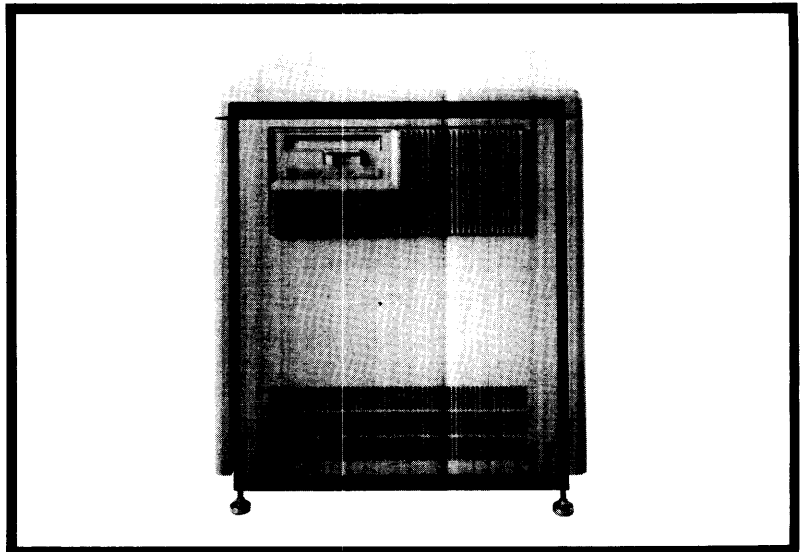
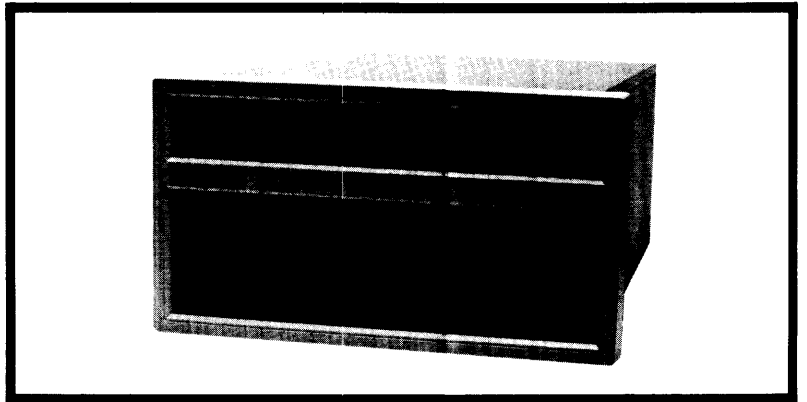
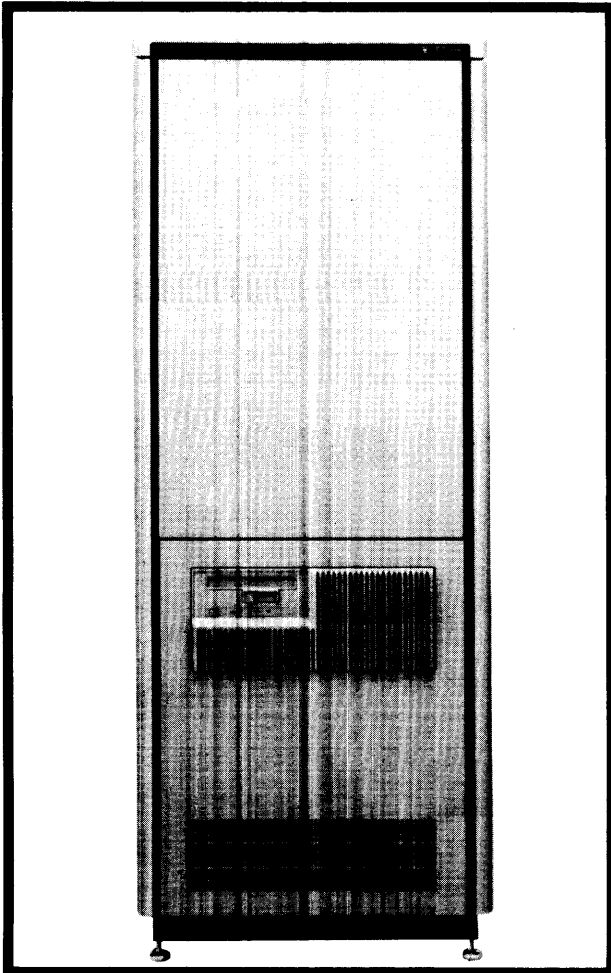


# HP 1000 A400 Computer

## Installation and Service Manual

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# HP 10000 A-Series





# HP 1000 A400 Computer

## Installation and Service Manual

### FEDERAL COMMUNICATIONS COMMISSION RADIO FREQUENCY INTERFERENCE STATEMENT

This equipment complies with the requirements in Part 15 of FCC Rules for a Class A computing device. Operation of this equipment in a residential area may cause unacceptable interference to radio and TV reception requiring the operator to take whatever steps are necessary to correct the interference.

**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.

---

Data Systems Division  
1266 Kifer Road  
Sunnyvale, CA 94086-5304

Manual Part No. 02134-90001  
E0188

Printed in U.S.A. January, 1988  
First Edition

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# 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 manual edition and update is compatible with your current software revision code, refer to the Manual Numbering File or the Computer User's Documentation Index. (The Manual Numbering File is included with your software. It consists of an "M" followed by a five digit product number.)

First Edition ..... Jan 1988 .....

# 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).

---

## 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.

---

### *Example of Caution*

---

## 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.

---

## 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.

---

### *Example of Warning*

---

## WARNING

SERVICING - 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.

---

### *Example of Warning*

---

## 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 A400 Computer. The HP 1000 A400 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 A400 is as follows:

1. HP 1000 A400 Computer Reference Manual (part no. 02424-90001).
2. RTE-A Primary System Software Installation Manual (part no. 92077-90038).
3. Getting Started with RTE-A (part no. 92077-90039).
4. HP 12009A HP-IB Interface Reference Manual (part no. 12009-90002).
5. Introduction to HP 1000 A-Series Computer Diagnostic Reference Manual (part no. 24612-90010).
6. HP 1000 A/L-Series Diagnostic Operating and Troubleshooting Manual (part no. 24612-90001).
7. HP 1000 A/L-Series DDL Operating and Programming Manual (part no. 24612-90002).
8. HP 1000 A/L-Series Computer Kernel Diagnostic Reference Manual (part no. 24612-90003).
9. HP 1000 A/L-Series Computer Interface Diagnostic Reference Manual (part no. 24612-90011).

An Engineering and Reference Document (part no. 02424-90003), is also available to those who wish in-depth knowledge about the HP 1000 A400 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

---

This section provides instructions that will enable the user to install the HP 1000 A400 Computer (HP 2134A). Included in this section is user information on the following:

1. Site Preparation
2. Unpacking and Inspection
3. Claims Procedure
4. Physical Inventory
5. Configuration Requirements
6. Installation Procedure
7. Repackaging for Shipment

Specifications for the HP 1000 A400 Computer are given in the HP 1000 A400 Computer Reference Manual (part no. 02424-90001).

## Site Preparation

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

### 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.

### Power Requirements

The HP 2134A 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 2134A is 700 watts. Changing from 115-Vac operation to 230-Vac operation (or vice versa) is described in Chapter 2. 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.

**Table 1-1. Environment Specifications**

<b>Ambient Temperature</b>	
<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
<b>Relative Humidity</b>	
	5% to 95%, without condensation
<b>Altitude</b>	
<b>Operating:</b>	to 4.6 km (15,000 ft)
<b>Non-Operating:</b>	15.3 km (50,000 ft)
<b>Vibration and Shock</b>	
	HP 1000 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.)

**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>	
	If an external battery is used, it 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

## Cooling Requirements

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

## 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.

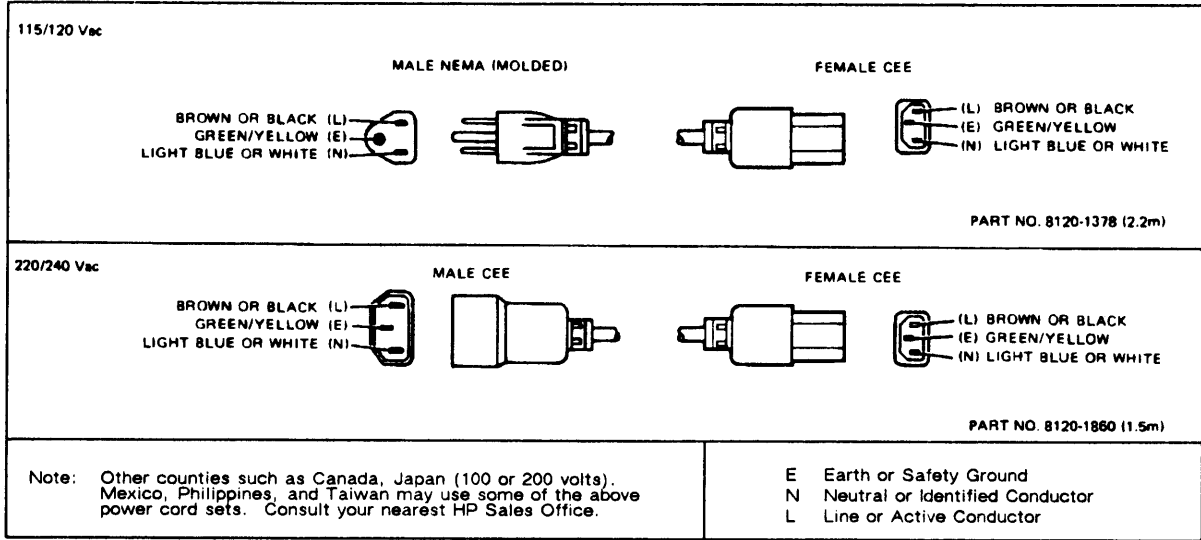
Table 1-3. HP 2134A Rack Mounting Dimensions

Height	Width	Depth	Weight
266 mm (10.5 in.)	483 mm (19 in.)	610 mm (24 in.)	29.1 kg (64 lbs)

## AC Power Outlet and External Ground

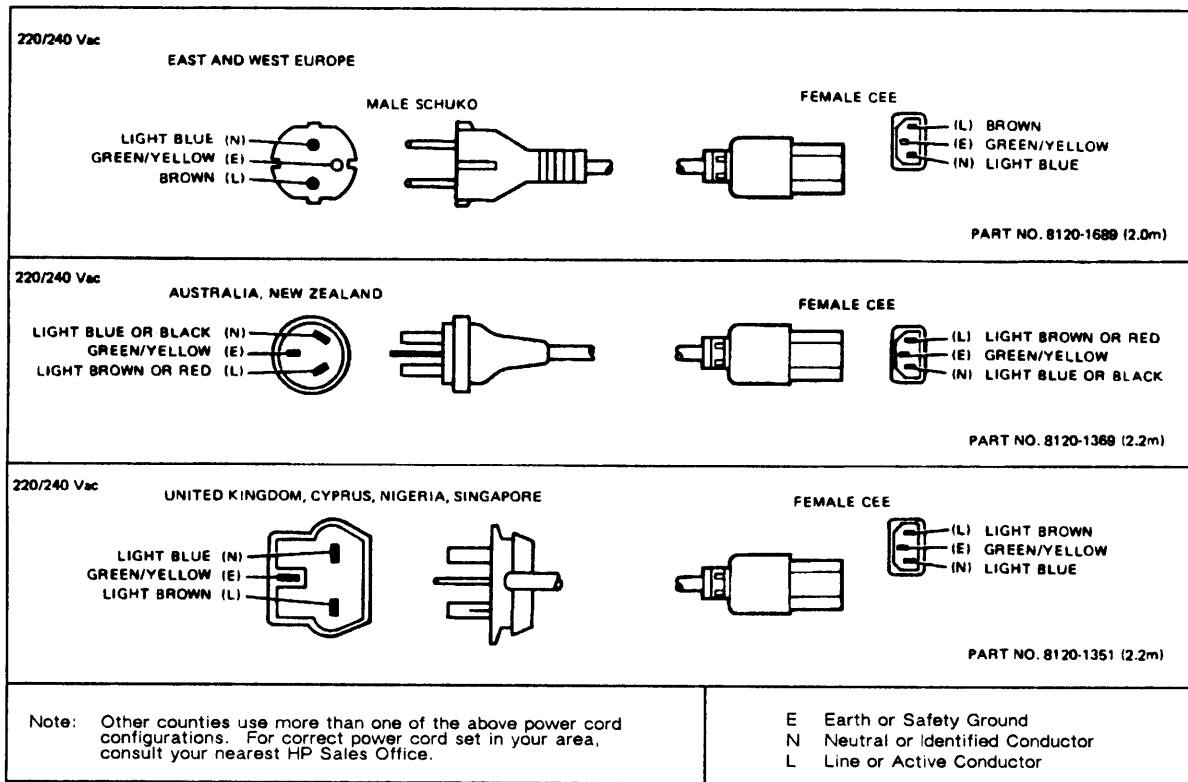
The female power outlet to be used to supply AC power to the computer must be checked by a qualified electrician to ensure that it furnishes the proper voltage for which the computer is set. The outlet and its associated wiring and fuses (or circuit breakers) must be capable of carrying the current specified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

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.



L8400-89

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



L8400-90

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

## **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.

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

## **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.

## **Physical Inventory**

### **Manuals**

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

### **Equipment**

#### **Computer**

The computer model number and serial number are printed on an identification label affixed to the rear 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.

---

## CAUTION

An incorrect power configuration may permanently damage the product.

---

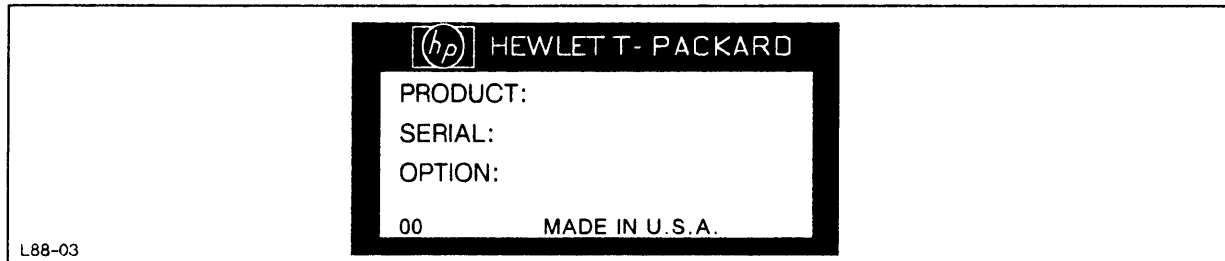


Figure 1-3. Identification and Information Label

## 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.

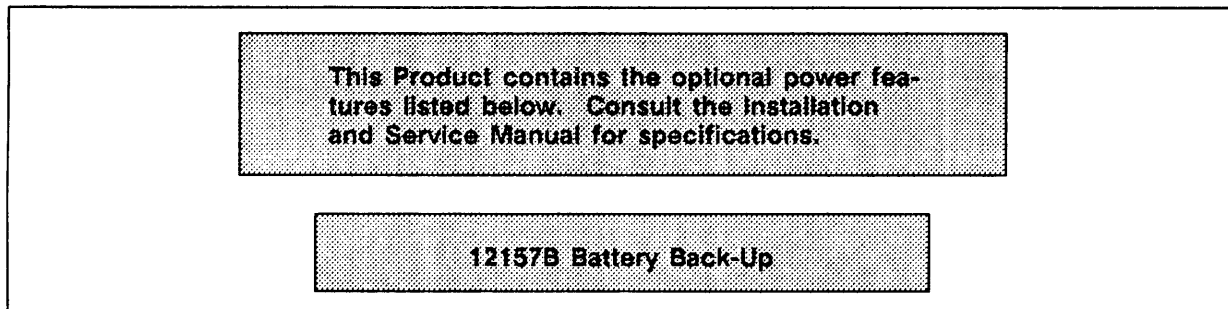


Figure 1-4. Power Option Labels

## Plug-In Cards

If I/O interface cards 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.



# Configuration Requirements

## Battery Backup

The HP 12157B Battery Backup will sustain memory for 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.

Note that if batteries are not installed then the strapping connector from the terminal on the lower board of the power supply must be connected to B.B. OFF. (See Figure 2-1.) If batteries are installed, the strapping connector must be connected to B.B. ON.

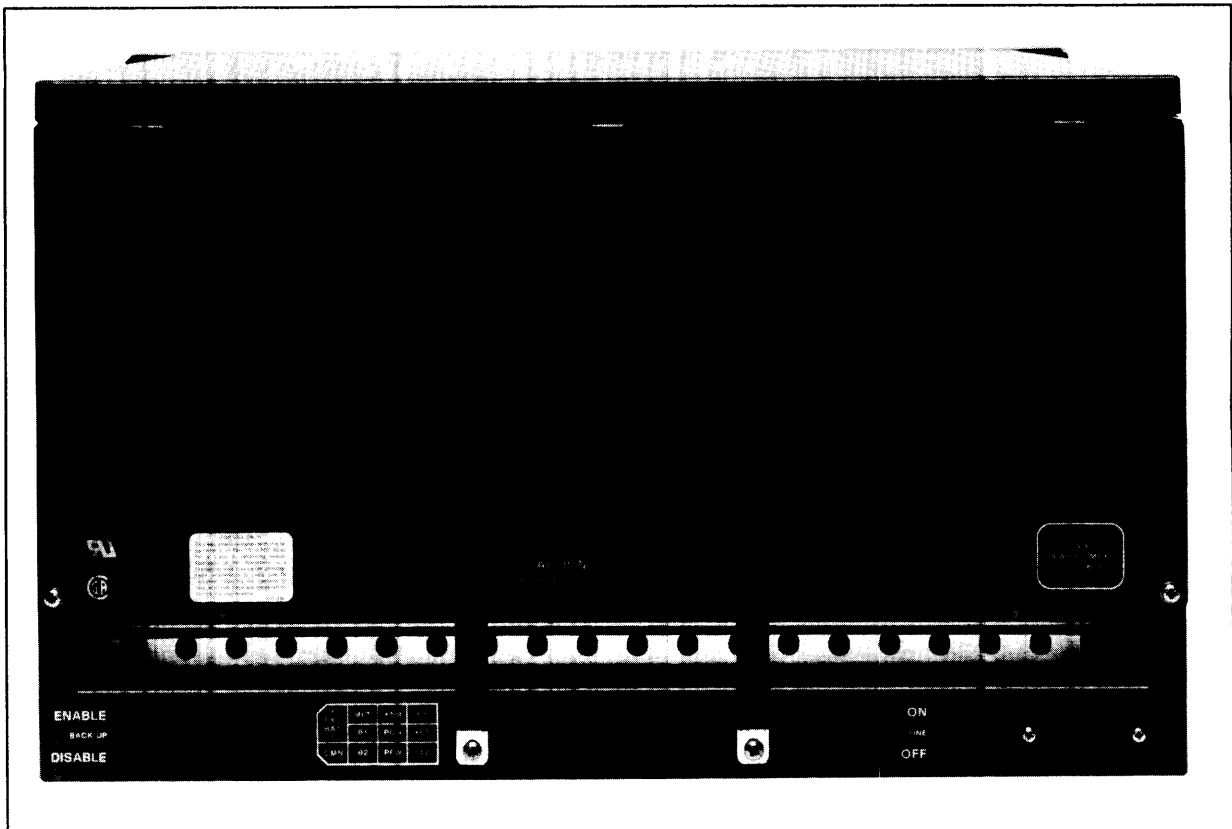


Figure 1-5. Computer Rear Panel

## Switch Configuration for A400 Processor Card

The HP 12100A plug-in processor card of the A400 computer has switches that must be set as appropriate for a particular system configuration. The A400 configuration switches are shown in Figure 1-6. If the system is to be reconfigured, check with the system manager to determine the proper settings for the switches. If hardware changes require the reassignment of select codes or the addition or deletion of interfaces or devices, a new operating system may need to be generated.

The start-up switch settings for the HP 12100A card are given in Table 1-4. There are two sets of switches on the card, the U1601 switches select the start-up options and the U1001 switches configure the four on-board I/O ports:

1. In the standard system, the U1601 BOOT SEL (S1-S6) switches are set to cause the computer to speed sense and execute the VCP routine after self-test executes. (U1601, S8 is the Memory Lost signal On/Off Switch.) Factory settings are OOCOCOCO; where O = open, and C = closed.
2. Memory Lost – The Memory Lost switch (U1016-8) is an auto-restart override switch. If it is set open, auto-restart is enabled if battery backup is installed and enabled. If the M switch is set closed, auto-restart is overridden.

---

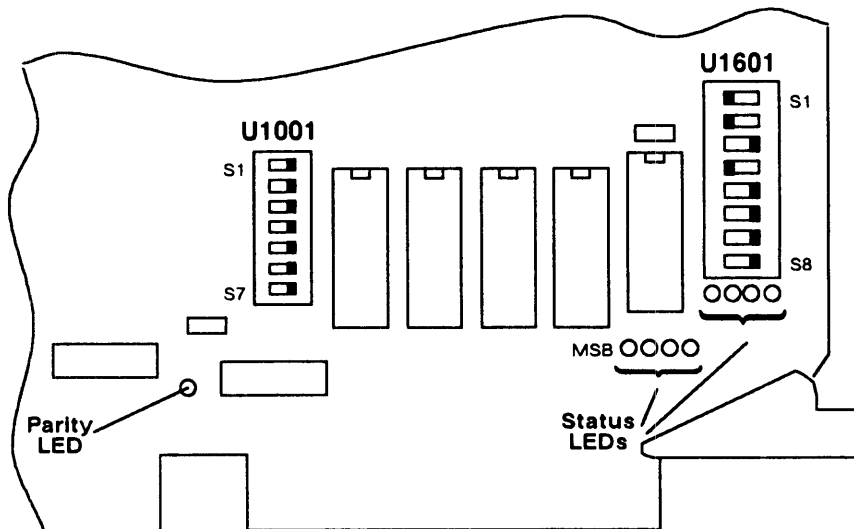
### NOTE

**If the M switch is open and batteries are not installed, a self-test error will occur.**

---

3. Switch bank U1001 (S1-S7) configures the on-board I/O ports. Switches S1-S4 configure for the RS-232/422/423 electrical standards. Switches S5-S6 configure modem control, and S7 determines if Port A will be the VCP interface. Note that if modem control is needed, S2 and/or S3 (Ports B and C, respectively) must be configured as RS-232 and S5 and S6 set for V.28 or RS-232. Refer to Table 1-5 for a definition of the switches.

When shipped from the factory these switches are configured for RS-232 on all ports, RS-232 modem ports, and Port A is enabled as the Virtual Control Panel (VCP) interface. Note that all ports are at select code 77 octal and cannot be changed. These settings are CCCCCCCC; where C = closed.



\* Note that the U1001 and U1601 switches are open when in the left position and closed when in the right position. In this diagram, the U1001 switches are all closed and the U1601 switches are OOCOCCCC.

L8600-17

Switch		Description
U1001	S1 thru S4	Selects RS-232 or RS-422/423 on all ports. Refer to Table 1-5.
	S5 and S6	Selects RS-232 or V.28 for modem control line DSR on Ports B and C. Refer to Table 1-5.
	S7	Determines if Port A will be the VCP interface. Refer to Table 1-5.
U1601	S1 thru S6	Start-Up (BOOT SEL) - Used during normal operation to select the bootstrap source. They also control the operation of the computer while Test 2 is executing. Refer to Table 1-4.
	S7	Don't care.
	S8	Memory Lost - The Memory Lost switch is an auto-restart override switch which can be set open when battery back-up is available.

Figure 1-6. A400 Configuration Switches

## 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 switch that must be set.

Table 1-4. Start-Up (U1601) Switch Settings

BOOT SEL Switches*						Computer Action
S1	S2	S3	S4	S5	S6	
C	C	C	C	z	y	Loop on self-test Test 2 regardless of error.
C	C	O	C	z	y	Loop on self-test Test 2 and stop on error.
C	O	O	C	z	y	Run Virtual Control Panel (VCP) routine on completion of self-test.
O	C	C	C	z	y	If memory lost (not sustained), run VCP routine; otherwise, re-start program (JMP 4B). See Note 2.
O	O	C	O	z	y	If memory lost (not sustained), speed sense and run VCP; otherwise, restart program (JMP 4B). See Notes 2, 3, and 4.
O	C	O	C	z	y	If memory lost, load and execute program via PROM card; otherwise, restart program (JMP 4B). (See Note 2.) (In order to auto-boot from PROM, the card must have select code 22. Equivalent to loader command %BRM.)
O	O	C	C	z	y	If memory lost, load and execute program via HDLC card; other restart program (JMP 4B). (See Note 2.) (In order to auto-boot via HDLC, the card must have select code 24. Equivalent to loader command %BDS.)
O	O	O	C	z	y	If memory lost, load and execute program from first file of disc (via HP-IB); otherwise, restart program (JMP 4B). (See 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.)
<p>* O = open; C = closed            y = C, normal mode, 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 (not halts).</p> <p>Notes: 1. Do not use any switch combination that is not shown above.            2. When a loader finishes an auto-boot, it starts execution of the loaded program at location 02. If auto-restart feature is disabled (switch M closed), the program cannot restart and the boot loader (or VCP routine) will execute.            3. Use this switch configuration for normal computer operation.            4. Speed sense allows VCP to execute at any supported baud rate on the A400 on-board I/O or the 8-channel MUX (rev. 4010 or higher).</p>						

## Virtual Control Panel (VCP) Configuration

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

1. Port A on the A400 processor card, an ASIC card, a MUX card, or an HDLC card must be selected as the VCP interface card. The ASIC card is the HP 12005 Asynchronous Serial Interface card. The MUX is the HP 12040 8-channel Multiplexer card. The HDLC card may be either the HP 12007 HDLC Modem Interface card or the HP 12044 HDLC Direct Connect Interface card.
2. On the A400 processor card, set switch U1001-S7 closed to select Port A as the VCP interface or set switch U1S1 on the designated interface card closed to select the card as the VCP interface card.

**Table 1-5. I/O (U1001) Switch Definition**

Switch	I/O Port Controlled	Definition
S1	A	Open = RS-422/423; Closed = RS-232.
S2	B	Open = RS-422/423; Closed = RS-232.
S3	C	Open = RS-422/423; Closed = RS-232.
S4	D	Open = RS-422/423; Closed = RS-232.
S5	C	Open = V-28; Closed = RS-232. You must also set switch S3 for RS-232 when using Port C for Modem control.
S6	B	Open = V-28; Closed = RS-232. You must also set switch S2 for RS-232 when using Port C for Modem control.
S7*	A	Open = does not operate as VCP; Closed = does operate as VCP.
* Note that only Port A can be used as the VCP interface.		

## I/O Priority Assignment

Each peripheral device in the system must be connected to the computer through one of the four on-board I/O ports or through an interface card installed in the card cage. A priority chain connects the four I/O ports and all interface cards in series to prioritize simultaneous interrupt requests from two or more peripherals.

The interrupt priority of a peripheral device is determined by the location of its interface. The four on-board ports of the A400 processor are always at the top of the priority chain. These four ports equally share the highest priority. The next highest priority is for the interface card located in the slot immediately to the left of the A400 card. (The I/O slot numbers and the A400 slot number move to the left to higher numbered slots as additional memory cards are added to the right of the A400 card in the low numbered slots.) The interface card in slot 20 has the lowest priority.

Interrupts from a higher priority device inhibit lower priority interrupts by breaking the priority chain. From the standpoint of system response time, it is more efficient to assign the higher priorities to high-speed peripheral devices. The computer card configuration in the 20-slot backplane is shown in Figure 1-7.

---

### NOTE

Correct computer operation requires that there not be any vacant slots between plug-in cards.

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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.

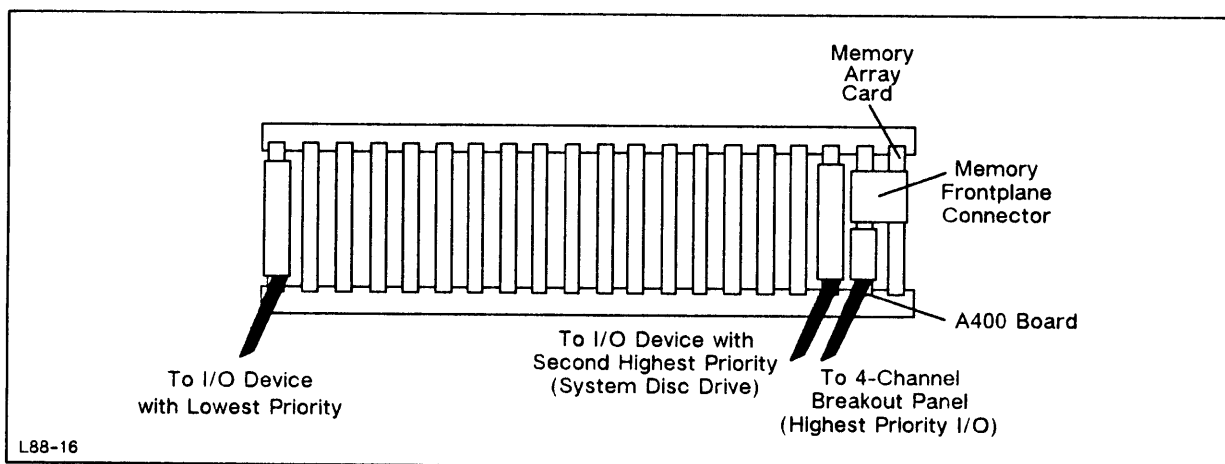


Figure 1-7. HP 2134A Card Configuration

## Memory Configurations

Several memory configurations can be installed in the 2134A computer. The available memory array cards and memory frontplanes are listed in Table 1-6. Typical configurations for both minimum and maximum memories is shown in Figure 1-8.

Note that memory array cards are added to the right of the A400 card and I/O interface cards are added to the left of the A400 card.

The A400 card has 512k bytes of on-board memory; therefore, a minimum memory configuration with no additional memory arrays would have 512k bytes of memory. Only parity memory can be installed in the computer.

Memory array cards can be added to provide up to 32 megabytes of addressable memory. When adding an HP 12103D 1024k-byte memory array card, you must take into account the memory between the card being added and the A400 card (including the 512k bytes of on-board memory), and install the card on the correct address boundary. Specifically, a 12103D card must be installed on a memory address boundary that is an integer multiple of 1024, and to meet this requirement a 12103C 512k byte card must be installed next to the 12100A processor card ahead of the 12103D card.

All other memory array cards listed in Table 1-6 can be installed without any concern about the memory boundary.

<b>Minimum A400 Memory Configuration</b>			
<b>Slot</b>		<b>Slot</b>	
11	Available for I/O Card	1	12100A A400 Card w/512k Byte Memory
12	Available for I/O Card	2	12009 HP-IB Interface Card (Optional)
13	Available for I/O Card	3	Available for I/O Card
14	Available for I/O Card	4	Available for I/O Card
15	Available for I/O Card	5	Available for I/O Card
16	Available for I/O Card	6	Available for I/O Card
17	Available for I/O Card	7	Available for I/O Card
18	Available for I/O Card	8	Available for I/O Card
19	Available for I/O Card	9	Available for I/O Card
20	Available for I/O Card	10	Available for I/O Card
<b>Maximum A400 Memory Configuration</b>			
<b>Slot</b>		<b>Slot</b>	
11	Available for I/O Card	1	12103M 8 Mbyte Memory Array Card
12	Available for I/O Card	2	12103M 8 Mbyte Memory Array Card
13	Available for I/O Card	3	12103M 8 Mbyte Memory Array Card
14	Available for I/O Card	4	12103M 8 Mbyte Memory Array Card
15	Available for I/O Card	5	12100A A400 Card w/512k Byte Memory
16	Available for I/O Card	6	12009A HP-IB Interface Card (Optional)
17	Available for I/O Card	7	Available for I/O Card
18	Available for I/O Card	8	Available for I/O Card
19	Available for I/O Card	9	Available for I/O Card
20	Available for I/O Card	10	Available for I/O Card
<b>Note:</b>		With four 8-Mbyte memory cards installed, the last 0.5 Mbytes of memory cannot be addressed.	

**Figure 1-8. HP 2134A Computer System Memory Configuration**

**Table 1-6. HP 2134A Memory Array Cards and Memory Frontplanes**

<b>Description</b>		<b>Part Number</b>
12103C	512k Byte Memory Parity Array Card	12103-60016
12103D	1024k Byte Memory Parity Array Card	12103-60004
12103K	2048k Byte Memory Parity Array Card	12103-66001
12103L	4096k Byte Memory Parity Array Card	12103-66002
12103M	8192k Byte Memory Parity Array Card	12103-66003
12038A	Memory Connector to 1 Memory Array Card	12038-60005
12038B	Memory Connector to 2 Memory Array Card	12038-60002
12038C	Memory Connector to 3 Memory Array Card	12038-60003
12038D	Memory Connector to 4 Memory Array Card	12038-60004



# Installation Procedure

## Manual Updating

Before installing the computer, perform any updating that may be required for the A400 computer documentation. Updating instructions (if any) are provided in a supplement supplied with the appropriate document.

## Tools Required

No installation tools other than ordinary hand tools are required.

## Self-Test 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. Check the power supply voltages as follows:

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

TEST POINT	NOMINAL VOLTAGE
+5	5.1 V $\pm 0.10V$
+12	12.0 V $+0.72V, -0.36 V$
-12	-12.0 V $\pm 0.72V$
+5M	5.1 V $\pm 2\%$
PON+ (Power On)	3.7 V $\pm 1.3V$
PFW- (Power Fail Warning)	3.7 V $\pm 1.3V$
MLT- (Memory Lost)	3.7 V $\pm 1.3V$ if battery backup installed 0.4 V $\pm 0.4V$ if battery backup not installed
$\phi 1, \phi 2$	19.5 Vrms $+1.95, -2.0$ Vrms (at 0 to .02 Amps) 19.5 Vrms $\pm 1.6$ Vrms (at .02 to 1.5 Amps)

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

The self-test consists of two test programs (Test 1 and Test 2) that automatically execute each time the computer is powered up. If there is a failure during the self-test, the computer may or may not operate depending upon what part of the self-test failed. Successful completion of the self-test is followed immediately by execution of a bootstrap loader or the Virtual Control Panel (VCP) program. These functions are selected by setting the processor BOOT SEL switches.

To run the self-test, do the following:

1. Set the LINE switch to the OFF position.
2. Set the LINE switch to the ON position. The tests execute when power is first turned on.
3. Observe the LEDs on the A400 card. If the computer passes the self-test, the LEDs on the processor display within 10 seconds one of the following values:

00000111 - VCP program is running  
00000001 - loader is running  
00000000 - User software is running  
10000000 - Loader error. Probably a checksum error; change media on loading device.  
1 = LED lit; 0 = LED unlit

Any other LED display indicates a self-test failure. Refer to Chapter 2 for troubleshooting information.

## Computer Mounting

### 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.

### 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.)

## Interface Cabling

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### 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 chassis.

---

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 remove the rear panel. 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. Install and secure the rear panel and set the LINE switch to the ON position.

### MUX Cabling

The HP 2134A Computer is equipped with a cable for the A400 card 4-Channel MUX. One end of the cable connects to the 35-pin edge connector (J2) on the A400 card; the other end is a 4-port breakout panel which contains four 25-pin D-connectors labeled A through D for RS-232 signal lines. Refer to Figure 1-9 for a diagram of the breakout panel and Figure 1-10 for a diagram of RS-232 Connector pin assignments on the MUX cable breakout panel.

### Breakout Panel DCE/DTE Switches

Ports A and D are wired to operate as Data Communication Equipment (DCE). Ports B and C are equipped with switches on the breakout panel allocating them to operate independently as DCE or Data Terminal Equipment (DTE). The direction of Data flow on pins 2 and 3 of the 25-pin D-connectors determines DTE or DCE operation. The directions shown on pins 2 and 3 in Figure 1-10 are for DCE operation. When the port select switch for port B or C is in the DTE position, the direction of data flow shown on pins 2 and 3 is reversed.

When connecting a terminal to Port B or C, the switch on the breakout panel must be in the DCE position. When connecting a modem to Port B or C, the switch must be in the DTE position.

The modem lines are labeled in Figure 1-10 for Ports B and C. Modem control is not supported on Ports A and D; the control lines are wired together as shown in the figure. Note that the numbers in parentheses next to the signal lines are the V.28 standard signal labels.

## Cable Breakout Panel Mounting

The cable breakout panel can be mounted in a standard 19-inch EIA cabinet by use of a mounting bracket (part no. 5001-5278). This is the same mounting bracket that is used with the HP 12040 8-channel MUX breakout panel. Note that the 12040 breakout panel and the A400 breakout panel can be mounted in the same mounting bracket. Hardware needed for mounting it is listed in Table 1-7. Note that the mounting bracket and its associated hardware is not included with the HP 2134A Computer and must be ordered separately.

## RS-422/423 Support

The four 25-pin RS-232 D-connectors on the breakout panel include signals complying with the RS-422/423 electrical standard. A mechanical standard, RS-449, is required for RS-422/423 hook-ups. An adapter cable must be fabricated by the user to connect the proper RS-422/423 signal lines from the breakout panel to an RS-449 standard connector. Figure 1-11 is a wiring diagram showing which pins from the RS-232 connector on the breakout panel connect to the proper pins on the RS-449 connector. Figure 1-12 is a diagram of how the adapter cable is used with the A400 for RS-422/423 communication.

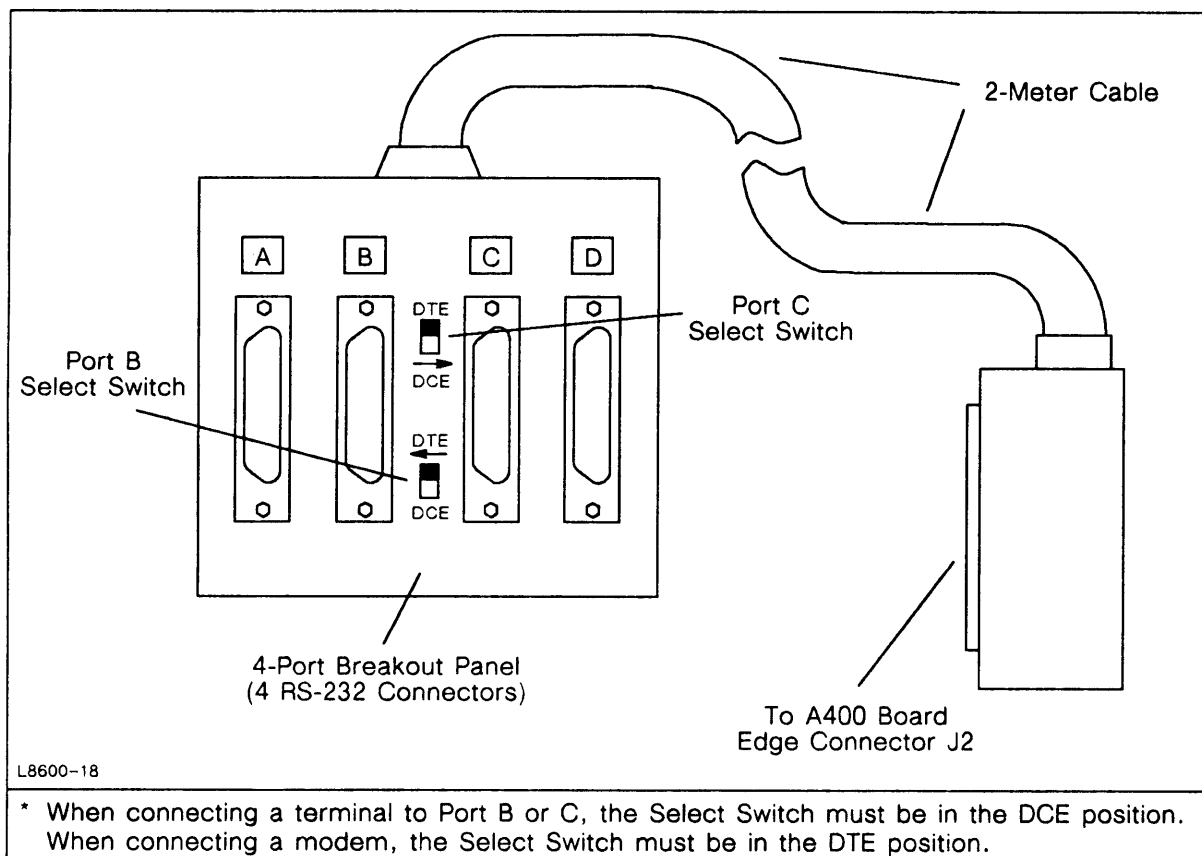
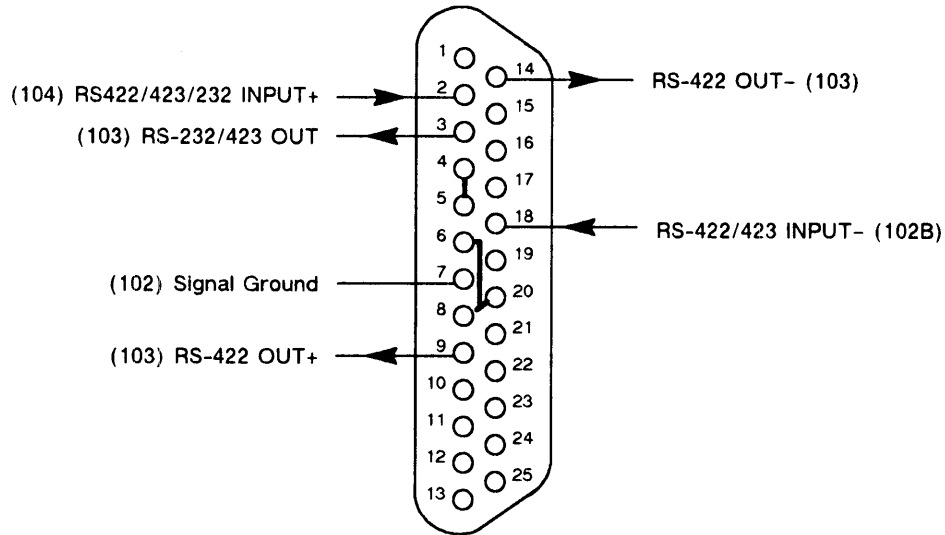
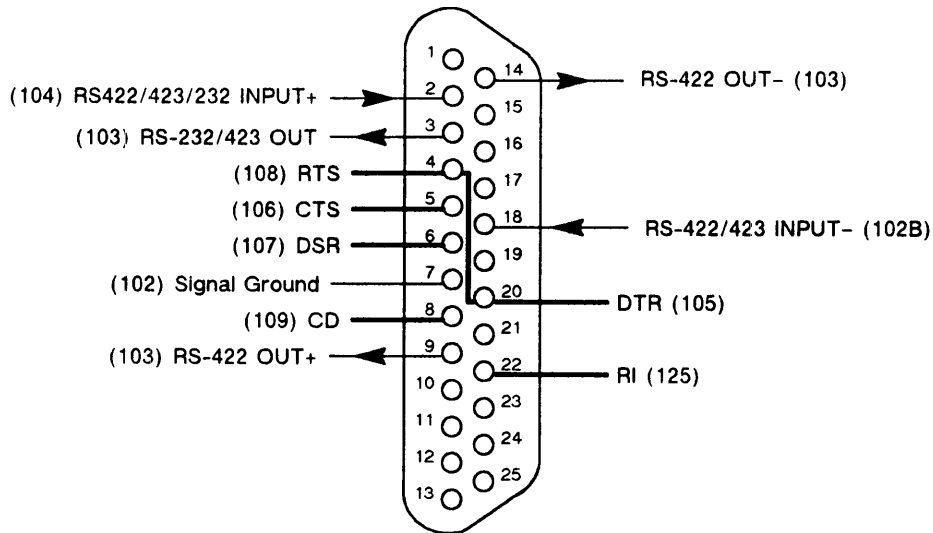


Figure 1-9. A400 4-Channel MUX Cable



**Pin Assignments for Signals on Ports A and D**



**Pin Assignments for Signals on Ports B and C**

L8600-19

Note the following:

1. Bold lines indicate modem control lines; all others are data lines.
2. The arrows indicate the direction of data flow.
3. Switches on the breakout panel will configure Ports B and C for either DCE or DTE. The switches reverse the direction of data flow in pins 2 and 3. The direction shown in this diagram is for DCE which is the same as the HP 12040 8-channel Multiplexer.

**Figure 1-10. RS-232 Connector Pin Assignment on the MUX Cable Breakout Panel**

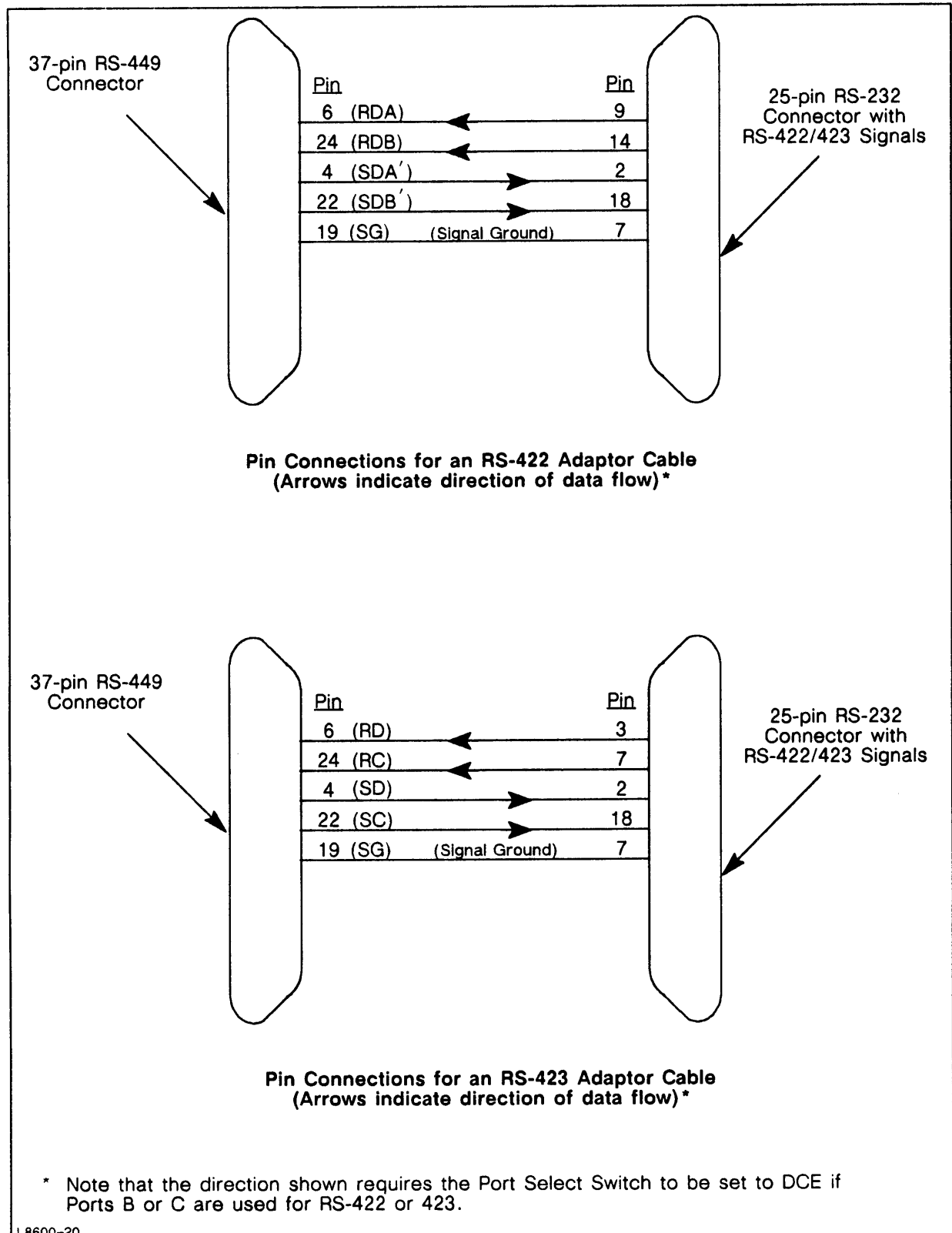
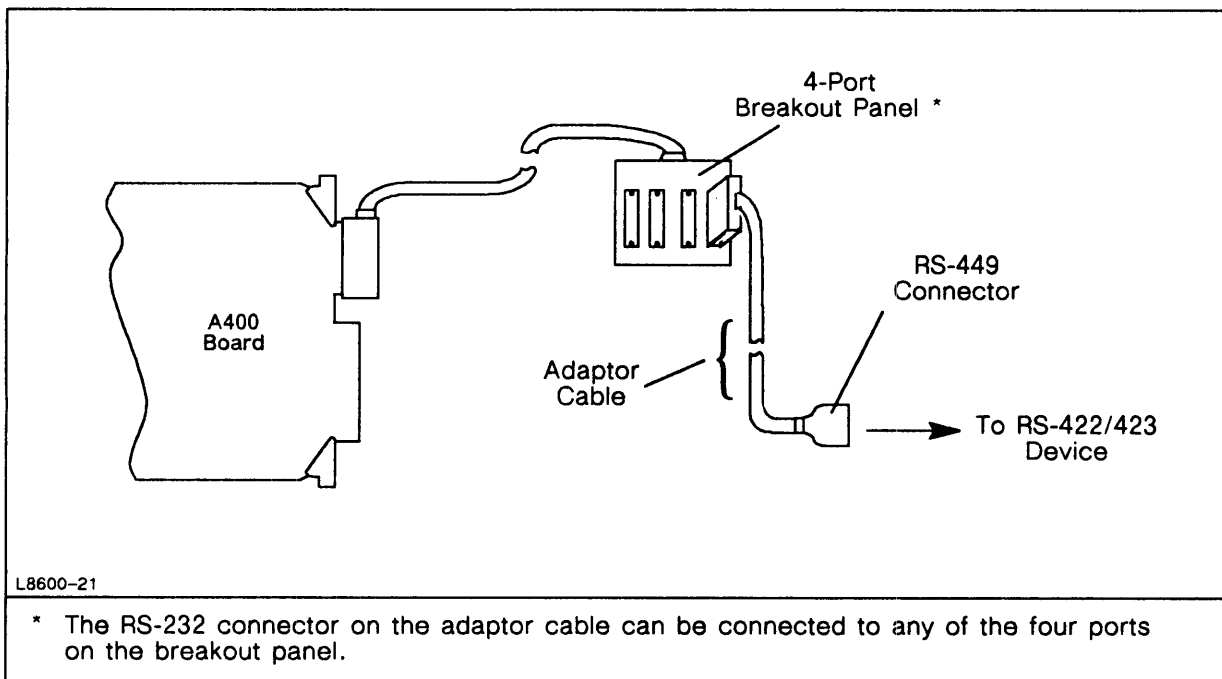


Figure 1-11. Wiring Diagram of RS-232 to RS-449 Connections for Adaptor Cable

**Table 1-7. Hardware Needed to Mount the 5001-5278 Mounting Bracket**

Part Number	Description	Quantity
To mount the bracket into the 19-inch cabinet use the following hardware:		
3050-0248	Nylon Washer	4
3050-0007	Cup Washer	4
2680-0119	10-32 x .62 82 DEG Screw	4
0590-0804	10-32 Captive Nut	4
To mount the bracket into the 19-inch cabinet use the following hardware:		
0515-0296	M4 x .70 x 35 Screw	1
3050-0139	8 Flat Washer	1
2190-0017	8 Split Lock Washer	1



**Figure 1-12. Cabling Diagram when Using an Adaptor Cable for RS-422/423 Communication**

## Performance Verification Check

Verify the computer installation and operation by running the diagnostic programs supplied in the HP 24612A Diagnostic Package for A400/A700 Processors. Follow the instructions in the operating manuals supplied with the package.

# Repackaging For Shipment

## 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.

## Shipment Using New Packaging

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

1. 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 indicate the type of service required. Include the computer model number and full serial number.
2. Use a strong shipping container. A double-wall carton constructed of 2.41 MPa (350-psi) test material is adequate.
3. 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.
4. Seal the shipping container securely and mark it "FRAGILE".
5. In any subsequent correspondence with Hewlett-Packard refer to the computer by model number and full serial number.



## Service

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

### 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.

### 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.

1. Clean the cabinet exterior and interior.
2. Check ventilating fans for proper operation.

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

---

### CAUTION

The air filter in the computer must be cleaned periodically to ensure that that computer remains free of dust. Failure to keep the filter clean may result in permanent damage to the computer.

---

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.

## Troubleshooting

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### NOTE

When the computer is cabled to HP 12025A/B I/O Extender, turning off power to the extender causes a power fail shutdown of the computer that may appear to be a computer failure.

---

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

1. Power supply check.
2. Self-tests.
3. Diagnostics.

When a malfunction is encountered, replace the assembly indicated in the test procedure. (Assembly removal and replacement procedures are given in this chapter.) After the malfunction is corrected, contact your nearest Hewlett-Packard Sales and Service Office for instructions regarding shipment of the defective assembly.

## 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:

1. Set the LINE switch on the back panel to the OFF position. Wait 90 seconds before proceeding to the following steps.

2. Remove the front panel and the fan panel.
3. Verify that the AC line configuration/fan power plug is plugged into the correct connector on the power supply. Refer to Figure 2-1.
  - a. The AC line configuration/fan power plug must be plugged into connector P8 if 115-Vac is used as the computer input power.
  - b. The AC line configuration/fan power plug must be plugged into connector P7 if 230-Vac is used as the computer input power.
4. Set the LINE switch on the back panel to the ON position.
5. Set the BACKUP switch on the back panel to the ENABLE position if the battery backup option is installed.
6. Using a digital voltmeter, verify that the following signals at the rear panel test connector are as listed below:

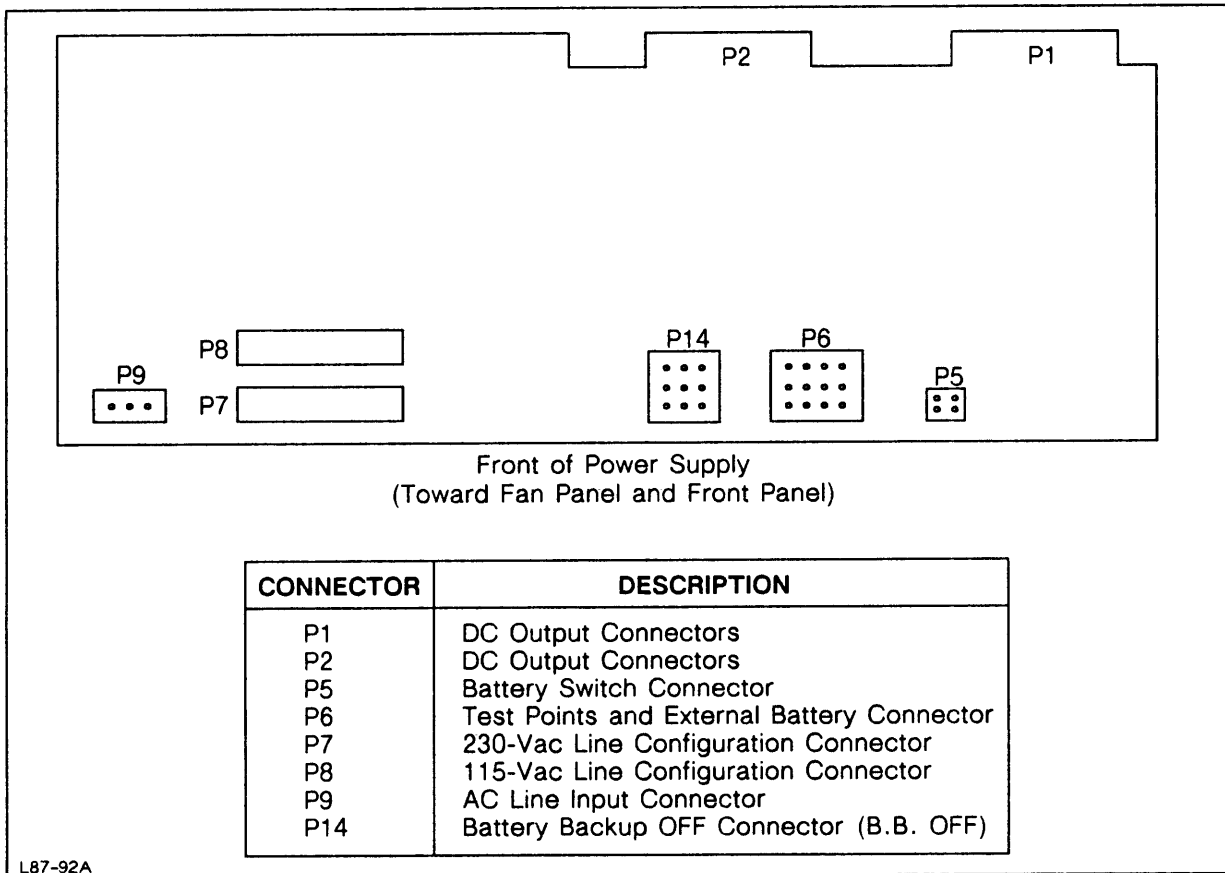
TEST POINT	NOMINAL VOLTAGE
+5	5.1 V $\pm$ 0.10V
+12	12.0 V $\pm$ 0.72V, -0.36 V
-12	-12.0 V $\pm$ 0.72V
+5M	5.1 V $\pm$ 2%
PON+ (Power On)	3.7 V $\pm$ 1.3V
PFW- (Power Fail Warning)	3.7 V $\pm$ 1.3V
MLT- (Memory Lost)	3.7 V $\pm$ 1.3V if battery backup installed 0.4 V $\pm$ 0.4V if battery backup not installed
$\phi$ 1, $\phi$ 2	19.5 Vrms $\pm$ 1.95, -2.0 Vrms (at 0 to .02 Amps) 19.5 Vrms $\pm$ 1.6 Vrms (at .02 to 1.5 Amps)

If the HP 12157B Battery Backup has a fully charged battery pack and the MLT (Memory Lost) 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 power supply.

If the battery pack is installed and it is fully charged, it should sustain 512 kilobytes of memory for 60 minutes or 8 megabytes of memory for 15 minutes. If it does not, replace the power supply. Note that the battery pack must be charged for 24 hours to sustain memory for the specified amount of time.

If the 25 kHz sine wave  $\phi$ 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 power supply.

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.



**Figure 2-1. HP 2134A Power Supply Connector Diagram**

## Self-Test

The 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. If either self-test program fails to complete successfully, the computer will not operate properly.

Test 1 tests the processor at the level of individual circuits, and Test 2 tests the processor at a functional level. (For example, Test 1 tests the hardware associated with an LIA instruction to ensure that it works correctly, and Test 2 executes an LIA instruction and checks the result.) If either self-test program fails, the computer will not operate. 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 processor card switches.

## Test 1

Test 1 is a microprogram stored in the base set PROMs on the processor board that executes immediately upon power-up. This test will execute in all configurations in which +5M power is present, including the case when the A400 card is the only assembly plugged into the backplane.

All of the LEDs are turned on when power is initially applied to the computer and remains on when there is a failure. Test 1 then begins execution. Upon successful completion, it extinguishes the rightmost LED. Failure is indicated by all the LEDs remaining on. If Test 1 detects a failure it stops executing and the LEDs indicate an error code. If Test 1 completes successfully, Test 2 begins execution. Test 1 execution time is negligible. LED error codes for Test 1 and Phase 1 of Test 2 are listed in Table 2-1.

## Test 2

Test 2 is part of the VCP program stored in PROM and executes automatically upon successful completion of Test 1. (Test 2 can also be initiated by the VCP command %T.) It has a maximum execution time of 10 seconds.

The first phase of Test 2 checks the computer's basic instruction set, several internal flags, and Boot RAM. Boot RAM is tested by writing into and reading back data into each location, then the complement of the data is written and read back, completing the test with zeroes in each location.

If Test 2 detects a failure during Phase 1, it stops executing so that booting does not occur and the LEDs indicate an error code (Table 2-1). If the basic instruction test, or the Time Base Generator (TBG) tick and the interrupt flag test fails, the processor is probably faulty.

The second phase of Test 2 tests the I/O Master of each interface to ensure that the functions of data transfer, flag, interrupt, and direct memory access (DMA) are processed correctly. Phase 2 of Test 2 also checks the computer configuration and tests main memory by writing all ones to each memory location, and reading back the data. Then all zeroes are written and read back, resulting in a cleared memory.

If Test 2 detects a failure during Phase 2, and 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 flashed once on the LEDs and then displayed on the VCP. The VCP console displays "PTEST ERROR xxxxxx xxxxxx." The first word is the main error code and the second word is the subcode. The main error code and the subcode are displayed alternately on the LEDs. These error words are shown in Table 2-2 along with the LED Display.

The octal number in the left field of Table 2-2 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 000201 indicates a memory error (340) in the first 32k block of memory.

**Table 2-1. LED Failure Indicators for Test 1 and Phase 1 of Test 2**

<b>Failure Pattern</b>	<b>Meaning</b>
11111111	Microcode self-test failed. Short or power supply fault if PON is low. Processor fault if PON high. (Backplane or processor data bus problem.)
11111110	Microcode self-test passed but first memory fetch failed. Check frontplane cabling and processor.
11111100	Basic instruction test failed. Check processor.
11111000	Boot memory access failed. Check processor VCP/Loader/Self-Test PROMs.
11110000	Time Base Generator (TBG) tick or interrupt failed. Check processor.

The LED indication on successful completion of Test 2 depends on the computer action selected by the Start-Up (BOOT SEL) switches. The self-test pass indications are shown in Table 2-3.

---

### **NOTE**

**If a self-test error occurs, do not boot up the operating system; the integrity of the system cannot be ensured. Use the diagnostics to find and eliminate the cause of the error.**

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## **Diagnostics**

The diagnostics in the HP 24612A Diagnostic Package for A-Series Computers 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. (Refer to the Introduction to HP 1000 A-Series Computer Diagnostics Reference Manual, part no. 24612-90010 for details.)

## **Memory Parity LED**

Memory parity status is indicated by a green LED on the A400 processor card and on each optional memory array card. Normally the LED is on indicating there has been no parity error. If the LED is off, it indicates that a parity error has occurred on that card since the last power-on. A parity error indication (LED off) can be cleared by cycling the power off and on, or by entering the %T or %P command from the VCP console. Frequently occurring parity errors can be eliminated by replacing the memory card that has the unlit LED.

**Table 2-2. Test 2 Failure Indications**

<b>Octal Code</b>	<b>LED Display</b>	<b>Definition</b>
360	11110000	TBG tick or interrupt flags failed. Bad CPU.
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 yyyyy 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.
211	10001001	Invalid select code for A400 on-board I/O.
212	10001010	Invalid ID Number for A400 on-board I/O.
213	10001011	Speed sensing failure on A400 on-board I/O or 8-channel MUX.
1 = lit LED, 0 = unlit LED		

**Table 2-3. Self-Test Pass Indications**

<b>Octal Code</b>	<b>LED Display</b>	<b>Definition</b>
007	00000111	VCP program is running.
001	00000001	A boot loader is running.
000	00000000	User software is running.
200	10000000	Loader error. Probably a checksum error; change media on loading device.
020	00010000	Running Diagnostic Design Language (DDL) program.
1 = lit LED, 0 = unlit LED		

# Assembly Removal and Replacement

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## 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 (Chapter 3). It is assumed that the computer is a freestanding device. If the computer is rack mounted, read the 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:

1. 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.
2. Disconnect all I/O cables from the computer interface cards.
3. Remove the computer from the rack.

Refer to Figure 2-2 (front view showing the power supply and battery pack) and Figure 2-3 (card cage rear view) as required for these procedures.

## Front Panel

### Removal

Remove the computer front panel as follows:

1. Grasp the front panel by the two indented handles at the side of the panel.
2. Pull the panel away from the computer chassis.

### Replacement

Replace the front panel by reversing the removal procedure.



## Fan Panel

### Removal

Remove the fan panel as follows:

1. Set the LINE switch to the OFF position and disconnect the power cord.
2. Remove the front panel as described above.
3. Remove the screws, lock washers and flat washers from the panel, and remove the fan panel from the computer chassis.
4. Disconnect the line configuration/fan power connector from the power supply, noting whether the connector is in P7 or P8.

### Replacement

Replace the fan panel by reversing the removal procedure.

Locate the fan panel close to the front of the box. Attach the fan cable to the appropriate connector for the desired line voltage. Use connector P8 for 115-Vac or connector P7 for 230-Vac.

## Fans

### Removal

Remove a fan as follows:

1. Set the LINE switch to the OFF position and disconnect the power plug.
2. Remove the fan panel as described above.
3. Disconnect the fan power plug.
4. Remove four screws, four lock washers and four flat washers, and remove the fan from the fan panel.

---

### CAUTION

When installing a fan, be sure to orient the fan so that the direction of air flow is into the computer. Air flow direction is indicated on the fan.

---

### Replacement

Replace the fan by reversing the removal procedure.

## 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.

---

### Removal

Remove the power supply as follows:

1. Refer to Figure 2-1 and Figure 2-2.
2. Remove the front panel and fan panel as described above.
3. Disconnect the AC line input connector from P9.
4. Disconnect the 115-Vac/230-Vac line configuration connector from P8 or P7.
5. Disconnect the test point/external battery connector from P6.
6. Disconnect the battery switch connector from P5.
7. Grasp the power supply card by the front edge and pull the power supply card away from the backplane.

### Replacement

Replace the power supply by reversing the removal procedure.

---

### 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.

---

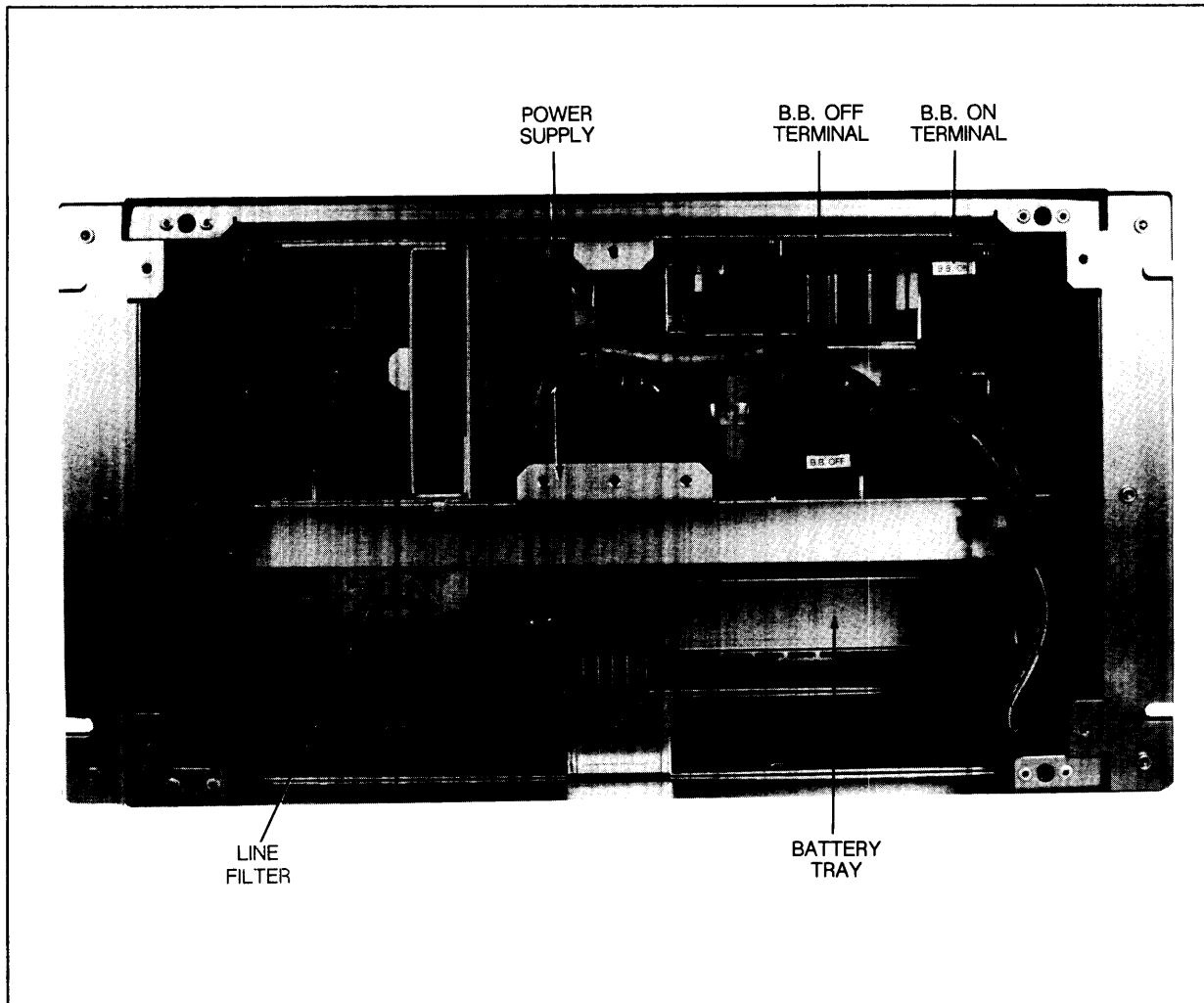


Figure 2-2. Power Supply and Battery Pack Locations (Front View)

## Battery Pack

### Removal

Remove the battery pack as follows:

1. Refer to Figure 2-1 and Figure 2-2.
2. Remove the front panel and the fan panel as described above.
3. Unplug the two power plugs from the battery pack.
4. Loosen two captive panel-fasteners and remove the battery tray.
5. Remove the battery pack.

## **Replacement**

Replace the battery pack as follows:

1. Install the battery pack (part no. 1420-0304) in the lower battery tray. Orient the positive(+) battery terminal so it is near the center of the box and the negative(-) terminal is near the right side. Be sure the battery pack terminals are accessible through the cut-outs in the battery tray.
2. Insert the battery tray in the lower part of the battery holder. Make sure that the tab on the battery tray is inserted in the slot on the right at the back of the battery holder. Tighten the two captive panel-fasteners.
3. Locate the battery backup cable (two wires with terminal lugs extending from the cable channel at the base of the box). The terminal lug on the white wire attaches to the positive(+) battery terminal. The terminal lug on the black wire attaches to the negative(-) battery terminal.

## **Memory Connector**

### **Removal**

Remove the memory connector as follows:

1. Refer to Figure 2-3.
2. Set the LINE switch to the OFF position and disconnect the power cord.
3. If the Battery Backup pack is installed, set the BACKUP switch to the DISABLE position.
4. Pull the memory connector away from the installed plug-in cards.

### **Replacement**

Replace the memory connector by reversing the removal procedure.

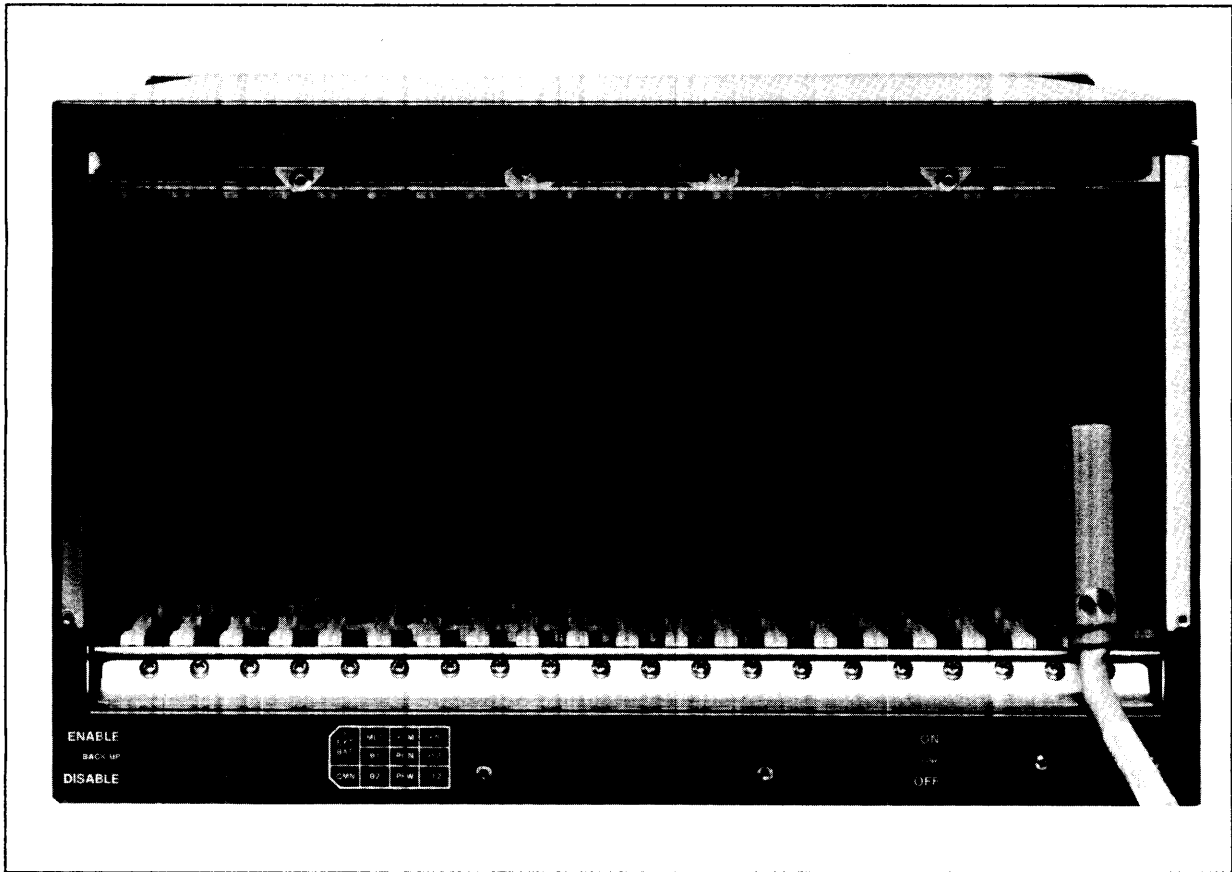


Figure 2-3. HP 2134A Computer Card Cage (Rear View)

## Plug-In Cards

### Removal

Remove a plug-in card from the card cage as follows:

1. Set the LINE switch to the OFF position and disconnect the power cord.
2. If the Battery Backup module is installed, set the BACKUP switch to the DISABLE position.
3. 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.

### 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.

## PROM Chips

---

### CAUTION

Observe anti-static procedures when removing or replacing the PROM chips.

---

### Removal

Remove a PROM chip from the card as follows:

1. Refer to Figure 2-4.
2. Remove the PROM chip by carefully lifting it away from the socket.

### Replacement

Replace the PROM chips by reversing the removal procedure.

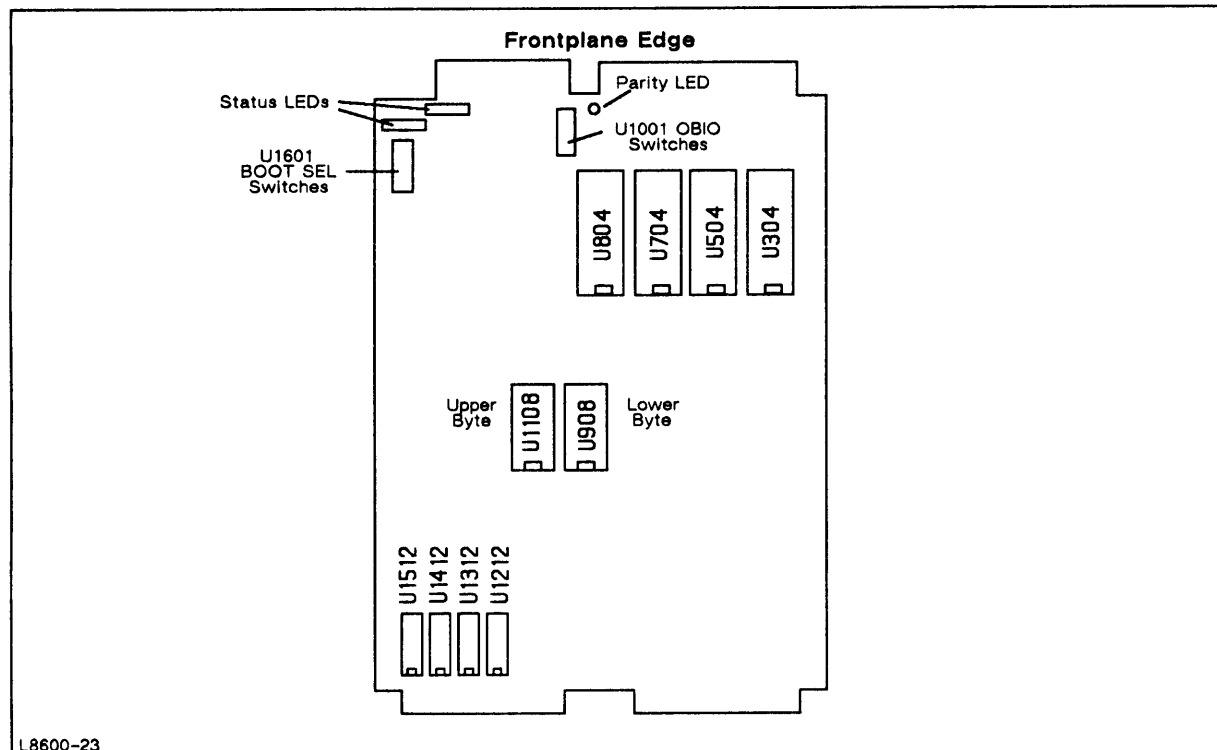


Figure 2-4. A400 Card (HP 12100A) PROM Location Diagram

## **Backplane**

### **Removal**

Remove the backplane as follows:

1. Remove the front panel, the fan panel, and the power supply as described above.
2. Remove the connectors on the line filter.
3. Remove four screws and remove the battery support.
4. Remove four screws and remove the left guide mounting bracket.
5. Remove 16 screws and remove the backplane.

### **Replacement**

Replace the backplane by reversing the removal procedure.

## **Line Filter**

### **Removal**

Remove the line filter as follows:

1. Refer to Figure 2-2.
2. Remove the fan panel as described above.
3. Remove the power connectors to the line filter.
4. Remove four screws and four washers, and remove the line filter.

### **Replacement**

Replace the line filter by reversing the removal procedure.

# 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.

---

1. If you are reconfiguring the power supply from 115-Vac to 230-Vac operation, apply the 230-Vac label to the rear panel of the computer.  
  
If you are reconfiguring the power supply from 230-Vac to 115-Vac operation, remove the 230-Vac label from the rear panel of the computer.
2. Remove the front panel of the computer and the fan panel, as described above.
3. Remove the connector by squeezing the tabs at the end of the connector. Insert the connector in the appropriate plug.
4. Replace the fan panel and the front panel.
5. Ensure that the correct power cord is used in the new configuration. Refer to Figures 1-1 and 1-2 (Chapter 1).

## Power Distribution Diagram

Figure 2-5 is the power distribution diagram for the HP 2134A computer.



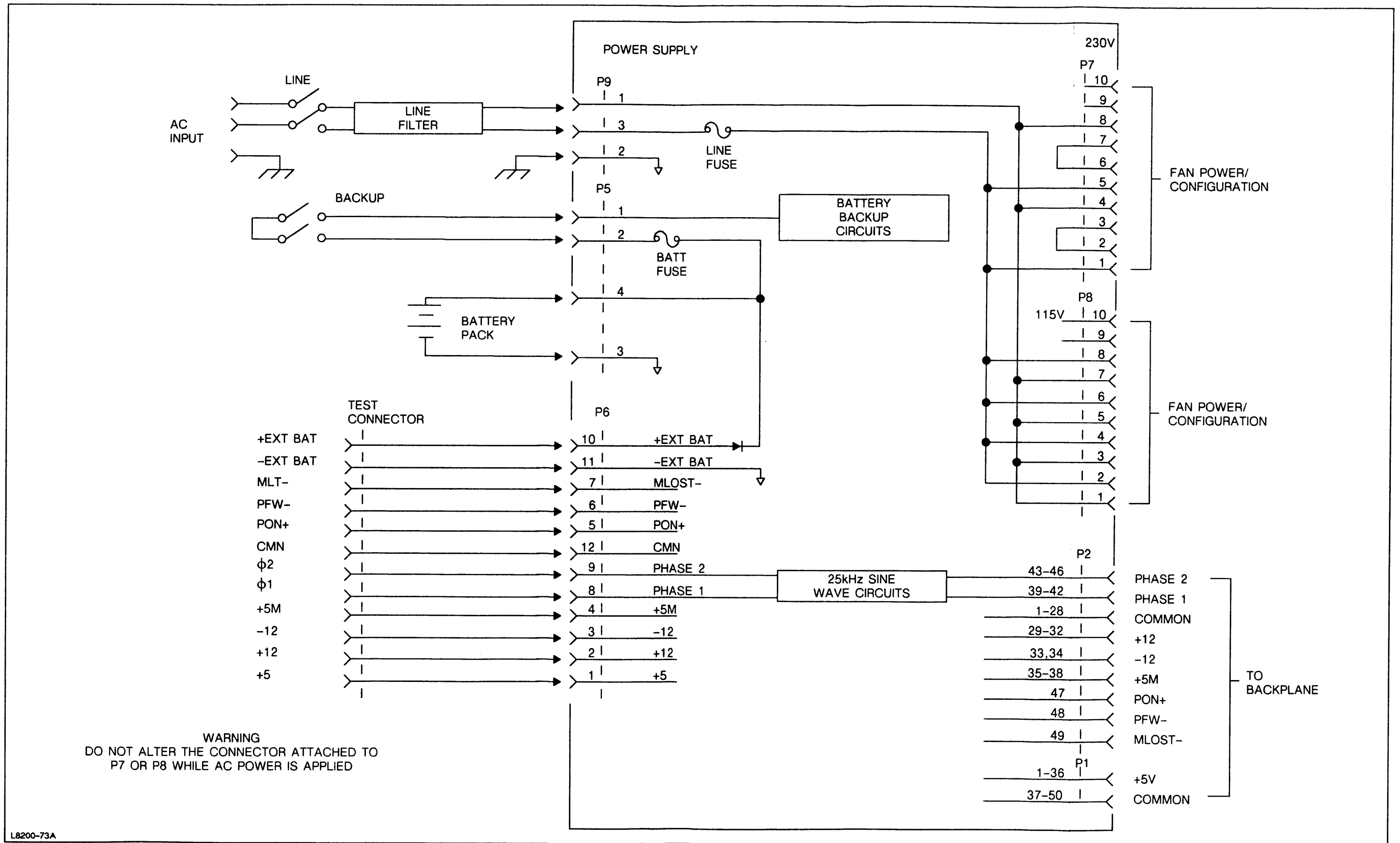


Figure 2-5. Power Distribution Diagram

# Replaceable Parts

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## Replaceable Parts

Tables 3-1 through 3-3, and Figures 3-1 and 3-2 list and illustrate the field-replaceable parts of the HP 2134A Computer. The replaceable parts are referenced to the exploded views by index number. The columns in the index-numbered list provide the following information for each part.

1. **INDEX NO.** The figure index number of the replaceable parts shown in an exploded view.
2. **HP PART NO.** The Hewlett-Packard part number for each replaceable part.
3. **DESCRIPTION.** The description of each replaceable part and its applicable reference designation.
4. **MFR CODE.** A five-digit code that identifies the manufacturer of the part (see Table 3-2).
5. **MFR PART NO.** The manufacturer's part number for each replaceable part. Commercially obtainable parts are designated OBD (order by description).

Table 3-3 lists the replaceable parts for the A400 processor card (part no. 12100-60001).

## 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:

1. Complete model number and serial number.
2. Hewlett-Packard part number for each part.
3. Complete description for each part as provided in the replaceable parts list.

# 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 2134A Computer Replaceable Parts**

Index No.	HP Part No.	Description	Mfg. Code	HP Part No.
1	12151-60026	Chassis A400	28480	12151-60026
2	12151-00032	Rack Ear	28480	12151-00032
3	12210-00020	Battery Support	28480	12210-00020
4	12151-00034	Battery Tray	28480	12151-00034
5	-	Not Listed	-	-
6	12210-00010	Fan Panel	28480	12210-00010
7	12210-00022	Rear Shield	28480	12210-00022
8	12210-00013	Guide Mounting Bracket	28480	12210-00013
9	12151-00039	Right Inner Rack Ear	28480	12151-00039
10	12151-00038	Left Inner Rack Ear	28480	12151-00038
11	12151-60009	Fan Cable	28480	12151-60009
12	12151-60006	AC Filter Cable	28480	12151-60006
13	12151-60007	AC Power Cable	28480	12151-60007
14	9135-0312	Line Filter	49956	-
15	3160-0315	Fan	23936	4606X
16	3160-0092	Fan Guard	28875	055012
17	0403-0436	Card Guide, Narrow	28480	0403-0436
18	0400-0085	Grommet	28480	0400-0085
19	0360-1263	Terminal	28480	0360-1263
20	-	Not Listed.	-	-
21	3050-0228	Flat Washer, #6	28480	3050-0228
22	3050-0139	Flat Washer, #8	28480	3050-0139
23	2190-0851	Lock Washer, #6	28480	2190-0851
24	2360-0318	Screw, PH, 6-32 x 1.875	28480	2360-0318
25	2360-0359	Screw, PH, 6-32 x 0.375	28480	2360-0359
26	2360-0203	Screw, PH, 6-32 x 0.625	28480	2360-0203
27	2510-0103	Screw, PH, 8-32 x 0.375	28480	2510-0103
28	2510-0099	Screw, PH, 8-32 x 0.25	28480	2510-0099
29	2510-0195	Screw, PH, 8-32 x 0.375	28480	2510-0195
30	2360-0333	Screw, FH, 6-32	28480	2360-0333
31	12210-20001	Pin, Locating	28480	12210-20001
32	1390-0607	Panel Fastener	55566	115-SS-0
33	2190-0073	Lock Washer, #8	28480	2190-0073
-	12151-60015	Cable Retainer Hardware Kit	28480	12151-60015
-	12210-00025	Front Panel Support	28480	12210-00025
-	12210-00026	Grill	28480	12210-00026
-	4208-0405	Air Filter (Foam)	28480	4208-0405
-	1420-0304	Battery Pack	19209	47B025FE02001
-	0950-1849	Power Supply	28480	0950-1849
34	12210-00038	Power Panel	28480	12210-00038
35	12210-00031	Ground Bracket	28480	12210-00031
36	12151-60002	Backplane	28480	12151-60002
-	1902-0939	Diode, Zener, 5V PD	11961	1N5908
-	1902-0941	Diode, Zener, 12V PD	11961	1.5SE15A
37	12151-40001	Front Panel	28480	12151-40001
38	3050-0228	Flat Washer, #6	28480	3050-0228
39	2360-0359	Screw, PH, 6-32 x 0.375	28480	2360-0359
40	2510-0045	Screw, 8-32 x 0.375	28480	2510-0045
41	2360-0116	Screw, FH, 6-32 x 0.312	28480	2360-0116
42	5061-6651	Rear Panel	28480	5061-6651
43	3101-0402	Power Switch	28480	3101-0402
44	1251-4470	Power Receptacle	28480	1251-4470
45	12151-60008	Test Point Cable	28480	12151-60008
-	12151-60010	Battery Backup Cable	28480	12151-60010

5180-4273 LABEC, INFO

**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
00000	Any Satisfactory Supplier		49956	Raytheon Co. . . . .	Lexington, MA 01803
11961	Semicon Inc. . . . .	Burlington, MA 01803	55566	R.A.F. Electronic Hardware, Inc. . . . .	Stratford, CT 06497
19209	General Electric Co. . . . .	Grainville, FL 32601	75915	Littlefuse Inc. . . . .	Des Plaines, IL 60016
23936	PAPST Mechatronic Corp. William J. Purdy Co.	Burlingame, CA 94010	78112	Scott Paper Co. . . . .	Philadelphia, PA 19113
19209	Hewlett-Packard Co. Corporate HQ . . . . .	Palo Alto, CA 94304	86845	Marquart Co. . . . .	Van Nuys, CA 91409
19209	IMC Magnetic Corp. . . . .	Rochester, NH 03867	*	Calmark Corp. . . . .	Gabriel, CA
			**	Kautt & Bux . . . . .	Addison, IL 60101

**Table 3-3. A400 Replaceable Parts**

Description	HP Part No.
A400 Board	12100-60001 *
PROM Chip U304 (Port A Processor)	12100-80002
PROM Chip U504 (Port B Processor)	12100-80002
PROM Chip U704 (Port C Processor)	12100-80002
PROM Chip U804 (Port D Processor)	12100-80002
PROM Chip U908 (VCP, Lower Byte)	5180-4271
PROM Chip U1108 (VCP, Upper Byte)	5180-4272
PROM Chip U1212 (A400 Base Set)	12100-80010
PROM Chip U1312 (A400 Base Set)	12100-80011
PROM Chip U1412 (A400 Base Set)	12100-80012
PROM Chip U1512 (A400 Base Set)	12100-80013
512k Byte Memory Array Card	12103-60016
1024k Byte Memory Array Card	12103-60004
2048k Byte Memory Array Card	12103-66001
4096k Byte Memory Array Card	12103-66002
8192k Byte Memory Array Card	12103-66003
Frontplane for 1 Memory Array Card	12038-60005
Frontplane for 2 Memory Array Cards	12038-60002
Frontplane for 3 Memory Array Cards	12038-60003
Frontplane for 4 Memory Array Cards	12038-60004

\* NOTE: Leave the PROM chips on the board when returning a failed A400 Board.

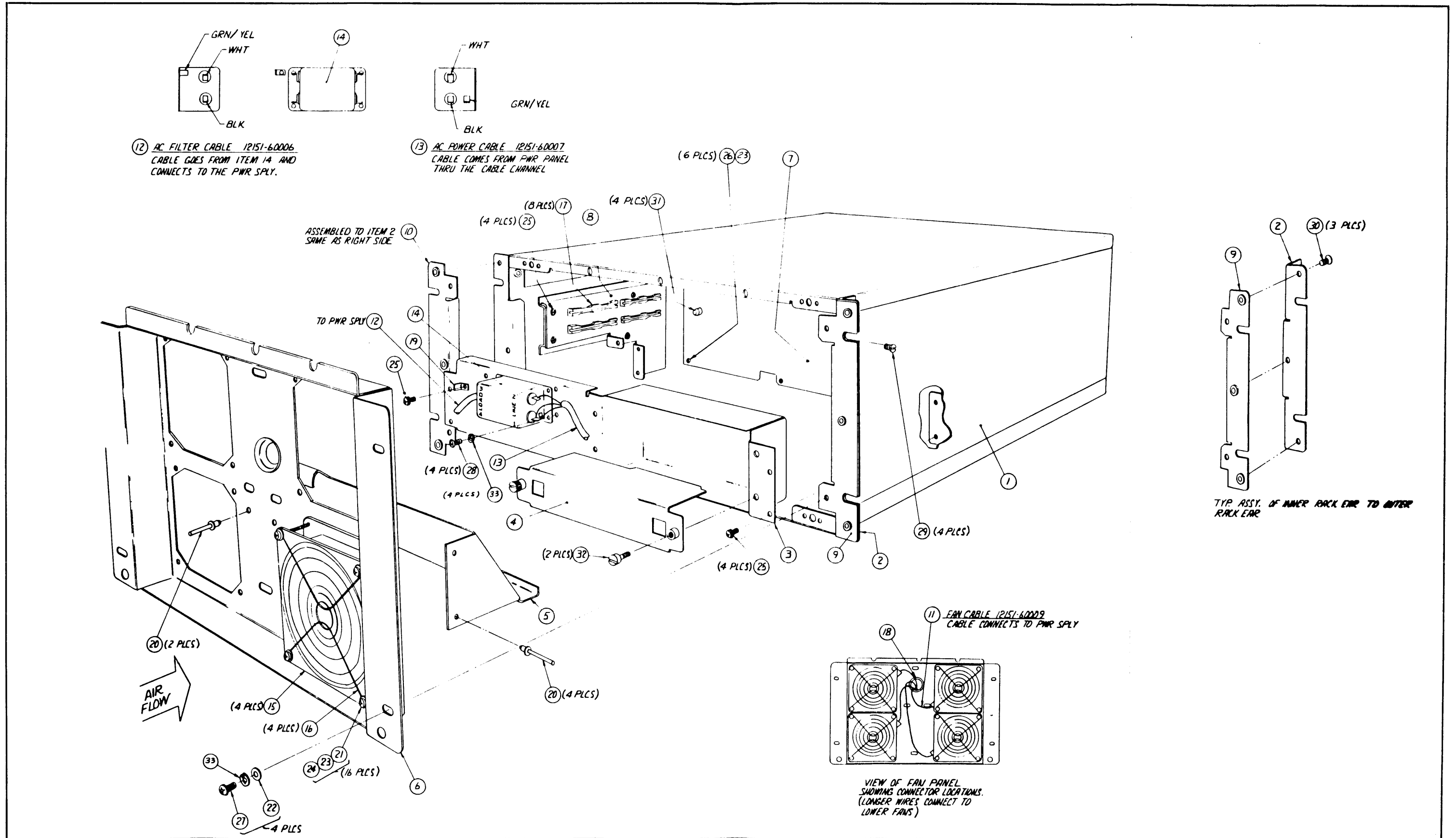


Figure 3-1. HP 2134 Computer Exploded View  
(Front View)  
Replaceable Parts 3-5/3-6

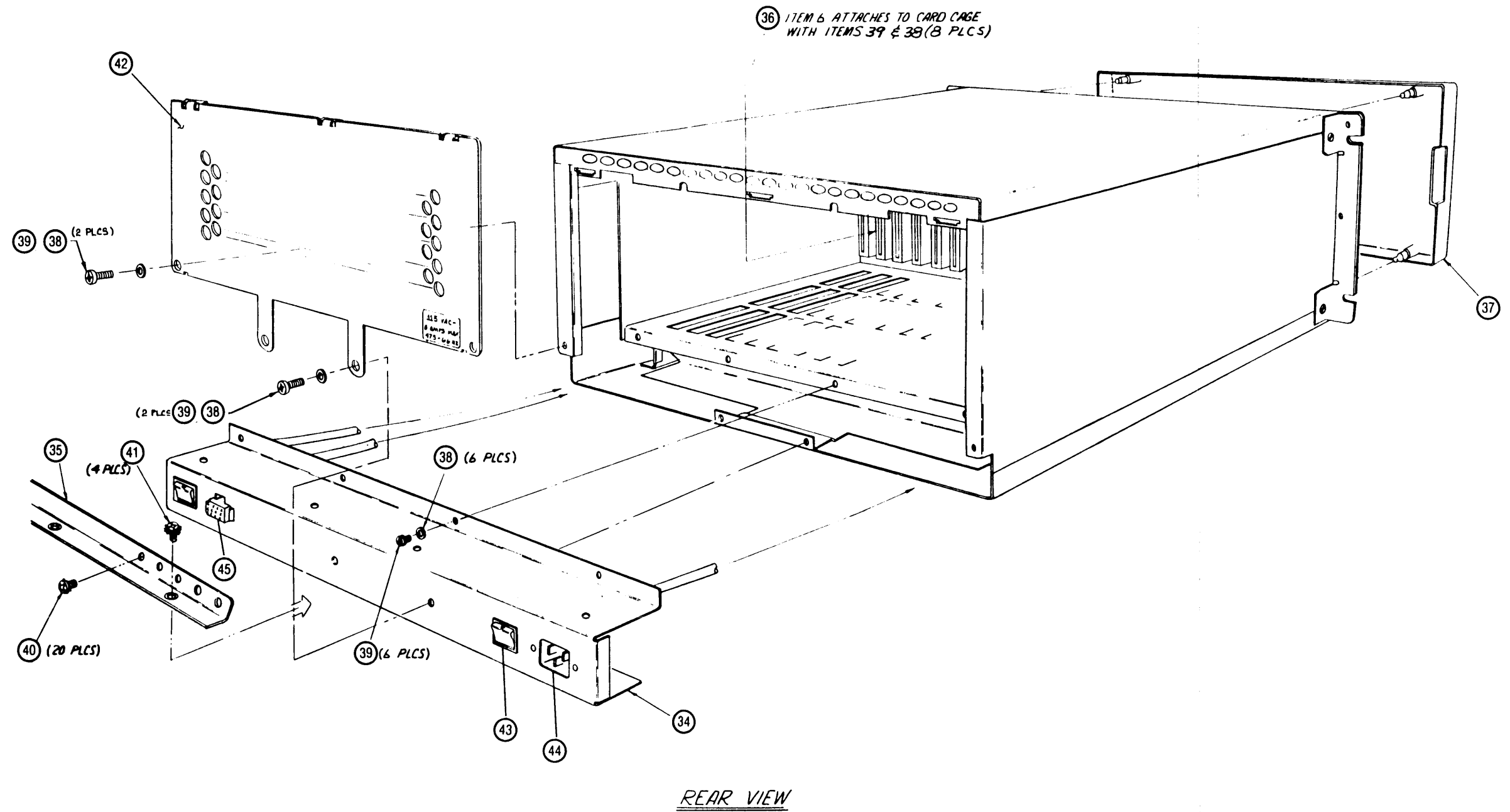


Figure 3-2. HP 2134 Computer Exploded View  
 (Rear View)  
 Replaceable Parts 3-7/3-8