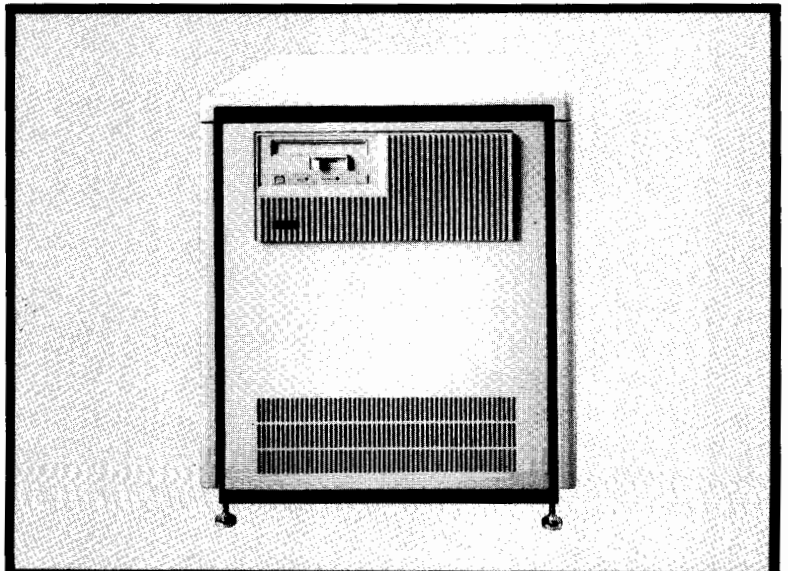
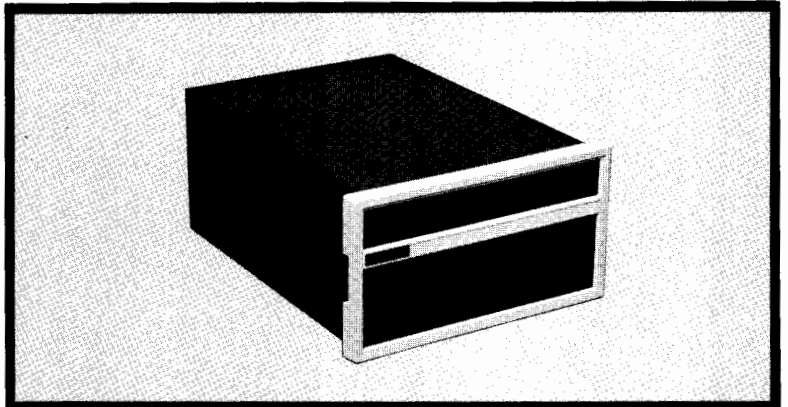
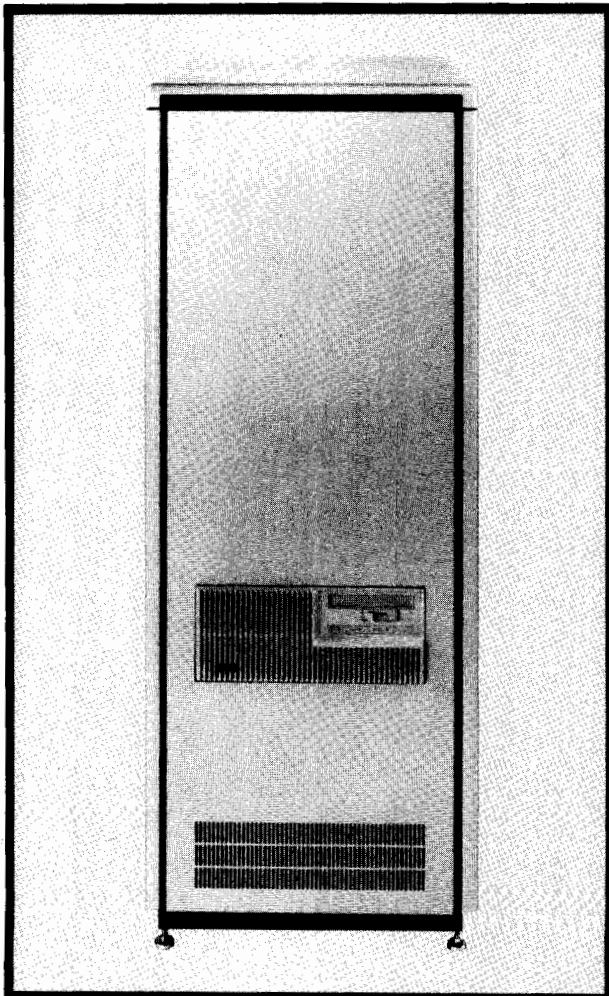


# HP 1000 A700 Computer

## Installation and Service Manual

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# HP 1000 A-Series



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# HP 1000 A700 Computer

## Installation and Service Manual

### FEDERAL COMMUNICATIONS COMMISSION RADIO FREQUENCY INTERFERENCE STATEMENT

The Federal Communications Commission (in 47 CFR 15.805) has specified that the following notice be brought to the attention of the users of this product.

**Warning:** This equipment generates, uses, and can radiate radio frequency energy and if not installed and used in accordance with the instruction manual, may cause interference to radio communications. It has been tested and found to comply with the limits for Class A computing devices pursuant to Subpart J of Part 15 of FCC Rules, which are designed to provide reasonable protection against such interference. Operation of this equipment in a residential area is likely to cause interference in which case the user at his own expense will be required to take whatever measures may be required to correct the interference.



# PRINTING HISTORY

The Printing History below identifies the Edition of this Manual and any Updates that are included. Periodically, Update packages are distributed which contain replacement pages to be merged into the manual, including an updated copy of this Printing History page. Also, the update may contain write-in instructions.

Each reprinting of this manual will incorporate all past Updates, however, no new information will be added. Thus, the reprinted copy will be identical in content to prior printings of the same edition with its user-inserted update information. New editions of this manual will contain new information, as well as all Updates.

To determine what software manual edition and update is compatible with your current software revision code, refer to the appropriate Software Numbering Catalog, Software Product Catalog, or Diagnostic Configurator Manual.

First Edition ..... Mar 1982  
Update 1 ..... Jul 1982

## NOTICE

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# SAFETY CONSIDERATIONS

**GENERAL** - This product and related documentation must be reviewed for familiarization with safety markings and instructions before operation.

## SAFETY SYMBOLS



Instruction manual symbol: the product will be marked with this symbol when it is necessary for the user to refer to the instruction manual in order to protect the product against damage.



Indicates hazardous voltages.



Indicates earth (ground) terminal (sometimes used in manual to indicate circuit common connected to grounded chassis).

## WARNING

The **WARNING** sign denotes a hazard. It calls attention to a procedure, practice, or the like, which, if not correctly performed or adhered to, could result in injury. Do not proceed beyond a **WARNING** sign until the indicated conditions are fully understood and met.

## CAUTION

The **CAUTION** sign denotes a hazard. It calls attention to an operating procedure, practice, or the like, which, if not correctly performed or adhered to, could result in damage to or destruction of part or all of the product. Do not proceed beyond a **CAUTION** sign until the indicated conditions are fully understood and met.

## CAUTION

### STATIC SENSITIVE DEVICES

Some of the semiconductor devices used in this equipment are susceptible to damage by static discharge. Depending on the magnitude of the charge, device substrates can be punctured or destroyed by contact or mere proximity to a static charge. These charges are generated in numerous ways such as simple contact, separation of materials, and normal motions of persons working with static sensitive devices.

When handling or servicing equipment containing static sensitive devices, adequate precautions must be taken to prevent device damage or destruction. Only those who are thoroughly familiar with industry accepted techniques for handling static sensitive devices should attempt to service the cards with these devices. In all instances, measures must be taken to prevent static charge buildup on work surfaces and persons handling the devices. Cautions are included through this manual where handling and maintenance involve static sensitive devices.

**SAFETY EARTH GROUND** - This is a safety class I product and is provided with a protective earthing terminal. An uninterruptible safety earth ground must be provided from the main power source to the product input wiring terminals, power cord, or supplied power cord set. Whenever it is likely that the protection has been impaired, the product must be made inoperative and be secured against any unintended operation.

**BEFORE APPLYING POWER** - Verify that the product is configured to match the available main power source per the input power configuration instructions provided in this manual.

If this product is to be energized via an auto-transformer (for voltage reduction) make sure the common terminal is connected to the earth terminal of the main power source.

## SERVICING

## WARNING

Any servicing, adjustment, maintenance, or repair of this product must be performed only by qualified personnel.

Adjustments described in this manual may be performed with power supplied to the product while protective covers are removed. Energy available at many points may, if contacted, result in personal injury.

Capacitors inside this product may still be charged even when disconnected from its power source.

To avoid a fire hazard, only fuses with the required current rating and of the specified type (normal blow, time delay, etc.) are to be used for replacement.

## WARNING

### EYE HAZARD

Eye protection must be worn when removing or inserting integrated circuits held in place with retaining clips.

# PREFACE

This manual provides installation and service instructions for the Hewlett-Packard 1000 A700 Computer. The HP 1000 A700 Computer is a high technology product and, because of the product design, a module replacement philosophy has been implemented to minimize on-site repair time. Supporting documentation for the HP 1000 A700 is as follows:

- a. HP 1000 A700 Computer Reference Manual, part no. 02137-90001.
- b. HP 1000 A700 User Control Store Installation and Reference Manual, part no. 02137-90003.
- c. HP 12156A Floating Point Processor Kit Installation and Reference Manual, part no. 12156-90001.
- d. HP 1000 A600/A700 Diagnostic Operating and Troubleshooting Manual, part no. 24612-90001.
- e. HP 24612A Diagnostic Package for A600/A700 Processor, Memory, and most interfaces.

An Engineering and Reference Document, part no. 02137-90005, is also available to those who wish in-depth knowledge about the HP 1000 A700 Computer. Consult the nearest Hewlett-Packard Sales and Service Office for details regarding this document. A list of HP Sales and Service Offices is provided at the back of this manual.

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# INSTALLATION

SECTION

I

This section provides instructions that will enable the user to install the HP 1000 A700 Computer (HP 2137A). Included in this section is user information on the following:

- a. Site Preparation
- b. Unpacking and Inspection
- c. Physical Inventory
- d. Configuration Requirements
- e. Installation Procedure
- f. Claims Procedure
- g. Repackaging for Shipment

Specifications for the HP 1000 A700 Computer are given in the HP 1000 A700 Computer Reference Manual, part no. 02137-90001.

## 1-1. SITE PREPARATION

Site preparation information for the computer includes environmental limitations, power requirements, and mounting considerations.

## 1-2. ENVIRONMENTAL LIMITATIONS

Environmental limitations for operating and non-operating conditions of the computer are specified in Table 1-1. The environmental limitations imposed by peripheral devices and associated components must be taken into consideration when the computer is located in the same area.

## 1-3. POWER REQUIREMENTS

The HP 2137A Computer is shipped with the power supply set to operate from a single-phase power source of either 86 to 138 volts (standard) or 178 to 276 volts (option 015) as specified in the purchase order. Maximum power consumption of the HP 2137A is 700 watts. Changing from 115 Vac operation to 230 Vac operation (or vice versa) is described in paragraph 2-55. The input power specifications are described in Table 1-2.

Various safety codes require that instrument chassis, panels, and housings be grounded to protect operating and service personnel. A grounded three-conductor female power outlet must be available to satisfy this requirement.

## 1-4. COOLING REQUIREMENTS

There are no external cooling requirements for the computer. The internal fans provide adequate ventilation

Table 1-1. Environmental Specifications

### AMBIENT TEMPERATURE

<b>Operating:</b>	0° to 55°C (32° to 131°F) up to 3048 metres (10,000 ft)
	0° to 45°C (32° to 113°F) up to 4572 metres (15,000 ft)
<b>Non-operating:</b>	-40° to 75°C (-40° to 167°F)
	-40° to 60°C (-40° to 140°F) with Battery Back-up

### RELATIVE HUMIDITY

5% to 95%, without condensation

### ALTITUDE

<b>Operating:</b>	to 4.6 km (15,000 ft)
<b>Non-operating:</b>	15.3 km (50,000 ft)

### VIBRATION AND SHOCK

HP 1000 A700-Series products are type tested for normal shipping and handling shock and vibration. (Contact factory for review of any application that requires operation under continuous vibration.)

when operated within the environmental limitations specified in Table 1-1. Four fans provide approximately 10.1 cubic metres per minute (360 CFM) front-to-rear air flow. Half of the air flow is used to cool the power supply and half the air flow is directed through the card cage.

## 1-5. MOUNTING CONSIDERATIONS

The computer may be used either as a freestanding device or mounted in a standard 483-millimeter (19-inch) equipment rack. When used in a mobile environment, the computer should be installed in a shock-mounted equipment rack. Rack-mounting dimensions for the computer are specified in Table 1-3.

## 1-6. AC POWER OUTLET AND EXTERNAL GROUND

The female power outlet to be used to supply ac power to the computer must be checked by a qualified electrician to ensure that it furnishes the proper voltage for which the computer is set. The outlet and its associated wiring and fuses (or circuit breakers) must be capable of carrying the current specified on the back door of the computer. An ac voltmeter is required to verify the adequacy of the ac power outlet.

Table 1-2. Input Power Specifications

<b>AC POWER REQUIRED</b>	
<b>Line Voltage:</b>	86-138 Vac (115 Vac -25%/+20% standard) 178-276 Vac (230 Vac -23%/+20% option 015)
<b>Line Frequency:</b>	47.5 to 66 Hz.
<b>Maximum Power Required:</b>	700 Watts
<b>OPTIONAL DC POWER</b>	
The external battery must be charged from an external source.	
<b>+EXT BAT Input:</b>	15.0V maximum 10.5V minimum 12.6V nominal
<b>-EXT BAT Input:</b>	Ground

Figures 1-1 and 1-2 illustrate and provide the necessary details of the various ac power cord configurations. If the computer is to be installed in a building, make sure that the local electrical code permits the use of the type of power cord furnished with the computer.

### 1-7. UNPACKING AND INSPECTION

The computer and accessories may be shipped in more than one container. When the shipment arrives, check to ensure the receipt of all containers as specified by the carrier's papers. Inspect each shipping container immediately upon receipt for evidence of mishandling during transit. If any container is damaged or waterstained, request the carrier's agent be present when that container is opened.

Open the shipping container marked "MANUALS AND ACCESSORIES". One of the items in this package is a list of equipment supplied. Compare this list against the purchase order to verify that the shipment is correct. Unpack the shipping container(s) and inspect each item for external damage. Look for damage such as broken controls and connectors, dented corners, bent panels, scratches, and loose components. Also check the rigid foam-plastic cushioning (if used) for signs of deformation which could be indicative of rough handling during transit.

Table 1-3. HP 2137A Rack Mounting Dimensions

HEIGHT	WIDTH	DEPTH	WEIGHT
266 mm (10.5 in.)	483 mm (19 in.)	610 mm (24 in.)	26.8 kg (59 lbs)

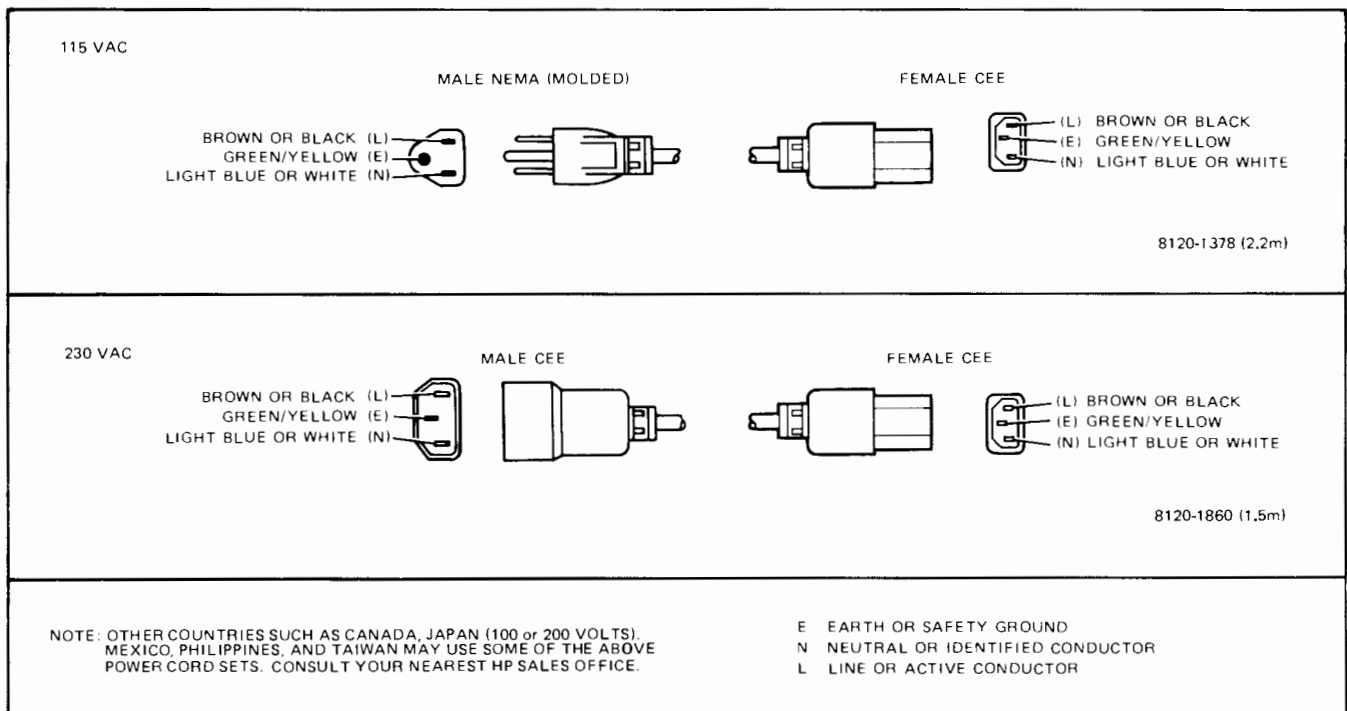


Figure 1-1. AC Power Cord Set (USA)

If the visual examination reveals any damage to the computer or accessories, follow the damage claim procedure described in paragraph 1-30. Retain the shipping container(s) and packing material for examination in the settlement of claims or for future reuse.

**1-8. PHYSICAL INVENTORY**

**1-9. MANUALS**

Check to ensure that all manuals listed on the list of materials have been received.

**1-10. EQUIPMENT**

**1-11. COMPUTER.** The computer model number and serial number are printed on an identification label affixed to the back door of the computer. Ensure that both the model number and serial number are identical with those specified in the packing list. A typical identification label is illustrated in Figure 1-3.

**1-12. OPTIONS.** Check that the options specified on the purchase order are listed on the Identification and Information label. If optional power features have been ordered, remove the computer snap-on front cover and verify that the correct option labels are present. The power option labels are shown in Figure 1-4.

**WARNING**

**An incorrect power configuration may permanently damage the product.**

**1-13. PLUG-IN CARDS.** If I/O interface cards, control store cards, floating point card, or additional memory array cards have been ordered and are integrated into the computer, verify that the cards listed in the purchase order have been supplied. If the cards have been ordered separately, ensure that they have been furnished with the shipment and in accordance with the purchase order.

Note that all plug-in cards must be installed with their component side to the right.

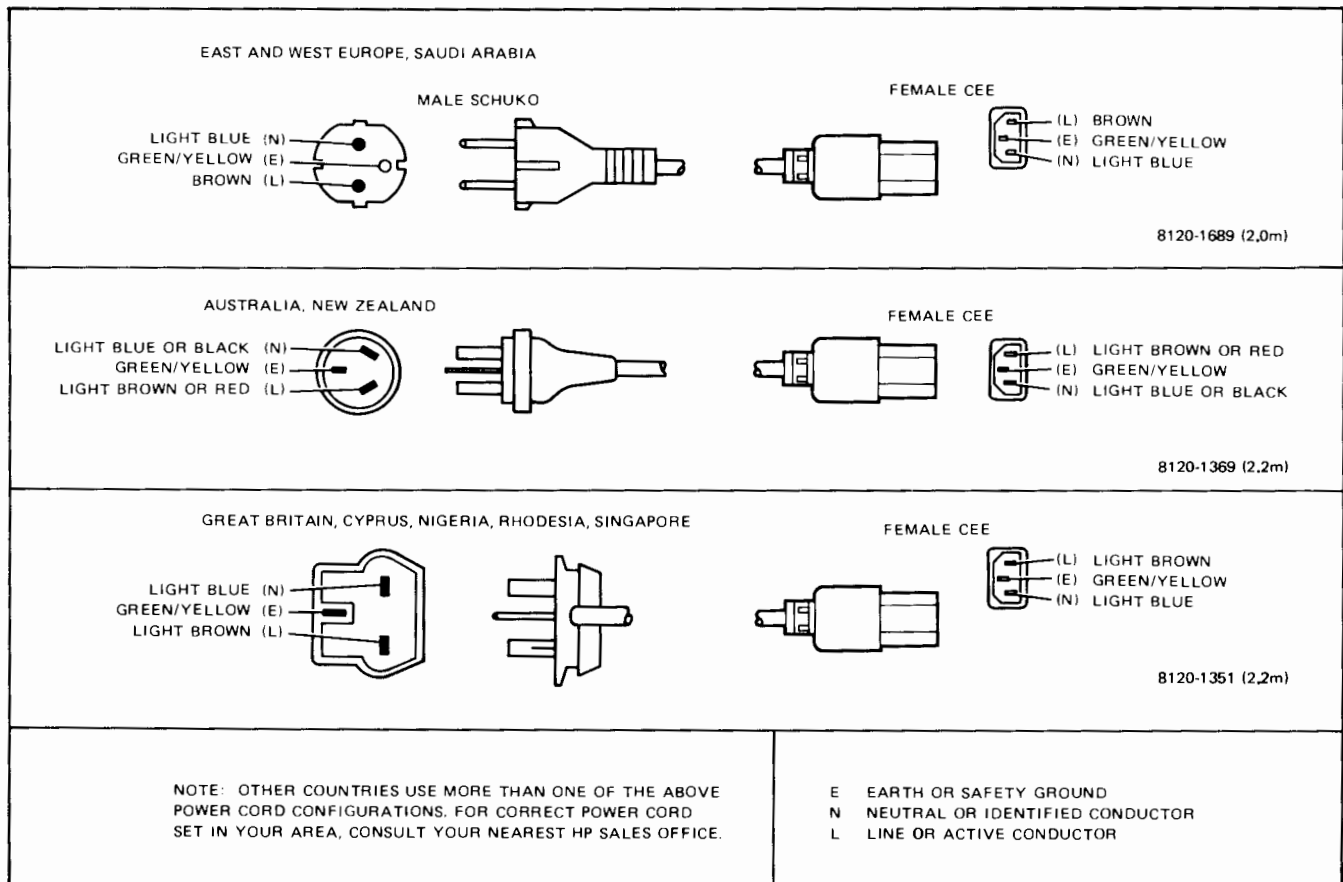


Figure 1-2. AC Power Cord Sets (Non-USA)

## 1-14. CONFIGURATION REQUIREMENTS

### 1-15. BATTERY BACKUP

The HP 12157A Battery Backup Module will sustain memory from 15 to 90 minutes, depending on the system configuration, state of charge and temperature. Additional memory hold-up time can be achieved by connecting an external battery.

If Battery Backup is installed, set the BACKUP switch on the back panel of the computer to the ENABLE position. The switch is shown in Figure 1-5. This switch should be set to the DISABLE position if the power is turned off and if memory backup is not required. The switch should also be set to the DISABLE position if the cards are to be connected or disconnected from the backplane.



Figure 1-3. Identification and Information Label

### 1-16. FRONTPLANE SWITCH CONFIGURATION

The frontplane switches determine the functions performed by the computer. They select Test 1 and Test 2 options, bootstrap source options, and the auto-restart options. Figure 1-6 shows how the switches are grouped and describes their functions.

Do the following for cold power-up:

1. Set the SLFTST (Self-Test) switches closed.
2. Set the DW (Diagnostic Window) switch closed.
3. Refer to Table 1-4 for the BOOT SEL switch settings for start-up.
4. If the battery backup option is installed and the firmware auto-restart is desired, set the M (Memory Lost) switch open. If the battery backup option is not installed or if the user software auto-restart is desired, set the switch closed.

### 1-17. INTERFACE CARD SWITCHES

Assign each I/O interface card to be installed in the computer a unique select code by setting the select code switches on the interface cards. Refer to the appropriate interface card reference manuals for select code switch information and for information on any other card switches that must be set.

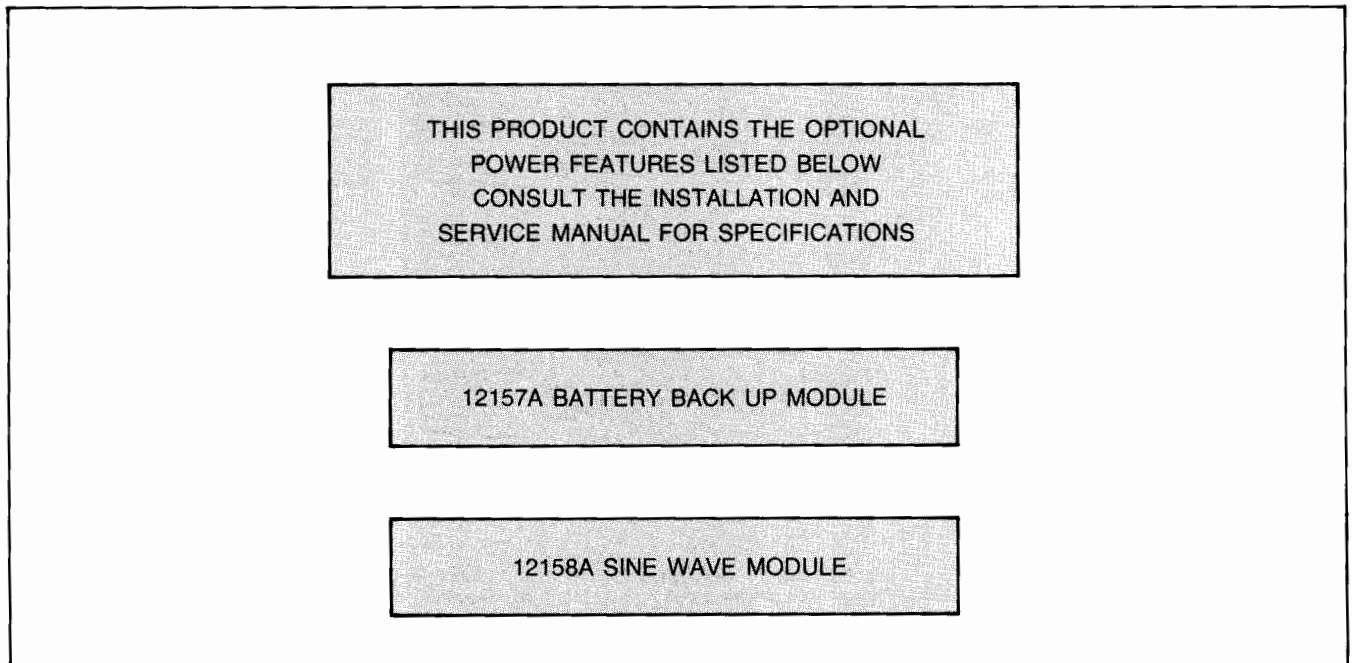


Figure 1-4. Power Option Labels

### 1-18. VIRTUAL CONTROL PANEL (VCP) CONFIGURATION

If a Virtual Control Panel (VCP) is used by the computer, the following conditions must be met:

1. One ASIC card or one HDLC card must be selected as the VCP interface card. The ASIC card is the HP 12005A Asynchronous Serial Interface card. The HDLC card may be either the HP 12007A HDLC Modem Interface card or the HP 12044A HDLC Direct Connect Interface card.
2. Set switch U1S1 on the interface card closed to indicate that the card is the VCP interface card.

### 1-19. I/O PRIORITY ASSIGNMENT

Each peripheral device in the system must be connected to the computer through an interface card installed in the

card cage. A priority chain connects all interface cards in series to prevent simultaneous interrupt requests being serviced from two or more peripherals. The priority of the interface card is determined by the slot that the card occupies. Interrupts from a higher priority device inhibit lower priority interrupts by breaking the priority chain. (Note that correct computer operation requires that there not be any vacant slots between plug-in cards.) From the standpoint of system response time, it is more efficient to assign the higher priorities to high-speed peripheral devices. The card closest to the processor has the highest priority.

The computer I/O priority scheme is shown in Figure 1-7. The frontplane and backplane priority schemes are shown in Figure 1-8.

Refer to the individual interface card manuals for information about card switch settings and priority considerations. Consult the system manager to establish I/O device priority and install the interface cards accordingly.

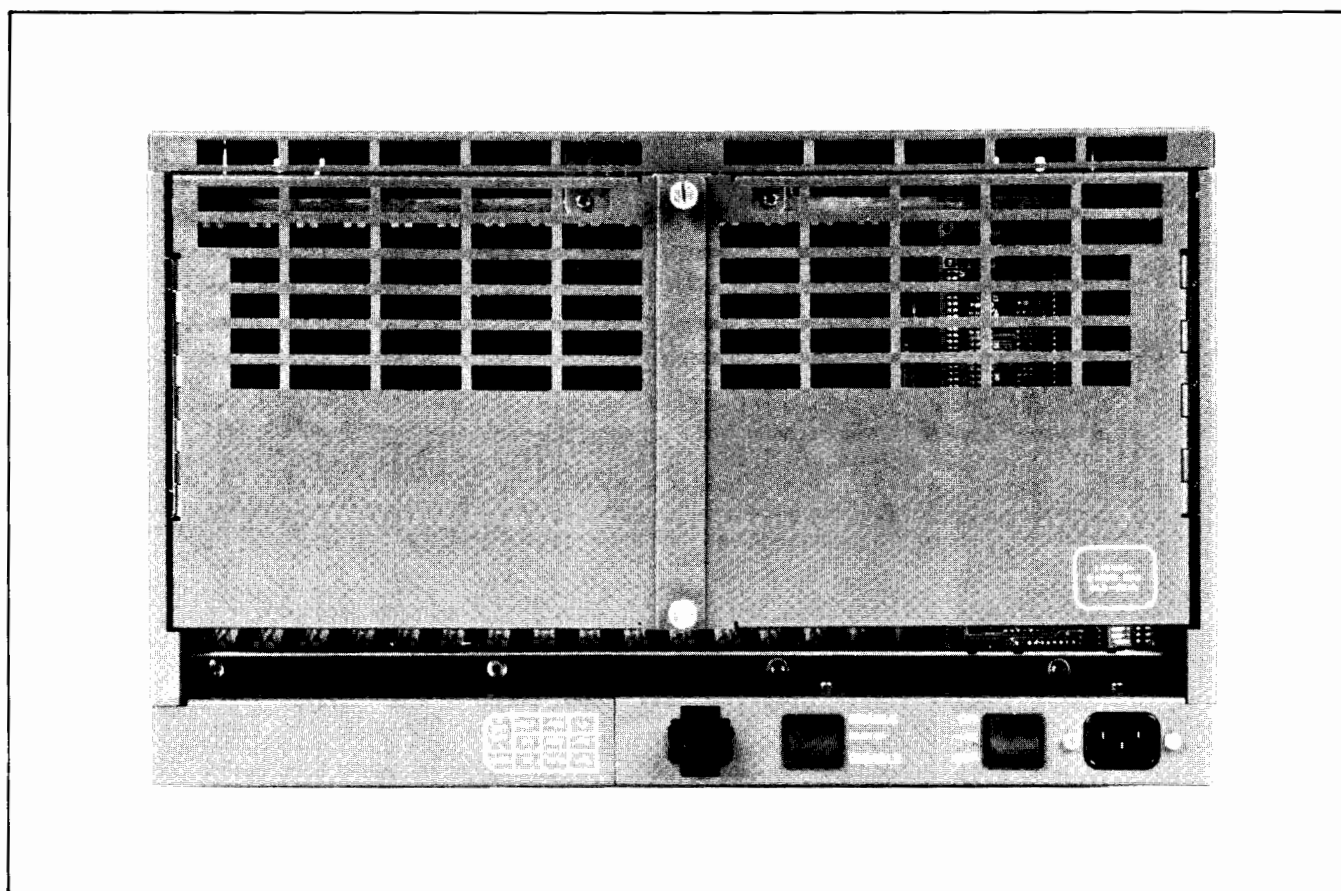


Figure 1-5. Computer Back Panel

### 1-20. MEMORY CONFIGURATIONS

Several memory subsystem configurations can be installed in the 2137A computer. The available memory array cards and memory frontplanes are listed in Table 1-5.

A memory array card must be installed on the correct address boundary. For example, a 128k byte card must be installed on a boundary that is an integer multiple of 128. A 512k byte card must be installed on an address boundary that is an integer multiple of 512. Use the following equation to determine whether a card can be added to an existing configuration without rearranging the installed memory cards.

$$\frac{\text{MEMORY SIZE NOW IN BACKPLANE}}{\text{SIZE OF ARRAY CARD TO BE ADDED}} = \text{INTEGER}$$

To avoid problems resulting from incorrect installation, install the memory array cards in descending order of memory size. Install the largest memory array card next to the memory controller card.

### 1-21. INSTALLATION PROCEDURE

#### 1-22. MANUAL UPDATING

Before installing the computer, perform any updating that may be required for the A700 computer documentation. Updating instructions (if any) are provided in a supplement supplied with the appropriate document.

#### 1-23. TOOLS REQUIRED

No installation tools other than ordinary handtools are required.

#### 1-24. SELF-TEST (TEST 1 AND TEST 2) AND POWER SUPPLY CHECK

Verify the power supply voltages and basic computer operation by performing the following procedures. These checks must be made with all plug-in cards installed in the computer.

<table border="1" style="margin: auto;"> <tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td></tr> <tr><td colspan="4" style="text-align: center;">SLFTST</td><td style="text-align: center;">D W</td><td colspan="3"></td></tr> </table>	1	2	3	4	5	6	7	8	SLFTST				D W				<table border="1" style="margin: auto;"> <tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td></tr> <tr><td colspan="6" style="text-align: center;">BOOT SEL</td><td></td><td style="text-align: center;">M</td></tr> </table>	1	2	3	4	5	6	7	8	BOOT SEL							M
1	2	3	4	5	6	7	8																										
SLFTST				D W																													
1	2	3	4	5	6	7	8																										
BOOT SEL							M																										
SWITCHES	DEFINITION																																
SLFTST	Self-Test — The four self-test switches control the operation of the processor during the execution of Test 1. The switches specify the normal branch to Test 2 and several loop tests in Test 1. See Table 2-1.																																
DW	Diagnostic Window — This switch is used to enable the diagnostic window. If the switch is set open, various parameters useful in debugging microcode are enabled on the CPU internal data bus after the execution of each instruction. Enabling this feature increases the execution time of each instruction by two microseconds.																																
6-8	Do not care.																																
BOOT SEL	Boot Select — The Boot Select switches are used during normal operation to select the bootstrap source. They also control the operation of the computer while Test 2 is executing. See Table 1-4.																																
7	Do not care.																																
M	Memory Lost — The Memory Lost switch is an auto-restart override switch. If it is set open, auto-restart will be executed by processor firmware if battery backup is installed and enabled and if power is lost. If it is set closed, auto-restart is overridden and restart is executed by the boot loader or VCP routine.																																

Figure 1-6. Frontplane Switches

Table 1-4. Start-Up Switch Settings

BOOT SEL switches*						COMPUTER ACTION
S1	S2	S3	S4	S5	S6	
C	C	C	Z	x	y	Loop on Self-test regardless of error.
C	C	O	Z	x	y	Loop on Self-test and stop on error.
C	O	C	Z	x	y	Start boot PROM program at location 30002B. (User loader routine.)
C	O	O	Z	x	y	Run VCP** routine on completion of self-test.
O	C	C	Z	x	y	If memory lost (not sustained), run VCP routine; otherwise, restart program (JMP 4B). (Note 2, Note 4.)
O	C	O	Z	x	y	If memory lost, load and execute program from PROM card; otherwise, restart program (JMP 4B). (Note 2) (In order to auto-boot from PROM, the card must have select code 22. Equivalent to loader command %BRM.)
O	O	C	Z	x	y	If memory lost, load and execute program via HDLC card; otherwise, restart program (JMP 4B). (Note 2) (In order to auto-boot via HDLC, the card must have select code 24. Equivalent to loader command %BDS.)
O	O	O	Z	x	y	If memory lost, load and execute program from first file of disc (via HP-IB); otherwise, restart program (JMP 4B). (Note 2) (In order to auto-boot via HP-IB, the HP-IB interface card must have select code 27 and the disc drive must have HP-IB address 2. Equivalent to loader command %BDC.)

\* O = open (up); C = closed (down)  
 X = do not care.  
 Y = C, system console uses ENQ-ACK handshake.  
 Y = O, system console does not use ENQ-ACK handshake.  
 Z = C, normal mode, break enabled.  
 Z = O, break disabled.  
 \*\* Virtual Control Panel.

- Notes:
1. When a loader finishes an auto-boot, it starts execution of the loader program at location 02.
  2. If the auto-restart feature is disabled (processor switch U1-S8 closed), the program cannot restart and the boot loader (or VCP routine) will execute.
  3. Do not use any switch combination that is not shown above.
  4. Use this switch configuration for normal computer operation.

Check the power supply voltages as follows:

- Set the LINE switch to the OFF (O) position and connect the power cord to a power outlet.
- Set the BACKUP switch to the ENABLE position if the Battery Backup option is installed.
- Set the BACKUP switch to the DISABLE position if the Battery Backup option is not installed.
- Set the LINE switch to the ON position.
- Using a digital voltmeter, measure the following signals at the test connector on the rear panel.

TEST POINT	NOMINAL VOLTAGE
+5	5.1V ±0.10V
+12	12.0V +0.72V, -0.36V
-12	-12.0V ±0.72V
+5M	5.1V ±2%
PON+ (Power On)	3.7V ±1.3V
PFW- (Power Fail (Warning))	3.7V ±1.3V
MLT- (Memory Lost)	3.7V ±1.3V if battery backup installed 0V if battery backup not installed
φ1	27.0 Vrms ±2.16V
φ2	27.0 Vrms ±2.16V



The MLT signal is not valid if the Battery Backup module and the battery pack are not installed.

The φ1 and φ2 signals are not valid if the Sine Wave module is not installed.

If the computer does not pass the above tests, refer to paragraph 2-3 for troubleshooting information.

To run Test 1 and Test 2, do the following:

- Set the LINE switch to the OFF (O) position.
- Configure the frontplane switches for your application as shown in Figure 1-6.
- Set the LINE switch to the ON position. The tests will run when power is first turned on or when the RESET switch on the frontplane is depressed and released.
- Observe the LEDs on the frontplane. If the computer passes Test 1, the eight upper LEDs on the frontplane will be set to one of the following values.

00011111 — CPU passed, floating point card not installed, or floating point card failed.

00001111 — CPU passed, floating point passed

1 = lit LED, 0 = unlit LED

If the computer passes Test 2, the eight lower LEDs on the frontplane will be set to one of the following values.

00000111 — VCP user interface is running

00000001 — loader is running

00000000 — user software is running



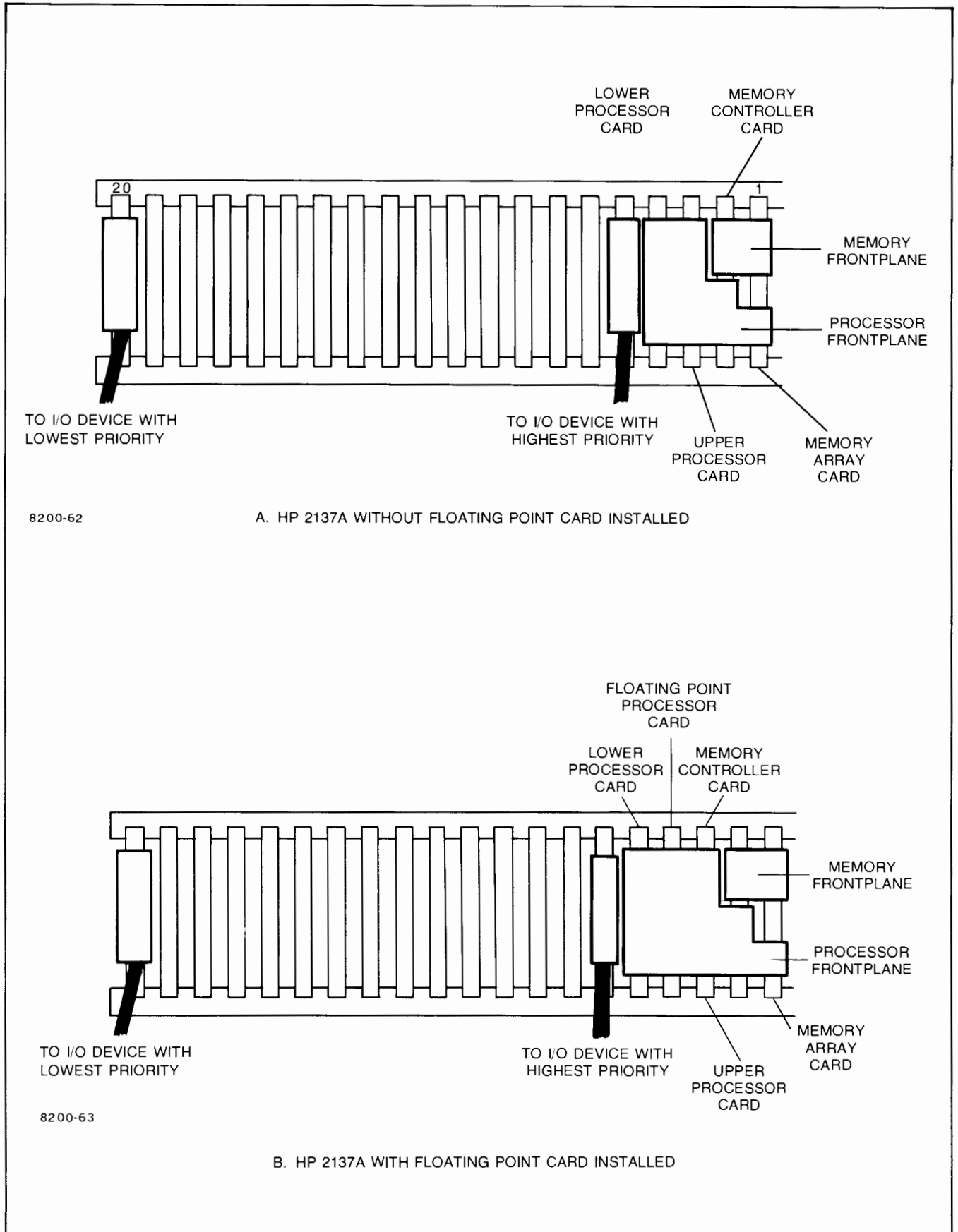


Figure 1-7. HP 2137A Card Configuration

Table 1-5. HP 2137A Memory Array Cards and Memory Frontplane Memory Components

DESCRIPTION	PART NUMBER
128k Byte Memory Array Card	12103-60001
256k Byte Memory Array Card	12103-60002
512k Byte Memory Array Card	12103-60003
512k Byte Error Correcting Memory Array Card	12104-60001
1024k Byte Memory Array Card	12103-60004
2-Connector Memory Frontplane	12038-60001*
3-Connector Memory Frontplane	12038-60002*
4-Connector Memory Frontplane	12038-60003*
5-Connector Memory Frontplane	12038-60004*

\*One connector is attached to the memory controller card.

The VCP indicators are valid only if error codes were not displayed immediately before the VCP indicators. Error codes are displayed for two seconds.

Any other LED display indicates a Test 1 or Test 2 failure. Refer to paragraph 2-3 for troubleshooting information.

### 1-25. COMPUTER MOUNTING

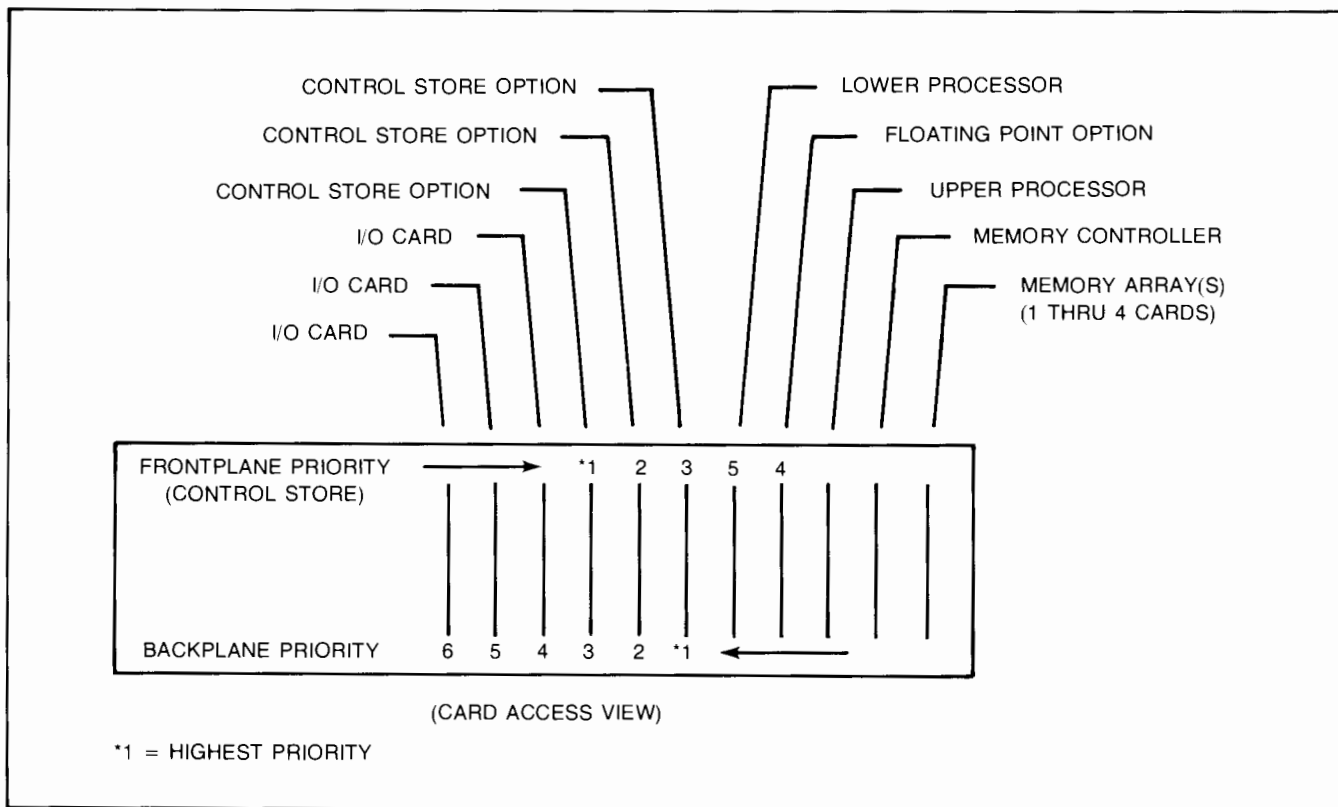
**1-26. BENCH MOUNTING.** The computer may be used as a freestanding instrument in a land-based environment. The only consideration is that adequate space be allowed at the front and rear to ensure full intake and exhaust of ventilating air and that all covers are installed. A minimum 38 centimeters (15 inches) of clearance behind the computer is required when removing and installing plug-in cards.

**1-27. RACK MOUNTING.** Install the computer in the rack and secure it in place with screws inserted through the mounting holes. (The computer is light enough to allow installation in the rack without being supported by any means other than the rack mounting screws; however, it is recommended that additional support be provided by mounting rails.)

### 1-28. INTERFACE CABLING

#### CAUTION

When connecting cables to the plug-in cards in the card cage, be sure to connect each cable to the appropriate card. Connect the I/O cable ground lug to the grounding strip on the chassis.



8200-1

Figure 1-8. Frontplane and Backplane Priority

Cable requirements to interconnect interface cards and associated peripherals are specified in the appropriate interface documentation. After all interface cables have been assembled, set the computer LINE switch to the OFF position and open the card cage doors. Install the hooded connector of each cable on the edge connector of the appropriate interface card, with the cable extending to the bottom of the card cage. Connect the other end of each cable to the appropriate peripheral device. Close and secure the card cage covers and set the LINE switch to the ON position.

### **1-29. PERFORMANCE VERIFICATION CHECK**

Verify the computer installation and operation by running the diagnostic programs supplied in the HP 24612A Diagnostic Package for A600/A700 Processors. Follow the instructions in the operating manuals supplied with the package.

### **1-30. CLAIMS PROCEDURE**

If the shipment is incomplete or if the equipment is damaged or fails to meet specifications, notify the nearest Hewlett-Packard Sales and Service Office. If damage occurred in transit, notify the carrier also. Hewlett-Packard will arrange for replacement or repair without waiting for settlement of claims against the carrier. In the event of damage in transit, retain the packing carton and packaging materials for inspection.

### **1-31. REPACKAGING FOR SHIPMENT**

#### **1-32. SHIPMENT USING ORIGINAL PACKAGING**

The same containers and materials used in factory packaging can be used for reshipment of the computer.

Alternatively, containers and packing materials may be obtained from Hewlett-Packard Sales and Service Offices. If the computer is being returned for servicing, attach a tag to the computer specifying the type of service required together with the computer model number and full serial number. Mark the container "FRAGILE" to ensure careful handling. In any subsequent correspondence, refer to the computer by model number and full serial number.

#### **1-33. SHIPMENT USING NEW PACKAGING**

The following instructions should be used as a guide when packaging the computer with commercially available materials:

- a. Wrap the computer in Aircap film or foam. If shipping the computer back to Hewlett-Packard, first attach a tag to the computer with your return address and indicating the type of service required. Include the computer model number and full serial number.
- b. Use a strong shipping container. A double-wall carton constructed of 2.41 MPa (350-psi) test material is adequate.
- c. Use sufficient shock-absorbing material on all sides of the computer to provide a firm cushion and to prevent movement inside the container. Use particular care to protect the computer corners and front and rear panels.
- d. Seal the shipping container securely and mark it "FRAGILE".
- e. In any subsequent correspondence with Hewlett-Packard refer to the computer by model number and full serial number.

This section includes periodic maintenance procedures, troubleshooting information for isolating malfunctions to the assembly level, and procedures for removing and replacing various computer assemblies.

replacement procedures are given in this section.) After the malfunction is corrected, contact your nearest Hewlett-Packard Sales and Service Office for instructions regarding shipment of the defective assembly.

## 2-1. ELECTRICAL SAFETY

Before proceeding with any maintenance or service on the computer which requires physical contact with electrical or electronic components, be sure that either power is removed or that safety precautions are followed to protect against shock. Heed all "WARNING" signs on equipment. All service work must be done by qualified personnel.

## 2-2. PERIODIC MAINTENANCE

Maintenance schedules should be set up according to the quality of the environment in which the computer is operating. A computer in a clean and air-conditioned atmosphere requires less periodic maintenance than one that is located in an atmosphere laden with dust, smoke, moisture, or other particulate matter.

Perform the following steps as often as necessary.

- a. Clean the cabinet exterior and interior
- b. Check ventilating fans for proper operation

The ventilating fans in the computer have sealed bearings and require no lubrication.

The air filter in the computer should be cleaned monthly to ensure that the computer remains free of dust. Clean the air filter by washing it in a solution of warm water and mild soap. Thoroughly dry the filter before reinstalling it in the computer.

## 2-3. TROUBLESHOOTING

Computer malfunctions can be isolated to the assembly level by sequentially performing the following tests:

- a. Power supply check (paragraph 2-4).
- b. Self-tests (paragraphs 2-5, 2-7 and 2-8).
- c. Diagnostics (paragraph 2-6).

When a malfunction is encountered, replace the assembly indicated in the test procedure. (Assembly removal and

## 2-4. POWER SUPPLY CHECK

### WARNING

#### HAZARDOUS VOLTAGES

**Any servicing, adjustment, maintenance or repair must be performed only by qualified personnel.**

To verify power supply operation, do the following:

- a. Set the LINE switch on the back panel to the OFF position. Wait 90 seconds before proceeding to the following steps.
- b. Verify that the AC line configuration/fan power plug is plugged into the correct connector on the power supply. Refer to Figure 2-1.
  1. The AC line configuration/fan power plug must be plugged into connector P8 if 115 Vac is used as the system input power.
  2. The AC line configuration/fan power plug must be plugged into connector P7 if 230 Vac is used as the system input power.
- c. Set the LINE switch on the back panel to the ON position.
- d. Set the BACKUP switch on the back panel to the ENABLE position if the battery backup option is installed.
- e. Using a digital voltmeter, measure the following signals at the test connector on the rear panel.

TEST POINT	NOMINAL VOLTAGE
+5	5.1V ±0.10V
+12	12.0V +0.72V, -0.36V
-12	-12.0V ±0.72V
+5M	5.1 V ±0.10V
PON+ (Power On)	3.7V ±1.3V
PFW- (Power Fail Warning)	3.7V ±1.3V
MLT- (Memory Lost)	3.7V ±1.3V if battery backup installed 0V if battery backup not installed
φ1	27.0 Vrms ±2.16V
φ2	27.0 Vrms ±2.16V

The MLT signal is not valid if the battery backup module and the battery pack are not installed.

The  $\phi 1$  and  $\phi 2$  signals are not valid if the sine wave module is not installed.

If the fully charged battery backup module and battery backup pack are installed and the MLT signal is not within tolerance, turn off the power supply for 90 seconds. Then turn the power supply back on. If the fault recurs, replace the battery backup module.

If the battery pack will not sustain two megabytes of memory for one hour or four megabytes of memory for 15 minutes, replace the battery pack. Note that the battery pack must be charged for 24 hours to sustain memory for the specified amount of time.

If the sine wave module is installed and the  $\phi 1$  and  $\phi 2$  signals are not within tolerance, turn off the power supply for 90 seconds. Then turn the power supply back on. If the fault recurs, replace the sine wave module.

If any of the remaining signals are not within tolerance, turn off the power supply for 90 seconds. Then turn the power supply back on. If the fault recurs, replace the power supply.

### 2-5. SELF-TEST

Self-test consists of two test programs (Test 1 and Test 2) that automatically execute each time the computer is powered up. The tests provide a quick, convenient check of basic computer operation. Self-test can also be executed by pressing the RESET switch on the frontplane. If either self-test program fails, the computer will not operate.

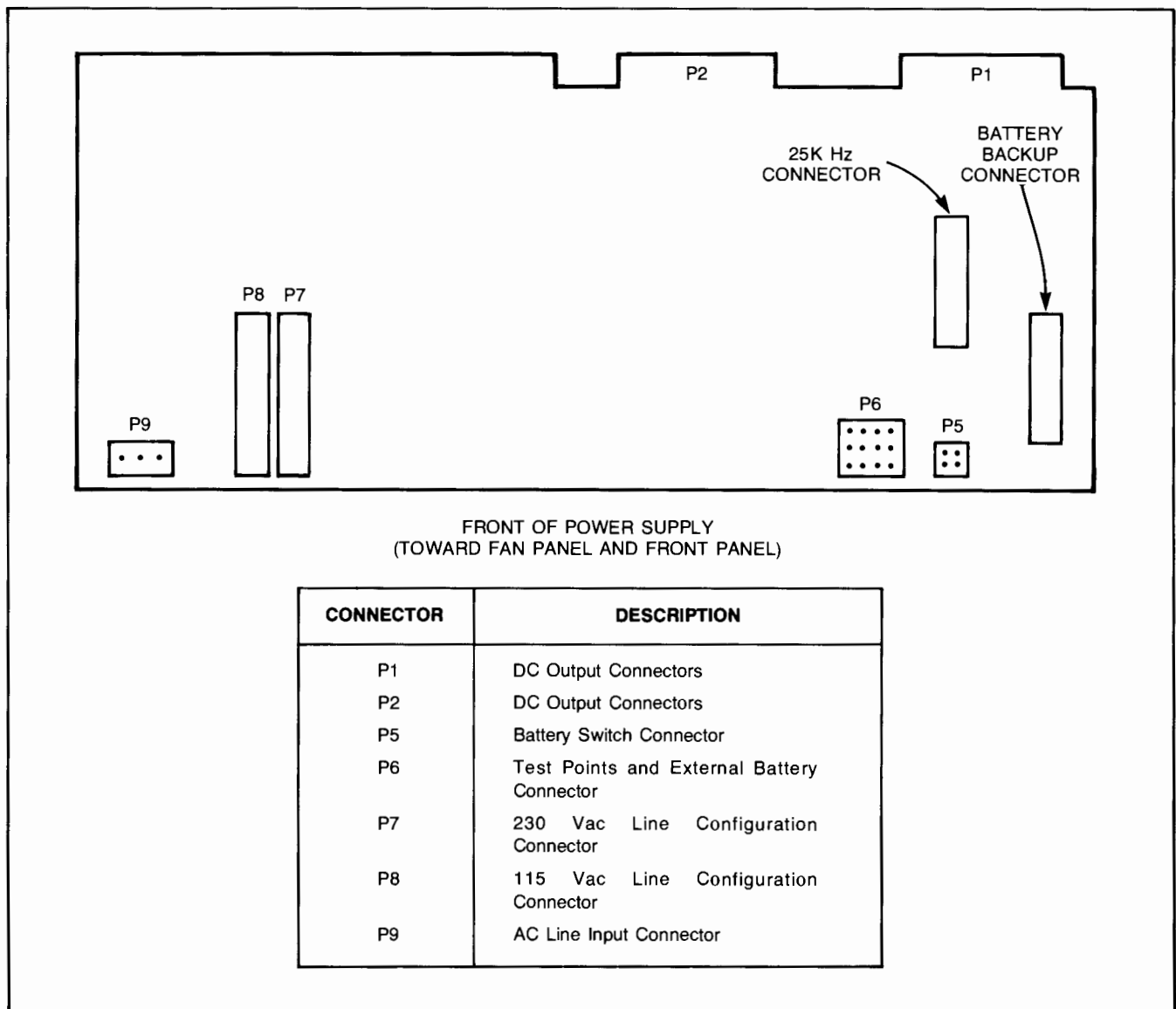


Figure 2-1. Power Supply Connector Diagram

Successful completion of the self-test is followed immediately by execution of a bootstrap loader, the Virtual Control Panel (VCP) program, or a program sustained in memory by an optional battery pack. These functions are selected by setting the frontplane switches.

Test 1 is a microprogram stored in the base set PROMs on the lower processor card and executes immediately upon power up. It checks logic and registers on the processor cards and checks the VCP/Loader/Test 2 PROMs on the memory controller card. If the floating point processor card is installed, it is also checked by Test 1. On successful completion, Test 2 is started. If Test 1 detects a failure of a processor card or the memory controller, it stops executing and the frontplane LEDs indicate a failure code. If a floating point processor error is detected, it is indicated by the LEDs and the test stops executing. Test 1 execution time is negligible. Each processor card test and the memory controller test can be looped for troubleshooting by setting the frontplane switches.

Test 2 is an assembly language program stored in PROM on the memory controller card and executes upon successful completion of Test 1. Test 2 checks the computer's basic instruction set, several internal flags, and all the memory. If memory is sustained by the optional battery pack, Test 2 checks it in a non-destructive manner by reading each memory location and making a parity check on the data. If a parity error occurs, the location is read again. Soft errors (defined as a parity error only on the first of two reads of a memory location) are reported to the VCP (if present). If memory is not sustained, Test 2 writes all ones to each memory location, and reads back the data. Test 2 then writes all zeros and reads back. (The memory is cleared.) Test 2 also checks the I/O Master logic on each interface card to ensure that data transfer, flag, interrupt, and direct memory access (DMA) functions are processed correctly. If Test 2 detects a failure, it stops executing and the frontplane LEDs indicate a failure code. If a VCP is in the system and the failure does not hinder VCP operation, the VCP program is entered and the failure code is displayed on the VCP. The LED indication on successful completion of Test 2 depends on the computer action selected by the Start-Up (BOOT SEL) switches on the frontplane. Test 2 has a maximum execution time of five seconds.

**2-6. TEST 1.** Test 1 sequentially tests the lower processor, upper processor, memory controller, and the floating point processor cards. The results of Test 1 are displayed on the LEDs on the frontplane. On power-up, all of the frontplane LEDs are turned on. The LEDs are then turned off, beginning with the high-order LED, to indicate the progress of Test 1. Test 1 accepts troubleshooting options specified by the frontplane switches. The switches should be set open only when troubleshooting hardware faults or when debugging microcode.

Table 2-1 shows the Test 1 switch options.

Only one switch should be set open at any time. If a switch is set open, the test specified by the switch and all of the

Table 2-1. Test 1 Switch Options

SWITCH SETTING	MEANING
00000xxx xxxxxxxx	Normal mode, go to Test 2
1xxxxxxx xxxxxxxx	Loop on Lower Processor Test
01xxxxxx xxxxxxxx	Loop on Upper Processor Test
001xxxxx xxxxxxxx	Loop on Memory Controller Test
0001xxxx xxxxxxxx	Loop on Floating Point Test, if installed
00001xxx xxxxxxxx	Enable Diagnostic window (microcode debug utility)
0 = switch closed 1 = switch open x = don't care	

tests before it will be executed. For example, if SLFTST switch 3 is set open, the Lower Processor test, the Upper Processor test, and the Memory Controller test will be executed. If no faults occur, these tests will continue to execute in a loop. If a failure is detected in any of the tests, the micromachine enters a one-instruction loop and sets the appropriate LEDs on. Table 2-2 shows the error codes that are displayed.

#### NOTE

The frontplane DW switch must be closed during normal operation. This switch is used to enable the Diagnostic Window. If the Diagnostic Window is enabled, various registers useful in debugging microcode are enabled on the CPU internal data bus after the execution of each instruction. Enabling this feature increases the execution time of each instruction by approximately two microseconds.

**2-7. LOWER PROCESSOR TEST.** The Lower Processor test performs a conditional branching test, an internal register test, a flag test, a counter (CT) test, a micromachine subroutine stack test, and an ALU function test. If any failures are detected, the micromachine enters a one-instruction loop and sets all of the LEDs on. If no errors are detected and if SLFTST switch 1 is open, the processor flashes a pattern through the LEDs and then restarts the Lower Processor test. If SLFTST switch 1 is closed, then LED 15 is turned off and control is passed to the Upper Processor test.

**2-8. UPPER PROCESSOR TEST.** The Upper Processor test performs a program counter test, internal register tests, and a memory addressing logic test. If any failures are detected, the micromachine enters a one-instruction loop. If no errors are detected and if SLFTST switch 2 is open, the processor flashes a pattern through

Table 2-2. Test 2 Failure Indicators

FAILURE PATTERN	MEANING
11111111 11111111	A700 Lower Processor card failed
01111111 11111111	A700 Upper Processor card failed
00111111 11111111	A700 Memory Controller or VCP PROMs failed
00011111 11111111	A700 Floating Point card failed
00011111 11111111	A700 CPU passed and no Floating Point card installed, or Floating Point card failed
00001111 11111110	A700 CPU passed and Floating Point passed.

the LEDs and then restarts the Lower Processor and Upper Processor tests in sequence. If SLFTST switch 2 is closed, LED 14 is turned off and control is passed to the Memory Controller test.

**2-9. MEMORY CONTROLLER TEST.** The Memory Controller test checks the Boot ROM by verifying the Boot ROM checksum. If any failures are detected, the micromachine enters a one-instruction loop. If no errors are detected and if SLFTST switch 3 is open, the processor flashes a pattern through the LEDs and then restarts the Lower Processor, Upper Processor, and Memory Controller tests in sequence. If SLFTST switch 3 is closed, LED 13 is turned off and control is passed to the Floating Point test, if that option is present, or to the Boot microcode.

**2-10. FLOATING POINT TEST.** The Floating Point test checks the operation of the Floating Point board. If any failures are detected, the micromachine enters a one-instruction loop. If no errors are detected and if SLFTST switch 4 is open, the processor flashes a pattern through the LEDs and then restarts the Lower Processor, Upper Processor, Memory Controller, and Floating Point tests in sequence. If SLFTST switch 4 is closed and the floating point card passes, LEDs 12 and 0 are turned off and control is passed to the Boot microcode.

LEDs 15, 14, 13, and 0 will be set off if the computer passes all Test 1 tests. LED 12 will be set off if the Floating Point board is installed and if it passes the Floating Point test.

**2-11. TEST 2.** Test 2 begins execution when Test 1 has been successfully completed. Test 2 can also be initiated by an operator command (%T) from the Virtual Control Panel (VCP). If Test 2 detects a failure during phase 1, it stops execution so that booting or restarting of the system will not occur. The frontplane LEDs indicate the type of failure. Phase 1 of Test 2 retests the Upper and Lower Processor boards and the Memory Controller board.

Table 2-3 shows the LED failure indicators for the first phase of Test 2. If the basic instruction test fails, the

Table 2-3. Test 2 Failure Indicators

FAILURE PATTERN	MEANING
000x1111 11111110	Microcode test passed but first memory fetch failed. First check memory controller, then check upper processor.
000x1111 11111100	Basic instruction test failed. Check lower processor, then upper processor.
000x1111 11111000	Boot memory access failed. Check memory controller and VCP/Loader/Self-test PROMs.
000x1111 11110000	Time Base Generator (TBG) tick or interrupt flags failed. Check lower processor, then upper processor.

Lower Processor board is probably faulty. If the Time Base Generator (TBG) tick and interrupt flag test fails, the Upper Processor board is probably faulty.

The second phase of Test 2 tests main memory, the I/O master of all installed I/O boards, and the computer configuration. Any failure after this point will still allow the VCP to run if the VCP interface is functioning properly and if a VCP terminal is installed. The failure will cause the LEDs to flash once. The VCP then displays PRETEST ERROR xxxxxx xxxxxx. The first word is the main error code and the second word is the flashing subcode. Table 2-4 shows the LED failure indicators for memory and I/O errors. The octal numbers to the left of the LED codes are displayed in the PRETEST ERROR fields. The number in the left field specifies the primary category of error — main memory error, I/O interface error, or interrupt error. The number in the right field identifies the specific error. For example, error code 000300 000203 indicates that an I/O error (300) has occurred and that the error was caused by duplicate select codes (203). An error code of 000340 000200 indicates a memory error (340) in 32k memory block zero.

If no VCP is present, any error that occurs during Test 1 or Test 2 must be corrected before the computer can be booted up.

Table 2-5 shows the switch settings that can be used in Test 2. The first two switch settings are used for troubleshooting. The remaining switch settings are used for configuring the computer.

**2-12. DIAGNOSTICS**

The diagnostics in the HP 24612A Diagnostic Package for A600/A700 Processors should be used for testing when the computer system is initially installed or when the self-test cannot detect a system malfunction. Instructions for running the diagnostics are provided in the operating manuals included in the diagnostic package.

Table 2-4. Test 2 Error Codes

OCTAL CODE	LED DISPLAY	DEFINITION
360	11110000	TGB tick or interrupt flags failed. Bad CPU. Probably upper processor board.
340 2xx	11100000 10xxxxxx	Main memory failure. The right field indicates the 32k block of memory that is bad.  If xxxxxx is zero, the memory controller could be bad.
300 2xx	11000000 10yyyyyy	I/O interface failure. The right field displays the interface select code or the error code.  If yyyyyy is greater than 17B, yyyyyy is the failing select code.  If yyyyyy is less than 20B, an interface error is indicated.
The values for yyyyyy are listed below.		
200	10000000	No I/O cards.
201	10000001	More than one interface has VCP Enable. (Switch U1S1 closed).
202	10000010	Priority chain broken or duplicate VCP select code.
203	10000011	Duplicate select code. The duplicate select code is contained in the B-register.
204	10000100	An I/O card has a select code less than 20B.
205	10000101	Terminal not connected for VCP. Check the cable and VCP Break Enable (Switch U1S1) on the VCP interface.
206	10000110	Unexpected time base generator interrupt.
207	10000111	Unexpected memory protect interrupt.
210	10001000	Unexpected unimplemented instruction trap (UIT) interrupt.

**2-13. MEMORY PARITY LED**

Memory parity status is indicated by an LED on the front edge of each memory card. When the green LEDs are lit, a memory parity error has not occurred. When an LED is off, a parity error has occurred. A parity error can be cleared by cycling the LINE switch on the backpanel or by depressing the RESET switch on the frontplane board. A parity error can also be cleared by entering the %T or %P command on the VCP. Frequently recurring parity errors can be eliminated by replacing the faulty memory card.

Table 2-5. Test 2 Switch Options

0000xxxx 000zxyxb	Loop on Test 2, regardless of error				
0000xxxx 001zxyxb	Loop on Test 2, stop on error				
0000xxxx 010zxyxb	Start Boot PROM program at location 30002B after Test 2				
0000xxxx 011zxyxb	Go to VCP upon completion of Test 2				
0000xxxx 100zxyxb	Go to or restart VCP upon completion of Test 2				
<table border="1"> <tr> <td>0</td> <td>= no battery backup</td> </tr> <tr> <td>1</td> <td>= battery backup installed</td> </tr> </table>		0	= no battery backup	1	= battery backup installed
0	= no battery backup				
1	= battery backup installed				
0 = switch closed	y = ENQ - ACK				
1 = switch open	z = Break Disable				
x = don't care					

**2-14. ERROR CORRECTING MEMORY TROUBLESHOOTING**

The 512k byte error correcting memory detects and corrects single-bit errors and detects double-bit errors. The eight red LEDs identify the faulty IC and the row in which it resides. The six low-order LEDs display the error syndrome code. The error syndrome codes identify which of the data bits and check bits are bad. The two high-order LEDs indicate the row the faulty IC is in.

The green LED indicates good parity if it is lit. The LED is turned off if a double-bit error occurs. If a double-bit error occurs, the values in the ROW and SYN bits identify the last single-bit error that occurred.

The LED display is shown in Figure 2-2. The error syndrome codes are shown in Table 2-6.

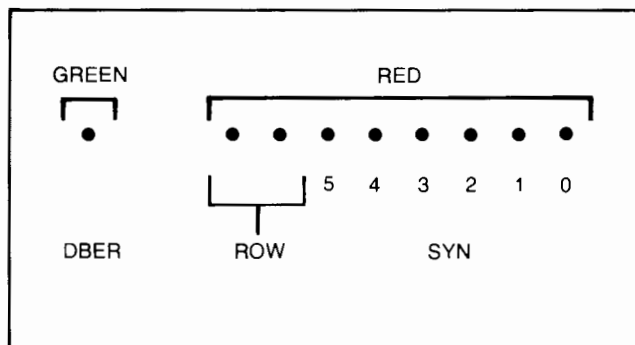


Figure 2-2. ECC LED Display



Table 2-6. ECC Error Syndrome Codes

ERROR SYNDROME CODE (OCTAL)	BIT IN ERROR
64	DB 0
62	DB 1
61	DB 2
54	DB 3
52	DB 4
51	DB 5
45	DB 6
43	DB 7
34	DB 8
32	DB 9
26	DB 10
25	DB 11
23	DB 12
16	DB 13
15	DB 14
13	DB 15
76	CB 0
75	CB 1
73	CB 2
67	CB 3
57	CB 4
37	CB 5
00	NO ERROR

entire assembly removal procedure and refer to Figures 3-1 and 3-2. When it is obvious that the procedure cannot be performed with the computer in the rack, do the following:

- a. Set the LINE switch to the OFF position and disconnect the power cord. If battery back-up is installed, set the BACKUP switch to the DISABLE position.
- b. Disconnect all I/O cables from the computer interface cards.
- c. Remove the computer from the rack.

**2-16. FRONT PANEL**

**2-17. REMOVAL.** Remove the computer front panel as follows:

- a. Grasp the front panel by the two indented handles at the side of the panel.
- b. Pull the panel away from the computer chassis.

**2-18. REPLACEMENT.** Replace the front panel by reversing the removal procedure.

**2-19. FAN PANEL**

**2-20. REMOVAL.** Remove the fan and panel as follows:

- a. Set the LINE switch to the OFF position and disconnect the power cord.
- b. Remove the front panel as described above.
- c. Remove four screws, four lock washers and four flat washers, and two screws in the middle of the panel, and remove the fan panel from the computer chassis.
- d. Disconnect the line configuration/fan power connector from the power supply. Note whether the connector is in P7 or P8.

**2-21. REPLACEMENT.** Replace the fan panel by reversing the removal procedure.

**2-22. FANS**

**2-23. REMOVAL.** Remove a fan as follows:

- a. Set the LINE switch to the OFF position and disconnect the power plug.
- b. Remove the front panel as described above.
- c. Disconnect the fan power plug.
- d. Remove four screws, four lock washers and four flat washers, and remove the fan from the fan panel.

**2-24. REPLACEMENT.** Replace the fan by reversing the removal procedure.

**2-15. ASSEMBLY REMOVAL AND REPLACEMENT**

**WARNING**

Hazardous voltages are present inside the computer mainframe. Heed all WARNING - HAZARDOUS VOLTAGE labels.

**CAUTION**

The contents of memory will be lost when the mains (line) and battery voltages are both off. Therefore, before proceeding, ensure that any contents of memory to be saved are stored on another medium for later retrieval.

The following paragraphs describe how to remove and replace the various computer assemblies shown in Figures 3-1 and 3-2. It is assumed that the computer is a freestanding device. If the computer is rack mounted, read the

**2-25. POWER SUPPLY****CAUTION**

Before removing the power supply, set the LINE switch to the OFF position and disconnect the power cord. Set the BACKUP switch to the DISABLE position. Allow 90 seconds for high voltages on the power supply to discharge.

**2-26. REMOVAL.** Remove the power supply as follows:

- Refer to Figure 2-1 and Figure 2-3.
- Remove the front panel and fan panel as described above.
- Disconnect the AC line input connector from P9.
- Disconnect the 115 Vac/230 Vac line configuration connector from P8 or P7.
- Disconnect the test point/external battery connector from P6.

- Disconnect the battery switch connector from P5 if battery backup is installed.
- Grasp the power supply card by the front edge and pull the power supply card away from the backplane.

**CAUTION**

All cables (AC Line, Test Point/External Battery and Battery Backup) must be dressed for minimum length above the power supply to prevent interference with the fans.

**2-27. REPLACEMENT.** Replace the power supply by reversing the removal procedure.

**2-28. BATTERY PACK**

**2-29. REMOVAL.** Remove the battery pack as follows:

- Refer to Figure 2-1 and Figure 2-3.

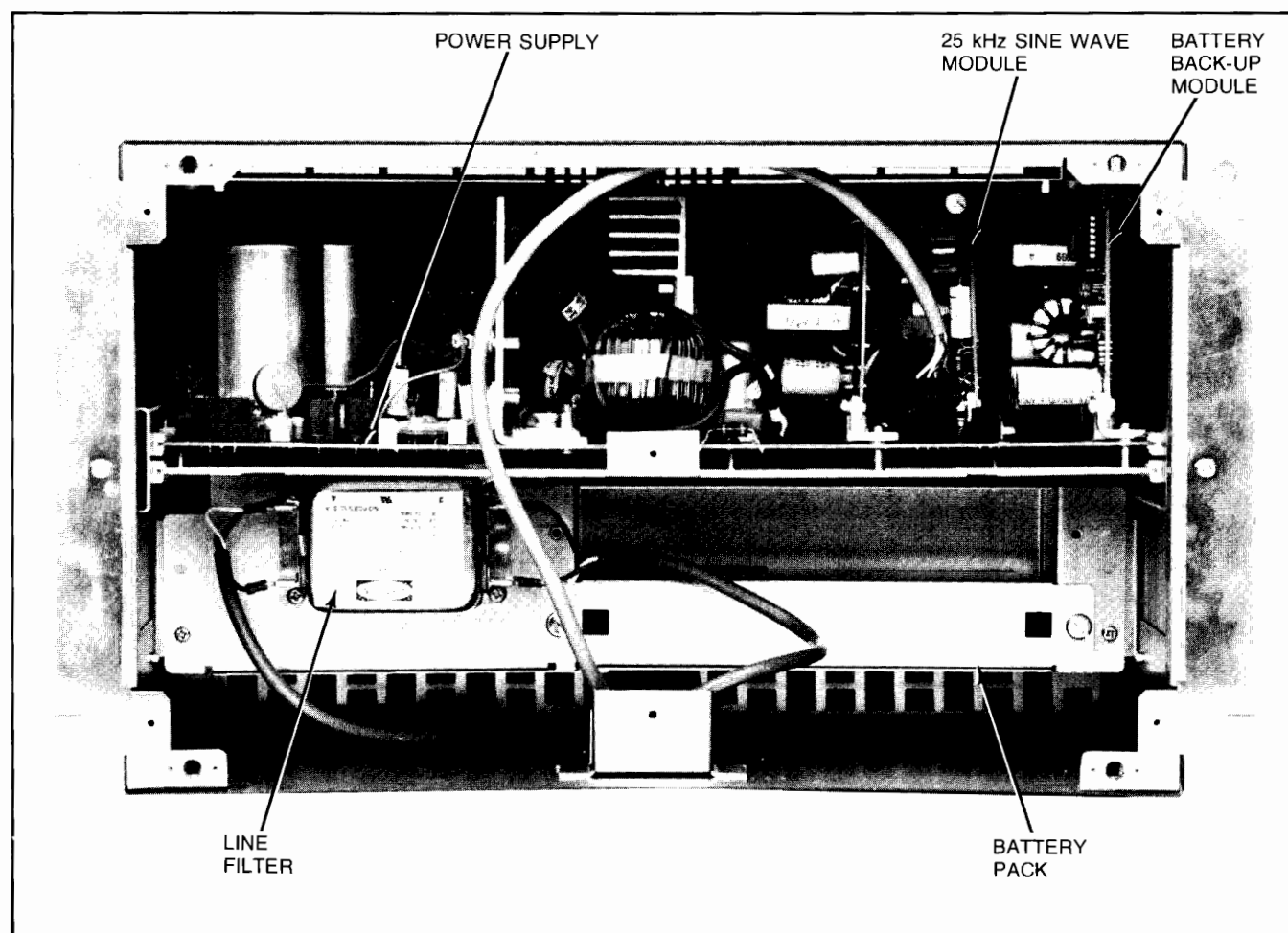


Figure 2-3. A700 Power Supply and Battery Pack Location Diagram

- b. Remove the front panel and the fan panel as described above.
- c. Unplug the two power plugs from the battery pack.
- d. Loosen two captive panel fasteners and remove the battery tray.
- e. Remove the battery pack.

**2-30. REPLACEMENT.** Replace the battery pack by reversing the removal procedure. Make sure the white wire is connected to the positive (+) terminal of the battery pack.

**2-31. 25 kHz SINE WAVE MODULE**

**2-32. REMOVAL.** Remove the 25 kHz Sine Wave module as follows:

- a. Refer to Figure 2-1 and Figure 2-3.
- b. Remove the front panel, the fan panel, and the power supply as described above.
- c. Loosen two captive screws and lift the 25 kHz Sine Wave module from the connector.

**2-33. REPLACEMENT.** Replace the 25 kHz Sine Wave module by reversing the removal procedure. If this is a new installation of the 25 kHz Sine Wave module, remove and discard the two screws in the power supply board.

**2-34. BATTERY BACKUP MODULE.**

**2-35. REMOVAL.** Remove the Battery Backup module as follows:

- a. Refer to Figure 2-1 and Figure 2-3. Set the BACKUP switch on the back panel to the DISABLE position.
- b. Remove the front panel, the fan panel, and the power supply as described above.
- c. Loosen two captive screws and lift the Battery Backup module from the connector.

**2-36. REPLACEMENT.** Replace the Battery Backup module by reversing the removal procedure. If this is a new installation of the Battery Backup module, remove and discard the two screws in the Power supply board. Remove the battery backup jumper board (P/N 12151-80004). This board must be saved in case future operation without the battery backup module becomes necessary.

**2-37. FRONTPLANE**

**2-38. REMOVAL.** Remove the frontplane as follows:

- a. Refer to Figure 2-4.
- b. Set the LINE switch to the OFF position and disconnect the power cord.
- c. If the Battery Backup module is installed, set the BACKUP switch to the DISABLE position.

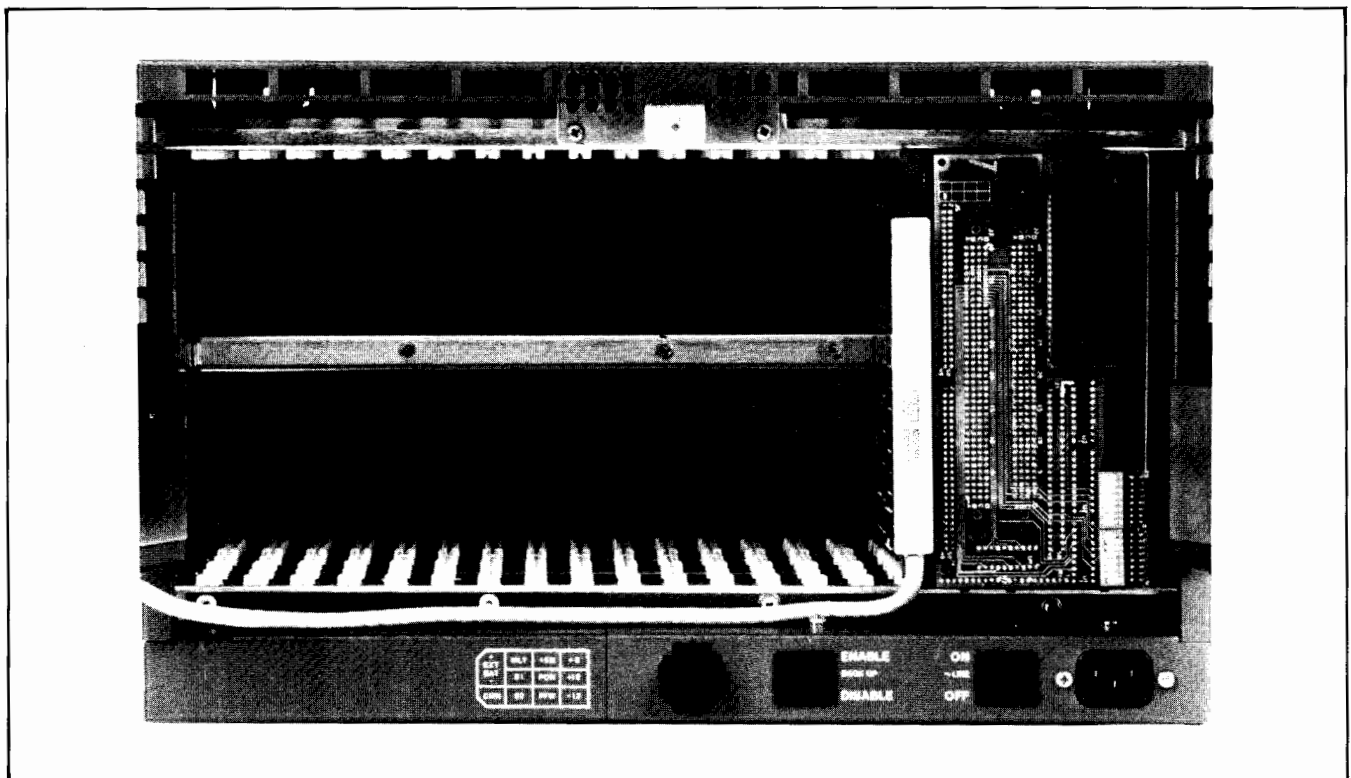


Figure 2-4. A700 Computer Frontplane

- d. Pull the frontplane away from the installed plug-in cards.

**2-39. REPLACEMENT.** Replace the frontplane by reversing the removal procedure.

**2-40. MEMORY FRONTPLANE**

**2-41. REMOVAL.** Remove the memory frontplane as follows:

- a. Refer to Figure 2-4.
- b. Set the LINE switch to the OFF position and disconnect the power cord.
- c. If the Battery Backup module is installed, set the BACKUP switch to the DISABLE position.
- d. Pull the memory frontplane away from the installed plug-in cards.

**2-42. REPLACEMENT.** Replace the frontplane by reversing the removal procedure.

**2-43. PLUG-IN CARDS**

**2-44. REMOVAL.** Remove a plug-in card from the card cage as follows:

- a. Set the LINE switch to the OFF position and disconnect the power cord.
- b. If the Battery Backup module is installed, set the BACKUP switch to the DISABLE position.
- c. If applicable, remove the cable connector from the plug-in card and disconnect the ground connector from the chassis. Remove the plug-in card by pulling outward on the card extractor levers.

**2-45. REPLACEMENT.** Replace a plug-in card by reversing the removal procedure. If a replacement card is being installed, be sure the switches on the card are set properly.

**2-46. PROM CHIPS.**

PROM chips are located on the Memory Controller card and the Lower Processor card. If a card must be replaced, remove the PROMs that are mounted on it. The PROM chips are not included as part of the card.

**CAUTION**

Observe antistatic procedures when removing or replacing the PROM chips.

**2-47. REMOVAL.** Remove a PROM chip from the appropriate card as follows:

- a. Refer to Figure 2-5 or Figure 2-6.
- b. Remove the PROM chip by carefully lifting it away from the socket.

**2-48. REPLACEMENT.** Replace the PROM chips by reversing the removal procedure.

**2-49. BACKPLANE**

**2-50. REMOVAL.** Remove the backplane as follows:

- a. Remove the front panel, the fan panel, and the power supply as described above.
- b. Remove the connectors on the line filter.
- c. Remove four screws and remove the battery support.
- d. Remove four screws and remove the left guide mounting bracket.
- e. Remove 16 screws and remove the backplane.

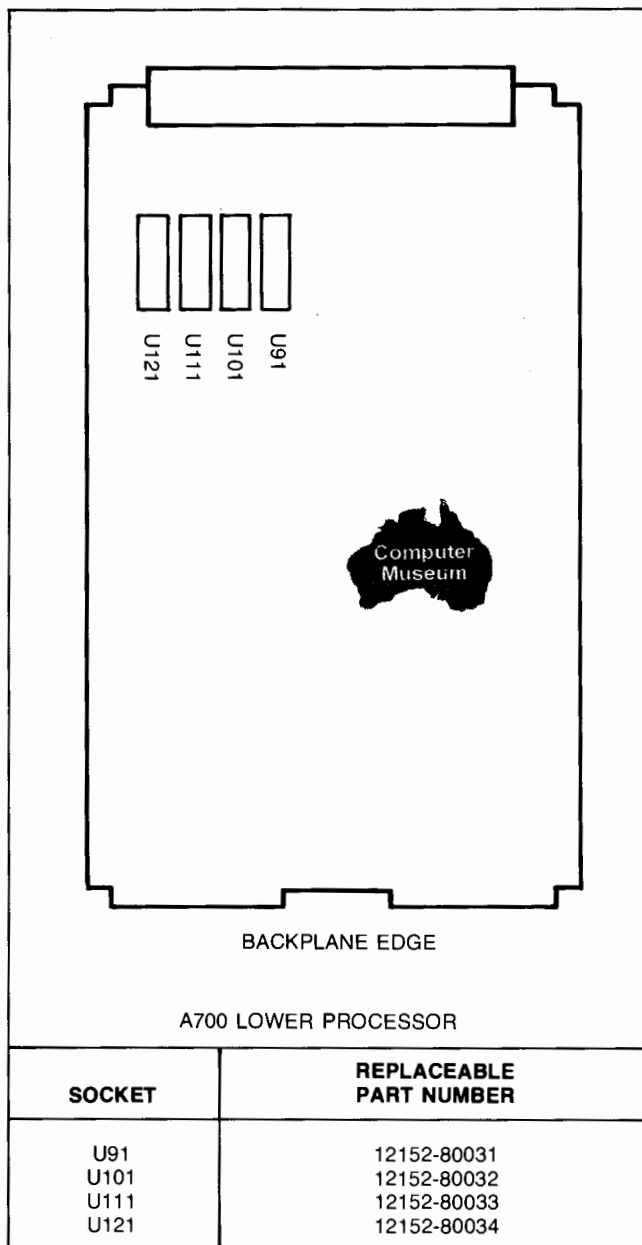


Figure 2-5. A700 Lower Processor PROM Location Diagram

**2-51. REPLACEMENT.** Replace the backplane by reversing the removal procedure.

**2-52. LINE FILTER**

**2-53. REMOVAL.** Remove the line filter as follows:

- a. Refer to Figure 2-3.
- b. Remove the fan panel as described above.

- c. Remove the power connectors to the line filter.
- d. Remove four screws and four washers, and remove the line filter.

**2-54. REPLACEMENT.** Replace the line filter by reversing the removal procedure.

**2-55. 115/230 VAC RECONFIGURATION**

**WARNING**

**Dangerous voltages are present in the power supply. Service must be performed only by qualified personnel.**

The computer ac line voltage configuration is determined by the position of the line configuration/fan power connector. The connector must be plugged into P8 in the power supply if the input line voltage is 115 Vac. The connector must be plugged into P7 on the power supply if the input line voltage is 230 Vac.

If it is necessary to change the position of the line configuration/fan power connector, proceed as follows:

**CAUTION**

Do not adjust the line configuration/ fan power connector while ac power is applied to the computer. Before proceeding, set the computer LINE switch to the OFF position and disconnect the power cord.

- a. If you are reconfiguring the power supply from 115 Vac to 230 Vac operation, apply the 230 Vac label to the right rear door of the computer.

If you are reconfiguring the power supply from 230 Vac to 115 Vac operation, remove the 230 Vac label from the right rear door of the computer.

- b. Remove the front panel of the computer and the fan panel, as described above.
- c. Remove the connector by squeezing the tabs at the ends of the connector.
- d. Insert the connector in the appropriate plug.
- e. Replace the fan panel and the front panel.
- f. Ensure that the correct power cord is used in the new configuration. Refer to Figures 1-1 or 1-2.

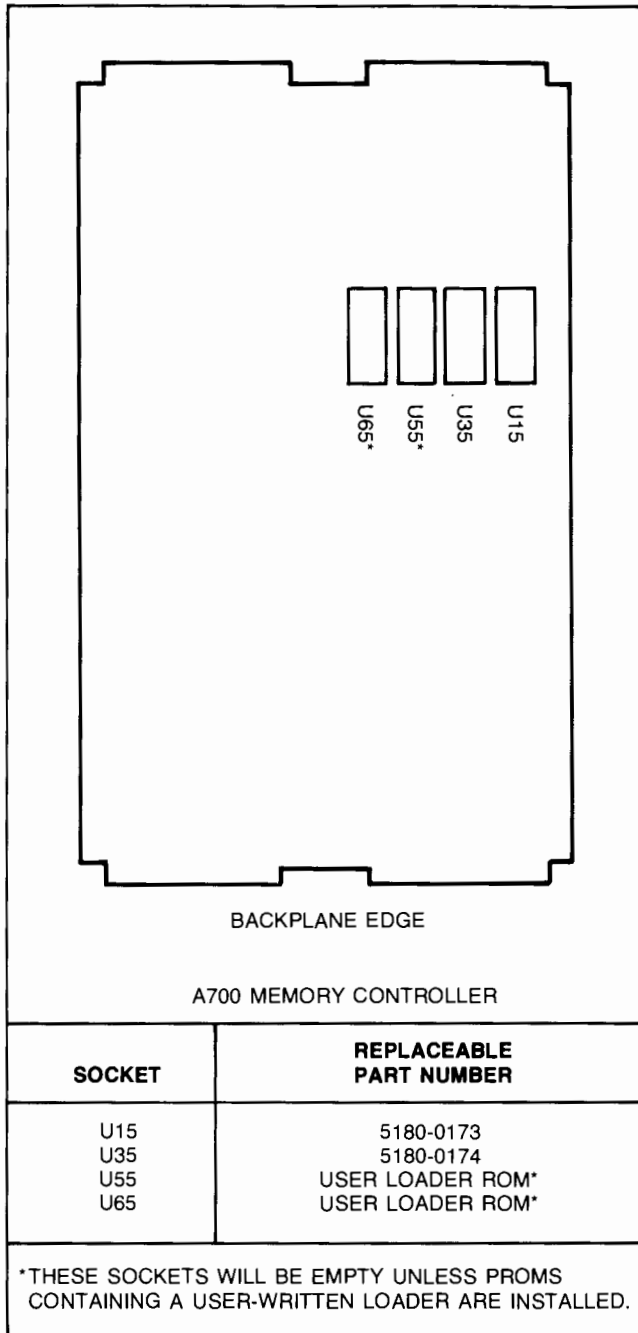


Figure 2-6. A700 Memory Controller PROM Location Diagram

**2-56. POWER DISTRIBUTION DIAGRAM**

Figure 2-7 is the power distribution diagram for the A700 computer.

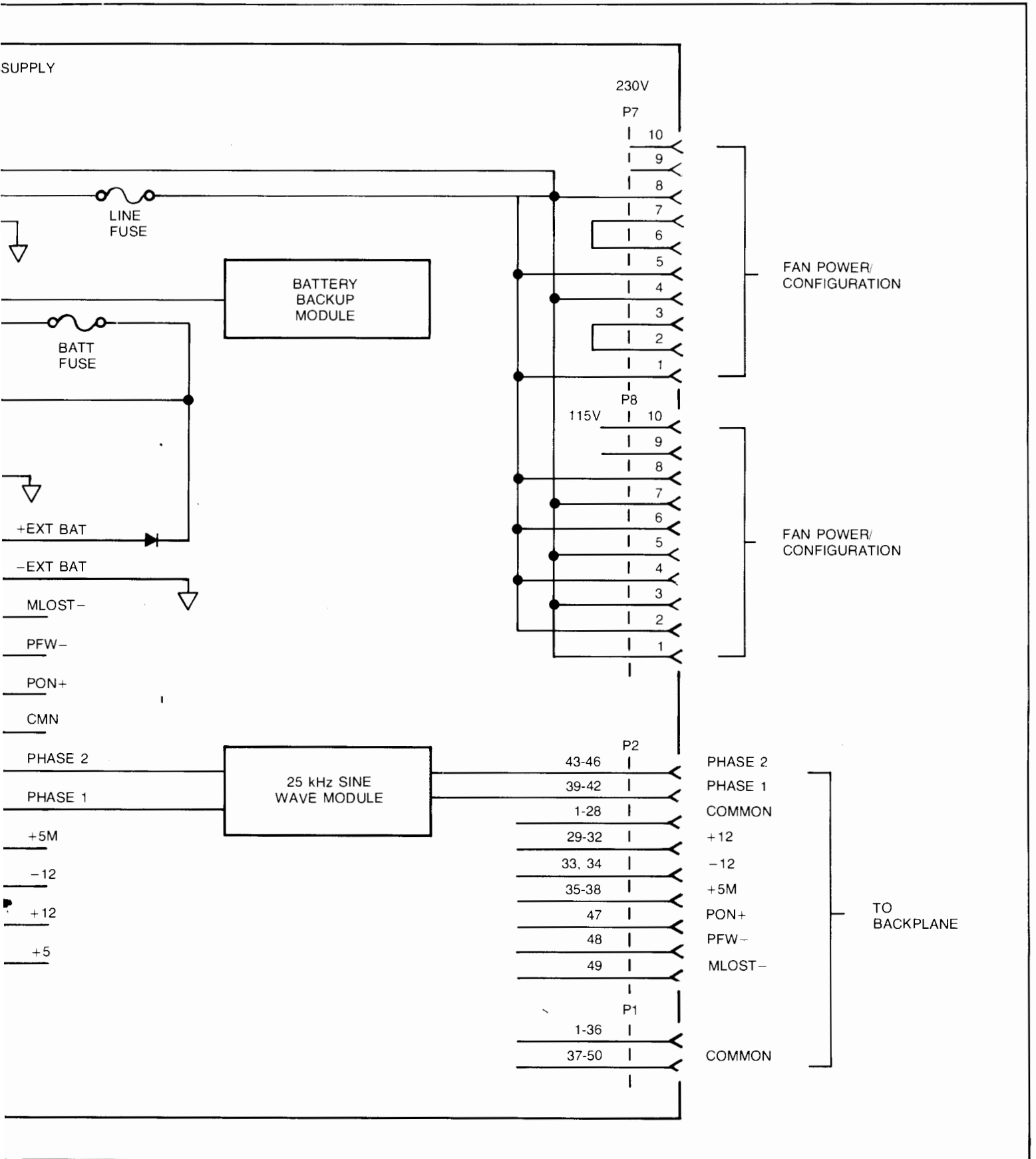
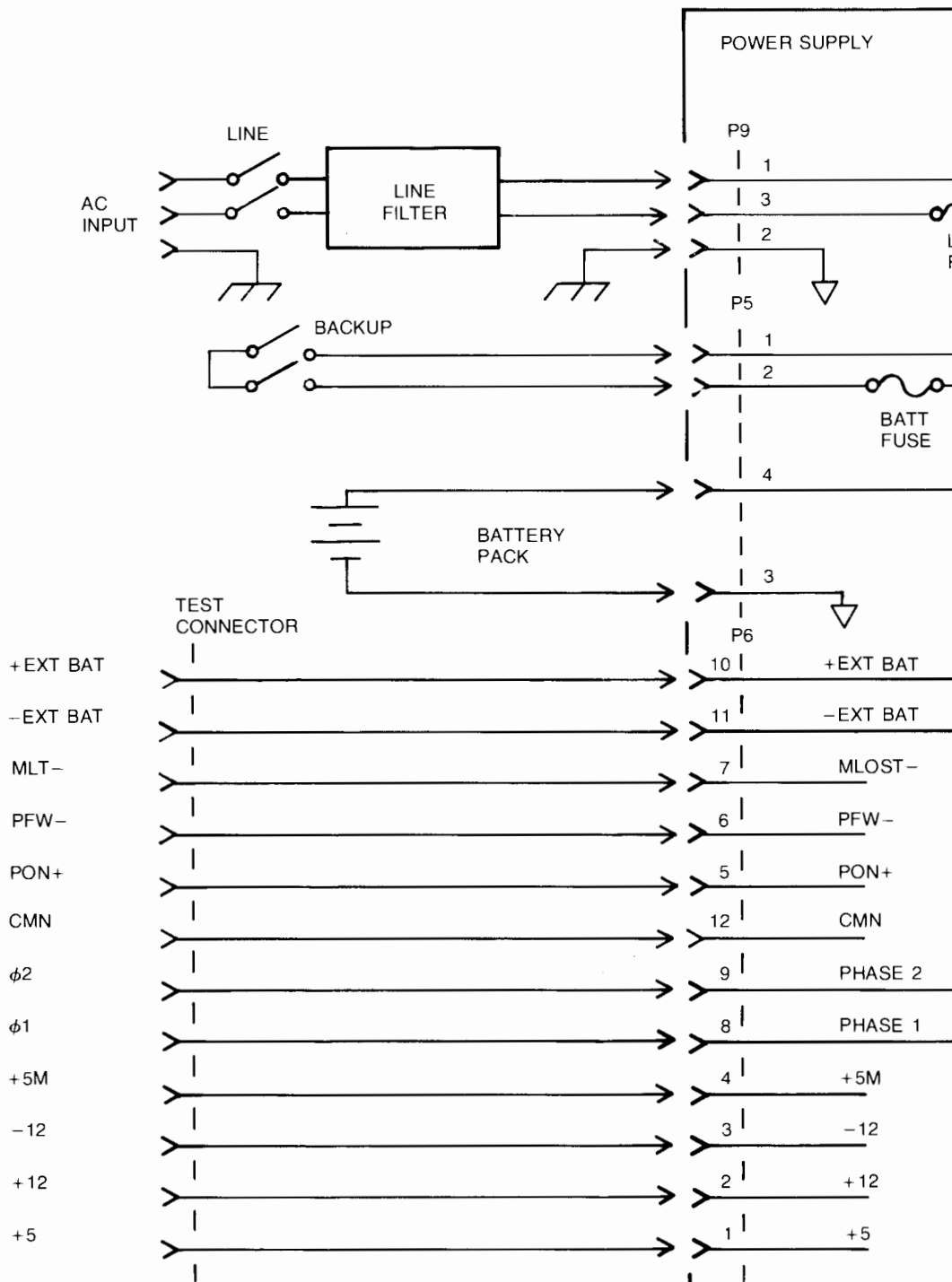


Figure 2-7. Power Distribution Diagram



**WARNING**

DO NOT ALTER THE CONNECTOR ATTACHED TO P7 OR P8 WHILE AC POWER IS APPLIED.

# REPLACEABLE PARTS

SECTION

III

This section provides a list of field-replaceable parts and an illustrated parts breakdown of the HP 2137A computer. Most component parts of the assemblies are not included because these parts are replaceable only at the factory or at a depot.

- e. **MFR PART NO.** The manufacturer's part number for each replaceable part. Commercially obtainable parts are designated OBD (order by description).

## 3-1. REPLACEABLE PARTS

Tables 3-1 and 3-2 and Figures 3-1 and 3-2 list and illustrate the field-replaceable parts of the HP 2137A computer. The replaceable parts are referenced to the exploded views by index numbers. The columns in the index-numbered list provide the following information for each part.

- a. **INDEX NO.** The figure index number of the replaceable parts shown in an exploded view.
- b. **HP PART NO.** The Hewlett-Packard part number for each replaceable part.
- c. **DESCRIPTION.** The description of each replaceable part and its applicable reference designation.
- d. **MFR CODE.** A five-digit code that identifies the manufacture of the part.

## 3-2. ORDERING INFORMATION

To order replaceable parts, address the order to the nearest Hewlett-Packard Sales and Service Office listed at the end of this manual. The following information should be included in the order for each replaceable part:

- a. Complete model number and serial number.
- b. Hewlett-Packard part number for each part.
- c. Complete description for each part as provided in the replaceable parts list.

## 3.3 EXCHANGE PROGRAM

A defective processor card, memory card, or power supply can be exchanged for an operating assembly. For the cost and other details of the exchange program, contact your nearest HP Sales and Service Office listed at the end of this manual.

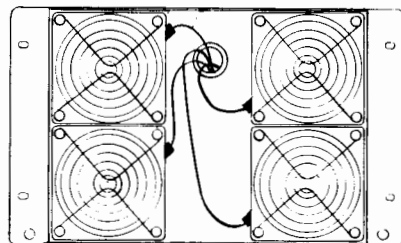
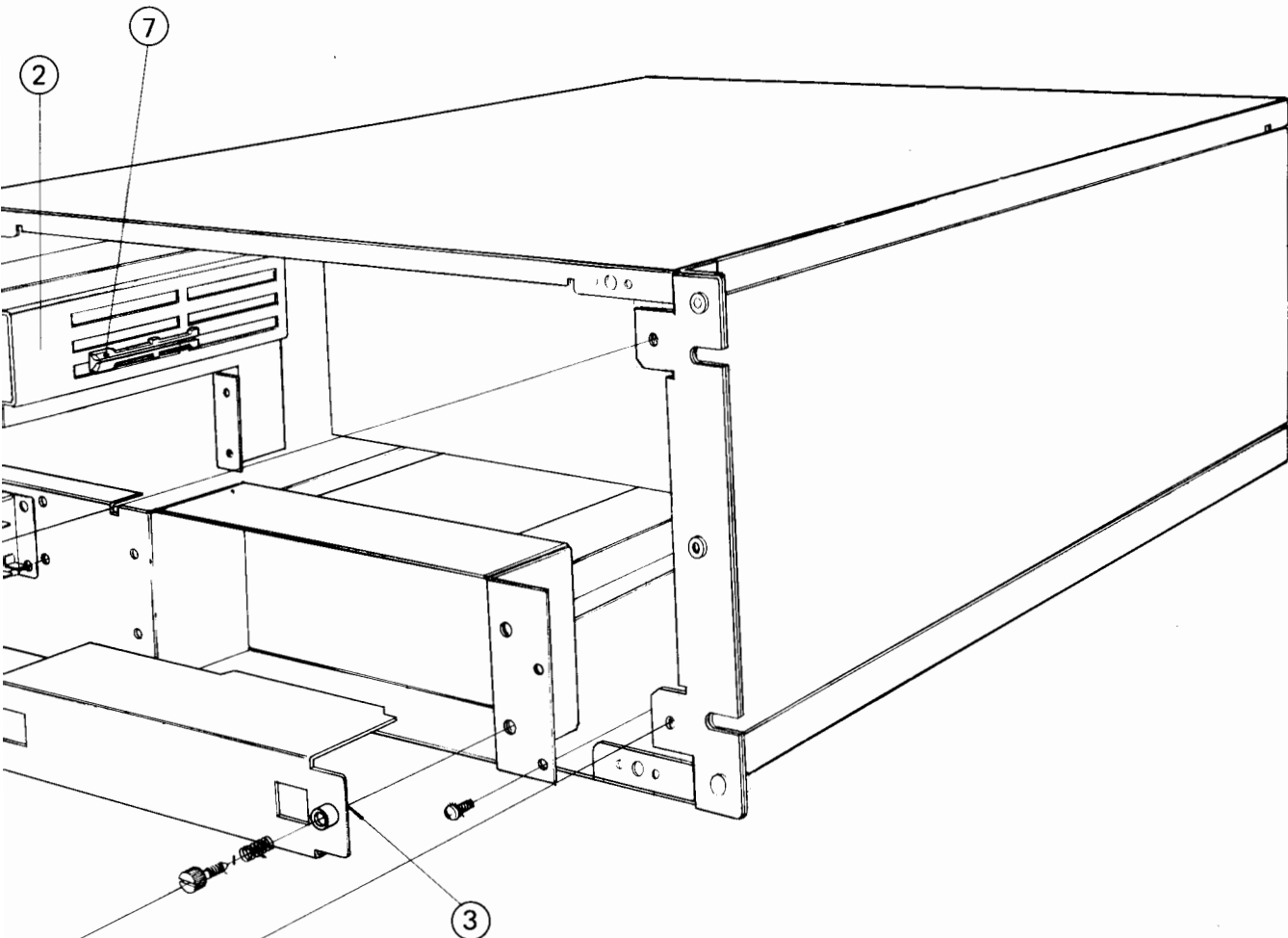
Table 3-1. HP 2137A Computer Replaceable Parts

INDEX NO.	HP PART NO.	DESCRIPTION	MFR. CODE	MFR. PART NO.
—	12151-60002	BACKPLANE	28480	12151-60002
—	12151-60006	AC FILTER CABLE	28480	12151-60006
—	12151-60007	AC POWER CABLE	28480	12151-60007
1	12151-60008	TEST POINT CABLE	28480	12151-60008
—	12151-60009	FAN CABLE	28480	12151-60009
—	12151-60010	BATTERY BACKUP CABLE	28480	12151-60010
2	12151-00046	GUIDE MOUNTING BRACKET	28480	12151-00046
3	12151-00034	BATTERY TRAY	28480	12151-00034
—	12151-40001	FRONT PANEL	28480	12141-40001
—	12151-00025	GRILL	28480	12151-00025
4	9135-0172	LINE FILTER	49956	10PSIOR
5	3160-0315	FAN	23936	4606X
6	3160-0092	FAN GUARD	28875	055012
—	1390-0607	PANEL FASTENER	55566	115-SS-0
7	0403-0436	CARD GUIDE	*	115-287
8	3101-0402	POWER SWITCH	86845	1802.1121
9	1251-4470	POWER RECEPTACLE	**	STF73A1
—	4208-0405	FOAM FILTER	78112	—
—	1420-0304	BATTERY PACK	19209	47B025FE02001



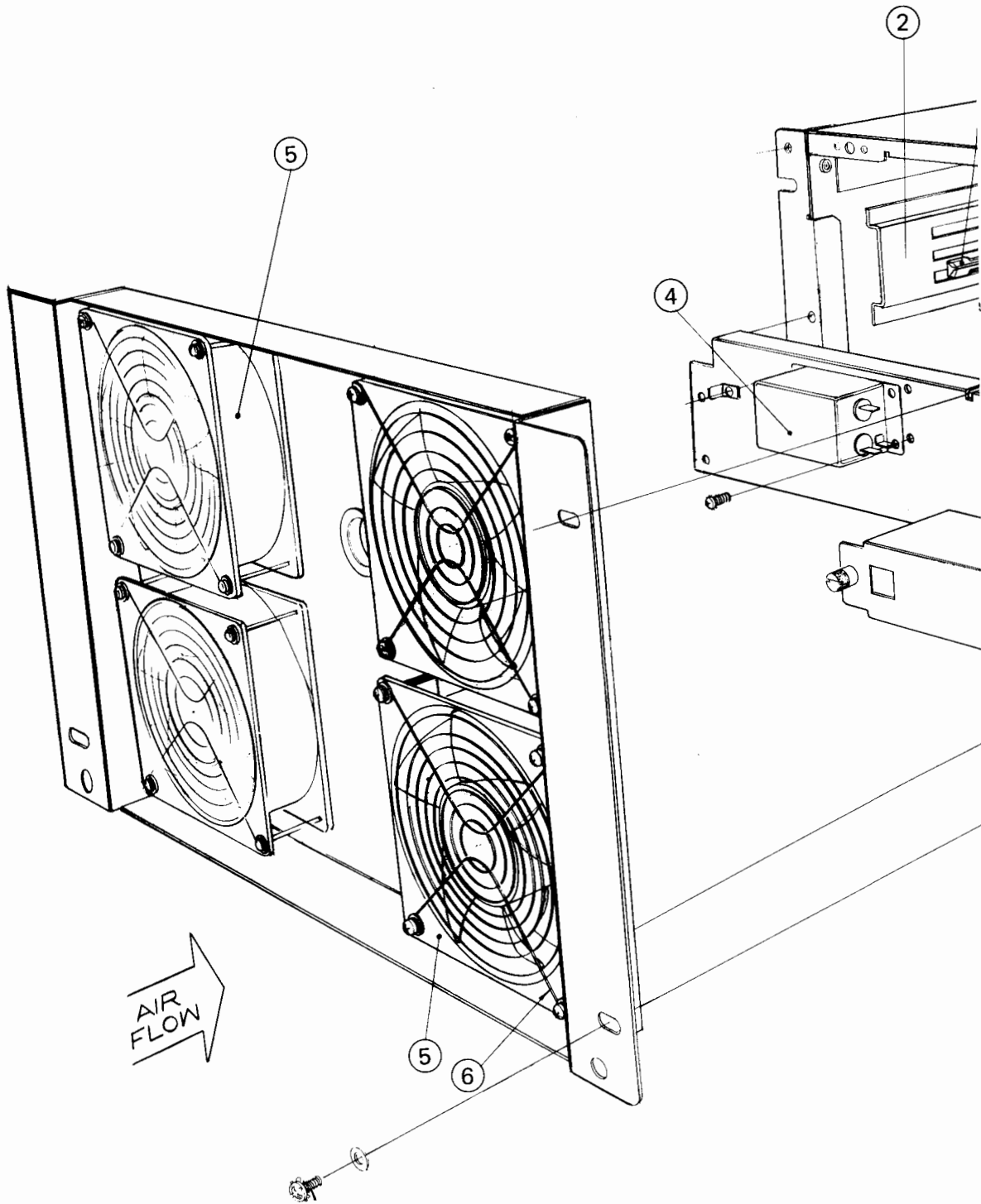
Table 3-2. Code List of Manufacturers

The following codes are from the Federal Supply Code for Manufacturers Cataloging Handbooks H4-1 and H4-2 and their latest supplements.					
CODE NO.	MANUFACTURER	ADDRESS	CODE NO.	MANUFACTURER	ADDRESS
19209	General Electric Co. ....	Gainsville, FL 32601	55566	R.A.F. Electronic Hardware, Inc. ....	Stratford, CT 06497
23936	Pamotor Div, William J. Purdy .....	Burlingame, CA 23936	78112	Scott Paper Co. ....	Philadelphia, PA 19113
28480	Hewlett-Packard Co. ....	Cupertino, CA 95014	86845	Marquart Co. ....	Van Nuys, CA 91409
28875	IMC Magnetic Corp. ....	Rochester, NH 03867	*	Calmark Corp. ....	Gabriel, CA
49956	Raytheon Co. ....	Lexington, MA 02173	**	Kautt & Bux .....	Addison, IL 60101



VIEW OF FAN PANEL  
SHOWING CONNECTOR  
LOCATIONS  
(LONGER WIRES CONNECT  
LOWER FANS)

Figure 3-1. HP 2137A Computer Exploded View  
(Front View)



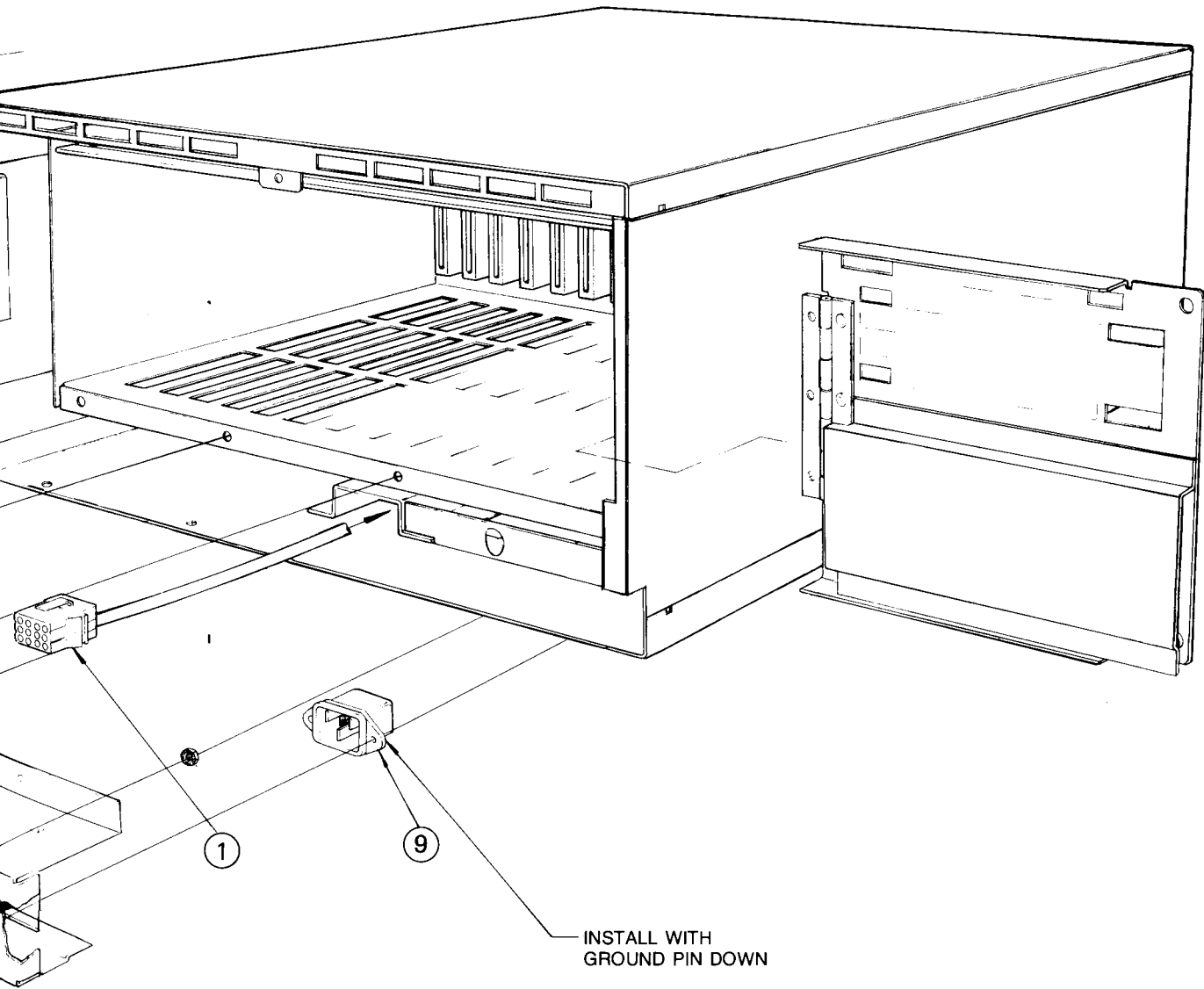
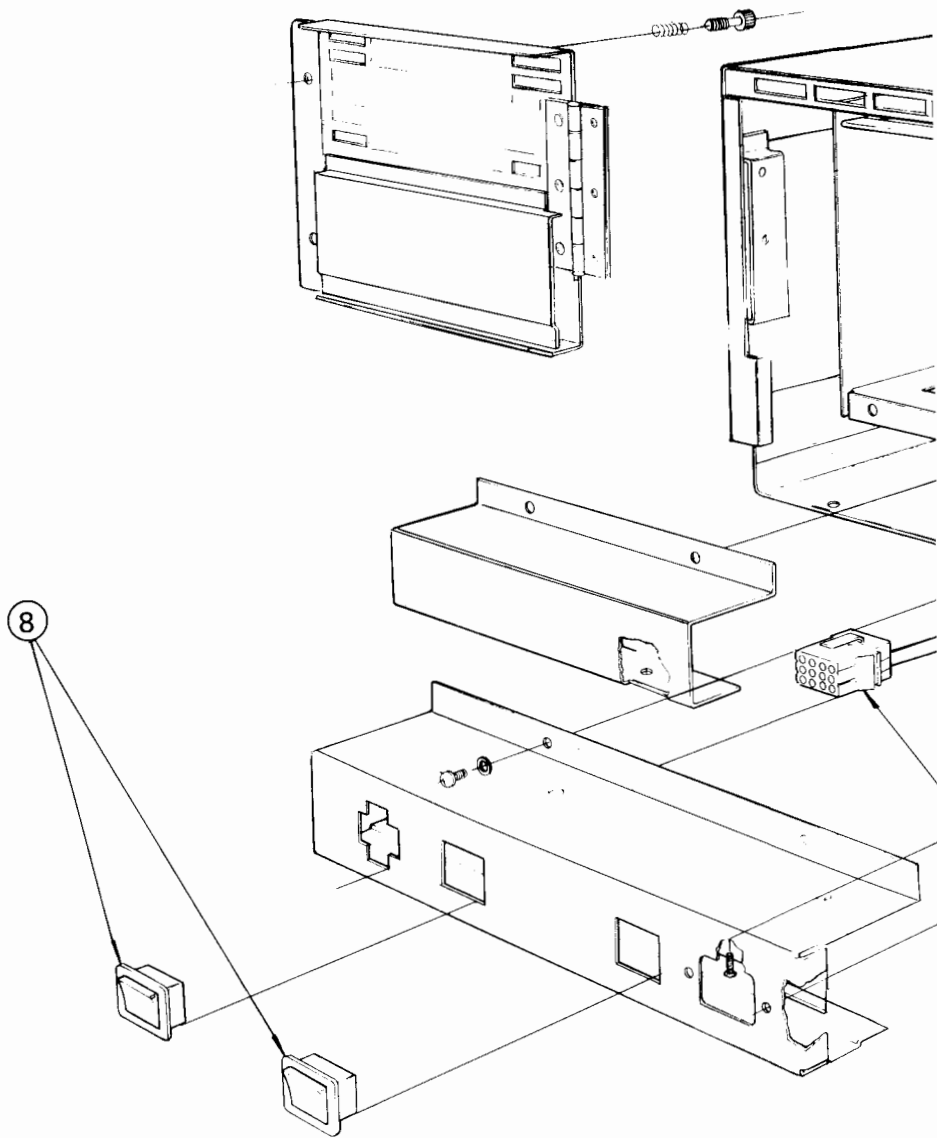


Figure 3-2. HP 2137A Computer Exploded View (Rear View)





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HEWLETT-PACKARD COMPANY  
Data Systems Division  
11000 Wolfe Road  
Cupertino, California 95014