HEWLETT PACKARD

HP 82906A

Printer

SERVICE MANUAL

Reorder Number
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Section
I

General Information

1.1 Introduction

This manual contains the information you will need to test and troubleshoot the HP 82906A Printer.

Before using this manual for an actual repair, read this section to become familiar with the printer and the organization of the manual. Then read the rest of the manual to learn how the printer works and how to repair it.

For ease of use, this manual has been divided into eight sections:

Section I	General Information
Section II	Functional Description
Section III	Disassembly and Reassembly
Section IV	Troubleshooting and Repair
Section V	Maintenance
Section VI	Replaceable Parts
Section VII	Reference Diagrams
Appendix	Component-Level Repair

1.2 Product Description

The HP 82906A Printer is an OEM (original equipment manufacturer) product based on the FX-80 Dot Matrix Printer by Epson, Shinsu Seiki Co. The major differences between the two are in the casings, the interface options, and the ROM code that determines the character sets available with the printer.

The HP 82906A printer is compatible with the HP 82905B printer in all respects except for its graphics capabilities, which conform to the raster graphics standard used in the HP 2631G printer and HP thermal printers.

The printer mechanism contains a print head which prints any one or more of 9 dots in a vertical line. As the print head moves laterally across the page the dots are printed in the proper sequences to form the desired alphanumeric and graphic characters. In the graphics mode, up to 576 dots per line can be printed. The print head operates under the control of the printer electronics at the command of the computer that is controlling the printer.

Three character sets can be accessed, and expanded and compressed modes as well as normal and graphics modes are available. Modes are selected by executing escape sequence commands, which are listed in the owner's manual (part number 82906-90001).

The HP-IB (Hewlett-Packard Interface Bus) is the only interface option utilized by the printer. Any one of 31 device addresses can be selected by

setting the device address switches on the interface printed circuit assembly (PCA).

Many printer features, such as page length, columns per line, normal and emphasized characters, skip-over-perforation, and line spacing, are program selectable.

Table 1-1. Specifications

Printer	
Characters per line:	40, 48, 68, 80, 96, 137.
Character size (normal):	2.1 mm (0.083 inch) by 3.1 mm (0.120 inch).
Character structure:	9 X 11 dot matrix.
Copies:	Three maximum, including original.
Feed:	Adjustable pin. Friction. Tractor (with optional tractor unit).
Form feed speed:	Seven seconds.
Graphics resolution:	72 by 72 dots to the inch.
Line feed repeat rate:	Six line feeds per second.
Line feed time:	150 ms/line approx. (at 6 lines/inch).
Line spacing:	6, 8, 9, 12, 16, 18, 24, 36, or 72 lines/inch, programmable.
Paper:	Fanfold: Width: 241.3 to 254 mm (9.5 to 10 inches). 101.6 to 228.6 mm (4 to 9 inches). (For use with tractor unit.) Roll: Width: 216 mm (8.5 inches). Letter: Width: 184.2 to 216 mm (7.25 to 8.5 inches).
Paper cutting:	Short tear-off within 2.5 cm (1.0 inch) from print position possible.

Table 1-1. Specifications (Continued)

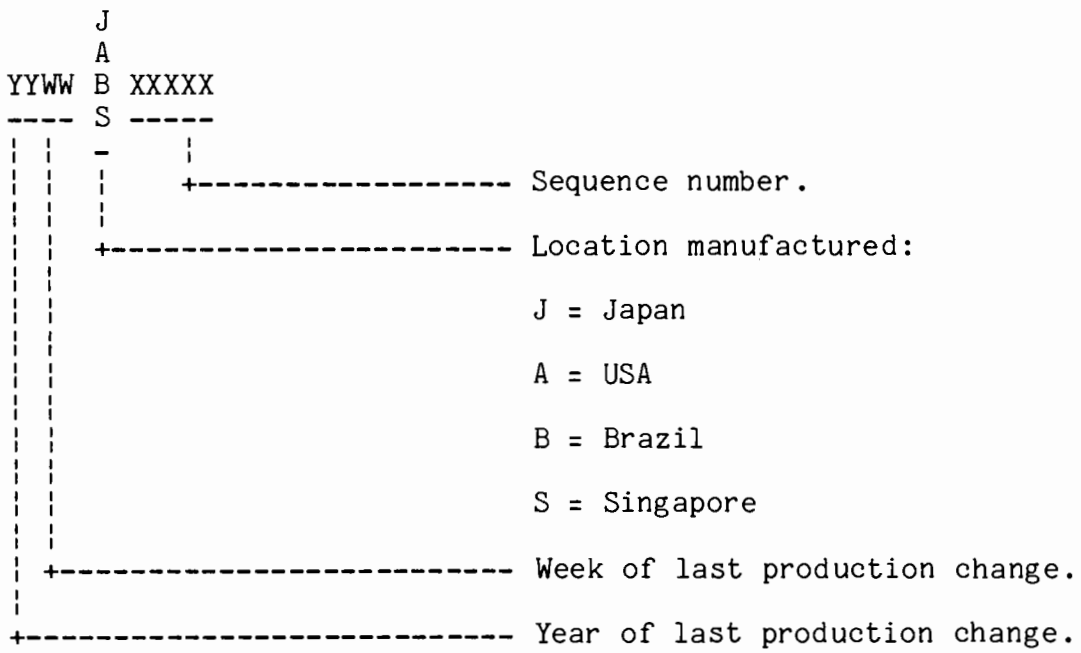
Print direction:		Alphanumeric/Graphic: bidirectional with logical seeking. Super/subscript: unidirectional (left to right). Bit image: unidirectional (left to right).
Printing method:		Impact dot matrix.
Printing speed:		160 CPS (characters per second).
Ribbon:		Black-inked cartridge.
Environmental		
Temperature		
Operating:		5 degrees to 35 degrees C (41 degrees to 95 degrees F).
Storage:		-30 degrees to 60 degrees C (-22 degrees to 140 degrees F).
Humidity		
Operating:		10 to 80 percent (no condensation).
Storage:		5 to 85 percent (no condensation).
Electrical		
Power supply:	Opt. 001	100V ±10 percent, 50/60 Hz.
	Opt. 002	120V ±10 percent, 50/60 Hz.
	Opt. 003	220V ±10 percent, 50/60 Hz.
	Opt. 004	240V ±10 percent, 50/60 Hz.
Power consumption:		70 VA, max.
Reliabiity		
Duty cycle:		40 pages per day (average).
MTBF:		5,000,000 lines (except print head).

Table 1-1. Specifications (Continued)

Print head life expectancy:	100,000,000 characters.
Ribbon life expectancy:	3,000,000 characters.
Physical	
Dimensions:	42 X 34.7 X 10 centimeters (16.5 X 13.7 X 3.9 inches).
Weight:	7.5 kilograms (16.5 pounds).

1.3 Identification

The serial number of the printer is used for identification and determination of warranty status. It is located on the back panel, near the power line connector. Its format is shown below:



1.4 Level of Repair

It is assumed throughout the body of this manual that you are interested in doing assembly and socketed-component level repair only. If you wish to do component-level repair, you will find the information in the appendix helpful.

Not all component-level parts are currently supported by Hewlett-Packard. Some of these parts may be set up if a demand exists for them. Use the Epson part number with "-EPS" added to it to order the part. First delivery may take up to 150 days. Contact the division for further information.

SECTION
II

Functional Description

2.1 Introduction

This section contains an overview of the principles of operation of the HP 82906A Printer and a brief functional description of its basic components and circuits. A block diagram and a description of the error indications are also included. Figure 2-1 shows the printer block diagram. For more detailed information, refer to the appropriate section in the appendix.

2.2 Principles of Operation

The HP 82906A Printer utilizes a 9 X 11 dot matrix character format. The printer mechanism generates a timing signal (PTS) which determines the position of the print head. A home position signal (HP) is generated which deterines the left margin default position. A carriage motor moves the print head from side to side, and a line-feed motor causes the paper to scroll up automatically after each carriage return (unless the auto-line-feed function has been disabled). An end-of-paper signal is generated when the printer runs out of paper. An alarm buzzer signals certain error conditions.

As the print head moves across the paper, individual elements of the nine print wires are activated, causing a pattern of dots to be printed in accordance with the input from the host computer and with the requirements of the preprogrammed character font in use.

All functions of the printer are under the control of the main CPU and the slave CPU.

An IEEE 488 interface assembly provides for the reception of data from the host computer and for the reception and transmission of the necessary handshake signals.

2.3 Power Circuit

The power circuit consists of the filter assembly, the power transformer, and the voltage regulator portion of the FMBD assembly. (See figure 2-1.)

The main ON-OFF power switch, a 2A 250V fuse for the 120 Vac option (a 800 ma 250V fuse for the 220/240 Vac option), and an LC filter are contained on the filter assembly circuit board (FFIL PCA). The filter prevents noise from entering the printer from the power line and also prevents noise from the printer from getting back onto the power line.

AC voltage is applied to the primary of the power transformer, which steps it down to 22 Vac that is applied to the voltage regulator circuit and 12 Vac that is available to the interface assembly but is not used by the HP-IB. Power supply voltages and their uses are listed in table 2-1.

The regulator circuit consists of a bridge rectifier, a chopper-type switching regulator IC, and associated resistors, capacitors, and inductors.

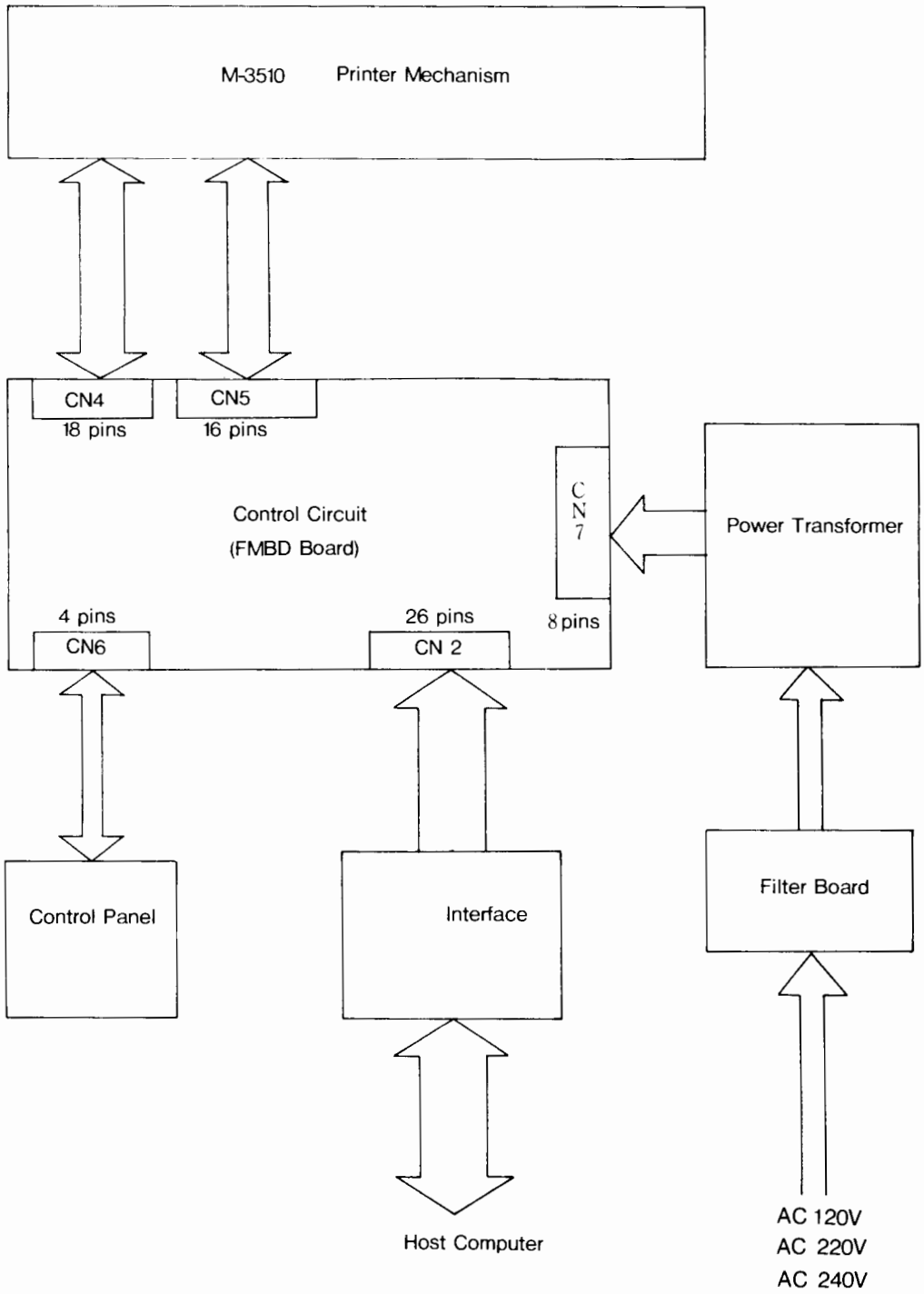


Figure 2-1. Printer Block Diagram

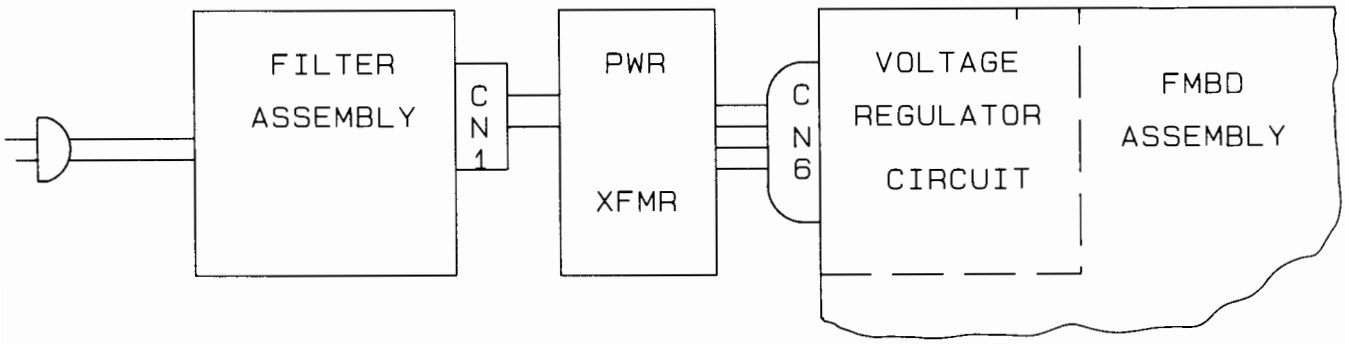


Figure 2-2. Power Circuit

Table 2-1. Power Supply Voltages

VOLTAGE	USE
+24V (VP)	Carriage motor drive. Line-feed motor drive. Print-head solenoid drive. Power for the optional interface assemblies.*
+5V (VCC)	Logic circuit drive. Carriage motor holding current. Line-feed motor holding curren. Indicator lamp drive. Power for the optional interface assemblies.*
+12V	Power for the optional interface assemblies.*
+12 Vac	Power for the optional interface assemblies.*
+5V (VXC)	Power reset. Power for the buzzer.
+5V (VXP)	Protection of the print-head solenoid, etc.

* - Does not include the HP-IB interface assembly.

2.4 Main CPU (see also section 2.14)

Primary control of the printer is provided by the main CPU (IC-3B). It executes all instructions in accordance with the programs stored in the internal (78010) and external (7810) ROMs.

Both versions of IC-3B have 256 bytes of RAM data memory, 40 I/O lines and 8 address/data lines. The 78010 also has 4K bytes of internal ROM. The clock frequency for both versions is 10 MHz.

2.5 Chip-Select ROM (see also section 2.14)

Acting as a decoder, IC-4B accepts signals from ports PF3-PF7 of the main CPU and provides chip-select signals to the external ROMs and RAMs, to the slave CPU, and to the data strobe signal latch.

2.6 ROM and RAM (see also section 2.14)

Printers using the 7810 CPU will have two 2764 8K byte programmable ROMs (ICs -4A and -5A) that will provide 16K bytes of external ROM capacity (only 12K bytes are used). Printers using the 78010 CPU will have one M64100 8K byte mask ROM (IC-5A) with socket -4A left empty.

ICs -2A and -3A provide 4 K of external RAM capacity of which 1 K is used as the system area of the main CPU, and the remaining 3 K of capacity are available for the data buffer.

2.7 Slave CPU

IC-9B operates as a slave CPU under the control of the main CPU; however, it independently exercises control of the carriage drive motor, the dip switch SW1, buzzer, and error signals. It contains 2K bytes of internal ROM and 128 bytes of internal RAM. Operating on its own clock of 11.0 MHz, it is not in synchronism with the main CPU.

Table 2-2. **Slave CPU Control Signals**

CONTROL SIGNALS				DESCRIPTION
CS	RD	WR	AO	
Low	High	Low	Low	Data is transferred from the main CPU to the input data buffer in the slave CPU.
Low	High	Low	High	Command is transferred from the main CPU to the input data buffer in the slave CPU.
Low	Low	High	-	Data is transferred from the output data buffer of the slave CPU to the main CPU.

2.8 Print Head Wire Control

The signals to the print-head wires required by the character generators are supplied from ports PA0 to 7 and PB7 of the main CPU to pins 1 to 7 of the predriver IC-1B and to pins 1 and 6 of the predriver IC-2C.

When the main CPU wishes to drive a print wire, it causes the output to the predriver to go low, which cuts off the output of the predriver. This in turn causes the driver transistor to conduct and drive the wire.

The conduction time of the driver is controlled to within 400±10 us, and the power supplies are adjusted and regulated by the main CPU to compensate for variations in the common head-power supply, VP.

2.9 Carriage Motor Control

The carriage motor is wired with four separate field windings. The direction of motion of the motor is controlled by selectively exciting two of the windings at a time. (Refer to table 2-3.)

Table 2-3. Carriage Motor Control

CARRIAGE	STEP	PHASE A	PHASE B	PHASE C	PHASE D
Left -->	1	ON	OFF	OFF	ON
	2	ON	OFF	ON	OFF
Right	3	OFF	ON	ON	OFF
	4	OFF	ON	OFF	ON
Right -->	1	ON	OFF	ON	OFF
	2	ON	OFF	OFF	ON
Left	3	OFF	ON	OFF	ON
	4	OFF	ON	ON	OFF

2.9.1 Motor Bias Voltages

Non-Operation +5V at IC2-2 (CN4-1) and IC-17 (CN4-6)

Operating +24V at IC2-2 (CN4-3) and IC-17 (CN4-6)

2.9.2 Motor Speed Control

The MTS signal from the timing signal sensor in the carriage motor is constantly monitored and compared to the timing program in the slave CPU.

The slave CPU controls the speed by varying the timing of the phase excitation to the motor.

2.10 Line-Feed Motor

The line-feed motor is under the direct control of the main CPU. It is the same type of motor as the carriage motor. Its phase excitation sequence is the same as that shown in table 2-3.

2.10.1 Motor Bias Voltages

Non-Operating +5V at pins CN4-11 and CN4-12

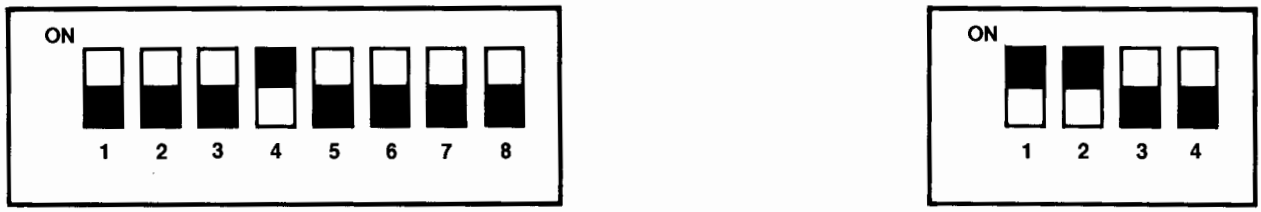
Operating +24V at pins CN4-11 and CN4-12

2.10.2 Motor Speed Control

The speed of the motor is controlled by the main CPU depending upon how much line feed is required.

2.11 DIP Switches

There are two DIP switches on the FMBD assembly that set default conditions for the main and slave CPUs. Their normal settings are shown in figure 2-3.



Switch 1 Switch 2

Figure 2-3. FMBD Assembly DIP Switch Position Settings

There are two DIP switches on the HP-IB interface assembly which set the addresses and handshaking for the printer. Their normal settings are shown in figure 2-4. Switch 1 may be changed if a different address is desired. In order to retain the standard HP-IB mode of operation, switch 2 should not be changed.

Switch 1 Switch 2

Figure 2-4. HP-IB Assembly DIP Switch Position Settings

2.12 Control Panel Assembly

The control panel assembly contains three operating keys--ON LINE, FF, and LF; and four status indicator lights--POWER, READY, PAPER OUT, and ON LINE.

2.13 Error Indications

The alarm system indicates errors by sounding an audible sound on a buzzer. The error indications are shown in table 2-4.

Table 2-4. Error Indications

BUZZER	MEANING
Pi,Pi,Pi; Pi,Pi,Pi	Slave CPU error.
Pee,Pee,Pee,Pee	Print-head driver transistor C-E shorted.
Pi,Pi,Pi,Pee,Pee, Pee	Print-head abnormality.
Pi,Pi,Pi,Pee	High-voltage error.

2.14 CPU - ROM Configuration

There are two possible configurations of ROMs, CPUs, Chip-Select ROMs, and System ROMs (refer to table 2-5). ICs from one configuration will not work in the other configuration. Jumper J1 is located between IC-1B and IC-3B.

Table 2-5. CPU - ROM Configurations

	Configuration A	Configuration B
CPU (IC-3B)	7810 (X400078100-EPS)	78010 *
Chip-Select ROM (IC-4B)	(Y440800001-EPS)	*
System ROM (IC-4A)	2764 (Y440803302-EPS)	Not Used
System ROM (IC-5A)	2764 (Y440803301-EPS)	M64100 *
Jumper	Out	In
* - Part number not yet available		

Section
III

Disassembly and Reassembly

3.1 Introduction

The following procedure describes the steps necessary to disassemble and reassemble the HP 82906A Printer to replace faulty assemblies and components.

CAUTION

Ensure that adequate precautions are taken regarding electrostatic protection. Work at a bench that is electrostatically protected, and wear a grounded wrist strap whenever you are working on the printer. Otherwise, ICs may be damaged.

3.2 Disassembly and Reassembly

In this section the step-by-step disassembly procedures required to replace faulty assemblies and components are explained. Unless otherwise stated inside brackets ([..]) after the disassembly instructions, reassembly is done in the exact reverse order of the disassembly.

Any parts which are bonded must be rebonded when reassembled. Some parts must be lubricated before reassembly. Refer to section V for bonding and lubrication information.

WARNING

When conducting print self tests during reassembly, power must be applied to the printer with the top case removed. Lethal voltages are then exposed. Exercise extreme caution! Otherwise, serious injury may occur.

Table 3-1. Recommended Tool List

The tools listed in this table, or equivalent, are recommended for disassembling and reassembling the printer.

HP PART NUMBER	DESCRIPTION
8710-1107	Pliers, long-nose
8710-0899	Screwdriver, Pozidriv, #1
8730-0008	Screwdriver, small, flat-blade
8710-0945	Screwdriver, Pozidriv, holding
8690-0219	Soldering tool

Table 3-2. Replaceable Assemblies and Components

These assemblies and components are replaceable for the purpose of repairing the printer.
Print-head assembly Printer assembly IEEE (HP-IB) interface assembly FMBD board assembly Power-filter assembly Paper-feed motor Print-head drive motor Paper-end switch assembly Home-position sensor assembly Keyboard assembly Upper case components Lower case components IC-2A, -3A, -4A, 5A, -3B, -4B, -9B Transformer Fuse

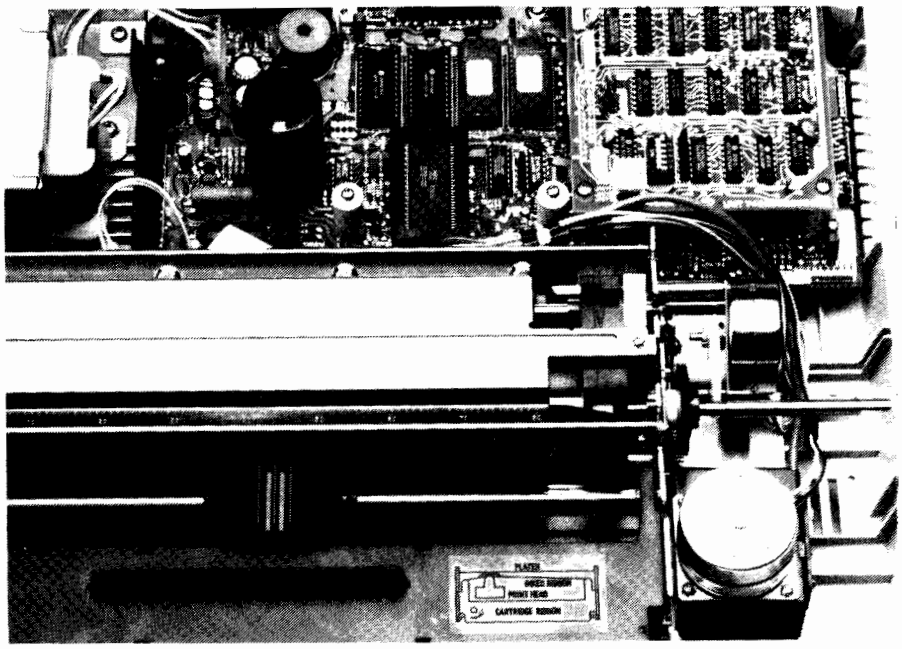


Figure 3-1. Replaceable Assemblies and Components

3.3 Removing the Top Case

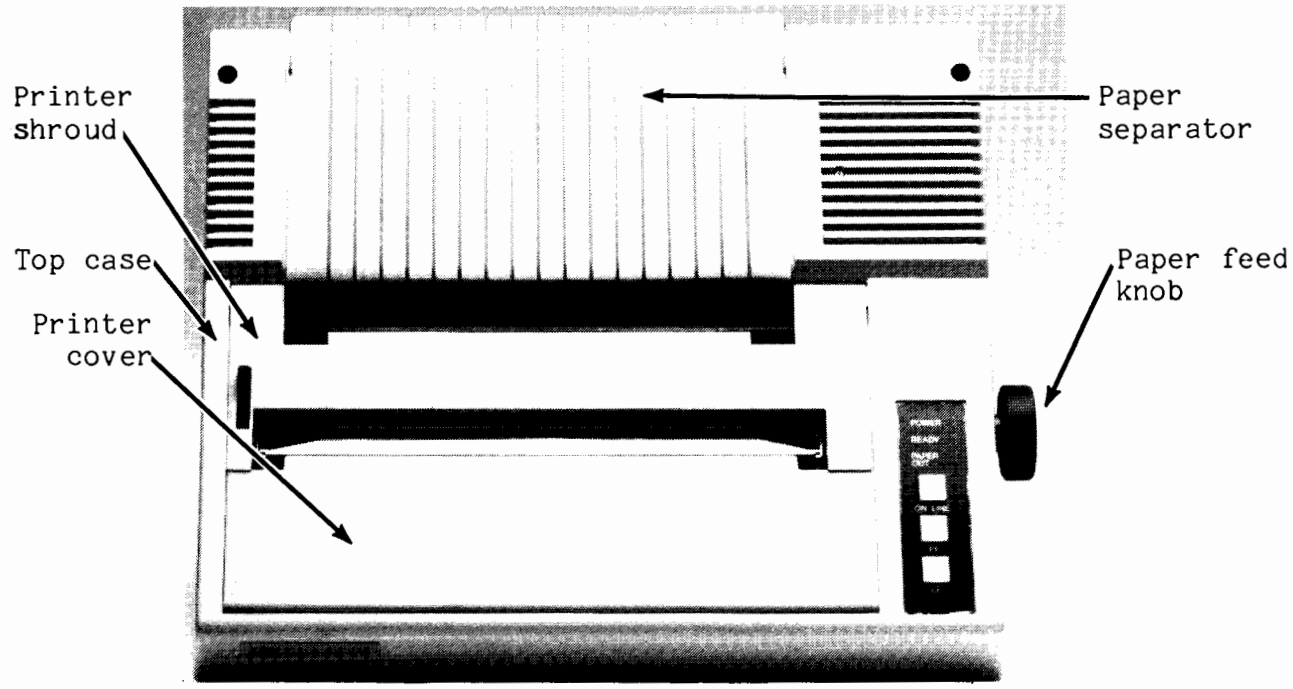


Figure 3-2. Top View of Printer

1. Disconnect the power cable from the printer, and remove any paper.

2. Pull the paper feed knob out and off.

3. Grasp the printer shroud with two fingers across the middle, and pull up gently until it comes out.

[3A. To reassemble the printer shroud, tip it to the right and engage the small tab on the cover in the hole in the top cover. Lay the cover flat and press down gently on the left end until the left-hand tab snaps into its hole in the top cover.]

4. Swing the printer cover up as far as it will go, and then lift it up and out.

5. Grasp the paper separator with both hands. Swing it up, and then pull it up gently until it comes out.

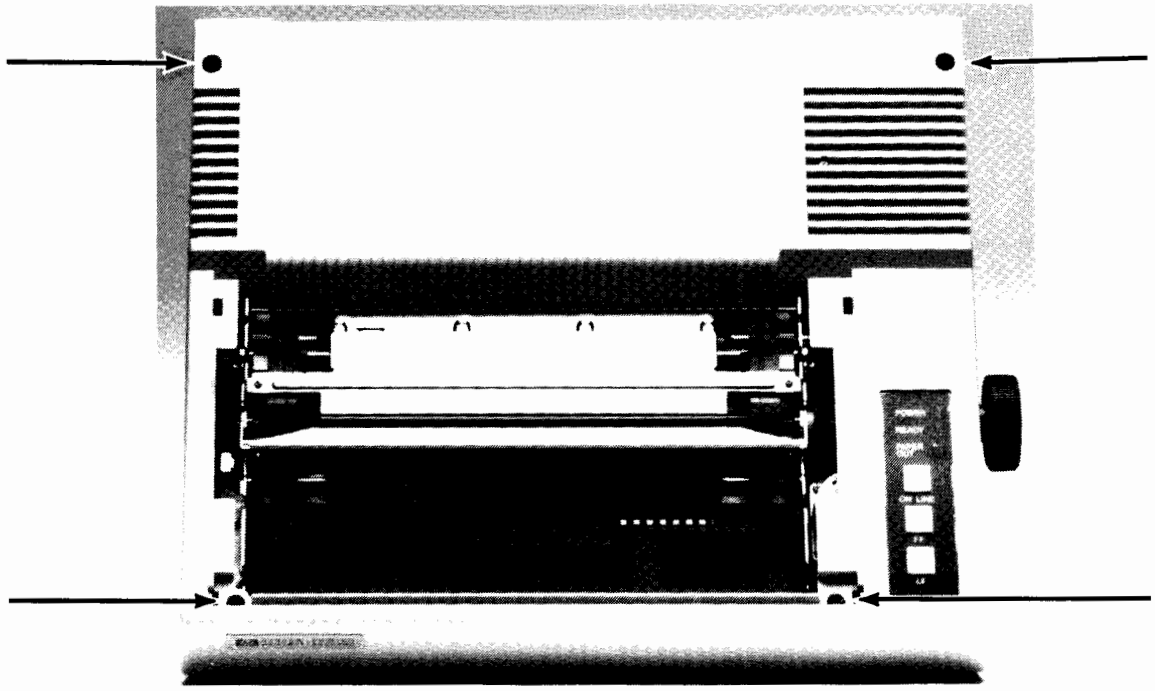


Figure 3-3. Top Case Screw Locations

6. Using a #1 Pozidriv screwdriver, unscrew the four top case screws.

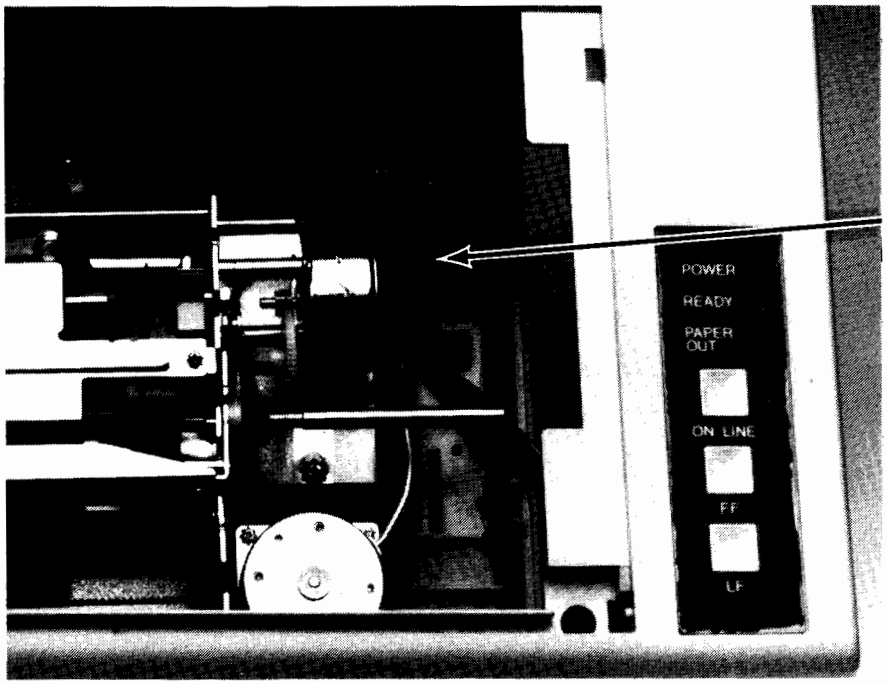


Figure 3-4. Keyboard Cable Location

7. Lift the top case up, and move it a short distance to the right.

8. Reaching through the top cover, disconnect the keyboard cable from the

FMBD board assembly and disengage it from the clip in the bottom case.

9. Lift the top case free of the bottom case.

3.4 Removing the Print-Head Assembly

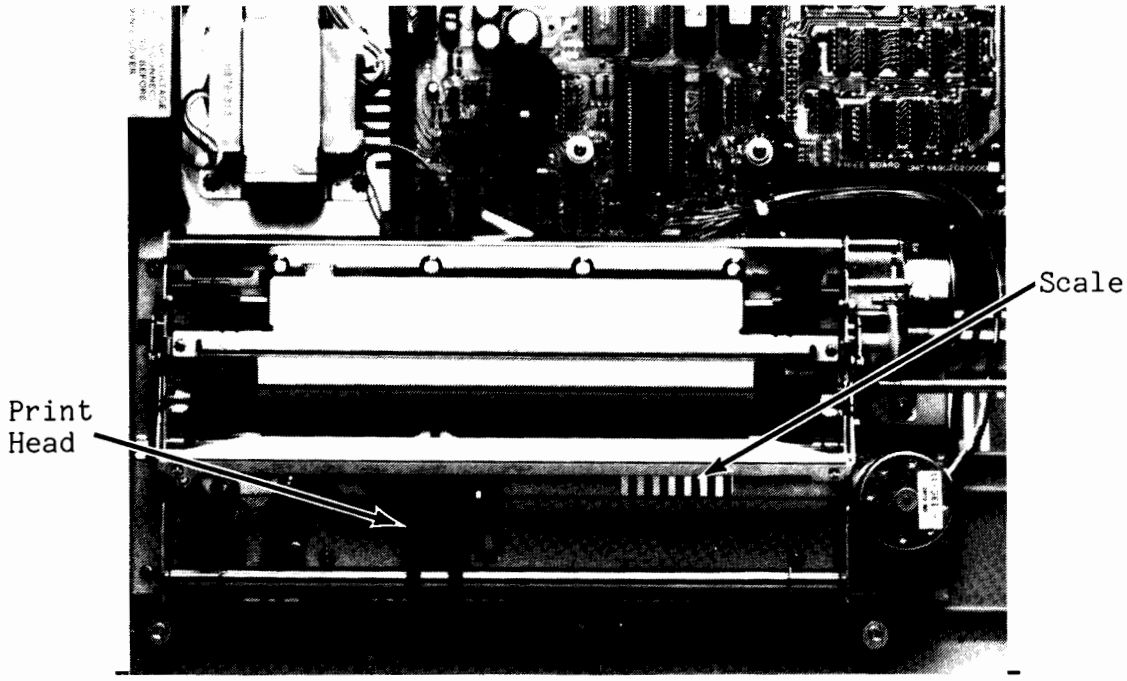


Figure 3-5. Print-Head Assembly Location

1. While pressing the scale towards the roller, lift it up as far as it will go.

2. Release the pressure on the scale. It should stay in the up position.

3. Remove the ribbon by grasping the projection on the top of the cartridge and lifting it up and out.

[3A. When reinstalling the cartridge, make sure the ribbon is not twisted and is positioned between the ribbon mask and the roller. Take up the slack on the ribbon by twisting the knob on the cartridge in the direction of the arrow; then move the print head back and forth by hand several times to insure proper seating of the ribbon. Press back on the scale, and it will drop into place.]

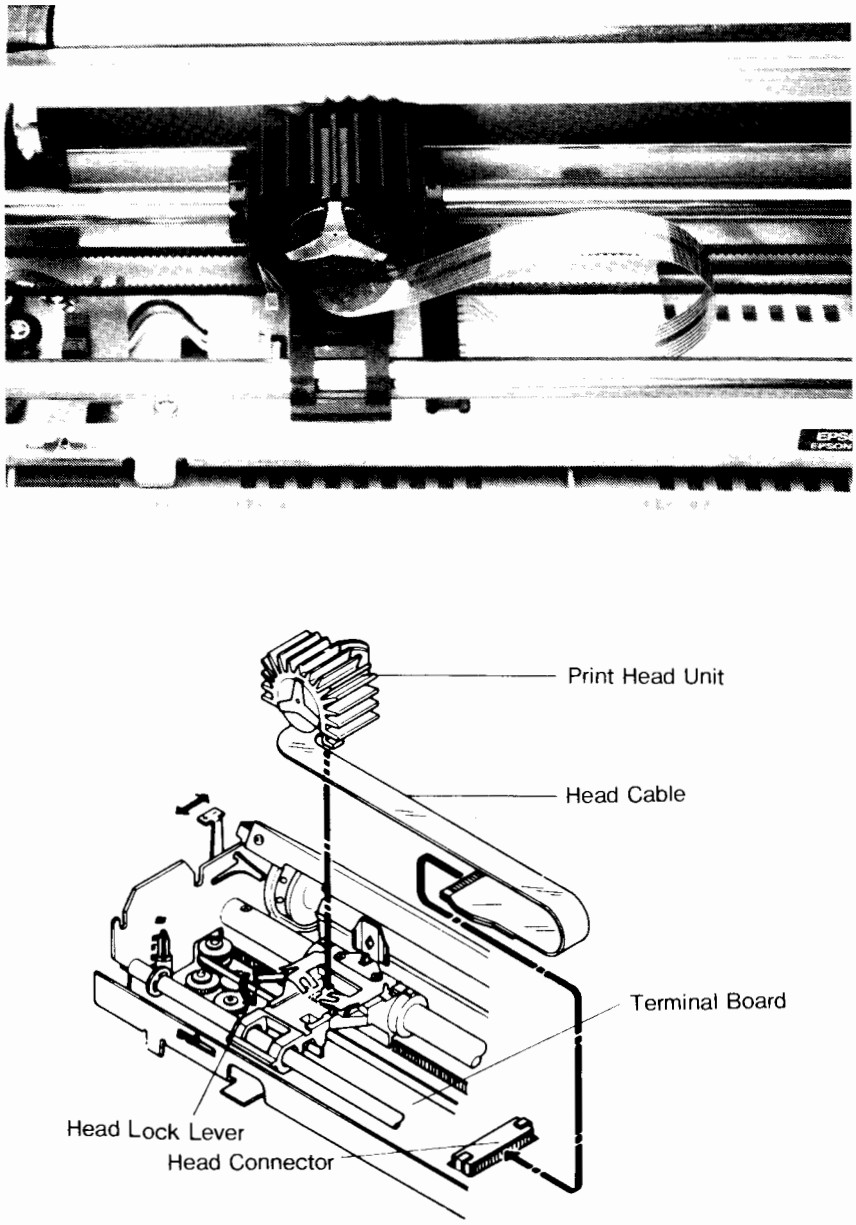


Figure 3-6. Print-Head Assembly

4. Push the print head to the left.

5. Gently lift up on the flex cable being careful not to crease it.

6. Grasp the plastic tab attached to the bottom of the flex cable and pull the tab and flex cable out of the connector. NEVER PULL DIRECTLY ON THE FLEX CABLE.

[6A. When reinstalling the print-head assembly, insert the flex cable into the connector by pressing on the plastic tab. None of the silver on the flex cable should be visible to the right of the connector.]

7. Move the head lock lever clockwise all the way to the left.

8. Place the scale in the up position as described in paragraph 3.3, steps 1 and 2.

9. Grasp the print head and lift it up and out of its carriage.

3.5 Removing the Printer Assembly

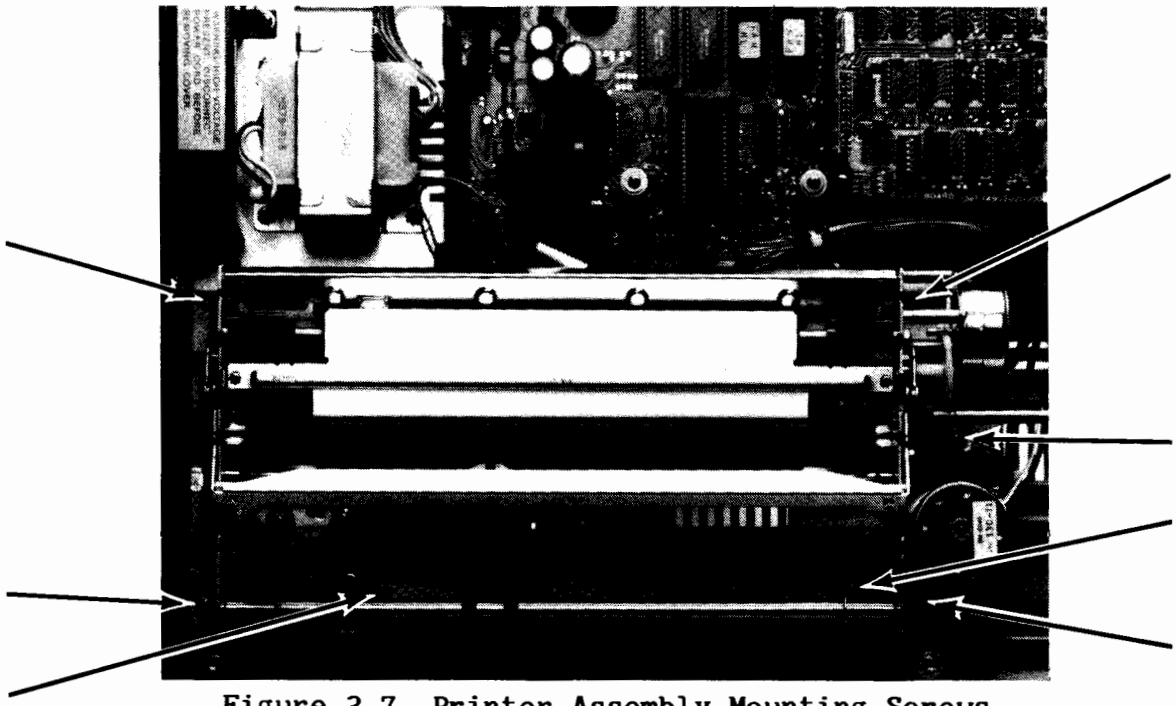


Figure 3-7. Printer Assembly Mounting Screws

1. Remove the seven mounting screws.

[1A. When reinstalling the printer assembly, make sure that the self-tapping screws go into the holes with plastic threads and the machine screws go into the holes with metal threads.]

2. Lift the printer assembly up and set it down in the forward part of the bottom case.

3. The motor cable should be unplugged first. Press down on the print-head cable connector while pulling up on the motor-cable connector to minimize flexing of the FMBD board.

4. Spread apart the holding clamps on the print-head cable connector, and unplug the connector.

[4A. When reinstalling, make sure the clamps are fully closed after plugging in the connector.]

5. Unplug the paper-end switch (PE) connector.

6. Lift the printer assembly out of the bottom case.

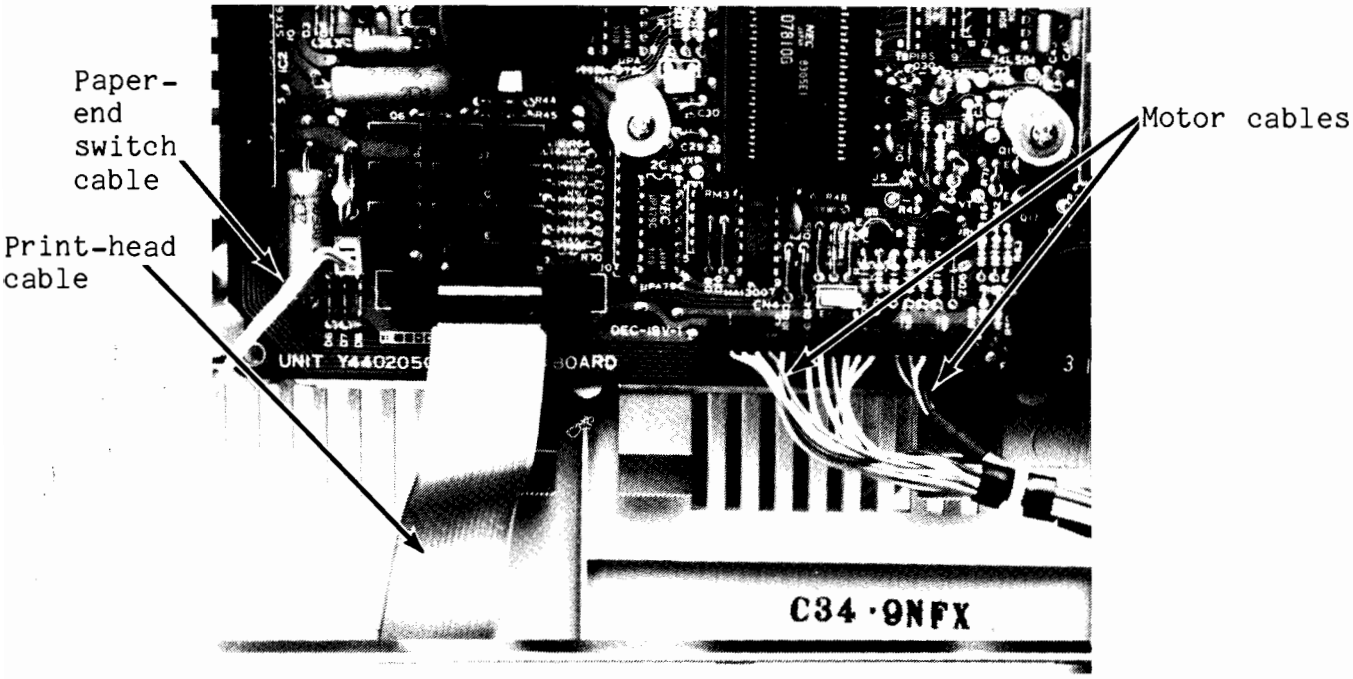


Figure 3-8. Printer Assembly Electrical Connectors

3.6 Removing the Print-Head Drive Motor Assembly

1. Remove the printer assembly from the bottom case as described in paragraph 3.4.

2. Cut the cable ties on the print-head drive motor cable, and separate the connector into three parts.

3. Unscrew the "A" pair of mounting screws, and remove the motor and bracket.

4. To replace the motor, unscrew the "B" pair of screws, and slide the motor shaft out through the slot in the bracket.

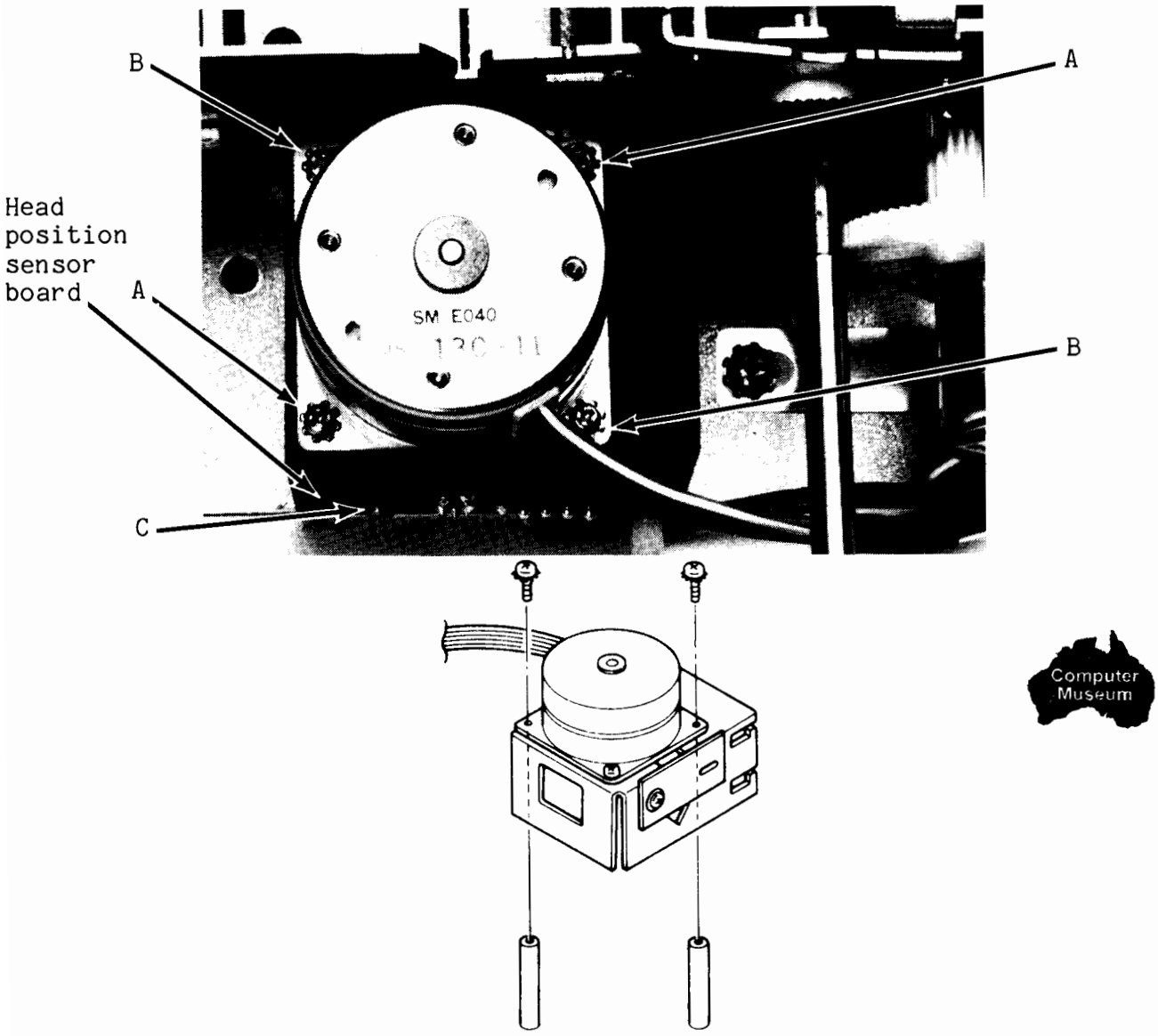


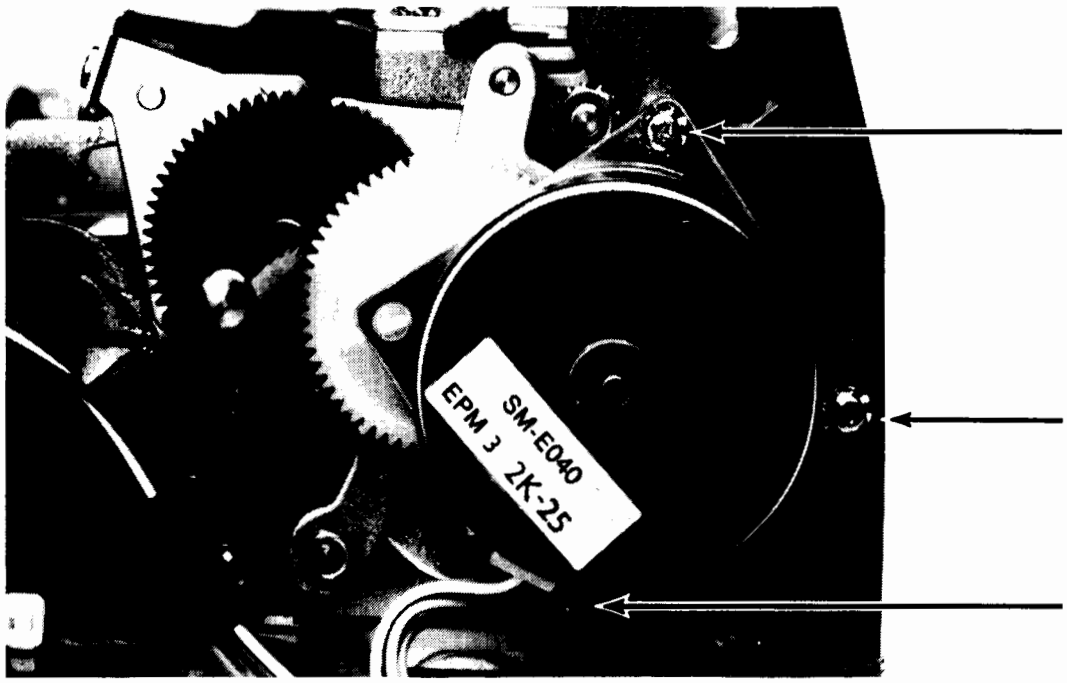
Figure 3-9. Print-Head Drive Motor Assembly

5. To replace the head position sensor assembly, unsolder the white, red, black, and blue wires from the board.

6. Unscrew the "C" screw and remove the board.

[6A. When reinstalling the board, make sure the slotted disc on the motor shaft turns freely and is not touching the electro-optical sensor housing. Connect the control panel to the FMBD assembly, and execute the print self test by holding the LF key down and then turning on the power. Adjust the board laterally so that the sound of the printer is the same as it travels in each direction.]

3.7 Removing the Paper-Feed Motor Assembly



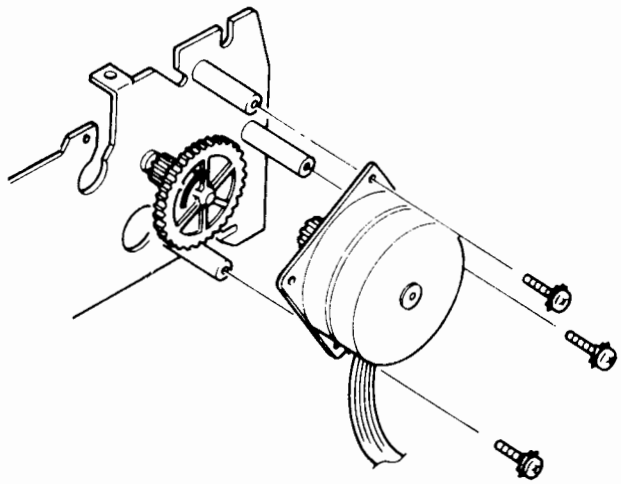


Figure 3-10. Paper-Feed Motor Mounting Screws

1. Remove the printer assembly as described in paragraph 3.4.
2. Cut the cable tie if you have not already done so.
3. Separate the motor-cable portion of the connector from the connector.
4. Unscrew the three mounting screws.

3.8 Removing the Power Filter Assembly

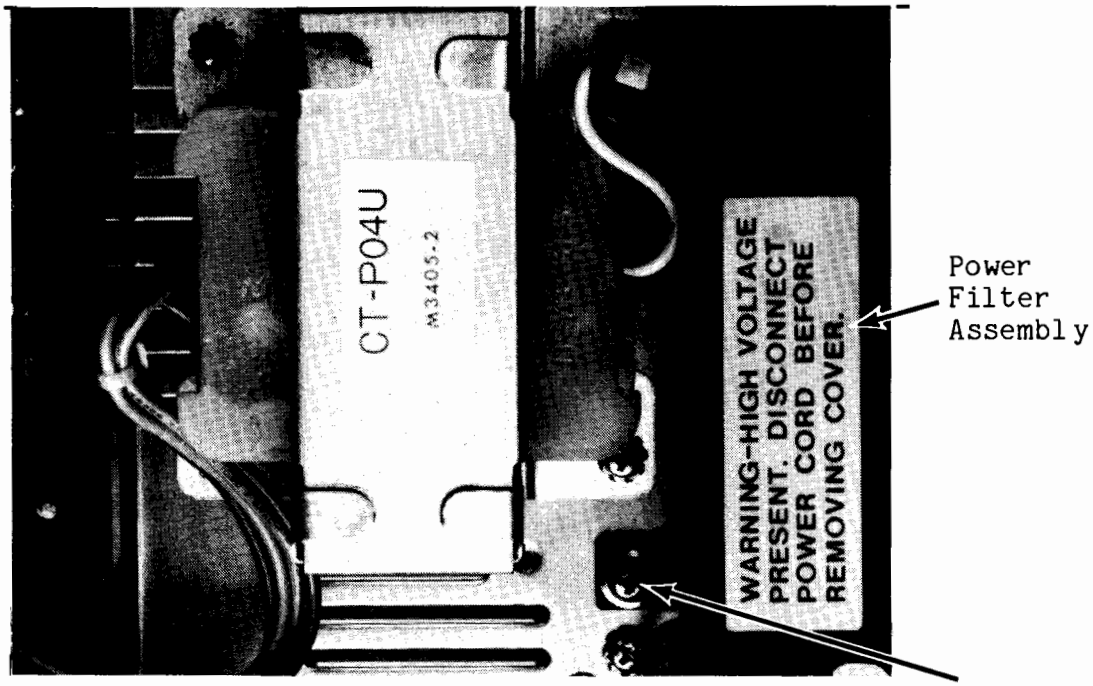


Figure 3-11. Power Filter Assembly

1. Unscrew the mounting screw, and lift off the cover.

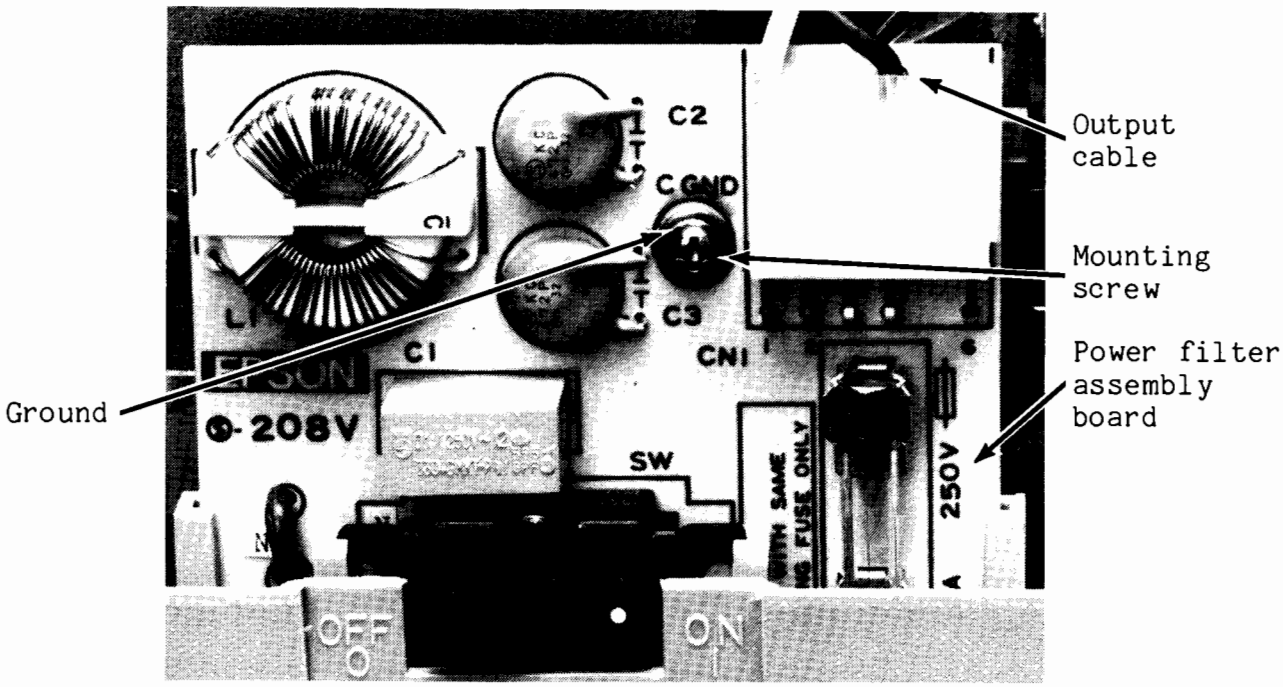


Figure 3-12. Power Filter Assembly - Cover Off

2. Unplug the output cable at connector CN1. Do not pull on the wires. Use a small flat-bladed screwdriver to pry the connector out of the clamp if necessary.

3. Unscrew the mounting screw located at "C GND" on the filter assembly.

4. Remove the screw fastening the ground wire coming from the ac outlet.

5. Lift the filter assembly up and out of the guide channels. The ac power plug will come with it.

3.9 Removing the Power Transformer

1. Unplug the transformer input cable from the filter assembly. Do not pull on the wires. Use a small flat-bladed screwdriver to pry the plug out of the clamp if necessary.

2. Unplug the transformer output cable from the FMBD board.

3. Unscrew the four mounting screws.

4. Lift the transformer out of the bottom case.

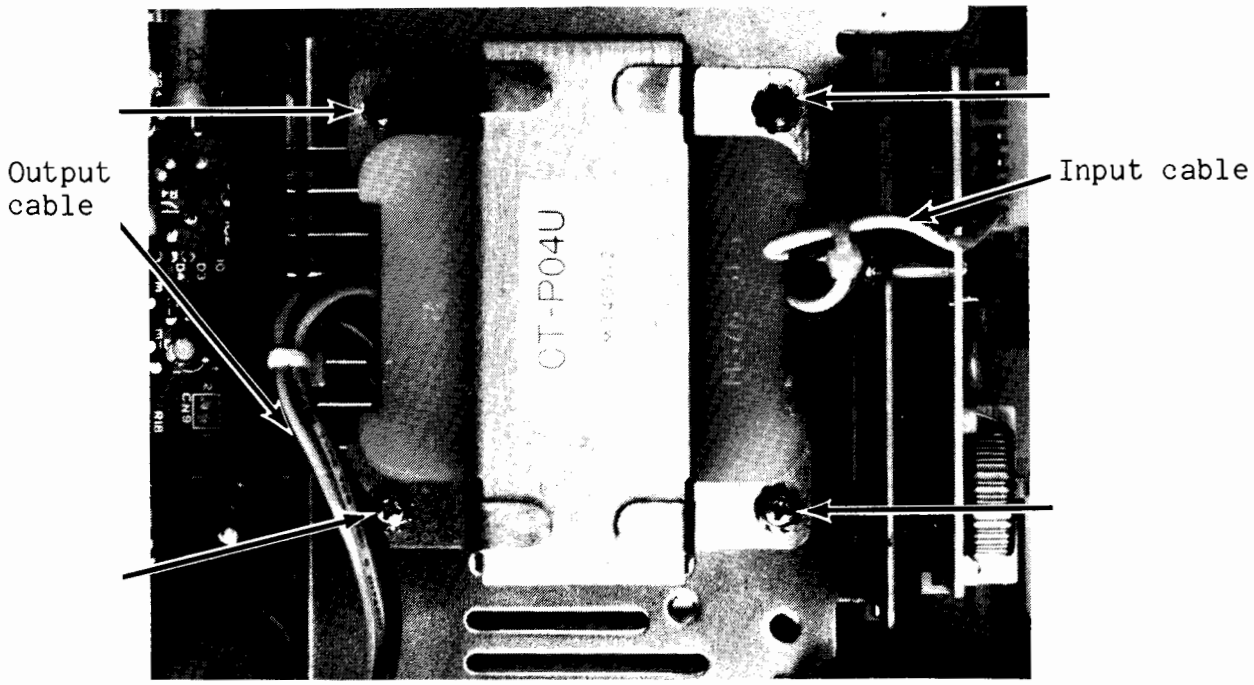


Figure 3-13. Power Transformer Screw Locations

3.10 Removing the I/O Interface Assembly

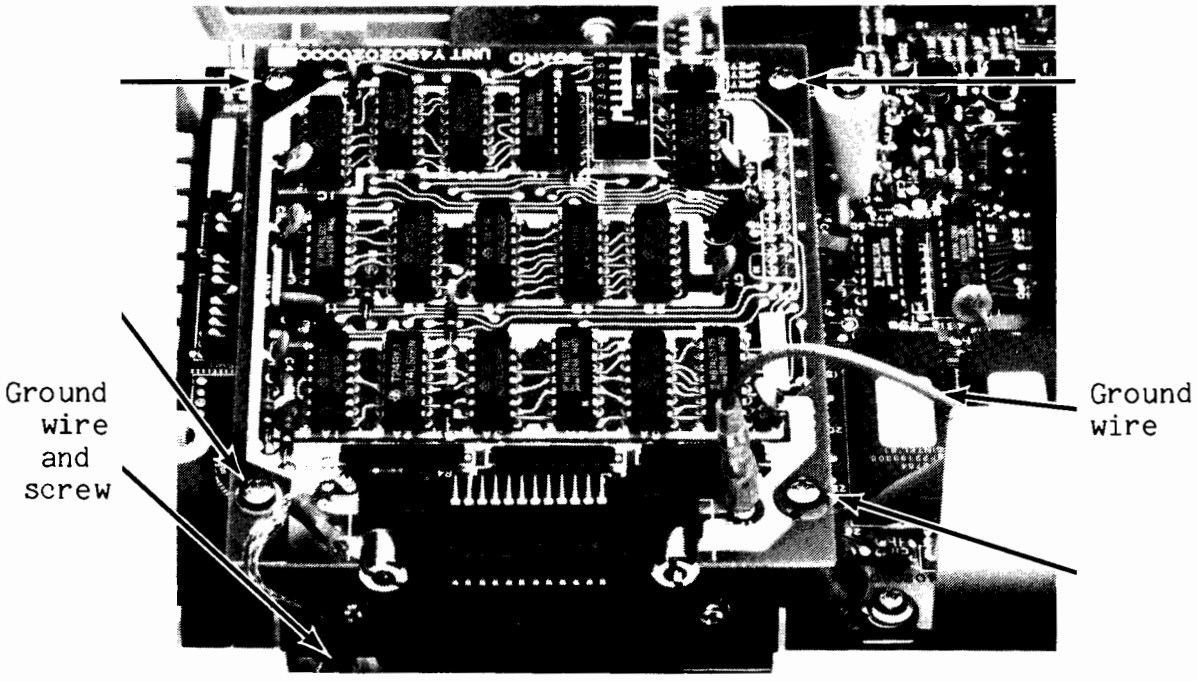


Figure 3-14. I/O Interface Assembly Screw Locations

1. Unscrew the four mounting screws.

2. Disconnect the ground wire from TP1 on the PCA.

3. Remove the screw connecting the other ground wire to the frame.

4. Grasping the assembly by its edges, lift up on it. The connector between it and the FMBD board will come apart, freeing the interface assembly.

3.11 Removing the FMBD Assembly

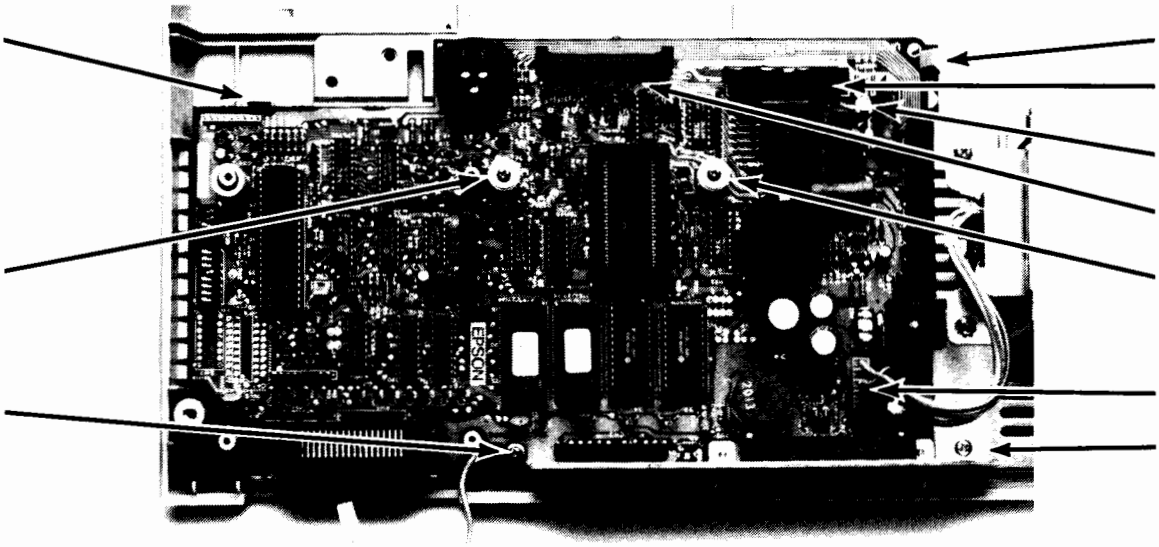


Figure 3-15. FMBD Assembly Mounting Screws, Clamps, and Connectors

1. Unscrew the four mounting screws.

CAUTION

Be very careful when handling the board during disassembly and reassembly. It is fragile and will break if bent excessively.

Take precautions against ESD damage while handing the board.

2. Disconnect the four connectors.

3. Disengage the clamps from the edge of the board.

4. Lift the board out of the bottom case.

3.12 Removing the Paper-End Switch Assembly

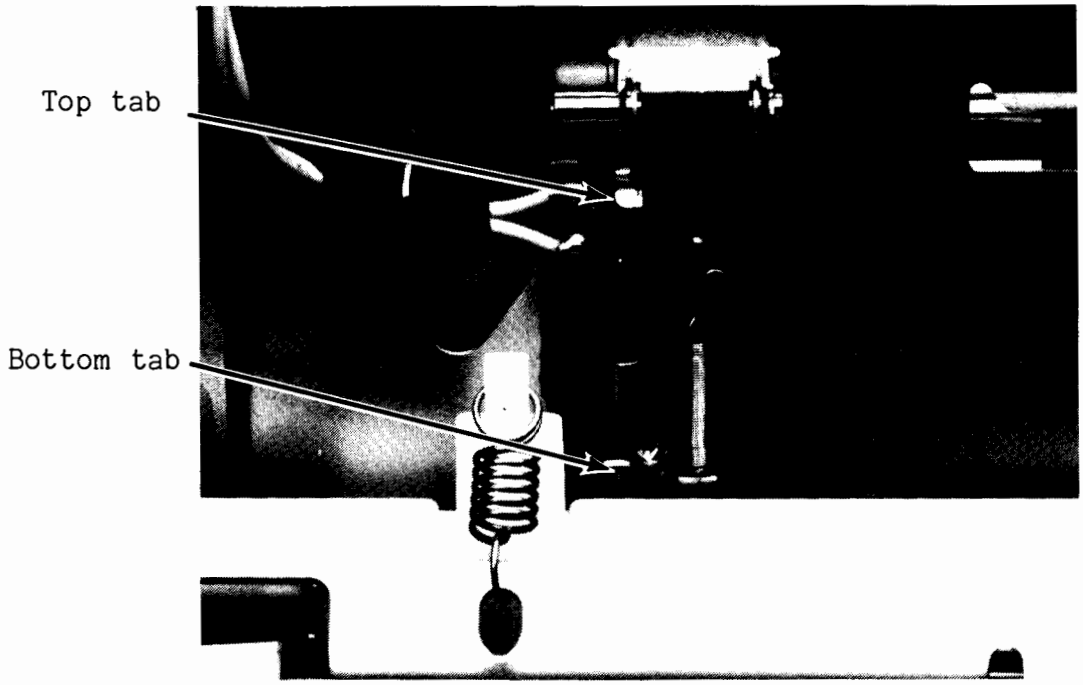


Figure 3-16. Paper-End Switch Assembly

1. Remove the printer assembly from the bottom case as described in paragraph 3.4.

2. Using a pair of long-nose pliers, disconnect the spring from the brass arm. Be careful not to stretch the spring out of shape.

3. Disengage the two wires from the bracket holding them in place.

4. Using a flat-blade screwdriver, pry up the top tab just enough to allow the circuit board to clear it.

5. Using a flat-blade screwdriver, pry the circuit board loose from the frame.

6. Lift the top of the circuit board up to clear the top tab. Tilt the board to the right to clear the bottom tab, then lift the board clear of the printer assembly.

3.13 Removing the Home Position Sensor Assembly

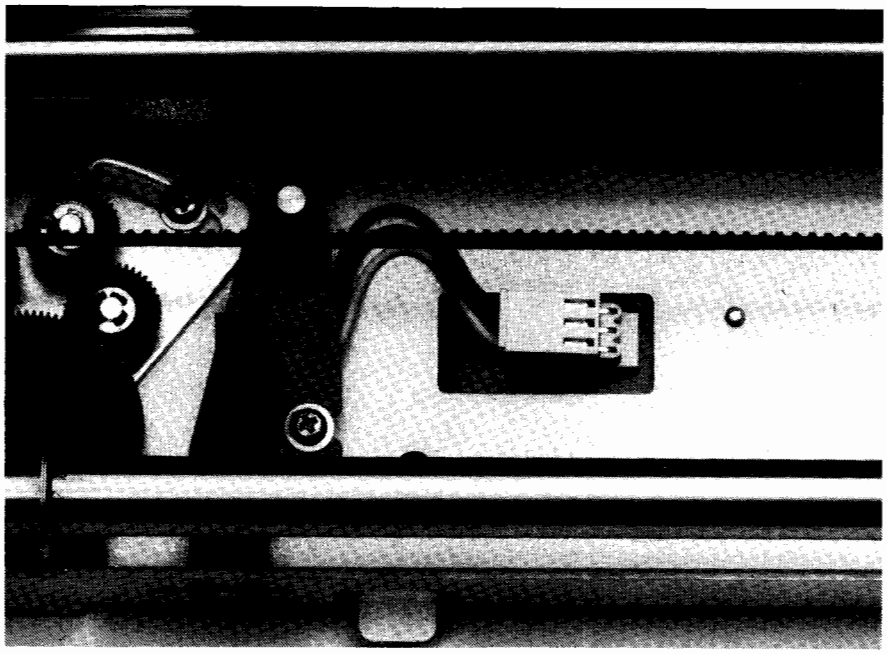


Figure 3-17. Home Position Sensor Assembly

1. Remove the ribbon cartridge as described in paragraph 3-4.

2. Unplug the connector by pushing it to the left.

3. Unscrew the mounting screw.

4. Disengage the assembly from the mounting post by sliding the assembly forward.

5. Lift the assembly up and out of the printer assembly.

[5A. When reinstalling the home position sensor assembly, adjust it so that the axis of the circuit board is approximately at right angles to the frame of the printer assembly. Execute a print self test by holding down the LF key and then turning on the power. The first character of each line should line up with the same point on the scale. Readjust the assembly until it does. If is positioned too far to the right, the buzzer will sound two bursts of three buzzes each. If this happens, reposition the assembly to the left until the buzzer no longer sounds when the self test is run.]

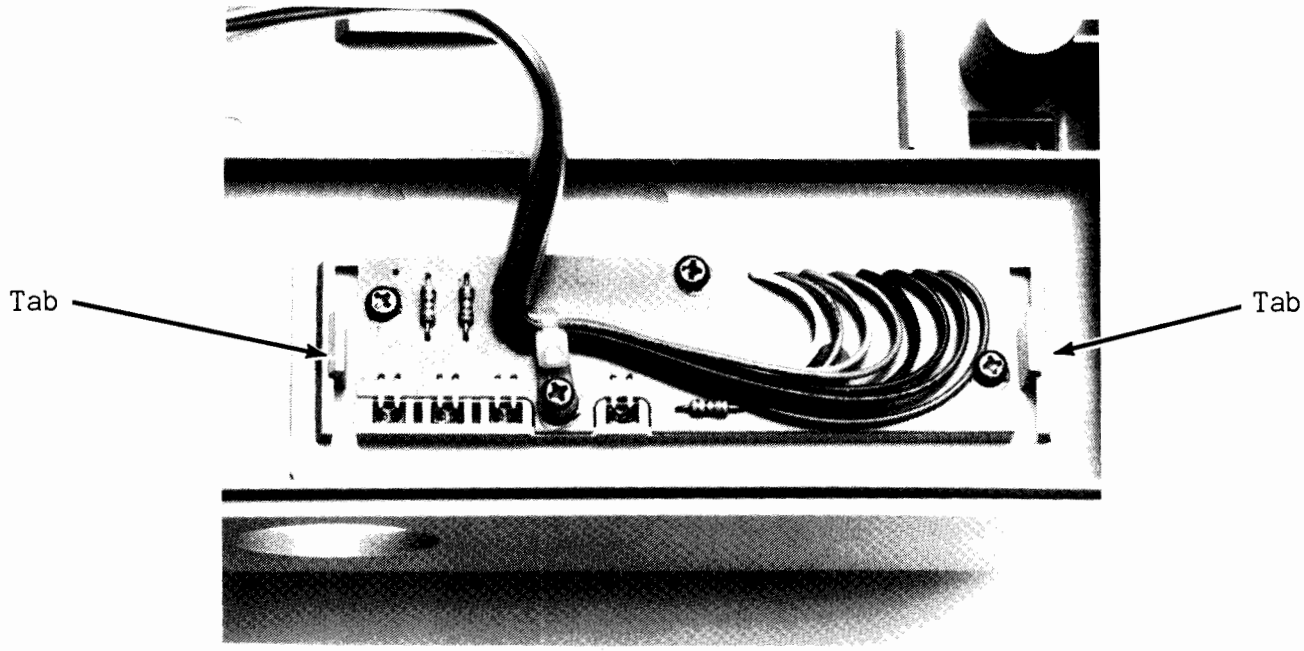


Figure 3-18. Keyboard Assembly

3.14 Removing the Keyboard Assembly

1. Remove the top case as described in paragraph 3.3.
2. Press the tabs on the keyboard assembly towards each other.
3. Pop the keyboard assembly out of the top of the top case.

3.15 Removing Socketed ICs

CAUTION

Be sure to take precautions against ESD when handling the ICs. You may damage them if you don't.

NOTE

You are advised to use tools specifically designed for the removal of socketed ICs. However, if you do not have such tools, you may use the method described here. Use extreme care in so doing.

1. Insert a small, flat-blade screwdriver between one end of the IC and the

socket. Do not push the screwdriver in more than about 2.5 millimeters (3/32 inch) or damage to the traces may result.

2. Pry up the end of the IC by raising the handle of the screwdriver. In order to avoid bending the pin at the opposite end of the IC or breaking the IC, do not lift the end of the IC more than 2.5 mm (3/32 inch) above the opposite end. (It may be necessary to move back and forth from one end of the IC to the other several times.)

3. Repeat steps 1 and 2 at the other end of the IC.

4. When the IC is sufficiently loosened, lift it up out of the socket.

The main CPU (IC-3B) has a rectangular clamp around it. Pull the clamp up while pressing down on the IC so that the clamp and IC do not come out together. If they do, the IC may be damaged. Remove the clamp; then remove the IC.

[When reinstalling an IC, orient the IC correctly with respect to the socket (semicircles on the IC and on the socket coinciding), and make sure all the pins on the IC are inserted into the corresponding holes in the socket; then press down evenly on the top surface of the IC until it snaps into the socket.]

SECTION
IV

Troubleshooting and Testing

4.1 Introduction

This section contains the procedures to follow to isolate a fault to a replaceable assembly or component. Repair at a lower level is not required; therefore, repair of the faulty assembly or component is not described.

CAUTION

Ensure that adequate precautions are taken regarding electrostatic protection. Work at a bench that is electrostatically protected, and wear a grounded wrist strap whenever you are working on the printer. Otherwise, ICs may be damaged.

WARNING

Lethal voltages are exposed when the top case is removed. For your own safety, when possible, always remove the power cord from the printer when the top case is off. If you are required to operate the printer with the top case off, exercise extreme caution! Otherwise, serious injury may result.

4.2 Required Tools

In addition to the recommended disassembly tools listed in table 3.1, you will need a standard volt-ohmmeter and an HP Series 80 host computer.

4.3 Initial Preparation

Before attempting to troubleshoot the printer, examine it for signs of physical damage. Replace any assemblies or replaceable components that are visibly damaged.

Determine the customer's concern, if possible. Frequently the customer includes with the unit a message describing the problem. However, the complete test procedures should always be conducted to make sure the problem

has been completely identified.

CAUTION

Check the name plate on the back of the printer to determine the line voltage it uses. Failure to use the correct line voltage could cause damage to the printer or could cause improper operation.

4.4 Printing on the Printer

At one point in the test procedure you will be asked to print a message on the printer. You need to connect a host computer to the printer to do this.

If you are using an HP-86 or HP-87, connect an HP-IB cable from the HP-IB connector on the computer to the printer. If you are using an HP-85, you will need to install an HP-IB plug-in interface card in the computer and then to connect it to the printer. The interface select code should be set to "7".

After your computer and printer are interconnected, perform the following steps in order:

1. Check to make sure the printer select code switches are set to "1". (Refer to the printer owner's manual for information on Setting the Printer Address.)

2. Turn the printer on.

3. Turn the computer on.

4. Enter these keystrokes: PRINTER IS 701, 80 [END LINE]

5. Verify that paper is loaded in the printer properly and that it is set to ON LINE.

6. Enter these keystrokes: PRINT "THIS IS A TEST!" [END LINE]

7. The message THIS IS A TEST! should be printed. Press ON LINE and then FF to see the message.

4.5 Test Procedure: Assembly-Level Repair

Perform the procedure starting with figure 4-2 to identify the faulty assembly or replaceable component. If you wish to do component-level repair, perform the procedure starting with paragraph 4.6 also.

Perform the action called for in the rectangles in the flow charts. Follow the arrows from the start through the transfer point, if any, to the end of each test sequence, making the yes (Y) or no (N) decisions called for in the diamonds as you come to them.

After replacing any component or assembly repeat the whole procedure from the beginning to verify that the fault has been corrected.

If you replace an assembly or component and the problem is not corrected, be sure to replace the original assembly or component in the printer,

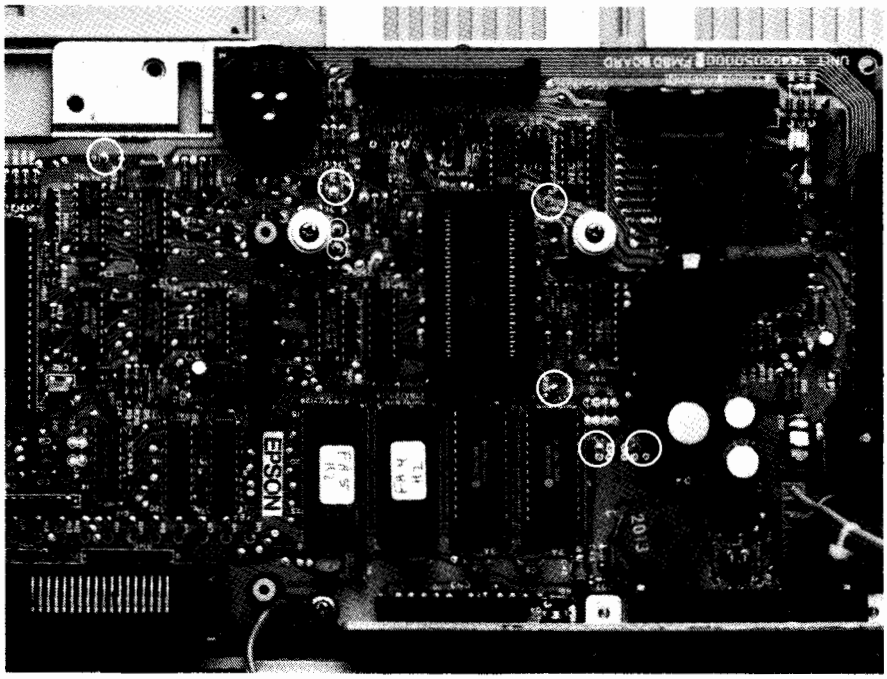


Figure 4-1. Test Point Locations

The FMBD assembly contains replaceable socketed ICs. The printer assembly contains the following relaceable units: two motors, the head-position sensor, the home-position sensor, the paper-end switch, and the print head.

If you are directed to replace the FMBD assembly or the printer assembly, determine that the fault does not lie in one of the replaceable units before replacing the entire assembly. You can do this by replacing the units one at a time with known good units, or you can use the component-level procedure of paragraph 4.6.

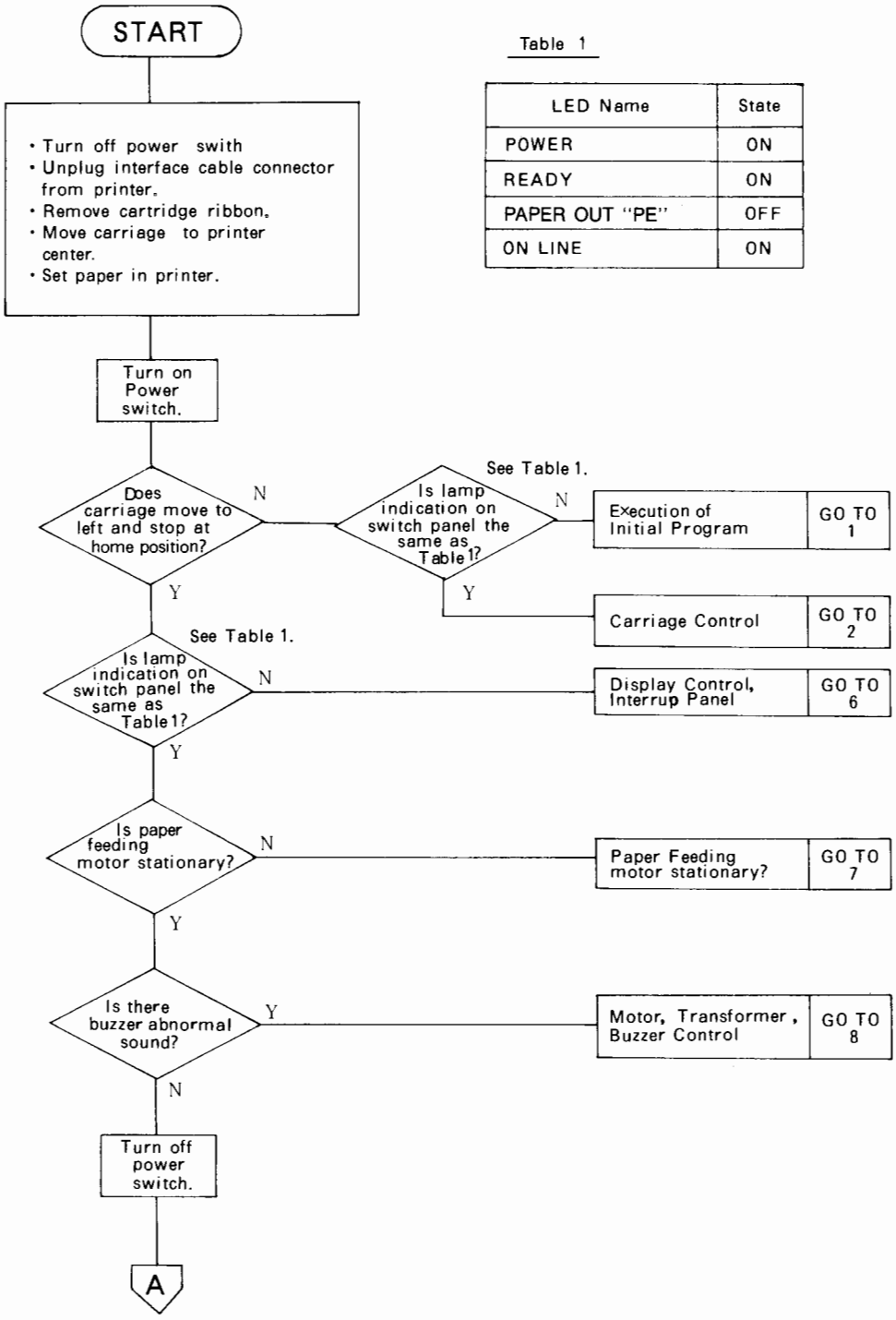


Table 1

LED Name	State
POWER	ON
READY	ON
PAPER OUT "PE"	OFF
ON LINE	ON

Figure 4-2. Check-Out Procedure

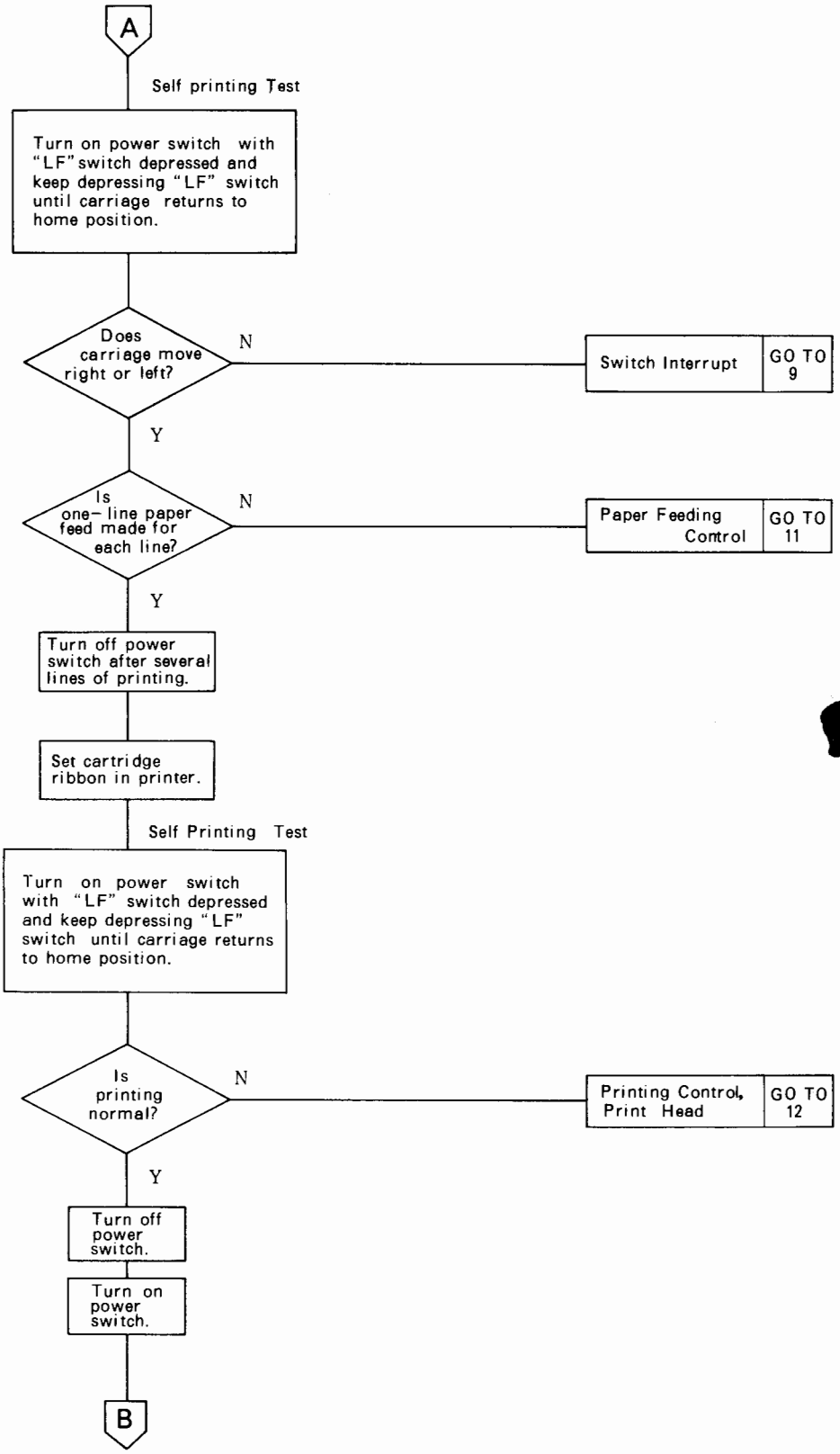


Figure 4-3. Self Printing Test

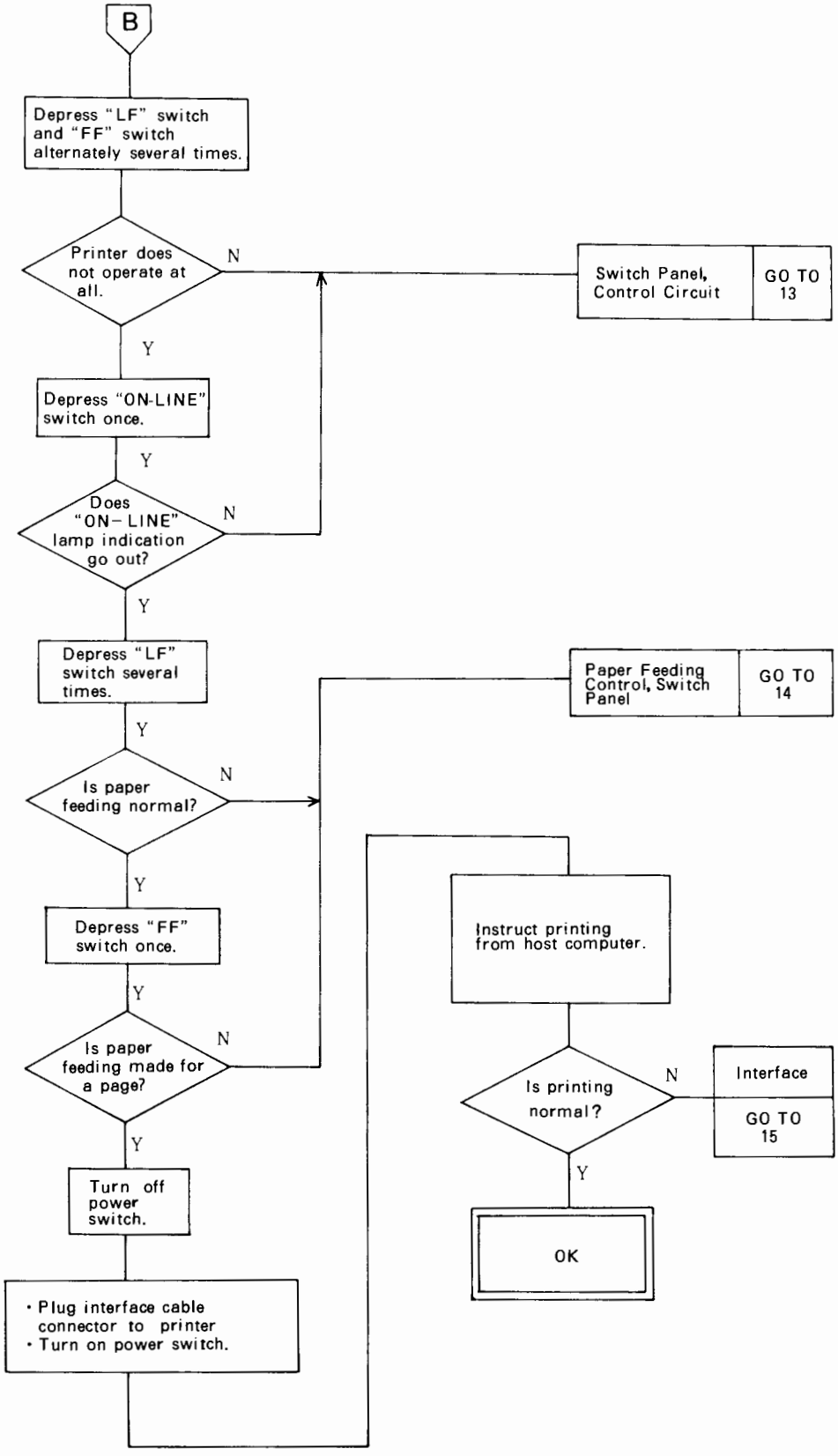


Figure 4-3. Self Printing Test (Continued)

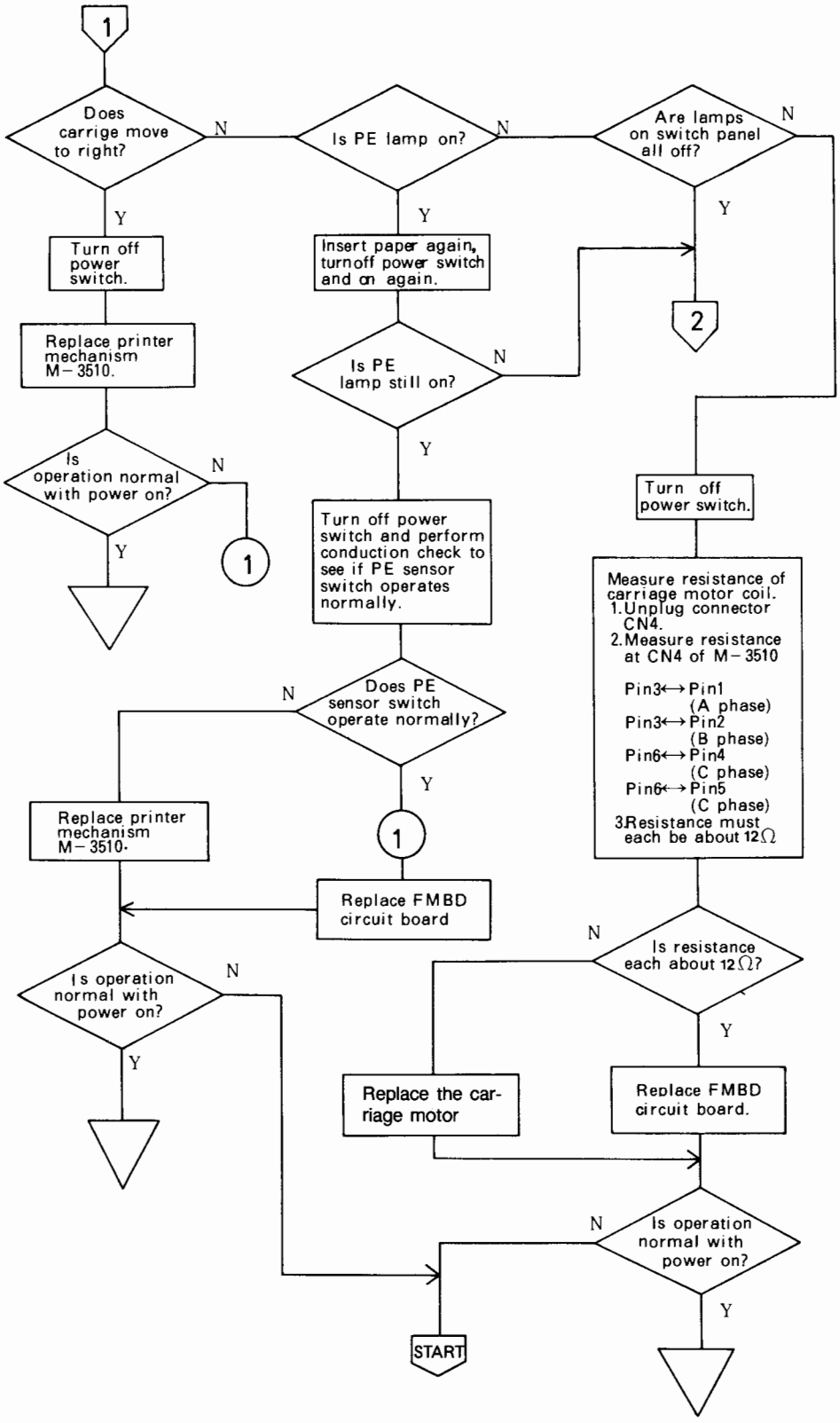


Figure 4-4. Execution of Initial Program Test

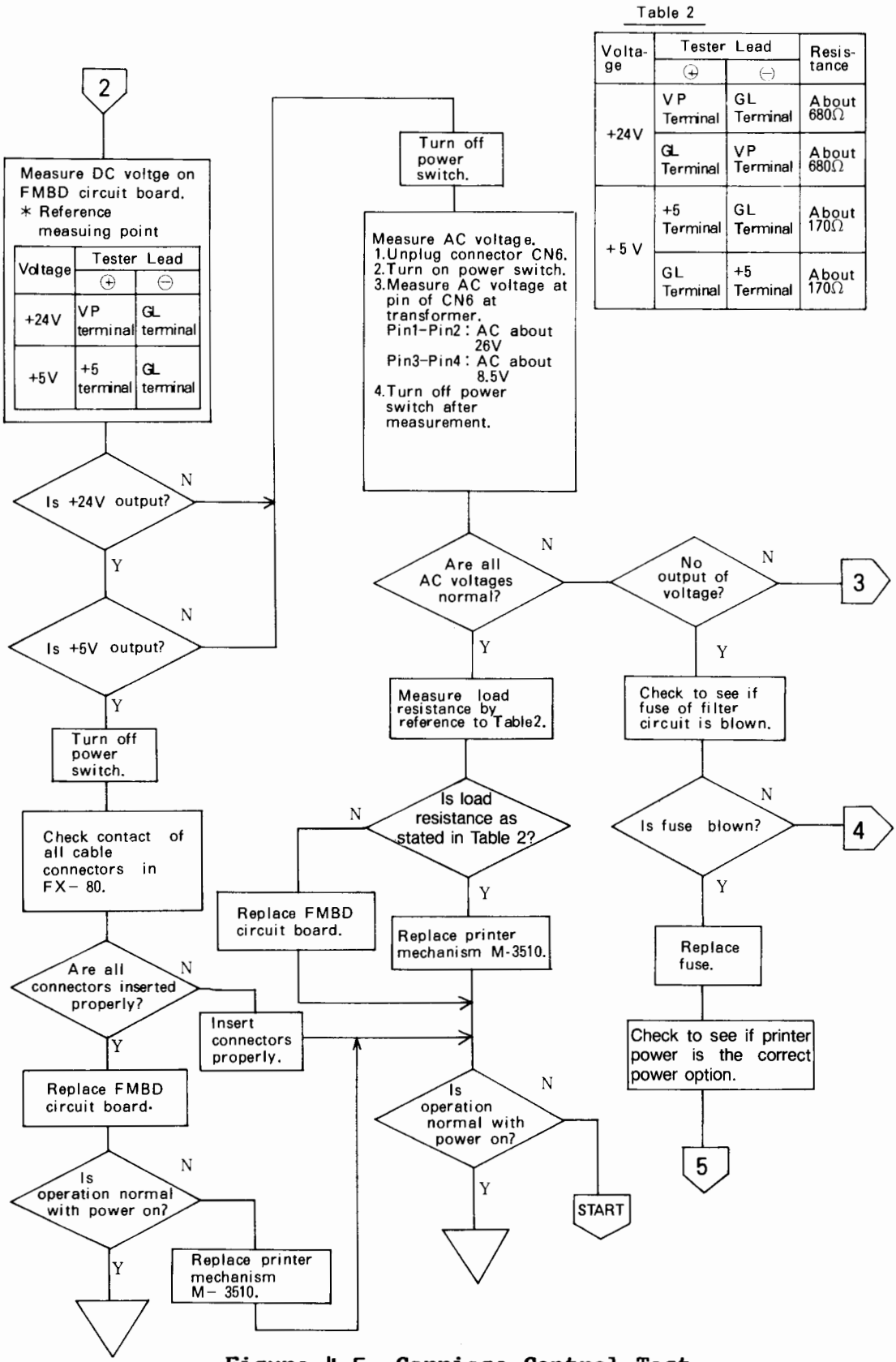


Figure 4-5. Carriage Control Test

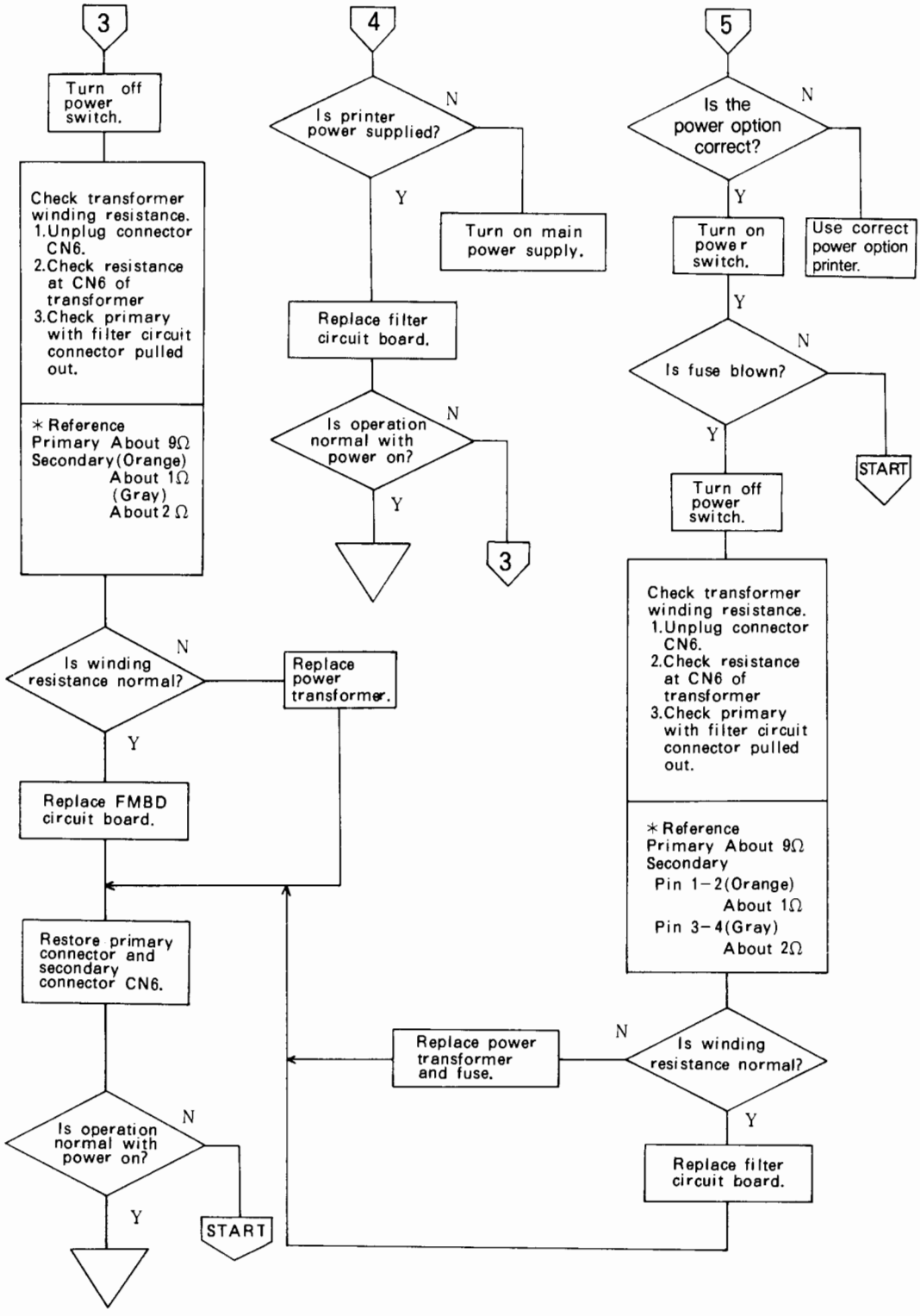


Figure 4-6. Power Supply Tests

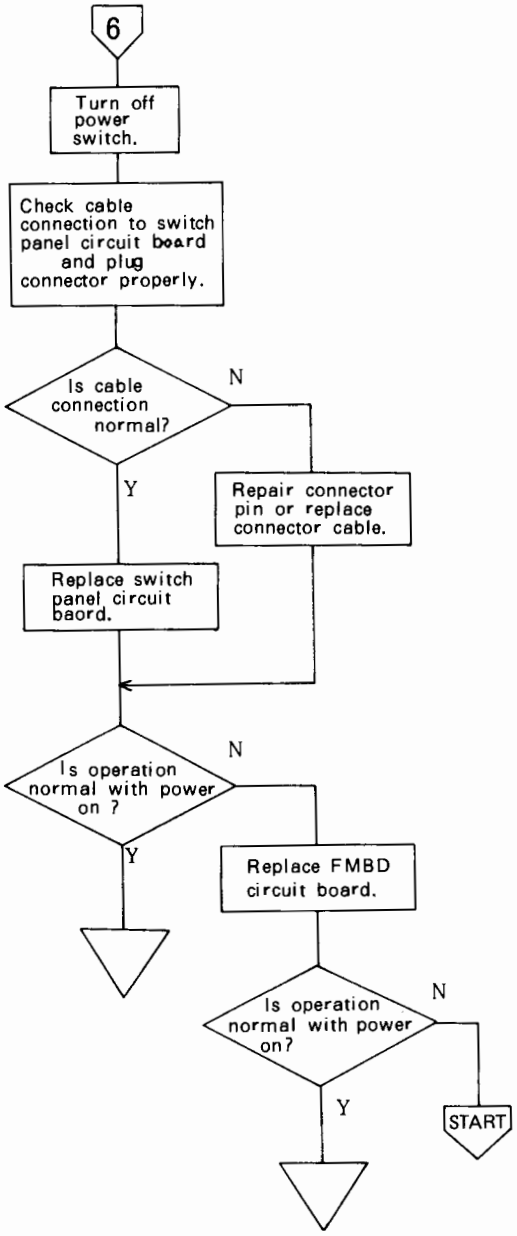


Figure 4-7. Display Control Test

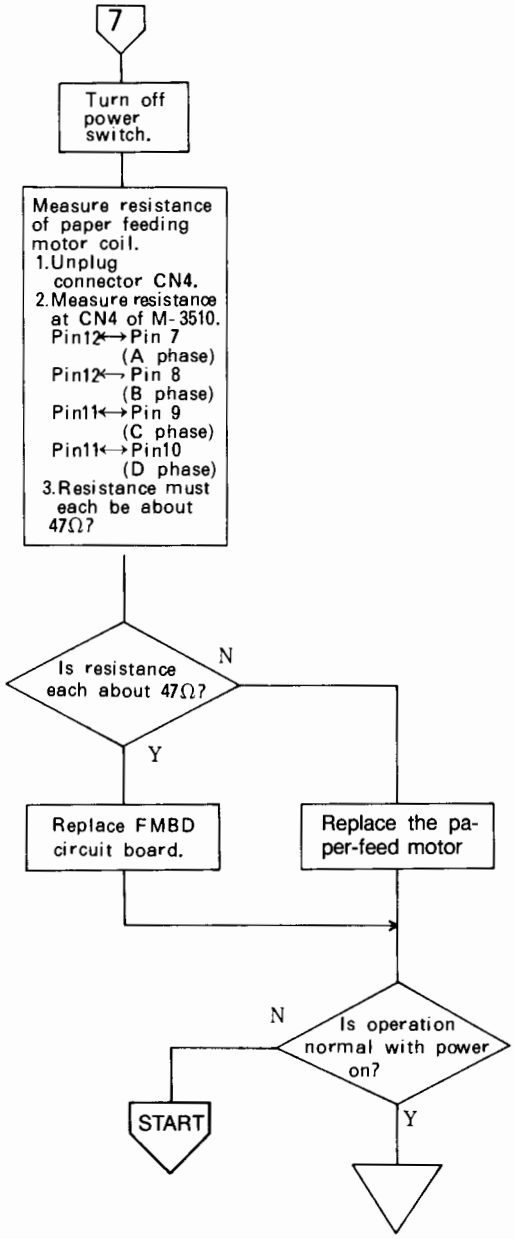


Figure 4-8. Paper Feed Motor Test

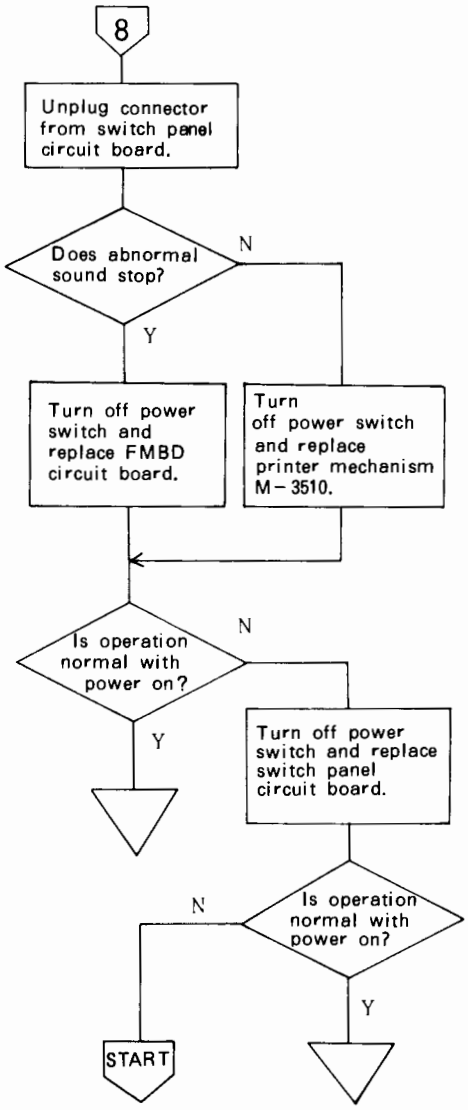


Figure 4-9. Buzzer Control Test

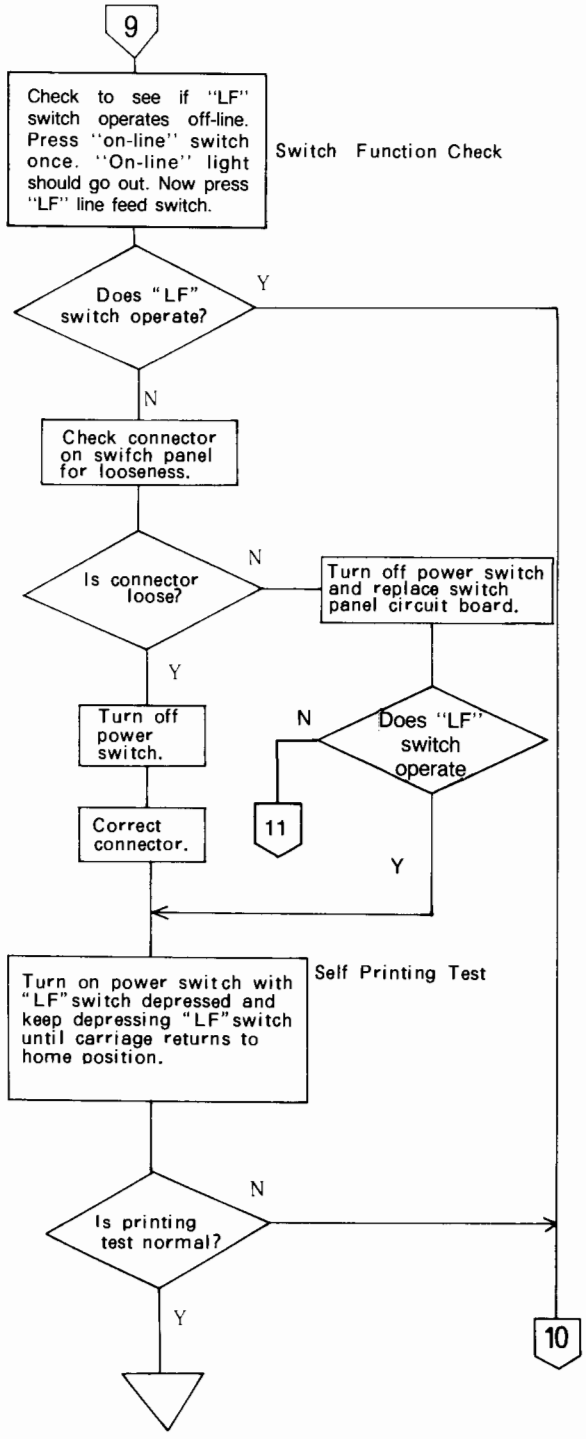


Figure 4-10. Switch Function Test

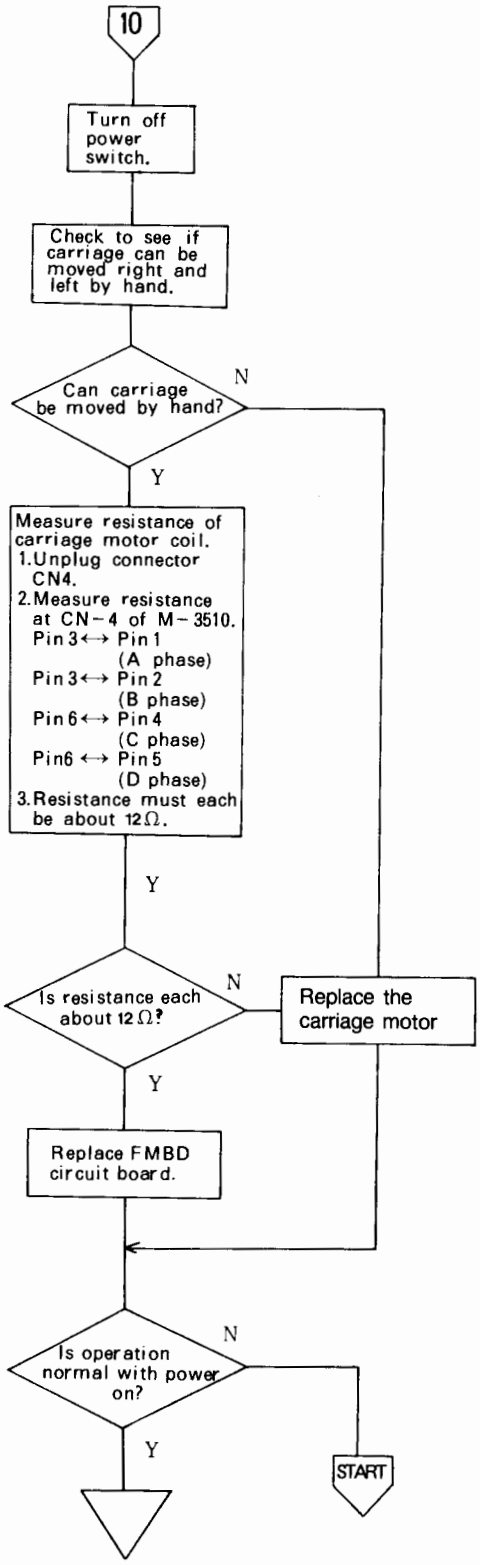


Figure 4-10. Switch Function Test (Continued)

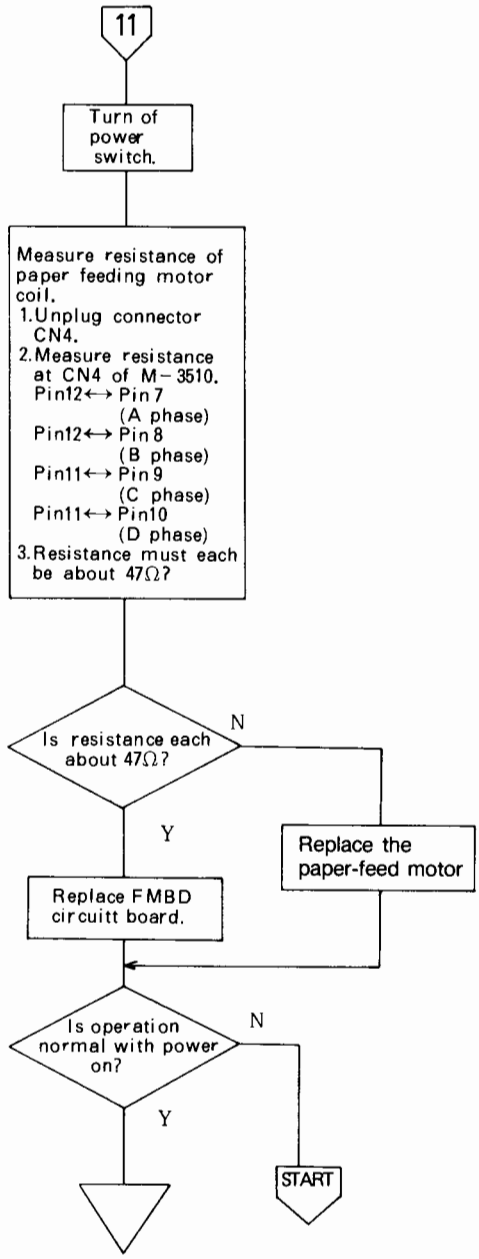


Figure 4-11. Paper-Feed Control Test

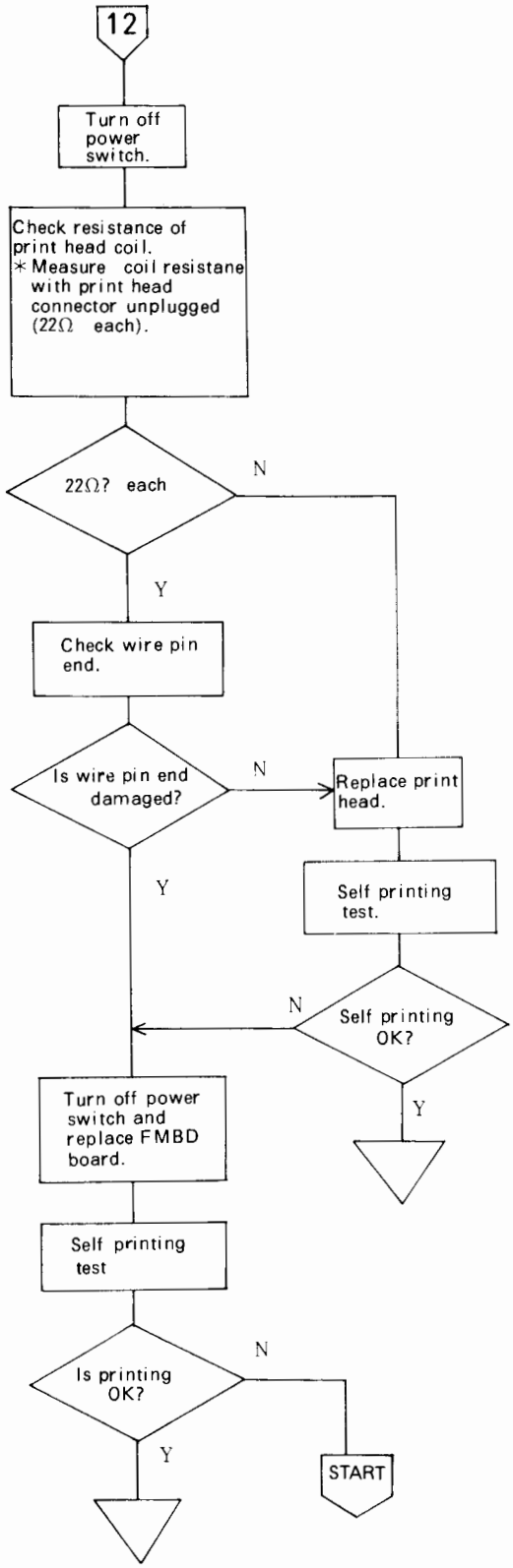


Figure 4-12. Print Head Test

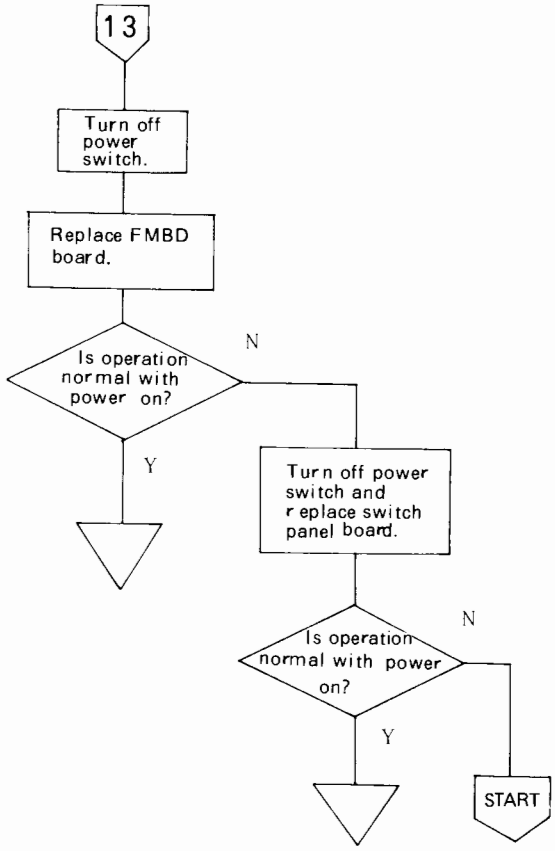


Figure 4-13. Switch Panel Control Test

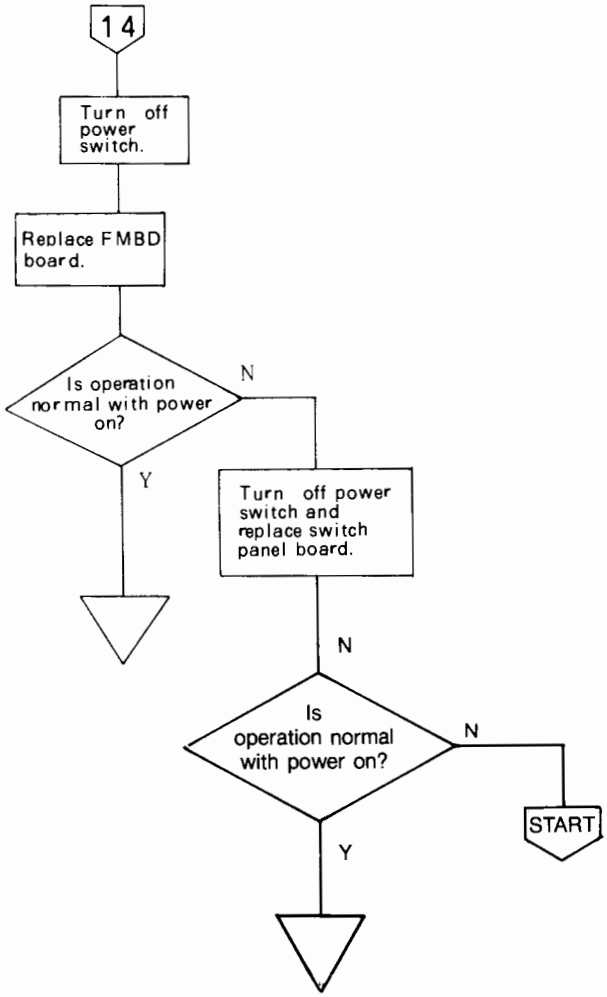


Figure 4-14. Paper-Feed Switch Test

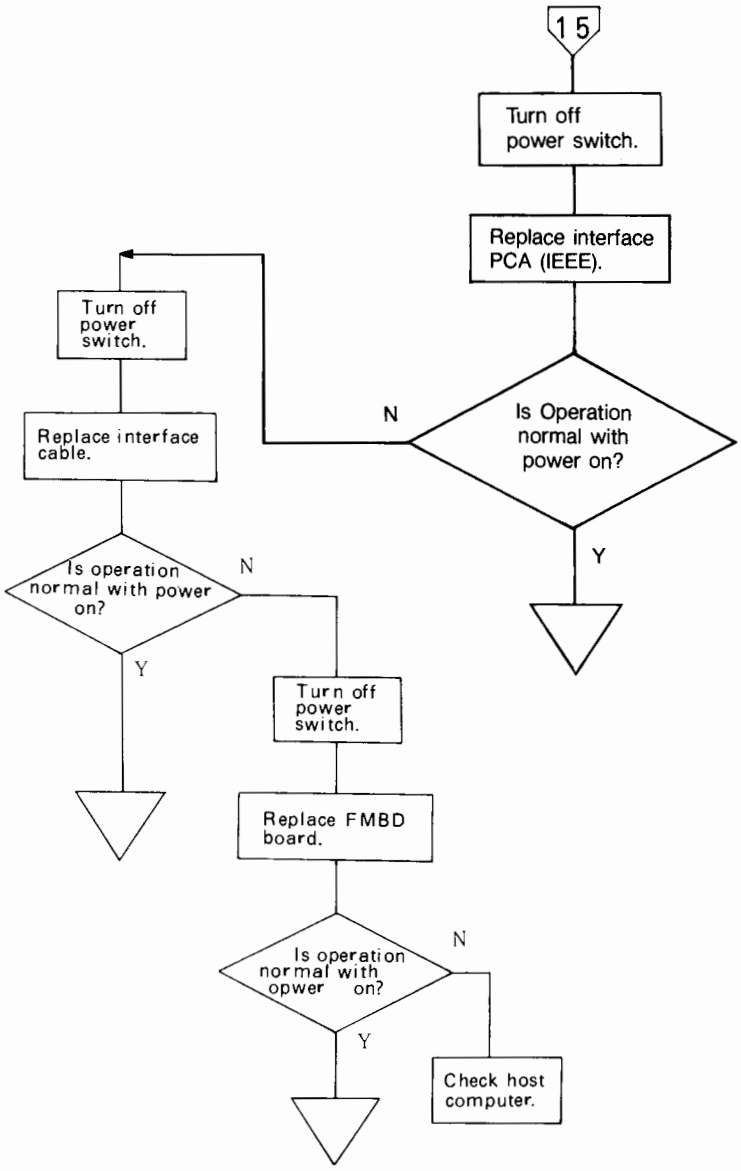


Figure 4-15. Interface Test

4.6 Test Procedure: Component-Level Repair

4.3 Unit Repair Flow Charts

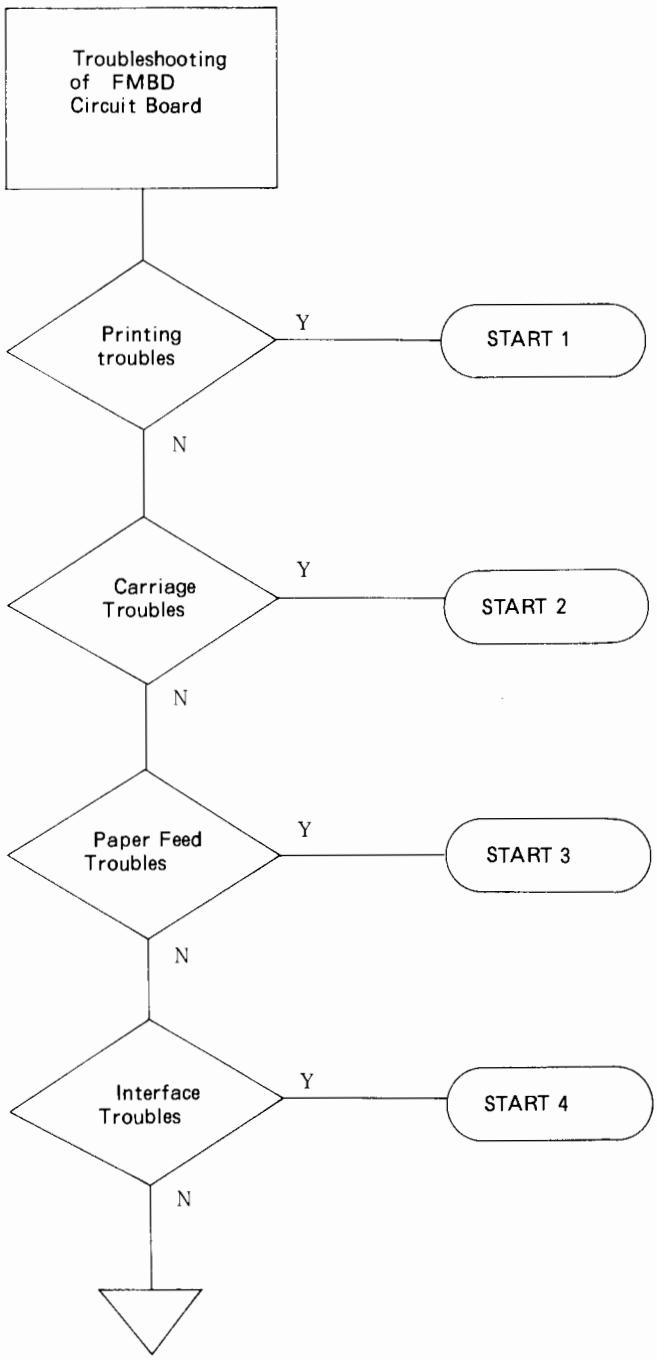


Figure 4-16. Component-Level Repair

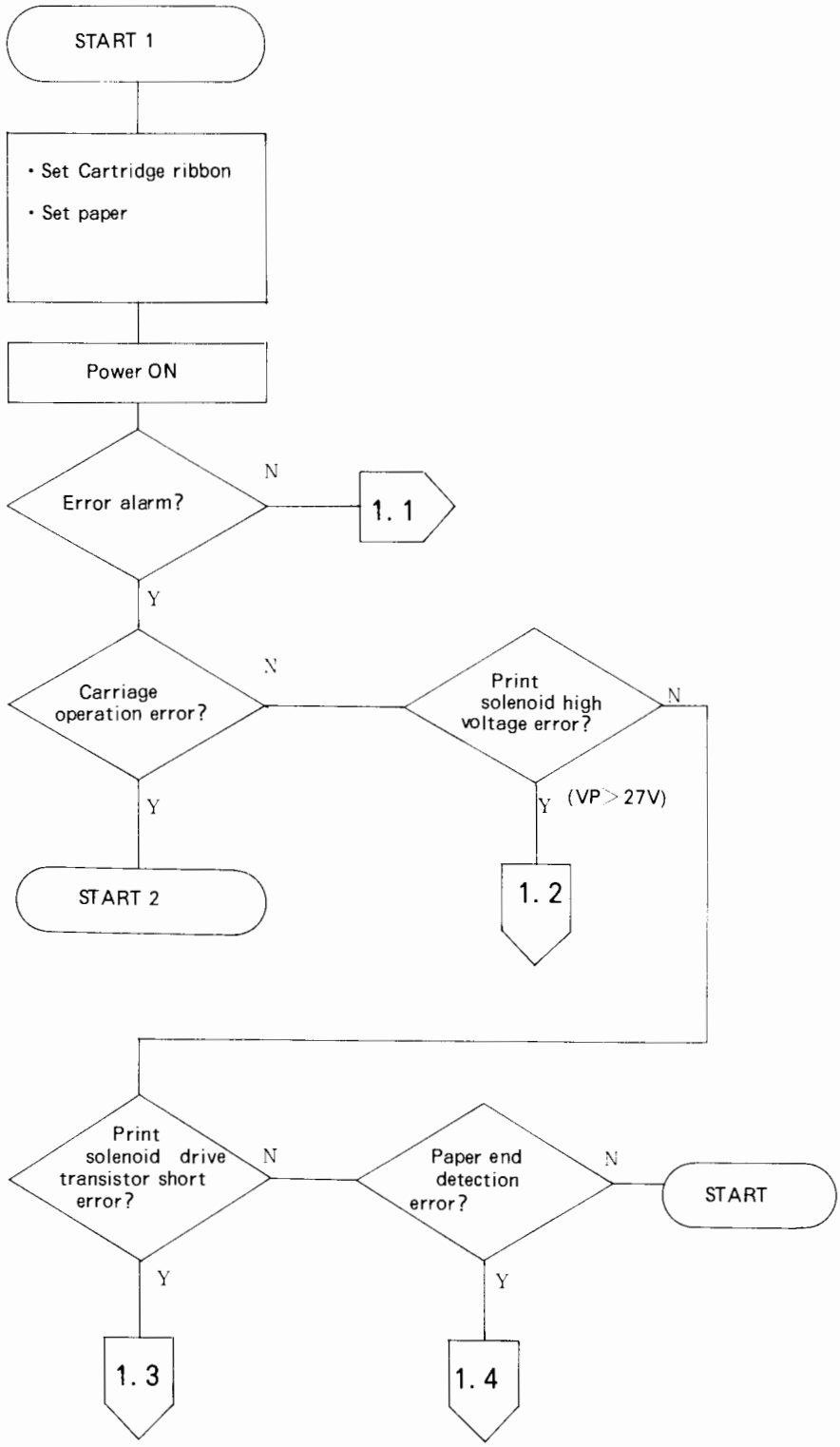


Figure 4-17. Printer Repair

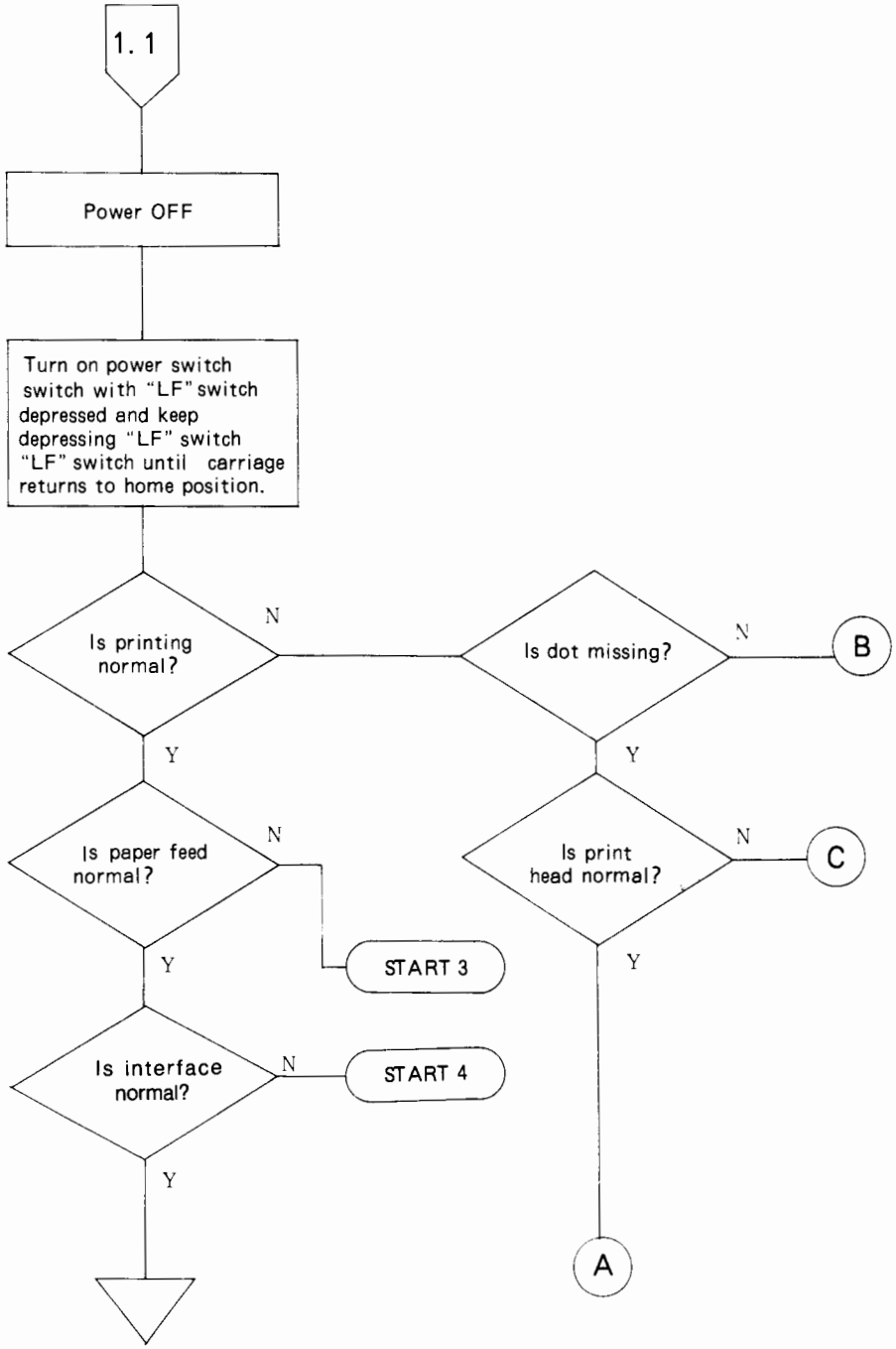


Figure 4-17. Printer Repair (Continued)

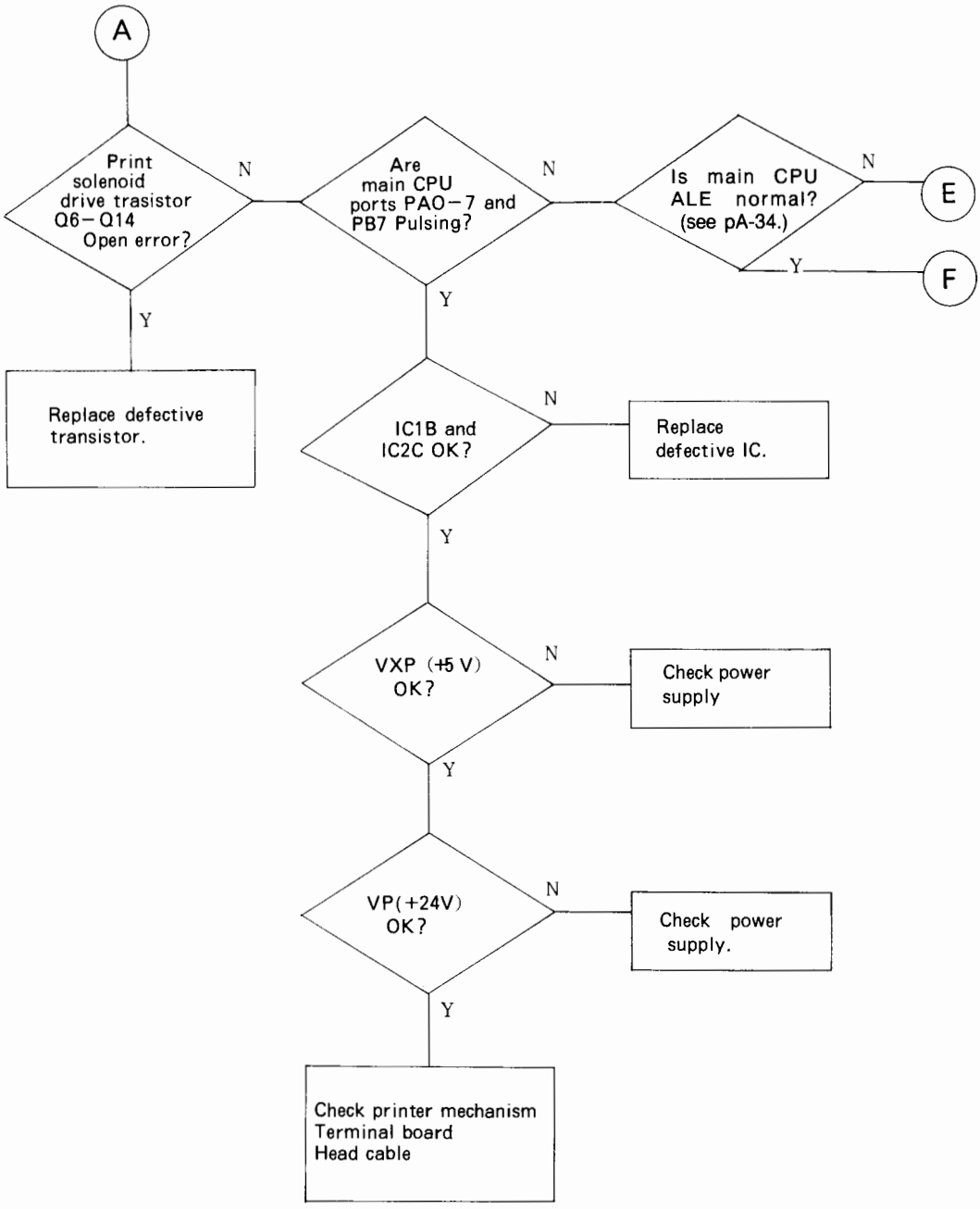


Figure 4-17. Printer Repair (Continued)

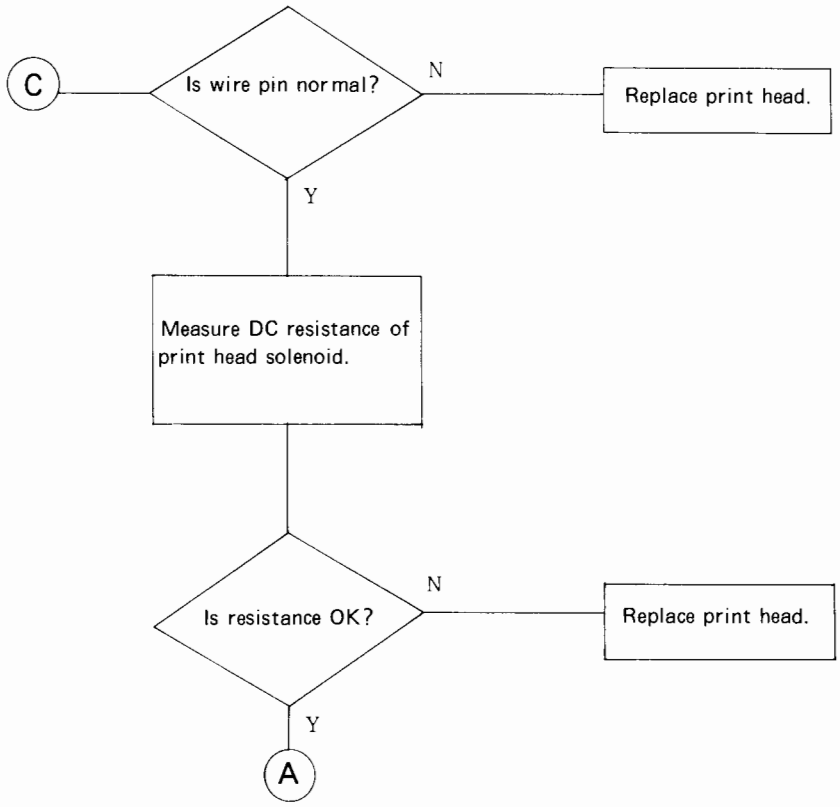


Figure 4-17. Printer Repair (Continued)

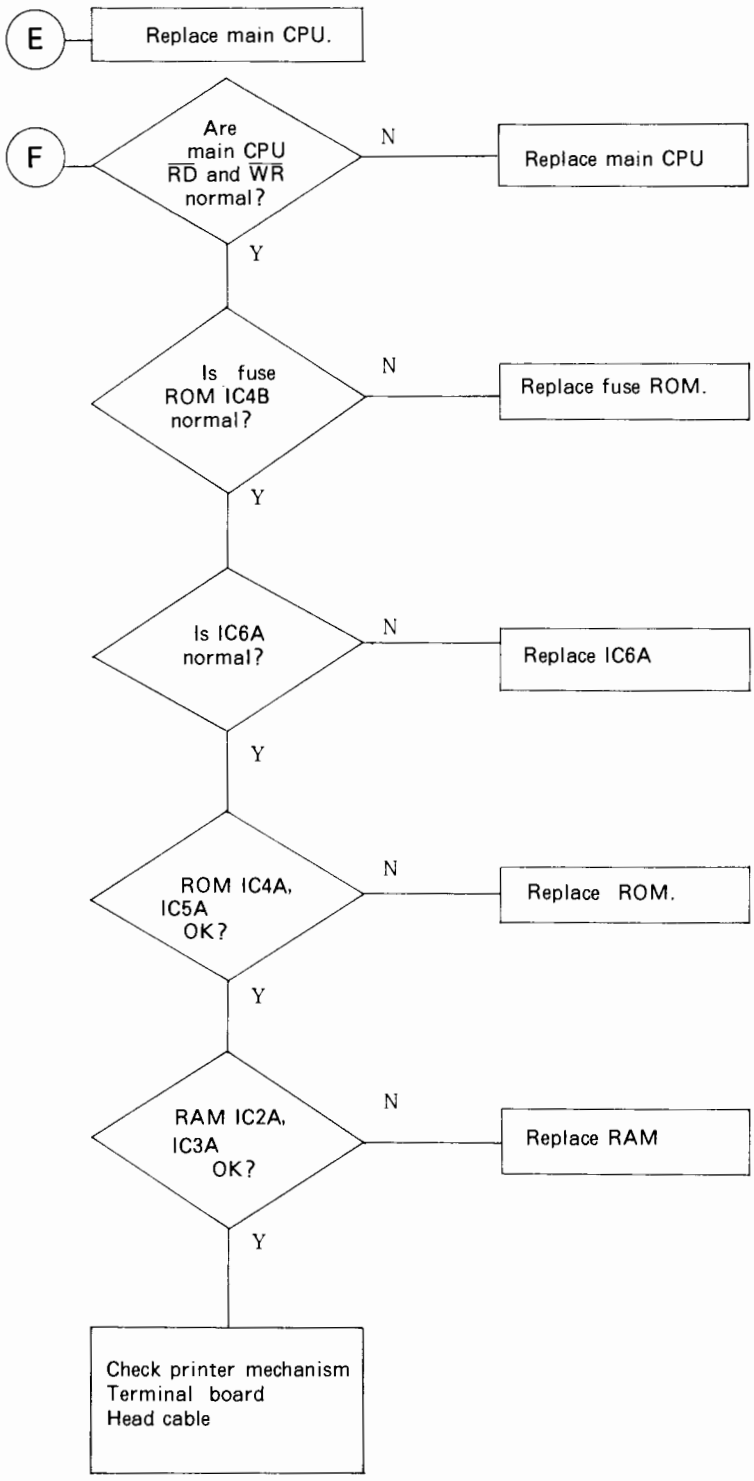


Figure 4-17. Printer Repair (Continued)

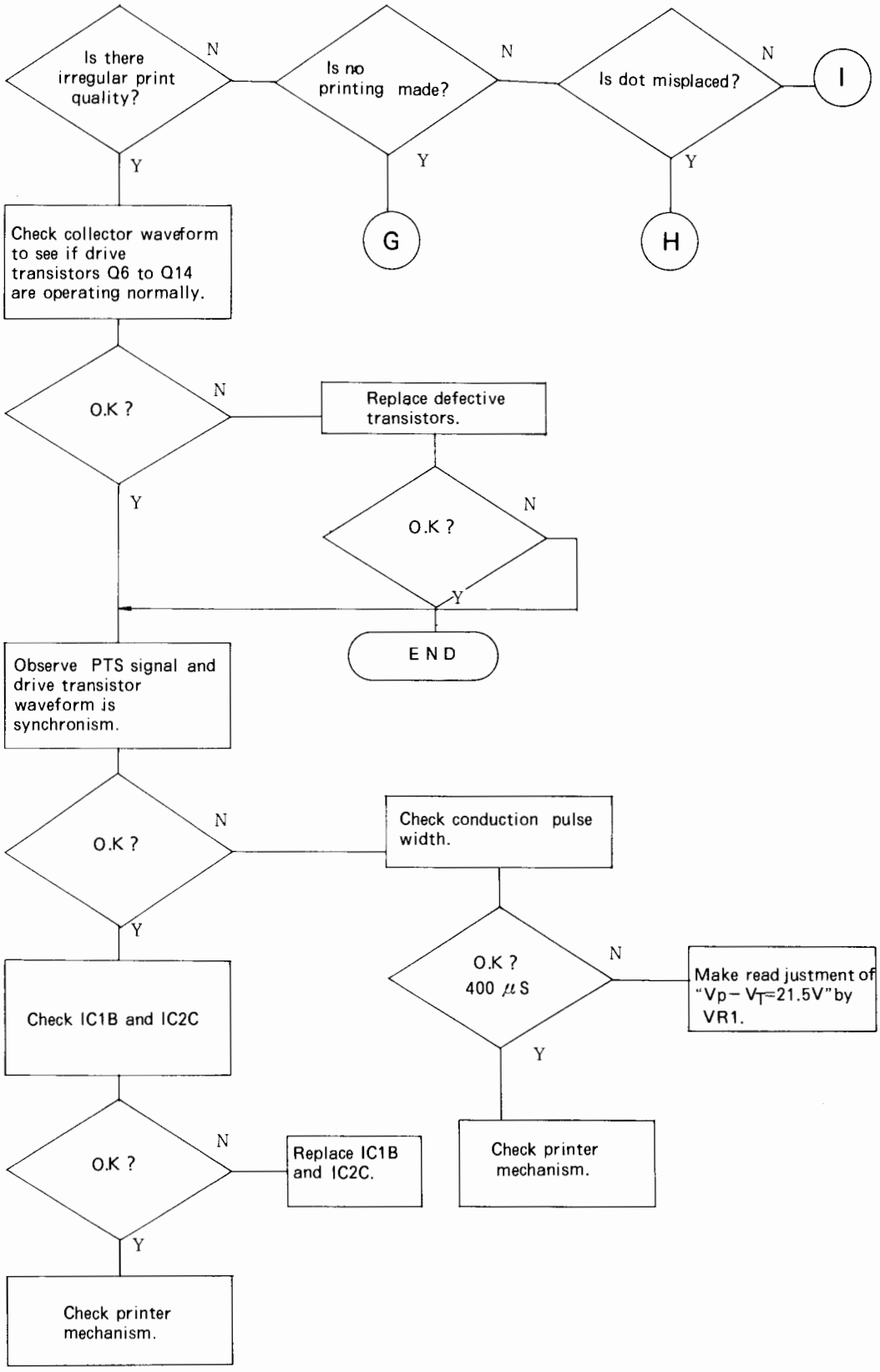


Figure 4-18. CPU Repair

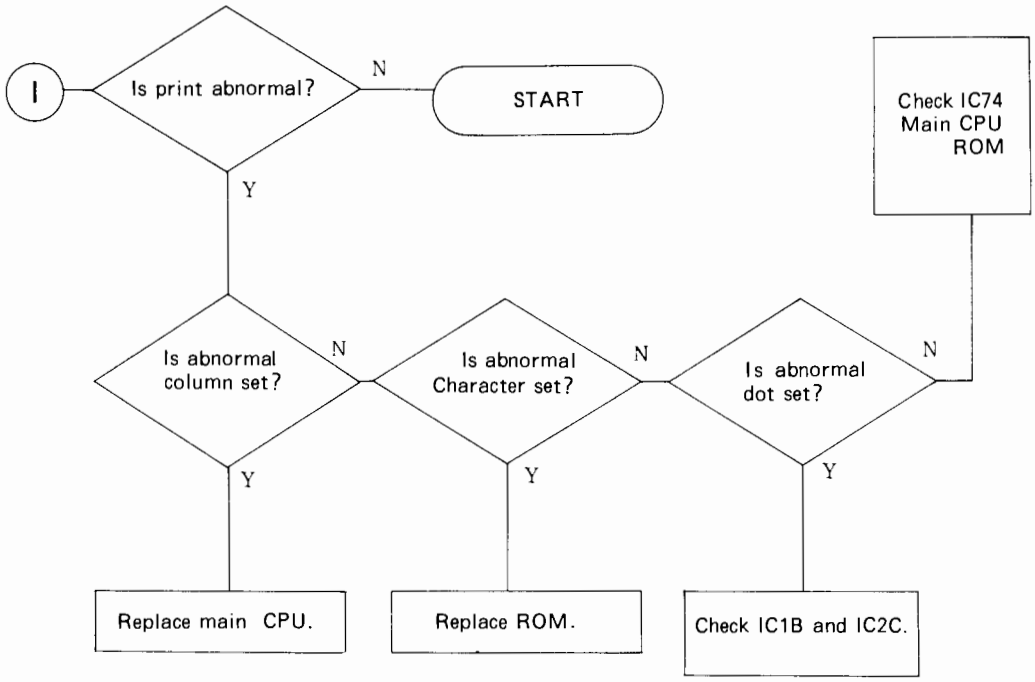


Figure 4-18. CPU Repair (Continued)

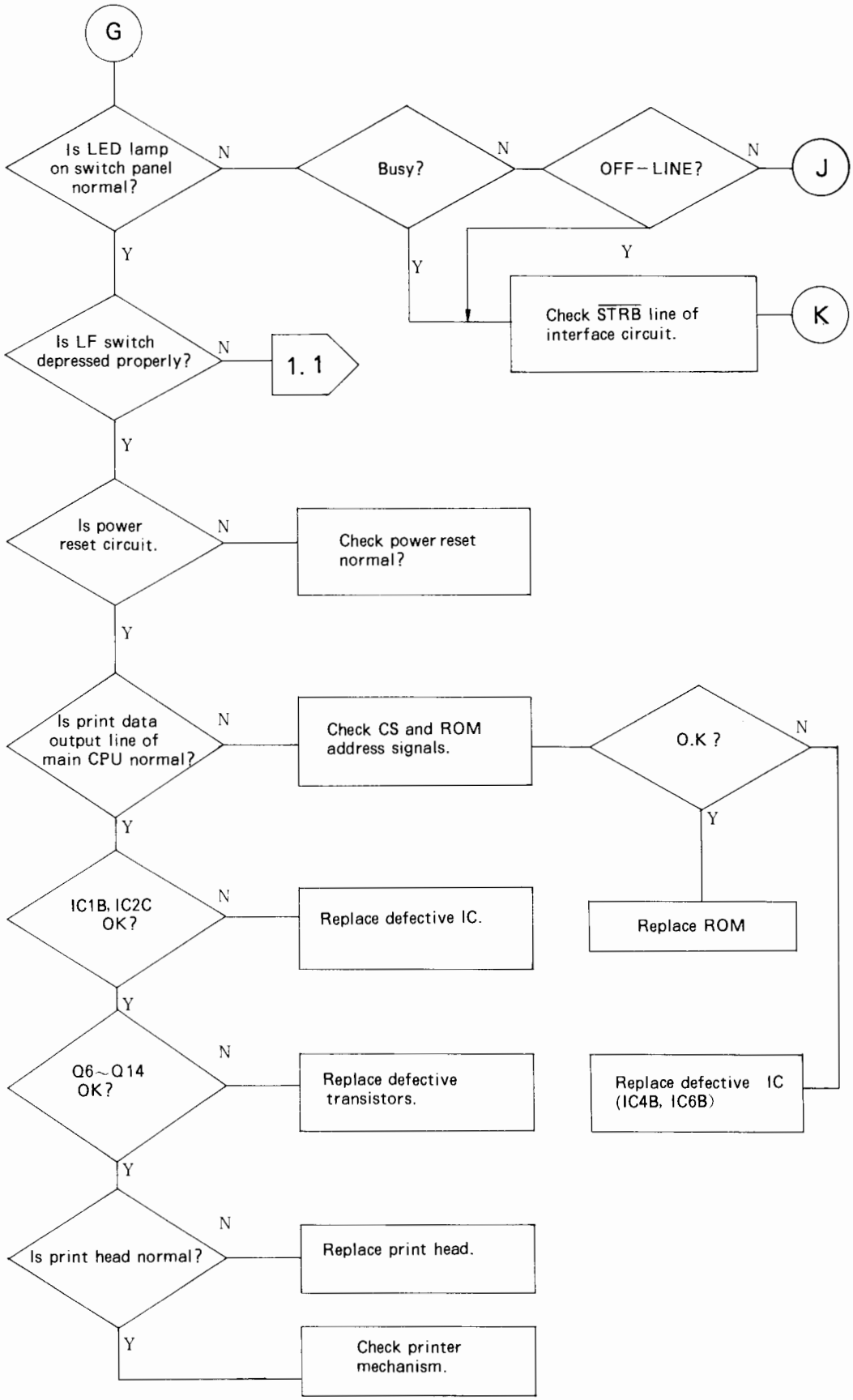


Figure 4-18. CPU Repair (Continued)

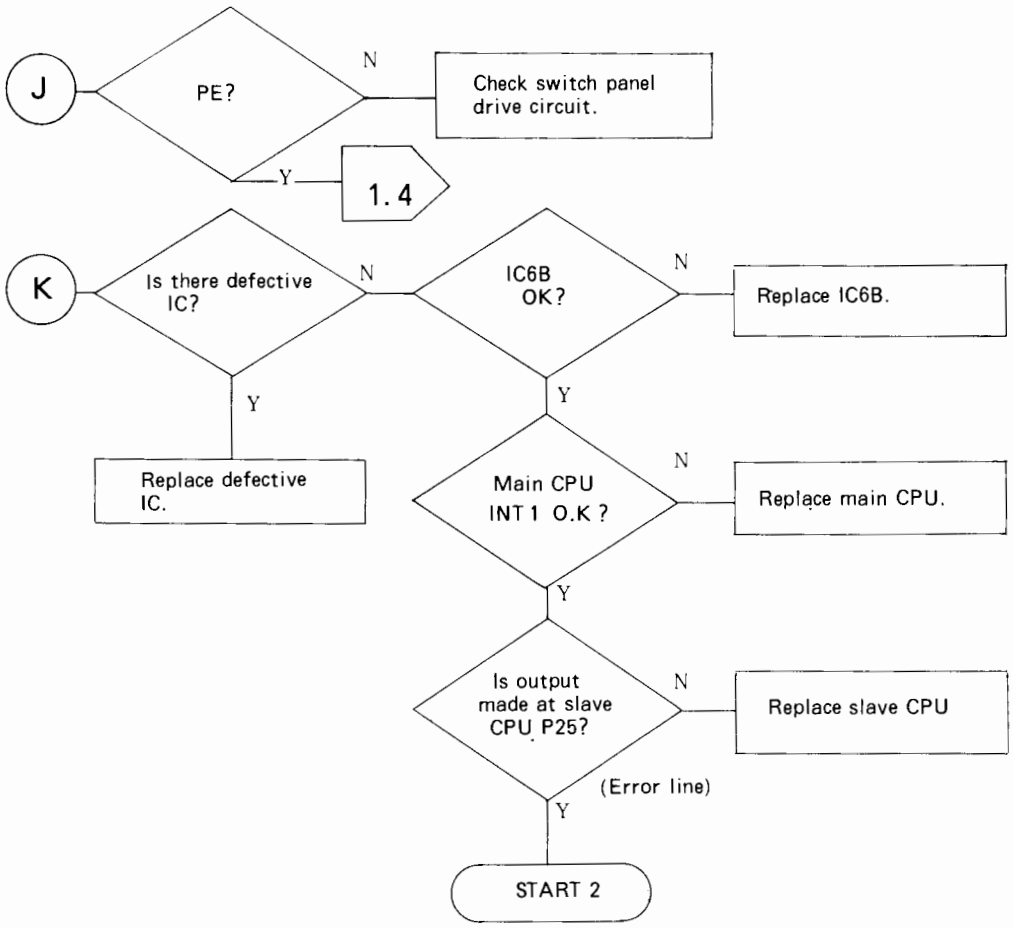


Figure 4-18. CPU Repair (Continued)

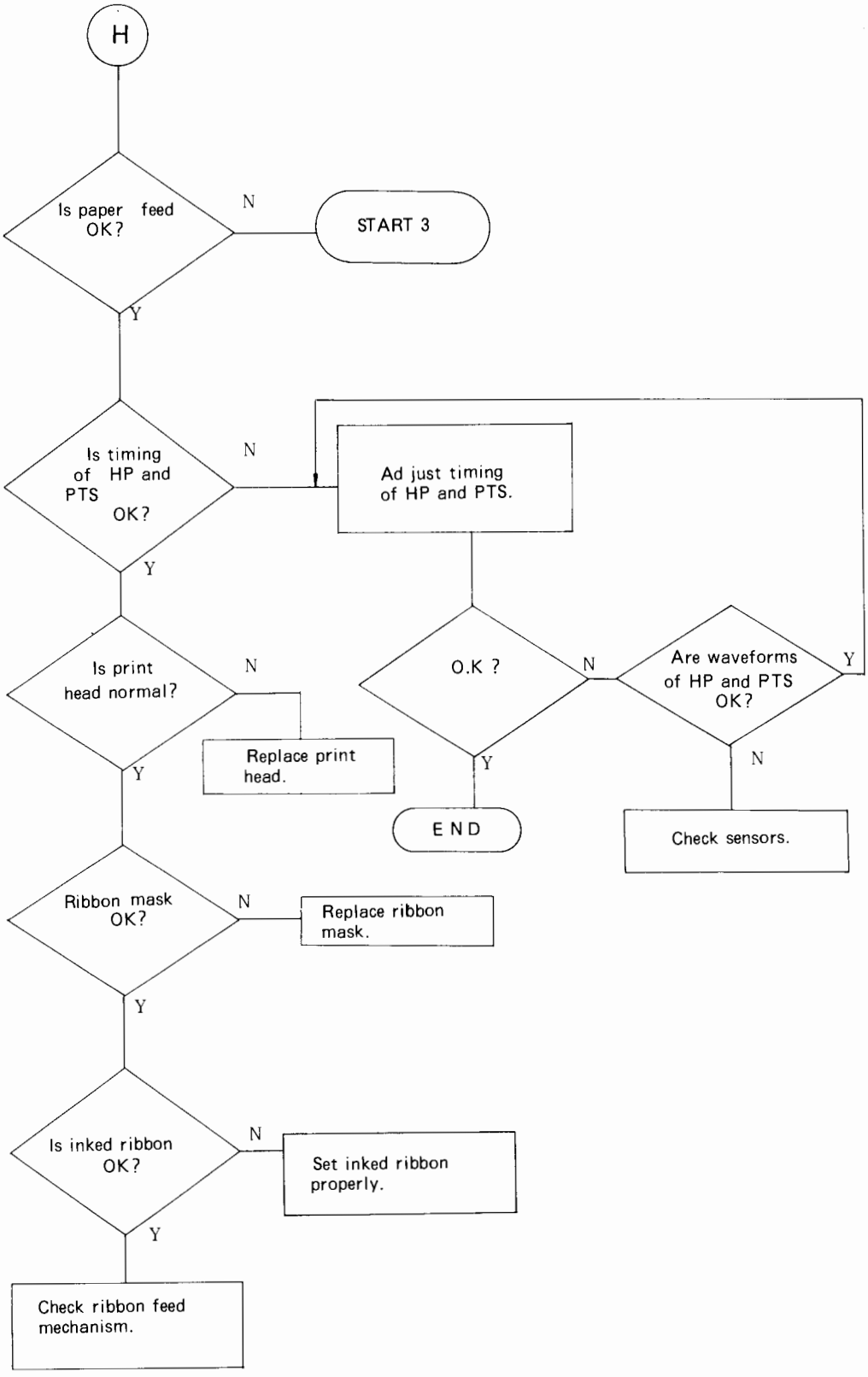


Figure 4-18. CPU Repair (Continued)

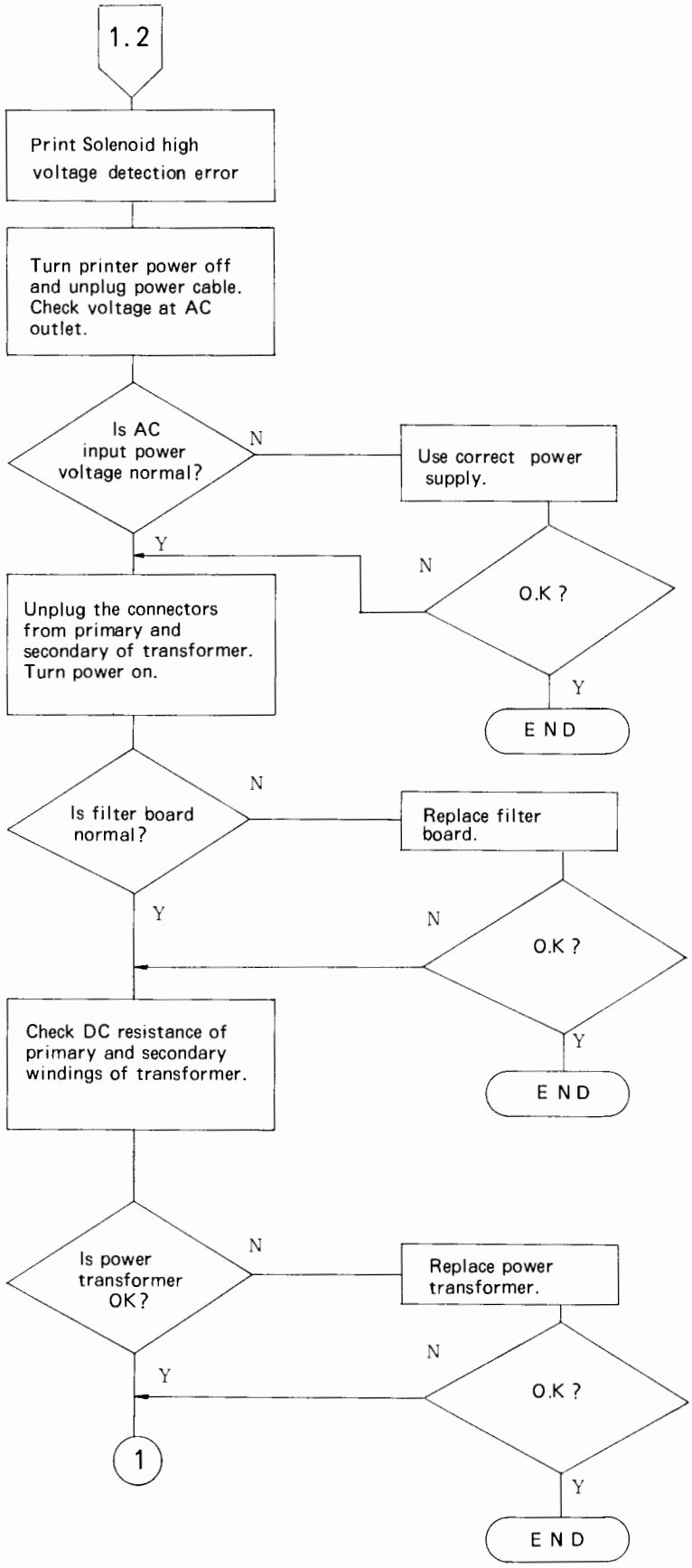


Figure 4-18. CPU Repair (Continued)

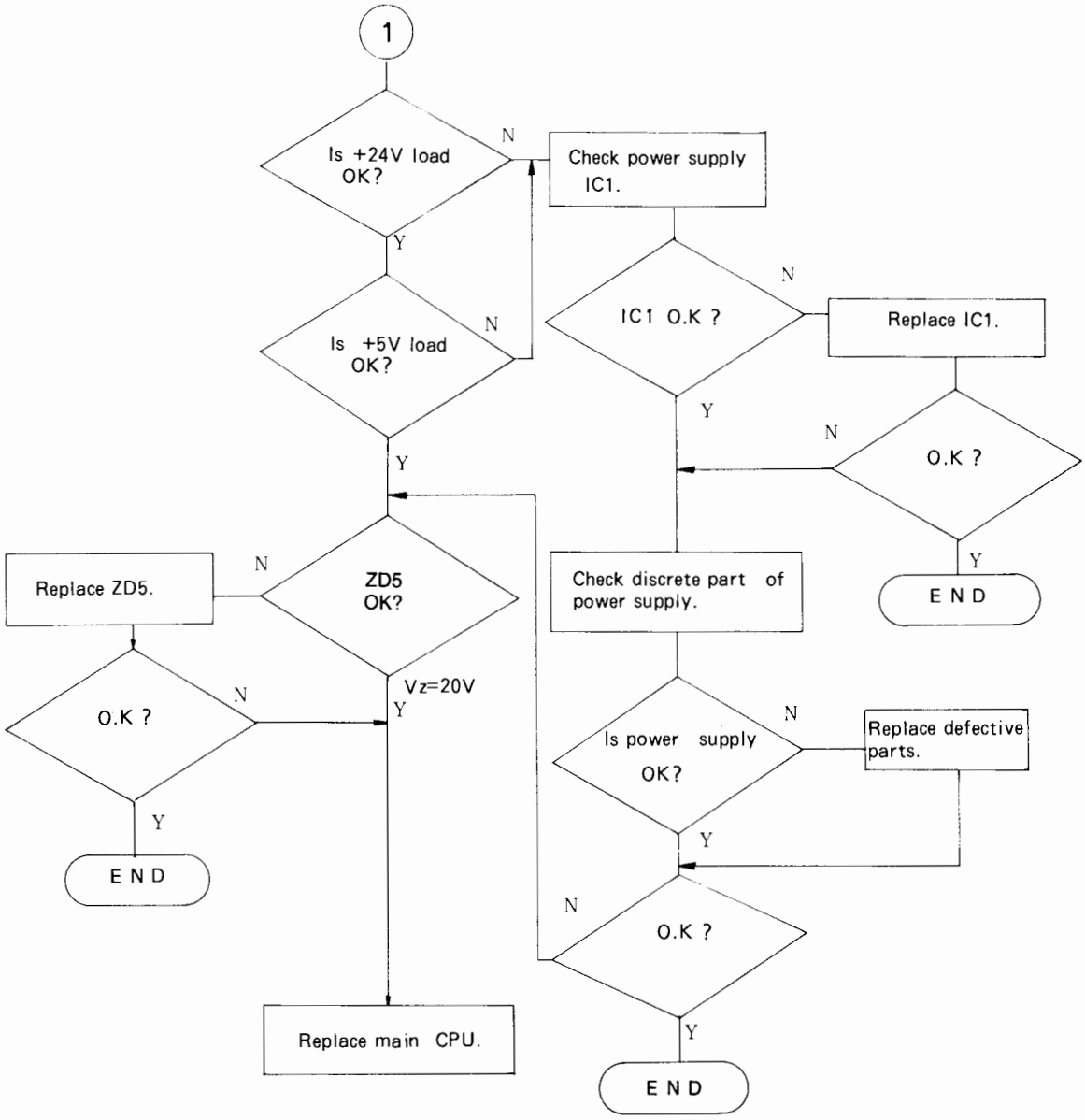


Figure 4-19. Power Supply Repair

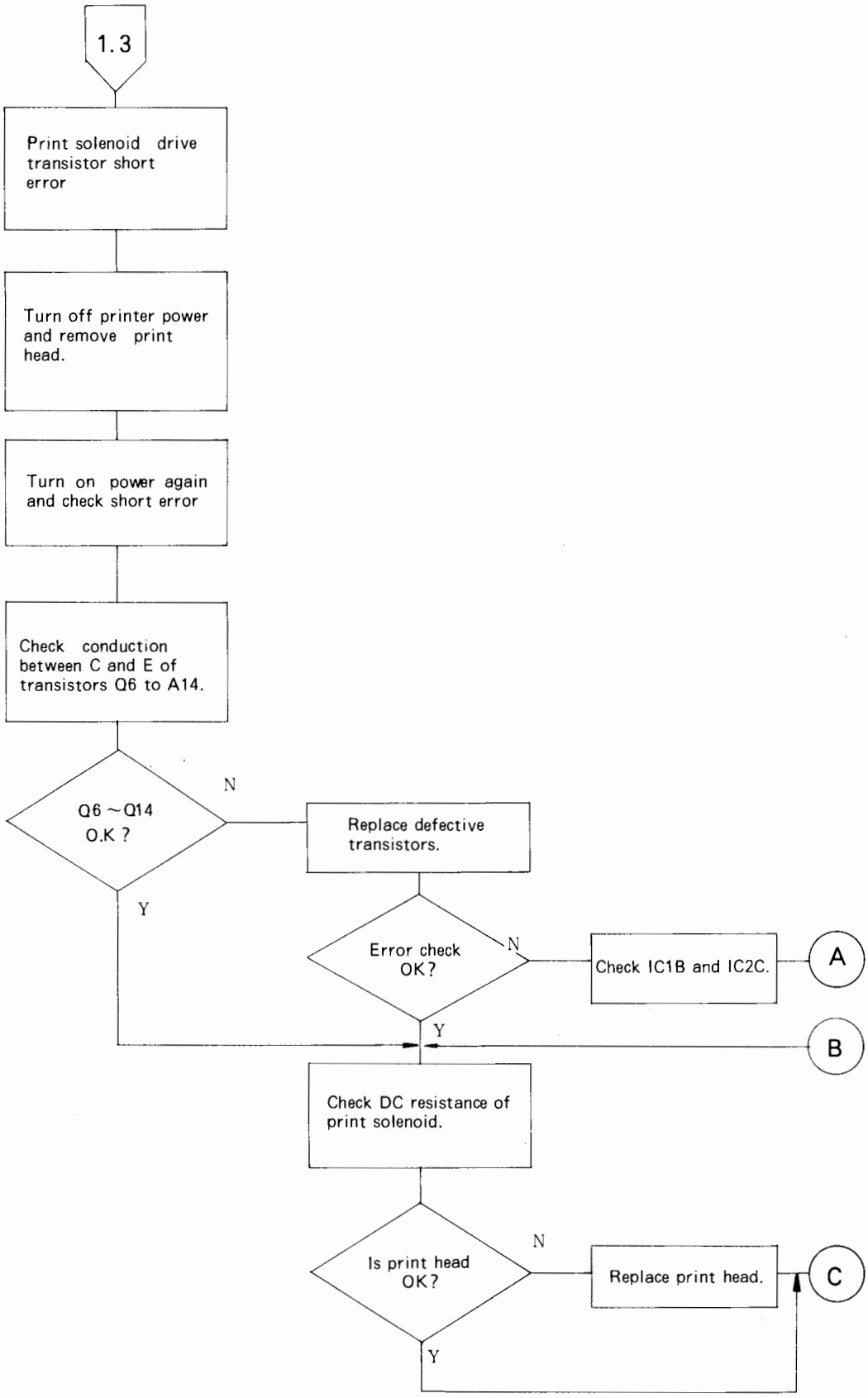


Figure 4-20. Transistor Repair

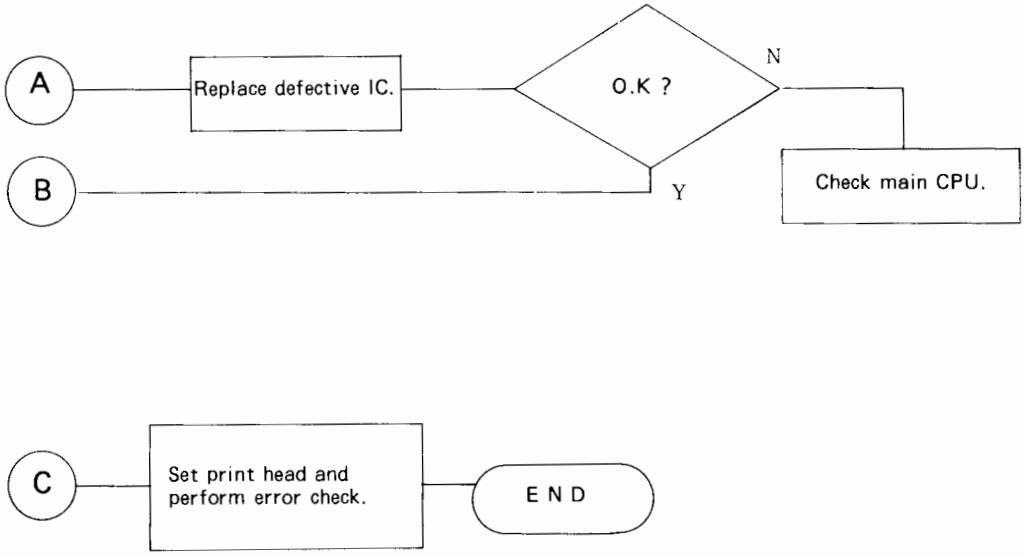


Figure 4-20. Transistor Repair (Continued)

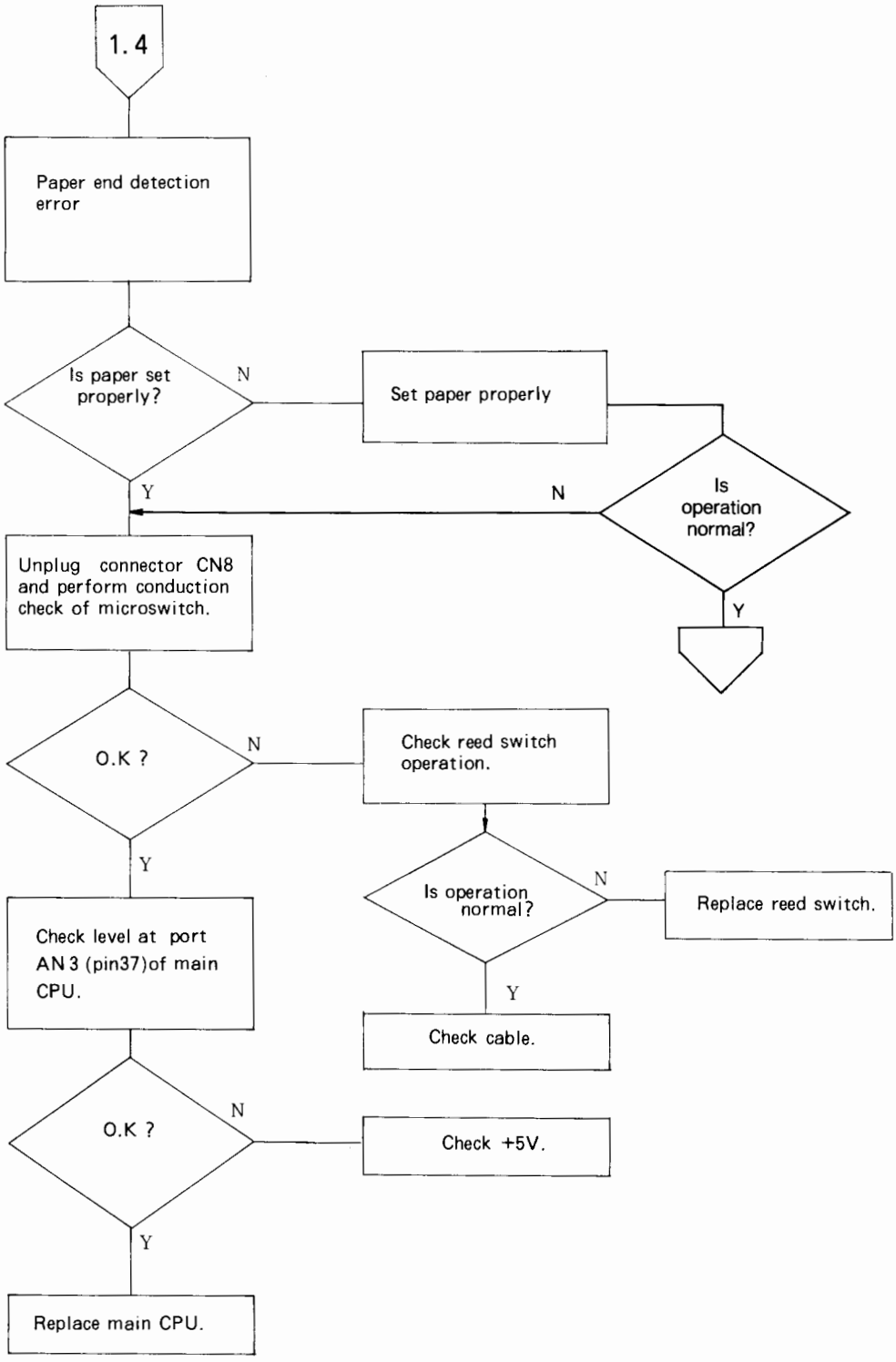


Figure 4-21. Reed Switch Repair

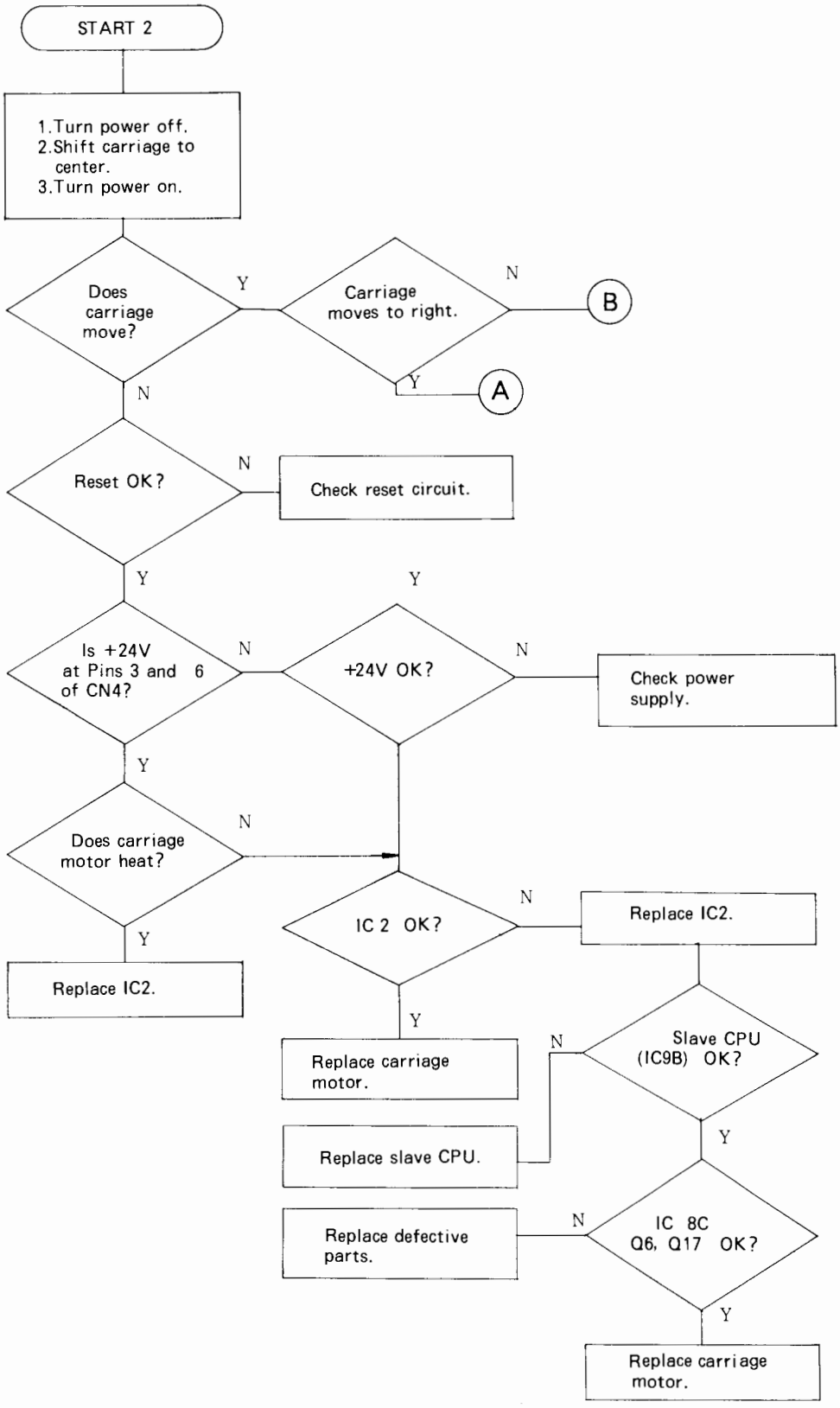


Figure 4-22. Carriage Repair

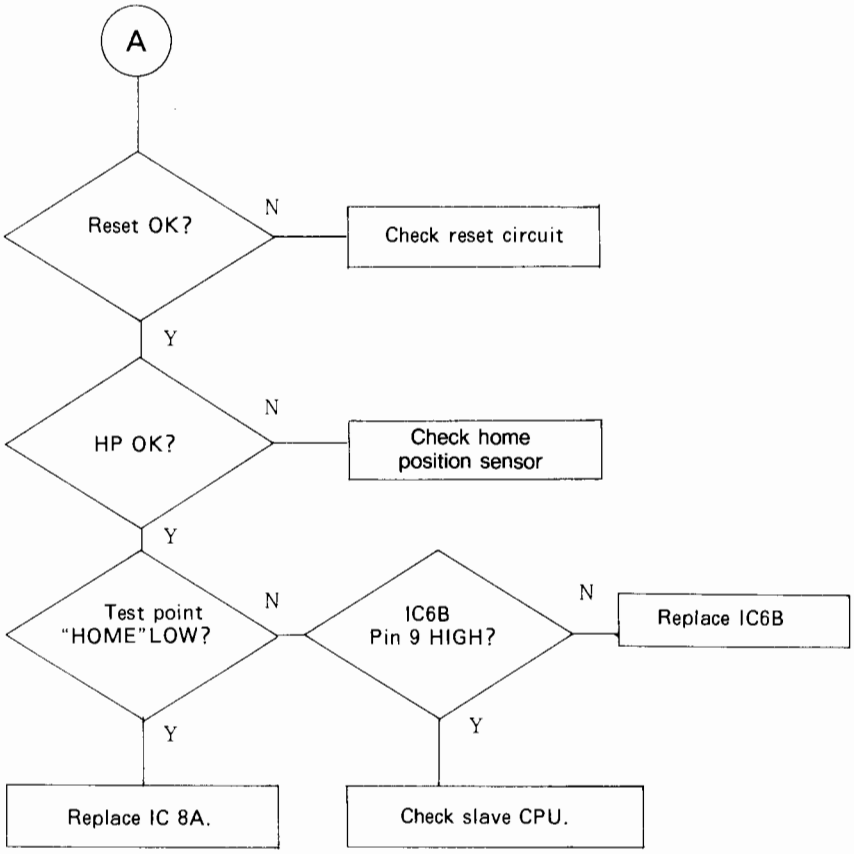


Figure 4-22. Carriage Repair (Continued)

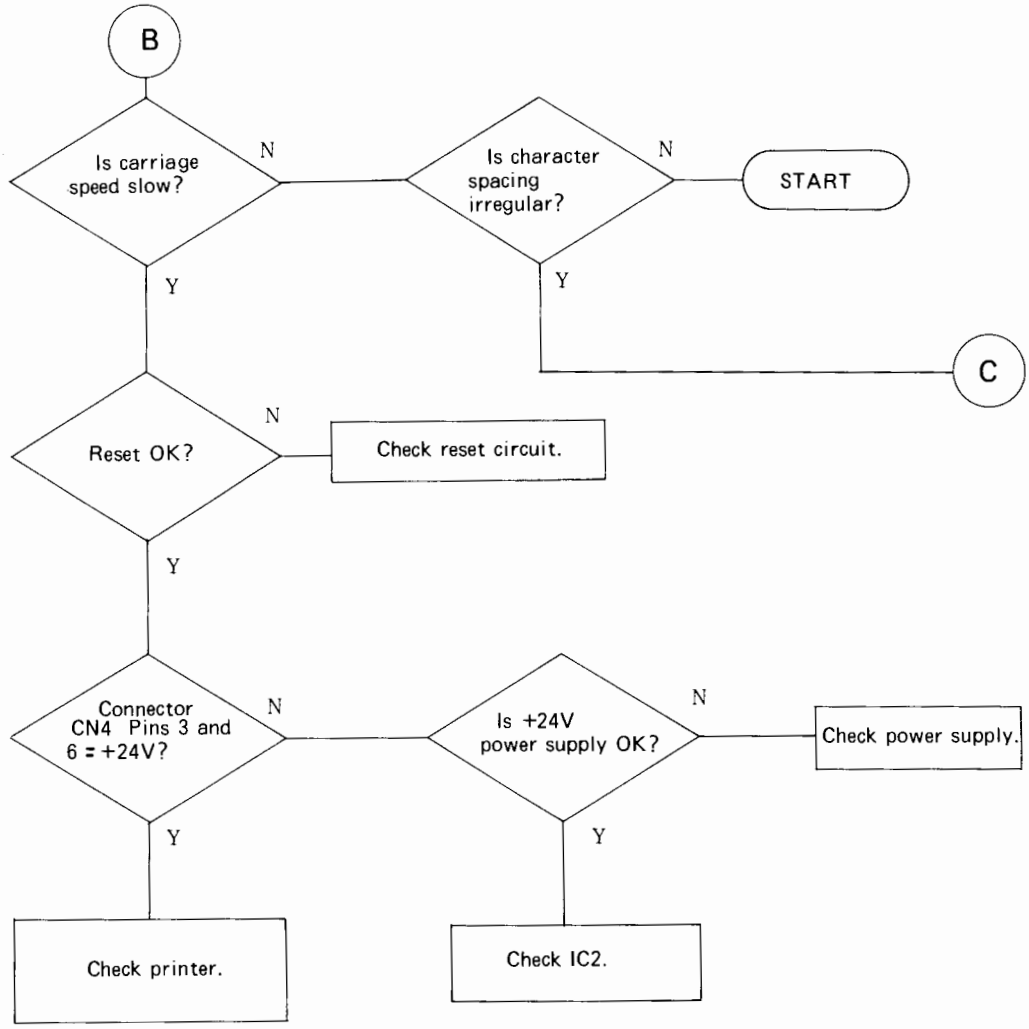


Figure 4-22. Carriage Repair (Continued)

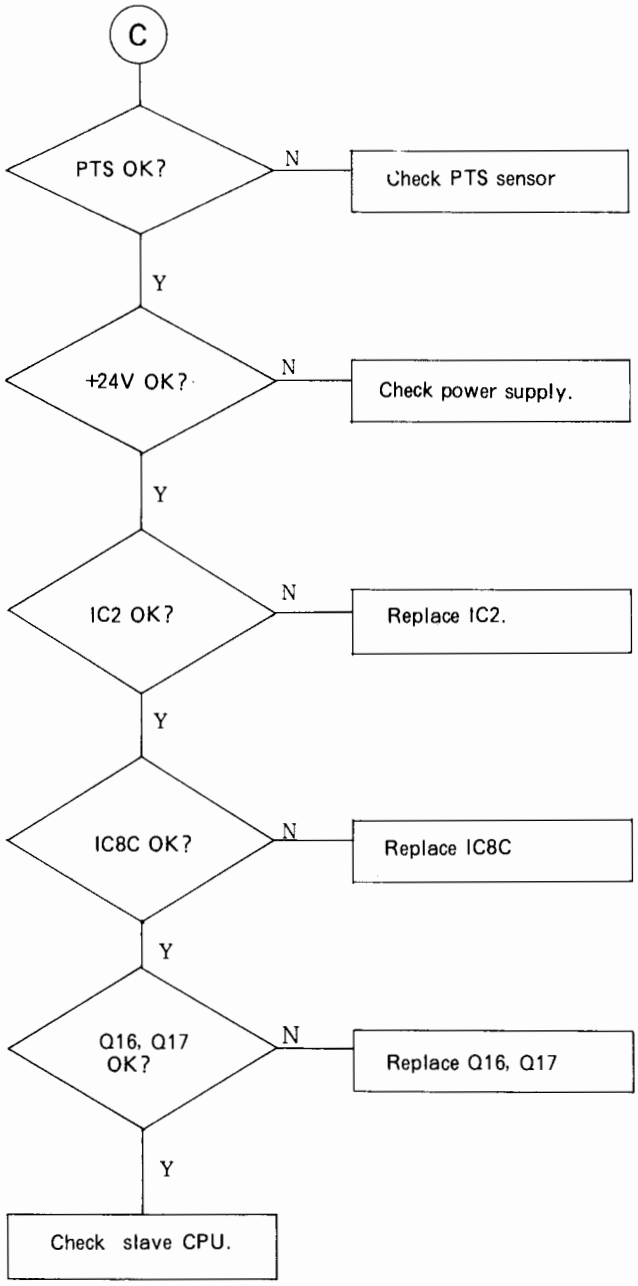


Figure 4-22. Carriage Repair (Continued)

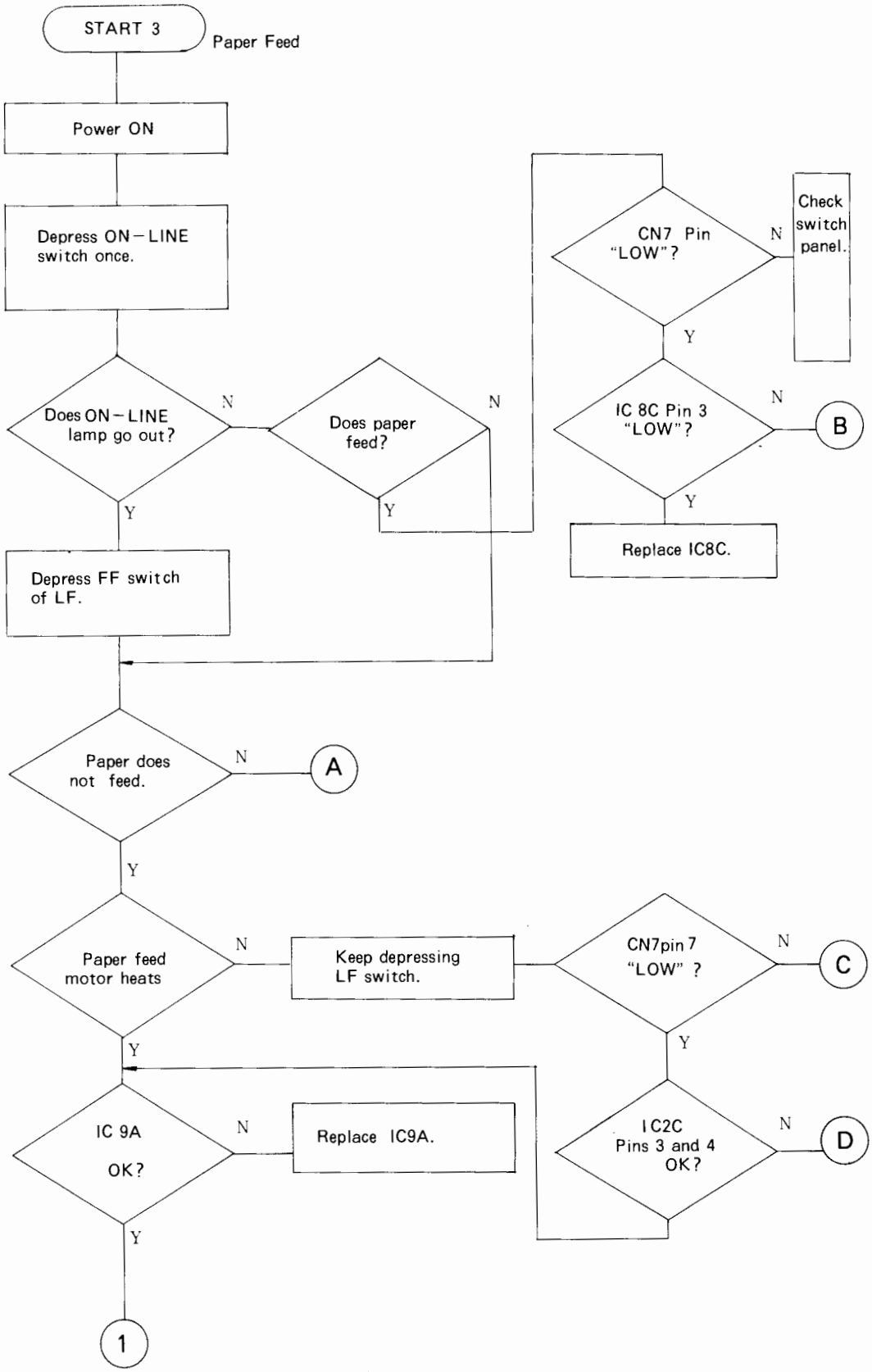


Figure 4-23. Paper Feed Repair

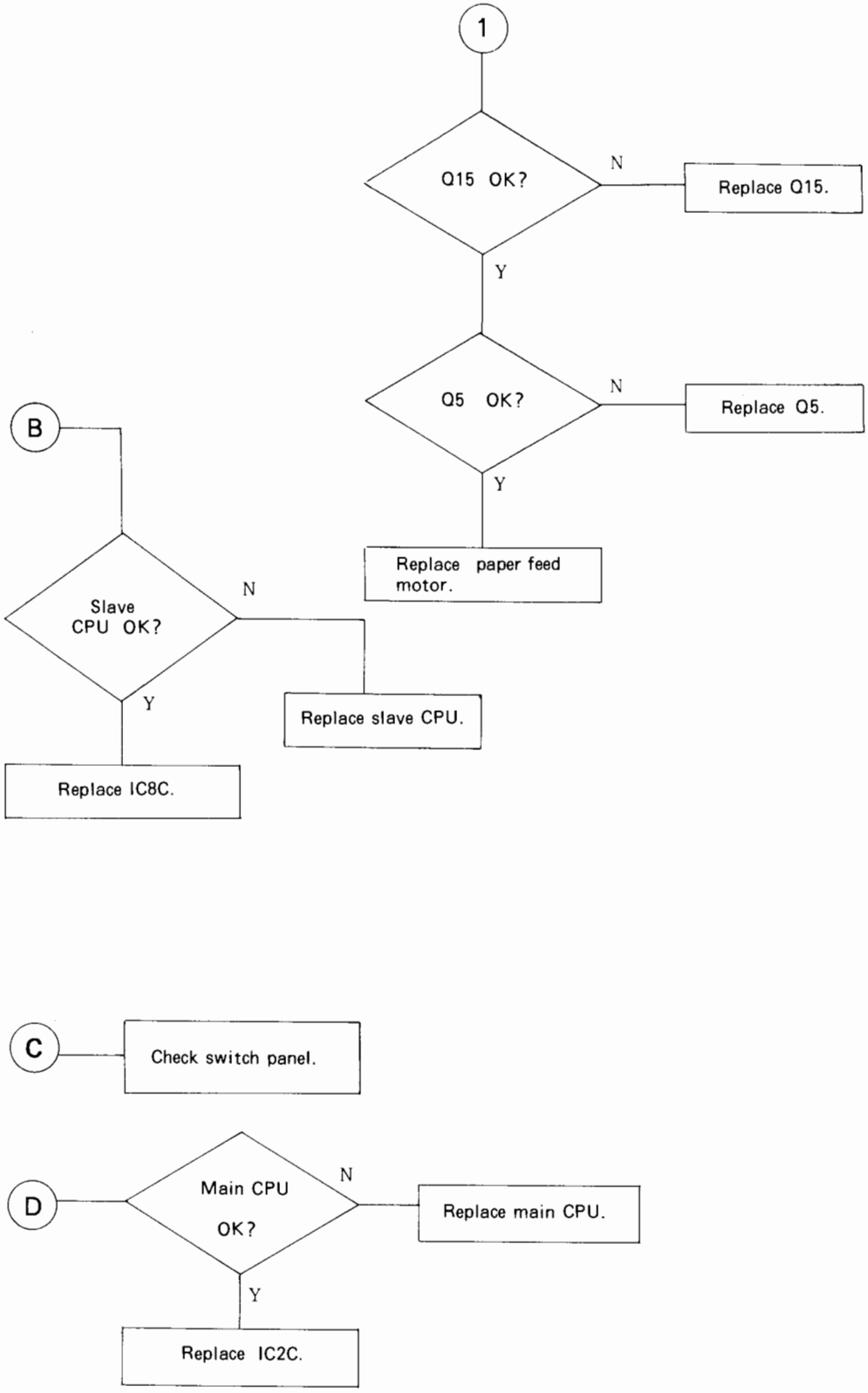


Figure 4-23. Paper Feed Repair (Continued)

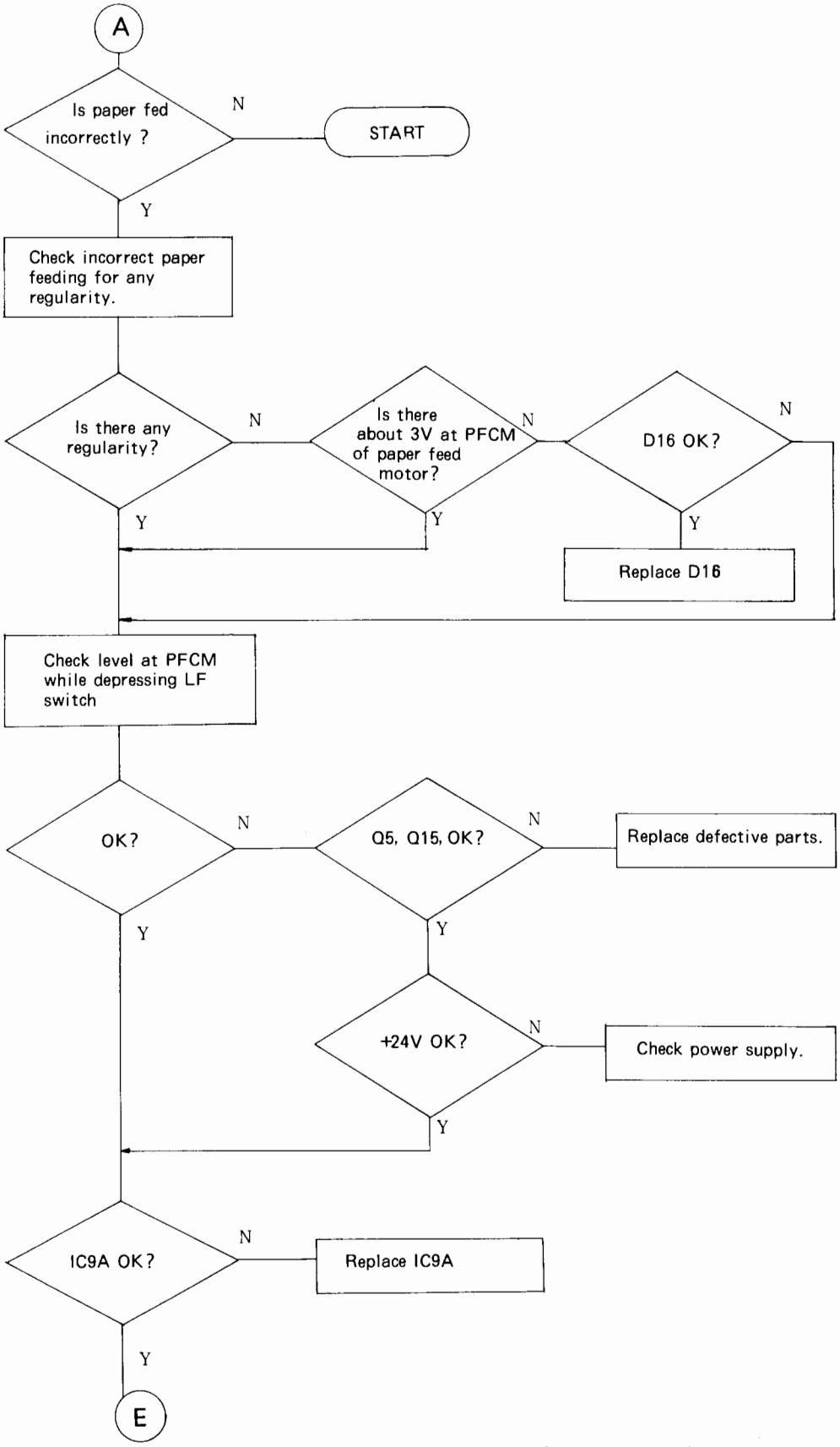


Figure 4-23. Paper Feed Repair (Continued)

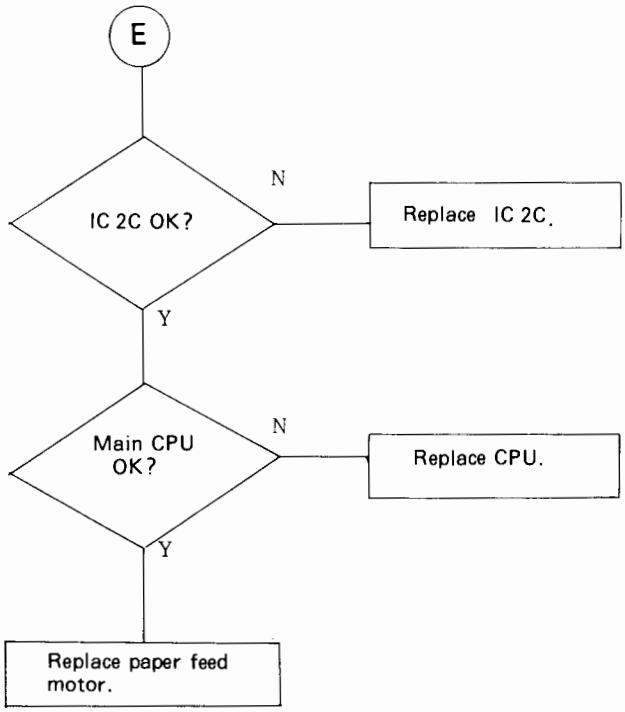


Figure 4-23. Paper Feed Repair (Continued)

4. Interface Troubles.

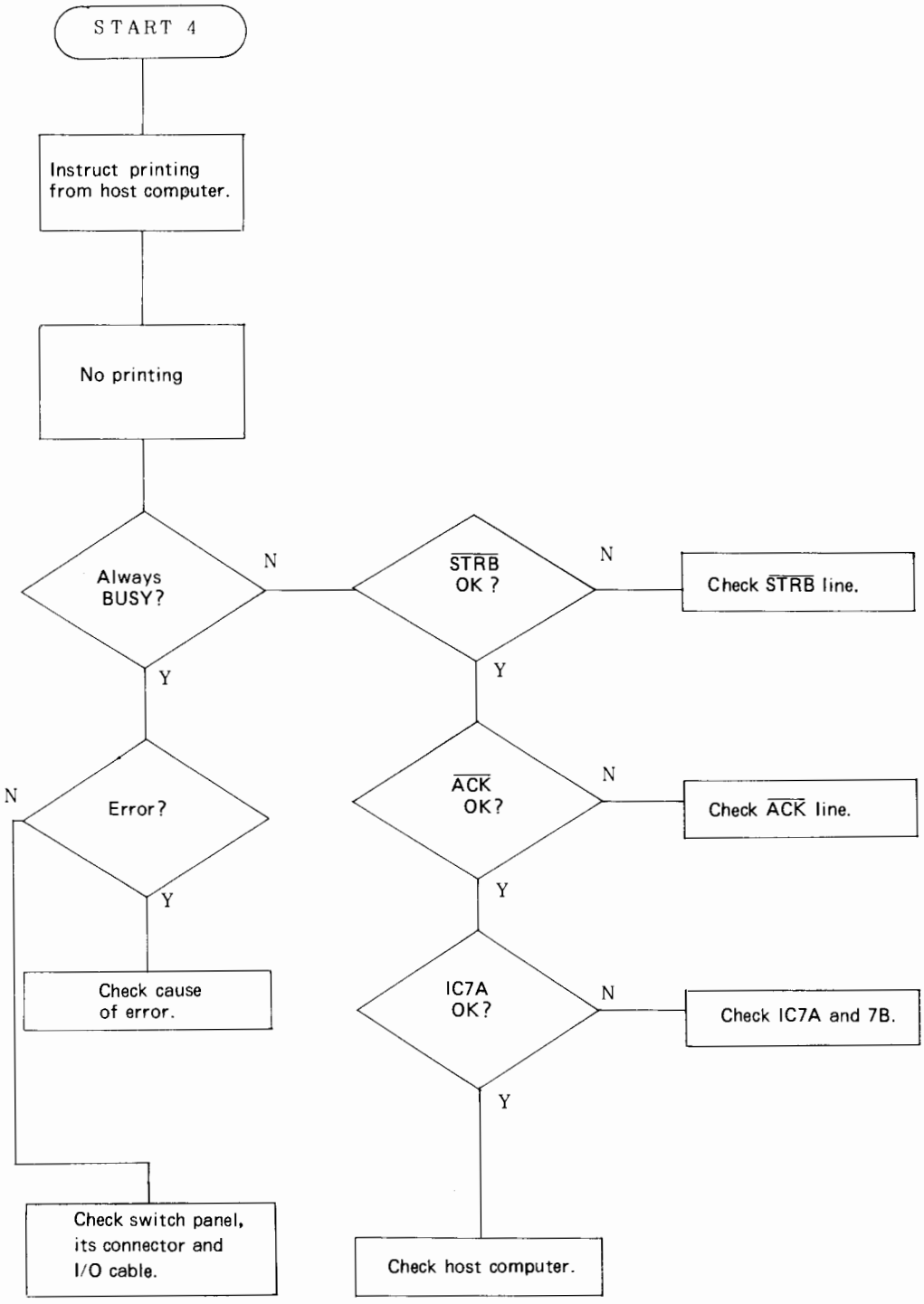


Figure 4-24. Interface Repair

Section
V

Maintenance

5.1 Introduction

This section describes the recommended lubrication and bonding procedures for the HP 82906A Printer. Lubrication is important to sustain the rated performance characteristics of the printer.

5.2 Lubrication

Perform lubrication in accordance with the procedures outlined in this section. See figures 5-1 for details of parts.

5.2.1 Lubricants

Printer performance and durability are greatly affected by the type of lubricant used. In particular, attention must be paid to the low temperature characteristics of each lubricant used for the printer. The lubricants listed in table 5-1 have been selected for use with the printer after extensive technical studies.

5.2.2 Lubrication Standards

The HP 82906A Printer requires the use of three kinds of lubricant; O-2 oil and G-2 and G-14 greases. Before lubricating the printer after its disassembly and before its reassembly, make sure all points requiring lubrication are thoroughly cleaned. Then follow the procedure in table 5-1.

No preventive maintenance procedures are required for the printer; however, **lubrication is mandatory after parts have been replaced or disassembly procedures have been performed. Carriage shafts A and B and felt ring 168 should always be lubricated as a part of every servicing.**

Table 5-1. Lubrication Points

NUMBER IN FIGURE 5-1	LUBRICATION POINT	LUBRICANT USED
1	Carriage shafts A and B	O-2-EPS
2	Moving part of print-head latch	G-2-EPS
3	Hook parts of print-head latch spring	G-2-EPS
4	Sliding part of print-head-adjusting lever	G-2-EPS

Table 5-1. Lubrication Points (Continued)

NUMBER IN FIGURE 5-1	LUBRICATION POINT	LUBRICANT USED
5	Toothed part of belt-driving pulley	G-2-EPS
6	Planetary pinion securing shaft	G-2-EPS
7	Teeth of platen gear	G-14-EPS
8	Teeth and shaft of paper-feed reduction gear	G-14-EPS
9	Teeth of sprocket transmission gear	G-14-EPS
10	Ribbon-driving-gear securing shaft	G-14-EPS
11	Contact between planetary pinion and leaf spring	G-2-EPS
12	Planetary-lever-subassembly-securing shaft	G-2-EPS
13	Contact between belt-driven pulley flange and plain washer	G-2-EPS
14	Sliding part between paper-holding lever R and L and frame	G-14-EPS
15	Sliding part between slit in paper-holding-auxiliary lever and E-shaped part	G-14-EPS
16	Sliding part between release lever and release auxiliary lever	G-14-EPS
17	Joint between paper-holding lever and release auxiliary lever	G-14-EPS
18	Paper-feeding roller and paper-feeding roller support	G-14-EPS
19	Felt ring 168 (on head carriage)	O-2-EPS

5.3 Bonding Standards

Screw Lock Green #2 adhesive is applied to the set screws and nuts securing the various parts of the printer mechanism to prevent the assembled parts from loosening due to vibration during transportation and operation of the printer. Whenever the printer mechanism is disassembled or parts are replaced, be sure to apply adhesive to the bonding points specified in table 5-2. Do not substitute other adhesives for Screw Lock Green #2. To order from CPC, order part number NEJI-EPS.

Caution

Be careful never to apply an excessive amount of adhesive. If you do, it may flow out of position and cause malfunction of nearby parts.

Table 5-2. Bonding Points

NUMBER IN FIGURE 5-1	BONDING POINT
31	Screws securing the terminal board assembly (2 places).
32	Screw securing the belt tension plate subassembly (1 place).
33	Screw securing the PTS sensor assmbly (1 place).
34	Screw securing the home position sensor assembly (1 place).
35	Screws securing the ribbon mask (2 places).
36	Screws securing the scale (inside) (2 places).
37	Engagement point between the carriage assembly and the timing belt (1 place).
39	Point between the PTS sensor board and the belt motor heat sink (2 places).
40	Point between the PE sensor board and the outer paper guide (2 places).

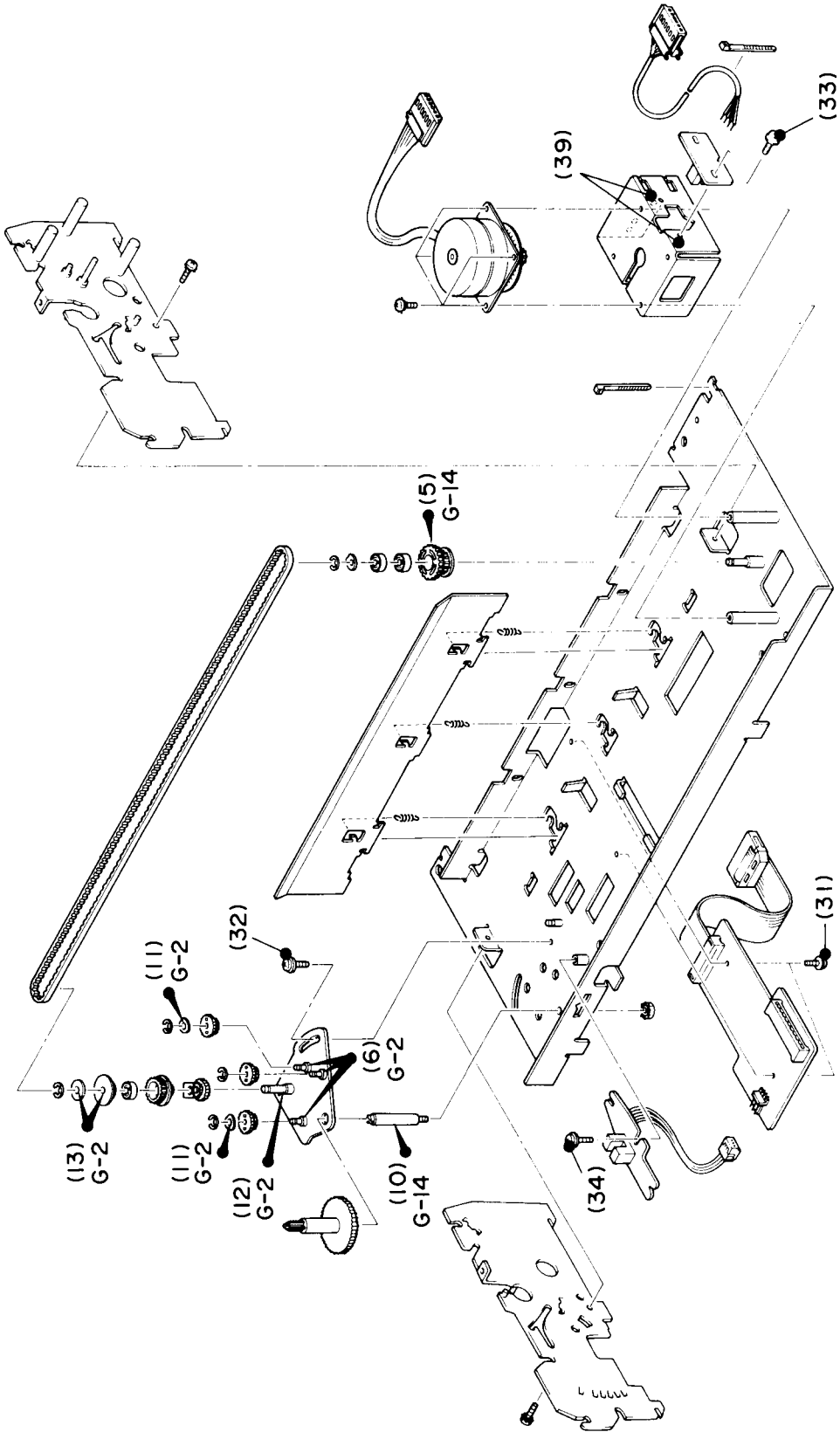


Figure 5-1. Lubrication and Adhesive Application Points

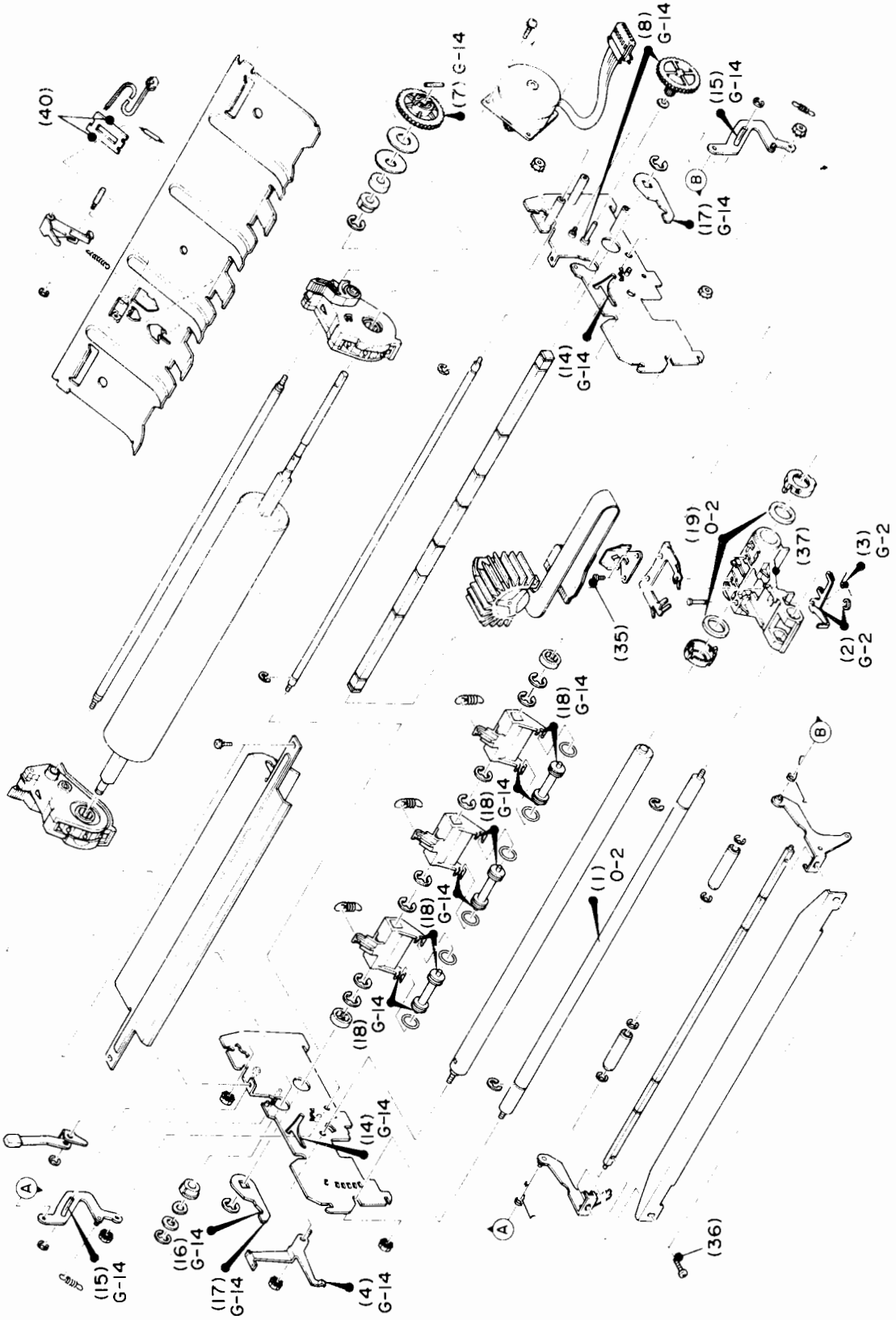


Figure 5-1. Lubrication and Adhesive Application Points (Continued)

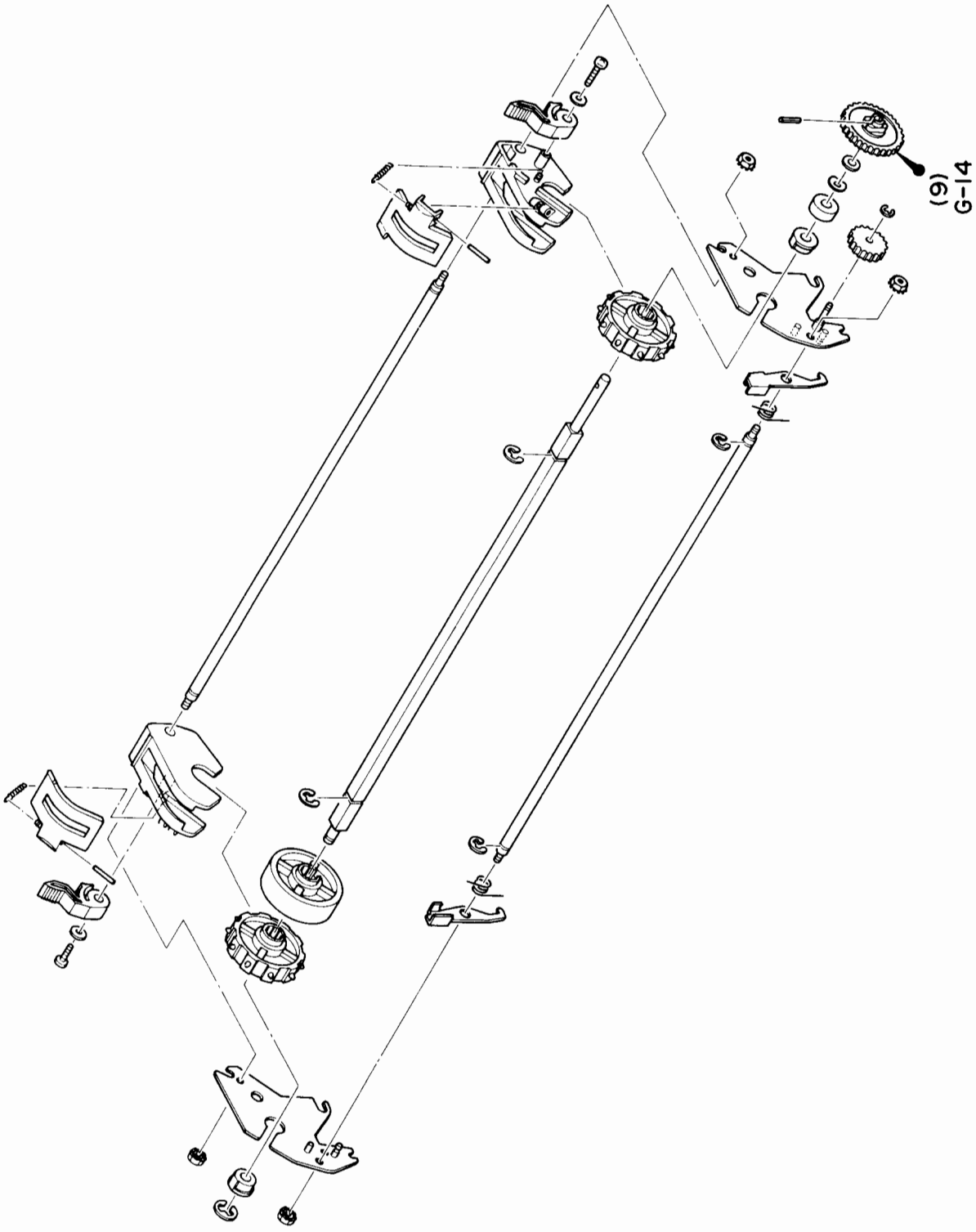


Figure 5-1. Lubrication and Adhesive Application Points (Continued)

Replaceable Parts

6.1 Introduction

This section lists the replaceable parts and assemblies of the HP 82906A Printer. This section also contains exploded view drawings of the major subassemblies of the printer. The parts listed are ordered by using the part number in the left column, which is given for all parts. There are a number of parts shown in the exploded view that are not replaceable individually, but only as part of the larger assembly. Although a part number is given in the parts list, the part may not be available. If you have an on-going need for a part of this type, contact Hewlett-Packard to determine if it can be carried as a stock item.

6.2 Ordering Information

To order replacement parts or assemblies, address your order or inquiry to your authorized HP dealer, to the nearest HP sales and service facility, or to Corporate Parts Center Europe. Specifiy the following information for each part ordered:

a. Printer version and power supply option.

b. Epson (or HP) part number. Add the suffix "-EPS" to all Epson numbers. e.g. The FMBD PCA is ordered as P/N Y440205000-EPS

c. Part description.

If you wish to make repairs at a component level, you may query your HP supply facility regarding the component's availability.

Table 6-1. Replaceable Parts

REFERENCE NUMBER IN FIGURE 6-1	PART NUMBER	DESCRIPTION	EPSON P/N	QTY
	A. LOWER CASE COMPONENTS			
100	Y440031001	LOWER CASE (440-1060) HP Unique	Y440005001	1
101	Y440006001	BASE PLATE (440-1070)		1
102	B011402411	C.T. SCREW (4x8)		1
103	B040451311	CP. SCREW WITH OW (3x5)		1
104	Y426030001	EARTH PLATE B (443-1110)		1
105	B040450411	C.P. SCREW WITH OW (4x6)		2
106	Y422030001	EARTH PLATE D (325-1860)		1
107	B040450411	C.P. SCREW WITH OW (4x6)		2
108	X440016001	BOARD SPACING (440-1200)		3
109	B011401711	C.T.P. SCREW (3x8)		1
110	B100164012	PLAIN WASHER (4x0.5x10)		1
111	X510190130	NYLON CLIP (NK-2N)		1
112	B015750311	C.T.C. SCREW (3x10)		1
113	B011402411	C.T. SCREW (4x8)		2
	B. UPPER CASE COMPONENTS			
120	Y440026001	UPPER CASE (440-1010) HP Unique	Y440000001	
121	B010104611	C.P. SCREW (4x10)		4
122	Y440034001	BOARD COVER (440-1160) HP Unique	Y440014001	1
123	B011401711	C.T.P. SCREW (3x8)		1
124	Y440002001	INTERFACE PLUG (440-1030)		1

Table 6-1. Replaceable Parts (Continued)

REFERENCE NUMBER IN FIGURE 6-1	PART NUMBER	DESCRIPTION	EPSON P/N	QTY
125	Y440029001	PRINTER COVER (440-1040) HP Unique	Y440003001	1
126	Y440030001	PRINTER LID (440-1170) HP Unique	Y440004101	1
127	Y440033001-FPS.	SEPARATOR (440-1130) HP Unique	Y440011001	1
128	Y440032001	KNOB A (440-1120) HP Unique	Y440010001	1
129	X510360010	KNOB SPRING		1
130	X426013001	RELEASE LEVER CAP (443-1210)		1
131	Y440037001	LOGO PLATE A (440-1250) HP Unique	Y440021001	1
140	Y440022101	PROTECTIVE PAPER		1
	C. CONTROL CIRCUIT COMPONENTS			
3B	X400078100	LSI (MPU uPD 7810G)		1
4A	Y440803301	LSI (P-ROM 2764-HA4-H2) HP Unique	Y440800601	1
5A	Y440803302	LSI (P-ROM 2764-HA5-H3) HP-Unique	Y440801101	1
	Y490202000	IEEE PCA		1
	D. FMBD CIRCUIT BOARD COMPONENTS			
200	~~Y440205000~~ Y440212000	FMBD CIRCUIT BOARD		1
2A,3A	X400040161	RAM		1
4B	Y440800001	FUSE P-ROM		1
IC1	X440755400	REGULATOR IC (24V 3.0A-5V 2.5A)		1

Table 6-1. Replaceable Parts (Continued)

REFERENCE NUMBER IN FIGURE 6-1	PART NUMBER	DESCRIPTION	EPSON P/N	QTY
IC2	X440759820	REGULATOR IC (30V 2.5A)		1
8A	X460458400	C-MOS IC (HEX SCHMITT TRIGGER)		1
8B	X420100060	TTL-IC (HEX INV. BUFFER/ DRIVER)		1
5B,7C	X420300040	TTL-IC (HEX INVERTER)		2
7B	X420300320	TTL-IC (QUAD 2-INPUT OR)		1
6B	X420300740	TTL-IC (DUAL D-TYPE FLIP-FLOP)		1
6A,7A	X420303730	TTL-IC (OCTAL TRANSPARENT LATCH)		2
1B,2C, 8C	X440150790	TRANSISTOR ARRAY (NPN 20V SI 150MA)		3
3C	X440170070	TRANSISTOR ARAY (QUAD DRIVER)		1
Q1,Q2	X300101502	TRANSISTOR (PNP 50V 0.4W)		2
Q15	X301079400	TRANSISTOR (PNP 60V 10W)		1
Q3,Q5 Q16-Q18	X302181502	TRANSISTOR (PNP 60V 0.4W)		5
Q6-Q16	X303121800	TRANSISTOR (NPN 50V 40W)		9
Q4	X303098600	TRANSISTOR (NPN 80V 10W)		1
DM1	X440150640	DIODE ARRAY		1
DB1	X340300010	DIODE BRIDGE (400V 2.7A)		1
DB1	X520000031	HEAT SINKER		1

Table 6-1. Replaceable Parts (Continued)

REFERENCE NUMBER IN FIGURE 6-1	PART NUMBER	DESCRIPTION	EPSON P/N	QTY
DB1	B040550511	C.P.S.P. SCREW WITH OW (3x12)		1
D9,D10 D13-D15, D17	X320010240	DIODE (SI 100V 1A)		6
D1,D2	X320010380	DIODE (SI 200V 0.5A)		2
D5	X320010390	DIODE (SI 35V 0.1A)		1
D3,D4 D5-D8, D11,D12, D16	X320010452	DIODE (SI 60V 150MA)		9
ZD3	X330000422	ZENER DIODE (12.4V-12.9V 5MA)		1
ZD5	X330000492	ZENER DIODE (19.5V-20.4V 2MA)		1
ZD2	X330000442	ZENER DIODE (20.2V-21.1V 2MA)		1
ZD1	X330000522	ZENER DIODE (3.1V-3.3V 5MA)		1
ZD4	X330020020	ZENER DIODE (22.7V-25.6V 2.5W)		1
CR1	X504002700	CERAMIC OSCILLATOR (10 MHz)		1
CR2	X504003400	CERAMIC OSCILLATOR (11 MHz)		1
CR3	X504002800	CERAMIC OSCILLATOR (61.4 MHz)		1
C28,C39 C42	X200500109	ALUMINIUM ELECTROLYTIC CAPACITOR (1uF 50VDC +-20%)		3
C22,C31 C41	X200201009	ALUMINIUM ELECTROLYTIC CAPACITOR (10uF 16DVC +-20%)		3

Table 6-1. Replaceable Parts (Continued)

REFERENCE NUMBER IN FIGURE 6-1	PART NUMBER	DESCRIPTION	EPSON P/N	QTY
C1	X200202209	ALUMINIUM ELECTROLYTIC CAPACITOR (22uF 16VDC +-20%)		1
C4,C5	X200102200	ALUMINIUM ELECTROLYTIC CAPACITOR (1000uF 10VDC +-20%)		2
C6	X200401020	ALUMINIUM ELECTROLYTIC CAPACITOR (1000uF 35 VDC +-20%)		1
C7	X202546820	ALUMINIUM ELECTROLYTIC CAPACITOR (6800uF 50VDC +-30%-10%)		1
C25,C26 C29,C30	X221223307	CERAMIC CAPACITOR (33pF 50VDC +-5%)		4
C12,C16 C24	X220224710	CERAMIC CAPACITOR (470pF 50VDC +-10%)		3
C13-C15 C32,C35, C36,C38, C40	X220221520	CERAMIC CAPACITOR (1500pF 50VDC +-10%)		8
C3,C2	X220221031	CERAMIC CAPACITOR (0.01uF 50VDC +-80%-20%)		2
C43	X220201042	CERAMIC CAPACITOR (0.1uF 50VDC +-80%-20%)		1
RM1	X110841220	RESISTOR ARRAY (1.2KOHM 1/8W 10%-4)		1
RM2	X110891220	RESISTOR ARRAY (1.2 OHM 1/8W 10%-9)		1
RM6,RM7	X110883320	RESISTOR ARRAY (3.3K OHM 1/8W 10%-8)		2
RM3	X110843320	RESISTOR ARRAY (3.3K OHM 1/8W 10%-4)		1

Table 6-1. Replaceable Parts (Continued)

REFERENCE NUMBER IN FIGURE 6-1	PART NUMBER	DESCRIPTION	EPSON P/N	QTY
RM5	X110851030	RESISTOR ARRAY (10K OHM 1/8W 10%-50)		1
VR1	X180000020	VARIABLE RESISTOR (1K OHM)		1
R2	X141411012	HIGH STABILIZED METAL FILM RESISTOR (1K OHM 1/4W 1%)		1
R1	X141411212	HIGH STABILIZED METAL FILM RESISTOR (1.24K OHM 1/4W 1%)		1
R41	X130111003	METAL OXIDE FILM RESISTOR (10 OHM 1W 5%)		1
R42,R46	X120310200	METAL OXIDE FILM RESISTOR (20 OHM 3W 5%)		2
R87-R89	X150441012	CARBON FILM RESISTOR (100 OHM 1/4W 5%)		3
R80	X150441612	CARBON FILM RESISTOR (160 OHM 1/4W 5%)		1
R43	X150442012	CARBON FILM RESISTOR (200 OHM 1/4W 5%)		1
R82	X150442212	CARBON FILM RESISTOR (220 OHM 1/4W 5%)		1
R22,R24	X150445112	CARBON FILM RESISTOR (510 OHM 1/4W 5%)		2
R21,R32 R34,R40, R44,R45, R56, R64-R70	X150441222	CARBON FILM RESISTOR (1.2K OHM 1/4W 5%)		14
R33,R53 R55	X150442222	CARBON FILM RESISTOR (2.2K OHM 1/4W 5%)		3
R25,R81 R94	X150443322	CARBON FILM RESISTOR (3.3K OHM 1/4W 5%)		3

Table 6-1. Replaceable Parts (Continued)

REFERENCE NUMBER IN FIGURE 6-1.	PART NUMBER	DESCRIPTION	EPSON P/N	QTY
R20,R23, R26,R27, R31,R35, R35,R36, R39,R47, R52,R93	X150444722	CARBON FILM RESISTOR (4.7K OHM 1/4W 5%)		12
R62,R63	X150445122	CARBON FILM RESISTOR (5.1K OHM 1/4W 5%)		2
R61	X150446222	CARBON FILM RESISTOR (6.2K OHM 1/4W 5%)		1
R48	X153212202	CARBON FILM RESISTOR (22 OHM 1/2W 5%)		
R3,R4	X153214702	CARBON FILM RESISTOR (47 OHM 1/2W 5%)		2
R18	X153211032	CARBON FILM RESISTOR (10K OHM 1/2W 5%)		1
SW1	X620400850	DIP SWITCH		1
SW2	X620400910	DIP SWITCH		1
L1,L3	Y440201002	COIL		2
L2	Y310202003	COIL		1
BZ1	X503000110	BUZZER		1
CN1	X600183660	CONNECTOR (36 PIN)		1
CN2	X600652600	CONNECTOR (26 PIN)		1
CN3	X600652400	CONNECTOR (32 PIN)		1
CN4	X600561800	CONNECTOR (18 PIN)		1
CN5	X600061630	CONNECTOR (16 PIN)		1
CN6	X600370400	CONNECTOR (4 PIN)		1

Table 6-1. Replaceable Parts (Continued)

REFERENCE NUMBER IN FIGURE 6-1	PART NUMBER	DESCRIPTION	EPSON P/N	QTY
CN7	X600320800	CONNECTOR (8 PIN)		1
CN8	X600210200	CONNECTOR (2 PIN)		1
J6	X600642520	JUMPER CONNECTOR		1
4B	X630111630	IC SOCKET (16 PIN)		1
2A-5A	X630112830	IC SOCKET (28 PIN)		4
9B	X630114030	IC SOCKET (40 PIN)		1
3B	X630116400	IC SOCKET (64 PIN)		1
4B	X630201600	IC SOCKET COVER (16 PIN)		1
2A-5A	X630202800	IC SOCKET COVER (28 PIN)		4
9B	X630204000	IC SOCKET COVER (40 PIN)		1
VXC,VXP +5V,GL, VP,PPS, HOME,VT	X640010020	TERMINAL PIN		8
R19,R37 R38,R51 R54,R57	X150441032	CARBON FILM RESISTOR (10K OHM 1/4W 5%)		6
R29	X150441532	CARBON FILM RESISTOR (15K OHM 1/4W 5%)		1
R30,R83	X150443332	CARBON FILM RESISTOR (33K OHM 1/4W 5%)		2
R58,R59	X150443932	CARBON FILM RESISTOR (39K OHM 1/4W 5%)		2
R5-R13 R15-R17, R72	X150421012	CARBON FILM RESISTOR (100 OHM 1/4W 5%)		13
R79	X150423912	CARBON FILM RESISTOR (390 OHM 1/4W 5%)		1

Table 6-1. Replaceable Parts (Continued)

REFERENCE NUMBER IN FIGURE 6-1	PART NUMBER	DESCRIPTION	EPSON P/N	QTY
R73	X150421222	CARBON FILM RESISTOR (1.2K OHM 1/4W 5%)		1
R28	X150421522	CARBON FILM RESISTOR (1.5K OHM 1/4W 5%)		1
R47,R49	X150422222	CARBON FILM RESISTOR (2.2K OHM 1/4W 5%)		2
R14,R60	X150423322	CARBON FILM RESISTOR (3.3K OHM 1/4W 5%)		2
R50,R76 R92	X150424722	CARBON FILM RESISTOR (4.7K OHM 1/4W 5%)		3
R71	X150426222	CARBON FILM RESISTOR (6.2K OHM 1/4W 5%)		1
R75,R77	X150421032	CARBON FILM RESISTOR (10K OHM 1/4W 5%)		2
R78	X150421242	CARBON FILM RESISTOR (120K OHM 1/4W 5%)		1
201	B040450911	C.P.SCREW WITH OW (4X10)		1
202	B040303611	CUP SCREW (4x6)		1
203	Y440007101	HEAT SINKER B (440-1096)		1
204	B040302411	CUP SCREW (3x5)		2
205	B040302811	CUP SCREW (3x10)		1
206	B040303211	CUP SCREW (3x16)		2
207	X510180030	INSULATION SPACER		1
208	B090300811	SPRING WASHER (3)		3
209	B070100311	HEXAGON NUT (3)		3

Table 6-1. Replaceable Parts (Continued)

REFERENCE NUMBER IN FIGURE 6-1	PART NUMBER	DESCRIPTION	EPSON P/N	QTY
	E. KEYBOARD COMPONENTS			
220	Y44020200	FPEL CIRCUIT BOART UNIT HP Unique	Y440505000	1
	F. POWER FILTER CIRCUIT BOARD COMPONENTS (See also page 6-19.)			
400	Y440203500	FFIL CIRCUIT BOARD UNIT	Y449293000	1
401	X502060020	FUSE (250V 2A)		1
402	B040302511	CUP SCREW (3x6)		1
303	Y440304000	AC CABLE HP Unique	Y422301001	1
304	X510640010	COLOR TIE (PVC 150MM)		1
305	Y440501000	POWER TRANSFORMER SET (120V)		1
306	B040450211	C.P. SCREW WITH OW (4x8)		4
	G. PRINTER MECHANISM			
600	Y440590000	PRINTER MECHANISM M-3510		1
601	B040450211	C.P. SCREW WITH OW (4x8)		4
	H. FRAME COMPONENTS			
1-1	F315002000	FRAME ASSY L		1
1-2	F315003000	FRAME ASSY R (120 V) HP UNIQUE		1
1-3	F315053000	BASE FRAME ASSY		1
CPO	B040451311	C.P.O. SCREW (3x5)		2
	I. DRIVE MECHANISM COMPONENTS			
2-1	F315059000	MOTOR ASSY		1
CPO	B040450812	C.P.O. SCREW (2.5x5)		4
2-2	F315058010	MOTOR HEAT SINKER		1
2-3	F315064000	PAPER FEEDING MOTOR ASSY		1

Table 6-1. Replaceable Parts (Continued)

REFERENCE NUMBER IN FIGURE 6-1	PART NUMBER	DESCRIPTION	EPSON P/N	QTY
CPO	B040450812	C.P.O. SCREW (2.5x5)		3
	J. DETECTING MECHANISM COMPONENTS			
3-1	F315009000	PAPER END SENSOR LEVER ASSY		1
3-2	F303007020	PAPER END SENSOR LEVER SPRING		1
3-3	F310009020	PAPER END SENSOR LEVER SHAFT		1
RE	B150300311	RETAINING RING TYPE-E (1.5)		1
3-4	F315010010	PAPER END SENSOR BOARD		1
3-5	A170202502	REED SWITCH		1
3-6	F315010020	PAPER END SENSOR LEAD WIRE		1
3-7	F315060000	PRINT TIMING SIGNAL SENSOR BOARD ASSY		1
CS	B040301311	CUP SCREW (2.5x4)		1
3-8	F315061000	PRINT TIMING SIGNAL SENSOR LEAD WIRE ASSY		1
3-9	F315056000	HOME POSITION SENSOR ASSY		1
CS	B040301311	CUP SCREW (2.5x4)		1
	K. TRANSMISSION MECHANISM COMPONENTS			
4-1	F303014010	TIMING BELT		1
4-2	F303017000	BELT DRIVING PULLEY		1
BB	B210151490	BALL BEARING		2
PW	B100150412	PLAIN WASHER (4x0.2x6)		1
RE	B150300611	RETAINING RING TYPE-E (3)		1

Table 6-1. Replaceable Parts (Continued)

REFERENCE NUMBER IN FIGURE 6-1	PART NUMBER	DESCRIPTION	EPSON P/N	QTY
4-3	F303018010	BELT DRIVEN PULLEY		1
BB	B210151490	BALL BEARING		1
4-4	F303018020	BELT DRIVEN PULLEY FLANGE		1
PW	B100152712	PLAIN WASHER (4x0.3x10)		1
RE	B150300611	RETAINING RING TYPE-E (3)		1
4-5	F303019000	BELT TENSION PLATE ASSY		1
	L. PRINTING MECHANISM COMPONENTS			
CS	B040301311	CUP SCREW (2.5x4)		1
5-2	F315005000	PLATEN ASSY		1
LS	B101252490	LEAF SPRING (6.2x0.3x2.5)		1
LS	B101251490	LEAF SPRING (6x0.15x11)		1
PW	B100163090	PLAIN WASHER (12.5x0.2x26.5)		1
PW	B100153912	PLAIN WASHER (6x0.15x10)		1
RE	B150300811	RETAINING RING TYPE-E (5)		2
5-3	F304004010	PLATEN GEAR		1
SP	B130103216	SPRING PIN (2x14)		1
5-4	F304004020	PLATEN PLAIN BEARING		2
5-5	F315004010	SPACER (FOR PLATEN)		1
5-6	F315006000	PLATEN SPROCKET ASSY L		1
5-7	F315007000	PLATEN SPROCKET ASSY R		1
5-8	F304001010	SPROCKET MOUNTING SHAFT		1
HNO	B080450111	HEXAGON NUT WITH OUTSIDE TOOTHED LOCK WASHER (4)		2

Table 6-1. Replaceable Parts (Continued)

REFERENCE NUMBER IN FIGURE 6-1	PART	DESCRIPTION	EPSON P/N	QTY
5-9	F315018000	CARRIAGE ASSY		1
5-10	F315018000	FELT RING 168		2
5-11	F315017030	FELT CAP		2
5-12	F315021110	HEAD SITTING PLATE		1
5-13	F303005010	HEAD LOCK LEVER		1
5-14	F303005020	HEAD LOCK LEVER SPRING		1
5-15	F315017010	HEAD LOCK LEVER SHAFT		1
5-16	F315021130	RIBBON MASK		1
CB	B010302211	C.B. SCREW (2.5x5)		2
RE	B150300311	RETAINING RING TYPE- (1.5)		1
5-17	F315021010	CARRIAGE SHAFT A		1
HNO	B080450111	HEXAGONAL NUT WITH OUTSIDE TOOTHED LOCK WASHER (4)		2
RE	B150301111	RETAINING RING TYPE-E (8)		1
5-18	F315021020	CARRIAGE SHAFT B		1
5-19	F315021030	HEAD ADJUST LEVER		1
HNO	B080450111	HEXAGONAL NUT WITH OUTSIDE TOOTHED LOCK WASHER (4)		1
5-20	F315014000	PAPER HOLDING LEVER ASSY L		1
5-21	F315021080	PAPER HOLDING LEVER		1
5-22	F315019000	SUB PAPER HOLDING LEVER ASSY L		1

Table 6-1. Replaceable Parts (Continued)

REFERENCE NUMBER IN FIGURE 6-1	PART NUMBER	DESCRIPTION	EPSON P/N	QTY
RE	B050300311	RETAINING RING TYPE-E (1.5)		1
5-23	F315021100	SUB PAPER HOLDING LEVER SPRING		2
5-24	F315021140	PAPER HOLDING JOINT SHAFT		1
HNO	B080450211	HEXAGONAL NUT WITH OUTSIDE TOOTHED LOCK WASHER (3)		2
RE	B150300611	RETAINING RING TYPE-E (3)		2
5-25	F315015000	PAPER HOLDING LEVER ASSY R		1
5-26	F315021090	PAPER HOLDING LEVER SPRING R		1
5-27	F315020000	SUB PAPER HOLDING LEVER ASSY R		1
RE	B150350111	RETAINING RING TYPE-E (2.3)		1
5-28	F315017010	SCALE		1
CB	B010302611	C.B. SCREW (2.5x12)		2
5-29	F315016010	PAPER HOLDING ROLLER SHAFT		1
5-30	F305008020	PAPER HOLDING ROLLER		2
RE	B150300611	RETAINING RING TYPE-3 (3)		4
	M. PAPER FEED MECHANISM			
6-1	F315008010	LOWER PAPER GUIDE		1
6-2	F315021110	INNER PAPER GUIDE		1
CPO	B040450812	C.P.O. SCREW (2.5x5)		2
6-3	F303036010	SPROCKET FRAME L		1
6-4	F303036020	PAPER HOLDING COVER L		1

Table 6-1. Replaceable Parts (Continued)

REFERENCE NUMBER IN FIGURE 6-1	PART NUMBER	DESCRIPTION	EPSON P/N	QTY
6-5	F303037010	SPROCKET FRAME R		1
6-6	F303037020	PAPER HOLDING COVER R		1
6-7	F303011060	G-PIN		2
6-8	F303011050	SPROCKET LOCK LEVER		2
CTP	B011401611	C.T.P. SCREW (3x6)		2
PW	B100150512	PLAIN WASHER (3x0.5x8)		2
6-9	F315104010	SPROCKET SHAFT		1
6-10	F315004010	PLATEN SPACER		1
6-11	F304004020	SPROCKET PLAIN BEARING		2
PW	B100150812	PLAIN WASHER (6x1x10)		1
LS	B101251490	LEAF SPRING (6x0.15x11)		1
RE	B150300811	RETAINING RING TYPE-E (5)		1
RE	B150300912	RETAINING RING TYPE-E (6)		2
6-12	F303010020	PAPER GUIDE ROLLER		1
6-13	F303011020	SPROCKET WHEEL		2
6-14	F303011040	PAPER HOLDING COVER SPRING		2
6-15	F303013020	SPROCKET GEAR		1
SP	B130103216	SPRING PIN (2x14)		1
6-16	F315101010	SPROCKET GUIDE SHAFT		1
HNO	B080450111	HEXAGON NUT WITH OUTSIDE TOOTHED LOCK WASHER (4)		2
6-17	F315101010	SPROCKET GUIDE SHAFT		1

Table 6-1. Replaceable Parts (Continued)

REFERENCE NUMBER IN FIGURE 6-1	PART NUMBER	DESCRIPTION	EPSON P/N	QTY
6-17	F315101010	SPROCKET GUIDE SHAFT		1
6-18	F315101020	SPROCKET MOUNTING LEVER L		1
6-19	F315101040	SPROCKET MOUNTING LEVER SPRING		2
6-20	F315101030	SPROCKET MOUNTING LEVER R		1
RE	B150300811	RETAINING RING TYPE-E (5)		2
HNO	B080450111	HEXAGON NUT WITH OUTSIDE TOOTHED LOCK WASHER (4)		2
6-21	F315020000	SPROCKET MOUNTING PLATE ASSY L		2
6-22	F315103000	SPROCKET MOUNTING PLATE ASSY R		1
6-23	F315101050	SPROCKET REDUCTION GEAR		1
RE	B150300611	RETAINING RING TYPE-E (3)		1
6-24	F315062010	PAPER GUIDE PLATE		1
6-25	F315062020	PAPER GUIDE PLATE SPRING		3
6-26	F315021070	PAPER FEEDING REDUCTION GEAR		1
LS	B091050311	LEAF SPRING (4x0.15x7)		1
6-27	F315011010	RELEASE LEVER SHAFT		1
6-28	F315021050	SUB RELEASE LEVER		2
6-29	F315021060	BUSH FOR SUBSIDIARY RELEASE LEVER		2
RE	B150300912	RETAINING RING TYPE-E (6)		8
6-30	F315012010	PAPER FEEDING ROLLER STAND		3

Table 6-1. Replaceable Parts (Continued)

REFERENCE NUMBER IN FIGURE 6-1	PART NUMBER	DESCRIPTION	EPSON P/N	QTY
6-31	F315062030	PAPER FEEDING SPRING		3
RE	B150300912	RETAINING RING TYPE-E (6)		8
6-32	F312008010	PAPER FEEDING ROLLER		3
6-33	F312008020	O-RING		6
6-34	F315021040	RELEASE LEVER		1
RE	B150300611	RETAINING RING TYPE-E (3)		1
	N. RIBBON FEEDING MECHANISM COMPONENTS			
7-1	F303020000	PLANETARY LEVER ASSY		1
7-2	F303020020	PLANETARY PINION		3
LS	B101252190	LEAF SPRING (3x0.07x6)		2
RE	B150350111	RETAINING RING TYPE-E (2.3)		3
7-3	F315052010	RIBBON DRIVING GEAR		1
7-4	F315053060	RIBBON DRIVING GEAR SHAFT		1
HNO	B080450111	HEXAGON NUT WITH OUTSIDE TOOTHED LOCK WASHER (4)		1
	O. CONNECTOR COMPONENTS			
8-1	F315054000	TERMINAL BOARD ASSY		1
CS	B040301311	CUP SCREW (2.5x4)		2
8-2	A279950001	WIRE BAND		2

Table 6-1. Replaceable Parts (Continued)

REFERENCE NUMBER IN FIGURE 6-1	PART NUMBER	DESCRIPTION	EPSON P/N	QTY
		P. ADDITIONAL FILTER CIRCUIT BOARD COMPONENTS		
401	X502014020	FUSE (250V 800 MA) 220/ 240V use		1
305	Y440503100	POWER TRANSFORMER SET (220V)		1
	Y440504100	POWER TRANSFORMER SET (240V)		1
403,406		CUP SCREWS		2
404		WASHER		1
405		POWER FILTER CIRCUIY BOARD COVER		1

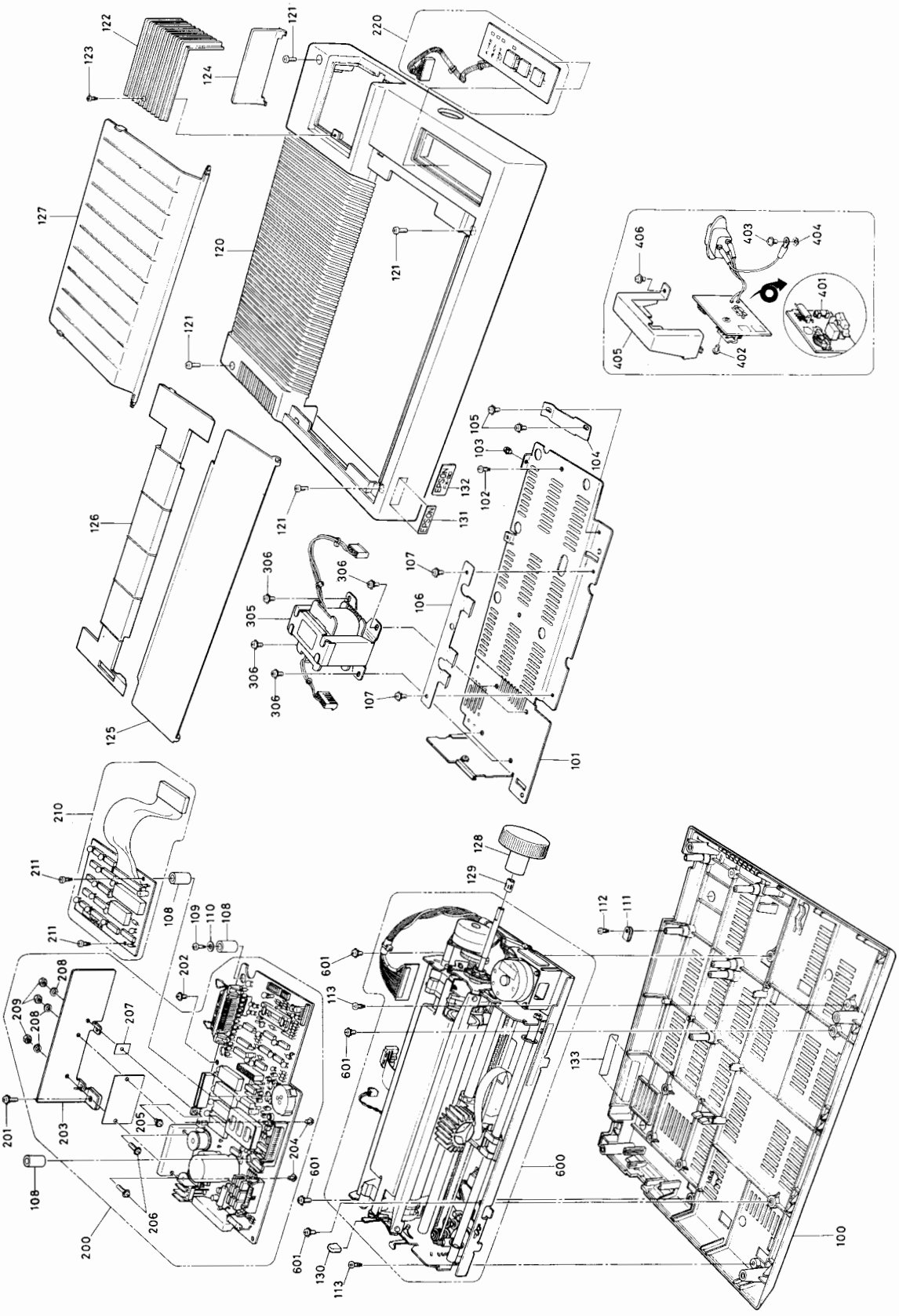


Figure 6-1. HP 82906A Exploded View

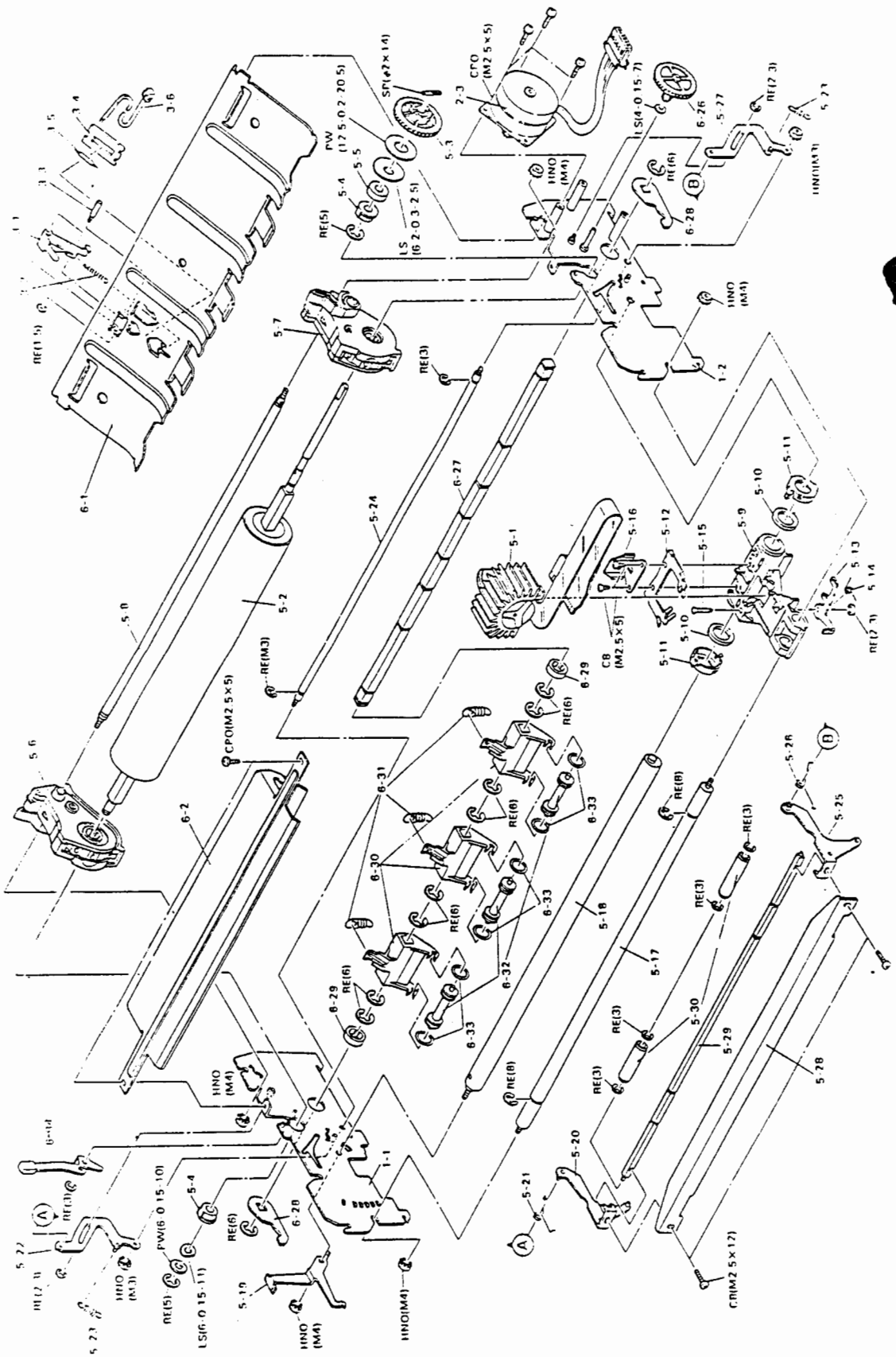


Table 6-1. HP 82906A Exploded View (Continued)

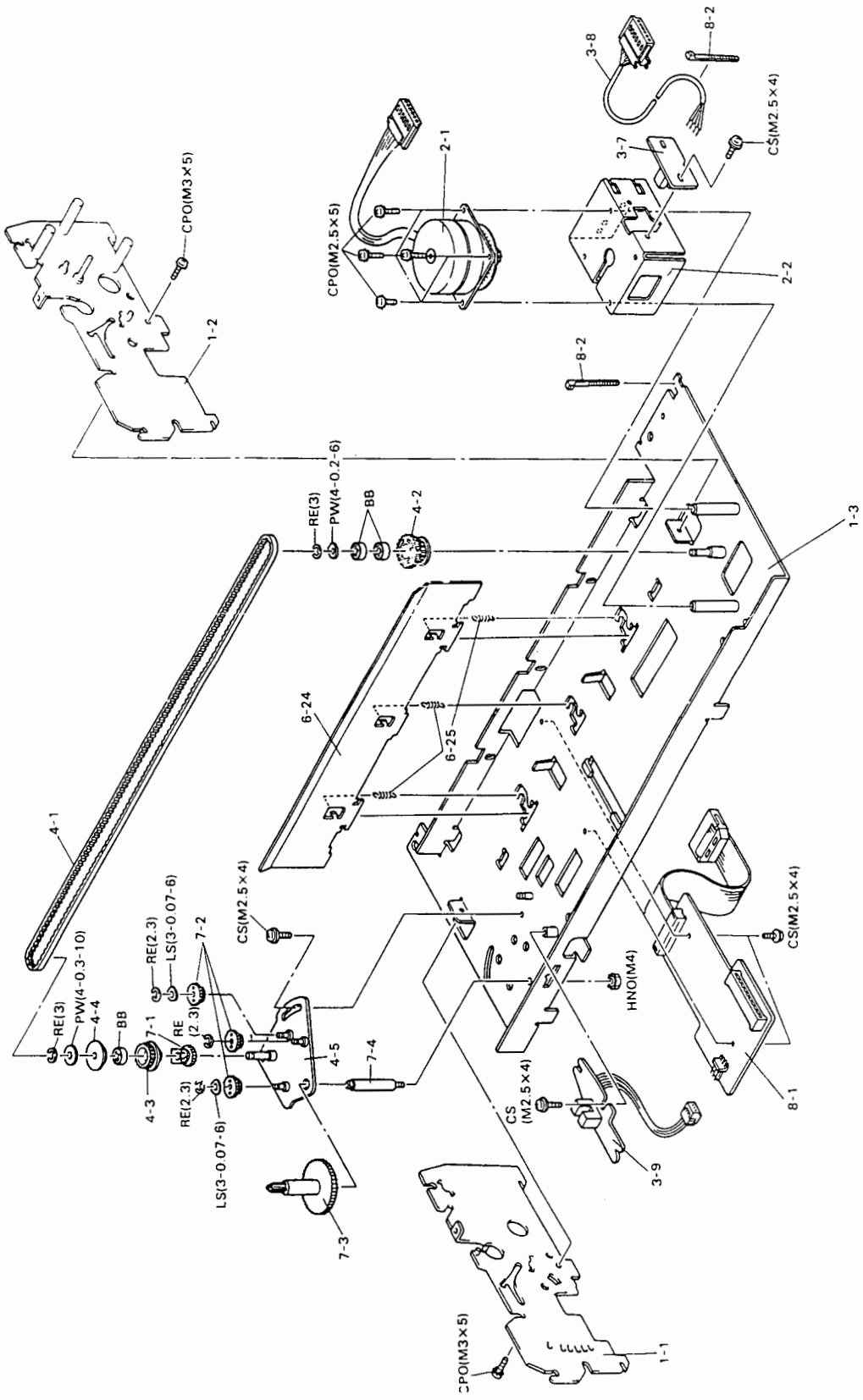


Figure 6-1. HP 82906A Exploded View (Continued)

Reference Diagrams

This section contains the schematic diagrams and the component location diagrams for the HP 82906A Printer and the IEEE 488 Interface Board.

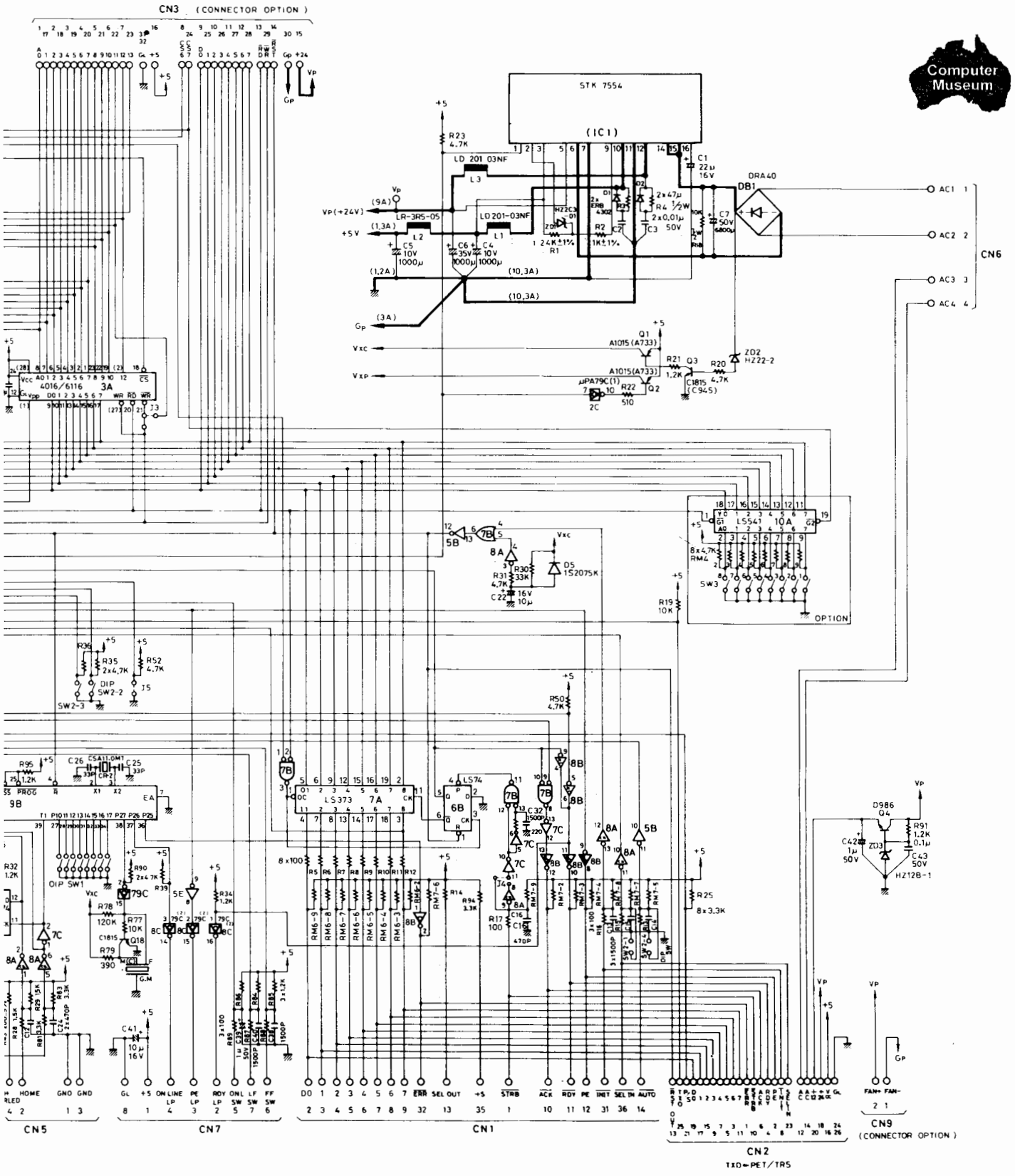
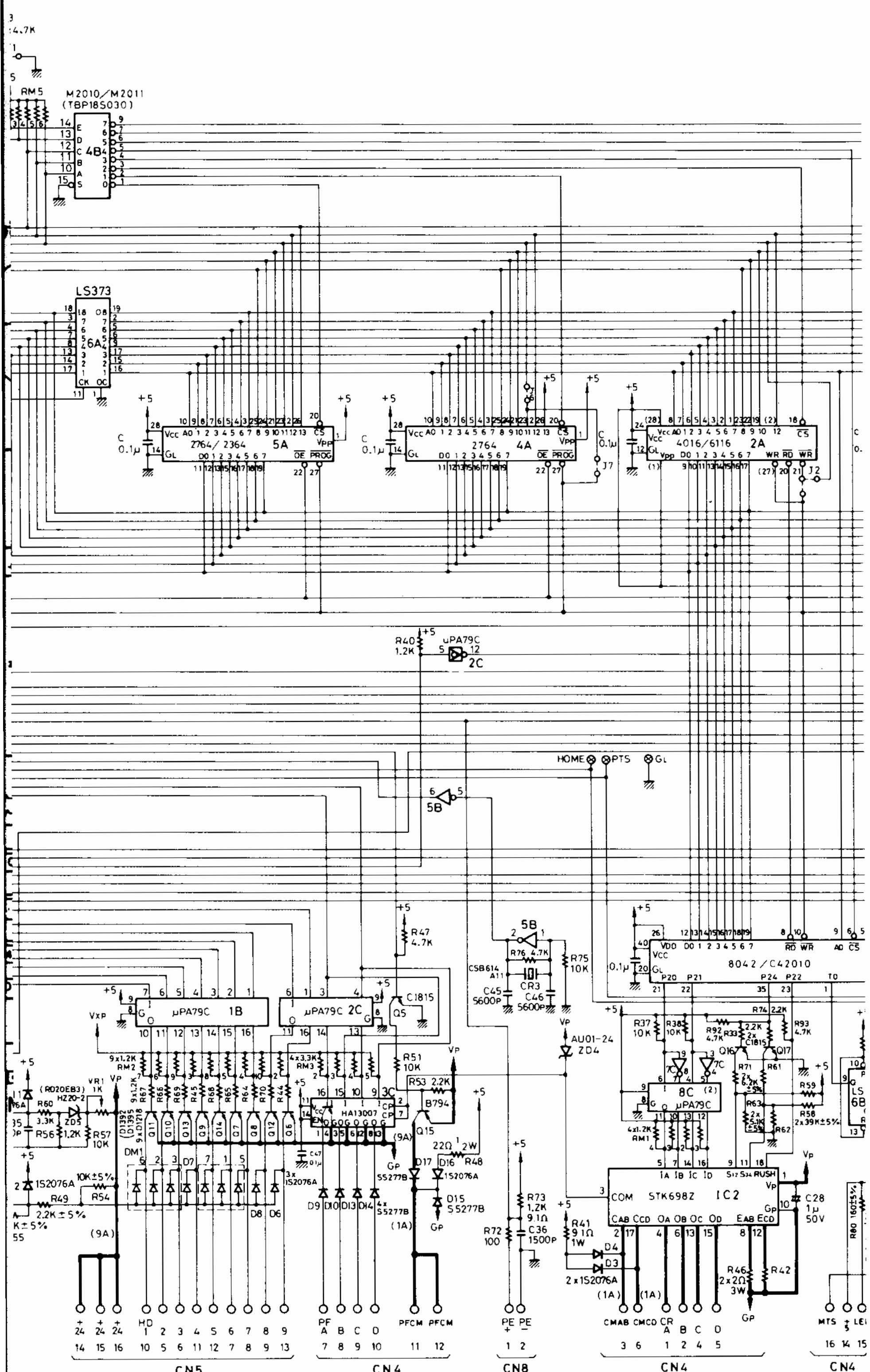
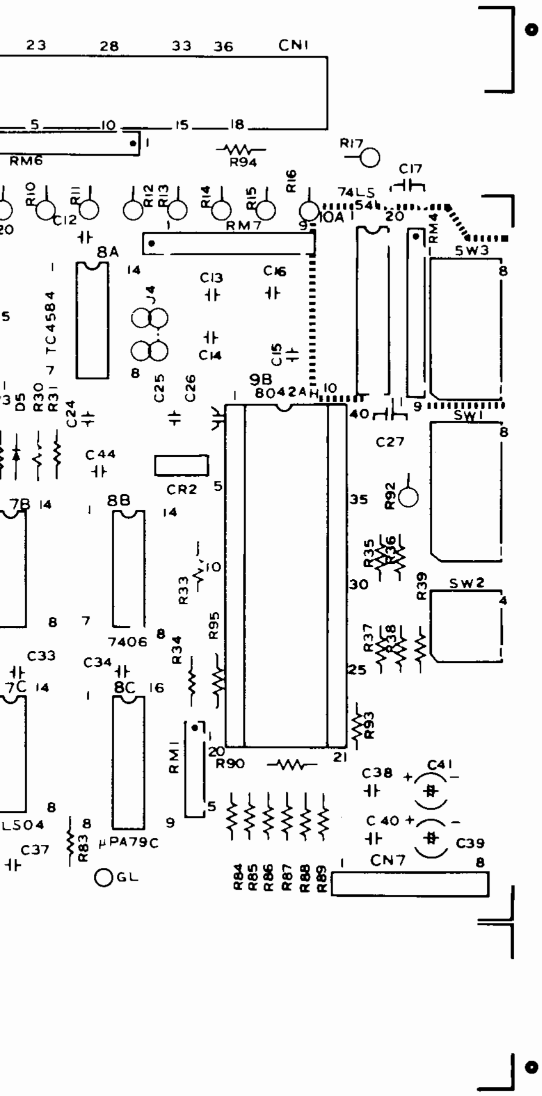
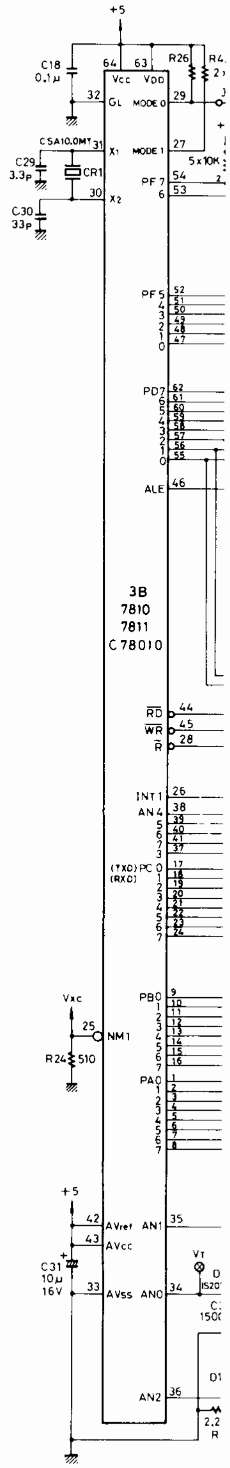


Figure 7-2. FMBD Board Schematic Diagram


RM5
M2010/M2011
(TBP18S030)
4B
LS373
6A
2764/2364
5A
2764
4A
4016/6116
2A
J7
J2
R40
1.2K
µPA79C
2C
HOME
PTS
GL
5B
µPA79C 1B
µPA79C 2C
C1815
Q5
HA13007
3C
R47
4.7K
R51
10K
R53 2.2K
B794
Q15
AU01-24
ZD4
CSB614
CR3
C45 5600P
C46 5600P
R75
10K
R76 4.7K
8042/C42010
8C
µPA79C
STK698Z
IC2
C28
1µ
50V
R41
9.1Ω
1W
2×1S2076A
R46
2×2Ω
3W
R42
R72
100
R73
1.2K
C36
1500P
CN5
CN4
CN8


CN1
23 28 33 36
5 10 15 18
RM6
R94
R17
C17
R10 R11 R12 R13 R14 R15 R16
C12
74LS
541
10A
RM7
RM4
SW3
8A
TC4584
C13 C16
J4
C14
C15
C25 C26
9B
8042AH
C27
SW1
D5 R30 R31
C24
C44
CR2
R92
7B
8B
7406
R33
R35 R36
SW2
R39
R95
R34
R37 R38
C33 C34
7C
8C
R93
RM1
R90
C38 C41
C40 C39
LS04
R83
μPA79C
C37
GL
R84 R85 R86 R87 R88 R89
CN7


+5
C18
0.1μ
Vcc VDD
R26
GL
MODE 0
CSA10.0MT
X1
MODE 1
C29
3.3P
CR1
5x10K
PF 7
X2
C30
33P
PF 5
PD7
ALE
3B
7810
7811
C78010
RD
WR
R
INT1
AN4
(TXD) PC 0
(RXD)
PB0
Vxc
NM1
R24 510
PA0
+5
AVref
AN1
AVcc
C31
10μ
16V
VT
AVss
AN0
AN2

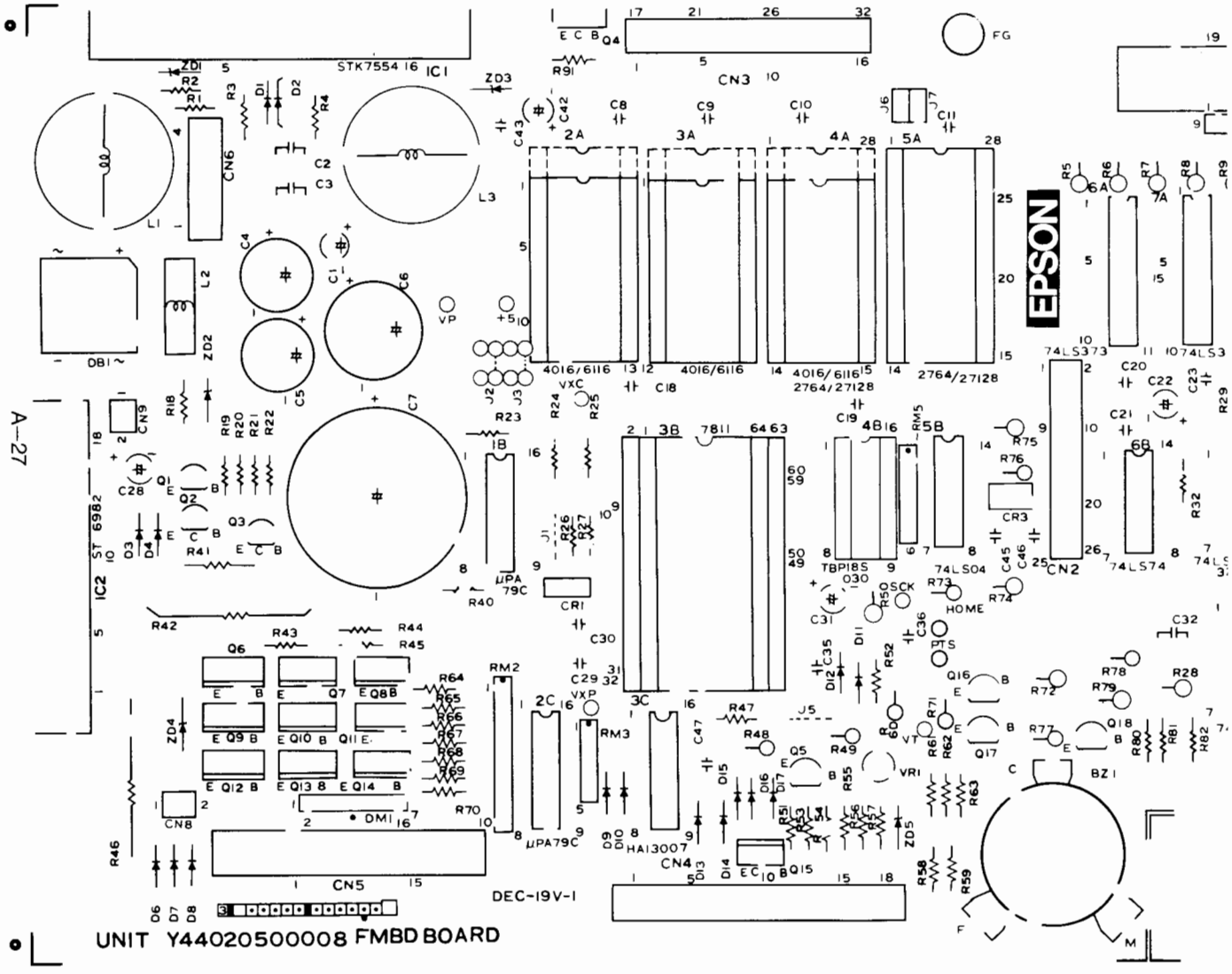


Figure 7-1. FMBD Board Component Location Diagram

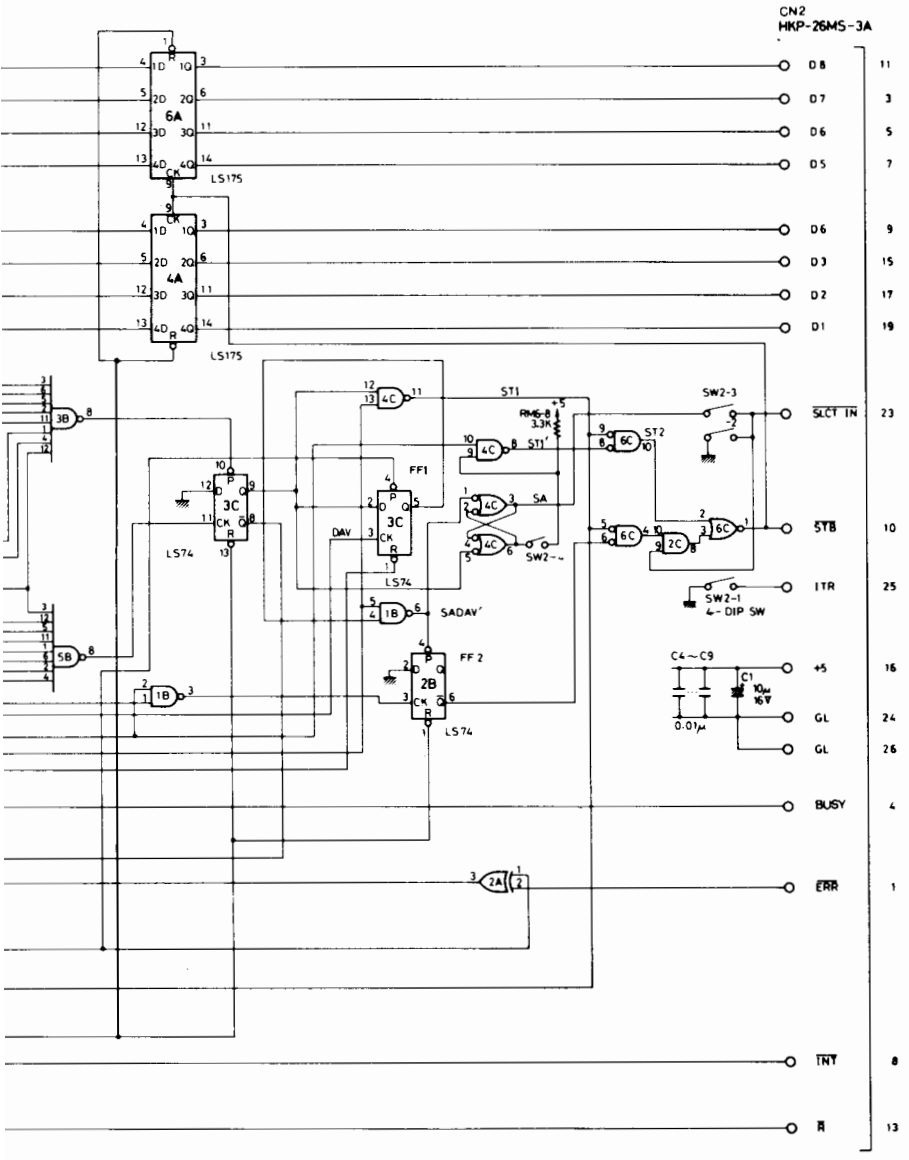
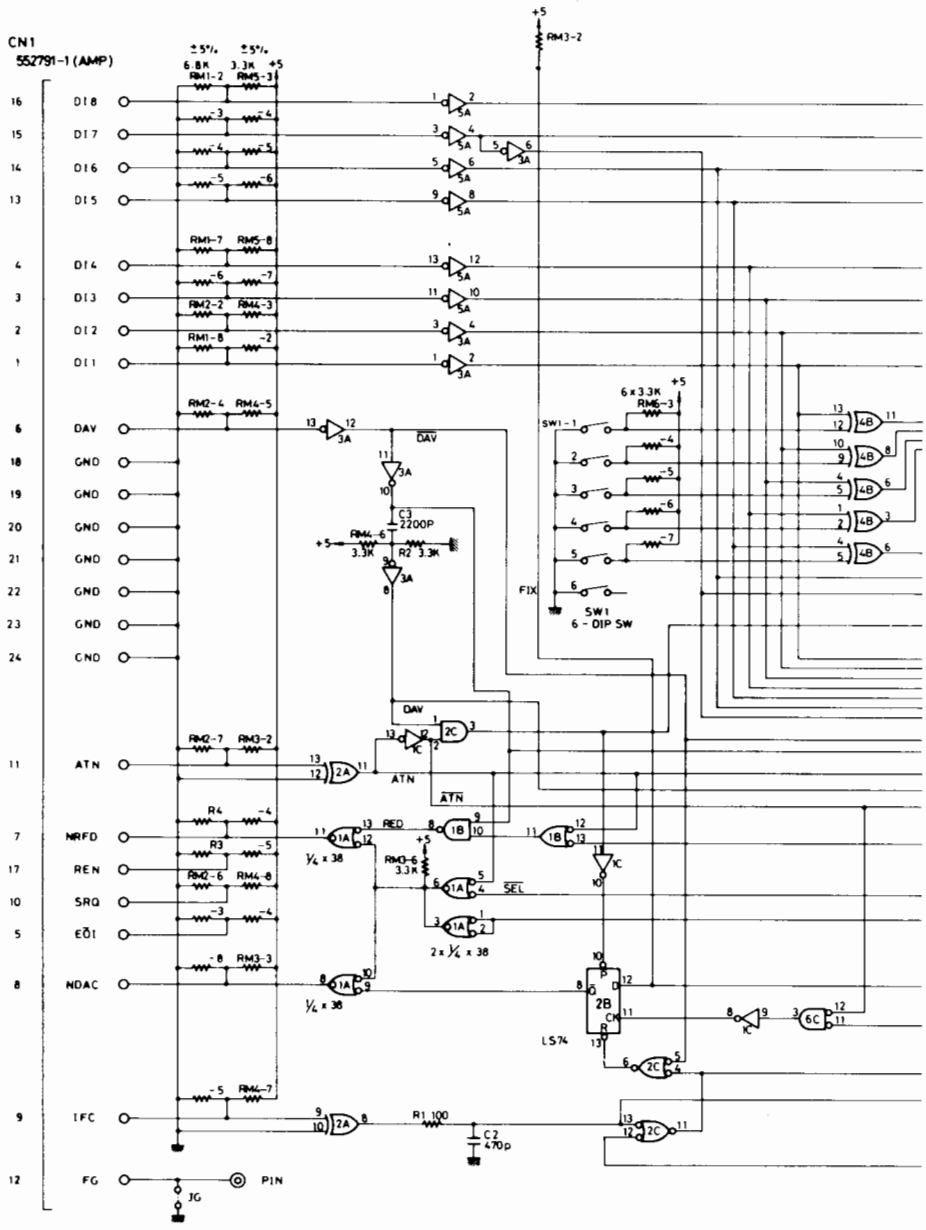


Figure 7-4. IEEE 488 Schematic Diagram


CN1
552791-1 (AMP)
±5%
6.8K
RM1-2
±5%
3.3K
RM5-3
+5
RM3-2
16 DI8
15 DI7
14 DI6
13 DI5
4 DI4
3 DI3
2 DI2
1 DI1
6 DAV
18 GND
19 GND
20 GND
21 GND
22 GND
23 GND
24 GND
11 ATN
7 NRFD
17 REN
10 SRQ
5 EOI
8 NDAC
9 IFC
12 FG
JG
PIN
RM1-7
RM5-8
RM2-2
RM4-3
RM1-8
RM2-4
RM4-5
RM2-7
RM3-2
R4
R3
RM2-6
RM4-8
RM3-3
RM4-7
R1 100
C2 470p
C3 2200P
RM4-6 3.3K
R2 3.3K
RM3-6 3.3K
6 x 3.3K
RM5-3
SW1-1
FIX
SW1
6 - DIP SW
DAV
ATN
SEL
RFD
1/4 x 38
2 x 1/4 x 38
LS74

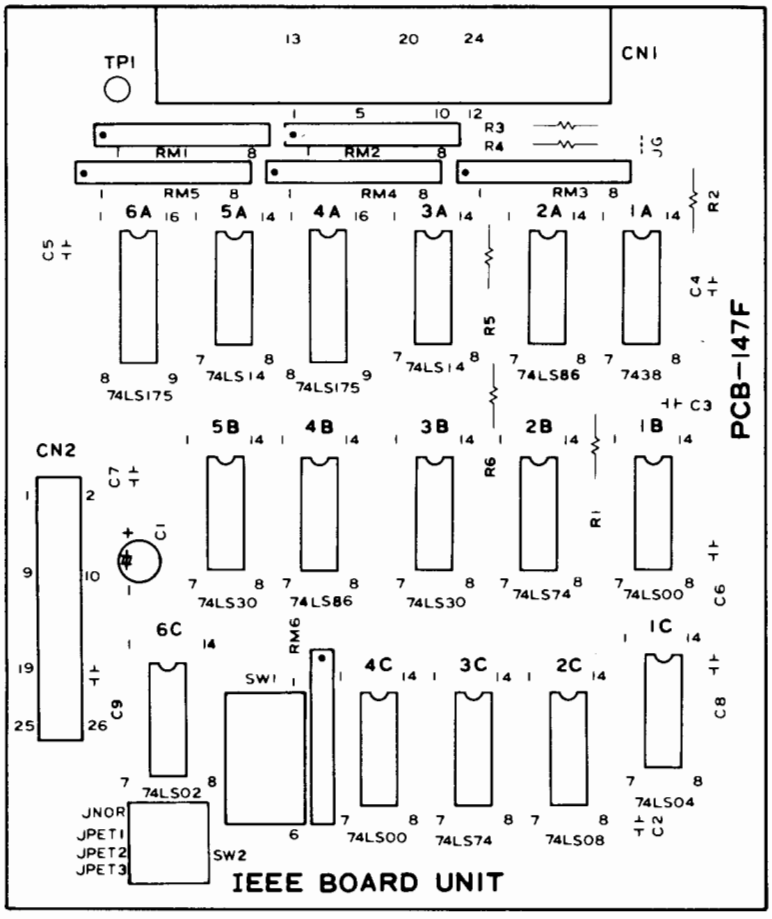


Figure 7-3. IEEE 488 Component Location Diagram

Component-Level Repair

A.1 Introduction

The additional detailed information in this appendix is useful in accomplishing component level repair of the HP 82906A Printer. If you do not intend to do component level repair, you do not need to read this appendix.

A.2 Additional Tool Requirements

In addition to the tools listed in table 3-1 and paragraph 4-2, you will require a 50 MHz bandwidth oscilloscope and a logic analyzer to do component level repair of the printer.

The unit repair test procedures listed in section IV also identify faulty components. You should complete these procedures before attempting further detailed analysis of a fault.

Note

All interface conditions are based on the TTL level. Both the rise and fall times of each signal must be less than 0.2 usec.

Data transfer must not be carried out by ignoring the ACKNLG or BUSY signal. When data transfer is made in an ERROR state, the processing and printing of the data can not be assured.

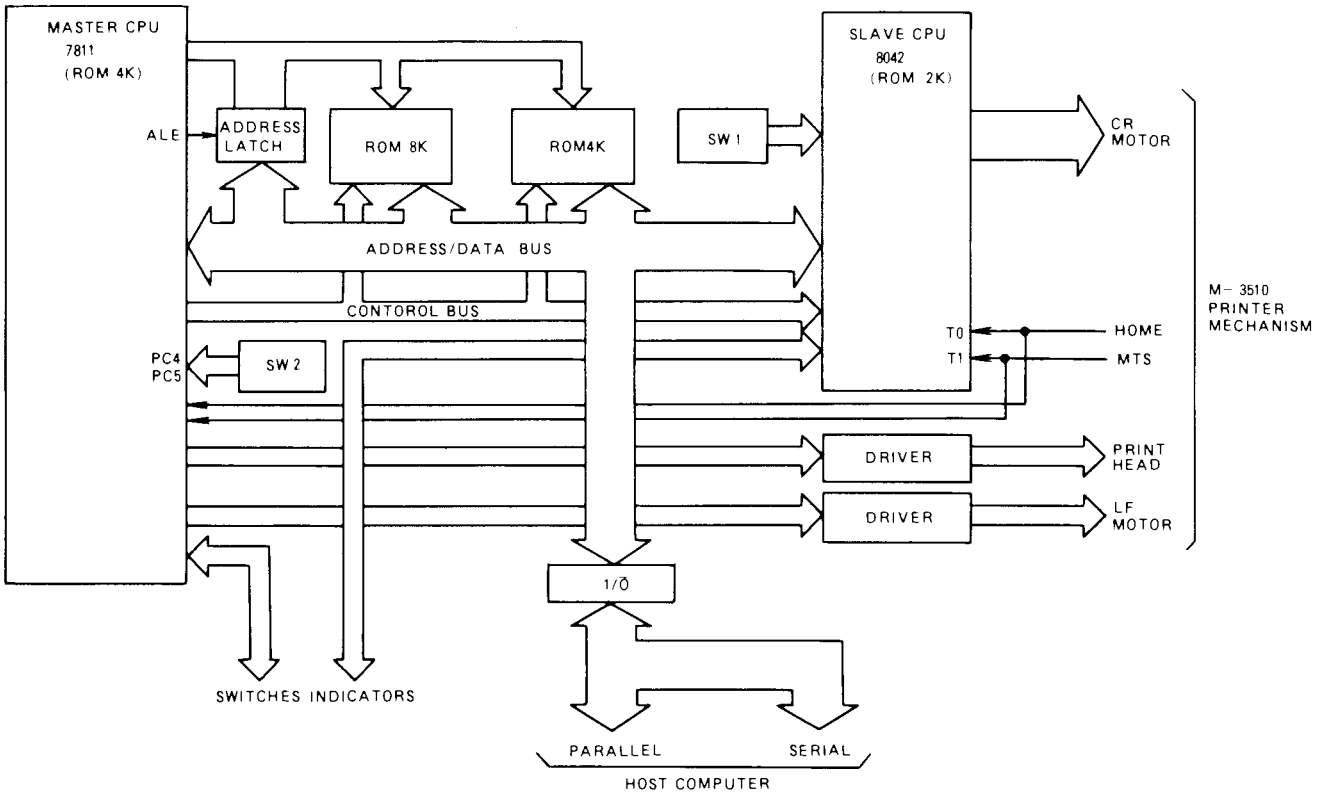


Figure A-1. FMBD Board Block Diagram

A-3. Connector CN1

a. Use: This connector is used for data exchange between the HP 82906A and the host computer.

b. Number of pins: 36 pins.

Table A-1. Pin Assignment of CN1

PIN NUMBER	RETURN PIN NUMBER **	SIGNAL NAME	DIRECTION*	DESCRIPTION OF SIGNAL
1	19	STROBE	In	Strobe pulse for read-in of data. Pulse width must be 0.5 usec or more at the receiving terminal. The signal is active low.
2	20	DATA 1	In	These signals represent the first through eighth bits of parallel data respectively. Each signal is at HIGH level when the data is a logical 1 and is at LOW level when the data is a logical 0. The condition of each bit must be fixed for 0.5 usec from the leading edge of the STROBE signal.
3	21	DATA 2	In	
4	22	DATA 3	In	
5	23	DATA 4	In	
6	24	DATA 5	In	
7	25	DATA 6	In	
8	26	DATA 7	In	
9	27	DATA 8	In	
10	28	ACKNLG	Out	Acknowledgment pulse with about 12 usec pulse width occuring upon completion of character input. New data can be transferred after this pulse, so this is also considered to be the data transfer request pulse.

*- Direction of signal flow as viewed from the printer.
**- Return denotes "TWISTED PAIR RETURN" and is to be connected at signal ground level

Table A-1. Pin Assignment of CN1 (Continued)

PIN NUMBER	RETURN PIN NUMBER	SIGNAL NAME	DIRECTION	DESCRIPTION OF SIGNAL
11	29	BUSY	Out	DC-level signal to indicate whether the entry of the next data is possible. A HIGH signal indicates the printer can not receive data. This signal becomes high when the printer is in the following conditions: - during data entry. - during printing operation. - in OFF-LINE state. - during printer error status.
12	30	PE	Out	DC-level signal to indicate that the printer is out of paper. This signal becomes high when the paper is gone.
13		SLCT	Out	This signal is pulled up to +5V through a 3.3 K-ohm resistor.
14		AUTOFEEDXT	In	With this signal LOW, the paper is automatically fed one line after printing, which starts at "print buffer full" or at the input of a CR (carriage return).
15	-	-	-	Not used.
16		0V		Logic ground.
17		CHASSIS GND		Printer chassis ground.
18				Not used.

Table A-1. Pin Assignment of CN1 (Continued)

PIN NUMBER	RETURN PIN NUMBER	SIGNAL NAME	DIRECTION	DESCRIPTION OF SIGNAL
19-30		GND		TWISTED PAIR RETURN signal GND level
31		LNIT	OUT	When this signal goes LOW, the printer is reset to the initial condition, and the print buffer is cleared.
32		ERROR	OUT	This signal goes LOW when the printer is in the PAPER END or OFF LINE state, or in an abnormal failure condition. The PAPER END state is sensed at line feed. If ESC8 is input to the printer beforehand, the ERROR line does not go LOW in the PE state.
33		GND		Same GND as pins 19 -30.
34		NC		Not used.
35		+5V		Pulled up to +5V through a 3.3k resistor.
36		SLCT IN	IN	When the printer is not in an error state, this signal at LOW level brings about the SELECT state and at HIGH level the DESELECT state, which are both output to the SLCT signal.

A-4. Connector CN2

a. Use: This connector is used for data exchange between the optional interface board and the control circuit board.

b. Number of pins: 26

Table A-2. Pin Assignments of CN2

PIN NUMBER	SIGNAL NAME	DIRECTION*	DESCRIPTION OF SIGNAL
1	ERR	Out	Error
2	PE	Out	Paper End
3	D7	In	Data bit 7
4	RDY(BUSY)	Out	Ready
5	D6	In	Data bit 6
6	ACK	Out	Acknowledge
7	D5/PAR DIS	In	Data bit 5/Parity disable
8	INIT	In	Initial
9	D4/O/E	In	Data bit 4/odd parity select/ even parity select
10	STB	In	Strobe
11	D8/SI	In	Data bit 8/serial signal input
12	AC12	Out	+12 Vac
13	R	Out	Reset
14	AC12	Out	+12 Vac
15	D3/B2	In	Data bit 3/bit rate select
16	+5	Out	+5 Vdc
17	D2/B1	In	Data bit 2/bit rate select
18	+24	Out	+24 Vdc

*- Direction of signal flow as viewed from the control circuit board.

Table A-2. Pin Assignments of CN2 (Continued)

PIN NUMBER	SIGNAL NAME	DIRECTION	DESCRIPTION OF SIGNAL
19	D1/8/7	In	Data select bit 1/8 bit select/ 7 bit
20	+12	Out	+12 Vdc
21	P/S	In	Parallel select/serial select
22	-	-	Not used
23	SELIN	In	Select in
24	GL	-	Ground
25	TXD(PET/TRS)	In	PET/TRS select
26	GL	-	Ground

A-5. Connector CN3

a. Use: This optional connector will be used for a future extension of printer capabilities.

b. Number of pins: 32

Table A-3. Pin Assignments of CN3

PIN NUMBER	SIGNAL NAME	DIRECTION*	DESCRIPTION OF SIGNAL
1	A0	Out	Address bit 0
2	A2	Out	Address bit 2
3	A4	Out	Address bit 4
4	A6	Out	Address bit 6
5	A8	Out	Address bit 8
6	A10	Out	Address bit 10
7	A12	Out	Address bit 12
8	CS6	Out	Chip select 6
9	D0	In/Out	Data bit 0
10	D2	In/Out	Data bit 2
11	D4	In/Out	Data bit 4
12	D6	In/Out	Data bit 6
13	RD	Out	Read-out signal
14	RST	Out	Reset
15	+24	Out	+24 Vdc
16	+5	Out	+5 Vdc
17	A1	Out	Address bit 1
18	A3	Out	Address bit 3
19	A5	Out	Address bit 5

* - Direction of signal flow as seen from the control circuit board.

Table A-3. Pin Assignments of CN3 (Continued)

PIN NUMBER	SIGNAL NAME	DIRECTION	DESCRIPTION OF SIGNAL
20	A7	Out	Address bit 7
21	A9	Out	Address bit 9
22	A11	Out	Address bit 11
23	A13	Out	Address bit 13
24	CS7	Out	Chip select 7
25	D1	In/Out	Data bit 1
26	D3	In/Out	Data bit 3
27	D5	In/Out	Data bit 5
28	D7	In/Out	Data bit 7
29	WR	Out	Write-in signal
30	GP	-	Power ground
31	GL	-	Logic ground
32	GL	-	Logic ground

A-6. Connector CN4

a. Use: This connector is used for the exchange of control signals between the control circuit board and the CR motor, the paper feed motor, and the MTS(PTS) sensor.

b. Number of pins: 18

Table A-4. Pin Assignment of CN4

PIN NUMBER	SIGNAL NAME	DIRECTION*	DESCRIPTION OF SIGNAL
1	CRA	Out	CR motor control, A phase
2	CRB	Out	CR motor control, B phase
3	CMAB	Out	CR motor, A and B phase common line
4	CRC	Out	CR motor control, C phase
5	CRD	Out	CR motor control, D phase
6	CMCD	Out	CR motor, C and D phase common line
7	PFA	Out	Paper feed motor, A phase
8	PFB	Out	Paper feed motor, B phase
9	PFC	Out	Paper feed motor, C phase
10	PFD	Out	Paper feed motor, D phase
11	PFCM	Out	Paper feed motor, common line
12	PFCM	Out	Paper feed motor, common line
13	-	-	Not used
14	+5	Out	MTS(PTS) sensor power, +5 Vdc
15	LED+	Out	MTS(PTS) sensor LED power
16	MTS	In	MTS(PTS) sensor timing signal
17	GP		PTS sensor ground
18	GP		PTS sensor shield

* - Direction of signal flow as viewed from the control circuit board.

A-7. Connector CN5

a. Use: This connector is used for the exchange of control signals between the control circuit board and the print head and home sensor.

b. Number of pins: 16

Table A-5. Pin Assignment of CN5

PIN NUMBER	SIGNAL NAME	DIRECTION*	DESCRIPTION OF SIGNAL
1	GND	-	Home sensor ground
2	HOME	In	Home sensor R signal
3	GND		Home sensor ground
4	RLED	Out	Home sensor LED power
5	HD2	Ot	Print solenoid, #2 drive signal
6	HD3	Out	Print solenoid, #3 drive signal
7	HD6	Out	Print solenoid, #6 drive signal
8	HD7	Out	Print solenoid, #7 drive signal
9	HD8	Out	Print solenoid, #8 drive signal
10	HD1	Out	Print solenoid, #1 drive signal
11	HD4	Out	Print solenoid, #4 drive signal
12	HD5	Out	Print solenoid, #5 drive signal
13	HD9	Out	Print solenoid, #9 drive signal
14	+24	Out	Print solenoid, common line +24V
15	+24	Out	Print solenoid, common line +24V
16	+24	Out	Print solenoid, common line +24V

* - Direction of signal flow as viewed from the control circuit board.

A-8. Connector CN6

a. Use: This connector is used to supply voltage from the power transformer to the control circuit board.

b. Number of pins: 4

Table A-6. Pin Assignment of CN6

PIN NUMBER	SIGNAL NAME	LEAD COLOR	DESCRIPTION OF SIGNAL
1	AC1	Orange	25V ac for logic circuit, step motor, and head solenoid
2	AC2	Orange	
3	AC3	Gray	12V ac for option interface
4	AC4	Gray	

A-9. Connector CN7

a. Use: This connector is used for signal exchange between the control panel and the control circuit board.

b. Number of pins: 8

Table A-7. Pin Assignment of CN7

PIN NUMBER	SIGNAL NAME	DIRECTION*	DESCRIPTION OF SIGNAL
1	+5	Out	LED drive power
2	RDY LP	Out	READY LED drive signal
3	PE LP	Out	Paper end LED drive signal
4	ON LINE LP	Out	ON LINE LED drive signal
5	LF SW	In	LINE FEED signal
6	FF SW	In	FORM FEED signal
7	ON LINE SW	In	ON/OFF LINE switching signal
8	GL	-	Logic ground

* - Direction of signal flow as viewed from the control circuit board.

A-10. Connector CN8

a. Use: This connector is used to send the signal from the paper end sensor to the control circuit board.

b. Number of pins: 2

Table A-8. Pin Assignment of CN8

PIN NUMBER	SIGNAL NAME	DIRECTION*	DESCRIPTION OF SIGNAL
1	PE+	In	Paper end sensor, + side
2	PE-	-	Paper end sensor, - side (logic ground)
* - Direction of signal flow as viewed from the control circuit board.			

A-11. Electrical Circuits

A-11.1 Power Supply Circuit

The power supply circuit of the HP 82906A Printer consists of the filter circuit, the power transformer, and the regulator circuit on the FMBD circuit board.

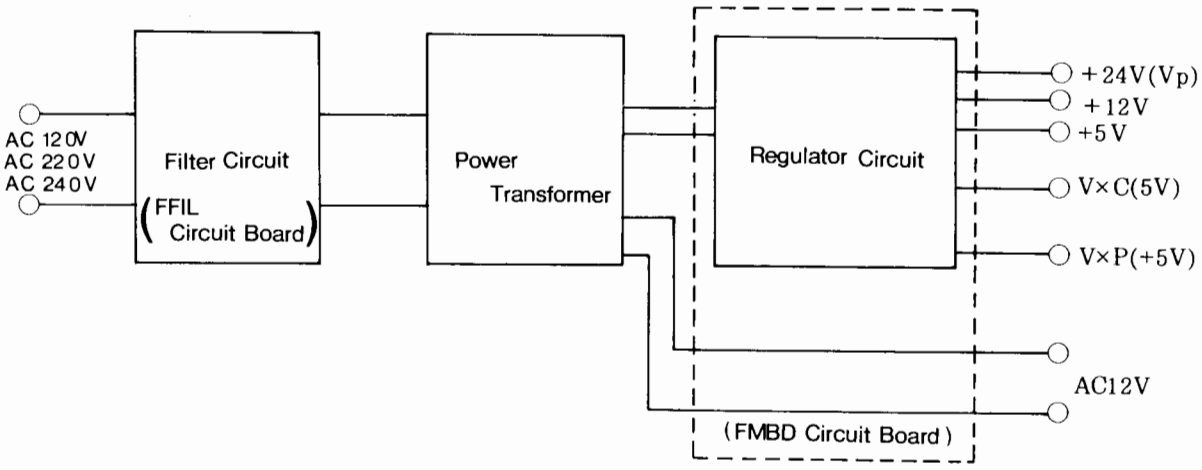


Figure A-2. Power Supply Circuit Block Diagram

a. Power supplies and their uses

Table A-9. Power Supplies

VOLTAGE	USE
+24V (Vp)	o Carriage motor power
	o Paper feed motor
	o Print solenoid power
	o Interface option board power
+5V (Vcc)	o Logic circuit power
	o Carriage motor holding current
	o Paper feed motor holding current
	o Indicator lamp power
	o Interface option board power
+12V	o Interface option board power

Table A-9. Power Supplies (Continued)

VOLTAGE	USE
12 Vac	o Interface option board power
+5V (Vxc)	o Power reset o Buzzer power
+5V (Vxp)	o Print solenoid protection

b. Filter Circuit

The filter circuit is located on the FFIL board together with the power switch for the printer and the fuse. The power cable is connected to the FFIL board.

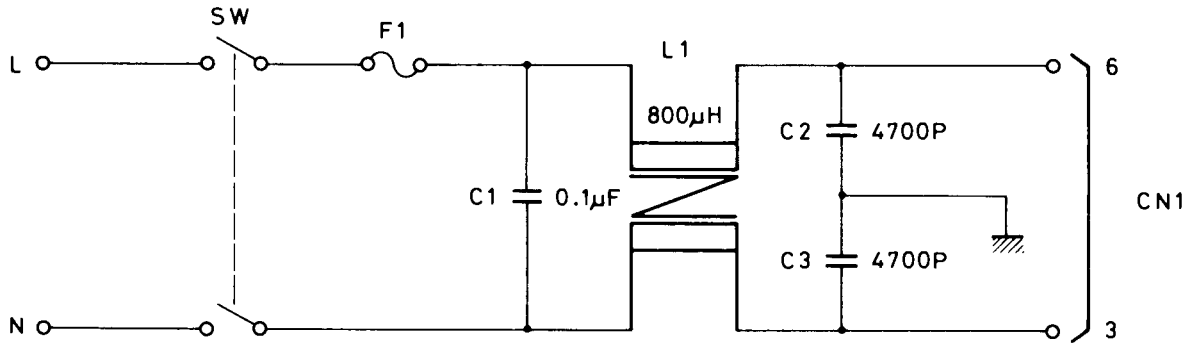


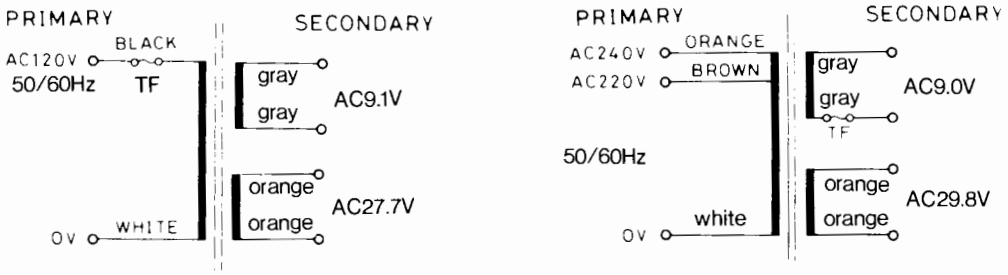
Figure A-3. Fuse and Filter Circuit

The ac voltage from the power line passes through the power switch and is then filterd by capacitor C1. It then passes through the LC noise suppression circuit and is applied to the primary winding of the transformer.

The noise suppression circuit prevents noise on the power line from coming into the printer and also prevents internally-generated noise from going out of the printer.

c. Power Transformer

The power transformer lowers the 120 Vac from the filter circuit to 22 Vac and 12 Vac and supplies voltages required by the control circuit and interface option circuit boards.



U.S.A Version European Version

Figure A-4. Power Transformer

d. Regulator Circuit

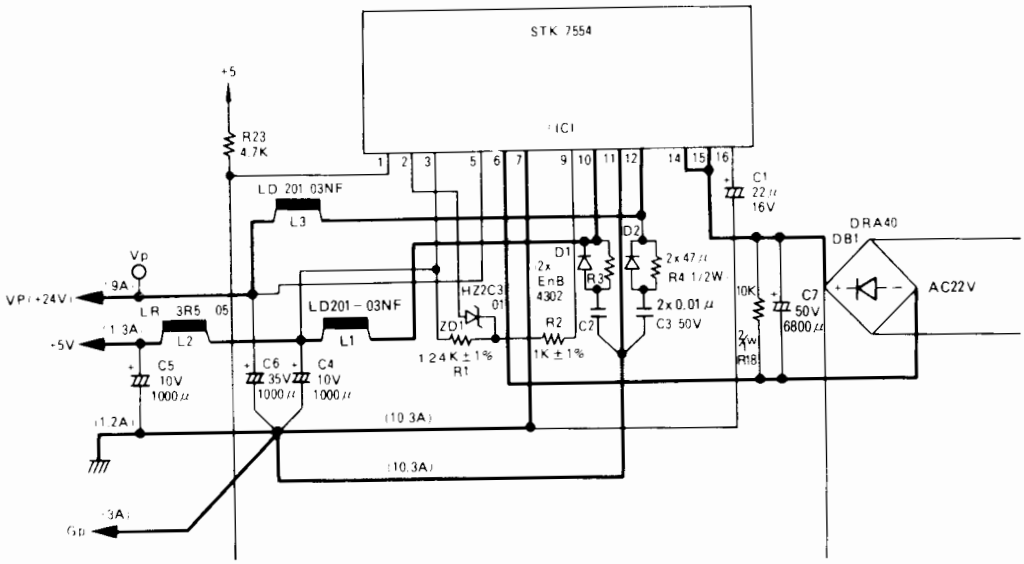


Figure A-5. Regulated Power Supplies

The regulator consists of a chopper-type switching regulator IC. It stabilizes the +24V and +5V power supplies.

The output voltage, Vout, from the regulated power supplies is supplied in three steps or modes (see figure A-6):

Mode 1: When Q is on, the input voltage, VIn, supplies energy to the inductor L and the capacitor C causing current IQ to flow.

Mode 2: When Q is off, the energy stored in the inductor causes current ID to flow through diode D.

Mode 3: When Q and D are both off, the energy stored in C causes current IC to flow to the load.

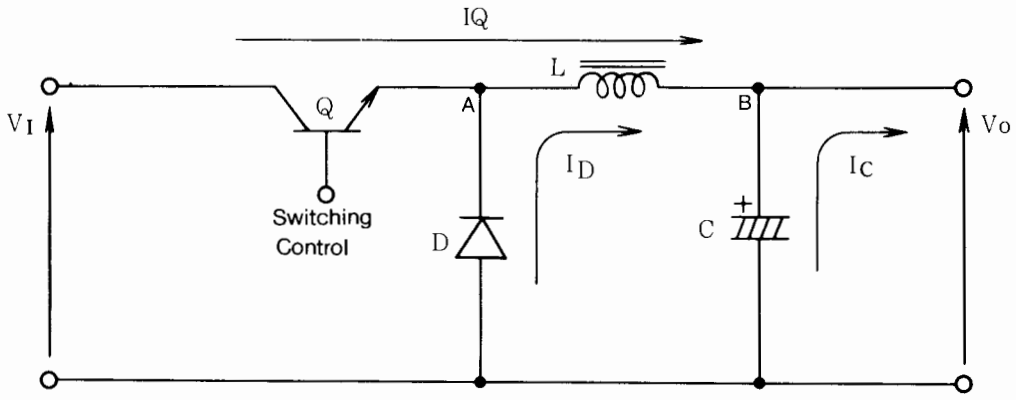


Figure A-6. Regulator Operating Principle

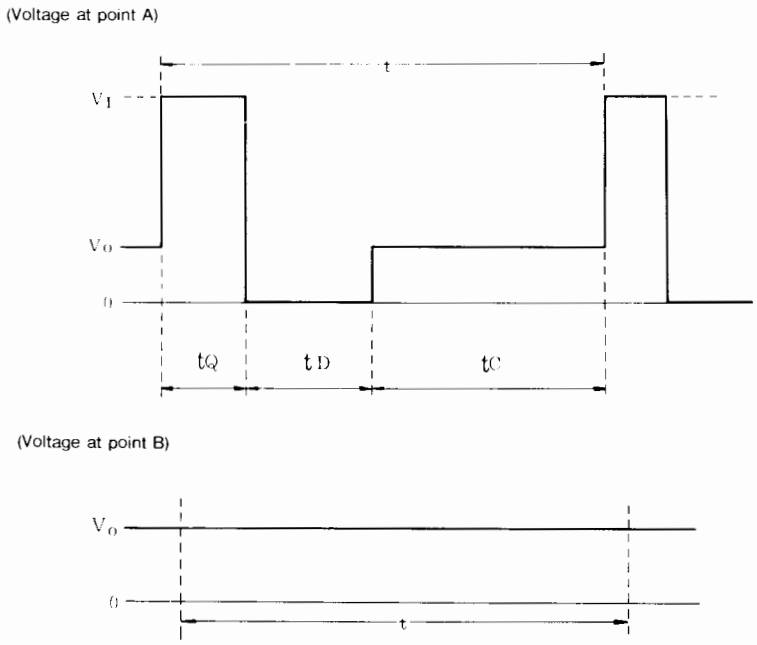


Figure A-7. Regulated Voltage Relationships

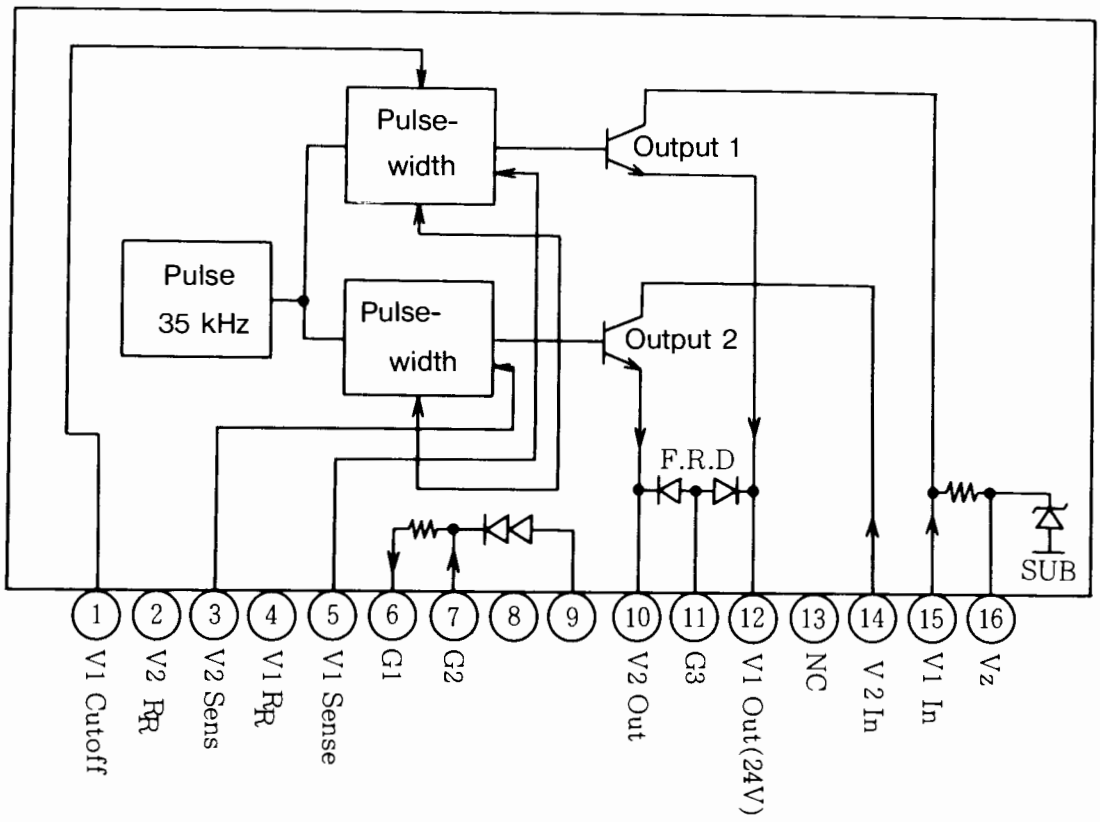


Figure A-8. Switching IC Internal Block Diagram

A-11.2 Reset Circuit

The reset signal prevents the malfunction of circuit elements and performs their initial setting when the power is turned on.

The only times the signal is output are when the power is turned on and when an INIT signal is received from the host computer.

The following ICs receive the reset signal:

- IC-3B, pin 28 (main CPU).
- IC-9B, pin 4 (slave CPU).
- IC-6B, pin 1 (data latch).

The reset signal also appears at CN2, pin 13 and CN3, pin 14 (not used).

a. System Reset at INIT signal

When an INIT signal is received from a host computer through CN2, pin 8 of the interface option board, the signal level goes low at IC-5B, pin 12.

While the INIT signal is low, the reset signal is supplied to the circuit.

The INIT signal is transmitted by a system reset or I/O reset command from the host computer.

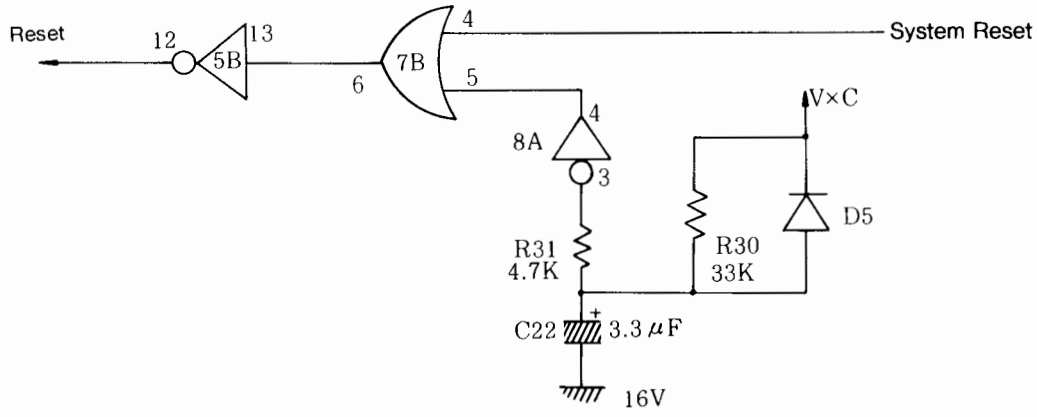


Figure A-9. System Reset Circuit

A-11.3 Main CPU, ROM, and RAM

a. 7810 (PROM version) - early units only.

The main CPU 7810, which is the main processor that controls the HP 82906A, executes all instructions in accordance with the programs that are stored in the external ROM.

The 7810 has a 256 byte RAM data memory, 40 I/O lines and 8 Address/Data lines, and operates on the clock pulse from the basic clock of 10.0 MHz.

b. C78010 (MROM version)

The min CPU C78010 (7810), which is the main processor that controls the HP 82906A, executes all instructions in accordance with the programs that are stored in the internal and external ROMs.

The C78010 has a 4K byte internal ROM, a 256 byte RAM data memory, 40 I/O lines, and 8 Address/Data lines, and operates on the clock pulse from the basic clock of 10.0 MHz.

Note

7810 -- NEC original code.

C78010 -- EPSON custom code.

c. Fuse ROM

Functioning like a decoder, the fuse ROM receives the address signal from port PE7-0 of the main CPU and produces the Chip Select signal for the external ROM. For 32 bits of input, a maximum of 64K bytes can be selected. Also, there are the following combinations with the main CPU:

(A) PROM version -- for use with external ROM.
7810 + M2010GA

(B) MROM version -- for use with internal and external ROM.
C78010 + M2011GA

Table A-10. HP010GA Chip Select Signals

M2010GA Output		Chip Select
Q	Low	IC-5A (ROM 2764)
Q1	Low	IC-4A (ROM 2764)
Q2	Low	IC-2A (ROM 4016)
Q3	Low	IC-3A (ROM 4016)
Q4	Low	IC-9B (SLAVE CPU 8042)
Q5	Low	IC-7A/IC-6B (DATA/STROBE signal latch
Q6	Low	Not used
Q7	Low	Not used

d. ROM

The HP 82906A with two 2764s has 16K bytes of ROM storage; however, it actually only uses 12K bytes.

(A) PROM version

7810		2764(IC-4A)		2764(IC-5A)
(without ROM)		(8K)		(8K)

(B) MROM version

C78010		M64100(IC-5A)
(with 4K)		(8K)

e. RAM

The external RAM capacity is 4K bytes with two 4016 chips. 1K byte is used as the system memory, and up to 3K bytes are used as the data buffer or down load area.

f. Memory Address Map

Table A-11. 7810 Memory Address Map

Address*	Description
0000-1FFF	IC-5A (2764 ROM) Main Program
2000-3FFF	IC-4A (2764 ROM) Character Generator
9000-97FF	IC-2A (4016 RAM)
9800-9FFF	IC-3A (4016 RAM)
B000-D7FF	IC-9B (8042-139 slave CPU)
D800-DFFF	IC-7A/IC-6B (LS373/LS74) (Data and strobe latch)
E000-E7FF	Option connector
E800-	Dip switch

* - hexadecimal

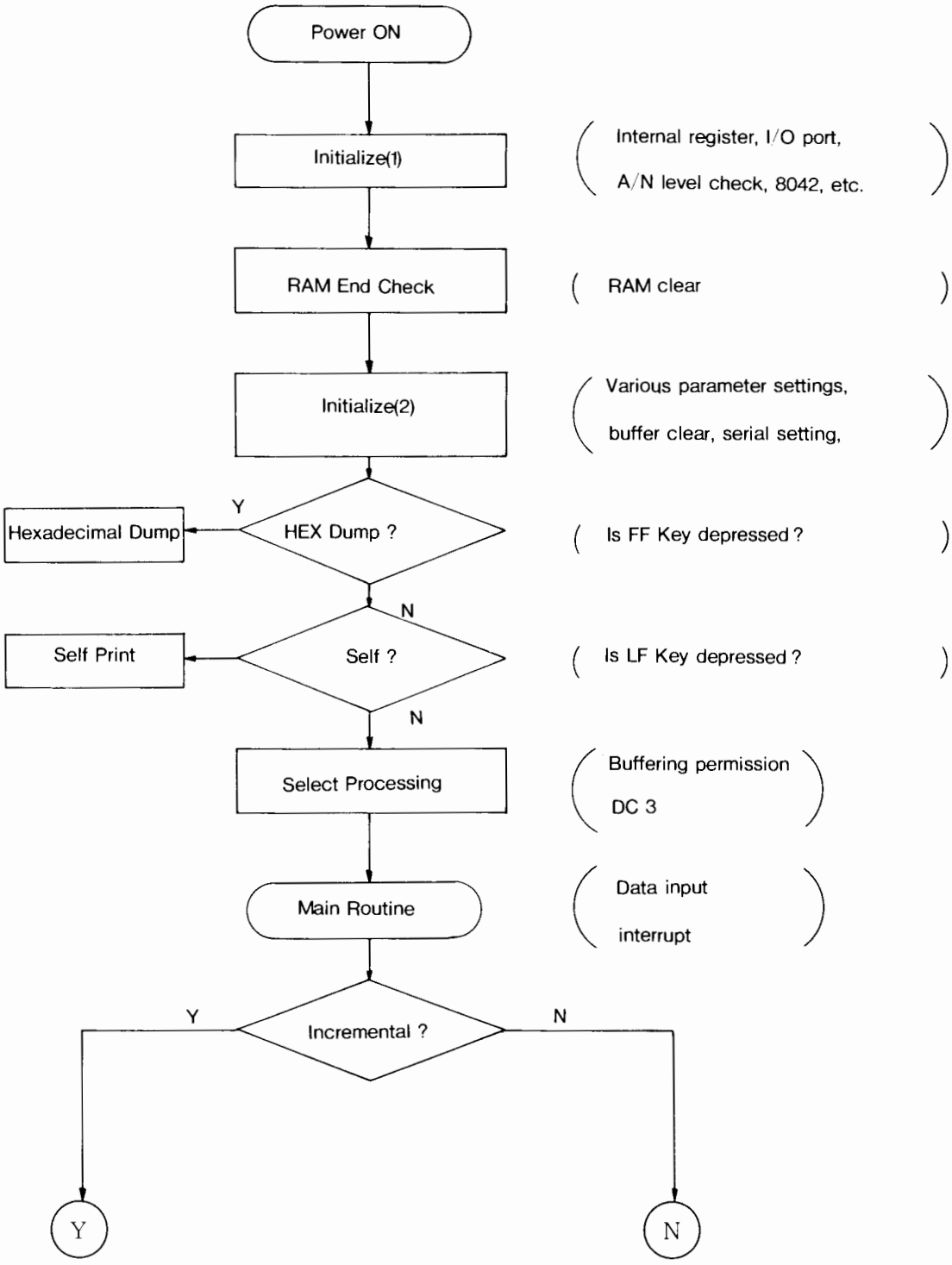


Figure A-9. Main CPU (7810/C78010) Flow Chart

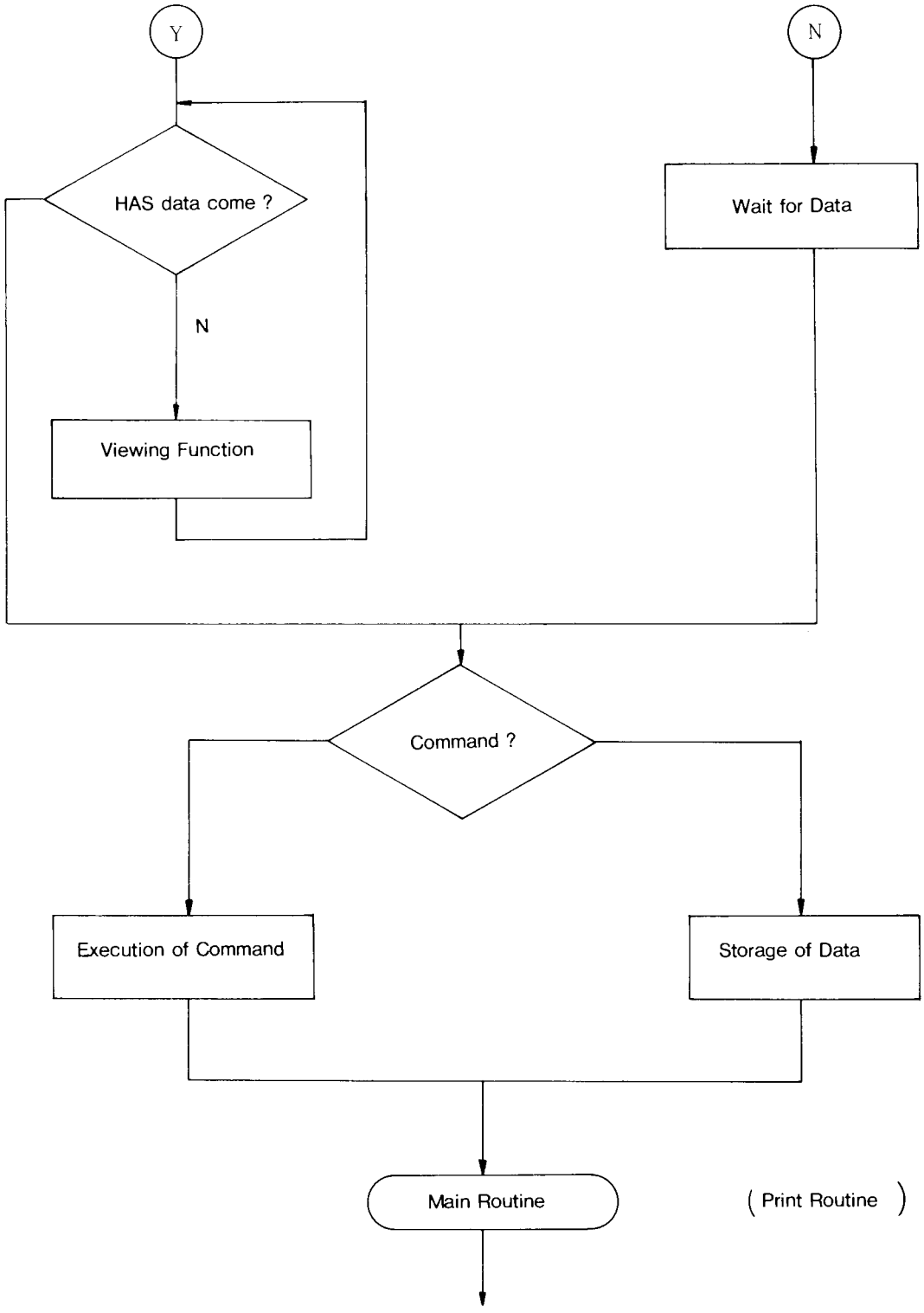


Figure A-9. Main CPU (7810/C78010) Flow Chart (Continued)

A-11.4 Slave CPU 8042

The slave CPU 8042 has a 2K-byte ROM and a 128-byte RAM in it. It is controlled by the main CPU, but it independently controls the CR motor, dip switch SW1, the buzzer, the error signal, etc. Operating on the basic 11.0 mHz clock, it is not in synchronism with the main CPU.

Table A-12. Slave CPU Control Signals

Control Signal				Description
CS	RD	WR	AO	
L	H	L	L	Data is transferred from the main CPU to the slave CPU IDB buffer.
L	H	L	H	Command is transferred from the main CPU to the slave CPU IDB buffer.
L	L	H	-	Data is transferred from the slave buffer ODB to the main CPU.

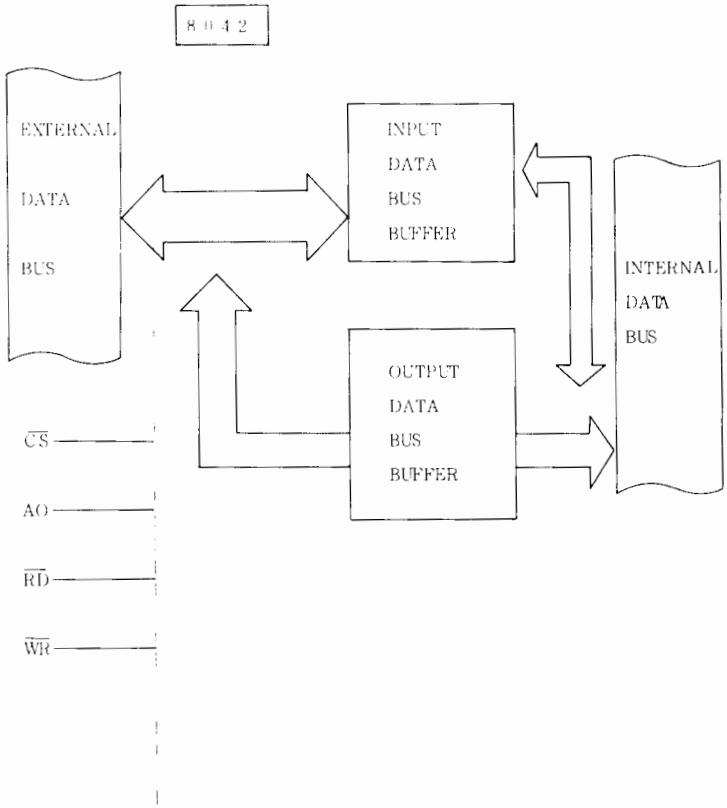


Figure A-10. Slave CPU Block Diagram

A-11.5 Head Control

The head wire drive signals corresponding to the character generators are supplied from ports PA7 to 0 and PB7 of the main CPU to pin 1 of IC-1B and IC-2C of the predriver.

The predriver input is normally high impedance, but the output of the predriver is cut off when the drive signal is low. Therefore, the external head driver transistor is driven during this time by Vxp and power is conducted to the head wire. The conduction time is controlled to within 400 usec $\pm$10 usec.

Vp - Vt must always equal 21.5V. This difference voltage is set by R1.

A-11.6 CR Motor Control

The carriage motor is controlled by exciting two of the four phase windings.

Table A-13. Carriage Motor Phase Excitation

CARRIAGE MOTION	STEP	PHASE A	PHASE B	PHASE C	PHASE D
Left to right	1	ON	OFF	OFF	ON
	2	ON	OFF	ON	OFF
	3	OFF	ON	ON	OFF
	4	OFF	ON	OFF	ON
Right to left	1	ON	OFF	ON	OFF
	2	ON	OFF	OFF	ON
	3	OFF	ON	OFF	ON
	4	OFF	ON	ON	OFF

a. Motor bias voltage

Non-operation: + 5V via D3 and D4
Operation: + 24V via pins 2 and 17 of IC2

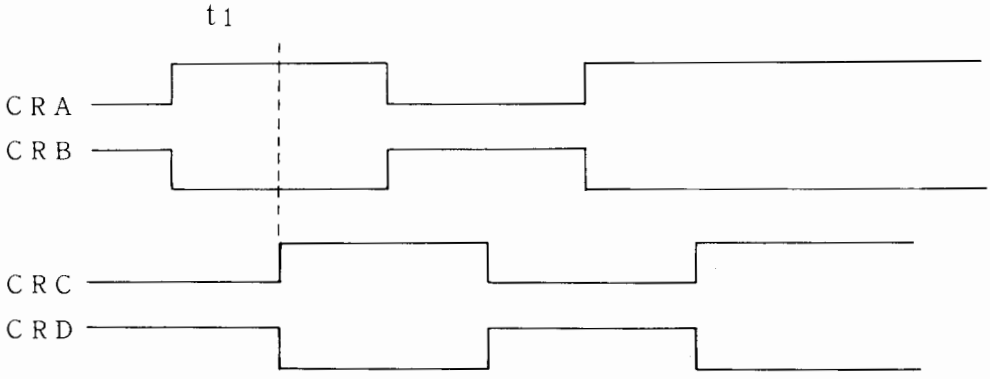


Figure A-11. Carriage Motor Drive Signal

b. Speed control

The signal from the timing signal sensor (MTS) is a square wave of period T=1.0 msec (nominal).

The MTS signal is input to the slave CPU. Using the built-in timer circuit of the slave CPU, the slave CPU program continually checks the period of the the MTS signal:

Normal running:

When the MTS period is longer than 1.0 msec, the phase switching of the motor is made at the leading edge of the next pulse.

When the MTS period is shorter than 1.0 msec, the phase switching of the motor is made at the timing of the internal timer.

Start:

RUSH (pin 18 of IC2) is driven (current control is ignored simultaneously) and the programmed timing pulse causes the phase switching to take place earlier. Thus more energy than normal is supplied to the motor.

Deceleration:

On completion of printing, the phase switching is delayed causing deceleration to take place.

(2) Speed control

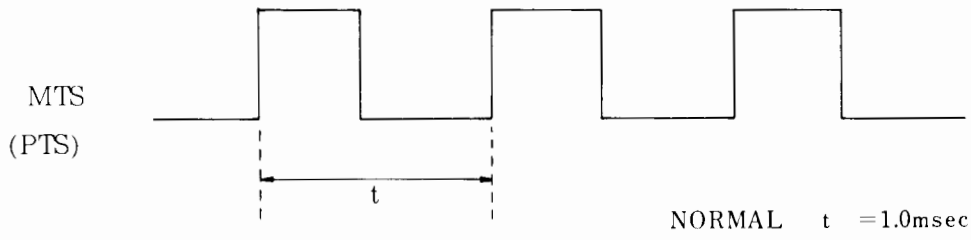


Figure A-12. MTS Signal

A-11.7 Line Feed Motor Control

The LF motor is the same type of phase switched motor as is the CR motor. It is controlled directly by the main CPU. The phase-switching sequence is the same as is shown in table A-13.

a. Motor bias voltage

Non operating: +5V (via D16, R48)

Operating: +24V

b. Speed control

Speed control is accomplished by phase switching under the direct control of the main CPU in accordance with the amount of paper feed required.

A-11.8 Jumper Line Specifications

J1	ON	MPROM CPU	C78010
	OFF	P ROM CPU	7810
J2	ON	4K RAM	Future
	OFF	2K RAM	Current
J3	ON	4K RAM	Future
	OFF	2K RAM	Current
J4	ON	PC8801	
	OFF	Standard/ PC8001	
J5	ON	Page length	11"
	OFF	Page length	12"
J6	ON	8K ROM	Current
	OFF	2K RAM	Future
J7	ON	2K RAM	Future
	OFF	8K ROM	Current

A-11.9 DIP Switches

SW1-1 to -8 — Slave CPU P10-P17 catch; main CPU reads the status of the slave CPU.

SW2-1	Main CPU AN 1
-2	Main CPU AN 5
-3	Main CPU AN 6
-4	Main CPU PB 4

A-11.10 Alarm System

The alarm system indicates errors by sounding the buzzer a number of times with di fferent tones:

Five buzzes (pi, pi, pi, pi, pi):	Paper end detection error
Six buzzes (pi, pi, pi; pi, pi, pi):	Slave CPU error (This may indicate that the slave CPU has detected a head error.)
Four buzzes (pee, pee, pee, pee):	Head driver transistor C to E short.
Four buzzes (pi, pi, pi, pee):	High voltage error

A-11.11 Serial Control

The 7810 is capable of serial control, in which case an external clock is used.

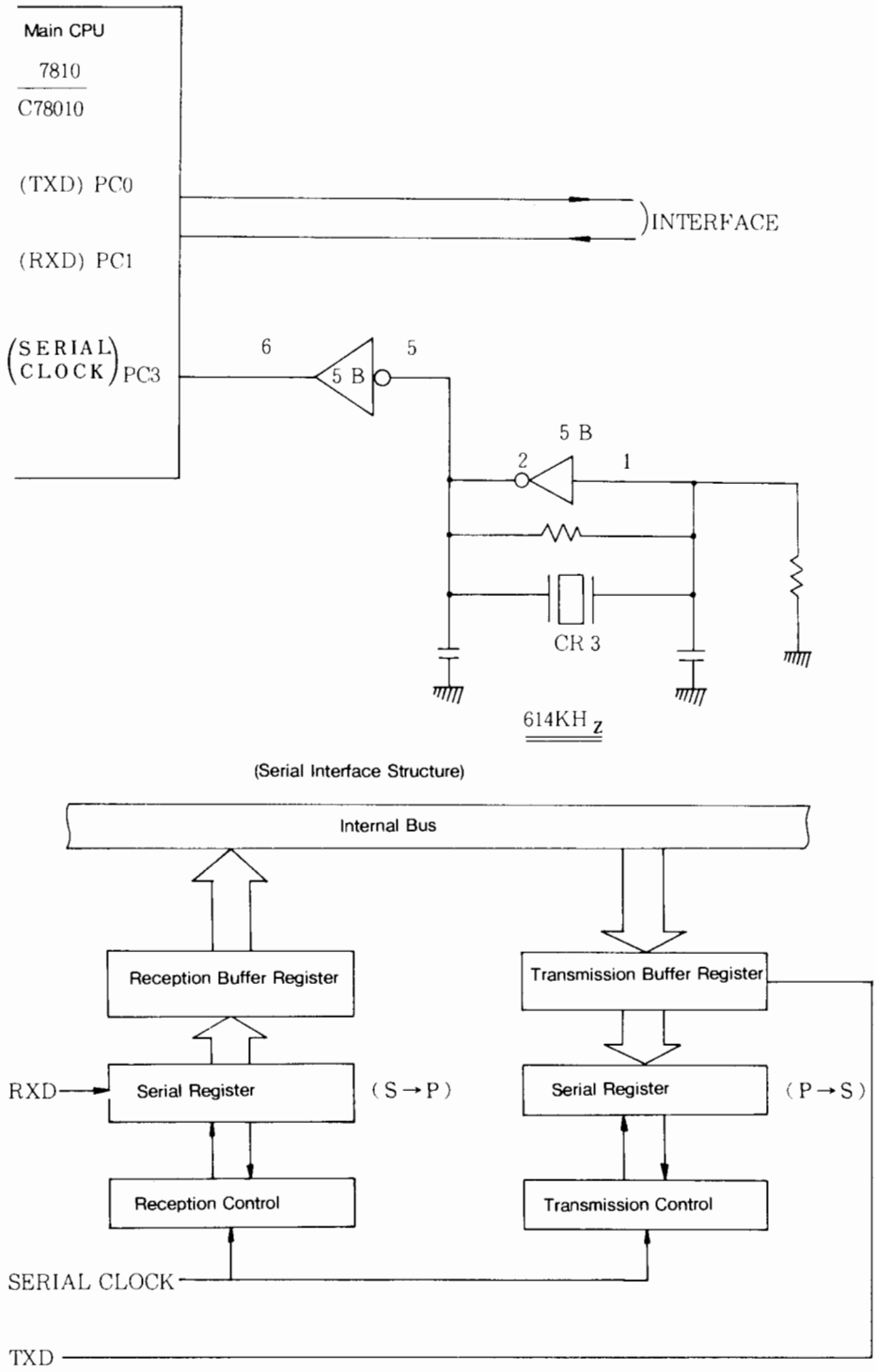
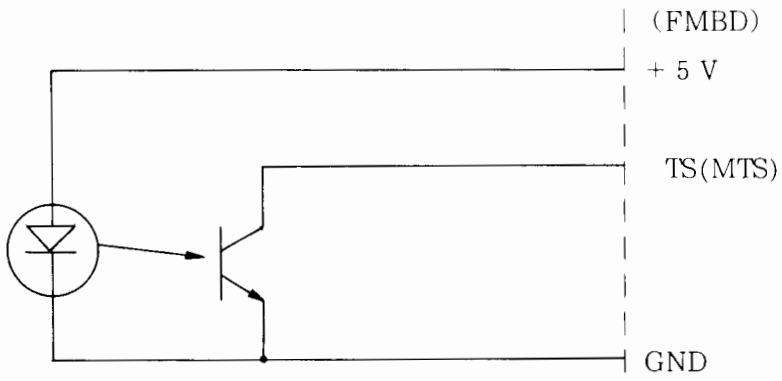


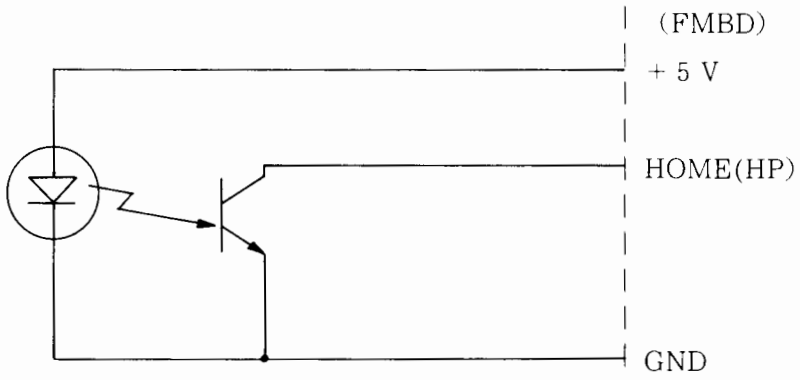
Figure A-13. Serial Interface Structure

A-11.12 Motor Timing Signal (MTS), Home (HP), and Paper End (PE)

a. MTS



b. HP



c. PE

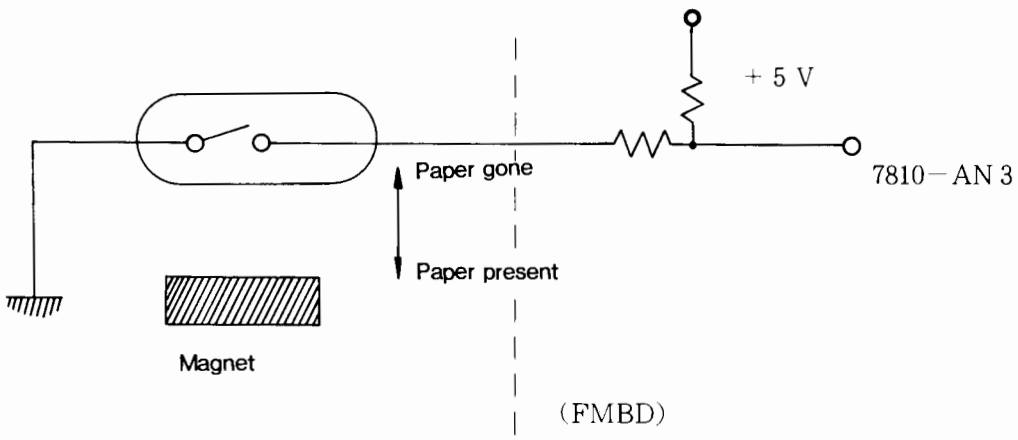


Figure A-14. MTS, HP, and PE Circuits

A-12. Description of Principal ICs

A12.1 uPD7811 (7810)

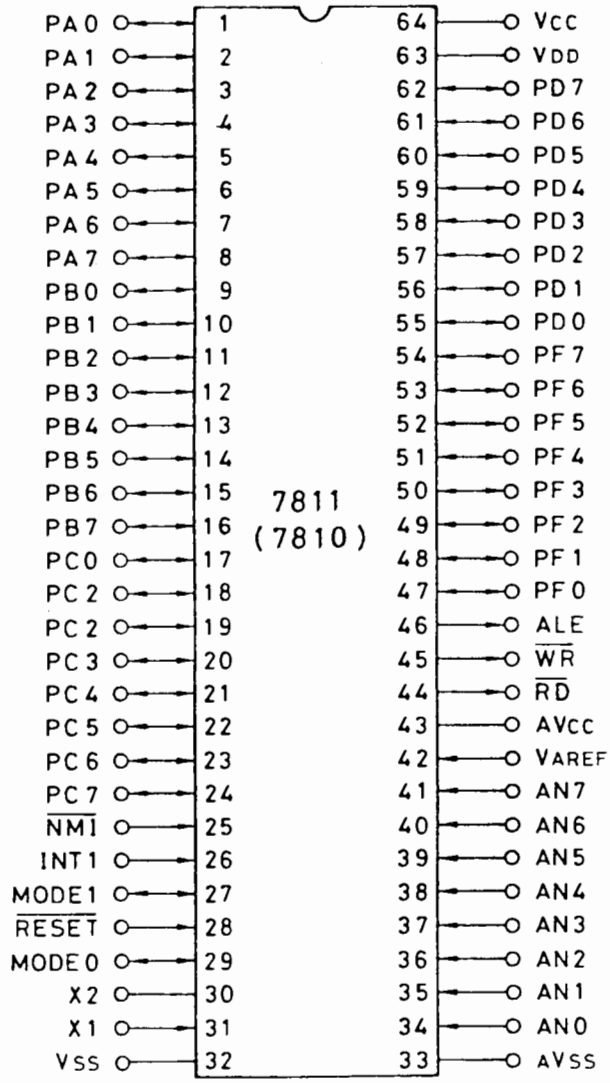


Figure A-15. 7810 Pin Configuration

Table A-14. 7810 Pin Functions

PA7-0: Port A	MODE 0.1: Mode 0.1
PB7-0: Port B	X1, X2: Crystal
PC7-0: Port C	AN7-0: Analog Input
PD7-0: Port D	RD: Read Strobe
PF7-0: Port F	WR: Write Strobe
NMI: Nonmaskable Interrupt	ALE: Address Latch Enable
INTI: Interrup Request	RESET: Reset
VAREF: Reference voltage	

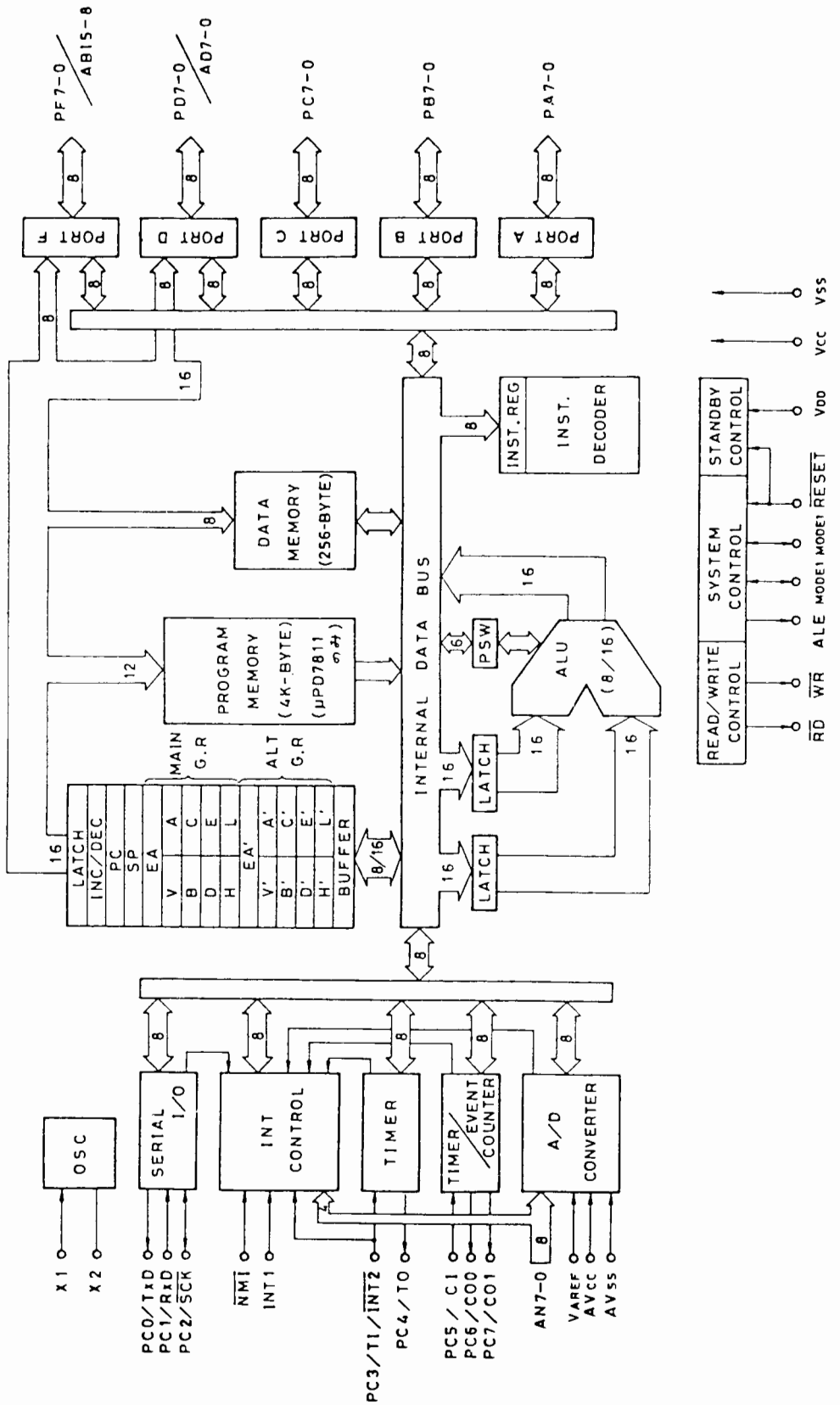


Figure A-16. 7810 Block Diagram

a. Features of the uPD7811 (7810)

Instructions:	158 kinds
Instruction cycle:	1 usec
Built-in Mask-ROM (uPD7811)	4096 bytes
Built-in RAM:	256 bytes
Direct addressing of up to 64K bytes possible:	
8 bit A/D converter	
General-purpose serial interface:	Asynchronous mode Synchronous mode I/O interface mode
16-bit timer/event counter	
8-bit timer	Two
Interrupt (3 external, 8 internal):	6 level priority 6 interrupt addresses
I/O line Input/Output port Edge detection input	 40 bits (uPD7811) 28 bits (uPD7810) 4 inputs
Zero cross detecting function Standby function	
Built-in clock pulse circuit NMOS	

b. Differences between the uPD7811 and the uPD7810

The uPD7811 has a built-in mask ROM at addresses 0 to 0FFF that is not contained in the uPD7810; both have RAM at addresses FF00 to FFFF.

c. Functions of the uPD7811 and the uPD 7810

Port A: 8-bit input/output port with output latch. Bit-by-bit input/output is made possible by Mode A register (MA).

Port B: 8-bit input/output port with output latch. Bit-by-bit input/output is made possible by Mode B register (MB).

Port C: 8-bit input/output port with output latch. Bit-by-bit port/control mode can be set by Mode Control C register (MCC).

Port D: 8-bit input/output port with output latch.

7811
Port mode: 8-bit input/output possible.

Extension mode: When the memory is extended beyond the built-in memory, PD7-0 act as the multiplex address/data bus (AD7-0)

7810

Port D acts only as the multiplex address/data bus to access external memory.

Port F: 8-bit input/output port with output latch.

7811

Port bit-by-bit input/output is made possible by Mode F register. Extension mode: stepwise address output assignment is possible depending upon the the size of memory to be extended externally. Refer to table A-15.

Table A-15. Operation of 7811 Port F

PF7	PF6	PF5	PF4	PF3	PF2	PF1	PF0	External Memory (max.)
Port	Port	Port	Port	Port	Port	Port	Port	256 bytes
Port	Port	Port	Port	AB11	AB10	AB9	AB8	4K bytes
Port	Port	AB13	AB12	AB11	AB10	AB9	AB8	16K bytes
AB15	AB14	AB13	AB12	AB11	AB10	AB9	AB8	60K bytes

7810

By setting Modes 0 and 1, assignment to the address bus (AB15 to AB8) can be made depending upon the size of the memory to be provided externally. The remaining terminals can be used as input/output ports. Refer to table A-16.

Table A-16. Operation of 7810 Port F

Mode 1/0	PF7	PF6	PF5	PF4	PF3	PF2	PF1	PF0	External Memory
0/0	Port	Port	Port	Port	AB11	AB10	AB9	AB8	4K bytes
0/1	Port	Port	AB13	AB12	AB11	AB10	AB9	AB8	16K bytes
1/1	AB15	AB14	AB13	AB12	AB11	AB10	AB9	AB8	64K bytes

WR (Write Strobe) - Output

Strobe signal for write to external memory operation.
HIGH level at times other than the data write to external memory machine cycle and at reset.

RD (Read Strobe) - Output

Strobe signal for read from external memory operation.
HIGH level at times other than the read to external memory machine cycle and at reset.

ALE (Address Latch Enable) - Output

Strobe signal to latch the lowest 8 bits of address to access external memory.

MODE 0, MODE 1 (Mode) - Input/Output

7811: Mode 0 is set at the LOW level, and MODE 1 is set at the HIGH level.

7810: Mode 0 and Mode 1 are set depending upon the size of the external memory. Refer to table A-17.

Table A-17. 7810 Mode 0, Mode 1 Operation

Mode 1	Mode 0	External Memory
0	0	4K bytes; Addresses 0 to 0FFF
0	1*	16K bytes; Addresses 0 to 3FFF
1*	1*	64K bytes; Addresses 0 to FEFF

* - The Mode terminal is pulled up to the HIGH level.

The following two functions are made possible by pulling up the Mode terminal:

Mode 0: Output of IO/M in synchronism with ALE.
Mode 1: Output of MI in synchronism with ALE.

NMI (Non-Maskable Interrupt) - Input

Non-maskable interrupt of the edge trigger (trailing edge).

INTI (Interrupt) - Input

Maskable interrupt input of the edge trigger (leading edge). It can also be used as the ac input zero cross detecting terminal.

AN7-0 (Analog Input) - Input

8 analog inputs to the A/D converter. AN7 to 4 can used as the input terminals to detect the leading edge and to set the flag upon detection of the trailing edge.

VAREF (Reference Voltage) - Input

Reference voltage input to the A/D converter.

AVcc (Analog Vcc)

Power terminal for the A/D converter.

AVss (Analog Vss)

Ground terminal for the A/D converter.

VDD

Power supply to the built-in RAM which supplies +5V during normal operation and standby.

X1,X2 (Crystal)

Crystal terminal for built-in clock pulse. When the clock pulse is supplied from the outside, input must be made to X1

RESET (Reset)

Reset input is at the LOW level.

At the reset input, conditions of the respective ports are as follows:

Port A: Input port (output high impedance)

Port B: Input port (output high impedance)

Port C: Input port (output high impedance)

Port D:

uPD7811: Input port (output high impedance)
uPD7810: Address output at PD7 to 0

Port F:

uPD7811: Input port (output high impedance)
uPD7810: Terminal designated by the address bus is for address output
Port terminal becomes an input port.

Timing

Three cycles of oscillation frequency are defined to be one state.

One machine cycle requires three states for read or write operation, and OP code fetch requires four states.

Wait state can not be inserted.

OP Code Fetch Timing

Of the T1 to T4 states that constitute the OP code fetch timing, T1 to T3 are for read of the program memory and T4 is for internal processing (interpretation of the instruction).

AB15 to 8 (PF 7 to 0) are output to T1 to T4.

AD7 to 0 (PD7 to 0) are of the multiplex mode; the address is latched in T1 state at the ALE signal. Since the memory addressed is enabled after the disabling of the AD7 to 0 driver, the RD signal is output to T1 to T3, fetched at T3, and processed internally at T4.

Memory Read Timing

This timing comprises T1 to T3 states.

Except for T4 of OP code fetch, the same thing applies to the address output, ALE, and RD signals

Memory Write Timing

This timing comprises T1 to T3 states.

The same thing as the memory read machine cycle applies to the address output and ALE signal. However, after an address output, AD7 to 0 (PD7 to 0) are not disabled and the write data is output at AD7 to 0 from the beginni of T2 to the end of T3.

The WR signal is output from the middle of T1 to the start of T3.

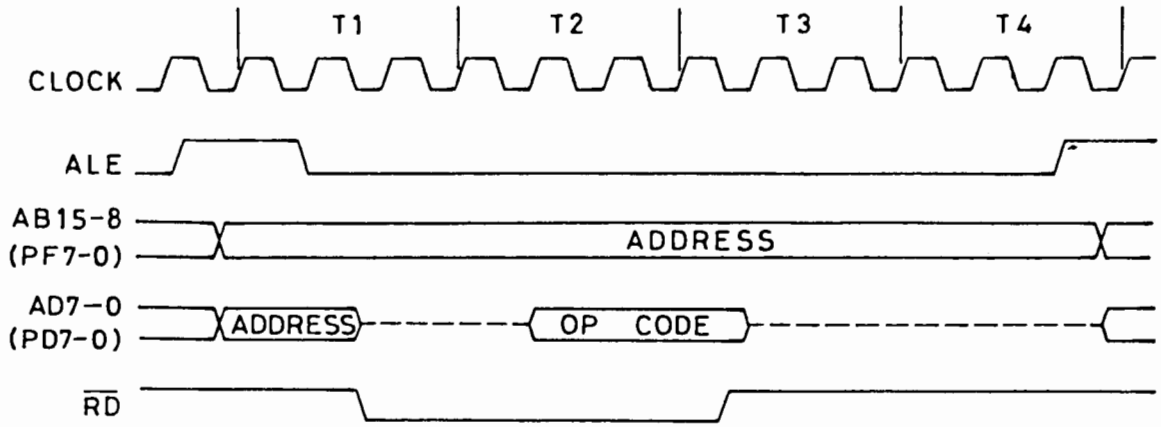


Figure A-17. OP Code Fetch Timing

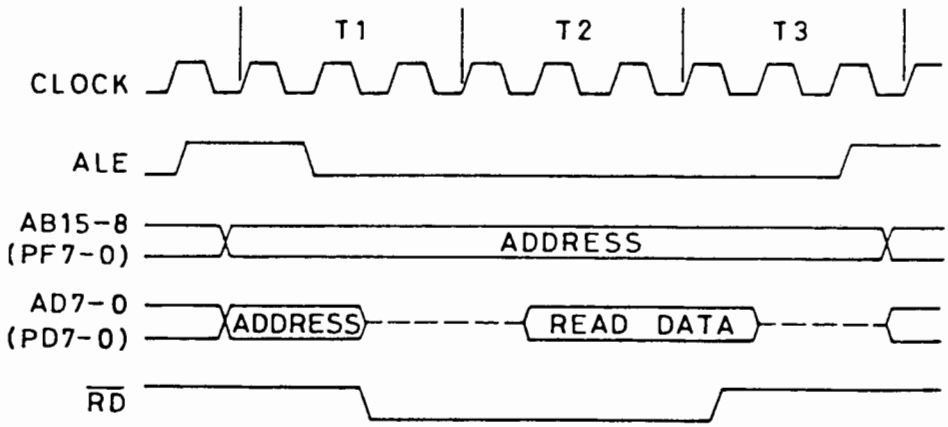


Figure A-18. Memory Read Timing

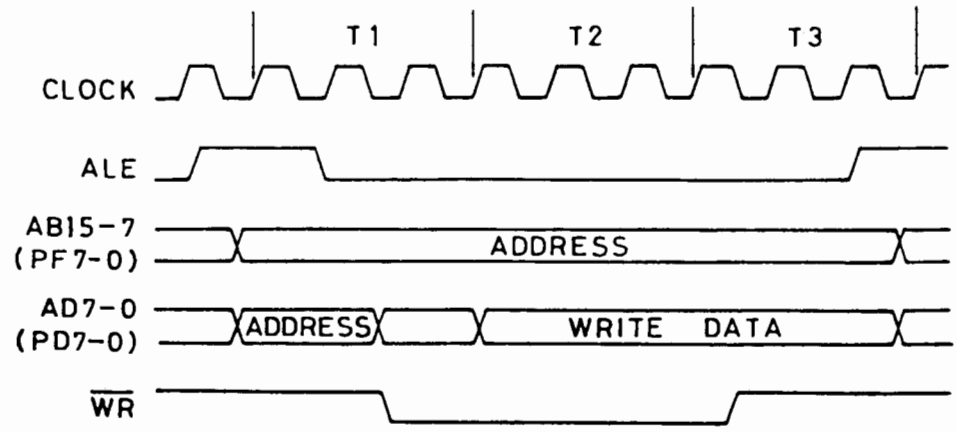
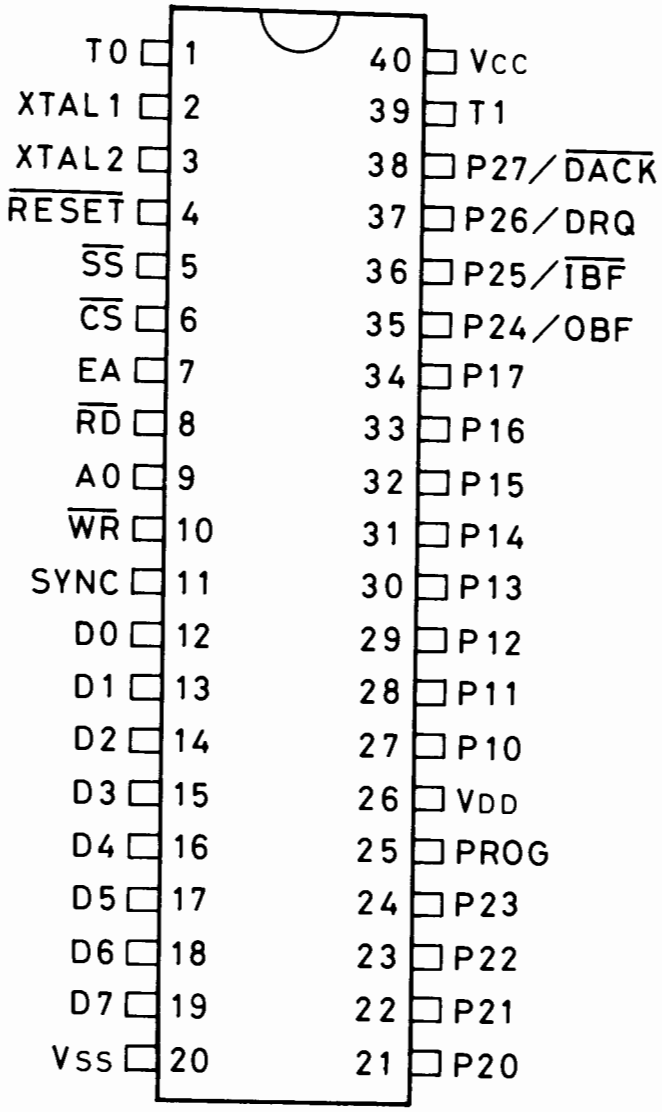


Figure A-19. Memory Write Timing

A-12.2 MBL 8042



XTAL1, XTAL2	:	Crystal
RESET	:	Reset
TO	:	Test Input 0
EA	:	External Address
D7-DO	:	Data Line (Lower Address Line)
P22-P20	:	Higher Address
RROG	:	Program Puogram Pulse Input Terminal

Figure A-20. 8042 Terminal Layout

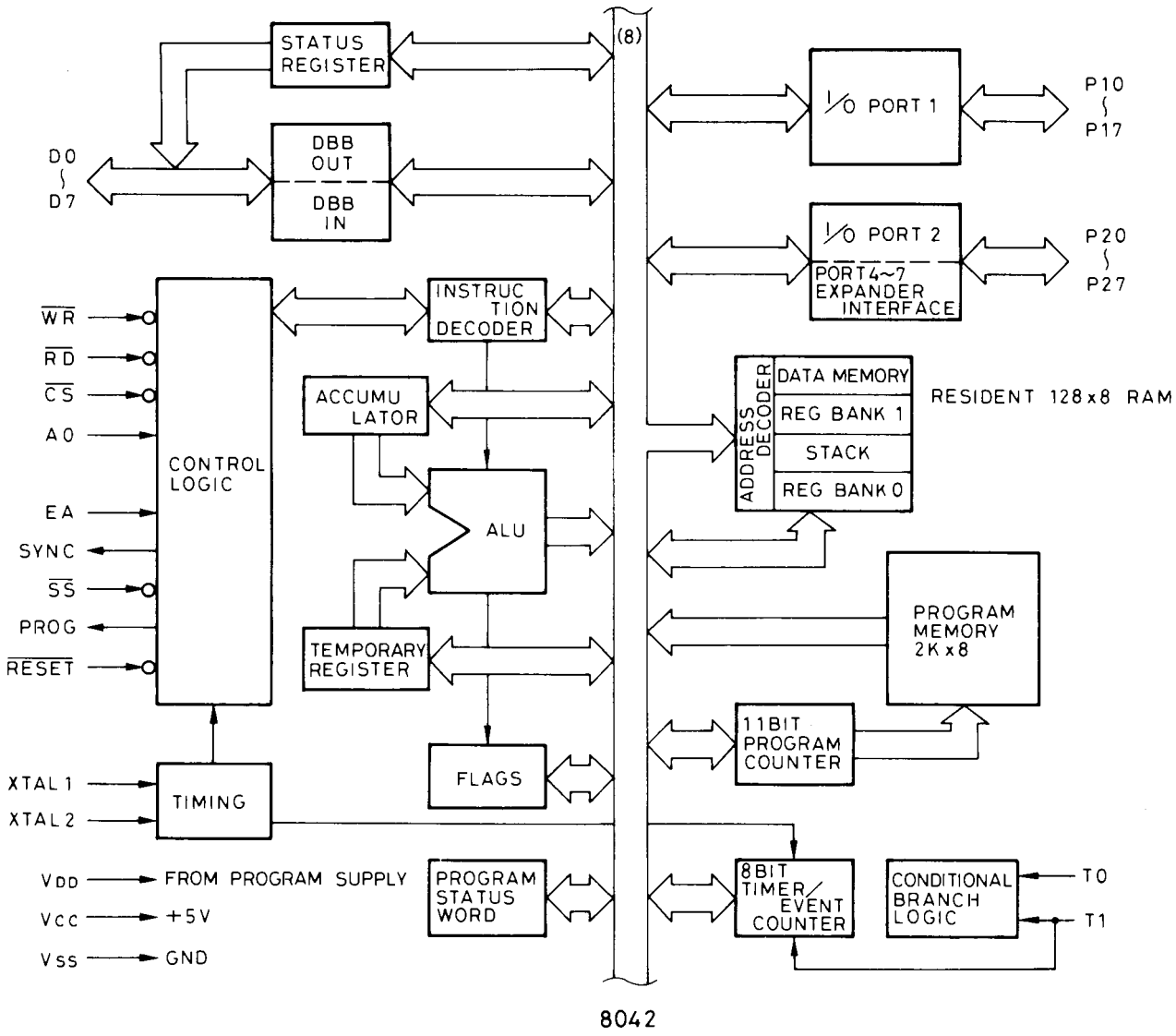


Figure A-21. 8042 Block Diagram

a. Features

8-bit microprocessor unit

Built-in 2K byte ROM

Built-in 128 byte RAM

8-bit I/O port (two sets)

Two test input lines

Built-in 11-bit program counter

Built-in 8-bit timer/counter

Built-in clock generator

8-bit status register

Two data buffer registers

93 instructions

DMA handshake interrupt request function

b. 8042 Terminal Functions

T0,T1 (Test Input 0,1) Input

Input terminals for testing by conditional branch instruction. T1 also serves for the event input of the event counter.

XTAL 1, 2 (Crystal 1, 2)

Crystal connection terminals for the built-in clock.

RESET Input

SS (Single Step) Input

Terminal for control of the single step operation. At the "L" level, the MPU stops upon completion of the command being executed.

CS (Chip Select) Input

Chip select for selection of UPI.

EA (External Address) Input

Terminal for emulation and test of the UPI. At the input of "L" and "H" level in normal operation, the UPI enters the test mode.

RD (Read Strobe) Input

Strobe signal for the master processor to read out output data buffer register.

AO (Address 0) Input

AO = "L" Read-out of data from output data bus buffer register or write-in of data to input bus buffer register.

AO = "H" Read-out from status register or write-in of command to input data bus buffer register.

WR (Write Strobe) Input

Strobe signal for the master processor to write data or command in input data bus buffer register.

SYNC (Synchronism)

Signal output for an instruction cycle. SYNC output is used as a strobe signal to external circuits. It is also used to synchronize single step operation.

D0 to D7 (Data) Input/Output

8-bit bidirectional data bus.

Except when the master processor is reading out the UPI, the data bus is in high impedance.

P20 to P27 (I/O port 2) Input/Output

In addition to the ordinary functions of the I/O ports, there are the following functions:

The lower four bits (P20 tO P23) can also serve as the interface ports with the MBL 8243 I/O expander. When the expanded I/O ports (Ports 4 to 7) are accessed, the address, command, and data are transmitted. In single step operation, the higher three bits of program fetch address are output to P22 and P20.

By software control, the following higher four bits (P24 to P27) can be used as the terminals for interrupt request and DMA (Direct Memort Access) handshake:

P24: OBF (Output Data Bus Buffer Register Fu11) output terminal
P25: IBF (Input Data Bus Buffer Register Fu11) output terminal
P26: DRQ (DMA Request) output terminal
P27: DACK (DMA Acknowkledge) input terminal

PROG (Program) Input/Output

Strobe signal to the 8243 I/O expander.

This terminal serves as the input terminal of the program pulse at write to the ROM inside the 8742 (with built-in EPROM)

VDD

+5V power source for the built-in RAM.

P10 to P17 (I/O Port 1) Input/Output

8-bit bidirectional I/O port

In single step operation, these terminals serve as the output terminals for the lower eight bits of program fetch address.

T1 (Test 1)

VCC

+5V power supply terminal

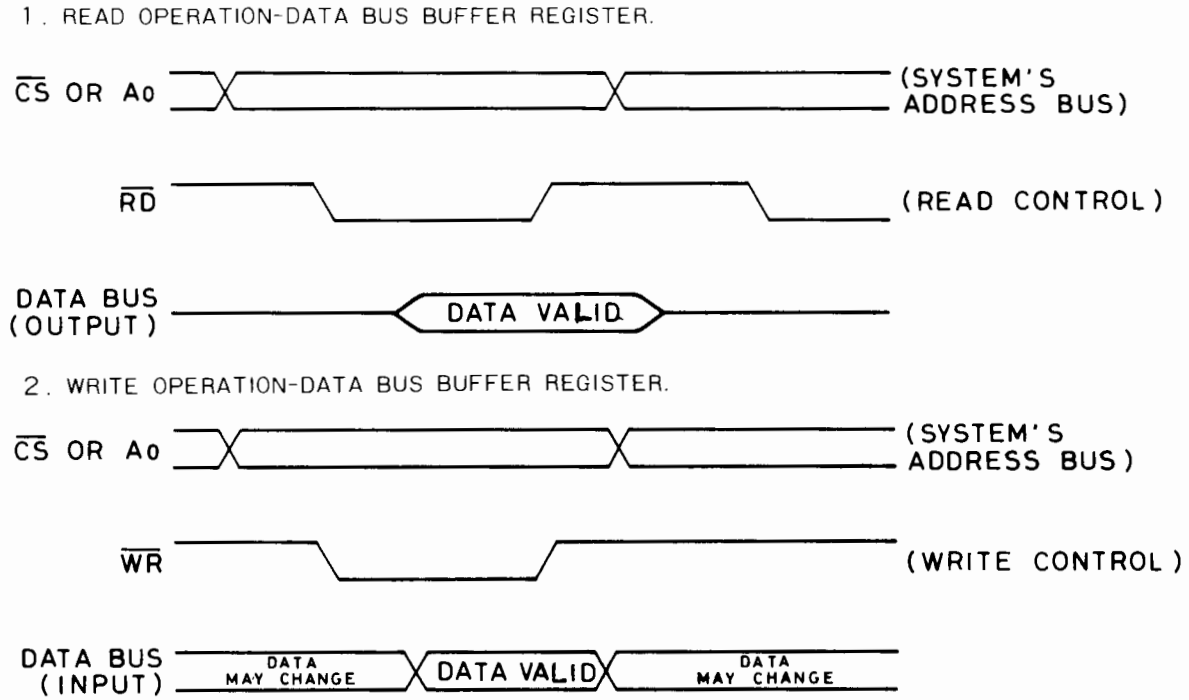
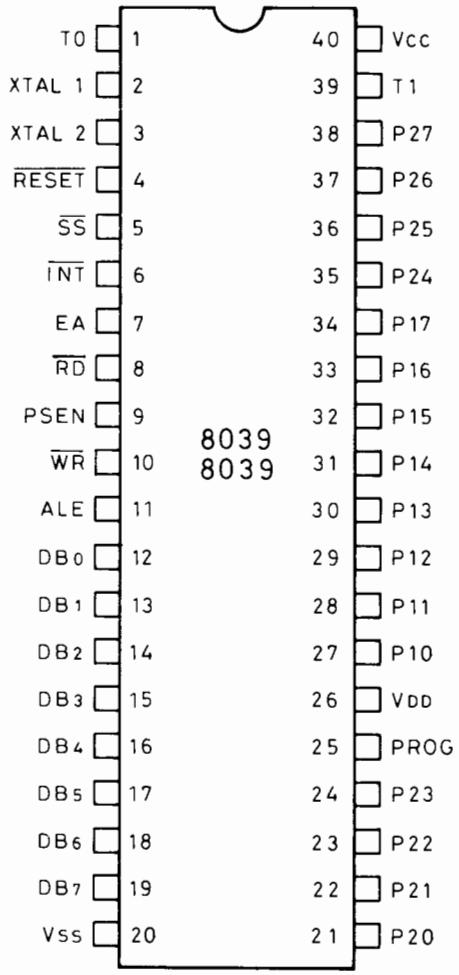


Figure A-22. 8042 Timing Diagram

A-12.3 8039/8049

The 8039 and 8049 microprocessors each have 128X8 RAM data memory, 27 I/O lines, an 8-bit timer/event counter, an 8-bit CPU, and a clock. The 8049 has, in addition, a 2Kx8 program memory.



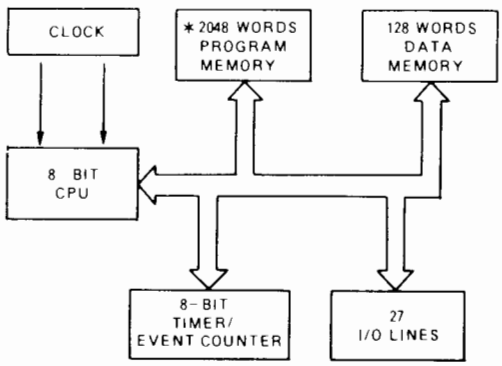


Figure A-23. 8039/8049 Pin Configuration

a. Terminal Functions of the 8039/8049

PROG: Strobe for the 8243 I/O expander

P10 to P17: 8-bit bidirectional port (Port 1)

P20 to P27: 8-bit bidirectional port (Port 2)

P20 to P23 hold the higher four bits of the program counter while the external program is taken out, thereby serving as the 4-bit expander bus of the 8243.

D0 to D7: 8-bit bidirectional bus

While the external program memory is taken out, these terminals hold the lower 8 bits of the program counter and receive the instruction addressed under PSEN control. During store instruction of external RAM data, they hold the address data under ALE, RD, and WR control.

T0: Test input pin. Designation for clock output by ENTO CLK instruction is possible.

T1: Test input pin. Designation for timer/counter input by STRT CNT instruction is possible.

INT: Interrupt pin.

RD: Strobe signal activated during BUS read.

WR: Strobe signal activated during BUS write.

RESET: Signal to initialize the processor.

ALE: Address latch strobe signal.

This signal is output once each conditional cycle and can be used as a clock signal.

At the negative end of ALE, the address is strobed to the external data/program memory.

PSEN: Program strobe enable.

This output is produced only once when data is being sent to the external program memory.

SS: Single step input that can be used in combination with the ALE signal.

EA: External access input to be taken out for forced comparison of the total program memory and external memory. It can be used for emulation and debug.

XTAL 1,2: Crystal connection terminals.

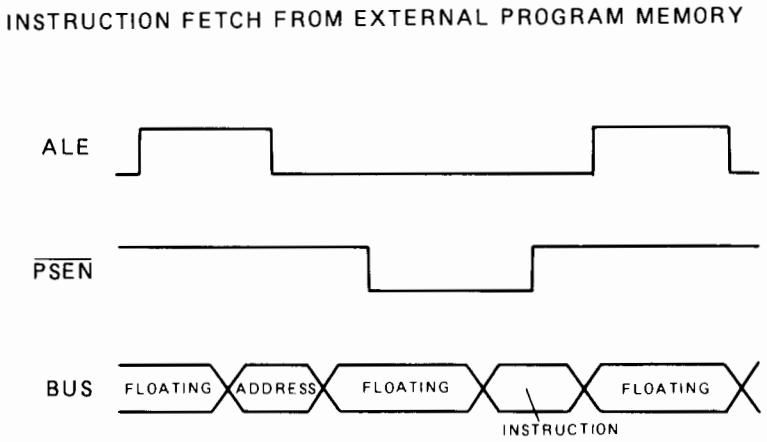
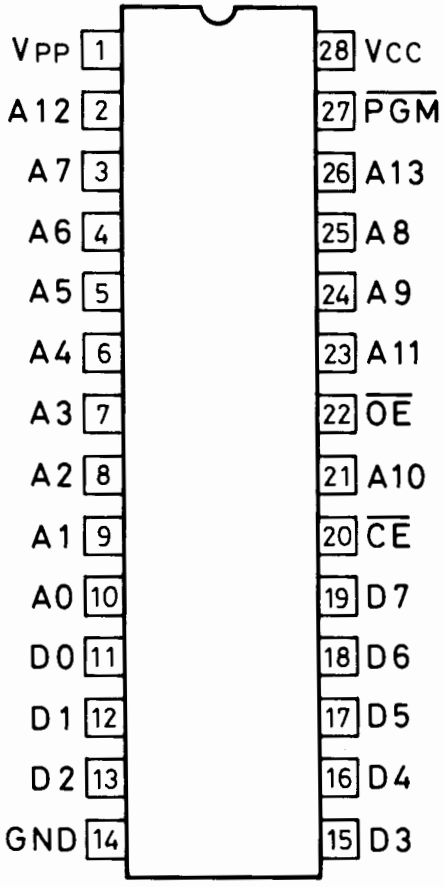


Figure A-24. 8039/8049 Timing Diagram

A-12.4 27128 16K Byte PROM, 2764 8K Byte PROM, and 2716 2K Byte PROM

At the input/output level of a single 5V power supply, these memories are TTL compatible in both program modes at read.

Operation is controlled by the Chip Enable CE single. At the trailing edge of CE, the device is activated and at the same time the address is latched. And after the determination of output, data is retained until the leading edge of CE.

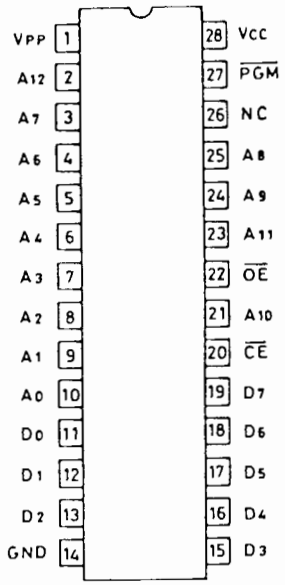


AO to A13	:	Address Designation
DO to D7	:	Data Output Terminal
$\overline{OE}$	:	Output Enable
$\overline{CE}$	:	Chip Enable
$\overline{PGM}$	:	Program Terminal
VCC	:	5V Voltage Terminal

Figure A-25. 27128 Pin Configuration and Terminal Functions

2764 8KB PROM

AO to A12	:	Address Designation
DO to D7	:	Data Output Terminal
$\overline{OE}$	:	Output Enable
$\overline{CE}$	:	Chip Enable
$\overline{PGM}$	:	Program Terminal
VCC	:	5V Voltage Terminal



At the input/output level of a single 5V power supply, this memory is TTL compatible in both program modes at read.

Operation is controlled by the Chip Enable $\overline{CE}$ single. At the trailing edge of $\overline{CE}$, the device is activated and at the same time the address is latched. And after the determination of output, data is retained until the leading edge of $\overline{CE}$.

Figure A-26. 2764 Pin Configuration and Terminal Functions

2716 (2KB PROM)

AO to A10	:	Address Designation
DO to D7	:	Data Output Terminal
$\overline{CS}$	:	Chip Select
PGM	:	Program Terminal

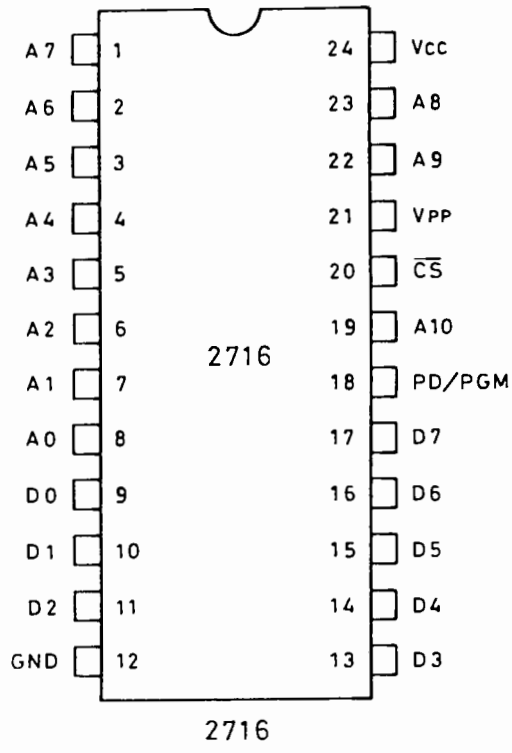
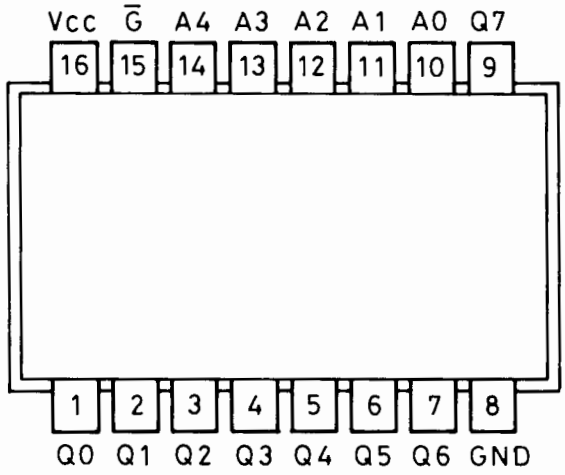


Figure A-27. 2716 Pin Configuration and Terminal Functions

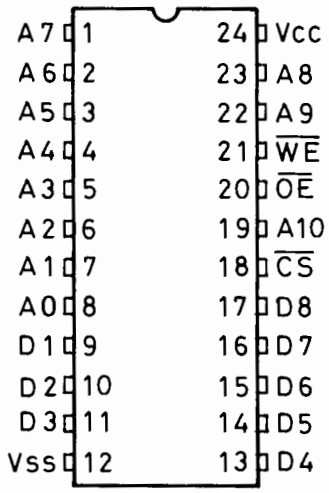
A-12.5 18S030 Programmable ROM



Output requires pull-up because of the open collector output.

Figure A-28. 18S030 Pin Configuration and Terminal Functions

A-12.6 4016/6116 2K Byte Static RAM

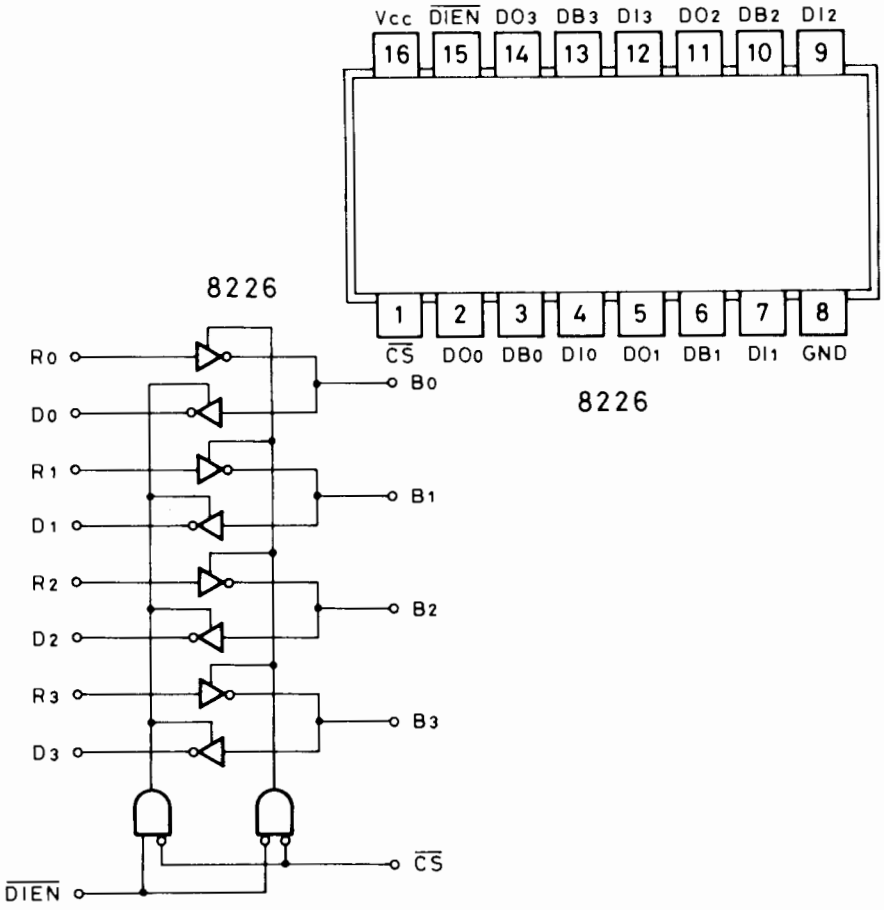


4016/6116

AO to A10	:	Address Designation
DO to D7	:	Data Input/Output Terminal
$\overline{OE}$	:	Output Enable
$\overline{WE}$	:	Write Enable
$\overline{CS}$	:	Chip Select

Figure A-29. 4016/6116 Pin Configuration and Terminal Functions

A-12.7 8226 Data Bus Buffer

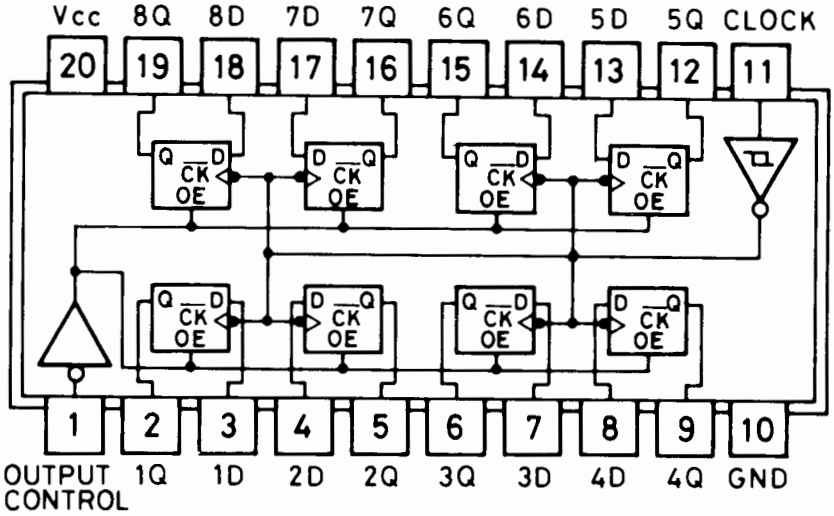


DBO to DB3	:	Bidirectional Data Bus
DIO to DI3	:	Data Input
DO3 to DO3	:	Data Output
$\overline{DIEN}$	:	Data In Enable Direction control
$\overline{CS}$	:	Chip Select

$\overline{DIEN}$	$\overline{CS}$	
0	0	DI $\rightarrow \overline{DB}$
1	0	DB $\rightarrow \overline{DO}$
0	1	High impedance
1	1	High impedance

Figure A-30. 8226 Pin Configuration and Terminal Functions

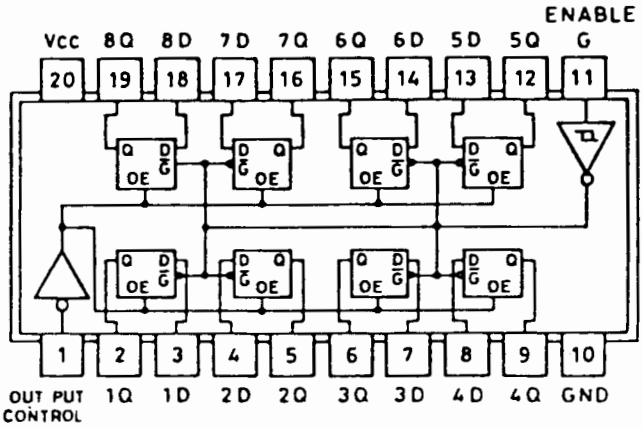
A-12.8 74LS374 8-Bit D-Type Flip-Flop

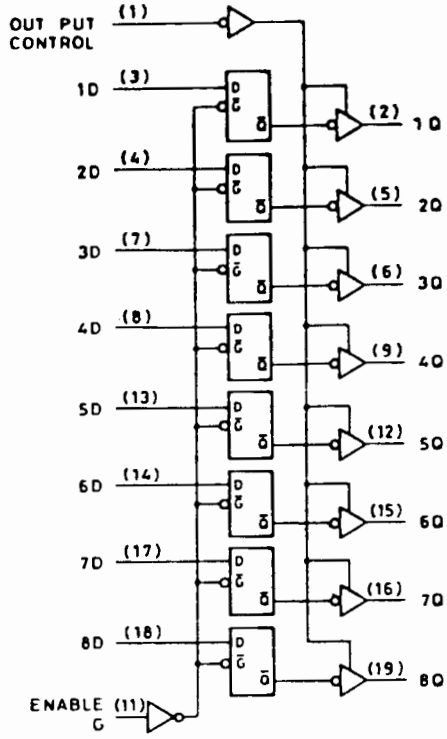


OUTPUT CONTROL	CLOCK	D	OUTPUT
L	↑	H	H
L	↑	L	L
L	L	X	Qo
H	X	X	Z

Figure A-31. 74LS374 Pin Configuration and Terminal Functions

A-12.9 74LS373 3-State 8-Bit Data Latch





At Output Control "H", 1Q to 8Q are of high impedance.
With G changed from "H" to "L", the data is latched.

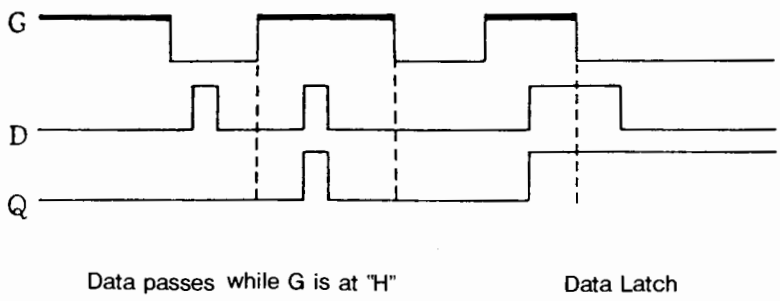
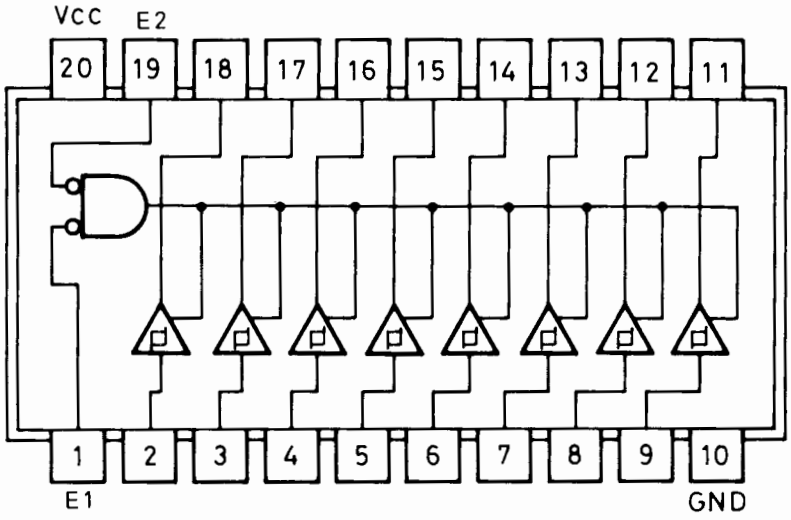


Figure A-32. 74LS373 Pin Configuration and Timing

A-12.10 74LS541 3-State 8-Bit Buffer



Data input is of Schmitt type.

Input		Output
E1	E2	
L	L	D
H	X	High-Z
X	H	

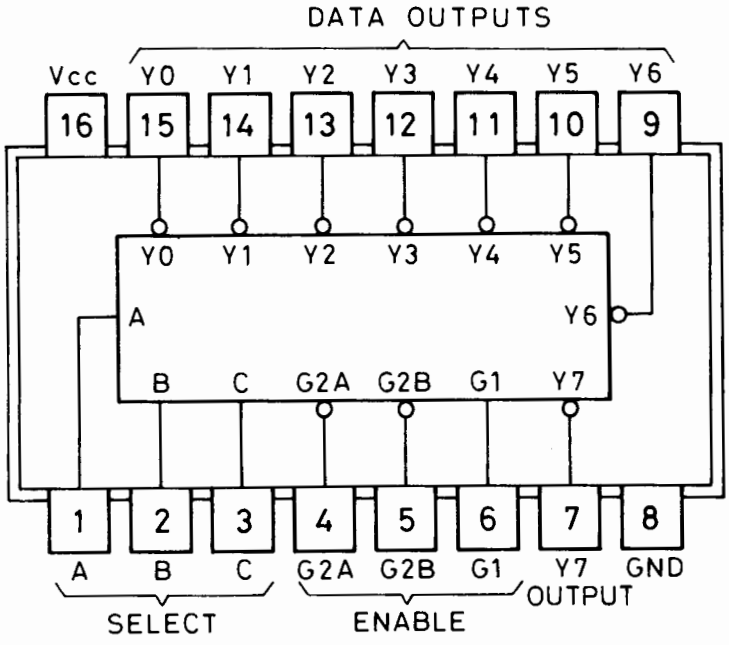
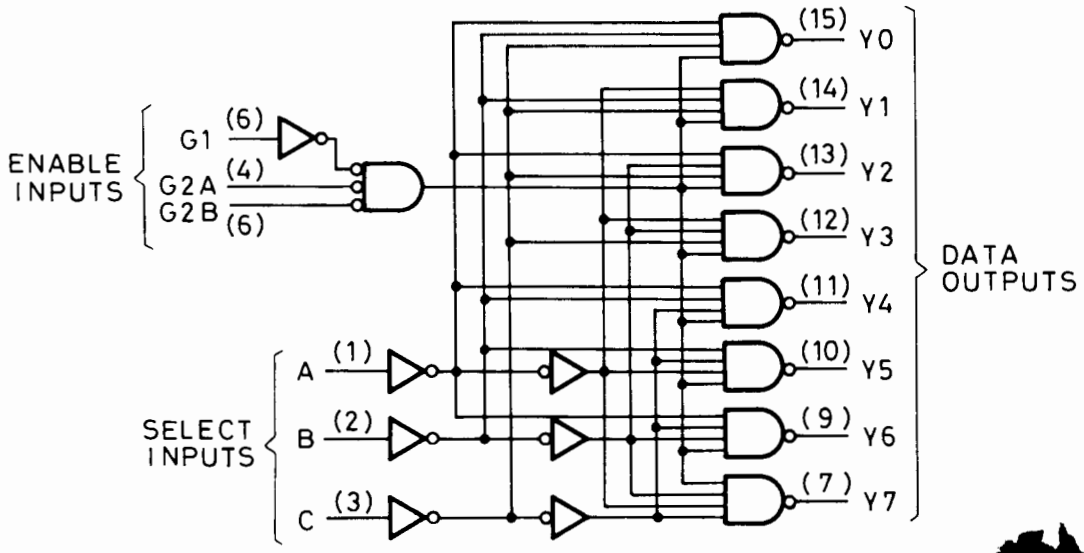


Figure A-33. 74LS541 Pin Configuration

A-12.11 74LS138 3 to 8 Line Decoder



C	A	Y
L	H	H
L	L	L
H	H	High impedance
H	L	High impedance

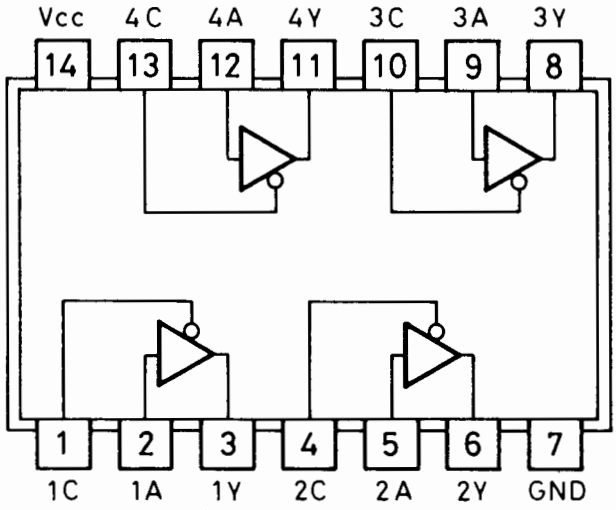
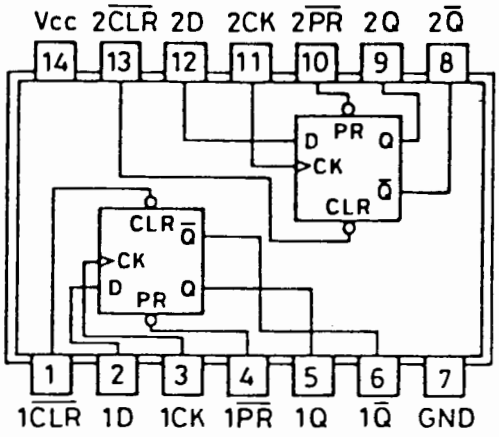
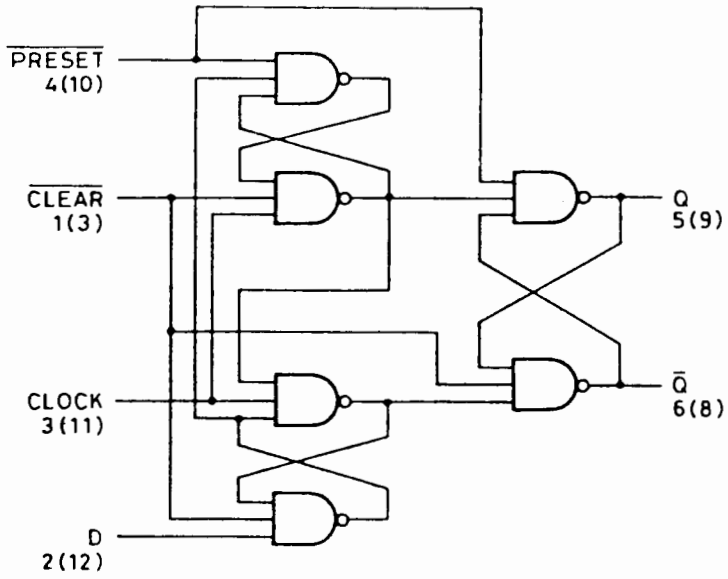


Figure A-34. 74LS138 Pin Configuration and Schematic Diagram

A-12.12 74LS74 Preset Clear DF/F



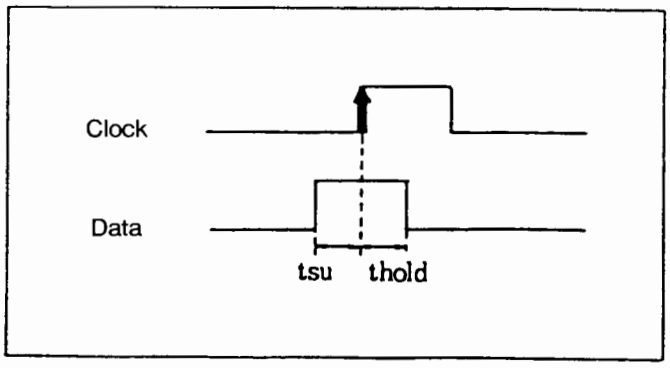


Leading edge trigger POS type

Q = H when "L" is added to $\overline{\text{PRESET}}$.

$\overline{Q}$ = H when "L" is added to $\overline{\text{CLEAR}}$.

At read-in of data by FF, time more than tsu and thold must be taken before and after the clock edge.

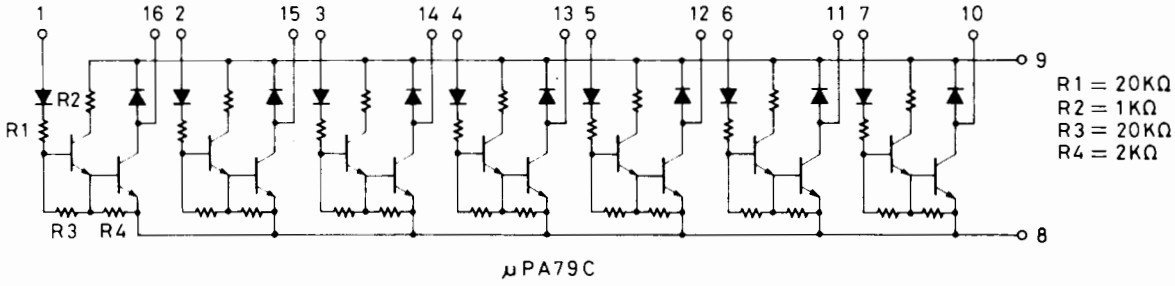


tsu = 25 ns (MIN)

thold = 5 ns (MIN)

Figure A-35. 74LS74 Pin Configuration and Schematic Diagram

A-12.13 uPA79C Silicon Transistor Array



D1 : Reverse bias prevention diode

D2 : Surge absorption diode

Figure A-36. PA79C Schematic Diagram

A-12.14 STK 6982

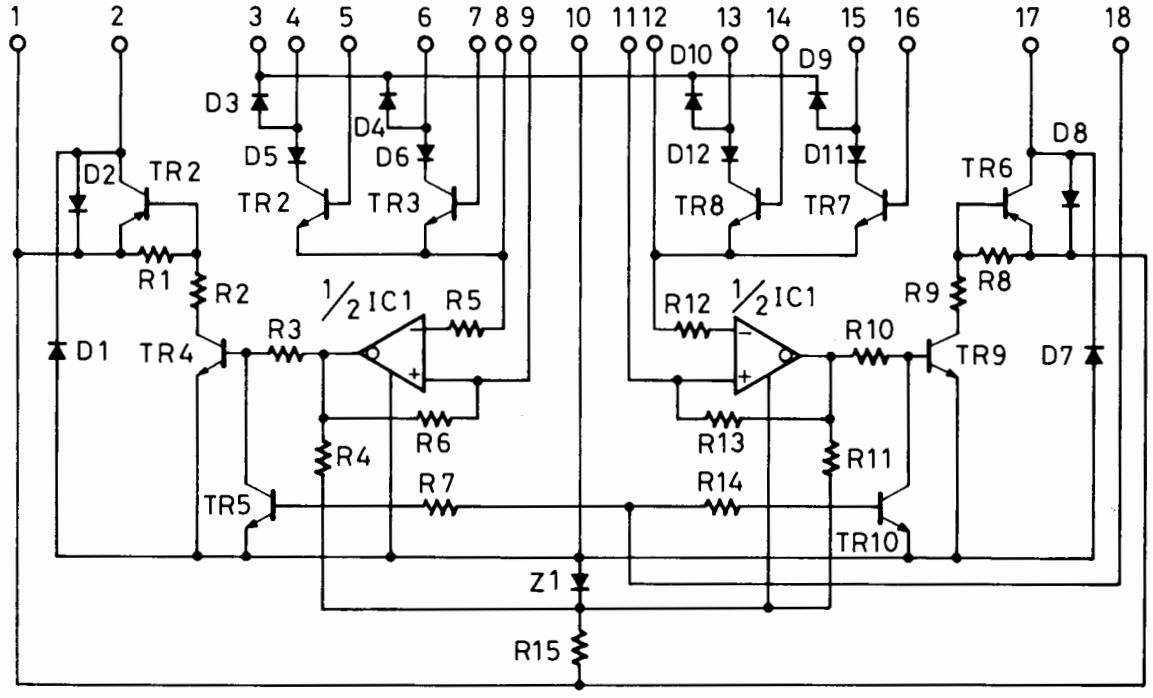


Figure A-37. STK 6982 Schematic Diagram

A-12.15 STK 7554

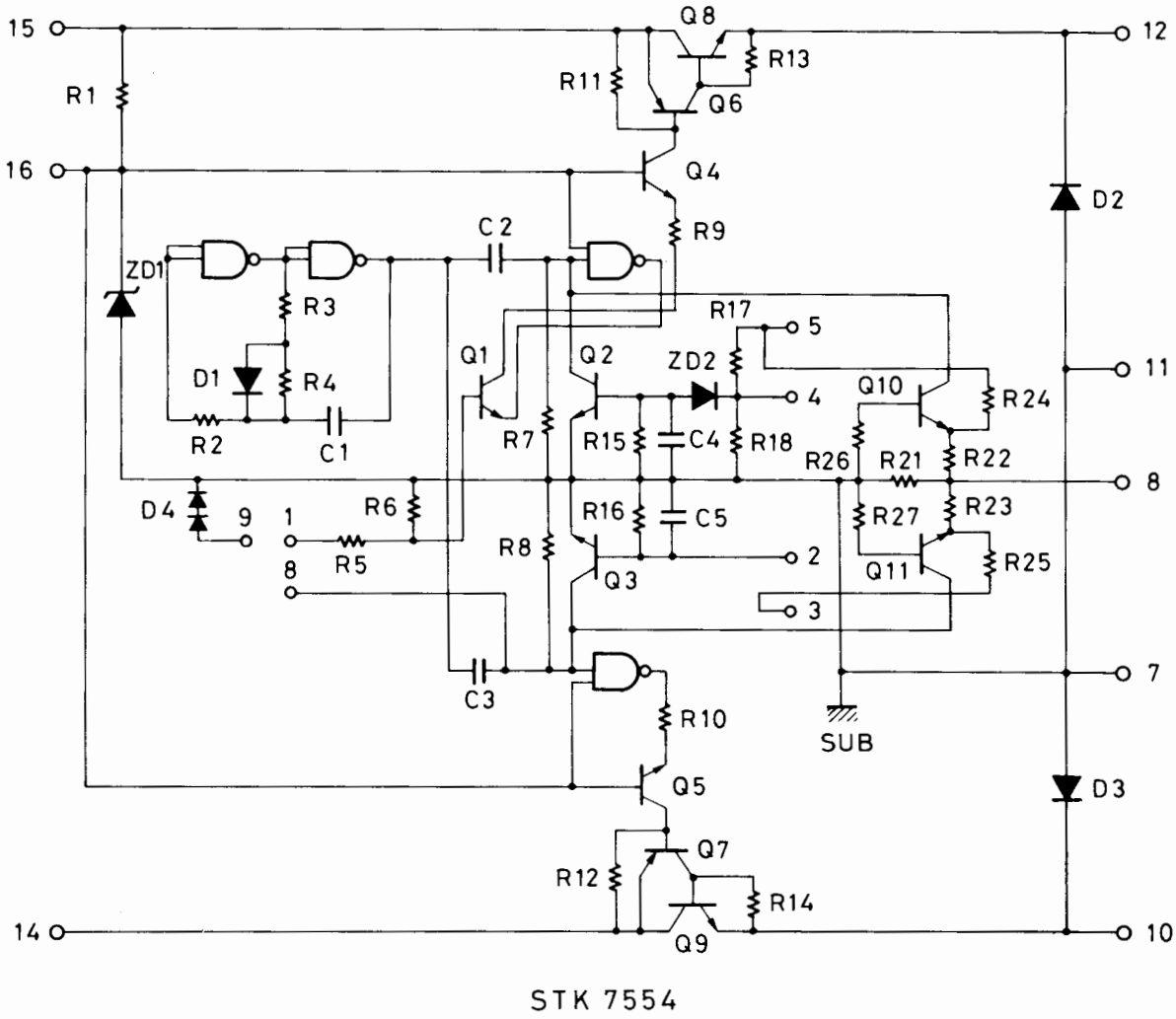


Figure A-37. STK 7554 Schematic Diagram (Continued)

A-12.16 74LS125 3-State Buffer

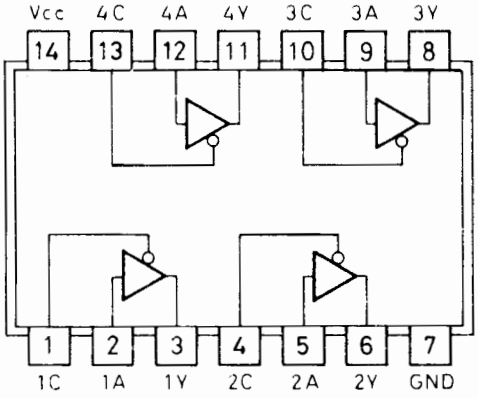


Figure A-38. 74LS125 Pin Configuration