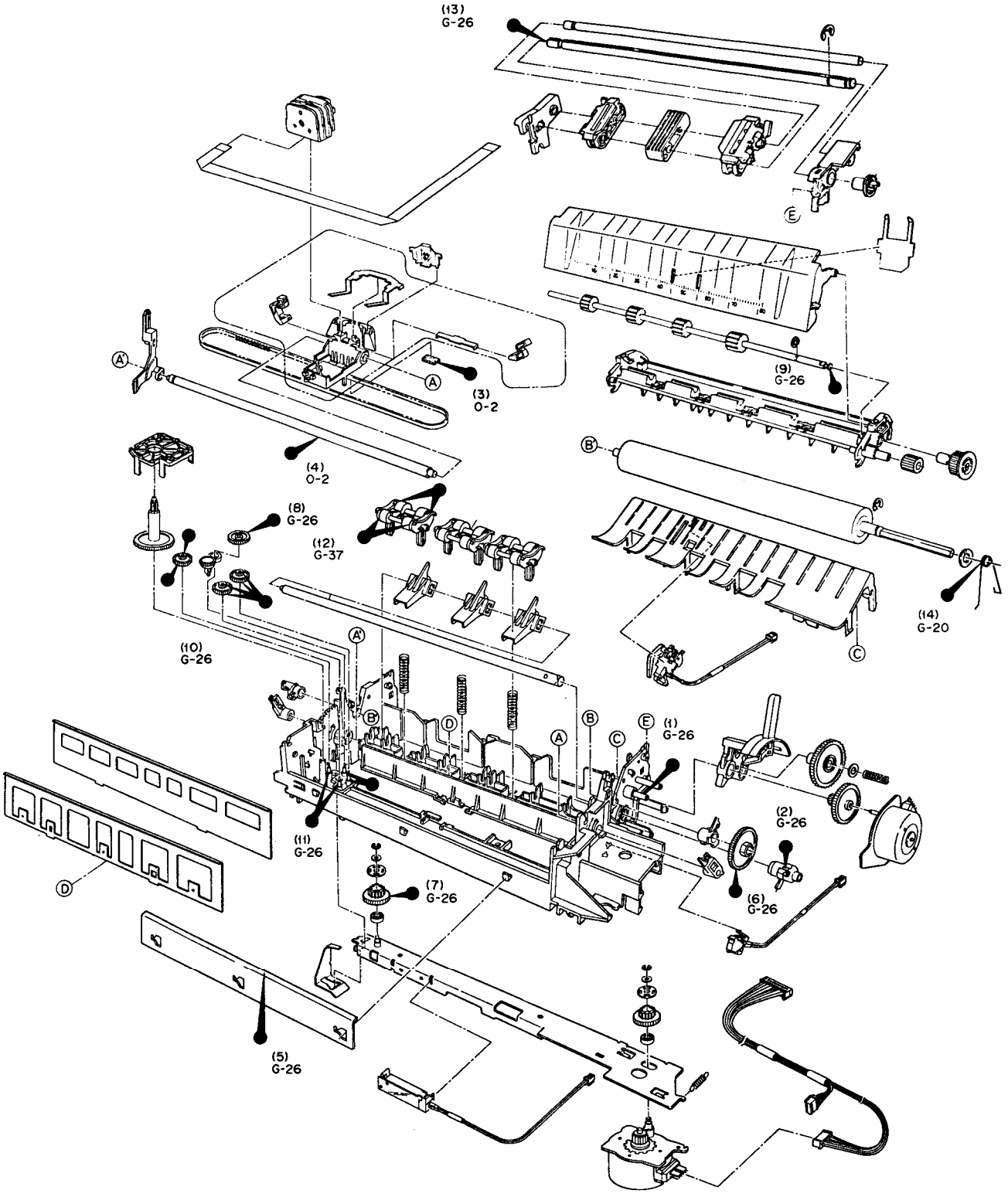


Figure 6-2. LX-81 0/850 Lubrication Points

APPENDIX

LIST OF FIGURES

LIST OF TABLES

This appendix provides detailed information about the integrated circuits, signal functions, capabilities, and other aspects of the LX-8 10/850 printer components.

A.1 INTEGRATED CIRCUITS WITHIN THE LX-810/850

Table A-1 shows TAMA board ICs.

Table A-1. TAMA Board ICs

Location	Name of IC	Type
2C	KPD7810HG	CPU 15 MHz
3B	E05A30	
3D	2064C	RAM 8 K x 8 bit
1C	ER59256	EEP-ROM
1A	SLA7020M	Step motor driver
3A	μPC494C	Pulse width modulation control

A.1.1 CPU μPD7810HG (2C)

The μPD78 10/781 1 HG is comprised of an 8-bit timer counter, an 8-bit A/D converter, 256 bytes of RAM, and a serial interface. A system can easily be constructed with this IC. The main features of this IC are listed below.

- O 256 bytes of built-in RAM (addresses FFOOH-FFFFH)
- 0 4096 bytes mask ROM (addresses 0-0FFFH) for the 7811 CPU
- O Direct addressing of up to 64K
- O 8-bit A\D converter
- O 158 instructions
- O 0.8 μs instruction cycle (15 MHz)
- O 16-bit event counter
- O Two 8-bit timer counters
- O 3 external and 8 internal interrupts (6 priority levels and 6 interrupt addresses)
- O General purpose serial interface (asynchronous, synchronous, and I/O modes)
- O I/O line (781 1 :40-bit I/O port; 78 10:24-bit edge detection, 4 inputs)
- O Zero cross detection
- O Standby function
- O Built-in clock pulse circuit
- O NMOS

Figures A-1 and A-2 illustrate the 780 1/78 11 HG microprocessor; Tables A-2 through A-5 describe its function.

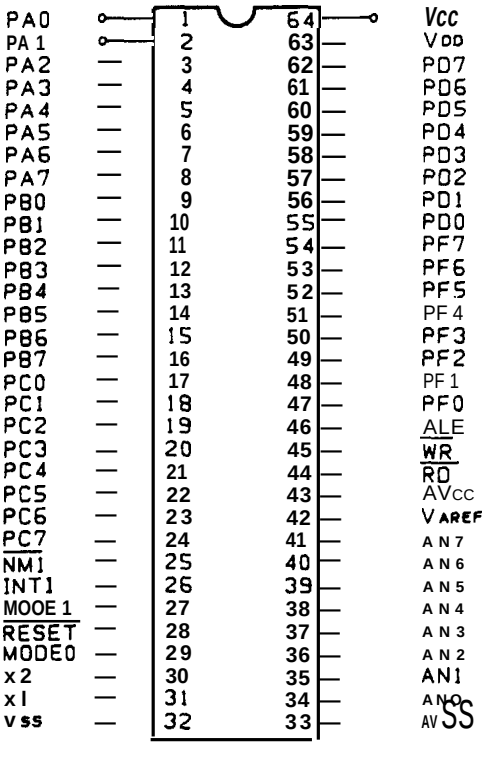


Figure A-1. μPD781 0/781 1 Pin Diagram

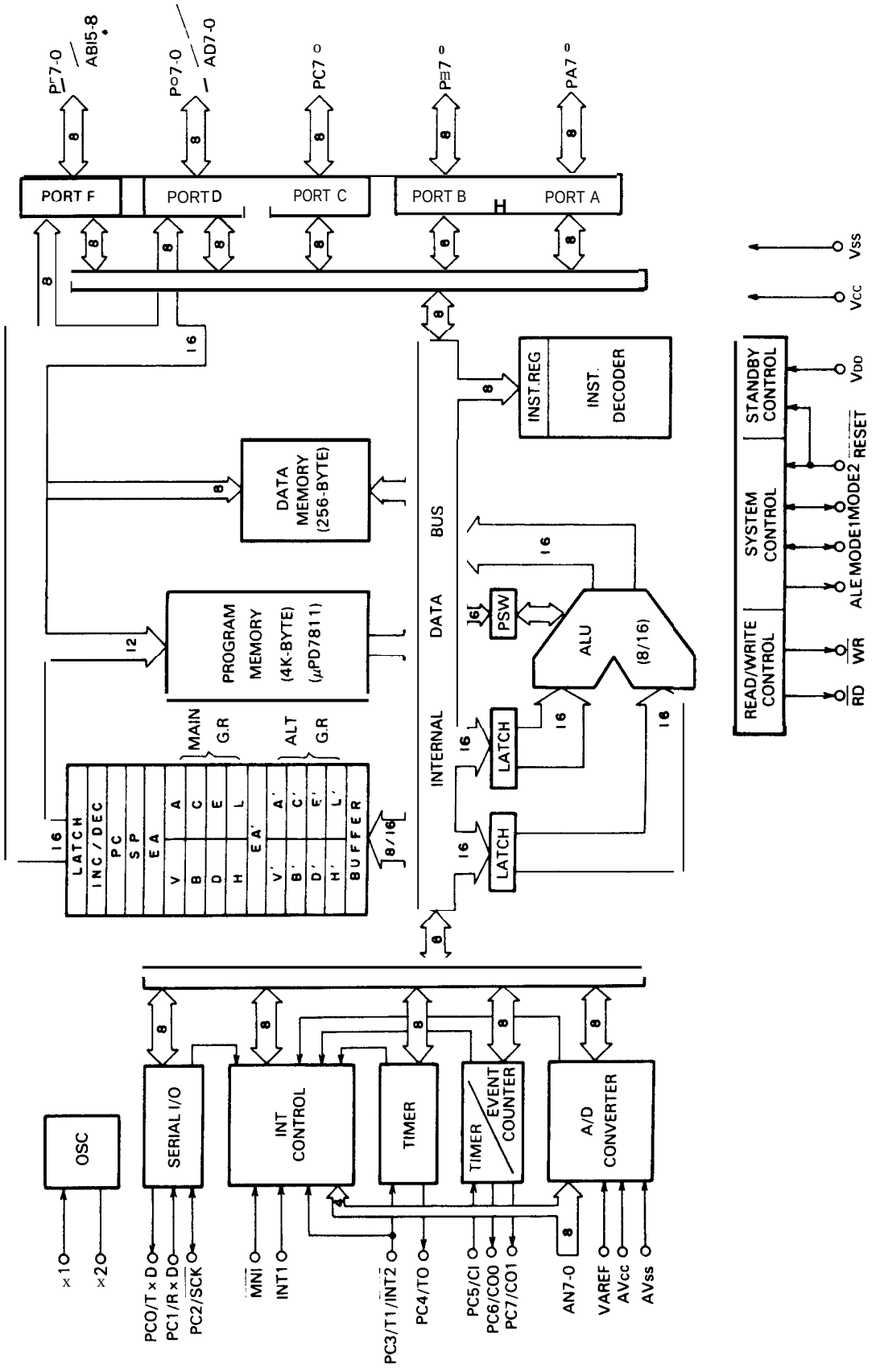


Figure A-2. μPD781 0/7811 HG Block Diagram

Table A-2. μPD781O Mode Setting

Mode 1	Mode O	External Memory
o	0	4K, addresses O to OFFF
o	1 (Note)	16K, addresses O to 3FFF
1 (Note)	1 (Note)	64K, addresses O to OFFF

Table A-3. μPD7811 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	AB 11	AB 10	AB9	AB8	4K (max.)
Port	Port	AB13	AB12	AB11	AB10	AB9	AB8	16K (max.)
AB 15	AB14	AB13	AB12	AB11	AB10	AB9	AB8	60K (max.)

Table A-4. μPD781O 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 (max.)
0	1	Port	Port	AB 13	AB 12	AB 11	AB 10	AB9	AB8	16K bytes (max.)
1	1	AB 15	AB 14	AB 13	AB 12	AB11	AB 10	AB9	AB8	64K bytes (max.)

Table A-5. NPD7810/7811 Port Functions

Pin	Signal	Direction	Descriptions
1-8	PAO-7	In/Out	Port A 8-bit I/O with output latch. I/O possible with mode A (MA) register. Output HIGH.
9-16	PBO-7	In/Out	Port B 8-bit I/O with output latch. I/O possible with mode B (MB) register. Output HIGH.
17-24	PCO-7	In/Out	Port C 8-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 according to external memory (see Table A-2).
28	$\overline{\text{RESET}}$	In	LOW reset
30,31	X2,X1	...	Crystal connection for built-in clock pulse. When clock pulses are supplied externally, input must be to X 1.
32	Vss	...	Supply voltage, Vss, OV
33	AVss	.	Analog Vss
34-41	ANO-7	In	8 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	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 B 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 mode 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-O acts 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

Refer to Figures A-3 through A-5 for CPU timing diagrams. Three oscillations define one state. The OP code fetch requires four states. During T 1 to T3, program memory is read, and instructions are interpreted during T4. Address bus lines 15-8 are output from T 1 to T4. Address bus lines 7-O (PD7-0) are used in the multiplex mode. The address is latched during T 1 at the ALE signal. Since the memory addressed is enabled after disengaging the driver (AD7-0), $\overline{RD}$ is output from T 1 -T3, fetched at T3, and processed internally at T4. The ALE and RD signals are executed from T1-T3, and the OP code fetch for these two signals is performed at T4. The WR signal is output from the middle of T 1 to the beginning of T3. The address and ALE timing is the same as that for memory read; however, following address output, AD7-0 (PD7-0) are not disabled, and write data is output at AD7-0 at the beginning of T1 and at the end of T3.

NOTE: When PD7-0 are set to the multiplexed address/data bus (AD7-0) and PF7-0 to the address bus (AB7-0), the RD and WR signals in the machine cycle are HIGH when memory is not being accessed.

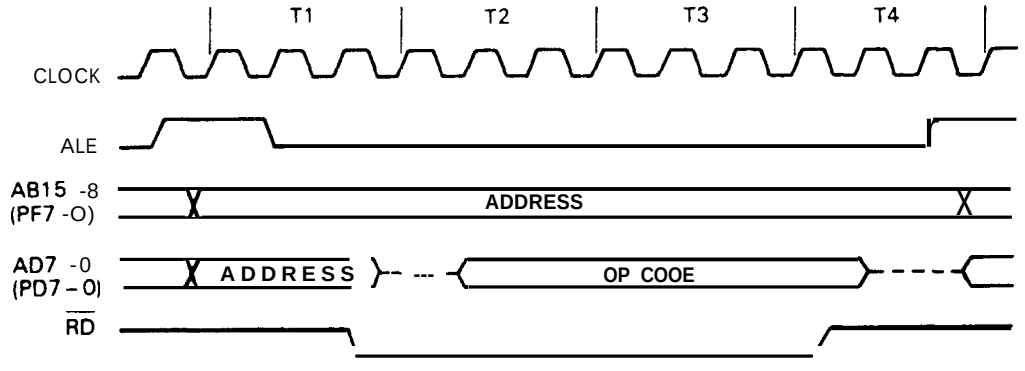


Figure A-3. OP Code Fetch Timing

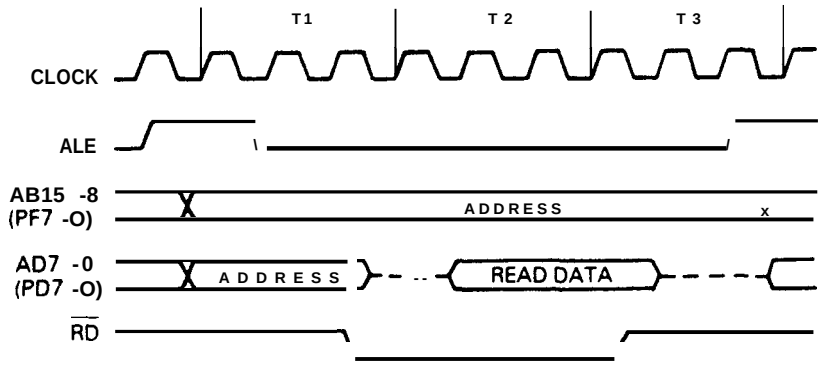


Figure A-4. Memory Read Timing

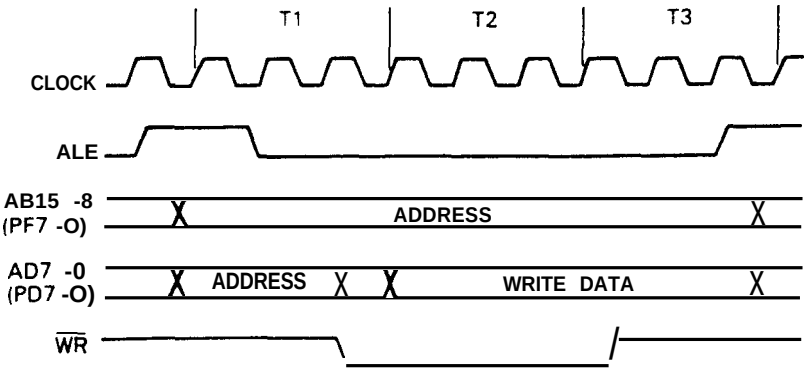


Figure A-5. Memory Write Timing

A.1.2 E05A30 (3B)

This gate array was newly developed for this printer. Its functions are as follows:

1. Parallel I/F
2. Address decoder
3. Control panel LED drive
4. Data address multiplexer
5. PF motor control
6. CR motor control
7. Printhead drive

Figure A-6 shows the E05A30 pin diagram. Table A-6 shows pin functions for the E05A30.

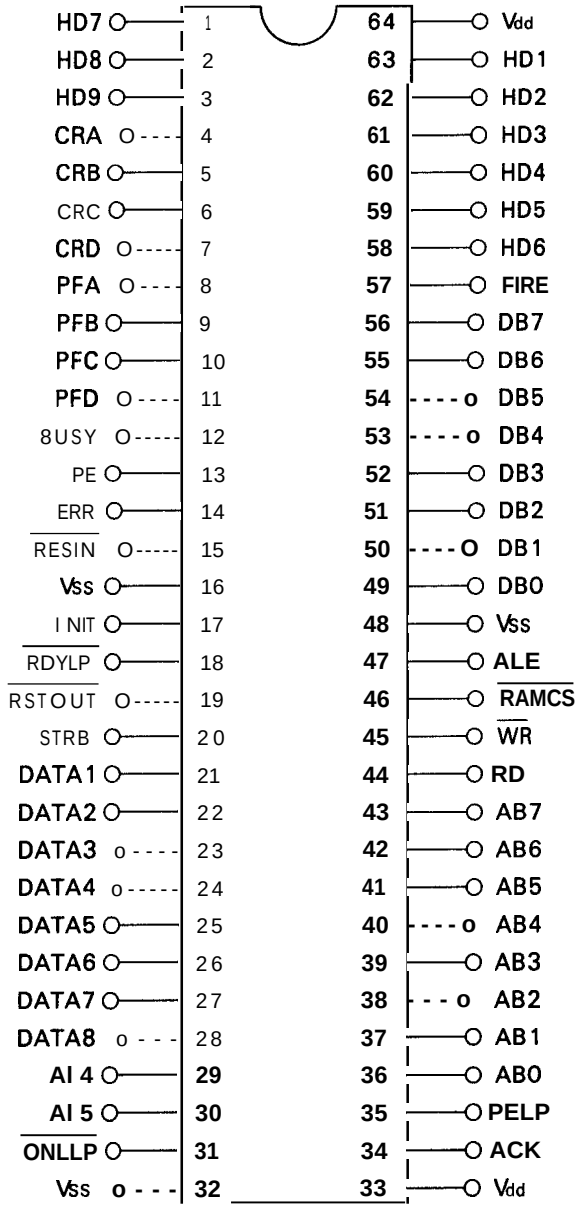


Figure A-6. E05A30 Pin Diagram

Table A-6. E05A30 Pin Functions

Pin No.	Signal	I/O	Function	Pin No.	Signal	I/O	Function
1	HD7	O	Printhead drive 7	33	Vdd		GND
2	HD8	O	Printhead drive 8	34	ACK	O	Parallel I/F $\overline{\text{ACKNLG}}$
3	HD9	O	Printhead drive 9	35	PELP	O	PE LED
4	CRA	O	CR motor phase A	36	AB0	O	Address O
5	CRB	O	CR motor phase B	37	AB 1	O	Address 1
6	CRC	O	CR motor phase C	38	AB2	O	Address 2
7	CRD	O	CR motor phase D	39	AB3	O	Address 3
8	PFA	O	PF motor phase A	40	AB4	O	Address 4
9	PFB	O	PF motor phase B	41	AB5	O	Address 5
10	PFC	O	PF motor phase C	42	AB6	O	Address 6
11	PFD	O	PF motor phase D	43	AB7	O	Address 7
12	BUSY	O	Parallel I/F BUSY	44	$\overline{\text{RD}}$	I	READ
13	PE	O	Parallel I/F PAPER END	45	WR	I	$\overline{\text{WRITE}}$
14	ERR	O	Parallel I/F $\overline{\text{ERROR}}$	46	$\overline{\text{RAMCS}}$	O	RAM select
15	$\overline{\text{RESIN}}$	I	$\overline{\text{RESET}}$ signal input	47	ALE	I	Address latch enable
16	Vss		Power supply	48	Vss	-	Powre supply
17	INIT	I	Parallel I/F INIT	49	DBO	I/O	DATA bus O
18	$\overline{\text{RDYLP}}$	O	READY LED	50	DB 1	I/O	DATA bus 1
19	$\overline{\text{RSTOUT}}$	O	$\overline{\text{RESET}}$ output	51	DB2	I/O	DATA bus 2
20	STRB	I	Parallel I/F $\overline{\text{STROBE}}$	52	DB3	I/O	DATA bus 3
21	DATA1	I	Parallel I/F DATA 1	53	DB4	I/O	DATA bus 4
22	DATA2	I	Parallel I/F DATA 2	54	DB5	I/O	DATA bus 5
23	DATA3	I	Parallel I/F DATA 3	55	DB6	I/O	DATA bus 6
24	DATA4	I	Parallel I/F DATA 4	56	DB7	I/O	DATA bus 7
25	DATA5	I	Parallel I/F DATA 5	57	FIRE	I	Head driving pulse
26	DATA6	I	Parallel I/F DATA 6	58	HD6	o	Head data 6 output
27	DATA7	I	Parallel I/F DATA 7	59	HD5	0	Haed data 5 output
28	DATA8	I	Parallel I/F DATA 8	60	HD4	0	Head data 4 output
29	A14	I	Address 14	61	HD3	0	Head data 3 output
30	AI 5	I	Address 15	62	HD2	0	Head data 2 output
31	$\overline{\text{ONLLP}}$	o	ON LINE LED	63	HD 1	O	Head data 1 output
32	Vss		Power supply	64	Vdd		GND

A.1.3 2064C SRAM (3D)

The 2064C is an 8K-byte CMOS static RAM. The 2064C has low power consumption, and its input\ output level is compatible with the TTLICs. Figure A-7 shows the 2064C pin diagram, and Figure A-8 shows a block diagram for the 2064C static RAM.

Features

Capacity of 8192 words X 8 bits
TTL compatible I/O
Power supply +5 VDC

Functions

AO - Al 2 : Input address
WE : Write enable
$\overline{OE}$: Output enable
CS1,CS2 : Chip select
DO - D7 : Input/Output data
NC : No connection

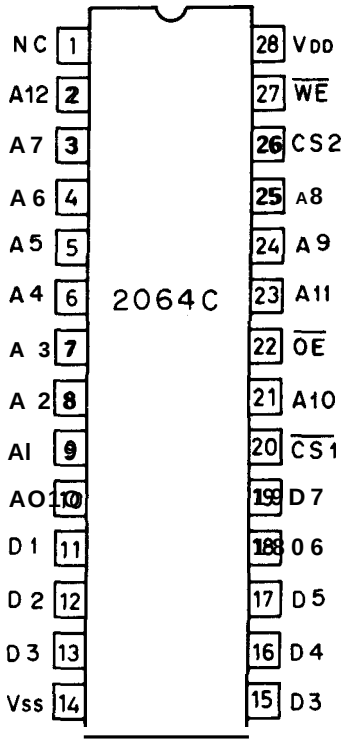


Figure A-7. 2064C Pin Diagram

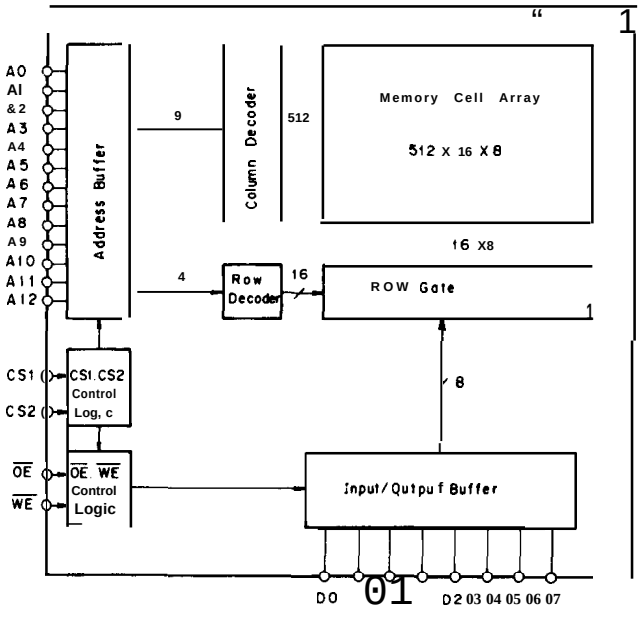


Figure A-8. 2064C SRAM Block Diagram

Table A-7. 2064C Truth Table

CS1	CS2	OE	WE	AO-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 ER59256 (1C)

The ER59256 is a 256-bit nonvolatile CMOS RAM containing 16 words x 16 bits, and the data can be transferred serially over the data bus.

The ER59256 uses a compact and low-priced 8-pin package. Each bit of RAM is paired with a bit in the nonvolatile electrically programmable ROM (EEPROM) for backup. Data is transferred between the RAM and EEPROM upon receiving an instruction, $\overline{\text{STORE}}$ signal , or $\overline{\text{RECALL}}$ signal from the processor. The nonvolatile data is stored in the EEPROM. The data in the RAM is read/written independently of the data stored in the EEPROM. The ER59256 requires only a signal 5V power supply.
All inputs are TTL level inputs.

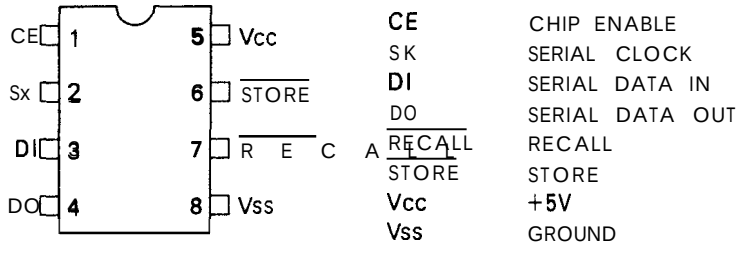


Figure A-9. ER59256 Pin Diagram

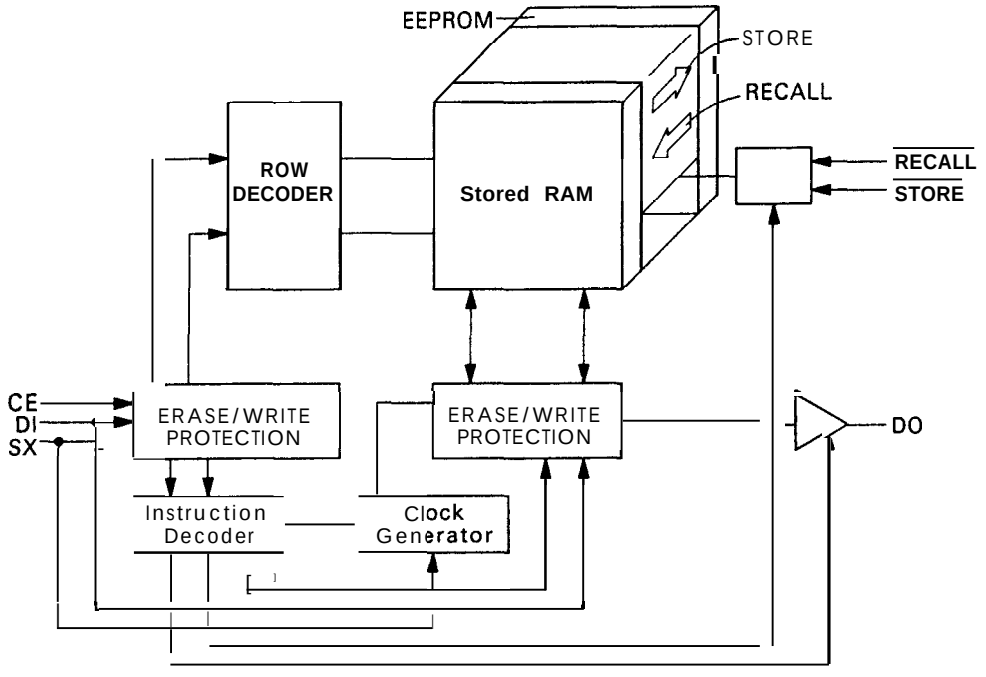


Figure A-1 O. ER59256 Block Diagram

A.1.5 SLA7020M (1A)

The SLA7020M ia a two-circuit, 4-phase step motor driver for unipolar constant current driving.

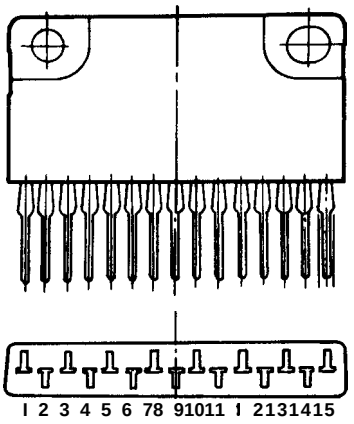


Figure A-1 1. SLA7020M Case Outline Drawing

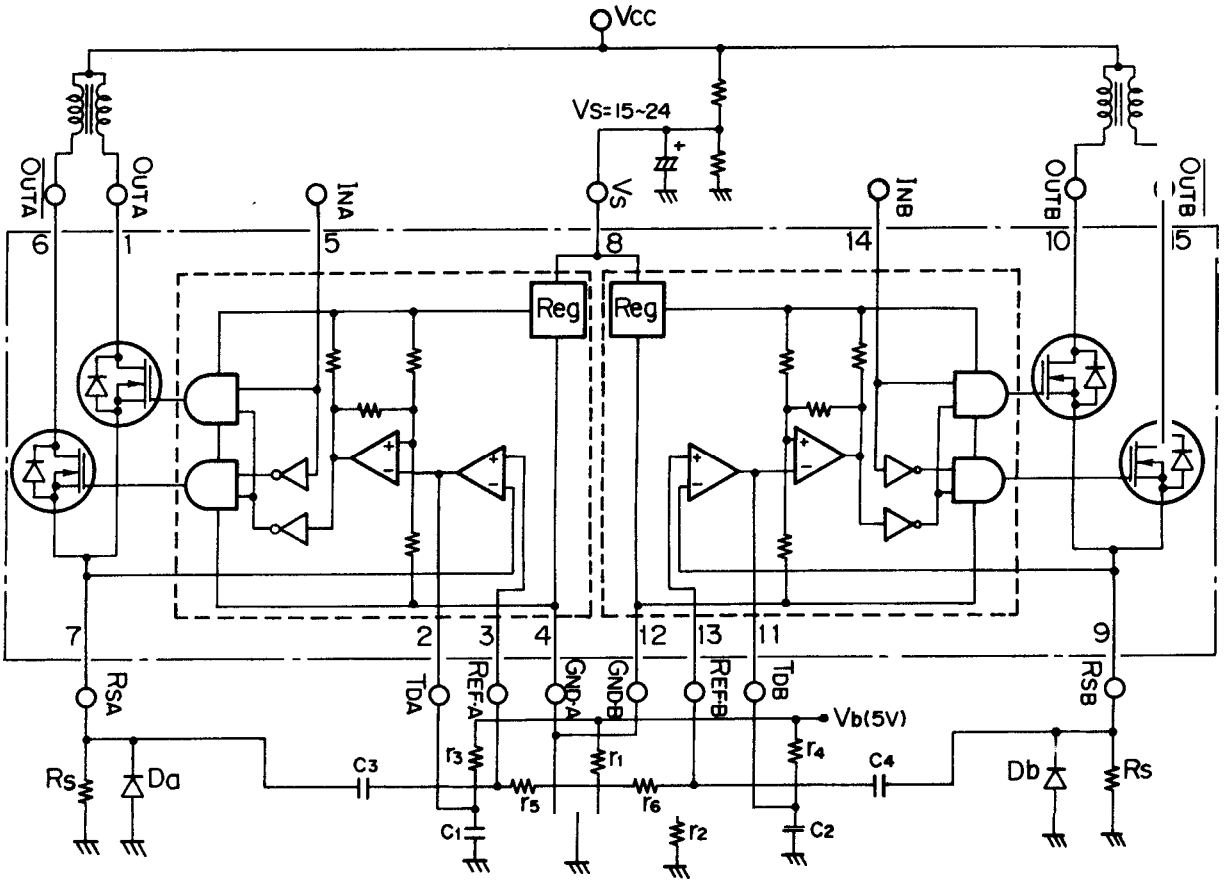


Figure A-1 2. SLA7020M Functional Equivalent Circuit

A.1.6 μPC494C (3A)

The μPC494C is pulse width modulation control. The **block diagram is shown in Figure A-13 shows**

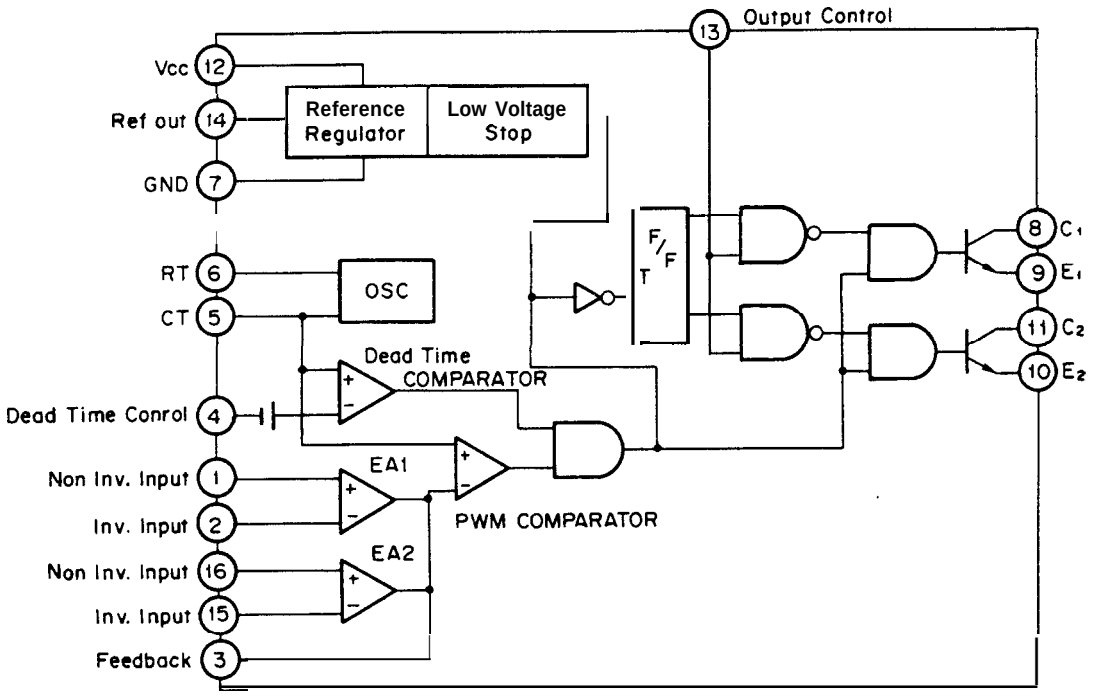


Figure A-1 3. μPC494C Block Diagram

A.2 EXPLODED DIAGRAMS AND SCHEMATICS

The exploded and schematic diagrams shown in Figures A-1 4 to A-22 are provided as additional reference.

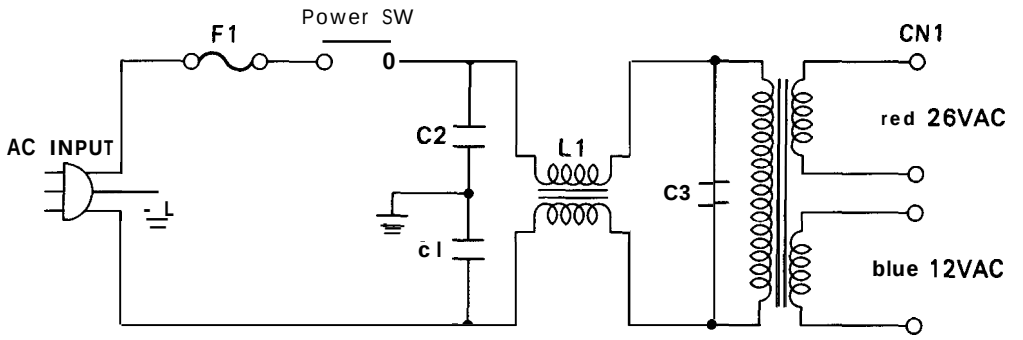


Figure A-1 4. TA Filter Unit Circuit Diagram

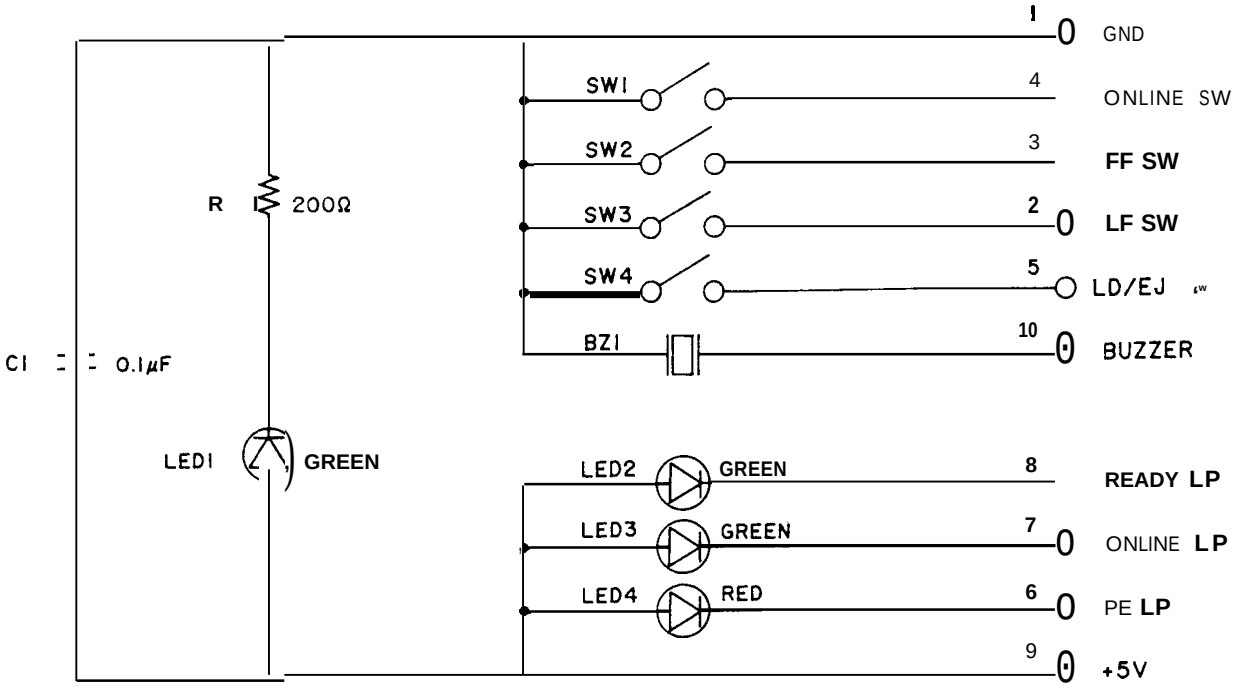


Figure A-1 5. TAPNL-W Board Circuit Diagram

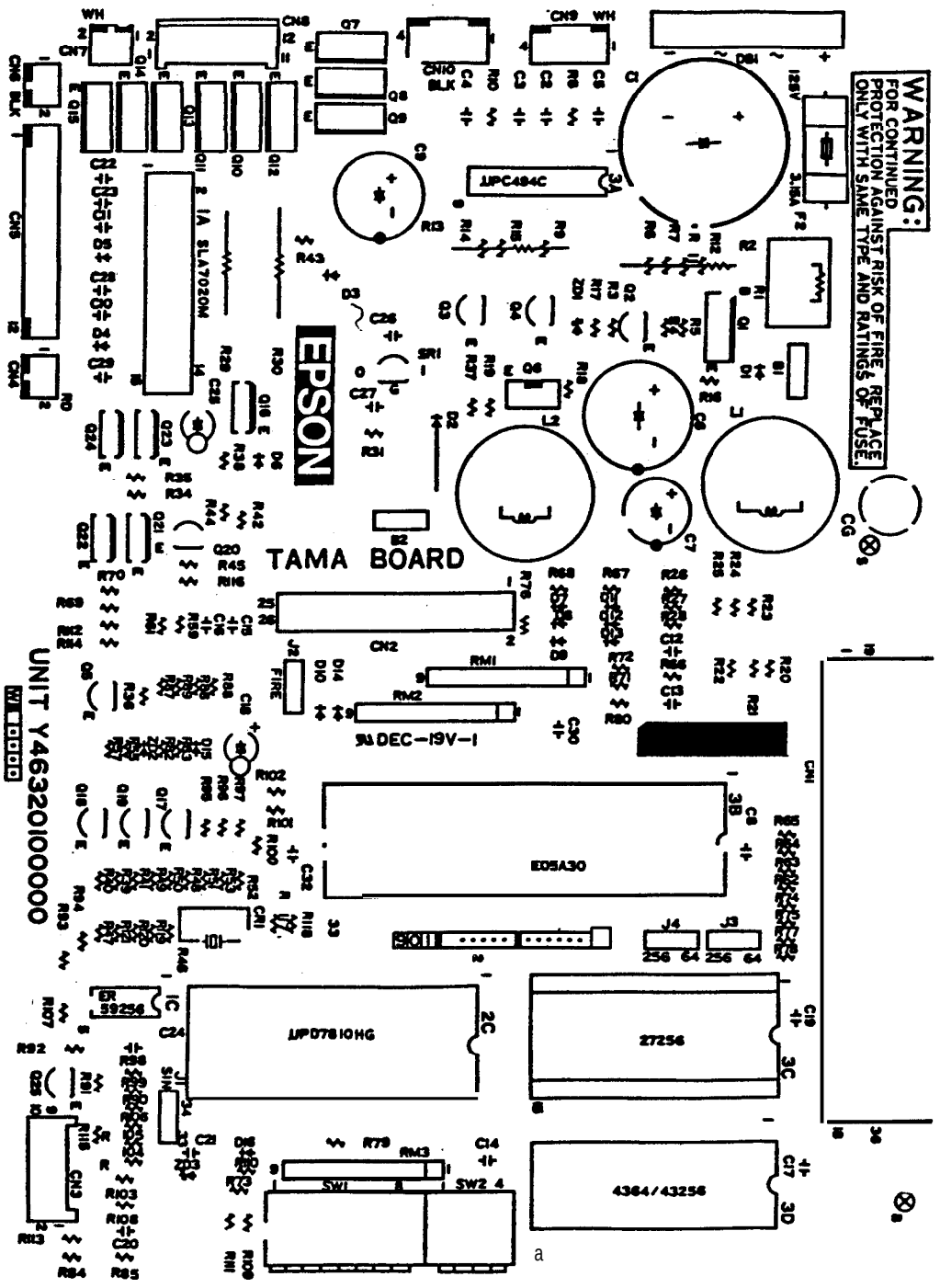


Figure *A-1 6.* **TAMA** *Board Component Layout*