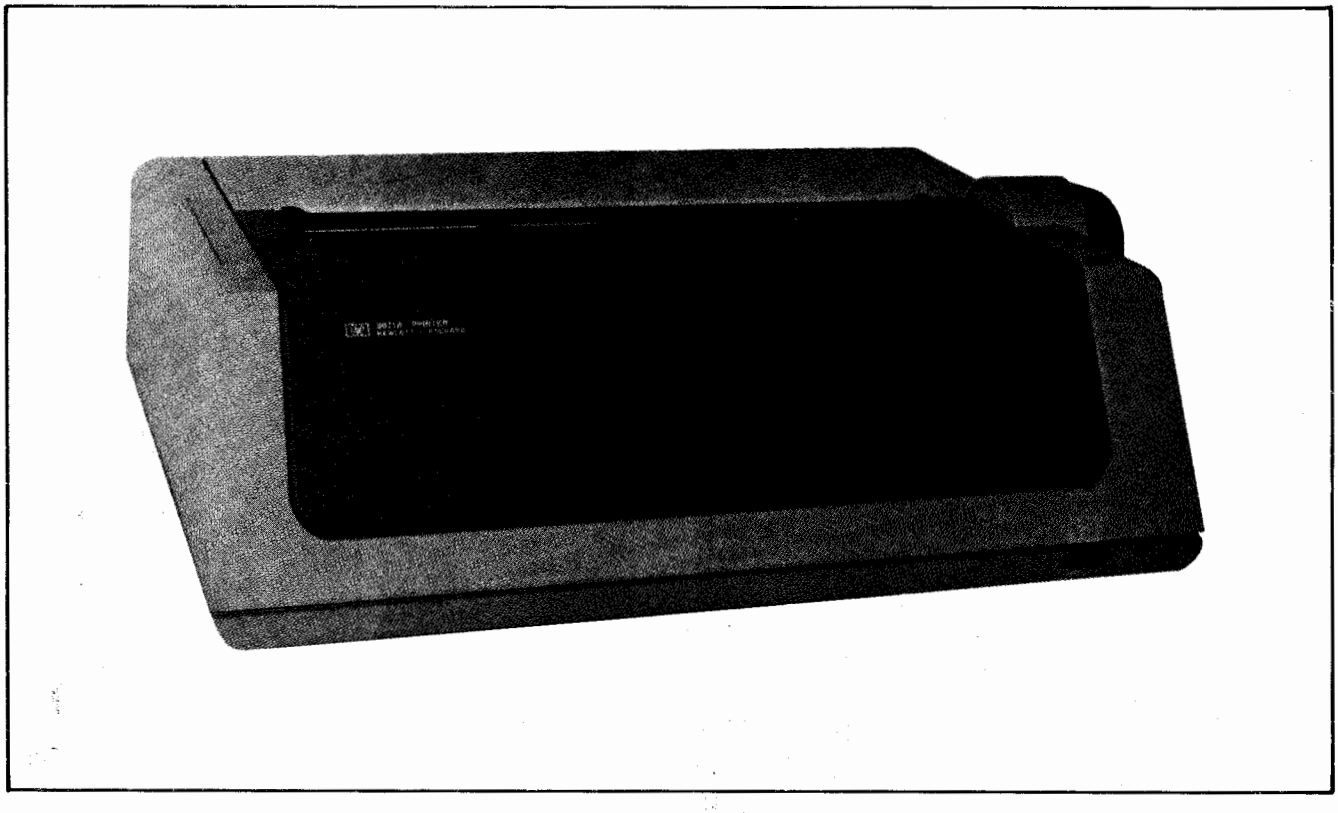
HEWLETT-PACKARD 9871A PRINTER OPERATING AND SERVICE MANUAL



Manual Changes

9871A Printer
Operating and Service Manual

(Manual P/N 09871-90030)

Page 1-3:

Add the following to to the options table.

Cyrillic Character Disk (option 803) 1530-1895.

Page 1-5:

Add the following to the initial turn-on procedure.

With the printer still switched OFF, install the ribbon.

To install the ribbon do the following:

1. Remove the printer's front cover by gently pulling the cover forward and off the printer.
2. Manually move the carrier to the center of the printer to better access the carrier.
3. Place the ribbon cartridge into place on the two ribbon spindles (see Figure 1-6).
4. Place the ribbon on the outside of the two ribbon guides on the carrier. Ensure that the ribbon is between the metal ribbon shield and the hammer.
5. Replace the front cover.

When the disk hub is in the reference position, the character disk can be installed. To install the character disk do the following:

1. Remove the front cover by gently pulling it forward and off the printer.
2. Hold the top of the disk, as shown in Figure 1-7, and place it in the carrier assembly between the hammer and the ribbon.
3. Gently push on the top of the disk to lock it into place.
4. Replace the front cover.

PRINT QUALITY

The reset position adjustments on the printer may require adjustment if the quality of the printing does not appear to be correct. Refer to the Reset Position adjustment on page 5-14.

Page 3-1:

The Ascii character for Clear All Horizontal Tabs in Table 3-1 should be ESC, 3.

Page 3-3:

Add the following to the Reset description.

A reset or self-test command will clear the printer's buffer. Any commands or characters present in the buffer when a reset is executed will be lost. To avoid this problem, ensure that there is an adequate "wait" after a reset command is given before subsequent characters and commands are sent to the printer. The "wait" time will vary depending on how soon the buffer empties and the reset command is executed.

Page 3-4:

Add the following to the Text Width description.

Left margins are normally set by the Set Left Margin command. A Text Width command will automatically set the left margin along with the text width. In this case, the current position of the carrier is set as the left margin. Ensure that the carrier is at the proper left margin position before setting the text width.

Page 3-5:

The character Fill Setup code should be 27,46 instead of 27,64.

Page 4-7:

The reference to Q3 in the seventh paragraph should be changed to Q6.

Page 4-13/4-14:

Make the following changes to Figure 4-5, the A3 Logic Assembly Schematic Diagram.

R23 is 715 ohms.

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R24 is 1.8K
R25 is 1K
Omit R20
R21 is 37.4K
Pin 1 of U15D sould be pin 11 (upper left corner).
The UMC, SMC and WRT designations in U16 should have bars (—) over them.
U34C, U36A and U41F should have inverted outputs.
The IC above U26 in Address Decoding should be labelled U18 instead of U12.
U30 should be U31F (upper right corner)

Page 4-15/4-16:

Make the following changes to Figure 4-6, the A1, A6, A4, A7 Motor Drive Assembly Schematic Diagram.

C4 is 60 UF.
C4 and C5 are grounded to A1P1 pin 10 not pin H.
Show A4C2 on the +5v line to ground on the A4 Assembly.
R1, R4, R8 and R9 are 2.26K.
R7 and R10 are 348K.
Reverse CR1 and R11 with CR2 and R12.

Page 4-17/4-18:

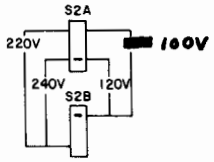
Make the following changes to Figure 4-7, the A2 Platten Drive Assembly Schematic Diagram.

The resistor connected to U7A pin 1 is R28 (1k)
Q11 is a PNP transistor (like Q13).
Pins 14 and 15 of U1B are reversed.
Pins 1 and 2 of U1A are reversed.
U1A pin 3 is the clear line.
R16 is 33.2 ohms.
Add C7, .01UF, across R15.
R3 is 95.3 ohms.
The unmarked diode near CR2 is CR1.
Omit CR15 and add R44, 2.7 ohms, in its place.
The center taps of the platten motor windings is changed as follows:
  Pins 6 and 7 are changed to pin 11.
  Pins 8 and 9 are changed to pin 12.
Resistor pack R1 should not have the 20 ohm series resistor going to A0J2 pin 10.

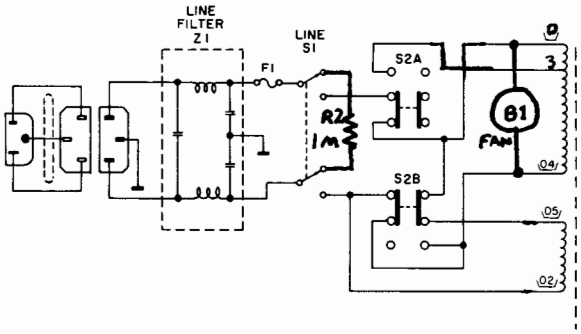
Page 4-19/4-20:

Make the following changes to Figure 4-8, the A0 Power Supply Schematic Diagram.

The line voltage setting diagram should appear as follows:



The transformer primary wiring should appear as follows:



CR3 is 14.0v.

Page 5-6:

Delete the caution on this page, the platten is now a rigid assembly.

Page 5-15:

In step 6, even a 90° rotation of the adjustment screw may be too much for the fine adjustment.

Page 7-2:

Make the following changes:

A0 CR3 is 1902-3199, 14v 2%.
Add 1205-0033, Heatsink for A0Q3.
1251-2171 (under A0 miscellaneous) should be 1251-4327.

Page 7-3:

Add A2C7, 0160-3558, capacitor-FXD .1UF 50vDC.

Page 7-4:

A2R16 is 0757-0389, 33.2 ohms.

Page 7-5:

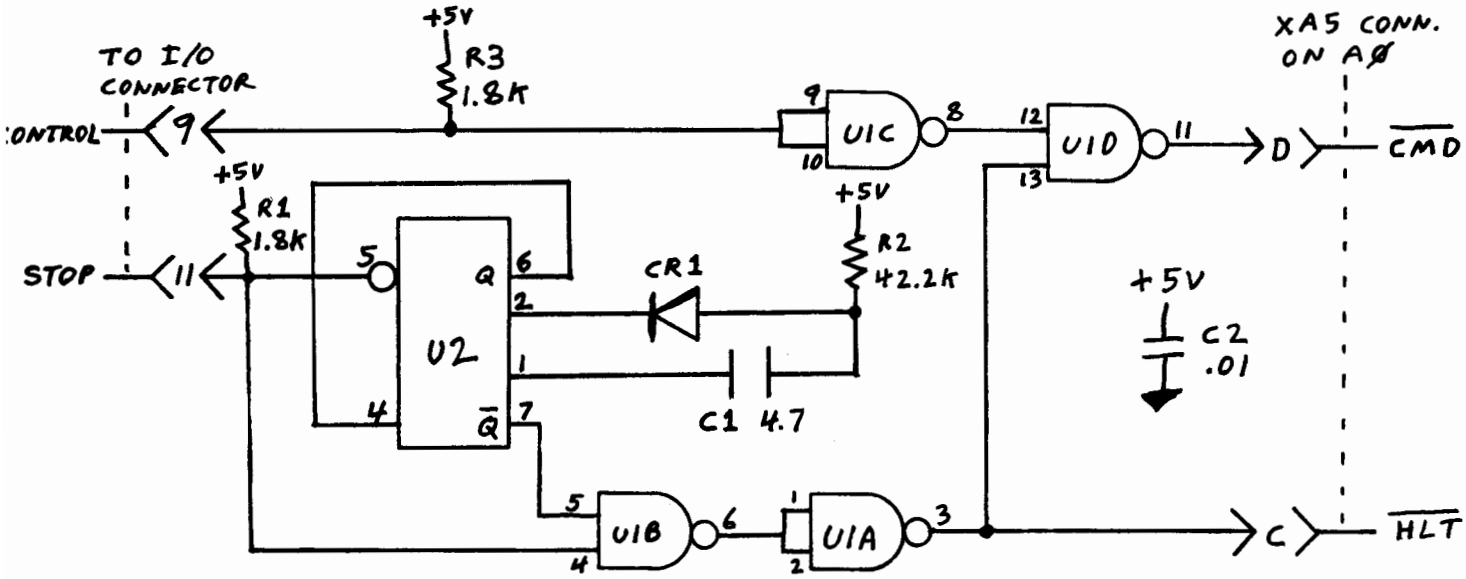
Add the following:

A4U1, 1826-0175.

R1, 1810-0254, Resistor Network.
R2, 0683-1055, R-F, 1 MEG, 5%
9135-0043, New Line Filter (requires new rear sub-panel)

Page 7-7:

The following circuit and components have been added to the 09871-66505 assembly. This assembly originally had no circuits on it.



Add the following components to the A5 parts list.

C1	0180-0100	1	C-F:	4.75UF	35v
C2	0160-3847	1	C-F:	.0IUF	25v
CR1	1901-0050	1	DIODE--SI		
R1, R3	0683-1825	2	R-F:	1.8K	5%
R2	0698-3450	1	R-F:	42.2K	1%
U1	1820-1197	1	IC:	74LS00	
U2	1820-0730	1	IC:	96L02	

Page 7-8

The new rear panel part number is 09871-00211.

The new rear sub-panel part number is 09871-00212.

The new intensity switch part number is 3101-1877.

Add the new paper guide support parts:

09871-01203,	1,	Right Lower Bracket
09871-01204,	1,	Left Lower Bracket
09871-01205,	2,	Upper Bracket
09871-27241,	2,	Cam Release
09871-27251,	2,	Paper Guide Hub
09871-27271,	2,	Standoff
1530-1954,	1,	Pin
1460-1450,	1,	Spring

Page 7-8:

Make the following changes.

Part 9 is 09871-25002, Left Stud Latch.
Part 17 is 09871-04105, Input Plate Assembly.
Part 18 is 09871-25003, Right Stud Latch.
Delete Parts 23, 24, 25, 26, 29, and 32.
Part 41 is 3030-0410, Setscrew.
Part 56 is a new line filter, 9135-0043.
Part 67 is 5040-8135, New Stop Block.

Page 7-9:

Make the following changes.

Part 79 is 0380-0664, 2, Solenoid Spacer.
Delete part 82.
Part 96 is 98011-67505, Coil Assembly.
Part 107 is 9871-03601, Key Gear.
Part 108 is 4208-0125, Motor Mount Pad.
Part 119 is 98011-67504, Hammer with pin.
Delete part 138.

Page 7-10:

Make the following changes:

Delete part 170.
Add to the miscellaneous parts:

0757-0399, 1, R-F: 82.5 ohm 1%
0757-0405, 1, R-F: 162 ohm 1%

Part 178 is 1410-0591
Part 179 is 1500-0470
Part 180 is 1500-0471
Part 181 is 1530-1889
Part 182 is 1530-1890
Part 183 is 1530-1891
Part 184 is 1530-1892

9871A Product History

Here is a brief summary of the 9871A changes and the approximate serial numbers when each change occurred. The serial number prefix in all cases is 1537A.

From serial number 00170, the ROM (A3U23), was revised to stop the printer from getting lost intermittantly. The part number of the ROM did not change.

From serial number 00280, the hammer arm actuator spring was removed and the hammer was shortened to help prevent character disk breakage.

From serial number 00375, the platten was changed to incorporate a solid coupling. The platten is now a one piece assembly.

From serial number 00626, a new line filter was added to the rear panel, along with a new sub-panel.

From serial number 1064, the homing stop block assembly was changed.

From serial number 1250, new ribbon guides on the upper carrier were added.

From serial number 1475, a circuit was added to the 09871-66505 assembly. A schematic is included in this change sheet.

From serial number 1488, a new rear panel was added. The new panel also has a new three position intensity switch.

From serial number 1490, a new paper guide support assembly was added.

9871A PRINTER OPERATING AND SERVICE MANUAL

HEWLETT–PACKARD CALCULATOR PRODUCTS DIVISION
P.O. Box 301, Loveland, Colorado 80537, Tel. (303) 667-5000
(For World-wide Sales and Service Offices see rear of manual.)

TABLE OF CONTENTS

CHAPTERS

FIGURES

TABLES

SPECIFICATIONS

Character Set	-	96 characters including lower case alpha
Character Font Size	-	Courier 10
Characters per Inch	-	Variable (Normal 10 characters per inch)
Lines per Inch	-	Variable (Normal 6 lines per inch)
Maximum Line Width	-	132 characters at 10 characters per inch
Multiple Copies	-	Up to 6 copies at a time
Power Supply	-	Internal
Printing Speed	-	30 characters per second (average)
Self Test	-	A built-in diagnostic routine checks the operation of the printer
Paper Slew	-	4 inches/sec. (10.16 cm/sec.)
Dimensions	-	Height 7 3/4" (19.7 cm) Width 22 1/4" (56.5 cm) Depth 15 1/4" (38.7 cm)
Weight	-	41 Lbs (18.6 KG)
Power Consumption	-	200 va (Printing) 60 va (non-printing)
Temperature Operating Range	-	0° C to 45° C
Storage Temperature Range	-	−20° C to 65° C
Buffer	-	158 characters - automatically fills if characters are received faster than the print rate

CHAPTER 1

GENERAL INFORMATION

INTRODUCTION

This manual describes how to operate and service the HP 9871A Printer. The various chapters include information about installation, operation, interfacing, theory of operation, preventive maintenance, troubleshooting, and replacement parts. This chapter describes how to install and maintain your 9871A Printer.

DESCRIPTION

The 9871A is a character-serial, impact printer capable of performing all normal typewriter and printer functions, plus plotting functions.

All printer operations are controlled from a calculator or other controlling device. The print intensity is the only manual printer adjustment.

The printer has a 158-character buffer which stores commands and characters when they are sent faster than the printer can print them.

Here is a summary of the 9871A functions.

General

Besides the normal typewriter and printer functions (bell, linefeed, backspace, etc.), the 9871A has some unique general functions.

- A variable "view" feature allows you to see the last line that was printed.
- A reverse line feed.
- Using "character replacement" any ASCII character can be redefined to a desired string of characters.
- A built-in self-test will check the printer's operation.
- The printer's circuits can be "reset" by the reset function.

Horizontal and Vertical Tabulation

Normal horizontal and vertical tabs may be set. In addition, horizontal tabulation can be either left or right and vertical tabulation can be either up or down.

Form and Margin Control

The following parameters may be set to define the size of a form and the size of the printing (or plotting) area, as shown in the illustration below.

- top of form
- form length
- left margin
- text length
- text width

The following illustration shows the parameters as they would be used.

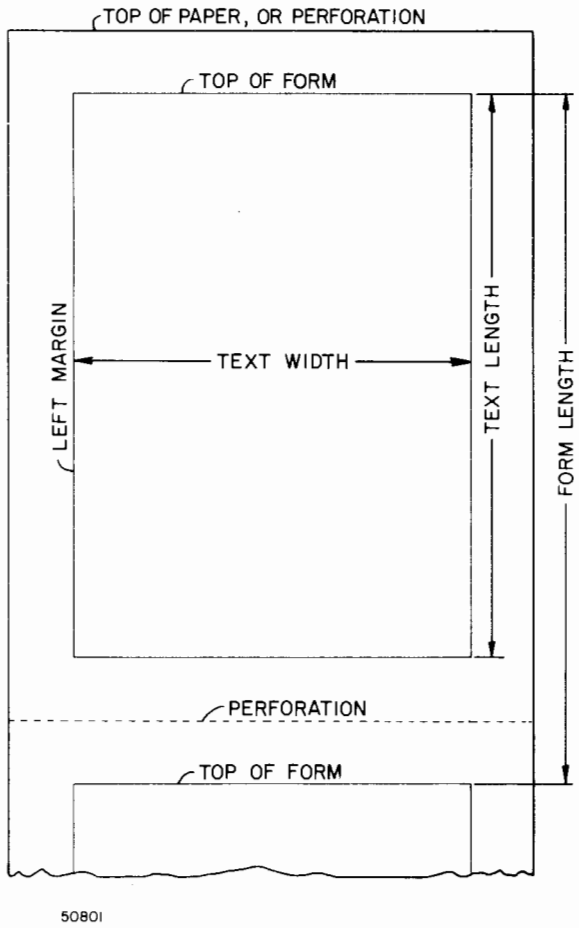


Figure 1-0. Form and Margin Parameters

Spacing

You can vary the horizontal spacing between characters and the vertical spacing between lines.

Plotting

Plotting functions allow you to use your printer as an incremental plotter.

EQUIPMENT SUPPLIED

The items supplied with each 9871A Printer are listed in Table 1-1.

Table 1-1. Standard Equipment Supplied

Equipment Supplied	Qty.	HP Part No.
Operating and Service Manual	1	09871-90030
Standard Character Disk	pkg. of 3	1530-0697
Ribbon	pkg. of 3	9282-0561
Fuse: 2A (NB)	1	2110-0002 (120V)
1A (SB)	1	2110-0312 (220V)
AC Power Cord	1	8120-1378
Dust Cover	1	9222-0492
Adjustment Wrench	1	5040-7437

OPTIONS

The following optional character disks are available for the 9871A

Description	HP Part No.
European Character Disk (Opt 800)	1530-1810
ASCII Character Disk (Opt 801)	1530-1811
Katakana Character Disk (Opt 802)	1530-1851

Table 3-3 lists the characters that are on each character disk (except Katakana).

ACCESSORIES

The following accessories are available for the 9871A:

11336A Interface – The HP 11336A Interface is needed to operate the 9871A Printer with the HP 9810A, 9820A, 9821A or 9830A Calculators. A package of select code labels (Part No. 7120-2940) is included with the interface.

Form-Feed Mechanism (98021A) – A Form-feed mechanism is available which allows the use of the continuous fan-fold or pin-feed forms in the 9871A. Both tractors are adjustable to different paper widths.

INSTALLATION

Initial Inspection

Your 9871A was carefully inspected, both electrically and mechanically, before shipment. It should be free of scratches and in perfect electrical order upon receipt. Carefully inspect the printer for physical damage caused in transit and check for the accessories listed in Table 1-1. The electrical performance check is given later in this chapter.

Grounding Requirements

To protect operating personnel, the National Electrical Manufacturers' Association (NEMA) recommends that the printer's frame be grounded. The printer is equipped with a three-conductor power cable which, when connected to an appropriate power receptacle, grounds the frame of the printer. To preserve this protection feature, do not operate the printer from an ac power outlet with no ground connection.

Power Requirements

The 9871A has the following power requirements:

- Line Voltage: The printer operates from nominal powerline voltages of 100, 120, 220, and 240 Vac. The range of operation is from −10% to +5% of each nominal voltage. Two switches on the rear panel of the printer enable any one of the four voltages to be selected.
- Line Frequency: The printer can be operated with any line frequency from 48 Hz to 66 Hz (nominally 50 Hz and 60 Hz).
- Power Consumption: The printer requires a maximum of 200 voltamps.

Fuses

The fuse is located on the rear panel (See Figure 1-1). The printer requires a 2-amp fuse for 100 or 120 Vac operation, and a 1-amp fuse for 220 or 240 Vac operation.

Table 1-2. 9871A Fuses

Voltage Setting	Fuse Rating	HP Part No.
100, 120	2 amp (NB)	2110-0002
220, 240	1 amp (SB)	2110-0312

WARNING
TO AVOID THE POSSIBILITY OF SERIOUS INJURY, ALWAYS DISCONNECT THE PRINTER FROM ITS POWER SOURCE BEFORE CHANGING A FUSE.

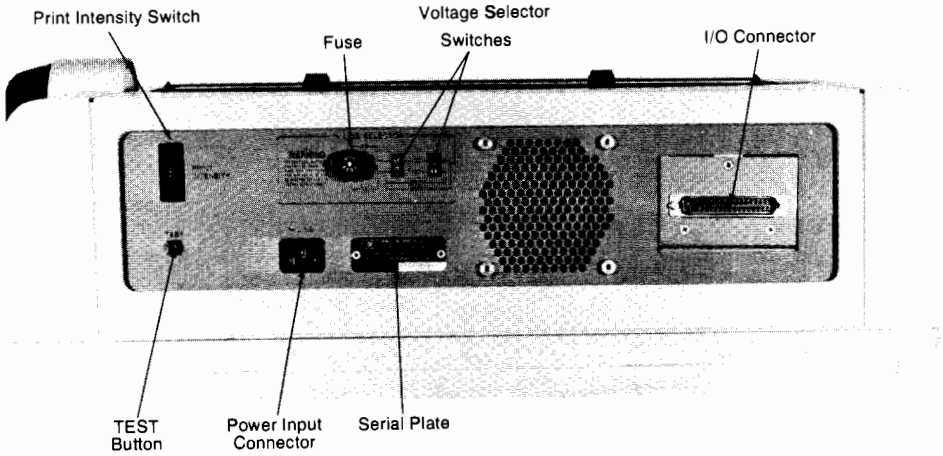


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Figure 1-1. 9871A Rear Panel

Initial Turn-On

Ensure that the power cord is not plugged into the printer. Then verify that the correct printer fuse has been installed for the powerline voltage in your area (refer to "Fuses" in this chapter).

Next, ensure that the two voltage selector switches on the rear panel are set to the correct powerline voltage. Figure 1-1 shows the location of the switches and Figure 1-2 shows the correct settings for each nominal line voltage. If it is necessary to alter the setting of either switch, insert the tip of a small screwdriver, or any small instrument, into the slot on the switch and slide the switch to the required position as shown in Figure 1-2.

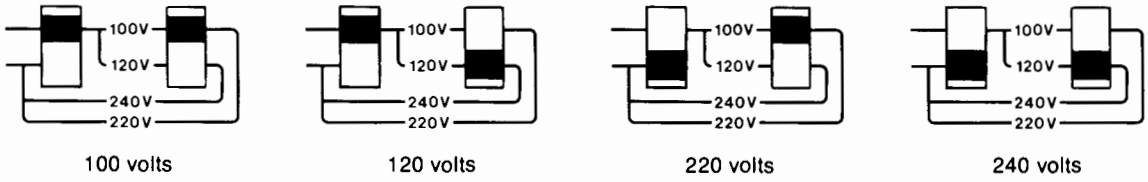

Figure 1-2. Switch Settings for the Nominal Powerline Voltages

Switch the OFF/ON switch, located on the right front of the printer, to the OFF position.

> **NOTE**
> If an interface for your standard 9871A is not available, refer to Chapter 2, Interfacing, for the printer's I/O line requirements prior to connecting the printer to a controlling device.

Connect the Interface cable to the I/O connector at the rear of the printer (Figure 1-1), and to the controlling device.

Connect the power cord to the power input connector (Figure 1-1) at the rear of the printer; plug the other end of the power cord into a suitable ac power outlet.

> **NOTE**
> The printer's front cover activates a cover interlock switch. The front cover must be on before the printer will print.

Switch the OFF/ON switch to the ON position. The printer's carrier will move to the left-most margin and the character disk will rotate to a reference position. At the reference position, a soft audible tone will be heard.

> **NOTE**
> If the printer "beeps" an audible tone when switched ON, an internal memory error is indicated. Switching the printer OFF, then ON, may clear the problem. If the beep persists, refer to Chapter 6, Troubleshooting.

The electrical inspection can be performed after the paper is loaded.

LOADING PAPER

To load paper (when the form-feed accessory is not installed), first move the paper release lever back as shown in Figure 1-3. Place the paper behind the platen with the left edge of the paper at the desired position. Lift the paper bail up, then turn the platen knob clockwise to feed the paper around the platen. Push the paper bail down, and ensure that the paper travels behind the bail.

Paper Release Lever

To remove or reposition the paper in the printer, move the paper release lever (Figure 1-3) forward. With the lever forward the paper is free to move. When the paper is properly positioned (horizontally and vertically), move the lever back.

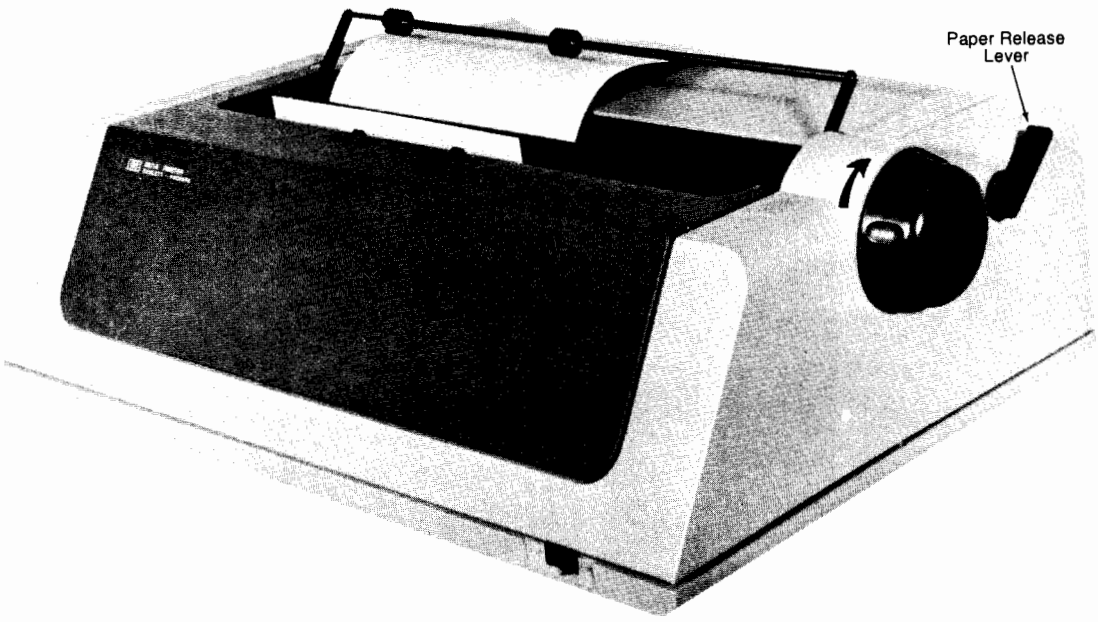

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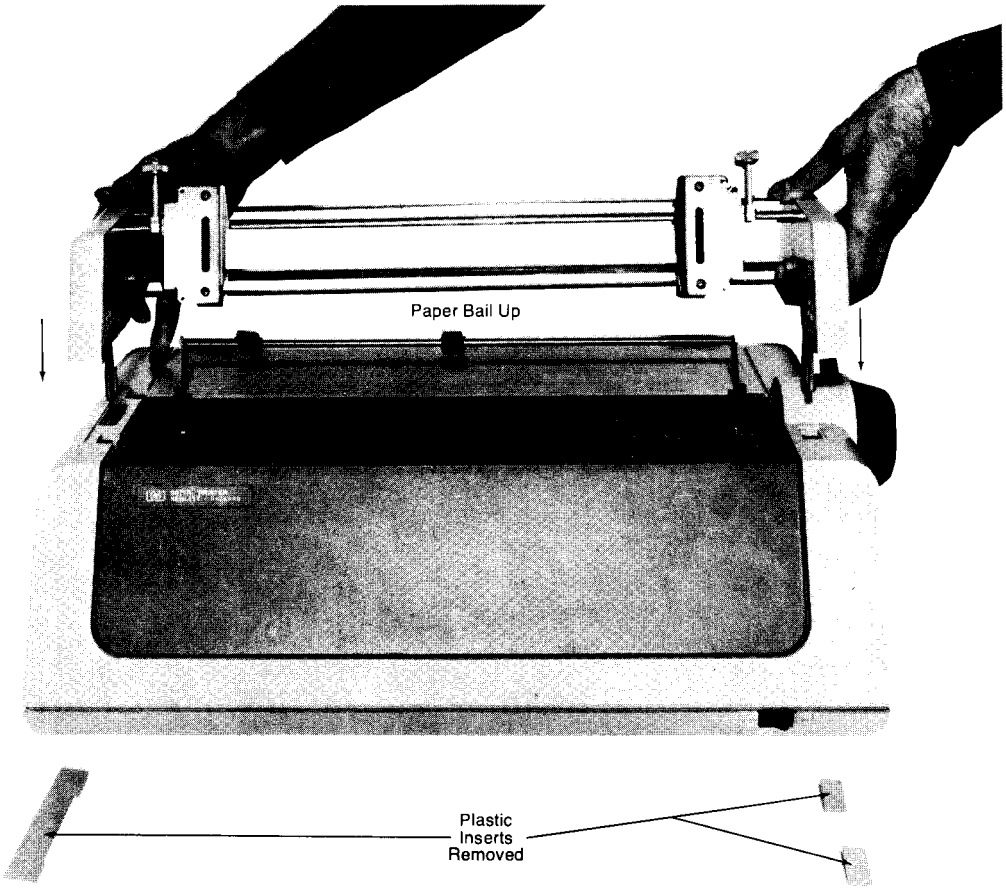
Figure 1-3. Loading Paper

FORM-FEED ACCESSORY (98021A)

The form-feed accessory allows you to use continuous fan-fold or pin-feed forms in the 9871A. To install the form-feed assembly on the printer, refer to the following procedure and Figure 1-4.

1. Remove the plastic inserts from the top of the printer. Insert a flat-bladed screwdriver in the plastic insert slot and pry the insert up.
2. Raise the paper bail.
3. Position the form-feed assembly over the printer and push down on the front edge of the assembly to lock it in place.



B-50818

Figure 1-4. Installing the Form-Feed Accessory

To load paper in the printer with the form-feed assembly installed, refer to the following procedure and Figure 1-5.

1. Move the paper release lever forward.
2. Insert the paper behind the platen and push the paper in so that it travels around the platen.
3. As the edge of the paper comes around the front of the platen, pull the paper up until it is near the tractors.
4. Open the hinged paper hold-downs on the paper tractors. Engage the feed holes of the form with the feed pins on the paper tractors.
5. Either tractor may be adjusted for the width (or position) of the form by loosening its locking screw and sliding it to the desired position.
6. The tractors should be adjusted for a slight tension across the form.
7. Close the paper hold-downs and secure the tractor locking screws. Ensure that the paper is not skewed in the printer.
8. Always leave the paper release lever in its forward position when the form-feed assembly is used.

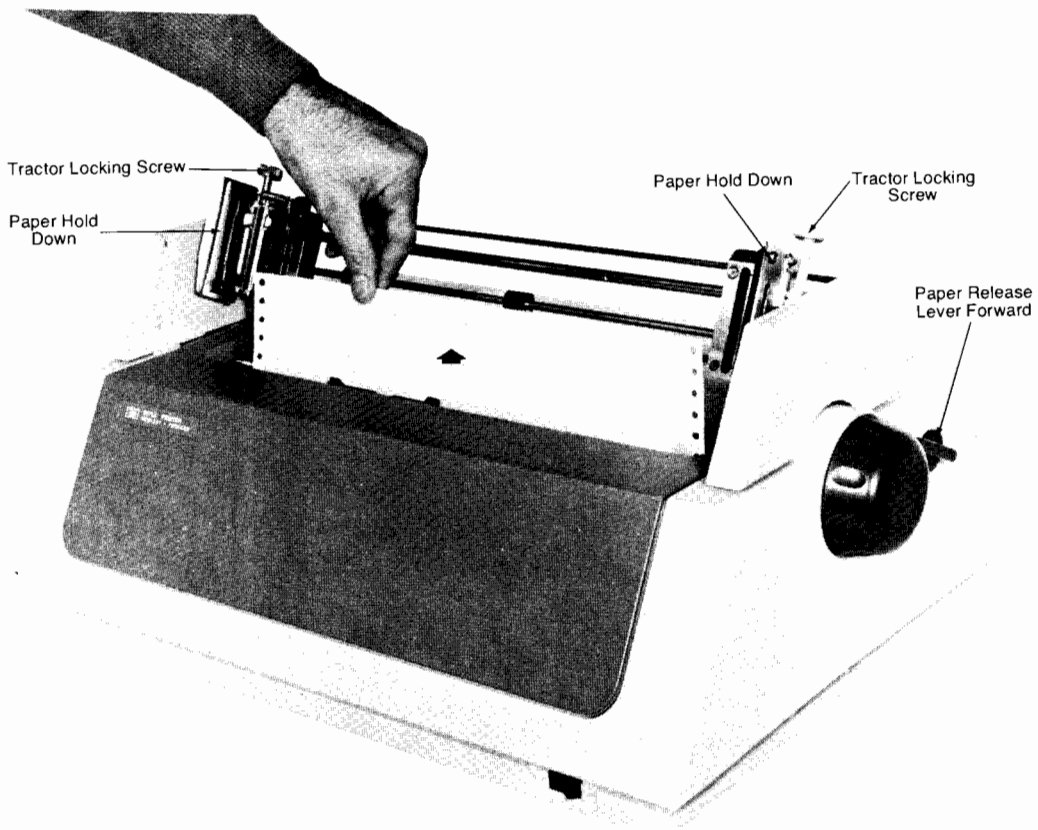


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Figure 1-5. Loading Paper in the Form-Feed Assembly

ELECTRICAL INSPECTION

After the printer has been installed, and the paper has been loaded, the printer can be checked for proper electrical operation. Paper 15 inches-wide should be loaded for the electrical inspection.

Press the TEST button on the printer's rear panel (Figure 1-1). The following printout should occur:

```
M.M.M.M.M.M.M.M.M.M!"#$%&´()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNO
PQRSTUVWXYZ[√]^_`abcdefghijklmnopqrstuvwxyzπ|→~M.M.M.M.M.M.M.M.M.M
```

The printer then makes a check of its Read-Only-Memory (ROM) and its Random-Access-Memory (RAM)

An error in the ROM-check is indicated by a single "beep", and an error in the RAM-check is indicated by a continuous series of "beeps".

Should the printer fail to give the correct printout, or should it "beep", switch it OFF, then ON and press TEST again. If the printer fails again, refer to Chapter 6, Troubleshooting.

PRINT INTENSITY

The intensity of printing can be adjusted by the intensity switch on the printer's rear panel (Figure 1-1). Turn the switch wheel up (higher number) to darken the print, and down (lower number) to lighten the print.

PRINTER MAINTENANCE

Changing the Printer Ribbon

The following ribbon cartridges* may be used in the 9871A Printer.

Manufacturer	Ribbon Number and Type
HEWLETT-PACKARD CO.	9282-0561, Nylon Fabric
FRANKEL MANUFACTURING CO.	IBM Selectric spool #7B Super Kemlon
AMERICAN STENCIL MFG CO.	35-3004, executor nylon (IBM Selectric Model 72)
ADDRESSOGRAPH MULTIGRAPH CORP.	122-2092-112, starlon nylon (IBM Selectric Model 72)
GENERAL RIBBON CO.	T26, miralon, (IBM Selectric Model 72)
IBM	#1136138, superior nylon (IBM Selectric Model 72)

To change the printer ribbon, perform the procedure below, and refer to Figure 1-6.

1. Switch the printer OFF, then remove the printer's front cover by pulling it forward and off the printer.
2. Manually move the carrier to the center of the printer to better access the ribbon cartridge.
3. Remove the ribbon cartridge by pulling it up.
4. Install the new cartridge by placing it on the two ribbon spindles and pressing it into place.
5. Place the ribbon on the outside of the two ribbon guides on the carrier. Ensure that the ribbon is between the character disk and the metal ribbon shield.
6. Remove any slack in the ribbon by turning one of the ribbon spindles. The ribbon should be straight and not twisted.
7. Replace the front cover.

*Ribbons with suitable characteristics from other manufacturers can also be used.

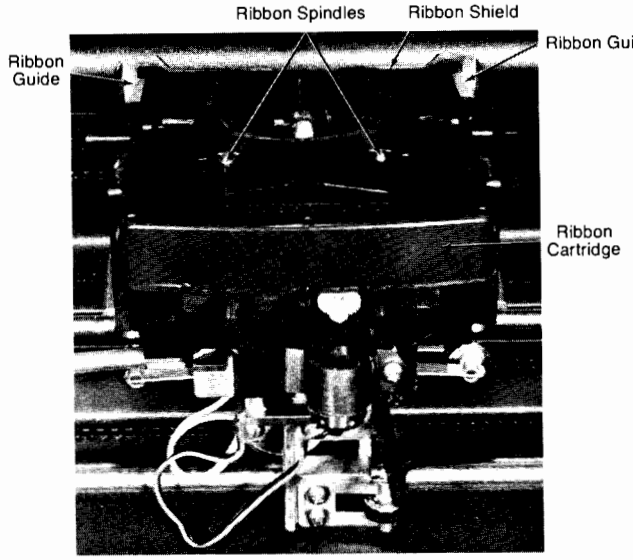

Figure 1-6. Installing a Ribbon

B-50820

Changing the Character Disk

To change the character disk, follow the procedure below, and refer to Figure 1-7.

1. Remove the front cover by pulling it forward and off the printer.
2. Ensure that the tab on the character disk is up (Figure 1-7); then press the character disk release lever to unlock the disk. If necessary move the belt to rotate the disk into position.
3. Hold the top of the character disk and pull it up and out of the carrier.
4. To install the new character disk, hold the top of the disk and place it in the carrier assembly between the hammer and the ribbon.
5. Gently push on the top of the disk to lock it into place.
6. Replace the front cover.

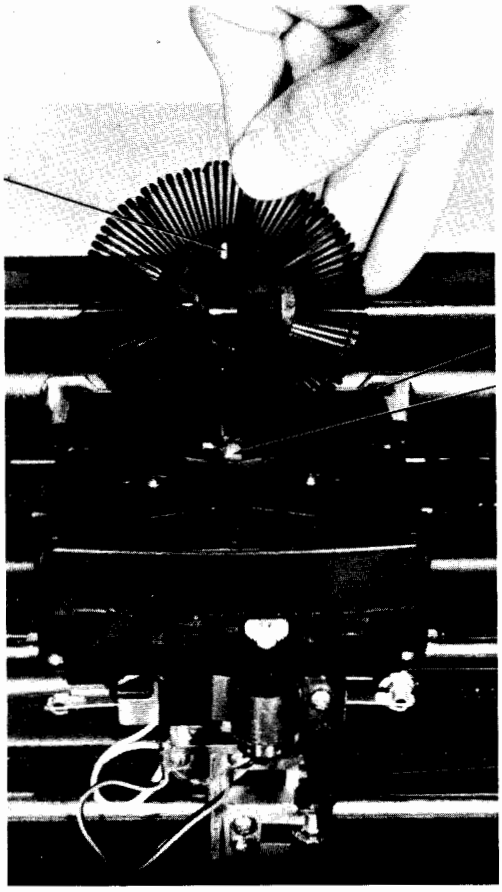

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Figure 1-7. Changing the Character Disk

CHAPTER 2

INTERFACING

INTRODUCTION

This chapter contains specifications for constructing an interface for the standard 9871A. The interface can be designed to be either internal or external to the printer.

Space is provided in the printer for a printed circuit board. Dimensions for an internal PC assembly are given later in this chapter.

An external interface can simply be plugged into the I/O connector on the rear panel. The connector details are given later in this chapter.

STANDARD 9871A INTERFACES

If the 9871A is to be used with a controlling device other than the 9810A, 9820A, 9821A and 9830A Calculators, it may be necessary to design and construct an interface to properly control the 9871A. The rest of this chapter describes interface construction, the 9871A signal line requirements and the recommended circuits to interface to the printer.

Internal Interface Construction

The standard 9871A Printer is equipped with a connector on the motherboard, and an I/O connector on the printer's rear panel. The printer's signal lines are wired directly from the motherboard connector to the I/O connector. A printed circuit board containing the interface circuits can be installed in the motherboard connector, and the PC board can be wired to the rear panel I/O connector. Figure 2-1 describes the maximum allowable size for an internal printed circuit board to hold the interface circuits.

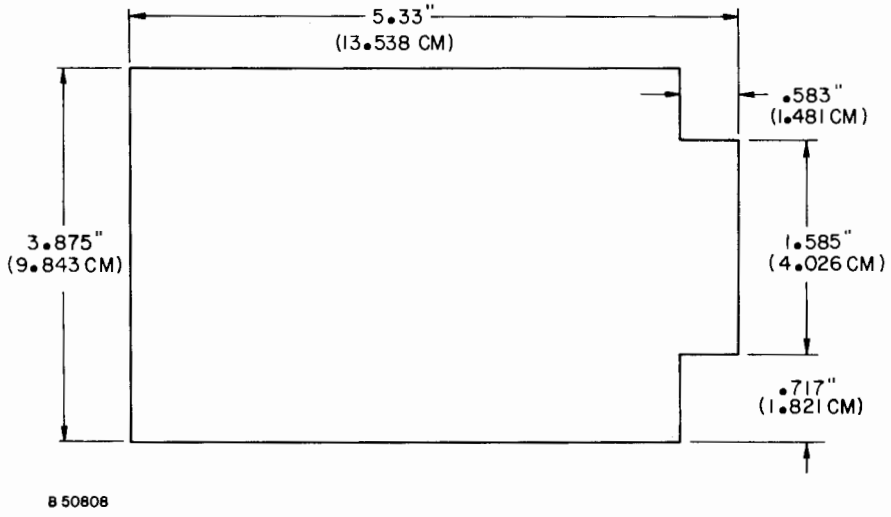
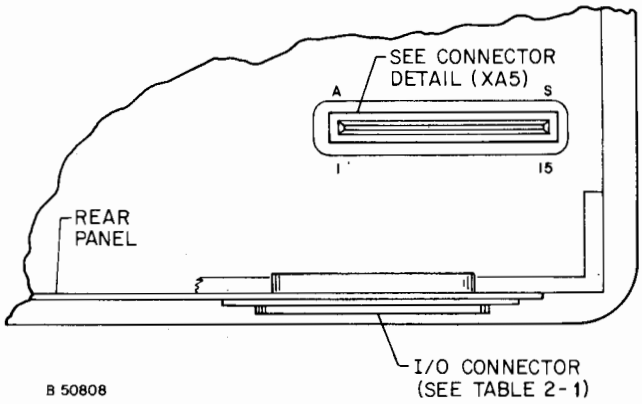
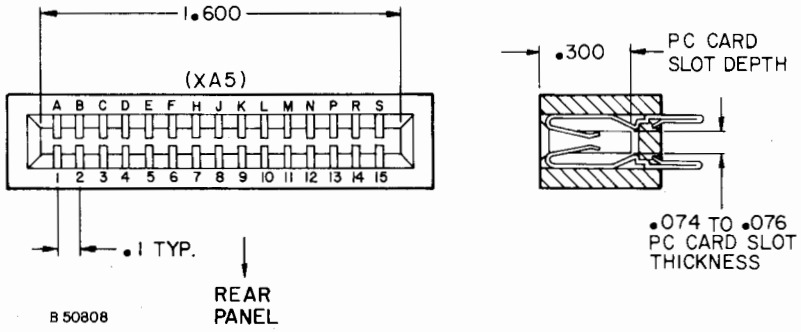


Figure 2-1. Internal Interface Dimensions

To access the interface board slot and the connectors, remove the printer's top cover. The connectors are labeled in the figure below.



The signals, pin connections and connector dimensions for the motherboard connector (XA5) are given below.



XA5 CONNECTOR DIMENSIONS

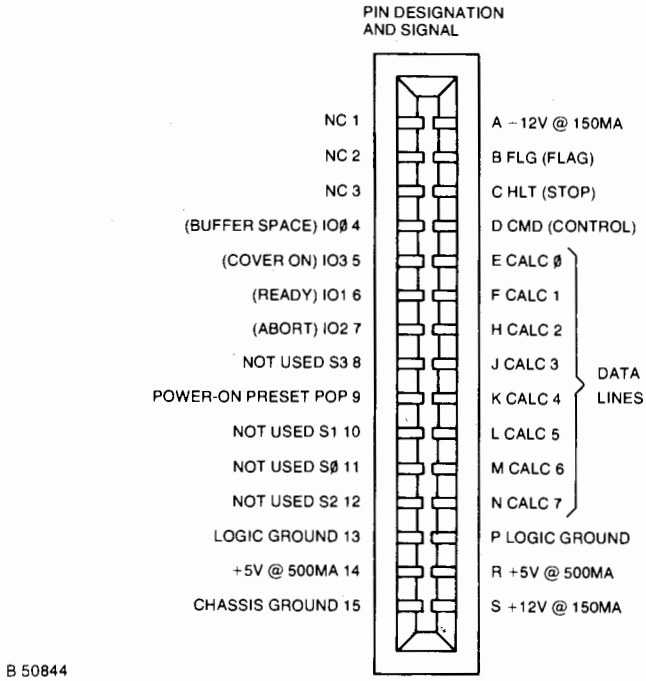


Figure 2-2. XA5 Motherboard Connector Signals

External Interface Connections

The standard printer's I/O connector is an Amphenol 205-210-1 (HP Part No. 1251-4150). The mating connector for the I/O connector is an Amphenol 205-209-1 (HP Part No. 1251-4149). Table 2-1 lists the I/O connector pins and the corresponding signals.

Table 2-1. I/O Connector Signals

I/O Connector pin number	9871A Signal	I/O Connector pin number	9871A Signal
3	S1 NOT USED	24	$\overline{\text{POP}}$ (Power-on Preset)
4	SØ NOT USED	25	Chassis ground
5	$\overline{\text{IO3}}$ (Cover On)	26	Logic ground
6	$\overline{\text{IO2}}$ (Abort)	27	
7	$\overline{\text{IO1}}$ (Ready)	28	Calc Ø } DATA LINES
8	$\overline{\text{IOØ}}$ (BufferSpace)	29	Calc 1 } DATA LINES
9	$\overline{\text{CMD}}$ (Control)	30	Calc 2 } DATA LINES
10	$\overline{\text{HLT}}$ (Stop)	31	Calc 3 } DATA LINES
11	$\overline{\text{FLG}}$ (Flag)	32	Calc 4 } DATA LINES
12	Calc 7 } DATA LINES	33	Logic Ground
13	Calc 6 } DATA LINES	34	Logic Ground
14	Calc 5 } DATA LINES	35	+5V @ 500 MA

9871A SIGNAL LINES

The following describes the printer's signal lines at the XA5 motherboard connector and the I/O Connector. All data and control lines are compatible with standard TTL levels. Technical specifications of the signal lines follow the descriptions.

+5V, ±12V	Voltages at the motherboard and I/O connector are available to drive interface circuits.
Data Lines (Calc Ø – Calc 7)	Eight lines are available to accept 8-bit-parallel ASCII characters (all 8 lines are used). Each line has a standard TTL input and a 1.8k pull-up resistor. A logical "Ø" (Low) on any data line indicates a true data signal.
Control ($\overline{\text{CMD}}$)	A low on the control line indicates that the interface is ready to output data to the printer. Control must be held low until FLAG goes low.
Flag ($\overline{\text{FLG}}$)	The printer indicates "data accepted" by forcing the flag line low.
Stop ($\overline{\text{HLT}}$)	A low on the stop line will stop the printer operation. The low stop signal must be held for at least 10 ms.
Power-on Preset ($\overline{\text{POP}}$)	A high on the $\overline{\text{POP}}$ line indicates that the printer is ON.
Ready ($\overline{\text{IO1}}$)	A low ready line indicates to the controlling device that the printer is ready to accept data.
Buffer Space ($\overline{\text{IOØ}}$)	A low buffer space indicates to the controlling device that there is room for less than 16 characters in the buffer.

Cover On ($\overline{IO3}$)	A low cover-on line indicates to the controlling device that the front cover interlock is not broken.
Abort ($\overline{IO2}$)	A low abort line indicates to the controlling device that the carrier drive motors can not turn.

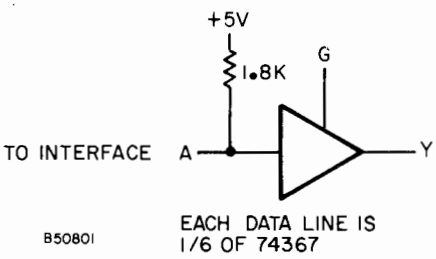
Signal Line Specifications

Data lines – Each data line is received (at the printer) by an SN74367 Bus Driver. Each driver has 3 output states: a high state or a low state when the gate (G) is low, and a high impedance state when the gate is high. Refer to the function table and schematic below.

74367
FUNCTION TABLE
(EACH DRIVER)

INPUTS		OUTPUT
G	A	Y
H	X	Z
L	H	H
L	L	L

H = high level, L = low level,
X = irrelevant, Z = high-impedance

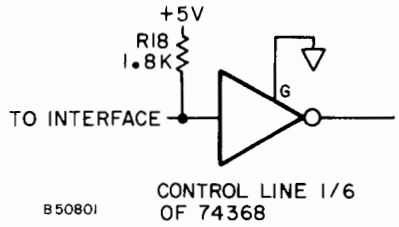


The following is a summary of the 74367 input specifications.

V_{IH}	High-level input voltage	>2V
V_{IL}	Low-level input voltage	<0.8V
V_I	Input clamp voltage (I_I = 12mA)	−1.5V
I_I	Input current when V_I = 5.5V	1mA
I_{IH}	High-level input current (V_{IH} = 2.4V)	40uA
I_{IL}	Low-level input current	−40uA(V_I = 0.5V, G = 2V) −1.6mA(V_I = 0.4V, G = 0.4V)

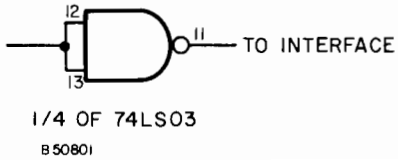
Control – The control line is received by an 74368 inverter. The inverter schematic and input specifications are shown below.

V_{IH}	High-level input voltage	>2V
V_{IL}	Low-level input voltage	<0.8V
V_I	Input clamp voltage	−1.5V
I_I	Input current when V_I = 5.5V	1mA
I_{IH}	High-level input current (V_{IH} = 2.4V)	−40uA
I_{IL}	Low-level input current	−1.6mA(V_I = 0.4V, G = 0.4V)



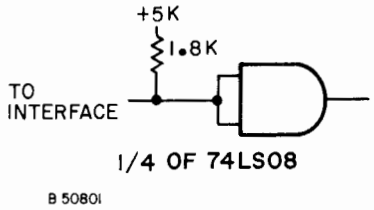
Flag – The flag signal is output from the printer to the interface by an SN74LS03 dual-input NAND gate. The NAND gate schematic and output specifications are shown below.

V_{OH}	High-level output voltage	5.5V
I_{OH}	High-level output current	100uA
V_{OL}	Low-level output voltage	0.35V (NOM)
I_{OL}	Low-level output current	8mA



Stop ($\overline{HLT}$) – The stop line is received by a 74LS08 dual-input AND gate. The AND gate schematic and input specifications are shown below.

V_{IH}	High-level input voltage	2V
V_{IL}	Low-level input voltage	0.8V
V_I	Input clamp voltage	−1.5V
I_I	Input current at maximum input voltage	0.1mA
I_{IH}	High-level input current	20mA
I_{IL}	Low-level input current	−0.36mA



Ready, Buffer Space, Cover On, Abort – These status signals are output from the printer to the interface by a 74LS75 four-bit bistable latch. The schematic of one latch and output specifications are shown below.

V_{OH}	High-level output voltage	+3.5V (TYP)
I_{OH}	High-level output current	−400uA
V_{OL}	Low-level output voltage (I_{OL} = 8mA)	0.35V (TYP) 0.5V (MAX)
I_{OL}	Low-level output current	8mA (MAX)

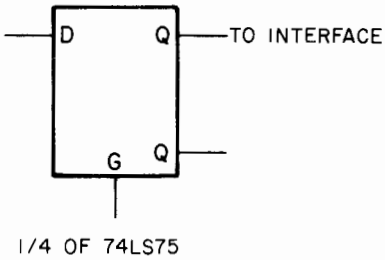


Figure 2-3 shows the required and optional signal requirements, and the basic timing considerations for the required signals.

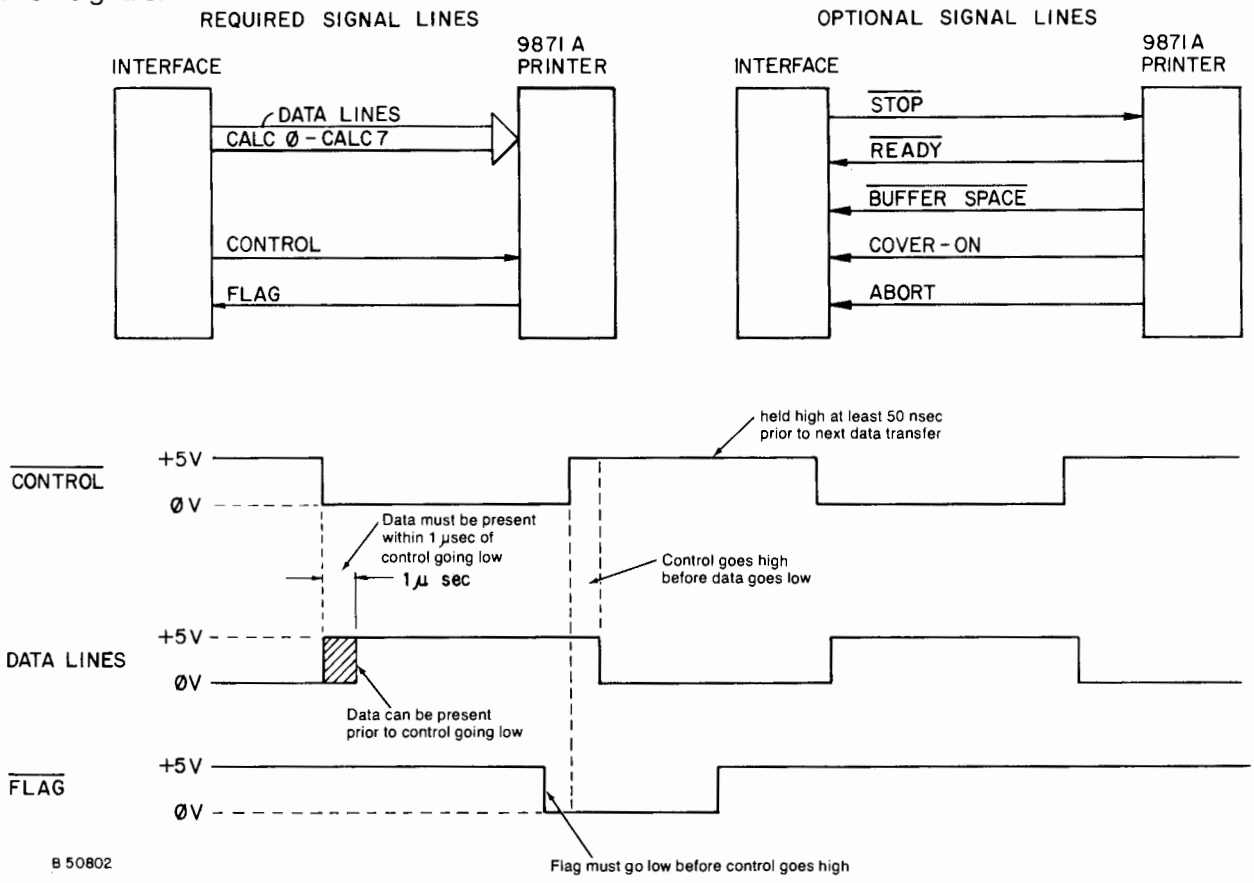


Figure 2-3. 9871A Signals and Timing

CHAPTER 3

OPERATING THE 9871A

INTRODUCTION

The 9871A responds to 8-level ASCII coded characters. Refer to Table 3-2. for the ASCII character set and their equivalent forms. By placing the appropriate binary code on the printer's I/O lines, the corresponding character will be printed or the corresponding function (e.g., backspace, tab, etc.) will be performed. The function codes allow you to use the printer to its full capability. The codes are described in detail following Table 3-1

Table 3-1. Function Codes

COMMAND	COMMAND CODE		
	ASCII CHARACTER	DECIMAL CODE	DECIMAL PARAMETER
GENERAL			
• Bell	BELL	7	
• Backspace	BS	8	
• Linefeed	LF	10	
• Carrier Return	CR	13	
• Shift Out	SO	14	
• Shift In	SI	15	
• View Delay	ESC, D	27, 68	INT(N/64),INT N
• Reverse Line Feed	ESC, LF	27, 10	
• Character Replacement	ESC, C	27, 67	"CHAR", N, "LIST"
• Reset	ESC, E	27, 69	
• Self Test	ESC, R	27, 122	
HORIZONTAL TABULATION			
• Set Horizontal Tab	ESC, 1	27, 49	
• Clear Horizontal Tab	ESC, 2	27, 50	
• Clear All Horizontal Tabs	ESC, 2	27, 51	
• Horizontal Tab Right	HTAB	9	
• Horizontal Tab Left	ESC, 4	27, 52	
VERTICAL TABULATION			
• Set Vertical Tab	ESC, 5	27, 53	
• Clear Vertical Tab	ESC, 6	27, 54	
• Clear All Vertical Tabs	ESC, 7	27, 55	
• Vertical Tab Up	ESC, 8	27, 56	
• Vertical Tab Down	VTAB	11	
FORM AND MARGIN CONTROL			
• Set Top of Form	ESC, T	27, 84	
• Form Length	ESC, F	27, 70	INT(N/64), INT N
• Text Length	ESC, L	27, 76	INT(N/64), INT N
• Form Feed	FF	12	
• Set Left Margin	ESC, M	27, 77	
• Text Width	ESC, W	27, 87	INT(N/64), INT N
SPACING CONTROL			
• Horizontal Spacing	ESC, H	27, 72	INT(N/64), INT N
• Vertical Spacing	ESC, V	27, 86	INT(N/64), INT N
• Variable Spacing	ESC, S	27, 83	
PLOTTING CONTROL			
• Absolute Plot	ESC, A	27, 65	INT(X/64), INT X, INT(Y/64), INT Y
• Relative Plot	ESC, R	27, 82	INT(X/64), INT X, INT(Y/64), INT Y
• Character Fill Setup	ESC, .	27, 46	P1, INT(P2/64), INT P2, P3
• Absolute Plot With Fill	ESC, a	27, 97	INT(X/64), INT X, INT(Y/64), INT Y
• Relative Plot With Fill	ESC, r	27, 114	INT(X/64), INT X, INT(Y/64), INT Y
• Plot Origin	ESC, O	27, 79	INT(X/64), INT X, INT(Y/64), INT Y

GENERAL

Bell (7) Causes the printer to make an audible beep.

Backspace (8) Moves the carrier to the left one character position unless it is in column one, in which case it remains fixed.

Linefeed (10) Moves the platen up to the next line. The carrier remains fixed.

Carrier Return (13) Moves the carrier to the first printing position on the same line (the left margin).

Shift Out (14) Replaces the circumflex (^ decimal 94) character with an ↑ (exponentiation) and the acute accent (´ decimal 39) character with an apostrophe ('). This is cancelled by "shift in" (15).

Shift In (15) Cancels the "Shift Out" (14) condition.

Space (32) Moves the carrier to the right one character position.

Reverse Line Feed (27, 10) Moves the platen back one line. The carrier remains fixed.

View Delay (27, 68,INT (N/64), INT N) When the printer is switched on or reset, the view delay function is disabled.*

After a view delay command has been given (N = positive number), the following conditions are set.

- Whenever the printer's character-buffer is empty, the platen advances to allow viewing of the last character printed. The platen automatically retracts before printing the next character.
- The delay time (N) is the time before the platen advances, and the character disk rotates to "home" position.
- The platen will not advance and the character disk will not home if another character is sent within the delay time.

N is the delay value in milliseconds, the maximum N value is 2047 or ≈ 2 seconds.

If N is a negative number, the platen will not advance, but the character disk will still wait the specified delay before rotating "home".

*View delay default: N = −200

SUMMARY

N =	RESULT
Positive number 0 to 2047	Platen advances and character disk homes after N time delay.
Negative number −0 to −2047	No platen advance character disk homes after N time delay.

Character Replacement (27, 67, char, N, list) This command allows any ASCII code to be interpreted as any desired sequence of codes, so that the sequence will be executed in place of the original character. The "character" parameter is the decimal code of the character to be replaced. The "N" parameter is the number of characters in the replacement list. The character replacement list is generated in the printer's memory in the area normally occupied by the buffer. To accommodate the list, the buffer length is

reduced by one character, and one character for every two characters in the replacement list. If the "character replacement" exceeds the printer memory available, the command will be ignored and a "beep" will sound. To restore a character to its original definition, a "character replacement" command must be given with the character to be restored, and a list length of zero. This will delete it from the replacement list in the printer memory, and expand the printer buffer accordingly. The maximum buffer length is 158-characters.

Reset (27, 69) Sets the printer to its "power up state" (the printer automatically assumes this state at turn-on). The power up state consists of the following printer conditions.

1. The carrier is moved to the extreme left and rotated into a mechanical stop. This synchronizes the internal logic with mechanical position. The carrier is then moved to column 1.
2. All tabs are cleared.
3. Horizontal spacing is set to 10 characters per inch. Variable horizontal spacing is disabled.
4. Vertical spacing is set to 6 lines per inch.
5. The view-delay function is disabled.
6. Top of form is assumed at the current platen position.
7. Left margin is assumed at column 1.
8. Text length is assumed to be 11 inches.
9. Form length is assumed to be 11 inches.
10. The standard "shift-in" character-set is assumed.
11. Text width is assumed to be 13.2 inches.
12. The origin for absolute plotting is set at the left margin and lower margin.
13. Character fill parameters are set to: decimal point, spacing = 3, vertical offset = +5.
14. All character replacements are cleared.
15. A ROM and RAM check is made.

Test (27, 122) Initializes the printer and:

- prints a 132 character test pattern followed by a carrier-return linefeed
- performs a check sum on internal ROM
- writes and then reads a test pattern in internal RAM
- sets the printer back to its power up state

The test command is the same as pressing the test button on the printer's rear panel. Refer to "Electrical Inspection" (page 1-8) for the test printout.

HORIZONTAL TABULATION

Set Horizontal Tab (27, 49) Sets a tab at the current position of the carrier for use by subsequent "horizontal tab" commands. The position is not affected by any changes in the character spacing. Tab settings are stored in the printer's buffer. Each tab uses one character space in the buffer.

Clear Horizontal Tab (27, 50) Clears the horizontal tab at the current carrier position.

Clear All Horizontal Tabs (27, 51) Clears all horizontal tabs regardless of the carrier position.

Horizontal Tab Right (9) Moves the carrier right to the next preset tab position. If there are no tabs set to the right of the current position, the carrier moves to the right margin.

Horizontal Tab Left (27, 52) Moves the carrier left to the next preset horizontal tab position. If there are no tabs set to the left of the current position, the carrier moves to the left margin.

VERTICAL TABULATION

Set Vertical Tab (27, 53) Sets a tab at the current position of the platen for use in subsequent "vertical tab" commands. The position of the tab is relative to the "top of form." Tab settings are stored in the printer's buffer. Each tab uses one character space in the buffer.

Clear Vertical Tab (27, 54) Clears any vertical tab at the current position of the platen.

Clear All Vertical Tabs (27, 55) Clears all vertical tabs.

Vertical Tab Up (27, 56) Moves the platen up to the next preset vertical tab position. If there are no tabs set above the current position, the platen moves up to the "top of form."

Vertical Tab Down (11) Moves the platen down to the next preset vertical tab position. If there are no tabs set below the current position, the platen moves to the lower margin.

FORM AND MARGIN CONTROL

Top of Form (27, 84) Establishes the current position of the platen as the top of form. This point is used as a reference for subsequent "form length" and "form feed" commands.

Form Length (27, 70, INT (N/64), INT N) This function establishes the length of a page or form. The parameter N specifies the number of 1/96 inch increments from the top of form, and this new position is established as the form length. If no form length is set, the printer assumes the form length to be 11 inches, or 1056 increments. Negative form length values set a form length of 273 inches.

Formfeed (12) Moves the platen to the first line on the next form or page. The carrier remains fixed. To use this code, the top of form and form length should be set. If form length is not set, the formfeed moves the paper 11 inches.

Set Left Margin (27, 77) When the printer is first turned on, the carrier is at the left-most printing position. To change left margin, space to the desired left margin position and output the left margin code (27, 77). Subsequent carrier returns will return the carrier to this position. This margin is also used as the default X-axis coordinate for absolute plotting

Text Width (27, 87, INT (N/64), INT N) This function establishes the right margin or the width of a line from the center of the first character to the center of the last character. The parameter N specifies the number of 1/120 inch increments to the right margin. If any character or space exceeds the right margin, a carrier return and a linefeed are automatically executed and the character is printed in the first column of the next line. If no width is set, the text width is assumed to be 13.2 inches (1584 increments).

Text Length (27, 76, INT (N/64), INT N) This function sets the desired text length from the top of form position. The parameter N specifies the number of 1/96 inch increments to the lower margin. This new position is used by subsequent "top of form" commands. Whenever a "linefeed" crosses this margin, a "top of form" command is automatically executed. If no lower margin is set, the automatic top-of-form will not occur. The lower margin is also the default y-axis coordinate for absolute plotting.

SPACING CONTROL

Horizontal Spacing (27, 72, INT (N/64), INT N) Defines the spacing between each printed character. This function overrides the normal 10 characters-per-inch spacing which is set when the printer is switched on or initialized. It also overrides any previous "horizontal spacing" command. The parameter N is an integer equal to the number of 1/120-inch increments desired following each printed character. Normal 10 characters-per-inch spacing is twelve, 1/120-inch increments per character.

Vertical Spacing (27, 86, INT (N/64), INT N) Defines the number of 1/96-inch increments to move when a linefeed command is given. This function overrides the normal 6 lines-per-inch spacing which is set when the printer is switched on or initialized. It also overrides any previous vertical spacing command. The parameter N is an integer equal to the number of 1/96-inch increments desired. Normal 6 lines-per-inch spacing is sixteen, 1/96-inch increments per line.

Variable Spacing (27, 83) This function sets a variable spacing mode in the printer; this mode requires that each character sent to the printer be followed by a spacing parameter which specifies the horizontal spacing for the character (including space and backspace). The spacing parameter specifies the number of 1/120-inch increments between characters. This mode is useful for printing with justified margins. A "reset" will cancel this mode. The maximum spacing parameter in this mode is 31.

PLOTTING CONTROL

Plot Origin (27, 79, INT (X/64), INT X, INT (Y/64), INT Y) This function describes the origin of the X and Y axes for absolute or relative plotting. The normal origin is the intersection of the left margin for X and the lower margin for Y. Using the plot origin function, the X and Y axis can be offset. The intersection of the offset X and Y axes becomes the new origin.

The X parameter specifies the number of 1/120-inch increments to the left (−) or right (+) of the left margin that the Y axis will be located.

The Y parameter specifies the number of 1/96-inch increments up (+) or down (−) from the lower margin that the X axis will be located.

Plot Absolute (27, 65, INT (X/64), INT X, INT (Y/64), INT Y) This function moves the specified number of 1/120-inch increments in X, and the number of 1/96-inch increments in Y. These increments are referenced to a point defined by the Plot Origin Command. The default origin point is the left margin for X and the lower margin for Y. For X, the carrier is moved the specified distance to the right of the origin for positive parameters, and to the left of the origin for negative parameters. For Y, the platen is moved above the origin for positive parameters, and below the origin for negative parameters.

Plot Relative (27, 82, INT (X/64), INT X, INT (Y/64), INT Y) This function moves the specified number of 1/120-inch increments in X, and the number of 1/96-inch increments in Y. These increments are referenced to a point defined by the current position of the carrier and platen. For X, the carrier is moved to the right of the current position for positive parameters, and to the left of the current position for negative parameters. For Y, the platen is moved above the current position for positive parameters, and below the current position for negative parameters.

Character Fill Setup (27, 64, P1, INT (P2/64), INT P2, P3) The character fill function is used to print a series of characters between two plotted points. This command is used to setup the conditions for plotting with character fill. Zero or any negative number will disable character fill.

The first parameter (P1) is the character to be used as the fill character.

The second parameter (P2) is used twice. P2 specifies the spacing (in increments) between the fill character. The spacing is determined in one of the following ways.

- If the slope* of the plotted points is less than 1, P2 represents the number of 1/120-inch increments between fill characters.
- If the slope* of the plotted points is 1 or greater, P2 represents the number of 1/96-inch increments between fill characters.

The third parameter (P3)specifies an offset for the fill character. Each offset increment represents 1/96-inch. Positive values will raise the character and negative values will lower it.

The power-up default conditions are: (P1) the decimal point, (P2) spacing = 3, (P3) offset = +5.

*The slope is the tangent of the angle made by a straight line with the X-axis.

Absolute Plot with Character Fill (27, 97, INT (X/64), INT X, INT (Y/64), INT Y) This function is identical to the "absolute plot" command except that fill-characters determined by a previous "character fill setup" command (or character fill default), are plotted along a straight line from the current X, Y position to the new position.

Relative Plot with Character Fill (27, 114, INT (X/64), INT X, INT (X/64), INT Y) This function is identical to the "relative-plot" command except that fill-characters determined by a previous "character fill setup" command (or character fill default), are plotted along a straight line from the current X, Y position to the new position.

> **NOTE**
> The plotting area is defined by the top of form, the text length, the left margin and the text width.

Table 3-2. ASCII Character Set

ASCII Char.	EQUIVALENT FORMS Binary	Octal	Dec
NULL	00000000	000	0
SOH	00000001	001	1
STX	00000010	002	2
ETX	00000011	003	3
EOT	00000100	004	4
ENQ	00000101	005	5
ACK	00000110	006	6
BELL	00000111	007	7
BS	00001000	010	8
HTAB	00001001	011	9
LF	00001010	012	10
VTAB	00001011	013	11
FF	00001100	014	12
CR	00001101	015	13
SO	00001110	016	14
SI	00001111	017	15
DLE	00010000	020	16
DC_1	00010001	021	17
DC_2	00010010	022	18
DC_3	00010011	023	19
DC_4	00010100	024	20
NAK	00010101	025	21
SYNC	00010110	026	22
ETB	00010111	027	23
CAN	00011000	030	24
EM	00011001	031	25
SUB	00011010	032	26
ESC	00011011	033	27
FS	00011100	034	28
GS	00011101	035	29
RS	00011110	036	30
US	00011111	037	31

ASCII Char.	EQUIVALENT FORMS Binary	Octal	Dec
space	00100000	040	32
!	00100001	041	33
"	00100010	042	34
#	00100011	043	35
$	00100100	044	36
%	00100101	045	37
&	00100110	046	38
'	00100111	047	39
(	00101000	050	40
)	00101001	051	41
*	00101010	052	42
+	00101011	053	43
,	00101100	054	44
–	00101101	055	45
.	00101110	056	46
/	00101111	057	47
ø	00110000	060	48
1	00110001	061	49
2	00110010	062	50
3	00110011	063	51
4	00110100	064	52
5	00110101	065	53
6	00110110	066	54
7	00110111	067	55
8	00111000	070	56
9	00111001	071	57
:	00111010	072	58
;	00111011	073	59
<	00111100	074	60
=	00111101	075	61
>	00111110	076	62
?	00111111	077	63

ASCII Char.	EQUIVALENT FORMS Binary	Octal	Dec
@	01000000	100	64
A	01000001	101	65
B	01000010	102	66
C	01000011	103	67
D	01000100	104	68
E	01000101	105	69
F	01000110	106	70
G	01000111	107	71
H	01001000	110	72
I	01001001	111	73
J	01001010	112	74
K	01001011	113	75
L	01001100	114	76
M	01001101	115	77
N	01001110	116	78
O	01001111	117	79
P	01010000	120	80
Q	01010001	121	81
R	01010010	122	82
S	01010011	123	83
T	01010100	124	84
U	01010101	125	85
V	01010110	126	86
W	01010111	127	87
X	01011000	130	88
Y	01011001	131	89
Z	01011010	132	90
[	01011011	133	91
\	01011100	134	92
]	01011101	135	93
^	01011110	136	94
_	01011111	137	95

ASCII Char.	EQUIVALENT FORMS Binary	Octal	Dec
`	01100000	140	96
a	01100001	141	97
b	01100010	142	98
c	01100011	143	99
d	01100100	144	100
e	01100101	145	101
f	01100110	146	102
g	01100111	147	103
h	01101000	150	104
i	01101001	151	105
j	01101010	152	106
k	01101011	153	107
l	01101100	154	108
m	01101101	155	109
n	01101110	156	110
o	01101111	157	111
p	01110000	160	112
q	01110001	161	113
r	01110010	162	114
s	01110011	163	115
t	01110100	164	116
u	01110101	165	117
v	01110110	166	118
w	01110111	167	119
x	01111000	170	120
y	01111001	171	121
z	01111010	172	122
{	01111011	173	123
|	01111100	174	124
}	01111101	175	125
~	01111110	176	126
DEL	01111111	177	127

9871A CHARACTER DISKS

Table 3-3 lists the characters, their codes, and the position of each character on the disk. The unique characters on the optional disks are also shown.

Table 3-3. 9871A CHARACTER FONTS AND CODE ASSIGNMENTS

Decimal Code	Spoke Number	Standard Characters
33	48	!
34	61	"
35	23	#
36	24	$
37	5	%
38	9	&
39	2	'
39 (SO)	89	`
40	38	(
41	36	)
42	26	*
43	25	+
44	6	,
45	27	-
46	33	.
47	31	/
48	18	0
49	17	1
50	19	2
51	16	3
52	20	4
53	15	5
54	21	6
55	14	7
56	22	8
57	13	9
58	52	:
59	59	;
60	10	<
61	29	=
62	12	>
63	54	?
64	7	@
65	47	A
66	58	B
67	39	C
68	53	D
69	45	E
70	57	F
71	34	G
72	41	H
73	50	I
74	66	J
75	30	K
76	55	L
77	37	M
78	49	N
79	51	O
80	56	P
81	65	Q
82	43	R
83	44	S
84	46	T
85	60	U
86	62	V
87	32	W
88	28	X
89	35	Y
90	63	Z
91	42	[
92	3	\
93	40	]
94	1	^
94 (SO)	8	↑
95	11	_
96	95	`
97	85	a
98	93	b
99	75	c
100	86	d
101	82	e
102	74	f
103	73	g
104	81	h
105	79	i
106	91	j
107	72	k
108	87	l
109	90	m
110	78	n
111	77	o
112	92	p
113	69	q
114	83	r
115	84	s
116	80	t
117	76	u
118	71	v
119	88	w
120	70	x
121	67	y
122	68	z
123	4	π
124	64	|
125	94	→
126	96	∿

Here are the unique characters found on the ASCII character disk.

Decimal Code	Spoke Number	ASCII Character
92	3	\
123	4	{
125	94	}

Here are the unique characters found on the European character disk.

Decimal Code	Spoke Number	European Character
35	23	£
39 (SO)	89	Ç
92	3	¿
94 (SO)	8	°
123	4	¨ (U.C.)
125	94	¨ (L.C.)

The character spokes are numbered clockwise, 1 to 96, beginning with the circumflex (^) character. Hold the character disk with the characters facing you and the locating tab up. The circumflex character (spoke 1) will be on top.

CHAPTER 4

THEORY OF OPERATION

INTRODUCTION

This chapter contains the 9871A theory of operation, block diagrams, signal timing diagrams, and schematic diagrams.

GENERAL THEORY OF OPERATION

Here is an explanation of the basic printer operation. Refer to the 9871A Block Diagram (Figures 4-Ø and 4-1).

The A3 logic assembly is the heart of the printer. This assembly contains the Processor, Read/Write Memory, and the Read-Only Memory. The logic assembly controls the incoming data and commands, translates the data, and outputs the appropriate command signals to the rest of the printer circuits.

Data and status of the controlling device are gated onto the logic assembly from the interface. The data goes to the processor via the Bidirectional Interface Buffer on the IDA lines.

The processor can initiate a memory (ROM) cycle, and internal BPC cycle, or send the data to RAM for decoding.

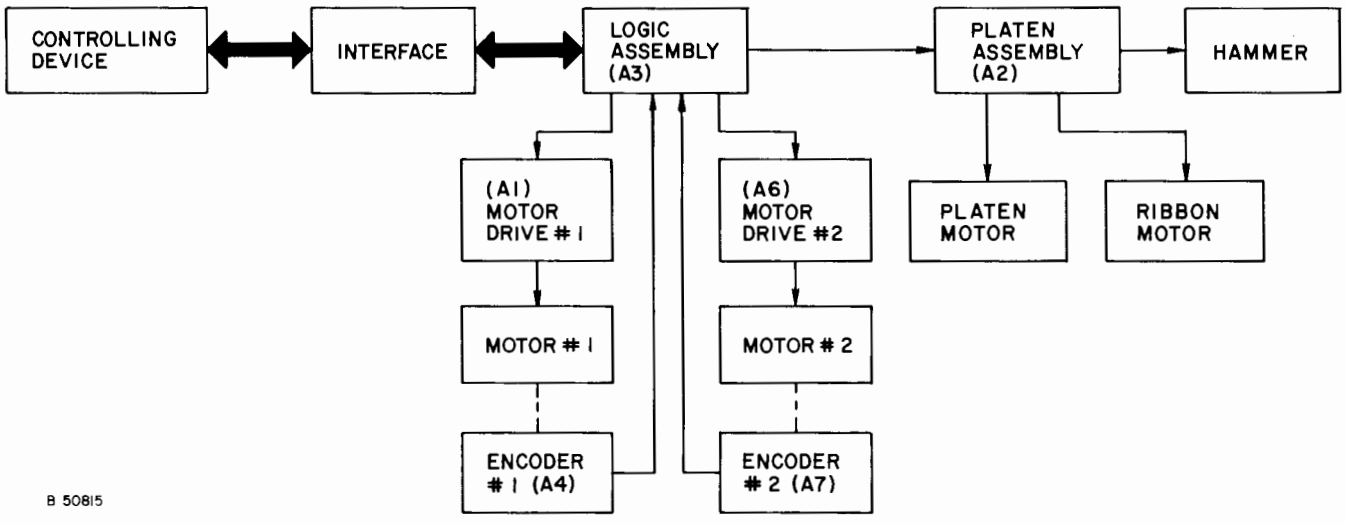


Figure 4-Ø. 9871A Simplified Block Diagram

Logic Assembly Outputs

The outputs from the logic assembly are as follows.

- ribbon movement
- platen movement
- carrier drive motor direction and rotation (these signals position the carrier and character disk)
- hammer signals (to print the character)
- status to the controlling device
- clock signals for the printer circuits

The ribbon, platen and hammer signals are sent from the logic assembly to the A2 Platen Drive assembly.

The ribbon signals are converted into drive signals for the ribbon motor.

The platen signals are decoded into the level of torque applied to the platen motor, and the particular motor winding to be energized.

The hammer signal enables the hammer driver to energize the hammer solenoid and print a character. The print intensity adjustment controls the amount of drive to the solenoid.

The carrier drive motor signals are sent to either one of the motor drive assemblies (A1 or A6). Decoding the drive signals determines which motor winding will be energized, and thus the direction and rotation of the motor is accomplished.

Clock signals provide synchronization of critical timing areas in the rest of the printer.

Four status lines at the I/O connector can be monitored by the controlling device.

Logic Assembly Inputs

Inputs to the logic assembly include the following.

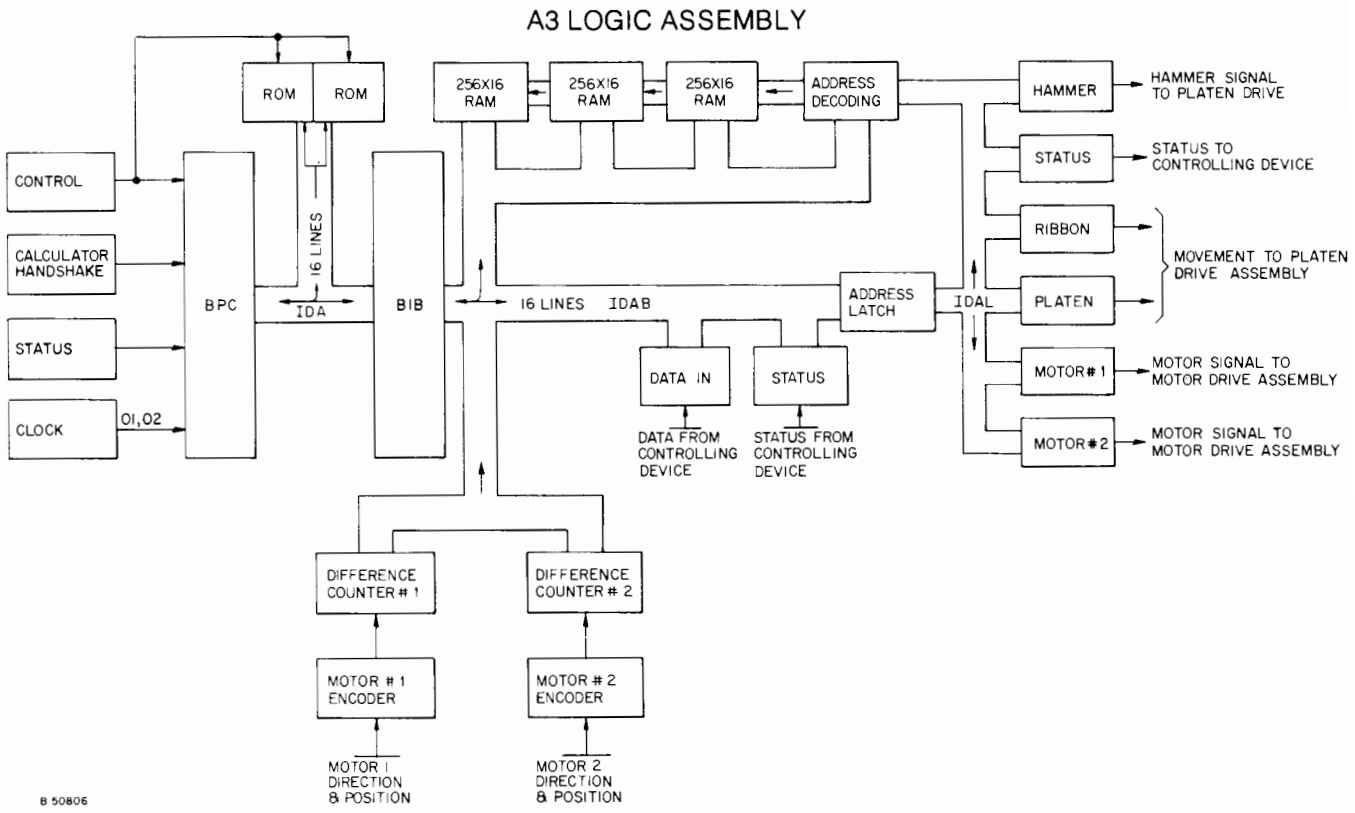
- data from the controlling device.
- status of the controlling device.
- the present position and direction of the drive motors.

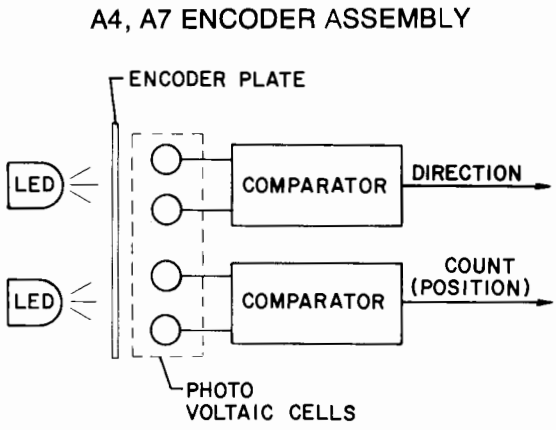
The present position and direction of the drive motors is monitored by the two encoder assemblies (A4 and A7). Each drive motor has its own encoder mounted on the back of the motor. The direction (DR) and position (CNT) signals are sent back to the logic assembly. The DR and CNT signal information is used as a reference on which future movement commands are based.

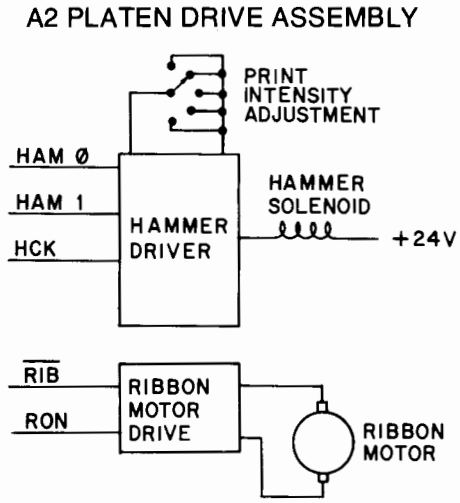
Data inputs from the controlling device are processed by the logic assembly to determine if the data requires a ROM, RAM or internal BPC cycle.

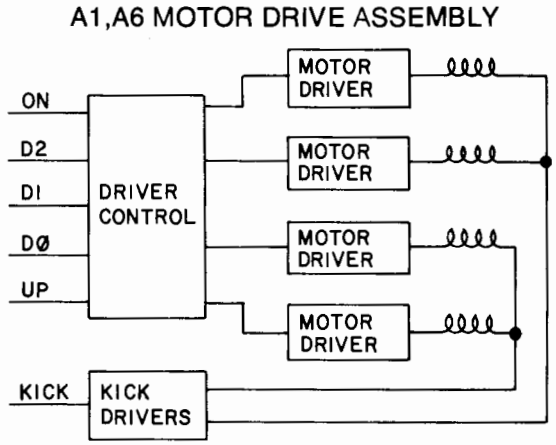
Table 4-1. 9871A Mnemonic List

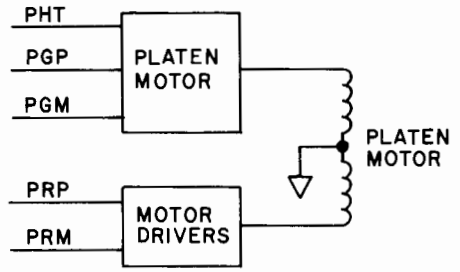
9871A MNEMONIC	MEANING	9871A Mnemonic	MEANING
CALC Ø - CALC 7	Data lines	PDR	Processor Driving
CE	Chip Enable	PGM	Platen Green Minus 24V
CMD	Control	PGP	Platen Green Positive 24V
CNT 1, CNT 2	Count Signal from encoder	PHT	Platen High Torque
		POP	Power-On Preset
DO 1 - DO 3	Position Data to Motor Drive	PRM	Platen Red Minus 24V
DR 1, DR 2	Direction Signal from encoder	PRP	Platen Red Positive 24V
		PWP	Power Pulse
DVL	Data Valid	RAL	Register Address Line
FLG	Flag	RIB	Ribbon Reverse
HAM Ø	Low Hammer Solenoid Current	RON	Ribbon On
HAM 1	High Hammer Solenoid Current	R/W	Read/Write
HCK	Hammer Clock	STM	Start Memory
HINT 1, HINT 2	Lines to Print Intensity Switch	STS	Status
		SMC	Synchronous Memory Complete
HLT	Halt	SØ - S4	Incoming Status
HM	Hour Meter	UMC	Unsynchronous Memory Complete
IDA	Instruction Data Lines	UP 1, UP 2	Drive Motor Rotation Signal
INT	Interrupt		
IO Ø - IO 3	Status Lines	VBG	Voltage Back Gate
KICK 1, KICK 2	Drive Motor High Voltage	VSW	+12V
		WRT	Write
ODD	Output Data Disable	Ø1	Clock Phase 1
ON 1, ON 2	Drive Motor Power	Ø2	Clock Phase 2











B 50806

Figure 4-1. 9871A Block Diagram

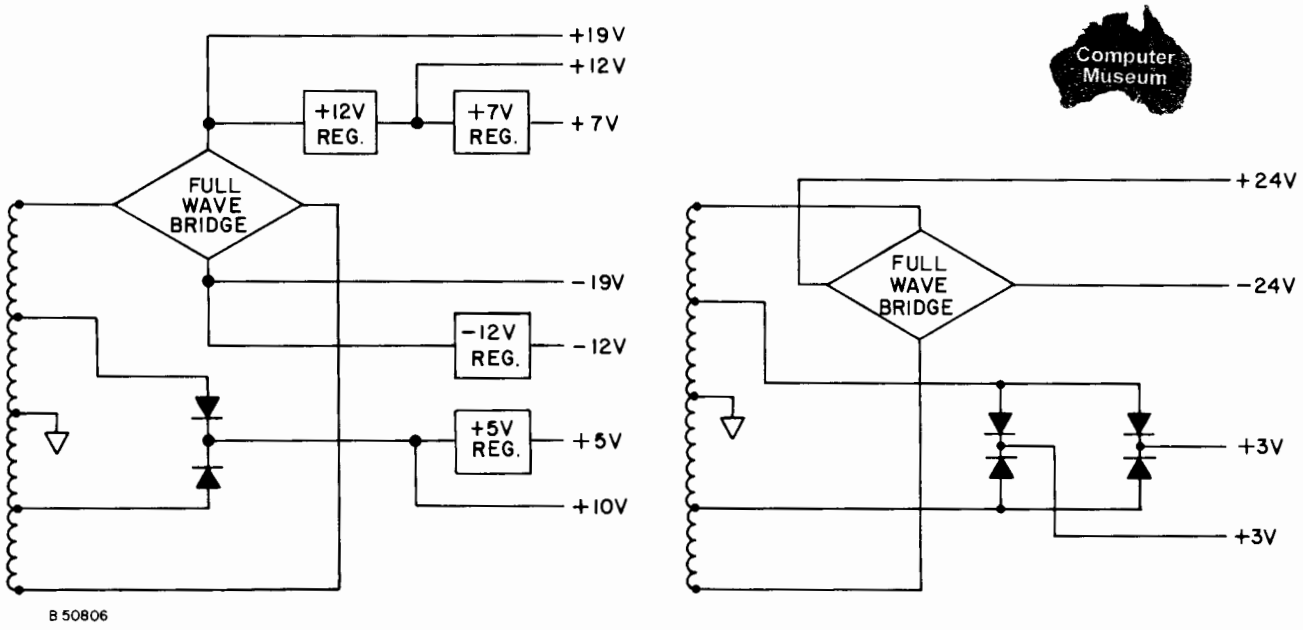
POWER SUPPLY

The AØ power supply provides six unregulated voltages and four regulated voltages. The transformer has two center-tapped secondary windings. ac is supplied to the +3V, +24V and −24V supplies by one of the secondary windings. The other secondary winding supplies ac to the ±19V, ±12V, +10V, +7V and +5V supplies. Refer to the power supply schematic diagram, Figure 4-8.

The +3V, ±24V, ±19V and +10V supplies are not regulated. The ±12V, +7V and +5V supplies are regulated.

POP Circuit

When the printer is turned on, the +10V supply is initially off. When the +10V supply rises to 5.62V, CR26 conducts. Q4 is then cut off and POP goes high. POP is used to preset various circuits in the printer at turn-on.



A3 LOGIC ASSEMBLY

The printer's clock is part of the logic assembly. The clock oscillator is crystal controlled at 12 mHz. The 12 mHz signal is divided by 2 and separated, resulting in two, 6 mHz, non-overlapping, clock signals. The two 6 mHz signals (Ø1 and Ø2) provide synchronization for the printer's circuits.

The logic assembly operation can be broken down into five major cycles:

Internal processor cycle (testing flags, arithmetic operations etc.)
ROM read cycle
RAM read and write cycle
I/O write cycle (data to motors, hammer, etc.)
I/O read cycle (data from encoder, status, etc.)

Refer to the timing diagrams (Figure 4-4) and the A3 schematic diagram (Figure 4-5) when reading this presentation.

The internal processor cycle consists of calculations and "housekeeping" operations inside the binary processor chip (BPC). Since it is not feasible to troubleshoot the BPC, no timing diagram is given for an internal cycle. Without going into processor theory, it is sufficient to say that these cycles do occur normally in the logic assembly operation.

A ROM read cycle consists of addressing the ROM, and reading the data from that address in the ROM on the IDA lines. The printer's function routines are contained in the ROMs. The cycle is initiated by the Start Memory ($\overline{STM}$) signal. The address is sent from the processor to the ROMs on the IDA lines. Two clock states later, data is read from the ROM. The ROM data can be used by the processor, the RAM or the I/O. The Unsynchronized Memory Complete ($\overline{UMC}$) signal indicates that the printer has processed the data. The Register Address (RAL) signal, is low during the ROM cycle.

The RAM write and the I/O write cycles are similar. An address is sent out on the IDA lines. At the same time, RAL, $\overline{PDR}$ and $\overline{WRT}$ go low. Then, $\overline{STM}$ goes low. If the address data is valid, DVL goes low. Data is then sent from the processor and written in that address location in the RAM during the RAM write cycle, or in the I/O latch specified in an I/O write cycle. An I/O write will output data to control the drive motor, ribbon movement, hammer, and platen.

A RAM read cycle starts out with the address sent out from the processor on the IDA lines. After the address is sent, the Processor Driving ($\overline{PDR}$) signal and the Write ($\overline{WRT}$) signal, goes high indicating a read operation. The data in the specified address location is read while the unsynchronous and synchronous memory complete signals ($\overline{UMC}$ and $\overline{SMC}$) are low. The data can be used by the processor or the I/O latches.

The I/O read cycle is used to input encoder assembly data, the printer status and the controlling device status. An address sent on the IDA lines determines which input data gates will be enabled. The data is sent to the processor during the time that $\overline{UMC}$ is low.

MOTOR DRIVE ASSEMBLY A1 OR A6

The printer uses two identical stepper motors to control the carrier and character disk movements. Each stepper motor is controlled by its own motor drive assembly. The motor drive assembly receives control signals from the A3 Logic Assembly. These signals are decoded and the proper stepper motor windings are switched in to drive the motor. During operation both motors act together to position the carrier and rotate the character disk. Refer to the A1, A6 schematic diagram, Figure 4-6.

The Stepper Motors

Each motor is a 4-phase, bifilar, permanent-magnet stepper. Each motor phase winding is rated at 1.3 Volts at 3.9 Amperes. There are normally 50 motor steps per revolution (360°). Each step is electrically divided into 8 increments (substeps) giving 400 increments to 360° (0.9° per increment).

Driver Signals

The digital signals that control the motor direction and steps, originate on the A3 Logic Assembly.

The DØ, D1, and D2 signals provide the "next state" information to the motor drive assemblies.

The $\overline{ON}$ signal goes high to turn the motor power off; when the $\overline{ON}$ signal is low it turns the motor power on. During operation this signal is normally low. A high $\overline{ON}$ signal disables the motor drive switches.

The UP signal determines the direction of motor rotation and controls the application of a KICK signal to the motor windings.

The $\overline{KICK}$ signal is normally high. This signal pulses low for 120 microseconds to counter back EMF and to increase the current rapidly to a steady state level when a winding is switched on. Thus, whenever a motor winding is turned on or off, a low 120 microsecond pulse is present on one of the two motor winding center taps.

The drive signals are decoded and applied to OR gates (U1, U2). A low output on either of these gates turns on the transistor switch associated with that gate, and current flows in the winding connected to that switch. A high signal output on these gates will disable the current to the motor windings.

Low outputs from the U3 OR-gates will cause the −24V KICK pulses to be applied. The motor has two separate windings, and each winding is center tapped. The center tap from each winding is connected to one of the KICK transistor switches.

Either two half-windings (one half of each winding) or one half-winding is energized at any time during the stepper motor movement.

Motor Drive

Figure 4-2 is a simplified diagram of the drive circuit for a motor winding. The component designators in the diagram below are used only for this presentation.

SW1 and SW2 determine the polarity of the field to be generated in the motor winding. This is accomplished by driving one-half of the center tapped winding. The field direction is determined by the direction of the current in the winding.

In the steady state condition, SW1 or SW2 is closed and SW3 is open, so that current flows through one half-winding to ground through CR1. When a half-winding is switched on, SW3 is closed momentarily to improve the current rise time during the switching-on of a winding. When SW1 or SW2 is opened, the voltage polarity across the half-winding reverses. The center tap is clamped to ground through CR1, and the other end of the half-winding is clamped to −48V by zener diodes CR4, CR5 and either diode CR2 or diode CR3.

A detailed schematic of one driver is given in Figure 4-3. Transistor Q2 is the winding selector switch. Transistor Q3 is the high voltage (−24V KICK) switch.

The timing diagram shown below describes the motor-drive assembly signals that occur to produce 1 motor step. Remember each motor step is divided into 8 substeps, and each substep steps (turns) the motor 0.9° . Note the following:

- Each winding is on for 3 consecutive substeps, and off for 5 substeps.
- One of the kick switches (Q5 and Q6) is turned on when a winding is switched on.
- At the beginning of the second substep when a motor is on, the appropriate Kick switch is turned on to overcome the back EMF.

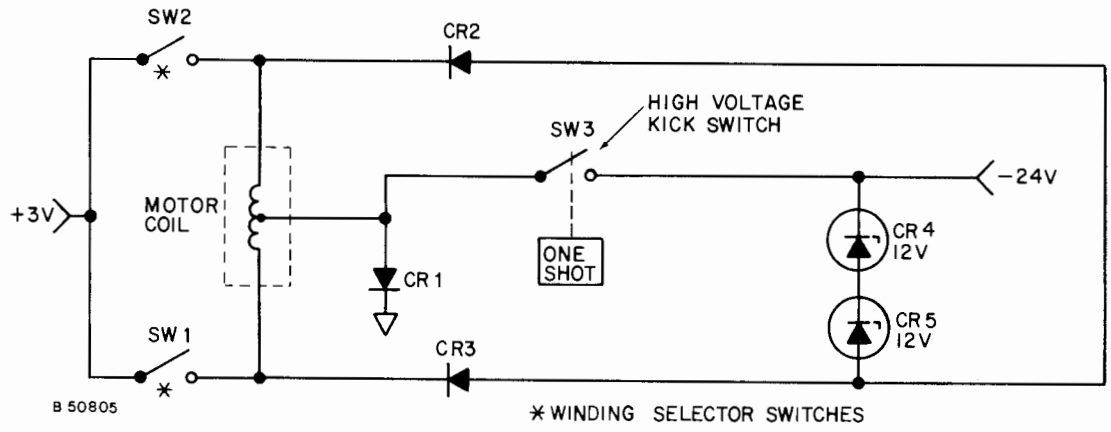


Figure 4-2. Simplified Drive Circuit

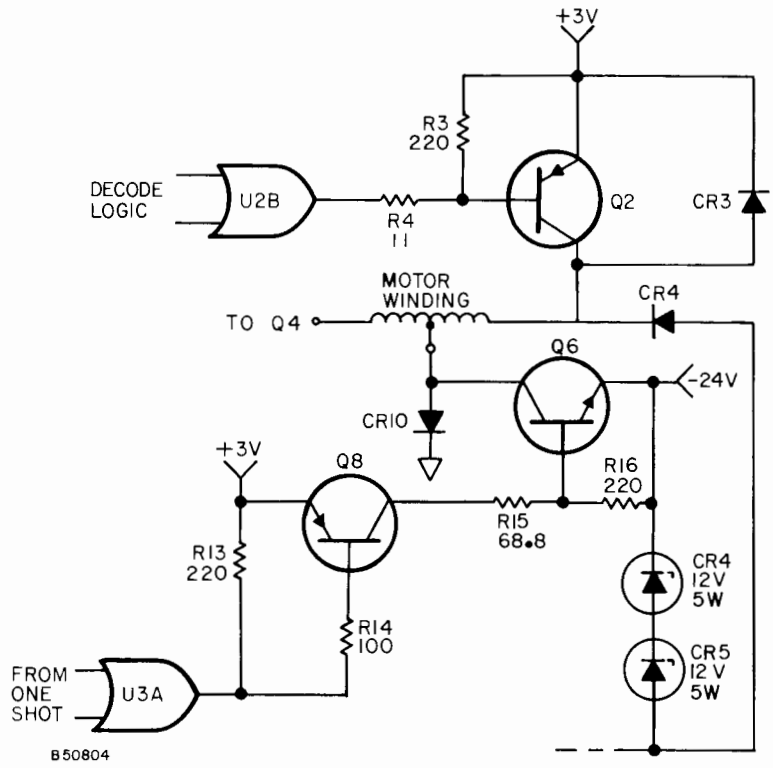
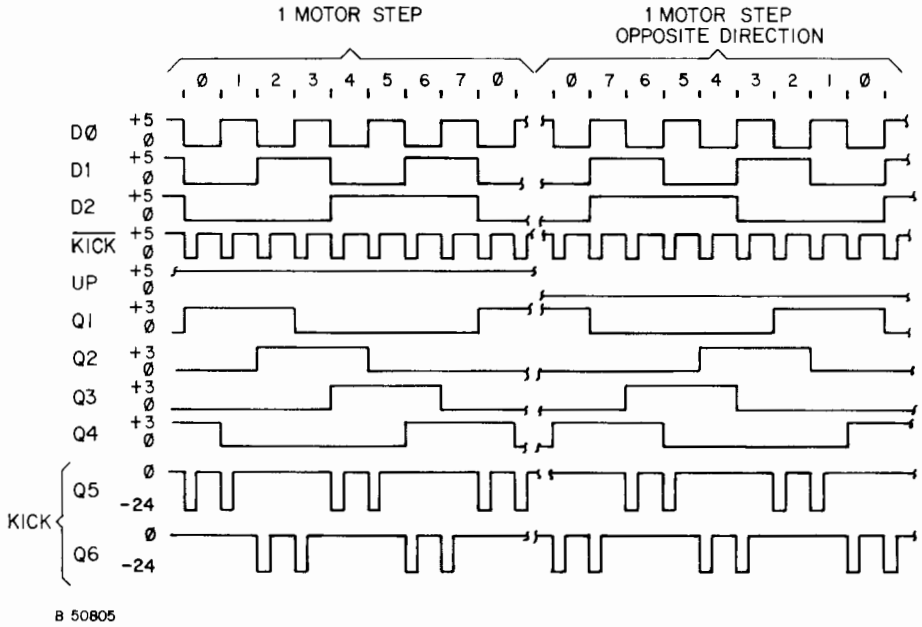


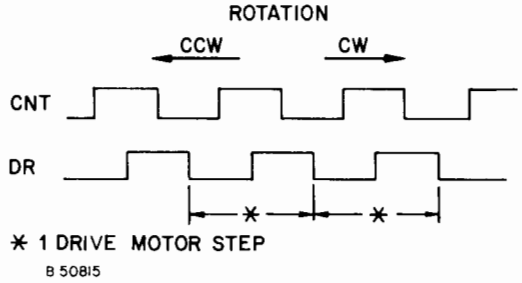
Figure 4-3. Drive Circuit



A4 OR A7 ENCODER ASSEMBLY

Each carrier drive motor has its own optical encoder assembly which is mounted on the back of the drive motor. The encoder provides relative position and direction information from its associated drive motor to the A3 logic assembly. Light from two infrared LEDs passes through a slotted disc on the back of each drive motor. Refer to the A4, A7 schematic diagram, Figure 4-6. Four photo-voltaic sensors, located on the other

side of the slotted disc (behind a grating), sense the light through the disc slots. When the motor is moving, the photo voltaic sensors each produce a periodic waveform. These four signals are split into pairs (each pair having a 180° phase difference) and each pair is applied to a differential comparator (acting as a Schmitt trigger) with positive feedback. The output of each comparator is a digitial TTL signal which is sent to the logic assembly. Direction is decoded by the logic assembly by comparing the two encoder digitial signals. If the motor is rotating clockwise, CNT leads DR, and if the motor is rotating counter-clockwise, CNT lags DR. See the timing diagram below.



A2 HAMMER DRIVE CIRCUIT

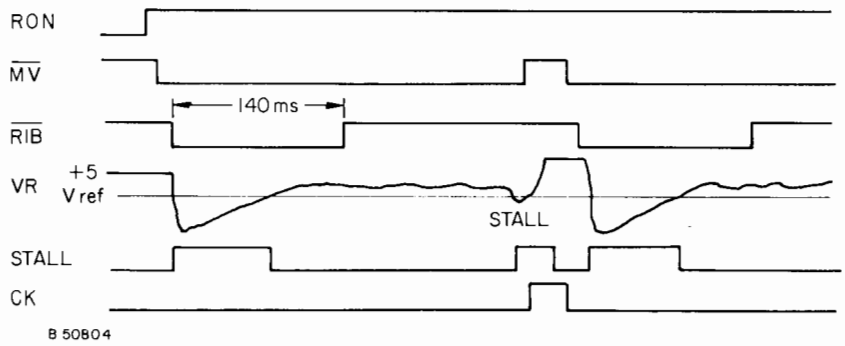
Refer to the A2 schematic diagram, Figure 4-7. The hammer clock ($\overline{HCK}$) signal enables either the HAM 1 signal to the base of Q2 or the HAM Ø signal to the base of Q3. By turning on one of these two transistors, the hammer solenoid will be energized. The HAM Ø signal produces a lower solenoid current, and is used when printing small area characters such as a period, comma, etc. The HAM 1 signal is used when printing all the other characters (except small area characters).

The print intensity switch setting controls the amount of drive applied to the hammer solenoid by Q6.

A2 RIBBON DRIVE CIRCUIT

Refer to the ribbon signal timing diagram below and the A2 schematic diagram (Figure 4-7).

A high ribbon on (RON) signal is required for the ribbon motor to run. The ribbon reverse ($\overline{RIB}$) signal is normally high. $\overline{RIB}$ is low when the ribbon is reversing or when the ribbon is starting to move. When $\overline{RIB}$ is low, printing is inhibited.



A2 PLATEN DRIVE CIRCUIT

Refer to the A2 schematic diagram, Figure 4-7. The platen motor is a stepper motor which has 4 half-windings. Since the center tap of these windings is not used, effectively there are only two motor windings. Each motor winding can be driven by either +24V or −24V. There are two amounts of torque delivered to the platen motor; low torque when the motor is stationary (idle), and high torque for motor movement. There is high torque anytime the printer is printing.

A signal from the logic assembly ($\overline{\text{PHT}}$) controls the high torque to the platen. Low torque is achieved by limiting the current to both stepper motor windings. A 200 ohm resistor, one per winding(R33 and R40), is used to limit the current. To obtain high torque, transistor switches shunt these limiting resistors.

The $\overline{\text{PGP}}$ and PGM lines determine whether +24V ($\overline{\text{PGP}}$) or −24V (PGM) is applied to the motor winding with the green lead (J2 pin 2, on the A2 assembly).

The $\overline{\text{PRP}}$ and PRM lines determine whether +24V ($\overline{\text{PRP}}$) or −24V (PRM) is applied to the motor winding with the red lead (J2 pin 1, on the A2 assembly).

The sequence of torque application to produce motor rotation is indicated below. Each step provides 0.9° of rotation.

PLATEN MOTOR		
STEP	**WINDING 1**	**WINDING 2**
0	+	0
1	+	+
2	0	+
3	−	+
4	−	0
5	−	−
6	0	−
7	+	−
0	+	0

+ = +Voltage
− = −Voltage
0 = No Torque

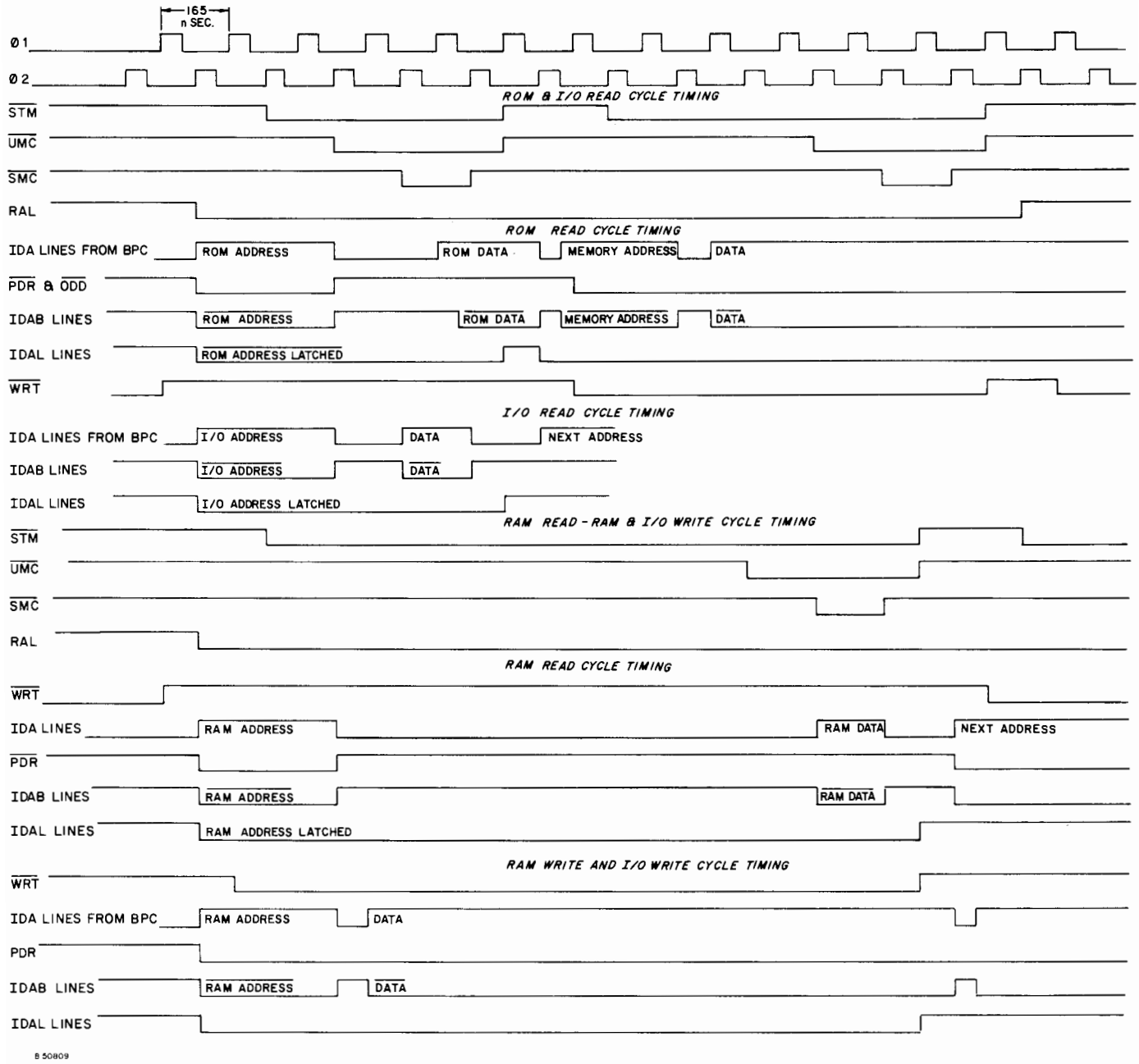


Figure 4-4. Logic Assembly Timing Diagrams

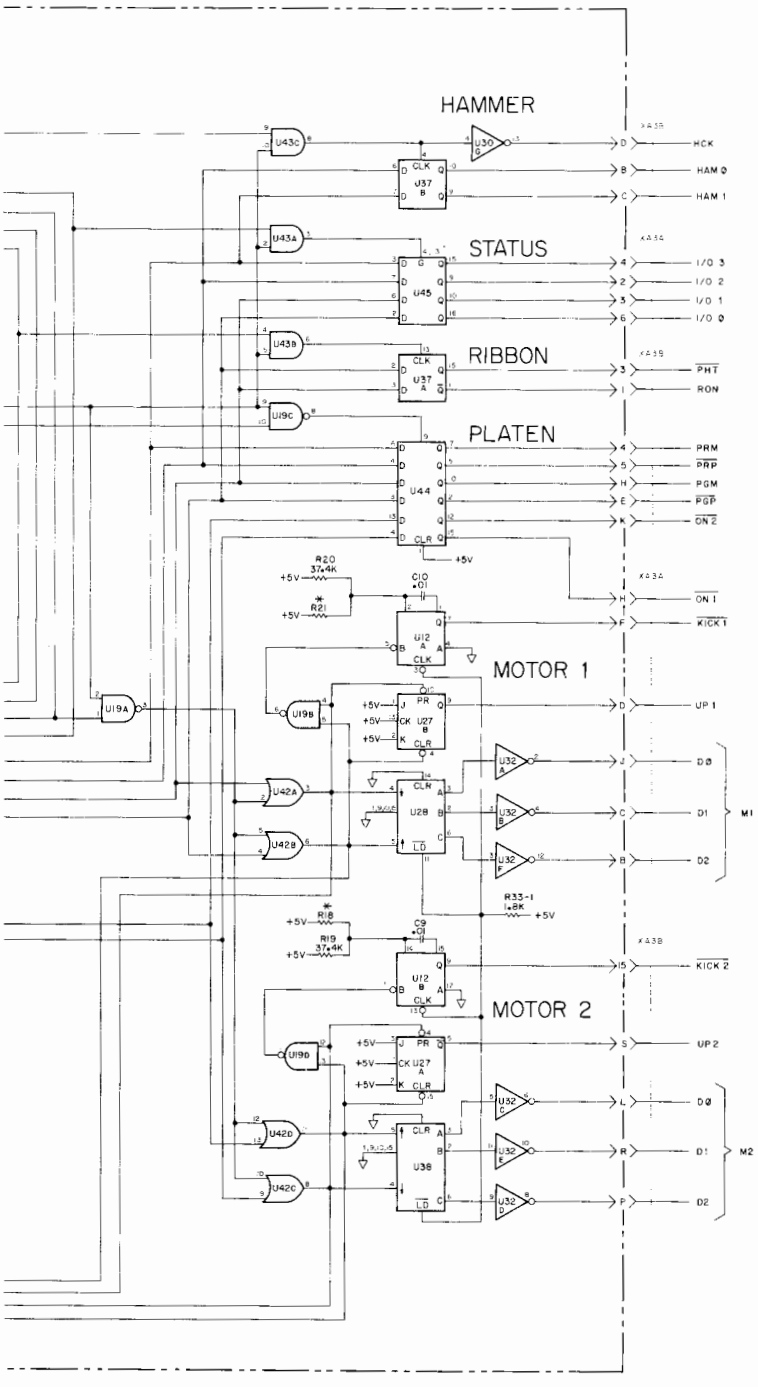
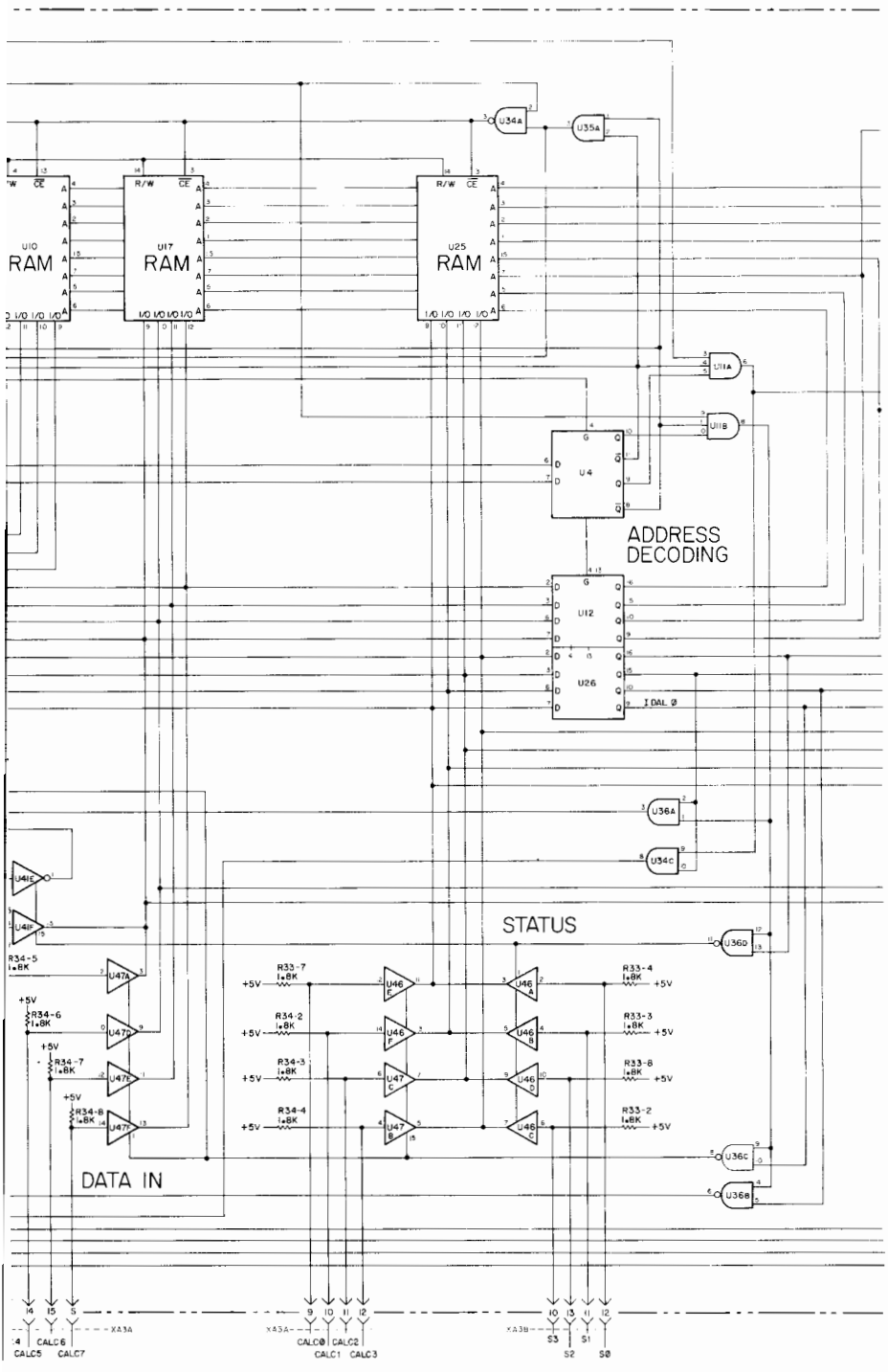
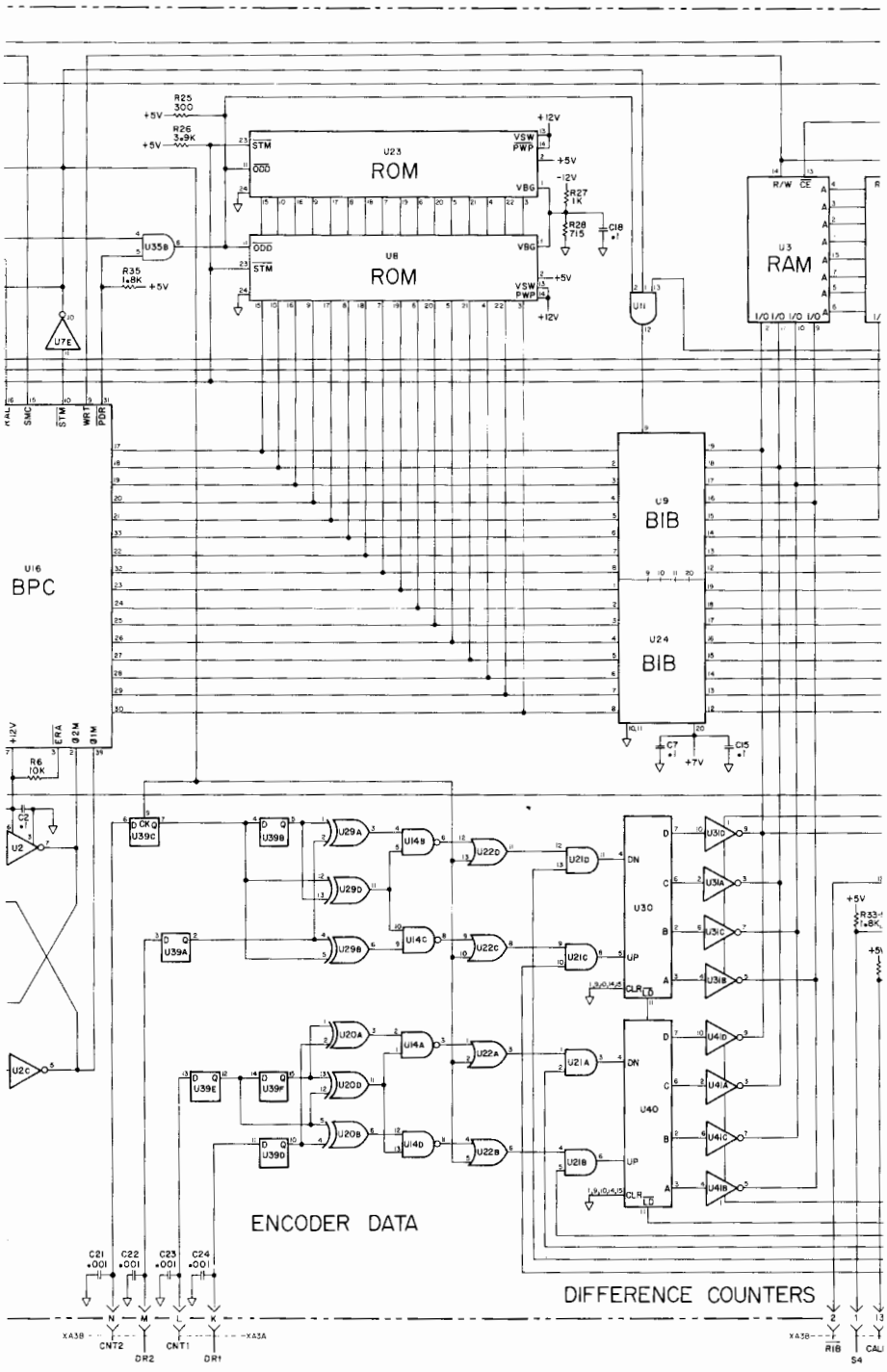
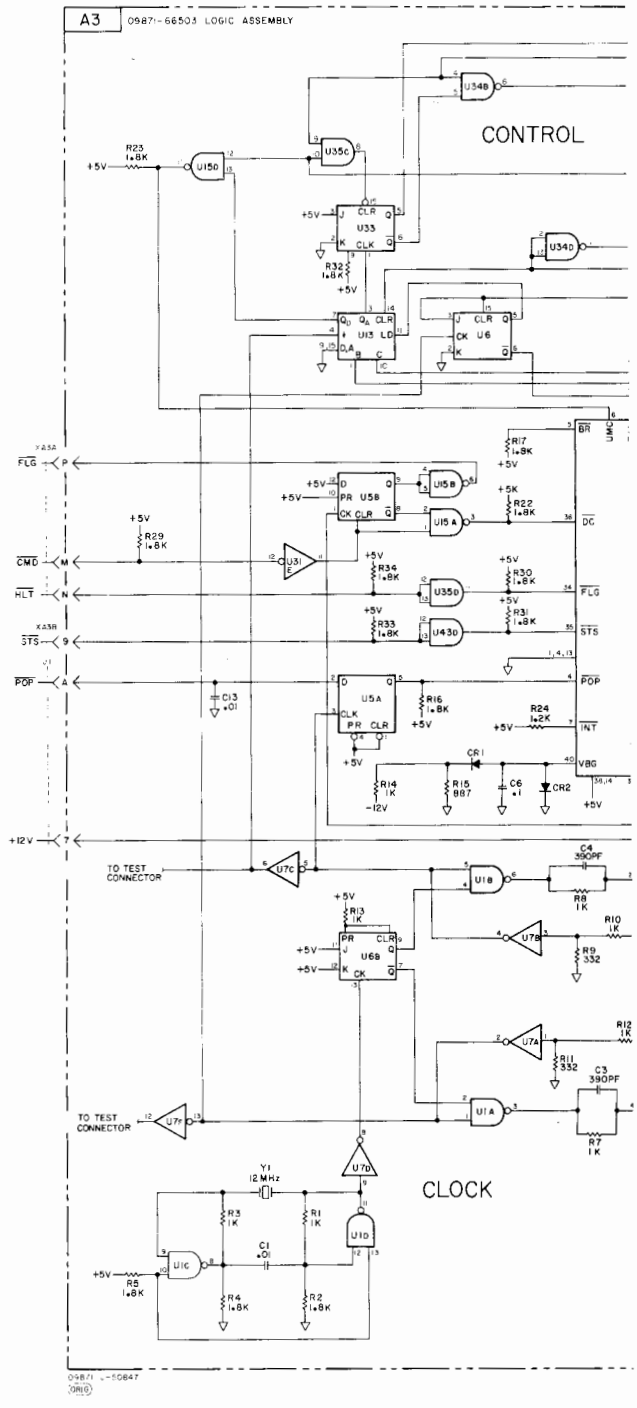
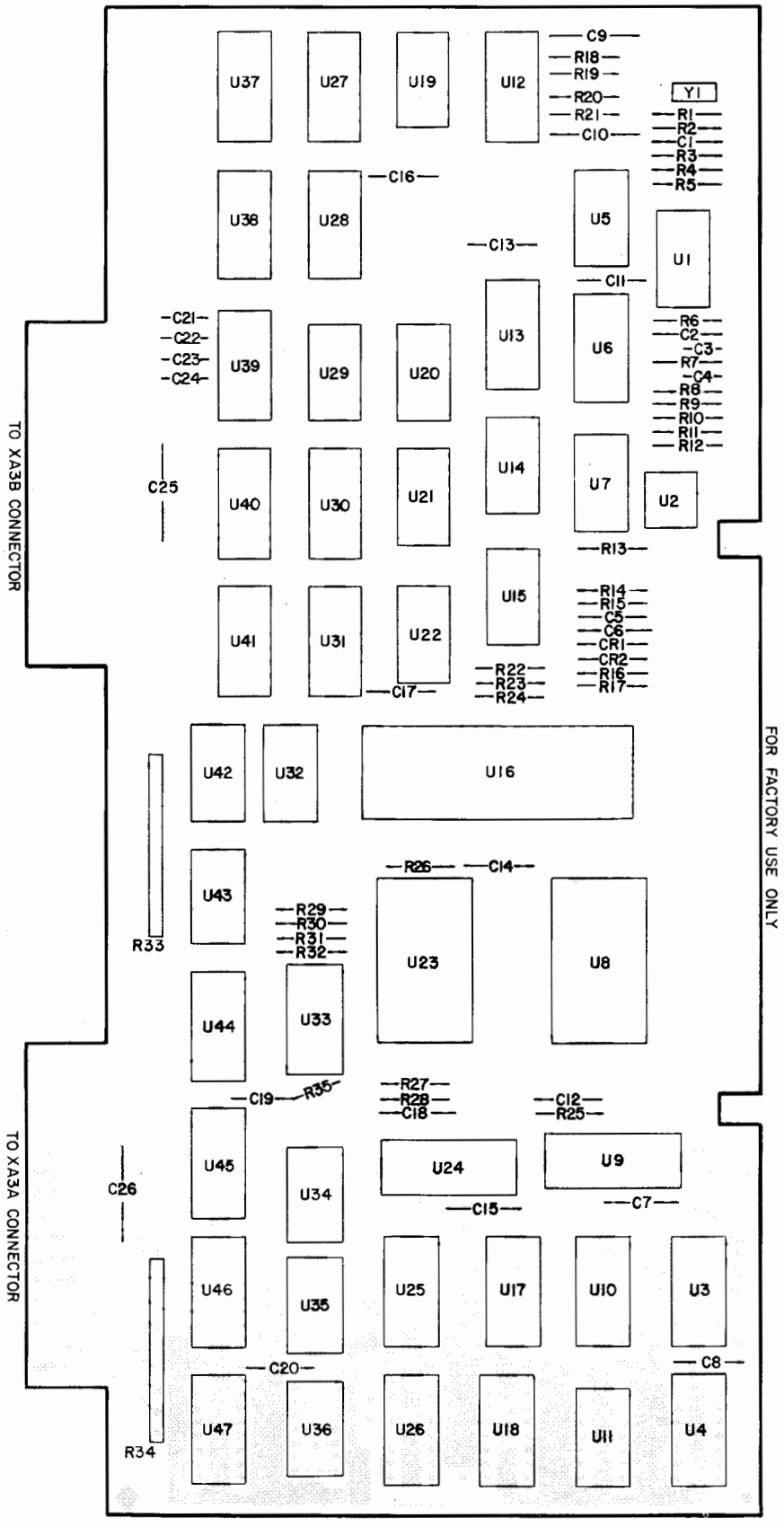


Figure 4-5. A3 Logic Assembly Schematic Diagram


U10
RAM
U17
RAM
U25
RAM
U34A
U35A
U11A
U11B
U4
ADDRESS
DECODING
U12
U26
IDAL Ø
U36A
U34C
U41E
U41F
STATUS
U36D
R34-5
1+8K
U47A
R33-7
1+8K
U46
C
U46
A
R33-4
1+8K
+5V
R34-6
1+8K
U47D
R34-2
1+8K
U46
F
U46
B
R33-3
1+8K
+5V
R34-7
1+8K
U47E
R34-3
1+8K
U47
C
U46
D
R33-8
1+8K
+5V
R34-8
1+8K
U47F
R34-4
1+8K
U47
B
U46
C
R33-2
1+8K
+5V
U36C
U36B
DATA IN
I4
I5
I6
I7
XA3A
CALC5
CALC6
CALC7
I9
I0
I1
I2
XA3A
CALC0
CALC1
CALC2
CALC3
I0
I3
I1
I2
XA3B
S3
S2
S1
S0


U23
ROM
U8
ROM
U35B
U7E
U11
U3
RAM
U9
BIB
U24
BIB
U16
BPC
U30
U40
ENCODER DATA
DIFFERENCE COUNTERS
CNT2
CNT1
DR2
DR1
XA3B
XA3A
R/W
I/O 1/O 1/O 1/O
+12V
+5V
-12V
+7V


A3
09871-66503 LOGIC ASSEMBLY
CONTROL
CLOCK
U34B
U35C
U15D
R23 1.8K
+5V
U33
U34D
R32 1.8K
U3 LD
U6
R17 1.8K
BR
FLG
U15B
U15A
R22 1.8K
DC
R29 1.8K
CMD
U31
R34 1.8K
U35D
R30 1.8K
HLT
R33 1.8K
U43D
R31 1.8K
STS
POP
U5A
C13 .01
R16 1.8K
R24 1.2K
INT
CR1
R14 1K
-12V
R15 887
C6 .1
CR2
VBG
+12V
TO TEST CONNECTOR
U7C
U1B
C4 390PF
R8 1K
U6B
R13 1K
U7B
R10 1K
R9 332
U7A
R12 1K
R11 332
C3 390PF
U1A
R7 1K
U7D
Y1 12 MHz
R3 1K
R1 1K
U1D
U1C
C1 .01
R5 1.8K
R4 1.8K
R2 1.8K



Component Designator: 09871-66503

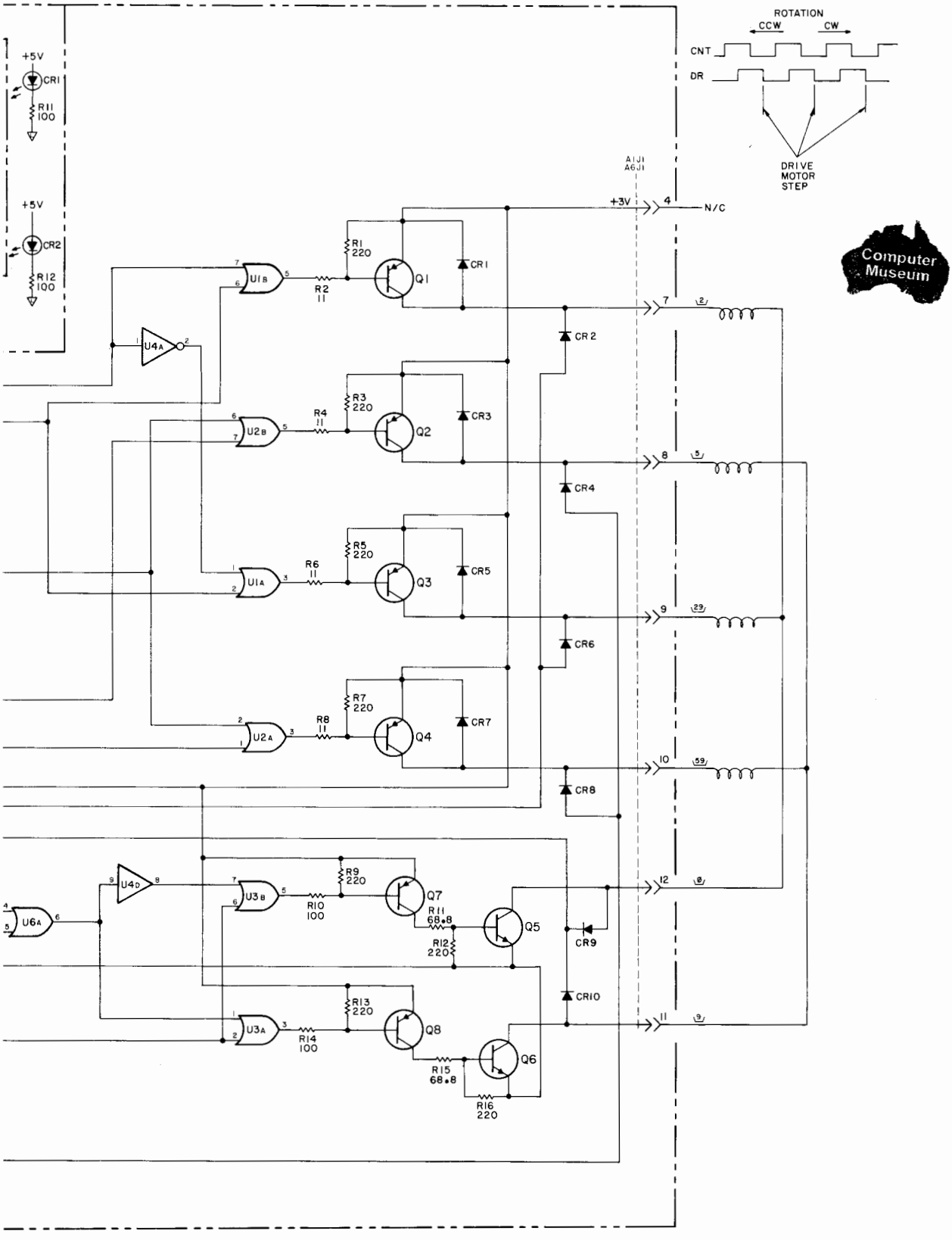
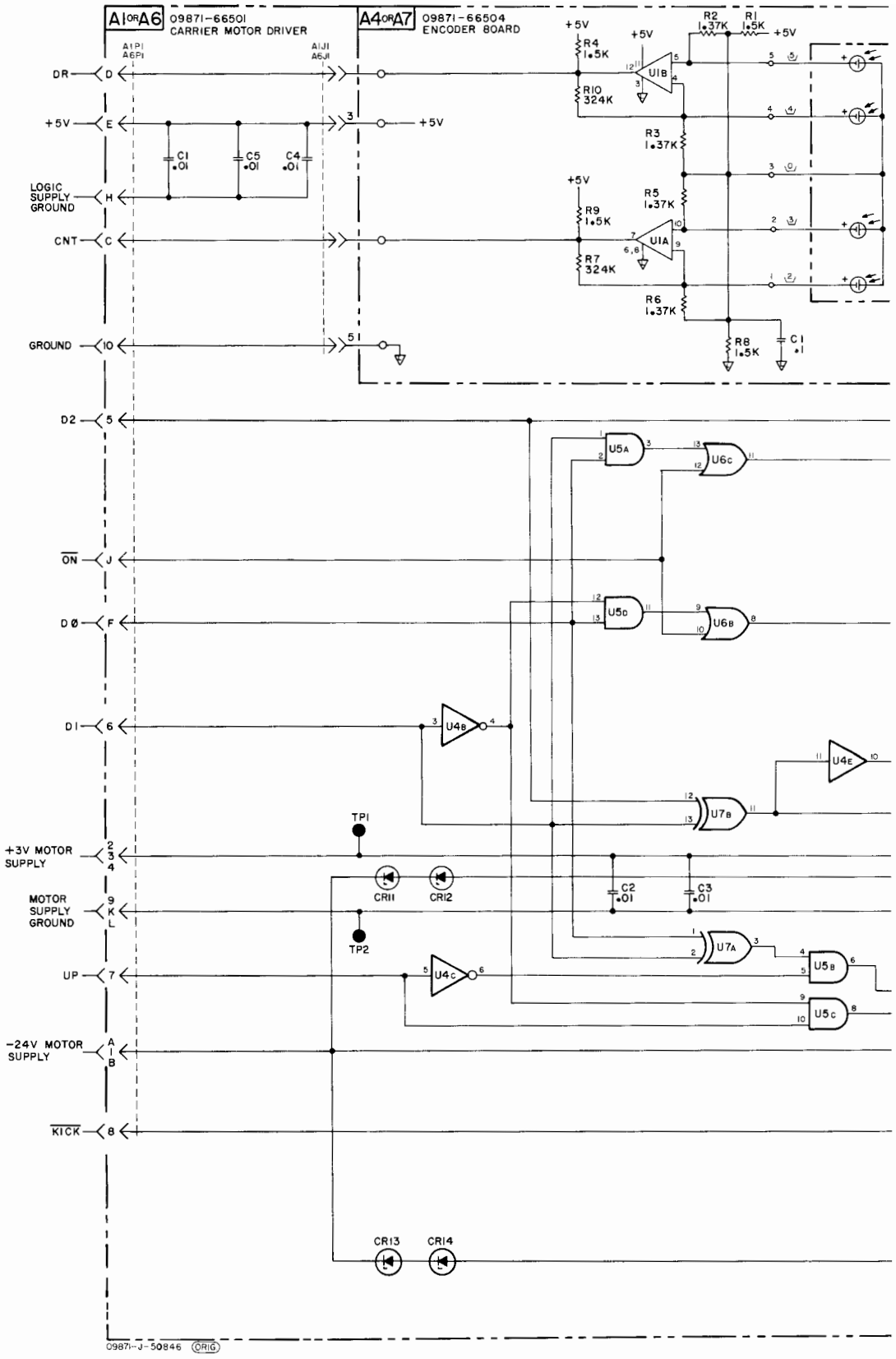
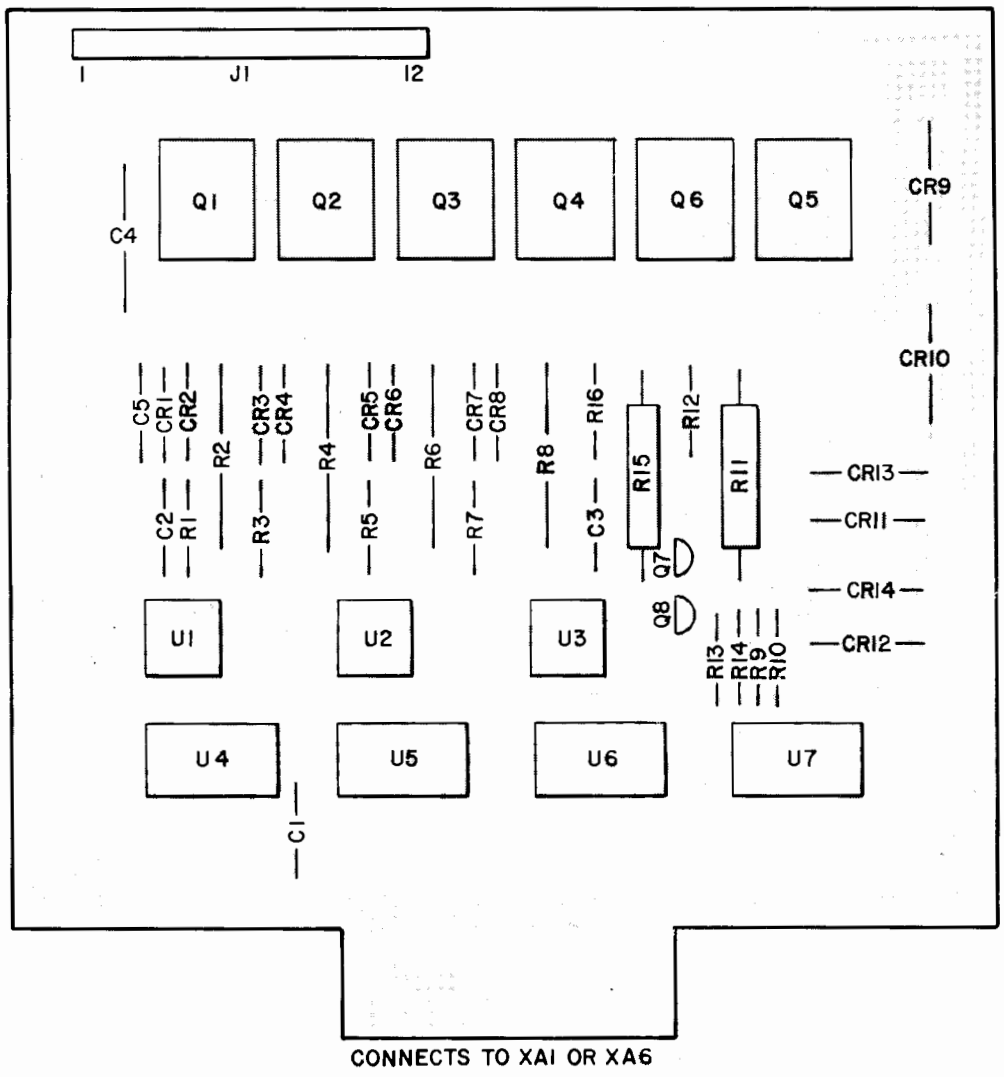
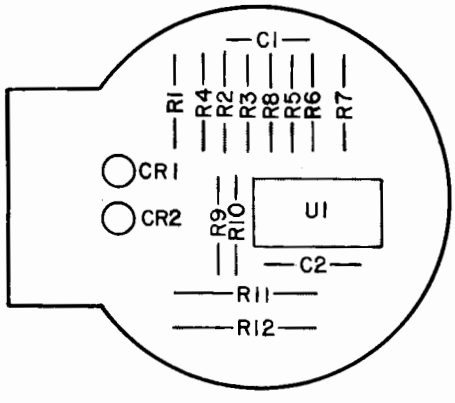


Figure 4-6. A1, A6, A4, A7, Motor Drive Assembly Schematic Diagram


A1 OR A6 09871-66501 CARRIER MOTOR DRIVER
A4 OR A7 09871-66504 ENCODER BOARD
A1P1 A6P1
A1J1 A6J1
DR
+5V
LOGIC SUPPLY GROUND
CNT
GROUND
D2
ON
DØ
D1
+3V MOTOR SUPPLY
MOTOR SUPPLY GROUND
UP
-24V MOTOR SUPPLY
KICK
C1 .01
C5 .01
C4 .01
R4 1.5K
R10 324K
R2 1.37K
R1 1.5K
R3 1.37K
R5 1.37K
R9 1.5K
R7 324K
R6 1.37K
R8 1.5K
C1 .1
U1B
U1A
U5A
U6C
U5D
U6B
U4B
U4E
U7B
U4C
U7A
U5B
U5C
TP1
TP2
CR11
CR12
CR13
CR14
C2 .01
C3 .01
09871-J-50846 ORIG



Component Designator: 09871-66501



Component Designator: 09871-66504

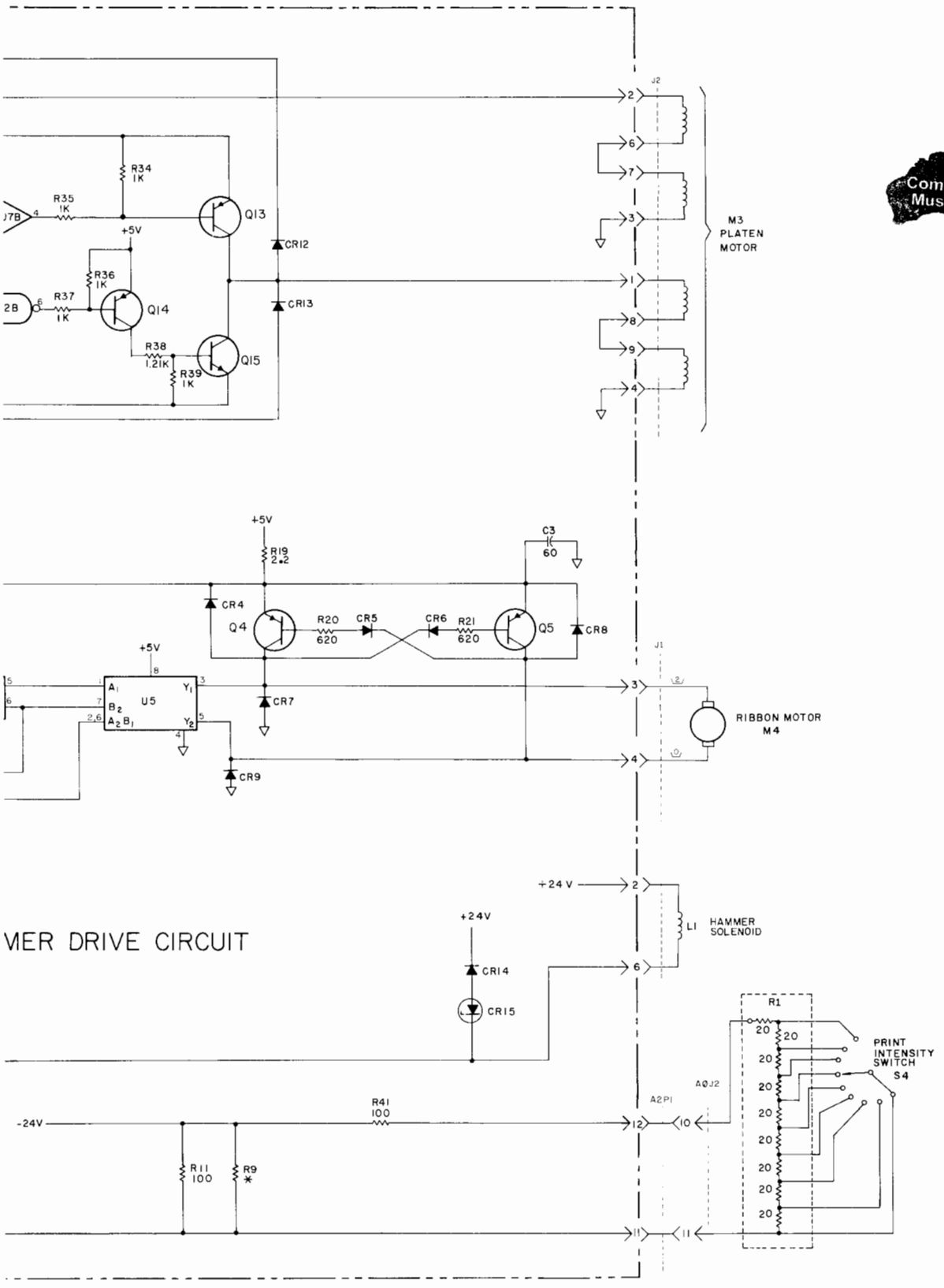
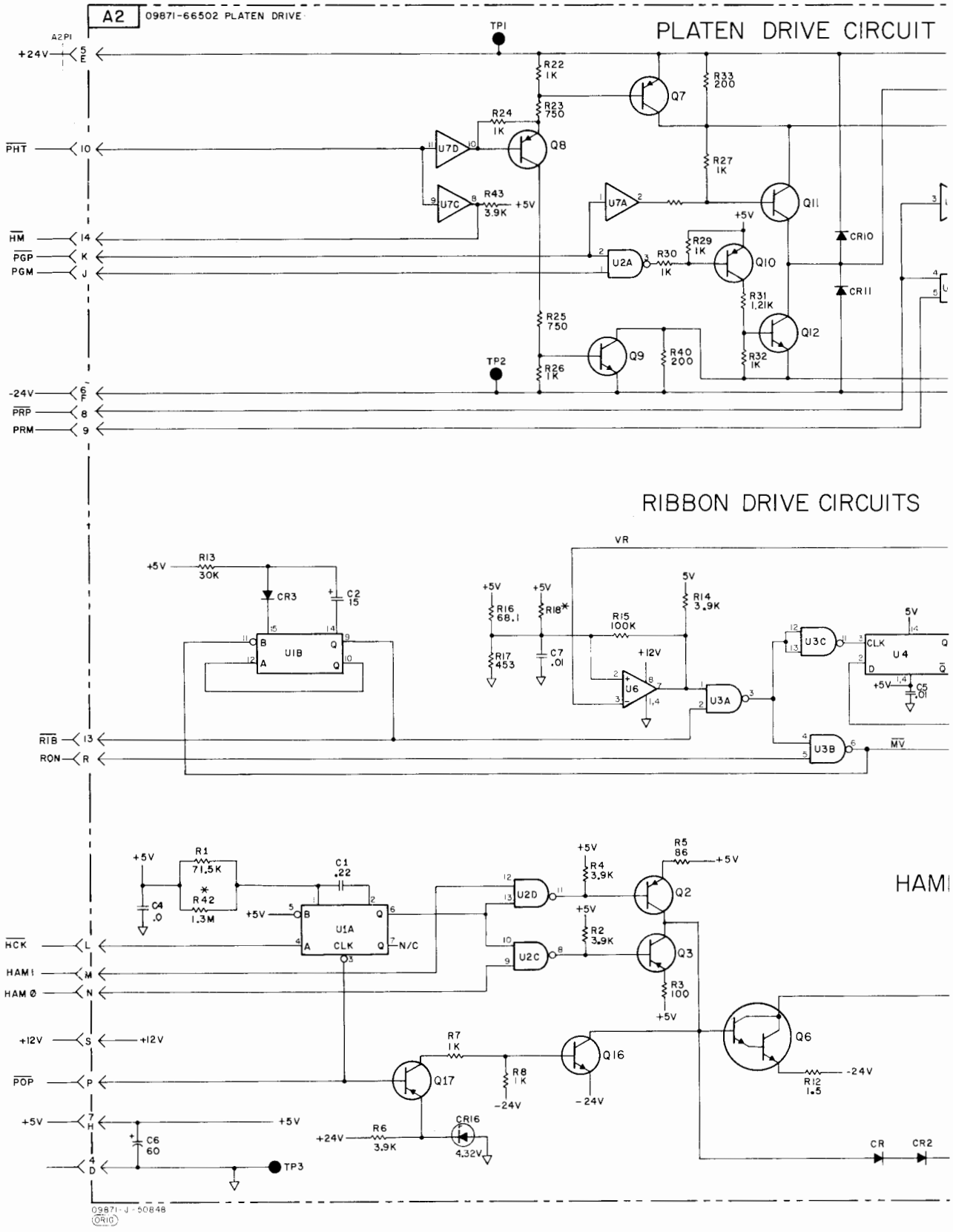
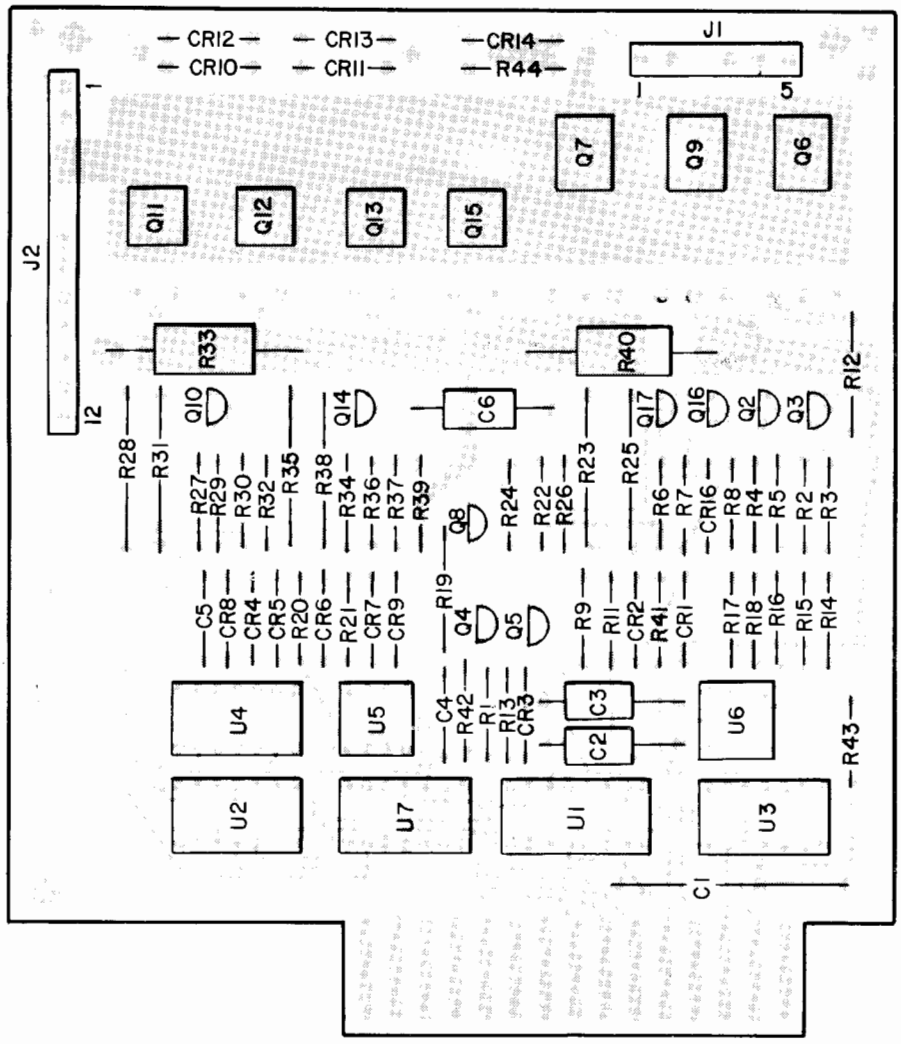


Figure 4-7. A2 Platen Drive Assembly Schematic Diagram


A2
09871-66502 PLATEN DRIVE
PLATEN DRIVE CIRCUIT
A2P1
+24V
PHT
HM
PGP
PGM
-24V
PRP
PRM
TP1
TP2
R22 1K
R23 750
R24 1K
R25 750
R26 1K
R27 1K
R29 1K
R30 1K
R31 1.21K
R32 1K
R33 200
R40 200
R43 3.9K
+5V
Q7
Q8
Q9
Q10
Q11
Q12
U7D
U7C
U7A
U2A
CR10
CR11
RIBBON DRIVE CIRCUITS
VR
R13 30K
CR3
C2 15
U1B
R16 68.1
R17 453
R18*
R15 100K
R14 3.9K
C7 .01
+12V
U6
U3A
U3B
U3C
U4
CLK
C5 .01
MV
RIB
RON
HAMI
R1 71.5K
R42 1.3M
C1 .22
C4 .0
U1A
N/C
HCK
HAM1
HAM Ø
U2D
U2C
R4 3.9K
R2 3.9K
R5 86
R3 100
Q2
Q3
Q6
Q16
Q17
R7 1K
R8 1K
R12 1.5
-24V
+12V
POP
C6 60
R6 3.9K
CR16
4.32V
TP3
CR
CR2
09871-J-50848
ORIG



A2P1

Component Designator: 09871-66502

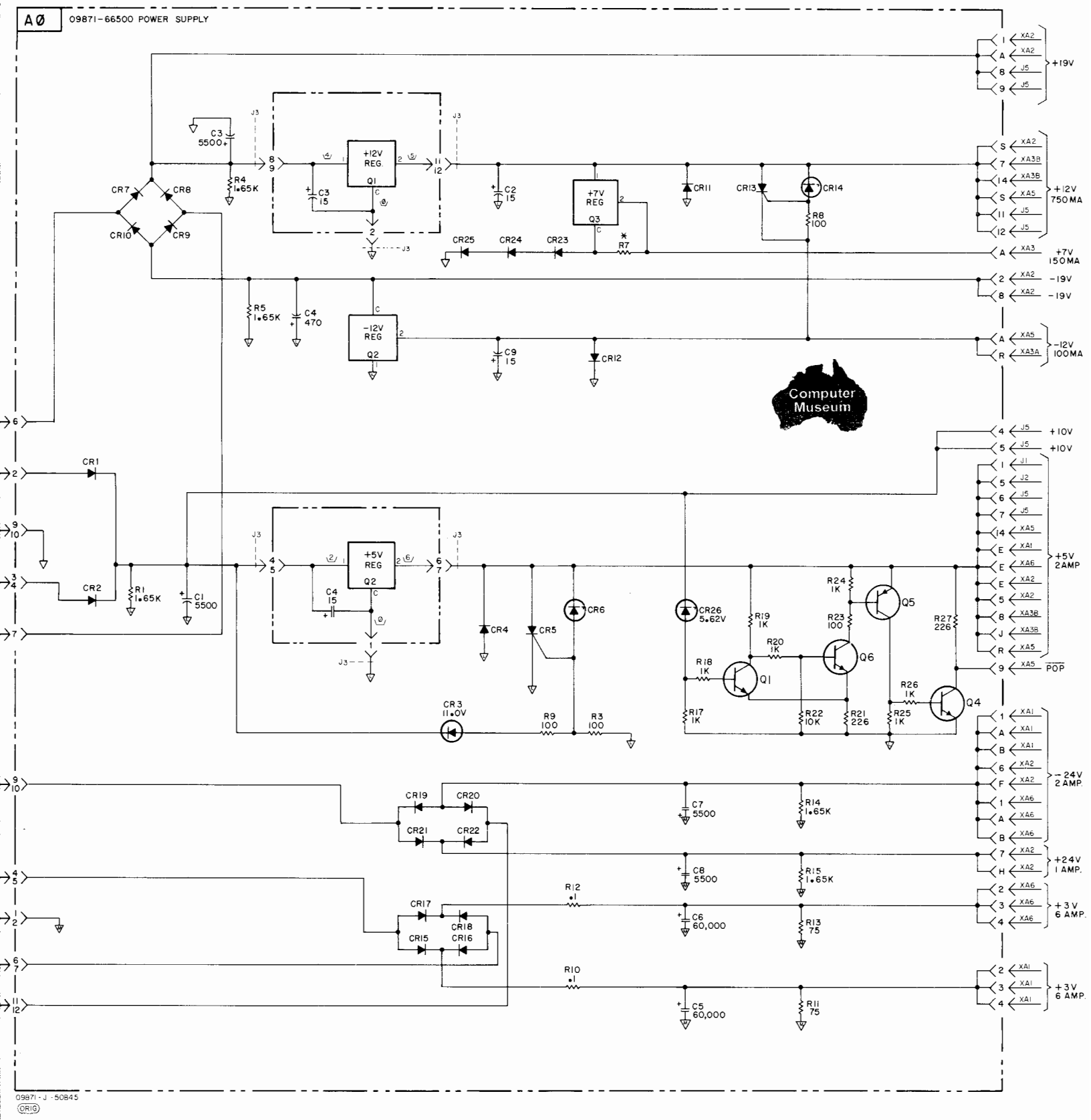
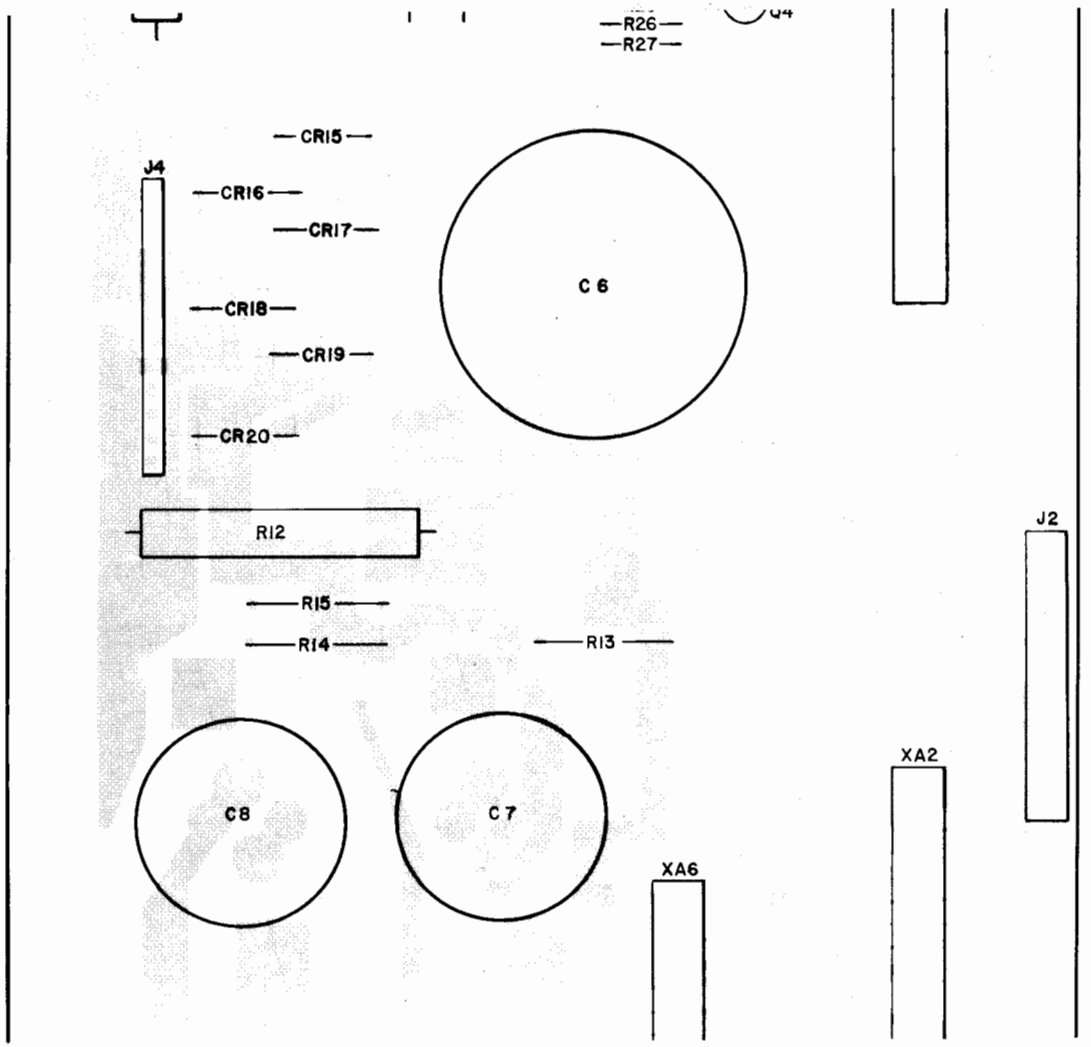
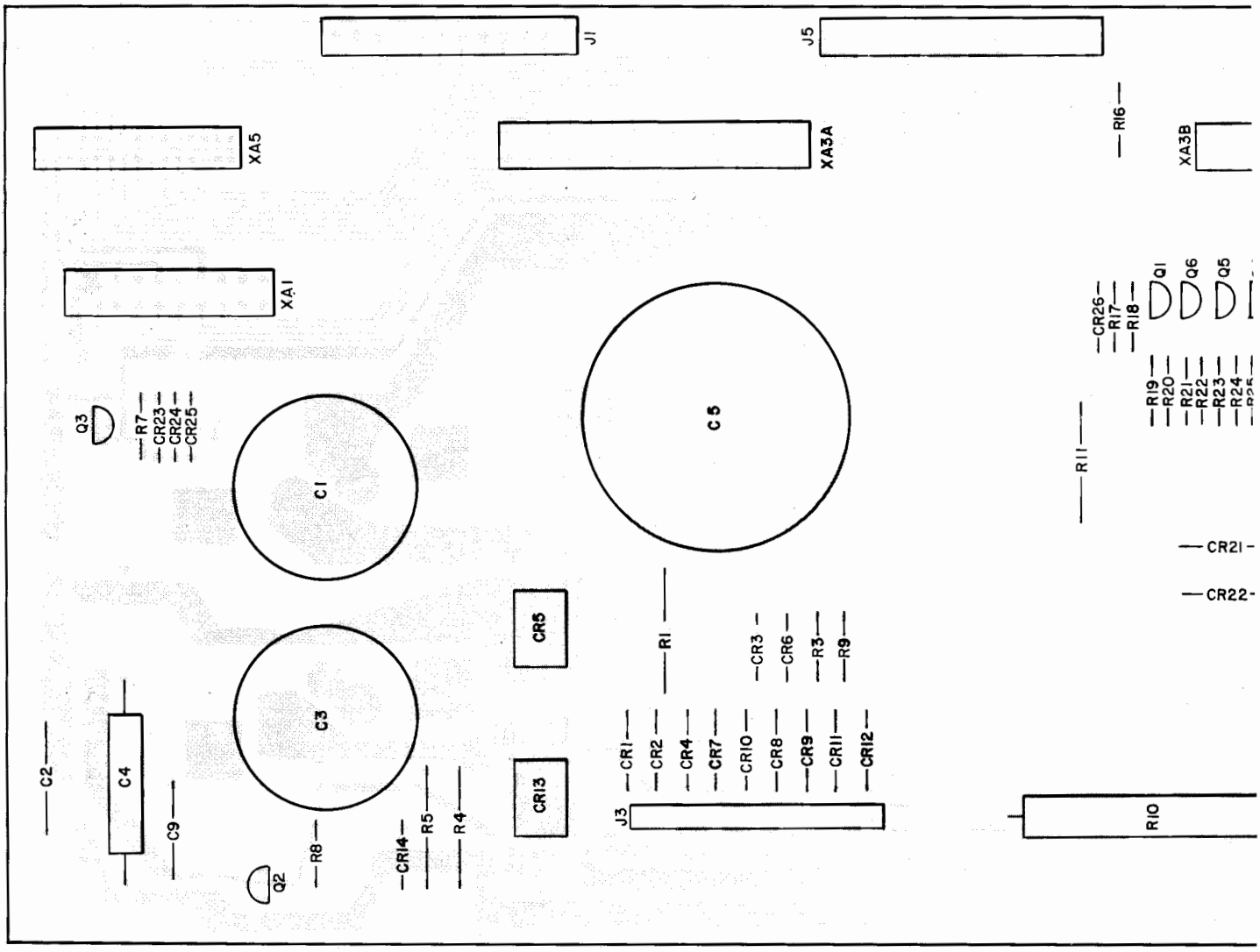


Figure 4-8. AØ Power Supply Schematic Diagram (part of AØ)

S2A
220V
120V
240V
120V
S2B
LINE
FILTER
Z1
LINE
S1
F1
S2A
S2B
B1
FAN
T1
1
2
3
4
5
6
7
8
9
10


R26
R27
Q4
CR15
J4
CR16
CR17
C 6
CR18
CR19
CR20
R12
J2
R15
R14
R13
XA2
C8
C7
XA6



Component Designator: 09871-66500

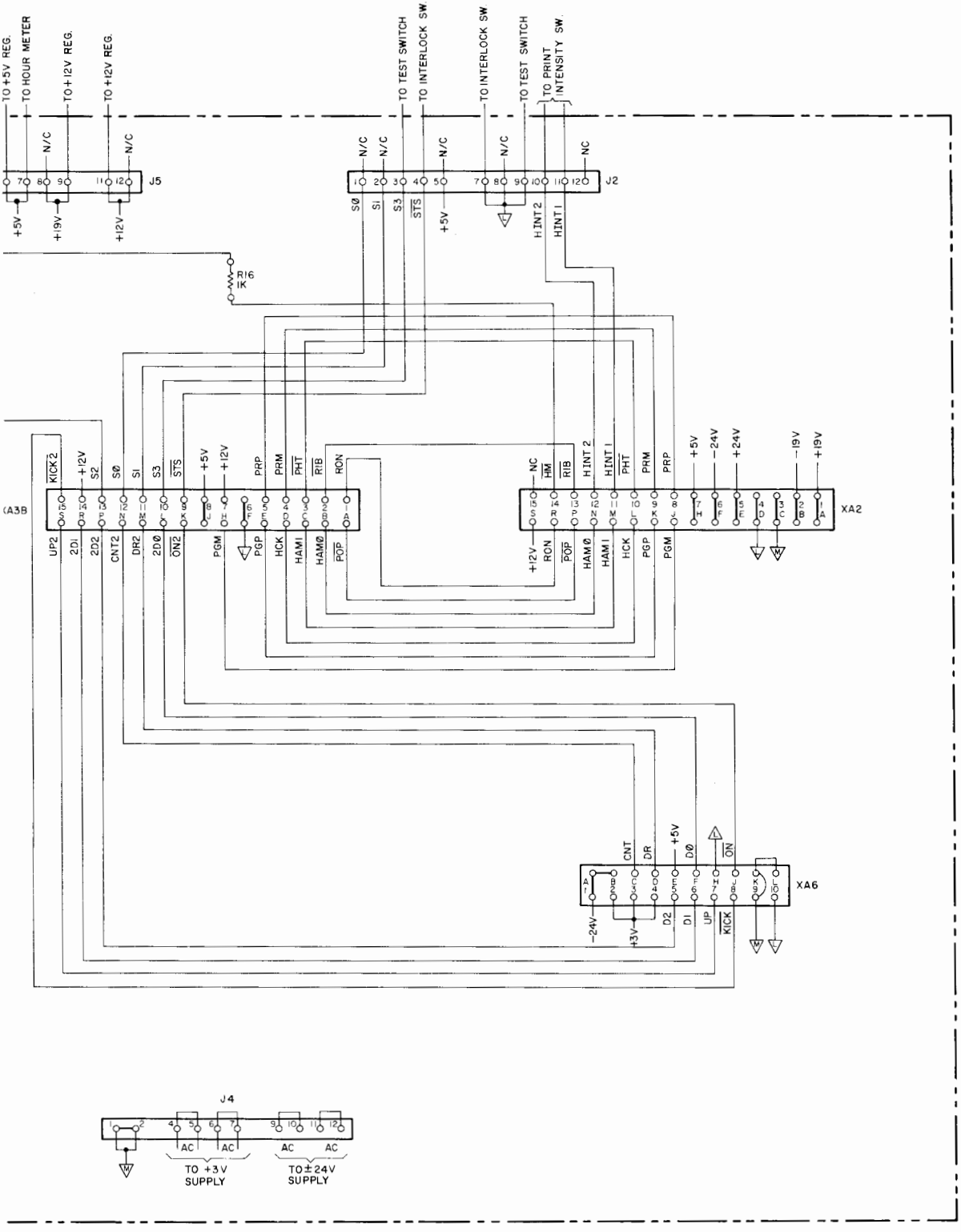
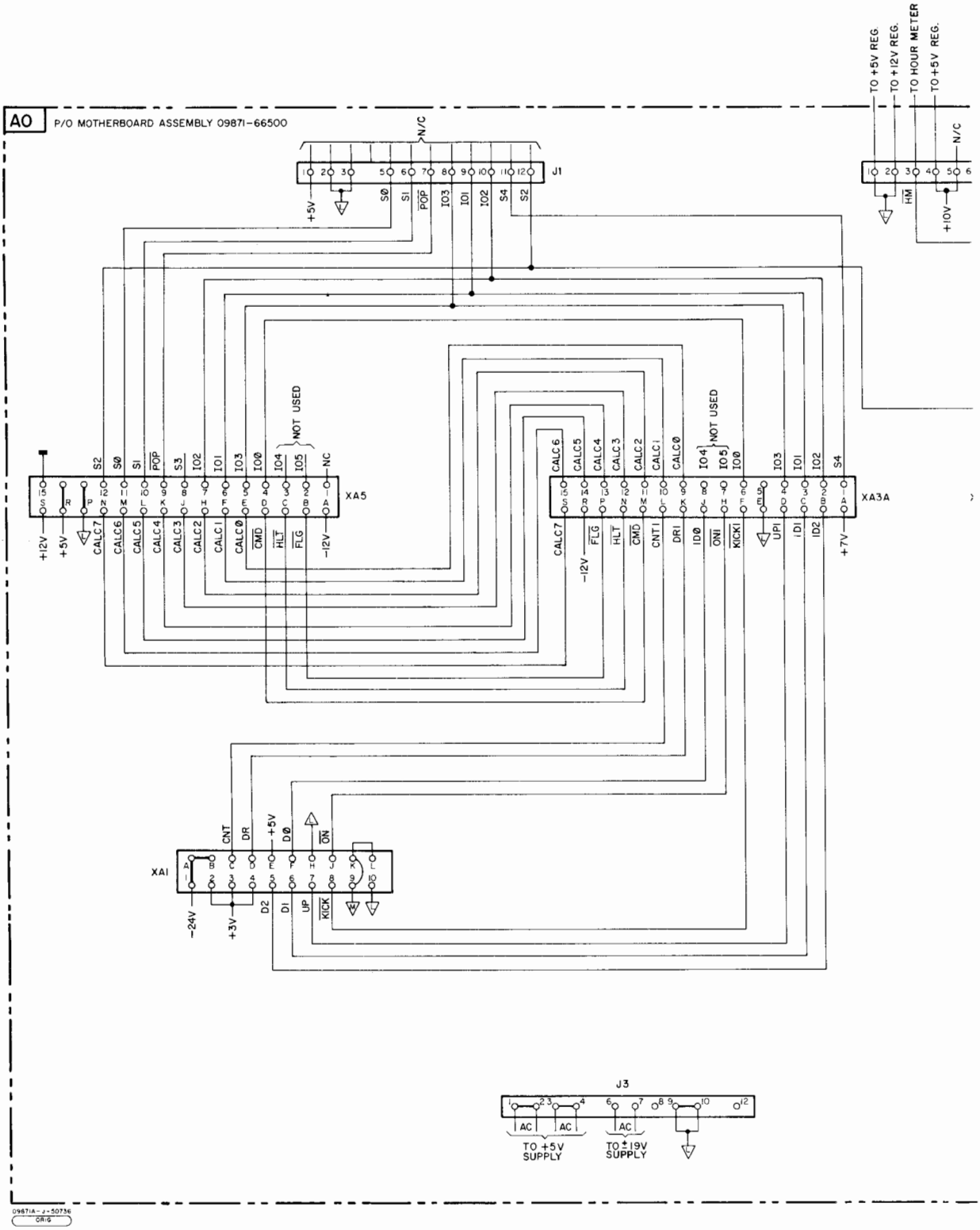


Figure 4-9. AØ Interconnecting Lines Schematic Diagram


A0
P/O MOTHERBOARD ASSEMBLY 09871-66500
TO +5V REG.
TO +12V REG.
TO HOUR METER
TO +5V REG.
N/C
J1
+5V
S0
S1
POP
IO3
IO1
IO2
S4
S2
HM
+10V
XA5
XA3A
NOT USED
+12V
CALC7
CALC6
CALC5
CALC4
CALC3
CALC2
CALC1
CALC0
CMD
HLT
FLG
-12V
NC
IO4
IO5
IO0
CALC7
CALC6
CALC5
CALC4
CALC3
CALC2
CALC1
CALC0
-12V
FLG
HLT
CMD
CNT1
DR1
ID0
ONI
KICK1
UPI
ID1
ID2
+7V
XA1
CNT
DR
+5V
D0
ON
-24V
+3V
D2
D1
UP
KICK
J3
AC
AC
AC
TO +5V SUPPLY
TO ±19V SUPPLY
09871A-J-50736
ORIG

CHAPTER 5

MAINTENANCE

INTRODUCTION

This chapter contains procedures which describe cleaning the printer, making mechanical and electrical checks and accessing the printer's assemblies.

CLEANING THE PRINTER

The printer does not require a normal schedule of preventive maintenance, however the following items should be cleaned when they appear to need cleaning.

Character Disk

To clean the character disk; first remove the disk from the printer (see Chapter 1). Then use a heavy-duty household cleaner and a typewriter brush to remove any ribbon particles and ink from the characters. Reinstall the character disk after cleaning.

Printer Cabinet

The printer's cabinet should be cleaned with a mild detergent and warm water. Do not allow water to enter inside the cabinet, use a damp cloth only. Switch the printer OFF; then remove the front cover by pulling the cover forward and off the printer. Clean the carrier assembly and the area around the belt; then replace the cover.

ASSEMBLY ACCESS

WARNING
THIS UNIT HAS DANGEROUS LINE VOLTAGES PRESENT AT VARIOUS POINTS WITHIN THE PRINTER. USE EXTREME CAUTION WHEN WORKING ON THE UNIT WITH THE COVER REMOVED, OR SERIOUS INJURY OR DEATH TO PERSONNEL MAY RESULT.

Top Cover Removal

Most of the assemblies can be accessed by removing the printer's top cover. To remove the top cover use the following procedure.

1. Switch the printer OFF; then remove the power cord and the interface cable from the printer.
2. Remove the front cover by pulling the cover forward and off the printer.
3. Remove the platen knob and the paper release lever.

4. Five screws secure the top cover to the printer (Refer to Figure 5-1). Remove the screws by placing the printer at the edge of a table to access the screws while the printer is on its feet (Figure 5-2).
5. Move the left side of the cover back to clear the components on the rear panel (Figure 5-3).
6. Lift the left side of the cover up; then move the cover up and to the right, off the printer.

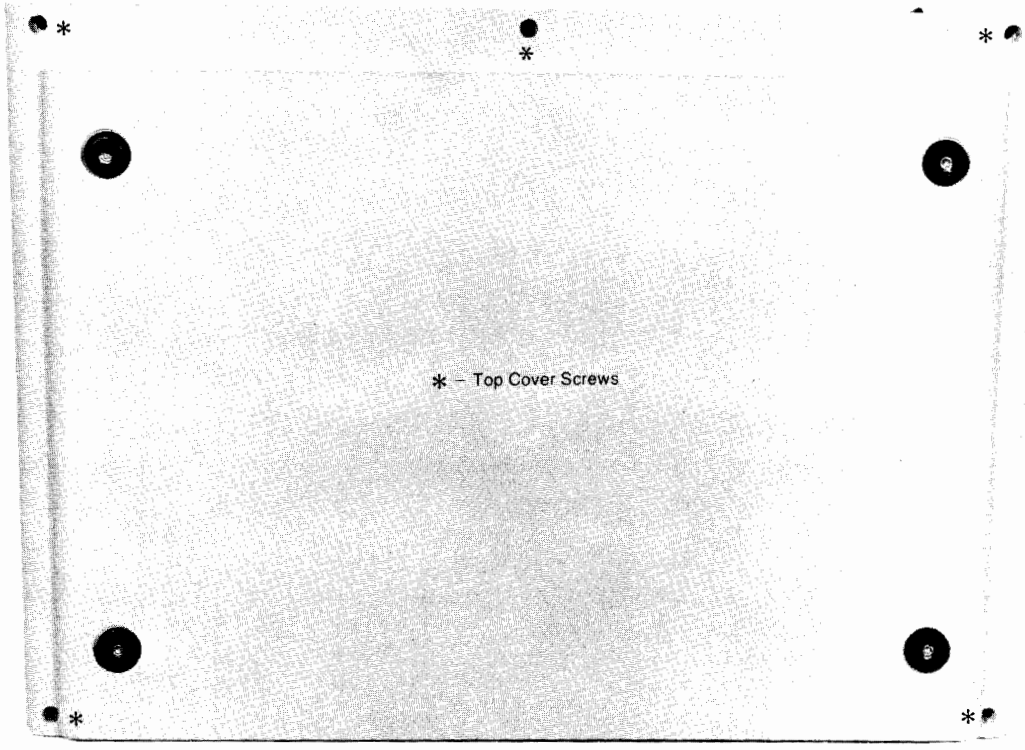
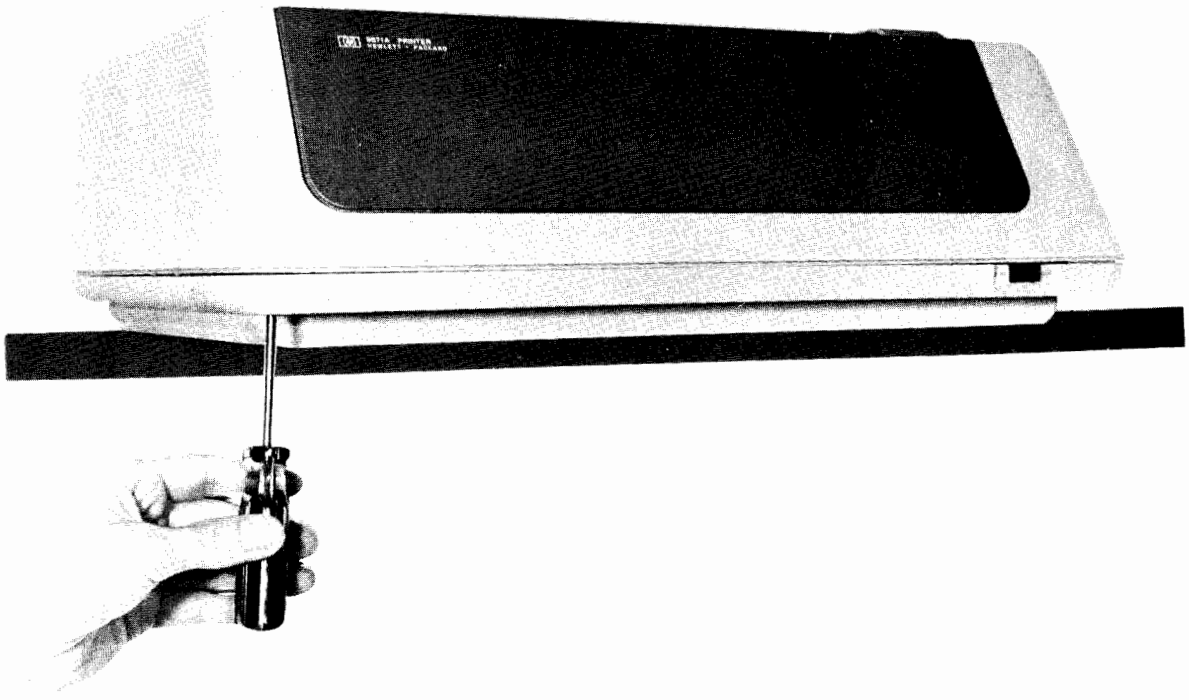
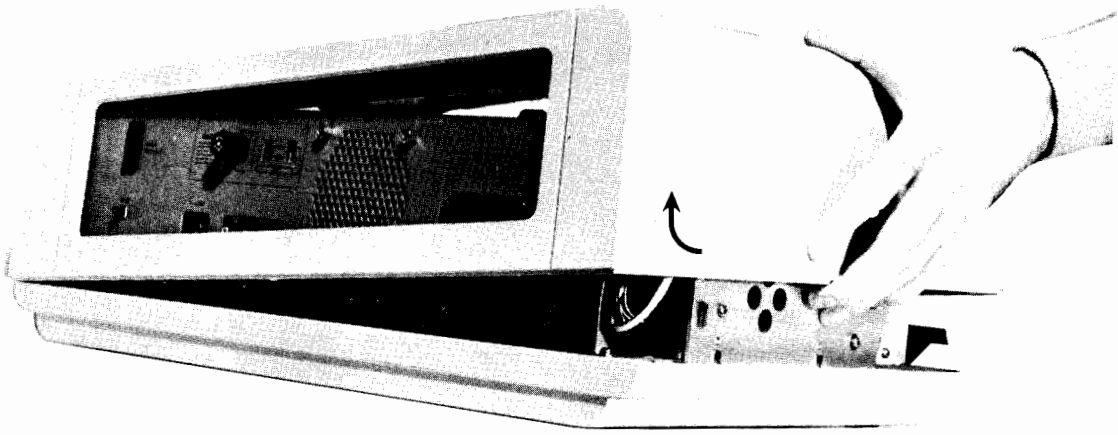


Figure 5-1. Top Cover Screws



50823

Figure 5-2. Removing the Top Cover Screws

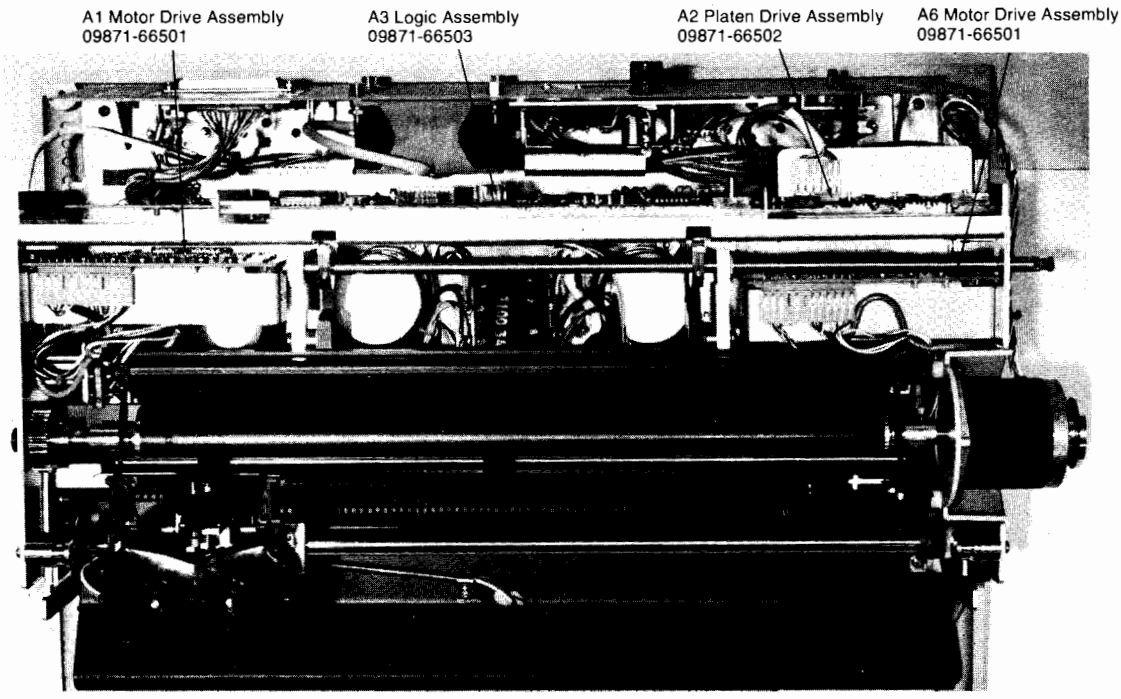


B-50824

Figure 5-3. Removing the Top Cover

Removing the Printed Circuit Assemblies

The printer's PC assemblies are shown in Figure 5-4. The following procedures describe each assembly's removal.



B-50825

Figure 5-4. Printer PC Assemblies

CAUTION

Remove AC power before removing or installing any PC assembly. Damage to the assembly components can result.

A3- Push outward on the colored extractors to separate the assembly from its connector; then pull the assembly up out of the printer.

A2- Remove the two plugs which connect to the assembly. Push outward on the colored extractors to separate the assembly from its connector; then pull the assembly up out of the printer.

A1 - A6 -

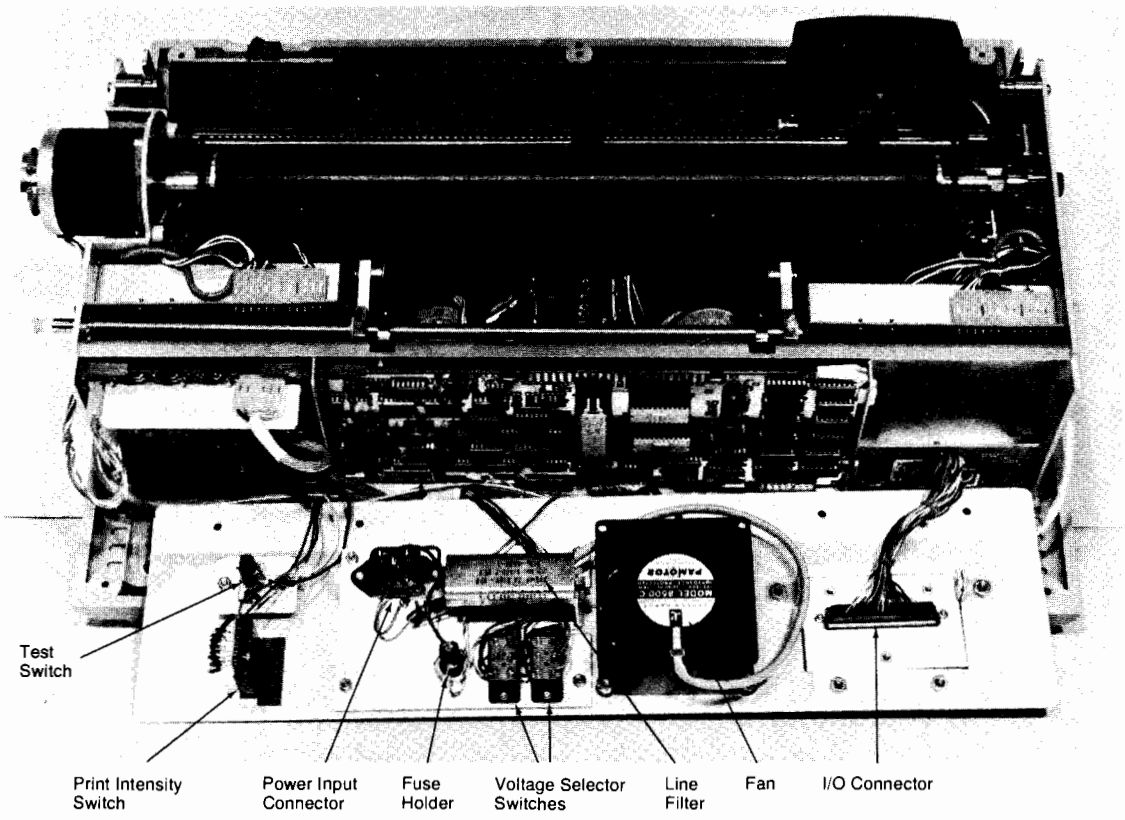
- To remove either the A1 or A6 assembly, first remove the screws that hold the heat sink to the printer chassis.
- Remove the plug which connects to the assembly.
- Pull the assembly up and out of the printer.

When replacing a PC assembly, ensure that it is properly installed in its guides.

Rear Panel

Once the top cover is removed, the rear panel can be loosened for easy access to the rear panel components.

- Ensure that the ac power cord is disconnected.
- Remove the 6 screws that hold the rear panel to the printer's frame.
- Carefully tilt the panel back to access the rear panel components (Figure 5-5). It may be necessary to disconnect the plugs on the motherboard to relieve stress on the rear panel wires.



B-50826

Figure 5-5. Rear Panel Components

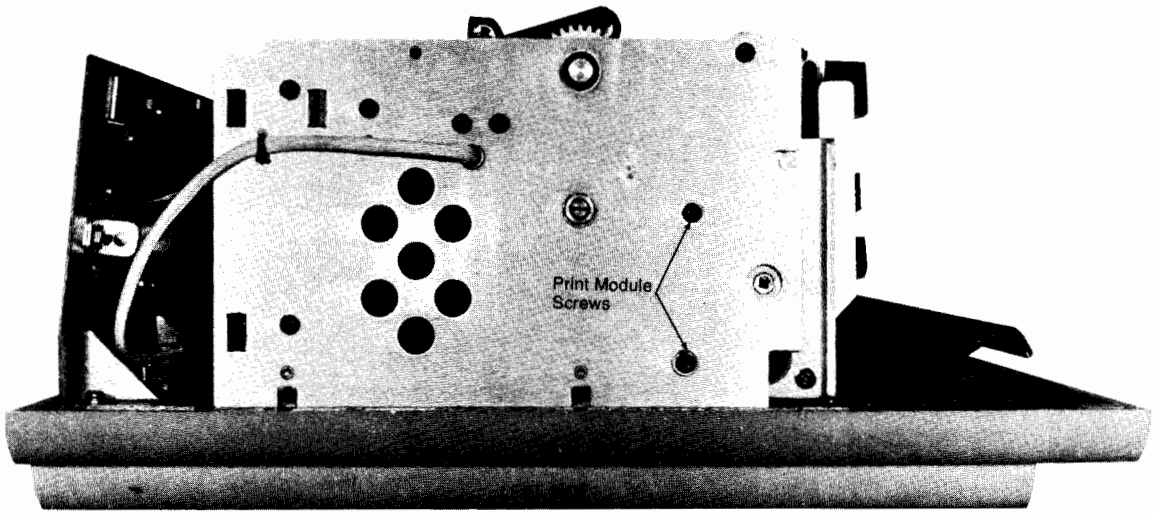
Print Module

Once the top cover is removed, the print module can be removed.

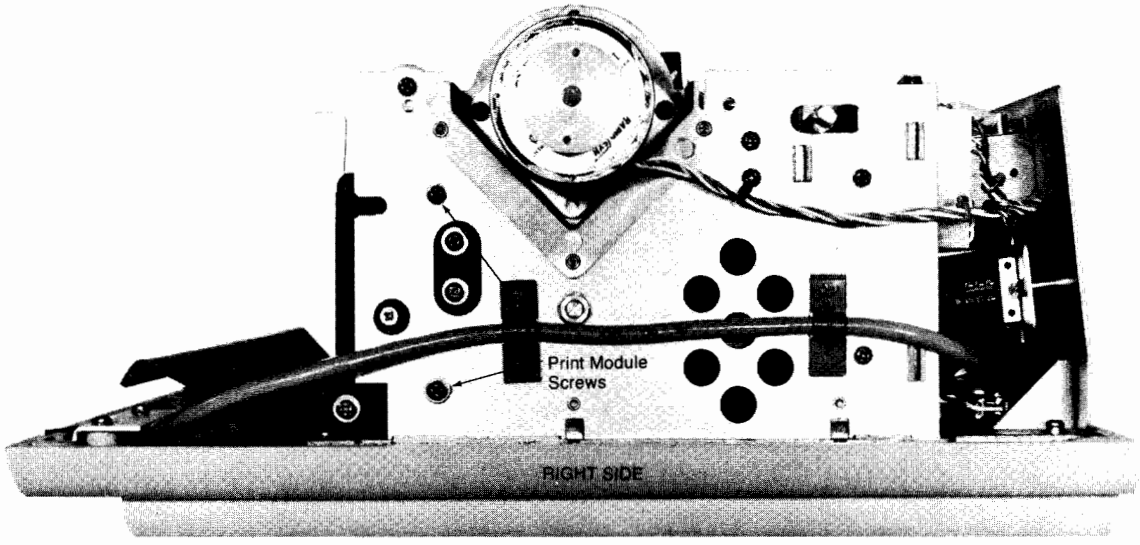
- Ensure that no power is applied to the printer.
- Disconnect the carrier's cable connector at the front center of the printer.
- Disconnect the plug on each motor drive assembly (A1 and A6).

- Remove the two screws on each side of the module that hold it to the frame (Figure 5-6).
- Move the print module forward, tilting the top of the assembly back so the drive motors will clear other assemblies.
- Guide the motor cables and connectors so they will not snag as the module is removed.

> **NOTE**
> The print module must be checked for proper character disk-to-platen spacing when installing the module. Refer to the Character Disk to Platen Spacing Check in this chapter.



B-50827



B-50828

Figure 5-6. Print Module Mounting Screws

Platen

To remove the platen and the platen drive motor; first remove the top cover.

- Disconnect the platen motor cable which plugs into the platen drive assembly (A2).
- Position the paper release lever forward and raise the paper bail.

- Loosen the two allen screws that hold the platen motor to the platen.
- Remove the two screws holding the platen motor to the chassis and remove the motor.

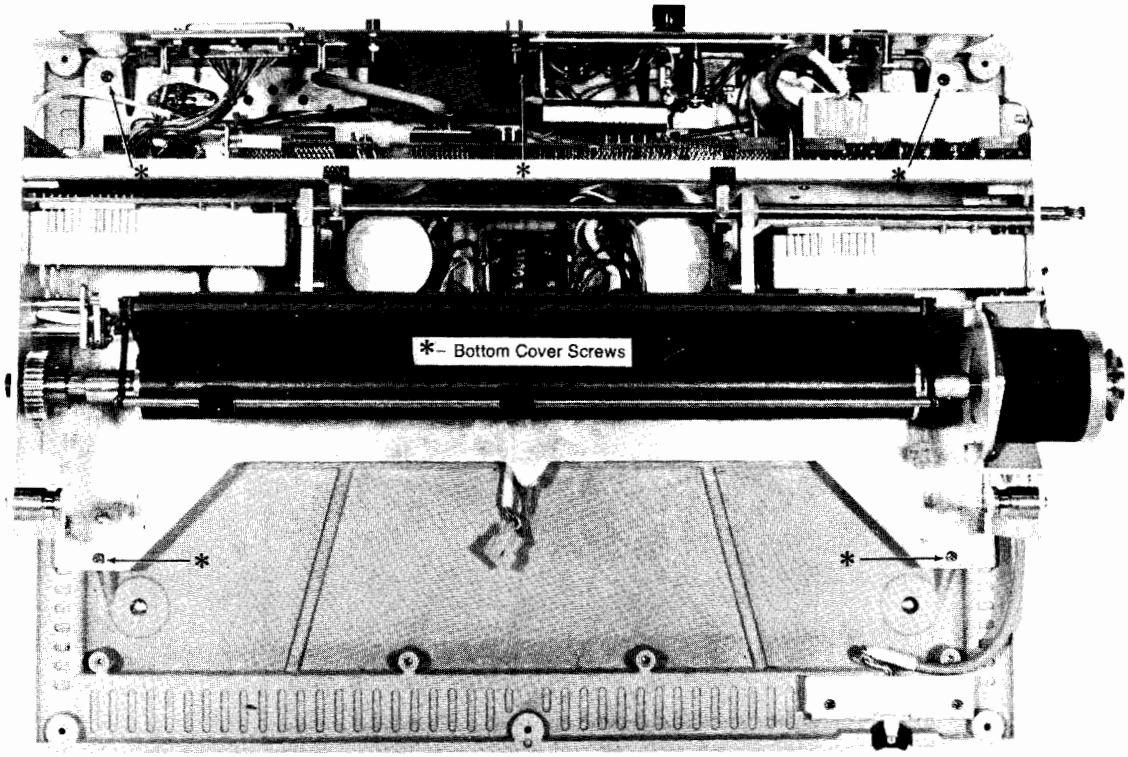
> **CAUTION**
> The platen motor is connected to the platen by a flexible coupling. Always remove the motor from the platen to prevent damage to the coupling.

- Slide the platen to the right and remove it.

Bottom Cover

Remove the bottom cover to provide access to the power supply (AØ) and the paper guide assembly screws.

- To remove the bottom cover, first remove the top cover.
- Remove the five screws which hold the chassis to the bottom cover (Figure 5-7).
- Remove the two screws holding the power switch to the bottom cover on the right front of the printer.
- Lift the chassis from the bottom cover.

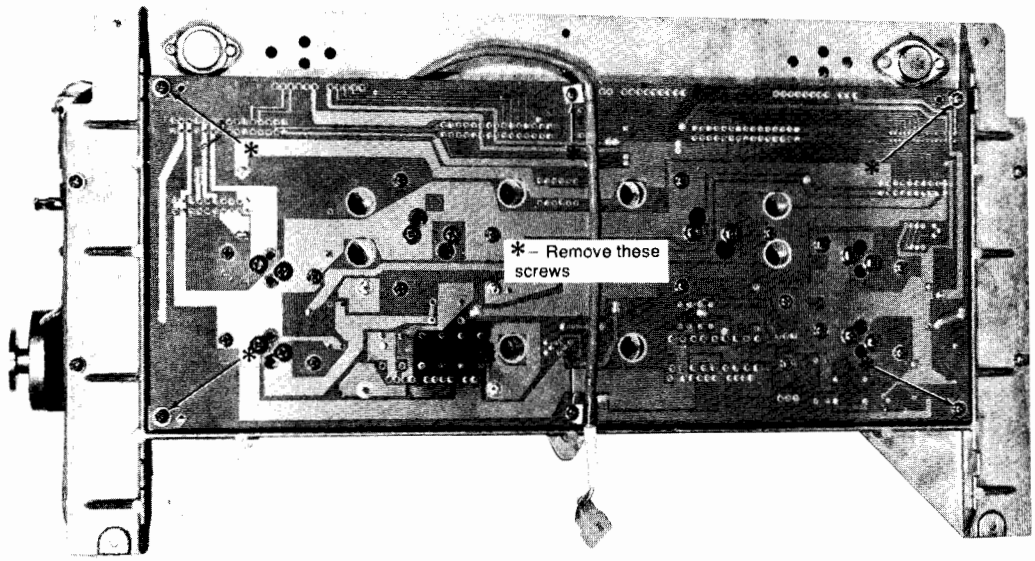


B-50829

Figure 5-7. Bottom Cover Screws

Power Supply Removal (AØ)

- Remove the top and bottom covers.
- Remove the A1, A2, A3 and A6 PC assemblies.
- Set the printer on its left side (Figure 5-8).
- Remove the six screws that hold the power supply assembly (AØ) to the chassis (Figure 5-8).
- Disconnect all the connectors that plug into the power supply and remove the power supply.



B-50830

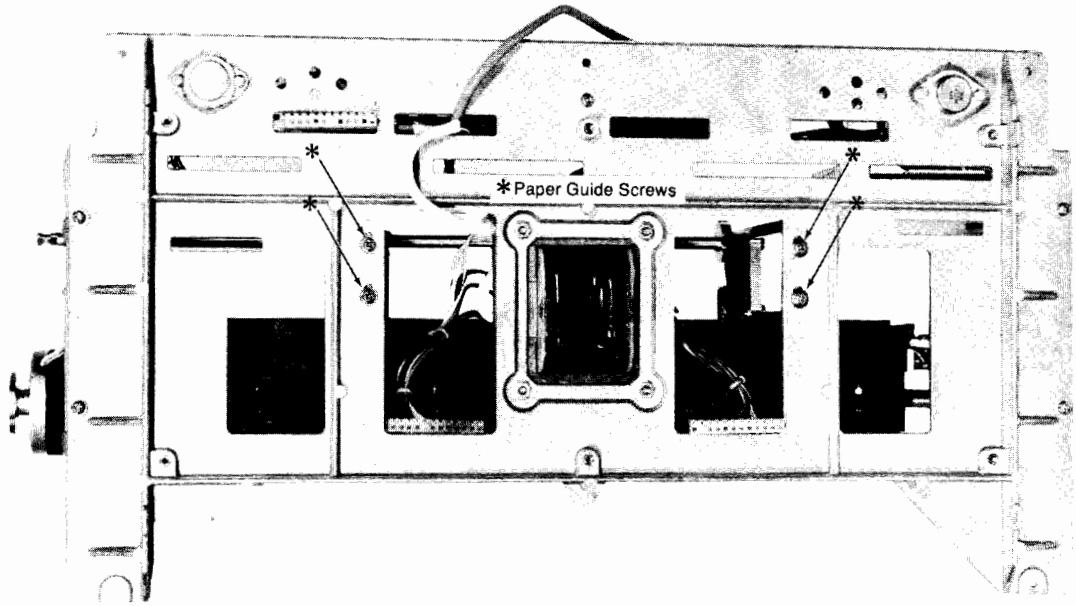
Figure 5-8. AØ Assembly Removal

Paper Guide Removal

> **CAUTION**
> The paper guide assembly is aligned at the factory. The alignment is critical, therefore the paper guide must not be removed except for replacement.

- Remove the top cover.
- Remove the platen assembly.
- Remove the bottom cover and power supply (AØ).
- Measure and record the distance from the paper guide frame to the front of the printer's casting.
- Remove the four screws that hold the paper guide to the chassis (Figure 5-9). Then remove the paper guide from the printer.

> **NOTE**
> When replacing the paper guide, the paper guide adjustments must be made to ensure the proper alignment with the platen and the carrier. See the Paper Guide Alignment Check in this chapter.



B-50831

Figure 5-9. Paper Guide Screws

Installing the Carrier Drive Belt

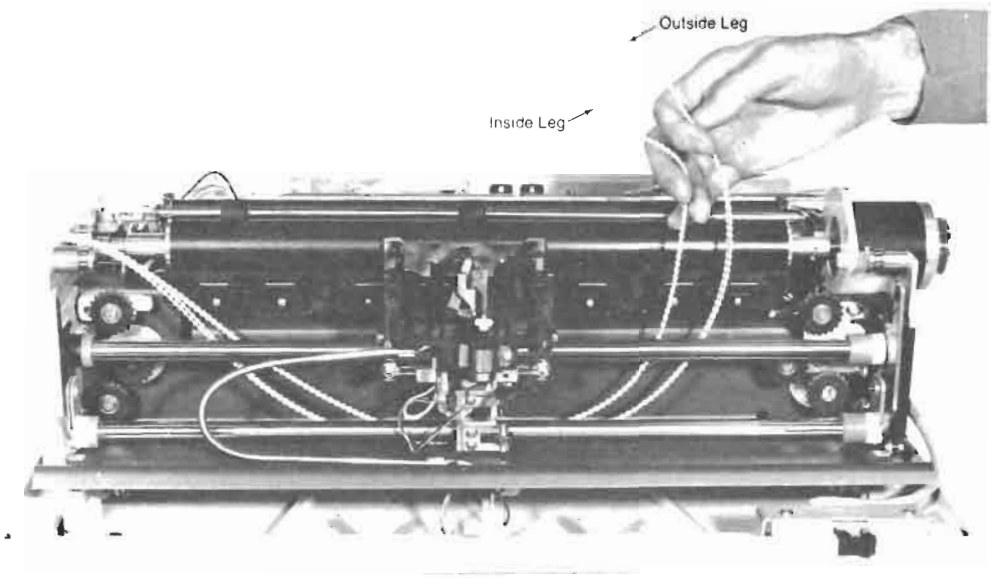
In case you ever have to dismantle the carrier's belt, the following procedure will help you reinstall the belt.

- Remove the ribbon and character disk.
- Position the carrier in the center of the print module.
- Place the belt under the carrier (Figure 5-10A). Make sure it is not twisted.
- Place the loop (outside leg on top) around the carrier sprocket (Figure 5-10B). Leave the loop between the two rows of sprocket teeth.
- Thread the outside leg (which is on top) around the two, right-hand, outside-loop, sprockets (Figure 5-10B). Thread the inside leg around the right inside-loop sprocket.
- Now straighten the other end of the belt and form another loop.
- Place this loop (outside leg on top) around the carrier sprocket (Figure 5-10D). This loop should be placed in front of the two rows of teeth (toward the platen).
- Thread the outside leg (which is on top) around the left-hand, outside-loop sprockets (Figure 5-10D).
- With your finger, slightly tighten the remaining inside leg loop (Figure 5-10D) and check that the belt is on all the loop sprockets but is not on the carrier sprocket teeth.
- Start the remaining inside loop over the top of the left inside loop sprocket (Figure 5-10E). Move the belt so that the belt will thread itself over the sprocket. Make sure that there are no twists in the belt.

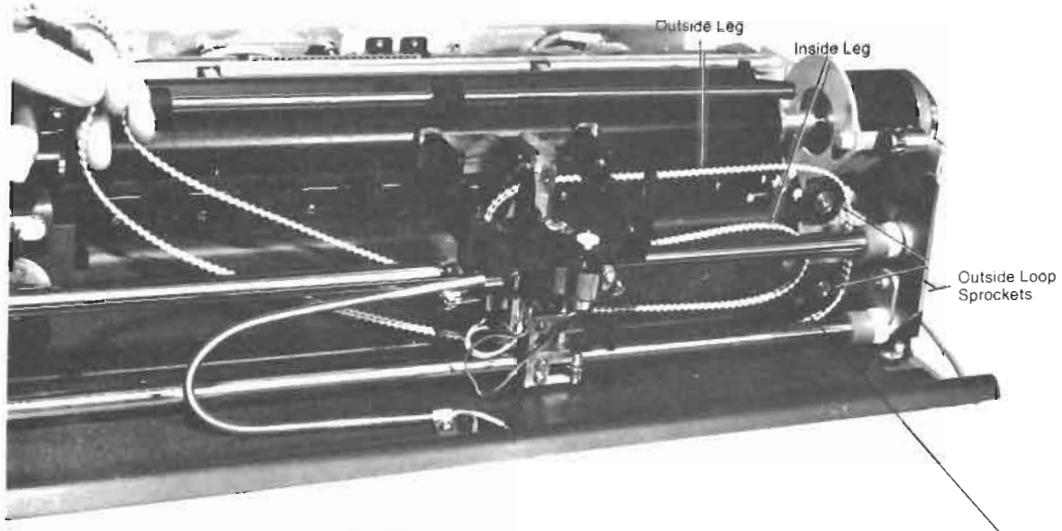
> **NOTE**
> It may be necessary to loosen the belt tension adjusting screws (Figure 5-13) to relieve tension on the belt during the next steps.

- Start the belt on the teeth of the carrier sprocket and move the belt so the belt will thread itself onto the sprocket teeth (Figure 5-10F).
- Check the tension on the belt as specified in the belt tension check.

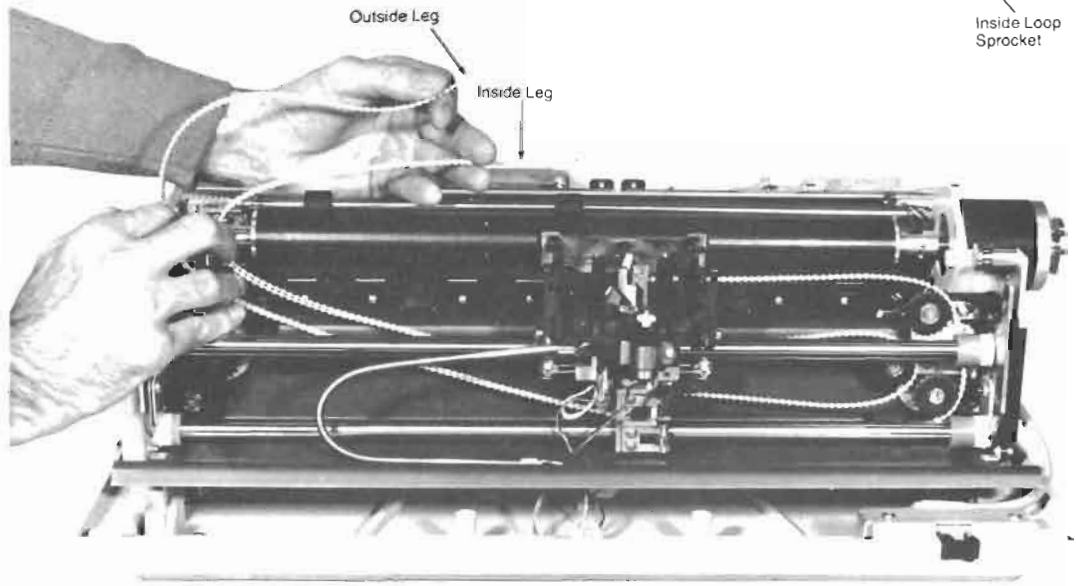
A

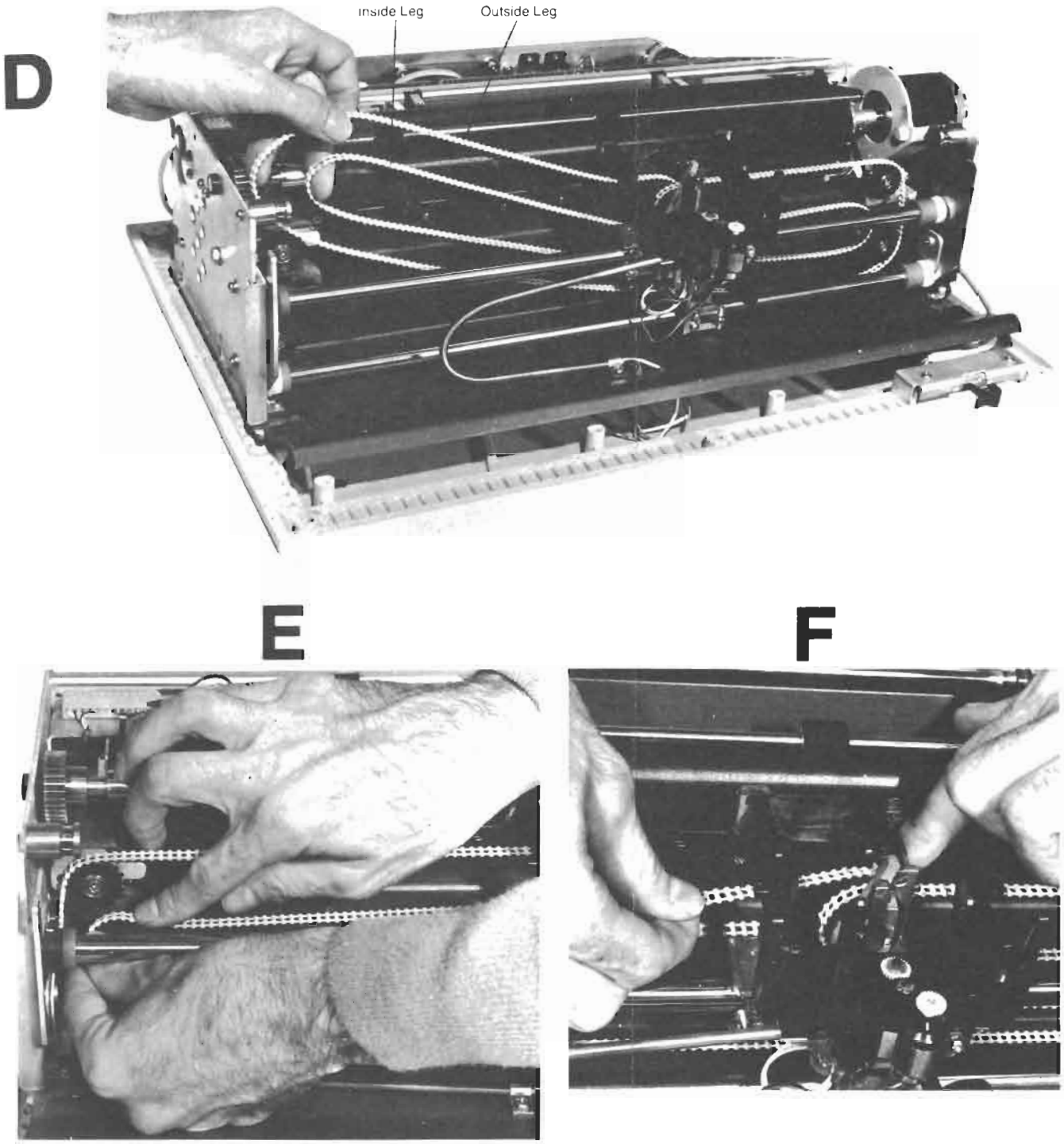

Outside Leg
Inside Leg

B


Outside Leg
Inside Leg
Outside Loop Sprockets
Inside Loop Sprocket

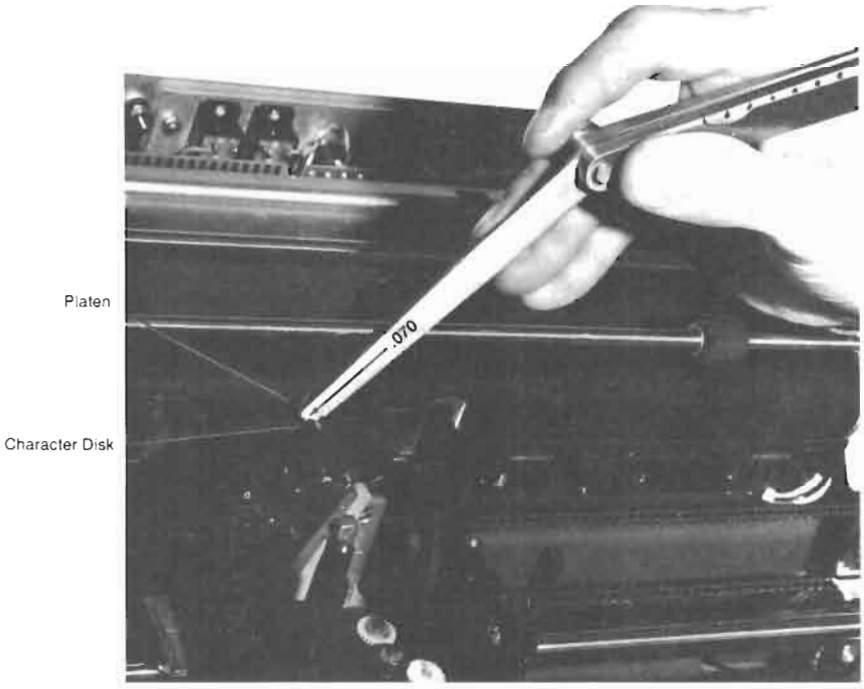
C


Outside Leg
Inside Leg



B-50832

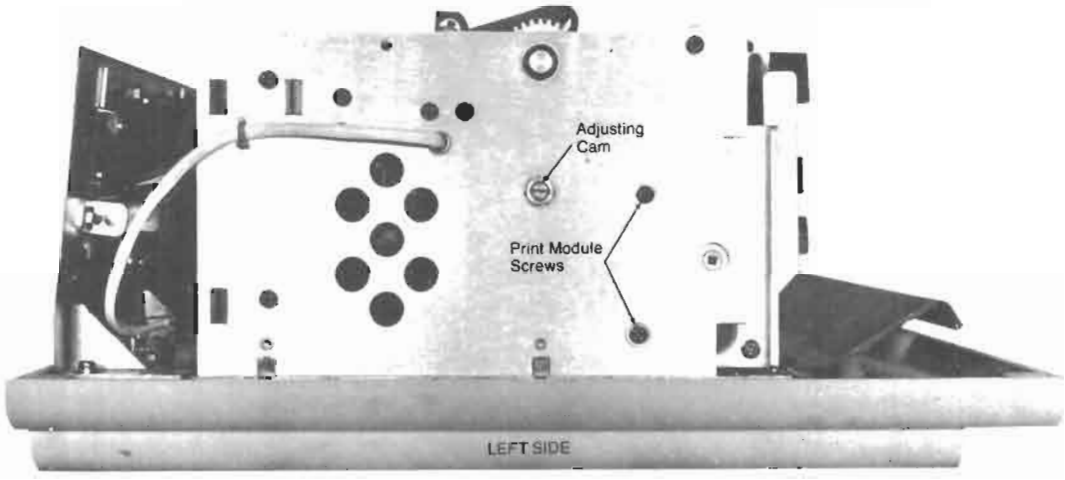
Figure 5-10. Installing the Drive Belt.



B-50833

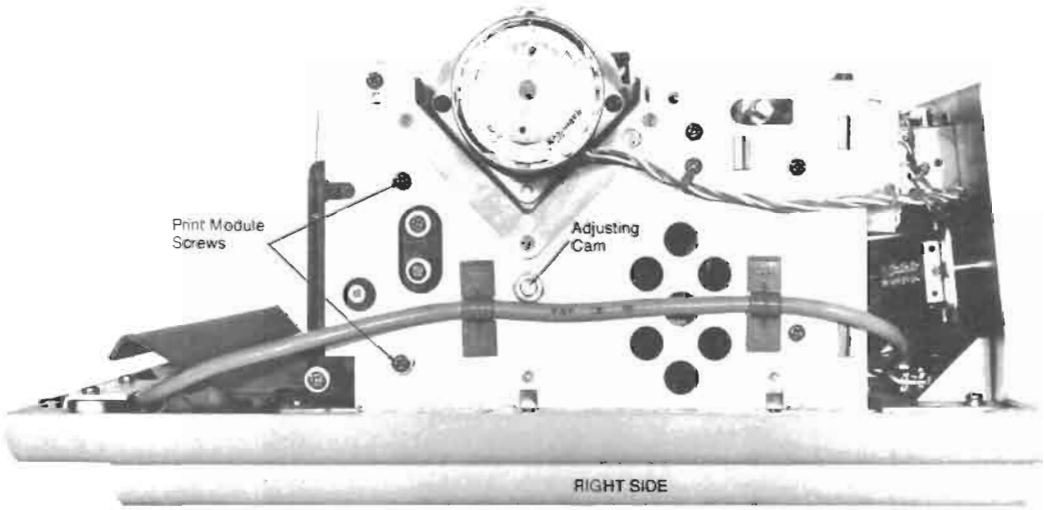
Figure 5-11. Character Disk to Platen Spacing

A



B-50834

B



B-50835

Figure 5-12. Spacing Adjustment

Belt Tension Check

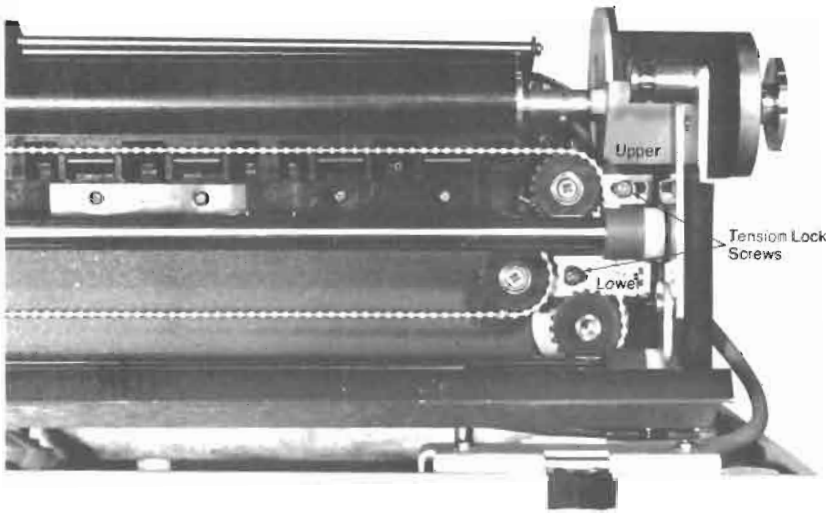
This check should be performed (when other maintenance is required) to see if the belt has stretched, and when a belt is installed.

TOOLS REQUIRED

POZIDRIV screwdriver

1. Move the carrier to the left-most position.
2. Loosen the two tension-lock screws shown in figure 5-13A.
3. Loosen the lower tension-adjusting screw (CCW) (Figure 5-13B) until the metal washer is loose, then tighten the screw until the washer just touches the plastic end casting.
4. Tighten the lower tension-lock screw.

A



B-50836

B

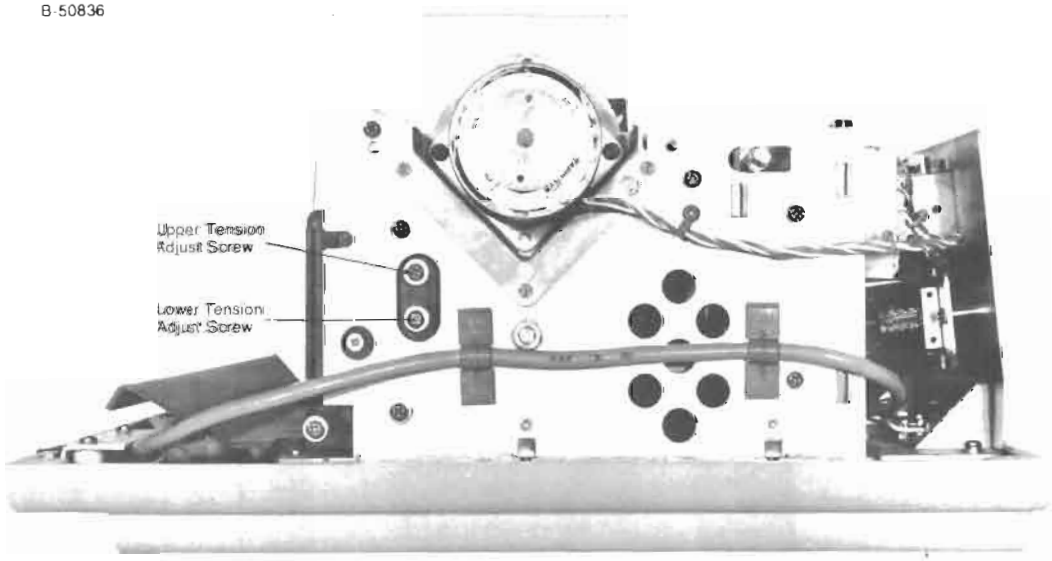


Figure 5-13. Belt Tension Adjustment

5. Turn the upper tension-adjust screw until the top belt strand has the same tension as the second belt strand (see Figure 5-13B).
6. Tighten the upper tension-lock screw.

Paper Guide Alignment Check

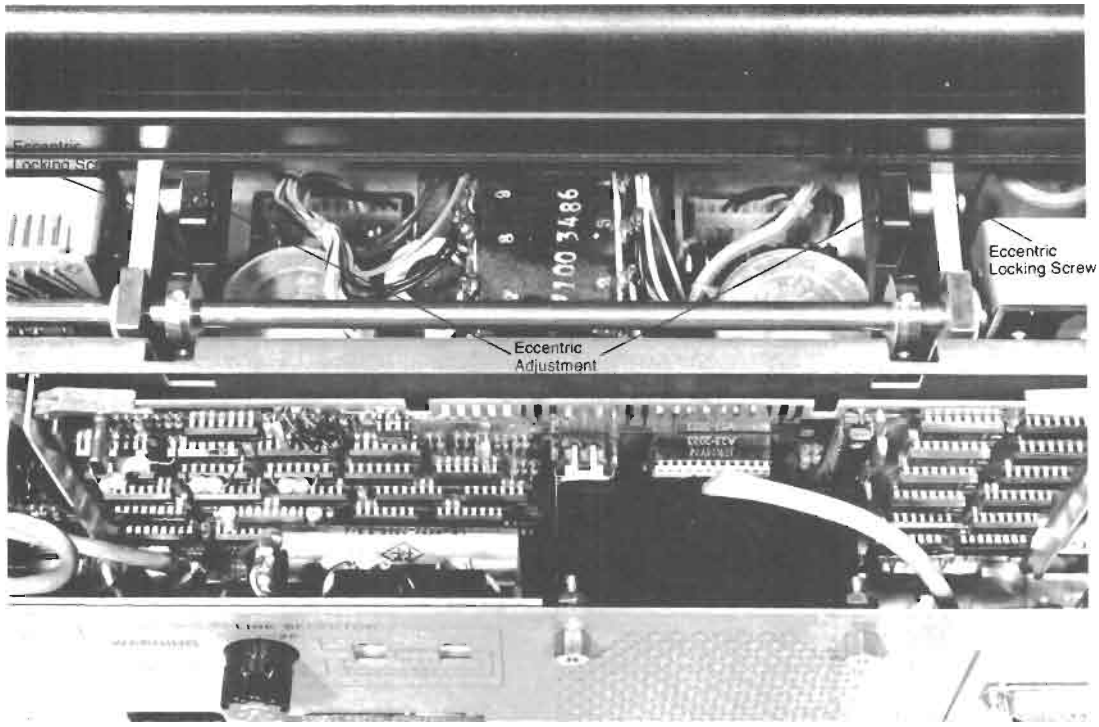
The paper guide is aligned at the factory. The paper guide alignment should be performed only if the paper guide has been removed.

TOOLS REQUIRED

POZIDRIV screwdriver
Flat-blade screwdriver
.010 inch feeler gauge

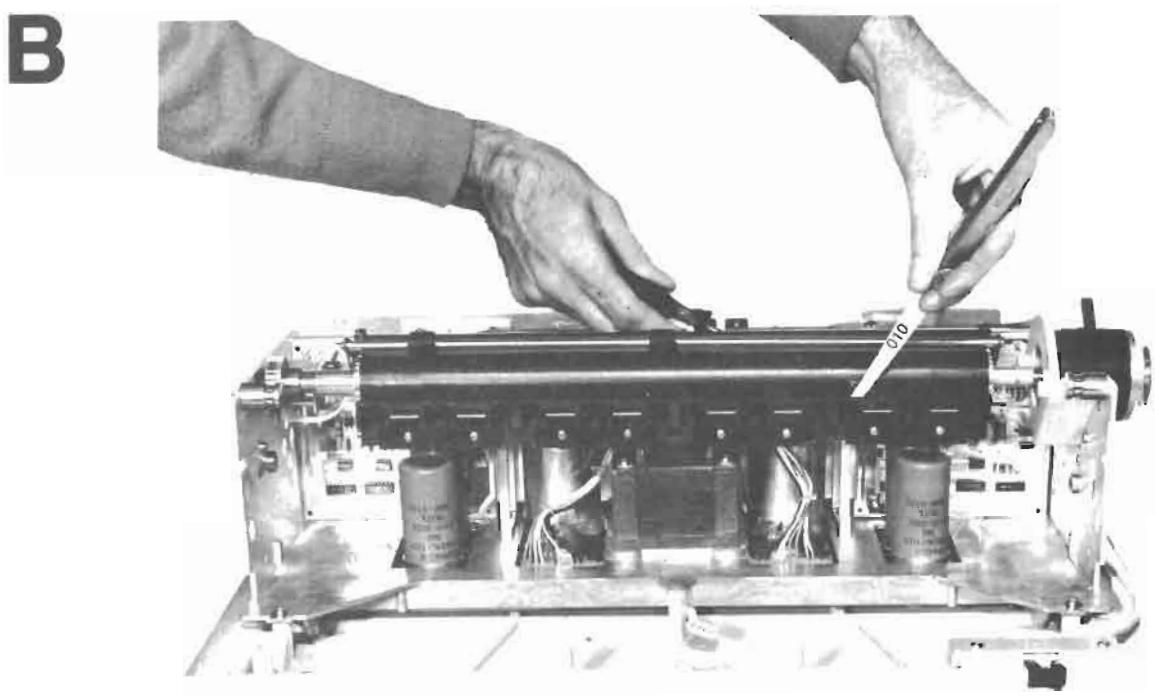
1. Install the paper guide in the printer and tighten the four screws that hold the paper guide to the frame.
2. Ensure that the distance between the paper guide and the front of the printer chassis is the same as recorded during the paper guide removal (see page 5-7).
3. With the paper release lever back, the space between the paper guide and the platen should be .010 inch (Figure 5-14B).
4. The .010 inch gap is adjusted by loosening the eccentric locking screw (Figure 5-14) on the paper guide and adjusting the eccentric screw for the specified gap.
5. Tighten the locking screw on each eccentric.

A



B-50837

Figure 5-14. Paper Guide Alignment



B-50838 **Figure 5-14. Paper Guide Alignment**

Reset Position Adjustment

TOOLS REQUIRED

#6 allen wrench

The reset position adjustment consists of a coarse and a fine adjustment.

Perform the coarse position adjustment when incorrect characters are printed.

Perform the fine position adjustment when one side of a character is printed lighter than the other side.

Coarse Reset Position Adjustment

1. Switch the printer OFF.
2. Remove the front cover.
3. Switch the printer ON; the carrier will move to the left and the character disk will rotate to the adjustment stop (see Figure 5-15).
4. Turn the adjustment screw until the "+" character is centered in front of the hammer.
5. Install the front cover; then press the "test" button on the printer's rear panel. The correct test printout should occur. If necessary perform the fine position adjustment which follows.

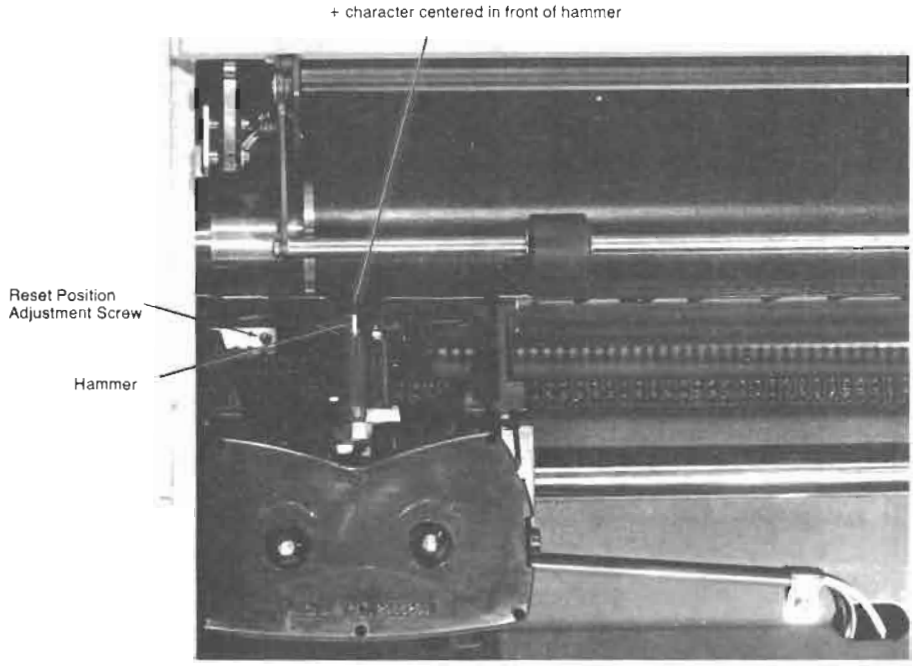


Figure 5-15. Coarse Reset Position Adjustment

Fine Reset Position Adjustment

6. If the right side of the characters are light, turn the adjustment screw clockwise 90° (see Figure 5-16).

   If the left side of the characters are light, turn the adjustment screw counter-clockwise 90° (see Figure 5-16).
7. Switch the printer OFF; then ON, to reset it.
8. Press the test button and observe the characters (in particular the M's) for even print intensity. If necessary, repeat steps 6 through 8 until the print intensity is even.

M.M.M.M.M.M.M.M.M.M

turn the adjustment screw counter-clockwise 90°

M.M.M.M.M.M.M.M.M.M

turn the adjustment screw clockwise 90°

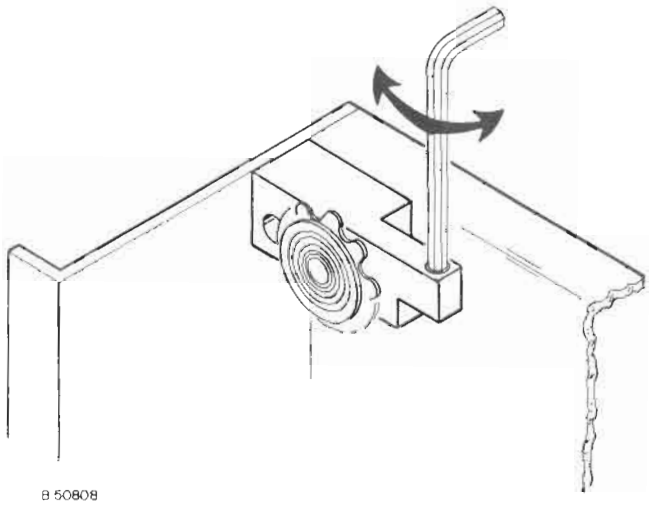


Figure 5-16. Fine Reset Position Adjustment

Carrier Vertical Adjustment

This adjustment should be made only if the top or bottom portion of each character is printed darker than the rest of the character.

TOOLS REQUIRED

POZIDRIV screwdriver

1. Remove the printer's top cover.
2. Loosen the adjusting arm lock screw on either side of the printer (see Figure 5-17).
3. Switch the printer ON and press the cover interlock switch down.
4. Press the test button on the printer's rear panel.
5. Observe the printout.
6. If the bottom of the character is darker, move the adjusting arms in, towards the platen (see Figure 5-17).

   If the top of the character is darker, move the adjusting arms out, away from the platen.

7. Press the test button again, and check the printout for even character intensity (vertically). If necessary, repeat steps 4 and 5.
8. Tighten the adjusting arm lock screws.
9. Replace the top cover.

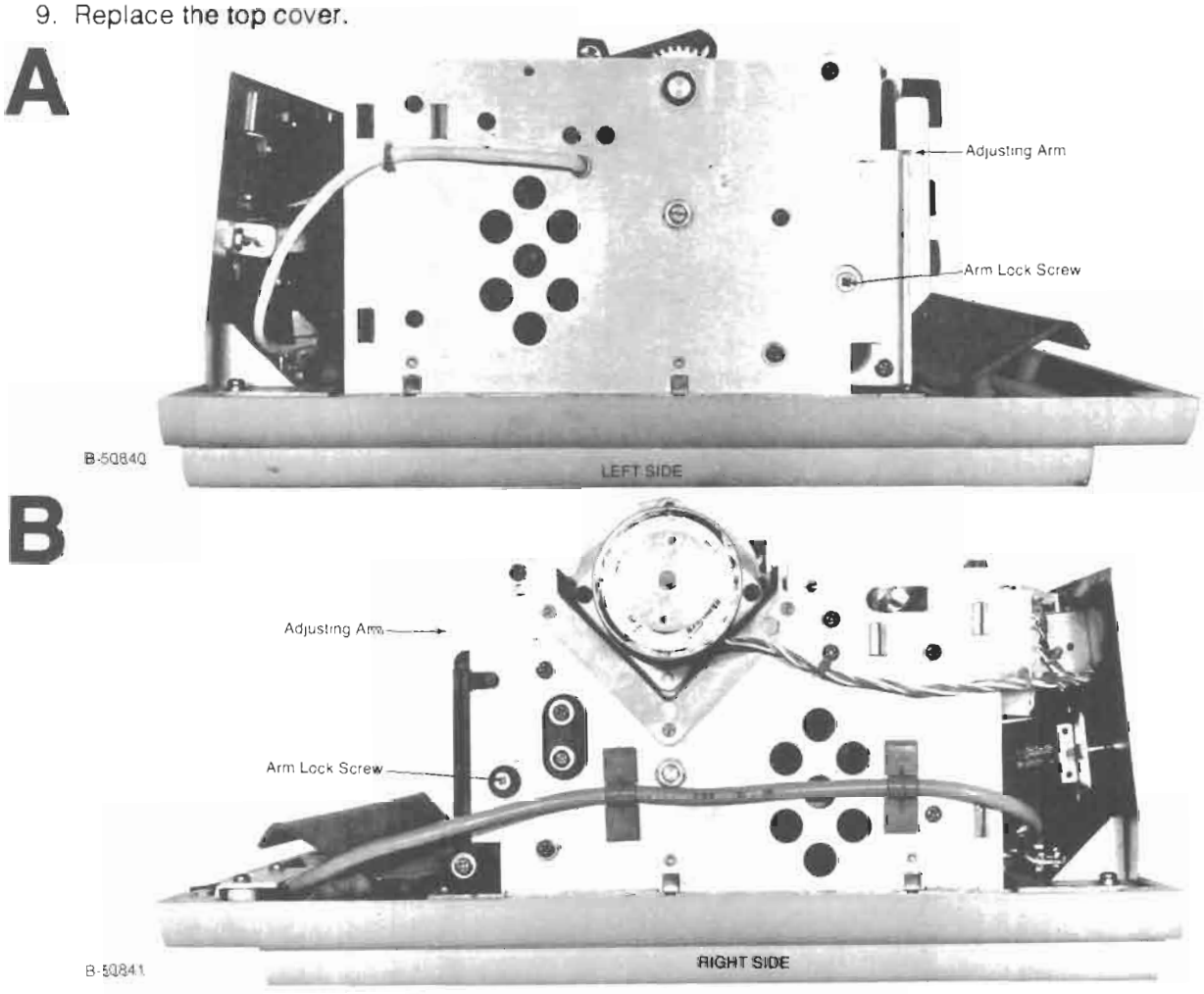


Figure 5-17. Carrier Vertical Adjustment

ELECTRICAL CHECKS AND ADJUSTMENTS

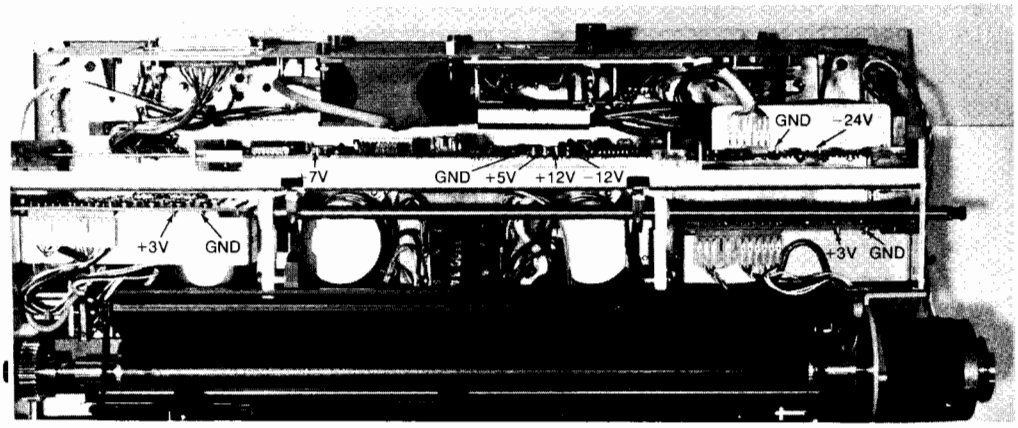
Power Supply Checks

The power supplies should be within the tolerances specified below. The voltages can be measured on the test points indicated in Figure 5-18, with an HP 427A Multimeter, or equivalent.

POWER SUPPLY VOLTAGES

POWER SUPPLY VOLTAGE (NOMINAL)	TOLERANCE
+24V	±3V
−24V	±3V
+12V	±0.4V
−12V	±0.4V
+7V	±0.25V
+5V	±0.25V
+3V*	>1.9V <4.7V

*The value of the +3V supply depends on the state of the carrier drive motors.



B-50842

Figure 5-18. Power Supply Test Points

Encoder Assembly Alignment

Each carrier drive motor has its own encoder assembly which is electrically aligned to the motor. When a motor or an encoder assembly is replaced, the motor and encoder must be realigned.

EQUIPMENT REQUIRED

Construct the alignment fixture shown below to perform the encoder alignment.

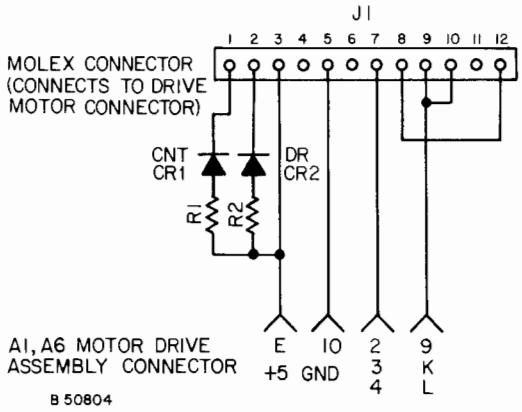


Figure 5-19. Encoder Alignment Fixture

The alignment fixture should be built on a PC card having the same dimensions and pin spacing as the motor drive assembly (A1, A6).

Here is a list of parts required to build the fixture.

DESIGNATOR	HP PART NO.	DESCRIPTION
CR1, CR2	5082-4684	LED
R1, R2	0683-1015	R-FXD: 100 ohm
J1	1251-4023	12 PIN MOLEX CONNECTOR

The alignment procedure is as follows:

1. It is assumed that since an encoder or motor was just replaced, the print module is out of the printer.
2. Remove one of the motor drive assemblies (A1 or A6), and plug the alignment fixture into the motor drive assembly PC connector in the printer (see Figure 5-20). Disconnect the other drive motor.
3. Plug the motor/encoder connector on the fixture's molex connector (Figure 5-20).
4. Switch the printer ON.
5. Loosen the encoder assembly locking collar (Figure 5-20) and turn the encoder until the DR-LED on the fixture is out.

NOTE

Ensure that the encoder cable and the locking collar are in the general original position.

6. With the DR-LED not lit,
   - apply rotational pressure (either CW or CCW) to the motor shaft. The CNT-LED should go out and then stay out when the pressure is released.
   - apply rotational pressure in the opposite direction to the motor shaft. The CNT-LED should light and then stay lit when the pressure is released.
7. Tighten the locking collar and repeat step 6 to recheck the setting.
8. Disconnect the fixture and install the print module.

> **NOTE**
> Due to eccentricities in the motors, the encoder may not align properly at all rotation positions. It is necessary only that the encoder align at one point.

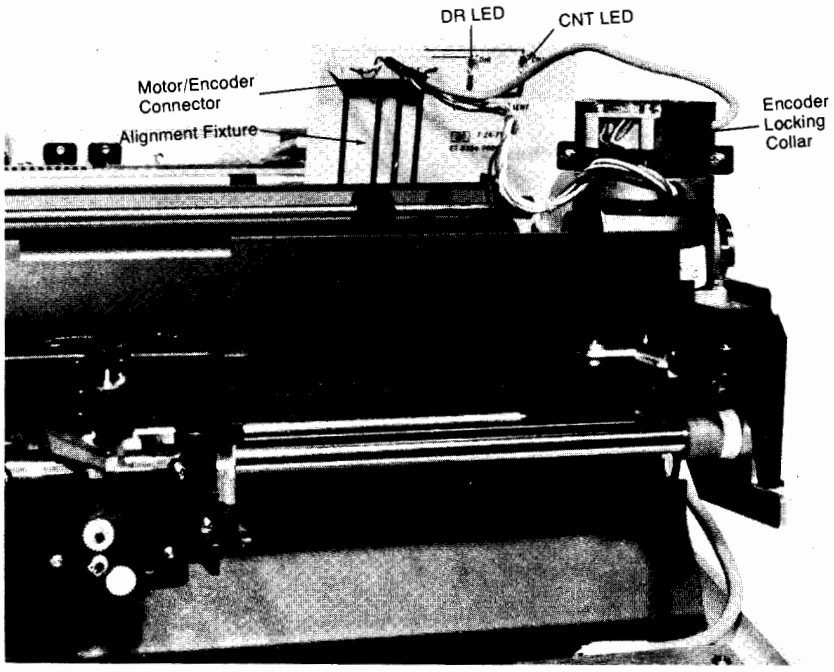


Figure 5-20. Encoder Alignment Setup

Hammer Solenoid Pull-In Voltage

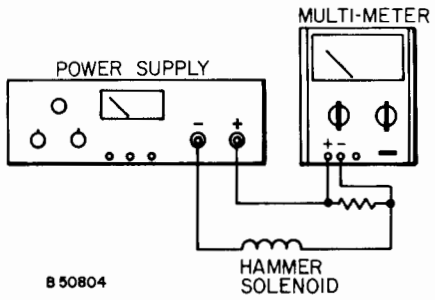
The hammer solenoid current should be checked only when the solenoid is replaced.

EQUIPMENT REQUIRED

15V@ 1 Amp power supply (variable current)
1 ohm (1%) resistor
Test leads
HP 427A multimeter

1. Mount the new solenoid on the carrier and install the print module.
2. Connect the test equipment as shown below.
3. Set the multimeter to +DC volts and select the 1 volt range.
4. Set the voltage control on the power supply for 15 volts, and set the current control for minimum current.
5. Switch the power supply ON, and increase the current control. When the voltmeter reads .600 to .670 volts, the printer's solenoid should energize. This can be seen by watching the hammer actuator lever.
6. Note the solenoid pull-in voltage (see step 5).
   - If the pull-in voltage is less than .600 volts, remove a 5-mil shim from behind the solenoid. If no shim is present, install a new solenoid.
   - If the pull-in voltage is greater than .670 volts, add a 5-mil shim behind the solenoid.

NOTE
No more than 2 shims should be used. If more than 2 shims are needed, check for friction and binding in the actuator arm and hammer.



CHAPTER 6

TROUBLESHOOTING

INTRODUCTION

This chapter will help you to isolate a problem in the printer. The schematic diagrams and timing diagrams in Chapter 4 will aid you in electronic troubleshooting. The rest of this chapter contains mechanical and electronic troubleshooting aids.

MECHANICAL TROUBLESHOOTING

Print Quality Problems

Table 6-1 lists print quality problems, their probable cause, and the most probable cure.

Table 6-1. Print Quality Problems

PROBLEM	PROBABLE CAUSE	PROBABLE CURE
LIGHT PRINT INTENSITY ALL CHARACTERS	Improper print intensity switch setting	Check print intensity switch setting
	Worn ribbon	Replace ribbon
	Binding hammer actuator arm or solenoid	Check hammer actuator arm for freedom of movement
	Electronic problems (A2)	
PRINTOUT INTENSITY UNEVEN (HORIZONTALLY)	Print module or carrier not positioned properly	Perform the character disk to platen spacing check, and the carrier vertical alignment check.
TOP OR BOTTOM PORTION OF CHARACTERS HAVE LIGHT INTENSITY	Print module or carrier not positioned properly	Perform the character disk to platen spacing check, and the carrier vertical alignment check.
CHARACTERS LIGHT INTENSITY ON LEFT OR RIGHT SIDE	Hammer not hitting the characters accurately	Perform the fine reset position adjustment
CHARACTER DISK SPOKES BREAK	Binding in hammer or hammer actuator arm	Check hammer and hammer actuator arm for freedom of movement
WRONG CHARACTERS PRINTED	Hammer hitting the wrong character	Perform the coarse and fine reset position adjustment
	Electronic problems	
PRINTER INOPERATIVE	Cover interlock switch	Check cover and switch actuating arm
	Electronic problems	

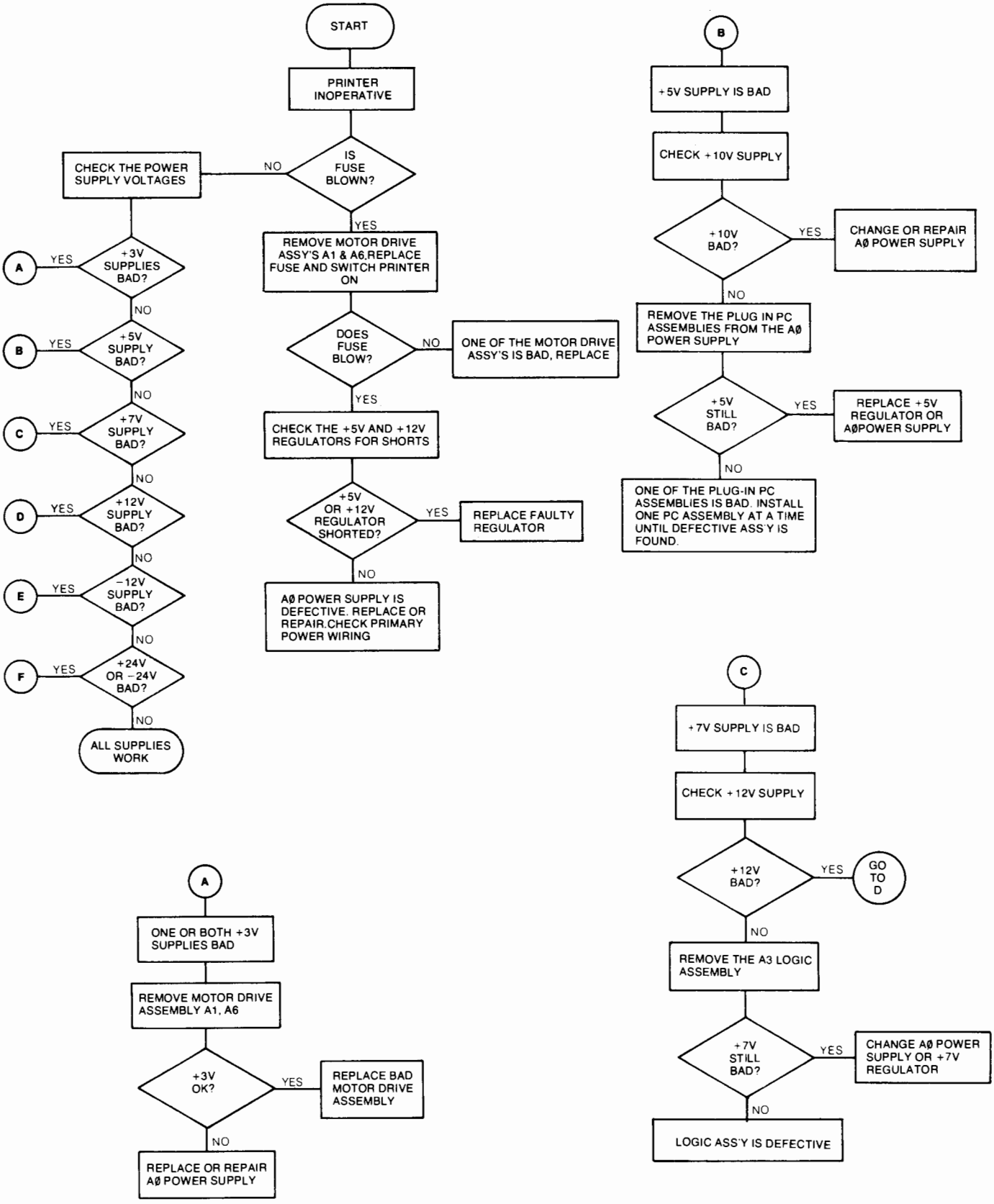


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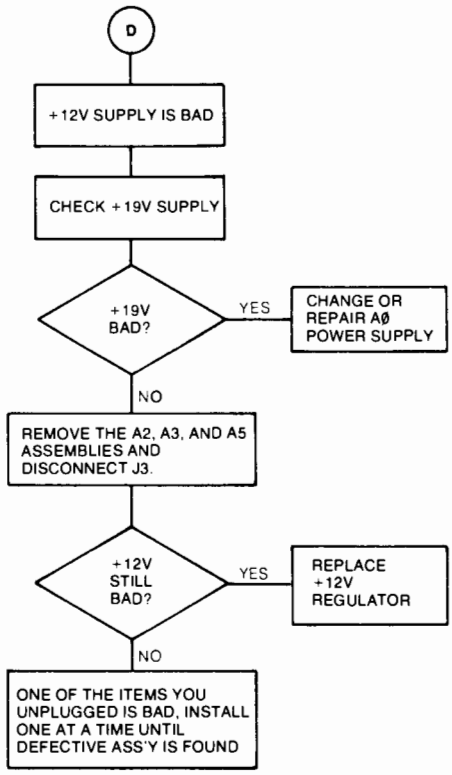
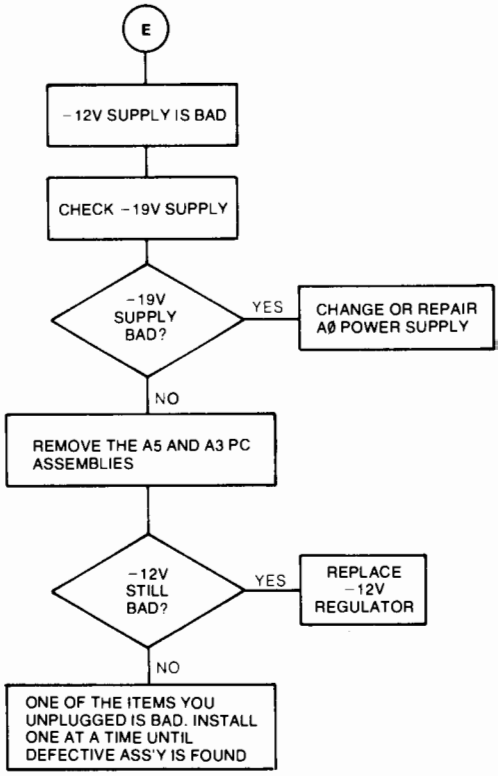
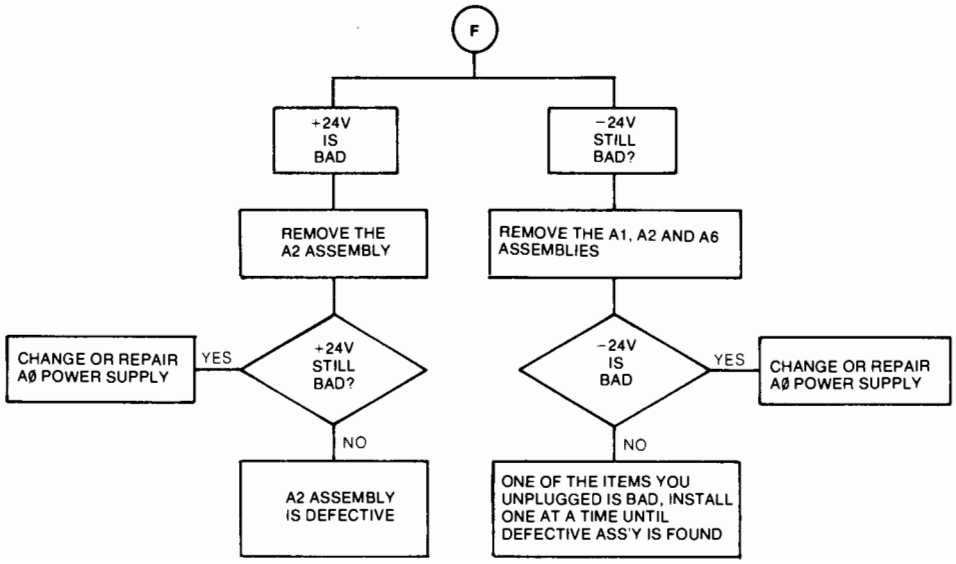
Figure 6-1. Power Supply Troubleshooting Tree


D
+12V SUPPLY IS BAD
CHECK +19V SUPPLY
+19V BAD?
YES
CHANGE OR REPAIR AØ POWER SUPPLY
NO
REMOVE THE A2, A3, AND A5 ASSEMBLIES AND DISCONNECT J3.
+12V STILL BAD?
YES
REPLACE +12V REGULATOR
NO
ONE OF THE ITEMS YOU UNPLUGGED IS BAD, INSTALL ONE AT A TIME UNTIL DEFECTIVE ASS'Y IS FOUND


E
-12V SUPPLY IS BAD
CHECK -19V SUPPLY
-19V SUPPLY BAD?
YES
CHANGE OR REPAIR AØ POWER SUPPLY
NO
REMOVE THE A5 AND A3 PC ASSEMBLIES
-12V STILL BAD?
YES
REPLACE -12V REGULATOR
NO
ONE OF THE ITEMS YOU UNPLUGGED IS BAD. INSTALL ONE AT A TIME UNTIL DEFECTIVE ASS'Y IS FOUND


F
+24V IS BAD
-24V STILL BAD?
REMOVE THE A2 ASSEMBLY
REMOVE THE A1, A2 AND A6 ASSEMBLIES
CHANGE OR REPAIR AØ POWER SUPPLY
YES
+24V STILL BAD?
-24V IS BAD
YES
CHANGE OR REPAIR AØ POWER SUPPLY
NO
A2 ASSEMBLY IS DEFECTIVE
NO
ONE OF THE ITEMS YOU UNPLUGGED IS BAD, INSTALL ONE AT A TIME UNTIL DEFECTIVE ASS'Y IS FOUND

ELECTRONIC TROUBLESHOOTING

To isolate an electronic problem, first ensure that the controlling device and the interface to the printer are functioning properly.

Check the fuse, voltage selector switch setting and the power supply voltages. Refer to the Power Supply Troubleshooting Tree (Figure 6-1).

Press the test button on the rear panel. If the printer "beeps" during the test, the A3 logic assembly is bad. The most probable failures on the logic assembly are the ROMs, the RAMs and the Binary Processor Chip.

Table 6-2 lists some of the possible electronic problems, the probable causes, and the checks to make.

Table 6-2. Electronic Problems

PROBLEM	PROBABLE CAUSE	CHECK
SLOW PRINTING SPEED	Improper encoder alignment Motor difference counter (A3) bad	Perform the Encoder Alignment procedure. Replace A3
LIGHT CHARACTER INTENSITY OR NO CHARACTERS PRINTED	Hammer drive circuit (A2) defective	Hammer drive circuit (A2)
WRONG CHARACTERS PRINTED	Improper homing	Switch printer OFF then ON
PRINTER "BEEPS" WHEN SWITCHED-ON	ROM (single beep) RAM (continuous beep)	Replace A3
CARRIER MOTION ERRATIC	Improper drive signals to either motor Improper data from processor (A3)	Motor drive circuits (A1, A6),difference counters and DØ - D3 lines (A3) Replace A3
PLATEN DOES NOT ROTATE	Platen drive circuit bad (A2)	Platen drive circuit (A2)
RIBBON DOES NOT MOVE OR REVERSE	Ribbon drive circuit bad (A2)	Ribbon drive circuit (A2)
PRINTER INOPERATIVE	+5V supply bad Clock inoperative	AØ power supply Clock circuit (A3)

CHAPTER 7

REPLACEABLE PARTS

This chapter provides ordering information for the printer's electrical parts in the order of their component designators. The mechanical parts in Table 7-1 have reference numbers. These reference numbers correspond to the numbered parts illustrations in Figures 7-1 through 7-8. The numbers in the quantity column indicate the total quantity of a part used in the printer. The quantity is given only the first time the part number is listed. The manufacturer's code and part number are included in the Table 7-1. Table 7-2 lists the manufacturers and their addresses.

The abbreviations used in the parts list are described below.

To obtain replacement parts from Hewlett-Packard, address order or inquiry to the nearest HP Sales and Service Office. A list of offices can be found at the back of this manual.

ABBREVIATIONS

Ag ..... silver
Al ..... Aluminum
A ..... Ampere(s)
Au ..... gold

C ..... capacitor
cer ..... ceramic
coef ..... coefficient
com ..... common
comp ..... composition
conn ..... connection

dep ..... deposited
DPDT ..... double-pole double-throw
DPST ..... double-pole single-throw

elect ..... electrolytic
encap ..... encapsulated

F ..... farad(s)
FET ..... field effect transistor
fxd ..... fixed

GaAs ..... gallium arsenide
GHz ..... gigahertz = 10^{+9} hertz
gd ..... guard(ed)
Ge ..... germanium
grd ..... ground(ed)

H ..... henry(ies)
Hz ..... mercury
Hz ..... hertz (cycle(s) per second)

ID ..... inside diameter
impg ..... impregnated
incd ..... incandescent
ins ..... insulation(ed)

kΩ ..... kilohm(s) = 10^{+3} ohms
kHz ..... kilohertz = 10^{+3} hertz

L ..... inductor
lin ..... linear taper
log ..... logarithmic taper

mA ... milliampere(s) = 10^{-3} amperes
MHz ..... megahertz = 10^{+6} hertz
MΩ ..... megohm(s) = 10^{+6} ohms
met flm ..... metal film
mfr ..... manufacturer
ms ..... millisecond
mtg ..... mounting
mV ..... millivolt(s) = 10^{-3} volts
μF ..... microfarad(s)
μs ..... microseconds(s)
μV ..... microvolt(s) = 10^{-6} volts
my ..... Mylar®

nA .... nanoampere(s) = 10^{-9} amperes
NC ..... normally closed
Ne ..... neon
NO ..... normally open
NPO ..... negative positive zero (zero temperature coefficient)

ns ..... nanosecond(s) = 10^{-9} seconds
nsr ..... not separately replaceable

Ω ..... ohm(s)
obd ..... order by description
OD ..... outside diameter

p ..... peak
pA ..... picoampere(s)
pc ..... printed circuit
pF ..... picofarad(s) = 10^{-12} farads

piv ..... peak inverse voltage
p/o ..... part of
pos ..... postion(s)
poly ..... polystyrene
pot ..... potiometer
p-p ..... peak-to-peak
ppm ..... parts per million
prec ..... precision (temperature coefficient, long term stability, and/or tolerance)

R ..... resistor
Rh ..... rhodium
rms ..... root-mean-square
rot ..... rotary

Se ..... selenium
sect ..... section(s)
Si ..... silicon
sl ..... slide

SPDT ..... single-pole double-throw
SPST ..... single-pole single-throw

Ta ..... tantalum
TC ..... temperature coefficient
TiD_2 ..... titanium dioxide
tog ..... toggle
tol ..... tolerance
trim ..... trimmer
TSTR ..... transistor

V ..... volt(s)
vacw ..... alternating current working voltage
var ..... variable
vdcw ... direct current working voltage

W ..... watt(s)
w/ ..... with
wiv ..... working inverse voltage
w/o ..... without
ww ..... wirewound

* ..... optimum value selected at factory, average value shown (part may be omitted)
** ..... no standard type number assigned (selected or special type

DECIMAL MULTIPLIERS

Prefix	Symbols	Multiplier	Prefix	Symbols	Multiplier
tera	T	10^{12}	centi	c	10^{-2}
giga	G	10^{9}	milli	m	10^{-3}
mega	M or Meg	10^{6}	micro	μ	10^{-6}
kilo	K or k	10^{3}	nano	n	10^{-9}
hecto	h	10^{2}	pico	p	10^{-12}
deka	da	10	femto	f	10^{-15}
deci	d	10^{-1}	atto	a	10^{-18}

DESIGNATORS

A ..... assembly
B ..... motor
BT ..... battery
C ..... capacitor
CR ..... diode
DL ..... delay line
DS ..... lamp
E ..... misc electronic part
F ..... fuse
FL ..... filter
HR ..... heater
J ..... jack
K ..... relay
L ..... inductor
LS ..... speaker, horn
M ..... meter
MP ..... mechanical part
P ..... plug
PU ..... recording head
Q ..... transistor
R ..... resistor
RT ..... thermistor
S ..... switch
T ..... transformer
TB ..... terminal board
TC ..... thermocouple
TP ..... test point
U ..... integrated circuit
V ..... vacuum tube, neon bulb, photocell, etc.
W ..... cable
X ..... socket
XDS ..... lampholder
XF ..... fuseholder
Y ..... crystal
Z ..... network

Rev K

STD-LL-S0442

Table 7-1. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A0	09871-66500	1	P.C. ASSEMBLY, MOTHER BOARD	28480	09871-66500
A0C1	0180-2392	4	CAPACITOR-FXD 5500UF+75-10% 30VDC AL	00853	500552U030AB2A
A0C2	0180-1746	5	CAPACITOR-FXD 15UF+-10% 20VDC TA	56289	1500156X9020B2
A0C3	0180-2392		CAPACITOR-FXD 5500UF+75-10% 30VDC AL	00853	500552U030AB2A
A0C4	0180-2506	1	CAPACITOR-FXD 470UF+50-10% 25VDC AL	28480	0180-2506
A0C5	0180-2599	2	CAPACITOR-FXD .06F+75-10% 5VDC AL	28480	0180-2599
A0C6	0180-2599		CAPACITOR-FXD .06F+75-10% 5VDC AL	28480	0180-2599
A0C7	0180-2392		CAPACITOR-FXD 5500UF+75-10% 30VDC AL	00853	500552U030AB2A
A0C8	0180-2392		CAPACITOR-FXD 5500UF+75-10% 30VDC AL	00853	500552U030AB2A
A0C9	0180-1746		CAPACITOR-FXD 15UF+-10% 20VDC TA	56289	1500156X9020B2
A0CR1	1901-0692	11	DIODE-PWR RECT 200V 3A 200NS	04713	MR852
A0CR2	1901-0692		DIODE-PWR RECT 200V 3A 200NS	04713	MR852
A0CR3	1902-3171	1	DIODE-ZNR 11V 5% DO-7 PD=.4W TC=+.062%	04713	SZ 10939-194
A0CR4	1901-0692		DIODE-PWR RECT 200V 3A 200NS	04713	MR852
A0CR5	1884-0082	2	THYRISTOR-SCR JEDEC 2N4441	04713	2N4441
A0CR6	1902-0041	1	DIODE-ZNR 5.11V 5% DO-7 PD=.4W TC=-.009%	04713	SZ 10939-98
A0CR7	1901-0692		DIODE-PWR RECT 200V 3A 200NS	04713	MR852
A0CR8	1901-0692		DIODE-PWR RECT 200V 3A 200NS	04713	MR852
A0CR9	1901-0692		DIODE-PWR RECT 200V 3A 200NS	04713	MR852
A0CR10	1901-0692		DIODE-PWR RECT 200V 3A 200NS	04713	MR852
A0CR11	1901-0692		DIODE-PWR RECT 200V 3A 200NS	04713	MR852
A0CR12	1901-0692		DIODE-PWR RECT 200V 3A 200NS	04713	MR852
A0CR13	1884-0082		THYRISTOR-SCR JEDEC 2N4441	04713	2N4441
A0CR14	1902-3269	1	DIODE-ZNR 26.1V 2%		
A0CR15	1901-0662	8	DIODE-PWR RECT 100V 6A	28480	1901-0662
A0CR16	1901-0662		DIODE-PWR RECT 100V 6A	28480	1901-0662
A0CR17	1901-0662		DIODE-PWR RECT 100V 6A	28480	1901-0662
A0CR18	1901-0662		DIODE-PWR RECT 100V 6A	28480	1901-0662
A0CR19	1901-0662		DIODE-PWR RECT 100V 6A	28480	1901-0662
A0CR20	1901-0662		DIODE-PWR RECT 100V 6A	28480	1901-0662
A0CR21	1901-0692		DIODE-PWR RECT 200V 3A 200NS	04713	MR852
A0CR22	1901-0692		DIODE-PWR RECT 200V 3A 200NS	04713	MR852
A0CR23	1901-0050	14	DIODE-SWITCHING 80V 200NA 2NS DO-7	28480	1901-0050
A0CR24	1901-0050		DIODE-SWITCHING 80V 200NA 2NS DO-7	28480	1901-0050
A0CR25	1901-0050		DIODE-SWITCHING 80V 200NA 2NS DO-7	28480	1901-0050
A0CR26	1902-3104	1	DIODE-ZNR 5.62V 5% DO-7 PD=.4W TC=+.016%	04713	SZ 10939-110
A0Q1	1854-0071	4	TRANSISTOR NPN SI PD=300MW FT=200MHZ	28480	1854-0071
A0Q2	1826-0178	1	IC LM 320 V RGLTR	27014	LM320H-12
A0Q3	1820-0429	1	IC LM 309 V RGLTR	27014	LM309H
A0Q4	1854-0071		TRANSISTOR NPN SI PD=300MW FT=200MHZ	28480	1854-0071
A0Q5	1853-0016	1	TRANSISTOR PNP SI TO-92 PD=300MW	28480	1853-0016
A0Q6	1854-0071		TRANSISTOR NPN SI PD=300MW FT=200MHZ	28480	1854-0071
A0R1	0698-3535	5	RESISTOR 1.65K 1% .5W F TC=0+-100	24546	NA6
A0R3	0757-0401	6	RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A0R4	0698-3535		RESISTOR 1.65K 1% .5W F TC=0+-100	24546	NA6
A0R5	0698-3535		RESISTOR 1.65K 1% .5W F TC=0+-100	24546	NA6
A0R7			NOT ASSIGNED		
A0R8	0757-0401		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A0R9	0757-0401		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A0R10	0811-3039	2	RESISTOR .1 1% 10W PW TC=0+-90	07088	KM-1000
A0R11	0757-0795	2	RESISTOR 75 1% .5W F TC=0+-100	19701	MF-1/2-T0-75R0-F
A0R12	0811-3039		RESISTOR .1 1% 10W PW TC=0+-90	07088	KM-1000
A0R13	0757-0795		RESISTOR 75 1% .5W F TC=0+-100	19701	MF-1/2-T0-75R0-F
A0R14	0698-3535		RESISTOR 1.65K 1% .5W F TC=0+-100	24546	NA6
A0R15	0698-3535		RESISTOR 1.65K 1% .5W F TC=0+-100	24546	NA6
A0R16	0757-0280	18	RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A0R17	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A0R18	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A0R19	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A0R20	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A0R21	0698-4420	2	RESISTOR 226 1% .125W F TC=0+-100	16299	C4-1/8-T0-226R-F
A0R22	0757-0442	1	RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A0R23	0757-0401		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A0R24	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A0R25	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A0R26	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A0R27	0698-4420		RESISTOR 226 1% .125W F TC=0+-100	16299	C4-1/8-T0-226R-F
			A0 MISCELLANEOUS		
	1210-0013	4	CLAMP-CAP STL	56289	4586-97A
	1251-1886	3	CONNECTOR-PC EDGE 15-CONT/ROW 2-ROWS	71785	252-15-30-340
	1251-1962	2	CONNECTOR-PC EDGE 10-CONT/ROW 2-ROWS	71785	252-10-30-330
	1251-2171	1	CONNECTOR-PC EDGE 15-CONT/ROW 2-ROWS	91637	SPC-148(WITHOUT MTG EARS)
	1251-2503	4	CONNECTOR-SGL CONT SKT .093-DIA	70892	M118-95AS

Table 7-1. Replaceable Parts (cont.)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
	1251-4023	7	CONNECTOR 12-PIN M POST TYPE	27264	09-64-1121
A1	09871-66501	1	P.C. ASSEMBLY, MOTOR DRIVE BOARD	28480	09871-66501
A1C1	0160-3847	18	CAPACITOR-FXD .01UF +100-0% 25WVDC CER	28480	0160-3847
A1C2	0160-3847		CAPACITOR-FXD .01UF +100-0% 25WVDC CER	28480	0160-3847
A1C3	0160-3847		CAPACITOR-FXD .01UF +100-0% 25WVDC CER	28480	0160-3847
A1C4	0180-0106	5	CAPACITOR-FXD 60UF+-20% 6VDC TA	56289	150D606X0006B2
A1C5	0160-3847		CAPACITOR-FXD .01UF +100-0% 25WVDC CER	28480	0160-3847
A1CR1	1901-0045	13	DIODE-PWR RECT 100V 750NA DO-29	28480	1901-0045
A1CR2	1901-0045		DIODE-PWR RECT 100V 750NA DO-29	28480	1901-0045
A1CR3	1901-0045		DIODE-PWR RECT 100V 750NA DO-29	28480	1901-0045
A1CR4	1901-0045		DIODE-PWR RECT 100V 750NA DO-29	28480	1901-0045
A1CR5	1901-0045		DIODE-PWR RECT 100V 750NA DO-29	28480	1901-0045
A1CR6	1901-0045		DIODE-PWR RECT 100V 750NA DO-29	28480	1901-0045
A1CR7	1901-0045		DIODE-PWR RECT 100V 750NA DO-29	28480	1901-0045
A1CR8	1901-0045		DIODE-PWR RECT 100V 750NA DO-29	28480	1901-0045
A1CR9	1901-0662		DIODE-PWR RECT 100V 6A	28480	1901-0662
A1CR10	1901-0662		DIODE-PWR RECT 100V 6A	28480	1901-0662
A1CR11	1902-1285	4	DIODE-ZNR 12V 05% PD=5W IR=50UA	28480	1902-1285
A1CR12	1902-1285		DIODE-ZNR 12V 05% PD=5W IR=50UA	28480	1902-1285
A1CR13	1902-1285		DIODE-ZNR 12V 05% PD=5W IR=50UA	28480	1902-1285
A1CR14	1902-1285		DIODE-ZNR 12V 05% PD=5W IR=50UA	28480	1902-1285
A1Q1	1853-0251	5	TRANSISTOR PNP SI PD=90W FT=2MHZ	28480	1853-0251
A1Q2	1853-0251		TRANSISTOR PNP SI PD=90W FT=2MHZ	28480	1853-0251
A1Q3	1853-0251		TRANSISTOR PNP SI PD=90W FT=2MHZ	28480	1853-0251
A1Q4	1853-0251		TRANSISTOR PNP SI PD=90W FT=2MHZ	28480	1853-0251
A1Q5	1854-0433	3	TRANSISTOR NPN SI PD=90W FT=2MHZ	28480	1854-0433
A1Q6	1854-0433		TRANSISTOR NPN SI PD=90W FT=2MHZ	28480	1854-0433
A1Q7	1853-0281	10	TRANSISTOR PNP 2N2907A SI TO-18 PD=400MW	04713	2N2907A
A1Q8	1853-0281		TRANSISTOR PNP 2N2907A SI TO-18 PD=400MW	04713	2N2907A
A1R1	0683-2215	8	RESISTOR 220 5% .25W FC TC=-400/+600	01121	CB2215
A1R2	0757-0985	4	RESISTOR 11 1% .5W F TC=0+-100	19701	MF7C1/2-T0-11R0-F
A1R3	0683-2215		RESISTOR 220 5% .25W FC TC=-400/+600	01121	CB2215
A1R4	0757-0985		RESISTOR 11 1% .5W F TC=0+-100	19701	MF7C1/2-T0-11R0-F
A1R5	0683-2215		RESISTOR 220 5% .25W FC TC=-400/+600	01121	CB2215
A1R6	0757-0985		RESISTOR 11 1% .5W F TC=0+-100	19701	MF7C1/2-T0-11R0-F
A1R7	0683-2215		RESISTOR 220 5% .25W FC TC=-400/+600	01121	CB2215
A1R8	0757-0985		RESISTOR 11 1% .5W F TC=0+-100	19701	MF7C1/2-T0-11R0-F
A1R9	0683-2215		RESISTOR 220 5% .25W FC TC=-400/+600	01121	CB2215
A1R10	0683-1015	2	RESISTOR 100 5% .25W FC TC=-400/+500	01121	CB1015
A1R11	0766-0003	2	RESISTOR 68.8 2% 3W MO TC=0+-250	27167	FP3-3-250-68R8-G
A1R12	0683-2215		RESISTOR 220 5% .25W FC TC=-400/+600	01121	CB2215
A1R13	0683-2215		RESISTOR 220 5% .25W FC TC=-400/+600	01121	CB2215
A1R14	0683-1015		RESISTOR 100 5% .25W FC TC=-400/+500	01121	CB1015
A1R15	0766-0003		RESISTOR 68.8 2% 3W MO TC=0+-250	27167	FP3-3-250-68R8-G
A1R16	0683-2215		RESISTOR 220 5% .25W FC TC=-400/+600	01121	CB2215
A1U1	1820-1016	4	IC SN75 453P DRIVER	01295	SN75453P
A1U2	1820-1016		IC SN75 453P DRIVER	01295	SN75453P
A1U3	1820-1016		IC SN75 453P DRIVER	01295	SN75453P
A1U4	1820-1199	2	IC SN74LS 04 N INV	01295	SN74LS04N
A1U5	1820-1201	4	IC SN74LS 08 N GATE	01295	SN74LS08N
A1U6	1820-1208	3	IC SN74LS 32 N GATE	01295	SN74LS32N
A1U7	1820-1211	3	IC SN74LS 86 N GATE	01295	SN74LS86N
			A1 MISCELLANEOUS		
	0340-0473	13	INSULATOR, TRANSISTOR	28480	0340-0473
	09871-01101	1	HEAT SINK, MOTOR DRIVE	28480	09871-01101
	1251-4023		CONNECTOR 12-PIN M POST TYPE	27264	09-64-1121
A2	09871-66502	1	PLATEN DRIVE BOARD ASSEMBLY	28480	09871-66502
A2C1	0160-2392	1	CAPACITOR-FXD .22UF +-5% 100WVDC POLYE	84411	663UW
A2C2	0180-1746		CAPACITOR-FXD 15UF+-10% 20VDC TA	56289	150D156X9020B2
A2C3	0180-0106		CAPACITOR-FXD 60UF+-20% 6VDC TA	56289	150D606X0006B2
A2C4	0160-3847		CAPACITOR-FXD .01UF +100-0% 25WVDC CER	28480	0160-3847
A2C5	0160-3847		CAPACITOR-FXD .01UF +100-0% 25WVDC CER	28480	0160-3847
A2C6	0180-0106		CAPACITOR-FXD 60UF+-20% 6VDC TA	56289	150D606X0006B2
A2CR1	1901-0050		DIODE-SWITCHING 80V 200NA 2NS DO-7	28480	1901-0050
A2CR2	1901-0050		DIODE-SWITCHING 80V 200NA 2NS DO-7	28480	1901-0050
A2CR3	1901-0050		DIODE-SWITCHING 80V 200NA 2NS DO-7	28480	1901-0050
A2CR4	1901-0050		DIODE-SWITCHING 80V 200NA 2NS DO-7	28480	1901-0050
A2CR5	1901-0050		DIODE-SWITCHING 80V 200NA 2NS DO-7	28480	1901-0050

Table 7-1. Replaceable Parts (cont.)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A2CR6	1901-0050		DIODE-SWITCHING 80V 200NA 2NS DO-7	28480	1901-0050
A2CR7	1901-0050		DIODE-SWITCHING 80V 200NA 2NS DO-7	28480	1901-0050
A2CR8	1901-0050		DIODE-SWITCHING 80V 200NA 2NS DO-7	28480	1901-0050
A2CR9	1901-0050		DIODE-SWITCHING 80V 200NA 2NS DO-7	28480	1901-0050
A2CR10	1901-0045		DIODE-PWR RECT 100V 750NA DO-29	28480	1901-0045
A2CR11	1901-0045		DIODE-PWR RECT 100V 750NA DO-29	28480	1901-0045
A2CR12	1901-0045		DIODE-PWR RECT 100V 750NA DO-29	28480	1901-0045
A2CR13	1901-0045		DIODE-PWR RECT 100V 750NA DO-29	28480	1901-0045
A2CR14	1901-0045		DIODE-PWR RECT 100V 750NA DO-29	28480	1901-0045
A2CR16	1902-3073	1	DIODE-ZNR 4.32V 5% DO-7 PD=.4W TC=-.035%	04713	SZ 10939-77
A2Q2	1853-0281		TRANSISTOR PNP 2N2907A SI TO-18 PD=400MW	04713	2N2907A
A2Q3	1853-0281		TRANSISTOR PNP 2N2907A SI TO-18 PD=400MW	04713	2N2907A
A2Q4	1853-0281		TRANSISTOR PNP 2N2907A SI TO-18 PD=400MW	04713	2N2907A
A2Q5	1853-0281		TRANSISTOR PNP 2N2907A SI TO-18 PD=400MW	04713	2N2907A
A2Q6	1854-0558	1	TRANSISTOR NPN SI DARL PD=70W FT=1MHZ	28480	1854-0558
A2Q7	1853-0251		TRANSISTOR PNP SI PD=90W FT=2MHZ	28480	1853-0251
A2Q8	1853-0281		TRANSISTOR PNP 2N2907A SI TO-18 PD=400MW	04713	2N2907A
A2Q9	1854-0433		TRANSISTOR NPN SI PD=90W FT=2MHZ	28480	1854-0433
A2Q10	1853-0281		TRANSISTOR PNP 2N2907A SI TO-18 PD=400MW	04713	2N2907A
A2Q11	1853-0234	2	TRANSISTOR PNP SI PD=40W FT=3MHZ	28480	1853-0234
A2Q12	1854-0456	2	TRANSISTOR NPN SI PD=40W FT=3MHZ	01295	TIP-31A
A2Q13	1853-0234		TRANSISTOR PNP SI PD=40W FT=3MHZ	28480	1853-0234
A2Q14	1853-0281		TRANSISTOR PNP 2N2907A SI TO-18 PD=400MW	04713	2N2907A
A2Q15	1854-0456		TRANSISTOR NPN SI PD=40W FT=3MHZ	01295	TIP-31A
A2Q16	1854-0071		TRANSISTOR NPN SI PD=300MW FT=200MHZ	28480	1854-0071
A2Q17	1853-0281		TRANSISTOR PNP 2N2907A SI TO-18 PD=400MW	04713	2N2907A
A2R1	0698-4505	1	RESISTOR 71.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-7152-F
A2R2	0683-3925	6	RESISTOR 3.9K 5% .25W FC TC=-400/+700	01121	CB3925
A2R3	0698-4401	1	RESISTOR 95.3 1% .125W F TC=0+-100	16299	C4-1/8-T0-95R3-F
A2R4	0683-3925		RESISTOR 3.9K 5% .25W FC TC=-400/+700	01121	CB3925
A2R5	0698-4398	1	RESISTOR 86.6 1% .125W F TC=0+-100	16299	C4-1/8-T0-86R6-F
A2R6	0683-3925		RESISTOR 3.9K 5% .25W FC TC=-400/+700	01121	CB3925
A2R7	0683-1025		RESISTOR 1K 5% .25W FC TC=-400/+600	01121	CB1025
A2R8	0683-1025		RESISTOR 1K 5% .25W FC TC=-400/+600	01121	CB1025
A2R9			* PADDING LIST (R9)		
	0698-3442		RESISTOR 237 1% .125W F TC=0+-100	16299	C4-1/8-T0-237R-F
	0698-4421		RESISTOR 249 1% .125W F TC=0+-100	16299	C4-1/8-T0-249R-F
	0698-3132		RESISTOR 261 1% .125W F TC=0+-100	16299	C4-1/8-T0-261R-F
	0757-0409		RESISTOR 274 1% .125W F TC=0+-100	24546	C4-1/8-T0-274R-F
	0698-3443		RESISTOR 287 1% .125W F TC=0+-100	16299	C4-1/8-T0-287R-F
	0757-0410	1	RESISTOR 301 1% .125W F TC=0+-100	24546	C4-1/8-T0-301R-F
	0698-3444		RESISTOR 316 1% .125W F TC=0+-100	16299	C4-1/8-T0-316R-F
	0757-0411	2	RESISTOR 332 1% .125W F TC=0+-100	24546	C4-1/8-T0-332R-F
	0698-3445		RESISTOR 348 1% .125W F TC=0+-100	16299	C4-1/8-T0-348R-F
	0757-0412		RESISTOR 365 1% .125W F TC=0+-100	24546	C4-1/8-T0-365R-F
	0698-3446		RESISTOR 383 1% .125W F TC=0+-100	16299	C4-1/8-T0-383R-F
	0698-3122		RESISTOR 412 1% .125W F TC=0+-100	03888	PME55-1/8-T0-4120-F
	0698-3488		RESISTOR 442 1% .125W F TC=0+-100	16299	C4-1/8-T0-422R-F
	0757-0415		RESISTOR 475 1% .125W F TC=0+-100	24546	C4-1/8-T0-475R-F
	0757-0416		RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
	0698-4456		RESISTOR 549 1% .125W F TC=0+-100	24546	C4-1/8-T0-549R-F
	0698-4458		RESISTOR 590 1% .125W F TC=0+-100	24546	C4-1/8-T0-590R-F
	0698-4459		RESISTOR 634 1% .125W F TC=0+-100	24546	C4-1/8-T0-634R-F
	0698-4461		RESISTOR 698 1% .125W F TC=0+-100	24546	C4-1/8-T0-698R-F
	0698-4462		RESISTOR 768 1% .125W F TC=0+-100	24546	C4-1/8-T0-768R-F
	0698-4463		RESISTOR 845 1% .125W F TC=0+-100	03888	PME55-1/8-T0-845R-F
	0698-4125		RESISTOR 953 1% .125W F TC=0+-100	16299	C4-1/8-T0-953R-F
A2R11	0757-0401		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A2R12	0811-3077	1	RESISTOR 1.5 5% .5W PW TC=0+-150	75042	BW20-1/2-1R5-J
A2R13	0683-3035	1	RESISTOR 30K 5% .25W FC TC=-400/+800	01121	CB3035
A2R14	0683-3925		RESISTOR 3.9K 5% .25W FC TC=-400/+700	01121	CB3925
A2R15	0683-1045	1	RESISTOR 100K 5% .25W FC TC=-400/+800	01121	CB1045
A2R16	0757-0397	1	RESISTOR 68.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-68R1-F
A2R17	0698-3510	1	RESISTOR 453 1% .125W F TC=0+-100	16299	C4-1/8-T0-453R-F
A2R18			* PADDING LIST (R18)		
	0698-3435		RESISTOR 38.3 1% .125W F TC=0+-100	16299	C4-1/8-T0-38R3-F
	0757-0391		RESISTOR 39.2 1% .125W F TC=0+-100	24546	C4-1/8-T0-39R2-F
	0698-3262		RESISTOR 40.2 1% .125W F TC=0+-100	16299	C4-1/8-T0-4022-F
	0698-4378		RESISTOR 41.2 1% .125W F TC=0+-100	16299	C4-1/8-T0-41R2-F
	0757-0316		RESISTOR 42.2 1% .125W F TC=0+-100	24546	C4-1/8-T0-42R2-F
	0757-0392		RESISTOR 43.2 1% .125W F TC=0+-100	24546	C4-1/8-T0-43R2-F
	0698-4379		RESISTOR 44.2 1% .125W F TC=0+-100	16299	C4-1/8-T0-44R2-F
	0698-4380		RESISTOR 45.3 1% .125W F TC=0+-100	16299	C4-1/8-T0-45R3-F
	0698-4037		RESISTOR 46.4 1% .125W F TC=0+-100	16299	C4-1/8-T0-46R4-F
	0757-0393		RESISTOR 47.5 1% .125W F TC=0+-100	24546	C4-1/8-T0-47R5-F
	0698-4381		RESISTOR 48.7 1% .125W F TC=0+-100	16299	C4-1/8-T0-48R7-F
	0757-0277		RESISTOR 49.9 1% .125W F TC=0+-100	24546	C4-1/8-T0-4992-F
A2R19	0811-3070	1	RESISTOR 2.2 5% 1W PW TC=0+-150	75042	BW-20
A2R20	0683-6215	2	RESISTOR 620 5% .25W FC TC=-400/+600	01121	CB6215
A2R21	0683-6215		RESISTOR 620 5% .25W FC TC=-400/+600	01121	CB6215
A2R22	0683-1025		RESISTOR 1K 5% .25W FC TC=-400/+600	01121	CB1025
A2R23	0757-0817	2	RESISTOR 750 1% .5W F TC=0+-100	19701	MF7C1/2-T0-751-F

Table 7-1. Replaceable Parts (cont.)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A2R24	0683-1025		RESISTOR 1K 5% .25W FC TC=-400/+600	01121	CB1025
A2R25	0757-0817		RESISTOR 750 1% .5W F TC=0+-100	19701	MF7C1/2-TO-751-F
A2R26	0683-1025		RESISTOR 1K 5% .25W FC TC=-400/+600	01121	CB1025
A2R27	0683-1025		RESISTOR 1K 5% .25W FC TC=-400/+600	01121	CB1025
A2R28	0757-0159	2	RESISTOR 1K 1% .5W F TC=0+-100	19701	MF7C1/2-TO-1R0-F
A2R29	0683-1025		RESISTOR 1K 5% .25W FC TC=-400/+600	01121	CB1025
A2R30	0683-1025		RESISTOR 1K 5% .25W FC TC=-400/+600	01121	CB1025
A2R31	0757-0821	2	RESISTOR 1.21K 1% .5W F TC=0+-100	19701	MF7C1/2-TO-1211-F
A2R32	0683-1025		RESISTOR 1K 5% .25W FC TC=-400/+600	01121	CB1025
A2R33	0811-1204	2	RESISTOR 200 5% 5W PW TC=0+-20	07088	KM-500
A2R34	0683-1025		RESISTOR 1K 5% .25W FC TC=-400/+600	01121	CB1025
A2R35	0757-0159		RESISTOR 1K 1% .5W F TC=0+-100	19701	MF7C1/2-TO-1R0-F
A2R36	0683-1025		RESISTOR 1K 5% .25W FC TC=-400/+600	01121	CB1025
A2R37	0683-1025		RESISTOR 1K 5% .25W FC TC=-400/+600	01121	CB1025
A2R38	0757-0821		RESISTOR 1.21K 1% .5W F TC=0+-100	19701	MF7C1/2-TO-1211-F
A2R39	0683-1025		RESISTOR 1K 5% .25W FC TC=-400/+600	01121	CB1025
A2R40	0811-1204		RESISTOR 200 5% 5W PW TC=0+-20	07088	KM-500
A2R41	0757-0401		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-TO-101-F
A2R42			* PADDING LIST (R42)		
	0757-0978		RESISTOR 95.3K 1% .125W F TC=0+-100	24546	C4-1/8-TO-9532-F
	0698-4513		RESISTOR 97.6K 1% .125W F TC=0+-100	03888	PME55-1/8-TO-9762-F
	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-TO-1003-F
	0698-3148		RESISTOR 102K 1% .125W F TC=0+-100	16299	C4-1/8-TO-1023-F
	0698-4514		RESISTOR 105K 1% .125W F TC=0+-100	24546	C4-1/8-TO-1053-F
	0698-4515		RESISTOR 107K 1% .125W F TC=0+-100	24546	C4-1/8-TO-1073-F
	0757-0466		RESISTOR 110K 1% .125W F TC=0+-100	24546	C4-1/8-TO-1103-F
	0698-4516		RESISTOR 113K 1% .125W F TC=0+-100	24546	C4-1/8-TO-1133-F
	0698-3271		RESISTOR 115K 1% .125W F TC=0+-100	16299	C4-1/8-TO-1153-F
	0698-3265		RESISTOR 118K 1% .125W F TC=0+-100	16299	C4-1/8-TO-1183-F
	0757-0467		RESISTOR 121K 1% .125W F TC=0+-100	24546	C4-1/8-TO-1213-F
	0757-0271		RESISTOR 124K 1% .125W F TC=0+-100	24546	C4-1/8-TO-1243-F
	0698-4517		RESISTOR 127K 1% .125W F TC=0+-100	24546	C4-1/8-TO-1273-F
	0757-0468		RESISTOR 130K 1% .125W F TC=0+-100	24546	C4-1/8-TO-1303-F
	0698-3451		RESISTOR 133K 1% .125W F TC=0+-100	16299	C4-1/8-TO-1333-F
	0698-4518		RESISTOR 137K 1% .125W F TC=0+-100	24546	C4-1/8-TO-1373-F
A2R43	0683-3925		RESISTOR 3.9K 5% .25W FC TC=+400/+700	01121	CB3925
A2R44	0683-0275	1	RESISTOR 2.7 5% .25W FC TC=-400/+500	01121	CB27G5
A2U1	1820-0730	2	IC MV	34335	96L02DC
A2U2	1820-1198	2	IC SN74LS 03 N GATE	01295	SN74LS03N
A2U3	1820-1197	5	IC SN74LS 00 N GATE	01295	SN74LS00N
A2U4	1820-1112	2	IC SN74LS 74 N FLIP-FLOP	01295	SN74LS74N
A2U5	1820-1016		IC SN75 453P ORIVER	01295	SN75453P
A2U6	1826-0065	1	IC LM 311 COMPARATOR	27014	LM311N
A2U7	1820-0668	1	IC SN74 07 N BUFFER	01295	SN7407N
			A2 MISCELLANEOUS		
	0340-0473		INSULATOR, TRANSISTOR	28480	0340-0473
	09871-01102	1	HEAT SINK, PLATEN	28480	09871-01102
	4040-0711	1	EXTRACTOR:8RN PC	28480	4040-0711
	4040-0712	2	EXTRACTOR:RED PC	28480	4040-0712
	1251-3760	1	CONNECTOR 6-PIN M POST TYPE	27264	09-64-1061
	1251-4023		CONNECTOR 12-PIN M POST TYPE	27264	09-64-1121
A3	09871-66503	1	P.C. ASSEMBLY, LOGIC BOARD	28480	09871-66503
A3C1	0160-3847		CAPACITOR-FXD .01UF +100-0% 25WVDC CER	28480	0160-3847
A3C2	0150-0121	6	CAPACITOR-FXD .1UF +80-20% 50WVDC CER	28480	0150-0121
A3C3	0140-0200	2	CAPACITOR-FXD 390PF +-5% 300WVDC MICA	72136	DM15F391J0300WV1CR
A3C4	0140-0200		CAPACITOR-FXD 390PF +-5% 300WVDC MICA	72136	DM15F391J0300WV1CR
A3C5	0160-3847		CAPACITOR-FXD .01UF +100-0% 25WVDC CER	28480	0160-3847
A3C6	0150-0121		CAPACITOR-FXD .1UF +80-20% 50WVDC CER	28480	0150-0121
A3C7	0150-0121		CAPACITOR-FXD .1UF +80-20% 50WVDC CER	28480	0150-0121
A3C8	0160-3847		CAPACITOR-FXD .01UF +100-0% 25WVDC CER	28480	0160-3847
A3C9	0160-0207	2	CAPACITOR-FXD .01UF +-5% 200WVDC POLYE	56289	292P10352
A3C10	0160-0207		CAPACITOR-FXD .01UF +-5% 200WVDC POLYE	56289	292P10352
A3C11	0160-3847		CAPACITOR-FXD .01UF +100-0% 25WVDC CER	28480	0160-3847
A3C12	0160-3847		CAPACITOR-FXD .01UF +100-0% 25WVDC CER	28480	0160-3847
A3C13	0160-3847		CAPACITOR-FXD .01UF +100-0% 25WVDC CER	28480	0160-3847
A3C14	0160-3847		CAPACITOR-FXD .01UF +100-0% 25WVDC CER	28480	0160-3847
A3C15	0150-0121		CAPACITOR-FXD .1UF +80-20% 50WVDC CER	28480	0150-0121
A3C16	0160-3847		CAPACITOR-FXD .01UF +100-0% 25WVDC CER	28480	0160-3847
A3C17	0160-3847		CAPACITOR-FXD .01UF +100-0% 25WVDC CER	28480	0160-3847
A3C18	0150-0121		CAPACITOR-FXD .1UF +80-20% 50WVDC CER	28480	0150-0121
A3C19	0160-3847		CAPACITOR-FXD .01UF +100-0% 25WVDC CER	28480	0160-3847
A3C20	0160-3847		CAPACITOR-FXD .01UF +100-0% 25WVDC CER	28480	0160-3847
A3C21	0160-0938	4	CAPACITOR-FXD 1000PF +-5% 100WVDC MICA	53021	D15C1E102J
A3C22	0160-0938		CAPACITOR-FXD 1000PF +-5% 100WVDC MICA	53021	D15C1E102J
A3C23	0160-0938		CAPACITOR-FXD 1000PF +-5% 100WVDC MICA	53021	D15C1E102J
A3C24	0160-0938		CAPACITOR-FXD 1000PF +-5% 100WVDC MICA	53021	D15C1E102J
A3C25	0180-0106		CAPACITOR-FXD 60UF+-20% 6VDC TA	56289	150D606X0006B2

Table 7-1. Replaceable Parts (cont.)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A3C26	0180-0106		CAPACITOR-FXD 60UF+20% 6VDC TA	56289	150D606X0006B2
A3CR1	1901-0050		DIODE-SWITCHING 80V 200NA 2NS DO-7	28480	1901-0050
A3CR2	1901-0050		DIODE-SWITCHING 80V 200NA 2NS DO-7	28480	1901-0050
A3R1	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A3R2	0757-0429	2	RESISTOR 1.82K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1821-F
A3R3	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A3R4	0757-0429		RESISTOR 1.82K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1821-F
A3R5	0683-1825		RESISTOR 1.8K 5% .25W FC TC=-400/+700	01121	CB1825
A3R6	0683-1035	1	RESISTOR 10K 5% .25W FC TC=-400/+700	01121	CB1035
A3R7	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A3R8	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A3R9	0757-0411		RESISTOR 332 1% .125W F TC=0+-100	24546	C4-1/8-T0-332R-F
A3R10	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A3R11	0757-0411		RESISTOR 332 1% .125W F TC=0+-100	24546	C4-1/8-T0-332R-F
A3R12	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A3R13	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A3R14	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A3R15	0698-4464	1	RESISTOR 887 1% .125W F TC=0+-100	24546	C4-1/8-T0-887R-F
A3R16	0683-1825		RESISTOR 1.8K 5% .25W FC TC=-400/+700	01121	CB1825
A3R17	0683-1825		RESISTOR 1.8K 5% .25W FC TC=-400/+700	01121	CB1825
A3R19	0698-4495	2	RESISTOR 37.4K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3742-F
A3R21	0698-4495		RESISTOR 37.4K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3742-F
A3R22	0683-1825		RESISTOR 1.8K 5% .25W FC TC=-400/+700	01121	CB1825
A3R23	0698-3700	2	RESISTOR 715 1% .125W F TC=0+-100	16299	C4-1/8-T0-715R-F
A3R24	0683-1825		RESISTOR 1.8K 5% .25W FC TC=-400/+700	01121	CB1825
A3R25	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A3R26	0683-3925		RESISTOR 3.9K 5% .25W FC TC=-400/+700	01121	CB3925
A3R27	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A3R28	0698-3700		RESISTOR 715 1% .125W F TC=0+-100	16299	C4-1/8-T0-715R-F
A3R29	0683-1825		RESISTOR 1.8K 5% .25W FC TC=-400/+700	01121	CB1825
A3R30	0683-1825		RESISTOR 1.8K 5% .25W FC TC=-400/+700	01121	CB1825
A3R31	0683-1825		RESISTOR 1.8K 5% .25W FC TC=-400/+700	01121	CB1825
A3R32	0683-1825		RESISTOR 1.8K 5% .25W FC TC=-400/+700	01121	CB1825
A3R33	1810-0076	2	NETWORK-RES 9-PIN-SIP .15-PIN-SPCG	28480	1810-0076
A3R34	1810-0076		NETWORK-RES 9-PIN-SIP .15-PIN-SPCG	28480	1810-0076
A3R35	0683-1825		RESISTOR 1.8K 5% .25W FC TC=-400/+700	01121	CB1825
A3U1	1820-0681	1	IC SN74S 00 N GATE	01295	SN74S00N
A3U2	1820-1366	1	IC MH0026CN DRIVER	27014	MH0026CN
A3U3	1818-0140	4	IC 2112 1K RAM NMOS	34649	2112
A3U4	1820-1411	5	IC SN74LS 75 N LATCH	01295	SN74LS75N
A3U5	1820-1112		IC SN74LS 74 N FLIP-FLOP	01295	SN74LS74N
A3U6	1820-0629	3	IC SN74S 112 N FLIP-FLOP	01295	SN74S112N
A3U7	1820-0683	1	IC SN74S 04 N INV	01295	SN74S04N
A3U8	1818-2625	1	IC, ROM	28480	1818-2625
A3U9	1820-1584	2	IC, 8IB	28480	1820-1584
A3U10	1818-0140		IC 2112 1K RAM NMOS	34649	2112
A3U11	1820-1203	1	IC SN74LS 11 N GATE	01295	SN74LS11N
A3U12	1820-0730		IC MV	34335	96L02DC
A3U13	1820-1194	5	IC SN74LS193N COUNTER	01295	SN74LS193N
A3U14	1820-1197		IC SN74LS 00 N GATE	01295	SN74LS00N
A3U15	1820-1198		IC SN74LS 03 N GATE	01295	SN74LS03N
A3U16	1818-2500	1	IC, BPC	28480	1818-2500
A3U17	1818-0140		IC 2112 1K RAM NMOS	34649	2112
A3U18	1820-1411		IC SN74LS 75 N LATCH	01295	SN74LS75N
A3U19	1820-1197		IC SN74LS 00 N GATE	01295	SN74LS00N
A3U20	1820-1211		IC SN74LS 86 N GATE	01295	SN74LS86N
A3U21	1820-1201		IC SN74LS 08 N GATE	01295	SN74LS08N
A3U22	1820-1208		IC SN74LS 32 N GATE	01295	SN74LS32N
A3U23	1818-2628	1	IC, ROM	28480	1818-2628
A3U24	1820-1584		IC, 8IB	28480	1820-1584
A3U25	1818-0140		IC 2112 1K RAM NMOS	34649	2112
A3U26	1820-1411		IC SN74LS 75 N LATCH	01295	SN74LS75N
A3U27	1820-0629		IC SN74S 112 N FLIP-FLOP	01295	SN74S112N
A3U28	1820-1194		IC SN74LS193N COUNTER	01295	SN74LS193N
A3U29	1820-1211		IC SN74LS 86 N GATE	01295	SN74LS86N
A3U30	1820-1194		IC SN74LS193N COUNTER	01295	SN74LS193N
A3U31	1820-1255	2	IC DM80 98N INV	27014	DM8098N
A3U32	1820-1199		IC SN74LS 04 N INV	01295	SN74LS04N
A3U33	1820-0629		IC SN74S 112 N FLIP-FLOP	01295	SN74S112N
A3U34	1820-1197		IC SN74LS 00 N GATE	01295	SN74LS00N
A3U35	1820-1201		IC SN74LS 08 N GATE	01295	SN74LS08N
A3U36	1820-1197		IC SN74LS 00 N GATE	01295	SN74LS00N
A3U37	1820-1411		IC SN74LS 75 N LATCH	01295	SN74LS75N
A3U38	1820-1194		IC SN74LS193N COUNTER	01295	SN74LS193N
A3U39	1820-1196	2	IC SN74LS174 N FLIP-FLOP	01295	SN74LS174N
A3U40	1820-1194		IC SN74LS193N COUNTER	01295	SN74LS193N

Table 7-1. Replaceable Parts (cont.)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A3U41	1820-1255		IC DM80 98N INV	27014	DM8098N
A3U42	1820-1208		IC SN74LS 32 N GATE	01295	SN74LS32N
A3U43	1820-1201		IC SN74LS 08 N GATE	01295	SN74LS08N
A3U44	1820-1196		IC SN74LS174 N FLIP-FLOP	01295	SN74LS174N
A3U45	1820-1411		IC SN74LS 75 N LATCH	01295	SN74LS75N
A3U46	1820-1049	2	IC DM80 97N BUFFER	27014	DM8097N
A3U47	1820-1049		IC DM80 97N BUFFER	27014	DM8097N
A3Y1	0410-0661	1	CRYSTAL QUARTZ 12.000MHZ .005% SER A3 MISCELLANEOUS	75378	S-1032-3F-H3W
	1200-0583	2	SOCKET-IC 24-CONT LSI DIP-SLDR	28480	1200-0583
	4040-0712		EXTRACTOR:RED PC	28480	4040-0712
	4040-0714	1	EXTRACTOR:YELLOW P C	28480	4040-0714
A4	09871-66504	1	ENCODER BOARD ASSEMBLY	28480	09871-66504
A4C1	0150-0121		CAPACITOR-FXD .1UF +80-20% 50WVDC CER	28480	0150-0121
A4C2	0160-3847		CAPACITOR-FXD .01UF +100-0% 25WVDC CER	28480	0160-3847
A4CR1	1990-0443	2	OPTO-ISOLATOR IF=200MA-MAX BVR=2V ID=2A	28480	1990-0443
A4CR2	1990-0443		OPTO-ISOLATOR IF=200MA-MAX BVR=2V ID=2A	28480	1990-0443
A4R1	0698-4433	4	RESISTOR 2.26K 1% .125W F TC=0+-100	16299	C4-1/8-T0-2261-F
A4R2			* PADDING LIST (R2)		
	0683-8215		RESISTOR 820 5% .25W FC TC=-400/+600	01121	CB8215
	0683-1025	13	RESISTOR 1K 5% .25W FC TC=-400/+600	01121	CB1025
	0683-1325		RESISTOR 1.3K 5% .25W FC TC=-400/+700	01121	CB1325
	0683-1825	10	RESISTOR 1.8K 5% .25W FC TC=-400/+700	01121	CB1825
	0683-2425		RESISTOR 2.4K 5% .25W FC TC=-400/+700	01121	CB2425
	0683-3325		RESISTOR 3.3K 5% .25W FC TC=-400/+700	01121	CB3325
A4R3	0698-4423	2	RESISTOR 1.37K 1% .125W F TC=0+-100	16299	C4-1/8-T0-1371-F
A4R4	0698-4433		RESISTOR 2.26K 1% .125W F TC=0+-100	16299	C4-1/8-T0-2261-F
A4R5			* PADDING LIST (R5)		
	0683-8215		RESISTOR 820 5% .25W FC TC=-400/+600	01121	CB8215
	0683-1025		RESISTOR 1K 5% .25W FC TC=-400/+600	01121	CB1025
	0683-1325		RESISTOR 1.3K 5% .25W FC TC=-400/+700	01121	CB1325
	0683-1825		RESISTOR 1.8K 5% .25W FC TC=-400/+700	01121	CB1825
	0683-2425		RESISTOR 2.4K 5% .25W FC TC=-400/+700	01121	CB2425
	0683-3325		RESISTOR 3.3K 5% .25W FC TC=-400/+700	01121	CB3325
A4R6	0698-4423		RESISTOR 1.37K 1% .125W F TC=0+-100	16299	C4-1/8-T0-1371-F
A4R7	0698-3458	2	RESISTOR 348K 1% .125W F TC=0+-100	03888	PME55S
A4R8	0698-4433		RESISTOR 2.26K 1% .125W F TC=0+-100	16299	C4-1/8-T0-2261-F
A4R9	0698-4433		RESISTOR 2.26K 1% .125W F TC=0+-100	16299	C4-1/8-T0-2261-F
A4R10	0698-3458		RESISTOR 348K 1% .125W F TC=0+-100	03888	PME55S
A4R11	0757-0178	2	RESISTOR 100 1% .25W F TC=0+-100	24546	C5-1/4-T0-101-F
A4R12	0757-0178		RESISTOR 100 1% .25W F TC=0+-100	24546	C5-1/4-T0-101-F
A5	09871-31001	1	I/O BOARD ASSEMBLY	28480	09871-31001
	09871-66505	1	I/O BOARD	28480	09871-66505
	09871-04103	1	PLATE, INPUT	28480	09871-04103
	1251-4150	1	CONNECTOR 37-PIN M RECTANGULAR	28480	1251-4150
	7120-5014	1	LABEL INFORMATION	28480	7120-5014
B1	3160-0209	1	FAN-TBAX 45-CFM 115V 50/60-HZ 1.5-THK	28480	3160-0209
C3	0180-1746		CAPACITOR-FXD 15UF+-10% 20VDC TA	56289	150D156X902082
C4	0180-1746		CAPACITOR-FXD 15UF+-10% 20VDC TA	56289	150D156X902082
F1	2110-0002	1	FUSE 2A 250V 1.25X.25 UL IEC (FOR 120V OPERATION)	71400	AGC-2
F1	2110-0312	1	FUSE 1A 250V SLO-BLO 1.25X.25 UL IEC (FOR 240V OPERATION)	71400	MDL-1,
HM1	1010-0048	1	METER, ELAPSED TIME	18583	MDL-420-CP-3
L1	9100-3837	1	COIL ASSEMBLY	28480	9100-3837
M1	09871-67912	2	MOTOR ASSEMBLY	28480	09871-67912
M2	09871-67912		MOTOR ASSEMBLY	28480	09871-67912
M3	3140-0559	1	MOTOR, STEPPER	28480	3140-0559
Q1	1826-0181	1	IC LM 323 V RGLTR	27014	LM323K
Q2	1826-0117	1	IC V RGLTR	07263	7812KC
T1	9100-3486	1	TRANSFORMER, POWER	28480	9100-3486
W1	8120-1378	1	CABLE ASSY 3-COND 18-AWG	28480	8120-1378
Z1	9100-0530	1	FILTER-LINE 1A, 250 VAC	28480	9100-0530

Table 7-1. Replaceable Parts (cont.)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
1	09871-64401	1	CABINET ASSEMBLY, TOP	28480	09871-64401
2	5040-7844	2	PLATE, COVER, RT	28480	5040-7844
3	5040-7845	1	PLATE, COVER, LT	28480	5040-7845
4	09871-64402	1	CABINET ASSEMBLY, BOTTOM	28480	09871-64402
5	09871-64403	1	ACCESS COVER ASSEMBLY	28480	09871-64403
6	0370-2869	1	KNOB, PLATEN	28480	0370-2869
7	09871-04116	2	CLAMP	28480	09871-04116
8	09871-06001	2	PLATE, LATCH	28480	09871-06001
9	09871-25001	2	STUD, LATCH	28480	09871-25001
10	0370-2890	1	PUSHBUTTON, SQUARE	28480	0370-2890
11	0370-2891	1	BEZEL, PUSHBUTTON, SQUARE	28480	0370-2891
12	0380-0006	2	STANDOFF-RND .375LG .181D .250D BRS NI	28480	0380-0006
13	09871-00201	1	PANEL, REAR	28480	09871-00201
14	09871-00202	1	SUB-PANEL	28480	09871-00202
15	09871-00204	1	PLATE, SWITCH	28480	09871-00204
16	09871-01103	1	SHIELD	28480	09871-01103
17	09871-01202	1	HINGE, PANEL	28480	09871-01202
18	09871-06002	1	PLATE, RETAINER	28480	09871-06002
19	0050-0615	1	CASTING, BASE PLATE	28480	0050-0615
20	09871-04133	1	PLATE, SUPPORT	28480	09871-04133
21	09871-21731	4	BUSHING, CAM	28480	09871-21731
22	09871-21732	1	BEARING, PLATEN	28480	09871-21732
23	09871-22534	4	SCREW, COUPLER	28480	09871-22534
24	09871-24134	1	CAP, PLATEN	28480	09871-24134
25	09871-24731	2	SUPPORT	28480	09871-24731
26	09871-26031	2	ECCENTRIC	28480	09871-26031
27	09871-26033	8	ROLLER, FR PAPER	28480	09871-26033
28	09871-26034	8	ROLLER, R PAPER	28480	09871-26034
29	09871-27231	2	CAM, RELEASE	28480	09871-27231
30	09871-27432	1	ADAPTER, KNOB	28480	09871-27432
31	09871-60102	1	PLATE, SENSOR	28480	09871-60102
32	09871-63234	1	COUPLER ASSEMBLY	28480	09871-63234
33	09871-64131	1	PLATE, FRAME, RT	28480	09871-64131
34	09871-64132	1	PLATE, FRAME, LT	28480	09871-64132
35	1010-0048	1	METER, ELAPSED TIME	18583	MDL-420-CP-3
36	1200-0479	2	SOCKET-XSTR 2-CONT TO-3-PKG	91833	4601
37	1251-3279		CONNECTOR 12-PIN F POST TYPE	27264	09-50-7121
38	1430-0564	1	GEAR, SPUR PLATEN	28480	1430-0564
39	1460-1435	4	SPRING, ROLLER	28480	1460-1435
40	1460-1450	2	SPRING, EXTENSION	84830	LE-0228-2-MW
41	1480-0060	1	PIN, ROLL .125	00000	OBD
42	1500-0456	1	SHAFT	28480	1500-0456
43	1500-0461	1	SHAFT, BAIL	28480	1500-0461
44	1530-1843	2	ROLLER, BAIL	28480	1530-1843
45	1530-1861	1	BRACKET, RT SIDE	28480	1530-1861
46	1530-1862	1	BRACKET, LT SIDE	28480	1530-1862
47	1530-1863	1	BRACKET, RT MOUNTING	28480	1530-1863
48	1530-1864	1	BRACKET, LT MOUNTING	28480	1530-1864
49	1530-1868	1	PLATEN	28480	1530-1868
50	5040-5187	1	PAPER GUIDE	28480	5040-5187
51	09871-61601	1	CABLE ASSEMBLY, POWER	28480	09871-61601
52	1400-0650	2	CLAMP, CABLE	06915	KKC-4
53	3100-3367	1	THUMBWHEEL, SWITCH	28480	3100-3367
54	3101-1767	1	SWITCH-PB DPDT MOM 1A 300VAC	28480	3101-1767
55	3160-0209	1	FAN-TBAX 45-CFM 115V 50/60-HZ 1.5-THK	28480	3160-0209
56	9100-0530	1	FILTER-LINE 1A, 250 VAC	28480	9100-0530
57	09871-62002	1	LEVER, RELEASE, FINISH	28480	09871-62002
58	09871-00111	1	CHASSIS, DRIVE	28480	09871-00111
59	09871-04111	1	ADJUSTABLE PLATE, LOWER	28480	09871-04111
60	09871-04112	1	ADJUSTABLE PLATE, UPPER	28480	09871-04112
61	09871-04113	1	END CAP, LT	28480	09871-04113
62	09871-21711	2	BEARING, RIGHT HUB	28480	09871-21711
63	09871-21712	2	BEARING, LEFT HUB	28480	09871-21712
64	09871-21713	2	SLEEVE, RIGHT SHAFT	28480	09871-21713
65	09871-21714	2	SLEEVE, LEFT SHAFT	28480	09871-21714
66	09871-26022	1	HOUSING, HAMMER	28480	09871-26022
67	09871-27211	1	BLOCK, STOP	28480	09871-27211
68	0460-1159	2	PAD, PHOTOCELL	28480	0460-1159
69	09871-21101	1	HEAD, ENCODER	28480	09871-21101
70	1251-3279		CONNECTOR 12-PIN F POST TYPE	27264	09-50-7121
71	1410-0587	2	RING, STAR TOOL	98023	OBD
72	1530-1839	1	PLATE, ENCODER	28480	1530-1839
73	3140-0560	1	GRATING, ENCODER	28480	3140-0560
74	5040-7815	1	SPROCKET, DRIVE	28480	5040-7815

Table 7-1. Replaceable Parts (cont.)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
75	5040-7847	1	ENCODER HOUSING, FRONT	28480	5040-7847
76	5040-7848	1	ENCODER HOUSING, REAR	28480	5040-7848
77	5040-7913	1	DISC ASSEMBLY, ENCODER	28480	5040-7913
78	1600-0529	1	SPACER, SOLENOID	28480	1600-0529
79	09871-22001	1	FRAME, CARRIER	28480	09871-22001
80	09871-27921	1	PLUNGER	28480	09871-27921
81	1410-0588	10	BEARING, ANTFRC RDL	28480	1410-0588
82	1460-1433	1	SPRING-TRSN .326-OD .3-LG MUW	28480	1460-1433
83	1460-1437	2	SPRING, HUB	28480	1460-1437
84	1460-1438	1	SPRING, EJECTOR	28480	1460-1438
85	1460-1457	3	SPRING-LEAF .625-W 1.094-LG SST	28480	1460-1457
86	0510-0553	2	SCREW, POST	28480	0510-0553
87	1530-1821	1	ACTUATOR PIVOT	28480	1530-1821
88	1530-1866	3	BEARING, AXLE	28480	1530-1866
89	1600-0509	1	LEVER EJECTOR	28480	1600-0509
90	3050-0417	1	WASHER, SPR CRVD	78189	3502-10-19-0541
91	4324-0071	1	PAD, FOAM, NEO. CL CELL SOFT GRADE ADH	12599	OBD
92	4324-0082	2	PAD, ACTUATOR	28480	4324-0082
93	5040-7708	1	HUB, CHAR DISK	28480	5040-7708
94	5040-7735	1	HAMMER, ACTUATOR	28480	5040-7735
95	5040-7785	2	SPROCKET, CARRIER	28480	5040-7785
96	9100-3837	1	COIL ASSEMBLY	28480	9100-3837
97	3101-1309	1	SWITCH-SENS SPDT SUBMIN 5A 250VAC	91929	311SM5-T
98			NOT ASSIGNED		
99	1460-1434	1	SPRING, COMPRESSION	28480	1460-1434
100	1460-1447	2	SPRING, RETAINING	28480	1460-1447
101	1530-1820	2	PIVOT, DRIVE GEAR	28480	1530-1820
102	1600-0502	1	BRACKET, MOTOR	28480	1600-0502
103	1600-0516	1	SHIELD, RIBBON	28480	1600-0516
104	2260-0001	1	NUT-HEX-DBL-CHAM 4-40-THD .094-THK	28480	2260-0001
105	3050-0480	3	WASHER, SPR CRVD	70472	W-125-0040
106	3140-0518	3	MOTOR, 6V (requires parts 107 and 109)	28480	T-87871
107	4040-1020	1	KEY GEAR	28480	4040-1020
108	4324-0071		PAD, FOAM, NEO. CL CELL SOFT GRADE ADH	12599	OBD
109	5040-7698	1	GEAR, MOTOR	28480	5040-7698
110	5040-7699	2	GEAR IDLER	28480	5040-7699
111	5040-7700	2	GEAR DRIVE	28480	5040-7700
112	5040-7737	1	SWING ARM	28480	5040-7737
113	5040-7862	1	CARRIER, UPPER	28480	5040-7862
114	1400-0084	1	FUSEHOLDER-EXTR. POST 15A 250V		
115	1460-1087	1	SPRING-CPRSN .24-OD .375-LG MUW	28480	1460-1087
116	1460-1445	1	SPRING-CPRSN .195-OD .65-LG MUW CD	28480	1460-1445
117	1500-0441	1	CHAIN, TRANSMISSION	28480	1500-0441
118	1500-0457	2	SHAFT, GUIDE	28480	1500-0457
119	1530-1838	1	HAMMER	28480	1530-1838
120	1600-0523	2	ADJUSTABLE PLATE, SHAFT	28480	1600-0523
121	5040-7814	4	SPROCKET, IDLER	28480	5040-7814
122	5040-7878	1	END CAP, RT	28480	5040-7878
123	1530-1867	2	ADJUSTOR, MODULE	28480	1530-1867
124	0380-0007		STANDOFF-RND .438LG .181D .250D BRS NI	28480	0380-0007
125	0380-0342	1	STANDOFF-RVT-ON .125LG 6-32THD .250D BRS	28480	0380-0342
126	0510-0045	2	RETAINER-RING .188-DIA CD PL STL	00138	1500-18-CD
127	0510-0052	2	RETAINER-RING .125-DIA CD PL STL	97464	7100-12-CD
128	0510-0070	3	RETAINER-RING .125-DIA CD PL STL	97464	2000-12-ST-CD
129	0510-0083	2	RETAINER-RING .25-DIA CD PL STL	07953	5133-25-MF
130	0510-0089	1	RETAINER-RING .188-DIA CD PL BE CU	97464	3100-18-BC-CD
131	0520-0155	2	SCREW-MACH 2-56 .125-IN-LG PAN-HD-POZI	28480	0520-0155
132	0590-0085	2	NUT-HEX-DBL-CHAM 3-48-THD .062-THK	28480	0590-0085
133	0624-0315	4	SCREW-TPG 4-20 .312-IN-LG 82 DEG	28480	0624-0315
134	2360-0322	6	SCREW-MACH 6-32 .375-IN-LG 100 DEG FL-HD	28480	2360-0322
135	2160-0003	8	NUT-NYLOCK, 4-40	28480	2120-0003
136	2190-0003	9	WASHER-LK HLCL NO.-4 .115-IN-ID	28480	2190-0003
137	2190-0006	10	WASHER-LK HLCL NO.-6 .141-IN-ID	28480	2190-0006
138	2190-0007	2	WASHER-LK INTL T NO.-6 .141-IN-ID	78189	1906-00
139	2190-0008	24	WASHER-LK EXT T NO.-6 .141-IN-ID	73734	1341
140	2190-0017	4	WASHER-LK HLCL NO.-8 .168-IN-ID	28480	2190-0017
141	2190-0034	2	WASHER-LK HLCL NO.-10 .194-IN-ID	28480	2190-0034
142	2190-0053	4	WASHER, LOCK	00000	OBD
143	2190-0054	1	WASHER-LK INTL T NO.-1/2 .505-IN-ID	78189	1924-12
144	2190-0913	17	WASHER-LK HLCL NO.-4 .115-IN-ID	28480	2190-0913
145	2190-0918	44	WASHER-LK HLCL NO.-6 .141-IN-ID	28480	2190-0918
146	2200-0139	14	SCREW-MACH 4-40 .25-IN-LG PAN-HD-POZI	28480	2200-0139
147	2200-0143	14	SCREW-MACH 4-40 .375-IN-LG PAN-HD-POZI	28480	2200-0143
148	2200-0153	2	SCREW-MACH 4-40 .875-IN-LG PAN-HD-POZI	28480	2200-0153
149	2200-0165	2	SCREW-MACH 4-40 .25-IN-LG 82 DEG	28480	2200-0165

Table 7-1. Replaceable Parts (cont.)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
150	2200-0169	5	SCREW-MACH 4-40 .5-IN-LG 82 DEG	28480	2200-0169
151	2260-0002	8	NUT-HEX-DBL-CHAM 4-40-THD .062-THK	28480	2260-0002
152	2360-0117	16	SCREW-MACH 6-32 .375-IN-LG PAN-HD-POZI	28480	2360-0117
153	2360-0194	5	SCREW-MACH 6-32 .312-IN-LG 100 DEG	28480	2360-0194
154	2360-0197	25	SCREW-MACH 6-32 .375-IN-LG PAN-HD-POZI	28480	2360-0197
155	2360-0199	3	SCREW-MACH 6-32 .438-IN-LG PAN-HD-POZI	28480	2360-0199
156	2360-0202	2	SCREW-MACH 6-32 .625-IN-LG 100 DEG	28480	2360-0202
157	2360-0203	7	SCREW-MACH 6-32 .625-IN-LG PAN-HD-POZI	28480	2360-0203
158	2360-0205	2	SCREW-MACH 6-32 .75-IN-LG PAN-HD-POZI	28480	2360-0205
159	2360-0212	2	SCREW-MACH 6-32 .875-IN-LG 82 DEG	28480	2360-0212
160	2420-0002	41	NUT-HEX-DBL-CHAM 6-32-THD .109-THK	28480	2420-0002
161	2420-0003	14	NUT-HEX-DBL-CHAM 6-32-THD .094-THK	28480	2420-0003
162	2680-0099	2	SCREW-MACH 10-32 .375-IN-LG PAN-HD-POZI	28480	2680-0099
163	2200-0147	8	SCREW-MACH .5 PAN	28480	2200-0147
164	2950-0038	1	NUT-SPCLY 1/2-24-THD .125-THK .688-A/F	75915	903-12
165	2580-0004	4	NUT-HEX-DBL-CHAM 8-32-THD .125-THK	28480	2580-0004
166	3050-0016	14	WASHER-FL MTLC NO.-6 .147-IN-ID	28480	3050-0016
167	3050-0066	38	WASHER-FL MTLC NO.-6 .147-IN-ID	28480	3050-0066
168	3050-0071	8	WASHER-FL MTLC NO.-8 .169-IN-ID	28480	3050-0071
169	2200-0737	3	SCREW-MACH 4-40; .25 FL/PHL		
170	3030-0624	1	SCREW-SET 6-32 .375-IN-LG FLAT-PT SST	28480	3030-0624
171	3050-0716	25	WASHER-FL MTLC NO.-5 .128-IN-ID	70318	NAS620-C5
172	2360-0201	26	SCREW-MACH 6-32 .5-IN-LG PAN-HD-POZI	28480	2360-0201
173			NOT ASSIGNED		
174	0624-0203	1	SCREW-TPG 4-40 .375-IN-LG 82 DEG	28480	0624-0203
175	09871-26021	5	BEARING, HUB	28480	09871-26021
177	3050-0693	1	WASHER, SOLENOID	28480	3050-0693
			MISCELLANEOUS PARTS		
	1251-2619	1	CONNECTOR 4-PIN M UTILITY	27264	03-06-2042
	1251-3275	1	CONNECTOR 6-PIN F POST TYPE	27264	09-50-7061
	1251-3279	6	CONNECTOR 12-PIN F POST TYPE	27264	09-50-7121
	7120-4808	1	LABEL, WARNING	28480	7120-4808
	1251-2618	1	CONNECTOR 4-PIN F UTILITY	27264	03-06-1042
	1251-3483	1	CONNECTOR 4-PIN F POST TYPE	08261	SS-65039-033
	7120-4535	1	LABEL, LINE	28480	7120-4535
	09871-90030	1	SERVICE MANUAL	28480	09871-90030
	1530-0697	1	CHARACTER DISK, COURIER FONT, 10-PITCH	0D16C	OBD
	2110-0002	2	FUSE 2A 250V 1.25X.25 UL IEC	71400	AGC-2
	2110-0312	1	FUSE 1A 250V SLO-BLO 1.25X.25 UL IEC	71400	MDL-1,
	5040-7437	1	KEY, RCM DOOR	28480	5040-7437
	7120-5027	1	WARNING LABEL	28480	7120-5027
	8120-1378	1	CABLE ASSY 3-COND 18-AWG	28480	8120-1378
			Form-Feed Assembly		
178	NOT ASSIGNED	2	Bearing Drive Shaft		
179	NOT ASSIGNED	1	Drive Shaft		
180	NOT ASSIGNED	3	Shaft		
181	NOT ASSIGNED	1	Left Tractor		
182	NOT ASSIGNED	1	Left Tractor Lock		
183	NOT ASSIGNED	1	Right Tractor		
184	NOT ASSIGNED	1	Right Tractor Lock		
185	1430-0563	1	Form Drive Gear		
186	1430-0565	1	Latch Gear		
187	98021-60101	1	Right Chassis Assembly		
188	98021-60102	1	Left Chassis Assembly		
189	98021-64401	1	Right Cabinet		
190	98021-64402	1	Left Cabinet		

Table 7-2. Code List of Manufacturers

MFR. NO.	MANUFACTURER NAME	ADDRESS
00000	U.S.A. COMMON	ANY SUPPLIER OF THE U.S.A.
0016C	CARACTERES SA	
0018A	AR TECH PACKAGING CORP	LOWELL MA 01854
00853	SANGAMO ELEC CO S CAROLINA DIV	PICKENS SC 29671
01121	ALLEN-BRADLEY CO	MILWAUKEE WI 53212
01295	TEXAS INSTR INC SEMICOND CMPNT DIV	DALLAS TX 75231
03888	PYROFILM CORP	WHIPPANY NJ 07981
04713	MOTOROLA SEMICONDUCTOR PRODUCTS	PHOENIX AZ 85008
06915	RICHCO PLASTIC CO	CHICAGO IL 60646
07088	KELVIN ELECTRIC CO	VAN NUYS CA 91401
07263	FAIRCHILD SEMICONDUCTOR DIV	MOUNTAIN VIEW CA 94040
07953	SALTER GEORGE A	EAGLEVILLE PA 19408
08261	SPECTRA-STRIP CORP	GARDEN GROVE CA 92642
12599	FLUOROCARBON CO	ANAHEIM CA 92803
16299	CORNING GL WK ELEC CMPNT DIV	RALEIGH NC 27604
18583	CURTIS INSTRUMENTS INC	MT KISCO NY 10549
19701	MEPCO/ELECTRA CORP	MINERAL WELLS TX 76067
24546	CORNING GLASS WORKS (BRADFORD)	BRADFORD PA 16701
27014	NATIONAL SEMICONDUCTOR CORP	SANTA CLARA CA 95051
27167	CORNING GLASS WORKS (WILMINGTON)	WILMINGTON NC 28401
27264	MOLEX PRODUCTS CO	DOWNERS GROVE IL 60515
28480	HEWLETT-PACKARD CO CORPORATE HQ	PALO ALTO CA 94304
34335	ADVANCED MICRO DEVICES INC	SUNNYVALE CA 94086
34649	INTEL CORP	MOUNTAIN VIEW CA 94040
53021	SANGAMO ELECTRIC CO	SPRINGFIELD IL 62705
56289	SPRAGUE ELECTRIC CO	NORTH ADAMS MA 01247
70318	ALLMETAL SCREW PRODUCTS CO INC	GARDEN CITY NY 11530
70472	ASSOCIATED SPRING CORP	BRISTOL CT 06010
70892	BEAD CHAIN MFG CO	BRIDGEPORT CT 06605
71400	BUSSMAN MFG DIV OF MCGRAW-EDISON CO	ST LOUIS MO 63017
71785	TRW ELEK COMPONENTS CINCH DIV	ELK GROVE VILLAGE IL 60007
72136	ELECTRO MOTIVE MFG CO INC	WILLIMANTIC CT 06226
73734	FEDERAL SCREW PRODUCTS CO	CHICAGO IL 60618
75042	TRW INC PHILADELPHIA DIV	PHILADELPHIA PA 19108
75378	CTS KNIGHTS INC	SANDWICH IL 60548
75915	LITTELFUSE INC	DES PLAINES IL 60016
78189	ILLINOIS TOOL WORKS INC SHAKEPROOF	ELGIN IL 60126
84411	TRW CAPACITOR DIV	OGALLALA NE 69153
84830	LEE SPRING CO	BOOKLYN NY 11201
91637	DALE ELECTRONICS INC	COLUMBUS NE 68601
91833	KEYSTONE ELECTRONICS CORP	NEW YORK NY 10012
91929	HONEYWELL INC MICRO SWITCH DIV	FREEPROT IL 61032
97464	INDUSTRIAL RETAINING RING CO	IRVINGTON NJ 07111
98023	STAR TOOL & DIE WORKS INC	DETROIT MI 48216

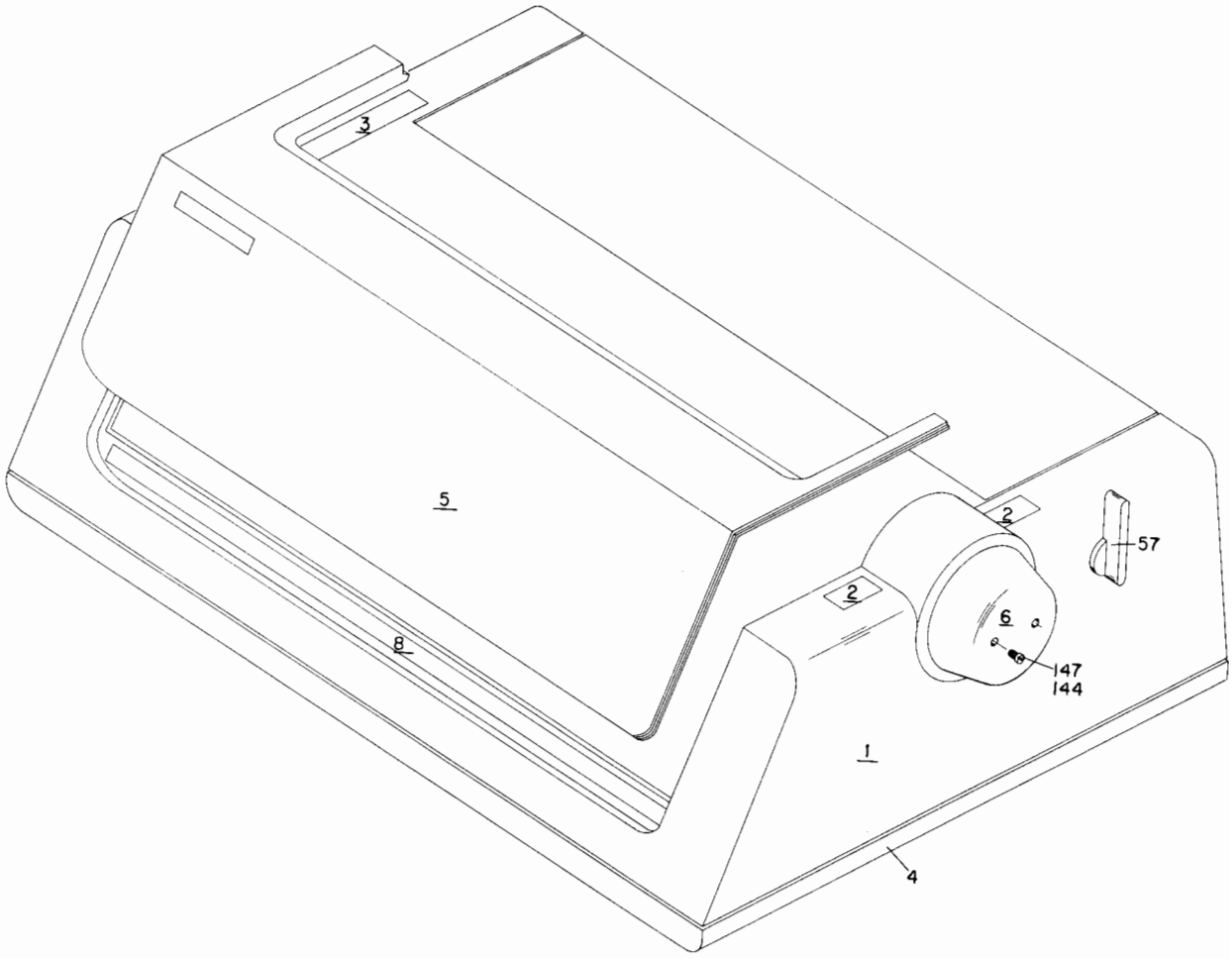


Figure 7-1. Printer Cabinet

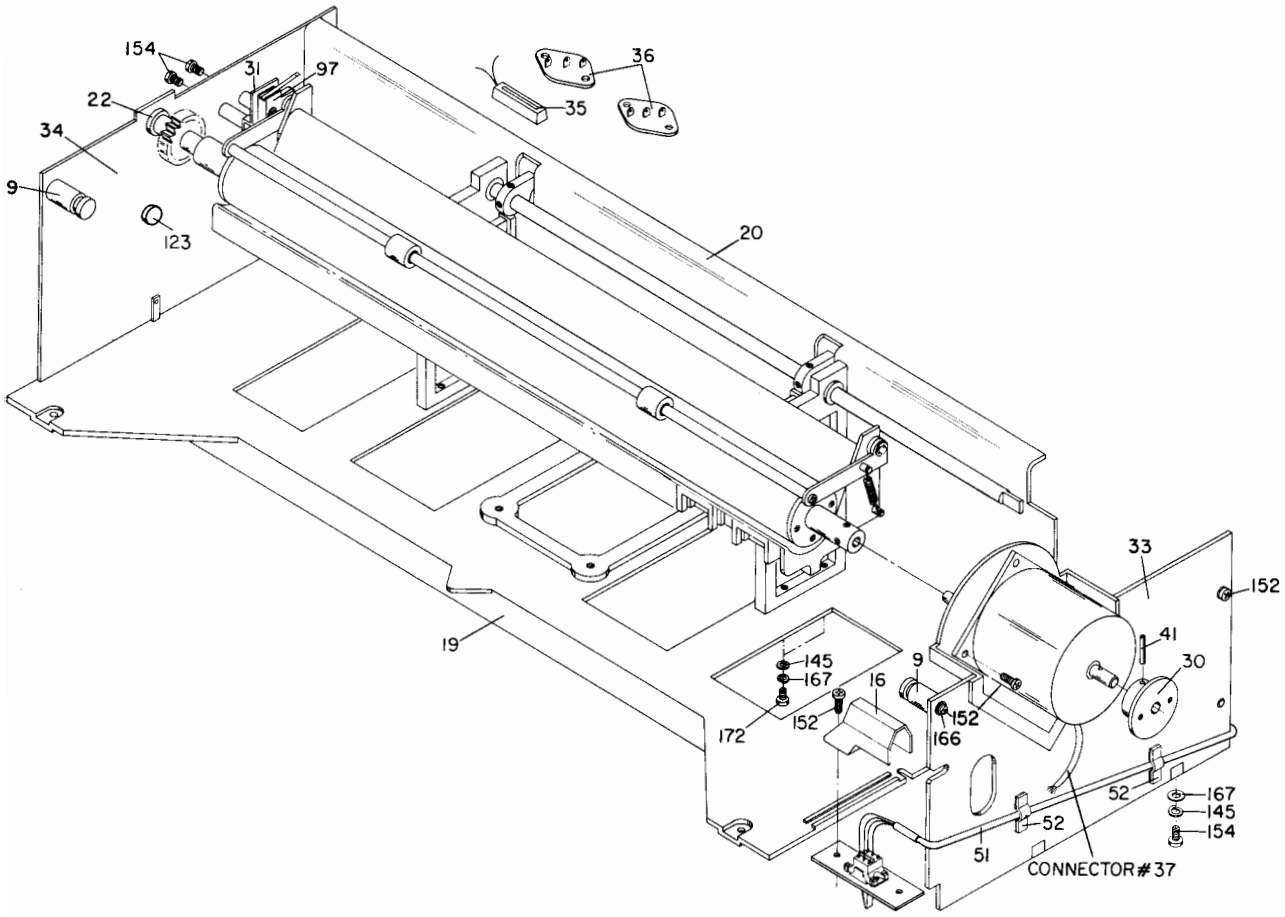


Figure 7-2. Printer Chassis

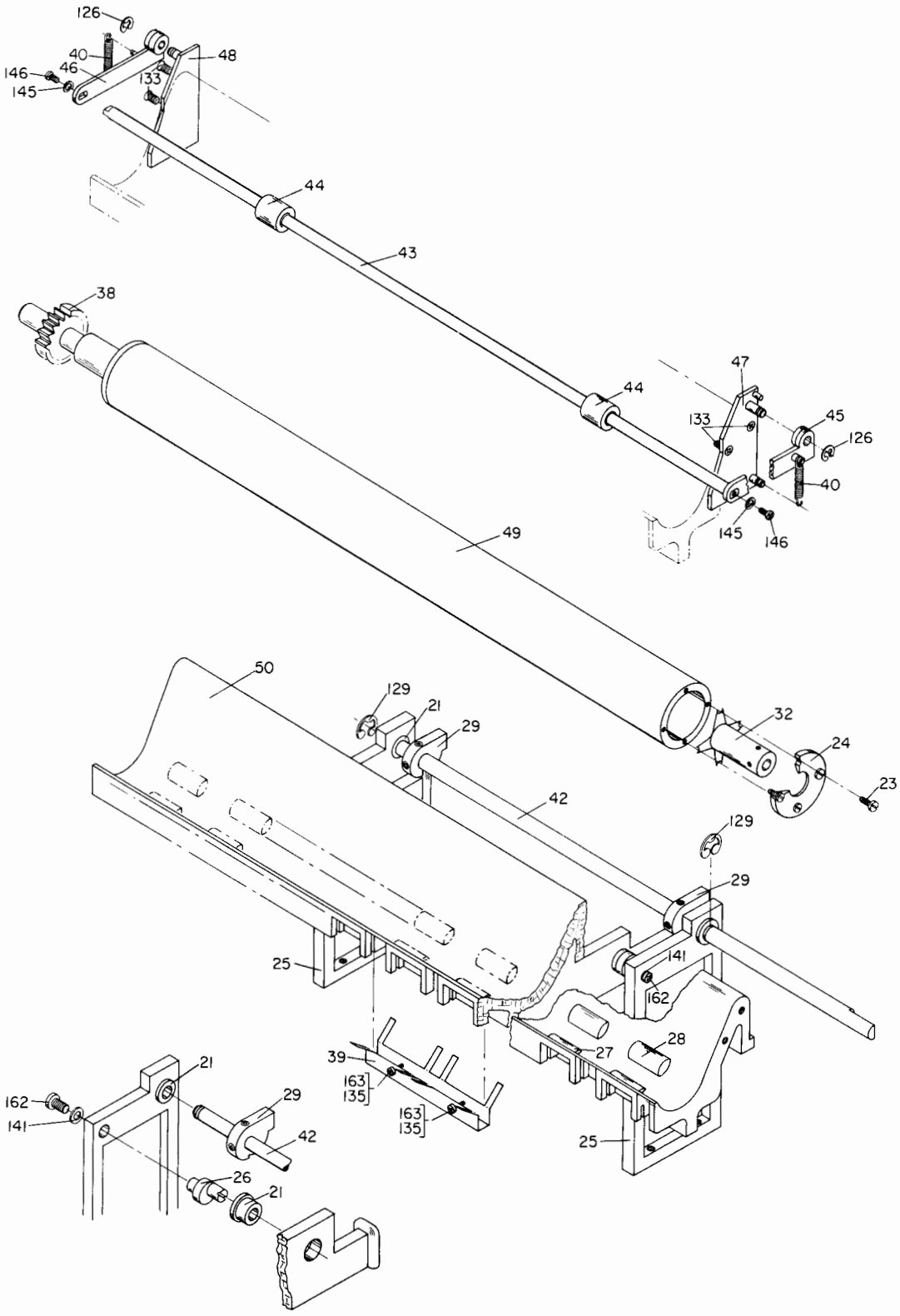


Figure 7-3. Paper Guide, Platen, Paper Bail

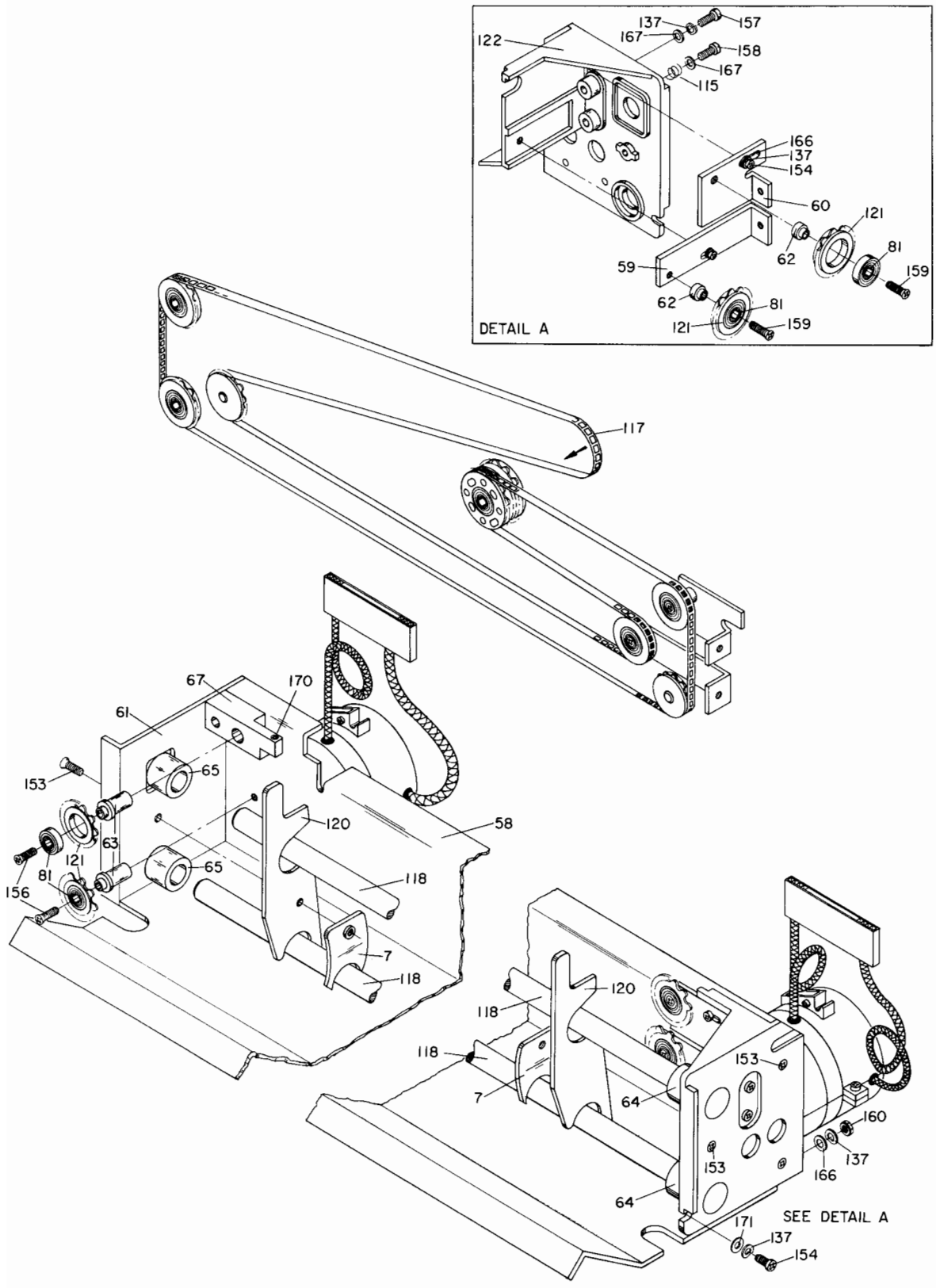


Figure 7-4. Print Module

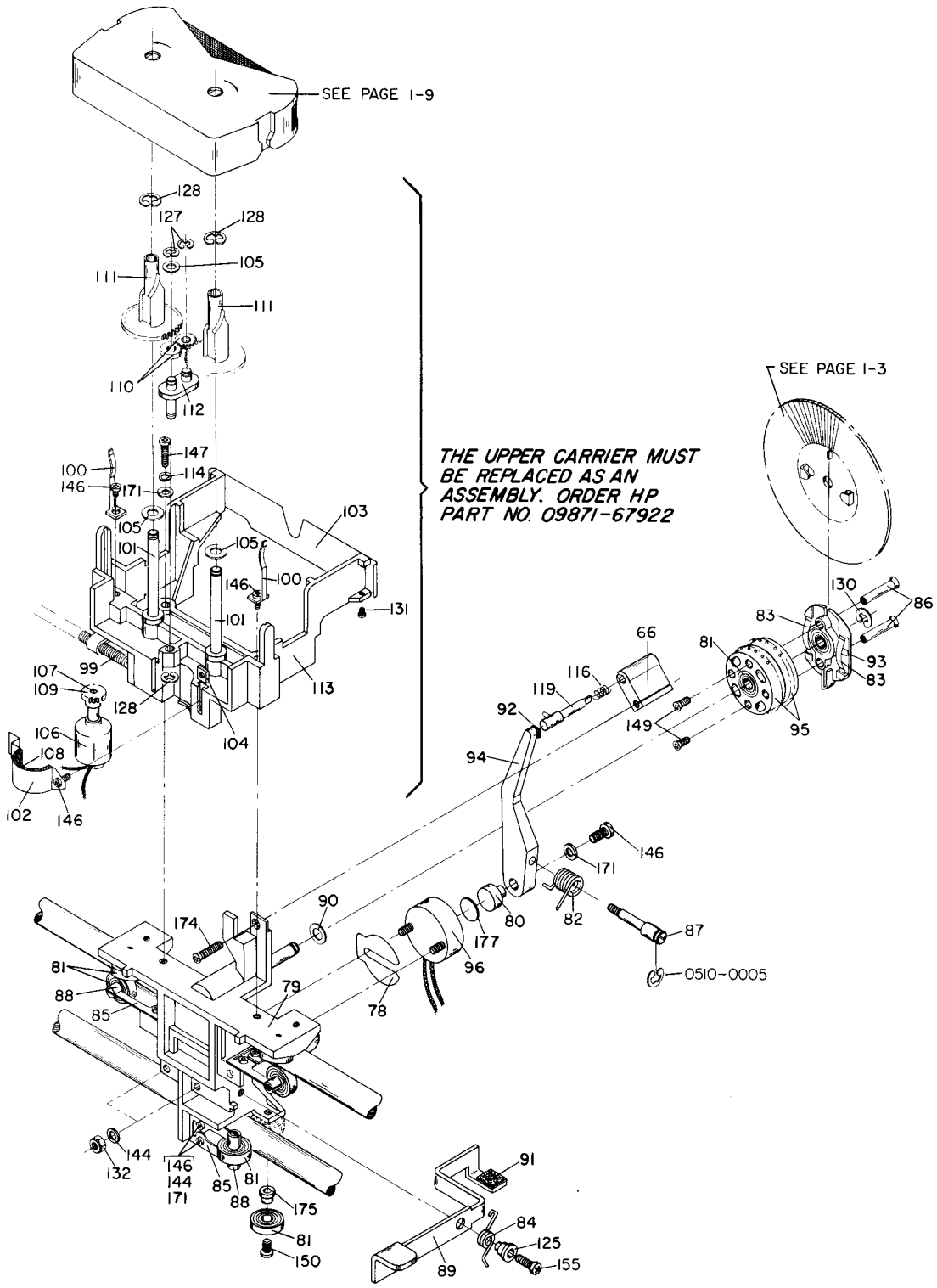


Figure 7-5. Carrier

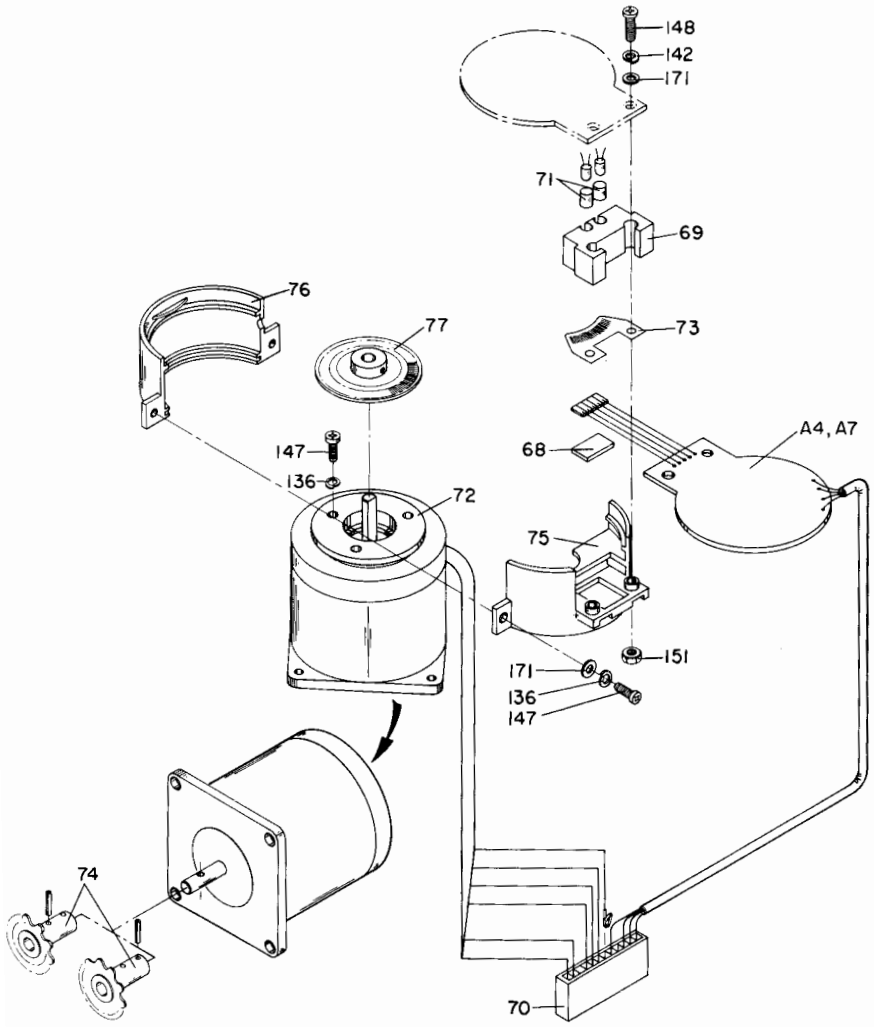


Figure 7-6. Encoder

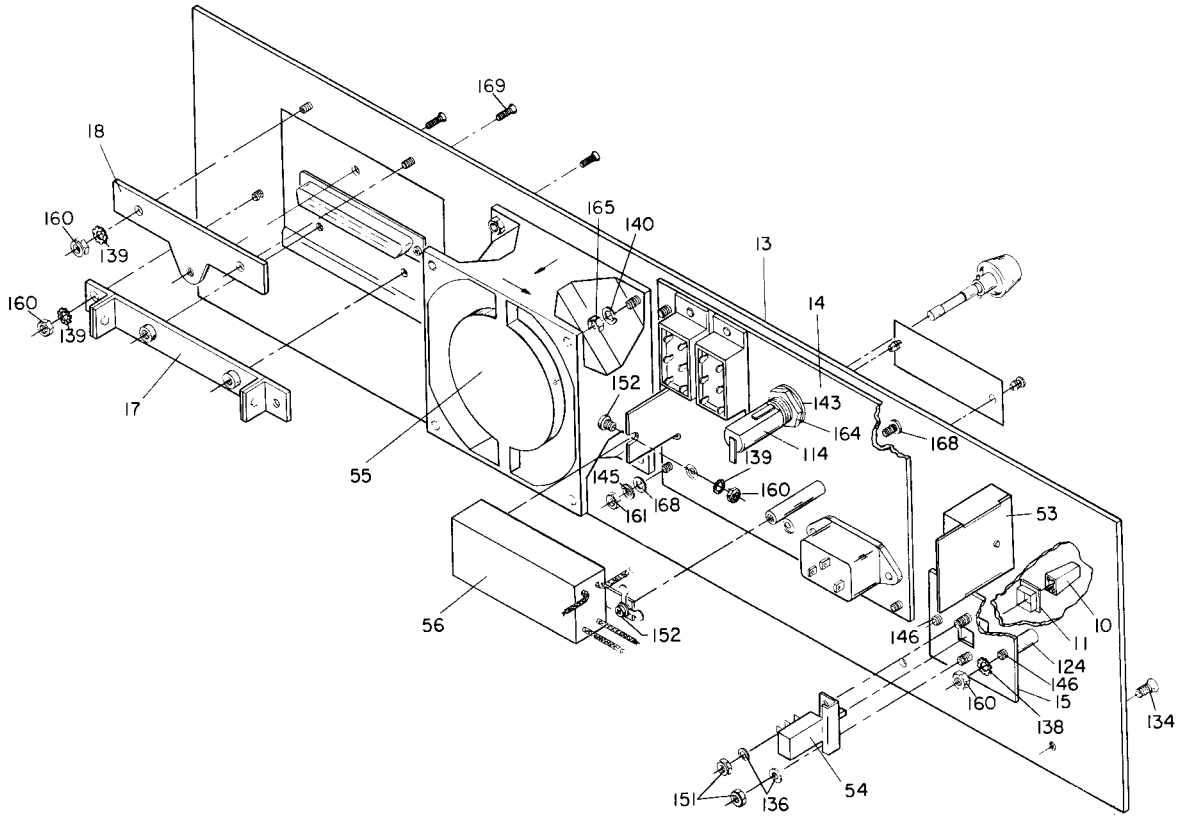


Figure 7-7. Rear Panel

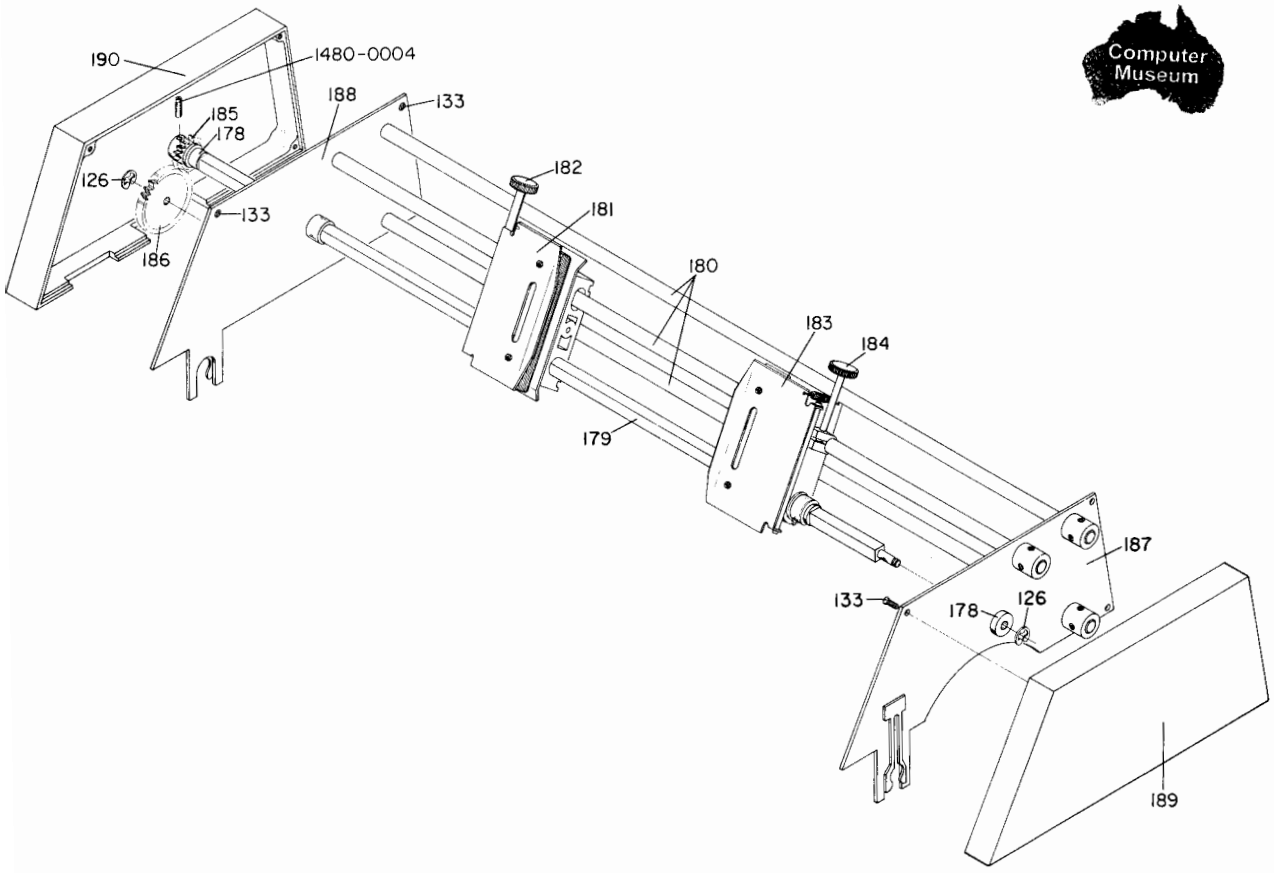


Figure 7-8. Form-Feed Accessory

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