HP 9000 Series 200 Computers
Model 217

[hp] HEWLETT
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HP 9817
Hardware Support Document

HP 9000 Series 200 Computers

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Hardware Support Document
for HP 9000 Series 200 Computers

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Hewlett-Packard Company
3404 East Harmony Road, Fort Collins, Colorado 80525

Printing History

New editions of this manual will incorporate all material updated since the previous edition. Update packages may be issued between editions and contain replacement and additional pages to be merged into the manual by the user. Each updated page will be indicated by a revision date at the bottom of the page. A vertical bar in the margin indicates the changes on each page. Note that pages which are rearranged due to changes on a previous page are not considered revised.

The manual printing date and part number indicate its current edition. The printing date changes when a new edition is printed. (Minor corrections and updates which are incorporated at reprint do not cause the date to change.) The manual part number changes when extensive technical changes are incorporated.

October 1985...Edition 1. Replaced part number 09817-90030. Merged September 1984 update.

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Product Description	Chapter
	1

Introduction

This manual contains all the servicing information for the HP Series 9000 Model 217 computer.

The Model 217 computer is referred to interchangeably by its product number, by HP 9817, or by the term "computer". All three forms refer to the Model 217.

Hewlett-Packard supports repairing HP 9817 computers to the assembly level only, that is, isolating the problem to an assembly such as the processor board. Then the defective assembly is exchanged for a new or rebuilt assembly.

Also included in this chapter is service support information and a list of the documentation available for HP 9817 computers.

Additional information in this manual includes:

- Site Preparation
- Installation and Configuration
- Preventive Maintenance
- Functional Description
- Troubleshooting and Diagnostics
- Adjustments
- Removal and Replacement
- Replacement Parts
- Reference Material
- Product History

Product Information

The HP 9000 Model 217 computer is a small, modular, MC68010-based computer. Modular refers to the fact that it is composed of a group of "modules", such as the keyboard, the display or the central processing unit. The MC68010 is fully object code-compatible with the MC68000, but has the added features of virtual memory support and enhanced execution timing.

It has these specifications:

Processor

Type:	Motorola 68010
Clock frequency:	8 MHz
Internal architecture:	32-bit data and address registers
Address range:	16M bytes
Data bus:	16-bit asynchronous
Instruction types:	57
Major data types:	5
Addressing modes:	14
Interrupt levels:	6 maskable and 1 non-maskable

Clock and Timers

Real-time clock

Resolution:	10 msec
Accuracy:	50 ppm (4.3 sec/day)
Power-on default:	Midnight, January 1

Timers

Delay interrupt:	10 msecs to 1.94 days in 10 msec increments
Cycled interrupt:	10 msecs to 1.94 days in 10 msec increments
Match interrupt:	Match on time of day, 0.00 to 84600.00 seconds (23.5 hours)

Beepers

Range (nominal):	81.375 Hz to 5208 Hz
Duration:	.01 to 2.55 sec

Beeper hardware supports three tone generators with attenuators and white noise source.

Features

- HP standard industrial package
- Six accessory card slots (three for external interface cards)
- Pascal 3.0 and BASIC 3.0 language systems
- Supports external 14-inch medium-resolution, monochrome display (35721A/B/C)
- HP-HIL keyboard support (46020A)

Physical

Height:	130 mm (5.12 inches)
Width:	325 mm (12.80 inches)
Depth:	285 mm (11.22 inches)
Net weight:	6 kg (13.2 pounds)
Shipping weight:	9.5 kg (20.9 pounds)

Power Requirements

Operating voltage:	90 to 125 Vac, 198 to 250 Vac switch-selectable
Operating frequency:	48 to 66 Hz
Power consumption:	130 W (maximum)
Accessory slot power:	41.25 W @ +5 V
	18.70 W @ +12 V
	6.00 W @ -12 V

The accessory slot +5 V lines are fuse-limited to 25 W for each pair of slots.

Product Configuration

The Model 217 is available in two configurations, the modular computer only (9817A) or a complete hardware system (9817H).

Product Number	Description

9817A	Model 217 Computer
	  * Built-in HP-IB interface with 2 m cable
	  * Built-in RS-232 interface (order cable separately)
	  * 6 accessory slots for interfaces, language systems and memory
	  * Built-in HP-HIL interface

9817H	Model 217 Computer
	  * Built-in HP-IB interface with 2 m cable
	  * Built-in RS-232 interface (order cable separately)
	  * 6 accessory slots for interfaces, language systems and memory
	  * Built-in HP-HIL interface
	512K bytes of RAM memory (two 98256A cards)
	46020A keyboard
	35721A, B or C 14-inch monochrome monitor
	98204B video interface
	35722A tilt and swivel unit
	
	Option 001: 1M byte RAM memory (one 98257A substituted for two 98256A cards)

Customer Service Support

Hewlett-Packard provides service support in three ways: on-site repair, service center repair and customer repair.

On-site Repair

For on-site repair, an HP Customer Engineer goes to the customer's site and troubleshoots and repairs the computer at the assembly level. The defective assembly is then exchanged for a new or reconditioned assembly. This is the fastest way to get the computer up and running. Consult your HP Sales and Service office for turnaround times.

Service Center Repair

For service center repair, the customer returns the defective computer to an HP Field Repair Center. An HP Service Technician repairs the computer and returns it to the customer[1]. Table 1-1 contains a list of the Field Repair Centers. Consult your HP Sales and Service office for turnaround times.

Customer Repair

Customers have the option of repairing their own computers. Contact your nearest HP Sales/ Service office for information concerning recommended spare assemblies and training.

INTERCONTINENTAL

ARGENTINA
BUENOS AIRES
Hewlett-Packard Argentina S.A.
Avda Santa Fe 2035
Martinez, 1640
Phone: /792-1293

AUSTRALIA

New South Wales
SYDNEY
Hewlett-Packard Australia Ltd.
17-23 Talavera Road
North Ryde, New South Wales 2113
Phone: 02 /887-1611

Victoria
MELBOURNE
Hewlett-Packard Australia Ltd.
31-41 Joseph Street
Blackburn, Victoria 3130
Phone: 03 /890-6351

BRAZIL
SAO PAULO
Hewlett-Packard Brasil I.e.C.
Alameda Rio Negro 750
Alphaville
Barueri, SP-06400
Phone: 011/421-1311

HONG KONG
HONG KONG
Hewlett-Packard Hong Kong Ltd.
5 Floor Sun Hung Kai Centre
30 Harbour Road
Wanchai,
Phone: 5 /832-3211

JAPAN

Kanagawa
SAGAMIHARA
Yokogawa Hewlett-Packard
1-27-15 Yabe
Sagamihara, Kanagawa 229
Phone: 427/59-1311

Osaka-Shi
OSAKA
Yokogawa-Hewlett-Packard Ltd.
Chuo Bldg. Nishinakajima
5-4-20, Yodogawa-ku
Osaka, Osaka-Shi 532
Phone: 6 /304-6021

Suginami-ku
TOKYO
Yokogawa-Hewlett-Packard Ltd.
3-29-21 Takaido-Higashi
Tokyo, Suginami-ku 168
Phone: 3 /331-6111

MEXICO
MEXICO CITY
Hewlett-Packard Mexicana SACV
Avenida Periferico Sur 6501
Col. Tepepan, Xochimilco
Mexico City, DF16020
Phone: 905/676-4600

SINGAPORE
SINGAPORE
Hewlett-Packard Singapore Ltd.
6th Floor, Inchcape House
450-452 Alexandra Road
Singapore, 0511
Phone: 5 /631-788

TAIWAN
TAIPEI
Hewlett-Packard Far East Ltd.
Bank Tower, 5th Floor
205 Tun Hwa North Road
Taipei,
Phone: 2 /751-0404

VENEZUELA
CARACAS
Hewlett-Packard Venezuela C.A.
Edificio Segre 2Y3
3a Transversal Los Ruices Nort
Caracas, 1071
Phone: 2 /239-4133

Figure 1-1. Field Repair Centers

NORTH AMERICA

CANADA

Alberta
EDMONTON
Hewlett-Packard Canada Ltd.
11620A 168th Street
Edmonton, Alberta T5M 3T9
Phone: 403/452-3670

British Columbia
VANCOUVER
Hewlett-Packard Canada Ltd.
10691 Shellbridge Way
Richmond, British Columbia
V6X 2W8
Phone: 604/270-2277

Ontario
TORONTO WEST
Hewlett-Packard Canada Ltd.
6877 Goreway Drive
Mississauga, Ontario L4V 1M8
Phone: 416/678-9430

UNITED STATES

California
LOS ANGELES WEST
Hewlett-Packard Company
5400 W. Rosecrans Blvd.
Lawndale, California 90260
Phone: 213/643-7500

SANTA CLARA
Hewlett-Packard Company
3003 Scott Boulevard
Santa Clara, California 95050
Phone: 408/988-7000

Colorado
DENVER
Hewlett-Packard Company
24 Inverness Place, East
Englewood, Colorado 80112
Phone: 303/771-3455

Georgia
ATLANTA
Hewlett-Packard Company
2000 South Park Place
Atlanta, Georgia 30339
Phone: 404/955-1500

Illinois
CHICAGO WEST
Hewlett-Packard Company
5201 Tollview Drive
Rolling Meadows, Illinois 60008
Phone: 312/255-9800

Maryland
WASHINGTON D.C.
Hewlett-Packard Company
2 Choke Cherry Road
Rockville, Maryland 20850
Phone: 301/948-6370

Massachusetts
BOSTON
Hewlett-Packard Company
32 Hartwell Avenue
Lexington, Massachusetts 02173
Phone: 617/861-8960

Michigan
DETROIT
Hewlett-Packard Company
39550 Orchard Hill Drive
Novi, Michigan 48050
Phone: 313/349-9200

New Jersey
PARAMUS
Hewlett-Packard Company
W120 Century Road
Paramus, New Jersey 07652
Phone: 201/265-5000

Pennsylvania
PHILADELPHIA
Hewlett-Packard Company
Valley Forge Corporate Center
2750 Monroe Boulevard
Valley Forge, Pennsylvania 19482
Phone: 215/265-7000

Texas
DALLAS
Hewlett-Packard Company
930 East Campbell Road
Richardson, Texas 75081
Phone: 214/231-6101

Washington
SEATTLE
Hewlett-Packard Company
15815 S.E. 37th Street
Bellevue, Washington 98006
Phone: 206/643-4000

EUROPE AND
MIDDLE EAST

AUSTRIA
VIENNA
Hewlett-Packard GmbH
Lieblgasse 1
Postfach 72
Vienna, A-1222
Phone: 222/3516210

BELGIUM
BRUSSELS
Hewlett-Packard Belgium SA/NV
Boulevard de la Woluwe 100
Woluwedal 100
Brussels, B-1200
Phone: 2/762-3200

DENMARK
COPENHAGEN
Hewlett-Packard A/S
Datavej 52
Birkeroed, DK-3460
Phone: 2/81-66-40

FINLAND
HELSINKI
Hewlett-Packard Oy
Revontulentie 7
Espoo, SF-02100
Phone: 90/455-0211

JYVASKYLA
Hewlett-Packard Oy
Vainonkatu 9c
Jyvaskyla, SF-40100
Phone: 41/216318

OULU
Hewlet-Packard Oy
Kainuuntieic
Oulu, SF-90140
Phone: 81/338785

FRANCE
ORSAY
Hewlett-Packard France
Les Ulis Avenue De Tropiques
Z. Industrielle de Courtaboeuf
Les Ulis, F-91947
Phone: 6/9077825

GERMANY
BOEBLINGEN
Hewlett-Packard GmbH
Herrenberger Strasse 110
Boeblingen, D-7030
Phone: 703/667750

ITALY
MILANO
Hewlett-Packard Italiana S.p.A
Via G. Di Vittorio 9
Cernusco Sul Navigl, I-20063
Phone: 2/903691

NETHERLANDS
AMSTELVEEN
Hewlett-Packard Nederland B.V.
Van Heuven Goedhartlaan 121
Amstelveen, NL-1181KK
Phone: 20/472021

NORWAY
OSLO
Hewlett-Packard Norge A/S
Oesterudalen 18
Oesteraas, N-1345
Phone: 2/17-11-80

SOUTH AFRICA

Transvaal
JOHANNESBURG
Hewlett-Packard South Africa
Private Bag
Wendywood
Sandton, Transvaal 2144
Phone: 11/802-511

SPAIN
MADRID
Hewlett-Packard Espanola S.A.
Costa Brava, 13-2
Mirasierra
Madrid, E-34
Phone: 91/734-1162

SWEDEN
STOCKHOLM
Hewlett-Packard Sverige AB
Skalholtsgatan 9, Kista
Box 19
Spanga, S-16393
Phone: 8/750-2000

SWITZERLAND
ZUERICH
Hewlett-Packard (schweiz) AG
allmend 2
Widen, CH-8967
Phone: 57/312111

UNITED KINGDOM

ENGLAND
MANCHESTER
Hewlett-Packard Ltd.
Trafalgar House
Navigation Road
Altrincham, England WA14 1NU
Phone: 61/928-6422

WINNERSH
Hewlett-Packard Ltd.
King Street Lane
Winnersh
Wokingham, England RG11 5AR
Phone: 734/784-774

Figure 1-1. Field Repair Centers (Cont.)

Backplane Power Limits

The limits for the backplane power available to accessories is not to be exceeded by the installed accessories. To help determine the power requirements of a particular set of accessories, the following power requirements for accessories are listed.

☐ CAUTION ☐

IF THE POWER REQUIRED FOR ACCESSORIES EXCEEDS THE POWER AVAILABLE AT THE COMPUTER BACKPLANE, DAMAGE TO THE COMPUTER'S POWER SUPPLY AND/OR THE ACCESSORY WILL OCCUR. HEWLETT-PACKARD DOES NOT SUPPORT ACCESSORY CONFIGURATIONS REQUIRING MORE POWER THAN IS RECOMMENDED AT THE COMPUTER BACKPLANE.

To determine the suitability of a given set of accessories for your computer, follow these instructions:

1. Calculate the accessory power required for each supply voltage and the total power required for the accessory using the information in Table 1-2. Enter these values in the "Total Power Required" block in Table 1-1.

2. If the total power required is greater than 56.26 W, or the power drawn at any given voltage exceeds the value for that level, you must:

    a. Change the type/number of accessories,

    b. Add an HP 9888A Expander, or

3. Recalculate the power required versus power available.

Table 1-1. Power Requirements Calculation Table

	Power Supply Voltage			Backplane
	+5	**+12**	**−12**	**Maximum**
accessory 1				
accessory 2				
accessory 3				
accessory 4				
accessory 5				
accessory 6				
Total power required HP 9817 power available	48.5 W	9.12 W	5.04 W	56.26 W

Table 1-2. Typical Power Requirements for Series 200 Accessories

Product	Description	Power Requirements			Total
		+5	+12	-12	
HP 9888A	Bus Expander	5.0			5.0
HP 13264A	Data Link Pod	0.2	1.9	0.3	2.4
HP 13265A	Modem	0.5	0.5	0.5	1.5
HP 13266A	Current Loop Pod	1.0	1.0	1.0	3.0
HP 98028A	Res. Mgmt. MUX	2.2	6.4		8.6
HP 98204B	Video w/o Graph.	7.5			7.5
HP 98204B	Video w/Graphics	15.0			15.0
HP 98253A	EPROM Prog.	5.7			5.7
HP 98254A	64K byte RAM	3.0			3.0
HP 98255A	EPROM Card	2.8			2.8
HP 98256A	256K byte RAM	4.1			4.1
HP 98257A	1M byte RAM	6.0			6.0
HP 98259A	128K byte Bubble	2.4	2.9		5.3
HP 98601A	BASIC 2.0 ROM	2.4			2.4
HP 98601A	BASIC 1.0 ROM	2.3			2.3
HP 98602A	BASIC 2.1 ROM	3.6			3.6
HP 98604A	HPL 2.0 ROM	1.5			1.5
HP 98620A	DMA Controller	6.0			6.0
HP 98621A	BASIC 1.0 Opt. 1	2.3			2.3
HP 98622A	GPIO Interface	3.8			3.8
HP 98623A	BCD Interface	2.5			2.5
HP 98624A	HP-IB Interface	2.4			2.4
HP 98625A	Disc Interface	3.0	0.1		3.1
HP 98626A	RS-232 Interface	2.0	0.6	0.6	3.2
HP 98627A	Color Interface	5.5			5.5
HP 98628A	Datacomm Interf.	3.6	0.5	0.7	4.8
HP 98629A	Resource Mgmt. w/o 98028A	3.7	0.5	0.5	4.7
HP 98629A	Resource Mgmt. w/98028A	5.9	6.9	0.5	13.3
HP 98630A	Breadboard Card	1.3			1.3
HP 98635A	Floating-Point	4.2			4.2
HP 98640A	A-D Card	1.0	0.7	0.6	2.3
HP 98644A	Serial Load Card	2.0	0.3	0.02	2.3
HP 98691A	Progr. Datacomm	6.4	2.0	1.3	9.7

User Documentation

BASIC Manual

Manual Part Number	Description
98613-10010	CSUB Preparation Manual
98613-87901	BASIC 3.0 Manual Kit contains one each of the following manuals:
98613-10020	Utilities Library Manual
98613-10030	Loader Utility Manual
98613-90010	BASIC 3.0 Programming Techniques
98613-90020	BASIC 3.0 Interfacing Techniques
98613-90030	BASIC 3.0 Graphics Techniques
98613-90040	BASIC 3.0 User's Guide
98613-90050	BASIC 3.0 Language Reference
98613-90060	Condensed Reference
98613-90070	Documentation Guide and Master Index

Pascal

Manual Part Number	Description
98615-87902	Pascal 3.0 Manual Kit contains one each of the following manuals:
09826-90072	Pascal Textbook (Wiley)
09826-90073	MC68000 User's Manual
98615-90021	Pascal 3.0 Workstation System
98615-90030	Pascal 3.0 Procedure Library
98615-90035	Pascal 3.0 Graphics Techniques
98615-90040	Pascal 3.0 User's Guide
98615-90050	HP Pascal Language Reference for Series 200 Computers

Service Documentation

Manual Part Number	Description
09817-90030	HP 9817 Hardware Support Document
09817-90039	HP 9817 CE Handbook Section
09817+49A-90101	Model 217 Self-Paced Hardware Training Guide
35721-90004	HP 35721A/B/C Service Manual

Miscellaneous

Manual Part Number	Description
98204-90001	HP 98204B Composite Video Card Installation Note
98257-90000	HP 98257A RAM Card Installation Note
98620-90001	HP 98620A/B DMA Card Installation Note
98622-90000	GPIO Installation Manual
98623-90000	BCD Installation Note
98624-90000	HP-IB Installation Note
98625-90000	Disc Interface Installation Manual
98626-90000	RS-232 Installation Manual
98627-90000	Color Video Interface Installation Manual
98628-90001	HP 98628/98691 Datacomm Installation Manual
98630-90000	HP 98630A Breadboard Installation Manual
98635-90000	HP 98635A Floating-Point Math Card Installation Note

Site Preparation and Requirements	Chapter
	2

Site Preparation

Site preparation requirements for the HP 9817 computer are:

Environmental Class B or higher: No site prep needed
Otherwise: Upgrade site to Class B

Class B Specifications

Class B specifications are designed for commercial and industrial environments, that is, light or medium industrial and commercial manufacturing facilities suitable for occupancy by operating personnel on a full-time basis without benefit of air conditioning or other protective measures.

This kind of environment is expected to fall within the specifications in Table 2-1. If any parameter falls outside the specification, steps must be taken to ensure that the computer is suitably protected.

Table 2-1. Class B Specifications

Temperature

Non-operating	−40 to +75°C
Operating Survival	−20 to +65°C
Operating	0 to +55°C

Humidity

Non-operating	90% R.H. @ 65°C
Operating	0 to 95% R.H. @ 40°C
Supersoak	24 Hours
Condensation	Operates without damage and recovers within specified time limits

Vibration

Cycle Range	5 to 55 to 5 Hz
Amplitude (p-p)	0.38 mm
Sweeptime	1 min./octave, 15 min. total
Dwell at Resonances	10 min. each resonance
Amplitude at Resonances	
5 to 10 Hz	3.17 mm
10 to 25 Hz	1.52 mm
25 to 55 Hz	.38 mm

Table 2.1. Class B Specifications (cont.)

Shock (non-operating)

Magnitude	30g
Duration	11 ms
Number of Shocks	18
Waveform	Half-sine
Bench Handling	102 mm Tilt Drop

Altitude

Non-operating	15 300 m
Operating	4600 m

Transportation

Drop Test (in shipping carton)	752 mm

Power Requirements

Power requirements for the HP 9817 computer are:

Power:	130 W
Voltage:	90 to 125 or 198 to 250 Vac
Frequency:	48 to 66 Hz

Installation and Configuration	Chapter
	3

This chapter is composed of the following installation documentation:

09817-90000   Model 217 Installation Guide

98257-90000   98256A and 98257A Installation Note

98204-90001   98204B Composite Video Interface Inst. Note

These documents are supplied with the HP 9817 Service Manual Kit. If you purchased this kit, place these documents after this page.

	Chapter
# Preventive Maintenance	**4**

There is no preventive maintenance for the HP 9817 computer, other than cleaning.

Cleaning

To preserve the appearance of the computer, follow these instructions:

Unplug the power cord and remove any interconnecting cables. Dampen a clean, soft, lint-free cloth with a solution of clean water and mild soap. Wipe the soiled areas, ensuring that no cleaning solution gets inside. Then dry with a clean, soft, lint-free cloth.

CAUTION

CHEMICAL SPRAY-ON CLEANERS USED FOR APPLIANCES AND OTHER HOUSEHOLD APPLICATIONS MAY DAMAGE THE FINISH. THESE AND OTHER CHEMICAL CLEANERS SHOULD NOT BE USED. THE COMPUTER SHOULD BE CLEANED WITH CLEAN WATER AND MILD SOAP ONLY.

Functional Description	Chapter
	5

Introduction

This chapter describes the function of the assemblies in the HP 9817 computer. The functional description may be easier to follow if you locate the various components on the block diagram, Figure 5-3.

The HP 9817 consists of these functional units:

- Processor board
- I/O connectorboard
- Power supply

The function of these units is as follows:

Processor Board

The processor board consists of two distinct sections, the processor section and the input/output section.

The processor section contains the CPU, a memory management unit, a programmable timer module, a system configuration register, a power-up configuration register, self test LEDs and control circuitry buffers.

The CPU is a Motorola MC68010 microprocessor, with 32-bit data and address registers, 16 megabyte direct addressing range, 57 instruction types and memory-mapped I/O. The CPU controls a bus with 23 address lines, 16 data lines and 17 control lines. Control signals allow asynchronous communication with a variety of memory and I/O devices, and allow for different bus masters, interrupt operation, and selective byte or word addressing.

The memory management unit provides virtual memory capabilities to the computer. The programmable timer module provides periodic interrupts to the CPU for multi-tasking purposes.

The system configuration register is a PROM which contains information about the configuration of the system as well as the machine serial number. The power-up configuration register is a switch block which allows the user to define a power-up configuration for the software. The eight self-test LEDs report the status of the self-test and any errors encountered by it.

The input/output (I/O) section of the processor board contains the boot ROM, a keyboard and speaker interface, an HP-IB interface and an RS-232 interface.

The boot ROM contains 48K bytes of software instructions. These are the first instructions executed by the CPU at start-up, and serve to initialize the 9817, run the turn-on self-test and load the language system.

The keyboard and speaker interface consists of an 8042A keyboard controller IC, an HP-HIL (Hewlett-Packard Human Interface Loop) controller, a 76494 tone generator and a speaker driver. The keyboard controller provides a system interface to the HP-HIL controller and to the tone generator, as well as system timer functions. The tone generator consists of three programmable tone generators and a programmable noise source. It produces an analog audio signal to the speaker driver. The speaker driver is an audio amplifier and produces a signal capable of driving the speaker mounted on the chassis. The HP-HIL controller provides an interface between the keyboard controller and the loop, and handles all HP-HIL external protocol. The loop is a four-wire, serial daisy chain, consisting of input devices such as a keyboard, joystick or mouse.

The built-in HP-IB interface contains all the circuitry required to communicate via an HP-IB cable. Direct Memory Access (DMA) support electronics is included, so that DMA via HP-IB is possible if a DMA card is installed in an accessory slot.

The built-in RS-232 interface contains all the circuitry required to communicate via an RS-232 cable. It operates on a dedicated 2.4576 MHz clock.

The input/output section contains switch blocks for selecting RS-232 baud rate, remote terminal, handshake, parity options, parity enable, number of stop bits, character length and control line defeat.

The chip select decodes buffered address lines BA16 thru BA23 into chip select signals for the internal HP-IB interface, the internal RS-232 interface and the keyboard.

The processor board contains switches for selecting HP-IB system controller, short or long memory test and continuous self-test.

I/O Connectorboard

The I/O connectorboard contains six accessory slots for adding RAM cards, a DMA controller card, a floating-point math card or for interface cards used for connecting peripherals.

Each two connectors are protected by a fuse on the +5V line. These fuses are mounted on the connectorboard, along with a fuse protecting the processor board.

The power supply post-regulators are mounted on the I/O connectorboard.

Power Supply

The function of the power supply is to change line voltage into filtered, regulated dc levels of +5 V, +12 V and −12 V. Overvoltage protection is provided on the +5 V line. Overcurrent protection is provided on the +12 and −12 V lines.

The power supply consists of these assemblies:

- ac input hardware
- power supply module
- post-regulators
- fan

Ac power enters through the ac socket on the rear panel. The socket contains a fuse and a voltage select switch which selects between 90-125 and 198-250 Vac. The ac passes to the power supply module, which rectifies it to dc. The power supply module is a switching supply, and produces regulated +5 Vdc and unregulated +14 and −14 Vdc. Post-regulators physically mounted on the I/O connectorboard convert the +14 Vdc to +12 Vdc and the −14 Vdc to −12Vdc.

The fan operates on the +5 and −14 V lines.

Figure 5-1 is a diagram of the distribution paths for ac and dc power.

Address Information
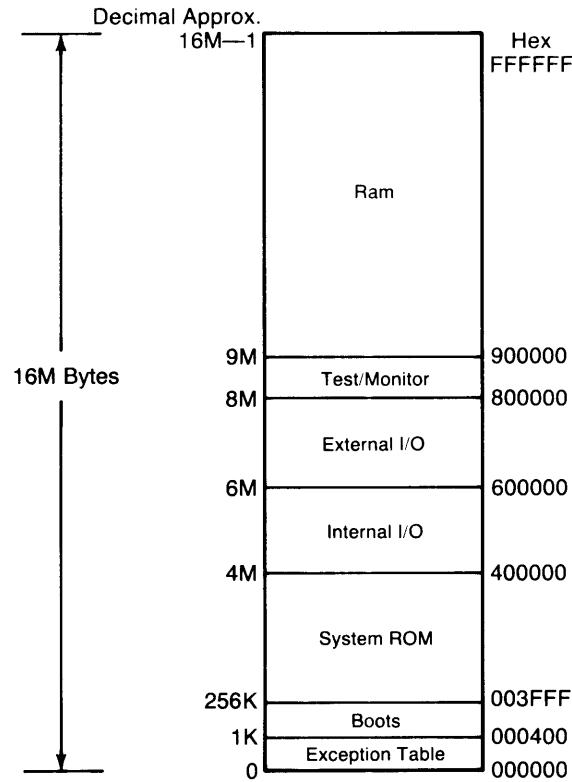
Figure 5-1. HP 9817 Memory Map

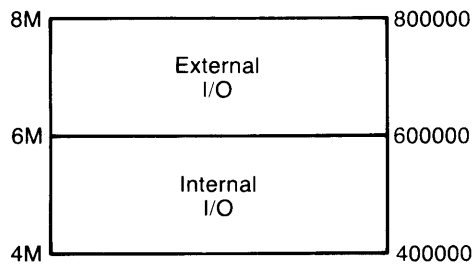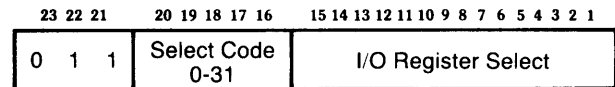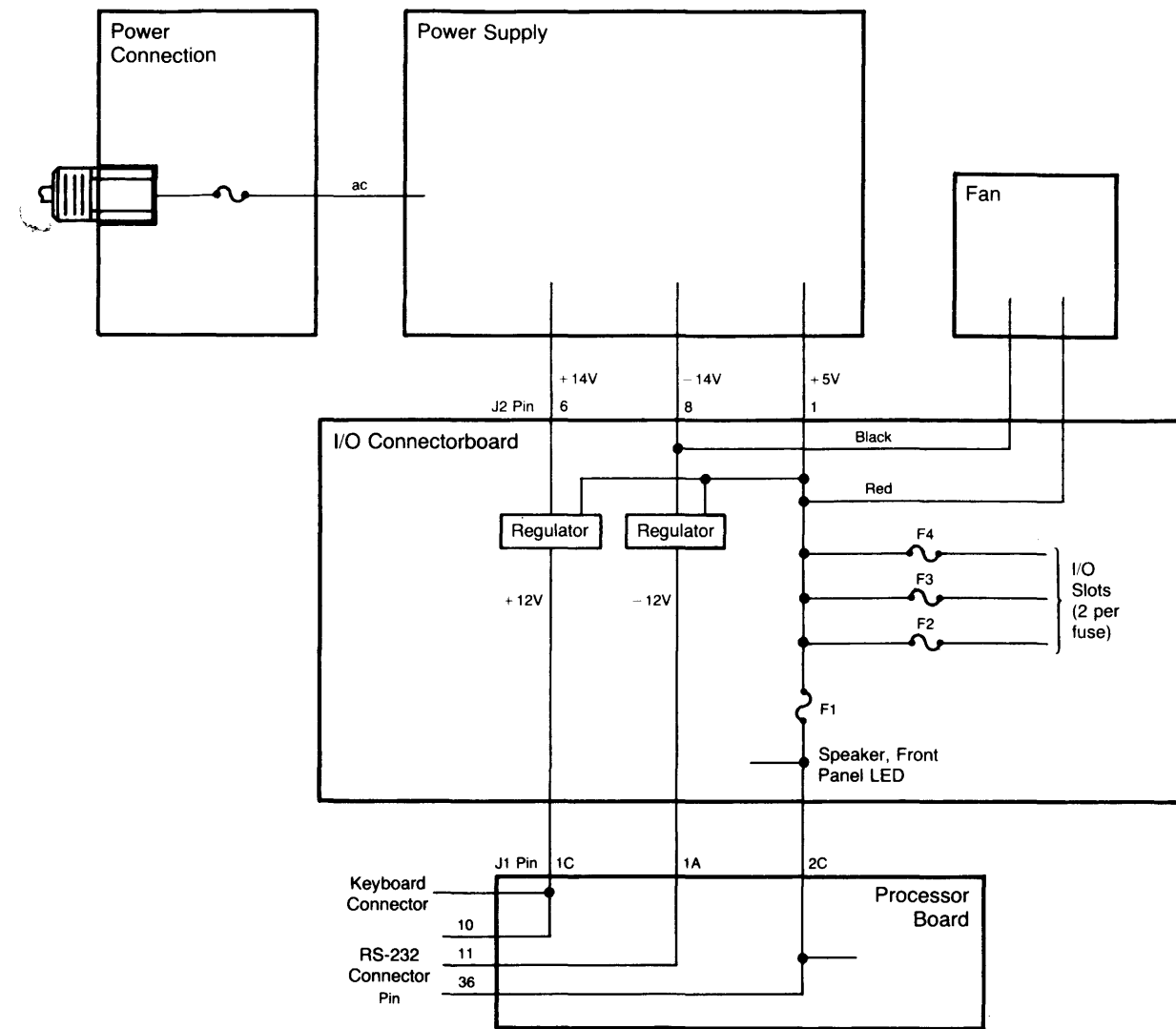**Figure 5-2. Power Distribution Diagram**
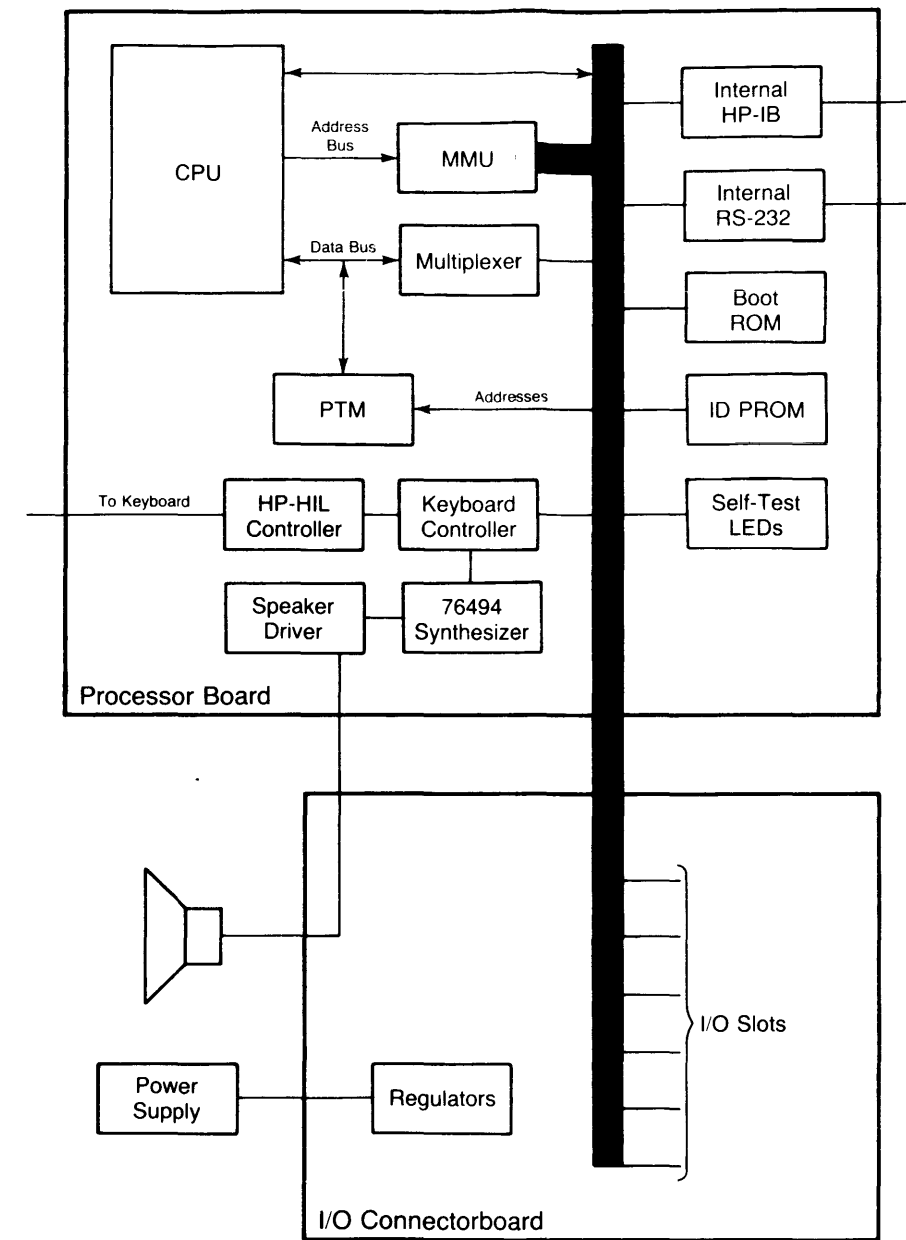
Figure 5-3. HP 9817 Block Diagram

Removal and Replacement	Chapter
	6

Introduction

This chapter describes how to access and remove the various assemblies from the HP 9817 computer, and how to reassemble it.

Where necessary, photographs show the assembly being removed. To reassemble the computer, reverse the removal procedure. Some procedures are given as an aid in reassembly.

Table 6-1 lists all the major assemblies and printed circuit boards in the computer. Figure 6-1 shows these major assemblies.

Table 6-1. Computer Configuration Chart

Description	HP 9817A	HP 9817H
Processor Board	09817-66511	09817-66511
Connector board	09817-66563	09817-66563
Power Supply	09817-66552	09817-66552
256K byte RAM Card	none	98256-66524
Keyboard	none	HP 46020A
Video Interface	none	HP 98204B
Monitor	none	HP 35721A
		HP 35721B
		HP 35721C
Optional Assemblies		
1M byte RAM Card	none	98257-66524

Top Shroud

Top Cover
(Early Production)

Top Plate

Power Socket.
Fuse,
Voltage Select

Power Supply

Fan

Speaker

ID PROM

I/O Connectorboard

I/O Slots

Processor Board
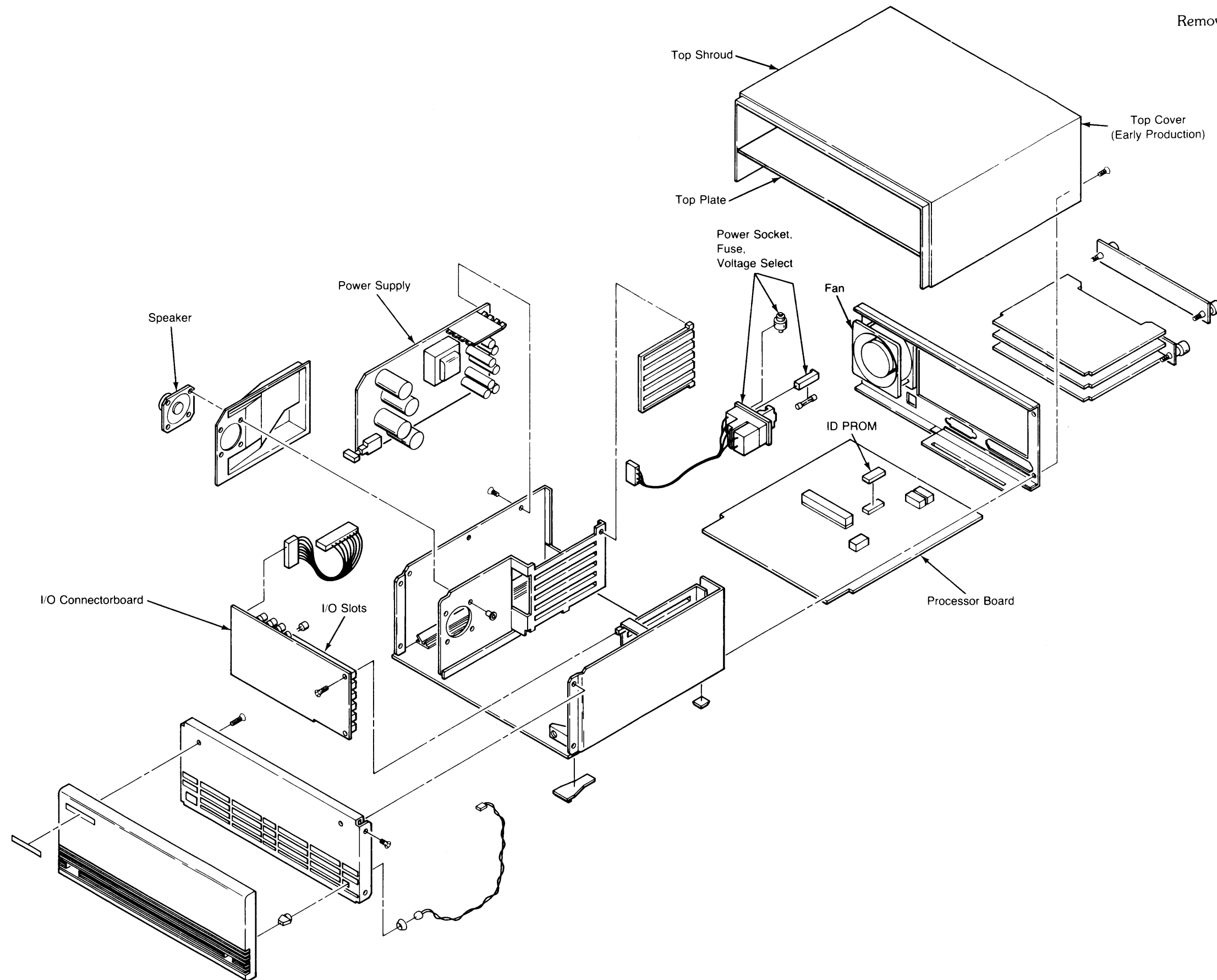
Figure 6-1. Computer Assembly Locations

WARNING

REMOVE ALL AC POWER TO THE COMPUTER BEFORE REMOV-
ING ANY ASSEMBLY.

CAUTION

INTEGRATED CIRCUITS CAN BE DAMAGED BY ELECTROSTA-
TIC DISCHARGE. USE THE FOLLOWING PRECAUTIONS:

DO NOT WEAR CLOTHING SUBJECT TO STATIC CHARGE BUIL-
DUP, SUCH AS WOOL OR SYNTHETIC MATERIALS.

DO NOT HANDLE INTEGRATED CIRCUITS IN CARPETED AREAS.

DO NOT REMOVE AN INTEGRATED CIRCUIT FROM ITS CON-
DUCTIVE FOAM PAD UNTIL YOU ARE READY TO INSTALL IT.

AVOID TOUCHING CIRCUIT LEADS. HANDLE BY THE PLASTIC
PACKAGE ONLY.

HANDLE BOARDS BY THE EDGES OR EJECTORS.

BOARDS SHOULD BE SHIPPED IN BLACK POLY BAGS. DO NOT
REMOVE A BOARD FROM ITS BAG UNTIL YOU ARE READY TO
INSTALL IT.

KEEP INTEGRATED CIRCUITS AND BOARDS AWAY FROM
SOURCES OF STATIC, SUCH AS: CLOTHING, PAPER, TAPE,
STYROFOAM, PLASTIC, WAX OR MOVING AIR.

KEEP INTEGRATED CIRCUITS AND BOARDS IN THEIR PROTEC-
TIVE PACKAGING WHEN NOT AT A STATIC-SAFE WORKSTA-
TION.

HANDLE INTEGRATED CIRCUITS AND BOARDS ONLY AT A STA-
TIC-SAFE WORKSTATION, AND ONLY WHEN YOU ARE PROPER-
LY GROUNDED.

AVOID TOUCHING CIRCUIT LEADS, TRACES, EDGE CONNEC-
TORS OR METALIZED IC CAPS.

Table 6-2 lists the tools needed to disassemble the computer.

Table 6-2. Disassembly Tools

HP Part No.	Description
–	Standard CE Tool Kit
–	#1 Pozidriv
–	5.5mm Wrench or Nut-driver
–	Nutdriver Extension
–	Flat-blade Screwdriver
–	IC Extractor
9300-0933	Anti-static Workstation

Top Cover Removal

There are two versions of the top cover, early production and late production. Late production has a separate RFI shield, and early production has a one-piece cover and RFI shield. Units with a serial number prefix of 2409, 2419 or 2420 are early production.

CAUTION

THE CASE PARTS ARE MADE OF MOLDED PLASTIC. USE CARE WHEN DISASSEMBLING AND REASSEMBLING THEM. IT IS NOT NECESSARY TO USE FORCE. IF FORCE IS NEEDED, YOU ARE PROBABLY DOING SOMETHING WRONG.

To remove the top cover, proceed as follows:

1. Remove the power cable.
2. Remove the two #1 Pozidriv screws from the lower corners of the rear panel.
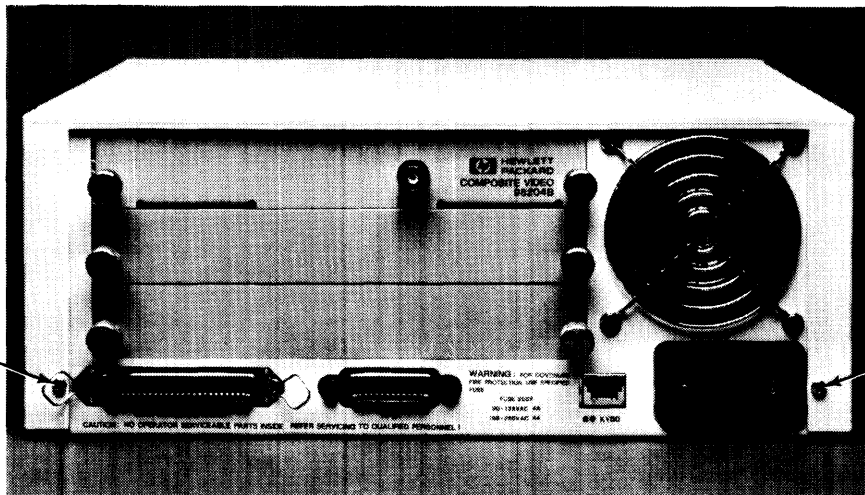
Top Cover Screws

3. Pull the rear edge of the cover up about 75 mm (3 inches), then straight back about 10 mm (1/4 inch).

4. Pull the cover straight up and off.

5. If a late production version, lift the front of the RFI shield and remove it from the computer.
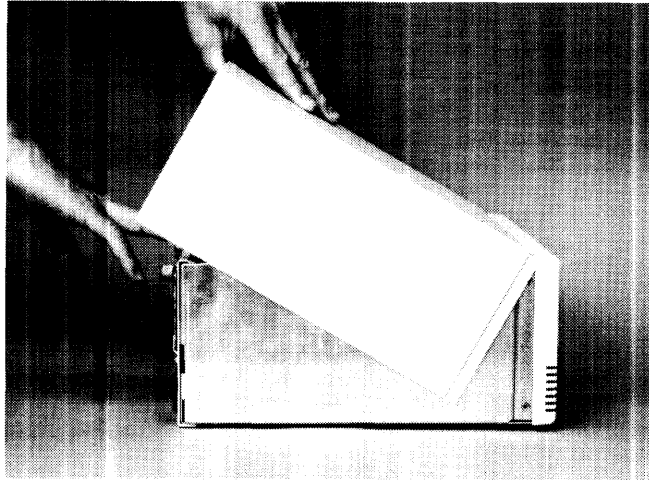
Removing the Top Cover

To re-install the top cover, follow this procedure:

1. If a late production version, install the RFI shield.
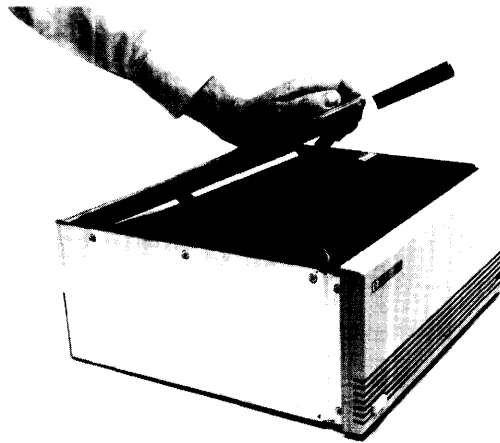
Installing the RFI Shield

2. Hold the top cover at a 45° angle and place the front edge of it underneath the top surface of the front cover.

3. Push the cover down while pressing it forward.

4. Reinstall the two screws in the rear panel.

Front Panel Removal

To remove the front panel, proceed as follows:

1. Remove the top cover.
2. Remove the four #1 Pozidriv screws fastening the front panel to the chassis.
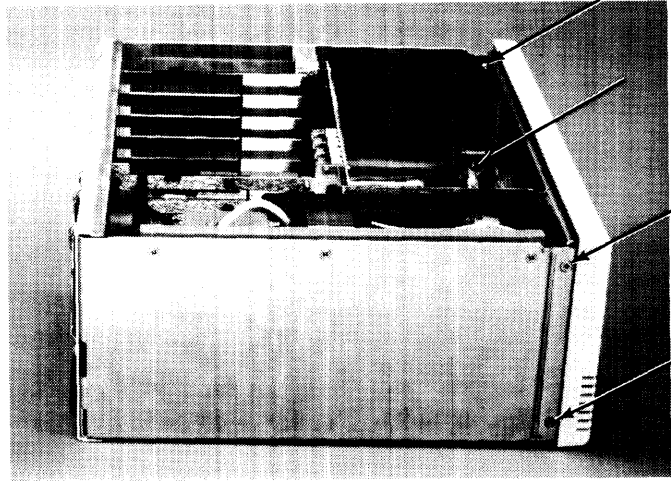
Front Panel Screws

3. Pull the front panel forward and unfasten the indicator at the right hand end of the panel.

Power Supply Removal

To remove the power supply, proceed as follows:

1. Remove the top cover and front panel.

2. Remove the three #1 Pozidriv screws fastening the power supply to the left side of the chassis.
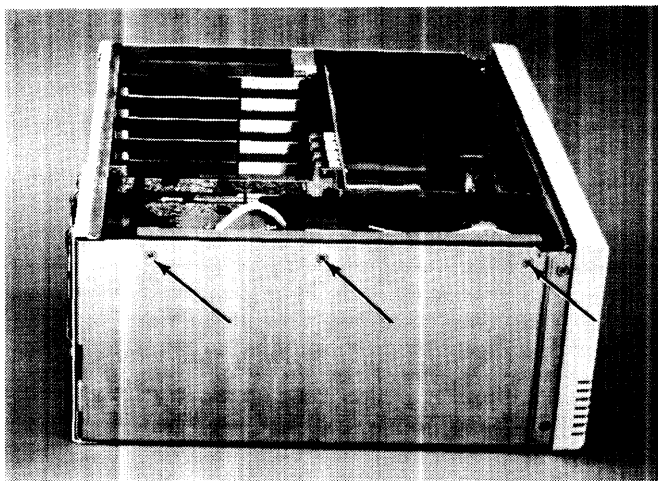
Power Supply Screws

3. Lift the back end of the power supply up and disconnect the eight-conductor cable from the bottom edge.
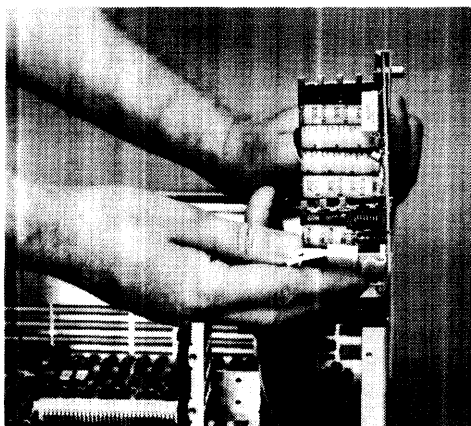
Disconnecting the Eight-conductor Cable

4. Lift the power supply straight up and disconnect the four-conductor cable from the bottom edge.
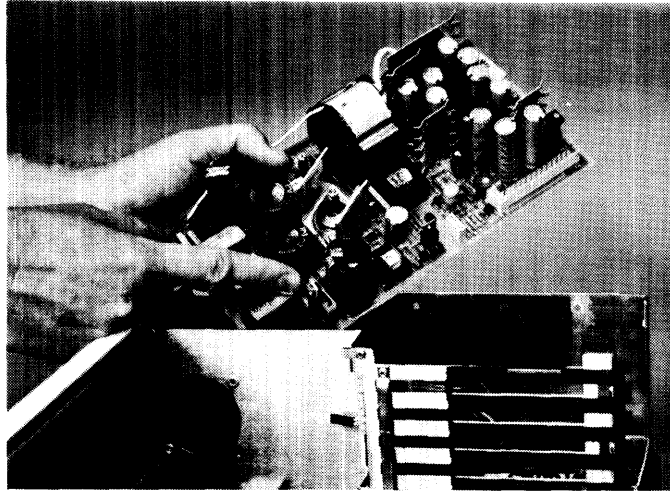
Disconnecting the Four-conductor Cable

When reinstalling the power supply, make sure that the bottom edge of the circuit board seats in the guide installed in the chassis, and that the four-conductor cable passes under the plastic baffle.

Rear Panel Removal

To remove the rear panel, proceed as follows:

1. Disconnect the power cord and the keyboard cable.
2. Remove the external interface cards and the backplane covers.
3. Remove the top cover.
4. Unplug the fan cable from the I/O connectorboard.
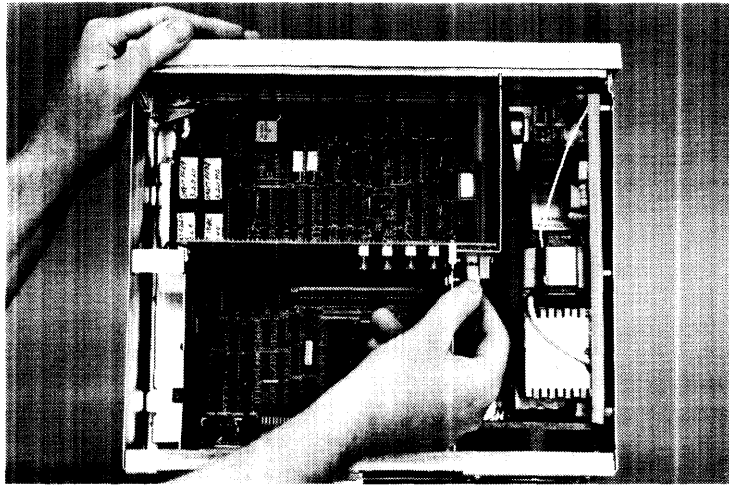
Unplugging the Fan Cable

5. Remove the two #1 Pozidriv screws from the upper corners of the rear panel.
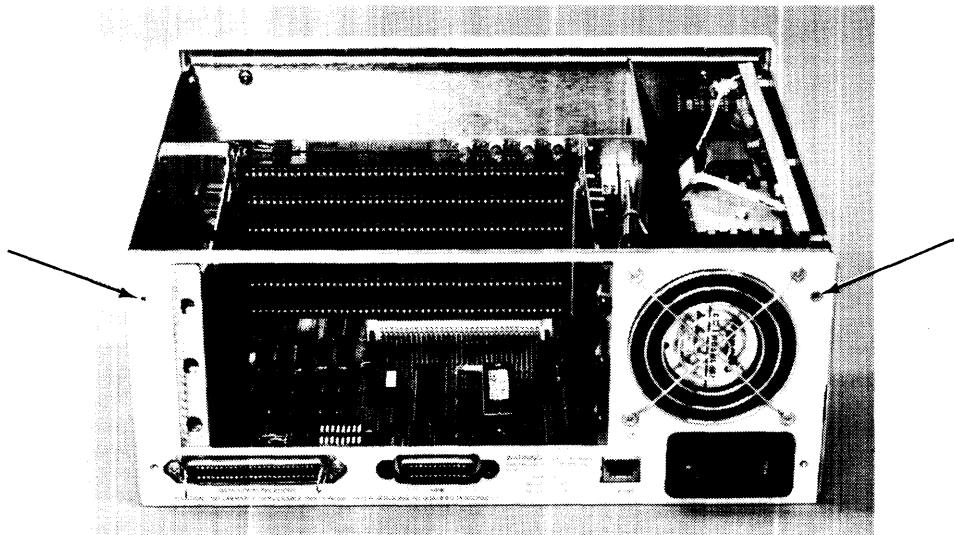
Rear Panel Screws

6. Pull the rear panel away from the chassis.

Processor Board Removal

To remove the processor board, proceed as follows:

1. Remove the top cover and rear panel.
2. Position the computer so that the back is facing you.
3. Place your thumbs on the interface connectors and lever the board out toward you.

When replacing a defective processor board with a new one, BE SURE to remove the ID PROM from the defective board and install it on the replacement board. Failure to do so will prevent the computer from running secured software.
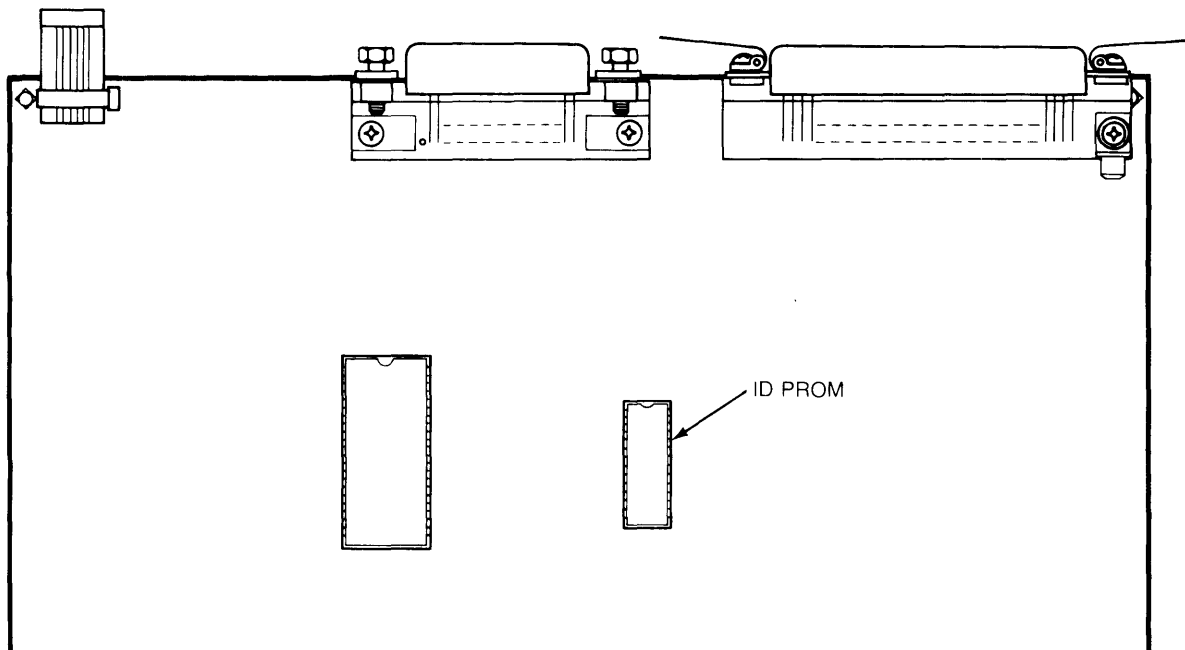
ID PROM

ID PROM Location

I/O Connectorboard Removal

To remove the I/O connectorboard, proceed as follows:

1. Remove the top cover and rear panel.
2. Remove (or at least loosen) the processor board and all cards in the backplane.
3. Disconnect the power-on LED connector.
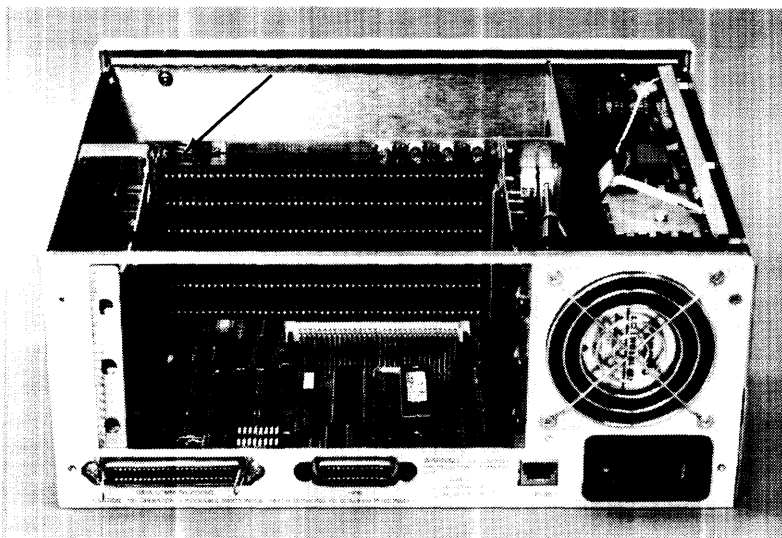
Power-on LED Connector Location

4. Disconnect the seven-conductor cable going to the power supply.
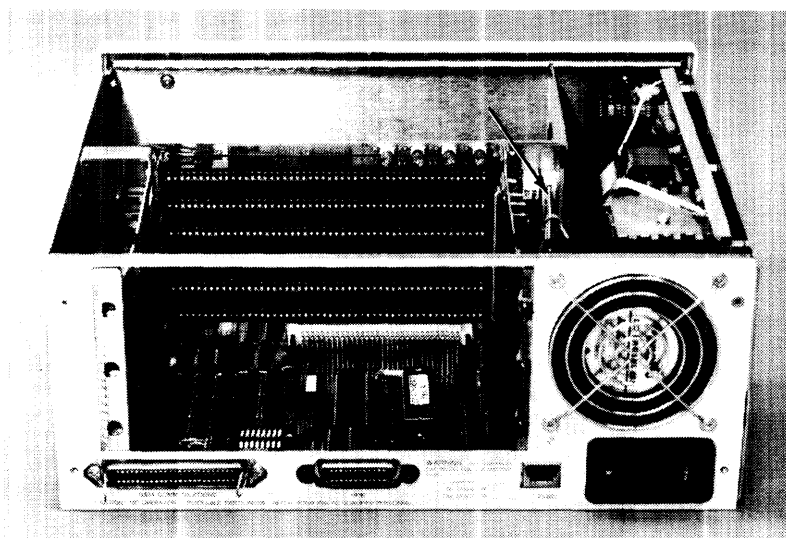
Seven-conductor Cable Location

5. Disconnect the two-conductor cable going to the speaker.

6. Using a 5.5mm nutdriver and an extension, remove the two nuts on the I/O connectorboard heat sink.
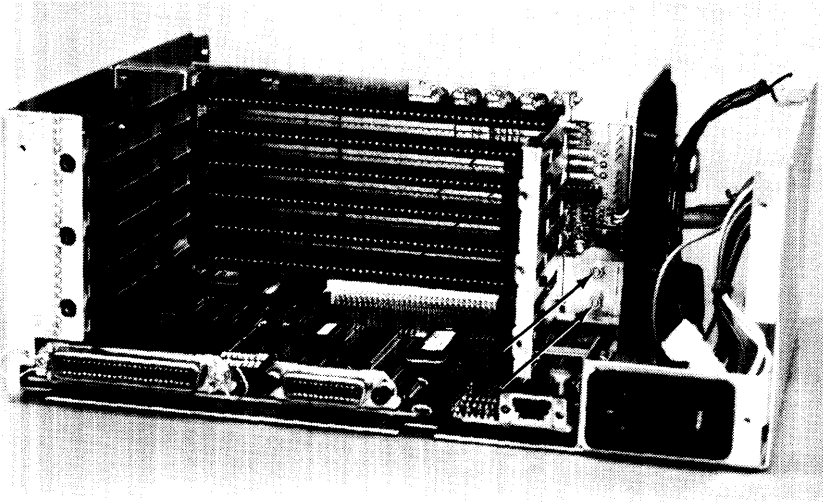
Heat Sink Nut Locations

7. Remove the three #1 Pozidriv screws on the solder side of the connectorboard. They are accessible from the front. You may need to remove the front panel if you do not have a small enough screwdriver.
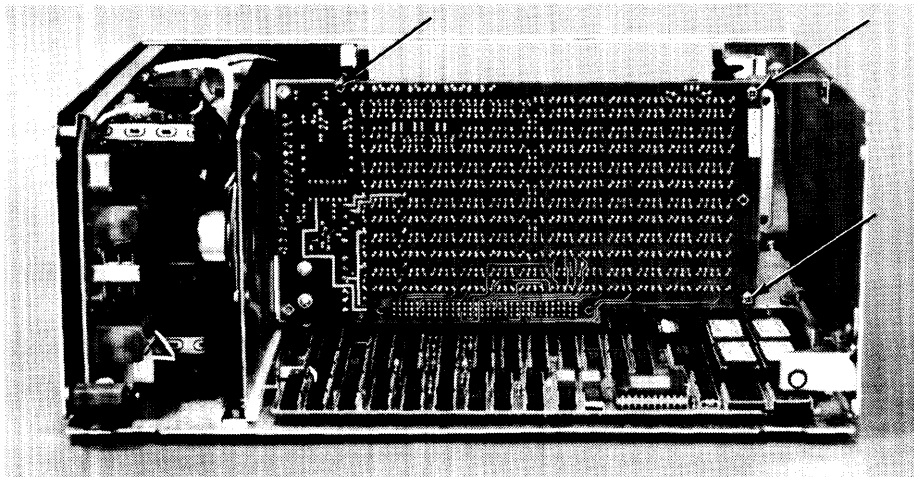
I/O Connectorboard Screw Locations

8. Lift the connectorboard up and out of the computer.

The two 5.5 mm nuts on the heat sink must be tightened to specifications. When reinstalling the connectorboard, follow this procedure to obtain the correct torque:

1. Install the three screws first.
2. Start one nut on the shaft and tighten it until contact is made.
3. Tighten the nut another one-quarter of a turn.
4. Repeat steps 2 and 3 for the other nut.

CAUTION

DO NOT OVERTIGHTEN THE 5.5 mm NUTS. DOING SO WILL DAMAGE THE REGULATOR ICS.

Power Receptacle Removal

Do not re-install the original power receptacle into the rear panel, because the removal process damages it. Obtain and install a new one.

To remove the power receptacle, follow this procedure:

1. Remove the top cover, rear panel and power supply.
2. Unscrew the nut from the grounding connection in front of the receptacle.
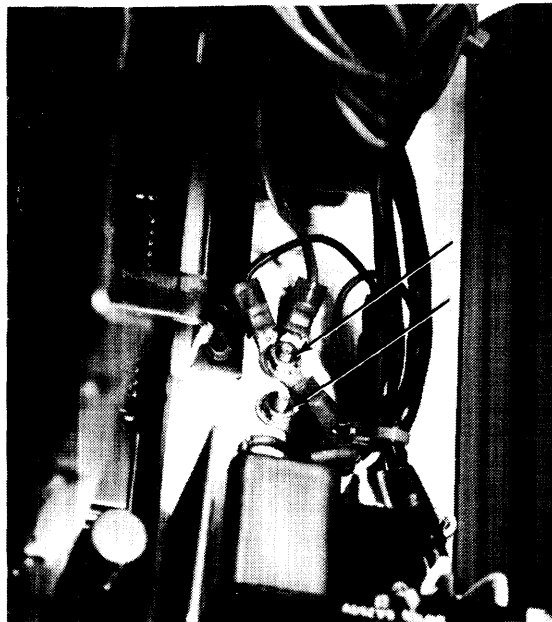
Grounding Nut Location

3. Using a flat-blade screwdriver, compress one of the receptacle ears and press that corner of the receptacle through the chassis.
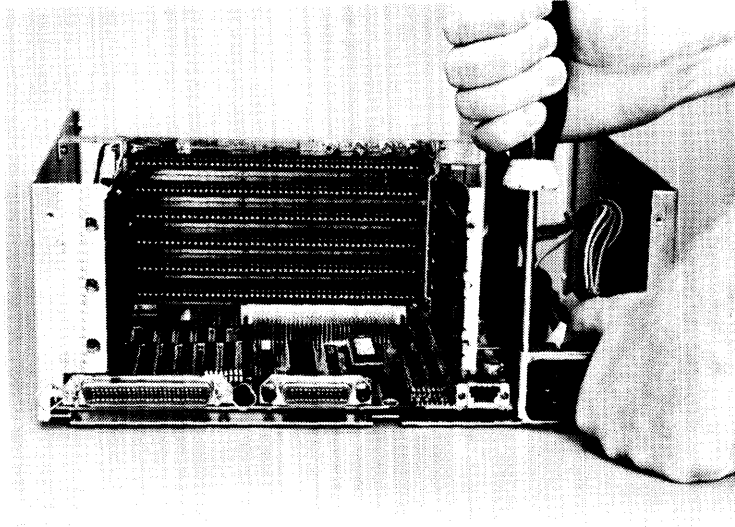
Removing the Power Receptacle

4. Repeat step 3 for the other three corners.
5. Remove the receptacle from the chassis.

Adjustments	Chapter
	7

The HP 9817 computer has no adjustments.

Refer to the HP 35721 Service Manual (part number 35721-90004) for information on adjusting the HP 35721 monitor.

Troubleshooting and Diagnostics	Chapter
	8

Introduction

This chapter contains information to troubleshoot the HP 9817 computer. Each section presents a flowchart and procedure for troubleshooting the computer to a specific level.

The various sections of the chapter cover:

Initial Troubleshooting Procedure. This section covers how to quickly determine what level to start at. It tells you which procedure to start with, rather than going through each procedure until the problem is diagnosed.

Dead Unit Procedure. This section covers troubleshooting a unit which will not power up at all. Dead units typically have problems in the power supply.

Live Unit Procedure. This section covers troubleshooting a unit which has correct power supply voltages but will not execute any instructions. Live units typically have problems with the processor, boot ROM, RAM or CPU bus.

Turn-on Self Test. This section covers troubleshooting a unit which can execute at least some instructions but has a problem accepting, storing or outputting data.

Table 8-1 lists the equipment needed to troubleshoot the HP 9817.

Table 8-1. Troubleshooting Equipment

HP Part Number	Description
3476B	Multimeter

Initial Troubleshooting Procedure

The different levels of troubleshooting require different portions of the computer to be functional. Here is a summary of the functions needed by each procedure:

Procedure	What MUST Operate Properly
Dead unit	Nothing
Live unit	Power supply
Turn-on self-test	Power supply, processor, first 16K RAM, system bus

In order to choose the best approach to start with, obtain as much information as possible from the user. If the user indicates that the unit is not working at all, the dead unit procedure is a good place to start. If the user indicates that most of the unit is operating properly, the turn-on self-test may be a good place to start. If the user's information is not conclusive, use the following procedure to determine the problem area. The Initial Troubleshooting Flowchart in Figure 8-1 summarizes this procedure.

1. Turn the computer on and check the power-on LED.
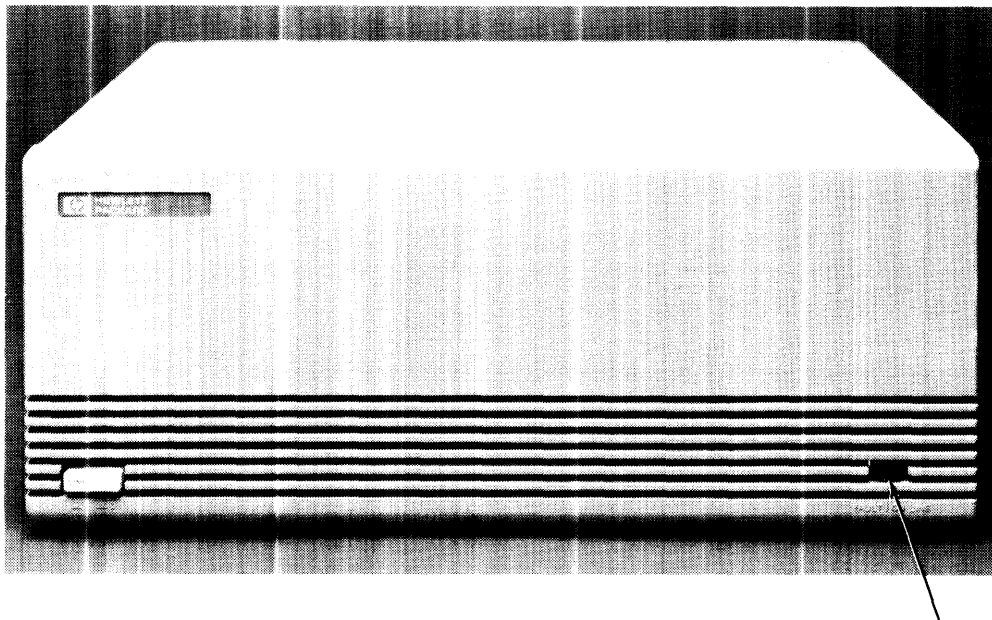
Power-on LED Location

2. If the power-on LED lights, skip to step 10. If the power-on LED does not light, check for airflow through the fan.
3. If the fan is not running, refer to the Dead Unit Procedure.
4. If the fan is running, remove the cover and check fuse F1 on the I/O connectorboard. If fuse F1 is good, skip to step 7.
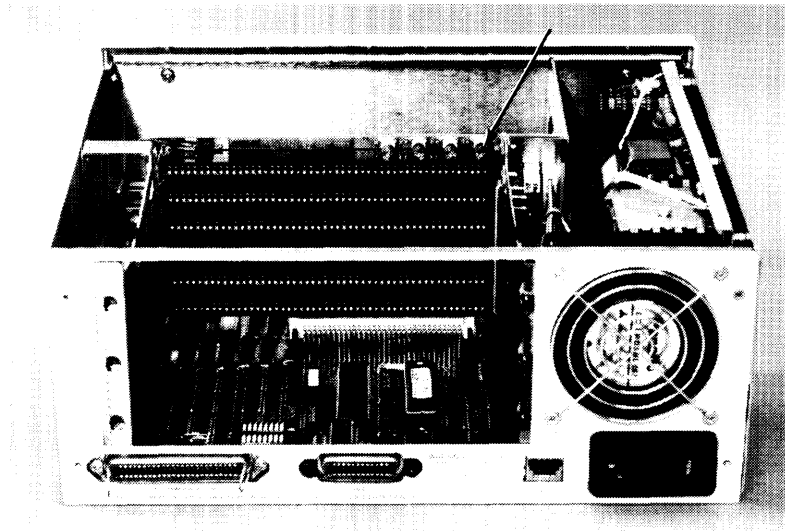
Fuse F1 Location

5. If fuse F1 is open, replace it. Then remove the rear panel and pull the processor board loose. Then turn the computer on for a few moments and recheck the fuse.

6. If the new fuse is open, the I/O connectorboard is defective. If it is okay, the processor board is defective.

7. If fuse F1 is good, loosen or disconnect the power-on LED plug from the I/O connectorboard and check the dc voltage across the terminal. If it is about 5V, the LED is defective.
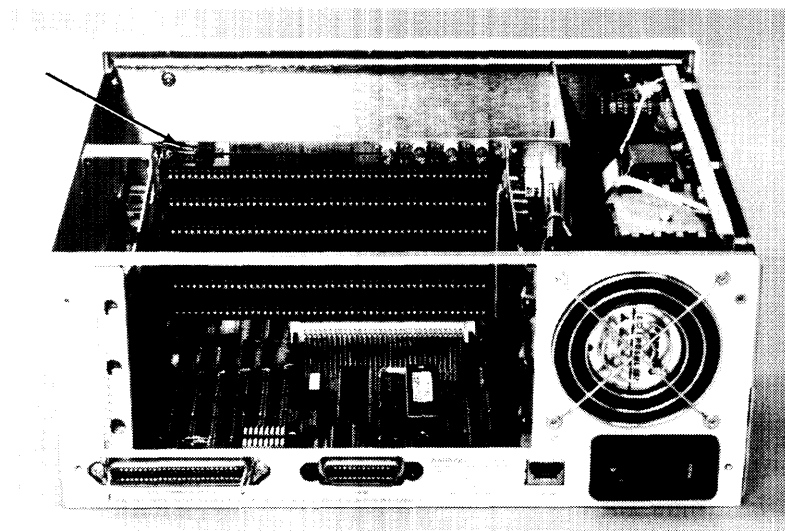
Power-on LED Terminal Location

8. Turn the computer off and locate the cable between the I/O connectorboard and the power supply (cable J2). Disconnect it from the connectorboard and check the 5V supply line (pin 1).
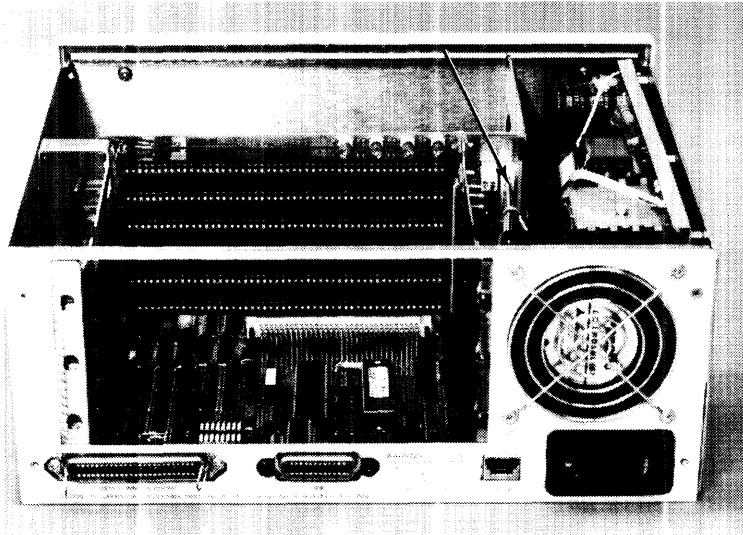
Power Supply to I/O Connectorboard Cable Location

9. If the voltage in the cable is defective, the power supply is defective. If it is okay, the connectorboard is defective.

10. If the power-on LED lights, check for airflow through the fan. If the fan is not running, skip to step 14.

11. If the fan is running, turn the computer off and back on again, then check the self-test LED display to see if self-test is running. If it is not running, refer to the Live Unit Procedure.
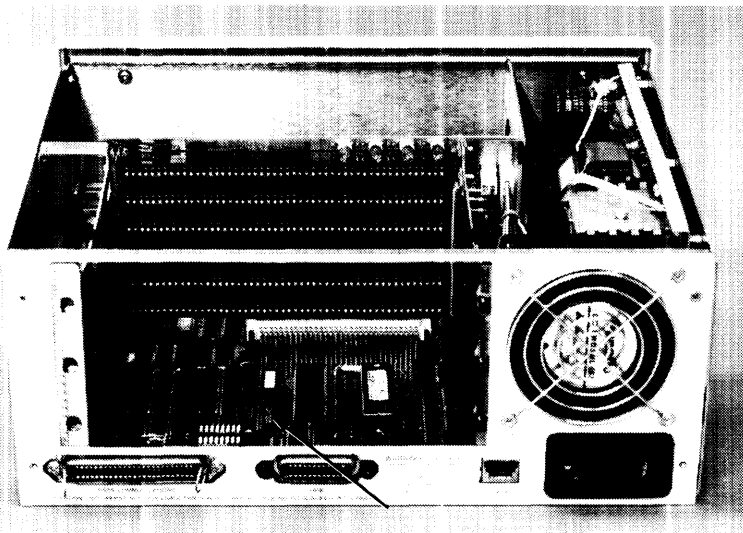
Self-test LEDs Location

12. If self-test is running, review the symptoms and decide whether the problem lies with one or more add-on cards in the I/O backplane. If so, check fuses F2 to F4 on the I/O connector-board.
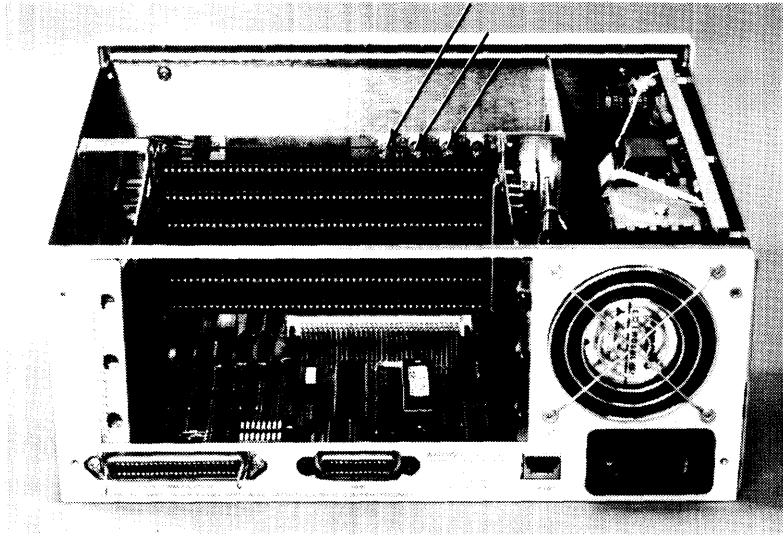
Fuses F2 to F4 Location

13. If the problem does not seem to be specific to backplane cards, refer to the Boot ROM Error Codes. They are located in Table 8-3 and in Chapter 10.

14. If the Power On LED lights but the fan does not run, turn the computer off and disconnect the fan. Then turn the computer back on and check the dc voltage across the fan terminal.
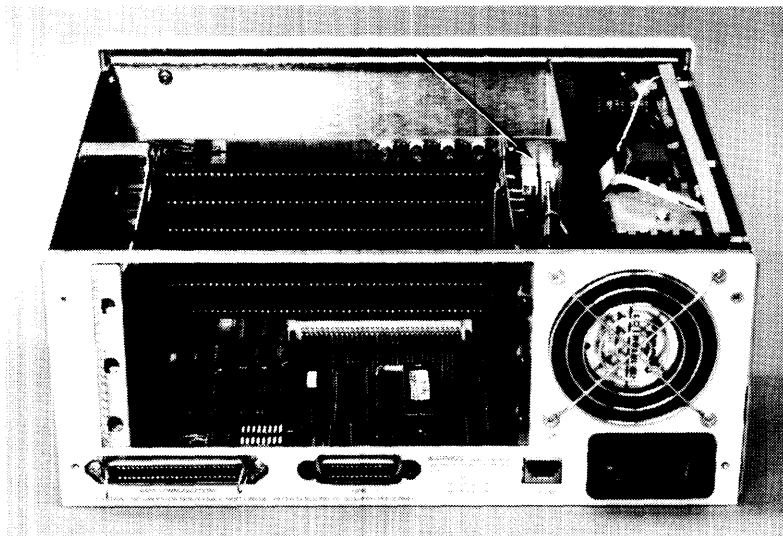
Fan Terminal Location

15. If the dc voltage across the fan terminals is about 19 V, the fan is defective. Otherwise, turn the computer off and locate the cable between the I/O connectorboard and the power supply (cable J2). Disconnect it from the connectorboard and check the − 14V supply line (pin 8).

16. If the − 14 V supply line is okay, the I/O connectorboard is defective. Otherwise, the power supply is defective.

Notes

Start

Turn Computer On

Refer to Dead Unit Procedure

No

Does Fan Run?

Yes

No

Does Front Panel LED Light ?

Yes

No

Does Fan Run?

Yes

Does Self Test Run?

No

Refer to Live Unit Procedure

Yes

Determine Whether Problem is Confined to External Cards

Confined to Backplane ?

Yes

Check Fuses F2-4 on I/O Connectorboard

No

Refer to Boot ROM Error Codes

No

Disconnect Fan. Check Vdc on Fan Terminal.

≈19V?

Yes

Defective Fan

No

Unplug I/O Connectorboard from Power Supply (J2)

Check − 14V in Cable J2 (Pin 8)

− 14V Okay?

Yes

Defective I/O Connectorboard

No

Defective Power Supply

Check Fuse F1 on I/O Connectorboard

Fuse Okay?

No

Disconnect Processor Board. Replace Fuse.

Operate Computer. Check Fuse.

Fuse Okay?

Yes

Defective Processor Board

No

Defective I/O Connectorboard

Yes

Yes

Disconnect Front Panel LED. Check Vdc on LED Terminal.

≈5V?

Yes

Defective LED

No

Unplug I/O Connectorboard from Power Supply (J2)

Check +5V in Cable J2 (Pin 1)

+5V Okay?

No

Defective Power Supply

Yes

Figure 8-1. Initial Troubleshooting Flowchart

Dead Unit Procedure

A dead unit is one which does not appear to function at all.

Power Supply

The power supply consists of an ac power receptacle and voltage select switch, a switching ac-to-dc converter, post-regulators and a dc-powered cooling fan. The converter is contained on the power supply board. The post-regulators are mounted on the I/O connectorboard. The fan is mounted on the rear panel. The power receptacle and voltage select switch protrudes through the rear panel, but is actually mounted on the chassis. The assemblies and components included in the power supply are pointed out in Figure 8-2.

Here is a list of the power supply assemblies:

09817-66563	I/O connectorboard
09817-66552	Power supply board
09817-64105	Rear panel (includes fan)
09817-61600	Power receptacle and voltage select switch
09817-61601	DC Cable

All of these are non-exchange items.
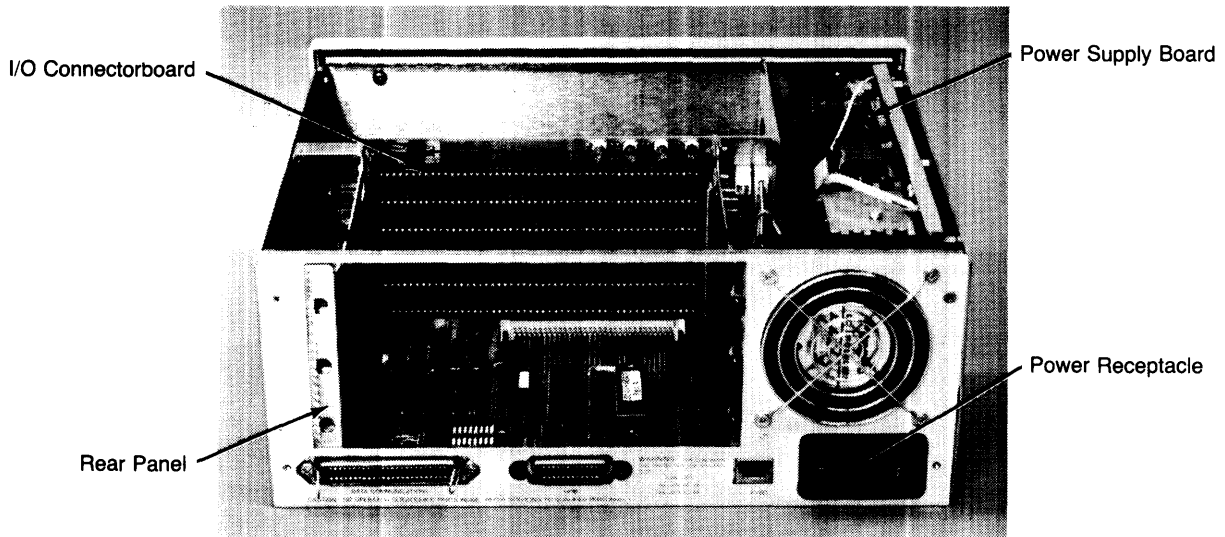
Figure 8-2. Power Supply Assemblies

Troubleshooting a Dead Unit

Nearly all dead units have at least one of these basic problems:

- Defective components
- Improperly adjusted supply voltages
- Voltage select switch in wrong position
- Loose mechanical connections

Use the following procedure to isolate the problem to one of those possibilities. If a component is defective, the procedure indicates which assembly should be replaced to eliminate the problem. Refer to Figure 8-3 for a flowchart of this procedure.

There is a voltage select switch on the rear panel of the computer. It selects between 90 to 125 Vac and 198 to 250 Vac. Make sure that it is in the correct position.

WARNING

HAZARDOUS VOLTAGES ARE PRESENT IN THE UNIT WHEN IT IS PLUGGED IN. UNPLUG THE UNIT BEFORE PLACING METER LEADS, CHECKING FUSES OR REMOVING OR REPLACING ASSEMBLIES.

---

1. Check that the computer is plugged in and that the voltage select switch is set correctly. If you do not know how it should be set, refer to Chapter 3.
2. Check that the line fuse is good and of the correct value. Refer to Chapter 3. If the fuse is open, replace it.
3. Turn the computer on; then turn it off and recheck the fuse. If the fuse is good, skip to Step 6. If the fuse is open, continue with Step 4.
4. Locate and disconnect the cable between the power supply and the I/O connectorboard (cable J2). Replace the line fuse and operate the computer for a few moments.
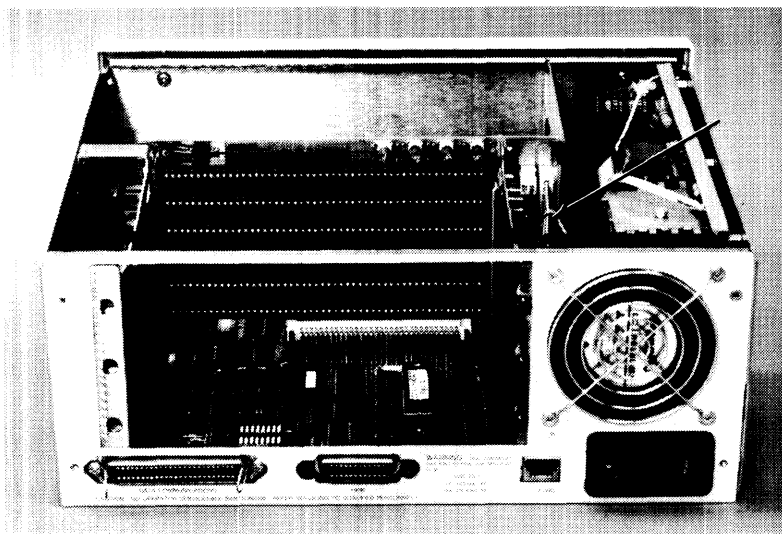
Power Supply to I/O Connectorboard Cable Location

5. Now recheck the line fuse. If it is okay, the I/O connectorboard is defective. Otherwise, the power supply or wiring is defective.

6. If the line fuse is okay, check the Vdc across the fan terminals. If it is about 19 V, the fan is defective. Otherwise, locate the cable between the power supply and the I/O connectorboard (J2). Check the dc voltages in the cable.

J2

1 — +5V

— Ground

— +14V

— −14V
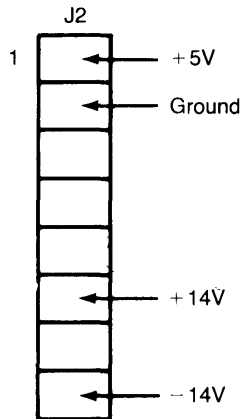
Cable Voltage Check Points

7. If the voltages are okay, the I/O connectorboard is defective. Otherwise, the power supply or wiring is defective.

Start

Check that
Computer is
Plugged in

Check Line
Voltage Switch
for Correct Setting

Check Line
Fuse Good and
Correct Value

Operate
Computer.
Turn off.
Check Fuse.

Fuse Open
?
— No

Check Vdc
at Fan
Terminals

≈19V? — Yes → Defective Fan
— No

Check −14, +5,
+14V on I/O
Connectorboard

Voltages
Okay? — Yes → Defective I/O Connectorboard
— No

Unplug I/O
Connectorboard
from Power
Supply (J2)

Check Vdc
in Cable J2

Voltages
Okay?
No → Defective
Power Supply
or Wiring

Fuse Open ? — Yes → Unplug ac Cable from Power Supply → Replace Fuse. Operate Computer. → Turn Computer Off. Check Fuse.

Fuse Open
?
No → Defective
Power Supply

Yes → Defective
ac Cable

Figure 8-3. Dead Unit Troubleshooting Flowchart

Power Supply Voltage Check

If the power supply is functioning but you suspect a problem with a voltage level, check the appropriate test points as shown in Figure 8-4. The various voltages should be within the specifications listed in Table 8-3.

Table 8-3. Power Supply Specifications

Voltage	Voltage Tolerance	Maximum Current	Ripple	Used By
− 14 V	− 13.30 to − 18.00 V	0.7 A	140 mV	Fan, I/O connectorboard
− 12 V	− 11.50 to − 12.40 V	0.6 A	200 mV	CPU board, I/O connectorboard
+ 5 V	5.125 to 5.275 V	13 A	50 mV	All assemblies
+ 12 V	11.50 to 12.40 V	1.6 A	200 mV	CPU board, I/O connectorboard
+ 14 V	13.30 to 18.00 V	2.0 A	140 mV	I/O connectorboard

Table 8-4. Power Supply Test Points

Voltage	Test Point to Ground
− 14 V	I/O connectorboard connector J2 pin 8
− 12 V	RS-232 connector pin 11
+ 5 V	RS-232 connector pin 36
+ 12 V	RS-232 connector pin 10
+ 14 V	I/O connectorboard connector J2 pin 6

Note that the + 5 V line to the I/O connectorboard contains fuses. Therefore, the test point could indicate proper voltage, but any interface may not be powered.

Front of I/O Connectorboard
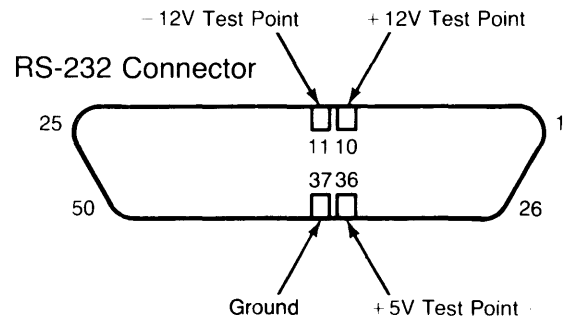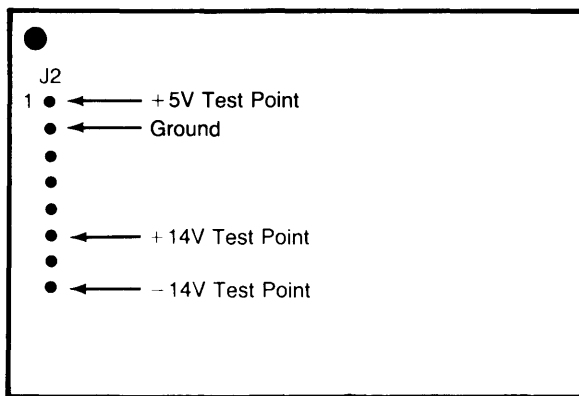
Figure 8-4. Power Supply Test Points

Live Unit Procedure

A live unit is one which has a properly functioning power supply, but will not execute some instructions. Live units often are very difficult to troubleshoot, since a problem with the system bus anywhere in the computer can shut the entire bus down and prevent the execution of any instructions, even those from the turn-on self-test.

The live unit procedure is a method for finding the defective assembly which prevents the unit from executing instructions. It assumes that the power supply has been checked and found to be operating properly, and that the turn-on self-test has been attempted and will not operate (that is, it stalls in a meaningless state, or will not start at all).

If the power supply has not been checked or is not operating properly, refer to the dead unit procedure. If the turn-on self test operates (that is, it runs through to completion and either displays a failure or initiates a system booting procedure, or it stalls in a meaningful state), refer to the turn-on self-test.

The live unit procedure is presented here as a series of steps, and in Figure 8-5 as a flowchart.

To troubleshoot a live unit, follow these steps:

1. Turn the computer off and remove all the cards from the backplane. Remove the top cover and check or swap fuses F2 to F4.
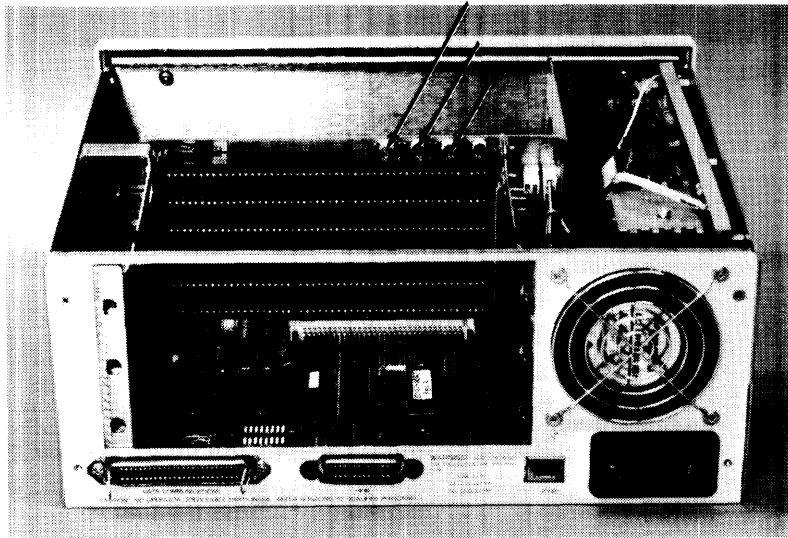
Fuses F2 to F4 Location

2. Turn the computer on and check the self-test LEDs. If they halt displaying 44 (0100 0100), skip to step 4.
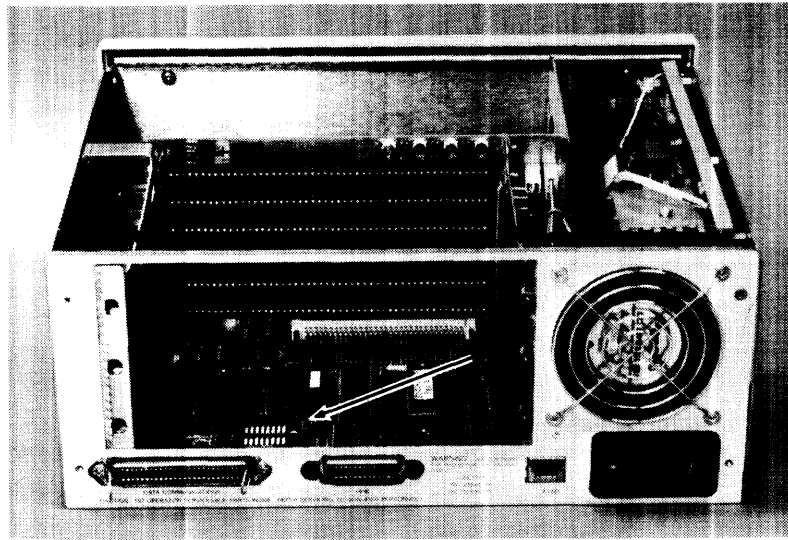
Self-test LEDs Location

3. If the LEDs do not display 44, swap the processor board. Then recheck the self-test LEDs. If they now display 44, the processor board was defective. If they still do not display 44, the I/O connectorboard is defective.

4. If the LEDs display 44, switch the computer off and re-install the RAM card containing the top 16K bytes of RAM into the computer. It is the one with the address switch segments all set the same.

5. Turn the computer on and observe the self-test LEDs. If the LEDs go through to 00 (all off), reinstall the remaining accessory cards one at a time, turning the computer off before each one.

6. Turn the computer on and observe the LEDs during self-test after installing each card. The card which prevents self-test from running through to 00 is defective.

7. If the LEDs do not go through to 00, recheck fuses F2 to F4. If they are all okay, the RAM card is probably defective. Try a different RAM card.

8. If more than one fuse is open, the I/O connectorboard is defective. If only one fuse is defective, move the RAM card to a different, non-adjacent slot. Turn the computer on for a few seconds, then check the two good fuses. If they are both good, the connectorboard is defective. If one is open, the RAM card is defective.

```
                    ┌──────────┐
                    │  Start   │
                    └────┬─────┘
                         │
                         ▼
                 ┌──────────────┐
                 │ Remove All   │
                 │ Cards from   │
                 │ Backplane    │
                 └──────┬───────┘
                        │
                        ▼
   ┌──────────────┐          ┌──────────────┐
   │ Check or Swap│          │  Processor   │
   │Fuses F2-4 on │          │  Board was   │
   │ I/O          │          │  Defective   │
   │ Connectorboard│         └──────┬───────┘
   └──────┬───────┘                 │ Yes
          │                         │
          ▼                      ◇ Do
   ┌──────────────┐            LEDs = 44   No   ┌──────────────┐
   │    Turn      │               ?  ──────────►│ Defective I/O│
   │  Computer    │                             │ Connectorboard│
   │    On        │                             └──────────────┘
   └──────┬───────┘
          │
          ▼
       ◇ Do          No   ┌──────────────┐
     LEDs = 44  ─────────►│   Swap       │
         ?                │  Processor   │
          │ Yes          │   Board      │
          │              └──────────────┘
          ▼
   ┌──────────────┐
   │ Replace Top  │
   │ 16K of RAM   │
   │ in Computer  │
   └──────┬───────┘
          │
          ▼
       ◇ Do        Yes  ┌──────────────┐      ◇ Do         No  ┌──────────────┐
     LEDs = 00  ───────►│ Re-install   │────► LEDs = 00  ─────►│ Last Card    │
         ?              │ Cards One    │          ?            │ Installed is │
          │ No         │ at a Time    │       │ Yes           │ Defective    │
          │            └──────────────┘       └───────────────┤ (loop)       │
          ▼                                                    └──────────────┘
   ┌──────────────┐     ◇ Fuses      No  ┌──────────────┐
   │Recheck Fuses │───► Okay?  ─────────►│ Defective I/O│
   │F2-4 on I/O   │        │             │ Connectorboard│
   │Connectorboard│        │ Yes         └──────────────┘
   └──────────────┘        │
                           ▼
                    ┌──────────────┐
                    │  Defective   │
                    │  RAM Card    │
                    └──────────────┘
```

Figure 8-5. Live Unit Flowchart

Turn-on Self-test

The turn-on self-test is a troubleshooting tool which can be used to test a unit which can execute some instructions, but still fails to operate properly. This means that the power supply, processor, CPU bus, boot ROMs and at least the first 16K bytes of RAM are functioning. If any of these are not known to be functional, refer to the initial troubleshooting procedure and flowchart.

The turn-on self-test checks many portions of the computer and produces error and status messages on the CRT. It also displays error codes on the self-test LED display located on the rear edge of the processor board, and annunciates the seven least-significant digits of the error code on the speaker.
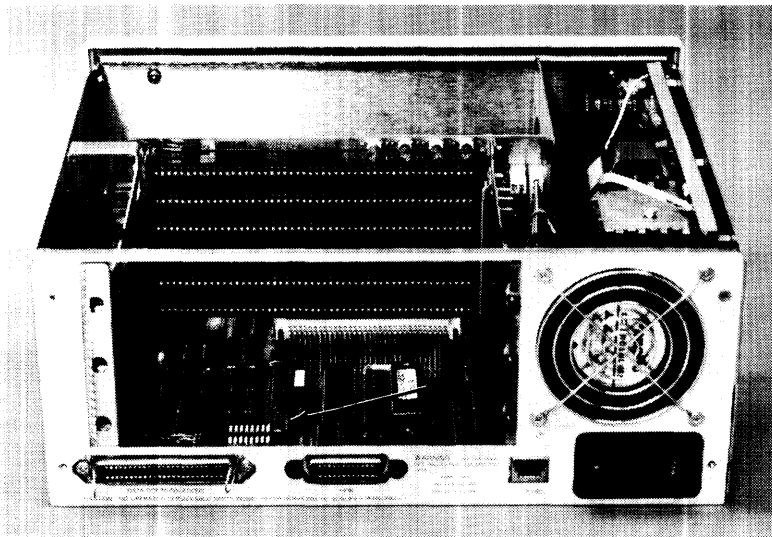
Self-test LEDs Location

The LEDs are read from back to front. The speaker represents a 0 with a low-pitched beep and a 1 with a high-pitched beep.

Self-test starts by turning all of the self-test LEDs on, then quickly turning them off from back to front. It then starts the tests of individual sections. If this routine does not occur, not enough hardware is operating for the self-test to be meaningful. Refer to the initial troubleshooting procedure.

Self-test can be made to run continuously. This is accomplished by enabling the CST switch on the processor board.
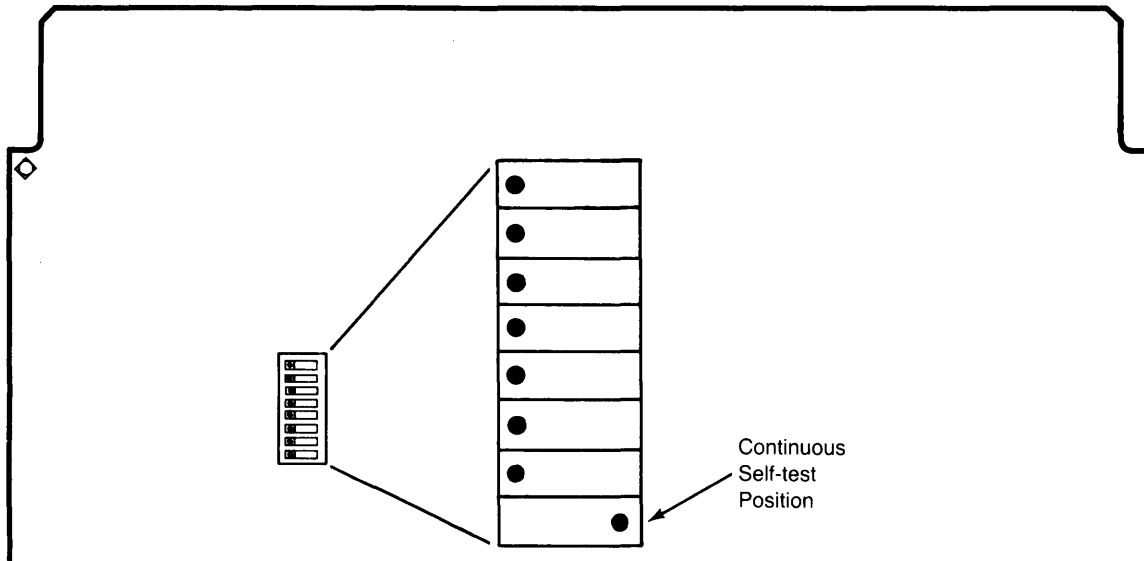
CST Switch Location

Self-test Sequence

The self-test consists of a sequence of tests which check individual sections of the computer. The names of the tests and the status of the LED display are as follows:

Self-test Sequence

(A filled circle indicates a lit LED.)

Test	LED display	Hex equivalent
Top 16K RAM	○○○○ ○●○○	04
Keyboard	○○○● ○○●○	12
Boot ROM	○○○○ ○○●●	03
Internal HP-IB	○○○● ○●○○	14
I/O card	○○●X XXXX	20 to 3F
ROM checksum	○○○○ ●●○●	0D
RAM	○○○○ ●○○●	09

This test sequence runs once upon turn-on, then initiates a system booting procedure if all hardware passed. If a failure was detected, one of two things happens: self-test will stall, with the number of the stalled test indicated in the LED display, or self-test will complete and the LED display will indicate an error code for the highest priority failure encountered.

If self-test completes and displays an error code, the beeper will annunciate the seven least-significant digits of the error code.

Running the Self-test

To run the turn-on self-test, follow this procedure:

1. Turn the computer on and observe the self-test LED display.
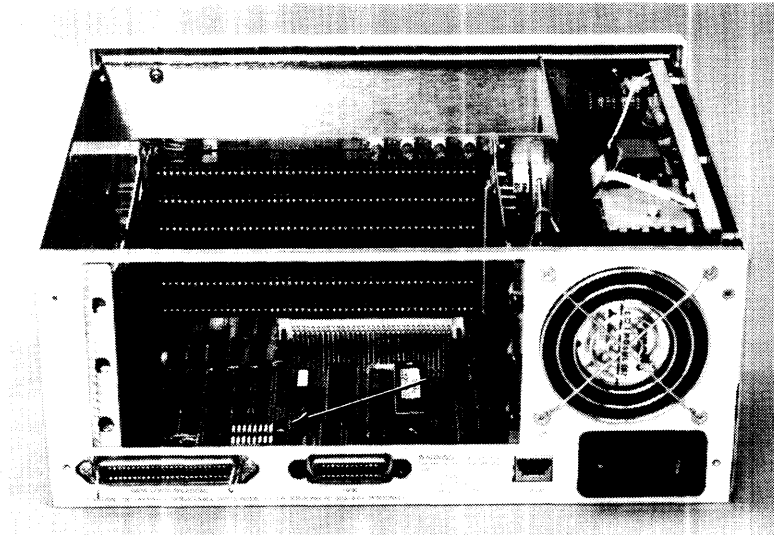
Self-test LEDs Location

All the LEDs should turn on, then turn off in sequence from back to front. Then they should start displaying test numbers. If the LEDs fail to go through this routine or display meaningless data, not enough of the computer is functioning for the self-test to produce results. Refer to the initial troubleshooting procedure.

2. If the self-test generates error messages, a hardware problem exists. The defective section is indicated by the displayed number according to this chart:

Boot ROM Error Codes

(A filled circle represents a lit LED.)

LEDs	Hexadecimal Equivalent	Probable Failure	What to Do
○○○○ ○○○○	00	No Failure Detected	
○●○○ ○●○○	44	Top RAM Failed Test	Check RAM Addressing
○●○● ○○●○	52	No Keyboard DTACK	Replace Processor Board
○●○● ○●○○	54	No HP-IB DTACK	Replace Processor Board
○●○● ●●●○	5E	No Alpha DTACK	Replace Video Interface
○●○● ●●●●	5F	No Graphics DTACK	Replace Video Interface
○●●X XXXX	60 to 7F	I/O Card at XXXXX no DTACK	Replace I/O Card at Select Code XXXXX
○●●○ ●○○●	69	No RS-232 DTACK	Replace Processor Board
●○○○ ○○○●	81	CPU Failed	Replace Processor Board
●○○○ ○○●●	83	Boot ROM Failed Checksum	Replace Processor Board
●○○○ ○●○○	84	Top RAM Failed Test	Check RAM Addressing Replace Processor Board
●○○○ ●○○●	89	RAM Failure	Check RAM Addressing Replace Processor Board
●○○○ ●○●○	8A	Insufficient RAM	Check RAM Addressing Replace Processor Board
●○○○ ●●○●	8D	ROM Operating System Failed Checksum	Replace ROM Operating System Replace Processor Board Replace I/O Connectorboard
●○○● ○○●○	92	Keyboard Processor Failed	Replace Processor Board
●○○● ○●○○	94	HP-IB Failed	Replace Processor Board
●○○● ●○○○	98	DMA Card Failed	Replace DMA Card Replace Processor Board
●○○● ●●●○	9E	Alpha Failed	Replace Video Interface
●○○● ●●●●	9F	Graphics Failed	Replace Video Interface
●○●X XXXX	A0 to BF	I/O Card at XXXXX Failed	Replace I/O Card at Select Code XXXXX Replace Processor Board Replace I/O Connectorboard
●●●● ●●●●	FF	LEDs Never Accessed	Replace Processor Board

Boot ROM Beeper Codes

The beeper annunciates the seven least-significant bits. A high beep indicates a 1 and a low beep indicates a 0.

A high first beep indicates an internal peripheral failed. A low first beep indicates an internal peripheral failed to DTACK. Therefore, if the first beep is low, the certainty of knowing what board failed is high. If the first beep is high, the certainty is low.

Refer to the appropriate section of this chapter for further information on isolating the problem.

Processor Test

The entire processor section is located on the processor board. The assembly involved is:

     09817-69511   Processor board

This is an exchange board.

Processor Test

The processor test does a write-read check of the CPU registers.

If the processor test fails, the following LED display and CRT message are presented:

LED Display	CRT Message	Probable Cause	What to Do
1000 0001	None	Defective CPU	Replace Processor Board

Boot ROM Memory Test

The boot ROM is located on the processor board. The assembly involved is:

09817-69511 Processor board

This is an exchange board.

Boot ROM Test

The boot Read-Only Memory (ROM) test performs a checksum on the boot ROM. While it is running, the LEDs display 0000 0011, and the CRT displays the message

   "BOOTROM X.Y"

where X.Y is the boot ROM version.

If the boot ROM test fails, the following LED display and CRT message are presented:

LED Display	CRT Message	Probable Cause	What to Do
1000 0011	"BOOTROM X.Y FAILED"	Defective Boot ROM	Replace Processor Board

RAM Memory Tests

Random-Access Read/Write Memory (RAM) is contained on optional RAM cards which are installed in the accessory slots. The assemblies involved are:

09826-69524   256K byte RAM card
98257-69524   1M byte RAM card

These are exchange items.

Top RAM Test

The self test needs 16K bytes of RAM to operate properly. The top RAM test checks to see that there are 16K bytes of good RAM available at the top of memory. While it is running, the LEDs display 0000 0100.

If the top RAM test fails, the following LED displays and CRT messages are presented:

LED Display	CRT Message	Probable Cause	What to Do
1000 0100	NEED GOOD RAM ABOVE FFC000	Defective RAM in top 16K bytes	Check addressing of RAM
1000 1010	Insufficient RAM for self-test	Replace RAM card for self-test	

RAM Pattern Test

The RAM pattern test checks all system RAM in the computer; that is, all RAM not dedicated to a specific purpose, such as the display. It exercises the RAM with an up/down march test. While it is running, the LEDs display 0000 1001, and the CRT displays the message

TESTING MEMORY

If the RAM pattern test fails, the following LED display and CRT message is presented:

LED Display	CRT Message	Probable Cause	What to Do
1000 1001	Memory Failed at XXXXXX W:ZZZZZZZZ, R:YYYYYYYY	RAM incorrectly addressed	Check RAM addressing
		Defective RAM	Replace RAM card

RAM Addressing

The size of the HP 9817 memory map is 16M bytes. Since 16M is 1000000 in hexadecimal, the memory map covers addresses from 000000 to FFFFFF (1000000 − 1). The top 7.5M bytes are reserved for RAM. Thus, RAM may occupy addresses from 880000 to FFFFFF.

The following addressing rules apply to add-on RAM:

1. It must start at the top of memory (that is, FFFFFF).
2. It must be contiguous.
3. It must not overlap.
4. It is limited to 7.5M bytes.

RAM can be visualized as a group of seven 1M byte blocks (plus a half-block), with each block covering the addresses from M00000 to MFFFFF, where M is a hexadecimal number from 9 thru F. For instance, the top 1M byte block covers the addresses from F00000 to FFFFFF.

Add-on RAM comes in two sizes, 1M byte (the 98257A card) and 256K bytes (the 98256A card). The 1M byte card occupies a 1M byte block. The 256K byte card occupies one-quarter of 1M byte block.

Checking a 1M Byte RAM Card Address

1M byte RAM card blocks cover addresses from M00000 to MFFFFF, where M is a hexadecimal number from 9 thru F. A four-segment switch determines the address. For instance, this switch is set to 1101:
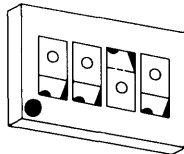
Binary	Hexadecimal
1101	D

Thus, this RAM card includes the addresses from D00000 to DFFFFF.

Checking a 256K Byte RAM Card Address

256K byte RAM card blocks cover addresses from MN0000 to MTFFFF, where M is a hexadecimal number from 8 thru F, N is a hexadecimal number 0, 4, 8 or C, and T equals N plus three. A six-segment switch determines the address. The left-most four segments of the switch determine the value of M, and the other two segments (and two implied segments) determine the values of N. For instance, this switch is set to 111101:
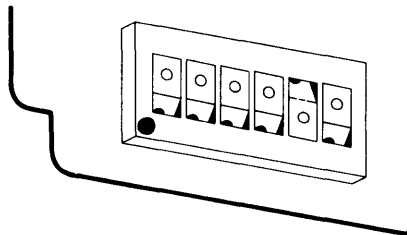
Binary	Hexadecimal
1111	F
01XX	4, 5, 6, 7

Thus, this RAM card includes the addresses from F40000 to F7FFFF.

Locating a Defective RAM Block

The RAM tests have error messages containing addresses of the form MNPQRS (hexadecimal). The RAM block causing an error is easily found using the paragraphs above on checking a RAM card address. Any RAM address MNPQRS is located on the card containing the address block MN0000 to MNFFFF. Convert the MN digits into binary, then find a RAM block with switch settings which match the binary number.

For instance, in the error message

Memory Failed at FB53A9 W:F58A8C2C, R:F78A8C2C

the defective RAM is on a board with a starting address of FB0000. FB in binary is 11111011. Thus the switch setting of the defective board would be:
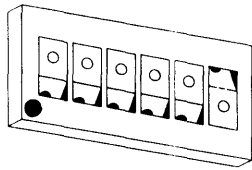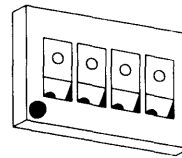
if a 256K RAM card,   or if a 1M RAM card.

Locate the board with this switch setting.

Keyboard Test

The keyboard section is made up of these assemblies:

09817-69511 Processor board
46020 Keyboard
46020-60001 Keyboard Cable

It is an exchange assembly.

Keyboard Test

The keyboard electronics are located on the keyboard and the processor board. The keyboard test only checks the electronics mounted on the processor board. If the electronics fails the test, one of these messages will appear on the CRT:

LED Display	CRT Message	Probable Cause	What to Do
1001 0010	Keyboard Failed	Defective Keyboard Hardware	Replace Processor Board
0101 0010	Keyboard Missing	Defective I/O Select Hardware	

The keyboard test checks the keyboard electronics located on the processor board. It does not check the electronics on the keyboard or the keyswitches. To check these areas, load a language system and press any suspected key or combination of keys. If the keyboard test passes, but some keys do not register correctly, the problem probably lies in the keyboard or cable. To decide which, make note of keys which are incorrect. If the same key or keys are repeatedly incorrect, the keyboard is probably defective. Otherwise, the cable is probably defective.

I/O Tests

The I/O section is made up of these assemblies:

09817-69511	Processor board
09817-66561	I/O Connectorboard
	External I/O cards

All of these boards are exchange boards except the connectorboard.

The I/O tests check the internal HP-IB interface and all external interfaces. The internal RS-232 interface is treated as an external interface located at select code 9.

If any interface hardware fails the test, one of these failure codes will be displayed:

LED Display	CRT Message	Probable Cause	What to Do
1001 0100	HP-IB Failed	Defective HP-IB Hardware	Replace Processor Board
0101 0100	HP-IB Missing	Defective I/O Select Hardware	
101P QRST	HP9862X at SC Failed	Defective I/O Card at select code SC (PQRST is the binary form of select code SC)	Replace I/O Card at select code SC
011P QRST	HP9862X at SC Missing	Defective Processor or I/O Board at select code SC	Replace Connectorboard Replace Processor Board

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CAUTION

ALWAYS TURN THE COMPUTER OFF BEFORE CONNECTING OR DISCONNECTING INTERFACE CABLES.

Replacement Parts	Chapter
	9

Introduction

This chapter contains part number information for the HP 9817 Computer. This information is listed in the following manner:

1. Electronic Assemblies
2. Miscellaneous Parts
3. Cable Assemblies
4. Labels
5. Case Parts
6. Fasteners

The part number information is presented in this manner:

Parts may be ordered from Corporate Parts Center (CPC). The address is:

Corporate Parts Center
333 Logue Avenue
Mountain View, California 94042 U.S.A.

The telephone number is: (415) 968-9200

Customers may order exchange boards and receive credit for the defective board by ordering the replacement board from their local HP office and then returning the defective board to the local HP office for credit.

Parts Warranty. The warranty on replacement parts is 90 days.

PC Boards. PC boards referred to in the parts lists are fully loaded boards. Empty PC boards are not available.

Rebuilt Assemblies. Part numbers of the form XXXXX-69XXX refer to rebuilt assemblies in the exchange program. Numbers of the form XXXXX-66XXX or -67XXX refer to new assemblies.

ID PROMS. When replacing the processor board, BE SURE to remove the ID PROM from it and install it on the replacement board. The ID PROM (part number 09817-80001) is ordered through normal channels, that is, the repair order or Hot-Line to CPC for the Customer Engineer and HP Order Processing for customers. Here is the procedure for ordering replacement ID PROMs:

1. On-site Customer Engineer determines that an ID PROM has failed and hot-lines the PROM from CPC. The hot-line order must include:

   a. The Model Number

   b. The serial number

   c. The CE's name

2. CPC orders the PROM from the supplying division.

3. The supplying division programs the PROM using the serial and Model number information supplied.

4. The supplying division ships the programmed PROM to the field office.

5. The Customer Engineer installs the PROM in the computer.

Top Shroud
09817-64104

Top Plate
09817-04104

09817-64103
Top Cover (Early Production)

0515-0407

7101-0591
I/O Cover Plate

1410-1207
Voltage Select Wheel

2110-0686
2110-0687
Fuse Holders

09817-41201
I/O Card Guide

2110-0055
Line Fuse(4ANB)

09817-66552
Power Supply

5041-1203
On/Off Pushbutton

09817-40100
Baffle

09817-67901
Speaker Assembly

09826-66524
256K Byte Memory

98204-66577
Graphics Interface

09817-80000
ID PROM

98204-66578
Alpha Interface

0515-0219

09817-41200
Power Supply Guide

09817-61601
Dc Cable

09817-61600
Ac Cable and
Power Receptacle

09817-64105
Rear Panel Assembly

2110-0520
Internal Fuse

09817-66563
I/O Connectorboard

09817-66511
Processor Board

0624-0458

09817- 04102
Front Sub-Panel

0403-0302
PC Board Guide

0403-0427
Rear Foot

0515-0211

09817-60100
Base Assembly

09121-48303
Front Foot

0515-0219

09817-84002
Front Panel Label

09817-60201
Front Panel Assembly

09817-47700
Light Pipe

1400-0560
LED Clamp

09817-61602
LED Cable

Figure 9-1. Exploded View

Table 9-1. 9817 Assemblies

Check Digit	HP Part Number	Total Quantity	Description	Repair Status
7	09817-66511	1	Processor Board	Exchange
6	09817-66552	1	Power Supply	Non-exchange
9	09817-66563	1	I/O Connectorboard	Non-exchange
9	09817-80000	1	ID PROM	Non-exchange
3	09826-66524		256K Byte Memory	Exchange
1	98257-66524		1M Byte Memory	Exchange
1	98204-66577		Graphics Inter.	Exchange
2	98204-66578		Alpha Interface	Exchange
7	46020AA		ASCII Keyboard	Exchange
8	35721-60001		35721A Monitor	Exchange
9	35721-60002		35721B Monitor	Exchange
0	35721-60003		35721C Monitor	Exchange

Table 9-2. Miscellaneous Parts

Check Digit	HP Part Number	Total Quantity	Description
2	2110-0055	1	Line Fuse (4 A Normal)
6	2110-0520	4	Internal Fuse
6	09817-47700	1	Light Pipe
1	09817-67901	1	Speaker Assembly
7	7101-0591	1	I/O Cover Plate
0	5041-1203	1	On/Off Pushbutton
6	09817-40100	1	Baffle
8	1400-0560	1	LED Clamp
5	2110-0686	1	U.S. Fuse Holder
6	2110-0687	1	European Fuse Holder
3	1410-1207	1	Line Voltage Select Wheel

Table 9-3. Case Parts

Check Digit	HP Part Number	Total Quantity	Description
9	09817-64103	1	Top Cover (Early Production)
4	09817-04104	1	Top Plate
0	09817-64104	1	Top Shroud
1	09817-64105	1	Rear Panel Assembly
0	09817-60201	1	Front Panel Assembly
8	09817-60100	1	Base Assembly
9	09817-41200	1	Power Supply Guide
0	09817-41201	2	I/O Card Guide
1	0403-0302	2	PC Board Guide
6	09121-48303	2	Front Foot
1	0403-0427	2	Rear Foot
2	09817-04102	1	Front Sub-panel

Table 9-4. Internal Cable Assemblies

Check Digit	HP Part Number	Total Quantity	Description
5	09817-61600	1	Ac Cable and Power Receptacle
6	09817-61601	1	Dc Cable
7	09817-61602	1	LED Cable

Table 9-5. External Cable Assemblies

Check Digit	HP Part Number	Total Quantity	Description
3	46020-60001		Keyboard Cable
9	8120-4221		Video Cable
8	HP 10833B		HP-IB Cable

Table 9-6. Labels

Check Digit	HP Part Number	Total Quantity	Description
5	7120-3428	1	Identification Label
9	09817-84002	1	Front Panel Label
0	09817-84003	1	Power Matrix Label

Table 9-7. Fasteners

Check Digit	HP Part Number	Total Quantity	Description
8	0515-0211	3	M3X0.5
6	0515-0219	9	M3X0.5
4	0515-0407	2	M3X0.5
2	0535-0031	4	Hex Nut
6	0624-0458	4	Screw 8-16

Reference

Boot ROM Error Codes

LEDs	Hexadecimal Equivalent	Probable Failure	What to Do
○○○○ ○○○○	00	No Failure Detected	
○●○○ ○●○○	44	Top RAM Failed Test	Check RAM Addressing
○●○● ○○●○	52	No Keyboard DTACK	Replace Processor Board
○●○● ○●○○	54	No HP-IB DTACK	Replace Processor Board
○●○● ●●●○	5E	No Alpha DTACK	Replace Video Interface
○●○● ●●●●	5F	No Graphics DTACK	Replace Video Interface
○●●X XXXX	60 to 7F	I/O Card at XXXXX no DTACK	Replace I/O Card at Select Code XXXXX
○●●○ ●○○●	69	No RS-232 DTACK	Replace Processor Board
●○○○ ○○○●	81	CPU Failed	Replace Processor Board
●○○○ ○○●●	83	Boot ROM Failed Checksum	Replace Processor Board
●○○○ ○●○○	84	Top RAM Failed Test	Check RAM Addressing Replace Processor Board
●○○○ ●○○●	89	RAM Failure	Check RAM Addressing Replace Processor Board
●○○○ ●○●○	8A	Insufficient RAM	Check RAM Addressing Replace Processor Board
●○○○ ●●○●	8D	ROM Operating System Failed Checksum	Replace ROM Operating System Replace Processor Board Replace I/O Connectorboard
●○○● ○○●○	92	Keyboard Processor Failed	Replace Processor Board
●○○● ○●○○	94	HP-IB Failed	Replace Processor Board
●○○● ●○○○	98	DMA Card Failed	Replace DMA Card Replace Processor Board
●○○● ●●●○	9E	Alpha Failed	Replace Video Interface
●○○● ●●●●	9F	Graphics Failed	Replace Video Interface
●○●X XXXX	A0 to BF	I/O Card at XXXXX Failed	Replace I/O Card at Select Code XXXXX Replace Processor Board Replace I/O Connectorboard
●●●● ●●●●	FF	LEDs Never Accessed	Replace Processor Board

Product History	Chapter
	11

Introduction

This chapter documents product changes vs. serial numbers. Additions to this product history are made through Manual Updates.

s/n 2409A-00101 ⎫
     2419A-00101 ⎬   First production units. No changes
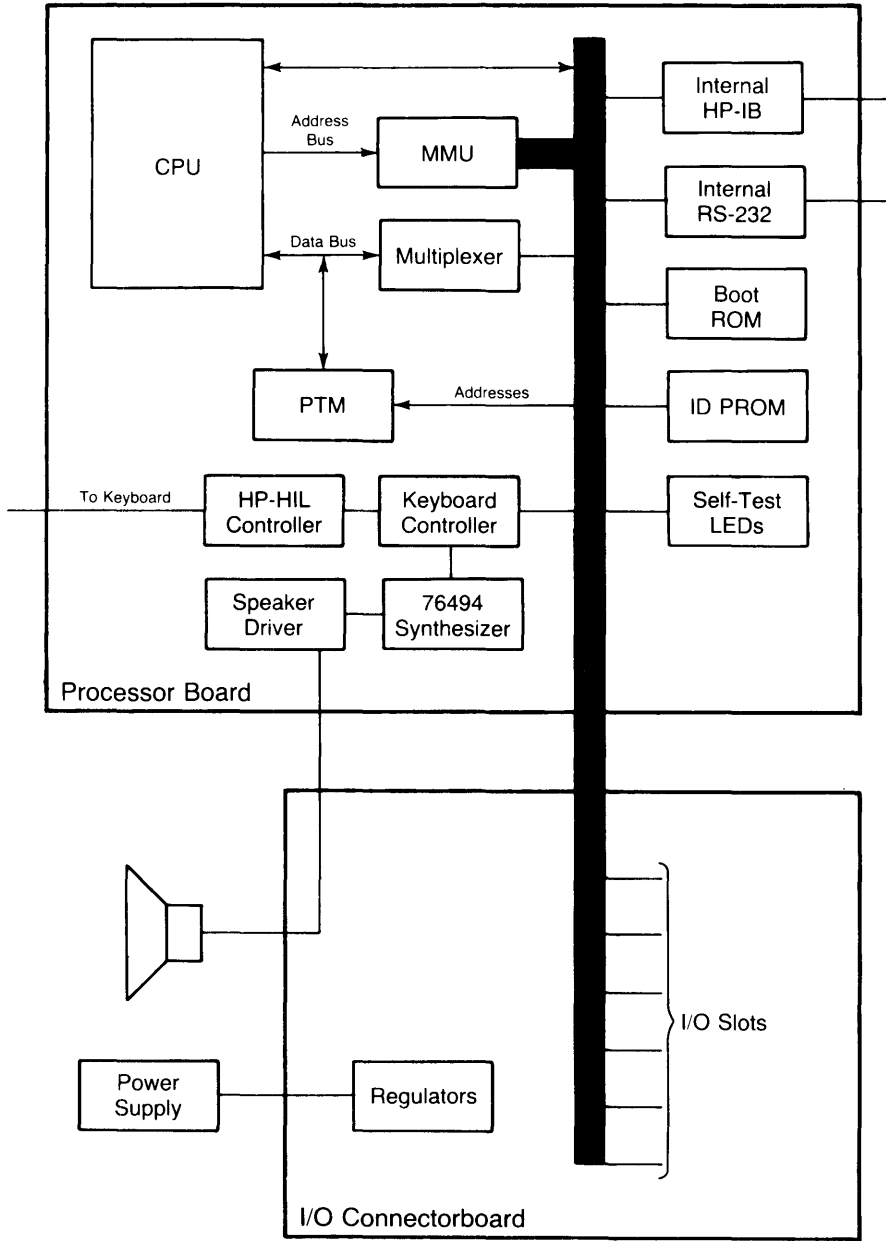   2420A-00101 ⎭

Diagrams	Chapter 12

Figure 12-1. Block Diagram
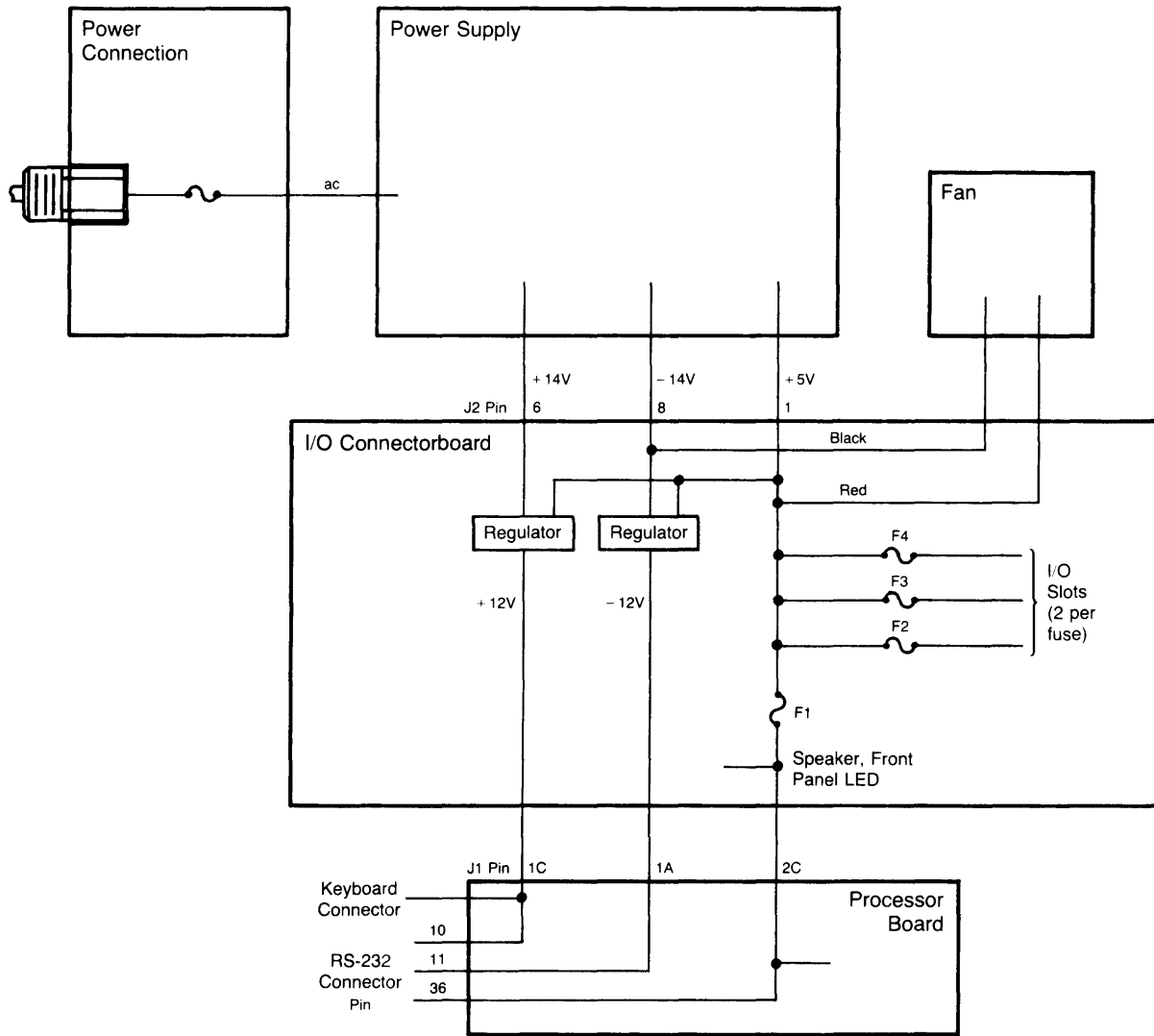
Figure 12-2. Power Distribution Diagram

Start

Turn Computer On

Refer to Dead Unit Procedure

No

Does Fan Run?

Yes

No

Does Front Panel LED Light?

Yes

Does Fan Run?

Yes

No

Does Self Test Run?

No

Refer to Live Unit Procedure

Yes

Determine Whether Problem is Confined to External Cards

Confined to Backplane?

Yes

Check Fuses F2-4 on I/O Connectorboard

No

Refer to Boot ROM Error Codes

Disconnect Fan. Check Vdc on Fan Terminal.

≈19V?

Yes

Defective Fan

No

Unplug I/O Connectorboard from Power Supply (J2)

Check −14V in Cable J2 (Pin 8)

−14V Okay?

Yes

Defective I/O Connectorboard

No

Defective Power Supply

Check Fuse F1 on I/O Connectorboard

Fuse Okay?

No

Disconnect Processor Board. Replace Fuse.

Yes

Disconnect Front Panel LED. Check Vdc on LED Terminal.

Operate Computer. Check Fuse.

Fuse Okay?

Yes

Defective Processor Board

No

Defective I/O Connectorboard

≈5V?

Yes

Defective LED

No

Unplug I/O Connectorboard from Power Supply (J2)

Check +5V in Cable J2 (Pin 1)

+5V Okay?

No

Defective Power Supply

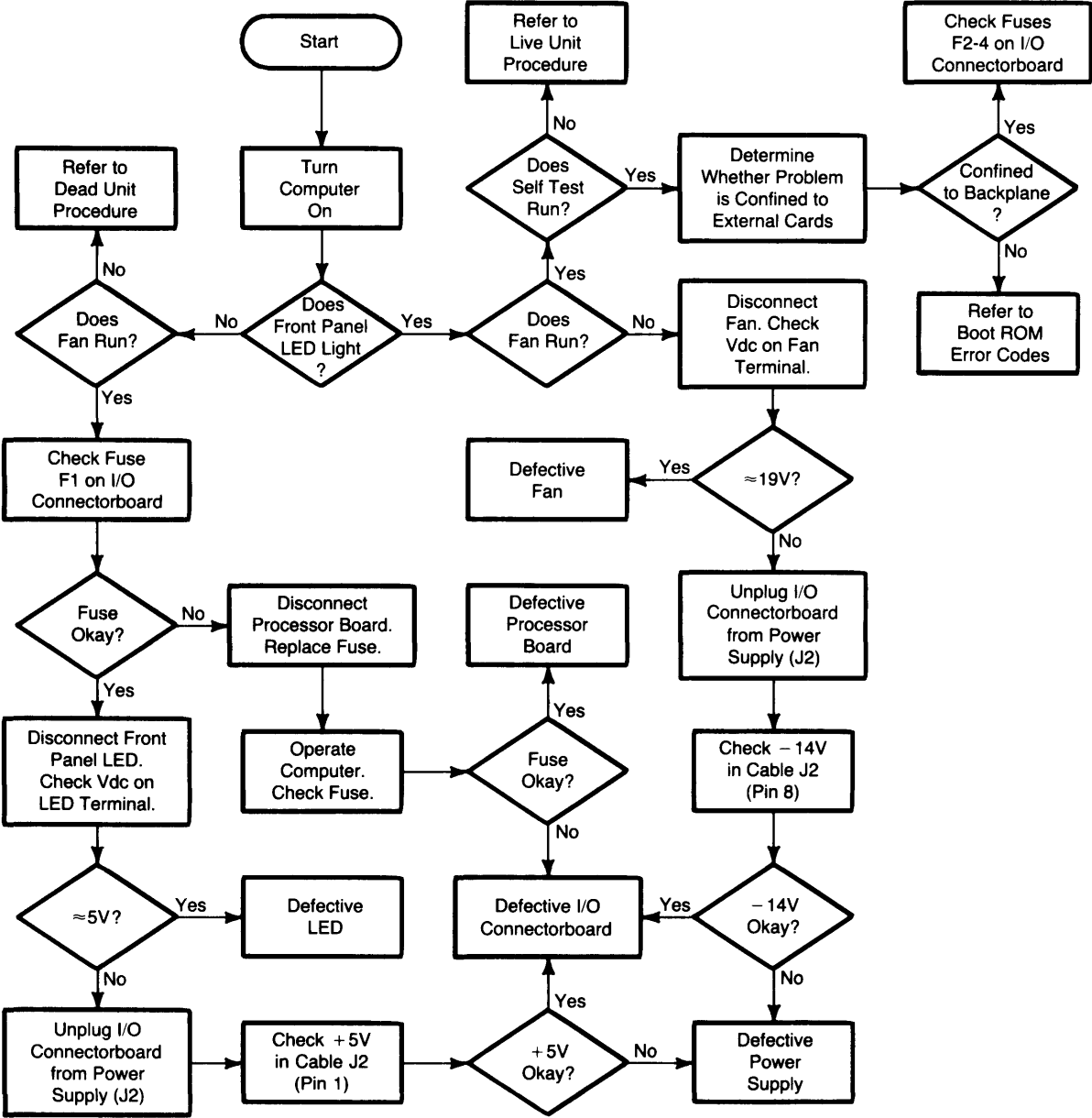Yes

Defective I/O Connectorboard

Figure 12-3. Initial Troubleshooting Flowchart

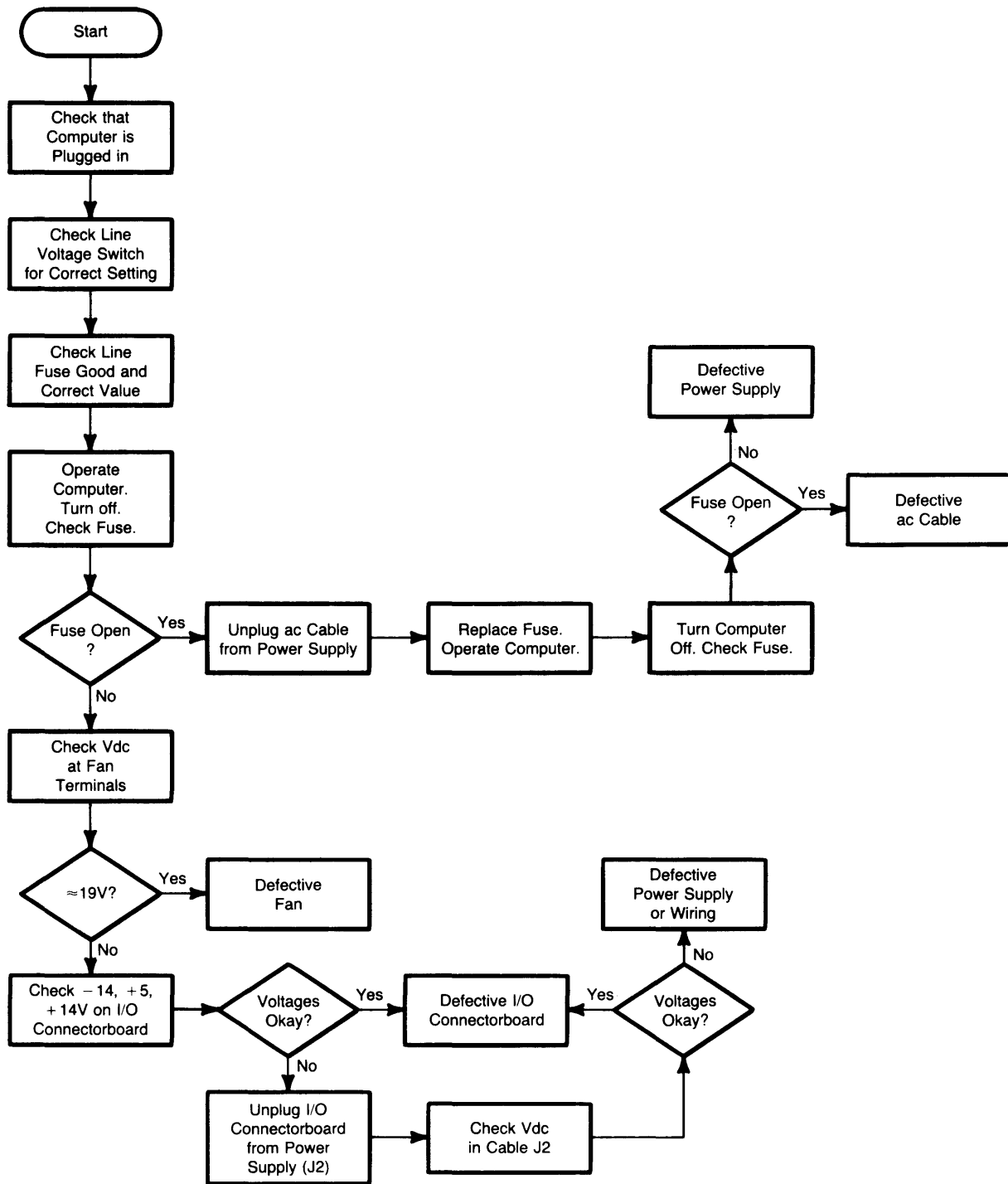**Figure 12-4. Dead Unit Troubleshooting Flowchart**
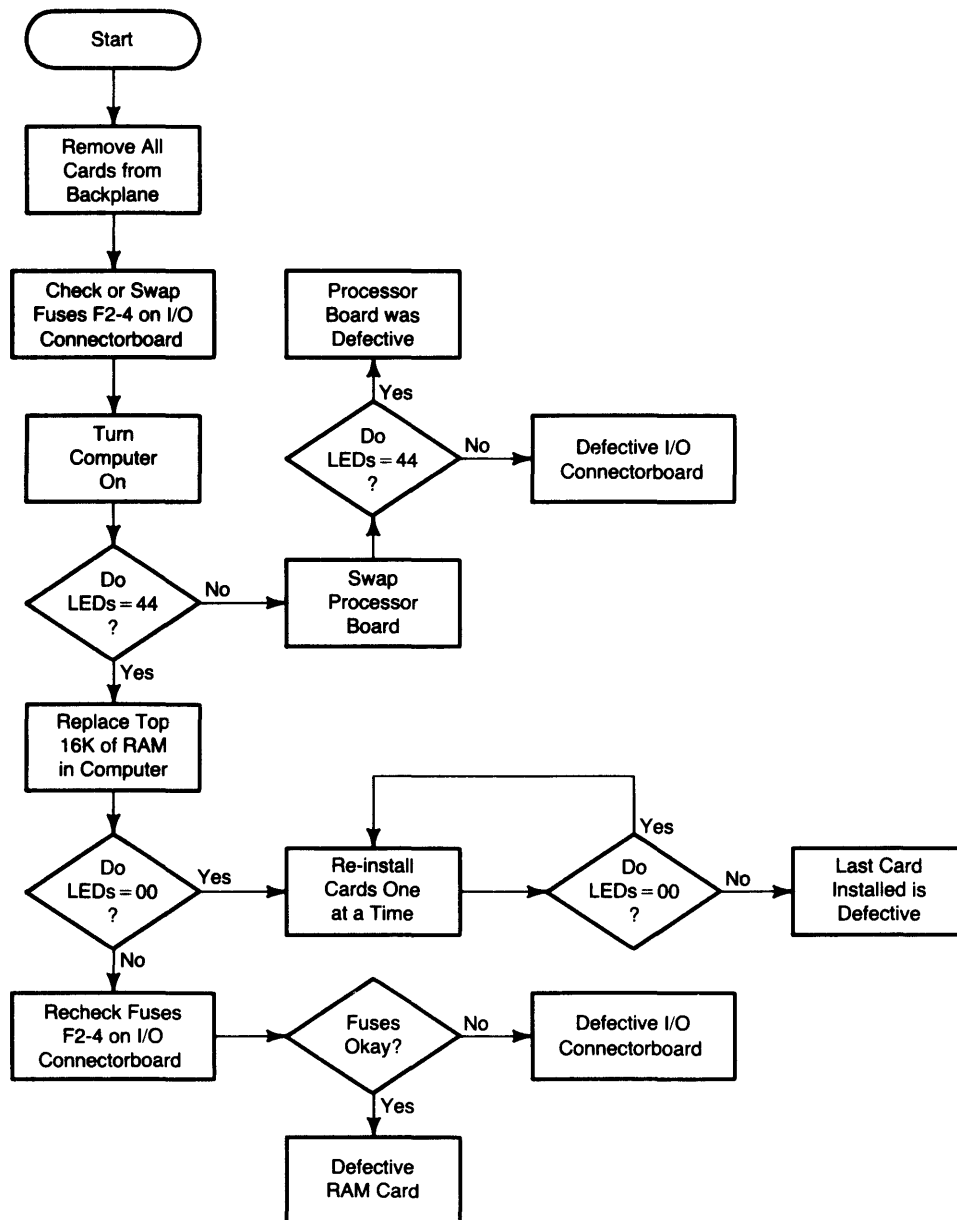
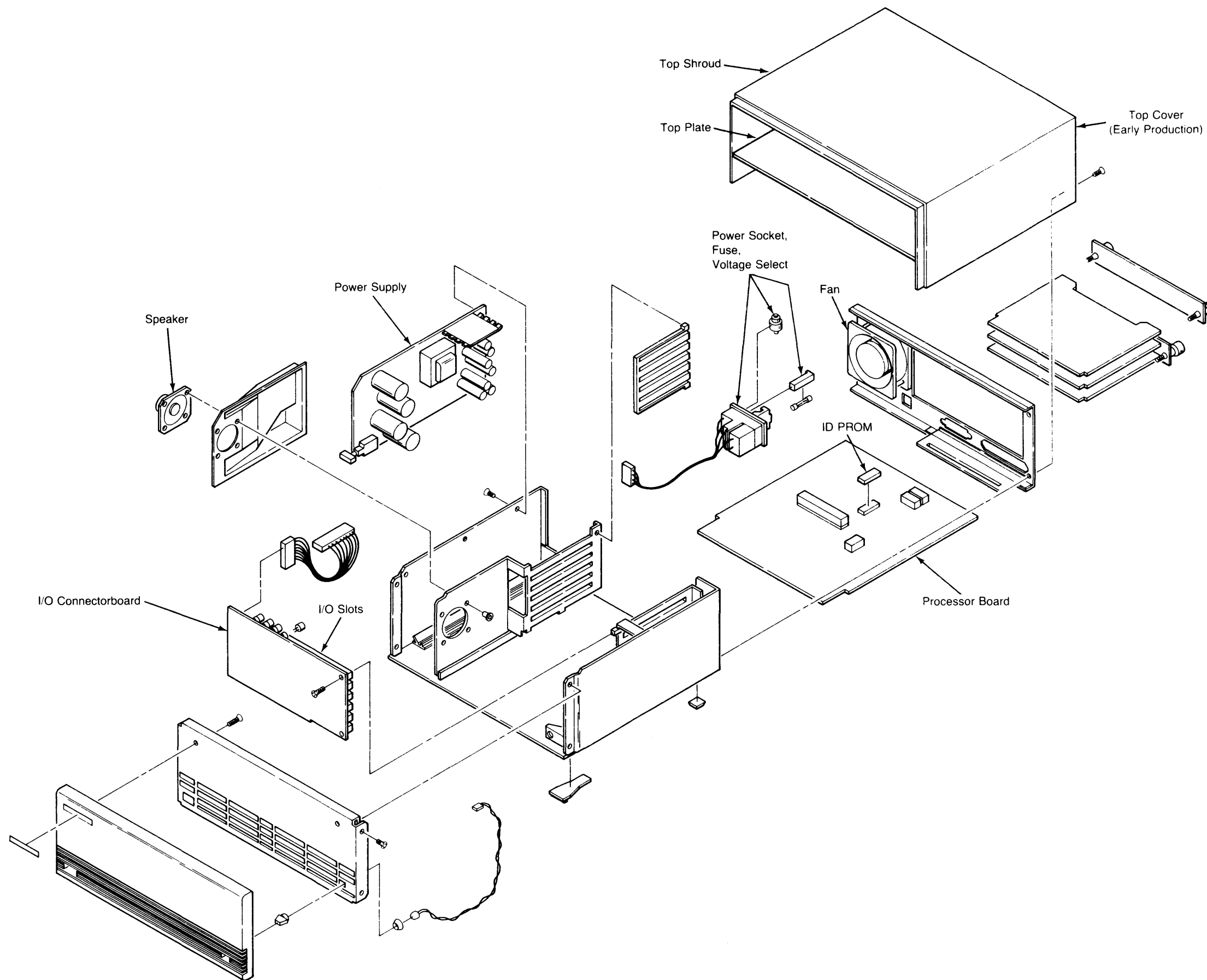**Figure 12-5. Live Unit Troubleshooting Flowchart**

Figure 12-6. Computer Assembly Locations

**HEWLETT
PACKARD**